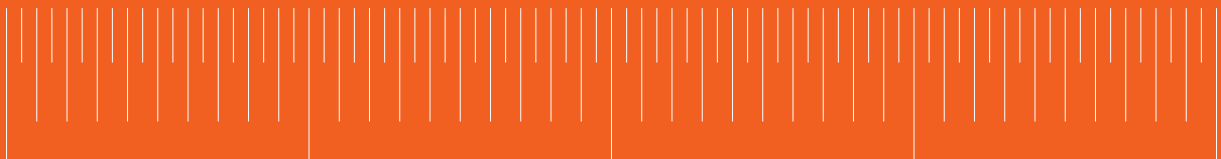


# Mitutoyo

Catalog No. US-1002



































## Measuring Instruments Catalog



# Mitutoyo Precision Measuring Machines Trusted throughout the World

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# Mitutoyo North America Operations



● **Mitutoyo America Corporation**  
■ **Corporate Headquarters**  
 Aurora, Illinois USA  
 (630) 820-9666



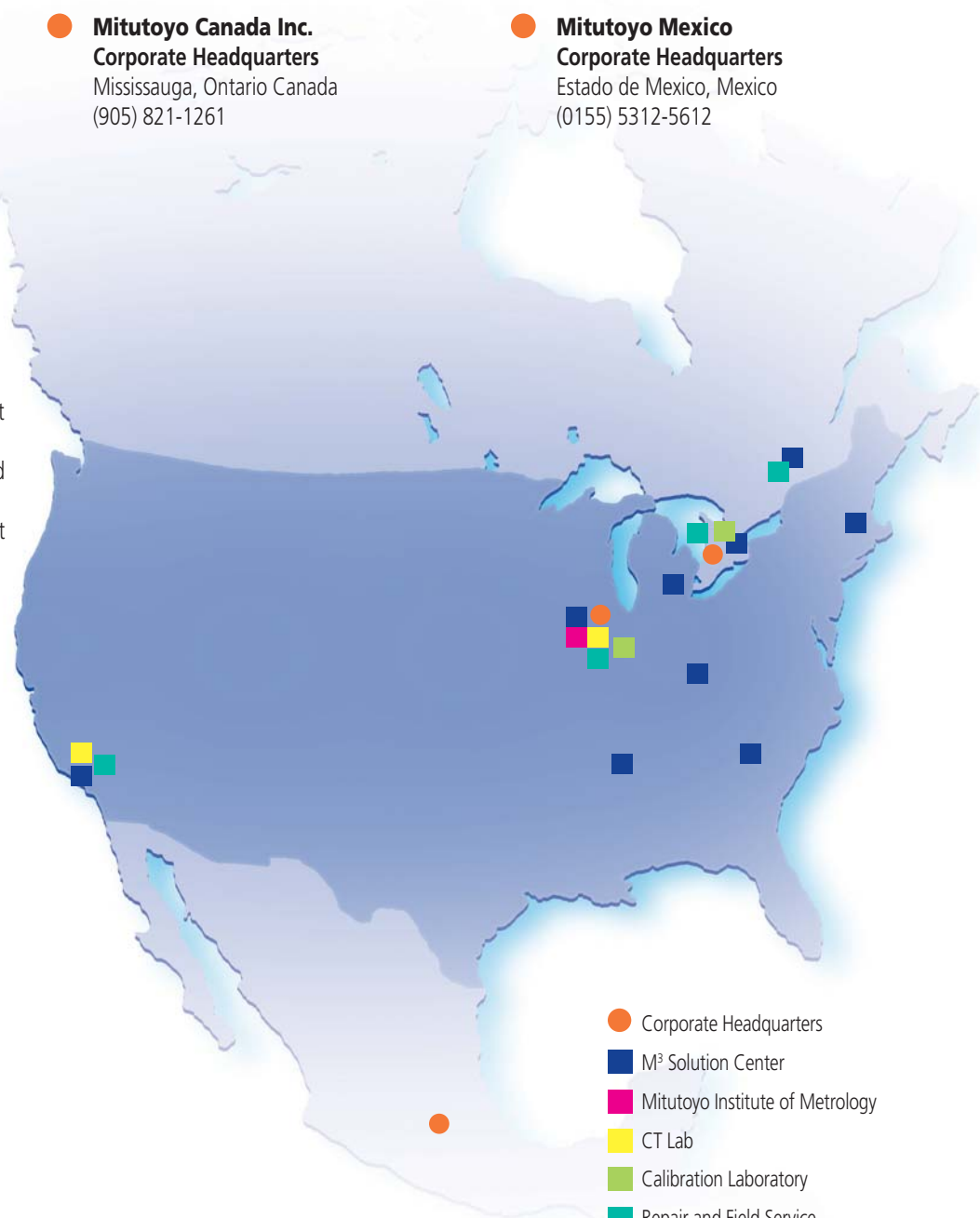
● **Mitutoyo Canada Inc.**  
● **Corporate Headquarters**  
 Mississauga, Ontario Canada  
 (905) 821-1261



● **Mitutoyo Mexico**  
● **Corporate Headquarters**  
 Estado de Mexico, Mexico  
 (0155) 5312-5612

## Mitutoyo America Corporation

Established in 1963, Mitutoyo America Corporation has locations all across the US and Canada, including corporate offices, sales offices, M<sup>3</sup> Solution Centers, calibration and repair laboratories, and research and development facilities. Mitutoyo America offers a full product line of precision measuring tools, instruments and equipment. Mitutoyo provides a comprehensive metrology organization, with dependable product and technical support, state-of-the-art calibration and repair services, unmatched education and training programs and cutting-edge research and development. As the leading metrology company in the world, Mitutoyo is committed to future product development that applies breakthrough technologies to its full range of dimensional measurement tools, instruments and systems. With the belief that providing high quality metrology goods and services to its customers will in turn, allow its customers to provide high quality product to theirs, Mitutoyo continues to develop the most advanced and sophisticated metrology equipment available. "Precision is our profession" is not just the company motto, but also the principle by which every Mitutoyo employee stands when serving our customers.



- Corporate Headquarters
- M<sup>3</sup> Solution Center
- Mitutoyo Institute of Metrology
- CT Lab
- Calibration Laboratory
- Repair and Field Service
- Micro Encoder Inc R&D

**Mitutoyo**

**Precision is our Profession**

One number to serve you better:  
**Toll Free: 1-888-MITUTOYO (1-888-648-8869)**  
 (US Inquiries Only)



**Aurora**  
 945 Corporate Blvd  
 Aurora, IL 60502  
 (630) 978-5385



**Aurora**  
 958 Corporate Blvd  
 Aurora, IL 60502  
 (630) 978-5385



**Elk Grove Village Calibration Lab**  
 2025 Tonne Road  
 Elk Grove Village, IL 60007  
 (847) 593-7750



## M<sup>3</sup> Solution Center

Mitutoyo Tools and instruments can be seen and demonstrated conveniently at any one of nine Mitutoyo M<sup>3</sup> Centers nationwide. These centers are fully equipped featuring operational models of the latest Mitutoyo tools and instruments. By appointment or walk-in basis, product demonstrations at M<sup>3</sup> Solution Centers are carried out by our experienced, highly trained staff. Contact your Mitutoyo distributor or the Mitutoyo regional office near you for more information.



**Birmingham**  
 2100 Riverchase Ctr, Suite 105  
 Birmingham, AL 35244  
 (205) 988-3705



**Detroit**  
 44768 Helm Street  
 Plymouth, MI 48170  
 (734) 459-2810



**Boston**  
 1 Park Drive, Suite 11  
 Westford, MA 01886  
 (978) 692-8765



**Los Angeles**  
 16925 East Gale Ave.  
 City of Industry, CA 91745  
 (626) 961-9661



**Charlotte**  
 11515 Vanstory Drive, Suite 150  
 Huntersville, NC 28078  
 (704) 875-8332



**Toronto**  
 2121 Meadowvale Blvd.  
 Mississauga, Ontario Canada  
 L5N 5N1  
 (905) 821-1261



**Cincinnati**  
 6220 Hi-Tek Court  
 Mason, OH 45040  
 (513) 754-0709



**Montréal**  
 7075 Place, Robert-Joncas, Suite 129  
 Montreal, Quebec Canada  
 H4M 2Z2  
 (514) 337-5994

## Product Sales Support

---

- Product Information
- Product and Part Availability
- Pricing
- Quotations

**All Products** Phone: (630) 978-5385  
Fax: (630) 978-3501

**CMM** Phone: (630) 723-3516  
Fax: (630) 978-5388

**Vision** Phone: (630) 723-3516  
Fax: (630) 978-5388

**Form** Phone: (734) 738-5529  
Fax: (734) 459-0455

**Canada** Phone: (905) 821-1261  
**www.mitutoyo.ca** Fax: (905) 821-4968

## M<sup>3</sup> Solution Centers

---

- Demonstrations
- Application support

**All US Offices** Phone: (888) 648-8869

**Toronto** Phone: (905) 821-1261

**Montreal** Phone: (514) 337-5994

## Technical Support Services

---

- Hardware / Software Technical Support
- Application support

### Precision Tools and Instruments (Hardware)

Phone: (630) 820-9785 option 2  
Email: tech.support@mitutoyo.com

### CMM/Vision/Form Software

Phone: (630) 820-9785 option 1  
Email: software.support@mitutoyo.com

### MeasurLink Software

Phone: (630) 723-3588  
Email: measurlink@mitutoyo.com

## Calibration Services

---

### Elk Grove, IL Calibration Lab



Phone: (847) 593-7750  
Fax: (847) 593-7758

### Canadian Calibration Lab



Phone: (905) 821-1261  
Fax: (905) 821-4968

## Other Product Services

---

### Repair Services

**Aurora** Phone: (630) 820-3334  
Fax: (630) 820-2530

**Los Angeles** Phone: (626) 961-9661  
Fax: (626) 961-8931

### Canadian Repair Services



Phone: (905) 821-1261  
Fax: (905) 821-4968

### Field Services (CMM and Precision Instruments)



Phone: (630) 820-9590  
Fax: (630) 820-9110

### Parts—General

Phone: (630) 978-5385  
Fax: (630) 978-3501

### Parts—CMM and Precision Instruments

Phone: (630) 820-9590  
Fax: (630) 820-9110

### Canadian Field Services



Phone: (905) 821-1261  
Fax: (905) 821-4968

## Education Services

---

- Seminars
- Textbooks

### Mitutoyo Institute of Metrology

Phone: (630) 978-6469  
Fax: (630) 978-6471

## Marketing Services

---

- Product Literature

**US** Phone: (630) 723-3614  
Fax: (630) 978-5394

**Canada** Phone: (905) 821-1261  
Fax: (905) 821-4968



## M<sup>3</sup> Solution Center

\*M<sup>3</sup> = Mitutoyo, Measurement, Metrology

### Product Demonstration / Application Support (M<sup>3</sup> Solutions Centers)

With 9 locations across North America, Mitutoyo's M<sup>3</sup> Solutions Centers provide hands on access to the full range of Mitutoyo Precision Tools and Instruments, including the latest technologies Mitutoyo has to offer. Available to walk-ins or by appointment, highly trained and industry experienced applications engineers will provide product demonstrations, answer questions and assist in the development of application specific solutions. Contact your Mitutoyo distributor or the M<sup>3</sup> Solutions Center in your area for additional information.

### Sales Support / Customer Service

To ensure fast, dependable responses to all product-related questions and needs, Mitutoyo America Corporation's Sales Support group is available to assist with information on all Mitutoyo precision tools and instruments. Friendly, knowledgeable customer service representatives can provide product specifications, availability, and pricing as well as recommend a local distributor authorized to sell Mitutoyo Products.

### Technical Support Services

Fast technical support for all Mitutoyo precision tools, instruments and software applications is available to distributors and customers through Mitutoyo's technical support services and is just one phone call away. Highly skilled engineers and technicians possessing a wealth of knowledge on all Mitutoyo products can provide product information, answer technical questions, and offer application guidance. Contract programming and inspection services utilizing our most advanced technologies are also available.

### Software Application Training

To maximize the value of Mitutoyo precision instrument purchases, Mitutoyo America Corporation provides customized end user training for all CMM, Vision, Form, and data management (MeasurLink) software applications it provides. Highly trained, industry knowledgeable software instructors provide hands-on one-on-one or group training with content appropriate for all customer needs. Training classes can be arranged at locations throughout North America.

### Calibration Services

Mitutoyo America Corporation's calibration laboratory utilizes state-of the art technology to calibrate virtually any metrology tool made. A2LA accredited to ISO/IEC 17025 for testing and calibration labs, this facility employs professional calibration technicians to provide NIST-traceable accuracy certification as well as calibration services for Mitutoyo and other manufacturer's gages and gage blocks. Canadian calibration laboratory is CLAS accredited to ISO/IEC 17025.

# Company Profile



## Field Services



Committed to ensuring value and longevity in its products, Mitutoyo America Corporation provides field services for all of its major measuring instrument products. A fully-staffed field service department will arrange the installation, repair, and A2LA accredited calibration of Mitutoyo metrology instruments. Capable of certifying calibration on any service visit, Mitutoyo's accredited field service technicians get equipment back into production quickly. Service agreements are available at the time of equipment purchase. Canadian field service laboratory is CLAS accredited to ISO/IEC 17025.

## Repair Services



Mitutoyo America Corporation's in-house repair facilities are capable of repairing the full range of Mitutoyo precision tools. Skilled technicians provide quality repairs backed by a full 90-day warranty on parts and labor. When sending an item in for repair, address the package to one of our two repair centers, 958 Corporate Blvd., Aurora, IL, or City of Industry, CA. Please include complete contact information in the package, including a fax number and a brief description of the problem. Once received, the item will be evaluated for repair requirements, and a repair estimate will be faxed to you. When sending in items for repair, it is not necessary to contact us in advance for a returned merchandise or returned goods authorization (RMA or RGA). Repair service is also available in Canada.

## Parts Center

Mitutoyo America Corporation's product parts center stocks over 10,000 individual parts for Mitutoyo products. Same day and 24-hour shipping is available for most part requests. For CMM parts, a specialized group is available to provide additional CMM support services. A Mitutoyo product parts catalog is available on CD-ROM through the Parts Center or through a local Mitutoyo distributor.

## Mitutoyo Institute of Metrology

The Mitutoyo Institute of Metrology provides training and metrology seminars on topics ranging from basic principles of metrology to advanced QC studies. The institute is a premier educational facility within the quality field with over 5,000 students per year taking our courses. Seminars are led by experienced, industry-leading professionals at locations across the US and Canada. Seminars can also be arranged for customers to be held at their own facilities. All courses are approved for CEU credits (Continued Education Units).

## CT Lab / MEI (R&D and Software Development)

Mitutoyo America's CT Labs and Micro Encoder Inc. are part of an international network of Mitutoyo research and development facilities charged with the responsibility of developing breakthrough technologies for application to the company's range of dimensional measurement tools, instruments and systems and for the advancement of the field of metrology in general. Highly skilled developers and engineers utilize cutting edge development tools to produce the most advanced and sophisticated metrology software and equipment available. Mitutoyo America Corporation is a Microsoft® Gold Certified Partner, providing the entire organization access to a host of Microsoft® development tools and support, and helping to ensure that Mitutoyo software applications work reliably in Microsoft® OS and network environments.

## Sales Solutions / System Design and Integration

Standard products alone can not always solve our customers' measuring challenges. That is why we established an engineering group to integrate our equipment into application-engineered custom solutions. Called Sales Solutions, this group can sometimes create a solution as simple as fixturing. Other times, the answer may require integration of the latest metrology equipment, process control software and robotics to create an automated metrology cell. Whatever the level of complexity, for application and integration of measurement technologies simple or complex – proven or newly emerging – you can count on Sales Solutions to develop a plan to improve your process capability, productivity and bottom line.

- Flexible turn-key measurement solutions
- Automated measurement cell technology

Since the establishment of its first micrometer factory in Japan in 1934, Mitutoyo Corporation has expanded its operations throughout the world. Mitutoyo currently maintains 58 sales, manufacturing, engineering and R&D facilities in 28 countries, and has established a superior network of distributors in 80 countries internationally. Mitutoyo retains its premier status as a leading global metrology provider by satisfying the unique precision measurement needs of every regional market that it serves.



Headquarters



Tohoku Sales Section



Kita-Kanto Sales Section 1



Koshin Sales Section



Nakatsugawa Plant



Shiwa Production Department



Kansai Sales Section 1



Seibu Sales Section



Kawasaki Plant



Kure Production Department



Miyazaki Plant



Tsukuba Laboratory



Utsunomiya Operations



Gohara Production Department



Kiyohara Production Department



- Headquarters
- Sales
- Service Center
- Calibration Center
- M<sup>3</sup> Solution Center
- Mitutoyo Institute of Metrology
- Research and Development Facility
- Manufacturing Facility

## Japan Headquarters

TEL (044) 813-8201 FAX (044) 813-8210

## Sales

### Tohoku Sales Section

TEL (022) 231-6881 FAX (022) 231-6884  
Sendai Office TEL (022) 231-6881  
Kooriyama Office TEL (024) 931-4331

### Kita-Kanto Sales Section 1

TEL (028) 660-6240 FAX (028) 660-6248  
Utsunomiya Office TEL (028) 660-6240  
Tsukuba Office TEL (029) 839-9139

### Kita-Kanto Sales Section 2

TEL (0270) 21-5471 FAX (0270) 21-5613  
Isezaki Office TEL (0270) 21-5471  
Niigata Office TEL (025) 281-4360  
Saitama Office TEL (048) 667-1431

### Minami-Kanto Sales Section 1

TEL (044) 813-1611 FAX (044) 813-1610  
Kawasaki Office TEL (044) 813-1611  
Tokyo Office TEL (03) 3452-0481

### Minami-Kanto Sales Section 2

TEL (046) 226-1020 FAX (046) 229-5450  
Atsugi Office TEL (046) 226-1020  
Fuji Office TEL (0545) 65-7008

## Koshin Sales Section

TEL (0266) 53-6414 FAX (0266) 58-1830  
Suwa Office TEL (0266) 53-6414  
Ueda Office TEL (0268) 26-4531

## Tokai Sales Section 1

TEL (0566) 98-7070 FAX (0566) 98-6761  
Anjo Office TEL (0566) 98-7070  
Hamamatsu Office TEL (053) 464-1451

## Tokai Sales Section 2

TEL (052) 741-0382 FAX (052) 733-0921  
Nagoya Office TEL (052) 741-0382  
Komaki Office TEL (0568) 74-7261  
Yokkaichi Office TEL (059) 350-0361

## Kansai Sales Section 1

TEL (06) 6613-8801 FAX (06) 6613-8817  
Osaka Office TEL (06) 6613-8801  
Kobe Office TEL (078) 924-4560

## Kansai Sales Section 2

TEL (077) 552-9408 FAX (077) 552-8174  
Ritto Office TEL (077) 552-9408  
Kanazawa Office TEL (076) 239-1807

## Chu-Shikoku Sales Section

TEL (082) 427-1161 FAX (082) 427-1163  
Higashihiroshima Office TEL (082) 427-1161  
Okayama Office TEL (086) 242-5625

## Seibu Sales Section

TEL (092) 411-2911 FAX (092) 473-1470  
Fukuoka Office TEL (092) 411-2911  
Kirishima Office TEL (0995) 48-5842

## Service Centers

### Techno-Service Business Division

TEL (044) 813-8213 FAX (044) 822-4136

### Tohoku & Kita-Kanto Service Section

TEL (028) 660-6280 FAX (028) 660-6257

### Minami-Kanto Service Section 1 /Section 2

TEL (045) 938-5718 FAX (045) 938-5721

### Koshin Service Section

TEL (0266)53-5495 FAX (0266)58-1830

### Tokai Service Section 1

TEL (052) 731-7100 FAX (052) 731-6110

### Tokai Service Section 2

TEL (0566) 96-0745 FAX (0566) 96-0747

### Kansai Service Section

TEL (06) 6613-8813 FAX (06) 6613-8818

### Chu-Shikoku Service Section

TEL (082) 427-1164 FAX (082) 427-1163

### Seibu Service Section

TEL (092) 411-2909 FAX (092) 482-7894

### Overseas Service Support Department

TEL (044) 813-8247 FAX (044) 822-4136

## Calibration Centers

### Utsunomiya Calibration Center

TEL (028) 656-1432 FAX (028) 656-8443

## Kawasaki Calibration Center

TEL (044) 813-8214 FAX (044) 813-8223

## Hiroshima Calibration Center

TEL (0823) 74-5462 FAX (0823) 73-5199

## M<sup>3</sup> Solution Centers

### UTSUNOMIYA

TEL (028) 660-6240 FAX (028) 660-6248

### TOKYO

TEL (044) 813-1611 FAX (044) 813-1610

### SUWA

TEL (0266) 53-6414 FAX (0266) 58-1830

### ANJO

TEL (0566) 98-7070 FAX (0566) 98-6761

### OSAKA

TEL (06) 6613-8801 FAX (06) 6613-8817

### HIROSHIMA

TEL (082) 427-1161 FAX (082) 427-1163

### FUKUOKA

TEL (092) 411-2911 FAX (092) 473-1470

## Mitutoyo Metrology Institute

### Mitutoyo Metrology Institute (Tokyo)

TEL (044) 822-4124 FAX (044) 822-4000

### Mitutoyo Metrology Institute (Osaka)

TEL (06) 6613-8810 FAX (06) 6613-8821

## Research and Development Facilities

### Tsukuba Laboratory

TEL (029) 839-1022 FAX (029) 839-1023

### Research & Development Division

TEL (044) 822-4137 FAX (044) 822-4127

## Manufacturing Facilities

### Kawasaki Plant

#### Production Department

TEL (044) 822-4132 FAX (044) 844-9835

### Utsunomiya Operations

#### Production Department 1

TEL (028) 656-1117 FAX (028) 656-2164

### Utsunomiya Operations

#### Production Department 2

TEL (028) 656-1309 FAX (028) 656-2164

### Utsunomiya Operations

#### Kiyohara Production Department

TEL (028) 667-4811 FAX (028) 667-4810

### Nakatsugawa Plant

#### Production Department

TEL (0573) 68-8201 FAX (0573) 68-8210

### Hiroshima Operations

#### Kure Production Department

TEL (0823) 71-6111 FAX (0823) 73-2193

### Hiroshima Operations

#### Shiwa Production Department

TEL (082) 433-2077 FAX (082) 433-2695

### Hiroshima Operations

#### Gohara Production Department

TEL (0823) 77-1721 FAX (0823) 77-1724

### Miyazaki Plant

TEL (0985) 86-2591 FAX (0985) 86-0827

### Onomi Plant

TEL (08895) 7-2036 FAX (08895) 7-2178



# Global Network



Mitutoyo Research Center Europe B.V.



Mitutoyo Europe GmbH & Mitutoyo Deutschland GmbH



Mitutoyo (UK) Ltd.



Mitutoyo France S.A.R.L.



Mitutoyo Italiana S.R.L.



Mitutoyo Nederland B.V.



Mitutoyo Belgium N.V.



Mitutoyo Schweiz AG



Mitutoyo Scandinavia AB



Mitutoyo Cesko, s.r.o.



Mitutoyo Polska Sp.z o.o.



Mitutoyo Hungaria Kft.



Mitutoyo Asia Pacific Pte. Ltd. Regional Headquarters



Mitutoyo (Malaysia) Sdn. Bhd.



PT. Mitutoyo Indonesia



Mitutoyo (Thailand) Co., Ltd.



Mitutoyo Vietnam Co., Ltd.



Mitutoyo South Asia Pvt. Ltd.

## Europe

**Mitutoyo Europe GmbH**  
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**Mitutoyo Deutschland GmbH**  
Borsigstrasse 8-10, 41469 Neuss, GERMANY  
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**M<sup>3</sup> Solution Center Hamburg**  
Tempowerkring 9 im HIT-Technologiepark 21079 Hamburg, GERMANY  
TEL:49(40)791894-0 FAX:49(40)791894-50

**M<sup>3</sup> Solution Center Leonberg**  
Steinbeisstrasse 2, 71229 Leonberg, GERMANY  
TEL:49(7152)6080-0 FAX:49(7152)608060

**M<sup>3</sup> Solution Center Berlin**  
Paradiesstrasse 208, 12526 Berlin, GERMANY  
TEL:49(30)2611 267 FAX:49(30)26 29 209

**M<sup>3</sup> Solution Center Eisenach**  
im tbz Eisenach, Heinrich-Ehrhardt-Platz, 99817 Eisenach, GERMANY  
TEL:49(3691)88909-0 FAX:49(3691)88909-9

**M<sup>3</sup> Solution Center Ingolstadt**  
Ziegeleistrasse 66, 85055 Ingolstadt, GERMANY  
TEL:49(841)954920 FAX:49(841)9549250

**Mitutoyo CTL Germany GmbH**  
Neckarstrasse 1/8, 78727 Oberndorf, GERMANY  
TEL:49(7423)8776-0 FAX:49(7423)8776-99

## U.K.

**Mitutoyo (UK) Ltd.**  
Joule Road, West Point Business Park, Andover, Hampshire SP10 3UX UNITED KINGDOM  
TEL:44(1264)353123 FAX:44(1264)354883

**M<sup>3</sup> Solution Center Coventry**  
Unit6, Banner Park, Wickmans Drive, Coventry, Warwickshire CV4 9XA, UNITED KINGDOM  
TEL:44(2476)426300 FAX:44(2476)426339

**M<sup>3</sup> Solution Center Halifax**  
Lowfields Business Park, Navigation Close, Elland, West Yorkshire HX5 9HB, UNITED KINGDOM  
TEL:44(1422)375566 FAX:44(1422)328025

**M<sup>3</sup> Solution Center East Kilbride**  
The Baird Building, Rankine Avenue, Scottish Enterprise Technology Park, East Kilbride G75 0QF, UNITED KINGDOM  
TEL:44(1355)581170 FAX:44(1355)581171

## France

**Mitutoyo France**  
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**M<sup>3</sup> Solution Center LYON**  
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**M<sup>3</sup> Solution Center STRASBOURG**  
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**M<sup>3</sup> Solution Center CLUSES**  
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TEL:39(0)11 9123995 FAX:39(0)11 9953202

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**M<sup>3</sup> Solution Center Alingsås**  
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**M<sup>3</sup> Solution Center Värnamo**  
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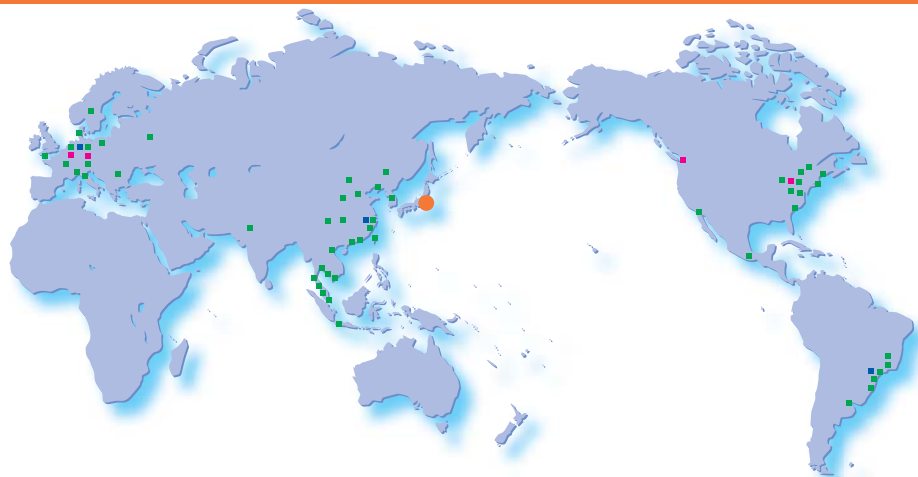
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- Manufacturing Facility



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# Meaning of Symbols

**ABSOLUTE**

## ABSOLUTE Linear Encoder

Mitutoyo's technology has realized the absolute position method (absolute method). With this method, you do not have to reset the system to zero after turning it off and then turning it on. The position information recorded on the scale is read every time. The following three types of absolute encoders are available: electrostatic capacitance model, electromagnetic induction model and model combining the electrostatic capacitance and optical methods. These encoders are widely used in a variety of measuring instruments as the length measuring system that can generate highly reliable measurement data.

### Advantages:

1. No count error occurs even if you move the slider or spindle extremely rapidly.
2. You do not have to reset the system to zero when turning on the system after turning it off\*1.
3. As this type of encoder can drive with less power than the incremental encoder, the battery life is prolonged to about 3.5 years (continuous operation of 20,000 hours)<sup>2</sup> under normal use.

\*1: Unless the battery is removed.

\*2: In the case of the ABSOLUTE Digimatic caliper. (electrostatic capacitance model)

## IP Codes

These are codes that indicate the degree of protection provided (by an enclosure) for the electrical function of a product against the ingress of foreign bodies, dust and water as defined in IEC standards (IEC 60529: 2001) and JIS C 0920: 2003. [IEC: International Electrotechnical Commission]

First characteristic numeral	Degrees of protection against solid foreign objects	
	Brief description	Definition
0	Unprotected	—
1	Protected against solid foreign objects of $\geq 50\text{mm}$ and greater	A $\geq 50\text{mm}$ object probe shall not fully penetrate enclosure*
2	Protected against solid foreign objects of $\geq 12.5\text{mm}$ and greater	A $\geq 12.5\text{mm}$ object probe shall not fully penetrate enclosure*
3	Protected against solid foreign objects of $\geq 2.5\text{mm}$ and greater	A $\geq 2.5\text{mm}$ object probe shall not fully penetrate enclosure*
4	Protected against solid foreign objects of $\geq 1.0\text{mm}$ and greater	A $\geq 1.0\text{mm}$ object probe shall not fully penetrate enclosure*
5	Protected against dust	Ingress of dust is not totally prevented, but dust that does penetrate must not interfere with satisfactory operation of the apparatus or impair safety.
6	Dust-proof	No ingress of dust allowed.
7	—	—
8	—	—

Second characteristic numeral	Degrees of protection against water	
	Brief description	Definition
0	Unprotected	—
1	Protected against vertical water drops	Vertically falling water drops shall have no harmful effects.
2	Protected against vertical water drops within a tilt angle of 15 degrees	Vertically falling water drops shall have no harmful effects when the enclosure is tilted at any angle up to 15° on either side of the vertical.
3	Protected against spraying water	Water sprayed at an angle up to 60° either side of the vertical shall have no harmful effects.
4	Protected against splashing water	Water splashed against the enclosure from any direction shall have no harmful effects.
5	Protected against water jets	Water projected in jets against the enclosure from any direction shall have no harmful effects.
6	Protected against powerful water jets	Water projected in powerful jets against the enclosure from any direction shall have no harmful effects.
7	Protection against water penetration	Ingress of water in quantities causing harmful effects shall not be possible when the enclosure is temporarily immersed in water under standardized conditions of pressure and time.
8	Protected against the effects of continuous immersion in water	Ingress of water in quantities causing harmful effects shall not be possible when the enclosure is continuously immersed in water under conditions which shall be agreed between manufacturer and user but which are more severe than for IPX7.

\*: For details of the test conditions used in evaluating each degree of protection, please refer to the original standard.

**IP65**

**IP66**

**IP67**



• Dust-tight + water jet protected IP65



• Dust-tight and water protected IP66



• Dust- and watertight IP67

## Independent Confirmation of Compliance

IP65, IP66 and IP67 protection level ratings for applicable Mitutoyo products have been independently confirmed by the German accreditation organization, TÜV Rheinland.



## Measuring Instruments Shipped with Inspection Certificate

Mitutoyo guarantees product quality as a leading precision measuring instrument manufacturer and ships measuring instruments with an inspection certificate that includes inspection data so that customers can use them with confidence.

Mitutoyo also calibrates the purchased measuring instrument and issues, for a fee, a calibration certificate that proves traceability to the relevant standard.

\* For the meaning of the inspection marks shown at left, refer to the detailed description of each product.

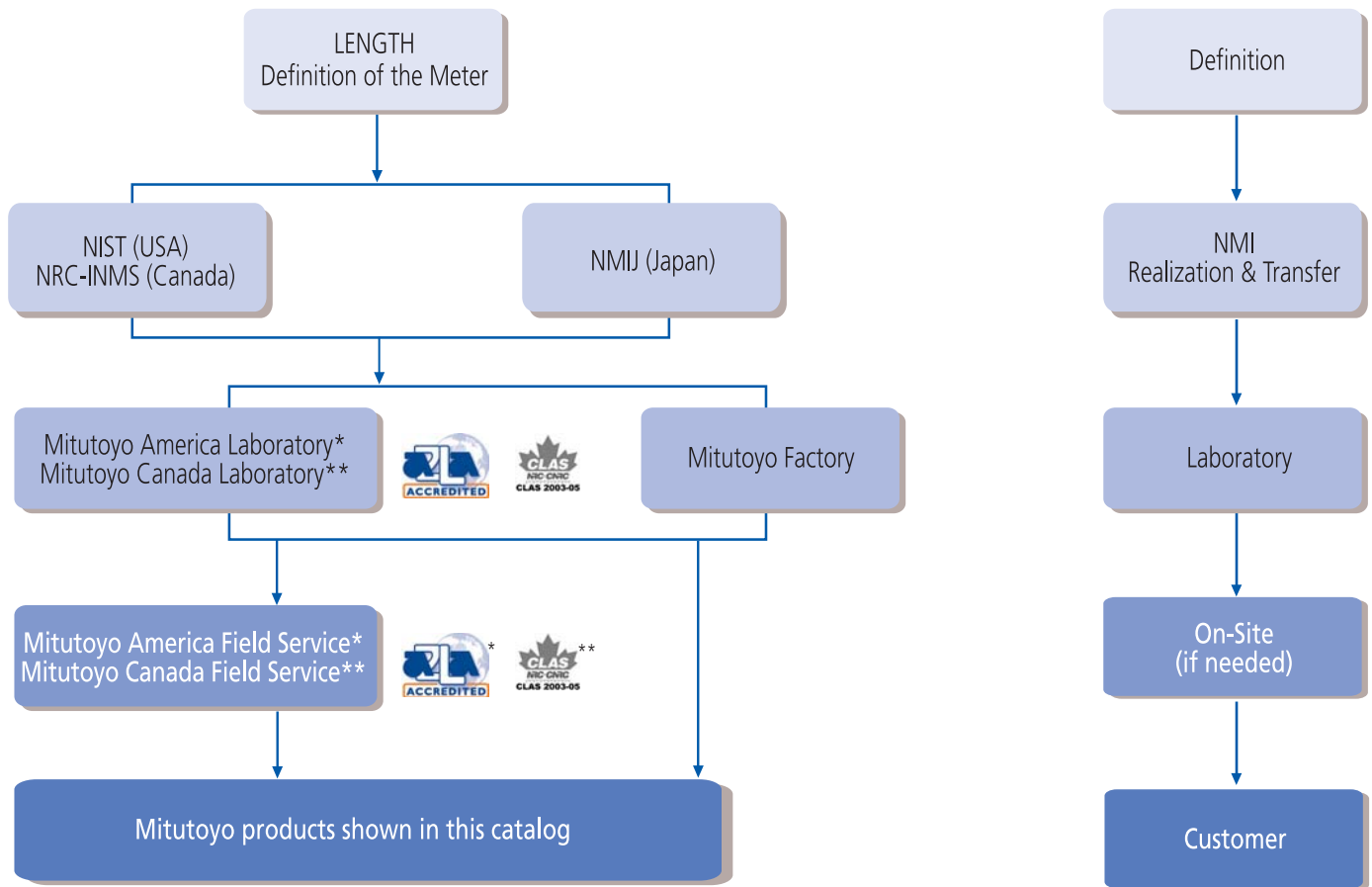
**Main Unit Startup System**

## Installation of Main Unit Startup System

As a part of the enhancement of our export control system, the large CNC measuring machines (all the CNC Coordinate Measuring Machines, Vision Measuring Systems, and Form Measuring Machines) are now equipped with a Main Unit Startup System (relocation detecting system) before export. This system is designed to take a machine out of operation upon detecting the mechanical shock that accompanies relocation. If you intend to relocate a measuring machine fitted with this system, please contact us beforehand so that our service engineers can assist you.

On the other hand, the system may be triggered in the event of a natural event such as a powerful earthquake. In this case, our service engineers will deal with the situation at the earliest opportunity.

# Traceability Mitutoyo North America



Traceability is an essential requirement for all measurements. At Mitutoyo, we consider providing traceability to our customers to be a critical part of our business. Traceability is often referred to as a “chain of comparisons”, and that chain always starts with a precise definition. For length measurements, the meter is defined by how far light moves in a vacuum in a defined amount of time. The job of reducing that definition into a practical measurement belongs to the world’s National Metrology Institutes (NMI). The NMI in the U.S. is the National Institute of Standards and Technology (NIST), where they realize and transfer the definition of length to physical measurements of gage blocks, line scales, and other primary standards. From there, traceable measurements at other laboratories and factories are possible. Mitutoyo factories and calibration labs regularly send their standards to NIST; however, traceability can also be established through other recognized NMIs, such as the National Metrology Institute of Japan (NMIJ). The world’s leading NMIs, such as NIST and NMIJ, routinely participate in intercomparisons to ensure global traceability to the same unit of length.

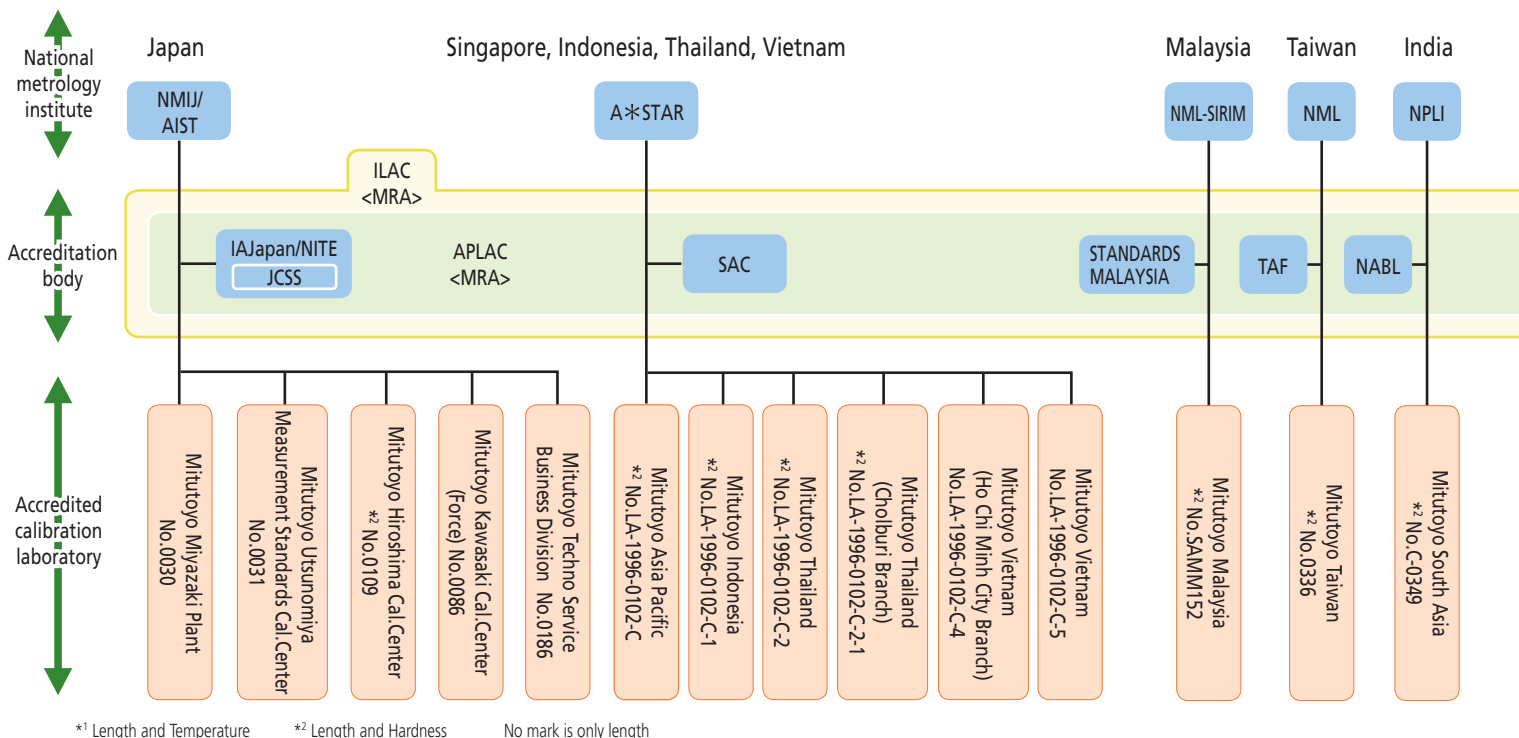
The requirements for demonstrating traceability vary from industry to industry. In the past, some industries required NIST test numbers, but that practice is now obsolete and has been replaced in many industries by the much more demanding requirement of ISO 17025 accreditation. To meet these needs, Mitutoyo America offers our customers A2LA accredited calibrations either in our labs or at your facility. None of our competitors can match the range and accuracy of accredited calibration services offered by Mitutoyo. Not every quality system requires accreditation, and for the less demanding needs, our standard factory issued certificates can still be used to ensure the required traceability.

Whatever the measurement, whatever the requirements for traceability, Mitutoyo has the most technically advanced metrology products and calibration services to meet your specific needs.

# Offering Reliable Traceability Worldwide

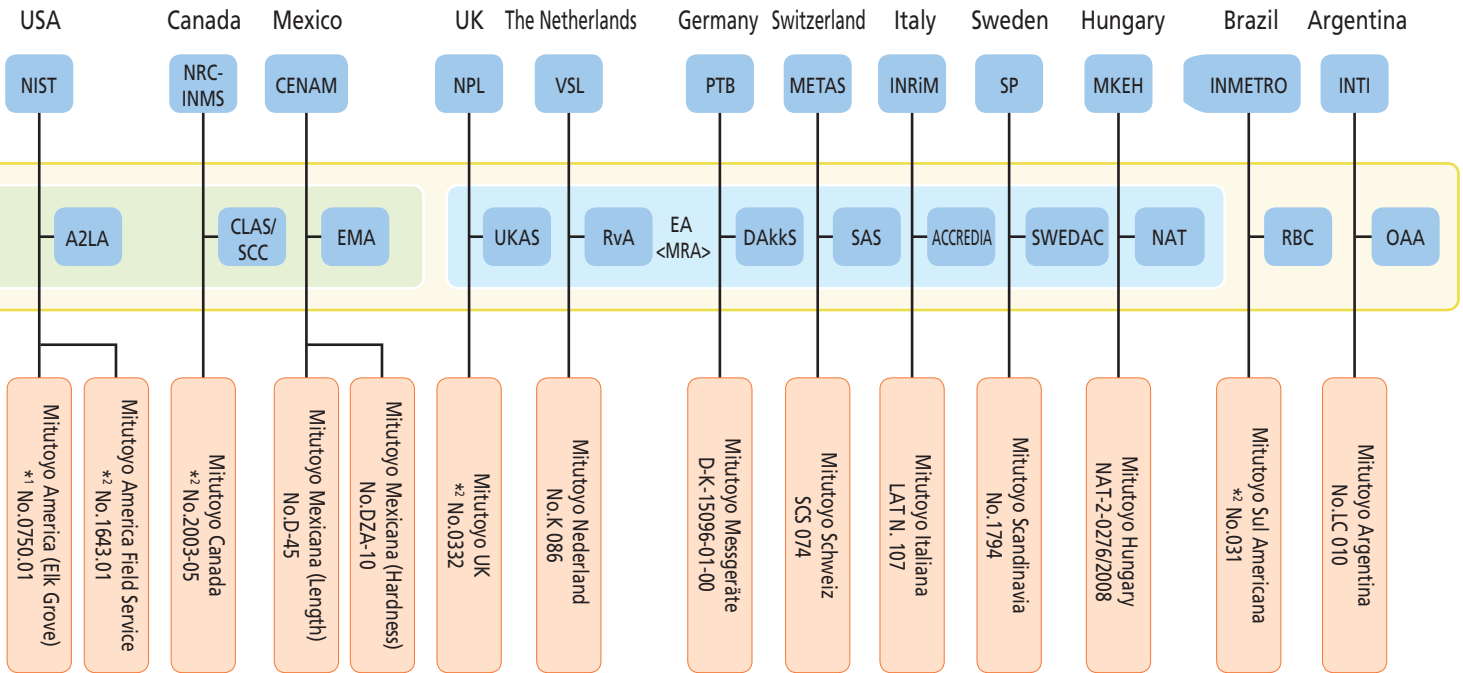
## Calibration laboratories worldwide

Mitutoyo has a system allowing comprehensive support for the calibration of precision measuring products in the global market. In order to provide calibration services on a global basis, Mitutoyo has calibration laboratories that have received ISO/IEC 17025 certification, which is an international standard, from the accredited organizations in each of the countries in which Mitutoyo operates and subsidiaries are located, both in Japan and overseas.



- AIST: National Institute of Advanced Industrial Science and Technology
- NMIJ: National Metrology Institute of Japan
- JCSS: Japan Calibration Service System
- NITE: National Institute of Technology and Evaluation
- IAJapan: International Accreditation Japan
- A\*STAR: Agency for Science, Technology and Research
- SAC: Singapore Accreditation Council
- NML: National Measurement Laboratory
- TAF: Taiwan Accreditation Foundation
- NML-SIRIM: National Metrology Laboratory, Standards and Industrial Research Institute of Malaysia
- STANDARDS MALAYSIA: Department of Standards Malaysia
- NIST: National Institute of Standards and Technology
- A2LA: American Association for Laboratory Accreditation
- NRC-INMS: National Research Council of Canada-Institute for National Measurement Standards
- CLAS: Calibration Laboratory Assessment Service
- SCC: Standards Council of Canada
- CENAM: Centro Nacional de Metrología
- EMA: Entidad Mexicana de Acreditación, a.c.
- UKAS: United Kingdom Accreditation Service
- NMI: Nederlands Meetinstituut

- RvA: Raad voor Accreditatie
- PTB: Physikalisch-Technische Bundesanstalt
- DAKKS: Deutsche Akkreditierungsstelle GmbH
- METAS: The Swiss Federal Office of Metrology and Accreditation
- SAS: Swiss Accreditation Service
- IMGC: Istituto di Metrologia " GUSTAVO COLONNETTI "
- ACCREDIA: L'NTE ITALIANO DI ACCREDITAMENTO
- SP: Swedish National Testing and Research Institute
- SWEDAC: Swedish Board for Accreditation and Conformity Assessment
- INMETRO: Instituto Nacional de Metrologia Normalizacao e Qualidade Industrial
- RBC: Rede Brasileira de Calibracao
- INTI: Instituto Nacional de Tecnologia Industrial
- OAA: Organismo Argentino de Acreditaci
- NPL: National Physical Laboratory
- NPLI: National Physical Laboratory of India
- NABL: National Accreditation Board for Testing and Calibration Laboratories
- (ILAC): International Laboratory Accreditation Cooperation
- (APLAC): Asia-Pacific Laboratory Accreditation Cooperation
- (EA): European Accreditation Cooperation
- (MRA): Mutual Recognition Arrangement
- #: Accreditation No.

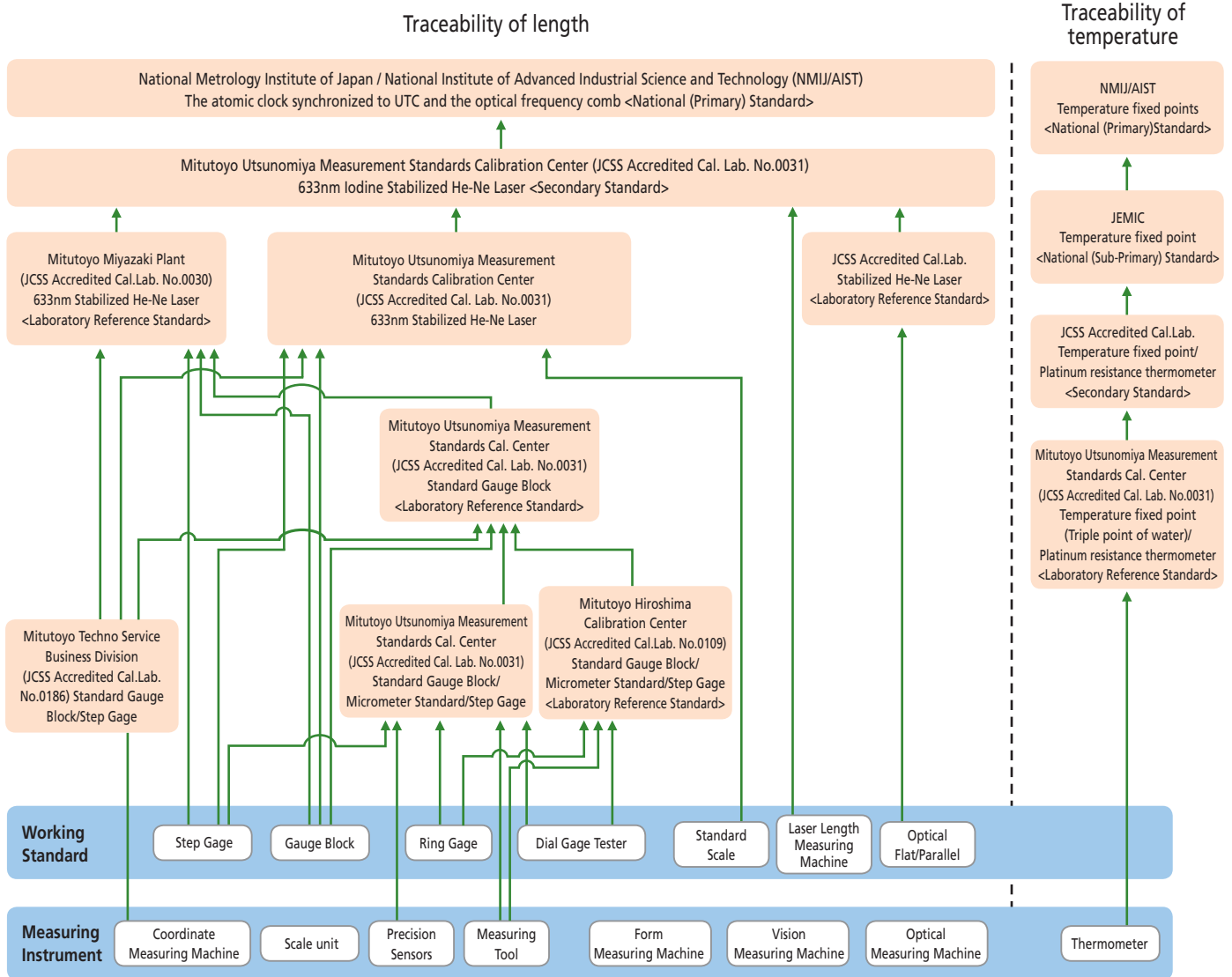


# Precision Assured Products through High Level in-house Calibration

## Traceability system

Mitutoyo has a traceability system made possible through an in-house calibration organization certified by the ISO/IEC 17025 international standard, with length standards directly related to national standards (atomic clock synchronized to UTC and the optical frequency comb) at the highest level.

National standards are mutually recognized by CIPM, and the certified calibration organization is mutually recognized by ILAC, so that the establishment and maintenance of traceability for Mitutoyo products is achieved both in Japan and overseas.

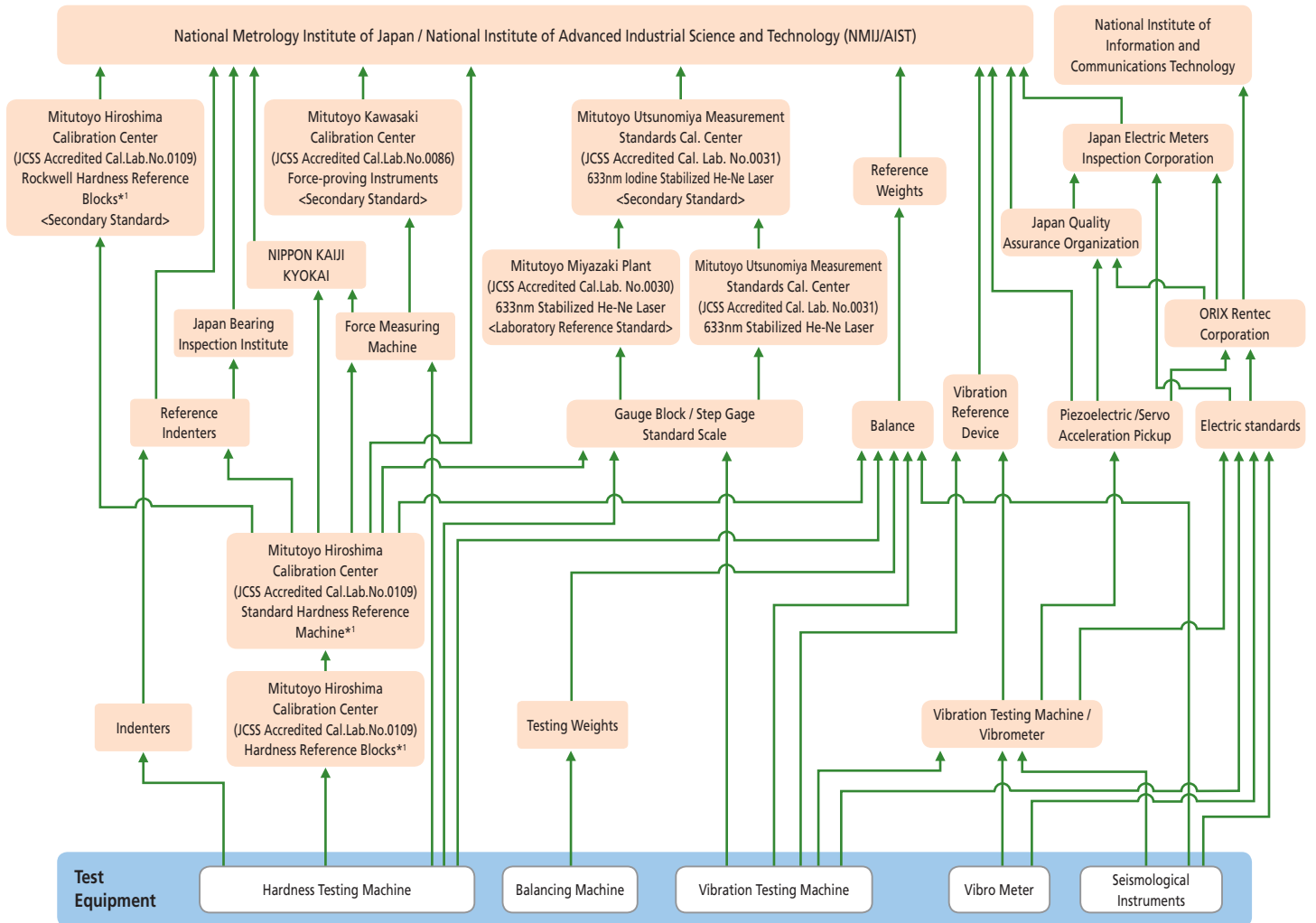


Note: This chart is a simplified representation of Mitutoyo's overall traceability system. Detailed traceability charts are published for each product.



Certificate of JCSS accredited laboratory (Mitutoyo Utsunomiya Measurement Standards Calibration Center)

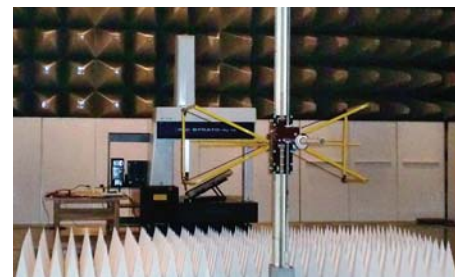
## Traceability of Test Equipment



\*1 The scope of JCSS accreditation is from 20HRC up to 65HRC in Rockwell Hardness Testing Machines and Hardness Reference Blocks.  
 Note: This chart is a simplified representation of Mitutoyo's overall traceability system. Detailed traceability charts are published for each product.

## Conformance to CE Marking

In order to improve safety, each plant has programs to comply with the Machinery Directives, the EMC Directives, and the Low Voltage Directives. Compliance to CE marking is also satisfactory. CE stands for "Conformité Européenne". CE marking indicates that a product complies with the essential requirements of the relevant European health, safety and environmental protection legislation.





# Measuring System Implementation

The following introduces system implementation principles showing how measurement results from various Mitutoyo measuring instruments are recorded and used for quality control purposes.

**Implementation Step 1**

- Recording and storing measurement results**
  - Eliminating writing by hand**

Prints out measurement data easily, providing the statistical calculation function.

**Digimatic Mini-Processor DP-1VR** (A-16)
  - To input data to a PC**

A keyboard signal conversion type Input tool can input measurement data directly into spreadsheet software such as Excel.

**Input tool series** (A-10)      **Multiplexers** (A-14)

RS-232C conversion type unit requires separate communication software.
  - To perform wireless communication**

**U-WAVE** (A-12)

**USB**      **Keyboard**      **RS-232C**

**Implementation Step 2**

- Using dedicated inspection and quality control software**
  - Setup for statistical process control**

A form is created easily with Excel.

**U-WAVE-R**      **U-WAVE-T**
  - Performing statistical process control**

Displays in real time GO/NG judgment, process capability, control chart, etc.

**U-WAVE-R**      **U-WAVE-T**

**MeasurLink Real-Time** (A-4)

**Implementation Step 3**

- Networking quality control data gathered from various locations**
  - Centralizing and analyzing measurement results**

Centralizes the inspection results.

The control department can monitor the results from measurement rooms and the shop floor, perform statistical analysis of cumulative data, and issue data forms.

Displays in real time GO/NG judgment, Cpk, control chart, etc.

**Database Server**      **Office**      **Quality control**

**In-plant LAN**

**Measurement room**      **Machining shop floor**

**Coordinate Measuring Machine**      **Vision Measuring System**      **U-WAVE-R**      **U-WAVE-T**      **Digimatic measuring instruments**

**MeasurLink** (A-2)

# A

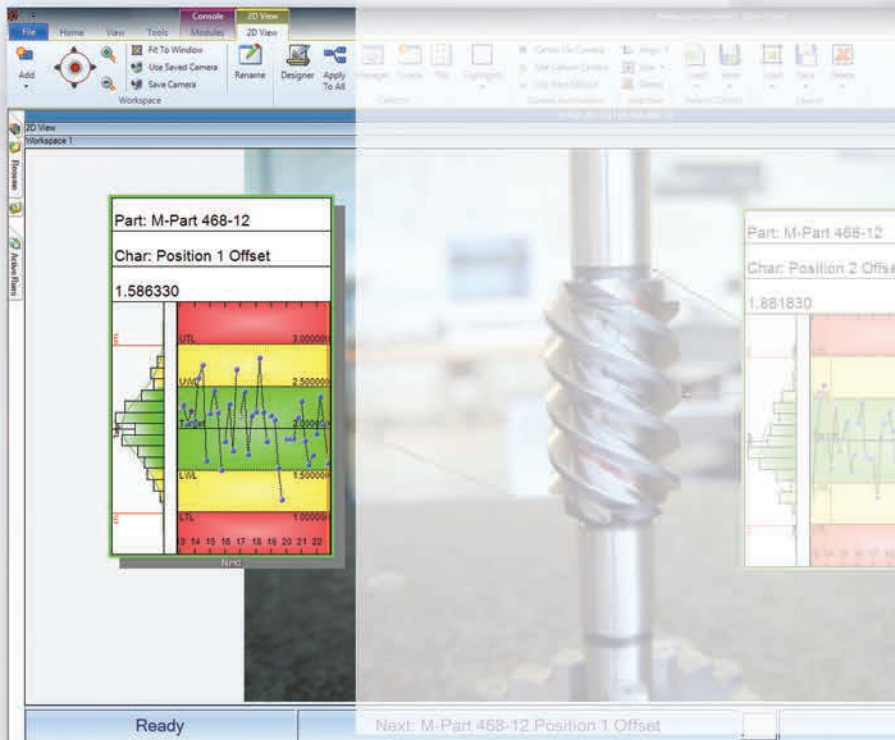
## Small Tool Instruments and Data Management



### Measurement Data Management

#### INDEX

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# MeasurLink®

An Integrated Solution for Quality Data Management

Most of Mitutoyo's electronic instruments can output data via optional connecting cables or wireless transmitters & receivers in the form of the Digimatic code. The Digimatic code can also be converted into RS-232C format by any of several available gage multiplexers. In this way, digital data can be sent to PCs for data acquisition and advanced statistical analysis.

As a client/server application, MeasurLink gives you the performance you need through distributed processing. Combined with a multi-user relational database, MeasurLink® delivers a safe and organized data warehousing system making quality data available for viewing and analysis by any member of the production,

engineering, and managerial staff throughout your company. Inspection in the factory produces data for analysis, corrective action, and various reporting needs. As the backbone of your quality efforts, MeasurLink® is guaranteed to reduce your production costs and increase your bottom line.

## Scalable Network

MeasurLink® is capable of linking and managing multiple "islands" of inspection into a common database of part information, statistical data, gage information, processes, etc. Information is shared across an entire manufacturing facility.



## MeasurLink 7 System Requirements

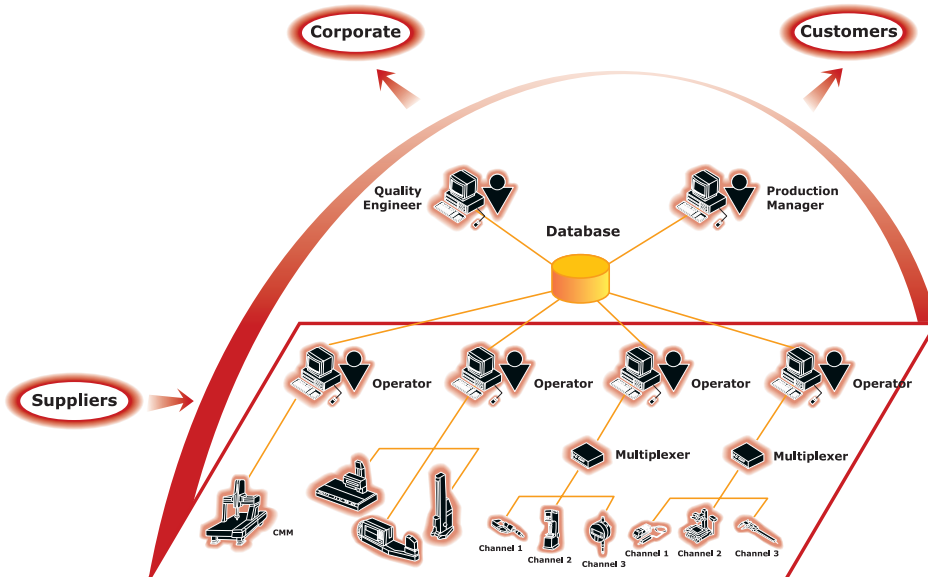
### Database Management System (DBMS) Requirements

MeasurLink 7 ships with a copy of Microsoft® SQL Server Express Edition 2008 R2, this can be for a standalone or a workgroup installation. MeasurLink 7 also supports Microsoft® SQL Server 2005 all editions or newer.

### Operating System Requirements

All MeasurLink 7 products are supported on the following Microsoft® Windows Operating System versions:

- All Windows® XP SP3 versions
- All Windows® Vista SP2 versions
- All Windows® 7 versions
- Both 32bit and 64bit operating systems supported



The Manufacturing Process with **MeasurLink®**

## MeasurLink Suite of Software

MeasurLink is an easy-to use, Windows-based family of quality data management software applications. MeasurLink combines real-time data acquisition, on-line statistical analysis, integrated networking, and quality information sharing into a comprehensive data management solution.

- **Real-Time**  
On-line real-time data collection
- **Process Analyzer**  
Analysis of all data
- **Process Manager**  
Network monitoring
- **Gage R&R**  
Gage repeatability and reproducibility
- **Gage Management**  
Gage inventory and calibration control

*Note: Upgrade packages are also available. Please contact our sales department for details.*

[www.measurlink.com](http://www.measurlink.com)

# MeasurLink®

An Integrated Solution for Quality Data Management

## User-friendly

Click a gage button and watch the charts update in real-time. This helps the operator stay on top of the process. Begin collecting data in minutes with the newly designed Inspection Wizard.

## Data acquisition

Collects data from digital micrometers, calipers, indicators, bore gages, etc. Keyboard entry is a snap. Collect data for one or a million parts.

## Comprehensive SPC

Easy to use Control Charts, Histograms, Capability, Detailed statistics, Assignable Causes, Corrective Actions, and Traceability all make this software "best in class".

## Variable data

Collect dimensional data (length, width, height, outside diameter, inside diameter weight, etc.). Supports derived features (calculations for run out, volume, true position, etc.)

## Attribute data

Collect data from visual inspections (burrs, cracks, dents, missing holes, etc.) to determine the fitness of a part. Track failures using a go/no-go style or count the defects on a characteristic to determine if a part is defective. There is complete flexibility to study the individual characteristics and as a group of them, too.

## Engineering specifications

Attach drawings to parts, routines or individual characteristics for viewing. Most file formats are supported as an attachment (e.g. Word, PDF, CAD).

## Multimedia aids

Attach movies (AVI, MOV, MPG), sound (WAV) and images (BMP, JPG, TIF) to parts, routines or individual characteristics as instructional aids for an operator.

## Revision history

Track specification adjustments and preserve historical data.

## Mathematically derived features

Full functioning real-time calculator with standard math functions including square root, exponential, trigonometric, sum, average, max, min, calculations.

## Part pictures

View scanned blueprints, digital photographs at a glance. On screen guided sequencing keeps the operator moving to the right feature.

## Data tests

Full support of Western Electric and Nelson Tests for pattern recognition in control charts (e.g. extreme point, trend, stratification, oscillation, etc.) along with various alerts for each failed test.

## Forced assignable cause

Force Assignable Cause Tags on Inspector during collection if process is out of control. Empower operator to build on existing pick list.

## Corrective action plans

Operators choose corrective action as applied to the part or process. Multiple corrective actions can be applied to any subgroup. Empower operator to build on existing Corrective Action list.

## Sequenced and random gage input

Flexible data input. Collect data by feature, by part or randomly. Guided sequencing minimizes inspection errors.

## Time stamped data

All observation data is marked with the data and time from the computer clock.

## Flexible reporting

Build report templates with company logos and free form text. Select and position chart types to customer specification.

## Mixed variable/attribute data

Mix your dimensions and non-conformances in the same Inspection Routine. Track defects and defectives along with your dimensional data.

## Crystal Reports

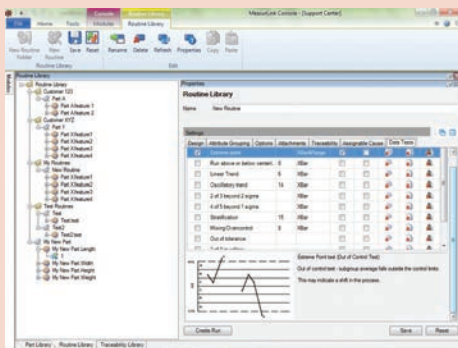
Create your own customized Crystal Reports for use with Part or Run data.

## FDA 21CFR Part11 support

Provides support for medical and pharmaceutical manufacturers electronic records, including audit trails, e-signatures (Process Analyzer Professional only) and advanced security.

## Inspection wizard

Begin collecting data in 60 seconds with a "Quick Run" by defining features, tolerances and input method.



**Easy-to-use** MeasurLink® provides to you the most intuitive interface with complete SPC functionality to help you monitor and manage your manufacturing processes. With MeasurLink®, you can easily manage the quality levels of your parts, identify problem areas and apply corrective action to areas in need of attention.

[www.measurlink.com](http://www.measurlink.com)

# MeasurLink® Real-Time

## On-line Real-Time Data Collection

### FEATURES

MeasurLink Real-Time performs as a data acquisition clearinghouse by enabling you to connect and acquire data from virtually any measuring device. It supports the full range of metrology technology, including calipers, micrometers, indicators, CMMs, vision systems and more. Select the edition to fit the device and the needs.

### Real-Time Standard Edition

Designed for customers who want to acquire and analyze data in real-time and check variable and attribute inspection to maximize production and minimize defects. It has views to allow the user to create Parts, Characteristics with nominal and tolerance and Traceability lists. The data collection interface provides real-time graphics for Run charts, Control charts, Histograms and Statistics. Standard views include Datasheet (observations and charts), Classic View (chart windows), and 2D view (part images with callouts that include charts and statistical data) along with an especially customizable Info View and additional Manager views. Full reporting template functionality is also provided.

**Supported data sources:** keyboard, RS232 and USB devices.



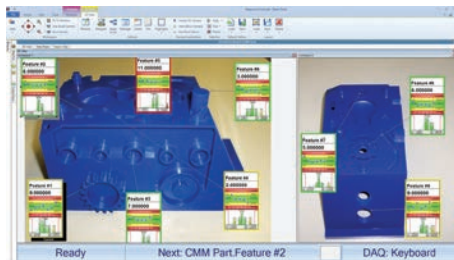
### SPECIFICATIONS

Order No.	Description
64AAB177	MeasurLink 7 Real-Time Standard Edition

### Real-Time Professional Edition

Enables customers to connect and acquire data from Mitutoyo Coordinate Measuring Machines, Vision and Form Measuring Systems via native integration (DDE). ASCII and QMD (xml-based) file import are also supported. In addition to all of the features supported by **MeasurLink 7 Real-Time Standard Edition**, this application also supports data filters. Full reporting functionality with templates is also provided

**Supported data sources:** keyboard, RS232 and USB devices, native Mitutoyo integration (DDE), ASCII and QMD (xml-based) file import.

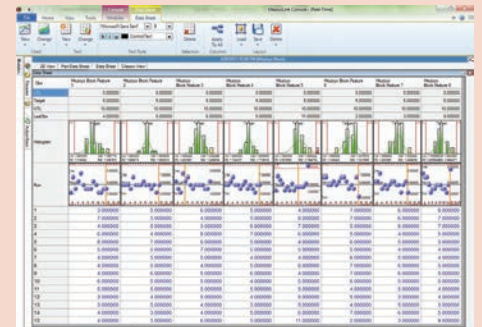


### Import templates

Easily create an import template that maps data in a text file to MeasurLink information. Templates are saved to the database for everyone to use and can be added as data sources to data collection stations. An import template can be verified against the source file without adding data to the system.

### SPECIFICATIONS

Order No.	Description
64AAB178	MeasurLink 7 Real-Time Professional Edition



MeasurLink is designed to detect and display patterns and provide additional statistical information. Many patterns can be seen appearing on SPC charts, including:

- Cycles
- Trends
- Freaks
- Mixtures
- Grouping or “bunching” of measurements
- Gradual change in level
- Sudden shift in level
- Instability (abnormally large fluctuations)
- Stratification (abnormally small fluctuations)
- Interactions (two or more variables acting together)
- Systematic variation
- Tendency of one chart to follow another

### Direct data transfer

Collect data into MeasurLink from Mitutoyo capital equipment running Mitutoyo Software that is MeasurLink enabled. This provides a tighter and more robust interface than importing data from files.

### Filter data

All data collected within a Real-Time run is related. Often, especially for runs containing a large volume of subgroups, requests are made for subsets of data that are further related from the entire run's population. MeasurLink provides robust filtering capabilities to comply with these requests.

### Import data

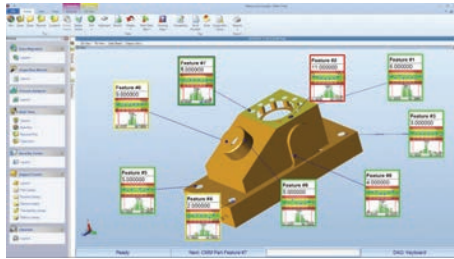
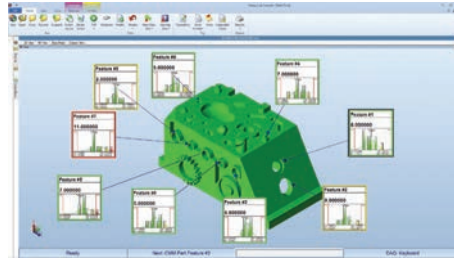
When set up as a data source, import templates are readily available to the operator, or periodic imports can be executed.

[www.measurlink.com](http://www.measurlink.com)

## Real-Time Professional 3D Edition

Designed for customers who wish to collect data using the Hoops 3D graphics view, in addition to all features offered by MeasurLink 7 Real-Time Professional Edition. Hoops 3D files can be exported from most CAD systems and provides the operator with a real view of the part. Camera angle and position can be saved for each characteristic providing for an intuitive prompted guided sequencing for the inspector.

**Supported data sources:** keyboard, RS232, and USB devices, native Mitutoyo integration (DDE), ASCII and QMD (xml-based) file import.



### 3D view

True three-dimensional model support with Hoops streaming files (\*.HSF). Export your part's model from Catia, Solidworks or other CAD software and place callouts in the 3D space.

### Flexible callout design

Callouts provide part acceptability at a glance. You can design them the same way as for the two-dimensional view to include charts or statistical information with the ability to size any element inside the callout.

### Guided sequence

The display can automatically change during data collection to show the next or last observation point, providing a simple guided sequence for the inspection procedure. By saving a different view for each characteristic to be inspected, you can have the model rotate, pan or zoom to show the operator details of the part.

## SPECIFICATIONS

Order No.	Description
64AAB179	MeasurLink 7 Real-Time Professional 3D Edition

## Edition Definitions

Function	Real-Time Standard	Real-Time Professional	Real-Time Professional	Process Analyzer Lite	Process Analyzer Professional
	Edition	Edition	3D Edition	Edition	Edition
Classic SPC views	X	X	X	X	X
Datasheet	X	X	X	X	X
2D View	X	X	X	X	X
Manager Views	X	X	X		
Hoops 3D View			X		
Filter		X	X		X
CMM/Vision/Form connectivity		X	X		
Import (ASCII)		X	X		
Audit Trails	X	X	X	X	X
Merge, Copy and Edit Data					X
Scatter Chart					X
Archive Data					X
Electronic Signatures					X

# MeasurLink® Process Analyzer

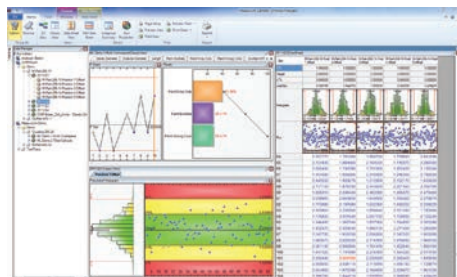
## Data Analysis Software for Windows

### FEATURES

Process Analyzer is an invaluable tool for your quality team. It gives you the flexibility to analyze your processes, identify problem areas and take corrective action to improve your product's quality. Inspection runs can be sorted by Inspection Station, Routine or Part, and are displayed with the look and feel of the Windows Explorer. Inspection data can be merged, filtered, grouped, charted and printed in the way you want it.

### Process Analyzer Lite Edition

Designed for offline viewing of Real-Time data in a networked environment. All views that are available in Real-Time Standard Edition are supported, with the exception of the Manager Views. Full reporting template functionality is also provided.



#### Review inspection data

Analyze inspection data, view notes and traceability. Open data from different runs to compare the data and process behavior.

#### Switch between databases

For larger installations that use different databases, the ability to switch the connection

allows an engineer to analyze data from all sources.

#### Tree control navigation

Self organized inspection data provided in an easy to use "navigation tree". Sort data by Station or Inspection Routine, part, year, month or day.

#### Reporting

Reporting is made easy through the use of a "what you see is what you get" style of template creation that allows you to pick chart and data through drag and drop with resizing. Several standard report templates are provided out of the box.

### SPECIFICATIONS

Order No.	Description
64AAB180	MeasurLink 7 Process Analyzer Lite Edition

### Process Analyzer Professional Edition

Designed for more robust manipulation of Real-Time data in a networked environment using advanced features not available in MeasurLink Process Analyzer Lite Edition. It enables Quality Engineering to slice and dice data in meaningful ways that contribute to quality control initiatives.

For larger installations that use different databases, the ability to switch the connection allows an engineer to analyze data from all sources.



#### Group, Search and Sort data

View data by part, routine, station, year, month, day. Apply saved filters to data and search for specific traceability or serial number criteria.

#### Merge Data

Combine lot based or just in time collected data to get a bigger picture of process variation and production quality.

#### Scatter Plots

Perform correlation studies to identify process interactions.

#### Electronic Signatures

The e-signatures can be applied to runs only in Process Analyzer Professional. When combined with Audit Trails available in Real-Time, and security is implemented, then MeasurLink provides support for FDA requirements for the Medical and Pharmaceutical Manufacturers.

### SPECIFICATIONS

Order No.	Description
64AAB181	MeasurLink 7 Process Analyzer Professional Edition

# MeasurLink®

An Integrated Solution for Quality Data Management

### MeasurLink Group Licensing

Order No.	Description
64AAB184	MeasurLink 7 Site License

MeasurLink 7 Site License is a bundle package that provides the customer with the ability to install up to and including 30 copies (mixed and matched) of any applications in the MeasurLink 7 suite.

Order No.	Description
64AAB185	MeasurLink 7 Workgroup License

MeasurLink 7 Workgroup License is a bundle package that provides the customer with the ability to install up to and including 15 copies (mixed and matched) of any applications in the MeasurLink 7 suite.

Order No.	Description
64AAB263	MeasurLink 7 Workgroup License – 10 Pack

MeasurLink 7 Workgroup License – 10 Pack is a bundle package that provides the customer with the ability to install up to and including 10 copies (mixed and matched) of any applications in the MeasurLink 7 suite.

Order No.	Description
64AAB264	MeasurLink 7 Workgroup License – 5Pack

MeasurLink 7 Workgroup License – 5 Pack is a bundle package that provides the customer with the ability to install up to and including 5 copies (mixed and matched) of any applications in the MeasurLink 7 suite.

Order No.	Description
64AAB265	MeasurLink 7 Academic License

MeasurLink 7 Academic License a bundle package that provides Universities and Technical Colleges with the ability to install up to and including 20 copies (mixed and matched) of any applications in the MeasurLink 7 suite for educational purposes.

*Note: Upgrade packages are also available. Please contact our sales department for details.*

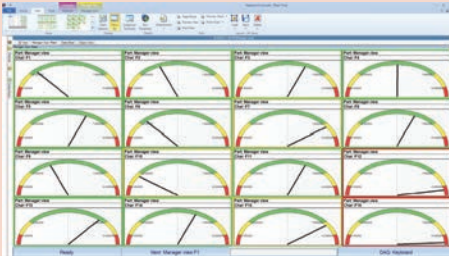
[www.measurlink.com](http://www.measurlink.com)

# MeasurLink® Process Manager

## Network Monitoring Software for Windows

### FEATURES

Real-time monitoring of data as it is collected. Provides the QC/Production Manager with the perfect tool to organize and maintain a shop-wide quality program at a glance.



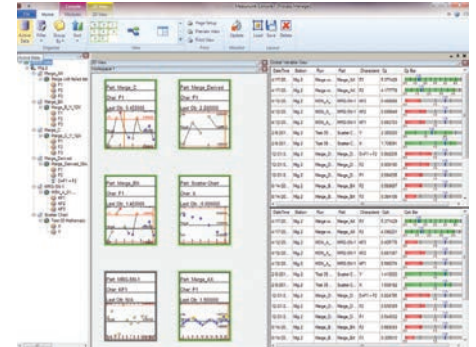
MeasurLink Process Manager displays snapshot windows of characteristics that are currently being collected in MeasurLink Real-Time. The data can be sorted by Station, Process, Capability or Timestamp.

### Process Manager Standard Edition

Process Manager provides a method to audit the entire shop floor inspection activity from a single PC. Easily see process information without walking from one inspection area to another by viewing current production across all machines. Show clients your quality operation for the entire facility.

The Quality Control personnel can choose to display only specific stations, parts, routines or even critical characteristics that they are responsible for. Establish Cpk thresholds for acceptability. Drill down for details on certain traceability, assignable cause, failed tests or serial numbers.

Various alerts are provided to recognize and stay up to the minute on production problems. Display the easy to read charts and detailed statistics.



### SPECIFICATIONS

Order No.	Description
64AAB182	MeasurLink 7 Process Manager Standard Edition

# MeasurLink® Gage R&R

## Measurement Systems Analysis

### FEATURES

Determines the repeatability and reproducibility, linearity, bias, and stability of inspection systems allowing you to isolate gauging problems.

### Gage R&R

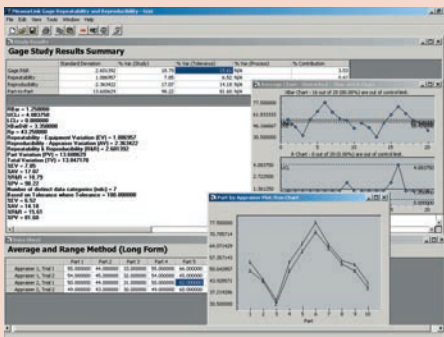
A Microsoft® Windows®-based Gage R&R software designed to the AIAG (Automotive Industry Action Group) Measurement System Analysis standard (MSA3) for ISO/ TS16949.

This software supports up to 25 appraisers per study, 25 trials per appraiser and 25 parts per trial. Each study supports a Gage ID, Gage type, Serial Number, Note, etc. A full search engine is available. This product is also integrated with MeasurLink Gage Management for recall and reporting purposes. MeasurLink Gage R&R works with virtually any gage or inspection system.

- Supports the following AIAG study methods:
  - 1) Range method.
  - 2) Average and range method.
  - 3) Average and range method including within part variation.
  - 4) Analysis of variance method.
  - 5) Short method for attribute gages.
  - 6) Bias study.
  - 7) Linearity study.
  - 8) Stability study.

- Input methods include: keyboard entry, direct gage input and text import.
- Builds a gage inventory and records your R&R study efforts.
- Generates reports that your customers will respect and value.

Provides graphical interpretation of appraiser consistency.



In addition to the standard calculations this software also provides graphical tools for analysis of the measurement system. The Xbar and R chart can show whether there is adequate gage discrimination to record part to part variation in production and if operators are self-consistent. The Part-by-Appraiser plot can show if there is a lack of consistency between operator inspection techniques.

[www.measurlink.com](http://www.measurlink.com)

### SPECIFICATIONS

Order No.	Description
64AAS941D	MeasurLink Gage R&R 6



## MeasurLink® Gage Management

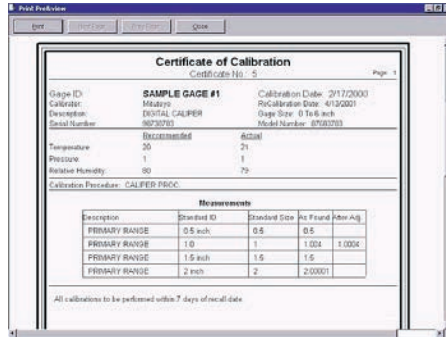
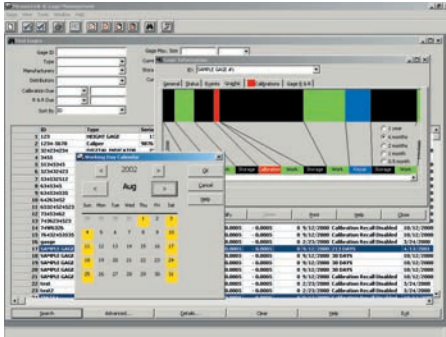
### Gage Inventory and Calibration Control

#### FEATURES

Gage Management is essential for monitoring the calibration history of a gage. Periodic adjustments may be required to bring a gage into specification.

#### Gage Management

A Microsoft® Windows®-based gage calibration tracking software. It is networkable and shares the same database used by the rest of the MeasurLink® software family. This assists users in developing, maintaining, organizing, and managing information about their gages. Information such as gage in-service dates, calibration recall dates, gage R&R dates and general gage event history is provided in an intuitive interface with complete reporting abilities. MeasurLink® Gage Management also supports the creation of vendor contact and user lists. It comes equipped with a "smart" calendar that allows you to define working days. Calibration procedure setup is easy and incremental response methods help to achieve optimal calibration frequencies. Customized gage label printing is supported.



MeasurLink Gage Management allows customers to build a complete gage (and fixture) inventory. Calibration procedures are established using a sequence of Standards. These procedures are associated with Gage IDs and are used when performing "in-house" calibration.

Calibration is made simple by supporting digital gages. Attribute gage calibration can be performed using any digital gage. Certificates of calibration can be printed for archiving or for distribution by calibration labs.

#### SPECIFICATIONS

Order No.	Description
64AAS007D	MeasurLink Gage Management 6

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# Input Tools

## SERIES 264 — Digimatic Gage/PC Data Input Device

### FEATURES

- The input tool is an interface enabling you to easily input measurement data from a Mitutoyo measuring instrument with the digimatic output feature to your PC.
- An USB keyboard signal conversion input tool, IT-012U converts measurement data to keyboard signals and directly inputs them to cells in off-the-shelf spreadsheet

software such as Excel. An RS-232C communication input tool, IT-007R is also available to input data through RS-232C communication.

- More accurate measurement is possible using an optional foot switch.

### SPECIFICATIONS

Product Code No.	Input Tool for Keyboard 264-005	Input Tool for RS-232C 264-007	Input Tool for USB 264-012-10
Measuring Tools Required*1	Mitutoyo Digimatic measuring tools with SPC output		
PC Requirement	PC compatible, with PS/2 style keyboard interface*2 (Can be also connected to a laptop computer.) Connects to keyboard port on CPU	PC Compatible, (including laptops) with RS-232C Interface Connects to RS-232C port on CPU (D-sub 9-pin connector)	PC Compatible, (including laptops) with USB 2.0 or 1.1 port
Outside Dimensions HxWxD	2.8" x 1.7" x .9" (72 x 44 x 23.5 mm)		
Mass	2.5oz. (70g)(including cable and connector)	3.2oz. (91g)(including cable and connector)	2.6oz. (74g)

\*1: Connecting cable (optional accessory) is required for a connection to a Digimatic measuring tool.

\*2: Cannot be used for computers that use USB keyboard. When using a IBM Think Pad Series, a commercial keyboard adapter is required. When using AT style keyboard, adapter for conversion is required.



264-005



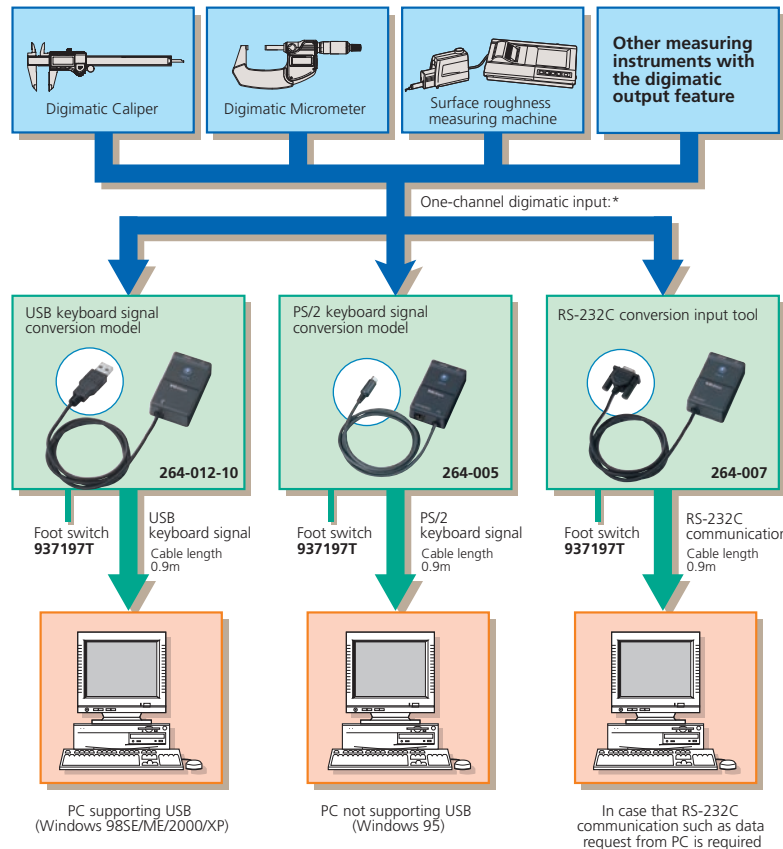
264-012-10



264-007

### Optional Accessories

- 937197T: Foot switch  
939039: Gage selector



\* When you use an optional gage selector 3, you can connect up to three measuring gages and select an input by switching them. When using 264-012, you can connect multiple input tools at the same time with an off-the-shelf USB hub. Simultaneous input, however, is not supported. For cables used to connect each measuring gage and input tool, refer to page A-14.

# USB Input Tool Direct: USB-ITN

Our USB Input Tool Direct has been streamlined into a range of dedicated models for each type of measuring instrument.

Data collection can start immediately after connecting the measuring instrument to a computer

Because the input tool is automatically recognized as an \*HID keyboard device (a standard Windows driver) just by connecting it to a USB port, no special software is required.

Patent pending (Japan)

\*HID (Human Interface Device)

The input tool directly connects the measuring instrument to a USB port on a computer

USB Input Tool Direct for micrometers: USB-ITN-B

The values displayed on the measuring instrument can be sent to the computer just by pressing the data switch.



This is the same result as that of typing numbers using the keyboard and then pressing Enter.

## Note on using a foot switch with USB-ITN

The USB-ITPAK and USB-FSW options are required (see below).

If not using optional software the IT-012U input tool can be used with a foot switch.

Although measurement data can be simply loaded directly into an Excel spreadsheet by connecting the instrument and input tool to a computer, using the optional USB-ITPAK software enables time-saving operations and procedures that significantly improve reliability and efficiency.

## Measurement data collection software: USB-ITPAK® Order No. 06ADV386

This setup and data collection software is used to input data from one or more measuring instruments (connected by way of USB-ITN) to any Excel sheet. (This software package cannot be used with IT-012U.)

### USB-ITPAK



### USB dongle



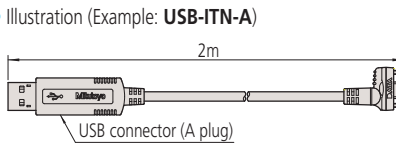
Software use requires USB dongle.

### Major features

- Excel input settings: The input destination (a workbook, sheet, or cell), cell-fill direction (right or down), cell-fill interval, and other settings can be specified.
- Measurement method selection: Any of the following three methods can be selected: Sequential measurement, batch measurement, or individual measurement.
- Data input control: Data can be requested, canceled, or skipped by using mouse buttons, function keys, or foot switch.
- Character string input by the USB foot switch adapter, USB-FSW: Any previously specified character string can be input using the foot switch. Examples: *pass* or *fail*
- Number of units that can be connected (total number for both USB-ITN and USB-FSW): Up to 20 units can be connected for Windows Vista or Windows 7, and up to 100 units can be connected for Windows 2000 or Windows XP. However, the above numbers might be less depending on the system configuration.
- Data importation time: About 0.2 to 0.3 seconds per unit. However, this value differs depending on the connected measuring instruments and measurement environment.
- Driver software: The VCP (virtual COM port) drivers for USB-ITN and USB-FSW are individually recognized using a built-in COM number. • Patent pending (Japan)

## Major specifications of USB Input Tool Direct

- Output specifications: USB 2.0 or 1.1
- Communication speed: 12 Mbps (full speed)
- Power supply: USB bus power
- Mass: 59 g
- USB 2.0 certification obtained
- Complies with the EMC Directive



Note: It is recommended to use a commercially available USB hub that has USB certification.

## USB-ITPAK usage environment

Supported operating systems*	Windows 2000 SP4, Windows XP SP2 or later, Windows Vista, and Windows 7
Supported Excel versions	Excel 2000, 2002, 2003, and 2007
Hard disk	At least 20 MB of free space (required for installation)
CD-ROM drive	Required for installation
USB ports	At least two ports (for the USB dongle and USB-ITN)
Resolution	At least 800 x 600 pixels, and at least 256 displayable colors

- \* 64-bit operating systems are not supported.
- The natural language selected in USB-ITPAK must be the same as that used in the operating system.

## Codes for the main measuring instruments classified according to the USB Input Tool Direct code, part number, and plug type

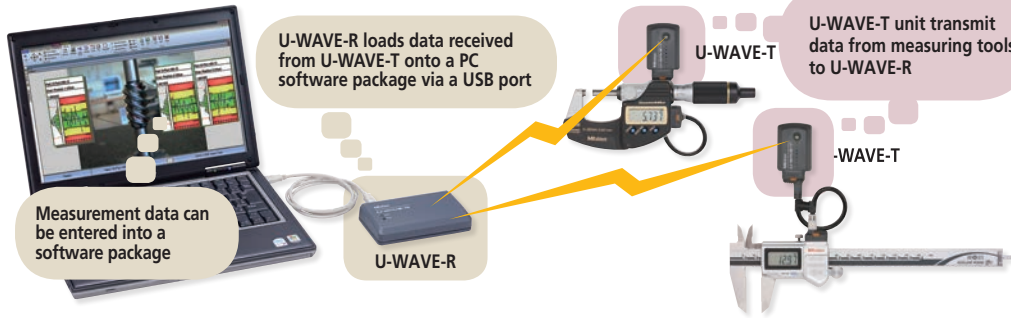
Determine the plug type suitable for your measuring instrument (one of the seven types from **A** to **G**) in the following table, and then select the corresponding USB Input Tool Direct.

Model	USB-ITN-A	USB-ITN-B	USB-ITN-C	USB-ITN-D	USB-ITN-E	USB-ITN-F	USB-ITN-G								
Order No.	06ADV380A	06ADV380B	06ADV380C	06ADV380D	06ADV380E	06ADV380F	06ADV380G								
Whether the existence of a data switch affects usability	Incorporates a data switch, so the tool is usable regardless of whether or not the measuring instrument has a switch.			Does not incorporate a data switch, so an instrument fitted with a switch is required in order to use the instrument alone. (However, the tool can be used with USB-ITPAK.)											
Cable type	<b>A</b> Water-proof with switch	<b>B</b> Water-proof with switch	<b>C</b> With switch	<b>D</b> 10-pin plain	<b>E</b> 6-pin round	<b>F</b> Straight type	<b>G</b> Water-proof straight type								
Illustration of the plug that connects to the measuring instrument															
Socket type on the measuring instrument															
Codes of major compatible measuring instruments	[Digimatic Caliper /Super Caliper] -500 series CD67-S_PM CD-PMX/PM/GM -550/551 series CDC-P_PMX CDN-P_PMX [Digimatic Carbon Fiber Caliper] -552 series CFC-G/GL/GC/GU [Digimatic Depth Gage] -571 series VDS-PMX [Digimatic Scale Unit] -572 series SD-G [Digimatic Exclusive Caliper] -573 series NTD-PMX/PM			[Digimatic Micrometer, QuantuMike] -293 series MDC-MJ/MJB/MJT MDE-MJ [Tubular Inside Micrometer] -337 series IMZ-MJ -339 series IMJ-MJ [Digimatic Micrometer Head] -350 series MHN-MB/MJB/MJNB [Digimatic Exclusive Micrometer] (The end of the mark is -MJ/MJB/M/MB/PM/PMB) [Digimatic Holtest] -468 series HTD-R			[Digimatic Micrometer Head] -164 series MHD-MB [Digimatic Caliper] -500 series CD-CX/C/S_C - 550/ 551 CDC-C/CX, CDN-C/CX [Digimatic Depth Gage] -571 series VDS-DCX/DC [Digimatic Scale Unit] -572 series SD-D/SDV-D [Digimatic Exclusive Caliper] -573 series The end of the mark is -CX/C			Measuring instrument models that incorporate a data switch					
	[Surface Roughness Tester] -178 series SJ-201/210/301/400/500 [Coating Thickness Gage] -179 series DGE-745/755 [Linear Height] -518 series QMH-S [Reference Gage] -515 series HMD-C [Digimatic Indicator] -543 series ID-H [Laser Scan Micrometer] -544 series LSM-9506/6100/6200/6900 [μ-checker] Digital μ-checker (Using the foot switch)				[Digimatic Micrometer] -121 series BD -164 series MHD-M -227 series CLM -293 series MDQ-M MDC-M [Tubular Inside Micrometer] -337 series IMZ-M [Tubular Inside Micrometer] -339 series IMJ-M [Digimatic Holtest] -468 series HTD [Reference Gage] -515 series HME-DM [Borematic] -568 series SBM-C [Hardness Testing Machines] -810 series HM-100/200 HV-100/HH-411 HR-500				[Digimatic Height Gage] -192/570/574 series HDM-A/AX, HD-A/AX HDS-H_C/C HDF-N [Digimatic Caliper] -500/550/551 series CD/CDC/CDN [Digimatic Bore Gage] -511 series CG-D [Digimatic Indicator] -543 series ID-C_X/_RB/_GB -339 series [Digimatic Depth Gage/ Digimatic Thickness Gage] -547 series Digimatic model (ID-CX) [Digimatic Carbon Fiber Caliper] -552 series CFC-P/_L/_C/_U [Digimatic Scale Unit] -572 series SD-E, SDV-E SD-F, SDV-F [Portable Hardness Testing Instruments] -811 series HH-300				[Digimatic Indicator] -543 series ID-N ID-B		
				Measuring instrument models that do not have a data switch											
[Digimatic Indicator] -543 series ID-F [Linear Gage/Counter] -542 series EF-PRH/ZR, EH-P/Z/S/D EB-P/Z/D EC-D [Litematic] -318 series VL-A/AS/AH				No corresponding models		[Digimatic Indicator] -543 series ID-C/S/C_A [Digimatic Depth Gage/ Digimatic Thickness Gage] -547 series Digimatic model (ID-C) -575 series ID-U		No corresponding models							

# U-WAVE

## Measurement Data Wireless Communication System

**MeasurLink** ENABLED  
Data Management Software by Mitutoyo



The **U-WAVE** system enables easy wireless data communication from a measuring tool to a PC using the Digimatic protocol. Measurement efficiency is improved by eliminating the long and cumbersome data cables. The user friendly interface allows data to be loaded into any software product that accepts keyboard input, such as Excel\* or Notepad.

### 1 U-WAVE-R · Registered Design (Japan)

Major Specifications of U-WAVE-R

Model Order No.	U-WAVE-R 02AZD810D*
Power supply	USB bus power system
Number of <b>U-WAVE-R</b> units that can be connected to one PC	Up to 16
Number of <b>U-WAVE-T</b> units that can be connected	Up to 100
External dimensions	5.51" x 3.15" x 1.24" (140 x 80 x 31.6mm)
Mass	.29 lbs (130g)



\*Detailed information on conformity standards of wireless communication specification is given below.

### 2 U-WAVE-T · Registered Design (Japan)

U-WAVE-T sends measurement data to U-WAVE-R.

#### Actual size



Standard accessory: driver

#### Major specifications of U-WAVE-T

Model Order No.	U-WAVE-T (IP67 model) 02AZD730D*	U-WAVE-T (Buzzer) 02AZD880D*
Protection Rating	IP67	-
Data reception indication	LEDs	LEDs and Buzzer
Power supply	Lithium battery CR2032★1	
Battery life	Approx. 400,000 transmissions	
External dimensions	1.73" x 1.17" x .73" (44 x 29.6 x 18.5 mm)	
Mass	.05 lbs (23g)	

\*Detailed information on conformity standards of wireless communication specification is given below.

### ■ Installation Bracket Kit

Order No. 02AZE200



500 Series Caliper



293 Series Micrometer



543 Series Indicator

### Specifications of wireless communication

Conformity standards	·European conformity standards* EN 50371:2002 EN 300 440-1 V1.3.1 EN 300 440-2 V1.1.2 EN 301 489-01 V1.6.1 EN 301 489-03 V1.4.1	Wireless standards	Conform to IEEE802.15.4
	·U.S.A. conformity standards 47 CFR Part 15.247:(Subpart :C) 47 CFR Part 15,(Subpart :B)	Wireless communication distance	Approx. 60ft (within visible range)
	·Canada conformity standards RSS-210 (Issue 7) RSS-Gen (Issue 2) ICES 003 (Issue 4)	Wireless communication speed	250 kbps
		Transmission output	1 mW (0 dBm) or less
		Modulation method	DS-SS (direct sequence spread spectrum) Resistant to interfering signal or noise.
		Communication frequency	2.4 GHz band (ISM band: universal frequency)
		Used band	15 channels (2.405 to 2.475GHz at intervals of 5MHz) The noise search function can avoid interference with other communication devices.

Note: In accordance with wireless regulations the use of this product is permitted in Japan, Europe (a total of 32 countries including 27 EU members, 4 EFTA members and Turkey), U.S.A. and Canada. This product must not be used in other countries or areas.  
· This product is not compatible with the conventional Mu-WAVE, for which communication specifications are different.  
\* Japan conformity standards: ARIB STD-T66

# U-WAVE

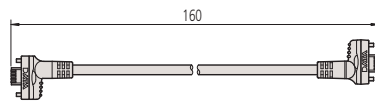
## Measurement Data Wireless Communication System

### List of U-WAVE-T Connecting Cables

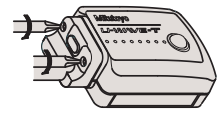
Select one from cables **A** to **G**, referring to the part number of connecting cable for wired connection in your measuring tool catalog or manual. If you are unsure which cable is appropriate, check the cable connectors, the shapes of terminal on the measuring tool side, or the codes of compatible measuring tool for cables **A** to **G** below. It is not possible to connect to EF and EH counters.

From seven types of cables (**A** to **G**), select one compatible with your measuring tool.

Measuring tool

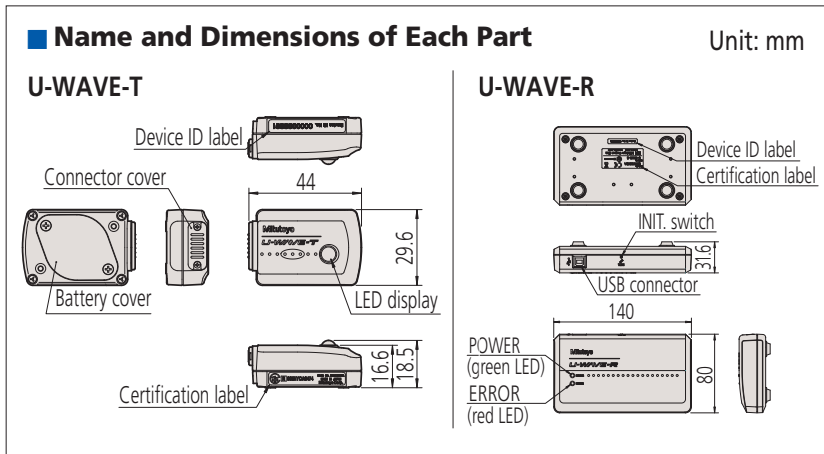


U-WAVE-T



Fasten the connector to **U-WAVE-T** with two screws.

Cable type	<b>A</b> water-proof model with output button	<b>B</b> water-proof model with output button	<b>C</b> With data-out button type	<b>D</b> 10-pin plain type	<b>E</b> 6-pin round	<b>F</b> Plain type straight	<b>G</b> Plain type straight water-proof model
Order No.	02AZD790A	02AZD790B	02AZD790C	02AZD790D	02AZD790E	02AZD790F	02AZD790G
Connector shape on the measuring tool side							
Socket shape on the measuring tool							
Codes of major compatible measuring tools and instruments	[Digimatic Caliper] CD67-S_PM CD-PMX CD-PM/GM CDC-P_PMX CDN-P_PMX CFC-G/GL/GC/GU [Digimatic Caliper] NTD-PMX [Digimatic Depth Gage] VDS-PMX [Digital Scale and DRO Systems] SD-G	[Digimatic Micrometer] MDE-MJ MDC-MJ/MJT [Digimatic Micrometer] The code suffix is -MJ. BLM-M OMV-M OMP-M PDM-M IMP-M VM-M [Digimatic Micrometer Heads] MHN-M/MJ/MJN [Digimatic Holtest] HTD-R [Digimatic Depth Gage] DMC-M	[Digimatic Caliper] CD-CX/-C CD-S_C CDC-CX/C CDN-CX/C [Digimatic Caliper] NTD-CX/C [Digimatic Depth Gage] VDS-DCX [Digital Scale and DRO Systems] SD-D, SDV-D	[Digimatic Indicator] ID-H/F [Linear Height] QMH-S [Linear Gage/Counter] EB,EC-D [μ-checker] Digital μ-checker [Laser Scan Micrometer] LSM-9506 [Reference Gage] HDM-C [Coating Thickness Gage] DGE-745/755 [Form Measurement] SJ-201/301/401	[Digimatic Micrometer] MDQ-M MDC-M CLM1-QM/DK PDM-QM PMU-DM BD-M [Digimatic Holtest] HTD [Reference Gage] HDM-DM [Hardness Testing Machines] HM-100/200 HV-100 HR-500 HH-411	[Digimatic Caliper] CD, CFC-P/-L/-C/-U [Digimatic Height Gages] HD-AX, HDM-AX HDS-H_C/-C HDM-A HDF-N [Digimatic Indicator] ID-C/_RB/_A/_GB ID-S/U [Digimatic Depth Gage] Digimatic model (ID-C) [Digital Scale and DRO Systems] SD-E, SDV-E SD-F, SDV-F [Portable Hardness Testing Instruments] HH-300	[Digimatic Indicator] ID-N ID-B
Reference Order No. of connecting cable	1m 05CZA624 2m 05CZA625	05CZA662 05CZA663	959149 959150	936937 965014	937387 965013	905338 905409	21EAA194 21EAA190



### Note on Wireless Communication Environment

Although the communication range for **U-WAVE** is approximately 60ft line-of-sight, performance may be affected by obstacles or environmental factors.

### Items that may cause communication errors

Item	Contents
Concrete wall	Communication is not possible into a room completely enclosed.
Metal partition	Communication speed may drop or communication may be interrupted.
Wireless LAN, communication device such as ZigBee Bluetooth, and microwave oven	Communication speed may drop or communication may be interrupted. Maintain the set frequency and installation distance if at all possible.
Medical instrument	Do not use this product near a medical instrument such as a laser knife or electronic scale.

### Cautions · Safety Caution:

- Do not use this device near medical equipment that might malfunction due to radio interference.
- Caution on radio law:** This device is certified as a 2.4 GHz band wide-band low-power data communication system based on the Radio Regulations in Japan, Europe, U.S.A. and Canada. It is prohibited by law to disassemble or modify this device or peel off the certification label from it.

# Multiplexers – MIG-2B, MIG-4A

## SERIES 982 — Digimatic/RS-232C Interface Unit

### FEATURES

- A measurement data transfer device, multiplexer MIG-2B and MIG-4A converts digimatic output measurement data to RS-232C and outputs it to an external device such as PC.
- Up to eight/four measuring instruments with the digimatic output feature can be connected.
- Units can be daisy-chained to meet any size needs.
- MIG-4A includes toggle switch for each input.

#### MIG-4A



982-548-10A  
Front view



982-548-10A  
Back view

#### MIG-2B



982-547-10A  
Front view



982-547-10A  
Back view

### SPECIFICATIONS

Model No.	MIG-2B	MIG-4A
Order No.	982-547-10A	982-548-10A
Gage Capacity	8	4
Dimension (mm) W x D x H	146 x 150 x 45	146 x 150 x 70
Mass (g)	540	710

### Technical Data

Data output: Via RS-232C interface

### Default Configuration

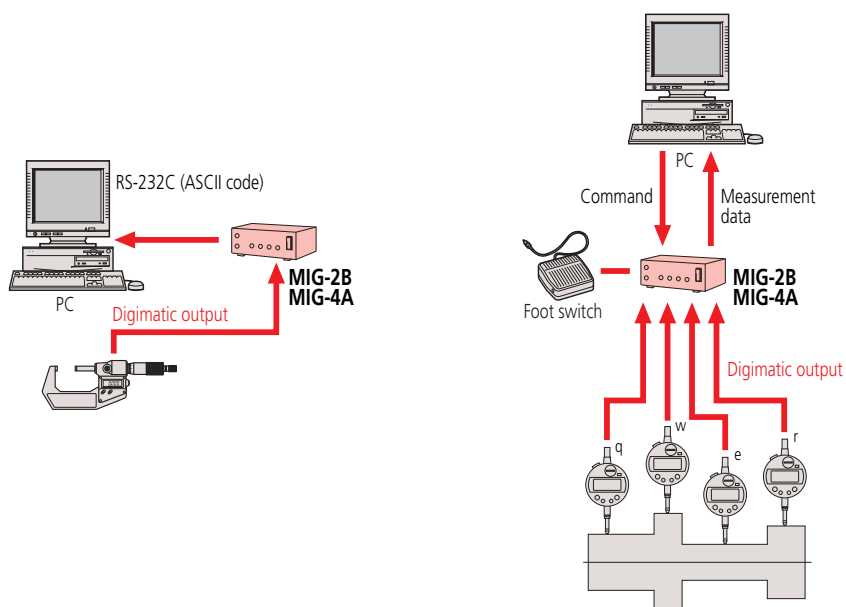
Data length: 8 bits  
Start bit: 1 bit  
Stop bit: 1 bit  
Parity check: None  
Baud rate: 4800

### Standard Accessory

526688A: AC Adapter  
RS232C: Cable (1.5m / 6Fz)

### Optional Accessories

937179T: Foot switch

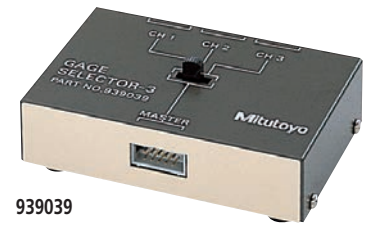


# Gage Selector 3

## 3-channel Switching Box for Data Transmission

### FEATURES

- 3 Digimatic gages can be connected.
- You can specify the gage which outputs the data with the channel switch.

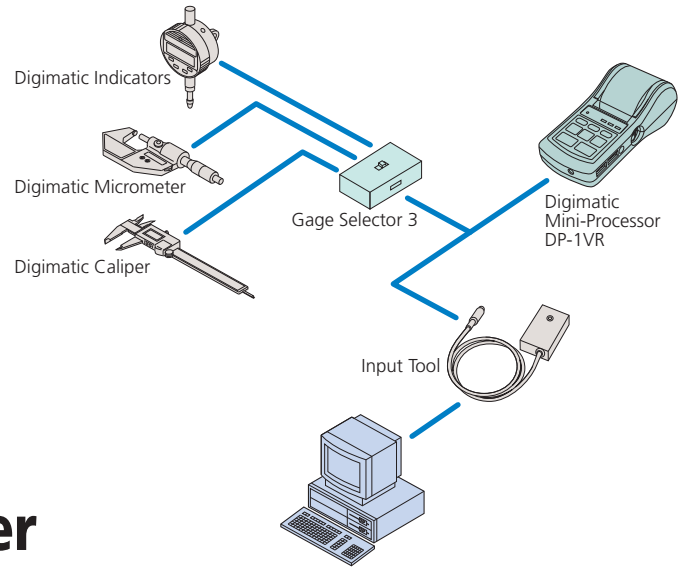


939039

### SPECIFICATIONS

Order No.	Description
939039:	Gage Selector 3

### Examples of Connections



# EC Counter

## SERIES 542 — Assembly Type Display Unit

### FEATURES

- Compact panel mounting type and DIN size. It can be easily incorporated into each system.

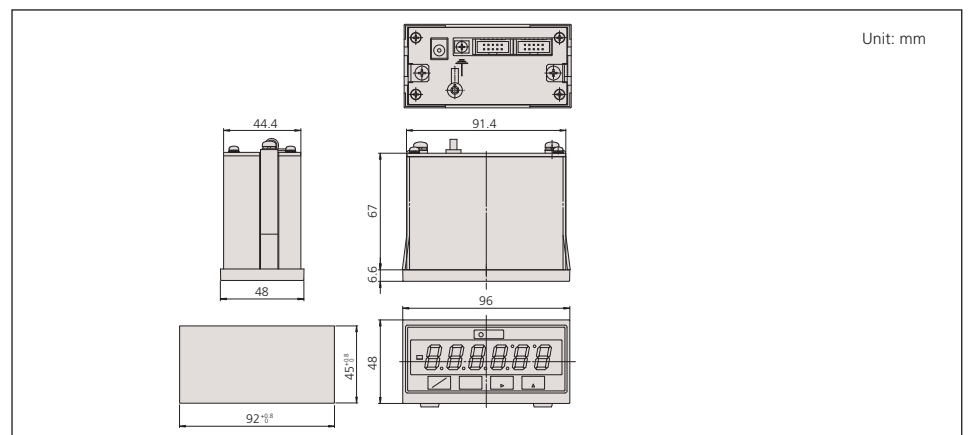


542-007A

### SPECIFICATIONS

Order No.	Description
542-007A	EC Counter

### DIMENSIONS



### Technical Data

Connection: Up to three gages  
 Signal: Digimatic code format  
 Connection: Bidirectional  
 External dimensions (W x D x H): 100 x 70 x 33mm

### Technical Data

Applicable gage: LGD, LGS, All SPC output gages  
 Resolution: .00005"/.0001"/0.001mm,  
 .0005"/.001"/0.01mm  
 No. of gage input: 1  
 Display: 6-digit LED and a negative [-] sign  
 Function: Preset  
 GO/±NG judgment  
 Output (open-collector): 3-step limit signal, Normal signal  
 External control: Preset, Data hold  
 Power supply: Via AC adaptor  
 Dimensions (W x D x H): 96 x 48 x 84.6mm  
 Mass: 50g

### Standard Accessory

06AEG302JA: AC Adapter



# DP-1VR

## SERIES 264 — Digimatic Mini-Processor

### FEATURES

- This is a palm-sized printer used to print measurement data from the digimatic gage or to perform statistical analysis.
- This printer offers excellent functionality. You can use it not only to print measurement data, perform a variety of statistical analyses, and draw a histogram or D chart but also to perform complicated operations for X-R control chart.

- Equipped with RS-232C output and GO/NG judgment output as standard functions, this processor ensures high reliability as an advanced quality inspection machine.
- The line thermal printer enables fast and quiet printing.

### SPECIFICATIONS

Order No.	Description
264-504-5A	DP - 1VR



264-504-5A

### Technical Data

Printing method: Thermal line printer  
 Printing dot: 384dot (8dot/mm)  
 Printing speed: 6.5mm/s (using AC adapter)  
 Printing paper: 48mm  
 Printing line: Approx. 6500 lines for large characters  
 Approx. 12000 lines for normal characters  
 Processing capacity: 9999 data (mode 1/2/3)  
 100000 data (mode 0)  
 Printing data: Measurement data, GO/NG judgment,  
 No. of data, Max/min value, Range, Average,  
 Standard deviation, No. of defective,  
 Fraction defective, Process capability index,  
 Histogram, D-chart, Control chart generation for  
 Xd-bar and control limit data, date and time  
 Output function: Output the measuring data (RS232C) or  
 GO/NG judgment  
 Input timer: 0.25s, 1s, 5s, 30s, 1min, 30min, 60min  
 Power: AC adapter 6V  
 Electric battery: LR6 (alkaline), Ni-Mh (AA size)  
 Battery life: 10 years (clock battery), 10000 lines (1600mA  
 1time/5 sec. using the nickel hydrofluoric  
 battery)  
 Dimensions (W x D x H): 94 x 201 x 75.2mm  
 Mass: 390g

### Standard Accessory

06AEG302JA: AC Adapter

### Optional Accessories

09EAA084\*: RS-232C changing cable (1m, 9pin)

965516\*: GO/NG judgment cable

937179T: Foot switch

09EAA082: (10 rolls)

\*It is impossible to use the both RS-232C cable and GO/NG judgment cable at the same time.



**Mode 0:** Record the measurement data and tolerance judgment.

**Mode 1:** Record the measurement data, statistical analysis and histogram.

**Mode 2:** A "D-chart" can be used to describe measurement data displacement visually. It's also possible to record the measurement data, statistical analysis and histogram at the same time.

**Mode 3:** Automatically record the various calculation results to make a X-R control chart.

\* The user can select large character format (excluding mode 2).

# SPC Connecting Cables

- These cables are used to output measurement data from the digimatic gage with the output feature to the digimatic mini processor, digimatic display unit, multiplexer or other device.

- Cables of one or two meters are available.
- Note that the shape of connector differs depending on the model.

Input plug to Data Processor			
Order No.		Applicable gages	
Straight type		<b>ALL CALIPERS WITHOUT ABSOLUTE ENCODER</b> Height Gage 570-2XX, 192-6XX, 192-67X Indicators 575-XXX, 543-6XX, 543-2XX, 543-4XX Depth Gages 547-21X, 547-25X, 571-2XX Scale Unit 572-XXX Thickness Gages 547-3XX, 547-4XX	
905338: 1m (40") 905409: 2m (80") 64AAA016: 3m (120") 64AAA017: 5m (200")			
Back type			
905689: 1m (40") 905690: 2m (80")			
Right type			
905691: 1m (40") 905692: 2m (80")			
Left type			
905693: 1m (40") 905694: 2m (80")			
With data out switch type			<b>ALL DIGIMATIC CALIPERS WITH ABSOLUTE ENCODER</b> Height Gage 570-2XX Depth Gages 571-2XX Scale Unit 572-XXX
959149: 1m (40") 959150: 2m (80") 64AAA074: 3m (120") 64AAA075: 5m (200")			
With data out switch type		Coolant Proof Caliper 500-68X, 500-76X, 500-78X. Coolant Proof Digimatic scale units 572-61X.	
05CZA624: 1m (40") 05CZA625: 2m (80")			
With data out switch type		Digimatic Micrometer IP65	
05CZA662: 1m (40") 05CZA663: 2m (80")			
6 pins type		<b>ALL MICROMETERS (not for IP65 mics)</b> Indicators 543-11X, 543-13X, 543-14X, 543-18X, 543-17X Holtest 468-2XX, 468-9XX Micrometer Head 164-162, 164-172, 350-71X, 329-71X Boremetrics 568-XXX Others Mikematic, Quickmike Bench Mike 121-XXX	
937387: 1m (40") 965013: 2m (80") 64AAA026: 3m (120") 64AAA027: 5m (200")			
10 pins type		Indicators 543-5XX MU-Checkers 519-4XX, 519-621A MU-Gages 179-204, 179-205, 179-206 Display 542-022-5A, 542-032-5A, 542-036-5A Display 572-011A, 572-031A Linear Height 518-314A, 518-315A Litematic 318-202A, 318-204A Heightmatic 57X SERIES. Digi Derm 179-7XX Hardness Tester (Micro Hardness Type)	
936937: 1m (40") 965014: 2m (80") 64AAA020: 3m (120") 64AAA021: 5m (200")			
Digimatic cable extension adapter 02ADF640		<b>DIGIMATIC CABLE EXTENSION ADAPTER</b> Need 936937 or 965014 to the Data Processor	
			



### Micrometers



### Micrometer Heads



MDH Micrometer



QuantuMike



Ratchet Thimble Micrometer



Digimatic Spline Micrometer



Micrometer Head with spindle clamp

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# Coolant Proof Micrometer

**SERIES 293 — with Dust/Water Protection Conforming to IP65 Level**

## FEATURES

- IP65 protection level, enabling use in environments exposed to cutting oil, etc\*.  
\*Anti-corrosion treatment is required after use.
- Measurement data output function is available with a water-resistant connection cable.
- Auto power ON/OFF function.
- Certificate of inspection\* is included. (2" /50mm or less range models)  
\*It is not the type used to obtain calibration certificates.
- With a standard bar except for 0-1" /0-25mm model.
- Supplied in fitted case. Plastic case up to 6" /150mm, Wooden box over 6" /150mm



293-340



293-352



Oil-resistance materials are used in all plastic components.



Measurement data output function is available with a water-resistant connection cable.



Certificate of inspection

## Technical Data

- Accuracy: Refer to the list of specifications.  
 Resolution: .00005" / 0.001mm or 0.001mm (up to 4" models)  
 .0001" / 0.001mm (over 4" models)  
 Flatness: .000012" / 0.3µm  
 Parallelism: .00004" / 1µm for models up to 2" / 50mm  
 .00008" / 2µm for models up to 4" / 100mm  
 .00012" / 3µm for models up to 7" / 175mm  
 .00016" / 4µm for models up to 11" / 275mm  
 .0002" / 5µm for models over 12" / 300mm  
 Measuring faces: Carbide tipped  
 Display: LCD  
 Battery: SR44 (1 pc.), 938882  
 Battery life: Approx. 1.2 years under normal use  
 (8 months: over 4" / 100mm models)  
 Dust/Water protection level: IP65

## Function

- Origin-set, Zero / ABS, Hold, Auto power on/off,  
 Data output (output models),  
 inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error

## Optional Accessories

- 05CZA662: SPC cable with data switch (40" / 1m)  
 05CZA663: SPC cable with data switch (80" / 2m)



SPC cable with data switch

## SPECIFICATIONS

### Metric \_\_\_\_\_ With ratchet stop

Range	Resolution	Order No.	Accuracy
0 - 25mm	0.001mm	<b>293-230 / 293-240*</b>	±1μm
25 - 50mm	0.001mm	<b>293-231 / 293-241*</b>	±1μm
50 - 75mm	0.001mm	<b>293-232 / 293-242*</b>	±1μm
75 - 100mm	0.001mm	<b>293-233 / 293-243*</b>	±2μm
100 - 125mm	0.001mm	<b>293-250-10</b>	±2μm
125 - 150mm	0.001mm	<b>293-251-10</b>	±2μm
150 - 175mm	0.001mm	<b>293-252-10</b>	±3μm
175 - 200mm	0.001mm	<b>293-253-10</b>	±3μm
200 - 225mm	0.001mm	<b>293-254-10</b>	±3μm
225 - 250mm	0.001mm	<b>293-255-10</b>	±4μm
250 - 275mm	0.001mm	<b>293-256-10</b>	±4μm
275 - 300mm	0.001mm	<b>293-257-10</b>	±4μm

\*without SPC data output

### Metric \_\_\_\_\_ With ratchet thimble

Range	Resolution	Order No.	Accuracy
0 - 25mm	0.001mm	<b>293-234 / 293-244*</b>	±1μm
25 - 50mm	0.001mm	<b>293-235 / 293-245*</b>	±1μm
50 - 75mm	0.001mm	<b>293-236 / 293-246*</b>	±1μm
75 - 100mm	0.001mm	<b>293-237 / 293-247*</b>	±2μm

\*without SPC data output

### Metric \_\_\_\_\_ With friction thimble

Range	Resolution	Order No.	Accuracy
0 - 25mm	0.001mm	<b>293-238 / 293-248*</b>	±1μm

\*without SPC data output

### Metric \_\_\_\_\_ Micrometer Set

Range	Order No.	Included in set
0-50mm (2pcs. Set)	<b>293-965</b>	293-230, 293-231, 1 standard bar, 1m SPC cable in the plastic case
0-100mm (4pcs. Set)	<b>293-964</b>	293-230, 293-231, 293-232, 293-234, 3 standard bar, 1m SPC cable in the wooden box

### Inch/Metric \_\_\_\_\_ With ratchet stop

Range	Resolution	Order No.	Accuracy
0 - 1" / 0 - 25.4mm	.00005" / 0.001mm	<b>293-330 / 293-340*</b>	±.00005"
1" - 2" / 25.4 - 50.8mm	.00005" / 0.001mm	<b>293-331 / 293-341*</b>	±.00005"
2" - 3" / 50.8 - 76.2mm	.00005" / 0.001mm	<b>293-332 / 293-342*</b>	±.00005"
3" - 4" / 76.2 - 101.6mm	.00005" / 0.001mm	<b>293-333 / 293-343*</b>	±.0001"
4" - 5" / 101.6 - 127.0mm	.0001" / 0.001mm	<b>293-350-10</b>	±.0001"
5" - 6" / 127.0 - 152.4mm	.0001" / 0.001mm	<b>293-351-10</b>	±.0001"
6" - 7" / 152.4 - 177.8mm	.0001" / 0.001mm	<b>293-352-10</b>	±.00015"
7" - 8" / 177.8 - 203.2mm	.0001" / 0.001mm	<b>293-353-10</b>	±.00015"
8" - 9" / 203.2 - 228.6mm	.0001" / 0.001mm	<b>293-354-10</b>	±.00015"
9" - 10" / 228.6 - 254.0mm	.0001" / 0.001mm	<b>293-355-10</b>	±.0002"
10" - 11" / 254.0 - 279.4mm	.0001" / 0.001mm	<b>293-356-10</b>	±.0002"
11" - 12" / 279.4 - 304.8mm	.0001" / 0.001mm	<b>293-357-10</b>	±.0002"

\*without SPC data output

### Inch/Metric \_\_\_\_\_ With ratchet thimble

Range	Resolution	Order No.	Accuracy
0 - 1" / 0 - 25.4mm	.00005" / 0.001mm	<b>293-334 / 293-344*</b>	±.00005"
0 - 1" / 0 - 25.4mm	.0001" / 0.001mm	<b>293-349*</b>	±.0001"
1" - 2" / 25.4 - 50.8mm	.00005" / 0.001mm	<b>293-345*</b>	±.00005"
2" - 3" / 50.8 - 76.2mm	.00005" / 0.001mm	<b>293-346*</b>	±.00005"
3" - 4" / 76.2 - 101.6mm	.00005" / 0.001mm	<b>293-347*</b>	±.0001"

\*without SPC data output

### Inch/Metric \_\_\_\_\_ With friction thimble

Range	Resolution	Order No.	Accuracy
0 - 1" / 0 - 25.4mm	.00005" / 0.001mm	<b>293-335 / 293-348*</b>	±.00005"
1" - 2" / 25.4 - 50.8mm	.00005" / 0.001mm	<b>293-336</b>	±.00005"

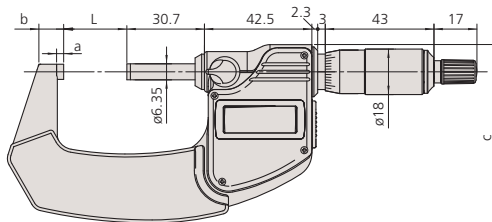
\*without SPC data output

### Inch/Metric \_\_\_\_\_ Micrometer Set .00005" / 0.001mm graduation model

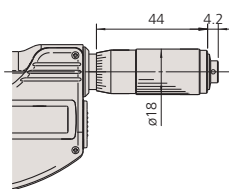
Range	Order No.	Included in set
0 - 3" / 0 - 76.2mm (3 pcs. set)	<b>293-960</b>	293-330, 293-331, 293-332, 2 standard bar in the plastic case
0 - 4" / 0 - 101.6mm (4 pcs. set)	<b>293-961</b>	293-330, 293-331, 293-332, 293-333 3 standard bar in the wooden box

## DIMENSIONS AND MASS

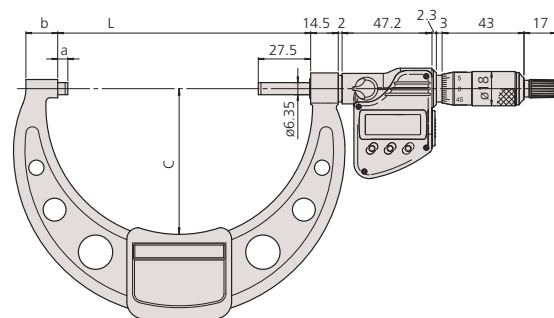
Ratchet stop type (up to 100mm/4")



Ratchet thimble type and friction thimble type



Unit: mm



Ratchet stop type (over 100mm/4" to 300mm/12")

Range (Metric / Inch)	L	a	b	c	Mass (g)
0 - 25mm / 0-1"	0	2.8	6.2	(59.8)	270
25 - 50mm / 1-2"	25	2.8	7	(70.3)	330
50 - 75mm / 2-3"	50	2.8	9.8	(91.9)	470
75 - 100mm / 3-4"	75	2.8	11.2	(112.9)	625
100 - 125mm / 4-5"	132.8	5.3	16.7	(76.5)	600
125 - 150mm / 5-6"	158.2	5.7	18.8	(91)	740
150 - 175mm / 6-7"	183.6	6.1	19.1	(103.1)	800
175 - 200mm / 7-8"	208.8	6.3	18.2	(115.3)	970
200 - 225mm / 8-9"	234.2	6.7	16.8	(126.8)	1100
225 - 250mm / 9-10"	258	5.5	18	(139.8)	1270
250 - 275mm / 10-11"	284	18	28	(152.3)	1340
275 - 300mm / 11-12"	309	18	28	(166)	1540

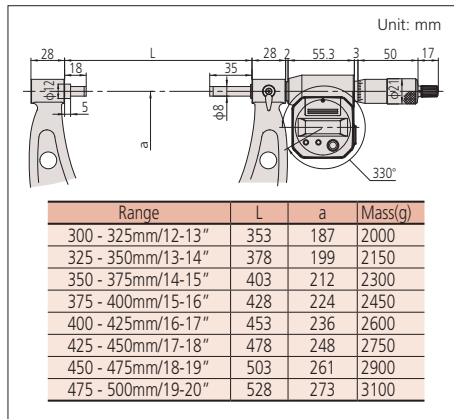
# Digimatic Micrometer

**SERIES 293**



293-582

## DIMENSIONS



## SPECIFICATIONS

Metric <input type="checkbox"/> With ratchet stop			
Range	Resolution	Order No.	Accuracy
300 - 325mm	0.001mm	<b>293-582</b>	±6μm
325 - 350mm	0.001mm	<b>293-583</b>	±6μm
350 - 375mm	0.001mm	<b>293-584</b>	±6μm
375 - 400mm	0.001mm	<b>293-585</b>	±7μm
400 - 425mm	0.001mm	<b>293-586</b>	±7μm
425 - 450mm	0.001mm	<b>293-587</b>	±7μm
450 - 475mm	0.001mm	<b>293-588</b>	±8μm
475 - 500mm	0.001mm	<b>293-589</b>	±8μm

Inch/Metric <input type="checkbox"/> With ratchet stop			
Range	Resolution	Order No.	Accuracy
12" - 13" / 304.8 - 330.2mm	.0001" / 0.001mm	<b>293-782</b>	±.0003"
13" - 14" / 330.2 - 355.6mm	.0001" / 0.001mm	<b>293-783</b>	±.0003"
14" - 15" / 355.6 - 381.0mm	.0001" / 0.001mm	<b>293-784</b>	±.0003"
15" - 16" / 381.0 - 406.4mm	.0001" / 0.001mm	<b>293-785</b>	±.00035"
16" - 17" / 406.4 - 431.8mm	.0001" / 0.001mm	<b>293-786</b>	±.00035"
17" - 18" / 431.8 - 457.2mm	.0001" / 0.001mm	<b>293-787</b>	±.00035"
18" - 19" / 457.2 - 482.6mm	.0001" / 0.001mm	<b>293-788</b>	±.0004"
19" - 20" / 482.6 - 508.0mm	.0001" / 0.001mm	<b>293-789</b>	±.0004"

## Technical Data

Accuracy: Refer to the list of specifications.  
 Resolution: .0001"/0.001mm or 0.001mm  
 Flatness: .000024" / 0.6μm  
 Parallelism: .0002"/5μm for models up to 15"/375mm  
 .00024"/6μm for models up to 19"/475mm  
 .00028"/7μm for models over 20"/500mm  
 Measuring faces: Carbide tipped  
 Display: LCD  
 Battery: SR44 (2 pcs.), **938882**  
 Battery life: Approx. 1.8 years under normal use

## Function

Preset, Zero-setting, Power ON/OFF, Data hold, Data output, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error

## Optional Accessories

**959149:** SPC cable (40"/1m)  
**959150:** SPC cable (80"/2m)  
**04AZB512:** SPC cable L-type (80"/2m)  
**04AZB513:** SPC cable L-type (80"/2m)



# Digimatic Micrometer

**SERIES 293 MDC-Lite**

## FEATURES

- Provided only with a zero set and in / mm (inch / metric models only) keys.
- A ratchet stop or friction thimble for a constant measuring force.
- Measurement readout with large characters on the LCD screen.
- No spindle clamp. No data output
- Supplied in fitted plastic case



## SPECIFICATIONS

Metric <input type="checkbox"/> With ratchet stop			
Range	Resolution	Order No.	Accuracy
0 - 25mm	0.001mm	<b>293-821</b>	±2μm

Inch/Metric <input type="checkbox"/> With ratchet stop			
Range	Resolution	Order No.	Accuracy
0 - 1" / 0 - 25.4mm	.00005" / 0.001mm	<b>293-831</b>	±.0001"

Inch/Metric <input type="checkbox"/> With friction thimble			
Range	Resolution	Order No.	Accuracy
0 - 1" / 0 - 25.4mm	.00005" / 0.001mm	<b>293-832</b>	±.0001"

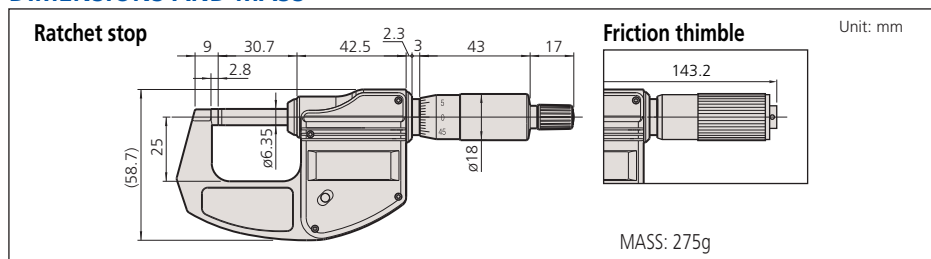
## Technical Data

Accuracy: Refer to the list of specifications.  
 Resolution: .00005"/0.001mm or 0.001mm  
 Flatness: .000012" / 0.3μm  
 Parallelism: .00008" / 2μm  
 Measuring faces: Carbide tipped  
 Display: LCD  
 Battery: SR44 (1 pc.), **938882**  
 Battery life: Approx. 1.2 years under normal use

## Function

Origin-set, Automatic power on/off, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error

## DIMENSIONS AND MASS



# MDH Micrometer

## SERIES 293 — High-Accuracy Sub-Micron Digimatic Micrometer

### Technical Data

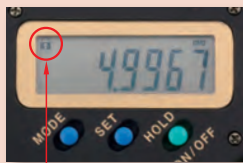
Flatness: 0.3µm/0.00012"  
 Parallelism: 0.6µm/0.00024  
 Measuring force: 7 to 9N  
 Power supply: Lithium battery (CR2032) x 1  
 Battery life: Approx. two years when used under normal conditions

### Functions

Preset (ABS measurement system)  
 Zero-setting (INC measurement system)  
 Hold, Resolution switching, Function lock, On/off, Auto power off, Measurement data output, Error alarm

### Optional Accessories

**05CZA662:** SPC cable with data switch (1m/40")  
**05CZA663:** SPC cable with data switch (2m/80")



Function lock

Heat shield



### FEATURES

- Enabling .000005"/0.1µm resolution measurement, this micrometer is ideal for customers who need to make highly accurate measurements with a hand-held tool.
- A highly rigid frame and high-performance constant-force mechanism\* enable more stable measurement, while the clicks emitted while the workpiece is being measured assure the operator that measurement is proceeding normally.

\* Patent pending in Japan, the United States of America, the European Union, and China.

- Body heat transferred to the instrument is reduced by a (removable) heat shield, minimizing the error caused by thermal expansion of the frame when performing handheld measurements.
- The ABS (absolute) rotary sensor also eliminates the need to perform origin setting each time the power is turned on, letting you start measuring straight away. With no possibility of overspeed errors, the High-Accuracy Digimatic Micrometer also delivers a higher level of reliability.



### SPECIFICATIONS

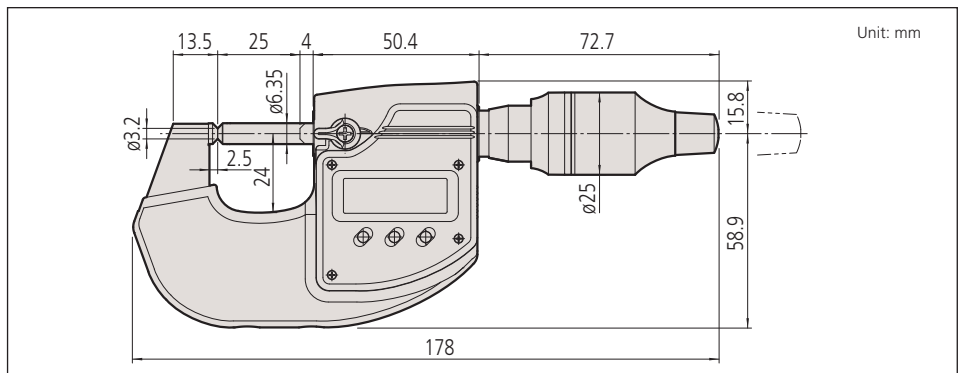
#### Metric

Order No.	Range	Resolution	Accuracy	Measuring surface	Mass
293-100	0 - 25mm	0.0001mm/0.0005mm (switchable)	±0.5µm	ø3.2mm	400g (440g w/Heat shield)

#### Inch/Metric

Order No.	Range	Resolution	Accuracy	Measuring surface	Mass
293-130	0 - 1" / 0 - 25.4mm	.000005"/0.0002" / 0.0001mm/0.0005mm (switchable)	±.00002"	ø3.2mm	400g (440g w/Heat shield)

### DIMENSIONS



# QuantuMike

## SERIES 293 — Coolant Proof Micrometer

### FEATURES

- Faster measurement with 2mm per revolution instead of the standard 0.5mm.
- A patented ratchet thimble mechanism helps ensure repeatability.
- A function lock helps prevent error.
- IP-65 protection level.
- Certificate of inspection provided.
- With a standard bar except for 0-25mm/0-1" model.
- Supplied in fitted plastic case.



### SPECIFICATIONS

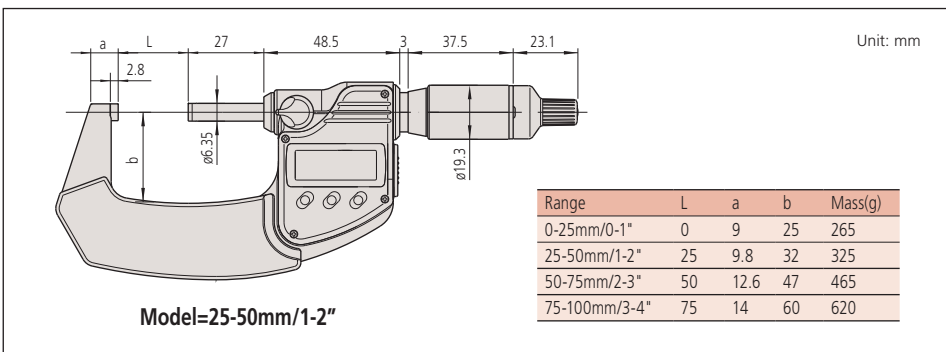
Metric			
Range	Resolution	Order No.	Accuracy
0-25mm	0.001mm	293-140	1µm
0-25mm	0.001mm	293-145*	1µm
25-50mm	0.001mm	293-141	1µm
25-50mm	0.001mm	293-146*	1µm
50-75mm	0.001mm	293-142	2µm
50-75mm	0.001mm	293-147*	2µm
75-100mm	0.001mm	293-143	2µm
75-100mm	0.001mm	293-148*	2µm

\* without SPC data output

Inch/Metric			
Range	Resolution	Order No.	Accuracy
0-1"/0 - 25.4mm	.00005"/0.001mm	293-180	.00005"
0-1"/0 - 25.4mm	.00005"/0.001mm	293-185*	.00005"
1-2"/25.4 - 50.8mm	.00005"/0.001mm	293-181	.00005"
1-2"/25.4 - 50.8mm	.00005"/0.001mm	293-186*	.00005"
2-3"/50.8 - 76.2mm	.00005"/0.001mm	293-182	.0001"
2-3"/50.8 - 76.2mm	.00005"/0.001mm	293-187*	.0001"
3-4"/76.2 - 101.6mm	.00005"/0.001mm	293-183	.0001"
3-4"/76.2 - 101.6mm	.00005"/0.001mm	293-188*	.0001"

\* without SPC data output

### DIMENSIONS AND MASS



Certificate of inspection

### Technical Data

Accuracy: Refer to the list of specifications.  
 Resolution: 0.001mm or .00005"/0.001mm  
 Flatness: 0.3µm/0.00012"  
 Parallelism: 1µm/0.0004" for models up to 50mm/2"  
 2µm/0.0008" for models up to 100mm/4"  
 Measuring faces: Carbide tipped  
 Display: LCD  
 Battery: SR44 (1 pc.), 938882  
 Battery life: Approx. 1.2 years under normal use  
 (8 months: over 100mm models)  
 Dust/Water protection level: IP65

### Function

Origin-set, Zero / ABS, Hold, Function locks, Auto power on/off, Data output (output models), inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error

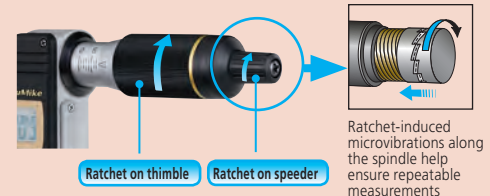
### Optional Accessories

- 05CZA662: SPC cable with data switch (1m/40")
- 05CZA663: SPC cable with data switch (2m/80")

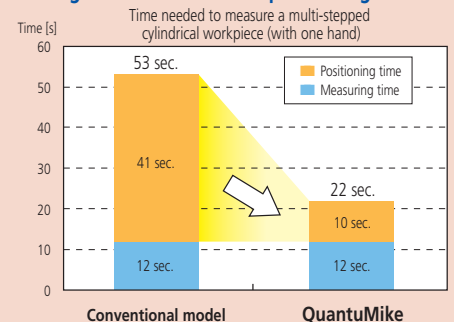


SPC cable with data switch

- 516-529-26 Inspection Gage Block Set  
Rectangular Steel Gage Block  
10 pc. blocks and 1 pc. optical parallel
- 516-319-26 Inspection Gage Block Set  
Rectangular Cera Gage Block  
10 pc. blocks and 1 pc. optical parallel



### Significant reduction in positioning time







### Technical Data

Accuracy: Refer to the list of specifications.  
 Resolution: .00005"/0.001mm or 0.001mm  
 Flatness: .000012" / 0.3µm  
 Parallelism: .00008" / 2µm  
 Accuracy of selected measuring force:  
 ± (0.1+selected measuring force/10)N  
 for 0.5-2.5N models  
 ± (0.4+selected measuring force/10)N  
 for 2-10N models

Measuring faces: Carbide tipped  
 Display: LCD  
 Battery: SR44 (1 pc.), **938882**  
 Battery life: Approx. 3 years under normal use  
 (1 year for .6 - 1.2" / 15-30mm, .4 - .8" /  
 10-20mm, .8-1.2" / 20-30mm range model)

### Function

Origin, Hold / Data, ON/OFF, Zero / ABS,  
 inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error

### Optional Accessories

**937387:** SPC cable (40" / 1m)  
**965013:** SPC cable (80" / 2m)



# ABSOLUTE Digimatic Micrometers

## SERIES 227 — with Adjustable Measuring Force

### FEATURES

- Constant and low measuring force mechanism in the thimble.
- Adjustable measuring force\* accommodates various kind of work materials.  
 \*0.5-2.5N or 2-10N
- The measurement-value hold function automatically retains the data at a specified measuring force, ensuring accuracy.
- Non-rotating spindle and the new ratchet friction thimble.
- Speedy spindle feed by .4"/rev and 10mm/rev for inch/metric model.
- With absolute linear scale.
- With SPC data output.
- With a standard bar to set the origin point (except for 0-15mm, 0-10mm, 0-.6", and 0-4" models).
- Supplied in fitted plastic case.



### SPECIFICATIONS

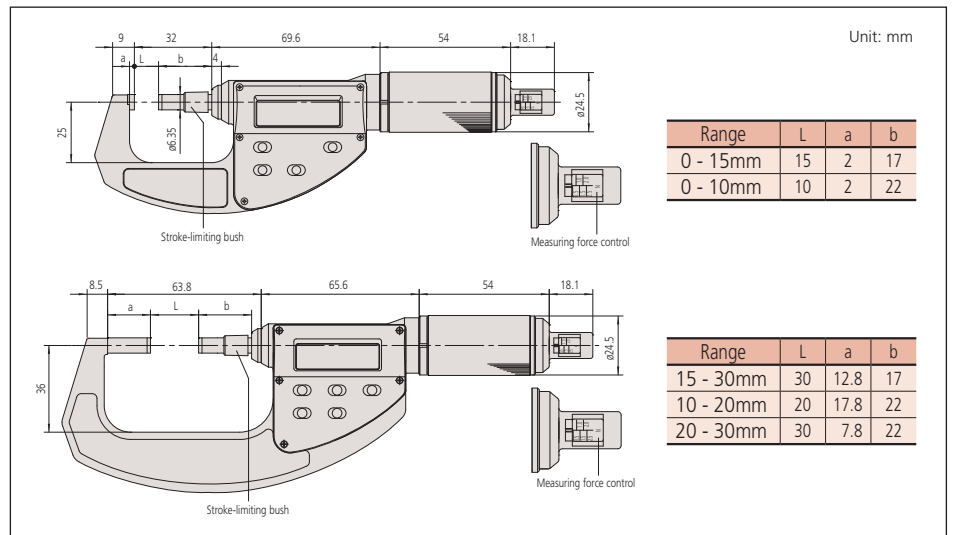
#### Metric

Order No.	Range	Resolution	Accuracy	Measuring Force	Mass(g)
<b>227-201</b>	0-15mm	0.001mm	±2µm	0.5-2.5 (0.5, 1.0, 1.5, 2, 2.5) N	300
<b>227-203</b>	15-30mm	0.001mm	±2µm	0.5-2.5 (0.5, 1.0, 1.5, 2, 2.5) N	380
<b>227-205</b>	0-10mm	0.001mm	±2µm	2-10 (2, 4, 6, 8, 10) N	340
<b>227-206</b>	10-20mm	0.001mm	±2µm	2-10 (2, 4, 6, 8, 10) N	425
<b>227-207</b>	20-30mm	0.001mm	±2µm	2-10 (2, 4, 6, 8, 10) N	415

#### Inch/Metric

Order No.	Range	Resolution	Accuracy	Measuring Force	Mass(g)
<b>227-211</b>	0-.6"	.00005"/0.001mm	±.0001"	0.5-2.5 (0.5, 1.0, 1.5, 2, 2.5) N	300
<b>227-213</b>	.6-1.2"	.00005"/0.001mm	±.0001"	0.5-2.5 (0.5, 1.0, 1.5, 2, 2.5) N	380
<b>227-215</b>	0-.4"	.00005"/0.001mm	±.0001"	2-10 (2, 4, 6, 8, 10) N	340
<b>227-216</b>	.4-.8"	.00005"/0.001mm	±.0001"	2-10 (2, 4, 6, 8, 10) N	425
<b>227-217</b>	.8-1.2"	.00005"/0.001mm	±.0001"	2-10 (2, 4, 6, 8, 10) N	415

### DIMENSIONS AND MASS



# Quickmike

## SERIES 293 — IP-54 ABSOLUTE Digimatic Micrometers

The Quickmike provides a speedy spindle feed of 10mm / .4" per thimble rotation as compared to the conventional micrometer with 0.5mm / .025" per rotation. Its wide 30mm / 1.2" measuring range allows various workpieces with different shapes to be measured quickly.

### FEATURES

- Non-rotating spindle and the new ratchet friction thimble.
- Speedy spindle feed by 10mm/rev and .4"/rev for inch/metric models.
- With absolute linear scale.
- IP54 dust/water protection (when not connected with data output cable).
- With SPC data output.
- With a standard bar to set the origin point (for models with a range over 30mm / 1.2").
- Supplied in fitted plastic case.



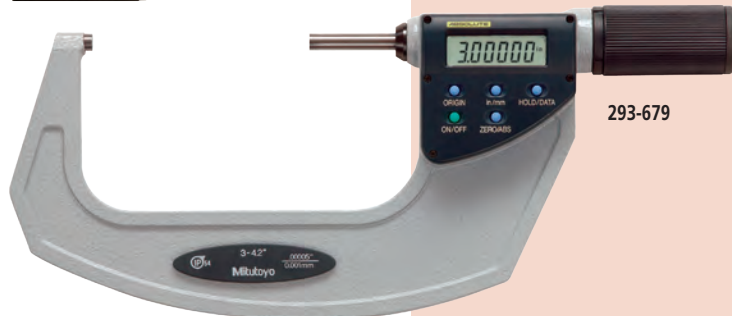
293-676



293-677



293-678



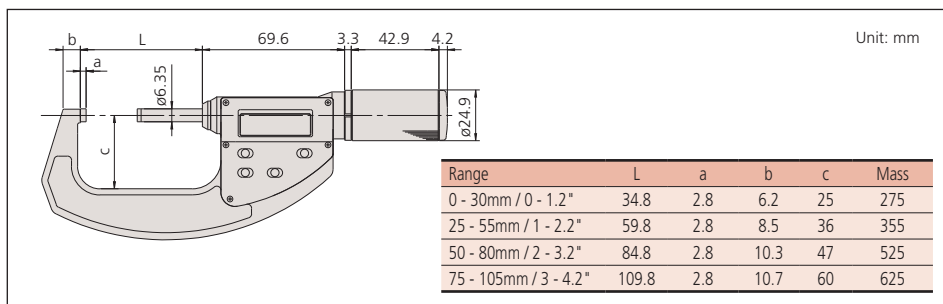
293-679

### SPECIFICATIONS

Metric			
Range	Resolution	Order No.	Accuracy
0 - 30mm	0.001mm	293-666	±2μm
25 - 55mm	0.001mm	293-667	±2μm
50 - 80mm	0.001mm	293-668	±3μm
75 - 105mm	0.001mm	293-669	±3μm

Inch/Metric			
Range	Resolution	Order No.	Accuracy
0 - 1.2" / 0 - 30.48mm	.00005" / 0.001mm	293-676	±.0001"
1" - 2.2" / 25.4 - 55.88mm	.00005" / 0.001mm	293-677	±.0001"
2" - 3.2" / 50.8 - 81.28mm	.00005" / 0.001mm	293-678	±.00015"
3" - 4.2" / 76.2 - 106.68mm	.00005" / 0.001mm	293-679	±.00015"

### DIMENSIONS AND MASS

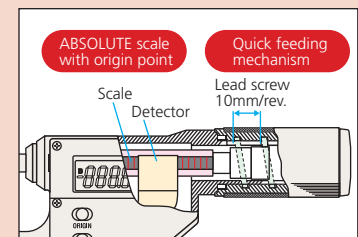


### Technical Data

Accuracy: Refer to the list of specifications.  
 Resolution: 0.001mm or .00005"/0.001mm  
 Flatness: 0.3μm / .000012"  
 Parallelism: 2μm / .00008" for models up to 80mm / 3.2"  
 3μm / .00012" for models up to 105mm / 4.2"  
 Measuring faces: Carbide tipped  
 Display: LCD  
 Battery: SR44 (1 pc.), 938882  
 Battery life: Approx. 3 years under normal use  
 (1 year for models over 30mm / 1.2")  
 Dust/Water protection level: IP54

### Function

Origin, Hold / Data, ON/OFF, Zero / ABS,  
 inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error



### Optional Accessories

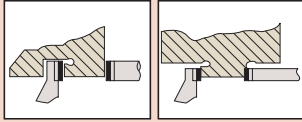
- 937387: SPC cable (1m / 40")
- 965013: SPC cable (2m / 80")

# Outside Micrometers

## SERIES 101

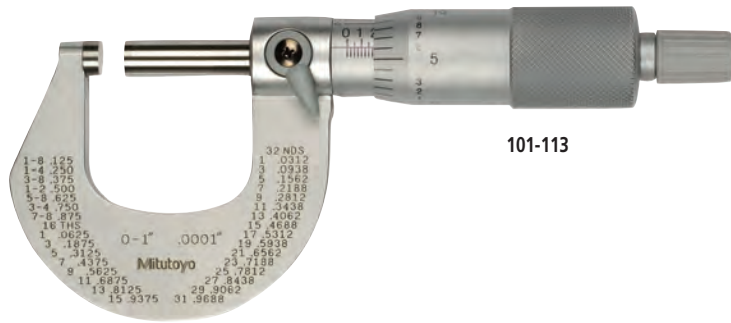
### Technical Data

Graduation: .0001"  
 Flatness: .000024"  
 Parallelism: .00008" for models up to 3"  
 .00012" for models over 3"  
 Measuring faces: Carbide tipped

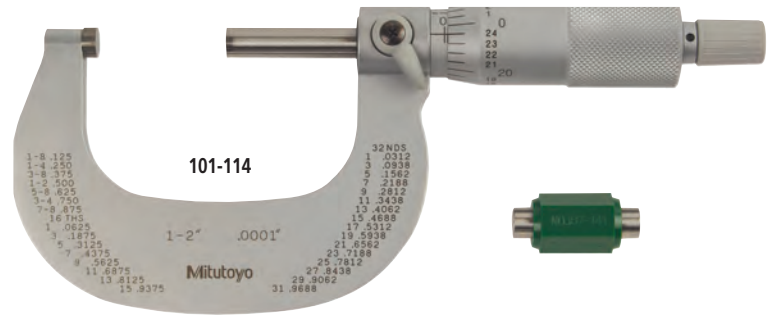


### FEATURES

- Satin-chrome-finished frame, tapered (on the anvil side) for hard-to-reach places.
- With a standard bar except for 0 - 1" models.
- Supplied in fitted plastic case.



101-113



101-114

### SPECIFICATIONS

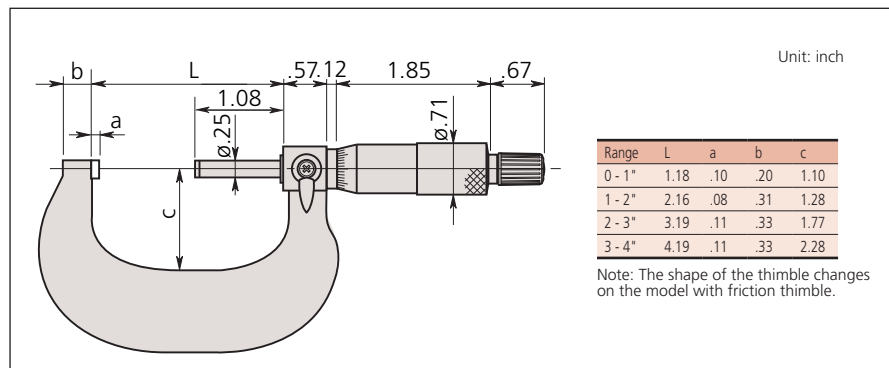
Inch		With friction thimble		
Range	Graduation	Order No.	Accuracy	Mass (g)
0 - 1"	.0001"	<b>101-117*</b>	±.0001"	180
1 - 2"	.0001"	<b>101-118*</b>	±.0001"	245

\*.0001" reading is obtained with vernier.

Inch		With ratchet stop		
Range	Graduation	Order No.	Accuracy	Mass (g)
0 - 1"	.0001"	<b>101-113*</b>	±.0001"	180
1 - 2"	.0001"	<b>101-114*</b>	±.0001"	245
2 - 3"	.0001"	<b>101-119*</b>	±.0001"	410
3 - 4"	.0001"	<b>101-120*</b>	±.00015"	550

\*.0001" reading is obtained with vernier.

### DIMENSIONS

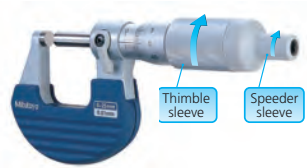


# Ratchet Thimble Micrometer

**SERIES 101, 102 — New smoother action Ratchet Thimble**

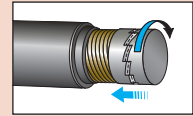
## FEATURES

- Ratchet function works both from the thimble and the speeder, allowing easy one-handed operation.
- Clearly audible ratchet operation for reassurance that measurement is being performed at constant, preset force.
- Provided with a Certificate of Inspection.
- With a standard bar except for 0 - 25mm and 0 - 1" models.
- Supplied in fitted plastic case.

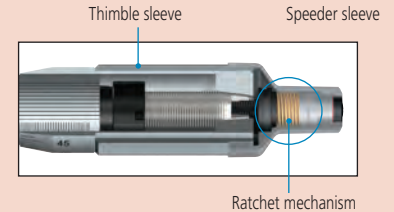


## Technical Data

Graduation: 0.01mm, 0.001mm, .001" or .0001"  
Flatness: 0.6μm / .000024"  
Parallelism: 2μm / .00008"  
Measuring faces: Carbide tipped  
Measuring force: 5-10N



Rotating the thimble/speeder when the workpiece is between the anvil and spindle causes the ratchet mechanism to tap the spindle and apply a constant measuring force to the workpiece.



## SPECIFICATIONS

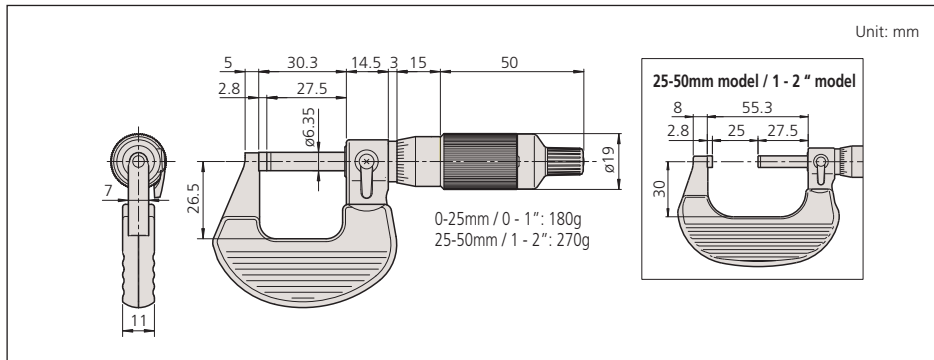
Metric			
Range	Graduation	Order No.	Accuracy
0 - 25mm	0.01mm	102-701	±2μm
0 - 25mm	0.001mm	102-707*	±2μm
25 - 50mm	0.01mm	102-702	±2μm
25 - 50mm	0.001mm	102-708*	±2μm

\*0.001mm reading is obtained with vernier.

Inch			
Range	Graduation	Order No.	Accuracy
0 - 1"	.001"	101-711	±.0001"
	.0001"	101-717*	±.0001"
	.0001"	102-717*	±.0001"
1 - 2"	.0001"	102-718*	±.0001"

\*.0001" reading is obtained with vernier.

## DIMENSIONS AND MASS





# Outside Micrometers

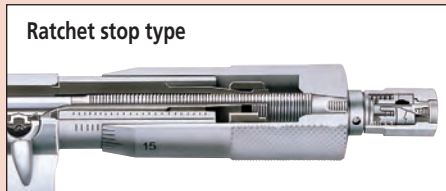
## SERIES 102

### FEATURES

- Heat-insulated frame, tapered (on the anvil side) for hard-to-reach places.
- With a standard bar except for 0 - 25mm model.
- A ratchet stop for a constant measuring force.
- Supplied in a fitted plastic case.

### Technical Data

Graduation: 0.01mm  
 Flatness: 0.3µm  
 Parallelism: 1µm for 25mm model  
                   3µm for models up to 100mm  
 Measuring faces: Carbide tipped



102-301

### SPECIFICATIONS

Metric — With ratchet stop			
Range	Graduation	Order No.	Accuracy
0 - 25mm	0.01mm	<b>102-301</b>	±2µm
25 - 50mm	0.01mm	<b>102-302</b>	±2µm
50 - 75mm	0.01mm	<b>102-303</b>	±2µm
75 - 100mm	0.01mm	<b>102-304</b>	±3µm

Metric — Micrometer set 0.01mm Graduation model		
Range	Order No.	Included in set
0 - 100mm (4 pcs/set)	<b>102-911-40</b>	<ul style="list-style-type: none"> <li>• 102-301</li> <li>• 102-302</li> <li>• 102-303</li> <li>• 102-304</li> <li>• 3 micrometer standards</li> </ul>

### DIMENSIONS AND MASS

Unit: mm

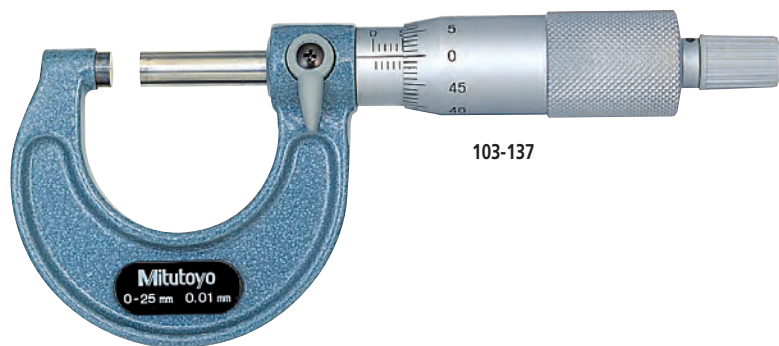
Range	L	a	b	c	d	Mass (g)
0 - 25mm	30.3	2.8	5	26	6.35	180
25 - 50mm	55.3	2.8	8	32	6.35	270
50 - 75mm	80.3	2.8	9	45	6.35	375
75 - 100mm	105.3	2.8	10	58	6.35	490

# Outside Micrometers

## SERIES 103

### FEATURES

- Hammertone, baked-enamel-finished frame.
- Ratchet Stop for exact repetitive readings.
- With a standard bar except for 0-25mm model.



103-137



### Technical Data

Graduation: 0.01mm, 0.001mm  
 Flatness: 0.6 μm for models up to 300mm"  
 1μ for models over 300mm  
 Parallelism: (2+R/100)μm, R=max, range (mm)  
 Measuring faces: Carbide tipped

### SPECIFICATIONS

**Metric** With ratchet stop

Range	Order No.	Accuracy	Mass (g)
0 - 25mm	103-137	±2μm	175
	103-129*	±2μm	175
25 - 50mm	103-138	±2μm	215
	103-130*	±2μm	215
50 - 75mm	103-139-10	±2μm	315
75 - 100mm	103-140-10	±3μm	375
100 - 125mm	103-141-10	±3μm	515
125 - 150mm	103-142-10	±3μm	665
150 - 175mm	103-143-10	±4μm	720
175 - 200mm	103-144-10	±4μm	920
200 - 225mm	103-145-10	±4μm	1080
225 - 250mm	103-146-10	±5μm	1255
250 - 275mm	103-147-10	±5μm	1405
275 - 300mm	103-148-10	±5μm	1565
300 - 325mm	103-149	±6μm	1985
325 - 350mm	103-150	±6μm	2155
350 - 375mm	103-151	±6μm	2305
375 - 400mm	103-152	±7μm	2455
400 - 425mm	103-153	±7μm	2715
425 - 450mm	103-154	±7μm	2965
450 - 475mm	103-155	±8μm	3215
475 - 500mm	103-156	±8μm	3450

(Models with a range up to 1000mm are available.)

\*0.001mm reading is obtained with vernier.

### DIMENSIONS AND MASS

Up to 300mm / 12"

Over 300mm / 12"

Range	L	a	b	c
0 - 25mm / 0 - 1"	30.3	2.8	9	28
25 - 50mm / 1 - 2"	55.3	2.8	10	38
50 - 75mm / 2 - 3"	80.3	2.8	12	49
75 - 100mm / 3 - 4"	105.3	2.8	14	60
100 - 125mm / 4 - 5"	132.8	5.3	17	79
125 - 150mm / 5 - 6"	158.2	5.7	19	94
150 - 175mm / 6 - 7"	183.6	6.1	20	106
175 - 200mm / 7 - 8"	208.8	6.3	19	118
200 - 225mm / 8 - 9"	234.2	6.7	18	130
225 - 250mm / 9 - 10"	258	5.5	18	143
250 - 275mm / 10 - 11"	284	6.5	18	156
275 - 300mm / 11 - 12"	309	6.5	18	169

Range	L	a	b	c
300 - 325mm / 12-13"	353	18	28	187
325 - 350mm / 13-14"	378	18	28	199
350 - 375mm / 14-15"	403	18	28	212
375 - 400mm / 15-16"	428	18	28	224
400 - 425mm / 16-17"	453	18	28	236
425 - 450mm / 17-18"	478	18	28	248
450 - 475mm / 18-19"	503	18	28	261
475 - 500mm / 19-20"	528	18	28	273

**Metric** Micrometer set

Range	Order No.	Included in set	Mass (g)
0 - 75mm (3 mikes/set)	103-927-10	103-137, 103-138, 103-139-10, 2 micrometer standards	750
0 - 150mm (6 mikes/set)	103-913-50	103-137, 103-138, 103-139-10, 103-140-10, 103-141-10, 103-142-10, 5 micrometer standards	2260
150 - 300mm (6 mikes/set)	103-915-10	103-143-10, 103-144-10, 103-145-10, 103-146-10, 103-147-10, 103-148-10, 6 micrometer standards	7695
0 - 300mm (12 mikes/set)	103-915-50	All micrometers of 103-913-50 and 103-915-10 in one set, 11 micrometer standards	9300

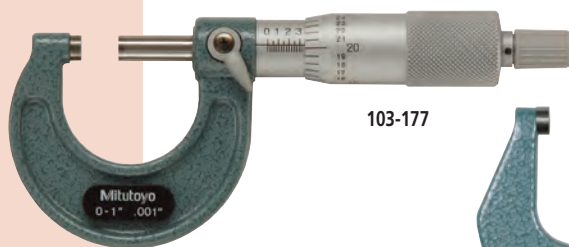


# Outside Micrometers

## SERIES 103— Inch Models

### FEATURES

- Hammertone, baked-enamel-finished frame.
- Ratchet Stop or Friction Thimble for exact repetitive readings.
- With a standard bar except for 0-1" model.



103-177



103-260

### Technical Data (Inch Model)

Accuracy: Refer to the list of specifications.

Graduation: .001" or .0001"

Flatness: .000024" for models up to 12"

.00004" for models over 12"

Parallelism: [.00008 + .00004 (L/4)]" L= max range (inch)

Measuring faces: Carbide tipped

### SPECIFICATIONS

**Inch** \_\_\_\_\_ With ratchet stop

Range	Graduation	Order No.	Accuracy	Mass (g)
0 - 1"	.001"	103-177	±.0001"	175
		103-259	±.0001"	175
1 - 2"	.001"	103-178	±.0001"	215
2 - 3"	.001"	103-179	±.0001"	315
3 - 4"	.001"	103-180	±.00015"	375
4 - 5"	.001"	103-181	±.00015"	515
5 - 6"	.001"	103-182	±.00015"	665
6 - 7"	.001"	103-183	±.0002"	720
7 - 8"	.001"	103-184	±.0002"	920
8 - 9"	.001"	103-185	±.0002"	1080
9 - 10"	.001"	103-186	±.00025"	1255
10 - 11"	.001"	103-187	±.00025"	1405
11 - 12"	.001"	103-188	±.00025"	1565
12 - 13"	.001"	103-189	±.0003"	1985
13 - 14"	.001"	103-190	±.0003"	2155
14 - 15"	.001"	103-191	±.0003"	2305
15 - 16"	.001"	103-192	±.00035"	2455
16 - 17"	.001"	103-193	±.00035"	2715
17 - 18"	.001"	103-194	±.00035"	2965
18 - 19"	.001"	103-195	±.0004"	3215
19 - 20"	.001"	103-196	±.0004"	3450
20 - 21"	.001"	103-197	±.0004"	4060
21 - 22"	.001"	103-198	±.00045"	4080
22 - 23"	.001"	103-199	±.00045"	4500
23 - 24"	.001"	103-200	±.00045"	4525
24 - 25"	.001"	103-201	±.0005	4915
25 - 26"	.001"	103-202	±.0005"	4930
26 - 27"	.001"	103-203	±.0005"	5200
27 - 28"	.001"	103-204	±.00055"	5215
28 - 29"	.001"	103-205	±.00055"	5835
29 - 30"	.001"	103-206	±.00055"	5860
30 - 31"	.001"	103-207	±.0006"	6385
31 - 32"	.001"	103-208	±.0006"	6410
32 - 33"	.001"	103-209	±.0006"	6925
33 - 34"	.001"	103-210	±.00065"	6940
34 - 35"	.001"	103-211	±.00065"	7565
35 - 36"	.001"	103-212	±.00065"	7590
36 - 37"	.001"	103-213	±.0007"	8215
37 - 38"	.001"	103-214	±.0007"	8240
38 - 39"	.001"	103-215	±.0007"	8860
39 - 40"	.001"	103-216	±.00075"	8880

**Inch** \_\_\_\_\_ With friction thimble

Range	Graduation	Order No.	Accuracy	Mass (g)
0 - 1"	.001"	103-127	±.0001"	175
	.0001"	103-135	±.0001"	175
1 - 2"	.001"	103-128	±.0001"	215
	.0001"	103-136	±.0001"	215

**Inch** \_\_\_\_\_ With ratchet stop

Range	Graduation	Order No.	Accuracy	Mass (g)
0 - 1"	.0001"	103-260*	±.0001"	175
0 - 1"	.0001"	103-131*	±.0001"	175
1 - 2"	.0001"	103-262*	±.0001"	215
1 - 2"	.0001"	103-132*	±.0001"	215
2 - 3"	.0001"	103-217*	±.0001"	315
3 - 4"	.0001"	103-218*	±.00015"	375
4 - 5"	.0001"	103-219*	±.00015"	515
5 - 6"	.0001"	103-220*	±.00015"	665
6 - 7"	.0001"	103-221*	±.0002"	720
7 - 8"	.0001"	103-222*	±.0002"	920
8 - 9"	.0001"	103-223*	±.0002"	1080
9 - 10"	.0001"	103-224*	±.00025"	1255
10 - 11"	.0001"	103-225*	±.00025"	1405
11 - 12"	.0001"	103-226*	±.00025"	1565

\*.0001" Reading is obtained with vernier

# Outside Micrometers

## SERIES 103 — Inch model set

Inch		Micrometer Set .001" Graduation Model	
Range	Order No.	Included in set	Mass (g)
0 - 3" (3pcs./set)	<b>103-929</b>	103-177, 103-178, 103-179, 2 Micrometer Standards	750
0 - 4" (4pcs./set)	<b>103-930</b>	103-177, 103-178, 103-179, 103-180, 3 Micrometer Standards	1600
0 - 6" (6pcs./set)	<b>103-904-10</b>	103-177, 103-178, 103-179, 103-180, 103-181, 103-182, 5 Micrometer Standards	2200
0 - 12" (12pcs./set)	<b>103-905-10</b>	103-177, 103-178, 103-179, 103-180, 103-181, 103-182, 103-183, 103-184, 103-185, 103-186, 103-187, 103-188, 11 Micrometer Standards	9000
6 - 12" (6pcs./set)	<b>103-906</b>	103-183, 103-184, 103-185, 103-186, 103-187, 103-188, 6 Micrometer Standards	7695



103-905-10

Inch		Micrometer Set .0001" Graduation Model	
Range	Order No.	Included in set	Mass (g)
0 - 3" (3pcs./set)	<b>103-922</b>	103-135, 103-136, 103-217, 2pcs. Micrometer Standards	705
0 - 4" (4pcs./set)	<b>103-931</b>	103-135, 103-136, 103-217, 103-218, 3pcs. Micrometer Standards	1600
0 - 6" (6pcs./set)	<b>103-907-40</b>	103-135, 103-136, 103-217, 103-218, 103-219, 103-220, 5 Micrometer Standards	2200
0 - 12" (12pcs./set)	<b>103-908-40</b>	102-135, 103-136, 103-217, 103-218, 103-219, 103-220, 103-221, 103-222, 103-223, 103-224, 103-225, 103-226, 11pcs. Micrometer Standards	9000
6 - 12" (6pcs./set)	<b>103-909</b>	103-221, 103-222, 103-223, 103-224, 103-225, 103-226, 6pcs. Micrometer Standards	6945



103-904-10





# Outside Micrometers

**SERIES 340, 104 — with Interchangeable Anvils, Inch model**

## FEATURES

- IP65 water/dust protection (Series 340\*).  
\*Models with a range up to 12" / 300mm.
- Wide measuring range with interchangeable anvils.
- With a Ratchet Stop for constant force.
- Supplied with zero-setting standards bar for each range.
- With SPC output (Series 340).
- Supplied in fitted wooden case.

## Technical Data

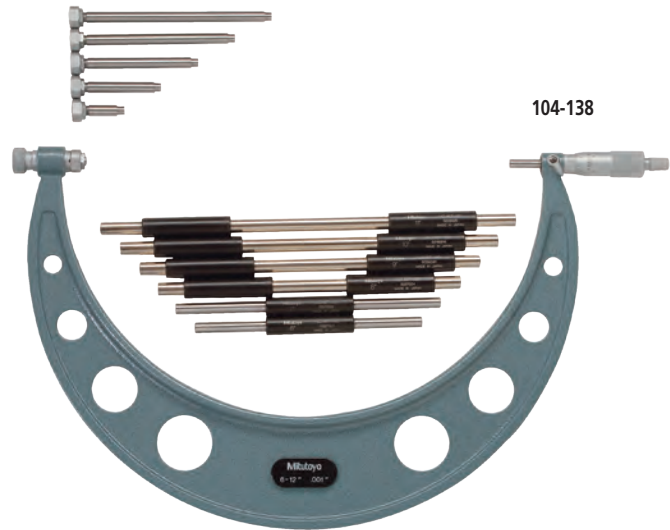
Accuracy:  $\pm[.00016" + .00004 (L/3)] L = \text{Max Range (Inch)}$   
 Resolution\*: .0001"/0.001mm  
**(340-351-10: .00005"/0.001mm)**  
 Graduation\*\*:.001" (104-165: is .0001")  
 Flatness: .000024" for models up to 12"  
 .00004" for models over 12"  
 Parallelism: .00008" for models up to 3"  
 .00012" for models up to 6"  
 $\pm[.00008" + .00004 (L/4)] L = \text{Max range (inch)}$   
 Measuring faces: Carbide tipped (spindle only)  
 Display\*: LCD  
 Battery\*: SR44 (1 pc.), **938882**  
 Battery life\*: Approx. 1.2 years under normal use  
 Dust/Water protection level\*: IP65 (up to 12" / 300mm)  
 \*Digital models \*\*Analog models

## Function of Digital Model

Zero / ABS, Data hold, Preset, Data output, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error  
 Function Lock\*\*\*  
 2 Presets\*\*\*  
 \*\*\* 4 - 12" / 100 - 300mm Models

## Optional Accessories for Digital Model

**05CZA662**: SPC cable with data switch (40" / 1m)  
**05CZA663**: SPC cable with data switch (80" / 2m)



## SPECIFICATIONS

Inch/Metric		Digital model			
Range	Resolution	Order No.	Mass (kg)	Remarks	
0-6" / 0-152.4mm	.00005" / 0.001mm	<b>340-351-10</b>	0.96	with 6 anvils & 5 standards	
6-12" / 152.4 - 304.8mm	.0001" / 0.001mm	<b>340-352-10</b>	1.88	with 6 anvils & 6 standards	
12-18" / 304.8 - 457.2mm	.0001" / 0.001mm	<b>340-720</b>	4.75	with 6 anvils & 6 standards	
18-24" / 457.2 - 609.6mm	.0001" / 0.001mm	<b>340-721</b>	6.62	with 6 anvils & 6 standards	
24-30" / 609.6 - 762.0mm	.0001" / 0.001mm	<b>340-722</b>	10.06	with 6 anvils & 6 standards	
30-36" / 762.0 - 914.4mm	.0001" / 0.001mm	<b>340-723</b>	11.98	with 6 anvils & 6 standards	

Inch					
Range	Graduation	Order No.	Mass(kg)	Remarks	
0-2"	.0001"	<b>104-165*</b>	0.32	with 1" anvil & 1 standard	
0-6"	.001"	<b>104-137</b>	1.35	with 6 anvils & 5 standards	
6-12"	.001"	<b>104-138</b>	2.65	with 6 anvils & 6 standards	
12-16"	.001"	<b>104-152</b>	3.31	with 4 anvils & 4 standards	
12-18"	.001"	<b>104-201</b>	4.69	with 6 anvils & 6 standards	
16-20"	.001"	<b>104-153</b>	4.81	with 4 anvils & 4 standards	
18-24"	.001"	<b>104-202</b>	6.51	with 6 anvils & 6 standards	
20-24"	.001"	<b>104-154</b>	6.35	with 4 anvils & 4 standards	
24-28"	.001"	<b>104-155</b>	7.72	with 4 anvils & 4 standards	
24-30"	.001"	<b>104-203</b>	9.95	with 6 anvils & 6 standards	
28-32"	.001"	<b>104-156</b>	9.08	with 4 anvils & 4 standards	
30-36"	.001"	<b>104-204</b>	11.87	with 6 anvils & 6 standards	
32-36"	.001"	<b>104-157</b>	10.41	with 4 anvils & 4 standards	
36-40"	.001"	<b>104-158</b>	11.78	with 4 anvils & 4 standards	
36-42"	.001"	<b>104-205</b>	13.68	with 6 anvils & 6 standards	

\*.0001" reading is obtained with vernier.



# Outside Micrometers

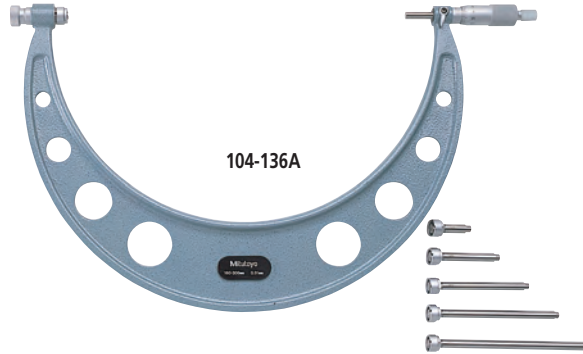
**SERIES 340, 104 — with Interchangeable Anvils, Metric Model**



## FEATURES

- IP65 water/dust protection (Series 340\*).  
\*Models with a range up to 300mm.
- Wide measuring range with interchangeable anvils.
- With a Ratchet Stop for constant force.
- Supplied with zero-setting standards bar for each range.
- With SPC output (Series 340).
- Supplied in fitted wooden case.

### Digital model



## SPECIFICATIONS

**Metric** Digital model

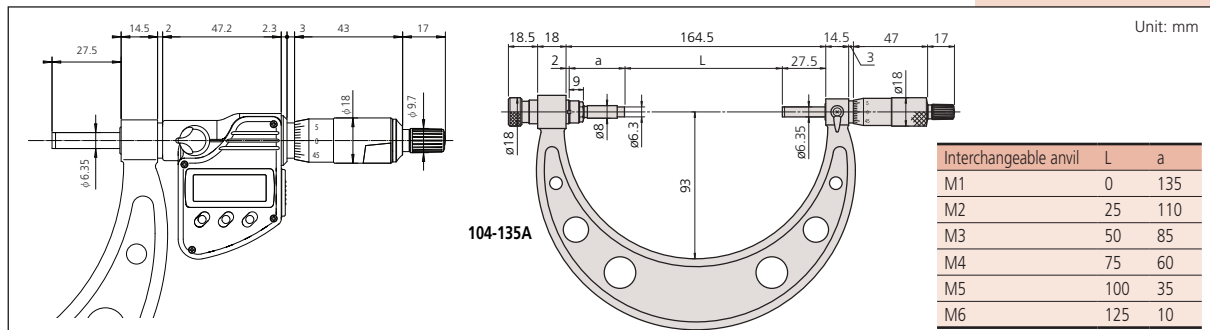
Range	Resolution	Order No.	Mass (kg)	Remarks
0 - 150mm	0.001mm	<b>340-251-10</b>	0.96	with 6 anvils & 5 standards
150 - 300mm	0.001mm	<b>340-252-10</b>	1.88	with 6 anvils & 6 standards
300 - 400mm	0.001mm	<b>340-520</b>	3.31	with 4 anvils & 4 standards
400 - 500mm	0.001mm	<b>340-521</b>	4.81	with 4 anvils & 4 standards
500 - 600mm	0.001mm	<b>340-522</b>	6.35	with 4 anvils & 4 standards
600 - 700mm	0.001mm	<b>340-523</b>	7.72	with 4 anvils & 4 standards
700 - 800mm	0.001mm	<b>340-524</b>	9.08	with 4 anvils & 4 standards
800 - 900mm	0.001mm	<b>340-525</b>	10.41	with 4 anvils & 4 standards
900 - 1000mm	0.001mm	<b>340-526</b>	11.78	with 4 anvils & 4 standards

**Metric**

Range	Graduation	Order No.	Mass (kg)	Remarks
0 - 50mm	0.01mm	<b>104-171*</b>	0.32	with 2 anvils & 1 standards
0 - 100mm	0.01mm	<b>104-139A</b>	0.79	with 4 anvils & 3 standards
0 - 150mm	0.01mm	<b>104-135A</b>	1.35	with 6 anvils & 5 standards
50 - 150mm	0.01mm	<b>104-161A</b>	1.35	with 4 anvils & 4 standards
100 - 200mm	0.01mm	<b>104-140A</b>	1.38	with 4 anvils & 4 standards
150 - 300mm	0.01mm	<b>104-136A</b>	2.65	with 6 anvils & 6 standards
200 - 300mm	0.01mm	<b>104-141A</b>	2.22	with 4 anvils & 4 standards
300 - 400mm	0.01mm	<b>104-142A</b>	3.31	with 4 anvils & 4 standards
400 - 500mm	0.01mm	<b>104-143A</b>	4.81	with 4 anvils & 4 standards
500 - 600mm	0.01mm	<b>104-144A</b>	6.35	with 4 anvils & 4 standards
600 - 700mm	0.01mm	<b>104-145A</b>	7.72	with 4 anvils & 4 standards
700 - 800mm	0.01mm	<b>104-146A</b>	9.08	with 4 anvils & 4 standards
800 - 900mm	0.01mm	<b>104-147A</b>	10.41	with 4 anvils & 4 standards
900 - 1000mm	0.01mm	<b>104-148A</b>	11.78	with 4 anvils & 4 standards

\*The frame is in a heat insulated cover

## DIMENSIONS



### Technical Data

Accuracy:  $\pm(4+R/75)\mu\text{m}$ , R=max. range (mm)  
 Resolution\*: 0.001mm  
 Graduation\*\*: 0.01mm  
 Flatness: 0.6 $\mu\text{m}$  for models up to 300mm  
 1 $\mu\text{m}$  for models over 300mm  
 Parallelism: 2 $\mu\text{m}$  for models up to 75mm  
 3 $\mu\text{m}$  for models up to 150mm  
 (2+R/100) $\mu\text{m}$  for models over 150mm, R=max. range (mm)  
 Measuring faces: Carbide tipped (spindle only)  
 Display\*: LCD  
 Battery\*: SR44 (1 pc.), **938882**  
 Battery life\*: Approx. 1.2 years under normal use  
 Dust/Water protection level\*: IP65 (up to 300mm)  
 \*Digital models \*\*Analog models

### Function of Digital Model

Zero / ABS, Data hold, Preset, Data output, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error  
 Function Lock\*\*\*  
 2 Presets\*\*\*  
 \*\*\*4 - 12" / 100 - 300mm Models

### Optional Accessories for Digital Model

**05CZA662**: SPC cable with data switch (40" / 1m)  
**05CZA663**: SPC cable with data switch (80" / 2m)

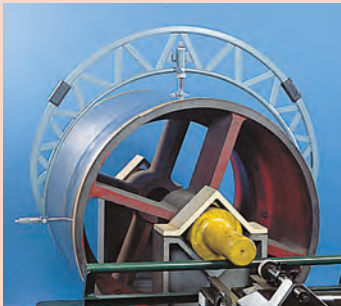
# Outside Micrometers

## SERIES 105 — with Extension Anvil Collars

### Technical Data

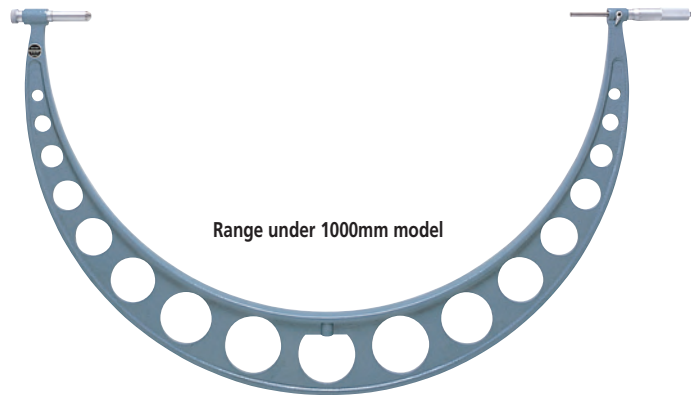
Accuracy:  $\pm(6+R/75)\mu\text{m}$ , R=max. range (mm)  
 Graduation: .001" / 0.01mm  
 Flatness: .000052" / 1.3 $\mu\text{m}$   
 Parallelism: [.00016" + .00004 (L/4)"] L=max. range (inch)  
 (2+R/100) $\mu\text{m}$ , R=max. range (mm)  
 Measuring faces: Carbide tipped

### Extension anvil collar

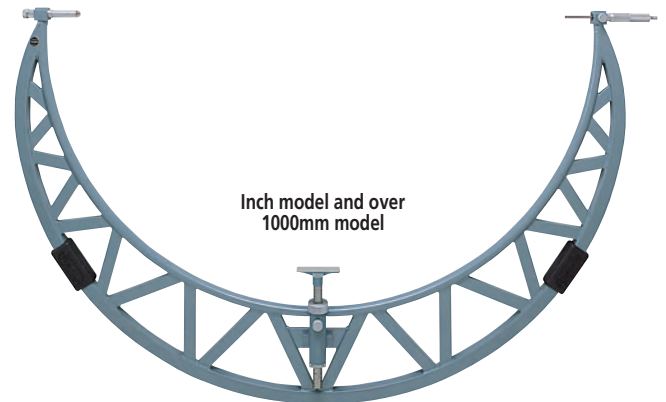


### FEATURES

- Wide measuring range with extension anvil collars.
- 50mm spindle stroke.
- With Ratchet Stop for constant force.
- Supplied with zero-setting standards bar for each range.
- Square and round pipes are combined for light weight and rigid frame (for models over 1000mm range).
- Workpiece stopper (for models over 1000mm range).
- Supplied in a fitted wooden case.



Range under 1000mm model



Inch model and over 1000mm model

### SPECIFICATIONS

#### Metric

Range	Order No.	Extension collars	Mass (kg)
500 - 600mm	105-103	50mm	5.53
600 - 700mm	105-104	50mm	6.35
700 - 800mm	105-105	50mm	7.17
800 - 900mm	105-106	50mm	7.99
900 - 1000mm	105-107	50mm	8.81
1000 - 1100mm	105-408	50mm	6.37
1100 - 1200mm	105-409	50mm	7.08
1000 - 1200mm	105-418	50mm, 100mm	13.77
1200 - 1300mm	105-410	50mm	7.79
1300 - 1400mm	105-411	50mm	8.50
1200 - 1400mm	105-419	50mm, 100mm	15.77
1400 - 1500mm	105-412	50mm	9.21
1500 - 1600mm	105-413	50mm	10.17
1400 - 1600mm	105-420	50mm, 100mm	17.91
1600 - 1700mm	105-414	50mm	11.13
1700 - 1800mm	105-415	50mm	12.09
1600 - 1800mm	105-421	50mm, 100mm	20.80
1800 - 1900mm	105-416	50mm	13.05
1900 - 2000mm	105-417	50mm	14.01
1800 - 2000mm	105-422	50mm, 100mm	22.76

#### Inch

Range	Order No.	Extension collars	Mass (kg)
40 - 44"	105-428	2"	10.0
44 - 48"	105-429	2"	10.9
48 - 52"	105-430	2"	11.4
52 - 56"	105-431	2"	11.9
56 - 60"	105-432	2"	12.6
60 - 64"	105-433	2"	13.2
64 - 68"	105-434	2"	14.1
68 - 72"	105-435	2"	14.9
72 - 76"	105-436	2"	15.8
76 - 80"	105-437	2"	16.7

# Outside Micrometers

## SERIES 406 — Non-Rotating Spindle Type

### FEATURES

- With a standard bar except for 0 - 1" / 0 - 25mm model.
- With SPC output.
- Supplied in a fitted plastic case.



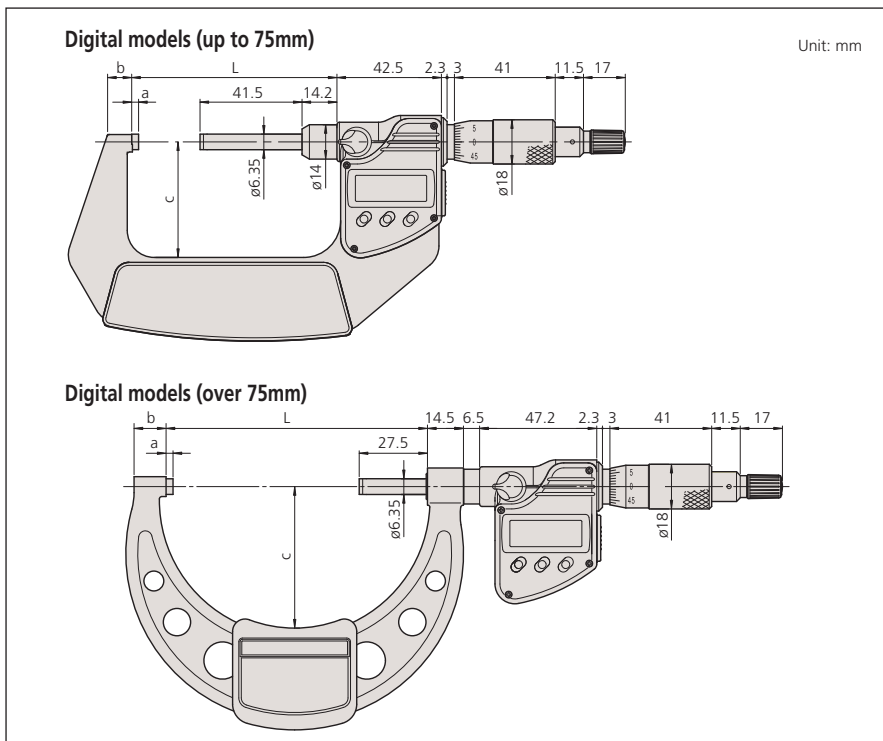
406-350

### SPECIFICATIONS

Metric		Digital model with ratchet stop	
Range	Resolution	Order No.	Accuracy
0 - 25mm	0.001mm	<b>406-250</b>	±3µm
25 - 50mm	0.001mm	<b>406-251</b>	±3µm
50 - 75mm	0.001mm	<b>406-252</b>	±3µm
75 - 100mm	0.001mm	<b>406-253</b>	±4µm

Inch/Metric		Digital model with ratchet stop	
Range	Resolution	Order No.	Accuracy
0 - 1" / 0 - 25.4mm	.00005" / 0.001mm	<b>406-350</b>	±.00015"
1 - 2" / 25.4 - 50.8mm	.00005" / 0.001mm	<b>406-351</b>	±.00015"
2 - 3" / 50.8 - 72.6mm	.00005" / 0.001mm	<b>406-352</b>	±.00015"
3 - 4" / 76.2 - 101.6mm	.00005" / 0.001mm	<b>406-353</b>	±.0002"

### DIMENSIONS AND MASS



### Technical Data

Accuracy: Refer to the list of specifications.  
 Resolution: .00005" / 0.001mm or 0.001mm  
 Flatness: 0.3µm / .000012"  
 Parallelism: .00012" / 3µm for models up to 3" / 75mm\*  
 .00016" / 4µm for models over 3" / 75mm\*  
 .000063" / 1.6µm for models up to 2" / 50mm\*\*  
 2µm for models over 50mm\*\*

Measuring faces: Carbide tipped  
 Display\*: LCD  
 Battery\*: SR44 (1 pc.), **938882**  
 Battery life\*: Approx. 1.2 years under normal use

### Function of Digital Model

Origin-set, Zero / ABS, Data hold, Data output, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error

### Optional Accessories for Digital Model

**05CZA662**: SPC cable with data switch (40" / 1m)  
**05CZA663**: SPC cable with data switch (80" / 2m)

# Outside Micrometers

## SERIES 107

### FEATURES

- Uses dial indicator for direct GO/NG-GO judgment for mass-produced parts.
- Anvil retracting trigger for quick measurement.
- With a standard bar except for 0 - 25mm models.
- Supplied in fitted plastic case.

### Technical Data

Graduation: 0.01mm (thimble)  
 Flatness: 0.6 $\mu$ m  
 Parallelism: (2+R/100) $\mu$ m, R=max. range (mm)  
 Measuring faces: Carbide tipped



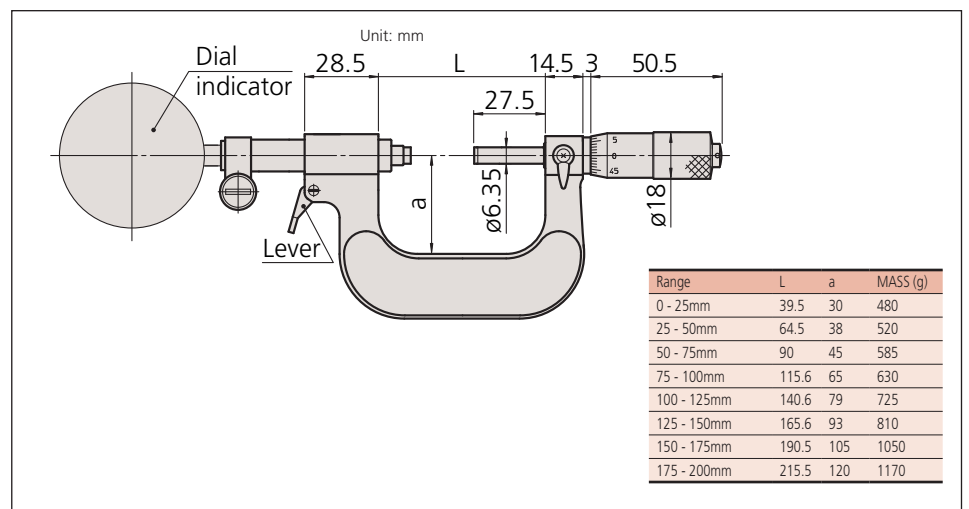
Dial indicator is an option

### SPECIFICATIONS

#### Metric

Range	Graduation	Order No.	Accuracy
0 - 25mm	0.01mm	107-201	$\pm 2\mu$ m
25 - 50mm	0.01mm	107-202	$\pm 2\mu$ m
50 - 75mm	0.01mm	107-203	$\pm 2\mu$ m
75 - 100mm	0.01mm	107-204	$\pm 3\mu$ m
100 - 125mm	0.01mm	107-205	$\pm 3\mu$ m
125 - 150mm	0.01mm	107-206	$\pm 3\mu$ m
150 - 175mm	0.01mm	107-207	$\pm 4\mu$ m
175 - 200mm	0.01mm	107-208	$\pm 4\mu$ m

### DIMENSIONS AND MASS



# Spline Micrometers

SERIES 331, 111



## FEATURES

- IP65 water/dust protection (Series 331).
- The anvil and spindle have a small diameter for measuring splined shafts, slots, and keyways.
- With Ratchet Stop for constant force.
- With SPC output (Series 331).
- With a standard bar except 0-1" and 0-25mm model.
- Supplied in fitted plastic case.



331-351



111-115

## Technical Data

Accuracy: Refer to the list of specifications.  
 Resolution\*: .00005"/0.001mm or 0.001mm  
 Graduation\*\*: .0001" or 0.01mm, .001"  
 Flatness: .000012" / 0.3µm  
 Parallelism: (2+R/100)µm, R=max. range (mm)  
 [.00008" + .00004" (L/4")]  
 L = max. range (inch)  
 Measuring faces: Carbide tipped  
 Display\*: LCD  
 Battery\*: SR44 (1 pc.), **938882**  
 Battery life\*: Approx. 1.2 years under normal use  
 Dust/Water protection level\*: IP65  
 \*Digital models \*\*Analog models

## Function of Digital Model

Origin-set, Zero-setting, Data hold, Data output, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error

## Optional Accessories for Digital Model

- 05CZA662:** SPC cable with data switch (40" / 1m)
- 05CZA663:** SPC cable with data switch (80" / 2m)

## SPECIFICATIONS

**Metric** Digital model

Range	Resolution	Order No.	Accuracy	Remarks	Mass (g)
0 - 25mm	0.001mm	<b>331-251</b>	±2µm	Type A	330
		<b>331-261</b>	±2µm	Type B	330
25 - 50mm	0.001mm	<b>331-252</b>	±2µm	Type A	470
		<b>331-262</b>	±2µm	Type B	470
50 - 75mm	0.001mm	<b>331-253</b>	±2µm	Type A	625
		<b>331-263</b>	±2µm	Type B	625
75 - 100mm	0.001mm	<b>331-254</b>	±3µm	Type A	565
		<b>331-264</b>	±3µm	Type B	565

**Inch/Metric** Digital model

Range	Resolution	Order No.	Accuracy	Remarks	Mass (g)
0 - 1" / 0 - 25.4mm	.00005" / 0.001mm	<b>331-351</b>	±.0001"	Type A	330
		<b>331-361</b>	±.0001"	Type B	330
1 - 2" / 25.4-50.8mm	.00005" / 0.001mm	<b>331-352</b>	±.0001"	Type A	470
		<b>331-362</b>	±.0001"	Type B	470
2 - 3" / 50.8-76.2mm	.00005" / 0.001mm	<b>331-353</b>	±.0001"	Type A	625
		<b>331-363</b>	±.0001"	Type B	625
3 - 4" / 76.2-101.6mm	.00005" / 0.001mm	<b>331-354</b>	±.00015"	Type A	565
		<b>331-364</b>	±.00015"	Type B	565

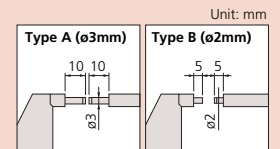
**Metric**

Range	Graduation	Order No.	Accuracy	Remarks	Mass (g)
0 - 25mm	0.01mm	<b>111-115</b>	±3µm	Type A	205
		<b>111-215</b>	±3µm	Type B	205
25 - 50mm	0.01mm	<b>111-116</b>	±3µm	Type A	305
		<b>111-117</b>	±3µm	Type A	370
50 - 75mm	0.01mm	<b>111-118</b>	±4µm	Type A	500
		<b>111-119</b>	±4µm	Type A	655
125 - 150mm	0.01mm	<b>111-120</b>	±4µm	Type A	710
		<b>111-121</b>	±5µm	Type A	900
175 - 200mm	0.01mm	<b>111-122</b>	±5µm	Type A	1040

**Inch**

Range	Graduation	Order No.	Accuracy	Remarks	Mass (g)
0 - 1"	.0001"	<b>111-166*</b>	±.00015"	Type A	205

\*.0001" reading is obtained with vernier.



## DIMENSIONS

Unit: mm

Models up to 75mm

Digital model

Models over 75mm

Digital model

Range	L	a	b	c
0 - 25mm	58.2 (55.3)	17.5 (17.8)	7.3 (10)	32 (38)
25 - 50mm	83.2 (80.3)	17.5 (17.8)	10.1 (12)	47 (49)
50 - 75mm	108.2 (105.3)	20.3 (17.8)	11.5 (14)	60 (60)
75 - 100mm	132.8 (132.8)	20.3 (20.3)	16.7 (17)	76.5 (79)

# Point Micrometers

**SERIES 342, 142, 112**

## FEATURES

- IP65 water/dust protection (Series 342).
- Pointed spindle and anvil for measuring the web thickness of drills, small grooves, keyways, and other hard-to-reach dimensions.
- 15 degree and 30 degree measuring points are available.
- The measuring points have approximately 0.3mm / .012" radius.
- With Ratchet Stop for constant force.
- With SPC output (Series 342).
- With digit counter (Series 142).
- With a standard bar except 0 - 1" and 0 - 25mm model.
- Supplied in fitted plastic case.

## Technical Data

Accuracy: Refer to the list of specifications.  
 Resolution\*: .00005"/0.001mm or 0.001mm  
 Graduation\*\*: .001" or 0.01mm  
 Display\*: LCD  
 Battery\*: SR44 (1 pc.), 938882  
 Battery life\*: Approx. 1.2 years under normal use  
 Dust/Water protection level\*: IP65  
 \*Digital models \*\*Analog models

## Function of Digital Model

Origin-set, Zero / ABS, Data hold, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error

## Optional Accessories for Digital Model

**05CZA662:** SPC cable with data switch (40" / 1m)  
**05CZA663:** SPC cable with data switch (80" / 2m)



342-351



112-201



Tip angle: 15° (R0.3mm)



Tip angle: 30° (R0.3mm)



## SPECIFICATIONS

Metric		Digital model (with carbide tip)				
Range	Resolution	Order No.	Accuracy	Point	Mass (g)	
0 - 25mm	0.001mm	342-251	±2µm	15°	330	
		342-261	±2µm	30°	330	
25 - 50mm	0.001mm	342-252	±2µm	15°	470	
		342-262	±2µm	30°	470	
50 - 75mm	0.001mm	342-253	±2µm	15°	625	
		342-263	±2µm	30°	625	
75 - 100mm	0.001mm	342-254	±3µm	15°	565	
		342-264	±3µm	30°	565	

Metric		Mechanical Counter Model				
Range	Graduation	Order No.	Accuracy	Point	Mass (g)	
0 - 25mm	0.01mm	142-153*	±3µm	15°	260	
		142-201*	±3µm	30°	260	

\*The points don't have carbide steel tips.

Metric		Digital model (with carbide tip)				
Range	Graduation	Order No.	Accuracy	Point	Mass (g)	
0 - 25mm	0.01mm	112-165	±3µm	15°	205	
		112-153*	±3µm	15°	205	
		112-213	±3µm	30°	205	
		112-201*	±3µm	30°	205	
25 - 50mm	0.01mm	112-166	±3µm	15°	305	
		112-154*	±3µm	15°	305	
		112-214	±3µm	30°	305	
		112-202*	±3µm	30°	305	
50 - 75mm	0.01mm	112-167	±3µm	15°	370	
		112-155*	±3µm	15°	370	
		112-215	±3µm	30°	370	
		112-203*	±3µm	30°	370	
75 - 100mm	0.01mm	112-168	±4µm	15°	500	
		112-156*	±4µm	15°	500	
		112-216	±4µm	30°	500	
		112-204*	±4µm	30°	500	

\*The points don't have carbide steel tips.

Inch/Metric		Digital model (with carbide tip)				
Range	Resolution	Order No.	Accuracy	Point	Mass (g)	
0 - 1" / 0 - 25.4mm	.00005" / 0.001mm	342-351	±.0001"	15°	330	
		342-361	±.0001"	30°	330	
1" - 2" / 25.4 - 50.8mm	.00005" / 0.001mm	342-352	±.0001"	15°	470	
		342-362	±.0001"	30°	470	
2" - 3" / 50.8 - 76.2mm	.00005" / 0.001mm	342-353	±.0001"	15°	625	
		342-363	±.0001"	30°	625	
3" - 4" / 76.2 - 101.6mm	.00005" / 0.001mm	342-354	±.00015"	15°	565	
		342-364	±.00015"	30°	565	

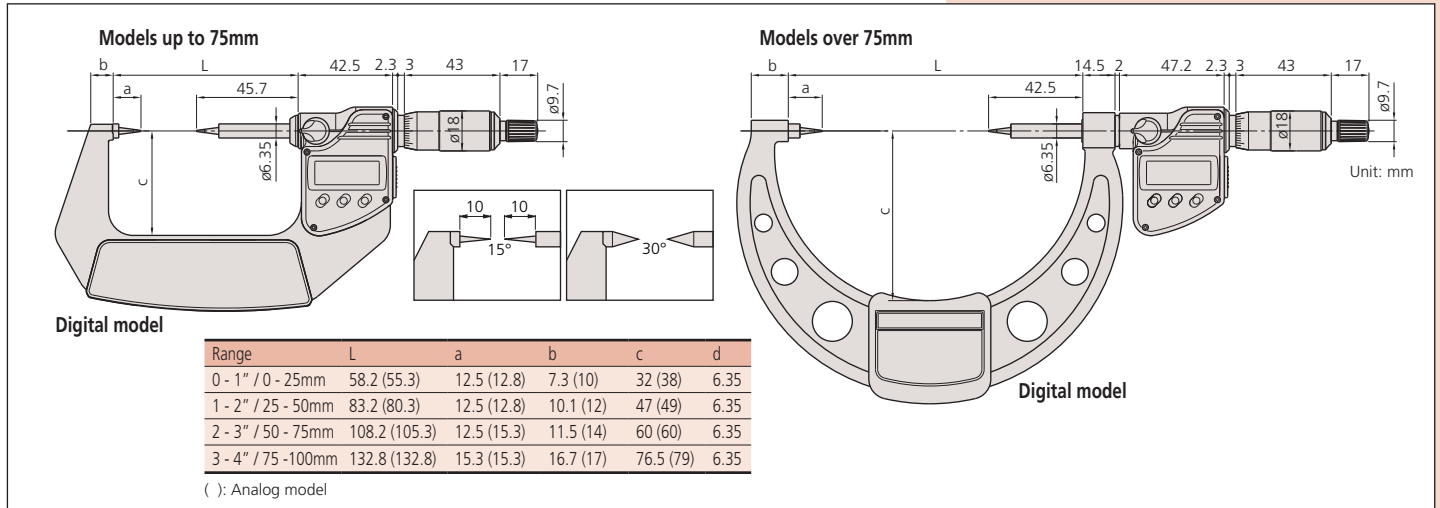
Inch		Mechanical Counter Model				
Range	Graduation	Order No.	Accuracy	Point	Mass (g)	
0 - 1"	.001"	142-177*	±.00015"	15°	260	
		142-225*	±.00015"	30°	260	

\*The points don't have carbide steel tips.

Inch		Digital model (with carbide tip)				
Range	Graduation	Order No.	Accuracy	Point	Mass (g)	
0 - 1"	.001"	112-189	±.00015"	15°	205	
		112-177*	±.00015"	15°	205	
		112-237	±.00015"	30°	205	
		112-225*	±.00015"	30°	205	
1 - 2"	.001"	112-190	±.00015"	15°	305	
		112-178*	±.00015"	15°	305	
		112-238	±.00015"	30°	305	
		112-226*	±.00015"	30°	305	
2 - 3"	.001"	112-191	±.00015"	15°	370	

\*The points don't have carbide steel tips.

## DIMENSIONS



# Crimp Height Micrometers

**SERIES 342, 142, 112 — Point Spindle and Blade Anvil**

## FEATURES

- IP54/65 water/dust protection (Series 342).
- Measures the height of crimp contacts.
- With Ratchet Stop for constant force.
- With SPC output (Series 342).
- With digit counter (Series 142).
- Supplied in fitted plastic case.



## Technical Data

Accuracy: Refer to the list of specifications.  
 Resolution\*: .00005" / 0.001mm or 0.001mm  
 Graduation\*\*: 0.01mm  
 Display\*: LCD  
 Battery\*: SR44 (1 pc.), **938882**  
 Battery life\*: Approx. 1.2 years under normal use  
 (3 years: Quickmike type)  
 Dust/Water protection level\*: IP65 / IP54  
 \*Digital models \*\*Analog models

## Function of Digital Model

Origin-set, Zero / ABS (342-271 342-371), Data hold, Data output, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error

## Optional Accessories for Digital Model

- 05CZA662**: SPC cable with data switch (40" / 1m)
- 05CZA663**: SPC cable with data switch (80" / 2m)
- 937387**: SPC cable for Quickmike type (40" / 1m)
- 965013**: SPC cable for Quickmike type (80" / 2m)



## SPECIFICATIONS

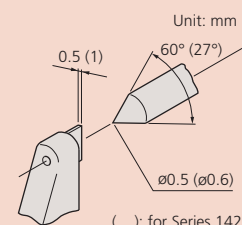
Metric Digital model					
Range	Resolution	Order No.	Accuracy	Mass (g)	
0 - 20mm	0.001mm	<b>342-271</b>	±3µm	270	

Metric Quickmike type					
Range	Resolution	Order No.	Accuracy	Mass (g)	
0 - 15mm	0.001mm	<b>342-451</b>	±3µm	275	

Metric Mechanical counter model					
Range	Graduation	Order No.	Accuracy	Mass (g)	
0 - 25mm	0.01mm	<b>142-402</b>	±3µm	200	
0 - 25mm	0.001mm	<b>142-403*</b>	±3µm	200	

Inch/Metric Digital model					
Range	Resolution	Order No.	Accuracy	Mass (g)	
0 - 0.8" / 0 - 20mm	.00005" / 0.001mm	<b>342-371</b>	±.00015"	270	

Metric					
Range	Graduation	Order No.	Accuracy	Mass (g)	
0 - 25mm	0.01mm	<b>112-401</b>	±3µm	165	



( ) : for Series 142

\* 0.001mm reading is obtained with vernier.





# V-Anvil Micrometers

**SERIES 314, 114 — 3 Flutes and 5 Flutes**

## FEATURES

- Measures the outside diameter of cutting tools (such as taps, reamers, end mills) with an odd number of flutes.
- With Ratchet Stop for constant force.
- Supplied with setting standard.
- V-anvils with a centerline groove are available. They are useful for measuring pitch diameters of taps which have a small diameter by using single-wire method.
- With SPC output (Series 314).
- Supplied in fitted plastic case.

### Technical Data

Accuracy: Refer to the list of specifications.  
 Resolution\*: .00005" / 0.001mm or 0.001mm  
 Graduation\*\*: .001" or .0001", 0.01mm  
 Flatness (spindle/anvil):  
 Analog model: .000024" / 0.6μm, .00005" / 1.3μm  
 Digital Model: .000012" / 0.3μm, .00004" / 1μm  
 Spindle face: Carbide tipped  
 Display\*: LCD  
 Battery\*: SR44 (1 pc.), **938882**  
 Battery life\*: Approx. 1.2 years under normal use  
 \*Digital models \*\*Analog models

### Function of Digital Model

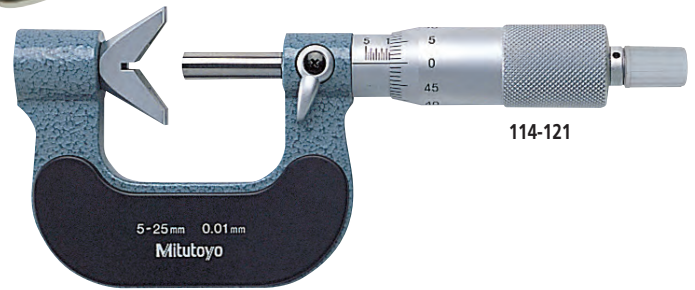
Zero / ABS, Data hold, Data output, Preset, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error  
 Function lock  
 2 Presets

### Optional Accessories for Digital Model

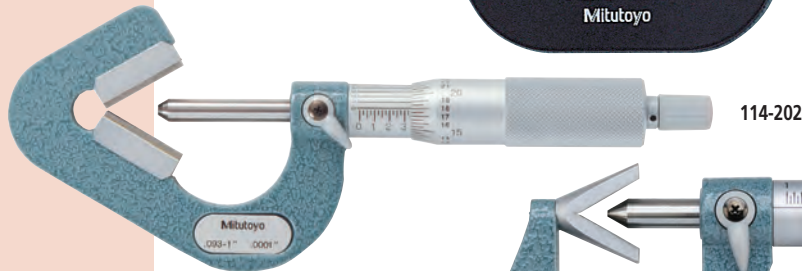
**05CZA662**: SPC cable with data switch (40" / 1m)  
**05CZA663**: SPC cable with data switch (80" / 2m)



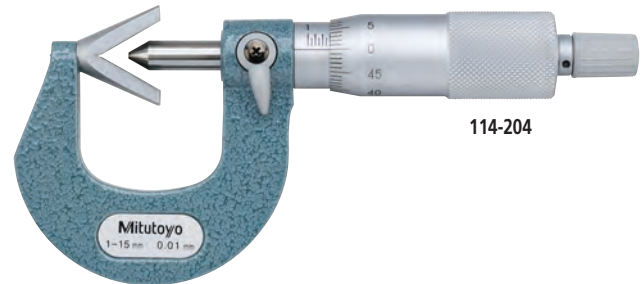
314-351-10



114-121

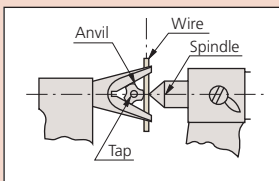


114-202



114-204

### Pitch Diameter Measurement of Tap by Single-wire Method Inch/Metric



## SPECIFICATIONS

**Metric** Digital model for 3 flutes cutting head

Range	Resolution	Order No.	Accuracy	Remarks	Setting Standard	Mass (g)
1 - 15mm	0.001mm	<b>314-251-10</b>	±4μm	w/Groove	ø5mm	275
		<b>314-261-10</b>	±4μm	—	ø5mm	275
10 - 25mm	0.001mm	<b>314-252-10</b>	±4μm	w/Groove	ø10mm	410
		<b>314-262-10</b>	±4μm	—	ø10mm	410
25 - 40mm	0.001mm	<b>314-253-10</b>	±5μm	—	ø25mm	465

**Inch/Metric** Digital model for 3 flutes cutting head

Range	Resolution	Order No.	Accuracy	Remarks	Setting Standard	Mass (g)
.05 - .6" / 1.27 - 15.24mm	.00005" / 0.001mm	<b>314-351-10</b>	±.0002"	w/Groove	ø.2"	275
		<b>314-361-10</b>	±.0002"	—	ø.2"	275
.4" - 1" / 10.16 - 25.4mm	.00005" / 0.001mm	<b>314-352-10</b>	±.0002"	w/Groove	ø.4"	410
		<b>314-362-10</b>	±.0002"	—	ø.4"	410
1" - 1.6" / 25.4 - 40.64mm	.00005" / 0.001mm	<b>314-353-10</b>	±.00025"	—	ø 1"	465

## SPECIFICATIONS

### Metric For 3 flutes cutting head

Range	Graduation	Order No.	Accuracy	Setting Standard	Remarks	Mass (g)
1 - 15mm	0.01mm	114-101	±4μm	ø5mm	w/Groove	120
		114-161	±4μm	ø5mm	—	120
10 - 25mm	0.01mm	114-102	±4μm	ø10mm	w/Groove	280
		114-162	±4μm	ø10mm	—	280
2.3 - 25mm	0.01mm	114-204*	±4μm	ø5mm	—	290
25 - 40mm	0.01mm	114-103	±5μm	ø25mm	—	400
40 - 55mm	0.01mm	114-104	±6μm	ø40mm	—	465
55 - 70mm	0.01mm	114-105	±6μm	ø55mm	—	675
70 - 85mm	0.01mm	114-106	±7μm	ø70mm	—	910

\*Carbide-tipped anvil

### Metric For 5 flutes cutting head

Range	Graduation	Order No.	Accuracy	Setting Standard	Remarks	Mass (g)
5 - 25mm	0.01mm	114-121	±4μm	ø5mm	w/Groove	255
		114-165	±4μm	ø5mm	—	255
2.3 - 25mm	0.01mm	114-137*	±4μm	ø5mm	—	220
25 - 45mm	0.01mm	114-122	±5μm	ø25mm	—	400
45 - 65mm	0.01mm	114-123	±6μm	ø55mm	—	540
65 - 85mm	0.01mm	114-124	±7μm	ø70mm	—	760

\*Carbide-tipped anvil

### Inch For 3 flutes cutting head

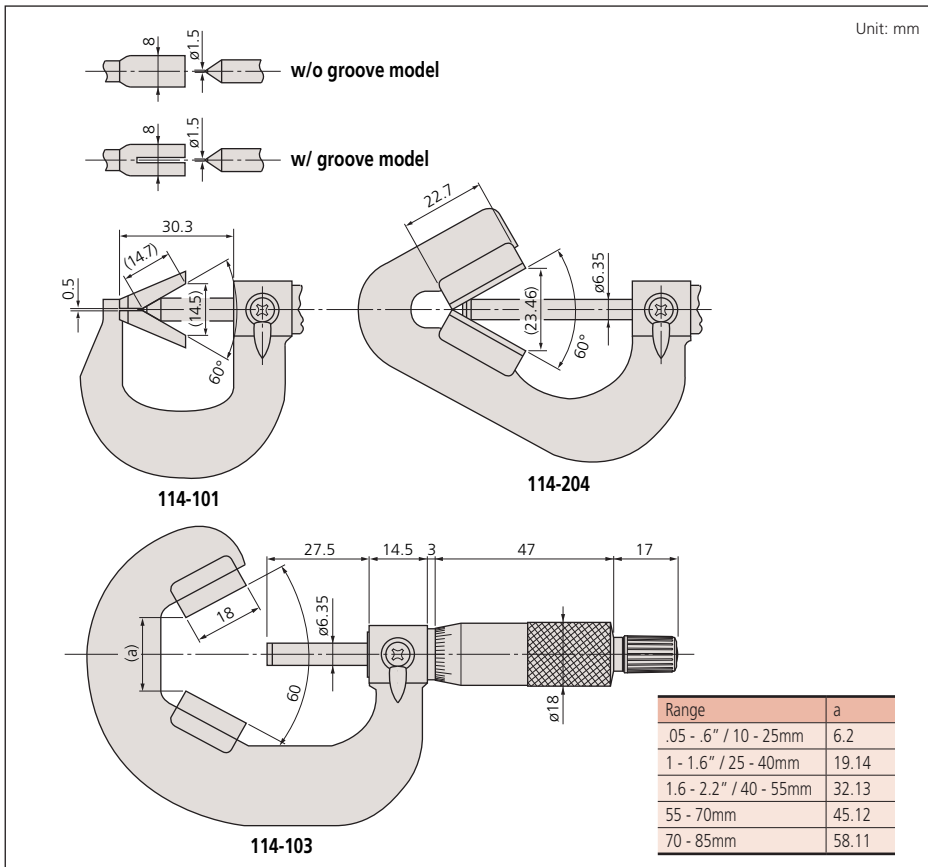
Range	Graduation	Order No.	Accuracy	Setting Standard	Mass (g)
.05 - .6"	.001"	114-163	±.0002"	ø.2"	120
.09 - 1"	.0001"	114-202*	±.0002"	ø.2"	280
1 - 1.6"	.001"	114-113	±.00025"	ø1"	400
1.6 - 2.2"	.001"	114-114	±.0003"	ø1.6"	465

\*Carbide-tipped anvil and .0001" reading is obtained with vernier

### Inch For 5 flutes cutting head

Range	Graduation	Order No.	Accuracy	Setting Standard	Mass (g)
.09 - 1"	.0001"	114-135	±.0002"	ø.2"	255

## DIMENSIONS

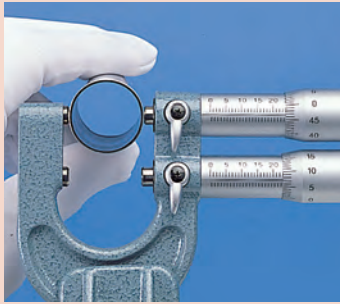


# Limit Micrometers

## SERIES 113

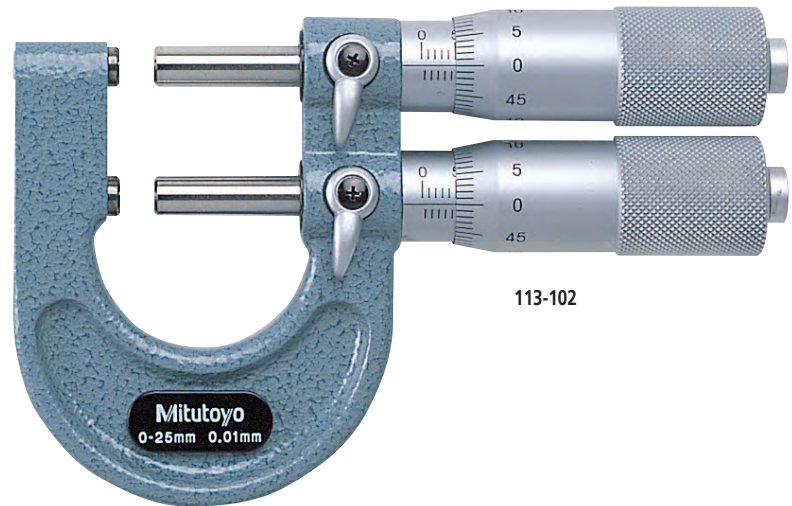
### FEATURES

- Can be used as a GO/±NG gage by setting the upper and lower limits.
- Provided with a standard bar for 25mm - 50mm model.
- Supplied in fitted plastic case.



### Technical Data

Graduation: 0.01mm  
 Flatness: 0.6μm  
 Parallelism: (3+R/100)μm, R=max. range (mm)  
 Measuring faces: Carbide tipped



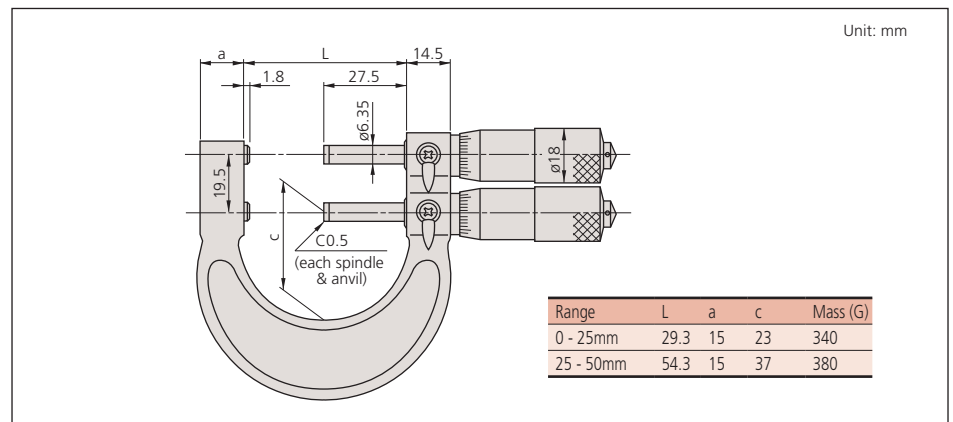
113-102

### SPECIFICATIONS

#### Metric

Range	Graduation	Order No.	Accuracy
0 - 25mm	0.01mm	113-102	±3μm
25 - 50mm	0.01mm	113-103	±3μm

### DIMENSIONS AND MASS



# Pana Micrometers

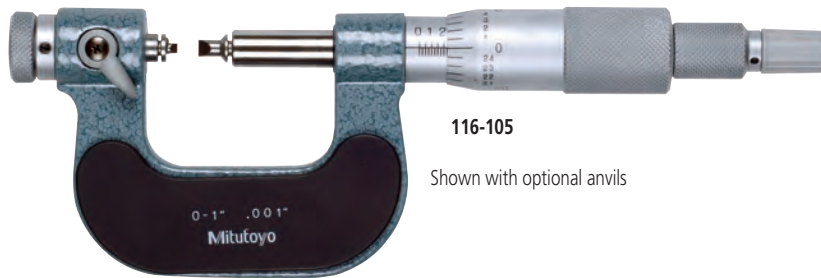
## SERIES 116 — Interchangeable Anvil Type

### FEATURES

- Non-rotating spindle with optional seven interchangeable anvils (flat, spline, spherical, point, knife-edge, disk, and blade) for a wide range of applications.
- Interchangeable anvils (pair) are optional.
- With a standard bar except 0-1" and 0 - 25 mm model.
- V-anvils and conical spindle tips (matching pair) for screw thread measurement are also available.
- With Ratchet Stop for constant force.



116-101



116-105

Shown with optional anvils

### SPECIFICATIONS

Metric			
Range	Graduation	Order No.	Accuracy
0 - 25mm	0.01mm	116-101	±4μm
25 - 50mm	0.01mm	116-102	±4μm

Inch			
Range	Graduation	Order No.	Accuracy
0 - 1"	.001"	116-105	±.0002"
1" - 2"	.001"	116-106	±.0002"

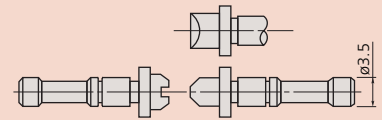
### Technical Data

Graduation: .001" or 0.01mm  
Spindle feed error: .00012" / 3μm

### Optional Accessories

Interchangeable V-anvil and conical spindle tip set:  
For Metric/Unified screw

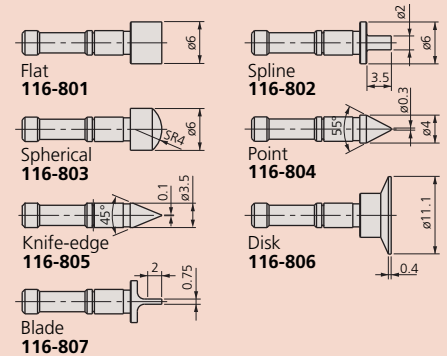
Order No.	Assortment of anvils and tips
116-830	0.4 - 0.5mm/64 - 48TPI (116-831) 0.6 - 0.9mm/44 - 28TPI (116-832) 1 - 1.75mm/24 - 14TPI (116-833) 2 - 3mm/13 - 9TPI (116-834) 3.5 - 5mm/8 - 5TPI (116-835) 5.5 - 7mm/4.5 - 3.5TPI (116-836)



116-830

### Interchangeable anvils set

Order No.	Assortment of anvils
116-800	Flat anvils (116-801) Spline anvils (116-802) Spherical anvils (116-803) Point anvils (116-804) Knife-edge anvils (116-805) Disk anvils (116-806) Blade anvils (116-807)



# Spherical Face Micrometers

**SERIES 395, 295, 115**

## Technical Data

Accuracy: Refer to the list of specifications.  
Flatness: .000024" / 0.6µm  
Display\*: LCD  
Battery\*: SR44 (1 pc.), **938882**  
Battery life\*: Approx. 1.2 years under normal use  
Dust/Water protection level\*: IP65  
\*Digital models \*\*Analog models

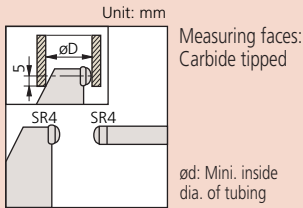
## Function of Digital Model

Origin-set, Zero / ABS, Data hold, Data output,  
inch/mm conversion (on inch/metric models only)  
Alarm: Low voltage, Counting value composition error

## Optional Accessories for Digital Model

**05CZA662**: SPC cable with data switch (40" / 1m)  
**05CZA663**: SPC cable with data switch (80" / 2m)

Spherical anvil-spindle type



## FEATURES

- IP65 water/dust protection (Series 395).
- Designed to measure the wall thickness of various tubing.
- With Ratchet Stop for constant force.
- With SPC output (Series 395).
- With digit counter (Series 295).
- With a standard bar except 0 - 1" and 0 - 25mm model.
- Supplied in fitted plastic case.



**IP65**



## SPECIFICATIONS

Metric Digital model with spherical anvil					
Range	Resolution	Order No.	Accuracy	Remarks	Mass (g)
0 - 25mm	0.001mm	395-251 <sup>S-F</sup>	±2µm	D: 15mm	270
		395-271 <sup>S-S</sup>	±2µm	D: 15mm	270
25 - 50mm	0.001mm	395-252 <sup>S-F</sup>	±2µm	D: 15mm	330
		395-272 <sup>S-S</sup>	±2µm	D: 15mm	330
50 - 75mm	0.001mm	395-253 <sup>S-F</sup>	±2µm	D: 19mm	470
		395-273 <sup>S-S</sup>	±2µm	D: 19mm	470
75 - 100mm	0.001mm	395-254 <sup>S-F</sup>	±3µm	D: 20mm	625
		395-274 <sup>S-S</sup>	±3µm	D: 20mm	625

S-F: Spherical anvil and flat spindle  
S-S: Spherical anvil and spherical spindle

Metric Mechanical counter model with spherical anvil					
Range	Graduation	Order No.	Accuracy	Remarks	Mass (g)
0 - 25mm	0.01mm	295-115 <sup>S-F</sup>	±3µm	D: 10mm	220
		295-215 <sup>S-S</sup>	±3µm	D: 10mm	220

S-F: Spherical anvil and flat spindle  
S-S: Spherical anvil and spherical spindle

Metric With spherical anvil					
Range	Graduation	Order No.	Accuracy	Remarks	Mass (g)
0 - 25mm	0.01mm	115-115 <sup>S-F</sup>	±3µm	D: 10mm	180
		115-215 <sup>S-S</sup>	±3µm	D: 10mm	180
25 - 50mm	0.01mm	115-116 <sup>S-F</sup>	±3µm	D: 11mm	240
		115-216 <sup>S-S</sup>	±3µm	D: 11mm	240
50 - 75mm	0.01mm	115-117 <sup>S-F</sup>	±3µm	D: 17mm	315
		115-217 <sup>S-S</sup>	±3µm	D: 17mm	315
75 - 100mm	0.01mm	115-118 <sup>S-F</sup>	±4µm	D: 18mm	375
		115-218 <sup>S-S</sup>	±4µm	D: 18mm	375

S-F: Spherical anvil and flat spindle  
S-S: Spherical anvil and spherical spindle

Inch/Metric Digital model with spherical anvil					
Range	Resolution	Order No.	Accuracy	Remarks	Mass (g)
0 - 1" / 0 - 25.4mm	.00005" / 0.001mm	395-351 <sup>S-F</sup>	±.0001"	D: .59"	270
		395-371 <sup>S-S</sup>	±.0001"	D: .59"	270
1" - 2" / 25.4 - 50.8mm	.00005" / 0.001mm	395-352 <sup>S-F</sup>	±.0001"	D: .59"	330
		395-372 <sup>S-S</sup>	±.0001"	D: .59"	330
2" - 3" / 50.8 - 76.2mm	.00005" / 0.001mm	395-353 <sup>S-F</sup>	±.0001"	D: .75"	470
		395-373 <sup>S-S</sup>	±.0001"	D: .75"	470
3" - 4" / 76.2 - 101.6mm	.00005" / 0.001mm	395-354 <sup>S-F</sup>	±.00015"	D: .79"	625
		395-374 <sup>S-S</sup>	±.00015"	D: .79"	625

S-F: Spherical anvil and flat spindle  
S-S: Spherical anvil and spherical spindle

Inch Mechanical counter model with spherical anvil					
Range	Graduation	Order No.	Accuracy	Remarks	Mass (g)
0 - 1"	.0001"	295-153 <sup>S-F*</sup>	±.00015"	D: .40"	220
		295-253 <sup>S-S*</sup>	±.00015"	D: .40"	220

S-F: Spherical anvil and flat spindle  
S-S: Spherical anvil and spherical spindle  
\*.0001" reading is obtained with vernier.

Inch With spherical anvil					
Range	Graduation	Order No.	Accuracy	Remarks	Mass (g)
0 - 1"	.0001"	115-153 <sup>S-F*</sup>	±.00015"	D: .40"	180
0 - 1"	.0001"	115-253 <sup>S-S*</sup>	±.00015"	D: .40"	180
1 - 2"	.001"	115-242 <sup>S-S</sup>	±.00015"	D: .44"	240
2 - 3"	.001"	115-243 <sup>S-S</sup>	±.00015"	D: .67"	315

S-F: Spherical anvil and flat spindle  
S-S: Spherical anvil and spherical spindle  
\*.0001" reading is obtained with vernier.

# Tube Micrometers

**SERIES 395, 295, 115— Spherical and Cylindrical Anvils**



## FEATURES

- IP65 water/dust protection (Series 395).
- Designed to measure the wall thickness of various tubing.
- The Tube Micrometers have two combinations of measuring faces (carbide-tipped): spherical-flat type.
- With Ratchet Stop for constant force.
- With SPC output (Series 395).
- With digit counter (Series 295).
- With a standard bar except 0 - 1" and 0 - 25mm model.
- Supplied in fitted plastic case.

## Technical Data

Accuracy: Refer to the list of specifications.  
 Flatness: .000024" / 0.6µm  
 Display\*: LCD  
 Battery\*: SR44 (1 pc.), **938882**  
 Battery life\*: Approx. 1.2 years under normal use  
 Dust/Water protection level\*: IP65  
 \*Digital models \*\*Analog models

## Function of Digital Model

Origin-set, Zero / ABS, Data hold, Data output, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error

## Optional Accessories for Digital Model

**05CZA662**: SPC cable with data switch (40" / 1m)  
**05CZA663**: SPC cable with data switch (80" / 2m)

Pin Anvil Type



## SPECIFICATIONS

Metric Digital model with cylindrical anvil					
Range	Resolution	Order No.	Accuracy	Remarks	Mass (g)
0 - 25mm	0.001mm	<b>395-261</b>	±3µm	Type A	270
		<b>395-262</b>	±3µm	Type B	270
		<b>395-263</b>	±3µm	Type C	310
		<b>395-264</b>	±3µm	Type D	310

Inch/Metric Digital model with cylindrical anvil					
Range	Resolution	Order No.	Accuracy	Remarks	Mass (g)
0 - 1" / 0 - 25.4mm	.00005" / 0.001mm	<b>395-362</b>	±.00015"	Type B	270
		<b>395-363</b>	±.00015"	Type C	310
		<b>395-364</b>	±.00015"	Type D	310

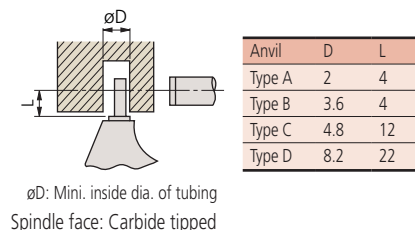
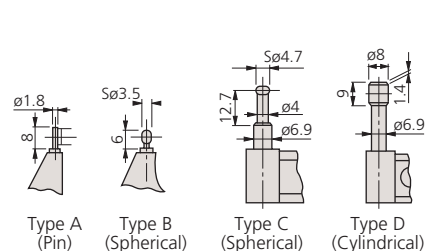
Metric Mechanical counter model					
Range	Graduation	Order No.	Accuracy	Remarks	Mass (g)
0 - 25mm	0.01mm	<b>295-302</b>	±3µm	Type A	210

Inch Mechanical counter model					
Range	Graduation	Order No.	Accuracy	Remarks	Mass (g)
0 - 1"	.0001"	<b>295-313</b>	±.00015"	Type C	210
		<b>295-314</b>	±.00015"	Type D	210

Metric With cylindrical anvil					
Range	Graduation	Order No.	Accuracy	Remarks	Mass (g)
0 - 25mm	0.01mm	<b>115-302</b>	±3µm	Type A	180
		<b>115-308</b>	±3µm	Type B	180
		<b>115-315</b>	±3µm	Type C	180
		<b>115-316</b>	±3µm	Type D	180
25 - 50mm	0.01mm	<b>115-303</b>	±3µm	Type A	240
		<b>115-309</b>	±3µm	Type B	240

Inch With cylindrical anvil					
Range	Graduation	Order No.	Accuracy	Remarks	Mass (g)
0 - 1"	.0001"	<b>115-305</b>	±.00015"	Type A	180
		<b>115-313*</b>	±.00015"	Type C	180
		<b>115-314*</b>	±.00015"	Type D	180

\*.0001" reading is obtained with vernier.





### Technical Data

Accuracy: Refer to the list of specifications.  
 Resolution\*: .00005" / 0.001mm or 0.001mm  
 Graduation\*\*\*: .0001" or 0.01mm  
 Spindle face: Carbide tipped  
 Display\*: LCD  
 Battery\*: SR44 (1 pc.), **938882**  
 Battery life\*: Approx. 1.2 years under normal use  
 Dust/Water protection level\*: IP65  
 \*Digital models \*\*Analog models

### Function of Digital Model

Origin-set, Zero / ABS, Data hold, Data output,  
 inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error

### Optional Accessories

- 05CZA662:** SPC cable with data switch (40" / 1m)\*
- 05CZA663:** SPC cable with data switch (80" / 2m)\*
- 201218:** V-anvil
- 950758:** Disc. anvil for 1" / 25mm models
- 950759:** Disc. anvil for 2" / 50mm models

\*Only for digital models

### Applications



Using flat anvil (201216)



With the disc. anvil (950758) Shown above, the Uni-Mike is used as a height micrometer

# "Uni-Mike"

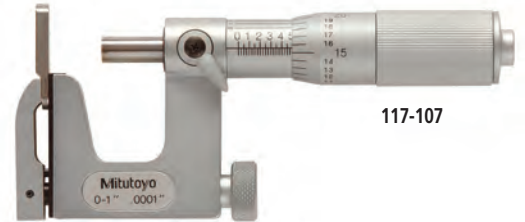
## SERIES 317, 117 — Interchangeable Anvil Type

### FEATURES

- IP65 water/dust protection (Series 317).
- Measures tubing thickness, shoulder-edge distance, rivet head height, etc. with interchangeable anvils (flat anvil, rod anvil, V-anvil).
- Supplied with Flat Anvil (**201216**) and Rod Anvil: .118"/ø3mm dia. rod anvil (**201217**) for 0-1"/0-25mm models, .197"/ø5mm (**201379**) for 1-2" / 25-50mm model.
- With special Disk Anvils. The Uni-Mike is used as a height micrometer. The disks have a lapped, mirror surface.
- With a standard bar except 0 -1" and 0-25mm model.
- Supplied in fitted plastic case.



317-351



117-107

### SPECIFICATIONS

**Metric** Digital model with ratchet stop

Range	Resolution	Order No.	Accuracy	Mass (g)
0 - 25mm	0.001mm	<b>317-251</b>	±4µm	335
25 - 50mm	0.001mm	<b>317-252</b>	±4µm	360

Excluding quantizing error

**Inch/Metric** Digital model with friction thimble

Range	Resolution	Order No.	Accuracy	Mass (g)
0 - 1" / 0 - 25.4mm	.00005" / 0.001mm	<b>317-351</b>	±.0002"	340
1 - 2" / 25.4 - 50.8mm	.00005" / 0.001mm	<b>317-352</b>	±.0002"	365

Excluding quantizing error

**Metric** With ratchet stop

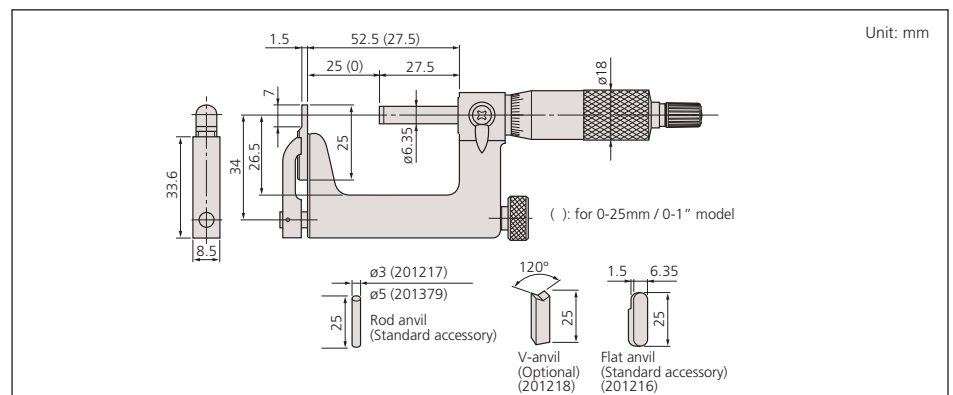
Range	Graduation	Order No.	Accuracy	Mass (g)
0 - 25mm	0.01mm	<b>117-101</b>	±4µm	255
25 - 50mm	0.01mm	<b>117-102</b>	±4µm	320

**Inch** With friction thimble

Range	Graduation	Order No.	Accuracy	Mass (g)
0 - 1"	.0001"	<b>117-107*</b>	±.0002"	255
1 - 2"	.0001"	<b>117-108*</b>	±.0002"	320

\*.0001" reading is obtained with vernier

### DIMENSIONS



# Sheet Metal Micrometers

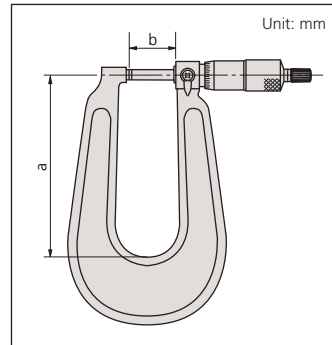
**SERIES 389, 119, 118**

## FEATURES

- Measures thickness of sheet metal, paper, plastic, and rubber parts.
- With Ratchet Stop for constant force.
- With a standard bar except for 0 - 1" / 0 - 25mm model.
- IP65 water/dust protection (Series 389\*).
- \*Except for **389-514** / **389-714**.
- Supplied in fitted plastic case.



## DIMENSIONS



## SPECIFICATIONS

Metric		Digital model			
Range	Resolution	Order No.	Accuracy	a/b	
0 - 25mm	0.001mm	<b>389-251</b>	±4µm	160/27.5mm	
0 - 25mm	0.001mm	<b>389-261<sup>S-F</sup></b>	±4µm	160/27.5mm	
0 - 25mm	0.001mm	<b>389-271<sup>S-S</sup></b>	±4µm	160/27.5mm	
0 - 25mm	0.001mm	<b>389-514</b>	±5µm	330/35mm	
25 - 50mm	0.001mm	<b>389-252</b>	±4µm	165/27.5mm	
25 - 50mm	0.001mm	<b>389-262<sup>S-F</sup></b>	±4µm	165/27.5mm	
25 - 50mm	0.001mm	<b>389-272<sup>S-S</sup></b>	±4µm	165/27.5mm	

S-F: Spherical anvil and flat spindle  
S-S: Spherical anvil and spherical spindle

Inch/Metric		Digital model			
Range	Resolution	Order No.	Accuracy	a/b	
0 - 1" / 0 - 25.4mm	.00005" / 0.001mm	<b>389-351</b>	±.0002"	6.3"/1.08"	
		<b>389-361<sup>S-F</sup></b>	±.0002"	6.3"/1.08"	
		<b>389-371<sup>S-S</sup></b>	±.0002"	6.3"/1.08"	
		<b>389-714</b>	±.00025"	13"/1.38"	
1 - 2" / 25.4 - 50.8mm	.00005" / 0.001mm	<b>389-352</b>	±.0002"	6.5"/1.08"	
		<b>389-362<sup>S-F</sup></b>	±.0002"	6.5"/1.08"	
		<b>389-372<sup>S-S</sup></b>	±.0002"	6.5"/1.08"	

S-F: Spherical anvil and flat spindle  
S-S: Spherical anvil and spherical spindle

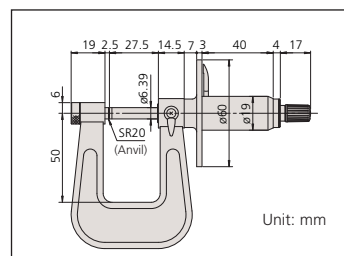
Metric		Dial reading model			
Range	Graduation	Order No.	Accuracy	a/b	
0 - 25mm	0.01mm	<b>118-101</b>	±4µm	110/27.5mm	
0 - 25mm	0.01mm	<b>118-102</b>	±4µm	160/27.5mm	
0 - 25mm	0.01mm	<b>118-114<sup>S-F</sup></b>	±4µm	160/27.5mm	
0 - 25mm	0.01mm	<b>118-118<sup>S-S</sup></b>	±4µm	160/27.5mm	
0 - 25mm	0.01mm	<b>118-103</b>	±5µm	330/35mm	
25 - 50mm	0.01mm	<b>118-110</b>	±4µm	165/27.5mm	

S-F: Spherical anvil and flat spindle  
S-S: Spherical anvil and spherical spindle

Inch		Dial reading model			
Range	Graduation	Order No.	Accuracy	a/b	
0 - 1"	.0001"	<b>118-129</b>	±.0002"	6.3"/1.08"	
		<b>118-116<sup>S-F</sup></b>	±.0002"	6.3"/1.08"	
		<b>118-120<sup>S-S</sup></b>	±.0002"	6.3"/1.08"	
	.001"	<b>118-107</b>	±.00025"	13"/1.38"	
1" - 2"	.001"	<b>118-112</b>	±.0002"	6.5"/1.08"	

S-F: Spherical anvil and flat spindle  
S-S: Spherical anvil and spherical spindle  
\*.0001" reading is obtained with vernier.

## DIMENSIONS AND MASS



Metric		Dial reading model		
Range	Graduation	Order No.	Accuracy	Throat
0 - 25mm	0.01mm	<b>119-202<sup>S-F</sup></b>	±4µm	50mm

S-F: Spherical anvil and flat spindle



## Technical Data

Accuracy: Refer to the list of specifications.  
Resolution\*: .00005"/0.001mm or 0.001mm  
Graduation\*\*: 0.01mm, .001" or .0001"  
Flatness: .000024" / 0.6µm for models with 6" / 150mm throat  
.00004" / 1µm for models with 12" / 300mm throat  
Parallelism: .00012" / 3µm  
Measuring faces: Carbide tipped  
Display\*: LCD  
Battery\*: SR44 [1 pc. (2 pcs.: **389-513** and **389-713**), **938882**  
Battery life\*: Approx. 1.2 years under normal use  
(1.8 years: **389-513** and **389-713**)  
Dust/Water protection level\*: IP65  
\*Digital models \*\*Analog models

## Function of Digital Model

Origin-set, Zero-setting, Data hold, Data output, inch/mm conversion (on inch/metric models only)  
Alarm: Low voltage, Counting value composition error

## Optional Accessories for Digital Model

- 05CZA662**: SPC cable with data switch (40" / 1m)
- 05CZA663**: SPC cable with data switch (80" / 2m)
- 937387**: SPC cable for **389-513/389-713** (40" / 1m)
- 965013**: SPC cable for **389-513/389-713** (80" / 2m)

## Anvil-Spindle Combinations



Standard, Flat-Flat



Spherical-Flat (S-F)



Spherical-Spherical (S-S)

The Series 119 is provided with a dial for making easy and quick reading.





## Technical Data

Accuracy: Refer to the list of specifications.

Resolution\*: .00005"/0.001mm or 0.001mm

Graduation\*\*: .0001" or 0.01mm

Parallelism: .00012" / 3µm for models up to 3" / 75mm

(3+R/100)µm for models over 75mm,

R=max. range (mm) .00016" for 4" models

Display\*: LCD

Battery\*: SR44 (1 pc.), **938882**

Battery life\*: Approx. 1.2 years under normal use

\*Digital models \*\*Analog models

## Function of Digital Model

Origin-set, Zero / ABS, Data hold, Data output, inch/mm conversion (on inch/metric models only)

Alarm: Low voltage, Counting value composition error

## Optional Accessories for Digital Model

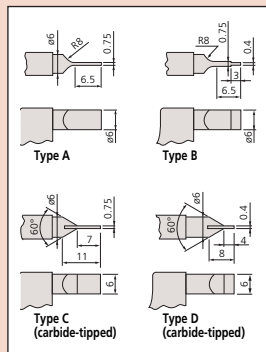
**05CZA662**: SPC cable with data switch (1m / 40")

**05CZA663**: SPC cable with data switch (2m / 80")

**937387**: SPC cable for Quickmike type (1m / 40")

**965013**: SPC cable for Quickmike type (2m / 80")

## TYPE AND DIMENSIONS



# Blade Micrometers

## SERIES 422,122 — Non-Rotating Spindle Type

### FEATURES

- The anvil and the spindle have a blade for measuring the groove diameter of shafts, keyways, and other hard-to-reach areas.
- With Ratchet Stop for constant force.
- Speedy spindle feed of .4"/10mm /rev. (Quickmike type).
- With a standard bar except 0 - 1" and 0 -25mm model.
- Supplied in fitted plastic case.

### Quickmike type



422-421



422-330



122-125

IP54

ABSOLUTE  
Master System Protected by ISO1000

## SPECIFICATIONS

Metric		Digital model			
Range	Resolution	Order No.	Accuracy	Remarks	Mass (g)
0 - 25mm	0.001mm	422-230	±3µm	Type A	365
		422-260	±3µm	Type B	365
		422-270	±3µm	Type C	365
		422-271	±3µm	Type D	365
25 - 50mm	0.001mm	422-231	±3µm	Type A	565
		422-261	±3µm	Type B	565
50 - 75mm	0.001mm	422-232	±3µm	Type A	465
75 - 100mm	0.001mm	422-233	±4µm	Type A	580

Metric		Quickmike type		
Range	Resolution	Order No.	Accuracy	Mass (g)
0 - 30mm	0.001mm	422-411	±3µm	350
25 - 55mm	0.001mm	422-412	±3µm	490

Metric					
Range	Graduation	Order No.	Accuracy	Remarks	Mass (g)
0 - 25mm	0.01mm	122-101	±3µm	Type A	260
		122-111	±3µm	Type B	260
		122-161	±3µm	Type C	275
		122-141	±3µm	Type D	275
25 - 50mm	0.01mm	122-102	±3µm	Type A	300
		122-112	±3µm	Type B	300
		122-162	±3µm	Type C	315
		122-142	±3µm	Type D	315
50 - 75mm	0.01mm	122-103	±3µm	Type A	360
75 - 100mm	0.01mm	122-104	±4µm	Type A	525
100 - 125mm	0.01mm	122-105	±4µm	Type A	670
125 - 150mm	0.01mm	122-106	±4µm	Type A	775
150 - 175mm	0.01mm	122-107	±5µm	Type A	950
175 - 200mm	0.01mm	122-108	±5µm	Type A	1140

Inch/Metric		Digital model			
Range	Resolution	Order No.	Accuracy	Remarks	Mass (g)
0 - 1" / 0 - 25.4mm	.00005" / 0.001mm	422-330	±.00015"	Type A	365
		422-360	±.00015"	Type B	365
		422-370	±.00015"	Type C	365
		422-371	±.00015"	Type D	365
1 - 2" / 25.4 - 50.8mm	.00005" / 0.001mm	422-331	±.00015"	Type A	565
		422-361	±.00015"	Type B	565
2 - 3" / 50.8 - 76.2mm	.00005" / 0.001mm	422-332	±.00015"	Type A	465
3 - 4" / 76.2 - 101.6mm	.00005" / 0.001mm	422-333	±.0002"	Type A	580

Inch/Metric		Quickmike type			
Range	Resolution	Order No.	Accuracy	Remarks	Mass (g)
0 - 1.2" / 0 - 30.48mm	.00005" / 0.001mm	422-421	±.00015"	Type A	350
1 - 2.2" / 25.4 - 55.88mm	.00005" / 0.001mm	422-422	±.00015"	Type A	490

Inch					
Range	Graduation	Order No.	Accuracy	Remarks	Mass (g)
0 - 1"	.0001"	122-125	±.00015"	Type A	260
		122-135	±.00015"	Type B	260
		122-151	±.00015"	Type D	275
1 - 2"	.0001"	122-126	±.00015"	Type A	300
2 - 3"	.0001"	122-127	±.00015"	Type A	360
3 - 4"	.0001"	122-128	±.0002"	Type A	525

# Disk Micrometers

## SERIES 323, 223, 123 - Rotating Spindle

### FEATURES

- Diameter of measuring disk: .787" / 20mm
- .028" / 0.7mm (1mm: models over 100mm) edge thickness to enter narrow recesses.
- With Ratchet Stop for constant force.
- With a standard bar except for 0 - 1" / 0 - 25mm model.
- With SPC output (Series 323).
- The Series 223 is provided with a mechanical digit counter for quick reading of measurements.
- Supplied in fitted plastic case. (Over 100mm models supplied wooden cases)



123-125



123-103



323-350



223-125

### SPECIFICATIONS

#### Metric Digital model

Range	Resolution	Order No.	Accuracy	Mass (g)
0 - 25mm	0.001mm	323-250	±4μm	290
25 - 50mm	0.001mm	323-251	±4μm	355
50 - 75mm	0.001mm	323-252	±6μm	555
75 - 100mm	0.001mm	323-253	±6μm	610

#### Metric Mechanical counter model

Range	Graduation	Order No.	Accuracy	Mass (g)
0 - 25mm	0.01mm	223-101	±4μm	260
25 - 50mm	0.01mm	223-102	±4μm	290

#### Metric

Range	Graduation	Order No.	Accuracy	Mass (g)
0 - 25mm	0.01mm	123-101	±4μm	200
		123-113*	±4μm	230
		123-113*	±4μm	230
25 - 50mm	0.01mm	123-102	±4μm	250
		123-114*	±4μm	270
50 - 75mm	0.01mm	123-103	±6μm	300
		123-115*	±6μm	320
75 - 100mm	0.01mm	123-104	±6μm	375
		123-116*	±6μm	390
		123-116*	±6μm	390
100 - 125mm	0.01mm	123-105	±7μm	520
125 - 150mm	0.01mm	123-106	±7μm	570
150 - 175mm	0.01mm	123-107	±8μm	730
175 - 200mm	0.01mm	123-108	±8μm	890
200 - 225mm	0.01mm	123-109	±8μm	1000
225 - 250mm	0.01mm	123-110	±9μm	1200
250 - 275mm	0.01mm	123-111	±9μm	1410
275 - 300mm	0.01mm	123-112	±9μm	1680

\*The measuring disks have carbide tips.  
Note: The disk diameter of models over 100mm is 30mm.

#### Inch/Metric Digital model

Range	Resolution	Order No.	Accuracy	Mass (g)
0 - 1" / 0 - 25.4mm	.00005" / 0.001mm	323-350	±.0002"	290
1 - 2" / 25.4 - 50.8mm	.00005" / 0.001mm	323-351	±.0002"	355
2 - 3" / 50 - 76.2mm	.00005" / 0.001mm	323-352	±.0003"	555
3 - 4" / 76.2 - 101.6mm	.00005" / 0.001mm	323-353	±.0003"	610

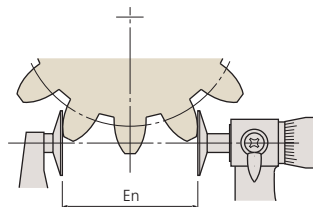
#### Inch Mechanical counter model

Range	Graduation	Order No.	Accuracy	Mass (g)
0 - 1"	.001"	223-125	±.0002"	260

#### Inch

Range	Graduation	Order No.	Accuracy	Mass (g)
0 - 1"	.001"	123-125	±.0002"	200
1 - 2"	.001"	123-126	±.0002"	250
2 - 3"	.001"	123-127	±.0003"	300
3 - 4"	.001"	123-128	±.0003"	375

### Root tangent length of gear (En)



Note: Root tangent length measurement is not available for some types of gears.



### Technical Data

Accuracy: Refer to the list of specifications.  
Resolution\*: .00005" / 0.001mm or 0.001mm  
Graduation\*\*: .001" or 0.01mm  
Flatness: .00004" / 1μm for models up to .00004" / 100mm  
.000063" / 1.6μm for models over 4" / 100mm  
Parallelism: .00016" / 4μm for models up to 2" / 50mm  
.00024" for models up to 4"  
(4+R/50)μm for models up to 100mm  
(5+R/75)μm for models over 100mm, R=max. range (mm)  
Measurable module: 0.5-6 (0.7-11: models over 100mm)  
Display\*: LCD  
Battery\*: SR44 (1 pc.), 938882  
Battery life\*: Approx. 1.2 years under normal use  
\*Digital models \*\*Analog models

### Function of Digital Model

Origin-set, Zero / ABS, Data hold, Data output, inch/mm conversion (on inch/metric models only)  
Alarm: Low voltage, Counting value composition error

### Optional Accessories for Digital Model

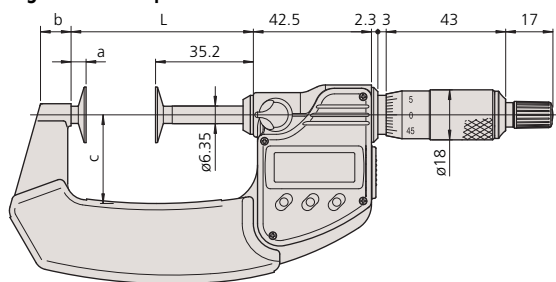
05CZA662: SPC cable with data switch (40" / 1m)  
05CZA663: SPC cable with data switch (80" / 2m)



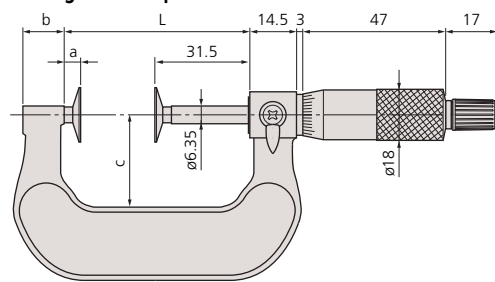
## DIMENSIONS

Unit: mm

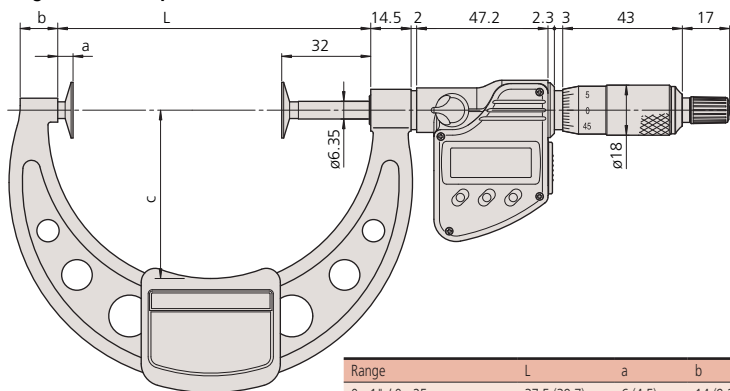
### Digital models up to 75mm



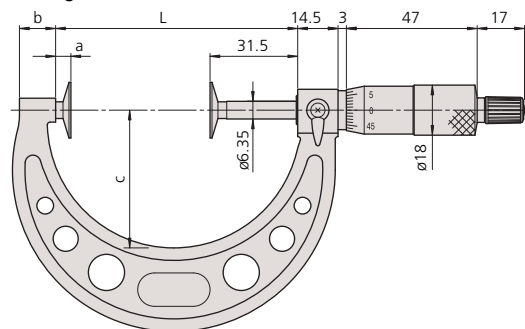
### Analog models up to 50mm



### Digital models up to 75mm

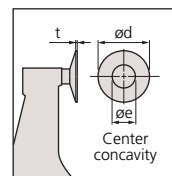


### Analog over 50mm



Range	L	a	b	c	ød	øe	t
0 - 1" / 0 - 25mm	37.5 (39.7)	6 (4.5)	14 (9.2)	25 (25.4)	20	8/9.8*	0.7
1 - 2" / 25 - 50mm	62.5 (65.6)	6 (5.4)	14 (11)	32 (31.9)	20	8/9.8*	0.7
2 - 3" / 50 - 75mm	87 (90.7)	5.5 (5.5)	11 (12.2)	49 (50)	20	8/9.8*	0.7
3 - 4" / 75 - 100mm	112 (112.5)	5.5 (5.5)	11 (13.5)	63 (60.5)	20	8/9.8*	0.7
4 - 5" / 100 - 125mm	137.5	6	12	79	30	12	1
5 - 6" / 125 - 150mm	162.5	6	15	94	30	12	1
6 - 7" / 150 - 175mm	187.5	6	16	106	30	12	1
7 - 8" / 175 - 200mm	212.5	6	15	118	30	12	1
8 - 9" / 200 - 225mm	237.5	6	14	130	30	12	1
9 - 10" / 225 - 250mm	262.5	6	14	143	30	12	1
10 - 11" / 250 - 275mm	287.5	6	15	156	30	12	1
11 - 12" / 275 - 300mm	312.5	6	15	169	30	12	1

Data in ( ) applies to those with carbide tipped disks.

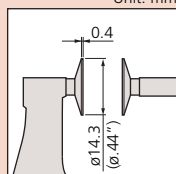


### Technical Data

Graduation: .001" or 0.01mm  
 Flatness: .00004" / 1µm  
 Parallelism: .00012" / 3µm  
 Measuring Force: 8.02 ±0.8N  
 53.9KPa ±4.9 KPa



Unit: mm



( ) : Inch model

# Paper Thickness Micrometers

**SERIES 169 — Non-Rotating Spindle Type Designed for Paper Thickness Measurement**

## FEATURES

- Non-rotating spindle.
- With Ratchet Stop for constant force.
- Supplied in fitted plastic case.

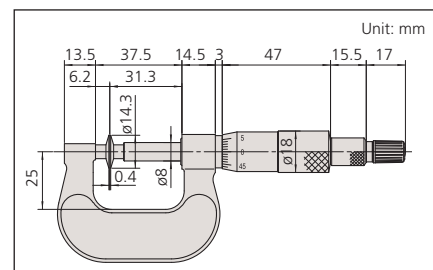


169-101

## SPECIFICATIONS

Metric				
Range	Graduation	Order No.	Accuracy	Mass (g)
0 - 25mm	0.01mm	169-101	±4µm	230g

## DIMENSIONS



Inch				
Range	Graduation	Order No.	Accuracy	Mass (g)
0 - 1"	.001"	169-103	±.0002"	230g

Mitutoyo

# Disk Micrometers

## SERIES 369, 227, 169 — Non-Rotating Spindle Type



### FEATURES

- The Disk Micrometer is designed to easily measure root tangent length of spur gears and helical gears.
- Non-rotating spindle eliminates torque on workpiece.
- With standard bar except 0 - 15mm, 0 - .6" 0 - 25mm, 0 - 1", 0 - 30mm & 0 - 1.2" model
- Speedy spindle feed of 10mm/rev. (Quickmike type).
- Diameter of measuring disk: .787" / 20mm
- With Ratchet Stop for constant force.
- With SPC output (Series 369).
- Supplied in fitted plastic case



369-350



Quickmike type

369-421

### Quickmike type with adjustable measuring force



227-221



169-201



### SPECIFICATIONS

Metric		Digital model	
Range	Resolution	Order No.	Accuracy
0 - 25mm	0.001mm	369-250	±4µm
25 - 50mm	0.001mm	369-251	±4µm
50 - 75mm	0.001mm	369-252	±6µm
75 - 100mm	0.001mm	369-253	±6µm

Inch/Metric		Digital model	
Range	Resolution	Order No.	Accuracy
0 - 1" / 0 - 25.4mm	.00005" / 0.001mm	369-350	±.0002"
1 - 2" / 25.4 - 50.8mm	.00005" / 0.001mm	369-351	±.0002"
2 - 3" / 50.8 - 76.2mm	.00005" / 0.001mm	369-352	±.0003"
3 - 4" / 76.2 - 101.6mm	.00005" / 0.001mm	369-353	±.0003"

Metric		Quickmike type	
Range	Resolution	Order No.	Accuracy
0 - 30mm	0.001mm	369-411	±4µm
25 - 55mm	0.001mm	369-412	±4µm

Inch/Metric		Quickmike type	
Range	Resolution	Order No.	Accuracy
0 - 1.2" / 0 - 30.48mm	.00005" / 0.001mm	369-421	±.0002"
1 - 2.2" / 25.4 - 55.88mm	.00005" / 0.001mm	369-422	±.0002"

Metric		Quickmike type with adjustable measuring force		
Range	Resolution	Order No.	Accuracy	Measuring force
0 - 10mm	0.001mm	227-223	±4µm	2N - 10N
0 - 15mm	0.001mm	227-221	±4µm	0.5N - 2.5N

Metric			
Range	Graduation	Order No.	Accuracy
0 - 25mm	0.01mm	169-201	±4µm
25 - 50mm	0.01mm	169-202	±4µm
50 - 75mm	0.01mm	169-205	±6µm
75 - 100mm	0.01mm	169-207	±6µm

Inch			
Range	Graduation	Order No.	Accuracy
0 - 1"	.001"	169-203	±.0002"
1 - 2"	.001"	169-204	±.0002"
2 - 3"	.001"	169-206	±.0003"
3 - 4"	.001"	169-208	±.0003"

### Technical Data

Accuracy: Refer to the list of specifications.  
 Resolution\*: .00005"/0.001mm or 0.001mm  
 Graduation\*\*: .001" or 0.01mm  
 Flatness: .00004" / 1µm  
 Parallelism: 4µm / .00016" for models up to 2" / 50mm  
 6µm / .00024" for models over 2" / 50mm  
 Measurable module: 0.5-6  
 Display\*: LCD  
 Battery\*: SR44 (1 pc.), 938882  
 Battery life\*: Approx. 1.2 years under normal use  
 (1 year: Quickmike type, 3 years: Quickmike type with fine-loading)  
 Series 227: Refer to page B-6 for more information.  
 \*Digital models \*\*Analog models

### Function of Digital Model

Origin-set, Zero / ABS, Data hold, Data output, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error

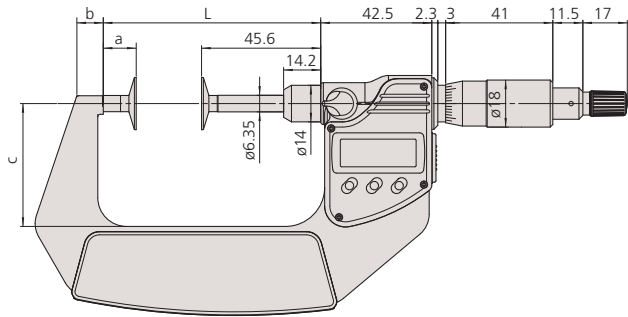
### Optional Accessories for Digital Model

- 05CZA662: SPC cable with data switch (40" / 1m)
- 05CZA663: SPC cable with data switch (80" / 2m)
- 937387: SPC cable for Quickmike type (40" / 1m)
- 965013: SPC cable for Quickmike type (80" / 2m)

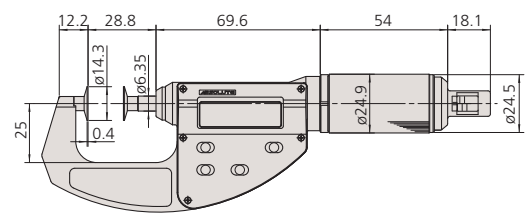
# DIMENSIONS AND MASS

Unit: mm

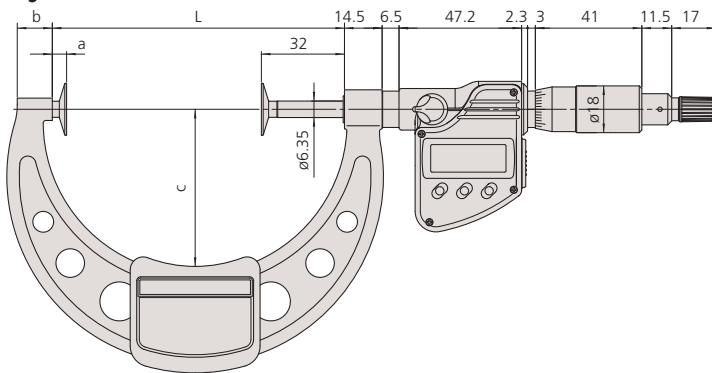
## Digital models up to 75mm



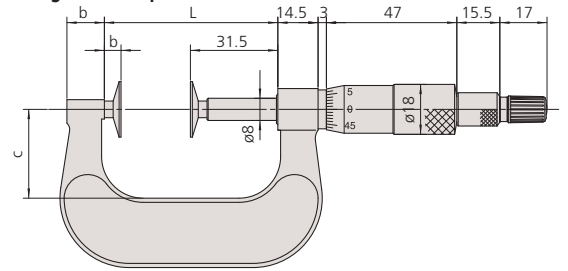
## Adjustable measuring force type



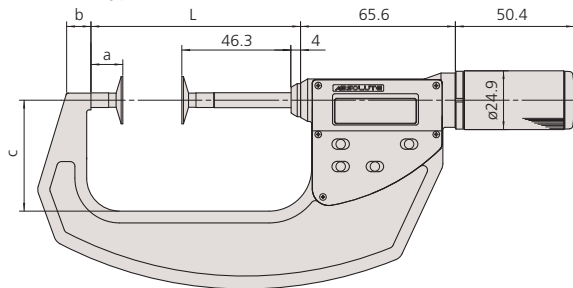
## Digital models over 75mm



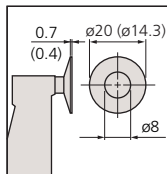
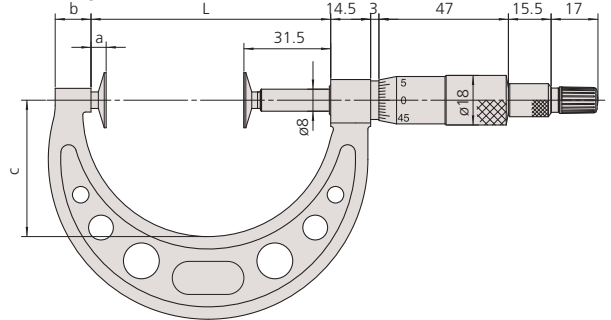
## Analog models up to 50mm



## Quickmike type



## Analog models over 50mm



( ): Adjustable measuring force type

### Digital model

Range	L	a	b	c	Mass (g)
0 - 25mm / 0 - 1"	58.5	12.9	7	32	340
25 - 50mm / 1 - 2"	83.5	12.9	9.8	47	480
50 - 75mm / 2 - 3"	108.5	12.9	11.2	60	635
75 - 100mm / 3 - 4"	112.5	5.5	13.5	60.5	475
0 - 30mm* / 0 - 1.2"	63.8	13.5	8.5	36	360
25 - 55mm* / 1 - 2.2"	88.8	13.5	10.3	47	490

\*Quickmike type

### Analog model

Range	L	a	b	c	Mass (g)
0 - 25mm / 0 - 1"	37.5	6	13.5	25	230
25 - 50mm / 1 - 2"	62.5	6	13.5	32	280
50 - 75mm / 2 - 3"	87	5.5	13	49.5	315
75 - 100mm / 3 - 4"	112	5.5	13	63.5	400

# Gear Tooth Micrometers

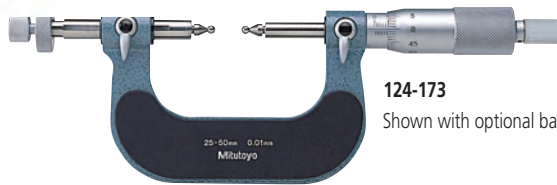
## SERIES 324, 124 — Interchangeable Ball Anvil-Spindle Tip Type

### FEATURES

- IP65 water/dust protection (Series 324).
- Measures over-pin diameter of gears with precision steel (carbide) ball-tipped measuring faces.
- With a standard bar except 0 - 25mm and 0 - 1" model
- Interchangeable ball anvil-spindle tips for various gear modules (0.5 - 5.25) are optional.
- With Ratchet Stop for constant force.
- With SPC output (Series 324).
- Supplied in fitted plastic case (0 - 150mm / 4" model 008 150mm model are wooden case).



**324-351-10**  
Shown with optional ball anvils



**124-173**  
Shown with optional ball anvils

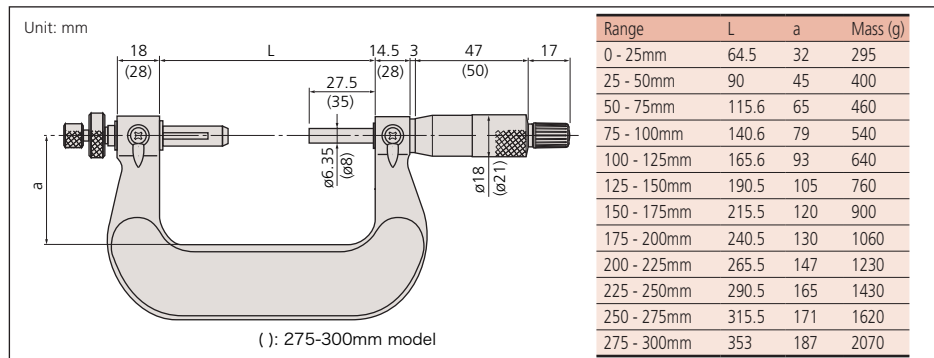
### SPECIFICATIONS

Metric		Digital model		
Range	Resolution	Order No.	Accuracy	Mass (g)
0 - 25mm	0.001mm	<b>324-251-10</b>	±4μm	400
25 - 50mm	0.001mm	<b>324-252-10</b>	±4μm	490
50 - 75mm	0.001mm	<b>324-253-10</b>	±4μm	530
75 - 100mm	0.001mm	<b>324-254-10</b>	±5μm	600

Inch/Metric		Digital model		
Range	Resolution	Order No.	Accuracy	Mass (g)
0 - 1" / 0 - 25mm	.00005" / 0.001mm	<b>324-351-10</b>	±.0002"	400
1 - 2" / 25 - 50mm	.00005" / 0.001mm	<b>324-352-10</b>	±.0002"	490
2 - 3" / 50 - 75mm	.00005" / 0.001mm	<b>324-353-10</b>	±.0002"	530
3 - 4" / 75 - 100mm	.00005" / 0.001mm	<b>324-354-10</b>	±.00025"	600

Metric				
Range	Graduation	Order No.	Accuracy	Mass (g)
0 - 25mm	0.01mm	<b>124-173</b>	±4μm	295
25 - 50mm	0.01mm	<b>124-174</b>	±4μm	400
50 - 75mm	0.01mm	<b>124-175</b>	±4μm	460
75 - 100mm	0.01mm	<b>124-176</b>	±5μm	540
100 - 125mm	0.01mm	<b>124-177</b>	±5μm	640
125 - 150mm	0.01mm	<b>124-178</b>	±5μm	760
150 - 175mm	0.01mm	<b>124-179</b>	±6μm	900
175 - 200mm	0.01mm	<b>124-180</b>	±6μm	1060
200 - 225mm	0.01mm	<b>124-181</b>	±6μm	1230
225 - 250mm	0.01mm	<b>124-182</b>	±7μm	1430
250 - 275mm	0.01mm	<b>124-183</b>	±7μm	1620
275 - 300mm	0.01mm	<b>124-195</b>	±7μm	2070

### DIMENSIONS AND MASS



### Technical Data

Accuracy: Refer to the list of specifications.  
 Resolution\*: 0.001mm or .00005"/0.001mm  
 Graduation\*\*: 0.01mm  
 Display\*: LCD  
 Battery\*: SR44 (1 pc.), **938882**  
 Battery life\*: Approx. 1.2 years under normal use  
 Dust/Water protection level\*: IP65  
 \*Digital models \*\*Analog models

### Function of Digital Model

Zero / ABS, Data hold, Data output, Preset, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error  
 Function Lock  
 2 Presets

### Optional Accessories

**05CZA662**: SPC cable with data switch (1m / 40")\*  
**05CZA663**: SPC cable with data switch (2m / 80")\*  
 \*Only for digital models



### Interchangeable ball anvil-spindle tip set:

Diameter of ball anvil	Order No.	Gear module	Diametral pitch
0.8mm	<b>124-801*</b>	0.5 - 0.55	50
1mm	<b>124-802*</b>	0.6 - 0.65	45
1.191mm (3/64")	<b>124-803*</b>	0.7 - 0.8	35 - 30
1.5mm	<b>124-821*</b>	0.9 - 1	28 - 26
1.588mm (1/16")	<b>124-804*</b>	0.9 - 1	28 - 26
2mm	<b>124-805*</b>	1.25	22
2.381mm (3/32")	<b>124-806</b>	1.5	17
2.5mm	<b>124-822</b>	1.5	17
3mm	<b>124-807</b>	1.75	15
3.175mm (1/8")	<b>124-808</b>	—	14
3.5mm	<b>124-823</b>	2	13
3.969mm (5/32")	<b>124-809</b>	2	13
4mm	<b>124-810</b>	2.25	11
4.5mm	<b>124-824</b>	2.5	10
4.763mm (3/16")	<b>124-811</b>	2.5	10
5mm	<b>124-812</b>	2.75	9
5.556mm (7/32")	<b>124-813</b>	3.0 - 3.25	8
6mm	<b>124-814</b>	3.5	7
6.35mm (1/4")	<b>124-815</b>	3.75	7
7mm	<b>124-816</b>	4.0	6.5
7.144mm (9/32")	<b>124-817</b>	4.25	6
7.938mm (5/16")	<b>124-818</b>	4.5	5.5
8mm	<b>124-819</b>	4.75	5.5
8.731mm (11/32")	<b>124-820</b>	5.0 - 5.25	5

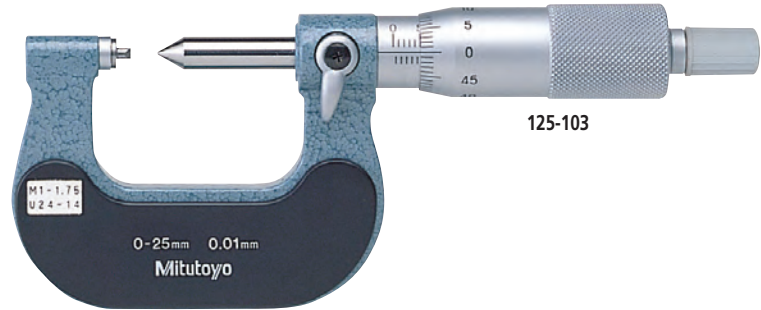
\*Carbide-tipped type

# Screw Thread Micrometers

## SERIES 125

### FEATURES

- Provided with a 60 degree V-anvil and conical spindle for easily measuring pitch diameters of metric or unified screw threads.
- With Ratchet Stop for constant force.
- With a standard bar for zero point adjustment except 0 - 25mm model.
- Supplied in fitted plastic case.



