

# Screw Driven automation tables

Precise multi-axis positioning systems play an integral part in today's semiconductor, computer peripheral, solar power, flat panel, life sciences, lab automation, biomedical and electronics industries. The demands for tighter specifications, improved throughput and consistent quality have become increasingly stringent. Because of the complexity associated with these systems, many manufacturers insist on a single source supplier to eliminate multiple vendor design incompatibilities and delivery conflicts. With over forty years' experience as a global leader in the development of products and technology, Parker provides the most advanced, easy to integrate high-precision electromechanical systems.

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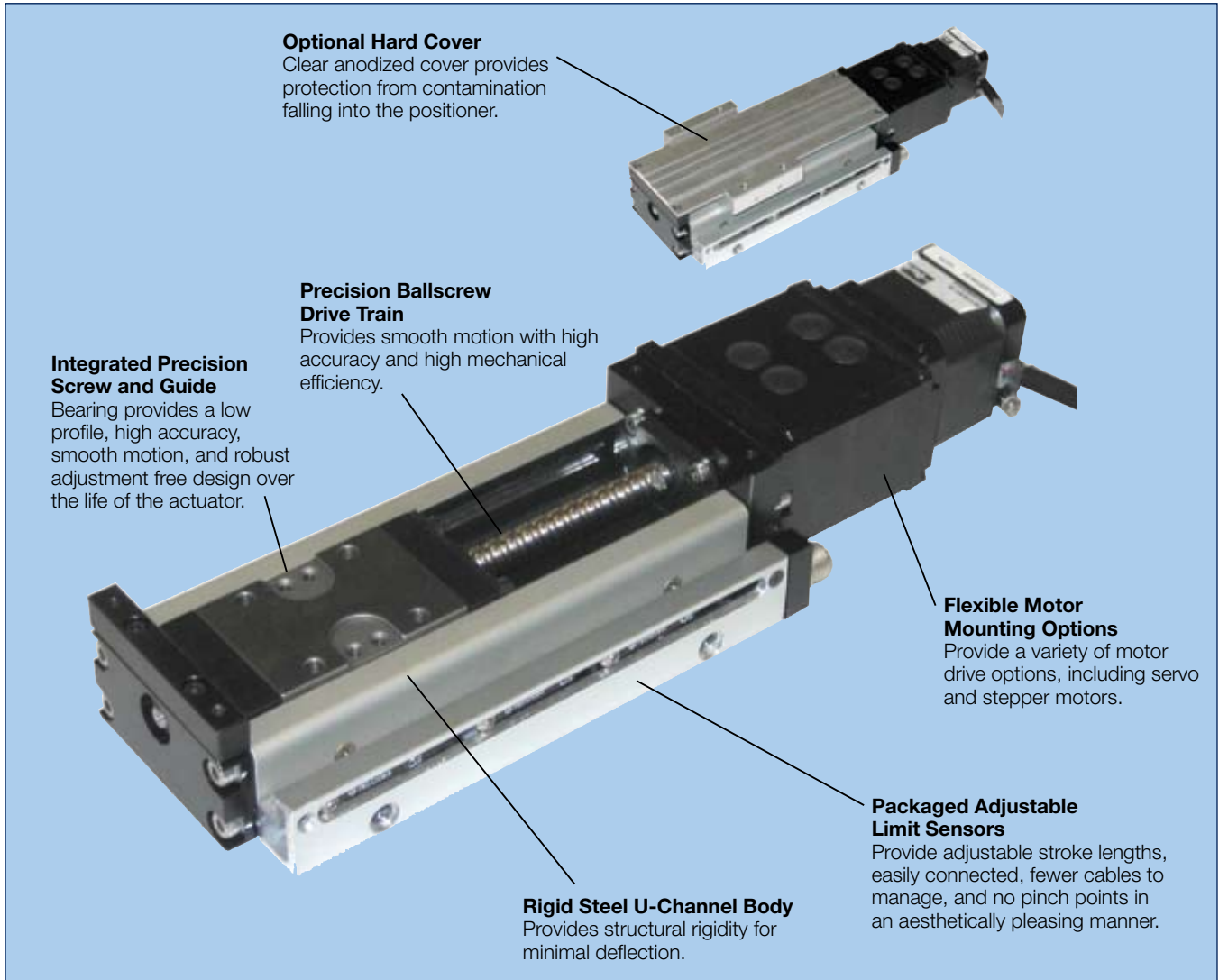
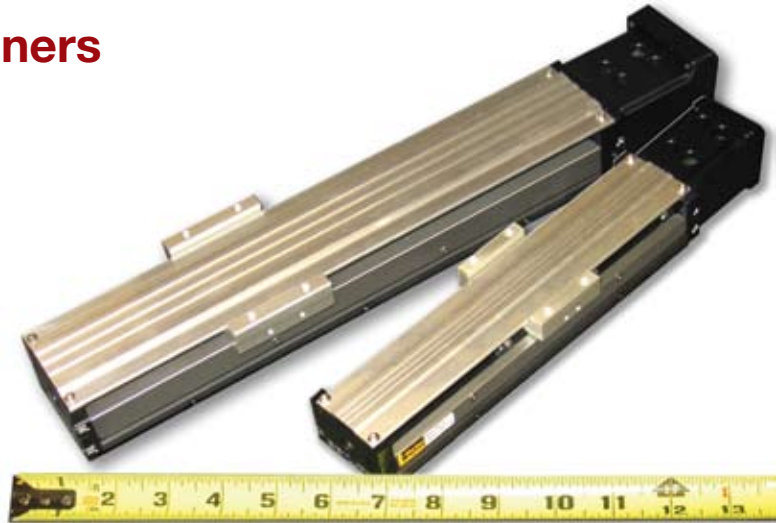
## 402/403XE Series Positioners

