

# Linear Motor Tables Contents

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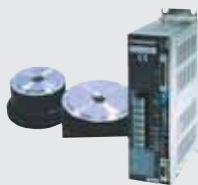
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A27 **Rotary Servo Motor Tables**

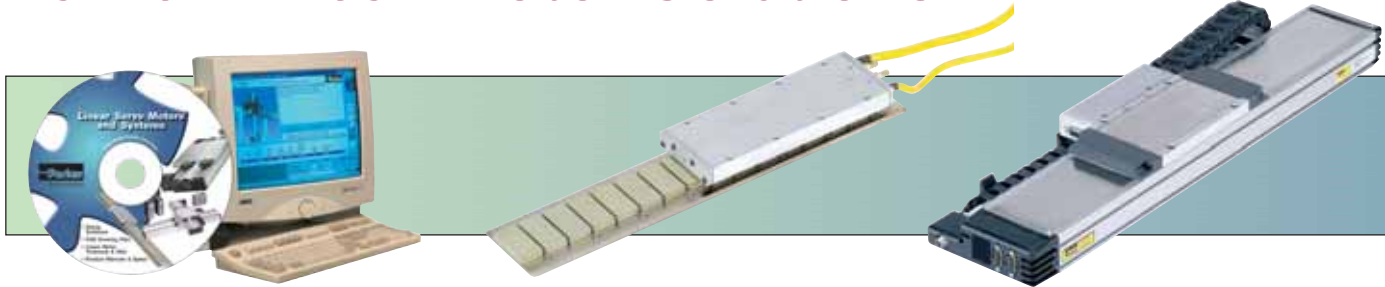
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A27 DM1004 Series

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# Parker Linear Motor Solutions



## Application Tools and Support

- Sizing and selection software
- CAD drawings – download from web
- CD with complete product information including FAQs
- Factory application engineers
- Regional field engineers
- Local automation technology centers
- Complete product testing and documentation

## Linear Servo Motors

- Complete size range
- Fastest response and settling time
- Single-row slotless design or double row ironless
- Lower cost and weight (compared to ironless design)
- Excellent heat dissipation
- Custom cables, connectors, windings, etc. for special requirements

## Linear Motor Tables

- Pre-engineered “plug and play” module
- Certified accuracy and repeatability
- Slotless or Iron Core linear motor drives
- Velocity to 4.5 m/sec.
- Acceleration to 5 Gs
- Encoder resolution to 0.1 microns
- Long life cable management system
- Proven protective strip seal
- Quick delivery

## Linear Motor Solutions at “Selectable Levels of Integration”™

### Component Products

If you have the capability and experience to develop your own systems, our broad range of innovative, easy-to-use products will help you get the job done.

- Short leadtime
- Large selection
- Proven reliability

### Subsystems

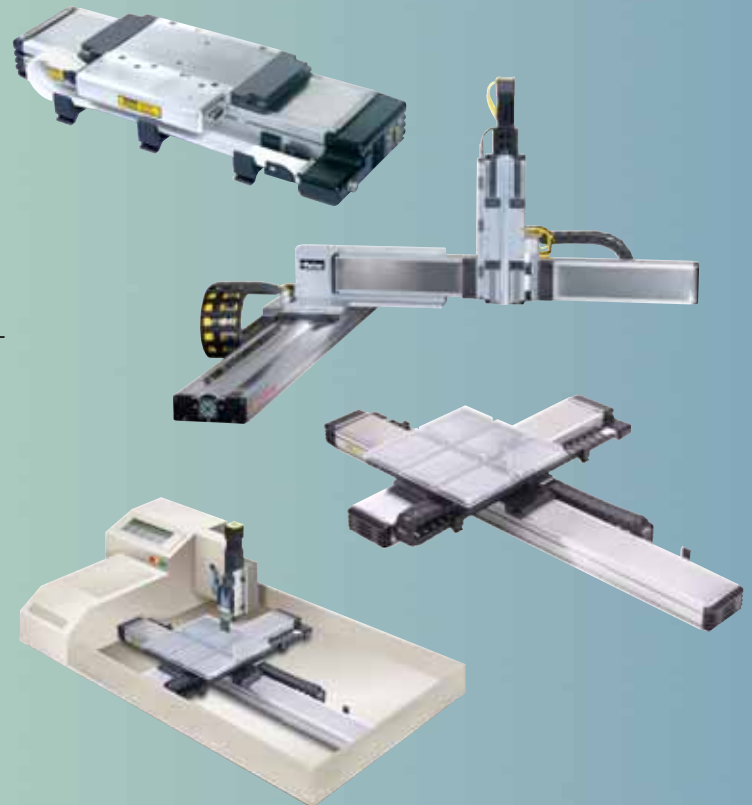
Our mechanical subsystems are often utilized by OEMs and Integrators who want a completely assembled multi-axis unit ready for direct hookup to an existing or a new Parker motor/drive/control system.