125-103

### Technical Data

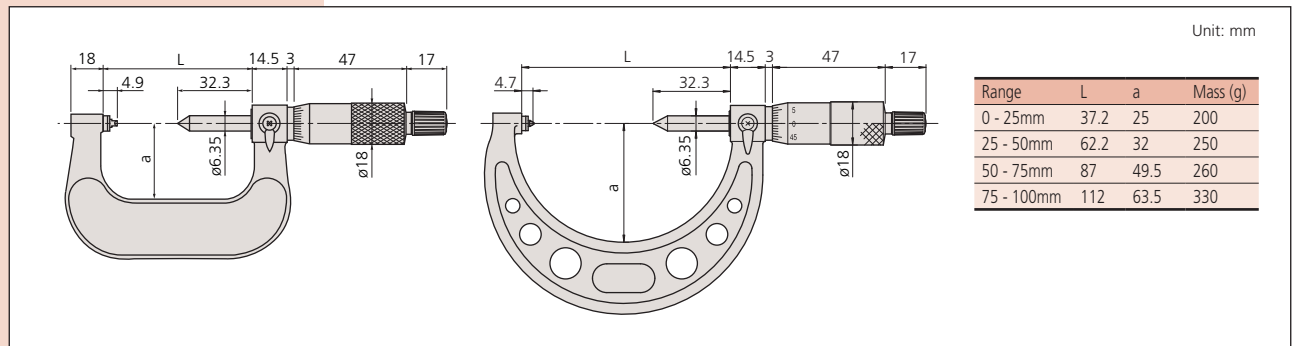
Accuracy:  $\pm(2+R/75)\mu\text{m}$ , R=max. range (mm)  
 Graduation: 0.01mm  
 Spindle feed error: 3 $\mu\text{m}$



### SPECIFICATIONS

Metric			
Range	Graduation	Order No.	Screw to be measured (Metric/Unified)
0 - 25mm	0.01mm	125-101	0.4 - 0.5mm/64 - 48TPI
		125-102	0.6 - 0.9mm/44 - 28TPI
		125-103	1 - 1.75mm/24 - 14TPI
		125-104	2 - 3mm/13 - 9TPI
		125-105	3.5 - 5mm/8 - 5TPI
25 - 50mm	0.01mm	125-106	0.4 - 0.5mm/64 - 48TPI
		125-107	0.6 - 0.9mm/44 - 28TPI
		125-108	1 - 1.75mm/24 - 14TPI
		125-109	2 - 3mm/13 - 9TPI
		125-110	3.5 - 5mm/8 - 5TPI
50 - 75mm	0.01mm	125-111	0.6 - 0.9mm/44 - 28TPI
		125-112	1 - 1.75mm/24 - 14TPI
		125-113	2 - 3mm/13 - 9TPI
		125-114	3.5 - 5mm/8 - 5TPI
		125-115	5.5 - 7mm/4.5 - 3.5TPI
75 - 100mm	0.01mm	125-116	0.6 - 0.9mm/44 - 28TPI
		125-117	1 - 1.75mm/24 - 14TPI
		125-118	2 - 3mm/13 - 9TPI
		125-119	3.5 - 5mm/8 - 5TPI
		125-120	5.5 - 7mm/4.5 - 3.5TPI

### DIMENSIONS AND MASS



# Screw Thread Micrometers

## SERIES 326, 126 — Interchangeable Anvil-Spindle Tip Type



### FEATURES

- IP65 water/dust protection (Series 326).
- 60 degree or 55 degree V-anvil and conical spindle (interchangeable) are optional, which are made of high-grade steel, hardened and precision ground.
- With Ratchet Stop for constant force.
- With SPC output (Series 326).
- With a standard bar except 0 - 25mm and 0 - 1" model.
- Supplied in fitted plastic case.



**126-125**  
Shown with optional anvils



**326-351-10**

### SPECIFICATIONS

Metric		Digital model		
Range	Resolution	Order No.	Accuracy	Mass (g)
0 - 25mm	0.001mm	<b>326-251-10</b>	±4µm	350
25 - 50mm	0.001mm	<b>326-252-10</b>	±4µm	380
50 - 75mm	0.001mm	<b>326-253-10</b>	±4µm	470
75 - 100mm	0.001mm	<b>326-254-10</b>	±5µm	510

Inch/Metric		Digital model		
Range	Resolution	Order No.	Accuracy	Mass (g)
0 - 1" / 0 - 25.4mm	.00005" / 0.001mm	<b>326-351-10</b>	±.0002"	350
1 - 2" / 25.4 - 50.8mm	.00005" / 0.001mm	<b>326-352-10</b>	±.0002"	380
2 - 3" / 50.8 - 76.2mm	.00005" / 0.001mm	<b>326-353-10</b>	±.0002"	470
3 - 4" / 76.2 - 101.6mm	.00005" / 0.001mm	<b>326-354-10</b>	±.00025"	510

Metric				
Range	Graduation	Order No.	Accuracy	Mass (g)
0 - 25mm	0.01mm	<b>126-125</b>	±4µm	240
25 - 50mm	0.01mm	<b>126-126</b>	±4µm	290
50 - 75mm	0.01mm	<b>126-127</b>	±4µm	390
75 - 100mm	0.01mm	<b>126-128</b>	±5µm	450
100 - 125mm	0.01mm	<b>126-129</b>	±5µm	530
125 - 150mm	0.01mm	<b>126-130</b>	±5µm	620
150 - 175mm	0.01mm	<b>126-131</b>	±6µm	730
175 - 200mm	0.01mm	<b>126-132</b>	±6µm	860
200 - 225mm	0.01mm	<b>126-133</b>	±6µm	1,030
225 - 250mm	0.01mm	<b>126-134</b>	±7µm	1,200
250 - 275mm	0.01mm	<b>126-135</b>	±7µm	1,370
275 - 300mm	0.01mm	<b>126-136</b>	±7µm	1,540

Inch				
Range	Graduation	Order No.	Accuracy	Mass (g)
0 - 1"	.001"	<b>126-137</b>	±.0002"	240
1 - 2"	.001"	<b>126-138</b>	±.0002"	290
2 - 3"	.001"	<b>126-139</b>	±.0002"	390
3 - 4"	.001"	<b>126-140</b>	±.00025"	450
4 - 5"	.001"	<b>126-141</b>	±.00025"	530
5 - 6"	.001"	<b>126-142</b>	±.00025"	620
6 - 7"	.001"	<b>126-143</b>	±.0003"	730

Inch		With anvil set (126 - 800)		
Range	Graduation	Order No.	Accuracy	Mass (g)
0 - 1"	.001"	<b>126-901</b>	±.0002"	240
1 - 2"	.001"	<b>126-902</b>	±.0002"	290
2 - 3"	.001"	<b>126-903</b>	±.0002"	390
3 - 4"	.001"	<b>126-904</b>	±.00025"	450
4 - 5"	.001"	<b>126-905</b>	±.00025"	530
5 - 6"	.001"	<b>126-906</b>	±.00025"	620

### Technical Data

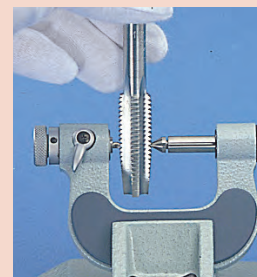
Resolution\*: 0.001mm or .00005"/0.001mm  
 Graduation\*\*: 0.01mm or .001"  
 Spindle feed error: 3µm / .00012"  
 Display\*: LCD  
 Battery\*: SR44 (1 pc.), **938882**  
 Battery life\*: Approx. 1.2 years under normal use  
 Dust/Water protection level\*: IP65  
 \*Digital models \*\*Analog models

### Function of Digital Model

Zero / ABS, Data hold, Data output, 2 Presets, Function Lock, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error

### Optional Accessories

**05CZA662**: SPC cable with data switch (1m / 40")\*  
**05CZA663**: SPC cable with data switch (2m / 80")\*  
 \*Only for digital models  
 (See page B-51.): Standard for screw thread micrometer



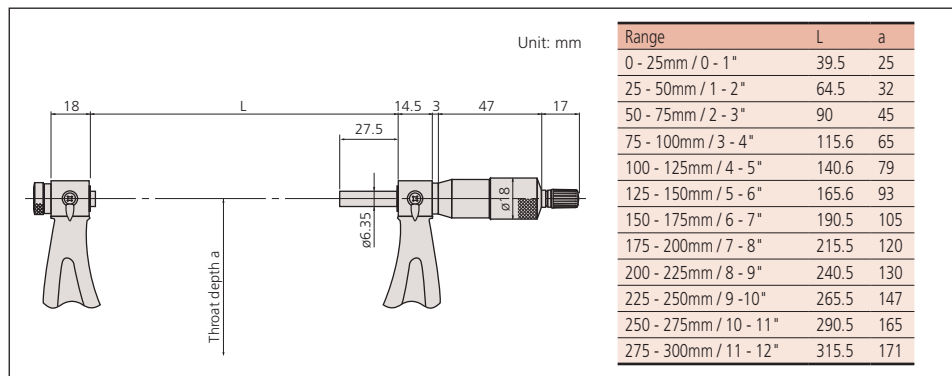
Anvil-spindle tip set:  
 For Metric/Unified screws (60° threads)

Order No.	Included in set
<b>126-800</b>	0.4 - 0.5mm/64 - 48TPI ( <b>126-801</b> ) 0.6 - 0.9mm/44 - 28TPI ( <b>126-802</b> ) 1 - 1.75mm/24 - 14TPI ( <b>126-803</b> ) 2 - 3mm/13 - 9TPI ( <b>126-804</b> ) 3.5 - 5mm/8 - 5TPI ( <b>126-805</b> ) 5.5 - 7mm/4.5 - 3.5TPI ( <b>126-806</b> )

For Whitworth screws (55° threads)

Order No.	Assortment of anvil-spindle tips
<b>126-810</b>	60 - 48TPI ( <b>126-811</b> ) 48 - 40TPI ( <b>126-812</b> ) 40 - 32TPI ( <b>126-813</b> ) 32 - 24TPI ( <b>126-814</b> ) 24 - 18TPI ( <b>126-815</b> ) 18 - 14TPI ( <b>126-816</b> ) 14 - 10TPI ( <b>126-817</b> ) 10 - 7TPI ( <b>126-818</b> ) 7 - 4.5TPI ( <b>126-819</b> ) 4.5 - 3.5TPI ( <b>126-820</b> )

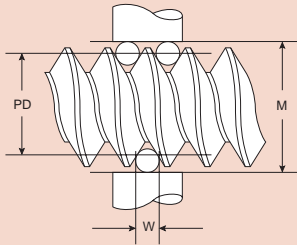
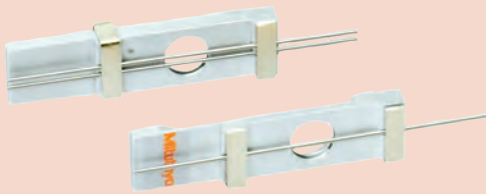
### DIMENSIONS





# 3-Wire Thread Measuring System

Individual Holder and Wire Set



P.D. = Pitch Diameter  
 M = Measurement over wires  
 W = Wire diameter  
 C = Constant  
 $C = .86603 \times \text{Pitch (inches)} - 3W$   
 $P.D. = M - C$   
 $W = .57735 \times P$

## Applications

- Measure set of thread plug gages and working thread plug gages
- Monitor the wear on working thread plug gages
- Monitor and control pitch diameter variation during thread fabrication
- Reduce measurement time to a fraction of the time normally taken using the traditional three wire method
- Use in conjunction with "Go" and "No Go" thread ring gages to control thread size to the most demanding specifications
- Determine out of roundness and taper that may exist in threaded parts
- Applications for preplating and post plating thread measurement

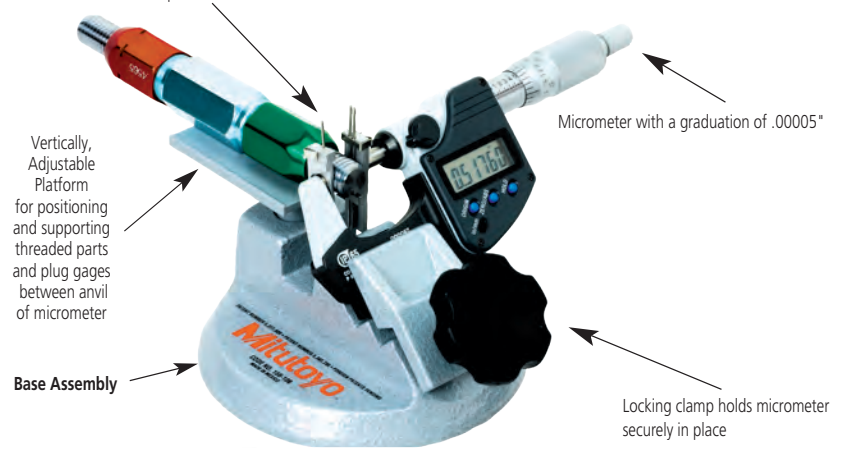
## Tolerance of Wires:

- Diameter +/- .000010"
- Roundness +/- .000010"
- Surface finish 2 micro inches AA, lapped.
- Hardness HRC 59-64
- Certification of accuracy included.
- Traceable to NIST.
- Meets or exceeds all ANSI and ISO specs.

## FEATURES

- Fast and accurate method of thread measuring available for use with Micrometer

Wire holders and 3 thread measuring wires assembled for each thread pitch



## INCH STANDARD HOLDERS AND WIRES SETS

Order No.	Threads Per Inch	Thread Measuring Wire Diameter
64AAA201	120	.00481
64AAA202	100	.00577
64AAA203	95	.00601
64AAA204	90	.00642
64AAA205	80	.00722
64AAA206	72	.00802
64AAA207	64	.00902
64AAA208	56	.01031
64AAA209	50	.01155
64AAA210	48	.01203
64AAA211	44	.01312
64AAA212	40	.01443
64AAA213	36	.01604
64AAA214	32	.01804
64AAA215	30	.01925
64AAA216	28	.02062
64AAA217	27	.02138
64AAA218	26	.02221
64AAA219	24	.02406
64AAA220	22	.02624
64AAA221	20	.02887
64AAA222	18	.03208
64AAA223	16	.03608
64AAA224	14	.04124
64AAA225	13	.04441
64AAA226	12	.04811
64AAA227	11.5	.05020
64AAA228	11	.05249
64AAA229	10	.05774
64AAA230	9	.06415
64AAA231	8	.07217
64AAA232	7.5	.07698
64AAA233	7	.08248
64AAA234	6	.09623
64AAA235	5.5	.10497
64AAA236	5	.11547

Compatible with Micrometers with 0.25" Anvils & Spindles

Stand Assembly  
 Order No. 156-106

## METRIC HOLDERS AND WIRES SETS

Order No.	Pitch	mm Diameter	Inch Diameter
64AAA251	.2mm	.1155	.00455
64AAA252	.225mm	.1299	.00511
64AAA253	.25mm	.1443	.00568
64AAA254	.30mm	.1732	.00682
64AAA255	.35mm	.2021	.00796
64AAA256	.40mm	.2309	.00909
64AAA257	.45mm	.2598	.01023
64AAA258	.50mm	.2887	.01137
64AAA259	.55mm	.3175	.01250
64AAA260	.60mm	.3464	.01364
64AAA261	.70mm	.4041	.01591
64AAA262	.75mm	.4330	.01705
64AAA263	.80mm	.4619	.01818
64AAA264	.85mm	.4907	.01932
64AAA265	.90mm	.5196	.02046
64AAA266	1.00mm	.5774	.02273
64AAA267	1.25mm	.7217	.02841
64AAA268	1.50mm	.8660	.03410
64AAA269	1.75mm	1.0104	.03978
64AAA270	2.00mm	1.1547	.04546
64AAA271	2.50mm	1.4434	.05683
64AAA272	3.00mm	1.7321	.06819
64AAA273	3.50mm	2.0207	.07956
64AAA274	4.00mm	2.3094	.09092

# Can Seam Micrometers

## SERIES 147

### FEATURES

- Measures the width, height, and depth of can seams.
- Three types of micrometers are available for: steel cans, aluminum cans, and sprayer cans.
- Supplied in fitted carton.



147-103

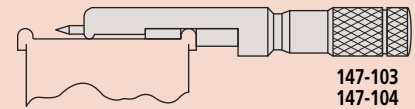
### SPECIFICATIONS

Metric			
Range	Graduation	Order No.	Remarks
0 - 13mm	0.01mm	147-103	for steel cans
		147-105	for aluminum cans
		147-202	for sprayer cans

Inch			
Range	Graduation	Order No.	Remarks
0 - .5"	.001"	147-104	for steel cans
		147-106	for aluminum cans
		147-201	for sprayer cans

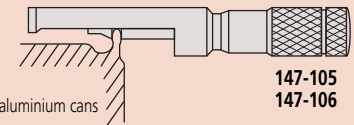
### Technical Data

Accuracy:  $\pm 0.0012"$  /  $\pm 3\mu\text{m}$   
 Graduation:  $.001"$  /  $0.01\text{mm}$



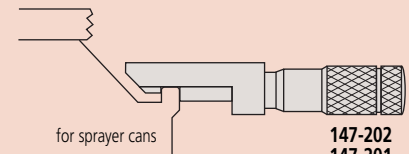
147-103  
147-104

for cans  
(for depth measurements up to 5mm)



147-105  
147-106

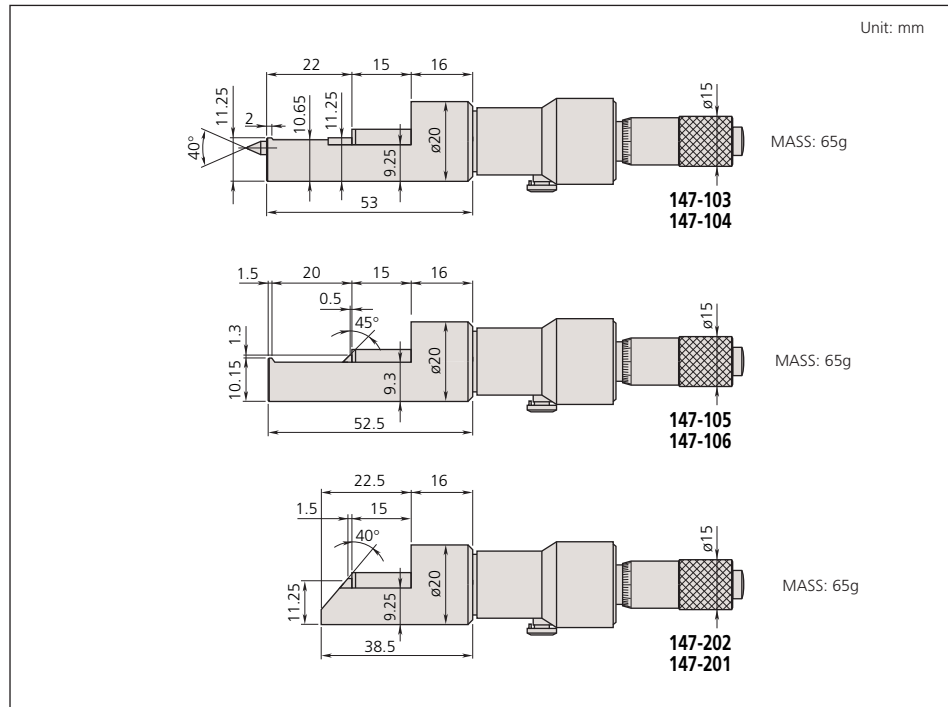
for aluminium cans



147-202  
147-201

for sprayer cans

### DIMENSIONS AND MASS

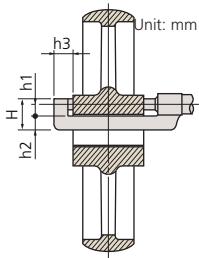
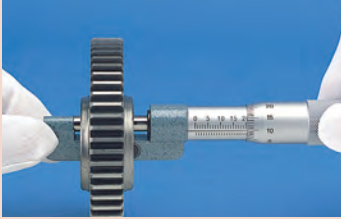


# Hub Micrometers

## SERIES 147

### Technical Data

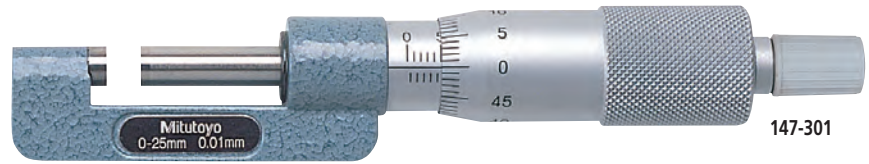
Accuracy: Refer to the list of specifications.  
 Graduation: 0.01mm / .001"  
 Flatness: 0.6µm / .000024"  
 Parallelism: (2+R/100)µm, R=max. range (mm)  
 [.00008" + .00004" (L/4)]", L = Max. range (inch).  
 Measuring faces: Carbide tipped



Range	h1	h2	h3	H	Mass (g)
0 - 1" / 0 - 25mm	6	8.5	13.5	17.5	135
1 - 2" / 25 - 50mm	6.5	11	14	20.5	150
3 - 4" / 50 - 75mm	6.5	11	13	20.5	170
4 - 5" / 75 - 100mm	6.5	11	13	20.5	185

### FEATURES

- Measures hub thickness and shoulders inside a bore.
- With Ratchet Stop for constant force.
- With a standard bar except for 0 - 1" / 0 - 25mm model.
- Supplied in fitted plastic case.



### SPECIFICATIONS

Metric			
Range	Graduation	Order No.	Accuracy
0 - 25mm	0.01mm	147-301	±2µm
25 - 50mm	0.01mm	147-302	±2µm
50 - 75mm	0.01mm	147-303	±2µm
75 - 100mm	0.01mm	147-304	±3µm

Inch			
Range	Graduation	Order No.	Accuracy
0 - 1"	.001"	147-351	±.0001"
1 - 2"	.001"	147-352	±.0001"
2 - 3"	.001"	147-353	±.0001"
3 - 4"	.001"	147-354	±.00015"

# Wire Micrometers

## SERIES 147

### FEATURES

- Designed for measuring wire thickness.
- Also used to measure the diameter of a small ball.
- Supplied in fitted plastic case.



### SPECIFICATIONS

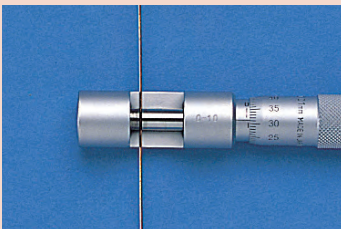
Metric				
Range	Graduation	Order No.	Accuracy	Mass (g)
0 - 10mm	0.01mm	147-401	±3µm	65

Inch				
Range	Graduation	Order No.	Accuracy	Mass (g)
0 - .4"	.0001"	147-402*	±.00015"	65

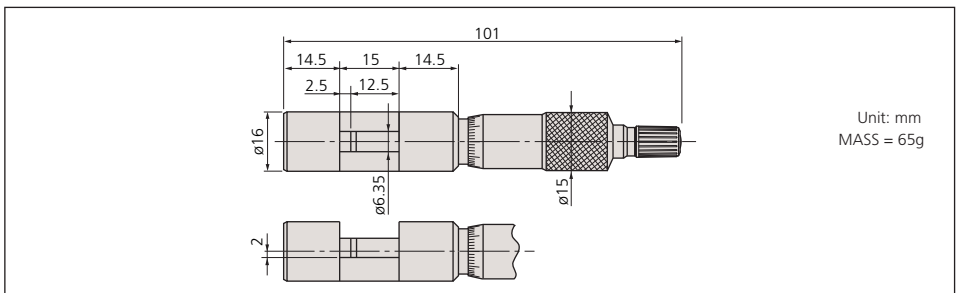
\*.0001" reading is obtained with vernier

### Technical Data

Graduation: .0001" or 0.01mm  
 Flatness: .000024" / 0.6µm  
 Parallelism: .00005" / 1.3µm  
 Measuring faces: Carbide tipped



### DIMENSIONS AND MASS



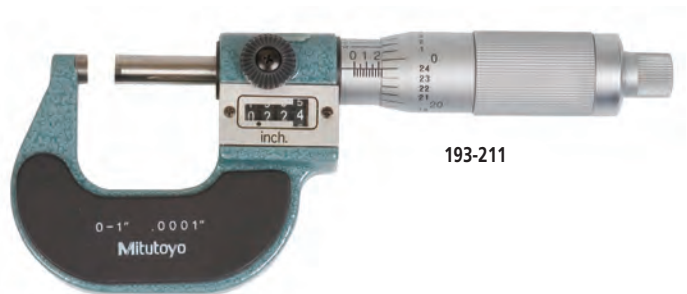
# Mitutoyo

# Digit Outside Micrometers

## SERIES 193

### FEATURES

- Mechanical digit counter with 0.01mm or .001" reading for quick and error-free reading.
- With a standard bar except for 0-25mm / 0 - 1" model.
- Supplied in fitted plastic case.



193-211

### SPECIFICATIONS

#### Metric \_\_\_\_\_ With ratchet stop

Range	Graduation	Order No.	Accuracy
0 - 25mm	0.01mm	193-101	±2μm
	0.001mm	193-111*	±2μm
25 - 50mm	0.01mm	193-102	±2μm
	0.001mm	193-112*	±2μm
50 - 75mm	0.01mm	193-103	±2μm
	0.001mm	193-113*	±2μm
75 - 100mm	0.01mm	193-104	±3μm
	0.001mm	193-114*	±3μm

\*0.001mm reading is obtained with vernier.

#### Metric \_\_\_\_\_ Micrometer sets

Range	Order No.	Included in set
0 - 75mm (3 pcs./set)	193-901	• 193-101, 193-102, 193-103 • 2 micrometer standards
0 - 75mm (3 pcs./set)	193-915	• 193-111, 193-112, 193-113, • 2 micrometer standards
0 - 100mm (4 pcs./set)	193-902	• 193-101, 193-102, 193-103, 193-104 • 3 micrometer standards
0 - 100mm (4 pcs./set)	193-916	• 193-111, 193-112, 193-113, 193-114 • 3 micrometer standards

#### Inch \_\_\_\_\_ With ratchet stop

Range	Graduation	Order No.	Accuracy
2 - 3"	.0001"	193-213*	±.0001"
3 - 4"	.0001"	193-214*	±.00015"

\*.0001" reading is obtained with vernier.

#### Inch \_\_\_\_\_ With friction thimble

Range	Graduation	Order No.	Accuracy
0 - 1"	.001"	193-201	±.0001"
	.0001"	193-211*	±.0001"
1 - 2"	.0001"	193-212*	±.0001"

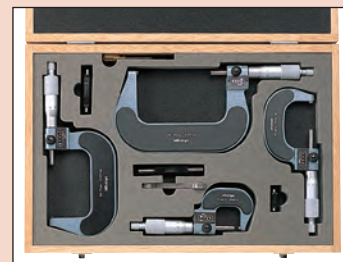
\*.0001" reading is obtained with vernier.

#### Inch \_\_\_\_\_ Micrometer sets

Range	Order No.	Included in set
0 - 3" (3 pcs./set)	193-923	• 193-211, 193-212, 193-213 • 2 micrometer standards

### Technical Data

Counter reading: 0.01mm or .001"  
 Graduation: 0.01mm, 0.001mm, .001" or .0001"  
 Flatness: 0.6μm / .000024"  
 Parallelism: (2+R/100)μm, R=max. range (mm)  
 [.00008" + .00004" (L/4)]", L= max. range (inch)  
 Measuring faces: Carbide tipped



193-916

### DIMENSIONS AND MASS

**Models up to 100mm / 4"**

Unit: mm

Range	L	a	b	c	Mass (g)
0 - 25mm / 0 - 1"	30	2.5	5	26	224
25 - 50mm / 1 - 2"	55	2.5	8	32	275
50 - 75mm / 2 - 3"	80	2.5	9	45	379
75 - 100mm / 3 - 4"	105	2.5	9	57	489

Note: The shape of the thimble changes on the model with Friction Thimble.

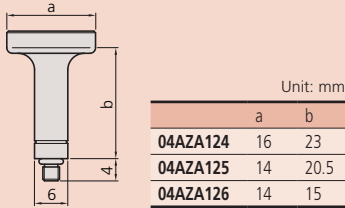
## Technical Data

Spindle feed error:  $3\mu\text{m} / .00012''$   
 Dial indication accuracy:  $1\mu\text{m} / .00004''$   
 Dispersion of indication:  $0.4\mu\text{m} / .00002''$   
 Graduation:  $0.001\text{mm}$  or  $.0001''$   
 Dial reading:  $0.001\text{mm}$  or  $.00005''$   
 Flatness:  $0.3\mu\text{m} / .000012''$   
 Parallelism:  $0.6\mu\text{m} / .000024''$  for models up to  $50\text{mm} / 2''$   
 $1\mu\text{m} / .00004''$  for models over  $50\text{mm} / 2''$   
 Measuring force: 5 - 10N (500 - 1000gf)  
 Measuring faces: Carbide tipped

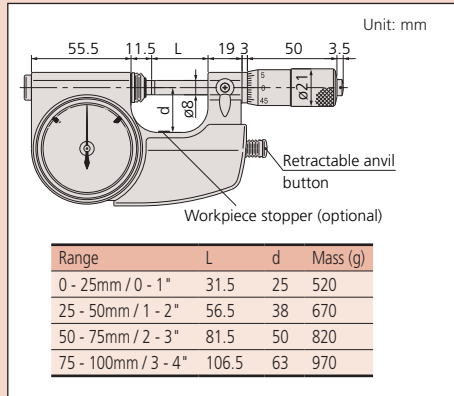


## Optional Accessories

**04AZA124:**  $\varnothing 16\text{mm} / \varnothing .63''$  workpiece stopper  
 (not available for  $25\text{mm} / 1''$  model)  
**04AZA125:**  $\varnothing 14\text{mm} / \varnothing .55''$  workpiece stopper  
**04AZA126:**  $\varnothing 14\text{mm} / \varnothing .55''$  workpiece stopper



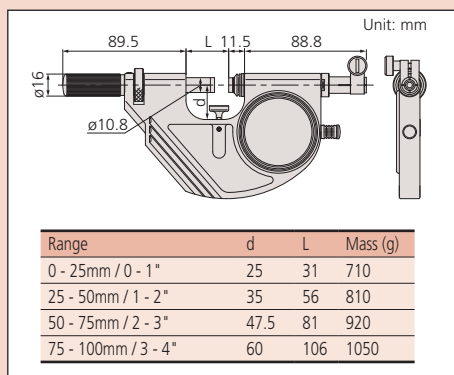
## DIMENSIONS AND MASS



## Technical Data

Flatness:  $0.3\mu\text{m} / .000012''$   
 Parallelism:  $0.6\mu\text{m} / .000024''$  for models up to  $50\text{mm} / 2''$   
 $1\mu\text{m} / .00004''$  for models over  $50\text{mm} / 2''$   
 Measuring force: 5 - 10N (500 - 1000gf)  
 Measuring faces: Carbide tipped

## DIMENSIONS AND MASS



# Indicating Micrometers

## SERIES 510

### FEATURES

- Retractable anvil with indicator for three-wire measurements of pitch diameter of precision screws and parallelism measurements.
- With a standard bar except for 0 - 25mm / 0 - 1" model.
- IP protection level: 54
- Supplied in fitted plastic case.



510-131

### SPECIFICATIONS

Metric			
Range	Graduation	Order No.	Indicating range
0 - 25mm	0.001mm	<b>510-121*</b> <b>510-141</b>	$\pm 0.060\text{mm}$
25 - 50mm	0.001mm	<b>510-122</b>	$\pm 0.060\text{mm}$
50 - 75mm	0.001mm	<b>510-123</b>	$\pm 0.060\text{mm}$
75 - 100mm	0.001mm	<b>510-124</b>	$\pm 0.060\text{mm}$

\*Retractable anvil button on the right side.

Inch			
Range	Graduation	Order No.	Indicating range
0 - 1"	.00005"	<b>510-131*</b> <b>510-151</b>	$\pm .0023''$
1 - 2"	.00005"	<b>510-132</b>	$\pm .0023''$
2 - 3"	.00005"	<b>510-133</b>	$\pm .0023''$
3 - 4"	.00005"	<b>510-134</b>	$\pm .0023''$

\*Retractable anvil button on the right side.

# Snap Meters

## SERIES 523

### FEATURES

- Various types of indicators, LVDT's and Linear Gages can be selected according to the measurement applications.
- Supplied in fitted plastic case.



523-141

Indicator is optional

### SPECIFICATIONS

Metric			Gage stem dia 8mm
Range	Order No.	Anvil movement	
0 - 25mm	<b>523-141</b>	2mm	
25 - 50mm	<b>523-142</b>	2mm	
50 - 75mm	<b>523-143</b>	2mm	
75 - 100mm	<b>523-144</b>	2mm	

Inch			Gage stem dia 3/8"
Range	Order No.	Anvil movement	
0 - 1"	<b>523-151</b>	.078"	
1 - 2"	<b>523-152</b>	.078"	
2 - 3"	<b>523-153</b>	.078"	
3 - 4"	<b>523-154</b>	.078"	

# Dial Snap Meters

## SERIES 523

### FEATURES

- Direct GO/NO-GO judgment for mass-produced parts.
- Spindle diameter: .425" / 10.8mm
- IP protection level: 54
- Supplied in fitted plastic case.



523-131

### SPECIFICATIONS

Metric			
Range	Graduation	Order No.	Indicating range
0 - 25mm	0.001mm	523-121	±0.060mm
25 - 50mm	0.001mm	523-122	±0.060mm
50 - 75mm	0.001mm	523-123	±0.060mm
75 - 100mm	0.001mm	523-124	±0.060mm

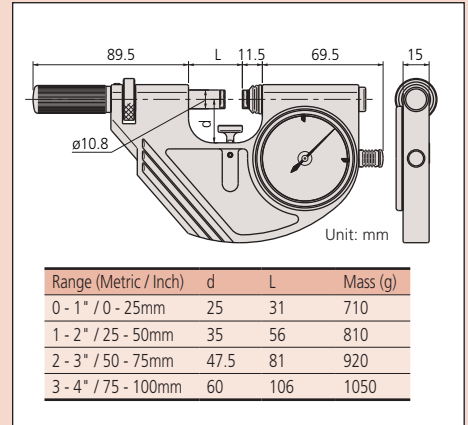
Inch			
Range	Graduation	Order No.	Indicating range
0 - 1"	.00005"	523-131	±.0023"
1 - 2"	.00005"	523-132	±.0023"
2 - 3"	.00005"	523-133	±.0023"
3 - 4"	.00005"	523-134	±.0023"



### Technical Data

Dial indication accuracy: .00005" / 1µm  
 Indication repeatability: .00002" / 0.4µm  
 Dial reading: .00005" or 0.001mm  
 Flatness: .000012" / 0.3µm  
 Parallelism: .000024" / 0.6µm for models up to 2" / 50mm  
 .00004" / 1µm for models over 2" / 50mm  
 Measuring force: 5 - 10N (500 - 1000gf)  
 Measuring faces: Carbide tipped

### DIMENSIONS AND MASS



# Dial Snap Meters

## SERIES 523

### FEATURES

- Direct GO/NO-GO judgment for mass-produced parts.
- Spindle diameter: 10.8mm
- Supplied in fitted plastic case (100-150mm models), wooden box (150-200mm models)



523-105

### SPECIFICATIONS

Metric			
Range	Order No.	Indicating range	Mass (g)
100 - 125mm	523-105	±0.15mm	880
125 - 150mm	523-106	±0.15mm	980
150 - 175mm	523-113	±0.15mm	1,420
175 - 200mm	523-114	±0.15mm	1,610

### Technical Data

Accuracy: ±2.5µm for up to ±50µm range  
 ±5µm for ±50µm to ±150µm range  
 (including dispersion of indication)  
 Dial reading: 0.005mm  
 Flatness: 0.3µm  
 Parallelism: 1.3µm for models up to 150mm  
 1.6µm for models over 150mm  
 Measuring force: 5 - 15N (500 - 1500gf)  
 Measuring faces: Carbide tipped

# Caliper Type Micrometers

## SERIES 343, 143

### Technical Data

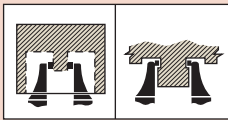
Accuracy: Refer to the list of specifications.  
 Resolution\*: 0.001mm or .00005"/0.001mm  
 Graduation\*\*: 0.01mm / .001"  
 Flatness: 0.3 $\mu$ m / .000012"  
 Parallelism: (3+R/75) $\mu$ m, R=max. range (mm)  
 [.00012" + .00004" (L/8)]"  
 L = Max. range (inch)  
 Measuring faces: Carbide tipped  
 Display\*: LCD  
 Battery\*: SR44 (1 pc.), **938882**  
 Battery life\*: Approx. 1.2 years under normal use  
 \*Digital models \*\*Analog models

### Function of Digital Model

Origin-set, Zero-setting, Data hold, Data output,  
 inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error

### Optional Accessories for Digital Model

**05CZA662**: SPC cable with data switch (1m / 40")  
**05CZA663**: SPC cable with data switch (2m / 80")



### FEATURES

- With Ratchet Stop for constant force.
- With SPC output (Series 343).
- With a standard bar except 0 - 25mm and 0 - 1" model.
- Supplied in fitted plastic case.



143-121



343-250

### SPECIFICATIONS

Metric		Digital model		
Range	Resolution	Order No.	Accuracy	Mass (g)
0 - 25mm	0.001mm	<b>343-250</b>	$\pm 5\mu$ m	630
25 - 50mm	0.001mm	<b>343-251</b>	$\pm 6\mu$ m	650
50 - 75mm	0.001mm	<b>343-252</b>	$\pm 7\mu$ m	1040
75 - 100mm	0.001mm	<b>343-253</b>	$\pm 8\mu$ m	1090

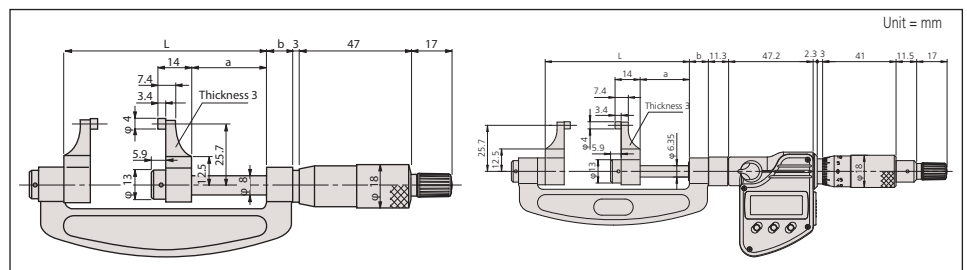
Inch / Metric		Digital model		
Range	Resolution	Order No.	Accuracy	Mass (g)
0 - 1" / 0 - 25.4mm	.00005" / 0.001mm	<b>343-350</b>	$\pm .00025"$	630
1 - 2" / 25.4 - 50.8mm	.00005" / 0.001mm	<b>343-351</b>	$\pm .0003"$	650
2 - 3" / 50.8 - 76.2mm	.00005" / 0.001mm	<b>343-352</b>	$\pm .00035"$	1040
3 - 4" / 76.2 - 101.6mm	.00005" / 0.001mm	<b>343-353</b>	$\pm .0004"$	1090

Metric				
Range	Graduation	Order No.	Accuracy	Mass (g)
0 - 25mm	0.01mm	<b>143-101</b>	$\pm 5\mu$ m	210
25 - 50mm	0.01mm	<b>143-102</b>	$\pm 6\mu$ m	230
50 - 75mm	0.01mm	<b>143-103</b>	$\pm 7\mu$ m	280
75 - 100mm	0.01mm	<b>143-104</b>	$\pm 8\mu$ m	330

Models with a range up to 300mm are available.

Inch				
Range	Graduation	Order No.	Accuracy	Mass (g)
0 - 1"	.001"	<b>143-121</b>	$\pm .00025"$	210
1 - 2"	.001"	<b>143-122</b>	$\pm .0003"$	230
2 - 3"	.001"	<b>143-123</b>	$\pm .00035"$	280

### DIMENSIONS



# Groove Micrometers

## SERIES 146

### FEATURES

- Flanged spindle for measuring width, depth, and location of grooves inside/outside bores, and tubes.
- Provided with two types of graduations for inside and outside measurements.
- Non-rotating spindle type has two-directional ratchet stop. (Measuring force: 0.7 - 1.2N)



### SPECIFICATIONS

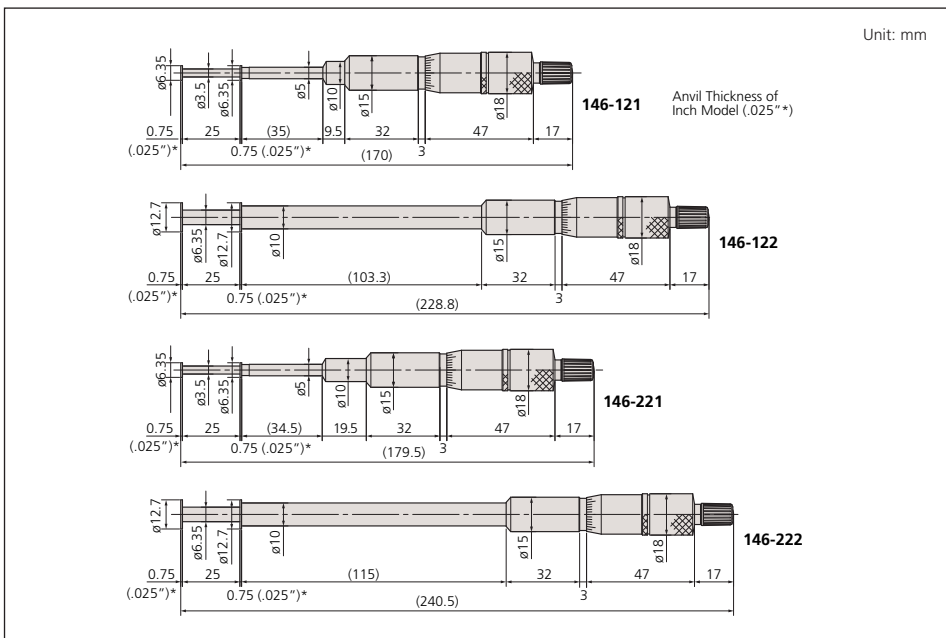
Metric Rotating spindle type					
Range Outside	Range Inside	Graduation	Order No.	Flange	Mass (g)
0 - 25mm	1.6 - 26.5mm	0.01mm	146-121	ø6.35mm	135
			146-122	ø12.7mm	185
25 - 50mm	26.5 - 51.5mm	0.01mm	146-123	ø12.7mm	175
50 - 75mm	51.5 - 76.5mm	0.01mm	146-124	ø12.7mm	165
75 - 100mm	76.5 - 101.5mm	0.01mm	146-125	ø12.7mm	160

Inch Rotating spindle type					
Range Outside	Range Inside	Graduation	Order No.	Flange	Mass (g)
0 - 1"	.055" - 1.05"	.001"	146-131	ø.25"	135
			146-132	ø.5"	185
1" - 2"	1.05" - 2.05"	.001"	146-133	ø.5"	175
2" - 3"	2.05" - 3.05"	.001"	146-134	ø.5"	165
3" - 4"	3.05" - 4.05"	.001"	146-135	ø.5"	160

Metric Non-rotating spindle type					
Range Outside	Range Inside	Graduation	Order No.	Flange	Mass (g)
0 - 25mm	1.6 - 26.5mm	0.01mm	146-221	ø6.35mm	135
			146-222	ø12.7mm	185
25 - 50mm	26.5 - 51.5mm	0.01mm	146-223	ø12.7mm	175
50 - 75mm	51.5 - 76.5mm	0.01mm	146-224	ø12.7mm	165
75 - 100mm	76.5 - 101.5mm	0.01mm	146-225	ø12.7mm	160

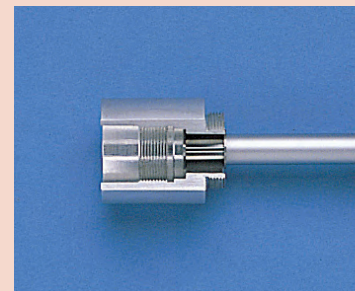
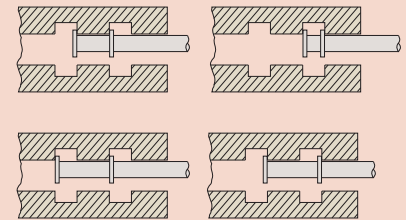
Inch Non-rotating spindle type					
Range Outside	Range Inside	Graduation	Order No.	Flange	Mass (g)
0 - 1"	.055" - 1.05"	.001"	146-231	ø.25"	135
			146-232	ø.5"	185
1" - 2"	1.05" - 2.05"	.001"	146-233	ø.5"	175
2" - 3"	2.05" - 3.05"	.001"	146-234	ø.5"	165
3" - 4"	3.05" - 4.05"	.001"	146-235	ø.5"	160

### DIMENSIONS



### Technical Data

Accuracy:  $\pm .0004"$  /  $\pm 10\mu\text{m}$   
 Parallelism:  $.0004"$  /  $10\mu\text{m}$





# Small Hole Gage Set

## SERIES 154

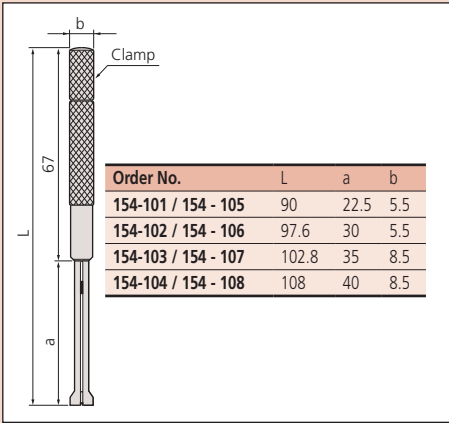
### FEATURES

- Used with an outside micrometer for measuring inside diameter of bores.
- 4 sizes of gages are supplied in a fitted pouch.
- Extra long for gaging deep and shallow holes, slots, and similar workpieces.
- Gaging surface is fully hardened to insure long tool life.



154-901

### DIMENSIONS



### SPECIFICATIONS

Metric		
Total range	Set Order No.	Assortment of gages
ø3 - 13mm (4-gage set)	154-902	ø3 - 5mm gage (154-101)
		ø5 - 7.5mm gage (154-102)
		ø7.5 - 10mm gage (154-103)
		ø10 - 13mm gage (154-104)

Inch		
Total range	Set Order No.	Assortment of gages
.125" - .5" DIA. (4-gage set)	154-901	.125" - .2" DIA. gage (154-105)
		.2" - .3" DIA. gage (154-106)
		.3" - .4" DIA. gage (154-107)
		.4" - .5" DIA. gage (154-108)

# Telescoping Gage Set

## SERIES 155

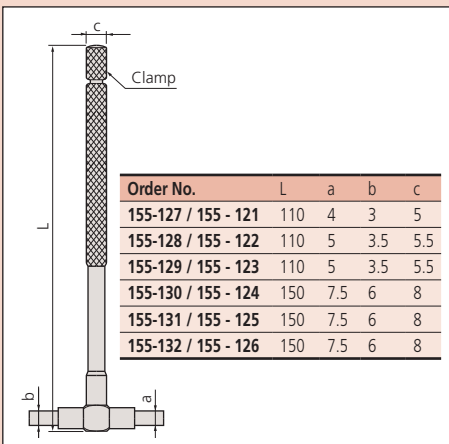
### FEATURES

- Spring-loaded plunger expands within the bore (or groove), allowing determination of the internal diameter (or groove width).
- With a knurled clamp.
- Supplied in a fitted pouch.



155-903

### DIMENSIONS



### SPECIFICATIONS

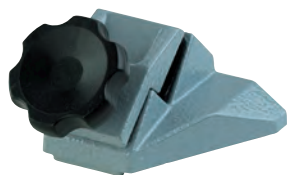
Metric		
Total range	Set Order No.	Included in set
8 - 150mm (6-gage set)	155-905	8 - 12.7mm gage (155-127)
		12.7 - 19mm gage (155-128)
		19 - 32mm gage (155-129)
		32 - 54mm gage (155-130)
		54 - 90mm gage (155-131)
		90 - 150mm gage (155-132)

Inch		
Total range	Set Order No.	Included in set
.313 - 6" (6-gage set)	155-903	.313" - .5" gage (155-121)
		.5" - .75" gage (155-122)
		.75" - 1.25" gage (155-123)
		1.25" - 2.125" gage (155-124)
		2.125" - 3.5" gage (155-125)
		3.5" - 6" gage (155-126)
.50 - 6" (5-gage set)	155-904	155-122, 155-123, 155-124, 155-125, 155-126
.315 - 2.125" (4-gage set)	155-907	155-121, 155-122, 155-123, 155-124

# Micrometer Stands

## SERIES 156

These stands are designed to allow bench-top use with hand micrometers or other gages.



156-105-10



156-106



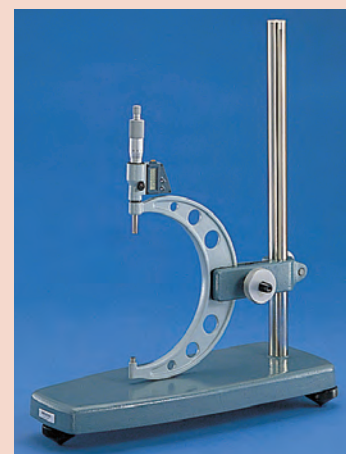
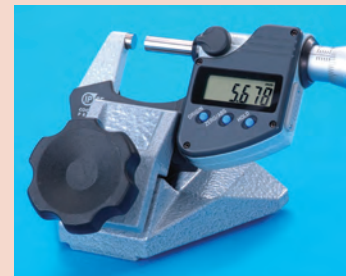
156-101-10



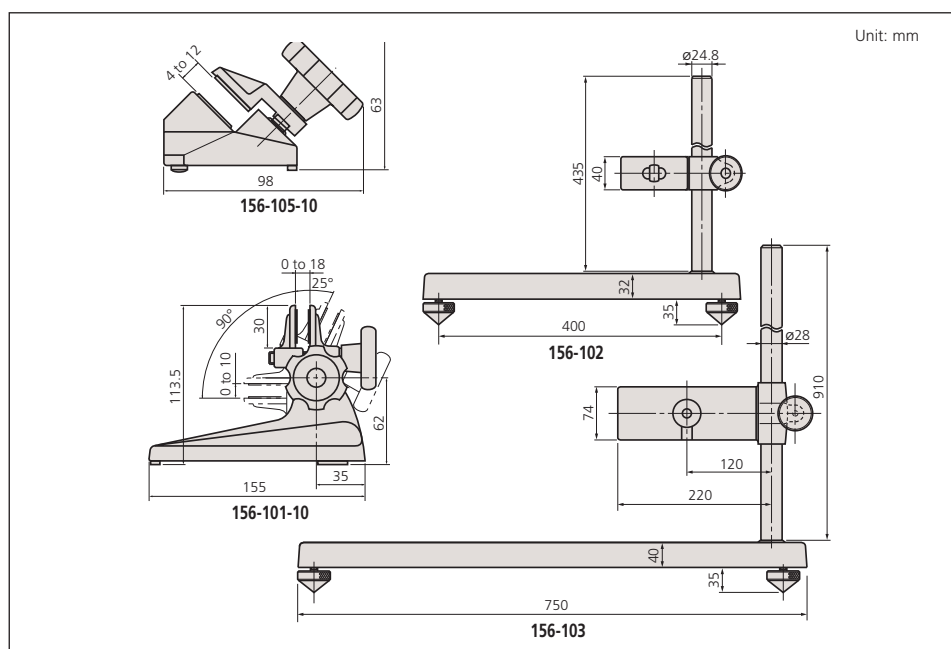
156-102

### SPECIFICATIONS

Micrometer ranges	Order No.	Remarks
0-1" / 0-25mm, 1-2" / 25-50mm	156-105-10	Fixed angle type
Up to 4" / 100mm	156-101-10	Adjustable angle type
5-12" / 125-300mm	156-102	Vertical type
12-40" / 300-1000mm	156-103	Vertical type
0-1" / 0-25mm 1-2" / 25-50mm	156-106	Fixed angle with platform

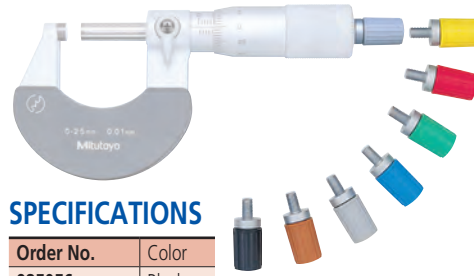


### DIMENSIONS



# Color Ratchet & Color Speeder

## Color ratchet

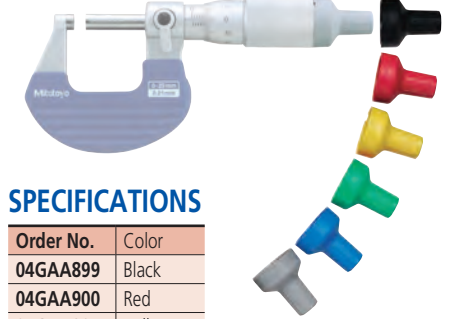


### SPECIFICATIONS

Order No.	Color
985056	Black
985061	Red
985081	Blue
985071	Yellow
985076	Green
985066	Brown
04GZA241*	Gray
04GZA239**	Gray
04GZA243***	Gray

\*for Series 293 digital model  
 \*\* up to 300mm / 12"  
 \*\*\* over 300mm / 12"

## Color speeder for Ratchet Thimble Micrometer



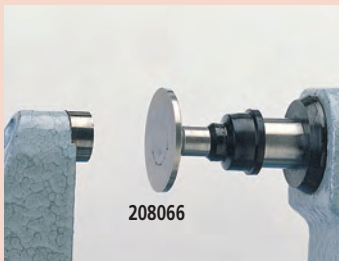
### SPECIFICATIONS

Order No.	Color
04GAA899	Black
04GAA900	Red
04GAA901	Yellow
04GAA902	Green
04GAA903	Blue
04AAB208	Gray

# Spindle Attachment Tip

### Technical Data

Tip length: For metric 10mm  $\pm 5\mu\text{m}$   
 For inch .5"  $\pm .0002$ "



101468 (.200" Dia.)  
 101469 (.250" Dia.)



208062\*  
 208098



208063\*  
 208099



208064\*  
 208100



208065\*  
 208101



208066\*  
 208102

### DIMENSIONS

Order No.	Dimension
208098 208062*	
208099 208063*	
208100 208064*	

Order No.	Dimension
208101 208065*	
208102 208066*	

\* For metric micrometer

To measure odd workpieces, several convenient anvil attachments are prepared by MITUTOYO. Among them the most often used one is the ball attachment.

The ball attachments are hardened steel balls with .200" and .250" diameters which are placed on the .250" and .315" diameter anvils, respectively, by rubber caps. With these attachments, regular micrometers can measure cylindrical wall thickness, but, .200" or .250" must be subtracted from the readings.

Other attachments shown here are .500" in length. The added amount must be subtracted from the reading.

# Micrometer Oil

207000 (30ml)



Mitutoyo

# Optical Parallels

## SERIES 157

### FEATURES

- Designed to inspect parallelism and flatness of measuring faces of micrometers.
- Each set consists of 4 thicknesses.
- Supplied in fitted wooden case.



### SPECIFICATIONS

Metric		
Range of micrometer to be checked	Order No.	Assortment of parallels (Thickness of parallel)
0-25mm	<b>157-903</b>	12.00mm (157-101) 12.12mm (157-102) 12.25mm (157-103) 12.37mm (157-104)
25-50mm	<b>157-904</b>	25.00mm (157-105) 25.12mm (157-106) 25.25mm (157-107) 25.37mm (157-108)

Inch		
Range of micrometer to be checked	Order No.	Assortment of parallels (Thickness of parallel)
0-1"	<b>157-901</b>	.5000" (157-109) .5062" (157-110) .5125" (157-111) .5187" (157-112)
1-2"	<b>157-902</b>	1.0000" (157-113) 1.0062" (157-114) 1.0125" (157-115) 1.0187" (157-116)

# Optical Flats

## SERIES 158

### FEATURES

- Used for inspecting the flatness of micrometer's or gage block's measuring faces with high accuracy.
- Supplied in fitted wooden case.



### SPECIFICATIONS

Metric		
Flatness	Order No.	Diameter/Thickness
0.2μm	<b>158-117</b>	45mm/12mm
	<b>158-119</b>	60mm/15mm
0.1μm	<b>158-118</b>	45mm/12mm
	<b>158-120</b>	60mm/15mm

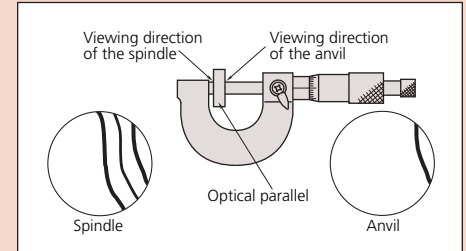
Inch		
Flatness	Order No.	Diameter/Thickness
.000004"	<b>158-122</b>	1.8"/.5"
	<b>158-124</b>	2.4"/.6"

### Technical Data

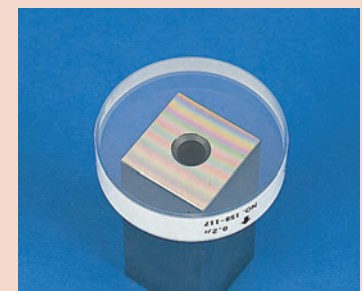
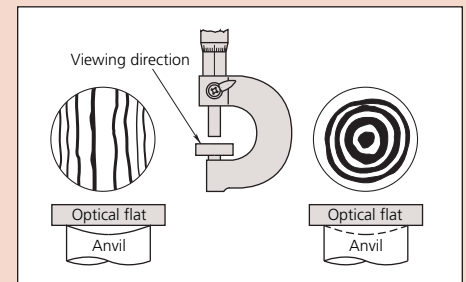
Flatness: .000004" / 0.1μm  
Parallelism: .000008" / 0.2μm  
Diameter: 1.18" / 30mm

### Parallelism Check between Measuring Faces by Means of Interference Fringe Produced by an Optical Parallel

The parallelism between the measuring faces can be determined as follows; place the optical parallel to the anvil and observe the number of interference fringes produced on the spindle side under the measuring force of the micrometers.  
The parallelism is about 1μm (0.32μm x 3 = 0.96μm). Fringe on the anvil side must not be more than one.

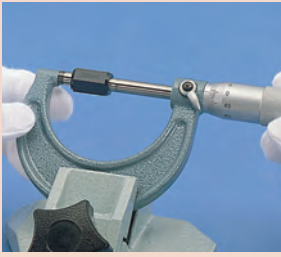


### Flatness Check of Measuring Faces Using Interference Fringe Pattern Produced by an Optical Flat



## Technical Data

Flatness: 0.3µm / .000012"  
 Parallelism: 2µm / .00008"



### Inch

Length (L)	Order No.	Diameter (D)	Accuracy
41"	167-405	.47"	.0004"
42"	167-406	.47"	.0004"
43"	167-407	.47"	.0004"
44"	167-408	.47"	.0004"
45"	167-409	.47"	.0004"
46"	167-410	.47"	.0004"
47"	167-411	.47"	.0004"
48"	167-412	.47"	.0004"
49"	167-413	.47"	.0004"
50"	167-414	.47"	.0004"
51"	167-415	.47"	.0004"
52"	167-416	.47"	.0004"
53"	167-417	.47"	.0004"
54"	167-418	.47"	.0004"
55"	167-419	.47"	.0004"
56"	167-420	.47"	.0004"
57"	167-421	.47"	.0004"
58"	167-422	.47"	.0004"
59"	167-423	.47"	.0004"
60"	167-424	.47"	.0004"
61"	167-425	.47"	.0004"
62"	167-426	.47"	.0004"
63"	167-427	.47"	.0004"
64"	167-428	.47"	.0004"
65"	167-429	.47"	.0004"
66"	167-430	.47"	.0004"
67"	167-431	.47"	.0004"
68"	167-432	.47"	.0004"
69"	167-433	.47"	.0004"
70"	167-434	.47"	.0004"
71"	167-435	.47"	.0004"
72"	167-436	.47"	.0004"
73"	167-437	.47"	.0004"
74"	167-438	.47"	.0004"
75"	167-439	.47"	.0004"
76"	167-440	.47"	.0004"
77"	167-441	.47"	.0004"
78"	167-442	.47"	.0004"
79"	167-443	.47"	.0004"

## Micrometer Standards Set

### Inch

Order No.	Size	Remarks
167-912*	1"-5"	5 pcs. Set (167-141, 142, 143, 144, 145)
167-913*	1"-11"	11 pcs. Set (167-141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151)

### Metric

Order No.	Size	Remarks
167-902*	25-125mm	5 pcs. Set (167-101, 102, 103, 104, 105)
167-903*	25-275mm	11 pcs. Set (167-101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111)

\*Supplied with fitted carrying case

# Micrometer Standards

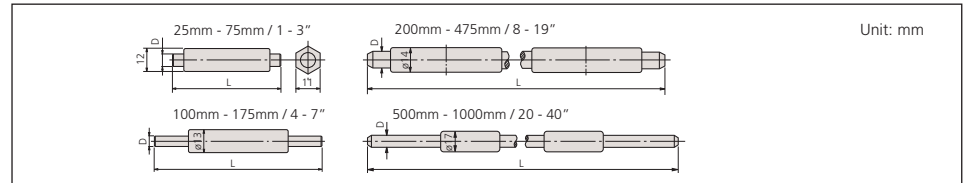
## SERIES 167

### FEATURES

- Used for the zero point setting of outside micrometers.
- Flat and lapped measuring faces.
- Heat insulating handle to prevent expansion due to body temperature.
- Supplied in fitted carton up to 500mm / 20" and wooden case for over 525mm / 21", length.



### DIMENSION



### SPECIFICATIONS

#### Metric

Length (L)	Order No.	Diameter (D)	Accuracy
25mm	167-101	6.35mm	±1.5µm
50mm	167-102	6.35mm	±2.0µm
75mm	167-103	6.35mm	±2.5µm
100mm	167-104	7.9mm	±3µm
125mm	167-105	7.9mm	±3.5µm
150mm	167-106	7.9mm	±4µm
175mm	167-107	7.9mm	±4.5µm
200mm	167-108	9.4mm	±5.0µm
225mm	167-109	9.4mm	±5.5µm
250mm	167-110	9.4mm	±6.0µm
275mm	167-111	9.4mm	±6.5µm
300mm	167-112	9.4mm	±7µm
325mm	167-113	9.4mm	±7.5µm
350mm	167-114	9.4mm	±8µm
375mm	167-115	9.4mm	±8.5µm
400mm	167-116	9.4mm	±9µm
425mm	167-117	9.4mm	±9.5µm
450mm	167-118	9.4mm	±1.0µm
475mm	167-119	9.4mm	±10.5µm
500mm	167-120	11.9mm	±11µm
525mm	167-121	11.9mm	±11.5µm
550mm	167-122	11.9mm	±12µm
575mm	167-123	11.9mm	±12.5µm
600mm	167-124	11.9mm	±13µm
625mm	167-125	11.9mm	±13.5µm
650mm	167-126	11.9mm	±14µm
675mm	167-127	11.9mm	±14.5µm
700mm	167-128	11.9mm	±15µm
725mm	167-129	11.9mm	±15.5µm
750mm	167-130	11.9mm	±16µm
775mm	167-131	11.9mm	±16.5µm
800mm	167-132	11.9mm	±17µm
825mm	167-133	11.9mm	±17.5µm
850mm	167-134	11.9mm	±18µm
875mm	167-135	11.9mm	±18.5µm
900mm	167-136	11.9mm	±19µm
925mm	167-137	11.9mm	±19.5µm
950mm	167-138	11.9mm	±20µm
975mm	167-139	11.9mm	±20.5µm
1000mm	167-140	11.9mm	±21µm

#### Inch

Length (L)	Order No.	Diameter (D)	Accuracy
1"	167-141	.25"	±.000005"
2"	167-142	.25"	±.0001"
3"	167-143	.25"	±.0001"
4"	167-144	.31"	±.0001"
5"	167-145	.31"	±.00015"
6"	167-146	.31"	±.00015"
7"	167-147	.31"	±.00015"
8"	167-148	.37"	±.00015"
9"	167-149	.37"	±.0002"
10"	167-150	.37"	±.0002"
11"	167-151	.37"	±.0002"
12"	167-152	.37"	±.00025"
13"	167-153	.37"	±.00025"
14"	167-154	.37"	±.00025"
15"	167-155	.37"	±.00025"
16"	167-156	.37"	±.00025"
17"	167-157	.37"	±.00025"
18"	167-158	.37"	±.00025"
19"	167-159	.37"	±.0003"
20"	167-160	.47"	±.0003"
21"	167-161	.47"	±.0003"
22"	167-162	.47"	±.0003"
23"	167-163	.47"	±.0003"
24"	167-164	.47"	±.0003"
25"	167-165	.47"	±.00035"
26"	167-166	.47"	±.00035"
27"	167-167	.47"	±.00035"
28"	167-168	.47"	±.00035"
29"	167-169	.47"	±.00035"
30"	167-170	.47"	±.00035"
31"	167-171	.47"	±.00035"
32"	167-172	.47"	±.00035"
33"	167-173	.47"	±.00035"
34"	167-174	.47"	±.00035"
35"	167-175	.47"	±.00035"
36"	167-176	.47"	±.00035"
37"	167-177	.47"	±.0004"
38"	167-178	.47"	±.0004"
39"	167-179	.47"	±.0004"
40"	167-180	.47"	±.0004"

# Standards for Screw Thread Micrometers

## SERIES 167 — 60 degree and 55 degree

### FEATURES

- Specially designed for the zero point setting of screw thread micrometers.
- Supplied in fitted carton.



167-264 (60°)



167-262 (60°)

### SPECIFICATIONS

Metric			
Length	Order No.	Thread angle	Accuracy
25mm	167-261	60°	±4μm
	167-272	55°	±4μm
50mm	167-262	60°	±5μm
	167-273	55°	±5μm
75mm	167-263	60°	±6μm
	167-274	55°	±6μm
100mm	167-264	60°	±7μm
	167-275	55°	±7μm
125mm	167-265	60°	±8μm
	167-276		±8μm
150mm	167-266	60°	±9μm
	167-277		±9μm
175mm	167-267	60°	±10μm
	167-278		±10μm
200mm	167-268	60°	±11μm
	167-279		±11μm
225mm	167-269	60°	±12μm
	167-280		±12μm
250mm	167-270	60°	±13μm
	167-281		±13μm
275mm	167-271	60°	±14μm
	167-282		±14μm

Inch			
Length	Order No.	Thread angle	Accuracy
1"	167-294	60°	±.00015"
	167-283	55°	±.00015"
2"	167-295	60°	±.0002"
	167-284	55°	±.0002"
3"	167-296	60°	±.00025"
	167-285	55°	±.00025"
4"	167-297	60°	±.0003"
	167-286	55°	±.0003"
5"	167-298	60°	±.00035"
	167-287	55°	±.00035"
6"	167-299	60°	±.0004"
	167-288	55°	±.0004"

### Technical Data

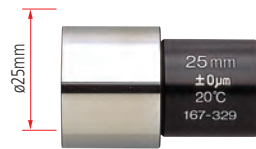
Thread angle: 55° or 60°  
Angle Accuracy: ±2°

# Standards for V-Anvil Micrometers

## SERIES 167

### FEATURES

- Specially designed for the zero point setting of V-anvil micrometers.
- Supplied in fitted carton.



167-329

### SPECIFICATIONS

Metric			
Diameter	Order No.	Type	Accuracy
5mm	167-327	Plug	±2μm
10mm	167-328	Plug	±2μm
25mm	167-329	Plug	±2μm
40mm	167-330	Ring	±3μm
55mm	167-331	Ring	±3μm
70mm	167-332	Ring	±3μm
85mm	167-333	Ring	±3μm

Inch			
Diameter	Order No.	Type	Accuracy
.2"	167-337	Plug	±.0001"
.4"	167-338	Plug	±.0001"
1"	167-339	Plug	±.0001"
1.6"	167-340	Ring	±.00015"
2.2"	167-341	Ring	±.00015"
2.8"	167-342	Ring	±.00015"
3.4"	167-343	Ring	±.00015"

# Tool Kits

The Digimatic Tool Kits include Mitutoyo's highly popular 0-1" / 0-25mm Digimatic Micrometer (choose ratchet or friction type) and 0-6" / 0-150mm Digimatic Caliper with Absolute Encoder. The case is made of handsome, solid mahogany and has space for gage batteries. The micrometer spanner is a supplied accessory.

Order No. 64PKA068 (Inch Tool Kit)	
Item No.	Description
103-135	Outside Micrometer (Friction Thimble Type) (Range: 0-1", Graduation: .0001")
505-675	Dial Caliper (Range: 0-6", Dial Graduation: .001")
182-204	6" Full-Flexible Rule (3R)
64PPP932	Mahogany Case



64PKA068

Order No. 64PKA069 (Inch Tool Kit)	
Item No.	Description
103-135	Outside Micrometer (Friction Thimble Type) (Range: 0-1", Graduation: .0001")
182-202	6" Full-Flexible Rule (16R)
513-518T	Test Indicator Set (Range: .04", Graduation: .001")
505-675	675 Dial Caliper (Range: 0-6", Dial Graduation: .001")
050501	Mahogany Case



64PKA069

The very basic measuring instruments recommended for vocational students and machinist apprentices are supplied in this kit.

Order No. 64PKA070 (Inch Tool Kit)	
Item No.	Description
101-117	Outside Micrometer (Friction Thimble Type) (Range: 0-1", Graduation: .0001")
129-132	Depth Micrometer (with 6 pcs Rods) (Range: 0-6", Graduation: .001")
182-202	Full-Flexible Rule (16R)
505-675	Dial Caliper (Range: 0-6", Graduation: .001")
050503	Mahogany Case



64PKA070

For operations where depth measurements are a primary concern, this kit is ideal for measuring depths to 6", in addition to providing the tools for regular precision measurements.

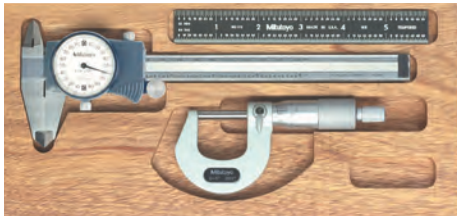
Order No. 64PKA071 (Inch Tool Kit)	
Item No.	Description
103-922	Outside Micrometer Set (3 pcs) (Range: 0-3", Graduation: .0001")
141-208	Inside Micrometer (with 6 pcs Rods)
180-905U	Combination Set (4R)
182-202	Full-Flexible Rule (16R)
513-518T	Test Indicator Set (Range: .04", Graduation: .001")
505-675	Dial Caliper (Range: 0-6", Dial Graduation: .001")
2416S	Dial Indicator (Range: 1.0", Graduation: .001")
7010S	Magnetic Stand
050504	Mahogany Case



64PKA071

Most every routine inspection assignment can be completed with the eight high-quality MITUTOYO Precision Measuring Instruments provided in this deluxe kit.

# Tool Kits



64PKA072

Order No. 64PKA072 (Inch Tool Kit)	
Item No.	Description
182-112	6" Black Steel Rule (16R)
103-105	Micrometer (Ratchet Thimble) (Range 0-1", Graduation .001")
505-717	Dial Caliper (Range: 0-6", Dial Graduation: .001")
64PPP932	Mahogany Case



64PKA073

Order No. 64PKA073 (Tool Kit Lite)	
Item No.	Description
182-112	6" Black Steel Rule (16R)
700-113-10	0 - 6" / 0 - 150mm MyCal Lite (Resolution: .001" / 0.1mm)
293-831	0 - 1" / 0 - 25.4mm MDC Lite (Ratchet Thimble) (Resolution: .00005" / 0.001mm)
64PPP932	Mahogany Case



64PKA076

Order No. 64PKA076 (Digimatic Tool Kit)	
Item No.	Description
293-340	Digimatic Micrometer (Ratchet Stop Type) (Range: 0 - 1" / 0 - 25.4mm, LCD Resolution: .00005" / 0.001mm)
500-196-20	Digimatic Caliper with Absolute Encoder (Range: 0 - 6" / 0 - 150mm, LCD Resolution: .0005" / 0.001mm)
64PPP932	Mahogany Case



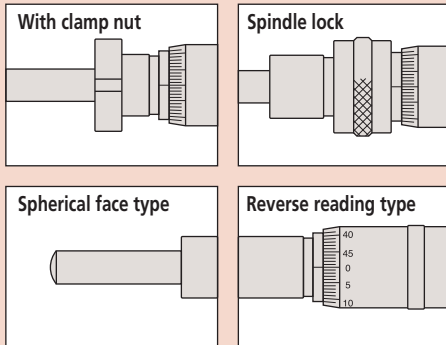
64PKA077

Order No. 64PKA077 (Digimatic Tool Kit)	
Item No.	Description
293-348	Digimatic Micrometer (Friction Thimble Type) (Range: 0 - 1" / 0 - 25.4mm, LCD Resolution: .00005" / 0.001mm)
500-196-20	Digimatic Caliper with Absolute Encoder (Range: 0 - 6" / 0 - 150mm, LCD Resolution: .0005" / 0.001mm)
64PPP932	Mahogany Case



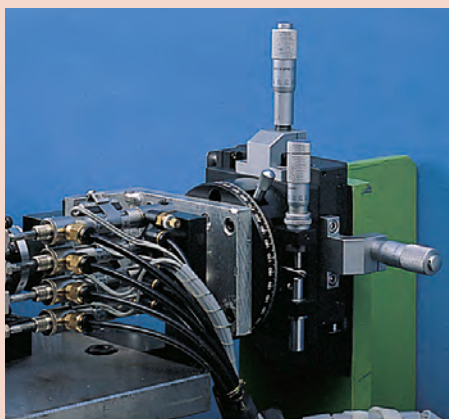
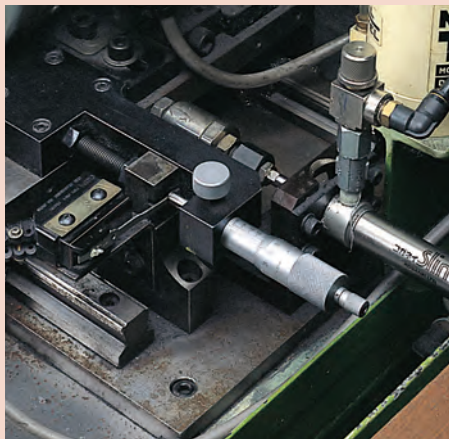
# Micrometer Head Selection Guide

## Variety of Specifications



The table below provides an outline of Mitutoyo micrometer heads for each series so you can locate the pages to refer to select the micrometer head most appropriate to your specific application. When selecting consider the following points:

- Dimensions
- Graduation/resolution and accuracy
- With or without spindle lock
- With or without clamping nut
- Normal or reverse reading
- With or without Ratchet Stop



## SELECTION TABLE

Range	Series	Remarks	Page
0 - 1mm	110	Differential screw translator (extra-fine feeding) type	B-69
0 - 2.5mm	110	Differential screw translator (extra-fine feeding) type	B-69
0 - 5mm	148	Ultra small type	B-60
0 - 6.5mm	148	Fine spindle feeding of 0.1mm/rev.	B-58
	148	Fine spindle feeding of 0.25mm/rev.	B-59
	148	Small type	B-60
	148	Large thimble diameter for easy reading	B-61
0 - 10mm	152	Fine feeding type	B-68
0 - 13mm	148	Common type in small size	B-62
	148	Spindle feeding of 0.25mm/rev.	B-59
	148	Zero-adjustable thimble type	B-63
	148	Large thimble diameter for easy reading	B-61
	110	Differential screw translator (extra-fine feeding) type	B-69
0 - 15mm	149	with carbide-tipped spindle type	B-64
	153	Non-rotating spindle type	B-67
	152	Quick spindle feeding of 1mm/rev.	B-68
0 - 25mm	164	Digital type	B-72
	350	Compact digital type	B-57
	150	Common type in middle size	B-65
	153	Non-rotating spindle type	B-67
	153	Fine graduation type	B-71
	151	Heavy duty type (ø8mm spindle)	B-66
	152	Quick spindle feeding of 1mm/rev.	B-68
	152	Fine feeding type	B-68
	152	for XY-stage	B-70
	164	High resolution and high accuracy type	B-72
	250	with digit counter type	B-73
0 - 50mm	164	Digital type	B-56
	151	Heavy duty type (ø8mm spindle)	B-66
	152	Quick spindle feeding of 1mm/rev.	B-68
	152	Fine feeding type	B-68
	197	Non-rotating spindle and large thimble	B-71

# Digimatic Micrometer Heads

## SERIES 164

### FEATURES

- The Digimatic Micrometer Heads...
- The display can be rotated up to 330° for easy reading in any position.

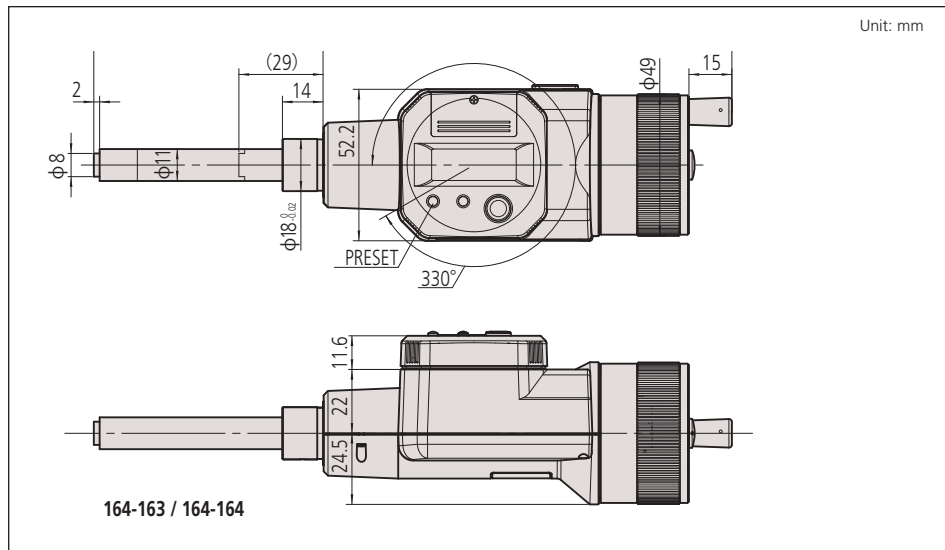


164-164

### SPECIFICATIONS

Metric				Inch/Metric			
Range	Order No.	Accuracy	Mass (g)	Range	Order No.	Accuracy	Mass (g)
0 - 50mm	164-163	±3µm	490	0 - 2" / 0 - 50.8mm	164-164	±.00015"	490

### DIMENSIONS



### Technical Data

Accuracy: Refer to the list of specifications.

Resolution: 0.001mm or .00005"/0.001mm  
 Display: LCD  
 Battery: SR44 (2 pcs.), **938882**  
 Battery life: 1.8 years:

### Function

Zero-setting, Data hold, Data output, Preset,  
 inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error

### Optional Accessories

**959149:** SPC cable (1m / 40")  
**959150:** SPC cable (2m / 80")

# Digimatic Micrometer Heads

## SERIES 350

### FEATURES

- The Digimatic Micrometer Heads...



350-251-10



350-281-10

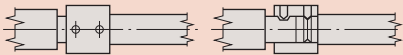


Measuring force: 5 - 10N

### Non-rotating device

350-261-10, 350-361-10

The non-rotating device provides no radial torsion on the workpiece surface so that workpiece wear and deformation are minimized.



### Technical Data

Accuracy\* ±2µm Metric model  
±.0001" Inch / Metric model

Resolution: 0.001mm or .00005"/0.001mm

Display: LCD

Battery: SR44 (1 pc) 938882

Battery life: Approx. 3 years under normal use

Dust/Water protection level: IP65

350-281-10, 350-282-10, 350-283-10, 350-284-10, 350-261-10  
350-381-10, 350-382-10, 350-383-10, 350-384-10, 350-361-10

### Function

Preset, inch/mm conversion (on inch/metric models only)

Alarm: Low voltage, Counting value composition error

Function Lock

2 Presets

### Optional Accessories

05CZA662: SPC cable with data switch (1m / 40")

05CZA663: SPC cable with data switch (2m / 80")

64PPP035: Stem Bushing (.375" ID/.709" OD)

### SPECIFICATIONS

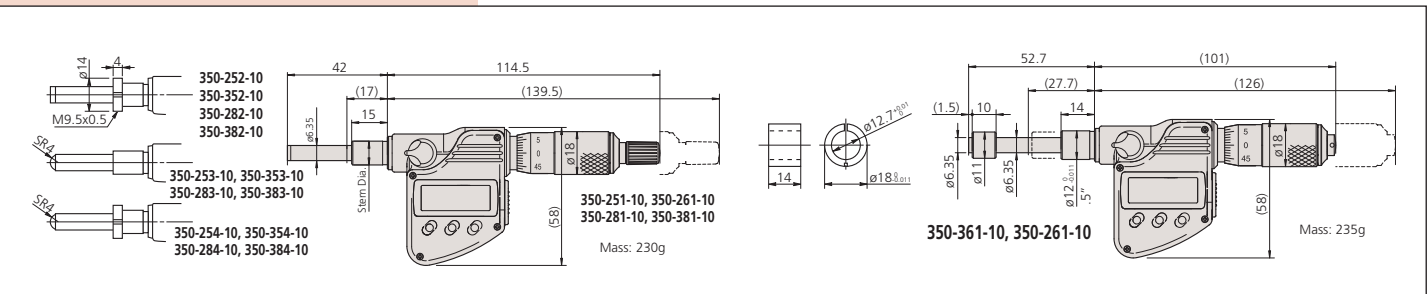
Metric					
Range	Order No.	Stem	Spindle face	Stem dia.	Remarks
0 - 25mm	350-251-10	Plain	Flat (carbide tip)	10mm	
0 - 25mm	350-252-10	w/ clamp nut	Flat (carbide tip)	10mm	
0 - 25mm	350-253-10	Plain	Spherical (SR4)	10mm	
0 - 25mm	350-254-10	w/ clamp nut	Spherical (SR4)	10mm	
0 - 25mm	350-281-10	Plain	Flat (carbide tip)	12mm	IP65
0 - 25mm	350-282-10	w/ clamp nut	Flat (carbide tip)	12mm	IP65
0 - 25mm	350-283-10	Plain	Spherical (SR4)	12mm	IP65
0 - 25mm	350-284-10	w/ clamp nut	Spherical (SR4)	12mm	IP65
0 - 25mm	350-261-10*	Plain	Flat	12mm	IP65

\*with non-rotating device and 18mm stem bushing.

Inch/Metric					
Range	Order No.	Stem	Spindle face	Stem dia.	Remarks
0 - 1" / 0 - 25.4mm	350-351-10	Plain	Flat (carbide tip)	.375"	
0 - 1" / 0 - 25.4mm	350-352-10	w/ clamp nut	Flat (carbide tip)	.375"	
0 - 1" / 0 - 25.4mm	350-353-10	Plain	Spherical (SR4)	.375"	
0 - 1" / 0 - 25.4mm	350-354-10	w/ clamp nut	Spherical (SR4)	.375"	
0 - 1" / 0 - 25.4mm	350-381-10	Plain	Flat (carbide tip)	.5"	IP65
0 - 1" / 0 - 25.4mm	350-382-10	w/ clamp nut	Flat (carbide tip)	.5"	IP65
0 - 1" / 0 - 25.4mm	350-383-10	Plain	Spherical (SR4)	.5"	IP65
0 - 1" / 0 - 25.4mm	350-384-10	w/ clamp nut	Spherical (SR4)	.5"	IP65
0 - 1" / 0 - 25.4mm	350-361-10*	Plain	Flat	.5"	IP65

\*with non-rotating device and 18mm stem bushing.

### DIMENSIONS AND MASS



# Micrometer Heads

## SERIES 148 — Fine Spindle Feeding of 0.1mm/rev

### FEATURES

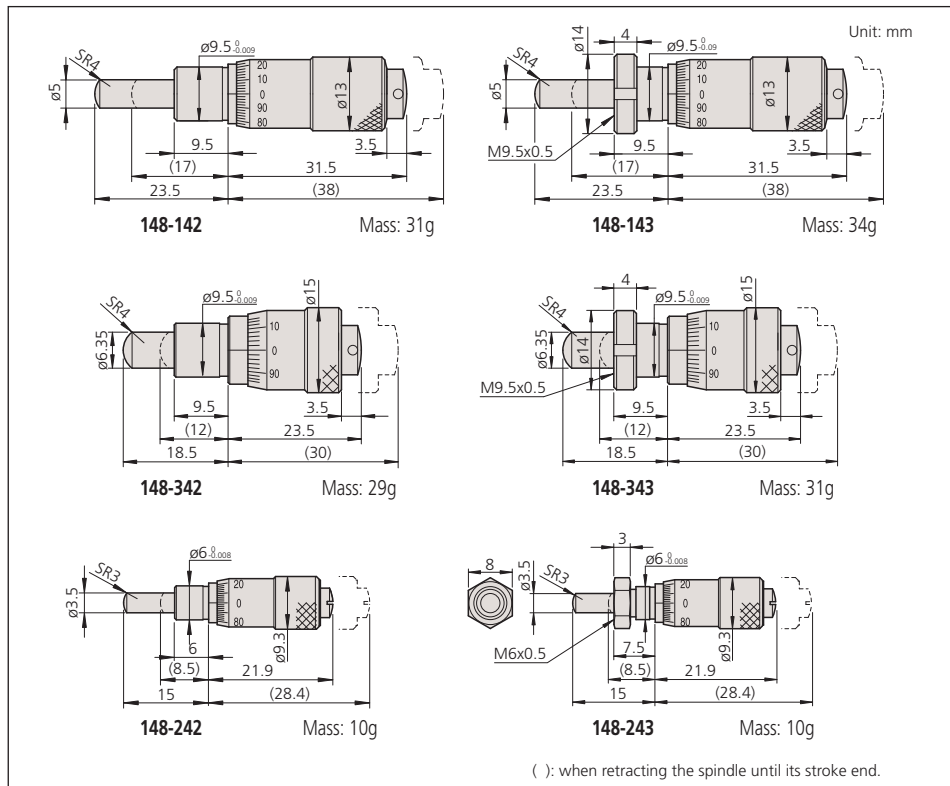
- Fine spindle feeding of just 0.1mm/rev for extra-fine adjustment and positioning.
- External dimensions are compatible with conventional 0.5mm pitch heads.



### SPECIFICATIONS

Metric						
Range	Order No.	Accuracy	Stem dia.	Stem	Spindle face	Remarks
0 - 6.5mm	148-142	±2μm	9.5mm	Plain	Spherical (SR4)	—
0 - 6.5mm	148-143	±2μm	9.5mm	w/clamp nut	Spherical (SR4)	—
0 - 6.5mm	148-342	±2μm	9.5mm	Plain	Spherical (SR4)	Thicker & shorter thimble
0 - 6.5mm	148-343	±2μm	9.5mm	w/clamp nut	Spherical (SR4)	Thicker & shorter thimble
0 - 6.5mm	148-242	±5μm	6mm	Plain	Spherical (SR3)	Small thimble diameter
0 - 6.5mm	148-243	±5μm	6mm	w/clamp nut	Spherical (SR3)	Small thimble diameter

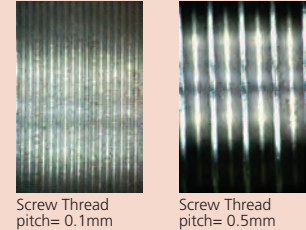
### DIMENSIONS AND MASS



### Technical Data

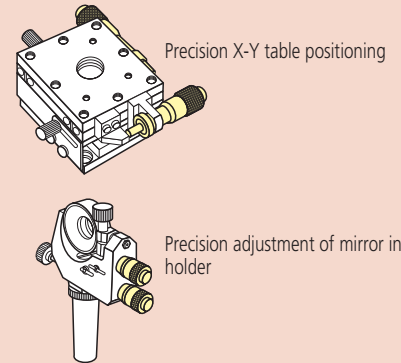
Graduations: 0.002mm  
 Spindle pitch: 0.1mm  
 Spindle face: Spherical of SKS3 (more than HRC60), lapped surface  
 Scale surface: Hard-chrome plating  
 Fixture thickness for clamp nut: 6mm (148-243: 4mm)

### Spindle pitch

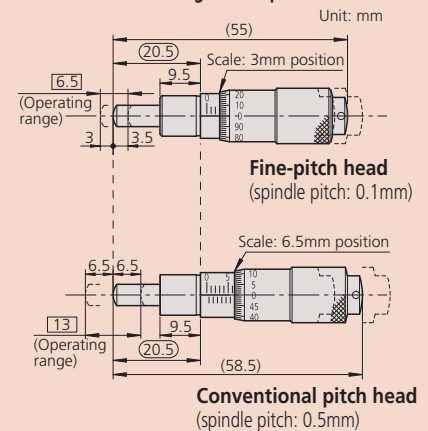


### Applications

Semiconductor wafer positioning machinery and optical component alignment units, etc.



Comparison of mounting dimensions between a standard fine-pitch head and a standard conventional pitch head at the mid-range travel position



While the fine-pitch micrometer head has a measuring range of 6.5mm, the conventional head has a larger range of 13mm. When replacing a conventional head, the fine-pitch type can use the common range in the middle of the spindle travel. The standard and compact types of fine-pitch head are completely interchangeable.

# Micrometer Heads

**SERIES 148 — Fine Spindle Feeding of 0.25 mm / rev**

## Technical Data

Graduations: 0.01mm  
 Spindle pitch: 0.25mm  
 Spindle face: Spherical of SKS3 (more than HRC60), lapped surface  
 Scale surface: Hard-chrome plating  
 Fixture thickness for clamp nut: 6mm

## FEATURES

- Fine spindle feeding of just 0.25mm/rev for fine adjustment and positioning.



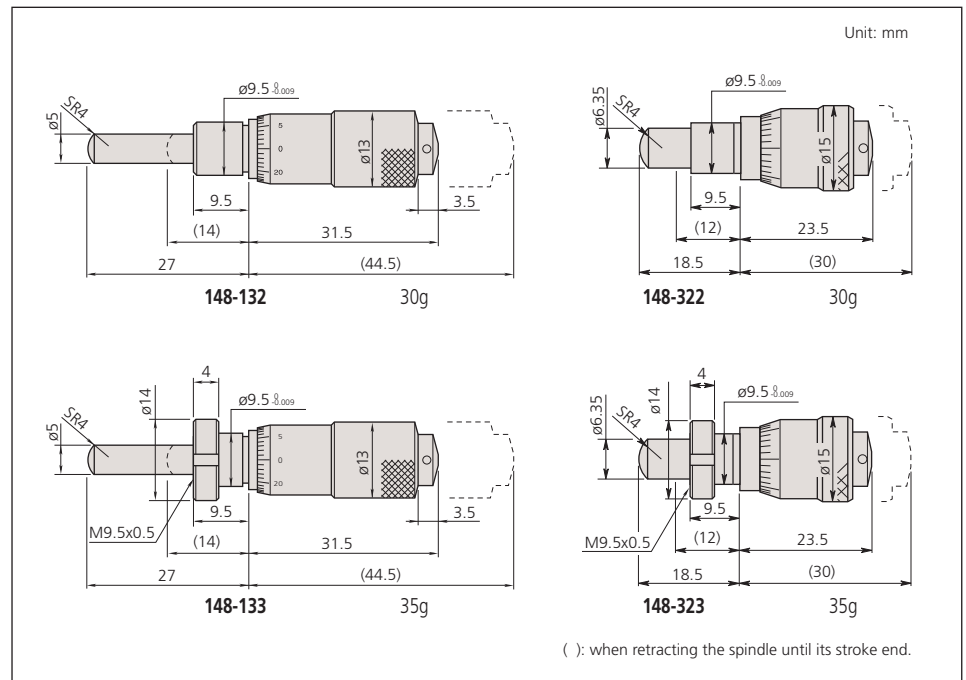
148-132

## SPECIFICATIONS

### Metric

Range	Order No.	Accuracy	Stem dia.	Stem	Spindle face
0 - 13mm	<b>148-132</b>	2mm	9.5mm	Plain	Spherical (SR4)
0 - 13mm	<b>148-133</b>	2mm	9.5mm	w/clamp nut	Spherical (SR4)
0 - 6.5mm	<b>148-322</b>	2mm	9.5mm	Plain	Spherical (SR4)
0 - 6.5mm	<b>148-323</b>	2mm	9.5mm	w/ clamp nut	Spherical (SR4)

## DIMENSIONS AND MASS



# Micrometer Heads

## SERIES 148 — Ultra-Small/Small Type

### FEATURES

- Miniature micrometer heads for ease of incorporating into machines.



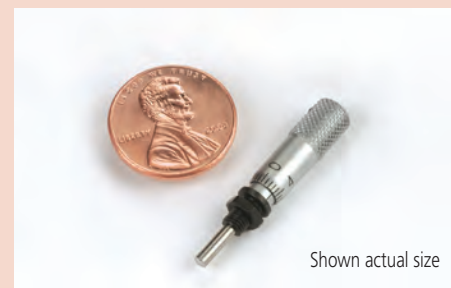
### Technical Data

Graduations: 0.02mm (148-215, 148-216), 0.01mm or .001"  
 Spindle pitch: 0.5mm  
 Spindle face: Flat or spherical of SKS3 (more than HRC60), lapped surface  
 Scale surface: Hard-chrome plating  
 Fixture thickness for clamp nut: 3mm (148-216, 148-218), 4mm

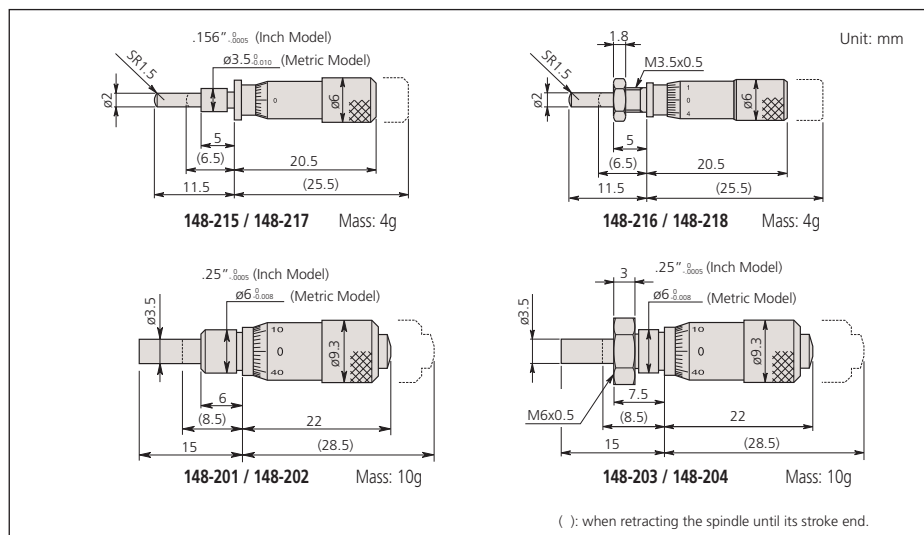
### SPECIFICATIONS

Metric						
Range	Order No.	Accuracy	Stem dia.	Stem	Spindle face	Remarks
0 - 5mm	148-215	±5μm	3.5mm	Plain	Spherical (SR1.5)	—
0 - 5mm	148-216	±5μm	3.5mm	w/clamp nut	Spherical (SR1.5)	—
0 - 6.5mm	148-201	±5μm	6mm	Plain	Flat	—
0 - 6.5mm	148-203	±5μm	6mm	w/clamp nut	Flat	—
0 - 6.5mm	148-205	±5μm	6mm	Plain	Spherical (SR3)	—
0 - 6.5mm	148-207	±5μm	6mm	w/clamp nut	Spherical (SR3)	—
6.5 - 0 mm	148-209	±5μm	6mm	Plain	Flat	Reverse reading
6.5 - 0 mm	148-211	±5μm	6mm	w/ clamp nut	Flat	Reverse reading

Inch						
Range	Order No.	Accuracy	Stem dia.	Stem	Spindle face	Remarks
0 - .2"	148-217	±5μm	.156"	Plain	Spherical (SR1.5)	—
0 - .2"	148-218	±5μm	.156"	w/clamp nut	Spherical (SR1.5)	—
0 - .25"	148-202	±5μm	.25"	Plain	Flat	—
0 - .25"	148-204	±5μm	.25"	w/clamp nut	Flat	—
0 - .25"	148-206	±5μm	.25"	Plain	Spherical (SR3)	—
0 - .25"	148-208	±5μm	.25"	w/clamp nut	Spherical (SR3)	—
.25 - 0"	148-210	±5μm	.25"	Plain	Flat	Reverse reading
.25 - 0"	148-212	±5μm	.25"	w/ clamp nut	Flat	Reverse reading



### DIMENSIONS AND MASS



# Micrometer Heads

## SERIES 148 — Large Thimble Diameter for Easy Reading

### FEATURES

- Easy reading due to the large thimble diameter. (Three types of thimble diameters can be selected.)

### SPECIFICATIONS

#### Metric

Range	Order No.	Accuracy	Stem dia.	Stem	Spindle face	Thimble Dia.
0 - 6.5mm	<b>148-301</b>	±2μm	9.5mm	Plain	Flat	15mm
0 - 6.5mm	<b>148-302</b>	±2μm	9.5mm	w/clamp nut	Flat	15mm
0 - 6.5mm	<b>148-303</b>	±2μm	9.5mm	Plain	Flat	20mm
0 - 6.5mm	<b>148-304</b>	±2μm	9.5mm	w/clamp nut	Flat	20mm
0 - 6.5mm	<b>148-305</b>	±2μm	9.5mm	Plain	Flat	29mm
0 - 6.5mm	<b>148-306</b>	±2μm	9.5mm	w/clamp nut	Flat	29mm
0 - 13mm	<b>148-307</b>	±2μm	9.5mm	Plain	Flat	15mm
0 - 13mm	<b>148-308</b>	±2μm	9.5mm	w/clamp nut	Flat	15mm
0 - 13mm	<b>148-309</b>	±2μm	9.5mm	Plain	Flat	20mm
0 - 13mm	<b>148-310</b>	±2μm	9.5mm	w/clamp nut	Flat	20mm
0 - 13mm	<b>148-311</b>	±2μm	9.5mm	Plain	Flat	29mm
0 - 13mm	<b>148-312</b>	±2μm	9.5mm	w/ clamp nut	Flat	29mm

#### Inch

Range	Order No.	Accuracy	Stem dia.	Stem	Spindle face	Thimble Dia.
0 - .25"	<b>148-351</b>	±.0001"	.375"	Plain	Flat	.59"
0 - .25"	<b>148-352</b>	±.0001"	.375"	w/clamp nut	Flat	.59"
0 - .25"	<b>148-353</b>	±.0001"	.375"	Plain	Flat	.79"
0 - .25"	<b>148-354</b>	±.0001"	.375"	w/clamp nut	Flat	.79"
0 - .25"	<b>148-355</b>	±.0001"	.375"	Plain	Flat	1.14"
0 - .25"	<b>148-356</b>	±.0001"	.375"	w/clamp nut	Flat	1.14"
0 - .5"	<b>148-357</b>	±.0001"	.375"	Plain	Flat	.59"
0 - .5"	<b>148-358</b>	±.0001"	.375"	w/clamp nut	Flat	.59"
0 - .5"	<b>148-359</b>	±.0001"	.375"	Plain	Flat	.79"
0 - .5"	<b>148-360</b>	±.0001"	.375"	w/clamp nut	Flat	.79"
0 - .5"	<b>148-361</b>	±.0001"	.375"	Plain	Flat	1.14"
0 - .5"	<b>148-362</b>	±.0001"	.375"	w/ clamp nut	Flat	1.14"



148-301



148-303

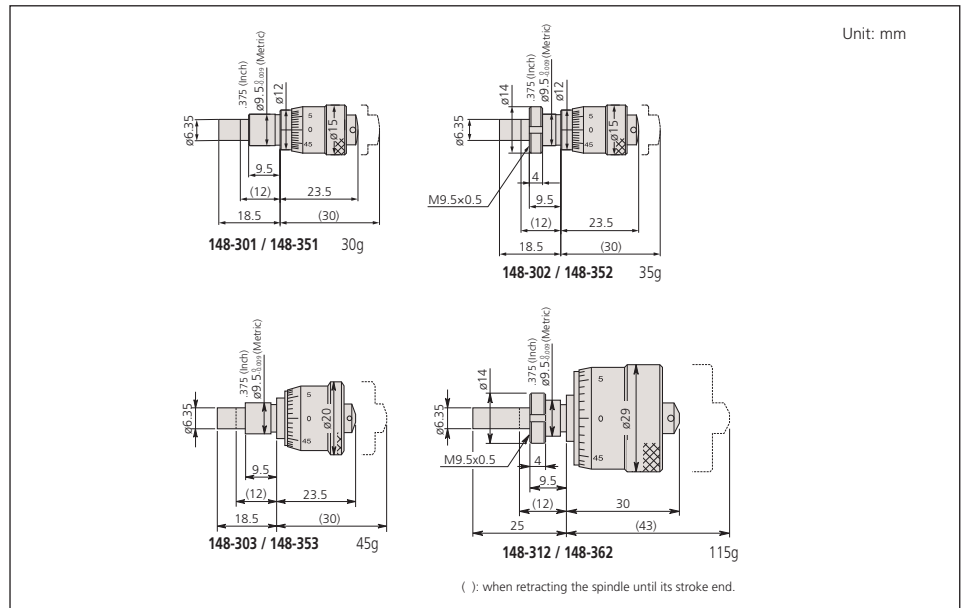


148-305

### Technical Data

Graduations: 0.01mm or .001"  
 Spindle pitch: 0.5mm or .025"  
 Spindle face: Flat of SKS3 (more than HRC60),  
 lapped surface  
 Scale surface: Hard-chrome plating  
 Fixture thickness for clamp nut: 6mm

### DIMENSIONS AND MASS



# Micrometer Heads

## SERIES 148 — Common Type in Small Size

### SPECIFICATIONS

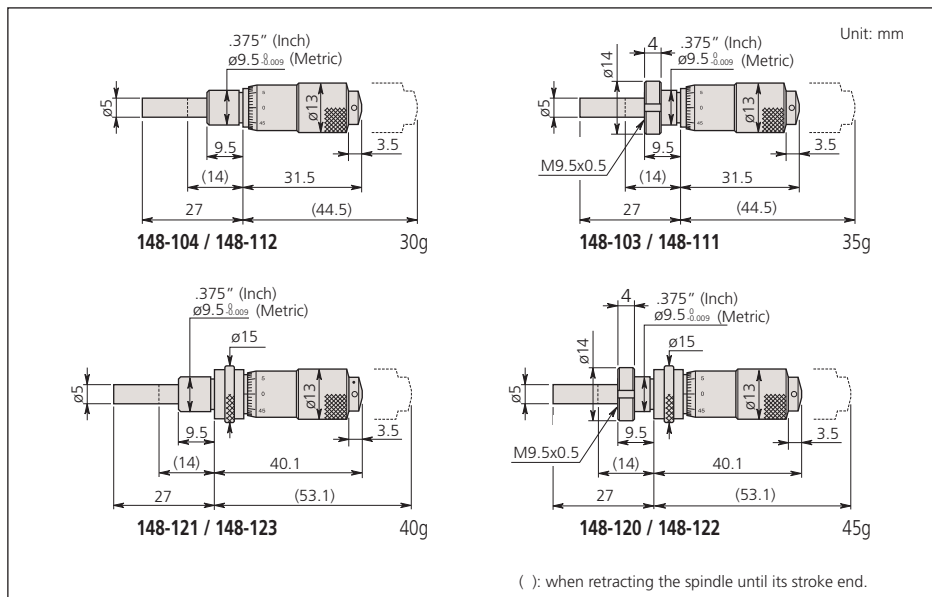
Metric						
Range	Order No.	Accuracy	Stem dia.	Stem	Spindle face	Remarks
0 - 13mm	148-104	±2μm	9.5mm	Plain	Flat	—
0 - 13mm	148-103	±2μm	9.5mm	w/clamp nut	Flat	—
0 - 13mm	148-121	±2μm	9.5mm	Plain*	Flat	—
0 - 13mm	148-120	±2μm	9.5mm	w/clamp nut*	Flat	—
0 - 13mm	148-801	±2μm	9.5mm	Plain	Spherical (SR4)	—
0 - 13mm	148-802	±2μm	9.5mm	w/clamp nut	Spherical (SR4)	—
0 - 13mm	148-803	±2μm	9.5mm	Plain*	Spherical (SR4)	—
0 - 13mm	148-804	±2μm	9.5mm	w/clamp nut*	Spherical (SR4)	—
13mm - 0	148-821	±2μm	9.5mm	Plain	Flat	Reverse reading
13mm - 0	148-822	±2μm	9.5mm	w/clamp nut	Flat	Reverse reading
13mm - 0	148-823	±2μm	9.5mm	Plain*	Flat	Reverse reading
13mm - 0	148-824	±2μm	9.5mm	w/ clamp nut*	Flat	Reverse reading

\*with spindle lock

Inch						
Range	Order No.	Accuracy	Stem dia.	Stem	Spindle face	Remarks
0 - .5"	148-112	±.0001"	.375"	Plain	Flat	—
0 - .5"	148-111	±.0001"	.375"	w/clamp nut	Flat	—
0 - .5"	148-123	±.0001"	.375"	Plain*	Flat	—
0 - .5"	148-122	±.0001"	.375"	w/clamp nut*	Flat	—
0 - .5"	148-811	±.0001"	.375"	Plain	Spherical (SR4)	—
0 - .5"	148-812	±.0001"	.375"	w/clamp nut	Spherical (SR4)	—
0 - .5"	148-813	±.0001"	.375"	Plain*	Spherical (SR4)	—
0 - .5"	148-814	±.0001"	.375"	w/clamp nut*	Spherical (SR4)	—
.5" - 0	148-831	±.0001"	.375"	Plain	Flat	Reverse reading
.5" - 0	148-832	±.0001"	.375"	w/clamp nut	Flat	Reverse reading
.5" - 0	148-833	±.0001"	.375"	Plain*	Flat	Reverse reading
.5" - 0	148-834	±.0001"	.375"	w/ clamp nut*	Flat	Reverse reading

\*with spindle lock

### DIMENSIONS AND MASS



148-103



148-104



148-121



148-120

### Technical Data

Graduations: 0.01mm or .001"

Spindle pitch: 0.5mm

Spindle face: Flat or spherical of SKS3 (more than HR60), lapped surface

Scale surface: Hard-chrome plating

Fixture thickness for clamp nut: 6mm



# Micrometer Heads

## SERIES 148 — Common Type in Small Size with Zero-Adjustable Thimble

### FEATURES

- The thimble can be set to zero at any position by loosening the setscrew

### SPECIFICATIONS

#### Metric

Range	Order No.	Accuracy	Stem dia.	Stem	Spindle face	Remarks
0 - 13mm	<b>148-503</b>	±2μm	9.5mm	Plain	Flat	—
0 - 13mm	<b>148-513</b>	±2μm	9.5mm	Plain	Flat	Stainless steel throughout
0 - 13mm	<b>148-508</b>	±2μm	9.5mm	w/clamp nut	Flat	—
0 - 13mm	<b>148-506</b>	±2μm	9.5mm	Plain*	Flat	—
0 - 13mm	<b>148-504</b>	±2μm	9.5mm	w/clamp nut*	Flat	—
0 - 13mm	<b>148-853</b>	±2μm	9.5mm	Plain	Spherical (SR4)	—
0 - 13mm	<b>148-854</b>	±2μm	9.5mm	w/clamp nut*	Spherical (SR4)	—
13mm - 0	<b>148-863</b>	±2μm	9.5mm	Plain	Flat	Reverse reading
13mm - 0	<b>148-864</b>	±2μm	9.5mm	w/ clamp nut*	Flat	Reverse reading

\*with spindle lock

#### Inch

Range	Order No.	Accuracy	Stem dia.	Stem	Spindle face	Remarks
0 - .5"	<b>148-501</b>	±.0001"	.375"	Plain	Flat	—
0 - .5"	<b>148-511</b>	±.0001"	.375"	Plain	Flat	Stainless steel throughout
0 - .5"	<b>148-507</b>	±.0001"	.375"	w/clamp nut	Flat	—
0 - .5"	<b>148-505</b>	±.0001"	.375"	Plain*	Flat	—
0 - .5"	<b>148-502</b>	±.0001"	.375"	w/clamp nut*	Flat	—
0 - .5"	<b>148-851</b>	±.0001"	.375"	Plain	Spherical (SR4)	—
0 - .5"	<b>148-852</b>	±.0001"	.375"	w/clamp nut*	Spherical (SR4)	—
.5" - 0	<b>148-861</b>	±.0001"	.375"	Plain	Flat	Reverse reading
.5" - 0	<b>148-862</b>	±.0001"	.375"	w/ clamp nut*	Flat	Reverse reading

\*with spindle lock



148-503



148-504

### Technical Data

Graduations: 0.01mm or .001"

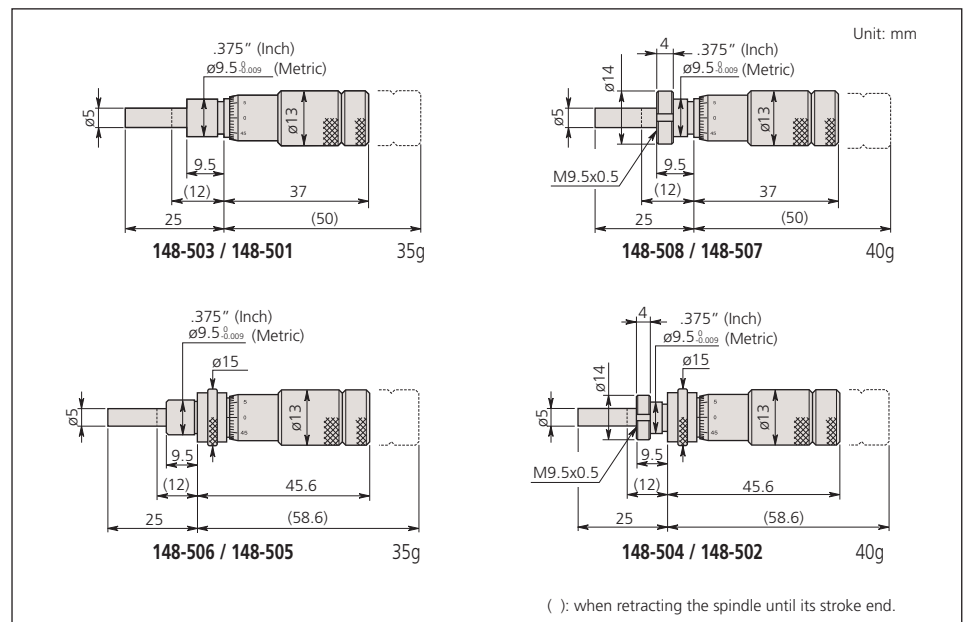
Spindle pitch: 0.5mm

Spindle face: Flat or spherical of SKS3 (more than HRC60), lapped surface

Scale surface: Hard-chrome plating

Fixture thickness for clamp nut: 6mm

### DIMENSIONS AND MASS



# Micrometer Heads

## SERIES 149 — Common Type in Small Size with Carbide-Tipped Spindle

### FEATURES

- Carbide tipped measuring face.

### SPECIFICATIONS

#### Metric

Range	Order No.	Accuracy	Stem dia.	Stem	Spindle face	Remarks
0 - 15mm	<b>149-132</b>	±2μm	9.5mm	Plain	Flat (carbide tip)	—
0 - 15mm	<b>149-131</b>	±2μm	9.5mm	w/clamp nut	Flat (carbide tip)	—
0 - 15mm	<b>149-183</b>	±2μm	9.5mm	Plain*	Flat (carbide tip)	With spindle lock
0 - 15mm	<b>149-184</b>	±2μm	9.5mm	w/clamp nut*	Flat (carbide tip)	With spindle lock
0 - 15mm	<b>149-801</b>	±2μm	9.5mm	Plain	Spherical (SR4)	—
0 - 15mm	<b>149-802</b>	±2μm	9.5mm	w/clamp nut	Spherical (SR4)	—
15mm - 0	<b>149-821</b>	±2μm	9.5mm	Plain	Flat (carbide tip)	Reverse reading
15mm - 0	<b>149-822</b>	±2μm	9.5mm	w/ clamp nut	Flat (carbide tip)	Reverse reading

\*with spindle lock.

#### Inch

Range	Order No.	Accuracy	Stem dia.	Stem	Spindle face	Remarks
0 - .5"	<b>149-148</b>	±.0001"	.375"	Plain	Flat (carbide tip)	—
0 - .5"	<b>149-147</b>	±.0001"	.375"	w/clamp nut	Flat (carbide tip)	—
0 - .5"	<b>149-185</b>	±.0001"	.375"	Plain*	Flat (carbide tip)	With spindle lock
0 - .5"	<b>149-182</b>	±.0001"	.375"	w/clamp nut*	Flat (carbide tip)	With spindle lock
0 - .5"	<b>149-811</b>	±.0001"	.375"	Plain	Spherical (SR4)	—
0 - .5"	<b>149-812</b>	±.0001"	.375"	w/clamp nut	Spherical (SR4)	—
.5" - 0	<b>149-831</b>	±.0001"	.375"	Plain	Flat (carbide tip)	Reverse reading
.5" - 0	<b>149-832</b>	±.0001"	.375"	w/ clamp nut	Flat (carbide tip)	Reverse reading

\*with spindle lock.

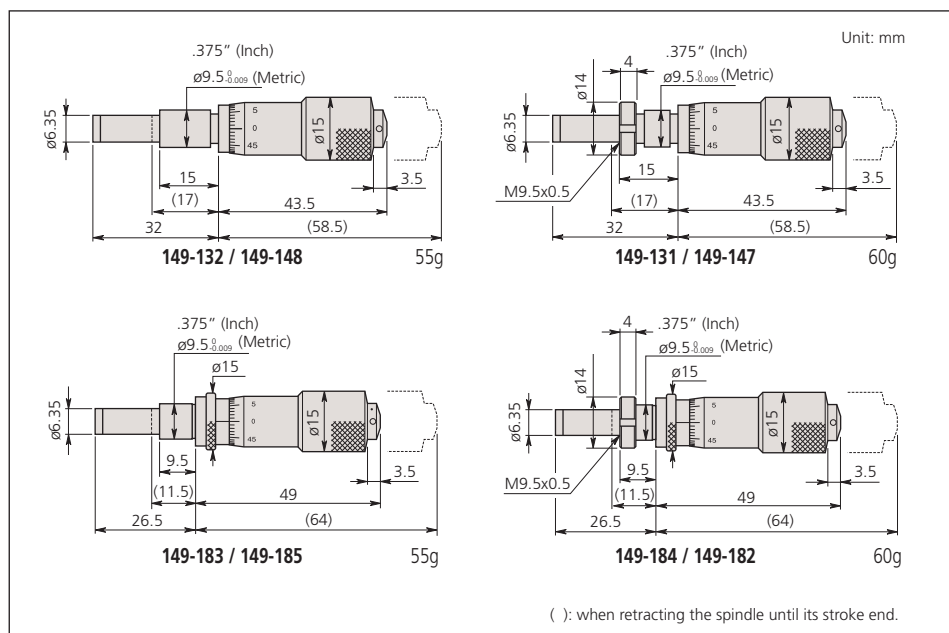


149-132



149-184

### DIMENSIONS AND MASS



### Technical Data

Graduations: 0.01mm or .001"

Spindle pitch: 0.5mm

Spindle face: Flat with carbide tip (more than HRA90) or spherical, lapped surface

Scale surface: Hard-chrome plating

Fixture thickness for clamp nut: 6mm

(149-131, 149-147: 11.5mm)

# Micrometer Heads

## SERIES 150 — Common Type in Middle Size

### FEATURES

- Ratchet stop for constant force.
- Long spindle type is available for a variety of applications.
- Carbide tipped measuring face.

### SPECIFICATIONS

#### Metric

Range	Order No.	Accuracy	Stem dia.	Stem	Spindle face	Remarks
0 - 25mm	<b>150-192</b>	±2μm	10mm	Plain	Flat (carbide tip)	—
0 - 25mm	<b>150-191</b>	±2μm	10mm	w/clamp nut	Flat (carbide tip)	—
0 - 25mm	<b>150-209</b>	±2μm	10mm	Plain*	Flat (carbide tip)	—
0 - 25mm	<b>150-210</b>	±2μm	10mm	w/clamp nut*	Flat (carbide tip)	—
0 - 25mm	<b>150-801</b>	±2μm	10mm	Plain	Spherical (SR4)	—
0 - 25mm	<b>150-802</b>	±2μm	10mm	w/clamp nut	Spherical (SR4)	—
0 - 25mm	<b>150-821</b>	±2μm	10mm	Plain	Flat (carbide tip)	Reverse reading
0 - 25mm	<b>150-822</b>	±2μm	10mm	w/clamp nut	Flat (carbide tip)	Reverse reading
0 - 25mm	<b>150-190</b>	±2μm	10mm	Plain	Flat (carbide tip)	w/ vernier (0.001mm)
0 - 25mm	<b>150-189</b>	±2μm	10mm	w/clamp nut	Flat (carbide tip)	w/ vernier (0.001mm)
0 - 25mm	<b>150-196</b>	±2μm	10mm	Plain*	Flat (carbide tip)	w/ vernier (.0001mm)
0 - 25mm	<b>150-195</b>	±2μm	10mm	w/clamp nut*	Flat (carbide tip)	w/ vernier (.0001mm)
0 - 25mm	<b>150-211</b>	±2μm	10mm	Plain*	Flat (carbide tip)	w/o ratchet stop
0 - 25mm	<b>150-212</b>	±2μm	10mm	w/clamp nut*	Flat (carbide tip)	w/o ratchet stop
0 - 25mm	<b>150-219</b>	±2μm	10mm	Plain	Flat	Long spindle
0 - 25mm	<b>150-220</b>	±2μm	10mm	w/ clamp nut	Flat	Long spindle

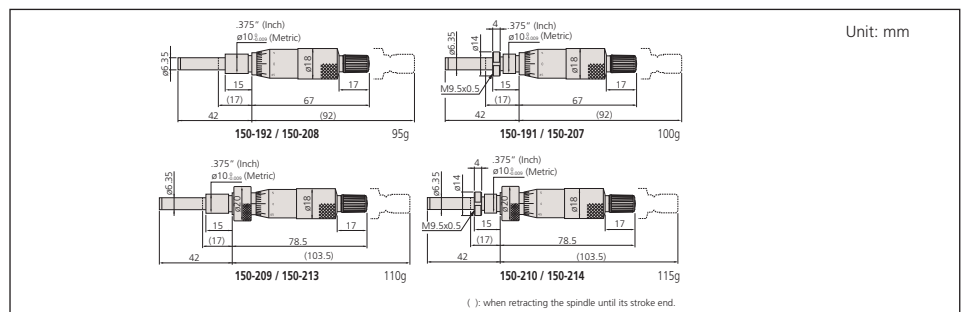
\*with spindle lock

#### Inch

Range	Order No.	Accuracy	Stem dia.	Stem	Spindle face	Remarks
0 - 1"	<b>150-208</b>	±.0001"	.375"	Plain	Flat (carbide tip)	—
0 - 1"	<b>150-198</b>	±.0001"	.375"	Plain	Flat (carbide tip)	w/o ratchet stop
0 - 1"	<b>150-207</b>	±.0001"	.375"	w/clamp nut	Flat (carbide tip)	—
0 - 1"	<b>150-197</b>	±.0001"	.375"	w/clamp nut	Flat (carbide tip)	w/o ratchet stop
0 - 1"	<b>150-213</b>	±.0001"	.375"	Plain*	Flat (carbide tip)	—
0 - 1"	<b>150-214</b>	±.0001"	.375"	w/clamp nut*	Flat (carbide tip)	—
0 - 1"	<b>150-811</b>	±.0001"	.375"	Plain	Spherical (SR4)	—
0 - 1"	<b>150-812</b>	±.0001"	.375"	w/clamp nut	Spherical (SR4)	—
0 - 1"	<b>150-831</b>	±.0001"	.375"	Plain	Flat (carbide tip)	Reverse reading
0 - 1"	<b>150-832</b>	±.0001"	.375"	w/clamp nut	Flat (carbide tip)	Reverse reading
0 - 1"	<b>150-206</b>	±.0001"	.375"	Plain	Flat (carbide tip)	w/ vernier (.0001")
0 - 1"	<b>150-205</b>	±.0001"	.375"	w/clamp nut	Flat (carbide tip)	w/ vernier (.0001")
0 - 1"	<b>150-215</b>	±.0001"	.375"	Plain*	Flat (carbide tip)	w/ vernier (.0001")
0 - 1"	<b>150-216</b>	±.0001"	.375"	w/clamp nut*	Flat (carbide tip)	w/ vernier (.0001")
0 - 1"	<b>150-217</b>	±.0001"	.375"	Plain*	Flat (carbide tip)	w/o ratchet stop
0 - 1"	<b>150-218</b>	±.0001"	.375"	w/clamp nut*	Flat (carbide tip)	w/o ratchet stop
0 - 1"	<b>150-221</b>	±.0001"	.375"	Plain	Flat	Long spindle
0 - 1"	<b>150-222</b>	±.0001"	.375"	w/ clamp nut	Flat	Long spindle

\*with spindle lock

### DIMENSIONS AND MASS



150-801



150-191

### Technical Data

Graduations: 0.01mm, 0.001mm, .001" or .0001"  
 Spindle pitch: 0.5mm  
 Spindle face: Flat with carbide tip\* (more than HRA90) or spherical, lapped surface  
 \*Long spindle type: SKS3 (more than HRC60)  
 Scale surface: Hard-chrome plating  
 Fixture thickness for clamp nut: 11.5mm

# Micrometer Heads

## SERIES 151 — Common Type in Middle Size with 8mm Diameter Spindle

### FEATURES

- 8mm diameter spindle for heavy duty use.
- Ratchet stop for constant force.
- Carbide tipped measuring face.

### SPECIFICATIONS

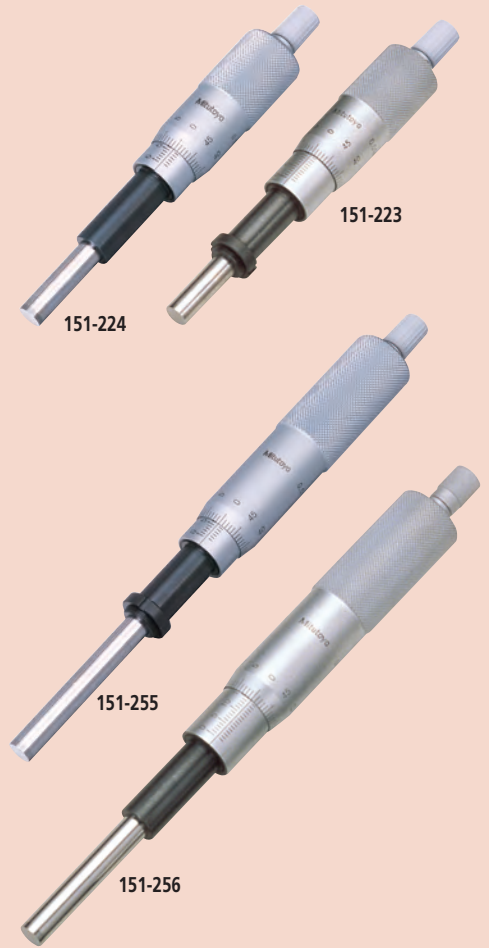
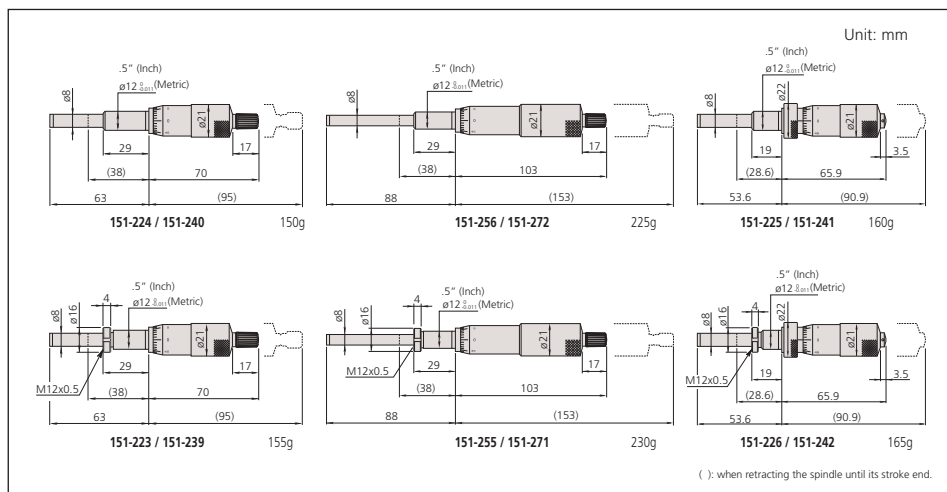
Metric						
Range	Order No.	Accuracy	Stem dia.	Stem	Spindle face	Remarks
0 - 25mm	151-224	±2μm	12mm	Plain	Flat (carbide tip)	—
0 - 25mm	151-223	±2μm	12mm	w/clamp nut	Flat (carbide tip)	—
0 - 25mm	151-214	±2μm	12mm	Plain*	Flat (carbide tip)	—
0 - 25mm	151-213	±2μm	12mm	w/clamp nut*	Flat (carbide tip)	—
0 - 25mm	151-222	±2μm	12mm	Plain	Flat (carbide tip)	w/ vernier (0.001mm)
0 - 25mm	151-221	±2μm	12mm	w/clamp nut	Flat (carbide tip)	w/ vernier (0.001mm)
0 - 25mm	151-212	±2μm	12mm	Plain*	Flat (carbide tip)	w/ vernier (0.001mm)
0 - 25mm	151-211	±2μm	12mm	w/clamp nut*	Flat (carbide tip)	w/ vernier (0.001mm)
0 - 25mm	151-227	±2μm	12mm	Plain	Flat (carbide tip)	w/o ratchet stop
0 - 25mm	151-228	±2μm	12mm	w/clamp nut	Flat (carbide tip)	w/o ratchet stop
0 - 25mm	151-225	±2μm	12mm	Plain*	Flat (carbide tip)	w/o ratchet stop
0 - 25mm	151-226	±2μm	12mm	w/clamp nut*	Flat (carbide tip)	w/o ratchet stop
0 - 50mm	151-256	±4μm	12mm	Plain	Flat (carbide tip)	—
0 - 50mm	151-255	±4μm	12mm	w/clamp nut	Flat (carbide tip)	—
0 - 50mm	151-260	±4μm	12mm	Plain	Flat (carbide tip)	w/o ratchet stop
0 - 50mm	151-259	±4μm	12mm	w/ clamp nut	Flat (carbide tip)	w/o ratchet stop

\*with spindle lock

Inch						
Range	Order No.	Accuracy	Stem dia.	Stem	Spindle face	Remarks
0 - 1"	151-240	±.0001"	.5"	Plain	Flat (carbide tip)	—
0 - 1"	151-239	±.0001"	.5"	w/clamp nut	Flat (carbide tip)	—
0 - 1"	151-238	±.0001"	.5"	Plain	Flat (carbide tip)	w/ vernier (.0001")
0 - 1"	151-237	±.0001"	.5"	w/clamp nut	Flat (carbide tip)	w/ vernier (.0001")
0 - 1"	151-243**	±.0001"	.5"	Plain*	Flat (carbide tip)	w/ vernier (.0001")
0 - 1"	151-244**	±.0001"	.5"	w/clamp nut*	Flat (carbide tip)	w/ vernier (.0001")
0 - 1"	151-241	±.0001"	.5"	Plain*	Flat (carbide tip)	w/o ratchet stop
0 - 1"	151-242	±.0001"	.5"	w/clamp nut*	Flat (carbide tip)	w/o ratchet stop
0 - 2"	151-272	±.0002"	.5"	Plain	Flat (carbide tip)	—
0 - 2"	151-271	±.0002"	.5"	w/clamp nut	Flat (carbide tip)	—

\*with spindle lock \*\*with ratchet stop

### DIMENSIONS AND MASS



### Technical Data

Graduations: 0.01mm, 0.001mm, .001" or .0001"  
 Spindle pitch: 0.5mm  
 Spindle face: Flat with carbide tip (more than HRA90), lapped surface  
 Scale surface: Hard-chrome plating  
 Fixture thickness for clamp nut: 25.5mm

# Micrometer Heads

## SERIES 153 — Non-Rotating Spindle Type

### FEATURES

- Carbide tipped measuring face.
- Non-rotating spindle.

### SPECIFICATIONS

#### Metric

Range	Order No.	Accuracy	Stem dia.	Stem	Spindle face	Remarks
0 - 15mm	<b>153-101</b>	±3μm	9.5mm	Plain	Flat (carbide tip)	w/ vernier (0.001mm)
0 - 25mm	<b>153-201*</b>	±3μm	12mm	Plain	Flat (carbide tip)	—
0 - 25mm	<b>153-202*</b>	±3μm	12mm	Plain	Flat (carbide tip)	w/ vernier (0.001mm)
0 - 25mm	<b>153-203</b>	±3μm	12mm	Plain	Flat (carbide tip)	—
0 - 25mm	<b>153-204</b>	±3μm	12mm	Plain	Flat (carbide tip)	w/ vernier (0.001mm)

\*with ratchet stop

#### Inch

Range	Order No.	Accuracy	Stem dia.	Stem	Spindle face	Remarks
0 - .5"	<b>153-108</b>	±.00015"	.375"	Plain	Flat (carbide tip)	w/ vernier (.0001")
0 - 1"	<b>153-205*</b>	±.00015"	.5"	Plain	Flat (carbide tip)	—
0 - 1"	<b>153-206*</b>	±.00015"	.5"	Plain	Flat (carbide tip)	w/ vernier (.0001")
0 - 1"	<b>153-207</b>	±.00015"	.5"	Plain	Flat (carbide tip)	—
0 - 1"	<b>153-208</b>	±.00015"	.5"	Plain	Flat (carbide tip)	w/ vernier (.0001")

\*with ratchet stop

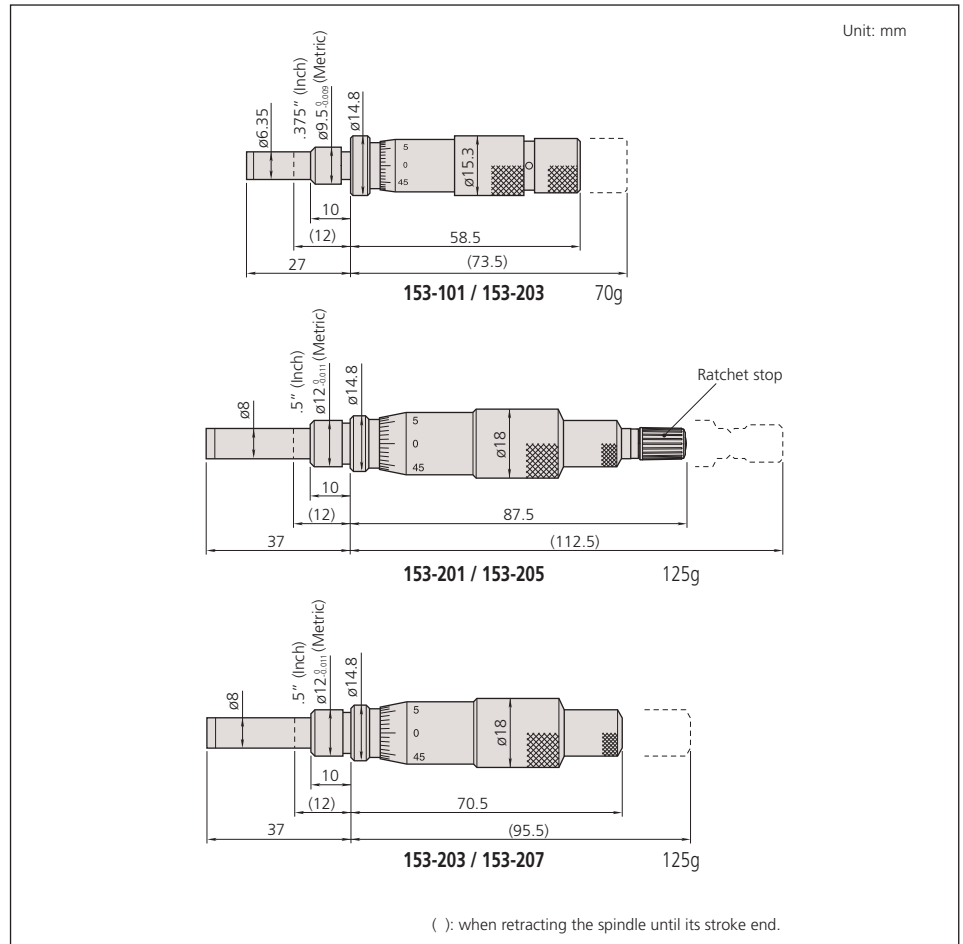


### Technical Data

Graduations: 0.01mm, 0.001mm, .001" or .0001"  
Spindle pitch: 0.5mm

Spindle face: Flat with carbide tip (more than HRA90), lapped surface  
Scale surface: Hard-chrome plating

### DIMENSIONS AND MASS



# Micrometer Heads

## SERIES 152 — Quick Spindle Feeding of 1mm/rev.

### FEATURES

- Quick spindle feeding of 1mm/rev.
- Carbide tipped measuring face.



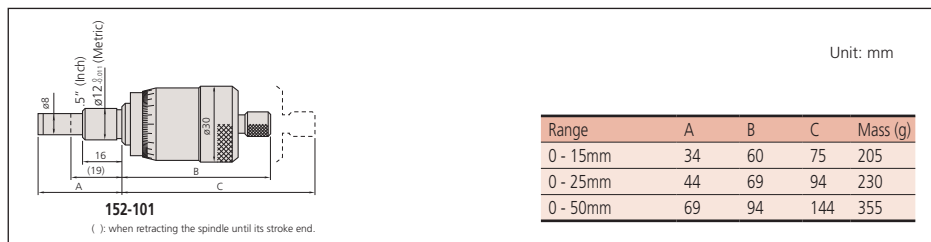
152-102

### SPECIFICATIONS

#### Metric

Range	Order No.	Accuracy	Stem dia.	Stem	Spindle face	Remarks
0 - 15mm	152-101	±2μm	12mm	Plain	Flat (carbide tip)	—
0 - 25mm	152-102	±2μm	12mm	Plain	Flat (carbide tip)	—
0 - 50mm	152-103	±4μm	12mm	Plain	Flat (carbide tip)	—

### DIMENSIONS AND MASS



# Micrometer Heads

## SERIES 152 — Large Thimble Type for Fine Feeding

### FEATURES

- The large diameter thimble for fine adjustment and positioning.
- Carbide tipped measuring face.

### SPECIFICATIONS

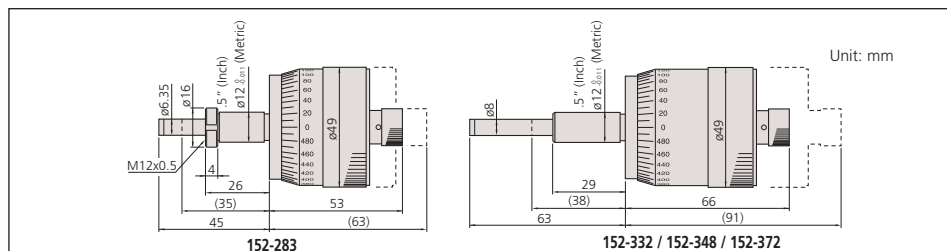
#### Metric

Range	Order No.	Accuracy	Stem dia.	Stem	Spindle face	Remarks
0 - 10mm	152-283	±2μm	12mm	w/clamp nut	Flat (carbide tip)	—
0 - 25mm	152-332	±2μm	12mm	Plain	Flat (carbide tip)	—
0 - 25mm	152-348	±2μm	12mm	Plain	Flat (carbide tip)	Bidirectional graduation
0 - 50mm	152-380	±4μm	12mm	Plain	Flat (carbide tip)	Bidirectional graduation

#### Inch

Range	Order No.	Accuracy	Stem dia.	Stem	Spindle face	Remarks
0 - 1"	152-372	±.0001"	.5"	Plain	Flat (carbide tip)	Bidirectional graduation
0 - 2"	152-388	±.0002"	.5"	Plain	Flat (carbide tip)	Bidirectional graduation

### DIMENSIONS AND MASS



### Technical Data

Graduations: 0.01mm

Spindle pitch: 1mm

Spindle face: Flat with carbide tip (more than HRA90), lapped surface

Scale surface: Hard-chrome plating



152-283

### Technical Data

Graduations: 0.002mm or .0001"

Spindle pitch: 1mm

Spindle face: Flat with carbide tip (more than HRA90), lapped surface

Scale surface: White anodized aluminum

Fixture thickness for clamp nut: 22.5mm

# Micrometer Heads

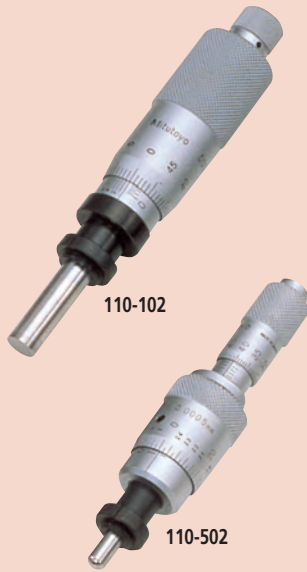
## SERIES 110 — Differential Screw Translator (Extra-Fine Feeding) Type

### FEATURES

- Differential movements of spindle threads and units allow fine spindle feeding (0.05mm/rev\*), resulting in high resolution measurements.

\*110-502, 110-504: 0.025mm/rev / .001"/rev (fine feeding)

- Carbide tipped measuring face.
- Non-rotating spindle.



### Technical Data

Graduations: 0.001mm, 0.0005mm, 0.0001mm, .00005" or .00002", .000005"

Spindle pitch: 0.05mm or 0.025mm

Spindle face: Flat with carbide tip (more than HRA90) or spherical, lapped surface

Scale surface: Hard-chrome plating

Fixture thickness for clamp nut: 9.5mm (11.5mm\*)

\*110-502, 110-504

### SPECIFICATIONS

#### Metric

Range	Order No.	Graduation	Accuracy*	Stem dia.	Stem	Spindle face
0 - 1mm	110-105	0.001mm	±3 / ±1.5μm	12mm	w/clamp nut	Flat (carbide tip)
0 - 1mm	110-106	0.0001mm	±3 / ±1.5μm	12mm	w/clamp nut	Flat (carbide tip)
0 - 1mm	110-107	0.001mm	±3 / ±1.5μm	12mm	w/clamp nut	Flat (carbide tip)
0 - 1mm	110-108	0.0001mm	±3 / ±1.5μm	12mm	w/clamp nut	Flat (carbide tip)
0 - 2.5mm	110-101	0.001mm	±3 / ±1.5μm	12mm	w/clamp nut	Spherical (SR8)
0 - 2.5mm	110-102	0.0001mm	±3 / ±1.5μm	12mm	w/clamp nut	Spherical (SR8)
0 - 13mm	110-502*	0.0005mm 0.01mm	±3 / ±1.5μm	9.5mm	w/clamp nut	Spherical (SR3)

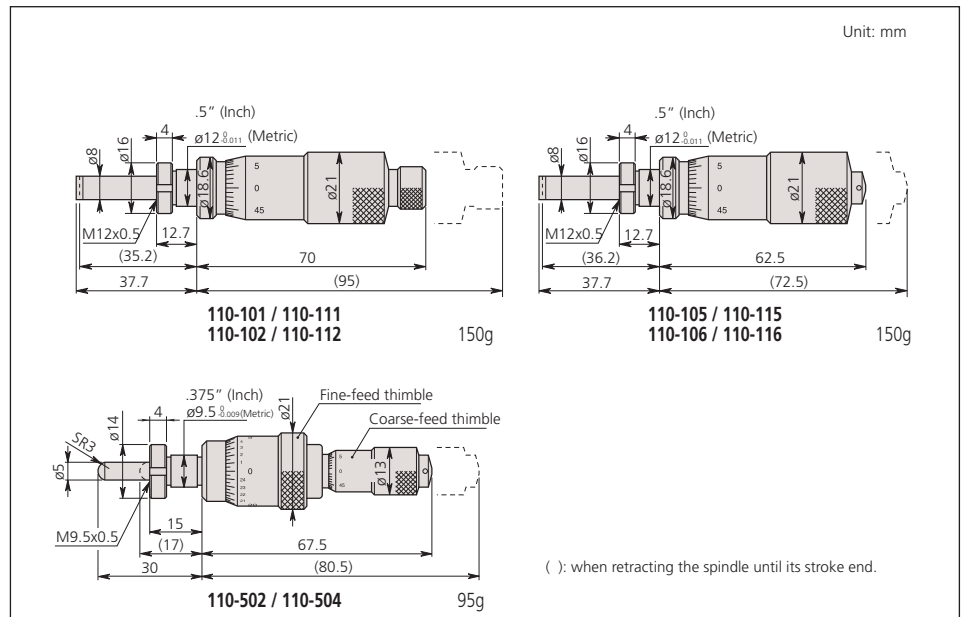
\* Narrow range: 0.2mm

#### Inch

Range	Order No.	Graduation	Accuracy*	Stem dia.	Stem	Spindle face
0 - .02"	110-115	.00005"	±.00015" / ±.00006"	.5"	w/clamp nut	Flat (carbide tip)
0 - .02"	110-116	.000005"	±.00015" / ±.00006"	.5"	w/clamp nut	Flat (carbide tip)
0 - .02"	110-117	.00005"	±.00015" / ±.00006"	.5"	w/clamp nut	Flat (carbide tip)
0 - .02"	110-118	.000005"	±.00015" / ±.00006"	.5"	w/clamp nut	Flat (carbide tip)
0 - .05"	110-111	.00005"	±.0002" / ±.00006"	.5"	w/clamp nut	Spherical (SR8)
0 - .05"	110-112	.000005"	±.0002" / ±.00006"	.5"	w/clamp nut	Spherical (SR8)
0 - .5"	110-504*	.00002" .001"	±.00015" / ±.00006"	.375"	w/clamp nut	Spherical (SR3)

\* Narrow range: .006"

### DIMENSIONS AND MASS



# Micrometer Heads

## SERIES 152 — for XY-Stage

### FEATURES

#### 152-390, 152-389, 152-391, 152-392

- Non-rotating device is attached to the spindle tip.
- Floating thimble allows easy zero setting at any spindle position.
- Bidirectional graduation for easy reading in both directions.

#### 152-401, 152-402

- Adjustable spindle can be moved with the thimble held at any position, allowing easy zero-setting.

### SPECIFICATIONS

Metric						
Range	Order No.	Accuracy	Stem dia.	Stem	Spindle face	Remarks
0 - 25mm	<b>152-390</b>	$\pm 2\mu\text{m}$	18mm	Plain	Flat (hardened) with non-rotating device	for X-axis, Bidirectional grad.
0 - 25mm	<b>152-389</b>	$\pm 2\mu\text{m}$	18mm	Plain		for Y-axis, Bidirectional grad.
0 - 25mm	<b>152-402*</b>	$\pm 2\mu\text{m}$	18mm	Plain	Spherical with carbide tip (SR10)	for X-axis, with vernier
0 - 25mm	<b>152-401*</b>	$\pm 2\mu\text{m}$	18mm	Plain		for Y-axis, with vernier

\*0.001mm reading is obtained with vernier

### Inch

Range	Order No.	Accuracy	Stem dia.	Stem	Spindle face	Remarks
0 - 1"	<b>152-392</b>	$\pm .0001"$	.709"	Plain	Flat (hardened) with non-rotating device	for X-axis, Bidirectional grad.
0 - 1"	<b>152-391</b>	$\pm .0001"$	.709"	Plain		for Y-axis, Bidirectional grad.



152-390

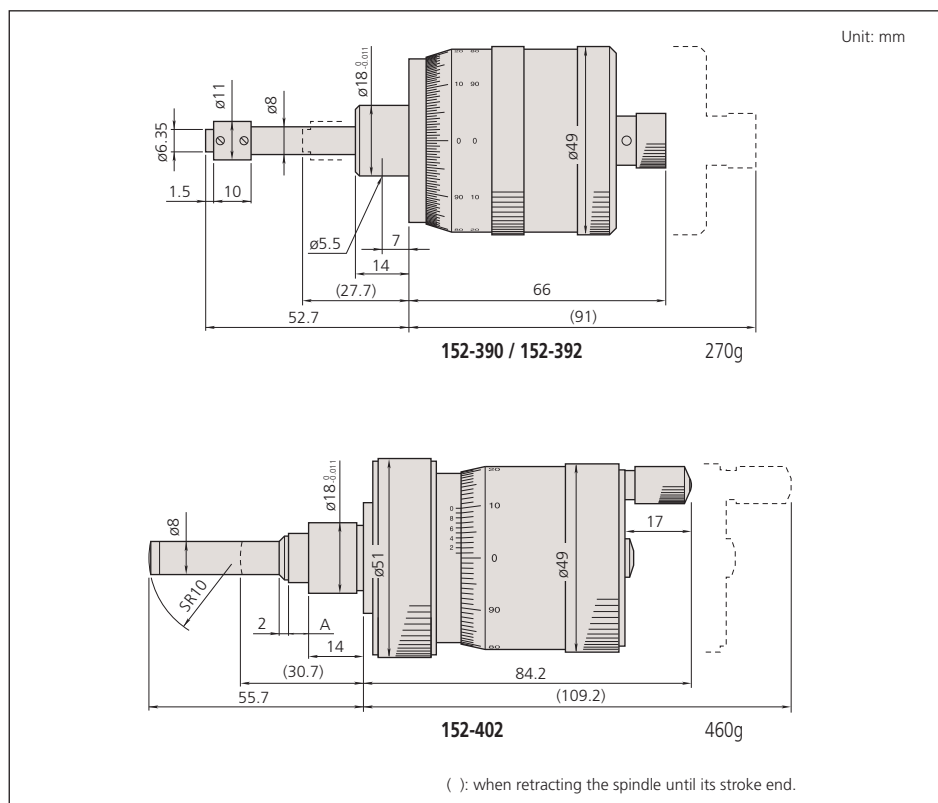
### Technical Data

Graduations: 0.005mm, 0.001mm\*  
\*vernier reading

Spindle pitch: 1mm

Spindle face: Flat (hardened) or spherical with carbide tip (more than HRA90), lapped surface  
Scale surface: White anodized aluminum

### DIMENSIONS AND MASS





# Micrometer Heads

## SERIES 197 — Non-Rotating Spindle and Large Thimble



197-101

### Technical Data

Graduations: 0.005mm or .0002"  
 Spindle pitch: 1mm  
 Spindle face: Flat with carbide tip (more than HRA90), lapped surface  
 Scale surface: White anodized aluminum

### FEATURES

- Large thimble micrometer head with non-rotating spindle.
- Floating thimble allows easy zero setting at any spindle position.
- Bidirectional graduation for easy reading in both directions.
- Dual-spindle mechanism for quick feeding of 1mm/rev.
- Carbide tipped measuring face.

### SPECIFICATIONS

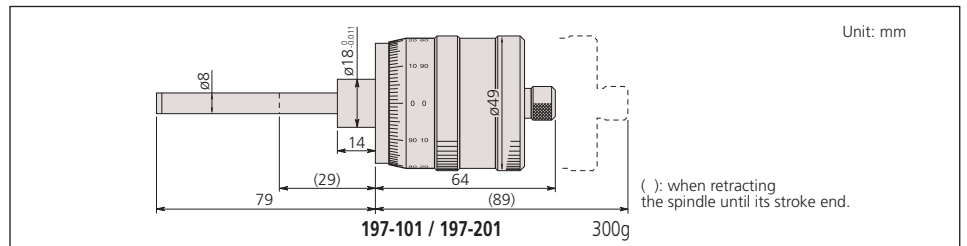
#### Metric

Range	Order No.	Accuracy	Stem dia.	Stem	Spindle face	Remarks
0 - 50mm	197-101	±5µm	18mm	Plain	Flat (carbide tip)	Bidirectional graduation

#### Inch

Range	Order No.	Accuracy	Stem dia.	Stem	Spindle face	Remarks
0 - 2"	197-201	±.0002"	.709"	Plain	Flat (carbide tip)	Bidirectional graduation

### DIMENSION AND MASS



153-301

### Technical Data

Graduations: 0.0005mm or .00001"  
 Spindle pitch: 0.5mm  
 Spindle face: Flat with carbide tip (more than HRA90), lapped surface  
 Scale surface: White anodized aluminum

# Micrometer Heads

## SERIES 153 — Fine Graduation and High Accuracy

### FEATURES

- Fine graduation and high resolution model.
- Large thimble micrometer head with non-rotating spindle.
- Bidirectional graduation for easy reading in both directions.
- Carbide tipped measuring face.

### SPECIFICATIONS

#### Metric

Range	Order No.	Accuracy*	Stem dia.	Stem	Spindle face	Remarks
0 - 25mm	153-301	±1 / ±0.5µm	18mm	Plain	Flat (carbide tip)	Bidirectional graduation

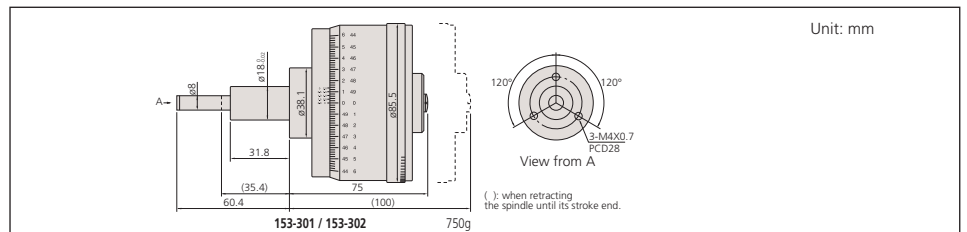
\*Wide range / narrow range

#### Inch

Range	Order No.	Accuracy*	Stem dia.	Stem	Spindle face	Remarks
0 - 1"	153-302	±.00004" / ±.00002"	.709"	Plain	Flat (carbide tip)	Bidirectional graduation

\*Wide range / narrow range

### DIMENSIONS AND MASS



# Digital Micrometer Heads

## SERIES 164 — High Resolution and High Accuracy

### FEATURES

- Connecting with an external display unit, the Electronic Micrometer Head provides the most efficient means of obtaining precision measurement on XY-stages and similar applications.
- External display units (KA Counter) are optional.



164-141



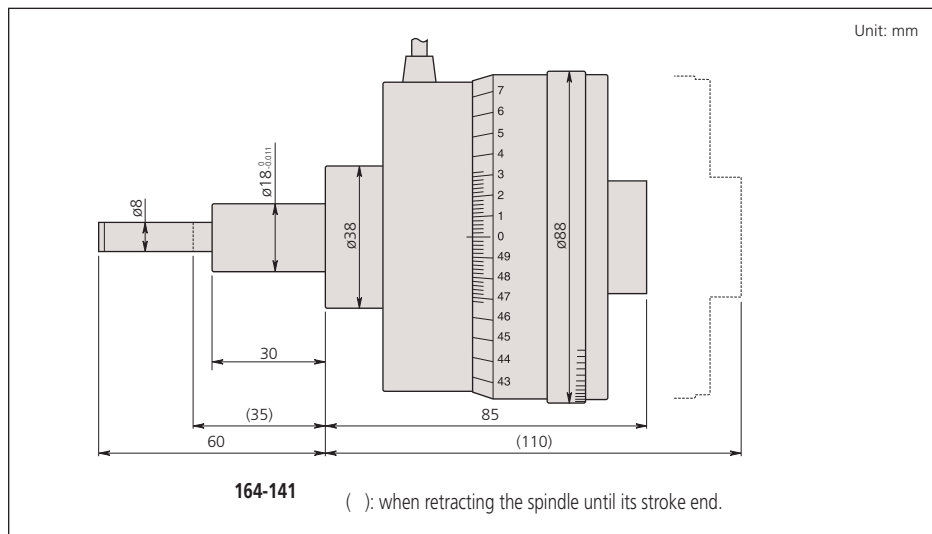
174-173A

### SPECIFICATIONS

Metric						
Range	Order No.	Accuracy	Stem dia.	Stem	Spindle face	Remarks
0 - 25mm	164-141	$\pm 0.001\text{mm} / \pm 0.0005\text{mm}^*$	38mm	Plain	Flat (carbide tip)	High accuracy model

\*Wide range / narrow range

### DIMENSIONS AND MASS

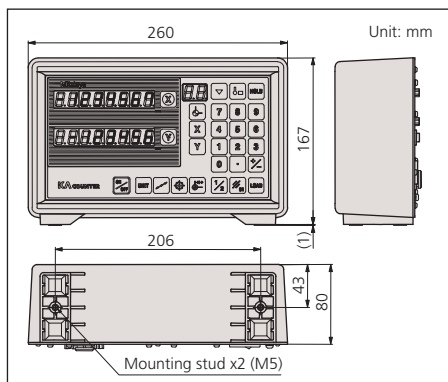


### SPECIFICATIONS: KA counter

Order No.	174-173A
Resolution	0.001mm, 0.005mm, .0001", .0005" (selectable)
Mass	1.1kg

09AAA207: Adapter (must purchase)

### DIMENSIONS



### Technical Data

Accuracy:  $\pm 2\mu\text{m}$

Stem diameter: 18mm

Resolution: 0.0001mm

When using the external KA counter (must purchase adapter: 09AAA207)

# Micrometer Heads

## SERIES 250 — with Digit Counter



250-301

### Technical Data

Graduations: 0.01mm or .0001"  
Spindle pitch: 0.5mm

Spindle face: Flat with carbide tip (more than HRA90), lapped surface

Scale surface: Hard-chrome plating

### FEATURES

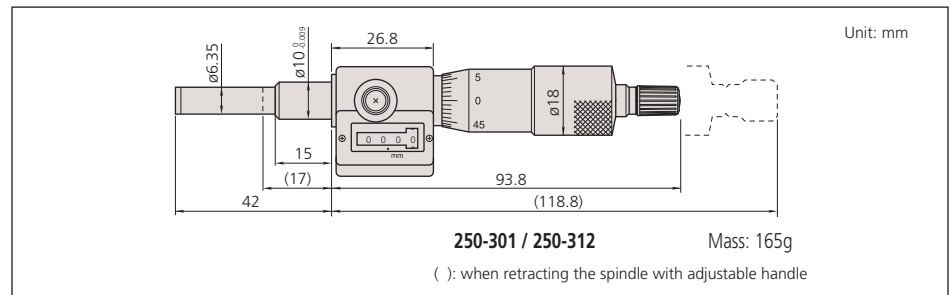
- Digit counter for easy reading of spindle movement.
- Carbide tipped measuring face.
- Ratchet Stop for constant force.

### SPECIFICATIONS

Metric						
Range	Order No.	Accuracy	Stem dia.	Stem	Spindle face	Remarks
0 - 25mm	250-301	±2µm	10mm	Plain	Flat (carbide tip)	—

Inch						
Range	Order No.	Accuracy	Stem dia.	Stem	Spindle face	Remarks
0 - 1"	250-312	±.0001"	.375"	Plain	Flat (carbide tip)	w / vernier (.0001")

### DIMENSIONS AND MASS



# Micro Jack

## SERIES 7

### FEATURES

- Used for accurate leveling of machines, surface plates, and other precision instruments.
- Easy adjustment under heavy load.



7850

### Technical Data

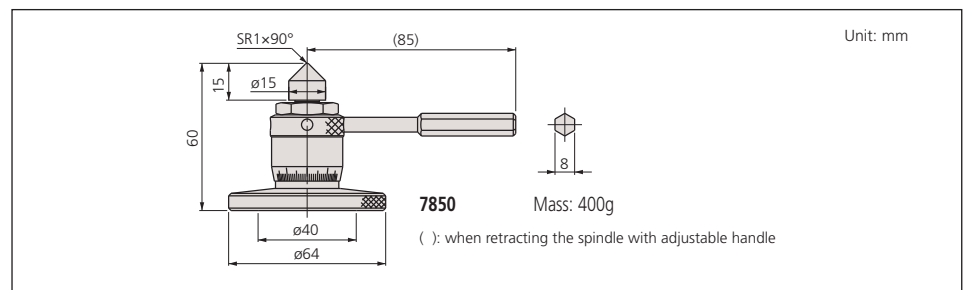
Graduations: 0.01mm



### SPECIFICATIONS

Metric				
Range	Order No.	Graduation	Max. Load	Remarks
60 - 75mm	7850	0.01mm	400kg	adjustable handle

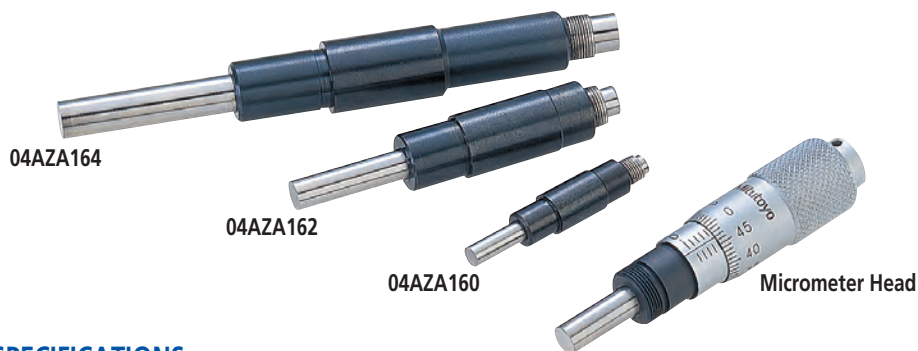
### DIMENSIONS AND MASS



# Precision Lead Screw

## FEATURES

- Mitutoyo manufactures simple and less expensive precision lead screws for precise positioning mechanisms and fine feed mechanisms, in addition to the conventional micrometer heads.
- Mitutoyo also manufactures screws with special specifications, such as 0.25 mm pitch, as well as those with the standard 0.5 mm feed pitch and with dimensions and forms that meet customer's requirements.



## SPECIFICATIONS

Order No.	04AZA160	04AZA161	04AZA162	04AZA163	04AZA164	04AZA165
Model	AS-6.5	BS-6.5	AS-13	BS-13	AS-25	BS-25
Stroke	6.5		13		25	
Feeding pitch	0.5					
Feeding accuracy	±5μm			±2μm		
Stem diameter	ø6-0.008		ø9.5-0.009		ø10-0.009	
Tip diameter	ø3.5		ø5		ø6.35	
Tail diameter	ø3-0.01		ø5-0.012		ø6-0.015	
Screw nominal diameter	M4.5 x 0.5		0		M7.35 x 0.5	
Sleeve diameter	ø7		ø10.5		ø12	
Measuring face	Hardening				With Carbide tip	
Mass (g)	10	11	27	30	61	64
Others	•AS type: Flat spindle tip without nut •BS type: Spherical spindle tip with nut					

## DIMENSIONS

Unit: mm

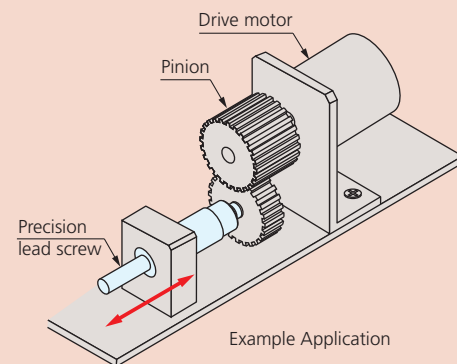
**Type A: Straight type**

**Type B: Stem with nut**

Order No.	L	L1	L2	L3	L4	L5
04AZA160	39	15	14.5	9	6	—
04AZA161	39	15	14.5	7.5	6	3
04AZA162	57.5	25	21.5	15.5	8	—
04AZA163	57.5	25	21.5	15.5	8	4
04AZA164	98.5	42	39.5	27	10	—
04AZA165	98.5	42	39.5	27	10	4

## Technical Data

- Durability: 100,000 cycles are guaranteed (use condition: 4 kg load; 2 kg for AS-6.5 and BS-6.5)
- Main applications
  - Precision feed stages
  - Fine adjustment of optical elements (mirrors, prisms)
  - Fiber optic centering devices
  - Various assembly and adjustment jigs

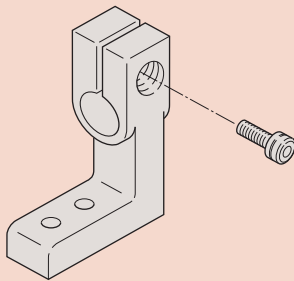
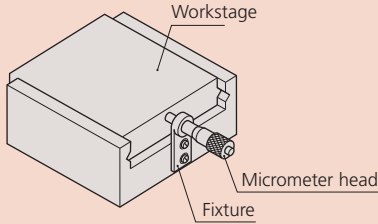


# Fixtures for Micrometer Heads

## FEATURES

• The act of fabricating brackets to mount micrometer heads for each particular application can be laborious and costly. Mitutoyo offers various types of fixtures for micrometer heads to meet a wide range of applications. These fixtures are made of nickel-plated cast iron.

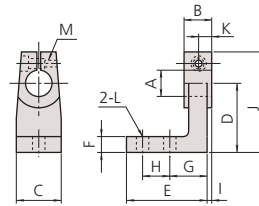
• There are two types of fixtures for micrometer heads with or without clamping nut on the stem.



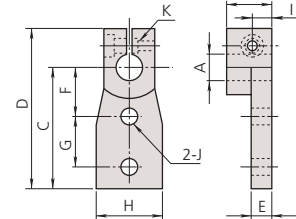
**Note:** Supplied with a socket head screw (M3x0.5x12mm) for the fixtures to be used with a micrometer head without clamp nut (plain stem type micrometer head).

## DIMENSIONS: Fixtures for plain stem type micrometer heads

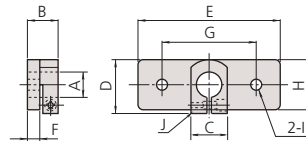
Unit: mm



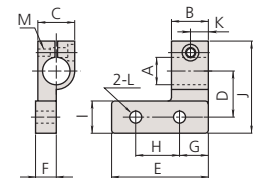
Order No.	303560	303569	303579
A	ø9.5	ø9.5	ø10
B	9	14.5	14.5
C	14.5	19.5	19.5
D	20	30	30
E	23	35	35
F	5	7	7
G	11	16	16
H	8	12	12
I	1.5	3.25	3.25
J	32.5	42.5	42.5
K	4.5	7.25	7.25
L	ø3.4	ø4.5	ø4.5
M	M3x0.5	M3x0.5	M3x0.5



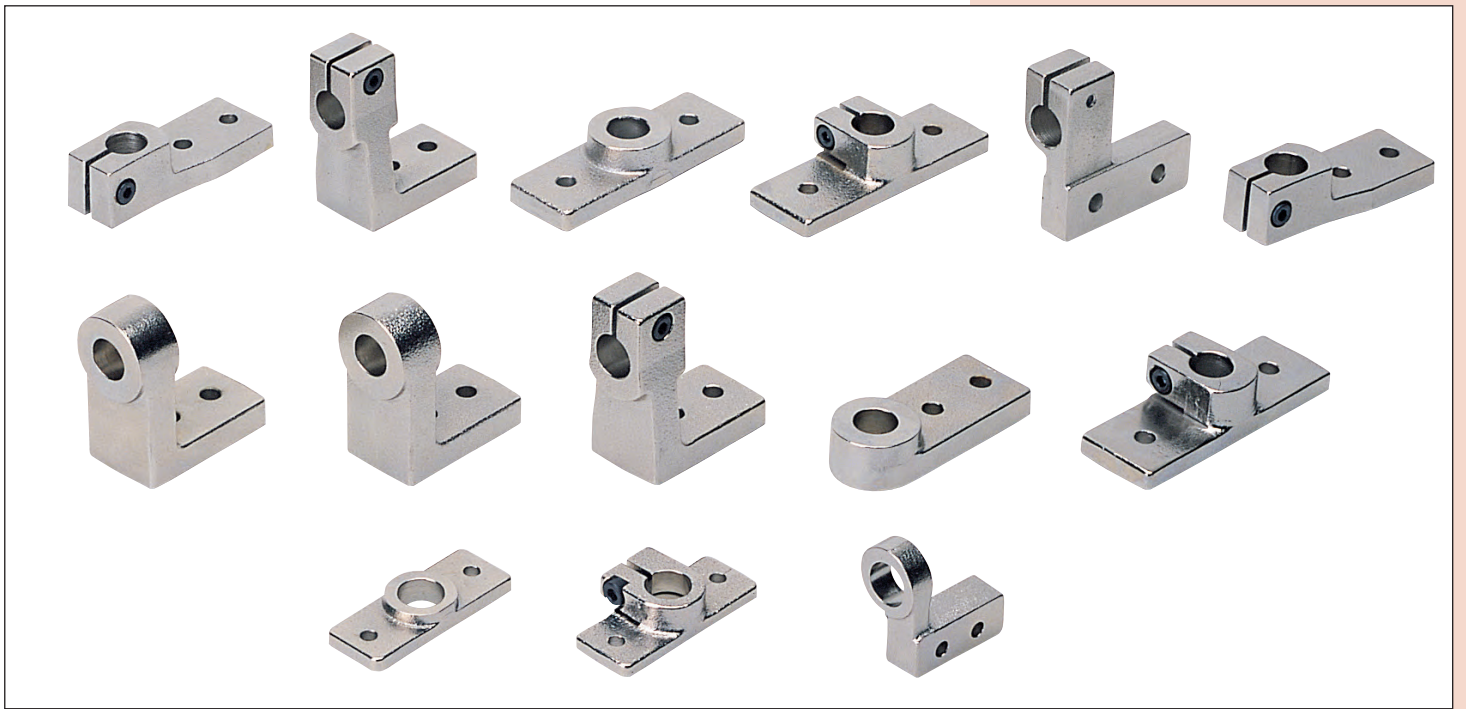
Order No.	303564	303573	303583
A	ø9.5	ø9.5	ø10
B	9	14.5	14.5
C	30	40	40
D	42.5	52.5	52.5
E	4	6	6
F	15	18	18
G	10	15	15
H	15	20	20
I	4.5	7.25	7.25
J	ø3.4	ø4.5	ø4.5
K	M3x0.5	M3x0.5	M3x0.5



Order No.	303562	303571	303581
A	ø9.5	ø9.5	ø10
B	9	14.5	14.5
C	15	15	15
D	20	22.5	22.5
E	40	60	60
F	3	5	5
G	30	40	40
H	15	20	20
I	ø3.4	ø4.5	ø4.5
J	M3x0.5	M3x0.5	M3x0.5

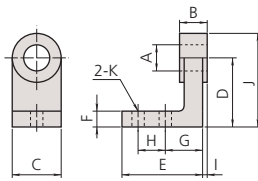


Order No.	303566	303575	303585
A	ø9.5	ø9.5	ø10
B	9	14.5	14.5
C	15	15	15
D	15	20	20
E	25	40	40
F	8.5	8.5	8.5
G	7.5	10	10
H	10	20	20
I	10	15	15
J	32.5	40	40
K	4.5	7.25	7.25
L	ø3.4	ø4.5	ø4.5
M	M3x0.5	M3x0.5	M3x0.5

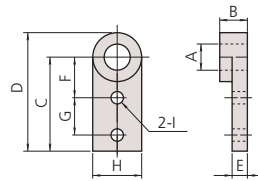


### DIMENSIONS: Fixtures for micrometer heads with clamp nut

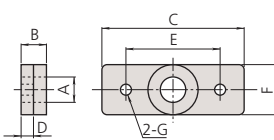
Unit: mm



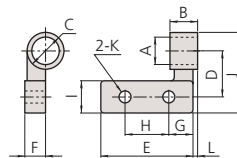
Order No.	303559	303568	303578
A	ø9.5	ø9.5	ø10
B	6	11.5	11.5
C	14.5	19.5	19.5
D	20	30	30
E	24	35	35
F	5	7	7
G	11	16	16
H	8	12	12
I	0.5	1.75	1.75
J	27.5	40	40
K	ø3.4	ø4.5	ø4.5



Order No.	303563	303572	303582
A	ø9.5	ø9.5	ø10
B	6	11.5	11.5
C	30	40	40
D	37.5	50	50
E	4.5	6.5	6.5
F	15	18	18
G	10	15	15
H	15	20	20
I	ø3.4	ø4.5	ø4.5



Order No.	303561	303570	303580
A	ø9.5	ø9.5	ø10
B	6	11.5	11.5
C	40	60	60
D	3.5	5.5	5.5
E	30	40	40
F	15	20	20
G	ø3.4	ø4.5	ø4.5



Order No.	303565	303574	303584
A	ø9.5	ø9.5	ø10
B	6	11.5	11.5
C	ø15	ø15	ø15
D	15	20	20
E	25	40	40
F	8.5	8.5	8.5
G	7.5	10	10
H	10	20	20
I	10	15	15
J	27.5	35	35
K	ø3.4	ø4.5	ø4.5
L	0.75	1.25	1.25



**Holtest ABSOLUTE Borematic**



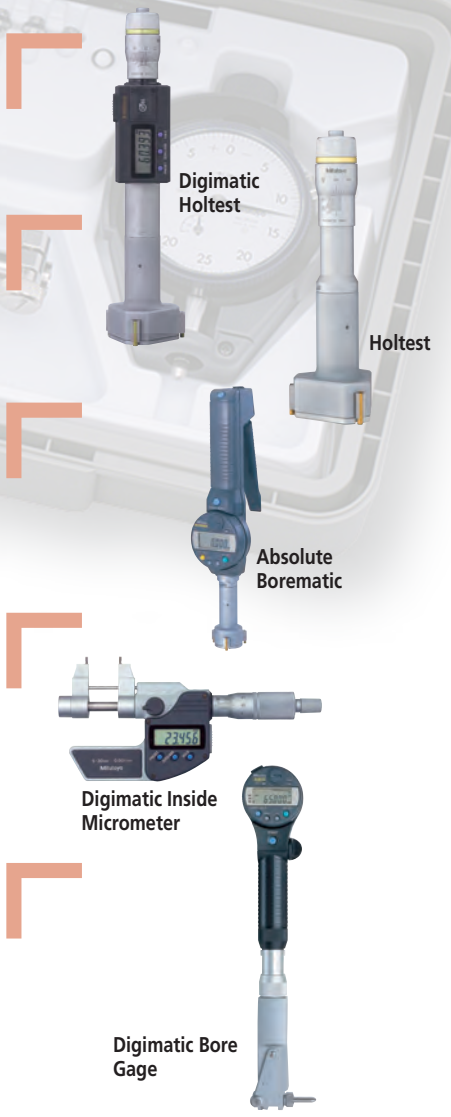
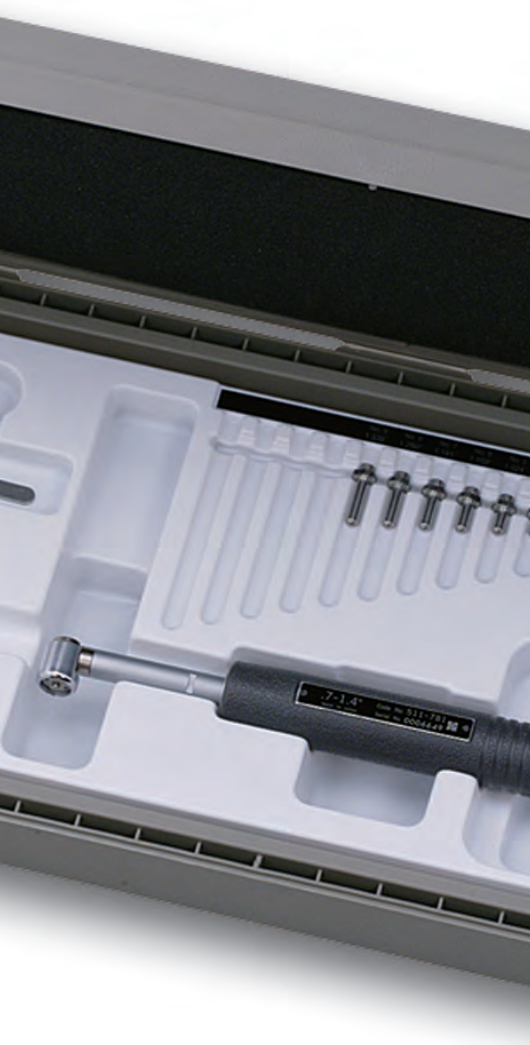
**Inside Micrometers**



**Bore Gages**

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Digimatic Holtest

Holtest

Absolute Borematic

Digimatic Inside Micrometer

Digimatic Bore Gage

# Digimatic Holtest

## SERIES 468 — Three-Point Internal Micrometers

### FEATURES

- TiN-coated measuring contact points provide excellent durability and impact resistance and allow the instrument to measure to the bottom of a blind hole (up to 100mm / 4" models).
- Large LCD readout.
- Functions available: Presetting, Zero/ABS, Auto power On/Off, Data hold, Data output, Error alarm, Battery replacement alarm.
- With Ratchet Stop for constant force.
- Can measure deep holes by attaching an Extension rod (optional).
- Setting rings for origin point setting are optional.
- Supplied in fitted plastic case up to 100mm / 4" . Over 100mm / 4" supplied in wooden case.



468-261

468-263



468-274



TiN coated contact points  
(\*-10" suffix models only)

### DIMENSIONS AND MASS

Unit: mm

Range	L	Mass (g)
6 - 8mm / .275 - .35"	59	400
8 - 10mm / .35 - .425"	59	400
10 - 12mm / .425 - .5"	59	400
12 - 16mm / .5 - .65"	84	430
16 - 20mm / .65 - .8"	84	430
20 - 25mm / .8 - 1"	93	500
25 - 30mm / 1 - 1.2"	93	510
30 - 40mm / 1.2 - 1.6"	103.8	510
40 - 50mm / 1.6 - 2"	103.8	530
50 - 63mm / 2 - 2.5"	105.4	650
62 - 75mm / 2.5 - 3.0"	105.4	660
75 - 88mm / 3.0 - 3.5"	105.4	990
87 - 100mm / 3.5 - 4.0"	105.4	1000
100 - 125mm / 4 - 5"	151.4	970
125 - 150mm / 5 - 6"	151.4	1060
150 - 175mm / 6 - 7"	151.4	1150
175 - 200mm / 7 - 8"	151.4	1240
200 - 225mm / 8 - 9"	151.4	1330
225 - 250mm / 9 - 10"	151.4	1420
250 - 275mm / 10 - 11"	151.4	1510
275 - 300mm / 11 - 12"	151.4	1600

#### Measuring a Blind Hole

The measuring contact points held in the jaws permit measuring the diameter of a blind hole to the bottom.  
(up to 100mm / 4" models)

Range	a	b	c
6 - 12mm / .275 - .5"	2	—	2.5
12 - 20mm / .5 - .8"	0.3	5.6	3.5
20 - 30mm / .8 - 1.2"	0.3	8.3	5.2
30 - 50mm / 1.2 - 2"	0.3	13	10
50 - 100mm / 2 - 4"	0.3	17	14
100 - 300mm / 4 - 12"	12.4	21	13.8



### Technical Data

Accuracy: Refer to the list of specifications.  
 Resolution: 0.001mm or .00005"/0.001mm  
 (over 4 - 5" models: .0001"/0.001mm)  
 Contact point: TiN coating  
 Measuring method: Three-point method  
 Display: LCD  
 Battery: SR44 (2 pcs.), **938882**  
 Battery life: Approx. 8 months under normal use

### Function

Zero/ABS, Auto Power On/Off, Data hold, Data output,  
 Preset, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error

### Optional Accessories

- 05CZA662:** SPC cable (1m / 40")
- 05CZA663:** SPC cable (2m / 80")
- 04AZB157:** Mounting plate for stand
- 156-101:** Stand
- 952322:** Extension rod 100mm / 3.94"  
For range 6-12mm / .275 - .5" models
- 952621:** Extension rod 150mm / 5.9"  
For range 12-20mm / .5" - .8" models
- 952622:** Extension rod 150mm / 5.9"  
For range 20-50mm / .8" - 2" models
- 952623:** Extension rod 150mm / 5.9"  
For range 50-300mm / 2" - 12" models



04AZB157



## SPECIFICATIONS

**Metric** Individual

Range	Order No.	Accuracy
6 - 8mm	<b>468-161</b>	±2µm
8 - 10mm	<b>468-162</b>	±2µm
10 - 12mm	<b>468-163</b>	±2µm
12 - 16mm	<b>468-164</b>	±2µm
16 - 20mm	<b>468-165</b>	±2µm
20 - 25mm	<b>468-166</b>	±3µm
25 - 30mm	<b>468-167</b>	±3µm
30 - 40mm	<b>468-168</b>	±3µm
40 - 50mm	<b>468-169</b>	±3µm
50 - 63mm	<b>468-170</b>	±3µm
62 - 75mm	<b>468-171</b>	±3µm
75 - 88mm	<b>468-172</b>	±3µm
87 - 100mm	<b>468-173</b>	±3µm
100 - 125mm	<b>468-174</b>	±5µm
125 - 150mm	<b>468-175</b>	±5µm
150 - 175mm	<b>468-176</b>	±5µm
175 - 200mm	<b>468-177</b>	±5µm
200 - 225mm	<b>468-178</b>	±5µm
225 - 250mm	<b>468-179</b>	±5µm
250 - 275mm	<b>468-180</b>	±5µm
275 - 300mm	<b>468-181</b>	±5µm

**Inch/Metric** Individual  with TiN coated contact points

Range	Order No.	Accuracy
.275 - .35" / 6.925 - 8.89mm	<b>468-261</b>	±.0001"
.35 - .425" / 8.89 - 10.795mm	<b>468-262</b>	±.0001"
.425 - .5" / 10.795 - 12.7mm	<b>468-263</b>	±.0001"
.5 - .65" / 12.7 - 16.51mm	<b>468-264</b>	±.0001"
.65 - .8" / 16.51 - 20.32mm	<b>468-265</b>	±.0001"
.8 - 1" / 20.32 - 25.4mm	<b>468-266</b>	±.00015"
1 - 1.2" / 25.4 - 30.48mm	<b>468-267</b>	±.00015"
1.2 - 1.6" / 30.48 - 40.64mm	<b>468-268</b>	±.00015"
1.6 - 2" / 40.64 - 50.8mm	<b>468-269</b>	±.00015"
2 - 2.5" / 50.8 - 63.5mm	<b>468-270</b>	±.00015"
2.5 - 3" / 63.5 - 76.2mm	<b>468-271</b>	±.00015"
3 - 3.5" / 76.2 - 88.9mm	<b>468-272</b>	±.00015"
3.5 - 4" / 88.9 - 101.6mm	<b>468-273</b>	±.00015"
4 - 5" / 101.6 - 127mm	<b>468-274</b>	±.00025"
5 - 6" / 127 - 152.4mm	<b>468-275</b>	±.00025"
6 - 7" / 152.4 - 177.8mm	<b>468-276</b>	±.00025"
7 - 8" / 177.8 - 203.2mm	<b>468-277</b>	±.00025"
8 - 9" / 203.2 - 228.6mm	<b>468-278</b>	±.00025"
9 - 10" / 228.6 - 254mm	<b>468-279</b>	±.00025"
10 - 11" / 254 - 279.4mm	<b>468-280</b>	±.00025"
11 - 12" / 279.4 - 304.8mm	<b>468-281</b>	±.00025"



468-986

### Complete Unit Set

Each set includes complete gages (display units and measuring heads for each size).

**Metric**

with TiN coated contact points

Range	Order No.	Individual range	Setting rings included	Remarks
6 - 12mm	<b>468-981</b>	6-8, 8-10, 10-12mm	ø8mm, ø10mm	—
12 - 25mm	<b>468-982</b>	12-16, 16-20, 20-25mm	ø16mm, ø20mm	—
25 - 50mm	<b>468-983</b>	25-30, 30-40, 40-50mm	ø30mm, ø40mm	—
50 - 75mm	<b>468-984</b>	50-63, 62-75mm	ø62mm	—
75 - 100mm	<b>468-985</b>	75-88, 87-100mm	ø87mm	—

**Inch/Metric**

with TiN coated contact points

Range	Order No.	Individual range	Setting rings included	Remarks
.275 - .5" / 6.925 - 12.7mm	<b>468-986</b>	.275-.35", .35-.425", .425-.5"	.35" DIA., .425" DIA.	—
.5 - 1" / 12.7 - 25.4mm	<b>468-987</b>	.5-.65", .65-.8", .8-1"	.65" DIA., .8" DIA.	—
1 - 2" / 25.4 - 50.8mm	<b>468-988</b>	1-1.2", 1.2-1.6", 1.6-2"	1.2" DIA., 1.6" DIA.	—
2 - 3" / 50.8 - 76.2mm	<b>468-989</b>	2-2.5", 2.5-3"	2.5" DIA.	—
3 - 4" / 76.2 - 101.6mm	<b>468-990</b>	3-3.5", 3.5-4"	3.5" DIA.	—



468-978

### Interchangeable Head Set

Each set includes one display unit with interchangeable measuring heads of the sizes specified.

**Metric**

with TiN coated contact points

Range	Order No.	Individual range	Setting rings included	Remarks
6 - 12mm	<b>468-971</b>	6-8, 8-10, 10-12mm	ø8mm, ø10mm	with extension rod
12 - 20mm	<b>468-972</b>	12-16, 16-20mm	ø16mm.	with extension rod
20 - 50mm	<b>468-973</b>	20-25, 25-30, 30-40, 40-50mm	ø25mm, ø40mm	with extension rod
50 - 100mm	<b>468-974</b>	50-63, 62-75, 75-88, 87-100mm	ø62mm, ø87mm	with extension rod
100 - 200mm	<b>468-975</b>	100-125, 125-150, 150-175, 175-200mm	ø125mm, ø175mm	with extension rod

**Inch/Metric**

with TiN coated contact points

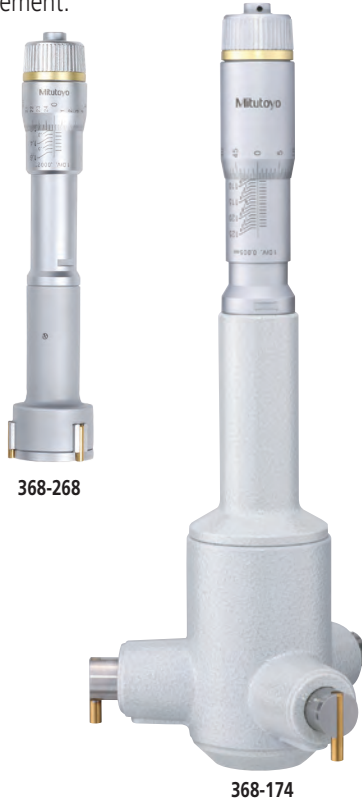
Range	Order No.	Individual range	Setting rings included	Remarks
.275 - .5" / 6.925 - 12.7mm	<b>468-976</b>	.275-.35", .35-.425", .425-.5"	.35" DIA., .425" DIA.	with extension rod
.5 - .8" / 12.7 - 20.32mm	<b>468-977</b>	.5-.65", .65-.8"	.65" DIA.	with extension rod
.8 - 2" / 20.32 - 50.8mm	<b>468-978</b>	.8-1", 1-1.2", 1.2-1.6", 1.6-2"	1" DIA., 1.6" DIA.	with extension rod
2 - 4" / 50.8 - 101.6mm	<b>468-979</b>	2-2.5", 2.5-3", 3-3.5", 3.5-4"	2.5" DIA., 3.5" DIA.	with extension rod
4 - 8" / 101.6 - 203.2mm	<b>468-980</b>	4-5", 5-6", 6-7", 7-8"	5" DIA., 7" DIA.	with extension rod

**Mitutoyo**

# Holtest

## SERIES 368 — Three-Point/Two-Point Internal Micrometers

These Holtests are versatile, self-centering three-point internal micrometers for the accurate and efficient direct-measurement of internal diameters. Three anvils, evenly spaced at 120° apart, contact the internal wall surfaces and find true alignment with the axis of the bore for accurate ID measurement.



368-268

368-174

### FEATURES

- TiN-coated measuring contact points (over 6mm / .275" range models) provide excellent durability and impact resistance and allow the instrument to measure to the bottom of a blind hole (up to 100mm / 4" models).
- Highly durable because of carbide-tipped contact points (anvils up to 12mm / .5" models).
- Can measure deep holes using an Extension rod (optional) which is available on models over 6mm (.275") measuring range.
- With Ratchet Stop for constant force.
- Setting Rings for zero point adjustment are optional.
- Supplied in fitted plastic case up to 100mm / 4". Over 100mm / 4" supplied in wooden case.



368-001

#### Two-point contact type



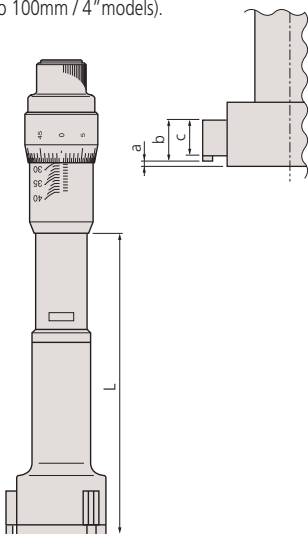
TiN coated contact points (excluding models up to 12mm/.5")

### DIMENSIONS

#### Measuring a Blind Hole

The measuring contact points held in the jaws permit measuring the diameter of a blind hole right down to the bottom (up to 100mm / 4" models).

Unit: mm



Range	L	Mass (g)	Range	L	Mass (g)
2 - 2.5mm / .08 - .1"	12	88	40 - 50mm / 1.6 - 2"	102	330
2.5 - 3mm / .1 - .12"	12	88	50 - 63mm / 2 - 2.5"	105	440
3 - 4mm / .12 - .16"	22	91	62 - 75mm / 2.5 - 3"	105	450
4 - 5mm / .16 - .2"	22	91	75 - 88mm / 3 - 3.5"	105	490
5 - 6mm / .2 - .24"	22	91	87 - 100mm / 3.5 - 4"	105	500
6 - 8mm / .275 - .35"	59	57	100 - 125mm / 4 - 5"	161	1050
8 - 10mm / .35 - .425"	59	58	125 - 150mm / 5 - 6"	161	1120
10 - 12mm / .425 - .5"	59	59	150 - 175mm / 6 - 7"	161	1190
12 - 16mm / .5 - .65"	82	140	175 - 200mm / 7 - 8"	161	1260
16 - 20mm / .65 - .8"	82	145	200 - 225mm / 8 - 9"	161	1420
20 - 25mm / .8 - 1"	94	250	225 - 250mm / 9 - 10"	161	1580
25 - 30mm / 1 - 1.2"	94	270	250 - 275mm / 10 - 11"	161	1600
30 - 40mm / 1.2 - 1.6"	102	290	275 - 300mm / 11 - 12"	161	1690

Range	a	b	c
2 - 6mm / .08 - .275"	—	—	2
6 - 12mm / .275 - .5"	2	—	2.5
12 - 20mm / .5 - .8"	0.3	5.6	3.5
20 - 30mm / .8 - 1.2"	0.3	8.3	5.2
30 - 50mm / 1.2 - 2"	0.3	13	10
50 - 100mm / 2 - 4"	0.3	17	14
100 - 300mm / 4 - 12"	12.4	21	13.8



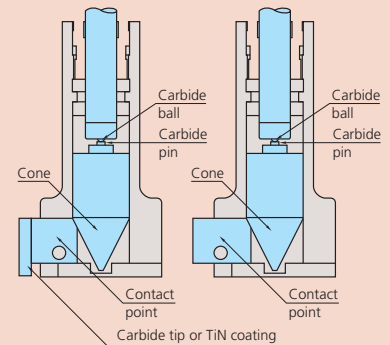
### Technical Data

Graduation: 0.001mm, 0.005mm\*, .0001" or .0002"\*  
(\*over 12mm or .5" models)

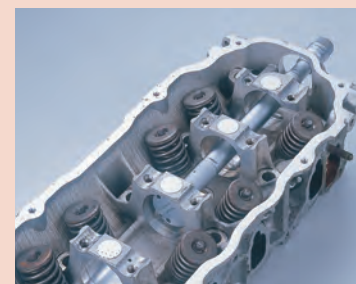
Range	Measuring method	Contact-point material
2-6mm/.08-.28"	Two-point method	Carbide
6-300mm/.275-12"	Three-point method	TiN coating (1700-2000HV)

### Optional Accessories

- 952322:** Extension rod 100mm / 3.94"  
For range 6-12mm / .275-.5" models
- 952621:** Extension rod 150mm / 5.9"  
For range 12-20mm / .5" - .8" models
- 952622:** Extension rod 150mm / 5.9"  
For range 20-50mm / .8" - 2" models
- 952623:** Extension rod 150mm / 5.9"  
For range 50-300mm / 2"-12" models



Using the optional extension rod



## SPECIFICATIONS

Metric Individual		
Range	Order No.	Accuracy
2 - 2.5mm	368-001	±2μm
2.5 - 3mm	368-002	±2μm
3 - 4mm	368-003	±2μm
4 - 5mm	368-004	±2μm
5 - 6mm	368-005	±2μm
6 - 8mm	368-161	±2μm
8 - 10mm	368-162	±2μm
10 - 12mm	368-163	±2μm
12 - 16mm	368-164	±2μm
16 - 20mm	368-165	±2μm
20 - 25mm	368-166	±3μm
25 - 30mm	368-167	±3μm
30 - 40mm	368-168	±3μm
40 - 50mm	368-169	±3μm
50 - 63mm	368-170	±3μm
62 - 75mm	368-171	±3μm
75 - 88mm	368-172	±3μm
87 - 100mm	368-173	±3μm
100 - 125mm	368-174	±5μm
125 - 150mm	368-175	±5μm
150 - 175mm	368-176	±5μm
175 - 200mm	368-177	±5μm
200 - 225mm	368-178	±5μm
225 - 250mm	368-179	±5μm
250 - 275mm	368-180	±5μm
275 - 300mm	368-181	±5μm

Inch Individual <input type="checkbox"/> with TiN coated contact points		
Range	Order No.	Accuracy
.08 - .1"	368-021	±.0001"
.1 - .12"	368-022	±.0001"
.12 - .16"	368-023	±.0001"
.16 - .2"	368-024	±.0001"
.2 - .24"	368-025	±.0001"
.24 - .28"	368-026	±.0001"
.275 - .35"	368-261	±.0001"
.35 - .425"	368-262	±.0001"
.425 - .5"	368-263	±.0001"
.5 - .65"	368-264	±.0001"
.65 - .8"	368-265	±.0001"
.8 - 1"	368-266	±.00015"
1 - 1.2"	368-267	±.00015"
1.2 - 1.6"	368-268	±.00015"
1.6 - 2"	368-269	±.00015"
2 - 2.5"	368-270	±.00015"
2.5 - 3"	368-271	±.00015"
3 - 3.5"	368-272	±.00015"
3.5 - 4"	368-273	±.00015"
4 - 5"	368-274	±.00025"
5 - 6"	368-275	±.00025"
6 - 7"	368-276	±.00025"
7 - 8"	368-277	±.00025"
8 - 9"	368-278	±.00025"
9 - 10"	368-279	±.00025"
10 - 11"	368-280	±.00025"
11 - 12"	368-281	±.00025"

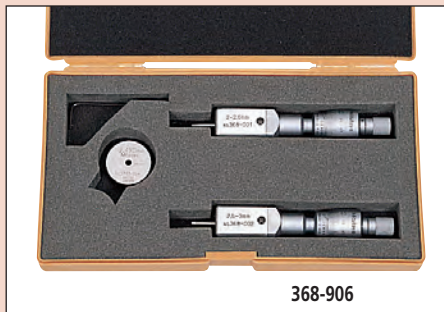
### Complete Unit Set

Each set includes complete gages (micrometer head units and measuring heads for each size).

Metric Individual <input type="checkbox"/> with TiN coated contact points				
Range	Order No.	Individual range	Setting rings included	Remarks
2 - 3mm	368-906	2-2.5, 2.5-3mm	ø2.5mm	—
3 - 6mm	368-907	3-4, 4-5, 5-6mm	ø4mm, ø5mm	—
6 - 12mm	368-911	6-8, 8-10, 10-12mm	ø8mm, ø10mm	with extension rod
12 - 20mm	368-912	12-16, 16-20mm	ø16mm	with extension rod
20 - 50mm	368-913	20-25, 25-30, 30-40, 40-50mm	ø25mm, ø40mm	with extension rod
50 - 100mm	368-914	50-63, 62-75, 75-88, 87-100mm	ø62mm, ø87mm	with extension rod
100 - 200mm	368-915	100-125, 125-150, 150-175, 175-200mm	ø125mm, ø175mm	with extension rod

Inch Individual <input type="checkbox"/> with TiN coated contact points				
Range	Order No.	Individual range	Setting rings included	Remarks
.08" - .12"	368-926	.08-.1", .1-.12"	.1" DIA.	—
.12" - .28"	368-927	.12-.16", .16-.2", .2-.24", .24-.28"	.16" DIA., .24" DIA.	—
.275" - .5"	368-916	.275-.35", .35-.425", .425-.5"	.35" DIA., .5" DIA.	with extension rod
.5" - .8"	368-917	.5-.65", .65-.8"	.65" DIA.	with extension rod
.8" - 2"	368-918	.8-1", 1-1.2", 1.2-1.6", 1.6-2"	1" DIA., 1.6" DIA.	with extension rod
2" - 4"	368-919	2-2.5", 2.5-3", 3-3.5", 3.5-4"	2.5" DIA., 3.5" DIA.	with extension rod
4" - 8"	368-920	4-5", 5-6", 6-7", 7-8"	5" DIA., 7" DIA.	with extension rod

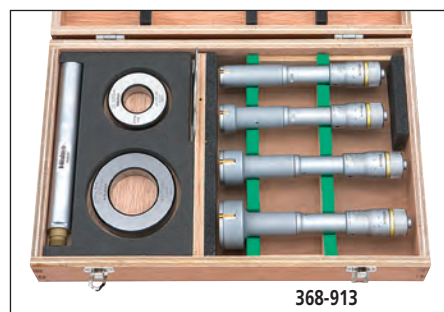
\*.0001" graduation



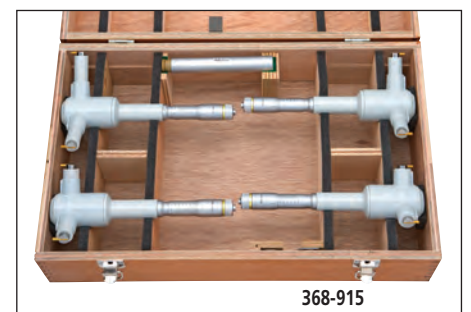
368-906



368-901-10



368-913



368-915

# Holtest (Type II)

## SERIES 368 — Three-Point Internal Micrometers

### FEATURES

- The Holtests (type II) have three contact points made of alloyed steel.
- Measurement can be taken closer to the bottom of the blind bore (up to 100mm / 4" models).
- Can measure deep holes using an Extension Rod (optional).
- With Ratchet Stop for constant force.
- Setting Rings for origin point settings are optional.
- Supplied in fitted plastic case up to 100mm / 4". Over 100mm / 4" supplied in wooden case.



368-869



368-770



368-774



### Technical Data

Graduation: 0.005mm or .0002"

Measuring method: Three-point method

Contact point: Hardening Steel (over HRC 60)

### Optional Accessories

**952621:** Extension rod 150mm / 5.9"  
For range 12-20mm / .5 - .8" models

**952622:** Extension rod 150mm / 5.9"  
For range 20-50mm / .8 - 2" models

**952623:** Extension rod 150mm / 5.9"  
For range 50-300mm / 2 - 12" models

### DIMENSIONS AND MASS

Range	L	Mass (g)
12 - 16mm / .5 - .65"	82	150
16 - 20mm / .65 - .8"	82	150
20 - 25mm / .8 - 1"	94	260
25 - 30mm / 1 - 1.2"	94	280
30 - 40mm / 1.2 - 1.6"	102	290
40 - 50mm / 1.6 - 2"	102	330
50 - 63mm / 2 - 2.5"	105	440
62 - 75mm / 2.5 - 3"	105	450
75 - 88mm / 3 - 3.5"	105	560
87 - 100mm / 3.5 - 4"	105	570
100 - 125mm / 4 - 5"	161	1020
125 - 150mm / 5 - 6"	161	1110
150 - 175mm / 6 - 7"	161	1200
175 - 200mm / 7 - 8"	161	1300
200 - 225mm / 8 - 9"	161	1420
225 - 250mm / 9 - 10"	161	1540
250 - 275mm / 10 - 11"	161	1690
275 - 300mm / 11 - 12"	161	1860

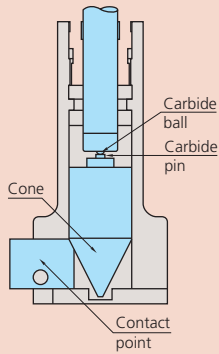
**Measuring a Blind Hole**

The measuring contact points held in the jaws permit measuring the diameter of a blind hole right down to the bottom (up to 100mm / 4" models).

Range	a	b
12 - 20mm / .5 - .8"	2.6	3.5
20 - 30mm / .8 - .12"	3.4	5.2
30 - 50mm / 1.2 - 2"	3.4	10
50 - 100mm / 2 - 4"	3.4	14
100 - 300mm / 4 - 12"	19.6	13.8

Unit: mm

## SPECIFICATIONS



### HT (Type II)

Head Assy Order No.	Measuring Range	HT (type II) Order No.
04AZA839	12 - 16mm	368-764
04AZA840	16 - 20mm	368-765
04AZA848	20 - 25mm	368-766
04AZA849	25 - 30mm	368-767
04AZA857	30 - 40mm	368-768
04AZA858	40 - 50mm	368-769
04AZA870	50 - 63mm	368-770
04AZA871	62 - 75mm	368-771
04AZA872	75 - 88mm	368-772
04AZA873	87 - 100mm	368-773
04AZA895	100 - 125mm	368-774
04AZA896	125 - 150mm	368-775
04AZA897	150 - 175mm	368-776
04AZA898	175 - 200mm	368-777
04AZA899	200 - 225mm	368-778
04AZA900	225 - 250mm	368-779
04AZA901	250 - 275mm	368-780
04AZA902	275 - 300mm	368-781
04AZA841	.5 - .65"	368-864
04AZA842	.65 - .8"	368-865
04AZA850	.8 - 1"	368-866
04AZA851	1 - 1.2"	368-867
04AZA859	1.2 - 1.6"	368-868
04AZA860	1.6 - 2"	368-869
04AZA874	2 - 2.5"	368-870
04AZA875	2.5 - 3"	368-871
04AZA876	3 - 3.5"	368-872
04AZA877	3.5 - 4"	368-873
04AZA903	4 - 5"	368-874
04AZA904	5 - 6"	368-875
04AZA905	6 - 7"	368-876
04AZA906	7 - 8"	368-877
04AZA907	8 - 9"	368-878
04AZA908	9 - 10"	368-879
04AZA909	10 - 11"	368-880
04AZA910	11 - 12"	368-881

Metric Individual		
Range	Order No.	Accuracy
12 - 16mm	368-764	±2µm
16 - 20mm	368-765	±2µm
20 - 25mm	368-766	±3µm
25 - 30mm	368-767	±3µm
30 - 40mm	368-768	±3µm
40 - 50mm	368-769	±3µm
50 - 63mm	368-770	±3µm
62 - 75mm	368-771	±3µm
75 - 88mm	368-772	±3µm
87 - 100mm	368-773	±3µm
100 - 125mm	368-774	±5µm
125 - 150mm	368-775	±5µm
150 - 175mm	368-776	±5µm
175 - 200mm	368-777	±5µm
200 - 225mm	368-778	±5µm
225 - 250mm	368-779	±5µm
250 - 275mm	368-780	±5µm
275 - 300mm	368-781	±5µm

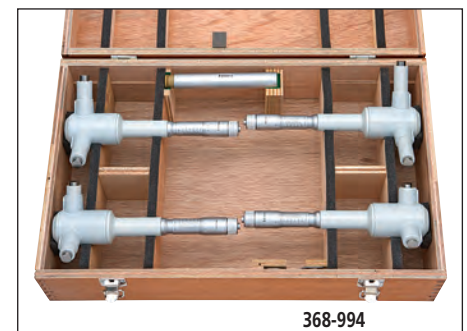
Inch Individual		
Range	Order No.	Accuracy
.5 - .65"	368-864	±.0001"
.65 - .8"	368-865	±.0001"
.8 - 1"	368-866	±.00015"
1 - 1.2"	368-867	±.00015"
1.2 - 1.6"	368-868	±.00015"
1.6 - 2"	368-869	±.00015"
2 - 2.5"	368-870	±.00015"
2.5 - 3"	368-871	±.00015"
3 - 3.5"	368-872	±.00015"
3.5 - 4"	368-873	±.00015"
4 - 5"	368-874	±.00025"
5 - 6"	368-875	±.00025"
6 - 7"	368-876	±.00025"
7 - 8"	368-877	±.00025"
8 - 9"	368-878	±.00025"
9 - 10"	368-879	±.00025"
10 - 11"	368-880	±.00025"
11 - 12"	368-881	±.00025"

### Complete Unit Set

Each set includes complete gages (micrometer head units and measuring heads for each size).

Metric				
Range	Order No.	Individual range	Setting rings included	Remarks
12 - 20mm	368-991	12-16, 16-20mm	ø16mm	with extension rod
20 - 50mm	368-992	20-25, 25-30, 30-40, 40-50mm	ø25mm, ø40mm	with extension rod
50 - 100mm	368-993	50-63, 62-75, 75-88, 87-100mm	ø62mm, ø87mm	with extension rod
100 - 200mm	368-994	100-125, 125-150, 150-175, 175-200mm	ø125mm, ø175mm	with extension rod

Inch				
Range	Order No.	Individual range	Setting rings included	Remarks
.5" - .8"	368-995	.5-.65", .65-.8"	.65" DIA.	with extension rod
.8" - 2"	368-996	.8-1", 1-1.2", 1.2-1.6", 1.6-2"	1" DIA., 1.6" DIA.	with extension rod
2" - 4"	368-997	2-2.5", 2.5-3", 3-3.5", 3.5-4"	2.5" DIA., 3.5" DIA.	with extension rod
4" - 8"	368-998	4-5", 5-6", 6-7", 7-8"	5" DIA., 7" DIA.	with extension rod



# Borematic

## SERIES 568 — ABSOLUTE Digimatic Snap Bore Gages

The Borematic enables the operator to take measurements more accurately and quicker than ever before. Once the origin point is set with the ORIGIN button, the Borematic retains the setting for the entire battery life. Therefore no longer repeated origin setting (presetting) is necessary.

### FEATURES

- TiN-coated measuring contact points provide excellent durability and impact resistance and allow the instrument to measure to the bottom of a blind hole.
- Large LCD digits of 8.5mm height for error-free reading.
- 330-degree rotatable display unit for easy reading at any angle.
- GO/NO-GO judgment function.
- The ABSOLUTE linear encoder eliminates over-speed errors.
- With SPC data output.
- Setting rings for origin point setting are optional.
- Can measure deep holes by attaching an optional extension rod.
- Measurement can be taken closer to the bottom of a blind bore.
- Supplied in fitted wooden case.



TiN coated contact points (" -10" suffix models only)

### SPECIFICATIONS

Metric	Individual		
Range	Order No.	Accuracy	Mass (g)
6 - 8mm	568-361	±5µm	480
8 - 10mm	568-362	±5µm	485
10 - 12mm	568-363	±5µm	485
12 - 16mm	568-364	±5µm	475
16 - 20mm	568-365	±5µm	480
20 - 25mm	568-366	±6µm	540
25 - 30mm	568-367	±6µm	555
30 - 40mm	568-368	±6µm	565
40 - 50mm	568-369	±6µm	610
50 - 63mm	568-370	±6µm	730
62 - 75mm	568-371	±6µm	740
75 - 88mm	568-372	±6µm	790
87 - 100mm	568-373	±6µm	800
100 - 113mm	568-374	±6µm	900
112 - 125mm	568-375	±6µm	910

Inch/Metric			
Range	Order No.	Accuracy	Mass (g)
.275 - .350" / 6.985 - 8.89mm	568-461	±.00025"	480
.350 - .425" / 8.89 - 10.795mm	568-462	±.00025"	485
.425 - .5" / 10.795 - 12.7mm	568-463	±.00025"	485
.50 - .65" / 12.7 - 16.51mm	568-464	±.00025"	475
.65 - .80" / 16.51 - 20.32mm	568-465	±.00025"	480
.8 - 1.0" / 20.32 - 25.4mm	568-466	±.0003"	540
1.0 - 1.2" / 25.4 - 30.48mm	568-467	±.0003"	555
1.2 - 1.6" / 30.48 - 40.64mm	568-468	±.0003"	565
1.6 - 2.0" / 40.64 - 50.8mm	568-469	±.0003"	610
2.0 - 2.5" / 50.8 - 63.5mm	568-470	±.0003"	730
2.5 - 3.0" / 63.5 - 76.2mm	568-471	±.0003"	740
3.0 - 3.5" / 76.2 - 88.9mm	568-472	±.0003"	790
3.5 - 4.0" / 88.9 - 101.6mm	568-473	±.0003"	800
4.0 - 4.5" / 101.6 - 114.3mm	568-474	±.0003"	900
4.5 - 5.0" / 114.3 - 127mm	568-475	±.0003"	910



### Technical Data

Accuracy: Refer to the list of specifications.

Resolution: 0.001mm or .00005"/0.001mm

Contact point: Carbide or TiN coating\*  
(\*over 12mm/.5" models)

Measuring method: Three-point method

Display: LCD

Battery: SR44 (1 pc.) (938882)

Battery life: Approx. 7,000 hours

### Functions

Zero/ABS, presetting, GO/NO-GO judgment, power on/off, inch/mm conversion (on inch/metric models only), SPC data output, data hold

### Optional Accessories

905338: SPC cable (1m / 40")

905409: SPC cable (2m / 80")

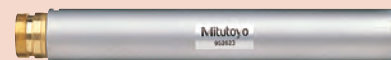
952322: Extension rod 100mm / 3.94"  
For range 6-12mm / .275-.5" models

952621: Extension rod 150mm / 5.9"  
For range 12-20mm / .5" - .8" models

952622: Extension rod 150mm / 5.9"  
For range 20-50mm / .8" - 2" models

952623: Extension rod 150mm / 5.9"  
For range 50-300mm / 2" - 12" models

-----: Setting ring (See page C-30.)



## Complete Unit Set

Each set includes complete gages display units and measuring heads for each size and extension rod.

### Metric

Range	Set Order No.	Individual Order No.	Setting rings included
6 - 12mm	568-955	568-361, 568-362 568-363	177-125 (ø8mm) 177-126 (ø10mm)
12 - 25mm	568-956	568-364, 568-365 568-366	177-177 (ø16mm) 177-286 (ø20mm)
25 - 50mm	568-957	568-367, 568-368 568-369	177-139 (ø25mm) 177-290 (ø40mm)
50 - 75mm	568-958	568-370 568-371	177-314 (ø62mm)
75 - 100mm	568-959	568-372 568-373	177-318 (ø87mm)

\*interchangeable contact points (4 sets)

### Inch/Metric

Range	Set Order No.	Individual Order No.	Setting rings included
.275" - .5" / 6.985 - 12.7mm	568-965	568-461, 568-462 568-463	177-179 (.35" DIA.) 177-283 (.425" DIA.)
.5" - 1" / 12.7 - 25.4mm	568-966	568-464, 568-465 568-466	177-182 (.65" DIA.) 177-287 (.8" DIA.)
1" - 2" / 25.4 - 50.8mm	568-967	568-467, 568-468 568-469	177-289 (1.2" DIA.) 177-291 (1.6" DIA.)
2" - 3" / 50.8 - 76.2mm	568-968	568-470 568-471	177-315 (2.5" DIA.)
3" - 4" / 76.2 - 101.6mm	568-969	568-472 568-473	177-319 (3.5" DIA.)

## Interchangeable Head Set

Each set includes one display unit with interchangeable measuring heads of the sizes specified and extension rod.

### Metric

Range	Set Order No.	Display Unit	Adaptor Supplied	Individual Head No.	Setting rings included
6 - 12mm	568-924	568-014	954595	04AZB136 04AZB137 04AZB138	177-125 (ø8mm) 177-126 (ø10mm)
12 - 25mm	568-925	568-014	216556 568-926	04AZA719 04AZA720 04AZA728	177-177 (ø16mm) 177-286 (ø20mm)
25 - 50mm	568-926	568-014	216557	04AZA729 04AZA737 04AZA738	177-288 (ø30mm) 177-290 (ø40mm)
50 - 100mm	568-927	568-014	216558	04AZA750, 04AZA751, 04AZA752 04AZA753	177-314 (ø62mm) 177-318 (ø87mm)

\*interchangeable anvils (Total 4 sets)

### Inch/Metric

Range	Set Order No.	Display Unit	Adaptor Supplied	Individual Head No.	Setting rings included
.275" - .5" / 6.985 - 12.7mm	568-928	568-015	954595	04AZB139 04AZB140 04AZB141	177-179 (.35" DIA.) 177-283 (.425" DIA.)
.5" - 1" / 12.7 - 25.4mm	568-929	568-015	216556 216557	04AZA721 04AZA722 04AZA730	177-182 (.65" DIA.) 177-287 (.8" DIA.)
1" - 2" / 25.4 - 50.8mm	568-930	568-015	216557	04AZA731 04AZA739 04AZA740	177-289 (1.2" DIA.) 177-291 (1.6" DIA.)
2" - 4" / 50.8 - 101.6mm	568-936	568-015	216558	04AZA754 04AZA755 04AZA756 04AZA757	177-315 (2.5" DIA.) 177-319 (3.5" DIA.)

\*interchangeable anvils (Total 4 sets)

## Interchangeable Contact Head Set



568-924

## Complete Unit Set



568-959

## DIMENSIONS

### Measuring a Blind Hole

The measuring pins held in the jaws permit measuring the diameter of a blind hole right down to the bottom.

Unit: mm

Range	L	a	b	c
6 - 12mm / .275 - .5"	83	2	—	2.5
12 - 20mm / .5 - .8"	53	0.3	5.6	3.5
20 - 30mm / .8 - 1.2"	59	0.3	8.3	5.2
30 - 50mm / 1.2 - 2"	67	0.3	13	10
50 - 125mm / 2 - 5"	75	0.3	17	14

( ) : 50-125mm model

# Holtest/Digimatic Holtest/Borematic

## SERIES 368, 468, 568 Replacement Head Assy List

TiN-coated measuring contact head assy

Head Assy Order No.	Measuring Range	HT(Type I)		HTD		SBM	
		Order No.	Model	Order No.	Model	Order No.	Model
04AZB136	6 - 8mm	368-161	HT-8R	468-161	HTD-8R	568-361	SBM-8C
04AZB137	8 - 10mm	368-162	HT-10R	468-162	HTD-10R	568-362	SBM-10C
04AZB138	10 - 12mm	368-163	HT-12R	468-163	HTD-12R	568-363	SBM-12C
04AZA719	12 - 16mm	368-164	HT-16R	468-164	HTD-16R	568-364	SBM-16C
04AZA720	16 - 20mm	368-165	HT-20R	468-165	HTD-20R	568-365	SBM-20C
04AZA728	20 - 25mm	368-166	HT-25R	468-166	HTD-25R	568-366	SBM-25C
04AZA729	25 - 30mm	368-167	HT-30R	468-167	HTD-30R	568-367	SBM-30C
04AZA737	30 - 40mm	368-168	HT-40R	468-168	HTD-40R	568-368	SBM-40C
04AZA738	40 - 50mm	368-169	HT-50R	468-169	HTD-50R	568-369	SBM-50C
04AZA750	50 - 63mm	368-170	HT-63R	468-170	HTD-63R	568-370	SBM-63C
04AZA751	62 - 75mm	368-171	HT-75R	468-171	HTD-75R	568-371	SBM-75C
04AZA752	75 - 88mm	368-172	HT-88R	468-172	HTD-88R	568-372	SBM-88C
04AZA753	87 - 100mm	368-173	HT-100R	468-173	HTD-100R	568-373	SBM-100C
04AZA775	100 - 125mm	368-174	HT-125R	468-174	HTD-125R	—	—
04AZA776	125 - 150mm	368-175	HT-150R	468-175	HTD-150R	—	—
04AZA777	150 - 175mm	368-176	HT-175R	468-176	HTD-175R	—	—
04AZA778	175 - 200mm	368-177	HT-200R	468-177	HTD-200R	—	—
04AZA779	200 - 225mm	368-178	HT-225R	468-178	HTD-225R	—	—
04AZA780	225 - 250mm	368-179	HT-250R	468-179	HTD-250R	—	—
04AZA781	250 - 275mm	368-180	HT-275R	468-180	HTD-275R	—	—
04AZA782	275 - 300mm	368-181	HT-300R	468-181	HTD-300R	—	—
04AZB139	.275 - .35"	368-261	HT-.35"R	468-261	HTD-.35"R	568-461	SBM-.35"C
04AZB140	.35 - .425"	368-262	HT-.425"R	468-262	HTD-.425"R	568-462	SBM-.425"C
04AZB141	.425 - .5"	368-263	HT-.5"R	468-263	HTD-.5"R	568-463	SBM-.5"C
04AZA721	.5 - .65"	368-264	HT-.65"R	468-264	HTD-.65"R	568-464	SBM-.65"C
04AZA722	.65 - .8"	368-265	HT-.8"R	468-265	HTD-.8"R	568-465	SBM-.8"C
04AZA730	.8 - 1"	368-266	HT-1"R	468-266	HTD-1"R	568-466	SBM-1"C
04AZA731	1 - 1.2"	368-267	HT-1.2"R	468-267	HTD-1.2"R	568-467	SBM-1.2"C
04AZA739	1.2 - 1.6"	368-268	HT-1.6"R	468-268	HTD-1.6"R	568-468	SBM-1.6"C
04AZA740	1.6 - 2"	368-269	HT-2"R	468-269	HTD-2"R	568-469	SBM-2"C
04AZA754	2 - 2.5"	368-270	HT-2.5"R	468-270	HTD-2.5"R	568-470	SBM-2.5"C
04AZA755	2.5 - 3"	368-271	HT-3"R	468-271	HTD-3"R	568-471	SBM-3"C
04AZA756	3 - 3.5"	368-272	HT-3.5"R	468-272	HTD-3.5"R	568-472	SBM-3.5"C
04AZA757	3.5 - 4"	368-273	HT-4"R	468-273	HTD-4"R	568-473	SBM-4"C
04AZA783	4 - 5"	368-274	HT-5"R	468-274	HTD-5"R	—	—
04AZA784	5 - 6"	368-275	HT-6"R	468-275	HTD-6"R	—	—
04AZA785	6 - 7"	368-276	HT-7"R	468-276	HTD-7"R	—	—
04AZA786	7 - 8"	368-277	HT-8"R	468-277	HTD-8"R	—	—
04AZA787	8 - 9"	368-278	HT-9"R	468-278	HTD-9"R	—	—
04AZA788	9 - 10"	368-279	HT-10"R	468-279	HTD-10"R	—	—
04AZA789	10 - 11"	368-280	HT-11"R	468-280	HTD-11"R	—	—
04AZA790	11 - 12"	368-281	HT-12"R	468-281	HTD-12"R	—	—
04AZA941	100 - 113mm	—	—	—	—	568-374	SBM-113C
04AZA942	112 - 125mm	—	—	—	—	568-375	SBM-125C
04AZA943	4 - 4.5"	—	—	—	—	568-474	SBM-4.5"C
04AZA944	4.5 - 5"	—	—	—	—	568-475	SBM-5"C



# Tubular Inside Micrometers

## SERIES 133 — Single Rod Type

### FEATURES

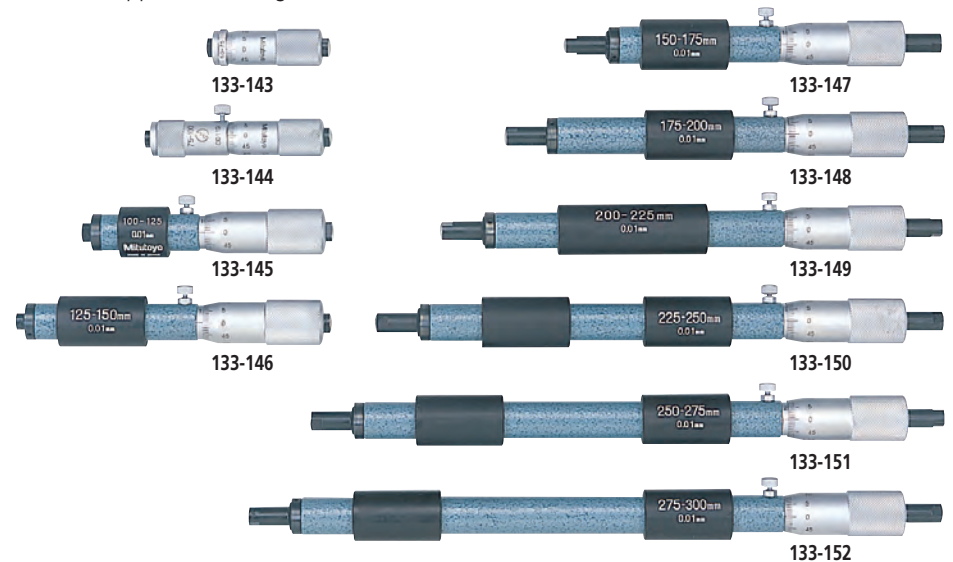
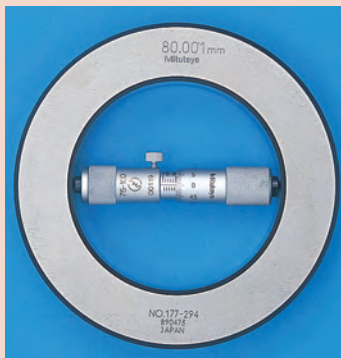
- With locking clamp.
- Zero point can be readjusted by rotating the micrometer head sleeve. A key wrench is supplied.
- Clear, crisp graduations on the satin chrome finished micrometer head.
- Carbide-tipped measuring faces.
- Supplied in fitted plastic case. Over 200mm / 8" supplied in wooden case.

### Technical Data

Accuracy: Refer to the list of specifications.  
Graduation: 0.01mm or .001"

### Optional Accessories

---- : Setting ring (See page C-30.)



### SPECIFICATIONS

Metric		Individual
Range	Order No.	Accuracy
50 - 75mm	133-143	±3µm
75 - 100mm	133-144	±4µm
100 - 125mm	133-145	±5µm
125 - 150mm	133-146	±5µm
150 - 175mm	133-147	±5µm
175 - 200mm	133-148	±5µm
200 - 225mm	133-149	±5µm
225 - 250mm	133-150	±6µm
250 - 275mm	133-151	±6µm
275 - 300mm	133-152	±6µm
300 - 325mm	133-153	±7µm
325 - 350mm	133-154	±7µm
350 - 375mm	133-155	±7µm
375 - 400mm	133-156	±8µm
400 - 425mm	133-157	±8µm
425 - 450mm	133-158	±8µm
450 - 475mm	133-159	±9µm
475 - 500mm	133-160	±9µm
500 - 525mm	133-161	±9µm
525 - 550mm	133-162	±10µm
550 - 575mm	133-163	±10µm
575 - 600mm	133-164	±10µm
600 - 625mm	133-165	±11µm
625 - 650mm	133-166	±11µm
650 - 675mm	133-167	±11µm
675 - 700mm	133-168	±12µm

Metric		Individual
Range	Order No.	Accuracy
700 - 725mm	133-169	±12µm
725 - 750mm	133-170	±12µm
750 - 775mm	133-171	±13µm
775 - 800mm	133-172	±13µm
800 - 825mm	133-173	±13µm
825 - 850mm	133-174	±14µm
850 - 875mm	133-175	±14µm
875 - 900mm	133-176	±14µm
900 - 925mm	133-177	±15µm
925 - 950mm	133-178	±15µm
950 - 975mm	133-179	±15µm
975 - 1000mm	133-180	±16µm

Inch		Individual
Range	Order No.	Accuracy
2" - 3"	133-223	±.00015"
3" - 4"	133-224	±.0002"
4" - 5"	133-225	±.00025"
5" - 6"	133-226	±.00025"
6" - 7"	133-227	±.00025"
7" - 8"	133-228	±.00025"
8" - 9"	133-229	±.00025"
9" - 10"	133-230	±.0003"
10" - 11"	133-231	±.0003"
11" - 12"	133-232	±.0003"

# Tubular Inside Micrometers

## SERIES 133



133-902

Metric Micrometer set		
Range	Order No.	Included in set
50 - 150mm (4 pcs. set)	133-901	<ul style="list-style-type: none"> <li>• 133-143, 133-144, 133-145, 133-146</li> <li>• with fitted case</li> </ul>
50 - 300mm (10 pcs. set)	133-902	<ul style="list-style-type: none"> <li>• 133-143, 133-144, 133-145, 133-146, 133-147, 133-148, 133-149, 133-150, 133-151, 133-152</li> <li>• with fitted case</li> </ul>

Inch Micrometer set		
Range	Order No.	Included in set
2" - 6" (4 pcs. set)	133-903	<ul style="list-style-type: none"> <li>• 133-223, 133-224, 133-225, 133-226</li> <li>• with fitted case</li> </ul>
2" - 12" (10 pcs. set)	133-904	<ul style="list-style-type: none"> <li>• 133-223, 133-224, 133-225, 133-226, 133-227, 133-228, 133-229, 133-230, 133-231, 133-232</li> <li>• with fitted case</li> </ul>

## DIMENSIONS

Unit: mm

Order No.	L	a	b
133-145 / 133-225	100	5	3
133-146 / 133-226	125	5	3
133-147 / 133-227	150	18	15
133-148 / 133-228	175	18	15
133-149 / 133-229	200	18	15
133-180 / 133-232	975	18	15

# Inside Micrometers

## SERIES 141 — Interchangeable Rod Type

### FEATURES

- Wide range of ID measurements with interchangeable rods.
- Each interchangeable rod is marked with its measuring range.
- The sizes of interchangeable rods can be adjusted with spacing collars.
- Both micrometer head and furnished rods are satin-chrome finished throughout.
- Supplied in fitted plastic case. Over 1000mm / 40" supplied in wooden case.

### Technical Data

Metric Model

Accuracy:  $\pm(6+L/50)\mu\text{m}^*$   
 \*L=Maximum measuring length (mm)  
 Fraction rounded up

Inch Model

Accuracy:  $\pm\{.00024+ (.00004 \times R/2)\}^*^*$   
 \*R=Maximum measuring length (inch)  
 Fraction rounded up

Graduation: 0.01mm or .001"

### Optional Accessories

---- : Setting ring (See page C-30.)

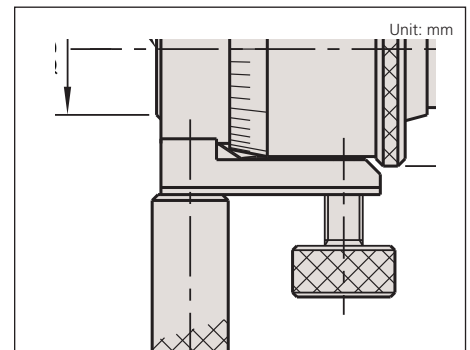


141-233



When using the extension rod

### DIMENSIONS



### SPECIFICATIONS

Metric			
Range	Order No.	Travel of micrometer head	Remarks
25 - 32mm	141-001 / 141-003*	7mm	—
25 - 50mm	141-101 / 141-103*	7mm	with 2 rods
50 - 63mm	141-025 / 141-027*	13mm	—
50 - 200mm	141-205 / 141-211*	13mm	with 3 rods
50 - 300mm	141-206 / 141-212*	13mm	with 5 rods
200 - 225mm	141-009 / 141-011*	25mm	—
200 - 500mm	141-117	25mm	with 3 rods
200 - 1000mm	141-118	25mm	with 8 rods

\*with carbide tipped face

### Inch

Range	Order No.	Travel of micrometer head	Remarks
1" - 1.25"	141-002 / 141-004*	.25"	—
1" - 2"	141-102 / 141-104*	.25"	with 2 rods
2" - 2.5"	141-026 / 141-028*	.5"	—
2" - 8"	141-208 / 141-214*	.5"	with 3 rods
2" - 12"	141-233 / 141-215*	.5"	with 5 rods
8" - 9"	141-010 / 141-012*	1"	—
8" - 20"	141-121	1"	with 3 rods
8" - 40"	141-122	1"	with 8 rods

\*with carbide tipped face

# Digimatic Tubular Inside Micrometers

**SERIES 337 — Extension Rod Type / SERIES 339 — Extension Pipe Type**

## FEATURES

- Wide range of ID measurements by combining extension rods (pipes) and anvils with the micrometer head.
- The 339 Series uses highly-durable extension pipes.
- Carbide-tipped measuring faces.
- Supplied in wooden case.



337-303



339-304



### Metric — Extension rod type

Range	Order No.	Travel of micrometer head	Extension rods
200 - 225mm	337-101	25mm	—
200 - 1000mm	337-301	25mm	25mm, 50mm, 100mm (2 pcs.), 200mm, 300mm
200 - 1500mm	337-302	25mm	25mm, 50mm, 100mm, 200mm, 300mm (3 pcs.)

### Inch/Metric — Extension rod type

Range	Order No.	Travel of micrometer head	Extension rods
8 - 9" / 203.2 - 228.6mm	337-102	1"	—
8 - 40" / 203.2 - 1016mm	337-303	1"	1", 2", 4" (2 pcs.), 8", 12"
8 - 60" / 203.2 - 1524mm	337-304	1"	1", 2", 4", 8", 12" (3 pcs.)

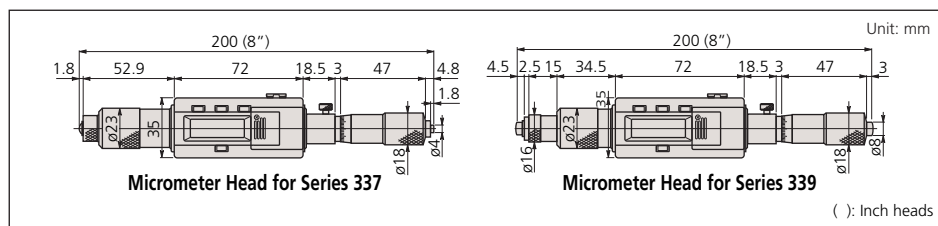
### Metric — Extension pipe type

Range	Order No.	Travel of micrometer head	Extension pipes
200 - 225mm	339-101	25mm	—
200 - 1000mm	339-301	25mm	25mm, 50mm, 100mm, 200mm, 400mm
200 - 2000mm	339-302	25mm	25mm, 50mm, 100mm, 200mm (2 pcs.), 400mm (3 pcs.)

### Inch/Metric — Extension pipe type

Range	Order No.	Travel of micrometer head	Extension pipes
8 - 9" / 203.2 - 228.6mm	339-102	1"	—
8 - 40" / 203.2 - 1016mm	339-303	1"	1", 2", 4", 8", 16"
8 - 60" / 203.2 - 1524mm	339-304	1"	1", 2", 4", 8" (2 pcs.), 16" (3 pcs.)

## DIMENSIONS



## Technical Data

Metric Model

Accuracy:  $\pm(3+n+L/50)\mu\text{m}^*$

\* n=Number of rod, L=Maximum measuring length (mm), Fraction rounded up, Excluding quantizing error

Inch Model

Accuracy:  $\pm\{.00012+ (.00004 \times R/2)\}^**$

\* R=Maximum measuring length (inch) Fraction rounded up

Resolution: 0.001mm or .0001"/0.001mm

Display: LCD

Battery: SR44 (1 pcs.), 938882

Battery life: Approx. 8 months under normal use

## Function

Zero/ABS, Data hold, Data output, Preset, inch/mm conversion (inch/mm models)

Alarm: Low voltage, Counting value composition error

## Optional Accessories

05CZA662: SPC cable (1m)

05CZA663: SPC cable (2m)

-----: Setting ring (See page C-30.)



# Tubular Inside Micrometers

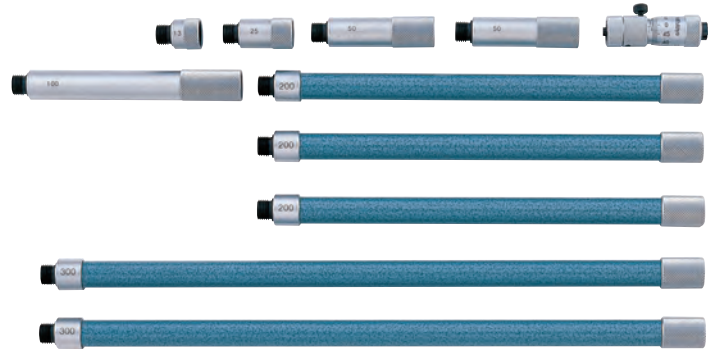
## SERIES 137 — Extension Rod Type

### FEATURES

- Wide range of ID measurements by combining extension rods (pipes) and anvils with the micrometer head.
- Carbide-tipped measuring faces are available.
- Supplied in fitted plastic case except 1500 mm / 60" come in wooden case.



137-011



137-205

### Technical Data

Metric Model

Accuracy:  $\pm(3+n+L/50)\mu\text{m}$   
 L=Maximum measuring length (mm), Fraction rounded up

Inch Model

Accuracy:  $\pm\{.00012+n+(\.00004 \times R/2)\}^*$   
 R=Maximum measuring length (inch), Fraction rounded up

Graduation: 0.01mm or .001"

### Optional Accessories

---- : Setting ring (See page C-30.)

### SPECIFICATIONS

#### Metric — Extension rod type

Range	Order No.	Travel of micrometer head	Extension rods
50 - 63mm	137-011 / 137-013*	13mm	—
50 - 150mm	137-201 / 137-206*	13mm	13mm, 25mm, 50mm
50 - 300mm	137-202 / 137-207*	13mm	13mm, 25mm, 50mm (2 pcs.), 100mm
50 - 500mm	137-203 / 137-208*	13mm	13mm, 25mm, 50mm (2 pcs.), 100mm, 200mm
50 - 1000mm	137-204 / 137-209*	13mm	13mm, 25mm, 50mm (2 pcs.), 100mm, 200mm (2 pcs.), 300mm
50 - 1500mm	137-205 / 137-210*	13mm	13mm, 25mm, 50mm (2 pcs.), 100mm, 200mm (3 pcs.), 300mm (2 pcs.)

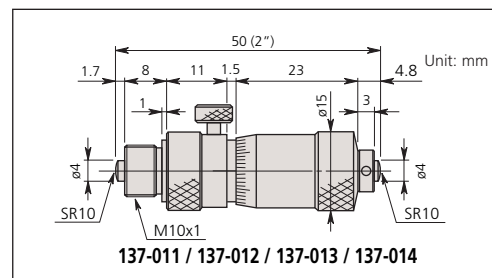
\*with carbide tipped face

#### Inch — Extension rod type

Range	Order No.	Travel of micrometer head	Extension rods
2" - 2.5"	137-012 / 137-014*	.5"	—
2" - 6"	137-211 / 137-216*	.5"	.5", 1", 2"
2" - 12"	137-212 / 137-217*	.5"	.5", 1", 2" (2 pcs.), 4"
2" - 20"	137-213 / 137-218*	.5"	.5", 1", 2" (2 pcs.), 4", 8"
2" - 40"	137-214 / 137-219*	.5"	.5", 1", 2" (2 pcs.), 4", 8" (2 pcs.), 12"
2" - 60"	137-215 / 137-220*	.5"	.5", 1", 2" (2 pcs.), 4", 8" (3 pcs.), 12" (2 pcs.)

\*with carbide tipped face

### DIMENSIONS

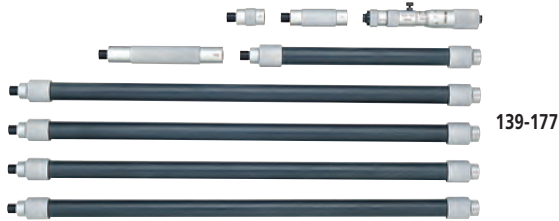


# Tubular Inside Micrometers

## SERIES 139 — Extension Pipe Type

### FEATURES

- Wide range of ID measurements by combining extension pipes and anvils with the micrometer head.
- Supplied in fitted wooden case except 500 mm / 20" come in plastic case.



### Metric — Extension pipe type

Range	Order No.	Travel of micrometer head	Extension pipes
100 - 125mm	139-001	25mm	—
100 - 500mm	139-173	25mm	25mm, 50mm, 100mm, 200mm
100 - 900mm	139-174	25mm	25mm, 50mm, 100mm, 200mm, 400mm
100 - 1300mm	139-175	25mm	25mm, 50mm, 100mm, 200mm, 400mm (2 pcs.)
100 - 1700mm	139-176	25mm	25mm, 50mm, 100mm, 200mm, 400mm (3 pcs.)
100 - 2100mm	139-177	25mm	25mm, 50mm, 100mm, 200mm, 400mm (4 pcs.)

### Inch — Extension pipe type

Range	Order No.	Travel of micrometer head	Extension pipes
4" - 5"	139-002	1"	—
4" - 20"	139-178	1"	1", 2", 4", 8"
4" - 36"	139-179	1"	1", 2", 4", 8", 16"
4" - 52"	139-180	1"	1", 2", 4", 8", 16" (2 pcs.)
4" - 68"	139-181	1"	1", 2", 4", 8", 16" (3 pcs.)
4" - 84"	139-182	1"	1", 2", 4", 8", 16" (4 pcs.)

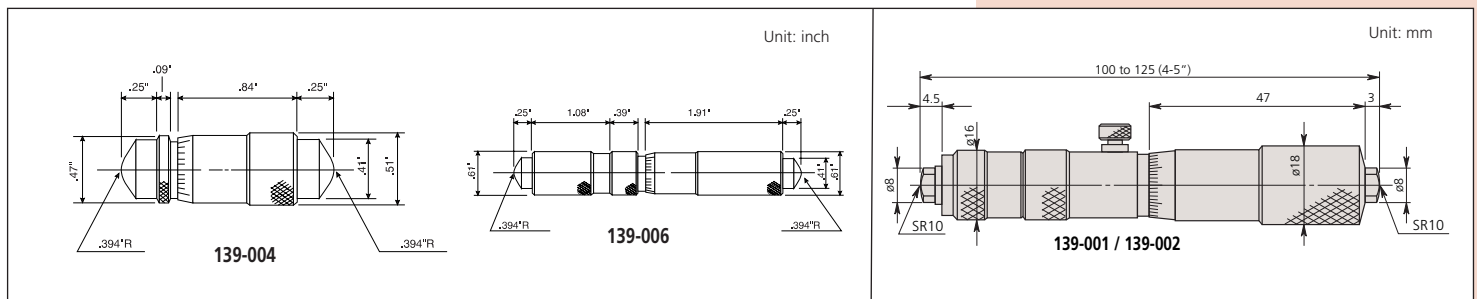


139-201

### Inch — Extension pipe type

Range	Order No.	Travel of micrometer head	Extension pipes	Remarks
1.5 - 2"	139-004	.5"	—	—
4 - 5"	139-006	1"	—	—
1.5 - 12"	139-201	.5"	.5", 1", 2", 2.5", 3", 3.5", 4", 6"	Includes 139-004
4 - 40"	139-202	1"	1", 2", 3", 6", 9", 12", 14", 16", 17", 19"	Includes 139-006

### DIMENSIONS



### Technical Data

Metric Model

Accuracy:

- Series 139:  $\pm(3+n+L/50)\mu\text{m}$   
L=Maximum measuring length (mm), Fraction rounded up

Inch Model

Accuracy:

- Series 139:  $\pm(.00012+m+(\.00004 \times R/2))^*$   
R=Maximum measuring length (inch), Fraction rounded up

Graduation: 0.01mm or .001"

### Optional Accessories

-----: Setting ring (See page C-30.)

# Tubular Inside Micrometers

## SERIES 140 — Extension Pipe Type

### Technical Data

Metric Model  
Accuracy:  $\pm(3+n+L/50)\mu\text{m}^*$   
\*n=Number of rod, L=Maximum measuring length (mm), Fraction rounded up

Inch Model  
Accuracy:  $\pm\{.00012+m+(.00004 \times R/2)\}^*$   
\*n=Number of rod, L=Maximum measuring length (mm), Fraction rounded up

Graduation: 0.01mm or .001"

### Optional Accessories

----- : Setting ring (See page C-30.)

### FEATURES

- Wide range of ID measurements by combining extension rods (pipes) and anvils with the micrometer head.
- The Series 140 use highly-durable/ large-diameter extension pipes.
- Supplied in fitted wooden case.

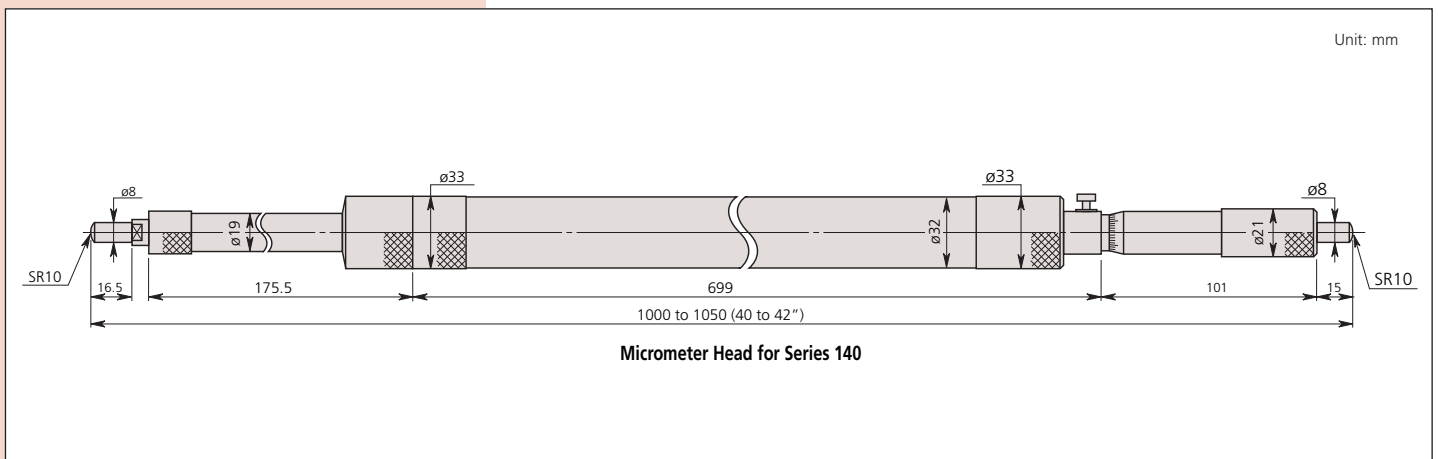
#### Metric — Extension pipe type

Range	Order No.	Travel of micrometer head	Extension pipes
1000 - 2000mm	<b>140-157</b>	50mm	50mm, 100mm (2 pcs.), 200mm, 500mm
1000 - 3000mm	<b>140-158</b>	50mm	50mm, 100mm (2 pcs.), 200mm, 500mm, 1000mm
1000 - 4000mm	<b>140-159</b>	50mm	50mm, 100mm (2 pcs.), 200mm, 500mm, 1000mm (2 pcs.)
1000 - 5000mm	<b>140-160</b>	50mm	50mm, 100mm (2 pcs.), 200mm, 500mm, 1000mm (3 pcs.)

#### Inch — Extension pipe type

Range	Order No.	Travel of micrometer head	Extension pipes
40" - 80"	<b>140-161</b>	2"	2", 4" (2 pcs.), 8", 20"
40" - 120"	<b>140-162</b>	2"	2", 4" (2 pcs.), 8", 20", 40"
40" - 160"	<b>140-163</b>	2"	2", 4" (2 pcs.), 8", 20", 40" (2 pcs.)
40" - 200"	<b>140-164</b>	2"	2", 4" (2 pcs.), 8", 20", 40" (3 pcs.)

### DIMENSIONS



# Inside Micrometers

## SERIES 345, 145 — Caliper Type

### FEATURES

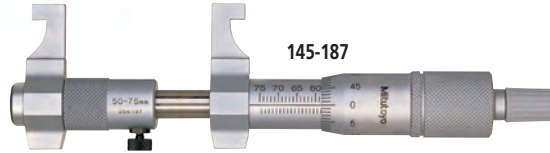
- Caliper type jaws are made of high-grade, tool steel.
- Locking clamp for positive locking of spindle.
- Satin-chrome finished.
- A special holder is available to be used with Mitutoyo Micrometer Stand.
- Supplied in fitted plastic case. Over 175mm / 4" supplied in wooden case.



345-350-10



145-193



145-187

### SPECIFICATIONS

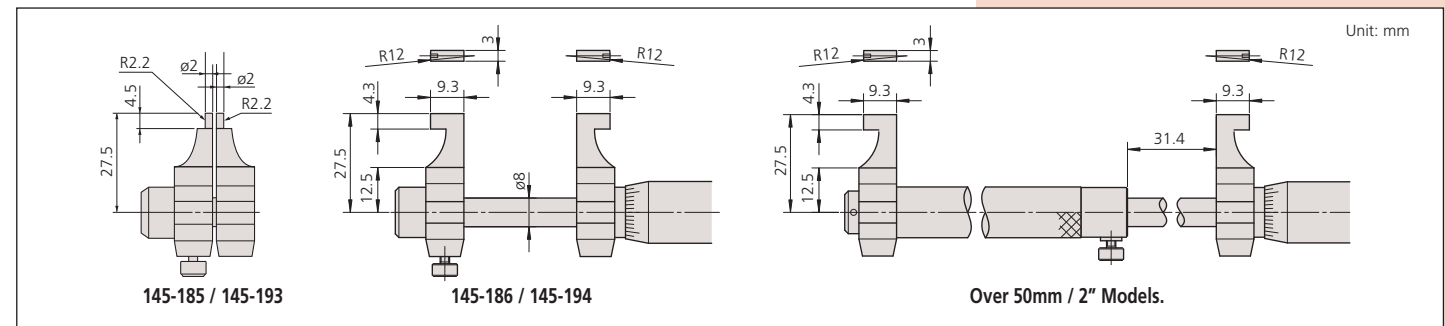
Metric		
Range	Order No.	Accuracy
5 - 30mm	345-250-10	±5µm
25 - 50mm	345-251-10	±6µm

Inch/Metric		
Range	Order No.	Accuracy
.2 - 1.2" / 5-30mm	345-350-10	±.00025"
1 - 2" / 25-50mm	345-351-10	±.0003"

Metric		
Range	Order No.	Accuracy
5 - 30mm	145-185	±5µm
25 - 50mm	145-186	±6µm
50 - 75mm	145-187	±7µm
75 - 100mm	145-188	±8µm
100 - 125mm	145-189	±9µm
125 - 150mm	145-190	±9µm
150 - 175mm	145-191	±10µm
175 - 200mm	145-192	±10µm
200 - 225mm	145-217	±11µm
225 - 250mm	145-218	±11µm
250 - 275mm	145-219	±12µm
275 - 300mm	145-220	±12µm

Inch		
Range	Order No.	Accuracy
.2 - 1.2"	145-193	±.00025"
1 - 2"	145-194	±.0003"
2 - 3"	145-195	±.00035"
3 - 4"	145-196	±.0004"

### DIMENSIONS



### Technical Data

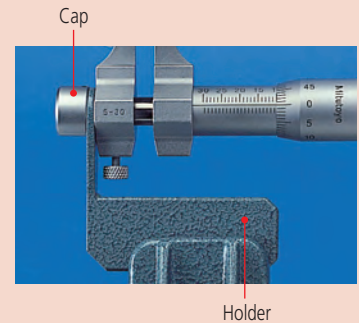
Accuracy: Refer to the list of specifications.  
(excluding quantizing error for digital models)  
Resolution\*: 0.01mm or .00005"/0.001mm  
Graduation\*\*: 0.01mm or .001"  
Measuring faces: Carbide tipped  
Display\*: LCD  
Battery\*: SR44 (1 pc.), 938882  
Battery life\*: Approx. 1.2 years under normal use  
\*Digital models \*\*Analog models

### Function of Digital Model

Origin-set, Zero-setting, Data hold, Data output, inch/mm conversion (inch/mm models)  
Alarm: Low voltage, Counting value composition error  
Function Lock  
2 Presets

### Optional Accessories

- 05CZA662: SPC cable with data switch 1m / 40"
- 05CZA663: SPC cable with data switch 2m / 80"
- : Setting ring (See page C-30.)
- 300401: Cap for stand holder
- 300400: Stand holder





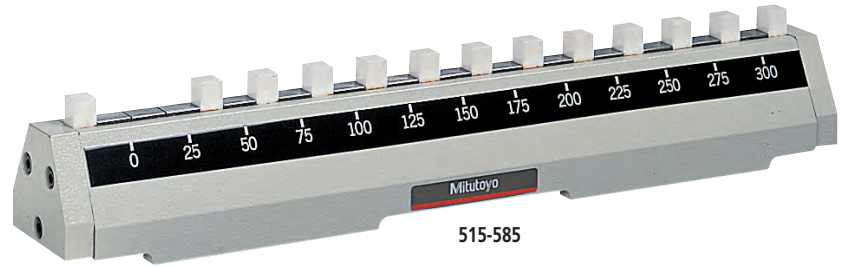


# Inside Micro Checker

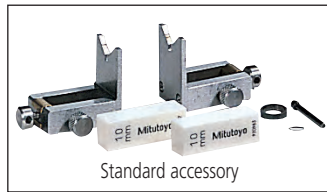
## SERIES 515

### FEATURES

- The Inside Micro Checker is designed to efficiently check the zero point of a tubular inside micrometer.
- Each measuring block is made of zirconia-based ceramic and it is free from deterioration and dimensional changes over time.



515-585



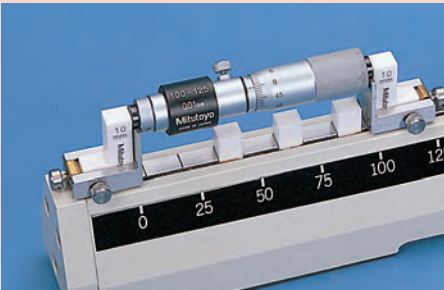
Standard accessory

### Technical Data

Block pitch accuracy:  $\pm(0.001+L/150000)\text{mm}^*$   
 \*L= Length to check (mm)

### Optional Accessories

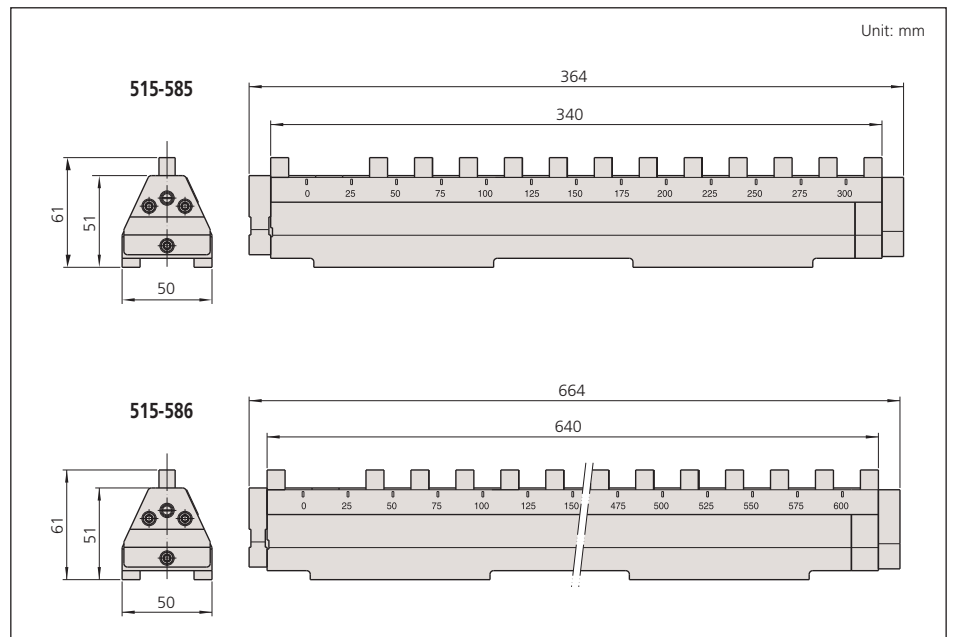
- 602160:** Wooden case for 300mm Inside Micro Checker  
**602163:** Wooden case for 600mm Inside Micro Checker



### SPECIFICATIONS

Range	Order No.	Length to check
300mm	<b>515-585</b>	25, 50, 75, 100, 125, 150, 175, 200, 225, 250, 275, 300mm
600mm	<b>515-586</b>	25, 50, 75, 100, 125, 150, 175, 200, 225, 250, 275, 300, 325, 350, 375, 400, 425, 450, 475, 500, 525, 550, 575, 600mm

### DIMENSIONS



# Bore Gages

## SERIES 511 — for Small Holes

### FEATURES

- Its interchangeable anvils are made of alloyed steel.
- The dial indicator is fully protected by a rugged cover.

### SPECIFICATIONS

#### Metric    Gage Stem $\varnothing$ 8mm

Measuring Range	Order No. Without Dial Gage	Order No. With 2046SB Graduation 0.01mm	Order No. With 2109SB-10 Graduation 0.001mm	Number of Anvils	Number of Spacers
6 - 10mm	511-209*	511-211	511-210	9	1
10 - 18.5mm	511-201*	511-204	511-203	9	1

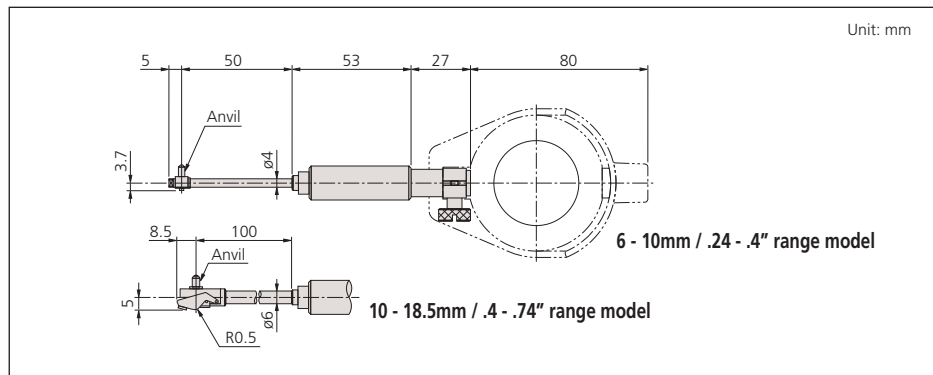
\*Does not come supplied with Dial Gage Protector Cover (21DZA000)

#### Inch    Gage Stem Dia .375"

Measuring Range	Order No. Without Dial Gage	Order No. With 2922SB Graduation .0005"	Order No. With 2923SB-10 Graduation .0001"	Number of Anvils	Number of Spacers
.24 - .4"	511-214*	511-213	511-212	9	1
.4 - .74"	511-205*	511-207	511-206	9	1

\*Does not come supplied with Dial Gage Protector Cover (21DZA000)

### DIMENSIONS

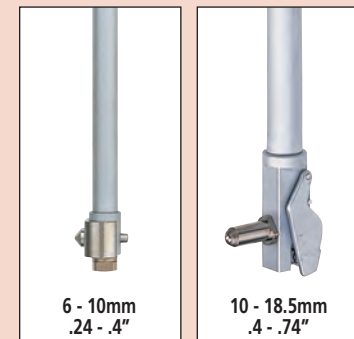


511-204

### Technical Data

Accuracy:  $5\mu\text{m}$  / .0002"  
 Indication stability:  $2\mu\text{m}$  / .00008"  
 Graduation: 0.01mm, 0.001mm, .0005" or .0001"

### Measuring Heads



### Optional Accessories

21DZA000: Dial Gage Protector Cover  
 - - - - : Setting ring (See page C-30.)

# Bore Gages

## SERIES 511—Standard Type

Mitutoyo offers a complete selection of Bore Gages, all of them with interchangeable anvils and necessary accessories to perform close tolerance ID measurements.

### FEATURES

- Most popular Bore Gages.
- Carbide-tipped contact points for durability.
- The dial indicator is fully protected by a rugged cover.
- Optional extension rods can be attached for measuring deep holes.



511-743

### SPECIFICATIONS

**Inch** — Gage Stem  $\varnothing$  3/8"

Measuring Range	Order No. Without Indicator	Order No. With 2922SB Graduation .0005"	Order No. With 2923SB-10 Graduation .0001"	Number of Anvils	Number of Spacers
.7 - 1.4"	511-731*	511-741	511-751	9	2
1.4 - 2.5"	511-732*	511-742	511-752	6	4
2.0 - 6.0"	511-733*	511-743	511-753	11 (2" sub anvil)	4
4.0 - 6.5"	511-734*	511-744	511-754	13	4
6.5 - 10"	511-735*	511-745	511-755	6	7
10 - 16"	511-736*	511-746	511-756	5 (3" sub anvil)	7
.7 - 6"	—	511-931	511-932	26 (2" sub anvil)	10

\*Does not come supplied with Dial Gage Protector Cover (21DZA000)

**Metric** — Gage Stem  $\varnothing$  8mm

Measuring Range	Order No. Without Indicator	Order No. With 2046SB Graduation 0.01mm	Order No. With 2109SB-10 Graduation 0.001mm	Number of Anvils	Number of Spacers
18 - 35mm	511-701*	511-711	511-721	9	2
35 - 60mm	511-702*	511-712	511-722	6	4
50 - 150mm	511-703*	511-713	511-723	11 (50mm Sub Anvil)	4
100 - 160mm	511-704*	511-714	511-724	13	4
160 - 250mm	511-705*	511-715	511-725	6	7
250 - 400mm	511-706*	511-716	511-726	5 (75mm Sub Anvil)	7
18 - 150mm	—	511-921 (3 pc set)	511-922 (3 pc set)	26 (50mm Sub Anvil)	10

\*Does not come supplied with Dial Gage Protector Cover (21DZA000)

### Technical Data

Accuracy:  $2\mu\text{m} / .00008"$

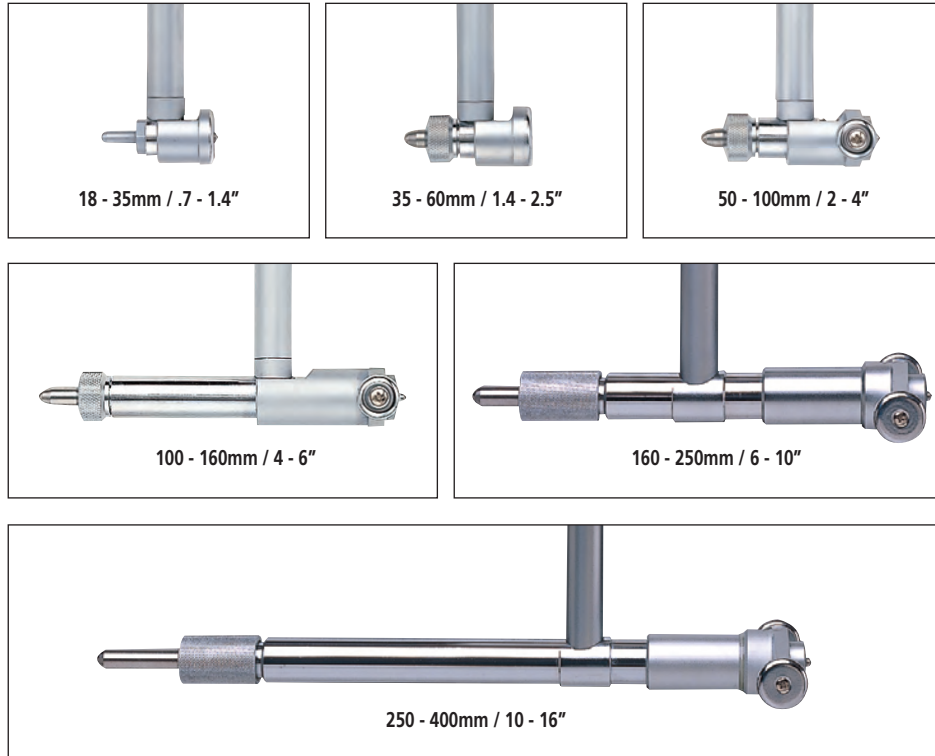
Indication stability:  $1\mu\text{m} / .00004"$

Graduation: 0.01mm, 0.001mm, .0005" or .0001"

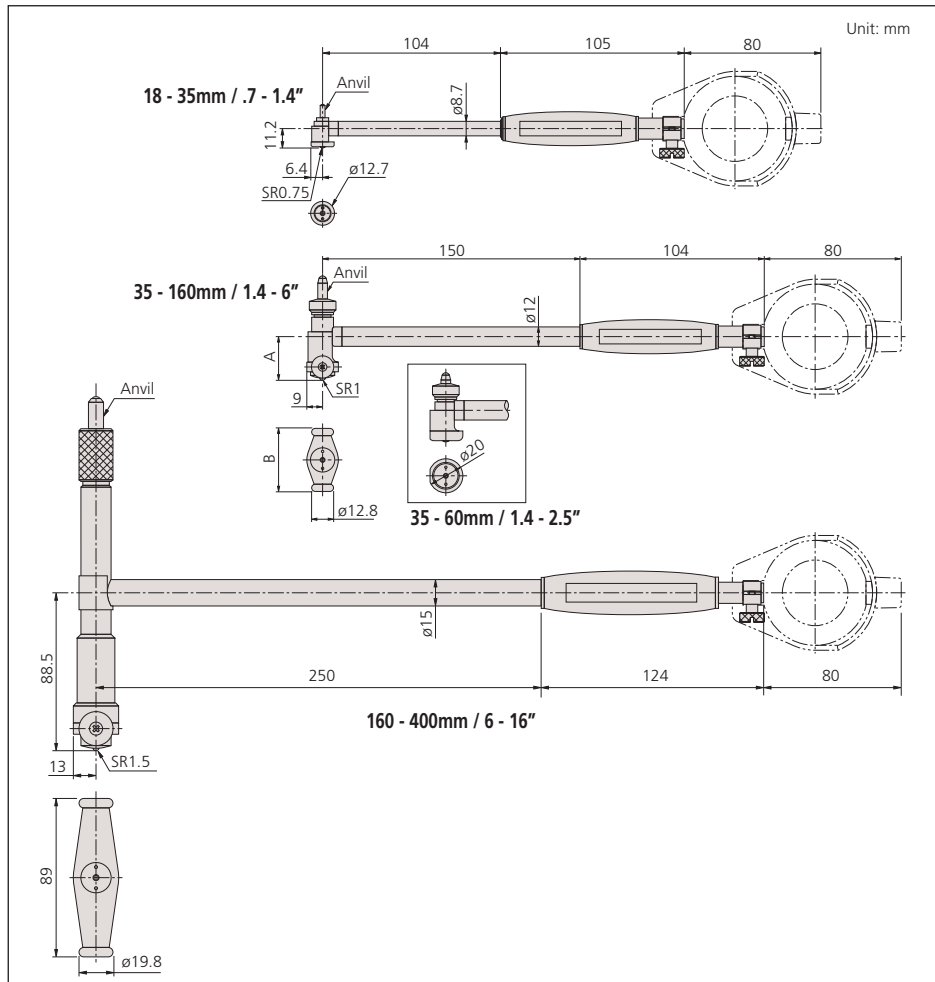


511-931

## Contact Point

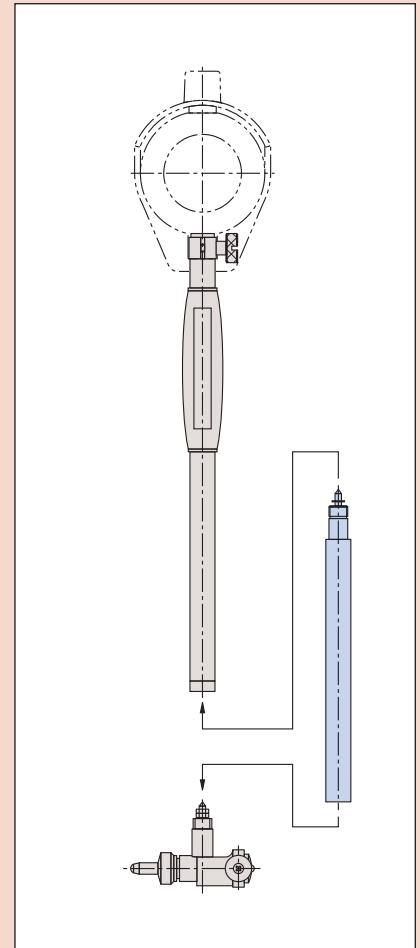


## DIMENSIONS



## Optional Accessories

- 953549: 125mm / 4.92" Extension rod for 18-35mm / .7 - 1.4" models
- 953552: 125mm / 4.92" Extension rod for 35-160mm / 1.4 - 6.5" models
- 953557: 125mm / 4.92" Extension rod for 160-400mm / 6.5 - 16" models
- 953550: 250mm / 9.84" Extension rod for 18-35mm / .7 - 1.4" models
- 953553: 250mm / 9.84" Extension rod for 35-160mm / 1.4 - 6.5" models
- 952361: 250mm / 9.84" Extension rod for 160-400mm / 6.5 - 16" models
- 953551: 500mm / 19.69" Extension rod for 18-35mm / .7 - 1.4" models
- 953554: 500mm / 19.69" Extension rod for 35-160mm / 1.4 - 6.5" models
- 953558: 500mm / 19.69" Extension rod for 160-400mm / 6.5 - 16" models
- 953555: 750mm / 29.53" Extension rod for 35-160mm / 1.4 - 6.5" models
- 953559: 750mm / 29.53" Extension rod for 160-400mm / 6.5 - 16" models
- 953556: 1000mm / 39.37" Extension rod for 35-160mm / 1.4 - 6.5" models
- 953560: 1000mm / 39.37" Extension rod for 160-400mm / 6.5 - 16" models



Setting ring (See page C-30.)

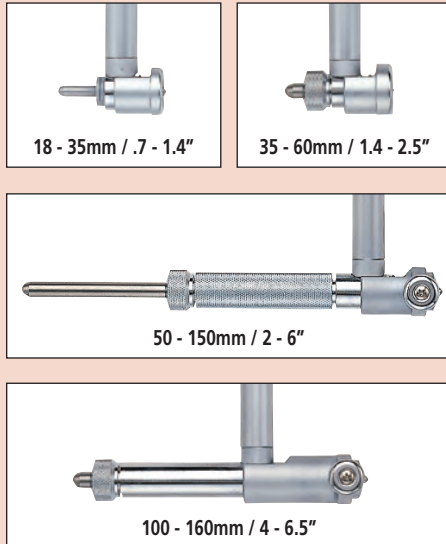


511-786

### Technical Data

Accuracy:  $2\mu\text{m} / .00008''$   
 Indication stability:  $1\mu\text{m} / .00004''$   
 Graduation: 0.01mm, 0.001mm, .0005" or .0001"

### Contact Point



### Optional Accessories

---- : Setting ring (See page C-30.)

# Bore Gages

## SERIES 511 — Short Leg Type

### FEATURES

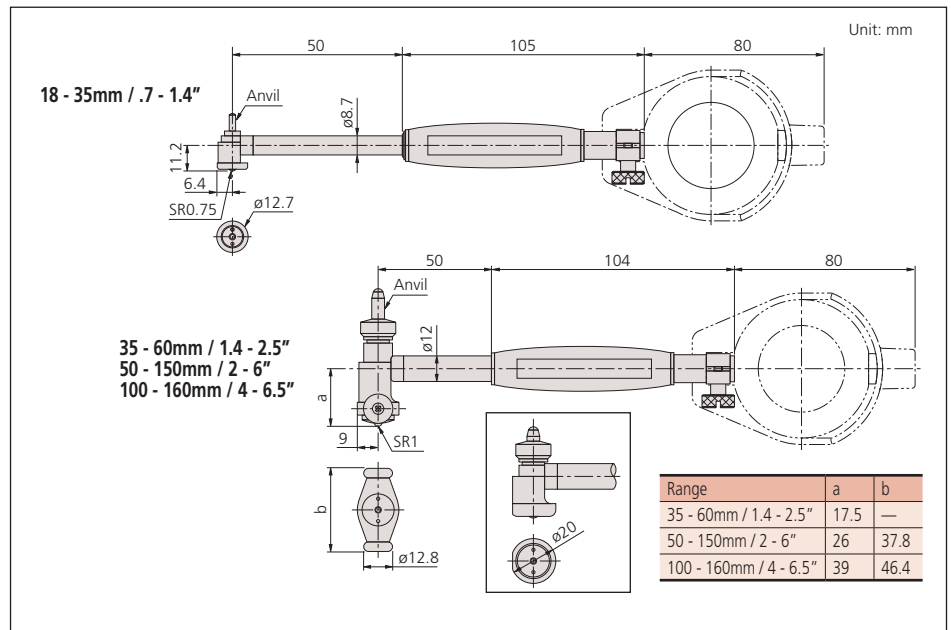
- Compact and lightweight because of the short length below the grip.
- Carbide-tipped contact point for durability.

### SPECIFICATIONS

Inch		Gage Stem $\varnothing 3/8''$		
Measuring Range	Order No. With 2922SB Graduation .0005"	Order No. With 2923SB-10 Graduation .0001"	Number of Anvils	Number of Spacers
.7 - 1.4"	511-786	511-791	9	2
1.4 - 2.5"	511-787	511-792	6	4
2.0 - 6.0"	511-788	511-793	11 (2" sub anvil)	4
4.0 - 6.5"	511-789	511-794	13	4

Metric		Gage Stem $\varnothing 8\text{mm}$		
Measuring Range	Order No. With 2046SB Graduation 0.01mm	Order No. With 2109SB-10 Graduation 0.001mm	Number of Anvils	Number of Spacers
18 - 35mm	511-766	511-771	9	2
35 - 60mm	511-767	511-772	6	4
50 - 150mm	511-768	511-773	11 (50mm Sub Anvil)	4
100 - 160mm	511-769	511-774	13	4

### DIMENSIONS



# Bore Gages

## SERIES 511 — for Blind Holes

### FEATURES

- Can measure ID at position close to the bottom of blind holes.

### SPECIFICATIONS

**Metric** Gage Stem  $\varnothing$  8mm

Measuring Range	Order No. Without Dial Gage	Order No. With 2046SB Graduation 0.01mm	Order No. With 2019SB-10 Graduation 0.001mm	Number of Anvils	Number of Spacers
15 - 35mm	511-401*	511-411	511-421	11 10mm Sub-Anvil	1
35 - 60mm	511-402*	511-412	511-422	6	4
50 - 100mm	511-403*	511-413	511-423	11	4
50 - 150mm	511-404*	511-414	511-424	11 50mm Sub-Anvil	4

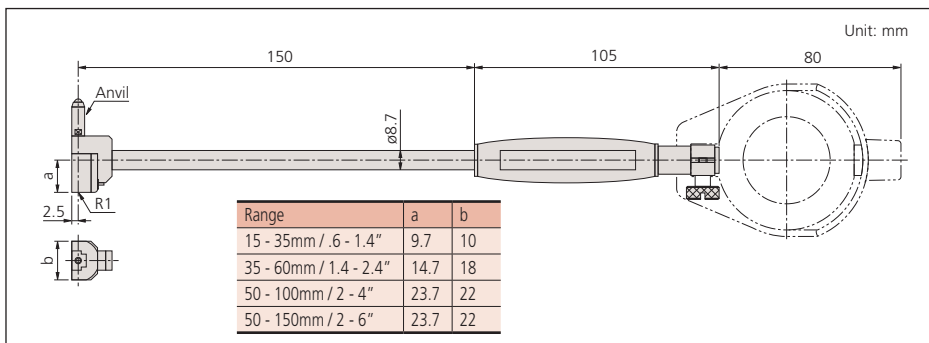
\*Does not come supplied with Dial Gage Protector Cover (21DZA000)

**Inch** Gage Stem Dia. .375"

Measuring Range	Order No. Without Dial Gage	Order No. With 2922SB Graduation .0005"	Order No. With 2923SB-10 Graduation .0001"	Number of Anvils	Number of Spacers
.6 - 1.4"	511-406*	511-431	511-441	11 .4" Sub-Anvil	1
1.4 - 2.4"	511-407*	511-432	511-442	6	4
2 - 4"	511-408*	511-433	511-443	11	4
2 - 6"	511-409*	511-434	511-444	11 2" Sub-Anvil	4

\*Does not come supplied with Dial Gage Protector Cover (21DZA000)

### DIMENSIONS

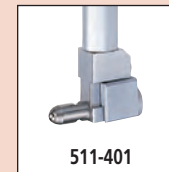


511-412

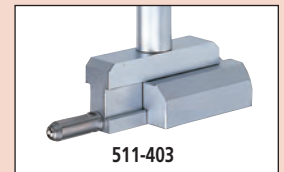
### Technical Data

Accuracy:  $5\mu\text{m} / .0002''$   
 Indication stability:  $2\mu\text{m} / .00008''$   
 Graduation: 0.01mm, 0.001mm, .0005" or .0001"

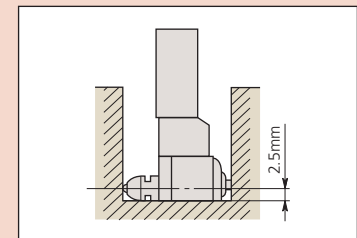
### Contact Point



511-401



511-403



### Optional Accessories

----- : Setting ring (See page C-30.)  
 Extension Rods are not available for these models



511-843

# Bore Gages

## SERIES 511 — with Micrometer Head

### FEATURES

- Interchangeable anvil is attached to a micrometer head for accurate dimensional setting.
- Wide measuring range with sub-anvils.
- Carbide ball contact point for durability.
- Extension rods (optional) can be attached for measuring deep holes.
- Optional Setting Rings offer the best method of zero-setting Bore Gages.