### Features

- Integrated bearing
- Rigid steel body
- Significant force per dollar value
- Easily integrated into multi-axis designs
- Adjustment free
- Small package size

### Reliable, Cost-Effective Positioning

The 402/403XE series of positioners combines a rugged steel body construction with an integrated precision ballscrew and bearing guide to produce a highly accurate, cost-effective line of positioners ideal for applications in the hard disk, semiconductor, medical, machine building and many other industries.





### Common Performance Specifications

Specifications	Units	402XE		403XE	
		2 mm Lead	5 mm Lead	5 mm Lead	10 mm Lead
Repeatability	µm	± 5		± 5	
Flatness	µm	15		see below	
Straightness	µm	15		see below	
Breakaway Torque	Nm	0.06		0.15	
Maximum Input Speed	RPS	90		see below	
Maximum Normal Load	kg	90		160	
Maximum Inverted Load	kg	90		160	
Static Permissible Pitch Moment	Nm	46		101	
Static Permissible Roll Moment	Nm	134		260	
Static Permissible Yaw Moment	Nm	51		120	
Torsional Pitch Stiffness	Arc-second/Nm	17.7		9.2	
Torsional Yaw Stiffness	Arc-second/Nm	11.8		6.1	
Torsional Roll Stiffness	Arc-second/Nm	5.9		5.9	
Drive Screw Diameter	mm	8		10	
Drive Screw Efficiency	%	90		90	
Linear Bearing Coefficient of Friction		0.01		0.01	
Running Torque	Nm	0.05		0.10	
Maximum Axial Load	Kg	13	17	31	27
Moment of Inertia X of Guide Rail	mm <sup>4</sup>	1.44 E+04		3.88 E+04	
Moment of Inertia Y of Guide Rail	mm <sup>4</sup>	1.37 E+05		3.14 E+05	
Weight of Carriage	kg	0.26		0.3	
Maximum Acceleration	g's	2		2	
Allowable Duty Cycle	%	100		100	

### 402XE Specifications

Specifications	Units	T01 (70 mm)	T02 (120 mm)	T03 (170 mm)	T04 (220 mm)
<b>402XE with 2 mm Lead</b>					
Accuracy over travel	µm	70	75	85	90
Input Inertia	x10 <sup>-6</sup> (Kg-m <sup>2</sup> )	0.615	0.772	0.929	1.09
Weight of Total Table	Kg	1.19	1.40	1.60	1.81
<b>402XE with 5 mm Lead</b>					
Accuracy over travel	µm	70	75	85	90
Input Inertia	x10 <sup>-6</sup> (Kg-m <sup>2</sup> )	0.741	0.898	1.06	1.21
Weight of Total Table	Kg	1.19	1.40	1.60	1.81