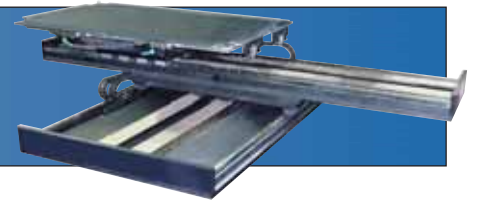
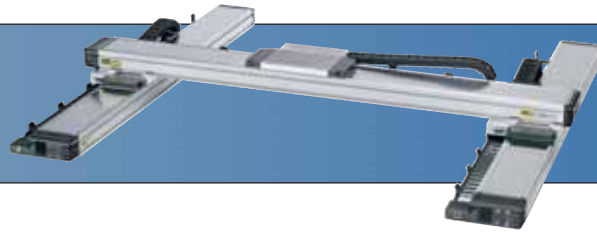
- Reduced engineering effort
- Straightforward integration
- Modular compatibility

### Systems

Machine builders and OEMs often choose to integrate a complete electromechanical system into the machine. They have confidence in knowing that our knowledge, experience, and support will ensure that their automation goals are met.

- Minimal design engineering
- Ensured component compatibility
- Single source supply





### Digital Servo Drives

- Optimized parameters for linear motors
- Pre-configured motor files for easy setup
- Sinusoidal commutation with encoder feedback
- Connectorized cabling for easy hookup
- Drive/controller models for direct motion programming and storage