### SPECIFICATIONS

**Inch** Gage Stem  $\varnothing$  3/8"

Measuring Range	Order No. Without Indicator	Order No. With 2922SB Graduation .0005"	Order No. With 2923SB-10 Graduation .0001"	Mic Head Travel	Sub Anvil
2.4 - 4.0"	511-833*	511-843	511-853	.4"	.4", .8"
4.0 - 6.4"	511-834*	511-844	511-854	.5"	.4", .8", .8"
6.0 - 10"	511-835*	511-845	511-855	.5"	.4", .8", .8", 2"
10 - 16"	511-836*	511-846	511-856	1"	1", 2", 2"
16 - 24"	511-837*	511-847	511-857	2"	2", 4"
24 - 32"	511-838*	511-848	511-858	2"	2", 4"

\*Does not come supplied with Dial Gage Protector Cover (21DZA000)

### Technical Data

Accuracy:  $2\mu\text{m}$  / .00008"  
 Indication stability:  $1\mu\text{m}$  / .00004"  
 Graduation: 0.01mm, 0.001mm, .0005" or .0001"

### Optional Accessories

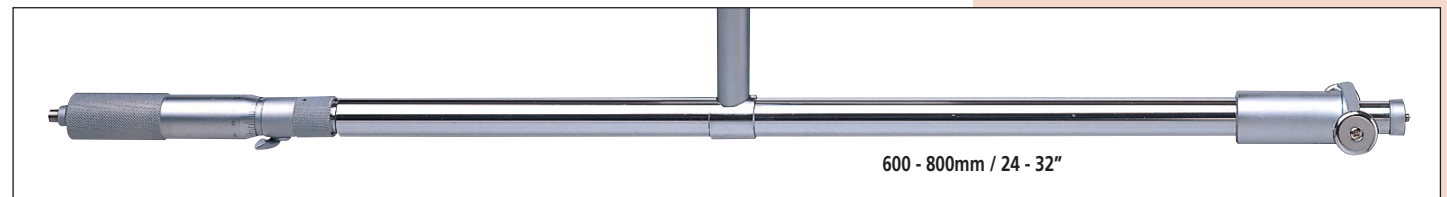
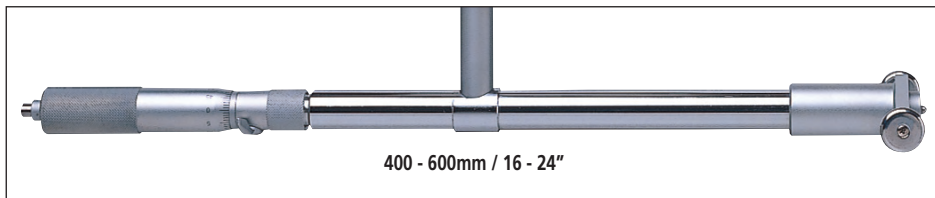
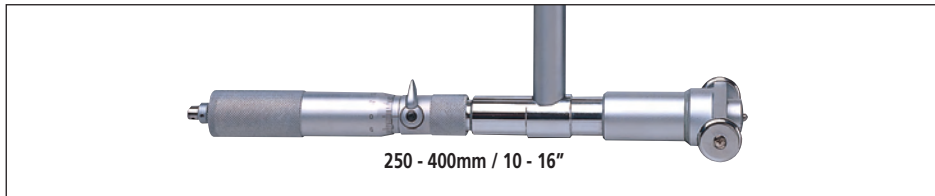
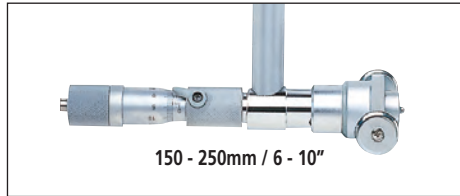
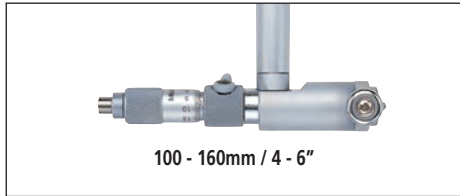
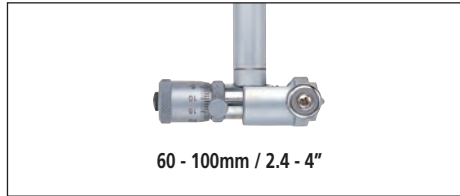
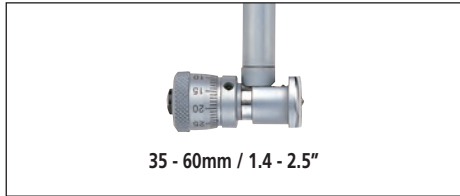
- 953549:** 125mm / 4.92" Extension rod for 18-35mm / .7 - 1.4" models
- 953552:** 125mm / 4.92" Extension rod for 35-160mm / 1.4 - 6.5" models
- 953557:** 125mm / 4.92" Extension rod for 160-400mm / 6.5 - 16" models
- 953550:** 250mm / 9.84" Extension rod for 18-35mm / .7 - 1.4" models
- 953553:** 250mm / 9.84" Extension rod for 35-160mm / 1.4 - 6.5" models
- 952361:** 250mm / 9.84" Extension rod for 160-400mm / 6.5 - 16" models
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- 953556:** 1000mm / 39.37" Extension rod for 35-160mm / 1.4 - 6.5" models
- 953560:** 1000mm / 39.37" Extension rod for 160-400mm / 6.5 - 16" models

**Metric** Gage Stem  $\varnothing$  8mm

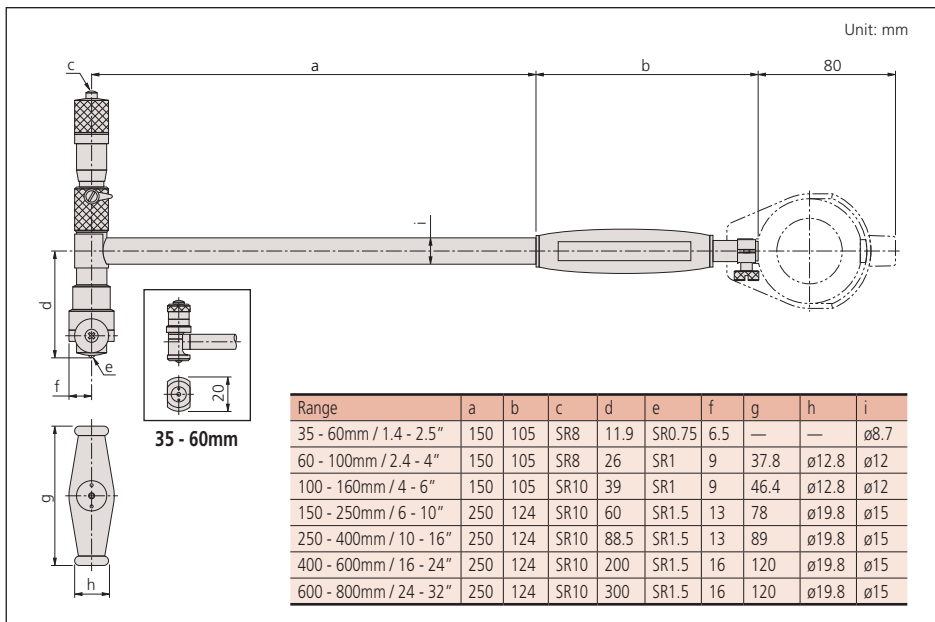
Measuring Range	Order No. Without Indicator	Order No. With 2046SB Graduation 0.01mm	Order No. With 2109SB-10 Graduation 0.001mm	Mic Head Travel	Sub Anvil
60 - 100mm	511-803*	511-813	511-823	10mm	10mm, 20mm
100 - 160mm	511-804*	511-814	511-824	13mm	10mm, 20mm, 20mm
150 - 250mm	511-805*	511-815	511-825	13mm	10mm, 20mm, 20mm, 50mm
250 - 400mm	511-806*	511-816	511-826	25mm	25mm, 50mm, 50mm
400 - 600mm	511-807*	511-817	511-827	50mm	50mm, 100mm
600 - 800mm	511-808*	511-818	511-828	50mm	50mm, 100mm

\*Does not come supplied with Dial Gage Protector Cover (21DZA000)

## Contact Point



## DIMENSIONS







SPC

**ABSOLUTE**  
Absolute System Patented by MITUTOYO

### Technical Data

Accuracy: Wide Range: 0.003mm / .00012"  
Narrow Range: 0.002mm / .00008"  
Resolution: .00005" / 0.001mm

Display: LCD

Battery: SR44 (1 pc.) (938882)

Battery life: Approx. 9 months for normal use

Dust/Water protection level: Conforming to IP53

### Functions

Origin-set, Zero-Setting, Presetting, Power on/off, inch/mm conversion (inch/mm type only), Data output, GO/±NG tolerance judgment

Alarm: Low battery voltage, scale contamination, over-flow error, tolerance limit setting error

### Optional Accessories

**21DZA089:** Extension rod 250 mm (10")

**21DZA081:** Extension rod 500 mm (20")

**516-118-10:** Origin setup metric rectangular gage block set

**516-119-10:** Origin setup metric square gage block set

**516-120-26:** GB calibration kit for series 511 bore gage. (9 pcs GB and plain jaw, 160mm holder)

**905338:** SPC cable (40" / 1m)

**905409:** SPC cable (80" / 2m)

----- : Setting ring (See page C-30.)



Origin setup gage block set

Example: using four extension rods.

# ABSOLUTE Digimatic Bore Gage

## SERIES 511

This ABSOLUTE Digimatic bore gage is exclusively designed for ID measurement.



511-521

### FEATURES

- The minimum value holding function provides the easy detection of hole diameter.

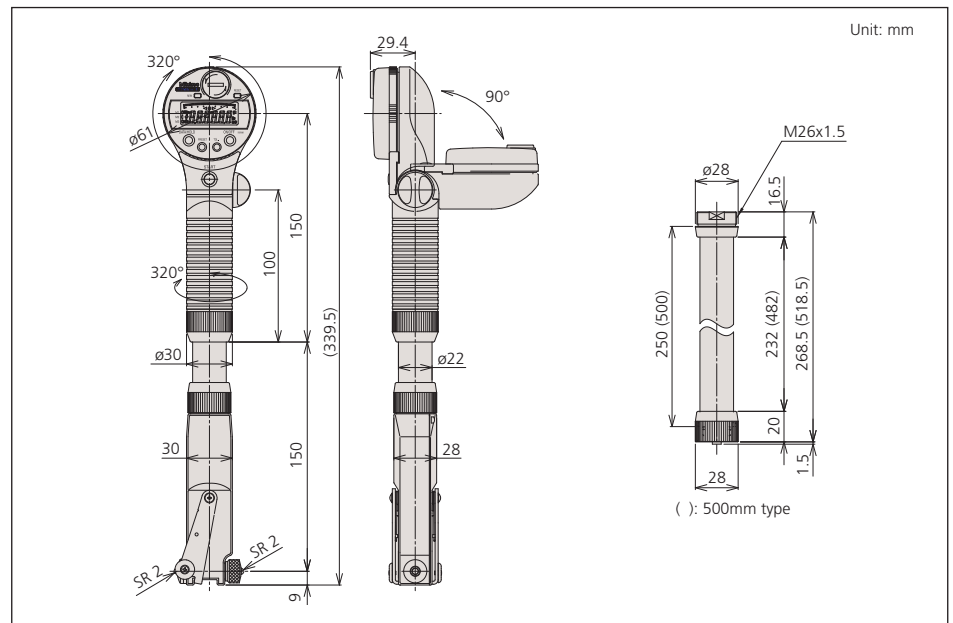


- Up to three sets of master value and upper/lower tolerance value can be memorized.
- An analog bar indicator is integrated to enhance the intuition in reading.
- GO/±NG judgment is performed by setting the upper and lower tolerances.
- Up to four rods (250mm or 500mm) can be used.

### SPECIFICATIONS

Inch/Metric		
Range	Order No.	Probe depth
1.8 - 4" / 45 - 100mm	511-521	6" (152.4mm)
4 - 6.5" / 100 - 160mm	511-522	6" (152.4mm)

### DIMENSIONS AND MASS



MASS: 500g

Mitutoyo

# Bore Gages

## SERIES 526 — for Extra Small Holes

These Bore Gages measure diameters of small holes. The radial displacement of split-ball contact is converted to axial displacement of measuring rod, which is shown on the dial indicator.

### FEATURES

- Optional stand (215-120M) is available for efficient measurement of multiple small holes.

### SPECIFICATIONS

**Metric** Gage Stem  $\varnothing$  8mm

Measuring Range	Order No. Without Dial Gage	Order No. With 2046SB Graduation 0.01mm	Order No. With 2019SB-10 Graduation 0.001mm	Number of Anvils	Number of Needles	Probe depth (D)
0.95 - 1.55mm	526-170*	526-173	526-172	6	1	11.5mm
1.5 - 4mm	526-160*	526-163	526-162	9	2	17.5, 22.5mm
3.7 - 7.3mm	526-150*	526-153	526-152	7	1	32mm
7 - 10mm	—	526-126	526-124	6	1	56mm
10 - 18mm	—	526-127	526-125	8	1	62mm

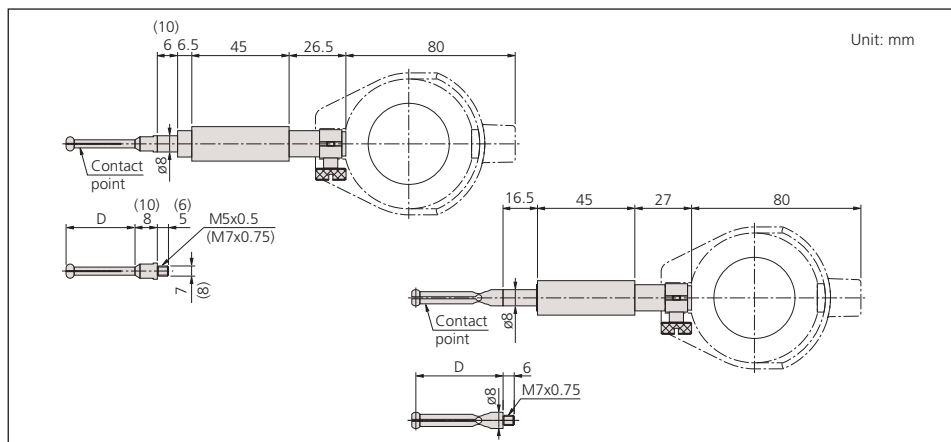
\*Does not come supplied with Dial Gage Protector (21DZA000)

**Inch** Gage Stem Dia .375"

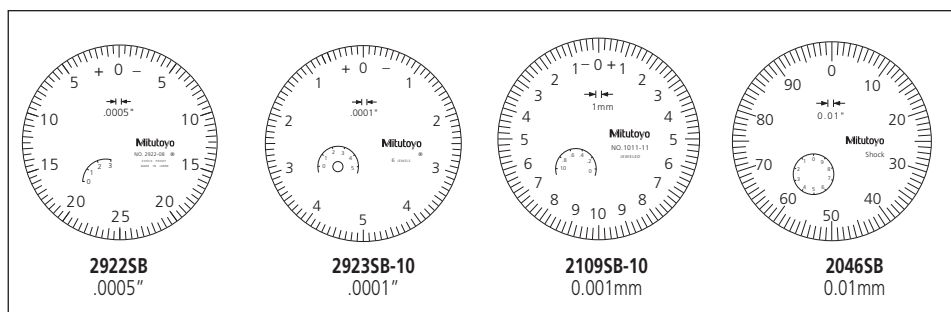
Measuring Range	Order No. Without Dial Gage	Order No. With 2922SB Graduation .0005"	Order No. With 2923SB-10 Graduation .0001"	Number of Anvils	Number of Needles	Probe depth (D)
.037 - .061"	526-175*	—	526-176	5	1	.45"
.06 - .157"	526-165*	—	526-166	9	2	.68", .89"
.145 - .29"	526-155*	—	526-156	7	1	1.26"
.3 - .4"	526-103*	526-119	526-122	6	1	2.2"
.4 - .7"	526-104*	526-120	526-123	8	1	2.4"

\*Does not come supplied with Dial Gage Protector (21DZA000)

### DIMENSIONS



### DIAL FACES



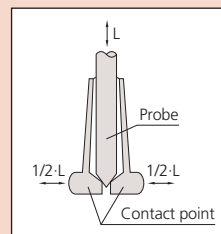
526-172

526-127

### Technical Data

Accuracy:  $4\mu\text{m} / .00016"$   
 Indication stability:  $2\mu\text{m} / .00008"$   
 Graduation: 0.01mm, 0.001mm, .0005" or .00001"

### Contact Point



### Optional Accessory

215-120-10: Bore gage stand



----- : Setting ring (See page C-30.)

# Digimatic Chamfer Chek

**SERIES 547 - I.D. Measures the top diameter of tapered holes and chamfers O.D. measures the minor end diameter of tapered conical parts**

## Standard Accessories

- 64AAA012: Master Plate 3"(W) x 2"(D) x .925"(H)
- 21BZA778: Black Leather Case 9.7"(W) x 2"(D) x 6.1"(H)
- 21BZA779\*: Wooden box 12.8"(W) x 5.1"(D) x 3.63"(H)  
\* 547-481 (DCI-2090) only

## Optional Accessories

### Setting Master

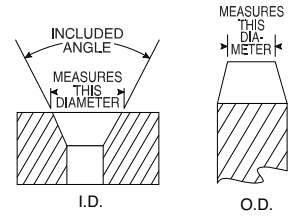
Order No.	Model No.	Diameter	Accuracy
<b>Chamfer Chek I.D.</b>			
64AAA007	SM-1000	*.375" / .750" (I.D.)	±.0002"
64AAA008	SM-2000	*1.25" / 1.75" (I.D.)	±.0003"
64AAA133		9.525mm (I.D.)	±0.005mm
64AAA134		19.05mm (I.D.)	±0.008mm
<b>Chamfer Chek O.D.</b>			
64AAA009	SM-1000E	*.375" / .750" (O.D.)	±.0002"

- 905338: SPC cable (40" / 1m)
- 905409: SPC cable (80" / 2m)



547-480

547-482



547-480 Shown with optional setting master.

## SPECIFICATIONS

### Inch / Metric

Resolution	Diameter Range	Order No.	Model No.	Accuracy	Mass
<b>Chamfer Chek I.D.</b>					
.0005"/0.01mm	.02-1" / 0.5-25.4mm	547-480	DCI-1090	±.001" / ±0.025mm	1.75lbs./793g
.0005"/0.01mm	1-2" / 25.4-50.8mm	547-481	DCI-2090	±.001" / ±0.025mm	3.97lbs./1,800g
<b>Chamfer Chek O.D.</b>					
.0005"/0.01mm	1/8"-1/2" / 3.18-12.7mm	547-482	DCO-0590	±.001" / ±0.025mm	1.75lbs./793g
.0005"/0.01mm	3/8"-1" / 9.52-25.4mm	547-483	DCO-1090	±.001" / ±0.025mm	1.75lbs./793g



526-007M-10

MEASURES THIS DIAMETER



# Digimatic Hole Chek

**SERIES 526 - Instant diameter measurement of small holes**

## SPECIFICATIONS

### Inch / Metric

Resolution	Diameter Range	Order No.	Model No.	Accuracy	Mass
.0005"/0.01mm	.010" - .330"	526-007M-10	DHC-0133	±.001" / ±0.025mm	1.5lbs./680g

## Optional Accessories

### Setting Master

Order No.	Model No.	Diameter	Accuracy
64AAA003	SM-040	.029"	±.0002"
64AAA004	SM-130	.078"	±.0002"
64AAA005	SM-230	.178"	±.0002"
64AAA006	SM-330	.278"	±.0002"

## Standard Accessories

- 21BZA778: Black Leather Case 9.7"(W) x 2"(D) x 6.1"(H)

# Setting Ring

## SERIES 177 — Accessories for Inside Micrometers, Holtest and Dial Bore Gages

### FEATURES

- Used for quick and accurate setting of dial bore gages, Holtest, and inside micrometers.
- If a setting ring of an optimal size is prepared, it can be used for calibration.

### Steel Setting Rings

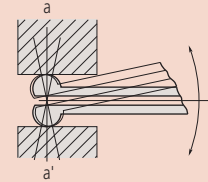


### Ceramic Setting Rings



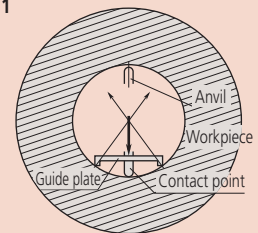
### How to read the indicated value

Series 526



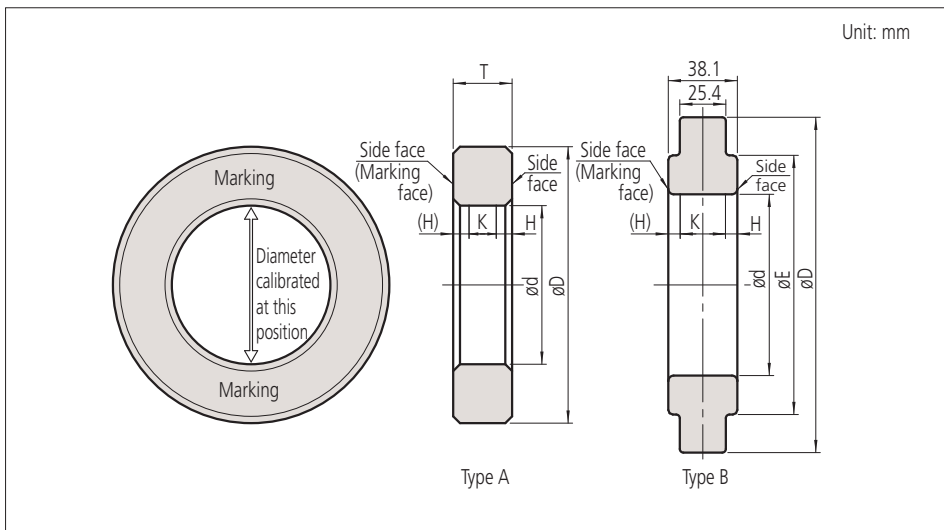
The 526 series has a gage head with high curvature. Alignment with the diameter (a-a') is achieved by rotating the gage head in the direction indicated by the arrow, and the reading is the maximum value read from the dial indicator.

Series 511



The 511 series provides a guide plate to align the setting ring diameter with the measurement axis of the bore gage.

### DIMENSIONS





# RM-120 Ring Master

## Ring Gage Measuring Machine

### FEATURES

- The laser holoscale incorporated in the RM-120 eliminates the need for a reference gage block set and reference ring gages.
- Probe change is not required for the entire measuring range.
- Enhanced repeatability and lower measuring force achieved with the air bearing on the probe carriage guide.
- Workpiece alignment is easy to perform with the specially designed measuring table which is capable of moving, tilting, elevating, and 90 degree rotating.
- The model with an analog meter will further facilitate workpiece positioning.

### SPECIFICATIONS

Model No.	RM-120 with analog meter
Order No.	565-204A
Range	ID: .236 to 4.75" / 6 to 120mm
Resolution (Counter)	.0000001" / 0.0001mm
Analog meter	200 $\mu$ m / .007874", 20 $\mu$ m / .0007874"
Accuracy ( $\pm 2\sigma$ )	$\pm(0.3 + 5D/1000)\mu$ m D: Ring gage size diameter (mm)
Measuring unit	Laser Holoscale
Measuring force	Approx. 0.2N
Work piece size	OD: .7874 - 7.874" / 20 - 200mm Thickness: Up to 1.574" / 40mm
Air requirement	400KPa (58psi)
Air consumption	Approx. 30 liter per minute (12.8CFM)
Dimension (W x D x H)	720mm x 494mm x 875mm 28.35" x 19.45" x 34.45"
Mass	Approx. 260kg (573.2lbs)



This RM-120 conforms to the US CDRH regulations in 21 CFR 1040.

### Optional Accessories

- 02ASE690: Master gage .250" with factory Inspection Certificate
- 02ASE700: Master gage .500" with factory Inspection Certificate
- 02ASE710: Master gage 3" with factory Inspection Certificate
- 02ASE720: Master gage 4.750" with factory Inspection Certificate
- 02ASC530: Master gage 6mm with factory Inspection Certificate
- 02ASC560: Master gage 12.5mm with factory Inspection Certificate
- 02ASC580: Master gage 75mm with factory Inspection Certificate
- 02ASC540: Master gage 120mm with factory Inspection Certificate
- 02ASE480: Vibration stand

# Bore Gage Zero Checker

## SERIES 515

The Bore Gage Zero Checker allows easy zero adjustment of dial bore gages with ranges of 18mm (.7") through 400mm (16") using gage blocks.

### SPECIFICATIONS

Order No.	Applicable range
515-590	18 -400mm (.7" - 16")

515-590





# D

## Small Tool Instruments and Data Management



### Digimatic Caliper



### Digimatic Height Gages



### Linear Height



### Depth Gages



SuperCaliper



ABSOLUTE Coolant Proof Caliper



ABSOLUTE Digimatic Caliper



ABSOLUTE Digimatic Offset Caliper



Digimatic Height Gage

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### Depth Gages

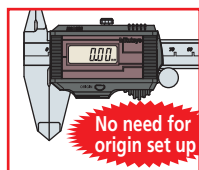
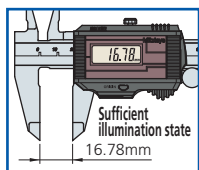
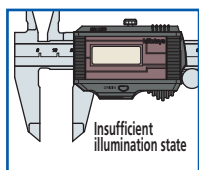
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# Super Caliper-Solar Powered

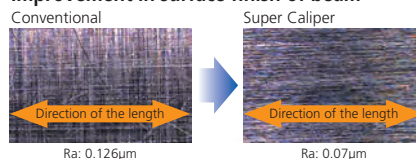
**SERIES 500 — No battery or origin reset needed for IP67 Digital Caliper**

## FEATURES

- With no annoying origin restoration necessary, a measurement can be started any time and there is no restriction on operating speed.
- World's unique\* solar-powered Super Caliper that is eco-friendly with no battery.  
\*According to Mitutoyo investigation in January, 2005
- The impact resistance of the display unit has been increased for improved usability in workshop conditions.
- IP67 protection assures waterproof reliability.
- This Super Caliper uses components that do not contain harmful substances and is compatible with RoHS Directives.
- Supplied in fitted plastic case.



### Improvement in surface finish of beam



500-784

## SPECIFICATIONS

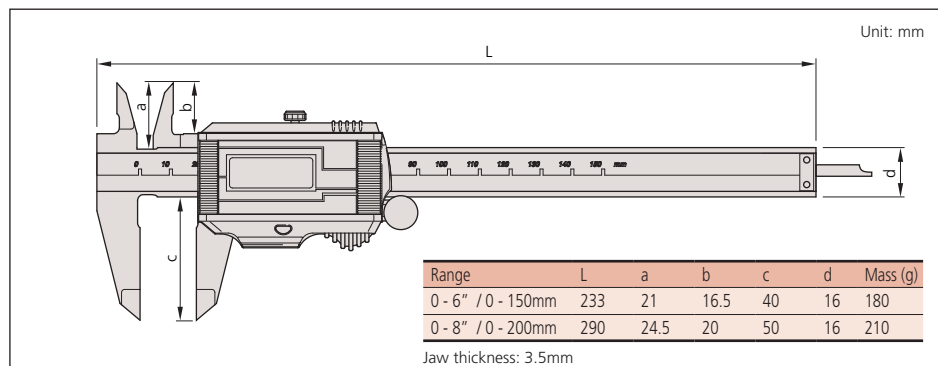
Metric			
Range	Order No.	Accuracy	Resolution
0 - 150mm	<b>500-776</b>	±0.02mm	0.01mm
0 - 150mm	<b>500-774*</b>	±0.02mm	0.01mm
0 - 200mm	<b>500-777</b>	±0.02mm	0.01mm
0 - 200mm	<b>500-775*</b>	±0.02mm	0.01mm

\*Without SPC data output

Inch/Metric			
Range	Order No.	Accuracy	Resolution
0 - 6" / 0 - 150mm	<b>500-786</b>	±.001"	.0005" / 0.01mm
0 - 6" / 0 - 150mm	<b>500-784*</b>	±.001"	.0005" / 0.01mm
0 - 8" / 0 - 200mm	<b>500-787</b>	±.001"	.0005" / 0.01mm
0 - 8" / 0 - 200mm	<b>500-785*</b>	±.001"	.0005" / 0.01mm

\*Without SPC data output

## DIMENSIONS AND MASS



**ABSOLUTE**  
Absolute System Patented by MITUTOYO

**SPC**



**IP67**



## Technical Data

Accuracy: Refer to the list of specifications  
 Resolution: .0005" / 0.01mm or 0.01mm  
 Repeatability: .0005" / 0.01mm  
 Display: LCD  
 Length standard: ABSOLUTE electromagnetic induction linear encoder  
 Max. response speed: Unlimited  
 Battery: Solar battery\*  
 Dust/Water protection level: IP67  
 \*Can be used continuously above 60 lux ambient illumination.

## Function

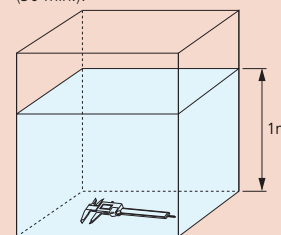
Origin-set, inch/mm conversion (on inch/metric models only)  
 Alarm: Counting value composition error

## Optional Accessories

**05CZA624:** SPC cable with data switch (40" / 1m)  
**05CZA625:** SPC cable with data switch (80" / 2m)

## IP67 protection level

Level 6: Dust-tight  
 No ingress of dust.  
 Level 7: Protected against the effects of temporary immersion in water.  
 Ingress of water in quantities causing harmful effects shall not be possible when the enclosure is temporarily immersed 1 meter in water under standardized conditions of pressure and time (30 min.).



## About the charge function (Super Caliper)

The minimum illumination required in the uncharged state is 60 lux. As shown in the table 'JIS Z 9110 Artificial Illumination Intensity Standard', this Super Caliper can be used without problems in a normal work environment.

The charge function allows the operator to use this Super Caliper without interrupting work even if the ambient illumination is temporarily insufficient.

- In the fully charged state this Super Caliper can operate for approximately an hour in an environment of 50lux illumination (less than the minimum necessary illumination intensity).
- The time necessary for full charge differs, depending on the charging conditions. If this Super Caliper is left unused in an illumination of 500 lux (usual for manufacturing environments), it takes approximately one hour to reach full charge.



# ABSOLUTE Solar Caliper

**SERIES 500 — No battery or origin reset needed**

Mitutoyo's Absolute Solar Digimatic Caliper retains its origin point even the display turns off for the entire life of the caliper. At 60 Lux and up the ABSOLUTE solar caliper is turned on ready to start measurement.

## FEATURES

- No more repeated zero setting caused by low light intensity.
- Hard-coated solar panel for increased durability.
- No fear for overspeed errors.
- With thumb roller.
- Supplied in fitted plastic case.



## Technical Data

Accuracy: Refer to the list of specifications  
 Resolution: .0005"/0.01mm or 0.01mm  
 Repeatability: .0005" / 0.01mm  
 Display: LCD  
 Length standard: ABSOLUTE electrostatic capacitance type linear encoder  
 Max. response speed: Unlimited  
 Battery: Solar battery\*  
 \*Can be used continuously above 60 lux ambient illumination.

## Function

Origin-set, Data hold, Data output, inch/mm conversion (on inch/metric models only)  
 Alarm: Counting value composition error

## Optional Accessories

**959143:** Data hold unit (SPC output model only)  
**959149:** SPC cable with data switch (40" / 1m)  
**959150:** SPC cable with data switch (80" / 2m)

## SPECIFICATIONS

### Metric

Range	Order No.	Accuracy	Resolution	Remarks
0 - 100mm	<b>500-443</b>	±0.02mm	0.01mm	ø1.9mm round depth bar
0 - 100mm	<b>500-453*</b>	±0.02mm	0.01mm	ø1.9mm round depth bar
0 - 150mm	<b>500-444</b>	±0.02mm	0.01mm	
0 - 150mm	<b>500-454*</b>	±0.02mm	0.01mm	
0 - 200mm	<b>500-445</b>	±0.02mm	0.01mm	
0 - 200mm	<b>500-455*</b>	±0.02mm	0.01mm	

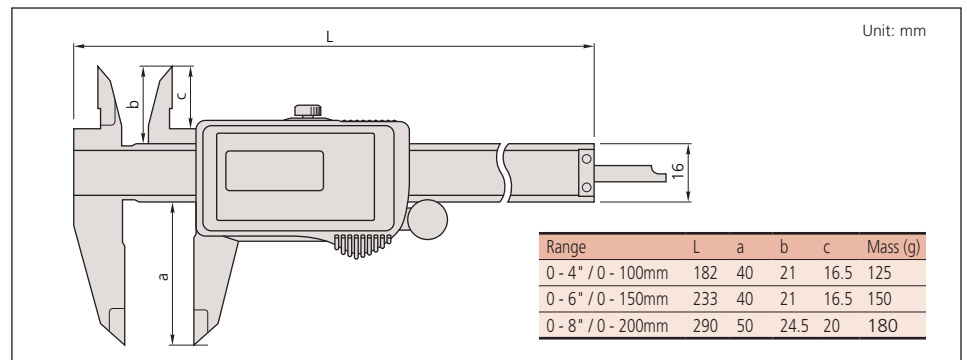
\*without SPC data output

### Inch/Metric

Range	Order No.	Accuracy	Resolution	Remarks
0 - 4" / 0 - 100mm	<b>500-463</b>	±.001"	.0005" / 0.01mm	.075" round depth bar
0 - 4" / 0 - 100mm	<b>500-473*</b>	±.001"	.0005" / 0.01mm	.075" round depth bar
0 - 6" / 0 - 150mm	<b>500-464</b>	±.001"	.0005" / 0.01mm	
0 - 6" / 0 - 150mm	<b>500-474*</b>	±.001"	.0005" / 0.01mm	
0 - 8" / 0 - 200mm	<b>500-465</b>	±.001"	.0005" / 0.01mm	
0 - 8" / 0 - 200mm	<b>500-475*</b>	±.001"	.0005" / 0.01mm	

\*without SPC data output

## DIMENSIONS AND MASS

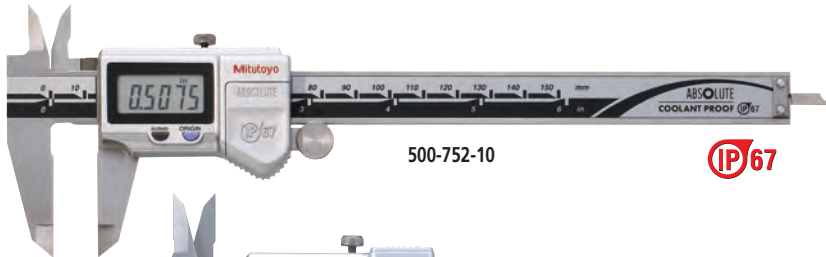


# ABSOLUTE Coolant Proof Caliper

**SERIES 500 — with Dust/Water Protection Conforming to IP67 Level**

## FEATURES

- Can be used in workshop conditions exposed to coolant, water, dust or oil.
- Easy to use - no need to wipe or clean the scale.
- Advanced design styling.
- Incorporates absolute measurement system.
- Automatic power-on/off.
- Data output function.
- With thumb roller.
- Supplied in fitted plastic case.



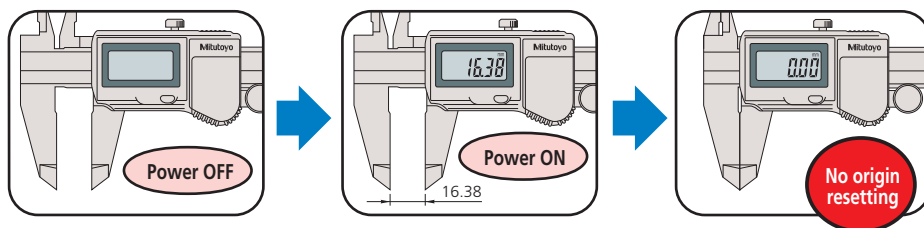
500-752-10



500-763-10



Built-in ABS (absolute) scale means that these calipers are ready to use immediately after power-on without origin resetting. It's as easy as vernier caliper measurements.



Certificate of inspection

CERTIFICATE OF INSPECTION / CERTIFICAT DE CONTROLE		Inspection Result/Resultats		(GR/F)
Product name/Designation	Digital Caliper/à lecture Électronique	Measuring length	150	
Model No./Model	CC-150Q	Resolution	0.005	
Code No./Reference	500-752	Repeatability	±0.002	
Serial No./No. de série	03419911	Accuracy	±0.0010	
Measuring range/Échelle de mesure	0-150mm	Temperature	20°C	
Minimum Indication Résolution	0.01mm	Standard Temperature	20°C	
Temperature of Reference	20°C	Temperature of Reference	20°C	
QC Manager/Responsable Qualité Contrôle	<i>[Signature]</i>	Overall Judgment	Passed/Passé Conformité conforme	



## Technical Data

- Accuracy: Refer to the list of specifications
- Resolution: .0005"/0.01mm or 0.01mm
- Repeatability: .0005"/0.01mm
- Display: LCD
- Length standard: ABSOLUTE electromagnetic induction linear encoder
- Max. response speed: Unlimited
- Battery: SR44 (1 pc./2 pcs\*), **938882**
- Battery life: Approx. 3 years under normal use (1 year: over 12" / 300mm models)
- Dust/Water protection level: IP67
- \*0 - 300mm model

## Function

- Origin-set, Zero-setting, Automatic power on/off, Data output, inch/mm conversion (on inch/metric models only)
- Alarm: Low voltage, Counting value composition error

## Optional Accessories

- 05CZA624:** SPC cable with data switch (40" / 1m)
- 05CZA625:** SPC cable with data switch (80" / 2m)



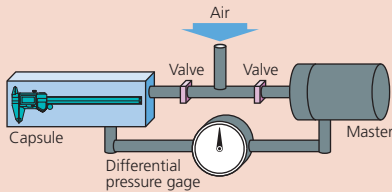
05CZA624



Measurement data output function is available with a water-resistant SPC cable.

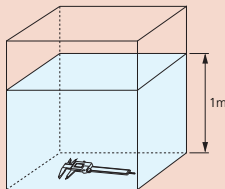
## Air leakage detection system used for water-proof testing

Generally, air leakage tests are performed to evaluate water resistance. Testing begins by placing a measuring tool into the capsule. Next, air with equivalent pressure is supplied to the capsule and the master, then the valves are closed. If none of the air in the capsule seeps into the measuring tool, the capsule's air pressure will remain equal to that in the master, and the differential pressure gage will continue to point to the center. However, if some air does seep into the measuring tool, it will create an air pressure difference in the amount indicated by the differential pressure gage. Thus, detection of air pressure differences is used as a criterion for judging leakage. Every single unit of the ABS Coolant Proof calipers and Coolant Proof micrometer is tested this way for air leakage to help ensure product quality.



## IP67 protection level

- Level 6: Dust-tight  
No ingress of dust.
- Level 7: Protected against the effects of temporary immersion in water.  
Ingress of water in quantities causing harmful effects shall not be possible when the enclosure is temporarily immersed 1 meter in water under standardized conditions of pressure and time (30 min.).



## SPECIFICATIONS

**Metric** IP67 model

Range	Order No.	Accuracy	Resolution	Remarks
0-150mm	<b>500-702-10*</b>	+/-0.02mm	0.01mm	
0-150mm	<b>500-712-10</b>	+/-0.02mm	0.01mm	
0-150mm	<b>500-719-10</b>	+/-0.02mm	0.01mm	dia. 1.9mm rod depth bar
0-150mm	<b>500-721-10</b>	+/-0.02mm	0.01mm	carbide-tipped jaws for ID measurement
0-150mm	<b>500-723-10</b>	+/-0.02mm	0.01mm	carbide-tipped jaws for OD & ID measurement
0-200mm	<b>500-703-10*</b>	+/-0.02mm	0.01mm	
0-200mm	<b>500-713-10</b>	+/-0.02mm	0.01mm	
0-200mm	<b>500-722-10</b>	+/-0.02mm	0.01mm	carbide-tipped jaws for ID measurement
0-200mm	<b>500-724-10</b>	+/-0.02mm	0.01mm	carbide-tipped jaws for OD & ID measurement
0-300mm	<b>500-704-10*</b>	+/-0.03mm	0.01mm	
0-300mm	<b>500-714-10</b>	+/-0.03mm	0.01mm	

\*without SPC data output

**Inch/Metric** IP67 model

Range	Order No.	Accuracy	Resolution	Remarks
0-6" / 0-150mm	<b>500-752-10*</b>	+/- .001"	.0005" / 0.01mm	
0-6" / 0-150mm	<b>500-762-10</b>	+/- .001"	.0005" / 0.01mm	
0-6" / 0-150mm	<b>500-768-10*</b>	+/- .001"	.0005" / 0.01mm	.075" rod depth bar
0-6" / 0-150mm	<b>500-769-10</b>	+/- .001"	.0005" / 0.01mm	.075" rod depth bar
0-6" / 0-150mm	<b>500-731-10*</b>	+/- .001"	.0005" / 0.01mm	carbide-tipped jaws for ID measurement
0-6" / 0-150mm	<b>500-735-10</b>	+/- .001"	.0005" / 0.01mm	carbide-tipped jaws for ID measurement
0-6" / 0-150mm	<b>500-733-10*</b>	+/- .001"	.0005" / 0.01mm	carbide-tipped jaws for OD & ID measurement
0-6" / 0-150mm	<b>500-737-10</b>	+/- .001"	.0005" / 0.01mm	carbide-tipped jaws for OD & ID measurement
0-8" / 0-200mm	<b>500-753-10*</b>	+/- .001"	.0005" / 0.01mm	
0-8" / 0-200mm	<b>500-763-10</b>	+/- .001"	.0005" / 0.01mm	
0-8" / 0-200mm	<b>500-732-10*</b>	+/- .001"	.0005" / 0.01mm	carbide-tipped jaws for OD measurement
0-8" / 0-200mm	<b>500-736-10</b>	+/- .001"	.0005" / 0.01mm	carbide-tipped jaws for ID measurement
0-8" / 0-200mm	<b>500-734-10*</b>	+/- .001"	.0005" / 0.01mm	carbide-tipped jaws for OD & ID measurement
0-8" / 0-200mm	<b>500-738-10</b>	+/- .001"	.0005" / 0.01mm	carbide-tipped jaws for OD & ID measurement
0-12" / 0-300mm	<b>500-754-10*</b>	+/- .0015"	.0005" / 0.01mm	
0-12" / 0-300mm	<b>500-764-10</b>	+/- .0015"	.0005" / 0.01mm	

\*without SPC data output

## DIMENSIONS AND MASS

Unit: mm

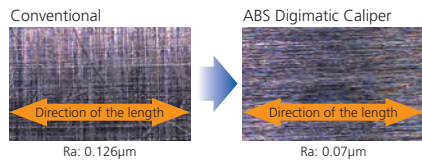
Range	L	a	b	c	e	Mass (g)
0 - 6" / 0 - 150mm	233	40	21	16.5	16	168
0 - 8" / 0 - 200mm	290	50	24.5	20	16	198
0 - 12" / 0 - 300mm	404	64	27.5	22	20	350

# ABSOLUTE Digimatic Caliper

**SERIES 500 — with Exclusive ABSOLUTE Encoder Technology**

Mitutoyo's absolute Digimatic Caliper is the next generation of electronic calipers. It keeps track of its origin point once set. Whenever turned on, the large LCD screen displays the actual slider position ready to start measurement. No more repeated zero setting is necessary with the absolute encoder technology as well as no more care for overspeed errors.

## High quality guide surface finish for smooth slider movement

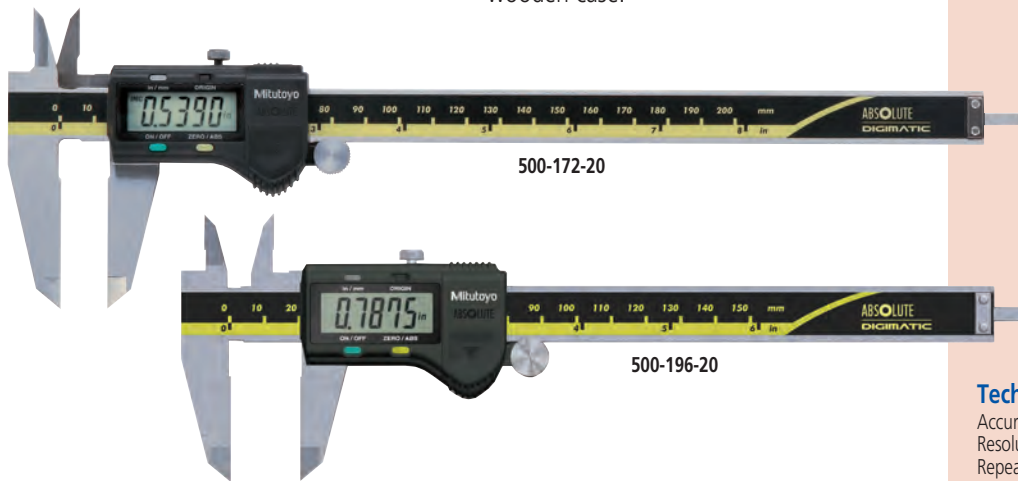


## FEATURES

- Large and clear LCD readout.
- The ZERO/ABS key allows the display to be Zero-Set at any slider position along the scale for incremental comparison measurements. This switch will also allow return to the absolute (ABS) coordinate and display of the true position from the origin point (usually jaws-closed point).
- Data Hold Unit (959143) is optional.
- Carbide-tipped jaw type calipers are also available.
- Thumb roller included only on calipers up to and including 12" or 300mm.
- Supplied in fitted plastic case. Except 40" / 1000mm supplied in wooden case.

SPC

**ABSOLUTE**  
Absolute System Patented by MITUTOYO



## DIMENSIONS AND MASS

Unit: mm

Range	L	a	b	c	d	Mass (g)
0 - 4" / 0 - 100mm	182	40	21	16.5	16	143
0 - 6" / 0 - 150mm	233	40	21	16.5	16	168
0 - 8" / 0 - 200mm	290	50	24.5	20	16	198
0 - 12" / 0 - 300mm	403	64	27.5	22	20	350

Range	L	a	b	c	d	Mass (g)
0 - 18" / 0 - 450mm	630	90	47	38	25	1170
0 - 24" / 0 - 600mm	780	90	47	38	25	1350
0 - 40" / 0 - 1000mm	1240	130	61	50	32	3300

## Technical Data

Accuracy: Refer to the list of specifications  
 Resolution: .0005" / 0.01mm or 0.01mm  
 Repeatability: .0005" / 0.01mm  
 Display: LCD  
 Length standard: ABSOLUTE electrostatic capacitance type linear encoder  
 Max. response speed: Unlimited  
 Battery: SR44 (1 pc.), **938882**  
 Battery life: Approx. 3.5 years under normal use

## Function

Origin-set, Zero-setting, Data output, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error

## Optional Accessories

- 959143:** Data hold unit
- 959149:** SPC cable with data switch (40" / 1m)
- 959150:** SPC cable with data switch (80" / 2m)





500-506-10

500-502-10

500-501-10

500-500-10

## SPECIFICATIONS

### Metric

Range	Order No.	Accuracy	Resolution	Remarks
0 - 100mm	<b>500-150-20</b>	±0.02mm	0.01mm	ø1.9mm rod depth bar
0 - 150mm	<b>500-151-20</b>	±0.02mm	0.01mm	—
0 - 150mm	<b>500-154-20</b>	±0.02mm	0.01mm	Carbide-tipped jaws for OD measurement
0 - 150mm	<b>500-155-20</b>	±0.02mm	0.01mm	Carbide-tipped jaws for OD & ID measurement
0 - 150mm	<b>500-158-20</b>	±0.02mm	0.01mm	ø1.9mm rod depth bar
0 - 200mm	<b>500-152-20</b>	±0.02mm	0.01mm	—
0 - 200mm	<b>500-156-20</b>	±0.02mm	0.01mm	Carbide-tipped jaws for OD measurement
0 - 200mm	<b>500-157-20</b>	±0.02mm	0.01mm	Carbide-tipped jaws for OD & ID measurement
0 - 300mm	<b>500-153</b>	±0.03mm	0.01mm	—
0 - 450mm	<b>500-500-10*</b>	±0.05mm	0.01mm	Without Thumb Roller
0 - 600mm	<b>500-501-10*</b>	±0.05mm	0.01mm	Without Thumb Roller
0 - 1000mm	<b>500-502-10*</b>	±0.07mm	0.01mm	Without Thumb Roller

\*without thumb rollers

### Inch/Metric

Range	Order No.	Accuracy	Resolution	Remarks
0 - 4" / 0 - 100mm	<b>500-170-20</b>	±.001"	.0005" / 0.01mm	.075" rod depth bar
0 - 4" / 0 - 100mm	<b>500-195-20*</b>	±.001"	.0005" / 0.01mm	.075" rod depth bar
0 - 6" / 0 - 150mm	<b>500-171-20</b>	±.001"	.0005" / 0.01mm	—
0 - 6" / 0 - 150mm	<b>500-174-20</b>	±.001"	.0005" / 0.01mm	Carbide-tipped jaws for OD measurement
0 - 6" / 0 - 150mm	<b>500-175-20</b>	±.001"	.0005" / 0.01mm	Carbide-tipped jaws for OD & ID measurement
0 - 6" / 0 - 150mm	<b>500-178-20</b>	±.001"	.0005" / 0.01mm	.075" rod depth bar
0 - 6" / 0 - 150mm	<b>500-196-20*</b>	±.001"	.0005" / 0.01mm	—
0 - 6" / 0 - 150mm	<b>500-159-20*</b>	±.001"	.0005" / 0.01mm	Carbide-tipped jaws for OD measurement
0 - 6" / 0 - 150mm	<b>500-160-20*</b>	±.001"	.0005" / 0.01mm	Carbide-tipped jaws for OD & ID measurement
0 - 8" / 0 - 200mm	<b>500-172-20</b>	±.001"	.0005" / 0.01mm	—
0 - 8" / 0 - 200mm	<b>500-176-20</b>	±.001"	.0005" / 0.01mm	Carbide-tipped jaws for OD measurement
0 - 8" / 0 - 200mm	<b>500-177-20</b>	±.001"	.0005" / 0.01mm	Carbide-tipped jaws for OD & ID measurement
0 - 8" / 0 - 200mm	<b>500-197-20*</b>	±.001"	.0005" / 0.01mm	—
0 - 8" / 0 - 200mm	<b>500-163-20*</b>	±.001"	.0005" / 0.01mm	Carbide-tipped jaws for OD measurement
0 - 8" / 0 - 200mm	<b>500-164-20*</b>	±.001"	.0005" / 0.01mm	Carbide-tipped jaws for OD & ID measurement
0 - 12" / 0 - 300mm	<b>500-173</b>	±.0015"	.0005" / 0.01mm	—
0 - 12" / 0 - 300mm	<b>500-167</b>	±.0015"	.0005" / 0.01mm	Carbide-tipped jaws for OD measurement
0 - 12" / 0 - 300mm	<b>500-168</b>	±.0015"	.0005" / 0.01mm	Carbide-tipped jaws for OD & ID measurement
0 - 12" / 0 - 300mm	<b>500-193*</b>	±.0015"	.0005" / 0.01mm	—
0 - 12" / 0 - 300mm	<b>500-165*</b>	±.0015"	.0005" / 0.01mm	Carbide-tipped jaws for OD measurement
0 - 12" / 0 - 300mm	<b>500-166*</b>	±.0015"	.0005" / 0.01mm	Carbide-tipped jaws for OD & ID measurement
0 - 18" / 0 - 450mm	<b>500-505-10</b>	±.002"	.0005" / 0.01mm	Without Thumb Roller
0 - 24" / 0 - 600mm	<b>500-506-10</b>	±.002"	.0005" / 0.01mm	Without Thumb Roller
0 - 40" / 0 - 1000mm	<b>500-507-10</b>	±.003"	.0005" / 0.01mm	Without Thumb Roller

\*without SPC data output

# Dial Caliper

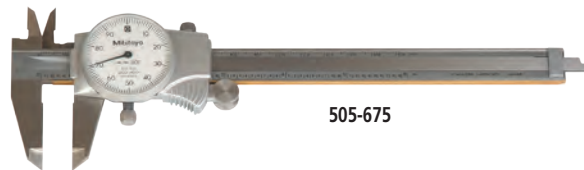
## SERIES 505

### FEATURES

- New designed dial movement for ultra smooth sliding and high shock protection.
- Titanium Nitride (TiN) coating is applied to the sliding surface to increase wear resistance (except for 0 - 12" and 0 - 300mm model).
- Lock screw for dial bezel and for holding the sliding jaw position.
- Can measure OD, ID, depth, and steps.
- Models available with carbide-tipped OD and ID jaws.
- Supplied in fitted plastic case.



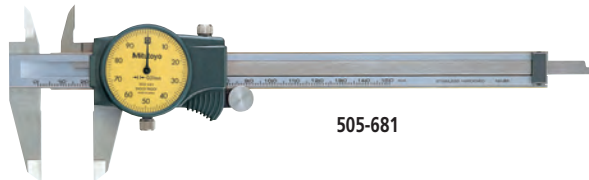
505-677



505-675



505-673



505-681

### SPECIFICATIONS

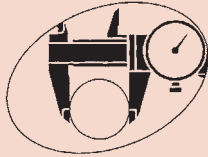
**Metric** 1mm Per One Revolution

Range	Order No.	Accuracy	Graduation	Remarks
0-100mm	505-680	+/-0.015mm	0.01mm	—
0-150mm	505-681	+/-0.03mm	0.01mm	—
0-200mm	505-682	+/-0.03mm	0.01mm	—

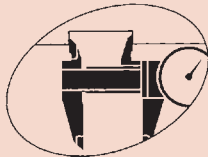
**Metric** 2mm Per One Revolution

Range	Order No.	Accuracy	Graduation	Remarks
0-150mm	505-671	+/-0.03mm	0.02mm	—
0-150mm	505-707	+/-0.03mm	0.02mm	Carbide-tipped jaws for OD measurement
0-150mm	505-711	+/-0.03mm	0.02mm	Carbide-tipped jaws for OD & ID measurement
0-200mm	505-672	+/-0.03mm	0.02mm	—
0-300mm	505-673	+/-0.04mm	0.02mm	—

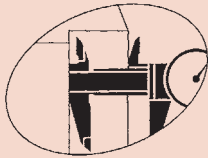
## "Quadri" (4-way) Measurement



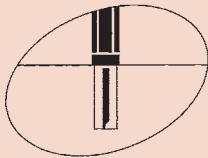
1. Outside measurement



2. Inside measurement



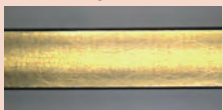
3. Step measurement



4. Depth measurement

Results of 1,000,000 cycle sliding wear test

TiN coating



Wear: 0µm

Conventional



Wear: 4µm

## SPECIFICATIONS

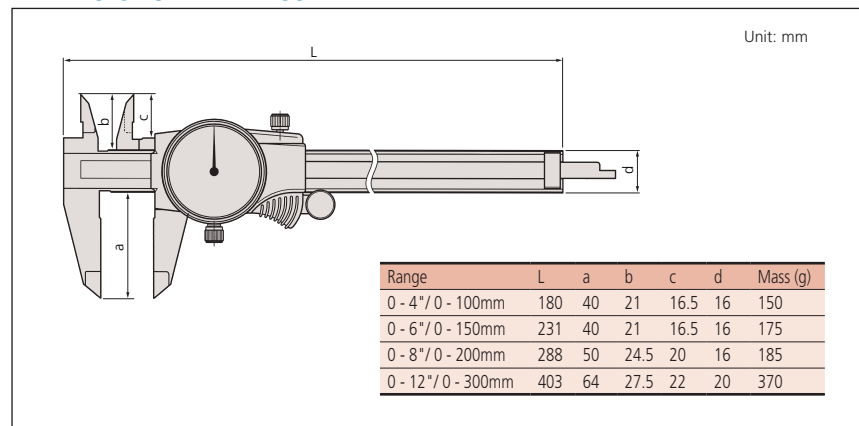
**Inch** .1" Per One Revolution

Range	Order No.	Accuracy	Graduation	Remarks
0-4"	505-674	+/- .001"	.001"	-
0-6"	505-675	+/- .001"	.001"	-
0-6"	505-675-51	+/- .001"	.001"	Blue Dial Face
0-6"	505-675-52	+/- .001"	.001"	Purple Dial Face
0-6"	505-675-53	+/- .001"	.001"	Green Dial Face
0-6"	505-675-54	+/- .001"	.001"	Red Dial Face
0-6"	505-675-55	+/- .001"	.001"	Orange Dial Face
0-6"	505-675-56	+/- .001"	.001"	Black Dial Face
0-6"	505-675-66	+/- .001"	.001"	Black Dial Face with Ratchet Stop
0-6"	505-689	+/- .001"	.001"	Extra smooth movement
0-6"	505-708	+/- .001"	.001"	Carbide-tipped jaws for OD measurement
0-6"	505-712	+/- .001"	.001"	Carbide-tipped jaws for OD & ID measurement
0-8"	505-676	+/- .002"	.001"	-
0-8"	505-690	+/- .002"	.001"	Extra smooth movement
0-8"	505-709	+/- .002"	.001"	Carbide-tipped jaws for OD measurement
0-8"	505-713	+/- .002"	.001"	Carbide-tipped jaws for OD & ID measurement
0-12"	505-677	+/- .002"	.001"	—
0-12"	505-710	+/- .002"	.001"	Carbide-tipped jaws for OD measurement
0-12"	505-714	+/- .002"	.001"	Carbide-tipped jaws for OD & ID

**Inch** .2" Per One Revolution

Range	Order No.	Accuracy	Graduation	Remarks
0-4"	505-716	+/- .001"	.001"	—
0-6"	505-717	+/- .001"	.001"	—
0-6"	505-718	+/- .001"	.001"	Carbide-tipped jaws for OD measurement
0-8"	505-719	+/- .002"	.001"	—
0-12"	505-720	+/- .002"	.001"	—
0-12"	505-721	+/- .002"	.001"	Carbide-tipped jaws for OD measurement

## DIMENSIONS AND MASS

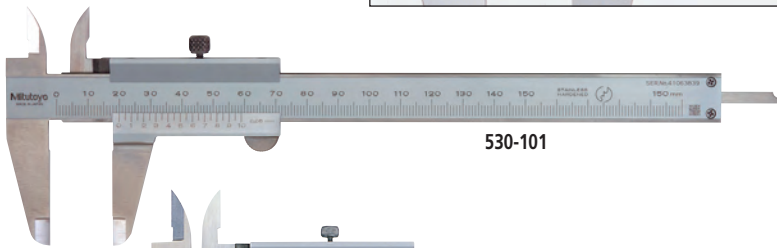
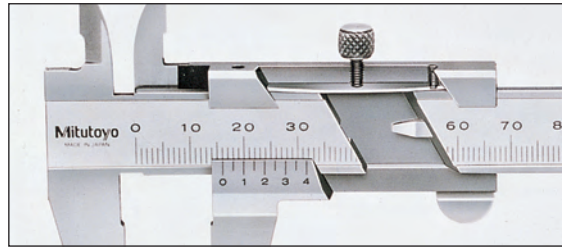
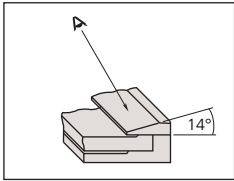


# Vernier Caliper

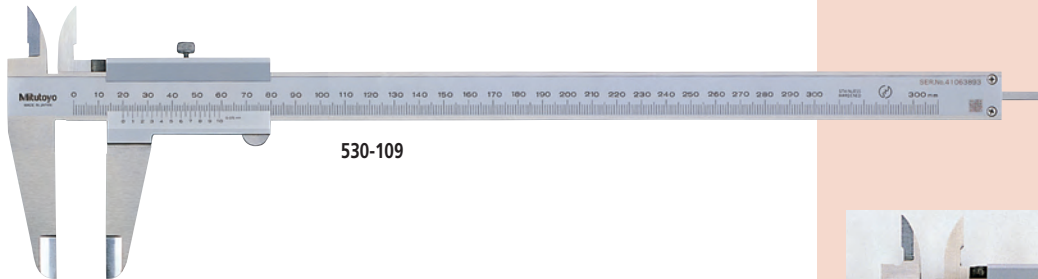
## SERIES 530 — Standard Model

### FEATURES

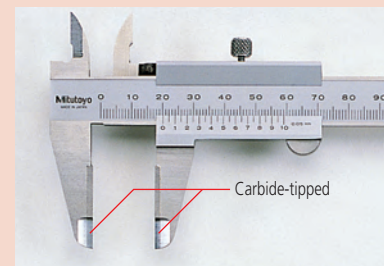
- Can measure OD (outside diameter), ID (inside diameter), depth, and steps.
- The small vernier face angle ( $14^\circ$ ) provides easy reading.
- Dual reading scales on vernier. (metric/inch and inch models only)
- Lock screw for holding the sliding jaw position.
- Carbide-tipped jaw type calipers are also available.
- Supplied with vinyl holster in fitted carton. Except 24" / 600mm models are carton only. 40" / 1000mm supplied in wooden case.



530-101

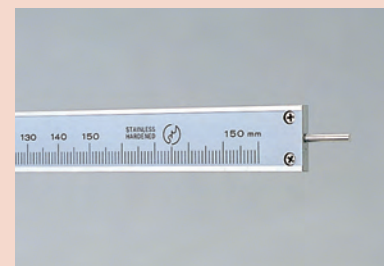
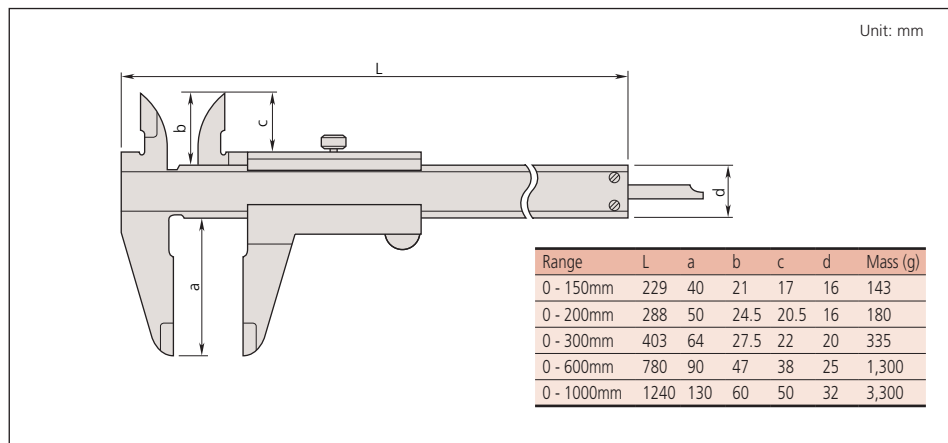


530-109



Carbide-tipped jaw type

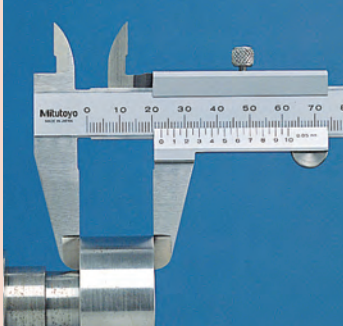
### DIMENSIONS AND MASS



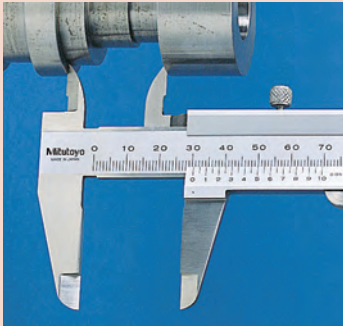
Round depth bar type



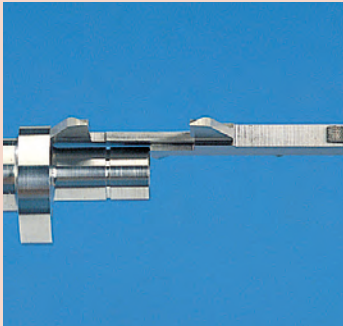
## "Quadri" (4 way) Measurement Measurement Applications



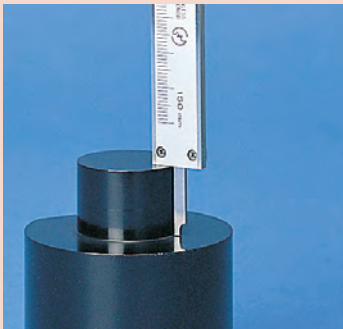
OD measurement



ID measurement



Step measurement



Depth measurement

## SPECIFICATIONS

### Metric

Range	Order No.	Accuracy	Graduation	Remarks
0 - 150mm	<b>530-102</b>	±0.05mm	0.05mm	∅ 1.9mm Depth bar
0 - 150mm	<b>530-101</b>	±0.05mm	0.05mm	—
0 - 150mm	<b>530-320</b>	±0.05mm	0.05mm	Carbide-tipped jaws for OD measurement
0 - 150mm	<b>530-335</b>	±0.05mm	0.05mm	Carbide-tipped jaws for OD & ID measurement
0 - 150mm	<b>530-122*</b>	±0.03mm	0.02mm	High accuracy model
0 - 200mm	<b>530-108</b>	±0.05mm	0.05mm	—
0 - 200mm	<b>530-321</b>	±0.05mm	0.05mm	Carbide-tipped jaws for OD measurement
0 - 200mm	<b>530-123*</b>	±0.03mm	0.02mm	High accuracy model
0 - 300mm	<b>530-109</b>	±0.08mm	0.05mm	—
0 - 300mm	<b>530-322</b>	±0.08mm	0.05mm	Carbide-tipped jaws for OD measurement
0 - 300mm	<b>530-124*</b>	±0.04mm	0.02mm	High accuracy model: ±0.04mm
0 - 600mm	<b>530-501**</b>	±0.1mm	0.05mm	—
0 - 1000mm	<b>530-502**</b>	±0.15mm	0.05mm	—

\*Graduation: 0.02mm

\*\*No depth measuring bar

### Metric/Inch with metric/inch dual scale

Range	Order No.	Accuracy	Vernier Graduation		Remarks
			Lower Scale	Upper Scale	
0 - 150mm / 0 - 6"	<b>530-104</b>	±0.05mm	0.05mm	1/128"	—
0 - 150mm / 0 - 6"	<b>530-316</b>	±0.05mm	0.05mm	1/128"	—
0 - 150mm / 0 - 6"	<b>530-312*</b>	±0.03mm	0.02mm	.001"	High accuracy model
0 - 200mm / 0 - 8"	<b>530-114</b>	±0.05mm	0.05mm	1/128"	—
0 - 200mm / 0 - 8"	<b>530-118*</b>	±0.03mm	0.02mm	.001"	High accuracy model
0 - 300mm / 0 - 12"	<b>530-115</b>	±0.08mm	0.05mm	1/128"	—
0 - 300mm / 0 - 12"	<b>530-119*</b>	±0.04mm	0.02mm	.001"	High accuracy model

\*Graduation: 0.02mm

### Inch with inch/inch dual scale

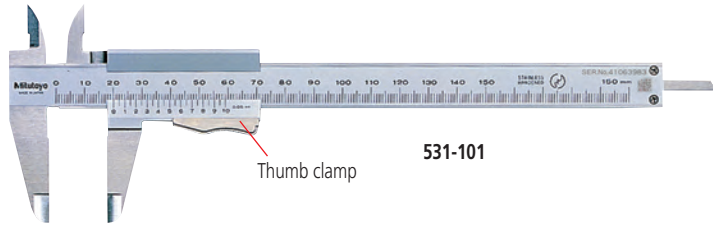
Range	Order No.	Accuracy	Vernier Graduation		Remarks
			Lower Scale	Upper Scale	
0 - 6"	<b>530-105</b>	±.0015"	.001"	1/128"	—
0 - 8"	<b>530-116</b>	±.0015"	.001"	1/128"	—

# Vernier Caliper

## SERIES 531 — with Thumb Clamp

### FEATURES

- The slider moves only when the spring loaded thumb clamp is depressed.
- Can measure OD, ID, depth, and steps
- Supplied with vinyl holster in fitted carton.



531-101

Thumb clamp

### SPECIFICATIONS

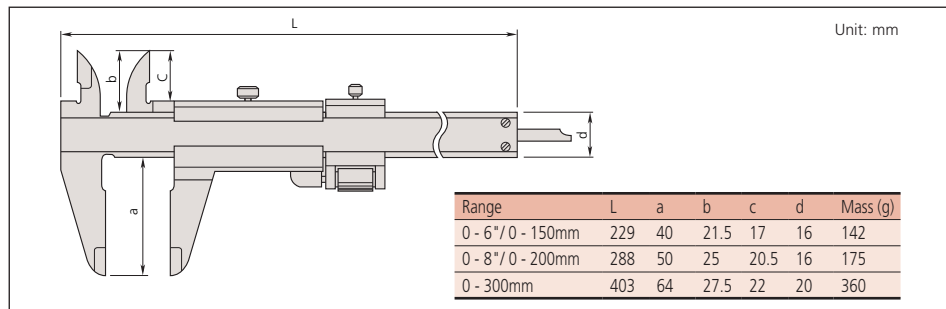
#### Metric

Range	Order No.	Accuracy	Graduation	Remarks
0 - 150mm	531-101	±0.05mm	0.05mm	—
0 - 200mm	531-102	±0.05mm	0.05mm	—
0 - 300mm	531-103	±0.08mm	0.05mm	—

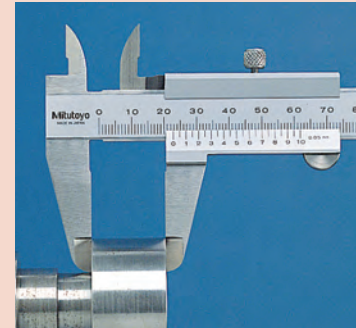
#### Metric/Inch with metric/inch dual scale

Range	Order No.	Accuracy	Graduation		Remarks
			Lower Scale	Upper Scale	
0 - 150mm / 0 - 6"	531-122	±0.05mm	0.05mm	1/128"	with inch/mm conversion label
0 - 150mm / 0 - 6"	531-128	±0.03mm	0.02mm	.001"	High accuracy model
0 - 200mm / 0 - 8"	531-108	±0.05mm	0.05mm	1/128"	—
0 - 200mm / 0 - 8"	531-129	±0.03mm	0.02mm	.001"	High accuracy model
0 - 300mm / 0 - 12"	531-109	±0.08mm	0.05mm	1/128"	—
0 - 300mm / 0 - 12"	531-112	±0.04mm	0.02mm	.001"	High accuracy model

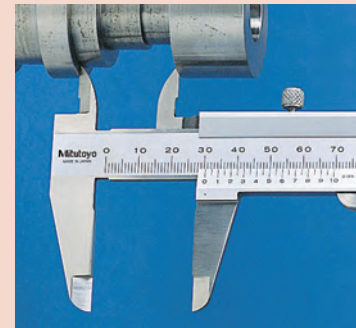
### DIMENSIONS AND MASS



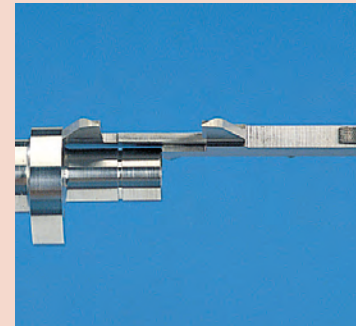
### "Quadri" (4 way) Measurement Measurement Applications



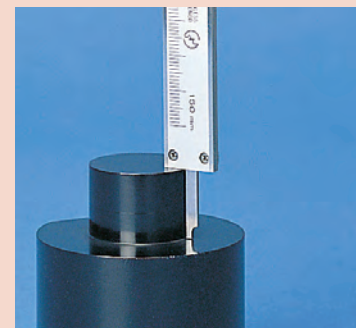
OD measurement



ID measurement



Step measurement

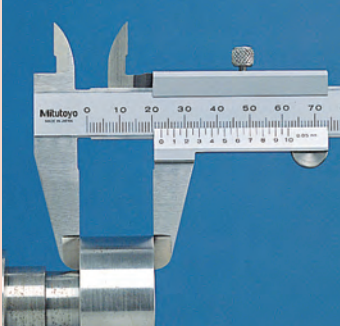


Depth measurement

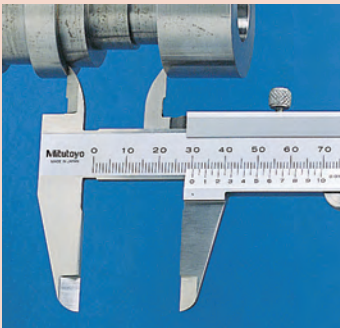
# Vernier Caliper

**SERIES 532 — with Fine Adjustment**

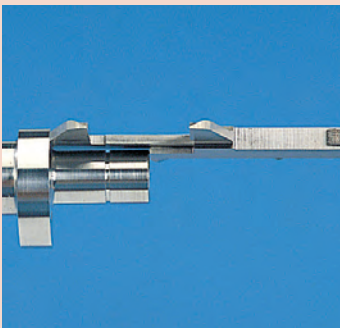
## “Quadri” (4 way) Measurement Measurement Applications



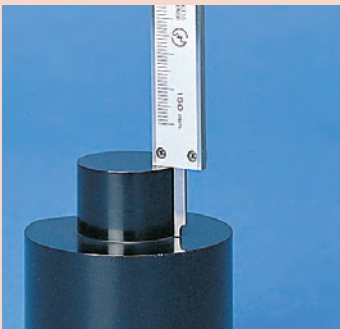
OD measurement



ID measurement



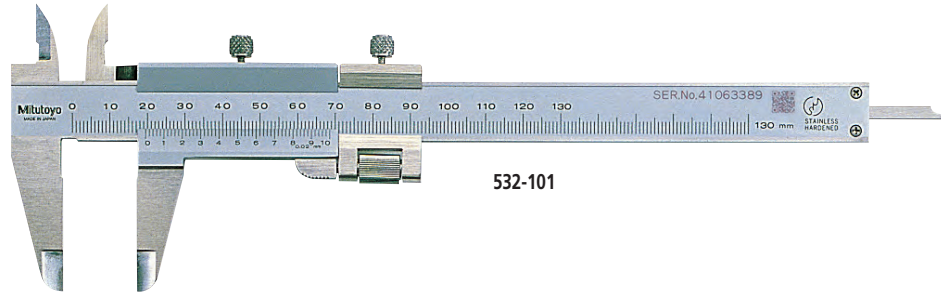
Step measurement



Depth measurement

## FEATURES

- Provided with a fine-adjustment carriage to feed the slider finely.
- Can measure OD, ID, depth, and steps.
- Supplied with vinyl holster in fitted carton.

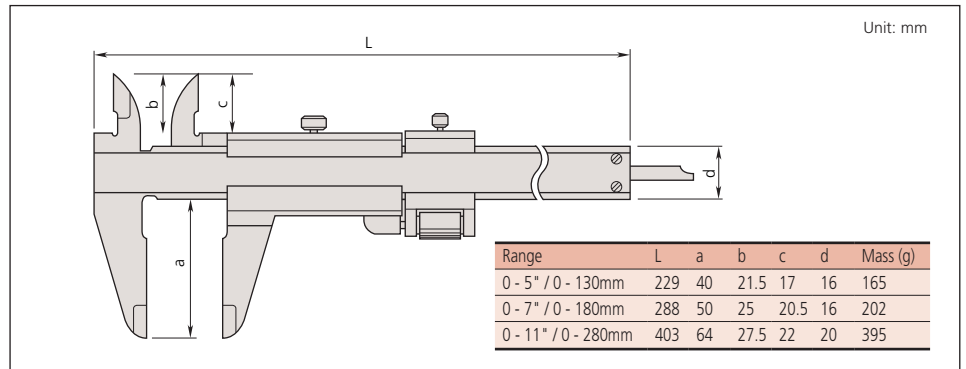


## SPECIFICATIONS

Metric			
Range	Order No.	Accuracy	Graduation
0 - 130mm	<b>532-101</b>	±0.03mm	0.02mm
0 - 180mm	<b>532-102</b>	±0.03mm	0.02mm
0 - 280mm	<b>532-103</b>	±0.04mm	0.02mm

Metric/Inch with metric/inch dual scale				
Range	Order No.	Accuracy	Graduation	
			Lower Scale	Upper Scale
0 - 130mm / 0 - 5"	<b>532-119</b>	±0.03mm	0.02mm	.001"
0 - 180mm / 0 - 7"	<b>532-120</b>	±0.03mm	0.02mm	.001"
0 - 280mm / 0 - 11"	<b>532-121</b>	±0.04mm	0.02mm	.001"

## DIMENSIONS AND MASS

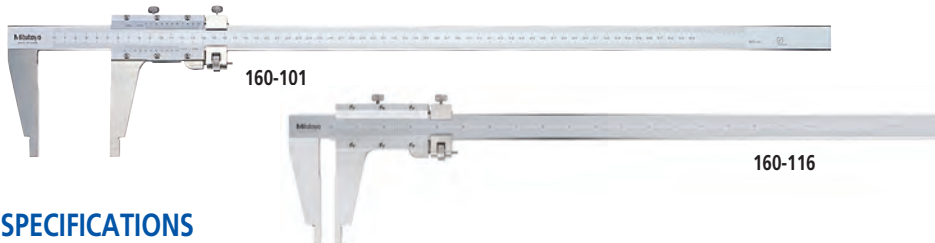


# Vernier Caliper

## SERIES 160 — with Nib Style Jaws and Fine Adjustment

### FEATURES

- The jaws have round measuring faces for accurate ID measurement.
- With fine adjustment carriage to feed the slider finely.
- Inside and outside measurements can be directly read from the upper and lower slider graduations, respectively.
- Supplied with vinyl holster in fitted carton. Except 12" / 300mm, 18" / 450mm and 24" / 600mm are fitted carton only. Over 24" / 600mm supplied in wooden case.



### SPECIFICATIONS

**Metric** with metric/metric dual scale

Range*	Order No.	Accuracy	Graduation		Mass (g)
			Lower Scale	Upper Scale	
0 (10) - 300mm	<b>160-127</b>	±0.04mm	0.02mm	0.02mm	450
0 (20) - 450mm	<b>160-128</b>	±0.05mm	0.02mm	0.02mm	1,200
0 (20) - 600mm	<b>160-101</b>	±0.05mm	0.02mm	0.02mm	2,600
0 (20) - 1000mm	<b>160-104</b>	±0.07mm	0.02mm	0.02mm	3,500
0 (20) - 1500mm	<b>160-110</b>	±0.09mm	0.02mm	0.02mm	4,850
0 (20) - 2000mm	<b>160-113</b>	±0.12mm	0.02mm	0.02mm	10,200

\*( ): Minimum dimension in ID measurement

**Metric/Inch** with metric/inch dual scale

Range*	Order No.	Accuracy	Graduation		Mass (g)
			Lower Scale	Upper Scale	
0 (10) - 300mm / 0 (.3") - 12"	<b>160-150</b>	±0.04mm	0.02mm	.001"	450
0 (20) - 450mm / 0 (.5") - 18"	<b>160-151</b>	±0.05mm	0.02mm	.001"	1,200
0 (20) - 600mm / 0 (.5") - 24"	<b>160-153</b>	±0.05mm	0.02mm	.001"	1,400
0 (20) - 1000mm / 0 (1") - 40"	<b>160-155</b>	±0.07mm	0.02mm	.001"	3,500
0 (20) - 1500mm / 0 (1") - 60"	<b>160-157</b>	±0.09mm	0.02mm	.001"	4,850
0 (20) - 2000mm / 0 (1") - 80"	<b>160-159</b>	±0.12mm	0.02mm	.001"	10,200

\*( ): Minimum dimension in ID measurement

**Inch** with inch/inch dual scale

Range*	Order No.	Accuracy	Graduation		Mass (g)
			Lower Scale	Upper Scale	
0 (.3") - 12"	<b>160-124</b>	±.0015"	.001"	.001"	450
0 (.5") - 18"	<b>160-116</b>	±.002"	.001"	.001"	1,200
0 (.5") - 24"	<b>160-102</b>	±.002"	.001"	.001"	1,400
0 (1") - 40"	<b>160-105</b>	±.003"	.001"	.001"	3,500
0 (1") - 60"	<b>160-111</b>	±.004"	.001"	.001"	4,850
0 (1") - 80"	<b>160-114</b>	±.005"	.001"	.001"	10,200

\*( ): Minimum dimension in ID measurement

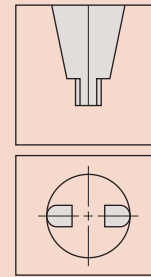
**Inch/Metric** with inch/metric dual scale

Range*	Order No.	Accuracy	Graduation		Mass (g)
			Lower Scale	Upper Scale	
0 (.3") - 12" / 0 (10) - 300mm	<b>160-125</b>	±.0015"	.001"	0.02mm	450
0 (.5") - 18" / 0 (20) - 450mm	<b>160-119</b>	±.002"	.001"	0.02mm	1,200
0 (.5") - 24" / 0 (20) - 600mm	<b>160-103</b>	±.002"	.001"	0.02mm	1,400
0 (1") - 40" / 0 (20) - 1000mm	<b>160-106</b>	±.003"	.001"	0.02mm	3,500
0 (1") - 60" / 0 (20) - 1500mm	<b>160-112</b>	±.004"	.001"	0.02mm	4,850
0 (1") - 80" / 0 (20) - 2000mm	<b>160-115</b>	±.005"	.001"	0.02mm	10,200

\*( ): Minimum dimension in ID measurement

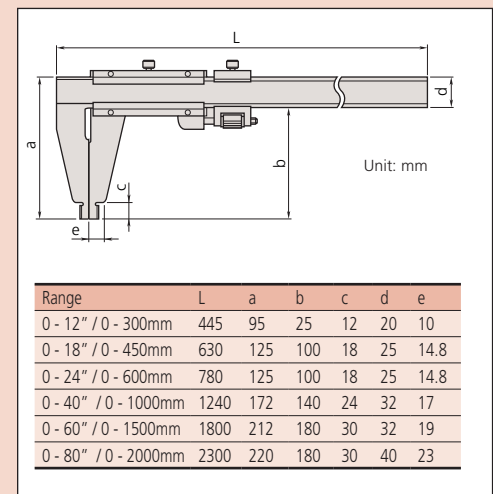
### Technical Data

Accuracy: Refer to the list of specifications.  
Graduation: Refer to the list of specifications.



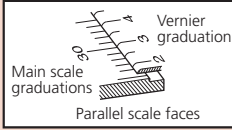
Round surface of jaws for accurate ID measurement

### DIMENSIONS





**ABSOLUTE**  
Absolute System Patented by MITUTOYO



### Technical Data

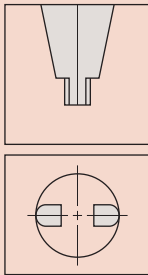
Accuracy: Refer to the list of specifications.  
Display\*: LCD  
Length standard\*: ABSOLUTE electrostatic capacitance type linear encoder  
Max. response speed\*: Unlimited  
Battery\*: SR44 (1 pc.), **938882**  
Battery life\*: Approx. 3.5 years under normal use  
\*Digital models \*\*Analog models

### Function of Digital Model

Origin-set, Zero-setting, Data output, inch/mm conversion (on inch/metric models only)  
Alarm: Low voltage, Counting value composition error

### Optional Accessories for Digital Model

**959143**: Data hold unit  
**959149**: SPC cable with data switch (40" / 1m)  
**959150**: SPC cable with data switch (80" / 2m)  
**05CZA624**: SPC cable with data switch (40" / 1m) for IP67 model  
**05CZA625**: SPC cable with data switch (80" / 2m) for IP67 model



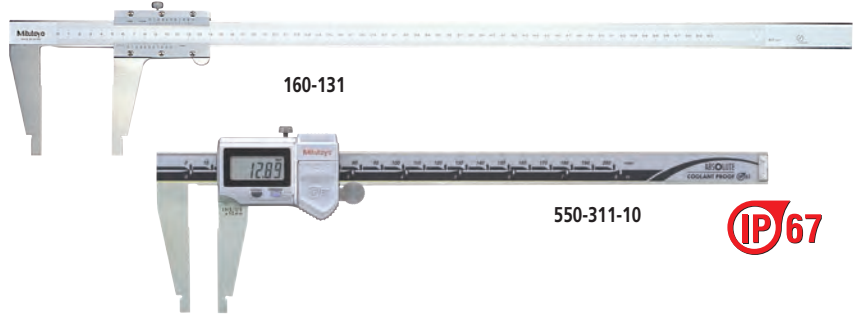
Round surface of jaws for accurate ID measurement

# ABSOLUTE Digimatic & Vernier Caliper

**SERIES 550, 160 — with Nib Style Jaws**

### FEATURES

- The rounded faces of the jaws are ideal for accurate ID (inside diameter) measurement.
- Inside and outside measurements can be directly read from the upper and lower slider graduations (Series 160).
- With fine-adjustment carriage type is available (Series 160).
- Parallax-free vernier scale type is available for easy and positive measurement (Series 160).
- With SPC output (Series 550).
- Supplied in fitted plastic case. Except 40"/1000mm supplied in wooden case.



### SPECIFICATIONS

#### Metric Digital model

Range*	Order No.	Accuracy	Resolution	Mass (g)	Remarks
0 (10) - 200mm	<b>550-301-10</b>	±0.03mm	0.01mm	180	IP67
0 (10) - 300mm	<b>550-331-10</b>	±0.03mm	0.01mm	380	w/ offset/preset function for easy ID measurement, IP67
0 (20) - 450mm	<b>550-203-10</b>	±0.05mm	0.01mm	1,110	
0 (20) - 600mm	<b>550-205-10</b>	±0.05mm	0.01mm	1,290	
0 (20) - 1000mm	<b>550-207-10</b>	±0.07mm	0.01mm	3,350	

\*( ): Minimum dimension in ID measurement

#### Inch/Metric Digital model

Range*	Order No.	Accuracy	Resolution	Mass (g)	Remarks
0 (.4") - 8" / 0 (10) - 200mm	<b>550-311-10</b>	±.001"	.0005" / 0.01mm	180	IP67
0 (.4") - 12" / 0 (10) - 300mm	<b>550-341-10</b>	±.0015"	.0005" / 0.01mm	380	w/ offset/preset function for easy ID measurement, IP67
0 (.5") - 18" / 0 (20) - 450mm	<b>550-223-10</b>	±.002"	.0005" / 0.01mm	1,110	—
0 (.5") - 24" / 0 (20) - 600mm	<b>550-225-10</b>	±.002"	.0005" / 0.01mm	1,290	—
0 (1") - 40" / 0 (20) - 1000mm	<b>550-227-10</b>	±.003"	.0005" / 0.01mm	3,350	—

\*( ): Minimum dimension in ID measurement

#### Metric with metric/metric dual scale

Range*	Order No.	Accuracy	Graduation	Mass (g)	Remarks
0 (20) - 450mm	<b>160-130</b>	±0.10mm	0.02mm	1,100	—
0 (20) - 600mm	<b>160-131</b>	±0.10mm	0.02mm	1,300	—
0 (20) - 1000mm	<b>160-132</b>	±0.15mm	0.02mm	3,350	—
0 (20) - 1500mm	<b>160-133</b>	±0.22mm	0.05mm	4,850	
0 (20) - 2000mm	<b>160-134</b>	±0.28mm	0.05mm	10,000	

\*( ): Minimum dimension in ID measurement

### DIMENSIONS

Range	L	a	b	d
0 - 8" / 0 - 200mm	288 (290)	60	8	16
0 - 12" / 0 - 300mm	445	75	12	20
0 - 18" / 0 - 450mm	632	100	18	25
0 - 24" / 0 - 600mm	780	100	18	25
0 - 40" / 0 - 1000mm	1240	140	24	32

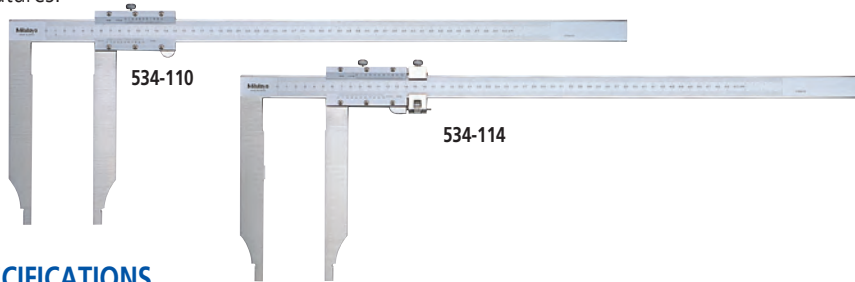
Unit: mm  
( ): Digital models

# Long Jaw Vernier Caliper

## SERIES 534

### FEATURES

- Long jaws for measuring hard-to-reach features.
- Supplied in fitted wooden case.



### SPECIFICATIONS

**Metric** with metric/metric dual scale without fine adjustment

Range*	Order No.	Accuracy	Graduation		Mass (g)
			Lower Scale	Upper Scale	
0 (10) - 300mm	534-109	±0.07mm	0.05mm	0.05mm	400
0 (20) - 500mm	534-110	±0.13mm	0.05mm	0.05mm	1,400

\*( ): Minimum dimension in ID measurement

**Metric** with metric/metric dual scale

Range*	Order No.	Accuracy	Graduation		Mass (g)
			Lower Scale	Upper Scale	
0 (10) - 300mm	534-113	±0.04mm	0.02mm	0.02mm	460
0 (20) - 500mm	534-114	±0.06mm	0.02mm	0.02mm	1,500
0 (20) - 750mm	534-115	±0.08mm	0.02mm	0.02mm	2,900
0 (20) - 1000mm	534-116	±0.10mm	0.02mm	0.02mm	3,500

\*( ): Minimum dimension in ID measurement

**Metric/Inch** with metric/inch dual scale

Range*	Order No.	Accuracy	Graduation		Mass (g)
			Lower Scale	Upper Scale	
0 (10) - 300mm / 0 (.3") - 12"	534-101	±0.07mm	0.05mm	1/128"	460
0 (10) - 300mm / 0 (.3") - 12"	534-105	±0.04mm	0.02mm	.001"	460
0 (20) - 500mm / 0 (.8") - 20"	534-102	±0.13mm	0.05mm	1/128"	1,500
0 (20) - 500mm / 0 (.8") - 20"	534-106	±0.06mm	0.02mm	.001"	1,500
0 (20) - 700mm / 0 (.8") - 30"	534-103	±0.16mm	0.05mm	1/128"	2,900
0 (20) - 700mm / 0 (.8") - 30"	534-107	±0.08mm	0.02mm	.001"	2,900
0 (20) - 1000mm / 0 (.8") - 40"	534-104	±0.20mm	0.05mm	1/128"	3,500
0 (20) - 1000mm / 0 (.8") - 40"	534-108	±0.10mm	0.02mm	.001"	3,500

\*( ): Minimum dimension in ID measurement

**Inch** with inch/inch dual scale

Range*	Order No.	Accuracy	Graduation		Mass (g)
			Lower Scale	Upper Scale	
0 (.3") - 12"	534-117	±.002"	.001"	.001"	400
0 (.8") - 20"	534-118	±.003"	.001"	.001"	1500
0 (.8") - 30"	534-119	±.004"	.001"	.001"	2900
0 (.8") - 40"	534-120	±.004"	.001"	.001"	3500

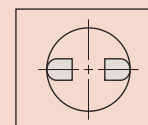
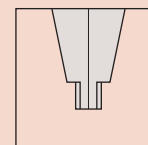
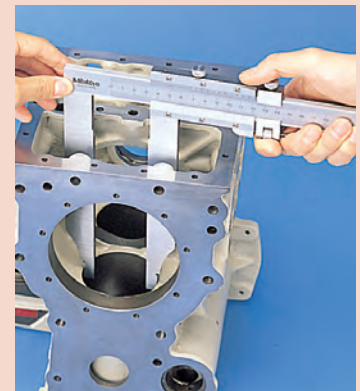
\*( ): Minimum dimension in ID measurement

### DIMENSIONS

Range	L	a	b	c	d	e
0 - 12" / 0 - 300mm	445	110	90	12	20	7
0 - 20" / 0 - 500mm	682	225	200	18.5	25	12
0 - 30" / 0 - 750mm	995	232	200	18.5	32	12
0 - 40" / 0 - 1000mm	1230	232	200	18.5	32	12

### Technical Data

Accuracy: Refer to the list of specifications.  
Graduation: Refer to the list of specifications.



Round surface of jaws for accurate CD measurement



### Technical Data

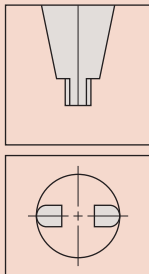
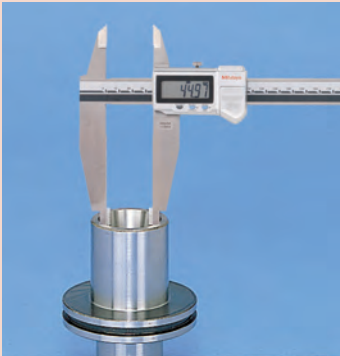
Accuracy: Refer to the list of specifications.  
 Resolution: 0.01mm or .0005"/0.01mm  
 Display: LCD  
 Length standard: ABSOLUTE electrostatic capacitance type linear encoder  
 Max. response speed: Unlimited  
 Battery: SR44 (1 pc.), **938882**  
 Battery life: Approx. 3.5 years under normal use

### Function of Digital Model

Origin-set, Zero-setting, Data output,  
 inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error

### Optional Accessories for Digital Model

**05CZA624:** SPC cable with data switch (1m / 40")  
**05CZA625:** SPC cable with data switch (2m / 80")



Round surface of jaws for accurate ID measurement

# ABSOLUTE Digimatic Caliper

**SERIES 551 — with Nib Style and Standard Jaws**

### FEATURES

- The rounded faces of the jaws are ideal for accurate ID (inside diameter) measurement.
- With SPC output.
- Supplied in fitted plastic holster in carton. 18" / 450mm and larger supplied wooden case.



### SPECIFICATIONS

**Metric** Digital model

Range*	Order No.	Accuracy	Resolution	Mass (g)	Remarks
0 (10) - 200mm	<b>551-301-10</b>	±0.03mm	0.01mm	180	IP67
0 (10) - 300mm	<b>551-331-10</b>	±0.04mm	0.01mm	380	with offset/preset function for easy ID measurement, IP67
0 (20) - 500mm	<b>551-204-10</b>	±0.06mm	0.01mm	1,060	—
0 (20) - 750mm	<b>551-206-10</b>	±0.06mm	0.01mm	1,410	—
0 (20) - 1000mm	<b>551-207-10</b>	±0.07mm	0.01mm	3,430	—

\*( ): Minimum dimension in ID measurement

**Inch/Metric** Digital model

Range*	Order No.	Accuracy	Resolution	Mass (g)	Remarks
0 (.4") - 8" / 0 (10) - 200mm	<b>551-311-10</b>	±.001"	.0005" / 0.01mm	180	IP67
0 (.4") - 12" / 0 (10) - 300mm	<b>551-341-10</b>	±.002"	.0005" / 0.01mm	380	w/ offset/preset function for easy ID measurement, IP67
0 (.5") - 20" / 0 (20) - 500mm	<b>551-224-10</b>	±.0025"	.0005" / 0.01mm	1,060	—
0 (.5") - 30" / 0 (20) - 750mm	<b>551-226-10</b>	±.0025"	.0005" / 0.01mm	1,410	—
0 (1") - 40" / 0 (20) - 1000mm	<b>551-227-10</b>	±.003"	.0005" / 0.01mm	3,430	—

\*( ): Minimum dimension in ID measurement

### DIMENSIONS

Series 551 Unit: mm

Range	a	b	c	d	R
0 - 8" / 0 - 200mm	60	43	8	30	5
0 - 12" / 0 - 300mm	90	68	10	40.1	5
0 - 20" / 0 - 500mm	150	115	15	56	10
0 - 30" / 0 - 750mm	150	115	15	56	10
0 - 40" / 0 - 1000mm	150	115	20	56	10

# Digimatic Carbon Fiber Caliper

**SERIES 552 — with optional jaw attachments**

**ABSOLUTE®**  
Absolute System Patented by MTUTOYO

## FEATURES

- Lightweight Digimatic Calipers that employ CFRP (Carbon Fiber Reinforced Plastics) in the beam and jaws.
- Highly durable and easy to handle.
- The range of applications can be expanded by using the optional attachments.
- Direct readout of ID measurements from the LCD. (Offset value can be set easily by pressing the Offset key.)
- Preset function for setting a desired starting point.
- With SPC data output.
- Special model available with ceramic jaws which are suitable for measuring abrasive and magnetic products.
- Supplied in fitted wooden case.

**SPC**

**IP66**

## Technical Data

Accuracy: Refer to the list of specifications.  
Resolution: .0005"/0.01mm or 0.01mm  
Display: LCD  
Length standard: Electrostatic capacitance type linear encoder  
Max. response speed: 1600mm/s  
Battery: SR44 (1 pc.), **938882**  
Battery life: Approx. 3,000 hours in continuous use



## SPECIFICATIONS

### Metric

Range*	Order No.	Accuracy	Resolution	Remarks
0(20)-450mm	<b>552-302-10</b>	+/-0.04mm	0.01mm	
0(20)-450mm	<b>552-150-10</b>	+/-0.06mm	0.01mm	long jaws 200mm
0(20)-450mm	<b>552-155-10</b>	+/-0.04mm	0.01mm	ceramic jaws
0(20)-600mm	<b>552-303-10</b>	+/-0.04mm	0.01mm	
0(20)-600mm	<b>552-151-10</b>	+/-0.06mm	0.01mm	long jaws 200mm
0(20)-600mm	<b>552-156-10</b>	+/-0.04mm	0.01mm	ceramic jaws
0(20)-1000mm	<b>552-304-10</b>	+/-0.05mm	0.01mm	
0(20)-1000mm	<b>552-152-10</b>	+/-0.07mm	0.01mm	long jaws 200mm
0(20)-1500mm	<b>552-305-10</b>	+/-0.09mm	0.01mm	
0(20)-1500mm	<b>552-153-10</b>	+/-0.11mm	0.01mm	long jaws 200mm
0(20)-2000mm	<b>552-306-10</b>	+/-0.12mm	0.01mm	
0(20)-2000mm	<b>552-154-10</b>	+/-0.14mm	0.01mm	long jaws 200mm

\*( ): Minimum dimension in ID measurement

### Inch/Metric

Range*	Order No.	Accuracy	Resolution	Remarks
0(.5")-18"	<b>552-312-10</b>	+/- .002"	.0005"/0.01mm	
0(.5")-18"	<b>552-160-10</b>	+/- .0025"	.0005"/0.01mm	long jaws 7.9"
0(.5")-18"	<b>552-165-10</b>	+/- .002"	.0005"/0.01mm	ceramic jaws
0(.5")-24"	<b>552-313-10</b>	+/- .002"	.0005"/0.01mm	
0(.5")-24"	<b>552-161-10</b>	+/- .0025"	.0005"/0.01mm	long jaws 7.9"
0(.5")-24"	<b>552-166-10</b>	+/- .002"	.0005"/0.01mm	ceramic jaws
0(1")-40"	<b>552-314-10</b>	+/- .002"	.0005"/0.01mm	
0(1")-40"	<b>552-162-10</b>	+/- .003"	.0005"/0.01mm	long jaws 7.9"
0(1")-60"	<b>552-315-10</b>	+/- .004"	.0005"/0.01mm	
0(1")-60"	<b>552-163-10</b>	+/- .0045"	.0005"/0.01mm	long jaws 7.9"
0(1")-80"	<b>552-316-10</b>	+/- .005"	.0005"/0.01mm	
0(1")-80"	<b>552-164-10</b>	+/- .0055"	.0005"/0.01mm	long jaws 7.9"

\*( ): Minimum dimension in ID measurement

## Function

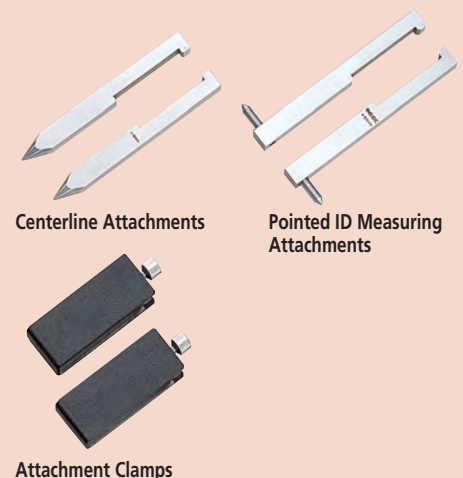
Origin-set, Zero-setting, Presetting, Offsetting, Data hold, Data output, inch/mm conversion (on inch/metric models only)  
Alarm: Low voltage, Counting value composition error

## Optional Accessories

**05CZA624:** SPC cable with data switch (40"/1m)  
**05CZA625:** SPC cable with data switch (80"/2m)

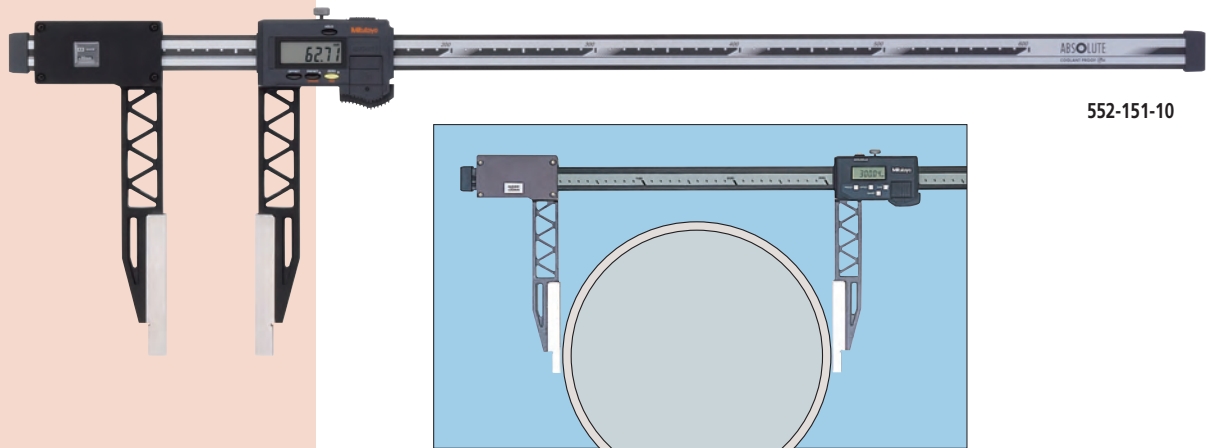
- 914055:** Centerline attachments (mm)\*
- 914056:** Centerline attachments (inch)\*
- 914057:** Pointed ID measuring attachments (mm)\*
- 914058:** Pointed ID measuring attachments (inch)\*
- 914053:** Attachment clamps (for models up to 24" / 600mm range)
- 914054:** Attachment clamps (for models over 24" / 600mm range)

\* Attachment clamps are required and not available for long jaw type.

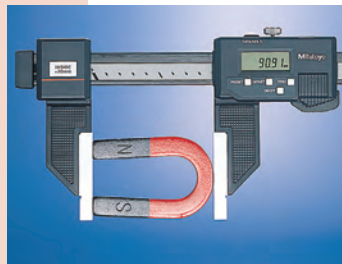


Attachment Clamps

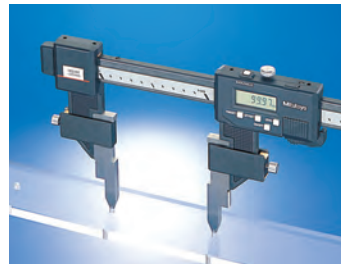




552-151-10



Ceramic jaws



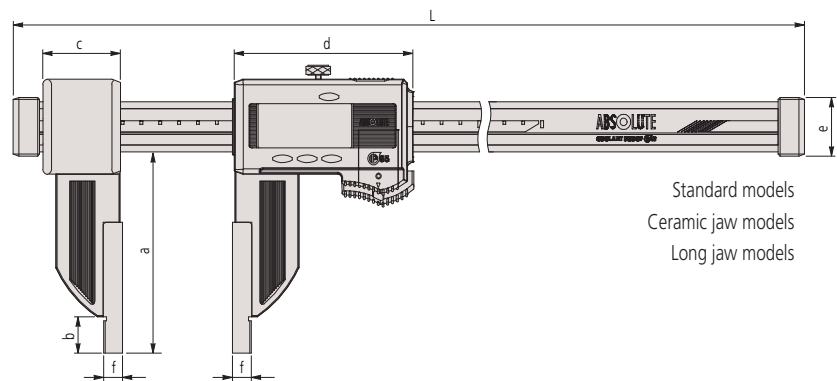
Centerline attachments



ID point attachments

## DIMENSIONS AND MASS

Unit: mm



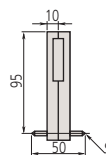
Standard models  
Ceramic jaw models  
Long jaw models

Standard models, Ceramic jaw models

Range	L	a	b	c	d	e	f	Mass (g)
0 - 18" / 0 - 450mm	640	100	18	41.2	91.8	25	10 (.25")	715
0 - 24" / 0 - 600mm	790	100	18	41.2	91.8	25	10 (.25")	790
0 - 40" / 0 - 1000mm	1230	150	24	62.8	113.8	32	10 (.5")	1,760
0 - 60" / 0 - 1500mm	1740	150	24	62.8	113.8	32	10 (.5")	2,160
0 - 80" / 0 - 2000mm	2250	150	24	62.8	113.8	32	10 (.5")	2,560

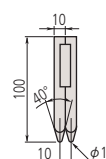
( ) : inch/mm models

Pointed ID Measuring Attachments



Unit: mm

Centerline Attachments



Long jaw models

Range	L	a	b	c	d	e	f	Mass (g)
0 - 18" / 0 - 450mm	680	200	24	89	91.8	25	10 (.25")	1,215
0 - 24" / 0 - 600mm	830	200	24	89	91.8	25	10 (.25")	1,290
0 - 40" / 0 - 1000mm	1280	200	24	110	113.8	32	10 (.5")	2,090
0 - 60" / 0 - 1500mm	1790	200	24	110	113.8	32	10 (.5")	2,490
0 - 80" / 0 - 2000mm	2300	200	24	110	113.8	32	10 (.5")	2,890

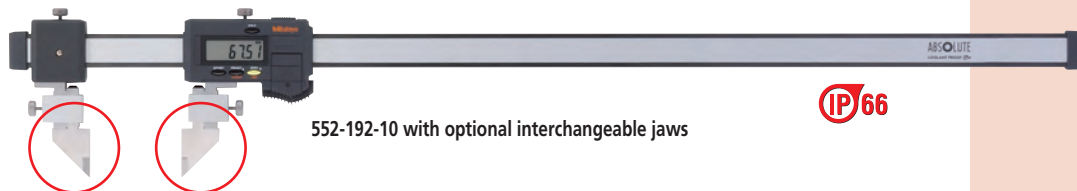
( ) : inch/mm models

# ABSOLUTE Coolant Proof Carbon Fiber Caliper

## SERIES 552 — with Interchangeable Jaws

### FEATURES

- The range of applications can be expanded by using interchangeable jaws (optional).
- Quick and easy exchanging of jaws due to the unique clamping mechanism. (A pair of clamping wheels is a standard accessory.)
- Provided with preset function for setting a desired starting point, which allows direct readout of offset measurements.
- SPC data output.



552-192-10 with optional interchangeable jaws

### SPECIFICATIONS

Inch/Metric

Range	Order No.	Accuracy	Mass(g)
0 - 18" / 0 - 450mm	552-191-10	±.002"	650
0 - 24" / 0 - 600mm	552-192-10	±.002"	725
0 - 40" / 0 - 1000mm	552-193-10	±.002"	1480
0 - 60" / 0 - 1500mm	552-194-10	±.004"	1880
0 - 80" / 0 - 2000mm	552-195-10	±.005"	2280

### Interchangeable Jaws (Optional)

**Standard type**

**Inside point type**

**Standard Type**

Order No.	Components	a	b
07CZA056	Right (07CAA044), Left (07CAA045)	28mm (1.1")	30mm (1.2")

**Inside Point Type**

Order No.	Components	a	b
07CZA058	07CZA041 x 2pcs.	25mm	50mm
07CZA059	07CZA048 x 2pcs.	1"	2"

**Surface Plate Type**

**Scriber Type**

**Centerline Type**

**Scriber Type**

Order No.	Components	a	b
07CZA055	Right (07CZA042), Left (07CZA043)	8mm	30mm
07CZA061	Right (07CZA042), Left (07CZA049)	031"	1.2"

**Surface Plate Type**

Order No.	a	b
07CZA044	3.5" / 90mm	1.1" / 28mm

**Centerline Type**

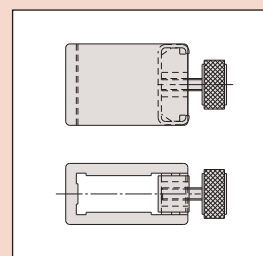
Order No.	Components	a	b
07CZA057	07CZA039 x 2pcs.	30mm	30mm
07CZA060	07CZA047 x 2pcs.	1.2"	1.2"

Unit: mm



### Technical Data

Accuracy: Refer to the list of specifications.  
 Resolution: .0005"/0.01mm  
 Display: LCD  
 Scale type: ABSOLUTE electromagnetic linear encoder  
 Max. response speed: Unlimited  
 Battery: SR44 (1 pc.), 938882  
 Battery life: Approx. 5,000 hours in continuous use  
 Dust/Water protection level: IP66  
 Standard accessory: Jaw clamps (2 pcs.), 05GZA033

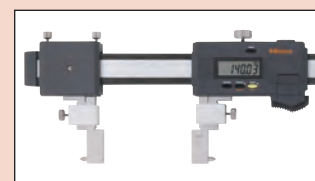


### Functions

Origin-set, Zero-setting, Presetting, Offsetting, Data hold,  
 Automatic power on/off, Data output, inch/mm conversion  
 (inch/mm models)  
 Alarm: Low voltage, Counting value composition error

### Optional Accessories

- 05CZA624: SPC cable with data switch (40" / 1m)
- 05CZA625: SPC cable with data switch (80" / 2m)
- 02AZD790A: SPC cable for U-WAVE w/ data switch (160mm)





**ABSOLUTE**<sup>®</sup>

Absolute System Patented by MITUTOYO

# ABSOLUTE Back-Jaw Centerline Caliper

**SERIES 573 — Center-to-Center & Edge-to-Center Types**

## FEATURES

- Specially designed to measure the distance between two centers or the distance from an edge to center.
- Provided with jaws on the back of the slider, measurements can be read easily by looking down.
- Direct reading of pitch measurements is available due to the offset value setting function.
- With SPC data output.
- Supplied fitted in wooden case.

## Technical Data

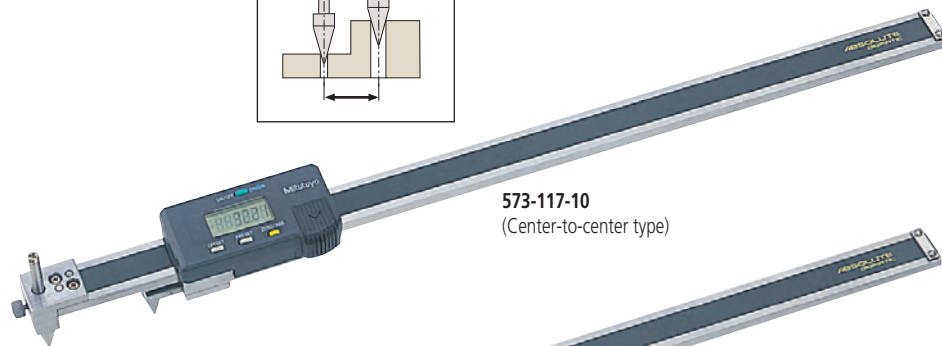
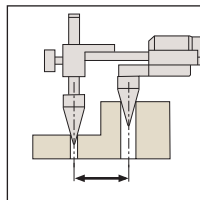
Accuracy: Refer to the list of specifications.  
 Resolution: 0.01mm  
 Display: LCD  
 Length standard\*: ABSOLUTE electrostatic capacitance type linear encoder  
 Max. response speed: Unlimited  
 Battery: SR44 (1 pc.), **938882**  
 Battery life: Approx. 3.5 years under normal use

## Function

Origin-set, Zero-setting, Power On/Off, Data output, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error

## Optional Accessories

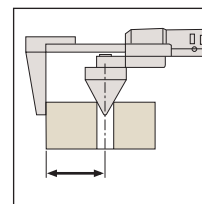
- 959143:** Data hold unit  
**959149:** SPC cable with data switch (1m)  
**959150:** SPC cable with data switch (2m)



**573-117-10**  
(Center-to-center type)



**573-119-10**  
(Edge-to-center type)



## SPECIFICATIONS

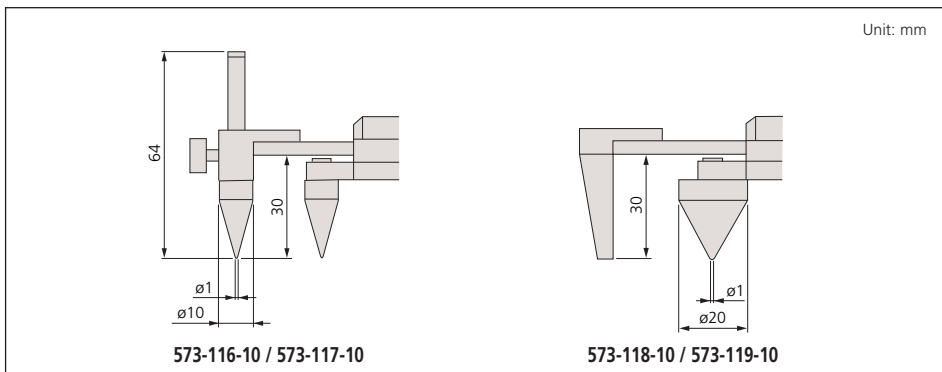
**Metric** — Center-to-center distance type

Range	Order No.	Accuracy	Resolution	Mass (g)
10 - 200mm	<b>573-116-10</b>	±0.10mm	0.01mm	482
10 - 300mm	<b>573-117-10</b>	±0.15mm	0.01mm	578

**Metric** — Edge-to-center distance type

Range	Order No.	Accuracy	Resolution	Mass (g)
10 - 200mm	<b>573-118-10</b>	±0.10mm	0.01mm	485
10 - 300mm	<b>573-119-10</b>	±0.15mm	0.01mm	581

## DIMENSIONS



**573-116-10 / 573-117-10**

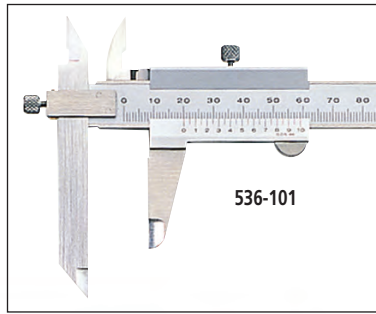
**573-118-10 / 573-119-10**

# Offset Caliper

**SERIES 573, 536 — ABSOLUTE Digimatic and Vernier Type**

## FEATURES

- Main scale jaw can slide up and down to facilitate measurement of stepped sections. (Hard-to-get-at dimensions such as A, B, C can be accurately measured.)
- With depth bar.
- With SPC data output. (Series 573)
- Supplied in fitted plastic case.



536-101



573-701



## SPECIFICATIONS

**Metric** Digital model

Range	Order No.	Accuracy	Resolution	Mass (g)
0 - 150mm	573-601	±0.02mm	0.01mm	168
0 - 200mm	573-602	±0.02mm	0.01mm	198
0 - 300mm	573-604	±0.03mm	0.01mm	350

**Metric**

Range	Order No.	Accuracy	Graduation	Mass (g)
0 - 150mm	536-101	±0.05mm	0.05mm	150
0 - 200mm	536-102	±0.05mm	0.05mm	200
0 - 300mm	536-103	±0.08mm	0.05mm	400

**Inch/Metric** Digital model

Range	Order No.	Accuracy	Resolution	Mass (g)
0 - 6" / 0 - 150mm	573-701	±.001"	.0005" / 0.01mm	168
0 - 8" / 0 - 200mm	573-702	±.001"	.0005" / 0.01mm	198
0 - 12" / 0 - 300mm	573-704	±.0015"	.0005" / 0.01mm	350

## DIMENSIONS

Unit: mm

Range	a	b	c	d
0 - 6" / 0 - 150mm	95	10	40	30.4 (30)
0 - 8" / 0 - 200mm	95	10	50	40.4 (38.5)
0 - 12" / 0 - 300mm	135	15	64	51

( ) Digital Model



## Technical Data

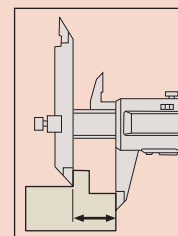
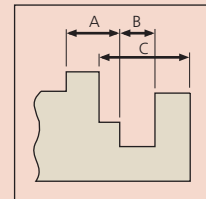
Accuracy: Refer to the list of specifications.  
 Resolution\*: .0005"/0.01mm or 0.01mm  
 Graduation\*\*: 0.05mm  
 Display\*: LCD  
 Length standard\*: ABSOLUTE electrostatic capacitance type linear encoder  
 Max. response speed\*: Unlimited  
 Battery\*: SR44 (1 pc.), 938882  
 Battery life\*: Approx. 3.5 years under normal use  
 \*Digital models \*\*Analog models

## Function of Digital Model

Origin-set, Zero-setting, Power On/Off, Data output, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error

## Optional Accessories for Digital Model

- 05CZA624**: SPC cable with data switch (40" / 1m)
- 05CZA625**: SPC cable with data switch (80" / 2m)





### Technical Data

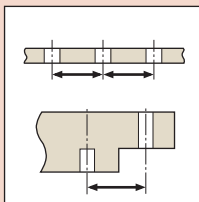
Accuracy: Refer to the list of specifications.  
 Resolution\*: .0005"/0.01mm or 0.01mm  
 Graduation\*\*: 0.05mm  
 Display\*: LCD  
 Length standard\*: ABSOLUTE electrostatic capacitance type linear encoder  
 Max. response speed\*: Unlimited  
 Battery\*: SR44 (1 pc.), 938882  
 Battery life\*: Approx. 3.5 years under normal use  
 \*Digital models \*\*Analog models

### Function of Digital Model

Origin-set, Zero-setting, Power On/Off, Data output, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error

### Optional Accessories for Digital Model

05CZA624: SPC cable with data switch (40" / 1m)  
 05CZA625: SPC cable with data switch (80" / 2m)

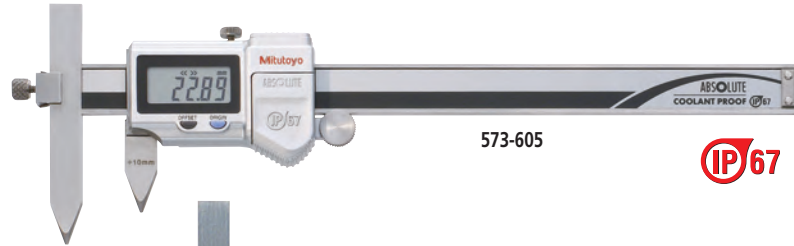


# Offset Centerline Caliper

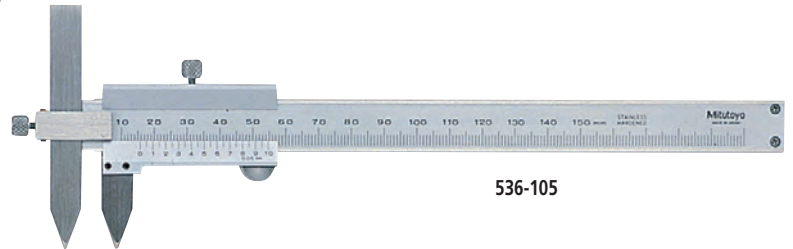
## SERIES 573, 536 — ABSOLUTE Digimatic and Vernier Type

### FEATURES

- Specially designed for center to center distance measurements on the same and offset planes.
- Can also measure from edge to center.
- Hole diameter should be in the range of 1.5mm - 10mm (.06" - .4").
- With SPC data output. (Series 573)
- Supplied in fitted plastic case.



573-605



536-105

### SPECIFICATIONS

Metric		Digital model		
Range	Order No.	Accuracy	Resolution	Mass (g)
10 - 150mm	573-605	±0.03mm	0.01mm	157
10 - 200mm	573-606	±0.03mm	0.01mm	177
10 - 300mm	573-608	±0.04mm	0.01mm	320

Inch/Metric		Digital model		
Range	Order No.	Accuracy	Resolution	Mass (g)
.4 - 6" / 10 - 150mm	573-705	±.0015"	.0005" / 0.01mm	157
.4 - 8" / 10 - 200mm	573-706	±.0015"	.0005" / 0.01mm	177
.4 - 12" / 10 - 300mm	573-708	±.0015"	.0005" / 0.01mm	320

Metric		Vernier model		
Range	Order No.	Accuracy	Graduation	Mass (g)
10 - 150mm	536-105	±0.05mm	0.05mm	140
10 - 200mm	536-106	±0.05mm	0.05mm	160
10 - 300mm	536-107	±0.08mm	0.05mm	320

### DIMENSIONS

Unit: mm

Range	a	t
0 - 6" / 0 - 150mm	75	3
0 - 8" / 0 - 200mm	75	3
0 - 12" / 0 - 300mm	100	3.8

# Point Caliper

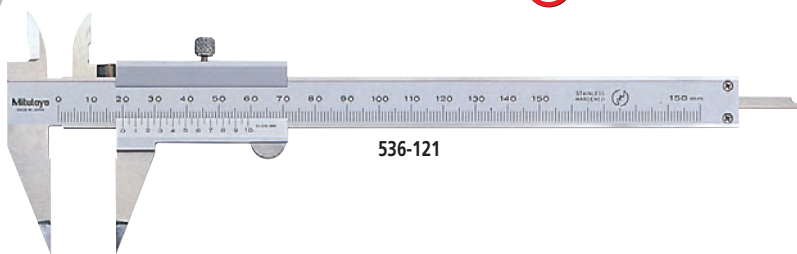
**SERIES 573, 536 — ABSOLUTE Digimatic and Vernier Type**

## FEATURES

- Narrow tip jaws fit into very small grooves and tracks, making many previously difficult outside measurements far easier to obtain.
- With depth bar.
- With SPC data output. (Series 573)
- Supplied in fitted plastic case.



573-721



536-121

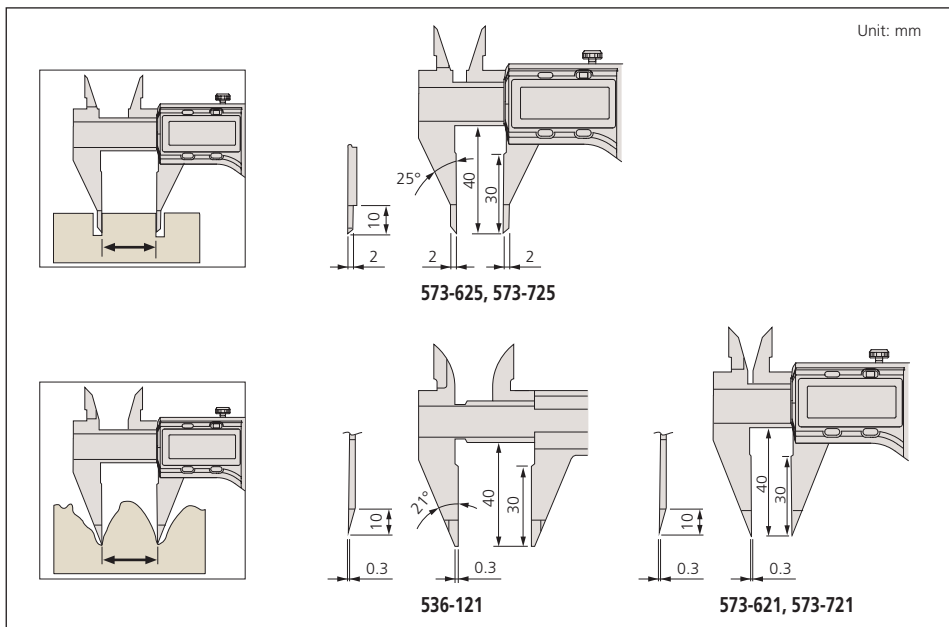
## SPECIFICATIONS

Metric		Digital model		
Range	Order No.	Accuracy	Resolution	Mass (g)
0 - 150mm	573-621	±0.02mm	0.01mm	163
0 - 150mm	573-625	±0.02mm	0.01mm	163

Inch/Metric		Digital model		
Range	Order No.	Accuracy	Resolution	Mass (g)
0 - 6" / 0 - 150mm	573-721	±.001"	.0005" / 0.01mm	163
0 - 6" / 0 - 150mm	573-725	±.001"	.0005" / 0.01mm	163

Metric		Vernier model		
Range	Order No.	Accuracy	Graduation	Mass (g)
0 - 150mm	536-121	±0.05mm	0.05mm	150

## DIMENSIONS



## Technical Data

Accuracy: Refer to the list of specifications.  
 Resolution\*: .0005"/0.01mm or 0.01mm  
 Graduation\*\*: 0.05mm  
 Display\*: LCD  
 Length standard\*: ABSOLUTE electrostatic capacitance type linear encoder  
 Max. response speed\*: Unlimited  
 Battery\*: SR44 (1 pc.), **938882**  
 Battery life\*: Approx. 3.5 years under normal use  
 \*Digital models \*\*Analog models

## Function of Digital Model

Origin-set, Zero-setting, Power On/Off, Data output, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error

## Optional Accessories for Digital Model

- 05CZA624**: SPC cable with data switch (40" / 1m)
- 05CZA625**: SPC cable with data switch (80" / 2m)





### Technical Data

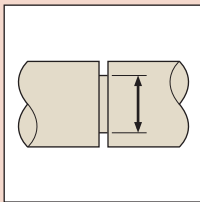
Accuracy: Refer to the list of specifications.  
 Resolution\*: .0005" / 0.01mm or 0.01mm  
 Graduation\*\*: 0.05mm  
 Display\*: LCD  
 Length standard\*: ABSOLUTE electrostatic capacitance type linear encoder  
 Max. response speed\*: Unlimited  
 Battery\*: SR44 (1 pc.), **938882**  
 Battery life\*: Approx. 3.5 years under normal use  
 \*Digital models \*\*Analog models

### Function of Digital Model

Origin-set, Zero-setting, Power On/Off, Data output, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error

### Optional Accessories for Digital Model

**05CZA624**: SPC cable with data switch (40" / 1m)  
**05CZA625**: SPC cable with data switch (80" / 2m)

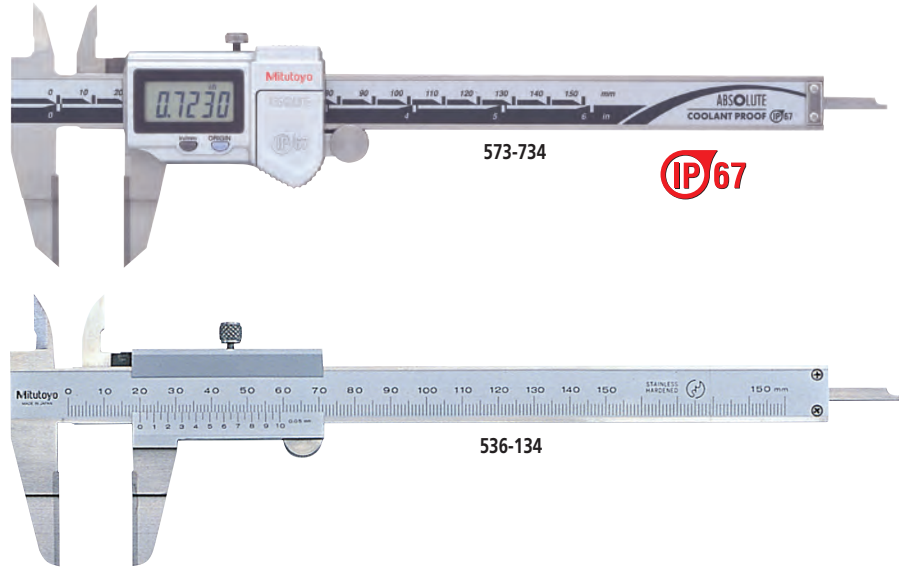


# Blade Type Caliper

## SERIES 573, 536 — ABSOLUTE Digimatic and Vernier Type

### FEATURES

- The thin blade type jaws fit into very small grooves and making previously difficult outside measurements far easier to obtain.
- The OD measuring faces are carbide-tipped.
- With depth bar.
- With SPC data output. (Series 573)
- Supplied in fitted plastic case.



### SPECIFICATIONS

Metric		Digital model		
Range	Order No.	Accuracy	Resolution	Mass (g)
0 - 150mm	<b>573-634</b>	±0.02mm	0.01mm	168

Inch/Metric		Digital model		
Range	Order No.	Accuracy	Resolution	Mass (g)
0 - 6" / 0 - 150mm	<b>573-734</b>	±.001"	.0005" / 0.01mm	168

Metric		Vernier model		
Range	Order No.	Accuracy	Graduation	Mass (g)
0 - 150mm	<b>536-134</b>	±0.05mm	0.05mm	130
0 - 200mm	<b>536-135</b>	±0.05mm	0.05mm	160
0 - 300mm	<b>536-136</b>	±0.08mm	0.05mm	340

### DIMENSIONS

Unit: mm

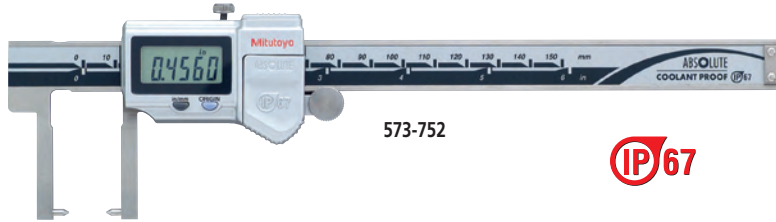
Range	a	b	c	t
0 - 6" / 0 - 150mm	40	20	0.75	3
0 - 200mm	50	25	0.75	3
0 - 300mm	64	30	1	3.8

# Neck Caliper

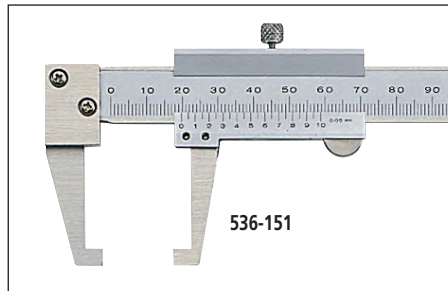
**SERIES 573, 536 — ABSOLUTE Digimatic and Vernier Type**

## FEATURES

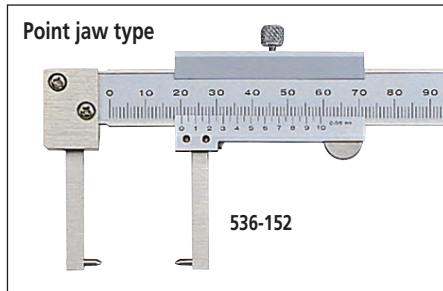
- Point jaw type can measure wall thickness inside bores and recesses.
- Flat jaw type can measure grooves and recesses.
- With SPC data output. (Series 573)
- Supplied in fitted plastic case.



573-752



536-151



536-152

## SPECIFICATIONS

### Metric Digital model

Range	Order No.	Accuracy	Resolution	Mass (g)
0 - 150mm	573-651	±0.03mm	0.01mm	157
0 - 150mm	573-652*	±0.03mm	0.01mm	157

\*Point jaw type

### Inch/Metric Digital model

Range	Order No.	Accuracy	Resolution	Mass (g)
0 - 6" / 0 - 150mm	573-751	±.0015"	.0005" / 0.01mm	157
0 - 6" / 0 - 150mm	573-752*	±.0015"	.0005" / 0.01mm	157

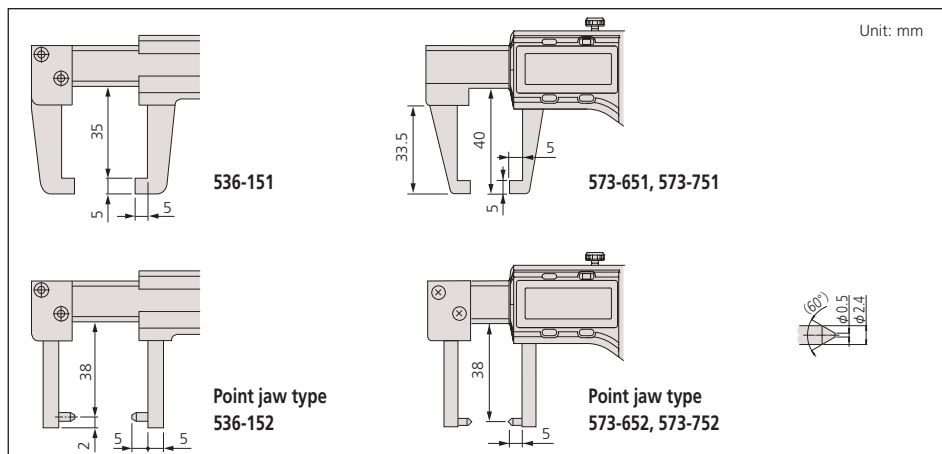
\*Point jaw type

### Metric

Range	Order No.	Accuracy	Graduation	Mass (g)
0 - 150mm	536-151	±0.05mm	0.05mm	140
0 - 150mm	536-152*	±0.05mm	0.05mm	140

\*Point jaw type

## DIMENSIONS



## Technical Data

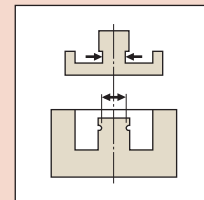
Accuracy: Refer to the list of specifications.  
 Resolution\*: 0.01mm or .0005"/0.01mm  
 Graduation\*\*: 0.05mm  
 Display\*: LCD  
 Length standard\*: ABSOLUTE electrostatic capacitance type linear encoder  
 Max. response speed\*: Unlimited  
 Battery\*: SR44 (1 pc.), **938882**  
 Battery life\*: Approx. 3.5 years under normal use  
 \*Digital models \*\*Analog models

## Function of Digital Model

Origin-set, Zero-setting, Power On/Off, Data output, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error

## Optional Accessories for Digital Model

- 05CZA624:** SPC cable with data switch (1m / 40")
- 05CZA625:** SPC cable with data switch (2m / 80")







### Technical Data

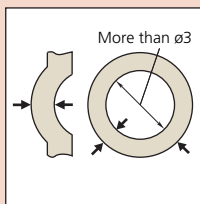
Accuracy: Refer to the list of specifications.  
 Display\*: LCD  
 Length standard: ABSOLUTE electrostatic capacitance type linear encoder  
 Max. response speed\*: Unlimited  
 Battery\*: SR44 (1 pc.), 938882  
 Battery life\*: Approx. 3.5 years under normal use  
 \*Digital models \*\*Analog models

### Function of Digital Model

Origin-set, Zero-setting, Power On/Off, Data output, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error

### Optional Accessories for Digital Model

05CZA624: SPC cable with data switch (40" / 1m)  
 05CZA625: SPC cable with data switch (80" / 2m)

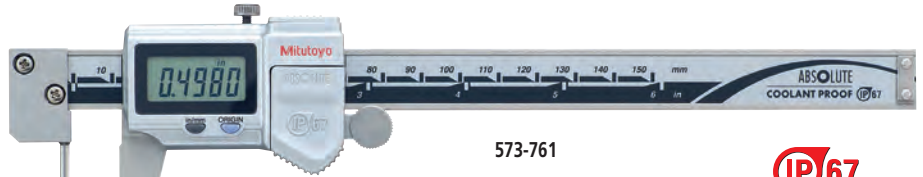


# Tube Thickness Caliper

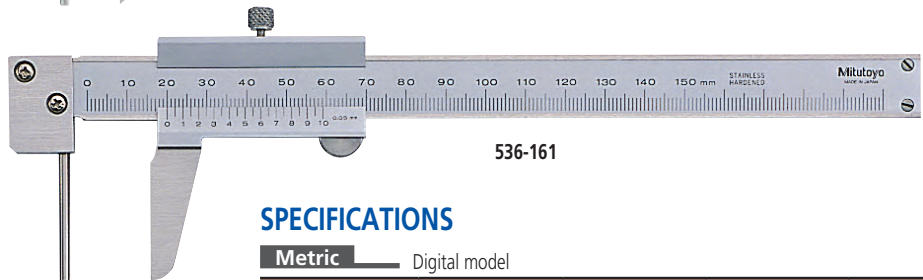
## SERIES 573, 536 — ABSOLUTE Digimatic and Vernier Type

### FEATURES

- The main scale jaw is a round bar that facilitates measurements of tube wall thickness.
- With SPC data output. (Series 573)
- Supplied in fitted plastic case.



573-761



536-161

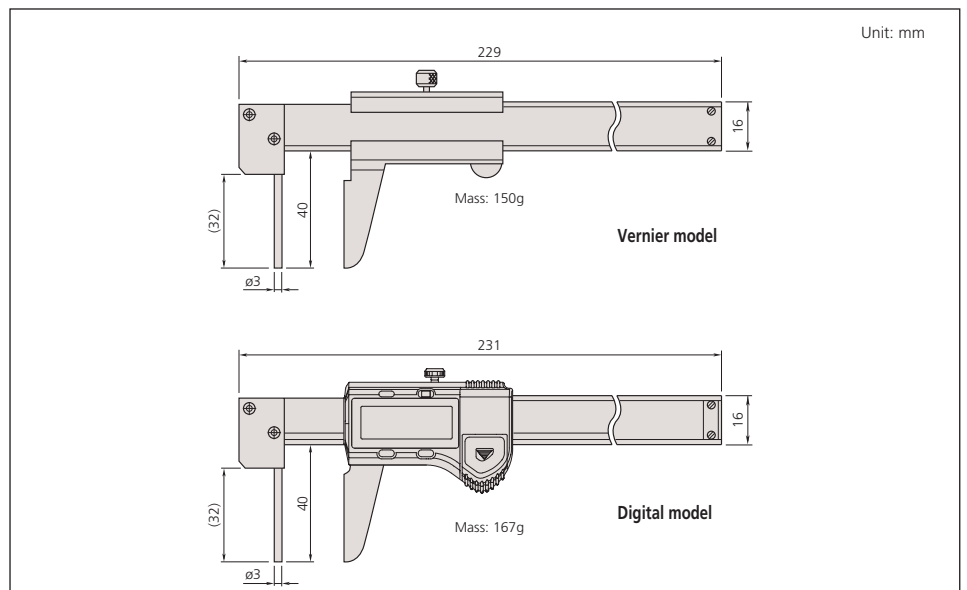
### SPECIFICATIONS

Metric		Digital model		
Range	Order No.	Accuracy	Resolution	Mass(g)
0 - 150mm	573-661	±0.05mm	0.01mm	167

Inch/Metric		Digital model		
Range	Order No.	Accuracy	Resolution	Mass(g)
0 - 6" / 0 - 150mm	573-761	±.002"	.0005" / 0.01mm	167

Metric		Vernier model		
Range	Order No.	Accuracy	Graduation	Mass(g)
0 - 150mm	536-161	±0.05mm	0.05mm	150

### DIMENSIONS AND MASS



# ABSOLUTE Low Force Caliper

**SERIES 573**

## FEATURES

- Due to the low measuring force these calipers are ideal for elastic or resilient workpieces such as plastic parts and

rubber parts that standard calipers cannot measure.

- With SPC data output.
- Supplied in fitted plastic case.



573-191-20

## SPECIFICATIONS

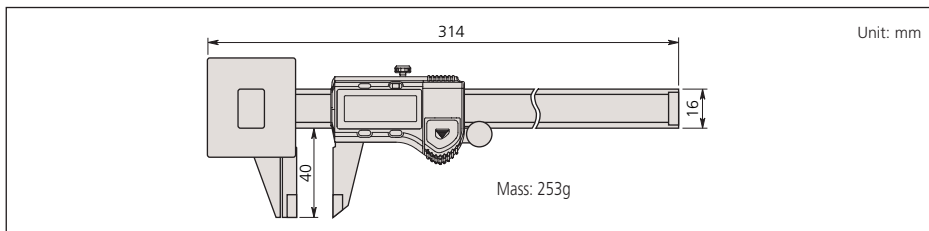
### Metric

Range	Order No.	Accuracy	Resolution	Mass (g)
0 - 180mm	573-191-20	±0.05mm	0.01mm	253

### Inch/Metric

Range	Order No.	Accuracy	Resolution	Mass (g)
0 - 7" / 0 - 180mm	573-291-20	±.002"	.0005" / 0.01mm	253

## DIMENSIONS AND MASS



# ABSOLUTE Snap Caliper

**SERIES 573**

## FEATURES

- The ABSOLUTE Digimatic snap caliper features a spring-loaded mechanism to allow quick and efficient GO/NO-GO

inspection for mass production parts.

- With SPC data output.
- Supplied in fitted plastic case.



573-281-20

## SPECIFICATIONS

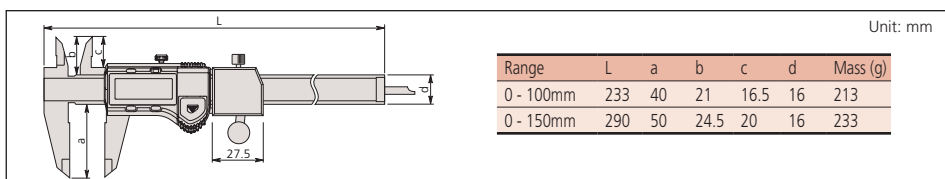
### Metric

Range	Order No.	Accuracy	Resolution	Mass (g)
0 - 100mm	573-181-20	±0.02mm	0.01mm	213
0 - 150mm	573-182-20	±0.02mm	0.01mm	233

### Inch/Metric

Range	Order No.	Accuracy	Resolution	Mass (g)
0 - 4" / 0 - 100mm	573-281-20	±.001"	.0005" / 0.01mm	213
0 - 6" / 0 - 150mm	573-282-20	±.001"	.0005" / 0.01mm	233

## DIMENSIONS AND MASS



## Technical Data

Accuracy: Refer to the list of specifications.  
 Resolution: .0005"/0.01mm or 0.01mm  
 Display: LCD  
 Length standard: ABSOLUTE electrostatic capacitance type linear encoder  
 Measuring force: 0.49N to 0.98N (50gf to 100gf)  
 Jaw retraction: 0.3mm  
 Max. response speed: Unlimited  
 Battery: SR44 (1 pc.), **938882**  
 Battery life: Approx. 3.5 years under normal use

## Function

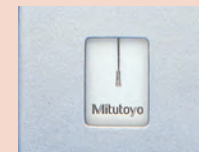
Origin-set, Zero-setting, Power On/Off, Data output, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error

## Optional Accessories

- 959143: Data hold unit
- 959149: SPC cable with data switch (40" / 1m)
- 959150: SPC cable with data switch (80" / 2m)



## Measurement procedures



To measure resilient workpieces take the measurement when the pointer is between the two index lines.



## Technical Data

Accuracy: Refer to the list of specifications.  
 Resolution: .0005"/0.01mm or 0.01mm  
 Repeatability: .0005" / 0.01mm  
 Display: LCD  
 Length standard: ABSOLUTE electrostatic capacitance type linear encoder  
 Measuring force: 7N to 14N (700gf to 1400gf)  
 Jaw retraction: 2mm  
 Max. response speed: Unlimited  
 Battery: SR44 (1 pc.), **938882**  
 Battery life: Approx. 3.5 years under normal use

## Function

Origin-set, Zero-setting, Power On/Off, Data output, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error

## Optional Accessories

- 959143: Data hold unit
- 959149: SPC cable with data switch (40" / 1m)
- 959150: SPC cable with data switch (80" / 2m)



### Technical Data

Accuracy: Refer to the list of specifications.  
 Display: LCD  
 Length standard: ABSOLUTE electrostatic capacitance type linear encoder  
 Max. response speed: Unlimited  
 Battery: SR44 (1 pc.), **938882**  
 Battery life: Approx. 3.5 years under normal use

### Function

Origin-set, Zero-setting, Power On/Off, Data output, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error

### Optional Accessories

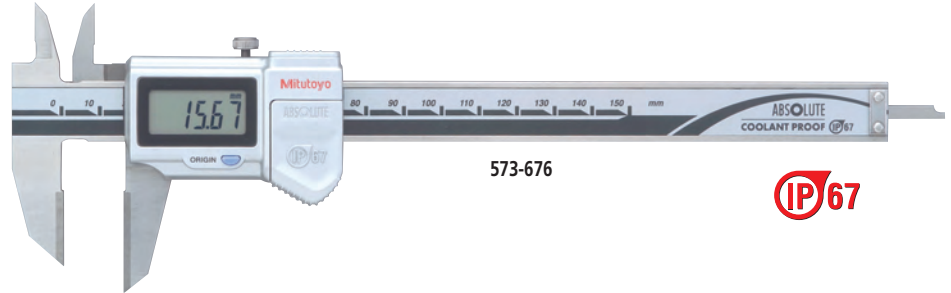
**05CZA624:** SPC cable with data switch (40" / 1m)  
**05CZA625:** SPC cable with data switch (80" / 2m)

# Scribing Caliper

## SERIES 573, 536 — ABSOLUTE Digimatic and Vernier Type

### FEATURES

- The carbide-tipped jaws facilitate fine scribing on workpiece.
- With depth bar.
- With SPC data output. (Series 573)
- Supplied in fitted plastic case.



### SPECIFICATIONS

Metric		Digital model			
Range	Order No.	Accuracy	Resolution	Mass (g)	
0 - 150mm	<b>573-676</b>	±0.02mm	0.01mm	166	
0 - 200mm	<b>573-677</b>	±0.02mm	0.01mm	196	
0 - 300mm	<b>573-679</b>	±0.03mm	0.01mm	345	

Metric		Vernier type			
Range	Order No.	Accuracy	Graduation	Mass (g)	
0 - 150mm	<b>536-221</b>	±0.05mm	0.05mm	150	
0 - 200mm	<b>536-222</b>	±0.05mm	0.05mm	180	
0 - 300mm	<b>536-223</b>	±0.08mm	0.05mm	355	

### DIMENSIONS

Range	L	a	b	c	d	e
0 - 150mm	229	46	21.5	17	16	33
0 - 200mm	288	50	25	20.5	16	43
0 - 300mm	403	64	27.5	22	20	54

Unit: mm

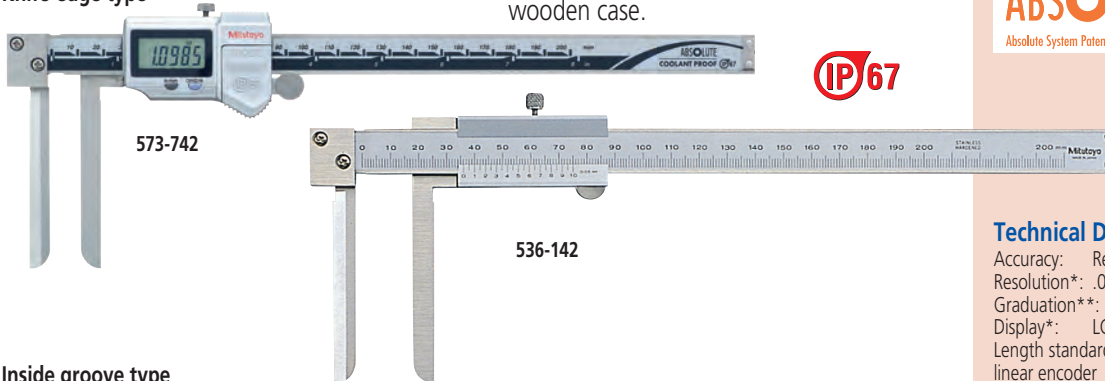
# ABSOLUTE Inside Caliper

**SERIES 573, 536 — Knife-edge/Inside Groove/Point Jaw Type**

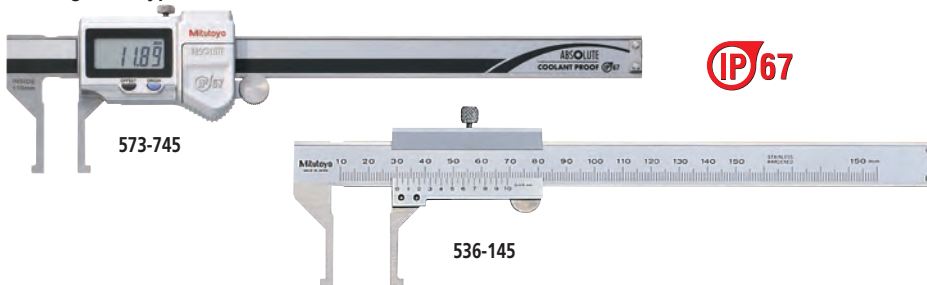
## FEATURES

- Specially designed for inside measurements in hard-to-reach places.
- With SPC data output. (Series 573)
- Supplied in fitted plastic case. 18" / 450mm and 24" / 600mm supplied in wooden case.

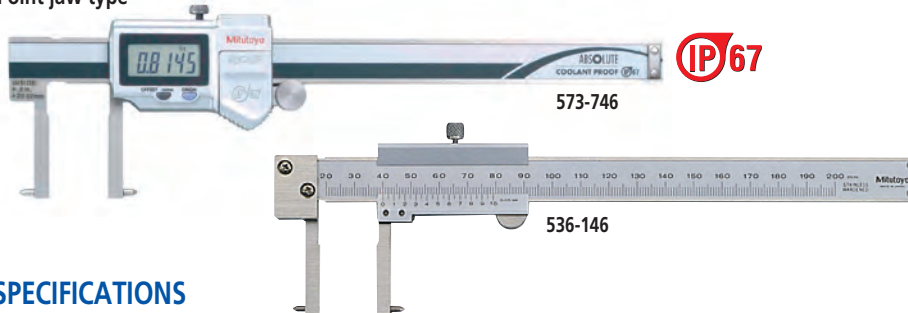
### Knife-edge type



### Inside groove type



### Point jaw type



## SPECIFICATIONS

### Metric Digital model

Range	Order No.	Accuracy	Remarks	Mass (g)
10 - 200mm	<b>573-642</b>	±0.05mm	Knife-edge type, Measurable min. hole diameter: ø10mm	227
10 - 160mm	<b>573-645</b>	±0.05mm	Inside groove type, Measurable min. hole diameter: ø10mm	147
20 - 170mm	<b>573-646</b>	±0.03mm	Point jaw type, Measurable min. hole diameter: ø20mm	157

### Inch/Metric Digital model

Range	Order No.	Accuracy	Remarks	Mass (g)
.4" - 8" / 10-200mm	<b>573-742</b>	±.002"	Knife-edge type, Measurable min. hole diameter: ø.4"	227
.4" - 6" / 10-150mm	<b>573-745</b>	±.002"	Inside groove type, Measurable min. hole diameter: ø.4"	147
.8" - 6" / 20-150mm	<b>573-746</b>	±.0015"	Point jaw type, Measurable min. hole diameter: ø.8"	157

### Metric

Range	Order No.	Accuracy	Remarks	Mass (g)
10 - 200mm	<b>536-142</b>	±0.12mm	Knife-edge type, Measurable min. hole diameter: ø10mm	210
10 - 150mm	<b>536-145</b>	±0.05mm	Inside groove type, Measurable min. hole diameter: ø10mm	130
20 - 150mm	<b>536-146</b>	±0.05mm	Point jaw type, Measurable min. hole diameter: ø20mm	140
30 - 300mm	<b>536-147</b>	±0.08mm	Point jaw type, Measurable min. hole diameter: ø30mm	370
70 - 450mm	<b>536-148</b>	±0.10mm	Point jaw type, Measurable min. hole diameter: ø70mm	1,250
70 - 600mm	<b>536-149</b>	±0.12mm	Point jaw type, Measurable min. hole diameter: ø70mm	1,430



## Technical Data

Accuracy: Refer to the list of specifications.  
 Resolution\*: .0005"/0.01mm / 0.01mm  
 Graduation\*\*: 0.05mm  
 Display\*: LCD  
 Length standard\*: ABSOLUTE electrostatic capacitance type linear encoder  
 Max. response speed\*: Unlimited  
 Battery\*: SR44 (1 pc.), **938882**  
 Battery life\*: Approx. 3.5 years under normal use  
 \*Digital models \*\*Analog models

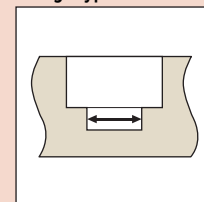
## Function of Digital Model

Origin-set, Zero-setting, Power On/Off, Data output, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error

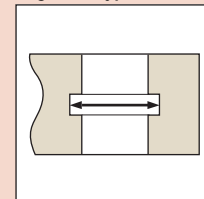
## Optional Accessories for Digital Model

- 05CZA624**: SPC cable with data switch (40" / 1m)
- 05CZA625**: SPC cable with data switch (80" / 2m)

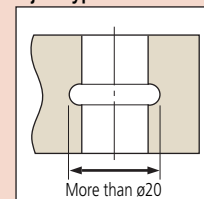
### Knife-edge type



### Inside groove type



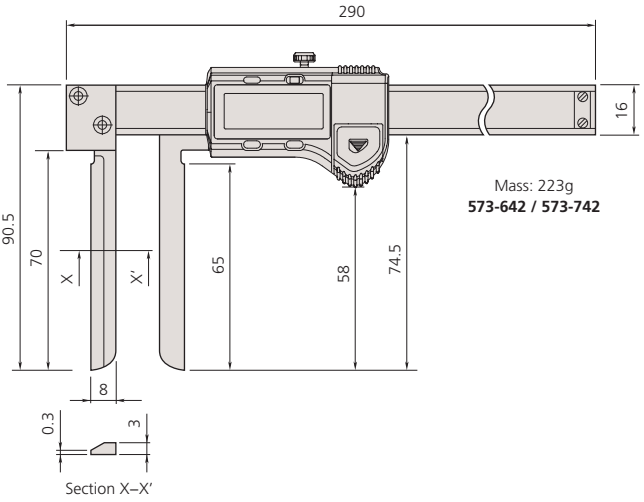
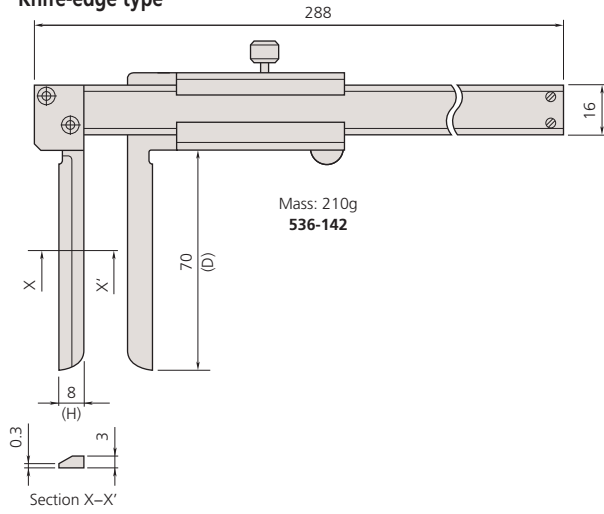
### Point jaw type



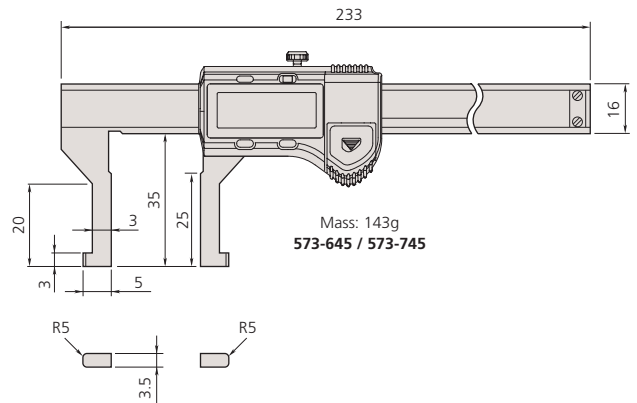
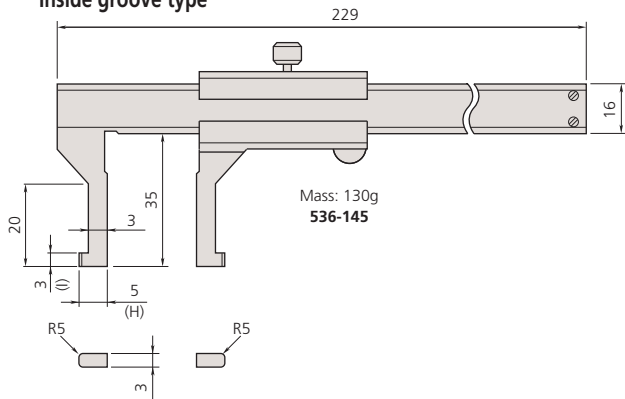
# DIMENSIONS AND MASS

Unit: mm

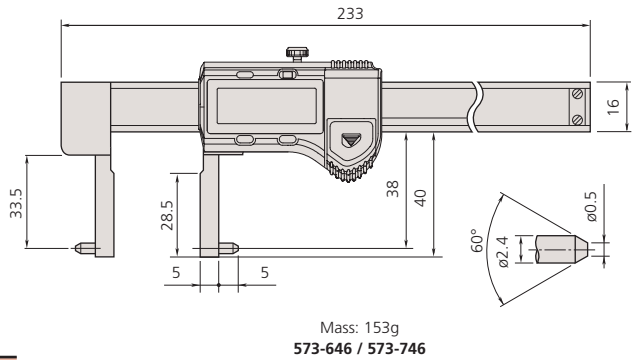
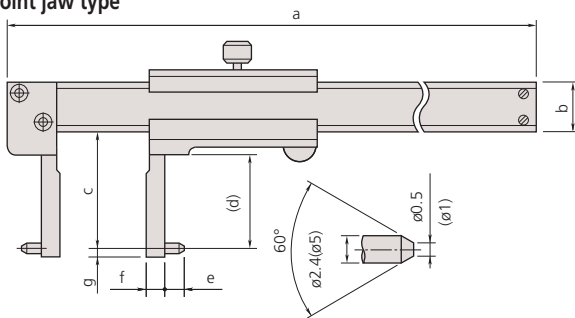
## Knife-edge type



## Inside groove type



## Point jaw type



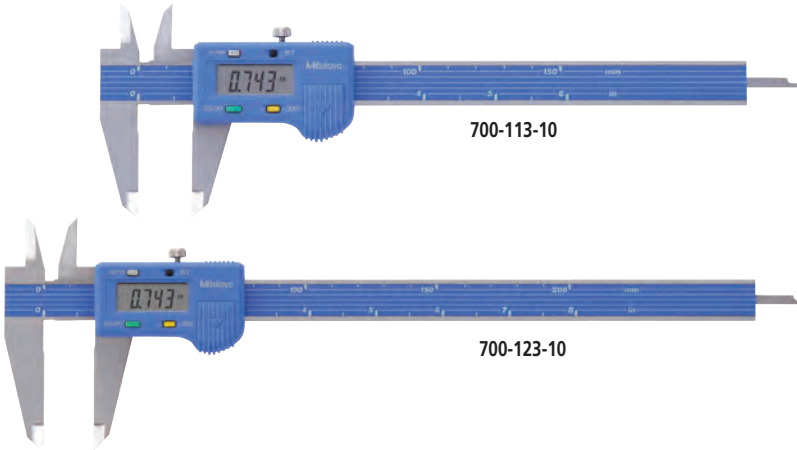
Order No.	Range	a	b	c	d	e	f	g	Mass (g)
<b>536-146</b>	150mm	229	16	38	31	5	5	2	140
<b>536-147</b>	300mm	403	20	98	89	5	10	2	370
<b>536-148</b>	450mm	610	25	145	136	10	25	5	1,250
<b>536-149</b>	600mm	750	25	145	136	10	25	5	1,430

# MyCAL-Lite

## SERIES 700 — Digital Caliper for DIY

### FEATURES

- The "MyCAL-Lite" is an ideal measuring tool for DIY.
- The LCD screen allows error-free readout of measurements.
- With depth measuring bar.



### Technical Data

Accuracy: Refer to the list of specifications.  
 Resolution: .001" / 0.1mm  
 Display: LCD  
 Length standard: Electrostatic capacitance type linear encoder  
 Max. response speed: 1800mm/s  
 Battery: SR44 (1 pc.), **938882**  
 Battery life\*: Approx. 2 years under normal use

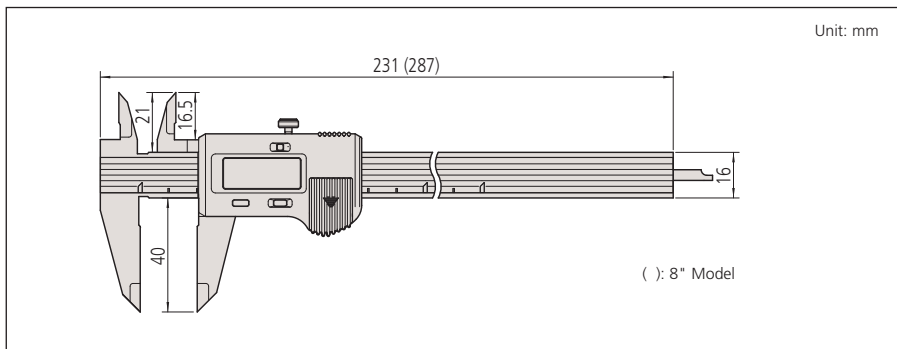
### Function

Zero-setting, Power on/off  
 inch/mm conversion  
 Alarm: Low voltage, Counting value composition error

### SPECIFICATIONS

Inch/Metric			
Range	Order No.	Accuracy	Mass (g)
0 - 6" / 0 - 150mm	<b>700-113-10</b>	±.005" / ±0.2mm	150
0 - 8" / 0 - 200mm	<b>700-123-10</b>	±.005" / ±0.2mm	170

### DIMENSIONS

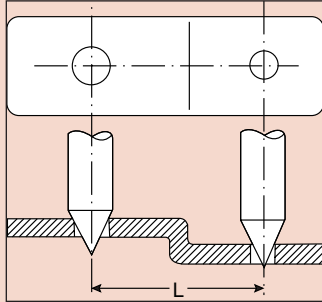


# Center Line Gage

## Optional Accessories for Caliper

### FEATURES

Pairs of conical probes are specially designed for Digimatic, Dial and Vernier calipers to quickly measure centerline distances.



**050001**

Application for 4", 6" and 8" Vernier, Dial and Digimatic Calipers, requiring dimensions over .375".



**050018**

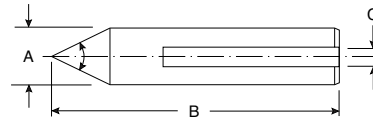
Application for 12" Vernier, Dial and Digimatic Calipers requiring dimensions over .5".

### SPECIFICATIONS

Center Line Gage

Order No.	Description
050001	For 4, 6 and 8" Calipers
050018	For 12" Calipers

### DIMENSIONS



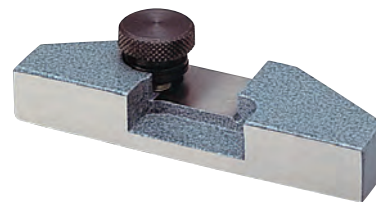
	A	B	C
050001	.375"	2.187"	.141"
050018	.500"	2.75"	.154"

# Depth Base Attachment

## Optional Accessories for Caliper

### FEATURES

- For 4", 6", 8", 12" / 100mm, 150mm, 200mm, 300mm, vernier, dial and digital calipers which have a depth measuring bar.
- Finely grounded base surface and secure locking clamp.



**050084-10**

### SPECIFICATIONS

Inch/Metric

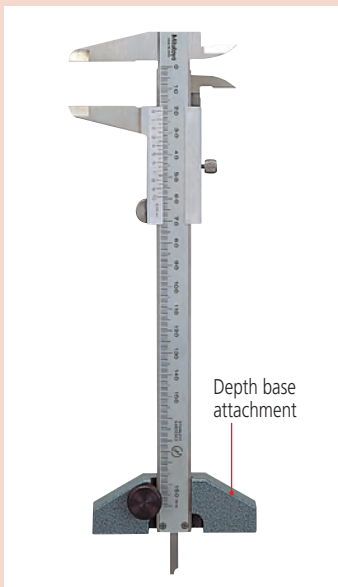
Size	Order No.	Remarks (applicable measuring range of caliper)
3" / 75mm	050083-10	4", 6", 8" / 100mm, 150mm, 200mm
4" / 100mm	050084-10	4", 6", 8" / 100mm, 150mm, 200mm
5" / 125mm	050085-10	12" / 300mm

### DIMENSIONS

Unit: mm

Size	a	b	c	d	e	t
3" / 75mm	25	75	26.5	13	18.5	12
4" / 100mm	25	100	26.5	13	18.5	12
5" / 125mm	30	125	28.5	13	20	14

t: Base thickness



# Digimatic Height Gage

## SERIES 192 — Multi-Function Type with SPC Data Output

### FEATURES

- Highly versatile multi-function type.
- Carbide-tipped long scriber is provided.
- Rigid construction ensures repeatable measurement.
- Switchable resolution.
- Coarse/fine feed switching.
- Bi-directional touch-signal probe is an optional accessory. It can quickly and accurately measure steps, inside width, and outside width.
- With SPC data output.
- Two preset reference height.



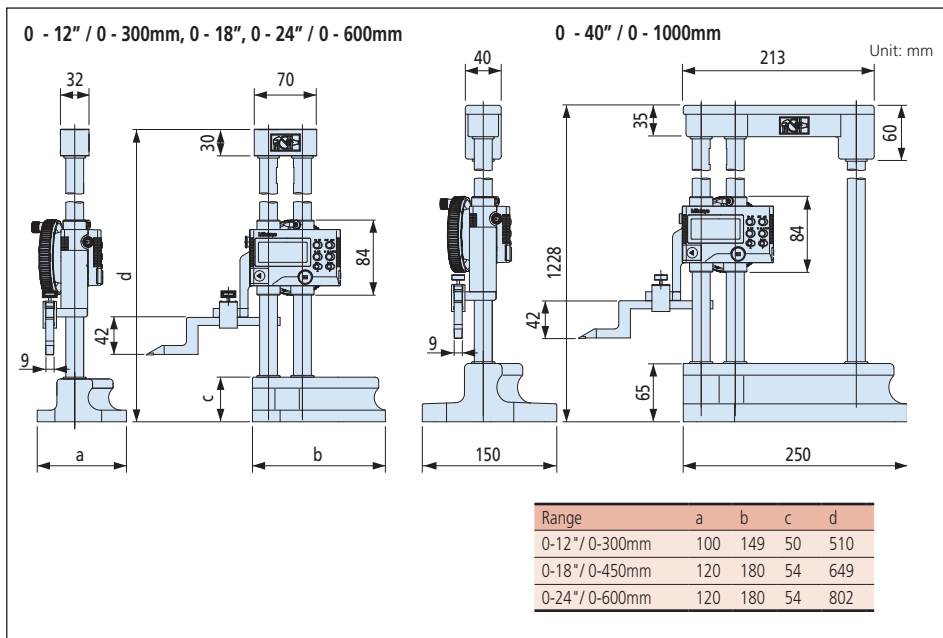
192-670-10

### SPECIFICATIONS

Inch/Metric				
Range	Order No.	Accuracy	Resolution	Mass (kg)
0-12"/0-300mm	192-670-10	±001"	.0005" (0.01mm) [.0002" (0.005mm) Switchable]	5.7
0-18"/0-450mm	192-671-10	±0015"	.0005" (0.01mm) [.0002" (0.005mm) Switchable]	7.5
0-24"/0-600mm	192-672-10	±0015"	.0005" (0.01mm) [.0002" (0.005mm) Switchable]	8.3
0-40"/0-1000mm	192-673-10	±0025"	.0005" (0.01mm) [.0002" (0.005mm) Switchable]	15.7

Metric				
Range	Order No.	Accuracy	Resolution	Mass (kg)
0-300mm	192-663-10	±0.02mm	Switchable between 0.01mm and 0.005mm	5.7
0-600mm	192-664-10	±0.04mm	Switchable between 0.01mm and 0.005mm	8.3
0-1000mm	192-665-10	±0.06mm	Switchable between 0.01mm and 0.005mm	15.7

### DIMENSIONS



### Technical Data

Accuracy: Refer to the list of specifications.  
 Resolution: 0.01+0.005mm or 0.0005" (0.01mm) [0.0002" (0.005mm) switchable]  
 Display: LCD, 7-digits, character height 11mm  
 Max. response speed: 500mm/s  
 Battery: SR44 (1 pc.), **938882**  
 Battery life: Approx. 2000 hours under normal use

### Function

Zero-setting, ABS/INC switching, Two presets, Probe tip diameter compensation, +/- switching, Power ON/OFF, Data hold, Data output, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error

### Standard Scriber Provided

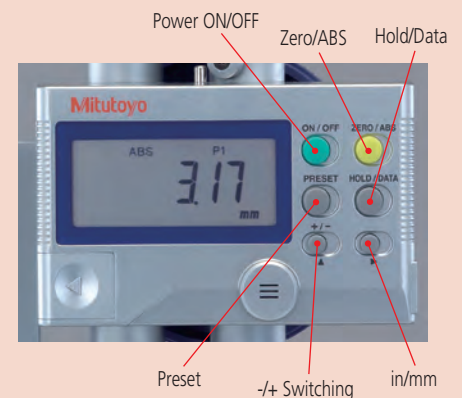
Metric models: Carbide-tipped scriber (**905200**) and scriber clamp (**05GZA033**)  
 Inch/Metric models: Carbide-tipped scriber (**905201**) and scriber clamp (**901385**)

### Optional Accessories

- 905338:** SPC cable (40" / 1m)
- 905409:** SPC cable (80" / 2m)
- 905691:** SPC cable (L-shape, 40" / 1m)
- 905692:** SPC cable (L-shape, 80" / 2m)
- 192-007:** Bi-directional touch-signal probe (metric)
- 192-008:** Bi-directional touch-signal probe (inch)
- 953638:** Holding bar for test indicator (length: 50mm)
- 900209:** Holding bar for test indicator (length: 100mm)
- 953639:** Holding bar for test indicator (length: 2")
- 900306:** Holding bar for test indicator (length: 4")
- 900321:** Swivel clamp used with holding bar (metric)
- 900322:** Swivel clamp used with holding bar (inch)



Shown with optional touch-signal probe







# Digimatic Height Gage

## SERIES 192 — Standard Type with SPC Data Output

### Technical Data

Accuracy: Refer to the list of specifications.  
 Resolution: .0005" (0.01mm) [.0002" (0.005mm)]  
 or 0.01mm and 0.005mm  
 Display: LCD, 7-digit, character height 11mm  
 Max. response speed: 500mm/s  
 Battery: SR44 (1 pc.), **938882**  
 Battery life: Approx. 2000 hours under normal use

### Function

Zero-setting, ABS/INC switching, Two presets, Probe tip diameter compensation, +/- switching, Power ON/OFF, Data hold, With Output, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error

### Standard Scriber Provided

Metric models: Carbide-tipped scriber (**07GZA000**) and scriber clamp (**05GZA033**)  
 Inch/Metric models: Carbide-tipped scriber (**900258**) and scriber clamp (**901385**)

### Optional Accessories

**953638:** Holding bar for test indicator (length: 50mm)  
**900209:** Holding bar for test indicator (length: 100mm)  
**953639:** Holding bar for test indicator (length: 2")  
**900306:** Holding bar for test indicator (length: 4")  
**900321:** Swivel clamp used with holding bar (metric)  
**900322:** Swivel clamp used with holding bar (inch)  
**905338:** SBC cable (CD type) 1M  
**905409:** SBC cable (CD type) 2M  
**905691:** CD/Connecting Cable L-Type 1M RIG  
**905692:** CD/Connecting Cable L-Type 2M RIG

### FEATURES

- Easy-to-use standard type.
- Carbide-tipped scriber is provided.
- Double-column structure ensures high measuring accuracy.
- Coarse/fine feed switching.
- Switchable resolution
- Two preset reference height

### SPECIFICATIONS

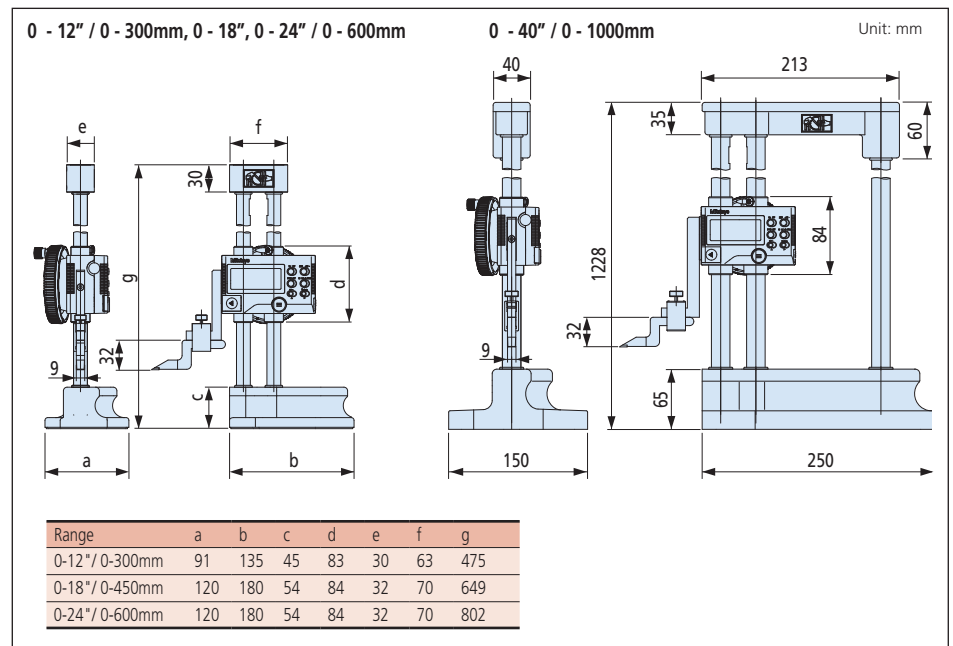
Inch/Metric				
Range	Order No.	Accuracy	Resolution	Mass (kg)
0-12"/0-300mm	<b>192-630-10</b>	±001"	.0005" (0.01mm) [.0002" (0.005mm) Switchable]	4.7
0-18"/0-450mm	<b>192-631-10</b>	±002"	.0005" (0.01mm) [.0002" (0.005mm) Switchable]	7.5
0-24"/0-600mm	<b>192-632-10</b>	±002"	.0005" (0.01mm) [.0002" (0.005mm) Switchable]	8.3
0-40"/0-1000mm	<b>192-633-10</b>	±003"	.0005" (0.01mm) [.0002" (0.005mm) Switchable]	15.7

Metric				
Range	Order No.	Accuracy	Resolution	Mass (kg)
0-300mm	<b>192-613-10</b>	±0.02mm	Switchable between 0.01mm and 0.005mm	4.7
0-600mm	<b>192-614-10</b>	±0.05mm	Switchable between 0.01mm and 0.005mm	8.3
0-1000mm	<b>192-615-10</b>	±0.07mm	Switchable between 0.01mm and 0.005mm	15.7



192-630-10

### DIMENSIONS



# Dial Height Gage

**SERIES 192 — with Digital Counter**

## FEATURES

- Easy and error-free reading with both up and down digital counters as well as a dial.
- Provided with a feed wheel for easy coarse feeding.
- Carbide-tipped scriber is provided.
- The counters and dial can be re-zeroed at any scriber position.

## SPECIFICATIONS

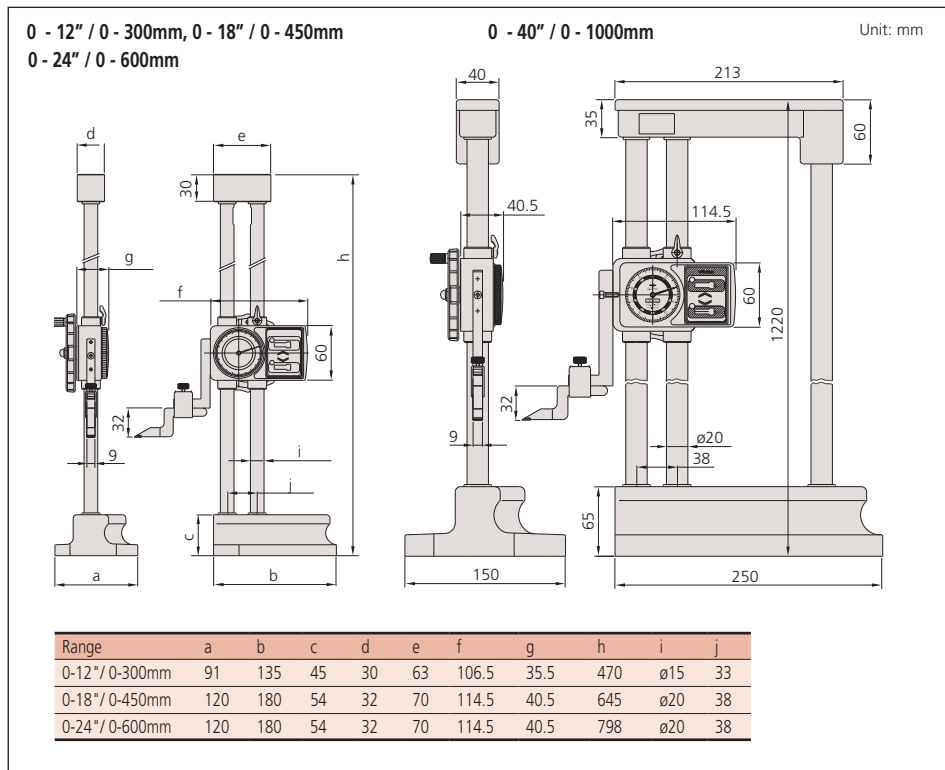
### Metric

Range	Order No.	Accuracy	Graduation	Mass (kg)
0 - 300mm	<b>192-130</b>	±0.03mm	0.01mm	4.2
0 - 450mm	<b>192-131</b>	±0.05mm	0.01mm	9.2
0 - 600mm	<b>192-132</b>	±0.05mm	0.01mm	9.8
0 - 1000mm	<b>192-133</b>	±0.07mm	0.01mm	17.0

### Inch

Range	Order No.	Accuracy	Graduation	Mass (kg)
0 - 12"	<b>192-150</b>	±.0015"	.001"	4.2
0 - 18"	<b>192-151</b>	±.002"	.001"	9.2
0 - 24"	<b>192-152</b>	±.002"	.001"	9.8
0 - 40"	<b>192-153</b>	±.003"	.001"	17.0

## DIMENSIONS



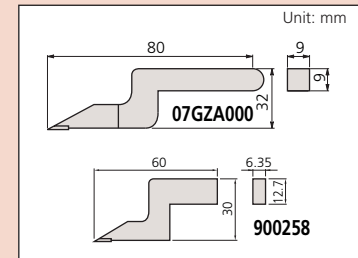
## Technical Data

Dial reading: 0.01mm or .001"

## Standard Scriber Provided

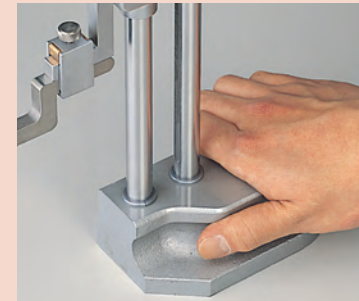
Metric models: Carbide-tipped scriber (**07GZA000**) and scriber clamp (**05GZA033**)  
Inch/Metric models: Carbide-tipped scriber (**900258**) and scriber clamp (**901385**)

## Dimension of scriber



## Optional Accessories

**953638:** Holding bar for test indicator (length: 50mm)  
**900209:** Holding bar for test indicator (length: 100mm)  
**953639:** Holding bar for test indicator (length: 2")  
**900306:** Holding bar for test indicator (length: 4")  
**900321:** Swivel clamp used with holding bar (metric)  
**900322:** Swivel clamp used with holding bar (inch)



Comfortable grip base



Easy and secure clamping



Easy and error free reading



# ABSOLUTE Digimatic Height Gage

**SERIES 570 — with ABSOLUTE Linear Encoder**

## FEATURES

- Built in ABSOLUTE linear encoder  
This encoder eliminates the necessity of setting the reference point at every power-on. It has improved reliability because no over-speed error will occur.
- Fine-adjustment carriage to feed the slider finely.
- Carbide-tipped scriber is provided.
- With SPC data output.

## Technical Data

Accuracy: Refer to the list of specifications.  
Resolution: .0005" / 0.01mm or 0.01mm  
Display: LCD, 6-digit  
Length standard: ABSOLUTE electrostatic capacitance type linear encoder  
Max. response speed: Un limited  
Battery: SR44 (1 pc.), **938882**  
Battery life: Approx. 5000 hours under normal use

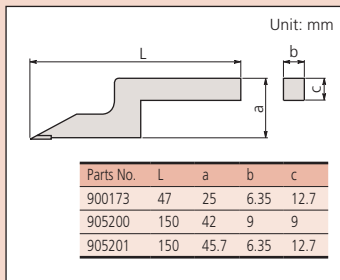
## Function

Origin setting, ABS/INC switching, Presetting, +/- switching, Data hold, Data output, inch/mm conversion (on inch/metric models only)  
Alarm: Low voltage, Counting value composition error

## Standard Scriber Provided

Metric models: Carbide-tipped scriber (900173/905200\*) and scriber clamp (901338/05GZA033\*)  
\*0 - 1000mm model  
Inch/Metric models: Carbide-tipped scriber (900173/905201\*) and scriber clamp (901338/901385\*)  
\*0 - 40" model

## Dimension of scriber

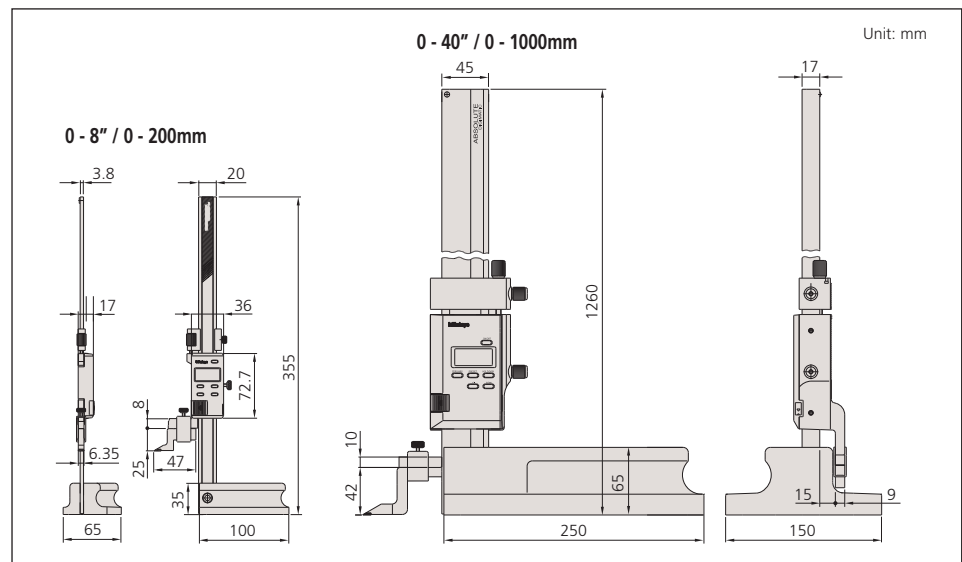


## SPECIFICATIONS

Metric				
Range	Order No.	Accuracy	Resolution	Mass (kg)
0 - 200mm	<b>570-227</b>	±0.03mm	0.01mm	1.4
0 - 1000mm	<b>570-230</b>	±0.07mm	0.01mm	16.8

Inch/Metric				
Range	Order No.	Accuracy	Resolution	Mass(kg)
0 - 8" / 0 - 200mm	<b>570-244</b>	±.001"	.0005" / 0.01mm	1.4
0 - 40" / 0 - 1000mm	<b>570-248</b>	±.003"	.0005" / 0.01mm	16.8

## DIMENSIONS



## Optional Accessories

- 905338:** SPC cable (40" / 1m)
- 905409:** SPC cable (80" / 2m)
- 953638:** Holding bar for test indicator (length: 50mm)
- 953639:** Holding bar for test indicator (length: 2")
- 902053:** Swivel clamp used with holding bar (metric)
- 900322:** Swivel clamp used with holding bar (inch)

# ABSOLUTE Digimatic Height Gage

**SERIES 570 — with ABSOLUTE Linear Encoder**



## FEATURES

- Built in ABSOLUTE linear encoder  
This encoder eliminates the necessity of setting the reference point at every power-on. It has improved reliability because no over-speed error will occur.
- Rigid column structure ensures high measuring accuracy.
- With large smooth slider feed wheel.
- Carbide-tipped scriber is provided.
- With SPC data output.



## SPECIFICATIONS

Metric			
Range	Order No.	Accuracy	Resolution
0 - 300mm	<b>570-302</b>	±0.03mm	0.01mm
0 - 600mm	<b>570-304</b>	±0.05mm	0.01mm

Inch/Metric			
Range	Order No.	Accuracy	Resolution
0 - 12" / 0 - 300mm	<b>570-312</b>	±.0015"	.0005" / 0.01mm
0 - 18" / 0 - 450mm	<b>570-313</b>	±.002"	.0005" / 0.01mm
0 - 24" / 0 - 600mm	<b>570-314</b>	±.002"	.0005" / 0.01mm

## DIMENSIONS AND MASS

Unit: mm

Range	L	a	b	c	Mass (kg)
0 - 12" / 300mm	507	160	122	72.6	4.6
0 - 18" / 450mm	662	181	142	74.1	5.9
0 - 24" / 600mm	812	181	142	74.1	6.4

## Technical Data

Accuracy: Refer to the list of specifications.  
 Resolution: .0005"/0.01mm or 0.01mm  
 Display: LCD, 6-digit  
 Length standard: ABSOLUTE electrostatic capacitance type linear encoder  
 Max. response speed: Un limited  
 Battery: SR44 (1 pc.), **938882**  
 Battery life: Approx. 20000 hours under normal use

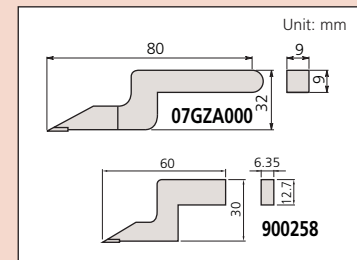
## Function

Origin setting, ABS/INC switching, Power ON/OFF, Data hold, Data output, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error

## Standard Scriber Provided

Metric models: Carbide-tipped scriber (**07GZA000**), scriber clamp (**05GZA033**)  
 Inch/Metric models: Carbide-tipped scriber (**900258**), scriber clamp (**901385**)

## Dimension of scriber



## Optional Accessories

- 905338:** SPC cable (40" / 1m)
- 905409:** SPC cable (80" / 2m)
- 953638:** Holding bar for test indicator (length: 50mm)
- 953639:** Holding bar for test indicator (length: 2")
- 902053:** Swivel clamp used with holding bar (metric)
- 900322:** Swivel clamp used with holding bar (inch)



Large smooth slider feed wheel



Large clamp lever



Comfortable grip base

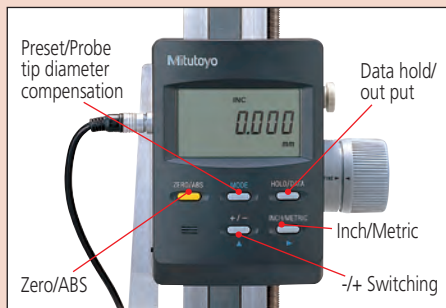


### Technical Data

Accuracy: Refer to the list of specifications.  
 Repeatability: .0001" / 0.001mm  
 Resolution: .0001"/0.001mm or 0.001mm  
 Display: LCD, 6-digit  
 Power supply: Via AC adapter

### Function

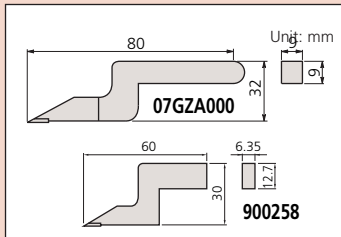
Zero-setting, Presetting, Probe tip diameter compensation, +/- switching, Data hold, Data output, inch/mm conversion (on inch/metric models only)  
 Alarm: Counting value composition error



### Standard Accessories

- 574-007: Touch-Signal Probe
- 901385: Scriber Clamp
- 06AEG180JA: AC Adapter

### Dimensions of Optional Scribers



### Optional Accessories

- 905691: SPC cable (40" / 1m)
- 905692: SPC cable (80" / 2m)
- 900322: Swivel clamp for dial test indicator (inch)
- 953639: Holding bar for swivel clamp (inch)
- 900258: Carbide-tipped scriber (inch)
- 145250:  $\phi 1$ mm contact point for touch-signal probe
- 145251:  $\phi 2$ mm contact point for touch-signal probe

### Touch-Signal Probe (Standard accessory)



Order No.: 574-007

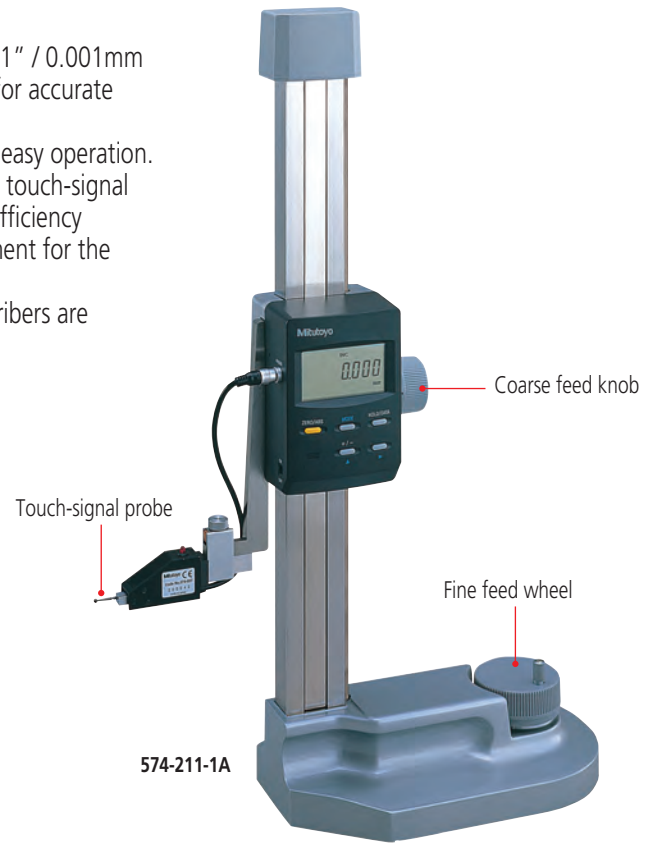
- Bi-directional type
- Over travel: Less than 3mm
- Contact point:  $\phi 3$ mm ball
- Repeatability: 0.0015mm
- Measuring force: 0.4N

# Heightmatic™

## SERIES 574 — High Precision Height Gage

### FEATURES

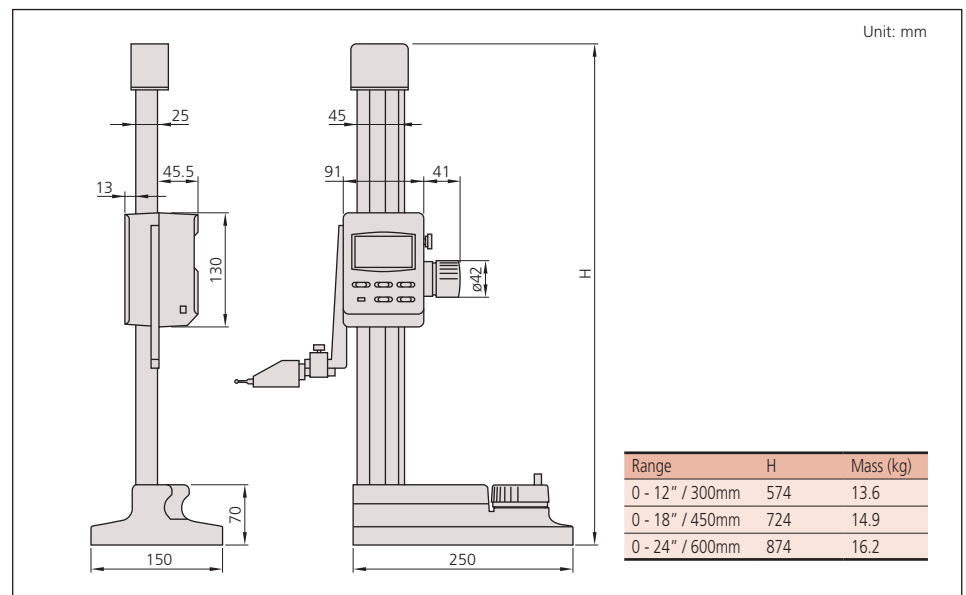
- Provides resolution of .0001" / 0.001mm on the large LCD readout for accurate measurements.
- Excellent functionality and easy operation.
- The standard bi-directional touch-signal probe provides improved efficiency and reliability of measurement for the Heightmatic.
- Optional carbide-tipped scribers are available.
- With SPC data output.



### SPECIFICATIONS

Inch/Metric			
Range	Order No.	Accuracy	Resolution
0 - 12" / 300mm	574-212-1A	$\pm 0.002$ "	.0001" / 0.001mm
0 - 18" / 450mm	574-211-1A	$\pm 0.002$ "	.0001" / 0.001mm
0 - 24" / 600mm	574-210-1A	$\pm 0.002$ "	.0001" / 0.001mm

### DIMENSIONS AND MASS

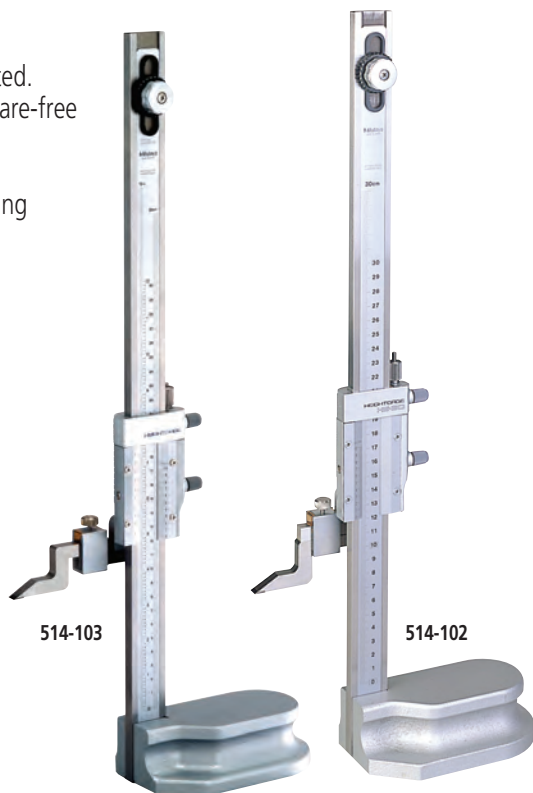


# Vernier Height Gage

## SERIES 514 — Standard Height Gage with Adjustable Main Scale

### FEATURES

- Zero reference point can be adjusted.
- Stain chrome finished scales for glare-free reading.
- Extra-large base for rigidity.
- Optional magnifier for easier reading
- Carbide-tipped scriber is provided.



### SPECIFICATIONS

Metric				
Range	Order No.	Accuracy	Graduation	Mass (kg)
0 - 300mm	<b>514-102</b>	±0.04mm	0.02mm	3.1
0 - 450mm	<b>514-104</b>	±0.05mm	0.02mm	3.4
0 - 600mm	<b>514-106</b>	±0.05mm	0.02mm	7.4
0 - 1000mm	<b>514-108</b>	±0.07mm	0.02mm	20.0
0 - 1500mm	<b>514-170</b>	±0.18mm	0.02mm	26.0

### Inch/Metric — Inch model with inch/metric dual scale

Range	Order No.	Accuracy	Graduation	Mass (kg)
0 - 12" / 0 - 300mm	<b>514-103</b>	±.002"	.001" / 0.02mm	3.1
0 - 18" / 0 - 450mm	<b>514-105</b>	±.002"	.001" / 0.02mm	3.4
0 - 24" / 0 - 600mm	<b>514-107</b>	±.002"	.001" / 0.02mm	7.4
0 - 40" / 0 - 1000mm	<b>514-109</b>	±.003"	.001" / 0.02mm	20.0

### DIMENSIONS

Range	L	a	b	c	d	e	f
0 - 12" / 0 - 300mm	525	32	20	70	28	45	135
0 - 18" / 0 - 450mm	675	32	20	70	28	45	135
0 - 24" / 0 - 600mm	870	32	24	85	35	54	180
0 - 40" / 0 - 1000mm	1340	42	30	110	45	65	250

### Technical Data

Main scale adjustment: 15mm or 25mm  
Slider fine feed: 4mm, 6mm, 7mm or 20mm

### Standard Scriber Provided

- Up to 600mm: Carbide-tipped scriber (**07GZA000**) and scriber clamp (**05GZA033**)
- 0 - 1000mm: Carbide-tipped scriber (**905200**) and scriber clamp (**05GZA033**)
- 0 - 1500mm: Carbide-tipped scriber (**900390**) and scriber clamp (**905008**)

### Dimension of scriber

Parts No.	L	a	b	c
905200	150	42	9	9
900390	144	45	45	16

### Optional Accessories

- 07GZA003:** Magnifier for 300, 450mm, 600mm models
- 07GZA015:** Magnifier for 1000mm and 1500mm models
- 953638:** Holding bar for test indicator (length: 50mm)
- 902053:** Swivel clamp used with holding bar



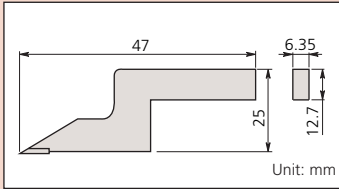
# Vernier Height Gage

## SERIES 506 — Light Weight Height Gage

### Standard Scriber Provided

Carbide-tipped scriber (900173) and scriber clamp (901338)

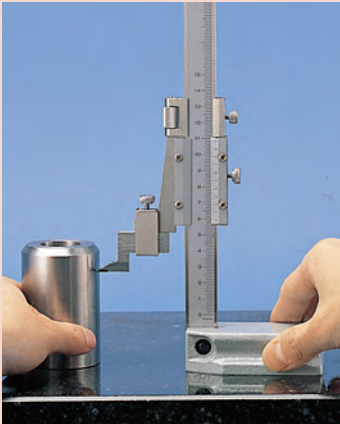
### Dimension of scriber



### Optional Accessories

953639: Holding bar for test indicator (length: 2" / 50mm)

900322: Swivel clamp used with holding bar



### FEATURES

- The Light Weight Height Gage is designed for scribing from a vertical base or for small parts.
- Stain chrome finished scales for glare-free reading.
- Beam and slider are made of stainless steel.
- Carbide-tipped scriber is provided.



### SPECIFICATIONS

#### Metric

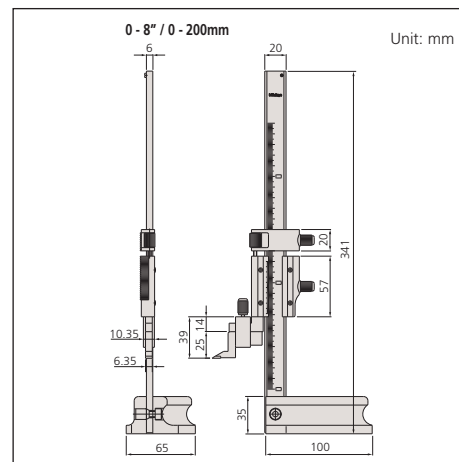
Range	Order No.	Accuracy	Graduation	Mass (kg)
0 - 200mm	506-207	±0.03mm	0.02mm	1.4

#### Inch/Metric

Inch model with inch/metric double scale

Range	Order No.	Accuracy	Graduation	Mass (kg)
0 - 8" / 0 - 200mm	506-208	±.001"	.001" / 0.02mm	1.4

### DIMENSIONS



# Carbide-Tipped Scriber

## Optional Accessory for Height Gage

### FEATURES

- Use the appropriate scriber and clamp for each height gage.

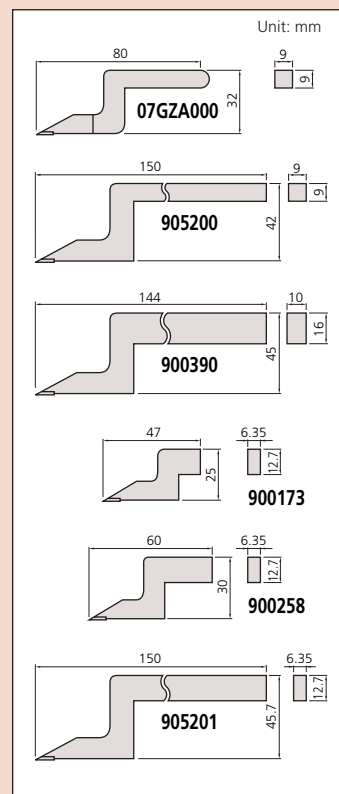
### SPECIFICATIONS

Metric	
Order No.	Remarks (applicable height gage)
07GZA000	192 Series Digimatic height gages (192-613-10, 192-614-10, 192-615-10)
	570 Series Digimatic Height Gages (570-302, 570-304)
	192 Series Dial Height Gages (192-130, 192-131, 192-132, 192-133)
	514 Series Vernier Height Gages (514-102, 514-104, 514-106, 514-103, 514-105, 514-107) 574 Series Heightmatic (574-112-1, 574-111-1, 574-110-1)
905200	192 Series Digimatic Height Gages (192-663-10, 192-664-10, 192-665-10)
	570 Series Digimatic Height Gages (570-230)
	514 Series Vernier Height Gages (514-108, 514-109)
900390	514 Series Vernier Height Gage (514-170)

Inch	
Order No.	Remarks (applicable height gage)
900173	570 Series Digimatic height gages (570-227, 570-244)
	506 Series Vernier Height Gages (506-201, 506-202, 506-204, 506-205, 506-207, 506-208)
	509 Series Vernier Height Gages (509-301, 509-302, 509-313, 509-314)
900258	192 Series Digimatic Height Gages (192-630-10, 192-631-10, 192-632-10, 192-633-10)
	570 Series Digimatic Height Gages (570-312, 570-313, 570-314)
	574 Series Heightmatic (574-212-1, 574-211-1, 574-210-1)
905201	192 Series Digimatic Height Gages (192-670-10, 192-671-10, 192-672-10, 192-673-10)
	570 Series Digimatic Height Gages (570-248)

### Dimension of scriber



# Optional Accessories

## Optional Accessories for Height Gage



### Center Master

#### FEATURES

- Allows quick measurement of center-to-center distance between holes.
- Measurable hole diameters: .040" to 1.50" /  $\varnothing 1 - \varnothing 38\text{mm}$ .

#### SPECIFICATIONS

Order No.: 951144 (with metric type holding bar)  
900581 (with inch type holding bar)



### Depth Gage Attachment

#### FEATURES

- Attached to a height gage to measure groove and hole depth.
- Minimum hole diameter: 5.5mm
- Maximum distance from the bottom of the holding bar to the contact point: 2.95" (inch type), 80mm (metric type)
- Uses standard dial indicator points

#### SPECIFICATIONS

Order No.: 900878 (with inch type holding bar)  
900764 (with metric type holding bar)



### Contact Sensor

#### FEATURES

- The contact sensor eliminates errors caused by jacking-up the height gage while taking measurements. When the scriber of a height gage touches a conductive workpiece, an indicator will light up to indicate that measurement can be taken, which will result in consistent height measurement.
- Battery (2 pcs. SR44 required) is not included.

#### SPECIFICATIONS

Order No.: 900872



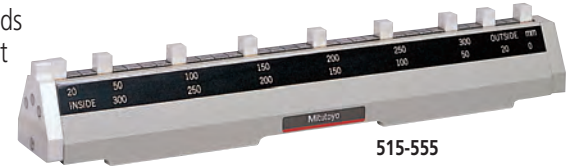


# CERA Caliper Checker

## SERIES 515

### FEATURES

- The CERA Caliper Checker is designed to inspect vernier, dial and Digimatic calipers. It is comprised of permanently wrung, high-grade CERA gage blocks in a protective casting.
- The CERA Caliper Checker also stands perpendicular to a surface for height gage inspection.
- The zirconia based ceramic CERA measuring blocks are corrosion resistant and dimensionally stable.



### Technical Data

Block pitch accuracy:  $\pm 0.005\text{mm}$  for range up to 300mm  
 $\pm 0.002''$  for range up to 12''  
 $\pm 0.007\text{mm}$  for range up to 600mm  
 Parallelism of blocks: 0.002mm for range up to 300mm  
 0.004mm for range up to 600mm

### Optional Accessories

**602162:** Wooden case for 300mm model  
**602164:** Wooden case for 600mm model

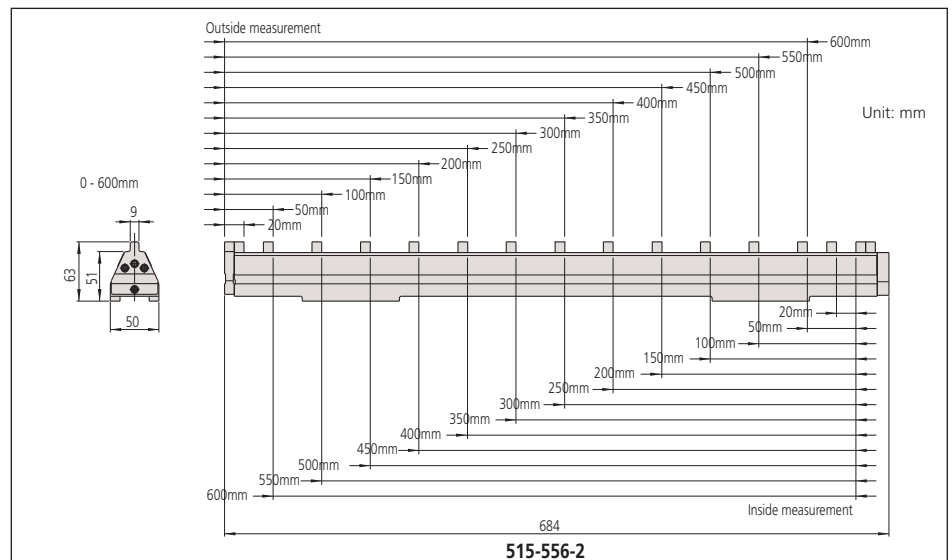
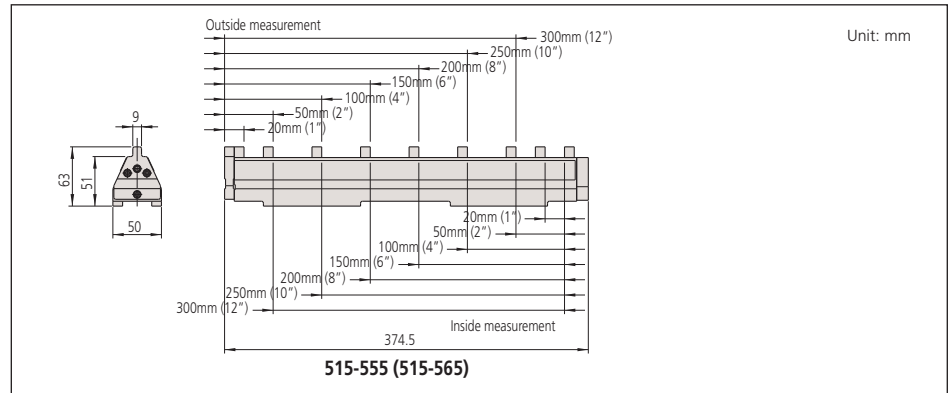
### SPECIFICATIONS

Metric			
Range	Order No.	Remarks (length to check)	Mass (kg)
0 - 300mm	<b>515-555</b>	Outside measurement: 20, 50, 100, 150, 200, 250, 300mm Inside measurement: 20, 50, 100, 150, 200, 250, 300mm	4.0
0 - 600mm	<b>515-556-2</b>	Outside, Inside measurement: 20, 50, 100, 150, 200, 250, 300, 350, 400, 450, 500, 550, 600mm	8.5

Inch			
Range	Order No.	Remarks (length to check)	Mass (kg)
0 - 12"	<b>515-565</b>	Outside measurement: 1", 2", 4", 6", 8", 10", 12" Inside measurement: 1", 2", 4", 6", 8", 10", 12"	4.0

### DIMENSIONS



Used for caliper



Used for height gage

# Linear Height LH-600E

## SERIES 518 — High Performance 2D Measurement System

### FEATURES

- Excellent accuracy of  $(1.1+0.6L/600)\mu\text{m}$  with  $0.1\mu\text{m}/0.5\mu\text{m}$  resolution/repeatability.
- Perpendicularity (frontal) of  $5\mu\text{m}$  and straightness of  $4\mu\text{m}$  are guaranteed.
- Pneumatic full/semi-floating system allows adjustment of air-cushion height.
- Basic statistical functions are provided and, additionally, RS-232C / USB data output provides the option of evaluating measurement data externally with SPC software on a PC.
- One-key operation for running a semi-automatic measurement.
- Data entry from a Digimatic tool.

with power grip



518-351A-21

### SPECIFICATIONS

Inch/Metric	
<b>Order No.</b>	<b>518-351A-21 (120V with English manual)</b>
Measuring Range (stroke)	0-38" (24") / 0-972mm(600mm)
Resolution (selectable)	.000001"/.00001"/.0001"/.001"/ 0.0001mm/0.001mm/0.01mm/0.1mm
Accuracy at 20°C	Measuring accuracy .000043 + (.000024 x L*/24)" / (1.1 + 0.6L**/600) $\mu\text{m}$
	Repeatability (2s) Plane: .000015"/0.4 $\mu\text{m}$ Bore: .000035"/0.9 $\mu\text{m}$
	Perpendicularity .0002"/5 $\mu\text{m}$
	Straightness .0002"/4 $\mu\text{m}$
Drive Method	Motor Drive (5, 10, 15, 20, 25, 30, 40mm/s=7 steps) / manual
Measuring Force	1N
Balancing Method	Counter balance
Main Unit Floating Method	Full/semi-floating with air
Air Source	Built-in air compressor
LCD	TFT LCD (color)
Language for Display	English/German/French/Spanish/Italian/Japanese
Number of Programs	50 (max.)
Number of Datas	60,000 (max.) 1 program 30,000 (Max.)
Power Supply	AC Adapter/Battery (Ni-MH)
Power Consumption	43VA
Operation Time	Approx. 5 hours
Standard Accessories	$\varnothing$ 5 Eccentric probe ( <b>12AAF634</b> )
	Probe diameter calibration block ( <b>12AAA715</b> )
	Battery ( <b>12AAA712</b> )
	AC adapter ( <b>357651</b> ), Power Cable ( <b>02ZAA010</b> )
	Clear Cover ( <b>223587</b> )
	Conveying handle ( <b>510434</b> )
Mass	24kg

L\*=Measuring length (inch) L\*\*=Measuring length (mm)



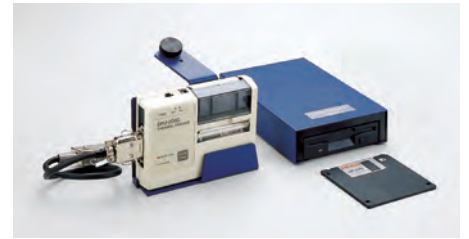
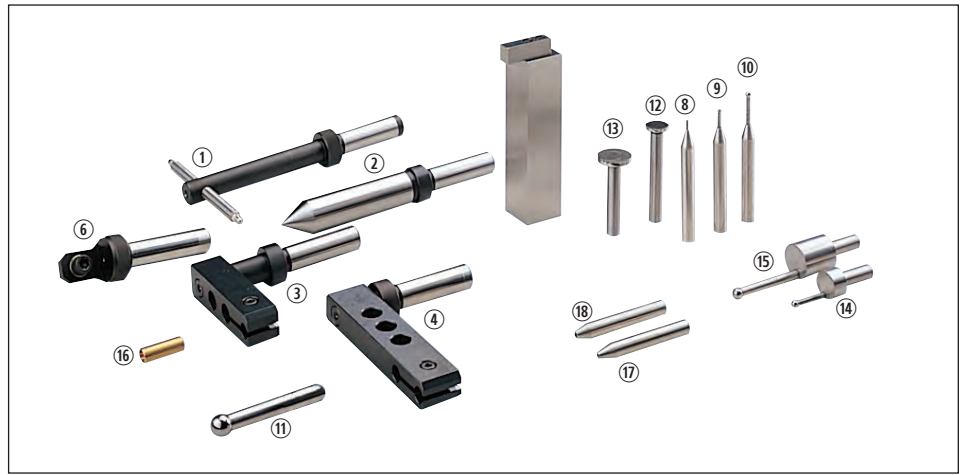
### Technical Data

Measuring range: 0 - 38" / 0 - 972mm  
 Slider stroke: 24" / 600mm  
 Resolution: .000001" / .00001" / .0001" / .001" or  
 (switchable) 0.0001 / 0.001 / 0.01 / 0.1mm /  
 0.0001 / 0.001 / 0.01 / 0.1mm  
 Accuracy at 20°C: Refer to the list of specifications.  
 Floating method: Full / semi-floating with built-in air  
 compressor  
 Display: TFT LCD (color)

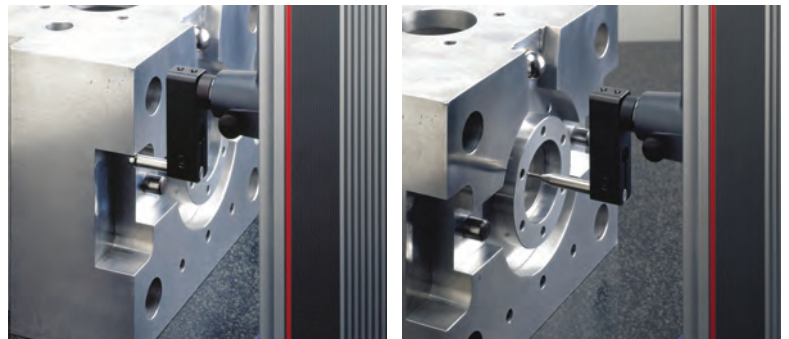
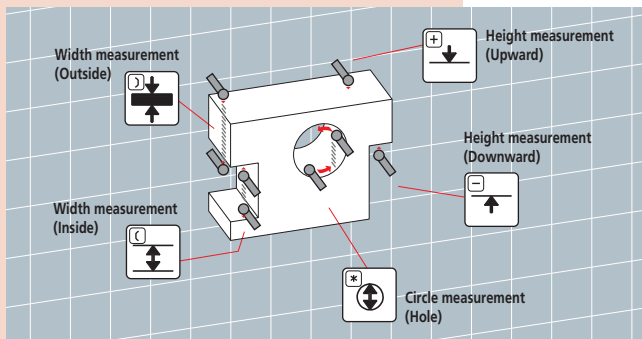
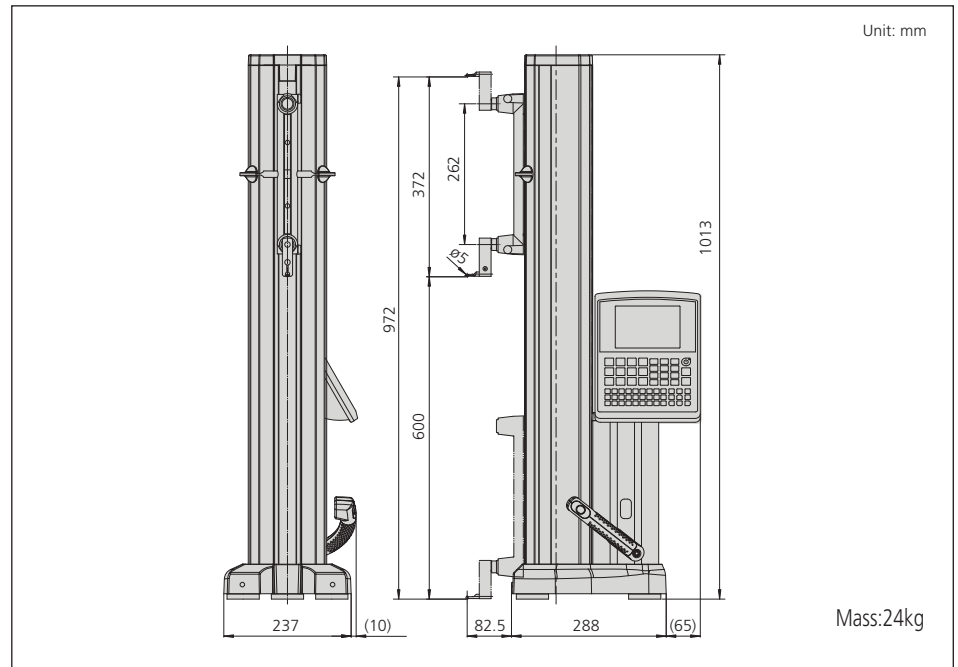


## Optional Accessories

- 12AAC072: ① Depth probe  
 12AAC073: ②  $\varnothing$ 20mm taper probe  
 12AAA787: Block for calibrating probe diameter (applicable to taper probe)  
 12AAA792: ③ Dial indicator ( $\varnothing$ 8mm stem) holder  
 12AAA837: Dial indicator ( $\varnothing$ 3/8" stem) holder  
 12AAA793: ④ Probe extension holder (3.3" / 85mm)  
 12AAB136:  $\varnothing$ 10mm cylindrical probe  
 932361: ⑥ Mu-checker lever head holder  
 12AAF666:  $\varnothing$ 1mm ball probe  
 12AAF667:  $\varnothing$ 2mm ruby ball probe  
 957261: ⑧  $\varnothing$ 2mm ball probe  
 957262: ⑨  $\varnothing$ 3mm ball probe  
 957263: ⑩  $\varnothing$ 4mm ball probe  
 12AAB552: ⑪  $\varnothing$ 10 mm ball probe, L=55mm  
 12AAF668:  $\varnothing$ 10mm ball probe, L=82mm  
 12AAF669:  $\varnothing$ 10mm ball probe, L=120mm  
 12AAF670:  $\varnothing$ 5mm disk probe  
 12AAF671:  $\varnothing$ 10mm disk probe  
 957264: ⑫  $\varnothing$ 14mm disk probe  
 957265: ⑬  $\varnothing$ 20mm disk probe  
 12AAF672:  $\varnothing$ 1mm ball offset probe  
 12AAA788: ⑭  $\varnothing$ 4mm ball offset probe  
 12AAA789: ⑮  $\varnothing$ 6mm ball offset probe  
 226116: ⑯ Test indicator ( $\varnothing$ 6mm stem) adapter  
 226117: ⑰ M2 CMM stylus adapter  
 226118: ⑱ M3 CMM stylus adapter  
 \_\_\_\_\_: CMM ball and disk hard probes are available.  
 12AAF712: Battery pack  
 12AAF675: Large capacity battery pack  
 12AAA797: Thermal printer (120V)  
 12AAA802: Thermal printing paper (10pcs.)  
 12AAA804: Cable for page printer\*\* (2m)  
 12AAA807: RS-232C cable 80" / 2m)  
 12AAA808: RS-232C cable (160" / 4m)  
 12AAH034: USB-Memory  
 12AAH035: USB-FDD



## DIMENSIONS AND MASS



# QM-Height

## SERIES 518 — High Precision ABSOLUTE Digital Height Gage

### FEATURES

- Newly developed high accuracy and high resolution ABSOLUTE linear encoder for position detection.
- Easy reference icon keys.
- Possible to measure inside/outside diameter via unique process (detect the circle apex and process by tracing measurement).
- Various types of optional probes are available.
- Large size LCD with back light.
- GO/±NG judgment is performed by setting the upper and lower tolerances. If a judgment result is out of tolerance, the display backlighting changes from green to red, so tolerance judgment can be made at a glance.
- Slider elevation knob (for travel) / wheel (for measurement).
- With SPC and RS-232C output.



518-223

### SPECIFICATIONS

#### Inch/Metric

Order No.	518-221	518-223
Range	0 - 14" (0 - 350mm)	0 - 24" (0 - 600mm)
Resolution	.00005", .0001", .0002" / 0.001mm, 0.005mm	
Accuracy	± (.00011 + .0002xL / 40)"	
Repeatability	.00007" (2s)	
Display	LCD	
Functions	Zero setting, +/- switching, Presetting, Data hold, Probe tip diameter compensation, inch/mm conversion (Inch/Metric model only), Data output	
Perpendicularity	.0003"	.0005"
Measuring force	1.6 ± 0.5N	
Data output	SPC, RS-232C	
Power supply	AC adapter (optional accessory) / Battery (LR6x4)	
Battery Life	Approx. 800 Hrs. (when backlight is not used) Approx. 260 Hrs. (When backlight is used in the power saving mode) Approx. 6 Hrs. (When backlight is used in the Full-Time Turn-On mode)	
Standard Accessories	ø5mm stepped probe (05HZA148) 4 pcs. AA Alkaline Batteries (LR6)	
Users Manual	99MAF017B	
Mass	22kg	27kg



**ABSOLUTE**<sup>®</sup>

Absolute System Patented by MITUTOYO

### Technical Data

Measuring range: 0 - 18.3" or 0 - 28.1"  
0 - 465mm or 0 - 715mm  
Slider stroke: 14" / 350mm or 24" / 600mm  
Resolution: .00005" / .0001" / .0002" / 0.001 / 0.005mm or 0.001 / 0.005mm  
Accuracy at 20°C: Refer to the list of specifications  
Guiding method: Roller bearing  
Drive method: Manual  
Length standard: ABSOLUTE electrostatic capacitance type linear encoder  
Measuring force: 1.6±0.5N  
Display: LCD  
Power supply: AC adapter (optional) / battery (LR6x4)  
Battery operation time: Approx. 260 hours (approx. 6 hours when using back light)



GO



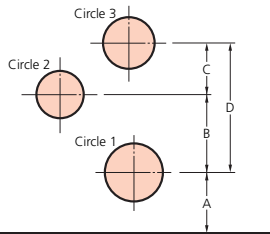
±NG

## Optional Accessories

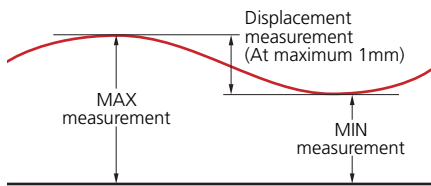
- 12AAC072: Depth probe
- 12AAA792: Dial indicator (ø8mm stem) holder
- 12AAA837: Dial indicator (ø3/8" stem) holder
- 12AAA793: Probe extension holder (3.3" / 85mm)
- 12AAF667: ø2mm ruby ball probe
- 957261: ø2mm ball probe
- 957262: ø3mm ball probe
- 957263: ø4mm ball probe
- 05HAA394: ø5mm ball probe (for 05HZA148)
- 12AAB552: ø10 mm ball probe, L=55mm
- 12AAF670: ø5mm disk probe
- 12AAF671: ø10mm disk probe
- 957264: ø14mm disk probe
- 957265: ø20mm disk probe
- 12AAA788: ø4mm ball offset probe
- 05HAA394: ø5mm ball offset probe
- 12AAA789: ø6mm ball offset probe
- 226116: Test indicator (ø6mm stem) adapter
- 05HZA173: Scriber
- 264-504-5A: DP-1VR
- 936937: SPC cable (40" / 1m)
- 965014: SPC cable (80" / 2m)
- 06AEG180JA: AC adapter (120V)

## Circle pitch measurement

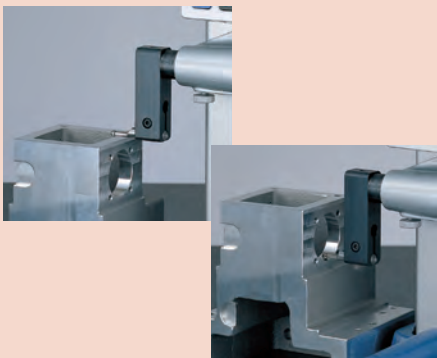
The length A, B, C and D can be determined by measuring circles 1 to 3 once each, using the memory of measuring data together with the calculation function. (A maximum of nine circle measurement data can be saved.)



## Maximum/minimum and displacement measurement

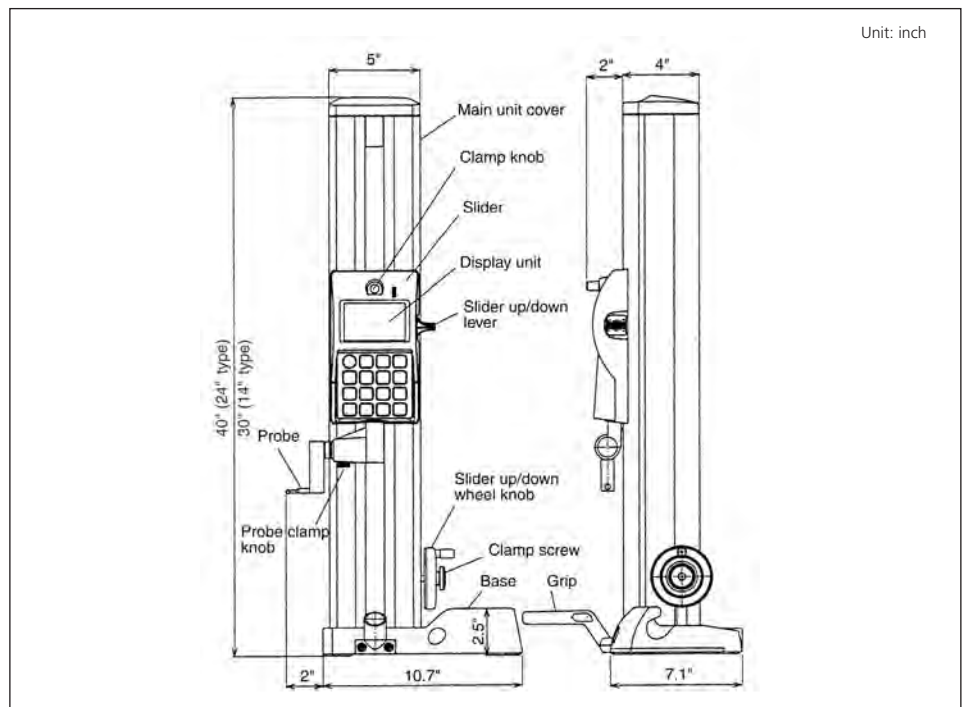


## Height measurement



Inside diameter measurement

## DIMENSIONS



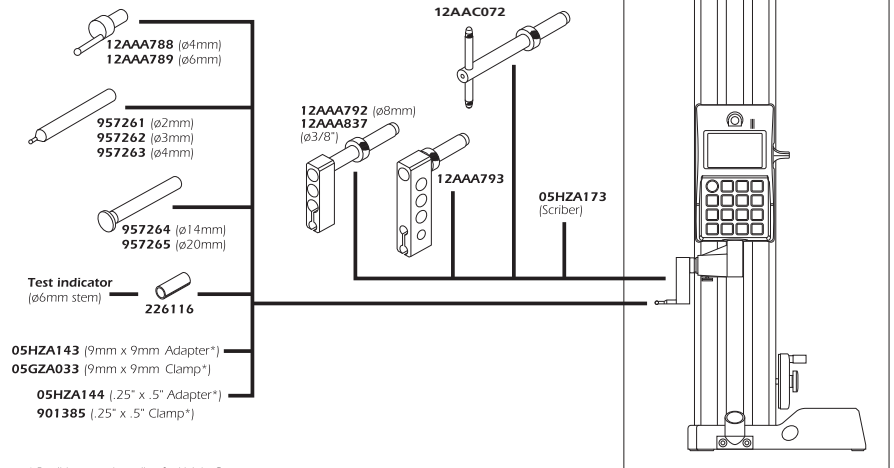
Unit: inch



Digimatic mini processor DP-1VR



936937 (1m)  
965014 (2m)



\* Possible to use the scriber for Height Gauge.

# Depth Micrometer

## SERIES 329, 129 — Interchangeable Rod Type

### FEATURES

- $\varnothing 4$ mm interchangeable rods, with lapped measuring end, provide a wide measuring range.
- The rod length can be adjusted in 1" or 25mm increments.
- With ratchet stop for constant force.
- With measuring rod clamp.
- With SPC output (Series 329).
- Supplied in fitted plastic case.



### SPECIFICATIONS

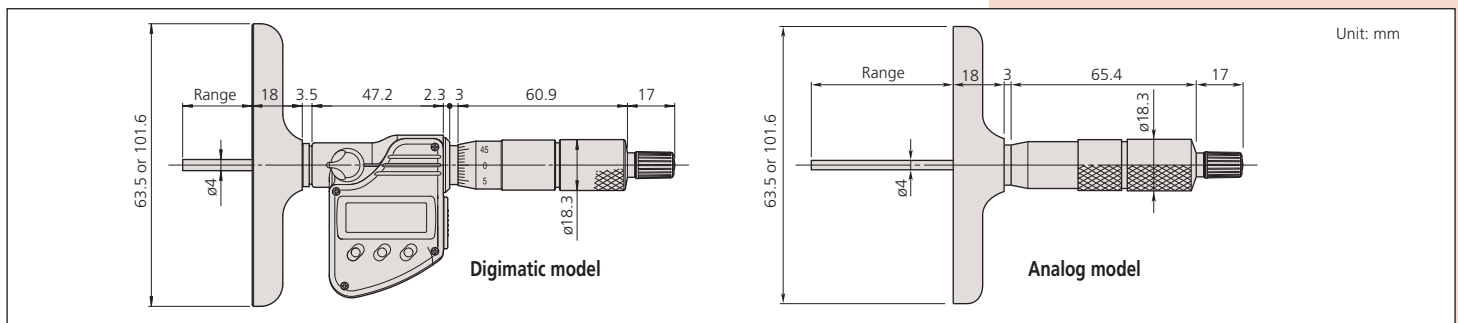
Metric Digimatic model			
Range	Order No.	Base Size	Rod Qty.
0 - 150mm	<b>329-250-10</b>	101.6x16mm	6 rods
0 - 300mm	<b>329-251-10</b>	101.6x16mm	12 rods

Metric			
Range	Order No.	Base Size	Rod Qty.
0 - 50mm	<b>129-109</b>	63.5x16mm	2 rods
0 - 100mm	<b>129-111</b>	63.5x16mm	4 rods
0 - 100mm	<b>129-115</b>	101.6x16mm	4 rods
0 - 150mm	<b>129-112</b>	63.5x16mm	6 rods
0 - 150mm	<b>129-116</b>	101.6x16mm	6 rods

Inch/Metric Digimatic model			
Range	Order No.	Base Size	Rod Qty.
0 - 6" / 0 - 152.4mm	<b>329-350-10</b>	4"x.63"	6 rods
0 - 12" / 0 - 304.8mm	<b>329-351-10</b>	4"x.63"	12 rods

Inch			
Range	Order No.	Base Size	Rod Qty.
0 - 4"	<b>129-127</b>	2.5"x.63"	4 rods
0 - 4"	<b>129-131</b>	4"x.63"	4 rods
0 - 6"	<b>129-128</b>	2.5"x.63"	6 rods
0 - 6"	<b>129-132</b>	4"x.63"	6 rods
0 - 12"	<b>129-149</b>	2.5"x.63"	12 rods
0 - 12"	<b>129-150</b>	4"x.63"	12 rods

### DIMENSIONS



### Technical Data

Accuracy:  $\pm 0.0012'' / \pm 3\mu\text{m}$  for micrometer head feed  
 $\pm [0.0008 + (.00004 \times R/3)]''$   
 R = max. measuring length (inch)  
 $\pm (2+L/75)\mu\text{m}$  for interchangeable rod,  
 L = Max. measuring length (mm)

Resolution\*:  $.00005'' / 0.001\text{mm}$  or  $0.001\text{mm}$   
 Graduation\*\*:  $.001''$  or  $0.01\text{mm}$   
 Flatness of reference face:  $.00005''$  for  $2.5'' / 1.3\mu\text{m}$  for  $63.5\text{mm}$  width base,  $.00008''$  for  $4'' / 2\mu\text{m}$  for  $101.6\text{mm}$  width base  
 Flatness of measuring rod face:  $0.3\mu\text{m}$   
 Parallelism between reference face and measuring rod face:  
 $[.00016 + (.00004 \times R/2)]''$   
 R = max. measuring range (inch)  
 $(4+L/50)\mu\text{m}$ , L = Max. measuring length (mm)

Measuring rod diameter:  $.157'' / 4\text{mm}$

Display\*: LCD

Battery\*: SR44 (1 pc.), **938882**

Battery life\*: Approx. 3.5 years under normal use

\*Digital models \*\*Analog models

### Function of Digimatic Model

Origin-set, Zero-setting, Data hold, Data output, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error  
 Function Lock  
 2 Presets

### Optional Accessories for Digimatic Model

**05CZA662**: SPC cable with data switch (40" / 1m)

**05CZA663**: SPC cable with data switch (80" / 2m)

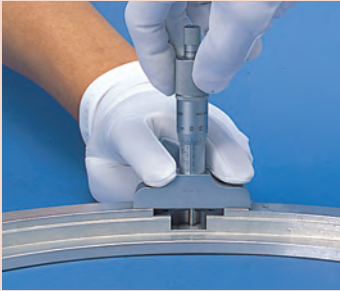


# Depth Micrometer

## SERIES 128

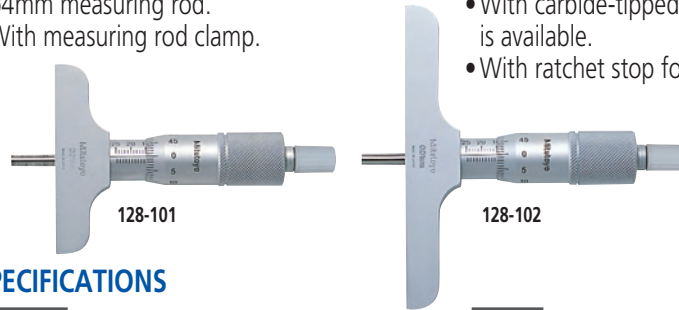
### Technical Data

Accuracy:  $\pm 3\mu\text{m}$  for micrometer head feed  
 Graduation: .001" or 0.01mm  
 Flatness of reference face: 1.3 $\mu\text{m}$  for 63.5mm width base,  
 2 $\mu\text{m}$  for 101.6mm width base  
 Flatness of measuring rod face: 0.3 $\mu\text{m}$   
 Parallelism between reference face and measuring rod face:  
 (4+L/50) $\mu\text{m}$ , L=Max. measuring length (mm)  
 Measuring rod diameter: 4mm



### FEATURES

- $\varnothing 4\text{mm}$  measuring rod.
- With measuring rod clamp.



- With carbide-tipped measuring rod model is available.
- With ratchet stop for constant force.

### SPECIFICATIONS

Metric		
Range	Order No.	Remarks (base)
0 - 25mm	128-101	63.5x16mm
0 - 25mm	128-103*	63.5x16mm
0 - 25mm	128-102	101.6x16mm
0 - 25mm	128-104*	101.6x16mm

Inch		
Range	Order No.	Remarks (base)
0 - 1"	128-105	2.5"x.63"
0 - 1"	128-106	4"x.63"

\*with carbide-tipped measuring rod

# Depth Micro Checker

## SERIES 515

### FEATURES

- The Depth Micro Checker is designed to efficiently check the zero point of a depth micrometer.

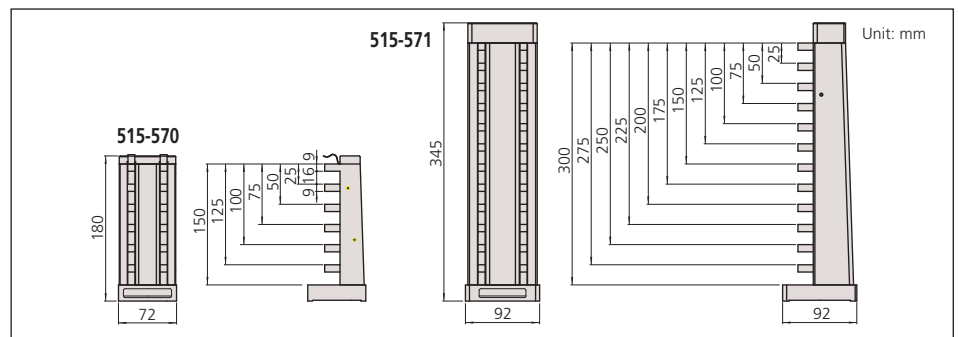


### SPECIFICATIONS

Metric		
Range	Order No.	Remarks (length to check)
0 - 150mm	515-570	25, 50, 75, 100, 125, 150mm
0 - 300mm	515-571	25, 50, 75, 100, 125, 150, 175, 200, 225, 250, 275, 300mm

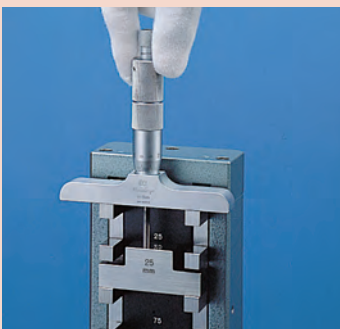
Inch		
Range	Order No.	Remarks (length to check)
0 - 6"	515-575	1", 2", 3", 4", 5", 6"

### DIMENSIONS



### Technical Data

Block pitch accuracy:  $\pm(1+L/150)\mu\text{m}$ ,  
 L=Length to check (mm)  
 Anvil block accuracy:  $\pm 0.5\mu\text{m}$

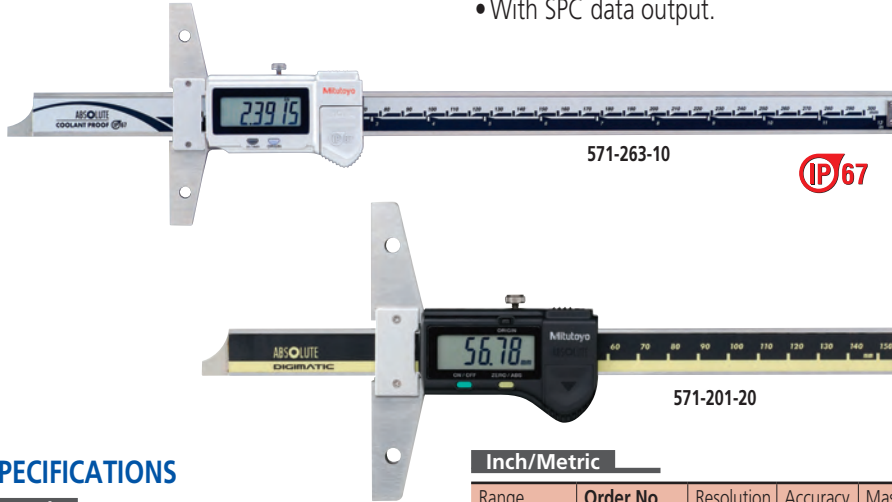


# ABSOLUTE Digimatic Depth Gage

**SERIES 571**

## FEATURES

- ABSOLUTE Digimatic Depth Gage can keep track of the origin point once set for the entire life of the battery.
- Base and measuring faces are hardened and micro-lapped.
- Optional wider extension base are available. (up to 450mm range models)
- With SPC data output.



## SPECIFICATIONS

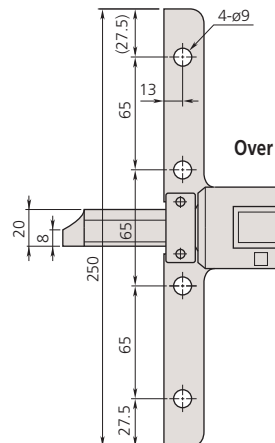
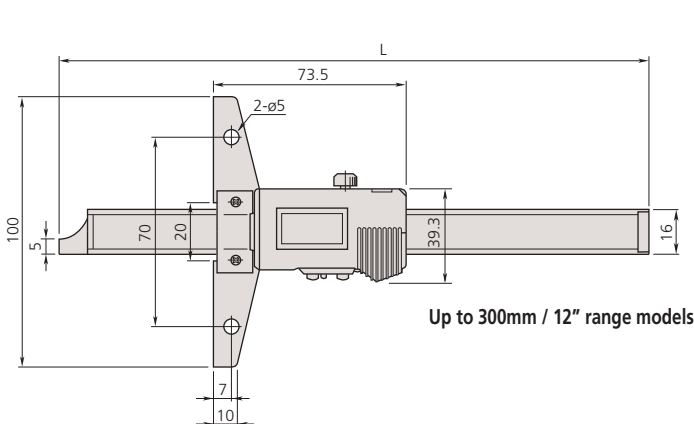
Metric				
Range	Order No.	Resolution	Accuracy	Mass(g)
0 - 150mm	571-201-20	0.01mm	±0.02mm	192
0 - 150mm	571-251-10*	0.01mm	±0.02mm	199
0 - 200mm	571-202-20	0.01mm	±0.02mm	212
0 - 200mm	571-252-10*	0.01mm	±0.02mm	219
0 - 300mm	571-203-20	0.01mm	±0.03mm	310
0 - 300mm	571-253-10*	0.01mm	±0.03mm	320
0 - 450mm	571-204-10	0.01mm	±0.05mm	1270
0 - 600mm	571-205-10	0.01mm	±0.05mm	1400
0 - 750mm	571-206-10	0.01mm	±0.06mm	1530
0 - 1000mm	571-207-10	0.01mm	±0.07mm	1760

\*IP67 Coolant Proof model

Inch/Metric				
Range	Order No.	Resolution	Accuracy	Mass(g)
0 - 6" / 0 - 150mm	571-211-20	.0005" / 0.01mm	±.001"	192
0 - 6" / 0 - 150mm	571-261-10*	.0005" / 0.01mm	±.001"	199
0 - 8" / 0 - 200mm	571-212-20	.0005" / 0.01mm	±.001"	212
0 - 8" / 0 - 200mm	571-262-10*	.0005" / 0.01mm	±.001"	219
0 - 12" / 0 - 300mm	571-213-10	.0005" / 0.01mm	±.0015"	310
0 - 12" / 0 - 300mm	571-263-10*	.0005" / 0.01mm	±.0015"	320
0 - 18" / 0 - 450mm	571-214-10	.0005" / 0.01mm	±.002"	1270
0 - 24" / 0 - 600mm	571-215-10	.0005" / 0.01mm	±.002"	1400
0 - 30" / 0 - 750mm	571-216-10	.0005" / 0.01mm	±.0025"	1530
0 - 40" / 0 - 1000mm	571-217-10	.0005" / 0.01mm	±.0025"	1760

\*IP67 Coolant Proof model

## DIMENSIONS



Range	L	Base thickness
0 - 6" / 0 - 150mm	237	6
0 - 8" / 0 - 200mm	287	6
0 - 12" / 0 - 300mm	403	6
0 - 18" / 0 - 450mm	635	10
0 - 24" / 0 - 600mm	785	10
0 - 30" / 0 - 750mm	935	10
0 - 40" / 0 - 1000mm	1200	10

SPC

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IP67

ABSOLUTE®  
Absolute System Patented by MITUTOYO

## Technical Data

Resolution: .0005" / 0.01mm or 0.01mm  
 Repeatability: 0.01mm  
 Display: LCD  
 Length standard: ABSOLUTE electrostatic capacitance (electromagnetic induction)\* type linear encoder  
 Max. response speed: Unlimited  
 Battery: SR44 (1 pc.), **938882**  
 Battery life: Approx. 20,000 hours (3 years)\* under normal use  
 Dust/Water protection level: IP67\*  
 \*Coolant Proof models

## Function

Origin-set, Zero-setting, Automatic power on/off, Data output, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error

## Optional Accessories

- 959143: Data hold unit
- 959149: SPC cable with data switch (40" / 1m)
- 959150: SPC cable with data switch (80" / 2m)
- 05CZA624: SPC cable with data switch (40" / 1m)\*
- 05CZA625: SPC cable with data switch (80" / 2m)\*
- \_\_\_\_\_ : Extension base (see page D-53.)

\*For IP67 models





# Vernier Depth Gage

## SERIES 527

### FEATURES

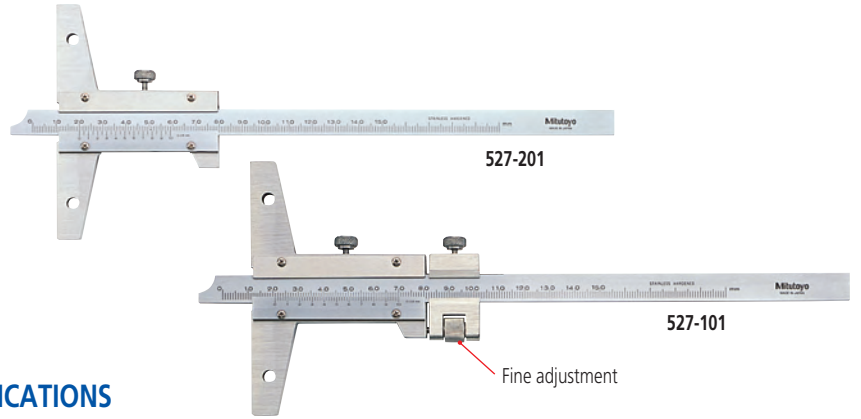
- Made of hardened stainless steel.
- Base and measuring faces are hardened and micro-lapped.
- Optional wider extension base are available. (up to 450mm range models)

### Technical Data

Graduation: .001" or 0.05mm, 0.02mm

### Optional Accessories

—: Extension base (see page D-53.)



### SPECIFICATIONS

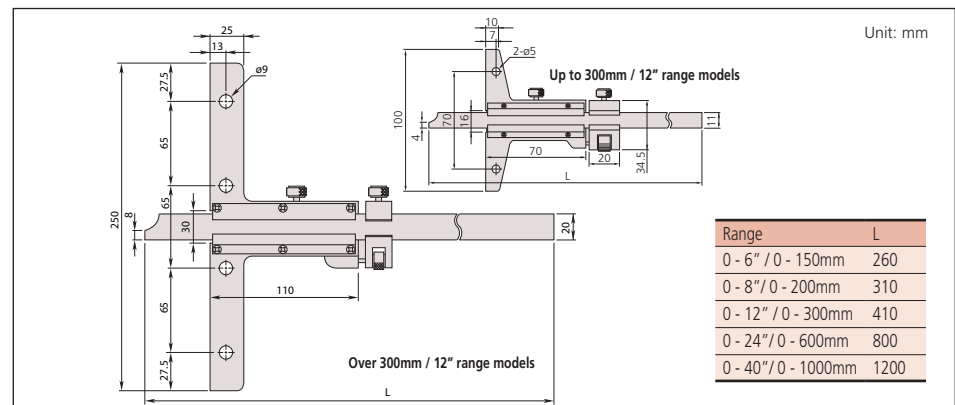
#### Metric

Range	Order No.	Vernier reading	Accuracy	Mass (g)	Remarks
0 - 150mm	527-201	0.05mm	±0.05mm	240	—
0 - 150mm	527-121	0.02mm	±0.03mm	215	—
0 - 150mm	527-101	0.02mm	±0.03mm	280	with fine adjustment
0 - 200mm	527-202	0.05mm	±0.05mm	260	—
0 - 200mm	527-122	0.02mm	±0.03mm	230	—
0 - 200mm	527-102	0.02mm	±0.03mm	300	with fine adjustment
0 - 300mm	527-203	0.05mm	±0.08mm	300	—
0 - 300mm	527-123	0.02mm	±0.04mm	265	—
0 - 300mm	527-103	0.02mm	±0.04mm	350	with fine adjustment
0 - 600mm	527-204	0.05mm	±0.10mm	1511	—
0 - 600mm	527-104	0.02mm	±0.05mm	1511	with fine adjustment
0 - 1000mm	527-205	0.05mm	±0.15mm	1880	—
0 - 1000mm	527-105	0.02mm	±0.07mm	1880	with fine adjustment

#### Inch

Range	Order No.	Vernier reading	Accuracy	Mass (g)	Remarks
0 - 6"	527-111	.001"	±.001"	280	with fine adjustment
0 - 8"	527-112	.001"	±.001"	300	with fine adjustment
0 - 12"	527-113	.001"	±.0015"	350	with fine adjustment
0 - 24"	527-114	.001"	±.002"	1511	with fine adjustment
0 - 40"	527-115	.001"	±.003"	1880	with fine adjustment

### DIMENSIONS

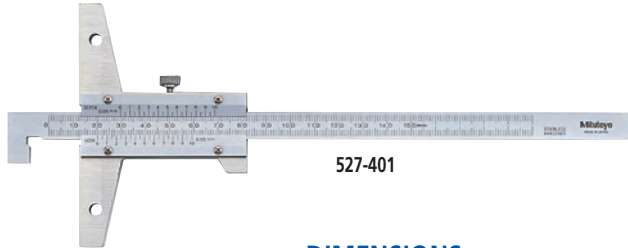


# Vernier Depth Gage

## SERIES 527 — Hook End Type

### FEATURES

- The end of the main scale is hook-shaped to allow depth and thickness measurements of a projected portion or lip in a hole, in addition to standard depth measurement.
- With fine adjustment models are available.
- Optional wider extension base are available.



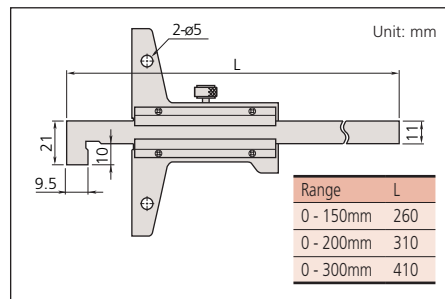
527-401

### SPECIFICATIONS

Metric				
Range	Order No.	Vernier reading	Accuracy	Mass (g)
0 - 150mm	527-401	0.05mm	±0.05mm	240
0 - 200mm	527-402	0.05mm	±0.05mm	240
0 - 300mm	527-403	0.05mm	±0.08mm	270

Metric with fine adjustment				
Range	Order No.	Vernier reading	Accuracy	Mass (g)
0 - 150mm	527-411	0.02mm	±0.03mm	280
0 - 200mm	527-412	0.02mm	±0.03mm	300
0 - 300mm	527-413	0.02mm	±0.04mm	350

### DIMENSIONS

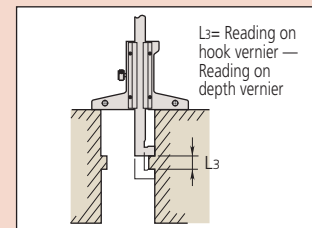
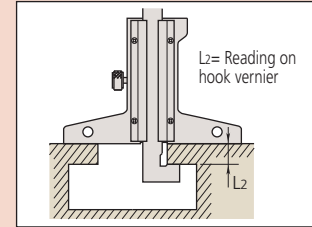
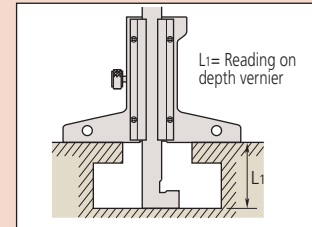


### Technical Data

Graduation: 0.05mm or 0.02mm  
Base size: 100x6.5mm (WxT)

### Optional Accessory

—: Extension base (see page D-53.)



# ABSOLUTE Digimatic Depth Gage

## SERIES 571 — Hook End Type

### FEATURES

- ABSOLUTE Digimatic Depth Gage can keep track of the origin point once set for the entire life of the battery.
- Base and measuring faces are hardened and micro-lapped.
- Optional wider extension base are available.
- With SPC data output.



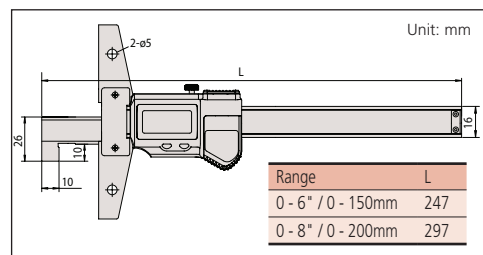
571-264-10



### SPECIFICATIONS

Inch/Metric				
Range	Order No.	Resolution	Accuracy	Mass (g)
0 - 6" / 0 - 150mm	571-264-10	.0005" / 0.01mm	±.0015"	578
0 - 8" / 0 - 200mm	571-265-10	.0005" / 0.01mm	±.0015"	598

### DIMENSIONS



### Technical Data

Resolution: .0005"/0.01mm  
Repeatability: .0005"/0.01mm  
Display: LCD  
Length standard: ABSOLUTE electrostatic capacitance (electromagnetic induction)\* type linear encoder  
Max. response speed: Unlimited  
Battery: SR44 (1 pc.), 938882  
Battery life: Approx. 20,000 hours (3 years)\* under normal use  
Dust/Water protection level: IP67

### Function

Origin-set, Zero-setting, Automatic power on/off, Data output, inch/mm conversion (on inch/metric models only)  
Alarm: Low voltage, Counting value composition error

### Optional Accessories

05CZA624: SPC cable with data switch (40" / 1m)\*

05CZA625: SPC cable with data switch (80" / 2m)\*

—: Extension base (see page D-53.)

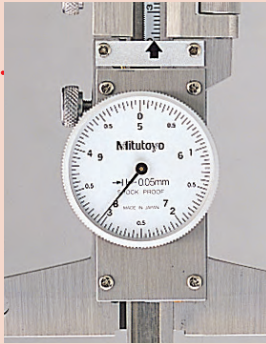
\*For IP67 models

# Dial Depth Gage

## SERIES 527 — with Fine Adjustment

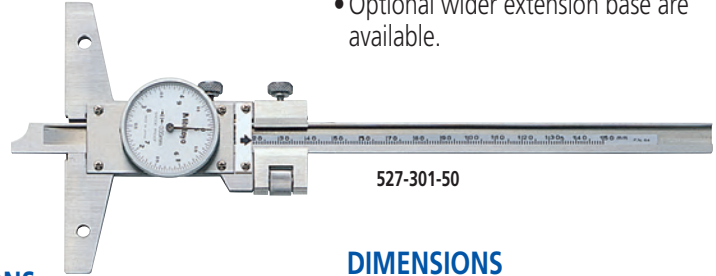
### Technical Data

Dial reading: .001" or 0.05mm  
 Base size: 100x6.5mm (WxT)



### FEATURES

- Easier and faster reading of dial.
- Made of hardened stainless steel.
- Base and measuring faces are hardened and micro-lapped.
- Optional wider extension base are available.



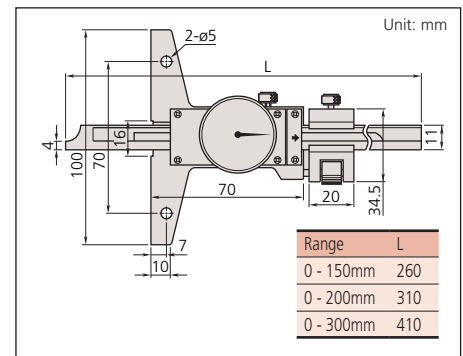
527-301-50

### SPECIFICATIONS

Metric				
Range	Order No.	Dial reading	Accuracy	Mass (g)
0 - 150mm	527-301-50	0.05mm	±0.05mm	280
0 - 200mm	527-302-50	0.05mm	±0.05mm	300
0 - 300mm	527-303-50	0.05mm	±0.08mm	340

Inch				
Range	Order No.	Dial reading	Accuracy	Mass (g)
0 - 6"	527-311-50	.001"	±.001"	280
0 - 8"	527-312-50	.001"	±.001"	300
0 - 12"	527-313-50	.001"	±.0015"	340

### DIMENSIONS

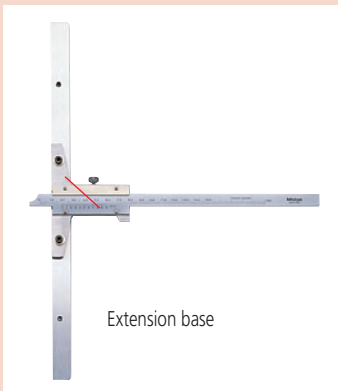


## Extension Bases

### Optional Accessory for Depth Gage

#### FEATURES

- Attached to the base (reference face) plate of a depth gage to extend its span.
- These extension base cannot be attached to 0-24" and 0-40", 0-600mm, 0-1000mm, range models.



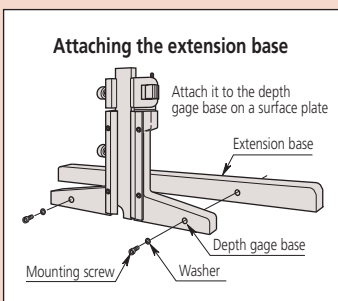
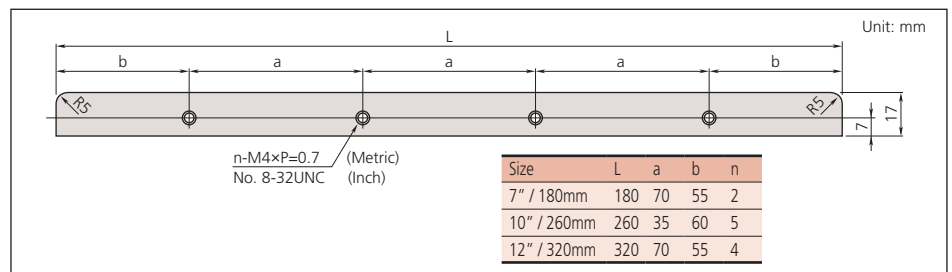
900372

### SPECIFICATIONS

Metric			
Size	Order No.	Remarks (dimension a, b / n)	
180mm	900370	70mm, 55mm	2
260mm	900371	35mm, 60mm	5
320mm	900372	70mm, 55mm	4

Inch			
Size	Order No.	Remarks (dimension a, b / n)	
7"	900367	2.76", 2.17"	2
10"	900368	1.38", 2.36"	5
12"	900369	2.76", 2.17"	4

### DIMENSIONS



# ABSOLUTE Digimatic/Dial Depth Gage

SERIES 547, 7



## FEATURES

- ABSOLUTE Digimatic Depth Gage can keep track of the origin point once set for the entire life of the battery. (Series 547)
- Wide probing range is available with the supplied extension rod.
- Bottom surface of the base is hardened, ground and lapped for highest degree of flatness.
- Designed with a back plunger type dial indicator for upward facing readings. (7231, 7237, 7238)
- With SPC data output. (Series 547)



## SPECIFICATIONS

Metric Digimatic model							
Range	Order No.	Resolution	Stroke	Accuracy	Extension rod	Base (WxT)	Flatness
0 - 200mm	547-211	0.01mm	12mm	±0.02mm	5 pcs. (10, 20, 30, 30, 100mm)	63.5x16mm	5µm
0 - 200mm	547-212	0.01mm	12mm	±0.02mm	5 pcs. (10, 20, 30, 30, 100mm)	101.6x16mm	5µm
0 - 200mm	547-251	0.001mm	12mm	±0.005mm	5 pcs. (10, 20, 30, 30, 100mm)	63.5x16mm	2µm
0 - 200mm	547-252	0.001mm	12mm	±0.005mm	5 pcs. (10, 20, 30, 30, 100mm)	101.6x16mm	2µm

0.01mm graduation 0.001mm graduation

Inch/Metric Digimatic model							
Range	Order No.	Resolution	Stroke	Accuracy	Extension rod	Base (WxT)	Flatness
0 - 8" / 0-200mm	547-2175	.0005" / 0.01mm	.5"	±.001"	4 pcs. (.5", 1", 2", 4")	2.5"x.63"	.0002"
0 - 8" / 0-200mm	547-2185	.0005" / 0.01mm	.5"	±.001"	4 pcs. (.5", 1", 2", 4")	4"x.63"	.0002"
0 - 8" / 0-200mm	547-2575	.00005" / 0.001mm	.5"	±.0003"	4 pcs. (.5", 1", 2", 4")	2.5"x.63"	.00008"
0 - 8" / 0-200mm	547-2585	.00005" / 0.001mm	.5"	±.0003"	4 pcs. (.5", 1", 2", 4")	4"x.63"	.00008"

.005"/0.01mm graduation .00005"/0.001mm graduation

Metric Dial Type							
Range	Order No.	Graduation	Stroke	Accuracy	Extension rod	Base (WxT)	Flatness
0 - 10mm	7210*	0.01mm	10mm	±0.015mm	—	40x16mm,	5µm
0 - 200mm	7211	0.01mm	10mm	±0.015mm	5 pcs. (10, 20, 30, 30, 100mm)	63.5x16mm	5µm
0 - 200mm	7212	0.01mm	10mm	±0.015mm	5 pcs. (10, 20, 30, 30, 100mm)	101.6x16mm	5µm
0 - 210mm	7213	0.01mm	30mm	±0.03mm	3 pcs. (30, 60, 90mm)	63.5x16mm	5µm
0 - 210mm	7214	0.01mm	30mm	±0.03mm	3 pcs. (30, 60, 90mm)	101.6x16mm	5µm
0 - 200mm	7220	0.01mm	10mm	±0.015mm	5 pcs. (10, 20, 30, 30, 100mm)	100x18mm	5µm
0 - 200mm	7221	0.01mm	10mm	±0.015mm	5 pcs. (10, 20, 30, 30, 100mm)	150x18mm	5µm
0 - 10mm	7222*	0.01mm	10mm	±0.015mm	5 pcs. (10, 20, 30, 30, 100mm)	ø16mm	5µm
0 - 10mm	7223	0.01mm	10mm	±0.015mm	5 pcs. (10, 20, 30, 30, 100mm)	ø25mm	5µm
0 - 10mm	7224	0.01mm	10mm	±0.015mm	5 pcs. (10, 20, 30, 30, 100mm)	ø40mm	5µm
0 - 200mm	7231	0.01mm	5mm	±0.015mm	5 pcs. (10, 20, 30, 30, 100mm)	63.5x16mm	5µm

\*with needle probe

Inch Dial Type							
Range	Order No.	Graduation	Stroke	Accuracy	Extension rod	Base (WxT)	Flatness
0 - 8"	72175	.001"	1"	±.002"	4 pcs. (.5", 1", 2", 4")	2.5"x.63"	.0002"
0 - 8"	72185	.001"	1"	±.002"	4 pcs. (.5", 1", 2", 4")	4"x.63"	.0002"
0 - 8"	7237	.001"	.2"	±.002"	4 pcs. (.5", 1", 2", 4")	2.5"x.63"	.0002"
0 - 8"	7238	.001"	.2"	±.002"	4 pcs. (.5", 1", 2", 4")	4"x.63"	.0002"

## Technical Data

Accuracy: Refer to the list of specifications.  
 Resolution\*: .0005"/0.01mm or 0.001mm, 0.01mm, .00005"/0.001mm  
 Dial reading\*\*: .001" or 0.01mm  
 Flatness of base face: 5µm  
 Contact point: Carbide-tipped ball point or needle point (7210, 7222)  
 Measuring force: 1.4N, 1.5N (digital model), 2.5N (7213, 7214, 72175, 72185)  
 Display\*: LCD  
 Battery\*: SR44 (1 pc.), 938882  
 Battery life\*: Approx. 3.5 years under normal use  
 \*Digital models \*\*Dial models

## Technical Data of Dial Mode

Accuracy: Refer to the list of specifications.  
 Dial reading: .001" or 0.01mm  
 Flatness of base face: 5µm or 2µm  
 Contact point: Carbide-tipped ball point (needle point: 7210, 7222)  
 Measuring force: 1.4N (2.5N: 7213, 7214, 7217, 7218)

## Function of Digimatic Model

Origin-set, Zero-setting, Data hold, Data output, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error

## Optional Accessories for Digimatic Model

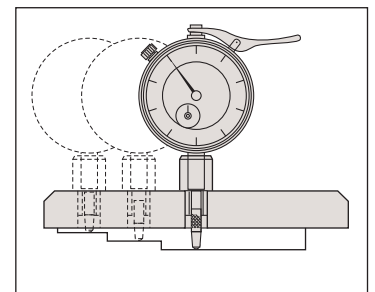
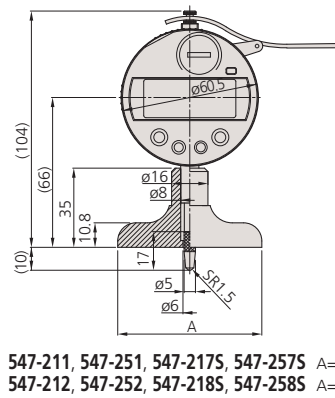
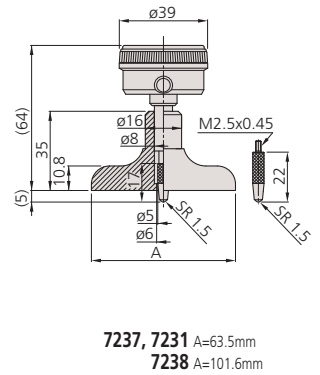
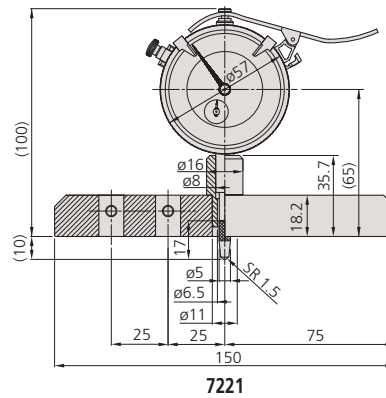
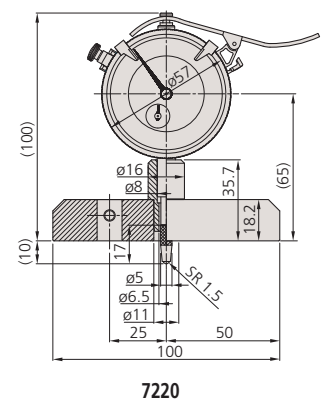
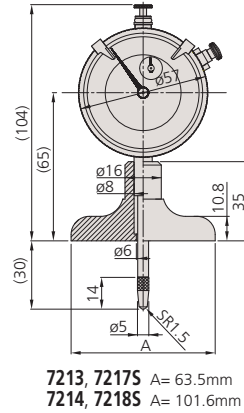
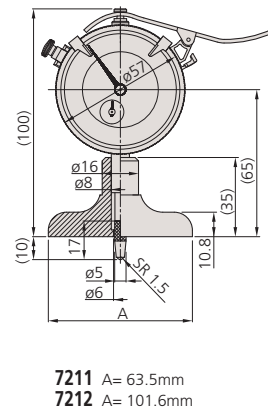
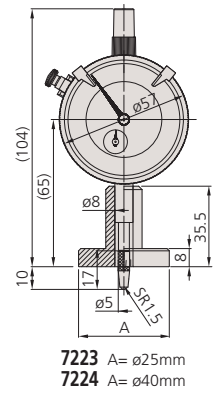
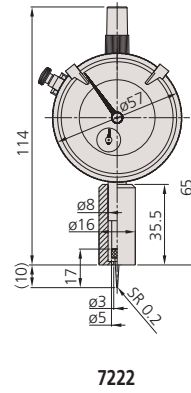
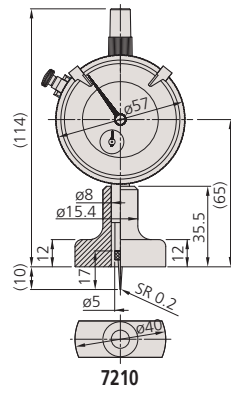
- 905338: SPC cable (40" / 1m)
- 905409: SPC cable (80" / 2m)
- 139167: .5" Extension Rod
- 301655: 1" Extension Rod
- 301657: 2" Extension Rod
- 301659: 4" Extension Rod
- 303611: 10mm Extension Rod
- 303612: 20mm Extension Rod
- 303613: 30mm Extension Rod
- 303614: 100mm Extension Rod

## Base Only (3/8" dia. hole)

Part No.	length	remark
902164:	2.5"	72175, 7237, 547-2175, 547-2575
902165:	4"	72185, 7238, 547-2185, 547-2585

# DIMENSIONS

Unit: mm



# Tire Tread Depth Gage

**SERIES 571, 700**

## FEATURES

- ABSOLUTE Digimatic Tread Depth Gage can keep track of the origin point once set for the entire life of the battery. (Series 571)
- Specially designed to measure tire tread depth.
- Plastic construction for light-weight use. (Series 700)
- With SPC data output. (Series 571)



571-100MOT-10



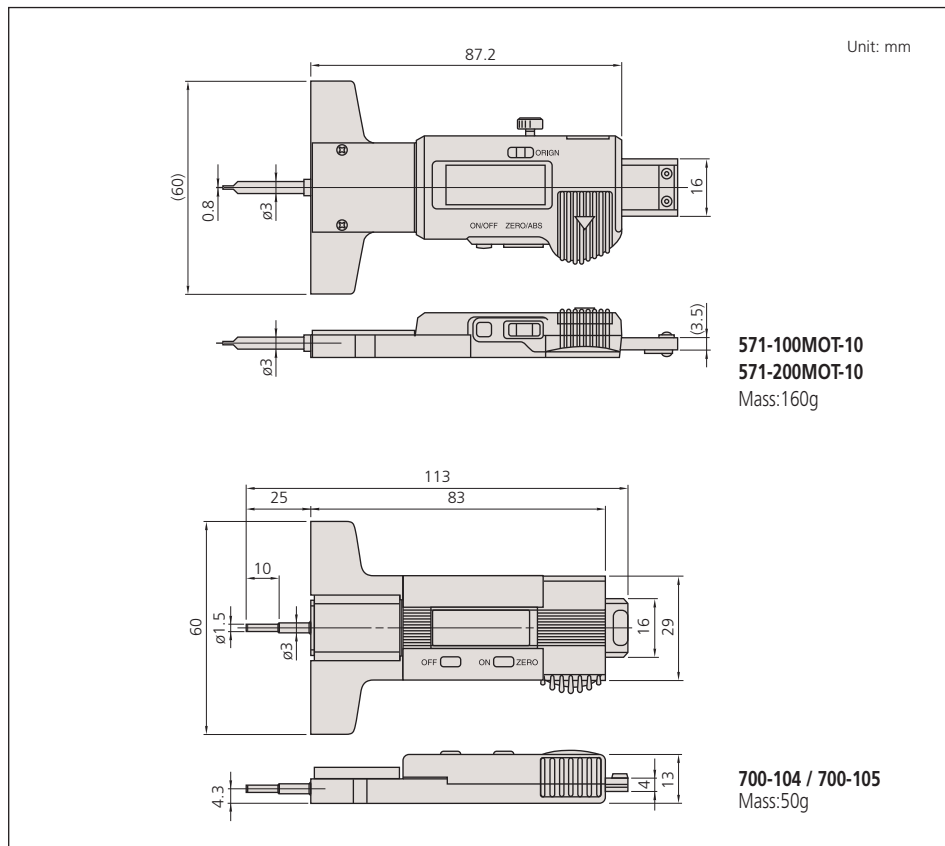
700-105

## SPECIFICATIONS

Metric			
Range	Order No.	Resolution	Accuracy
0 - 25mm	<b>571-100MOT-10</b>	0.01mm	±0.02mm
0 - 25mm	<b>700-104</b>	0.1mm	±0.2mm

Inch/Metric			
Range	Order No.	Resolution	Accuracy
0 - 1" / 0 - 25.4mm	<b>571-200MOT-10</b>	.0005" / 0.01mm	±.0005"
0 - 1" / 0 - 25.4mm	<b>700-105</b>	.001" / 0.1mm	±.008"

## DIMENSIONS AND MASS



## Technical Data

Accuracy: Refer to the list of specifications.  
 Resolution: .0005"/0.01mm or 0.01mm (571 Series)  
 .001"/0.1mm or 0.1mm (700 Series)  
 Display: LCD  
 Battery: SR44 (1 pc.), **938882**  
 Battery life: Approx. 2 years under normal use  
 (approx. 2000 hours: Series 571)

## Function

Origin-set\*, Zero-setting, Power ON/OFF,  
 inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error  
 \*Series 571

## Optional Accessories for Series 571

- 959143:** Data hold unit
- 959149:** SPC cable with data switch (40" / 1m)
- 959150:** SPC cable with data switch (80" / 2m)





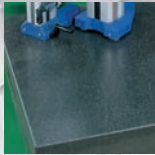
**Gage Block**



**Height Master**



**Reference Gages**



**Granite Surface Plates & Bench Comparator**



**CERA/Steel Combination Gage Block Sets**



**Step Master**



**ZERO CERA BLOCK**



**Ceramic Straight Master**

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# Gage Block

## SERIES 516

### FEATURES

Precision gage blocks are the primary standards vital to dimensional quality control in the manufacture of parts. Mitutoyo offers

a complete selection of gage blocks available in a choice of rectangular or square, metric or inch and steel or CERA (ceramic) types.

### Accuracy

Gage blocks offered by an all-round precision measuring machine manufacturer, Mitutoyo, guarantee such a high accuracy that users can use them without anxiety. Needless to say, Mitutoyo has established a traceability system for our measurement products, up to the Metrology Management Center of the National Institute of Advanced Industrial Science and Technology (AIST) and we have been certified by the Japanese government as an accredited laboratory.

### Wringing

The lapping technique is one of Mitutoyo's specialties. Our advanced lapping technique, developed for more than a half century, enables us to achieve the best flatness and surface roughness needed for gage blocks and realize a great wringing force.

### Abrasion Resistance and Dimensional Stability

High-carbon high-chrome steel is employed to sufficiently satisfy a variety of material characteristics required for gage blocks. A high degree of hardness, obtained by our heat treatment technology and that reassures users, as well as methodically repeated heat treatment, have successfully reduced deterioration change over time to the minimum.

### CERA Blocks

CERA blocks, made of ceramic materials with superior surface quality, that were developed by Mitutoyo's ultra precision machining techniques solve all problems that the steel gage block had.

#### 1. Corrosion-Resistant

Anti-corrosion treatment is not required when handled normally (i.e. with fingers), resulting in simple maintenance and storage.

#### 2. No Burrs Caused by Dents, etc.

Since the CERA Block is very hard, it will not scratch and is highly resistant to burrs. If a burr is formed, it can easily be removed with a ceramic deburring stone (Ceraston).

#### 3. Abrasion Resistant

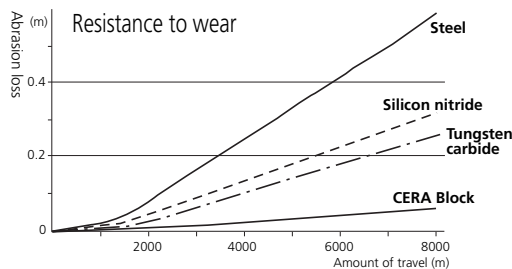
CERA Blocks have 10 times the abrasion resistance of steel gage blocks.

#### 4. Dimensional Stability

CERA Blocks are free from dimensional change over time.

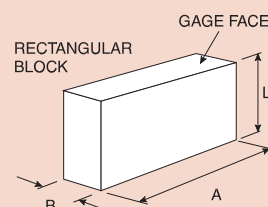
#### 5. Marking

The black characters, indicating the nominal length, are inscribed by laser and are clearly visible against the white surface of the block.



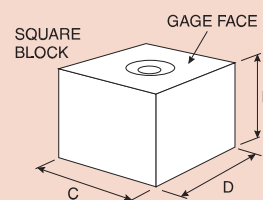
### Selecting Gage Blocks

- Select gage blocks in accordance with the combination range required. If a large length is required, add a long block set.
- Select gage blocks in accordance with the minimum length step required. Add wear block sets if necessary.
- If a set containing a large number of gage blocks is selected, the number of combination gage blocks required for a length is reduced and the number of combinations is increased. The accuracy will be retained and damage will be reduced.
- The specific gage block set for micrometer inspection and caliper inspection is available.
- If using only one length repeatedly, it is a good idea to purchase discrete gage blocks.
- The 2mm-based gage blocks, which take the base of the minimum length step as 2mm, are easy to handle and will not warp, as compared to the 1mm-based gage blocks.



### Rectangular Block

Gage Size	Face Width (A)	Face Depth (B)
Up to 2"	1.181"	.355"
Over .2" up to 40"	1.378"	.355"
Up to 10mm	30mm	9mm
Over 10mm up to 1000mm	35mm	9mm



### Square Block

Gage Size	Face Width (C)	Face Depth (D)
Inch (up to 40")	.95"	.95"
Metric (up to 1000mm)	24.1mm	24.1mm



## Grade and Application

Refer to the following table to select the gage block grade according to usage.