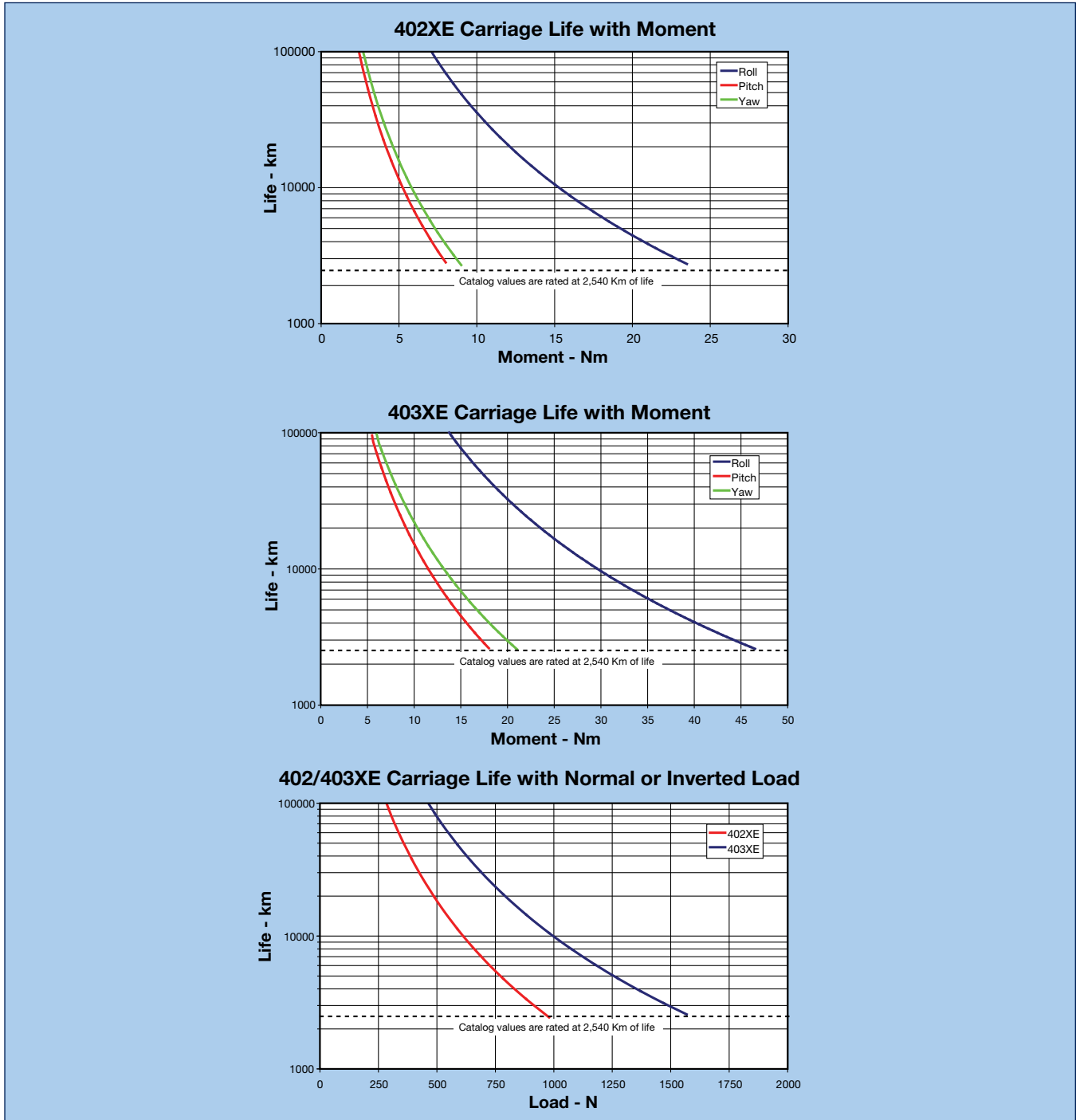
### 403XE Specifications

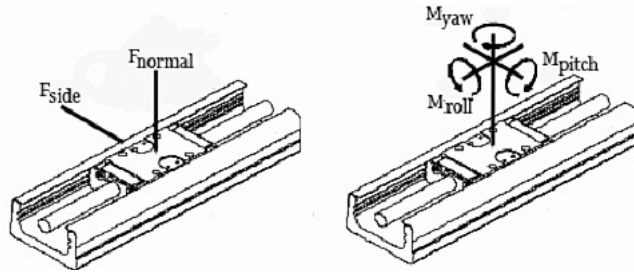
Specifications	Units	T01 (55 mm)	T02 (105 mm)	T03 (205 mm)	T04 (305 mm)	T05 (305 mm)	T06 (505 mm)	T07 (605 mm)	T08 (655 mm)
<b>403XE with 5 mm Lead</b>									
Travel Accuracy	µm	70	80	90	95	100	110	120	n/a
Flatness	µm	15	15	15	15	25	25	25	n/a
Straightness	µm	15	15	15	15	25	25	25	n/a
Maximum Input Speed	RPS	80	80	80	80	80	80	60	n/a
Input Inertia	x10 <sup>-6</sup> (Kg-m <sup>2</sup> )	1.72	2.10	2.87	3.63	4.40	5.17	5.93	n/a
Weight of Total Table	Kg	1.85	2.25	2.85	3.55	4.25	4.85	5.55	n/a
<b>403XE with 10 mm Lead</b>									
Accuracy over travel	µm	70	80	90	95	100	110	120	130
Maximum Input Speed	RPS	80	80	80	80	80	80	60	42
Input Inertia	x10 <sup>-6</sup> (Kg-m <sup>2</sup> )	2.50	2.88	3.65	4.42	5.18	5.95	6.7	7.10
Weight of Total Table	Kg	1.85	2.25	2.85	3.55	4.25	4.85	5.55	5.85