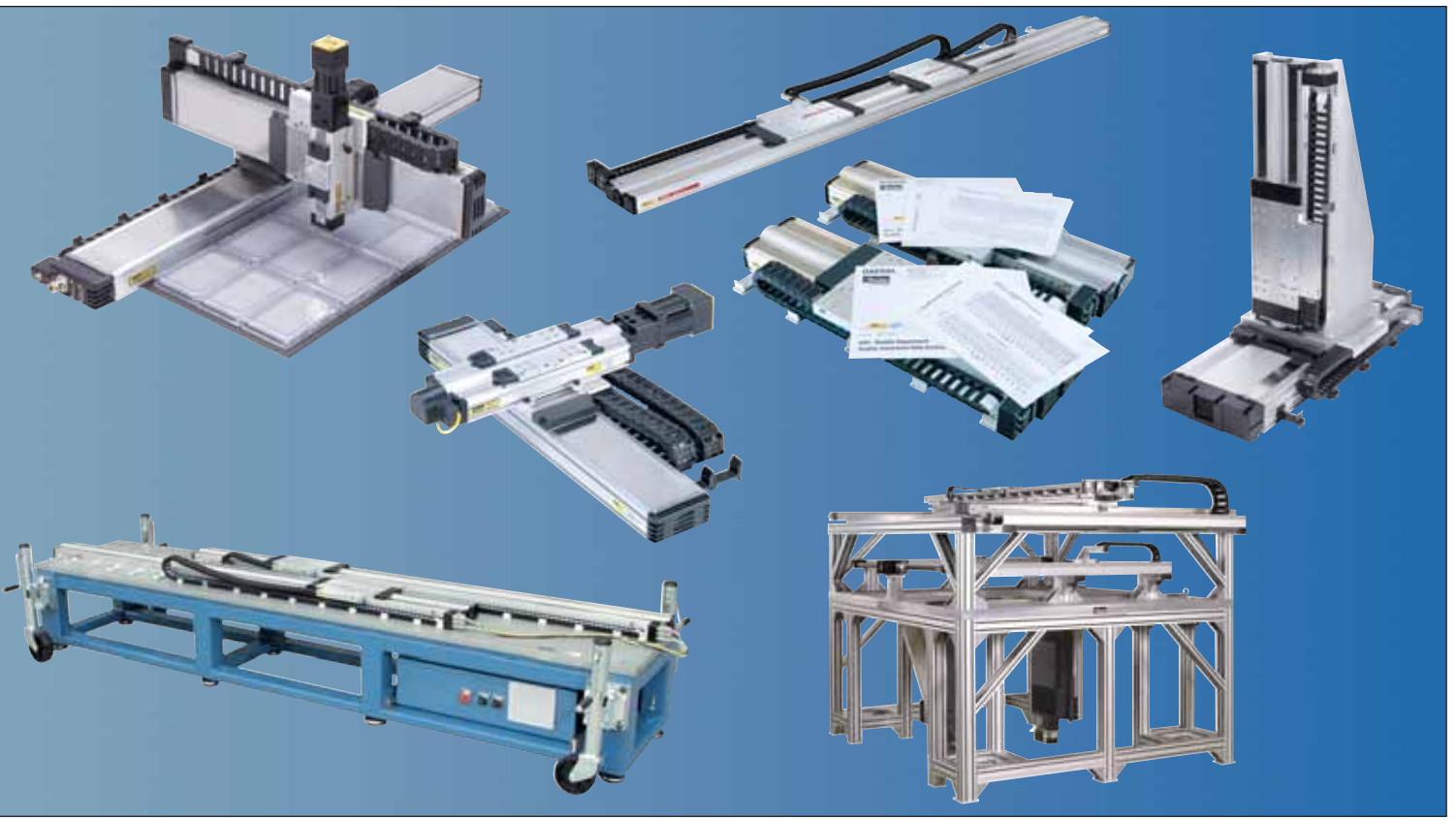
### Modular Linear Motor Systems

- Cost-effective multi-axis systems easily developed from standard 400LXR modules
- Multi-axis cable management
- Seamless integration with other Parker motion components including ballscrew tables and actuators
- Selectable Levels of Integration™

### Custom Engineered Systems

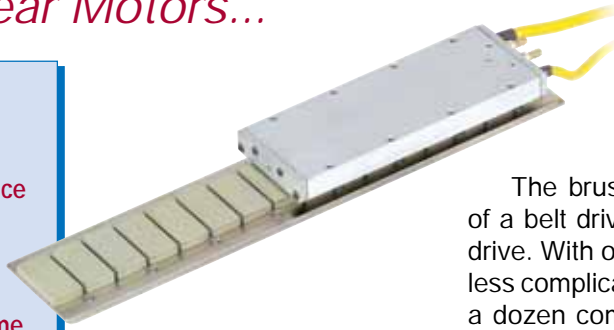
- Single or multi-axis solutions designed "from the ground up" to precisely meet customer requirements
- Systematic process to convert initial concepts into final solutions in the shortest time
- Total system reliability
- CAD generated approval drawings
- Special testing and certification of final performance and specifications

Linear Motor Tables



About Linear Motors...

- ▶ High speeds
- ▶ High stiffness
- ▶ Low maintenance
- ▶ High precision
- ▶ Zero backlash
- ▶ Fast settling time



The brushless linear servo motor offers the speed of a belt drive with the precision of a ground ballscrew drive. With only two primary elements, it is considerably less complicated than the ballscrew which has more than a dozen components in the drive train. The result is a response rate that can be 10 times faster, translating into quicker acceleration and settling times for higher throughput.

The idea is simple enough. Take a conventional rotary servo motor and unwrap it. What was the stator is now a forcer and the rotor becomes a magnet bar. With this design, the motor is connected directly to the load. Linear motion is achieved without any rotary to linear transmission. The forcer is a set of windings that conducts current, while the stator is a linear path of rare earth magnets mounted in alternating polarity. Commutation is electronic, either with hall effect sensors or sinusoidal drives.