	Applications	Grade
Workshop use	• Mounting tools and cutters	AS-1 or AS-2
	• Manufacturing gages • Calibrating instruments	0 or AS-1
Inspection use	• Inspecting mechanical parts, tools, etc.	0 or AS-1
	• Checking the accuracy of gages • Calibrating instruments	00 or 0
Calibration use	• Checking the accuracy of gage blocks for workshop • Checking the accuracy of gage blocks for inspection • Checking the accuracy of instruments	K or 00
Reference use	• Checking the accuracy of gage blocks for calibration • For academic research	K

### Grade AS-1:

These gage blocks are intended for shop floor use to set and calibrate fixtures as well as precision instruments.

### Grade 0:

This grade is used within an inspection area to verify the accuracy of plug and snap gages as well as for setting electronic measuring devices.

### Grade 00:

These higher accuracy gages are intended for use within a controlled environment by skilled inspection staff. Mainly used as reference standards for setting high precision measuring equipment and for the calibration of lower grade gage blocks.

### Grade K:

Gage blocks of this accuracy are intended for use within a temperature controlled inspection room or calibration laboratory. They should be used as masters with certificates against other gage blocks which are calibrated by comparison.

### Combination of a Required Length

Multiple combinations of gage blocks can be used to make a required length. Care should be exercised in the following points.

1. Use as few gage blocks as possible to obtain the required length. (= Select thick gage blocks whenever possible.)
2. Select gage blocks starting with the one that has least significant digit required, and then work up to ones with more significant digits.
3. There are multiple combinations for the integer part of a length. To prevent wear as much as possible, do not always use the same gage blocks.

Example combination

Required length = 45.6785mm

#### For the 1mm-based gage block set (112 pcs.)

```

1.005
1.008
1.17
17.5
+ 25
-----
45.6785mm
    
```

#### For the 2mm-based gage block set (112 pcs.)

```

2.005
2.008
2.17
14.5
+ 25
-----
45.6785mm
    
```

## 6. Anti-magnetic Nature Keeps Away Steel Powders

### 7. High wringing force

An even, dense tissue can maintain a strong wringing force.



### 8. Material of CERA block

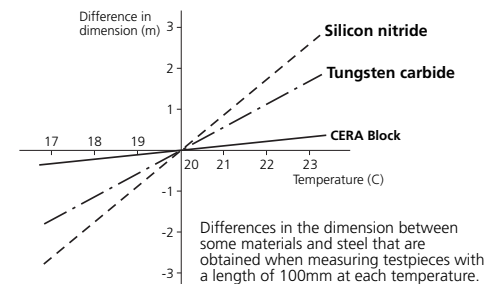
Property	Material	CERA Block (ZrO <sub>2</sub> )	Steel (Fe)	Carbide (WC-Co)	Silicon nitride (Si <sub>3</sub> N <sub>4</sub> )
Hardness (HV)		1350	800	1650	1500
Coefficient of thermal expansion (10 <sup>-6</sup> /K)		9.3±0.5	10.8±0.5	5.5±1.0	2
Flexural strength by 3-point bending (MPa)		1270	1960	1960	580
Fracture toughness K1c (MPa•m <sup>1/2</sup> )		7	120	12	6.5
Young's modulus x104 (MPa)		20.6	20.6	61.8	28.4
Poisson's ratio		0.3	0.3	0.2	0.3
Specific gravity		6.0	7.8	14.8	3.2
Thermal conductivity (W/m•k)		2.9	54.4	79.5	16.7

### 9. Closest Expansion Coefficient to Steel

The thermal expansion coefficient of a CERA Block is quite similar to that of a steel gage block.

### 10. Highly Resistant Against Drops and Other Shocks

The CERA Block material is one of the toughest ceramics materials. It is extremely difficult to crack under normal use.



## Features of Square Gage Blocks

### 1. Perfect wringing is possible using the center hole.

After wringing the square gage blocks, an optional tie rod can be inserted through the center hole to fix the blocks using a screw.

### 2. A height reference standard can easily be made.

A precision height reference standard can be made easily and inexpensively using accessories such as the plain jaw and block base.

### 3. A dedicated inspection jig can be easily be made.

A dedicated inspection jig for periodic inspection of instruments can be made easily and inexpensively.

### 4. A wide measuring surface with cross section dimensions of [24.1 x 24.1mm / .95 x .95"] is available.

A square gage block can retain stable orientation both longitudinally and laterally. A wide range of application measurements can be made, including cutting tool positioning, angle measurement with a sine bar, taper measurement with a roller, and inspection of depth micrometers.



## Long and Ultra-Thin Gage Blocks

Mitutoyo offers extra thin gage blocks from 0.10 mm to 0.99 mm (increments of 0.01 mm) as well as long gage blocks up to 1,000 mm as standard products.

# Gage Block

## SERIES 516

### Accuracies of Mitutoyo Gage Blocks

All Mitutoyo gage blocks meet or exceed all known specifications. The flatness, parallelism and surface finish necessary to achieve the required accuracies are the same as or better than government requirements.

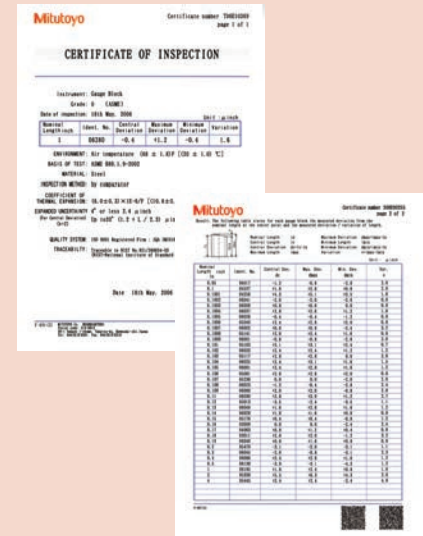
### ASME (American Society of Mechanical Engineers) Deviations and Tolerance on Length for Metric and inch Gage Blocks: ASME B89.1.9-2002 (USA)

Nominal Length Range l <sub>n</sub> in inches	Calibration Grade K		Grade 00		Grade 0		Grade AS-1		Grade AS-2	
	Limit Deviations of Length at any Point From Nominal Length ± l <sub>e</sub> μin.	Tolerance for the Variation In Length ± l <sub>v</sub> μin.	Limit Deviations of Length at any Point From Nominal Length ± l <sub>e</sub> μin.	Tolerance for the Variation In Length ± l <sub>v</sub> μin.	Limit Deviations of Length at any Point From Nominal Length ± l <sub>e</sub> μin.	Tolerance for the Variation In Length ± l <sub>v</sub> μin.	Limit Deviations of Length at any Point From Nominal Length ± l <sub>e</sub> μin.	Tolerance for the Variation In Length ± l <sub>v</sub> μin.	Limit Deviations of Length at any Point From Nominal Length ± l <sub>e</sub> μin.	Tolerance for the Variation In Length ± l <sub>v</sub> μin.
l <sub>n</sub> ≤ .05	12	2	4	2	6	4	12	6	24	12
.05 l <sub>n</sub> ≤ .4	10	2	3	2	5	4	8	6	18	12
.45 l <sub>n</sub> ≤ 1	12	2	3	2	6	4	12	6	24	12
1 l <sub>n</sub> ≤ 2	16	2	4	2	8	4	16	6	32	12
2 l <sub>n</sub> ≤ 3	20	2	5	3	10	4	20	6	40	14
3 l <sub>n</sub> ≤ 4	24	3	6	3	12	5	24	8	48	14
4 l <sub>n</sub> ≤ 5	32	3	8	3	16	5	32	8	64	16
5 l <sub>n</sub> ≤ 6	32	3	8	3	16	5	32	8	64	16
6 l <sub>n</sub> ≤ 7	40	4	10	4	20	6	40	10	80	16
7 l <sub>n</sub> ≤ 8	40	4	10	4	20	6	40	10	80	16
8 l <sub>n</sub> ≤ 10	48	4	12	4	24	6	48	10	104	18
10 l <sub>n</sub> ≤ 12	56	4	14	4	28	7	56	10	112	20
12 l <sub>n</sub> ≤ 16	72	5	18	5	36	8	72	12	144	20
16 l <sub>n</sub> ≤ 20	88	6	20	6	44	10	88	14	176	24
20 l <sub>n</sub> ≤ 24	104	6	25	6	52	10	104	16	200	28
24 l <sub>n</sub> ≤ 28	120	7	30	7	60	12	120	18	240	28
28 l <sub>n</sub> ≤ 32	136	8	34	8	68	12	136	20	260	32
32 l <sub>n</sub> ≤ 36	152	8	38	8	76	14	152	20	300	36
36 l <sub>n</sub> ≤ 40	160	10	40	10	80	16	168	24	320	40

Nominal Length Range l <sub>n</sub> in mm	Calibration Grade K		Grade 00		Grade 0		Grade AS-1		Grade AS-2	
	Limit Deviations of Length at any Point From Nominal Length ± l <sub>e</sub> μm	Tolerance for the Variation In Length ± l <sub>v</sub> μm	Limit Deviations of Length at any Point From Nominal Length ± l <sub>e</sub> μm	Tolerance for the Variation In Length ± l <sub>v</sub> μm	Limit Deviations of Length at any Point From Nominal Length ± l <sub>e</sub> μm	Tolerance for the Variation In Length ± l <sub>v</sub> μm	Limit Deviations of Length at any Point From Nominal Length ± l <sub>e</sub> μm	Tolerance for the Variation In Length ± l <sub>v</sub> μm	Limit Deviations of Length at any Point From Nominal Length ± l <sub>e</sub> μm	Tolerance for the Variation In Length ± l <sub>v</sub> μm
l <sub>n</sub> ≤ 0.5	0.30	0.05	0.10	0.05	0.14	0.10	0.30	0.16	0.60	0.30
0.5 l <sub>n</sub> ≤ 10	0.20	0.05	0.07	0.05	0.12	0.10	0.20	0.16	0.45	0.30
10 l <sub>n</sub> ≤ 25	0.30	0.05	0.07	0.05	0.14	0.10	0.30	0.16	0.60	0.30
25 l <sub>n</sub> ≤ 50	0.40	0.06	0.10	0.06	0.20	0.10	0.40	0.18	0.80	0.30
50 l <sub>n</sub> ≤ 75	0.50	0.06	0.12	0.06	0.25	0.12	0.50	0.18	1.00	0.35
75 l <sub>n</sub> ≤ 100	0.60	0.07	0.15	0.07	0.30	0.12	0.60	0.20	1.20	0.35
100 l <sub>n</sub> ≤ 150	0.80	0.08	0.20	0.08	0.40	0.14	0.80	0.20	1.60	0.40
150 l <sub>n</sub> ≤ 200	1.00	0.09	0.25	0.09	0.50	0.16	1.00	0.25	2.00	0.40
200 l <sub>n</sub> ≤ 250	1.20	0.10	0.30	0.10	0.60	0.16	1.20	0.25	2.40	0.45
250 l <sub>n</sub> ≤ 300	1.4	0.10	0.35	0.10	0.70	0.18	1.40	0.25	2.80	0.50
300 l <sub>n</sub> ≤ 400	1.80	0.12	0.45	0.12	0.90	0.20	1.80	0.30	3.60	0.50
400 l <sub>n</sub> ≤ 500	2.20	0.14	0.50	0.14	1.10	0.25	2.20	0.35	4.40	0.60
500 l <sub>n</sub> ≤ 600	2.60	0.16	0.65	0.16	1.30	0.25	2.60	0.40	5.00	0.70
600 l <sub>n</sub> ≤ 700	3.00	0.18	0.75	0.18	1.50	0.30	3.00	0.45	6.00	0.70
700 l <sub>n</sub> ≤ 800	3.40	0.20	0.85	0.20	1.70	0.30	3.40	0.50	6.50	0.80
800 l <sub>n</sub> ≤ 900	3.80	0.20	0.95	0.20	1.90	0.35	3.80	0.50	7.50	0.90
900 l <sub>n</sub> ≤ 1000	4.20	0.25	1.00	0.25	2.00	0.40	4.20	0.60	8.00	1.00

### Mitutoyo Gage Blocks and Inspection Certificates

A Certificate of Inspection is furnished with all Mitutoyo gage blocks with a serial number on the case and an identification number on each block. The deviation of each block is registered. For this inspection, each gage block is measured relative to the upper level master using a gage block comparator. Grade K gage blocks are manufactured by absolute measurement using an interferometer. The gage block set and discrete gage block are supplied with a Certificate of Calibration. The Certificate of Calibration specifies the deviation from the nominal length. (Comparative measurement, however, is performed for all square gage blocks.)



A Certificate of Accuracy, traceable to the NIST, is furnished with each MITUTOYO gage block set and individual block

# Metric Rectangular Gage Block Set

## SERIES 516 — 1mm Base Block Set



Steel 112-block set



Steel 103-block set



Steel 47-block set



CERA 112-block set

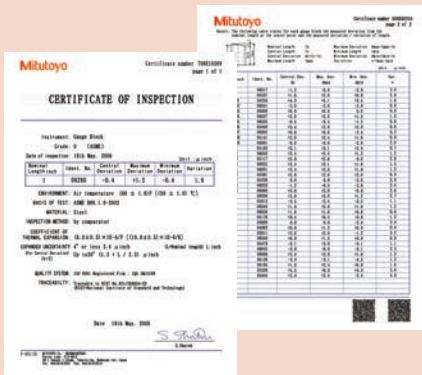


CERA 56-block set



CERA/Steel combination  
47-block set

### Provided with Inspection Certificate



### SPECIFICATIONS

#### 1mm Base Block Set

Blocks per set	Order No.		Grade	Blocks included in set		
	Steel	CERA		Size	Step	Qty.
112	516-531-56	516-541-56	K	1.0005		1
	516-937-26	516-337-26	00	1.001 - 1.009	0.001	9
	516-938-26	516-338-26	0	1.01 - 1.49	0.01	49
	516-939-26	516-339-26	AS-1	0.5 - 24.5	0.5	49
	516-940-26	516-340-26	AS-2	25 - 100	25	4
	516-941-26	516-341-26	AS-2	25 - 100	25	4
103	516-533-56	516-542-56	K	1.005		1
	516-941-26	516-341-26	00	1.01 - 1.49	0.01	49
	516-942-26	516-342-26	0	0.5 - 24.5	0.5	49
	516-943-26	516-343-26	AS-1	25 - 100	25	4
	516-944-26	516-344-26	AS-2	25 - 100	25	4
	516-945-26	516-345-26	AS-2	25 - 100	25	4
87	516-535-56	515-543-56	K	1.001 - 1.009	0.001	9
	516-945-26	516-345-26	00	1.01 - 1.49	0.01	49
	516-946-26	516-346-26	0	0.5 - 9.5	0.5	19
	516-947-26	516-347-26	AS-1	10 - 100	10	10
	516-948-26	516-348-26	AS-2	10 - 100	10	10
	516-949-26	516-349-26	AS-2	10 - 100	10	10
56	516-536-56	516-544-56	K	0.5		1
	516-953-26	516-353-26	00	1.001 - 1.009	0.001	9
	516-954-26	516-354-26	0	1.01 - 1.09	0.01	9
	516-955-26	516-355-26	AS-1	1.1 - 1.9	0.1	9
	516-956-26	516-356-26	AS-2	1 - 24	1	24
	516-957-26	516-357-26	AS-2	25 - 100	25	4
47	516-537-56	516-545-56	K	1.005		1
	516-957-26	516-357-26	00	1.01 - 1.09	0.01	9
	516-958-26	516-358-26	0	1.1 - 1.9	0.1	9
	516-959-26	516-359-26	AS-1	1 - 24	1	24
	516-960-26	516-360-26	AS-2	25 - 100	25	4
	516-961-26	516-361-26	AS-2	25 - 100	25	4



# Metric Rectangular Gage Block Set

**SERIES 516 — Long Block Set, Wear Block Set**



CERA 8-block set



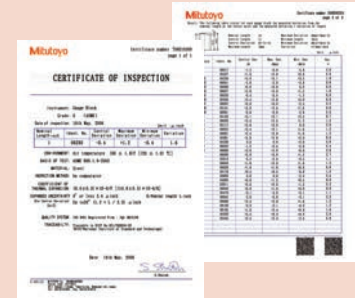
Steel 8-block set

Provided with Inspection Certificate

## SPECIFICATIONS

### Long Block Set

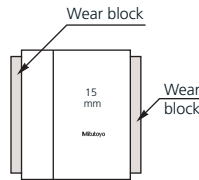
Blocks per set	Order No.		Grade	Blocks included in set		
	Steel	CERA		ASME	Size	Step
8	—	516-547-56	K	25-200	25	8
	—	516-164-26	00	—	—	—
	516-115-26	516-165-26	0	—	—	—
	516-116-26	516-166-26	AS-1	—	—	—
8	516-540-26	516-546-56	K	125 - 175	25	3
	516-701-26	516-731-26	00	200 - 250	50	2
	516-702-26	516-732-26	0	300 - 500	100	3
	516-703-26	516-733-26	AS-1	—	—	—



CERA 2-block set



Carbide 2-block



## SPECIFICATIONS

### Wear Block Set

Blocks per set	Order No.*		Grade	Blocks included in set	
	Carbide	CERA		ASME	Size
2	516-807-26	516-832-26	0	1	2
	516-806-26	516-833-26	AS-1	—	—
2	516-803-26	516-830-26	0	2	2
	516-802-26	516-831-26	AS-1	—	—

# Inch Rectangular Gage Block Set

**SERIES 516 — Inch Block Set, Thin Block Set, Long Block Set, Wear Block Set**

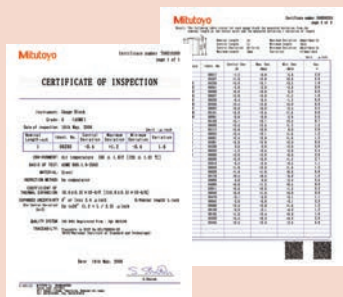
## SPECIFICATIONS

### Inch Block Set

Blocks per set	Order No.			Grade	Blocks included in set		
	Steel	CERA	Steel/CERA		Size	Step	Qty.
<b>81</b>	516-549-56	516-557-56	—	K	.1001 – .1009	.0001	9
	516-901-26	516-301-26	—	00	.101 – .149	.001	49
	516-902-26	516-302-26	516-302-27**	0	.05 – .95	.05	19
	516-903-26	516-303-26	—	AS-1	1 - 4	1	4
	516-904-26	516-304-26	—	AS-2			
<b>35</b>	516-550-56	516-558-56	—	K	.10005		1
	516-913-26	516-313-26	—	00	.1001 – .1009	.0001	9
	516-914-26	516-314-26	—	0	.101 – .109	.001	9
	516-915-26	516-315-26	—	AS-1	.11 – .19	.01	9
	516-916-26	516-316-26	—	AS-2	.1 - .3	.1	3
					.5, 1, 2, 4		4

\*\*CERA blocks are adopted for frequently-used blocks.  
81-block set: All are CERA blocks. Except 2", 3", and 4" are Steel blocks

Provided with Inspection Certificate



## SPECIFICATIONS

### Thin Block Set

Blocks per set	Order No.		Grade	Blocks included in set		
	Steel	CERA		Size	Step	Qty.
<b>28</b>	516-551-56	—	K	.02005		1
	516-917-26	—	00	.0201 – .0209	.0001	9
	516-918-26	—	0	.021 – .029	.001	9
	516-919-26	—	AS-1	.01 – .09	.01	9
	516-920-26	—	AS-2			
<b>10</b>	516-926-26	—	0	.005 - .050	.005	10
	516-927-26	—	AS-1			

## SPECIFICATIONS

### Long Block Set

Blocks per set	Order No.		Grade	Blocks included in set		
	Steel	CERA		Size	Step	Qty.
<b>8</b>	516-126-26	516-176-26	0	1-8	1	8
	516-127-26	516-177-26	AS-1			
<b>8</b>	—	516-564-56	K	5 - 7	1	3
	—	516-741-26	00	8, 10, 12	2	3
	516-712-26	516-742-26	0	16, 20	4	2
	516-713-26	516-743-26	AS-1			

## SPECIFICATIONS

### Wear Block Set


Blocks per set	Order No.		Grade	Blocks included in set	
	Carbide	CERA		Size	Qty.
<b>2</b>	516-809-26	516-836-26	0	.05	2
	516-808-26	516-837-26	AS-1		
<b>2</b>	516-805-26	516-834-26	0	.1	2
	516-804-26	516-835-26	AS-1		


# Micrometer Inspection Gage Block Sets


## SERIES 516


- Can be fixed a series of gage blocks to be used for micrometer inspection.
- Can be measured in both vertical and horizontal posture.
- Parallelism is measured by attaching the optical parallel (optional accessory) to the GB set.

### SPECIFICATIONS

Metric  Micro Checker (holder only)	
Order No.	516-607
Applicable gage block set	516-106-26, 516-107-26, 516-156-26, 516-157-26
Applicable gage block size (mm)	2.5, 5.1, 7.7, 10.3, 12.9, 15, 17.6, 20.2, 22.8, 25

Inch/Metric  Micro Checker (holder only)	
Order No.	516-608
Applicable gage block set	516-921-26, 516-922-26, 516-923-26, 516-321-26, 516-322-26, 516-323-26
Applicable gage block size (inch)	.105, .210, .315, .420, .5, .605, .815, .920

Metric Block Set 				
Blocks per set	Order No.		Grade	Blocks included in set
	Steel	CERA		
10	516-103-26	516-152-26	0	1.00, 1.25, 1.50, 2, 3, 5, 10, 15, 20, 25mm
	516-101-26	516-153-26	AS-1	
10	516-106-26	516-156-26	0	2.5, 5.1, 7.7, 10.3, 12.9, 15, 17.6, 20.2, 22.8, 25mm • Optical parallel (t = 12mm)
	516-107-26	516-157-26	AS-1	

Inch Block Set 				
Blocks per set	Order No.		Grade	Blocks included in set
	Steel	CERA		
10	516-552-56	516-559-56	K	.105, .210, .315, .420, .500, .605, .710, .815, .920, 1" • Optical parallel (t = .5")
	516-921-26	516-321-26	00	
	516-922-26	516-322-26	0	
	516-923-26	516-323-26	AS-1	
10	516-529-26*	516-319-26*	0	.087, .189, .307, .409, .472, .598, .669, .772, .890, 1" • Optical parallel (t = .5")
9	516-554-56	516-561-56	K	.0625, .100, .125, .200, .250, .300, .500, 1, 2" • Optical parallel (t = .5")
	516-929-26	516-333-26	00	
	516-930-26	516-334-26	0	
	516-931-26	516-335-26	AS-1	
9	—	516-563-56	K	.0625, .100, .125, .200, .250, .300, .500, 1, 2"
	—	516-329-26	00	
	516-934-26	516-330-26	0	
	516-935-26	516-331-26	AS-1	

\* For QuantuMike

### Micro Checker



(Gage Blocks are optional)

# Bore Gage Calibration Kit

## SERIES 516

### SPECIFICATIONS

Blocks per set	Order No.	Grade	Blocks included in set
	Carbide		Size
9	516-120-26	0	.04", .08", .16", .2", .4", .8", 1", 2", 3" 2pcs. of 619970 (plain jaw) and 619004 (160mm holder)

# Individual Metric Rectangular Gage Block

## FEATURES

- If using only one length repeatedly, it is a good idea to purchase discrete gage blocks.
- Each gage block is supplied with a Certificate of Inspection.
- Each Grade K gage block of ASME standard is specially supplied with a Certificate of Calibration which certifies that the gage block was manufactured through interferometry.



## Suffix Number for Selecting Standard and Certificate Provided

ASME	
Grade	Steel, CERA
K	-516**
00	-521*
0	-531*
AS-1	-541*
AS-2	-551*

\* provided with Inspection Certificate  
 \*\* provided with Calibration Certificate and Inspection Certificate

Example: 611821-521  
 0.1mm gage block in grade 00.  
 We make custom length gage block length:  
 0.1-1000mm



Inspection Certificate

## SPECIFICATIONS

Metric Block			Metric Block			Metric Block		
Length (mm)	Order No.		Length (mm)	Order No.		Length (mm)	Order No.	
	Steel	CERA		Steel	CERA		Steel	CERA
0.1	611821	—	0.53	611894	—	0.96	611937	—
0.11	611860	—	0.54	611895	—	0.97	611938	—
0.12	611861	—	0.55	611896	—	0.98	611939	—
0.13	611862	—	0.56	611897	—	0.99	611940	—
0.14	611863	—	0.57	611898	—	0.991	611551	613551
0.15	611822	—	0.58	611899	—	0.992	611552	613552
0.16	611864	—	0.59	611900	—	0.993	611553	613553
0.17	611865	—	0.6	611901	—	0.994	611554	613554
0.18	611866	—	0.61	611902	—	0.995	611555	613555
0.19	611867	—	0.62	611903	—	0.996	611556	613556
0.2	611823	—	0.63	611904	—	0.997	611557	613557
0.21	611868	—	0.64	611905	—	0.998	611558	613558
0.22	611869	—	0.65	611906	—	0.999	611559	613559
0.23	611870	—	0.66	611907	—	1	611611	613611
0.24	611871	—	0.67	611908	—	1.0005	611520	613520
0.25	611824	—	0.68	611909	—	1.001	611521	613521
0.26	611872	—	0.69	611910	—	1.002	611522	613522
0.27	611873	—	0.7	611911	—	1.003	611523	613523
0.28	611874	—	0.71	611912	—	1.004	611524	613524
0.29	611875	—	0.72	611913	—	1.005	611525	613525
0.3	611825	—	0.73	611914	—	1.006	611526	613526
0.31	611876	—	0.74	611915	—	1.007	611527	613527
0.32	611877	—	0.75	611916	—	1.008	611528	613528
0.33	611878	—	0.76	611917	—	1.009	611529	613529
0.34	611879	—	0.77	611918	—	1.01	611561	613561
0.35	611826	—	0.78	611919	—	1.02	611562	613562
0.36	611880	—	0.79	611920	—	1.03	611563	613563
0.37	611881	—	0.8	611921	—	1.04	611564	613564
0.38	611882	—	0.81	611922	—	1.05	611565	613565
0.39	611883	—	0.82	611923	—	1.06	611566	613566
0.4	611827	—	0.83	611924	—	1.07	611567	613567
0.41	611884	—	0.84	611925	—	1.08	611568	613568
0.42	611885	—	0.85	611926	—	1.09	611569	613569
0.43	611886	—	0.86	611927	—	1.1	611570	613570
0.44	611887	—	0.87	611928	—	1.11	611571	613571
0.45	611828	—	0.88	611929	—	1.12	611572	613572
0.46	611888	—	0.89	611930	—	1.13	611573	613573
0.47	611889	—	0.9	611931	—	1.14	611574	613574
0.48	611890	—	0.91	611932	—	1.15	611575	613575
0.49	611891	—	0.92	611933	—	1.16	611576	613576
0.5	611506	613506	0.93	611934	—	1.17	611577	613577
0.51	611892	—	0.94	611935	—	1.18	611578	613578
0.52	611893	—	0.95	611936	—	1.19	611579	613579

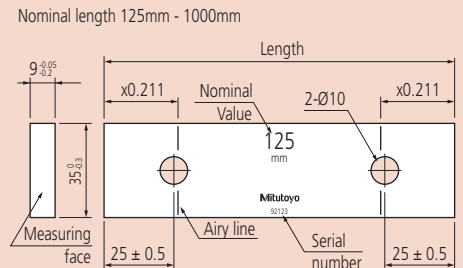
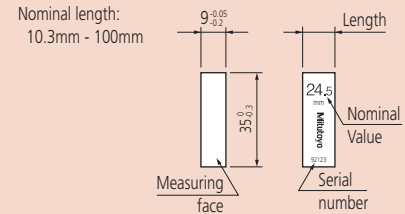
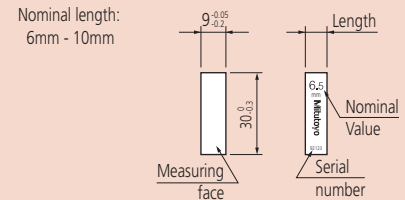
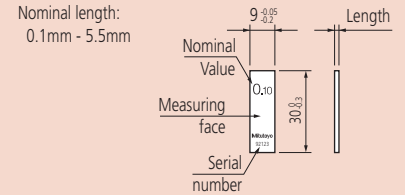
Length (mm)	Order No.		Length (mm)	Order No.		Length (mm)	Order No.	
	Steel	CERA		Steel	CERA		Steel	CERA
1.2	611580	613580	2.17	611717	—	13	611623	613623
1.21	611581	613581	2.18	611718	—	13.5	611653	613653
1.22	611582	613582	2.19	611719	—	14	611624	613624
1.23	611583	613583	2.2	611720	—	14.5	611654	613654
1.24	611584	613584	2.21	611721	—	15	611625	613625
1.25	611585	613585	2.22	611722	—	15.5	611655	613655
1.26	611586	613586	2.23	611723	—	16	611626	613626
1.27	611587	613587	2.24	611724	—	16.5	611656	613656
1.28	611588	613588	2.25	611725	—	17	611627	613627
1.29	611589	613589	2.26	611726	—	17.5	611657	613657
1.3	611590	613590	2.27	611727	—	17.6	611854	613854
1.31	611591	613591	2.28	611728	—	18	611628	613628
1.32	611592	613592	2.29	611729	—	18.5	611658	613658
1.33	611593	613593	2.3	611730	—	19	611629	613629
1.34	611594	613594	2.31	611731	—	19.5	611659	613659
1.35	611595	613595	2.32	611732	—	20	611672	613672
1.36	611596	613596	2.33	611733	—	20.2	611855	613855
1.37	611597	613597	2.34	611734	—	20.5	611660	613660
1.38	611598	613598	2.35	611735	—	21	611631	613631
1.39	611599	613599	2.36	611736	—	21.5	611661	613661
1.4	611600	613600	2.37	611737	—	22	611632	613632
1.41	611601	613601	2.38	611738	—	22.5	611662	613662
1.42	611602	613602	2.39	611739	—	22.8	611856	613856
1.43	611603	613603	2.4	611740	—	23	611633	613633
1.44	611604	613604	2.41	611741	—	23.5	611663	613663
1.45	611605	613605	2.42	611742	—	24	611634	613634
1.46	611606	613606	2.43	611743	—	24.5	611664	613664
1.47	611607	613607	2.44	611744	—	25	611635	613635
1.48	611608	613608	2.45	611745	—	25.25	611754	613754
1.49	611609	613609	2.46	611746	—	30	611673	613673
1.5	611641	613641	2.47	611747	—	35	611755	613755
1.6	611516	613516	2.48	611748	—	40	611674	613674
1.7	611517	613517	2.49	611749	—	41.3	611857	613857
1.8	611518	613518	2.5	611642	613642	45	611756	613756
1.9	611519	613519	2.6	611750	—	50	611675	613675
2	611612	613612	2.7	611751	—	60	611676	613676
2.0005	611690	—	2.8	611752	—	70	611677	613677
2.001	611691	—	2.9	611753	—	75	611801	613801
2.002	611692	—	3	611613	613613	80	611678	613678
2.003	611693	—	3.5	611643	613643	90	611679	613679
2.004	611694	—	4	611614	613614	100	611681	613681
2.005	611695	—	4.5	611644	613644	125	611802	613802
2.006	611696	—	5	611615	613615	131.4	611858	613858
2.007	611697	—	5.1	611850	613850	150	611803	613803
2.008	611698	—	5.5	611645	613645	175	611804	613804
2.009	611699	—	6	611616	613616	200	611682	613682
2.01	611701	—	6.5	611646	613646	250	611805	613805
2.02	611702	—	7	611617	613617	300	611683	613683
2.03	611703	—	7.5	611647	613647	400	611684	613684
2.04	611704	—	7.7	611851	613851	500	611685	613685
2.05	611705	—	8	611618	613618	600	611840	—
2.06	611706	—	8.5	611648	613648	700	611841	—
2.07	611707	—	9	611619	613619	750	611842	—
2.08	611708	—	9.5	611649	613649	800	611843	—
2.09	611709	—	10	611671	613671	900	611844	—
2.1	611710	—	10.3	611852	613852	1000	611845	—
2.11	611711	—	10.5	611650	613650			
2.12	611712	—	11	611621	613621			
2.13	611713	—	11.5	611651	613651			
2.14	611714	—	12	611622	613622			
2.15	611715	—	12.5	611652	613652			
2.16	611716	—	12.9	611853	613853			

**Metric Wear Block**

Length (mm)	Order No.
	Tungsten carbide
1	612611
2	612612

**DIMENSIONS**

Unit: mm





**Suffix Number for Selecting Standard and Certificate Provided**

<b>ASME</b>	
Grade	Steel, CERA
K	-516**
00	-521*
0	-531*
AS-1	-541*
AS-2	-551*

\* provided with Inspection Certificate  
 \*\* provided with Calibration Certificate and Inspection Certificate

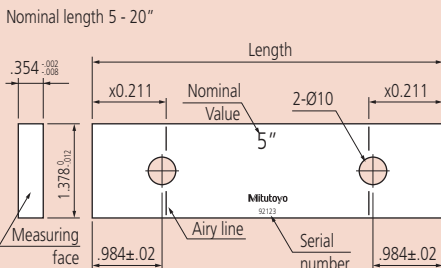
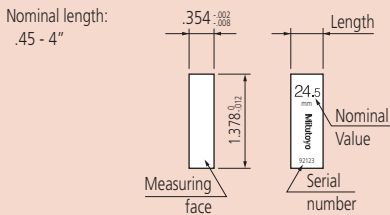
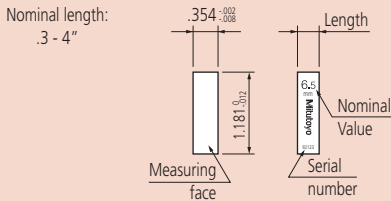
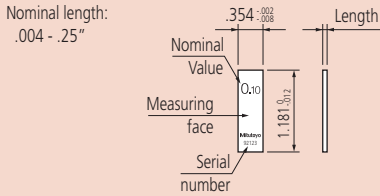
Example: 611310-521  
 .1" gage block in grade 00.  
 We make custom length gage block length:  
 .004 - 20"



Inspection Certificate

**DIMENSIONS**

Unit: Inch



# Individual Inch Rectangular Gage Block

**SPECIFICATIONS**

**Inch Block**

Length (inch)	Order No.	
	Steel	CERA
.004	611304	—
.005	611305	—
.006	611306	—
.007	611307	—
.008	611308	—
.009	611309	—
.01	611310	—
.011	611311	—
.012	611312	—
.013	611313	—
.014	611314	—
.015	611315	—
.016	611316	—
.017	611317	—
.018	611318	—
.019	611319	—
.02	611320	—
.02005	611240	—
.0201	611231	—
.0202	611232	—
.0203	611233	—
.0204	611234	—
.0205	611235	—
.0206	611236	—
.0207	611237	—
.0208	611238	—
.0209	611239	—
.021	611321	—
.022	611322	—
.023	611323	—
.024	611324	—
.025	611325	—
.026	611326	—
.027	611327	—
.028	611328	—
.029	611329	—
.03	611330	—
.031	611331	—
.03125 (1/32)	611101	613103
.032	611332	—
.033	611333	—
.034	611334	—
.035	611335	—
.036	611336	—
.037	611337	—
.038	611338	—
.039	611339	—
.04	611340	—
.041	611341	—
.042	611342	—
.043	611343	—
.044	611344	—
.045	611345	—
.046	611346	—
.046875 (3/64)	611102	613104
.047	611347	—
.048	611348	—
.049	611349	—
.05	611105	613105

Length (inch)	Order No.	
	Steel	CERA
.06	611106	—
.0625	611303	613303
.07	611107	—
.078125 (5/64)	611103	613100
.08	611108	—
.09	611109	—
.09375 (3/32)	611104	613101
.1	611191	613191
.100025	611111	613110
.10005	611135	613135
.100075	611121	613111
.1001	611121	613121
.1002	611122	613122
.1003	611123	613123
.1004	611124	613124
.1005	611125	613125
.1006	611126	613126
.1007	611127	613127
.1008	611128	613128
.1009	611129	613129
.101	611141	613141
.102	611142	613142
.103	611143	613143
.104	611144	613144
.105	611145	613145
.106	611146	613146
.107	611147	613147
.108	611148	613148
.109	611149	613149
.109375 (7/64)	611110	613102
.11	611150	613150
.111	611151	613151
.112	611152	613152
.113	611153	613153
.114	611154	613154
.115	611155	613155
.116	611156	613156
.117	611157	613157
.118	611158	613158
.119	611159	613159
.12	611160	613160
.121	611161	613161
.122	611162	613162
.123	611163	613163
.124	611164	613164
.125	611165	613165
.126	611166	613166
.127	611167	613167
.128	611168	613168
.129	611169	613169
.13	611170	613170
.131	611171	613171
.132	611172	613172
.133	611173	613173
.134	611174	613174
.135	611175	613175
.136	611176	613176
.137	611177	613177
.138	611178	613178

Length (inch)	Order No.	
	Steel	CERA
.139	611179	613179
.14	611180	613180
.141	611181	613181
.142	611182	613182
.143	611183	613183
.144	611184	613184
.145	611185	613185
.146	611186	613186
.147	611187	613187
.148	611188	613188
.149	611189	613189
.15	611115	613115
.16	611116	613116
.17	611117	613117
.18	611118	613118
.19	611119	613119
.2	611192	613192
.21	611221	613221
.25	611212	613212
.3	611193	613193
.315	611209	613209
.35	611213	613213
.375 (3/8)	611113	613112
.4	611194	613194
.420	611210	613210
.45	611214	613214
.5	611195	613195
.55	611215	613215
.6	611196	613196
.605	611211	613211
.65	611216	613216
.7	611197	613197
.710	611220	613220
.75	611217	613217
.8	611198	613198
.815	611226	613226
.85	611218	613218
.9	611199	613199
.920	611227	613227
.95	611219	613219
1	611201	613201
2	611202	613202
3	611203	613203
4	611204	613204
5	611205	613205
6	611206	613206
7	611207	613207
8	611208	613208
10	611222	613222
12	611223	613223
16	611224	613224
20	611225	613225

**Inch Wear Block**

Length (inch)	Order No.
.05	Tungsten carbide 612105
.1	612191

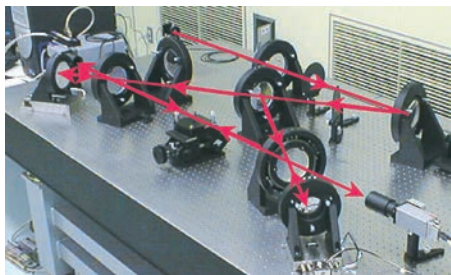


# Rectangular Gage Block with CTE

## Gage Blocks with Thermal Expansion Coefficient Data

### FEATURES

- Mitutoyo offers top-level gage blocks (steel and ceramic) which are superior to the K class blocks, with their quality supported by Mitutoyo's best technologies.
- Comes with a highly accurate thermal expansion coefficient measured with a high accuracy double-faced interferometer (DFI).
- The high accuracy gage block interferometer (GBI) guarantees a high dimensional accuracy.
- Mitutoyo offers rectangular gage blocks, having nominal values from 100 to 500mm Grade: K class in ASME  
 Uncertainty of thermal expansion coefficient:  $0.035 \times 10^{-6}/K$  ( $k = 2$ )  
 Uncertainty of dimension measurement: 30nm ( $k = 2$ ), for 100mm block



double-faced interferometer (DFI)

### SPECIFICATIONS

Metric Block with CTE		
Length (mm)	Order No. Steel	Order No. CERA
100	611681-51B	613681-51B
125	611802-51B	613802-51B
150	611803-51B	613803-51B
175	611804-51B	613804-51B
200	611682-51B	613682-51B
250	611805-51B	613805-51B
300	611683-51B	613683-51B
400	611684-51B	613684-51B
500	611685-51B	613685-51B

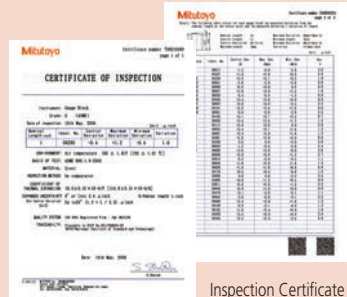
Inch Block with CTE		
Length (inch)	Order No. Steel	Order No. CERA
4	611204-51B	613204-51B
5	611205-51B	613205-51B
6	611206-51B	613206-51B
7	611207-51B	613207-51B
8	611208-51B	613208-51B
10	611222-51B	613222-51B
12	611223-51B	613223-51B
16	611224-51B	613224-51B
20	611225-51B	613225-51B



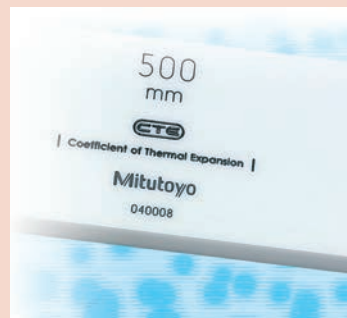
\* Suffix Number for Selecting Standard and Certificate Provided

ASME	
Grade K	Steel, CERA
	-51B

-51B: provided with JCSS Calibration Certificate and Inspection Certificate



Inspection Certificate



# Rectangular Gage Block Accessories

## SERIES 516 – For Gage Blocks over 100mm

Specially designed for the long gage blocks over 100mm which have two holes on the body for coupling.

### SPECIFICATIONS

#### Accessories for gage blocks over 100mm

Order No. 516-605	Included in set
1 pc.	Holder A (619031)
1 pc.	Holder B (619032)
1 pc.	Holder C (619033)
1 pc.	Holder D (619034)
1 pc.	Holder E (619035)
3 pcs.	Adaptor (619036)
1 pc.	Holder base 35mm (619009)
2 pcs.	Half round jaw 12mm (619013)
2 pcs.	Plain jaw (619018)
1 pc.	Scriber point (619019)

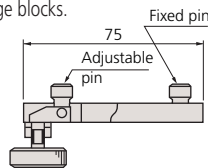
Note: These accessories can be used for inch rectangular gage blocks.



516-605

#### Holder A: 619031

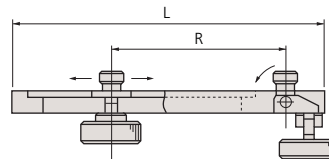
Used for coupling two long gage blocks.



#### Holder B and C:

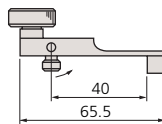
Used for coupling two long gage blocks together with other gage blocks up to 35mm (Holder B) or 140mm (Holder C). Also used for attaching jaws with two adaptors.

	Order No.	R (max.)	L
Holder B	619032	90mm	126mm
Holder C	619033	200mm	236mm



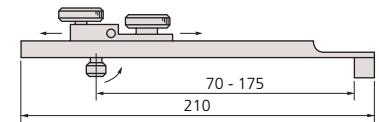
#### Holder D: 619034

Used for attaching to the holder base.



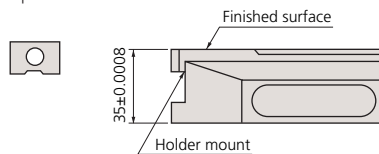
#### Holder E: 619035

Used for attaching to the holder base together with other gage blocks up to 125mm. Used for attaching jaws with one adaptor.

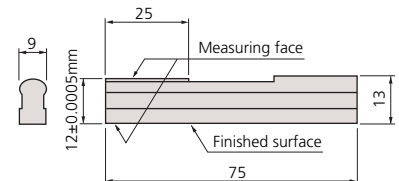


#### Holder base: 619009

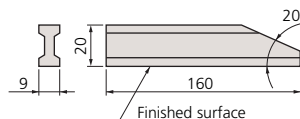
Adaptor: 619036



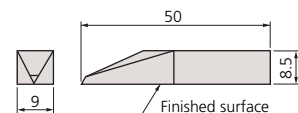
#### Half round jaw: 619013



#### Plain jaw: 619018



#### Scriber point: 619019



# Rectangular Gage Block Accessories

## SERIES 516

To expand the variety of rectangular gage block (steel and CERA) applications, Mitutoyo offers the gage block accessories set. By assembling the items in the set, you can easily and quickly build up a precision measuring instrument.



516-602



516-601

## SPECIFICATIONS

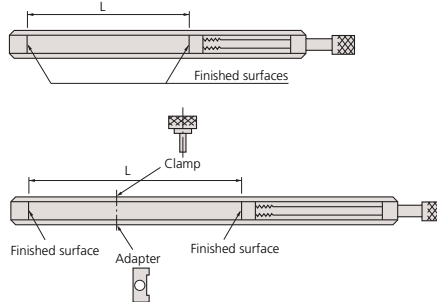
### Assortment of Accessories

Order No.	Accessories	Metric Set Order No.		Accessory (s) included in a set
		516-601	516-602	
619002	Holder 60mm		•	1 pc.
619003	Holder 100mm	•	•	1 pc.
619004	Holder 160mm	•	•	1 pc.
619005	Holder 250mm	•	•	1 pc.
619009	Holder Base 35mm	•	•	1 pc.
619010	Half round jaw 2mm	•	•	2 pcs.
619011	Half round jaw 5mm	•	•	2 pcs.
619012	Half round jaw 8mm	•	•	2 pcs.
619013	Half round jaw 12mm	•	•	2 pcs.
619014	Half round jaw 20mm	•	•	2 pcs.
619018	Plain jaw 160mm	•	•	2 pcs.
619019	Scriber point	•	•	1 pc.
619020	Center point	•	•	1 pc.
619021	Tram point	•	•	2 pcs.
619022	Triangular straightness edge 100mm	•	•	1 pc.
619023	Triangular straight edge 160mm	•	•	1 pc.
	<b>Total Qty. in set</b>	22 pcs.	14 pcs.	



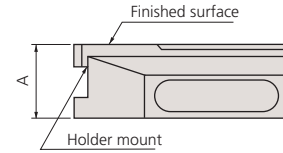
# Rectangular Gage Block Accessories

Holder:  
Used as a clamp if using plain jaws, scriber point, etc.



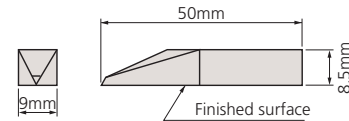
Order No.	L
619002	15 - 61mm
619003	4 - 106mm
619004	62 - 165mm
619005	153 - 256mm

Holder base 35mm: **619009**  
Measures a height on the surface plate and scribes a workpiece if used with the holder.

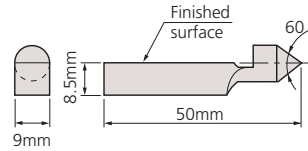


Order No.	A
619009	35±0.005mm

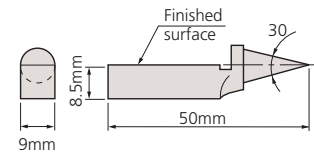
Scriber point: **619019**  
Scribes a workpiece if used with the holder and holder base.



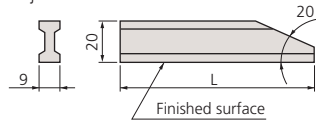
Center point: **619020**  
Scribes a workpiece if used with the holder and holder base.



Tram point: **619021**  
Inspects the scale of the height gage, etc., if used with the holder and holder base.

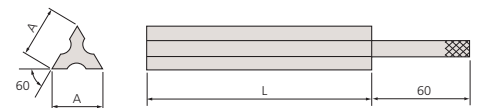


Plain jaw: **619018**  
Measures an outside or inside diameter if used with a pair of jaws and the holder.



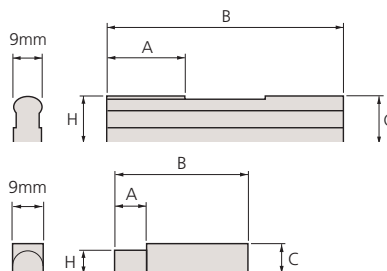
Order No.	L
619018	160mm

Triangular straight edge: Measures parallelism.



Order No.	L
619022	100mm
619023	160mm

Half round jaw:  
Measures an outside or inside diameter if used with a pair of jaws and the holder.



Order No.	H	A	B	C
619010	2±0.0005mm	6mm	40mm	8mm
619011	5±0.0005mm	6mm	50mm	8mm
619012	8±0.0005mm	12mm	60mm	8mm
619013	12±0.0005mm	25mm	75mm	13mm
619014	20±0.0005mm	25mm	125mm	20.5mm

# Metric Square Gage Block Set

## SERIES 516 — Metric Block Set, Long Block Set, Wear Block Set

A Square Gage Block can retain stable orientation both longitudinally and laterally. A wide range of application measurements can be made, including cutting tool positioning, angle measurement with a sine bar, taper measurement with a roller, and inspection of depth micrometers.



Steel 32-block set



Steel 76-block set



Steel 103-block set



Steel 112-block set

## SPECIFICATIONS

### Metric Block Set

Blocks per set	Order No.		Grade	Blocks included in set		
	Steel	CERA		Size	Step	Qty.
112	516-437-26	—	00	1.005	—	1
	516-438-26	—	0	1.001 - 1.009	0.001	9
	516-439-26	—	AS-1	1.01 - 1.49	0.01	49
	516-440-26	—	AS-2	0.5 - 24.5	0.5	49
	—	—	—	25 - 100	25	4
103	516-441-26	—	00	1.005	—	1
	516-442-26	—	0	1.01 - 1.49	0.01	49
	516-443-26	—	AS-1	0.5 - 24.5	0.5	49
	516-444-26	—	AS-2	25 - 100	25	4
	—	—	—	—	—	—
76	516-449-26	—	00	1.005	—	1
	516-450-26	—	0	1.01 - 1.49	0.01	49
	516-451-26	—	AS-1	0.5 - 9.5	0.5	19
	516-452-26	—	AS-2	10 - 40	10	4
	—	—	—	50 - 100	25	3
47	516-457-26	—	00	1.005	—	1
	516-458-26	—	0	1.01 - 1.09	0.01	9
	516-459-26	—	AS-1	1.1 - 1.9	0.1	9
	516-460-26	—	AS-2	1 - 24	1	24
	—	—	—	25 - 100	25	4
32	516-465-26	—	00	1.005	—	1
	516-466-26	—	0	1.01 - 1.09	0.01	9
	516-467-26	—	AS-1	1.1 - 1.9	0.1	9
	516-468-26	—	AS-2	1 - 9	1	9
	—	—	—	10 - 30	10	3
—	—	—	60	—	1	

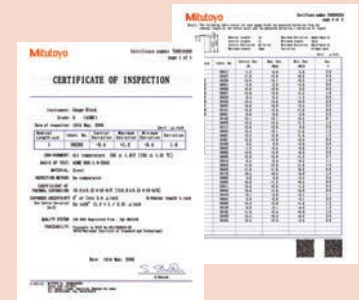
### Metric Long Block Set

Blocks per set	Order No.		Grade	Blocks included in set		
	Steel	CERA		Size	Step	Qty.
8	516-751-26	—	00	125, 150, 175	25	3
	516-752-26	—	0	200, 250	50	2
	516-753-26	—	AS-1	300, 400, 500	100	3
	516-754-26	—	AS-2	—	—	—

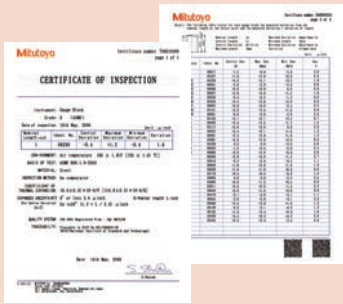
### Metric Wear Block Set

Blocks per set	Order No.		Grade	Blocks included in set		
	Carbide	CERA		Size	Step	Qty.
2	516-820-26	—	0	1	—	2
	516-821-26	—	AS-1	—	—	—
2	516-822-26	—	0	2	—	2
	516-823-26	—	AS-1	—	—	—

Provided with Inspection Certificate



Provided with Inspection Certificate



# Inch Square Gage Block Set

**SERIES 516 — Inch Block Set, Long Block Set, Wear Block Set**

## SPECIFICATIONS

### Inch Block Set

Blocks per set	Order No.		Grade	Blocks included in set		
	Steel	CERA		Size	Step	Qty.
<b>81</b>	516-401-26	516-201-26	00	.1001 - .1009	.0001	9
	516-402-26	516-202-26	0	.101 - .149	.001	49
	516-403-26	516-203-26	AS-1	.05 - .95	.05	19
	516-404-26	516-204-26	AS-2	1 - 4	1	4
<b>36</b>	516-421-26	516-221-26	00	.05"		1
	516-422-26	516-222-26	0	.1001 - .1009	.0001	10
	516-423-26	516-223-26	AS-1	.101 - .109	.001	9
	516-424-26	516-224-26	AS-2	.11 - .19	.01	9
				.1 - .5	.1	5
<b>28</b>	516-417-26	—	00	.02005"		1
	516-418-26	—	0	.0201 - .0209"	.0001	9
	516-419-26	—	AS-1	.021 - .029"	.001	9
	516-420-26	—	AS-2	.021 - .029"	.01	9
				.10 - .090"		



Steel 47-block set

### Inch Long Block Set

Blocks per set	Order No.		Grade	Blocks included in set		
	Steel	CERA		Size	Step	Qty.
<b>8</b>	516-762-26	—	0	5 - 7	1	3
	516-763-26	—	AS-1	8, 10, 12	2	3
				16, 20	4	2



Steel 8-block set

### Inch Wear Block Set

Blocks per set	Order No.		Grade	Blocks included in set		
	Carbide	CERA		Size	Step	Qty.
<b>2</b>	516-824-26	516-846-26	0	.05	—	2
	516-825-26	516-847-26	AS-1			
<b>2</b>	516-826-26	516-844-26	0	.1	—	2
	516-827-26	516-845-26	AS-1			



Carbide 2-block set

### 92 pcs. Gage Blocks with accessories set in wooden box

Blocks in set	Order No.	Grade	Blocks included in set			Individual No.	Description	Qty.
			Size	Step	Qty.			
<b>92</b>	516-405-26	0	.0625	.0001	1	619052	Plain Jaw .500"	2
			.078125		1	619051	Half round jaw .250"	2
			.09375		1	619055	Holder base .500"	1
			.100025		1	619057	Flat head screw 1 1/4"	2
			.10005		1	619058	Flat head screw 5/8"	2
			.100075		1	619056	Stud	2
			.109375		1	619066	Knurled head screw	2
			.1001 - .1009		9	619059	Slotted head nut	2
			.101 - .149		49	619062	Tie rod 3"	1
			.05 - .95		4	619063	Tie rod 2 1/4"	1
			.16 - .19		19	619064	Tie rod 1 1/2"	1
			1 - 4		4	619065	3/4"	1

# Individual Metric Square Gage Block



## SPECIFICATIONS

### Metric Block

Length (mm)	Order No.		Length (mm)	Order No.		Length (mm)	Order No.	
	Steel	CERA		Steel	CERA		Steel	CERA
0.5	614506	—	1.33	614593	—	13	614623	—
1	614611	—	1.34	614594	—	13.5	614653	—
1.0005	614520	—	1.35	614595	—	14	614624	—
1.001	614521	—	1.36	614596	—	14.5	614654	—
1.002	614522	—	1.37	614597	—	15	614625	—
1.003	614523	—	1.38	614598	—	15.5	614655	—
1.004	614524	—	1.39	614599	—	16	614626	—
1.005	614525	—	1.4	614600	—	16.5	614656	—
1.006	614526	—	1.41	614601	—	17	614627	—
1.007	614527	—	1.42	614602	—	17.5	614657	—
1.008	614528	—	1.43	614603	—	18	614628	—
1.009	614529	—	1.44	614604	—	18.5	614658	—
1.01	614561	—	1.45	614605	—	19	614629	—
1.02	614562	—	1.46	614606	—	19.5	614659	—
1.03	614563	—	1.47	614607	—	20	614672	—
1.04	614564	—	1.48	614608	—	20.5	614660	—
1.05	614565	—	1.49	614609	—	21	614631	—
1.06	614566	—	1.5	614641	—	21.5	614661	—
1.07	614567	—	1.6	614516	—	22	614632	—
1.08	614568	—	1.7	614517	—	22.5	614662	—
1.09	614569	—	1.8	614518	—	23	614633	—
1.1	614570	—	1.9	614519	—	23.5	614663	—
1.11	614571	—	2	614612	—	24	614634	—
1.12	614572	—	2.5	614642	—	24.5	614664	—
1.13	614573	—	3	614613	—	25	614635	—
1.14	614574	—	3.5	614643	—	30	614673	—
1.15	614575	—	4	614614	—	40	614674	—
1.16	614576	—	4.5	614644	—	50	614675	—
1.17	614577	—	5	614615	—	60	614676	—
1.18	614578	—	5.5	614645	—	75	614801	—
1.19	614579	—	6	614616	—	100	614681	—
1.2	614580	—	6.5	614646	—	125	614802	—
1.21	614581	—	7	614617	—	150	614803	—
1.22	614582	—	7.5	614647	—	175	614804	—
1.23	614583	—	8	614618	—	200	614682	—
1.24	614584	—	8.5	614648	—	250	614805	—
1.25	614585	—	9	614619	—	300	614683	—
1.26	614586	—	9.5	614649	—	400	614684	—
1.27	614587	—	10	614671	—	500	614685	—
1.28	614588	—	10.5	614650	—			
1.29	614589	—	11	614621	—			
1.3	614590	—	11.5	614651	—			
1.31	614591	—	12	614622	—			
1.32	614592	—	12.5	614652	—			

### Metric Wear Block

Length (mm)	Order No. Tungsten carbide
1	615611
2	615612

Suffix Number for Selecting Standard and Certificate Provided

### ASME

Grade	Steel
K	—
00	-521*
0	-531*
AS-1	-541*
AS-2	-551*

\* provided with Inspection Certificate

Example: 614611-521  
1mm gage block in grade 00.

We make custom length gage block length:  
0.5 - 500mm.



Inspection Certificate



# Individual Inch Square Gage Block

## Suffix Number for Selecting Standard and Certificate Provided

ASME	
Grade	Steel, CERA
K	—
00	-521*
0	-531*
AS-1	-541*
AS-2	-551*

\* provided with Inspection Certificate

Example: 614310-521  
.01" gage block in grade 00.

We make custom length gage block length:  
.01 - 20"

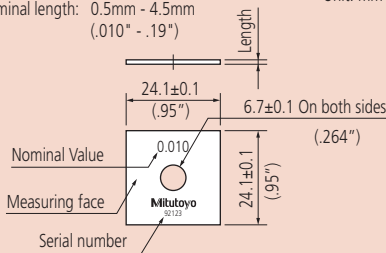


Inspection Certificate

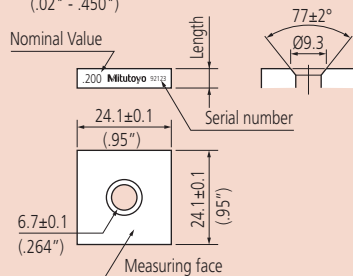
## DIMENSIONS

Nominal length: 0.5mm - 4.5mm  
(.010" - .19")

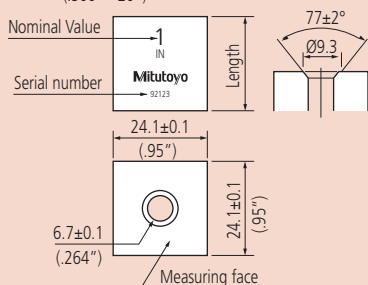
Unit: mm



Nominal length: 5mm - 14.5mm  
(.02" - .450")



Nominal length: 15mm - 500mm  
(.500" - 20")



## SPECIFICATIONS

### Inch Block

Length (inch)	Order No.		Length (inch)	Order No.		Length (inch)	Order No.	
	Steel	CERA		Steel	CERA		Steel	CERA
.01	614310	—	.106	614146	616146	.25	614212	616212
.02005	614240	—	.107	614147	616147	.3	614193	616193
.0201	614231	—	.108	614148	616148	.35	614213	616213
.0202	614232	—	.109	614149	616149	.375 (3/8)	614309	—
.0203	614233	—	.109375 (7/64)	614306	—	.4	614194	616194
.0204	614234	—	.11	614150	616150	.45	614214	616214
.0205	614235	—	.111	614151	616151	.5	614195	616195
.0206	614236	—	.112	614152	616152	.55	614215	616215
.0207	614237	—	.113	614153	616153	.6	614196	616196
.0208	614238	—	.114	614154	616154	.65	614216	616216
.0209	614239	—	.115	614155	616155	.7	614197	616197
.02	614320	—	.116	614156	616156	.75	614217	616217
.021	614321	—	.117	614157	616157	.8	614198	616198
.022	614322	—	.118	614158	616158	.85	614218	616218
.023	614323	—	.119	614159	616159	.9	614199	616199
.024	614324	—	.12	614160	616160	.95	614219	616219
.025	614325	—	.121	614161	616161	1	614201	616201
.026	614326	—	.122	614162	616162	2	614202	616202
.027	614327	—	.123	614163	616163	3	614203	616203
.028	614328	—	.124	614164	616164	4	614204	616204
.029	614329	—	.125	614165	616165	5	614205	—
.03	614330	—	.126	614166	616166	6	614206	—
.03125 (1/32)	614301	—	.127	614167	616167	7	614207	—
.04	614340	—	.128	614168	616168	8	614208	—
.046875 (3/64)	614302	—	.129	614169	616169	10	614222	—
.05	614105	616105	.13	614170	616170	12	614223	—
.06	614106	—	.131	614171	616171	16	614224	—
.0625	614303	616303	.132	614172	616172	20	614225	—
.07	614107	—	.133	614173	616173			
.078125 (5/64)	614304	—	.134	614174	616174			
.08	614108	—	.135	614175	616175			
.09	614109	—	.136	614176	616176			
.09375 (3/32)	614305	—	.137	614177	616177			
.1	614191	616191	.138	614178	616178			
.100025	614307	—	.139	614179	616179			
.10005	614135	616135	.14	614180	616180			
.100075	614308	—	.141	614181	616181			
.1001	614121	616121	.142	614182	616182			
.1002	614122	616122	.143	614183	616183			
.1003	614123	616123	.144	614184	616184			
.1004	614124	616124	.145	614185	616185			
.1005	614125	616125	.146	614186	616186			
.1006	614126	616126	.147	614187	616187			
.1007	614127	616127	.148	614188	616188			
.1008	614128	616128	.149	614189	616189			
.1009	614129	616129	.15	614115	616115			
.101	614141	616141	.16	614116	616116			
.102	614142	616142	.17	614117	616117			
.103	614143	616143	.18	614118	616118			
.104	614144	616144	.19	614119	616119			
.105	614145	616145	.2	614192	616192			

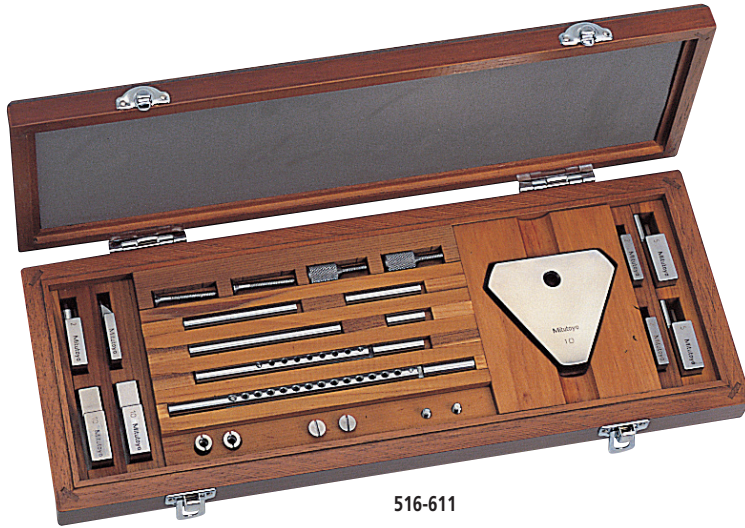
### Inch Wear Block

Length (inch)	Order No. Tungsten carbide
.05	615105
.1	615191

# Square Gage Block Accessories

## SERIES 516

To expand the variety of Square Gage Block applications, Mitutoyo offers the Gage Block Accessories Set. By assembling the items in the set, you can easily and quickly build up a precision measuring instrument.

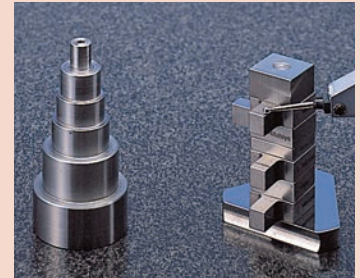
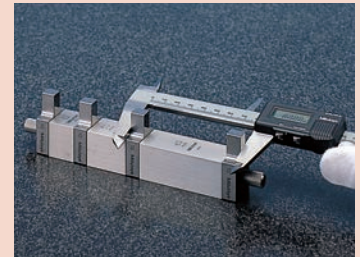


516-611

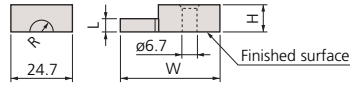
### SPECIFICATIONS

Metric	
Order No. 516-611	Included in set
2 pcs.	Half round jaw 2mm (619070)
2 pcs.	Half round jaw 5mm (619071)
2 pcs.	Plain jaw (619072)
1 pc.	Center point (619073)
1 pc.	Scriber point (619054)
1 pc.	Block base (619074)
2 pcs.	Flat head screw 1-1/4" (619057)
2 pcs.	Flat head screw 5/8" (619058)
2 pcs.	Slotted head nut (619059)
2 pcs.	Adjustable tie rod 6" (619060)
2 pcs.	Adjustable tie rod 4-1/2" (619061)
1 pc.	Tie rod 3" (619062)
1 pc.	Tie rod 2-1/4" (619063)
1 pc.	Tie rod 1-1/2" (619064)
1 pc.	Tie rod 3/4" (619065)
2 pcs.	Stud (619056)
2 pcs.	Knurled head screw (619066)

Inch	
Order No. 516-612	Included in set
2 pcs.	Half round jaw .125" (619050)
2 pcs.	Half round jaw .25" (619051)
2 pcs.	Plain jaw (619052)
1 pc.	Center point (619053)
1 pc.	Scriber point (619054)
1 pc.	Block base (619055)
2 pcs.	Flat head screw 1-1/4" (619057)
2 pcs.	Flat head screw 5/8" (619058)
2 pcs.	Slotted head nut (619059)
2 pcs.	Adjustable tie rod 6" (619060)
2 pcs.	Adjustable tie rod 4-1/2" (619061)
1 pc.	Tie rod 3" (619062)
1 pc.	Tie rod 2-1/4" (619063)
1 pc.	Tie rod 1-1/2" (619064)
1 pc.	Tie rod 3/4" (619065)
2 pcs.	Stud (619056)
2 pcs.	Knurled head screw (619066)

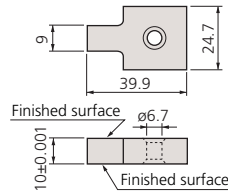


Half round jaw:  
Used to measure an inside or outside diameter.

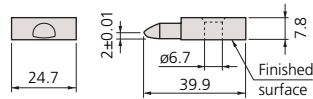


Order No.	R	L	W	H
619070	1.95mm	2mm	33.6mm	5.3mm
619071	4.95mm	5mm	39.9mm	10.3mm
619050	.123"	.125"	33.6mm	5.3mm
619051	.248"	.25"	39.9mm	10.3mm

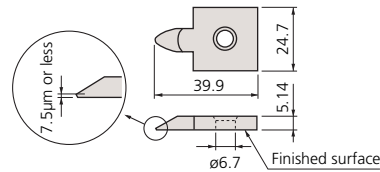
Plain jaw: 619072 (10mm), 619052 (.5")  
Used to measure an inside or outside diameter.



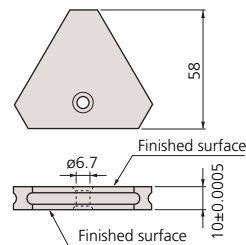
Center point: 619073 (2mm), 619053 (.1")  
Used to scribe a workpiece.



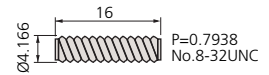
Scriber point: 619054  
Used to scribe a workpiece.



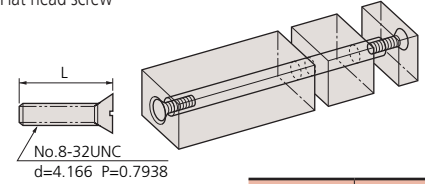
Base: 619074 (10mm), 619055 (.5")  
Used as clamps by inserting them into the center hole of a square gage block.



Stud: 619056

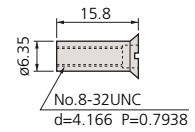


Flat head screw

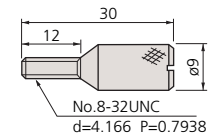


Order No.	L
619057	31.6mm
619058	15.8mm

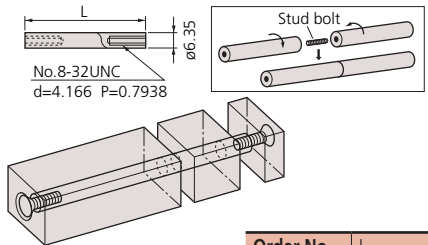
Slotted head nut: 619059



Knurled head screw: 619066

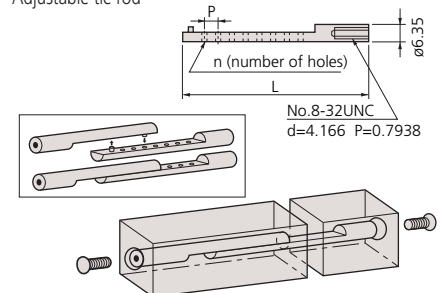


Tie rod



Order No.	L
619065	19mm
619064	38mm
619063	57mm
619062	76mm

Adjustable tie rod



Order No.	L	P	n
619060	124.5mm	6.35mm	14
619061	86.5mm	6.35mm	8

# Ceraston

## Accessory for Gage Blocks

### FEATURES

- Alumina-ceramic grinding stone for removing burrs from hard materials such as ceramics that ordinary grinding stones cannot handle.
- Can be used both for steel gage blocks and CERA Blocks.



### SPECIFICATIONS

Order No.	Dimensions (W x D x H)	Mass
601645	100 x 25 x 12mm	110g
601644	150 x 50 x 20mm	530g

# Maintenance Kit for Gage Block

## SERIES 516

### FEATURES

- Includes all necessary maintenance tools for daily care and storage of gage blocks.
- Supplied in a fitted wooden case for portable use.



516-650E

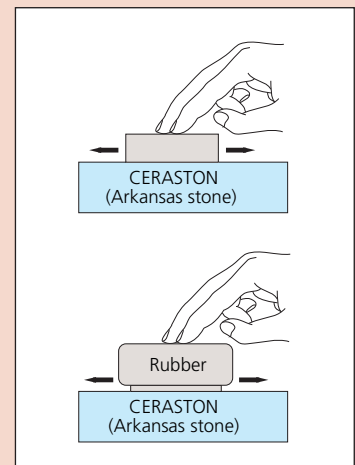
### SPECIFICATIONS

Order No.	Assortment of tools and accessories
516-650E	Ceraston (601645): Used for removing burrs on the measuring surface
	Optical flat (600003): Used for checking whether burrs exist.
	Tweezers (600004): Used for handling thin gage blocks.
	Blower brush (600005): Used for blowing out dust on the measuring surface.
	Cleaning paper (600006): Used for wiping off rust preventive oil and contamination.
	Artificial leather mat (600007): Used as a gage block mat.
	Reagent bottle (600008): Bottle of wiping solution (100mL)
	Gloves



### Removing burrs

- (1) Wipe any dust and oil films from the gage block and the Ceraston (or Arkansas stone) using a solvent.
- (2) Place the gage block on the Ceraston so that the measuring face that has burrs is on the abrasive surface of the stone. While applying light pressure, move the gage block to and fro about ten times (Fig. 1). Use a block rubber for thin gage blocks to apply even pressure (Fig. 2).
- (3) Check the measuring face for burrs with an optical flat. If the burrs have not been removed, repeat step (2). If burrs are too large, they may not be removed with a grinding stone. If so, discard the gage block.



Note: The abrasive surface of a Ceraston must be made flat by lapping it from time to time. After lapping the Ceraston, the lapping powder must be completely removed from the surface to prevent the surface of the gage block from being scratched. Mitutoyo does not handle the Arkansas stone.



# Step Master

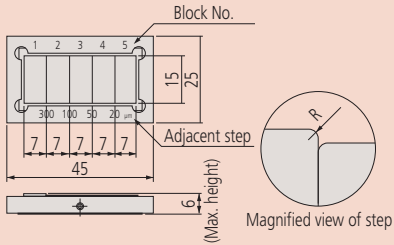
**SERIES 516**

## FEATURES

Step master is a master gage used for the z-axis (vertical direction) calibration of optical instruments.

- Each adjacent step is measured down to 0.01 $\mu$ m by using an interferometer within  $\pm 0.20\mu$ m allowance.
- Steel and ceramic types are available.

## Dimension



**516-498**  
Ceramic type



**516-199**  
Steel type



## SPECIFICATIONS

### Metric

Order No.	Step value between adjacent blocks				Remarks
	No. 1 - No. 2	No. 2 - No. 3	No. 3 - No. 4	No. 4 - No. 5	
<b>516-198</b>	10 $\mu$ m	5 $\mu$ m	2 $\mu$ m	1 $\mu$ m	Steel type
<b>516-199</b>	300 $\mu$ m	100 $\mu$ m	50 $\mu$ m	20 $\mu$ m	Steel type
<b>516-498</b>	10 $\mu$ m	5 $\mu$ m	2 $\mu$ m	1 $\mu$ m	Ceramic type
<b>516-499</b>	300 $\mu$ m	100 $\mu$ m	50 $\mu$ m	20 $\mu$ m	Ceramic type

# Made-to-order Block & Reference

## Available Dimension

Nominal size: .004 to 20" / 0.1 to 1000mm (steel)  
.1 to 20" / 0.5 to 500mm (ceramic)

Nominal pitch: 0.0005mm (up to 100mm)  
0.001mm (over 100mm)

Minimum section dimension:  
Approx. .24 x .24" / 6 x 6mm

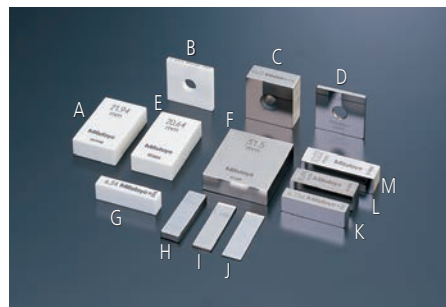
Maximum section dimension:  
Approx. 5.5 x 5.5" / 140 x 140mm (steel)  
Approx. 6.3" Dia. /  $\phi$ 160mm (steel, cylindrical)  
Approx. 3.94 x 1.97" / 100 x 50mm (ceramic)  
Approx. .24" Dia. /  $\phi$ 60mm (ceramic, cylindrical)

Accuracy: Gage Block Grade level

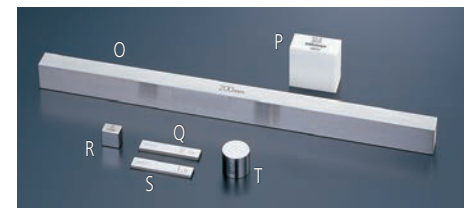
Special materials of low expansion glass and low expansion ceramic are available.

## FEATURES

- Mitutoyo can provide Gage Blocks and reference gages to you size and design.



- A: Ceramic rectangular gage block (21.94mm)
- B: Ceramic square gage block (2.1005mm)
- C: Steel square gage block (10.72mm)
- D: Steel square gage block (2.2065mm)
- E: Ceramic rectangular gage block (20.64mm)
- F: Steel rectangular gage block (31.5mm)
- G: Ceramic rectangular gage block (6.34mm)
- H: Steel rectangular gage block (3.603mm)
- I: Steel rectangular gage block (1.1505mm)
- J: Steel rectangular gage block (0.555mm)
- K: Steel rectangular gage block (6.156mm)
- L: Steel rectangular gage block (9.694mm)
- M: Steel rectangular gage block (10.02mm)



- O: Steel Long rectangular block (15 x 10 x 200mm)
- P: Ceramic square block (24.1 x 24.1 x 12.3mm)
- Q: Steel thin rectangular block (30 x 6 x 1.9mm)
- R: Steel square block (9 x 9 x 6mm)
- S: Steel thin rectangular block (30 x 6 x 2.1mm)
- T: Steel cylindrical block ( $\phi$ 13.08 x 12mm)



- U: Cylindrical reference block for depth micrometer ( $\phi$ 60 x 150mm)
- V: Ceramic reference plate (50 x 50 x 50mm, flatness 0.3 $\mu$ m)
- W: Ceramic stepped block (30 x 18 x 5mm, step: 0.15mm)

# Gage Block Comparator GBCD-250

## SERIES 565 — Manual Type Comparator with Dual Gage Heads

### FEATURES

- Gage blocks between 0.1mm and 250mm can be easily compared with the standard gage block on the GBCD-250.
- The differential dual gaging heads assure the operator of a high-accuracy measurement with ease of use.

### SPECIFICATIONS

Inch/Metric	
Model No.	GBCD-250
Order No.	565-150A
Range	0.1mm - 250mm / .004 - 10"
Resolution	0.00001mm (0.01 $\mu$ m) / .000001"
Accuracy in narrow range (20°C)	$\pm(0.03+0.3L/1000)\mu\text{m}^*$ L = Gage block length (mm)
Measuring units	Laser Hologage (upper), Mu-checker (lower)
Operating condition	Temperature: 20°C $\pm$ 1°C Humidity: 58%RH $\pm$ 15%RH
Data output	Via SPC output port
Dimensions (W x D x H)	Main unit: 455 x 318 x 691mm Display unit: 345 x 397 x 187mm
Mass	Main unit: Approx. 50kg Display unit: Approx. 9kg

\*Uncertainty of measurement is 95% (not including the calibration error of the standard gage block).



### Optional Accessories

- 962723: Gage head calibration kit  
 02ASD130: Square gage block holder kit  
 02ASF040: Heat protection shield  
 02ASD100: Gage block set for accuracy inspection PC System  
 02ASG610A: GBPAK-M\*  
 \* Included: Software  
 Foot Switch (937179T)  
 MUX-10F (264-002A)  
 Connecting cable (936937)

# Gage Block Comparator GBCD-100A

## SERIES 565 — Automatic Type Comparator with Dual Gage Heads

### SPECIFICATIONS

Model No.	GBCD-100A
Order No.	565-160A
Resolution	0.00001mm (0.01 $\mu$ m) / .000001"
Range	0.5mm - 100mm / .02 - 4"
Measuring unit	Differential (dual-head) type Mu-Checker
Accuracy in narrow range (20°C)	$\pm(0.03+0.3L/1000)\mu\text{m}^*$ L = Gage block length (mm) *Uncertainty of measurement is 95% (not including the calibration error of the standard gage block).
Measuring force	Upper gage head: 1N (100gf) Lower gage head: 0.6N (60gf)
Air requirement	400kPa (4kgf/cm <sup>2</sup> )
Operating condition	Temperature: 20°C $\pm$ 1°C Humidity: 58%RH $\pm$ 15%RH
Dimensions (W x D x H)	Main unit: 710 x 366 x 783mm Electronic unit: 160 x 410 x 382mm
Mass	Main unit: 120kg Electronic unit: 14kg



### Standard Accessories

GBPAK-A (software)

### Optional Accessories

- 962723: Gage block set for probe calibration  
 962764: Gage block holder for probe calibration  
 611615-02: 5mm gage block (glade 0) for origin setting  
 243989: Auxiliary stage (size: 360 x 253mm)  
 218-007: Work bench PC System

The GBCD-100A Automatic Gage Block Comparator is an easy-to-operate dual-head type gage block inspecting system. It automatically compares workpieces with a standard gage block and determines accuracies of such as central length, maximum length, minimum length, and parallelism through the operation of an optional personal computer.



### Technical Data

Graduation: .00001" or 0.001mm  
 Counter resolution: .001" or 0.01mm  
 Character Height: .16" / 4mm  
 Micrometer Head  
 Travel stroke: 1" or 20mm  
 Pitch: .025"/rev or 0.5mm/rev  
 Hysteresis: .00004" or 1µm  
 Provided with inspection certificate.

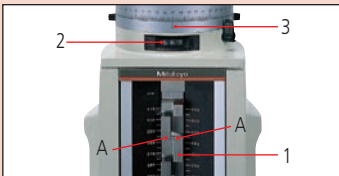
### Standard Accessories

Reference Block: 11mm for 515-322  
 Reference Block: .3" for 515-310, 515-311

### Optional Accessories

515-112: Auxiliary block kit for bore gage (mm)  
 515-119: Auxiliary block kit for bore gage (for 515-310)  
 515-121: Auxiliary block kit for bore gage (for 515-311)  
 \_\_\_\_\_: Riser block

### Reading



#### Height A

1. Scale 280. mm  
 2. Counter 5.67 mm  
 3. Thimble 0.000 mm

285.670 mm



# Height Master

## SERIES 515

### FEATURES

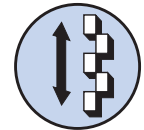
- Models with staggered arrangement of block stack have two measuring faces on the same level, one facing up and the other down (except for 515-310).
- Each Height Master is supplied with a gage block for zero-setting.
- Supplied in fitted wooden case.



515-322



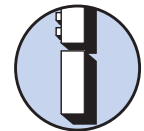
515-310



Staggered 20mm blocks (movable)



Vertical orientation



Riser block

### SPECIFICATIONS

#### Metric

Range (H)	Order No.	Block step	Graduation	Block Pitch Accuracy	Parallelism of Block	Micrometer Head Accuracy	Mass (kg)
5 < H ≤ 310mm	515-322	20mm (staggered)	0.001mm	±1.5µm	1µm	±1µm	23

#### Inch

Range (H)	Order No.	Block step	Graduation	Block Pitch Accuracy	Parallelism of Block	Micrometer Head Accuracy	Mass (kg)
.2" < H ≤ 12.2"	515-310	.5" (straight)	.00001"	±.00005"	.00004"	±.00005"	23
.2" < H ≤ 12.2"	515-311	1" (staggered)	.00001"	±.00005"	.00004"	±.00005"	23

# Digital Height Master

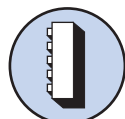
## SERIES 515

### FEATURES

- Standard model with a digital display, featuring all essential specifications required for versatile height standard.
- With SPC output.
- Each Height Master is supplied with a gage block for zero setting.



Staggered 20mm blocks (movable)



Vertical orientation



Riser block



### Technical Data

Resolution (LCD): .0001" or 0.001mm  
 Graduation: .0001" or 0.002mm  
 Character Height .21" / 5.4mm

### Micrometer Head

Travel Stroke: 1" or 20mm  
 Pitch: .025"/rev or 0.5mm/rev  
 Hysteresis: .0001" For all inch models  
 0.002mm for 300mm models  
 0.0025mm for 450 & 600mm models  
 Battery: SR44 (2 pcs.), **938882**  
 Battery life: Approx. 1.8 years under normal use

### Function

Zero-setting, Presetting, ABS/INC switching, Data hold, Data output, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error

### Standard Accessories

Reference Block: 11mm for Metric Height Master  
 Reference Block: .6" for for Inch Height Master  
 Provided with inspection certificate.

### Optional Accessories

- 515-111:** Auxiliary block kit for bore gage (mm)
- 515-120:** Auxiliary block kit for bore gage (inch)
- : Riser block (see page E-27.)
- 959149:** SPC cable (40" / 1m)
- 959150:** SPC cable (80" / 2m)
- 050019:** Fitted Mohogany case for 12" / 300mm model
- 050059:** Fitted Mohogany case for 18" / 450mm model  
24" / 600mm model

## SPECIFICATIONS

### Metric

Range (H)	Order No.	Block step	Resolution	Block Pitch Accuracy	Parallelism	Micrometer Head Accuracy	Mass (kg)
10 < H ≤ 310mm	<b>515-374</b>	20mm (staggered)	0.001mm	±1.5µm	2µm	±2µm	9.5
10 < H ≤ 460mm	<b>515-376</b>	20mm (staggered)	0.001mm	±2.5µm	2.5µm	±2µm	13.6
10 < H ≤ 610mm	<b>515-378</b>	20mm (staggered)	0.001mm	±3.5µm	2.5µm	±2.5µm	16.0

### Inch/Metric

Range (H)	Order No.	Block step	Resolution	Block Pitch Accuracy	Parallelism	Micrometer Head Accuracy	Mass (kg)
.5" < H ≤ 12"	<b>515-375</b>	1" (staggered)	.0001" / 0.001mm	±.0001"	.00005"	±.0001"	9.5
.5" < H ≤ 18"	<b>515-377</b>	1" (staggered)	.0001" / 0.001mm	±.0001"	.0001"	±.0001"	13.6
.5" < H ≤ 24"	<b>515-379</b>	1" (staggered)	.0001" / 0.001mm	±.0001"	.0001"	±.0001"	16.0



# Riser Blocks

## SERIES 515

### FEATURES

- These riser blocks are specially designed for standard/Digimatic height masters.



### SPECIFICATIONS

Metric			
Height	Order No.	Accuracy of height	Mass (kg)
150mm	515-113	$\pm 0.6\mu\text{m}$	5.7
300mm	515-114	$\pm 1.0\mu\text{m}$	11.3
600mm	515-115	$\pm 2.0\mu\text{m}$	31

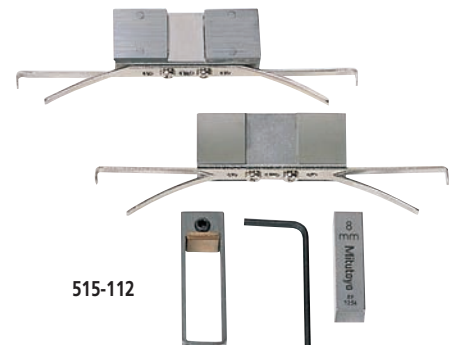
Inch			
Height	Order No.	Accuracy of height	Mass (kg)
6"	515-116	$\pm 20\mu\text{in}$	5.7
12"	515-117	$\pm 40\mu\text{in}$	11.3
24"	515-118	$\pm 80\mu\text{in}$	31

# Auxiliary Block Kit

## SERIES 515 — for Bore Gage

### FEATURES

- Used for efficient zero-setting of dial bore gages and tubular inside micrometers (18 - 150mm) on a Height Master.



Bore gage zero-setting



### SPECIFICATIONS

Metric	
Order No.	Applicable height master
515-110	Universal Height Master
515-111	Digimatic Height Master
515-112	Height Master

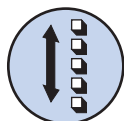
Inch	
Order No.	Applicable height master
515-119	Universal Height Master, Height Master (515-310)
515-120	Digimatic Height Master
515-121	Height Master (515-311)

# Universal Height Master

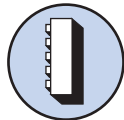
**SERIES 515 — Usable in Vertical and Horizontal Orientations**

## FEATURES

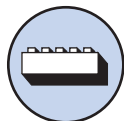
- The Universal Height Master is designed for both vertical and horizontal orientations, providing a wide range of applications such as accuracy checking of machine tool table movements.
- Fitted wooden case supplied.



Single-row 10mm blocks (movable)



Vertical orientation



Horizontal orientation



Riser block

515-520

## SPECIFICATIONS

### Metric

Range (R)	Order No.	Block step	Graduation	Block Pitch Accuracy	Parallelism of Block	Micrometer Head Accuracy	Mass (kg)
$5 < R \leq 610\text{mm}$	<b>515-520</b>	10mm (straight)	0.001mm	$\pm 1.5\mu\text{m}$	$1.0\mu\text{m}$	$\pm 1.2\mu\text{m}$	42
$5 < R \leq 1010\text{mm}$	<b>515-523</b>	10mm (straight)	0.001mm	$\pm 3.5\mu\text{m}$	$2.5\mu\text{m}$	$\pm 1.5\mu\text{m}$	63.5

### Inch

Range (R)	Order No.	Block step	Graduation	Block Pitch Accuracy	Parallelism of Block	Micrometer Head Accuracy	Mass (kg)
$.2" < R \leq 18.2"$	<b>515-512</b>	.5" (straight)	.00001"	$\pm .00005"$	.00006"	$\pm .00004"$	42
$.2" < R \leq 24.2"$	<b>515-510</b>	.5" (straight)	.00001"	$\pm .0001"$	.00006"	$\pm .00004"$	50
$.2" < R \leq 40.2"$	<b>515-513</b>	.5" (straight)	.00001"	$\pm .00015"$	.00008"	$\pm .00006"$	63.5



## Technical Data

Graduation: 0.001mm or .00001"  
 Counter Resolution: .001" or 0.01mm  
 Character Height: .16" / 4mm  
 Block arrangement: Straight arrangement

### Micrometer Head

Travel stroke: 1" or 20mm  
 Pitch: .025"/rev or 0.5mm/rev  
 Hysteresis: .00004" / 1.2 $\mu\text{m}$  up to 24.2" / 610mm  
 .00006" / 1.5 $\mu\text{m}$  for 40.2" / 1010mm

Block pitch accuracy:  $\pm 1.5\mu\text{m}$  ( $0 < R \leq 310\text{mm}$ )  
 $\pm 2.5\mu\text{m}$  ( $310 < R \leq 610\text{mm}$ )  
 $\pm 3.5\mu\text{m}$  ( $610 < R \leq 1010\text{mm}$ )

Parallelism of blocks:  $1.0\mu\text{m}$  ( $0 < R \leq 310\text{mm}$ )  
 $2.5\mu\text{m}$  ( $310 < R \leq 1010\text{mm}$ )

Provided with inspection certificate.

## Optional Accessories

- 900574:** Supporting base for vertical operation  
 Mass: 3kg  
 (\*supplied as a standard for **515-523** and **515-513**)
- 515-112:** Auxiliary block kit for bore gage (mm)  
**515-119:** Auxiliary block kit for bore gage (inch)



Using in horizontal orientation



Supporting base



# High Accuracy Check Master HMC-H

## SERIES 515

### Technical Data

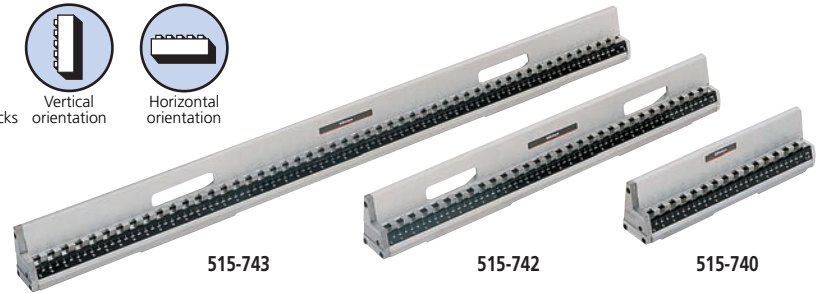
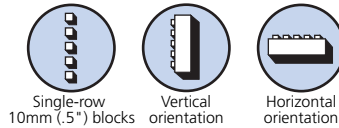
Measuring range (R): Refer to the list of specifications.  
 Block pitch accuracy:  $\pm 1.2\mu\text{m}$  ( $0 < R \leq 310\text{mm}$ )  
 $\pm 1.8\mu\text{m}$  ( $310 < R \leq 610\text{mm}$ )  
 $\pm 2.5\mu\text{m}$  ( $610 < R \leq 1010\text{mm}$ )  
 $\pm 4.0\mu\text{m}$  ( $1010 < R \leq 1510\text{mm}$ )  
 Parallelism of blocks:  $1.0\mu\text{m}$  ( $0 < R \leq 450\text{mm}$ )  
 $1.5\mu\text{m}$  ( $450 < R \leq 1010\text{mm}$ )  
 $2.0\mu\text{m}$  ( $1010 < R \leq 1510\text{mm}$ )  
 Provided with inspection certificate.

### FEATURES

- Designed to check the accuracy of table movements of machine tools and calibrate CMMs. Permanently wrung stack of gage blocks is housed in a rigid frame.
- Can be used in either vertical and horizontal orientation.
- Fitted wooden case supplied.

### Specifications for Ceramic Check Master:

- Each measuring block is made of zirconia-based ceramic that requires no anti-corrosion treatment for measuring faces.
- Free from deterioration and dimensional changes over time.



### SPECIFICATIONS

#### Metric

Range (R)	Order No.		Pitch		Accuracy of block pitch for the range shown below as measured from the bottom block				Length	Parallelism	Mass (kg)
	Steel	Ceramic	P	P	up to 300mm	300-600mm	600-1000mm	1000-1500mm			
300mm	515-740	515-760	20mm	10mm	$\pm 1.2\mu\text{m}$	—	—	—	331mm	$1\mu\text{m}$	3.6
450mm	515-741	515-761	20mm	10mm	$\pm 1.2\mu\text{m}$	$\pm 1.8\mu\text{m}$	—	—	482mm	$1\mu\text{m}$	5.4
600mm	515-742	515-762	20mm	10mm	$\pm 1.2\mu\text{m}$	$\pm 1.8\mu\text{m}$	—	—	631mm	$1.5\mu\text{m}$	7.2
1000mm	515-743	515-763	20mm	10mm	$\pm 1.2\mu\text{m}$	$\pm 1.8\mu\text{m}$	$\pm 2.5\mu\text{m}$	—	1037mm	$1.5\mu\text{m}$	12.0
1500mm	515-744	515-764	20mm	10mm	$\pm 1.2\mu\text{m}$	$\pm 1.8\mu\text{m}$	$\pm 2.5\mu\text{m}$	$\pm 4.0\mu\text{m}$	1546mm	$2\mu\text{m}$	18.0

#### Inch

Range (R)	Order No.		Pitch		Accuracy of block pitch for the range shown below as measured from the bottom block				Length	Parallelism	Mass (kg)
	Steel	Ceramic	P	P	up to 12"	12-24"	24-40"	40-60"			
12"	515-730	515-750	1"	.5"	$\pm 50\mu\text{in}$	—	—	—	13.0"	$40\mu\text{in}$	3.4
18"	515-731	515-751	1"	.5"	$\pm 50\mu\text{in}$	$\pm 70\mu\text{in}$	—	—	19.0"	$40\mu\text{in}$	5.2
24"	515-732	515-752	1"	.5"	$\pm 50\mu\text{in}$	$\pm 70\mu\text{in}$	—	—	25.0"	$60\mu\text{in}$	6.9
40"	515-733	515-753	1"	.5"	$\pm 50\mu\text{in}$	$\pm 70\mu\text{in}$	$\pm 100\mu\text{in}$	—	41.0"	$60\mu\text{in}$	11.5
60"	515-734	515-754	1"	.5"	$\pm 50\mu\text{in}$	$\pm 70\mu\text{in}$	$\pm 100\mu\text{in}$	$\pm 158\mu\text{in}$	61.5"	$80\mu\text{in}$	17.3

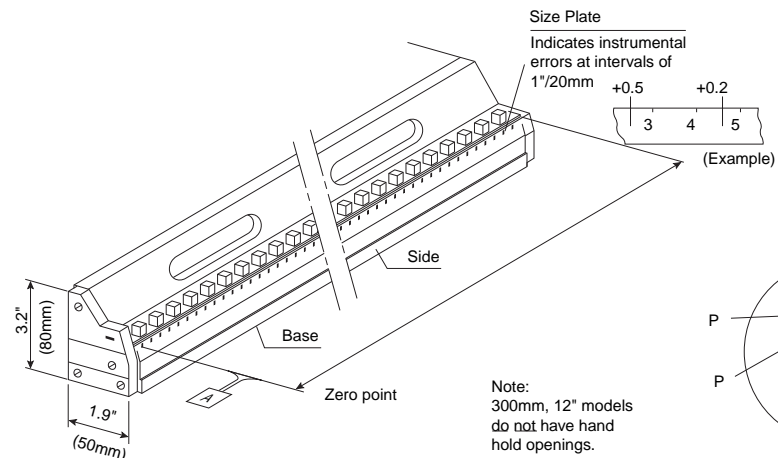
### Optional Accessories

**601167:** Supporting base for vertical operation  
 (\*supplied as a standard for 515-523 and 515-513)

Dimensions: 14.2"(W) x 8.7"(D) x 8.3"(H)  
 360mm(W) x 220mm(D) x 210mm(H)  
 Mass: 3kg



Supporting base



# CERA Straight Master SM-C

## SERIES 311 — Straightness Measuring Instrument

### FEATURES

CERA Straight master is a master gage used for the straightness inspection of each axis movement such as a CMM, machine tool, semiconductor related equipment and form measuring machine.

- Made from Alumina ceramic
- 50mm/2" pitch gradation scales
- Precision lapped measuring surface
- Double faced type is lapping the double face which can be used for straightness in horizontal and vertical as a reference square.
- Lightweight
- Supplied with fitted wooden case.



### SPECIFICATIONS

Metric		Inch		High accuracy model		
Nominal length	Order No.*	Nominal length	Order No.*	Straightness	Size (L x H x W)	Mass
400mm	311-302-33	16"	311-322-33	0.3μm	440 x 35 x 50mm	1.8kg
700mm	311-305-33	28"	311-325-33	0.5μm	740 x 35 x 50mm	3kg
1000mm	311-307-33	40"	311-327-33	1.0μm	1040 x 45 x 80mm	8kg
1300mm	311-309-33	52"	311-329-33	1.5μm	1340 x 45 x 80mm	10kg

Metric		Inch		Ultra high accuracy model		
Nominal length	Order No.*	Nominal length	Order No.*	Straightness	Size (L x H x W)	Mass
400mm	311-332-33	16"	311-342-33	0.2μm	440 x 35 x 50mm	1.8kg
700mm	311-335-33	28"	311-345-33	0.4μm	740 x 35 x 50mm	3kg
1000mm	311-337-33	40"	311-347-33	0.5μm	1040 x 45 x 80mm	8kg
1300mm	311-339-33	52"	311-349-33	0.7μm	1340 x 45 x 80mm	10kg

Double faced type



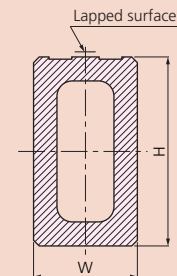
### SPECIFICATIONS

Metric		Inch		Double faced model		
Nominal length	Order No.*	Nominal length	Order No.*	Straightness	Size (L x H x W)	Mass
400mm	311-352-33	16"	311-362-33	0.3μm	440 x 45 x 80mm	3.2kg
700mm	311-355-33	28"	311-365-33	0.5μm	740 x 45 x 80mm	5.5kg
1000mm	311-357-33	40"	311-367-33	1.0μm	1040 x 45 x 80mm	8kg
1300mm	311-359-33	52"	311-369-33	1.5μm	1340 x 45 x 80mm	10kg

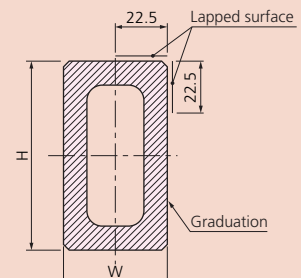
### Technical Data

Provided with inspection certificate.

### Cross section



### Double faced type



# Square Master

## SERIES 311 — Squareness / Straightness Measuring Instrument

### Technical Data

Squareness: Refer to the list of specifications  
 Straightness: Refer to the list of specifications  
 Dial test indicator provided  
 Range: 0.2mm  
 Graduation: 0.002mm  
 Accuracy: 3µm

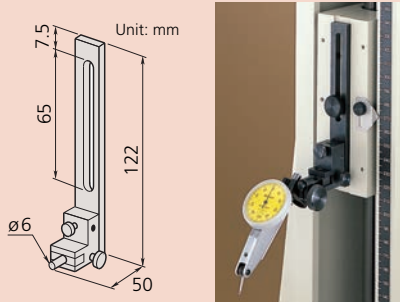
### Optional Accessory

—: Riser blocks (see page E-27.)\*  
**517-665:** Granite square, 45 (W) x 140 (D) x 280 (H) mm  
**900571:** Adjustable holder  
**900551:** Extension holder  
**900565:** Feeler\*\*

\*Not available for 450mm model.  
 \*\*Adapter (902803) is required for metric model.

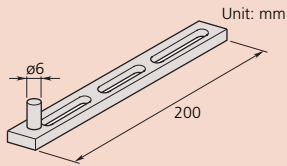
### Adjustable holder

No.900571



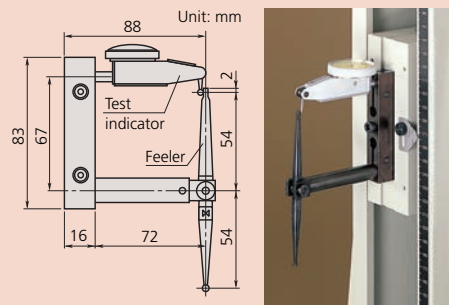
### Extension holder

No.900551



### Feeler

No.900565



### FEATURES

- Squareness (perpendicularity) and straightness measurements can be performed accurately and efficiently by moving a lever.
- With a dial test indicator for reading displacements.
- Its own squareness is adjustable for high accuracy measurement.



311-215



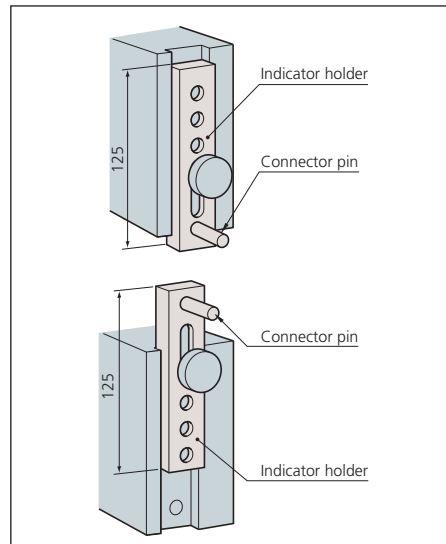
311-225



311-245

### SPECIFICATIONS

Metric				
Vertical travel	Order No.	Squareness	Straightness	Mass (kg)
150mm	<b>311-215</b>	3µm	2µm	13.7
250mm	<b>311-225</b>	6µm	2.5µm	16.2
450mm	<b>311-245</b>	9µm	3.5µm	24



# Standard Scales

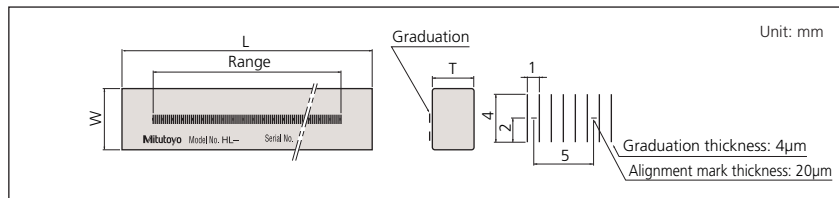
**SERIES 182 — Made of Low Expansion Glass**

## FEATURES

- High precision glass scales manufactured under Mitutoyo's leading-edge Linear Scale production technology.
- High accuracy is guaranteed to be used as a standard for calibrating graduated scales.



## DIMENSIONS



## Technical Data

Accuracy (at 20°C):  $(0.5+L/1000)\mu\text{m}$ ,  
 L = Measured length (mm)  
 Glass material: Low expansion glass  
 Thermal expansion coefficient:  $8 \times 10^{-6}/\text{K}$   
 Graduation: 1mm  
 Graduation thickness: 4µm  
 Mass: 0.75kg (250mm), 1.8kg (500mm)

## SPECIFICATIONS

### Metric

Range	Order No.	L	W	T
250mm	<b>182-501-50</b>	280mm	20mm	10mm
250mm	<b>182-501-60*</b>	280mm	20mm	10mm
500mm	<b>182-502-50</b>	530mm	30mm	20mm
500mm	<b>182-502-60*</b>	530mm	30mm	20mm

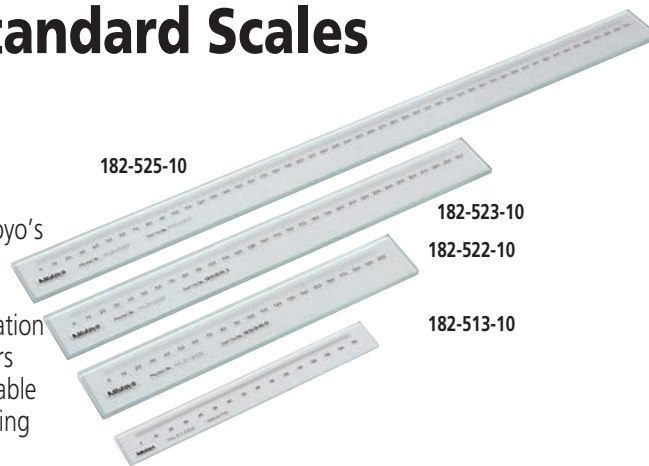
\*with English JCSS certificate.

# Working Standard Scales

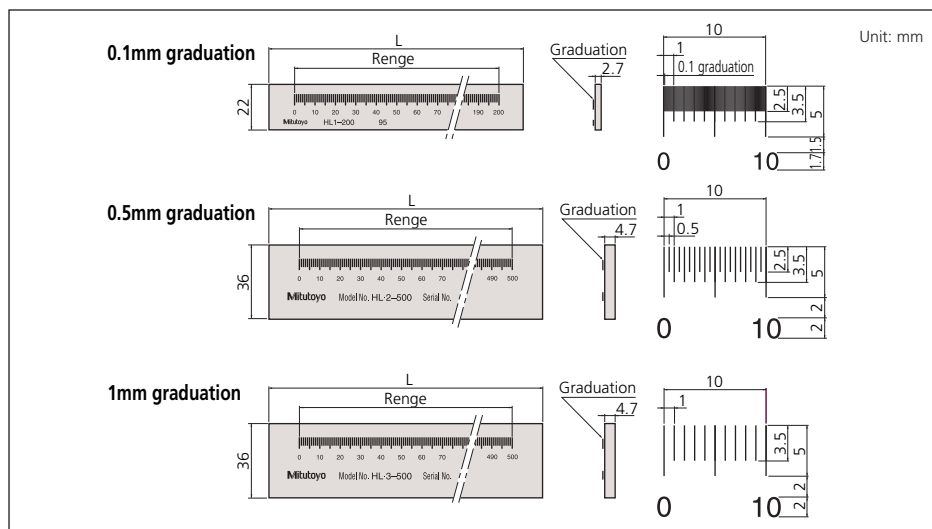
**SERIES 182**

## FEATURES

- High precision glass scales manufactured under Mitutoyo's leading-edge Linear Scale production technology.
- Ideal for checking magnification accuracy of profile projectors and microscopes, and the table feeding accuracy of measuring equipment.



## DIMENSIONS



## Technical Data

Accuracy (at 20°C):  $(1.5+2L/1000)\mu\text{m}$ ,  
 L = Measured length (mm)  
 Glass material: Sodium glass  
 Thermal expansion coefficient:  $8.5 \times 10^{-6}/\text{K}$   
 Graduation: 0.1mm (thickness: 20µm)  
 0.5mm (thickness: 50µm)  
 1mm (thickness: 100µm)

## SPECIFICATIONS

### Metric

Range	Order No.	Graduation	L	Mass
50mm	<b>182-511-10</b>	0.1mm	75mm	0.23kg
100mm	<b>182-512-10</b>	0.1mm	125mm	0.24kg
150mm	<b>182-513-10</b>	0.1mm	175mm	0.35kg
200mm	<b>182-514-10</b>	0.1mm	225mm	0.36kg
100mm	<b>182-521-10</b>	0.5mm	130mm	0.27kg
200mm	<b>182-522-10</b>	0.5mm	230mm	0.32kg
300mm	<b>182-523-10</b>	0.5mm	330mm	0.57kg
400mm	<b>182-524-10</b>	0.5mm	430mm	0.71kg
500mm	<b>182-525-10</b>	0.5mm	530mm	0.86kg
250mm	<b>182-531-10</b>	1mm	280mm	0.55kg
500mm	<b>182-532-10</b>	1mm	530mm	0.86kg
750mm	<b>182-533-10</b>	1mm	780mm	1.22kg
1000mm	<b>182-534-10</b>	1mm	1030mm	1.54kg

# Steel Squares

## SERIES 916

Regular type and beveled-edge type steel squares.

All edges are hardened and precision ground. (Only blade is hardened on engineers Square)

### SPECIFICATIONS

#### Beveled Edge Squares

Inch

Size	Order No.	Outside Dim.	Squareness
2"	916-100	2 x 1.6"	.00010"
3"	916-101	3 x 2"	.00011"
4"	916-102	4 x 2.75"	.00012"
6"	916-103	6 x 4"	.00014"
8"	916-104	8 x 5"	.00018"

#### Regular Squares

Inch

Size	Order No.	Outside Dim.	Squareness
3"	916-401	2.9 x 1.9"	.00026"
4"	916-402	3.9 x 2.7"	.00028"
6"	916-403	5.9 x 3.9"	.00032"
8"	916-404	7.8 x 5.1"	.00036"
10"	916-405	9.8 x 6.5"	.00040"
12"	916-406	11.8 x 7.8"	.00044"
16"	916-407	15.7 x 9.8"	.00052"
20"	916-408	19.6 x 11.8"	.00059"
30"	916-409	29.7 x 15.7"	.00080"
40"	916-410	39.3 x 19.6"	.00116"

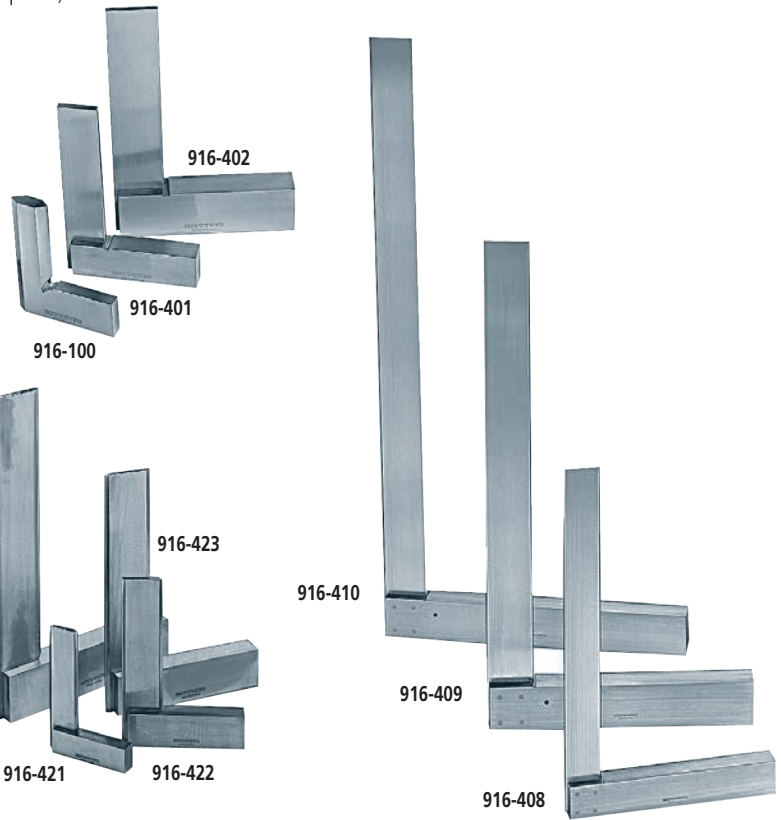
#### Regular Squares "Engineers Square"

Size	Order No.	Outside Dim.	Squareness
2"	916-590	2.70 x 1.98"	.00063"
3"	916-591	3.73 x 2.38"	.00063"
4"	916-592	4.65 x 2.97"	.00063"
6"	916-593	6.85 x 3.93"	.00063"
9"	916-594	10.50 x 6.30"	.0008"
12"	916-595	13.63 x 8.25"	.001"
18"	916-596	20.25 x 10.50"	.0012"
24"	916-597	26.83 x 13.35"	.0015"
2, 3, 4, 6" Set	916-598		
4, 6, 9, 12" Set	916-599		

#### Beveled Edge Squares with Beam

Inch

Size	Order No.	Outside Dim.	Squareness
3"	916-421	3 x 2"	.000091"
4"	916-422	4 x 2.75"	.000094"
6"	916-423	6 x 4"	.00010"
8"	916-424	8 x 5"	.00011"



# High Precision Square

## SERIES 311

### FEATURES

The High Precision Square is a gage used for inspecting the travel straightness and axial perpendicularity of moving elements on equipment such as machine tools, CMMs, form measuring machines and semiconductor related equipment.

- Four precision-lapped reference surfaces.
- Better than 1µm/300mm straightness and perpendicularity.

### SPECIFICATIONS

Metric

Order No.	Dimension (W x L x T)	Mass
311-111	90 x 110 x 25mm	1.5kg
311-112	160 x 210 x 25mm	5.0kg
311-113	260 x 310 x 30mm	14.0kg

\* 311-113 is supplied with a removable handle.



311-111



311-112



311-113

# Knife Edge Straight Edge

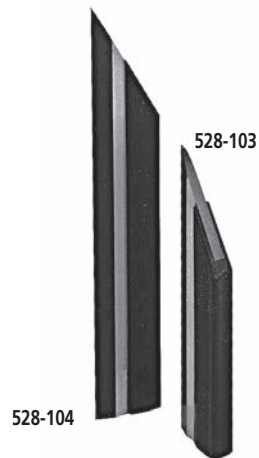
## SERIES 528

The test edge is approximately .004" in thickness, a cross section of which has radius to provide a straight line contact with the work surface. Straightness is  $\pm .00005"$ .

For ease of inspection, the blade is dyed in black, and the upper edge is covered with a grip plate. The acute angle is 30 degrees.

### SPECIFICATIONS

Length	Order No.	Remarks
4"	528-102	with protective cover
6"	528-103	with protective cover
8"	528-104	with protective cover
10"	528-105	with protective cover

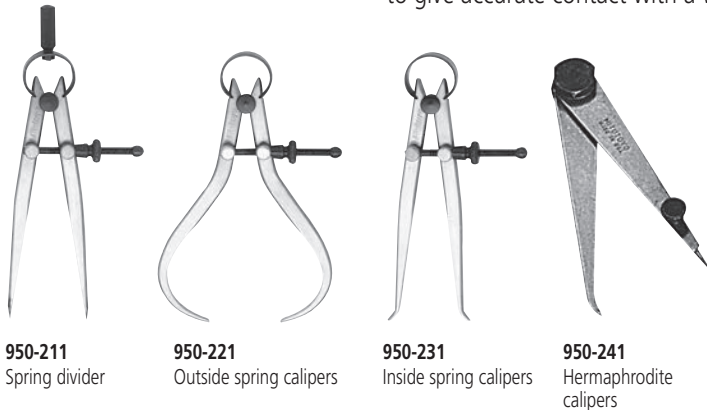


# Spring Dividers and Calipers

## SERIES 950

### FEATURES

- Spring Divider — Fully hardened and tempered joints, spring, washers and divider points.
- Outside Spring Caliper — Contact ends fully rounded to give accurate dimensions.
- Inside Spring Caliper — Ends fully rounded to give accurate contact with a workpiece.



950-211  
Spring divider

950-221  
Outside spring calipers

950-231  
Inside spring calipers

950-241  
Hermaphrodite calipers

### SPECIFICATIONS

Range	Order No.			
	Spring divider	Outside spring calipers	Inside spring calipers	Hermaphrodite calipers
4" (100mm)	950-211	950-221	950-231	950-241
6" (150mm)	950-212	950-222	950-232	950-242
8" (200mm)	950-213	950-223	950-233	
10" (250mm)	950-214	950-224	950-234	
12" (300mm)	950-215	950-225	950-235	
6" (150mm)	—	—	950-236*	—

\* Quick nut model.



# Combination Square Set

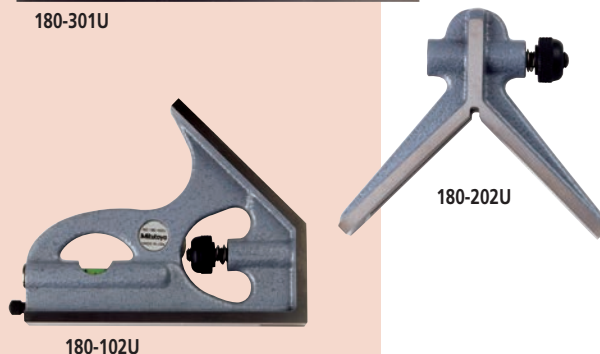
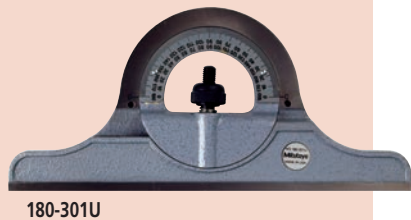
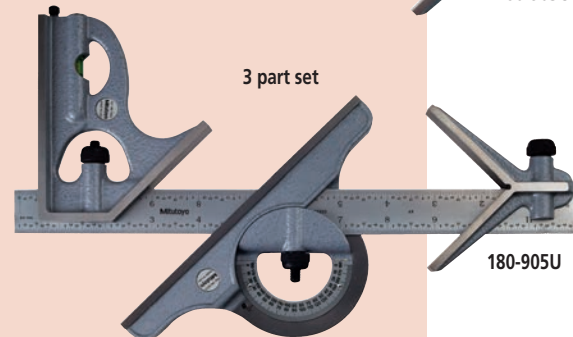
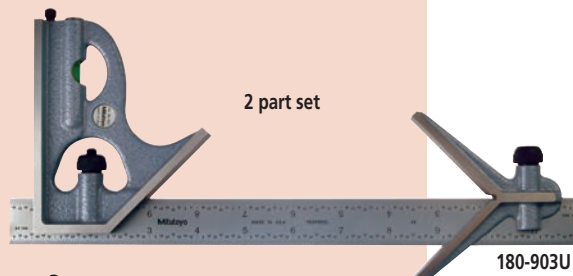
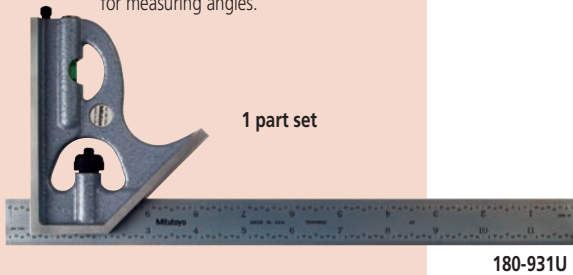
## SERIES 180

### Technical Data

- Square head:** Used to set the rule at 90 degrees or 45 degrees to edge of a workpiece.
- Center head:** Used to locate centers of round workpieces
- Protractor head:** Used to set the rule at a desired angle to an edge of a workpiece. Also used for measuring angles.

### FEATURES

- Measuring head are attached to the graduated steel rule (blade), allowing versatile measurements on various types of workpieces
- The measuring head come hardened or cast iron-not-hardened
- Economy sets not including a protractor head are also available



### SPECIFICATIONS

**Head Only**  Hardened

Order No.	Description
180-102U	Square Head for 12"/300mm to 24"/600mm
180-202U	Center Head for 12"/300mm to 24"/600mm

**Head Only**  Cast iron-not hardened

Order No.	Description
180-112U	Square Head for 12"/300mm to 24"/600mm
180-212U	Center Head for 12"/300mm to 24"/600mm
180-301U	Protractor Head for 12"/300mm to 24"/600mm
180-113U	Double Square Head for 4"/100mm and 6"/150mm

**Inch/Metric**  Hardened Combination Square Sets

Set No.	Blade		Square Head	Center Head	Protractor Head	
	Size	Type				
180-903U	12"	4R	180-501U	180-102U	180-202U	-
180-904U	12"	16R	180-502U	180-102U	180-202U	-
180-905U	12"	4R	180-501U	180-102U	180-202U	180-301U*
180-906U	12"	16R	180-502U	180-102U	180-202U	180-301U*
180-907U	12"/300mm	E/M	180-503U	180-102U	180-202U	180-301U*
180-910U	300mm	Metric	180-505U	180-102U	180-202U	180-301U*
180-931U	12"	4R	180-501U	180-102U	-	-
180-932U	12"	16R	180-502U	180-102U	-	-
180-933U	12"/300mm	E/M	180-503U	180-102U	-	-
180-934U	300mm	Metric	180-505U	180-102U	-	-

\*Cast iron-not hardened

**Inch/Metric**  Cast iron-not hardened Combination Square Sets

Set No.	Blade		Square Head	Center Head	Protractor Head	
	Size	Type				
180-803U	12"	4R	180-501U	180-112U	180-212U	-
180-804U	12"	16R	180-502U	180-112U	180-212U	-
180-805U	12"	4R	180-501U	180-112U	180-212U	180-301U
180-806U	12"	16R	180-502U	180-112U	180-212U	180-301U
180-807U	12"/300mm	E/M	180-503U	180-112U	180-212U	180-301U
180-810U	300mm	Metric	180-505U	180-112U	180-212U	180-301U
180-831U	12"	4R	180-501U	180-112U	-	-
180-832U	12"	16R	180-502U	180-112U	-	-
180-833U	12"/300mm	E/M	180-503U	180-112U	-	-
180-834U	300mm	Metric	180-505U	180-112U	-	-

\*Cast iron-not hardened

# Combination Square Set

## SERIES 180

### FEATURES

- Three measuring heads are attached to the stainless steel rule (blade), allowing versatile measurements on various types of workpieces.
- The measuring heads are hardened.
- Economy sets not including a protractor head are also available.

### Technical Data

- Square head: Used to set the rule at 90 degrees or 45 degrees to an edge of a workpiece.
- Center head: Used to locate centers of round workpieces
- Protractor head: Used to set the rule at a desired angle to an edge of a workpiece. Also used for measuring angles.

### SPECIFICATIONS

Inch / Metric		Blades only		
Order No.	Length	Graduations	Accuracy (length)	
180-406U	4"	8, 16, 32, 64ths (4R)	+0.004" (+0.1mm) -0.0035" (-0.09mm)	
180-407U	4"	32, 64, 50, 100ths (16R)		
180-408U	4" x 100mm	32, 64ths, 1, 0.5mm		
180-409U	100mm	1, .5, 1, 0.5mm		
180-401U	6"	8, 16, 32, 64ths (4R)		
180-402U	6"	32, 64, 50, 100ths (16R)		
180-403U	6" x 150mm	32, 64ths, 1, 0.5mm		
180-405U	150mm	1, .5, 1, 0.5mm		
180-501U	12"	8, 16, 32, 64ths (4R)		+0.005" (+0.13mm) -0.0035" (-0.09mm)
180-502U	12"	32, 64, 50, 100ths (16R)		
180-503U	12" x 300mm	32, 64ths, 1, 0.5mm		
180-505U	300mm	1, .5, 1, 0.5mm		
180-701U	18"	8, 16, 32, 64ths (4R)		
180-702U	18"	32, 64, 50, 100ths (16R)		
180-703U	18" x 450mm	32, 64ths, 1, 0.5mm		
180-705U	450mm	1, .5, 1, 0.5mm		
180-601U	24"	8, 16, 32, 64ths (4R)	+0.007" (+0.18mm) -0.0035" (-0.09mm)	
180-602U	24"	32, 64, 50, 100ths (16R)		
180-603U	24" x 600mm	32, 64ths, 1, 0.5mm		
180-605U	600mm	1, .5, 1, 0.5mm		

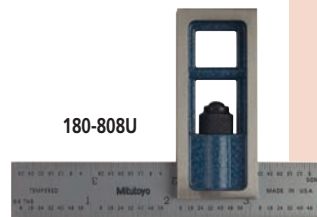


180-501U

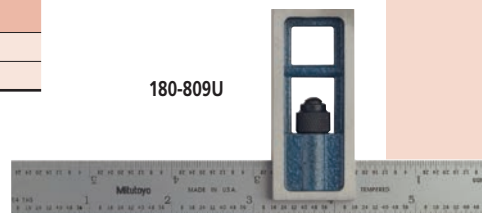
# Double Square Set

## SERIES 180

Set Order No.	Blade		Double Square Head	
	Size	Type	Order No.	Order No.
180-808U	4"	4R	180-406U	180-113U
180-809U	6"	4R	180-401U	180-113U



180-808U



180-809U

# Steel Rules

## SERIES 182

### FEATURES

- Clear graduations on satin-chrome finish.
- Stainless tempered.



182-125



182-110

### SPECIFICATIONS

#### Wide Rigid Rules (thickness 3/64")

Order No.	Black Chrome Rule Order No.	Size	Graduations				Width	Accuracy (Length)
182-101	182-109	6"(4R)	1/8	1/16	1/32	1/64th	3/4"	+0.004" / -0.0035" (+0.1mm / -0.09mm)
182-102	182-112	6"(16R)	1/32	1/64	1/50	1/100th	3/4"	
182-103	182-110	6"(5R)	1/32	1/64	1/10	1/100th	3/4"	
182-104	182-113	6"(3R)	1/32	1/64	1/10	1/50th	3/4"	
182-105	182-114	6" x 150mm	1/32	1/64	1mm	0.5mm	3/4"	
182-106	—	6" x 150mm	1/50	1/100	1mm	0.5mm	3/4"	
182-107	—	6" x 150mm	1/10	1/100	1mm	0.5mm	3/4"	
182-108	—	6" x 150mm	1/10	1/50	1mm	0.5mm	3/4"	
182-111	182-115	150mm	1mm	0.5mm	1mm	0.5mm	19mm	
182-112	182-127	12"(4R)	1/8	1/16	1/32	1/64th	1"	
182-122	182-129	12"(16R)	1/32	1/64	1/50	1/100th	1"	
182-123	182-128	12"(5R)	1/32	1/64	1/10	1/100th	1"	
182-124	—	12"(3R)	1/32	1/64	1/10	1/50th	1"	
182-125	182-130	12" x 300mm	1/32	1/64	1mm	0.5mm	1"	
182-126	—	12" x 300mm	1/50	1/100	1mm	0.5mm	1"	
182-131	182-132	300mm	1mm	0.5mm	1mm	0.5mm	25mm	
182-241	182-146	18"(4R)	1/8	1/16	1/32	1/64	13/16"	+0.006" / -0.0035" (+0.15mm / -0.09mm)
182-142	182-148	18"(16R)	1/32	1/64	1/50	1/100th	13/16"	
182-143	182-147	18"(5R)	1/32	1/64	1/10	1/100th	13/16"	
182-144	—	18"(3R)	1/32	1/64	1/10	1/50th	13/16"	
182-145	—	18" x 450mm	1/32	1/64	1mm	0.5mm	13/16"	
182-151	—	450mm	1mm	0.5mm	1mm	0.5mm	30mm	
182-161	182-166	24"(4R)	1/8	1/16	1/32	1/64	13/16"	+0.007" / -0.0035" (+0.18mm / -0.09mm)
182-162	182-168	24"(16R)	1/32	1/64	1/50	1/100th	13/16"	
182-163	182-167	24"(5R)	1/32	1/64	1/10	1/100th	13/16"	
182-164	—	24"(3R)	1/32	1/64	1/10	1/50th	13/16"	
182-165	—	24" x 600mm	1/32	1/64	1mm	0.5mm	13/16"	
182-171	—	600mm	1mm	0.5mm	1mm	0.5mm	30mm	
182-401	—	36"(4R)	1/8	1/16	1/32	1/64	1 1/4"	
182-403	—	36"(16R)	1/32	1/64	1/50	1/100th	1 1/4"	
182-405	—	36"(5R)	1/32	1/64	1/10	1/100th	1 1/4"	
182-406	—	36" x 900mm	1/32	1/64	1mm	0.5mm	1 1/4"	
182-402	—	48"(4R)	1/8	1/16	1/32	1/64	1 1/4"	+0.008" / -0.004" (+0.2mm / -0.1mm)
182-404	—	48"(16R)	1/32	1/64	1/50	1/100th	1 1/4"	
182-407	—	48" x 1219.2mm	1/32	1/64	1mm	0.5mm	1 1/4"	

# Steel Rules

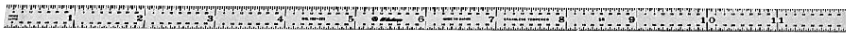
## SERIES 182

### FEATURES

- Clear graduations on satin-chrome finish.
- Stainless tempered.



182-265



182-223

### SPECIFICATIONS

#### Full-Flexible Rules (thickness 1/64")

Order No.	Black Chrome Rule Order No.	Size	Graduations				Width	Accuracy (Length)
182-201	182-212	6"(4R)	1/8	1/16	1/32	1/64th	1/2"	+0.004" / -0.0035" (+0.1mm / -0.09mm)
182-202	182-214	6"(16R)	1/32	1/64	1/50	1/100th	1/2"	
182-203	182-213	6"(5R)	1/32	1/64	1/10	1/100th	1/2"	
182-204	182-215	6"(3R)	1/32	1/64	1/10	1/50th	1/2"	
182-205	182-216	6" x 150mm	1/32	1/64	1mm	0.5mm	1/2"	
182-206	—	6" x 150mm	1/50	1/100	1mm	0.5mm	1/2"	
182-207	—	6" x 150mm	1/10	1/100	1mm	0.5mm	1/2"	
182-208	—	6" x 150mm	1/10	1/50	1mm	0.5mm	1/2"	
182-211	182-209	150mm	1mm	0.5mm	1mm	0.5mm	12mm	+0.005" / -0.0035" (+0.13mm / -0.09mm)
182-221	182-217	12"(4R)	1/8	1/16	1/32	1/64th	1/2"	
182-222	182-219	12"(16R)	1/32	1/64	1/50	1/100th	1/2"	
182-223	182-218	12"(5R)	1/32	1/64	1/10	1/100th	1/2"	
182-224	—	12"(3R)	1/32	1/64	1/10	1/50th	1/2"	
182-225	182-220	12" x 300mm	1/32	1/64	1mm	0.5mm	1/2"	
182-226	—	12" x 300mm	1/50	1/100	1mm	0.5mm	1/2"	
182-231	182-210	300mm	1mm	0.5mm	1mm	0.5mm	12mm	
182-141	182-246	18"(4R)	1/8	1/16	1/32	1/64	3/4"	+0.006" / -0.0035" (+0.15mm / -0.09mm)
182-242	182-248	18"(16R)	1/32	1/64	1/50	1/100th	3/4"	
182-243	182-247	18"(5R)	1/32	1/64	1/10	1/100th	3/4"	
182-244	—	18"(3R)	1/32	1/64	1/10	1/50th	3/4"	
182-245	—	18" x 450mm	1/32	1/64	1mm	0.5mm	3/4"	
182-251	—	450mm	1mm	0.5mm	1mm	0.5mm	18mm	
182-261	182-266	24"(4R)	1/8	1/16	1/32	1/64	3/4"	+0.007" / -0.0035" (+0.18mm / -0.09mm)
182-262	182-268	24"(16R)	1/32	1/64	1/50	1/100th	3/4"	
182-263	182-267	24"(5R)	1/32	1/64	1/10	1/100th	3/4"	
182-264	—	24"(3R)	1/32	1/64	1/10	1/50th	3/4"	
182-265	—	24" x 600mm	1/32	1/64	1mm	0.5mm	3/4"	
182-271	—	600mm	1mm	0.5mm	1mm	0.5mm	18mm	

#### Flexible Rules

182-411	—	36"(4R)	1/8	1/16	1/32	1/64	3/4"	+0.007" / -0.0035" (+0.18mm / -0.09mm)
182-413	—	36"(16R)	1/32	1/64	1/50	1/100th	3/4"	
182-415	—	36"(5R)	1/32	1/64	1/10	1/100th	3/4"	
182-416	—	36" x 900mm	1/32	1/64	1mm	0.5mm	3/4"	+0.008" / -0.004" (+0.2mm / -0.1mm)
182-412	—	48"(4R)	1/8	1/16	1/32	1/64	3/4"	
182-414	—	48"(16R)	1/32	1/64	1/50	1/100th	3/4"	

# Semi-Flexible Rules

## SERIES 182

### FEATURES

- Engraved on frontside only



182-304

### SPECIFICATIONS

Inch/Metric								
Order No.	Size	Graduations					Width	Accuracy (Length)
182-301	4" x 100mm	1/2mm	1mm	1/32	1/64	1/16th	5/8"	+0.004" / -0.0035"
182-302	6" x 150mm	1/2mm	1mm	1/32	1/64	1/16th	5/8"	(+0.1mm / -0.09mm)
182-303	8" x 200mm	1/2mm	1mm	1/32	1/64	1/16th	5/8"	
182-304	10" x 250mm	1/2mm	1mm	1/32	1/64	1/16th	5/8"	+0.005" / -0.0035"
182-305	12" x 300mm	1/2mm	1mm	1/32	1/64	1/16th	5/8"	+0.13mm / -0.09mm)
182-307	20" x 500mm	1/2mm	1mm	1/32	1/64	1/16th	5/8"	+0.007" / -0.0035" (+0.18mm / -0.09mm)
182-309	40" x 1000mm	1/2mm	1mm	1/32	1/64	1/16th	5/8"	+0.008" / -0.004" (+0.2mm / -0.1mm)

# Hook Rules

## SERIES 182

### FEATURES

- Hardened and tempered tool steel.
- Hard chrome finish.
- Furnished with adjustable hook.



182-421

### SPECIFICATIONS

Order No.	Size	Graduations					Width	Accuracy (Length)
182-421	6" (4R)	1/8	1/16	1/32	1/64	3/4"	+0.004" / -0.0035"	
182-422	12" (4R)	1/8	1/16	1/32	1/64	1"	+0.005" / -0.0035"	
182-423	18" (4R)	1/8	1/16	1/32	1/64	1-1/8"	+0.006" / -0.0035"	
182-424	24" (4R)	1/8	1/16	1/32	1/64	1-1/8"	+0.007" / -0.0035"	

# Pocket Steel Rule

## SERIES 950

### FEATURES

- Engraved on frontside only.
- Backside: Inch/Metric equivalents



950-300

### SPECIFICATIONS

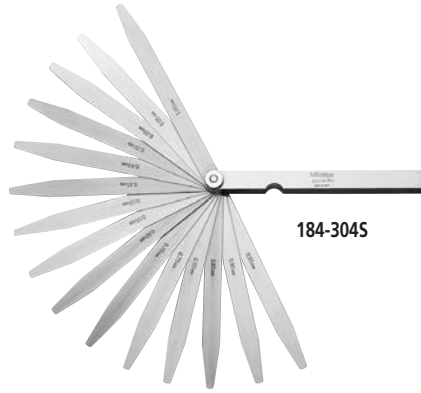
Order No.	Size	Graduation		Width	Accuracy (Length)
950-300	6" x 150mm	1mm	1/64ths	1/2"	+0.004" / -0.0035" (+0.1mm / -0.09mm)
950-301	6"	1/32mths	1/64ths	1/2"	+0.004" / -0.0035"

# Thickness Gages

## SERIES 950, 184

### FEATURES

- Metric thickness gages are available with tapered leaves.
- Each leaf is marked with its thickness.
- Each leaf is detachable if necessary.



### SPECIFICATIONS

Inch				
Range	Order No.	Type of Blade	Blade Length	Composition of leaves
.002" - .035" (26 leaves)	950-251	Straight 1/2" width	3"	.002 thru .018" by .001" step plus .022, .024, .025, .028, .030, .032, .035"
.0015" - .025" (26 leaves)	950-252	Tapered 1/4" width at tip	3"	.002 thru .025" by .001" step plus .0015, .0025"
.0015" - .200" (15 leaves)	950-254	Straight 1/2" width	3"	.0015, .002, .003, .004, .006, .008, .010, .012, .015, .020, .030, .040, .075, .100, .200"
.0015" - .200" (13 leaves)	950-255	Straight 1/2" width	4.5"	.0015, .002, .003, .004, .006, .008, .010, .020, .030, .040, .075, .100, .200"
.0015" - .015" (8 leaves)	950-256	Straight 1/2" width	6"	.0015, .002, .003, .004, .008, .010, .012, .015"

Metric				
Range	Order No.	Type of Blade	Blade Length	Composition of leaves
0.05 - 1mm	184-313S	Straight 13mm width	100mm	28 leaves: 0.05 - 0.15mm by 0.01mm, 0.2 - 1mm by 0.05mm
	184-303S		150mm	28 leaves: 0.05 - 0.15mm by 0.01mm, 0.2 - 1mm by 0.05mm
0.05 - 1mm	184-304S	Straight 13mm width	150mm	20 leaves: 0.05 - 1mm by 0.05mm
	184-305S		100mm	13 leaves: 0.05 - 0.3mm by 0.05mm, 0.4 - 1mm by 0.1mm
0.05 - 1mm	184-301S	Straight 13mm width	150mm	13 leaves: 0.05 - 0.3mm by 0.05mm, 0.4 - 1mm by 0.1mm
	184-306S		100mm	10 leaves: 0.05 - 0.2mm by 0.05mm, 0.3 - 0.8mm by 0.1mm
0.05 - 0.8mm	184-308S	Straight 13mm width	150mm	10 leaves: 0.05 - 0.2mm by 0.05mm, 0.3 - 0.8mm by 0.1mm
	184-307S		Straight 13mm width	100mm
0.03 - 0.5mm	184-302S			150mm

### Technical Data

Accuracy of Leaves Thickness	Tolerance
<b>Nominal Thickness</b>	
Metric	
0.01mm to less than 0.06mm:	±0.003mm
0.06mm to less than 0.10mm:	±0.004mm
0.10mm to less than 0.35mm:	±0.005mm
0.35mm to less than 0.65mm:	±0.008mm
0.65mm to less than 3.0mm:	±0.01mm
Inch	
.0015 to less than .007":	±.0002"
.007 to less than .015":	±.0003"
.015 to less than .025":	±.0004"
.026 to less than .030":	±.00045"
.031 to less than .040":	±.0005"
.041 to less than .075":	±.00055"
.076 to less than .100":	±.0006"
.101 to less than .200":	±.00065"
.200" and over :	±.00075"

# Precision Levels

## SERIES 960

### FEATURES

- High precision longitudinal and transverse vials make it possible to check or level surfaces.

### SPECIFICATIONS

Order No.	Sensitivity	Accuracy	Dimensions (W x D x H)
960-703	0.02mm/m	±0.006mm	200 x 44 x 200mm

Order No.	Sensitivity	Accuracy	Dimensions		
			W	D	H
960-611	.0012"/12"	±.0006"	7.87"	1.73"	1.50"
960-612	.0006"/12"	±.0003"	7.87"	1.73"	1.50"
960-613	.00024"/12"	±.00017"	7.87"	1.73"	1.50"



960-611



960-703

# Digital Universal Protractor

## SERIES 187

### Technical Data

Range:	-360° to +360°
Tolerance:	±2' (±0.03°)
Repeatability:	1'
Resolution:	1' (0.01°)
Battery:	Lithium Battery
Battery life:	2,000 hours

### Function

Presetting

### Standard Accessories

- 12" Blade (Code No. 187-103)
- Battery (CR2032) (Part No. 055AA217)
- Clamp box for Inch Height Gage (Part No. 950749)
- Plastic Case

### Optional Accessories

- 187-104 6" blade
- 187-105 Acute angle attachment
- 950750 Clamp box for Metric Height Gage
- 905338 Connecting cable (40" / 1m)
- 905409 Connecting cable (80" / 2m)

### FEATURES

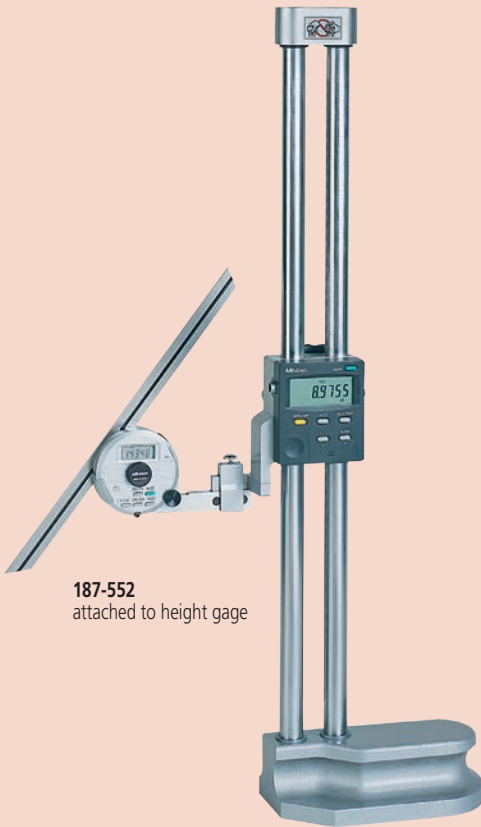
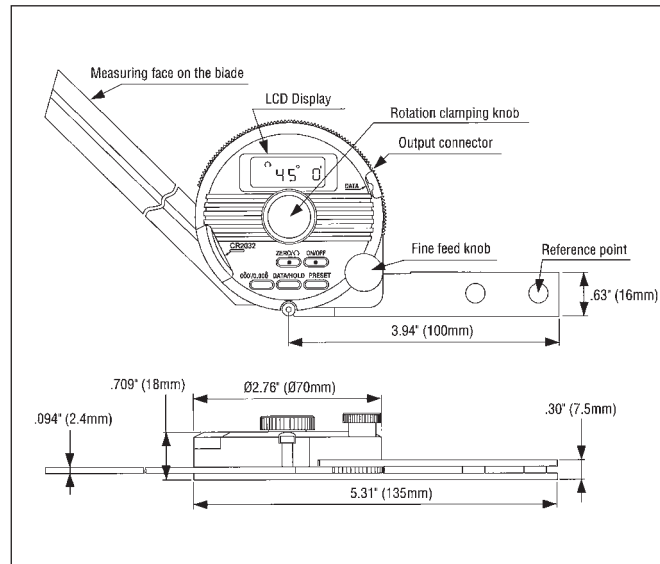
- Data output function make it easy to see the statistical data.
- Can be attached to height gages, gage holder (950750, metric)
- Setting preset value.
- Removable blade.



### SPECIFICATIONS

Code No.	187-552
Model	BP-D300E
Blade	12" (187-103)
Display	LCD - 5 digit, (-) sign, character height 6.5mm
Measuring range	-360° ~ +360°
Resolution	1' (0.01°)
Accuracy	± 2' (±0.03°)
Repeatability	1' (0.01°)
Mass	1.45 lbs (659g)
Dust / Water protection level	IP40
Function	Zero, Direction select, Data output / Data hold, Preset, Switchable Seagesimal or Decimal Notation
Max. response speed	3 rps
Battery	Lithium battery (CR2032) 1 pc. (Part No. 055AA217)
Battery life	2,000 hours
Alarm	Battery voltage low, Over speed error (Err)
Temperature	Operation temperature: 0 to 40°C Storage temperature: -10 to 60°C

### DIMENSIONS



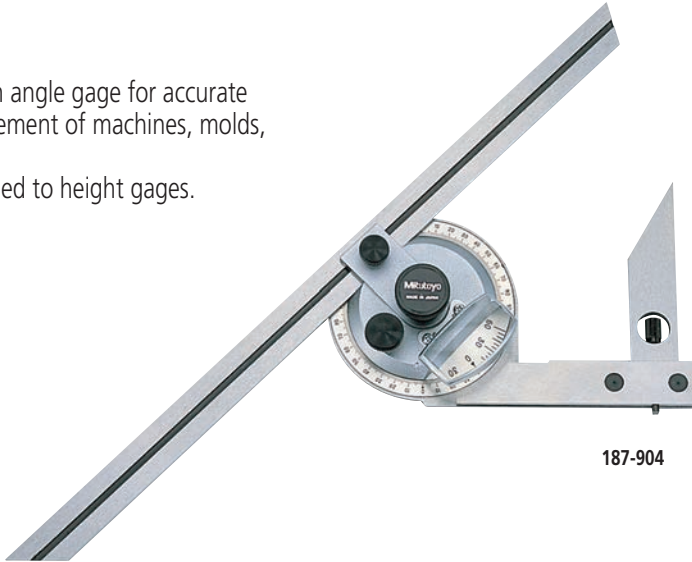
187-552  
attached to height gage

# Universal Bevel Protractor

## SERIES 187

### FEATURES

- High-precision angle gage for accurate angle measurement of machines, molds, and jigs.
- Can be attached to height gages.



187-904

### Technical Data

Graduation:	5min. (0° - 90° - 0°)
Accuracy	
Vernier	±5'
Straightness	[.00016" + (.00005xL/2)]"
Parallelism	[.00016" + (.00005xL/2)]"
L = Length in inch	
Diameter:	2.56" / 70mm

### SPECIFICATIONS

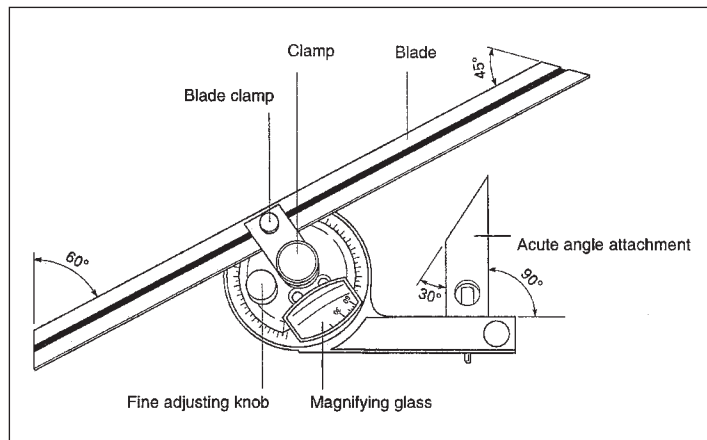
#### Universal Bevel Protractors

Graduation			
Order No.	Dial	Vernier	Remarks
187-904	1°	5 min	with 6" blade (187-104) and Clamp box for Inch Height Gages (950749)
187-906	1°	5min	with 12" blade (187-103) and Clamp box for Inch Height Gages (950749)

#### Universal Bevel Protractor Accessories and Parts

Order No.	Remarks
187-103	12" Blade.
187-104	6" Blade.
187-105	Acute angle attachment
950749	Clamp box for Inch Height Gages
950750	Clamp box for Metric Height Gages

### DIMENSIONS

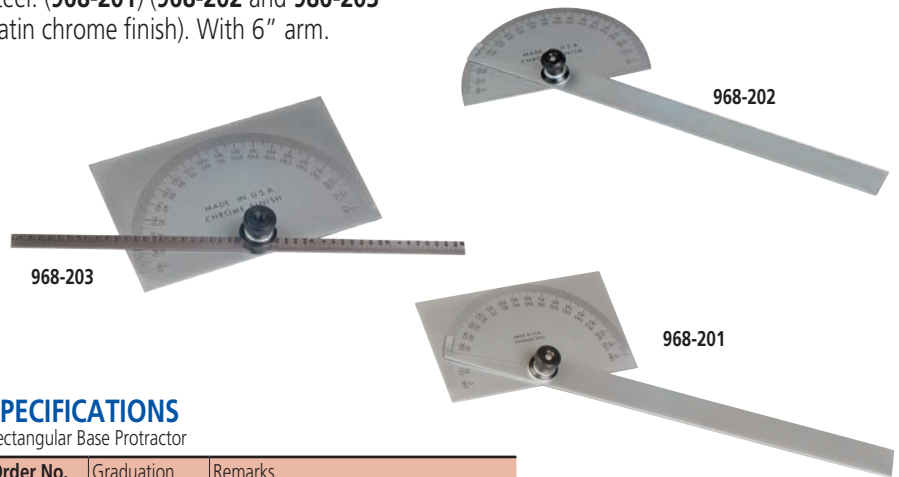




# Protractor

## SERIES 968

Basegular Base Protractor's scale plate and indicator blade are made entirely of stainless steel. (968-201) (968-202 and 986-203 Satin chrome finish). With 6" arm.



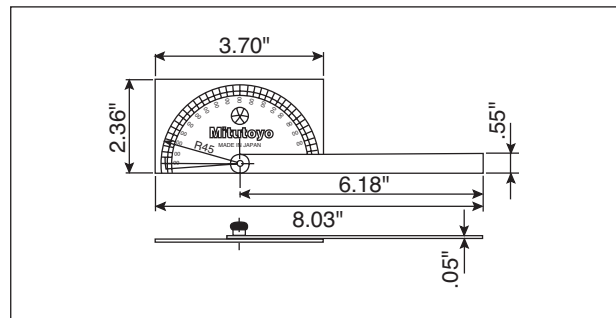
### SPECIFICATIONS

Rectangular Base Protractor

Order No.	Graduation	Remarks
968-201	1°	Protractor Graduation: 0°-90°, 90°-180°, 180°-90°, 90°-0°
968-202	1°	Semi-Circle: 0°-180°, 180°-0°
968-203*		Rectangle: 0°-180°, 180°-0°

\*6" Arm with graduation rule.

### DIMENSIONS



# Bevel Protractor

## SERIES 187

### Technical Data

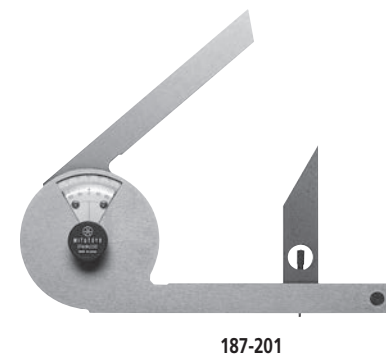
Graduation: 5 min. (0° - 90° - 0°)  
Blade edge angle: 30° and 60°  
Diameter: 2.56" / 70mm

### FEATURES

- Consists of three sheets of stainless steel, the middle one of which is made for angle measurements.

### SPECIFICATIONS

Order No.	Graduation	Remarks
187-201	1° / 5 min	Center black knob locks the blade position Protractor Graduation: 0°-90°, 90°-0°



Mitutoyo

# Depth Gage, Adjustable Angle

## SERIES 950

### FEATURES

- Head made of hardened steel.
- Base surface measures 2-1/2" x 1/8" thick.
- Includes 6" rule: 7/32" wide and .041" thick.
- Includes 6" rod: 3/32" diameter.

### SPECIFICATIONS

Order No.	Protractor Graduation	Rule Graduation
950-271	30°, 45°, 60°	1/32", 1/64"



# Zero-It

## SERIES 950

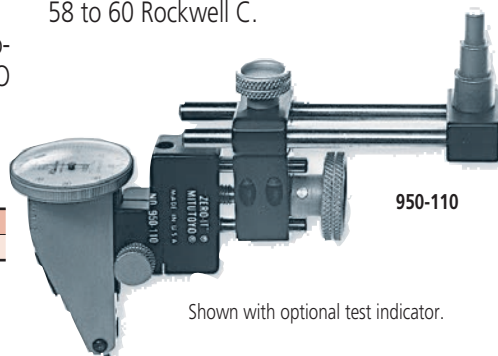
"Zero-It" is specially designed for MITUTOYO Test Indicators with Dovetails, and functions as a quick and practical work positioning device.

Attach "Zero-It" directly to the collet, then zero in the work position by reading MITUTOYO

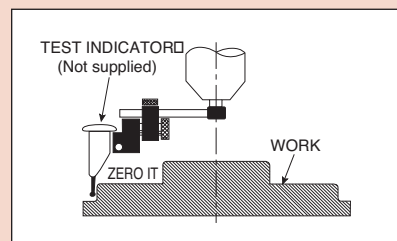
Test Indicator. The hardened clamping post consists of three ODs, from top, 1/4", 3/8" and 1/2", and has hardness of approximately 58 to 60 Rockwell C.

### SPECIFICATIONS

Order No.	Coarse	Fine
950-110	10°	3/8"



Shown with optional test indicator.



# Zero-Setter

## SERIES 950

Fast and sure establishment of "0" reference point with built-in indicator.

Spring loaded setting face to safe guard against damage from over run.

Body dia. 1.44" (36.5mm)

Wooden case included.

### SPECIFICATIONS

Order No.	Height	Graduation
950-111	1"	.0005"
950-112	25mm	0.01mm



# Angle Gages

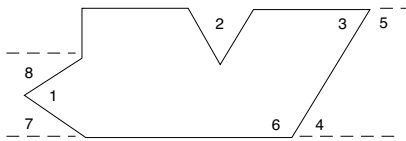
## SERIES 186

### FEATURES

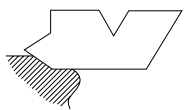
- Manufactured from stainless steel, satin finished.
- 18 individual gages for easy use.
- Eight gaging surfaces per gage.
- Precision finished edges for accurate checking.
- Each gage checks primary, 1/2 primary and complementary angles.
- Sharp cornered workpieces can be checked at all 8 angles except below 50° on primary angle 2.
- Quick and accurate inspection of angles and I.D. or O.D. chamfers—in or out of the machine.
- Positioning of lathe tools for chamfers.
- Inspecting angles on ground form tools and cutters.
- Fast set-ups and fixturing of workpieces.
- Eliminates time consuming measuring set-ups.



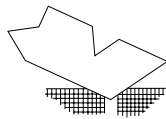
186-910



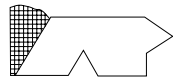
Angles 1, 2, 3, 4 are primary  
Angles 5, 6, are complementary  
Angles 7, 8 are 1/2 primary



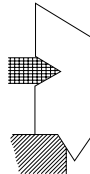
Gaging of angles of adjoining inside/outside diameters or flat surfaces.



Gaging of the countersink angles of drilled and tapped holes.



Gaging of primary and complementary angles from a surface plate.



Gaging of I.D. and O.D. chamfers. Included angles are easily verified.

### SPECIFICATIONS

Set Order No.	Description	No. of Leaves
186-910	Angle Gage Set w/case	18

### Individual Part No.

Part No.	Primary Angle	1/2 Primary Angle	Accuracy	Complementary Angle
051000*	5°	2° 30'	±5'	175°
051001*	10°	5°	±5'	170°
051002*	15°	7° 30'	±5'	165°
051003	20°	10°	±5'	160°
051004	35°	12° 30'	±5'	155°
051005	30°	15°	±5'	150°
051006	35°	17° 30'	±5'	145°
051007	40°	20°	±5'	140°
051008	45°	22° 30'	±5'	135°
051009	50°	25°	±5'	130°
051010	55°	27° 30'	±5'	125°
051011	60°	30°	±5'	120°
051012	65°	32° 30'	±5'	115°
051013	70°	35°	±5'	110°
051014	75°	37° 30'	±5'	105°
051015	80°	40°	±5'	100°
051016	85°	42° 30'	±5'	95°
051017	90°	45°	±5'	90°
051018	Vinyl Case			

\* Angle 2 omitted

# Angle Blocks

## SERIES 981

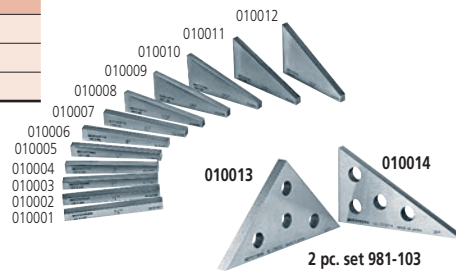
### SPECIFICATIONS

Order No.	Angle	Accuracy	Remarks
010001	1/4°	±20 sec	Hardened steel over HRC 55 Precision ground throughout
010002	1/2°		
010003	1°		
010004	2°		
010005	3°		
010006	4°		
010007	5°		
010008	10°		
010009	15°		
010010	20°		
010011	25°		
010012	30°		
010013	45°, 45°, 90°	± 40 sec	
010014	30°, 60°, 90°		



981-102

Set Order No.	Remarks
981-101	10 pc. Set (Order No. 010003-010012)
981-102	12 pc. Set (Order No. 010001-010012)
981-103	2 pc. Set (Order No. 010013-010014)



2 pc. set 981-103

# Adjustable Parallels

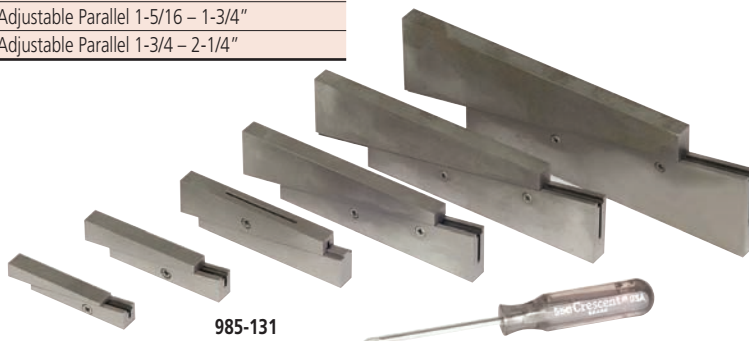
## SERIES 985

### FEATURES

- Consists of two precision ground pieces which slide smoothly on each other.
- Locked into position by set screws.
- Can be quickly inserted into openings and expanded to exact size, then measured with a micrometer.

### SPECIFICATIONS

Order No.	Remarks
985-130	4 pcs. Adjustable Parallel Set 3/8 – 1-15/16"
985-131	6 pcs. Adjustable Parallel Set 3/8 – 2-1/4"
985-132	Adjustable Parallel 3/8 – 1/2"
985-133	Adjustable Parallel 1/2 – 11/16"
985-134	Adjustable Parallel 11/16 – 15/16"
985-135	Adjustable Parallel 15/16 – 1-5/16"
985-136	Adjustable Parallel 1-5/16 – 1-3/4"
985-137	Adjustable Parallel 1-3/4 – 2-1/4"



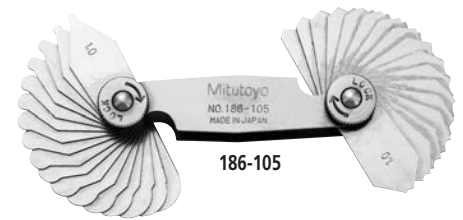
985-131

# Radius Gages

## SERIES 186

### FEATURES

- Radius size is stamped on each gage.
- Both concave and convex radius gages become a pair.
- With a locking clamp.



### SPECIFICATIONS

#### Metric

Range	Order No.	Composition of leaves	Remarks
0.4 - 6mm	<b>186-110</b>	18 leaves: 0.4, 0.8, 1, 1.2, 1.5, 1.6mm, 1.75 - 3mm by 0.25mm, 3.5 - 6mm by 0.5mm	90° arc
0.5 - 13mm	<b>186-902</b>	26 leaves: 0.5 - 13mm by 0.5mm	90° arc
1 - 7mm	<b>186-105</b>	34 pairs: 1 - 3mm by 0.25mm 3.5 - 7mm by 0.5mm	180° arc
7.5 - 15mm	<b>186-106</b>	32 pairs: 7.5 - 15mm by 0.5mm	180° arc
15.5 - 25mm	<b>186-107</b>	15 pairs: 15.5 - 20mm by 0.5mm, 21 - 25mm by 1mm	180° arc

#### Inch

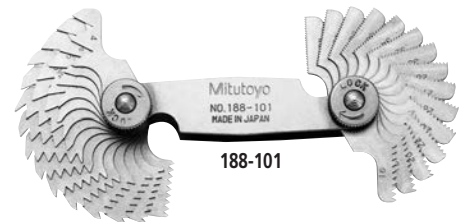
Range	Order No.	Composition of leaves	Remarks
1/32" - 17/64"	<b>186-103</b>	16 leaves: 1/32" - 17/64" by 64ths	90° arc
1/32" - 1/4"	<b>186-101</b>	15 pairs: 1/32" - 1/4" by 64ths	180° arc
17/64" - 1/2"	<b>186-102</b>	16 pairs: 17/64" - 1/2" by 64ths	180° arc
9/32" - 33/64"	<b>186-104</b>	16 leaves: 9/32" - 33/64" by 64ths	90° arc

# Pitch Gages

## SERIES 188, 950

### FEATURES

- Thread pitch size is stamped on each gage.
- Metric, Unified, and Whitworth screw pitch gages.



### SPECIFICATIONS

#### Metric Screw Pitch Gages (60°)

Range	Order No.	Composition of leaves
0.25 - 2.5mm	<b>188-153</b>	28 leaves: 0.25, 0.30, 0.35, 0.40, 0.45, 0.50, 0.55, 0.60, 0.65, 0.70, 0.75, 0.80, 0.85, 0.90, 1.00, 1.10, 1.20, 1.25, 1.30, 1.40, 1.50, 1.60, 1.70, 1.75, 1.80, 1.90, 2.00, 2.50 mm
0.35 - 6mm	<b>188-130</b>	22 leaves: 0.35, 0.4, 0.45, 0.5, 0.6, 0.7, 0.75, 0.8, 1, 1.25, 1.5, 1.75, 2, 2.5, 3, 3.5, 4, 4.5, 5, 5.5, 6mm and 60° angle gage
0.4 - 7mm	<b>188-122</b>	21 leaves: 0.4, 0.5, 0.7, 0.75, 0.8, 0.9, 1, 1.25, 1.5, 1.75, 2, 2.5, 3, 3.5, 4, 4.5, 5, 5.5, 6, 6.5, 7mm
0.4 - 7mm	<b>188-121</b>	18 leaves: 0.4, 0.5, 0.75, 1, 1.25, 1.5, 1.75, 2, 2.5, 3, 3.5, 4, 4.5, 5, 5.5, 6, 6.5, 7mm

#### Unified Screw Pitch Gages (60°)

Range	Order No.	Composition of leaves
4 - 42 TPI	<b>188-111</b>	30 leaves: 4, 4 1/2, 5, 5 1/2, 6, 7, 8, 9, 10, 11, 11 1/2, 12, 13, 14, 15, 16, 18, 20, 22, 24, 26, 27, 28, 30, 32, 34, 36, 38, 40, 42 TPI
4 - 84 TPI	<b>950-253</b>	51 leaves: 4, 4 1/2, 5, 5 1/2, 6, 7, 8, 9, 10, 11, 11 1/2, 12, 13, 14, 15, 16, 18, 20, 22, 24, 26, 27, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84 TPI

Note: Metric and Unified Pitch Gage Set (**188-151**) is available. It consists of **188-122** (Metric) and **188-111** (Unified).

#### Metric and Unified Screw Pitch Gage Set (60°)

Range	Order No.	Composition of leaves
0.4 - 7mm / 4 - 42 TPI	<b>188-151</b>	51 leaves: Set of 188-122 and 188-111
0.5 - 6mm / 4 - 56 TPI	<b>188-152</b>	28 leaves: 4, 6, 8, 10, 11, 11-1/2, 12, 13, 16, 20, 28, 32, 40, 56 TPI 0.50, 0.75, 1.00, 1.23, 1.50, 1.75, 2.00, 2.50, 3.00, 3.50, 4.00, 4.50, 5.00, 6.00 mm

#### Whitworth Screw Pitch Gages (55°)

Range	Order No.	Composition of leaves
4 - 42 TPI	<b>188-101</b>	30 leaves: 4, 4 1/2, 5, 5 1/2, 6, 7, 8, 9, 10, 11, 11 1/2, 12, 13, 14, 15, 16, 18, 20, 22, 24, 26, 27, 28, 30, 32, 34, 36, 38, 40, 42 TPI
4 - 60 TPI	<b>188-102</b>	28 leaves: 4, 4 1/2, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 16, 18, 19, 20, 22, 24, 25, 26, 28, 30, 32, 34, 36, 40, 48, 60 TPI

**Mitutoyo**

# Radius Gages-Sets

## SERIES 186

### FEATURES

#### Decimal Radius Gages to 1" Fractional Radius Gages to 1"

MITUTOYO Radius Gages are recommended for checking or laying out concave or convex radii. An individual gage for each dimension makes it possible to verify radius or fillet dimensions easier, faster and more accurately in machining, layout, inspection and pattern-making work. The measuring surfaces are precisely finished with smooth, accurate edges. The Radius Gages are available separately or in six handy sets. Each Radius Gage has five measuring locations, and it is identified with its particular radius dimensions. The gages have a satin or dull-chrome finish.

The Holding Cases, provided to protect the sets of Radius Gages, have indexed pockets to facilitate the selection of the proper size gage. A 4" long holder is furnished with Set No. 186-901 to make it possible to check radii in confined or hard-to-reach locations.

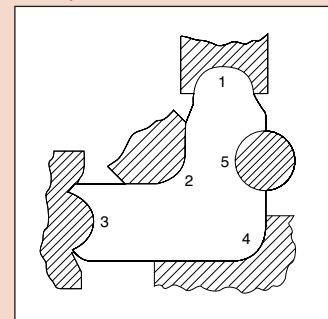


186-901

### SPECIFICATIONS

Order No.	No. of Leaves	Sizes	Remarks
186-901	25	1/64"–17/64" by 64ths and 9/32"–1/2" by 32nds	Holder
186-903	17	1/64"–17/64" by 64ths	
186-904	8	9/32"–1/2" by 32nds	
186-905	8	9/16"–1" by 16ths	Holder
186-906	26	.010–.030" by .005" .040–.100" by .010" .120–.300" by .020" .350–.500" by .050"	Holder
186-907	10	.550–1" by .050"	

Accuracy: ±.0016" / 0.04mm



5 concave and convex radii per each leaf.

#### Decimal

Radius	Part No.	Radius	Part No.
.010"	211798	.240"	211816
.015"	211799	.260"	211817
.020"	211800	.280"	211818
.025"	211801	.300"	211819
.030"	211802	.350"	211820
.040"	211803	.400"	211821
.050"	211804	.450"	211822
.060"	211805	.500"	211823
.070"	211806	.550"	211824
.080"	211807	.600"	211825
.090"	211808	.650"	211826
.100"	211809	.700"	211827
.120"	211810	.750"	211828
.140"	211811	.800"	211829
.160"	211812	.850"	211830
.180"	211813	.900"	211831
.200"	211814	.950"	211832
.220"	211815	1.000"	211833

#### Fraction

Radius	Part No.	Radius	Part No.
1/64"	201441	5/16"	201459
1/32"	201442	11/32"	201460
3/64"	201443	3/8"	201461
1/16"	201444	13/32"	201462
5/64"	201445	7/16"	201463
3/32"	201446	15/32"	201464
7/64"	201447	1/2"	201465
1/8"	201448	9/16"	211790
9/64"	201449	5/8"	211791
5/32"	201450	11/16"	211792
11/64"	201451	3/4"	211793
3/16"	201452	13/16"	211794
13/64"	201453	7/8"	211795
7/32"	201454	15/16"	211796
15/64"	201455	1"	211797
1/4"	201456		
17/64"	201457		
9/32"	201458		

# Standard Gages

## SERIES 950

### FEATURES

- Made of high quality steel.
- Satin chrome finish.

### SPECIFICATIONS

**Inch**

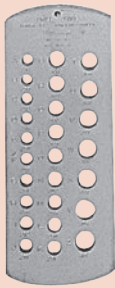
Order No.	Type	Size
950-202	American Standard Wire Gage	Gage Range 0-36
950-203	U.S. Standard Wire Gage	Gage Range 0-36



950-202



950-203



950-209



950-204

# Tap and Drill Gage

## SERIES 950

### FEATURES

- Each drill gage is marked with drill size in fractions and decimals.
- Satin chrome finish.
- Tap and drill gage shows the correct tap drill for National Fine or National Coarse thread series.
- Approximate plate size is 6-3/8" x 2-1/2" x 5/64".

### SPECIFICATIONS

**Inch/Metric**

Order No.	Type	Size
950-200	Twist Drill and Drill Rod Gage	61-80 Twist Drill and Drill Rod
950-204	Drill Gage / Mach. Screw Gage	Tap Size 2-56 to 1/4-28
950-206	Fractional Drill Gage	Drill Size 1/16" to 1/2"
950-207	Metric Drill Gage	1.5 to 12.5mm 30 holes
950-208	Metric Drill Gage	1.0 to 5.9mm 57 holes
950-209	A to Z Alphabet Drill Gage	Drill size A to Z
950-276	Twist Drill and Drill Rod Gage	1-60 Twist Drill and Drill Rod

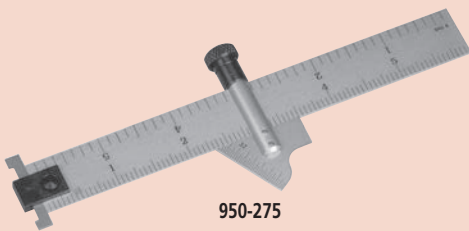
# Drill Point Gage

## SERIES 950

### FEATURES

- For measuring properly grounded 59° drill tips.
- Rule and slide made of steel.
- Satin chrome finish.

- Slide graduated in 32nds.
- End clip is adjustable and removable.
- Versatile - Can be used as Rule, Hook Rule, Try Square, Depth Gage or Caliper, and for Layout



950-275

### SPECIFICATIONS

Order No.	Size	Rule Graduation
950-275	6"	1/8, 1/16, 1/32, 1/64

# Thread Gage

## SERIES 950

### FEATURES

Used for grinding and setting tools when cutting acme threads whose side have an inclination of 14-1/2° (29° included angle)

### SPECIFICATIONS

Order No.	Description
950-257	29° Acme screw thread gage



950-257

# Center Gage

## SERIES 950

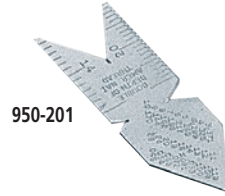
### FEATURES

- Hardened with lapped edges and notches.
- Meets requirements of the American National and US 60° Standards.

- Scales with 14ths and 20ths graduations provided on one side, 24ths and 32nds on reverse side.

### SPECIFICATIONS

Inch	
Order No.	Type
950-201	Center Gage



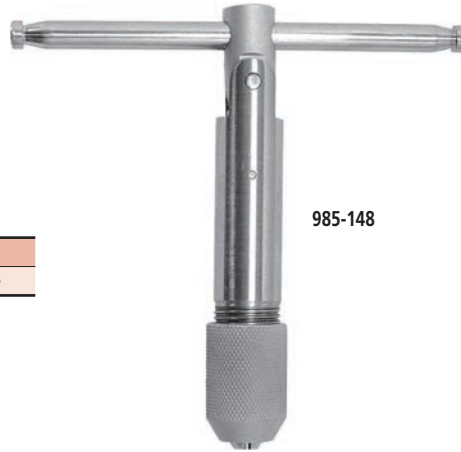
# Tap Wrench

## SERIES 985

### FEATURES

#### T-Handle Cam Lock Tap Wrenches

- Widest Range Available for Tap Size (1/8 - 1/2") (M3-M12)
- Patented Revolutionary Cam Lock System
- Quick Action Clamping for Easy Replacement
- Tap will Never Release During Use
- Heavy Duty Design for Extra Long Life
- Capable of Handling Extreme Torque
- Can Also be Used as a Hand Drill for Sizes 1/16 - 5/16"



### SPECIFICATIONS

Order No.	Clamping Capacity	Remarks
985-148	1/8" - 1/2" (M3-M12)	Cam Lock Type

Patent No. 6,945,145





# Scribers

## SERIES 985

MITUTOYO provides a full line of scribers to accommodate every shop need. All the scribers, with the exception of the **985-105**, have tungsten-carbide tips. The **985-105** has a diamond tip.

### SPECIFICATIONS

Order No.	Length	Replacement Point
985-101	6.75"	No. 050561
985-102	6.12"	—
985-103	8.87"	—
985-104*	5.75"	No. 050562
985-105*	5.12"	No. 050563

\* Retractable



985-138

# Center Punches

## SERIES 985

### SPECIFICATIONS

Order No.	Length	Replacement Point	Remarks
985-112	5.25"	No. 050565	.68" (DIA), Plastic housing
985-113	6.0"	No. 050566	1.0" (DIA), Plastic housing
985-114	3.0"	—	.31" (DIA)
985-115	4.0"	—	.39" (DIA)
985-116	4.3"	—	.59" (DIA)
985-117	5.0"	—	.67" (DIA)
885-138	4.0", 1/16" dia. punch is 3"	—	5 pcs set 1/16", 5/64", 3/32", 9/64", 5/32"



985-114

985-112

985-113

# Drive Pin Punches

## SERIES 985

### SPECIFICATIONS

Order No.	Length	Remarks
985-118	8"	5pcs. Extra long Drive Pin Punch Set 1/8, 3/16, 1/4, 5/16, 3/8"
985-119	4"	8pcs. Drive Pin Punch Set 1/16, 3/32, 1/8, 5/32, 3/16, 7/32, 1/4, 5/16"
985-120	4"	8pcs. Brass Drive Pin Punch Set 1/16, 3/32, 1/8, 5/32, 3/16, 7/32, 1/4, 5/16"



985-119

# Center Finder

**SERIES 985**

## FEATURES

- Accurately and quickly locates center on round workpieces.
- Satin chrome finish

## SPECIFICATIONS

Order No.	Remarks
985-144	Center finder

- Place tool in drill chuck or collet and line up pointer with line scribed on shaft.



985-144

# Pin Vises

**SERIES 985**

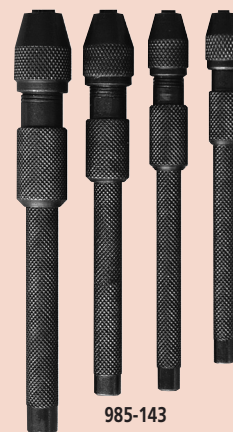
## FEATURES

- Made of alloy steel, black oxide finish
- Collets grip firmly when chuck is tightened
- Knurled finger grip
- Range of Set 0 - .188"

## SPECIFICATIONS

Order No.	Remarks
985-143	4 pcs. pin vise set

- Supplied in plastic punch
- Ideal for holding small tools, rods, wires, taps, etc.



985-143

# Wiggler

**SERIES 985**

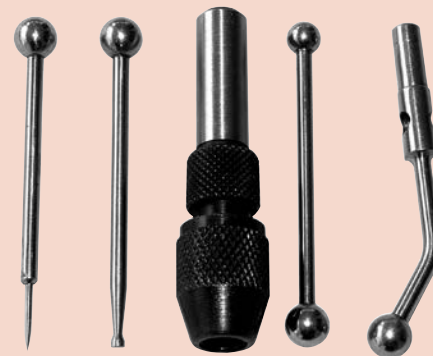
## FEATURES

- Made from precision ground tool steel
- Includes offset indicator holder and improved chuck design for holding attachments
- Attachments readily interchangeable

## SPECIFICATIONS

Order No.	Remarks
985-142	5 pcs. set

- Tool adapts to countless applications
- Attachments snap into chuck and clamp to ball swivel joint which permits adjustments to angular positions or true concentricity



985-142

# Optical Center Punch

**SERIES 985**

## FEATURES

- Efficient, precision punching of hole centers
- Center dot & circle for targeting the punch
- Magnifies without distortion or parallax

## SPECIFICATIONS

Order No.	Remarks
985-139	9X Acrylic Lens



985-139

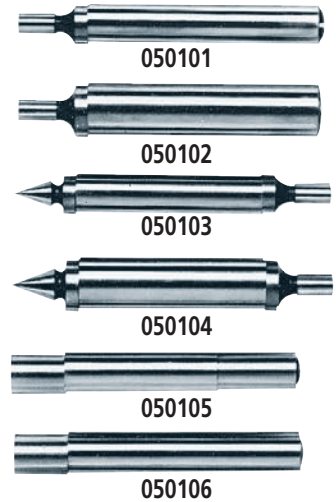
# Edge & Center Finders

## FEATURES

The Edge and Center Finders are hardened and ground on all surfaces.

## SPECIFICATIONS

Order No.	Shank (DIA)	Tip (DIA)	Remarks
050101	3/8" (.375")	.20"	Edge Type
050102	1/2" (.50")	.20"	Edge Type
050103	3/8" (.375")	.20"	Center Type
050104	1/2" (.50")	.20"	Center Type
050105	.375"/10mm	10mm	Edge Type
050106	10mm	10mm	Edge Type
050109	1/2" (.50")	.50"	Edge Type
050110	1/2" (.50")	.20", .50"	Double Edge Finder



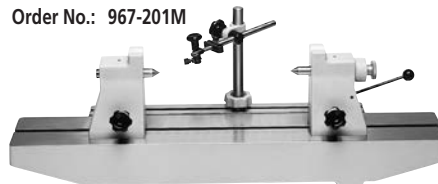
# Bench Center

## SERIES 967

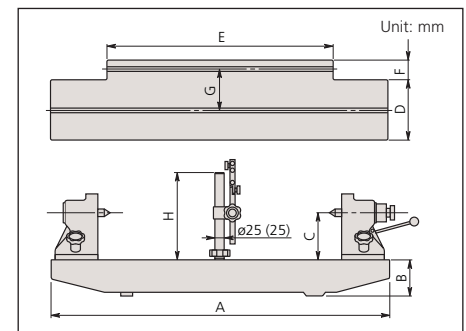
### FEATURES

- Used with a dial test indicator (optional), the Bench Center provides precision measurement of concentricity verification on cylindrical workpieces.
- With an indicator clamp. (Holding stem diameter: 9.53mm / .375")

Order No.: 967-201M



### DIMENSIONS



Order No.	A	B	C	D	E	F	G	H
967-203-10	310	40	50	70	178	41	60	134.5
967-201-10	500	45	75	80	370	36	60	194.5
967-204-10	700	80	100	140	500	65	110	194.5
967-202-10	900	100	125	160	600	50	104	230

### SPECIFICATIONS

Order No.	Center-to-Center	Workpiece Capacity Diameter	Max. Weight Hold	Parallelism of Centers	Flatness of Surface	Attachment Diameter	Mass (kg)
967-203-10	5.9" / 150mm	3.8"	17.5 lbs. (8kg)	.0002"	.0004"	Ø3/8"	7
967-201-10	11.8" / 300mm	5.8"	35 lbs. (16kg)	.0002"	.0006"	Ø3/8"	13
967-204-10	17.7" / 450mm	7.8"	44 lbs. (20kg)	.0002"	.0007"	Ø3/8"	60
967-202-10	23.6" / 600mm	9.8"	66 lbs. (30kg)	.00024"	.0008"	Ø3/8"	70

### Technical Data

Maximum workpiece dia.: 300mm  
 Maximum workpiece height: 150mm  
 Mass: 13kg

### Optional Accessories:

**56AAJ988** Special attachment for mounting **967-201-10** in vertical position.

**56AAJ987** Special attachment for mounting **967-203-10** in vertical position.

# Digital Protractor

## SERIES 950

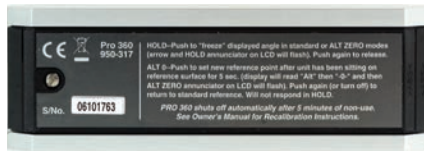
### FEATURES

These Digital Protractors present inclination values on an easy-to-read liquid crystal display. The measurements are generated by an electronic gravity sensor and processed by the latest low-power electronic circuit technology.

- Full 360° range (90° x 4).
- Machined aluminum frame.
- Alternate reference (zero).
- Reading hold.
- Simple calibration requiring no special fixtures.
- Display remains upright to view at all angles. (950-317, Pro 360 Model).
- RS232C output. (950-318 Pro 3600 Model).
- Supplied in fitted carrying case.



Front View



950-317 Back View



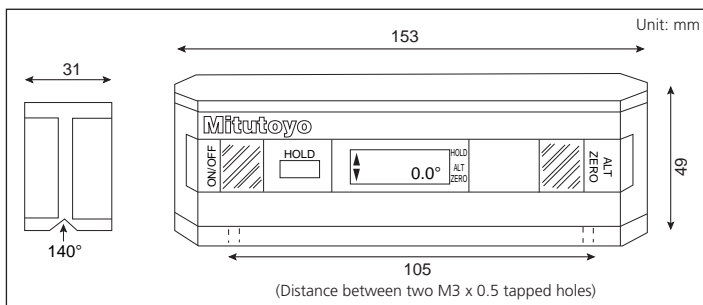
950-318 Back View

### SPECIFICATIONS

Order No.	950-317	950-318
Model	Pro 360	Pro 3600
Range	360° (90°x4)	360° (90°x4)
Resolution	0.1°	0.01° (0° to 9.99°) 0.1° (10° to 90°)
Accuracy	±0.1° Level ±10°, Plumb ±10° ±0.2° Maximum error	±0.05° (0° to 10°) ±0.1° (80° to 90°) ±0.2° (10° to 80°)
Repeatability	±0.1°	±0.05°
Cross Axis Error	Minimal	Minimal
Battery Life	500 Hrs. Standard 9-Volt Battery	500 Hrs. Standard 9-Volt Battery
Temperature Operation	-5°C to 50°C (23° to 122°F)	-5°C to 50°C (23° to 122°F)
Storage	-20°C to 65°C (-4°F to 149°F)	-20°C to 65°C (-4°F to 149°F)
Weight	289g (10.2oz.)	295g (10.4oz.)
Output	N/A	RS-232C Compatible
Standard Accessories	Plastic Case	Plastic Case

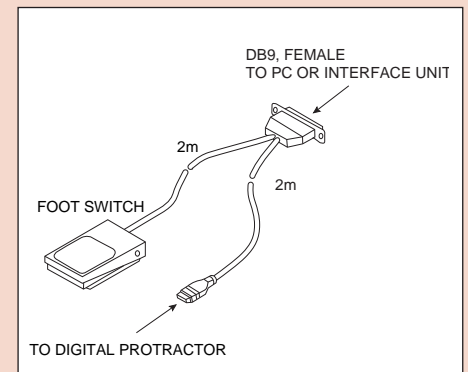
±Represents clockwise or counter-clockwise slope.

### DIMENSIONS



### Optional Accessories

- 64PPP795 Magnetic base
- 50AAA983A RS-232C Output cable w/foot switch



50AAA983A RS-232C Output cable w/foot switch 10P-25P

# Digital Hand Tachometers

## SERIES 982

### FEATURES

- New Digital Hand Tachometers are compact and easy to handle.
- NIST Certification is supplied with each Digital Hand Tachometer.
- Model PH-200LC (982-552) has laser Diode Detection and a combination of Contact and Non-Contacts measurement.
- Supplied with plastic carrying case.

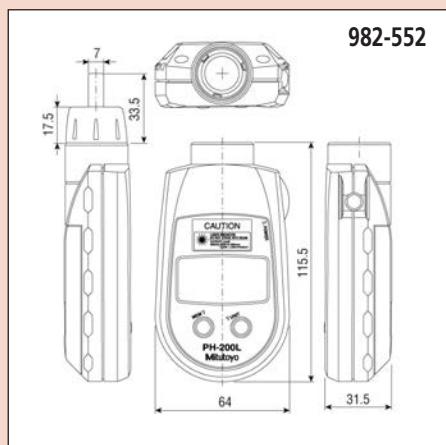
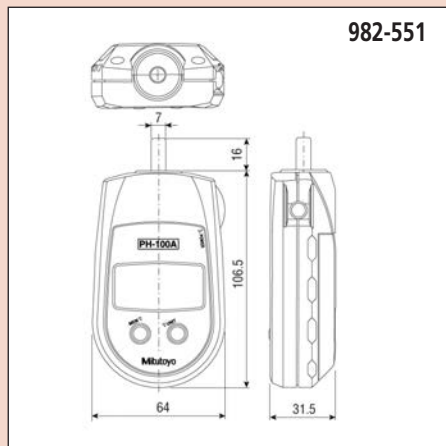


982-551



982-552

### DIMENSIONS



### SPECIFICATIONS

Order No.	982-551	982-552
Model No.	PH-100A	PH-200LC
Revolution per minute	1.0 – 25,000 rpm	—
Rotation speed	—	Non-contact: 6.0 – 99,999 rpm; Contact: 6.0 – 25,000 rpm
Measuring accuracy Revolution Surface, Speed, Length	1.0 – 599.9rpm: ±1rpm, 600.0 – 25,000 rpm: ±0.006% and ±0.5 digit ±0.4% and 1 digit	6.0 – 599.9 rpm: ±1rpm, 600.0 – 99,999 rpm ±0.006% and ±0.5 digit ±0.4% and ±1 digit
Detection	Optical coupler, 20 pulses per revolution	Laser diode
Outside dimensions	4.83" L x 2.52" W x 1.24" H (122.5mm x 64mm x 31.5mm)	4.55" L x 2.52" W x 1.24" H Overall length with contact adapter: 149mm
Mass	170 g	160 g
Power	Battery: AA 3 pcs.	Battery: AA 3 pcs.

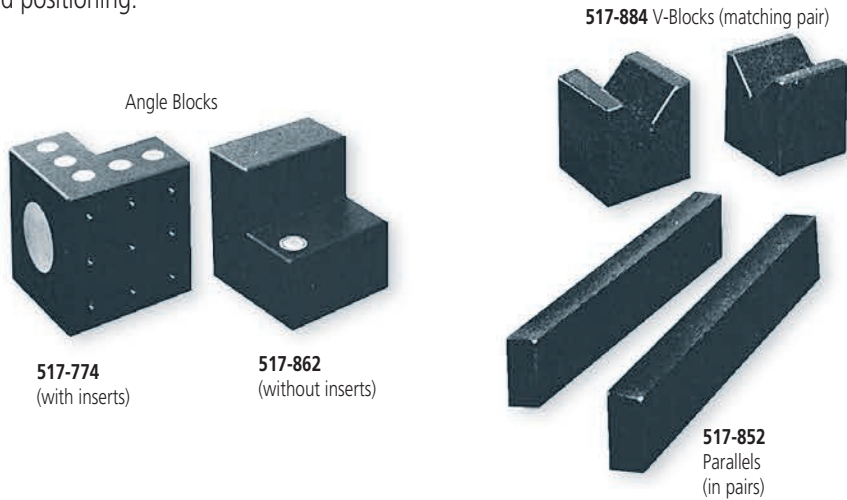
### Optional Accessories For Digital Hand Tachometers

Order No.	Description	Dimension	Drawing
010049	Cone Adapter, Standard	D = 1/2"	
010050	Cone Adapter, 5/8"	D = 5/8"	
010051	Cone Adapter, 3/4"	D = 3/4"	
010052	Cone Adapter, 1-1/4"	D = 1-1/4" d = 1/2"	
010053	Funnel Adapter, Standard	D = 1/2"	
010054	Funnel Adapter, 3/4"	D = 3/4"	
010055	Measuring Wheel FPM (6" cir), Standard	D = 1.91"	
010056	Measuring Wheel FPM (12" cir)	D = 3.82"	
010057	Measuring Wheel YPM (0.1 yard cir)	D = 1.15"	
010058	Measuring Wheel MPM (0.1 meter cir)	D = 1.25"	
010059	Reflective Tabs 1/2" square (35 pcs)		
010060	Extension Shaft (3" length)		

# Granite Surface Plate Accessories

## SERIES 517

These accessories made from the same high quality black granite as Mitutoyo surface plates, allow extra flexibility in work holding and positioning.



## SPECIFICATIONS

### Angle Blocks with or without inserts

Grade	Laboratory*			Master**			Case
	2 Face	4 Face		2 Face	4 Face		
		no inserts	w/ inserts		no inserts	w/ inserts	
4 x 4 x 4"	<b>517-767</b>	<b>517-761</b>	<b>517-773</b>	<b>517-867</b>	<b>517-861</b>	<b>517-873</b>	<b>050021</b>
6 x 6 x 6"	<b>517-768</b>	<b>517-762</b>	<b>517-774</b>	<b>517-868</b>	<b>517-862</b>	<b>517-874</b>	<b>050022</b>

\*Laboratory overall accuracy: .000025" per 6".

\*\*Master overall accuracy: .000050" per 6".

### Parallels Pair

Grade	Accuracy	Laboratory		Master			Case
		2 Face	4 Face	Accuracy	2 Face	4 Face	
.75 x 1 x 6"	.00003"	<b>517-755</b>	<b>517-750</b>	.00006"	<b>517-855</b>	<b>517-850</b>	<b>050027</b>
.75 x 1.5 x 9"	.00004"	<b>517-756</b>	<b>517-751</b>	.00008"	<b>517-856</b>	<b>517-851</b>	<b>050028</b>
1 x 2 x 12"	.00006"	<b>517-757</b>	<b>517-752</b>	.0001"	<b>517-857</b>	<b>517-852</b>	<b>050029</b>

### V-Blocks Matching Pair

V-1 type have matching accuracy on "V" from the bottom face only.

V-5 type have four face matching accuracy plus "V".

Grade	Laboratory*		Master**		Case
	V-1	V-5	V-1	V-5	
2 x 2 x 2.5"	<b>517-787</b>	<b>517-783</b>	<b>517-887</b>	<b>517-883</b>	<b>050039</b>
3 x 3 x 3"	<b>517-788</b>	<b>517-784</b>	<b>517-888</b>	<b>517-884</b>	<b>050040</b>
6 x 6 x 6"	<b>517-789</b>	<b>517-785</b>	<b>517-889</b>	<b>517-885</b>	<b>050022X2</b>

\*Laboratory overall accuracy: .00005" per 6".

\*\*Master overall accuracy: .0001" per 6"

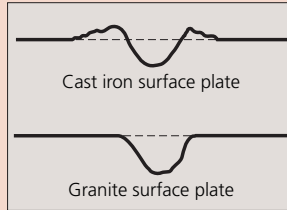
# Black Granite Surface Plate

## SERIES 517

### FEATURES

- Natural granite seasoned for thousands of years is free from deterioration or dimensional change over time.
- Granite surface plate has many advantages over cast iron surface plates:
  - Twice as hard as cast iron.
  - Minimal changes in dimension due to temperature changes.
  - Free from wringing, so there is no interruption of work.
  - Free from burrs or protrusions because of the fine grain structure and insignificant

- stickiness; this ensures a high degree of flatness over a long service life and causes no damage to other parts or instruments.
- Trouble-free operation for use with magnetic materials.
- Long life and rust-free, resulting in low maintenance costs.
- MITUTOYO Granite Surface Plates meet or exceed Federal Specification GGG-P-463c. Each Surface Plate is shipped with a Certificate of Accuracy which guarantees its accuracy and verifies its traceability to the National Institute of Standards and Technology.
- All plates from 48" x 108" and larger are Machine Base Gray Granite. Smaller plates are Black Granite.
- Surface Plates, to size of specifications other than standard, available on special order.
- Surface Plates, with the bolt screws, available on special order.
- All MITUTOYO Surface Plates shipped F.O.B. Escondido, California.



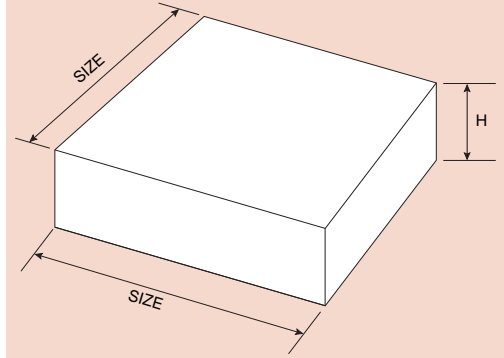
### SPECIFICATIONS

**Inch** 100 lbs.-Load / sq. ft. no ledge

Size	AA Laboratory Grade				A Inspection Grade				B Shop Grade			
	H	Acc.	Order No.	Wt.	H	Acc.	Order No.	Wt.	H	Acc.	Order No.	Wt.
8 x 12"	3"	50	517-700	30	2"	100	517-800	25	2"	200	517-900	25
9 x 12"	3"	50	517-701	40	3"	100	517-801	40	2"	200	517-901	30
12 x 12"	3"	50	517-702	50	3"	100	517-802	50	3"	200	517-902	50
12 x 18"	4"	50	517-703	100	4"	100	517-803	100	4"	200	517-903	100
18 x 18"	4"	50	517-704	150	4"	100	517-804	150	3"	200	517-904	100
18 x 24"	4"	65	517-705	200	4"	130	517-805	200	4"	260	517-905	200
24 x 24"	5"	70	517-706	310	4"	140	517-806	259	3"	280	517-906	200
24 x 30"	5"	75	517-707	400	5"	150	517-807	400	4"	300	517-907	300
24 x 36"	6"	85	517-708	600	5"	170	517-808	500	4"	340	517-908	400
24 x 48"	8"	150	517-709	1000	6"	300	517-809	800	5"	600	517-909	650
30 x 36"	6"	100	517-710	800	5"	200	517-810	600	5"	400	517-910	600
30 x 48"	8"	150	517-711	1300	6"	300	517-811	1000	6"	600	517-911	1000
30 x 60"	12"	200	517-712	1900	10"	500	517-812	1535	8"	1000	517-912	1150
36 x 36"	6"	100	517-713	900	5"	200	517-813	780	5"	400	517-913	700
36 x 48"	8"	150	517-714	1500	6"	300	517-814	1200	6"	600	517-914	1200
36 x 60"	12"	200	517-715	2850	10"	400	517-815	2350	8"	800	517-915	1900
36 x 72"	12"	250	517-716	3400	10"	500	517-816	2850	8"	1000	517-916	2300
48 x 48"	8"	200	517-717	2025	6"	400	517-817	1525	6"	800	517-917	1500
48 x 60"	12"	250	517-718	3800	10"	500	517-818	3150	8"	1000	517-918	2525
48 x 72"	12"	300	517-719	4500	10"	600	517-819	3800	8"	1200	517-919	3050
48 x 84"	14"	350	517-720	6150	12"	700	517-820	5325	10"	1400	517-920	4450
48 x 96"	14"	400	517-721	7000	12"	800	517-821	6050	10"	1600	517-921	5150
48 x 108"	14"	500	517-722	7900	12"	1000	517-822	6830	10"	2000	517-922	5700
48 x 120"	18"	700	517-723	11300	16"	1400	517-823	10160	14"	2800	517-923	8800
48 x 144"	18"	800	517-724	13500	16"	1600	517-824	12200	14"	3200	517-924	10500
60 x 60"	14"	250	517-725	5500	12"	500	517-825	4800	10"	1000	517-925	4000
60 x 72"	14"	350	517-726	6600	12"	700	517-826	5750	10"	1400	517-926	4900
60 x 96"	14"	500	517-727	8800	12"	1000	517-827	7600	10"	2000	517-927	6500
60 x 120"	16"	700	517-728	11050	14"	1400	517-828	11100	12"	2800	517-928	9800
60 x 144"	18"	900	517-729	16950	16"	1800	517-829	15100	14"	3600	517-929	14200
72 x 72"	14"	400	517-730	8000	12"	800	517-830	7000	10"	1600	517-930	5700
72 x 96"	16"	500	517-731	12025	14"	1000	517-831	10800	12"	2000	517-931	9200
72 x 120"	16"	700	517-732	15070	14"	1400	517-832	13400	12"	2800	517-932	11400
72 x 144"	18"	1000	517-733	20300	16"	2000	517-833	18100	14"	4000	517-933	15900

**Inch** 50 lbs.-Load / sq. ft. no ledge

Size	AA Laboratory Grade				A Inspection Grade				B Shop Grade			
	H	Acc.	Order No.	Wt.	H	Acc.	Order No.	Wt.	H	Acc.	Order No.	Wt.
8 x 12"	2"	50	<b>517-740</b>	25	2"	100	<b>517-840</b>	25	2"	200	<b>517-940</b>	25
12 x 18"	3"	50	<b>517-741</b>	80	3"	100	<b>517-841</b>	80	2"	200	<b>517-941</b>	60
18 x 24"	4"	65	<b>517-742</b>	200	3"	130	<b>517-842</b>	165	2"	260	<b>517-942</b>	100
24 x 36"	5"	85	<b>517-743</b>	500	4"	170	<b>517-843</b>	400	3"	340	<b>517-943</b>	300
36 x 48"	6"	150	<b>517-746</b>	1200	5"	300	<b>517-846</b>	1000	4"	600	<b>517-946</b>	800



## Steel Stands

Steel Stands for supporting Black Granite Surface Plates, at working levels, are available either stationary or with casters. Sizes and weights are given below.



### SPECIFICATIONS

Size	Stationary		With Casters	
	Order No.	Wt.	Order No.	Wt.
12 x 18"	<b>517-950</b>	42lbs	<b>517-950-1</b>	46lbs
18 x 18"	<b>517-951</b>	46lbs	<b>517-951-1</b>	50lbs
18 x 24"	<b>517-952</b>	50lbs	<b>517-952-1</b>	56lbs
24 x 24"	<b>517-954</b>	65lbs	<b>517-954-1</b>	69lbs
24 x 30"	<b>517-955</b>	70lbs	<b>517-955-1</b>	74lbs
24 x 36"	<b>517-956</b>	73lbs	<b>517-956-1</b>	77lbs
24 x 48"	<b>517-957</b>	90lbs	<b>517-957-1</b>	94lbs
30 x 36"	<b>517-960</b>	85lbs	<b>517-960-1</b>	89lbs
30 x 48"	<b>517-961</b>	95lbs	<b>517-961-1</b>	99lbs
30 x 60"	<b>517-962</b>	105lbs	<b>517-962-1</b>	109lbs
36 x 36"	<b>517-963</b>	95lbs	<b>517-963-1</b>	99lbs
36 x 48"	<b>517-964</b>	105lbs	<b>517-964-1</b>	109lbs
36 x 60"	<b>517-965</b>	160lbs	<b>517-965-1</b>	164lbs
36 x 72"	<b>517-966</b>	180lbs	<b>517-966-1</b>	184lbs
48 x 48"	<b>517-967</b>	190lbs	<b>517-967-1</b>	194lbs
48 x 60"	<b>517-968</b>	200lbs	<b>517-968-1</b>	204lbs
48 x 72"	<b>517-969</b>	205lbs	<b>517-969-1</b>	209lbs
48 x 84"	<b>517-970</b>	320lbs	<b>517-970-1</b>	324lbs
48 x 96"	<b>517-971</b>	335lbs	<b>517-971-1</b>	339lbs
48 x 108"	<b>517-972</b>	350lbs	<b>517-972-1</b>	354lbs
48 x 120"	<b>517-973</b>	365lbs	<b>517-973-1</b>	369lbs
48 x 144"	<b>517-974</b>	430lbs	<b>517-974-1</b>	434lbs
60 x 60"	<b>517-975</b>	245lbs		
60 x 72"	<b>517-976</b>	340lbs		
60 x 96"	<b>517-977</b>	375lbs		
60 x 120"	<b>517-978</b>	455lbs		
60 x 144"	<b>517-979</b>	480lbs		
72 x 72"	<b>517-980</b>	380lbs		
72 x 96"	<b>517-981</b>	465lbs		
72 x 120"	<b>517-982</b>	510lbs		
72 x 144"	<b>517-983</b>	530lbs		

Note: The total height of stand and granite plate is 36". If ordering only stand, stand height will be made according to a Grade A granite plate thickness.





### Digimatic Indicators



### Dial Indicators



### Dial Test Indicators



### Dial Indicator Applications and Stands



Solar ID-S



ID-H



ID-N / ID-B



Caliper gage

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# ABSOLUTE Solar Digimatic Indicator ID-S

543 Series – With Simple Design

## FEATURES

- Mitutoyo's unique ABSOLUTE sensor automatically restores the last origin position when the indicator is turned on. This allows quick-start operation, which is especially useful in multipoint measurement.
- Measurement tool with a solar power source. Ready for use from 40 lux illumination.
- As compact as Series 2 dial indicators.
- SPC Output provided
- Two large buttons (three on inch/mm models) improve functionality



## SPECIFICATIONS

**Inch/Metric** with 3/8" dia. Stem, #4-48UNF Thread

Order	Model	Range	Resolution	Accuracy	Stem Diameter	Measuring Force	Back Type
543-502	ID-S112ES	.5"/12.7mm	.00005"/0.001mm	.0001"/0.003mm	3/8" (ANSI/AGD)	1.5N or less	Lug Back
543-502B	ID-S112ESB	.5"/12.7mm	.00005"/0.001mm	.0001"/0.003mm	3/8" (ANSI/AGD)	1.5N or less	Flat Back
543-507	ID-S1012ES	.5"/12.7mm	.0005"/0.01mm	.001"/0.02mm	3/8" (ANSI/AGD)	1.5N or less	Lug Back
543-507B	ID-S1012ESB	.5"/12.7mm	.0005"/0.01mm	.001"/0.02mm	3/8" (ANSI/AGD)	1.5N or less	Flat Back

**Metric** with 8mm dia. Stem, M2.5x.45 Thread

Order	Model	Range	Resolution	Accuracy	Stem Diameter	Measuring Force	Back Type
543-500	ID-S112S	12.7mm	0.001mm	0.003mm	8mm (ISO)	1.5N or less	Lug Back
543-500B	ID-S112SB	12.7mm	0.001mm	0.003mm	8mm (ISO)	1.5N or less	Flat Back
543-505	ID-S1012S	12.7mm	0.01mm	0.02mm	8mm (ISO)	1.5N or less	Lug Back
543-505B	ID-S1012SB	12.7mm	0.01mm	0.02mm	8mm (ISO)	1.5N or less	Flat Back

**Inch/Metric** with 8mm dia. Stem, M2.5x.45 Thread

Order	Model	Range	Resolution	Accuracy	Stem Diameter	Measuring Force	Back Type
543-501	ID-S112MS	.5"/12.7mm	.00005"/0.001mm	.0001"/0.003mm	8mm (ISO)	1.5N or less	Lug Back
543-501B	ID-S112MSB	.5"/12.7mm	.00005"/0.001mm	.0001"/0.003mm	8mm (ISO)	1.5N or less	Flat Back
543-506	ID-S1012MS	.5"/12.7mm	.0005"/0.01mm	.001"/0.02mm	8mm (ISO)	1.5N or less	Lug Back
543-506B	ID-S1012MSB	.5"/12.7mm	.0005"/0.01mm	.001"/0.02mm	8mm (ISO)	1.5N or less	Flat Back

## Technical Data

Accuracy: Refer to the list of specifications  
 Resolution: 0.01mm, 0.001mm, .00005"/0.001mm, or .0005"/0.01mm  
 Display: LCD  
 Length Standard: ABSOLUTE electrostatic capacitance type linear encoder  
 Max. Response Speed: Unlimited  
 Measuring Force: Refer to the list of specifications  
 Battery: Solar Battery\*  
 Dust/Water Protection Level: IP42  
 \*can be used continuously above 40 lux

## Function

Origin Set, Counting Direction Switching, in/mm conversion

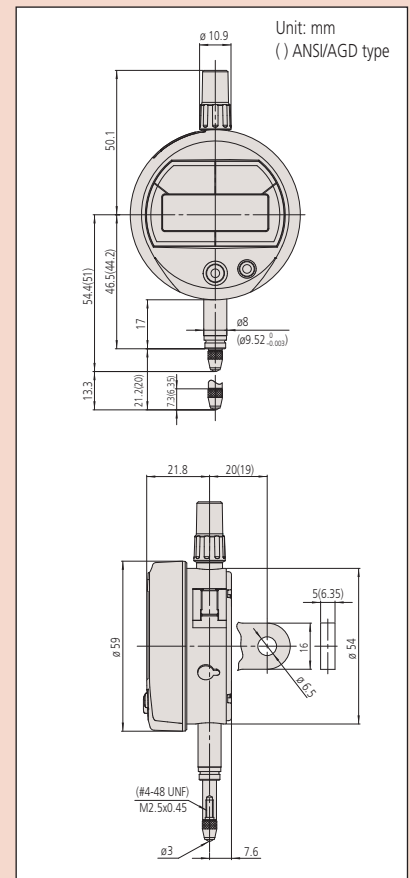
## Optional Accessories

21EZA198 Lifting lever (mm)  
 21EZA199 Lifting lever (inch)  
 540774 Lifting cable  
 21EZA105 Lifting knob (mm)  
 21EZA150 Lifting knob (inch)  
 905338 SPC cable (1m)  
 905409 SPC cable (2m)  
 All Mitutoyo Series 2 standard backs

## About the charge function:

Reserve capacity allows a fully charged ID-S Solar to be used for about 3.5 hours under light conditions below the minimum level. The charging time differs depending on the environment, but it usually takes about 1.5 hours for a fully discharged ID-S Solar to fully recharge under light conditions of 500 lux.

## DIMENSIONS





### Technical Data

Accuracy: Refer to the list of specifications  
 Resolution: 0.01mm, 0.001mm, .0005"/0.01mm, .0001"/0.001mm or .00005"/0.001mm  
 Display: LCD  
 Length standard: ABSOLUTE electrostatic capacitance type linear encoder  
 Max. response speed: Unlimited  
 Measuring force: Refer to the list of specifications  
 Battery: SR44 (1 pc.), 938882  
 Battery life: Approx. 20,000 hours under normal use  
 Dust/Water protection level: IP42 (IP53: 543-694, 543-695, 543-696)

### Function

Origin-set, Zeraset, Counting direction switching, Power ON/OFF, Data output, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error, Over-flow error

### Optional Accessories

- 905338: SPC cable (40" / 1m)
- 905409: SPC cable (80" / 2m)
- 903424: Spindle lifting lever (ISO/JIS type)
- 903425: Spindle lifting lever (ANSI/AGD type)
- 540774: Spindle lifting cable (stroke: .4" / 10mm)
- 125317: Spare rubber boot (for dust-proof type)
- 02ACB420: Lug-on-center back for ISO/JIS type
- 02ACB430: Lug-on-center back for AGD type
- 02ACB440: Flat back
- 02ACB610: Back with post
- 02ACB620: Adjustable back for AGD type
- 02ACB630: Adjustable back (ISO/JIS type)
- 02ACB640: Back with offset lug
- 02ACB650: Magnetic back
- 02ACB660: Back with screw mount for AGD type
- 02ACB670: Back with screw mount (ISO/JIS type)
- 02ACB680: Back with adjustable bracket
- : Contact points (See page F-34.)



# ABSOLUTE Digimatic Indicator ID-S

## SERIES 543 — with Simple Design

### FEATURES

- As compact as standard Series 2 dial indicators.
- After the initial zero-setting with the ORIGIN button, the repeated absolute positioning is no longer necessary over the entire battery life.
- Employing the ABSOLUTE linear encoder, the ID-S always displays the spindle "Absolute Position" from the origin at power-on. Also unlimited response speed eliminates over-speed errors.
- SPC data output.



543-683B



543-690

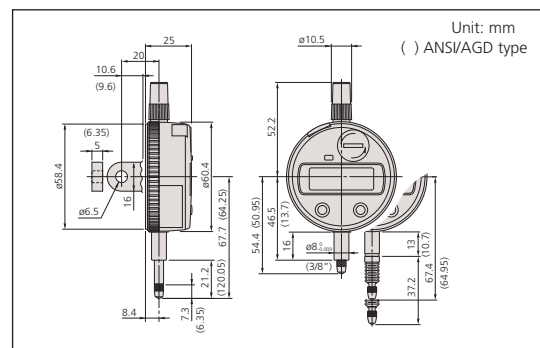
### SPECIFICATIONS

Inch/Metric	Stem dia. 3/8", #4-48 UNF Thread		ISO/JIS type	ANSI/AGD type				
	Resolution	Range	Order No.		Model	Accuracy	Measuring force	Remarks
			w/ lug back	w/ flat-back				
.00005"/0.001mm	.5" / 12.7mm	543-692	543-692B	ID-S112E	.00012"	2.0N	—	
.00005"/0.001mm	.5" / 12.7mm	543-696	543-696B	ID-S112PE	.00012"	2.5N	Dust-proof	
.0001"/0.001mm	.5" / 12.7mm	543-693	543-693B	ID-S112T	.00012"	2.0N	—	
.0005"/0.01mm	.5" / 12.7mm	543-683	543-683B	ID-S1012E	.0008"	2.0N	—	

Inch/Metric	Stem ø 8mm, M2.5 x 0.45 Thread							
	Resolution	Range	Order No.		Model	Accuracy	Measuring force	Remarks
			w/ lug back	w/ flat-back				
.00005"/0.001mm	.5" / 12.7mm	543-691	543-691B	ID-S112M	.00012"	2.0N or less	—	
.00005"/0.001mm	.5" / 12.7mm	543-695	543-695B	ID-S112PM	.00012"	2.5N or less	Dust-proof	
.0005"/0.01mm	.5" / 12.7mm	543-682	543-682B	ID-S1012M	.0008"	2.0N or less	—	

Metric	Stem ø 8mm, M2.5 x 0.45 Thread							
	Resolution	Range	Order No.		Model	Accuracy	Measuring force	Remarks
			w/ lug back	w/ flat-back				
0.001mm	12.7mm	543-690	543-690B	ID-S112	0.003mm	2.0N or less	—	
0.001mm	12.7mm	543-694	543-694B	ID-S112P	0.003mm	2.5N or less	Dust-proof	
0.01mm	12.7mm	543-681	543-681B	ID-S1012	0.02mm	2.0N or less	—	

### DIMENSIONS

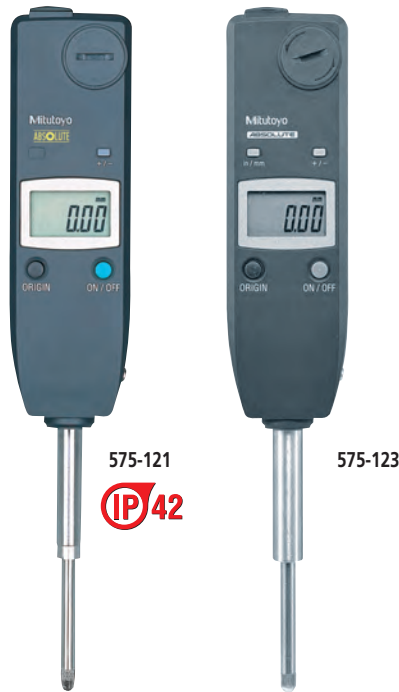


# ABSOLUTE Digimatic Indicator ID-U

**SERIES 575 — with Slim and Simple Design**

## FEATURES

- Slim type digital indicator with low price.
- Large LCD and simple key operation.
- After the initial origin setting, the ID-U no longer needs absolute positioning over the entire battery life; the origin is remembered even after power-off.
- Ideal for installation into measuring devices because of its compact design and long battery life.
- Employing the ABSOLUTE linear encoder, the ID-U always displays the spindle "Absolute Position" from the origin at power-on. Also unlimited response speed eliminates over-speed errors.
- Flat back type only no option for backs.
- SPC data output.



## SPECIFICATIONS

**Inch/Metric** Stem dia. 3/8", #4-48 UNF Thread    ISO/JIS type    ANSI/AGD type

Resolution	Range	Order No.	Model	Accuracy	Measuring force
.0005"/0.01mm	1" / 25.4mm	<b>575-123</b>	ID-U1025E	.0008"	1.8N or less

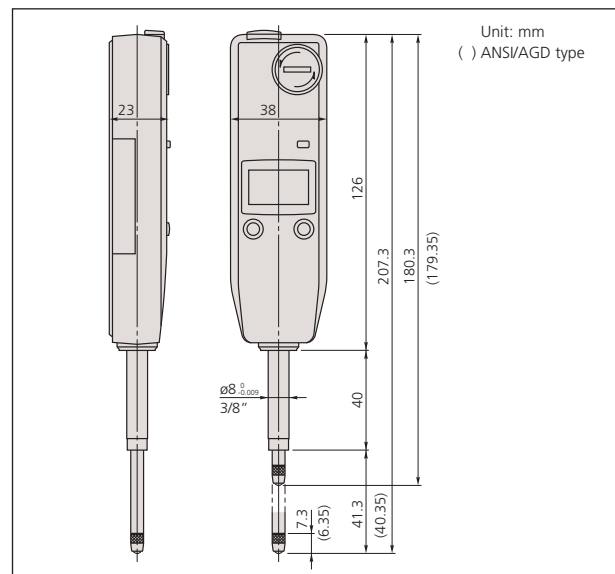
**Inch/Metric** Stem  $\varnothing$  8mm, M2.5 x 0.45 Thread

Resolution	Range	Order No.	Model	Accuracy	Measuring force
.0005"/0.01mm	1" / 25.4mm	<b>575-122</b>	ID-U1025M	.0008"	1.8N or less

**Metric** Stem  $\varnothing$  8mm, M2.5 x 0.45 Thread

Resolution	Range	Order No.	Model	Accuracy	Measuring force
0.01mm	25.4mm	<b>575-121</b>	ID-U1025	0.02mm	1.8N or less

## DIMENSIONS



## Technical Data

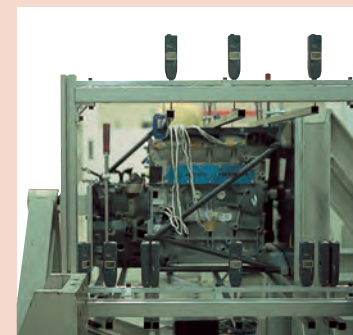
Accuracy: Refer to the list of specifications  
 Resolution: 0.01mm or .0005"/0.01mm,  
 Display: LCD  
 Length standard: ABSOLUTE electrostatic capacitance type linear encoder  
 Max. response speed: Unlimited  
 Measuring force: Refer to the list of specifications  
 Battery: SR44 (1 pc.), **938882**  
 Battery life: Approx. 20,000 hours under normal use  
 Dust/Water protection level: IP42

## Function

Origin-set, Zeroset, Counting direction switching, Power ON/OFF, Data output, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error, Over-flow error

## Optional Accessories

**905338:** SPC cable (40" / 1m)  
**905409:** SPC cable (80" / 2m)  
**540774:** Spindle lifting cable (stroke: 4" / 10mm)  
 \_\_\_\_\_: Contact points (See page F-34.)



Application example



### Technical Data

Accuracy:	Refer to the list of specifications	
Resolution:	0.01mm type	0.01mm
	0.001mm type*	0.001mm/0.01mm
	.0005"/0.01mm type	.0005"/0.01mm
	.00005"/0.001mm type*	.0005"/.0001"/.00005"/0.01mm/0.001mm

\* Switchable resolution

Display: LCD  
 Length standard: ABSOLUTE electrostatic capacitance type linear encoder  
 Max. response speed: Unlimited  
 Measuring force: Refer to the list of specifications  
 Battery: SR44 (1 pc.), **938882**  
 Battery life: Approx. 5,000 hours under normal use  
 Dust/Water protection level: IP42 or IP53 (dust-proof type)

### Function

Origin-set/Preset, Zerose, GO/±NG judgment, Counting direction switching, Power ON/OFF, Data output, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error, Over-flow error, Tolerance limit setting error  
 Internal calculations using the simple formula of  $[F(x) = Ax]$  are available.

### Optional Accessories

- 905338:** SPC cable (40" / 1m)
- 905409:** SPC cable (80" / 2m)
- 21EZA198:** Spindle lifting lever (ISO/JIS type)\*
- 21EZA199:** Spindle lifting lever (ANSI/AGD type)\*
- 21EZA105:** Spindle lifting knob (12.7mm/.5" ISO/JIS type)\*\*
- 21EZA150:** Spindle lifting knob (12.7mm/.5" ANSI/AGD type)\*\*
- 21EZA197:** Spindle lifting knob (25.4mm/1", 50.8mm/2" models)
- 21EZA200:** Spindle lifting knob (50.8mm/2")
- 540774:** Spindle lifting cable (stroke: 1" / 25.4mm)
- 02ACA571:** Auxiliary spindle spring for 25mm/1" models\*\*\*
- 02ACA773:** Auxiliary spindle spring for 50mm/2" models\*\*\*
- : Backs (See page F-33.)
- : Contact points (See page F-34.)

\*Can be used on 12mm/.5" models only.  
 \*\*Not available for low measuring force models.  
 \*\*\*Required when orienting gage upside down.

# ABSOLUTE Digimatic Indicator ID-C

## SERIES 543 — Standard Type

### FEATURES

- As compact as standard Series 2 dial indicators.
- Large, easy-to-read LCD.
- GO/±NG judgment can be performed by setting upper and lower tolerance limits. The judgment result (GO/±NG) can be displayed in full-size characters.
- The positive/negative count resulting from the spindle's up/down movement can be toggled.
- Internal calculations using the simple formula of  $[F(x) = Ax]$  are available.
- Employing the ABSOLUTE linear encoder, the ID-C always displays the spindle "Absolute Position" from the origin at power-on. Also unlimited response speed eliminates over-speed errors.
- The ID-C indicator face can be rotated 330° to an appropriate angle for easy reading.
- With SPC data output.



**IP42**  
543-392



**IP42**  
543-402



**IP42**  
543-472B



**IP42**  
543-492B

# SPECIFICATIONS

**Inch/Metric** Stem dia. 3/8", #4-48 UNF Thread ISO/JIS type ANSI/AGD type

Resolution	Range	Order No. (w/lug, flat-back)		Model	Accuracy	Measuring force	Remarks
.00005"/0.001mm*	.5" / 12.7mm	<b>543-392</b>	<b>543-392B</b>	ID-C112EXB	.0001"	1.5N or less	—
.00005"/0.001mm*	.5" / 12.7mm	<b>543-396</b>	<b>543-396B</b>	ID-C112CEX	.0001"	0.4N - 0.7N	Low measuring force
.00005"/0.001mm*	1" / 25.4mm	—	<b>543-472B</b>	ID-C125EXB	.0001"	1.8N or less	—
.00005"/0.001mm*	2" / 50.8mm	—	<b>543-492B</b>	ID-C150EXB	.0002"	2.3N or less	—
.0005"/0.01mm	.5" / 12.7mm	<b>543-402</b>	<b>543-402B</b>	ID-C1012EX	.001"	0.9N or less	—
.0005"/0.01mm	.5" / 12.7mm	<b>543-406</b>	<b>543-406B</b>	ID-C1012CEX	.001"	0.2N - 0.5N	Low measuring force
.0005"/0.01mm	1" / 25.4mm	—	<b>543-476B</b>	ID-C1025EXB	.001"	1.8N or less	—
.0005"/0.01mm	2" / 50.8mm	—	<b>543-496B</b>	ID-C112CEXB	.0016"	2.3N or less	—

\* Switchable Resolution Type

**Inch/Metric** Stem ø 8mm, M2.5 x 0.45 Thread

Resolution	Range	Order No. (w/lug, flat-back)		Model	Accuracy	Measuring force	Remarks
.00005"/0.001mm*	.5" / 12.7mm	<b>543-391</b>	<b>543-391B</b>	ID-C112MX	.0001"	1.5N or less	—
.00005"/0.001mm*	.5" / 12.7mm	<b>543-395</b>	<b>543-395B</b>	ID-C112CMX	.0001"	0.4N - 0.7N	Low measuring force
.00005"/0.001mm*	1" / 25.4mm	—	<b>543-471B</b>	ID-C125MXB	.0001"	1.8N or less	—
.00005"/0.001mm*	2" / 50.8mm	—	<b>543-491B</b>	ID-C150MXB	.0002"	2.3N or less	—
.0005"/0.01mm	.5" / 12.7mm	<b>543-401</b>	<b>543-401B</b>	ID-C1012MX	.001"	0.9N or less	—
.0005"/0.01mm	.5" / 12.7mm	<b>543-405</b>	<b>543-405B</b>	ID-C1012CMX	.001"	0.2N - 0.5N	Low measuring force
.0005"/0.01mm	1" / 25.4mm	—	<b>543-475B</b>	ID-C1025MXB	.001"	1.8N or less	—
.0005"/0.01mm	2" / 50.8mm	—	<b>543-495B</b>	ID-C1050MXB	.0016"	2.3N or less	—

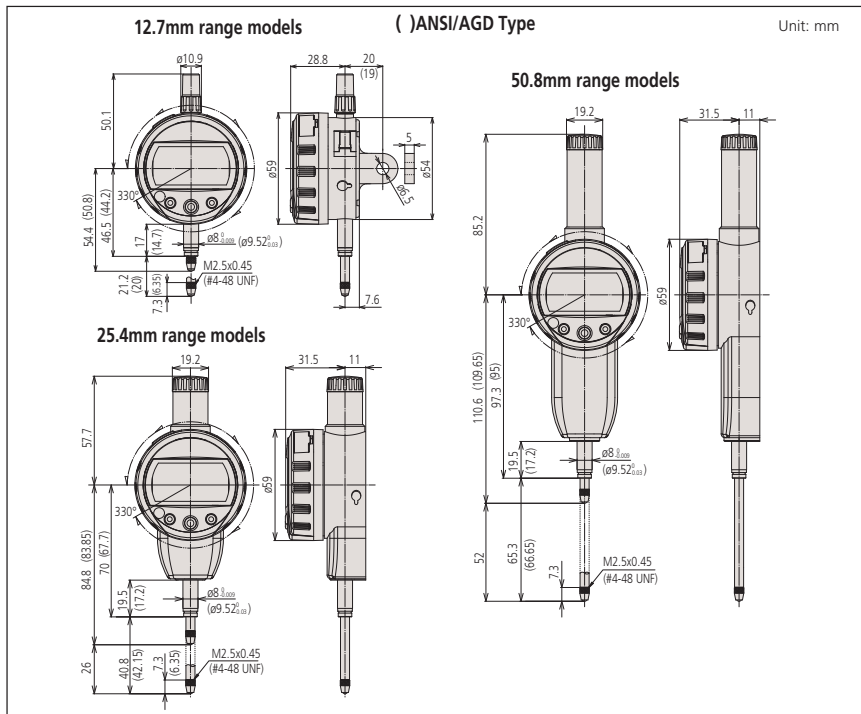
\* Switchable Resolution Type

**Metric** Stem ø 8mm, M2.5 x 0.45 Thread

Resolution	Range	Order No. (w/lug, flat-back)		Model	Accuracy	Measuring force	Remarks
0.001mm*	12.7mm	<b>543-390</b>	<b>543-390B</b>	ID-C112X	0.003mm	1.5N or less	—
0.001mm*	12.7mm	<b>543-394</b>	<b>543-394B</b>	ID-C112CX	0.003mm	0.4N - 0.7N	Low measuring force
0.001mm*	25.4mm	—	<b>543-470B</b>	ID-C125XB	0.003mm	1.8N or less	—
0.001mm*	50.8mm	—	<b>543-490B</b>	ID-C150XB	0.006mm	2.3N or less	—
0.01mm	12.7mm	<b>543-400</b>	<b>543-400B</b>	ID-C1012X	0.02mm	0.9N or less	—
0.01mm	12.7mm	<b>543-404</b>	<b>543-404B</b>	ID-C1012CX	0.02mm	0.2N - 0.5N	Low measuring force
0.01mm	25.4mm	—	<b>543-474B</b>	ID-C1025XB	0.03mm	1.8N or less	—

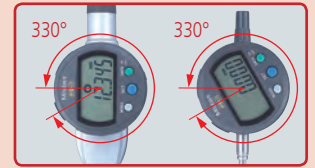
\* Switchable Resolution Type

# DIMENSIONS



## 330° Rotary display

The display can be rotated 330°, allowing use at a position where you can easily read the measurement value.



## Calculation: f(x) = Ax

Mounting the ID-C on a measuring jig and setting the multiplying factor 'A' (to any value) allows direct measurement without using a conversion table and improves measurement efficiency.



## Function locking

Ensures reliability of measurement by locking the settings to prevent preset function settings from being changed by mistake.



## Setting measuring force on low measuring force models

### •543-404/404B/405/405B/406/406B

Spindle orientation	Spring	Weight (approximately 0.1N)	Maximum measuring force
Pointing vertically downward	Yes	Yes	0.5N
	Yes	No	0.4N
	No	Yes	0.3N
Horizontal	No	No	0.2N
Horizontal	Yes	No	0.2N

Note) Operation using configurations other than shown above is not guaranteed.

### •543-394/394B/395/395B/396/396B

Spindle orientation	Spring	Weight (approximately 0.1N)	Maximum measuring force
Pointing vertically downward	Yes	Yes	0.7N
	Yes	No	0.6N
	No	Yes	0.4N
Horizontal	No	No	Not guaranteed
Horizontal	Not guaranteed		

Note) Operation using configurations other than shown above is not guaranteed.



### Technical Data

Accuracy: Refer to the list of specifications  
 Resolution: 0.0002mm - 1mm or  
 .00001" - .05"/0.0002mm - 1mm  
 Display: LCD  
 Length standard: ABSOLUTE electrostatic capacitance type  
 linear encoder  
 Max. response speed: Unlimited  
 Measuring force: 1.5N or less  
 Battery: SR44 (1 pc.), **938882**  
 Battery life: Approx. 12 months under normal use

### Function

Origin-set/Pre-set, Zero-set, GO/±NG judgment, Counting direction switching, Power ON/OFF, Data output, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error, Over-flow error, Tolerance limit setting error

### Optional Accessories

- 905338:** SPC cable (40" / 1m)
- 905409:** SPC cable (80" / 2m)
- 902011:** Spindle lifting lever (ISO/JIS type)
- 540774:** Spindle lifting cable (Stroke: .4" / 10mm)
- : Backs (See page F-33.)
- : Contact points (See page F-34.)

### APPLICATIONS



- Various fixtures suited for individual workpieces can be prepared.
- Measuring accuracy is subject to fixture accuracy

# ABSOLUTE Digimatic Indicator ID-C

## SERIES 543 — Calculation Type

### FEATURES

A conventional Digimatic indicator simply displays a spindle displacement, but the Calculation-Type Digimatic indicator incorporates an internal calculation function in place of spindle displacement. With fixtures, measurements such as feeler, inside diameter and radius of curvature measurement can easily be obtained without the hassle of conversion tables or equivalents.

- The Absolute Digimatic indicator performs internal calculations using the formula  $Ax+B+Cx^{-1}$  (assuming spindle displacement as  $x$ ) while the specified coefficients  $A$ ,  $B$  and  $C$  can be set with respect to the purpose of measurement or dimensions of the fixtures. This unique features allows you to read your measurements directly, without fumbling for conversions.



543-287B

### SPECIFICATIONS

ISO/JIS type      ANSI/AGD type

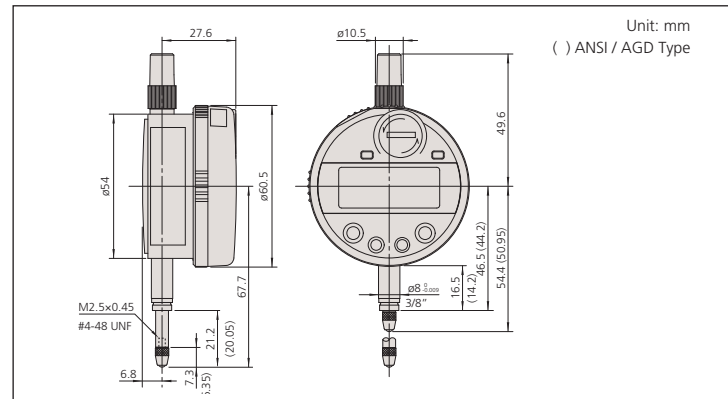
Inch/Metric		Stem dia. 3/8" #4-48 UNF Thread			
Resolution	Range	Order No.*	Model	Accuracy	Measuring Force
.00001" - .05"/ 0.0002 - 1mm	.5" / 12.7mm	<b>543-287B</b>	ID-C112REB	.00012"	1.5N or less
(switchable)	1" / 25.4mm	<b>543-482B</b>	ID-C125REB	.00012"	2.0N or less
	2" / 50.8mm	<b>543-487B</b>	ID-C150REB	.00025"	2.3N or less

Inch/Metric		Stem ø 8mm, M2.5 x 0.45 Thread			
Resolution	Range	Order No.*	Model	Accuracy	Measuring Force
.00001" - .05"/ 0.0002 - 1mm	.5" / 12.7mm	<b>543-286B</b>	ID-C112RMB	.00012"	1.5N or less
(switchable)	1" / 25.4mm	<b>543-481B</b>	ID-C125RMB	.00012"	2.0N or less
	2" / 50.8mm	<b>543-486B</b>	ID-C150RMB	.00025"	2.3N or less

Metric		Stem ø 8mm, M2.5 x 0.45 Thread			
Resolution	Range	Order No.*	Model	Accuracy	Measuring Force
0.0002 - 1mm (switchable)	12.7mm	<b>543-285B</b>	ID-C112RB	0.003mm	1.5N or less
	25.4mm	<b>543-480B</b>	ID-C125RB	0.003mm	2.0N or less
	50.8mm	<b>543-485B</b>	ID-C150RB	0.006mm	2.3N or less

\*Flat back

### DIMENSIONS



# ABSOLUTE Digimatic Indicator ID-C

SERIES 543 — with Green/Red LED and GO/NG Signal Output Function



## FEATURES

- With the max./min. value holding function, the signal ID-C can output the signal of the GO/±NG judgment result against the peak values set. Substitute for the mechanical/electrical contact, the judgment is carried out by calculating the measurement data obtained. This provides high reliability with no deterioration of the contact point and volume adjustment.
- The signal can be output to an external device like a sequencer through the NPN open-collector.
- The GO/±NG judgment result is also indicated by the green/red LED and the "<, O, >" signs on LCD.
- Employing the ABSOLUTE linear encoder, the Signal ID-C always displays the spindle "Absolute Position" from the origin at power-on.
- The Signal ID-C achieves the IP54 protection level to resist dust and contaminants for safe operation in harsh machine shop environments.



543-282

## SPECIFICATIONS

**Inch/Metric** Stem dia. 3/8" #4-48 UNF Thread □ ISO/JIS type □ ANSI/AGD type

Resolution	Range	Order No. (w/ lug, flat-back)	Model	Accuracy	Measuring force
.00005"/0.001mm	.5" / 12.7mm	<b>543-282</b> <b>543-282B</b>	ID-C112JE	.00012"	2.0N or less
.0005"/0.01mm	.5" / 12.7mm	<b>543-283</b> <b>543-283B</b>	ID-C112JT	.00012"	2.0N or less

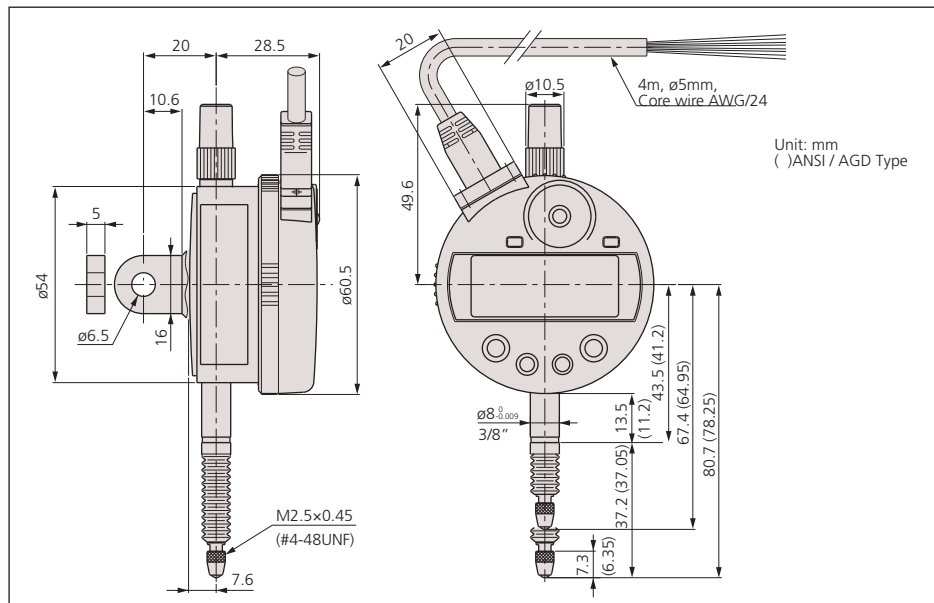
**Inch/Metric** Stem ø 8mm, M2.5 x 0.45 Thread

Resolution	Range	Order No. (w/ lug, flat-back)	Model	Accuracy	Measuring force
.00005"/0.001mm	.5" / 12.7mm	<b>543-281</b> <b>543-281B</b>	ID-C112JM	.00012"	2.0N or less

**Metric** Stem ø 8mm, M2. x 0.45 Thread

Resolution	Range	Order No. (w/ lug, flat-back)	Model	Accuracy	Measuring force
0.001mm	12.7mm	<b>543-280</b> <b>543-280B</b>	ID-C112J	0.003mm	2.0N or less

## DIMENSIONS



## Technical Data

Accuracy: Refer to the list of specifications  
 Resolution: 0.001mm, .00005"/0.001mm or .0001"/0.001mm  
 Display: LCD  
 Length standard: ABSOLUTE electrostatic capacitance type linear encoder  
 Max. response speed: Unlimited  
 Measuring force: 2.0N or less  
 Power supply: DC 12 - 24V±10%  
 Dust/Water protection level: IP54

## Function

Data output (-NG/OK/NG signal, NPN open collector), Remote control (hold-preset, preset-recall, zero-set), Origin-set/Preset, Zeroset, GO/±NG judgment, Max/Min/Runout value holding, Counting direction switching, Power ON/OFF, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error, Over-flow error, Tolerance limit setting error

## Optional Accessories

- 902011:** Spindle lifting lever\* (ISO/JIS type)
- 902794:** Spindle lifting lever\* (ANSI/AGD type)
- 540774:** Spindle lifting cable\* (Stroke: .4" / 10mm)
- 125317:** Rubber boot
- Backs (See page F-33.)
- Contact points (See page F-34.)

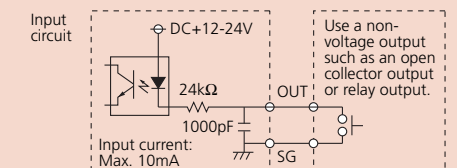
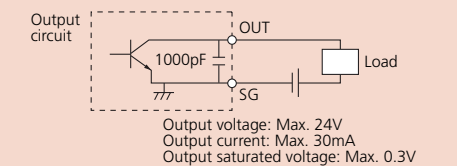
\*When using the spindle lifting lever/cable, IP54 is not guaranteed.

## Output pattern

Wire	- NG	OK	+ NG	Composition error
Orange (- NG)	Low	High	High	High
Green (OK)	High	Low	High	High
Brown (+ NG)	High	High	Low	High
LED	Red	Green	Red	Red (blinking)
LCD	<	O	>	"x.xx" indication

## I/O Specifications

Wire	Signal	I/O	Description
Black	- V (GND)	—	Connected to minus (-) terminal
Red	+ V (GND)	I	Power supply (12 - 24VDC)
Orange	- NG	O	Tolerance judgment result output: Only the terminal corresponding to a judgment result is set to the below level.
Green	OK	O	
Brown	+ NG	O	
Yellow	PRESET_RECALL ZERO	I	External input terminal: If the relevant terminal is set to the low level, its signal becomes true.
Blue	HOLD_RESET	I	
Shield	FG	—	Connected to GND







### Technical Data

Accuracy: Refer to the list of specifications  
 Resolution: 0.001mm, .00005"/0.001mm or .0001"/0.001mm  
 Display: LCD  
 Length standard: ABSOLUTE electrostatic capacitance type linear encoder  
 Max. response speed: Unlimited  
 Measuring force: 1.5N or less  
 Battery: SR44 (2 pcs.), **938882**  
 Battery life: Approx. 800 - 1300 hours under normal use  
 Dust/Water protection level: IP42

### Function

Origin-set/Preset, Zeraset, GO/±NG judgment, Max/Min/Runout value holding, Counting direction switching, Power ON/OFF, Data output, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error, Over-flow error, Tolerance limit setting error

### Optional Accessories

- 905338:** SPC cable (40" / 1m)
- 905409:** SPC cable (80" / 2m)
- 902011:** Spindle lifting lever (ISO/JIS type)
- 902794:** Spindle lifting lever (ANSI/AGD type)
- 540774:** Spindle lifting cable (stroke: .4" / 10mm)
- : Backs (See page F-33.)
- : Contact points (See page F-34.)

# ABSOLUTE Digimatic Indicator ID-C

## SERIES 543 — with Max./Min. Value Holding Function

With max./min. value holding function model of the ID-C Series Digimatic Indicators.

### FEATURES

- The maximum, minimum, or runout value can be displayed during measurement.
- GO/±NG judgment is performed by setting the upper and lower tolerances for max., min. and runout values.
- High speed sampling ratio of 50 times/s.
- Employing the ABSOLUTE linear encoder, the Signal ID-C always displays the spindle "Absolute Position" from the origin at power-on.



543-260

### SPECIFICATIONS

ISO/JIS type      ANSI/AGD type

Inch/Metric		Stem dia. 3/8" #4-48 UNF Thread		
Resolution	Range	Order No.*	Model	Accuracy
.00005"/0.001mm	.5" / 12.7mm	<b>543-262</b>	ID-C112AE	.00012"
.0001"/0.001mm	.5" / 12.7mm	<b>543-263</b>	ID-C112AT	.00012"

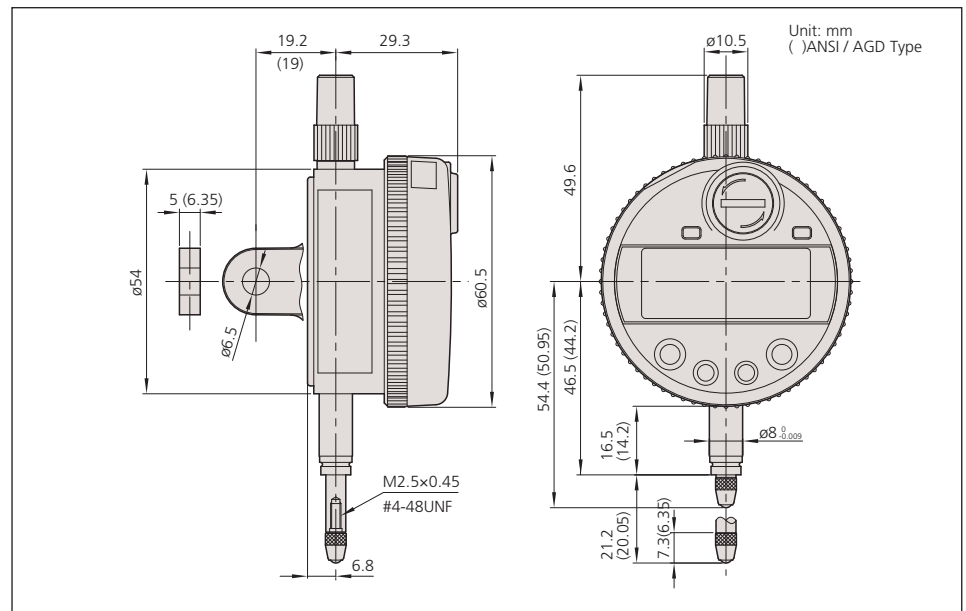
Inch/Metric		Stem ø 8mm, M2.5 x 0.45 Thread		
Resolution	Range	Order No.*	Model	Accuracy
.00005"/0.001mm	.5" / 12.7mm	<b>543-261</b>	ID-C112AM	.00012"

\*Back with lug

Metric		Stem ø 8mm, M2.5 x 0.45 Thread		
Resolution	Range	Order No.*	Model	Accuracy
0.001mm	12.7mm	<b>543-260</b>	ID-C112A	0.003mm

\*Back with lug

### DIMENSIONS



# ABSOLUTE Digimatic Indicator ID-C

## SERIES 543 — Specially Designed for Bore Gage Application

This ID-C Series Digimatic Indicators are exclusively designed for ID measurement.

### FEATURES

- The minimum value holding function provides the easy of detection of hole diameter.
- An analog bar indicator is integrated to enhance the intuition in reading.
- GO/±NG judgment is performed by setting the upper and lower tolerances.
- Up to three sets of master value and upper/lower tolerance value can be memorized.
- Employing the ABSOLUTE linear encoder, the Signal ID-C always displays the spindle "Absolute Position" from the origin at power-on.



543-266B

### SPECIFICATIONS

ISO/JIS type    ANSI/AGD type

**Inch/Metric**    Stem dia. 3/8" #4-48 UNF Thread

Resolution	Range	Order No.*	Model	Accuracy
.00005"/0.001mm	.5" / 12.7mm	543-266B	ID-C112GE	.00012"
.0001"/0.001mm	.5" / 12.7mm	543-267B	ID-C112G	.00012"

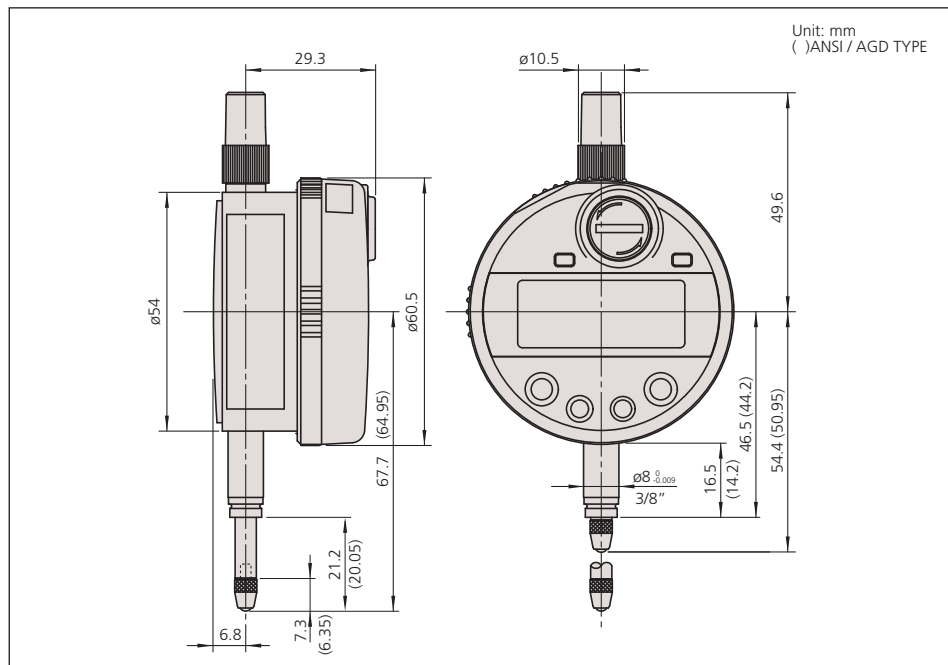
\*Back with lug

**Metric**    Stem  $\varnothing$  8mm, M2.5 x 0.45 Thread

Resolution	Range	Order No.*	Model	Accuracy
0.001mm	12.7mm	543-264B	ID-C112G	0.003mm

\*Back with lug

### DIMENSIONS



### Technical Data

Accuracy: Refer to the list of specifications  
 Resolution: 0.001mm or .00005"/0.001mm  
 Display: LCD  
 Length standard: ABSOLUTE electrostatic capacitance type linear encoder  
 Max. response speed: Unlimited  
 Measuring force: 1.5N or less  
 Battery: SR44 (2 pcs.), **938882**  
 Battery life: Approx. 2000 hours under normal use  
 Dust/Water protection level: IP42

### Function

Origin-set/Pre-set, Zero-set, GO/±NG judgment, Power ON/OFF, Data output, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error, Over-flow error, Tolerance limit setting error

### Optional Accessories

**905338:** SPC cable (40" / 1m)  
**905409:** SPC cable (80" / 2m)  
 Applicable Gages Series 511 and 526



Installed on bore gage probe (511-127)



### Technical Data

Accuracy: Refer to the list of specifications  
 Resolution: 0.0005mm/0.001mm or .00002"/.00005"  
 /.0001"/0.0005mm/0.001mm  
 Display: LCD  
 Length standard: Linear encoder  
 Max. response speed: 1000mm/s  
 Measuring force: 2.0N/2.5N\* or less (\*60mm range models)  
 Power supply: 6V DC (via AC adaptor)

### Function

Origin-set/Preset, Zeroset, GO/±NG judgment, Max/Min value hold, Runout measurement, Resolution switching, Counting direction switching, Power ON/OFF, Data output, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error, Over-flow error, Tolerance limit setting error

### Standard Accessories

06AEG302JA: AC Adapter 120v  
 137693: Lifting Lever

### Optional Accessories

936937: SPC cable (40" / 1m)  
 965014: SPC cable (80" / 2m)  
 21EAA131: RS-232C cable (80" / 2m)  
 21EZA099: Remote controller  
 540774: Spindle lifting cable (stroke: .4" / 10mm)  
 21EZA101: Spindle lifting knob  
 264-504-5A: Digimatic Min-processor DP-1VR  
 543-004A: Digimatic presetter  
 21EZA152A: FREE PARAMETER SETTING SOFTWARE  
 —: Backs (See page F-33.)  
 —: Contact points (See page F-34.)

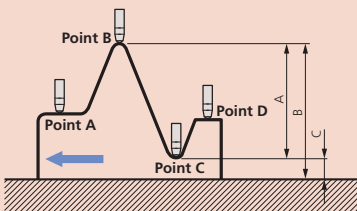
\*Required when orienting the indicator upside down.

### Application

#### Difference/Runout measurement

#### Example: Indicator travel from points A to D

Difference (or Total Runout) is displayed as A. Dimensions B (maximum value) and C (minimum value) can be recalled from memory with a simple key sequence.



Order No.	A	B	C	D	E
543-561A	251.3	47.3	30.48	60	7.3
543-562A	250.35	46.35	30.48	60	6.35
543-563A	311.3	77.3	60.96	90	7.3
543-564A	310.35	76.35	60.96	90	6.35

# ABSOLUTE Digimatic Indicator ID-H

## SERIES 543 — High Accuracy and High Functional Type

### FEATURES

- This new-generation digital indicator offers the excellent accuracy and functionality expected from this class of indicator. Take advantage of its high accuracy backed up by 0.5µm / .00002" resolution, remote control functionality via a handheld controller (or an RS-232C interface) and easy runout measurements with the well-established analog bar display.
- The maximum, minimum, or runout value can be displayed during measurement.
- GO/±NG judgment is performed by setting the upper and lower tolerances. If a judgment result is out of tolerance, the display backlighting changes from green to red, so tolerance judgment can be made at a glance.
- With SPC data output.
- With RS-232C input/output



### SPECIFICATIONS

**Inch/Metric** Stem dia. 3/8" #4-48 UNF Thread

Resolution	Range	Order No.*	Model	Accuracy
.00002", .00005", .0001", 0.0005mm, 0.001mm	1.2" / 30.4mm	543-562A	ID-H530E	0.0015mm
	2.4" / 60.9mm	543-564A	ID-H560E	0.0025mm

**Metric** Stem ø 8mm M2.5 X 0.45 Thread

Resolution	Range	Order No.*	Model	Accuracy
0.0005mm, 0.001mm	30.4mm	543-561A	ID-H530	0.0015mm
	60.9mm	543-563A	ID-H560	0.0025mm

Tolerance judgment



Analog bar display



Max/Min value measurement



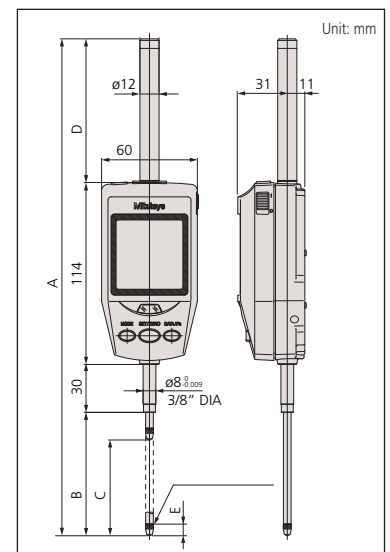
Runout measurement



Resolution switching



### DIMENSIONS



# ABSOLUTE Digimatic Indicator ID-F

SERIES 543 — with Back-lit LCD Screen



## FEATURES

- With the ABSOLUTE Linear Encoder technology, once the measurement reference point has been preset it will not be lost when the power is turned on.
- GO/±NG judgment is performed by setting the upper and lower tolerances. If a judgment result is out of tolerance, the display backlighting changes from green to red, so tolerance judgment can be made at a glance.



- The maximum, minimum, or runout value can be displayed during measurement.

- An analog bar indicator has been integrated to handle upper/lower limit approaching and zero approaching. It enhances the ease of operation in the same manner as a dial indicator. The display range of the analog bar can be changed.
- With SPC data output.



## SPECIFICATIONS

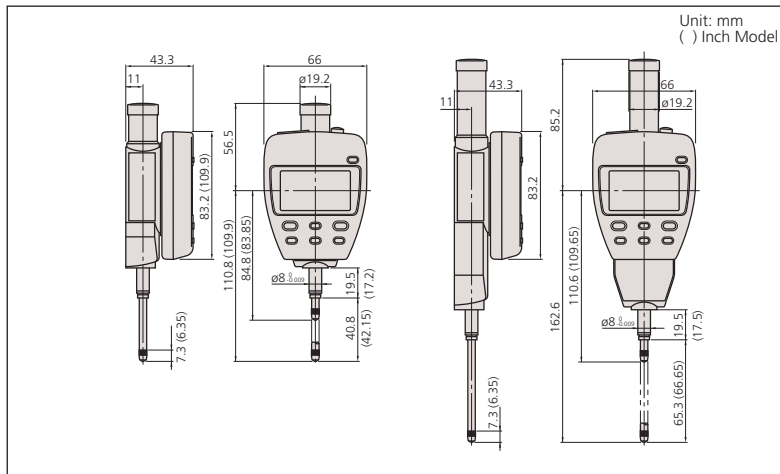
**Inch/Metric** Stem dia. 3/8" #4-48 UNF Thread

Resolution	Range	Order No.*	Model	Accuracy
.00005", .0001", .0005", .001", 0.001mm, 0.01mm	1" / 25.4mm	<b>543-552A</b>	ID-F125E	.00012"
	2" / 50.8mm	<b>543-558A</b>	ID-F150HE	.00012"

**Metric** Stem  $\varnothing$  8mm M2.5 X 0.45 Thread

Resolution	Range	Order No.*	Model	Accuracy
0.001mm, 0.01mm	25mm	<b>543-551A</b>	ID-F125	0.003mm
	50mm	<b>543-557A</b>	ID-F150H	0.003mm

## DIMENSIONS



## Technical Data

Accuracy: Refer to the list of specifications  
 Resolution: 0.01mm/0.001mm or .00005"/.0001"/.0005"/.001"/0.001mm/0.01mm  
 Display: LCD  
 Length standard: ABSOLUTE electrostatic capacitance type linear encoder  
 Max. response speed: Unlimited  
 Measuring force: 1.8N/2.3N\* or less (\*50mm range models)  
 Power supply: 9V DC (via AC adaptor)

## Function

Origin-set/Preset, Zeroset, GO/±NG judgment, Max/Min value hold, Runout measurement, Resolution switching, Counting direction switching, Power ON/OFF, Data output, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error, Over-flow error, Tolerance limit setting error

## Standard Accessories

**06AEG180A:** AC Adapter 120V  
**137693:** Lifting Lever

## Optional Accessories

**936937:** SPC cable (40" / 1m)  
**965014:** SPC cable (80" / 2m)  
**540774:** Spindle lifting cable (stroke: .4" / 10mm)  
**02ACA571:** Auxiliary spindle spring for 25mm/1" models\*  
**02ACA773:** Auxiliary spindle spring for 50mm/2" models\*  
**264-504-5A:** Digimatic Min-processor DP-1VR  
**543-004-1:** Digimatic presetter  
 — Backs (See page F-33.)  
 — Contact points (See page F-34.)

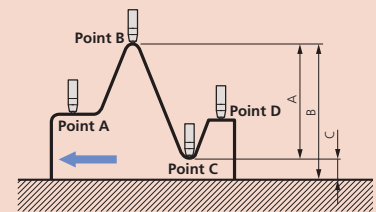
\*Required when orienting the indicator upside down.

## Application

### Difference/Runout measurement

**Example: Indicator travel from points A to D**

Difference (or Total Runout) is displayed as A. Dimensions B (maximum value) and C (minimum value) can be recalled from memory with a simple key sequence.





### Technical Data

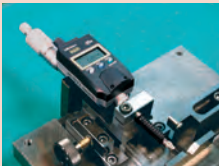
Accuracy: Refer to the list of specifications  
 Resolution: 0.01mm, 0.01mm/0.001mm, .0005"/0.01mm or .0005"/0.0005"/0.01mm/0.001mm  
 Display: LCD  
 Length standard: ABSOLUTE electrostatic capacitance type linear encoder  
 Max. response speed: Unlimited  
 Measuring force: 2.5N (2.0N: Back plunger type)  
 Battery: SR44 (1 pc.), **938882**  
 Battery life: Approx. 7000 hours under normal use  
 Dust/Water protection level: IP66

### Function

Zero-setting, Presetting, Direction switching, Tolerance judgment, Display hold, Data output, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error, Over-flow error, Tolerance limit setting error

### Optional Accessories

- 21EZA105:** Lifting knob (for ISO/JIS model)
  - 21EZA150:** Lifting knob (for AGD model)
  - 21EZA145:** Lug (for JIS/ISO model)
  - 21EZA146:** Lug (for AGD model)
  - 02ACA376:** Rubber boot (for ID-N, NBR)
  - 238774:** Rubber boot (for ID-N, silicon)
  - 125317:** Rubber boot (for ID-B, NBR)
  - 21EAA212:** Rubber boot (for ID-B, silicon)
  - 21EAA194:** SPC cable (40" / 1m)
  - 21EAA190:** SPC cable (80" / 2m)
  - 21EAA210:** Bifurcated connecting cable with zero-setting terminal (40" / 1m)
  - 21EAA211:** Bifurcated connecting cable with zero-setting terminal (80" / 2m)
- : Contact points (See page F-34.)



# ABSOLUTE Digimatic Indicator ID-N / B

## SERIES 543 — with Dust/Water Protection Conforming to IP66

### FEATURES

- Proven ABSOLUTE sensor.
- Rated to IP66 water- and dust-proofing standard and oil resistance improved.
- Slim body design is advantageous for multi-point measurements.
- Improvement in workability with the LCD readout-rotation function.
- Back plunger design (ID-B).
- Built-in tolerance judgment function.
- Switchable resolution\*.
- Waterproof data output connector.
- Built-in hold/preset function



Slim type ID-N  
543-576



Back plunger type ID-B  
543-586

### ID-B Digimatic Indicators

#### SPECIFICATIONS

Metric		Stem $\varnothing$ 8mm M2.5 X 0.45 Thread			
Resolution	Range	Order No.	Model No.	Accuracy	Measuring Force
0.01mm	5.0mm	<b>543-580</b>	ID-B1005	0.02mm	2.0N or less
0.001mm	5.0mm	<b>543-585</b>	ID-B105	0.003mm	2.0N or less

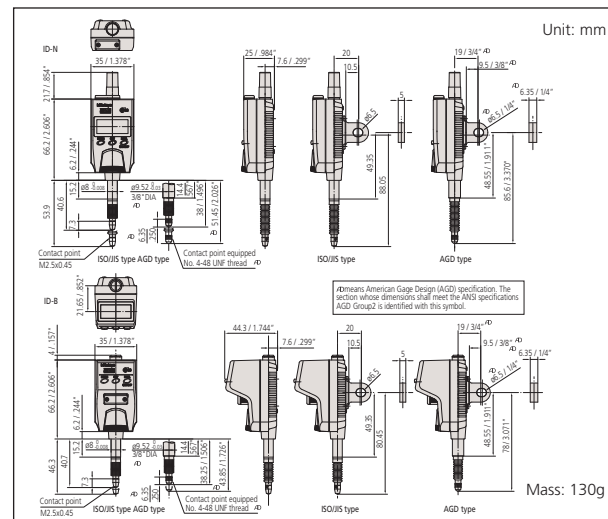
Inch / Metric		Stem dia. 3/8" #4-48 UNF Thread			
Resolution	Range	Order No.	Model No.	Accuracy	Measuring Force
.0005" / 0.01mm	.22" / 5.6mm	<b>543-581</b>	ID-B1005E	.0008" / 0.02mm	2.0N or less
.0005" / 0.01mm	.22" / 5.6mm	<b>543-586*</b>	ID-B105E	.00012" / 0.003mm	2.0N or less

### ID-N Digimatic Indicators

Metric		Stem $\varnothing$ 8mm M2.5 X 0.45 Thread			
Resolution	Range	Order No.	Model No.	Accuracy	Measuring Force
0.01mm	5.0mm	<b>543-570</b>	ID-N1012	0.02mm	2.0N or less
0.001mm / 0.01mm	5.0mm	<b>543-575</b>	ID-N112	0.003mm	2.0N or less

Inch / Metric		Stem dia. 3/8" #4-48 UNF Thread			
Resolution	Range	Order No.	Model No.	Accuracy	Measuring Force
.0005" / 0.01mm	.5" / 12.7mm	<b>543-571</b>	ID-N1012E	.0008" / 0.02mm	2.0N or less
.0005" / 0.01mm	.5" / 12.7mm	<b>543-576*</b>	ID-N112E	.00012" / 0.003mm	2.0N or less

### DIMENSIONS AND MASS



# EC Counter

## SERIES 542 — Low-cost, Assembly, Type Display Unit

### FEATURES

- Employed the DIN size (96 X 48mm) and mount-on-panel configuration, which greatly facilitates the incorporation into a system.
- Possible to produce either tolerance judgment output or Digimatic output.

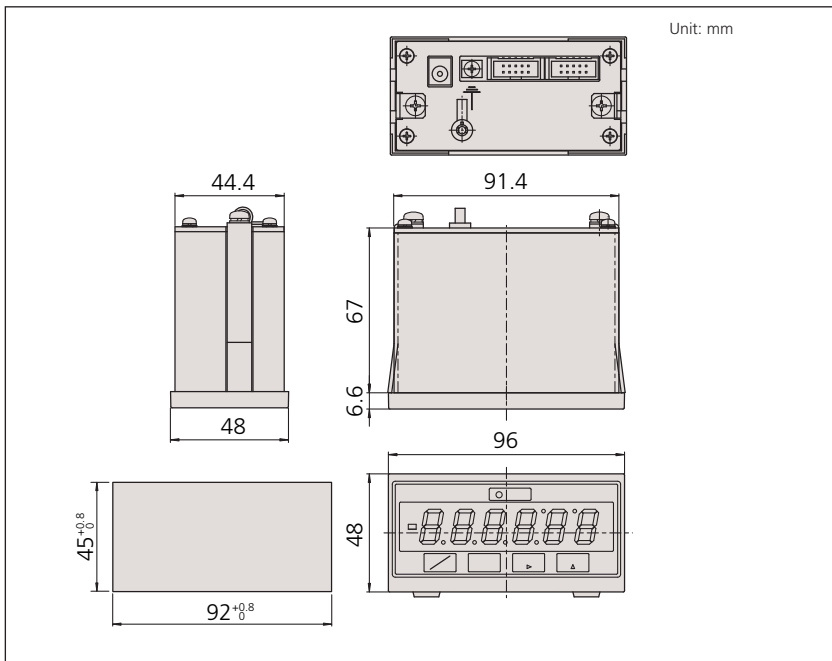


542-007A

### SPECIFICATIONS

Order No.	Description
542-007A	EC Counter

### DIMENSIONS



### EC Counter

#### Technical Data

Applicable gage: LGD, LGS, All SPC output gages  
 Resolution: 0.001mm, 0.01mm  
 No. of gage input: 1  
 Display: 6-digit LED and a negative [-] sign  
 Function: Preset  
 GO/±NG judgment  
 Output (open-collector): 3-step limit signal, Normal signal  
 External control: Preset, Data hold  
 Power supply: Via AC adaptor  
 Dimensions (W x D x H): 96 x 48 x 84.6mm  
 Mass: 500g

#### Standard Accessories

**06AEG302JA:** AC Adapter  
**936937:** SPC cable (40"/1m)  
**965014:** SPC cable (80"/1m)  
**214938:** PJ-2 (DC Plug)  
**C162-155:** GO/±NG judgement cable

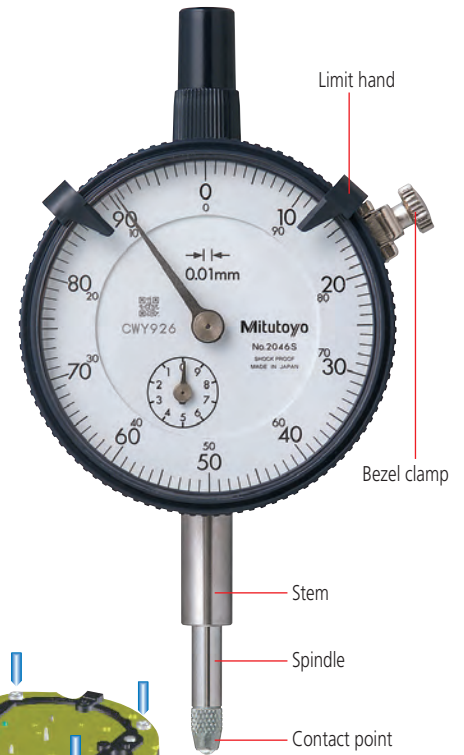
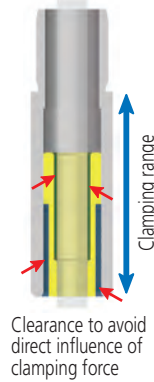
# Dial Indicators

## Description of Icon

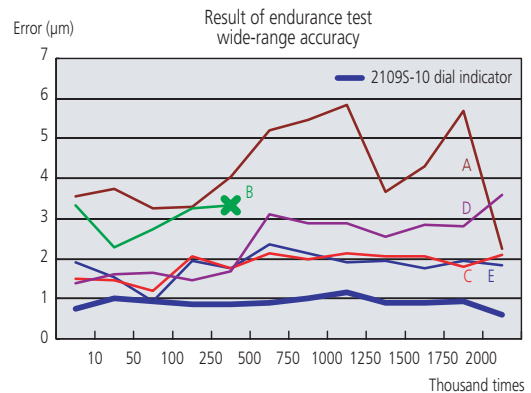
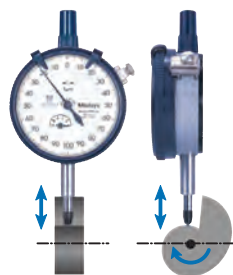
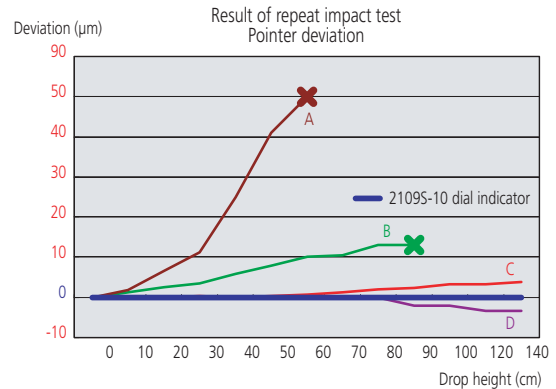
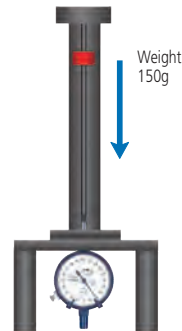
Icon	Description
	Reverse reading type suitable for depth and step measurement.
	One revolution type for easy and error-free reading
	Double scale spacing type, easy-on-the-eyes
	Shockproof type
	Waterproof type
	With damper at lowest rest point
	Jeweled bearing type
	Peak retaining type
	Long stem type
	Dustproof type
	With coaxial revolution counter
	Back plunger type
	Adjustable hand type
	Double-face type

## FEATURES: S Series

- Revolutionary stem-bush design for trouble free stem clamping (longer clamping range).
- No through screw-hole on the frame for high dust-resistance.



- Involute curved lifting lever for smooth movement of spindle and dovetail joint for tool-less connection.
- Grater rigidity in the bearing plate for reducing the retracing error (20%) and 4-screw mounting for increasing impact resistance.



# Dial Indicators

## SERIES 0 - Compact type



1911



1923




1911




1913-10

### SPECIFICATIONS

**Inch** Stem dia. 3/8", #4-48 UNF Thread □ ANS/AGD type

Graduation	Range	Range/rev	Dial reading	Order No.		Accuracy		Measuring force	
				w/ lug	Flat-back	First 2.5 Rev	Overall Accuracy		
.0001"	.01"	.004"	0-2-0	<b>1927-10</b>	<b>1927B-10</b>	±.0002"	±.0002"	1.4N or less	✓
.0001"	.025"	.01"	0-5-0	<b>1925-10</b>	<b>1925B-10</b>	±.0002"	±.0002"	1.4N or less	✓
.0005"	.05"	.02"	0-10-0	<b>1923</b>	<b>1923B</b>	±.0005"	±.0005"	1.4N or less	—
.001"	.1"	.04"	0-20-0	<b>1921</b>	<b>1921B</b>	±.001"	±.001"	1.4N or less	—

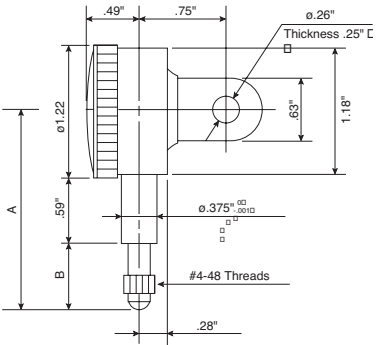
**Metric** Stem ø 8mm, M2.5 x 0.45 Thread □ ISO/JIS type

Graduation	Range	Range/Rev	Dial reading	Order No.		Accuracy		Measuring force	
				w/ lug	Flat-back	First 2.5 Rev	Overall Accuracy		
0.002mm	0.5mm	0.2mm	0-100-0	<b>1913-10</b>	<b>1913B-10</b>	±0.011mm	±0.011mm	1.4N or less	✓
0.01mm	2.5mm	1mm	0-50-0	<b>1911</b>	<b>1911B</b>	±0.011mm	±0.011mm	1.4N or less	—

 Jeweled bearing type

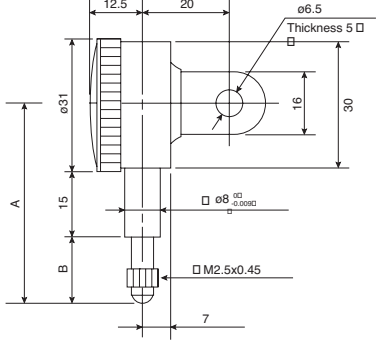
### DIMENSIONS

**Inch Model** Unit: Inch



Order Number	A	B
<b>1927-10</b>	1.46"	.26"
<b>1925-10</b>	1.48"	.28"
<b>1923</b>	1.51"	.31"
<b>1921</b>	1.58"	.37"

**Metric Model** Unit: mm



Order Number	A	B
<b>1911</b>	42	11.5
<b>1913-10</b>	39.5	9

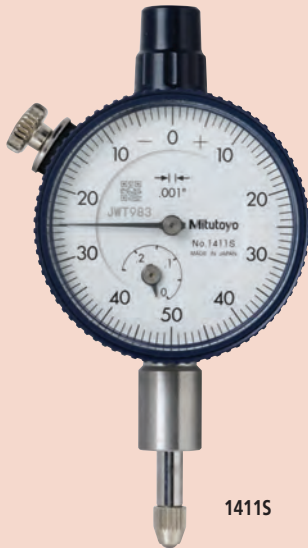


# Dial Indicators

## SERIES 1



18035-10



14115



15065

### SPECIFICATIONS

**Inch** Stem dia. 3/8" #4-48 UNF Thread ANSI/AGD type

Graduation	Range	Range / Rev	Dial reading	Order No.		Accuracy		Measuring force	Shockproof type	Jeweled bearing type
				(W/Lug)	(Flat-back)	First 2.5 Rev	Overall Accuracy			
.0001"	.025"	.01"	0-10	<b>18025-10</b>	<b>18025B-10</b>	±.0001"	±.0001"	1.4N or less	✓	✓
.0001"	.025"	.01"	0-5-0	<b>18035-10</b>	<b>18035B-10</b>	±.0001"	±.0001"	1.4N or less	✓	✓
.0005"	.1"	.04"	0-40	<b>16705</b>	<b>16705B</b>	±.0005"	±.0005"	1.4N or less		
.0005"	.1"	.04"	0-20-0	<b>16715</b>	<b>16715B</b>	±.0005"	±.0005"	1.4N or less		
.0005"	.125"	.05"	0-50	<b>15065</b>	<b>15065B</b>	±.0005"	±.0005"	1.4N or less		
.0005"	.125"	.05"	0-25-0	<b>15075</b>	<b>15075B</b>	±.0005"	±.0005"	1.4N or less		
.001"	.125"	.05"	0-50	<b>17805</b>	<b>17805B</b>	±.001"	±.001"	1.4N or less		
.001"	.125"	.025"	0-25-0	<b>17815</b>	<b>17815B</b>	±.001"	±.001"	1.4N or less		
.001"	.25"	.1"	0-100	<b>14105</b>	<b>14105B</b>	±.001"	±.001"	1.4N or less		
.001"	.25"	.1"	0-100	<b>14105-10</b>	<b>14105B-10</b>	±.001"	±.001"	1.4N or less		✓
.001"	.25"	.1"	0-50-0	<b>14115</b>	<b>14115B</b>	±.001"	±.001"	1.4N or less		



Shockproof type

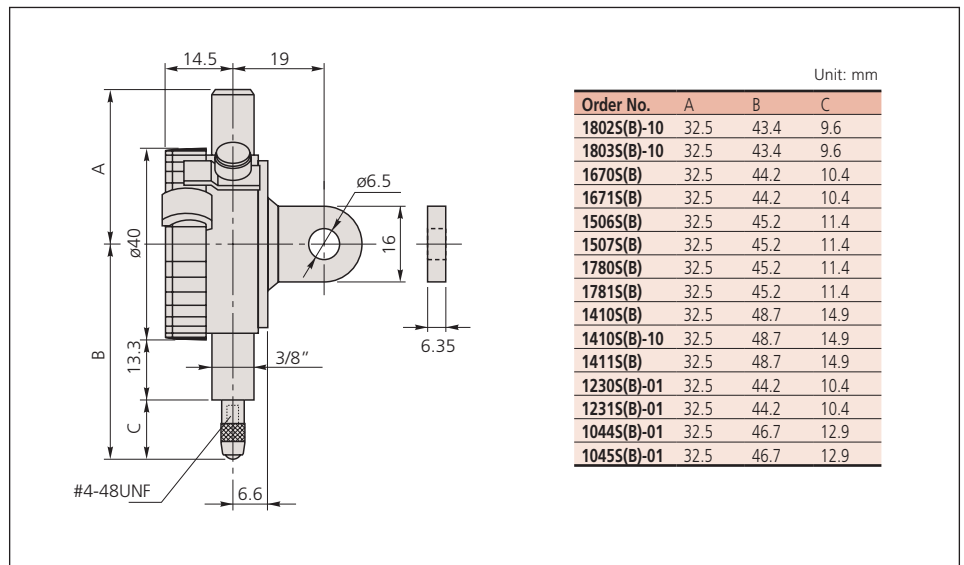


Jeweled bearing type

**Metric** Metric - ANSI Standard Stem dia. 3/8" #4-48 UNF Thread yellow dial face ANSI/AGD type

Graduation	Range	Range / Rev	Dial reading	Order No.		Accuracy		Measuring force
				(W/Lug)	(Flat-back)	First 2.5 Rev	Overall Accuracy	
0.002mm	0.5mm	0.2mm	0-20	<b>10105-11</b>	<b>10105B-11</b>	±0.002mm	±0.002mm	1.5N or less
0.002mm	0.5mm	0.2mm	0-10-0	<b>10115-11</b>	<b>10115B-11</b>	±0.002mm	±0.002mm	1.5N or less
0.01mm	2.5mm	1mm	0-100	<b>12305-01</b>	<b>12305B-01</b>	±0.01mm	-	1.4N or less
0.01mm	2.5mm	1mm	0-50-0	<b>12315-01</b>	<b>12315B-01</b>	±0.01mm	-	1.4N or less
0.01mm	5mm	1mm	0-100	<b>10445-01</b>	<b>10445B-01</b>	±0.01mm	±0.013mm	1.4N or less
0.01mm	5mm	1mm	0-50-0	<b>10455-01</b>	<b>10455B-01</b>	±0.01mm	±0.013mm	1.4N or less

### DIMENSIONS



# Dial Indicators

## SERIES 1



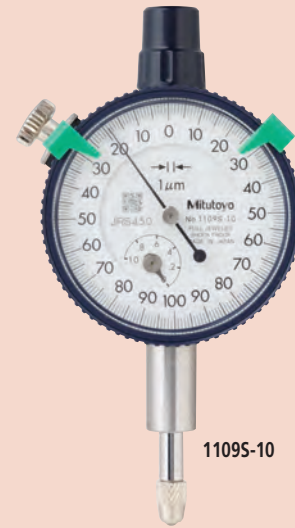
1040S



1013S






1045S



1109S-10

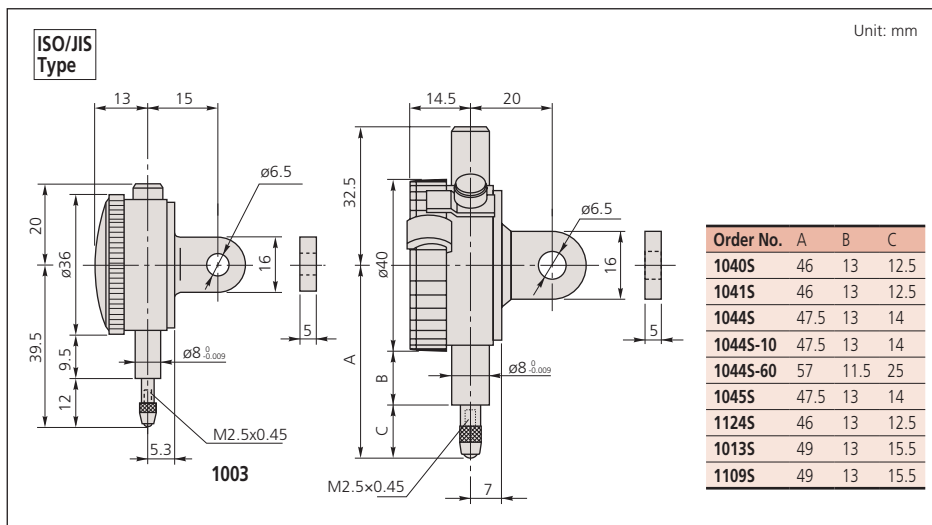
**Metric** Stem  $\phi$  8mm M2.5 X 0.45 Thread ISO/JIS type

Graduation	Range	Range / Rev	Dial reading	Order No.		Accuracy		Measuring force			
				(W/Lug)	(Flat-back)	First 2.5 Rev	Overall Accuracy				
0.001mm	1mm	0.2mm	0-100-0	<b>1109S-10</b>	<b>1109SB-10</b>	$\pm 0.001\text{mm}$	$\pm 0.007\text{mm}$	1.5N or less	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
0.002mm	1mm	0.2mm	0-100-0	<b>1013S-10</b>	<b>1013SB-10</b>	$\pm 0.002\text{mm}$	$\pm 0.01\text{mm}$	1.5N or less	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
0.005mm	3.5mm	0.5mm	0-50	<b>1124S</b>	<b>1124SB</b>	$\pm 0.005\text{mm}$	$\pm 0.013\text{mm}$	1.4N or less	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
0.01mm	3.5mm	0.5mm	0-50-0	<b>1040S</b>	<b>1040SB</b>	$\pm 0.01\text{mm}$	$\pm 0.013\text{mm}$	1.5N or less	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
0.01mm	3.5mm	0.5mm	0-25-0	<b>1041S</b>	<b>1041SB</b>	$\pm 0.01\text{mm}$	$\pm 0.013\text{mm}$	1.5N or less	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
0.01mm	4mm	1mm	0-50-0	<b>1003</b>	<b>1003B</b>	$\pm 0.01\text{mm}$	$\pm 0.013\text{mm}$	1.5N or less	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
0.01mm	5mm	1mm	0-100	<b>1044S</b>	<b>1044SB</b>	$\pm 0.01\text{mm}$	$\pm 0.013\text{mm}$	1.5N or less	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
0.01mm	5mm	1mm	0-100	<b>1044S-60</b>	<b>1044SB-60</b>	$\pm 0.01\text{mm}$	$\pm 0.013\text{mm}$	2N or less	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
0.01mm	5mm	1mm	0-100	<b>1044S-10</b>	<b>1044SB-10</b>	$\pm 0.01\text{mm}$	$\pm 0.013\text{mm}$	4N or less	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
0.01mm	5mm	1mm	0-50	<b>1045S</b>	<b>1045SB</b>	$\pm 0.01\text{mm}$	$\pm 0.013\text{mm}$	1.4N or less	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



1003

## DIMENSIONS



1044S



# Dial Indicators

## SERIES 1 — Compact One Revolution Type for Error-free Reading



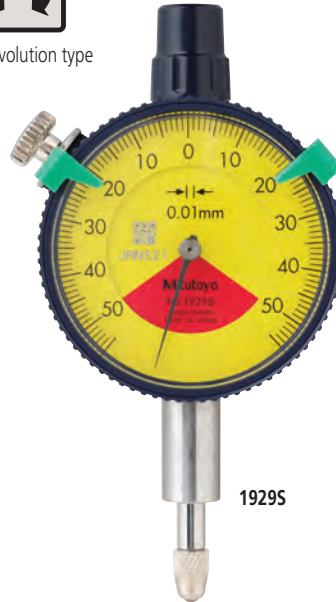
One revolution type



1929S  
1929S-62



1900S-10  
1900S-72



1929S

Unlike many other dial indicators, the one-revolution dial indicator literally shows the entire spindle travel or range as one sweep of the hand, eliminating the possibility of reading errors due to miscounting the multiple revolutions. With one-revolution dial indicators, "within tolerance" and "out-of-tolerance" can never be misinterpreted. An unique shock-proof mechanism is incorporated, providing improved immunity to shock due to sudden spindle retraction caused by high impact.