**402/403XE Load-Life Performance**

The following performance information is provided as a supplement to the product specification pages. The useful life of a linear table at full catalog specifications is dependent on the forces acting upon it. These forces include both static components resulting from payload weight, and dynamic components due to acceleration/deceleration of the load. In multi-axis applications, the primary positioner at the bottom of the stack usually

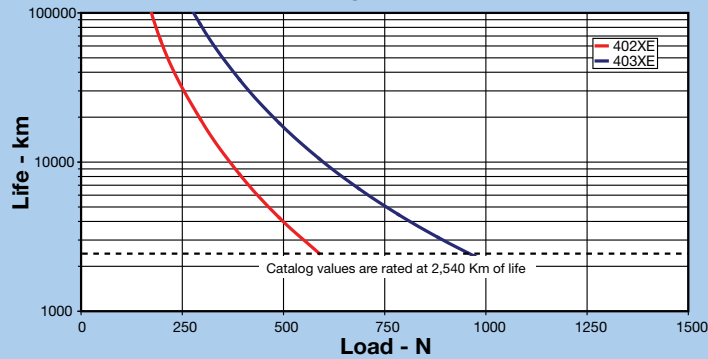
establishes the load limits for the combined axes. When evaluating life versus load, it is critical to include the weight of all positioning elements that contribute to the load supported by the primary axis. The following graphs are used to establish the table life relative to the applied loads. For more information, download the product manual at [www.parkermotion.com](http://www.parkermotion.com) or contact our applications department at (800) 245-6903.



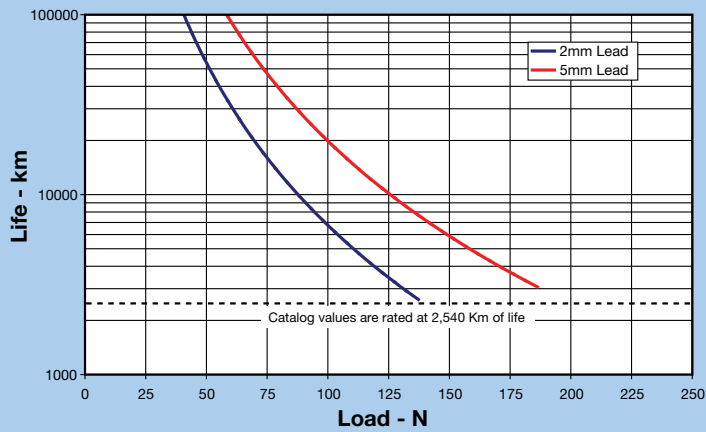


Screw Driven Tables

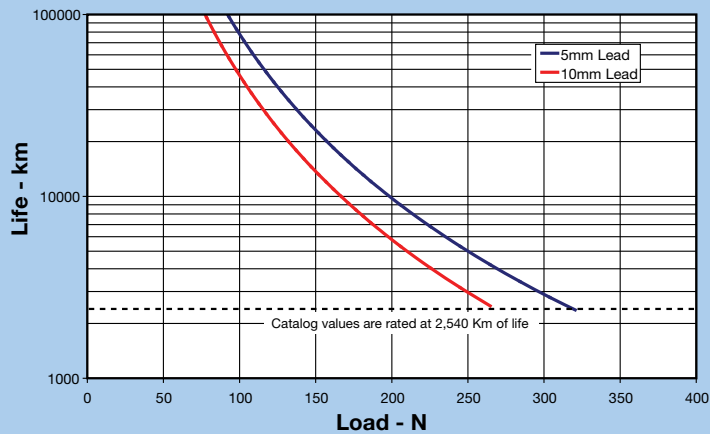
**402/403XE Carriage Life with Side Load**



**402XE Ballscrew Life with Axial Load**



**403XE Ballscrew Life with Axial Load**



The 402/403XE Series offers complete flexibility, from motor-mounting options to cleanroom compatibility and a variety of offerings in between. Whether the application calls for a hardcover protection for the linear guide, cleanroom-compatible solutions, custom motors mounted at the factory, or an aesthetically appealing engineered limit sensor package, the 402/403XE can be customized to fit the task at hand.

### Motor Mounting Flexibility



With standard options for the NEMA 17, NEMA 16, NEMA 23, and other Parker Automation motors, the 402/403XE allows the user to select the motor of their choice without being restricted to one model. To further customize the application solution, the 402/403XE can be ordered ready to mount onto most other manufacturers' motors as well.

### Low-Profile Design



The highly integrated ballscrew and guide bearing design allows for a greatly reduced overall height when compared to traditional stacking of a bearing and screw assembly. This results in a more compact footprint.

### Rigidity



With the steel U channel body and integrated bearing design, the structural rigidity of the 402/403XE is significantly stiffer than most aluminum body positioners. The increased stiffness results in reduced overall cost due to the elimination of support structures.