There are three main types of brushless linear motors: iron core, ironless, and slotless. Each offers certain performance advantages. The slotless design exhibits the best combination of attributes for the majority of applications. These include good linear force, smooth translation, thermal stability and low cost. The iron core design provides significantly higher continuous and peak thrusts to handle applications involving heavy payloads with high acceleration.

1. "Pass-Through" Cabling

Pre-wired, plug-in connection of the moving payload for easy hookup of user instruments or end effectors.

2. Connector Panel

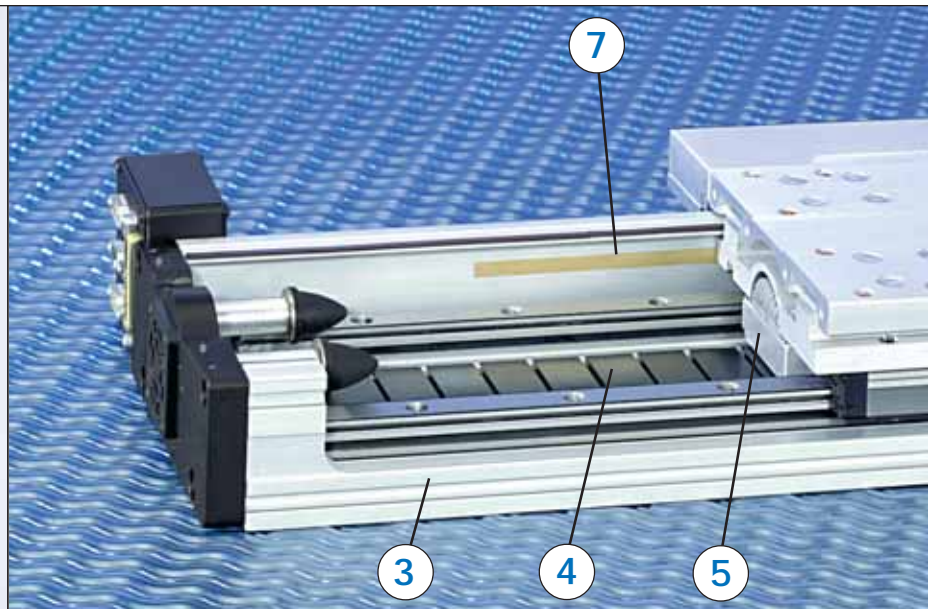
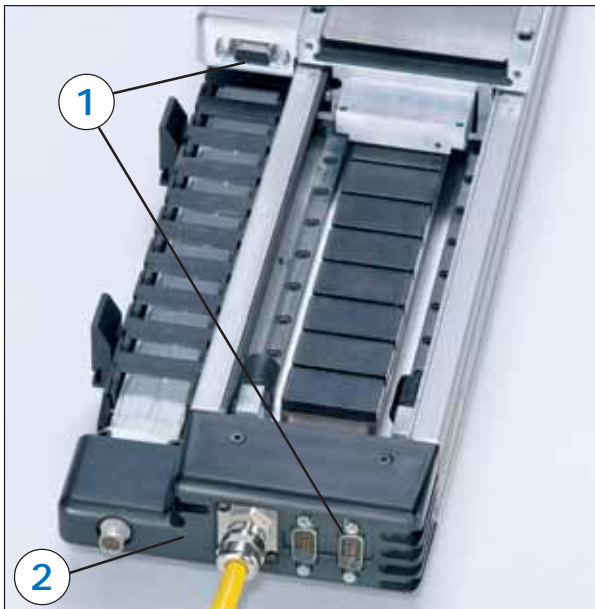
Electrically shielded panel provides "plug-in" connectivity and quick disconnect for all signal and power requirements.

3. High Strength Aluminum Body

Extruded aluminum housing is precision machined to provide outstanding straightness and flatness.

4. Magnet Rail

Single rail of high energy rare earth magnets offers lower weight and lower cost than double magnet type.