Shockproof type



Dustproof type



Waterproof type



Jeweled bearing type

### SPECIFICATIONS

**Inch**

Stem dia. 3/8", #4-48 UNF Thread

ANSI/AGD type

Graduation	Range (range/full stroke)	Dial reading	Order No.		Accuracy	Measuring force			<input type="checkbox"/>	
			w/lug	Flat-back						
.0001"	.006" / .0079"	3-0-3	<b>1910S-72</b>	<b>1910SB-72</b>	±.0001"	1.4N or less	✓	✓	—	—
.0005"	.04" / .055"	20-0-20	<b>1909S-62</b>	<b>1909SB-62</b>	±.0005"	1.4N or less	✓	✓	—	—

**Metric**

Stem ø 8mm, M2.5 x 0.45 Thread

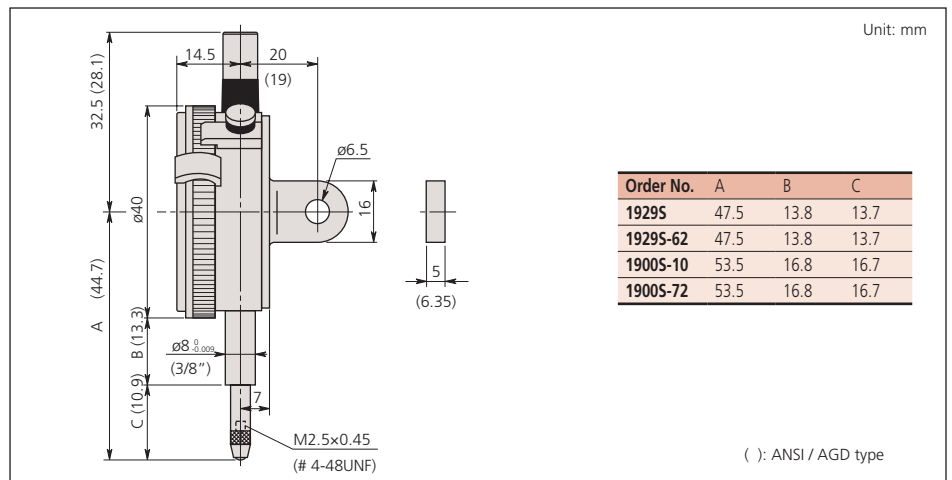
ISO/JIS type

Graduation	Range (range/full stroke)	Dial reading	Order No.		Accuracy	Measuring force			<input type="checkbox"/>	
			w/lug	Flat-back						
0.001mm	0.1mm / 0.14mm	50-0-50	<b>1900S-10</b>	<b>1900SB-10</b>	±0.005mm	1.5N or less	✓	—	—	✓
0.001mm	0.1mm / 0.14mm	50-0-50	<b>1900S-72</b>	<b>1900SB-72</b>	±0.006mm	1.5N or less	✓	✓	—	✓
0.01mm	1mm / 1.4mm	50-0-50	<b>1929S</b>	<b>1929SB</b>	±0.011mm	1.4N or less	✓	—	—	—
0.01mm	1mm / 1.4mm	50-0-50	<b>1929S-62</b>	<b>1929SB-62</b>	±0.011mm	1.4N or less	✓	✓	—	—

### Optional Accessories

- : Backs (See page F-33.)
- : Contact points (See page F-34.)

### DIMENSIONS

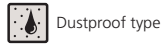
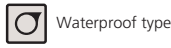


# Dial Indicators

## SERIES 2 — Standard One Revolution Type for Error-free Reading



One revolution type.



### SPECIFICATIONS

**Metric** Stem  $\varnothing$  8mm, M2.5 x 0.45 Thread □ ISO/JIS type

Graduation	Range (range/full stroke)	Dial reading	Order No.		Accuracy	Measuring force	Shockproof	Waterproof	Dustproof	Jeweled bearing
			w/ lug	Flat-back						
0.001mm	0.08mm / 0.1mm	40-0-40	<b>2900S-10</b>	<b>2900SB-10</b>	$\pm 0.003$ mm	1.4N or less	✓	—	—	✓
0.001mm	0.08mm / 0.1mm	40-0-40	<b>2900S-70</b>	<b>2900SB-70</b>	$\pm 0.003$ mm	2.0N or less	✓	✓	—	✓
0.001mm	0.08mm / 0.1mm	40-0-40	<b>2900S-72</b>	<b>2900SB-72</b>	$\pm 0.003$ mm	2.0N or less	✓	—	✓	✓
0.001mm	0.16mm / 0.2mm	80-0-80	<b>2901S-10</b>	<b>2901SB-10</b>	$\pm 0.004$ mm	1.4N or less	✓	—	—	✓
0.01mm	0.8mm / 1mm	40-0-40	<b>2929S</b>	<b>2929SB</b>	$\pm 0.009$ mm	2.0N or less	✓	—	—	—
0.01mm	0.8mm / 1mm	40-0-40	<b>2929S-60</b>	<b>2929SB-60</b>	$\pm 0.009$ mm	2.0N or less	✓	✓	—	—
0.01mm	0.8mm / 1mm	40-0-40	<b>2929S-62</b>	<b>2929SB-62</b>	$\pm 0.009$ mm	2.0N or less	✓	—	✓	—
0.01mm	1.6mm / 2mm	80-0-80	<b>2959S</b>	<b>2959SB</b>	$\pm 0.013$ mm	1.4N or less	✓	—	—	—
0.01mm	0.5mm / 0.7mm	25-0-25	—	<b>2971*</b>	$\pm 0.010$ mm	1.4N or less	✓	—	✓	—
0.01mm	1mm / 1.4mm	50-0-50	—	<b>2972*</b>	$\pm 0.012$ mm	1.4N or less	✓	—	✓	—
0.02mm	1.6mm / 2mm	80-0-80	—	<b>2973*</b>	$\pm 0.016$ mm	1.4N or less	✓	—	✓	—
0.1mm	4mm / 10mm	2-0-2	<b>2928S</b>	<b>2928SB</b>	$\pm 0.040$ mm	1.4N or less	✓	—	—	—

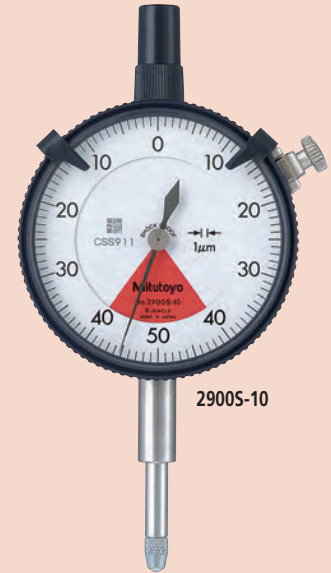
\* Flat back type only. (Lug-on-center back is not available.)

### DIMENSIONS

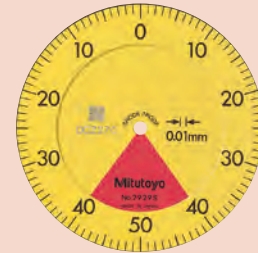
ISO/JIS Type

Unit: mm

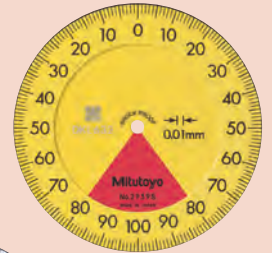
Order No.	A	B	C	D	E	F	H
<b>2971</b>	43.2	65.6	55.6	16.2	21	16.8	55
<b>2972</b>	43.2	66.0	55.6	16.2	21	17.2	55
<b>2973</b>	43.2	66.3	55.6	16.2	21	17.5	55
<b>2929S</b>	48.8	65.2	57	17.7	12.3	29.2	52
<b>2929S-62</b>	48.8	65.2	57	17.7	16.9	19.8	52
<b>2929S-60</b>	48.8	70	57	17.7	12.3	29.2	52
<b>2959S</b>	48.8	65.2	57	17.7	16.9	19.8	52
<b>2900S-10</b>	48.8	66	57	17.7	16.9	20.6	52
<b>2900S-72</b>	48.8	66	57	17.7	16.9	20.6	52
<b>2900S-70</b>	48.8	67	57	17.7	12.3	26.2	52
<b>2901S-10</b>	48.8	66.1	57	17.7	16.9	20.7	52
<b>2928S</b>	48.8	65.2	57	17.7	16.9	19.8	52



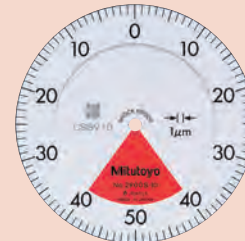
2900S-10



2929S  
2929S-60  
2929S-62



2959S



2900S-10  
2900S-70  
2900S-72



2901S-10

### Optional Accessories

- : Backs (See page F-33.)
- : Contact points (See page F-34.)



# Dial Indicators

## SERIES 2 — Standard One Revolution Type for Error-free Reading

### FEATURES

- An unique shock-proof mechanism is incorporated, providing improved immunity to shock due to sudden spindle retraction caused by high impact.
- The crystal is hard coated for durability and scratch resistance.
- Approximately 40% lighter than the conventional dial indicator.

- Provided with an improved resistance to shop floor contaminants such as water and dust.
- Due to the spindle bushing being offset from the stem, spindle movement will not be hindered or jammed when clamping along the stem.
- A pair of limit hands are provided for quick and easy tolerance judgment (GO/±NG).



2909S-62



2978



One revolution type.

### SPECIFICATIONS

**Inch** Stem 3/8" dia., #4-48 UNF Thread

ANSI/AGD type

Graduation	Range	Range/full stroke	Dial reading	Order No.		Accuracy	Measuring force	Shock Proof	Water Resistant	Hard Coated
				w/ lug	Flat-back					
.0001"	.008"	.01"	4-0-4	2910S-10	2910SB-10	±.0001"	1.8N or less	✓	✓	✓
.0001"	.008"	.01"	4-0-4	2910S-72	2910SB-72	±.0001"	2.5N or less	✓	✓	✓
.0005"	.04"	.05"	20-0-20	2909S-62	2909SB-62	±.0005"	2.5N or less	✓	✓	✓
.0005"	.02"	.028"	10-0-10	—	2976*	±.0005"	1.4N or less	✓	✓	✓
.0005"	.04"	.055"	20-0-20	—	2977*	±.0005"	1.4N or less	✓	✓	✓
.001"	.06"	.079"	30-0-30	—	2978*	±.001"	1.4N or less	✓	✓	✓

\*Flat back type only. (Lug-on-center back is not available.)

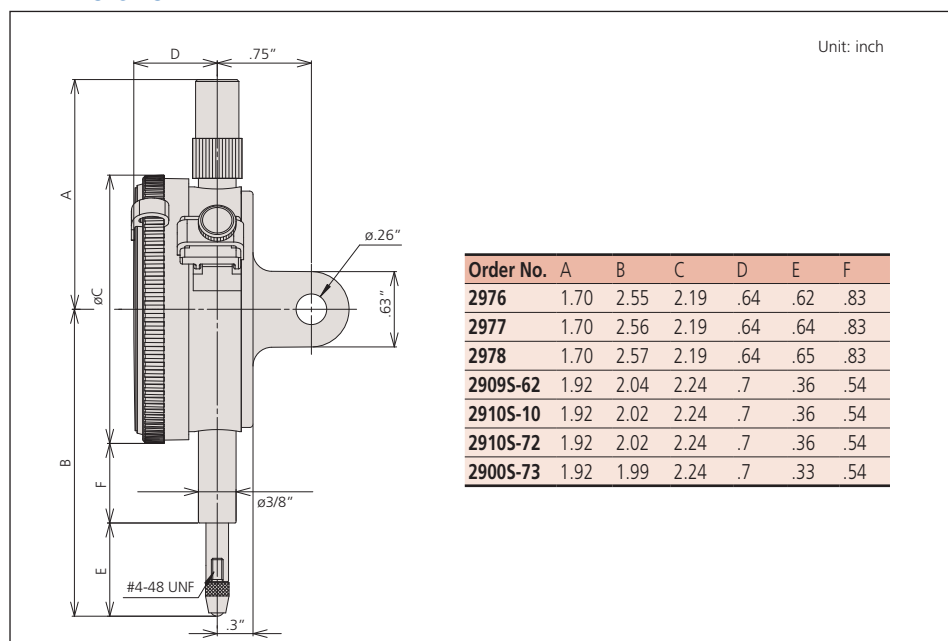
**Metric** Stem 3/8" dia., #4-48 UNF Thread Yellow Dial Face

ANSI/AGD type

Graduation	Range	Range/full stroke	Dial reading	Order No.		Accuracy	Measuring force	Shock Proof	Water Resistant	Hard Coated
				w/ lug	Flat-back					
0.001mm	0.08mm	0.1mm	40-0-40	2900S-73	2900SB-73	±0.003mm	2.0N or less	✓	✓	✓

\*Flat back type only. (Lug-on-center back is not available.)

### DIMENSIONS



# Special Dial Indicators

## SERIES 2



Adjustable hand



20485-10

### Adjustable hand dial gauge

The hand position can be adjusted independently of the vertical movement of the spindle by rotating the top knob.



Peak hold



20465-80

### Peak hold type dial gauge

A mechanism that stops the pointer and the spindle at the depressed position where the spindle is depressed makes the pointer stop and display the maximum value.



Double-face type



29405

### Double-face type dial gauge

The displacement of the spindle can be read from either the front or rear face.

## SPECIFICATIONS

Inch				Stem dia. 3/8" #4-48 UNF Thread				ANSI/AGD type			
Graduation	Range	Range /rev	Dial reading	Order No.		Accuracy		Measuring force			
				w/lug	Flat-back	First 2.5 Rev	Overall Accuracy				
.001"	.5"	.1"	0-100	29155-10	29155B-10	±.001"	±.001"	1.8N or less	✓	✓	✓
.001"	.5"	.1"	0-50-0	29185-10	29185B-10	±.001"	±.001"	1.8N or less	✓	✓	✓

Metric				Stem dia. 3/8" #4-48 UNF Thread, Yellow Dial Face				ANSI/AGD type			
Graduation	Range	Range /rev	Dial reading	Order No.		Accuracy		Measuring force			
				w/lug	Flat-back	First 2.5 Rev	Overall				
0.01mm	10mm	1mm	0-100	20485-11	20485B-11	±13μm	±0.013mm	1.4N or less	✓	✓	✓

Metric				Stem ø 8mm, M2.5 x 0.45 Thread				ISO/JIS type				
Graduation	Range	Range /rev	Dial reading	Order No.		Accuracy	Measuring force					
				w/lug	Flat-back							
0.01mm	10mm	1mm	0-100	20485-10	20485B-10	±0.015mm	1.4N or less	✓	✓	✓		
0.01mm	10mm	1mm	0-100	20465-80	20465B-80	±0.015mm	5.0N or less				✓	
0.01mm	10mm	1mm	0-100	29405	—	±0.015mm	3.0N or less					✓

## DIMENSIONS

Order No.	A	B	C
29155-10, 29185-10	52.2	64.1	22
20485-11	47.7	59.5	17.4

Unit: mm

( ) : ANSI / AGD Type



# Dial Indicators

## SERIES 2 — Standard Type, Inch Reading



2416S



2803S-10

### Optional Accessories

- : Backs (See page F-33.)
- : Contact points (See page F-34.)

### SPECIFICATIONS

Inch		Stem 3/8" dia. ø8mm #4-48 UNF Thread				ANSI/AGD type					
Graduation	Range	Range /Rev	Dial Reading	Order No.		Accuracy		Measuring force	Shockproof	Reverse Reading	Jeweled Bearing
				w/lug	Flat-back	First 2.5 Rev	Overall				
.0001"	.025"	.01"	0-10	<b>2802S-10</b>	<b>2802SB-10</b>	±.0001"	±.0001"	2.5N or less	✓		✓
.0001"	.025"	.01"	0-5-0	<b>2803S-10</b>	<b>2803SB-10</b>	±.0001"	±.0001"	2.5N or less	✓		✓
.0001"	.05"	.01"	0-10	<b>2804S-10</b>	<b>2804SB-10</b>	±.0001"	±.0002"	2.0N or less	✓		✓
.0001"	.05"	.01"	0-5-0	<b>2805S-10</b>	<b>2805SB-10</b>	±.0001"	±.0002"	2.0N or less	✓		✓
.0001"	.05"	.01"	10-0	<b>2905S-10</b>	<b>2905SB-10</b>	±.0001"	±.0002"	2.0N or less	✓	✓	✓
.0001"	.05"	.01"	0-5-0	<b>2923S-10</b>	<b>2923SB-10</b>	±.0001"	±.0002"	2.0N or less	✓		✓
.0001"	.25"	.01"	0-10	<b>2356S-10</b>	<b>2356SB-10</b>	±.0001"	±.0005"	2.0N or less			✓
.0001"	.5"	.01"	0-10	<b>2358S-10</b>	<b>2358SB-10</b>	±.0001"	±.0008"	2.0N or less			✓
.0005"	.125"	.05"	0-50	<b>2506S</b>	<b>2506SB</b>	±.0005"	±.0005"	1.8N or less			
.0005"	.125"	.05"	0-25-0	<b>2507S</b>	<b>2507SB</b>	±.0005"	±.0005"	1.8N or less			
.0005"	.125"	.05"	0-25-0	<b>2922S</b>	<b>2922SB</b>	±.0005"	±.0005"	1.8N or less			
.0005"	.5"	.05"	0-50	<b>2514S</b>	<b>2514SB</b>	±.0005"	±.0015"	1.8N or less			
.0005"	1"	.05"	0-50	<b>2776S</b>	<b>2776SB</b>	±.0005"	±.002"	2.5N or less			
.001"	.5"	.1"	0-100	<b>2414S</b>	<b>2414SB</b>	±.001"	±.001"	1.8N or less			
.001"	.5"	.1"	0-50-0	<b>2415S</b>	<b>2415SB</b>	±.001"	±.001"	1.8N or less			
.001"	1"	.1"	0-100	<b>2416S</b>	<b>2416SB</b>	±.001"	±.002"	1.8N or less			
.001"	1"	.1"	0-100	<b>2416S-06*</b>	<b>2416SB-06*</b>	±.001"	±.002"	1.8N or less			
.001"	1"	.1"	0-100	<b>2416S-10</b>	<b>2416SB-10</b>	±.001"	±.002"	1.8N or less			✓
.001"	1"	.1"	0-50-0	<b>2417S</b>	<b>2417SB</b>	±.001"	±.002"	1.8N or less			
.001"	1"	.1"	100-0	<b>2904S</b>	<b>2904SB</b>	±.001"	±.002"	1.8N or less		✓	
.001"	2"	.1"	0-100	<b>2424S-19</b>	<b>2424SB-19</b>	±.001"	±.003"	2.5N or less	✓		✓

\* Black Face



Shockproof type



Reverse reading type



Jeweled bearing type





# Dial Indicators

## SERIES 2 — Metric Standard Type

Series 2 dial indicators are Mitutoyo's most popular, and have the widest application.



### FEATURES

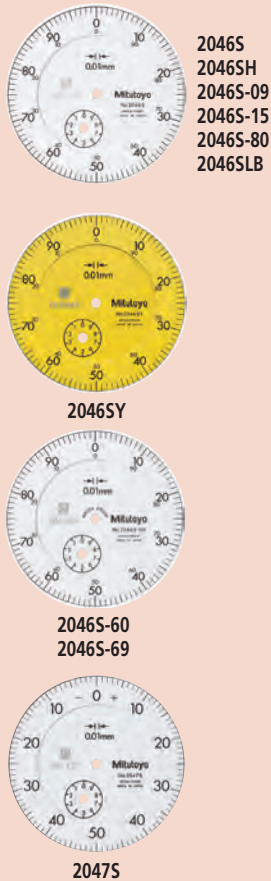
- Standard 0.01mm graduation dial gauges having an outer frame with an outside diameter of 57mm. All types come with limit pins and an outer frame clamp as standard.
- The outer clamp and lifting lever (optional) can be attached to either the right or left side. These parts can be easily installed and removed without tools.
- Secured adhesion between the outer frame and crystal as well as the use of an O-ring ensure countermeasures against water and oil permeation via the front face.
- The stem spindle is made of high-strength quench-hardened stainless steel which resists strenuous use.
- A carbide contact point is used.
- The grand gear uses stainless steel that is resistant to wear and deformation.
- Application of a hard coating on the surface of the crystal makes the gauge highly scratch- and chemical-resistant.



### SPECIFICATIONS

**Metric** Stem dia. ø8mm M2.5 x 0.45 Thread

ISO/JIS type



Graduation	Range	Range / Rev	Dial reading	Order No.		Accuracy	Measuring force	Features									
				w/ lug	Flat-back			Shockproof	Waterproof	Long stem	Jeweled bearing	Double scale	Coaxial counter	Reverse reading	Damper		
0.001mm	1mm	(0.1mm)	0-100	2110S-10	2110SB-10	±0.005mm	1.5N or less	✓				✓	✓				
0.001mm	1mm	(0.1mm)	0-100	2110S-70	2110SB-70	±0.005mm	2.0N or less	✓	✓			✓	✓				
0.001mm	1mm	(0.2mm)	0-100-0	2109S-10	2109SB-10	±0.005mm	1.5N or less	✓				✓	✓				
0.001mm	1mm	(0.2mm)	0-100-0	—	2109SLB-10	±0.005mm	1.5N or less	✓		✓		✓	✓				
0.001mm	1mm	(0.2mm)	0-100-0	2109S-70	2109SB-70	±0.005mm	2.0N or less	✓	✓			✓	✓				
0.001mm	2mm	(0.2mm)	0-100-0	2113S-10	2113SB-10	±0.007mm	1.5N or less	✓				✓	✓				
0.001mm	5mm	(0.2mm)	0-100-100	2118S-10	2118SB-10	±0.010mm	1.5N or less					✓	✓				
0.001mm	5mm	(0.2mm)	0-100-0	2119S-10	2119SB-10	±0.010mm	1.5N or less					✓	✓				
0.005mm	5mm	(0.5mm)	0-50	2124S-10	2124SB-10	±0.012mm	1.5N or less					✓	✓				
0.01mm	5mm	(1mm)	0-100	2044S	2044SB	±0.012mm	1.4N or less										
0.01mm	5mm	(1mm)	0-100	2044S-09	2044SB-09	±0.013mm	1.4N or less	✓									
0.01mm	5mm	(1mm)	0-100	2044S-60	2044SB-60	±0.012mm	2.5N or less		✓								
0.01mm	5mm	(1mm)	0-50-0	2045S	2045SB	±0.012mm	1.4N or less										✓
0.01mm	10mm	(1mm)	0-100	2046S	2046SB	±0.013mm	1.4N or less										
0.01mm	10mm	(1mm)	0-100	2046SY	2046SYB	±0.013mm	1.4N or less										
0.01mm	10mm	(1mm)	0-100	2046SH	2046SHB	±0.08mm	1.4N or less										
0.01mm	10mm	(1mm)	0-100	—	2046SLB	±0.013mm	1.4N or less				✓						
0.01mm	10mm	(1mm)	0-100	2046S-09	2046SB-09	±0.015mm	1.4N or less	✓									
0.01mm	10mm	(1mm)	0-100	2046S-60	2046SB-60	±0.013mm	2.5N or less		✓								
0.01mm	10mm	(1mm)	0-100	2046S-69	2046SB-69	±0.015mm	2.5N or less	✓	✓								
0.01mm	10mm	(1mm)	0-100	2046S-15	2046SB-15	±0.013mm	0.8N or less*						✓				
0.01mm	10mm	(1mm)	0-100	2310S-10	2310SB-10	±0.015mm	1.4N or less						✓		✓		
0.01mm	10mm	(1mm)	100-0	2902S	2902SB	±0.013mm	1.4N or less										✓
0.01mm	10mm	(1mm)	0-50-0	2047S	2047SB	±0.013mm	1.4N or less										
0.01mm	20mm	(1mm)	0-100	2050S	2050SB	±0.020mm	2.0N or less										✓
0.01mm	20mm	(1mm)	0-100	2050S-60	2050SB-60	±0.020mm	2.5N or less			✓							
0.01mm	20mm	(1mm)	0-100	2050S-19	2050SB-19	±0.020mm	2.0N or less	✓				✓					✓
0.01mm	20mm	(1mm)	0-100	2320S-10	2320SB-10	±0.020mm	2.0N or less					✓		✓			✓
0.01mm	30mm	(1mm)	0-100	2052S	2052SB	±0.025mm	2.5N or less										✓
0.01mm	30mm	(1mm)	0-100	2052S-19	2052SB-19	±0.025mm	2.5N or less	✓				✓					✓
0.01mm	30mm	(1mm)	0-100	2330S-10	2330SB-10	±0.025mm	2.5N or less					✓		✓			✓
0.01mm	30mm	(1mm)	100-0	2952S	2952SB	±0.025mm	2.5N or less										✓

\*Use in a vertical position only (contact point downward).

# Dial Indicators

## SERIES 2 — Metric Standard Type

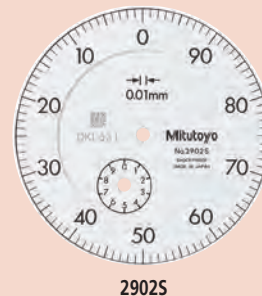


### DIMENSIONS

**ISO/JIS Type**

Unit: mm

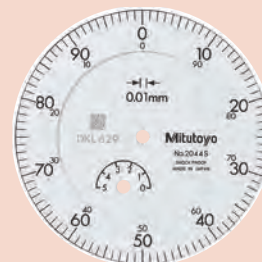
Order No.	A	B	C
2124S-10	60.3	16.9	14.9
2110S-10	66.5	16.9	21.1
2110S-70	67.5	12.3	26.7
2109S-10	60.5	16.9	15.1
2109S-70	65.3	12.3	24.5
2113S-10	61	16.9	15.6
2118S-10	60.3	16.9	14.9
2119S-10	60.3	16.9	14.9
2044S	65.2	16.9	19.8
2044S-09	65.2	16.9	19.8
2044S-60	70	12.3	29.2
2045S	65.2	16.9	19.8
2046S	65.2	16.9	19.8
2046SH	65.2	16.9	19.8
2046SLB	85.2	36.9	19.8
2046S-09	65.2	16.9	19.8
2046S-60	70	12.3	29.2
2046S-69	70	12.3	29.2
2046S-15	65.2	16.9	19.8
2310S-10	65.2	16.9	19.8
2902S	65.2	16.9	19.8
2047S	65.2	16.9	19.8



2902S



2310S-10

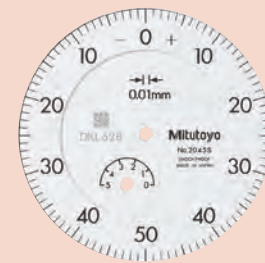


2044S  
2044S-60  
2044S-09

**ISO/JIS Type**

Unit: mm

Order No.	A	B	C	D
2050S	38.8	75.2	16.9	29.8
2050S-60	59.8	87.2	12.3	46.4
2050S-19	38.8	75.2	16.9	29.8
2320S-10	38.8	75.2	16.9	29.8
2052S	38.8	88.7	16.9	43.3
2052S-19	38.8	88.7	16.9	43.3
2330S-10	38.8	88.7	16.9	43.3
2952S	38.8	88.7	16.9	43.3



2045S

### Optional Accessories

- : Backs (See page F-33.)
- : Contact points (See page F-34.)

# Dial Indicators

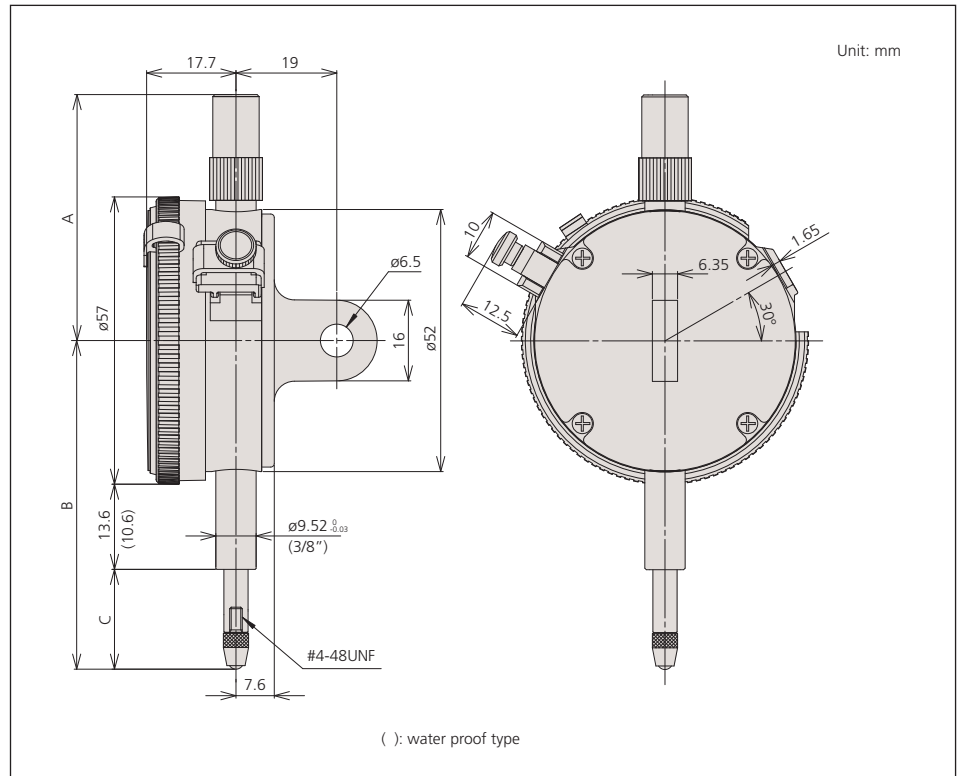
## SERIES 2 — ANSI / AGD Type Metric Dial Indicator

### SPECIFICATIONS

Graduation	Range	Range / Rev	Dial reading	Order No.		Accuracy		Measuring force				
				w/ lug	Flat-back	First 2.5 Rev	Overall					
0.001mm	1mm	0.2mm	0-100-0	<b>2109S-11</b>	<b>2109SB-11</b>	±0.003mm	±0.004mm	1.5N or less	✓	✓		
0.001mm	5mm	0.2mm	0-100-0	<b>2119S-11</b>	<b>2119SB-11</b>	±0.007mm	±0.01mm	1.5N or less	✓			
0.01mm	2.5mm	1mm	0-100	<b>2230S-01</b>	<b>2230SB-01</b>	±0.01mm	±0.01mm	1.4N or less				
0.01mm	2.5mm	1mm	0-50-0	<b>2231S-01</b>	<b>2231SB-01</b>	±0.01mm	±0.01mm	1.4N or less				
0.01mm	5mm	1mm	0-100	<b>2044S-01</b>	<b>2044SB-01</b>	±0.01mm	±0.01mm	1.4N or less				
0.01mm	10mm	1mm	0-100	<b>2046S-01</b>	<b>2046SB-01</b>	±0.01mm	±0.013mm	1.4N or less				
0.01mm	10mm	1mm	0-100	<b>2046S-11</b>	<b>2046SB-11</b>	±0.01mm	±0.013mm	1.4N or less	✓			
0.01mm	10mm	1mm	0-50-0	<b>2047S-01</b>	<b>2047SB-01</b>	±0.01mm	±0.013mm	1.4N or less				
0.01mm	10mm	1mm	0-50-0	<b>2047S-11</b>	<b>2047SB-11</b>	±0.01mm	±0.013mm	1.4N or less	✓			
0.01mm	10mm	1mm	100-0	<b>2902S-01</b>	<b>2902SB-01</b>	±0.01mm	±0.013mm	1.4N or less				
0.01mm	20mm	1mm	0-100	<b>2050S-01</b>	<b>2050SB-01</b>	±0.01mm	±0.02mm	2.0N or less				
0.01mm	20mm	1mm	0-100	<b>2050S-11</b>	<b>2050SB-11</b>	±0.01mm	±0.02mm	2.0N or less	✓			
0.01mm	25mm	1mm	0-100	<b>2056S-01</b>	<b>2056SB-01</b>	±0.01mm	±0.025mm	2.5N or less				

### DIMENSIONS

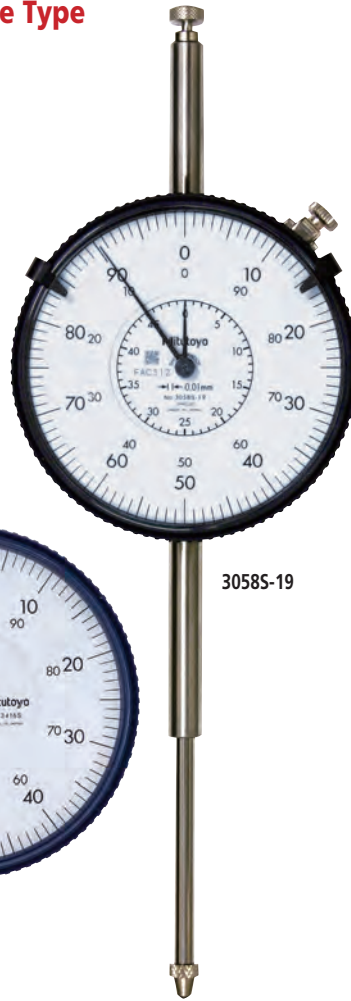
Order No.	A	B	C
<b>2109S-11</b>	48.8	51.4	9.3
<b>2119S-11</b>	48.8	55.8	13.7
<b>2230S-01</b>	48.8	53.6	11.5
<b>2231S-01</b>	48.8	53.6	11.5
<b>2044S-01</b>	48.8	56.1	14.0
<b>2046S-01</b>	48.8	61.1	19.0
<b>2046S-11</b>	48.8	61.1	19.0
<b>2047S-01</b>	48.8	61.1	19.0
<b>2902S-01</b>	48.8	61.1	19.0
<b>2050S-01</b>	38.8	71.1	29.0
<b>2050S-11</b>	38.8	71.1	29.0
<b>2056S-01</b>	38.8	76.1	34.0



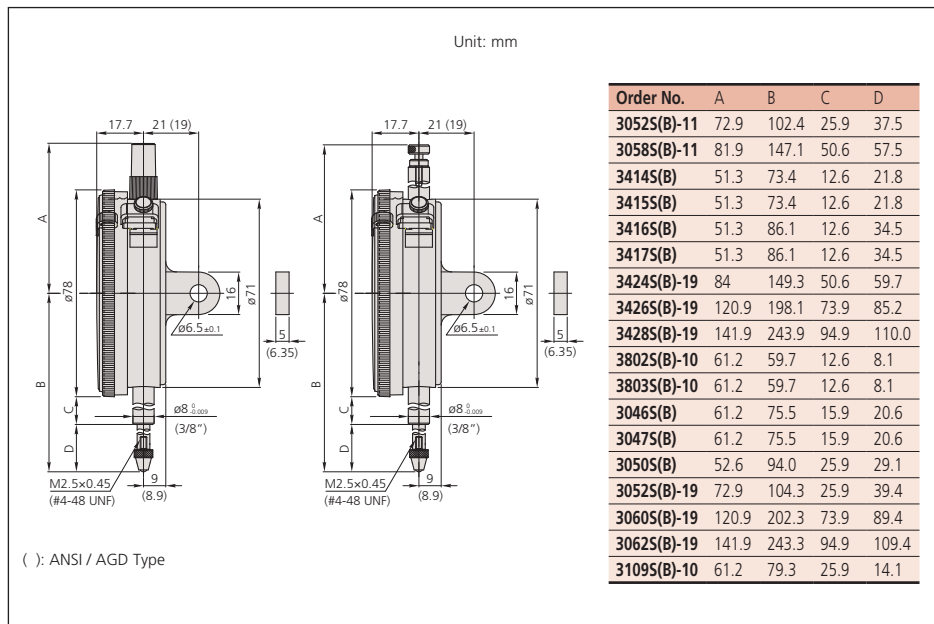
# Dial Indicators

## SERIES 3 — Large Dial Face and Long Stroke Type

- Dial gages with a large-diameter (78mm / 3.07") graduation face to ease reading.
- All types come with limit pins and an outer frame clamp as standard.



### DIMENSIONS






# Dial Indicators




## SERIES 3 — Large Dial Face

### SPECIFICATIONS






**Inch** Stem 3/8" DIA. #4-48 UNF Thread ANSI/AGD type

Graduation	Range	Range /rev	Dial reading	Order No.		Accuracy		Measuring force			
				W/ lug	Flat-back	First 2.5 Rev	Overall accuracy				
.0001"	.025"	.01"	0-10	<b>3802S-10</b>	<b>3802SB-10</b>	±.0001"	±.0001"	2.0N or less	✓	✓	
.0001"	.025"	.01"	0-5-0	<b>3803S-10</b>	<b>3803SB-10</b>	±.0001"	±.0001"	2.0N or less	✓	✓	
.001"	.5"	.1"	±0-100	<b>3414S</b>	<b>3414SB</b>	±.001"	±.001"	1.8N or less			
.001"	.5"	.1"	0-50-0	<b>3415S</b>	<b>3415SB</b>	±.001"	±.001"	1.8N or less			
.001"	1"	.1"	±0-100	<b>3416S</b>	<b>3416SB</b>	±.001"	±.002"	1.8N or less			
.001"	1"	.1"	0-50-0	<b>3417S</b>	<b>3417SB</b>	±.001"	±.002"	1.8N or less			
.001"	2"	.1"	±0-100	<b>3424S-19</b>	<b>3424SB-19</b>	±.001"	±.003"	3.0N or less	✓	✓	✓
.001"	3"	.1"	±0-100	<b>3426S-19</b>	<b>3426SB-19</b>	±.001"	±.005"	3.0N or less	✓	✓	✓
.001"	4"	.1"	±0-100	<b>3428S-19</b>	<b>3428SB-19</b>	±.001"	±.005"	3.2N or less	✓	✓	✓

**Metric** Stem 3/8" DIA. #4-48 UNF Thread, Yellow dial face ANSI/AGD type

Graduation	Range	Range /rev	Dial reading	Order No.		Accuracy		Measuring Force			
				W/ lug	Flat-back	First 2.5 Rev	Overall accuracy				
0.01mm	30mm	1mm	±0-100	<b>3052S-11</b>	<b>3052SB-11</b>	±0.01mm	±0.03mm	2.5N or less	✓	✓	✓
0.01mm	50mm	1mm	±0-100	<b>3058S-11</b>	<b>3058SB-11</b>	±0.01mm	±0.04mm	3.0N or less	✓	✓	✓

**Metric** Stem ø 8mm M2.5x0.45 Thread ISO/IS type

Graduation	Range	Range /rev	Dial reading	Order No.		Accuracy	Measuring Force				
				W/ lug	Flat-back						
0.001mm	1mm	0.2mm	0-10-0	<b>3109S-10</b>	<b>3109SB-10</b>	±0.004mm	1.5N or less	✓	✓		
0.01mm	10mm	1mm	0-100	<b>3046S</b>	<b>3046SB</b>	±0.015mm	1.4N or less				
0.01mm	10mm	1mm	0-50-0	<b>3047S</b>	<b>3047SB</b>	±0.015mm	1.4N or less				
0.01mm	20mm	1mm	0-100	<b>3050S</b>	<b>3050SB</b>	±0.020mm	2.0N or less				✓
0.01mm	30mm	1mm	0-100	<b>3052S-19</b>	<b>3052SB-19</b>	±0.025mm	2.5N or less	✓	✓	✓	
0.01mm	50mm	1mm	0-100	<b>3058S-19</b>	<b>3058SB-19</b>	±0.035mm	3.0N or less	✓	✓	✓	
0.01mm	80mm	1mm	0-100	<b>3060S-19*</b>	<b>3060SB-19*</b>	±0.045mm	3.0N or less	✓	✓	✓	
0.01mm	100mm	1mm	0-100	<b>3062S-19*</b>	<b>3062SB-19*</b>	±0.050mm	3.2N or less	✓	✓	✓	

\*use in a vertical position only



Shockproof type



w/ coaxial revolution counter



w/ damper at lowest rest point



Jeweled bearing type

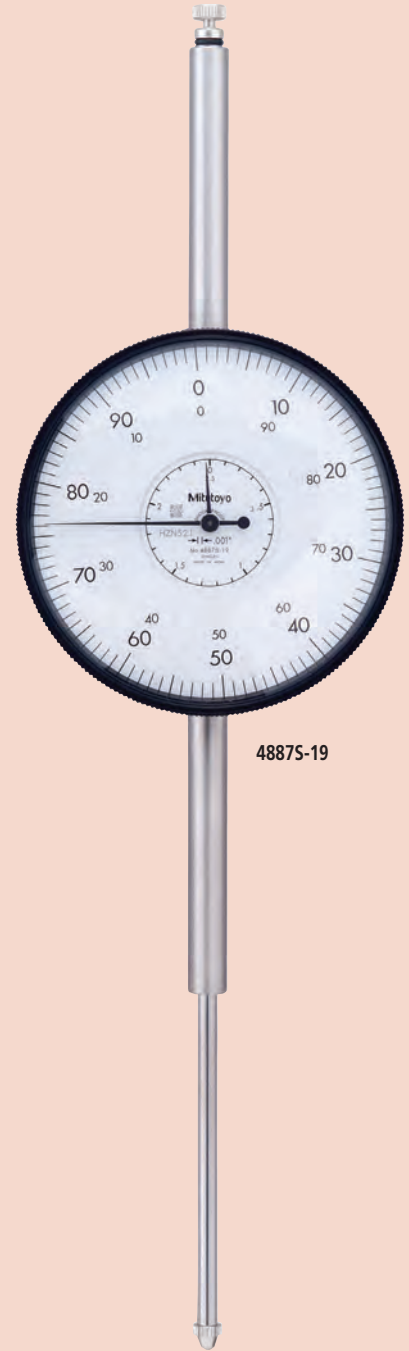
# Dial Indicators

## SERIES 4 — Large Dial Face

- Dial gauges with a large-diameter (92mm / 3.62") graduation face to ease reading.
- All types come with limit pins and an outer frame clamp as standard.












4046S



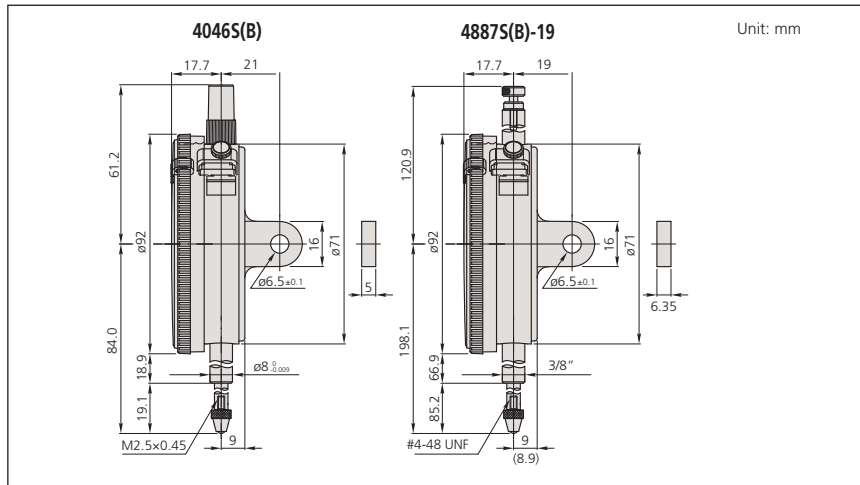
4887S-19

### SPECIFICATIONS

Inch		Stem 3/8" DIA. #4-48 UNF Thread				ANSI/AGD type			
Graduation	Range	Range /rev	Dial reading	Order No.		Accuracy		Measuring Force	 
				W/ lug	Flat-back	First 2.5 Rev	Overall accuracy		
.001"	3"	.1"	±0-100	<b>4887S-19</b>	<b>4887SB-19</b>	±.001"	±.005"	3.0N or less	  

Metric		Stem ø 8mm M2.5x0.45 Thread				ISO/JIS type			
Graduation	Range	Range /rev	Dial reading	Order No.		Accuracy		Measuring force	 
				W/ lug	Flat-back	First 2.5 Rev	Overall accuracy		
0.01mm	10mm	1mm	0-100	<b>4046S</b>	<b>4046SB</b>	± 0.01mm	± 0.015mm	1.4N or less	 

### DIMENSIONS



# Back Plunger Type Dial Indicators

## SERIES 1 and 2



Mitutoyo's back plunger type dial indicators are built with the measuring spindles on the back of the units. This type of indicator offers the same precision and durability as all other Mitutoyo dial indicators, and operates very effectively with optional holding bars.

- Back plunger type dial gauges are suitable for mounting onto leveling machine tool tables or inspection jigs, and for use in small spaces where the graduations of standard dial gauges are difficult to see.
- Model No. 1960, which uses Mitutoyo's proprietary shock-proofing mechanism, has excellent durability and shock resistance.



One revolution type



Shockproof type



Jeweled bearing type

### Optional Accessories

- 136567:** Holding bar (ø6mm, L=81mm)  
**136568:** Holding bar (ø8mm, L=81mm)  
**124625:** Holding bar (.25" DIA, L=3.19")

—: Backs (See page F-33.)

—: Contact points (See page F-34.)

### SPECIFICATIONS

**Inch** Series 1 Stem 3/8" dia., #4-48 UNF Thread ANSI/AGD type

Graduation	Range	Range / Rev	Dial reading	Order No.	Accuracy	Measuring force			
.001"	.04"	.05"*	20-0-20	<b>1961</b>	±.001"	1.4N or less	✓	✓	
.001"	.2"	.05"	0-50	<b>1166</b>	±.001"	1.4N or less			
.001"	.2"	.05"	0-25-0	<b>1167</b>	±.001"	1.4N or less			
.001"	.2"	.05"	50-0	<b>1168</b>	±.001"	1.4N or less			✓

\*Full stroke

**Metric** Series 1 Stem ø8mm, M2.5x0.45 Thread ISO/JIS type

Graduation	Range	Range / Rev	Dial reading	Order No.	Accuracy	Measuring force				Remarks
0.01mm	1mm	1.27mm*	50-0-50	<b>1960</b>	±0.014mm	1.4N or less	✓	✓		—
0.01mm	5mm	1mm	0-100	<b>1160</b>	±0.016mm	1.4N or less				—
0.01mm	5mm	1mm	100-0	<b>1162</b>	±0.016mm	1.4N or less			✓	—

**Inch** Series 2 Stem 3/8" dia., #4-48 UNF Thread ANSI/AGD type

Graduation	Range	Range/full stroke	Dial reading	Order No.	Accuracy	Measuring force			
.0001"	.008"	.01"	4-0-4	<b>2991</b>	±.0002"	1.5N or less	✓	✓	✓
.0005"	.04"	.05"	20-0-20	<b>2961F</b>	±.0005"	1.8N or less	✓	✓	

**Metric** Series 2 Stem ø8mm, M2.5x0.45 Thread ISO/JIS type

Graduation	Range	Range/full stroke	Dial reading	Order No.	Accuracy	Measuring force			
0.001mm	0.1mm	0.14mm	50-0-50	<b>2990</b>	±0.0065mm	1.5N or less	✓	✓	✓
0.01mm	1mm	1.27mm	50-0-50	<b>2960F</b>	±0.014mm	1.4N or less	✓	✓	

# Back Plunger Type Dial Indicators

SERIES 1 and 2



1960



2960F

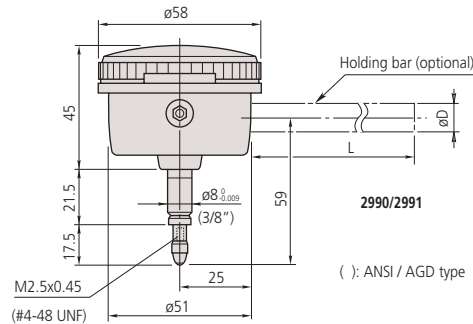
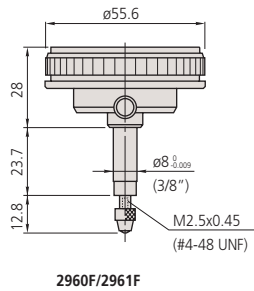
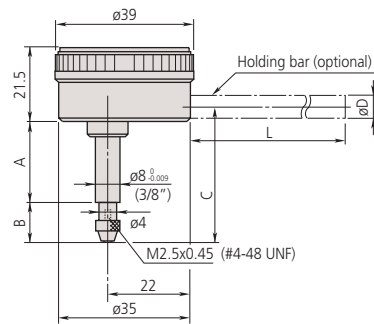


2991

## DIMENSIONS

Unit: mm

Order No.	A	B	C
1160	25.0	13.8	43.3
1162	25.0	13.8	43.3
1166	25.0	13.0	42.5
1167	25.0	13.0	42.5
1168	25.0	13.0	42.5
1960	28.7	12.8	46.0
1961	25.0	10.9	40.4



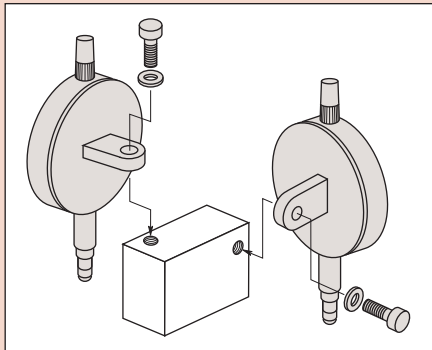


# Backs




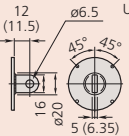

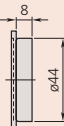

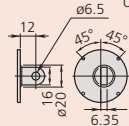

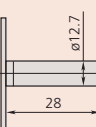

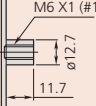

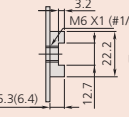

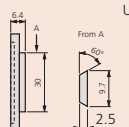

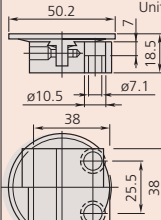
## Optional Accessory for Digimatic and Dial Indicators

There are two ways to support Digimatic and dial indicators; by either holding the stem or the lug on the back of the indicator. The back of the indicator may need to be replaced for special applications. A wide variety of backs are available for Mitutoyo Digimatic and dial indicators.

### Application



### SPECIFICATIONS

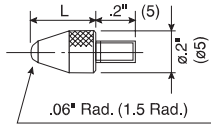
Description		Order No.			
		Series 0 ( $\phi$ 31mm) 1003 ( $\phi$ 36mm)	Series 1 ( $\phi$ 41mm)	Series 2 ( $\phi$ 57mm)	Series 3, 4 ( $\phi$ 77, 91mm)
Flat Back 	 Unit: mm	<b>191559:</b> a=1.0 <b>137906:</b> for 1003 a=1.0	<b>101211:</b> a=2.2 <b>136872:</b> for water-proof type <b>191559:</b> for 1911, 1913-10	<b>101039:</b> a=2.5 <b>21AZB231:</b> for water-proof of S type	<b>100836:</b> a=3.0
Lug-on-Center Back 	 Unit: mm	<b>190561:</b> Metric type <b>190139:</b> Inch type <b>137905:</b> for 1003	<b>101210:</b> metric type <b>101307:</b> inch type <b>190561:</b> for 1911, 1913-10	<b>101040:</b> metric type <b>101306:</b> inch type <b>21AZB230:</b> for water-proof of S type	<b>100691:</b> metric type <b>100797:</b> inch type
Magnetic Back 	 Unit: mm	—	<b>Special order</b>	<b>900928</b>	<b>900929</b>
Back with Offset Lug 	 Unit: mm	—	<b>Special order</b>	<b>101167</b>	<b>100837</b>
Back with Post 	 Unit: mm	—	<b>193172</b>	<b>101169</b>	<b>100839</b>
Back with Screw Mount 	 Unit: mm	—	<b>193173:</b> M6x1, <b>193174:</b> #1/4-28UNF,	<b>136023:</b> M6x1 <b>101170:</b> #1/4-28UNF	<b>136024:</b> M6x1 <b>100840:</b> #1/4-28UNF
Adjustable Back 	 Unit: mm	—	<b>136025:</b> M6x1 <b>129721:</b> #1/4-28UNF	<b>136026:</b> M6x1 <b>101168:</b> 1/4-28UNF	<b>136027:</b> M6x1 <b>100838:</b> #1/4-28UNF
Back with Dovetail 	 Unit: mm	—	—	<b>900008</b>	<b>Special order</b>
Back with Adjustable Bracket 	 Unit: mm	—	—	<b>901963:</b> Set No. <b>129902:</b> Dovetail Rack Back <b>901964:</b> Dovetail bracket for rack back	—

( ) : ANSI / AGD Type

# Contact Points

## Optional Accessories for Digimatic and Dial Indicators and Linear Gages

### ø.118" (ø3mm) Ball Point



#### 4-48UNF

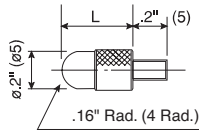
L	Carbide	Sapphire	Ruby	Plastic
.25"	21BZB005*	—	—	—
.28"	—	—	—	902018
.3"	131262	131263	131264	—
.6"	131265	131266	131267	—
1"	131268	131269	131270	—

#### M2.5 x 0.45mm

L	Carbide	Sapphire	Ruby	Plastic
7.3mm	901312*	—	—	901994
8mm	120045	120046	120047	—
15mm	120049	120050	120051	—
25mm	120053	120054	120055	—

\*Furnished with standard metric dial indicators.

### Shell type point



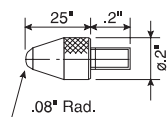
#### 4-48UNF

L	Order No.
3/32" (.094")	193697
5/32" (.156")	101184
1/4" (.25")	21AAA031
3/8" (.375")	21AAA032
1/2" (.5")	101185
5/8" (.625")	21AAA033
3/4" (.75")	101186
7/8" (.875")	21AAA034
1"	101187
1 1/4" (1.25")	21AAA035
1 1/2" (1.5")	21AAA036
1 3/4" (1.75")	21AAA037
2"	21AAA038
2 1/4" (2.25")	21AAA039
2 1/2" (2.5")	21AAA040
2 3/4" (2.75")	21AAA041
3"	21AAA042

#### M2.5 x 0.45mm

L	Order No.
5mm	101386
10mm	101118
15mm	137393
20mm	101387
25mm	101388
30mm	21AAA254

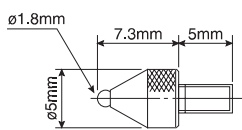
### ø.16 Ball Point



#### 4-48UNF

Order No.
900032

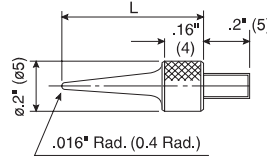
### ø1.8mm Ball Point



#### M2.5 x 0.45mm

Order No.
101122

### Needle point



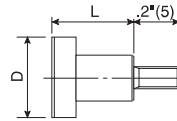
#### 4-48UNF

L	Order No.
.6"	21AAA030
1"	21AAA046
1 1/2"	21AAA047
2"	21AAA048

#### M2.5 x 0.45mm

L	Order No.
15mm	101121
17mm	137413

### Flat Point



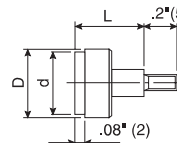
#### 4-48UNF

D	L	Order No.
ø1/2"	3/8"	101188
ø3/8"	3/8"	101189

#### M2.5 x 0.45mm

D	L	Order No.
ø10mm	10mm	101117

### Flat Point, Carbide Tip



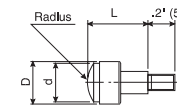
#### 4-48UNF

D	d	L	Order No.
ø.2"	ø.17"	.2"	131259
ø.27"	ø.25"	.4"	131260
ø.41"	ø.37"	.4"	131261

#### M2.5 x 0.45mm

D	d	L	Order No.
ø5.2mm	ø4.3mm	5mm	120041
ø7mm	ø6.5mm	10mm	120042
ø10.5mm	ø9.5mm	10mm	120043

### Spherical Point, Carbide Tip



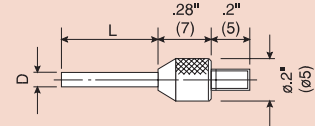
#### 4-48UNF

D	d	Radius	L	Order No.
ø.2"	ø.17"	.2"	.2"	131273
ø.27"	ø.16"	.16"	.4"	131274
ø.41"	ø.37"	.4"	.4"	131275

#### M2.5 x 0.45mm

D	d	Radius	L	Order No.
ø5.2mm	ø4.3mm	5mm	5mm	120058
ø7mm	ø6.5mm	7mm	10mm	120059
ø10.5mm	ø9.5mm	10mm	10mm	120060

### Needle point, Carbide tipped



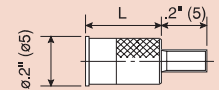
#### 4-48UNF

D	L	Order No.
ø.018"	.12"	131281
ø.04"	.12"	131280
ø.06"	.5"	131279
ø.078"	.04"	131271

#### M2.5 x 0.45mm

D	L	Order No.
ø0.45mm	2.5mm	120066
ø1mm	2.5mm	120065
ø1.5mm	13mm	120064
ø2mm	1mm	120056
ø2mm	8mm	137257

### ø.2" (ø5mm) Flat Point



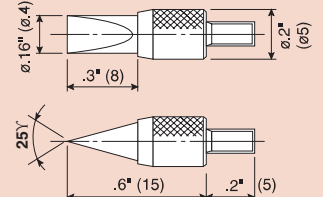
#### 4-48UNF

L	Order No.
5/16"	133017
1/2"	21AAA043
3/4"	21AAA044
1"	21AAA045

#### M2.5 x 0.45mm

L	Order No.
8mm	131365

### Knife edge point, Carbide tipped



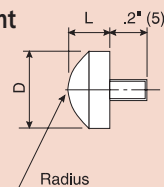
#### 4-48UNF

Order No.
131282

#### M2.5 x 0.45mm

Order No.
120067

### Spherical point



#### 4-48UNF

D	L	Radius	Order No.
ø.5"	.125"	.28"	101205
ø.375"	.09375"	.35"	101204

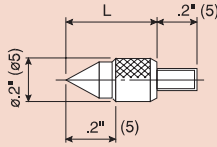
#### M2.5 x 0.45mm

D	L	Radius	Order No.
ø10mm	5mm	7mm	101119

# Contact Points

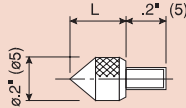
Optional Accessories for Digimatic and Dial Indicators and Linear Gages

## 60° Conical point



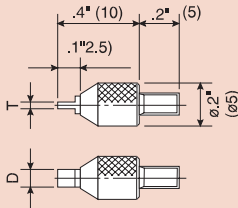
4-48UNF		M2.5 x 0.45mm	
L	Order No.	L	Order No.
1/2"	101190	10mm	101120

## 90° Conical point



4-48UNF		M2.5 x 0.45mm	
L	Order No.	L	Order No.
1/4"	101191	5mm	101385

## Blade Point, Carbide Tip



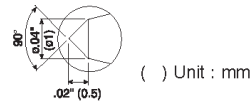
4-48UNF			M2.5 x 0.45mm		
D	T	Order No.	D	T	Order No.
.08"	.016"	131276	2mm	0.4mm	120061
.08"	.024"	131277	2mm	0.6mm	120062
.16"	.04"	131278	4mm	1mm	120063

## Interchangeable Contact Point Set (4-48 UNF)

Set Order No. 21AZA034

Individual No.	Description
101184	Shell Type Point 5/32"
101185	Shell Type Point 1/2"
101186	Shell Type Point 3/4"
101187	Shell Type Point 1"
101188	Flat Point $\phi$ 1/2"
101189	Flat Point $\phi$ 3/8"
101190	60° Conical Point
101191	90° Conical Point
101204	Spherical Point $\phi$ 3/8"
21AAA030	Needle Point .6"

## 90° Conical point, Carbide tipped

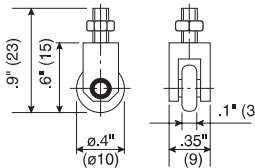


4-48UNF		4-48UNF	
L	Order No.	L	Order No.
.08"	131272	.3"	131283

M2.5 x 0.45mm		M2.5 x 0.45mm	
L	Order No.	L	Order No.
2mm	120057	8mm	120068

## Roller Point



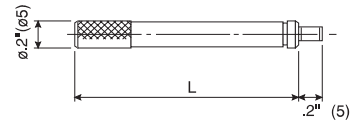
4-48UNF		M2.5 x 0.45mm	
Order No.	Order No.	Order No.	Order No.
901991	901954	901991	901954

## Interchangeable Carbide Contact Point Set (4-48 UNF)

Set Order No. 21AZA035

Individual No.	Description
131260	Flat Point $\phi$ 1/4"
131274	Spherical Point $\phi$ 1/4"
131279	Needle Point $\phi$ .06" 1/2" Long
131262	Ballpoint $\phi$ .118"
131271	Needle Point $\phi$ .078" .04" Long

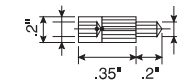
## Extension Rod



4-48UNF		M2.5 x 0.45mm	
L	Order No.	L	Order No.
1/2"	139167	10mm	303611
1"	301655	20mm	303612
2"	301657	30mm	303613
4"	301659	100mm	303614

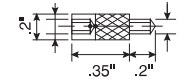
## Point Conversion

M2.5 x 0.45mm 4-48 UNFI



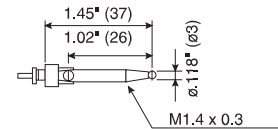
Order No.
21AAA011

4-48 UNFI M2.5 x 0.45mm



Order No.
21AAA012

## Lever Point



4-48UNF		M2.5 x 0.45mm	
Order No.	Order No.	Order No.	Order No.
900393	900393	900393	900391

## Interchangeable Contact Point Set (M2.5x0.45)

Set Order No. 7822



Individual No.	Description
131365	Flat Point ( $\phi$ 5mm)
101117	Flat Point ( $\phi$ 10mm)
101121	Needle Point
101119	Spherical Point
101118	Shell Type Point
101387	Shell Type Point

# Spindle Lifting Lever and Cable

## Optional Accessories for Digimatic and Dial Indicators

### Spindle Lifting Lever

- The Spindle Lifting Lever is attached to the top end of the spindle for improved inspection efficiency when using a dial indicator mounted on a stand.

Applicable S-Type Gages

Order No.	Description
21AZB149	2,3, and 4 series up to (.5" / 12.7mm)
21AZB150	2,3, and 4 series up to (.5" / 12.7mm up to 1" / 25.4mm)
21AZB151	S-Type thickness gage



Dove Tail Type Lever Assy

Order No.	Lever up to .5" / 12.7mm	Screw	Screw Thread
21EZA198	21AZB149	101171	M2.5
21EZA199	21AZB149	101047	4/48 UNF



ANSI Screw **101047**  
JIS Screw **101171**

### Spindle Lifting Cable

- 901975:** with auto-stop function
- 540774:** without auto-stop function
- Lifting range: 1" / 25.4mm
- Cable length: 300mm



### Spindle Lifting Knob

- 137693**
- Applicable spindle diameter; 4.8mm



Use for Series 1 dial indicators.(up 5mm / .25")

Set Order No.	Lever	Screw	Screw Thread
21BZA610	900527	101047	4-48 UNF
21BZA205	900527	101171	M2.5 x 0.45



Use for Series 2 dial indicators (up to 10mm/.4")

Set Order No.	Lever	Screw	Screw Thread
902794	900525	101047	4-48 UNF
902011	900525	101171	M2.5 x 0.45



Use for Series 2 dial indicators (up to 10mm/.4") and 1 Group S-Type

Set Order No.	Lever	Screw	Screw Thread
21BZA613	21BZA612	101047	4-48 UNF
902100	21BZA612	101171	M2.5 x 0.45



Use for Series 2 dial indicators (up to 20mm/.8") and Series 3 and 4 dial indicators (up to 10mm/.4")

Set Order No.	Lever	Screw	Screw Thread
903425	903307	192753	4-48 UNF
903424	903307	192686	M2.5 x 0.45

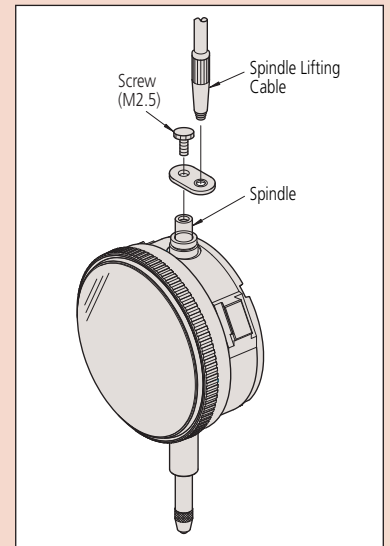
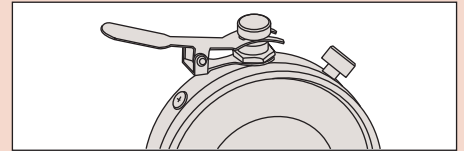
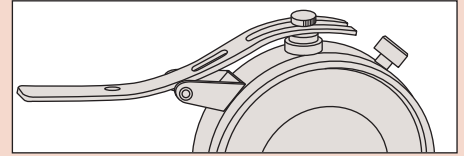


### Spindle Lifting Knob

Set Order No.	Range
21EZA197	For 1" range
21EZA200	For 2" range



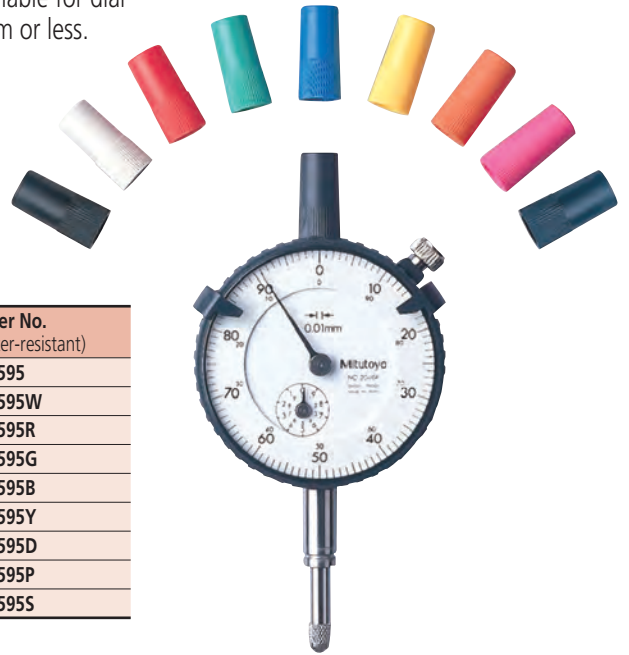
### Application



# Color Spindle Caps

## Optional Accessories for Digimatic and Dial Indicators

8 colors of spindle caps are available for dial indicators with a range of 10mm or less.



### SPECIFICATIONS

Color	Order No. (normal)	Order No. (water-resistant)
Black	193051	193595
White	193051W	193595W
Red	193051R	193595R
Green	193051G	193595G
Blue	193051B	193595B
Yellow	193051Y	193595Y
Orange	193051D	193595D
Pink	193051P	193595P
Dark blue	193051S	193595S

# Limit Stickers

## Optional Accessories for Digimatic and Dial Indicators

### FEATURES

- Stuck on the dial face or crystal of a Series 2 dial indicator (55.6mm or 57mm bezel dia.) to indicate tolerance limits.



136420: Red (10-sheet/set)



136421: Green (10-sheet/set)

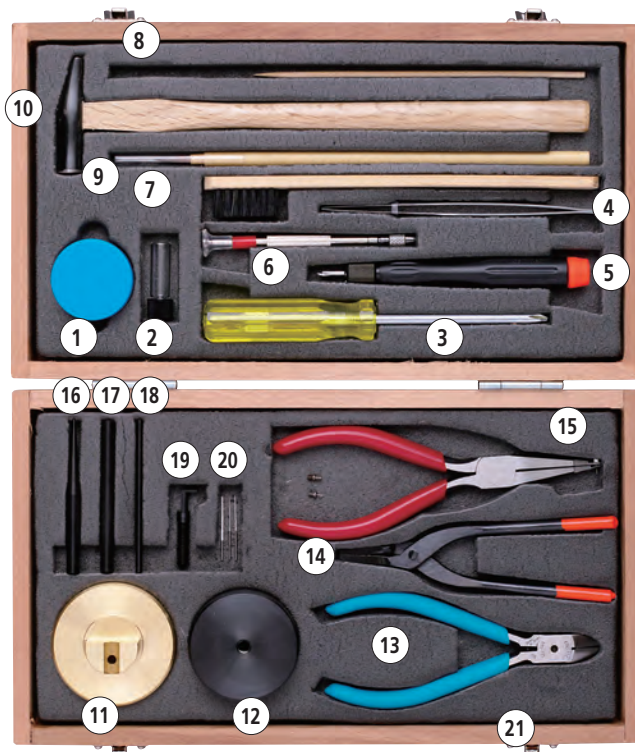


136422: Yellow (10-sheet/set)

# Dial Indicator Repair Tool Kit

## Optional Accessories for Digimatic and Dial Indicators

Mitutoyo offers a tool set designed to let you perform simple repairs to your Mitutoyo dial indicator, and a device that lets you reset the indicator crystals.



7823

### SPECIFICATIONS

Order No.	Description
7823	Dial indicator repair tool kit

# Dial Indicator Crystal Setter

## Optional Accessories for Test and Dial Indicators

### FEATURES

- Used for fitting a crystal on dial indicators, dial test indicators, and dial calipers.

### SPECIFICATIONS

Order No.	Description
7000	Dial indicator crystal setter



7000

With 8 sizes of crystal setting pads

### Order No. 7823

#### Set Configuration

- (1) 901171: Molykote (lubricant)
- (2) 21JAA313: Lubricating oil
- (3) 901173: Screwdriver (Phillips)
- (4) 901174: Screwdriver (Phillips/flat blade)
- (5) 129729: Tweezers
- (6) 901175: Pin-vise
- (7) 901176: Brush
- (8) 21JAA314: Stick
- (9) 901177: Brush
- (10) 901178: Hammer
- (11) 129730: Spindle rest
- (12) 129731: Pin rest
- (13) 901179: Nippers
- (14) 901180: Pliers
- (15) 901181: Hand remover
- (16) 129732: Pin remover
- (17) 129733: Punch
- (18) 129734: Bearing adjuster
- (19) 129735: Pinion rest
- (20) 129736: Reamer  $\varnothing 1$
- (21) 193702: Reamer  $\varnothing 0.6$
- 21JAA273: Reamer  $\varnothing 0.5$
- 901182: Case

#### Optional Accessories For Hand Remover

- 126630: Interchangeable Pin, 0.8mm DIA.
- 126630B: Interchangeable Pin, 0.5mm DIA.
- 126630C: Interchangeable Pin, 1.6mm DIA.

# Dial Test Indicators

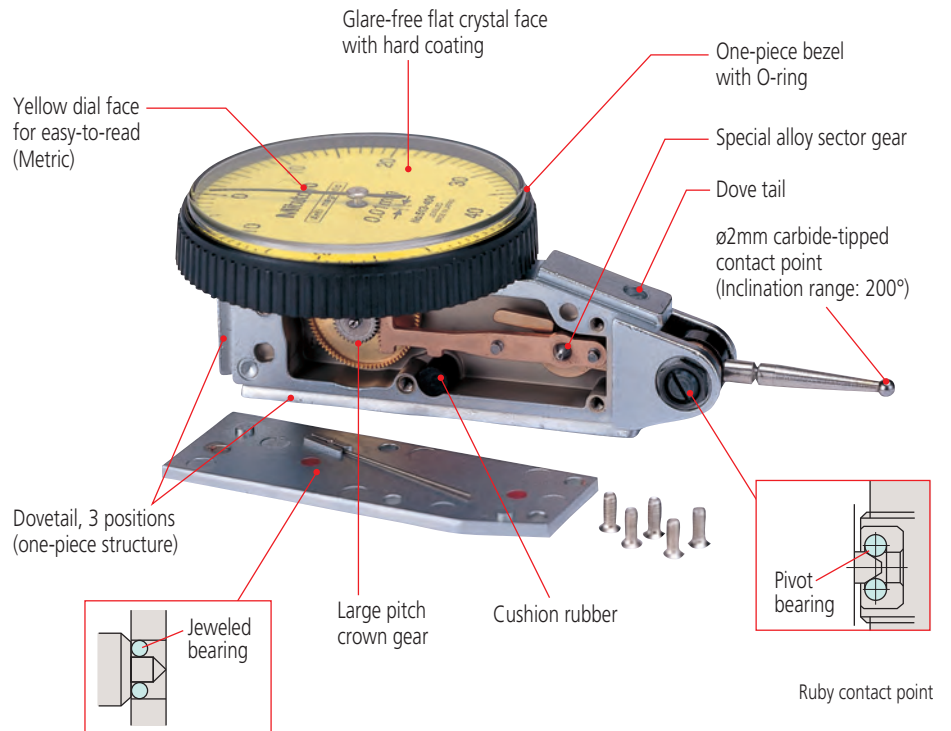
## SERIES 513

### Description of Icon

Icon	Description
	With revolution counter type
	Long contact point type
	Jeweled bearing type
	Double scale spacing type, easy-on-the-eyes
	Compact type
	Dustproof type
	Anti-magnetic type

### FEATURES

- Narrow or deep places, which cannot be measured with a normal dial gauge, can be easily and accurately measured.
- Mitutoyo's proprietary new structure permits smooth pointer operation.
- Use of a hard frame body provides excellent rigidity and durability.
- Non-magnetic pointer and contact point permit secure operation even in environments with magnetism.
- Use of a clear and concise wide dial face allows excellent visibility.
- The surface of the crystal is hard-coated, to make it scratch-resistant.
- Flat crystal makes graduations easy to read. Moreover, the unified structure of the outer frame prevents oil and water from permeating via the front face.
- Six types are available: vertical, inclined, perpendicular, horizontal, universal, and pocketable, allowing users to select the model most suited to their needs.
- Vertical: Standard
- Inclined: Dial face inclined 20°, compared with the vertical type, allows easy reading.
- Perpendicular: Best suited for centering holes.
- Horizontal: The graduations can be read from the front, with the probe on the tip of the horizontal conical rod abutting the workpiece.
- Universal: The direction of the probe movement can be freely changed.
- Pocketable: Compact type



# Dial Test Indicators

## SERIES 513 — Horizontal Type

### FEATURES

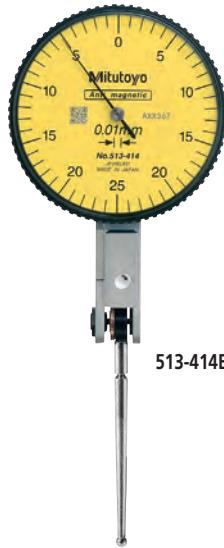
- Performs easy and accurate measurement of narrow or recessed areas, plus inside and outside diameters that dial indicators cannot access.
- No-clutch structure for automatic reversal of measuring direction.
- Resistant to water and dust thanks to the one-piece bezel and "crystal" design with O-ring.
- The glare-free flat crystal face has a scratch-resistant coating.
- High-sensitivity and quick-response because of jeweled bearings.
- A carbide contact point is provided as standard.



513-424E



513-404E



513-414E



513-403



513-474E

### Optional Accessories

- : Swivel clamp
- : Holding bar
- : Stem
- : Contact points

### Special Set: No. 513-908 (mm)

- 513-404E: Dial test indicator
- 7014: Mini magnetic stand

### No. 513-907 (inch)

- 513-402: Dial test indicator
- 7014E: Mini magnetic stand

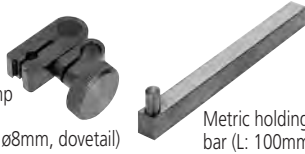




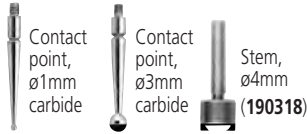
## Set Configuration: Metric Test Indicators

### Full set

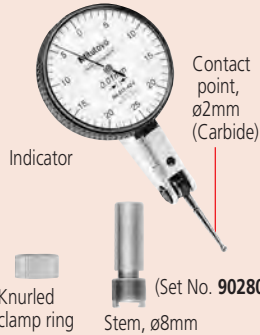
Swivel clamp  
(900321,  
for  $\phi 4\text{mm}$ ,  $\phi 8\text{mm}$ , dovetail)



Metric holding bar (L: 100mm)  
(900209)



### Basic set



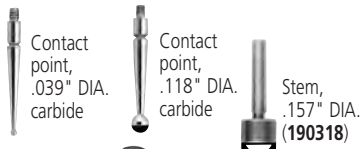
Contact point,  
 $\phi 2\text{mm}$   
(Carbide)

Knurled  
clamp ring

Stem,  $\phi 8\text{mm}$   
(Set No. 902804)

## Set Configuration: Inch Test Indicators

### Full set

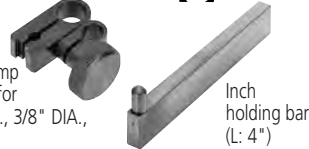


Contact point,  
.039" DIA.  
carbide

Contact point,  
.118" DIA.  
carbide

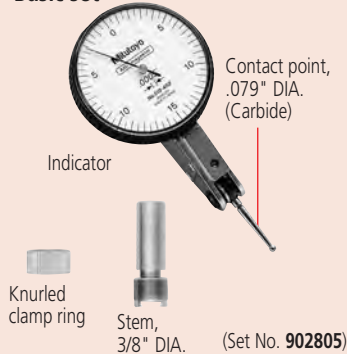
Stem,  
.157" DIA.  
(190318)

Swivel clamp  
(900322, for  
.157" DIA., 3/8" DIA.,  
dovetail)



Inch holding bar  
(L: 4")  
(900306)

### Basic set



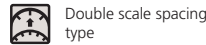
Contact point,  
.079" DIA.  
(Carbide)

Knurled  
clamp ring

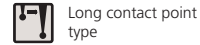
Stem,  
3/8" DIA.  
(Set No. 902805)



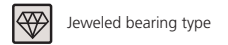
Anti-magnet type



Double scale spacing  
type



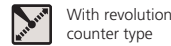
Long contact point  
type



Jeweled bearing type



Compact type



With revolution  
counter type



513-466E



513-464E



513-463

## SPECIFICATIONS

### Metric

Graduation	Order No.		Range	Accuracy	Dial reading	Measuring force	L (mm)						
	Basic set	Full set											
0.01mm	513-424E	513-424T	0.5mm	5 $\mu\text{m}$	0-25-0	0.3N or less	22.3	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
0.01mm	513-414E	513-414T	0.5mm	10 $\mu\text{m}$	0-25-0	0.2N or less	36.8	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
0.01mm	513-466E	—	0.5mm	5 $\mu\text{m}$	0-25-0	0.3N or less	22.3	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
0.01mm	513-404E	513-404T	0.8mm	8 $\mu\text{m}$	0-40-0	0.3N or less	20.9	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
0.01mm	513-474E*	—	0.8mm	8 $\mu\text{m}$	0-40-0	0.3N or less	20.9	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
0.01mm	513-464E	—	0.8mm	8 $\mu\text{m}$	0-40-0	0.3N or less	20.9	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
0.01mm	513-415E	513-415T	1mm	10 $\mu\text{m}$	0-50-0	0.2N or less	44.5	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
0.01mm	513-426E	—	1.5mm	8 $\mu\text{m}$	0-25-0	0.4N or less	22.3	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
0.002mm	513-405E	513-405T	0.2mm	3 $\mu\text{m}$	0-100-0	0.3N or less	14.7	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
0.002mm	513-465E	—	0.2mm	3 $\mu\text{m}$	0-100-0	0.3N or less	14.7	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
0.002mm	513-425E	—	0.6mm	6 $\mu\text{m}$	0-100-0	0.4N or less	14.7	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
0.001mm	513-401E	—	0.14mm	3 $\mu\text{m}$	0-70-0	0.3N or less	12.8	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

\*provided with a  $\phi 2\text{mm}$  ruby contact point as a substitute for  $\phi 2\text{mm}$  carbide contact point.

### Inch

Graduation	Order No.		Range	Accuracy	Dial reading	Measuring force	L (mm)					
	Basic set	Full set										
.0005"	513-402	513-402T	.03"	$\pm 0.0005$ "	0-15-0	0.3N or less	19.9	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
.0005"	513-412	513-412T	.03"	$\pm 0.0005$ "	0-15-0	0.2N or less	33.9	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
.0005"	513-462	—	.03"	$\pm 0.0005$ "	0-15-0	0.3N or less	19.9	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
.0001"	513-403	513-403T	.008"	$\pm 0.0001$ "	0-4-0	0.3N or less	15	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
.0001"	513-463	—	.008"	$\pm 0.0001$ "	0-4-0	0.3N or less	15	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

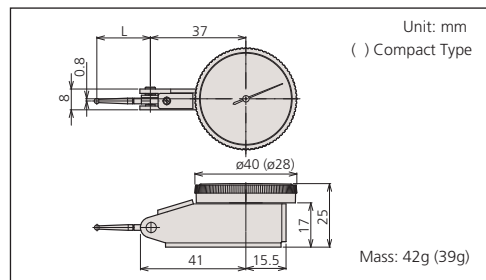
### Metric/inch

Graduation	Order No.		Range	Accuracy	Dial reading	Measuring force	L (mm)		
	Basic set	Full set							
0.002mm, .0001"	513-409	513-409T	0.2mm, .0075"	3 $\mu\text{m}$	0-10-0, 0-38-0	0.3N or less	14.7	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

### Inch/Metric

Graduation	Order No.		Range	Accuracy	Dial reading	Measuring force	L (mm)		
	Basic set	Full set							
.0005", 0.01mm	513-406	513-406T	.03", 0.7mm	$\pm 0.0005$ "	0-15-0, 0-35-0	0.3N or less	19.9	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

## DIMENSIONS AND MASS

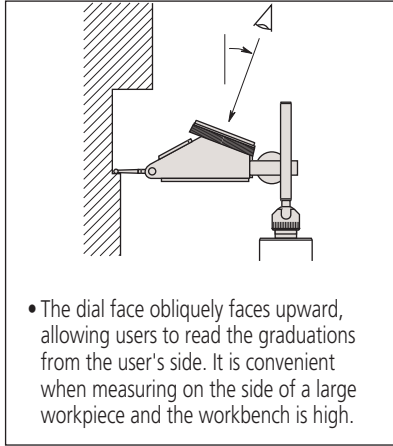


# Dial Test Indicators

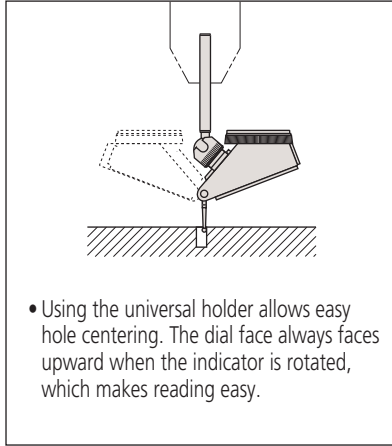
## SERIES 513 — Horizontal (20° Tilted Face), Vertical, and Parallel Types

### FEATURES

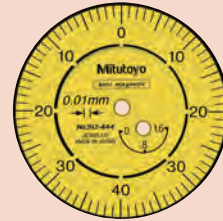
- Specially designed for easy viewing of measurements.



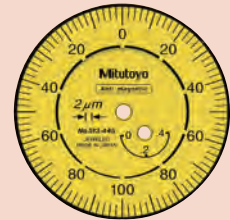
- The dial face obliquely faces upward, allowing users to read the graduations from the user's side. It is convenient when measuring on the side of a large workpiece and the workbench is high.



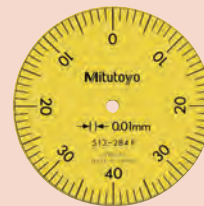
- Using the universal holder allows easy hole centering. The dial face always faces upward when the indicator is rotated, which makes reading easy.



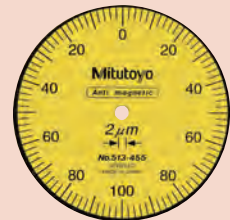
513-444E



513-445E



513-454E  
513-284GE



513-455E



513-452



513-282G



513-444E



513-445E



513-284G



513-442



513-446

### Optional Accessories

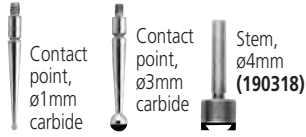
- : Swivel clamp
- : Holding bar
- : Stem
- : Contact points

## Set Configuration: Metric

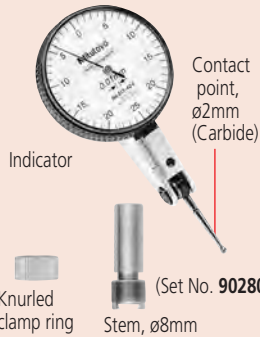
### Full set

Swivel clamp  
(900321,  
for  $\varnothing 4\text{mm}$ ,  $\varnothing 8\text{mm}$ , dovetail)

Metric holding bar  
(L: 100mm)  
(900209)



### Basic set



## Set Configuration: Inch

### Full set

Contact point,  
.039" DIA.  
carbide

Contact point,  
.118" DIA.  
carbide

Stem,  
.157" DIA.  
(190318)

Swivel clamp  
(900322, for  
.157" DIA., 3/8" DIA.,  
dovetail)

Inch  
holding bar  
(L: 4")  
(900306)

### Basic set

Indicator

Contact point,  
.079" DIA.  
(Carbide)

Knurled  
clamp ring

Stem,  
.157" DIA.  
(190318)

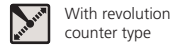
(Set No. 902805)

Stem,  
3/8" DIA.

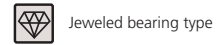
Basic set for 20° Tilted face type.  
Also supplied .039" and .118" Contact points



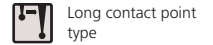
Anti-magnet type



With revolution counter type



Jeweled bearing type



Long contact point type

## SPECIFICATIONS

### Metric Horizontal (20° tilted face) type

Graduation	Order No.		Range	Accuracy	Dial reading	Measuring force	Mass (g)	L (mm)			
	Basic set	Full set									
0.01mm	513-444E	513-444T	1.6mm	10 $\mu\text{m}$	0-40-0	0.3N or less	48	20.9	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
0.002mm	513-445E	513-445T	0.4mm	5 $\mu\text{m}$	0-100-0	0.3N or less	48	14.7	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

### Inch Horizontal (20° tilted face) type

Graduation	Order No.		Range	Accuracy	Dial reading	Measuring force	Mass (g)	L (mm)					Remarks
	Basic set	Full set											
.0005"	513-442	513-442T	.06"	$\pm 0.0005$ "	0-15-0	0.3N or less	48	19.9	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	—
.0005"	513-442-01	513-442T-01	.06"	$\pm 0.0005$ "	0-15-0	0.3N or less	48	19.9	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Blue dial
.0005"	513-442-06	513-442T-06	.06"	$\pm 0.0005$ "	0-15-0	0.3N or less	48	19.9	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Black dial
.0005"	513-446	513-446T	.06"	$\pm 0.0005$ "	0-15-0	0.2N or less	48	33.9	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	—
.0005"	513-446-06	513-446T-06	.06"	$\pm 0.0005$ "	0-15-0	0.2N or less	48	33.9	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Black dial
.0001"	513-443	513-443T	.016"	$\pm 0.0002$ "	0-4-0	0.3N or less	48	15	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	—
.0001"	513-443-06	513-443T-06	.016"	$\pm 0.0002$ "	0-4-0	0.3N or less	48	15	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Black dial

### Metric Vertical type

Graduation	Order No.		Range	Accuracy	Dial reading	Measuring force	Mass (g)	L (mm)		
	Basic set	Full set								
0.01mm	513-454E	513-454T	0.8mm	8 $\mu\text{m}$	0-40-0	0.3N or less	50	20.9	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
0.002mm	513-455E	513-455T	0.2mm	3 $\mu\text{m}$	0-100-0	0.3N or less	50	14.7	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

### Inch Vertical type

Graduation	Order No.		Range	Accuracy	Dial reading	Measuring force	Mass (g)	L (mm)		
	Basic set	Full set								
.0005"	513-452	513-452T	.03"	$\pm 0.0005$ "	0-15-0	0.3N or less	50	19.9	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
.0001"	513-453	513-453T	.008"	$\pm 0.0001$ "	0-4-0	0.3N or less	50	15	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

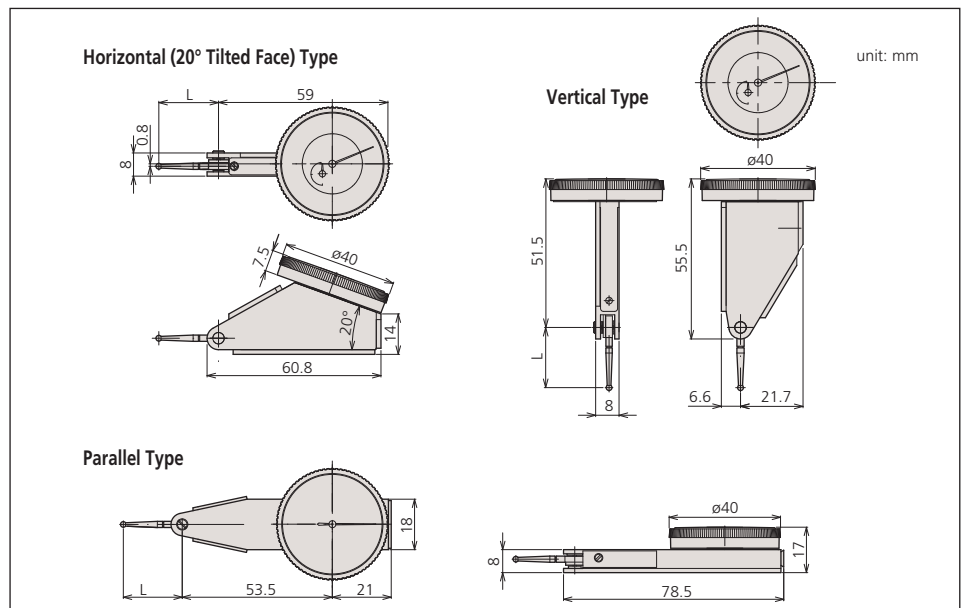
### Metric Parallel type

Graduation	Order No.		Range	Accuracy	Dial reading	Measuring force	Mass (g)	L (mm)	
	Basic set	Full set							
0.01mm	513-284GE	513-284GT	0.8mm	8 $\mu\text{m}$	0-40-0	0.3N or less	68	20.9	<input checked="" type="checkbox"/>

### Inch Parallel type

Graduation	Order No.		Range	Accuracy	Dial reading	Measuring force	Mass (g)	L (mm)	
	Basic set	Full set							
.0005"	513-282G	513-282GT	.03"	$\pm 0.0005$ "	0-15-0	0.3N or less	68	20	<input checked="" type="checkbox"/>

## DIMENSIONS

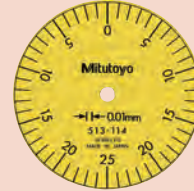
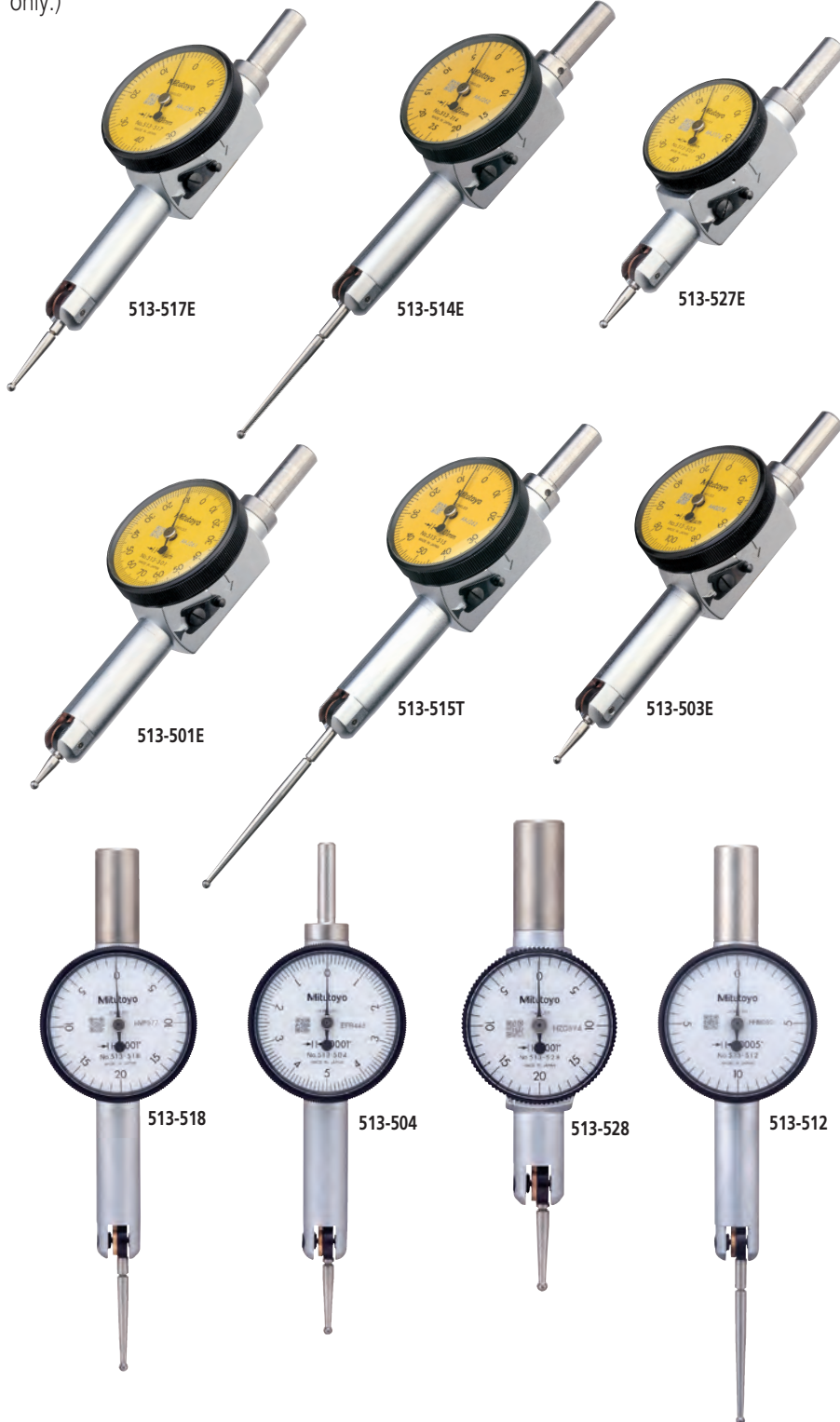


# Pocket Type Dial Test Indicators

## SERIES 513

### FEATURES

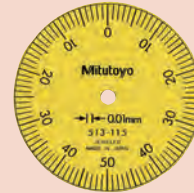
- Jeweled bearings assure higher sensitivity and accuracy.
- Reversible measuring direction.
- Two holding bars are supplied. (Full sets only.)
- Fully adjustable bezel/dial face.
- Contact point is adjustable within 220°.
- Bezel is sealed with an O-ring to keep out water / oil.



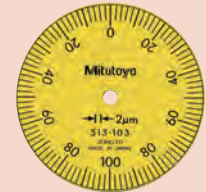
513-514E



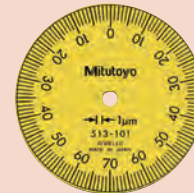
513-517E  
513-527E



513-515T



513-503E

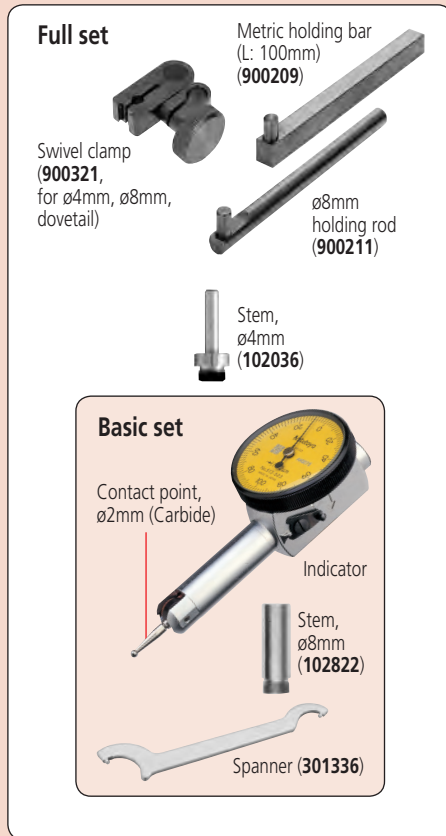


513-501E

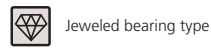
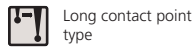
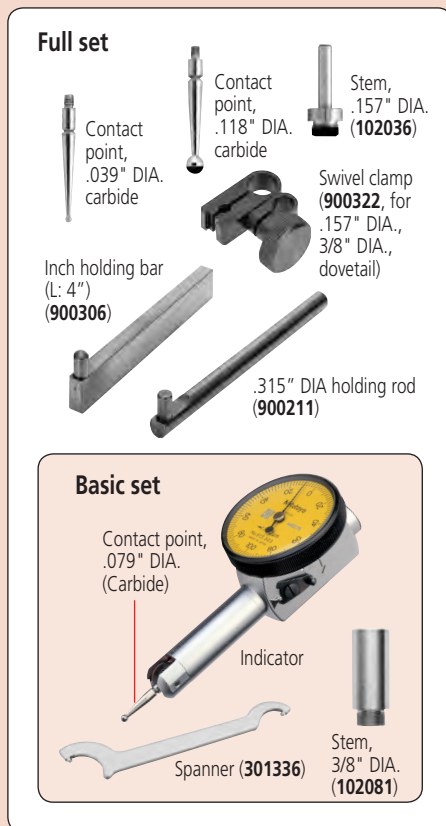
### Optional Accessories

- : Swivel clamp
- : Holding bar
- : Stem
- : Contact points

## Set Configuration: Metric



## Set Configuration: Inch



## SPECIFICATIONS

### Metric

Graduation	Order No.		Range	Accuracy	Dial reading	Measuring force	L (mm)			
	Basic set	Full set								
0.01mm	513-514E	513-514T	0.5mm	10µm	0-25-0	0.3N or less	36.8	✓	✓	—
0.01mm	513-517E	513-517T	0.8mm	8µm	0-40-0	0.3N or less	20.9	—	✓	—
0.01mm	513-527E	513-527T	0.8mm	8µm	0-40-0	0.3N or less	14.7	—	✓	✓
0.01mm	—	513-515T	1mm	10µm	0-50-0	0.3N or less	44.5	✓	✓	—
0.002mm	513-503E	513-503T	0.2mm	3µm	0-100-0	0.3N or less	14.7	—	✓	—
0.001mm	513-501E	513-501T	0.14mm	3µm	0-70-0	0.4N or less	12	—	✓	—

### Inch

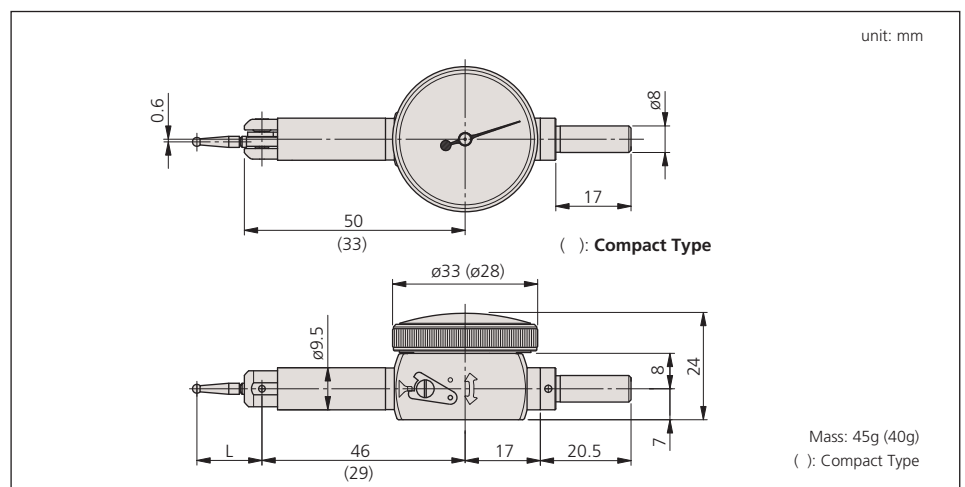
Graduation	Order No.		Range	Accuracy	Dial reading	Measuring force	L (mm)			
	Basic set	Full set								
.001"	513-518	513-518T	.04"	±.001"	0-20-0	0.3N or less	26.5	—	✓	—
.001"	513-528	513-528T	.04"	±.001"	0-20-0	0.3N or less	18.7	—	✓	✓
.0005"	513-512	513-512T	.02"	±.0005"	0-10-0	0.3N or less	37.4	✓	✓	—
.0001"	513-504	513-504T	.01"	±.0002"	0-5-0	0.3N or less	18.7	—	✓	—

## Optional Contact Points

### Pocket Type

Order No.	1mm	2mm	3mm	0.5mm	0.7mm
513-501E	136756	136104	136758	—	—
513-503E 513-527E	103017	103010	103018	190547	190548
513-504 513-528	131314	103011	131315	—	—
513-512	131316	131324	131317	—	—
513-514E	137746	129949	137747	—	—
513-515T	136235	136013	136236	190656	190655
513-517E	103013	103006	103014	190549	190550
513-518	103008	103007	103009	—	—

## DIMENSIONS AND MASS

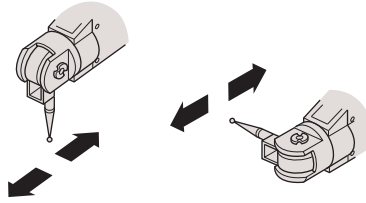


# Dial Test Indicators

## SERIES 513 — Universal Type

### FEATURES

- Universal application to all directions. (Not only the direction of the measuring point, but also the direction of measurement itself can be adjusted 360 degrees without moving the indicator.)



513-304GE

### SPECIFICATIONS



Jeweled bearing type

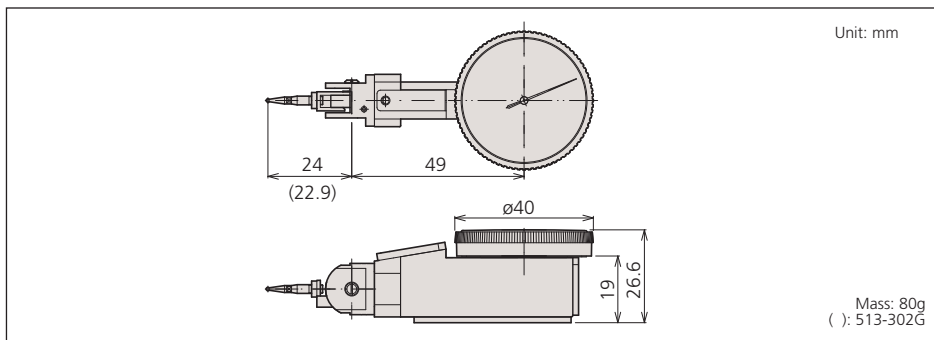
#### Metric

Graduation	Order No.		Range	Accuracy	Dial reading	Measuring force	
	Basic set	Full set					
0.01mm	513-304GE	513-304GT	0.8mm	8μm	0-40-0	0.3N or less	✓

#### Inch

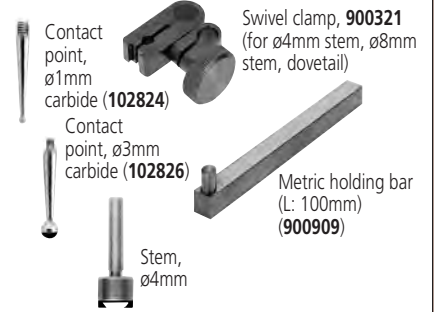
Graduation	Order No.		Range	Accuracy	Dial reading	Measuring force	
	Basic set	Full set					
.0005"	513-302G	513-302GT	.03"	±.0005"	0-15-0	0.3N or less	✓

### DIMENSIONS AND MASS

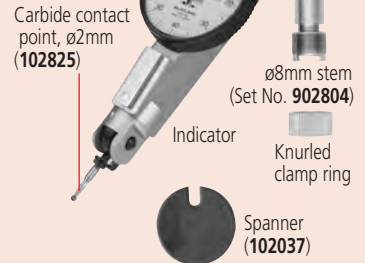


### Set Configuration: Metric

#### Full set

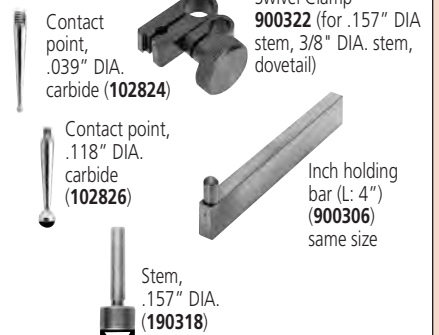


#### Basic set

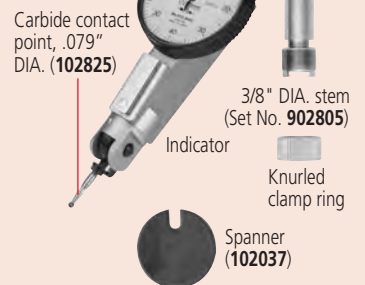


### Set Configuration: Inch

#### Full set



#### Basic set



### Optional Accessories

- : Swivel clamp
- : Holding bar
- : Stem

# Contact Points and Clamp Holders

## Optional Accessories for Dial Test Indicator

### Contact Points

Order No.	1mm	2mm	3mm	0.5mm	0.7mm
513-401E	21CZA044	21CZA036	21CZA045		
513-405E    513-425E	103017	103010	103018	190547	190548
513-465E    513-445E					
513-455E    513-409					
513-404E    513-464E	103013	103006	103014	190549	190550
513-444E    513-454E					
513-284GE					
513-424E    513-466E	137558	137557	137559	190654	190653
513-426E					
513-415E	136235	136013	136236	190656	190655
513-414E	137746	129949	137747		
513-402    513-462	133196	133195	133197		
513-406    513-442					
513-442-01    513-442-06					
513-452    513-282G					
513-403    513-463	136076	136075	136077		
513-443    513-443-06					
513-453					
513-412    513-446	136291	136290	136292		
513-446-06					

### Holding Bars



9 x 9mm    953638 (Length: 50mm)  
900209 (Length: 100mm)



ø8mm    900211 (Length: 115mm)



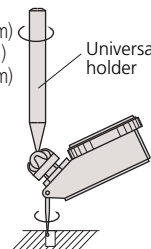
.25" x .5"    953639 (Length: 2")  
900306 (Length: 4")

### Universal Holder

- Allows the indicator to be set at a desired position.

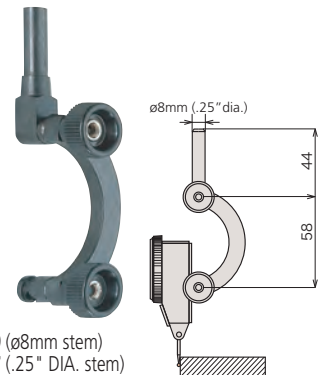


901916 (ø8mm stem, Length: 80mm)  
901459 (.25" DIA. stem, Length: 3")  
901461 (ø6mm stem, Length: 80mm)



### Centering Holder

- Allows large diameter cylinders or holes to be centered.



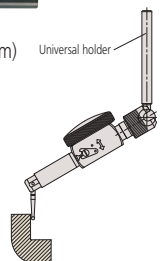
901959 (ø8mm stem)  
901997 (.25" DIA. stem)

### Universal Holder (pocket type)

- Since the Dial Test Indicator can be swiveled to a desired angle, the holder is useful for centering workpieces and installing workpieces on a milling machine.



901917 (ø8mm stem, Length: 84mm)  
901546 (.25" DIA. stem, Length: 84mm)  
901547 (ø6mm stem, Length: 84mm)



# i-Checker

## SERIES 170 – Inspection Instrument for Dial Indicator

The i-Checker is specially designed to calibrate dial indicators, dial test indicators, and other electronic comparison gage heads with a stroke of up to 100mm (4").

- $\pm(0.2+L/100)\mu\text{m}$  indication accuracy.
- Directly inspects an indicator with a stroke of up to 100mm (4"). The dial test indicator, bore gage and lever-type inductive head can be inspected with optional accessories.

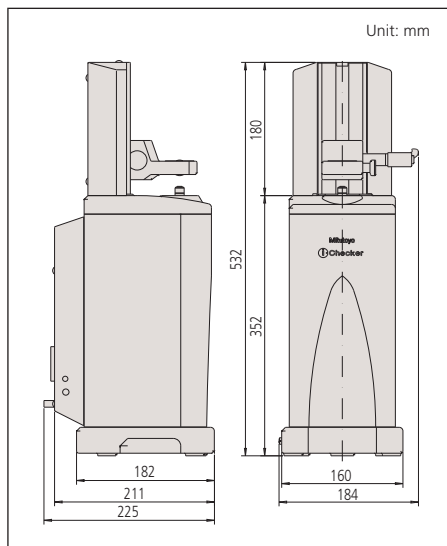
- Adjustment of the measurement position is very easily accomplished because of semi-automatic measurement and fully automatic measurement functions.
- Creates and prints out a simple inspection certificate.
- Saves inspection results as a CSV file for analysis by software.



### SPECIFICATIONS

Order No.	Remarks
170-311	with $\varnothing 8\text{mm}$ bush
170-312A	with $\varnothing 3/8"$ bush

### DIMENSIONS



### Applicable Indicators

- Dial indicator
- Hicator
- Digimatic indicator\*\*\*
- Test indicator\*
- Bore gage\*\*
- Linear gage

\* requires optional test indicator attachment set.  
 \*\* Contact the nearest Mitutoyo sales office for testable indicators.  
 \*\*\* requires optional bore gage accessory.  
 \*\*\*\* requires optional SPC cable for fully automatic measurement.



Using test indicator attachment set (02ASK000)



### Technical Data

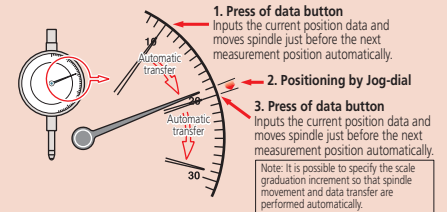
Measuring Range: 100mm/4"  
 Resolution: 0.02 $\mu\text{m}/0.8\mu\text{in}$   
 Accuracy:  $\pm(0.2+L/100)\mu\text{m}$  in vertical position  
 $\pm(0.3+2L/100)\mu\text{m}$  in lateral position  
 L = arbitrary length (mm)  
 Drive method: Electric motor  
 Measuring Unit: Reflective-type glass linear encoder  
 Thermal expansion coefficient:  $(8\pm 1)\times 10^{-6}/\text{K}$   
 Measurement method: Semi-automatic / Fully automatic\*  
 Dimensions: 184 x 225 x 532mm (W x D x H)  
 Operating temperature range: 20°C $\pm$ 3°C  
 Power supply: 100VAC to 240VAC  $\pm$ 10%, 50/60Hz  
 Mass: 20kg/44.1lbs

\* Automatic measurement requires the indicator's connection cable. Additionally some form of indicator, along with a connecting machine (the optional accessory for indicator as a Digimatic power-supply unit on EF counter) will be needed.

### Functions

#### Inspect your analog indicator semi-automatically!

The pointer of the analog indicator is positioned just before the measuring point automatically via Mitutoyo's Semi-automatic Measurement function. After that, inspection begins simply by adjusting the pointer position with the jog-dial. Because of this function, measurement time is reduced and user fatigue is practically eliminated. Additionally all functions necessary for inspection are combined in the control box so that the operator need not rely on excessive eye movement to adjust the pointer.



#### Fully automatic inspection of digital indicator

The Automatic Measurement function, in tandem with a digital indicator makes the spindle move so that measurement data is acquired automatically. Therefore, manual adjustment to the measurement position is unnecessary and the efficiency of every inspection is enhanced.



#### Create and printout a simplified inspection certificate

It is possible to create, edit and print out your own inspection certificate. Furthermore, that data can be saved as a CSV file.

### Optional Accessories

- 02ASK000: Test indicator attachment set ( $\varnothing 6\text{mm}$  stem)
- 02ASK180: Test indicator attachment set ( $\varnothing 8\text{mm}$  stem)
- 02ASK370: Test indicator holder ( $\varnothing 6\text{mm}$  stem)
- 02ASK380: Test indicator holder ( $\varnothing 8\text{mm}$  stem)
- 02ASL310: Accessory for Bore gages
- 902803:  $\varnothing 6\text{mm}$  dovetail grooved stem
- 902804:  $\varnothing 8\text{mm}$  dovetail grooved stem
- 02ASK040: Stem bush  $\varnothing 6\text{mm}$
- 02ASJ856: Stem bush  $\varnothing 8\text{mm}$
- 02ASK150: Stem bush  $\varnothing 8\text{mm}$ , short
- 02ASL150: Stem bush  $\varnothing 10$ , short
- 02ASK050: Bush  $\varnothing 9.5$  (Requires 02ASK070)
- 02ASK060: Stem bush  $\varnothing 12\text{mm}$
- 02ASK070: Stem bush  $\varnothing 15\text{mm}$
- 02ASK080: Stem bush  $\varnothing 20\text{mm}$
- 02ASK710: Stem bush  $\varnothing 28\text{mm}$
- 02ASK090: Stem bush 3/8"
- 02ASK130: Stem bush case
- 02ASK730: Reflector
- 937179T: Foot switch





### Optional Accessory

**21AKK824:** Stand for bore gage inspection



# UDT-2 Dial Gage Testers

## SERIES 170

The UDT-2 Dial Gage Tester consists of a specially designed 0-1" / 0-25mm micrometer head, with a large disc, and rigid holding fixtures. Gage tester to calibrate measuring accuracy of dial indicators, dial test indicators and dial bore gage.

### FEATURES

- Clamping stem diameter—  
170-102-10: 6mm and 8mm,  
170-101-10: .25" and .375"
- With the optional stand (**12AAK824**), inspection of Dial Bore Gages becomes possible to perform.

### SPECIFICATIONS

Metric			
Range	Order No.	Graduation	Accuracy
0 - 25mm	<b>170-102-10</b>	0.001mm	±1µm



170-102-10

Inch			
Range	Order No.	Graduation	Accuracy
0 - 1"	<b>170-101-10</b>	.0001"	±.0001"

# Calibration Testers

## SERIES 521

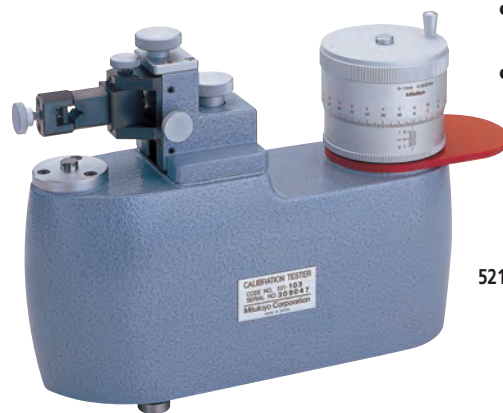
The Calibration Tester is specially designed to calibrate measuring accuracy of short range dial indicators, dial test indicators, and other electronic comparison gage heads.

### FEATURES

- Universal bracket accepts any dial indicator, dial test indicator, lever head of Mu-Checker without any additional accessory.
- Clamping capacity: ø4mm - ø10mm / .157"-.394" dia.
- Dual color-indexed directional graduations to facilitate measurements.



Calibrating test indicator



521-103

### SPECIFICATIONS

Metric			
Range	Order No.	Graduation	Accuracy
0 - 1mm	<b>521-103</b>	0.0002mm	±0.2µm
0 - 5mm	<b>521-105</b>	0.0002mm	±0.8µm

Inch			
Range	Order No.	Graduation	Accuracy
0 - .05"	<b>521-104</b>	.00001"	±.00001"
0 - .2"	<b>521-106</b>	.00001"	±.00003"

# Thickness Gages

## SERIES 547, 7

The Thickness Gages offer a quick and efficient means of inspection with their convenient grip handle, thumb trigger and spring-loaded spindle. The various models cover a wide range of applications.

### FEATURES

- Wide range of applications with various types of measuring faces (on the spindle and anvil).

- The digital models incorporate Mitutoyo's popular ID-C and ID-S Series Digimatic Indicators to provide error-free LCD readings as well as data output for SPC analysis.
- **547-4005** is ideally suited for measuring thicknesses of paper, film, wire, sheet metal and similar materials.

### Flat Anvil Type

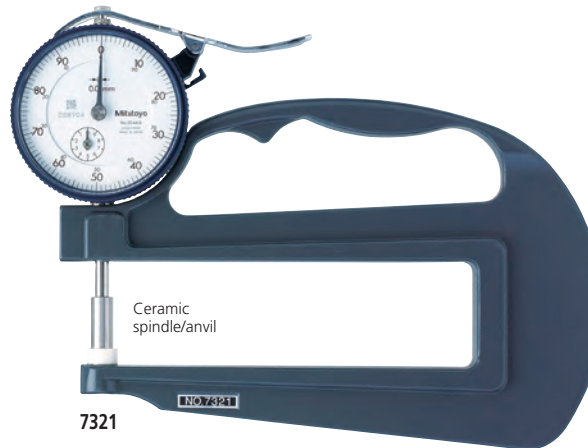
#### Standard Type / Digital



#### Deep Throat Type / Digital



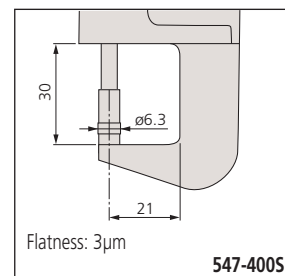
#### Deep Throat Type / Dial



#### High Accuracy Type / Digital



### DIMENSIONS



SPC

ABSOLUTE<sup>®</sup>  
Absolute System Patented by MITUTOYO

### Technical Data

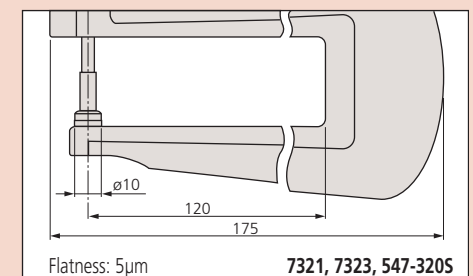
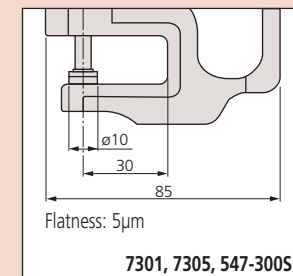
#### Function of Digital Models

- IDS Types
- ON/OFF
  - Inch / mm Conversion
  - Origin
  - $\pm$ Direction Changeover
  - SPC Output
  - Battery Life: 20,000 hrs
  - Power Supply: Silver Oxide Cell (SR-44 1pc.)

#### IDC Types

- ON/OFF
- Inch / mm Conversion
- Zero / ABS
- $\pm$ Direction Changeover
- SPC Output
- Battery Life: 5,000 hrs
- Power Supply: Silver Oxide Cell (SR-44 1pc.)
- Preset
- Provides GO /  $\pm$ NG Judgement
- Face Rotates 330 $^{\circ}$

### DIMENSIONS



# Thickness Gages

## SERIES 547, 7

### Optional Accessories

- 905338:** SPC cable (40" / 1m) for digital type
- 905409:** SPC cable (80" / 2m) for digital type
- 902794:** Spindle lifting lever for IDS digimatic type (stroke .5" / 12.7mm)
- 21AZB149:** Spindle lifting lever for digimatic and dial thickness gage (stroke .5" / 12.7mm)
- 21AZB150:** Spindle lifting lever for dial indicator (stroke 1" / 25.4mm)

### Flat Anvil Type

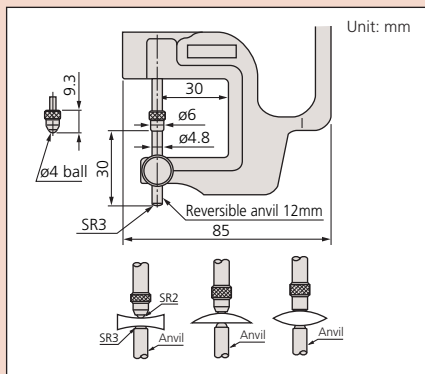
#### SPECIFICATIONS

Inch/Metric		Digital Type			
Range	Order No.	Resolution	Accuracy	Measuring force	Indicator
0 - .47" / 0 - 12mm	<b>547-500</b>	.0005"/0.01mm	±.001"	1.5N or less	Digimatic IDS
0 - .47" / 0 - 12mm	<b>547-520</b>	.0005"/0.01mm	±.001"	1.5N or less	Digimatic IDS
0 - .47" / 0 - 12mm	<b>547-526</b>	.0001"/0.001mm	±.0002"	1.5N or less	Digimatic IDS
0 - .4" / 0 - 10mm	<b>547-3005</b>	.0005"/0.01mm	±.001"	1.5N or less	Digimatic IDC
0 - .4" / 0 - 10mm	<b>547-3205</b>	.0005"/0.01mm	±.001"	1.5N or less	Digimatic IDC
0 - .47" / 0 - 12mm	<b>547-4005</b>	.00005"/0.001mm	±.00015"	3.5N or less	Digimatic IDC

Inch		Dial Type			
Range	Order No.	Graduation	Accuracy	Measuring force	Remarks
0 - .05"	<b>7326S</b>	.0001"	±.0002"	1.4N or less	Fine dial reading, ceramic spindle/anvil
0 - .5"	<b>7300S</b>	.001"	±.001"	1.4N or less	Standard, ceramic spindle/anvil
0 - 1"	<b>7304S</b>	.001"	±.002"	2.0N or less	Standard, ceramic spindle/anvil
0 - 1"	<b>7322S</b>	.001"	±.002"	2.0N or less	Deep throat, ceramic spindle/anvil

Metric		Dial Type			
Range	Order No.	Graduation	Accuracy	Measuring force	Remarks
0 - 1mm	<b>7327</b>	0.001mm	±5µm	1.4N or less	Fine dial reading, ceramic spindle/anvil
0 - 10mm	<b>7301</b>	0.01mm	±15µm	1.4N or less	Standard, ceramic spindle/anvil
0 - 20mm	<b>7305</b>	0.01mm	±20µm	2.0N or less	Standard, ceramic spindle/anvil
0 - 10mm	<b>7321</b>	0.01mm	±15µm	1.4N or less	Deep throat, ceramic spindle/anvil
0 - 20mm	<b>7323</b>	0.01mm	±22µm	2.0N or less	Deep throat, ceramic spindle/anvil

### DIMENSIONS



### Lens thickness measurement (reverse anvil)



#### SPECIFICATIONS

Inch/Metric		Digital Type			
Range	Order No.	Resolution	Accuracy	Measuring force	Indicator
0 - .47" / 0 - 12mm	<b>547-512</b>	.0005"/0.01mm	±.001"	1.5N or less	Digimatic IDS
0 - .47" / 0 - 12mm	<b>547-3125</b>	.0005"/0.01mm	±.001"	1.5N or less	Digimatic IDC

Inch		Dial Type			
Range	Order No.	Graduation	Accuracy	Measuring force	Remarks
0 - .5"	<b>7312S</b>	.001"	±.001"	1.4N or less	Lens thickness

Metric		Dial Type			
Range	Order No.	Graduation	Accuracy	Measuring force	Remarks
0 - 10mm	<b>7313</b>	0.01mm	±15µm	1.4N or less	Lens thickness

# Thickness Gages

## SERIES 547, 7

### Tube thickness measurement



SPC  
ABSOLUTE  
Inch-Scale Models 547/7



### SPECIFICATIONS

**Inch/Metric** Digital Type

Range	Order No.	Resolution	Accuracy	Measuring force	Indicator
0 - .47" / 0 - 10mm	547-561	.0005"/0.01mm	±.001"	1.5N or less	Digimatic IDS
0 - .47" / 0 - 12mm	547-3615	.0005"/0.01mm	±.001"	1.5N or less	Digimatic IDC

**Inch** Dial Type

Range	Order No.	Graduation	Accuracy	Measuring force	Remarks
0 - .5"	73615	.001"	±.001"	1.4N or less	Tube thickness

**Metric** Dial Type

Range	Order No.	Graduation	Accuracy	Measuring force	Remarks
0 - 10mm	7360	0.01mm	±15µm	1.4N or less	Tube thickness

### Groove thickness measurement (Blade anvil type)



SPC  
ABSOLUTE  
Inch-Scale Models 547/7



### SPECIFICATIONS

**Inch/Metric** Digital Type

Range	Order No.	Resolution	Accuracy	Measuring force	Indicator
0 - .47" / 0 - 12mm	547-516	.0005"/0.01mm	±.001"	1.5N or less	Digimatic IDS
0 - .47" / 0 - 10mm	547-3165	.0005"/0.01mm	±.001"	1.5N or less	Digimatic IDC

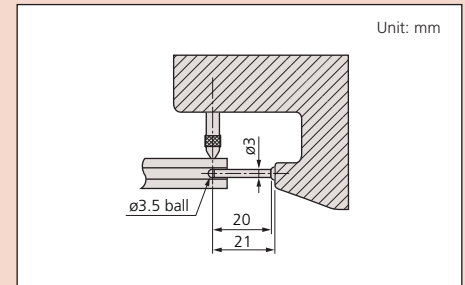
**Inch** Dial Type

Range	Order No.	Graduation	Accuracy	Measuring force	Remarks
0 - .5"	73165	.001"	±.001"	1.4N or less	Groove thickness

**Metric** Dial Type

Range	Order No.	Graduation	Accuracy	Measuring force	Remarks
0 - 10mm	7315	0.01mm	±15µm	1.4N or less	Groove thickness

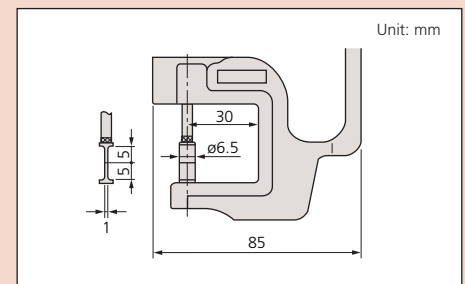
### DIMENSIONS



### Optional Accessories

- 905338: SPC cable (40" / 1m) for digital type
- 905409: SPC cable (80" / 2m) for digital type
- 902794: Spindle lifting lever for IDS digimatic type (stroke .5" / 12.7mm)
- 21AZB149: Spindle lifting lever for digimatic and dial thickness gage (stroke .5" / 12.7mm)
- 21AZB150: Spindle lifting lever for dial indicator (stroke 1" / 25.4mm)

### DIMENSIONS



# Thickness Gages

## SERIES 547, 7

Universal Type (interchangeable anvils)



547-528

### SPECIFICATIONS

**Inch/Metric** Digital Type

Range	Order No.	Resolution	Accuracy	Measuring force	Indicator
0 - .47" / 0 - 12mm	<b>547-528</b>	.0005"/0.01mm	±.001"	1.5N or less	Digimatic IDS

**Inch** Dial Type

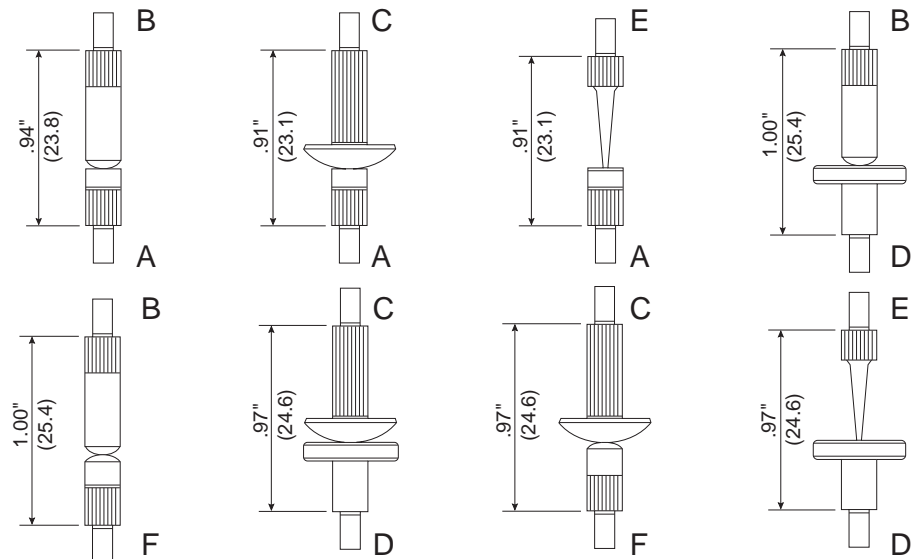
Range	Order No.	Graduation	Accuracy	Measuring force	Remarks
0 - .4"	<b>73285</b>	.001"	±.001"	1.5N or less	Interchangeable anvils

### Optional Accessories

- 905338:** SPC cable (40" / 1m) for digital type
- 905409:** SPC cable (80" / 2m) for digital type
- 902011:** Spindle lifting lever for metric dial type (stroke 10mm)
- 902794:** Spindle lifting lever for digital and inch dial type (stroke .4" / 10mm)

### Standard Accessories

#### Recommended Combinations



- |                    |                 |              |
|--------------------|-----------------|--------------|
| <b>A. 133017</b>   | Flat Point      | ø.20         |
| <b>B. 21AAA033</b> | Shell Point     | .16" Radius  |
| <b>C. 21BZA767</b> | Spherical Point | .36" Radius  |
| <b>D. 101188</b>   | Flat Point      | ø.50         |
| <b>E. 21AAA030</b> | Needle Point    | .016" Radius |
| <b>F. 21AAA032</b> | Shell Point     | .16" Radius  |

# Quick-Mini

## SERIES 700

A compact comparator designed for carrying convenience, it is very suited for quick inspection of paper thickness, leather, wires, plastic parts, etc. The digital display provides error-free reading with 0.01mm / .0005" resolution.

### FEATURES

- Measuring force less than 2N.
- Supplied in fitted plastic case.

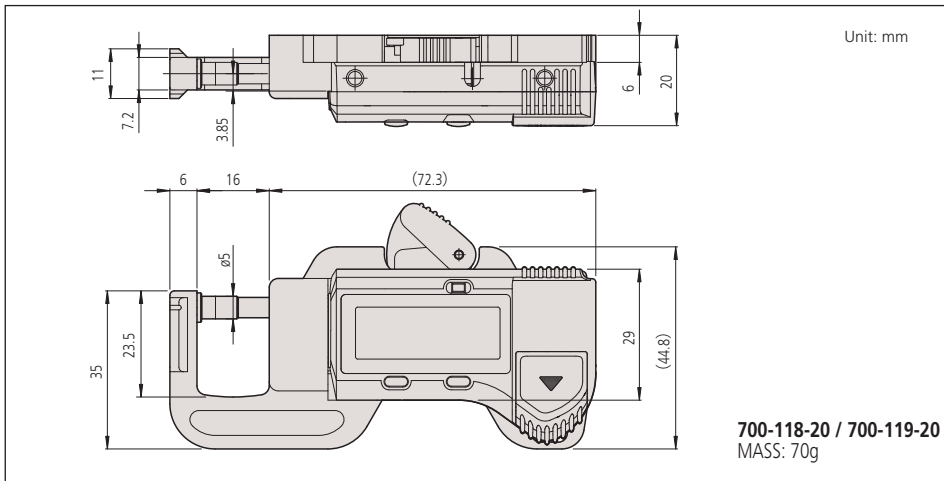


700-118-20

### SPECIFICATIONS

Metric			Inch/Metric		
Range	Order No.	Accuracy	Range	Order No.	Accuracy
0 - 12mm	700-119-20	±0.02mm	0 - .5"/0 - 12.7mm	700-118-20	±.001"

### DIMENSIONS AND MASS



### Technical Data

Accuracy: Refer to the list of specifications.  
 Resolution: 0.01mm or .0005"/0.01mm  
 Display: LCD  
 Battery: SR44 (1 pc.), **938882**  
 Battery life: Approx. 2 years under normal use

### Function

Zero-setting, Data hold, Power ON/OFF, inch/mm conversion (on inch/metric models only)





# Digimatic Caliper Gages

## SERIES 209 — Internal Tube Thickness Measurement Type

Versatile ID measuring gages for holes diameters, groove thickness, tube thickness, and hard-to-reach dimensions. The Digimatic

Caliper Gages provide error-free LCD readings as well as data output for SPC analysis.

### Technical Data

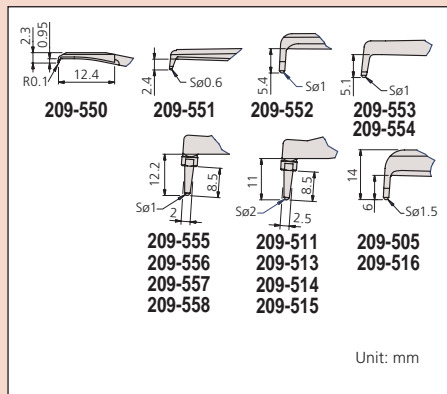
Accuracy: Refer to the list of specifications  
 Resolution: .001", .0005", or .0002"  
 0.01mm, 0.02mm, or 0.005mm  
 Display: LCD Analog / Digital  
 Power Supply: AA Battery (1pc)  
 Battery life: Approx. 350 hours  
 Measuring Force: 0.7 - 1.7N  
 Dust/Water protection level: IP67  
 Provided with inspection certificate.

### Function

Zeraset, Preset, Auto power OFF, Inch/Metric, conversion  
 Data hold, Max/Min value holding, Data output

### Optional Accessories

21JAA300D: SPC cable kit (80" / 2m)  
 for 209-505, 209-511, 209-513, 209-514, 209-515,  
 209-516, 209-517



### Internal measurement type

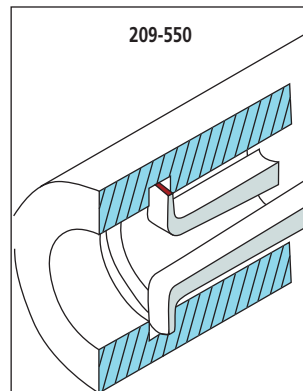
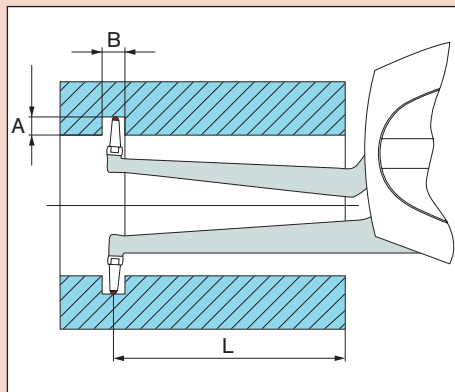
209-552



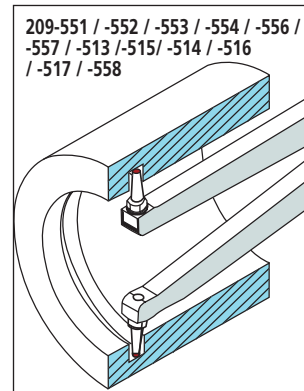
### SPECIFICATIONS

Inch / Metric

Range	Order No.	Resolution	Accuracy	Max. Measuring Depth L	Max. Groove Depth A	Min. Groove Width B	Type of Measuring Contact	Mass(g)
.10 - .49" / 2.5 - 12.5mm	209-550	.0002" / 0.005mm	.0008" / 0.015mm	.47" / 12mm	.027" / 0.7mm	.023" / 0.5mm	Chisel R. .0039" / 0.1mm	225
.20 - .59" / 5 - 15mm	209-551	.0002" / 0.005mm	.0008" / 0.015mm	1.37" / 35mm	.09" / 2.3mm	.032" / 0.8mm	Ball .024" / 0.6mm dia.	230
.39 - 1.18" / 10 - 30mm	209-552	.0005" / 0.01mm	.0015" / 0.03mm	3.3" / 85mm	.19" / 5.2mm	.06" / 1.2mm	Ball .04" / 1mm dia.	250
.79 - 1.58" / 20 - 40mm	209-553	.0005" / 0.01mm	.0015" / 0.03mm	3.3" / 85mm	.26" / 7mm	.06" / 1.2mm	Ball .04" / 1mm dia.	250
1.18 - 1.97" / 30 - 50mm	209-554	.0005" / 0.01mm	.0015" / 0.03mm	3.3" / 85mm	.26" / 7mm	.06" / 1.2mm	Ball .04" / 1mm dia.	255
1.58 - 2.36" / 40 - 60mm	209-555	.0005" / 0.01mm	.0015" / 0.03mm	3.3" / 85mm	.31" / 8.3mm	.06" / 1.2mm	Ball .04" / 1mm dia.	265
1.97 - 2.75" / 50 - 70mm	209-556	.0005" / 0.01mm	.0015" / 0.03mm	3.3" / 85mm	.31" / 8.3mm	.06" / 1.2mm	Ball .04" / 1mm dia.	265
2.36 - 3.15" / 60 - 80mm	209-557	.0005" / 0.01mm	.0015" / 0.03mm	3.3" / 85mm	.31" / 8.3mm	.06" / 1.2mm	Ball .04" / 1mm dia.	270
2.75 - 3.54" / 70 - 90mm	209-558	.0005" / 0.01mm	.0015" / 0.03mm	3.3" / 85mm	.31" / 8.3mm	.06" / 1.2mm	Ball .04" / 1mm dia.	270
.60 - 2.17" / 15 - 55mm	209-505	.001" / 0.02mm	.002" / 0.04mm	4.49" / 115mm	.177" / 5mm	.10" / 1.8mm	Ball .059" / 1.5mm dia.	360
1.38 - 2.95" / 35 - 75mm	209-511	.001" / 0.02mm	.002" / 0.04mm	4.49" / 115mm	.315" / 8mm	.157" / 2.2mm	Ball .079" / 2.0mm dia.	380
2.17 - 3.74" / 55 - 95mm	209-513	.001" / 0.02mm	.002" / 0.04mm	4.49" / 115mm	.315" / 8mm	.157" / 2.2mm	Ball .079" / 2.0mm dia.	380
2.95 - 4.52" / 75 - 115mm	209-514	.001" / 0.02mm	.002" / 0.04mm	4.49" / 115mm	.315" / 8mm	.157" / 2.2mm	Ball .079" / 2.0mm dia.	380
3.75 - 5.32" / 95 - 135mm	209-515	.001" / 0.02mm	.002" / 0.04mm	4.49" / 115mm	.315" / 8mm	.157" / 2.2mm	Ball .079" / 2mm dia.	380
.60 - 2.95" / 15 - 75mm	209-516	.001" / 0.02mm	.003" / 0.06mm	6.89" / 175mm	.196" / 5mm	.07" / 1.8mm	Ball .059" / 1.5mm dia.	440
1.57 - 3.94" / 40 - 100mm	209-517	.001" / 0.02mm	.003" / 0.06mm	7.77" / 195mm	.315" / 8mm	.086" / 2.2mm	Ball .079" / 2.0mm dia.	440



Edge R 0.1 mm



Ball  $\phi 0.6$ mm,  $\phi 1$ mm,  $\phi 1.5$ mm and  $\phi 2$ mm



# Digimatic Caliper Gages

## SERIES 209 — External Tube Thickness Measurement Type

Versatile OD measuring gages for holes diameters, groove thickness, tube thickness, and hard-to-reach dimensions. The Digimatic Caliper Gages provide error-free LCD readings as well as data output for SPC analysis.

External measurement type

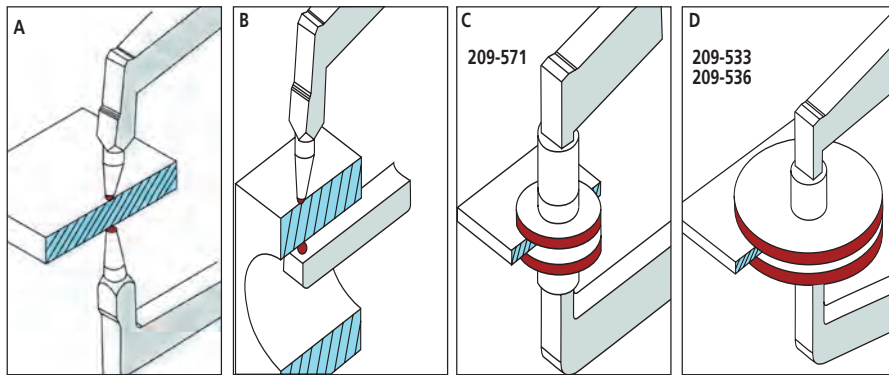
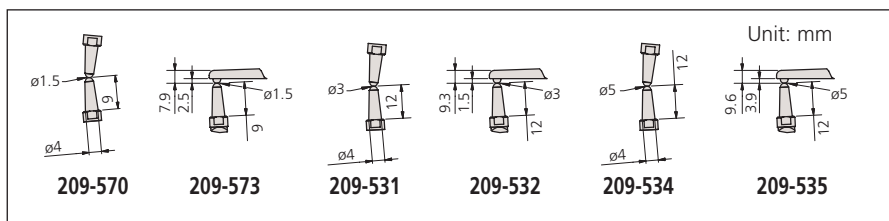
209-572



### SPECIFICATIONS

Inch / Metric

Range	Order No.	Resolution	Accuracy	Max. Measuring Depth L	Measuring Contact length Hb	Measuring Contact length Hf	Type of Measuring Contact/type of set up	Mass(g)
0 - .39" / 0 - 10mm	209-570	.0002" / 0.005mm	.0008" / 0.05mm	1.37" / 35mm	.75" / 19.1mm	.73" / 18.6mm	Ball .059" / 1.5mm dia. Both / A	240
0 - .39" / 0 - 10mm	209-571	.0002" / 0.005mm	.001" / 0.02mm	1.37" / 35mm	.85" / 21.7mm	.58" / 14.8mm	Desc .24" / 6mm dia. Both / C	175
0 - .78" / 0 - 20mm	209-572	.0005" / 0.01mm	.0015" / 0.03mm	3.2" / 85mm	.97" / 24.7mm	.97" / 24.6mm	Ball .059" / 1.5mm dia. Both / A	280
0 - .78" / 0 - 20mm	209-573	.0005" / 0.01mm	.0015" / 0.03mm	3.2" / 80mm	.97" / 24.7mm	.10" / 2.5mm	Ball .059" / 1.5mm dia. Both / B	270
0-1.57" / 0-40mm	209-531	.001" / 0.02mm	.002" / 0.04mm	4.33" / 115mm	.98" / 24.9mm	.1" / 25.4mm	Ball .118" / 3.0mm dia. Both / A	380
0-1.57" / 0-40mm	209-532	.001" / 0.02mm	.002" / 0.04mm	4.33" / 100mm	.98" / 32mm	.059" / 3.5mm	Ball .118" / 3.0mm dia. Both / B	380
0-1.57" / 0-40mm	209-533	.001" / 0.02mm	.002" / 0.04mm	4.33" / 115mm	1.14" / 30mm	.77" / 19.4mm	Desc 1.97" / 50mm dia. Both / D	380
0-2.36" / 0-60mm	209-534	.001" / 0.02mm	.003" / 0.06mm	7.48" / 190mm	.98" / 25mm	.98" / 25mm	Ball .197" / 5.0mm dia. Both / A	470
0-2.36" / 0-60mm	209-535	.001" / 0.02mm	.003" / 0.06mm	5.9" / 150mm	.98" / 25mm	.13" / 3.5mm	Ball .197" / 5.0mm dia. Both / B	470
0-2.36" / 0-60mm	209-536	.001" / 0.02mm	.004" / 0.08mm	7.48" / 190mm	1.06" / 27mm	.77" / 19.5mm	Desc 1.97" / 50mm dia. Both / D	470



Ball  $\phi$  1.5 and 3mm for wall thickness

Ball  $\phi$  1.5 and 3mm for min. wall thickness  $\phi$  3mm / 9mm

Disk  $\phi$  6mm for flat surfaces

Disk  $\phi$  50mm for flat surfaces



### Technical Data

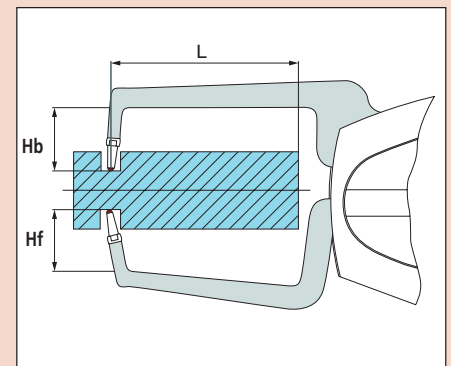
Accuracy: Refer to the list of specifications  
 Resolution: .001", .0005", or .0002"  
 0.01mm, 0.02mm, or 0.005mm  
 Display: Analog / Digital  
 Power Supply: AA Battery (1pc)  
 Battery life: Approx. 350 hours  
 Measuring Force: 0.5 - 1.5N  
 Dust/Water protection level: IP67  
 Provided with inspection certificate.

### Function

Zeraset, Preset, Auto power OFF, Inch/Metric conversion, Data hold, Max/Min value holding, Data output  
 \* Contact type 3, 4 does not have max. min. value hold.

### Optional Accessories

21JAA300D: SPC cable kit (80" / 2m)





# Dial Caliper Gages

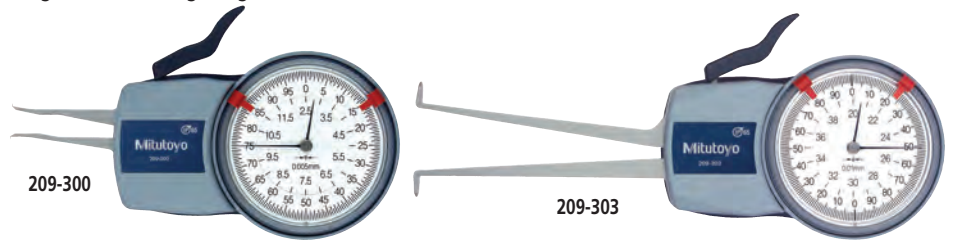
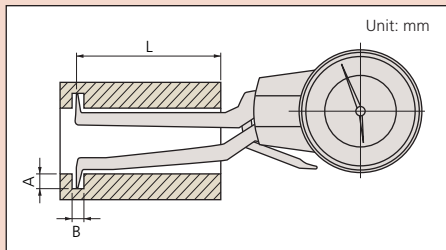
## SERIES 209 — Internal Measurement Type



These Dial Caliper Gages are used only as comparison gages, and should be used along with a Setting Ring or a micrometer.

The caliper is spring loaded and makes point contact at constant measuring pressure.

### DIMENSIONS



### SPECIFICATIONS

#### Inch

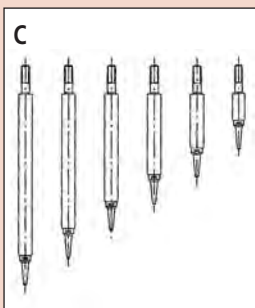
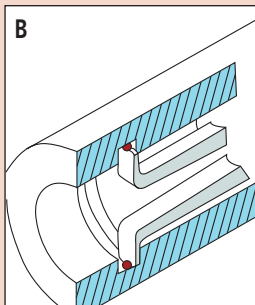
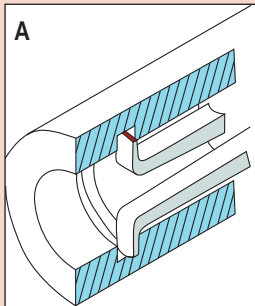
Measuring Range	Order No.	Graduation	Accuracy	Max. Measuring Depth L	Max. Groove Depth A	Min. Groove Width B	Measuring Contact Type	Size (mm)	Mass (g)
.10 - .50"	<b>209-350</b>	.0002"	± .0008"	.47"	.027"	.023"	A	R0.1	200
.20 - .60"	<b>209-351</b>	.0002"	± .0008"	1.37"	.09"	.032"	B	ø0.6	200
.40 - 1.2"	<b>209-352</b>	.0005"	± .0015"	3.3"	.19"	.06"	B	ø1	200
.80 - 1.6"	<b>209-354</b>	.0005"	± .0015"	3.3"	.26"	.06"	B	ø1	200
1.2 - 2"	<b>209-355</b>	.0005"	± .0015"	3.3"	.26"	.06"	B	ø1	200
1.6 - 2.4"	<b>209-356</b>	.0005"	± .0015"	3.3"	.31"	.06"	B	ø1	200
2 - 2.8"	<b>209-357</b>	.0005"	± .0015"	3.3"	.31"	.06"	B	ø1	200
2.4 - 3.2"	<b>209-358</b>	.0005"	± .0015"	3.3"	.31"	.06"	B	ø1	250
2.8 - 3.6"	<b>209-359</b>	.0005"	± .0015"	3.3"	.31"	.06"	B	ø1	250
3.2 - 4"	<b>209-360</b>	.0005"	± .0015"	3.3"	.31"	.06"	B	ø1	250
2 - 4"	<b>209-361*</b>	.0005"	± .0015"	3.3"	.31"	.06"	C	ø1	250
3.6 - 5.6"	<b>209-362*</b>	.0005"	± .0015"	3.3"	.31"	.06"	C	ø1	250
5.2 - 7.2"	<b>209-363*</b>	.0005"	± .0015"	3.3"	.31"	.06"	C	ø1	250

\*Interchangeable contact points (additional anvil 4 pcs.) with ball point .04" dia.

#### Metric

Measuring Range	Order No.	Graduation	Accuracy	Max. Measuring Depth L	Max. Groove Depth A	Min. Groove Width B	Measuring Contact Type	Size (mm)	Mass(g)
2.5 - 12.5mm	<b>209-300</b>	0.005mm	±0.015mm	12mm	0.7mm	0.5mm	A	R0.1	155
5 - 15mm	<b>209-301</b>	0.005mm	±0.015mm	35mm	2.3mm	0.8mm	B	ø0.6	160
10 - 30mm	<b>209-302</b>	0.01mm	±0.03mm	85mm	5.2mm	1.2mm	B	ø1	180
20 - 40mm	<b>209-303</b>	0.01mm	±0.03mm	85mm	7mm	1.2mm	B	ø1	180
30 - 50mm	<b>209-304</b>	0.01mm	±0.03mm	85mm	7mm	1.2mm	B	ø1	185
40 - 60mm	<b>209-305</b>	0.01mm	±0.03mm	85mm	8.3mm	1.2mm	B	ø1	195
50 - 70mm	<b>209-306</b>	0.01mm	±0.03mm	85mm	8.3mm	1.2mm	B	ø1	195
60 - 80mm	<b>209-307</b>	0.01mm	±0.03mm	85mm	8.3mm	1.2mm	B	ø1	200
70 - 90mm	<b>209-308</b>	0.01mm	±0.03mm	85mm	8.3mm	1.2mm	B	ø1	200
80 - 100mm	<b>209-309</b>	0.01mm	±0.03mm	85mm	8.3mm	1.2mm	B	ø1	200
50 - 100mm	<b>209-310*</b>	0.01mm	±0.03mm	85mm	8.3mm	1.2mm	C	ø1	220
90 - 140mm	<b>209-311*</b>	0.01mm	±0.03mm	85mm	8.3mm	1.2mm	C	ø1	230
130 - 180mm	<b>209-312*</b>	0.01mm	±0.03mm	85mm	8.3mm	1.2mm	C	ø1	240
15-65mm	<b>209-896</b>	0.05mm	±0.05mm	175mm	5mm	1.8mm	B	ø1.5	400
40-90mm	<b>209-897</b>	0.05mm	±0.05mm	175mm	8mm	2.2mm	B	ø2	440
70-120mm	<b>209-898</b>	0.05mm	±0.05mm	175mm	8mm	2.2mm	B	ø2	440

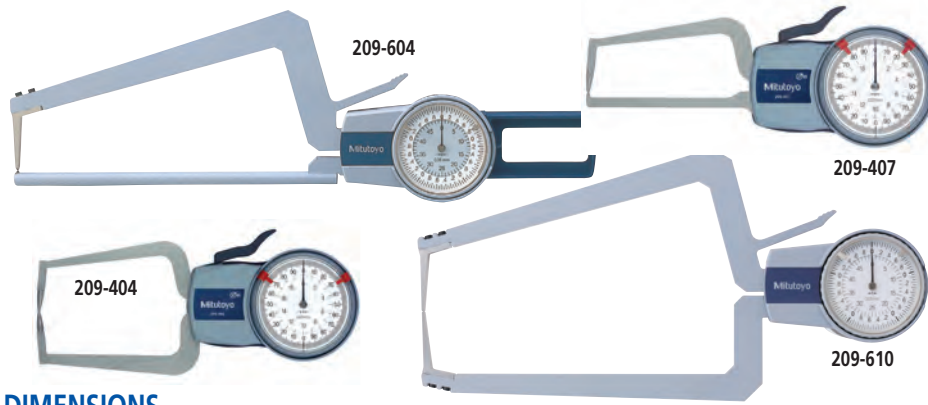
\*Interchangeable contact point (additional anvil 5pcs.) with ball point 1mm dia



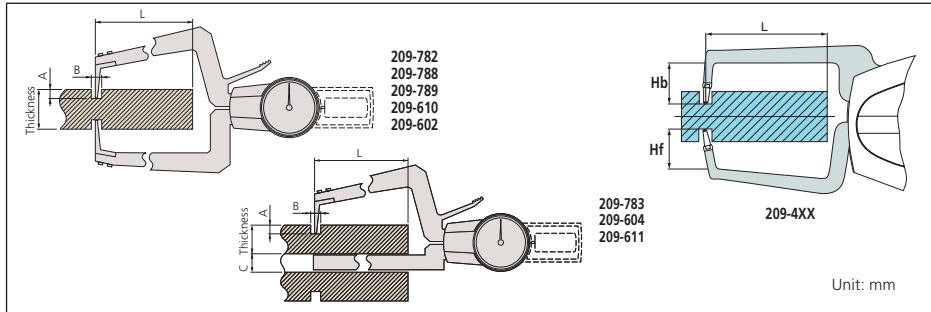
# Dial Caliper Gages

**SERIES 209 — External Measurement Type**

**IP65**



## DIMENSIONS



## SPECIFICATIONS

**Inch**

Measuring Range	Order No.	Graduation	Accuracy	Max. Measuring Depth L	Max. Groove Depth A/Hb	Min. Groove B/Hf	Measuring Contact Type	Size (mm)	Mass (g)
0 - .40"	<b>209-450</b>	.0002"	±.0008"	1.37"	.75"	.75"	K/K	ø1.5	170
0 - .40"	<b>209-451</b>	.0002"	±.001"	1.37"	.85"	.58"	T	ø6	175
0 - .40"	<b>209-452</b>	.0002"	±.0008"	1.37"	.75"	.035"	RK/K	ø1.5	165
0 - .40"	<b>209-453</b>	.0002"	±.0008"	1.37"	.75"	.035"	R/S	Chisel R0.4, ø1.5	165
0 - .50"	<b>209-789</b>	.005"	±.005"	1.38"	-	-	PK	ø2, Chisel R0.5	40
0 - .50"	<b>209-790</b>	.005"	±.005"	1.38"	-	-	PR	ø2	40
0 - .80"	<b>209-454</b>	.0005"	±.0015"	3.2"	.97"	.97"	S	Chisel R0.4	210
0 - .80"	<b>209-455</b>	.0005"	±.0015"	3.2"	.97"	.97"	K/K	ø1.5	210
0 - .80"	<b>209-456</b>	.0005"	±.0015"	3.2"	.97"	.10"	RK/K	ø1.5	200
0 - .80"	<b>209-457</b>	.0005"	±.0015"	3.2"	.97"	.10"	R/S	Chisel R0.4, ø1.5	200
0 - 2.0"	<b>209-782</b>	.001"	±.002"	6.7"	1.26"	.18"	K/K	ø2	560
0 - 2.0"	<b>209-783</b>	.001"	±.002"	6.7"	1.26"	.18"	R	ø2.5	520
2.0 - 4.0"	<b>209-788</b>	.001"	±.003"	6.7"	1.26"	.18"	K/K	ø2	580

**Metric**

Measuring Range	Order No.	Graduation	Accuracy	Max. Measuring Depth L	Max. Groove Depth A/Hb	Min. Groove B/Hf	Measuring Contact	Size (mm)	Mass (g)
0 - 10mm	<b>209-402</b>	0.005mm	±0.015mm	35mm	19.1mm	18.6mm	K/K	ø1.5	240
0 - 10mm	<b>209-403</b>	0.005mm	±0.02mm	35mm	21.7mm	14.8mm	T	ø6	175
0 - 20mm	<b>209-404</b>	0.01mm	±0.03mm	85mm	7mm	24.6mm	K/K	ø1.5	210
0 - 20mm	<b>209-405</b>	0.01mm	±0.03mm	85mm	7mm	24.6mm	S	R 0.4	210
0 - 20mm	<b>209-406</b>	0.01mm	±0.03mm	80mm	7mm	2.5mm	R/S	Chisel R0.4, ø1.5	200
0 - 20mm	<b>209-407</b>	0.01mm	±0.03mm	80mm	7mm	2.5mm	RK/K	ø1.5	200
0 - 10mm	<b>209-843</b>	0.1mm	±0.1mm	36mm	-	-	PK	ø2, Chisel R0.5	40
0 - 10mm	<b>209-603</b>	0.1mm	±0.1mm	33mm	-	-	PR	ø2	40
0 - 50mm	<b>209-602</b>	0.05mm	±0.05mm	170mm	10mm	4.5mm	K/K	ø2	560
0 - 50mm	<b>209-604</b>	0.05mm	±0.05mm	170mm	10mm	4.5mm	PR	ø2, Chisel R0.5	520
0 - 50mm	<b>209-610</b>	0.05mm	±0.05mm	170mm	10mm	4.5mm	R	ø2.5	560
0 - 50mm	<b>209-611</b>	0.05mm	±0.05mm	170mm	10mm	4.5mm	S/R	ø2, Chisel R0.75	525

## Type of Contact Points

**S** Upper / Lower contact point  
R0.4 / R0.4: **209-454, 209-405**  
R0.75 / R0.75: **209-610**

**K/K** Upper / Lower contact point  
ø2.0 / ø2.0 ball: **209-602, 209-782, 209-788, 209-789**  
ø1.5 / ø1.5 ball: **209-450, 209-455, 209-402, 209-404**

**R/S** R0.4 / ø1.5 carbide ball: **209-406, 209-453**

**RK/K** Upper / Lower contact point  
ø1.5 / ø1.5 ball: **209-407, 209-452, 209-456**

**S/R** Upper / Lower contact point  
R0.75 / ø2 ball: **209-611**

**R** Upper / Lower contact point  
ø2 / ø2.5 ball: **209-604, 209-783**

**T** Upper / Lower contact point  
**209-451:**  
**209-403:**

**PR** Upper / Lower contact point  
ø2 / R0.5: **209-790, 209-603**

**PK** Upper / Lower contact point  
**209-789:**  
**209-843:**

# Dial Caliper Gages

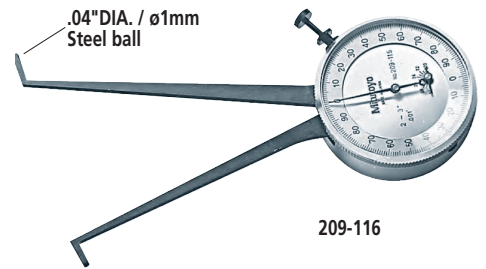
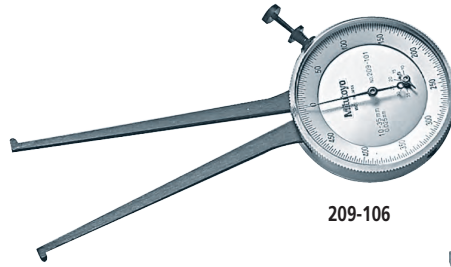
## SERIES 209 — Internal Measurement Type

These Dial Caliper Gages are used only as comparison gages, and should be used along with a Setting Ring or a micrometer.

The caliper is spring loaded and makes point contact at constant measuring pressure.

### Technical Data

Dial Diameter: 2" / 50mm  
 Measuring Force: 2.0N or less  
 Repeatability: .001" / 0.025mm



Metric		Yellow Dial Face	
Order No.	Range	Graduation	Accuracy
209-106	10–35mm	0.025mm	$\pm 0.075$ mm
209-107	30–55mm	0.025mm	$\pm 0.075$ mm
209-108	50–75mm	0.025mm	$\pm 0.075$ mm

Inch		Yellow Dial Face	
Order No.	Range	Graduation	Accuracy
209-116	.4"–1.4"	.001"	$\pm .003$ "
209-117	1.2"–2.2"	.001"	$\pm .003$ "
209-118	2.0"–3.0"	.001"	$\pm .003$ "

### DIMENSIONS

80mm

Range	A	B	Mass(g)
10 - 35mm / .4 - 1.4"	2.6mm	2.6mm	85
30 - 55mm / 1.2 - 2.2"	8.5mm	7.5mm	85
50 - 75mm / 2.0 - 3.0"	8.5mm	7.5mm	85

$\phi 1.6$ mm

B

# Dial Tension Gages

## SERIES 546

### FEATURES

- Can measure dynamic tension in Newton (N) units.
- Dial Tension Gages are widely used to determine the contact force of other measuring instruments as well as that of electrical relays, micro-switches, valves and precision springs.
- Convenient peak-hold type gages are also available.



### SPECIFICATIONS

#### Standard

Range	Order No.	Minimum reading
6mN - 50mN	546-112	2mN
10mN - 100mN	546-113	5mN
30mN - 300mN	546-114	10mN
0.06N - 0.5N	546-115	0.02N
0.1N - 1N	546-116	0.05N
0.15N - 1.5N	546-117	0.05N
0.3N - 3N	546-118	0.1N
0.6N - 5N	546-119	0.2N

#### Peak hold

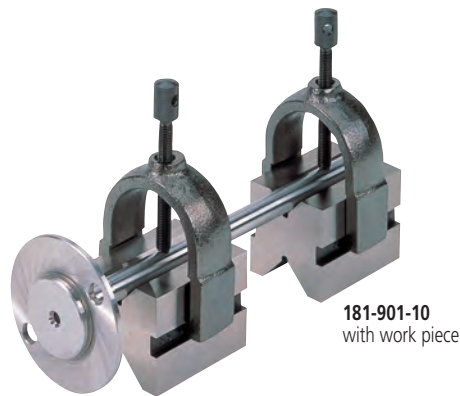
Range	Order No.	Graduation
10mN - 100mN	546-133	5mN
30mN - 300mN	546-134	10mN
0.06N - 0.5N	546-135	0.02N
0.1N - 1N	546-136	0.05N
0.15N - 1.5N	546-137	0.05N
0.3N - 3N	546-138	0.1N
0.6N - 5N	546-139	0.2N

# V-Block Sets

## SERIES 181

### FEATURES

- Two V-blocks per set.
- Magnetic type is available. (The magnetic type V-block is not provided with a workpiece clamp.)



### SPECIFICATIONS

#### Inch

Max. workpiece dia.	Order No.	Thread Size	Remarks	Mass(g)
1"	181-901-10	UNC 1/4"-20	With clamp	750
2"	181-904-10	5/16"-18NC	With clamp	3600

# Magnetic V-Block

## SERIES 181

### SPECIFICATIONS

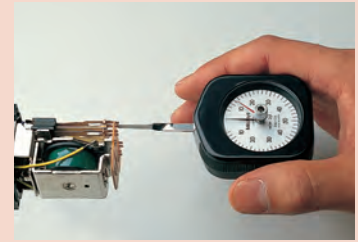
#### Metric

Max. workpiece dia.	Order No.	Magnetic Pull	Remarks
2"	181-146	60 kg	1 Piece

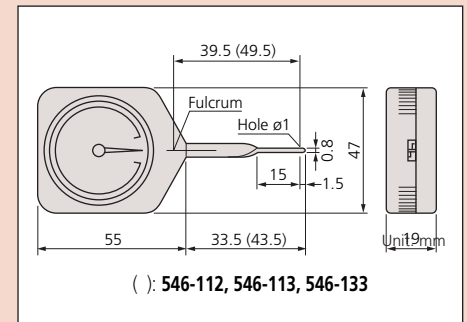


### Application

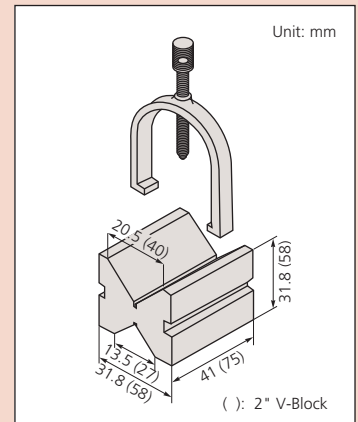
Measuring contact force of relay



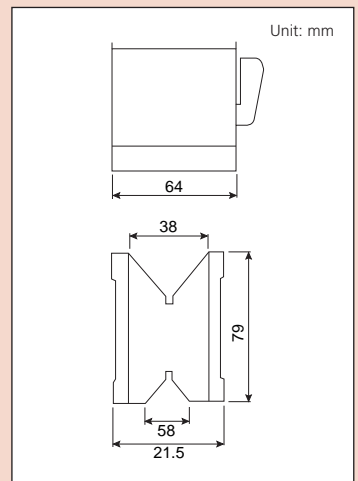
### DIMENSIONS



### DIMENSIONS



### DIMENSIONS

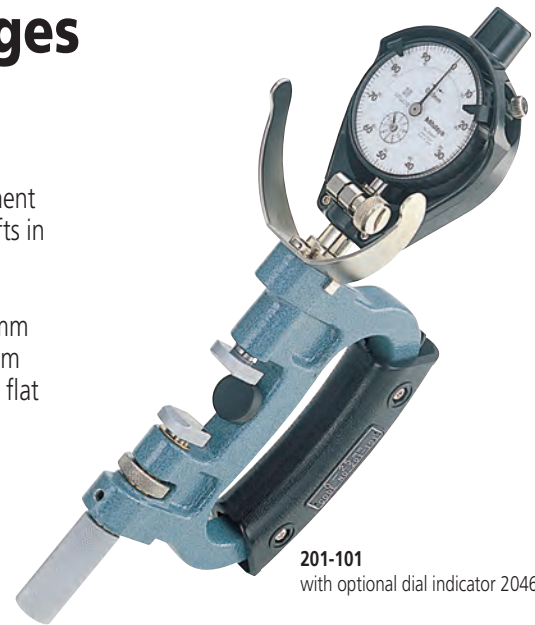


# Dial Snap Gages

## SERIES 201

### FEATURES

- Designed for quick GO/NG judgment of diameters of cylinders and shafts in machining processes.
- Dial indicator is optional.
- Anvil retracting stroke: .078" / 2mm
- Anvil positioning range: 1" / 25mm
- Wide (.53 x .47" / 13.5 x 12mm), flat carbide anvils.
- Both front edges of the anvil are chamfered for easy insertion.



201-101  
with optional dial indicator 2046SB.

### Technical Data

Accuracy: Refer to the list of specifications  
 Anvil retracting stroke: .078" / 2mm  
 Anvil positioning range: 1" / 25mm  
 Anvil flatness: .00004" / 1μm

### SPECIFICATIONS

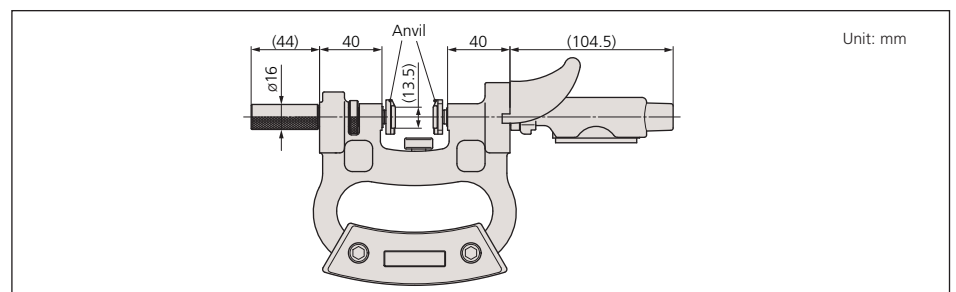
**Metric** Gage stem diameter 8mm

Range	Order No.	Parallelism	Measuring force	Recommended dial indicator (optional)
0 - 25mm	201-101	5μm or less	15N±3N	2046SB (0.01mm reading), 2109SB-10 (0.001mm reading)
25 - 50mm	201-102	5μm or less	15N±3N	2046SB (0.01mm reading), 2109SB-10 (0.001mm reading)
50 - 75mm	201-103	5μm or less	15N±3N	2046SB (0.01mm reading), 2109SB-10 (0.001mm reading)
75 - 100mm	201-104	5μm or less	15N±3N	2046SB (0.01mm reading), 2109SB-10 (0.001mm reading)
100 - 125mm	201-105	5μm or less	15N±3N	2046SB (0.01mm reading), 2109SB-10 (0.001mm reading)
125 - 150mm	201-106	5μm or less	15N±3N	2046SB (0.01mm reading), 2109SB-10 (0.001mm reading)
150 - 175mm	201-107	5μm or less	15N±3N	2046SB (0.01mm reading), 2109SB-10 (0.001mm reading)
175 - 200mm	201-108	5μm or less	15N±3N	2046SB (0.01mm reading), 2109SB-10 (0.001mm reading)
200 - 225mm	201-109	5μm or less	15N±3N	2046SB (0.01mm reading), 2109SB-10 (0.001mm reading)
225 - 250mm	201-110	5μm or less	15N±3N	2046SB (0.01mm reading), 2109SB-10 (0.001mm reading)
250 - 275mm	201-111	5μm or less	15N±3N	2046SB (0.01mm reading), 2109SB-10 (0.001mm reading)
275 - 300mm	201-112	5μm or less	15N±3N	2046SB (0.01mm reading), 2109SB-10 (0.001mm reading)

**Inch** Gage stem diameter 3/8"

Range	Order No.	Parallelism	Measuring force	Recommended dial indicator (optional)
0 - 1"	201-151	.00025" or less	15N±3N	2803SB-10 (.0001" reading)
1 - 2"	201-152	.00025" or less	15N±3N	2803SB-10 (.0001" reading)
2 - 3"	201-153	.00025" or less	15N±3N	2803SB-10 (.0001" reading)
3 - 4"	201-154	.00025" or less	15N±3N	2803SB-10 (.0001" reading)
4 - 5"	201-155	.00025" or less	15N±3N	2803SB-10 (.0001" reading)
5 - 6"	201-156	.00025" or less	15N±3N	2803SB-10 (.0001" reading)
6 - 7"	201-157	.00025" or less	15N±3N	2803SB-10 (.0001" reading)
7 - 8"	201-158	.00025" or less	15N±3N	2803SB-10 (.0001" reading)
8 - 9"	201-159	.00025" or less	15N±3N	2803SB-10 (.0001" reading)
9 - 10"	201-160	.00025" or less	15N±3N	2803SB-10 (.0001" reading)
10 - 11"	201-161	.00025" or less	15N±3N	2803SB-10 (.0001" reading)
11 - 12"	201-162	.00025" or less	15N±3N	2803SB-10 (.0001" reading)

### DIMENSIONS

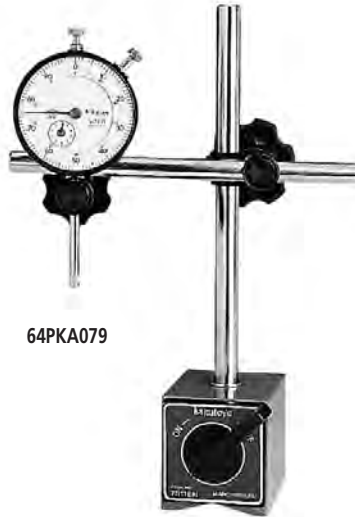


# Dial/Test Indicator & Magnetic Stand Sets

## SERIES 7



513-907



64PKA079

### SPECIFICATIONS

Set No.	Included in set
64PKA078	2804S-10, 7010S
64PKA079	2416S, 7010S
513-907	513-402, 7014E
513-908	513-404E, 7014

\*Supplied with collar 02AZC291

# Magnetic Stands

## SERIES 7

Mitutoyo's Magnetic Stands accept all dial indicators and dial test indicators. The ON-OFF switch offers instant mounting and dismounting without any adverse effect to the indicators or workpiece surface.



7033B



7010S



7011BN



7014 / 7014E  
No magnet force ON/OFF



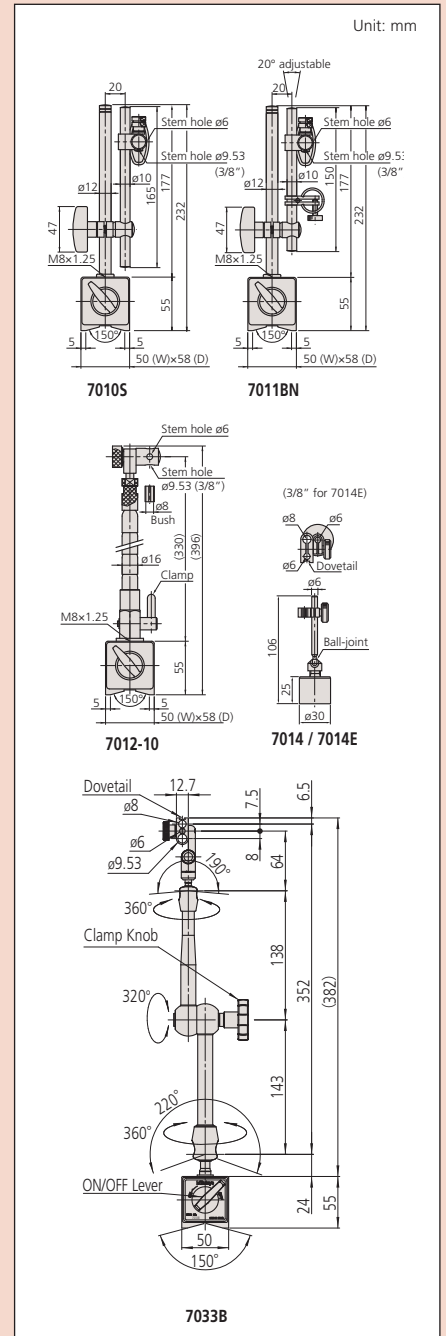
7012-10

### SPECIFICATIONS

Order No.	Description	Applicable holding stem dia.	Dovetail groove	Remarks
7010S	Magnetic stand	ø6mm, ø8mm*, ø9.53mm (3/8")	—	—
7011BN	Magnetic stand	ø6mm, ø8mm*, ø9.53mm (3/8")	—	With fine adjustment
7012-10	Magnetic flexi-stand	ø6mm, ø8mm*, ø9.53mm (3/8")	—	For dial test indicator
7014	Mini magnetic stand	ø6mm, ø8mm	Provided	Without magnet ON/OFF
7014E	Mini magnetic stand	ø6mm, ø8mm*, ø9.53mm (3/8")	Provided	Without magnet ON/OFF
7033B	Universal magnetic stand	ø6mm, ø8mm, ø9.53mm (3/8")	Provided	With mechanical locking system

\*Supplied with collar 02AZC291

### DIMENSIONS



# Dial Gage Stands

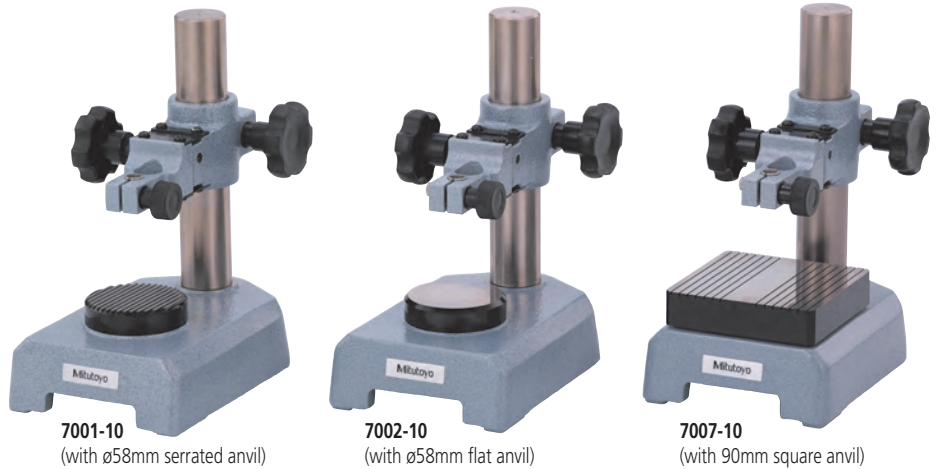
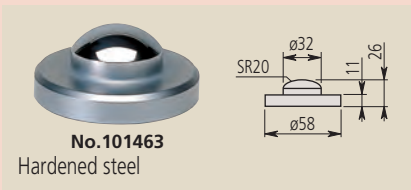
## SERIES 7

### FEATURES

- Dial Gage Stands are designed for comparison measurements of size using a dial indicator or Digimatic Indicator.
- Anvil of 7001-10 and 7002-10:  $\phi 58\text{mm}$   
Anvil of 7007-10: 90mm square
- Vertical fine adjustment is available with one-touch control thanks to the parallel spring suspension.

### Optional Accessories

- 101461:** Hardened steel flat anvil
  - 101462:** Hardened steel serrated anvil
  - 101463:** Hardened steel domed anvil\*
- \*Not available for 7007-10.

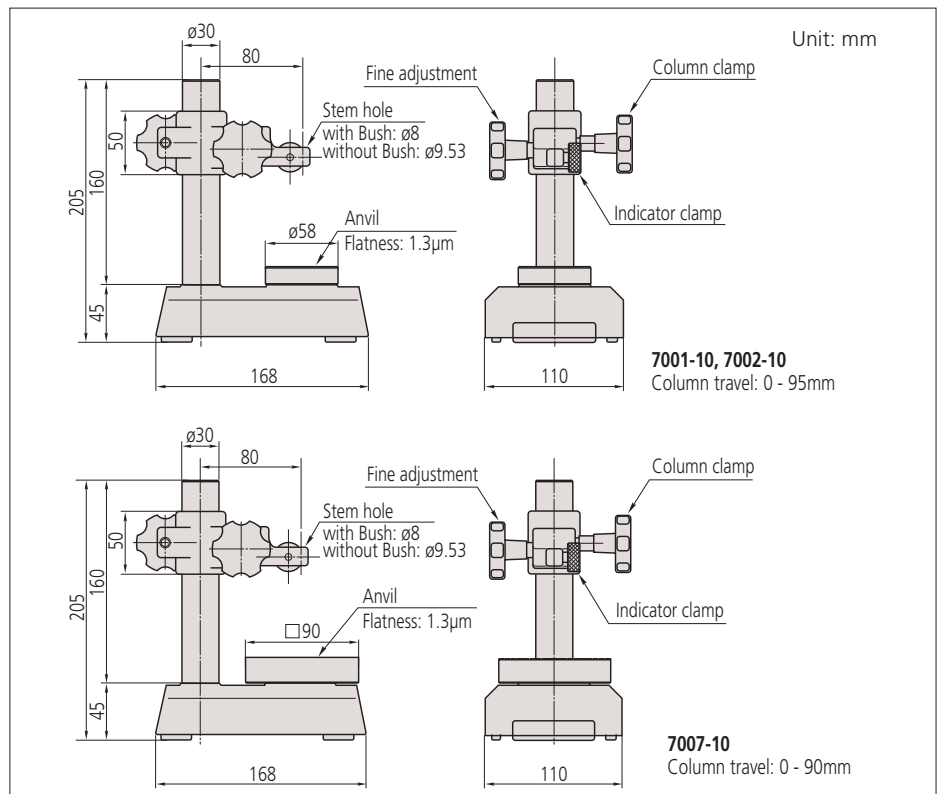


### SPECIFICATIONS

#### Metric

Order No.	Stem hole	Remarks	Mass(g)
7001-10	$\phi 8\text{mm}$ , $\phi 9.53\text{mm}$	With serrated anvil (101462)	4
7002-10	$\phi 8\text{mm}$ , $\phi 9.53\text{mm}$	With flat anvil (101461)	4
7007-10	$\phi 8\text{mm}$ , $\phi 9.53\text{mm}$	With square anvil	5

### DIMENSIONS

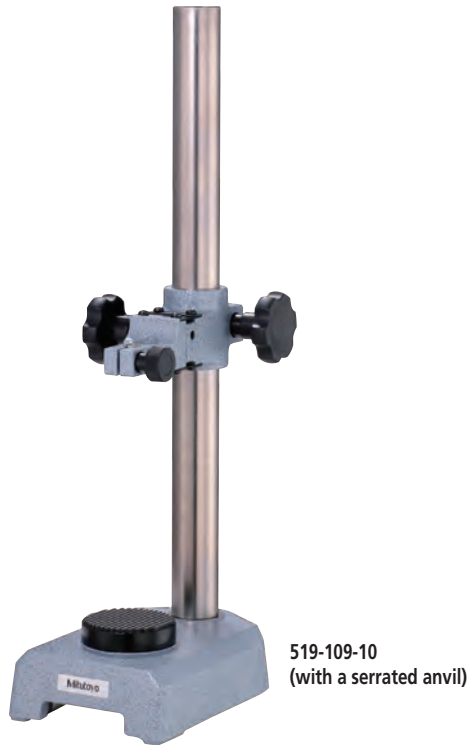


# Transfer Stands

## SERIES 519

### FEATURES

- Transfer Stands are designed for comparison measurements of size using a dial indicator or Digimatic Indicator.

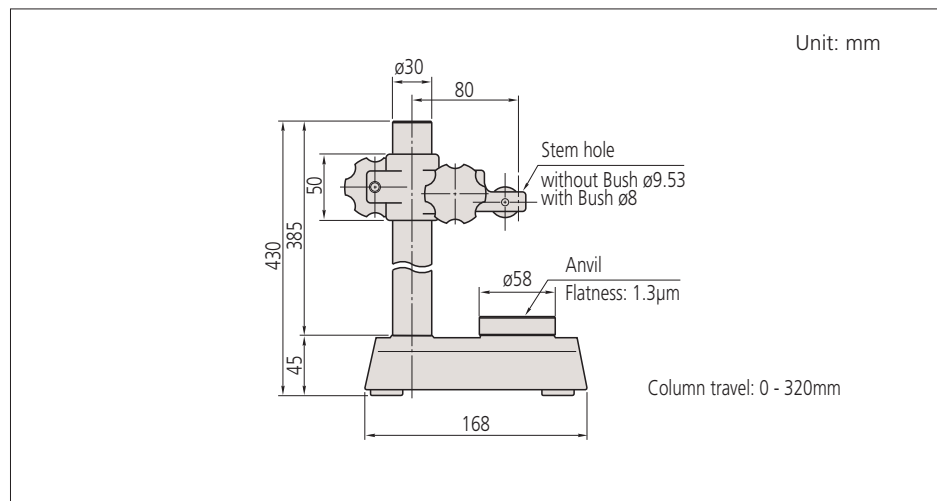


519-109-10  
(with a serrated anvil)

### SPECIFICATIONS

Metric		
Order No.	Stem hole	Remarks
519-109-10	ø8mm, ø9.53mm	With serrated anvil (101462)

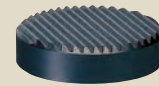
### DIMENSIONS



### Optional Accessories

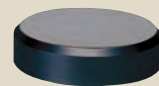
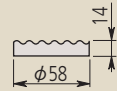
101461: Hardened steel flat anvil

101463: Hardened steel domed anvil



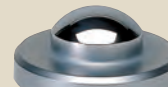
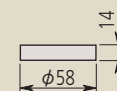
No. 101462

Hardened steel



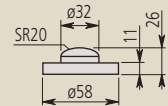
No. 101461

Hardened steel



No. 101463

Hardened steel





# Granite Comparator Stands

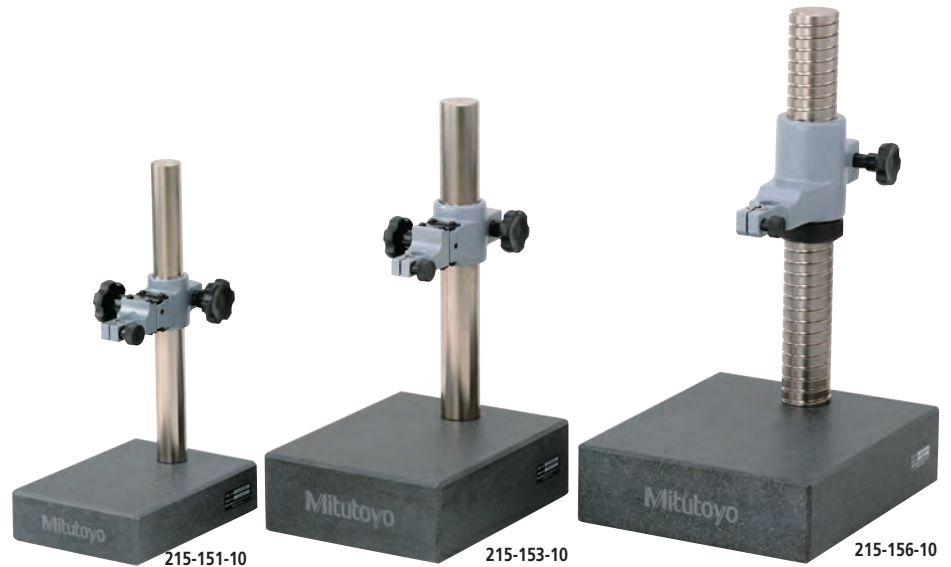
## SERIES 215

### FEATURES

- The base is made of black granite that stays free of burrs and pileups due to its fine-grain composition.
- Easy maintenance due to the non-rusting base.
- The rigid granite base is free from burrs and pileups due to its fine-grain composition and less viscousness compared with casting iron: the flatness is always accurate and the workpiece is free from damage.

### Optional Accessories

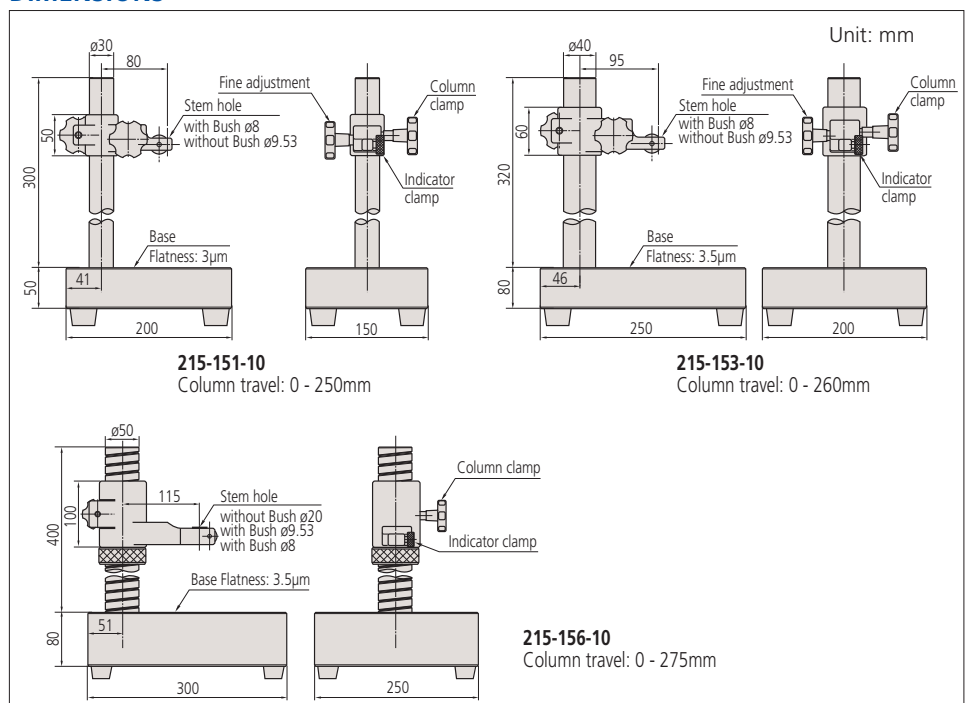
21JAA329:  $\varnothing 8$ mm bush  
 21JAA330:  $\varnothing 9.53$ mm bush  
 21JAA331:  $\varnothing 15$ mm bush  
 only available for 215-156-10



### SPECIFICATIONS

Order No.	Granite base size (W x D x H)	Column travel	Stem hole	Remarks
215-151-10	150 x 200 x 50mm	250mm	$\varnothing 8$ mm, $\varnothing 9.53$ mm	With fine adjustment of 1mm range
215-153-10	200 x 250 x 80mm	260mm	$\varnothing 8$ mm, $\varnothing 9.53$ mm	With fine adjustment of 1mm range
215-156-10	300 x 250 x 80mm	275mm	$\varnothing 8$ mm, $\varnothing 9.53$ mm, $\varnothing 20$ mm	With fine adjustment over the entire travel

### DIMENSIONS



# Comparator Stands

## SERIES 215

### FEATURES

- Comparator Stands have a very stable, cast-iron which enables precise measurement.
- The partially serrated anvil prevents very flat workpieces from wringing to it and the 2.3µm flatness (or better) promotes accurate measurement.
- The **215-505-10** model has a threaded column which enables easy and precise coarse adjustment.
- Serrated anvils 110×110mm are supplied with **215-405-10**, and 150×150mm with **215-505-10** models.



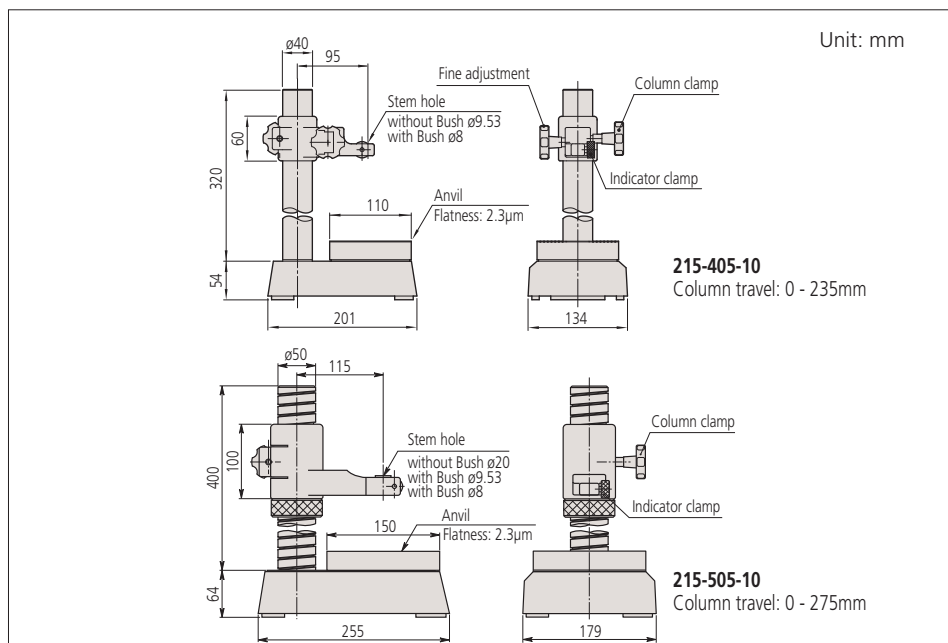
Application example using Digimatic Indicator ID-H.

### SPECIFICATIONS

Order No.	Square anvil size (W x D)	Column travel	Stem hole	Remarks
<b>215-405-10</b>	110 x 110mm	235mm	ø8mm, ø9.53mm	With fine adjustment of 1mm range
<b>215-505-10</b>	150 x 150mm	275mm	ø8mm, ø9.53mm, ø20mm	With fine adjustment over the entire travel

\* Perpendicularity of the mounting hole to the anvil: less than 0.4mm/100mm

### DIMENSIONS



### Optional Accessories

- 21JAA329:** ø8mm bush\*
  - 21JAA330:** ø9.53mm (3/8") bush\*
  - 21JAA331:** ø15mm bush\*
- \* Only available for **215-505-10**.

# Precision Granite Stands (with black granite bases)

## SERIES 517

### FEATURES

Mitutoyo's Granite Comparator Stands are basic building-blocks for the assembly of special-purpose, precision measuring equipment. By mounting precision measuring instruments such as Digimatic indicators, Mu-Checker Cartridge Heads, and Linear Gages onto the stands, it is possible to satisfy all manner of measuring assignment. The rigid granite base is free from burrs, pileups, rust, and deterioration over time.

### Optional Accessories

**58AAA151:** ø8mm bush\*

**58AAA273:** ø9.53mm (3/8") bush\*

**58AAA276:** ø15mm bush\*

\*Only available for 215-156.

**517-895**  
(stand only)

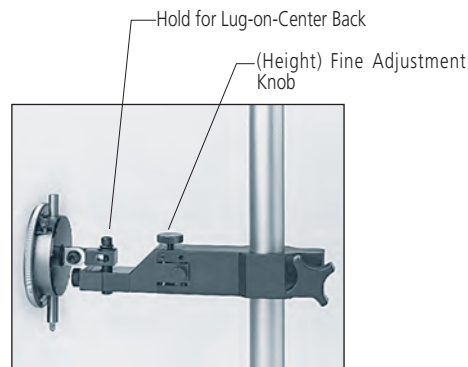


**517-898**  
(stand only)



### SPECIFICATIONS

Order No.	Base	Column Diameter	Column Height	Throat Clearance	Table Flatness	Table Thickness	Weight
517-890	6 x 8"	1.181"	6"	4.375"	.0001"	2"	18 lbs
517-891	6 x 8"	1.181"	8"	4.375"	.0001"	2"	19 lbs
517-892	6 x 8"	1.181"	12"	4.375"	.0001"	2"	20 lbs
517-893	6 x 8"	1.181"	18"	4.375"	.0001"	2"	21 lbs
517-895	8 x 12"	1.181"	6"	5.8"	.0001"	2"	29 lbs
517-896	8 x 12"	1.181"	8"	5.8"	.0001"	2"	30 lbs
517-897	8 x 12"	1.181"	12"	5.8"	.0001"	2"	31 lbs
517-898	8 x 12"	1.181"	18"	5.8"	.0001"	2"	32 lbs
517-899	8 x 12"	1.181"	24"	5.8"	.0001"	2"	35 lbs



# G

## Sensor Systems

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#### Sensor Systems

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### Linear Gages







### Laser Scan Micrometers































Linear Gage LGK

Laser Scan Micrometer  
LSM-500S

# Linear Gage / Display Selection Guide

Resolution	Liner Gage			
		5mm	10mm	25mm
0.00001mm	LGH 0.01µm Laser Hologage Page G-11		LGH-110  LGH-110C Page G-10	
	LGB®2 Page G-4 LGK Page G-5 LGF® 0.1µm Page G-6	LGB2-0105L Page G-4	LGK-0110 LGF-0110L-B Page G-6	LGF-0125L-B Page G-6
0.0001mm	LGH 0.1µm Laser Hologage Page G-10		LGH-1010  LGH-1010C Page G-10	
	Motor Drive Page G-12			
0.0005mm	LGK Page G-5 LGF® 0.5µm Page G-6		LGF-0510L-B LGK-0510 Page G-5	LGF-0525L-B Page G-6
	LGK Page G-5 LGF® 1µm Page G-6		LGK-110 LGF-110L-B Page G-6	LGF-125L-B Page G-6
0.001mm	LGB® ø8mm P399 Page G-4	LGB-105L Page G-4	LGB-110 LGB-110S LGB-110HLGB-110A LGB-110-1LGB-110AR Page G-4	
	Motor Drive Page G-12			
	LGB No/Nut Page G-4	LGB2-105L Page G-4	LGB2-110 LGB2-110H LGB2-110-1 LGB2-110S LGB2-110AR Page G-4	
0.005mm	LGF® 5µm No/Nut Page G-6			LGF-525L-B Page G-6
0.0005mm	LGF® 0.5µm Origin Mark Page G-6		LGF-0510ZL-B  Page G-6	LGF-0525ZL-B Page G-6
0.001mm	LGF® 1µm Origin Mark Page G-6		LGF-110ZL-B  Page G-6	LGF-125ZL-B Page G-6
0.01mm	LGD® Digimatic Page G-8		LGD-1010L-B  Page G-8	LGD-1025L-B Page G-8
	LGS Digimatic Page G-9		LGS-1012P  Page G-9	

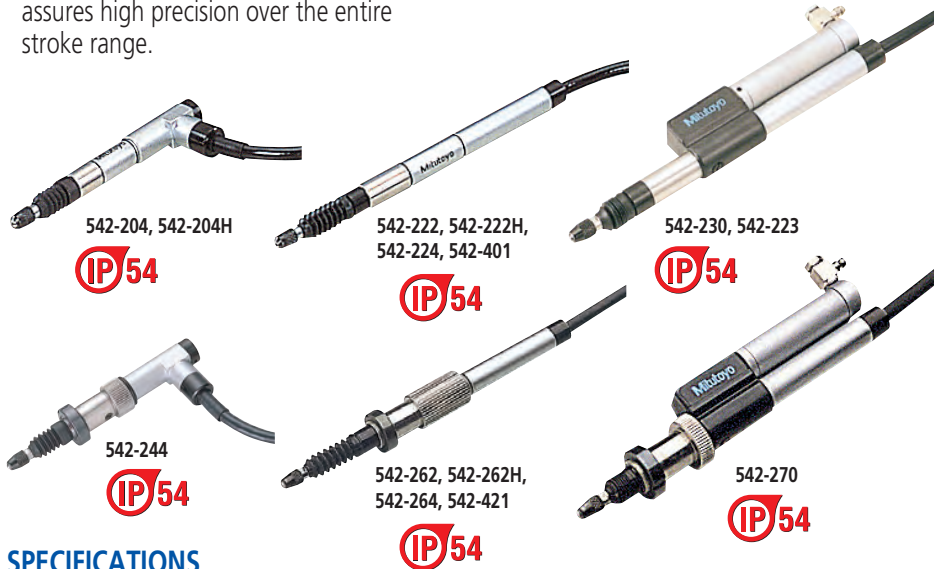
Linear Gage		Display		
50mm	100mm	Single Display	Double Display	Multigage System
		EH-120S 		
	LG-01100 LG-01100C  LGM-01100 LGM-01100C 	EG-101P  EH-101P 	EH-102P 	
LGF-0550L-B 		EG-101P 	EH-102P 	EV-16P 
LGF-150L-B 				
	LG-1100N LG-1100C  LGM-1100N 	EB-11P  EH-101P 		
LGF-550L-B 		EG-101Z 		
LGF-0550ZL-B 			EH-11ZR 	EV-16Z 
LGF-150ZL-B 		EB-11Z 		
LGD-1050L-B 		EC-101D  EG-101D 	EH-102D 	EV-16D 
		EB-11D 		

# Linear Gage LGB

## SERIES 542 — 0.001mm Reading

### FEATURES

- Extremely compact design. Available with an outside diameter as small as 8mm.
- The small photoelectric linear encoder assures high precision over the entire stroke range.
- The ball bearings used in the spindle unit ensure superb durability.

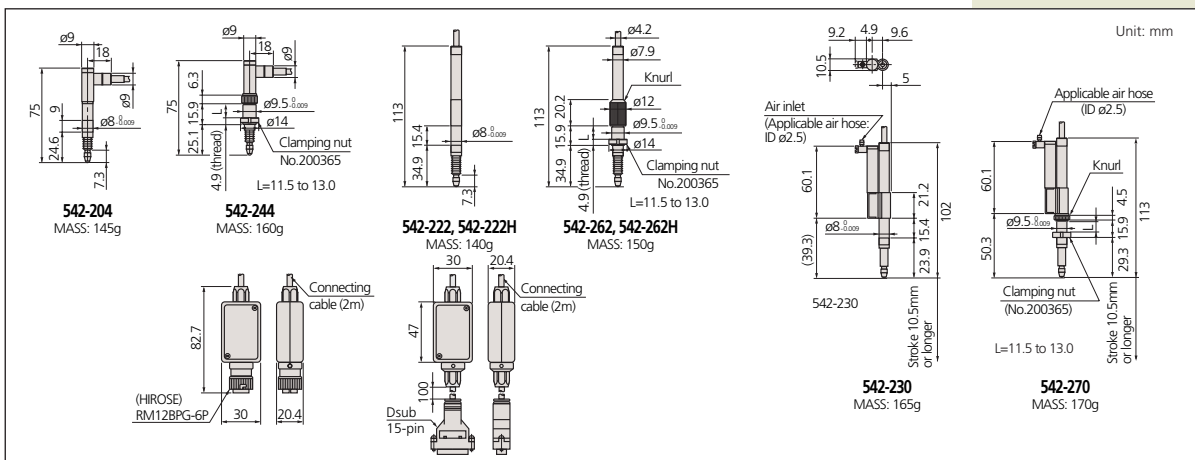


### SPECIFICATIONS

Range	Order No.	Resolution	Accuracy	Measuring force*	Stem dia.	Remarks
5mm (.2")	542-204	0.001mm	2μm	0.65N / 0.6N / 0.55N	8mm	—
5mm (.2")	542-204H	0.001mm	1μm	0.65N / 0.6N / 0.55N	8mm	—
10mm (.4")	542-222	0.001mm	2μm	0.8N / 0.75N / 0.7N	8mm	—
10mm (.4")	542-222H	0.001mm	1μm	0.8N / 0.75N / 0.7N	8mm	—
10mm (.4")	542-401	0.001mm	2μm	0.8N / 0.75N / 0.7N	8mm	Sine-wave output
10mm (.4")	542-224	0.001mm	2μm	0.6N / 0.55N / 0.5N	8mm	—
10mm (.4")	542-230	0.001mm	2μm	0.8N / 0.75N / 0.7N	8mm	w/ pneumatic cylinder
10mm (.4")	542-223	0.001mm	2μm	0.8N / 0.75N / 0.7N	8mm	w/ pneumatic cylinder
5mm (.2")	542-244	0.001mm	2μm	0.65N / 0.6N / 0.55N	9.5mm	Low measuring force
10mm (.4")	542-262	0.001mm	2μm	0.8N / 0.75N / 0.7N	9.5mm	—
10mm (.4")	542-262H	0.001mm	1μm	0.8N / 0.75N / 0.7N	9.5mm	—
10mm (.4")	542-421	0.001mm	2μm	0.8N / 0.75N / 0.7N	9.5mm	Sine-wave output
10mm (.4")	542-264	0.001mm	2μm	0.6N / 0.55N / 0.5N	9.5mm	Low measuring force
10mm (.4")	542-270	0.001mm	2μm	0.8N / 0.75N / 0.7N	9.5mm	w/ pneumatic cylinder

\*Posture of gage: Upward (☺) / Horizontal (←○, →○) / Downward (☹)

### DIMENSIONS AND MASS



### Technical Data

Accuracy: Refer to the list of specifications  
 Resolution: 1μm  
 Inch Resolution: Refer to the applicable counters  
 Length standard: Photoelectric linear encoder  
 Max. response speed: 900mm/s  
 Contact point: ø3mm carbide  
 Stem: ø8mm or ø9.5mm  
 Bearing type: Stroke ball bearing  
 Measuring force: Refer to the list of specifications  
 Output signal: 90° phase difference, differential square wave (RS-422A equivalent)  
 (Sign-wave output: 542-401, 542-424)  
 Signal pitch: 4μm  
 Cable length: 80"/2m  
 Dust/Water protection level: IP54

### Applicable Counters

EH counter (542-060A, 542-062A)  
 EB counter (542-092-2)  
 EG counter (542-015)  
 EV counter (542-063)

### Optional Accessories

238773: Rubber boot for 5mm LGB (spare)  
 238772: Rubber boot for 10mm LGB (spare)  
 902434: Extension cable (5m)  
 902433: Extension cable (10m)  
 902432: Extension cable (20m)

# Linear Gage LGK

SERIES 542 — 0.1µm, 0.5µm or 1µm Reading

## Technical Data

Accuracy: Refer to the list of specifications (excluding quantizing error)  
 Resolution: 1µm, 0.5µm or 0.1µm  
 Inch Resolution: Refer to the applicable counters  
 Length standard: Photoelectric linear encoder  
 Max. response speed: 1500mm/s, 400mm/s (542-158)  
 Contact point: ø3mm carbide  
 Stem: ø8mm  
 Bearing type: Stroke ball bearing  
 Measuring force: Refer to the list of specifications  
 Output signal: 90° phase difference, differential square wave (RS-422A equivalent)  
 Signal pitch: 0.4µm (542-158), 2µm (542-157), 4µm (542-156)  
 Cable length: 80"/2m  
 Dust/Water protection level: IP66

## Applicable Counters

EH counter (542-060A, 542-062A)  
 EG counter (542-015)  
 EB counter (542-092-2)\*  
 EV counter (542-063)\*

\* Only applicable for resolution 0.0005mm and 0.001mm LGK

## Optional Accessories

238772: Rubber boot (10mm)  
 902434: Extension cable (5m)  
 902433: Extension cable (10m)  
 902432: Extension cable (20m)  
 02ADE230: Air drive unit  
 02ADB680: Thrust stem set  
 02ADB682: Clamping nut  
 02ADB683: Wrench

## FEATURES

- Compact design with a 8mm stem diameter
- Excellent protection against dust and water splash (IP-66) in harsh shop-floor environments.
- Maximum permissible acceleration values for shock and impact, 11ms (IEC68-2-27)
- Output differential square wave signals for a wide range of applications.
- Employs linear stroke bearings on the spindle movement for durability
- Thrust Stem with a clamping nut is optional.
- Interchangeable contact points for dial indicators can be used.

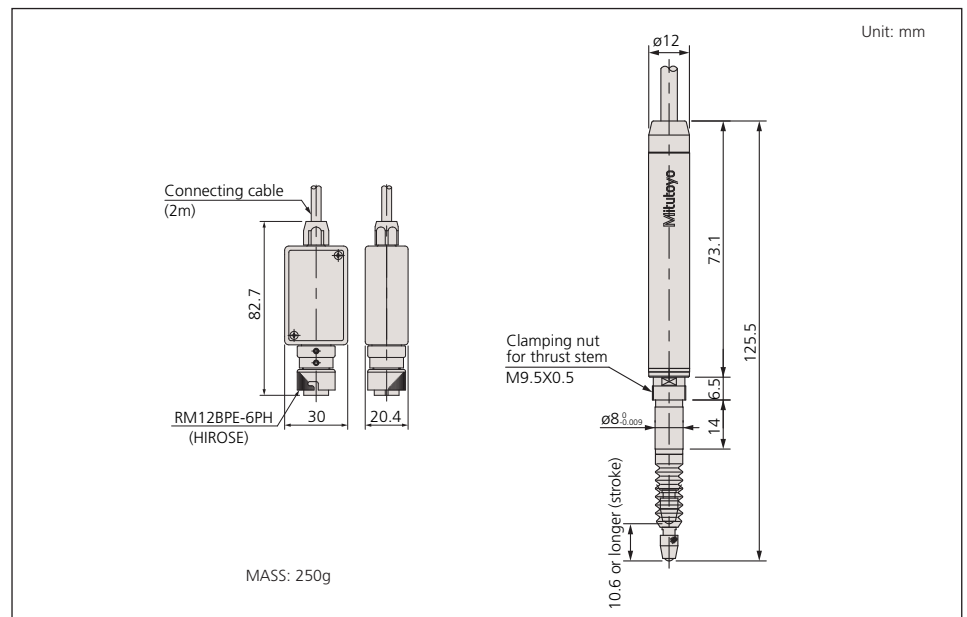


## SPECIFICATIONS

Range	Order No.	Resolution	Accuracy*	Measuring force**	Stem dia.	Remarks
10mm (.4")	542-156	0.001mm	(1.5+L/50)µm	0.65N / 0.6N / 0.55N	8mm	—
10mm (.4")	542-157	0.0005mm	(1.5+L/50)µm	0.65N / 0.6N / 0.55N	8mm	—
10mm (.4")	542-158	0.0001mm	(0.8+L/50)µm	0.65N / 0.6N / 0.55N	8mm	—

\*L = Measured length (mm) \*\*Posture of gage: Upward (⤴) / Horizontal (→) / Downward (⤵)

## DIMENSIONS AND MASS



Mitutoyo



# Linear Gage LGF

SERIES 542 — 0.1µm, 0.5µm or 1µm Reading



## Technical Data

Accuracy: Refer to the list of specifications  
 Resolution: 1µm, 0.5µm or 0.1µm  
 Inch Resolution: Refer to the applicable counters  
 Length standard: Photoelectric linear encoder  
 Max. response speed: 1500mm/s, (400mm/s: **542-181, 542-182**)  
 Contact point: ø3mm carbide  
 Stem: ø8mm or ø15mm  
 Bearing type: Stroke ball bearing  
 Measuring force: Refer to the list of specifications  
 Output signal: 90° phase difference, differential square wave (RS-422A equivalent)  
 Signal pitch: 4µm (**542-161, 542-162, 542-163**), 2µm (**542-171, 542-172, 542-173**) or 0.4µm (**542-181, 542-182**)  
 Cable length: 80"/2m  
 Dust/Water protection level: IP66

## Applicable Counters

EH counter (**542-075A, 542-071A**)  
 EG counter (**542-015**)  
 EB counter (**542-092-2**)  
 EV counter (**542-063**)

## SPECIFICATIONS

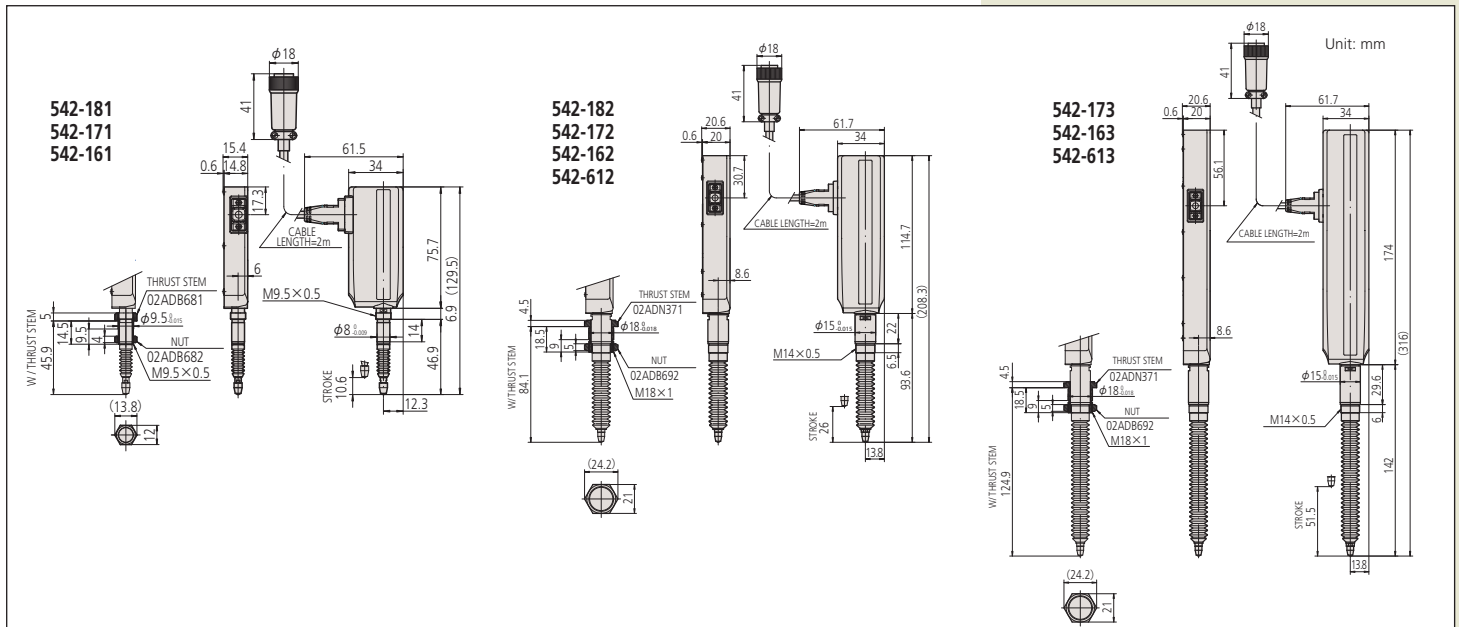
Range	Order No.	Resolution	Accuracy*	Measuring force**	Stem dia.	Remarks
10mm (.4")	<b>542-181</b>	0.0001mm	(0.8+L/50)µm	1.2N / 1.1N / 1.0N	8mm	—
10mm (.4")	<b>542-171</b>	0.0005mm	(1.5+L/50)µm	1.2N / 1.1N / 1.0N	8mm	—
10mm (.4")	<b>542-161</b>	0.001mm	(1.5+L/50)µm	1.2N / 1.1N / 1.0N	8mm	—
25mm (1")	<b>542-182</b>	0.0001mm	(0.8+L/50)µm	4.6N / 4.3N / 4.0N	15mm	—
25mm (1")	<b>542-172</b>	0.0005mm	(1.5+L/50)µm	4.6N / 4.3N / 4.0N	15mm	—
25mm (1")	<b>542-162</b>	0.001mm	(1.5+L/50)µm	4.6N / 4.3N / 4.0N	15mm	—
25mm (1")	<b>542-612</b>	0.005mm	(7.5+L/50)µm	4.6N / 4.3N / 4.0N	15mm	—
50mm (2")	<b>542-173</b>	0.0005mm	(1.5+L/50)µm	5.7N / 5.3N / 4.9N	15mm	—
50mm (2")	<b>542-163</b>	0.001mm	(1.5+L/50)µm	5.7N / 5.3N / 4.9N	15mm	—
50mm (2")	<b>542-613</b>	0.005mm	(7.5+L/50)µm	5.7N / 5.3N / 4.9N	15mm	—

\*L = Measured length (mm) \*\*Posture of gage: Upward (♀) / Horizontal (♂) / Downward (♁)

## Optional Accessories

**238772**: Rubber boot (10mm)  
**962504**: Rubber boot (25mm)  
**962505**: Rubber boot (50mm)  
**902434**: Extension cable (5m\*)  
**902433**: Extension cable (10m\*)  
**902432**: Extension cable (20m\*)  
**02ADB680**: Thrust stem set (for 10mm range models)  
**02ADB690**: Thrust stem set (for 25, 50mm range models)  
**02ADE230**: Air lifting units (10mm range)  
**02ADE250**: Air lifting units (25mm range)  
**02ADE270**: Air lifting units (50mm range)  
 \*not available for **542-181** and **542-182**

## DIMENSIONS AND MASS



# Linear Gage LGF-Z with Origin Point Mark

SERIES 542 — 0.5µm or 1µm Reading

## Technical Data

Accuracy: Refer to the list of specifications  
 Resolution: 1µm or 0.5µm  
 Inch Resolution: Refer to the applicable counters  
 Length standard: Photoelectric linear encoder  
 Max. response speed: 1500mm/s  
 Contact point: ø3mm carbide  
 Stem: ø8mm or ø15mm  
 Bearing type: Stroke ball bearing  
 Measuring force: Refer to the list of specifications  
 Output signal: 90° phase difference, differential square wave (RS-422A equivalent)  
 Signal pitch: 4µm (542-164, 542-165, 542-166) or 2µm (542-174, 542-175, 542-176)  
 Cable length: 80" / 2m  
 Dust/Water protection level: IP66

## Applicable Counters

EH counter (542-073A)  
 EB counter (542-094-2)  
 EG counter (542-017)  
 EV counter (542-067)

## Optional Accessories

238772: Rubber boot (10mm)  
 962504: Rubber boot (25mm)  
 962505: Rubber boot (50mm)  
 02ADB680: Thrust stem set (for 10mm range models)  
 02ADB690: Thrust stem set (for 25, 50mm range models)  
 02ADE230: Air lifting units (10mm range)  
 02ADE250: Air lifting units (25mm range)  
 02ADE270: Air lifting units (50mm range)

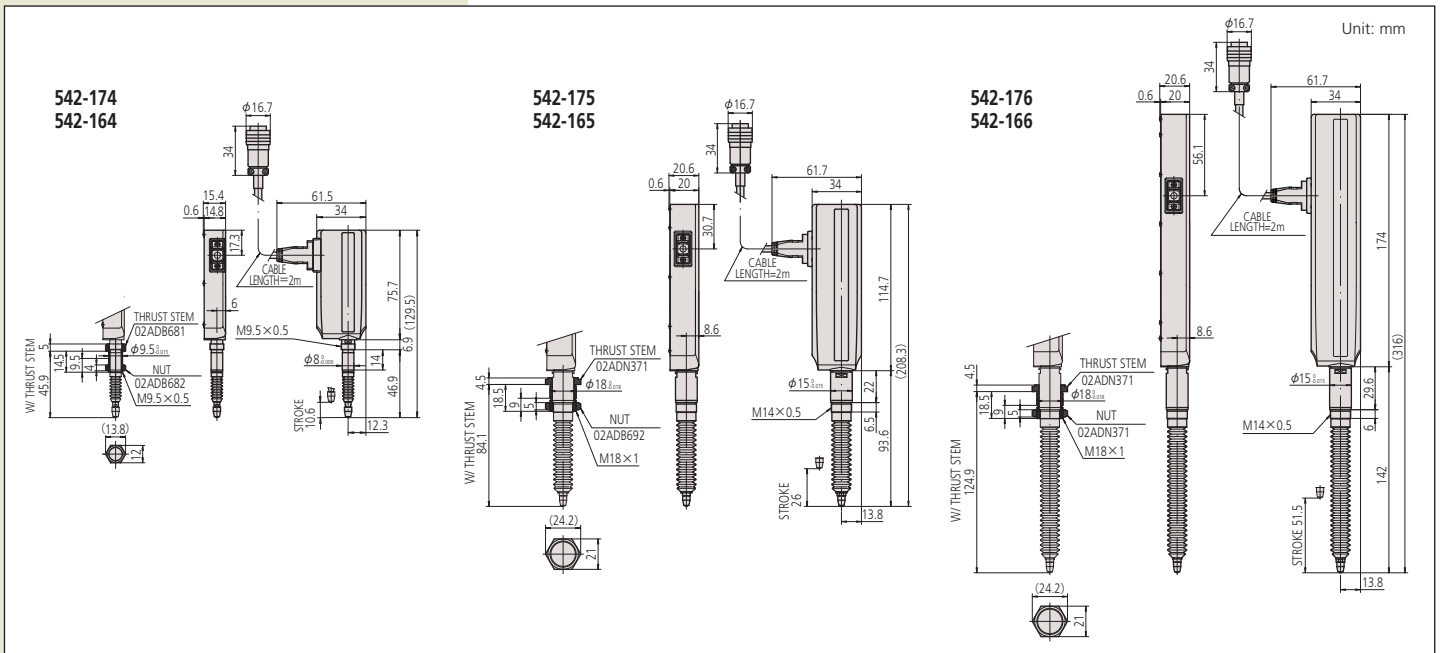


## SPECIFICATIONS

Range	Order No.	Resolution	Accuracy*	Measuring force**	Stem dia.	Remarks
10mm (.4")	542-174	0.0005mm	(1.5+L/50)µm	1.2N / 1.1N / 1.0N	8mm	w/ origin point mark
10mm (.4")	542-164	0.001mm	(1.5+L/50)µm	1.2N / 1.1N / 1.0N	8mm	w/ origin point mark
25mm (1")	542-175	0.0005mm	(1.5+L/50)µm	4.6N / 4.3N / 4.0N	15mm	w/ origin point mark
25mm (1")	542-165	0.001mm	(1.5+L/50)µm	4.6N / 4.3N / 4.0N	15mm	w/ origin point mark
50mm (2")	542-176	0.0005mm	(1.5+L/50)µm	5.7N / 5.3N / 4.9N	15mm	w/ origin point mark
50mm (2")	542-166	0.001mm	(1.5+L/50)µm	5.7N / 5.3N / 4.9N	15mm	w/ origin point mark

\*L = Measured length (mm) \*\*Posture of gage: Upward (∩) / Horizontal (←, →) / Downward (∪)

## DIMENSIONS AND MASS



# Linear Gage LGD

**SERIES 575 — .0005" / 0.01mm Reading**

The LGD is an ultra-compact ABS Linear Gage designed to fit into very tight spaces. It keeps track of its origin point once set.

## FEATURES

- The use of an absolute scale\* in the sensor makes it possible to maintain the origin setting even when the power is switched off.

- Special linear ball bearings are used for the spindle guide to ensure a long service life.
- Optional thrust stem and tightening nut facilitate setup of the LGD linear gage in holes of a plate or fixture.



## Technical Data

Accuracy: Refer to the list of specifications  
 Resolution: 1μm or .0005"  
 Length standard: Capacitance-type ABSOLUTE linear encoder  
 Max. response speed: Unlimited  
 Contact point: ø3mm carbide  
 Stem: ø8mm or ø15mm  
 Bearing type: Stroke ball bearing  
 Measuring force: Refer to the list of specifications  
 Output signal: Digimatic output  
 External input: Origin-setting signal (Absolute origin position can be changed externally.)  
 Cable length: 80"/2mm

## Applicable Counters

EC counter (542-007A)  
 EB counter (542-093-2)  
 EG counter (542-016)  
 EV counter (542-064)

## Optional Accessories

- 238772: 10mm rubber boot (spare)
- 962504: 25mm rubber boot (spare)
- 962505: 50mm rubber boot (spare)
- 02ADC730: ø9.5mm Thrust stem set (for 10mm model)
- 02ADC740: ø18mm Thrust stem set (for 25mm/50mm model)
- 965275\*: Digimatic Power Supply Unit
- 02ADE230: Air lifting units (10mm range)
- 02ADE250: Air lifting units (25mm range)
- 02ADE270: Air lifting units (50mm range)

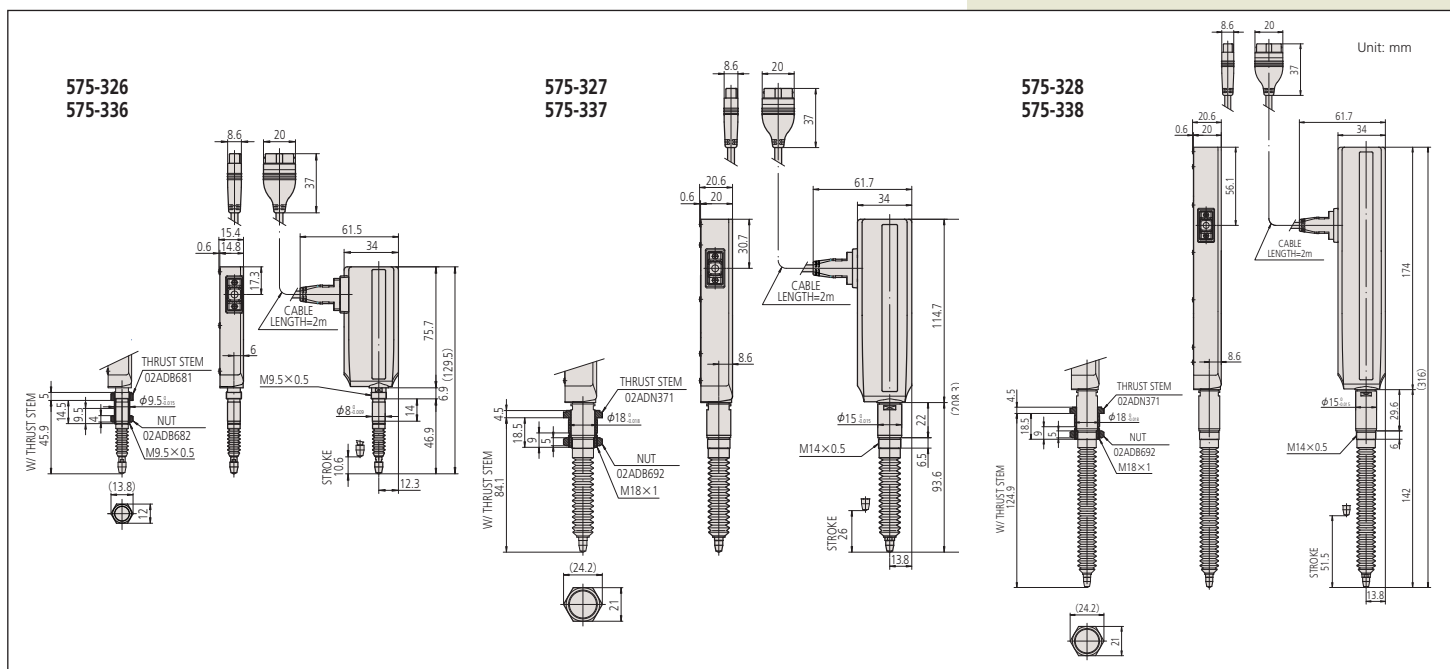
\* To denote your AC line voltage add the following suffixes to the order No. (e.g.: **965275A**):  
**A** for UL/CSA, **D** for CEE, **E** for BS, **F** for SAA, **DC** for China, **K** for EK, **No suffix** is required for JIS/100V

## SPECIFICATIONS

Metric		LGD				
Range	Order No.	Resolution	Accuracy	Measuring force*	Stem dia.	Remarks
10mm	575-326	0.01mm	20μm	1.2N / 1.1N / 1.0N	8mm	—
25mm	575-327	0.01mm	20μm	4.6N / 4.3N / 4.0N	15mm	—
50mm	575-328	0.01mm	30μm	5.7N / 5.3N / 4.9N	15mm	—

Inch		LGD				
Range	Order No.	Resolution	Accuracy	Measuring force*	Stem dia.	Remarks
.4"	575-336	.0005"	.001"	1.2N / 1.1N / 1.0N	8mm	—
1"	575-337	.0005"	.001"	4.6N / 4.3N / 4.0N	15mm	—
2"	575-338	.0005"	.0012"	5.7N / 5.3N / 4.9N	15mm	—

## DIMENSIONS AND MASS





# Linear Gage LGS

**SERIES 575 — .0005" / 0.01mm Reading**

The LGS is compact Linear Gage designed to fit into tight spaces.

## Technical Data

Accuracy: Refer to the list of specifications  
 Resolution: 0.01mm or .0005"  
 Length standard: Capacitance-type ABSOLUTE linear encoder  
 Max. response speed: Unlimited  
 Contact point:  $\varnothing$ 3mm carbide ( $\varnothing$ 3mm steel: **575-313**)  
 Stem:  $\varnothing$ 8mm or 3/8" DIA  
 Bearing type: Slide-bearing  
 Measuring force: Refer to the list of specifications  
 Output signal: Digimatic output  
 Cable length: 80"/2m  
 Dust/Water protection level: IP66

## Applicable Counters

EC counter (**542-007A**)  
 EB counter (**542-093-2**)  
 EG counter (**542-016**)  
 EV counter (**542-064**)

## Optional Accessories

**238774**: Spare rubber boot  
**903594**: Air Drive Unit (metric)  
**903598**: Air Drive Unit (inch)  
**02ADF640**: SPC cable extension adapter  
**02ADD950**: Extension cable (0.5m)  
**936937**: Extension cable (1m)  
**965014**: Extension cable (2m)  
 —: EC Counter



575-303



## SPECIFICATIONS

### Metric

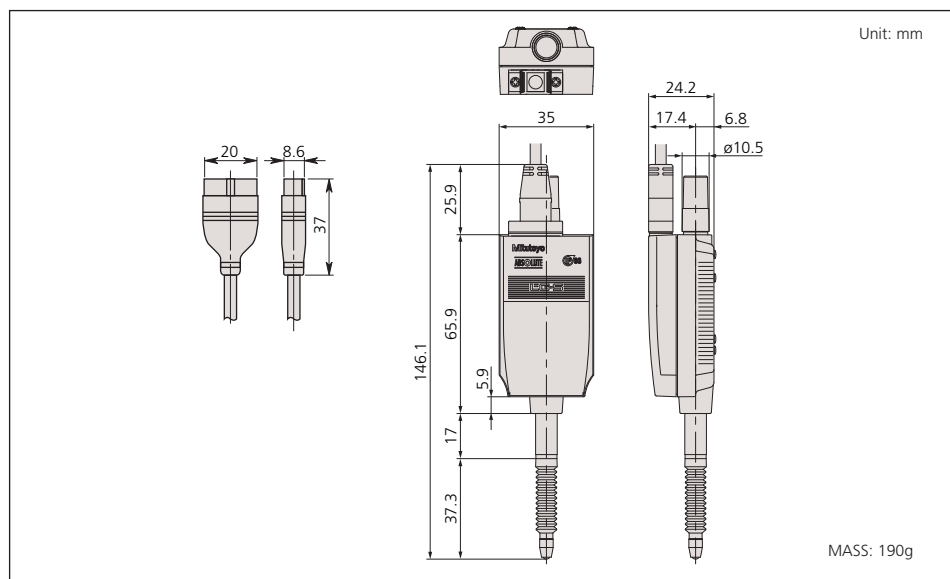
Range	Order No.	Resolution	Accuracy	Measuring force*	Stem dia.	Remarks
12.7mm	<b>575-303</b>	0.01mm	0.015mm	2.0N / 1.8N / 1.6N	8mm	—

### Inch

Range	Order No.	Resolution	Accuracy	Measuring force*	Stem dia.	Remarks
.5"	<b>575-313</b>	.0005"	.0006"	2.0N / 1.8N / 1.6N	3/8 DIA	—

\*Posture of gage: Upward (♀) / Horizontal (+○, ○+) / Downward (♂)

## DIMENSIONS AND MASS



# Laser Hologage LGH

## SERIES 542 — 0.1µm Reading

These are extra-high accuracy gaging heads provided with resolution up to 0.0001mm. The compact dimensions allow easy installation to very tight spaces. The Laser Hologage employs a unique holography scale as the length standard, ensuring excellent measuring accuracy and repeatability. The dedicated display unit (EH Counter) is optional.

### FEATURES

- A linear ball bearing in the spindle guide provides excellent durability for an extended service life.
- The 0.0001mm reading type LGB linear gage (542-246) comes with a clamping nut on the stem.

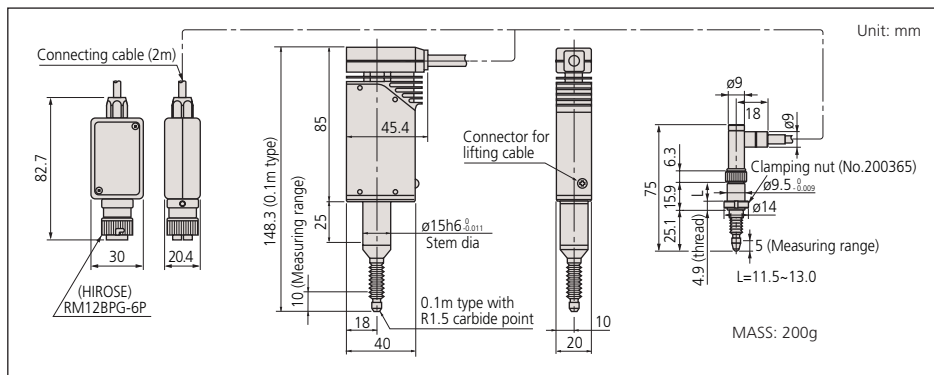


### SPECIFICATIONS

Range	Order No.	Resolution	Accuracy	Measuring force*	Stem dia.	Remarks
10mm (.4")	542-711-1	0.1µm	0.2µm	0.55N / 0.45N / 0.35N	15mm	—
10mm (.4")	542-712-1	0.1µm	0.2µm	0.1N / — / —	15mm	Low measuring force

\*Posture of gage: Upward (♀) / Horizontal (♂, ♂) / Downward (♂)

### DIMENSIONS AND MASS



# Linear Gage LGB

## SERIES 542 — 0.1µm Reading

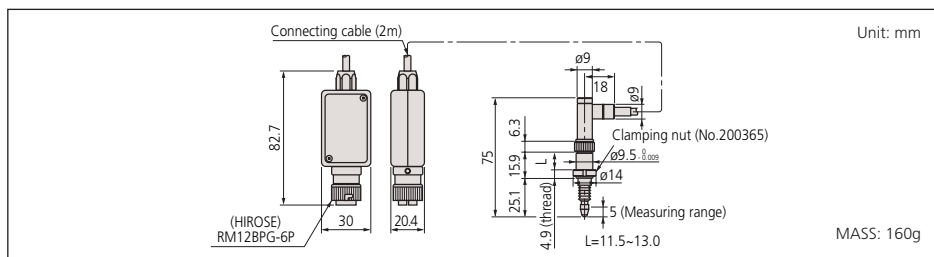


### SPECIFICATIONS

Range	Order No.	Resolution	Accuracy	Measuring force*	Stem dia.	Remarks
5mm (.2")	542-246	0.1µm	0.8µm	0.65N / 0.60N / 0.55N	9.5mm	—

\*Posture of gage: Upward (♀) / Horizontal (♂, ♂) / Downward (♂)

### DIMENSIONS AND MASS



### Technical Data

Accuracy: Refer to the list of specifications  
 Resolution: 0.1µm  
 Inch Resolution: Refer to the applicable counters  
 Length standard: Laser-hologram measurement sensor  
 Max. response speed: 250mm/s  
 Contact point: R1.5mm carbide  
 Stem: ø15mm  
 Bearing type: High precision linear ball bearing  
 Measuring force: Refer to the list of specifications  
 Output signal: 90° phase difference, differential square wave (RS-422A equivalent)  
 Signal pitch: 0.25µm  
 Cable length: 80"/2m

### Applicable Counters

EH counter (542-075A, 542-071A)  
 EG counter (542-015)

### Optional Accessories

238773: Rubber boot  
 971751: Stem fixture for fixing to top surface  
 971752: Stem fixture for fixing to bottom surface  
 971753: Spindle lifting cable  
 971750: Laser Hologage stand

### Technical Data

Accuracy: Refer to the list of specifications  
 Resolution: 0.1µm  
 Inch Resolution: Refer to the applicable counters  
 Length standard: Photoelectric linear encoder  
 Max. response speed: 380mm/s  
 Contact point: R1.5mm carbide  
 Stem: ø9.5mm  
 Bearing type: Linear ball bearing  
 Measuring force: Refer to the list of specifications  
 Output signal: 90° phase difference, differential square wave (RS-422A equivalent)  
 Signal pitch: 0.4µm  
 Cable length: 80"/2m  
 Dust/Water protection level: IP54

### Applicable Counters

EH counter (542-075A, 542-071A)  
 EG counter (542-015)

### Optional Accessories

902434: Extension cable (5m)  
 902433: Extension cable (10m)  
 902432: Extension cable (20m)  
 238773: Rubber boot

# Laser Hologage

## SERIES 542 — 0.01μm / 1μin Reading

### Technical Data

Accuracy: Refer to the list of specifications  
 Resolution: 0.01μm  
 Length standard: Laser-hologram measurement sensor  
 Max. response speed: 250mm/s  
 Contact point: R5mm carbide  
 Stem: ø15mm  
 Bearing type: High precision linear ball bearing  
 Measuring force: Refer to the list of specifications  
 Output signal: 90° phase difference, two-phase sine wave  
 Signal pitch: 0.25μm  
 Cable Length: 80"/2m

### Optional Accessories

971751: Stem fixture for fixing to top surface  
 971752: Stem fixture for fixing to bottom surface  
 971753: Spindle lifting cable  
 971750: Laser Hologage stand

The Mitutoyo Laser Hologage is a high-end digital gaging system that employs diffracted laser beam interference to make highly accurate and repeatable measurements. It features ultra-fine diffraction gratings which are holographically recorded on the scale. The Laser Hologage is suitable for measuring ultra-high precision parts, especially those in semiconductor and related industries.

### FEATURES

- Highly accurate measurement due to an ultra-high resolution of 0.00001mm (0.01μm), which is close to the performance of laser interferometers.
- Excellent measuring stability — the design is also highly resistant to unfavorable environmental conditions such as air movement and atmospheric pressure changes.
- High-precision linear ball bearings are used in the guide for extremely smooth movement and exceptional durability.
- A display unit is provided.



Gage head



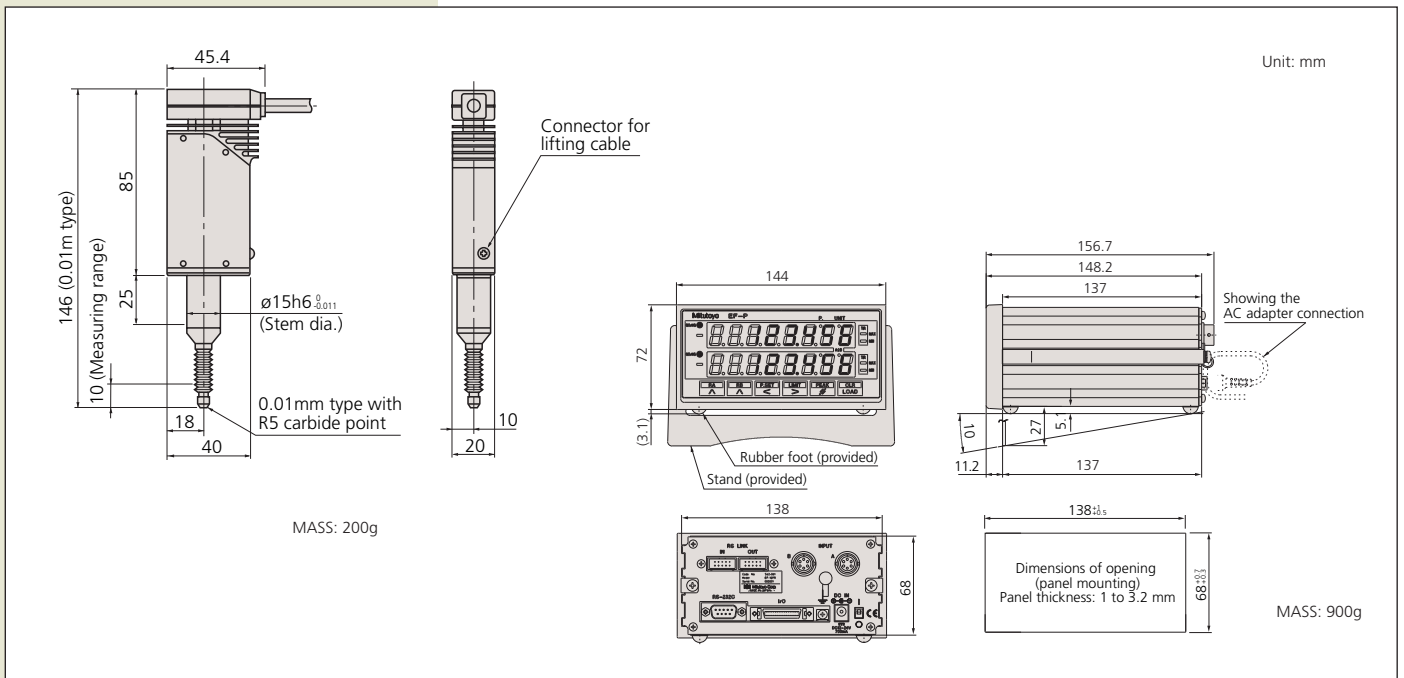
EH-120S

### SPECIFICATIONS

Range	Order No.	Resolution	Accuracy	Measuring force*	Stem dia.	Remarks
10mm (.4")	542-925A	0.01μm / 1μinch	0.1μm	0.55N / 0.45N / 0.35N	15mm	—
10mm (.4")	542-926A	0.01μm / 1μinch	0.1μm	0.1N / — / —	15mm	Low measuring force

\*Posture of gage: Upward (↕) / Horizontal (↔, ⇄) / Downward (⤵)

### DIMENSIONS AND MASS

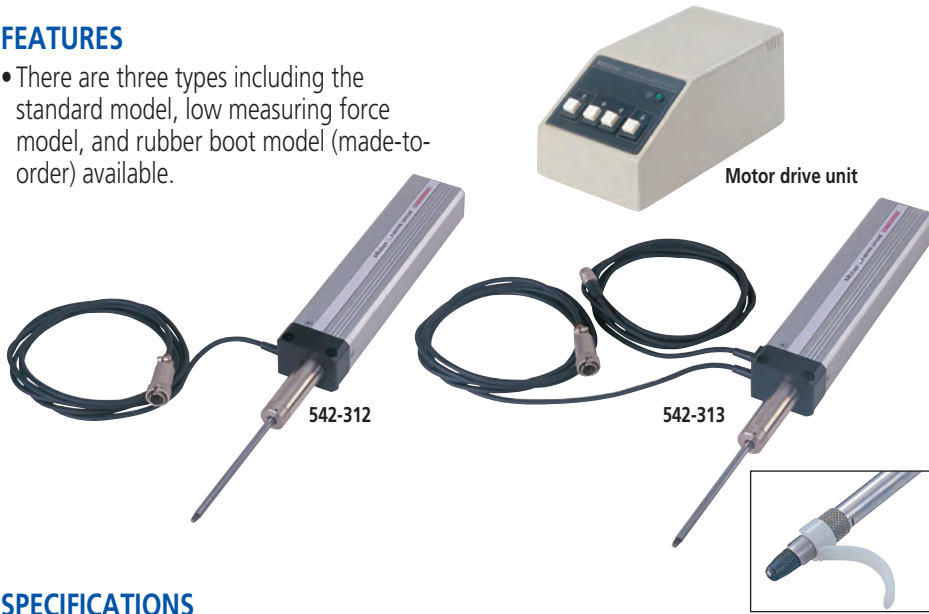


# Long Stroke Linear Gage LG/LGM

**SERIES 542 — 0.1 / 1 $\mu$ m Reading**

## FEATURES

- There are three types including the standard model, low measuring force model, and rubber boot model (made-to-order) available.



## Technical Data

Accuracy: Refer to the list of specifications  
 Resolution: 1 $\mu$ m or 0.1 $\mu$ m  
 Inch Resolution: Refer to the applicable counters  
 Length standard: Photoelectric linear encoder  
 Max. response speed: 400mm/s (800mm/s: motor-driven type)  
 Contact point:  $\phi$ 3mm carbide  
 Stem:  $\phi$ 20mm  
 Bearing type: Bearing guide  
 Measuring force: Refer to the list of specifications  
 Output signal: 90° phase difference, differential square wave (RS-422A equivalent)  
 Cable length: 80"/2m  
 Dust/Water protection level: IP54

## Applicable Counters

EH counter (542-075A, 542-071A)  
 EG counter (542-015)  
 EB counter (542-092-2)\*  
 EV counter (542-063)\*  
 \* Resolution 1 $\mu$ m LGM only

## SPECIFICATIONS

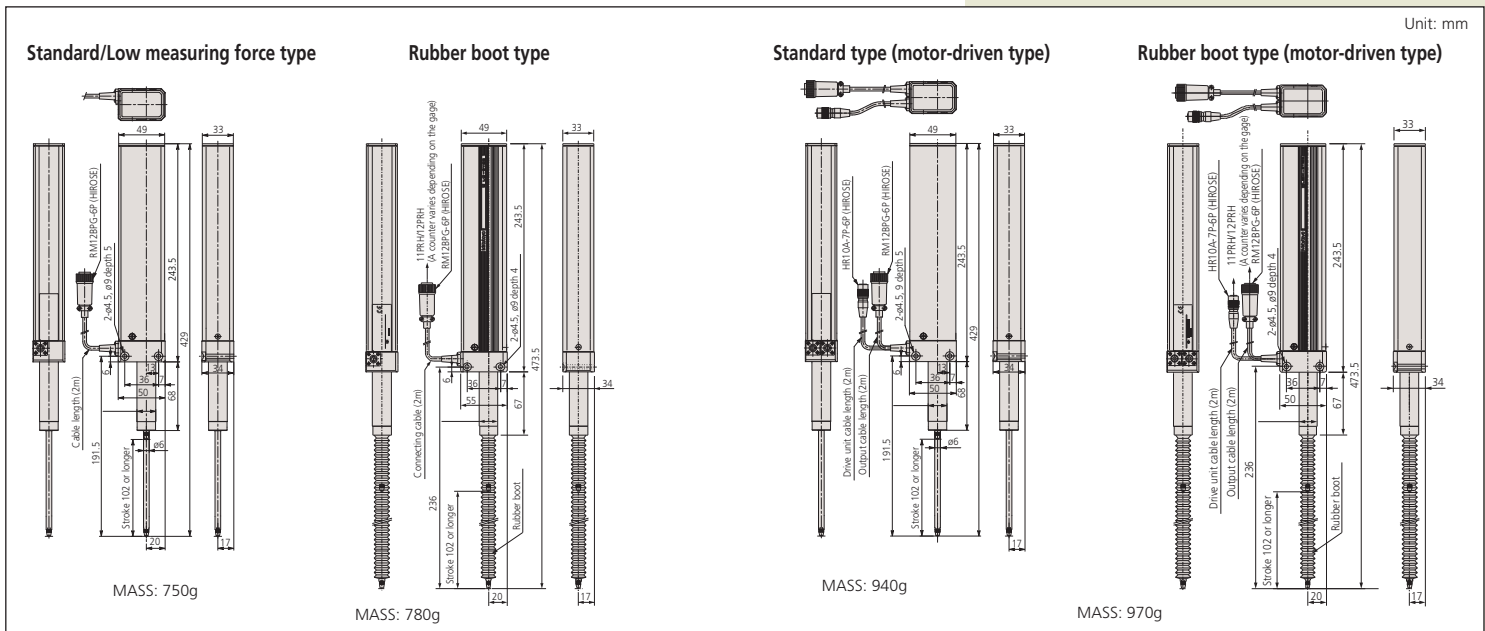
Range	Order No.	Resolution	Accuracy*	Measuring force**	Stem dia.	Remarks
100mm (4")	542-312	0.1 $\mu$ m	(2+L/100) $\mu$ m $\leq$ 2.5 $\mu$ m	8.0N / 6.5N / 5.0N	20mm	Standard
100mm (4")	542-316	0.1 $\mu$ m	(2+L/100) $\mu$ m $\leq$ 2.5 $\mu$ m	3.0N / — / —	20mm	Low measuring force
100mm (4")	542-314	0.1 $\mu$ m	(2+L/100) $\mu$ m $\leq$ 2.5 $\mu$ m	8.0N / 6.5N / 5.0N	20mm	w/ rubber boot
100mm (4")	542-332	1 $\mu$ m	(2.5+L/100) $\mu$ m $\leq$ 3 $\mu$ m	8.0N / 6.5N / 5.0N	20mm	Standard
100mm (4")	542-336	1 $\mu$ m	(2.5+L/100) $\mu$ m $\leq$ 3 $\mu$ m	3.0N / — / —	20mm	Low measuring force
100mm (4")	542-334	1 $\mu$ m	(2.5+L/100) $\mu$ m $\leq$ 3 $\mu$ m	8.0N / 6.5N / 5.0N	20mm	w/ rubber boot

\*L = Measured length (mm) \*\*Posture of gage: Upward / Horizontal / Downward

Range	Order No.	Resolution	Accuracy*	Measuring force**	Stem dia.	Remarks
100mm (4")	542-313	0.1 $\mu$ m	(2+L/100) $\mu$ m $\leq$ 2.5 $\mu$ m	3.0N / 6.5N / 9.5N	20mm	Motor-driven Type
100mm (4")	542-315	0.1 $\mu$ m	(2+L/100) $\mu$ m $\leq$ 2.5 $\mu$ m	4.5N / — / 6.0N	20mm	Motor-driven Type
100mm (4")	542-333	1 $\mu$ m	(2.5+L/100) $\mu$ m $\leq$ 3 $\mu$ m	3.0N / 6.5N / 9.5N	20mm	Motor-driven Type
100mm (4")	542-335	1 $\mu$ m	(2.5+L/100) $\mu$ m $\leq$ 3 $\mu$ m	4.5N / — / 6.0N	20mm	Motor-driven Type

\*L = Measured length (mm) \*\*Posture of gage: Upward (↕) / Horizontal (↔) / Downward (⤵) With rubber boot: 542-315, 542-335

## DIMENSIONS AND MASS



# EC Counter

## SERIES 542 — Assembly Type Display Unit for LGD and LGS

### Function

Zero set  
Preset, GO/±NG judgment

### Output (selectable)

**Tolerance judgment:** -NG, OK, +NG (open-collector)  
**Data:** Digimatic code (SPC)

### External control signal input

Preset, data hold

### Power supply

Via AC adaptor 06AEG302JA (Standard accessory)

### Optional Accessories

**936937:** SPC cable (40"/1m)  
**965014:** SPC cable (80"/1m)  
**214938:** PJ-2 (DC Plug)  
**C162-155:** GO/±NG judgement cable

### FEATURES

- Employed the DIN size (96X48mm) and mount-on-panel configuration, which greatly facilitates the incorporation into a system.
- Possible to produce either tolerance judgment output or Digimatic output (SPC).



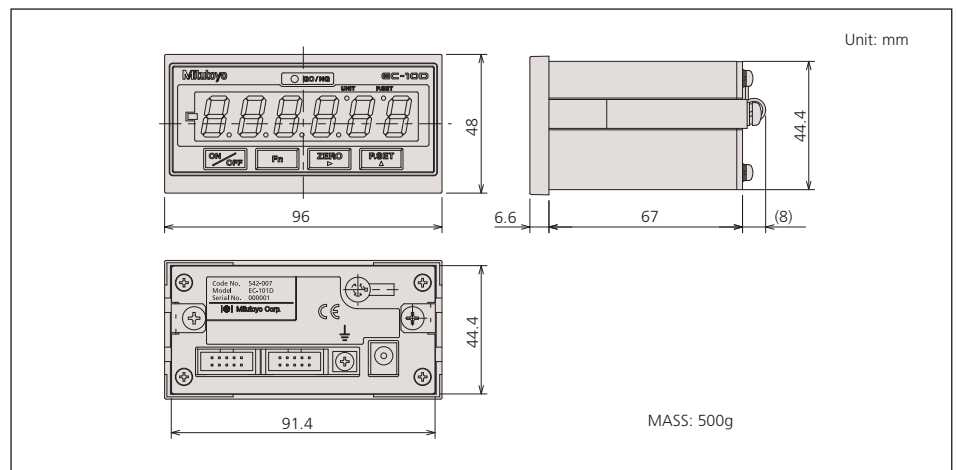
542-007



### SPECIFICATIONS

<b>Model</b>	EC-101D
<b>Order No.</b>	542-007A
Applicable input	Digimatic code (SPC)
Applicable gage	LGD, LGD-L, LGD-ML, LGS and SPC output gages.
Number of gage input	1
Resolution	.001", .0005", .0001", .00005" / 0.01mm, 0.001mm (Automatically set depending on the gage.)
Display	6-digit and a negative [-] sign LED (Amber, Green, Red)

### DIMENSIONS AND MASS





# EB Counter

## SERIES 542 — Assembly Type Display Unit with Multiple Limit Setting

### FEATURES

- Possible to produce 3-step/5-step X 7 kinds of tolerance output and limit value output independently for each of 7 channels.
- Provided with serial BCD output capability, which makes the connection to a programmable controller or personal computer, etc. possible with the minimum cabling requirement.
- Possible to perform dynamic measurement with the simplified analog output.
- Employed the DIN size (96X48mm) and mount-on-panel configuration, which greatly facilitates the incorporation into a system.



542-092



542-093

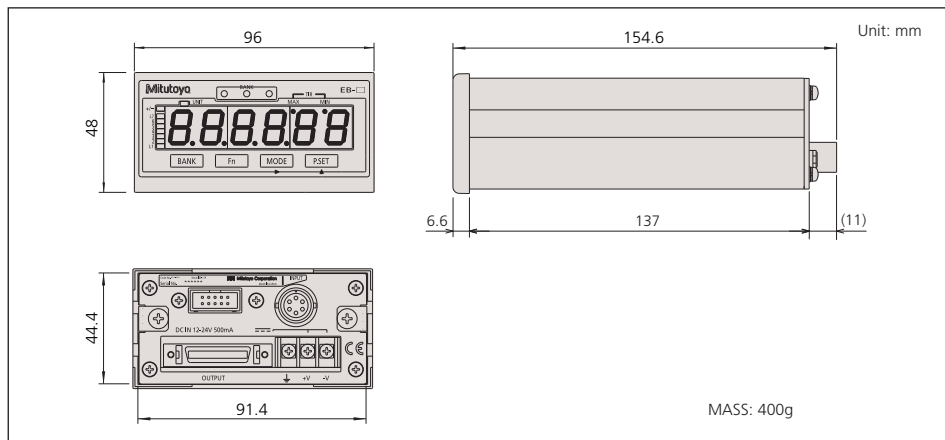


542-094

### SPECIFICATIONS

Model	EB-11P	EB-11Z	EB-11D
Order No.	542-092-2	542-094-2	542-093-2
Applicable input	Differential square-wave	Differential square-wave w/origin point mark	Digimatic code (SPC)
Applicable gage	LGK, LGF, LGB, LGE	LGF with origin point mark	LGD, LGS
Number of gage input	1		
Resolution	.0005", .0001", .00005", .000005" / 0.01mm, 0.005mm, 0.001mm, 0.0005mm		.0005", .0001", .00005" / 0.01mm, 0.001mm
Tolerance judgment display	LED display (3 steps: Amber, Green, Red/5 steps: Amber, Amber flash, Green, Red flash, Red)		

### DIMENSIONS AND MASS



### Function

Preset, tolerance judgment output (3/5-step X 7 kinds), limit value output (2 kinds independently for each of the 7 channels), peak (maximum, minimum, runout) measurement, diverse data output (serial BCD, simplified analog)

### Output

**Tolerance judgment:** L1 to L5, open-collector  
**Control:** Normal operation signal (NORMAL), open-collector

### External control signal input

Preset, display hold, peak value clear, tolerance judgment BANK switch, open-collector or no-voltage contact signal (with/without contact point)

### Interface

**Serial BCD:** Bit-serial format, open-collector  
**Analog output:** 2.5V + Counting value X voltage resolution (25mV/2.5mV): Full-scale 0 to 5V

### Digimatic input/output:

- Connecting to the external switch box (No. 02ADF180) makes it easy to enter tolerance limits and preset values. (Note) This can not be used when the gage is connected to a Mitutoyo DP-1VR Digimatic Mini-Processor
- Possible to connect with a Mitutoyo DP-1VR Digimatic Mini-Processor.
- Number of tolerance steps can be expanded by making a set of EB-D counters.

### Quantization error

±1 count

### Maximum input frequency

1.25MHz (The response speed depends on the gage being used.)  
 The response speed depends on the gage being used. (542-093)

### Power supply voltage

DC+12 to 24V

### Power consumption

6W (500mA) or less (Secure power supply more than 1A for each unit.)

### Optional Accessories

- 02ADB440:** I/O output connector
- 02ADF180:** 10-key unit
- 936937:** SPC cable (40"/1m)
- 965014:** SPC cable (80"/2m)
- 02ADD930:** Terminal block connecting cable
- 02ADN460:** AC adapter
- 02ZAA010:** Power cable



02ADB440

02ADN460

02ZAA010

# EG Counter

## SERIES 542 — Assembly Type Display Unit

### Function

Preset, direction switch, tolerance judgment (3/5-step, 3 kinds), peak (max., min., runout) measurement, constant number, smoothing, error display/output, protection over keys

### Output

**Tolerance judgment:** L1 to L5 (Switchover between open-collector output and BCD output by means of the parameter)

**Control:** NOM (normal signal) open-collector

**BCD:** 6-digit (positive/negative-true logic) open-collector (Switchover between tolerance judgment output by means of the parameter)

### External control signal input

Preset, display hold, peak value clear, tolerance judgment BANK switch

### Quantization error

±1 count

### Maximum input frequency

1.25MHz (The response speed depends on the gage being used.)

### Power supply voltage

DC+12 to 24V

### Power consumption

6W (500mA) or less (Secure power supply more than 1A for each unit.)

### Optional Accessories

**02ADD930:** Terminal connecting cable

**02ADB440:** I/O output connector

**02ADN460:** AC adapter

**02ZAA010:** Power cable



02ADB440

02ADN460

02ZAA010

### FEATURES

- Possible to produce 3-step/5-step X 3 kinds of tolerance output and BCD output.
- The smoothing function can reduce the fluctuation of display digits.
- Employed the DIN size (96X48mm) and mount-on-panel configuration, which greatly facilitates the incorporation into a system.



542-015



542-017

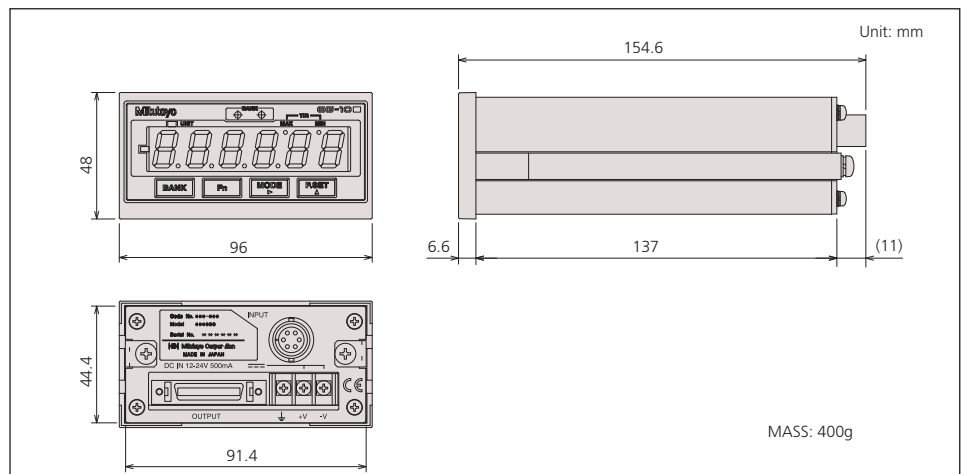


542-016

### SPECIFICATIONS

Model	EG-10P	EG-10Z	EG-10D
Order No.	542-015	542-017	542-016
Applicable input	Differential square-wave	Differential square-wave w/origin point mark	Digimatic code (SPC)
Applicable gage	LGK, LGF, LGB, LGE, LGM, LGH (excluding with origin point and sign wave types)	LGF with origin point mark	LGD, LGS
Number of gage input	1		
Resolution (Depending on the linear gage type connected)	.001", .0005", .0001", .00005", .00001", .000005" / 0.01mm, 0.005mm, 0.001mm, 0.0005mm, 0.0001mm		.001", .0005", .0001", .00005" / 0.01mm, 0.001mm
Tolerance judgment display	LED display (3 steps: Amber, Green, Red/5 steps: Amber, Amber flash, Green, Red flash, Red)		

### DIMENSIONS AND MASS



# EH Counter

## SERIES 542 — Multi-function Display Unit

### FEATURES

- DIN compatible Panel-mounting type and DIN size (144 x 72mm). It can be easily incorporated into each system instrument.
- This counter can be used on a desktop by mounting it on the supplied stand leg.
- The standard RS-232C interface allows easy communication with an external PC.
- The RS Link function permits multiple EH counters (6 units maximum) to be

connected with daisy chain and data to be input/output from one channel of the terminal RS-232C interface.

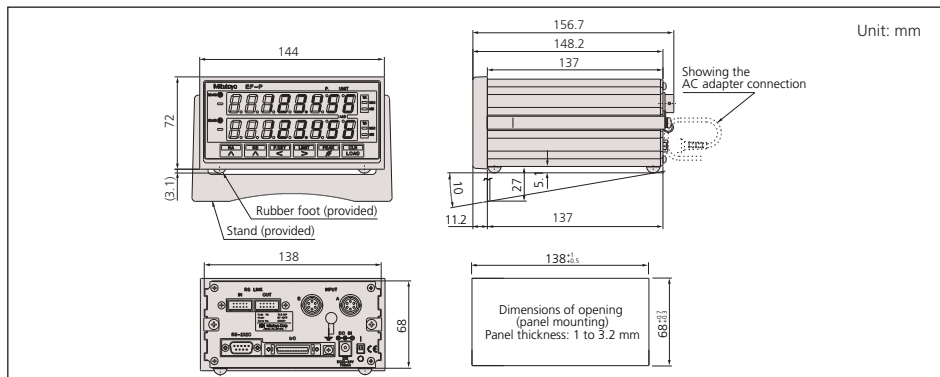
- The maximum value, minimum value, and TIR (runout) measurements are possible.
- The 2-gage input type can perform 2-axis display and make addition or subtraction calculations between 2 gages.



### SPECIFICATIONS

Model	EH-101P	EH-102P	EH-102Z	EH-102S	EH-102D
Order No.	542-075A	542-071A	542-073A	542-074A	542-072A
Applicable input	2.5MHz (Differential square-wave)			1MHz Differential sine-wave	Digimatic code SPC
Applicable gage	LGK, LGF with scale origin point mark, LGB, LGH (0.1um)		LGF with scale origin point mark, LGF 5um	LGH (0.01um)	LGD, LGS, ID
Number of gage input	1 (Single-display)		2 (Double-display)		
Resolution (Depending on the linear gage type connected)	.000005", .00005", .0005"/0.0001mm, 0.0005mm, 0.001mm, 0.005mm, 0.01mm			.000001"/0.1um, 0.01um	.0005" / 0.01mm
Mass	760g	800g	800g	900g	800g
Tolerance judgment display	LED display (3 step: Amber, Green, Red / 5 step: Amber, Amber flash, Green, Red flash, Red)				

### DIMENSIONS



### Function

Zerose, preset, limit setting (3 or 5-step), GO/±NG judgement, GO/±NG signal output, MAX/MIN/TIR (runout) measurement, counting direction switching, double reading, mm/inch switching, sum/difference calculation of 2 gages (542-071A, 542-073A, 542-074A, 542-072A only), output mode selection

### Output

I/O: Tolerance judgment output (3/5 stages), normal operation output RS-232C or Digimatic code (selectable): Various measurement data

### External Control

I/O: Preset, Data hold and Error clear RS-232C: Displayed value output, MAX/MIN/TIR switching, Zero set, peak value clear, preset value input, tolerance value input and error clear

### RS Link

Up to six EH counters may be connected via one RS-232C port.(daisy chain)

### Error display/output

Power-supply voltage error, overspeed error, overflow error, gage error, communication error, and tolerance setting error

### Power supply:

Standard accessory  
Via AC adaptor (12 - 24V DC, 700mA (max))

### Optional Accessories

- 02ADB440: I/O output connector
- 02ADF180: 10-key unit
- 936937: SPC cable (40"/1m)
- 965014: SPC cable (80"/2m)
- 02ADD930: Terminal block connecting cable
- 02ADN460: AC adapter
- 02ZAA010: Power cable



# EV Counter

## SERIES 542 — For Multi-gage System

### Function

GO/±NG judgment, GO/±NG signal output, MAX/MIN/TIR (runout) measurement, counting direction switching, mm/inch switching, calculation of sum, average, maximum, minimum and maximum difference between specified axes, and output-mode selection

### Output

I/O: Normal operation output and GO/±NG signal (three steps), measurement data (BCD code), or 21-stage segment output (selectable) RS-232C: Various measurement data

### External Control

I/O: Axis designation, preset, data hold, and error clear RS-232: Displayed value output command, MAX/MIN/TIR switching and peak value clear, zero set, preset value input, tolerance value input, error clear, and command to output calculated value between specified axes

### RS Link

Up to 10 EV counters can be connected via a single RS-232 port. (daisy chain) EV and EH counters can be mixed (in which case a total of six counters can be connected).

### Error display/output

Power-supply voltage error, overspeed error, overflow error, gage error, communication error, and tolerance setting error

### Maximum input frequency

1.25MHz (differential square-wave): Max counting Speed : 5MHz

### Power supply

Terminal block (M3 screws), DC +12 to +24V, 700mA (max.)

### Optional Accessories

**02ADB440:** I/O output connector

**02ADD400:** D-EV (external display unit)

**936937:** RS link connector cable (40"/1m)

**965014:** RS link connector cable (80"/2m)

**357651:** AC adapter (must order 02ADD930 and 02AAA010)

**02ADD930:** Terminal connecting cable

**02ADN460:** AC adapter

**02ZAA010:** Power cable



### FEATURES

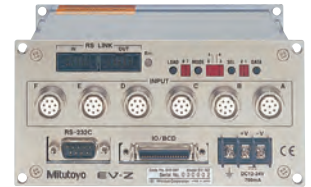
- Up to six gages can be connected to one unit.
- Able to connect up to 10 EV counters to one personal computer using the RS link function to facilitate the configuration of a multi-point measurement system comprising a maximum of 60 gages.
- A range of output modes to choose from; I/O output for tolerance judgment and segment output, BCD data output and RS-232 output are available.
- Peak-hold measurements are possible for maximum value, minimum value, runout (TIR), etc.
- Able to calculate a sum, average, maximum, minimum, maximum difference, etc., between gages connected to the same unit.



542-063



542-064



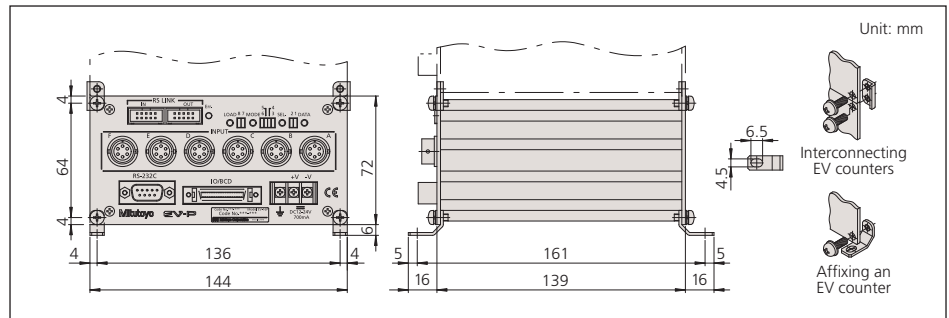
542-067

### SPECIFICATIONS

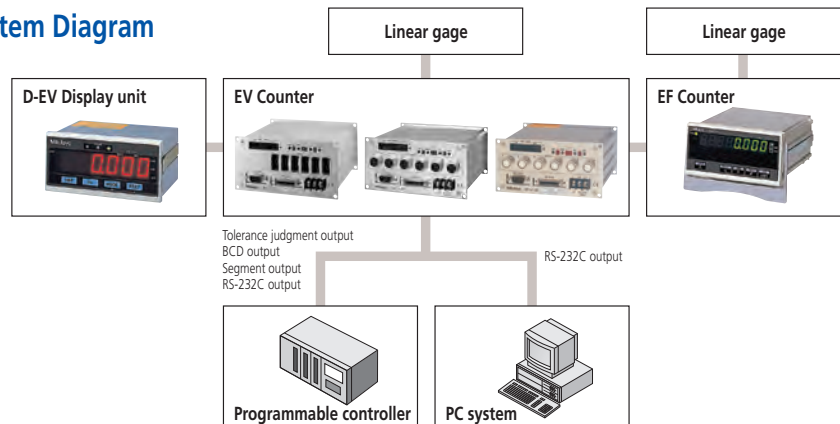
Model	EV-16P	EV-16Z	EV-16D
Order No.	542-063	542-067	542-064
Applicable input	Differential square-wave		Digimatic code (SPC)
Applicable gage	LGB (ex. 0.0001mm resolution), LGF, LGE, LG	LGF with origin point mark	LGD, LGD-M, LGS
Number of gage input	6		
Resolution (internal) - no display capability	.000005", .00005", .0005" / 0.0005mm, 0.001mm, 0.005mm, 0.01mm		.00005"* , .0005" / 0.001mm* , 0.01mm
Mass	910g	910g	830g

\*: Will not be indicated when combined with a LG gage.

### DIMENSIONS



### System Diagram



Mitutoyo

# D-EV Display Unit

## FEATURES

- Display unit for the EV counter.
- Using this display allows various settings for the EV counter without a personal computer or other equipment.
- Able to display each axis measurement value and GO/NG judgment result, total GO/NG judgment result for all axes, setting details, and errors.

## SPECIFICATIONS

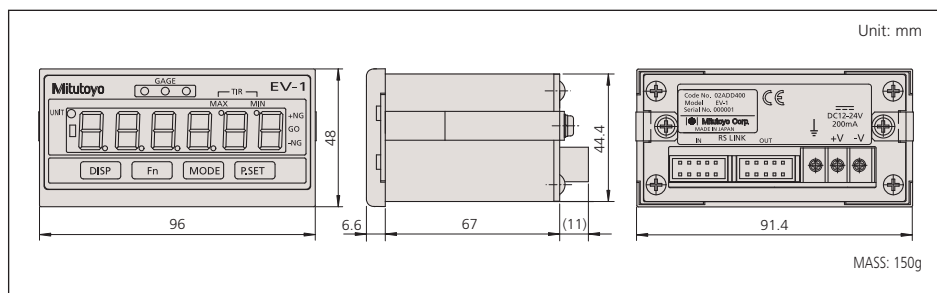
Model	D-EV
Order No.	02ADD400

- DIN compatible compact panel-mounting - cutout dimensions  $45^{+0.8} \times 92^{+0.8}$
- The required power supply is DC +12 to +24V, 200mA (357651+02AAA010) at the terminal block (02ADD930).



02ADD400

## DIMENSIONS AND MASS



# SENSORPAK

This software facilitates the loading of measurement data from a linear gage counter with the RS-232C interface into user's personal computer.

## FEATURES

- Maximum 60 channels of measuring points can be processed.
- Possible to perform arithmetical calculation and maximum width calculation using the measurement data.
- Possible to export the measurement data into MS-Excel.
- Diverse graphic functions (numeric value display, meter display, bar-graph display, overall judgment display)
- Frequency of data loading: Max. 9999 times (60ch) to 60000 times (6CH)

## SPECIFICATIONS

Order No.	Description
54SAA622	Sensorpak



the standard in world metrology software  
**SENSOR**



## Technical Data

Number of connectable units: One display unit allows external display and setting for one EV counter.  
 Displayed digits: It uses a single sign plus six digits (EV counter operates on eight-digit data internally but displays only the last six digits).  
 LED display: Channel display (also for display of judgment result): 3 (three-color LED) Measurement mode display (current, maximum, minimum, and runout): 2 Status display: 1 (two-color)  
 Operating switches: 4  
 Switches and their functions: Channel switching, measurement mode switching (current value, maximum value, minimum value and runout), parameter setting, preset, and tolerance setting  
 Input/output: RS Link connectors: 1 in and 1 out.  
 Error display: Overspeed, gage error and others.  
 Power supply: Terminal block (M3 screws), DC +12 to +24V, 200mA

## Optional Accessories

- 527428A:** AC adapter (must order 02ADD930)
- 357651:** AC adapter (must order 02ADD930 and 02AAA010)
- 02ADD930:** Terminal connecting cable
- 02ADN460:** AC adapter
- 02ZAA010:** Power cable

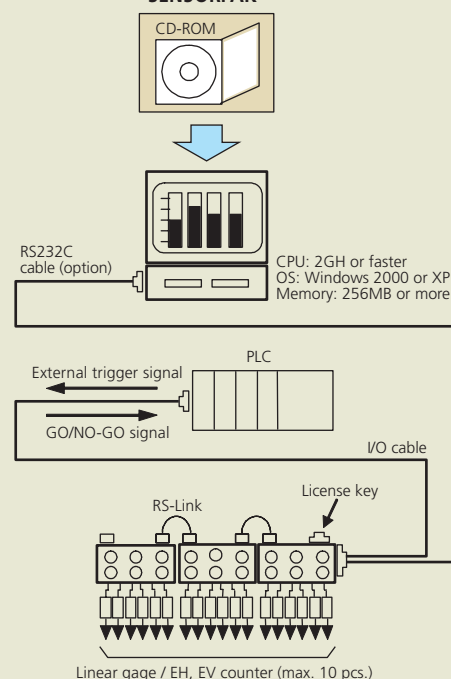


02ADB440

02ADN460

02ZAA010

## SENSORPAK



# Litematic and Litematic Head

## SERIES 318 — High-resolution Measuring Unit

### Technical Data

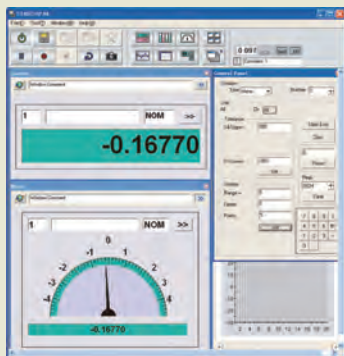
Accuracy: Refer to the list of specifications.  
(excluding quantizing error)  
Resolution: Refer to the list of specifications.  
Repeatability:  $\sigma=0.05\mu\text{m}$   
Display unit: 8 digits and 14mm character height  
Stroke: 51.2mm (using standard contact point)  
Measuring force: 0.01N: **318-221A**  
0.15N: **318-222A**  
1N: **318-223A**  
0.01N: **318-226A**  
0.15N: **318-227A**  
1N: **318-228A**  
Spindle feed speed: 2mm/s, 4mm/s, 8mm/s  
Length standard: Photoelectric linear encoder  
Contact point:  $\phi 3\text{mm}$  carbide ball  
Power supply: 85 - 264V AC

### Optional Accessories

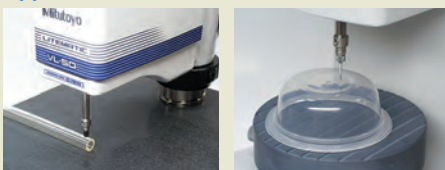
**936937:** SPC cable (1mm)  
**965014:** SPC cable (2mm)  
**957460:** 300x250mm granite stand with bracket for Litematic Head  
**101118:** Contact point, Shell  
**120066:** Contact point,  $\phi 0.45\text{mm}$  needle (carbide)  
**120059:** Contact point,  $\phi 7.0\text{mm}$  spherical (carbide)  
**120060:** Contact point,  $\phi 10.5\text{mm}$  spherical (carbide)  
**937179T:** Foot switch  
**264-504-5A:** Digimatic Mini-processor DP-1VR  
**264-012-10:** Input tool (for USB port)  
**02ADM260-2:** SENSORPAK (data capture software w/ I/O cable)



\* Digimatic output is to six significant figures.