### Hardcover Protection



For added protection to the bearing system and drive train, an optional hardcover is available. This will bring the positioner to an IP20 rating and prevent large particles from entering and damaging the screw or bearings.

### Cleanroom & Raydent Coatings

Cleanroom ratings are possible with the XE product. The actual cleanroom rating will be dependent upon such variables as the location of the sniffer device, the velocity of the table, etc. Consult the factory for specific cleanroom-capability details or test results.



### Riser Plates

Most of the motors used with the 402/403XE and some of the 404XE motors have a taller profile than the positioner. Thus the motor can interfere with the positioner mounting surface. To accommodate riser plates can be provided to space the unit above the mounting surface. See XE product Manual for dimensional details and part numbers. Also available are X-Y transition plates for XE to XE and LP mounting.

### 402/403XE Demo Units



Order 803-0346 for a multi-axis demo unit to learn the product and display for shows and presentations. The demo will come in a watertight pelican carrying case and will be ready for demonstration programmed from the factory.





### Packaged Limit Sensors

Limit sensor flexibility allows for a completely packaged sensor kit with a connectorized cable and a single cable to manage multi-axis solutions. It also allows for a simpler sensor pack out of which the sensor wires exit in a flying-leads style with 3 meters of cable from the point of the sensor. To further accommodate each application's unique needs, the sensors can be specified as NPN, PNP, normally open, or normally closed varieties. With the unmatched design, the sensor pack on the 402/403XE allows for fully adjustable sensors along the travel length of the positioner, which creates no pinch points for other cables or hoses to be sliced.

The limit/home switch installed on the 402XE and 403XE is a Hall effect sensor tripped by a magnet located in a housing attached to the carriage. On the switch body is an LED to indicate activation. Normally open sensors are typically used for home and normally closed are typically used for limits. With a current sinking sensor, the output lead provides a path to ground when activated, and with a current sourcing sensor, the output lead provides a positive (+) voltage potential relative to ground. Refer to your controller's manual for compatibility. Limit/home switch information is below.

**Limit sensor mounting screws are reverse-thread style so tightening the screw loosens the limit sensor in the track and vice versa.**



Screw Driven Tables

#### 402/403XE Wiring Code

Power (+)	Brown
Output Signal	Black
Ground (-)	Blue

#### 402/403XE Sensor Pack Wiring Code

Power (+)	Red
Limit 1 <sup>(1)</sup> Output Signal	Blue
Limit 1 <sup>(1)</sup> Output Signal	Orange
Home Output Signal	Green
Ground (-)	Blue
Shield (Connect to Earth Ground)	Green w/ Yellow Stripe

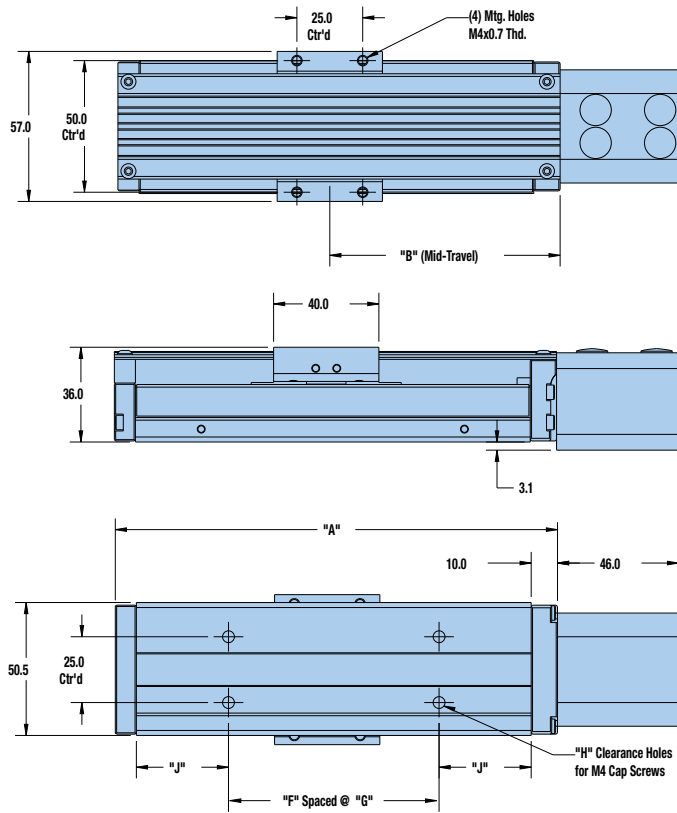
(1) Limit 1 is the switch farthest from the connector on the sensor pack housing; Limit 2 is the switch closest to the connector.