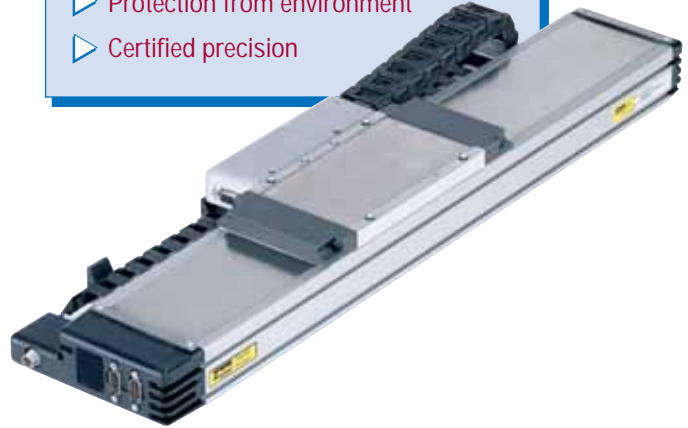


## About Linear Motor Tables...

Linear motors cannot function on their own. Before motion can occur, a platform must be engineered to provide support, direction, and feedback for the linear motor. Bearings, cables, connectors, encoder, travel stops, homing sensor and other components must be performance matched and integrated to achieve desired motion and control.

Parker linear motor tables provide all this and more in a pre-engineered, easily mounted, ready to run package. The linear motor magnet rail is mounted to a stationary base and the forcer is mounted to the moveable carriage. The only contact between the moving carriage and the stationary base is through the linear support bearings. High precision square rail bearings provide load support, low-friction translation, and a precise linear path. A high resolution linear encoder provides the required velocity and positional information to the motor controller, and a unique cable management system enables high performance motion with a life of 30 million inches and beyond. Parker tables, with the slotless linear motor, are offered in three sizes (404LXR, 406LXR, 412LXR). The largest (412LXR) is also available with an iron core linear motor for heavy duty, high performance applications.

- ▶ Pre-engineered package
- ▶ Performance matched components
- ▶ Protection from environment
- ▶ Certified precision



Linear Motor Tables

### 5. Slotless or Iron Core Linear Motor

Provides a highly responsive, zero backlash drive system. Both motors offer excellent heat management, durability, and have built-in thermal sensor and hall sensors.

### 6. Linear Guidance System

The highly engineered carriage and bearing system effectively counters the combined problematic effects of heat, high speed and high acceleration.

### 7. Integral Linear Encoder

Protected non-contact feedback with selectable resolutions to 0.1 micron. Z channel is factory aligned to home sensor for precise homing.

### 8. Limit/Home Sensors

Proximity sensors establish end of travel and "home" location and are easily adjustable over entire length to restrict the travel envelope.

### 9. "Quick Change" Cabling

Innovative Cable Transport Module offers extended life (30 million cycles) and a simple cable changing system for preventative maintenance.

### 10. Protective Seals

Hard Shell aluminum cover combined with stainless steel strip seals provide IP30 protection to interior components as well as enhance overall appearance.



## 400LXR Series Linear Motor Tables

### Features

- ❑ Velocity to 4.5 m/sec
- ❑ Acceleration to 5 Gs
- ❑ Encoder resolution to 0.1 micron
- ❑ Cleanroom compatible
- ❑ Easy multi-axis mounting
- ❑ Cable management system
- ❑ Proven strip seal



### Performance Matched Components

The 400LXR Series linear servo motor tables achieve optimum performance by combining slotless or ironcore motor technology with performance matched mechanical elements and feedback devices. Fast response, high acceleration, smooth translation, high velocity, and quick settling time describe the performance characteristics found in the 400LXR while high repeatability, precise accuracy, and sub-micron resolution define the positioning attributes.

### Sized to fit



The 400LXR Tables are offered in three widths (100, 150, and 300 mm), and travel lengths up to 3 meters to accommodate the size and performance requirements of many industries including life sciences, photonics, semiconductor and general automation.