### Applications



### FEATURES

- The Litematic is designed for measuring easily-deformed workpieces and high-precision parts such as pin gages, thin-wall bearings, plastic parts, and springs.
- Extra-low measuring force of 0.01N (1gf).
- Super Litematic employs a unique Laser Holescale as the length standard, ensuring excellent measuring accuracy and repeatability.
- Ceramic anvil is free from corrosion and easy to maintain (Litematic).
- The measuring unit can be mounted onto fixtures or an optional stand to allow great flexibility of use (Litematic Head).
- Includes SPC output.



**318-221A**  
Litematic



**318-226A**  
Litematic Head

Shown with optional granite stand

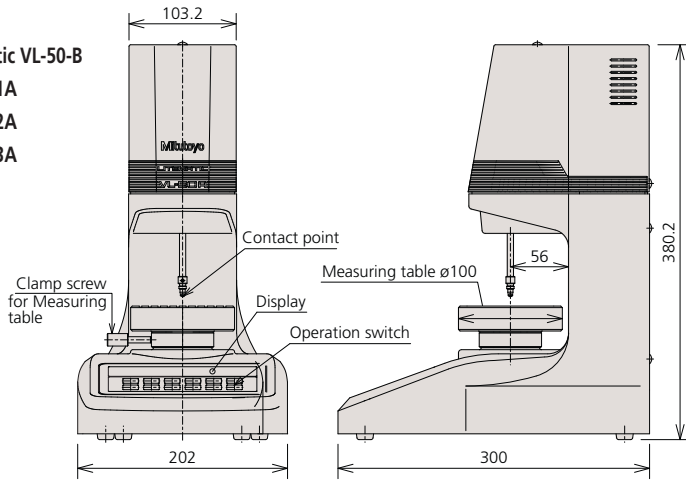
### SPECIFICATIONS

Range	Order No.	Resolution	Accuracy (at 20°C±1°C)**	Remarks
0 - 50mm	<b>318-221A</b>	0.01 $\mu\text{m}$ , 0.1 $\mu\text{m}$ , 1 $\mu\text{m}$ , 0.5 $\mu\text{inch}$ , 5 $\mu\text{inch}$ , 50 $\mu\text{inch}$ switchable	(0.5+L/100) $\mu\text{m}$ L=Measured length (mm)	1 piece unit w/ $\phi 100\text{mm}$ grooved ceramic anvil
	<b>318-222A</b>			
	<b>318-223A</b>			
	<b>318-226A</b>			
	<b>318-227A</b>			
	<b>318-228A</b>			Separate Type

# DIMENSIONS

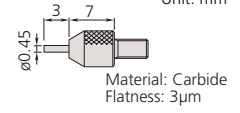
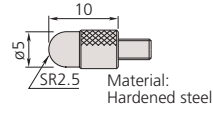
Unit: mm

**Litematic VL-50-B**  
 318-221A  
 318-222A  
 318-223A



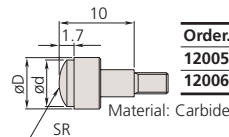
## Interchangeable contact points

Unit: mm



Order No.	Measuring force
101118	0.02N

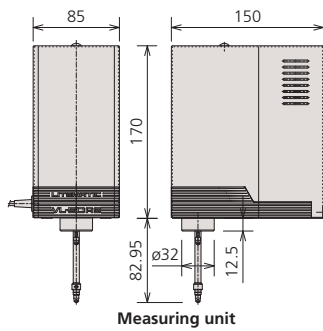
Order No.	Measuring force
120066	0.01N



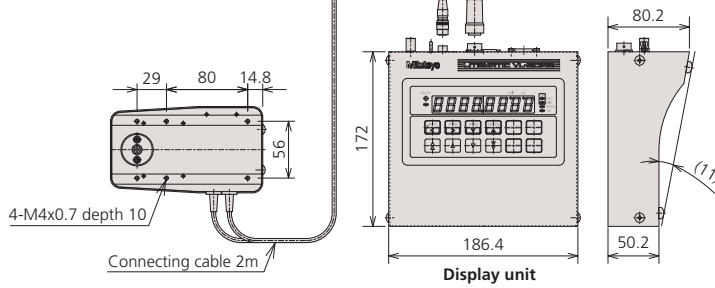
Order.No.	Measuring force	D	d	SR
120059	0.03N	$\phi 7.5$	$\phi 6.5$	7
120060	0.06N	$\phi 10.5$	$\phi 9.5$	10

**Litematic Head VL-50S-B**

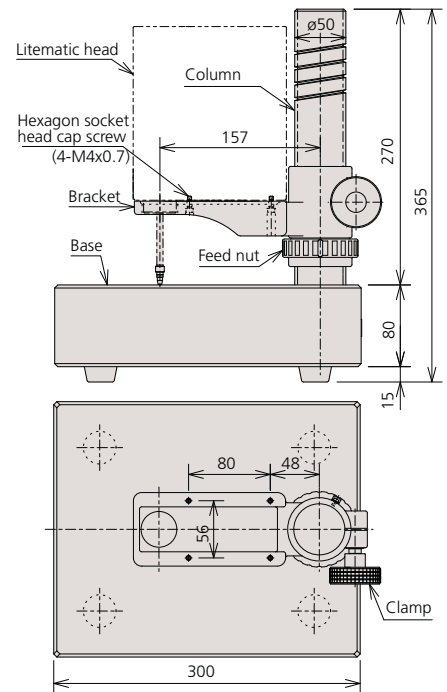
318-2226A  
 318-2227A  
 318-2228A



Measuring unit



**Optional stand for VL-50S-B: 957460**





# Laser Scan Micrometer Selection Guide

## MEASURING UNITS

Appearance	Model	Laser Classification	Measuring range	Resolution (Selectable)
	LSM-902*	Visible (650nm), IEC Class 2/ FDA Class II	0.1 - 25mm (.004" - 1.0")	0.01μm - 10μm (.000001" - .0005")
	LSM-500S	Visible (650nm), IEC Class 2/ FDA Class II	0.005 - 2mm (.0002" - .08")	0.01μm - 10μm (.000001" - .0005")
	LSM-501S	Visible (650nm), IEC Class 2/ FDA Class II	0.05 - 10mm (.002" - .4")	0.01μm - 10μm (.000001" - .0005")
	LSM-503S	Visible (650nm), IEC Class 2/ FDA Class II	0.3 - 30mm (.012" - 1.18")	0.02μm - 100μm (.000001" - .005")
	LSM-506S	Visible (650nm), IEC Class 2/ FDA Class II	1 - 60mm (.04" - 2.36")	0.05μm - 100μm (.000002" - .005")
	LSM-512S	Visible (650nm), IEC Class 2/ FDA Class II	1 - 120mm (.04" - 4.72")	0.1μm - 100μm (.000005" - .005")
	LSM-516S	Visible (650nm), IEC Class 2/ FDA Class II	1 - 160mm (.04" - 6.30")	0.1μm - 100μm (.000005" - .005")
 With display unit	LSM-9506 Measuring unit - display unit one-piece structure for bench- top use only	Visible (650nm), IEC Class 2/ FDA Class II	0.5 - 60mm (.02" - 2.36")	0.05μm - 100μm (.000002" - .005")

## DISPLAY UNITS

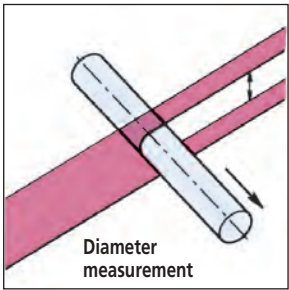
Appearance	Model	Type	Application	Interface units equipped
	LSM-6200 LSM-6900*	Multi-function type	Bench-top use	<ul style="list-style-type: none"> <li>• RS-232C</li> <li>• I/O</li> <li>• Analog output</li> </ul>
	LSM-5100**	Compact type (Low cost)	Assembly/ bench-top use (DIN size)	<ul style="list-style-type: none"> <li>• RS-232C</li> <li>• I/O</li> <li>• Analog output</li> </ul>

\*LSM-902 and LSM-6900 are factory-set package.

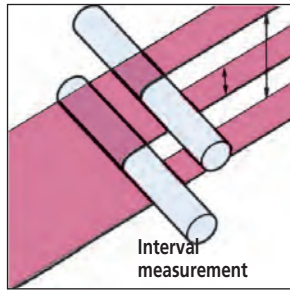
\*\*When connecting with the LSM-500S series, the scanning speed becomes 1600 scans/sec.



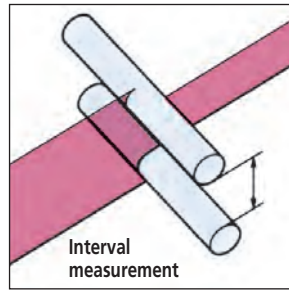
# Laser Scan Micrometer



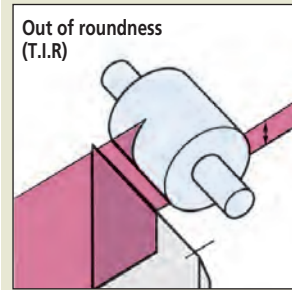
Enamel wire (Coated wire)  
Cable  
Spring wire  
Tungsten wire  
Pressure hose



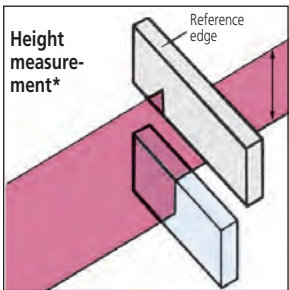
Pins located in parallel



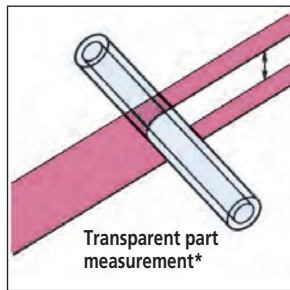
Gap of rollers



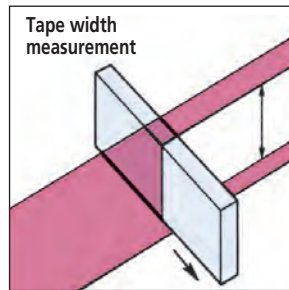
Rubber roller  
Roller bearing  
Motor shaft  
Reference edge



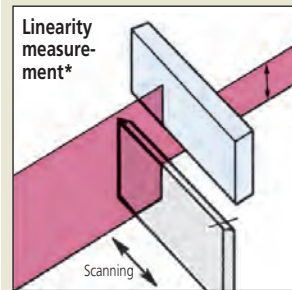
\*Using offset function



Optical fiber  
Glass tube  
\*Only segment Nos. 1 and 2 can be used.

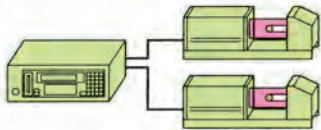


Tape  
Belt  
Bracket cable

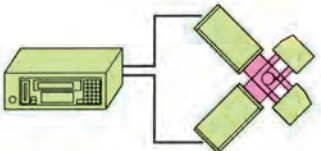


## Dual-Unit Measurement:

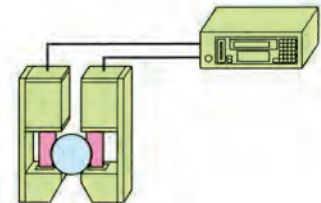
By using an optional dual-type add on unit (02AGP150), one display unit can process the measurement data from two measuring units. e.g.) Two measurements with a single display unit



e.g.) XY measurement with a display unit  $[X-Y \text{ or } (X + Y)/2]$



e.g.) Two laser units used to measure large diameter workpieces



## Dual-Program Measurement:

Two measurement programs with different conditions are set, and can be performed at the same time. e.g.) Measurement of two dimensions



PROG. 0 (segment No. 2 is ON.) and PROG. 5 (segment No. 4 is ON.)



This LSM conforms to the US CDRH regulations in 21 CFR 1040.

# Laser Scan Micrometer LSM-9506

## SERIES 544 — Bench Top Type Non-contact Measuring System



LSM-9506

### SPECIFICATIONS

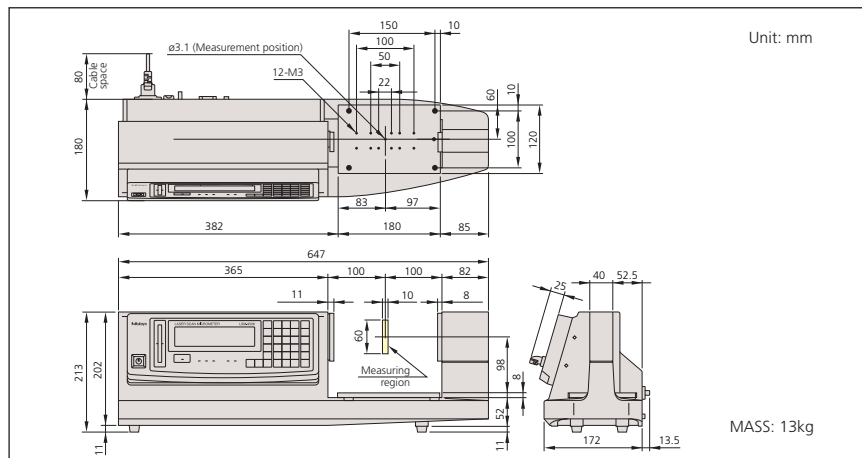
<b>Model</b>	<b>LSM-9506</b>	
<b>Order No.</b>	<b>544-116-1A</b>	
Measuring range	.02 - 2.36" (0.5 - 60mm)	
Measuring area	.02 x 2.36" (5 x 60mm) (*1)	
Scanning Rate	1600/sec	
Resolution	.00002 to .005" (0.00005 to 0.1mm) [Selectable]	
Repeatability	± .00003" (±0.6μm) (±2 σ measuring rate: 0.32s)	
Accuracy	Linearity (*2) ± .0001" (±2.5μm) The optical axis direction ± .0001" (±2.5μm) The scanning direction ±(.00008+L/10000)" [L:inch] (*3) ±(2.0+L/10)μm [L:mm] (*3)	
Laser type	Visible semiconductor laser Wavelengths: 670nm Scanning speed: 8900"/s (226m/s)	
Display	Fluorescent display 16-digit+11-digit, guidance LEDs	Offset Setting and Mastering Reference Value Setting
Measuring function	Segment designation: 1 to 7 (1 to 3 for Transparent) 10 Program storage (PROG. 0 to PROG. 9) 255 Edge Designations can be detected Multi Limit GO/±NG Tolerance Judgment (up to 7 intervals) Dual-Axis LED Display	Automatic Workpiece Detection Dual-Gage Calibration Inch/mm Conversion Abnormal Data Elimination Dual Program Measurement Statistical Processing Workpiece Position display Foot-switch Connector
Data output standard	RS-232C, I/O Analog Interface, SPC	
Power Supply	AC 100V - 240V ±10% 50/60Hz 40VA	
Power Cord	930966	
Power Switch	Key switch use	
Operating Environment	32~104°F(0~40°C), 35 - 85% RH (without condensation)	

### Optional Accessories

- 02AGD170:** Calibration gage set for LSM-9506
- 02AGD600B:** Thermal printer (w/120V AC adapter)

(\*1): The area given by [measuring range on the optical axis] x [Measuring range in the scanning direction].  
 (\*2): Specified at the center of the measurement region.  
 (\*3): L=Deviation between the center of workpiece and the optical axis. (See fig. 1)

### DIMENSIONS AND MASS



# Laser Scan Micrometer LSM-902 / 6900

SERIES 544 — Ultra-high Accuracy Non-contact Measuring System



LSM-6900 display unit

544-496A

LSM-902 measuring unit

## SPECIFICATIONS

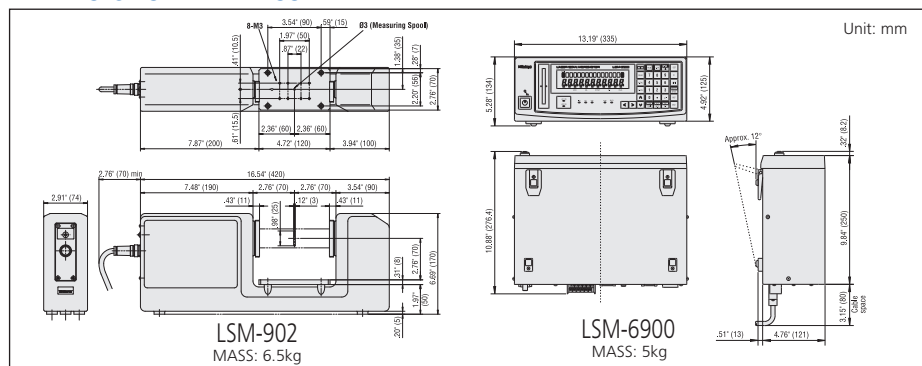
LSM-902	
Measuring range	.004 - 1.0" (0.1 - 25mm)
Resolution	.000001 to .0005" (0.00001 to 0.01mm) [Selectable]
Repeatability* <sup>1</sup>	± .000002" (±0.05μm)* <sup>2</sup>
Linearity* <sup>1</sup>	Whole range
	Small range
Positional error* <sup>1</sup> * <sup>5</sup>	± .000020" (±0.5μm)
Measuring region	± .6 x 1.0" (±1.5 x 25mm)* <sup>6</sup>
Number of scans	800/sec
Laser wavelength	650nm [Visible LD], 1.5mW (peak)
Laser scanning speed	2240"/sec (56m/sec)
LSM-6900	
Display	Fluorescent display 16-digit + 11 digit, Guidance LEDs
Measuring function* <sup>7</sup>	Segment designation
	Edge designation
	Averaging method
Scanning signal monitor connector	Provided as standard (with the plug)
Remote interlock connector	Provided as standard (with the plug)
Powerswitch	Key switch used
Built-in interface	RS-232C; Foot switch connector; I/O analog interface
Optional interface	DCU slot
	Expansion slot (1-slot)
Power supply	AC 100V - 240V±10%, 50/60Hz, 40VA

## Optional Accessories

- 02AGD180: Calibration gage set for LSM-902/6900
- 02AGD270: Workstage
- 02AGD280: Adjustable workstage
- 02AGD600B: Thermal printer (w/120VAC adapter)

\*<sup>1</sup> Accuracy inspection environment/Temperature 20°C±1°C, Humidity: 50%±10%.  
 \*<sup>2</sup> The repeatability is determined by the value for ±2σ- at the measurement interval of 1.28 sec.  
 \*<sup>3</sup> Specified at the center of the measurement region.  
 \*<sup>4</sup> ΔD: Diameter difference to master gage.  
 \*<sup>5</sup> An error due to workpiece shift either in the optical axis direction or in the scanning direction.  
 \*<sup>6</sup> The area given by [measuring range on the optical axis] x [measuring range in the scanning direction.]  
 \*<sup>7</sup> The combination of functions is limited, details are described in the user's manual.

## DIMENSIONS AND MASS



# Laser Scan Micrometer LSM-500S

SERIES 544 — High Accuracy Non-contact Measuring System



544-532

## Optional Accessories for LSM-500S

- 02AGD110:** Calibration gage set (ø0.1mm, ø2.0mm)
- 02AGD200:** Wire guiding pulley
- 02AGD220:** Air blow cover
- 957608:** Air cleaner for air blow cover
- 02AGN780A:** Extension signal cable 5m
- 02AGN780B:** Extension signal cable 10m
- 02AGN780C:** Extension signal cable 15m

## SPECIFICATIONS

Model		LSM-500S
Order No.		544-532
Applicable display unit		LSM-6200
Laser Scanning Range	inch(mm)	Up to .49" (12.5mm) (Detecting regions are limited to about .4" (10mm) approx.)
Measuring range	inch(mm)	.0002 to .08" (0.005 to 2mm) .004 to .08" (0.1 to 2mm) [*1]
Resolution	inch(mm)	.00001 to .0005" (0.00001 to 0.01mm) [Selectable]
Repeatability [*2]	inch(µm)	±.0000012" (±0.03µm) [*3]
Linearity [*2]	inch(µm)	±.000012" (±0.3µm) [*4]
Positional error [*2][*5]	inch(µm)	±.000016" (±0.4µm)
Measuring region	inch(mm)	.04 x .08" (1 x 2mm) [Optical axis direction x Scanning direction]
Number of scans for averaging	scan	16 to 2048 [*6]
Laser classification		Class 2 (Max. Output: 1.3mW with a scanning laser, semiconductor laser; wavelength 650nm)
Number of laser scans	/sec	3200
Laser scanning rate	inch/sec (m/sec)	2992"/sec (76m/sec)
Protection level		IP64
Operation environment	Temperature	0°C to 40°C
	Humidity	35%RH to 85%RH [without condensation]
	Altitude	2000m or less
Storage environment	Temperature	-15°C to 55°C
	Humidity	35%RH to 85%RH [without condensation]

\*[1]: Measuring range available when set to "No extra-fine wire measurement" or "Edge specification" in the basic setup mode.

\*[2]: Environment for accuracy validation: 20°C ± 1°C temperature; 50% ± 10% humidity.

\*[3]: The value of ±2σ with a 2mm-diameter gage has been measured for two minutes with a measurement interval of 0.32 seconds, where σ is the standard deviation.

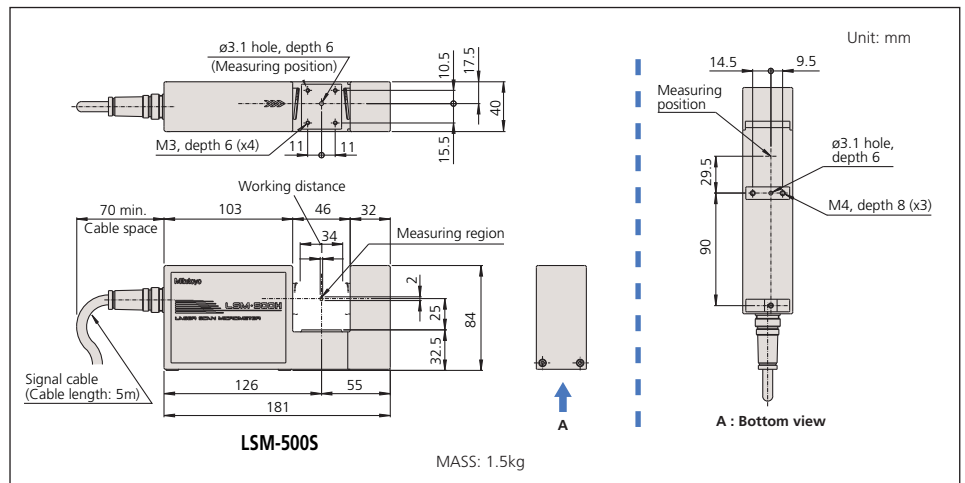
\*[4]: The value of measurements in the center of the measurement region.

\*[5]: Error due to the positional shift of the workpiece in the optical axis direction or scanning direction

\*[6]: Averaging scans between 1 and 8 times can be made if "No extra-fine wire measurement" is specified in the basic setup mode.

The measuring range, however, is limited to 0.1mm to 2mm in this case.

## DIMENSIONS AND MASS



# Laser Scan Micrometer LSM-501S

SERIES 544 — High Accuracy Non-contact Measuring System



544-534



## SPECIFICATIONS

Model		LSM-501S
Order No.		544-534
Applicable display unit		LSM-6200
Laser Scanning Range	inch(mm)	Up to .74" (19mm)
Measuring range	inch(mm)	.002 to .4" (0.05 to 10mm)
Resolution	inch(mm)	.000001 to .0005" (0.00001 to 0.01mm) [Selectable]
Repeatability [*1]	inch(μm)	±.0000016" (±0.04μm) [*2]
Linearity [*1]	Whole range	inch(μm) ±.00002" (±0.5μm) [*3]
	Narrow measuring range	μm ±(0.3 + 0.1 ΔD) ——— [*3][*4] inch ±(.000012" + .000004" ΔD)
Positional error [*1][*5]	inch(μm)	±.00002" (±0.5μm)
Measuring region	inch(mm)	.08 × .4" (2 × 10mm) (Measuring region: .002 to .004" (0.05 to 0.1mm)) .16 × .4" (4 × 10mm) (Measuring region: .004 to .4" (0.1 to 10mm)) [Optical axis direction × Scanning direction]
Number of scans for averaging	scan	1 to 2048
Laser classification		Class 2 (Max. Output: 1.3mW with a scanning laser, semiconductor laser: wavelength 650nm)
Number of laser scans	/sec	3200
Laser scanning rate	inch/sec (m/sec)	4449"/sec (113m/sec)
Protection level		IP64
Distance between the laser emission unit and reception unit	inch(mm)	Standard 2.68" (68mm) Max. 3.93" (100mm) [*6]
Operation environment	Temperature	0°C to 40°C
	Humidity	35%RH to 85%RH [without condensation]
	Altitude	2000m or less
Storage environment	Temperature	-15°C to 55°C
	Humidity	35%RH to 85%RH [without condensation]

[\*1] Environment for accuracy validation: 20°C ± 1°C temperature; 50% ± 10% humidity.

[\*2] A value of ±2 with a 10mm-diameter gage has been measured for two minutes with a measurement interval of 0.32 seconds, where σ is the standard deviation.

[\*3] The value of measurements in the center of the measurement region.

[\*4] ΔD is the difference in diameter of the workpiece and the master gage.

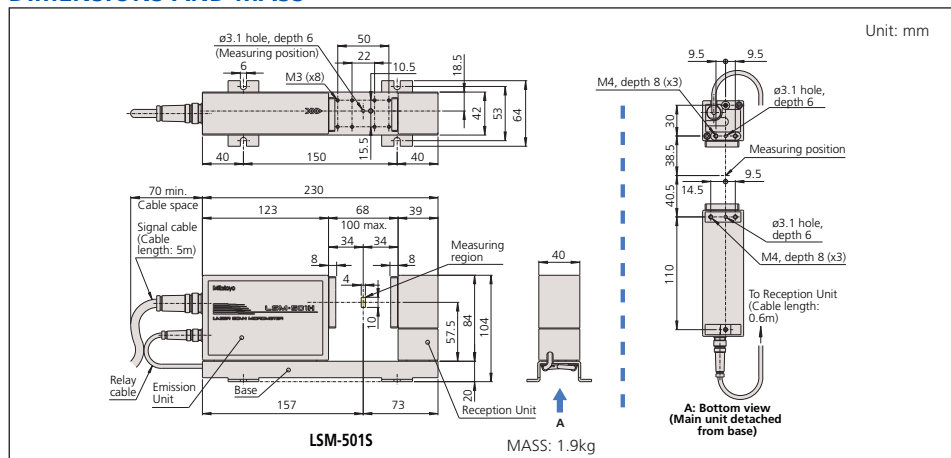
[\*5] Error due to the positional shift of workpiece in optical axis direction or scanning direction.

[\*6] The distance between the laser emission unit and reception unit other than the standard, may affect the accuracy.

## Optional Accessories for LSM-501S

- 02AGD120:** Calibration gage set (ø0.1mm, ø10mm)
  - 02AGD210:** Wire guiding pulley
  - 02AGD400:** Adjustable workstage
  - 02AGD440:** Center support\*
  - 02AGD450:** Adjustable V-block\*
  - 02AGD230:** Air blow cover
  - 957608:** Air cleaner for air blow cover
  - 02AGC150A:** Extension relay cable 1m
  - 02AGN780A:** Extension signal cable 5m
  - 02AGN780B:** Extension signal cable 10m
  - 02AGN780C:** Extension signal cable 15m
- \*Use with an adjustable workstage.

## DIMENSIONS AND MASS





# Laser Scan Micrometer LSM-503S

SERIES 544 — High Accuracy Non-contact Measuring System



## SPECIFICATIONS

Model		LSM-503S
Order No.		544-536
Applicable display unit		LSM-6200
Laser Scanning Range		inch(mm) Up to 1.3" (34mm)
Measuring range		inch(mm) .012 to 1.18" (0.3 to 30mm)
Resolution		inch(mm) .000001 to .005" (0.00002 to 0.1mm) [Selectable]
Repeatability [*1]		inch(μm) ±.0000044" (±0.11μm) [*2]
Linearity [*1]	Whole range	inch(μm) ±.00004" (±1.0μm) [*3]
	Narrow measuring range	μm ±(0.6 + 0.1 ΔD) ————— [*3][*4] inch ±(.000024" + .000004" ΔD)
Positional error [*1][*5]		inch(μm) ±.00006" (±1.5μm)
Measuring region		inch(mm) .08 x .4" (2 x 10mm) (Measuring region: .002 to .004" (0.05 to 0.1mm)) .16 x .4" (4 x 10mm) (Measuring region: .004 to .4" (0.1 to 10mm)) [Optical axis direction x Scanning direction]
Number of scans for averaging		scan 1 to 2048
Laser classification		Class 2 (Max. Output: 1.3mW with a scanning laser, semiconductor laser: wavelength 650nm)
Number of laser scans		/sec 3200
Laser scanning rate		inch (m/sec) 4449"/sec (113m/sec)
Protection level		IP64
Distance between the laser emission unit and reception unit		inch(mm) Standard 5.12" (130mm) Max. 13" (350mm) [*6]
Operation environment	Temperature	0°C to 40°C
	Humidity	35%RH to 85%RH [without condensation]
	Altitude	2000m or less
Storage environment	Temperature	-15°C to 55°C
	Humidity	35%RH to 85%RH [without condensation]

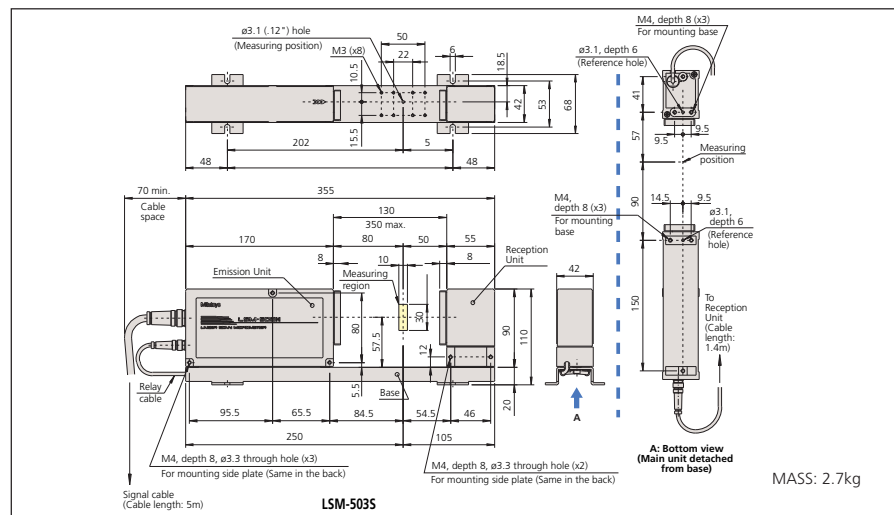
### Optional Accessories for LSM-503S

- 02AGD130: Calibration gage set (ø1mm, ø30mm)
- 02AGD490: Adjustable workstage
- 02AGD440: Center support\*
- 02AGD450: Adjustable V-block\*
- 02AGD240: Air blow cover
- 957608: Air cleaner for air blow cover
- 02AGC150A: Extension relay cable 1m
- 02AGC150B: Extension relay cable 3m
- 02AGC150C: Extension relay cable 5m
- 02AGN780A: Extension signal cable 5m
- 02AGN780B: Extension signal cable 10m
- 02AGN780C: Extension signal cable 15m
- 02AGN780D: Extension signal cable 20m

\*Use with an adjustable workstage.

- \*[1] Environment for accuracy validation: 20°C ± 1°C temperature; 50% ± 10% humidity.
- \*[2] A value of ±2 with a 10mm-diameter gage has been measured for two minutes with a measurement interval of 0.32 seconds, where σ is the standard deviation.
- \*[3] The value of measurements in the center of the measurement region.
- \*[4] ΔD is the difference in diameter of the workpiece and the master gage.
- \*[5] Error due to the positional shift of workpiece in optical axis direction or scanning direction.
- \*[6] The distance between the laser emission unit and reception unit other than the standard, may affect the accuracy.

## DIMENSIONS AND MASS



# Laser Scan Micrometer LSM-506S

SERIES 544 — High Accuracy Non-contact Measuring System



## SPECIFICATIONS

Model		LSM-506S	
Order No.		544-538	
Applicable display unit		LSM-6200	
Laser Scanning Range	inch(mm)	Up to 2.6" (66mm)	
Measuring range	inch(mm)	.04 to 2.36" (1 to 60mm)	
Resolution	inch(mm)	.000002 to .005" (0.00005 to 0.1mm) [Selectable]	
Repeatability [*1]	inch(μm)	±.000014" (±0.36μm) [*2]	
Linearity [*1]	Whole range	inch(μm)	±.00012" (±3.0μm) [*3]
	Narrow measuring range	μm	±(1.5 + 0.5 ΔD) [3][*4]
	inch	±(.00012" + .00002" ΔD)	
Positional error [*1][*5]	inch(μm)	±.00016" (±4.0μm)	
Measuring region	inch(mm)	.8 x 2.36" (20 x 60) [Optical axis direction × Scanning direction]	
Number of scans for averaging	scan	1 to 2048	
Laser classification		Class 2 (Max. Output: 1.3mW with a scanning laser, semiconductor laser: wavelength 650nm)	
Number of laser scans	/sec	3200	
Laser scanning rate	inch/sec (m/sec)	17795"/sec (452m/sec)	
Protection level		IP64	
Distance between the laser emission unit and reception unit	inch(mm)	Standard 10.75" (273mm) Max. 27" (700mm) [*6]	
Operation environment	Temperature	0°C to 40°C	
	Humidity	35%RH to 85%RH [without condensation]	
	Altitude	2000m or less	
Storage environment	Temperature	-15°C to 55°C	
	Humidity	35%RH to 85%RH [without condensation]	

[\*1] Environment for accuracy validation: 20°C ± 1°C temperature; 50% ± 10% humidity.

[\*2] A value of ±2σ with a 60mm-diameter gage has been measured for two minutes with a measurement interval of 0.32 seconds, where σ is the standard deviation.

[\*3] The value of measurements in the center of the measurement region.

[\*4] ΔD is the difference in diameter of the workpiece and the master gage.

[\*5] Error due to the positional shift of workpiece in optical axis direction or scanning direction.

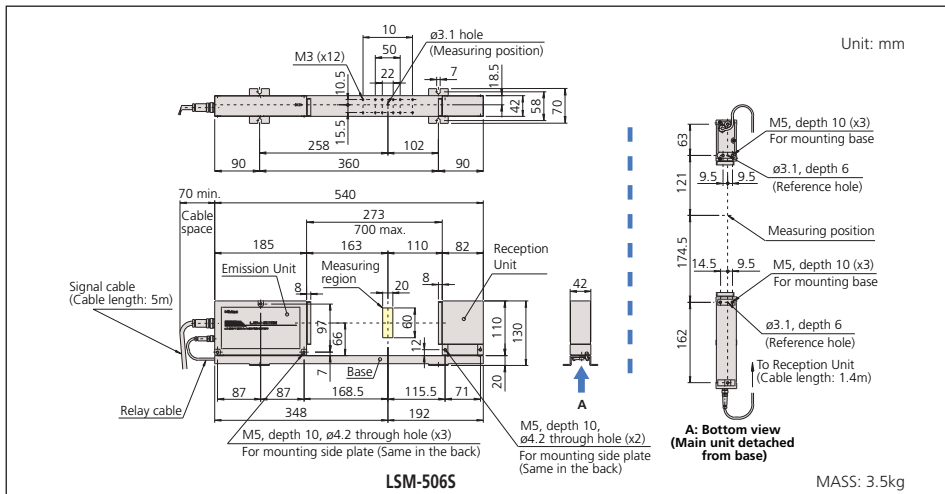
[\*6] The distance between the laser emission unit and reception unit other than the standard, may affect the accuracy.

## Optional Accessories for LSM-506S

- 02AGD140:** Calibration gage set (ø1mm, ø60mm)
- 02AGD520:** Adjustable workstage
- 02AGD580:** Center support\*
- 02AGD590:** Adjustable V-block\*
- 02AGD250:** Air blow cover
- 957608:** Air cleaner for air blow cover
- 02AGC150A:** Extension relay cable 1m
- 02AGC150B:** Extension relay cable 3m
- 02AGC150C:** Extension relay cable 5m
- 02AGN780A:** Extension signal cable 5m
- 02AGN780B:** Extension signal cable 10m
- 02AGN780C:** Extension signal cable 15m
- 02AGN780D:** Extension signal cable 20m

\*Use with an adjustable workstage.

## DIMENSIONS AND MASS



# Laser Scan Micrometer LSM-512S

SERIES 544 — High Accuracy Non-contact Measuring System



544-540

## SPECIFICATIONS

Model		LSM-512S
Order No.		544-540
Applicable display unit		LSM-6200
Laser Scanning Range	inch(mm)	Up to 5.0" (126mm)
Measuring range	inch(mm)	.04 to 4.72" (1 to 120mm)
Resolution	inch(mm)	.00005 to .005" (0.0001 to 0.1mm) [Selectable]
Repeatability [*1]	inch(μm)	±.000033" (±0.85μm) [*2]
Linearity [*1]	Whole range	inch(μm) ±.00024" (±6.0μm) [*3]
	Narrow measuring range	μm ±(4.0 + 0.5 ΔD) ————— [*3][*4] inch ±(.00016" + .00002" ΔD)
Positional error [*1][*5]	inch(μm)	±.0003" (±8.0μm)
Measuring region	inch(mm)	1.2 x 4.72" (30 x 120) [Optical axis direction x Scanning direction]
Number of scans for averaging	scan	1 to 2048
Laser classification		Class 2 (Max. Output: 1.3mW with a scanning laser, semiconductor laser: wavelength 650nm)
Number of laser scans	/sec	3200
Laser scanning rate	inch/sec (m/sec)	35590"/sec (904m/sec)
Protection level		IP64
Distance between the laser emission unit and reception unit	inch(mm)	Standard 12.64" (321mm) Max. 27" (700mm) [*6]
	Operation environment	Temperature 0°C to 40°C Humidity 35%RH to 85%RH [without condensation] Altitude 2000m or less
Storage environment	Temperature	-15°C to 55°C
	Humidity	35%RH to 85%RH [without condensation]

### Optional Accessories for LSM-512S

- 02AGD150:** Calibration gage set (ø20mm, ø120mm)
- 02AGD260:** Air blow cover
- 957608:** Air cleaner for air blow cover
- 02AGC150A:** Extension relay cable 1m
- 02AGC150B:** Extension relay cable 3m
- 02AGC150C:** Extension relay cable 5m
- 02AGN780A:** Extension signal cable 5m
- 02AGN780B:** Extension signal cable 10m
- 02AGN780C:** Extension signal cable 15m
- 02AGN780D:** Extension signal cable 20m

\*[1] Environment for accuracy validation: 20°C ± 1°C temperature; 50% ± 10% humidity.

\*[2] A value of ±2σ with a 120mm-diameter gage has been measured for two minutes with a measurement interval of 0.32 seconds, where σ is the standard deviation.

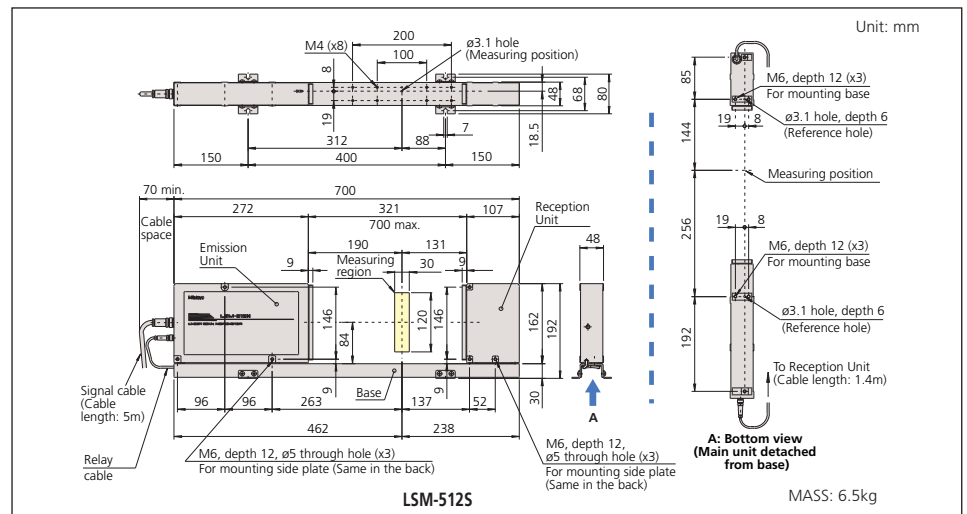
\*[3] The value of measurements in the center of the measurement region.

\*[4] ΔD is the difference in diameter of the workpiece and the master gage.

\*[5] Error due to the positional shift of workpiece in optical axis direction or scanning direction.

\*[6] The distance between the laser emission unit and reception unit other than the standard, may affect the accuracy.

## DIMENSIONS AND MASS





# Laser Scan Micrometer LSM-516S

SERIES 544 — High Accuracy Non-contact Measuring System



## SPECIFICATIONS

Model		LSM-516S	
Order No.		544-542	
Applicable display unit		LSM-6200	
Laser Scanning Range	inch(mm)	Up to 6.7" (170mm)	
Measuring range	inch(mm)	.04 to 6.3" (1 to 160mm)	
Resolution	inch(mm)	.000005 to .005" (0.0001 to 0.1mm) [Selectable]	
Repeatability [*1]	inch(μm)	±.000055" (±1.4μm) [*2]	
Linearity [*1]	Whole range	inch(μm)	±.00028" (±7.0μm) [*3]
	Narrow measuring range	μm	±(4.0 + 2.0 ΔD) [3][*4]
inch		±(.00016" + .000079" ΔD)	
Positional error [*1][*5]	inch(μm)	±.0003" (±8.0μm)	
Measuring region	inch(mm)	1.57 x 6.3" (40 x 160) [Optical axis direction x Scanning direction]	
Number of scans for averaging	scan	1 to 2048	
Laser classification		Class 2 (Max. Output: 1.3mW with a scanning laser, semiconductor laser: wavelength 650nm)	
Number of laser scans	/sec	3200	
Laser scanning rate	inch/sec (m/sec)	47480"/sec (1206m/sec)	
Protection level		IP64	
Distance between the laser emission unit and reception unit	inch(mm)	Standard 15.74" (400mm) Max. 32.72" (800mm) [*6]	
Operation environment	Temperature	0°C to 40°C	
	Humidity	35%RH to 85%RH [without condensation]	
	Altitude	2000m or less	
Storage environment	Temperature	-15°C to 55°C	
	Humidity	35%RH to 85%RH [without condensation]	

[\*1] Environment for accuracy validation: 20°C ± 1°C temperature; 50% ± 10% humidity.

[\*2] A value of ±2σ with a 160mm-diameter gage has been measured for two minutes with a measurement interval of 0.32 seconds, where σ is the standard deviation.

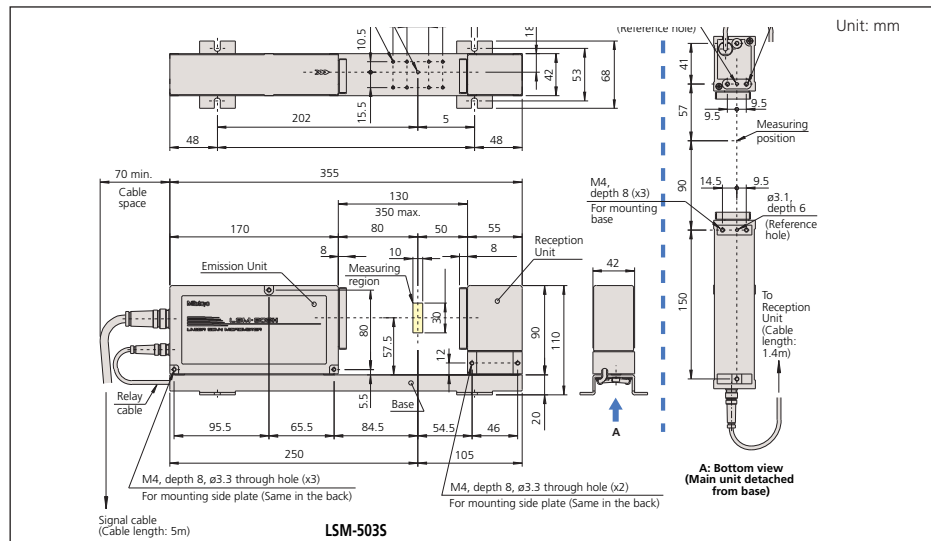
[\*3] The value of measurements in the center of the measurement region.

[\*4] ΔD is the difference in diameter of the workpiece and the master gage.

[\*5] Error due to the positional shift of workpiece in optical axis direction or scanning direction.

[\*6] The distance between the laser emission unit and reception unit other than the standard, may affect the accuracy.

## DIMENSIONS AND MASS



## Optional Accessories for LSM-516S

002AGM300: Calibration gage set (ø20mm, ø160mm)

02AGC150A: Extension relay cable 1m

02AGC150B: Extension relay cable 3m

02AGC150C: Extension relay cable 5m

02AGN780A: Extension signal cable 5m

02AGN780B: Extension signal cable 10m

02AGN780C: Extension signal cable 15m

02AGN780D: Extension signal cable 20m

# LSM-5200 Display Unit

**SERIES 544 — Compact Display Unit for Real-time Multi-channel Measurement**

## Technical Data

Main display: 9-digit LED  
 Interface units equipped: RS-232C, Analog I/O, Foot switch  
 Power supply: +24V DC±10%, 1A

## Function of Display Unit

Zero-setting, presetting, GO/±NG judgment, Offset value setting, Sample measurement, Statistical calculation, Data output, Workpiece position display, mm/inch switching, Dual-gage calibration, Transparent object measurement, Automatic measurement, Abnormal data eliminating

## FEATURES

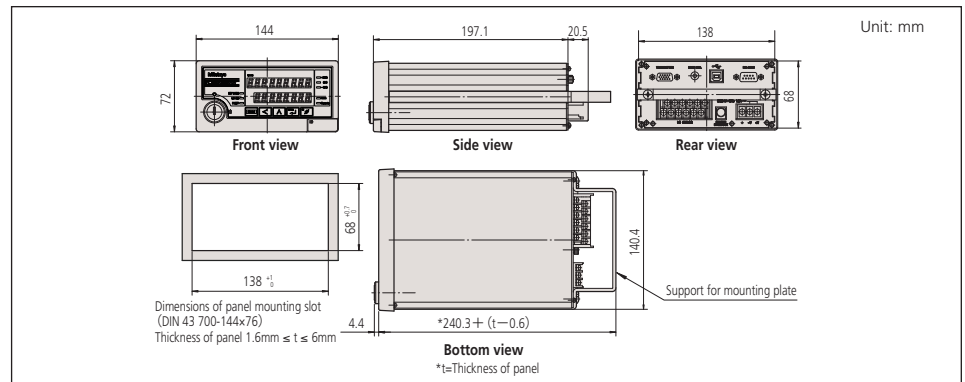
- Panel-mount type (with dimensions conforming to DIN standards) allows easy system integration.
- Capable of calculating mean, maximum, minimum, and range (maximum - minimum).
- Either the segment measurement (7 segments max.) or edge measurement (1 to 255 edges) can be selected.
- The RS-232C interface and the I/O and analog interface are provided as standard.

- The arithmetical average or moving average can be selected.
- GO/±NG judgment function.



544-047

## DIMENSIONS



## Technical Data

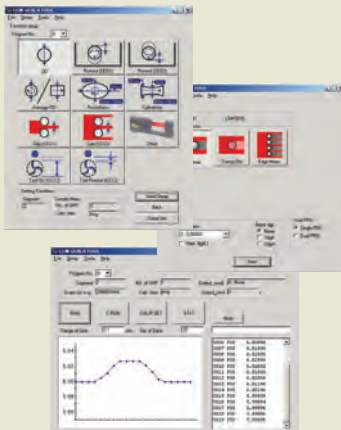
Main display: 16-digit fluorescent tube  
 Interface units equipped: RS-232C, Analog I/O, Foot switch  
 Power supply: 100 - 240V AC±10%, 40VA, 50/60Hz

## Function of Display Unit

Zero-setting, Presetting, GO/±NG judgment, Multi-limit judgment, Offset value setting, Sample measurement, Statistical calculation, Group judgment, Data output, Workpiece position display, mm/inch switching, Dual-gage calibration, Transparent object measurement, Dual-unit measurement (optional), Automatic measurement, Abnormal data eliminating

## QUICKTOOL

QUICKTOOL is a free software program that makes programming the LSM-6200 quick and easy. Please contact your Mitutoyo office for more information.



# LSM-6200 Display Unit

**SERIES 544 — Standard Display Unit for Laser Scan Micrometer**

## FEATURES

- With a dual-display design setup values can be continuously monitored. Also, two measurement value items can be displayed on the sub-display with the simultaneous measurement function.
- Either the segment measurement (7 segments max.) or edge measurement (1 to 255 edges) can be selected.

- The RS-232C interface and the I/O and analog interface are provided as standard.
- A statistical calculation function and abnormal data eliminating function are provided.

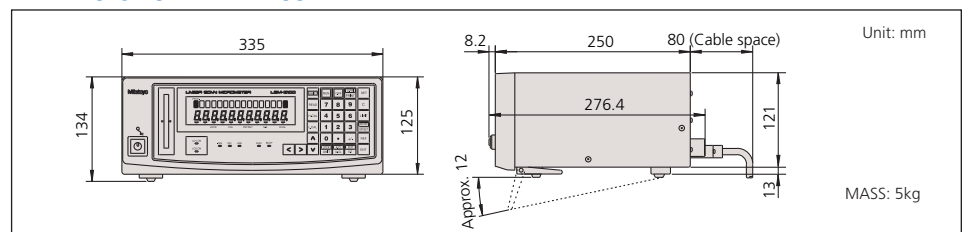


544-072A (Inch/Metric)

## SPECIFICATIONS










Model	LSM-6200
Order No.	544-072A

## DIMENSIONS AND MASS



**Mitutoyo**

# Optional Accessories for LSM

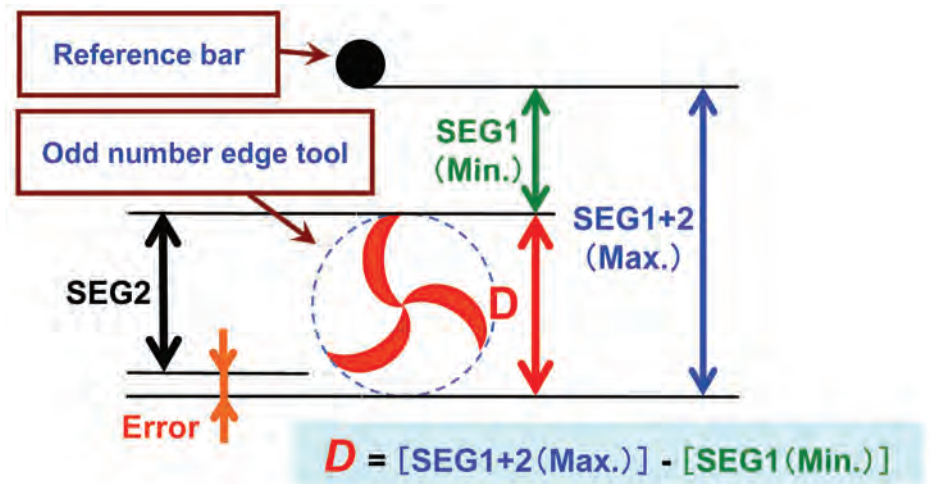
Appearance	Order No.	Description	Application
	02AGD110 02AGD120 02AGD180 02AGD130 02AGD140 02AGD150 02AGM300 02AGD170	Calibration gage set Calibration gage set Calibration gage set Calibration gage set Calibration gage set Calibration gage set Calibration gage set Calibration gage set	LSM-500S LSM-501S LSM-902 LSM-503S LSM-506S LSM-512S LSM-516S LSM-9506
	02AGP150	Dual-type add-on unit	LSM-6200
	02AGC840 02AGC880 02AGC910 02AGC940	Digimatic (SPC) codeout unit 2nd I/O & analog interface unit BCD interface unit GP-IB interface unit	LSM-6200/6900 LSM-6200/6900 LSM-6200/6900 LSM-6200/6900
	02AGN780A 02AGN780B 02AGN780C 02AGN780D  02AGC150A 02AGC150B 02AGC150C	Extension signal cable (5m) Extension signal cable (10m) Extension signal cable (15m) Extension signal cable (20m)  Extension relay cable (1m) Extension relay cable (3m) Extension relay cable (5m)	Any model of LSM* Any model of LSM* Any model of LSM* Any model of LSM*  Any model of LSM** Any model of LSM** Any model of LSM**
	936937	SPC cable (1m)	LSM-6200/6900/9506
	937179T	Footswitch	LSM-6200/6900/9506
	02AGD270 02AGD400 02AGD280 02AGD490 02AGD520 02AGD370 02AGD680 02AGD440 02AGD580 02AGD450 02AGD590	Work stage Adjustable workstage Adjustable workstage Adjustable workstage Adjustable workstage Adjustable workstage Adjustable workstage Center support Center support Adjustable V-block Adjustable V-block	LSM-501S/503S/902 LSM-501S LSM-902 LSM-503S LSM-506S LSM-9506 LSM-9506 LSM-501S/503S/902 LSM-506S/9506 LSM-501S/503S/902 LSM-506S/9506
	02AGD200 02AGD210	Wire guiding pulley Wire guiding pulley	LSM-500S LSM-501S
	02AGD220 02AGD230 02AGD240 02AGD250 02AGD260 957608	Air blow cover Air blow cover Air blow cover Air blow cover Air blow cover Air cleaner	LSM-500S LSM-501S LSM-503S LSM-506S LSM-512S Any model of LSM
	02AGD600B	Thermal printer (120V AC)	Any model of LSM

\* Except for LSM-902  
\*\* Except LSM-500S/902

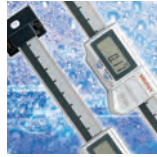
# Laser Scan Micrometer

## Application Example

- Drill / End mill (Odd-number teeth)  
outer-diameter standard function at  
LSM-6200 Display Unit







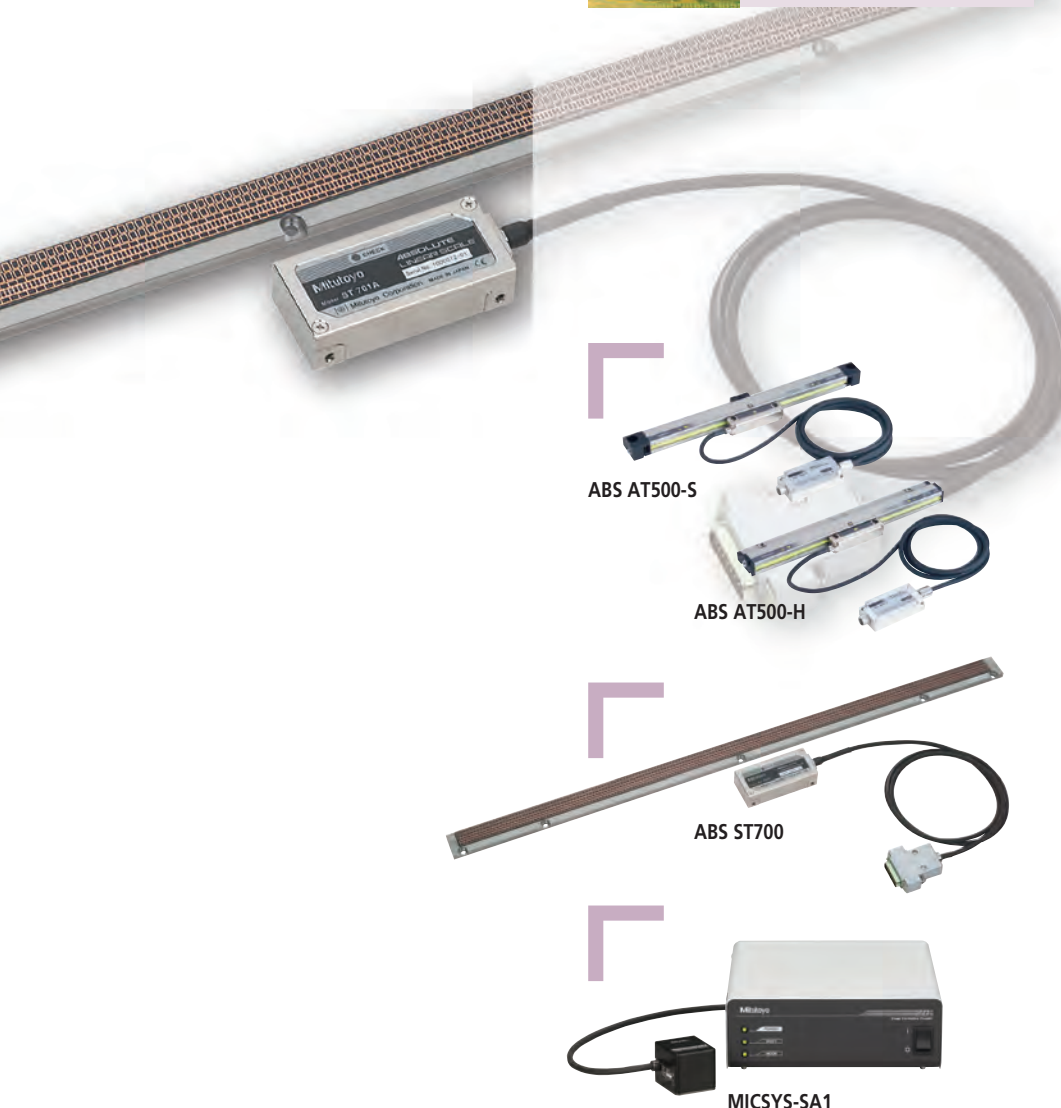
### Digimatic Scale Units



### Linear Scales



### 2D Image Correlation Encoder



ABS AT500-S

ABS AT500-H

ABS ST700

MICSYS-SA1

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### Digimatic Scale Units

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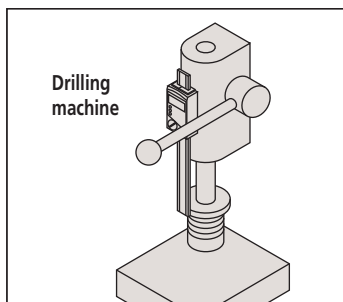
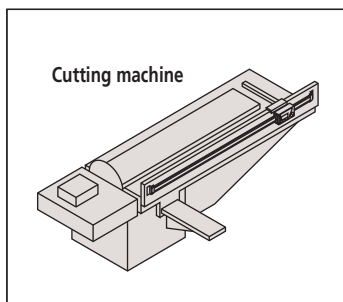
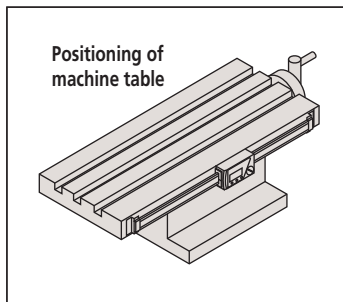
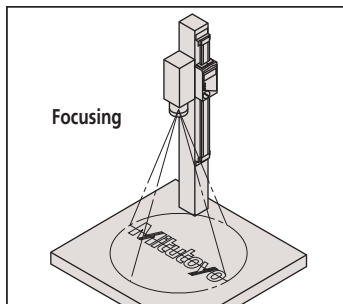
# ABSOLUTE Digimatic Scale Units

## SERIES 572

Mitutoyo's ABSOLUTE Digimatic Scale Units can be installed on almost any equipment, offering the user precise linear measurement capability with the added benefits of LCD readout and output for recording data and SPC.

### APPLICATIONS

- Positioning of tables, etc., in adverse environments
- Measuring equipment to be used on the workshop floor
- Measurement of structure displacements
- Positioning of plain machine tools
- Measuring equipment to be used outside (in the rain)



### EC Counter

#### FEATURES

- The Digimatic Display Unit with GO/NG judgement function offers a large LED display for a Digimatic Scale Unit. The bright LED readout is ideal for low-light situations or when the scale unit must be inserted into an area where its own display cannot be viewed directly.



EC counter: 542-007A

### Coolant Proof Scale Unit



### Single Function Type Scale Unit



### Multi-function Type Scale Unit



### Multi-function Type Scale Unit



- 1. 05CZA624: 40" / 1m cable with data switch
- 05CZA625: 40" / 1m cable with data switch
- 2. 959149: 40" / 1m cable with data switch
- 959150: 40" / 1m cable with data switch
- 3. 905338: 40" / 1m cable
- 905409: 80" / 2m cable
- 4. 905689: 40" / 1m cable
- 905690: 80" / 2m cable



- 5. 905691: 40" / 1m cable
- 905692: 80" / 2m cable
- 6. 905693: 40" / 1m cable
- 905694: 80" / 2m cable
- 936937: 40" / 1m cable
- 965014: 80" / 2m cable

Note: Match Key no. to Diagram



# ABSOLUTE Coolant Proof Digimatic Scale Units

## SERIES 572 — With Dust/Water Protection IP66 Level

### FEATURES

- Newly employed detection method (Electromagnetic induction method) enables use in adverse environments with water and cutting oil.
- Specially designed output cables are developed to maintain the water resistant structure.
- No over speed error since it employs absolute scale which reads the absolute value.
- Once an absolute zero (origin) point is set, the Digimatic Scale Unit shows its absolute distance from the point whenever turned on rather than 0.00".



### Technical Data

Accuracy: Refer to the list of specifications  
 Resolution: 0.01mm or .0005"/0.01mm  
 Repeatability: 0.01mm  
 Display: LCD  
 Length standard: ABSOLUTE electromagnetic induction linear encoder  
 Max. response speed: Unlimited  
 Battery: SR44 (1 pc.), **938882**  
 Battery life: Approx. 1.5 years under normal use  
 Dust/Water protection level: IP66

### Function

Origin-set, Zero-setting, Automatic power on/off,  
 Data output, inch/mm conversion (on inch/metric models only)  
 Alarm: Low voltage, Counting value composition error

### Optional Accessories

**05CZA624:** SPC cable with data switch (1m / 40")  
**05CZA625:** SPC cable with data switch (2m / 80")

### IP (International Protection) Codes:

Example, IP66 Means:  
 1st Digit "6": Dust sealing  
 2nd Digit "6": Water Resistant  
 For detailed descriptions, see page X

### SPECIFICATIONS

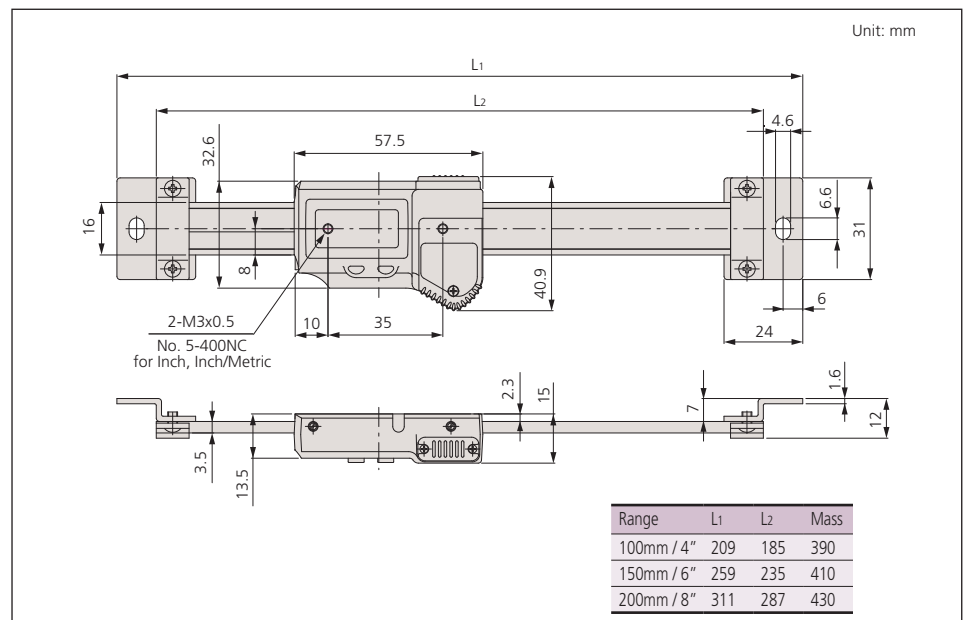
#### Metric

Range	Order No.	Accuracy	Resolution
0 - 100mm	<b>572-600</b>	0.03mm	0.01mm
0 - 150mm	<b>572-601</b>	0.03mm	0.01mm
0 - 200mm	<b>572-602</b>	0.03mm	0.01mm

#### Inch/Metric

Range	Order No.	Accuracy	Resolution
0 - 4" / 0 - 100mm	<b>572-613</b>	.001" / 0.03mm	.0005" / 0.01mm
0 - 6" / 0 - 150mm	<b>572-614</b>	.001" / 0.03mm	.0005" / 0.01mm
0 - 8" / 0 - 200mm	<b>572-615</b>	.001" / 0.03mm	.0005" / 0.01mm

### DIMENSIONS AND MASS





# ABSOLUTE Digimatic Scale Units

## SERIES 572

### FEATURES

- The ORIGIN key allows setting of an absolute zero point to be used as reference in subsequent measurements. Once set, the ABS Digimatic Scale Unit is ready to show its true position whenever turned on rather than 0.00" as with standard models.
- The ZERO/ABS key allows the display to be zero-set at any slider position along the beam for incremental comparison measurements. This key will also allow return to the absolute coordinate with a display of the true position
- from the origin point.
- No rack, no pinion, no glass scale. Digimatic Scale Unit is safely embedded in the hardened stainless steel blade.
- Horizontal or vertical face according to the scale mounting direction.
- Special type that is provided with diameter displaying function is available for lathes.
- All units come with two mounting brackets, each located at either end of the scale.
- With SPC data output.

Horizontal single function type



Horizontal multi-function type



Horizontal multi-function type



Vertical single function type



572-301-20

Vertical multi-function type



572-561

Vertical multi-function type



572-581-10



### Technical Data

Accuracy: Refer to the list of specifications.  
 Resolution: 0.01mm or .0005"/0.01mm  
 Display: LCD  
 Length standard: ABSOLUTE electrostatic capacitance type linear encoder  
 Max. response speed: Unlimited  
 Battery: SR44 (1 pc.), **938882**  
 Battery life: Approx. 3.5 years under normal use

### Function

Origin-set, Zero-setting, Power on/off, Presetting, Data hold, Data output, inch/mm conversion (on inch/metric models only), Counting direction switching\*  
 Alarm: Low voltage, Counting value composition error  
 \*not available for single function models

### Optional Accessories

- 959143:** Data hold unit for single function type
- 959149:** SPC cable with data switch for single function type (40" / 1m)
- 959150:** SPC cable with data switch for single function type (80" / 2m)
- 905338:** SPC cable (40" / 1m standard)
- 905409:** SPC cable (80" / 2m standard)
- 905689:** SPC cable (40" / 1m L-shape, back)
- 905690:** SPC cable (80" / 2m L-shape, back)
- 905691:** SPC cable (40" / 1m L-shape, right)
- 905692:** SPC cable (80" / 2m L-shape, right)
- 905693:** SPC cable (40" / 1m L-shape, left)
- 905694:** SPC cable (80" / 2m L-shape, left)

Refer to bottom of page H-2 for SPC cable details

# SPECIFICATIONS

Range	Order No.		Accuracy	Resolution
	Horizontal	Vertical		
100mm	572-200-20	572-300-10	0.03mm	0.01mm
	572-460*	572-560*	0.03mm	0.01mm
	572-480-10**	572-580-10**	0.03mm	0.01mm
150mm	572-201-20	572-301-10	0.03mm	0.01mm
	572-461*	572-561*	0.03mm	0.01mm
	572-481-10**	572-581-10**	0.03mm	0.01mm
200mm	572-202-20	572-302-10	0.03mm	0.01mm
	572-462*	572-562*	0.03mm	0.01mm
	572-482-10**	572-582-10**	0.03mm	0.01mm
300mm	572-203-10	572-303-10	0.04mm	0.01mm
	572-463*	572-563*	0.04mm	0.01mm
	572-483-10**	572-583-10**	0.04mm	0.01mm
450mm	572-464*	572-564*	0.04mm	0.01mm
	572-484-10**	572-584-10**	0.04mm	0.01mm
600mm	572-465*	572-565*	0.05mm	0.01mm
	572-485-10**	572-585-10**	0.05mm	0.01mm
800mm	572-466*	572-566*	0.06mm	0.01mm
	572-486-10**	572-586-10**	0.06mm	0.01mm
1000mm	572-467*	572-567*	0.07mm	0.01mm
	572-487-10**	572-587-10**	0.07mm	0.01mm

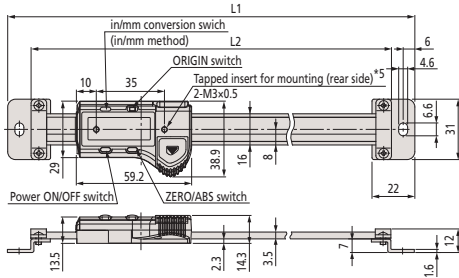
\* Multi-function type  
 \*\* Multi-function type with diameter displaying function for lathe  
 (Counting direction switching function is not provided.)

Range	Order No.		Accuracy	Resolution
	Horizontal	Vertical		
4" / 100mm	572-210-20	572-310-10	.001"	.0005" / 0.01mm
	572-470*	572-570*	.001"	.0005" / 0.01mm
	572-490-10**	572-590-10**	.001"	.0005" / 0.01mm
6" / 150mm	572-211-20	572-311-10	.001"	.0005" / 0.01mm
	572-471*	572-571*	.001"	.0005" / 0.01mm
	572-491-10**	572-591-10**	.001"	.0005" / 0.01mm
8" / 200mm	572-212-20	572-312-10	.001"	.0005" / 0.01mm
	572-472*	572-572*	.001"	.0005" / 0.01mm
	572-492-10**	572-592-10**	.001"	.0005" / 0.01mm
12" / 300mm	572-213-10	572-313-10	.002"	.0005" / 0.01mm
	572-473*	572-573*	.002"	.0005" / 0.01mm
	572-493-10**	572-593-10**	.002"	.0005" / 0.01mm
18" / 450mm	572-474*	572-574*	.002"	.0005" / 0.01mm
	572-494-10**	572-594-10**	.002"	.0005" / 0.01mm
24" / 600mm	572-475*	572-575*	.002"	.0005" / 0.01mm
	572-495-10**	572-595-10**	.002"	.0005" / 0.01mm
32" / 800mm	572-476*	572-576*	.0025"	.0005" / 0.01mm
	572-496-10**	572-596-10**	.0025"	.0005" / 0.01mm
40" / 1000mm	572-477*	572-577*	.0025"	.0005" / 0.01mm
	572-497-10**	572-597-10**	.0025"	.0005" / 0.01mm

\* Multi-function type  
 \*\* Multi-function type with diameter displaying function for lathe  
 (Counting direction switching function is not provided.)

# DIMENSIONS AND MASS

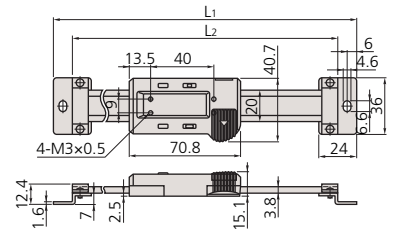
Single function type horizontal (100-200mm / 4-8")



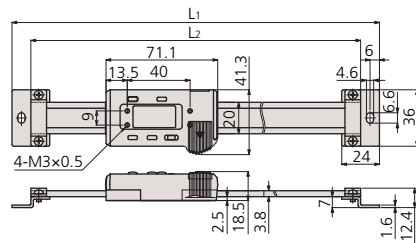
572-200-20~572-202-20  
 572-210-20~572-212-20

Range	L1	L2	Mass
4" / 100mm	209	185	230
6" / 150mm	259	235	250
8" / 200mm	311	287	270
12" / 300mm	444	420	370

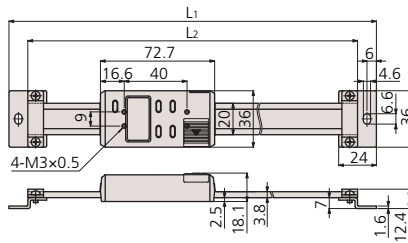
Single function type horizontal (300 / 12")



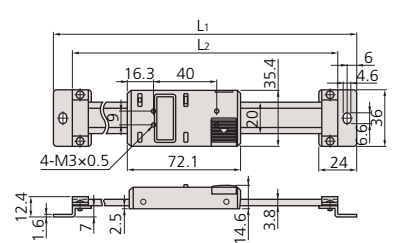
Multi function type horizontal (100-300mm / 4-12")



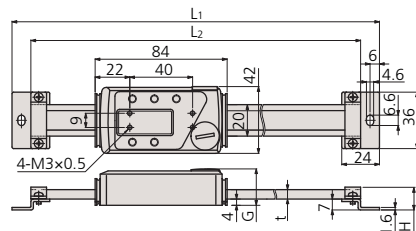
Multi function type vertical (100-300mm / 4-12")



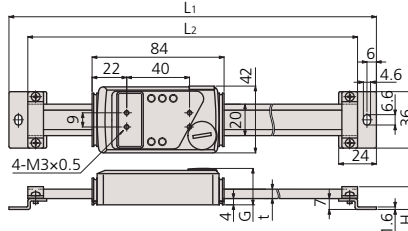
Single function type vertical (100-300mm / 4-12")



Multi function type horizontal (450-1000mm / 18-40")



Multi function type vertical (450-1000mm / 18-40")



Range	L1	L2	Mass
4" / 100mm	244	220	250
6" / 150mm	294	270	280
8" / 200mm	344	320	310
12" / 300mm	444	420	370
18" / 450mm	594	570	760
24" / 600mm	774	750	900
32" / 800mm	974	950	1710
40" / 1000mm	1174	1150	2040

# Quill Kit with ABSOLUTE Encoder

Easy Installation Fits Most Vertical Knee Mills

## FEATURES

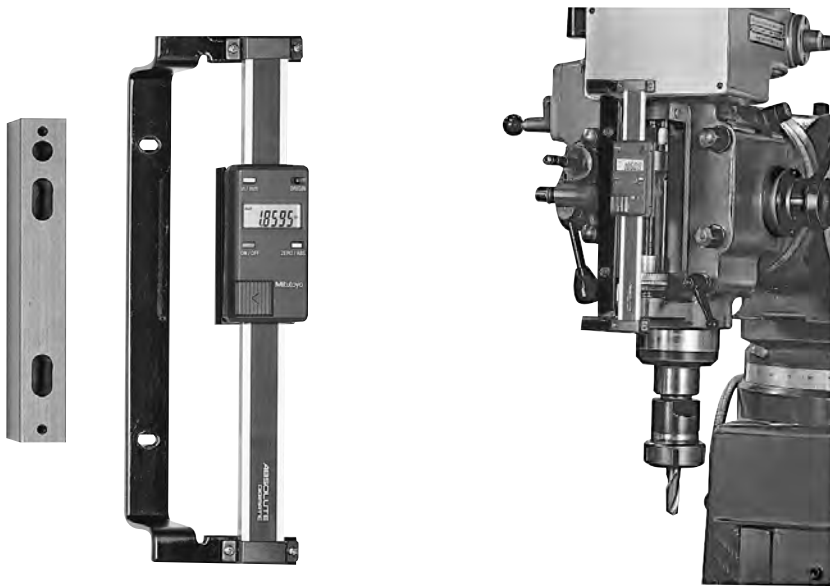
- Easy to read LCD with resolution of .0005"/0.01mm. 0 -6" Travel inch/mm
- Push button controls for inch/mm, Zero-Set and On/Off.
- Powered by a single SR-44 Battery which lasts about 1 year with normal use.
- SPC Output for data transmission to Data Processors or a Remote Display.

## SPECIFICATIONS

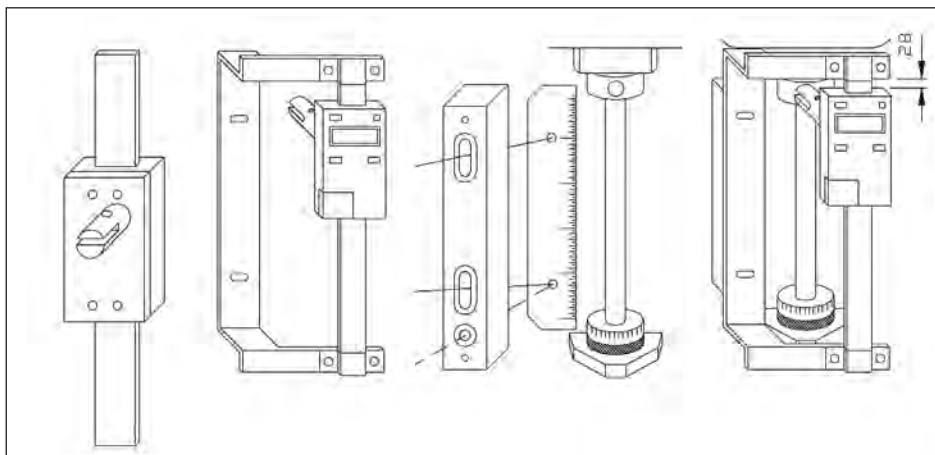
Order No.	Description
053906B	Digimatic Quill Kit complete with brackets & scale for Bridgeport Type machines.

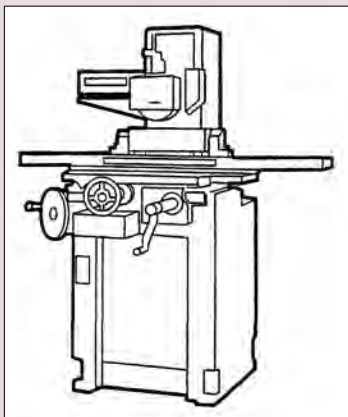
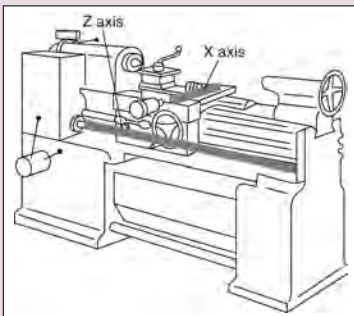
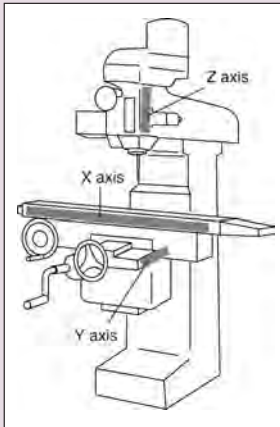
## Optional Accessories

- 905338: SPC cable (40" / 1m standard)
- 905409: SPC cable (80" / 2m standard)
- 264-504-5A: DP-1VR data processor, 120V AC
- 02AZD810D: U-Wave-R (wireless receiver)
- 02AZD730D: U-Wave-T/IP67 type (wireless transmitter)
- 02AZD790F: U-Wave connecting cable F
- 02AZE200: U-Wave-T installation brackets kit



The Mitutoyo Quill Kit mounted on a vertical mill.





# KA Counter DRO packages 2-Axis/3-Axis Travels

For Milling, Lathes & Surface Grinding Systems

## Package Includes:

- KA Counter
- Brackets for Scales
- AT715 and AT116 Linear Scale combinations
- Display Arm Kit
- 2 Axis or 3 Axis

## Glass Linear Scale Packages for Grinder Systems

Vertical	Cross Side			
	AT116-150 (6")	AT116-200 (8")	AT116-250 (10")	AT116-300 (12")
AT116-300 (12")	<b>64PKA026</b>	<b>64PKA028</b>	-	-
AT116-350 (14")	<b>64PKA027</b>	<b>64PKA029</b>	-	-
AT116-400 (16")	-	<b>64PKA030</b>	-	-
AT116-450 (18")	-	-	<b>64PKA031</b>	<b>64PKA033</b>
AT116-500 (20")	-	-	-	<b>64PKA034</b>
AT116-600 (24")	-	-	<b>64PKA032</b>	-

## Lathe Packages

Z axis travel	X Axis Travel (AT116 Slim Glass Scale)					
	AT116-150 (6")	AT116-200 (8")	AT116-250 (10")	AT116-300 (12")	AT116-350 (14")	AT116-400 (16")
AT715-700 (28")	<b>64PKA035</b>	-	-	-	-	-
AT715-750 (30")	<b>64PKA036</b>	-	-	-	-	-
AT715-900 (36")	<b>64PKA037</b>	-	-	-	-	-
AT715-1000 (40")	<b>64PKA038</b>	<b>64PKA039</b>	<b>64PKA042</b>	<b>64PKA046</b>	<b>64PKA052</b>	-
AT715-1100 (44")	-	<b>64PKA040</b>	<b>64PKA043</b>	<b>64PKA047</b>	<b>64PKA053</b>	-
AT715-1200 (48")	-	<b>64PKA041</b>	<b>64PKA044</b>	<b>64PKA048</b>	<b>64PKA054</b>	-
AT715-1300 (52")	-	-	-	<b>64PKA049</b>	<b>64PKA055</b>	-
AT715-1500 (60")	-	-	<b>64PKA045</b>	<b>64PKA050</b>	<b>64PKA056</b>	<b>64PKA057</b>
AT715-1800 (72")	-	-	-	<b>64PKA051</b>	-	-

## Bridgeport Mills Only

X Axis Travel	Y Axis Travel
	12"
30"	<b>64PKA058</b>
36"	<b>64PKA059</b>



## Universal Type Mills Only

X Axis Travel	Y Axis Travel			
	12"	14"	16"	18"
30"	<b>64PKA058</b>	<b>64PKA060</b>	-	-
36"	<b>64PKA059</b>	-	<b>64PKA062</b>	-
40"	-	<b>64PKA061</b>	<b>64PKA063</b>	<b>64PKA064</b>

Available in 3 axis (quill or knee).

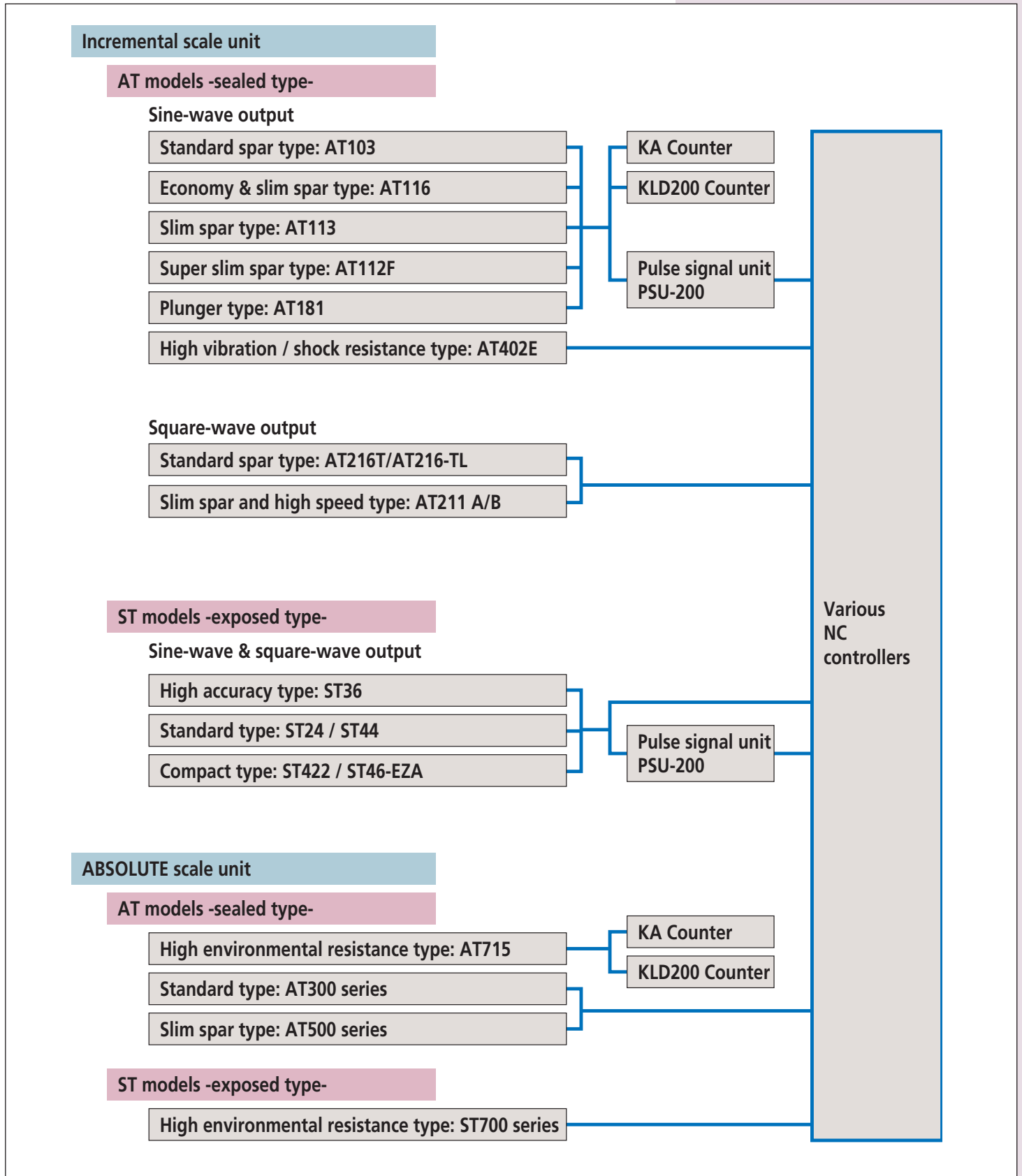
## 3 Axis, KA Counter Milling System (Z Axis 6" Travel AT715)

Order No.	Description
<b>64PKA065</b>	MILL pkg, 3-axis, ABS Scales, 12" x 30" 6", w/DRO
<b>64PKA066</b>	MILL pkg, 3-axis, ABS Scales, 12" x 36" 6", w/DRO
<b>64PKA067</b>	MILL pkg, 3-axis, ABS Scales, 16" x 36" 6", w/DRO

# Linear Scale

## Linear Encoder System

### System Guide



# AT103 Linear Scales

## SERIES 539 — Standard Spar Type

### Technical Data

Effective range:	4 - 240" (100 - 6000mm)	
Accuracy at 20°C:		
Effective range	Standard type	High-accuracy type
100 to 2000mm	(5+5L/1000)μm	(3+3L/1000)μm
2200 to 3000mm	(5+5L/1000)μm	—
3250 to 6000mm	(5+8L/1000)μm	—
	L = Effective range (mm)	
Output wave form:	Two 90° phase-shifted sinusoidal signals	
Maximum response speed:	120m/min. (up to 3000mm)	
	50m/min. (3250mm and over)	
Scale grating pitch:	20μm	
Scale reference point pitch:	50mm	
Dust/water protection level:	IP53	
Operating temperature:	0°C to 45°C	

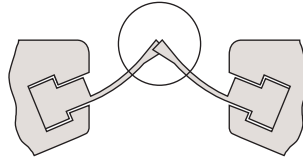
### Optional Accessories

- 09AAA033A: Extension cable (80" / 2m)
- 09AAA033B: Extension cable (200" / 5m)
- 09AAA033C: Extension cable (280" / 7m)

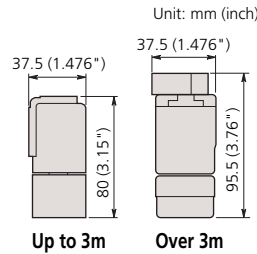
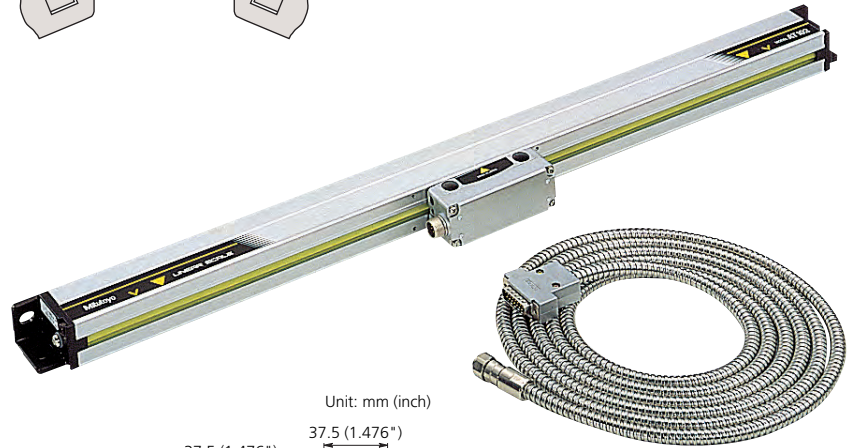


### FEATURES

- Enhanced vibration-resistance and durability.
- The innovative rubber lips keep out contaminants on a machine shop.



- An armored signal cable is used to connect the scale unit to the DRO counter for safe operation in harsh shop environment.
- The signal cable outlet can be positioned on either side of the detector head so the signal cable can be connected from either direction.



### SPECIFICATIONS

Effective range	Order No. (standard)	Order No. (high-accuracy)	Signal cable length
4" (100mm)	539-111-30	539-111-40	120" / 3m
6" (150mm)	539-112-30	539-112-40	120" / 3m
8" (200mm)	539-113-30	539-113-40	120" / 3m
10" (250mm)	539-114-30	539-114-40	120" / 3m
12" (300mm)	539-115-30	539-115-40	120" / 3m
14" (350mm)	539-116-30	539-116-40	120" / 3m
16" (400mm)	539-117-30	539-117-40	120" / 3m
18" (450mm)	539-118-30	539-118-40	120" / 3m
20" (500mm)	539-119-30	539-119-40	120" / 3m
24" (600mm)	539-121-30	539-121-40	120" / 3m
28" (700mm)	539-123-30	539-123-40	120" / 3m
30" (750mm)	539-124-30	539-124-40	120" / 3m
32" (800mm)	539-125-30	539-125-40	120" / 3m
36" (900mm)	539-126-30	539-126-40	120" / 3m
40" (1000mm)	539-127-30	539-127-40	200" / 5m
44" (1100mm)	539-128-30	539-128-40	200" / 5m
48" (1200mm)	539-129-30	539-129-40	200" / 5m
52" (1300mm)	539-130-30	539-130-40	200" / 5m
56" (1400mm)	539-131-30	539-131-40	200" / 5m
60" (1500mm)	539-132-30	539-132-40	200" / 5m
64" (1600mm)	539-133-30	539-133-40	200" / 5m

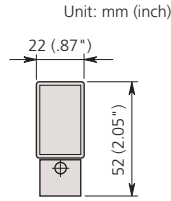
Effective range	Order No. (standard)	Order No. (high-accuracy)	Signal cable length
68" (1700mm)	539-134-30	539-134-40	200" / 5m
72" (1800mm)	539-135-30	539-135-40	200" / 5m
80" (2000mm)	539-136-30	539-136-40	200" / 5m
88" (2200mm)	539-137-30	—	200" / 5m
96" (2400mm)	539-138-30	—	280" / 7m
100" (2500mm)	539-139-30	—	280" / 7m
104" (2600mm)	539-140-30	—	280" / 7m
112" (2800mm)	539-141-30	—	280" / 7m
120" (3000mm)	539-142-30	—	280" / 7m
130" (3250mm)	539-143-30	—	400" / 10m
140" (3500mm)	539-144-30	—	400" / 10m
150" (3750mm)	539-145-30	—	400" / 10m
160" (4000mm)	539-146-30	—	400" / 10m
170" (4250mm)	539-147-30	—	400" / 10m
180" (4500mm)	539-148-30	—	400" / 10m
190" (4750mm)	539-149-30	—	600" / 15m
200" (5000mm)	539-150-30	—	600" / 15m
210" (5250mm)	539-151-30	—	600" / 15m
220" (5500mm)	539-152-30	—	600" / 15m
230" (5750mm)	539-153-30	—	600" / 15m
240" (6000mm)	539-154-30	—	600" / 15m

# AT116 Linear Scales

## SERIES 539 — Economy and Slim Spar Type

### FEATURES

- Suitable for milling machines, XY tables, jigs, etc.
- Dimensionally compatible with AT111 linear scale units.



### SPECIFICATIONS

Effective range	Order No.	Signal cable length
4" (100mm)	<b>539-271-30</b>	140" / 3.5m
6" (150mm)	<b>539-272-30</b>	140" / 3.5m
8" (200mm)	<b>539-273-30</b>	140" / 3.5m
10" (250mm)	<b>539-274-30</b>	140" / 3.5m
12" (300mm)	<b>539-275-30</b>	140" / 3.5m
14" (350mm)	<b>539-276-30</b>	140" / 3.5m
16" (400mm)	<b>539-277-30</b>	140" / 3.5m
18" (450mm)	<b>539-278-30</b>	140" / 3.5m
20" (500mm)	<b>539-279-30</b>	140" / 3.5m
24" (600mm)	<b>539-281-30</b>	140" / 3.5m

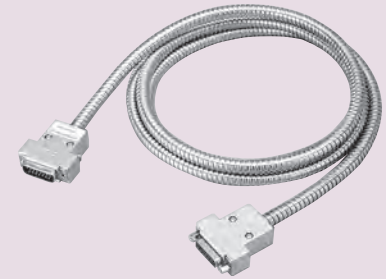
Effective range	Order No.	Signal cable length
28" (700mm)	<b>539-283-30</b>	140" / 3.5m
30" (750mm)	<b>539-284-30</b>	140" / 3.5m
32" (800mm)	<b>539-285-30</b>	140" / 3.5m
36" (900mm)	<b>539-286-30</b>	140" / 3.5m
40" (1000mm)	<b>539-287-30</b>	200" / 5m
44" (1100mm)	<b>539-288-30</b>	200" / 5m
48" (1200mm)	<b>539-289-30</b>	200" / 5m
52" (1300mm)	<b>539-290-30</b>	200" / 5m
56" (1400mm)	<b>539-291-30</b>	200" / 5m
60" (1500mm)	<b>539-292-30</b>	200" / 5m

### Technical Data

Effective range: 4 - 60" (100 - 1500mm)  
 Accuracy at 20°C: (5+5L/1000)µm  
 L = Effective range (mm)  
 Output wave form: Two 90° phase-shifted sinusoidal signals  
 Maximum response speed: 50m/min.  
 Scale grating pitch: 20µm  
 Scale reference point pitch: 50mm  
 Dust/water protection level: IP53  
 Operating temperature: 0°C to 45°C

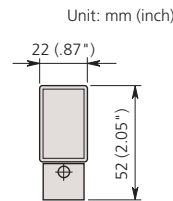
### Optional Accessories

- 09AAB674A:** Extension cable (2m / 80")
- 09AAB674B:** Extension cable (5m / 200")
- 09AAB674C:** Extension cable (7m / 280")



# AT113 Linear Scales

## SERIES 539 — Slim Spar Type



### SPECIFICATIONS

Effective range	Order No. (standard)	Order No. (high-accuracy)	Signal cable length
4" (100mm)	<b>539-201-30</b>	<b>539-201-40</b>	140" / 3.5m
6" (150mm)	<b>539-202-30</b>	<b>539-202-40</b>	140" / 3.5m
8" (200mm)	<b>539-203-30</b>	<b>539-203-40</b>	140" / 3.5m
10" (250mm)	<b>539-204-30</b>	<b>539-204-40</b>	140" / 3.5m
12" (300mm)	<b>539-205-30</b>	<b>539-205-40</b>	140" / 3.5m
14" (350mm)	<b>539-206-30</b>	<b>539-206-40</b>	140" / 3.5m
16" (400mm)	<b>539-207-30</b>	<b>539-207-40</b>	140" / 3.5m
18" (450mm)	<b>539-208-30</b>	<b>539-208-40</b>	140" / 3.5m
20" (500mm)	<b>539-209-30</b>	<b>539-209-40</b>	140" / 3.5m
24" (600mm)	<b>539-211-30</b>	<b>539-211-40</b>	140" / 3.5m

Effective range	Order No. (standard)	Order No. (high-accuracy)	Signal cable length
28" (700mm)	<b>539-213-30</b>	<b>539-213-40</b>	140" / 3.5m
30" (750mm)	<b>539-214-30</b>	<b>539-214-40</b>	140" / 3.5m
32" (800mm)	<b>539-215-30</b>	<b>539-215-40</b>	140" / 3.5m
36" (900mm)	<b>539-216-30</b>	<b>539-216-40</b>	140" / 3.5m
40" (1000mm)	<b>539-217-30</b>	<b>539-217-40</b>	200" / 5m
44" (1100mm)	<b>539-218-30</b>	<b>539-218-40</b>	200" / 5m
48" (1200mm)	<b>539-219-30</b>	<b>539-219-40</b>	200" / 5m
52" (1300mm)	<b>539-220-30</b>	<b>539-220-40</b>	200" / 5m
56" (1400mm)	<b>539-221-30</b>	<b>539-221-40</b>	200" / 5m
60" (1500mm)	<b>539-222-30</b>	<b>539-222-40</b>	200" / 5m

### Technical Data

Effective range: 4 - 60" (100 - 1500mm)  
 Accuracy at 20°C: Standard type (5+5L/1000)µm  
 High-accuracy type (3+3L/1000)µm  
 L = Effective range (mm)  
 Output wave form: Two 90° phase-shifted sinusoidal signals  
 Maximum response speed: 120m/min.  
 Scale grating pitch: 20µm  
 Scale reference point pitch: 50mm  
 Dust/water protection level: IP53  
 Operating temperature: 0°C to 45°C

### Optional Accessories

- 09AAA033A:** Extension cable (80" / 2m)
- 09AAA033B:** Extension cable (200" / 5m)
- 09AAA033C:** Extension cable (280" / 7m)

# AT112 Linear Scales

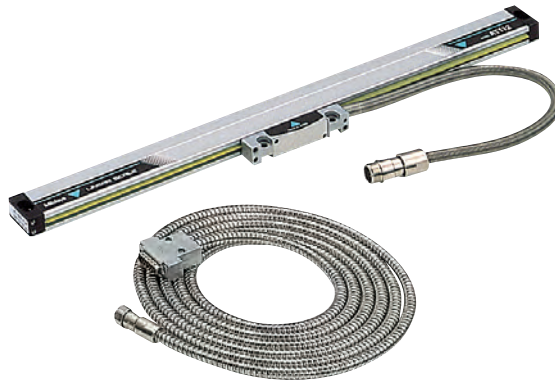
## SERIES 539 — Super Slim Spar High Accuracy Type

### Technical Data

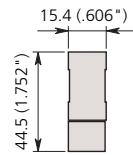
Effective range: 1.5 - 40" (50 - 1020mm)  
 Accuracy at 20°C:  
 High-accuracy type (3+3L/1000) $\mu$ m  
 L = Effective range (mm)  
 Output wave form: Two 90° phase-shifted sinusoidal signals  
 Maximum response speed: 72m/min.  
 Scale grating pitch: 20 $\mu$ m  
 Scale reference point pitch: 50mm  
 Dust/water protection level: IP53  
 Operating temperature: 0°C to 45°C

### Optional Accessories

**09AAA033A:** Extension cable (80" / 2m)  
**09AAA033B:** Extension cable (200" / 5m)  
**09AAA033C:** Extension cable (280" / 7m)



Unit: mm (inch)



### SPECIFICATIONS

Effective range	Order No. (high-accuracy)	Signal cable length
1.5" (50mm)	<b>539-251-10</b>	120" / 3m
2.5" (70mm)	<b>539-252-10</b>	120" / 3m
4.5" (120mm)	<b>539-253-10</b>	120" / 3m
6.5" (170mm)	<b>539-254-10</b>	120" / 3m
8.5" (220mm)	<b>539-255-10</b>	120" / 3m
10.5" (270mm)	<b>539-256-10</b>	120" / 3m
12.5" (320mm)	<b>539-257-10</b>	120" / 3m
14.5" (370mm)	<b>539-258-10</b>	120" / 3m
16.5" (420mm)	<b>539-259-10</b>	120" / 3m
18.5" (470mm)	<b>539-260-10</b>	120" / 3m

Effective range	Order No. (high-accuracy)	Signal cable length
20" (520mm)	<b>539-261-10</b>	120" / 3m
22" (570mm)	<b>539-262-10</b>	120" / 3m
24" (620mm)	<b>539-263-10</b>	120" / 3m
26" (670mm)	<b>539-264-10</b>	120" / 3m
28" (720mm)	<b>539-265-10</b>	120" / 3m
30" (770mm)	<b>539-266-10</b>	120" / 3m
32" (820mm)	<b>539-267-10</b>	120" / 3m
36" (920mm)	<b>539-268-10</b>	120" / 3m
40" (1020mm)	<b>539-269-10</b>	120" / 3m

# AT181 Linear Scales

## SERIES 539 — Plunger Type (High Water-proof Design)

### Technical Data

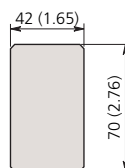
Effective range: 4 - 24" (100 - 600mm)  
 Accuracy at 20°C:  
 Standard type (5+5L/1000) $\mu$ m  
 L = Effective range (mm)  
 Output wave form: Two 90° phase-shifted sinusoidal signals  
 Maximum response speed: 50m/min.  
 Scale grating pitch: 20 $\mu$ m  
 Scale reference point pitch: 50mm  
 Dust/water protection level: IP54  
 Operating temperature: 0°C to 45°C

### Optional Accessories

**09AAA033A:** Extension cable (80" / 2m)  
**09AAA033B:** Extension cable (200" / 5m)  
**09AAA033C:** Extension cable (280" / 7m)



Unit: mm (inch)



### SPECIFICATION

Effective range	Order No. (standard)	Signal cable length
4" (100mm)	<b>539-301</b>	120" / 3m
6" (150mm)	<b>539-302</b>	120" / 3m
8" (200mm)	<b>539-303</b>	120" / 3m
10" (250mm)	<b>539-304</b>	120" / 3m
12" (300mm)	<b>539-305</b>	120" / 3m
14" (350mm)	<b>539-306</b>	120" / 3m
16" (400mm)	<b>539-307</b>	120" / 3m
18" (450mm)	<b>539-308</b>	120" / 3m
20" (500mm)	<b>539-309</b>	120" / 3m
22" (550mm)	<b>539-310</b>	120" / 3m
24" (600mm)	<b>539-311</b>	120" / 3m



# AT715 Linear Scales

## SERIES 539 — ABSOLUTE and High Environment Resistance Type



### FEATURES

- Employs ABSOLUTE® electromagnetic induction system to achieve IP67 environmental resistance.
- Detects and outputs an absolute position - no reference point setup needed at every power-on.
- An abnormal calculation doesn't accumulate even if the calculation mistake is generated by the influence of an electric noise.
- It is the most suitable scale to mount on the X-axis of a small lathe. 2 mounting directions of the scale main unit allows easy to mount on a machining tool with the difficult mounting position.



### Technical Data

Effective range: 100 - 3000mm (4"-120")  
 Accuracy at 20°C: ±5μm (Lo: 100 - 500mm)  
 ±7μm (Lo: 600 - 1800mm)  
 ±10μm (Lo: 2.000 - 3.000)  
 L = Effective range (mm)

Detecting method: Electromagnetic induction system  
 Maximum response speed: 50m/min.  
 Dust/water protection level: IP67  
 Operating temperature: 0°C to 45°C

### Optional Accessory

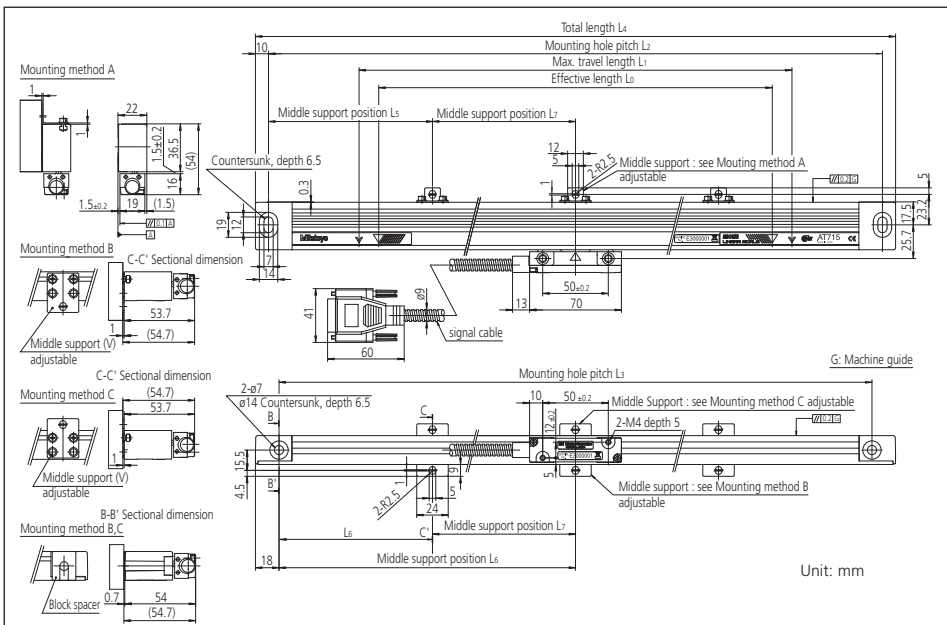
- 09AAB674A: Extension cable 80" / 2m
- 09AAB674B: Extension cable 200" / 5m
- 09AAB674C: Extension cable 280" / 7m

### SPECIFICATIONS

Effective length Lo	Order No.	L1 (mm)	L2 (mm)	L3 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	L7 (mm)	Cable (m)
4" / 100mm	539-801	120	258	242	278	—	—	—	140" / 3.5m
6" / 150mm	539-802	170	308	292	328	—	—	—	140" / 3.5m
8" / 200mm	539-803	220	358	342	378	—	—	—	140" / 3.5m
10" / 250mm	539-804	270	408	392	428	—	—	—	140" / 3.5m
12" / 300mm	539-805	330	468	452	488	—	—	—	140" / 3.5m
14" / 350mm	539-806	380	518	502	538	—	—	—	140" / 3.5m
16" / 400mm	539-807	430	568	552	588	—	—	—	140" / 3.5m
18" / 450mm	539-808	480	618	602	638	—	—	—	140" / 3.5m
20" / 500mm	539-809	540	678	662	698	339	331	—	140" / 3.5m
24" / 600mm	539-811	640	778	762	798	389	381	—	140" / 3.5m
28" / 700mm	539-813	740	878	862	898	439	431	—	140" / 3.5m
30" / 750mm	539-814	780	918	902	938	459	451	—	140" / 3.5m
32" / 800mm	539-815	840	978	962	998	489	481	—	140" / 3.5m
36" / 900mm	539-816	940	1078	1062	1098	539	531	—	140" / 3.5m
40" / 1000mm	539-817	1040	1178	1162	1198	589	581	—	200" / 5m

Effective length Lo	Order No.	L1 (mm)	L2 (mm)	L3 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	L7 (mm)	Cable (m)
44" / 1100mm	539-818	1140	1278	1262	1298	424	416	430	200" / 5m
48" / 1200mm	539-819	1240	1378	1362	1398	459	451	460	200" / 5m
52" / 1300mm	539-820	1340	1478	1462	1498	494	486	490	200" / 5m
56" / 1400mm	539-821	1440	1578	1562	1598	524	516	530	200" / 5m
60" / 1500mm	539-822	1540	1678	1662	1698	559	451	560	200" / 5m
64" / 1600mm	539-823	1640	1778	1762	1798	459	451	430	200" / 5m
68" / 1700mm	539-824	1740	1878	1862	1898	479	471	460	200" / 5m
72" / 1800mm	539-825	1840	1978	1962	1998	459	451	530	200" / 5m
80" / 2000mm	539-860	2040	2178	2162	2198	539	531	550	200" / 5m
88" / 2200mm	539-861	2240	2378	2362	2398	469	461	480	200" / 5m
96" / 2400mm	539-862	2440	2578	2562	2598	509	501	520	280" / 7m
100" / 2500mm	539-863	2540	2678	2662	2698	529	521	540	280" / 7m
104" / 2600mm	539-864	2640	2778	2762	2798	549	541	560	280" / 7m
112" / 2800mm	539-865	2840	2978	2962	2998	489	481	500	280" / 7m
120" / 3000mm	539-866	3040	3178	3162	3198	529	521	530	280" / 7m

### DIMENSIONS

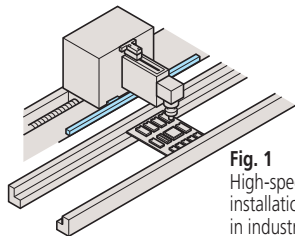


## Technical Data

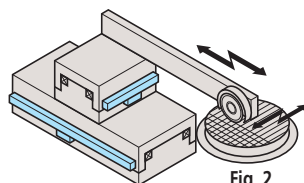
Effective range: 4 - 240" / 100 - 6000mm  
 Accuracy (at 20°C):  
 100 to 1500mm (3+3L/1000)µm  
 1600 to 3000mm (5+5L/1000)µm  
 3250 to 6000mm (5+8L/1000)µm  
 L = Effective range (mm)  
 Output signal: Two 90° phase-shifted quadrature signals  
 Maximum response speed: 11-120m/min.  
 Resolution: 0.1, 0.5, 1µm  
 Scale reference point pitch: 50mm  
 Dust/Water protection level: IP53

### Linear Scales for Numerical Motion Control System

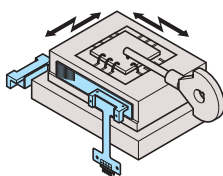
The Linear Scales for the Numerical Motion Control System are high-accuracy linear measurement systems for a wide range of applications. These types of linear scales are designed to be integrated into precision machines and instruments including measuring machines and instruments, as well as machine tools, optics, data equipment, industrial robots, etc. Two types of linear scales for the Numerical Motion Control System are available: the AT Series have the high-accuracy glass scale and the detector head encased together in an aluminum casing for improved durability and resistance against vibration; the ultra-portable and lighter ST Series have the scale and the detector head separately.



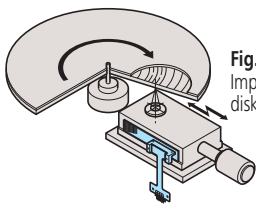
**Fig. 1**  
High-speed, high-accuracy installation of electronics in industrial robots



**Fig. 2**  
Positioning dicing saw in semiconductor production process



**Fig. 3**  
Positioning IC tip for wire-bonding



**Fig. 4**  
Improving seek-time of disk drive system

## Technical Data

Effective range: 4 - 60" (100 - 1500mm)  
 Accuracy at 20°C:  
 Effective range Standard type High-accuracy type  
 100 to 500mm (3+3L/1000)µm (2+2L/1000)µm  
 500 to 1500mm (3+3L/1000)µm —  
 L = Effective range (mm)  
 Output signal: Two 90° phase-shifted quadrature signals  
 Maximum response speed: 5.4 - 120m/min.  
 Resolution: 0.1, 0.2, 0.5, 1, 2.5, 5µm  
 Signal output pitch: 20mm  
 Dust/Water protection level: IP53

# AT203 Linear Scales

## SERIES 539 — Standard Spar Type

### FEATURES

- Sealed type incremental linear scales suitable for feedback system of NC machine tools.
- Direct connection with NC machine tools are possible.



### SPECIFICATION

Effective range	Order No.	Signal cable length
4" / 100mm	539-411-30	200" / 5m
6" / 150mm	539-412-30	200" / 5m
8" / 200mm	539-413-30	200" / 5m
10" / 250mm	539-414-30	200" / 5m
12" / 300mm	539-415-30	200" / 5m
14" / 350mm	539-416-30	200" / 5m
16" / 400mm	539-417-30	200" / 5m
18" / 450mm	539-418-30	200" / 5m
20" / 500mm	539-419-30	200" / 5m
24" / 600mm	539-421-30	200" / 5m
28" / 700mm	539-423-30	200" / 5m
30" / 750mm	539-424-30	200" / 5m
32" / 800mm	539-425-30	200" / 5m
36" / 900mm	539-426-30	200" / 5m
40" / 1000mm	539-427-30	200" / 5m
44" / 1100mm	539-428-30	200" / 5m
48" / 1200mm	539-429-30	200" / 5m
52" / 1300mm	539-430-30	200" / 5m
56" / 1400mm	539-431-30	200" / 5m
60" / 1500mm	539-432-30	200" / 5m
64" / 1600mm	539-433-30	200" / 5m

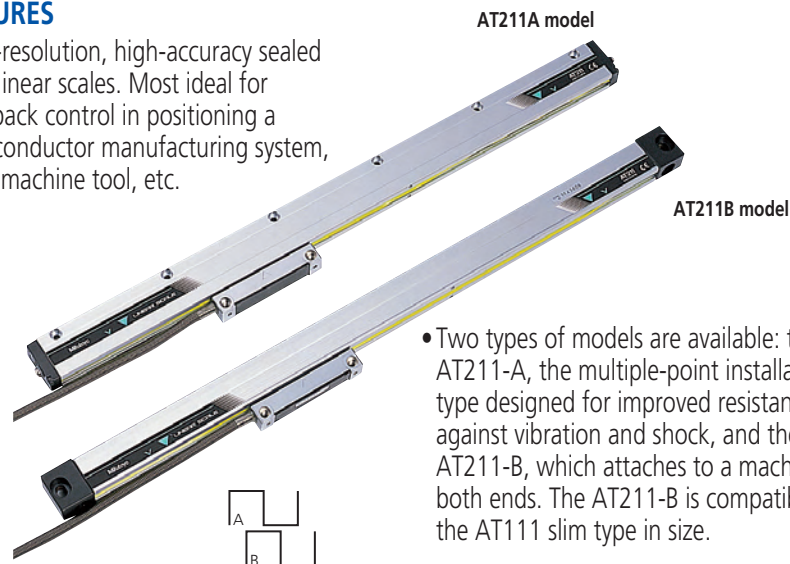
Effective range	Order No.	Signal cable length
68" / 1700mm	539-434-30	200" / 5m
72" / 1800mm	539-435-30	200" / 5m
80" / 2000mm	539-436-30	200" / 5m
88" / 2200mm	539-437-30	200" / 5m
96" / 2400mm	539-438-30	200" / 5m
100" / 2500mm	539-439-30	200" / 5m
104" / 2600mm	539-440-30	200" / 5m
112" / 2800mm	539-441-30	200" / 5m
120" / 3000mm	539-442-30	200" / 5m
130" / 3250mm	539-443-30	200" / 5m
140" / 3500mm	539-444-30	200" / 5m
150" / 3750mm	539-445-30	200" / 5m
160" / 4000mm	539-446-30	200" / 5m
170" / 4250mm	539-447-30	200" / 5m
180" / 4500mm	539-448-30	200" / 5m
190" / 4750mm	539-449-30	200" / 5m
200" / 5000mm	539-450-30	200" / 5m
210" / 5250mm	539-451-30	200" / 5m
220" / 5500mm	539-452-30	200" / 5m
230" / 5750mm	539-453-30	200" / 5m
240" / 6000mm	539-454-30	200" / 5m

# AT211A / AT211B Linear Scales

## SERIES 539 — Slim Spar Type

### FEATURES

- High-resolution, high-accuracy sealed type linear scales. Most ideal for feedback control in positioning a semiconductor manufacturing system, CNC machine tool, etc.



- Two types of models are available: the AT211-A, the multiple-point installation type designed for improved resistance against vibration and shock, and the AT211-B, which attaches to a machine at both ends. The AT211-B is compatible with the AT111 slim type in size.

# AT402E Linear Scales

## SERIES 539 — High Vibration / Shock Resistance Type

### FEATURES

- Achieving the world-class vibration resistance (20G) and shock resistance (40G) for using with a heavy cutting machine tool.
- Multi-point elastic fixing for very linear and smooth expansion and contraction with temperature changes
- 1Vpp/20µm signal output for high connectivity with various machine controllers.
- Absolute Interval Code for a simple and affordable Absolute Measuring System.
- High-response speed of 120m/min
- High measuring accuracy of ±2µm (up to 540mm)



### SPECIFICATIONS

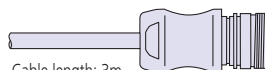
Effective length	Order No. (w/o cable)	Order No. (w/ cable A)	Order No. (w/ cable B)	Order No. (w/ cable C)
140mm	539-371-00	539-371-01	539-371-02	539-371-03
240mm	539-373-00	539-373-01	539-373-02	539-373-03
340mm	539-374-00	539-374-01	539-374-02	539-374-03
440mm	539-375-00	539-375-01	539-375-02	539-375-03
540mm	539-376-00	539-376-01	539-376-02	539-376-03
640mm	539-377-00	539-377-01	539-377-02	539-377-03
740mm	539-378-00	539-378-01	539-378-02	539-378-03
840mm	539-379-00	539-379-01	539-379-02	539-379-03
940mm	539-380-00	539-380-01	539-380-02	539-380-03
1040mm	539-381-00	539-381-01	539-381-02	539-381-03
1140mm	539-382-00	539-382-01	539-382-02	539-382-03
1240mm	539-383-00	539-383-01	539-383-02	539-383-03
1340mm	539-384-00	539-384-01	539-384-02	539-384-03
1440mm	539-385-00	539-385-01	539-385-02	539-385-03
1540mm	539-386-00	539-386-01	539-386-02	539-386-03
1640mm	539-387-00	539-387-01	539-387-02	539-387-03
1740mm	539-388-00	539-388-01	539-388-02	539-388-03
1840mm	539-389-00	539-389-01	539-389-02	539-389-03
2040mm	539-390-00	539-390-01	539-390-02	539-390-03
2240mm	539-391-00	539-391-01	539-391-02	539-391-03
2440mm	539-392-00	539-392-01	539-392-02	539-392-03
2640mm	539-393-00	539-393-01	539-393-02	539-393-03
2840mm	539-394-00	539-394-01	539-394-02	539-394-03
3040mm	539-395-00	539-395-01	539-395-02	539-395-03

Cable A: Lead wires type



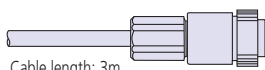
Cable length: 3m

Cable B: Connectable to Euro controller



Cable length: 3m

Cable C: Connectable to FANUC serial board C

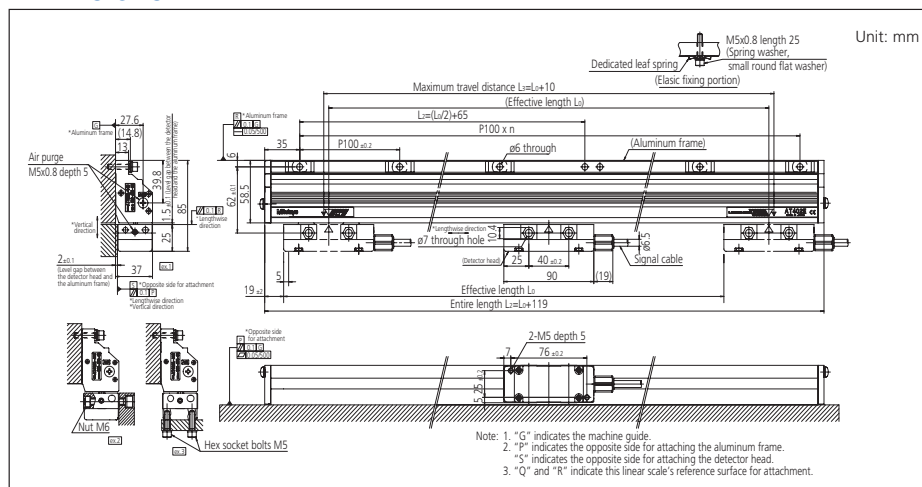


Cable length: 3m

### Technical Data

Effective range:	(140 - 3040mm)
Accuracy (at 20°C):	
140 to 540mm	±2µm
640 to 940mm	±3µm
1040 to 3040mm	±3µm/m
Output signal:	Two 90° phase-shifted sinusoidal signals (1 Vpp)
Maximum response speed:	120m/min.
Signal output pitch:	20µm
Dust/water protection level:	IP53
Operating temperature:	0°C to 45°C

### DIMENSIONS



**Technical Data**

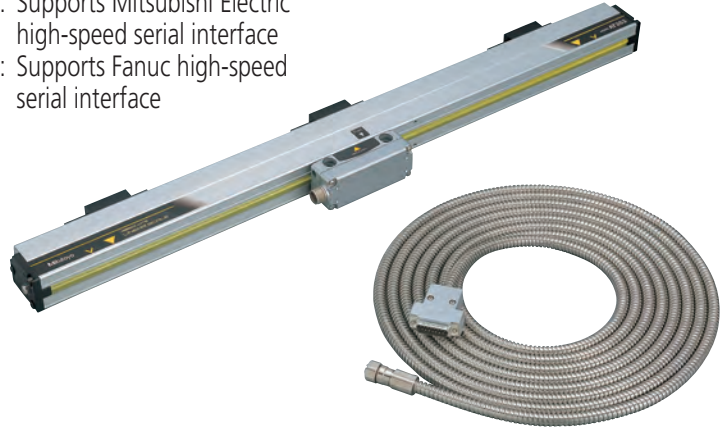
Effective range: 4 - 120" (100 - 3000mm)  
 Accuracy (at 20°C):  
 100 to 1500mm (3+3L/1000)µm  
 1600 to 3000mm (5+5L/1000)µm  
 L = Effective range (mm)  
 Signal output pitch: 20µm  
 Maximum response speed: 120m/min.  
 Resolution: 0.05µm  
 Dust/Water protection level: IP53

# AT300 Linear Scales

**SERIES 539 — ABSOLUTE and Standard Spar Type**

**FEATURES**

- Sealed type absolute linear scales with very fine resolution up to 0.05µm.
- Direct connection with NC machine tools are possible.
  - ABS AT303: Supports Mitutoyo standard serial interface
  - ABS AT343: Supports Mitsubishi Electric high-speed serial interface
  - ABS AT353: Supports Fanuc high-speed serial interface



# AT500 Linear Scales

**SERIES 539 — ABSOLUTE and Slim Spar Type**

**FEATURES**

- Sealed type absolute linear scales with very fine resolution up to 0.05µm.
- Direct connection with NC machine tools are possible.
  - ABS AT505/AT503: Supports Mitutoyo standard serial interface
  - ABS AT545/AT543: Supports Mitsubishi Electric high-speed serial interface
  - ABS AT555/AT553: Supports Fanuc high-speed serial interface
- Two types are available:
  - S model: high-rigid type
  - H model: high-accuracy type.

**Technical Data**

Effective range:  
 -S model 4 - 88" (100 - 2200mm)  
 -H model 4 - 40" (100 - 1000mm)  
 Accuracy (at 20°C):  
 -S model (3+3L/1000)µm  
 -H model (2+2L/1000)µm  
 L = Effective range (mm)  
 Signal output pitch: 20µm  
 Maximum response speed: 150m/min.  
 (72m/min: ABS AT5\_5-H model)  
 Resolution:  
 ABS AT5\_5 model: 0.005µm  
 ABS AT5\_3 model: 0.05µm  
 Dust/Water protection level: IP53



# ST700 Series Linear Scales

## SERIES 579 — ABSOLUTE and High Environment Resistance Type



### FEATURES

- Absolute scales have eliminated the need for origin restoration.
- Optimized for the control of linear motors.
- Optimized for high-speed, high-acceleration control.
- Provides high resistance to the contamination of water and oil.
- A non-contact detection system allows a longer service life.
- Signal adjustment at installation is automatically performed with dedicated software.



### Technical Data

Effective range:	4 - 240" (100 - 6000mm)
Accuracy (at 20°C):	(8+5L/1000)µm L = Effective range (mm)
Detecting method:	Electromagnetic induction system
Resolution:	0.1, 0.5µm
Maximum response speed:	5000mm/sec
Dust/Water protection level:	IP65

### Signal Adjusting Method When Mounting ABS ST700 Series

Patented (United States), patent pending (Japan, China, and Europe).

In order for signal adjustment and confirmation after the unit is mounted, the "ABS ST700 Signal Adjustment Program" dedicated software and a conversion unit are necessary.

Using this software, the following settings and confirmation can be made.

- 1) Automatic adjustment of scale signals → The scale base and detector head must have been mounted observing the prescribed dimensions
- 2) Scale signal amplitude (signal intensity) check
- 3) Scale origin (absolute position data = 0) setting
- 4) Absolute position data check
- 5) Error history clear
- 6) ABS synthesis error check (only for models with effective measuring length of 3200mm to 6000mm).

#### Required Items

Item	Qty	Description	Remarks
PC*	1	Windows	Prepared by the customer.
Conversion unit	1	SS-4248WP-1or2 (System Sacom Sales Corp.)	Option (package deal)
Connection cable A	1	RS-232C cable	
Connection cable B	1	RS-485 cable	
Dedicated software	1	Name of software: "ABS ST700 Signal Adjustment Program"	

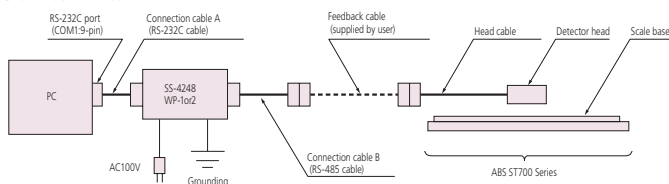
\*The following defines the minimum specification of the PC necessary to run this program.  
 PC : DOS/V with Pentium 200 MHz or faster (with RS-232C port)  
 Memory : 64 MB min. (128 MB or more recommended)  
 Program size : 10MB  
 OS : Windows95 or later  
 Monitor : 256 colors, 800 x 600 or higher resolution  
 (1,024 x 768 or higher resolution recommended)  
 RS-232C : COM1 port normally used (another can also be used.)

#### "Conversion Unit, Dedicated Software" Set Parts No.\*

Power Supply Specifications	Parts No.	Scale Type
AC adaptor specifications	09ZAA175	ABS ST74□A, ABS ST74□AL Note: When connected to MR-J2S.
	09ZAA177	ABS ST77□A, ABS ST77□AL, ABS ST78□A, ABS ST78□AL
	09ZAA179	ABS ST74□A, ABS ST74□AL Note: When connected to MR-J3. ABS ST70□A, ABS ST70□AL, ABS ST74□L, ABS ST74□L
	06ACN747	ABS ST75□, ABS ST75□L
Power supply cable specifications	09ZAA176	ABS ST74□A, ABS ST74□AL Note: When connected to MR-J2S.
	09ZAA178	ABS ST77□A, ABS ST77□AL, ABS ST78□A, ABS ST78□AL
	09ZAA180	ABS ST74□A, ABS ST74□AL Note: When connected to MR-J3. ABS ST70□A, ABS ST70□AL, ABS ST74□L, ABS ST74□L
	06ACN750	ABS ST75□, ABS ST75□L

\*With 0.05 µm resolution, custom software is required.

#### Connection Method



\*Ground the device to prevent the risk of electric shock

\*Connect the head cable with connection cable B when using "Part No.09ZAA179" and "Part No.09ZAA180".

### Compatibility of Detector Head and Main Scale

- For the ST700A series with effective range of 3000mm or less and the ST700AL series with effective range of 3200mm or more, note the following differences when mounting the detector head.

Please note that ST700A (100mm-3000mm range) and ST700AL (3200mm-6000mm range) detector head or scale **are not** compatible. ST700A scale and detector head are compatible. Also, ST700AL scale and detector head **are** compatible. ST700AL (3200mm-6000mm) requires signal adjustment software.

Main Scale		Detector Head
For effective range of 3200mm to 6000mm	← Compatible →	For effective range of 3200mm to 6000mm
	← Incompatible →	
For effective range of 3000mm or less	← Compatible →	For effective range of 3000mm or less

### Feedback cable

- Yaskawa Electric Corporation serial cable can be used as the feedback cable to connect to a Yaskawa Electric Corporation servo amplifier.

Cable model number : JZSP-CLP- (03, 05, 10, 15, 20)

- For the feedback cable to connect to a Mitsubishi Electric Corporation MR-J2S/MR-J3, contact Mitutoyo with the following code numbers.

For the MR-J2S	5m :	No.06ACF116A
	10m :	No.06ACF116B
For the MR-J3	5m :	No.06ACF117A
	10m :	No.06ACF117B

### Technical Data

Effective range:	0.4 - 120" (10 - 3000mm)	
Accuracy (at 20°C):		
10 - 300mm	±0.5µm	
350 - 500mm	±1µm	
500 - 1000mm	±2µm	
1000 - 3000mm	±2µm/m	
Output signal:	Two 90° phase-shifted sinusoidal signals	
	Two 90° phase-shifted quadrature signals	
Scale grating pitch:	8µm	
Signal output pitch:	4µm	
Resolution:	0.01, 0.02, 0.05, 0.1µm	
Maximum response speed:	1200mm/sec	
Scale reference point pitch:		
10 - 80mm	Center point	
100 - 3000mm	50mm	

## ST36 Linear Scales

### SERIES 579 — High Accuracy Type

#### FEATURES

- High-resolution, high-accuracy and portable model designed for exposed installation.
- High-reliability with stable signal output.
- Outputs two-phase sine wave signal (signal pitch 4µm) and two-phase pulse signal simultaneously.
- Equipped with a compact interface box.



### Technical Data

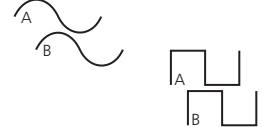
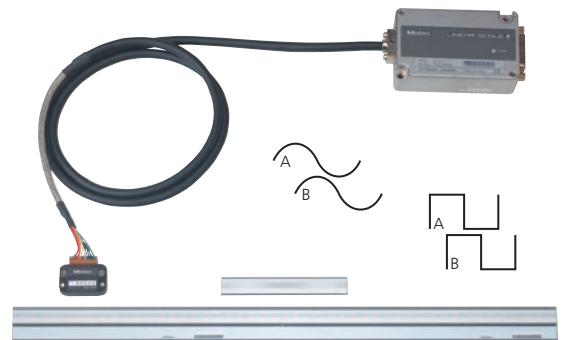
Effective range:	0.4 - 120" (10 - 3000mm)	
Accuracy (at 20°C):		
10 - 300mm	±1µm	
350 - 500mm	±2µm	
500 - 1000mm	±3µm	
1100 - 3000mm	±3.0µm/m	
Output signal:	Two 90° phase-shifted sinusoidal signals	
	Two 90° phase-shifted quadrature signals	
Scale grating pitch:	40µm	
Signal output pitch:	40µm	
Resolution:	0.2, 0.5, 1, 5µm	
Maximum response speed:	5000mm/sec	
Scale reference point pitch:		
10 - 75mm	Center point	
100 - 3000mm	50mm	

## ST422 Linear Scales

### SERIES 579 — Compact Type

#### FEATURES

- Compact design exposed type incremental linear scales.
- Maximum of up to 5000mm/s high response speed.
- Provided with alarm LED error indication with fault detection signal output for over speed and sinusoidal signal anomaly errors.



### Technical Data

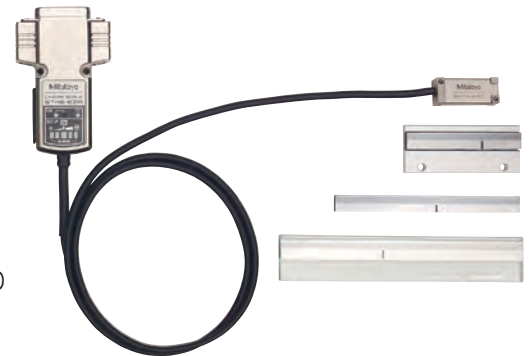
Effective Range:	10 - 3000mm (Glass scale)	
Accuracy (at 20°C) :		
10 - 300mm	±1µm	
350 - 500mm	±2µm	
600 - 1000mm	±3µm	
1100 - 3000mm	±3µm/m	
Output signal:	Pulse and sinusoidal signal outputs compliant with RS-422	
Scale grating pitch:	20µm	
Signal output pitch:	20µm	
Minimum resolution:	0.05µm	
Maximum response speed:	2600mm/s	
Scale reference point pitch:		
10-80mm	Center point	
100-3000mm	50mm	
Equipped with EZA function		

## ST46-EZA Glass Linear Scales

### SERIES 579 — Glass and EZA Type

#### FEATURES

- EZA function enhanced ST46, valued for compact reader head.
- Simple installation and adjustment without oscilloscope, dedicated tester and PC.
- Compact detector head and control unit design promotes efficient integration.
- Maximum effective length of 3000mm for large device applications.
- Anomalies signaled through integrated LED display.
- Maximum response speed of 2600mm/sec (Sine wave max response speed at -3dB).



# KA Counter

## SERIES 174 — Standard Type

### FEATURES

- High performance, low cost 2 or 3 axis counter
- The KA counter has both mill and lathe functions, as well as standard functions
- Connectable with AT715 electromagnetic scales and AT100 series glass scales



174-173A (for 1-axis or 2-axis)

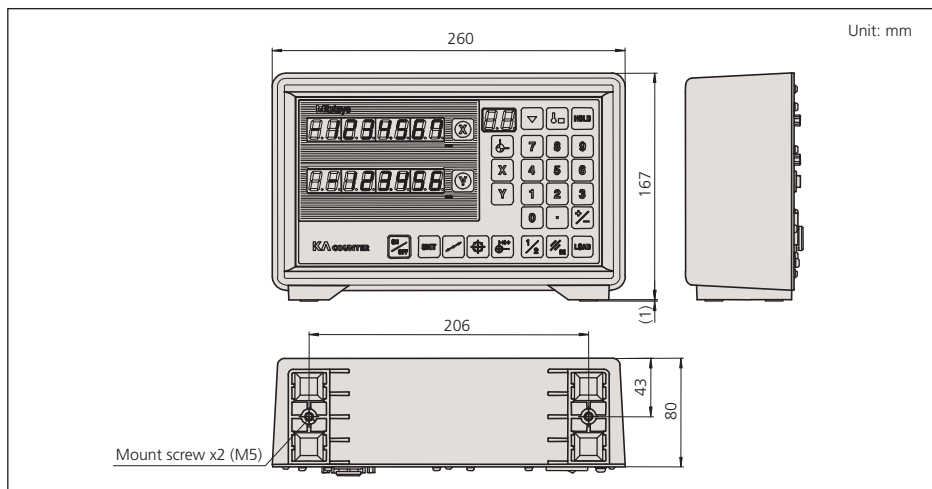


174-175A (for 3-axis)

### SPECIFICATIONS

Order No.	174-173A	174-175A
Scale input ports	2	3

### DIMENSIONS

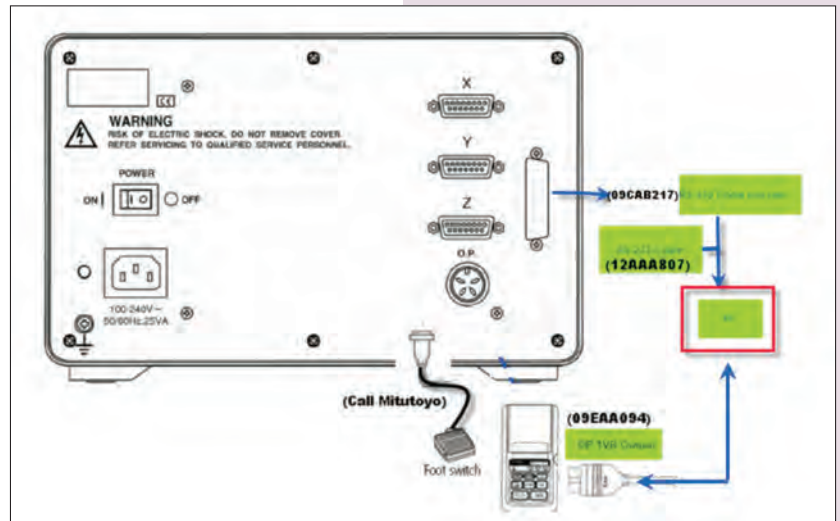


### Technical Data: Common

Scale input ports: 2, 3  
 Resolution: .000005", .00005", .0001", .0002", .0005"  
 (0.0001mm, 0.001mm, 0.002mm, 0.005mm, 0.010mm) (changeable with parameters)  
 Display: 7-digit LED and a negative [-] sign  
 Power supply: 100V-240V AC, 50/60Hz  
 Mass: 1.1kg (2-axis), 1.2kg (3-axis)

### Optional Accessories

- 09CAB217: RS232C code out unit
- 64PMT114: Converter cable, RS232C to Digimatic SPC
- 965004: RS-232C ext. load foot switch
- 264-504-5A: DP-1VR, 120V AC
- 09EAA094: RS-232C counter cable



### Functions

ZERO	Zero-Setting	●
P.SET	Preset	●
0.001 / 0.01	Resolution setting	● <sup>1</sup>
→	Counting direction setting	●
mm / in	mm/inch conversion	●
1/2	1/2 calculation	●
ABS/INC	ABS/INC coordinate selection	● <sup>2</sup>
123	Lower digit blanking out	●
🔒	Memory backup	●
↔	Expansion/contraction coefficient setting	●
→	Zero approach machining [ABS mode]	●
→	Zero approach machining [INC mode]	●
⊕	Bolt-hole circle machining	●
👉	Touch-signal probe	○
▼ Set	Scale reference point setting	● <sup>6</sup>
MAX / MIN	Maximum/minimum value hold	●
∅	Diameter display	●
Z1-Z2	Addition of 2-scale data	● <sup>4</sup>
TOOL	Cutting tool selection	● <sup>5</sup>
↔	Linearity error compensation	●
1234	Smoothing	●
RS-232C OUTPUT	RS-232C Interface Unit	○

- : Provided as standard
- : Optional accessory
- <sup>1</sup> Resolutions to be set differ depending upon the type of Counters.
- <sup>2</sup> 1 absolute (ABS) coordinate and 9 incremental (INC) coordinate are provided for the KA Counter.
- <sup>4</sup> Not available on the 1-axis Counters.
- <sup>5</sup> Not available on the 2-axis Counters.
- <sup>6</sup> 10 cutting tools can be specified on the KA Counter. When connecting AT100 Series Glass Scale.

# KLD Counter

## SERIES 174 — Special Purpose Type with Limit Signal Output

### FEATURES

- A 1-axis counter dedicated to sending signals when a linear scale displacement value and a preset limit value coincide.
- Two types of limit settings are available: 2 steps, 4 steps.
- Connectable with AT715 electromagnetic scale or AT100 series glass scale.
- For controlling a vertical position of an EDM or a grinding machine.
- Can be connected to a personal computer or a sequencer by installing an RS-232C Interface Unit or a BCD Code Out Unit. (Both interface units are optional accessories.)

### Technical Data: Common

Limit signal output: 1-step, 4-step  
 Scale input ports: 1  
 Resolution: 0.0005mm, 0.001mm, 0.002mm, 0.005mm, 0.01mm, .00002", .00005", .0001", .0002", .0005", .001"  
 Display: 9-digit LED and a negative [-] sign  
 Limit value setting method: Digital switch, Ten-keyboard  
 Power supply: 100-120V/200-240V AC, 50/60Hz  
 Mass: 4.5kg

### Optional Accessories

**907569:** RS-232C Interface Unit  
**907570:** BCD Code Out Unit  
**965004:** External load foot switch\*  
**937326:** External load box\*  
**936551:** External zero-set box  
 \*RS-232C Interface Unit (907569) is required



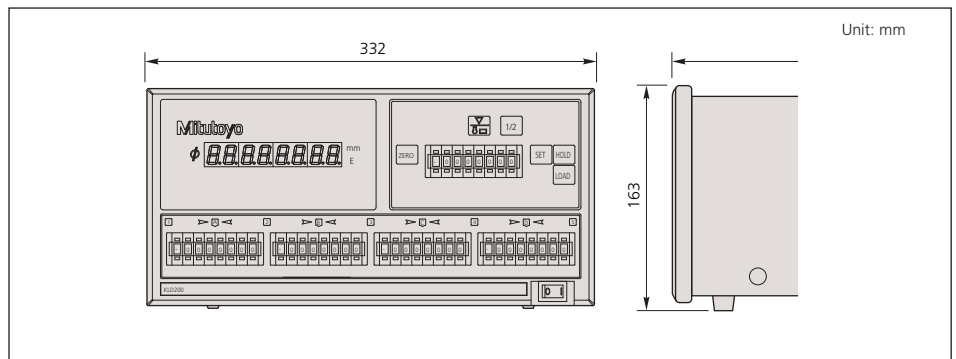
### SPECIFICATIONS

Order No.	174-147A
Limit signal output	4-step
Limit value setting method	Digital switch

Function	Counter	KLD
Zero-setting	●	●
Zero-set remote controller	—	—
Preset	●	●
Resolution setting	●	●
Counting direction setting	●	●
mm/inch conversion	●	●
1/2 calculation	●	●
ABS/INC coordinate selection	—	—
Lower digit blanking out	●	●
Memory backup	●	●
Expansion/contraction coefficient setting	●	●
Zero approach machining (ABS mode)	—	—
Zero approach machining (INC mode)	—	—
Bolt-hole circle machining	—	—
Touch-signal probe	▲	▲
Scale reference point setting	●	●
Addition/subtraction	—	—
Maximum/minimum value hold	●	●

●: Provided as standard  
 ▲: Optional accessory  
 —: Not available

### DIMENSIONS



Mitutoyo



# PSU-200

## SERIES 539 — Pulse Signal Conversion Interface

### FEATURES

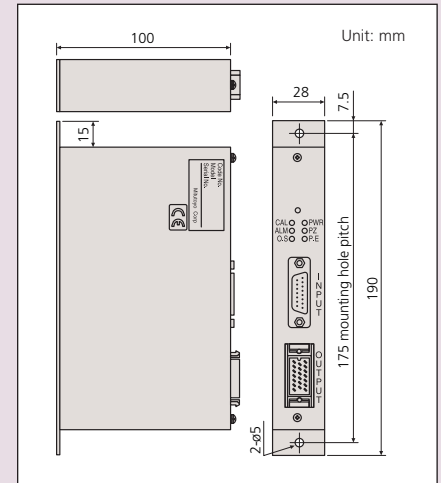
- Applicable with Linear Scales with the sinusoidal signal output.
- Quadrature signal output (conforming to EIA standard RS422-A).
- Alarm function for detecting broken wires or short circuits in the detector, over-speed and fluctuation errors in the input signal from the detector.

### SPECIFICATIONS

Order No.	539-005
Number of axes	1
Number of deviation	4, 8, 10, 20, 40, 80, 100 or 200 (switchable)
Functions	Division setting, Min. edge interval setting, LED for alarm indication, Alarm output mode switching, LED for origin detection, LED for low-level power supply voltage warning
Power supply	DC5V±5%
Consumption	200mA
Mass	620g



### DIMENSIONS



# MICSYS-SA1 2D Image Correlation Encoder

## SERIES 549

### FEATURES

- High accuracy non-contact 2D encoder using image correlation.
- Simultaneous X-Y position measurements.
- Nanometer resolution.
- Easy alignment.
- Allows minute strain measurement and deflection measurement.

### Applications

1. Evaluation of stages used in manufacturing equipment and inspection systems

a) Evaluation of position repeatability      b) Evaluation of standstill stability and drift
2. Highly accurate positioning of workpieces

Setting and removal
3. Measurement of minute displacement

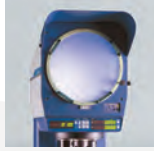
a) Measurement of minute displacement of a structure      b) Measurement of minute displacement of a workpiece



### Technical Data

Effective range:	±100μm (2D)
Accuracy (at 20°C):	±100nm
Resolution:	1nm
Working Distance:	10±0.2mm (Including thickness of standard target: 6.1mm)
Linearity (at 20°C):	80nm
Repeatability (at 20°C):	5nm

**Profile Projectors**



**Microscopes**



PJ-H30

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MF



MF-U

# PJ-A3000

## SERIES 302 — Vertical Profile Projectors

### FEATURES

- The PJ-A3000 Series vertical profile projectors are medium-size 11.8" (300mm) models that feature high versatility and easy operation.
- Easy-to-read digital XY counter is located near the projection screen to minimize eye movement.
- Digital readout protractor screen facilitates angle measurement.



PJ-A3010F-200



PJ-A3005D-50



PJ-A3010F-100

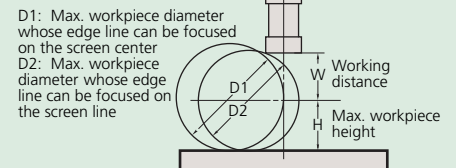


PJ-A3005F-150



PJ-A3010F-200

### Projection Capacity



	Magnification			
	10X	20X	50X	100X
View field	ø31.5	ø15.7	ø6.3	ø3.1
W	66 (20)	32.5 (2)	12.6	5
H	-50 models*	123.5	123.5	123.5
	-100 models	91	91	91
	-150 models	103.5	103.5	103.5
	200 models	92.5	92.5	92.5
D1	-50 models*	224 (198)	87 (61)	27
	-100 models	182	87 (61)	27
	-150 models	207 (198)	87 (61)	27
	200 models	185	87 (61)	27
D2		154 (120)	69 (23)	25

( ): When using surface illumination

## Optional Accessories

- 172-202:** 10X projection lens set (Standard accessory)
- 172-203:** 20X projection lens set
- 172-223:** 10X projection lens
- 172-224:** 20X projection lens
- 172-204:** 50X projection lens
- 172-207:** 100X projection lens
- 172-229:** Oblique illumination mirror for 10X lens
- 172-230:** Oblique illumination mirror for 20X lens
- 172-116:** Standard scale (50mm)
- 172-117:** Standard scale (2")
- 172-118:** Reading scale (200mm)
- 172-161:** Reading scale (300mm)
- 172-119:** Reading scale (8")
- 172-162:** Reading scale (12")
- 172-160-2:** Green filter (for PJ-A3000, -50 models)
- 172-160-3:** Green filter (for -100, -150, -200 models)
- 512305:** Halogen bulb (24V, 150W)

## Fixture and Stage Accessories

- 176-106:** Rotary table (Effective diameter: 66mm)
- 172-196:** Rotary table (Effective diameter: 100mm)
- 172-198:** Rotary table with fine feed wheel (Effective diameter: 4" / 100mm)
- 176-105:** Swivel center support (Max. workpiece dia.: 2.7" / 70mm)
- 172-197:** Swivel center support (Max. workpiece dia.: 3.1" / 80mm)
- 176-107:** Holder with clamp
- 172-378:** V-block with clamp (Max. workpiece dia.: 1" / 25mm)
- 999678:** Fixture mount adapter

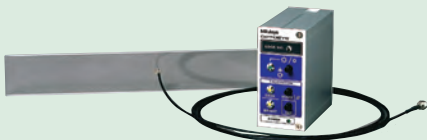
Availability	PJ-A3005D-50	PJ-A3005F-150	PJ-A3010F-100 PJ-A3010F-200
<b>176-106</b>	✓	✓	
<b>172-196</b>		✓	✓*
<b>172-198</b>		✓	✓*
<b>176-105</b>	✓		
<b>172-197</b>		✓	✓*
<b>176-107</b>	✓	✓	✓*
<b>176-378</b>	✓	✓	✓*

\* Fixture mount adapter (999678) is required for PJ-3010F-200







### QM-Data200

- 264-155A:** Stand mount type
- 264-156A:** Arm mount type
- 2-D data processing unit.
- (Refer to page I-23 for more details.)

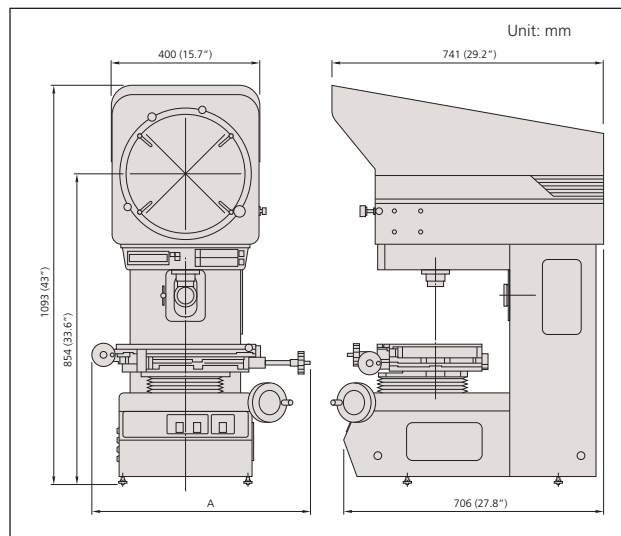


- 332-151:** Optoeye  
Edge detection system for QM-Data 200
- 12AAE671:** Detector Attachment

## SPECIFICATIONS

				
Model	PJ-A3010F-200	PJ-A3005F 150	PJ-A3010F-100	PJ-A3005D-50
Order No.	<b>302-701A</b>	<b>302-702A</b>	<b>302-703A</b>	<b>302-704A</b>
Projected image	Inverted image			
Protractor screen	Effective diameter	12.4" / 315mm		
	Screen material	Fine ground glass		
	Reference line	Cross hair line		
	Angle display (LED)	Resolution: 1' or 0.01° (switchable), Range: ±360° Functions: Absolute/incremental mode switching, Zero Set		
Projection lens	Standard Accessory 10X ( <b>172-202</b> )			
Magnification accuracy	Contour illumination	±0.1% or less		
	Surface illumination	±0.15% or less		
Contour illumination	Light source	Halogen bulb (24V, 150W)		
	Optical system	Telecentric system		
	Functions	2-stage brightness switch, Heat-absorbing filter		
Surface illumination	Light source	Halogen bulb (24V, 150W)		
	Optical system	Vertical illumination with a half-reflection mirror		
XY range	8" x 4" (200 x 100mm)	6" x 2" (150 x 50mm)	4" x 4" (100x100mm)	2" x 2" (50 x 50mm)
Resolution	.0001" / 0.001mm	.0001" / 0.001mm	.0001" / 0.001mm	.0001" / 0.001mm
Measuring Unit	Built-in linear scales	Built-in linear scales	Built-in linear scales	Digimatic mic heads
Table size	14.96x9.84" (380x250mm)	11.02x5.98" (280x152mm)	9.84x9.84" (250x250mm)	5.98x5.98" (152x152mm)
Effective table area	10.47x6.69" (266x170mm)	7.24x3.23" (184x82mm)	5.6x5.6" (142x142mm)	3.23x3.23" (82x82mm)
Max. workpiece height	3.64" (92.5mm)	4.07" (103.5mm)	3.58" (91mm)	4.86" (123.5mm)
Functions	± direction switching, SPC output zero-setting	Zero-setting, ± direction switching, SPC output	Zero-setting, ± direction switching, SPC output	± direction switching, SPC output zero-setting
Power supply	120V AC, 50/60Hz			
Mass	308 lbs. (140kg)	255 lbs. (116kg)	246 lbs. (112kg)	235 lbs. (107kg)
Standard accessories	10X projection lens set, masking shield, power cord, halogen bulb, tube fuse, grounding wire, Allen key, cap			

## DIMENSIONS



Model	PJ-A3005D-50	PJ-A3010F-100	PJ-A3005F-150	PJ-A3010F-200
A	17.9" / 455mm	16.8" / 427mm	17.6" / 446mm	23.3" / 593mm

# PJ-H30

## SERIES 303 — High Accuracy Profile Projectors

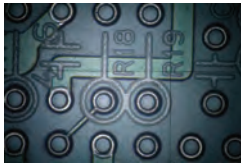
By separating axial motion, and stabilizing the XY measuring table in the vertical direction, high measuring accuracy of  $(3+0.02L)\mu\text{m}$  has been achieved on the PJ-H30 Series Profile Projectors. Focusing is accomplished by moving the screen head itself up & down with the hand wheel or motorized unit. The power focusing (PJ-H30D type) provides higher performance.

### FEATURES

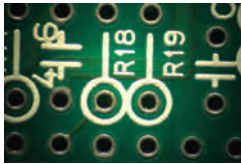
- Newly designed optical system with high NA lenses provide drastically brighter and clearer screen images during surface illumination.
- The three-lens mounting turret includes a 10X lens as standard. Four types of projection lenses (5X, 20X, 50X, 100X) are available.



Adjustable / oblique switchable surface illumination



Vertical illumination

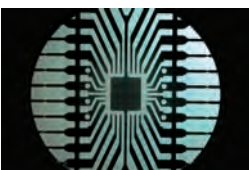
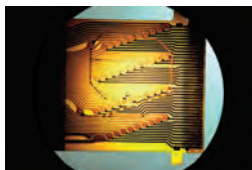
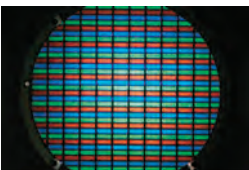


Oblique illumination

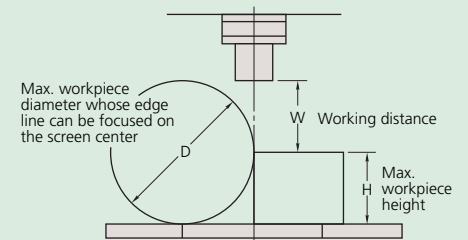


### PJ-H30A3017B

XY stage travel range: 12x7" / 300x170mm



### Projection Capacity



Unit: mm

	Magnification				
	5X	10X	20X	50X	100X
View field	ø61.2	ø30.6	ø15.3	ø6.12	ø3.06
H	100	100	100	100	100
W	66	70.5	56.5	50	50
D	148	197	137	114	123

## Optional Accessories

172-271:	5X projection lens
172-472:	10X projection lens
172-473:	20X projection lens
172-474:	50X projection lens
172-475:	100X projection lens
172-116:	Standard scale (50mm)
172-117:	Standard scale (2")
172-118:	Reading scale (200mm)
172-161:	Reading scale (300mm)
172-119:	Reading scale (8")
172-162:	Reading scale (12")
12AAG981:	Green filter
172-269:	Machine stand
990600:	External counter zero switch
515530:	Halogen bulb (24V, 150W)

## Fixture and Stage accessories

172-198:	Rotary table (Effective diameter: 4" / 100mm)
176-305:	Rotary table (Effective diameter: 7.2" / 183mm)
176-306:	Rotary table (Effective diameter: 9.4" / 240mm)
176-105:	Swivel center support (Max. workpiece dia.: 2.8" / 70mm)
172-197:	Swivel center support (Max. workpiece dia.: 3.1" / 80mm)
176-107:	Holder with clamp
172-378:	V-block with clamp (Max. workpiece dia.: 1" / 25mm)
176-317:	Fixture mount adapter C
176-304:	Fixture mount adapter A

Availability	Models	
	PJ-H30A1010B	PJ-H30A2017B
	PJ-H30B1010B	PJ-H30B2017B
	PJ-H30D1010B	PJ-H30D2017B
	PJ-H30A2010B	PJ-H30A3017B
	PJ-H30B2010B	PJ-H30B3017B
	PJ-H30D2010B	PJ-H30D3017B
172-198	✓**	✓****
176-305	✓**	
176-306		✓****
176-107 *	✓**	✓****
172-378 *	✓**	✓****
172-197 *	✓**	✓****
176-105	✓***	✓****
176-654	✓**	✓

\*: Able to attach to a Rotary table(172-198 or 176-305)  
 \*\*: Fixture mount adapter C (176-317) is required.  
 \*\*\*: Rotary table(172-198) is required.  
 \*\*\*\*: Fixture mount adapter A (176-304) is required.

## QM-Data200

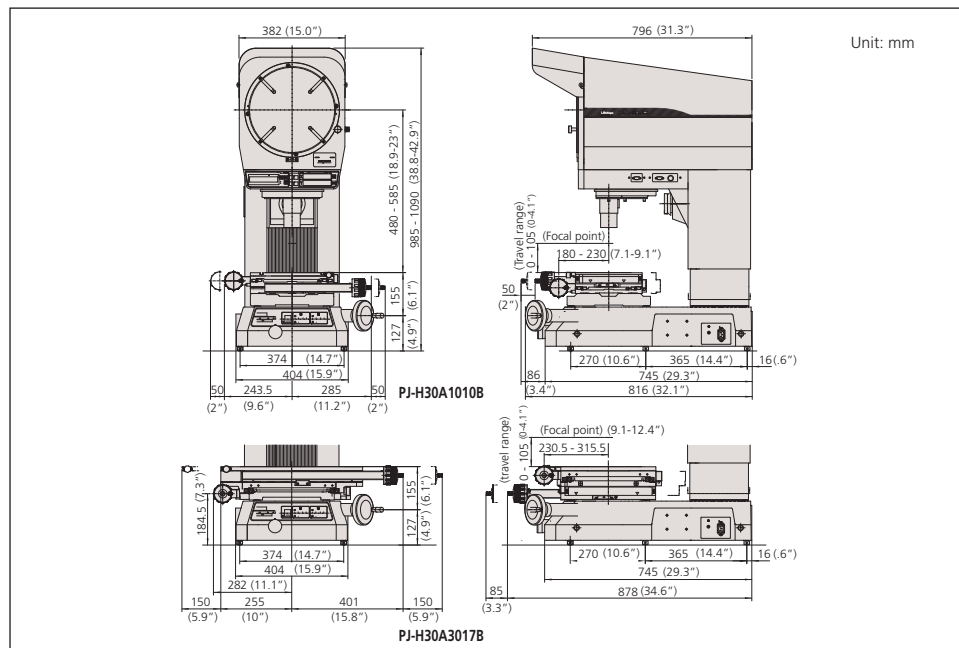
264-155A: Stand mount type  
 264-156A: Arm mount type\*  
 \*Attachment stand (12AAG982) is required  
 2-D data processing unit.  
 (Refer to page I-23 for more details.)



332-151: Optoeye  
 Edge detection system for QM-Data 200  
 12AAE671: Detector Attachment

Manual Focus type	Model No.	PJ-H30A1010B	PJ-H30A2010B	PJ-H30A2017B	PJ-H30A3017B
	Order No.	303-712A	303-713A	303-714A	303-715A
Power Focus, built-in OPTOEYE type	Model No.	PJ-H30D1010B	PJ-H30D2010B	PJ-H30D2017B	PJ-H30D3017B
	Order No.	303-732A	303-733A	303-734A	303-735A
Projected Image		Erect image			
Protractor screen	Effective diameter	12" / 306mm			
	Screen material	Fine ground glass			
	Reference line	Cross hair line			
	Screen rotation	±360°, fine feed and clamp			
	Angle display(LED)	Resolution: 1' or 0.01°(switchable), Range: ±370°, Functions: Absolute/incremental mode switching, Zero set			
Projection lens		Standard accessory: 10x(172-472), Optional accessories: 2X, 20X, 50X, 100X			
Lens mount		3-lenses mounting turret			
Magnification accuracy	Contour illumination	±0.1% or less			
	Surface illumination	±0.15% or less			
Contour illumination	light source	Halogen bulb(24V 150W)			
	Optical system	Zoom telecentric system			
	Functions	Brightness adjustment, Heat-absorbing filter, Cooling fan			
Surface illumination	light source	Halogen bulb(24V 150W)			
	Optical system	Vertical / Oblique illumination with an adjustable condenser lens			
	Functions	Non-stepped brightness adjustment, Heat-absorbing filter, Cooling fan			
	XY Range	4 x 4" 100 x 100mm	8 x 4" 200 x 100mm	8 x 6.7" 200 x 170mm	12 x 6.7" 300 x 170mm
	Resolution	.0001" / 0.001mm			
Measuring Unit	Built in Linear scale				
Table size		11.8 x 9.4" 300 x 240mm	13.8 x 11" 350 x 280mm	16.1 x 13.5" 410 x 342mm	20 x 13.5" 510 x 342mm
	Effective table area	7.1 x 5.9" 180 x 150mm	9.8 x 5.9" 250 x 150mm	10.6 x 9.4" 270 x 240mm	14.6 x 9.4" 370 x 240mm
Max. workpiece ht.	4.1" / 105mm				
Max. workpiece load	22lbs / 10kg	22lbs / 10kg	44 lbs / 20kg	44 lbs / 20kg	
Power supply	120V AC, 50/60Hz				
Mass	391lbs / 176kg	396lbs / 178kg	556lbs / 205kg	471lbs / 212kg	
Standard accessories	10x projection lens set, masking shield, power cord, halogen bulb, tube fuse, grounding wire, allen key, cap				

## DIMENSIONS



# PV-5110

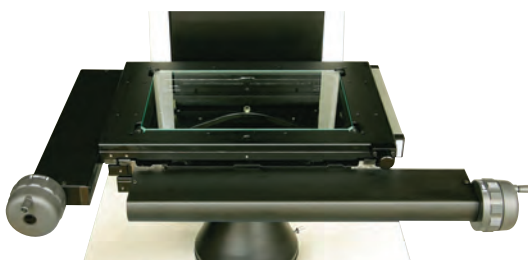
## SERIES 304 — Profile Projectors

### FEATURES

- Large 500mm screen
- Floor model that uses a downward illumination system.
- Digital readout protractor screen (including zero-setting, ABS/INC coordinate switching functions) for easy and error-free angle measurement.
- Angled screen allows projected images to be easily traced or compared with a template.
- The oblique surface illumination system provides clear and bright images, allowing easy inspection of non-reflective workpieces such as plastic parts or printed materials.

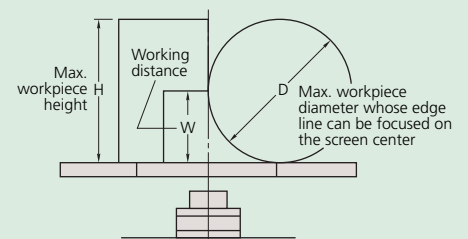


PV-5110  
with optional KA counter



PV-5110

### Projection Capacity



Unit: mm

	Magnification				
	5X	10X	20X	50X	100X
View field	ø101.6	ø50.8	ø25.4	ø10.16	ø5.08
H	125	181	206	87	87
W	60 (27)	60	60	32.4	22.5
D	120	120	120	64.8	45

( ): When using surface illumination

## Optional Accessories

- 172-401: 5X projection lens set
- 172-406: 5X projection lens
- 172-402: 10X projection lens set (standard accessory)
- 172-409: 10X projection lens
- 172-403: 20X projection lens set
- 172-411: 20X projection lens
- 172-404: 50X projection lens set
- 172-413: 50X projection lens
- 172-405: 100X projection lens set
- 172-415: 100X projection lens
- 172-419: Surface illumination unit (standard accessory)
- 172-116: Standard scale (50mm)
- 172-117: Standard scale (2")
- 172-118: Standard scale (200mm)
- 172-119: Standard scale (8")
- 172-161: Reading scale (300mm)
- 172-329: Reading scale (600mm)
- 172-162: Reading scale (12")
- 172-160-2: Green filter
- 172-319: Canopy
- 512305: Halogen bulb (24V, 150W)
- 510189: Vinyl cover

## Fixture and Stage accessories

- 172-196: Rotary table\*  
(Effective diameter: 4" / 100mm)
- 172-198: Rotary table with fine feed wheel\*  
(Effective diameter: 4" / 100mm)
- 172-197: Swivel center support\*  
(Max. workpiece dia.: 3.1" / 80mm)
- 176-107: Holder with clamp\*
- 172-378: V-block with clamp\*  
(Max. workpiece dia.: 1" / 25mm)

\*Fixture mount adapter (999678) is required.



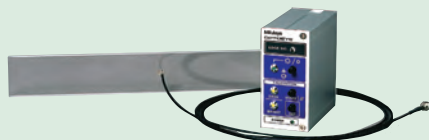
### KA Counter

(Refer to the page H-18 for more details.)



### QM-Data200

- 264-155A: Stand mount type
  - 264-156A: Arm mount type
- 2-D data processing unit.  
(Refer to page I-23 for more details.)



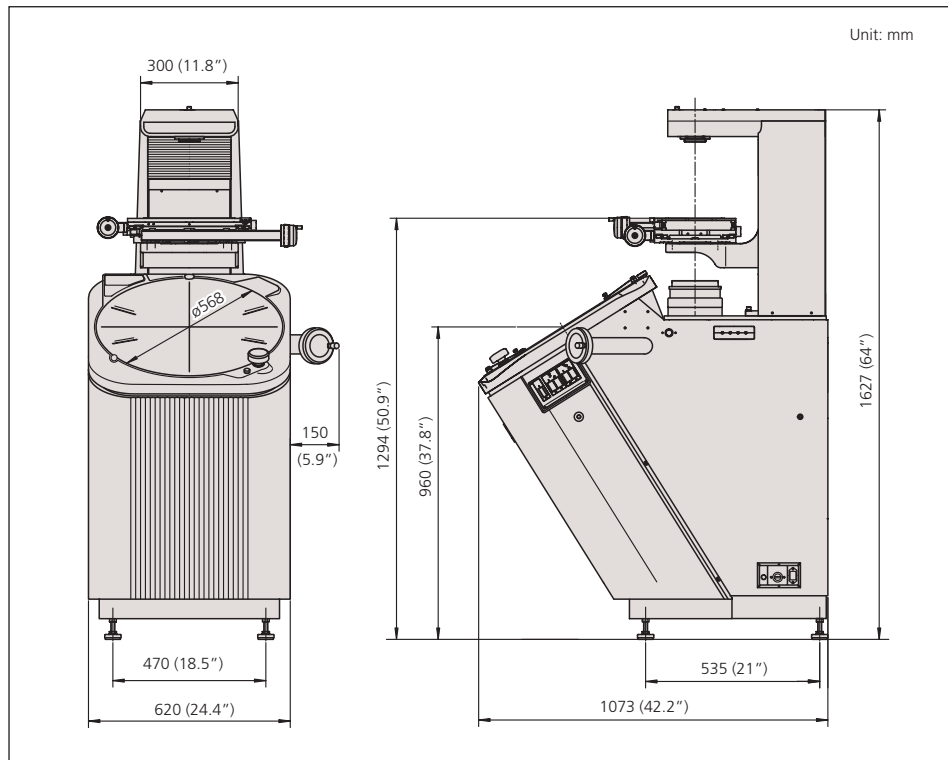
- 332-151: Optoeye  
Edge detection system for QM-Data 200
- 12AAE672: Detector Attachment (B)

## SPECIFICATIONS

Model No.	PV-5110	
Order No.	304-909A	
Projected Image	Invert image	
Protractor screen	Effective diameter	20" / 508mm
	Screen material	Fine ground glass
	Reference line	Cross hair line
	Screen rotation	±360°, fine feed and clamp
	Angle display (LED)	Resolution: 1' or 0.01°(switchable), Range: ±370°, Functions: Absolute/incremental mode switching, Zero set
Projection lens	Standard accessory: 10x(172-472), Optional accessories: 5X, 20X, 50X, 100X	
Magnification accuracy	Contour illumination	±0.1% or less
	Surface illumination	±0.15% or less
Contour illumination	light source	Halogen bulb(24V 150W)
	Optical system	Zoom telecentric system
	Functions	2-step brightness switch, Heat-absorbing filter, Cooling fan
Surface illumination	light source	Halogen bulb(24V 150W)
	Optical system	Vertical illumination
	Functions	Adjustable condenser lens. Oblique illumination (for 5X, 10X, and 20X), 2-step brightness switch, Heat-absorbing filter, Cooling fan
	XY Range	8 x 4" / 200 x 100mm
	Resolution	.0001" / 0.001mm*
Measuring Unit	Built in Linear scale	
Table size	15 x 9.8" / 380 x 250mm	
Effective table area	10.5 x 6.7" / 266 x 170mm	
Max. workpiece height	See (H) on page I-6	
Max. workpiece load	11lbs / 5kg	
Power supply	120V AC, 50/60Hz	
Mass	467lbs / 210kg	
Standard accessories	200x100mm (8" x 4") stage, 10x projection lens set, Surface illumination unit. Counter stand for KA counter, power cord, halogen bulb, tube fuse, grounding wire, allen key, cap	

\* Counter not included

## DIMENSIONS





# PH-A14

## SERIES 172 — Profile Projector

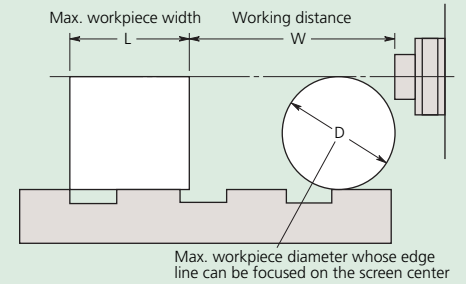
### FEATURES

- Bench-top model that uses horizontal optical system.
- Suitable for thread pitch measurements—blurred or distorted images will not be produced when workpiece is angled.
- Inverted image on the day-bright screen.
- 14" (356mm) diameter protractor screen with cross-hairs and staggered lines for easy alignment.
- Heavy-duty workpiece table incorporates linear scales for fast, accurate measurement.



PH-A14

### Projection Capacity



PH-A14

Unit: mm

	Magnification			
	10X	20X	50X	100X
View field	70.6	17.3	7.12	3.56
L	235	235	80	109
W	93	40	14.6	11
D	105	105	30.4	19

## Optional Accessories

172-011:	10X projection lens
172-012:	20X projection lens
172-013:	50X projection lens set
172-014:	100X projection lens set
172-116:	Standard scale (50mm)
172-117:	Standard scale (2")
172-118:	Reading scale (200mm)
172-161:	Reading scale (300mm)
172-119:	Reading scale (8")
172-162:	Reading scale (12")
172-286:	Green filter
512305:	Halogen bulb (24V, 150W)

### Fixture and Stage accessories

172-142:	Center support
172-143:	Center support riser
172-144:	Rotary vise (Max. workpiece dia.: 2.4" / 60mm)
172-234:	V-block with clamp (Max. workpiece dia.: 2" / 50mm)
172-132:	Vertical holder
64AAA129B:	Machine stand



### KA Counter

(Refer to page H-18 for more details.)

64AAB149: Counter stand



### QM-Data200

2-D data processing unit.

264-155A: Stand mount type

264-156A: Arm mount type

(Refer to page I-23 for more details.)



### 332-151: Optoeye

Edge detection system for QM-Data 200

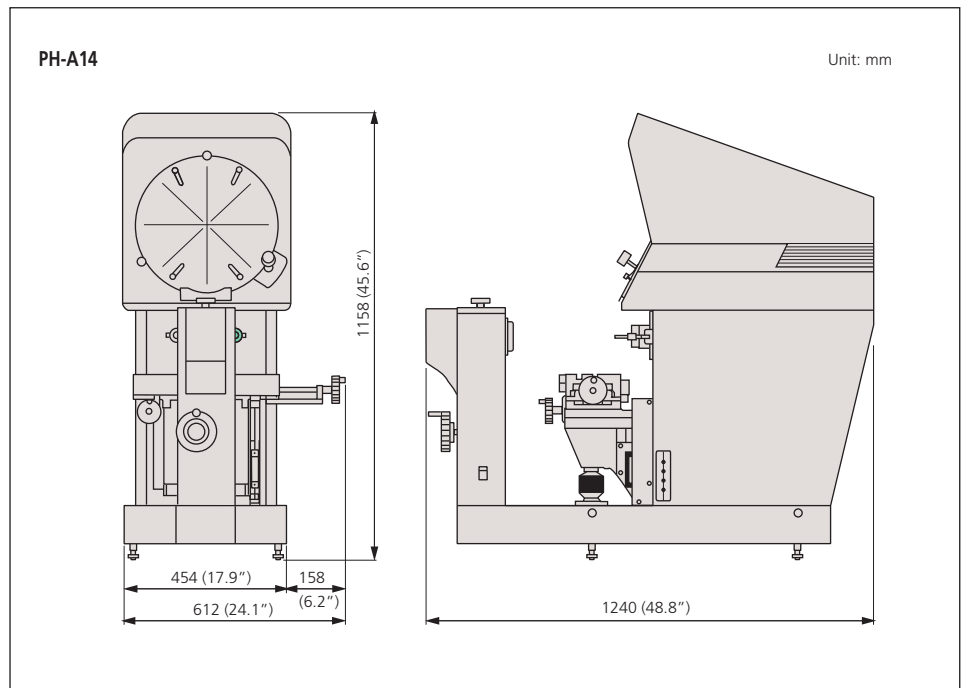
12AAE671: Detector attachment (A)

## SPECIFICATIONS

Model No.	PH-A14	
Order No.	172-810-10A	
Projected image	Inverted image	
Protractor screen	Effective diameter	14" / 356mm
	Screen material	Fine ground glass
	Reference line	Cross hair line
	Screen rotation	±360°, fine feed and clamp
	Angle display	Vernier reading, Resolution: 2'
Projection lens	Standard accessory: 10x(172-011), Optional accessories: 20X, 50X, 100X	
Magnification accuracy	Contour illumination	±0.1% or less
	Surface illumination	±0.15% or less
Contour illumination	light source	Halogen bulb(24V 150W)
	Optical system	Telecentric system
	Functions	Heat-absorbing filter, Cooling fan
Surface illumination	light source	Halogen bulb(24V 150W)
	Optical system	Twin fiber optic illumination
XY Stage	Table travel (X-axis)	8" / 203.2mm
	Table size(X, Z)	16 x 6" / 407 x 153mm
	Vertical travel (Y-axis)	4" / 101.6mm
	Resolution	.00005" / 0.001mm*
	Measuring Unit	Built in Linear scale
	Max. workpiece width	See (L) on page I-12
Max. workpiece load	100lbs / 45kg	
Power supply	120V AC, 50/60Hz	
Mass	308lbs / 140kg	
Standard accessories	10x projection lens set, work stage, power cord, halogen bulb, tube fuse, grounding wire, allen key, cap	

\*Counter not included

## DIMENSIONS



# PH-3515F

## SERIES 172 — Profile Projector

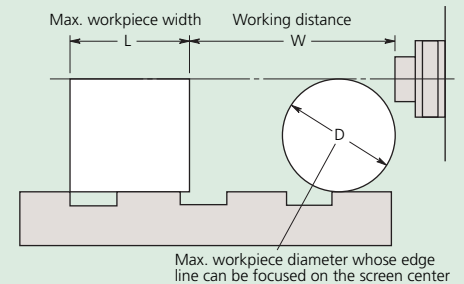
### FEATURES

- Bench-top model that uses horizontal optical system.
- Suitable for thread pitch measurements—blurred or distorted images will not be produced when workpiece is angled.
- Erect image on the day-bright screen.
- Twin fiber optic illumination comes standard.
- 14" (353mm) diameter protractor screen with cross-hairs and staggered lines for easy alignment.
- Digital angle measurement to 1' or 0.01°.
- Heavy-duty workpiece table incorporates linear scales for fast, accurate measurement.
- Built-in linear scales for use with optional display counters.



PH-3515F

### Projection Capacity



PH-3515F

Unit: mm

	Magnification				
	5X	10X	20X	50X	100X
View field	70.6	35.3	17.65	7.06	3.5
L	175	235	235	80	109
W	160 (64)	93 (35)	40	14.6	9.5
D	152.4	152.4	116	30.4	19

( ) : When using surface illumination

## Optional Accessories

172-145:	5X projection lens set
172-175:	5X projection lens
172-184:	10X projection lens set (standard accessory)
172-011:	10X projection lens
172-173:	20X projection lens set
172-165:	50X projection lens set
172-174:	50X projection lens
172-166:	100X projection lens set
172-116:	Standard scale (50mm)
172-117:	Standard scale (2")
172-118:	Reading scale (200mm)
172-161:	Reading scale (300mm)
172-119:	Reading scale (8")
172-162:	Reading scale (12")
172-286:	Green filter
512305:	Halogen bulb (24V, 150W)
172-133:	Surface illumination
64AAB004:	Fiber optical illumination cable
64PPP277:	Halogen lamp (for 64AAB004)
58ZZA097:	Machine stand

### Fixture and Stage accessories\*

172-142:	Center support
172-143:	Center support riser
172-144:	Rotary vise (Max. workpiece dia.: 2.3" / 60mm)
172-234:	V-block with clamp (Max. workpiece dia.: 2" / 50mm)
172-132:	Vertical holder
172-001:	Tipped-saw support stand
172-002:	Cutter support stand

\* See page I-17 for details



174-173A KA Counter  
64AAB003: Counter tray  
(Refer to page H-18 for more details.)



QM-Data200  
2-D data processing unit.  
264-155A: Stand mount type  
264-156A: Arm mount type  
(Refer to page I-23 for more details.)



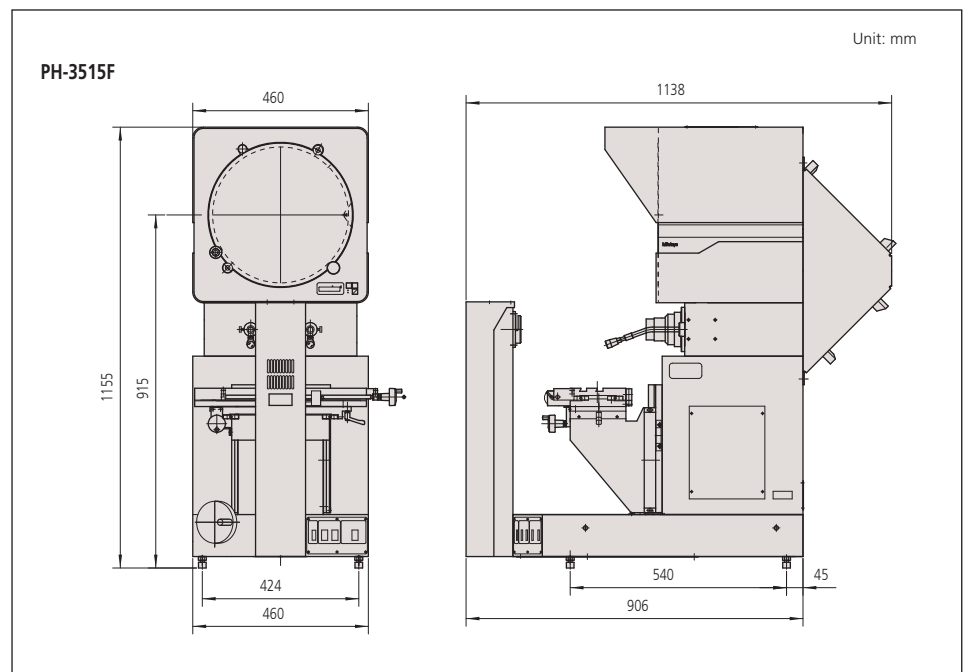
332-151: Optoeye  
Edge detection system for QM-Data 200  
12AAE671: Detector attachment (A)

## SPECIFICATIONS

Model No.	PH-3515F	
Order No.	172-858-A	
Projected Image	Erect image	
Protractor screen	Effective diameter	14" / 353mm
	Screen material	Fine ground glass
	Reference line	Cross hair line
	Screen rotation	±360°, fine feed and clamp
	Angle display(LED)	Resolution: 1' or 0.01°(switchable), Range: ±370°, Functions: Absolute/incremental mode switching, Zero set
Projection lens	Standard accessory: 10x(172-184), Optional accessories: 5X, 20X, 50X, 100X	
Magnification accuracy	Contour illumination	±0.1% or less
	Surface illumination	±0.15% or less
Contour illumination	light source	Halogen bulb (24V 150W)
	Optical system	Telecentric system
	Functions	2-step brightness switch, Heat-absorbing filter, Cooling fan
Surface illumination (Optional accessories)	light source	Halogen bulb(24V 150W)
	Functions	Adjustable condenser lens. Heat-absorbing filter, Cooling fan
XY Stage	Table travel (X-axis)	10" / 254mm
	Table size (X, Z)	17.7"x5.7" / 450x146mm
	Vertical travel (Y-axis)	6" / 152mm
	Resolution	0.001mm/.0001"*
	Measuring Unit	Built in Linear scale
	Max. workpiece width	See (L) on page I-10
	Max. workpiece load	100lbs / 45kg
Power supply	120V AC, 50/60Hz	
Mass	333lbs / 150kg	
Standard accessories	10x projection lens set, work stage, power cord, halogen bulb, tube fuse, grounding wire, allen key, cap, Vinyl cover	

\* Counter not included

## DIMENSIONS



# Accessories for Profile Projectors

## SERIES 172 — Profile Projector

### Standard Scales



172-116

- Used for checking magnification accuracy.

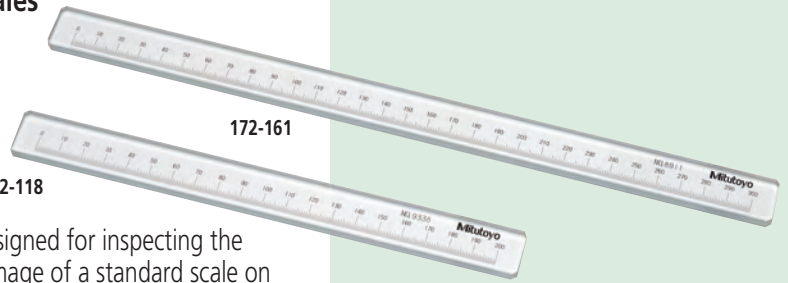
### SPECIFICATIONS

Metric				
Graduation	Range	Order No.	Accuracy (20°C)*	
0.1mm	50mm	172-116	(3+5L/1000)μm	
0.1mm	80mm	172-330	(3+5L/1000)μm	

\*L = Measured length (mm)

Inch				
Graduation	Range	Order No.	Accuracy (20C)	
.01"	2"	172-117	.00013"	

### Reading Scales



172-118

172-161

- Specially designed for inspecting the magnified image of a standard scale on the projection screen.

### SPECIFICATIONS

Metric				
Graduation	Range	Order No.	Accuracy	
0.5mm	200mm	172-118	18μm (15+15L/1000)μm	
0.5mm	300mm	172-161	19.5μm (15+15L/1000)μm	
0.5mm	600mm	172-329	24μm (15+15L/1000)μm	

Inch				
Graduation	Range	Order No.	Accuracy	
.02"	8"	172-119	.00071"	
.02"	12"	172-162	.00077"	

# Micrometer Heads

## for Profile Projectors and Toolmaker's Microscopes

### Micrometer Heads for XY Stage

#### FEATURES

- Non-rotating device is provided.
- The thimble reading can be zero-set at any spindle position.
- Black and red figures of the bi-directional graduation allow easy reading in both directions.
- Clamping stem diameter: 18mm

### SPECIFICATIONS

Metric					
Graduation	Range	Order No.	Accuracy	Remarks	
0.005mm	25mm	152-390	±2μm	for X-axis	
0.005mm	25mm	152-389	±2μm	for Y-axis	

Inch					
Graduation	Range	Order No.	Accuracy	Remarks	
.0001"	1"	152-391	±.0001"	for X-axis	
.0001"	1"	152-392	±.0001"	for Y-axis	

### Digimatic Micrometer Heads

#### FEATURES

- Large LCD digits for error-free reading.
- The display rotates 330° for easy viewing.
- The spindle does not rotate.
- With SPC data output.

### Adjustable Micrometer Heads for XY Stages

#### FEATURES

- The adjustable spindle can be fed under the thimble clamped at any reading, allowing easy reference point setting.
- The spherical measuring face is carbide-tipped.
- Clamping stem diameter: 18mm

### SPECIFICATIONS

Metric					
Graduation	Range	Order No.	Accuracy	Remarks	
0.001mm*	25mm	152-402	±2μm	for X-axis	
0.001mm*	25mm	152-401	±2μm	for Y-axis	

\*Obtained by using vernier.



164-164



152-390

### SPECIFICATIONS

Inch/Metric				
Resolution	Range	Order No.	Accuracy	
.00005"/0.001mm	2" (50mm)	164-164	±.00015"	

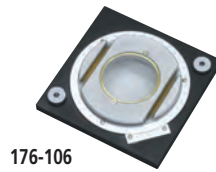
### Optional Accessories

- 937387: SPC cable for series 164 (1m)
- 965013: SPC cable for series 164 (2m)

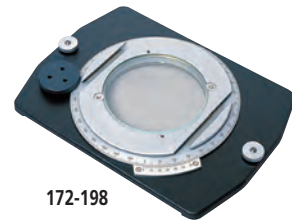
# Workpiece Fixtures

for Profile Projectors and Measuring Microscopes

## Rotary Tables



176-106



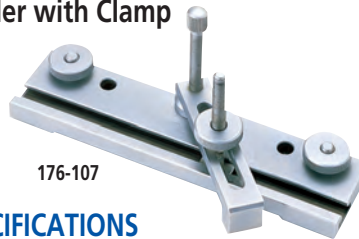
172-198

### SPECIFICATIONS

Order No.	176-106	172-198
Effective glass dia.	66mm	100mm
Angle reading	6'	2' (w/ fine adjustment)
Mass	1.7kg	2.5kg

Note: Holder with clamp (176-107) can be mounted.

## Holder with Clamp



176-107

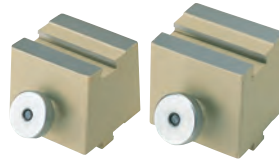
### SPECIFICATIONS

Order No.	176-107
Max. workpiece height	35mm
Mass	0.42kg

## Center Support



172-142



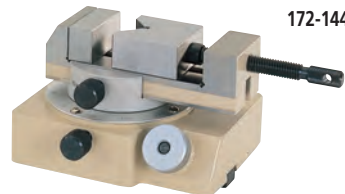
172-143

### SPECIFICATIONS

Order No.	172-142
Max. workpiece height	120mm (240mm)*
Mass	3.3kg

\*When using a center support riser (172-143)

## Rotary Vise



172-144

### SPECIFICATIONS

Order No.	172-144
Max. workpiece height	60mm
Width of jaw	40mm
Angle reading	5°
Mass	2.5kg

## Swivel Center Supports



176-105



172-197

### SPECIFICATIONS

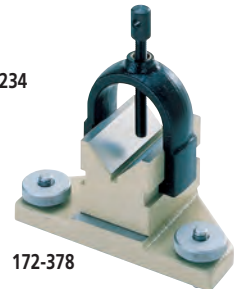
Order No.	176-105	172-197
Max. workpiece dia.	70mm (45mm)*	80mm (65mm)*
Max. workpiece length	140mm	140mm
Swivel range	±10°	±10°
Mass	2.4kg	2.5kg

\*When swiveled 10°

## V-Block with Clamp



172-234

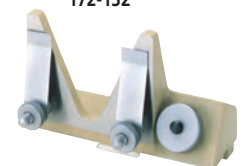


172-378

### SPECIFICATIONS

Order No.	172-234	172-378
Max. workpiece dia.	50mm	25mm
Width of block	60mm	41mm
Mass	1.24kg	0.8kg

## Vertical Holder



172-132

### SPECIFICATIONS

Order No.	172-132
Mass	1.3kg

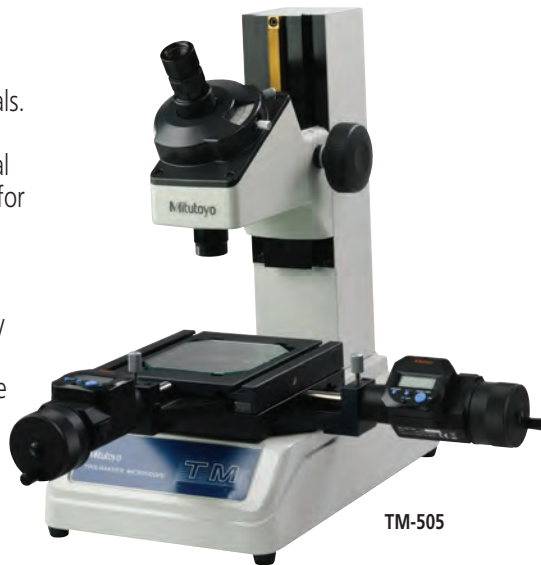
# TM-505/510

## SERIES 176 — Toolmaker's Microscopes

The Mitutoyo TM Series is a toolmaker's microscope well suited for measuring dimensions and angles of machined metals. It can also be used to check the shape of screws and gears by attaching an optional reticle. The compact body makes it ideal for use on shop-floors with limited space.

### FEATURES

- Angle measurement is performed easily by turning the angle scale disc to align the cross-hair reticle with the workpiece image.
- Illumination intensity can be adjusted.

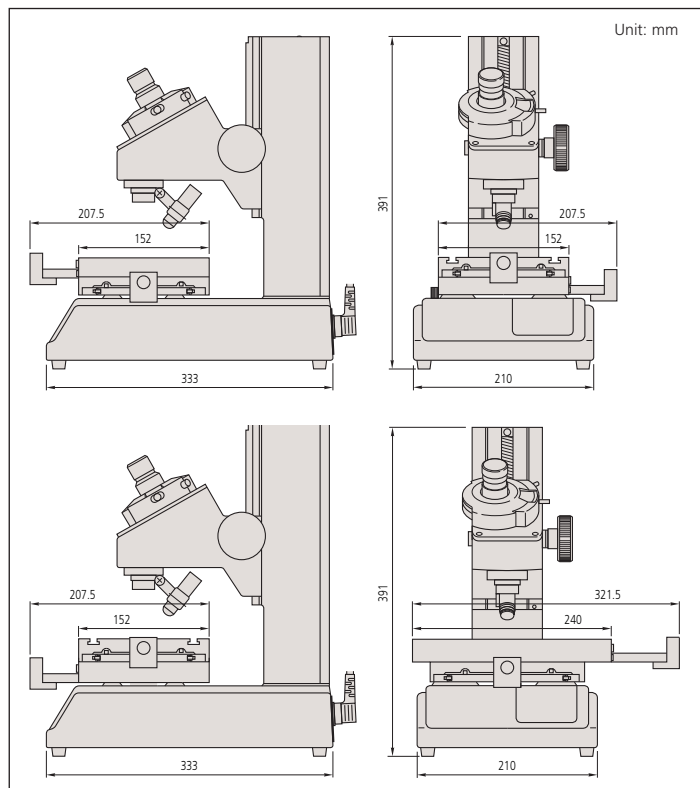


### SPECIFICATIONS

Model No.	TM-505		TM-510	
Order No.	176-808A	176-811A	176-809A	176-812A
XY stage travel range	2 x 2" / 50 x 50mm		4 x 2" / 100 x 50mm	
Measurement method	Digimatic Micrometer Head IN/MM (164-164 2pc)	Optional*	Digimatic Micrometer Head IN/MM (164-164 2pc)	Optional*
XY stage table top size	6 x 6" / 152 x 152mm		9.4 x 6" / 240 x 152mm	
Effective area of table	3.8 x 3.8" / 96 x 96mm		6 x 3.8" / 154 x 96mm	
Max. workpiece height	4.5" / 115mm		4.2" / 107mm	
Max. stage loading	11lbs			

\* See page I-12

### DIMENSIONS



Angle reading



### Technical Data

- Observation image: Erect image  
 Optical tube: Monocular (diopter adjustable)  
 Depression angle: 30°  
 Reticle: 90° broken cross-hair (176-126)  
 Range: 360°  
 Angle reading: Minimum reading: 6' (by vernier)  
 Eyepiece: 15X (176-116), View field dia.: 0.5" / 13mm  
 Optional: 10X, 20X  
 Objective: 2X (176-138), Working distance: 2.6" / 67mm  
 Optional: 5X, 10X  
 Total magnification: 30X  
 Contour illumination  
 • Light source: Tungsten bulb (24V, 2W)  
 • Functions: With green filter, Light intensity adjustable  
 Surface illumination:  
 • Light source: Tungsten bulb (24V, 2W)  
 • Functions: Light intensity adjustable  
 Power supply: 120V AC, 50/60Hz  
 Mass: 30lbs / 13.5kg (32lbs / 14.5kg: TM-510)

### Optional Accessories

- 176-115: 10X eyepiece (view field dia.: 13mm)  
 176-116: 15X projection lens set\*  
 176-117: 20X eyepiece (view field dia.: 10mm)  
 176-139: Objective, 5X (W.D.: 33mm, N.A.: 0.10)  
 176-137: Objective, 10X (W.D.: 14mm, N.A.: 0.14)  
 164-161: Digimatic micrometer head (range: 50mm, reading: 0.001mm)  
 164-164: Digimatic micrometer head (range: 2"/50mm, reading: .00005"/0.001mm)  
 152-390: Micrometer head for X-axis (range: 25mm, reading: 0.005mm)  
 152-389: Micrometer head for Y-axis (range: 25mm, reading: 0.005mm)  
 152-391: Micrometer head for X-axis (range: 1", reading: .0001")  
 152-392: Micrometer head for Y-axis (range: 1", reading: .0001")  
 611201-531: Rectangular gauge block (1")  
 611202-531: Rectangular gauge block (2")  
 383038: Halogen bulb (24V, 2W)  
 176-204: Dial indicator attachment for Z-axis measurement  
 965013: SPC cable (2m) for Digimatic micrometer head

### Fixture and Stage accessories

- 990561: Workpiece clip (2pcs/set)  
 176-106: Rotary table for TM-505 (effective dia.: 66mm)  
 172-196: Rotary table for TM-510 (effective dia.: 100mm)  
 176-105: Swivel center support for TM-505 (max. workpiece dia.: 2.7" / 70mm)  
 172-197: Swivel center support for TM-510 (max. workpiece dia.: 3.1" / 80mm)  
 172-378: V-block with clamp (max. workpiece dia.: 1" / 25mm)  
 176-107: Holder with clamp

### Illumination units

- 176-366: Fiber-optic ring light  
 176-203: Twin-bulb reflected illumination unit  
 176-344: Bifurcated fiber illuminator

### Reticles

- 176-111: Concentric circles (up to ø4mm, 0.05mm increment)  
 176-135: Concentric circle (up to ø.2", .01" increment)  
 176-113: 55° angle  
 176-114: 60° angle  
 176-109: Metric screw threads (pitch = 0.25 - 1mm)  
 176-110: Metric screw threads (pitch = 1.25 - 2mm)  
 176-140: ISO metric screw threads (pitch = 0.075 - 0.7mm)  
 176-141: ISO metric screw threads (pitch = 0.75 - 2mm)  
 176-142: ISO unified screw threads (80 - 28TPI)  
 176-143: ISO unified screw threads (24 - 14TPI)  
 176-144: ISO unified screw threads (13 - 10TPI)  
 176-123: Unified screw threads (80 - 28TPI)  
 176-124: Unified screw threads (24 - 14TPI)  
 176-125: Unified screw threads (13 - 10TPI)  
 176-120: Whitworth screw threads (60 - 26TPI)  
 176-121: Whitworth screw threads (24 - 18TPI)  
 176-122: Whitworth screw threads (16 - 11TPI)  
 176-127: NF screw threads (80 - 28TPI)  
 176-128: NF screw threads (24 - 14TPI)  
 176-129: NF screw threads (13 - 10TPI)  
 176-130: 14.5° involute gear teeth (normal rack type)  
 176-112: 20° involute gear teeth (normal rack type)

# MF

## SERIES 176 — Measuring Microscopes

### Technical Data

Observation image: Erect image  
 Optical tube (optional): Monocular or binocular tube (depression: 25°), Reticle projection method, with TV mount, Optical path ratio (eyepiece/TV mount: 50/50)  
 Eyepiece lens (optional): 10X, 15X, 20X  
 Objective: 3X (**375-037**), W.D.: 72.5mm  
 Optional: 1X, 5X 10X, 20X, 50X, 100X

Transmitted illumination  
 • Light source: Halogen bulb or LED (12V, 50W)  
 • Optical system: Telecentric illumination with adjustable aperture diaphragms  
 • Functions: Light intensity adjustable, Non-stepped brightness adjustment

Surface illumination  
 • Light source: Halogen bulb or LED (12V, 50W)  
 • Optical system: Koehler illumination with adjustable aperture diaphragms  
 • Functions: Light intensity adjustable, Non-stepped brightness adjustment

Display unit:  
 • No. of axis: 2 axes (MF-A type) or 3 axes (MF-B type)  
 • Resolution: .0001" / .00005" / .00001" / 0.001mm / 0.0005mm / 0.0001mm  
 • Functions: Zero-setting, Direction switching, Data output (via RS-232C interface)

Power supply: 120V AC, 50/60Hz  
 Mass: 145lbs / 65.5kg (505C, 1010C) / 153lbs / 69.5kg (2010C) / 287lbs / 130kg (2017C) / 304lbs / 138kg (3017C) / 317lbs / 144kg (4020C)

### Optional Reticles for 3X Eyepiece

- 12AAG838 (12AAG878): Cross-hair (7 $\mu$ m width)
  - 12AAG836 (12AAG877): Cross-hair (5 $\mu$ m width)
  - 12AAG873 (12AAG876): Cross-hair (3 $\mu$ m width)
  - 12AAG839 (12AAG879): Cross-hair and 45° angle
  - 12AAG840 (12AAG880): Broken cross-hair and 60° angle
  - 12AAG841 (12AAG881): Zeiss type chart
  - 12AAG842\*: 20mm scale (0.1mm reading)
  - 12AAG843\*: Concentric circle ( $\phi$ 1.2 -  $\phi$ 18mm)
  - 12AAG844\*: 10mm scale (0.1mm reading)
  - 12AAG845\*: 5mm scale (0.05mm reading)
  - 12AAG846\*: 10x10mm section (1mm min.)
  - 12AAG847\*: Metric screw thread (P = 0.25-1.0)
  - 12AAG848\*: Metric screw thread (P = 1.25-2.0)
  - 12AAG849\*: Involute gear tooth (14.5°), module = 0.1 - 1.0
  - 12AAG850\*: Involute gear tooth (20°), module = 0.1 - 1.0
  - 12AAG851\*: Unified screw thread (80 - 28TPI)
  - 12AAG852\*: Unified screw thread (24 - 14TPI)
  - 12AAG853\*: Unified screw thread (13 - 10TPI)
  - 12AAG854\*: Concentric circle ( $\phi$ .01" -  $\phi$ .2")
- ( ) : for MF-U models, \* : MF/MF-U compatible

Reticle mount  
(standard accessory)



for MF models

Cross-hair and 45° angle  
(standard accessory)



12AAG839

The MF measuring microscopes' expandability, such as when used in combination with Mitutoyo's vision unit to boost its performance or data management on a PC, promises further improved measuring efficiency.

### FEATURES

- Observation with a clear and flare-less erect image and a wide field of view
- Measuring accuracy that is the highest in its class (and conforms to JIS B 7153)
- ML series, high-NA objectives that are specially designed for the MF series (long working distance type)

- Illumination unit (reflected/transmitted) selectable from a high-intensity LED or halogen bulb (required)
- Variable aperture diaphragm (reflected/transmitted) allows observation measurement while suppressing light diffraction
- Variety of standardized stages in sizes up to 400x200mm
- Quick-release mechanism useful for moving the stage quickly when measuring workpieces that are large in size or quantity
- Coarse/fine feed handles equipped as standard on both sides allow precise focus and observation measurement regardless of handedness
- High-magnification eyepiece observation up to 2000x
- Standard measuring microscope that has a wide variety of optional accessories including a Vision Unit and various digital CCD cameras



**MF-B2017C**  
 XY stage travel range: 8 x 6.6" / 200 x 170mm  
 (with optional binocular tube)



Using optional slide type nosepiece with 2-lens mount (factory set option)

### Selection of XY stage by travel range

1010C: 4 x 4" / 100 x 100mm



2010C: 8 x 4" / 200 x 100mm



3017C: 12 x 6.6" / 300 x 170mm



4020C: 16 x 8" / 400 x 200mm



**Mitutoyo**



# MF

## SERIES 176 — Measuring Microscopes

### SPECIFICATIONS

Model No. (XY stage size)	1010C	2010C	2017C	3017C	4020C	
Order No.	MF-A	<b>176-662-10</b>	<b>176-663-10</b>	<b>176-664-10</b>	<b>176-665-10</b>	<b>176-666-10</b>
	MF-B	<b>176-682-10</b>	<b>176-683-10</b>	<b>176-684-10</b>	<b>176-685-10</b>	<b>176-686-10</b>
XY stage travel range	4 x 4" 100 x 100mm	8 x 4" 200 x 100mm	8 x 6.7" 200 x 170mm	6 x 6.7" 300 x 170mm	16 x 8" 400 x 200mm	
Z-axis travel range	6" / 150mm	6" / 150mm	8.7" / 220mm	8.7" / 220mm	8.7" / 220mm	
Focusing method	Manual focusing (coarse focusing: 30mm/rev., fine focusing: 0.2mm/rev.)					
Measurement method	Linear encoder (2-axis model: X / Y-axis, 3-axis model: X / Y / Z-axis)					
Resolution (switchable)	.0001" / .00005" / .00001" / 0.001mm / 0.0005mm / 0.0001mm					
Measuring accuracy (at 20°C)	XY-axis: (2.2+0.02L) $\mu$ m, L = Measuring length (mm) when not loaded, JIS B 7153					
Indication accuracy (at 20°C)	Z-axis: (5+0.04L) $\mu$ m, L = Measuring length (mm) (MF-B type)					
Floating function	X and Y axes with Quick-release mechanism					
XY stage top size	11 x 11" 280 x 280mm	14 x 11" 350 x 280mm	16.1 x 13.4" 410 x 342mm	20.07 x 13.4" 510 x 342mm	24" x 13.4" 610 x 342mm	
Effective glass size	7 x 7" 180 x 180mm	10 x 6" 250 x 150mm	10.6 x 9.4" 270 x 240mm	14.5 x 9.4" 370 x 240mm	17.3 x 9.4" 440 x 240mm	
Swiveling function	—	—	$\pm 5^\circ$ (left)	$\pm 5^\circ$ (left)	$\pm 3^\circ$ (left)	
Max. stage loading	22lbs / 10kg	22lbs / 10kg	44lbs / 20kg	44lbs / 20kg	33lbs / 15kg	
Max. workpiece height	6" / 150mm	6" / 150mm	8.7" / 220mm	8.7" / 220mm	8.7" / 220mm	

### Selection of machine type

Machine type	MF-A	MF-B
Measurement system	X and Y-axis (2-axis type)	X, Y and Z-axis (3-axis type)

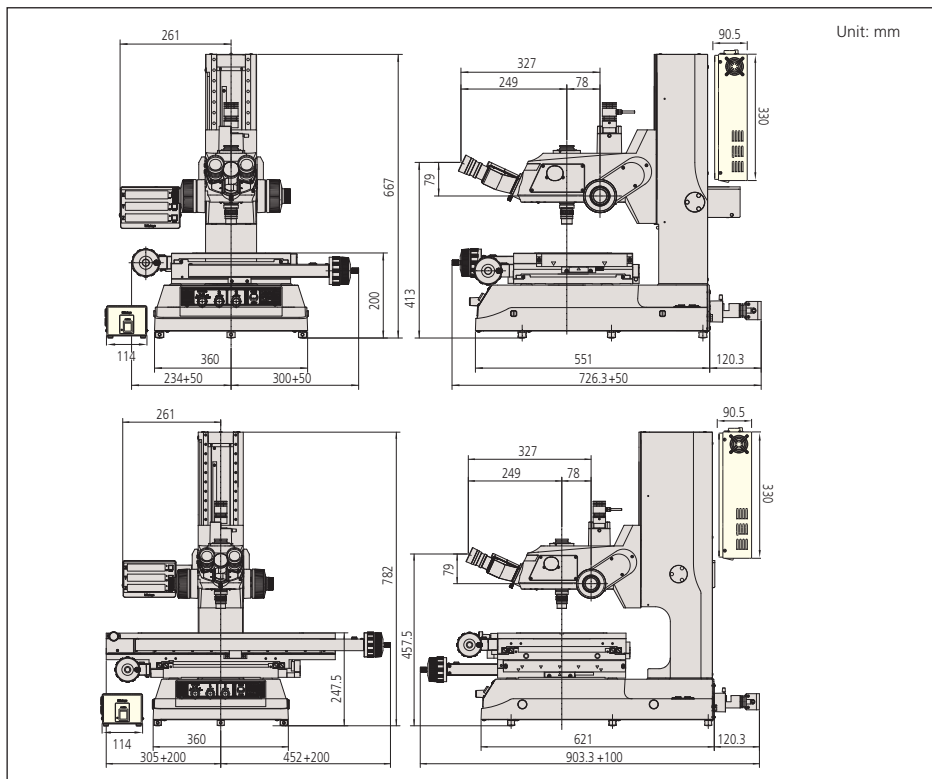
### Illumination Unit (must select)

Applicable Illumination Unit	LED	Halogen
Order No.	<b>176-345A</b>	<b>176-347A</b>

### Eye Tube Selection (must select)

Monocular with 10X eyepiece	<b>172-392</b>
Binocular with 10X eyepiece	<b>172-393</b>

### DIMENSIONS



### Optional Accessories

- 176-392:** Monocular tube with 10X eyepiece
- 176-393:** Binocular tube with 10X eyepiece set
- 378-866:** 10X eyepiece set (view field dia.: 24mm)
- 378-857:** 15X eyepiece set (view field dia.: 16mm)
- 378-858:** 20X eyepiece set (view field dia.: 12mm)
- 375-043:** Protractor eyepiece (10X)
- 176-313:** Digital protractor eyepiece (10X)
- 375-036-2:** 1X objective (W.D.: 61mm, N.A.: 0.03)
- 375-037-1:** 3X objective (W.D.: 77mm, N.A.: 0.09)
- 375-034-1:** 5X objective (W.D.: 61mm, N.A.: 0.13)
- 375-039:** 10X objective (W.D.: 51mm, N.A.: 0.21)
- 375-051:** 20X objective (W.D.: 20mm, N.A.: 0.42)
- 375-052:** 50X objective (W.D.: 13mm, N.A.: 0.55)
- 375-053:** 100X objective (W.D.: 6mm, N.A.: 0.7)
- 176-314-1:** Slide type nosepiece (2-mount, parfocal)
- 176-314-2:** Slide type nosepiece (2-mount, mag. adjusted)
- 12AAA643:** ND2 color filter (transmitted / surface)
- 12AAA644:** ND8 color filter (transmitted / surface)
- 12AAA645:** GIF filter (transmitted / surface)
- 12AAA646:** LB80 color filter (transmitted / surface)
- 375-054:** 0.5X camera adapter (with C-mount adapter)
- 970441:** C-mount adapter
- 513667:** Halogen bulb (24V, 50W)
- 12BAB345:** Halogen bulb (long life type, 24V, 50W)
- 176-308:** Vibration damping stand
- 176-309:** Mounting stand
- 375-056:** Stage micrometer
- 12AAA165:** Lens cleaning kit
- 12AAA846:** Foot switch

### Illumination units

- 176-351-6A:** Oblique surface illumination unit
- 176-367-2A:** LED ring illuminator
- 176-343A:** Twin fiber-optics illuminator
- 176-366A:** Ring fiber-optics illuminator
- 12AAG806:** GIF color filter (for fiber-optics illuminator)
- 12AAG807:** LB80 color filter (for fiber-optics illuminator)

### Fixture and Stage accessories

- 176-107:** Holder with clamp\*
- 172-378:** V-block with clamp\*  
(max. workpiece dia.: 1" / 25mm)
- 172-197:** Swivel center support\*  
(max. workpiece dia.: 3.1" / 80mm)
- 176-305:** Rotary stage with fine feed knob for 505C/1010C/2010C models
- 176-306:** Rotary stage with fine feed knob for 2017C/3017C/4020C models

\*Fixture mount adapter (**176-310**) is required for 2010C models.  
Fixture mount adapter (**176-304**) is required for 2017C/3017C/4020C models.



**QM-Data200**  
2-D data processing unit  
**264-155A:** Stand mount type  
**12AAA807:** Connecting cable set

**Focus pilot FP-05**  
Focus assisting system



**Vision Unit**  
PC-based vision measuring system

## Technical Data

Observation image:	Erect image
Optical tube:	Siedentoph type (pupil distance adjustment: 51 - 76mm), 1X tube lens, Binocular tube (depression: 30°), Reticle projection method, with TV mount, Optical path ratio (eyepiece/TV mount: 50/50)
Eyepiece lens:	10X (field No.: 24mm), Optional: 15X, 20X
Turret (optional):	Manual or power
Objective (optional):	M / BD Plan Apo objective from 1X to 100X
Transmitted illumination	
• Light source:	Halogen bulb (12V, 50W) or LED
• Optical system:	Telecentric illumination with adjustable aperture diaphragms
• Functions:	Light intensity adjustable, Non-stepped brightness adjustment
Surface illumination	
• Light source:	Optional halogen illumination unit (fiber-optic cold light illumination) or LED
• Optical system:	Koehler illumination with adjustable aperture diaphragms
• Functions:	Light intensity adjustable, Non-stepped brightness adjustment
Display unit:	
• No. of axes:	2 axes or 3 axes
• Resolution:	.0001" / .00005" / .00001" / 0.001mm / 0.0005mm / 0.0001mm
• Functions:	Zero-setting, Direction switching, Data output (via RS-232C interface)
Power supply:	120V AC, 50/60Hz
Mass:	145lbs/65.5kg (505C, 1010C) / 153lbs/69.5kg (2010C) / 287lbs/130kg (2017C) / 304lbs/138kg (3017C) / 317lbs/144kg (4020C)

## Selection of XY stage by travel range



# MF-U

## SERIES 176 — High-power Multi-function Measuring Microscopes

### FEATURES

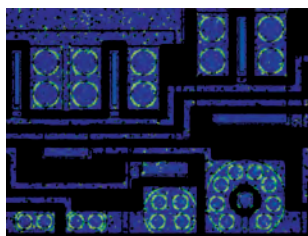
- Observation with a clear and flare-less erect image and a wide field of view
- Measuring accuracy that is the highest in its class (and conforms to JIS B 7153)
- Proven high-NA objectives from the FS optical system (long working distance type)



- Integration of metallurgical and measurement microscope functions provides high-resolution observation and high-accuracy measurement solution
- Illumination unit (reflected/transmitted) selectable from a high-intensity LED or halogen bulb (required)
- Variable aperture diaphragm (reflected/transmitted) allows observation measurement while suppressing light diffraction
- Variety of standardized stages in sizes up to 400 x 200 mm
- Quick-release mechanism useful for moving the stage quickly when measuring workpieces that are large in size or quantity
- High-magnification eyepiece observation up to 4000X
- Low-noise design

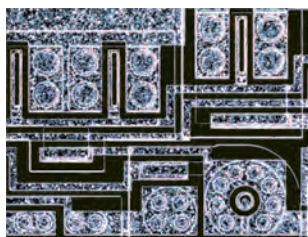
#### MF-UB3017C

XY stage travel range: 12 x 6.7" / 300 x 170mm (with optional turret, objective and fiber illumination)



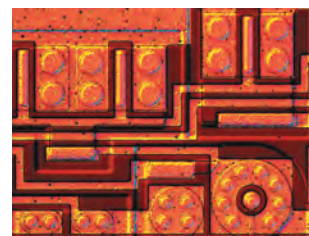
#### Polarized light observation:

Observing only the filtered light that vibrates in one direction. Used for observing materials with special optical characteristics, such as mineral and liquid crystal.



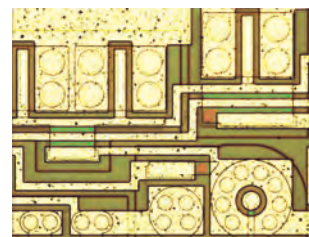
#### Dark field (DF) observation:

Observing only the scattered light by shutting down the direct light to the objectives. The scratches and dust that cannot be viewed in the bright view field can be observed by this method in high-contrast.



#### Differential interference contrast (DIC) observation:

Effective in detecting fine scratches and steps on the surface of metal, liquid crystal, and semiconductors.



#### Bright field (BF) observation:

Most common method of observation. Observing directly the light reflected from the surface of the workpiece.

# MF-U

## SERIES 176 — High-power Multi-function Measuring Microscopes

### SPECIFICATIONS

Model No. (XY stage size)	1010C	2010C	2017C	3017C	4020C
<b>Order No.</b>	<b>MF-UA</b> 176-668-10	<b>176-669-10</b>	<b>176-670-10</b>	<b>176-671-10</b>	<b>176-672-10</b>
	<b>MF-UB</b> 176-688-10	<b>176-689-10</b>	<b>176-690-10</b>	<b>176-691-10</b>	<b>176-692-10</b>
	<b>MF-UC</b> 176-674-10	<b>176-675-10</b>	<b>176-676-10</b>	<b>176-677-10</b>	<b>176-678-10</b>
	<b>MF-UD</b> 176-694-10	<b>176-695-10</b>	<b>176-696-10</b>	<b>176-697-10</b>	<b>176-698-10</b>
XY stage travel range	4 x 4" 100 x 100mm	8 x 4" 200 x 100mm	8 x 6.7" 200 x 170mm	12 x 6.7" 300 x 170mm	16 x 8" 400 x 200mm
Z-axis travel range	6" / 150mm		8.7" / 220mm		
Focusing method	Manual focusing (coarse focusing: 10mm/rev., fine focusing: 0.1mm/rev.)				
Measurement method	Linear encoder (2-axis model: X / Y-axis, 3-axis model: X / Y / Z-axis)				
Resolution (switchable)	.0001" / .00005" / .00001" (0.001mm / 0.0005mm / 0.0001mm)				
Measuring accuracy (at 20°C)	XY-axes: (2.2+0.02L)µm, L = Measuring length (mm) when not loaded, JIS B 7153				
Indication accuracy (at 20°C)	Z-axis: (5+0.04L)µm, L = Measuring length (mm)				
Floating function	X and Y axes with Quick-release mechanism				
XY stage top size	11 x 11" 280 x 280mm	14 x 11" 350 x 280mm	16 x 13.6" 410 x 342mm	20 x 13.6" 510 x 342mm	24 x 13.6" 610 x 342mm
Effective glass size	7.1 x 7.1" 180 x 180mm	10 x 6" 250 x 150mm	10.6 x 9.6" 270 x 240mm	14.6 x 9.6" 370 x 240mm	17.3 x 9.6" 440 x 240mm
Swiveling function	—	—	±5° (left)	±5° (left)	±3° (left)
Max. stage loading	22lbs / 10kg		44lbs / 20kg	44lbs / 20kg	33lbs / 15kg
Max. workpiece height	6" / 150mm		8.7" / 220mm		

### Selection of machine type

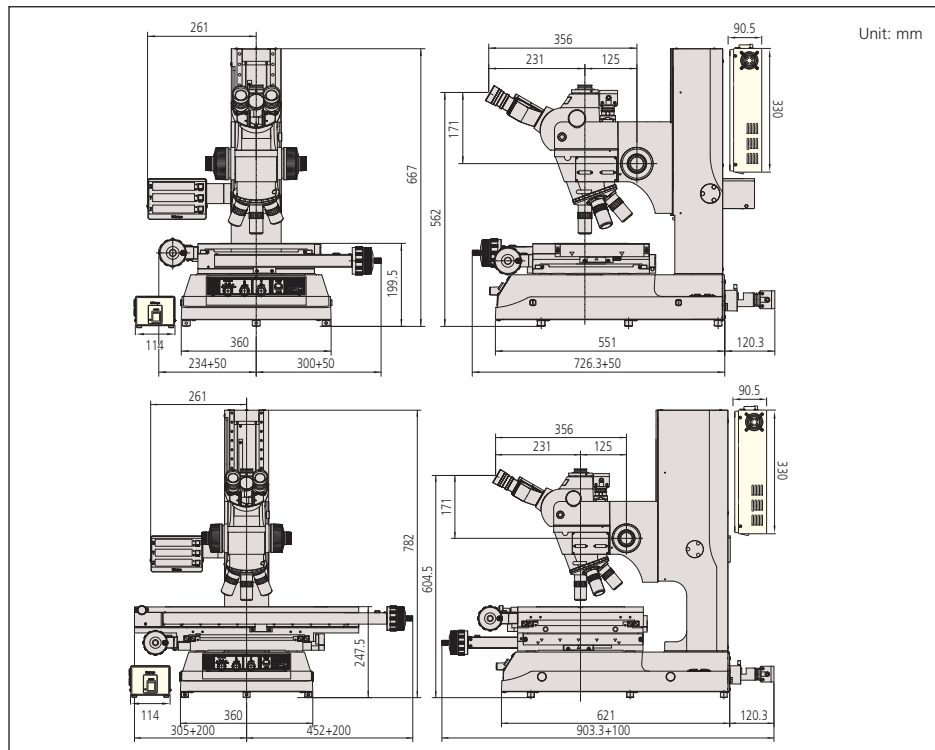
Machine type	MF-UA	MF-UB	MF-UC	MF-UD
Observation type	Bright field (BF)	Bright field (BF)	Bright / Dark field (BF/DF)	Bright / Dark field (BF/DF)
Measurement system	X and Y-axis (2 axes)	X, Y and Z-axis (3 axes)	X and Y-axis (2 axes)	X, Y and Z-axis (3 axes)

### Illumination Unit (must select illumination unit)

Applicable Illumination Unit	LED	Halogen
Order No.	176-346A	176-348A

Note: "Generation C type" does not include the illumination unit, it is necessary to select the either LED illumination unit or Halogen illumination unit.

### DIMENSIONS



### Optional Accessories

- 378-857:** 15X eyepiece set (view field dia.: 16mm)  
**378-858:** 20X eyepiece set (view field dia.: 12mm)
- Objective**  
**378-018:** Adjustable manual BF turret  
**378-116A:** Adjustable power BF turret  
**176-211:** Adjustable manual BF/DF turret  
**176-210A:** Adjustable power BF/DF turret

- Reticles**  
**378-092:** Polarization unit  
**378-076:** DIC unit for 100X, SL80X, SL50X objective  
**378-078:** DIC unit for 50X, SL20X objective  
**378-079:** DIC unit for 20X objective  
**378-080:** DIC unit for 10X, 5X objective  
**12AAA643:** ND2 color filter  
**12AAA644:** ND8 color filter  
**12AAA645:** GIF filter  
**12AAA646:** LB80 color filter  
**375-054:** 0.5X camera adapter (with C-mount adapter)
- 970441:** C-mount adapter  
**513667:** Halogen bulb (24V, 50W)  
**12BAB345:** Halogen bulb (long life type, 24V, 50W)  
**517181:** Halogen bulb (24V, 100W)  
**12BAD602:** High intensity halogen bulb (24V, 100W)  
**176-308:** Vibration damping stand  
**176-309:** Mounting stand  
**375-056:** Stage micrometer  
**12AAA165:** Lens cleaning kit  
**12AAA846:** Foot switch

### Illumination units

- 176-315A:** Halogen illumination unit (12V, 100W)  
**176-316A:** Halogen illumination unit (12V, 150W)  
**176-343A:** Twin fiber-optics illuminator  
**12AAG806:** GIF color filter (for 176-315)  
**12AAG807:** LB80 color filter (for 176-315)  
 See page I-28 for lens selection

### Fixture and Stage accessories

- 176-107:** Holder with clamp\*  
**172-378:** V-block with clamp\* (max. workpiece dia.: 1" / 25mm)  
**172-197:** Swivel center support\* (max. workpiece dia.: 3.1" / 80mm)  
**176-305:** Rotary stage with fine feed knob for 505C/1010C/2010C models  
**176-306:** Rotary stage with fine feed knob for 2017C/3017C models

\*Fixture mount adapter (176-310) is required for 2010C models. Fixture mount adapter (176-304) is required for 2017C/3017C models.

### Manual and Power Turrets



# Hyper MF/MF-U

## SERIES 176 — High-Accuracy Measuring Microscopes

### Technical Data: Hyper MF

Observation image:	Erect image
Optical tube:	Monocular or binocular tube (optional, depression: 25°), Reticle projection method, with TV mount, Optical path ratio (eyepiece/TV mount: 50/50)
Eyepiece lens (optional):	10X, 15X, 20X
Objective:	3X ( <b>375-037-1</b> ), W.D.: 77.0mm Optional: 1X, 5X 10X, 20X, 50X, 100X
Transmitted illumination	
• Light source:	Halogen bulb (12V, 50W) (fiber-optic cold light illumination)
• Optical system:	Telecentric illumination with adjustable aperture diaphragms
• Functions:	Light intensity adjustable, 100 steps brightness adjustment
Surface illumination	
• Light source:	Halogen bulb (12V, 100W)
• Optical system:	Koehler illumination with adjustable aperture diaphragms
• Functions:	Light intensity adjustable, 100 steps brightness adjustment
Data output:	Via RS-232C interface
Power supply:	120V AC, 50/60Hz
Dimensions:	35x36x30" / 880x913x770mm (main unit) 6.3x19x15" / 160x476x381 (power unit)
Mass:	562lbs / 254kg (main unit), 33lbs / 14kg (power unit)

### Technical Data: Hyper MF-U

Observation image:	Erect image
Optical tube:	Siedentoph type (pupil distance adjustment: 51 - 76mm), 1X tube lens, Binocular tube (depression: 25°), Reticle projection method, with TV mount, Optical path ratio (eyepiece/TV mount: 50/50)
Eyepiece lens:	10X (field No.: 24mm), Optional: 15X, 20X
Turret (optional):	Power Objective (optional): M / BD Plan Apo objective from 1X to 100X
Transmitted illumination	
• Light source:	Halogen bulb (12V, 50W)
• Optical system:	Telecentric illumination with adjustable aperture diaphragms
• Functions:	Light intensity adjustable, 100 steps brightness adjustment
Surface illumination	
• Light source:	Halogen bulb (12V, 100W)
• Optical system:	Koehler illumination with adjustable aperture diaphragms
• Functions:	Light intensity adjustable, 100 steps brightness adjustment
Data output:	Via RS-232C interface
Power supply:	120V AC, 50/60Hz
Dimensions:	35x36x30" / 880x913x770mm (main unit) 6.3x19x15" / 160x476x381 (power unit)
Mass:	562lbs / 255kg (main unit), 33lbs / 14kg (power unit)

### FEATURES

- The world highest accuracy XY measuring accuracy of  $(0.9+3L/1000)\mu\text{m}$
- Selectable LAF (Laser Auto Focus) function
- High operability and repeatability
- Three-axis motorized control
- Power-drive auto focus unit is a standard feature.

Hyper MF-U  
with optional optical tube,  
turret and objectives



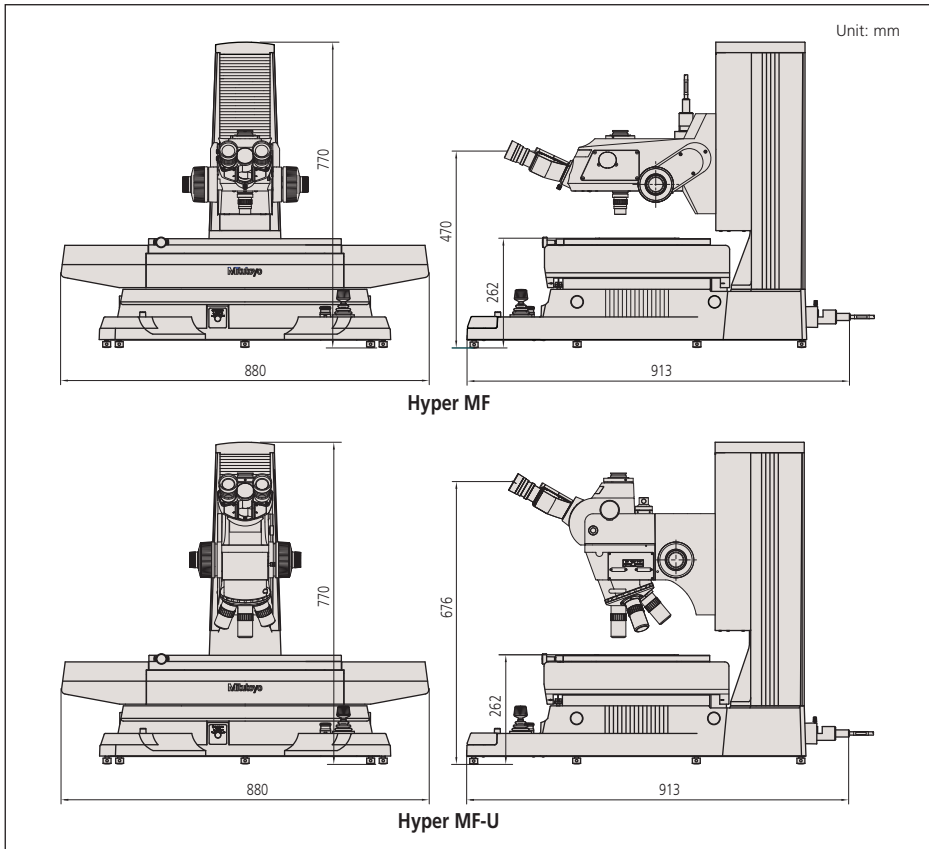
### SPECIFICATIONS

Model No.	Hyper MF-B2515B	Hyper MF-UB2515B	Hyper MF-UD2515B	Hyper MF-UE2515B	Hyper MF-UF2515B
Order No. (mm)	<b>176-430A</b>	<b>176-431A</b>	<b>176-432A</b>	<b>176-433A</b>	<b>176-434A</b>
Observation type	BF	BF	BF or BF/BD	BF	BF or BF/BD
Digital counter	—	—	—	—	—
Laser auto focus function	—	—	—	Available	Available
XY stage travel range	10 x 6" 250 x 150mm	10 x 6" 250 x 150mm	10 x 6" 250 x 150mm	10 x 6" 250 x 150mm	10 x 6" 250 x 150mm
Measuring unit	Linear encoder	Linear encoder	Linear encoder	Linear encoder	Linear encoder
Resolution	0.01 $\mu\text{m}$	0.01 $\mu\text{m}$	0.01 $\mu\text{m}$	0.01 $\mu\text{m}$	0.01 $\mu\text{m}$
Measuring accuracy (at 20°C)	$(0.9+3L/1000)\mu\text{m}$ , L = XY axis measuring length (mm) when not loaded				
Drive system (X, Y, Z-axis)	Motor-driver control with the joystick				
XY stage top size	18 x 14" 460 x 350mm	18 x 14" 460 x 350mm	18 x 14" 460 x 350mm	18 x 14" 460 x 350mm	18 x 14" 460 x 350mm
Effective glass size	12 x 8" 300 x 200mm	12 x 8" 300 x 200mm	12 x 8" 300 x 200mm	12 x 8" 300 x 200mm	12 x 8" 300 x 200mm
Swiveling function	$\pm 3^\circ$	$\pm 3^\circ$	$\pm 3^\circ$	$\pm 3^\circ$	$\pm 3^\circ$
Max. stage loading	66 lbs / 30kg	66 lbs / 30kg	66 lbs / 30kg	66 lbs / 30kg	66 lbs / 30kg
Max. workpiece height	6" / 150mm	6" / 150mm	6" / 150mm	6" / 150mm	6" / 150mm

# Hyper MF/MF-U

SERIES 176 — High-Accuracy Measuring Microscopes

## DIMENSIONS

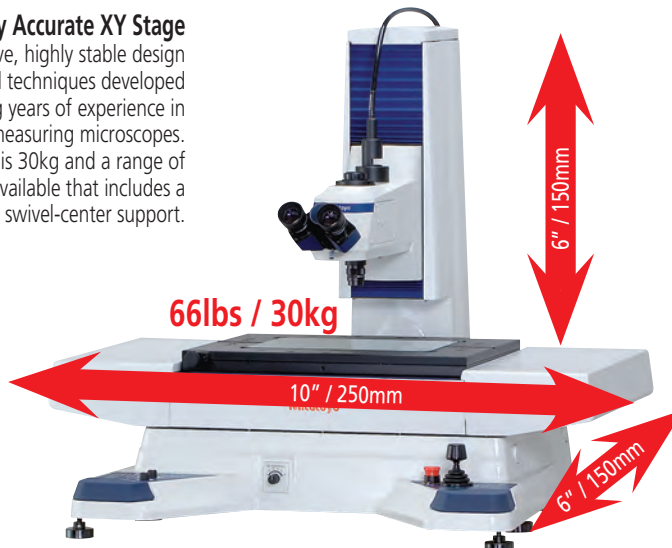


### Three-axis Motor-driven Joystick

The X, Y, and Z axes are driven and controlled with one joystick that serves as the nerve center of operation. Speed control is possible from high-speed traverse of the stage to ultra low-speed, precise positioning of a workpiece.

### Large, Highly Accurate XY Stage

The XY stage is a massive, highly stable design created using mechanical techniques developed over Mitutoyo's long years of experience in manufacturing precision measuring microscopes. Maximum stage loading is 30kg and a range of useful fixtures is available that includes a wafer holder and swivel-center support.



## Optional Accessories



**QM-Data200**  
2-D data processing unit



**Vision Unit**  
PC-based vision measuring system

### Highly Accurate Digital Scales

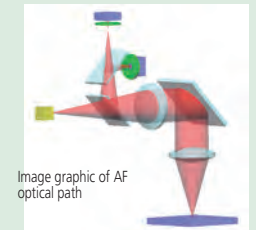
These microscopes are equipped with highly accurate digital glass scales on all three axes. Mitutoyo produces glass scales in an underground laboratory where the temperature and humidity are constant throughout the year. The XY (stage) and Z (optical tube) displacements are displayed digitally.

### LAF Optical Tube

The LAF (Laser Auto Focus) optical tube can be selected. The LAF system achieves high repeatability when measuring minute steps, etc., enabling difficult measurements with minimum fatigue.



\*Available for model MF-U only

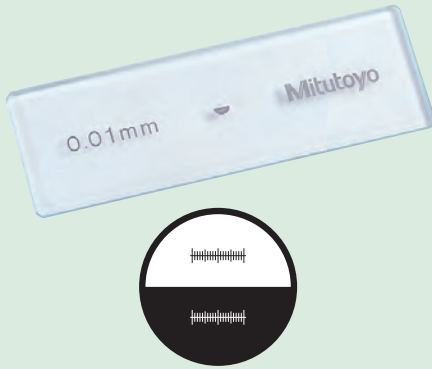


The LAF uses a low-power laser that corresponds to Class 2 (visible radiation) of JIS C6802/1997, Safety of Laser Products.



# Accessories for Measuring Microscope

## Stage Micrometer



### SPECIFICATIONS

Order No.	375-056
Range	1mm
Graduations	0.01mm
Accuracy (at 20°C)	(1+L)μm, L = Measuring length (mm)
Dimensions (WxD)	3" x 1" / 76 x 26mm
Mass	16g

## Focus Pilot FP-05

### FEATURES

- By installing this system on the camera mount of an MF series measuring microscope and projecting the focusing chart onto the workpiece surface, the focal point can be detected with high-accuracy and high-repeatability.
- The brightness of the chart can be adjusted.
- A wide view field observation on the monitor is made possible with the use of a CCD camera (C-mount adapter is included.)

- Four types of chart patterns are available. The pattern should be selected in accordance with the type of workpiece surface texture.



Concentric circle

Slit

### SPECIFICATIONS

Order No.	375-057A	375-058A	375-067A	375-068A
Applicable microscopes	MF C models		MF-U C models	
Light source	Green LED	Red LED	Green LED	Red LED
Magnification	0.5X, Accuracy: 0.1% **			
Camera adapter	C-mount (provided)			
Applicable CCD camera	Up to 2/3-inch			
Mass	4lbs / 1.8kg		4lbs / 1.8kg	

\*\* Within 2/3 area from the center of view field



## Power Focus Unit



### SPECIFICATIONS

Order No.	Please contact us
Applicable microscopes	MF-C models, MF-UC models
Resolution	0.4μm
Drive speed	3.2mm/s
Power supply	100 - 240V AC, 50/60Hz
Dimensions (WxDxH)	Control box: 4.1 x 3 x 7.6" 108 x 72 x 193mm

## Manual and Power Turrets

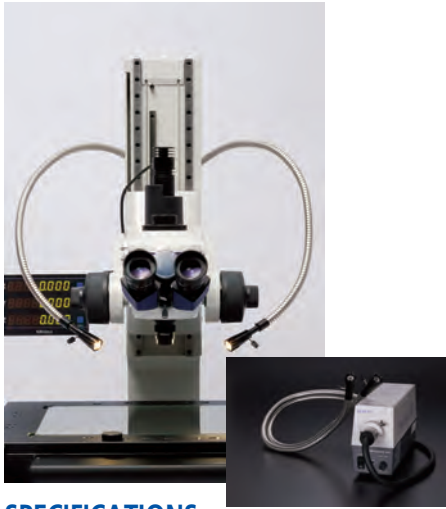


### SPECIFICATIONS

Order No.	176-211	378-018	176-210A	378-016A	378-116A
Observation type	BD	BF	BD	BF	BF
No. of objective mounts	4-mount	4-mount	4-mount	4-mount	5-mount
Driving method	Manual		Motor		
Dimensions (W x D x H)	—		Turret: 6.5 x 2.6 x 5.4" 164 x 65 x 137 Control Box: 4.1 x 3 x 7.6" 108 x 72 x 193		

# Accessories for Measuring Microscope

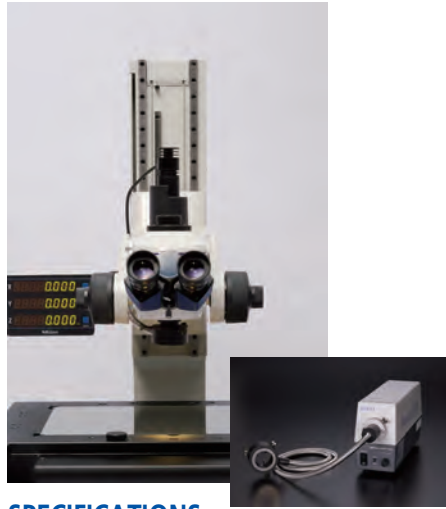
## Twin fiber-optics illuminator



### SPECIFICATIONS

Order No.	176-343A
Applicable microscopes	MF, MF-U models
Length of fiber cable	28" / 700mm
Light source	Halogen bulb (12V, 100W) (517181: halogen bulb)
Dimensions (W x D x H)	Light unit: 9.3 x 3 x 4.7" 235 x 76 x 120mm

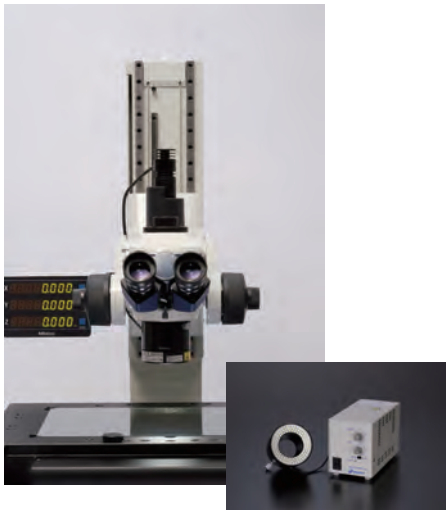
## Ring fiber-optics illuminator



### SPECIFICATIONS

Order No.	176-366A
Applicable microscopes	MF models
Length of fiber cable	40" x 1000mm
Light source	Halogen bulb (12V, 100W) (517181: halogen bulb)
Dimensions (W x D x H)	Light unit: 9.3 x 3 x 4.7" 235 x 76 x 120mm

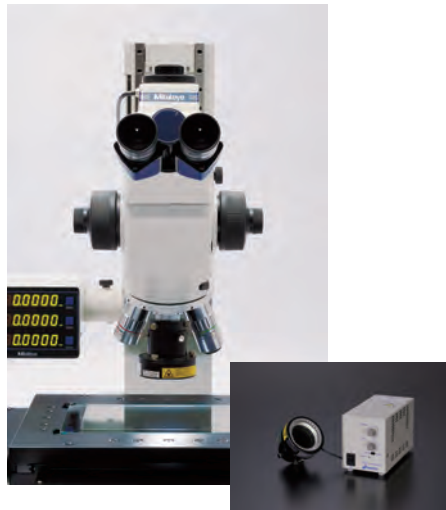
## LED Ring Illuminator



### SPECIFICATIONS

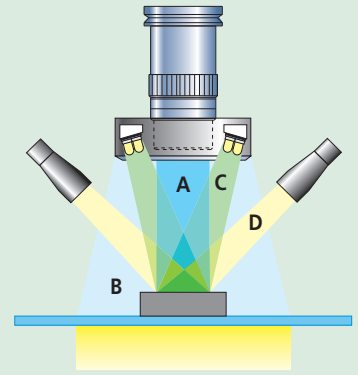
Order No.	176-367-2A
Applicable microscopes	MF models with 1X/3X/5X/10X objective
Light source	White LED
Length of LED cable	59" / 1500mm

## LED Ring Light (for FS Objectives)

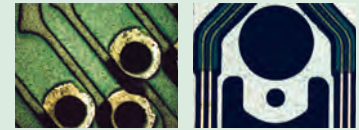


### SPECIFICATIONS

Order No.	Please contact us
Applicable microscopes	MF models with 1X/3X/5X objective
Light source	Supplied from microscope (surface illumination)

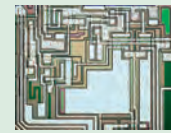


A: Vertical surface illumination (Halogen)



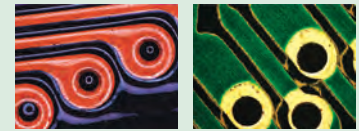
PCB

HDD suspension



IC circuit

B: Ring fiber optics illumination



Flexible PCB

PCB



Electric parts

C: LED ring illumination



HDD suspension

PCB



Black resin molded parts

D: Twin fiber optics illumination



IC package

Garnet



PCB

# QM-Data200

## SERIES 264 — 2-D Data Processing Unit

### Technical Data

Resolution:	0.0001mm
Program functions:	Part program creation, execution, editing
Statistical processing:	Number of data, maximum value, minimum value, mean value, standard deviation, range, histogram
Element memory:	Maximum of 1000 elements
Element recall:	Point, line, circle, distance, ellipse, rectangular hole, slotted hole, intersection and intersecting angle
Element key-in:	Point, line, circle
Display system:	Monographic LCD (320 x 240 dots, with back light)
Measurement result file output:	RS-232C/USB output (CSV format, MUX-10F format)
Display language:	Japanese/English/German/French/Italian/Spanish/Portuguese/Swedish/Polish/Dutch/Hungarian
Data input:	RS-232C/USB, X/Y/Z-axis signal, Footswitch
Data output:	RS-232C/USB
Power supply:	120V AC, 50/60Hz
Mass:	2.2kg (stand-mount type) 2.1kg (arm-mount type)

### QM-Data200

Order No.: 264-155A (stand-mount type)  
Order No.: 264-156A (arm-mount type)  
Order No.: 264-159A (for Hyper MF/MF-U)

The QM-Data200 is a geometric readout/analysis unit for optical instruments like a profile projectors. This features powerful 2-D coordinate measurement capabilities with unmatched simple key operation. The QM-Data200 improves operator productivity, minimizes errors and save a total measurement time and production cost.

### FEATURES

- Various graphic displays on the large colored LCD screen for easy measurement operations.
- One-key operation for combined measurements that are often used (circle-circle distance, etc.)



QM-Data 200  
Stand-mount type

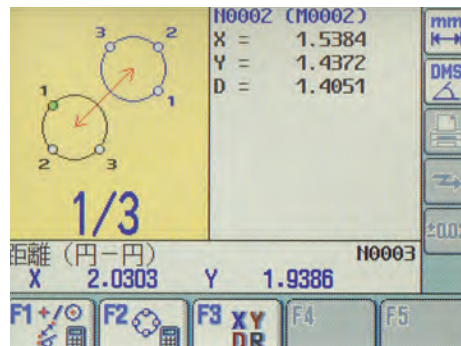
- The AI measurement function (automatic identification of measuring item) eliminates switching between the measurement command keys.
- Equipped with the measurement procedure teaching function and the measuring position navigation in Repeat mode.
- The user menu function allows user to register measurement commands or part programs to create his/her own menu.
- Tolerance zone measurement of data processing result and various statistical processing for each item are available.
- Measurement result output to "MS-Excel" in spreadsheet (CSV) format.
- The measurement procedure and measurement result can be saved, using a USB drive.
- Two models are available: a stand-alone type with tilt system and a flexible arm type that can be mounted on a Profile Projector.

### • Intuitive panel design

The QM-Data200 employs the "Geometry Keys" to accelerate the measurement process. The probing routine of standard geometric features and combinations are designed with Geometry Keys on the front panel. Click of a key that you need and capture features you can complete the measurement quickly and accurately. This improves operator productivity, reduce errors and save operation time and cost.

### • Graphic display

Measurement information and data are visualized on the back-lit colored LCD display with graphical interfaces. The geometric feature that you selected is displayed with the probing navigator. The measurements map and blink indication show you the probing points and sequences. Simply probe points and click by following the blink indicator the measurement can be easily completed even a beginner. This improves operation accuracy and reduces errors and time.

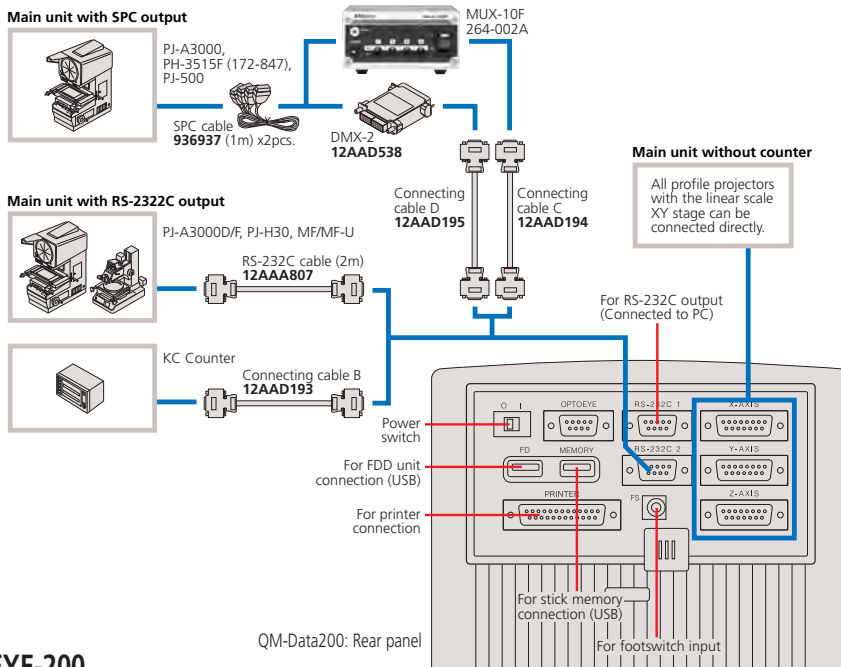




# QM-Data200

## SERIES 264 — 2-D Data Processing Unit

### SYSTEM DIAGRAM



### OPTOEYE-200

The OPTOEYE-200 Image Edge Sensor eliminates human errors which may be involved in visual alignment, ensuring speedy, accurate, and consistent measurements, regardless of operator's skill.

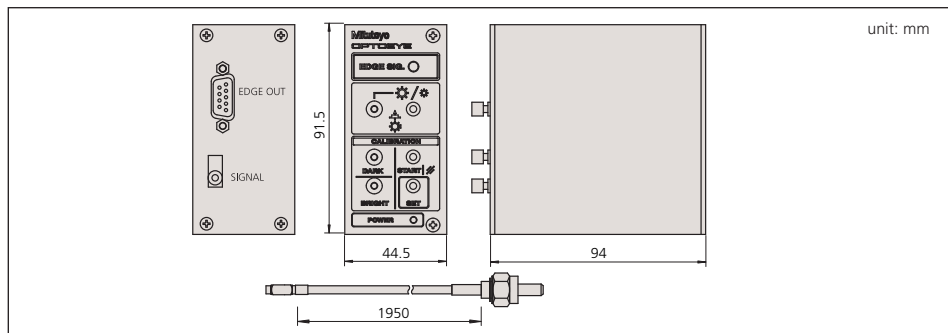
### FEATURES

• OPTOEYE-200 adopts a thin fiber-optic cable for detector connection to offer easy set-up and smart operation without obstructing your view.

- Bright and dark buttons allow easy calibration.
- OPTOEYE can be powered by QM-Data200 via the connecting cable. It means that no AC adapter is required.
- The brightness of the chart can be adjusted.



### DIMENSIONS



### Optional Accessories

- 12AAH035: Floppy disk drive unit (USB type)
- 12AAD034: Receipt printer (for 120V)
- 908353: Printer paper for receipt printer
- 12AAA804: Printer cable (2m)
- 937179T: Foot switch
- 12AAD193: Connection cable B
- 12AAD194: Connection cable C
- 12AAD195: Connection cable D
- 12AAA807: RS-232C cable (2m)
- 12AAA920: RS-232C cable (3m)

### Technical Data

#### Image detection

- Directivity: Non-direction
- Min. diameter:  $\varnothing 2\text{mm}$  on the screen
- Min. width: 1mm on the screen
- Max. moving speed: 1000mm/s

#### Applicable illumination

- Type: Surface / Contour illumination
- Range: 30Lx to 1500Lx on the screen

#### Repeatability:

#### Function:

1 $\mu\text{m}$  in contour illumination  
Error in detection of illumination change  
Supporting a contour illumination brightness selector switch of projector

### Optional Accessories

#### 12AAE671:

#### Detector attachment (A)

PJ-A3000, PJ-H30, PH-3515, PH-A14 series  
(Adaptation diameter of a screen: 10" /  $\varnothing 250$  to 14" /  $\varnothing 350\text{mm}$ )

#### 12AAE672:

#### Detector attachment (B)

PJ-500, PV-5110, PV-600A series  
(Adaptation diameter of a screen: 20" /  $\varnothing 500$  to 24" /  $\varnothing 600\text{mm}$ )



# Vision Unit

## SERIES 359 — Vision System Retrofit for Microscopes

### Technical Data

Projected image:	Inverted image
Camera unit	
• Image sensor:	Color CMOS camera
• Resolution:	0.0001mm
• Dimensions:	4x2.3x3.5" / 100x58x89mm (WxDx H)
• Mass:	1lbs / 0.4kg
Adapter unit	
• Operating software:	QSPAK VUE (optional)
• Dimensions:	1.8 x 5" / 45 x 123mm
• Magnification:	0.5X
• Mass:	0.8lbs / 0.3kg
Magnifications:	21X - 210X on 19" monitor
Standard accessory:	Foot switch (12AAJ088)

### QSPAK, optional software

#### For observation/comparison of form

- Template matching function
- Manual pattern matching function

#### For simple measurement

- One-click edge detection tool function
- Smart tool function
- User macro function

#### For repeated measurement/auto-measurement

- Quick navigation function
- Playback function
- Graphic function
- External data output function
- Statistical calculation function

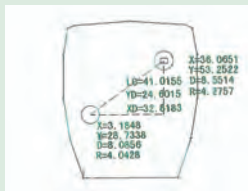
### One-click Edge Detection

Just by clicking the mouse near the edge of a workpiece, QSPAK automatically scans the edge and detects it, showing its coordinates. This function also works with the point tool, box tool, circle tool and auto-focus tool.



### Graphic Window

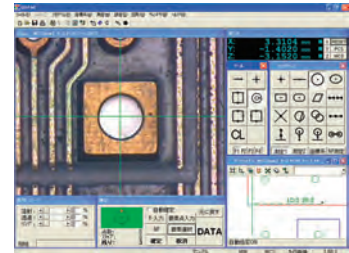
The measurement results and measured elements are plotted in the graphic window in real-time. By using this function the user can check the current measuring position at a glance. The graphic window can be used for geometrical calculation.



### FEATURES

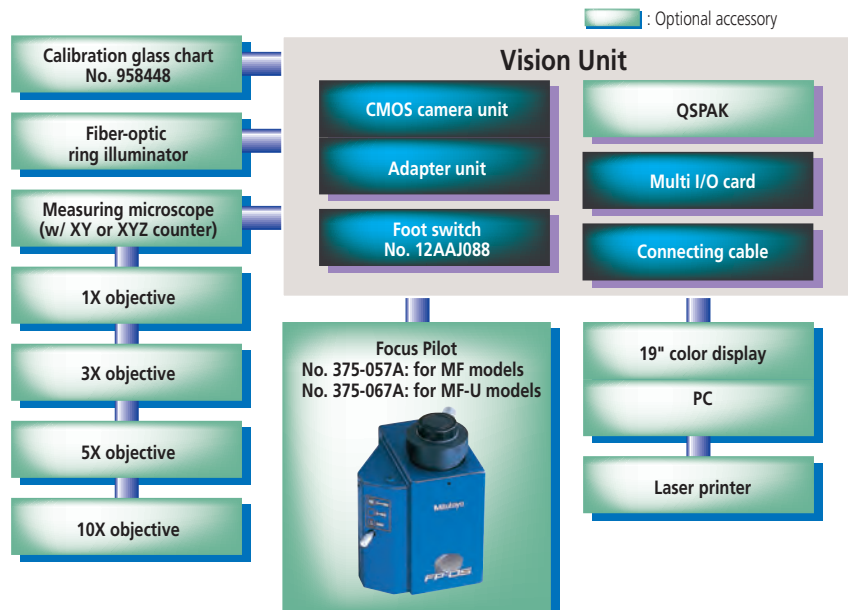
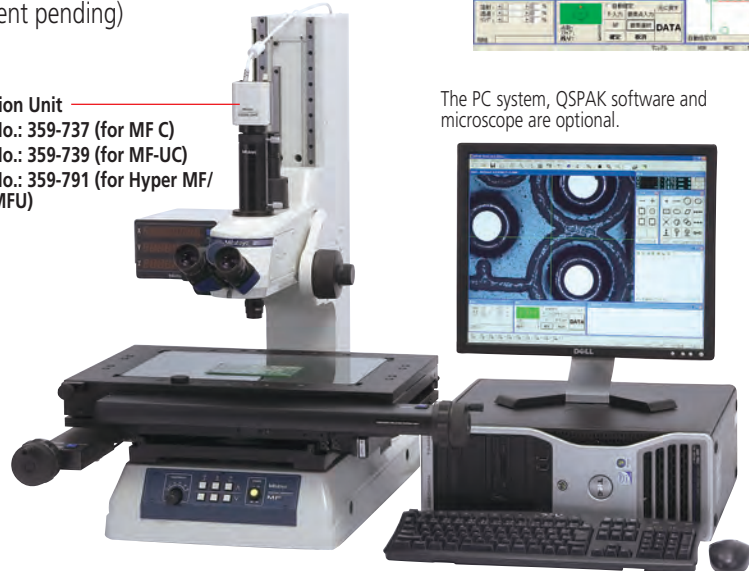
- The automatic edge-detection tools and various macro icons allow measurement in one easy step.
- The graphics and measurement navigation functions facilitate operation.
- Image data input/storage function.
- Measurement results are output to MS-Excel®. This lets the user generate an inspection table on the same computer.
- Allows the tolerance zone measurement of measurement results and various types of statistical processing for each item.
- Combined use with the focus pilot provides high-accuracy in height measurements. (Patent pending)
- A series of measuring operations can be performed using just one screen display.
- The auto-brightness control function faithfully reproduces the type and degree of illumination used. (This function is limited to the MF/MF-U series.)

### QSPAK Measurement Window



The PC system, QSPAK software and microscope are optional.

Vision Unit  
 No.: 359-737 (for MF C)  
 No.: 359-739 (for MF-UC)  
 No.: 359-791 (for Hyper MF/MFU)



# FS-70

## SERIES 378 — Microscope Unit for Semiconductor Inspection

### FEATURES

- The optical system that has originally developed for the best seller FS 60 models was further enhanced for the FS70 models. It is ideal as a microscope unit of a prober station for semiconductors. (All models CE marked.)
- The FS70L supports three types of YAG laser wavelength ranges (1064nm, 532nm and 355nm), while the FS70L4 supports two types of wavelength ranges (532nm and 266nm), thus expanding a scope of laser applications, allowing laser-cutting of thin-films used in semiconductors and liquid crystal substrates. However, Mitutoyo assumes no responsibility whatsoever for the performance and/or safety of the laser system used with Mitutoyo microscopes. a careful examination is recommended in selecting a laser-emission unit.
- Bright field, Differential Interference Contrast (DIC) and polarized observations are standard with the FS70Z. The FS70L and FS70L4 do not support the DIC method.
- By employing an inward revolver, the long working distance objectives provide excellent operability.
- An ergonomic design with superb operatability: the FS70 employs the erect-image optical system (the image in the field of view has the same orientation as the specimen) and enlarged fine focus adjustment wheel with rubber grip coarse adjustment knob.



FS70Z



FS70L



FS70L4

### SPECIFICATIONS

Model No. Order No.	FS70 378-184-1	FS70-TH 378-184-3	FS70Z 378-185-1	FS70Z-TH 378-185-3	FS70L 378-186-1	FS70L-TH 378-186-3	FS70L4 378-187-1	FS70L4-TH 378-187-3
Short base model No. Order No.	FS70-S 378-184-2	FS70-THS 378-184-4	FS70Z-S 378-185-2	FS70Z-THS 378-185-4	FS70L-S 378-186-2	FS70L-THS 378-186-4	FS70L4-S 378-187-2	FS70L4-THS 378-187-4
Focus adjustment	50mm travel range with concentric coarse (3.8mm/rev) and fine (0.1mm/rev) focusing wheels (right / left)							
Image	Erect image							
Pupil distance	Siedentopf type, adjustment range: 2 - 3" / 51 - 76mm							
Field number	24							
Tilt angle	—	0° - 20°	—	0° - 20°	—	0° - 20°	—	0° - 20°
Optical pass ratio	50/50	100/0 or 0/100	50/50	100/0 or 0/100	100/0 or 0/100		100/0 or 0/100	
Protective filter	—		—		Built-in laser beam filter		Built-in laser beam filter	
Tube lens	1X		1X - 2X zoom		1X		1X	
Applicable laser	—		—		1064/532/355nm		532/266nm	
Camera mount	C-mount (using optional adapter B)				Use a laser with TV port.		C-mount receptacle (with green filter switch)	
Illumination system, optional	Reflective illumination for bright field (Koehler illumination, with aperture diaphragm) 12V 100W fiber optics, non-stepped adjustment, light guide length: 1.5m, power consumption 150W							
Objective, optional (for observation)	M Plan Apo, M Plan Apo SL, G Plan Apo							
Objective, optional (for laser-cutting)	—				M/LCD Plan NIR, M/LCD Plan NUV		M Plan UV	
Loading weight*	32lbs/14.5kg	30lbs/13.6kg	31lbs/14.1kg	29lbs/13.2kg	31lbs/14.2kg	30lbs/13.5kg	31lbs/13.9kg	29lbs/13.1kg
Mass (main unit)	13lbs/6.1kg	15.5lbs/7.1kg	14.5lbs/6.6kg	16.5lbs/7.5kg	14lbs/6.4kg	15.5lbs/7.2kg	14.5lbs/6.7kg	16.5lbs/7.5kg

\*Loading weight on optical tube excluding weight of objective lenses and eyepieces

### Technical Data

Focus adjustment	
• Method:	With concentric coarse and fine focusing wheels (right and left) 50mm travel range
• Range:	0.1mm/rev. for fine adjustment, 3.8mm/rev. for coarse adjustment
Trinocular tube Image:	Erect image
Pupil distance:	Siedentopf type, adjustment range: 2-3" / 51-76mm
Field number:	24
Tilt angle:	0° - 20° (only -TH, -THS models)
Illumination system:	Reflective illumination for bright field (Koehler illumination, with aperture diaphragm)
Light source:	12V/100W fiber optics, non-stepped adjustment, light guide length 1.5m, power consumption 150W
Objectives (optional):	M Plan Apo-4, M Plan Apo SL, G Plan Apo

# VMU

## SERIES 378 — Video Microscope Unit

The VMU is a compact, light-weight, and easy-to-install microscope unit for CCD camera monitoring in semiconductor fabrications.

### FEATURES

- The optical system features ultra-long working distance objectives and correction for the wide range of radiation.
- The fiber-optic reflected illumination keeps the workpiece free from thermal expansion caused by heat. The fiber-optic illuminator is required for the light source.
- Also available with a laser mount or revolving nosepiece (objective mount).



### SPECIFICATIONS

Maginification of tube	1X
Applicable wavelength	378-505, 378-506 378-507, 378-513 378-508 378-514
	Near-infrared and visible radiation Near-infrared—visible—near-ultraviolet radiation Visible and ultraviolet radiation Near-infrared to ultraviolet
Objective	(Optional)
Reflected illumination	• Telecentric system with aperture stop system • Fiber-optic illuminator (optional) is required.
Light source	Halogen bulb (21V, 150W) (optional)
Mass	<b>378-505:</b> 570g <b>378-506:</b> 590g <b>378-507:</b> 980g <b>378-508:</b> 1010g <b>378-513:</b> 1300g <b>378-514:</b> 1300g

### Selection Guide of System Configuration

Order No. (Depends on each system configuration)	378-505	378-506	378-507	378-508	378-513	378-514
Vertical CCD camera mount	●	●	●	●	●	●
Horizontal CCD camera mount		●				
YAG laser mount			●	●	●	●
Fiber-optic illumination unit			●	●	●	●
M Plan Apo, M Plan Apo SL, G Plan Apo objectives for bright field observation	▲	▲	▲	▲	▲	▲
M Plan Apo NIR, LCD Plan Apo NIR, M Plan Apo NUV and LCD Plan Apo NUV objectives for laser cutting			▲		▲	▲
M Plan UV objectives for laser machining				▲		▲

●: Provided, ▲: Available as optional accessory

# Eyepieces

## SERIES 378

### FEATURES

- The field of view is extra wide.
- Optional reticles are available.



378-866



378-857



378-858

### SPECIFICATIONS

Order No. (2pcs. set)	Magnification	Field number	Mass	Individual order No.
378-866	10X	24	85g	378-866-5
378-857	15X	16	40g	378-857-5
378-858	20X	12	55g	378-858-8

### Reticles (optional)

- 516848: Cross-hair
- 516576: Broken cross hair (90° and 60°)
- 516578: Concentric circle (Diametric increment: 1.2mm)
- 516577: 20mm scale (Minimum reading: 0.1mm) with cross hair
- 516849: 10mm scale (Minimum reading: 0.1mm)
- 516850: 5mm scale (Minimum reading: 0.05mm)
- 516851: 10x10mm section (Minimum section: 1x1mm)

# Objectives

## SERIES 378

The Mitutoyo 378 Series objectives have the world's longest working distance and an infinity correction optical system. These objectives provide flexible observation at high magnifications and independent correction of chromatic aberration.

### FEATURES

- The long working distance type objectives provide excellent clearance between the lens surface and the workpiece surface in focus, making it possible to observe workpieces which are usually hard-to-focus because of awkward projections.

- The metallurgical plan apochromatic (M Plan Apo) objective is an excellent optical system. This objective provides a flat, chromatic aberration-free image throughout the field of view, making it is suitable for any type of microscope.
- Specially designed objectives are also available with correction for near-infrared radiation, near-ultraviolet radiation, and ultraviolet radiation, or various thicknesses of LCD screen glasses.
- The mounting screw threads of objectives are designed to conform to JIS B-7141-1988.



M Plan Apo and M Plan Apo SL objectives for bright field observation



BD Plan Apo and BD Plan Apo SL objectives for bright/dark field observation



Near-infrared radiation corrected M Plan Apo NIR objectives



Near-ultraviolet radiation corrected M Plan Apo NUV objectives



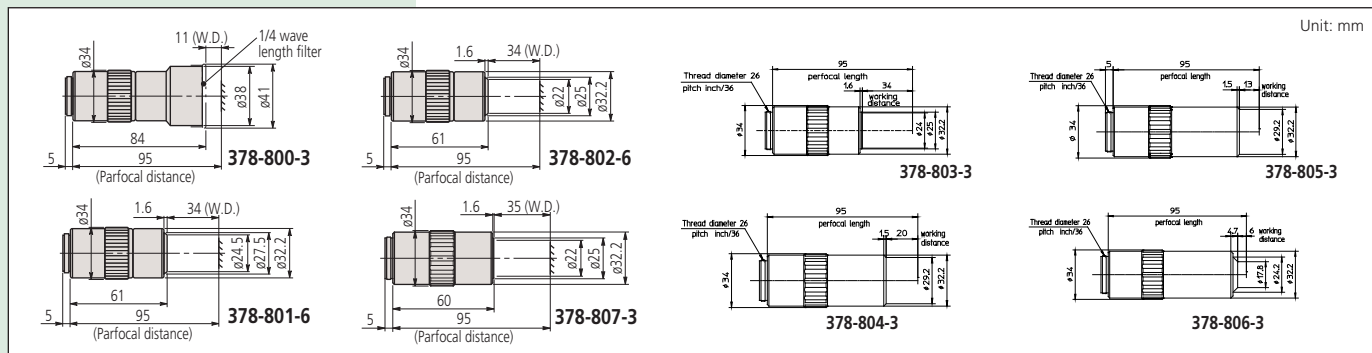
Ultraviolet radiation corrected M Plan UV objectives

Note:  
Polarizing unit (**378-074**) is required when using 1X objective.

### M Plan Apo for Bright Field Observation

Order No.	Mag.	N.A.	W.D.	f	R	D.F.	View field 1	View field 2	Mass
<b>378-800-3</b>	1X	0.025	11.0mm	200mm	11.0μm	440μm	ø24mm	4.8x6.4mm	300g
<b>378-801-6</b>	2X	0.055	34.0mm	100mm	5.0μm	91μm	ø12mm	2.4x3.2mm	220g
<b>378-802-6</b>	5X	0.14	34.0mm	40mm	2.0μm	14.0μm	ø4.8mm	0.96x1.28mm	230g
<b>378-807-3</b>	7.5X	0.21	35.0mm	26.67mm	1.3μm	6.2μm	ø3.6mm	0.64x0.85mm	240g
<b>378-803-3</b>	10X	0.28	34.0mm	20mm	1.0μm	3.5μm	ø2.4mm	0.48x0.64mm	240g
<b>378-804-3</b>	20X	0.42	20.0mm	10mm	0.7μm	1.6μm	ø1.2mm	0.24x0.32mm	270g
<b>378-805-3</b>	50X	0.55	13.0mm	4mm	0.5μm	0.9μm	ø0.48mm	0.10x0.13mm	290g
<b>378-806-3</b>	100X	0.70	6.0mm	2mm	0.4μm	0.6μm	ø0.24mm	0.05x0.06mm	320g

### DIMENSIONS

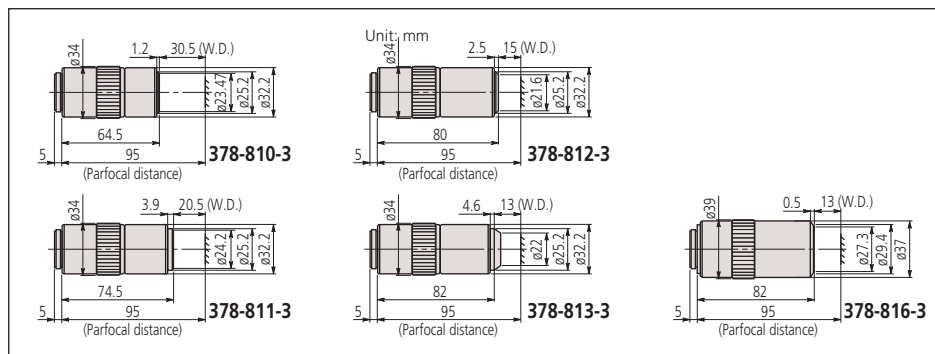


Note:  
These objectives offer extra-long working distance.

### M Plan Apo SL for Bright Field Observation

Order No.	Mag.	N.A.	W.D.	f	R	D.F.	View field 1	View field 2	Mass
<b>378-810-3</b>	20X	0.28	30.5mm	10mm	1.0μm	3.5μm	ø1.2mm	0.24x0.32mm	240g
<b>378-811-3</b>	50X	0.42	20.5mm	4mm	0.7μm	1.6μm	ø0.48mm	0.10x0.13mm	280g
<b>378-812-3</b>	80X	0.50	15.0mm	2.5mm	0.6μm	1.1μm	ø0.3mm	0.06x0.08mm	280g
<b>378-813-3</b>	100X	0.55	13.0mm	2mm	0.5μm	0.9μm	ø0.24mm	0.05x0.06mm	290g
<b>378-816-3</b>	200X	0.62	13.0mm	1mm	0.4μm	0.7μm	ø0.12mm	0.025x0.03mm	490g

### DIMENSIONS

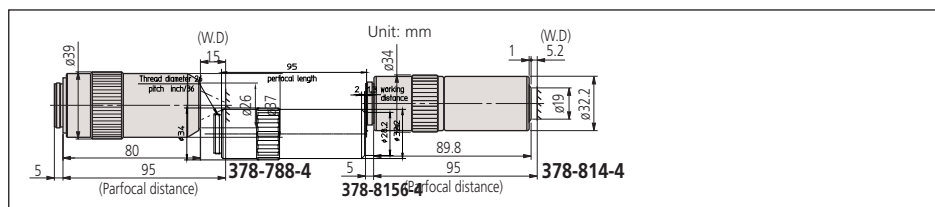


Note:  
These objectives offer extra-high resolving power.

### M Plan Apo HR for Bright Field Observation

Order No.	Mag.	N.A.	W.D.	f	R	D.F.	View field 1	View field 2	Mass
<b>378-788-4</b>	10X	0.42	15mm	20mm	0.7μm	1.6μm	ø2.4mm	0.48x0.64mm	460g
<b>378-814-4</b>	50X	0.75	5.2mm	4mm	0.4μm	0.49μm	ø0.48mm	0.10x0.13mm	400g
<b>378-815-4</b>	100X	0.90	1.3mm	2mm	0.3μm	0.34μm	ø0.24mm	0.05x0.06mm	410g

### DIMENSIONS



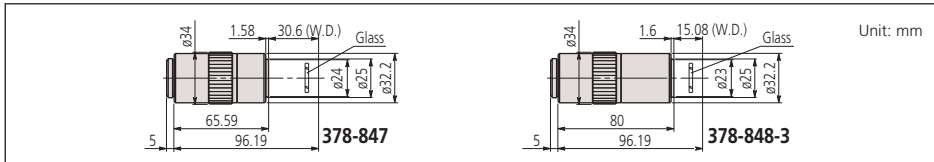
Mag.: Magnification  
N.A.: Numerical aperture  
W.D.: Working distance  
f: Focal distance  
R: Resolving power  
D.F.: Focal depth  
View field 1:  
Field of view when using ø24mm eyepiece  
View field 2:  
Field of view when using 1/2" CCD camera

## Glass Thickness (t = 3.5mm) Corrected G Plan Apo for Bright Field Observation

Order No.	Mag.	N.A.	W.D.	f	R	D.F.	View field 1	View field 2	Mass
378-847	20X	0.28	29.42mm*	10mm	1.0 $\mu$ m	3.5 $\mu$ m	$\phi$ 1.2mm	0.24x0.32mm	270g
378-848-3	50X	0.50	13.89mm*	4mm	0.6 $\mu$ m	1.1 $\mu$ m	$\phi$ 0.48mm	0.10x0.13mm	320g

\*In air

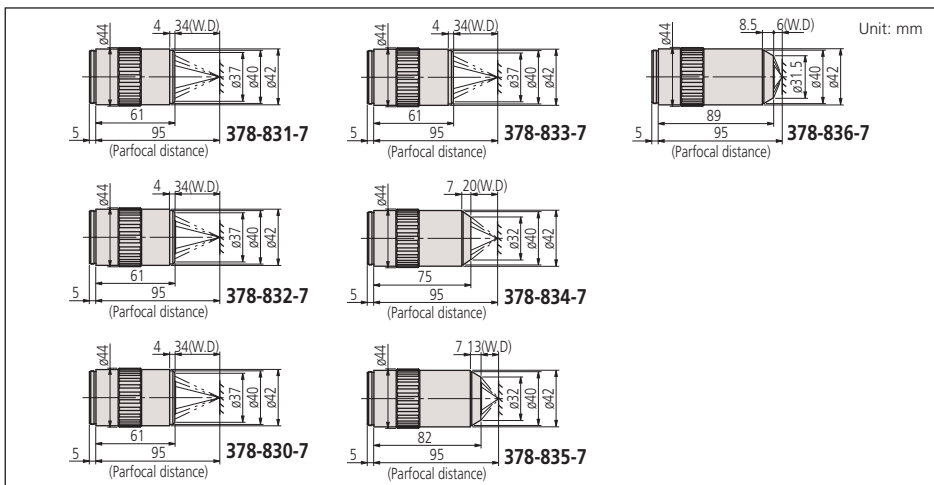
### DIMENSIONS



## BD Plan Apo for Bright/Dark Field Observation

Order No.	Mag.	N.A.	W.D.	f	R	D.F.	View field 1	View field 2	Mass
378-831-7	2X	0.055	34.0mm	100mm	5.0 $\mu$ m	91 $\mu$ m	$\phi$ 12mm	2.4x3.2mm	340g
378-832-7	5X	0.14	34.0mm	40mm	2.0 $\mu$ m	14.0 $\mu$ m	$\phi$ 4.8mm	0.96x1.28mm	350g
378-830-7	7.5X	0.21	34.0mm	26.67mm	1.3 $\mu$ m	6.2 $\mu$ m	$\phi$ 3.6mm	0.64x0.85mm	350g
378-833-7	10X	0.28	34.0mm	20mm	1.0 $\mu$ m	3.5 $\mu$ m	$\phi$ 2.4mm	0.48x0.64mm	350g
378-834-7	20X	0.42	20.0mm	10mm	0.7 $\mu$ m	1.6 $\mu$ m	$\phi$ 1.2mm	0.24x0.32mm	400g
378-835-7	50X	0.55	13.0mm	4mm	0.5 $\mu$ m	0.9 $\mu$ m	$\phi$ 0.48mm	0.10x0.13mm	440g
378-836-7	100X	0.70	6.0mm	2mm	0.4 $\mu$ m	0.6 $\mu$ m	$\phi$ 0.24mm	0.05x0.06mm	460g

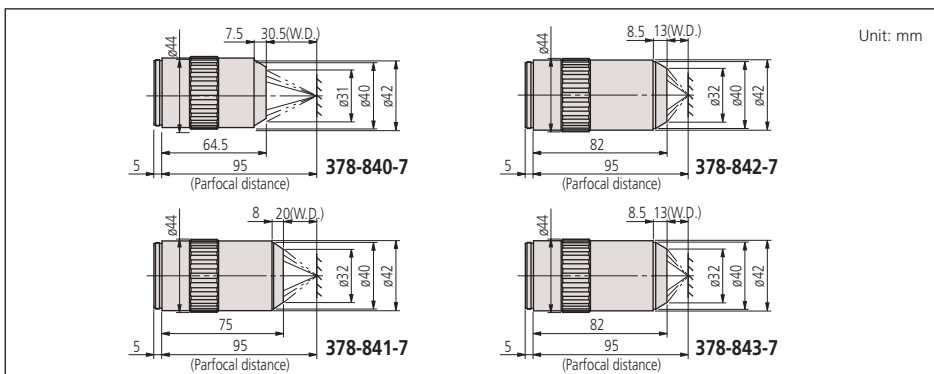
### DIMENSIONS



## BD Plan Apo SL for Bright/Dark Field Observation

Order No.	Mag.	N.A.	W.D.	f	R	D.F.	View field 1	View field 2	Mass
378-840-7	20X	0.28	30.5mm	10mm	1.0 $\mu$ m	3.5 $\mu$ m	$\phi$ 1.2mm	0.24x0.32mm	350g
378-841-7	50X	0.42	20.0mm	4mm	0.7 $\mu$ m	1.6 $\mu$ m	$\phi$ 0.48mm	0.10x0.13mm	410g
378-842-7	80X	0.50	13.0mm	2.5mm	0.6 $\mu$ m	1.1 $\mu$ m	$\phi$ 0.3mm	0.06x0.08mm	430g
378-843-7	100X	0.55	13.0mm	2mm	0.5 $\mu$ m	0.9 $\mu$ m	$\phi$ 0.24mm	0.05x0.06mm	440g

### DIMENSIONS



Note:  
The G Plan Apo Series are designed for observing a workpiece through glass (thickness = 3.5mm).

Note:  
These objectives offer extra-long working distance.

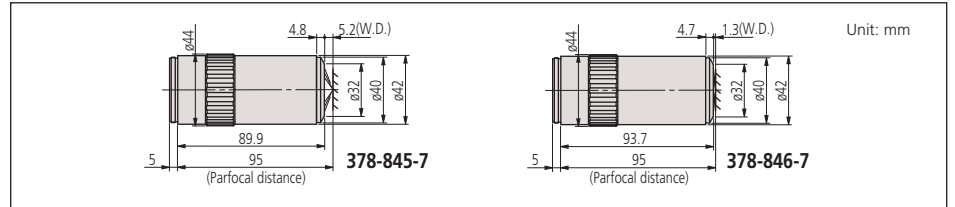
Mag.: Magnification  
N.A.: Numerical aperture  
W.D.: Working distance  
f: Focal distance  
R: Resolving power  
D.F.: Focal depth  
View field 1:  
Field of view when using  $\phi$ 24mm eyepiece  
View field 2:  
Field of view when using 1/2" CCD camera

Note:  
These objectives offer extra-high resolving power.

### BD Plan Apo HR for Bright/Dark Field Observation

Order No.	Mag.	N.A.	W.D.	f	R	D.F.	View field 1	View field 2	Mass
378-845-7	50X	0.75	5.2mm	4mm	0.4μm	0.49μm	ø0.48mm	0.10x0.13mm	530g
378-846-7	100X	0.90	1.3mm	2mm	0.3μm	0.34μm	ø0.24mm	0.05x0.06mm	545g

### DIMENSIONS

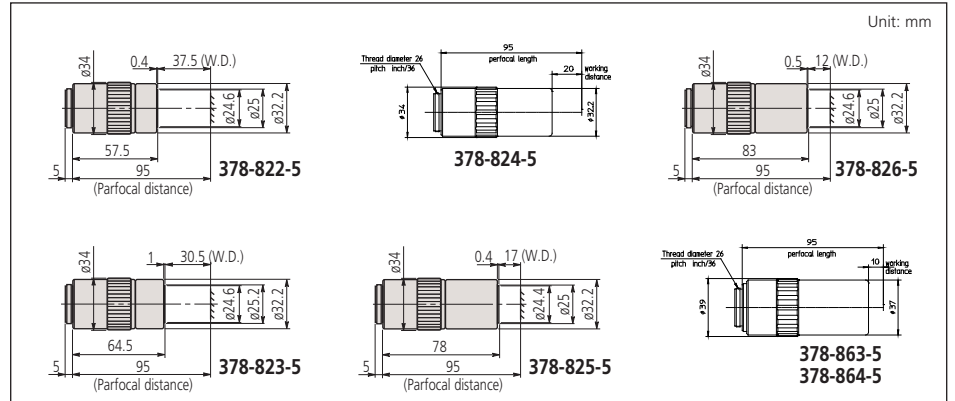


Note:  
These objectives are designed so that a workpiece's image can be focused within the focal depth even when the wavelength used is changed anywhere from the visible range ( $\lambda = 480\text{nm}$ ) up to near-infrared range ( $\lambda = 1800\text{nm}$ ). Therefore the M Plan NIR Series are suitable for laser repair. However, when the wavelength used exceeds 1100nm, the focussing position may slightly deviate from that in the visible range due to changes in glass dispersion and refractive index.