### 402/403XE Home/Limit Switch Specifications

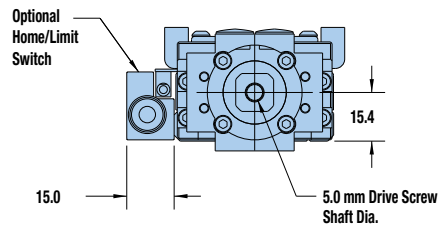
	Units	H2 or L2 Option	H3 or L3 Option	H4 or L4 Option	H5 or L5 Option	H11 or L11 Option	H12 or L12 Option	H13 or L13 Option	H14 or L14 Option
Switch Type		N.C.	N.O.	N.C.	N.O.	N.C.	N.O.	N.C.	N.O.
Logic		NPN	NPN	PNP	PNP	NPN	NPN	PNP	PNP
Operating Voltage	VDC					10-30			
Voltage Drop	VDC (Max)					2.5			
Continuous Current	mA					100			
Repeatability	μ (Max)					100			
Reverse Polarity Protection						Yes			
Short-Circuit Protection						Yes			
Power-Up Pulse Suppression						Yes			
Enclosure Rating						IP67			
Operating Temperature	°C					-25 to +75			
Cable Length	m		3.0 m from Switch				3.0 m from end of Sensor Pack		

402XE with Hardcover

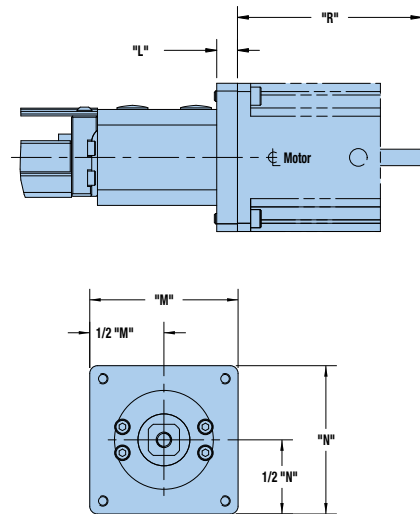
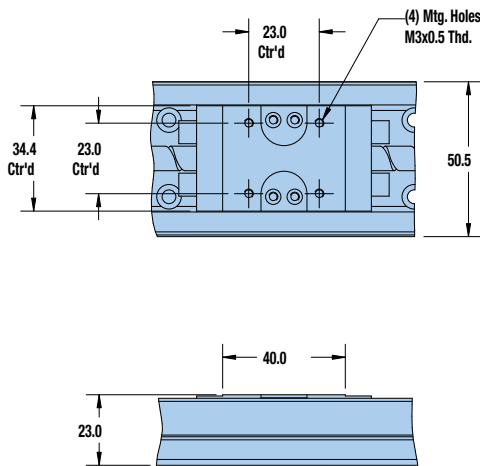
Dimensions (mm)



Order Code	Travel	"A"	"B"	"F"	"G"	"H"	"J"
T01	70 mm	168.0	87.5	1	80.0	4	35.0
T02	120 mm	218.0	112.5	2	160.0	6	20.0
T03	170 mm	268.0	137.5	2	160.0	6	45.0
T04	220 mm	318.0	162.5	3	240.0	8	30.0



402XE without Hardcover



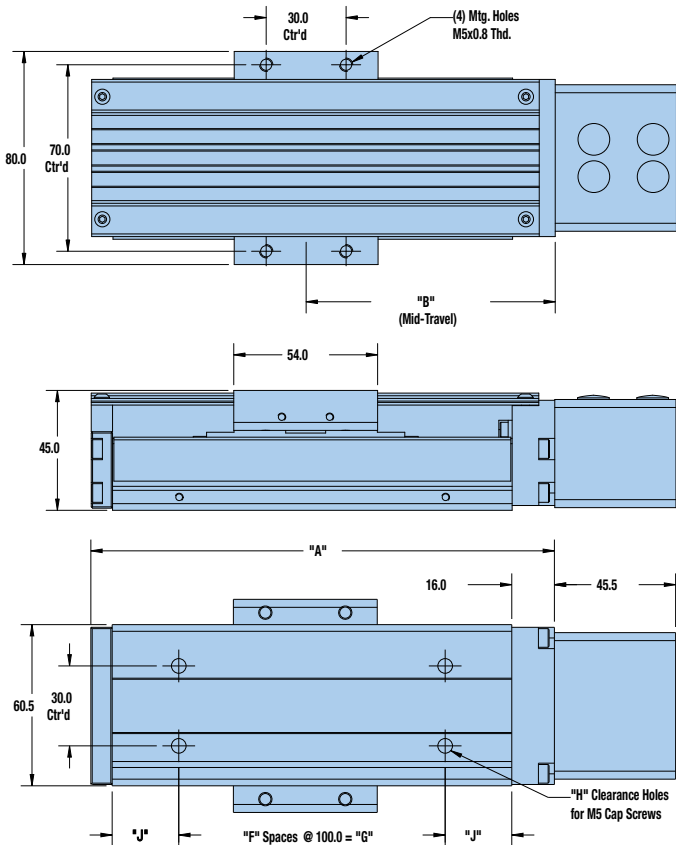
Motor Option	Motor or Motor Size	L	M	N	R
M2	SM16/BE16	8.0	40.6	40.6	-
M3	NEMA23/SM23	8.0	57.2	57.2	-
M37	NEMA17	8.0	43.0	37.0	-
M41	SM162AQ-NPSN	8.0	37.0	40.6	136.7
M46	HV232-02-10	8.0	57.2	57.2	71.1
M61	BE23	15.0	57.2	57.2	-