### "Designer Friendly" Features and Options

A vast assortment of "designer friendly" features and options simplify the engineering challenges often confronted with "base model" positioning devices. Features like the IP30 protective strip seal and long life cable management system, exemplify the built-in value found in the 400LXR units. Other selectable enhancements like cleanroom compatibility, travel limit sensors, motor drives, encoder resolution, and pinning holes for tooling location, simplify machine design and integration efforts.



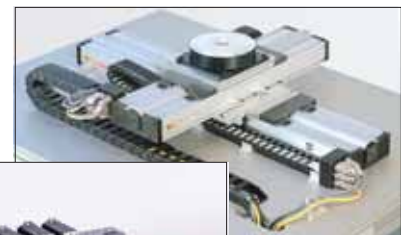
### Flexibility and Multi-Axis Compatibility

The 400LXR's selection flexibility and mounting compatibility with the 400XR ballscrew driven tables enables single axis or complex multi-axis units to be configured in a straightforward manner. Parker's matching servo drives and motion controllers can be included to complete the motion system.



### Customs and Systems

For specialized applications requiring customization, Parker design engineers can easily modify these tables to suit, or engineer complete interactive linear motion systems to desired specifications. Parker's 400LXR series tables have taken the mystery, difficulty and cost out of integrating linear motor tables into high throughput precision positioning applications.



Specifications

Model Motor	404LXR 8 Pole	406LXR 8 Pole	406LXR 12 Pole	412LXR 12 Pole	412LXR 24 Pole (no cooling)	412LXR 24 Pole (forced air)	412LXR 24 Pole (watercooled)
Rated Load kg (lb)	45(99)	180(396)	180(396)	950(2090)	1148(2526)	1148(2526)	1148(2526)
Maximum Acceleration	5 Gs						
Maximum Velocity (m/sec.)							
Encoder Resolution: 0.1 μm	0.3	0.3	0.3	0.3	0.3 [0.3]*	0.3 [0.3]*	0.3 [0.3]*
0.5 μm	1.5	1.5	1.5	1.5	1.5 [1.5]*	1.5 [1.5]*	1.5 [1.5]*
1.0 μm	3.0	3.0	3.0	3.0	2.0 [3.0]*	2.0 [3.0]*	2.0 [3.0]*
5.0 μm	3.0	3.0	3.0	3.0	2.0 [4.5]*	2.0 [4.5]*	2.0 [4.5]*
Sine Output	3.0	3.0	3.0	3.0	2.0 [4.5]*	2.0 [4.5]*	2.0 [4.5]*
Positional Repeatability							
Encoder Resolution: 0.1 μm	± 1.0 μm						
0.5 μm	± 1.0 μm						
1.0 μm	± 2.0 μm						
5.0 μm	±10.0 μm						
Sine Output	(interpolation dependent)						
Peak Force N (lb)	180 (40)	225 (50)	330 (75)	1000 (225)	2650 (595)	2650 (595)	2650 (595)
Continuous Force N (lb)	50 (11)	75 (17)	110 (25)	355 (80)	750 (169)	970 (218)	1720 (387)
Carriage Mass (kg)	1.4	3.2	4.1	12.3	23	23	23



\* Bracketed velocity values [ ] apply to 675VDC bus (480 VAC drive input).