### Near-infrared Radiation Corrected M Plan Apo NIR for Bright Field Observation

Order No.	Mag.	N.A.	W.D.	f	R	D.F.	View field 1	View field 2	Mass
378-822-5	5X	0.14	37.5mm	40mm	2.0μm	14.0μm	ø4.8mm	0.96x1.28mm	220g
378-823-5	10X	0.26	30.5mm	20mm	1.1μm	4.1μm	ø2.4mm	0.48x0.64mm	250g
378-824-5	20X	0.40	20.0mm	10mm	0.7μm	1.7μm	ø1.2mm	0.24x0.32mm	300g
378-825-5	50X	0.42	17.0mm	4mm	0.7μm	1.6μm	ø0.48mm	0.10x0.13mm	315g
378-826-5	100X	0.50	12.0mm	2mm	0.6μm	1.1μm	ø0.24mm	0.05x0.06mm	335g
378-863-5	50X	0.65	10mm	4mm	0.4μm	0.7μm	ø0.48mm	0.10x0.13mm	450g
378-864-5	100X	0.70	10mm	2mm	0.4μm	0.6μm	ø0.24mm	0.05x0.06mm	450g

### DIMENSIONS

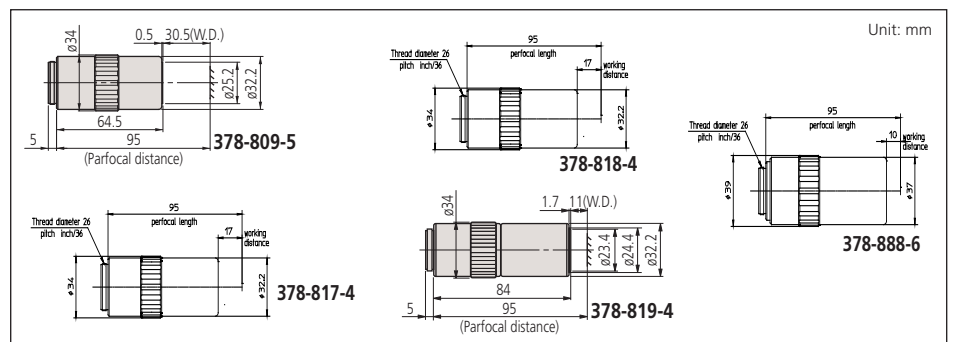


Note:  
These objectives are designed so that a workpiece's image can be focused within the focal depth even when the wavelength used is changed anywhere from the visible range ( $\lambda = 620\text{nm}$ ) to the near-ultraviolet range ( $\lambda = 355\text{nm}$ ). Therefore The M Plan NUV Series are suitable for laser repair using a high frequency laser beam.

### Near-ultraviolet Radiation Corrected M Plan Apo NUV for Bright Field Observation

Order No.	Mag.	N.A.	W.D.	f	R	D.F.	View field 1	View field 2	-
378-809-5	10X	0.28	30.5mm	20mm	1μm	3.5μm	ø2.4mm	0.48x0.64mm	255g
378-817-4	20X	0.40	17.0mm	10mm	0.7μm	1.7μm	ø1.2mm	0.24x0.32mm	340g
378-818-4	50X	0.42	15.0mm	4mm	0.7μm	1.6μm	ø0.48mm	0.10x0.13mm	350g
378-819-4	100X	0.50	11.0mm	2mm	0.6μm	1.1μm	ø0.24mm	0.05x0.06mm	380g
378-888-6	50X	0.65	10.00mm	4mm	0.42μm	0.65μm	ø0.48mm	0.10x0.13mm	500g

### DIMENSIONS



Mag.: Magnification  
N.A.: Numerical aperture  
W.D.: Working distance  
f: Focal distance  
R: Resolving power  
D.F.: Focal depth  
View field 1: Field of view when using ø24mm eyepiece  
View field 2: Field of view when using 1/2" CCD camera

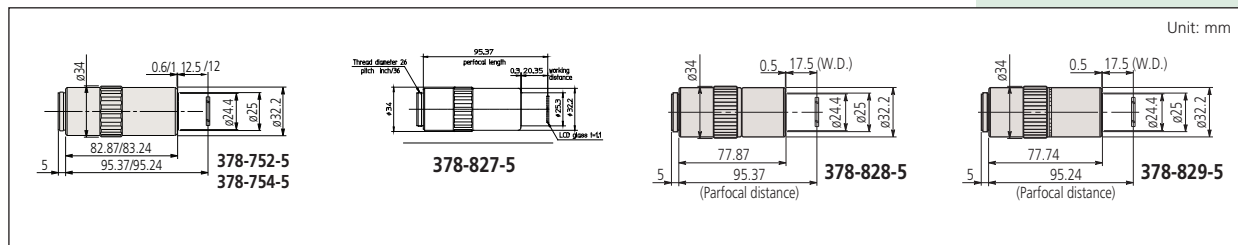


## Near-Infrared Radiation and LCD Glass Thickness (t = 1.1mm or 0.7mm) Corrected LCD Plan Apo NIR for Bright Field Observation

Order No.	Mag.	N.A.	W.D.	f	R	D.F.	View field 1	View field 2	Mass
378-827-5	20X (t1.1)	0.40	19.98mm*	10mm	0.7 $\mu$ m	1.7 $\mu$ m	$\varnothing$ 1.2mm	0.24x0.32mm	305g
378-828-5	50X (t1.1)	0.42	17.13mm*	3.9mm	0.7 $\mu$ m	1.6 $\mu$ m	$\varnothing$ 0.48mm	0.10x0.13mm	320g
378-829-5	50X (t0.7)	0.42	17.26mm*	3.9mm	0.7 $\mu$ m	1.6 $\mu$ m	$\varnothing$ 0.48mm	0.10x0.13mm	320g
378-752-5	100X (t1.1)	0.50	12.13mm*	2mm	0.6 $\mu$ m	1.1 $\mu$ m	$\varnothing$ 0.24mm	0.05x0.06mm	335g
378-754-5	100X (t0.7)	0.50	11.76mm*	2mm	0.6 $\mu$ m	1.1 $\mu$ m	$\varnothing$ 0.24mm	0.05x0.06mm	335g

\*In air

### DIMENSIONS

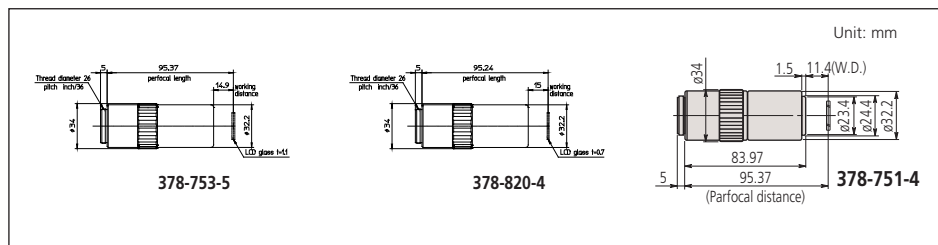


## Near-ultraviolet Radiation and LCD Glass Thickness (t = 0.7mm) Corrected LCD Plan Apo NUV for Bright Field Observation

Order No.	Mag.	N.A.	W.D.	f	R	D.F.	View field 1	View field 2	Mass
378-820-4	50X (t0.7)	0.42	14.76mm*	4mm	0.7 $\mu$ m	1.6 $\mu$ m	$\varnothing$ 0.48mm	0.10x0.13mm	310g
378-753-4	50X (t1.1)	0.42	14.53mm	4mm	0.7 $\mu$ m	1.6 $\mu$ m	$\varnothing$ 0.48mm	0.10x0.13mm	310g
378-751-4	100X (t1.1)	0.50	11.03mm	2mm	0.6 $\mu$ m	1.1 $\mu$ m	$\varnothing$ 0.24mm	0.05x0.06mm	380g

\*In air

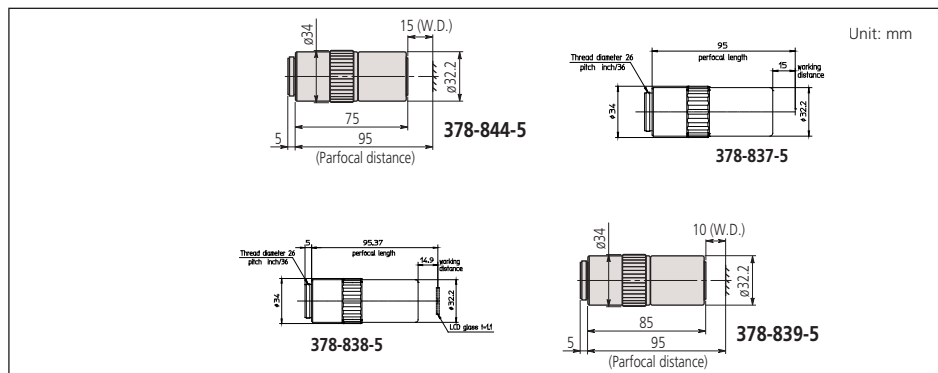
### DIMENSIONS



## Ultraviolet Radiation Corrected M Plan UV for Bright Field Observation

Order No.	Mag.	N.A.	W.D.	f	R	D.F.	View field 1	View field 2	Mass
378-844-5	10X	0.25	20mm	20mm	1.1 $\mu$ m	4.4 $\mu$ m	$\varnothing$ 2.4mm	0.48x0.64mm	310g
378-837-5	20X	0.36	15.0mm	10mm	0.8 $\mu$ m	2.1 $\mu$ m	$\varnothing$ 1.2mm	0.24x0.32mm	330g
378-838-5	50X	0.40	12.0mm	4mm	0.7 $\mu$ m	1.7 $\mu$ m	$\varnothing$ 0.48mm	0.10x0.13mm	400g
378-839-5	80X	0.55	10.0mm	2.5mm	0.5 $\mu$ m	0.9 $\mu$ m	$\varnothing$ 0.3mm	0.06x0.08mm	380g

### DIMENSIONS



Note:

These near-infrared ( $\lambda = 1800\text{nm}$ ) corrected objectives are designed for observing a workpiece through LCD glass (thickness = 1.1mm (378-827-5, 378-828-5, 378-752-5) or 0.7mm (378-829-5, 378-754-5)) and for laser repair.

Note:

These near ultraviolet corrected objectives are designed for observing a workpiece through LCD glass (thickness = 1.1mm (378-753-4, 378-751-4) or 0.7mm (378-820-4)) and for laser repair.

Note:

These ultraviolet corrected objectives are designed so that a workpiece's image can be focused within the focal depth even when the wavelength used is changed anywhere from the visible range ( $\lambda = 550\text{nm}$ ) to the ultraviolet range ( $\lambda = 266\text{nm}$ ). Therefore the M Plan UV Series are suitable for laser repair using a high frequency laser beam.

Mag.: Magnification  
 N.A.: Numerical aperture  
 W.D.: Working distance  
 f: Focal distance  
 R: Resolving power  
 D.F.: Focal depth  
 View field 1: Field of view when using  $\varnothing$ 24mm eyepiece  
 View field 2: Field of view when using 1/2" CCD camera

# MSM-400

## SERIES 377 — Stereo Microscopes

### FEATURES

- Continuous 1X - 4X magnification
- Image always in focus throughout zoom range
- Crisp, erect images with high resolution and excellent stereoscopic effect
- Stereo-tube can be rotated a full 360°, for viewing at any angle
- Bilateral zoom control knob adds convenience and increases operator efficiency
- Diopter adjustment for both eyepieces

- Binocular Tube Inclination: 45°
- Focusing Range: 1.46" (37mm)
- Interpupillary Adjustable Range: 2.12" - 2.99" (54mm - 76mm)
- Optional zoom ranges from 2.5X - 10X to 30X - 120X

The MSM-414L is a traditional binocular stereo microscope for industrial, medical, and classroom applications. It is ideal for electrical small part inspection, assembly, and medical/biological dissection.



377-972A

### Optional Accessories

#### Illuminated Stand

Order No.	Description
377-412	Pole Type Stand (top: 12V/10W flat filament tungsten, bottom: 5W fluorescent)
377-413*	Pole Type Stand (top: 12V/10W flat filament tungsten, bottom: 12V/10W halogen with intensity control)
377-414	Fixed Arm Stand (top: 12V/10W flat filament tungsten, bottom: 5W fluorescent)
377-415	Fixed Arm Stand (top: 12V/10W flat filament tungsten, bottom: 12V/10W halogen with intensity control)
377-416	Fixed Arm Stand (top: 5W fluorescent, bottom: 5W fluorescent)

\*Standard Accessory

### Digital Imaging with Software

Order No.	Description
64PMI189*	Digital camera, 2.0 Megapixel, USB 2.0 interface
64PMI236	Digital camera, 3.0 Megapixel, USB 2.0 interface

\* Can mount to both eyepiece slot & trinocular port.  
If using trinocular, order **377-481 C** mount.



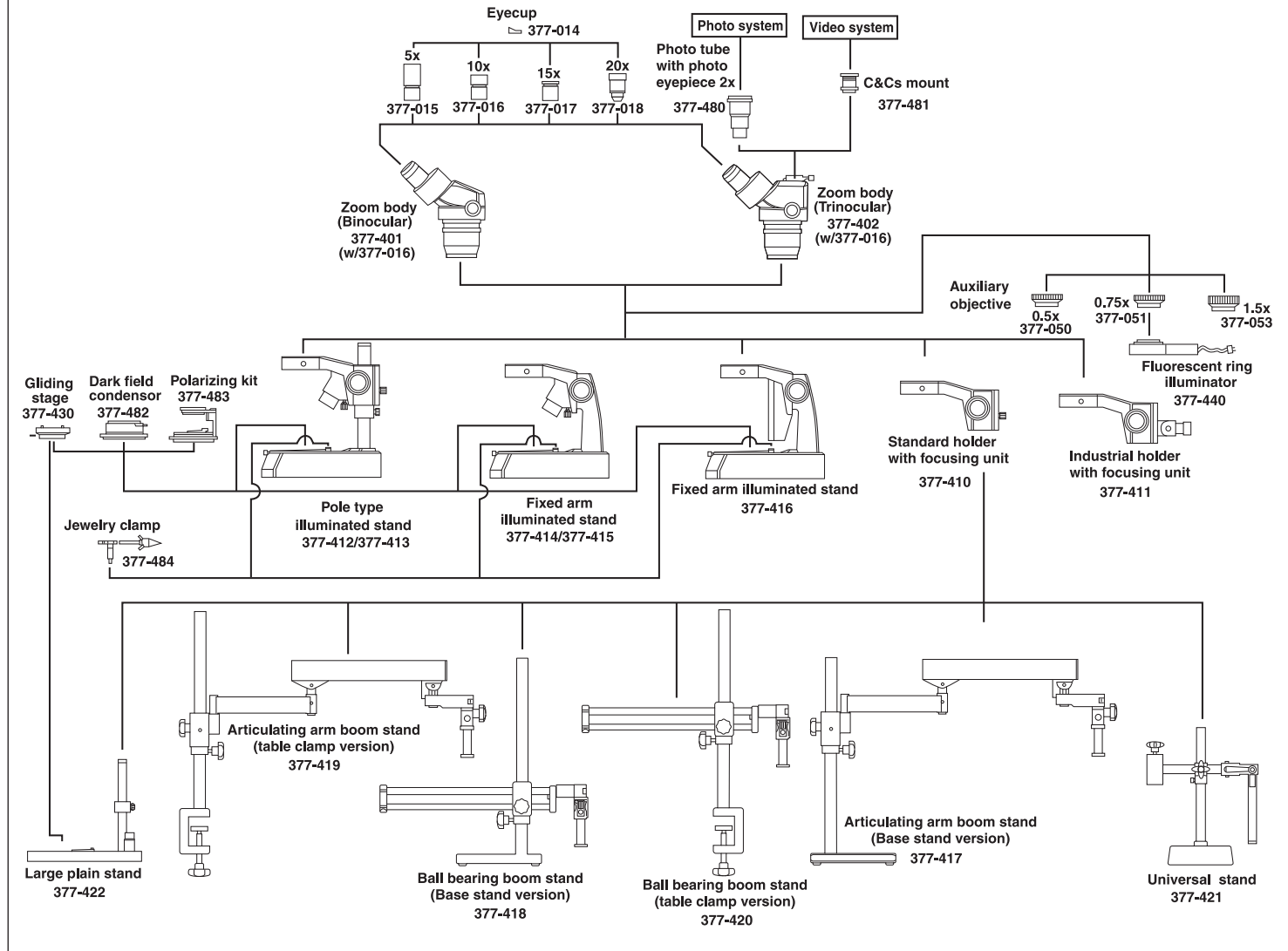
### SPECIFICATIONS

Model.	MSM-414L	MSM-414TL
<b>Order No.</b>	<b>377-972A</b>	<b>377-974A</b>
Optical tube	Binocular	Trinocular
Total magnification	10X - 40X	
Eyepiece	10X (377-016)	
Objective	1X - 4X	
Working distance	80mm	
Field of view	20mm - 5mm	
Dimensions	H=13.2" x W=6.7" x D=9.3"	
Mass	13.2 lbs (6kg)	

# Stereo Microscopes

SERIES 377

377-972A/377-974A SYSTEM DIAGRAM



# MSM-400

## SERIES 377 — Stereo Microscopes

### FEATURES

- Superior quality optics provide high-resolution
- Crystal sharp, high color contrast image with excellent depth of field
- Always in sharp focus at all magnifications
- The Parfocal Optical System allows relaxed strain-free viewing
- Long working distance
- Extreme large field of view (23mm diameter)

The MSM-465L, Order No. 377-990A, is a high-accuracy four-step magnification stereo microscope. With a horizontal

changer allowing 6X, 12X, 25X, and 50X magnifications with a standard 1X objective and 10X eyepieces, the MSM-465L has limitless capabilities for electrical small part inspection.

The MSM-464L, Order No. 377-991A, with its vertical five-step magnification changer is ideal for small part assembly. This stereo microscope with standard 6.4X, 10X, 16X, 25X, and 40X magnifications, has flexibility from 3.2X to 160X magnifications.



MSM-465L  
377-990A



MSM-464L  
377-991A

### Optional Accessories

#### Photo System and Video System

Order No.	Description
377-488	Video System for 377-990A
377-489	Video System for 377-991A

### Digital Imaging with Software

Order No.	Description
64PM1189	Digital camera, 2.0 Megapixel, USB 2.0 interface
64PM1236	Digital camera, 3.0 Megapixel, USB 2.0 interface

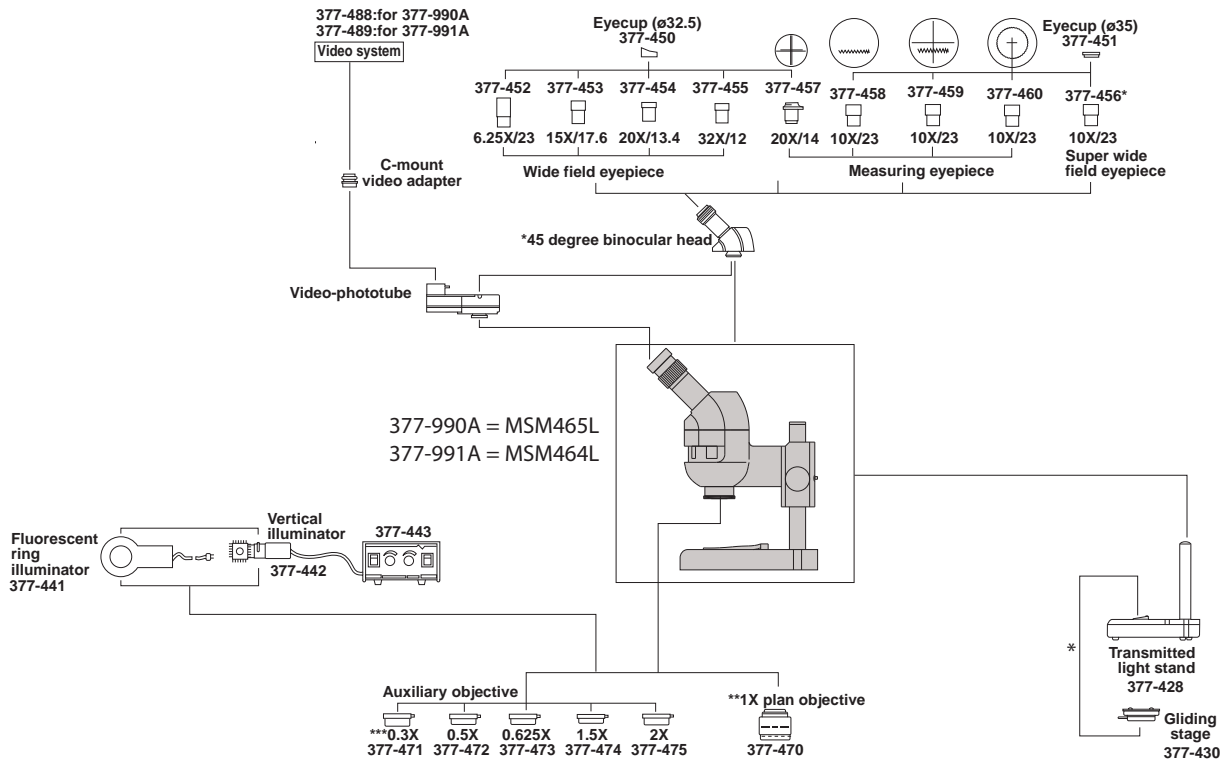
### SPECIFICATIONS

Model. Order No.	MSM-465L 377-990A	MSM-464TL 377-991A
Optical tube	Binocular	Trinocular
Total magnification	6X - 50X	6.4X - 40X
Eyepiece	10X (377-456)	10X (377-456)
Objective	.6X, 1.2X, 2.5X, 5X	.6X, 1X, 1.6X, 2.5X, 4X
Working distance	89mm	89mm
Field of view	23mm (w/377-456)	23mm (w/377-456)
Dimensions	H=14.6" x W=13" x D=11"	H=14.3" x W=13" x D=11"
Mass	15.5 lbs (7kg)	15.5 lbs (7kg)
Stand	Transmitted Light Stand (377-428)	Transmitted Light Stand (377-428)

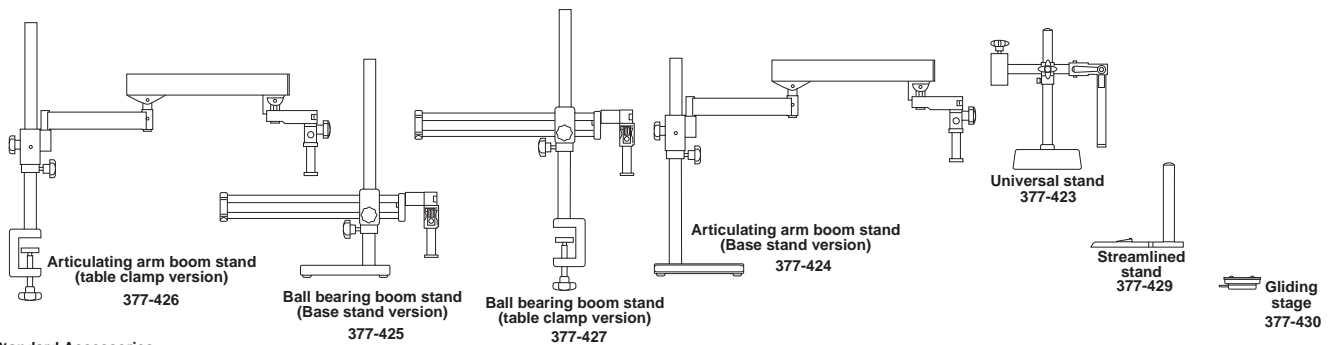
# Stereo Microscopes

SERIES 377

## 377-990A/377-991A SYSTEM DIAGRAM



### Optional Stand



- \* Standard Accessories
- \*\* 1X plan objective can replace 1X standard built-in objective
- \*\*\* 350mm long stand post is required. (377-431)

# Pocket Magnifiers

## SERIES 183

### FEATURES

- Suitable for inspecting metal surfaces.

### SPECIFICATIONS

Magnification	Order No.	Remarks
25X	183-201	Pen type
	183-202	With stand
50X	183-203	With stand



183-201

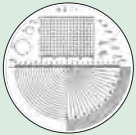


183-202



183-203

### Optional Reticles for pocket comparators



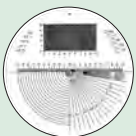
183-102



183-103



183-104



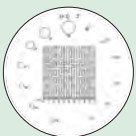
183-105



183-106



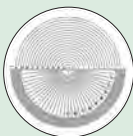
183-107



183-108



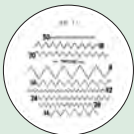
183-109



183-110



183-111



183-112



183-113



183-114



183-115

### Pocket Comparator 8x with Reticles Set

#### Set No.

183-901 183-101, 183-106

183-902 183-101, 183-102, 183-106, 183-107, 183-112, 183-113, 183-114

183-903 183-101, 183-102, 183-106, 183-107, 183-109, 183-113, 183-115

183-904 183-101, 183-102

# Pocket Comparators

## SERIES 183

### FEATURES

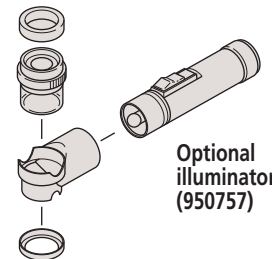
- By replacing optional reticles, dimensional, angle, and other types of measurements can be performed.
- Illuminator (950757) is available.

### SPECIFICATIONS

Magnification	Order No.	Remarks
8X	183-101	Optional reticles available
10X	183-131	Optional reticles available



183-101



Optional illuminator (950757)

# Zoom Loupe

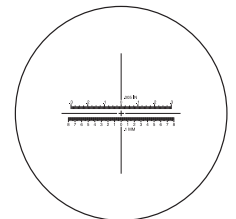
## SERIES 183

### FEATURES

- Allows the user 8X - 16X zoom observation.
- Magnification indicator is provided for 8X, 10X, 12X, 14X, and 16X observation.
- Metric and inch scales are provided for measuring.
- Comes with a carrying case.



183-304



Reticle provided

### SPECIFICATIONS

Magnification	Order No.	Remarks
8X - 16X	183-304	With reticle (Scale graduation: 0.1mm, .0005")

# Clear Loupe

## SERIES 183



183-301



183-302



183-303

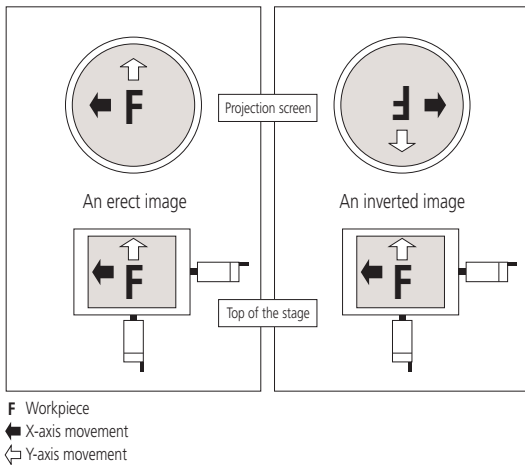
### SPECIFICATIONS

Magnification	Order No.	Remarks
7X	183-301	Drawtube removable
10X	183-302	Drawtube removable
15X	183-303	Drawtube removable

# Quick Guide to Precision Measuring Instruments

## ■ Erect Image and Inverted Image

An image of an object projected onto a screen is erect if it is orientated the same way as the object on the stage. If the image is reversed top to bottom, left to right and by movement with respect to the object on the stage (as shown in the figure below) it is referred to as an inverted image (also known as a reversed image, which is probably more accurate).



## ■ Magnification Accuracy

The magnification accuracy of a projector when using a certain lens is established by projecting an image of a reference object and comparing the size of the image of this object, as measured on the screen, with the expected size (calculated from the lens magnification, as marked) to produce a percentage magnification accuracy figure, as illustrated below. The reference object is often in the form of a small, graduated glass scale called a 'stage micrometer' or 'standard scale', and the projected image of this is measured with a larger glass scale known as a 'reading scale'.

(Note that magnification accuracy is not the same as measuring accuracy.)

$$\Delta M(\%) = \frac{L - \ell M}{\ell M} \times 100$$

- ΔM(%): Magnification accuracy expressed as a percentage of the nominal lens magnification
- L: Length of the projected image of the reference object measured on the screen
- ℓ: Length of the reference object
- M: Magnification of the projection lens

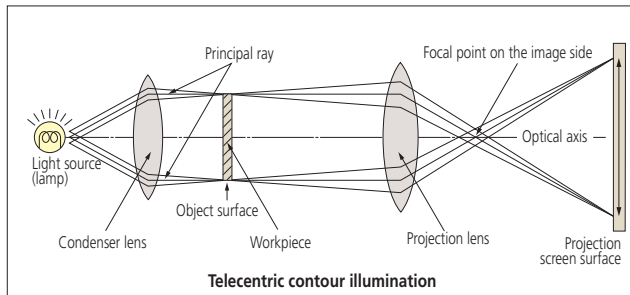
## ■ Type of Illumination

- **Contour illumination:** An illumination method to observe a workpiece by transmitted light and is used mainly for measuring the magnified contour image of a workpiece.
- **Coaxial surface illumination:** An illumination method whereby a workpiece is illuminated by light transmitted coaxially to the lens for the observation/measurement of the surface. (A half-mirror or a projection lens with a built-in half-mirror is needed.)
- **Oblique surface illumination:** A method of illumination by obliquely illuminating the workpiece surface. This method provides an image of enhanced contrast, allowing it to be observed three-dimensionally and clearly. However, note that an error is apt to occur in dimensional measurement with this method of illumination. (An oblique mirror is needed. Models in the PJ-H30 series are supplied with an oblique mirror.)

## ■ Telecentric Optical System

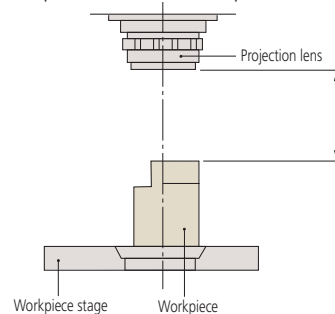
An optical system based on the principle that the principal ray is aligned parallel to the optical axis by placing a lens stop on the focal point on the image side. Its functional feature is that the image will not vary in size though the image blurs as the object is shifted along the optical axis.

For measuring projectors and measuring microscopes, an identical effect is obtained by placing a lamp filament at the focal point of a condenser lens instead of a lens stop so that the object is illuminated with parallel beams. (See the figure below.)



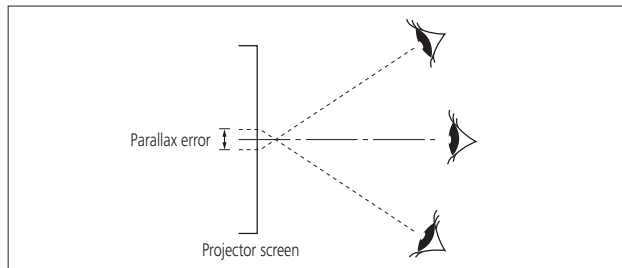
## ■ Working distance

Refers to the distance from the face of the projection lens to the surface of a workpiece in focus. It is represented by L in the diagram below.



## ■ Parallax error

This is the displacement of an object against a fixed background caused by a change in the observer's position and a finite separation of the object and background planes.



## ■ Field of view diameter

The maximum diameter of workpiece that can be projected using a particular lens.

$$\text{Field of view diameter (mm)} = \frac{\text{Screen diameter of profile projector}}{\text{Magnification of projection lens used}}$$

Example: If a 5X magnification lens is used for a projector with a screen of ø500mm:

$$\text{Field of view diameter is given by } \frac{500\text{mm}}{5} = 100\text{mm}$$

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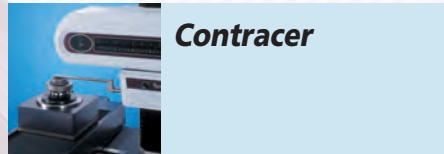
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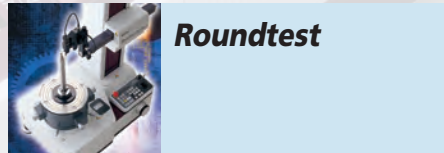
**Surftest**



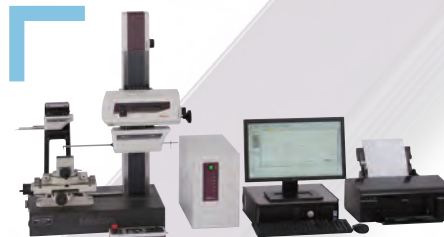
**Formtracer**



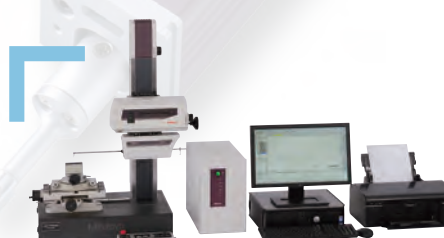
**Contracer**



**Roundtest**



SV-C3200 / SV-C4500



CV-3200 / CV-4500



SJ-410



SV-3000CNC + QVP



RA-120



# Surftest SJ-210 / SJ-310

SERIES 178 — Portable Surface Roughness Tester



Surftest SJ-210



Surftest SJ-310

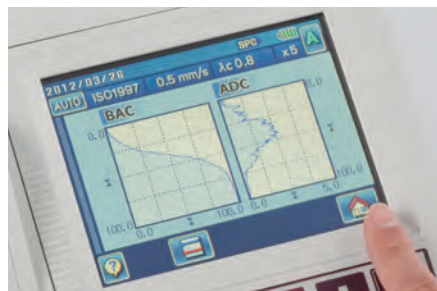
## FEATURES: SJ-210

- The 2.4-inch color graphic LCD provides excellent readability and an intuitive display that is easy to negotiate. The LCD also includes a backlight for improved visibility in dark environments.
- The Surftest SJ-210 can be operated easily using the buttons on the front of the unit and under the sliding cover.
- Up to 10 measurement conditions and one measured profile can be stored in the internal memory.
- An optional memory card can be used as an extended memory to store large quantities of measured profiles and conditions.
- Access to each feature can be password-protected, which prevents unintended operations and allows you to protect your settings.
- The display interface supports 16 languages, which can be freely switched.
- An alarm warns you when the cumulative measurement distance exceeds a preset limit.
- The Surftest SJ-210 complies with the following standards: JIS (JIS-B0601-2001, JIS-B0601-1994, JIS B0601-1982), VDA, ISO-1997, and ANSI.
- In addition to calculation results, the Surftest SJ-210 can display sectional calculation results and assessed profiles, load curves, and amplitude distribution curves.



## FEATURES: SJ-310

- The handheld data processing unit and the 5.7-inch color graphic LCD touch-panel provide superior readability and operability. The LCD also includes a backlight for improved visibility in dark environments.
- The excellent user interface provides intuitive and easy-to-understand operability.
- Complies with the following standards: JIS (JIS-B0601-2001, JIS-B0601-1994, JIS B0601-1982), VDA, ISO-1997, and ANSI.
- The Measure-Start and other frequently used buttons are strengthened to resist wear and the detrimental effects of workshop contaminants.
- Equipped with a large-capacity battery allowing approximately 1500 measurements when fully charged.
- Includes convenient carrying case for protection in the field.
- A high-speed printer is built into the main unit. Either landscape or portrait mode can be selected according to the application. Paper saving mode is supported.
- The display interface supports 16 languages, which can be freely switched.
- 10 sets of measurement conditions can be saved in the measurement unit—an optional memory card can save measurement conditions and the measured profile.



## Technical Data: SJ-210

X axis (drive unit)	
Measuring range:	.70", .22" (17.5, 5.6mm (Transverse tracing drive unit type))
Measuring speed:	.01, .02", .03"/s (0.25, 0.5, 0.75mm/s) .039"/s (1mm/s) (Returning))
Detector	
Range:	360μm (-200μm to +160μm)
Measuring method:	skidded
Measuring force:	0.75mN or 4mN
Stylus tip:	Diamond, 90° / 5μmR (60° / 2μmR)
Skid radius of curvature:	40mm
Skid force:	less than 400mN
Type:	Differential inductance
Power supply:	Two-way power supply: battery (rechargeable Ni-MH battery) and AC adapter
Charging time:	about 4hours (may vary due to ambient temperature)
Endurance:	about 1000 measurements (differs slightly due to use conditions/environment)
External I/O:	USB I/F, Digimatic Output, Printer Output, RS-232C I/F, Foot SW I/F
Data storage:	Memory card (option <b>12AAL069</b> )
Dimensions (WxDxH)	
Display unit:	2.05x2.59x6.3" (52.1 x 65.8 x 160mm)
Drive unit:	6.85x2.59x2" (115 x 23 x 26mm)
Mass:	About 1.1lb (0.5kg) (Display unit + Drive unit + Standard detector)

## Evaluation Capability: SJ-210

Applicable standards:	JIS'82, JIS'94, JIS'01, ISO'97, ANSI, VDA
Assessed profiles:	Primary profile, Roughness profile, DF profile, Roughness profile-Motif
Evaluation parameters:	Ra, Rc, Ry, Rz, Rq, Rt, Rmax, Rp, Rv, R3z, Rsk, Rku, Rc, Rpc, Rsm, Rz1max, S, HSC, RzJIS, Rppi, RΔa, RΔq, Rlr, Rmr, Rmr(c), Rδc, Rk, Rpk, Rvk, Mr1, Mr2, A1, A2, Vo, Rpm, tp, Htp, R, Rx, AR, Possible Customize
Analysis graphs:	Bearing area curve / Amplitude distribution curve
Digital filters:	Gaussian, 2CR75, PC75
Cut off length:	λc: .003, .01, .03, .1" (0.08, 0.25, 0.8, 2.5mm) λs: .1", .3" (2.5, 8μm)
Sampling length:	.003", .01", .03", .1" (0.08, 0.25, 0.8, 2.5mm)
Number of sampling lengths (x n):	x1, x2, x3, x4, x5, x6, x7, x8, x9, x10 arbitrary length (0.3 to 16.0mm: 0.01mm interval) x1, x2, x3, x4, x5, x6, x7, x8, x9, x10 arbitrary length (0.3 to 5.6mm: 0.01mm interval)*
	* Only for Transverse tracing drive unit type

## Function: SJ-210

Customization: Desired parameters can be selected for calculation and display.  
 GONG judgment: By max value / 16% / Standard deviation  
 Storage of measurement condition: Save the conditions at power OFF  
 Storage: Internal memory: Measurement condition (10sets), Measured profile (1set)  
 Memory card (Option): 500 measurement conditions, 10000 measured profiles, 500 display images  
 Text file (Measurement conditions / Measured profile / Assessed profile / Bearing area curve / Amplitude distribution curve)  
 Calibration: Auto-calibration with the entry of numerical value / Average calibration with multiple measurement (Max.5 times) is available

## Technical Data: SJ-310

X axis (drive unit)  
 Measuring range: .70", .22" (17.5, 5.6mm (Transverse tracing drive unit type))  
 Measuring speed: 0.75mN or 4mN  
 .01", .02", .03"/s  
 (0.25, 0.5, 0.75mm/s .039"/s(1mm/s) (Returning))

Detector  
 Range: 360µm (-200µm to +160µm)  
 Measuring method: skidded  
 Measuring force: 0.75mN or 4mN  
 Stylus tip: Diamond, 90° / 5µmR (60° / 2µmR)  
 Skid radius of curvature: 40mm  
 Skid force: less than 400mN  
 Type: Differential inductance  
 Power supply: Two-way power supply: battery (rechargeable Ni-MH battery) and AC adapter

Battery  
 Charging time: 4 hours maximum  
 Recharge cycles: Approximately 1500 times (slightly varies with the usage and environmental conditions)

External I/O: USB I/F, Digimatic Output, RS-232C I/F, External SW I/F

Data storage: Memory card (option **12AAL069**)

Dimensions (WxDxH)  
 Control unit: 10.8x4.29x7.8" (275 x 109 x 198mm)  
 Drive unit: 6.85x2.59x2" (115 x 23 x 26mm)

Mass  
 Display unit: Approx. 3.7lb(1.7kg)  
 Drive unit: .4lb(0.2kg)

## Evaluation Capability: SJ-310

Applicable standards: JIS'82, JIS'94, JIS'01, ISO'97, ANSI, VDA

Assessed profiles: P (primary profile), R (roughness profile), DIN4776, roughness motif, waviness motif

Evaluation parameters: Ra, Ry, Rz, Rt, Rp, Rq, Rv, Rsk, Rku, Rc, RSm, S, Rpc, R3z, Rmr (c), Rpk, Rvk, Rfc, Rk, Mr1, Mr2, Lo, Rppi, R, AR, Rx, A1, A2, Vo, HSC, Rmr, SK, Ku, RΔa, RΔq, Rlr, a, q, Rpm, RzJIS (JIS'01), tp (ANSI), Htp (ANSI), Wte, Vx, V, AW, Rz1max (ISO), Rmax (VDA, ANSI, JIS'82), Possible Customize

Analysis graphs: Bearing Area Curve (BAC), Amplitude Distribution Curve (ADC)

Digital filter 2CR, PC75, Gaussian  
 Cutoff length λc: .003, .01, .03, .1, .3" (0.08, 0.25, 0.8, 2.5, 8mm)  
 λs: .1", .3" (2.5, 8mm)

Sampling length: .003, .01, .03, .1, .3" (0.08, 0.25, 0.8, 2.5, 8mm)

Number of sampling lengths (x n): x1, x2, x3, x4, x5, x6, x7, x8, x9, x10 arbitrary length (0.3 to 16.0mm: 0.01mm interval)

x1, x2, x3, x4, x5, x6, x7, x8, x9, x10 arbitrary length (0.3 to 5.6mm: 0.01mm interval)\*

\* Only for Transverse tracing drive unit type

Printer Thermal type  
 Printing width 48mm (paper width: 58mm)

Recording magnification  
 Vertical magnification: 10X to 100,000X, Auto  
 Horizontal magnification: 1X to 1,000X, Auto

## Function: SJ-310

Customization: Desired parameters can be selected for calculation and display.

Statistical processing: Maximum value, minimum value, mean value, standard deviation, pass rate, histogram of each parameter

GO/NG judgment: maximum value rule, 16% rule, average value rule, standard deviation (1σ, 2σ, 3σ)

Storage: Internal memory: Measurement condition (10 sets)  
 Memory card (Option): 500 measurement conditions, 10000 measured profiles, 500 display images, Text file (Measurement conditions / Measured profile / Assessed profile / Bearing area curve / Amplitude distribution curve), 500 statistical data, etc.

Calibration: Auto-calibration with the entry of numerical value /Average calibration with multiple measurement (Max.12 times) is available.

Power saving function: Auto-sleep-function, Auto light-off of Backlight by ECO mode.

# Surftest SJ-210 / SJ-310

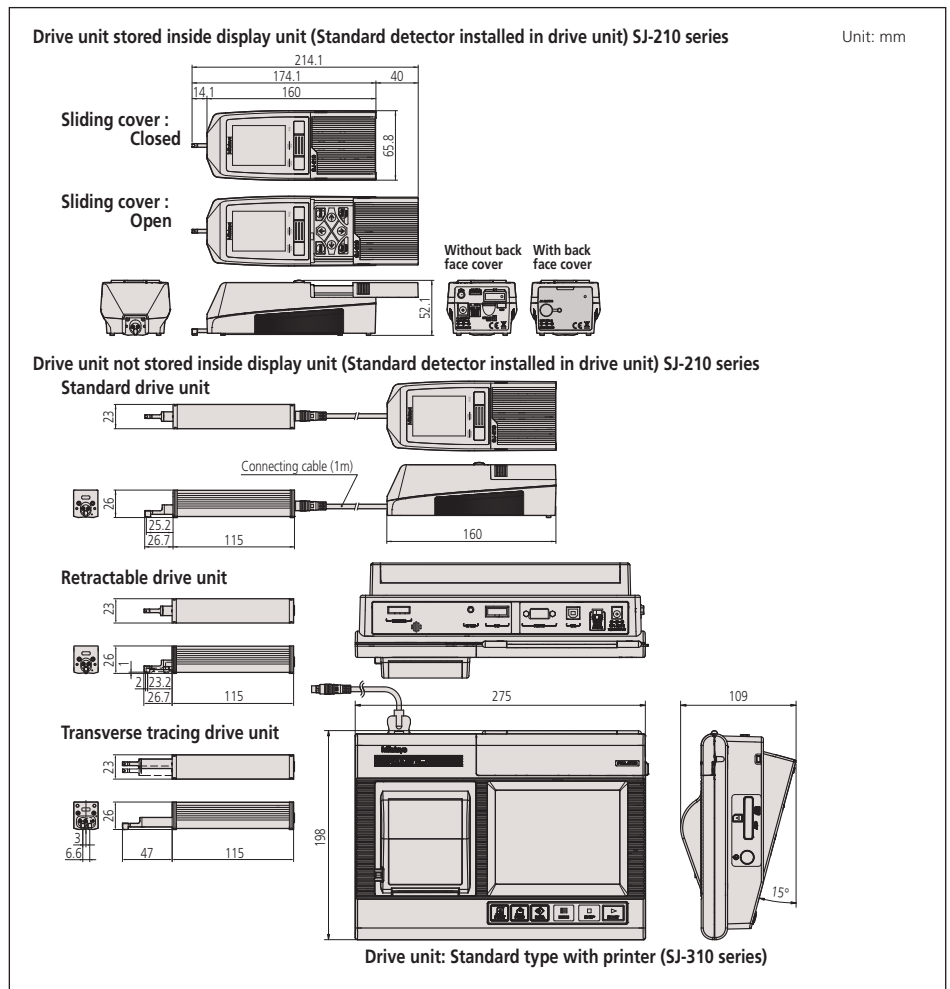
## SERIES 178 — Portable Surface Roughness Tester

### SPECIFICATIONS/CONFIGURATION

Model No.	SJ-210					
Order No. (inch/mm)	178-561-01A	178-561-02A	178-563-01A	178-563-02A	178-565-01A	178-565-02A
Drive unit	Standard type (178-230-2)		Retractable type (178-235)		Transverse tracing type (178-233-2)	
Detector	0.75mN type (178-296)	4mN type (178-390)	0.75mN type (178-296)	4mN type (178-390)	0.75mN type (178-387)	4mN type (178-386)
Display unit	Compact type (178-253A)					
Detector: Conical taper angle	60°	90°	60°	90°	60°	90°
Stylus tip radius	2µm	5µm	2µm	5µm	2µm	5µm
Detector measuring force	0.75mN	4mN	0.75mN	4mN	0.75mN	4mN

Model No.	SJ-310					
Order No. (inch/mm)	178-571-01A	178-571-02A	178-573-01A	178-573-02A	178-575-01A	178-575-02A
Drive unit	Standard type (178-230-2)		Retractable type (178-235)		Transverse tracing type (178-233-2)	
Detector	0.75mN type (178-296)	4mN type (178-390)	0.75mN type (178-296)	4mN type (178-390)	0.75mN type (178-387)	4mN type (178-386)
Display unit	Standard type with printer					
Detector: Conical taper angle	60°	90°	60°	90°	60°	90°
Stylus tip radius	2µm	5µm	2µm	5µm	2µm	5µm
Detector measuring force	0.75mN	4mN	0.75mN	4mN	0.75mN	4mN

### DIMENSIONS Display unit, Drive unit



# Surftest SJ-210 / SJ-310

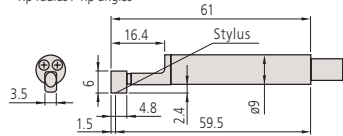
## SERIES 178 — Optional Accessories

### Detectors

#### Standard detectors

Order No.	Measuring force	Stylus profiles*	Remarks column
178-296	0.75mN	2 $\mu$ mR/60°	Dedicated to the standard/retractable drive unit
178-390	4 mN	5 $\mu$ mR/90°	
178-387	0.75mN	2 $\mu$ mR/60°	Dedicated to the transverse tracing drive unit
178-386	4 mN	5 $\mu$ mR/90°	
178-391	4 mN	10 $\mu$ mR/90°	Dedicated to the standard/retractable drive unit

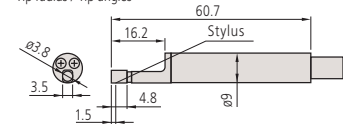
\* Tip radius / Tip angles



#### Small hole detectors

Order No.	Measuring force	Stylus profiles*	Remarks column
178-383	0.75mN	2 $\mu$ mR/60°	Minimum measurable hole diameter: $\varnothing$ 4.5mm
178-392	4 mN	5 $\mu$ mR/90°	

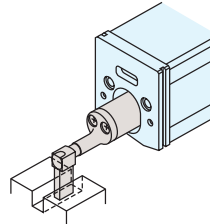
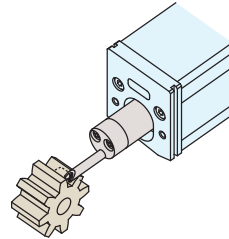
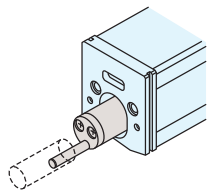
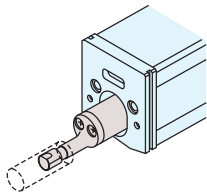
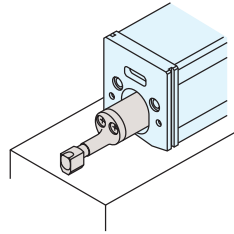
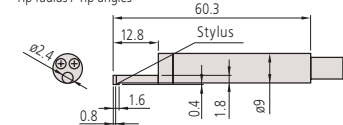
\* Tip radius / Tip angles



#### Extra small hole detectors

Order No.	Measuring force	Stylus profiles*	Remarks column
178-384	0.75mN	2 $\mu$ mR/60°	Minimum measurable hole diameter: $\varnothing$ 2.8mm
178-393	4 mN	5 $\mu$ mR/90°	

\* Tip radius / Tip angles

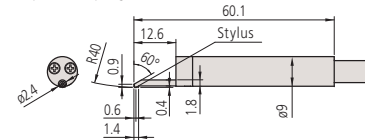


Unit: mm

#### Gear-tooth surface detectors

Order No.	Measuring force	Stylus profiles*
178-388	0.75mN	2 $\mu$ mR/60°
178-398	4 mN	5 $\mu$ mR/60°

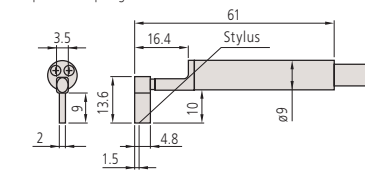
\* Tip radius / Tip angles



#### Deep groove detectors

Order No.	Measuring force	Stylus profiles*	Remarks column
178-385	0.75mN	2 $\mu$ mR/60°	Not available for the transverse tracing drive unit
178-394	4 mN	5 $\mu$ mR/90°	

\* Tip radius / Tip angles



### SJ-Printer for SJ-210

Assessed profiles and calculation results and curves can be printed out by connecting the SJ-210-dedicated printer, which is palm sized (WxDxH: 93x125x70mm) and can run on an internal battery.

- Power supply can be selected. (AC adapter or battery pack)
- Printable items: Measurement conditions, calculation results, assessed profile, bearing area curve (BAC), amplitude distribution curve (ADC), and environment settings.



178-421A



Example of the connection with SJ-210

Durable Printer paper (25m, 5 rolls/set): **12AAA876**

Printer paper (5 packs): **270732**

RS-232C cable: **12AAL067**

### DP-1VR

It is possible to process Digimatic data output from the Surftest SJ series with the DP-1VR. This compact, hand-held device can provide printouts of measurement data and various statistical analyses results such as histograms, D-charts, and X bar R control charts. With optional output cables, DP-1VR is also capable of RS-232C output of measurement data to a PC (cable **09EAA084**) and GO/NG condition output (cable **965516**).



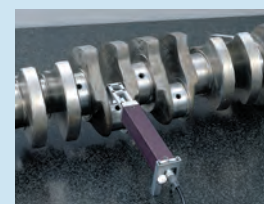
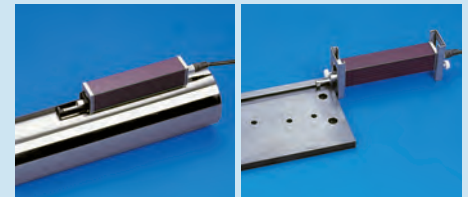
264-504-5A

Connecting cable: **936937** 40'' (1m)

Connecting cable: **965014** 80'' (2m)

AC adapter: **09EAA088**

Printer paper: **09EAA082**



### Optional Software

#### SJ-Tools

Output software based on Microsoft-Excel\* for controlling the devices and reproducing and storing the measurement data.

\* Microsoft-Excel is not included in the scope of supply. Complete with exclusive accessories.

- Measurement device control
- Definition of measurement variables
- Graphic representation of the profile
- Storage of measurement records
- Documentation of measurement results
- Connecting cable

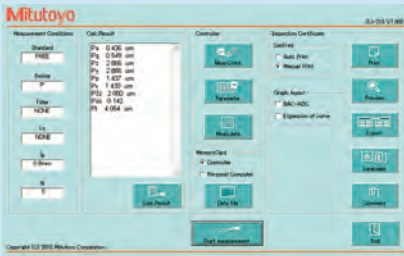
Optional cables are required.

**12AAL068:** USB PC connecting cable (USB cable) for SJ-210

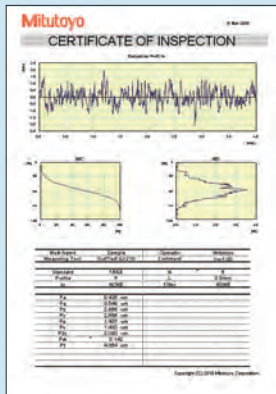
**12AAD510:** USB PC connecting cable (USB cable) for SJ-310

**12AAL067:** RS-232C cable for SJ-210

**12AAA882:** RS-232C cable for SJ-310



SJ-Tools input mask for Surftest SJ series



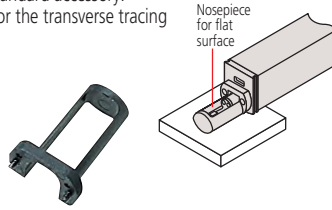
SJ-Tools output record from MS-Excel

### Nosepiece, Adapter

#### Nosepiece for flat surfaces

##### 12AAA217

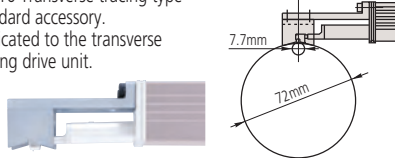
- SJ-310/310R standard accessory.
- Not available for the transverse tracing drive unit.



#### V-type adapter

##### 12AAE644

- SJ-310 Transverse tracing type standard accessory.
- Dedicated to the transverse tracing drive unit.

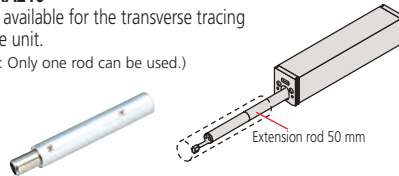


#### Extension rod (50mm)

##### 12AAA210

- Not available for the transverse tracing drive unit.

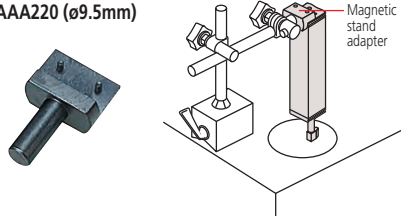
(Note: Only one rod can be used.)



#### Magnetic stand adapter

##### 12AAA221 (ø8mm)

##### 12AAA220 (ø9.5mm)



#### Extension cable (1m)

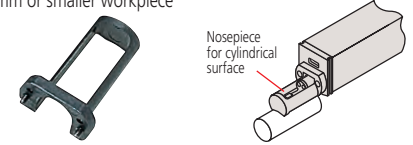
##### 12BAA303

- Only one cable can be used.

#### Nosepiece for cylindrical surfaces

##### 12AAA218

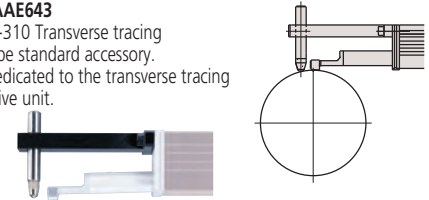
- SJ-310/310R standard accessory.
- Not available for the transverse tracing drive unit.
- ø30mm or smaller workpiece



#### Point-contact adapter

##### 12AAE643

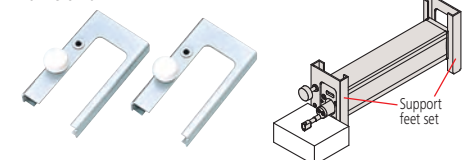
- SJ-310 Transverse tracing type standard accessory.
- Dedicated to the transverse tracing drive unit.



#### Support feet set

##### 12AAA216

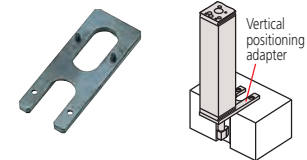
- SJ-310/310R standard accessory.
- Not available for the detector side of the transverse tracing drive unit.



#### Vertical positioning adapter

##### 12AAA219

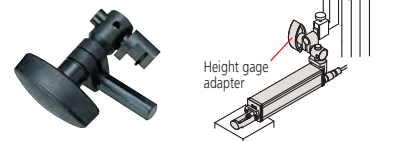
- Not available for the transverse tracing drive unit.



#### Height gage adapter

##### 12AAA222 (9mm x 9mm)

##### 12AAA233 (1/4" x 1/2")



### Setting attachments

\* Not available for the transverse tracing drive unit

Improves measurement efficiency by allowing the setup of multiple workpieces of the same type and the positioning of hard-to-access features of a workpiece.

#### No. 178-033

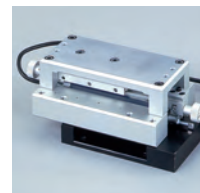
V-type for measuring in the cylinder axis direction



The V-width is adjustable to the cylinder diameter facilitating axial measurement of a wide range of cylinder diameters.  
• Adjustable range: ø 5 - 150mm

#### No. 178-034

Setting attachment: Magnetic slider type



The magnet attached to the bottom surface of the frame allows hands-free measurements to be made.

#### No. 178-035

Setting attachment: Inside diameter type



Greatly facilitates measurement of internal wall surfaces of, for example, cylinder-block bores.  
• Applicable diameter: ø75 - ø95mm  
• Accessible depth: 30 - 135mm

# Surftest SJ-410

## SERIES 178 — Portable Surface Roughness Tester

### FEATURES

- Both skidded and skidless measurement are possible with this series. Equipped with 46 roughness parameters that conform to the latest ISO, DIN, ANSI, and JIS standards.
- A wide-range, high-resolution detector and a drive unit provide superior high-accuracy measurement in its class.
- Ultra-fine steps, straightness and waviness can be measured by using the skidless measurement function.
- The handheld data processing unit and the 5.7-inch color graphic LCD touch-panel provides superior readability and operability. The LCD also includes a backlight for improved visibility in dark environments.
- The excellent user interface provides intuitive and easy-to-understand operability.
- Measured data can be output to a PC with optional RS-232C or USB cable.
- Digital filter function for non-distorted roughness profiles.
- GO/NG judgment function.
- Auto-calibration function.
- The display interface supports 16 languages, which can be freely switched.
- Simplified contour analysis function supports the four types of measurement: step, level change, area and coordinate difference.
- Access to each feature can be password-protected, which prevents unintended operations and allows you to protect your settings.
- The optional attachments for mounting on a column stand significantly increase the operability.

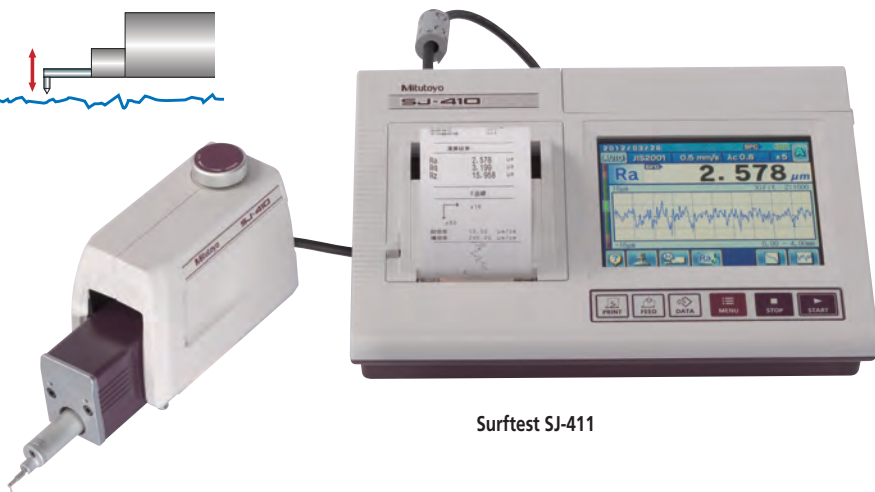
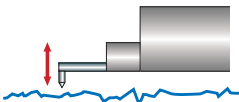
**Detector**  
Measuring range: 800µm  
Resolution: 0.000125µm (at 8µm range)

**Drive unit**  
Straightness/traverse length  
SJ-411: 0.3µm/25mm  
SJ-412: 0.5µm/50mm



- A skidless detector and a curved surface compensation function provide efficient evaluation of cylinder surface roughness.

### Skidless measurement



Surftest SJ-411

### SPECIFICATIONS

Model No.	SJ-411	SJ-411	SJ-412	SJ-412
<b>Order No. (inch/mm)</b>	<b>178-581-01A</b>	<b>178-581-02A</b>	<b>178-583-01A</b>	<b>178-583-02A</b>
Detector measuring force	0.75mN	4mN	0.75mN	4mN
Evaluation range	25mm	25mm	50mm	50mm
Stylus tip	Tip angle	60°	90°	60°
	Tip radius	2µm	5µm	2µm

### Technical Data<sup>X</sup> axis (drive unit)

Measuring range: 1" (25mm)(SJ-411), 2" (50mm) (SJ-412)  
Measuring speed: .002, .004, .008, .02, .04"/s  
(0.05, 0.1, 0.5, 1.0mm/s)  
Return speed: .02, .04, .08"/s (0.5, 1.0, 2.0mm/s)  
Traversing direction: Backward  
Traverse linearity: 12 µin / 1" (0.3µm/25mm) (SJ-411),  
20 µin / 2" (0.5µm/50mm) (SJ-412)  
Positioning: ±1.5° (tilting), 10mm (up/down)

**Detector**  
Range / resolution: 800µm / 0.0125µm, 80µm / 0.00125µm,  
8µm / 0.000125µm (up to 2400µm with  
an optional stylus)  
Measurement method: Skidless / skidded  
Measuring force: 0.75mN or 4mN  
Stylus tip: Diamond, 60° / 2µmR  
(90° / 5µmR)  
Skid radius of curvature: 40mm  
Type: Differential inductance  
Power supply: Via AC adapter / rechargeable battery  
Battery life: Max. app. 1000 measurements (w/o printing)  
Recharge time: 4 hours Data output Via USB interface /  
RS-232C interface / SPC output

**Storage: Internal memory:** Measurement condition (10 sets)  
Memory card (Option): 500 measurement conditions,  
10000 measured profiles, 500 display images, Text file  
(Measurement conditions / Measured profile / Assessed  
profile / Bearing area curve / Amplitude distribution curve),  
500 statistical data, etc.

**Dimensions (WxDxH)**  
Display unit: 10.8x4.3x7.8" (275x109 x198mm)  
Height-tilt adjustment unit: 5.16x2.48x3.9" (131x63x99mm)  
Drive unit:  
5.04x1.41x1.83" (128x36x47mm)(SJ-411),  
6.1x1.41x1.83" (155x36x47mm) (SJ-412)

**Mass Control unit:** Approx. 3.75lb(1.7kg)  
Height-tilt adjustment unit: Approx. .9lb(0.4kg)  
Drive unit: 1.3lb(0.6kg) (SJ-411), 1.5lb(0.7kg)(SJ-412)

### Evaluation Capability

Applicable standards: JIS'82, JIS'94, JIS'01, ISO'97, ANSI, VDA, Free  
Assessed profiles: P (primary profile), R (roughness profile),  
DF (DF profile), W (filtered waviness profile),  
roughness motif, waviness motif

Evaluation parameters: Ra, Rq, Rz, Ry, Rp, Rv, Rt, R3z, Rsk, Rku,  
Rc, Rpc, RSm, Rmax(VDA, ANSI), Rz1max(ISO'97), S, HSC,  
Rz1JIS(JIS'01), Rppi, RΔa, RΔq, Rlr, Rmr, Rmr(c), Rδc, Rk, Rpk, Rvk,  
Mr1, Mr2, A1, A2, Vo, λq, Lo, Rpm, tp(ANSI), Htp(ANSI), R, Rx,  
AR, W, AW, Wx, Wte

Analysis graphs: Bearing Area Curve (BAC),  
Amplitude Distribution Curve (ADC)

Digital filter: 2CR, PC75, Gaussian  
Cutoff length  
λc: .003, .01, .03, .1, .3"  
(0.08, 0.25, 0.8, 2.5, 8mm)  
λs: 100, 320, 1000µin  
(2.5, 8, 25µm) (Availability of switching  
depends of the selected standard.)

Sampling length: 0.08, 0.25, 0.8, 2.5, 8, 25\*mm; or  
arbitrary length in range 0.1 to 25mm  
(0.1 to 50mm: SJ-412) in 0.01mm  
increments

Number of sampling lengths: 1, 2, 3, ~20 (limited by traverse range)

Printer: Thermal type  
Printing width: 48mm (paper width: 58mm)

Recording magnification  
Vertical magnification: 10X to 100,000X, Auto  
Horizontal magnification: 1X to 1,000X, Auto

Function  
Customize: Selection of display/evaluation parameter  
Data compensation: R-surface, Tilt compensation  
Ruler function: Step, level change, area and coordinate  
difference  
D.A.T. function: Helps to level workpiece prior to skidless  
measurement Displacement detection mode  
enables the stylus displacement to be  
input while the drive unit is stopped.

Statistical processing: Max. value, Min. value, Mean value,  
Standard deviation (s), Pass ratio, Histogram

GO/NG judgement: Maximum value rule, 16% rule, average  
value rule, standard deviation (1σ, 2σ, 3σ)

Calibration: Auto-calibration with the entry of numerical  
value / Average calibration with multiple  
measurement (Max.12 times) is available.

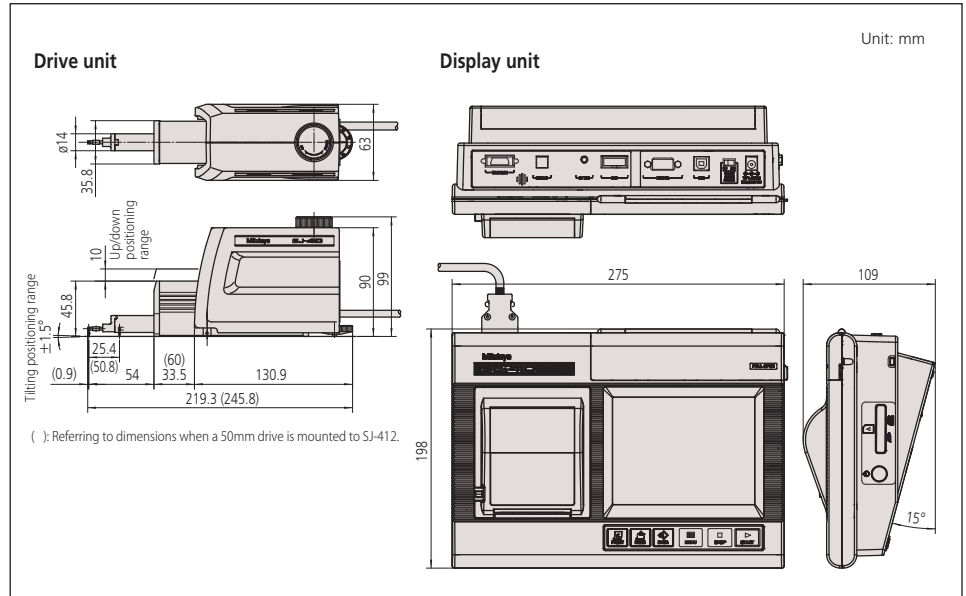
Power saving function: Auto-sleep-function, Auto light-off of  
Backlight by ECO mode.

\* Only for SJ-412

# Surftest SJ-410

## SERIES 178 — Portable Surface Roughness Tester

### DIMENSIONS



### Optional Software

#### SJ-Tools

Output software based on Microsoft-Excel\* for controlling the devices and reproducing and storing the measurement data.

\*Microsoft-Excel is not included in the scope of supply.

Complete with exclusive accessories.

- Measurement device control
- Definition of measurement variables
- Graphic representation of the profile
- Storage of measurement results
- Documentation of measurement results

Optional cables are required.

**12AAD510:** USB PC connecting cable (USB cable)

**12AAA882:** RS-232C connecting cable

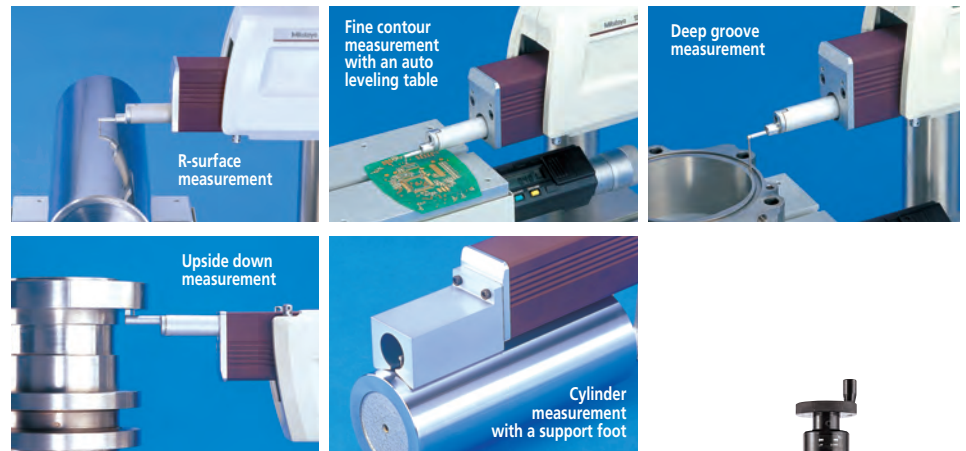
### Optional Accessories

- 178-611:** Step gage (2µm, 10µm)
- 178-612:** Step gage (2µm, 10µm, 79µin, 394µin)
- 178-610:** Step gage (step: 1µm, 2µm, 5µm, 10µm)
- 12AAM556:** Height/tilt adjustment unit for SJ-410
- 178-039:** Manual column stand (granite base) (vertical travel: 250mm)
- 178-010:** Auto-set unit for **178-039**
- 178-020:** X axis adjustment unit for **178-039**
- 178-030:** Tilting adjustment unit (Inclination adjustment unit) for **178-039**
- 12AAB358:** Cylindrical surface adapter (workpiece dia.: 15 - 60mm)
- 178-016:** Leveling table (tilting: ±1.5°, max. loading: 15kg)
- 178-048:** Leveling table with D.A.T function (mm) (tilting: ±1.5°, max. loading: 15kg)
- 178-058:** Leveling table with D.A.T function (inch) (tilting: ±1.5°, max. loading: 15kg)
- 178-043-1:** XY leveling table (25 x 25mm) (tilting: ±1.5°, max. loading: 15kg, swiveling: ±3°)
- 178-053-1:** XY leveling table (1" x 1") (tilting: ±1.5°, max. loading: 15kg, swiveling: ±3°)
- 178-042-1:** Digital XY leveling table (25 x 25mm) (tilting: ±1.5°, max. loading: 15kg, swiveling: ±3°)
- 178-052-1:** Digital XY leveling table (1" x 1") (tilting: ±1.5°, max. loading: 15kg, swiveling: ±3°)
- 178-049:** Digital XY leveling table (25 x 25mm) (max. loading: 15kg)
- 178-059:** Digimatic XY leveling table (1" x 1") (max. loading: 15kg)
- 178-019:** Precision vise for XY leveling table (jaw opening: 36mm)
- 998291:** Precision V-block for XY leveling table (workpiece dia.: 1 - 160mm)
- 12AAL069:** Memory card
- 12AAD510:** USB PC connecting cable (USB cable)
- 12AAA882:** PC connecting cable (RS-232C cable)
- 965014:** SPC cable (2m)
- 264-012-10:** Input tool (USB type)
- 264-504-5A:** DP-1VR
- : Detectors, Styli, and nosepieces

### Consumables

- 12AAN040:** LCD protective sheet (10 sheets/set)
- 12AAA876:** Durable printer paper (25m, 5 rolls/set)
- 270732:** Printer paper (5 pack)
- 12AAN046:** Replacement battery
- 12AAJ088:** Footswitch

### MEASUREMENT APPLICATIONS



Carrying case is a standard accessory.



With optional accessories.

- Auto-set unit
- X-axis adjustment unit
- Tilting adjustment unit

# Surftest SJ-500/P, SV-2100

**SERIES 178 — with Dedicated Control / PC System / Display Unit**

High precision and high performance type surface roughness tester with a dedicated control unit, achieving user-friendly display and simple operation

## FEATURES

- User-friendly display and simple operation equipped with a highly visible color 7.5-inch TFT LCD.
- Easy positioning  
A joy stick built in the dedicated control unit allows easy and quick positioning. Fine positioning of a small stylus, required for measuring the inner side of a small hole, can be easily made using the manual knob.

- Easy setting of measuring conditions for surface roughness.  
Equipped with simple input function allows inputs according to drawing instruction symbols of ISO/JIS roughness standards. Troublesome measuring condition settings can be easily input by directly selecting a drawing instruction symbol for surface roughness from the menu.



SJ-500

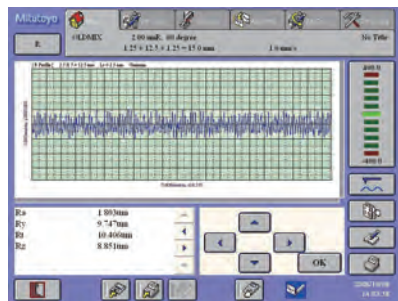


SV-2100S4



SJ-500P

## SURFPAK-EZ: Easy-to-use task-focused software



Measurement and results display screen

User-friendly graphical display and button layout allows intuitive operation. Simplified fine-contour analysis provided as standard, including step, area, angle, and circle calculation.

## Technical Data: SJ-500

X-axis (drive unit)	
Measuring range:	1.97" (50mm)
Resolution:	1.97µin (0.05µm)
Measurement method:	Linear encoder
Drive speed:	0 - 0.78"/s (0 - 20mm/s)
Measuring speed:	0.00078 - 0.2"/s (0.02 - 5mm/s)
Traversing direction:	Pull
Traverse linearity:	0.0078µin/1.97" (0.2µm / 50mm)
Positioning:	±1.5° (tilting, with DAT function) 1.18" (30mm) (up/down)
Detector	
resolution / Range:	0.4µin/3200µin, 0.04µin/3200µin, 0.004µin/320µin 0.01µm (800µm), 0.001µm (80µm), 0.0001µm (8µm)
Detecting method:	Skidless / skid measurement
Measuring force:	4mN or 0.75mN (low force type)
Stylus tip:	Diamond, 90° / 5µmR (60° / 2µmR: low force type)
Skid radius of curvature:	1.57" (40mm)
Detecting method:	Differential inductance
Control unit	
Display:	7.5" color TFT with backlight
Printer:	Built-in thermal printer
Magnification:	Horizontal: X10 to X500,000, Auto Vertical: X0.5 to X10,000, Auto
Drive unit control:	Joystick operation with manual knob

## Technical Data: SV-2100

X-axis (drive unit)	
Measuring range:	3.94" (100mm)
Resolution:	1.97µin (0.05µm)
Measurement method:	Linear encoder
Drive speed:	0 - 1.57"/s (0 - 40mm/s)
Measuring speed:	0.00078 - 0.197"/s (0.02 - 5mm/s)
Traversing direction:	Pull
Traverse linearity:	6µin/4" (0.15µm / 100mm)
Z2-axis (column)	
Type:	Manual operation or power drive
Vertical travel:	13.8" or 21.6" (350mm or 550mm*)
Resolution*:	1µm
Measurement method*:	Rotary encoder
Drive speed*:	0 - 0.78"/s (0 - 20mm/s)
*Only for power drive type	
Detector	
resolution / Range :	0.4µin/3200µin, 0.04µin/3200µin, 0.004µin/320µin 0.01µm / 800µm , 0.001µm / 80µm, 0.0001µm / 8µm
Detecting method:	Skidless / skid measurement
Measuring force:	4mN or 0.75mN (low force type)
Stylus tip:	Diamond, 90° / 5µmR (60° / 2µmR: low force type)
Skid radius of curvature:	1.57" (40mm)
Detecting method:	Differential inductance
Control unit	
Display:	7.5" color TFT with backlight
Printer:	Built-in thermal printer
Magnification:	Horizontal: X10 to X500,000, Auto Vertical: X0.5 to X10,000, Auto
Drive unit control:	Joystick operation with manual knob

## Evaluation Capability

Cutoff length	
Is:	0.25µm, 0.8µm, 2.5µm, 8µm, 25µm, 250µm, no filter
Ic*:	0.025mm, 0.08mm, 0.25mm, 0.8mm, 2.5mm, 8mm, 25mm
If:	0.08mm, 0.25mm, 0.8mm, 2.5mm, 8mm, 25mm, no filter
Sampling length (L)*	
	0.025mm, 0.08mm, 0.25mm, 0.8mm, 2.5mm, 8mm, 25mm, 80mm (SV-2100 only)
Data compensation functions	
	Parabola compensation, hyperbola compensation, ellipse compensation, R-plane (curved surface) compensation, conic compensation, tilt compensation
*Arbitrary length can be specified in the range from 0.02mm to 50mm.	

**No.12AAA876** Printer Paper (5 Rolls/set)

# Surftest SJ-500/P, SV-2100

SERIES 178 — with Dedicated Control / PC System / Display Unit

## SPECIFICATIONS

Model no.	SJ-500P	SJ-500	SV-2100M4	SV-2100S4	SV-2100H4	SV-2100W4
Type of Data processing	PC System	Dedicated Data Processor	Dedicated Data Processor			
Order No. (inch)	178-531-02A	178-533-02A	178-637-01A	178-681-01A	178-683-01A	178-685-01A
Measuring force of detector	4mN	4mN	0.75mN			
X-axis measuring range	2" (50mm)		4" (100mm)			
Vertical travel	Optional stand		13.8" (350mm) manual column	13.8" (350mm) power column	21.6" (550mm) power column	
Granite base size (WxD)	Optional stand		23.6" x 17.7" (600 x 450mm)			39.4" x 17.7" (1000 x 450mm)
PC I/F Unit	13.7" x 10.4" x 3.4" (350 x 263 x 86mm)	NA	NA	NA	NA	NA
Dimensions (main unit, WxDxH)	16.7" x 3.7" x 6.3" (425 x 94 x 160mm)		28.2" x 17.7" x 34" (716 x 450 x 863mm)	28.2" x 17.7" x 38" (716 x 450 x 966mm)	28.2" x 17.7" x 46" (716 x 450 x 1166mm)	44" x 17.7" x 46.3" (1116 x 450 x 1176mm)
Main unit Mass	5.9 lbs. (2.7 kg)		308.6 lbs. (140 kg)	308.6 lbs. (140 kg)	330 lbs. (150 kg)	485 lbs (220 kg)
Assessed profiles	Dedicated data processor type: P (primary profile), R (roughness profile), WC, envelope residual profile, roughness motif, waviness motif PC system type: P (primary profile), R (roughness profile), WC, WCA, WE, WEA, DIN4776 profile, E (envelope residual profile), roughness motif, waviness motif					
Evaluation parameters	Dedicated data processor type: Ra, Rc, Ry, Rz, Rq, Rt, Rmax, Rp, Rv, R3z, Sm, S, Pc, mr (c), δc, mr, tp, Htp, Lo, lr, Ppi, HSC, Δa, Δq, Ku, Sk, Rpk, Rvk, Rk, Mr1, Mr2, A1, A2, Vo, λa, λq, R, AR, Rx, W, AW, Wx, Wte, (43 parameters), Customization PC system type: Pa, Pq, Psk, Pku, Pp, Pv, Pz, Pt, Pc, PSm, PΔq, Pmr (c), Pmr, Pδc, Ra, Rq, Rsk, Rku, Rp, Rv, Rz, Rt, Rc, RSm, RΔq, Rmr (c), Rmr, Rδc, Wa, Wq, Wsk, Wku, Wp, Wv, Wz, Wt, Wc, WSm, WΔq, Wmr (c), Wmr, Wδc, Rk, Rpk, Rvk, Mr1, Mr2, A1, A2, Rx, AR, R, Wx, AW, W, Wte, Ry, RyDIN, RzDIN, R3y, R3z, S, HSC, Lo, lr, Δa, λa, λq, Vo, Htp, NR, NCRX, CPM, SR, SAR, NW, SW, SAW					
Analysis graphs	Dedicated data processor type: ADC, BAC, power spectrum graph PC system type: ADC, BAC Graph, power spectrum graph, auto-correlation graph, Walsh power spectrum graph, Walsh auto-correlation graph, slope distribution graph, local peak distribution graph, parameter distribution graph					
Curved surface compensation	Dedicated data processor type: Parabolic compensation, Hyperbolic compensation, Elliptical compensation, Circular compensation, Conic compensation, Inclination (Entire, Arbitrary) PC system type: Parabolic compensation, Hyperbolic compensation, Elliptical compensation, Circular compensation, Conic compensation, Inclination (Entire, Arbitrary), Polynomial compensation					
Contour analysis	Dedicated data processor type: Area, Circle, Angle, Coordinate difference, Step, Inclination PC system type (SURFPAK-EZ): Area, Circle, Angle, Coordinate difference, Step, Inclination					
Filters	Dedicated data processor type: 2CR-75%, 2CRPC-75%, Gaussian, Robust-spline PC system type: 2CR-75%, 2CR-50%, 2CRPC-75%, 2CRPC-50%, Gaussian, Robust-spline					

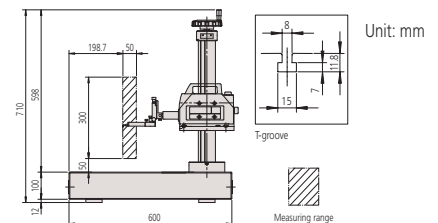
### Manual column stand: 178-085 (for SJ-500)

Suitable for desktop use in inspection rooms and such.



**No.178-085** \* Except measuring unit  
Vertical adjustment range: 11.8" (300mm)  
Dimension (W x D x H): 23.6" x 17.7" x 28" (600 x 450 x 710mm)  
Weight: 242 lbs (110kg)

Dimensions of SJ-500 with manual column stand



### Auto-leveling table: 178-081 (for SJ-500 / SV-2100M4), 178-083 (for SV-2100S4 / H4 / W4)



This is a stage that performs fully automatic leveling as measurement starts, freeing the user from this tedious operation. Fully automatic leveling can be done quickly by anyone. In addition, the operation is easy and reliable.

Inclination adjustment angle	±2°
Maximum load	15.4 lbs (7kg)
Table dimensions	5.12" x 3.94" (130x100mm)
Mass	7.7lbs (3.5kg)





# Surftest SV-3100

## SERIES 178 — Surface Roughness Testers



SV-3100H4 with personal computer system

The Surftest SV-3100 Series provide high-accuracy, high-level analysis, and multi-functionality in measurement of surface roughness.

### FEATURES

- Mitutoyo's Surftest SV-3100 Series provide high-accuracy, high-level analysis, and multi-functionality in three dimensional analysis and measurement of fine contour, as well as the conventional type surface roughness measurement.
- Peripheral devices such as the auto-leveling table are available to enhance operability and to enable automatic measurement.
- FORMTRACEPAK V5, a dedicated data-analyzing software is installed. This software allows data management in a consistent format, from the work site to the laboratory.
- Ceramic, which is known for its superb anti-abrasive property, is used as the X-axis drive unit guide. No lubrication of the guide is required.
- High-accuracy glass scales are built-in on X-axis (resolution: 1.97 $\mu$ m (0.05 $\mu$ m) and Z2-axis (column, resolution: 39.4 $\mu$ m (1 $\mu$ m) to insure high-accuracy positioning. The SV-3100 series manifest high-reliability especially in the horizontal roughness parameters (S, Sm), that require high-accuracy of the X-axis travel.
- Equipped with high-accuracy detector stylus.
- Equipped with various functions such as: the "straightness compensation" function, which improves the linear accuracy of the X-axis; the "circular compensation" function for the vertical movement of the stylus; and the "stylus-tip diameter compensation" function.
- The stylus and the skid can be replaced easily. Optional styli and skids are available for a wide variety of roughness measurement applications, such as measurement of small holes, deep holes, etc.
- An easy-to-operate Control Box is provided. The Control Box independent of the main unit allows positioning, measurement start/stop, retracting, and other operations to be performed remotely. The Drive Unit up/down position and the X-axis traverse can be controlled manually.

**MiCAT**  
Mitutoyo Intelligent Computer Aided Technology  
the standard in world  
metrology software  
**FORM**

### Technical Data

X-axis	
Measuring range:	4" or 8" (100mm or 200mm)
Resolution:	1.97 $\mu$ m (0.05 $\mu$ m)
Measurement method:	Linear encoder
Drive speed:	0 - 3.1"/s (0 - 80mm/s)
Measuring speed:	0.00078 - 0.2"/s (0.02 - 5mm/s)
Traversing direction:	Pull
Traverse linearity:	4": (2+L) $\mu$ m (0.05+0.001L) $\mu$ m* 8": 20 $\mu$ m / 8" (0.5 $\mu$ m/200mm)
Z2-axis (column)	
Vertical travel:	12" or 20" (300mm or 500mm) power drive
Resolution:	39.4 $\mu$ m (1 $\mu$ m)
Measurement method:	ABSOLUTE linear encoder
Drive speed:	0 - 0.78"/s (0 - 20mm/s)
Detector	
Range / resolution:	32000 $\mu$ m / .4 $\mu$ m, 3200 $\mu$ m / .04 $\mu$ m, 320 $\mu$ m / .004 $\mu$ m (up to 96000 $\mu$ m with an optional stylus) ({800 $\mu$ m / 0.01 $\mu$ m, 80 $\mu$ m / 0.001 $\mu$ m, 8 $\mu$ m / 0.0001 $\mu$ m) (up to 2400 $\mu$ m with an optional stylus)}
Detecting method:	Skidless / skid measurement
Measuring force:	0.75mN (low force type)
Stylus tip:	Diamond, 60°/2 $\mu$ mR (low force type)
Skid radius of curvature:	1.57" (40mm)
Detecting method:	Differential inductance
Base size (W x H):	23.6 x 17.7" (600 x 450mm) or 39.4 x 17.7" (1000 x 450mm)
Base material:	
Dimension (W x D x H):	Granite 28.8 x 19.0 x 38.0" (756 x 482 x 966mm) (S4-type) 29.8 x 19.0 x 45.9" (756 x 482 x 1166mm) (H4-type) 45.5 x 19.0 x 46.3" (1156 x 482 x 1176mm) (W4-type) 30.2 x 19.0 x 38.0" (766 x 482 x 966mm) (S8-type) 30.2 x 19.0 x 45.9" (766 x 482 x 1166mm) (H8-type) 45.9 x 19.0 x 46.3" (1166 x 482 x 1176mm) (W8-type)
Mass	
	308 lbs (140kg) (S4-type, S8-type) 330 lbs (150kg) (H4-type, H8-type) 485 lbs (220kg) (W4-type, W8-type)
*L = Measured length inch (mm)	

### Evaluation Capability: FORMTRACEPAK V5

#### Assessed profiles

P (primary profile), R (roughness profile), WC, WCA, WE, WEA, DIN4776 profile, envelope residual profile, roughness motif, waviness motif

#### Evaluation parameters

Ra, Rq, Rz, Ry, Rz(JIS), Rc, Rp, Rpmax, Rpi, Rv, Rvmax, Rvi, Rt, Rti, R3z, R3zi, R3y, S, Pc (Ppi), Sm, HSC, mr,  $\delta$ c, plateau ratio, mrd, Rk, Rpk, Rvk, Mr1, Mr2,  $\Delta$ a,  $\Delta$ q,  $\lambda$ a,  $\lambda$ q, Sk, Ku, Lo, Lr, A1, A2

Roughness motif parameters: Rx, R, AR, SR, SAR, NR, NCRX, CPM

Waviness motif parameters: Wte, Wx, W, AW SW, SAW, NW

#### Analysis graphs

ADC, BAC1, BAC2, power spectrum chart, auto-correlation chart, Walsh power spectrum chart, Walsh auto-correlation chart, slope distribution chart, local peak distribution chart, parameter distribution chart

Digital filter 2CR-75%, 2CR-50%, 2CR-75% (phase corrected), 2CR-50% (phase corrected), Gaussian-50%

#### Cutoff length\*

$\lambda$ c: .001, .003, .01, .03, .1, .3, 1"  
(0.025mm, 0.08mm, 0.25mm, 0.8mm, 2.5mm, 8mm, 25mm)  
fl: .001, .003, .01, .03, .1, .3, 1"  
(0.08mm, 0.25mm, 0.8mm, 2.5mm, 8mm, 25mm)  
fh: .001, .003, .01, .03, .1, .3, 1"  
(0.08mm, 0.25mm, 0.8mm, 2.5mm, 8mm)

Sampling length (L)\*.001, .003, .01, .03, .1, .3, 1"  
(0.025mm, 0.08mm, 0.25mm, 0.8mm, 2.5mm, 8mm, 25mm)

#### Data compensation functions

Tilt compensation, R-plane (curved surface) compensation, ellipse compensation, parabola compensation, hyperbola compensation, quadric curve automatic compensation, polynomial compensation, polynomial automatic compensation

\*Arbitrary length can be specified in the range from .001" (0.025mm) to the maximum traverse length.

# Surftest SV-3100

## SERIES 178 — Surface Roughness Testers

### Optional Accessories

- 178-611:** Reference Step Specimen (2µm, 10µm)
  - 178-612:** Reference Step Specimen (2µm, 10µm, 79µin, 394µin)
  - 178-610:** Step gage (1µm, 2µm, 5µm, 10µm)
  - 178-047:** Three-axis adjustment table (including 998291 precision V-block.)
  - 178-016:** Leveling table
  - 178-042-1:** Digimatic XY leveling table (25 x 25mm)
  - 178-052-1:** Digimatic XY leveling table (1" x 1")
  - 178-043-1:** XY leveling table (25 x 25mm)
  - 178-053-1:** XY leveling table (1" x 1")
  - 178-019:** Precision vise\*
  - 998291:** Precision V-block\*
  - 181-902-10:** V-block set with clamp (Max. workpiece dia.: 25mm)
  - 181-901-10:** V-block set with clamp (Max. workpiece dia.: 1")
- (See page J-26.) Detectors, styli, and nosepieces  
\*Use with an XY leveling table

### Simplified CNC Function

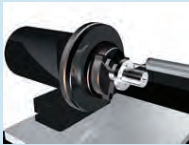
A wide range of peripherals are available to support quick and easy CNC operation.



Y-axis Table



Rotary Table θ1



Rotary Table θ2

(See page J-28 for more details.)

### SPECIFICATIONS

Models without X-axis inclination function

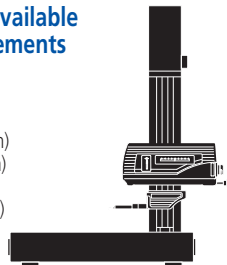
Model No.	SV-3100S4	SV-3100H4	SV-3100W4
<b>Order No. (inch)</b>	<b>178-461A-1</b>	<b>178-462A-1</b>	<b>178-463A-1</b>
<b>Order No. (inch)</b>	<b>178-481A-1</b>	<b>178-482A-1</b>	<b>178-483A-1</b>
Measuring force of detector	0.75mN	0.75mN	0.75mN
X-axis measuring range	4" (100mm)	4" (100mm)	4" (100mm)
Vertical travel	12" (300mm) power column	20" (500mm) power column	20" (500mm) manual column
Granite base size (WxD)	23.6 x 17.7" (600 x 450mm)	23.6 x 17.7" (600 x 450mm)	39.4 x 17.7" (1000 x 450mm)
Dimensions (main unit, WxDxH)	29.8 x 19.0 x 38.0" (756 x 482 x 966mm)	29.8 x 19.0 x 45.9" (756 x 482 x 1166mm)	45.5 x 19.0 x 46.3" (1156 x 482 x 1176mm)
Mass (main unit)	308 lbs (140kg)	330 lbs (150kg)	485 (220kg)

Model No.	SV-3100S8	SV-3100H8	SV-3100W8
<b>Order No. (inch)</b>	<b>178-466A-1</b>	<b>178-467A-1</b>	<b>178-468A-1</b>
<b>Order No. (inch)</b>	<b>178-486A-1</b>	<b>178-487A-1</b>	<b>178-488A-1</b>
Measuring force of detector	0.75mN	0.75mN	0.75mN
X-axis measuring range	8" (200mm)	8" (200mm)	8" (200mm)
Vertical travel	12" power column	20" power column	20" manual column
Granite base size (WxD)	23.6 x 17.7" (600 x 450mm)	23.6 x 17.7" (600 x 450mm)	39.4 x 17.7" (1000 x 450mm)
Dimensions (main unit, WxDxH)	30.2 x 19.0 x 38.0" (766 x 482 x 966mm)	30.2 x 19.0 x 45.9" (766 x 482 x 1166mm)	45.9 x 19.0 x 46.3" (1166 x 482 x 1176mm)
Mass (main unit)	308 lbs (140kg)	330 lbs (150kg)	485 (220kg)

### A variety of models available for measuring requirements

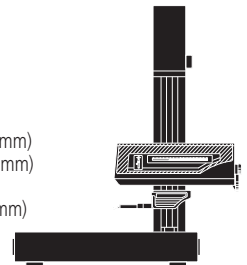
#### SV-3100S4

**Traverse range:** 4" (100mm)  
**Vertical travel:** 12" (300mm)  
**Base size (W x D):** 23.6" x 17.7" (600 x 450mm)  
**Base material:** Granite



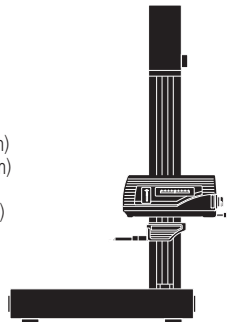
#### SV-3100S8

**Traverse range:** 8" (200mm)  
**Vertical travel:** 12" (300mm)  
**Base size (W x D):** 23.6" x 17.7" (600 x 450mm)  
**Base material:** Granite



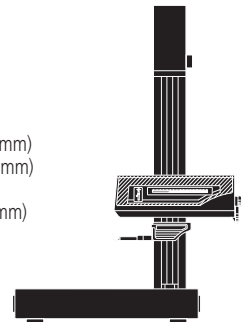
#### SV-3100H4

**Traverse range:** 4" (100mm)  
**Vertical travel:** 20" (500mm)  
**Base size (W x D):** 23.6" x 17.7" (600 x 450mm)  
**Base material:** Granite



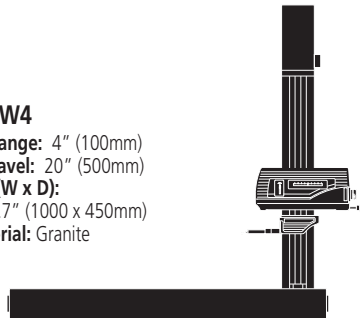
#### SV-3100H8

**Traverse range:** 8" (200mm)  
**Vertical travel:** 20" (500mm)  
**Base size (W x D):** 23.6" x 17.7" (600 x 450mm)  
**Base material:** Granite



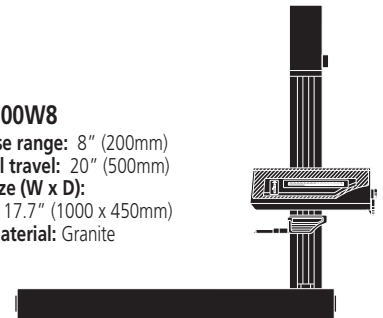
#### SV-3100W4

**Traverse range:** 4" (100mm)  
**Vertical travel:** 20" (500mm)  
**Base size (W x D):** 39.4" x 17.7" (1000 x 450mm)  
**Base material:** Granite



#### SV-3100W8

**Traverse range:** 8" (200mm)  
**Vertical travel:** 20" (500mm)  
**Base size (W x D):** 39.4" x 17.7" (1000 x 450mm)  
**Base material:** Granite



# Surftest Extreme SV-3000CNC / SV-M3000CNC

## SERIES 178 — CNC Surface Measuring Instruments

### FEATURES

- High-accuracy CNC Surface Roughness Measuring Instrument that allows surface roughness measurement in both axes.
- Each axis has the maximum drive speed of 200 mm/s, which permits high-speed positioning that may result in a large increase in the throughput of multiple-profile/multiple-workpiece measurement tasks.
- For models with the  $\alpha$ -axis, it is possible to perform continuous measurement over horizontal and inclined surfaces by power-tilting the drive unit.
- For models with the Y-axis table, it is possible to expand the measuring range for multiple workpieces, etc., through positioning in the Y-axis direction.
- Using optional rotary table  $\theta 1$  and  $\theta 2$  designed to use with the CNC models enables it to expand the CNC measurement application range.
- Inclined plane measurements is possible through 2-axis simultaneous control in the X- and Y-axis directions.
- Since the detector unit incorporates an anti-collision safety device, the detector unit will automatically stop even if its main body collides with a workpiece or fixture.
- Supplied with an easy-to-operate Remote Box. The user can make any movement by selecting the required axis using the two joysticks. The current axis selection is easily identified by the icon on the key top.
- Communication with the Data Processing/Analysis section is via USB.



SV-3000CNC with personal computer system and software

\* PC stand not included

### SPECIFICATIONS

Model No.	SV-3000CNC		SV-3000CNC		SV-3000CNC		SV-3000CNC	
Order No. (100V - 120V)	178-521-1	178-541-1	178-522-1	178-542-1	178-523-1	178-543-1	178-524-1	178-544-1
X1-axis measuring range	7.87" (200mm)	7.87" (200mm)	7.87" (200mm)	7.87" (200mm)	7.87" (200mm)	7.87" (200mm)	7.87" (200mm)	7.87" (200mm)
Z2-axis vertical travel	11.8" (300mm)	19.7" (500mm)	11.8" (300mm)	19.7" (500mm)	11.8" (300mm)	19.7" (500mm)	11.8" (300mm)	19.7" (500mm)
Y-axis table unit	—	—	—	—	Installed	Installed	Installed	Installed
$\alpha$ -axis unit	—	—	Installed	Installed	—	—	Installed	Installed

### Technical Data: SV-3000CNC

X1-axis	
Measuring range:	8" (200mm)
Resolution:	1.97 $\mu$ m (0.05 $\mu$ m)
Measurement method:	Reflective-type linear encoder
Drive speed:	7.87"/s (200mm/s) (CNC, max.) 0 - 2.4"/s (0 - 60mm/s) (joystick)
Measuring speed:	0.00078" - 0.078"/s (0.02 - 2mm/s)
Traversing direction:	Backward
Traverse linearity:	20 $\mu$ m/8" (0.5 $\mu$ m/200mm)
$\alpha$ -axis	
Inclination angle:	-45° to +10°
Resolution:	0.000225°
Rotating speed:	1rpm
Z2-axis (column)	
Vertical travel:	12" (300mm) 20"*(500mm)
Resolution:	1.97 $\mu$ m (0.05 $\mu$ m)
Measurement method:	Reflective-type linear encoder
Drive speed:	7.87"/s (200mm/s) (max., CNC) 0 - 2.4"/s (0 - 60mm/s) (joystick)
Base size (W x H):	29.5 x 23.6" (750 x 600mm)
Base material:	Granite
Detector	
Range / resolution:	32000 $\mu$ m / .4 $\mu$ m, 3200 $\mu$ m / .04 $\mu$ m, 320 $\mu$ m / .004 $\mu$ m (up to 96000 $\mu$ m with an optional stylus) {800 $\mu$ m / 0.01 $\mu$ m, 80 $\mu$ m / 0.001 $\mu$ m, 8 $\mu$ m / 0.0001 $\mu$ m} (up to 2400 $\mu$ m with an optional stylus)}
Measuring force:	4mN or 0.75mN (low force type)
Stylus tip:	Diamond, 90°/5 $\mu$ mR (60°/2 $\mu$ mR: low force type)
Dimension (W x D x H):	31.5 x 24.4 x 39.4" (800 x 620 x 1000mm) 31.5 x 24.4 x 47.2" (800 x 620 x 1200mm)*
Mass	529 lbs (240kg) 551 lbs (250kg)*

\*High column model

### Optional Accessories

Vibration isolation stand	
Vibration isolation mechanism: Diaphragm air spring	
Natural frequency :	2.5 - 3.5Hz
Damping mechanism:	Orifice
Leveling mechanism:	Automatic control with mechanical valves
Air supply pressure:	0.4MPa
Allowable loading capacity:	772 lbs (350kg)
Dimensions (W x D x H):	39.4 x 35.2 x 28.1" (1000 x 895 x 715mm)
Mass:	617 lbs (280kg)
Y-axis table unit	
Measuring range:	8" (200mm)
Minimum reading :	1.97 $\mu$ m (0.05 $\mu$ m)
Scale unit:	Reflective-type Linear Encoder
Drive speed:	7.87"/s (200mm/s) (max., CNC) 0 - 2.4"/s (0 - 60mm/s) (joystick)
Maximum loading capacity:	44 lbs (20kg)
Traverse linearity	20 $\mu$ m/8" (0.5 $\mu$ m/200mm)
Linear displacement accuracy (at 20°C):	$\pm (80+2L/4)\mu$ m ( $\pm (2+2L/100)\mu$ m) L: Dimension between two measured points (mm)
Table size:	7.87" x 7.87" (200 x 200mm)
Dimensions (W x D x H):	12.6 x 25.4 x 4.1" (320 x 646 x 105mm)
Mass:	77 lbs (35kg)

## Technical Data: SV-MC3000CNC

### X1-axis

Measuring range: 8" (200mm)  
 Resolution: 1.97µin (0.05µm)  
 Measurement method: Reflective-type linear encoder  
 Drive speed: 7.87"/s (200mm/s) (max., CNC)  
 0 - 1.97"/s (0 - 50mm/s) (joystick)  
 Measuring speed: 0.00078" - 0.08"/s (0.02 - 2mm/s)  
 Traverse linearity: 20µin/8" (0.5µm/200mm)  
 28µin/8" (0.7µm/200mm)  
 (long-type detector)  
 20µin/8" (0.5µm/200mm)  
 (rotary-type detector,  
 up/down direction)  
 28µin/8" (0.7µm/200mm)  
 (long-type detector,  
 forward/backward direction)

### α-axis

Inclination angle: -45° to +10°  
 Resolution: 0.000225°  
 Rotating speed: 1rpm

### Z2-axis (column)

Vertical travel: 20" (500mm)  
 Resolution: 1.97µin (0.05µm)  
 Measurement method: Reflective-type linear encoder  
 Drive speed: 7.87"/s (200mm/s) (CNC, max.)  
 0 - 1.97"/s (0 - 50mm/s) (joystick)

### Y-axis

Measuring range: 32" (800mm)  
 Resolution: 1.97µin (0.05µm)  
 Measurement method: Reflective-type linear encoder  
 Drive speed: 7.87"/s (200mm/s) (max., CNC)  
 0 - 1.97"/s (0 - 50mm/s) (joystick)  
 Measuring speed: 0.00078" - 0.08"/s (0.02 - 2mm/s)  
 Traverse linearity: 20µin/2" (0.5µm/50mm), 80µin/32"  
 (2µm/800mm) 28µin/2" (0.7µm/50mm),  
 120µin/32" (3µm/800mm)  
 (long-type detector)  
 28µin/2" (0.7µm/50mm),  
 120µin/32" (3µm/800mm)  
 (rotary-type detector, up/down direction)

### Base unit

Size (W x H): 23.6 x 59.1" (600 x 1500mm)  
 Material: Steel  
 Loading capacity: 661 lbs (300kg)

### Detector

Range / resolution: 32000 µin / .4 µin, 3200µin / .04µin,  
 320 µin / .004µin  
 (up to 96000 µin with an optional stylus)  
 {800µm / 0.01µm, 80µm / 0.001µm,  
 8µm / 0.0001µm (up to 2400µm with  
 an optional stylus)}  
 Detecting method: Skidless / skid measurement  
 Measuring force: 4mN or 0.75mN (low force type)  
 Stylus tip: Diamond, 90°/5µmR  
 (60°/2µmR: low force type)  
 Skid radius of curvature: 1.57" (40mm)  
 Detecting method: Differential inductance  
 Dimension (W x D x H): 42.7 x 66.7 x 75.7"  
 (1085 x 1695 x 1922mm)  
 Mass: 3527 lbs (1600Kg)  
 (including vibration isolating unit)

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**FORM**

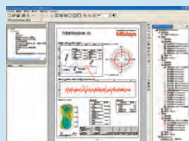
## Optional Software

### FORMTRACEPAK V5

Enables control of the optional motor-driven Y-axis table and rotary table for realizing efficient measurement automation. You can also perform contour evaluation that allows free analysis of level differences, angle, pitch, area and other characteristics based on surface roughness data. In addition, analysis results can be saved in the "html" or "mhtml" format which allows Internet Explorer or MS-Word compatibility, allowing PC without layout editing programs to view analysis results.



Contour Measurement Screen



Surface Roughness Measurement Screen

# Surftest Extreme SV-3000CNC / SV-M3000CNC

## SERIES 178 — CNC Surface Measuring Instruments



SV-M3000CNC with personal computer system and software

\* PC stand not included

## FEATURES

- CNC Surface Roughness Tester that covers measurement of large/heavy workpieces such as engine blocks, crankshafts, etc.
- In combination with the surface roughness detector rotating unit, S-3000AR (optional), it can perform continuous measurement over the bottom, top and side surfaces of a workpiece.
- Compatible with the optional large table for supporting a load of 220 lbs (100 kg) or a large Ø2 table. Enables continuous automatic measurement of large-size workpieces.
- Suitable for automatic surface roughness measurement on large and heavy workpieces.
- Employs the column-moving type configuration that is not restricted by workpiece size. This is advantageous for measuring heavy workpieces such as engine blocks, crankshafts, etc.
- Provides 31.5" (800mm) of Y-axis stroke. This makes it possible to measure multiple profiles on large workpieces.
- Load table has a self-contained structure to ensure that various size workpieces, jigs, auto-feed devices, etc., are easily accommodated and can be specified, if required, by special order.

## SPECIFICATIONS

Model No.	SV-M3000CNC
Order No. (100V - 120V)	178-549-1
X1-axis measuring range	7.87" (200mm)
Z2-axis column travel range	19.7" (500mm)
Y-axis travel range	31.5" (800mm)
α-axis inclination angle	-45° (CCW), +10° (CW)

# Surftest Extreme SV-3000CNC + Vision Probe

## Series 178 – CNC Surface Roughness Testers

### FEATURES

- The vision measurement function allows it to measure width and pitch.
  - The CNC Surface Measurement is capable of positioning minute workpieces such as precision molds and fiber optics.
  - Multiple profile auto measurement function increases the overall measurements throughout.
  - Each axis (X1, Y and Z2) has maximum drive speeds of 200mm/s, which allows high-speed positioning that increases throughput of multiple profile/multiple workpiece measurement tasks.
  - Two choices of measurement force 4mN and 0.75mN to select.
- With the optional Y-axis table it is possible to expand the measuring range for multiple workpieces by positioning in the Y-axis as well.
  - The Z1-axis detector and Vision Probe incorporates an anti-collision safety device, the detector will automatically stop when the machine collides with a workpiece or fixture.
  - Supplied with the easy-to-operate Remote Box, the user can make any movement by selecting the required axis using the two joysticks. The current axis selection is easily identified by the icon on the key top.



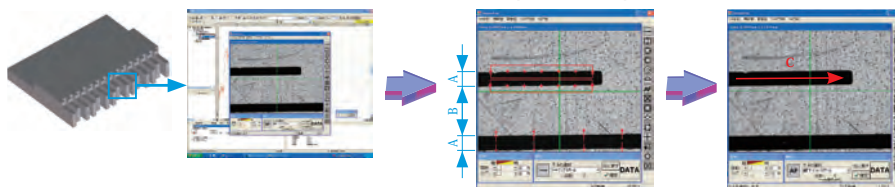
**SV-3000CNC + Vision Probe QVP II with PC system and software**

\*PC stand not included

### SPECIFICATIONS

Model No.	SV-3000CNC + Vision Probe	
Order No.	178-558A-1 (.75mN force)	178-558A-2 (4mN force)
X1-axis measuring range	8" (200mm)	8" (200mm)
Z2-axis vertical travel	13.8" (350mm) (from top of Y-axis)	13.8" (350mm) (from top of Y-axis)
Y-axis table unit	Installed	Installed
α-axis unit	Installed	Installed

With the Vision Probe, the Surftest is able to set measurement position and perform vision measurements.



### Technical Data

- X1-axis**  
 Measuring range: 8" (200mm)  
 Resolution: 0.05µm  
 Scale: Reflective-type linear encoder  
 Drive speed: 200mm/s (max. CNC)  
 0-50mm/s (joystick)
- Form measuring:**  
 Measuring speed: 0.02-2mm/s  
 Measure direction: Pull  
 Straightness accuracy: 0.5 µm/200mm  
 Noise level measured in Rz\*1\*2: Rz<0.1 µm
- Vision measuring:**  
 Accuracy\*3 (20°C) E1x: ±(2+3L1/1000)µm  
 L1=measurement length (mm)
- Z1-axis (detector)**  
 Measuring range\*1: 800µm, 80µm, 8µm  
 Resolution\*1: 0.01µm(800µm), 0.001µm(80µm), 0.0001µm(8µm)  
 Stylus up/down: Arc movement  
 Scale: Differential inductance  
 Measuring force\*1: 0.75mN (0.075gf) or 4mN
- Z2-axis (column)**  
 Measuring range: 13.8" (350mm) From top of Y-axis  
 Resolution: 0.05µm  
 Scale: Reflective-type linear encoder  
 Drive speed: 200mm/s (max. CNC)  
 0-50mm/s (joystick)  
 Base size: 29.5" x 23.6" (750 x 600mm)  
 Base material: Granite
- Y-axis**  
 Measuring range: 8" (200mm)  
 Resolution: 0.05µm  
 Scale: Reflective-type linear encoder  
 Drive speed: 200mm/s (max. CNC)  
 0-50mm/s (joystick)  
 Max. loading capacity: 44lbs. (20kg)
- Form measuring:**  
 Straightness accuracy: 0.5µm/200mm  
 Noise level measured in Rz\*1\*2: Rz<0.1 µm  
 Linear accuracy (20°C)±(2+2L/100)µm L=Drive length (mm)
- Vision measuring:**  
 Accuracy\*3 (20°C) E1y: ±(2+3L1/1000)µm  
 L1=measurement length (mm)  
 Table size: 7.9" x 7.9" (200 x 200mm)  
 Dimension: 12.6" x 25.4" x 4.1" (320 x 646 x 105mm)
- Main unit:**  
 Dimension (W x D x H): 31.5" x 24.4" x 47.2" (800 x 620 x 1200)  
 Mass: 653lbs. (296kg)  
 Operating temp. range: 15-25°C  
 Operating humidity range: 20-80% RH (w/o condensation)  
 Storage temp. range: -10-50°C  
 Storage humidity range: 5-90% RH (w/o condensation)
- Vision Probe (QVP II):**  
 CCD size: 1.3" (B/W)  
 Optical tube magnification: 0.375x  
 Illumination: Reflected: White LED - Power consumption 5W or less  
 Ring\*4: White LED - Power consumption 10W or less
- Controller:**  
 Dimension: 9.8" x 20.4" x 18.4" (250 x 517 x 467mm)  
 Mass: 62lbs. (28kg)  
 Interface: USB  
 Power supply: 10-120V, 200-240V ±10%, AC50/60Hz  
 Power consumption: 500W
- WF box:**  
 Dimension: 15.4" x 10.8" x 2" (390 x 275 x 52mm)  
 Mass: 8.4lbs. (3.8kg)  
 Power supply: 100-240V, AC 50/60Hz  
 Power consumption: 40W
- Remote joystick box:**  
 Dimension: 11.8" x 5.6" x 2.8" (300 x 143 x 71mm)  
 Mass: 3.3lbs. (1.5kg)
- Cabin (protective shield)**  
 Dimension: 42.5" x 34" x 43.3" (1080 x 860 x 1100mm)  
 Mass: 112lbs. (51kg)
- \*1 Using standard stylus (12AAC731 or 12AAB403)  
 \*2 Measuring optical flat—measuring speed: 1mm/s, Filter: Gaussian, Cut-off length λc: 0.8, No. of samples: 5 (ISO4287 1997)  
 \*3 Guaranteed condition—measuring reference gage at 150mm height from top of Y-axis with ML10X lens  
 \*4 Using ring light unit

## CS-H5000CNC w/QVPII Standard Accessories

02ATN695	Calibration chart with holder
12AAL052	Off-set value acquisition kit
12AAJ041	2X stylus (2µmR, 60°)
12AAJ039	2X stylus (5µmR, 40°)
12AAD546	2X ball stylus (250µmR ball)
12AAE282	φ20 Master ball
12AAD645	Nosepiece
12AAH444	Main unit connecting cable
12AAE319	USB communication cable
12AAL257	Calibration kit for CS-H (inch)

## SV-3000CNC w/QVPII Standard Accessories

178-396-2	Low force detector (0.75mN) w/ <b>12AAC731</b> (2µm R) 1 set; depends on model machine selected
178-397-2	Standard force detector (4mN) w/ <b>12AAB403</b> (5µm R)
178-602	Roughness specimen (in/mm)
178-612	Step gage (in/mm)
02ATN695	Calibration chart with holder
12AAD878	Nosepiece with safety cover
12AAE282	φ20 Master ball
12AAE319	USB communication cable
12AAH444	Main unit connecting cable
12AAL052	Off-set value acquisition kit

## Optional Accessories

## Remarks

178-016	Leveling table	
178-019	Precision vise	
178-037	2D-Auto Leveling Table	
178-077	3D-Auto Leveling Table	
178-078	Ø2 axis unit	
375-037-1	ML 3X Objective	
375-034-1	ML 5X Objective	
375-039	ML 10X Objective	
378-810-3	M Plan Apo SL 20X	MT40 tube lens is required
378-010	MT40 Tube lens	M Plan Apo SL 20X
525-001	Small Ø1 table with 3D-ALT attached to Y-axis table	
12AAD975	Ø1 axis table	
12AAE032	Air isolation stand	
12AAE286	Indexing table (200 x 200mm) for Ø1-axis	
12AAE449*	Cover for high column (protective shield)	
12AAE679	Setting plate/ALT	
12AAE707	Attachment plate for Ø2-axis	
12AAL962-USE	Formtracepak-Pro V3.X	No Hasp (inch/mm)
12AAL493	Ring light unit A	Objectives: ML 3X, ML 5X, ML 10X
12AAL494	Ring light unit B	Objectives: M Plan Apo SL 20X
998923	System rack	
998291	V-block	

\* Only used for SV-3000CNC

## VISION PROBE QVPII



CCD size	1/3 inch (B/W)	
Optical tube magnification	0.375X	
Illuminating function	Co-axial	White light LED source
	Ring (Option)	

The vision probe has been specially designed for use with CNC form measuring machines and incorporates the knowledge gained through many years of experience with coordinate measuring machines and image measuring machines.

The ring light and ML 10x objective lens shown mounted are optional items.

## A bright, long-life white LED is standard equipment



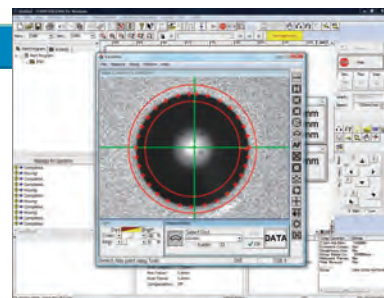
The standard QVPII is equipped with co-axial illumination directed down through the lens, and a ring light is available as an option. The illumination brightness is adjustable.

The ring light and ML 10x objective lens shown mounted are optional items.

## Automatic edge detection

The VISIONPAK software package processes the QVPII probe images to automatically detect the edges of features, and the general-purpose contour FORMTRACEPAK V5 package is used to perform the necessary calculations (such as determining dimensions and geometrical deviation).

VISIONPAK runs in combination with FORMTRACEPAK V5, and the image window is automatically displayed when QVPII is switched on.



## Aligning the detector with the QVPII

The detector's stylus tip\* location can be conveniently aligned with the QVPII crosshairs on the monitor image by simply using an offset value Acquisition kit.

In addition, because it is possible to program switches between QVPII and the detector\*, automatic measurement that includes both contact-based and non-contact-based measurement is possible.

\* Depends on the stylus

## Powerful image processing tools

VISIONPAK's range of image processing tools makes it possible to quickly detect simple or complex edges visible within the image.

## Built-in safety mechanism

The Z-axis detector and QVPII include a safety device that prevents damage by automatically turning off the equipment if the detector is in danger of colliding with a workpiece or jig.

## Outlier removal

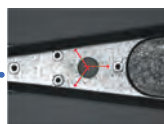
When measuring very small shapes, removing burrs and dust on the measured object is difficult, and such imperfections can cause measurement errors. VISIONPAK can recognize these imperfections as outliers to prevent such errors.

## VISIONPAK Image Processing Tools

### Simple tool



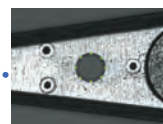
Detects a single point on the edge pointed to by the arrow.



### Manual tool



Detects an arbitrary edge pointed to (clicked on) by the mouse.



### Box tool



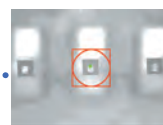
Detects a straight edge enclosed by a rectangular box and creates multiple points along that edge.



### Centroid tool



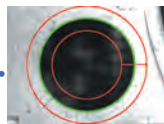
Detects the center of area of an arbitrary form.



### Circle tool



Detects a circular edge enclosed within concentric circles and creates multiple points along that edge. As with the box tool, it can collect data that is free from the effect of burrs and dust.



### Edge self-tracing tool



By simply specifying the start point and measurement interval, the target edge can be detected while automatically tracing an unknown geometry.



# Formtracer SV-C3200 / SV-C4500

## SERIES 525 — Surface Roughness / Contour Measuring System



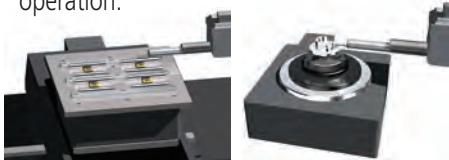
SV-C3200S4 with personal computer system and software

### FEATURES

- Dramatically increased drive speed (X axis: 3.1"/s (80mm/s), Z2 axis column: 1.2"/s (30mm/s) further reduces total measurement time.
- In order to maintain the traverse linearity specification for an extended period of time, Mitutoyo has adopted highly rigid ceramic guides that combine the characteristics of smallest secular change and remarkable resistance to abrasion.
- The drive unit (X-axis) and column (Z2-axis) are equipped with a high-accuracy linear encoder (ABS type on Z2-axis). This improves reproducibility of continuous automatic measurement of small holes in the vertical direction and repeated measurement of parts which are difficult to position.

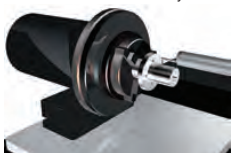
### Automatic Measurement

- A wide range of optional peripherals are available to support quick and easy CNC operation.



Y-axis Table

Rotary Table 01



Rotary Table 02

(See page J-28 for more details.)

### Surface Roughness Measurement



- Traverse linearity:  $(2+1L)\mu\text{m}$  ( $\pm(0.05+0.001L)\mu\text{m}^*$ )  
Designed to handle workpieces calling for high accuracy.  
\*S4, H4, W4 types, L = Drive length inch (mm)
- Compliant with JIS '82/'94/'01, ISO, ANSI, DIN, VDA, and other international surface roughness standards.
- Equipped with a standard high accuracy detector (0.75mN/4mN measuring force) providing a resolution down to 0.004 $\mu\text{m}$  (0.0001 $\mu\text{m}$ ).

### Contour Drive Measurement



- X axis accuracy:  $\pm(31.5+10L)\mu\text{m}$  ( $\pm(0.8+0.01L)\mu\text{m}^*$ )  
Z1-axis accuracy:  $\pm(31.5+120H)\mu\text{m}$  ( $\pm(0.8+12H/100)\mu\text{m}^*$ )  
Designed to handle workpieces calling for high accuracy.  
\*SV-C4500S4, H4, W4 types, L = Drive length, H = Measurement height inch (mm)
- The contour drive unit of SV-C4500 series instruments can continuously measure in the upward and downward directions without the need to change the arm orientation or reset the workpiece, when combined with the double cone-end stylus (a new product with contact points in the upward and downward directions).

### Technical Data: Common

Base size (W x H):	23.6 x 17.7" (600 x 450mm) or 39.4 x 17.7" (1000 x 450mm)
Base material:	Granite
Mass	
Main unit:	308 lbs (140kg) (S4), 330 lbs (150kg) (H4), 485 lbs (220kg) (W4) 308 lbs (140kg) (S8), 330 lbs (150kg) (H8), 485 lbs (220kg) (W8)
Controller Unit:	31 lbs (14kg)
Remote Control Box:	2 lbs (0.9kg)
Power supply:	100 - 240VAC $\pm$ 10%, 50/60Hz
Power consumption:	400W (main unit only)

### Technical Data: Contour Measurement

X-axis	
Measuring range:	4" (100mm) or 8" (200mm)
Resolution:	1.97 $\mu\text{m}$ (0.05 $\mu\text{m}$ )
Measurement method:	Reflective-type linear encoder
Drive speed:	3.1"/s (80mm/s) and manual
Measuring speed:	0.00078 - 0.2"/s (0.02 - 5mm/s)
Measuring direction:	Forward/backward
Traverse linearity:	32 $\mu\text{m}/4"$ (0.8 $\mu\text{m}/100\text{mm}$ ) 79 $\mu\text{m}/8"$ (2 $\mu\text{m}/200\text{mm}$ ) <small>*with the X axis in horizontal orientation</small>
Linear displacement:	$\pm(32+10L)\mu\text{m}$ ( $\pm 0.8+0.01L\mu\text{m}$ ) (SV-C3200S4, H4, W4)
accuracy (at 20°C)	$\pm(32+10L)\mu\text{m}$ ( $\pm 0.8+0.01L\mu\text{m}$ ) (SV-C4500S4, H4, W4) $\pm(32+20L)\mu\text{m}$ ( $\pm 0.8+0.02L\mu\text{m}$ ) (SV-C3200S8, H8, W8) $\pm(32+20L)\mu\text{m}$ ( $\pm 0.8+0.02L\mu\text{m}$ ) (SV-C4500S8, H8, W8) <small>*L = Drive length inch (mm)</small>
Inclination range:	$\pm 45^\circ$
Z2-axis (column)	
Vertical travel:	12" (300mm) or 20" (500mm)
Resolution:	39.4 $\mu\text{m}$ (1 $\mu\text{m}$ )
Measurement method:	ABSOLUTE linear encoder
Drive speed:	0 - 1.2"/s (0 - 30mm/s) and manual
Z1-axis (detector unit)	
Measuring range:	$\pm 2.4"$ ( $\pm 30\text{mm}$ )
Resolution:	1.57 $\mu\text{m}$ (0.04 $\mu\text{m}$ ) (SV-C3200 series), .78 $\mu\text{m}$ (0.02 $\mu\text{m}$ ) (SV-C4500 series)
Measurement method:	Linear encoder (SV-C3200 series), Laser hologage (SV-C4500 series)
Linear displacement:	$\pm(63+120H)\mu\text{m}$ ( $\pm(1.6+12H/100)\mu\text{m}$ ) (SV-C3200 series)
accuracy (at 20°C)	$\pm(31.5+120H)\mu\text{m}$ ( $\pm(0.8+12H/100)\mu\text{m}$ ) (SV-C4500 series) <small>*H: Measurement height from the horizontal position (mm)</small>
Stylus up/down operation:	Arc movement
Face of stylus:	Upward/downward (SV-C3200) Upward/downward (Direction switch by Formtracepak) (SV-C4500)
Measuring force:	30mN (SV-C3200) 10, 20, 30, 40, 50mN (SV-C4500) <small>*As for SV-C4500, set the measurement force with Formtracepak.</small>
Traceable angle:	Ascent: 77°, descent: 87° (using the standard stylus provided and depending on the surface roughness)
Stylus tip	Radius: 25 $\mu\text{m}$ , carbide tip

### Technical Data: Surface Roughness Measurement

X1-axis	
Measuring range:	4" (100mm) or 8" (200mm)
Resolution:	1.97 $\mu\text{m}$ (0.05 $\mu\text{m}$ )
Measurement method:	Linear encoder
Drive speed:	3.1"/s (80mm/s)
Traversing direction:	Backward
Traverse linearity:	$(2+1L)\mu\text{m}$ (0.05+1L/1000) $\mu\text{m}$ (S4, H4, W4 types) 20 $\mu\text{m}/8"$ (0.5 $\mu\text{m}/200\text{mm}$ ) (S8, H8, W8 types)
Z2-axis (column)	
Vertical travel:	12" (300mm) or 20" (500mm)
Resolution:	39.4 $\mu\text{m}$ (1 $\mu\text{m}$ )
Measurement method:	ABSOLUTE linear encoder
Drive speed:	0 - 1.2"/s (0 - 30mm/s) and manual
Detector	
Range / resolution:	32000 $\mu\text{m}$ / .4 $\mu\text{m}$ , 3200 $\mu\text{m}$ / .04 $\mu\text{m}$ , 320 $\mu\text{m}$ / .004 $\mu\text{m}$ (up to 96000 $\mu\text{m}$ with an optional stylus) {800 $\mu\text{m}$ / 0.01 $\mu\text{m}$ , 80 $\mu\text{m}$ / 0.001 $\mu\text{m}$ , 8 $\mu\text{m}$ / 0.0001 $\mu\text{m}$ (up to 2400 $\mu\text{m}$ with an optional stylus)}
Detecting method:	Skidless / skid measurement
Measuring force:	0.75mN (low force type)
Stylus tip:	Diamond 60°/2 $\mu\text{m}$ R (low force type)
Skid radius of curvature:	1.57" (40mm)
Detecting method:	Differential inductance

# Formtracer SV-C3200 / SV-C4500

## SERIES 525 — Surface Roughness / Contour Measuring System

**MiCAT**

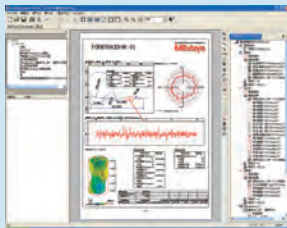
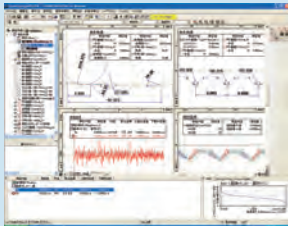
Mitutoyo Intelligent Computer Aided Technology

the standard in world  
metrology software  
**FORM**

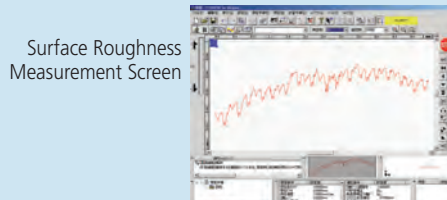
### Optional Software

#### FORMTRACEPAK V5

Enables control of the optional motor-driven Y-axis table and rotary table for realizing efficient measurement automation. You can also perform contour evaluation that allows free analysis of level differences, angle, pitch, area and other characteristics based on surface roughness data. In addition, analysis results can be saved in the "html" or "mhtml" format which allows Internet Explorer or MS-Word compatibility, allowing PC without layout editing programs to view analysis results.



Contour  
Measurement  
Screen



Surface Roughness  
Measurement Screen

### SPECIFICATIONS

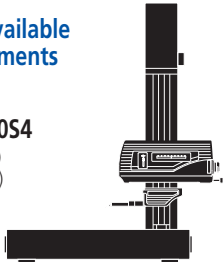
Model No.	SV-C3200S4	SV-C3200H4	SV-C3200W4
Order No. (inch)	525-491A-1	525-492A-1	525-493A-1
Model No.	SV-C4500S4	SV-C4500H4	SV-C4500W4
Order No. (inch)	525-451A-1	525-452A-1	525-453A-1
X1-axis measuring range	4" (100mm)	4" (100mm)	4" (100mm)
Measuring force of detector	0.75mN	0.75mN	0.75mN
Vertical travel	12" (300mm) power column	20" (500mm) power column	20" (500mm) power column
Granite base size (WxD)	23.6 x 17.7" (600 x 450mm)	23.6 x 17.7" (600 x 450mm)	39.4 x 17.7" (1000 x 450mm)
Dimensions (main unit, WxDxH)	39.2 x 22.6 x 38.0" (996 x 575 x 966mm)	39.2 x 22.6 x 46.3" (996 x 575 x 1176mm)	55.4 x 22.6 x 46.3" (1396 x 575 x 1176mm)
Mass (main unit)	308 lbs (140kg)	330 lbs (150kg)	485 lbs (220kg)

Model No.	SV-C3200S8	SV-C3200H8	SV-C3200W8
Order No. (inch)	525-496A-1	525-497A-1	525-498A-1
Model No.	SV-C4500S8	SV-C4500H8	SV-C4500W8
Order No. (inch)	525-456A-1	525-457A-1	525-458A-1
X1-axis measuring range	8" (200mm)	8" (200mm)	8" (200mm)
Measuring force of detector	0.75mN	0.75mN	0.75mN
Vertical travel	12" (300mm) power column	20" (500mm) power column	20" (500mm) power column
Granite base size (WxD)	23.6 x 17.7" (600 x 450mm)	23.6 x 17.7" (600 x 450mm)	39.4 x 17.7" (1000 x 450mm)
Dimensions (main unit, WxDxH)	39.6 x 22.6 x 38.0" (1006 x 575 x 966mm)	39.6 x 22.6 x 46.3" (1006 x 575 x 1176mm)	55.4 x 22.6 x 46.3" (1406 x 575 x 1176mm)
Mass (main unit)	308 lbs (140kg)	330 lbs (150kg)	485 lbs (220kg)

### A variety of models available for measuring requirements

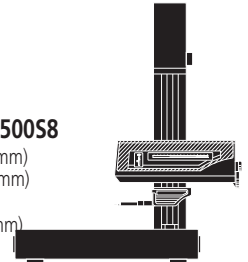
#### SV-C3200S4 / SV-C4500S4

Traverse range: 4" (100mm)  
Vertical travel: 12" (300mm)  
Base size (W x D):  
23.6" x 17.7" (600 x 450mm)  
Base material: Granite



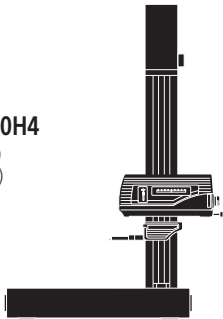
#### SV-C3200S8 / SV-C4500S8

Traverse range: 8" (200mm)  
Vertical travel: 12" (300mm)  
Base size (W x D):  
23.6" x 17.7" (600 x 450mm)  
Base material: Granite



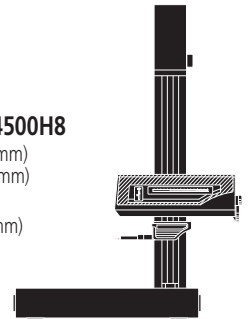
#### SV-C3200H4 / SV-C4500H4

Traverse range: 4" (100mm)  
Vertical travel: 20" (500mm)  
Base size (W x D):  
23.6" x 17.7" (600 x 450mm)  
Base material: Granite



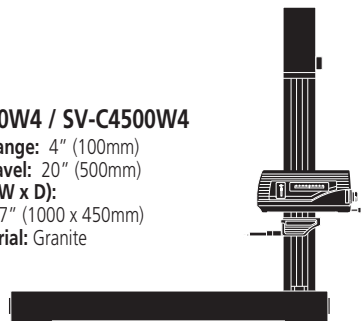
#### SV-C3200H8 / SV-C4500H8

Traverse range: 8" (200mm)  
Vertical travel: 20" (500mm)  
Base size (W x D):  
23.6" x 17.7" (600 x 450mm)  
Base material: Granite



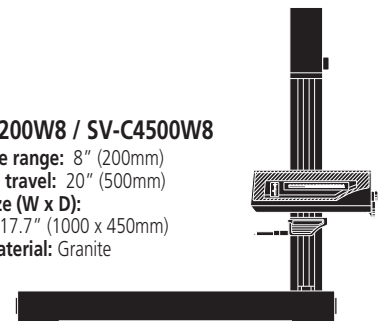
#### SV-C3200W4 / SV-C4500W4

Traverse range: 4" (100mm)  
Vertical travel: 20" (500mm)  
Base size (W x D):  
39.4" x 17.7" (1000 x 450mm)  
Base material: Granite



#### SV-C3200W8 / SV-C4500W8

Traverse range: 8" (200mm)  
Vertical travel: 20" (500mm)  
Base size (W x D):  
39.4" x 17.7" (1000 x 450mm)  
Base material: Granite





# Formtracer Extreme SV-C3000CNC / SV-C4000CNC

## SERIES 525 — Surface Roughness/Form Measuring Instrument



SV-3000CNC with personal computer system and software

\* PC stand not included

Surface roughness detector



Contour Z-axis detector



### FEATURES

- High-accuracy CNC Surface Roughness/Form Measuring Instrument that allows both measurement of surface roughness and form/contour with one unit.
- Each axis has the maximum drive speed of 7.87"/s (200 mm/s), which permits high-speed positioning that may result in a large increase in the throughput of multiple-profile/multiple-workpiece measurement tasks.
- For models with the  $\alpha$  axis, it is possible to perform continuous measurement over horizontal and inclined surfaces by power-tilting the detector unit.
- For models with the Y-axis table, it is possible to expand the measuring range for multiple workpieces, etc., through positioning in the Y-axis direction.
- The contour detector unit of SV-C4000CNC series is equipped with a Laser Hologage detector giving excellent narrow/wide range accuracy and resolution in the Z1 axis (vertical).
- Enables inclined plane measurements through 2-axis simultaneous control in the X- and Y-axis directions.
- When the detector for form/contour measurement is replaced with that for surface roughness measurement, or vice versa, it is a simple, one-touch replacement without re-routing of the connecting cables.
- Since the Z1-axis detector incorporates an anti-collision safety device, the detector unit will automatically stop even if its main body collides with a workpiece or fixture.
- Supplied with an easy-to-operate Remote Box. The user can make any movement by selecting the required axis using the two joysticks. The current axis selection is easily identified by the icon on the key top.
- Communication with the Data Processing/Analysis section is via USB.

### Technical Data: Common

Base size (W x H):	29.5 x 23.6" (750 x 600mm)
Base material:	Granite
Mass:	529 lbs (240kg), 551 lbs (250kg) (high column type)
Power supply:	100 – 120VAC $\pm$ 10%, 50/60Hz
Power consumption:	500W (main unit only)

### Technical Data: Contour Measurement

X1-axis	
Measuring range:	8" (200mm)
Resolution:	1.97 $\mu$ m (0.05 $\mu$ m)
Measurement method:	Reflective-type linear encoder
Drive speed:	7.87"/s (200mm/s) (max., CNC) 0 - 2.36"/s (0 - 60mm/s) (joystick)
Measuring speed:	0.00078" - 0.08"/s (0.02 - 2mm/s)
Measuring direction:	Push/Pull
Traverse linearity:	80 $\mu$ m / 8" (2 $\mu$ m/200mm) *with the X axis in horizontal orientation
Linear displacement accuracy (at 20°C):	$\pm$ (40+20L) $\mu$ m ( $\pm$ (1+0.02L) $\mu$ m) * L = Drive length (mm)

### $\alpha$ -axis

Inclination angle:	-45° to +10°
Resolution:	0.000225°
Rotating speed:	1rpm

### Z2-axis (column)

Vertical travel:	12" or 20" (300mm or 500mm)
Resolution:	1.97 $\mu$ m (0.05 $\mu$ m)
Measurement method:	Reflective-type linear encoder
Drive speed:	7.87"/s (200mm/s) (max., CNC) 0 - 2.36"/s (0 - 60mm/s) (joystick)

### Z1-axis (detector unit)

Measuring range:	$\pm$ 1" ( $\pm$ 25mm)
Resolution:	7.87 $\mu$ m (0.2 $\mu$ m) (SV-C3000CNC), 1.97 $\mu$ m (0.05 $\mu$ m) (SV-C4000CNC)
Measurement method:	Linear encoder (SV-C3000CNC), laser hologage (SV-C4000CNC)
Linear displacement:	$\pm$ (120+140H) $\mu$ m ( $\pm$ (3+12H/25) $\mu$ m) (SV-C3000CNC)
Accuracy (at 20°C)	$\pm$ (32+110H) $\mu$ m ( $\pm$ (0.8+10.5H/25) $\mu$ m) (SV-C4000CNC)
	*H: Measurement height from the horizontal position (mm)
Stylus up/down operation:	Arc movement
Face of stylus:	Downward
Measuring force:	30mN
Traceable angle:	Ascent: 70°, descent: 70° (using the standard stylus provided and depending on the surface roughness)

### Stylus tip

Radius: 25 $\mu$ m, carbide tip

### Technical Data: Surface Roughness Measurement

X1-axis	
Measuring range:	8" (200mm)
Resolution:	1.97 $\mu$ m (0.05 $\mu$ m)
Measurement method:	Reflective-type linear encoder
Drive speed:	7.87"/s (200mm/s) (max., CNC) 0 - 2.36"/s (0 - 60mm/s) (joystick)
Measuring speed:	0.00078" - 0.08"/s (0.02 - 2mm/s)
Traversing direction:	Backward
Traverse linearity:	20 $\mu$ m/8"
$\alpha$ -axis	
Inclination angle:	-45° to +10°
Resolution:	0.000225°
Rotating speed:	1rpm
Z2-axis (column)	
Vertical travel:	12" or 20" (300mm or 500mm)
Resolution:	1.97 $\mu$ m (0.05 $\mu$ m)
Measurement method:	Reflective-type linear encoder
Drive speed:	7.87"/s (200mm/s) (max., CNC) 0 - 2.36"/s (0 - 60mm/s) (joystick)
Detector (optional)	
Range / resolution:	32000 $\mu$ m / .4 $\mu$ m, 3200 $\mu$ m / .04 $\mu$ m, 320 $\mu$ m / .004 $\mu$ m (up to 96000 $\mu$ m with an optional stylus) (800 $\mu$ m / 0.01 $\mu$ m, 80 $\mu$ m / 0.001 $\mu$ m, 8 $\mu$ m / 0.0001 $\mu$ m (up to 2400 $\mu$ m with an optional stylus))
Detecting method:	Skidless / skid measurement
Measuring force:	4mN or 0.75mN (low force type)
Stylus tip:	Diamond, 90°/5 $\mu$ mR (60°/2 $\mu$ mR: low force type)
Skid radius of curvature:	1.57" (40mm)
Detecting method:	Differential inductance

# Formtracer Extreme SV-C3000CNC / SV-C4000CNC

## SERIES 525 — Surface Roughness/Form Measuring Instrument

### Optional Accessories

#### Vibration isolation stand

Vibration isolation mechanism: Diaphragm air spring  
 Natural frequency: 2.5 - 3.5Hz  
 Damping mechanism: Orifice  
 Leveling mechanism: Automatic control with mechanical valves  
 Air supply pressure: 0.4Mpa  
 Allowable loading capacity: 772 lbs (350kg)  
 Dimensions (W x D x H): 39.4 x 35.2 x 28.1"  
 (1000 x 895 x 715mm)  
 Mass: 617 lbs (280kg)

#### Y-axis table unit

Measuring range: 8" (200mm)  
 Minimum reading: 1.97µin (0.05µm)  
 Scale unit: Reflective-type Linear Encoder  
 Drive speed: 200mm/s (max., CNC)  
 0 - 2.36"/s (0 - 60mm/s) (joystick)  
 Maximum loading capacity: 44 lbs (20kg)  
 Traverse linearity: 20µin/8" (0.5µm/200mm)  
 Linear displacement accuracy (at 20°C):  
 ± (80+20L)µin  
 {± (2+2L/100) µm}, contour mode  
 L: Dimension between two measured points (mm)  
 Table size: (200 x 200mm)  
 Dimensions (W x D x H): 2.6 x 25.4 x 4.1"  
 (320 x 646 x 105mm)  
 Mass: 77 lbs (35kg)

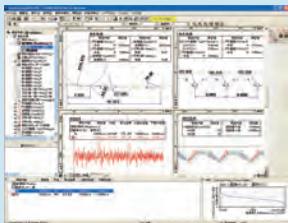
**MICAT**  
 Mitutoyo Intelligent Computer Aided Technology

the standard in world  
 metrology software  
**FORM**

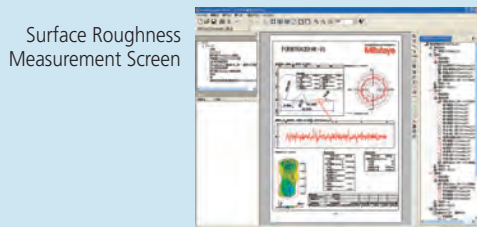
### Optional Software

#### FORMTRACEPAK V5

Enables control of the optional motor-driven Y-axis table and rotary table for realizing efficient measurement automation. You can also perform contour evaluation that allows free analysis of level differences, angle, pitch, area and other characteristics based on surface roughness data. In addition, analysis results can be saved in the "html" or "mhtml" format which allows Internet Explorer or MS-Word compatibility, allowing PC without layout editing programs to view analysis results.



Contour Measurement Screen



Surface Roughness Measurement Screen

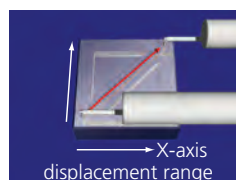
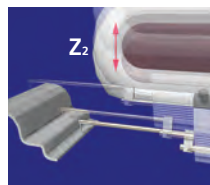
### SPECIFICATIONS

Model No.	SV-C3000CNC	SV-C3000CNC	SV-C3000CNC	SV-C3000CNC
Order No. (100V - 120V)	525-521-1	525-522-1	525-523-1	525-524-1
X1-axis measuring range	8" (200mm)	8" (200mm)	8" (200mm)	8" (200mm)
Z2-axis vertical travel	12" (300mm)	12" (300mm)	12" (300mm)	12" (300mm)
Y-axis table unit	—	—	Installed	Installed
α-axis unit	—	Installed	—	Installed
Granite base size (WxD)	29.5 x 23.6" (750 x 600mm)	29.5 x 23.6" (750 x 600mm)	29.5 x 23.6" (750 x 600mm)	29.5 x 23.6" (750 x 600mm)
Dimensions (main unit, WxDxH)	31.5 x 24.4 x 39.4" 800 x 620 x 1000mm	31.5 x 24.4 x 39.4" 800 x 620 x 1000mm	31.5 x 24.4 x 39.4" 800 x 620 x 1000mm	31.5 x 24.4 x 39.4" 800 x 620 x 1000mm
Mass (main unit)	529 lbs (240kg)	529 lbs (240kg)	529 lbs (240kg)	529 lbs (240kg)

Model No.	SV-C3000CNC	SV-C3000CNC	SV-C3000CNC	SV-C3000CNC
Order No. (100V - 120V)	525-541-1	525-542-1	525-543-1	525-544-1
X1-axis measuring range	8" (200mm)	8" (200mm)	8" (200mm)	8" (200mm)
Z2-axis vertical travel	20" (500mm)	20" (500mm)	20" (500mm)	20" (500mm)
Y-axis table unit	—	—	Installed	Installed
α-axis unit	—	Installed	—	Installed
Granite base size (WxD)	29.5 x 23.6" (750 x 600mm)	29.5 x 23.6" (750 x 600mm)	29.5 x 23.6" (750 x 600mm)	29.5 x 23.6" (750 x 600mm)
Dimensions (main unit, WxDxH)	31.5 x 24.4 x 47.2" 800 x 620 x 1200mm	31.5 x 24.4 x 47.2" 800 x 620 x 1200mm	31.5 x 24.4 x 47.2" 800 x 620 x 1200mm	31.5 x 24.4 x 47.2" 800 x 620 x 1200mm
Mass (main unit)	551 lbs (250kg)	551 lbs (250kg)	551 lbs (250kg)	551 lbs (250kg)

Model No.	SV-C4000CNC	SV-C4000CNC	SV-C4000CNC	SV-C4000CNC
Order No. (100V - 120V)	525-621-1	525-622-1	525-623-1	525-624-1
X1-axis measuring range	8" (200mm)	8" (200mm)	8" (200mm)	8" (200mm)
Z2-axis vertical travel	12" (300mm)	12" (300mm)	12" (300mm)	12" (300mm)
Y-axis table unit	—	—	Installed	Installed
α-axis unit	—	Installed	—	Installed
Granite base size (WxD)	29.5 x 23.6" (750 x 600mm)	29.5 x 23.6" (750 x 600mm)	29.5 x 23.6" (750 x 600mm)	29.5 x 23.6" (750 x 600mm)
Dimensions (main unit, WxDxH)	31.5 x 24.4 x 39.4" 800 x 620 x 1000mm	31.5 x 24.4 x 39.4" 800 x 620 x 1000mm	31.5 x 24.4 x 39.4" 800 x 620 x 1000mm	31.5 x 24.4 x 39.4" 800 x 620 x 1000mm
Mass (main unit)	529 lbs (240kg)	529 lbs (240kg)	529 lbs (240kg)	529 lbs (240kg)

Model No.	SV-C4000CNC	SV-C4000CNC	SV-C4000CNC	SV-C4000CNC
Order No. (100V - 120V)	525-641-1	525-642-1	525-643-1	525-644-1
X1-axis measuring range	8" (200mm)	8" (200mm)	8" (200mm)	8" (200mm)
Z2-axis vertical travel	20" (500mm)	20" (500mm)	20" (500mm)	20" (500mm)
Y-axis table unit	—	—	Installed	Installed
α-axis unit	—	Installed	—	Installed
Granite base size (WxD)	29.5 x 23.6" (750 x 600mm)	29.5 x 23.6" (750 x 600mm)	29.5 x 23.6" (750 x 600mm)	29.5 x 23.6" (750 x 600mm)
Dimensions (main unit, WxDxH)	31.5 x 24.4 x 47.2" 800 x 620 x 1200mm	31.5 x 24.4 x 47.2" 800 x 620 x 1200mm	31.5 x 24.4 x 47.2" 800 x 620 x 1200mm	31.5 x 24.4 x 47.2" 800 x 620 x 1200mm
Mass (main unit)	551 lbs (250kg)	551 lbs (250kg)	551 lbs (250kg)	551 lbs (250kg)



# Formtracer CS-3200

SERIES 525 — Form Measuring Instruments

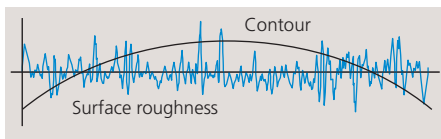
**ABSOLUTE**<sup>®</sup>  
Absolute System Patented by MITUTOYO



CS-3200S4 with personal computer system and software  
\* PC stand not included.

## FEATURES

- Highest measurement accuracy in its class.  
X axis:  $\pm(1+0.01L)\mu\text{m}$   
Z1 axis:  $\pm(1.5+2H/100)\mu\text{m}$
- To detect surface roughness and contour in a single measurement the Z1-axis detector unit of CS-3200S4 has a wide measuring range and high resolution of 5mm / 0.08 $\mu\text{m}$  to 0.05mm / 0.0008 $\mu\text{m}$ .
- The detector unit can be extended to avoid interference between the drive unit and workpiece. The measuring range is shifted to the left by 2.76" (70mm).



- In order to maintain the traverse linearity specification for an extended period of time, Mitutoyo has adopted highly rigid ceramic guides that combine the characteristics of smallest secular change and remarkable resistance to abrasion.
- Drastically increased drive speed further reduces total measurement time.  
X axis: 80mm/s, Z2 axis: 20mm/s
- To enhance safety during fast traverse, the Z-axis detector unit incorporates a safety device (Automatic Stop-On-Collision Mechanism).



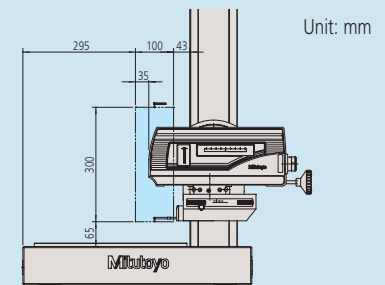
- Incorporation of an ABS scale in the Z2 axis eliminates the need for origin point re-setting conventionally required for every step of repeated measurements over step or multiple sections.
- Small holes and inclined planes can be efficiently measured using the inclined X-axis drive unit and fine-feed handles on the X and Z2 axes.
- All detector and drive unit cables are housed inside the main unit to eliminate any risk of abrasion and guarantee trouble free, high-speed operation.
- Orientation of the drive unit can be inclined by  $\pm 45^\circ$ . This allows CS-3200 to measure an inclined surface quickly.

## Technical Data: Contour Measurement

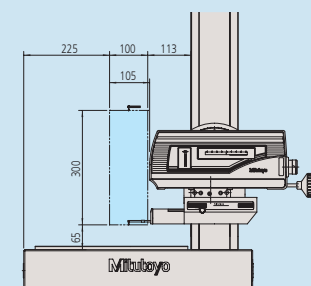
X1-axis	
Measuring range:	4" (100mm)
Resolution:	1.97 $\mu\text{m}$ (0.05 $\mu\text{m}$ )
Measurement method:	Reflective-type linear encoder
Drive speed:	0 - 3.1"/s (0 - 80mm/s) and manual
Measuring speed:	0.00078 - 0.00787"/s (0.02 - 0.2mm/s) (surface roughness) 0.00078 - 0.0787"/s (0.02 - 2mm/s) (contour)
Measuring direction:	(Push/Pull)
Traverse linearity:	8 $\mu\text{in}/4"$ (16 $\mu\text{in}/4"$ ) [0.2 $\mu\text{m}/100\text{mm}$ (0.4 $\mu\text{m}/100\text{mm}$ )] ( ) : at the protruded detector position *with the X axis in horizontal orientation
Linear displacement accuracy (at 20°C):	$\pm(32+10L)\mu\text{in}$ ( $\pm(0.8+0.01L)\mu\text{m}$ ) * L = Drive length (mm)
Inclination range:	$\pm 45^\circ$
Z2-axis (column)	
Vertical travel:	12" (300mm)
Resolution:	39.4 $\mu\text{in}$ (1 $\mu\text{m}$ )
Measurement method:	ABSOLUTE linear encoder
Drive speed:	0 - 0.78"/s (0 - 20mm/s) and manual
Z1-axis (detector unit)	
Measuring range / resolution:	3 $\mu\text{in}/.2"$ , .3 $\mu\text{in}/.02"$ , .03 $\mu\text{in}/.002"$ (0.08 $\mu\text{m}/5\text{mm}$ , 0.008 $\mu\text{m}/0.5\text{mm}$ , 0.0008 $\mu\text{m}/0.05\text{mm}$ )
Measurement method:	Differential inductance method
Linear displacement:	$\pm(60+20H)\mu\text{in}$ ( $\pm(1.5+2H/100)\mu\text{m}$ )
Accuracy (at 20°C)	*H: Measurement height from the horizontal position (mm)
Stylus up/down operation:	Arc movement
Face of stylus:	Downward
Measuring force:	0.75mN
Traceable angle:	Ascent: 65°, descent: 65° (using the standard stylus provided and depending on the surface roughness)
Stylus tip	Radius: 2 $\mu\text{m}$ , diamond
Base size (W x H):	23.6 x 17.7" (600 x 450mm)
Base material:	Granite
Mass:	309 lbs (140kg) (main unit)
Power supply:	100 - 240VAC $\pm 10\%$ , 50/60Hz
Power consumption:	400W (main unit only)

## Protrusion of Detector Position

### Normal detector position



### When detector is maximally extended (Extended by 70mm from normal position)



# Formtracer CS-3200

## SERIES 525 — Form Measuring Instruments

**MiCAT**

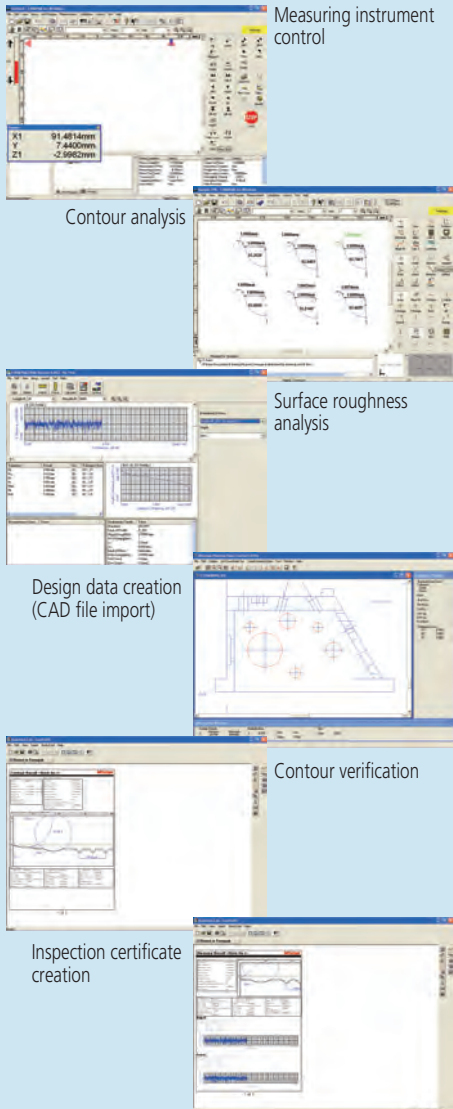
Mitutoyo Intelligent Computer Aided Technology

the standard in world  
metrology software  
**FORM**

### Optional Software

#### FORMTRACEPAK-6000

Enables control of the optional motor-driven Y-axis table and rotary table for realizing efficient measurement automation. You can also perform contour evaluation that allows free analysis of level differences, angle, pitch, area and other characteristics based on surface roughness data. In addition, you can create an original inspection certificate by setting the print format to suit your particular requirements.



#### Main Unit Startup System

This machine incorporates a startup system (relocation detection system), which disables operation when an unexpected vibration is applied or the machine is relocated. Be sure to contact your nearest Mitutoyo prior to relocating this machine after initial installation.

### SPECIFICATIONS

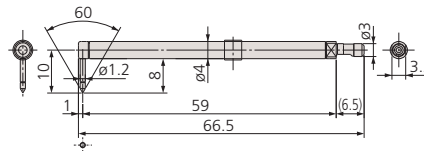
Model No.	CS-3200S4
Order No. (inch)	525-411A
X1-axis measuring range	4" (100mm)
Z2-axis vertical travel	12" (300mm)

### Stylus

(Unit: inch (mm))

#### Standard stylus: No. 12AAD554

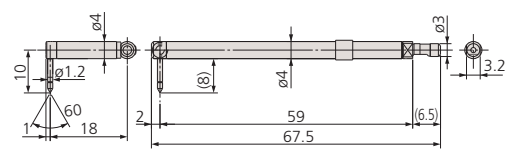
Tip radius: 2  $\mu$ m  
Tip angle: 60° cone  
Tip material: Diamond



For contour/surface roughness measurement  
Measurable depth: .28" (7mm) max.

#### Eccentric stylus: No. 12AAD558

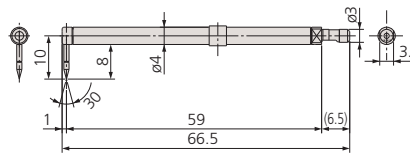
Tip radius: 2  $\mu$ m  
Tip angle: 60° cone  
Tip material: Diamond



For contour/surface roughness measurement  
Measurable offset length: .60" (15mm)

#### Cone stylus: No. 12AAD552

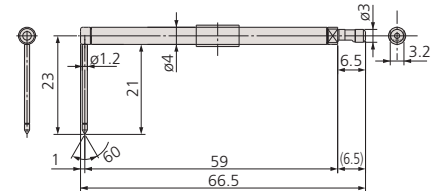
Tip radius: 25  $\mu$ m  
Tip angle: 30° cone  
Tip material: Sapphire



For contour measurement  
Measurable depth: .28" (7mm) max.

#### Deep Groove stylus: No. 12AAD560

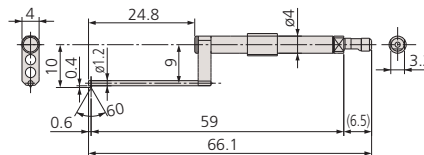
Tip radius: 2  $\mu$ m  
Tip angle: 60° cone  
Tip material: Diamond



For contour/surface roughness measurement  
Measurable depth: .79" (20mm) max.

#### Small hole stylus: No. 12AAD556

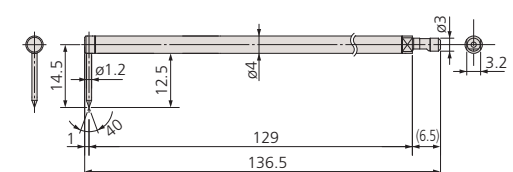
Tip radius: 2  $\mu$ m  
Tip angle: 60° cone  
Tip material: Diamond



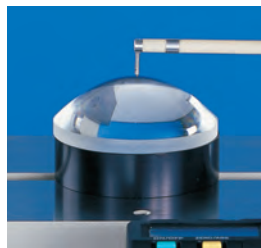
For contour/surface roughness measurement  
Applicable hole:  $\phi$ 0.08" ( $\phi$ 2mm) min.

#### 2x-long stylus: No. 12AAD562

Tip radius: 5  $\mu$ m  
Tip angle: 40° cone  
Tip material: Diamond



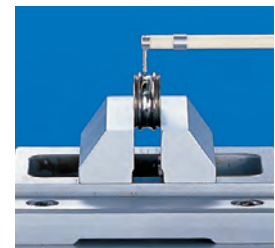
For contour/surface roughness measurement  
Measurable depth: .39" (10mm) max.



Measuring lens



Measuring ball screw



Measuring bearing ring

# Formtracer Extreme CS-5000CNC / CS-H5000CNC

## SERIES 525 — CNC Form Measuring Instruments



CS-5000CNC with personal computer system and software

\* PC stand not included

Remote box



Wide range detector employing active control technology



### FEATURES

- High-accuracy stylus type CNC Surface Measuring Instrument that allows simultaneous measurement of surface roughness and form/contour.
- The X1 axis has a maximum drive speed of 1.57"/s (40 mm/s) and Z2 axis has a maximum drive speed of 7.87"/s (200 mm/s). This permits high-speed positioning that may result in a large increase in the throughput of multiple-profile / multiple-workpiece measurement tasks.
- A Mitutoyo Laser Hologram is incorporated in the X1 axis and Z1 axis so that high resolution (X1 axis: 6.25nm, Z1 axis: 4nm/8nm) is achieved and batch measurement of form / contour and surface roughness can be made.
- The active control method is employed for the Z1-axis detector to implement a wide-range measurement capability wherein the variation in dynamic measuring force is restricted.
- Since the Z1-axis detector incorporates an anti-collision safety device, the detector unit will automatically stop even if its main body collides with a workpiece or fixture.
- For models with the  $\alpha$ -axis, it is possible to perform continuous measurement over horizontal and inclined surfaces by power-tilting the X1 axis.
- For models with the Y-axis table, it is possible to expand the measuring range for multiple workpieces, etc., through positioning in the Y-axis direction.
- Supplied with the easy-to-operate Remote Box, the user can make any movement by selecting the required axis using the two joysticks. The current axis selection is easily identified by the icon on the key top.
- Uses USB for communicating with the Data Processing / Analysis Unit (optional).

### Technical Data:

X1 axis	
Measuring range:	8" (200mm)
Resolution:	0.25 $\mu$ m (0.00625 $\mu$ m)
Measurement method:	Laser Hologram
Drive speed:	Max. 1.57"/s (40mm/s) (in CNC mode) 0 - 1.57"/s (0 - 40mm/s) (in joystick control mode)
Measuring speed:	0.0008 - 0.008"/s (0.02 - 0.2mm/s) (surface roughness) 0.0008 - 0.08"/s (0.02 - 2mm/s) (form/contour)
Measuring direction:	Forward / backward direction
Traverse linearity:	(4+1.5L) $\mu$ m {(0.1+0.0015L) $\mu$ m} with standard stylus (8+1.5L) $\mu$ m {(0.2+0.0015L) $\mu$ m} with 2X-long stylus
*Traverse linearity:	(2+3L) $\mu$ m {(0.05+0.0003L) $\mu$ m} with standard stylus (4+1.5L) $\mu$ m {(0.1+0.0015L) $\mu$ m} with 2X-long stylus
Linear displacement accuracy $\pm$ (20°C):	$\pm$ (12+2L) $\mu$ m { $\pm$ (0.3+0.002L) $\mu$ m}
*Linear displacement accuracy $\pm$ (20°C):	$\pm$ (2.8+6.3+L) $\mu$ m { $\pm$ (0.16+0.001L) $\mu$ m}
L = Measured length inch (mm)	
Z1 axis	
Measuring range:	0.47" (12mm) (with standard stylus) 0.94" (24mm) (with 2X-long stylus)
Resolution:	0.16 $\mu$ m (0.004 $\mu$ m) (with standard stylus) 0.32 $\mu$ m (0.008 $\mu$ m) (with 2X-long stylus)
Stylus up/down:	Arc movement
Measurement method:	Laser Hologram
Linear displacement accuracy (20°C):	$\pm$ (12+120H) $\mu$ m { $\pm$ (0.3+10.02H) $\mu$ m}
*Linear displacement accuracy (20°C):	$\pm$ (2.8+120H) $\mu$ m { $\pm$ (0.07+10.02H) $\mu$ m}
H = Measured height inch (mm)	
Measuring force:	4mN (with standard stylus) 0.75mN (with 2X-long stylus)
Traceable angle:	60° for ascent, 60° for descent (Depending on the workpiece surface condition)
Stylus tip:	(ball stylus) Radius: 5 $\mu$ m, angle: 40°, diamond (Radius: 0.25mm, sapphire)
Face of stylus:	Downward
Z2 axis (column unit)	
Measuring range:	12" (300mm) (20" (500mm) high column type)
Resolution:	1.97 $\mu$ m (0.05 $\mu$ m)
Measurement method:	Reflective-type linear encoder
Drive speed:	Max. 7.87"/s (200mm/s) (in CNC mode) 0 - 1.97"/s (0 - 50mm/s) (in joystick control mode)
Base size (W x D):	29.5 x 23.6" (750 x 600mm)
Base material:	Granite
Dimension (W x D x H):	31.5 x 24.4 x 39.4" (800 x 620 x 1000mm) 31.5 x 24.4 x 47.2" (800 x 620 x 1200mm: high column type)
Mass:	529 lbs (240kg) 551 lbs (250kg): high column type)

\*CS-H5000CNC model in red.

# Formtracer Extreme CS-5000CNC / CS-H5000CNC

## SERIES 525 — CNC Form Measuring Instruments

### SPECIFICATIONS

Model No.	CS-5000CNC	CS-5000CNC	CS-5000CNC	CS-5000CNC
<b>Order No.</b> (100V - 120V)	<b>525-721-1</b>	<b>525-722-1</b>	<b>525-723-1</b>	<b>525-724-1</b>
X1-axis measuring range	8" (200mm)	8" (200mm)	8" (200mm)	8" (200mm)
Z2-axis vertical travel	12" (300mm)	12" (300mm)	12" (300mm)	12" (300mm)
Y-axis table unit	—	—	Installed	Installed
$\alpha$ -axis unit	—	Installed	—	Installed

Model No.	CS-5000CNC	CS-5000CNC	CS-5000CNC	CS-5000CNC
<b>Order No.</b> (100V - 120V)	<b>525-741-1</b>	<b>525-742-1</b>	<b>525-743-1</b>	<b>525-744-1</b>
X1-axis measuring range	8" (200mm)	8" (200mm)	8" (200mm)	8" (200mm)
Z2-axis vertical travel	20" (500mm)	20" (500mm)	20" (500mm)	20" (500mm)
Y-axis table unit	—	—	Installed	Installed
$\alpha$ -axis unit	—	Installed	—	Installed

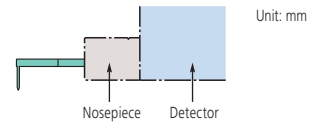
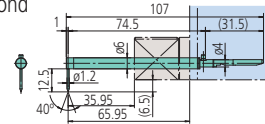
Model No.	CS-H5000CNC	CS-H5000CNC
<b>Order No.</b> (100V - 120V)	<b>525-761-1</b>	<b>525-763-1</b>
X1-axis measuring range	8" (200mm)	8" (200mm)
Z2-axis vertical travel	12" (300mm)	12" (300mm)
Y-axis table unit	—	Installed

### Stylus

**12AAD543\*1:** Standard-length stylus (tip radius: 5 $\mu$ m)

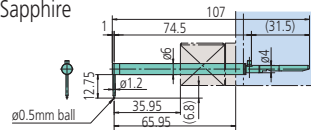
**12AAJ037\*2:** For CS-H5000CNC (tip radius: 5 $\mu$ m)

Tip material: Diamond



**12AAD544\*1\*2:** Standard-length ball stylus (tip radius: 5 $\mu$ m)

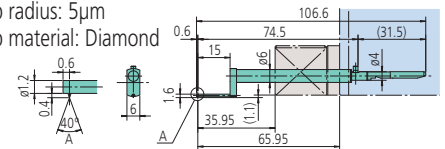
Tip material: Sapphire



**12AAD651:** Standard-length stylus for small hole

Tip radius: 5 $\mu$ m

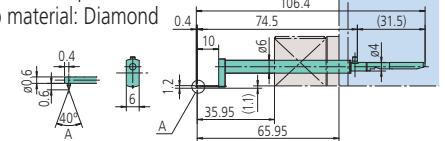
Tip material: Diamond



**12AAD652:** Standard-length stylus for extra-small hole

Tip radius: 5 $\mu$ m

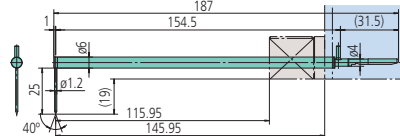
Tip material: Diamond



**12AAD545\*1:** Double-length stylus (tip radius: 5 $\mu$ m)

**12AAJ039\*2:** For CS-H5000CNC (tip radius: 5 $\mu$ m)

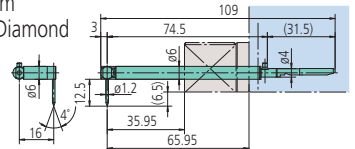
Tip material: Diamond



**12AAD653:** Standard-length eccentric stylus

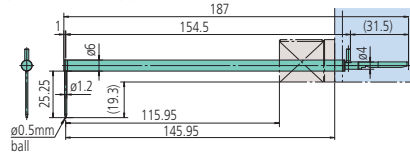
Tip radius: 5 $\mu$ m

Tip material: Diamond



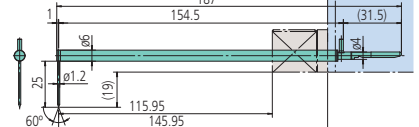
**12AAD546\*1\*2:** Double-length ball stylus

Tip material: Sapphire



**12AAJ041\*2:** Double-length stylus (tip radius: 2 $\mu$ m)

Tip material: Diamond



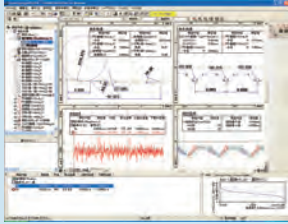
\*1: Standard accessory of CS-5000CNC

\*2: Standard accessory of CS-H5000CNC

### Optional Software

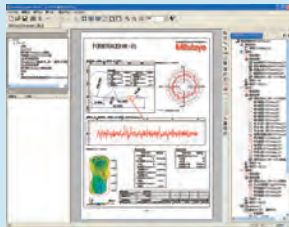
#### FORMTRACEPAK V5

Enables control of the optional motor-driven Y-axis table and rotary table for realizing efficient measurement automation. You can also perform contour evaluation that allows free analysis of level differences, angle, pitch, area and other characteristics based on surface roughness data. In addition, analysis results can be saved in the "html" or "mhtml" format which allows Internet Explorer or MS-Word compatibility, allowing PC without layout editing programs to view analysis results.



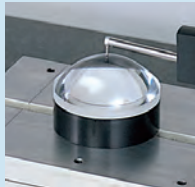
Contour Measurement Screen

#### Surface Roughness Measurement Screen



#### ASLPAK

Aspherical lens analysis program Recommended to be used with CS-H5000CNC and CS-5000CNC models. To make full use of software functions, optional accessories such as y-axis table, 3DALT and theta  $\theta$ -1 table are required. The functions can be restricted without the optional accessories.



# Formtracer Extreme CS-H5000CNC + Vision Probe

## Series 525 – CNC Form Measuring Instruments

### FEATURES

- With the Vision Probe, the Formtracer is able to set measurement position and perform vision measurements.
- The vision measurement function allows it to measure width and pitch.
- The CNC Surface Measurement is capable of positioning minute workpieces such as precision molds and fiber optics.
- Multiple profile auto measurement function increases the overall measurements throughout.
- X1-axis maximum drive speed is 40mm/s, Y-axis and Z2- axis maximum drive speeds of 200mm/s permits high-speed positioning that increases throughput of multiple profile/multiple workpiece measurement tasks.

- A Laser HoloScale is incorporated in the X1 and Z1-axis so that high resolution (X1-axis 6.25nm, Z1-axis 2nm) is achieved and batch measurement of form contour and surface roughness can be made.
- The active control method is employed for the Z1-axis detector to implement a wide range measurement capability wherein the variation in dynamic measuring force is restricted.
- The Z1-axis detector and Vision Probe incorporates an anti-collision safety device, the detector will automatically stop when the machine collides with a workpiece or fixture.
- Supplied with the easy-to-operate Remote Box, the user can make any movement by selecting the required axis using the two joysticks. The current axis selection is easily identified by the icon on the key top.



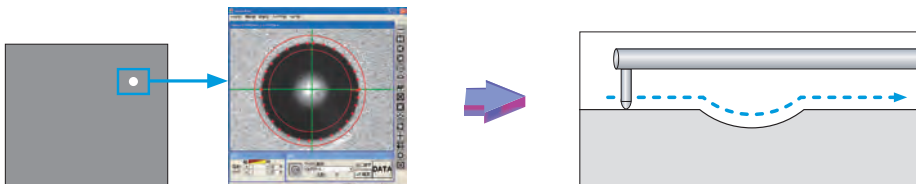
CS-H5000CNC + Vision Probe QVP II with PC system and software

\*PC stand not included

### SPECIFICATIONS

Model No.	CS-H5000CNC + Vision Probe
Order No.	525-769A
X1-axis measuring range	8" (200mm)
Z2-axis vertical travel	13.8" (350mm) (from top of Y-axis)
Y-axis table unit	Installed
α-axis unit	Installed

For small sized objects, it is easier to identify positioning quickly and then measure.



### Technical Data

- X1-axis  
 Measuring range: 8" (200mm)  
 Resolution: 0.00625µm  
 Scale: Laser HoloScale  
 Drive speed: 40mm/s (max. CNC)  
 0~40mm/s (joystick)
- Form measuring:  
 Measuring speed: 0.02~0.2mm/s (Roughness measure)  
 0.02~2mm/s (Contour measure)
- Measure direction: Push / Pull  
 Straightness accuracy\*1\*2: (0.1+15L/1000)µm L=Drive length (mm)  
 Linear accuracy (20°C): ±(0.16+L/1000)µm L=Drive length (mm)
- Vision measuring:  
 Accuracy\*3 (20°C) E1x: ±(2+3L/1000)µm L1=measurement length (mm)
- Z1-axis (detector)  
 Measuring range\*1: 0.95" (24mm)  
 Resolution\*1: 0.002µm  
 Stylus up/down: Arc movement  
 Scale: Laser HoloScale  
 Linear accuracy (20°C)\*1: ±(0.07+2H/100)µm H= measurement height (mm)  
 Measuring force\*1: 0.75mN (0.075gf)  
 Stylus tip: 2x stylus (2µm, 60°, diamond)  
 2x stylus (5µm, 40°, diamond)  
 2x ball stylus (250µm, sapphire)
- Z2-axis (column)  
 Measuring range: 13.8" (350mm) From top of Y-axis  
 Resolution: 0.05µm  
 Scale: Reflective-type linear encoder  
 Drive speed: 200mm/s (max. CNC)  
 0~50mm/s (joystick)  
 Base size: 29.5" x 23.6" (750 x 600mm)  
 Base material: Granite
- Y-axis  
 Measuring range: 8" (200mm)  
 Resolution: 0.05µm  
 Scale: Reflective-type linear encoder  
 Drive speed: 200mm/s (max. CNC)  
 0~50mm/s (joystick)  
 Max. loading capacity: 44lbs. (20kg)
- Form measuring:  
 Straightness accuracy\*1: 0.5µm/200mm  
 Linear accuracy (20°C)\*1: ±(2+2L/100)µm L=Drive length (mm)
- Vision measuring:  
 Accuracy\*3 (20°C) E1y: ±(2+3L/1000)µm L1=measurement length (mm)  
 Table size: 7.9" x 7.9" (200 x 200mm)  
 Dimension: 12.6" x 25.4" x 4.1" (320 x 646 x 105mm)
- Main unit:  
 Dimension (W x D x H): 31.5" x 24.4" x 47.2" (800 x 620 x 1200)  
 Mass: 653lbs. (296kg)  
 Operating temp. range: 15~25°C  
 Operating humidity range: 20~80% RH  
 Storage temp. range: -10~50°C  
 Storage humidity range: 5~90% RH
- Vision Probe (QVP II):  
 CCD size: 1.3" (B/M)  
 Optical tube magnification: 0.375x  
 Illumination: Reflected: White LED - Power consumption 5W or less  
 Ring\*: White LED - Power consumption 10W or less
- Controller:  
 Dimension: 9.8" x 20.4" x 18.4" (250 x 517 x 467mm)  
 Mass: 62lbs. (28kg)  
 Interface: USB  
 Power supply: 10~120V, 200~240V ±10%, AC50/60Hz  
 Power consumption: 500W
- I/F box:  
 Dimension: 15.4" x 10.8" x 2" (390 x 275 x 52mm)  
 Mass: 8.4lbs. (3.8kg)  
 Power supply: 100~240V, AC 50/60Hz  
 Power consumption: 40W
- Remote joystick box:  
 Dimension: 11.8" x 5.6" x 2.8" (300 x 143 x 71mm)  
 Mass: 3.3lbs. (1.5kg)
- Vibration Isolation stand:  
 Isolation mechanism: Diaphragm air spring  
 Natural frequency: 2.5~3.5Hz  
 Damping mechanism: Orifice  
 Leveling mechanism: Automatic control with mechanical valves  
 Air supply pressure: 0.4MPa  
 Max. loading capacity: 772lbs. (350kg)  
 Dimension: 42.5" x 39.2" x 28.3" (1080 x 995 x 718mm)  
 Mass: 694lbs. (315kg)
- Cabin (protective shield)  
 Dimension: 42.5" x 34" x 43.3" (1080 x 860 x 1100mm)  
 Mass: 112lbs. (51kg)
- \*1 Using 2x stylus (P/N 12AAJ039)  
 \*2 Measuring optical flat---measuring speed 1mm/s, Pull direction, λs: 2.5mm  
 \*3 Guaranteed condition---measuring reference gage at 150mm height from top of Y-axis with ML10X lens  
 \*4 Using ring light unit

### CS-H5000CNC w/QVP11 Standard Accessories

02ATN695	Calibration chart with holder
12AAL052	Off-set value acquisition kit
12AAJ041	2X stylus (2µmR, 60°)
12AAJ039	2X stylus (5µmR, 40°)
12AAD546	2X ball stylus (250µmR ball)
12AAE282	φ20 Master ball
12AAD645	Nosepiece
12AAH444	Main unit connecting cable
12AAE319	USB communication cable
12AAL257	Calibration kit for CS-H (inch)

### SV-3000CNC w/QVP11 Standard Accessories

178-396-2	Low force detector (0.75mN) w/ <b>12AAC731</b> (2µm R) 1 set; depends on model machine selected
178-397-2	Standard force detector (4mN) w/ <b>12AAB403</b> (5µm R)
178-602	Roughness specimen (in/mm)
178-612	Step gage (in/mm)
02ATN695	Calibration chart with holder
12AAD878	Nosepiece with safety cover
12AAE282	φ20 Master ball
12AAE319	USB communication cable
12AAH444	Main unit connecting cable
12AAL052	Off-set value acquisition kit

### Optional Accessories

### Remarks

178-016	Leveling table	
178-019	Precision vise	
178-037	2D-Auto Leveling Table	
178-077	3D-Auto Leveling Table	
178-078	Ø2 axis unit	
375-037-1	ML 3X Objective	
375-034-1	ML 5X Objective	
375-039	ML 10X Objective	
378-810-3	M Plan Apo SL 20X	MT40 tube lens is required
378-010	MT40 Tube lens	M Plan Apo SL 20X
525-001	Small Ø1 table with 3D-ALT attached to Y-axis table	
12AAD975	Ø1 axis table	
12AAE032	Air isolation stand	
12AAE286	Indexing table (200 x 200mm) for Ø1-axis	
12AAE449*	Cover for high column (protective shield)	
12AAE679	Setting plate/ALT	
12AAE707	Attachment plate for Ø2-axis	
12AAE032-USE	Formtracepak-Pro V3.X	No Hasp (inch/mm)
12AAL493	Ring light unit A	Objectives: ML 3X, ML 5X, ML 10X
12AAL494	Ring light unit B	Objectives: M Plan Apo SL 20X
998923	System rack	
998291	V-block	

\* Only used for SV-3000CNC

### VISION PROBE QVP11



CCD size	1/3 inch (B/W)	
Optical tube magnification	0.375X	
Illuminating function	Co-axial	White light LED source
	Ring (Option)	

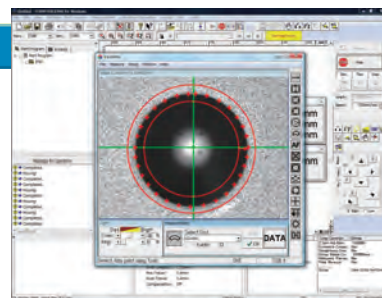
The vision probe has been specially designed for use with CNC form measuring machines and incorporates the knowledge gained through many years of experience with coordinate measuring machines and image measuring machines.

The ring light and ML 10x objective lens shown mounted are optional items.

### Automatic edge detection

The VISIONPAK software package processes the QVP11 probe images to automatically detect the edges of features, and the general-purpose contour FORMTRACEPAK V5 package is used to perform the necessary calculations (such as determining dimensions and geometrical deviation).

VISIONPAK runs in combination with FORMTRACEPACK V5, and the image window is automatically displayed when QVP11 is switched on.



### Aligning the detector with the QVP11

The detector's stylus tip\* location can be conveniently aligned with the QVP11 crosshairs on the monitor image by simply using a offset value Acquisition kit.

In addition, because it is possible to program switches between QVP11 and the detector\*, automatic measurement that includes both contact-based and non-contact-based measurement is possible.

\* Depends on the stylus

### Powerful image processing tools

VISIONPAK's range of image processing tools makes it possible to quickly detect simple or complex edges visible within the image.

### A bright, long-life white LED is standard equipment



The standard QVP11 is equipped with co-axial illumination directed down through the lens, and a ring light is available as an option. The illumination brightness is adjustable.

The ring light and ML 10x objective lens shown mounted are optional items.

### Built-in safety mechanism

The Z-axis detector and QVP11 include a safety device that prevents damage by automatically turning off the equipment if the detector is in danger of colliding with a workpiece or jig.

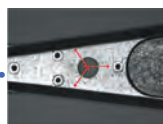
### Outlier removal

When measuring very small shapes, removing burrs and dust on the measured object is difficult, and such imperfections can cause measurement errors. VISIONPAK can recognize these imperfections as outliers to prevent such errors.

### VISIONPAK Image Processing Tools

#### Simple tool

Detects a single point on the edge pointed to by the arrow.



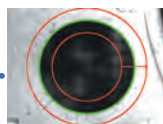
#### Box tool

Detects a straight edge enclosed by a rectangular box and creates multiple points along that edge.



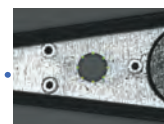
#### Circle tool

Detects a circular edge enclosed within concentric circles and creates multiple points along that edge. As with the box tool, it can collect data that is free from the effect of burrs and dust.



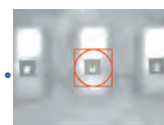
#### Manual tool

Detects an arbitrary edge pointed to (clicked on) by the mouse.



#### Centroid tool

Detects the center of area of an arbitrary form.



#### Edge self-tracing tool

By simply specifying the start point and measurement interval, the target edge can be detected while automatically tracing an unknown geometry.









# Optional Accessories for Automatic Measurement

Compatible with SV-3100, SV-C3200, SV-C4500, CS-3200 and CNC Models

## Y-axis table\*: 178-097

Enables efficient, automatic measurement of multiple aligned workpieces and multiple points on a single measurement surface.

\* available as a factory set accessory for CNC model.

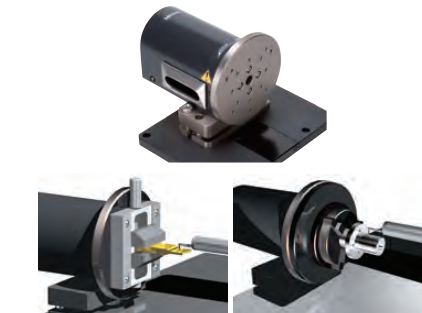


Travel range	8" (200mm)
Resolution	1.97µm (0.05µm)
Positioning accuracy	±3µm
Drive speed	Max. 3.15"/s (80mm/s)
Maximum load	110 lbs (50kg)
Mass	62 lbs (28kg)

## θ2-axis table: 178-078\*

You can measure multiple points on a cylindrical workpiece and automate front/rear-side measurement.

\* θ2-axis mounting plate (12AAE718) is required when directly installing on the base of the SV-3100.



Displacement	360°
Resolution	0.0072°
Maximum load (loading moment)	8.8 lbs (4kg) (343 N•cm or less)
Rotational speed	Max. 18°/s
Mass	11 lbs (5kg)

## Quick chuck: 211-032

This chuck is useful when measuring small workpieces. You can easily clamp them with its knurled ring.

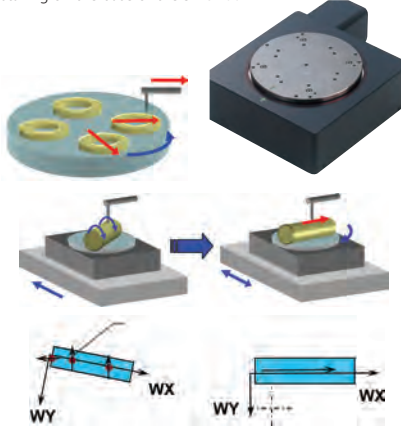


Retention range	Inner latch	OD: ø 0.04" - 1.42" (1 - 36mm)
	Inner latch	ID: ø 0.55" - 2.76" (14 - 70mm)
	Outer latch	OD: ø 0.04" - 2.95" (1 - 75mm)
Dimensions	ø 4.65" x 1.61" (118 x 41mm)	
Mass	2.6 lbs (1.2kg)	

## θ1-axis table: 12AAD975\*

For efficient measurement in the axial/transverse directions. When measuring a cylindrical workpiece, automatic alignment can be performed in combination with the Y-axis table.

\* θ1-axis mounting plate (12AAE630) is required when directly installing on the base of the SV-3100.



Displacement	360°
Resolution	0.004°
Maximum load	26.5 lbs (12kg)
Rotational speed	Max. 10°/s
Mass	15 lbs (7kg)

## Auto-leveling table: 178-087

This is a stage that performs fully automatic leveling as measurement starts, freeing the user from this troublesome operation. Fully automatic leveling can be done quickly by anyone. In addition, the operation is easy and reliable.



Inclination adjustment angle	±2°
Maximum load	15 lbs (7kg)
Table dimensions	5.1" x 3.9" (130 x 100mm)
Mass	7.7 lbs (3.5kg)

## Micro-chuck: 211-031

This chuck is suitable for clamping extra-small diameter workpieces (ø1mm or less), which cannot be retained with the centering chuck.



Retention range	OD: ø 0 - 0.06" (0 - 1.5mm)
Dimensions	ø 4.65" x 1.9" (118 x 48.5mm)
Mass	1.3 lbs (0.6kg)

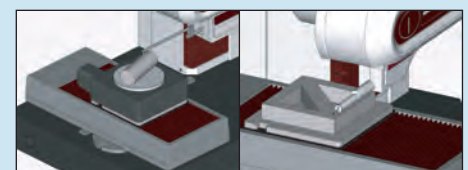
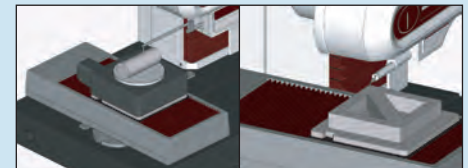
## Examples of optimal combinations of accessories for CNC models

Optional accessory \ Function	Y-axis Table	θ1 Table	θ2 Table
Automatic leveling	—	—	—
Automatic alignment (Patent registered: Japan)	●	●	—
Multiple workpiece batch measurement	▲	—	—
Measurement in the Y-axis direction	●	—	—
Oblique measurement of XY plane **	●	—	—
Outside 3D surface roughness measurement/evaluation **	●	—	—
Multiple-piece measurement in the Y-axis direction (Positioning in the Y-axis direction)	●	—	—
Multiple-piece measurement in the radius direction (Positioning in the rotating direction of XY plane)	▲	●	—
Tracking measurement in the Z-axis direction *	—	—	—
Inclined surface measurement in the X-axis direction	▲	—	—
Inclined hole inside measurement in the X-axis direction	▲	—	—
Multiple cylinder generatrix line measurement	▲	—	●
Measurement of both top and bottom surfaces	▲	—	●
Rotary positioning of large workpiece ***	—	—	—
Upward/downward and frontward/backward measurement of large workpiece ***	—	—	—

\* : Applicable only to form/contour measurement

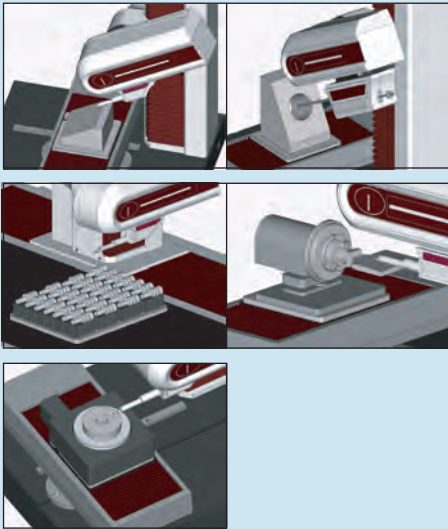
\*\* : Applicable only to surface roughness measurement

\*\*\* : Applicable only for SV-M3000CNC



Drive unit tilting function (Patent pending: Japan)	Large $\theta$ Table	Rotary-type detector holder
●	—	—
▲	—	—
—	—	—
—	—	—
—	—	—
▲	—	—
—	—	—
—	—	—
—	—	—
—	—	—
—	—	—
—	●	—
—	—	—
—	—	●

●: Essential    ▲: Better to provide with  
—: Not necessary

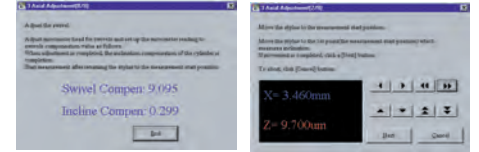
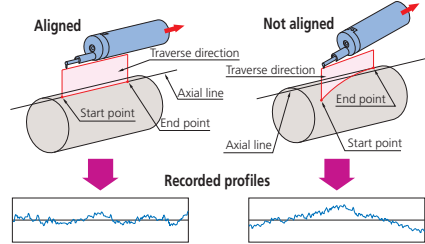


# Optional Accessories for Surftest / Formtracer

Compatible with Desktop Models of Surftest and Formtracer

## 3-axis adjustment table

This table helps make the alignment adjustments required when measuring cylindrical surfaces. The corrections for the pitch angle and the swivel angle are determined from a preliminary measurement and the Digimatic micrometers are adjusted accordingly. A flat-surfaced workpiece can also be leveled with this table.



## Leveling table

- 178-043-1 (mm),  
178-053-1 (inch)
- Table top: 130 x 100mm
  - Leveling range:  $\pm 1.5^\circ$
  - XY travel:  $\pm 12.5$ mm



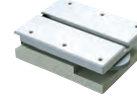
## Digital leveling table

- 178-042-1 (mm)  
178-052-1 (inch)
- Table top: 130 x 100mm
  - Leveling range:  $\pm 1.5^\circ$
  - XY travel:  $\pm 12.5$ mm



## Leveling table

- 178-016
- Table top: 130 x 100mm
  - Leveling range:  $\pm 1.5^\circ$
  - Height: 40mm



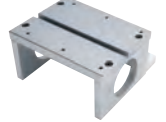
## Calibration stand<sup>\*1</sup>

12AAM100



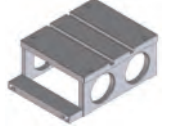
## Calibration stand<sup>\*2</sup>

12AAG175



## Calibration stand<sup>\*3</sup>

12AAM309



## V-block

- 998291
- Workpiece diameter: 1mm to 160mm
  - Can be mounted on a leveling table



## Precision vise

- 178-019
- Max. workpiece size: 36mm
  - Can be mounted on a leveling table.



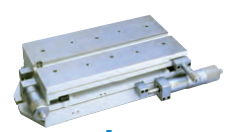
## Cross-travel table

- 218-001 (mm),  
218-011 (inch)
- Table top: 280 x 180mm
  - XY travel: 100 x 50mm



## Cross-travel table

- 218-041 (mm),  
218-051 (inch)
- Table top: 280 x 152mm
  - XY travel: 50 x 25mm



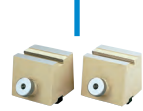
## Rotary vise

- 218-003
- Two-slide jaw type.
  - Max. workpiece size:  $\phi 60$ mm
  - Minimum reading:  $1^\circ$



## Center support

- 172-142
- Max. workpiece dia.: 120mm
  - 60mm riser is optional



## Center support riser

- 172-143
- Used with a center support.
  - Max. workpiece dia.: 240mm



## Swivel center support

- 172-197
- Max. workpiece dia.: 80mm\*  
\*65mm when swiveled  $10^\circ$
  - Max. workpiece length: 140mm



## Holder with clamp

- 176-107
- Used with a cross-travel table or rugged table.
  - Max. workpiece height: 35mm



## V-block with clamp

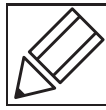
- 172-234,  
172-378
- Used with a cross-travel table or rugged table.
  - Max. workpiece dia.: 50mm (172-234), 25mm (172-378)

\*1: Required for calibrating upward measurement of CV-3200 series.

\*2: Required for calibrating in bulk by mounting straight arm/small-hole stylus arm without using cross-travel table and Y-axis table.

\*3: Required for calibrating in bulk by mounting straight arm/eccentric arm/small-hole stylus arm without using cross-travel table and Y-axis table.

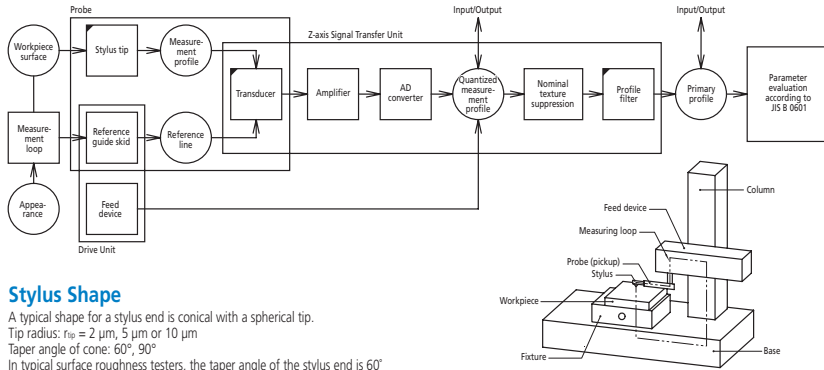
# Quick Guide to Precision Measuring Instruments



## Surftest (Surface Roughness Testers)

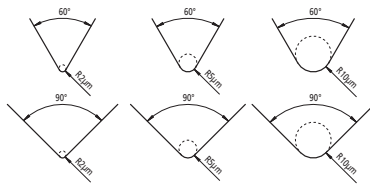
- JIS B 0601: 2001 Geometric Product Specifications (GPS)–Surface Texture: Profile method– Terms, definitions, and surface texture parameters
- JIS B 0632: 2001 Geometric Product Specifications (GPS)–Surface Texture: Profile method– Metrological characterization of phase-correct filters
- JIS B 0633: 2001 Geometric Product Specifications (GPS)–Surface Texture: Profile method– Rules and procedures for the assessment of surface texture
- JIS B 0651: 2001 Geometric Product Specifications (GPS)–Surface Texture: Profile method– Nominal characteristics of contact (stylus) instruments

### Nominal Characteristics of Contact (Stylus) Instruments



#### Stylus Shape

A typical shape for a stylus end is conical with a spherical tip.  
 Tip radius:  $r_{10} = 2 \mu\text{m}, 5 \mu\text{m}$  or  $10 \mu\text{m}$   
 Taper angle of cone:  $60^\circ, 90^\circ$   
 In typical surface roughness testers, the taper angle of the stylus end is  $60^\circ$  unless otherwise specified.



#### Static Measuring Force

Nominal radius of curvature of stylus tip: $\mu\text{m}$	Static measuring force at the mean position of stylus: mN	Tolerance on static measuring force variations: mN/ $\mu\text{m}$
2	0.75	0.035
5	0.75 (4.0) <sup>Note 1</sup>	0.2
10		

Note 1: The maximum value of static measuring force at the average position of a stylus is to be  $4.0\text{mN}$  for a special structured probe including a replaceable stylus.

### Relationship between Cutoff Value and Stylus Tip Radius

The following table lists the relationship between the roughness profile cutoff value  $\lambda_c$ , stylus tip radius  $r_{10}$ , and cutoff ratio  $\lambda_c/\lambda_s$ .

$\lambda_c$ mm	$\lambda_s$ $\mu\text{m}$	$\lambda_c/\lambda_s$	Maximum $r_{10}$ $\mu\text{m}$	Maximum sampling length $\mu\text{m}$
0.08	2.5	30	2	0.5
0.25	2.5	100	2	0.5
0.8	2.5	300	2 <sup>Note 1</sup>	0.5
2.5	8	300	5 <sup>Note 2</sup>	1.5
8	25	300	10 <sup>Note 2</sup>	5

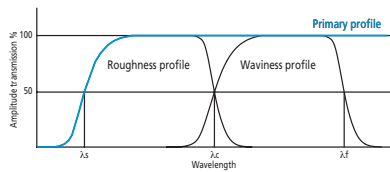
Note 1: For a surface with  $Ra > 0.5 \mu\text{m}$  or  $Rz > 3 \mu\text{m}$ , a significant error will not usually occur in a measurement even if  $r_{10} = 5 \mu\text{m}$ .  
 Note 2: If a cutoff value  $\lambda_c$  is  $2.5 \mu\text{m}$  or  $8 \mu\text{m}$ , attenuation of the signal due to the mechanical filtering effect of a stylus with the recommended tip radius appears outside the roughness profile pass band. Therefore, a small error in stylus tip radius or shape does not affect parameter values calculated from measurements. If a specific cutoff ratio is required, the ratio must be defined.

### Metrological Characterization of Phase Correct Filters

A profile filter is a phase-correct filter without phase delay (cause of profile distortion dependent on wavelength). The weight function of a phase-correct filter shows a normal (Gaussian) distribution in which the amplitude transmission is 50% at the cutoff wavelength.

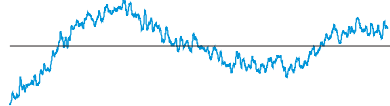
JIS B 0632: 2001 (ISO 11562: 1996)

### Surface Profiles



#### Primary Profile

Profile obtained from the measured profile by applying a low-pass filter with cutoff value  $\lambda_s$ .



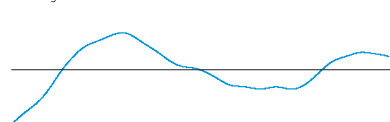
#### Roughness Profile

Profile obtained from the primary profile by suppressing the longer wavelength components using a high-pass filter of cutoff value  $\lambda_c$ .



#### Waviness Profile

Profile obtained by applying a band-pass filter to the primary profile to remove the longer wavelengths above  $\lambda_f$  and the shorter wavelengths below  $\lambda_c$ .

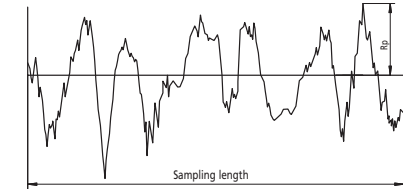


### Definition of Parameters

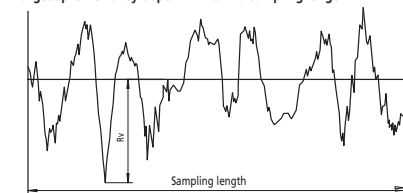
JIS B 0601: 2001 (ISO 4287: 1997)

#### Amplitude Parameters (peak and valley)

Maximum peak height of the primary profile  $P_p$   
 Maximum peak height of the roughness profile  $R_p$   
 Maximum peak height of the waviness profile  $W_p$   
 Largest profile peak height  $Z_p$  within a sampling length

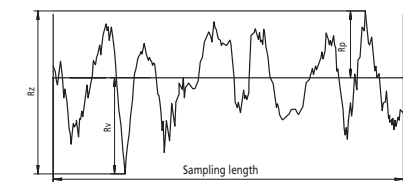


Maximum valley depth of the primary profile  $P_v$   
 Maximum valley depth of the roughness profile  $R_v$   
 Maximum valley depth of the waviness profile  $W_v$   
 Largest profile valley depth  $Z_v$  within a sampling length



Maximum height of the primary profile  $P_z$   
 Maximum height of the roughness profile  $R_z$   
 Maximum height of the waviness profile  $W_z$

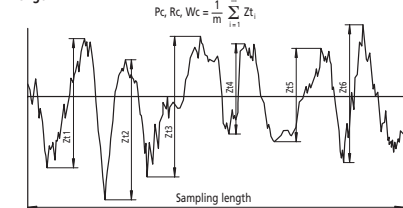
Sum of height of the largest profile peak height  $Z_p$  and the largest profile valley depth  $Z_v$  within a sampling length



In Old JIS and ISO 4287-1:1984,  $R_z$  was used to indicate the "ten point height of irregularities". Care must be taken because differences between results obtained according to the existing and old standards are not always negligibly small. (Be sure to check whether the drawing instructions conform to existing or old standards.)

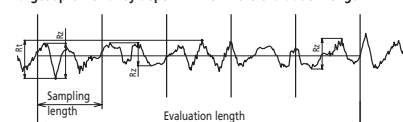
Mean height of the primary profile elements  $P_c$   
 Mean height of the roughness profile elements  $R_c$   
 Mean height of the waviness profile elements  $W_c$

Mean value of the profile element heights  $Z_t$  within a sampling length

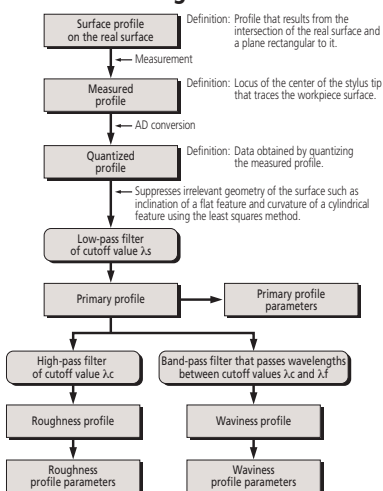


Total height of the primary profile  $P_t$   
 Total height of the roughness profile  $R_t$   
 Total height of the waviness profile  $W_t$

Sum of the height of the largest profile peak height  $Z_p$  and the largest profile valley depth  $Z_v$  within the evaluation length



### Data Processing Flow



## Amplitude Parameters (average of ordinates)

Arithmetical mean deviation of the primary profile  $P_a$   
 Arithmetical mean deviation of the roughness profile  $R_a$   
 Arithmetical mean deviation of the waviness profile  $W_a$   
 Arithmetic mean of the absolute ordinate values  $Z(x)$  within a sampling length

$$P_a, R_a, W_a = \frac{1}{l} \int_0^l |Z(x)| dx$$

with  $l$  as  $l_p$ ,  $l_r$ , or  $l_w$  according to the case.

Root mean square deviation of the primary profile  $P_q$   
 Root mean square deviation of the roughness profile  $R_q$   
 Root mean square deviation of the waviness profile  $W_q$   
 Root mean square value of the ordinate values  $Z(x)$  within a sampling length

$$P_q, R_q, W_q = \sqrt{\frac{1}{l} \int_0^l Z^2(x) dx}$$

with  $l$  as  $l_p$ ,  $l_r$ , or  $l_w$  according to the case.

Skewness of the primary profile  $P_{sk}$   
 Skewness of the roughness profile  $R_{sk}$   
 Skewness of the waviness profile  $W_{sk}$

Quotient of the mean cube value of the ordinate values  $Z(x)$  and the cube of  $P_q$ ,  $R_q$ , or  $W_q$  respectively, within a sampling length

$$R_{sk} = \frac{1}{R_q^3} \left[ \frac{1}{l_r} \int_0^{l_r} Z^3(x) dx \right]$$

The above equation defines  $R_{sk}$ .  $P_{sk}$  and  $W_{sk}$  are defined in a similar manner.  $P_{sk}$ ,  $R_{sk}$ , and  $W_{sk}$  are measures of the asymmetry of the probability density function of the ordinate values.

Kurtosis of the primary profile  $P_{ku}$   
 Kurtosis of the roughness profile  $R_{ku}$   
 Kurtosis of the waviness profile  $W_{ku}$

Quotient of the mean quartic value of the ordinate values  $Z(x)$  and the fourth power of  $P_q$ ,  $R_q$ , or  $W_q$  respectively, within a sampling length

$$R_{ku} = \frac{1}{R_q^4} \left[ \frac{1}{l_r} \int_0^{l_r} Z^4(x) dx \right]$$

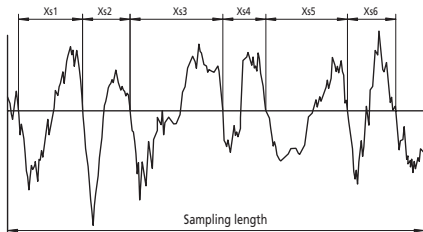
The above equation defines  $R_{ku}$ .  $P_{ku}$  and  $W_{ku}$  are defined in a similar manner.  $P_{ku}$ ,  $R_{ku}$ , and  $W_{ku}$  are measures of the sharpness of the probability density function of the ordinate values.

## Spacing Parameters

Mean width of the primary profile elements  $PS_m$   
 Mean width of the roughness profile elements  $RS_m$   
 Mean width of the waviness profile elements  $WS_m$

Mean value of the profile element widths  $X_s$  within a sampling length

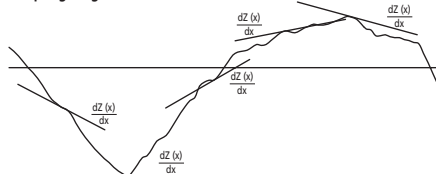
$$PS_m, RS_m, WS_m = \frac{1}{m} \sum_{i=1}^m X_{s_i}$$



## Hybrid Parameters

Root mean square slope of the primary profile  $PA_\lambda$   
 Root mean square slope of the roughness profile  $RA_\lambda$   
 Root mean square slope of the waviness profile  $WA_\lambda$

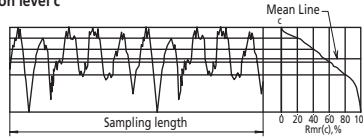
Root mean square value of the ordinate slopes  $dZ/dX$  within a sampling length



## Curves, Probability Density Function, and Related Parameters

Material ratio curve of the profile (Abbott-Firestone curve)

Curve representing the material ratio of the profile as a function of section level  $c$



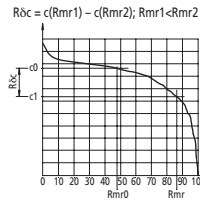
Material ratio of the primary profile  $Pmr(c)$   
 Material ratio of the roughness profile  $Rmr(c)$   
 Material ratio of the waviness profile  $Wmr(c)$

Ratio of the material length of the profile elements  $MI(c)$  at a given level  $c$  to the evaluation length

$$Pmr(c), Rmr(c), Wmr(c) = \frac{MI(c)}{l_n}$$

Section height difference of the primary profile  $Pdc$   
 Section height difference of the roughness profile  $Rdc$   
 Section height difference of the waviness profile  $Wdc$

Vertical distance between two section levels of a given material ratio



Relative material ratio of the primary profile  $Pmr$   
 Relative material ratio of the roughness profile  $Rmr$   
 Relative material ratio of the waviness profile  $Wmr$

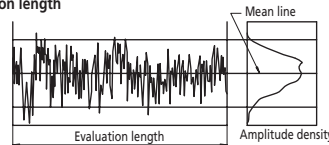
Material ratio determined at a profile section level  $R_0c$  (or  $P_0c$  or  $W_0c$ ), related to the reference section level  $c_0$

$$Pmr, Rmr, Wmr = Pmr(c_1), Rmr(c_1), Wmr(c_1)$$

where  $c_1 = c_0 - R_0c$ ,  $R_0c = Rdc$ ,  $W_0c = Wdc$   
 $c_0 = c(Pm_0, Rm_0, Wm_0)$

Probability density function (profile height amplitude distribution curve)

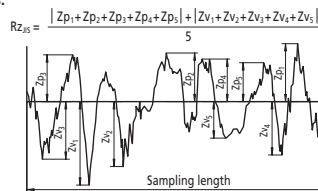
Sample probability density function of the ordinate  $Z(x)$  within the evaluation length



## JIS Specific Parameters

Ten-point height of irregularities,  $Rz_{15}$

Sum of the absolute mean height of the five highest profile peaks and the absolute mean depth of the five deepest profile valleys, measured from the mean line within the sampling length of a roughness profile. This profile is obtained from the primary profile using a phase-correct band-pass filter with cutoff values of  $lc$  and  $ls$ .



Symbol	Used profile
$Rz_{15S2}$	Surface profile as measured
$Rz_{15S4}$	Roughness profile derived from the primary profile using a phase-correct high-pass filter

Arithmetic mean deviation of the profile  $Ra_{75}$

Arithmetic mean of the absolute values of the profile deviations from the mean line within the sampling length of the roughness profile (75%). This profile is obtained from a measurement profile using an analog high-pass filter with an attenuation factor of 12db/octave and a cutoff value of  $\lambda_c$ .

$$Ra_{75} = \frac{1}{l_n} \int_0^{l_n} |Z(x)| dx$$

## Sampling Length for Surface Roughness Parameters

JIS B 0633: 2001 (ISO 4288: 1996)

Table 1: Sampling lengths for aperiodic profile roughness parameters ( $R_a$ ,  $R_q$ ,  $R_{sk}$ ,  $R_{ku}$ ,  $R_{\Delta q}$ ), material ratio curve, probability density function, and related parameters

$R_a$ $\mu m$	Sampling length $l_r$ mm	Evaluation length $l_n$ mm
$(0.006) < R_a \leq 0.02$	0.08	0.4
$0.02 < R_a \leq 0.1$	0.25	1.25
$0.1 < R_a \leq 2$	0.8	4
$2 < R_a \leq 10$	2.5	12.5
$10 < R_a \leq 80$	8	40

Table 2: Sampling lengths for aperiodic profile roughness parameters ( $R_z$ ,  $R_v$ ,  $R_p$ ,  $R_c$ , and  $R_t$ )

$R_z$ $Rz1max$ $\mu m$	Sampling length $l_r$ mm	Evaluation length $l_n$ mm
$(0.025) < R_z, Rz1max \leq 0.1$	0.08	0.4
$0.1 < R_z, Rz1max \leq 0.5$	0.25	1.25
$0.5 < R_z, Rz1max \leq 10$	0.8	4
$10 < R_z, Rz1max \leq 50$	2.5	12.5
$50 < R_z, Rz1max \leq 200$	8	40

1)  $R_z$  is used for measurement of  $R_z$ ,  $R_v$ ,  $R_p$ ,  $R_c$ , and  $R_t$ .  
 2)  $Rz1max$  only used for measurement of  $Rz1max$ ,  $Rv1max$ ,  $Rp1max$ , and  $Rt1max$ .

Table 3: Sampling lengths for measurement of periodic roughness profile roughness parameters and periodic or aperiodic profile parameter  $R_{sm}$

$R_{sm}$ mm	Sampling length $l_r$ mm	Evaluation length $l_n$ mm
$0.013 < R_{sm} \leq 0.04$	0.08	0.4
$0.04 < R_{sm} \leq 0.13$	0.25	1.25
$0.13 < R_{sm} \leq 0.4$	0.8	4
$0.4 < R_{sm} \leq 1.3$	2.5	12.5
$1.3 < R_{sm} \leq 4$	8	40

## Procedure for determining a sampling length if it is not specified

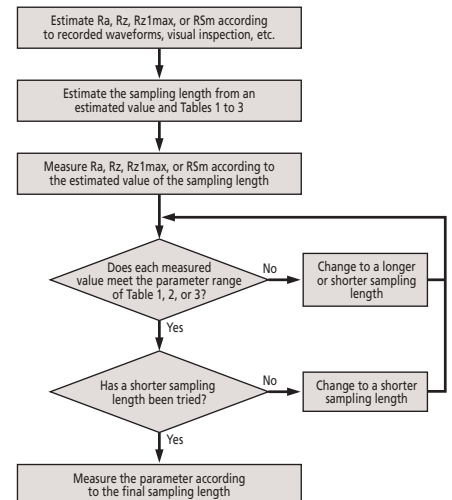


Fig.1 Procedure for determining the sampling length of an aperiodic profile if it is not specified.

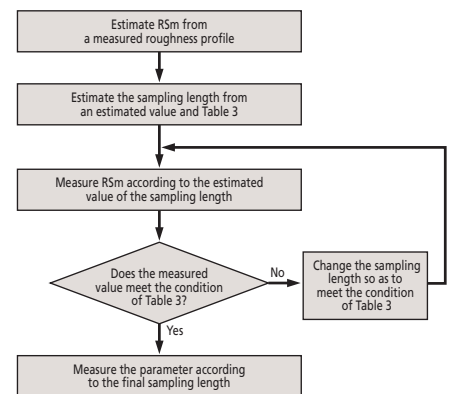


Fig.2 Procedure for determining the sampling length of a periodic profile if it is not specified.

# Contracer CV-1000 / CV-2000

## SERIES 218 — Contour Measuring Instruments

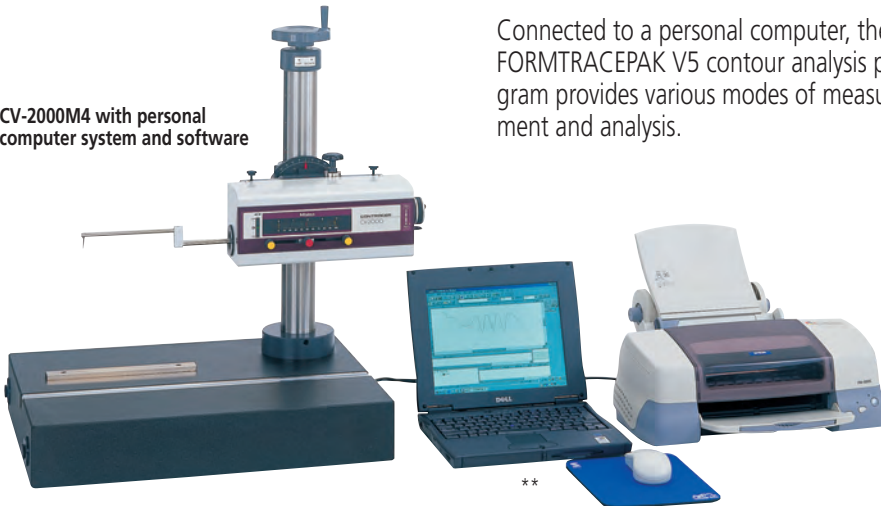
### FEATURES

- The digital arc scale is equipped in the Z-axis detecting unit. This gives you a wider range of measurement with higher resolution. No more reliance on measurement magnifications.
- A data analysis system (personal computer system and software FORMTRACEPAK V5) is available.

CV-2000S4 with personal computer system and software

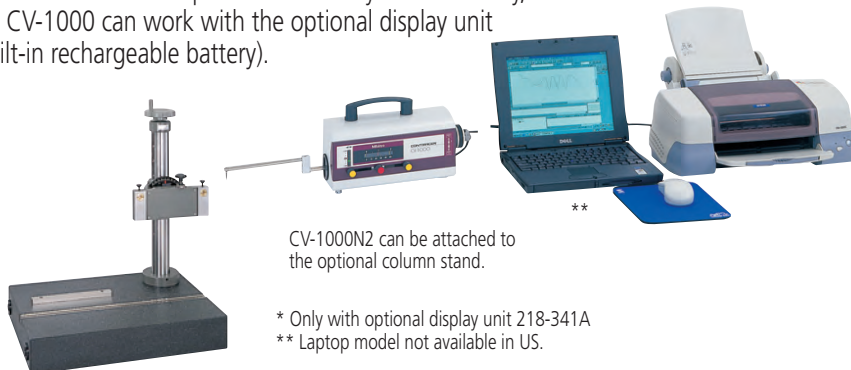


CV-2000M4 with personal computer system and software



Connected to a personal computer, the FORMTRACEPAK V5 contour analysis program provides various modes of measurement and analysis.

\*The CV-1000 is portable and can be carried to the machine-shop for measurement of large workpieces. Even at a site where a power source may not be nearby, the CV-1000 can work with the optional display unit (built-in rechargeable battery).



CV-1000N2 can be attached to the optional column stand.

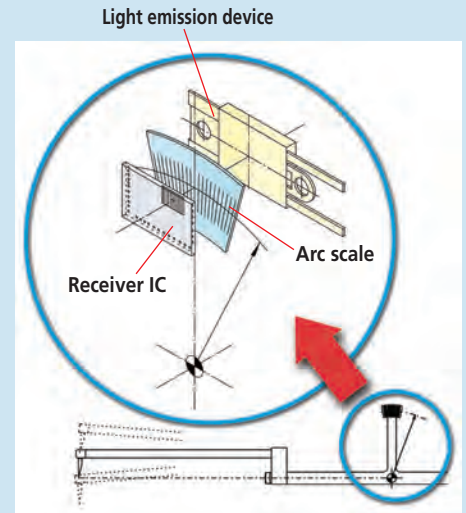
\* Only with optional display unit 218-341A  
 \*\* Laptop model not available in US.

### Technical Data

X1-axis  
 Measuring range: 2" (50mm) (CV-1000) or 4" (100mm) (CV-2000)  
 Resolution: 7.87 $\mu$ m (0.2 $\mu$ m)  
 Measurement method: Reflective-type linear encoder  
 Drive speed: 0.00787"/s, 0.0394"/s (0.2, 1mm/s) and manual  
 Measuring speed: 0.00787"/s, 0.02"/s (0.2, 0.5mm/s)  
 Measuring direction: Pull  
 Traverse linearity: 138 $\mu$ m/2" (3.5 $\mu$ m/50mm) (CV-1000), 138 $\mu$ m/4" (3.5 $\mu$ m/100mm) (CV-2000) \*with the X axis in horizontal orientation  
 Linear displacement:  $\pm(138+20L)\mu$ m  $\pm(3.5+2L/100)\mu$ m \* L = Drive length (mm)  
 Inclining range:  $\pm 45^\circ$  (CV-2000)  
 Z2-axis (column, CV-2000 only)  
 Column type: Power drive (S4 type), Manual (M4 type)  
 Vertical travel: 9.8" (250mm) (S4 type), 12.6" (320mm) (M4 type)  
 Resolution: 7.87 $\mu$ m (0.2 $\mu$ m) (S4 type)  
 Measurement method: ABSOLUTE linear encoder (S4 type)  
 Drive speed: 0 - 0.2"/s (0 - 5mm/s) and manual

Z1-axis (detector unit)  
 Measuring range: 1" (25mm) (CV-1000) or 1.57" (40mm) (CV-2000)  
 Resolution: 0.4 $\mu$ m (CV-1000) or 0.5 $\mu$ m (CV-2000)  
 Measurement method: Arc encoder  
 Linear displacement:  $\pm(138+158h)\mu$ m  $\pm(3.5+14H25)\mu$ m \*H: Measurement height from the horizontal position (mm)  
 Accuracy (at 20°C)  
 Stylus up/down operation: Arc movement  
 Face of stylus: Downward  
 Measuring force: 10 - 30mN  
 Traceable angle: Ascent: 77°, descent: 87° (using the standard stylus provided and depending on the surface roughness)  
 Stylus tip Radius: 25 $\mu$ m, carbide tip  
 Base size (W x H): 23.6 x 17.7" (600 x 450mm) (CV-2000)  
 Base material: Granite (CV-2000)  
 Mass: 11 lbs (5kg) (CV-1000N2), 255 lbs (115.8kg) (CV-2000M4), 273 lbs (124kg) (CV-2000S4)  
 Power supply: 100 - 240VAC  $\pm 10\%$ , 50/60Hz  
 Power consumption: 150W (main unit only)

### Arc scale on the Z-axis



# Contracer CV-1000 / CV-2000

## SERIES 218 — Contour Measuring Instruments

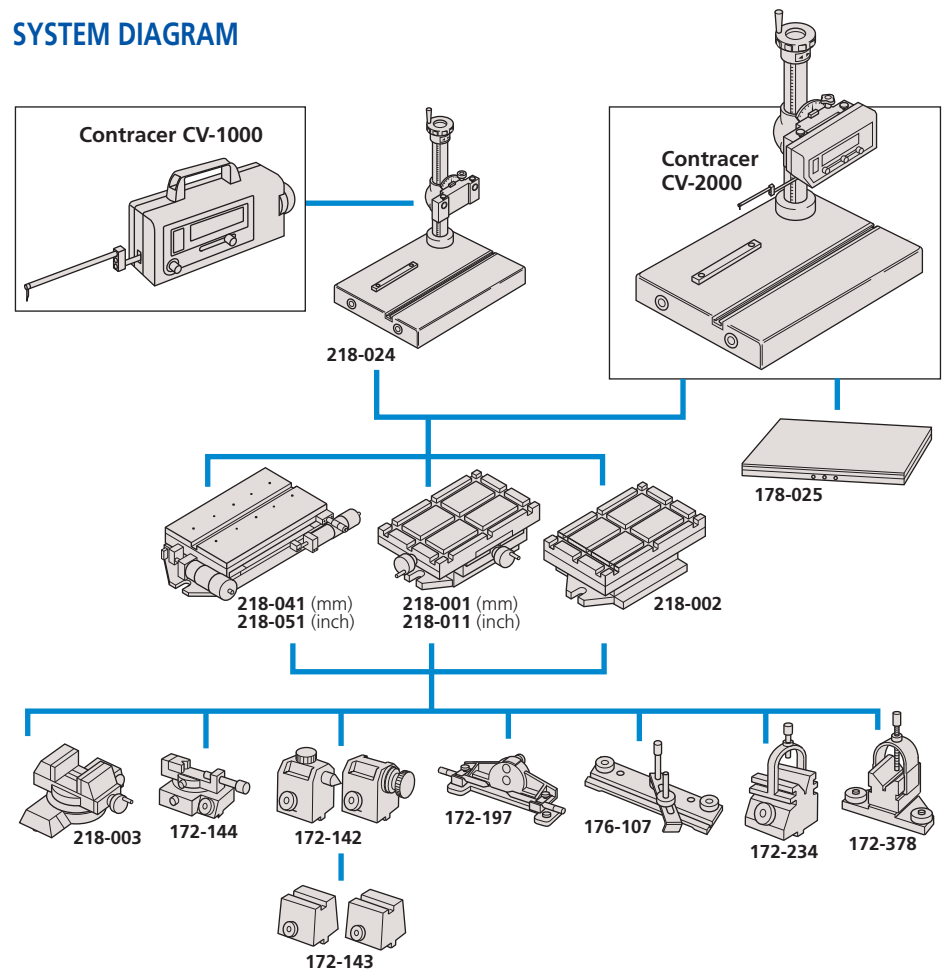
### SPECIFICATIONS

Model No.	CV-1000N2	CV-2000M4	CV-2000S4
Order No. (inch)	<b>218-621A</b>	<b>218-641A</b>	<b>218-642A</b>
X1-axis measuring range	2" (50mm)	4" (100mm)	4" (100mm)
Z1-axis measuring range	1" (25mm)	1.57" (40mm)	1.57" (40mm)
Z2-axis vertical travel	—	12.6" (320mm)	9.84" (250mm)

### Optional Accessories

- 12AAA841:** RAM card
- 218-341A:** Display unit
- 218-024:** Column stand for CV-1000  
(vertical travel: 250mm, inclination:  $\pm 45^\circ$ )
- 218-001:** Cross-travel table (XY range: 100 x 50mm)
- 218-011:** Cross-travel table (XY range: 4" x 2")
- 218-041:** Cross-travel table (XY range: 50 x 25mm)
- 218-051:** Cross-travel table (XY range: 2" x 1")
- 218-002:** Rugged table
- 176-107:** Holder with clamp
- 218-003:** Rotary vise (heavy-duty type)
- 172-144:** Rotary vise
- 172-234:** V-block with clamp  
(Max. workpiece dia.: 50mm)
- 172-378:** V-block with clamp  
(Max. workpiece dia.: 25mm)
- 172-197:** Swivel center support
- 172-142:** Center support
- 172-143:** Center support riser
- 998862:** Pin gage unit for calibration (mm)
- 998861:** Pin gage unit for calibration (inch)
- : Arms and styli (See page J-36.)
- 12AAC766:** Connecting cable for CV-2000
- 12AAE319:** USB communication cable

### SYSTEM DIAGRAM





# Contracer CV-3200 / CV-4500

## SERIES 218 — Contour Measuring Instruments



CV-3200S4 with personal computer system and software

### FEATURES

- Dramatically increased drive speed (X axis: 80 mm/s, Z2 axis: 20 mm/s) further reduces total measurement time.
- In order to maintain the traverse linearity specification for an extended period of time, Mitutoyo has adopted highly rigid ceramic guides that combine the characteristics of smallest secular change and remarkable resistance to abrasion.
- With the support for a wide range of optional peripherals designed for use with the CNC models enables simplified CNC measurement.
- The drive unit (X-axis) and column (Z2-axis) are equipped with a high-accuracy linear encoders (ABS type on Z2-axis). This improves reproducibility of continuous automatic measurement of small holes in the vertical direction and repeated measurement of parts which are difficult to position.
- A newly designed straight arm has reduced interference on the workpiece and expanded the measurement range in the Z1 axis (height) direction.
- One-touch mounting and removal of the arm.
- X1-axis accuracy:  $\pm(0.8+0.01L)\mu\text{m}^*$   
Z1-axis accuracy:  $\pm(1.6+12HI/100)\mu\text{m}$   
Designed to handle workpieces calling for high accuracy.

\* CV-3200S4, H4, W4 types, L = Drive length, H = Measurement height (mm)

With the addition of a new function for continuously measuring top and bottom faces, the variable measuring force function has become more useful, enabling a wide variety of efficient, high-precision measurements.

- When combined with the double cone-end stylus (a new product with diametrically opposed contact points), the instrument can continuously measure in the upward and downward directions without the need to change the arm orientation or reset the workpiece fixturing.
- The measuring force can be switched among five levels (upward and downward) from the data-processing program (Formtracepak).
- High-precision and high-speed drive has been achieved, significantly improving measurement efficiency.
- A newly designed straight arm has reduced interference on the workpiece and expanded the measurement range in the Z1 axis (height) direction.
- One-touch mounting and removal of the arm.



### Technical Data

X-axis	
Measuring range:	4" (100mm) or 8" (200mm)
Resolution:	1.97 $\mu\text{m}$ (0.05 $\mu\text{m}$ )
Measurement method:	Reflective-type linear encoder
Drive speed:	3.15"/s (80mm/s) and manual
Measuring speed:	0.0008 - 0.02"/s (0.02 - 5mm/s)
Measuring direction:	Push/Pull
Traverse linearity:	32 $\mu\text{m}/4"$ , 80 $\mu\text{m}/8"$ (0.8 $\mu\text{m}/100\text{mm}$ , 2 $\mu\text{m}/200\text{mm}$ ) *with the X axis in horizontal orientation
Linear displacement:	(31.5+10L) $\mu\text{m}$ { $\pm(0.8+0.01L)\mu\text{m}$ } (CV-3200S4, H4, W4)
Accuracy (at 20°C)	(32+10L) $\mu\text{m}$ { $\pm(0.8+0.01L)\mu\text{m}$ } (CV-4500S4, H4, W4) (31.5+20L) $\mu\text{m}$ { $\pm(0.8+0.02L)\mu\text{m}$ } (CV-3200S8, H8, W8) (32+20L) $\mu\text{m}$ { $\pm(0.8+0.02L)\mu\text{m}$ } (CV-4500S8, H8, W8) * L = Drive length (mm)
Inclining range:	$\pm 45^\circ$
Z2-axis (column)	
Vertical travel:	10" (300mm) or 20" (500mm)
Resolution:	39.4 $\mu\text{m}$ (1 $\mu\text{m}$ )
Measurement method:	ABSOLUTE linear encoder
Drive speed:	0 - 1.2"/s (0 - 30mm/s) and manual
Z1-axis (detector unit)	
Measuring range:	$\pm 2.4"$ ( $\pm 30\text{mm}$ )
Resolution:	1.57 $\mu\text{m}$ (.04 $\mu\text{m}$ ) (CV-3200 series), .78 $\mu\text{m}$ (0.02 $\mu\text{m}$ ) (CV-4500 series)
Measurement method:	Rotary arc encoder (CV-3200 series), (CV-4500 series)
Linear displacement:	$\pm(63+120H)\mu\text{m}$ { $\pm(1.6+12HI/100)\mu\text{m}$ } (CV-3200 series)
Accuracy (at 20°C)	$\pm(32+120H)\mu\text{m}$ { $\pm(0.8+12HI/100)\mu\text{m}$ } (CV-4500 series) *H: Measurement height from the horizontal position (mm)
Stylus up/down operation:	Arc movement
Face of stylus:	Upward/downward
Measuring force:	30mN (CV-3200)
Measuring force:	10, 20, 30, 40, 50mN (CV-4500) (Specified from the data-processing program Formtracepak)
Traceable angle:	Ascent: 77°, descent: 87° (using the standard stylus provided and depending on the surface roughness)
Stylus tip	
Base size (W x H):	Radius: 25 $\mu\text{m}$ , carbide tip 17.7" x 23.6" (450 x 600mm) or 39.4 x 17.7 (1000 x 450mm)
Base material:	
Mass	Granite
Main unit:	309lbs (140kg) (S4), 331lbs (150kg) (H4), 485lbs (220kg) (W4) 309lbs (140kg) (S8), 331lbs (155kg) (H8), 485lbs (220kg) (W8) 31lbs (14kg)
Controller Unit:	31lbs (14kg)
Remote Control Box:	2lbs (0.9kg)
Power supply:	100 - 240VAC $\pm 10\%$ , 50/60Hz
Power consumption:	400W (main unit only)

### Collective Calibration Function

- A dedicated calibration gage enables the user to calibrate the instrument for Z-axis gain, symmetry, stylus-tip radius, etc. in a single procedure.



Calibration Kit:  
12AAM113

# Contracer CV-3200 / CV-4500

## SERIES 218 — Contour Measuring Instruments

**MiCAT**

Mitutoyo Intelligent Computer Aided Technology

the standard in world  
metrology software  
**FORM**

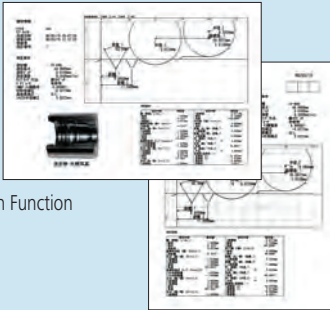
### Optional Software FORMTRACEPAK V5



Measurement Control Screen

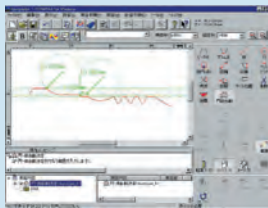


Profile Analysis Screen

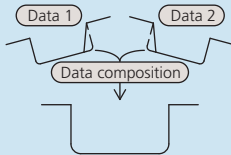


Report Creation Function

### Automatic Circle/Line Application Function



### Data Composition Function



### SPECIFICATIONS

Model No.	CV-3200S4	CV-3200H4	CV-3200W4
Order No. (inch)	<b>218-491A</b>	<b>218-492A</b>	<b>218-493A</b>
Model No.	CV-4500S4	CV-4500H4	CV-4500W4
Order No. (inch)	<b>218-451A</b>	<b>218-452A</b>	<b>218-453A</b>
X1-axis measuring range	4" (100mm)	4" (100mm)	4" (100mm)
Vertical travel	12" power column	20" power column	20" power column
Granite base size (WxD)	23.6 x 17.7" (600 x 450mm)	23.6 x 17.7" (600 x 450mm)	39.4 x 17.7" (1000 x 450mm)
Dimensions (main unit, WxDxH)	29.2 x 17.7 x 35.6" (741 x 450 x 905mm)	29.2 x 17.7 x 43.5" (741 x 450 x 1105mm)	44.0 x 17.7 x 43.7" (1118 x 450 x 1111mm)
Mass (main unit)	309 lbs (140kg)	331 lbs (150kg)	485 lbs (220kg)

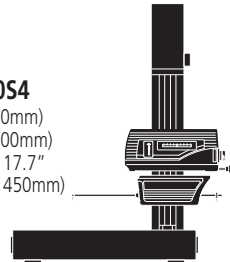
Model No.	CV-3200S8	CV-3200H8	CV-3200W8
Order No. (inch)	<b>218-496A</b>	<b>218-497A</b>	<b>218-498A</b>
Model No.	CV-4500S8	CV-4500H8	CV-4500W8
Order No. (inch)	<b>218-456A</b>	<b>218-457A</b>	<b>218-458A</b>
X1-axis measuring range	8" (200mm)	8" (200mm)	8" (200mm)
Vertical travel	12" power column	20" power column	20" power column
Granite base size (WxD)	23.6 x 17.7" (600 x 450mm)	23.6 x 17.7" (600 x 450mm)	39.4 x 17.7" (1000 x 450mm)
Dimensions (main unit, WxDxH)	30.2 x 19 x 38" (767 x 482 x 966mm)	30.2 x 19 x 46" (767 x 482 x 1166mm)	45.9" x 19 x 46.3" (1166 x 482 x 1176mm)
Mass (main unit)	309 lbs (140kg)	331 lbs (150kg)	485 lbs (220kg)

### A variety of models available for measuring requirements

#### CV-3200S4 / CV-4500S4

Traverse range: 4" (100mm)  
Vertical travel: 12" (300mm)  
Base size (W x D): 23.6 x 17.7"  
(600 x 450mm)

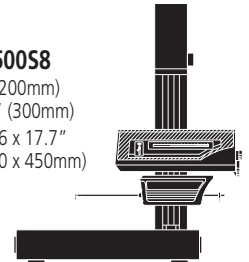
Base material: Granite



#### CV-3200S8 / CV-4500S8

Traverse range: 8" (200mm)  
Vertical travel: 12" (300mm)  
Base size (W x D): 23.6 x 17.7"  
(600 x 450mm)

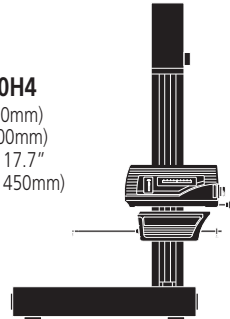
Base material: Granite



#### CV-3200H4 / CV-4500H4

Traverse range: 4" (100mm)  
Vertical travel: 20" (500mm)  
Base size (W x D): 23.6 x 17.7"  
(600 x 450mm)

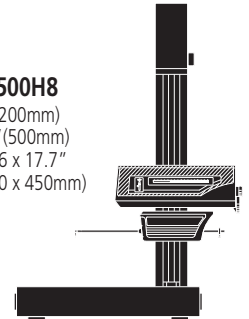
Base material: Granite



#### CV-3200H8 / CV-4500H8

Traverse range: 8" (200mm)  
Vertical travel: 20" (500mm)  
Base size (W x D): 23.6 x 17.7"  
(600 x 450mm)

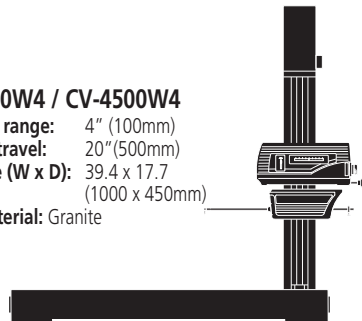
Base material: Granite



#### CV-3200W4 / CV-4500W4

Traverse range: 4" (100mm)  
Vertical travel: 20" (500mm)  
Base size (W x D): 39.4 x 17.7"  
(1000 x 450mm)

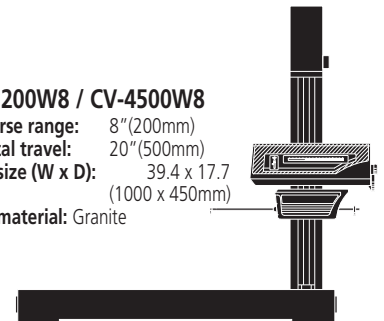
Base material: Granite



#### CV-3200W8 / CV-4500W8

Traverse range: 8" (200mm)  
Vertical travel: 20" (500mm)  
Base size (W x D): 39.4 x 17.7"  
(1000 x 450mm)

Base material: Granite



# Contracer Extreme CV-3000CNC / CV-4000CNC

## SERIES 218 — CNC Contour Measuring Instruments



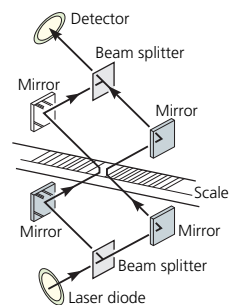
CV-3000CNC with personal computer system and software

\* PC stand not included

### FEATURES

- High-accuracy CNC contour / form measuring instrument.
- X1, (Y), and Z2 axes have a maximum drive speed of 200 mm/s, which permits high-speed positioning that may result in a large increase in the throughput of multiple-profile / multiple-workpiece measurement tasks.
- For models with the  $\alpha$ -axis, it is possible to perform continuous measurement over horizontal and inclined surfaces by power-tilting the X1 axis.
- The detector unit of CV-4000CNC series is equipped with a Laser Hologage detector giving excellent narrow/wide range accuracy and resolution in the Z axis (vertical).
- For models with the Y-axis table, it is possible to expand the measuring range for multiple workpieces, etc., through positioning in the Y-axis direction.
- Enables inclined plane measurements through 2-axis simultaneous control in the X- and Y-axis directions.
- Since the Z1-axis detector incorporates an anti-collision safety device, the detector unit will automatically stop even if its main body collides with a workpiece or jig.
- Supplied with an easy-to-operate Remote Box, the user can make any movement by selecting the required axis using the two joysticks. The current axis selection is easily identified by the icon on the key top.
- Communication with the Data Processing / Analysis section is via USB.

### Principle of Operation



Mitutoyo's innovative Laser Hologage technology provides near interferometer-grade accuracy using the interference phenomenon of diffracted light, coupled with a resolution of 0.05 $\mu$ m over the entire detecting range of 50mm.

### Technical Data

<b>X1-axis</b>	
Measuring range:	8" (200mm)
Resolution:	1.97 $\mu$ m (0.05 $\mu$ m)
Measurement method:	Reflective-type linear encoder
Drive speed:	Max. 200mm/s (CNC)
	0 - 2"/s (0 - 50mm/s) (joystick)
Measuring speed:	0.0008 - 0.08"/s (0.02 - 2mm/s)
Measuring direction:	Push/Pull
Traverse linearity:	80 $\mu$ m/8" (2 $\mu$ m/200mm) *with the X axis in horizontal orientation
Linear displacement accuracy (at 20°C):	$\pm(40+20L)\mu$ m * L = Drive length (mm) $\pm(1+4L/200)\mu$ m
<b><math>\alpha</math>-axis</b>	
Inclination angle:	-45° to +10°
Resolution:	0.000225°
Rotating speed:	1rpm
<b>Z2-axis (column)</b>	
Vertical travel:	12" (300mm) or 20" (500mm)
Resolution:	1.97 $\mu$ m (0.05 $\mu$ m)
Measurement method:	Reflective-type linear encoder
Drive speed:	Max. 7.87"/s (200mm/s) (CNC)
	0 - 2"/s (0 - 50mm/s) (joystick)
<b>Z1-axis (detector unit)</b>	
Measuring range:	$\pm 1"$ ( $\pm 25$ mm)
Resolution:	0.008 $\mu$ m (0.2 $\mu$ m) (CV-3000CNC), 1.97 $\mu$ m (0.05 $\mu$ m) (CV-4000CNC)
Measurement method:	Linear encoder (CV-3000CNC), laser hologage (CV-4000CNC)
Linear displacement:	$\pm (120+40H)\mu$ m ( $\pm(3+12H/25)\mu$ m) (CV-3000CNC)
Accuracy (at 20°C)	$\pm (32+110H)\mu$ m ( $\pm(0.8+10.5H/25)\mu$ m) (CV-4000CNC) *H: Measurement height from the horizontal position (mm)
Stylus up/down operation:	Arc movement
Face of stylus:	Upward/downward
Measuring force:	30mN
Traceable angle:	Ascent: 70°, descent: 70° (using the standard stylus provided and depending on the surface roughness)
Stylus tip	Radius: 25 $\mu$ m, carbide tip
Base size (W x H):	29.5 x 23.6" (750 x 600mm)
Base material:	Granite
Mass:	529 lbs, 551 lbs (240kg, 250kg) (high column type)
Power supply:	100 - 240VAC $\pm 10\%$ , 50/60Hz
Power consumption:	400W (main unit only)

# Contracer Extreme CV-3000CNC / CV-4000CNC

## SERIES 218 — CNC Contour Measuring Instruments

### SPECIFICATIONS



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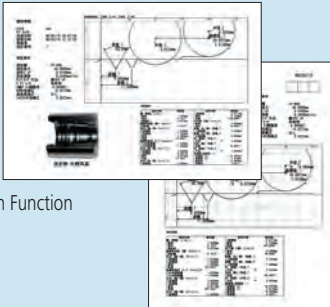
#### Optional Software FORMTRACEPAK V5



Measurement Control Screen

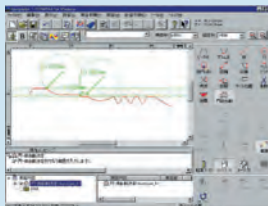


Profile Analysis Screen

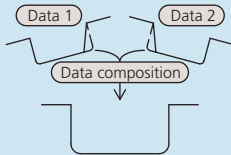


Report Creation Function

#### Automatic Circle/Line Application Function



#### Data Composition Function



Model No.	CV-3000CNC	CV-3000CNC	CV-3000CNC	CV-3000CNC
<b>Order No. (100V - 120V)</b>	<b>218-521-1</b>	<b>218-522-1</b>	<b>218-523-1</b>	<b>218-524-1</b>
X1-axis measuring range	8" (200mm)	8" (200mm)	8" (200mm)	8" (200mm)
Z2-axis vertical travel	12" (300mm)	12" (300mm)	12" (300mm)	12" (300mm)
Y-axis table unit	—	—	Installed	Installed
α-axis unit	—	Installed	—	Installed
Granite base size (WxD)	29.5 x 23.6" (750 x 600mm)	29.5 x 23.6" (750 x 600mm)	29.5 x 23.6" (750 x 600mm)	29.5 x 23.6" (750 x 600mm)
Dimensions (main unit, WxDxH)	31.5 x 24.4 x 39.4" (800 x 620 x 1000mm)	31.5 x 24.4 x 39.4" (800 x 620 x 1000mm)	31.5 x 24.4 x 39.4" (800 x 620 x 1000mm)	31.5 x 24.4 x 39.4" (800 x 620 x 1000mm)
Mass (main unit)	529 lbs (240kg)	529 lbs (240kg)	529 lbs (240kg)	529 lbs (240kg)

Model No.	CV-3000CNC	CV-3000CNC	CV-3000CNC	CV-3000CNC
<b>Order No. (100V - 120V)</b>	<b>218-541-1</b>	<b>218-542-1</b>	<b>218-543-1</b>	<b>218-544-1</b>
X1-axis measuring range	8" (200mm)	8" (200mm)	8" (200mm)	8" (200mm)
Z2-axis vertical travel	20" (500mm)	20" (500mm)	20" (500mm)	20" (500mm)
Y-axis table unit	—	—	Installed	Installed
α-axis unit	—	Installed	—	Installed
Granite base size (WxD)	29.5 x 23.6" (750 x 600mm)	29.5 x 23.6" (750 x 600mm)	29.5 x 23.6" (750 x 600mm)	29.5 x 23.6" (750 x 600mm)
Dimensions (main unit, WxDxH)	31.5 x 24.4 x 47.2" (800 x 620 x 1200mm)	31.5 x 24.4 x 47.2" (800 x 620 x 1200mm)	31.5 x 24.4 x 47.2" (800 x 620 x 1200mm)	31.5 x 24.4 x 47.2" (800 x 620 x 1200mm)
Mass (main unit)	551 lbs (250kg)	551 lbs (250kg)	551 lbs (250kg)	551 lbs (250kg)

Model No.	CV-4000CNC	CV-4000CNC	CV-4000CNC	CV-4000CNC
<b>Order No. (100V - 120V)</b>	<b>218-561-1</b>	<b>218-562-1</b>	<b>218-563-1</b>	<b>218-564-1</b>
X1-axis measuring range	8" (200mm)	8" (200mm)	8" (200mm)	8" (200mm)
Z2-axis vertical travel	12" (300mm)	12" (300mm)	12" (300mm)	12" (300mm)
Y-axis table unit	—	—	Installed	Installed
α-axis unit	—	Installed	—	Installed
Granite base size (WxD)	29.5 x 23.6" (750 x 600mm)	29.5 x 23.6" (750 x 600mm)	29.5 x 23.6" (750 x 600mm)	29.5 x 23.6" (750 x 600mm)
Dimensions (main unit, WxDxH)	31.5 x 24.4 x 39.4" (800 x 620 x 1000mm)	31.5 x 24.4 x 39.4" (800 x 620 x 1000mm)	31.5 x 24.4 x 39.4" (800 x 620 x 1000mm)	31.5 x 24.4 x 39.4" (800 x 620 x 1000mm)
Mass (main unit)	529 lbs (240kg)	529 lbs (240kg)	529 lbs (240kg)	529 lbs (240kg)

Model No.	CV-4000CNC	CV-4000CNC	CV-4000CNC	CV-4000CNC
<b>Order No. (100V - 120V)</b>	<b>218-581-1</b>	<b>218-582-1</b>	<b>218-583-1</b>	<b>218-584-1</b>
X1-axis measuring range	8" (200mm)	8" (200mm)	8" (200mm)	8" (200mm)
Z2-axis vertical travel	20" (500mm)	20" (500mm)	20" (500mm)	20" (500mm)
Y-axis table unit	—	—	Installed	Installed
α-axis unit	—	Installed	—	Installed
Granite base size (WxD)	29.5 x 23.6" (750 x 600mm)	29.5 x 23.6" (750 x 600mm)	29.5 x 23.6" (750 x 600mm)	29.5 x 23.6" (750 x 600mm)
Dimensions (main unit, WxDxH)	31.5 x 24.4 x 47.2" (800 x 620 x 1200mm)	31.5 x 24.4 x 47.2" (800 x 620 x 1200mm)	31.5 x 24.4 x 47.2" (800 x 620 x 1200mm)	31.5 x 24.4 x 47.2" (800 x 620 x 1200mm)
Mass (main unit)	551 lbs (250kg)	551 lbs (250kg)	551 lbs (250kg)	551 lbs (250kg)

#### Optional Accessories

##### Vibration isolation stand

Vibration isolation mechanism: Diaphragm air spring  
 Natural frequency: 2.5 - 3.5Hz  
 Damping mechanism: Orifice  
 Leveling mechanism: Automatic control with mechanical valves  
 Air supply pressure: 390kPa  
 Allowable loading capacity: 772 lbs (350kg)  
 Dimensions (W x D x H): 39.4 x 35.2 x 28.1" (1000 x 895 x 715mm)  
 Mass: 617 lbs (280kg)

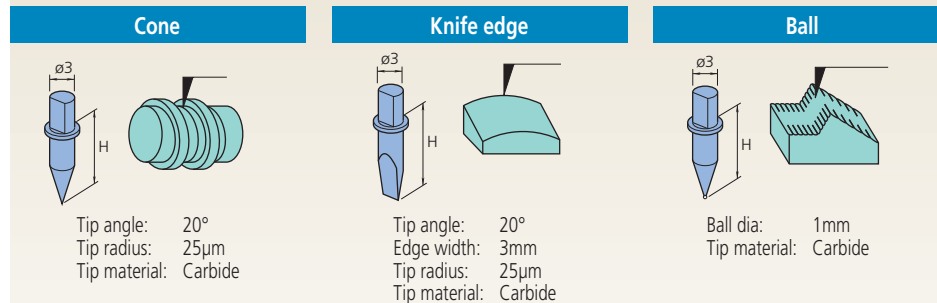
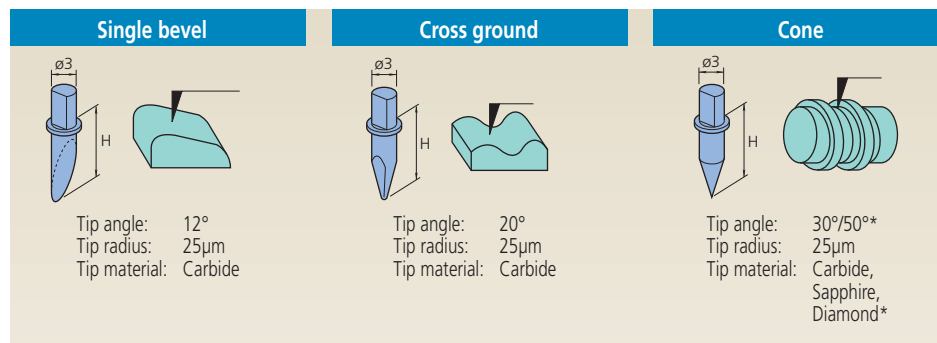
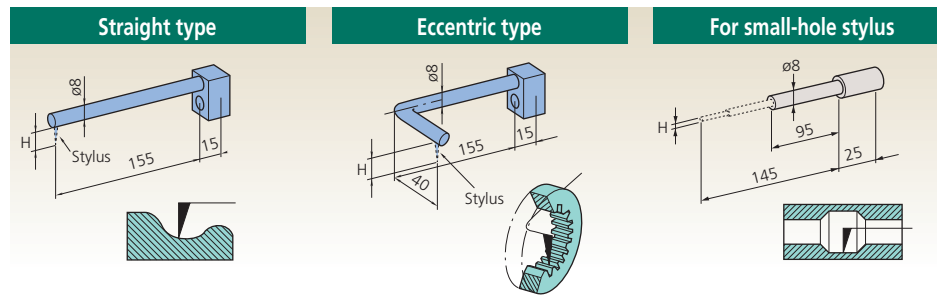
##### Y-axis table unit

Measuring range: 8" (200mm)  
 Minimum reading: 1.97μm (0.05μm)

Scale unit: Reflective-type Linear Encoder  
 Drive speed: Max. 7.87"/s(200mm/s) (CNC)  
 0 - 2"/s (0 - 50mm/s) (joystick)  
 Maximum loading capacity: 44 lbs (20 kg)  
 Traverse linearity: 20 μin/8" (0.5μm/200mm) (surface roughness)  
 80 μin/ 8" (2μm/200mm) (contour)  
 Linear displacement accuracy (at 20°C): ± (80+20L) μin {±(2+2L/100)μm} contour mode  
 L: Dimension between two measured points (mm)  
 Table size: 7.8" x 7.8" (200 x 200mm)  
 Dimensions (W x D x H): 12.6 x 25.4 x 4.1" (320 x 646 x 105mm)  
 Mass: 77 lbs (35kg)

# Optional Arms and Styli for Contour Measurement

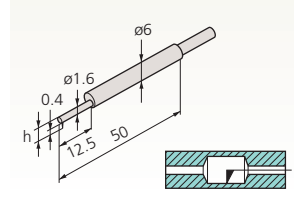
For CV-1000 and CV-2000



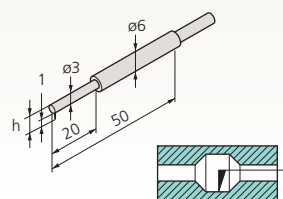
Small hole: 932693 / 12AAE873

Small hole: 932694 / 12AAE874

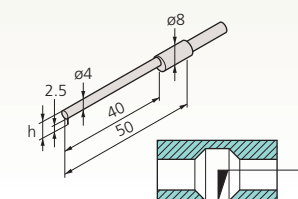
Small hole: 932695 / 12AAE875



**932693**    **12AAE873**  
 Tip shape: Single bevel    Cone  
 Tip angle: 20°    30°  
 Tip radius: 25µm    25µm  
 Tip material: Carbide    Carbide



**932694**    **12AAE874**  
 Tip shape: Single bevel    Cone  
 Tip angle: 20°    30°  
 Tip radius: 25µm    25µm  
 Tip material: Carbide    Carbide



**932695**    **12AAE875**  
 Tip shape: Single bevel    Cone  
 Tip angle: 20°    30°  
 Tip radius: 25µm    25µm  
 Tip material: Carbide    Carbide

## List of Applicable Arms

Arm name	Order No.	Compatible stylus height
Straight type	935111	H = 6mm
	935112	H = 12mm
	935113	H = 20mm
	935114	H = 30mm
	935115	H = 42mm
Eccentric type	935116	H = 6mm
	935117	H = 12mm
	935118	H = 20mm
	935119	H = 30mm
	935120	H = 42mm
Small hole	935110	H = 0.4, 1, 2.5mm

## List of Applicable Styli

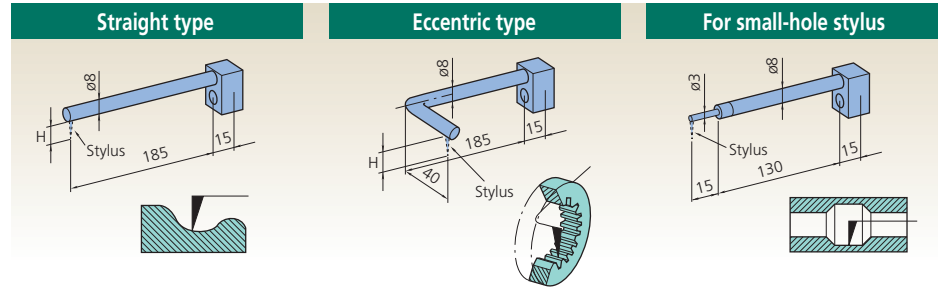
Stylus name	Order No.	Stylus height
Single-bevel stylus carbide-tipped	354882	H = 6mm
	354883	H = 12mm
	354884	H = 20mm
	354885	H = 30mm
	354886	H = 42mm
Cross-ground stylus carbide-tipped	354887	H = 6mm
	354888	H = 12mm
	354889	H = 20mm
	354890	H = 30mm
	354891	H = 42mm
Cone stylus carbide-tipped tip angle 20°	12AAE865	H = 6mm
	12AAE866	H = 12mm
	12AAE867	H = 20mm
	12AAE868	H = 30mm
	12AAE869	H = 42mm
Cone stylus sapphire tipped tip angle 30° *Diamond tipped *tip angle 50°	354892	H = 6mm
	354893	H = 12mm
	354894	H = 20mm
	355129*	H = 20mm
	354895	H = 30mm
Cone stylus carbide-tipped tip angle 30°	354896	H = 42mm
	12AAA566	H = 6mm
	12AAA567	H = 12mm
	12AAA568	H = 20mm
	12AAA569	H = 30mm
Knife-edge stylus carbide-tipped	12AAA570	H = 42mm
	354897	H = 6mm
	354898	H = 12mm
	354899	H = 20mm
	354900	H = 30mm
Ball stylus carbide-tipped	354901	H = 42mm
	354902	H = 6mm
	354903	H = 12mm
	354904	H = 20mm
	354905	H = 30mm
Small-hole stylus carbide-tipped single bevel	354906	H = 42mm
	932693	H = 2mm
	932694	H = 4mm
Small-hole stylus carbide-tipped cone	932695	H = 6.5mm
	12AAE873	H = 2mm
	12AAE874	H = 4mm
	12AAE875	H = 6.5mm

# Optional Arms and Styli for Contour Measurement

## List of Applicable Arms

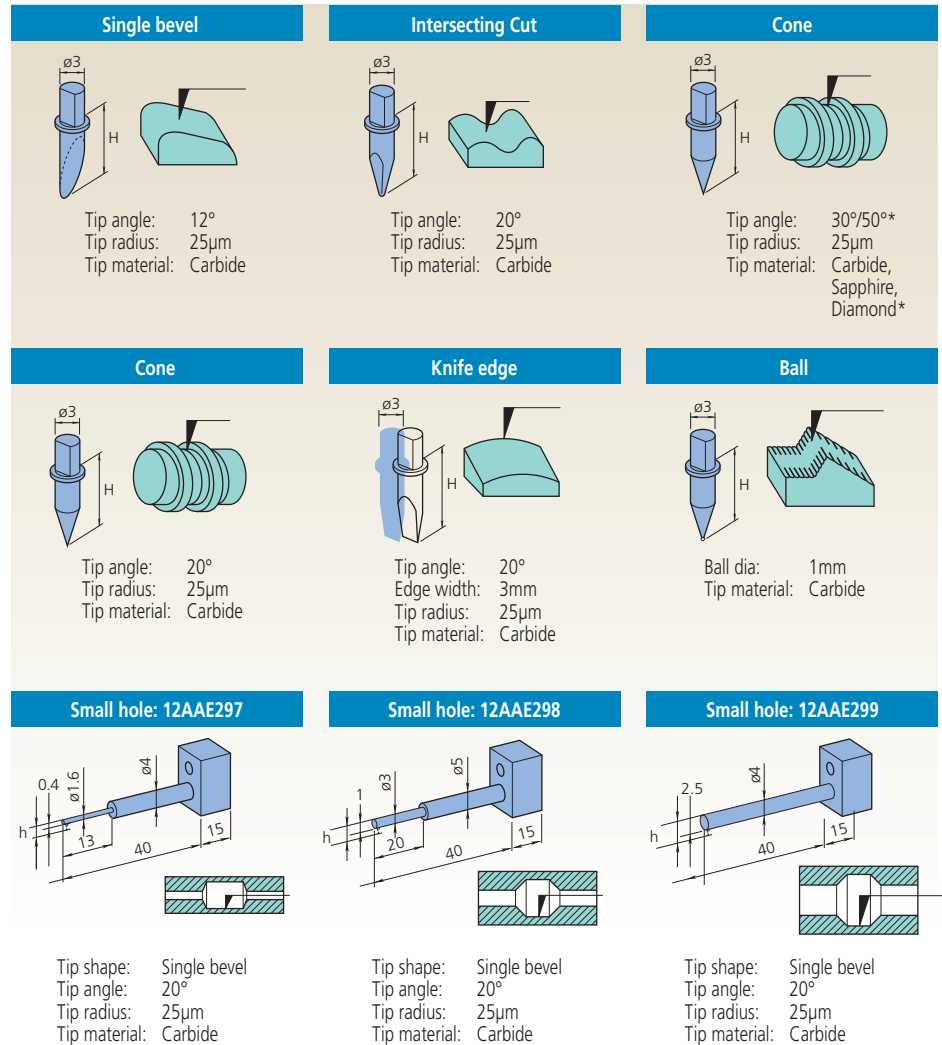
Arm name	Order No.	Compatible stylus height
Straight type	12AAE294	H = 6mm
	12AAE295	H = 12mm
	996506	H = 20mm
	996507	H = 30mm
	996508	H = 42mm
Eccentric type	996509	H = 6mm
	996510	H = 12mm
	996511	H = 20mm
	996512	H = 30mm
	996513	H = 42mm
Small hole	12AAE296	Small-hole stylus

(For CV-3200, CV-4500 see page J-40), CV-3000CNC, CV-4000CNC, SV-C3000CNC and SV-C4000CNC



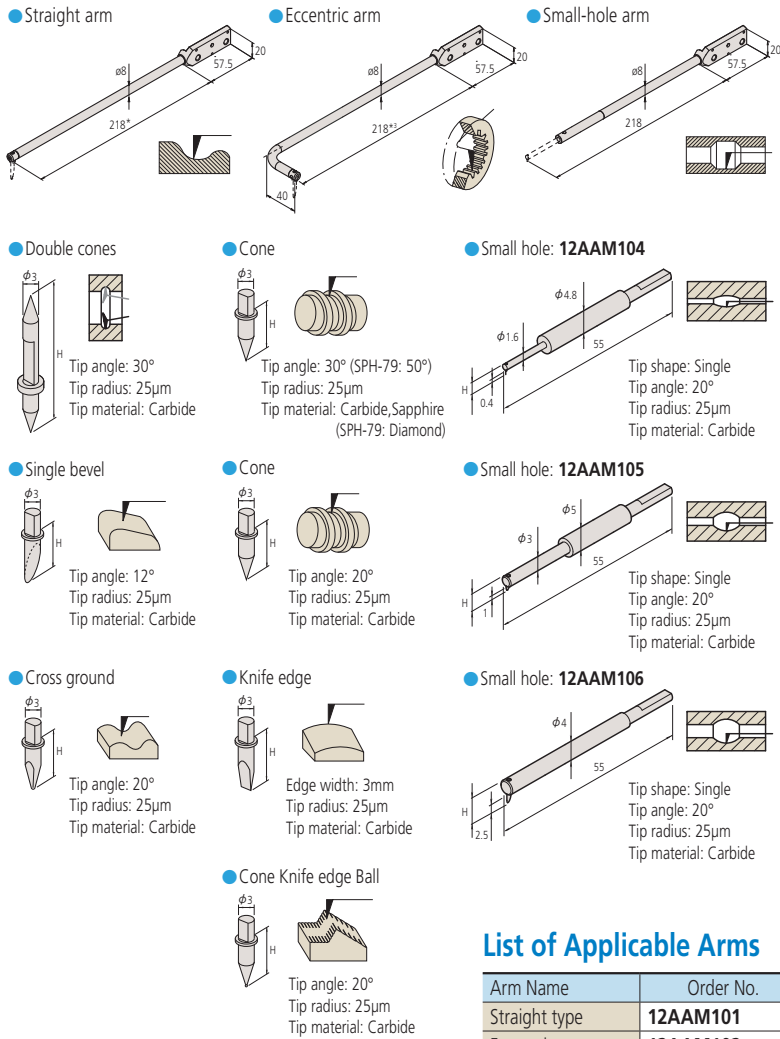
## List of Applicable Styli

Stylus name	Order No.	Stylus height
One-sided cut stylus carbide-tipped	354882	H = 6mm
	354883	H = 12mm
	354884	H = 20mm
	354885	H = 30mm
	354886	H = 42mm
Intersecting cut stylus carbide-tipped	354887	H = 6mm
	354888	H = 12mm
	354889	H = 20mm
	354890	H = 30mm
	354891	H = 42mm
Cone stylus carbide-tipped tip angle 20°	12AAE865	H = 6mm
	12AAE866	H = 12mm
	12AAE867	H = 20mm
	12AAE868	H = 30mm
	12AAE869	H = 42mm
Cone stylus sapphire tipped tip angle 30° *Diamond tipped *tip angle 50°	354892	H = 6mm
	354893	H = 12mm
	354894	H = 20mm
	355129*	H = 20mm
	354895	H = 30mm
Cone stylus carbide-tipped tip angle 30°	12AAA566	H = 6mm
	12AAA567	H = 12mm
	12AAA568	H = 20mm
	12AAA569	H = 30mm
	12AAA570	H = 42mm
Knife-edge stylus carbide-tipped	354897	H = 6mm
	354898	H = 12mm
	354899	H = 20mm
	354900	H = 30mm
	354901	H = 42mm
Ball stylus carbide-tipped	354902	H = 6mm
	354903	H = 12mm
	354904	H = 20mm
	354905	H = 30mm
	354906	H = 42mm
Small-hole stylus carbide-tipped single bevel	12AAE297	H = 2mm
	12AAE298	H = 4mm
	12AAE299	H = 6.5mm
Small-hole stylus carbide-tipped cone	12AAE870	H = 2mm
	12AAE871	H = 4mm
	12AAE872	H = 6.5mm



• Any specified arm and stylus other than above listed can be custom-made to special order.

# Optional Arms and Styli for Contour Measurement For CV-3200/4500



## List of Applicable Arms

Arm Name	Order No.
Straight type	12AAM101
Eccentric type	12AAM102
Small hole	12AAM103

\*1: Standard accessory  
 \*2: Stylus for CV-4500 series  
 \*3: One-sided cut stylus SPH-71 (standard accessory) mounting

## List of Applicable Styli

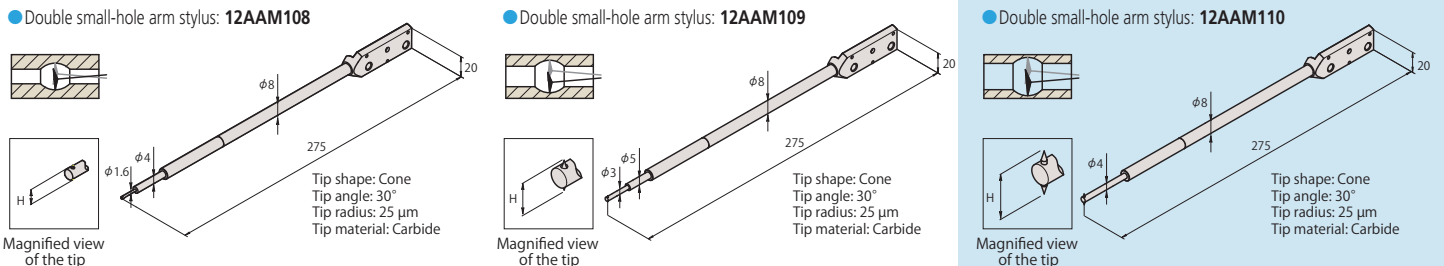
Stylus Name	Order No.	H (mm)
Double cones stylus *4	12AAM095 *5	20
	12AAM096	32
	12AAM097	48
Single-bevel stylus carbide-tipped	354882	6
	354883	12
	354884 *6	20
	354885	30
	354886	42
Cross-ground stylus carbide-tipped	354887	6
	354888	12
	354889	20
	354890	30
	354891	42
Cone stylus sapphire tipped tip angle 30°	354892	6
	354893	12
	354894	20
	354895	30
	354896	42
Cone stylus carbide-tipped tip angle 30°	12AAA566	6
	12AAA567	12
	12AAA568	20
	12AAA569	30
	12AAA570	42
Cone stylus carbide-tipped tip angle 20°	12AAE865	6
	12AAE866	12
	12AAE867	20
	12AAE868	30
Cone stylus diamond tipped tip angle 50°	355129	20
Knife-edge stylus carbide-tipped	354897	6
	354898	12
	354899	20
	354900	30
	354901	42
Ball stylus carbide-tipped	354902	6
	354903	12
	354904	20
	354905	30
	354906	42
Small-hole stylus *7	12AAM104	2
	12AAM105	4
	12AAM106	6.5

\*4: Stylus for CV-4500 series  
 \*5: Standard accessory of CV-4500 series  
 \*6: Standard accessory of CV-3200 series  
 \*7: Styli SPH-21, 22, and 23 for CV-3100/4100 series are not available.

## Arm stylus (integrated arm and stylus) only for CV-4500

Arm stylus name	Order No.	H (mm)
Double small-hole arm stylus *8	12AAM108	2.4
	12AAM109	5
	12AAM110	9

\*8: Arm Stylus for CV-4500 series



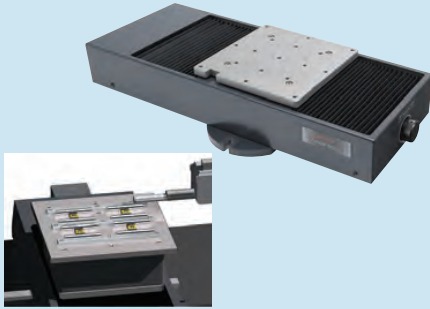
# Optional Accessories for Automatic Measurement

Compatible with CV-3200, CV-4500 and CNC Models

## Y-axis table\*: 178-097

Enables efficient, automatic measurement of multiple aligned workpieces and multiple points on a single measurement surface.

\* available as a factory set accessory for CNC model.

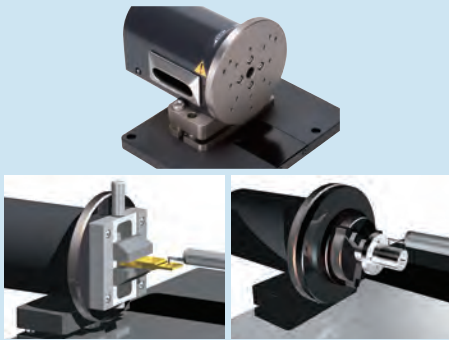


Travel range	7.87" (200mm)
Resolution	1.97µin (0.05µm)
Positioning accuracy	±3µm
Drive speed	Max. 3.15"/s (80mm/s)
Maximum load	110 lbs (50kg)
Mass	61.7 lbs (28kg)

## θ2-axis table: 178-078\*

You can measure multiple points on a cylindrical workpiece and automate front/rear-side measurement.

\*θ2-axis mounting plate (12AAE718) is required when directly installing on the base of the SV-3100.



Displacement	360°
Resolution	0.0072°
Maximum load (loading moment)	4kg (343N•cm or less)
Rotational speed	Max. 18°/s
Mass	11 lbs (5kg)

## Quick chuck: 211-032

This chuck is useful when measuring small workpieces. You can easily clamp them with its knurled ring.

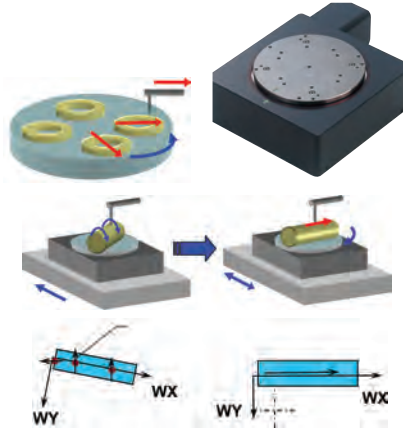


Retention range	Inner latch	OD: ø 0.04" - 1.42" (1 - 36mm)
	Inner latch	ID: ø 0.55" - 2.76" (14 - 70mm)
	Outer latch	OD: ø 0.04" - 2.95" (1 - 75mm)
Dimensions		ø 4.65" x 1.61" (118 x 41mm)
Mass		2.65 lbs (1.2kg)

## θ1-axis table: 12AAD975\*

For efficient measurement in the axial/transverse directions. When measuring a cylindrical workpiece, automatic alignment can be performed in combination with the Y-axis table.

\*θ1-axis mounting plate (12AAE630) is required when directly installing on the base of the SV-3100.



Displacement	360°
Resolution	0.004°
Maximum load	26.5 lbs (12kg)
Rotational speed	Max. 10°/s
Mass	15 lbs (7kg)

## Automatic-leveling table: 178-087 (SV, CV, CS3200)

## Automatic-leveling table: 178-037 (CNC Models)

This is a stage that performs fully automatic leveling as measurement starts, freeing the user from this troublesome operation. Fully automatic leveling can be done quickly by anyone. In addition, the operation is easy and reliable.



Inclination adjustment angle	±2°
Maximum load	7kg
Table dimensions	130 x 100mm
Mass	7.7lbs (3.5kg)

## Micro-chuck: 211-031

This chuck is suitable for clamping extra-small diameter workpieces (ø1 mm or less), which cannot be retained with the centering chuck.



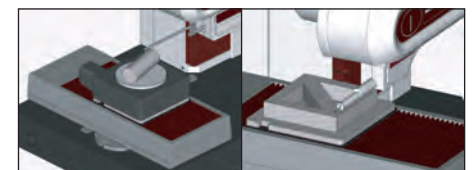
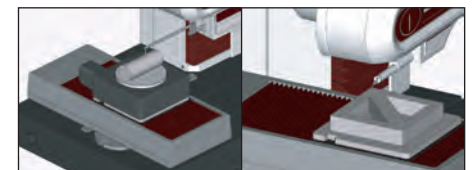
Retention range	OD: ø 0-0.06" (0 - 1.5mm)
Dimensions	ø 4.65" x 1.9" (118 x 48.5mm)
Mass	1.32 lbs (0.6kg)

## Examples of optimal combinations of accessories for CNC models

Optional accessory	Y-axis Table	θ1 Table	θ2 Table
Function			
Automatic alignment (Patented : Japan)	●	●	—
Multiple workpiece batch measurement	▲	—	—
Multiple-piece measurement in the Y-axis direction (Positioning in the Y-axis direction)	●	—	—
Multiple-piece measurement in the radius direction (Positioning in the rotating direction of XY plane)	▲	●	—
Tracking measurement in the Z-axis direction *	—	—	—
Inclined surface measurement in the X-axis direction	▲	—	—
Inclined hole inside measurement in the X-axis direction	▲	—	—
Multiple cylinder generatrix line measurement	▲	—	●
Measurement of both top and bottom surfaces	▲	—	●
Rotary positioning of large workpiece **	—	—	—
Upward/downward and forward/backward measurement of large workpiece **	—	—	—

\* : Applicable only to form/contour measurement

\*\* : Applicable only for SV-M3000CNC





# Optional Accessories for Contracer / Formtracer

Compatible with Desktop Models of Contracer and Formtracer

## Cross-travel table

- Table top: 11" x 7" (280 x 180mm)
- XY travel: 3.94" x 1.97" (100 x 50mm)



218-001 (mm)  
218-011 (inch)

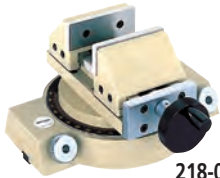
- Table top: 11" x 5.98" (280 x 152mm)
- XY travel: 1.97" x .98" (50 x 25mm)



218-041 (mm)  
218-051 (inch)

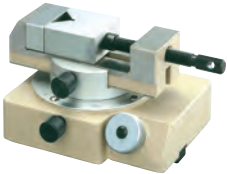
## Rotary vise

- Two-slide jaw type.
- Max. workpiece size:  $\phi$  2.36" (60mm)
- Minimum reading: 1°



218-003

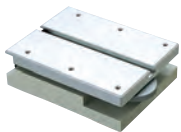
- One-slide jaw type.
- Max. workpiece size:  $\phi$  2.36" (60mm)
- Minimum reading: 5°



172-144

## Leveling table

- Table top: 5.12" x 3.94" (130 x 100mm)
- Leveling range:  $\pm 1.5^\circ$
- Height: 1.57" (40mm)



178-016

## V-block with clamp

- Used with a cross-travel table or rugged table.
- Max. workpiece diameter: 1.97" (50mm)
- Max. workpiece diameter: .98" (25mm)



172-234

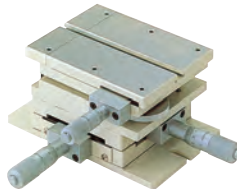
- Workpiece diameter: 0.039" to 6.3" (1mm to 160mm)
- Can be mounted on a leveling table



998291

## Leveling table

- Table top: 5.12" x 3.94" (130 x 100mm)
- Leveling range:  $\pm 1.5^\circ$
- XY travel: .49"  $\pm$  (12.5mm)



178-043-1 (mm)  
178-053-1 (inch)

## Digital Leveling table

- Table top: 5.12" x 3.94" (130 x 100mm)
- Leveling range:  $\pm 1.5^\circ$
- XY travel: .49"  $\pm$  (12.5mm)



178-042-1 (mm)

## Three-axis adjustment table



178-047

## Precision vise

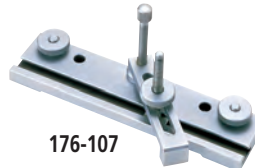
- Max. workpiece size: 1.42" (36mm)
- Can be mounted on a leveling table.