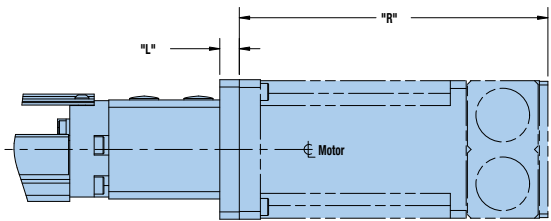
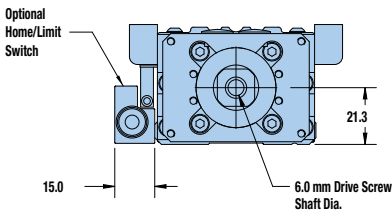


403XE with Hardcover

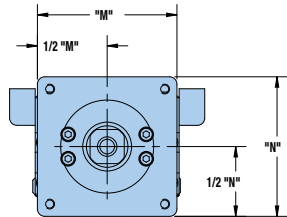
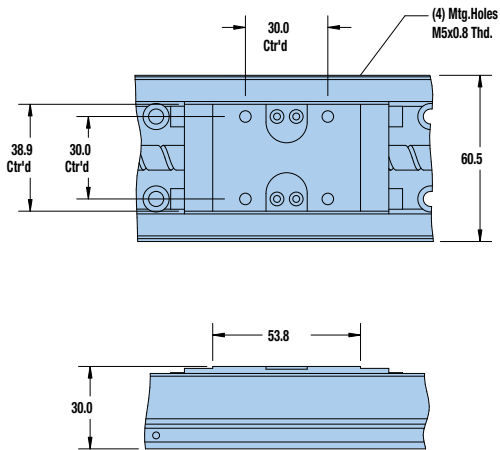
Dimensions (mm)



Order Code	Travel	"A"	"B"	"F"	"G"	"H"	"J"
T01	55 mm	174.0	93.5	1	100.0	4	25.0
T02	105 mm	224.0	118.5	1	100.0	4	50.0
T03	205 mm	324.0	168.5	2	200.0	6	50.0
T04	305 mm	424.0	218.5	3	300.0	8	50.0
T05	405 mm	524.0	268.5	4	400.0	10	50.0
T06	505 mm	624.0	318.5	5	500.0	12	50.0
T07	605 mm	724.0	368.5	6	600.0	14	50.0
T08	655 mm	774.0	383.5	7	700.0	16	25.0



403XE without Hardcover



Motor Option	Motor or Motor Size	L	M	N	R
M2	SM16/BE16	8.0	40.6	40.6	-
M3	NEMA23/SM23	8.0	57.2	57.2	-
M37	NEMA17	8.0	55.0	37.0	-
M41	SM162AQ-NPSN	8.0	40.6	40.6	136.7
M42	SM232AQ-NPSN	8.0	57.2	57.2	126.5
M46	HV232-02-10	8.0	57.2	57.2	71.1
M61	BE23	15.0	57.2	57.2	-

Screw Driven Tables



Fill in an order code from each of the numbered fields to create a complete model order code.

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪

**Order Example:** 402 T03 XE S D9 H4 L5 M2 C3 R11 P1

**① Series**

402 50 mm

**② Travel**

T01\* 70 mm  
T02 120 mm  
T03 170 mm  
T04 220 mm

\* Limited to H1L2, H1L3, H1L4, H1L5, H1L1, or H2L1, H3L1, H4L1, or H5L1 home and limit options

**③ Family**

XE XE Series

**④ Grade**

S Standard Grade

**⑤ Drive Screw**

D2 5 mm  
D9 2 mm

**⑥ Home Sensor**

H1 No home sensor  
H2 N.C. sinking, flying leads  
H3 N.O. sinking flying leads  
H4 N.C. sourcing, flying leads  
H5 N.O. sourcing, flying leads  
H11\* N.C. sinking, sensor pack  
H12\* N.O. sinking, sensor pack  
H13\* N.C. sourcing, sensor pack  
H14\* N.O. sourcing, sensor pack