Travel Dependent Specifications

Travel (mm)	Accuracy* (μm)			Unit Weight (Kg)				
	Positional		Straightness & Flatness Accuracy* (μm)					
	0.1,0.5,1.0 resolution (μm)	5.0 resolution (μm)		404LXR 8 Pole	406LXR 8 Pole	406LXR 12 Pole	412LXR 12 Pole	412LXR 24 Pole
50	6	16	6	4.4	8.7	11.1	-	-
100	7	17	6	4.8	-	-	-	-
150	8	18	9	5.2	10.3	13.4	41	-
200	10	20	10	5.6	-	-	-	49
250	12	22	12	6.0	12.6	14.1	45	-
300	14	24	13	6.4	-	-	-	-
350	16	26	15	6.8	13.3	15.7	49	-
400	18	28	16	7.2	-	-	-	-
450	20	30	18	-	14.8	17.2	-	-
500	21	31	19	8.0	-	-	-	61
550	23	33	21	-	16.4	18.7	-	-
600	25	35	22	8.9	-	-	-	-
650	26	36	24	-	17.9	20.2	61	67
700	28	38	25	9.7	-	-	-	-
750	29	39	27	-	19.4	21.8	-	-
800	31	41	29	10.6	-	-	67	-
850	32	43	30	-	20.9	23.3	-	75
900	33	44	32	11.5	-	-	-	-
950	34	44	33	-	22.5	-	-	-
1000	35	45	35	12.4	-	27.1	75	-
1050	37	47	36	-	-	-	-	83
1200	39	49	41	-	26.3	-	83	-
1350	42	52	45	-	-	30.9	-	95
1450	43	53	48	-	30.1	-	-	-
1500	44	54	50	-	-	-	95	-
1600	45	55	53	-	-	34.7	-	105
1700	46	56	56	-	33.9	-	-	-
1750	46	56	57	-	-	-	105	-
1850	47	57	60	-	-	38.6	-	113
1950	48	58	63	-	37.7	-	-	-
2000	48	58	65	-	-	-	113	-
2350	49	59	76	-	-	-	-	133
2500	50	60	80	-	-	-	133	-
2850	50	60	84	-	-	-	-	153
3000	50	60	84	-	-	-	153	-

\* Accuracy stated is at 20 degrees C, utilizing slope correction factor provided

Encoder Specifications

Description	Specification
Input Power	5 VDC +/- 5% 150 mA
Output (Incremental)	Square wave differential line driver (EIA RS422) 2 channels A and B in quadrature (90) phase shift.
Reference (Z channel)	Synchronized pulse, duration equal to one resolution bit. Repeatability of position is unidirectional moving toward positive direction.

Limit and Home Sensor Specifications

Description	Specification
Input Power	+5 to +24 VDC 60 mA (20 mA per sensor)
Output	Output form is selectable with product: Normally Closed Current Sinking Normally Open Current Sinking Normally Closed Current Sourcing Normally Open Current Sourcing All types Sink or Source maximum of 50 mA
Repeatability	Limits: +/- 10 microns (unidirectional) Home: See Z channel specifications

Hall Effect Specifications

Description	Specification
Input Power	+5 to +24 VDC, 30 mA
Output	Open Collector, Current Sinking, 20 mA Max



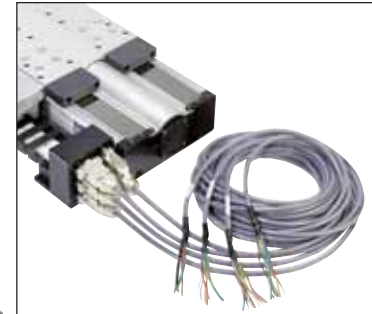
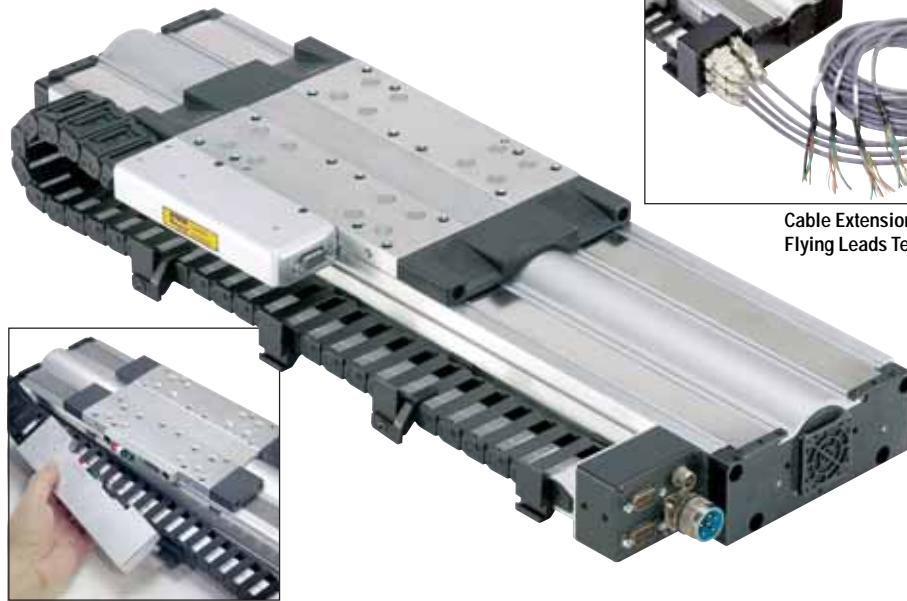