178-019

## Holder with clamp

- Used with a cross-travel table or rugged table.
- Max. workpiece height: 1.38" (35mm)



176-107

## Swivel center support

- Max. workpiece diameter: 3.15" (80mm)\*
- \*2.56" (65mm) when swiveled 10°
- Max. workpiece length: 5.51" (140mm)



172-197

## Center support

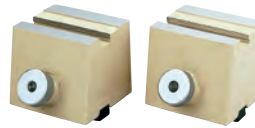
- Max. workpiece diameter: 4.72" (120mm)
- 2.36" (60mm) riser is optional (172-143)



172-142

## Center support riser

- Used with a center support.
- Max. workpiece diameter: 9.45" (240mm)



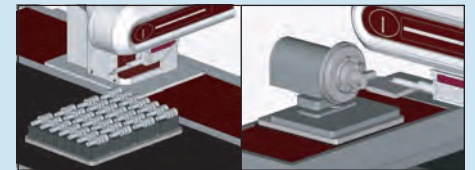
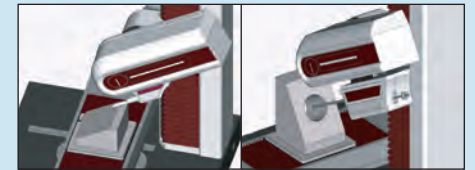
172-143

Drive unit tilting function (Patent pending: Japan)	Large $\theta$ Table	Rotary-type detector holder
▲	—	—
—	—	—
—	—	—
—	—	—
—	—	—
●	—	—
●	—	—
—	—	—
—	—	—
—	●	—
—	—	●

●: Essential

▲: Better to provide with

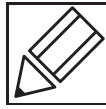
—: Not necessary



## Three-axis adjustment table

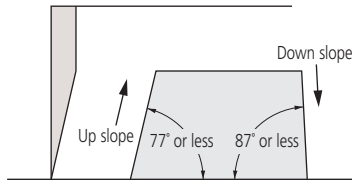
Order No.	178-047
Table top	5.11 x 3.94" (130 x 100mm)
Workpiece weight	33lbs. (15kg) at max.
Workpiece diameter	0.04 - 6.3" (1 - 160mm)
Leveling range	$\pm 1.5^\circ$
Swivel range	$\pm 2^\circ$
Y-axis adjustment	$\pm 0.5"$ ( $\pm 12.5$ mm)
Height	6" (152.5mm)
Mass	19.8lbs. (9kg)
Remarks	V-block (998291) is provided

# Quick Guide to Precision Measuring Instruments



## Contracer (Contour Measuring Instruments)

### Traceable Angle

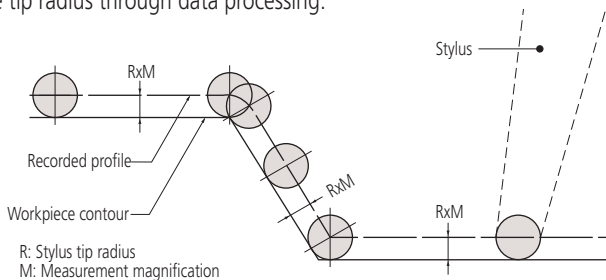


The maximum angle at which a stylus can trace upwards or downwards along the contour of a workpiece, in the stylus travel direction, is referred to as the traceable angle. A one-sided sharp stylus with a tip angle of  $12^\circ$  (as in the above figure) can trace a maximum  $77^\circ$  of up slope and a maximum  $87^\circ$  of down slope. For a conical stylus ( $30^\circ$  cone), the traceable angle is smaller. An up slope with an angle of  $77^\circ$  or less overall may actually include an angle of more than  $77^\circ$  due to the effect of surface roughness. Surface roughness also affects the measuring force.

For model CV-3200/4500, the same type of stylus (SPH-71: one-sided sharp stylus with a tip angle of  $12^\circ$ ) can trace a maximum  $77^\circ$  of up slope and a maximum  $83^\circ$  of down slope.

### Compensating for Stylus Tip Radius

A recorded profile represents the locus of the center of the ball tip rolling on a workpiece surface. (A typical radius is 0.025mm.) Obviously this is not the same as the true surface profile so, in order to obtain an accurate profile record, it is necessary to compensate for the effect of the tip radius through data processing.



If a profile is read from the recorder through a template or scale, it is necessary to compensate for the stylus tip radius beforehand according to the applied measurement magnification.

### Compensating for Arm Rotation

The stylus is carried on a pivoted arm so it rotates as the surface is traced and the contact tip does not track purely in the Z direction. Therefore it is necessary to apply compensation in the X direction to ensure accuracy. There are three methods of compensating for arm rotation.

- 1: Mechanical compensation
- 2: Electrical compensation

### Accuracy

As the detector units of the X and Z axes incorporate scales, the magnification accuracy is displayed not as a percentage but as the linear displacement accuracy for each axis.

### Overload Safety Cutout

If an excessive force (overload) is exerted on the stylus tip due, perhaps, to the tip encountering a too-steep slope on a workpiece feature, or a burr, etc., a safety device automatically stops operation and sounds an alarm buzzer. This type of instrument is commonly equipped with separate safety devices for the tracing direction (X axis) load and vertical direction (Y axis) load.

For model CV-3200/4500, a safety device functions if the arm comes off the detector mount.

### Simple or Complex Arm Guidance

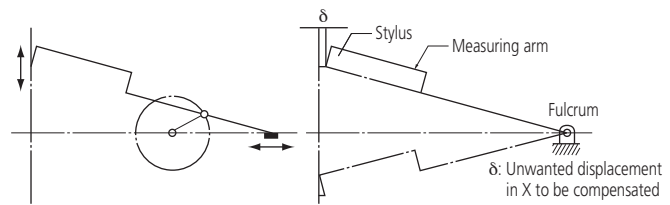
In the case of a simple pivoted arm, the locus that the stylus tip traces during vertical movement (Z direction) is a circular arc that results in an unwanted offset in X, for which compensation has to be made. The larger the arc movement, the larger is the unwanted X displacement ( $\delta$ ) that has to be compensated. (See figure, lower left.) The alternative is to use a complex mechanical linkage arrangement to obtain a linear translation locus in Z, and therefore avoid the need to compensate in X.

### Z axis Measurement Methods

Though the X axis measurement method commonly adopted is by means of a digital scale, the Z axis measurement divides into analog methods (using a differential transformer, etc.) and digital scale methods.

Analog methods vary in Z axis resolution depending on the measurement magnification and measuring range. Digital scale methods have fixed resolution.

Generally, a digital scale method provides higher accuracy than an analog method.



- 3: Software processing. To measure a workpiece contour that involves a large displacement in the vertical direction with high accuracy, one of these compensation methods needs to be implemented.

## ■ Contour analysis methods

You can analyze the contour with one of the following two methods after completing the measurement operation.

### Data processing section and analysis program

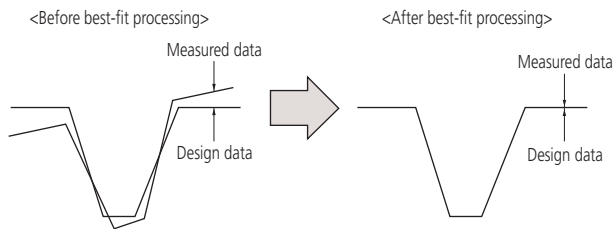
The measured contour is input into the data processing section in real time and a dedicated program performs the analysis using the mouse and/or keyboard. The angle, radius, step, pitch and other data are directly displayed as numerical values. Analysis combining coordinate systems can be easily performed. The graph that goes through stylus radius correction is output to the printer as the recorded profile.

## ■ Tolerancing with Design Data

Measured workpiece contour data can be compared with design data in terms of actual and designed shapes rather than just analysis of individual dimensions. In this technique each deviation of the measured contour from the intended contour is displayed and recorded. Also, data from one workpiece example can be processed so as to become the master design data to which other workpieces are compared. This function is particularly useful when the shape of a section greatly affects product performance, or when its shape has an influence on the relationship between mating or assembled parts.

## ■ Best-fitting

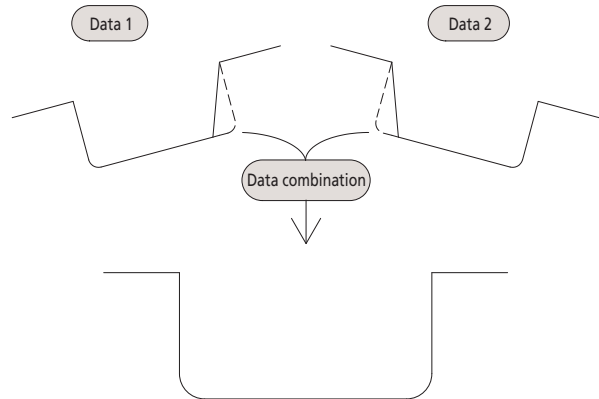
If there is a standard for surface profile data, tolerancing with design data is performed according to the standard. If there is no standard, or if tolerancing only with shape is desired, best-fitting between design data and measurement data can be performed.



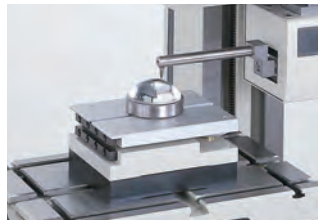
The best-fit processing algorithm searches for deviations between both sets of data and derives a coordinate system in which the sum of squares of the deviations is a minimum when the measured data is overlaid on the design data.

## ■ Data Combination

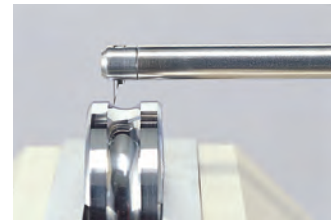
Conventionally, if tracing a complete contour is prevented by stylus traceable-angle restrictions then it has to be divided into several sections that are then measured and evaluated separately. This function avoids this undesirable situation by combining the separate sections into one contour by overlaying common elements (lines, points) onto each other. With this function the complete contour can be displayed and various analyses performed in the usual way.



## ■ Measurement Examples



Aspheric lens contour



Inner/outer ring contour of a bearing



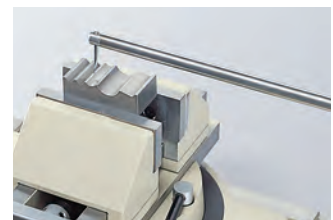
Internal gear teeth



Female thread form



Male thread form



Gage contour



# Roundtest RA-10

## SERIES 211 — Roundness Measuring Instruments

### Technical Data

#### Turntable

Rotational accuracy: (0.04+6H/10000) $\mu$ m  
H: Probing height (mm)

Rotating speed: 6rpm

Table top diameter:  $\phi$  6" (150mm)

Maximum probing diameter:  $\phi$  3.94" (100mm)

Maximum workpiece diameter:  $\phi$  12.6" (320mm)

Maximum workpiece weight: 22 lbs (10kg)

#### Vertical column (Z-axis)

Vertical travel: 4.6" (117mm)

Maximum probing height: 5.98" (152mm) from turntable top

Maximum probing depth: 3.94" (100mm)

(min. ID:  $\phi$  1.18" (30mm))

#### Horizontal arm (X-axis)

Horizontal travel: 2.95" (75mm) (Including a protrusion of .98" (25mm) turntable rotation center)

#### Probe and stylus

Measuring range:  $\pm$ 1000 $\mu$ m

Measuring force: 70 to 100mN

Standard stylus: 12AAL021, carbide ball,  $\phi$  1.6mm

Measuring direction: Two directional

Stylus angle adjustment:  $\pm$ 45° (with graduations)

#### Data analysis unit:

Processing unit: Built-in

#### Data analysis items:

Roundness, Coaxiality, Concentricity, Flatness, Circular runout (radial)

#### Reference circles for roundness evaluation:

LSC, MZC, MIC, MCC

#### Recording device:

Built-in thermal line printer (optional external printer)

#### Recording magnification:

X5 to X200,000 (15-step)

#### Roughness component reduction:

Low pass filter, band pass filter

#### Filter type:

2CR-75%, 2CR-50%, 2CR-75% (phase corrected),

2CR-50% (phase corrected), Gaussian, filter OFF

#### Cutoff value:

15 $\mu$ r, 50 $\mu$ r, 150 $\mu$ r, 500 $\mu$ r, 15-150 $\mu$ r, 15-500 $\mu$ r,

50-500 $\mu$ r

#### Number of measuring sections

1-section to 5-section: Roundness, Coaxiality, Flatness

1-section to 3-section: Circular runout (radial)

2-section: Concentricity

#### Air supply

Air pressure: 390kPa

Air consumption: 30L/min.

Power supply: 100V AC - 240V AC, 50/60Hz

Dimensions (W x D x H): 17.7" x 14.2" x 19"

(450 x 360 x 486mm)

Mass: 57 lbs (26kg)

Compact roundness tester combines outstanding cost/performance ratio with full measurement capabilities and beginner-friendly operation.

### FEATURES

- The key layout is large and simple, easy to view and understand.
- One-time setup recall function: Complex setups are stored in advance, ready for recall when required by one-key operation.
- Zero-setting function: The detector's level can be set to zero (0) with one single key press. This relieves the user from the chore of meticulously positioning the detector.
- The operation knobs for vertical direction (Z-axis) and radial direction (X-axis) adjustments have been positioned on the slider for best functionality.
- Despite being a low-priced model, the rotary table with air bearings offers rotational accuracy as high as (0.04+6H/10000) $\mu$ m, thus assuring a precision that compares well to that of higher models.
- Large LCD panel displays measurement results and recorded profiles in an easy-to-view fashion
- The machine calls for only a small installation space as its compact body integrates electronics and printer.

#### RA-10

with optional X-axis stop and Z-axis scale unit

Order No.: 211-601A



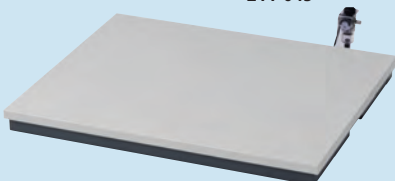
211-016



997090



211-045



950-990



Optional X-axis stopper

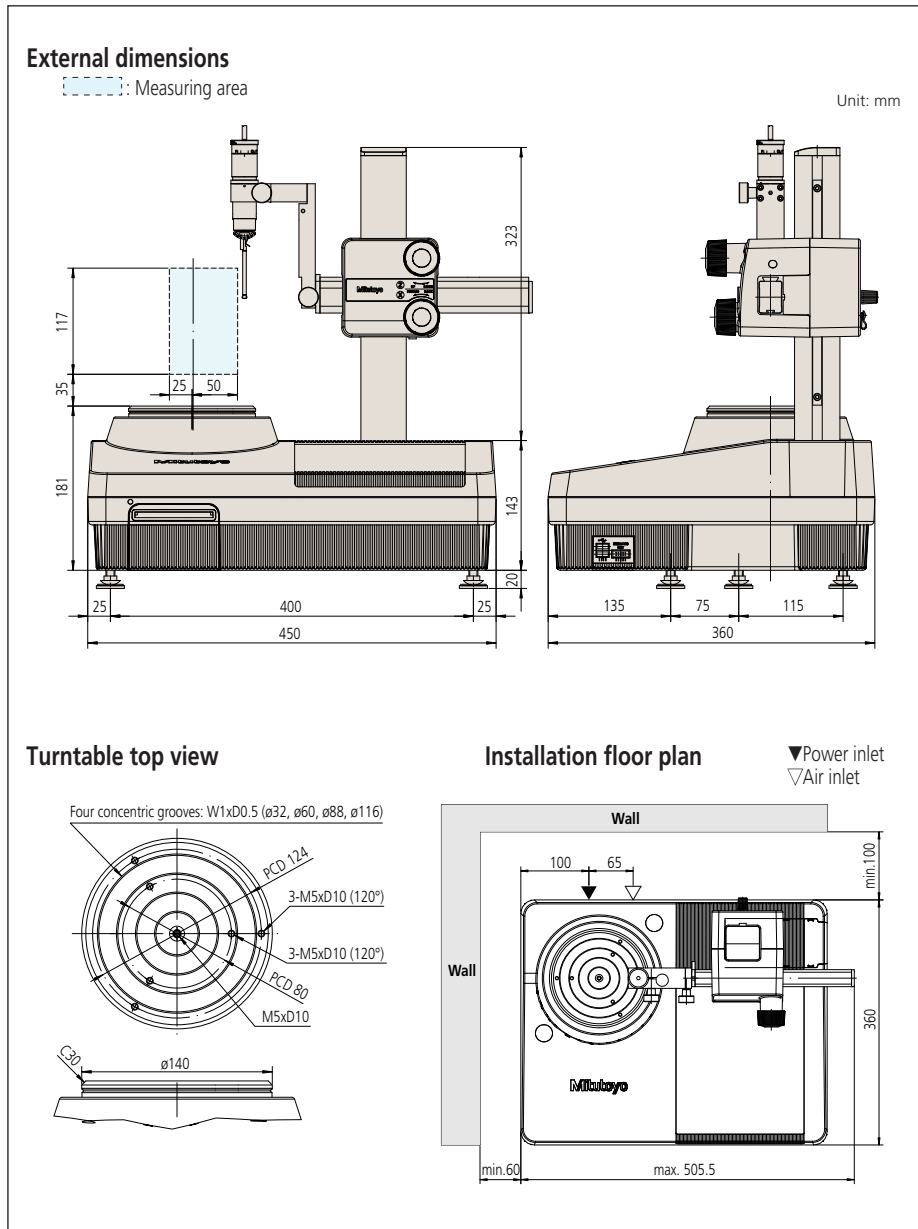


Optional Z-axis scale unit

# Roundtest RA-10

## SERIES 211 — Roundness Measuring Instruments

### DIMENSIONS



### CONSUMABLE PARTS

<b>12AAH181:</b>	Printer paper	10 rolls/set
<b>358592:</b>	Element for air filter	1 pc./set
<b>358593:</b>	Element for air regulator	10 pcs./set

### Optional Accessories

- 211-016: Reference hemisphere
- 12AAH420: Spacer for reference hemisphere
- 997090: Gauge block set for calibration
- 211-045: Magnification checking gage
- 211-032: Quick chuck (OD: 0 - 79mm, ID: 16 - 69mm)\*
- 211-031: Micro-chuck (OD: 1.5mm max.)\*
- 356038: Auxiliary stage for a low-height workpiece\*
- 12AAH426: Alignment table with DAT function (inch/mm)
- 12AAH427: Alignment table with mechanical heads
- 211-052: Quick chuck (OD: 1 - 79mm, ID: 16 - 69mm)
- 211-053: V-block jig A (for ø50mm)
- 211-054: V-block jig B (for ø50mm)
- 211-055: OD/ID mating jig (for ø10mm)
- 211-051: Collet chuck (OD: 0.5 - 10mm)
- 12AAH402: Individual collets (ø0.5 - 1.0mm)
- 12AAH403: Individual collets (ø1.0 - 1.5mm)
- 12AAH404: Individual collets (ø1.5 - 2.0mm)
- 12AAH405: Individual collets (ø2.0 - 2.5mm)
- 12AAH406: Individual collets (ø2.5 - 3.0mm)
- 12AAH407: Individual collets (ø3.0 - 3.5mm)
- 12AAH408: Individual collets (ø3.5 - 4.0mm)
- 12AAH409: Individual collets (ø4.0 - 5.0mm)
- 12AAH410: Individual collets (ø5.0 - 6.0mm)
- 12AAH411: Individual collets (ø6.0 - 7.0mm)
- 12AAH412: Individual collets (ø7.0 - 8.0mm)
- 12AAH413: Individual collets (ø8.0 - 9.0mm)
- 12AAH414: Individual collets (ø9.0 - 10.0mm)
- 12AAH320: X-axis stopper
- 12AAH318: Z-axis scale unit
- 938882: SR44 (for Z-axis scale unit and alignment table head)
- 950-990: Vibration damping stand
- : Interchangeable styli (See page J-54.)

\*Can be installed on the alignment table (12AAH425 / 426 / 427) only.



# Roundtest RA-120 / 120P

## SERIES 211 — Roundness Measuring Instruments

### Technical Data

Turntable  
 Rotational accuracy: (0.04+6H/10000) $\mu$ m  
H: Probing height (mm)  
 Rotating speed: 6rpm  
 Table top diameter:  $\varnothing$  1.96" (150mm)  
 Centering range:  $\pm$ .12" (3mm)  
 Leveling range:  $\pm$ 1 $^{\circ}$   
 Maximum probing diameter:  $\varnothing$  11" (280mm)  
 Maximum workpiece diameter:  $\varnothing$  17.3" (440mm)  
 Maximum workpiece weight: 55 lbs (25kg)

Vertical column (Z-axis)  
 Vertical travel: 11" (280mm)  
 Feeding: 1.18" (30mm)/rev. (coarse),  
 0.039" (1mm)/rev. (fine)  
 Maximum probing height: 11" (280mm) from the turntable top  
 Maximum probing depth: 3.94" (100mm) (min. ID: 1.18" (30mm))

Horizontal arm (X-axis)  
 Horizontal travel: 65" (165mm) (Including a protrusion of 1" (25mm) the turntable rotation center)

Probe and stylus  
 Measuring range:  $\pm$ 1000 $\mu$ m  
 Measuring force: 7 to 10mN  
 Standard stylus: 12AAL021, carbide ball,  $\varnothing$ 1.6mm  
 Measuring direction: Two directional  
 Stylus angle adjustment:  $\pm$ 45 $^{\circ}$  (with graduations)

Data analysis unit:  
 Processing unit: Built-in (PC with Roundpak)\*  
 Data sampling points: 3,600 points/rotation  
 Data analysis items:  
 Roundness, Coaxiality, Concentricity, Flatness, Circular runout (radial), Circular runout (axial), Squareness (against axis), Squareness (against plane), Thickness deviation, Parallelism  
 Reference circles for roundness evaluation:  
 LSC, MZC, MIC, MCC  
 Recording device:  
 Built-in thermal line printer (optional external printer)\*  
 Recording magnification:  
 X5 to X200,000, Auto (X1 to X500,000)\*  
 Roughness component reduction:  
 Low pass filter, band pass filter  
 Filter type:  
 2CR-75%, 2CR-50%, 2CR-75% (phase corrected),  
 2CR-50% (phase corrected), Gaussian, filter OFF  
 Cutoff value:  
 15 $\mu$ pr, 50 $\mu$ pr, 150 $\mu$ pr, 500 $\mu$ pr, 15-150 $\mu$ pr, 15-500 $\mu$ pr,  
 50-500 $\mu$ pr, Manual setting\*  
 Number of measuring sections  
 Max. 5-section (100-section)\*

\*RA-120P

The Roundtest RA-120 / 120P are a compact, affordable, and simple-to-use device for measuring part geometry on the shop floor. It also provides such superb data analysis capabilities as required with laboratory roundness measuring instruments and has a  $\pm$ 1000 $\mu$ m wide range detector and precision turn table with excellent rotation accuracy.

The RA-120 is a dedicated processor based model which controls all operations via the control panel incorporated in the main unit.



Z-axis scale unit



Optional X-axis stop



RA-120

Order No.: 211-621A (with mechanical table)

Order No.: 211-623A (with DAT function, inch/mm)

### SPECIFICATIONS

Model No.	RA-120	RA-120D	RA-120P	RA-120PD
Order No.	211-621A	211-623A	211-625A	211-627A

The RA-120P is a PC based model which controls all operations via ROUNDPAK software (optional).



RA-120P

Order No.: 211-625A (with mechanical table)

Order No.: 211-627A (with DAT function, inch/mm)

## MiCAT

Mitutoyo Intelligent Computer Aided Technology

the standard in world metrology software

FORM

# Mitutoyo

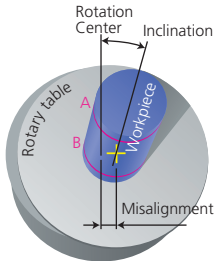
# Roundtest RA-120 / 120P

## SERIES 211 — Roundness Measuring Instruments

### DAT (Digital Adjustment Table) function

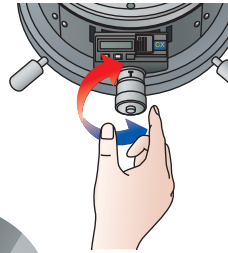
The turntable digitally displays the centering and leveling adjustments, turning what used to be a difficult and finicky task into one that is simple enough for even untrained operator to perform.

1. Preliminary measurement of two cross sections "A" and "B".



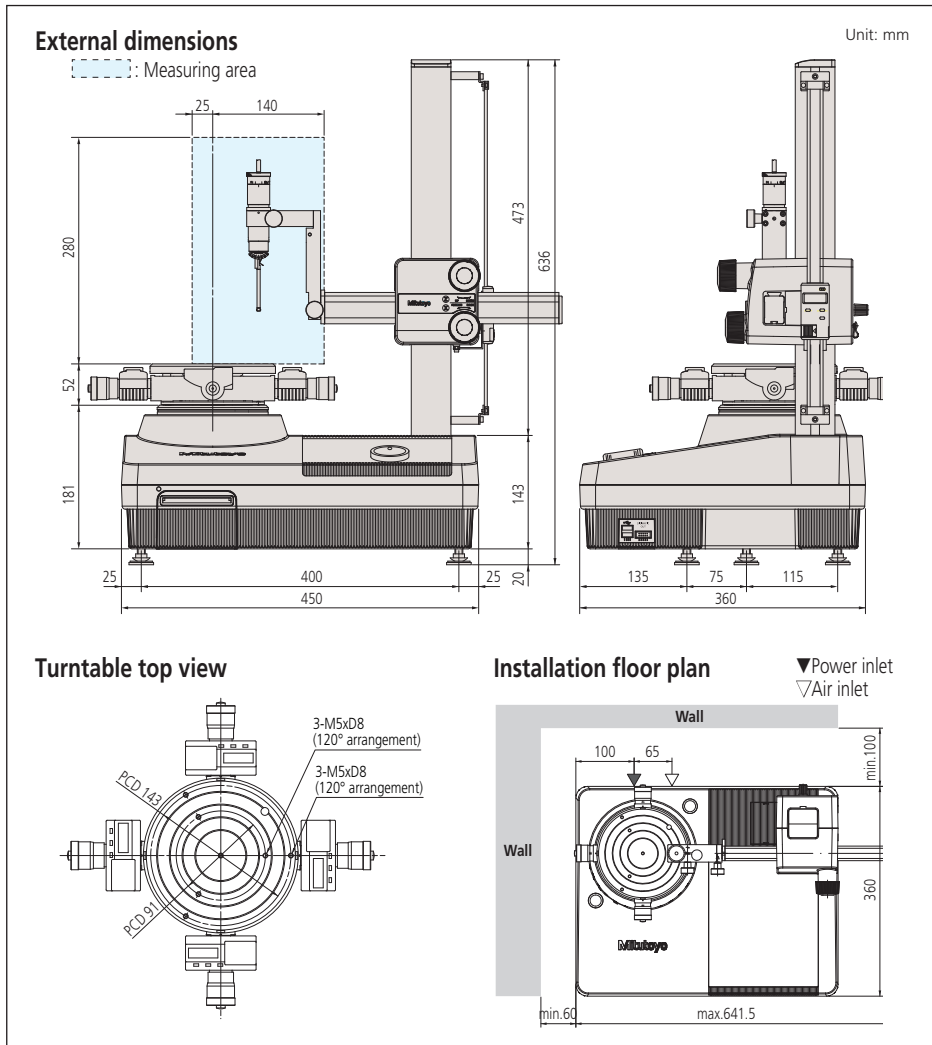
2. Following preliminary measurement, the centering and leveling adjustment values are displayed on the monitor.

3. Manipulate the digital micrometer heads of the rotary table so that the adjustment values displayed on the monitor are realized.



4. Centering and leveling are complete.  
Centering range:  $\pm 3\text{mm}$   
Leveling (inclination) range:  $\pm 1^\circ$

### DIMENSIONS



### Functions

- Notched workpiece measurement
- Recalculation of datum/measured data
- Limaçon function compensates for eccentricity
- Rotation of 3D display\*\*
- Real-time display\*\*
- Simplified layout (divided layout)\*\*
- Hair line, auxiliary line, hidden line, fill line\*\*
- Color setting of measured data\*\*
- Offsetting of recorded profile generation\*\*
- Zooming of recorded profile\*\*
- Data deletion\*\*
- Graph analysis (displacement/angle between measured points)\*\*
- Power spectrum analysis\*\*
- Gear tooth analysis\*\*
- Harmonic analysis\*\*
- Text data output (via CSV format)\*\*

\*\*Function of ROUNDPAK software

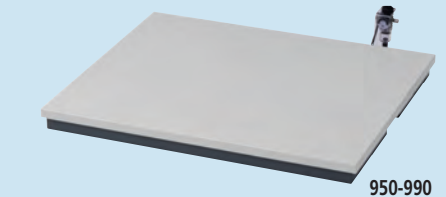
### Air supply

- Air pressure: 390kPa
- Air consumption: 30L/min.
- Power supply: 100V AC – 240V AC, 50/60Hz
- Dimensions (W x D x H): 17.7" x 14.2" x 25"  
(450 x 360 x 636mm)
- Mass: 70.5 lbs (32kg) (main unit),  
4.4 lbs (2kg) (air regulator)

### Optional Accessories

- 211-032:** Quick chuck (OD: 1 - 79mm, ID: 16 - 69mm)
- 211-014:** Three-Jaw chuck (OD: 2 - 78mm, ID: 25 - 68mm)
- 211-031:** Micro-chuck (OD: 1.5mm max.)
- 356038:** Auxiliary stage for a low-height workpiece
- 211-016:** Reference hemisphere
- 211-045:** Magnification checking gage
- 997090:** Gauge block set for calibration
- 12AAH320:** X-axis stop
- 211-013:** Vibration damping stand

—: Interchangeable styli (See page J-54.)



### CONSUMABLE PARTS

- 12AAH181:** Printer paper 10 rolls/set
- 358592:** Element for air filter 1 pc./set
- 358593:** Element for air regulator 10 pcs./set



# Roundtest RA-220

## SERIES 211 — Roundness Measuring Instruments

### Technical Data

Turntable  
 Rotational accuracy  
 Radial: (0.04+6H/10000) $\mu$ m  
 H: Probing height (mm)  
 Axial: (0.04+6X/10000) $\mu$ m  
 X: Probing radius (mm)  
 Rotational speed: 6rpm  
 Table top diameter:  $\varnothing$ 6" ( $\varnothing$ 150mm)  
 Centering range: .118"  $\pm$ (3mm)  
 Leveling range:  $\pm$ 1°  
 Maximum probing diameter: 11.02" ( $\varnothing$ 280mm)  
 14.96" ( $\varnothing$ 380mm: When the detector orientation is changed to the vertical position, only samples up to 2" (50mm) from the table top surface can be measured)  
 Maximum workpiece diameter: 18.5" ( $\varnothing$ 470mm)  
 Maximum table loading: 55lbs (25kg)  
 Vertical column (Z-axis)  
 Vertical travel: 11.02" (280mm)  
 Straightness (in narrow range): 0.2 $\mu$ m/20mm  
 Straightness (in entire range): 0.5 $\mu$ m/100mm  
 Parallelism with turntable axis: 0.5 $\mu$ m/100mm  
 Maximum probing height: 11.02" (280mm) from the turntable top  
 Maximum probing depth: 4" (100mm) (minimum ID: 1.18"  $\varnothing$ (30mm)  
 Horizontal arm (X-axis)  
 Horizontal travel: 6.5" (165mm) (Including a protrusion of 1" (25mm) over the turntable axis)  
 Probe and stylus  
 Measuring range:  $\pm$ 1000 $\mu$ m ( $\pm$ 30%)  
 Measuring force: 70 to 100mN  
 Standard stylus: 12AAL021, carbide ball,  $\varnothing$ 1.6mm  
 Measuring direction: Bi-directional  
 Stylus angle adjustment:  $\pm$ 45° (with graduations)  
 Data analysis unit  
 Processing unit: Built-in  
 Data analysis items:  
 Roundness, Coaxiality, Concentricity, Flatness, Circular runout (radial), Circular runout (axial), Squareness (against axis), Squareness (against plane), Thickness deviation, Parallelism, Cylindricity  
 Reference circles for roundness evaluation:  
 LSC, MZC, MIC, MCC  
 Recording device:  
 Built-in thermal line printer (optional external printer)  
 Recording magnification:  
 X5, X10, X20, X50, X100, X200, X500, X1k, X2k, X5k, X10k, X20k, X50k, X100k, X200k (15 step)  
 Roughness component reduction:  
 Low pass filter, band pass filter  
 Filter type:  
 2CR-75%, 2CR-50%, 2CR-75% (phase corrected), 2CR-50% (phase corrected), Gaussian, filter OFF  
 Cutoff values:  
 15 $\mu$ r, 50 $\mu$ r, 150 $\mu$ r, 500 $\mu$ r, 15-150 $\mu$ r, 15-500 $\mu$ r, 50-500 $\mu$ r  
 Number of measuring sections  
 (1) 1 to 5 cross sections : Roundness, Coaxiality, Flatness  
 (2) 1 to 3 cross sections : Radial runout, Squareness (axis reference)  
 (3) 2 cross sections : Concentricity, Thickness deviation, Parallelism  
 (4) 3 cross sections : Squareness (plane reference)  
 (5) 3 to 5 cross sections : Cylindricity  
 Air supply  
 Air pressure: 390kPa  
 Air consumption: 30L/min  
 Power supply: 100VAC-240VAC, 50/60Hz  
 Dimensions (WxDxH): 17.7x14.2x25" (450x360x636mm)  
 Mass: 332lbs (151kg) (Main unit)  
 4.4lbs (2kg) (Air regulator)

The RA-220 is a small, manual type Roundness/Cylindricity measuring instrument

### FEATURES

- Exceptional analysis capabilities and easy operation
- Equipped with X/Z axis fine adjustment mechanism
- Scale is incorporated in the Z axis
- Equipped with inside/outside diameter continuous measurement function
- Equipped with DAT function
- Employs a wide range detector
- Compact and highly accurate (equipped with premium quality air-bearing)



211-643A

### Simple, interactive display screen

The large LCD screen with backlight shows easy-to-understand measurement results and graphs. Forms can be checked and notch processing can be set while observing the displayed graphs.

Measurement screen	Measurement results
<ul style="list-style-type: none"> <li>• Set the position of the detector and measurement conditions here</li> <li>• During measurement, graphs are displayed in real time</li> </ul>	<ul style="list-style-type: none"> <li>• Filter, display magnification, etc., can be altered</li> <li>• Besides circles, developed views can also be displayed</li> </ul>
<p>▲ Measurement screen</p>	<p>Result screen ▲</p>
<p>▲ Measurement in progress screen</p>	<p>Result screen ▲</p>

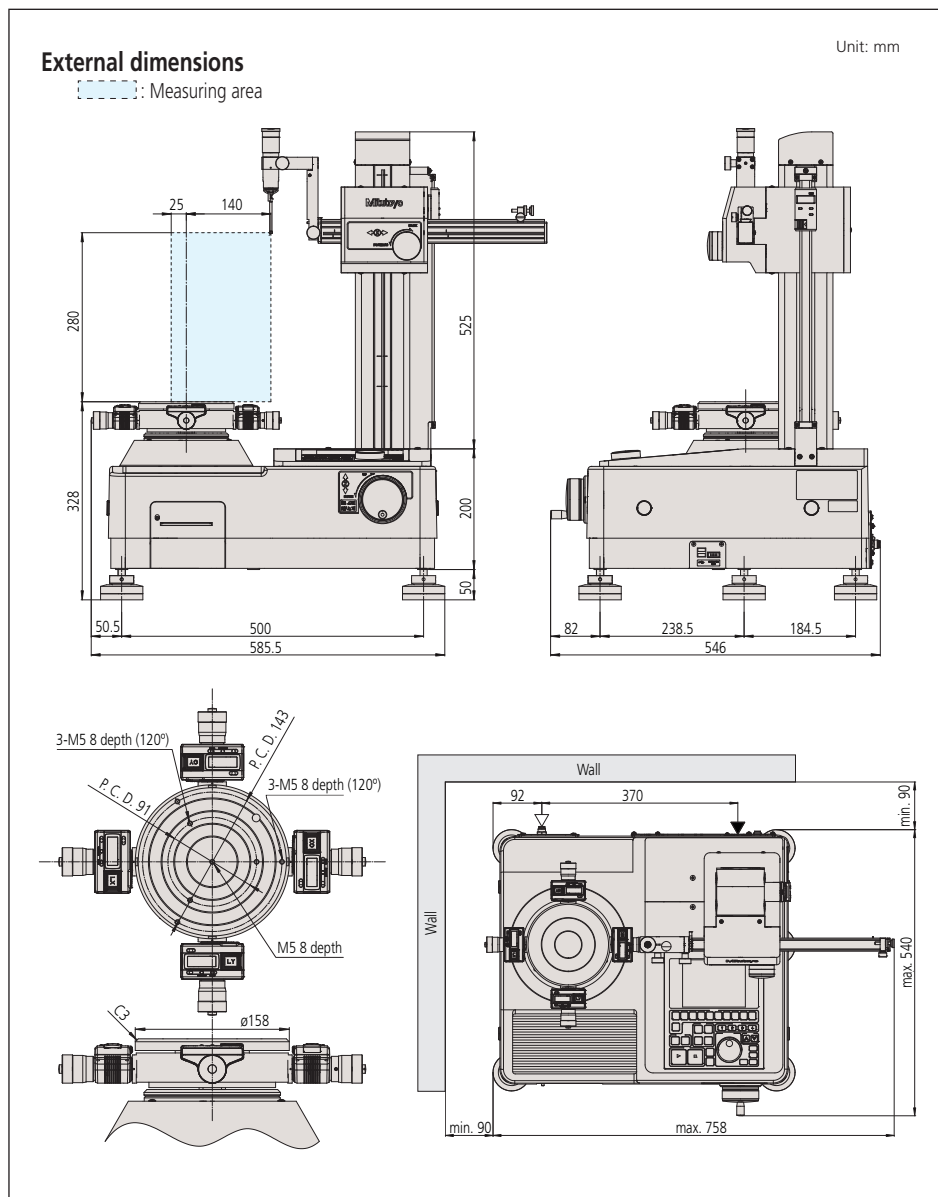
# Roundtest RA-220

## SERIES 211 — Roundness Measuring Instruments

### SPECIFICATIONS

Model No.	RA-220
Order No.(mm/inch)	211-643A

### DIMENSIONS



### Optional Accessories

- 211-032: Quick chuck (OD: 1 - 79mm, ID: 16 - 69mm)
- 211-014: Three-Jaw chuck (OD: 2 - 78mm, ID: 25 - 68mm)
- 211-031: Micro-chuck (OD: 0.1 - 1.5mm max.)
- 211-061: Collet chuck (OD: 0.5 - 10mm)  
Individual collets
- 356038: Auxiliary stage for a low-height workpiece
- 211-045: Magnification checking gage
- 997090: Gauge block set for calibration
- 12AAH320: X-axis stop
- 950-990: Vibration damping table
- : Interchangeable styli (See page J-54.)



### CONSUMABLE PARTS

- 12AAH181: Printer paper 10 rolls/set
- 358592: Element for air filter 1 pc./set
- 358593: Element for air regulator 10 pcs./set



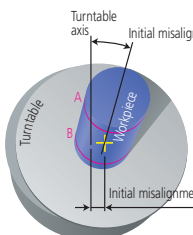
# Roundtest RA-1600

## SERIES 211 — Roundness/Cylindricity Measuring System

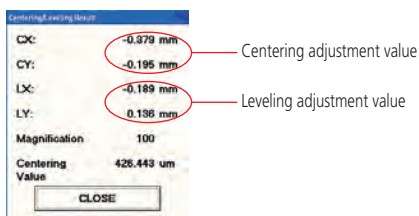
### DAT (Digital Adjustment Table) function

The turntable displays centering and leveling adjustments digitally, making this challenging task simple enough for even an untrained operator to perform.

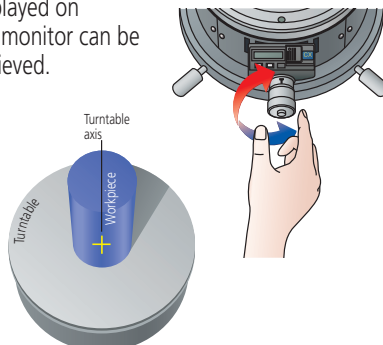
1. Preliminary measurement of two cross sections "A" and "B".



2. Following preliminary measurement, the centering and leveling adjustment values are displayed on the monitor.



3. By adjusting the digital micrometer heads for the rotary table, the adjustment values displayed on the monitor can be achieved.

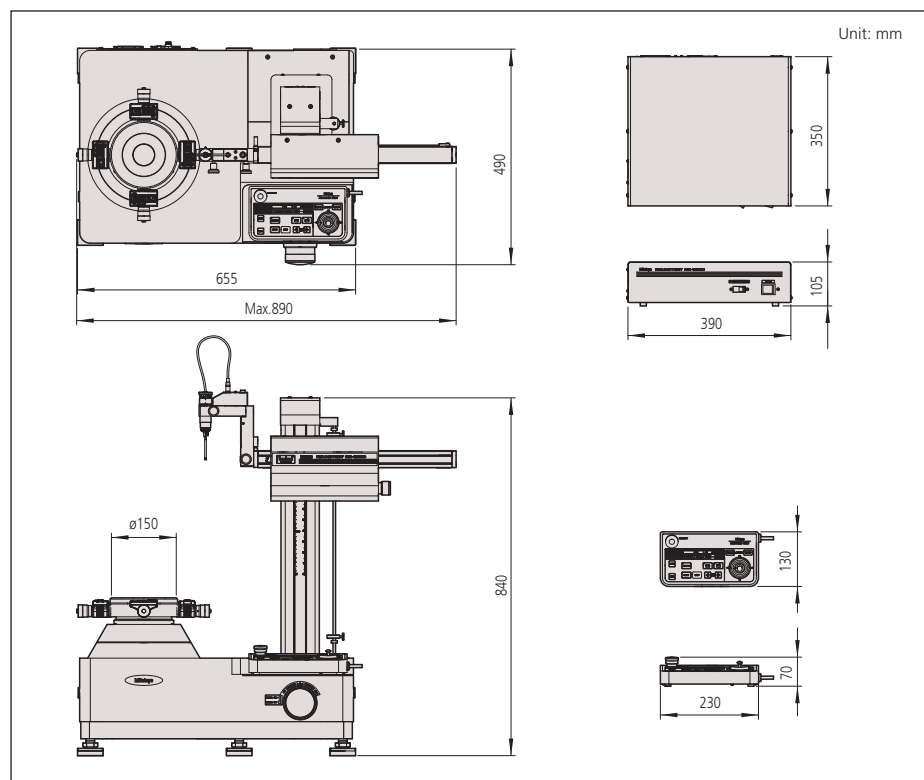


4. Centering and leveling are complete. Centering range:  $\pm 3$ mm Leveling (inclination) range:  $\pm 1^\circ$

## SPECIFICATIONS

Model No.	RA-1600
Order No. (inch/mm)	211-733A

## DIMENSIONS



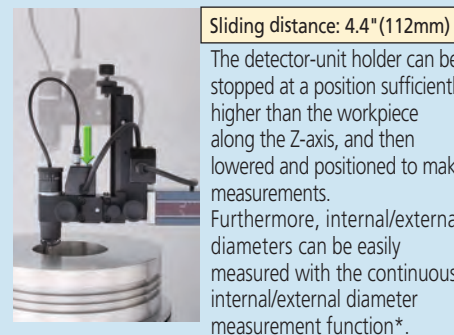
### Optional Accessories

- 350850: Cylindrical square
- 356038: Auxiliary stage for a low-height workpiece
- 12AAF203: 2x extension detector holder
- 12AAF204: Auxiliary detector holder for a large-diameter workpiece
- 12AAL090: Sliding detector holder
- 211-045: Magnification checking gage
- 211-014: Chuck (OD:  $\phi 2 - 78$ mm, ID:  $\phi 25 - 68$ mm)
- 211-032: Quick chuck (OD:  $\phi 1 - 79$ mm, ID:  $16 - 69$ mm)
- 211-031: Micro-chuck (OD:  $\phi 0.1 - 1.5$ mm max.)
- 178-025: Vibration isolator (Desk top type)
- 64AAB213: Vibration isolation workstation
- 12AAL019: Side table for PC
- : Interchangeable styli (See page J-54.)



### Sliding detector-unit holder (Option) 12AAL090

The detector-unit holder is equipped with a sliding mechanism, enabling one-touch measurement of a workpiece with a deep hole having a thick wall, which has been difficult with the conventional standard arm.

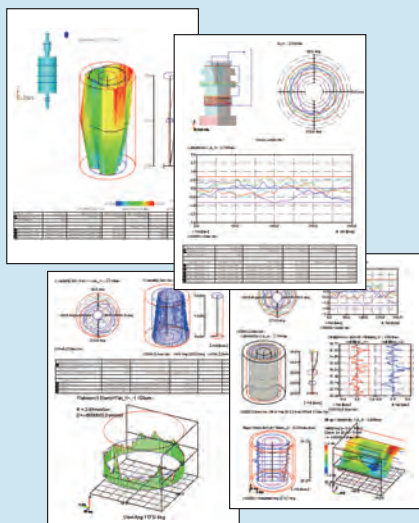


\*: See this page for details about the continuous ID and OD measuring function.

## Technical Data

Turntable  
 Rotational accuracy (radial):  $(.8+.35H)\mu\text{m}$   $\{(0.02+3.5H/10000)\mu\text{m}\}$   
 Rotational accuracy (axial):  $(.8+.35R)\mu\text{m}$   $\{(0.02+3.5R/10000)\mu\text{m}\}$   
H: Probing height (mm), R: Probing radius (mm)  
 Rotating speed: 2, 4, 6, 10rpm  
 Table top diameter:  $\varnothing 9.2''$  (235mm) AS / AH models  
 $\varnothing 7.9''$  (200mm) DS / DH models  
 Centering range:  $\pm 3\text{mm}$  ( $\pm 5\text{mm}$ : DS / DH models)  
 Leveling range:  $\pm 1^\circ$   
 Maximum probing diameter:  $\varnothing 11.8''$  (300mm)  
 Maximum workpiece diameter:  $\varnothing 22.8''$  (580mm)  
 Maximum workpiece weight: 66 lbs (30kg)  
 Vertical column (Z-axis)  
 Vertical travel: 11.8" (300mm) (22.8" (500mm): AH/DH models)  
 Straightness ( $\lambda c 2.5$ ): 0.10 $\mu\text{m}$  / 100mm, 0.15 $\mu\text{m}$  / 300mm  
 (0.25 $\mu\text{m}$  / 500mm: AH / DH models)  
 Parallelism with rotating axis: 0.7 $\mu\text{m}$  / 300mm  
 (1.2 $\mu\text{m}$  / 500mm: AH / DH models)  
 Positioning speed: Max. 50mm/s  
 Measuring speed: 0.5, 1, 2, 5mm/s  
 Maximum probing height: 11.8" (300mm) (OD / ID)  
 [22.8" (500mm): AH / DH models]  
 Maximum probing depth: over  $\varnothing 32$ : 85mm (w/standard stylus)  
 over  $\varnothing 7$ : 50mm (w/standard stylus)  
 Horizontal arm (X-axis)  
 Horizontal travel: 6.9" (175mm) (Including a protrusion of  
 1" (25mm) the turntable rotation center)  
 Straightness ( $\lambda c 2.5$ ): 0.7 $\mu\text{m}$  / 150mm  
 Squareness with rotating axis: 1.0 $\mu\text{m}$  / 150mm  
 Positioning speed: Max. 30mm/s with joystick operation  
 Measuring speed: 0.5, 1, 2, 5mm/s  
 Probe and stylus  
 Measuring range:  $\pm 400\mu\text{m}/\pm 40\mu\text{m}/\pm 4\mu\text{m}$   
 ( $\pm 5\text{mm}$ : tracking range)  
 Measuring force: 10mN~50mN (in 5 steps)  
 Standard stylus: **12AAL021**, carbide ball,  $\varnothing 1.6\text{mm}$   
 Measuring direction: Two directional  
 Stylus angle adjustment:  $\pm 45^\circ$  (with graduations)  
 Data analysis system  
 Analysis software: Roundpak  
 Filter type:  
 2CRPC-75%, 2CRPC-50%, 2CR-75% (phase corrected),  
 2CR-50% (phase corrected), Gaussian, filter OFF  
 Cutoff value;  
 15upr, 50upr, 150upr, 500upr, 1500upr,  
 15-150upr, 15-500upr, 15-1500upr, 50-500upr,  
 50-1500upr, 150-1500upr, Manual setting  
 Reference circles for roundness evaluation:  
 LSC, MZC, MIC, MCC  
 Air supply  
 Air pressure: 390kPa (4kgf/cm<sup>2</sup>)  
 Air consumption: 30L/min.  
 Power supply: 100V AC – 240V AC, 50/60Hz  
 Dimensions (W x D x H): 26.3 x 20 x 35.4"  
 (667 x 510 x 900mm)  
 26.3 x 20 x 43.3"  
 (667 x 510 x 1100mm: AH / DH models)  
 Mass: 396 lbs (180kg)  
 440 lbs (200kg) AH / DH models

## Printout



# Roundtest RA-2200AS / DS / AH / DH

## SERIES 211 — Roundness / Cylindricity Measuring System

The RA-2200 provides a high accuracy, high speed and high performance in roundness measurement. The fully-automatic or a DAT (Digital Adjustment Table) function aided manual workpiece centering and leveling turns what used to be a difficult and finicky task into one that is simple enough for even untrained

users to perform. This facilitates substantial reductions in overall measurement time. The RA-2200 system comes complete with powerful data analysis software ROUNDPAK which requires only simple manipulation using a mouse and icon, achieving enhanced functionality and ease of operation.

### RA-2200AS with personal computer system and software

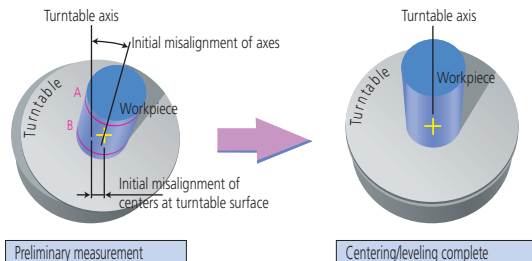
\* Shown with optional vibration isolator and side table for PC



### Highly accurate and easy-to-use turntable

With extremely high rotational accuracy, both in the radial and axial directions, the turntable allows high accuracy flatness testing to be performed in addition to roundness and cylindricity measurements.

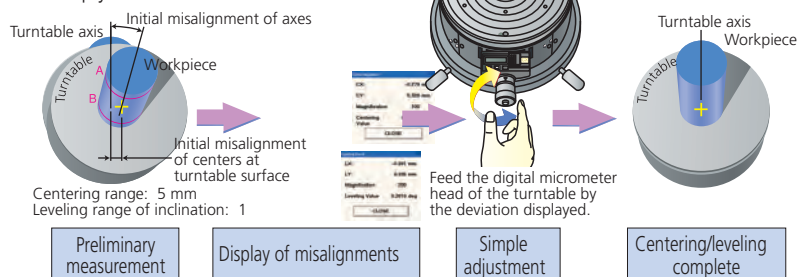
Incorporating an automatic centering/leveling turntable (A.A.T.), the top-of-the-line RA-2200AS/AH models relieve the operator of the bothersome task of workpiece centering and leveling.



Preliminary measurement of two cross-sections 'A' and 'B'.

Preliminary measurement is followed by automatic centering and leveling

A guidance system (D.A.T.) is incorporated into the turntables on the RA-2200DS/DH models to help the operator perform manual centering and leveling smoothly and simply.



Preliminary measurement of two cross-sections 'A' and 'B'.

Centering range: 5 mm  
 Leveling range of inclination: 1

Feed the digital micrometer head of the turntable by the deviation displayed.

# Roundtest RA-2200AS / DS / AH / DH

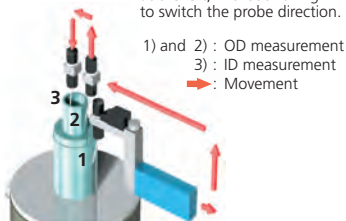
## SERIES 211 — Roundness / Cylindricity Measuring System

### Greater productivity by continuous measurement

Both the OD and ID of a workpiece\* can be measured in succession without the need for changing the traverse direction of the stylus.

\*Inside diameter up to 50 mm.

Continuous measurement is possible as shown in steps (1) through (3) on the figure at the left, without having to switch the probe direction.



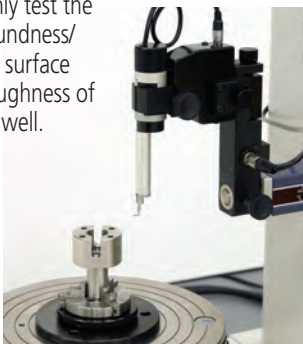
Highly repeatable measurements with high-accuracy scales Mitutoyo linear scales are used in the X/Z drive unit to guarantee the high precision positioning so vital for repetitive measurement.

### Unique design allows system upgrading

The system can be upgraded to CNC operation by replacing and adjusting the detector unit. (This task should be performed by a Mitutoyo technician.)

### Surface roughness measurement function (Surface roughness unit: option)

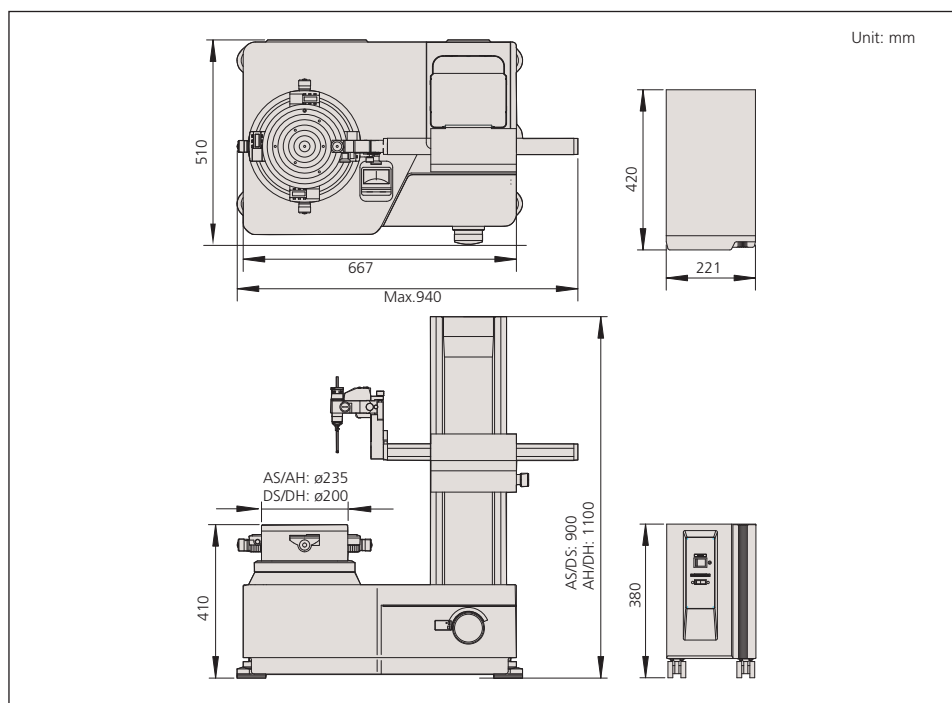
A surface roughness detector, compliant with the relevant International Standards, can be mounted in place of the roundness measuring detector. This creates a multiple sensor system that can not only test the geometrical roundness/cylindricity of a surface but also the roughness of that surface as well.



## SPECIFICATIONS

Model No.	RA-2200AS	RA-2200DS	RA-2200AH	RA-2200DH
Order No.	211-511A (mm/inch)	211-514A (inch)	211-512A (mm/inch)	211-516A (inch)
Effective table diameter	9.25" (235mm)	8" (200mm)	9.25" (235mm)	8" (200mm)
Centering/leveling adjustment	A.A.T.	D.A.T.	A.A.T.	D.A.T.
Centering range	±0.118" (±3mm)	±0.197" (±5mm)	±0.118" (±3mm)	±0.197" (±5mm)
Column travel	12" (300mm) (standard column)		20" (500mm) (high column)	
Basic unit mass	396lbs. (180kg)		440lbs. (200kg)	

## DIMENSIONS



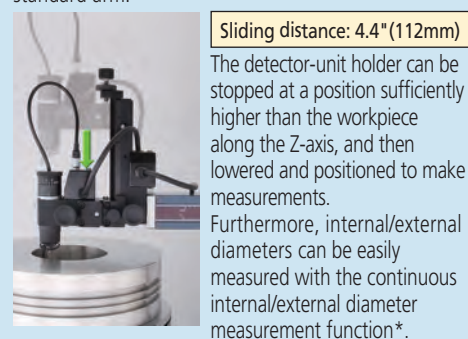
## Optional Accessories

- 350850: Cylindrical square
- 356038: Auxiliary stage for a low-height workpiece
- 12AAF203: Extension probe holder (2X higher)
- 12AAF204: Auxiliary probe holder for a large diameter workpiece
- 211-045: Magnification checking gage
- 211-014: Chuck (OD: 1 - 85mm, ID: 33 - 85mm)
- 211-032: Quick chuck (OD: 1 - 75mm, ID: 14 - 70mm)
- 211-031: Micro-chuck (OD: 1.5mm max.)
- 178-025: Vibration isolator
- 178-024: Stand for vibration isolator
- : Interchangeable styli (See page J-54.)
- 12AAK110: Vibration isolator
- 12AAK120: Monitor arm
- 12AAL019: Side table for PC

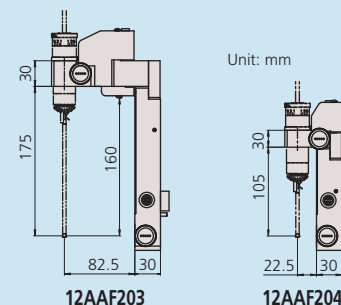


### Sliding detector-unit holder (Standard) 12AAL090

The detector-unit holder is equipped with a sliding mechanism, enabling one-touch measurement of a workpiece with a deep hole having a thick wall, which has been difficult with the conventional standard arm.



\*: See this page for details about the continuous ID and OD measuring function.



12AAF203

12AAF204

# Roundtest RA-H5200AS / AH

## SERIES 211 — Roundness / Cylindricity Measuring System

### Technical Data

Turntable  
 Rotational accuracy (radial):  $(.8+35H)\mu\text{m}$   $\{(0.02+3.5H/10000)\mu\text{m}\}$   
 Rotational accuracy (axial):  $(.8+35X)\mu\text{m}$   $\{(0.02+3.5X/10000)\mu\text{m}\}$   
H: Probing height (mm), X: Distance from the turntable axis (mm)  
 Rotating speed: 2, 4, 6, 10rpm (20rpm: auto-centering)  
 Table top diameter:  $\varnothing 11.8"$  (300mm)  
 Centering range:  $\pm 5\text{mm}$   
 Leveling range:  $\pm 1^\circ$   
 Maximum probing diameter:  $\varnothing 15.7"$  (400mm)  
 Maximum workpiece diameter:  $\varnothing 26.8"$  (680mm)  
 Maximum workpiece weight: 176 lbs (80kg)  
 143 lbs (65kg): auto-centering

Vertical column (Z-axis)  
 Vertical travel: 13.8" (350mm), (21.7" (550mm): AH model)  
 Straightness ( $\lambda c2.5$ ):  $0.05\mu\text{m} / 100\text{mm}$ ,  $0.14\mu\text{m} / 350\text{mm}$   
 (0.2 $\mu\text{m} / 550\text{mm}$ : AH model)  
 Parallelism with rotating axis:  $0.2\mu\text{m} / 350\text{mm}$   
 (0.32 $\mu\text{m} / 550\text{mm}$ : AH model)  
 Positioning speed: Max. 60mm/s  
 Measuring speed: 0.5, 1, 2, 5mm/s  
 Maximum probing height: 13.8" (350mm) (OD / ID)  
 [21.7" (550mm) (OD / ID): AH model]  
 Maximum probing depth: over  $\varnothing 32$ : 85mm (w/standard stylus)  
 over  $\varnothing 7$ : 50mm (w/standard stylus)

Horizontal arm (X-axis)  
 Horizontal travel: 8.9" (225mm)  
 Straightness ( $\lambda c2.5$ ):  $0.4\mu\text{m} / 200\text{mm}$   
 Squareness with rotating axis:  $0.5\mu\text{m} / 200\text{mm}$   
 Positioning speed: Max. 50mm/s  
 Measuring speed: 0.5, 1, 2, 5mm/s

Probe and stylus  
 Measuring range:  $\pm 400\mu\text{m}$  ( $\pm 5\text{mm}$ : tracking range)  
 Measuring force: 10mN~50mN (in 5 steps)  
 Standard stylus: **12AAL021**, carbide ball,  $\varnothing 1.6\text{mm}$   
 Measuring direction: Two directional  
 Stylus angle adjustment:  $\pm 45^\circ$  (with graduations)

Data analysis system  
 Analysis software: Roundpak  
 Filter type:  
 2CRPC-75%, 2CRPC-50%, 2CR-75% (phase corrected),  
 2CR-50% (phase corrected), Gaussian, filter OFF  
 Cutoff value;  
 15upr, 50upr, 150upr, 500upr, 1500upr,  
 15-150upr, 15-500upr, 15-1500upr, 50-500upr,  
 50-1500upr, 150-1500upr, Manual setting  
 Reference circles for roundness evaluation:  
 LSC, MZC, MIC, MCC

Air supply  
 Air pressure: 390kPa (4kgf/cm<sup>2</sup>)  
 Air consumption: 45L/min.  
 Power supply: 100V AC – 240V AC, 50/60Hz  
 Dimensions (W x D x H): 49.6 x 28.0 x 66.9"  
 (1260 x 710 x 1700mm)  
 49.6 x 28.0 x 74.8"  
 (1260 x 710 x 1900mm: AH model)

Mass: Main unit: 1433lbs. (650kg)  
 1477lbs. (670kg): AH model  
 Vibration isolator: 375 lbs (170kg)

RA-H5200AS / AH, a roundness/cylindricity measuring system developed to combine world-class accuracy with maneuverability/high analysis capability.

Enhanced detector safety functions such as accidental touch and collision detection is installed to minimize damage to both machine and workpieces.



RA-H5200AS  
with personal computer  
system and software

\* Shown with optional  
side table for PC.

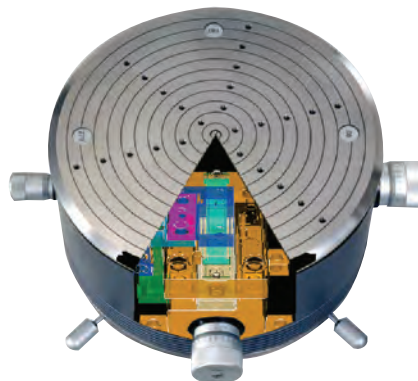
### High-accuracy automatic centering/leveling turntable

A highly accurate, highly rigid turntable has been achieved through exceptional manufacturing accuracy of the critical components, such as the rotor and stator, in addition to an air-bearing incorporating a complex aperture that provides superior rigidity and uniform pressure distribution. As a result, the rotational accuracy (radial), which is the heart of the roundness/cylindricity measuring system, is a world-class ( $0.02 + 3.5H/10000$ ) $\mu\text{m}$ .

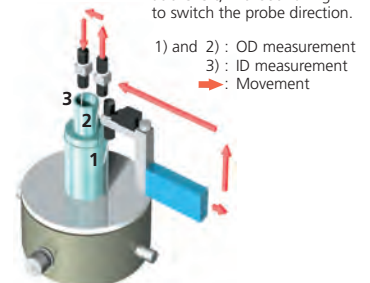
### Automatic continuous OD/ID measurement

Automatic measurement can be performed continuously from external diameter to internal diameter without having to change the probe position. This not only reduces measurement time but eliminates the error factors otherwise involved in changing the probe position, greatly facilitating high-accuracy measurement.

The automatic centering/leveling mechanism incorporates a high-precision glass scale on each axis of the turntable. This allows feedback to be generated that prevents positioning errors from affecting centering/leveling adjustments. The high-speed, automatic, centering/leveling capability achieved greatly contributes to reducing the total measurement time from workpiece setting to workpiece measurement.



Continuous measurement is possible as shown in steps (1) through (3) on the figure at the left, without having to switch the probe direction.



1) and 2) : OD measurement  
 3) : ID measurement  
 → : Movement

# Roundtest RA-H5200AS / AH

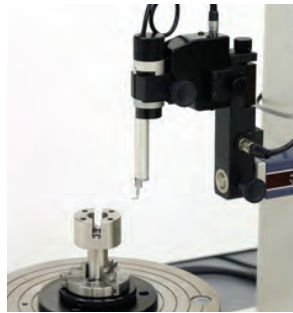
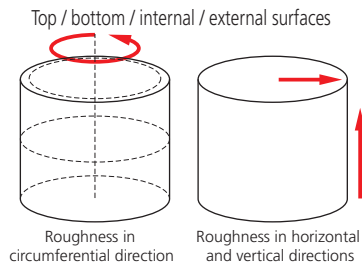
## SERIES 211 — Roundness / Cylindricity Measuring System

### X-axis tracking measurement

Because of the linear scale incorporated into the X-axis, measurement can be performed by tracking the workpiece surface (tracking range:  $\pm 5\text{mm}$ ). This function is effective for measuring a workpiece with a displacement that exceeds the detection range of the probe in measuring roundness/cylindricity or a taper that is determined with slider/column movement.

### Surface roughness measurement function (Surface roughness unit: option)

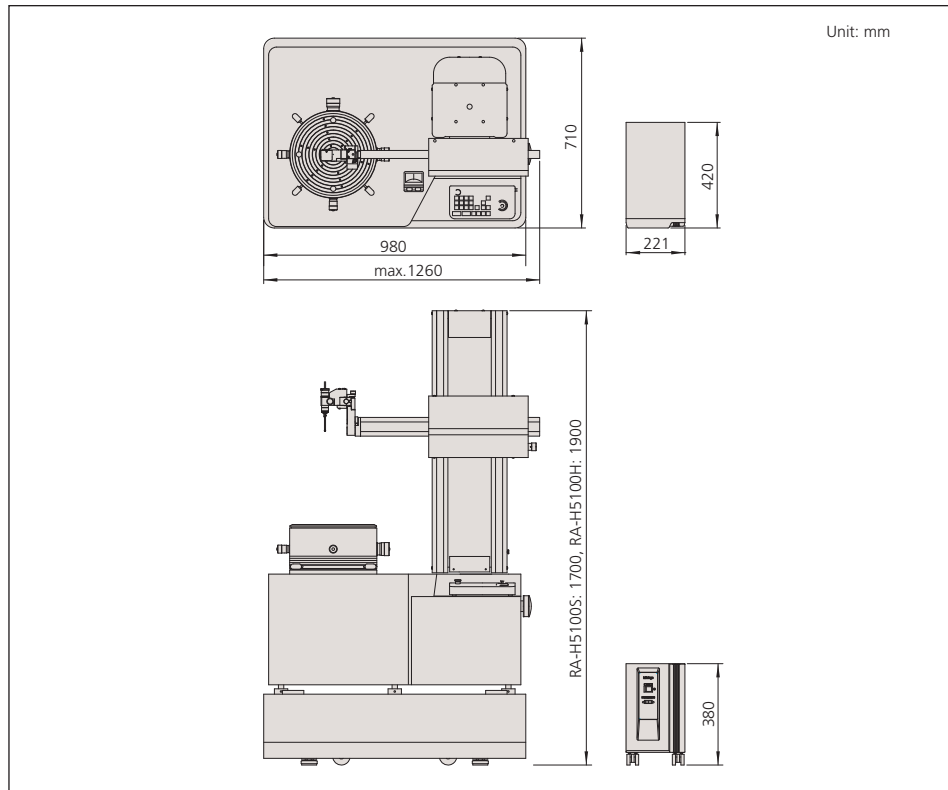
A surface roughness detector, compliant with the relevant International Standards, can be mounted in place of the roundness measuring detector. This creates a multiple sensor system that can not only test the geometrical roundness/cylindricity of a surface but also the roughness of that surface as well.



### SPECIFICATIONS

Model No.	RA-H5200AS	RA-H5200AH
Order No. * with vibration isolating stand	211-531A	211-532A
Column travel	13.77" (350mm) (standard column)	21.65" (550mm) (high column)

### DIMENSIONS



### Optional Accessories

- 350850: Cylindrical square
- 12AAF203: Extension probe holder (2X higher)
- 12AAF205: Extension probe holder (3X higher)
- 12AAF204: Auxiliary probe holder for a large diameter workpiece
- 211-045: Magnification calibration gage
- 211-014: Chuck (OD: 2 - 78mm, ID: 25 - 68mm)
- 211-032: Quick chuck (OD: 1 - 79mm, ID: 16 - 69mm)
- 211-031: Micro-chuck (OD: 0.1~1.5mm max.)
- 12AAB598: Protective shield
- : Interchangeable styli (See page J-54.)
- 12AAL019: Side table for PC



### Sliding detector-unit holder(Standard) 12AAL090

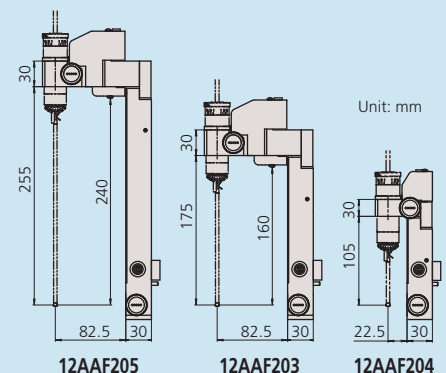
The detector-unit holder is equipped with a sliding mechanism, enabling one-touch measurement of a workpiece with a deep hole having a thick wall, which has been difficult with the conventional standard arm.



Sliding distance: 4.4" (112mm)

The detector-unit holder can be stopped at a position sufficiently higher than the workpiece along the Z-axis, and then lowered and positioned to make measurements. Furthermore, internal/external diameters can be easily measured with the continuous internal/external diameter measurement function\*.

\*: See this page for details about the continuous ID and OD measuring function.





## Technical Data: RA-2200CNC

### Turntable

Rotational accuracy (radial):  $(.8+.35H)\mu\text{in}$   $((0.02+3.5H/10000)\mu\text{m})$

Rotational accuracy (axial):  $(.8+.35X)\mu\text{in}$   $((0.02+3.5X/10000)\mu\text{m})$

H: Probing height (mm), X: Distance from the turntable axis (mm)

Rotating speed: 2, 4, 6, 10rpm

Table top diameter:  $\varnothing 9.25"$  (235mm)

Centering range:  $\pm 3\text{mm}$

Leveling range:  $\pm 1^\circ$

Maximum probing diameter:  $\varnothing 10.1"$  (256mm)

Maximum workpiece diameter:  $\varnothing 22.8"$  (580mm)

Maximum workpiece weight: 66 lbs (30kg)

### Vertical column (Z-axis)

Vertical travel: 11.8" (300mm) 19.7" (500mm): 2200H model)

Straightness ( $\lambda c2.5$ ): 0.10 $\mu\text{m}$  / 100mm, 0.15 $\mu\text{m}$  / 300mm

(0.25 $\mu\text{m}$  / 500mm: 2200H model)

Parallelism with rotating axis: 0.7 $\mu\text{m}$  / 300mm

(1.2 $\mu\text{m}$  / 500mm: 2200H model)

Positioning speed: Max. 50mm/s

Measuring speed: 0.5, 1, 2, 5mm/s

Maximum probing height: 11.8" (300mm) (OD / ID)

[19.7" (500mm) (OD / ID): 2200H model]

Maximum probing depth: over  $\varnothing 32$ : 104mm (w/standard stylus)

over  $\varnothing 12.7$ : 26mm (w/standard stylus)

### Horizontal arm (X-axis)

Horizontal travel: 6.9" (175mm) (Including a protrusion of

1" (25mm) the turntable rotation center)

Straightness ( $\lambda c2.5$ ): 0.7 $\mu\text{m}$  / 150mm

Squareness with rotating axis: 1.0 $\mu\text{m}$  / 150mm

Positioning speed: Max. 30mm/s

Measuring speed: 0.5, 1, 2, 5mm/s

### Probe and stylus

Measuring range:  $\pm 400\mu\text{m} \pm 40\mu\text{m} \pm 4\mu\text{m}$  ( $\pm 5\text{mm}$ : tracking range)

Measuring force: 40mN (in 5 steps)

Standard stylus: **12AAE301**, carbide ball,  $\varnothing 1.6\text{mm}$

Measuring direction: one direction

Stylus angle adjustment:  $\pm 45^\circ$  (with graduations)

### Air supply

Air pressure: 390kPa (4kgf/cm<sup>2</sup>)

Air consumption: 30L/min.

Power supply: 100V AC – 240V AC, 50/60Hz

Dimensions (W x D x H): 26.3 x 20 x 35.4"

(667 x 510 x 900mm)

(26.3 x 20 x 43.3"

(667 x 510 x 1100mm): 2200H model)

Mass: 397 lbs (180kg) (441 lbs (200kg): 2200H model)

## Technical Data: RA-H5200CNC

### Turntable

Rotational accuracy (radial):  $(.8+.35H)\mu\text{in}$   $((0.02+3.5H/10000)\mu\text{m})$

Rotational accuracy (axial):  $(.8+.35X)\mu\text{in}$   $((0.02+3.5X/10000)\mu\text{m})$

H: Probing height (mm), X: Distance from the turntable axis (mm)

Rotating speed: 2, 4, 6, 10rpm (20rpm: auto-centering)

Table top diameter:  $\varnothing 300\text{mm}$

Centering range:  $\pm 5\text{mm}$

Leveling range:  $\pm 1^\circ$

Maximum probing diameter:  $\varnothing 14"$  (356mm)

Maximum workpiece diameter:  $\varnothing 26.8"$  (680mm)

Maximum workpiece weight: 176 lbs (80kg)

143 lbs (65kg): auto-centering

### Vertical column (Z-axis)

Vertical travel: 13.7" (350mm) 21.7" (550mm): H5200H model)

Straightness ( $\lambda c2.5$ ): 0.05 $\mu\text{m}$  / 100mm, 0.14 $\mu\text{m}$  / 350mm

(0.2 $\mu\text{m}$  / 550mm: H5200H model)

Parallelism with rotating axis: 0.2 $\mu\text{m}$  / 350mm

(0.32 $\mu\text{m}$  / 550mm: H5200H model)

Positioning speed: Max. 60mm/s

Measuring speed: 0.5, 1, 2, 5mm/s

Maximum probing height: 13.7" (350mm) (OD / ID)

[21.7" (550mm) (OD / ID): H5200H model]

Maximum probing depth: over  $\varnothing 32$ : 104mm (w/standard stylus)

over  $\varnothing 12.7$ : 26mm (w/standard stylus)

### Horizontal arm (X-axis)

Horizontal travel: 8.8" (225mm)

Straightness ( $\lambda c2.5$ ): 0.4 $\mu\text{m}$  / 200mm

Squareness with rotating axis: 0.5 $\mu\text{m}$  / 200mm

Positioning speed: Max. 50mm/s

Measuring speed: 0.5, 1, 2, 5mm/s

### Probe and stylus

Measuring range:  $\pm 400\mu\text{m}$  ( $\pm 5\text{mm}$ : tracking range)

Measuring force: 40mN (in 5 steps)

Standard stylus: **12AAE301**, carbide ball,  $\varnothing 1.6\text{mm}$

Measuring direction: one direction

Stylus angle adjustment:  $\pm 45^\circ$  (with graduations)

### Air supply

Air pressure: 390kPa (4kgf/cm<sup>2</sup>)

Air consumption: 45L/min.

Power supply: 100V AC – 240V AC, 50/60Hz

Dimensions (W x D x H): 49.6 x 28.0 x 66.9"

(1260 x 710 x 1700mm)

(49.6 x 28.0 x 74.8"

(1260 x 710 x 1900mm: H5200H model)

Mass: Main unit: 1433lbs. (650kg)

1477lbs (670kg): H5200H (model)

Vibration isolator: 375lbs (170kg)

# Roundtest Extreme RA-2200CNC / RA-H5200CNC

## SERIES 211 — CNC Roundness / Cylindricity Measuring System

Mitutoyo offers innovative roundness/cylindricity measuring systems capable of automated measurement with independent/simultaneous multi-axis CNC control. In addition to high measuring accuracy and reliability, these CNC models provide excellent inspection productivity. Roundness and surface roughness measurements are both available from a single measuring system so workpiece resetting for roughness measurement is not required. Roughness measurement is possible in the axial and circumferential directions.



Holder-arm orientation switching (vertical position - horizontal position)



Detector rotation mechanism (0 to 290°, in increments of 1°)



RA-2200H CNC  
with personal computer  
system and software

\* Shown with optional  
vibration isolator and side  
table for PC.



RA-H5200H CNC  
with personal computer  
system and software

\* Shown with optional  
side table for PC.

# Mitutoyo

# Roundtest Extreme RA-2200CNC / RA-H5200CNC

## SERIES 211 — CNC Roundness / Cylindricity Measuring System

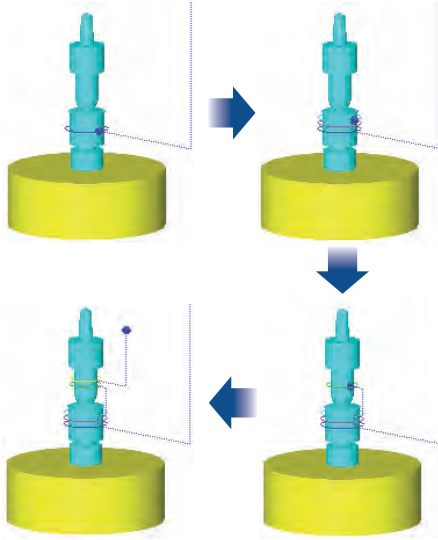
### ROUNDPAK

#### Off-line measurement procedure programming function

On-screen virtual 3D simulation measurements can be performed with the incorporated off-line teaching function that allows a part program (measurement procedure) to be created without an objective workpiece. The probe and the holder unit of the Roundtest Extreme can be precisely represented and an alarm can be raised to indicate that there is a collision risk predicted by the simulation.



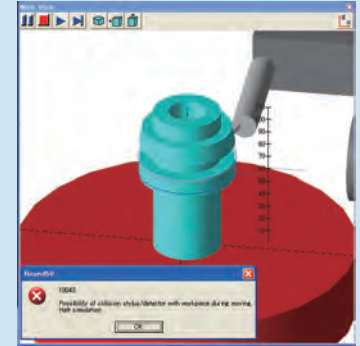
3D simulation screens (work-view windows) can be generated after entering CAD data (in IGES, DXF form) and text data.



# MiCAT

Mitutoyo Intelligent Computer Aided Technology

the standard in world  
metrology software  
**FORM**



### Optional Accessories

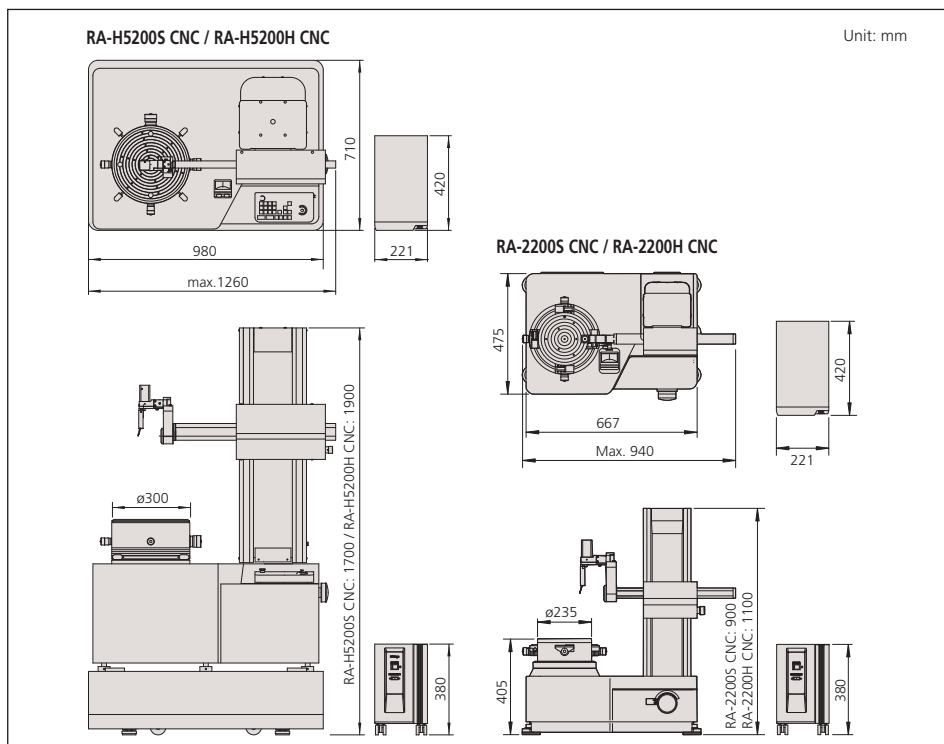
- 350850:** Cylindrical square
- 211-045:** Magnification calibration gage
- 211-014:** Chuck (OD: 1 - 78mm, ID: 25 - 68mm)
- 211-032:** Quick chuck (OD: 1 - 79mm, ID: 16 - 69mm)
- 211-031:** Micro-chuck (OD: 0.1-1.5mm max.)
- 12AAB598:** Protective shield (RA-H5200 only)
- Interchangeable styli (See page J-54.)
- 12AAK110:** Vibration isolator (RA-2200 only)
- 12AAK120:** Monitor arm (RA-2200 only)
- 12AAL019:** Side table for PC
- 12AAG419:** Surface roughness detector for RA-CNC

### SPECIFICATIONS

Model No.	EXTREME RA-2200S CNC	EXTREME RA-2200H CNC
Order No.	<b>211-517A</b>	<b>211-518A</b>
Column travel	11.8" (300mm) (standard column)	19.7" (500mm) (high column)

Model No.	EXTREME RA-H5200S CNC	EXTREME RA-H5200H CNC
Order No. with vibration isolating stand	<b>211-533A</b>	<b>211-534A</b>
Column travel	13.77" (350mm) (standard column)	21.65" (550mm) (high column)

### DIMENSIONS



**050165B Workstation**

- Height adjusts to 6 different positions.
- Interchangeable mouse platform and adjustable width CPU holder.
- Security rail safeguards equipment.
- Back cut out on monitor shelf allows cords to be routed with unit flush against the wall.
- Teak tops with black frames.
- 2" casters (2 locking) included.
- 25-33" H x 42 1/4" W x 34" D

# Optional Styli for Roundtest

## Interchangeable Styli for RA-10, RA-120, RA-120P, RA-220, RA-1600, RA-2200, RA-H5200

Application/Type	Standard (Standard accessory)	Notch	Deep groove	Corner	Cutter mark
<b>Order No.</b>	<b>12AAL021*</b>	<b>12AAL022</b>	<b>12AAL023</b>	<b>12AAL024</b>	<b>12AAL025</b>
Stylus tip	ø1.6 mm tungsten carbide	ø3 mm tungsten carbide	SR0.25mm sapphire	SR0.25mm sapphire	tungsten carbide
Dimensions (mm)					
Application/Type	Small hole (ø0.8)	Small hole (ø1.0)	Small hole (ø1.6)	Extra small hole (Depth 3mm)	ø1.6 mm ball
<b>Order No.</b>	<b>12AAL026</b>	<b>12AAL027</b>	<b>12AAL028</b>	<b>12AAL029</b>	<b>12AAL030</b>
Stylus tip	ø0.8 mm tungsten carbide	ø1 mm tungsten carbide	ø1.6 mm tungsten carbide	ø0.5 mm tungsten carbide	ø1.6 mm tungsten carbide
Dimensions (mm)					
Application/Type	Disk	Crank (ø0.5)	Crank (ø1.0)	Flat surface	2X-long type**
<b>Order No.</b>	<b>12AAL031</b>	<b>12AAL032</b>	<b>12AAL033</b>	<b>12AAL034</b>	<b>12AAL035</b>
Stylus tip	ø12 mm tungsten carbide	ø0.5 mm tungsten carbide (Depth 2.5 mm)	ø1 mm tungsten carbide (Depth 5.5 mm)	tungsten carbide	ø1.6 mm tungsten carbide
Dimensions (mm)					
Application/Type	2X-long type notch**	2X-long type deep groove**	2X-long type corner**	2X-long type cutter mark**	2X-long type Small hole**
<b>Order No.</b>	<b>12AAL036</b>	<b>12AAL037</b>	<b>12AAL038</b>	<b>12AAL039</b>	<b>12AAL040</b>
Stylus tip	ø3 mm tungsten carbide	SR0.25 mm sapphire	SR0.25 mm sapphire	tungsten carbide	ø1 mm tungsten carbide
Dimensions (mm)					
Application/Type	3X-long type**	3X-long type deep groove**	Stylus shank	Stylus shank(standard groove)	Stylus shank(2X-long groove)**
<b>Order No.</b>	<b>12AAL041</b>	<b>12AAL042</b>	<b>12AAL043</b>	<b>12AAL044</b>	<b>12AAL045</b>
Stylus tip	ø1.6 mm tungsten carbide	SR0.25 mm sapphire	For mounting CMM stylus (mounting thread M2)	For mounting CMM stylus (mounting thread M2)	For mounting CMM stylus (mounting thread M2)
Dimensions (mm)					

\* 12AAL021 is a standard accessory for all Roundtest models.

\*\* Not available for RA-10, RA-120/P and RA-220

Measuring is only in the vertical direction. Measuring magnification of 20000X is available using the 2X-long stylus.

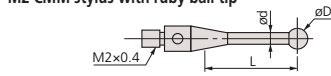
Customized special interchangeable styli are available on request. Please contact any Mitutoyo office for more information.

† New design for holding styli is not shown in above illustrations.

**New styli for RA-2200 / H5200 are compatible with old RA-2100 / H5100 detectors.**

**Old styli for RA-2100 / H5100 are NOT compatible with new RA-2200 / H5200 detectors.**

### M2 CMM stylus with ruby ball tip



- 06ABN752**  
D = ø0.5, d = ø0.34, L = 3.0, Mass = 0.3g
- 06ABN753**  
D = ø0.7, d = ø0.5, L = 4.0, Mass = 0.3g
- 06ABN754**  
D = ø1.0, d = ø0.7, L = 4.5, Mass = 0.3g

- 06ABN758**  
D = ø1.5, d = ø0.7, L = 4.5, Mass = 0.3g
- 06ABN761**  
D = ø2.0, d = ø1.0, L = 6.0, Mass = 0.3g
- 06ABN769**  
D = ø3.0, d = ø1.5, L = 7.5, Mass = 0.4g
- 06ABN774**  
D = ø4.0, d = ø1.5, L = 10.0, Mass = 0.4g

- 06ABN780**  
D = ø5.0, d = ø2.5, R = 10.0, Mass = 0.7g
- 06ABN786**  
D = ø6.0, d = ø2.5, R = 10.0, Mass = 0.9g
- 06ABN788**  
D = ø8.0, d = ø2.5, R = 11.0, Mass = 1.5g

Unit: mm

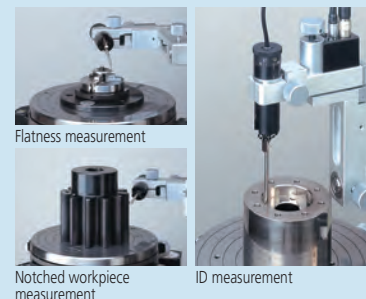
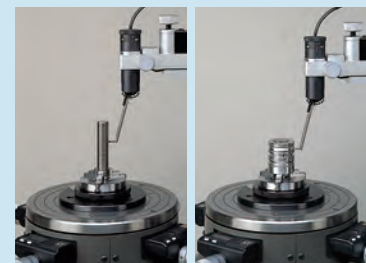
# Optional Styli for Roundtest

## Interchangeable Styli for RA-2200 CNC, RA-H5200 CNC

Application/Type	Groove	Flat surface	General purpose	Notch
Order No.	<b>12AAE310</b>	<b>12AAE302</b>	<b>12AAE301</b>	<b>12AAE309</b>
Stylus tip	ø1.6 mm tungsten carbide	ø1.6 mm tungsten carbide	ø1.6 mm tungsten carbide	ø3 mm tungsten carbide
Dimensions (mm)				
Application/Type	ø1.6 mm ball	ø0.8 mm ball	ø0.5 mm ball	Deep groove
Order No.	<b>12AAE303</b>	<b>12AAE304</b>	<b>12AAE305</b>	<b>12AAE308</b>
Stylus tip	ø1.6 mm tungsten carbide	ø0.8 mm tungsten carbide	ø0.5 mm tungsten carbide	ø1.6 mm tungsten carbide
Dimensions (mm)				
Application/Type	Deep hole A		Deep hole B	
Order No.	<b>12AAE306</b>		<b>12AAE307</b>	
Stylus tip	ø1.6 mm tungsten carbide		ø1.6 mm tungsten carbide	
Dimensions (mm)				

Analyzing items		Models							
		RA-H5200CNC/ RA-H5200	RA-2200CNC/ RA-2200	RA-1600	RA-220	RA-120P	RA-120	RA-10	
Roundness	○	●	●	●	●	●	●	●	
Cylindricity	∅	●	●	●	●	—	—	—	
Concentricity	◎	●	●	●	●	●	●	●	
Coaxiality	axis-element	●	●	●	●	●	●	●	
	Axis-axis	●	●	●	—	●	—	—	
Flatness	□	●	●	●	●	●	●	●	
Parallelism	//	●	●	●	●	●	●	●	
Perpendicularity	⊥	●	●	●	●	●	●	—	
Runout	↗	●	●	●	●	●	●	●	
Total runout	↗↖	●	●	●	—	—	—	—	
Straightness	—	●	●	●	—	—	—	—	
Inclination	∠	●	●	●	—	—	—	—	
Taper	∧	●	●	●	—	—	—	—	

### Usage examples of styli



# Optional Accessories for Roundtest



## Centering chuck (ring operated)

**211-032**

Suitable for holding small parts with easy-to-operate knurled-ring clamping.

- Holding capacity:  
Internal jaws: OD = 1-36 mm, ID = 14-70 mm.  
External jaws: OD = 1-75 mm.
- External dimensions:  $\phi 118 \times 34$  mm
- Mass: 1.2kg



## Micro-chuck

**211-031**

Used for clamping a workpiece (less than  $\phi 1$  mm dia.) that the centering chuck cannot handle.

- Holding capacity: up to  $\phi 1.5$  mm
- External dimensions:  $\phi 118 \times 48.5$  mm
- Mass: 0.8kg



## Centering chuck (key operated)

**211-014**

Suitable for holding longer parts and those requiring a relatively powerful clamp.

- Holding capacity:  
Internal jaws: OD = 1 - 35mm, ID = 33 - 85mm  
External jaws: OD = 30-80mm.
- External dimensions:  $\phi 157 \times 76$ mm
- Mass: 3.8kg



## Magnification calibration gage

**211-045**

Used for normalizing detector magnification by calibrating detector travel against displacement of a micrometer spindle.

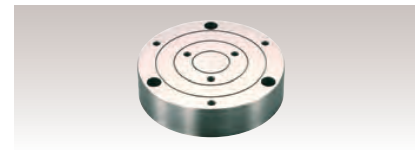
- Maximum calibration range: 400 $\mu$ m
- Graduation: 0.2 $\mu$ m
- Mass: 4kg

## Vibration Isolated frame with work surface

**64AAB213**



Code No.	Dimensions	Load Capacity
<b>64AAB213</b>	30 x 48 x 30"	1300 lbs



## Auxiliary workpiece stand

**356038**

• Used for measuring a workpiece whose diameter is 20mm or shorter and whose height is 20mm or lower.



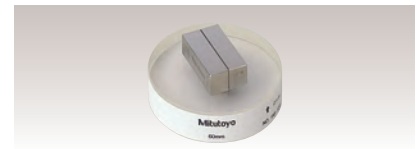
**211-016**  
Reference Hemisphere



## Cylindrical square

**350850**

- Used for checking and aligning table rotation axis parallel to the Z-axis column.
- Squareness: 3 $\mu$ m
- Straightness: 1 $\mu$ m
- Cylindricity: 2 $\mu$ m
- Roundness: 0.5 $\mu$ m
- Mass: 7.5kg



## Magnification checking kit\*

**997090**

• A combination of gage blocks and an optical flat.

\* Standard accessory for RA-2200, RA-2200CNC,

RA-H5200 and RA-H5200CNC



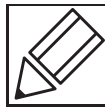
## Origin-point gage\*

**998382**

• A gage for zero setting of the R-axis and Z-axis.

\* Standard accessory for RA-2200 and RA-H5200

# Quick Guide to Precision Measuring Instruments

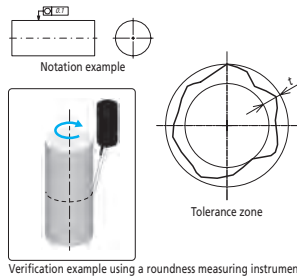


## Roundtest (Roundform Measuring Instruments)

- JIS B 7451-1997: Roundness measuring instruments
- JIS B 0621-1984: Definition and notation of geometric deviations
- JIS B 0021-1998: Geometric property specifications (GPS) of products – Geometric tolerance Roundness Testing

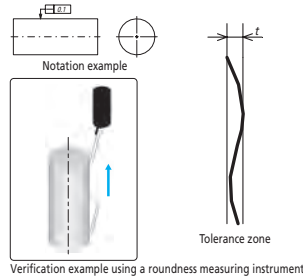
### ○ Roundness

Any circumferential line must be contained within the tolerance zone formed between two coplanar circles with a difference in radii of  $t$



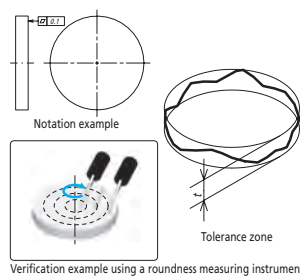
### — Straightness

Any line on the surface must lie within the tolerance zone formed between two parallel straight lines a distance  $t$  apart and in the direction specified



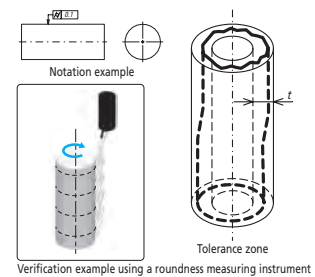
### □ Flatness

The surface must be contained within the tolerance zone formed between two parallel planes a distance  $t$  apart



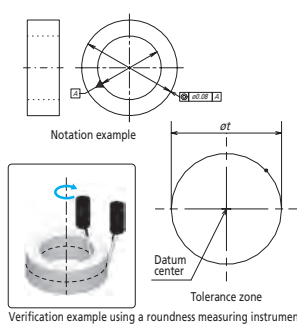
### ⊘ Cylindricity

The surface must be contained within the tolerance zone formed between two coaxial cylinders with a difference in radii of  $t$



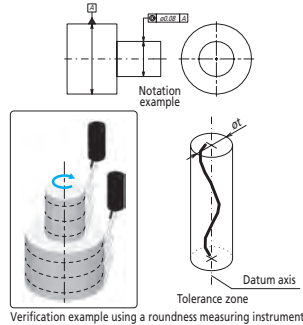
### ◎ Concentricity

The center point must be contained within the tolerance zone formed by a circle of diameter  $t$  concentric with the datum



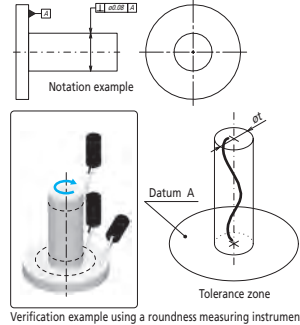
### ◎ Coaxiality

The axis must be contained within the tolerance zone formed by a cylinder of diameter  $t$  concentric with the datum



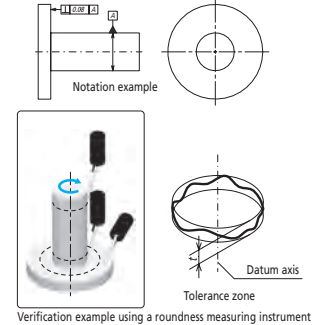
### ⊥ Perpendicularity

The line or surface must be contained within the tolerance zone formed between two planes a distance  $t$  apart and perpendicular to the datum



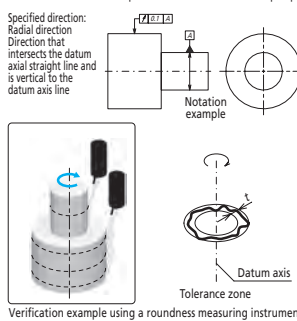
### ⊥ Perpendicularity

The line or surface must be contained within the tolerance zone formed between two planes a distance  $t$  apart and perpendicular to the datum



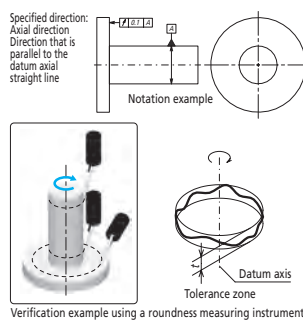
### ↻ Circular Runout

The line must be contained within the tolerance zone formed between two coplanar and/or concentric circles a distance  $t$  apart concentric with or perpendicular to the datum



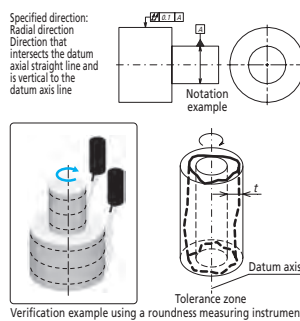
### ↻ Total Runout

The surface must be contained within the tolerance zone formed between two coaxial cylinders with a difference in radii of  $t$ , or planes a distance  $t$  apart, concentric with or perpendicular to the datum



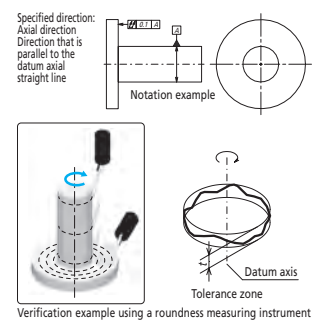
### ↻ Total Runout

The surface must be contained within the tolerance zone formed between two coaxial cylinders with a difference in radii of  $t$ , or planes a distance  $t$  apart, concentric with or perpendicular to the datum



### ↻ Total Runout

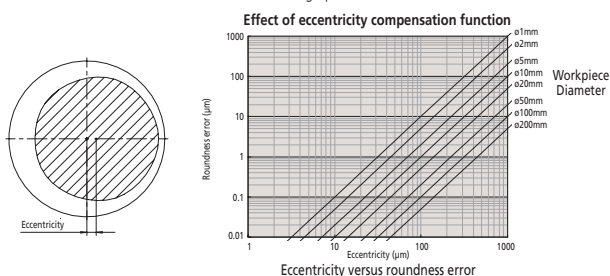
The surface must be contained within the tolerance zone formed between two coaxial cylinders with a difference in radii of  $t$ , or planes a distance  $t$  apart, concentric with or perpendicular to the datum



## ■ Adjustment prior to Measurement

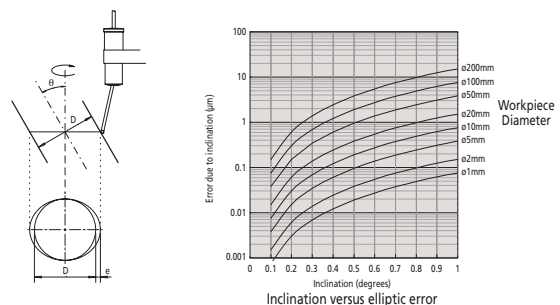
### Centering

A displacement offset (eccentricity) between the Roundtest's rotary table axis and that of the workpiece results in distortion of the measured form (limaçon error) and consequently produces an error in the calculated roundness value. The larger the eccentricity, the larger is the error in calculated roundness. Therefore the workpiece should be centered (axes made coincident) before measurement. Some roundness testers support accurate measurement with a limaçon error correction function. The effectiveness of this function can be seen in the graph below.



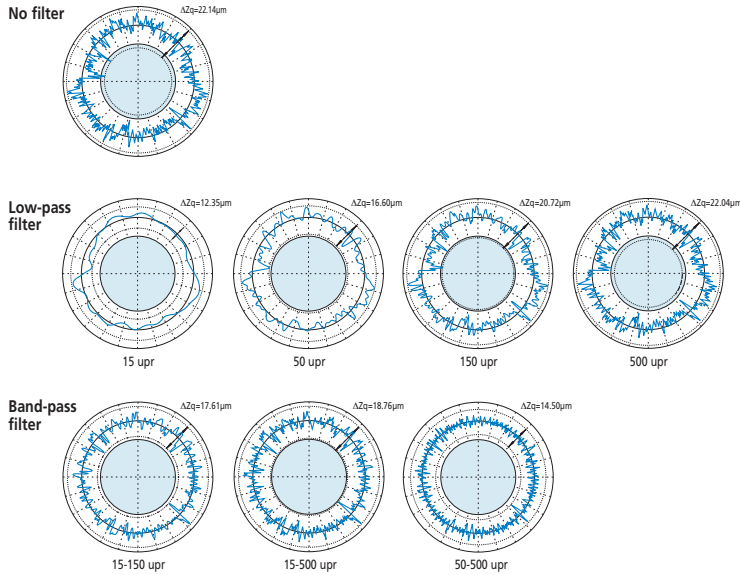
### Leveling

Any inclination of the axis of a workpiece with respect to the rotational axis of the measuring instrument will cause an elliptic error. Leveling must be performed so that these axes are sufficiently parallel.



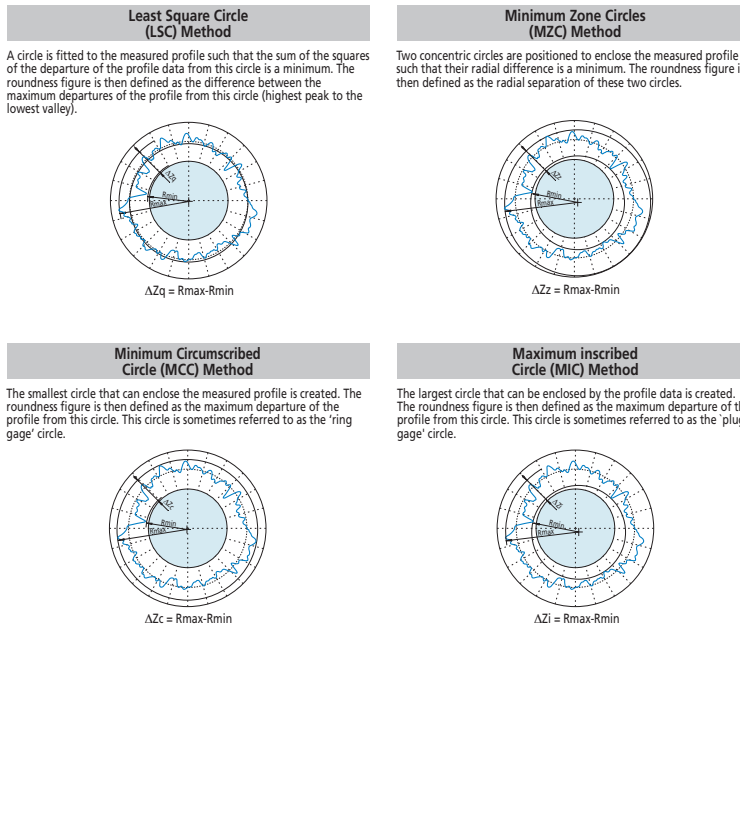
## Effect of Filter Settings on the Measured Profile

Roundness values as measured are greatly affected by variation of filter cutoff value. It is necessary to set the filter appropriately for the evaluation required.



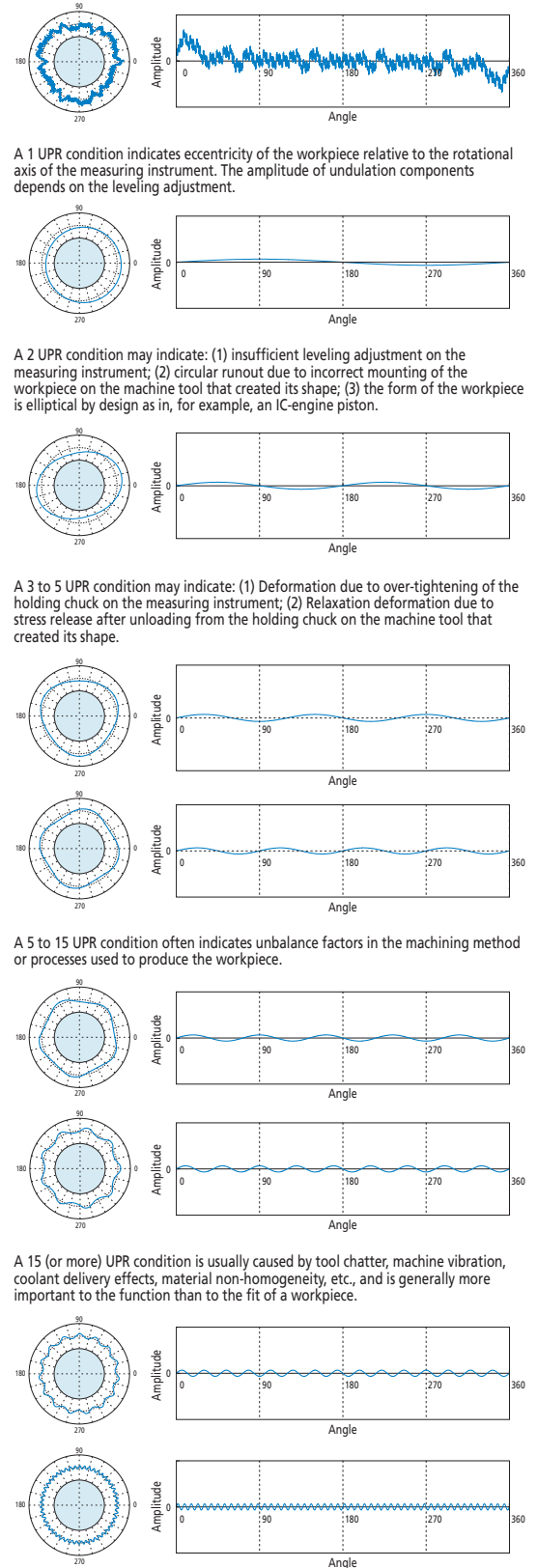
## Evaluating the Measured Profile Roundness

Roundness testers use the measurement data to generate reference circles whose dimensions define the roundness value. There are four methods of generating these circles, as shown below, and each method has individual characteristics so the method that best matches the function of the workpiece should be chosen.



## Undulations Per Revolution (UPR) data in the roundness graphs

Measurement result graphs



# K

## Test Equipment



### Micro Hardness Testing Machines



### Rockwell Hardness Testing Machines



### Micro Zone Test System



### Portable Hardness Testing Instruments



HARDMATIC HH-411



AAV-500

## INDEX

### Test Equipment

#### Micro Hardness Testing Machines

Lineup of Hardness Testing Machines	K-2,3
HM-101 / 112 / 113 / 122	K-4
HM-210 / 220	K-5
AAV-500	K-6
MZT-500	K-7
HV-112 / 113 / 114 / 115	K-8
Optional Accessories Micro-Vickers/Vickers Hardness Testing Machine	K-9,10

#### Rockwell Hardness Testing Machines

HR-521(L) / 523(L)	K-11
HR-210MR/320MS/430MR/430MS	K-12
Optional Accessories For Rockwell/Rockwell Superficial Type Hardness Testing machine	K-13,14

#### Portable Hardness Testing Machines

Hardmatic HH-411	K-15
Hardmatic HH-300	K-16
Hardmatic HH-300 Test Block Set	K-17



HR-210MR



HR-320MS



HR-430MR



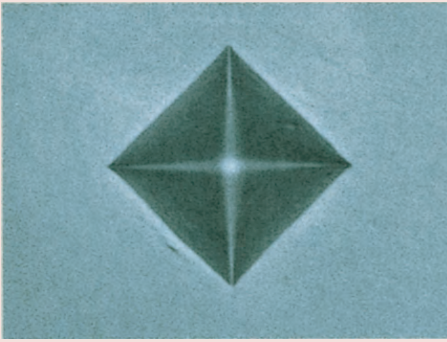
HR-430MS



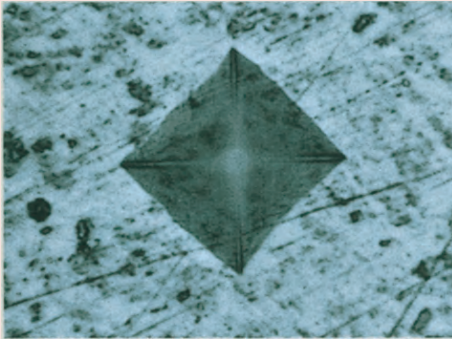
# Lineup of Hardness Testing Machines

Hardness testing machines provide the simplest and most economical testing methods among many material testing machines, playing an important role in research activities, production activities, and commercial transactions. Mitutoyo offers a choice of standard hardness testing machines that are optimal for hard materials such as metals to soft materials such as plastic and rubber, as well as custom-designed testers such as in-line type automatic machines and labor-saving machines required on the shop floor.

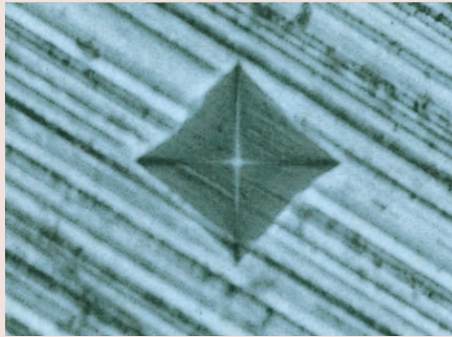




Polished Surface



Scratched Surface



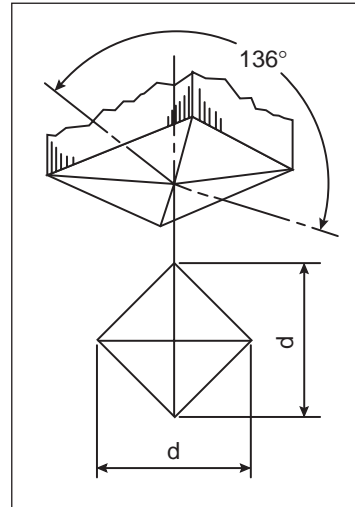
Ground Surface

## Vickers Hardness

In the Vickers hardness test, a diamond pyramid indenter with a  $136^\circ$  angle between opposite faces is pressed into the specimen under a test force  $F$  (kgf). The hardness number (HV) is obtained by dividing  $F$  by the area,  $A$  ( $\text{mm}^2$ ), of contact between the indenter and specimen. This area is calculated from the diagonal length,  $d$  (mm), of the indentation when the indenter is removed.

The Vickers hardness test is the most versatile hardness testing method of those that use different load settings. The Micro-Vickers hardness test, which accepts load settings of 1 kgf (9.807N) or less, is especially well suited for industrial production today, where accuracy requirements are increasing due to technology improvements.

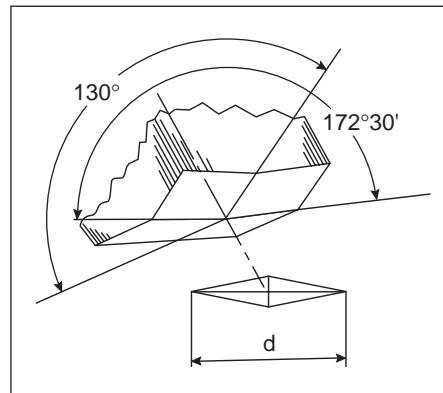
Vickers hardness testing at loads of 1 kilogram and up is also known as heavy load Vickers or Macro Vickers. The other testing parameters are similar to lighter load vickers testing. This type of testing may be used to meet the requirements of international specifications or to replace Rockwell testing.



## Knoop Hardness

In the Knoop hardness test, a diamond pyramid indenter, which has a rhombic base with included angles of  $172^\circ30'$  and  $130^\circ$ , is pressed onto the specimen under a test force  $F$  (kgf). The hardness number (HK) is obtained by dividing the test force  $F$  by the projected area,  $A$  ( $\text{mm}^2$ ), of the indentation. This area is calculated from the longer diagonal length,  $d$  (mm), of the indentation when the indenter is removed.

The Knoop hardness scale is generally used when shallower depth indentations are required. Knoop hardness can be measured by installing a Knoop indenter on the Macro-Vickers hardness testing machine.



# HM-101 / 112 / 113 / 122

## SERIES 810 — Micro-Vickers Hardness Testing Machines

### FEATURES

- A wide range of test force from 9.807 X10-3N to 9.807N (10gf to 1000gf) is available for measuring a various type of specimens. The load duration can be set in 1sec increments between 5 and 99 sec\*. The minimum reading of indentation is 0.01µm\* and allows small indentations to be measured with high precision. \*HM-112, HM-113
- Up to 3 Objective lenses and 1 or 2 indenters mounted on manual or motorized turret
- Eyepiece or CCTV
- Measuring Versions
- Camera port



**HM-113** Reduce individual differences in visual measurement with the TV monitor. The statistical calculation function reduces operation time.

**HM-112** Digital display of measurement results and a statistical calculation function.



Touch screen type



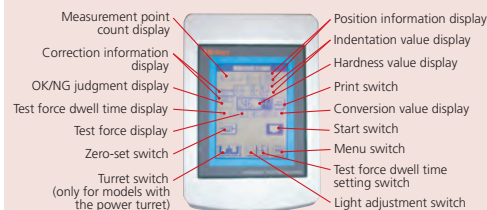
**HM-101**

### SPECIFICATIONS

Model	HM101	HM-112	HM-113	HM122 V	HM122 V/K
<b>Order No.</b>	<b>810-124A</b>	<b>810-126-07A</b>	<b>810-969A</b>	<b>810-127-01A</b>	<b>810-127-02A</b>
Supplied Indenter	VICKERS				VICKERS/KNOOP
Test force*	98.07mN(10g), 245.2mN(25g), 490.3mN(50g), 980.7mN(100g), 1961mN(200g), 2942mN(300g), 4903mN(500g), 9807mN(1000g)				
Test force selection	Dial				
Loading control	Automatic (loading, duration, unloading)				
Load duration	5s-30s	5s to 99s (specified in 1-second increments)			
Loading Rate	60µm/sec.				
Objective Lenses	10x, 50x	10x, 50x		10x, 20x, 50x	
Turret	Manual			Motor Drive	
Measuring microscope total magnification	100x, 500x	100x, 500x		100x, 200x, 500x	
Video monitor screen	—	—	9" B/W 250x, 1250x	—	—
Total Magnification	—	—	—	—	—
Filar eyepiece	10x	10x	—	10x	10x
Minimum reading	0.2mm	0.01µm			
Maximum Reading	140µm	700 / 140µm	500 / 100µm	700 / 350 / 140µm	
Type	Micrometer Drum	Digital Optical Encoder			
XY stage					
Dimension	4 x 4" (100 x 100mm)				
Travel range	1 x 1" (25 x 25mm)				
Minimum reading	.005" (0.01mm)	.0005" (0.001mm)			
Specimen					
Maximum height	3.75" (95mm)				
Maximum depth	5.91" (150mm)				
Display Function	Conversion; Hard: TENS, HS, HBS, HR15N, HR30N, HR45N, HRA, HRD, HRC, HK, HV, OFF Soft: TENS, HR15T, HR30T, HR45T, HRA, HRF, HRB, HRG, HK, HV, OFF OK/NG Judgement Curve correction: 0.01 to 200.00mm Data processing; Number to measurements 2 to 256 data Statistical list: N, Max., Min., Average, Range, High, Low, Good, Over, Under, SD(n-1), SD(n)				
Output	RS-232C, SPC, Centronics				
Dimensions	Main unit: W=16.1 x D=23.6 x H=23.2" (410 x 600 x 590mm) Display: W=6.5 x D=10.2 x H=4.1" (165 x 260 x 105mm)				
Weight	Main unit: 92.4 lbs. (42kg)				
Power supply	120V AC (±10%), 60 Hz				
Power consumption	20VA	60VA			

### Optional Accessories

See Page K-9



## Technical Data

Test force range:  
 HM-210A: 9 steps + arbitrary test force  
 HM-220A: 19 steps + arbitrary test force  
 Load dwell time: 0 - 999s  
 Manual XY stage unit  
 Stage size: 100x100mm  
 Travel range: 25x25mm  
 with Digimatic in/mm micrometer heads  
 Resolution: 0.001mm  
 Max. specimen height: 133mm (Stage size: 25 x 25mm)  
 Max. specimen height: 121mm (Stage size: 50 x 50mm)  
 Max. specimen depth: 160mm (from the center of indenter)  
 Optical path: 4-port objectives switching system of  
 Infinity-correction optical system  
 Resolution: 0.01µm (When using objectives of X40 or more)  
 Data output: Serial interface (RS-232),  
 Digimatic interface, USB 2.0  
 Power supply: 39VA 100-125/220-240V AC, 50/60Hz  
 Dimensions: (W x D x H): 315x671x595mm  
 Mass: 43kg

## Optional Accessories (Factory-installed option)

**11AAC104:** Objective lens unit 2X  
**11AAC105:** Objective lens unit 5X  
**11AAC106:** Objective lens unit 10X  
**11AAC107:** Objective lens unit 20X  
**11AAC108:** Objective lens unit 100X  
**11AAC129:** Measuring microscope (Digital ocular)  
**11AAC109:** Knoop Indenter Assembly (HM-210 Series)  
**11AAC110:** Knoop Indenter Assembly (HM-220 Series)

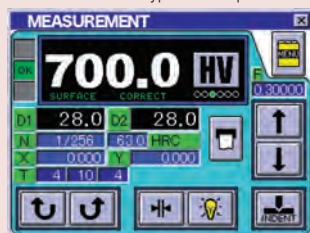
## Optional Accessories

**810-354A:** TV camera unit (8.4 inch LCD)  
**19BAA058:** Diamond indenter for Vickers (HM210 Series standard test force)  
**19BAA059:** Diamond indenter for Vickers (HM220 Series low test force)  
**19BAA061:** Diamond indenter for Knoop (HM210 Series)  
**19BAA062:** Diamond indenter for Knoop (HM220 Series)  
**810-017:** Vise  
**810-013:** Specimen (thin plate) holder  
**810-014:** Specimen (wire) holder  
**810-015:** Specimen (wire or ball) holder  
**810-019:** Specimen tilting holder  
**810-020:** Universal specimen holder  
**810-018:** Rotary table  
**810-084:** Rotatable universal specimen holder  
**810-085:** Adjustable specimen (thin plate) holder  
**810-095:** Rotatable specimen stage  
**375-056:** Stage Micrometer (glass) Micro-scale  
**810-650-1:** Resin mold specimen stage ø25.4  
**810-650-2:** Resin mold specimen stage ø30  
**810-650-3:** Resin mold specimen stage ø31.75  
**810-650-4:** Resin mold specimen stage ø38.1  
**810-650-5:** Resin mold specimen stage ø40  
**02ATE760:** Table  
**810-641:** Vibration Isolator  
**810-870A:** Sample Heating Device HST-250  
**810-420:** 25x25mm stage (metric only)  
**810-423:** 50x50mm stage (metric only)  
**810-424:** 1"x1" in/mm stage (standard)  
**810-427:** 2"x2" in/mm stage



Power turret with up to 2 indenter mounts and 4 objective mounts (manual operation possible)

Touch-screen type control panel



# HM-210 / 220

## SERIES 810 — Micro Vickers Hardness Testing Machines

### FEATURES

- The latest technology electromagnetic force motor used in the loading mechanism enables the test force to be freely selected (see test force specifications) over the wide range of 0.4903mN to 19610mN (0.05gf to 2 kgf). It is also possible to freely set load dwell times. Now your desire for absolute control over the indentation size in Vickers hardness testing can be satisfied. The HM-200 series always offers the test force most appropriate for the specimen material and shape.
- The long working distance objectives used enable a very comfortable working distance between the objective and the specimen surface. This, greatly reduces the possibility of collision between the specimen and the objective during focusing operations. (e.g. for 50X objectives: 1.1mm for conventional models, 2.5mm for HM-200 series)
- Newly-designed 'MH Plan' objectives are optimized for measuring indentation images. The lineup includes 6 types of long working distance objectives: 10X, 20X, 50X and 100X for measuring indentation images, and 2X and 5X for enabling wide-range measurement around indentations.
- LEDs, which have a longer life, produce less heat, consume less power and are more energy efficient than incandescent bulbs, are employed for the illumination system.
- The motorized turret allows for up to 4 objective lenses and 2 indenter assemblies to be mounted at the same time.



Stray light reduction around the indentation



HM-210A

### SPECIFICATIONS TYPE A Digital Hardness Tester

Model No.	HM-210 Type A	HM-210 Type A V/K	HM-220 Type A	HM-220 Type A V/K
Part No.	64AAB305	64AAB306	64AAB307	64AAB308
Fixed test force (mN)	98.07, 196.1, 294.2, 490.3, 980.7, 1961, 2942, 4903, 9807 (10gf-1000gf)		0.4903, 0.9807, 1.961, 2.942, 4.903, 9.807, 19.61, 29.42, 49.03, 98.07, 196.1, 294.2, 490.3, 980.7, 1961, 2942, 4903, 9807, 19610 (0.05 gf-2kgf)	
Arbitrary test force	≤100 gf in 1 gram increments, > 100gf in 10 gram increments		< 1 gf in .1 gf increments, ≤100 gf in 1 gram increments, > 100gf in 10 gram increments	
Test force control	Force generation by electromagnetic and automatic control (load, dwell, unload)			
Control unit	Color LCD Touch Screen			
Loading Rate	60 µ/sec		11, 33, 60 µ/sec	
Load Dwell Time	0-999 sec			
Indenter	Vickers	Vickers and Knoop	Vickers	Vickers and Knoop
Objective Lenses	10x, 50x	10x, 20x, 50x	10x, 50x, 100x	10x, 50x, 100x
Objective turret	Motor driven and manual operation			
Filar Eye Piece	Dual Line, 10X, .01µ min			

### SPECIFICATIONS TYPE B PC Driven Test System

Model No.	HM-210 Type B	HM-210 Type B V/K	HM-220 Type B	HM-220 Type B V/K
Part No.	64AAB323	64AAB324	64AAB325	64AAB326
Fixed test force (mN)	98.07, 196.1, 294.2, 490.3, 980.7, 1961, 2942, 4903, 9807 (10gf-1000gf)		0.4903, 0.9807, 1.961, 2.942, 4.903, 9.807, 19.61, 29.42, 49.03, 98.07, 196.1, 294.2, 490.3, 980.7, 1961, 2942, 4903, 9807, 19610 (0.05 gf-2kgf)	
Arbitrary test force	≤100 gf in 1 gram increments, > 100gf in 10 gram increments		< 1 gf in .1 gf increments, ≤100 gf in 1 gram increments, > 100gf in 10 gram increments	
Test force control	Force generation by electromagnetic and automatic control (load, dwell, unload)			
Control unit	None, By PC*			
Loading Rate	60 µ/sec		11, 33, 60 µ/sec	
Load Dwell Time	0-999 sec			
Indenter	Vickers	Vickers and Knoop	Vickers	Vickers and Knoop
Objective Lenses	10x, 50x	10x, 20x, 50x	10x, 50x, 100x	10x, 50x, 100x
Objective turret	Motor driven and manual operation			
Filar Eye Piece	None			
CCTV Camera	3 megapixel, 1/2"		3 megapixel, 1/2"	
Software	AV Pak		AV Pak	

\*Must use specified PC

# AAV-500

## SERIES 810 — Automatic Vickers Hardness Testing System

### FEATURES

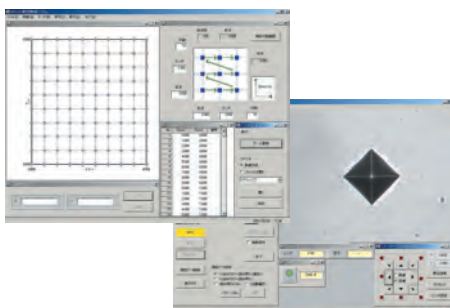
It can perform all operations required in the Vickers hardness test and Knoop hardness test such as loading, turret indexing, focusing, indentation dimension detecting, and measurement position movement in full automatic, so it is optimal for labor saving requirements of your test environment.



AAV-503/504

- An indentation dimension automatic detecting time of 0.3 seconds is achieved (when a PC with recommended specifications is used), which dramatically improves operation efficiency.
- Detecting reproducibility of  $\pm 0.5\%$  is achieved (For objective lens 50X, diagonal line 11 to 45mm, and 500HV), which provides reliable and stable test results.
- All operations from test condition setting to test result analysis can be performed on a Windows PC. In addition, data processing for the test results can be performed by using spreadsheet software.

The AAV-500 Series reduces individual differences in impression dimension measurement in the Vickers hardness test by adopting special image analysis technologies. In addition, improved precision and high speed have been realized with a detecting time of 0.3 seconds.

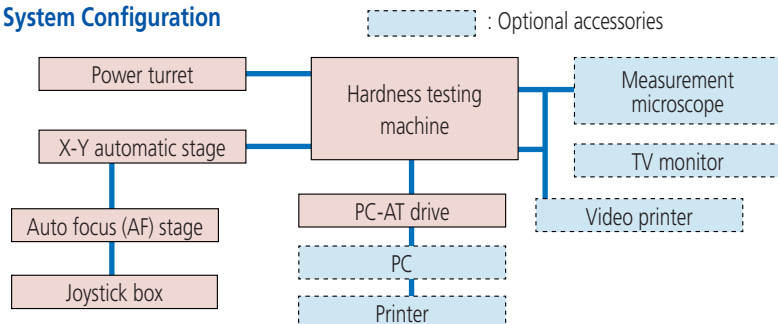


### SPECIFICATIONS

Model No.	AAV-503	AAV-504
<b>Order No.*</b>	<b>810-727A</b>	<b>810-728A</b>
Test force range	1.961 - 196.1N (200gf - 20kgf)	9.807 - 490.3N (1kgf - 50kgf)
Test force switching	Manual	Manual
Objective	10X / 20X	10X / 20X
Measurable indentation size	40 - 400 / 20 - 100 $\mu$ m	40 - 400 / 20 - 100 $\mu$ m
Minimum reading	0.1 $\mu$ m	0.1 $\mu$ m

\* PC is optional

### System Configuration



### Technical Data

Automatic indication detection  
 Detecting reproducibility:  $\pm 0.5\%$  (0.1 $\mu$ m)  
 Detecting method: Quadratic curve regression method  
 Detecting time: 0.3 seconds  
 Detecting minimum unit: 0.1 $\mu$ m  
 Manual measurement function: Measurement method with video line

X-Y automatic stage  
 Stage area: 130 x 130mm  
 Movement range: 50 x 50mm  
 Minimum pitch: 1 $\mu$ m

Software function  
 Patterned measurement: Line, staggered, 3-point staggered, matrix, circle, arc, random  
 Teaching measurement pattern setting  
 Hardness calculation function  
 Hardness conversion function  
 OK/NG judgment

Analysis software function:  
 Device condition display  
 Measurement data display  
 Statistical calculation  
 Graph display

Dimensions (W x D x H) / Mass  
 AAV-503 / AAV-504: 665 x 516 x 1000mm / 91kg

### Optional Accessory

PC System

# MZT-500

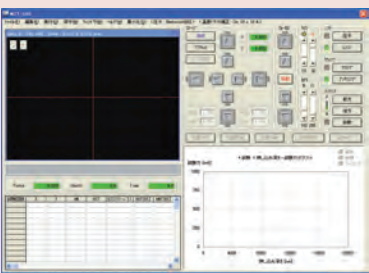
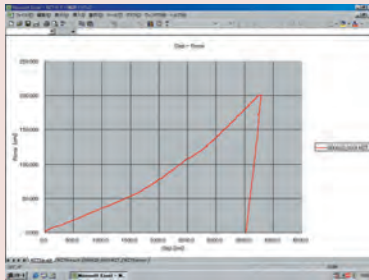
## SERIES 810 — Micro Zone Test System

### FEATURES

When it comes to evaluating mechanical properties of ultra-small regions of ultra-fine specimens, the MZT-500 Series models are exceptionally powerful tools in the fields of research and development and quality control. The MZT-500 can evaluate mechanical properties, which conventional

hardness testing machines for fine specimens cannot measure, such as various CVD and PVD-deposited or generated films, including ion-plated films; hardness of ultra-fine cross-sections; bonding mechanical properties; and mechanical wear properties of carbon fibers, glass fibers, whiskers, etc.

- Test data  
The indentation factor can be obtained, which is related to the hardness value (partially) shown in Martens hardness test (ISO14577) and Young's modulus. Deformation characteristics in the load, dwell, and unload phases are also obtainable for use in determining properties of the specimen material.
- Hardness tests such as Vickers and Knoop hardness tests are supported.
- The balance lever vibration isolation mechanism reduces the effect of external vibrations on measurements.
- Indenter indentation depth can be measured up to a maximum of 20 $\mu$ m with a resolution of 0.1nm.
- Test forces between 0.1mN and 1000mN can be applied electromagnetically for evaluation of material properties in submicroscopic areas.
- Field-compatible form with cover for protection against dust and wind.



### SPECIFICATIONS

Model No.	MZT-500L	MZT-500P
<b>Order No.</b>	<b>810-813A</b>	<b>810-814A</b>
Basic system	✓	✓
Data analysis / control device	✓	✓
Manual type XY stage (Travel range 25x25mm)	✓	—
Automatic XY stage (Travel range: 50x50mm)	—	✓

Test force loading device	Test force range: 0.1 to 1000mN
	Control resolution: 0.916 $\mu$ N
	Loading speed: 0.01 to 100mN/s
Indentation depth measurement	Range: 0 to 20 $\mu$ m
	Resolution: 0.1nm
Indenter	Type: Bercovich triangular pyramid indenter
Sample surface observation method	Camera: 1/3 inch black and white (410,000 pixels)
	Objective (monitor magnification): 100X (2500X),
	Optional: 10X (250X), 40X (1000X)
Specimen dimensions	Maximum height: 90mm
	Maximum depth: 90mm (From the center of the indenter axis)
Test type	Indentation test (with preliminary test force)
	Indentation test (without preliminary test force)
	Indentation depth setting test, continuous indentation test, repeated indentation test

# HV-112 / 113 / 114 / 115

## SERIES 810 — Vickers Hardness Testing Machines

### FEATURES

- A wide range of test forces from 1.961N to 490.3N\* (.2kgf - 50kgf) is available for measuring a wide variety of specimens. The load duration can be set in 1sec increments between 5 and 99sec. The minimum reading of indentation is 0.1µm. It allows small indentations to be measured with high precision.

### Function: Control unit

- Back-lit LCD graphic display for Indentation size (D1 and D2), Hardness value and scale, Number of measurement point Test conditions (HV / HK indenter type, test force, load duration), GO / ±NG tolerance judgment, Cylindrical and spherical surface compensation and offset
- Remote control of power turret
- Conversion to other hardness scales
- Statistical processing



HV-112, HV-114



HV-113, HV-115

### SPECIFICATIONS

Model	HV112	HV113	HV114	HV115
<b>Order No.</b>	<b>810-163A</b>	<b>810-981A</b>	<b>810-165A</b>	<b>810-985A</b>
Test force	1.961N (0.2kgf), 2.942N (0.3kgf), 4.903N (0.5kgf), 9.807N (1kgf), 24.51N (2.5kgf), 49.03N (5kgf), 98.07N (10kgf), 196.1N (20kgf)		9.807N (1kgf), 19.61N (2kgf), 29.42N (3kgf), 49.03N (5kgf), 98.07N (10kgf), 196.1N (20kgf), 294.2N (30kgf), 490.3N (50kgf)	
Test force selection	Dial			
Loading accuracy	±1%			
Load control	50 - 100µ/s Automatic (loading, duration, unloading) Automatic			
Load rate	5~99 sec.			
Objective lenses	10X, 20X			
Measuring microscope	100X / 200X		100X / 200X	—
Total magnification				
Measuring range	350, 700µm	—	350, 700mm	—
Minimum reading	0.1µm			
Video monitor	—	CCD	—	CCD
Camera	—		—	
Display	—	9" monochrome CRT	—	9" monochrome CRT
Total magnification	—	250X, 500X	—	250X, 500x
Monitoring range	—	520 x 670µm, 260 x 330µm	—	520 x 670µm, 260 x 330µm
Measuring range	—	410 x 570µm, 200 x 280µm	—	410 x 570µm, 200 x 280µm
Display Function	Conversion: Hard: TENS, HS, HBS, HR15N, HR30N, HR45N, HRA, HRD, HRC, HK, HV, Soft: TENS, HR15T, HR30T, HR45T, HRA, HRF, HRB, HRG, HK, HV, Statistical list; N, Max., Min., Average, Range, High, Low, Good, Over, Under, SD(n-1), SD(n-1), SD(n) OK/NG Judgement, Curve correction; 0.01 to 200.00mm			
Specimen Maximum height	8.07" (205mm) or Flat anvil			
Maximum depth	6.7" (170mm) from center of indenter shaft			
Optical path	2-way switchable (microscope/photograph)			
Output	SPC, RS-232C Centronics			
Power supply	120V AC (±10%) 60Hz			
Dimensions (WxDxH) Main Unit only	9.7" x 20.3" x 31.3" (245 x 515 x 770mm)			
Mass	110 lbs. (50kg)	121.4 lbs. (55.2kg)	110 lbs. (50kg)	121.4 lbs. (55.2kg)

\* 7.48" (190mm) if using 50 x 50mm-travel XY stage (No. 810-012).

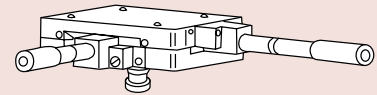
### Technical Data

- Motorized lens turret
- Adjustable loading rate

### Optional Accessories

- 19BAA011: Hardness test block (200HV)
- 19BAA012: Hardness test block (300HV)
- 19BAA013: Hardness test block (400HV)
- 19BAA014: Hardness test block (500HV)
- 19BAA015: Hardness test block (600HV)
- 19BAA016: Hardness test block (700HV)
- 19BAA017: Hardness test block (800HV)
- 19BAA018: Hardness test block (900HV)

### 50x50mm travel stage



Dimensions: 4.92x4.92" (125x125mm)

Minimum reading: 0.01mm

810-012

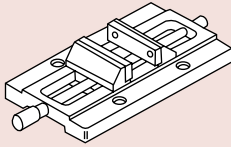
### Consumable Parts

- 513667: Illumination lamp (1 pc.)

# Optional Accessories

## Micro-Vickers/Vickers Hardness Testing Machine

### Clamping devices (Vises)

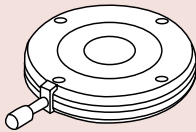


Vise

Max. opening: 3.94" (100mm)

810-017

### Rotary Table



Rotary Table

810-018

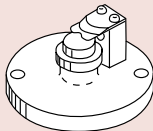
### Round Tables



Dimensions: 8" (203mm)

810-037-7

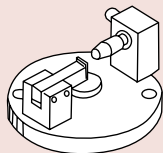
### Specimen (thin plate) Holder



Secures a plate with a thickness of .197" (5mm) or less, or foil-like specimens.

810-013

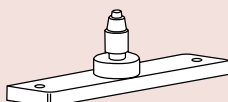
### Specimen (wire) Holder



Used to horizontally secure a wire or needle specimen that has a diameter of .126" (3.2mm) or less.

810-014

### Specimen (wire or ball) Holder



Used to vertically secure a wire or ball specimen that has a diameter of .126" (3.2mm) or less.

810-015

### Test Blocks

Order No.	Description	Load
64BAA173	Vickers 100HV Test Block	100gf
64BAA174	Vickers 200HV Test Block	100gf
64BAA175	Vickers 300HV Test Block	100gf
64BAA176	Vickers 400HV Test Block	100gf
64BAA177	Vickers 500HV Test Block	100gf
64BAA178	Vickers 600HV Test Block	100gf
64BAA179	Vickers 700HV Test Block	100gf
64BAA180	Vickers 800HV Test Block	100gf
64BAA181	Vickers 900HV Test Block	100gf
64BAA182	Vickers 100HV Test Block	500gf
64BAA183	Vickers 200HV Test Block	500gf
64BAA184	Vickers 300HV Test Block	500gf
64BAA185	Vickers 400HV Test Block	500gf
64BAA186	Vickers 500HV Test Block	500gf
64BAA187	Vickers 600HV Test Block	500gf
64BAA188	Vickers 700HV Test Block	500gf
64BAA189	Vickers 800HV Test Block	500gf
64BAA190	Vickers 900HV Test Block	500gf
64BAA191	Vickers 100HV Test Block	1000gf
64BAA192	Vickers 200HV Test Block	1000gf
64BAA193	Vickers 300HV Test Block	1000gf
64BAA194	Vickers 400HV Test Block	1000gf
64BAA195	Vickers 500HV Test Block	1000gf
64BAA196	Vickers 600HV Test Block	1000gf
64BAA197	Vickers 700HV Test Block	1000gf
64BAA198	Vickers 800HV Test Block	1000gf
64BAA199	Vickers 900HV Test Block	1000gf
64BAA200	Knoop 200HK Test Block	100gf
64BAA201	Knoop 300HK Test Block	100gf
64BAA202	Knoop 400HK Test Block	100gf
64BAA203	Knoop 500HK Test Block	100gf
64BAA204	Knoop 600HK Test Block	100gf
64BAA205	Knoop 700HK Test Block	100gf
64BAA206	Knoop 800HK Test Block	100gf
64BAA207	Knoop 250HK Test Block	500gf
64BAA208	Knoop 300HK Test Block	500gf
64BAA209	Knoop 400HK Test Block	500gf
64BAA210	Knoop 500HK Test Block	500gf
64BAA211	Knoop 600HK Test Block	500gf
64BAA212	Knoop 700HK Test Block	500gf
64BAA213	Knoop 800HK Test Block	500gf
64BAA214	Knoop 250HK Test Block	1000gf
64BAA215	Knoop 300HK Test Block	1000gf
64BAA216	Knoop 400HK Test Block	1000gf
64BAA217	Knoop 500HK Test Block	1000gf
64BAA218	Knoop 600HK Test Block	1000gf
64BAA219	Knoop 700HK Test Block	1000gf
64BAA220	Knoop 800HK Test Block	1000gf

\*other hardness ranges and test forces available

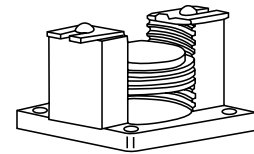
### Bulbs

Order No.	Description
513667	Bulb, 12v/50w, halogen double pin type, HM series with box style illuminators.
19BAA219	Bulb, 6v/2 0w, halogen double pin type, Later H series
19BAA095	Bulb, 6v/15w, halogen bayonet type, all E, G and early H series testers.

### Indenters

Order No.	Type	Model
19BAA061	Knoop Indenter	H, HM Standard Series
19BAA058	Vickers Indenter	H, HM Standard Series
19BAA062	Knoop Indenter	MVK-H2, H3, HM114, HM220
19BAA059	Vickers Indenter	MVK-H2, H3, HM114, HM220
19BAA060	Vickers Indenter	HV, AVK-C Series

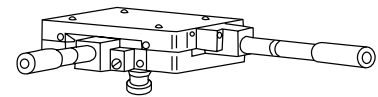
### Universal Specimen Holder



Used to secure a specimen, that has a measuring surface that is hard to stabilize, perpendicular to the indenter axis.

810-020

### 50x50mm travel stage

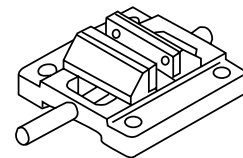


Dimensions: 4.92x4.92" (125x125mm)

Minimum reading: 0.01mm

810-012

### Clamping devices (Vises)



Vise

Max. opening: 1.77" (45mm)

Standard for the HM 100 series.

810-016



## Rockwell hardness scales

### Preliminary test force: 98.07N (10kgf)

Scale	Indenter	Test force	Applications
A	Diamond	588.4N(60kgf)	Cemented carbide, thin steel plates case hardened steel
D		980.7N(100kgf)	
C		1471N(150kgf)	
F	1/16" diameter steel ball	588.4N(60kgf)	Bearing metal, copper, annealed steel, brass, hard-drawn aluminum alloys beryllium copper, phosphor bronze
B		980.7N(100kgf)	
G		1471N(150kgf)	
H	1/8" diameter steel ball	588.4N(60kgf)	Bearing metal
E		980.7N(100kgf)	
K		1471N(150kgf)	
L	1/4" diameter steel ball	588.4N(60kgf)	Plastics, lead
M		980.7N(100kgf)	
P		1471N(150kgf)	
R	1/2" diameter steel ball	588.4N(60kgf)	Plastics
S		980.7N(100kgf)	
V		1471N(150kgf)	

### Hardness and Hardness Measurement

Hardness is a measure of resistance of a material to deformation when an external force or load is applied to the material. There are several hardness scales, which use different methods of applying force and quantifying the resistance to deformation. Hardness is closely correlated to other mechanical characteristics. It is, like many other mechanical characteristics, a relative value that has no fundamental quantity or absolute standard and is different from physical quantities such as length, time, and force. Because of this, hardness values are determined using a standard testing machine under standard conditions.

Today the most popular hardness scales are Brinell hardness (HB), Vickers hardness (HV), Rockwell and Rockwell superficial hardness (HR) and Knoop hardness (HK). Most hardness tests determine hardness from the area of the indentation made in a specimen by the indenter under a known load. The Brinell test was devised in Sweden, the Vickers test in the United Kingdom, and the other hardness tests in the United States. Although hardness is a relative value, Brinell, Vickers, and Knoop hardness are expressed in a unit of stress (1 kgf/mm<sup>2</sup> or 9.8MPa).

## Rockwell Superficial hardness scales

### Preliminary test force: 29.42N (3kgf)

Scale	Indenter	Test force	Applications
15N	Diamond	147.1N(15kgf)	Carburized layer, sintered
30N		294.2N(30kgf)	
45N		441.3N(45kgf)	
15T	1/16" diameter steel ball	147.1N(15kgf)	Thin copper plates (brass, bronze), mild steel
30T		294.2N(30kgf)	
45T		441.3N(45kgf)	
15W	1/8" diameter steel ball	147.1N(15kgf)	Plastics, zinc, bearing alloys
30W		294.2N(30kgf)	
45W		441.3N(45kgf)	
15X	1/4" diameter steel ball	147.1N(15kgf)	Plastics, zinc, bearing alloys
30X		294.2N(30kgf)	
45X		441.3N(45kgf)	
15Y	1/2" diameter steel ball	147.1N(15kgf)	Plastics, zinc, bearing alloys
30Y		294.2N(30kgf)	
45Y		441.3N(45kgf)	

### Rockwell Hardness and Rockwell Superficial Hardness

In the Rockwell hardness and the Rockwell superficial hardness tests, a conical diamond indenter with a 120° angle and a radius of curvature of 0.2mm, or a steel or carbide ball indenter is pressed into the specimen. First, a preliminary test force is applied, then a total test force is applied, and then the test load is reduced to the preliminary test force. The hardness number is determined from the difference, h, of the indentation depth of the indenter between the first and second applications of the preliminary test force.

The Rockwell hardness test uses a preliminary load of 10kgf, and the Rockwell superficial hardness test uses a preliminary test force of 3kgf. The Rockwell and Rockwell superficial hardness have multiple scales to indicate specific combinations of the indenter type, test force, and formula to obtain the hardness. A unique symbol is given to each scale.

### Minimum Thickness Chart

Thicker or harder material can be tested.	Rockwell Superficial Hardness Scales			Rockwell Regular Hardness Scales		
Thickness inches (mm)	15N	30N	45N	A	D	C
.006 (0.15)	92	•	•	•	•	•
.008 (0.20)	90	•	•	•	•	•
.010 (0.25)	88	•	•	•	•	•
.012 (0.30)	83	82	77	•	•	•
.014 (0.36)	76	78.5	74	•	•	•
.016 (0.41)	68	74	72	86	•	•
.018 (0.46)	√	66	68	84	•	•
.020 (0.51)	√	57	63	82	77	•
.022 (0.56)	√	47	58	79	75	69
.024 (0.61)	√	√	51	76	72	67
.026 (0.66)	√	√	37	71	68	65
.028 (0.71)	√	√	20	67	63	62
.030 (0.76)	√	√	√	60	58	57
.032 (0.81)	√	√	√	√	51	52
.034 (0.86)	√	√	√	√	43	45
.036 (0.91)	√	√	√	√	√	37
.038 (0.96)	√	√	√	√	√	28
.040 (1.02)	√	√	√	√	√	20

Thicker or harder material can be tested.	Rockwell Superficial Hardness Scales			Rockwell Regular Hardness Scales		
Thickness inches (mm)	15T	30T	45T	F	B	G
.010 (0.25)	91	•	•	•	•	•
.012 (0.30)	86	•	•	•	•	•
.014 (0.36)	81	80	•	•	•	•
.016 (0.41)	75	72	71	•	•	•
.018 (0.46)	68	64	62	•	•	•
.020 (0.51)	√	55	53	•	•	•
.022 (0.56)	√	45	43	•	•	•
.024 (0.61)	√	34	31	98	94	94
.026 (0.66)	√	√	18	91	87	87
.028 (0.71)	√	√	4	85	80	76
.030 (0.76)	√	√	√	77	71	68
.032 (0.81)	√	√	√	69	62	59
.034 (0.86)	√	√	√	√	52	50
.036 (0.91)	√	√	√	√	40	42
.038 (0.96)	√	√	√	√	28	31
.040 (1.02)	√	√	√	√	√	22

√ - Can be tested - no minimum hardness.

# HR-521(L) / 523(L)

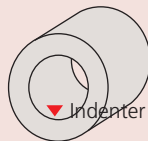
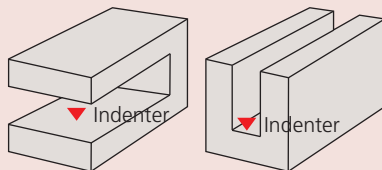
## SERIES 810 — Rockwell Type Hardness Testing Machines

### Technical Data

Preliminary test force:	29.42N, 98.07N
Test force	
Rockwell superficial:	147.1, 294.2, 441.3N
Rockwell:	588.4, 980.7, 1471N
Brinell*:	
Test force setting:	By control unit
Load control:	Automatic (loading, duration, unloading)
Load duration:	0s - 120s (1s increments)
Max. specimen height:	205mm (for standard flat anvil)
Max. specimen depth:	150mm (from the center of indenter shaft)
Stage elevation:	Manual or power drive
Control unit:	Sheet-switch type or touch screen type
Data output:	RS-232C, Digimatic code (SPC) and Centronics
Power supply:	120V AC, 50/60Hz
Dimensions (W x D x H)	
Main unit:	250 x 670 x 605mm
Control unit:	165 x 260 x 105mm

**Optional Accessories:** See page K-13, 14

**Various shapes of specimen can be measured.**  
(Nose-type indenter axis mechanism has been adopted)  
The nose-type indenter mechanism allows measurement of pipe samples as well as the top surface of a flat sample.



### Function: Touch screen type

- Touch screen operation with a back-lit LCD graphic display.
- Remote selection of the test force linked to the hardness scale selection.
- Choice of message language in English, German, French, Spanish, Italian and Japanese for user friendly operation.
- Cylindrical and spherical surface compensation.
- Data offset
- Conversion to other hardness scales.
- Powerful statistical processing with flexible data point editing and 1024 data memory.
- Measured data editing
- OK/NG tolerance judgment.
- Statistical processing, histogram and X-R chart

### FEATURES

- Multiple test force generation for Rockwell, Rockwell Superficial and Brinell hardness.
- Dolphin-nose indenter arm for easy reach of interior (min.  $\varnothing 40\text{mm}/\varnothing 22\text{mm}^*$ ) and exterior surfaces.  
\*When using an optional diamond indenter (19BA292).
- Real time electronic test force control for accurate loading. This perfectly eliminates load force overshooting.
- Indenter escape function for continuous testing at fixed table position. This eliminates instability caused by the table retraction.
- Auto-stop elevation table and automatic preliminary test force loading to provide stable test force generation.



### SPECIFICATIONS

Model	HR-521	HR521L	HR-523	HR-523L
Order No.	810-202-03A	810-205-03A	810-204-03A	810-207-03A
Preliminary Test Force	29.42N (3kgf), 98.07N (10kgf)			
Test Force	Rockwell 588.4N (60kgf), 980.7N (100kgf), 1471N (150kgf)			
	Rockwell Superficial 147.1N (15kgf), 294.2N (30kgf), 441.3N (45kgf)			
	Brinell 1839N (187.5kgf) (for use with 2.5mm ball)			
Force Control	Automatic control (unloading/duration/unloading) with closed loop feed back			
Console/Display Unit	Touch screen operation with back-lit LCD graphic display			
Test Force Selection	By touch screen			
Table up/down drive	Manual (w/Auto-brake mechanism)		Power-Drive (for full-automatic measurement)	
Load Duration	0 to 120 sec. (1 sec. step)			
Maximum Specimen Height	8.1" (205mm)	15.5" (395mm)	8.1" (205mm)	15.5" (395mm)
Maximum Specimen Depth	5.9" (150mm)			
Display Indication Functions	Hardness value, Converted hardness value, Test conditions, OK/NG tolerance judgement, statistical processing result Rockwell/Rockwell superficial hardness testing. Continuous testing. Cylindrical/spherical surface compensation, data offset Hardness conversion (HV, HK, HRA/B/C/D/F/G/15T/30T/45T/15N/30N/45N, HS, HB, HBW, tensile strength) OK/NG tolerance judgement, measured data editing, data memory (max 1024 data) SPC calculation (No. of data, max/min/mean values, range, upper/lower limit values, standard deviation, No. of passing/defective) Histogram, X-R chart			
Data Output	RS-232C, SPC, Centronics			
Dimensions (W x D x H)	9.84" x 26.38" x 23.82" (250 x 670 x 605mm)			
Mass	60kg			

# HR-210MR/320MS/430MR/430MS

## SERIES 963 — Rockwell Hardness Testing Machines

### FEATURES

- The new frame design allows the full 7.1" of specimen capacity without the need to cut a whole in the table.
- Simple to operate; the Dial Type HR210 features an automatic zero reset. The digital HR320 model uses a flashing bar graph to indicate when the initial test force has been reached.
- Automatic brake and automatic start function that prevents overloading and begins test cycle. The HR430 model also includes the dial a weight system for easier load selection.
- All models are complete with Flat and VEE anvils, diamond and 1/6" carbide ball indenters, 2 HRC and 1 HRBW Rockwell blocks (MR models) or 3 Rockwell blocks and an HR30N and HR30TW for MS testers.



**HR-210MR**  
Rockwell hardness testing machine  
Motorized Loading  
Motor drive - Button start model



**HR-320MS**  
Rockwell/Rockwell Superficial hardness testing machine  
Motorized Loading  
Motor drive - Button start model



**HR-430MR**  
Rockwell hardness testing machine  
Motorized Loading  
Motor drive - Automatic start model



**HR-430MS**  
Rockwell/Rockwell Superficial hardness testing machine  
Motorized Loading  
Motor drive - Automatic start model

### Technical Data

Preliminary test force: 29.42N\*, 98.07N  
Test force  
Rockwell superficial\*: 147.1, 294.2, 441.3N  
Rockwell: 588.4, 980.7, 1471N  
Test force setting: By dial  
Load control: Automatic (loading, duration, unloading)  
Anvil: Flat (ø64mm)  
Max. specimen height: 7.1" / 180mm  
Max. specimen depth: 6.5" / 165mm (from the center of indenter shaft)  
Stage elevation: Manual  
Data output\*: RS-232C, Digimatic code (SPC)  
Power supply: 120V AC, 50/60Hz

\*HR320-430 only

### SPECIFICATIONS

Order Number	963-220-10A	963-231-10A	963-240-10A	963-241-10A
Model	HR-210MR	HR-320MS	HR-430MR	HR-430MS
Test Scales	Rockwell	Rockwell and Rockwell Superficial	Rockwell	Rockwell and Rockwell Superficial
Standard	JIS B 7726 ISO 6508-2 ASTM E18-10			
Preliminary Test Force	98.07N (10kgf)	98.07N (10kgf), 29.42 (3kgf)	98.07N (10kgf), 29.42 (3kgf)	98.07N (10kgf), 29.42 (3kgf)
Test Force Rockwell	588.4N (60kgf), 980.7N (100kgf), 1471N (150kgf)			
Test Force Superficial	—	147.1N (15kgf), 294.2N (30kgf), 441.3N (45kgf)	—	147.1N (15kgf), 294.2N (30kgf), 441.3N (45kgf)
Display	Dial	Matrix Backlight LCD		
Hardness Minimum Value	0.5 HR	0.1 HR		
Scale Conversions	—	HRC, HRB, HV, HBW, HS, Mpa plus offset, OK/NG		
Preliminary Test Force	Manual (with automatic zero set)	Manual (with Loading Navigator)	Manual (with automatic brake-start)	
Total Test Force Control	Automatic (loading, duration, unloading)			
Loading Method	Dead Weight			
Load Duration (Dwell)	Fixed (3s to 5.5s) or Manual	Adjustable (1s to 99s) or Manual		
Maximum Specimen Ht.	7.1" (180mm)			
Maximum Depth	6.5" (165mm)			
Data Output	—	RS-232C, SPC		
Power Supply	120V AC (±10%), 60Hz			
Dimensions (D x W x H)	20.15"(512mm) x 9.25"(235mm) x 30.7"(780mm)	20.6"(523mm) x 9.25"(235mm) x 30.7"(780mm)	20.6"(523mm) x 9.25"(235mm) x 30.7"(780mm)	20.6"(523mm) x 9.25"(235mm) x 30.7"(780mm)
Mass	100.53lb (45.6kg)	102.07lb (46.3kg)	108.69lb (49.3kg)	110.01lb (49.9kg)

# Optional Accessories

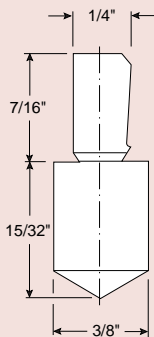
## For Rockwell/Rockwell Superficial Type Hardness Testing machine



### Calibration Set

Order No.	Order No.
<b>64BAA241</b>	<b>64BAA242</b>
C Scale Set	B Scale Set
Test Blocks	Test Blocks
64BAA125	64BAA126
64BAA124	64BAA132
64BAA158	64BAA135
Indenter	Indenter
64BAA072	64BAA078
Order No.	Order No.
<b>64BAA243</b>	<b>64BAA244</b>
30N Scale Set	30T Scale Set
Test Blocks	Test Blocks
64BAA128	64BAA129
64BAA165	64BAA140
64BAA167	64BAA130
Indenter	Indenter
64BAA073	64BAA078

### Rockwell Type Diamond Indenters



Order No.	Scale
<b>64BAA072</b>	C
<b>64BAA073</b>	N
<b>64BAA086</b>	A
<b>64BAA071</b>	C & N

Order No.	Hardness
<b>64BAA159</b>	HRA81/86 Rockwell Test Block
<b>64BAA160</b>	HRA75/79 Rockwell Test Block
<b>64BAA161</b>	HRA70/73 Rockwell Test Block
<b>64BAA162</b>	HRA65/68 Rockwell Test Block
<b>64BAA163</b>	HRA60/62 Rockwell Test Block

<b>64BAA249</b>	HRBW95/100 Rockwell Test Block
<b>64BAA126</b>	HRBW90/95 Rockwell Test Block
<b>64BAA131</b>	HRBW80/85 Rockwell Test Block
<b>64BAA132</b>	HRBW70/75 Rockwell Test Block
<b>64BAA133</b>	HRBW60/65 Rockwell Test Block
<b>64BAA134</b>	HRBW50/55 Rockwell Test Block
<b>64BAA135</b>	HRBW40/45 Rockwell Test Block
<b>64BAA127</b>	HRBW30/35 Rockwell Test Block
<b>64BAA136</b>	HRBW20/25 Rockwell Test Block
<b>64BAA137</b>	HRBW10/15 Rockwell Test Block
<b>64BAA138</b>	HRBW0/5 Rockwell Test Block

<b>64BAA125</b>	HRC60/65 Rockwell Test Block
<b>64BAA157</b>	HRC50/55 Rockwell Test Block
<b>64BAA124</b>	HRC40/45 Rockwell Test Block
<b>64BAA123</b>	HRC30/35 Rockwell Test Block
<b>64BAA158</b>	HRC20/25 Rockwell Test Block

Order No.	Hardness
<b>64BAA129</b>	HR30T74/79 Rockwell Test Block
<b>64BAA139</b>	HR30T70/73 Rockwell Test Block
<b>64BAA140</b>	HR30T63/67 Rockwell Test Block
<b>64BAA141</b>	HR30T56/60 Rockwell Test Block
<b>64BAA142</b>	HR30T49/53 Rockwell Test Block
<b>64BAA130</b>	HR30T43/47 Rockwell Test Block
<b>64BAA143</b>	HR30T36/39 Rockwell Test Block
<b>64BAA144</b>	HR30T29/33 Rockwell Test Block
<b>64BAA145</b>	HR30T22/26 Rockwell Test Block
<b>64BAA146</b>	HR30T15/18 Rockwell Test Block

<b>64BAA147</b>	HR15T90/92 Rockwell Test Block
<b>64BAA148</b>	HR15T86/69 Rockwell Test Block
<b>64BAA149</b>	HR15T83/85 Rockwell Test Block
<b>64BAA150</b>	HR15T80/82 Rockwell Test Block
<b>64BAA151</b>	HR15T77/79 Rockwell Test Block
<b>64BAA152</b>	HR15T72/74 Rockwell Test Block
<b>64BAA153</b>	HR15T70/72 Rockwell Test Block
<b>64BAA154</b>	HR15T68/69 Rockwell Test Block
<b>64BAA155</b>	HR15T64/66 Rockwell Test Block
<b>64BAA156</b>	HR15T61/63 Rockwell Test Block

Order No.	Hardness
<b>64BAA222</b>	HR45N65/70 Rockwell Test Block
<b>64BAA223</b>	HR45N55/60 Rockwell Test Block
<b>64BAA224</b>	HR45N45/50 Rockwell Test Block
<b>64BAA225</b>	HR45N35/40 Rockwell Test Block
<b>64BAA226</b>	HR45N25/30 Rockwell Test Block

<b>64BAA128</b>	HR30N77/82 Rockwell Test Block
<b>64BAA164</b>	HR30N68/73 Rockwell Test Block
<b>64BAA165</b>	HR30N59/64 Rockwell Test Block
<b>64BAA166</b>	HR30N50/55 Rockwell Test Block
<b>64BAA167</b>	HR30N40/45 Rockwell Test Block

<b>64BAA168</b>	HR15N90/93 Rockwell Test Block
<b>64BAA169</b>	HR15N85/88 Rockwell Test Block
<b>64BAA170</b>	HR15N80/83 Rockwell Test Block
<b>64BAA171</b>	HR15N75/77 Rockwell Test Block
<b>64BAA172</b>	HR15N69/72 Rockwell Test Block

### Carbide Ball Indenters

Order No.	Description
<b>19BAA515</b>	1/16" Carbide ball indenter
<b>19BAA504</b>	1/8" Carbide ball indenter
<b>19BAA505</b>	1/4" Carbide ball indenter
<b>19BAA506</b>	1/2" Carbide ball indenter
<b>19BAA507</b>	1/16" Carbide ball (1pc.)
<b>19BAA508</b>	1/8" Carbide ball (1pc.)
<b>19BAA509</b>	1/4" Carbide ball (1pc.)
<b>19BAA510</b>	1/2" Carbide ball (1pc.)

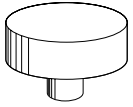
### Steel Ball Indenters

Order No.	Description
<b>64BAA074</b>	1/16" diameter steel ball indenter
<b>19BAA078</b>	1/16" diameter steel ball indenter (auto-discrimination type)
<b>64BAA075</b>	1/8" diameter steel ball indenter
<b>19BAA079</b>	1/8" diameter steel ball indenter (auto-discrimination type)
<b>64BAA076</b>	1/4" diameter steel ball indenter
<b>19BAA080</b>	1/4" diameter steel ball indenter (auto-discrimination type)
<b>64BAA077</b>	1/2" diameter steel ball indenter
<b>19BAA081</b>	1/2" diameter steel ball indenter (auto-discrimination type)
<b>64BAA082</b>	1/16" diameter spare steel ball (10 pcs)
<b>64BAA083</b>	1/8" diameter spare steel ball (10 pcs)
<b>64BAA084</b>	1/4" diameter spare steel ball (10 pcs)
<b>64BAA085</b>	1/2" diameter spare steel ball (10 pcs)

# Optional Accessories

For Rockwell/Rockwell Superficial Type Hardness Testing machine

## Flat anvil



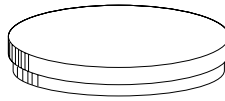
Diameter: 2.5" (64mm)

**810-039-7**

Diameter: 1.5" (38mm)

**810-039-8**

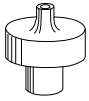
## Round Table



Diameter: 8" (203mm)

**810-037-7**

## Spot anvils



Diameter: .25" (6.4mm)

Height: .88" (22mm)

**810-044-7**



Diamond-tipped type for  
Rockwell superficial hardness measurement

**810-030-7**

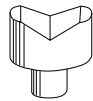
## V-anvils



Diameter: 1.5" (38mm)

Groove width: .38" (9.7mm)

**810-041-7**



Diameter: 1.5" (38mm)

Groove width: 1.5" (38mm)

**810-040-7**



Diameter: .38" (9.7mm)

Groove width: .38" (9.7mm)

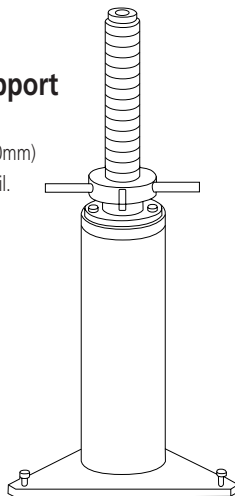
**810-042-7**

## Adjustable support

Adjustable height:  
13 to 18.5" (330 to 470mm)

Used to mount a V-anvil.

**810-028-7**



264-504-5A



937386



## Optional Accessories

**937387:** SPC cable (40"/1m)

**06ADV580E:** USB input tool

Reference page A-12 for specifications

# Hardmatic HH-411

## SERIES 810 — Impact Type Hardness Testing Unit

### Technical Data

Impactor:	Impact hammer with integrated detector and carbide-ball tip (D type: conforming to ASTM A 956)
Display unit:	7-segment LCD
Functions:	Auto angle compensation, Offset, OK/NG judgment, Hardness scale conversion Data storage (1800 data entries) Statistical analysis (Average, Maximum, Minimum, Dispersion) Auto sleep function Impact counter display function
Testable workpiece:	
Thickness:	Minimum 5mm or more
Mass:	5kg or more in mass
Test points:	5mm or more from the edge of the sample, 3mm or more to each of the tested points.
Surface roughness:	Ra 10µm or less
Power supply:	Alkaline AA battery 2pcs or optional AC adapter (battery life: 70 hours)

### Standard Accessories

<b>19BAA265</b>	Test Block HLD800
<b>810-291</b>	Display Unit
<b>810-287</b>	Detector
<b>19BAA460</b>	Cable
	Battery AA (Alkaline) 2pcs.

### Optional Accessories

<b>264-504-5A:</b>	Digimatic Mini-Processor DP-1VR
<b>937387:</b>	Connecting cable for
<b>09EAA082:</b>	Printer paper (10 rolls/set)
<b>810-622A:</b>	Thermal printer DUP-414
<b>19BAA262:</b>	Thermal printer connecting cable
<b>19BAA157:</b>	Thermal printer paper
<b>19BAA238:</b>	RS-232C connecting cable for PC
<b>06AEG302JA:</b>	AC adapter of display unit
<b>19BAA243:</b>	Hardness test block (880HLD)
<b>19BAA244:</b>	Hardness test block (830HLD)
<b>19BAA245:</b>	Hardness test block (730HLD)
<b>19BAA246:</b>	Hardness test block (620HLD)
<b>19BAA247:</b>	Hardness test block (520HLD)
<b>19BAA248:</b>	Support ring for convex surface of cylinder (R10 - R20)
<b>19BAA249:</b>	Support ring for convex surface of cylinder (R14 - R20)
<b>19BAA250:</b>	Support ring for convex surface of sphere (R10 - R27.5)
<b>19BAA251:</b>	Support ring for concave surface of sphere (R13.5 - R20)
<b>19BAA457:</b>	Carbide ball for D, DC, D+15 type impactors
<b>19BAA458:</b>	Ball shaft for DL type impactor
<b>810-287:</b>	D type impactor UD-411
<b>810-288:</b>	DC type impactor UD-412
<b>810-289:</b>	D+15 type impactor UD-413
<b>810-290:</b>	DL type impactor UD-414

HH-411 is a rebound type portable hardness tester for metal with a compact body and high operability. It allows anyone to perform hardness testing easily at the touch of a key, so it can be used widely on various components in the field.



**810-298:** ASTM standard  
Including the display unit, D type impactor (810-287) and carbide ball (19BAA457).

### SPECIFICATIONS

Model	HH-411		
Order No.	810-298		
Hardness Range	L-Value (ASTM A956)		
Detector	Input device D (carbide ball)		
Display	<b>Hardness</b>	<b>Range</b>	<b>Resolution</b>
	HL	1-999 HL	1 HL
	HV	43-950 HV	1 HV
	HB	20-894 HB	1 HB
	HRC	19.3-68.2 HRC	0.1 HRC
	HRB	13.5 - 101.7 HRB	0.1 HRB
	HS	13.2 - 99.3 HS	0.1 HS
	HTN	499 - 1996 Mpa	1 Mpa
Functions	Conversions: HL, HV, HB, HRC, HRB, HS, HTN Judgment: OK/NG Offsetting Memory: 1,800 data		
Indentation Direction	Any direction		
Output	RS-232C, SPC		
Power supply	Alkaline AA Battery 2pcs.		
Dimensions	Detector: (Dia. X H) 1.10" x 6.89" (28 x 175mm) Display: (W x D x H) 2.76" x 4.33" x 1.38" (70 x 110 x 35mm)		
Mass	Detector: .26lbs (120g) Display: .44lbs (200g)		

### Impactors (Optional accessories)

Various impactors can be connected to the display unit.



**810-288**  
Use for inner walls of cylinders. The grip is short to allow easy positioning within a cylinder.



**810-290**  
Use for gear teeth, welded corners, etc.



**810-289**  
Use for concave workpieces such as gear teeth, ball bearing races, etc.

# Hardmatic HH-300

## SERIES 811 — Durometers for Rubber and Plastics Hardness Testing

### FEATURES

Digital / Dial Durometers are suitable for testing the nature of the following materials — natural rubber, neoprene, polyesters, P.V.C., leather, nitrile rubber, wax, vinyl, cellulose acetates, glass polystyrene, etc.



### SPECIFICATIONS

Order No.	Digital	811-330	811-336	811-336-01	811-332	811-338	811-338-01	811-334
	Dial	811-329	811-335	811-335-01	811-331	811-337	811-337-01	811-333
Model No.	Digital	HH-330	HH-336	HH-336-01	HH-332	HH-338	HH-338-01	HH-334
	Dial	HH-329	HH-335	HH-335-01	HH-331	HH-337	HH-337-01	HH-333
Scale		Shore E	Shore A			Shore D		
Applications		Soft Rubber, Sponge, Felt, Hard Foam	Natural rubber, soft elastomers, etc.			Hard elastomers, plastics, hard rubber, ebonite, etc.		
Resolution		0.5 (digital) or 1 (dial)					0.5 (digital) or 1 (dial)	
Range		HA: 10 - 90					HD: 20 - 90	
Standards	ASTM D 2240	—	✓	✓		✓	✓	
	ISO 868	—	✓	✓		✓	✓	
	ISO 7619	—	✓	✓		✓	✓	
	DIN 53 505	—	—	✓		—	✓	
	JIS K 6253	✓	✓	✓		✓	✓	
	JIS K 7215	—	✓	✓		✓	✓	
Pressure foot		44 x 18mm	44 x 18mm ø18mm			44 x 18mm ø18mm		
Spring force (mN)		WE=550+HE	WA=550+75HD (HA:Reading 10-90)			WD=444.5HD (HD:Reading 20-90)		
Indenter		Sphere (Tip diameter: 0.79mm)	Blunt taper (Tip diameter: 0.79mm)			Sharp point (Tip curvature: 0.1±0.01mm)		
Tip angle		35°±0.25°				30°±0.5°		
Indenter diameter		1.25mm						
Indenter protrusion		2.5mm						
Functions		Digital: Data hold, Zero -setting, SPC output, Power ON/OFF (Power supply: SR44 x 1pc.) Analog Durometer: Peak retaining hand						
Type		Compact	Compact	Long-leg	Compact	Long-leg		
Dimensions (WxDxH)	Digital	60 x 28.5 x 151	60 x 28.5 x 151mm		60 x 28.5 x 193mm	60 x 28.5 x 151mm		60 x 28.5 x 193mm
	Dial	56 x 33.5 x 144mm	56 x 33.5 x 144mm		56 x 33.5 x 186mm	56 x 33.5 x 144mm		56 x 33.5 x 186mm
Mass	Digital	290g	290g	310g	290g	310g		310g
	Dial	300g	300g	320g	300g	320g		320g

### Technical Data

- Designed in accordance with the ASTM D 2240, ISO868, ISO 7619, DIN 53 505, JIS K 6253, and JIS K 7215 specifications.
- Units are available in both Shore A and Shore D scales, and will test a wide variety of applications.
- The Digital Durometer is provided with data hold function, permitting the operator to make an error-free reading on the LCD screen.
- The Dial Durometer is provided with a peak retaining hand for error-free reading.

### Testing stand applications

These stands are used to mount Durometers. They allow constant-pressure hardness measurement by pressing the Durometer vertically on a workpiece.

- Anyone can perform repeatable hardness measurement due to fewer possibilities of human error and measurement variations.
- The supplied weights can be attached directly to a Durometer and allow constant-pressure hardness measurement of large samples for which a stand cannot be used.
- The supplied weights are used for calibrating the spring tension of Durometers.

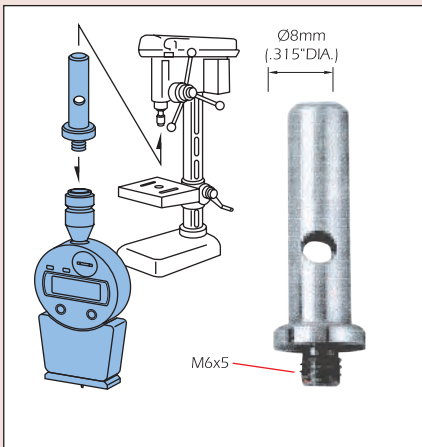


# Hardmatic HH-300

## Test Block Set

### Holding Bar

The holding bar is used to mount a Durometer on a drill press.



64AAA964



64AAA963



905693

811-332

Item No.	Description
64AAA964	Calibration Set (Shore A Scale) Test Block 30* DURO (Blue) Test Block 60* DURO (Yellow) Test Block 90* DURO (Gray) Mahogany Box
64AAA590	Calibration Set (Shore D Scale) Test Block 20* DURO (Blue) Test Block 40* DURO (Gray) Test Block 80* DURO (Black)
64AAA962	"A" Scale Durometer Stand
64AAA794	"A" Scale Durometer Stand with Air Damper
64AAA796	Combination "D" & "A" Scale Durometer Stand
64AAA963	O-Ring Fixture Set 1/16", 3/32", 1/8", 3/16" and 1/4" O-Ring cross sections
19BAA406	Digimatic Miniprocessor with printer
905693	Connecting Cable 40" (1m) for Durometer and Digimatic Miniprocessor

\* Values shown are nominal only. Test Block Size 2" x 2" x 1/4"





## Coordinate Measuring Machines

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SurfaceMeasure 606

**NEW-STYLE**  
Coordinate Measuring Machines

Bright-STRATO

MACH-3A 653

# Crysta-Apex S Series

## SERIES 191 — Standard CNC CMM

Designed and constructed using all Mitutoyo's experience in CNC CMM technology, CRYSTA-Apex S and Crysta-Apex C feature lightweight materials and an innovative machine structure, providing high motion stability, high accuracy, and affordability. The temperature correction function (16°C to 26°C) can yield accurate measurements even on the shop floor. In addition to point-to-point measurement, the MPP-310Q and Metris Laser probes provide a contact/non-contact scanning function.



CRYSTA-Apex S544



CRYSTA-Apex S776



CRYSTA-Apex S9106



Temperature compensation system (photo: temperature sensors)



Joystick controller



The machine structure has been optimized using FEM (Finite-Element Method) and modal analysis.

### Technical Data

Length standard:	High accuracy linear encoder
Guide system:	Air bearing
Max. drive speed:	519mm/sec
Max. acceleration:	2309mm/sec <sup>2</sup> (1732mm/sec <sup>2</sup> Type Z800)
Air pressure:	0.4MPa
Air consumption:	50L/min (500 series) 60L/min (700, 900 series)

### Guaranteed accuracy temperature environment\*

Temperature range		18°C - 22°C	16°C - 26°C
Temperature change	Per hour	1.0K	1.0K
	Per 24 hours	2.0K	5.0K
Temperature gradient	Vertical	1.0K/m	1.0K/m
	Horizontal	1.0K/m	1.0K/m

\*When using temperature compensation system.

#### Main Unit Startup System

This machine incorporates a startup system (relocation detection system), which disables operation when an unexpected vibration is applied or the machine is relocated. Be sure to contact your nearest Mitutoyo prior to relocating this machine after initial installation. Refer to page VIII for details.

## SPECIFICATIONS

Model No.	Crysta-Apex S544	Crysta-Apex S574	Crysta-Apex S776	Crysta-Apex S7106	Crysta-Apex S9106 [Crysta-Apex S9108]	Crysta-Apex S9166 [Crysta-Apex S9168]	Crysta-Apex S9206 [Crysta-Apex S9208]	
Range	X-axis	19.88" (505mm)	19.88" (505mm)	27.75" (705mm)	27.75" (705mm)	35.62" (905mm)	35.62" (905mm)	
	Y-axis	15.94" (405mm)	27.75" (705mm)	27.75" (705mm)	39.56" (1005mm)	39.56" (1005mm)	63.18" (1605mm)	
	Z-axis	15.94" (405mm)	15.94" (405mm)	23.82" (605mm)	23.81" (605mm)	23.81" 605mm [31.69" (805mm)]	23.81" 605mm [31.69" (805mm)]	
Resolution	.000004" (0.0001mm)							
Accuracy*	MPE <sub>E</sub>	(1.7+3L/1000)µm**, (1.7+4L/1000)µm***						
	MPE <sub>P</sub>	1.7µm						
	MPE <sub>THP</sub>	2.3µm						
	MPT <sub>THP</sub>	110 sec						
Work table	Material	Granite						
	Size	25.11" x 33.86" (638mm x 860mm)	25.11" x 45.67" (638mm x 1160mm)	34.64" x 55.90" (880mm x 1420mm)	34.64" x 67.71" (880mm x 1720mm)	42.51" x 67.71" (1080mm x 1720mm)	42.51" x 91.33" (1080mm x 2320mm)	42.51" x 107.0" (1080mm x 2720mm)
	Tapped insert	M8 x 1.25mm						
Workpiece	Max. height	21.46" (545mm)	21.46" (545mm)	31.49" (800mm)	31.49" (800mm)	31.49" (800mm) [39.36" (1000mm)]	31.49" (800mm) [39.36" (1000mm)]	
	Max. load	396 lbs (180kg)	396 lbs (180kg)	1763 lbs (800kg)	2204 lbs (1000kg)	2645 lbs (1200kg)	3306 lbs (1500kg)	3968 lbs (1800kg)
Mass (including stand and controller)	1135 lbs (515kg)	1377 lbs (625kg)	3692 lbs (1675kg)	4301 lbs (1951kg)	4918 lbs (2231kg) [4984 lbs (2261kg)]	6322 lbs (2868kg) [6388 lbs (2898kg)]	8624 lbs (3912kg) [8690 lbs (3942kg)]	
Dimensions (W x D x H)	42.60x44.17x86.02" (1082x1122x2185mm)	42.60x57.40x86.02" (1082x1458x2185mm)	57.87x64.96x107.48" (1470x1650x2730mm)	57.87x76.77x107.48" (1470x1950x2730mm)	65.74x76.77x107.48" (1670x1950x2730mm) [65.74x76.77x123.22"] [(1670x1950x3130mm)]	65.74x105.90x107.48" (1670x2690x2730mm) [65.74x105.90x123.22"] [(1670x2690x3130mm)]	65.74x121.65x107.48" (1670x3090x2730mm) [65.74x121.65x123.22"] [(1670x3090x3130mm)]	

\*When using temperature compensation system.

ISO10360-2: 2001 & ISO 10360-4, Probe system used: SP25M with ø4 x 50mm stylus, L: Measuring length (mm)

\*\*Guaranteed accuracy temperature range: 64.4°F - 71.6°F (18°C - 22°C).

\*\*\*Guaranteed accuracy temperature range: 60.8°F - 78.8°F (16°C - 26°C).

# Crysta-Apex C/S Series

## SERIES 191 — Standard CNC CMM



Crysta-Apex C205016



Crysta-Apex S122010

### SPECIFICATIONS

Model No.		Crysta-Apex C203016 [Crysta-Apex C203020]	Crysta-Apex C204016 [Crysta-Apex C204020]	Crysta-Apex C205016 [Crysta-Apex C205020]
Range	X-axis	78.93" (2005mm)	78.93" (2005mm)	78.93" (2005mm)
	Y-axis	118.30" (3005mm)	157.67" (4005mm)	197.04" (5005mm)
	Z-axis	63.18" (1605mm) [78.93" (2005mm)]	63.18" (1605mm) [78.93" (2005mm)]	63.18" (1605mm) [78.93" (2005mm)]
Resolution	.000004" (0.0001mm)			
Accuracy*	MPE <sub>E</sub>	(4.5+8L/1000)μm**, (4.5+9L/1000)μm*** [(6+9L/1000)μm**, (6+10L/1000)μm***]		
	MPE <sub>P</sub>	6.0μm [7.5μm]		
	MPE <sub>THP</sub>	6.0μm [7.5μm]		
	MPT <sub>THP</sub>	150 sec		
Work table	Material	Granite		
	Size	86.61" x 165.55" (2200mm x 4205mm)	86.61" x 204.92" (2200mm x 5205mm)	86.61" x 244.29" (2200mm x 6205mm)
	Tapped insert	M8 x 1.25mm		
Workpiece	Max. height	70.86" (1800mm) [86.61" (2200mm)]	70.86" (1800mm) [86.61" (2200mm)]	70.86" (1800mm) [86.61" (2200mm)]
	Max. load	8818 lbs (4000kg)	11023 lbs (5000kg)	13227 lbs (6000kg)
Mass (including controller and stand)		31085 lbs (14100kg) [31195 lbs (14150kg)]	42990 lbs (19500kg) [43100 lbs (19550kg)]	61729 lbs (28000kg) [61839 lbs (28050kg)]
Dimensions (W x D x H)		122.04 x 181.10 x 196.45" (3100 x 4600 x 4990mm) [122.04 x 181.10 x 227.95"] [(3100 x 4600 x 5790mm)]	122.04 x 220.47 x 198.42" (3100 x 5600 x 5040mm) [122.04 x 220.47 x 229.92"] [(3100 x 5600 x 5840mm)]	122.04 x 259.84 x 202.36" (3100 x 6600 x 5140mm) [122.04 x 259.84 x 233.85"] [(3100 x 6600 x 5940mm)]

\* When using temperature compensation system.

ISO 10360-2:2009 / ISO 10360-5:2010 P<sub>RTU.MPE</sub> / ISO 10360-4, Probe system used: SP25M with ø4 x 50mm stylus, L: Measuring length (mm)

\*\* Guaranteed accuracy temperature range: 64.4°F - 71.6°F (18°C - 22°C).

\*\*\* Guaranteed accuracy temperature range: 60.8°F - 78.8°F (16°C - 26°C), 60.8°F - 75.2°F (16°C - 24°C) for 1600, 2000 Series.

#### Main Unit Startup System

This machine incorporates a startup system (relocation detection system), which disables operation when an unexpected vibration is applied or the machine is relocated. Be sure to contact your nearest Mitutoyo prior to relocating this machine after initial installation. Refer to page VIII for details.

### SPECIFICATIONS

Model No.	Crysta-Apex S121210	Crysta-Apex S122010	Crysta-Apex S123010	Crysta-Apex C163012 [Crysta-Apex C163016]	Crysta-Apex C164012 [Crysta-Apex C164016]	Crysta-Apex C165012 [Crysta-Apex C165016]	
Range	X-axis	47.24" (1200mm)	47.24" (1200mm)	47.24" (1200mm)	63.18" (1605mm)	63.18" (1605mm)	
	Y-axis	47.24" (1200mm)	78.8" (2000mm)	118.1" (3000mm)	118.30" (3005mm)	157.67" (4005mm)	
	Z-axis	39.4" (1000mm)	39.4" (1000mm)	39.4" (1000mm)	47.44" (1205mm) [63.18" (1605mm)]	47.44" (1205mm) [63.18" (1605mm)]	47.44" (1205mm) [63.18" (1605mm)]
Resolution	.000004" (0.0001mm)						
Accuracy*	E <sub>0</sub> .MPE	(2.3+3L/1000)μm**, (2.3+4L/1000)μm***			(3.3+4.5L/1000)μm**, (3.3+5.5L/1000)μm***, [(4.5+5.5L/1000)μm**, (4.5+6.5L/1000)μm***]		
	P <sub>F</sub> TU.MPE	2.0μm			5.0μm [6.0μm]		
	MPE <sub>THP</sub>	2.8μm (50s)			6.0μm [7.0μm] (120s)		
Work table	Material	Granite					
	Size	55.90" x 85.23" (1420mm x 2165mm)	55.90" x 116.73" (1420mm x 2965mm)	55.90" x 156.10" (1420mm x 3965mm)	70.86" x 165.55" (1800mm x 4205mm)	70.86" x 204.92" (1800mm x 5205mm)	70.86" x 244.29" (1800mm x 6205mm)
	Tapped insert	M8 x 1.25mm					
Workpiece	Max. height	47.24" (1200mm)	47.24" (1200mm)	47.24" (1200mm)	55.11" (1400mm) [70.86" (1800mm)]	55.11" (1400mm) [70.86" (1800mm)]	
	Max. load	4409 lbs (2000kg)	5511 lbs (2500kg)	6613 lbs (3000kg)	7716 lbs (3500kg)	9920 lbs (4500kg)	11023 lbs (5000kg)
Mass (including controller and stand)	8928 lbs (4050kg)	13558 lbs (6150kg)	20084 lbs (9110kg)	23368 lbs (10600kg) [23479 lbs (10650kg)]	32628 lbs (14800kg) [37738 lbs (14850kg)]	42990 lbs (19500kg) [43100 lbs (19550kg)]	
Dimensions (W x D x H)	86.61x100.19x143.50" (2200x2545x3645mm)	86.61x131.69x143.50" (2200x3345x3645mm)	86.61x171.06x143.50" (2200x4345x3645mm)	106.29 x 181.10 x 162.99" (2700 x 4600 x 4140mm) [106.29 x 181.10 x 194.49"] [(2700 x 4600 x 4940mm)]	106.29 x 220.47 x 164.96" (2700 x 5600 x 4190mm) [106.29 x 220.47 x 196.46"] [(2700 x 5600 x 4990mm)]	106.29 x 259.84 x 166.93" (2700 x 6600 x 4240mm) [106.29 x 259.84 x 198.43"] [(2700 x 6600 x 5040mm)]	

# LEGEX

## SERIES 356 — Ultra-high Accuracy CNC CMM

Achieving premium performance, the fixed bridge structure and precision air bearings resting on the rigid guideways ensure superior stability of motion and ultra-high measuring accuracy. It is suitable for complex small to medium size workpieces such as a gear, bearing, lens, die, or scroll rotor which require high dimensional accuracy. The MPP-300Q probe adds a scanning function to the standard point-to-point measurement.



LEGEX 574

### FEATURES

- The most accurate CNC CMM family is launched, made possible by rigorous analysis of all possible error-producing factors and elimination or minimization of their effects.
- A newly developed, ultra-high accuracy crystallized-glass scale with the ultra-low expansion coefficient of  $0.01 \times 10^{-6}/K$  is used on each axis.
- The fixed bridge structure and precision air bearings running on highly rigid guideways ensure superior motion stability and ultra-high geometrical accuracy.
- Many types of optional probe systems are available, including touch-trigger probes, laser scanning probes, and a vision measuring probe.



LEGEX 774



Mitutoyo original standard type glass scale (above) and ultra-high accuracy glass scale with virtually zero thermal expansion (below)



CMM calibration tool using the virtually zero thermal expansion glass gage

### Technical Data

Length standard:	Ultra high accuracy linear encoder (glass scale with virtually zero thermal expansion coefficient)
Guide system:	Air bearing
Max. drive speed:	200mm/sec
Max. acceleration:	1000mm/sec <sup>2</sup>
Air pressure:	0.4MPa (0.5MPa: LEGEX 9106)
Air consumption:	120L/min

### Guaranteed accuracy temperature environment\*

Temperature range		20±2°C
Temperature change	Per hour	0.5K
	Per 24 hours	1.0K
Temperature gradient	Vertical	1.0K/m
	Horizontal	1.0K/m

\*When using temperature compensation system.

#### Main Unit Startup System

This machine incorporates a startup system (relocation detection system), which disables operation when an unexpected vibration is applied or the machine is relocated. Be sure to contact your nearest Mitutoyo prior to relocating this machine after initial installation.

### SPECIFICATIONS

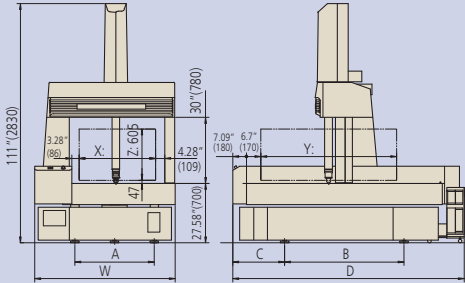
Model No.	LEGEX 574	LEGEX 774	LEGEX 776	LEGEX 9106	LEGEX 12128	
Range	X-axis	20.07" (510mm)	27.95" (710mm)	27.95" (710mm)	35.82" (910mm)	47.63" (1210mm)
	Y-axis	27.95" (710mm)	27.95" (710mm)	27.95" (710mm)	39.76" (1010mm)	47.63" (1210mm)
	Z-axis	17.91" (455mm)	17.91" (455mm)	24.01" (610mm)	24.01" (610mm)	31.69" (805mm)
Resolution	.000004" (0.0001mm)					
Accuracy*	MPE <sub>E</sub>	(0.35+L/1000)μm			(0.6+1.5L/1000)μm	
	MPE <sub>P</sub>	0.45μm			0.6μm	
	MPE <sub>THP</sub>	1.4μm			1.8μm	
	MPT <sub>THP</sub>	150 SEC				
Work table	Material	Cast iron (Ceramic coating optional)	Cast iron (Ceramic coating optional)	Cast iron (Ceramic coating optional)	Cast iron (Ceramic coating optional)	Cast iron (Ceramic coating optional)
	Size	21.65" x 29.52" (550mm x 750mm)	29.52" x 29.52" (750mm x 750mm)	37.40" x 41.33" (950mm x 1050mm)	49.21" x 49.21" (1250mm x 1250mm)	
	Tapped insert	M8 x 1.25mm				
Workpiece	Max. height	27.8" (706mm)	27.4" (696mm)	33.93" (862mm)	33.70" (856mm)	41.57" (1056mm)
	Max. load	440 lbs (200kg)	1102 lbs (500kg)		1763 lbs (800kg)	2205 lbs (1000kg)
Mass (main unit)	8598 lbs (3900kg)	11023 lbs (5000kg)	11243 lbs (5100kg)	14330 lbs (6500kg)	23148 lbs (10500kg)	
Dimensions (W x D x H)	62.44 x 100.00 x 102.16" (1586 x 2540 x 2595mm)	78.07 x 102.20 x 101.77" (1856 x 2596 x 2585mm)	78.07 x 102.20 x 113.58" (1856 x 2596 x 2885mm)	80.94 x 125.98 x 119.29" (2056 x 3200 x 3030mm)	92.75 x 142.59 x 141.33" (2356 x 3622 x 3590mm)	

\*When using temperature compensation system.  
ISO10360-2: 2001 & 10360-4, Probe system used: MPP-300Q L: Measuring length (mm)

## Technical Data

Length standard: High accuracy linear encoder  
 Guide system: Air bearing  
 Max. drive speed: 519mm/sec (500mm/sec: 1600 series)  
 Max. acceleration: 0.23G (0.13G: 1600 series)  
 Air pressure: 0.4MPa  
 Air consumption: 50L/min: 700 Series  
 70L/min: 900 Series  
 150L/min: 1600 Series

## Dimensions



Item	STRATO-Apex 776	STRATO-Apex 7106	STRATO-Apex 9106	STRATO-Apex 9166
A	29.13" (740mm)		37.01" (940mm)	
B	27.56" (700mm)	39.37" (1000mm)		55.51" (1410mm)
C	20.47" (520mm)		24.11" (612.5mm)	
D	76.38" (1940mm)	88.19" (2240mm)		111.81" (2840mm)
W	67.32" (1710mm)		75.20" (1910mm)	

### STRATO-Apex Guaranteed accuracy temperature environment\*

Temperature range		66.2°F - 69.8°F (19°C - 21°C)
Temperature change	Per hour	1.0K
	Per 24 hours	2.0K
Temperature gradient	Vertical	1.0K/m
	Horizontal	1.0K/m

FALCIO-Apex 162012



### FALCIO-Apex 1600 Guaranteed accuracy temperature environment\*

Temperature range		64.4°F - 71.6°F (18°C - 22°C)
Temperature change	Per hour	1.0K
	Per 24 hours	2.0K
Temperature gradient	Vertical	1.0K/m
	Horizontal	1.0K/m

#### Main Unit Startup System

This machine incorporates a startup system (relocation detection system), which disables operation when an unexpected vibration is applied or the machine is relocated. Be sure to contact your nearest Mitutoyo prior to relocating this machine after initial installation.

# STRATO-Apex

## SERIES 355 — High Accuracy CNC CMM

High performance models in the STRATO / FALCIO-Apex series have a high-end moving bridge type CNC CMM with upgraded kinematic accuracy.

## FEATURES

- High measuring accuracy and high-speed motion.
  - Full-digital motion control.
  - Improved rigid air bearings on all axial guideways.
- Temperature compensation system.



STRATO-Apex 700/900

## SPECIFICATIONS

Model No.	STRATO-Apex 776	STRATO-Apex 7106	STRATO-Apex 9106	STRATO-Apex 9166
Range	X-axis	27.75" (705mm)		35.62" (905mm)
	Y-axis	27.75" (705mm)	39.56" (1005mm)	63.18" (1605mm)
	Z-axis		23.81" (605mm)	
Resolution			0.0000008" (0.00002mm)	
Accuracy*	MPE <sub>E</sub>	(0.9+2.5L/1000)μm		
	MPE <sub>P</sub>	0.9μm		
	MPE <sub>THP</sub>	1.8μm		
Work table	Material	Granite		
	Tapped insert	M8 x 1.25mm		
Workpiece	Max. height	30.31" (770mm)	30.31" (770mm)	30.31" (770mm)
	Max. loading	1102lbs (500kg)	1763lbs (800kg)	1763lbs (800kg)
Mass (main unit)	4088lbs (1895kg)	4806lbs (2180kg)	5313lbs (2410kg)	6801lbs (3085kg)

# FALCIO-Apex

## SERIES 355 — High Accuracy CNC CMM

## SPECIFICATIONS

Model No.	FALCIO-Apex 162012 [FALCIO-Apex 162015]	FALCIO-Apex 163012 [FALCIO-Apex 163015]	FALCIO-Apex 164012 [FALCIO-Apex 164015]
Range	X-axis	63.18" (1605mm)	
	Y-axis	78.93" (2005mm)	118.30" (3005mm)
	Z-axis	47.44" (1205mm) [59.25" (1505mm)]	
Resolution	0.000004" (0.0001mm)		
Accuracy*	MPE <sub>E</sub>	(2.8+4.0L/1000)μm [(3.3+4.5L/1000)μm: Z-axis = 1505mm]	
	MPE <sub>P</sub>	2.8μm [3.3μm]	
	MPE <sub>THP</sub>	2.8μm(90s) [3.5μm(90s)]	
Work table	Material	Granite	
	Size	72.83" x 129.13" (1850mm x 3280mm)	72.83" x 168.50" (1850mm x 4280mm)
	Tapped insert	M8 x 1.25mm	
Workpiece	Max. Ht.	53.14" (1350mm) [64.96" (1650mm)]	
	Max. Wt.	7716 lbs (3500kg)	8818 lbs (4000kg)
Mass (includes controller & air stand)	21054 lbs (9550kg) [21164 lbs (9600kg)]	30864 lbs (14000kg) [30974 lbs (14050kg)]	55115 lbs (25000kg) [55225 lbs (25050kg)]
Dimensions (WxDxH)	110.35 x 145.07 x 170.86" (2803 x 3685 x 4340mm) [110.35 x 145.07 x 194.48"] [(2803 x 3685 x 4940mm)]	110.35 x 145.07 x 172.83" (2803 x 3685 x 4390mm) [110.35 x 145.07 x 196.45"] [(2803 x 4685 x 4990mm)]	110.35 x 145.07 x 176.77" (2803 x 3685 x 4490mm) [110.35 x 145.07 x 200.39"] [(2803 x 5685 x 5090mm)]

\*When using temperature compensation system.  
 ISO10360-2: 2001 & ISO10360-4, L: Measuring length (mm), Probe system: SP25M with ø4 x 50mm stylus

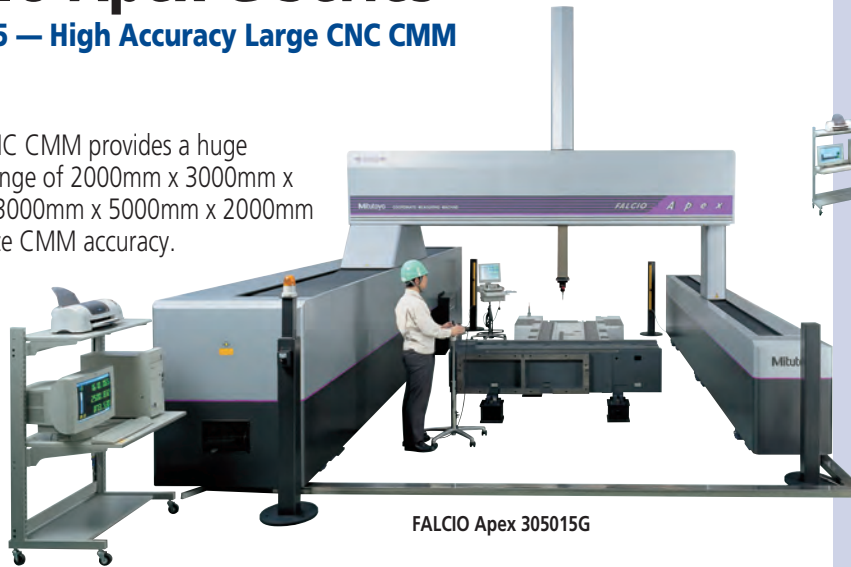
Mitutoyo

# FALCIO Apex G Series

## SERIES 355 — High Accuracy Large CNC CMM

### FEATURES

This giant CNC CMM provides a huge measuring range of 2000mm x 3000mm x 1500mm to 3000mm x 5000mm x 2000mm with large-size CMM accuracy.



FALCIO Apex 305015G



Main Unit Startup System

This machine incorporates a startup system (relocation detection system), which disables operation when an unexpected vibration is applied or the machine is relocated. Be sure to contact your nearest Mitutoyo prior to relocating this machine after initial installation. Refer to page VIII for details.

### SPECIFICATIONS

Model No.	FALCIO Apex 203015	FALCIO Apex 204015	FALCIO Apex 205015	FALCIO Apex 305015
Range	X-axis	78.94" (2005mm)		118.31" (3005mm)
	Y-axis	118.31" (3005mm)	157.68" (4005mm)	197.05" (5005mm)
	Z-axis	59.25" (1505mm)		
Resolution	.000004" (0.0001mm)			
Accuracy*	MPEE	(3.5+4L/1000)µm [(4.4+4.5L/1000)µm]		
	MPEP	3.5µm [4.0µm]		
	MPETHP	3.8µm (90s) [4.2µm (90s)]		
Mass (main unit)	26455 lbs (12000kg)	30864 lbs (14000kg)	33069 lbs (15000kg)	35273 lbs (16000kg)

\* The machine is equipped with the temperature compensation system. According to ISO 10360-2 methods when using the SP25M probe system with a ø4 x 50mm stylus. L: Measuring length (mm)

# Crysta-Apex C Series

## SERIES 191 — Standard Large CNC CMM



### SPECIFICATIONS

Model No.	Crysta-Apex C203016G	Crysta-Apex C306016G
Range	X-axis	78.94" (2005mm)
	Y-axis	118.31" (3005mm)
	Z-axis	63.18" (1605mm) [78.93" (2005)]
Resolution	.000004" (0.0001mm)	
Accuracy*	MPEE	(6+6L/1000)µm [(7+7L/1000)µm]
	MPEP	6µm [7µm]
	MPETHP	6.5µm (90s) [7.5µm (90s)]
Mass (main unit)	26455 lbs (12000kg)	35273 lbs (16000kg)

\* The machine is equipped with the temperature compensation system. According to ISO 10360-2 methods when using the SP25M probe system with a ø4 x 50mm stylus. L: Measuring length (mm)

### Technical Data

Length standard: High accuracy linear encoder  
Guide system: Air bearing  
Max. drive speed: 520mm/sec

### Guaranteed accuracy temperature environment\*

Temperature range	18°C - 22°C	
Temperature change	Per hour	1.0K
	Per 24 hours	2.0K
Temperature gradient	Vertical	1.0K/m
	Horizontal	1.0K/m

\*When using temperature compensation system.

#### • Operating Convenience

The user makes a measurement by simply operating the X, Y, and Z control wheels to bring the touch-trigger probe into contact with target points on the workpiece.

#### • Measuring Large Workpieces

Large workpieces that exceed the measuring range of the CP1057 can be measured, indirectly, by moving the CP1057's main unit along the surface plate and linking the measurement results obtained before and after movement.

#### • A Choice of Probes

Various probes are available for the CP1057, such as a point probe that can be used for scribed line pointing measurements, in addition to the standard touch-trigger probe.

#### • Temperature Compensation System (Option)

An optional temperature compensation system can be installed in the CP1057 to ensure measuring accuracy is maintained over a wide temperature range 59°F - 86°F (15°C to 30°C).

### Technical Data

Length standard: High accuracy linear encoder  
Guide system: Air bearing  
Max. drive speed: 500mm/sec

### Guaranteed accuracy temperature environment\*

Temperature range	18°C - 22°C	
Temperature change	Per hour	1.0K
	Per 24 hours	2.0K
Temperature gradient	Vertical	1.0K/m
	Horizontal	1.0K/m

\*When using temperature compensation system.

Main Unit Startup System

This machine incorporates a startup system (relocation detection system), which disables operation when an unexpected vibration is applied or the machine is relocated. Be sure to contact your nearest Mitutoyo prior to relocating this machine after initial installation. Refer to page VIII for details.

# CARBstrato / CARBapex

## SERIES 355 — Car Body Measuring System

CARBstrato	
401420	157.47" x 55.11" x 78.73" (4000mm X 1400mm X 2000mm)
401424	157.47" x 55.11" x 94.48" (4000mm X 1400mm X 2400mm)
401620	157.47" x 62.99" x 78.73" (4000mm X 1400mm X 3000mm)
401624	157.47" x 62.99" x 94.48" (4000mm X 1600mm X 2400mm)
601620	236.21" x 62.99" x 78.73" (6000mm X 1600mm X 2000mm)
601624	236.21" x 62.99" x 94.48" (6000mm X 1600mm X 2400mm)
601626	236.21" x 62.99" x 102.36" (6000mm X 1600mm X 2600mm)
801620	314.95" x 62.99" x 78.73" (8000mm X 1600mm X 2000mm)
801624	314.95" x 62.99" x 94.48" (8000mm X 1600mm X 2400mm)
801626	314.95" x 62.99" x 102.36" (8000mm X 1400mm X 2600mm)
601420D	236.21" x 110.23" x 78.73" (6000mm X 1400mm X 2000mm)
601424D	236.21" x 110.23" x 94.48" (6000mm X 1400mm X 2400mm)
601426D	236.21" x 110.23" x 102.36" (6000mm X 1400mm X 2600mm)
601430D	236.21" x 110.23" x 118.10" (6000mm X 1400mm X 3000mm)
601620D	236.21" x 125.98" x 78.73" (6000mm X 1600mm X 2000mm)
601624D	236.21" x 125.98" x 94.48" (6000mm X 1600mm X 2400mm)
601626D	236.21" x 125.98" x 102.36" (6000mm X 1600mm X 2600mm)
601630D	236.21" x 125.98" x 118.10" (6000mm X 1600mm X 3000mm)
801620D	314.95" x 125.98" x 78.73" (8000mm X 1600mm X 2000mm)
801624D	314.95" x 125.98" x 94.48" (8000mm X 1600mm X 2400mm)
801626D	314.95" x 125.98" x 102.36" (8000mm X 1600mm X 2600mm)
801630D	314.95" x 125.98" x 118.10" (8000mm X 1600mm X 3000mm)
Resolution	1μ
Accuracy*	(18+20L/1000)μm

### Main Unit Startup System

This machine incorporates a startup system (relocation detection system), which disables operation when an unexpected vibration is applied or the machine is relocated. Be sure to contact your nearest Mitutoyo prior to relocating this machine after initial installation.

CARBapex	
401420	157.47" x 55.11" x 78.73" (4000mm X 1400mm X 2000mm)
401424	157.47" x 55.11" x 94.48" (4000mm X 1400mm X 2400mm)
401620	157.47" x 62.99" x 78.73" (4000mm X 1400mm X 3000mm)
401624	157.47" x 62.99" x 94.48" (4000mm X 1600mm X 2400mm)
601620	236.21" x 62.99" x 78.73" (6000mm X 1600mm X 2000mm)
601624	236.21" x 62.99" x 94.48" (6000mm X 1600mm X 2400mm)
601626	236.21" x 62.99" x 102.36" (6000mm X 1600mm X 2600mm)
801620	314.95" x 62.99" x 78.73" (8000mm X 1600mm X 2000mm)
801624	314.95" x 62.99" x 94.48" (8000mm X 1600mm X 2400mm)
801626	314.95" x 62.99" x 102.36" (8000mm X 1400mm X 2600mm)
601420D	236.21" x 110.23" x 78.73" (6000mm X 1400mm X 2000mm)
601424D	236.21" x 110.23" x 94.48" (6000mm X 1400mm X 2400mm)
601426D	236.21" x 110.23" x 102.36" (6000mm X 1400mm X 2600mm)
601430D	236.21" x 110.23" x 118.10" (6000mm X 1400mm X 3000mm)
601620D	236.21" x 125.98" x 78.73" (6000mm X 1600mm X 2000mm)
601624D	236.21" x 125.98" x 94.48" (6000mm X 1600mm X 2400mm)
601626D	236.21" x 125.98" x 102.36" (6000mm X 1600mm X 2600mm)
601630D	236.21" x 125.98" x 118.10" (6000mm X 1600mm X 3000mm)
801620D	314.95" x 125.98" x 78.73" (8000mm X 1600mm X 2000mm)
801624D	314.95" x 125.98" x 94.48" (8000mm X 1600mm X 2400mm)
801626D	314.95" x 125.98" x 102.36" (8000mm X 1600mm X 2600mm)
801630D	314.95" x 125.98" x 118.10" (8000mm X 1600mm X 3000mm)
Resolution	1μ
Accuracy*	(25+28L/1000)μm



### Technical Data

Length standard: High accuracy linear encoder  
 Guide system: Air bearing (Y and Z) Linear Guide (X)  
 Max. drive speed: 866mm/sec (CARBstrato) / 519mm/sec (CARBapex)  
 Max. acceleration: 0.2G (CARBstrato) / 0.1G (CARBapex)

### Guaranteed accuracy temperature environment\*

Temperature range	60.8°F - 78.8°F 16°C - 26°C
Temperature change	Per hour 1.0K Per 24 hours 5.0K
Temperature gradient	Vertical 1.0K/m Horizontal 1.0K/m

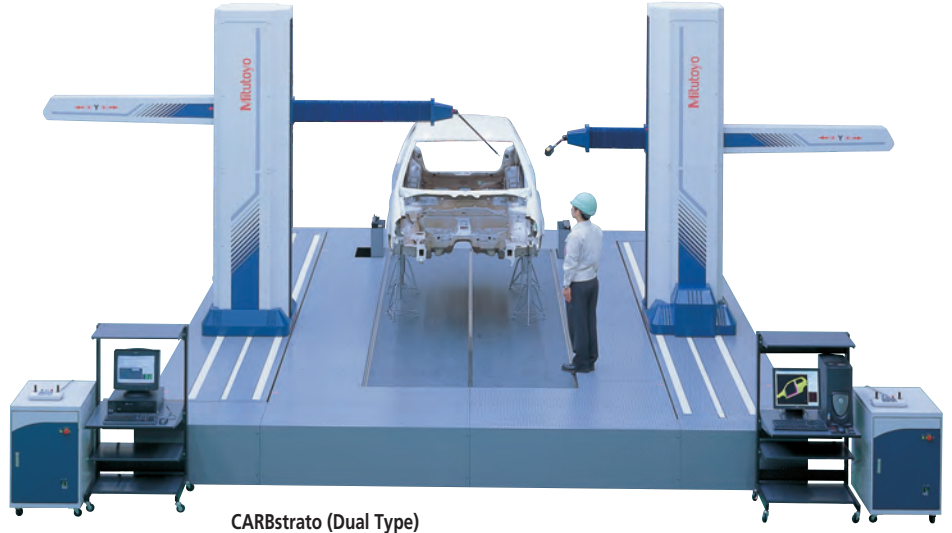
\*When using temperature compensation system.

### FEATURES: CARBstrato

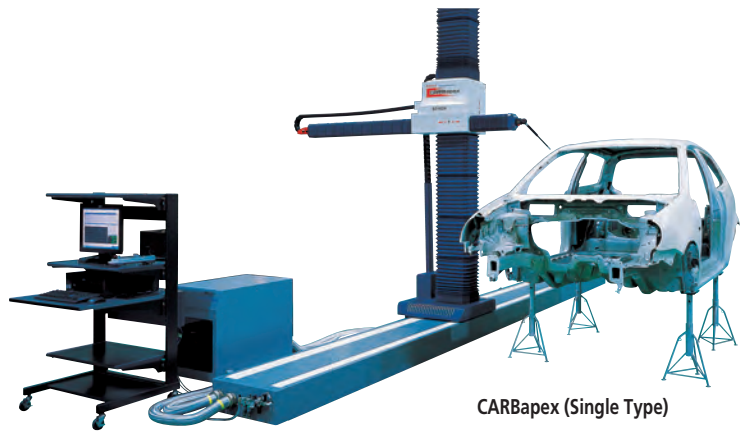
A very large, high precision, horizontal-type CNC CMM scaled for measuring car bodies. Single-arm or dual-arm types are available. The dual-arm configuration measures by controlling two arms simultaneously, one from each side.

### FEATURES: CARBapex

A large, affordable, horizontal-type CNC CMM scaled for measuring car bodies. Single-arm or dual-arm types are available. The dual-arm configuration measures by controlling two arms simultaneously, one from each side.



CARBstrato (Dual Type)



CARBapex (Single Type)

### SPECIFICATIONS

Model No.		CARBstrato	CARBapex
Range	X-axis	236.22" (6000mm)	236.22" (6000mm)
	Y-axis	62.99" (1600mm)	62.99" (1600mm)
	Z-axis	94.49" (2400mm)	94.49" (2400mm)
Accuracy* MPE	Single	18+20L/1000≤70μm	25+28L/1000≤95μm
	Dual	38+30L/1000≤90μm	50+35L/1000≤120μm
Max Measuring Range	X-axis	708.66" (18000mm)	708.66" (18000mm)
	Z-axis	137.80" (3500mm)	137.80" (3500mm)
	Single Y	78.74" (2000mm)	78.74" (2000mm)
	Dual Y	153.54" (3900mm)	153.54" (3900mm)
Dimensions (H x W x D)		155.63x176.10x288.35" (3953x4473x7324mm)	144.33x163.19x275.59" (3666x4145x7000mm)

Conformed standard: ISO10360-2: 2001  
 Probe system used: TP2/TP20 with ø3 x 20mm stylus  
 L: Measuring length (mm)

# MACH-V565 /9106

## SERIES 360 — In-line Type CNC CMM

### FEATURES

The MACH-3A and MACH-V maximize machining operations by performing in-line or near-line, high speed coordinate measuring in conjunction with your CNC machine tools. These high throughput machines can be incorporated right into the manufacturing line and can provide pre/post machining feedback to your machine tool for machining adjustments.



MACH-V9106

### SPECIFICATIONS

Model No.	MACH-V565	MACH-V9106
Range	X-axis	19.88" (505mm)
	Y-axis	23.82" (605mm)
	Z-axis	19.88" (505mm)
Resolution	0.000004" (0.0001mm)	
Accuracy*	MPE <sub>E</sub>	(2.5+3.5L/1000)μm / (2.9+4.3L/1000)μm / (3.6+5.8L/1000)μm**
	MPE <sub>P</sub>	2.5μm (2.2μm: using SP25M)
Dimensions (W x D x H)	86.81x41.57x103.86" (2205x1056x2638mm)	118.31x57.36x112.68" (3005x1457x2862mm)

\* The machine is equipped with the temperature compensation system.

\*\* Guaranteed accuracy temperature range: 66.2°F - 69.8°F (19°C - 21°C), 59°F - 77°F (15°C - 25°C), 41°F - 95°F (5°C - 35°C)

# MACH-3A 653

## SERIES 360 — In-line Type CNC CMM



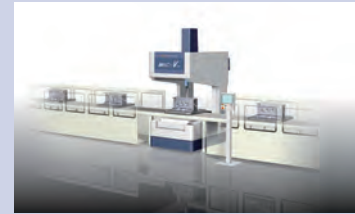
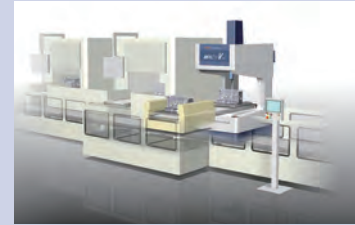
### SPECIFICATIONS

Model No.	MACH-3A 653	
Range	X-axis	23.81" (605mm)
	Y-axis	19.88" (505mm)
	Z-axis	11.22" (285mm)
Resolution	0.000004" (0.0001mm)	
Accuracy*	MPE <sub>E</sub>	(2.5 + 3.5L/1000)μm, (2.8 + 4.2L/1000)μm, (3.2 + 5.0L/1000)μm, (3.5 + 5.7L/1000)μm, (3.9 + 6.5L/1000)μm**
	MPE <sub>P</sub>	2.5μm
Dimensions W x D x H	(1870 x 1280 x 1920mm) 73.62" x 50.39" x 75.59"	

\* The machine is equipped with the temperature compensation system.

According to ISO 10360-2 methods when using the TP7M probe system with a ø4 x 20mm stylus. L: Measuring length (mm)

\*\* Guaranteed accuracy temperature range: 19°C - 21°C / 15°C - 25°C / 10°C - 30°C / 5°C - 35°C / 35°C - 40°C



### Technical Data

Length standard: High accuracy linear encoder  
Guide system: Linear guide: MACH-V  
Max. drive speed: 866mm/sec: MACH-V  
Max. acceleration: 0.86G: MACH-V

### Guaranteed accuracy temperature environment

Temperature range	5°C - 35°C	
Temperature change	Per hour	2.0K
	Per 24 hours	10.0K
Temperature gradient	Vertical	1.0K/m
	Horizontal	1.0K/m

#### Main Unit Startup System

This machine incorporates a startup system (relocation detection system), which disables operation when an unexpected vibration is applied or the machine is relocated. Be sure to contact your nearest Mitutoyo prior to relocating this machine after initial installation.



### Technical Data

Length standard: High accuracy linear encoder  
Guide system: Linear guide  
Max. drive speed: 1212mm/sec  
Max. acceleration: 1.2G

### Guaranteed accuracy temperature environment

Temperature range	5°C - 40°C	
Temperature change	Per hour	2.0K
	Per 24 hours	10.0K
Temperature gradient	Vertical	1.0K/m
	Horizontal	1.0K/m

#### Main Unit Startup System

This machine incorporates a startup system (relocation detection system), which disables operation when an unexpected vibration is applied or the machine is relocated. Be sure to contact your nearest Mitutoyo prior to relocating this machine after initial installation.

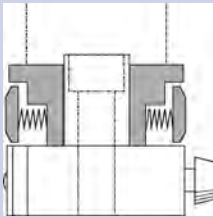


# Crysta-Plus M443 / 574 / 7106

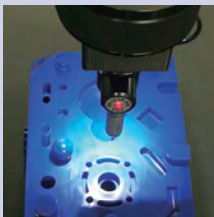
## SERIES 196 — Manual-Floating Type CMM



One-touch air clamp and fine feed for rapid and easy positioning



Ergonomically designed guide grip on Z-axis for reliable measurement  
(only for Crysta-Plus M776 and M7106)



Probe illumination (optional) to illuminate the probe and styli directly and brighten the working field

Manual floating type CMMs developed in quest for high-accuracy, low-cost and easy operation. The Crysta-Plus M is suitable to measure a wide range of applications from a simple dimension to complex form.

### FEATURES

- Smooth operation utilizing high-precision air bearings and lightweight moving members.
- Continuous fine feed over the entire measuring range.
- One-touch air clamp for each axis.

Crysta-Plus M443



Crysta-Plus M574



Crysta-Plus M7106



### Technical Data

Length standard: High accuracy linear encoder  
Guide system: Air bearing  
Axis clamp: One-touch air clamp  
(Screw clamp: M776, M7106)  
Fine feed range: Entire range  
Air pressure: 0.4MPa (0.35MPa: M443, M574)  
Air consumption: 50L/min

### Guaranteed accuracy temperature environment

Temperature range		19°C - 21°C	15°C - 30°C*
Temperature change	Per hour	—	<b>2.0K</b>
	Per 24 hours	—	<b>5.0K</b>
Temperature gradient	Vertical	0.5K/m	<b>1.0K/m</b>
	Horizontal	0.5K/m	<b>1.0K/m</b>

\*The values shown in Bold in the table above apply to the case when using the temperature compensation system. (Option)

### SPECIFICATIONS

Model No.		Crysta-Plus M443	Crysta-Plus M574	Crysta-Plus M7106
Range	X-axis	15.74" (400mm)	19.69" (500mm)	27.56" (700mm)
	Y-axis	15.74" (400mm)	27.56" (700mm)	39.37" (1000mm)
	Z-axis	11.81" (300mm)	15.74" (400mm)	23.62" (600mm)
Resolution		.0002" (0.0005mm)		
Accuracy*	E	(3.0+4.0L/1000)µm	(3.5+4.5L/1000)µm	(4.5+4.5L/1000)µm
	R	4.0µm		5.0µm
Work table	Material	Granite		
	Size	24.56" x 31.69" (624mm x 805mm)	30.07" x 46.25" (764mm x 1175mm)	35.43" x 68.50" (900mm x 1740mm)
	Tapped insert	M8 x 1.25mm		
Workpiece	Max. Ht.	18.90" (480mm)	23.22" (590mm)	31.49" (800mm)
	Max.Wt.	396 lbs (180kg)		1763 lbs (800kg)
Mass (main unit & stand)		903 lbs (410kg)	1424 lbs (646kg)	3968 lbs (1800kg)
Dimensions (W x D x H)		38.62x41.22x77.44" (981x1047x1967mm)	56.45x47.44x89.25" (1434x1205x2267mm)	57.48x79.40x111.81" (1460x2017x2840mm)

\* ISO10360-2: 2001, L: Measuring length (mm), Temp: 20°C ± 1°C, Probe system: TP20

# CMM Probes

## Scanning probe system



**MPP-300Q**  
**MPP-300**  
Ultra-high accuracy and low measuring force type



**SP80**  
High accuracy type and available with 500mm long extension stylus



**SP25M**  
Compact and high accuracy type



**MPP-10**  
For effective screw depth measurement



## Optical (non-contact) probe system



**QVP (Quick Vision Probe)**  
For video measurement



**CF20**  
Centering microscope system





Micro Touch probe  
UMAP-CMM

### Probe heads



PH10M / PH10MQ  
Motor drive index type



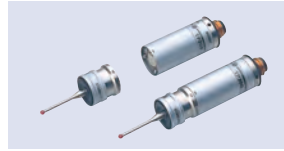
MIH  
Manual index type

# CMM Probes

## Touch-trigger probe system



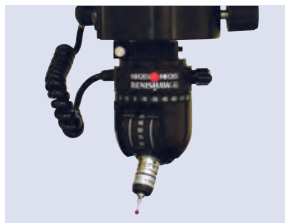
TP7M  
High accuracy type



TP200  
Compact and high accuracy (stylus change) type



TP20 Compact (stylus change) type



MH20i / MH20 Manual head type



# SurfaceMeasure 606

## Non-Contact Line-Laser Probe

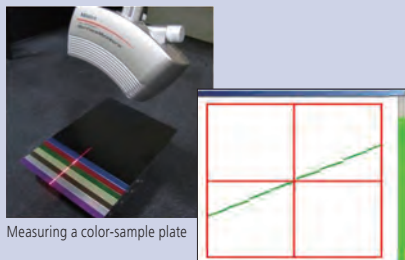
### FEATURES

New scanning probe automatically adjusts to workpiece surface characteristics to deliver highly efficient measurements.

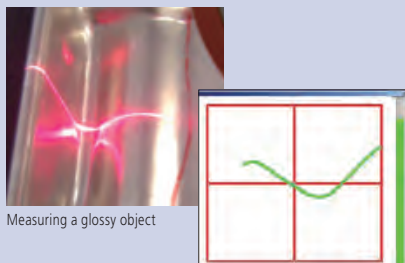
With a conventional laser probe, laser intensity and camera sensitivity must be adjusted according to the environment and the workpiece material. In contrast, the SurfaceMeasure 606, which automatically adjusts these factors, enables simpler and more comfortable laser scanning.



**NEW-STYLE**  
Coordinate Measuring Machines



Measuring a color-sample plate

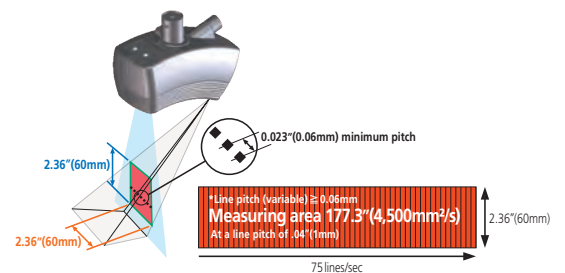


Measuring a glossy object

Since the laser intensity and camera sensitivity are automatically adjusted, stable shape data can be obtained even when the workpiece has multiple colors and varying degrees of reflectance.

### SPECIFICATIONS

Working distance: 3.66"(93mm)  
 Max. scan width: 2.36"(60mm)  
 Measuring range: 2.36"(60mm)  
 Scanning error: 12 μm [1σ/sphere fit]  
 [Target: Specific reference ball ø1.18"(30mm)]  
 (According to Mitutoyo's acceptance procedure)  
 Resolution: 0.06mm  
 Max. Acquisition rate: 75,000 points/sec  
 1,000 points/line  
 75 Hz  
 Laser Class: Class 2 [EN/IEC60825-1(2007)]  
 Mass: .948lb (430g)



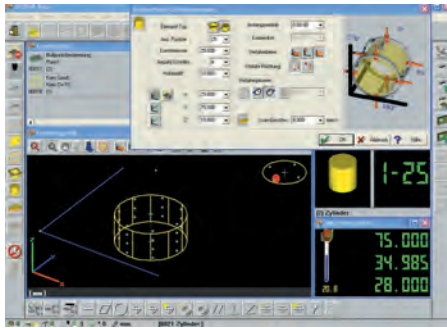
# MCOSMOS

## Software for Manual / CNC Coordinate Measuring Machine

### Three levels of module configuration

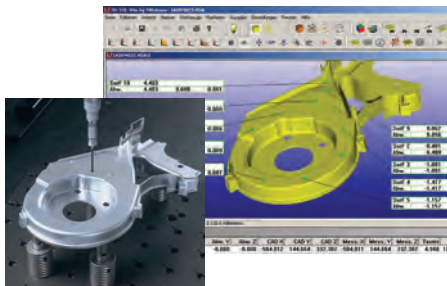
MCOSMOS has three choices of module configuration. From the basic MCOSMOS C1 to the advanced MCOSMOS C3, you can choose a best configuration for your measurement applications.

Module included	GEOPAK	CAT1000P	CAT1000S	SCANPAK
MCOSMOS C1	✓	—	—	—
MCOSMOS C2	✓	✓	✓	—
MCOSMOS C3	✓	✓	✓	✓



#### GEOPAK (Geometry module)

Geopak is our universal geometric measurement program, which allows you to control the measurement of your workpiece from drawing to completion, or simply to run existing measurement programs on a repeat basis.



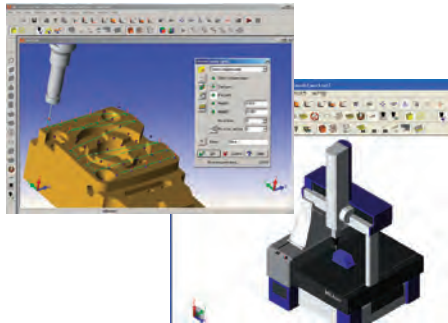
#### CAT1000S (free form surface evaluation module)

In addition to the online/offline part program creation, CAD model based generation of surface measurement points, and comparison of actual/nominal data, with graphical output.



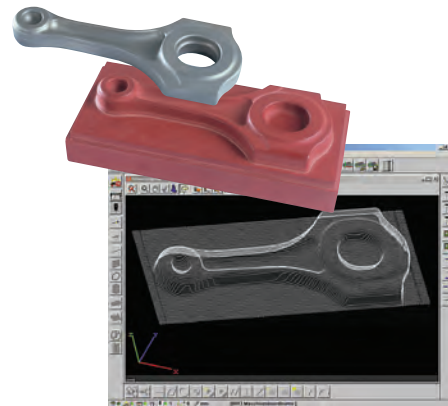
#### GEARPAK (gear measurement and analysis module)

Advances in CMM controller techniques make the measurement of gears feasible, and the Gearpak module takes advantage of this to bring sophisticated measurement capabilities within easy reach.



#### CAT1000P (offline part program module)

For online/offline part program creation, using the measurement of geometric elements directly from the CAD model, with automatic collision avoidance.



#### SCANPAK (2D profile evaluation module)

For the scanning and evaluation of workpiece contours (2D), and data transfer to CAD system.



#### MAFIS (Mitutoyo Airfoil Inspection System)

Evaluation and analysis of airfoil shape such as Turbine Blades require special calculations according to the particular design specifications. The MAFIS system uses cross sectional data of the shape obtained by Scanpak to perform these calculations, and output the result via the standard geometry program.





### Vision Measuring Systems



Quick Vision ELF



QV Apex606PRO

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# Quick Vision ELF

## Bench-Top CNC Vision Measuring Systems

### FEATURES

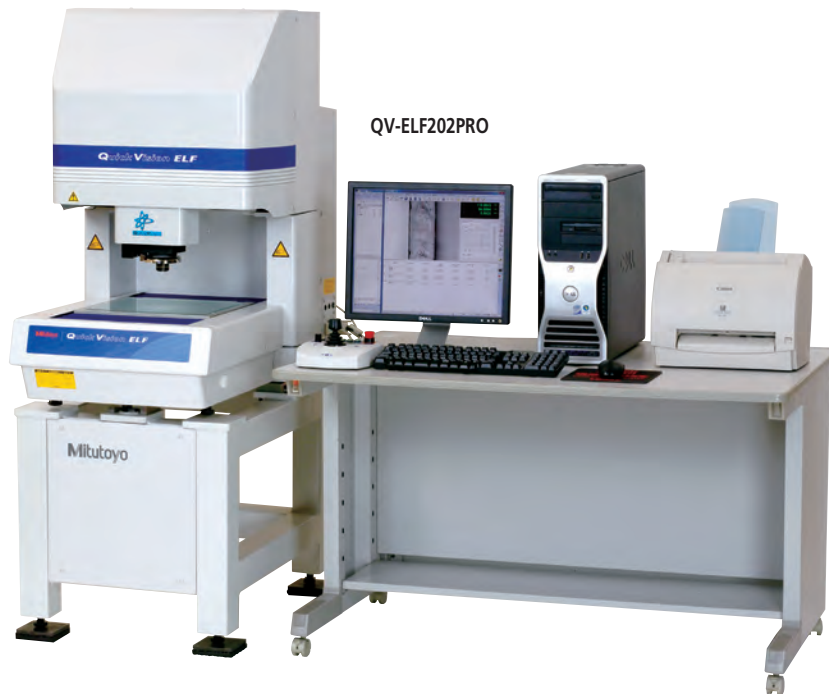
- **Controller-integrated compact size design**

This series is appropriate for installation at a small site because of its light weight and space saving design.

- **Small body packed full of functions**

This series offers various types of machines equipped with the PRL illuminator and power turret. Also, the laser auto-focus unit can be installed, as a factory option.

- **The highest performance/cost ratio of the Quick Vision series**



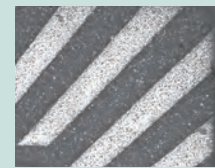
### SPECIFICATIONS

Model No. and Type		QV-ELF202
		PRO machine
Range	X-axis	10" / 250mm
	Y-axis	8" / 200mm
	Z-axis	8" / 200mm
Resolution		0.1μm
High-sensitivity CCD camera		B&W
Accuracy* (20°C±1°C)	E1XY	(2.0+3L/1000)μm
	E1Z	(3.0+5L/1000)μm
Max. drive speed (XYZ-axis)		200mm/s
Illumination (PRL: Programmable Ring Light)	Surface	LED, White
	Contour	LED, White
	Ring light	LED, White
Magnification change system		Programmable power turret (1X, 2X, 6X)
Stage glass size		12.24 x 10.59" / 311 x 269mm
Max workpiece load		33lbs / 15kg
Optional accessory *		laser auto-focus (factory installed option)

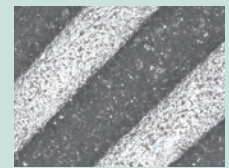
\* The measuring accuracy is defined at the following conditions  
 Programmable power turret: 1X Objective lens: 2.5X (HR or SL) L = Dimension between two arbitrary points (mm)

### Programmable Power Turret (PPT)

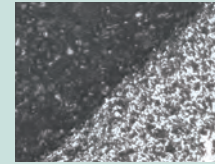
The three tube lens selection provides three magnification levels with the same objective lens. Replacement objective lenses allow a wide range of magnifications to support a variety of measurements.



1X tube lens x 2.5X objective  
View field: 2.5 x 1.88 mm



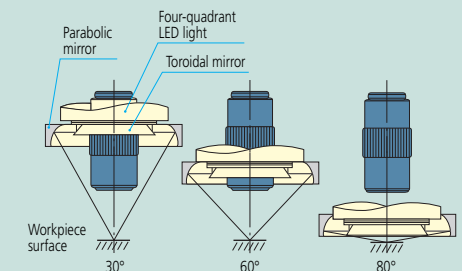
2X tube lens x 2.5X objective  
View field: 1.25 x 0.94 mm



6X tube lens x 2.5X objective  
View field: 0.41 x 0.31 mm

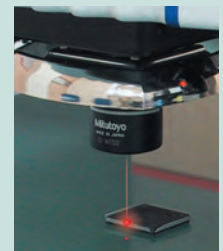
### Programmable Ring Light (PRL)

Fine control of obliquity and direction provides illumination optimal for measurement. Obliquity can be arbitrarily set in the range from 30° to 80°. This type of illumination is effective for enhancing the edge of inclined surfaces or very small steps. Illumination can be controlled independently in every direction, front and back, right and left. Measurement with edge enhancement is possible by forming a shadow by lighting from only one direction.



### Laser Auto Focus (LAF) Function\*

Mitutoyo offers models featuring the LAF system which enables high-speed focusing. Refer to page N-7 for more details. \*Available on the PRO model. (Factory installed option)



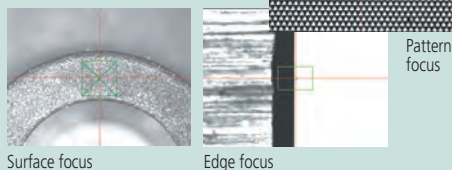
(Factory installed option)

### Touch System

The QV Touch system is available on all the QVE, QV Apex and QV Accel models as a factory option. All systems include probe, calibration articles and installed software.

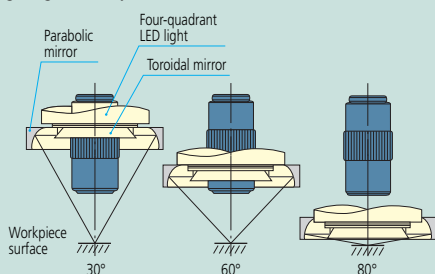
## Image Multi-AutoFocus

The optimal focus can be selected for each surface texture and measured feature, realizing high reproducibility and reliable edge detection.



## Programmable Ring Light (PRL)

Fine control of obliquity and direction provides illumination optimal for measurement. Obliquity can be arbitrarily set in the range from 30° to 80°. This type of illumination is effective for enhancing the edge of inclined surfaces or very small steps. Illumination can be controlled independently in every direction, front and back, right and left. Measurement with edge enhancement is possible by forming a shadow by lighting from only one direction.



## RGB Color LED Illumination

Changing the illumination color to red, green, blue, or white (synthesized) allows detection of edges which could not be measured with conventional white light.



## Laser Auto Focus (LAF) Function\*

Mitutoyo offers models featuring the LAF system which enables high-speed focusing. \*Available on 3 models. Refer to page M-7 for more details.



## Optional Index table\*

Automatic multi-plane measurement is possible with the optional index table. Refer to page N-7 for more details. \*Not available with QV ACCEL models



# QV Apex / Hyper QV

## SERIES 363 — CNC Vision Measuring System



QV Apex302PRO



Hyper QV404PRO



QV Apex606PRO

## SPECIFICATIONS

Model No.		QV Apex302PRO QV Apex302PRO3 Hyper QV302PRO	QV Apex404PRO QV Apex404PRO3 Hyper QV404PRO	QV Apex606PRO QV Apex606PRO3 Hyper QV606PRO
Range	X-axis	12" / 300mm	16" / 400mm	24" / 600mm
	Y-axis	8" / 200mm	16" / 400mm	26" / 650mm
	Z-axis	8" / 200mm	10" / 250mm	10" / 250mm
Resolution		0.1µm [0.02µm]		
High-sensitivity CCD camera		B&W (PRO3 model: color)		
Accuracy*	E1XY	(1.5+3L/1000)µm [(0.8+2L/1000)µm]		
	E1Z	(1.5+4L/1000)µm [(1.5+2L/1000)µm]		
	E2XY	(2+4L/1000)µm [(1.4+3L/1000)µm]		
Illumination (PRL: Programmable Ring Light)	Surface	LED, RGB (PRO2 and PRO3 models: Halogen)		
	Contour	LED, white (PRO2 and PRO3 models: Halogen)		
	PRL	LED, RGB (PRO2 and PRO3 models: Halogen)		
Magnification change system		Programmable power turret (1X, 2X, 6X)		
Max. drive speed	X/Y-axis	300mm/s [200mm/s]	400mm/s [200mm/s]	400mm/s [200mm/s]
	Z-axis	300mm/s [200mm/s]	300mm/s [200mm/s]	300mm/s [200mm/s]
Stage glass size		15.7x10.7" / 399 x 271mm	19.4x21.7" / 493 x 551mm	27.4x29.8" / 697 x 758mm
Max workpiece height		7.8" / 200mm	9.8" / 250mm	9.8" / 250mm
Max. stage loading		44lbs [33lbs] / 20kg [15kg]	88lbs [66lbs] / 40kg [30kg]	110lbs [88lbs] / 50kg [40kg]
Dimensions (W x D x H)**		33.8 x 37.4 x 63.3"	40.4 x 55.3 x 70"	51.5 x 78.1 x 70.6"
		859 x 951 x 1609mm	1027 x 1407 x 1778mm	1309 x 1985 x 1794mm
Mass**		794lbs / 360kg	1276lbs / 579kg	3196lbs / 1450kg

\* The measuring accuracy is defined at the following conditions, Programmable power turret: 1X, Objective lens: 2.5X (HR or SL), L = Dimension between two arbitrary points (mm)

\*\*Including machine stand

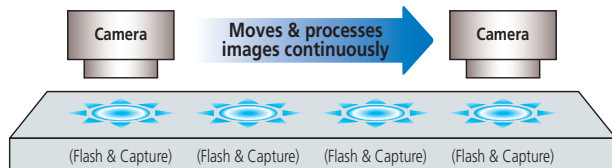
Optional Accessories: Refer to page M-8.

# QV STREAM PLUS

## SERIES 363 — CNC Vision Measuring System



### STREAM MODE



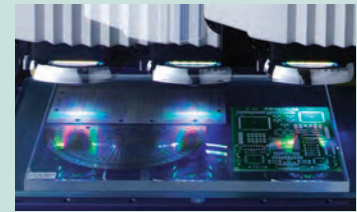
## SPECIFICATIONS

Model No.		QV STREAM PLUS 302	QV STREAM PLUS 404	QV STREAM PLUS 606
Range	X-axis	12" / 300mm	16" / 400mm	24" / 600mm
	Y-axis	8" / 200mm	16" / 400mm	26" / 650mm
	Z-axis	8" / 200mm	10" / 250mm	10" / 250mm
Resolution		0.1µm		
High-sensitivity CCD camera		B&W, progressive scan CCD		
Accuracy*	E1xy	(1.5+3L/1000)µm		
	E1z	(1.5+4L/1000)µm		
	E2xy	(2.0+4L/1000)µm		
Max. drive speed (X/Y/Z-axis)		300mm/s	XY: 400mm/s, Z:300mm/s	XY: 400mm/s, Z:300mm/s
Max. measuring speed		40mm/s	40mm/s	40mm/s
Illumination (PRL: Programmable Ring Light)	Surface	Hi-intensity LED [stroboscopic (B) and continuous (RGB & W) illumination, switchable]		
	Contour	Hi-intensity LED [stroboscopic (B) and continuous (B) illumination, switchable]		
	PRL	Hi-intensity LED [stroboscopic (B) and continuous (RGB & W) illumination, switchable]		
Magnification change system		Programmable power turret (1X, 2X, 6X)		
Stage glass size		15.7 x 10.7" / 399 x 271mm	19.4 x 21.7" / 493 x 551mm	27.4 x 29.8" / 697 x 758mm
Max. stage loading		44lbs / 20kg	88lbs / 40kg	110lbs / 50kg
Dimensions (W x D x H)**		33.8 x 37.4 x 63.3"	40.4 x 55.3 x 70"	51.5 x 78.15 x 70.62"
		859 x 951 x 1609mm	1027 x 1407 x 1778mm	1309 x 1985 x 1794mm
Mass**		794lbs / 360kg	1276lbs / 579kg	3196lbs / 1450kg

\* The measuring accuracy is defined at the following conditions  
 Programmable power turret: 1X Objective lens: 2.5X (HR or SL)  
 L = Dimension between two arbitrary points (mm)

\*\* Including machine stand

## FEATURES



### Non-stop Vision Measurement Extreme Improvement in Throughput\*

Conventional vision measuring systems endlessly repeat the cycle of stage displacement, stage stop, measurement, stage start and stage displacement again. This mode of operation is a fundamental limitation on improving measurement throughput.

In contrast, the Quick Vision Stream system uses an innovative image capture technique that avoids the need to repeatedly stop the stage so measurement can be continuous, but measuring accuracy is retained. Eliminating the time needed to accelerate, decelerate and then hold the stage motionless while a measurement is made achieves an extreme improvement in productivity.

### Measurement Throughput Comparison between QV STREAM and the Conventional System

STREAM PLUS series: more than 5 times faster

\* Comparison of measurement throughput using a Mitutoyo sample workpiece with that of Mitutoyo conventional systems

### STREAM Mode

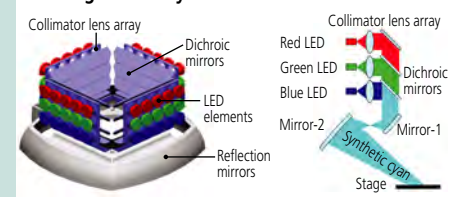
The measurement mode of a non-stop vision measuring system is referred to as the STREAM mode.

### Newly Developed Stroboscopic Illumination System

The development of a high-intensity LED flash illuminator has made non-stop vision measurement possible. At the precise moment the stage reaches a measurement point the illuminator creates an extremely short, high-intensity flash that effectively freezes all motion. The illuminator turns on and off so fast that no image blur occurs and the image is captured in full and accurate detail.

This innovative design takes full advantage of high-density, high-intensity LED arrays aided by collimating lenses and dichroic mirrors to produce ultra bright, directional and efficient illumination.

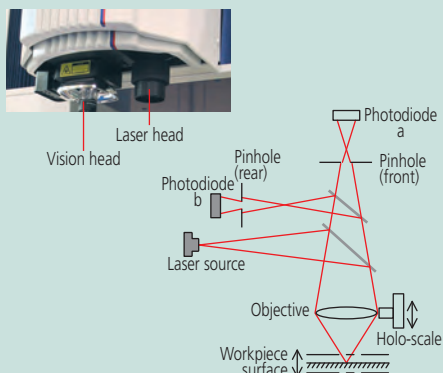
### High-density mounting of ultra-high intensity LED elements





### FEATURES: Hybrid Type1

- The focusing point method minimizes the difference in the measuring face reflectance and realizing high measurement reproducibility.
- The double pinhole method (less directivity) is employed as the measurement principle.



### Laser Beam Safety Precautions

This system uses a low-power invisible laser beam (780nm) which corresponds to a CLASS 1 (invisible radiation) of IEC60825-1 for measurement. The CLASS 1 laser warning label as shown below is attached to the main unit.

**CLASS 1 LASER PRODUCT**

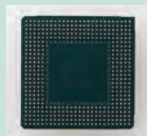
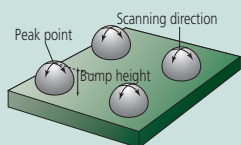
### FEATURES: Hybrid Type3

- Enables surface roughness or thickness measurement of thin and transparent objects such as film. Measurable thickness: 25 to 300µm
- Enables detection of high inclination angles both for mirrored surfaces and diffusing surfaces. Maximum tracking inclination angle ±87° (diffusing surface)
- Realizes high-resolution and high-accuracy height measurement by the wavelength confocal method using axial chromatic aberration.

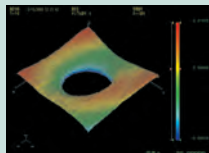
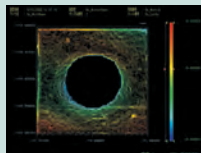
\*For Type3, due to the white halogen light, it is not applicable to JIS C 6802 "Radiation safety standard of laser products".

### Applications

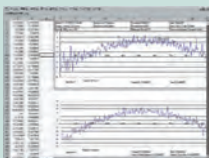
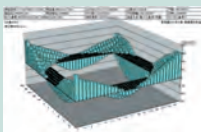
- Measurement of BGA/CSP bump height and coplanarity of IC packages



- Curved-form analysis (MSHAPE-QV)  
2D/3D contour lines display  
2D/3D unfiltered profile display  
Shadow graph display  
Curved plane analysis  
Unfiltered profile analysis, etc.



- Data processing (QV Graph)  
3D Bar chart display  
3D Surface chart display  
2D continuous cross-section graph display



### Main Unit Startup System

This machine incorporates a startup system (relocation detection system), which disables operation when an unexpected vibration is applied on the machine is relocated. Be sure to contact your nearest Mitutoyo prior to relocating this machine after initial installation. Refer to page IX for details.

# QV HYBRID TYPE1, TYPE3

## SERIES 365 — CNC Vision Measuring System

### FEATURES

The Quick Vision Hybrid is an advanced machine which allows vision measurement with both a CCD camera and high-speed scanning by applying a vision measurement unit in parallel with a non-contact displacement sensor.



### SPECIFICATION: QV Apex-based

Model No.	QVH Apex302		QVH Apex404		QVH Apex606	
Range	Vision	12"x8"x8" 300 x 200 x 200mm	16"x16"x10" 400 x 400 x 250mm	24"x26"x10" 600 x 650 x 250mm		
	Non-contact displacement sensor	Type1	7"x8"x8" 180 x 200 x 200mm	11"x16"x10" 280 x 400x 250mm	19"x26"x10" 480 x 650 x 250mm	
		Type3	7"x8"x8" 176 x 200 x 200mm	11"x16"x10" 276 x 400 x 250mm	19"x26"x10" 476 x 650 x 250mm	
Accuracy**	E1XY	(1.5+3L/1000)µm				
	E1Z	(1.5+4L/1000)µm / (1.5+4L/1000)µm*				
	E2XY	(2.0+4L/1000)µm				

### SPECIFICATION: QV STREAM PLUS-based

Model No.	QVH STREAM PLUS302		QVH STREAM PLUS404		QVH STREAM PLUS606	
Range	Vision	12"x8"x8" 300 x 200 x 200mm	16"x16"x10" 400 x 400 x 250mm	24"x26"x10" 600 x 650 x 250mm		
	Non-contact displacement sensor	Type1	7"x8"x8" 180 x 200 x 200mm	11"x16"x10" 280 x 400x 250mm	19"x26"x10" 480 x 650 x 250mm	
		Type3	7"x8"x8" 176 x 200 x 200mm	11"x16"x10" 276 x 400 x 250mm	19"x26"x10" 476 x 650 x 250mm	
Accuracy**	E1XY	(1.5+3L/1000)µm				
	E1Z	(1.5+4L/1000)µm / (1.5+4L/1000)µm*				
	E2XY	(2.0+4L/1000)µm				

### SPECIFICATION: Hyper QV-based

Model No.	Hyper QVH302		Hyper QVH404		Hyper QVH606	
Range	Vision	12"x8"x8" 300 x 200 x 200mm	16"x16"x10" 400 x 400 x 250mm	24"x26"x10" 600 x 650 x 250mm		
	Non contact displacement sensor	Type1	7"x8"x8" 180 x 200 x 200mm	11"x16"x10" 280 x 400x 250mm	19"x26"x10" 480 x 650 x 250mm	
		Type3	7"x8"x8" 176 x 200 x 200mm	11"x16"x10" 276 x 400 x 250mm	19"x26"x10" 476 x 650 x 250mm	
Accuracy**	E1XY	(0.8+2L/1000)µm				
	E1Z	(1.5+2L/1000)µm / (1.5+2L/1000)µm*				
	E2XY	(1.4+3L/1000)µm				

### SPECIFICATION: QV ACCEL-based

Model No.	QVH ACCEL808		QVH ACCEL1010		QVH ACCEL1212		QVH ACCEL1517	
Range	Vision	32"x32"x6" 800 x 800 x 150mm	40"x40"x6" 1000 x 1000 x 150mm	50"x50"x4" 1250 x 1250 x 100mm	60"x70"x4" 1500 x 1750 x 100mm			
	Non contact displacement sensor	Type1	27"x32"x6" 680 x 800 x 150mm	35"x40"x6" 880 x 1000 x 150mm	45"x50"x4" 1130 x 1250 x 100mm		55"x70"x4" 1380 x 1750 x 100mm	
Accuracy**		E1XY	(1.5+3L/1000)µm				(2.2+3L/1000)µm	
	E1Z	(1.5+4L/1000)µm / (1.5+4L/1000)µm*				(2.5+5L/1000)µm / (2.5+5L/1000)µm*		
	E2XY	(2.5+4L/1000)µm				(3.5+4L/1000)µm		

\* Using Non-contact displacement sensor

\*\*The measuring accuracy is defined at the following conditions

Programmable power turret: 1X, Objective lens: 2.5X (HR or SL), L = Dimension between two arbitrary points (mm)

# Quick Vision WLI

**SERIES 363 — CNC Video Measuring System with White Light Interferometry**

## FEATURES

Both non-contact measurement & minute 3D evaluation in single machine. High precision hybrid measurement system with built in WLI (White Light Interferometer) head.

Large format style, evaluation series with built in vibration isolation stand.



QV Hyper Apex404

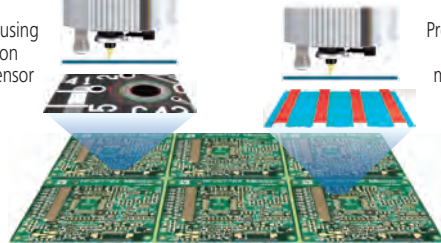


QV objective

WLI objective

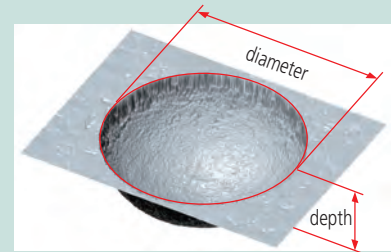
Projected image using the Quick Vision measurement sensor

Projected image using the WLI measurement sensor

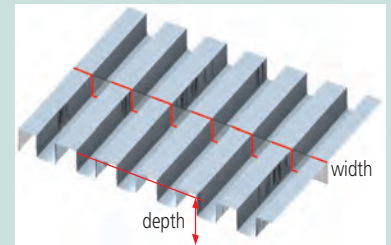


QV WLI 10x objective

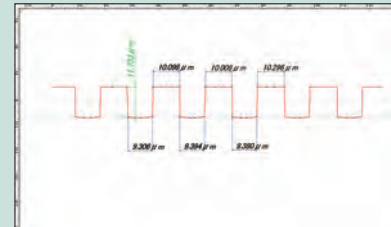
QV WLI 25x objective



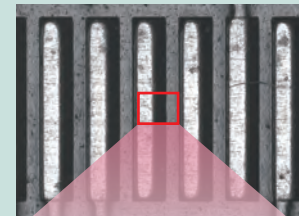
Application view of nano hole



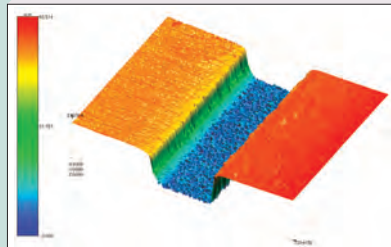
Application view of surface trace



QV - FORMPAK 2D analysis



Region of interest evaluation



3-dimensional topographical result, data of micro-circuit

## SPECIFICATIONS

Model		Quick Vision WLI 404	Quick Vision WLI 606
Stroke	Vision Head	16 x 16 x 9.5" 400x400x240mm	24 x 26 x 9.5" 600x650x240mm
XxYxZ	WLI Head	12 x 16 x 9.5" 315x400x240mm	20 x 26 x 9.5" 515x650x240mm
<b>WLI Head</b>			
Tube Lens		2x	
Field of View (HxV)		10xLen: Approx .013 x .1" / 0.32x0.24mm 25xLen: Approx .005 x .004" / 0.128x0.096mm	
Repeatability		2≤0.2μm	
Z-axis measuring range		200um	
<b>Vision Head</b>			
Magnification change mechanism		PPT 1x-2x-6x	
CCD Camera		B&W	
Illumination Unit	Surface	Color LED	
	Contour	White LED	
	PRL	Color LED	
Measurement	E1 XY axis	(0.8+2L/1000)μm	
Accuracy	E1 Z axis	(1.5+2L/1000)μm	
	E2 XY plane	(1.4+3L/1000)μm	
<b>Main Unit</b>			
Minimum Reading		0.01um	
Maximum Stage Loading		55lbs / 25kg	77lbs / 35kg
Guiding method		Linear motion bearing	
Main Unit Dimension WxDxH		40 x 55 x 70"	52 x 78 x 71"
		1027x1407x1775mm	1309x1985x1797mm

# ULTRA QV

## SERIES 363 — Ultra-high Accuracy CNC Vision Measuring System

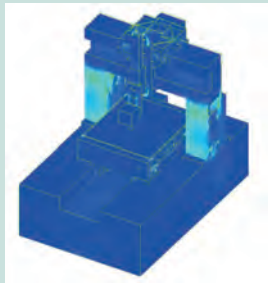


Ultra-high accuracy crystallized glass scale with virtually zero thermal expansion

The Ultra Quick Vision is equipped with a crystallized glass scale having a resolution of 0.01 $\mu$ m and linear expansion coefficient of 0.08x10<sup>-6</sup>/K. This virtually zero thermal expansion means the Ultra Quick Vision can minimize accuracy fluctuation resulting from thermal changes.



Ultra-precision manufacture eleven meters underground



By using FEM (Finite-Element Method) analysis of the base design, the placement of stiffening ribs and beams has been determined for the Ultra Quick Vision to provide optimal structural rigidity.

### FEATURES

- Minimizes straightness errors through the use of a precision air-bearing linear guide system.
- Utilizes a 0.01 $\mu$ m resolution glass scale manufactured at an ultra-precision facility located eleven meters underground.
- Minimizes accuracy fluctuation against thermal change through the use of virtually zero thermal expansion glass scales.
- Optimizes the mechanical structure of the main unit in Finite Element Method analysis.
- Stabilizes the geometrical accuracy (i.e. straightness of each axis and perpendicularity) to lessen thermal effects.



### SPECIFICATIONS

Model No.		ULTRA QV404 PRO
Range	X-axis	16" / 400mm
	Y-axis	16" / 400mm
	Z-axis	8" / 200mm
Resolution		0.01 $\mu$ m
High-sensitivity CCD camera		B&W
Accuracy* (20°C $\pm$ 0.2°C)	E1XY	(0.25+L/1000) $\mu$ m
	E1Z	(1.5+2L/1000) $\mu$ m [(1+2L/1000) $\mu$ m: 10 - 60mm]
	E2XY	(0.5+2L/1000) $\mu$ m
Max. drive speed (X/Y/Z-axis)		150mm/sec
Illumination (PRL: Programmable Ring Light)	Surface	Halogen
	Contour	Halogen
	PRL	Halogen
Magnification change system		Programmable power turret (1X, 2X, 6X)
Stage glass size		19.4 x 21.7" / 493 x 551mm
Max. stage loading		88lbs / 40kg
Dimensions (W x D x H)**		47.2 x 68.3 x 75.2" / 1200 x 1735 x 1910mm
Mass**		4464lbs / 2025kg

\* The measuring accuracy is defined at the following conditions  
Programmable power turret: 1X, Objective lens: 5X  
L = Dimension between two arbitrary points (mm)

\*\*Including machine stand

# QV ACCEL

## SERIES 363 — CNC Vision Measuring System

### FEATURES

#### Moving-bridge type structure

Designed with primary focus on measurement efficiency, the machine adopts a more rigid construction and drives the X and Y axes at 400mm/s (QV ACCEL808, ACCEL1010), which is approximately 30% faster than that of standard QV Apex

models. The moving-bridge type structure also eliminates the need for a moving stage. This facilitates a more simplified design of the workpiece fixture, resulting in a significant reduction in the man-hours required for fixture fabrication and inspection.



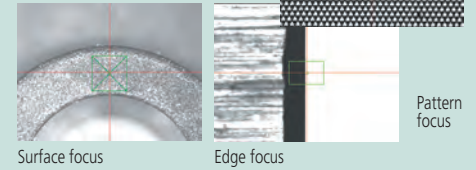
### SPECIFICATIONS

Model No.	QV ACCEL808PRO QV ACCEL808PRO3	QV ACCEL1010PRO QV ACCEL1010PRO3	QV ACCEL1212PRO QV ACCEL1212PRO3	QV ACCEL1517PRO QV ACCEL1517PRO3	
Range	X-axis	32" / 800mm	40" / 1000mm	50" / 1250mm	60" / 1500mm
	Y-axis	32" / 800mm	40" / 1000mm	50" / 1250mm	70" / 1750mm
	Z-axis	6" / 150mm	6" / 150mm	4" / 100mm	4" / 100mm
Resolution	0.1µm				
High-sensitivity CCD camera	B&W (PRO3 model: color)				
Accuracy*	E1xy	(1.5+3L/1000)µm		(2.2+3L/1000)µm	
	E1z	(1.5+4L/1000)µm		(2.5+5L/1000)µm	
	E2xy	(2.5+4L/1000)µm		(3.5+4L/1000)µm	
Max. drive speed	X/Y-axis	400mm/s		300mm/s	
	Z-axis	150mm/s		150mm/s	
Illumination (PRL: Programmable Ring Light)	Surface	LED, RGB (PRO3 models: Halogen)			
	Contour	LED, white (PRO3 models: Halogen)			
	PRL	LED, RGB (PRO3 models: Halogen)			
Magnification change system	Programmable power turret (1X, 2x, 6x)				
Stage glass size	34.8" x 37.7"	46.7" x 46.7"	56.7" x 56.7"	67.5" x 77.5"	
	883 x 958mm	1186 x 1186mm	1440 x 1440mm	1714 x 1968mm	
Dimensions (W x D x H)	58 x 67.5 x 62"	75.3 x 82 x 63"	85.3 x 92 x 61"	96 x 113 x 61"	
	1475x1716x1578mm	1912x2086x1603mm	2166x2340 x1554mm	2440 x 2868 x 1554mm	
Max stage loading	22lbs / 10kg	66.1lbs / 30kg	66.1lbs / 30kg	66.1lbs / 30kg	
Mass	5666lbs / 2570kg	6504lbs / 2950kg	7937lbs / 3600kg	9921lbs / 4500kg	

\* The measuring accuracy is defined at the following conditions, Programmable power turret: 1X, Objective lens: 2.5X (HR or SL), L = Dimension between two arbitrary points (mm)

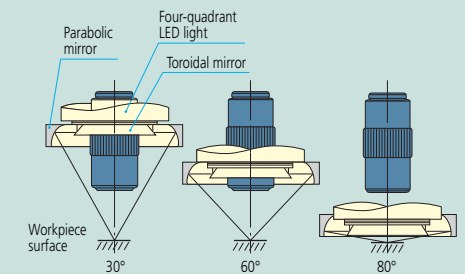
### Image Multi-AutoFocus

The optimal focus can be selected for each surface texture and measured feature, realizing high reproducibility and reliable edge detection.



### Programmable Ring Light (PRL)

Fine control of obliquity and direction provides illumination optimal for measurement. Obliquity can be arbitrarily set in the range from 30° to 80°. This type of illumination is effective for enhancing the edge of inclined surfaces or very small steps. Illumination can be controlled independently in every direction, back and forth, right and left. Measurement with edge enhancement is possible by forming a shadow by lighting from only one direction.



### RGB Color LED Illumination

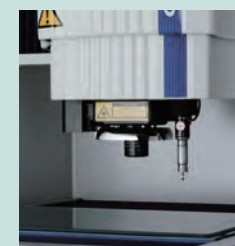
Changing the illumination color to red, green, blue, or white (synthesized) allows detection of edges which could not be measured with conventional white light.



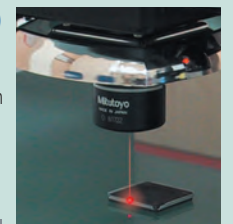
### Laser Auto Focus (LAF) Function\*

Mitutoyo offers models featuring the LAF system which enables high-speed focusing.

\*Also available to PRO 3 model. (Factory option)



(Factory installed option)



### Touch System

The QV Touch system is available on the QV Accel models as a factory option. All systems include probe, calibration articles and installed software.

# Accessories for Quick Vision

## Objective †

Objective	Order No.	Working distance
QV-SL0.5X	<b>02AKT199</b>	30.5mm
QV-HR1X	<b>02AKT250</b>	40.6mm
QV-SL1X	<b>02ALA150</b>	52.5mm
QV-HR2.5X	<b>02AKT300</b>	40.6mm
QV-SL2.5X	<b>02ALA170</b>	60mm
QV-5X	<b>02ALA420</b>	33.5mm
QV-10XHR	<b>02AKT650</b>	20mm
QV-25X	<b>02ALG020</b>	13mm

The monitor magnification and field of view values are for the PRO machine.  
 QV-10X, QV-25X: Depending on a workpiece of illumination may be insufficient at a turret lens magnification of 2X and 6X.  
 QV-25X: The PRL illumination is restricted in its usable position.



## Calibration glass chart

### No. 02AKN020 †

A calibration chart is used to compensate for the pixel size of the CCD chip, autofocus accuracy and the optical axis offset at each magnification of the variable magnification unit (PPT).



## Compensation chart

### No. 02AKU400\*

A compensation chart is used to decrease optical distortion and errors caused by difference of the pattern & texture on the workpiece surface.

## Laser Auto Focus\* (Factory-installed option)

The system can be equipped with a Laser Auto Focus unit that allows a stable, high-speed height measurement during high-speed travel. This unit provides stable measurement results with minimum dependence on surface inclination since the double pinhole method is adopted in the detection system.

Objective	QV2.5X HR
Measurement principle	Double pinhole method
Laser spot diameter	3µm
Repeatability	$\sigma = 0.4\mu\text{m}$

Objective mag.	Turret lens mag.	Monitor mag.	View Field
0.5X	1X	16X	12.54 x 9.40
	2X	32X	6.27 x 4.70
	6X	96X	2.09 x 1.56
1X	1X	32X	6.27 x 4.70
	2X	64X	3.13 x 2.35
	6X	192X	1.04 x 0.78
2.5X	1X	80X	2.50 x 1.88
	2X	160X	1.25 x 0.94
	6X	480X	0.41 x 0.31
5X	1X	160X	1.25 x 0.94
	2X	320X	0.62 x 0.47
	6X	960X	0.20 x 0.15
10X	1X	320X	0.62 x 0.47
	2X	640X	0.31 x 0.23
	6X	1920X	0.10 x 0.07
25X	1X	800X	0.25 x 0.18
	2X	1600X	0.12 x 0.09
	6X	4800X	0.04 x 0.03

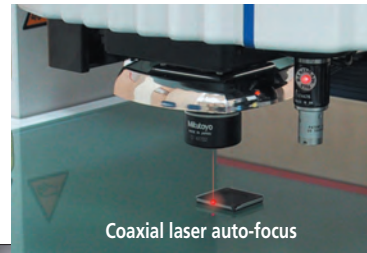


## QV-Index Head\*

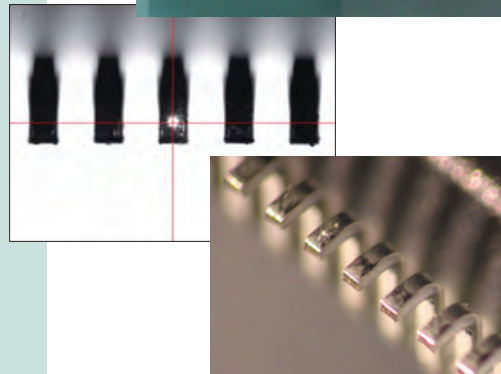
Automatic multi-plane measurement is possible with the optional index table.



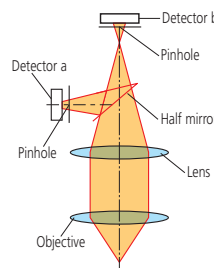
Max. workpiece diameter	5.51" / 140mm
Max. workpiece mass	4.41 lbs / 2kg
Min. rotation angle	0.1°
Positioning accuracy	±0.5°
Max. rotation speed	10rpm



Coaxial laser auto-focus



Example: Height of leads from a QFP package



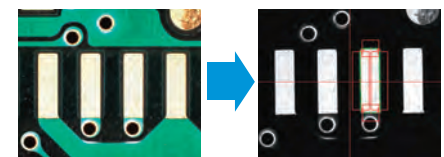
## Safety Precautions against Laser Beam

This system uses a low-power visible laser beam which corresponds to a CLASS 1 (visible light) of IEC 60825 for measurement. The CLASS 1 laser warning label as shown right is attached to the main unit.

CLASS 1 LASER PRODUCT

## RGB color filtering unit\* (PRO 3 only)

The color filtering function can be added to the vertical reflected illumination or programmable ring light in Quick Vision models that use a halogen light source. This function enhances the visibility of low-reflection surfaces on colored workpieces, facilitating edge detection. This function can also be retrofitted to a conventional Quick Vision. In addition, a yellow filter enables vision measurement in the yellow light region, which provides high sensitivity.



Red filter used



\* Accessories for Quick Vision Series only

† Accessories for Quick Vision and Quick Scope Series

# Quick Scope

## SERIES 359 — CNC / Manual Vision Measuring System



### SPECIFICATIONS

Model No.	<b>Q5250Z</b>	
Range	X-axis	8" / 200mm
	Y-axis	10" / 250mm
	Z-axis	4" / 100mm
Resolution	0.5µm	
Scale type	Linear encoder	
Measuring accuracy (at 20°C)*	XY: (2.5+6L/1000)µm, Z: (5+6L/1000)µm	
Magnification	Objective	0.5X - 3.5X zoom
	On monitor	21X - 147X
Image detecting unit	Color CCD camera	
Illumination	Surface: co-axial light, fiber-optic ring light Contour: stage light	
Stage glass size	10.6 x 12.2" / 269 x 311mm	
Max. workpiece height	4.3" / 110mm	
Max. stage loading	22lbs / 10kg	
Dimensions (W x D x H), Mass	18.3 x 32 x 26" / 465 x 815 x 663mm, 167lbs / 76kg	

\*When using 2.5X objective or the zoom lens in 2.5X magnification (Magnification on monitor: 105X), L = Measuring length (mm)



### SPECIFICATIONS

Model No.	QS-L2010ZB	QS-L3017ZB	QS-L4020ZB
Range (X-axis / Y-axis / Z-axis)	8" x 4" x 6" / 200 x 100 x 150mm	12" x 6.7" x 6" / 300 x 170 x 150mm	15.7" x 8" x 6" / 400 x 200 x 150mm
Resolution	0.1µm		
Scale type	Linear encoder		
Measuring accuracy (at 20°C and 3.0x magnification)*	"XY: (2.5+20L/1000)µm Z: (5+40L/1000)µm"		
Image detecting unit	1/2" 3 MP Color CMOS camera		
Illumination (Halogen)	Surface: co-axial light, fiber-optic ring light Contour, stage light		
Stage glass size	250 x 150 mm	370 x 240 mm	440 x 240 mm
Max. workpiece height	6" / 150mm		
Max. stage loading	22 lbs / 10 kg	44 lbs / 20 kg	33 lbs / 15 kg
Dimensions (W x D x H)	25" x 30" x 28" / 624 x 769 x 722 mm	27" x 33" x 36" / 682 x 837 x 916 mm	30" x 33" x 37" / 757 x 837 x 930 mm
Mass (Main Unit)	158.7 lbs / 72 kg	308.6 lbs / 140 kg	321.9 lbs / 146 kg

### Zoom Lens Magnifications

QSL Magnification	Zoom Mag.	0.75x	0.98x	1.28x	1.5x	2.25x	3x	3.75x	5.25x
	On monitor	30x	39x	51	60x	89	119	149	208x
	FOV (mm)	8.8 x 6.6	6.8 x 5.1	5.2x3.9	4.4x3.3	2.9x2.2	2.2x1.6	1.7x1.3	1.2x0.9
QS 250 Magnification	Zoom Mag.	.5x	.05x	.85x	1.0x	1.5x	2.0x	2.5x	3.5x
	On monitor	20x	25x	34x	39x	59x	78x	98x	137x
	FOV (mm)	8.8 x 6.6	6.8 x 5.1	5.2x3.9	4.4x3.3	2.9x2.2	2.2x1.6	1.7x1.3	1.2x0.9

### FEATURES: CNC model

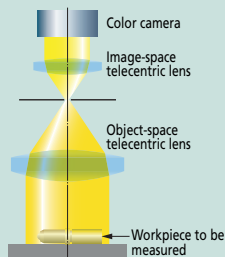
- Surface, contour and fiber-optic ring light illumination options enables users to configure the QS lighting to meet a variety of measurement needs.
- Powerful, Windows® based QSPAK software is easy to use and offers a wide spectrum of measuring and analysis capabilities.
- Functions include zoom, auto-focus, measurement playback, one-click edge detection, graphic display, 48 different macros and a pattern matching function for several common part features.
- The stage can be controlled by mouse or through the optional multi-function control box.

### FEATURES: Manual model

- Excellent surface observation model for a wide variety of workpieces.
- 0.1µm resolution and 150mm Z-axis range.
- Power zoom enables easy and fast magnification change.
- Fine illumination capability enables lighting changes to match workpiece requirements.
- The quick release system on the stage enables instant switching between coarse movement and fine movement.
- Quick Navigation function enables the user to repeat measurements quickly.

## Double-telecentric optics enable highly efficient measurement with a wide field of view

Batch measurement with a wide view field 1.259" x 0.945" (32 x 24mm) realized using a 0.2X magnification model can substantially improve measurement efficiency. With a 0.5X magnification model, dimensions of very small workpieces and stepped workpieces can be easily measured.



Actual image acquired with a 0.2X magnification model



Actual image acquired with a 0.5X magnification model



# Quick Image

## SERIES 361 — Non-contact 2-D Vision Measuring System

Quick Image is a new concept in 2-D vision measuring instruments. It provides unique features for improving measurement efficiency.

### FEATURES

- Long focal depth and wide field of view
- Telecentric optical system
- Mega-pixel color CCD camera
- Large quadrant LED ring light



QI-A2010B



QI-B4020B



## SPECIFICATIONS

Model		QI-A1010B	QI-B1010B	QI-A2010B	QI-B2010B	QI-A2017B	QI-B2017B	QI-A3017B	QI-B3017B	QI-A4020B	QI-B4020B
Range	X, Y-axis	4 x 4" / 100 x 100mm		8 x 4" / 200 x 100mm		8 x 7" / 200 x 170mm		12 x 7" / 300 x 170mm		16 x 8" / 400 x 200mm	
	Z-axis	4" / 100mm		4" / 100mm		4" / 100mm		4" / 100mm		4" / 100mm	
Measuring mode		High-resolution mode and Normal mode									
Accuracy	Within the screen	QI-A models: ±5μm (high-resolution mode), ±8μm (normal mode) [QI-B models: ±2.7μm (high-resolution mode), ±4μm (normal mode)]									
	$U_{1XY}$	±(5+0.08L)μm L = measuring length (mm)									
Repeatability within the screen (±2σ)		QI-A models: ±1μm (high-resolution mode), ±2μm (normal mode) [QI-B models: ±0.7μm (high-resolution mode), ±1μm (normal mode)]									
CCD camera		Megapixels color CCD camera									
Optical system	Magnification*	0.2X	0.5X	0.2X	0.5X	0.2X	0.5X	0.2X	0.5X	0.2X	0.5X
	Working distance	90mm									
	Depth of focus	High-resolution mode: ±0.6mm, Normal mode: ±11mm (±1.8mm) ( ): QI-B models									
Illumination	Contour	✓		✓		✓		✓		✓	
	Surface	✓		✓		✓		✓		✓	
	4-quadrant LED	✓		✓		✓		✓		✓	
Stage glass size		170 x 170mm		242 x 140mm		260 x 230mm		360 x 230mm		440 x 232mm	
Max. stage loading		10kg		10kg		20kg		20kg		15kg	
Mass		70kg		74kg		140kg		148kg		154kg	

\*Double telecentric system

# Quick Guide to Precision Measuring Instruments



## Vision Measuring Machines

### ■ Vision Measurement

Vision measuring machines mainly provide the following processing capabilities.

#### ■ Edge detection

Detecting/measuring edges in the XY plane



#### ■ Auto focusing

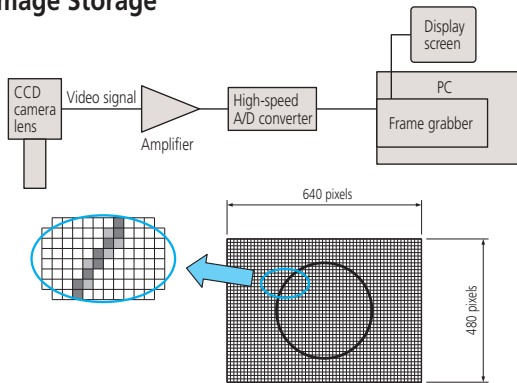
Focusing and Z measurement



#### ■ Pattern recognition

Alignment, positioning, and checking the presence of a feature

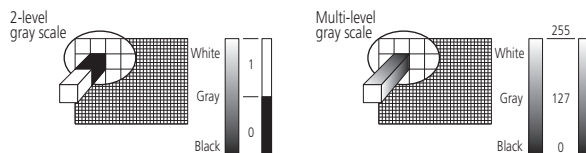
### ■ Image Storage



An image is comprised of a regular array of pixels, similar to the process that produces a printed image picture on fine plotting paper with each square solid-filled.

### ■ Gray Scale

A PC stores an image after internally converting it to numeric values. A numeric value is assigned to each pixel of an image. Image quality varies depending on how many levels of gray scale are defined by the numeric values. The PC provides two types of gray scale: two-level and multi-level. The pixels in an image are usually displayed as the 256-level gray scale.



Pixels in an image brighter than a given level are displayed as white and all other pixels are displayed as black.

Each pixel is displayed as one of 256 levels between black and white. This allows high-fidelity images to be displayed.

### ■ Difference in Image Quality

Difference between 2-level and 256-level gray-scale images



Sample image displayed in 2-level gray scale

Sample image displayed in 256-level gray scale

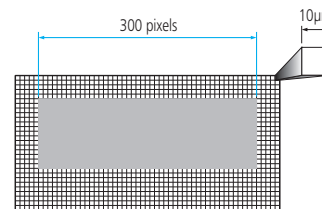
### ■ Variation in Image Depending on Threshold Level



These three pictures are the same image displayed as 2-level gray scale at different slice levels (threshold levels). In a 2-level gray-scale image, different images are provided as shown above due to a difference in slice level. Therefore, the 2-level gray scale is not used for high-precision vision measurement since numeric values will change depending on the threshold level that is set.

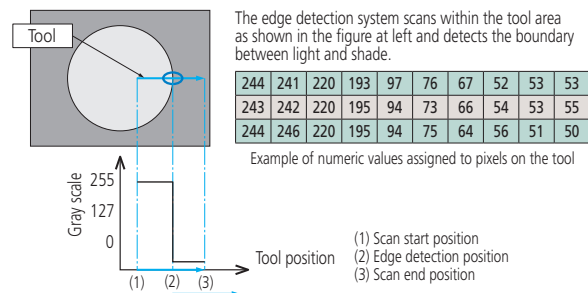
### ■ Dimensional Measurement

An image consists of pixels. If the number of pixels in a section to be measured is counted and is multiplied by the size of a pixel, then the section can be converted to a numeric value in length. For example, assume that the total number of pixels in the lateral size of a square workpiece is 300 pixels as shown in the figure below. If a pixel size is 10µm under a specific imaging magnification, the total length of the workpiece is given by 10µm x 300 pixels = 3000µm = 3mm.



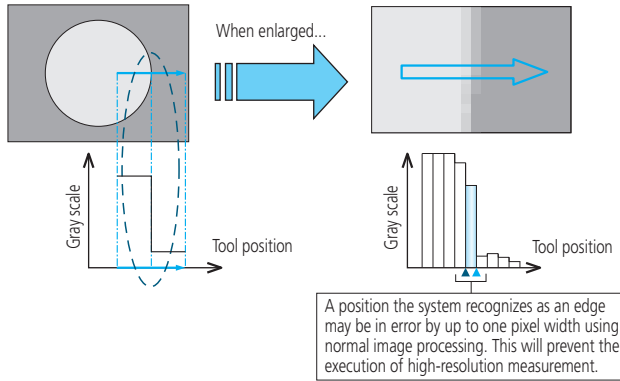
### ■ Edge Detection

How to actually detect a workpiece edge in an image is described using the following monochrome picture as an example. Edge detection is performed within a given domain. A symbol which visually defines this domain is referred to as a tool. Multiple tools are provided to suit various workpiece geometries or measurement data.





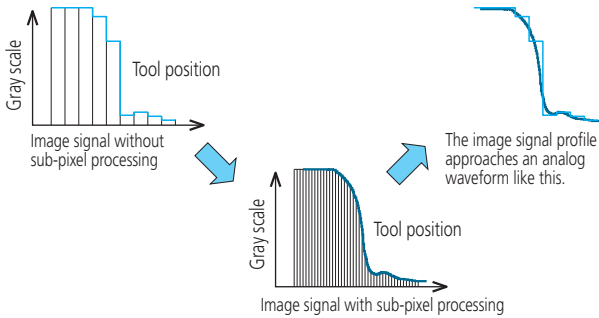
## High-resolution Measurement



To increase the accuracy in edge detection, sub-pixel image processing is used.

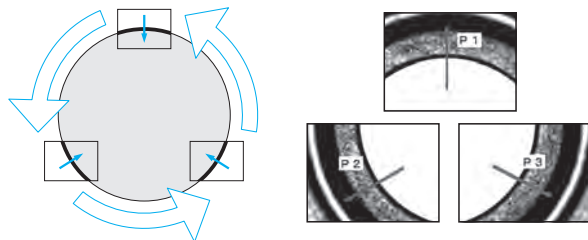
An edge is detected by determining an interpolation curve from adjacent pixel data as shown below.

As a result, it allows measurement with a resolution higher than 1 pixel.



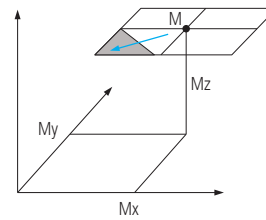
## Measurement along Multiple Portions of an Image

Large features that cannot be contained on one screen have to be measured by precisely controlling the position of the CCD sensor and stage so as to locate each reference point within individual images. By this means the system can measure even a large circle, as shown below, by detecting the edge while moving the stage across various parts of the periphery.

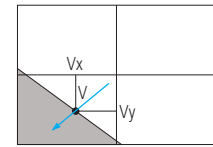


## Composite Coordinates of a Point

Machine coordinate system



Vision coordinate system



Measuring machine stage position

$$M = (M_x, M_y, M_z)$$

Detected edge position (from the center of vision)

$$V = (V_x, V_y)$$

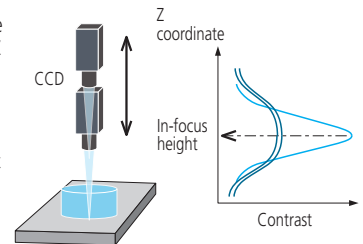
Actual coordinates are given by  $X = (M_x + V_x)$ ,  $Y = (M_y + V_y)$ , and  $Z = M_z$ , respectively.

Since measurement is performed while individual measured positions are stored, the system can measure dimensions that cannot be included in one screen.

## Principle of Auto Focusing

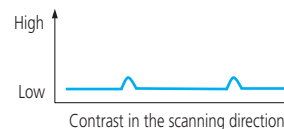
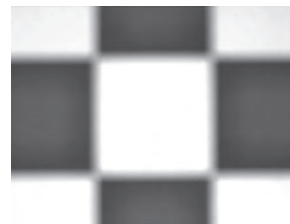
The system can perform XY-plane measurement, but cannot perform height measurement using only the CCD camera image. The system is commonly provided with the Auto Focus (AF) mechanism for height measurement. The following explains the AF mechanism that uses a common image, although some systems may use an AF laser.

The AF system analyzes an image while moving the CCD up and down in the Z axis. In the analysis of image contrast, an image in sharp focus will show a peak contrast and one out of focus will show a low contrast. Therefore, the height at which the image contrast peaks is the just-in-focus height.

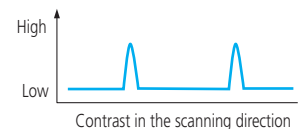


## Variation in Contrast Depending on the Focus Condition

Edge contrast is low due to out-of-focus edges.



Edge contrast is high due to sharp, in-focus edges.



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