\* Must be ordered with L11, L12, L13, or L14 limit option

**⑦ Limit Sensor**

L1 None  
L2 N.C. sinking, flying leads  
L3 N.O. sinking, flying leads  
L4 N.C. sourcing, flying leads  
L5 N.O. sourcing, flying leads  
L11 N.C. sinking, sensor pack  
L12 N.O. sinking, sensor pack  
L13 N.C. sourcing, sensor pack  
L14 N.O. sourcing, sensor pack

**⑧ Motor Mount**

M1 MTR block coupling housing only  
M2 MTR block with flange kit for SM16  
M3 MTR block with flange kit for NEMA 23  
M37 MTR block with flange kit for NEMA 17  
M41\* SM162AQ-NPSN motor mounted  
M46\*\* HV232-02-10 stepper motor mounted  
M61 MTR block with flange kit for BE23

\* Order with C2 or C3 coupling option

\*\* Order with C4 or C5 coupling option

**⑨ Motor Coupling**

C1 Not required  
C2 0.25" Oldham  
C3 0.25" Bellows  
C4 0.375" Oldham  
C5 0.375" Bellows  
C24 5 mm Oldham  
C25 5 mm Bellows

**⑩ Environmental Options**

R11 Hard cover  
R12\* Hard cover, cleanroom prep  
R13 No cover  
R14\* No cover, cleanroom prep

\* Cleanroom class rating should be checked for each application due to variation of compatibility at different speeds

**⑪ Orthogonality Options**

P1 X axis for single axis  
P20\* X axis for X-Y assembly motor @ 12:00  
P43\* Y axis for X-Y assembly motor @ 3:00  
P49\* Y axis for X-Y assembly motor @ 9:00

\* Pinning to 130 arc-sec orthogonality. Additional bracketing required. Contact factory for details.



Fill in an order code from each of the numbered fields to create a complete model order code.

- ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪

**Order Example:** 403 T04 XE S D2 H3 L2 M4 C3 R13 P1

**① Series**

403 60 mm

**② Travel**

T01\* 55 mm  
 T02\* 105 mm  
 T03 205 mm  
 T04 305 mm  
 T05 405 mm  
 T06 505 mm  
 T07 605 mm  
 T08\*\* 655 mm

\* Limited to H1L2, H1L3, H1L4, H1L5, H1L1, or H2L1, H3L1, H4L1, or H5L1 home and limit options  
 \*\* Only available with D3 drive option

**③ Family**

XE XE Series

**④ Grade**

S Standard Grade

**⑤ Drive Screw**

D2 5 mm  
 D3 10 mm

**⑥ Home Sensor**

H1 No home sensor  
 H2 N.C. sinking, flying leads  
 H3 N.O. sinking flying leads  
 H4 N.C. sourcing, flying leads  
 H5 N.O. sourcing, flying leads  
 H11\* N.C. sinking, sensor pack  
 H12\* N.O. sinking, sensor pack  
 H13\* N.C. sourcing, sensor pack  
 H14\* N.O. sourcing, sensor pack

\* Must be ordered with L11, L12, L13, or L14 limit option

**⑦ Limit Sensor**

L1 None  
 L2 N.C. sinking, flying leads  
 L3 N.O. sinking, flying leads  
 L4 N.C. sourcing, flying leads  
 L5 N.O. sourcing, flying leads  
 L11 N.C. sinking, sensor pack  
 L12 N.O. sinking, sensor pack  
 L13 N.C. sourcing, sensor pack  
 L14 N.O. sourcing, sensor pack

**⑧ Motor Mount**

M1 MTR block coupling housing only  
 M2 MTR block with flange kit for SM16  
 M3 MTR block with flange kit for NEMA 23  
 M37 MTR block with flange kit for NEMA 17  
 M41\* SM162AQ-NPSN motor mounted  
 M46\*\* HV232-02-10 stepper motor mounted  
 M61 MTR block with flange kit for BE23

\* Order with C2 or C3 coupling option  
 \*\* Order with C4 or C5 coupling option

**⑨ Motor Coupling**

C1 Not required  
 C2 0.25" Oldham  
 C3 0.25" Bellows  
 C4 0.375" Oldham  
 C5 0.375" Bellows  
 C24 5 mm Oldham  
 C25 5 mm Bellows

**⑩ Environmental Options**

R11 Hard cover  
 R12\* Hard cover, cleanroom prep  
 R13 No cover  
 R14\* No cover, cleanroom prep

\* Cleanroom class rating should be checked for each application due to variation of compatibility at different speeds

**⑪ Orthogonality Options**

P1 X axis for single axis  
 P20\* X axis for X-Y assembly motor @ 12:00  
 P43\* Y axis for X-Y assembly motor @ 3:00  
 P49\* Y axis for X-Y assembly motor @ 9:00

\* Pinning to 130 arc-sec orthogonality. Additional bracketing required. Contact factory for details.

Screw Driven Tables