## 400LXR Cable Management

### Cable Transport Module

The LXR's Cable Transport Module offers the convenience of "plug and play" connectivity for fast, easy table installation and "quick change" replacement. This system of cable management includes the highest quality **high-flex ribbon cable** with a life rating of 30 million cycles, a cable track with support brackets, a "quick change" carriage cartridge, and a plug-in connector panel housing. It also provides a "pass-through" connection and cabling for customer application. This transport module option is ideal for high throughput continuous duty requirements where downtime is not acceptable.

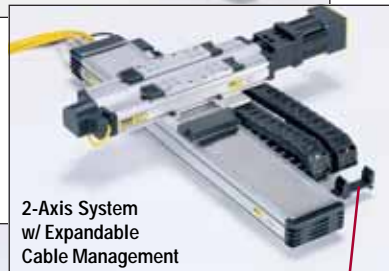
The **high-flex ribbon cable** permits a cable track bend radius that is small enough to clear payloads of large dimension. The cable transport can be ordered with a variety of extension cable options. These cables provide extensions from the connector panel on the cable transport module, to the motor drive amplifier and controller. The cables are high-flex, long life cables so they can be utilized on a second or third axis unit.



Cable Extensions –  
Flying Leads Terminations



"Quick Change" Cartridge



2-Axis System  
w/ Expandable  
Cable Management



404LXR Cable  
Transport Module



### Cable Transport Module – Order Code

Order Code	Extension Cable Length	Extension Cable Termination
CM02	No Extension Cables	
CM07	3.0 meters	flying leads
CM08	7.5 meters	flying leads
CM09	3.0 meters	Gemini Conn.
CM10	7.5 meters	Gemini Conn.
CM13	3.0 meters	Aries/Vix Conn.
CM14	7.5 meters	Aries/Vix Conn.
CM22*	3.0 meters	Compax Conn.
CM23*	7.5 meters	Compax Conn.

\* 24 Pole motor models only

### Connection Ends



404LXR



406LXR/412LXR



## 400LXR Cable Management

### OEM Cable System

The LXR's unharnessed cable system is offered for OEMs and others who have independent methods of routing and managing cables. These systems offer the "quick change" cartridge, "pass-through" connection and round high-flex cables in lengths of 3.0 or 7.5 meters. They are available with flying lead end terminations, Gemini, Aries, or Compax3 Connectors.



### OEM Cable System – Order Code

Order Code	Extension Cable Length	Extension Cable Termination
CM03	3.0 meters	flying leads
CM04	7.5 meters	flying leads
CM05	3.0 meters	Gemini Conn.
CM06	7.5 meters	Gemini Conn.
CM11	3.0 meters	Aries/Vix Conn.
CM12	7.5 meters	Aries/Vix Conn.
CM20*	3.0 meters	Compax Conn.
CM21*	7.5 meters	Compax Conn.

\* 24 Pole motor models only



406LXR with OEM cables and flying leads

### User "Pass-Through" Cabling Feature



- Pre-wired plug-in connection to the moving payload
- Nine user conductors for end-effectors or instruments
- High-Flex long life cables:  
 Ribbon Cable – Transport Module System  
 Round Cable – OEM System

Cable concerns regarding the routing and durability for payload or instrument signals are addressed by the pass-through connectivity feature included with both of the LXR cable management systems. Nine pin D-connectors pro-

vided on the carriage (with the transport module units) and the cable connecting block combine with high-flex, long life cables for easy setup and dependable performance.

Note: Extension Cables are available and can be ordered separately:  
 006-1743-01 (3 meters); 006-1743-02 (7.5 meters).

## Digital Drive Options

- ❑ Pre-configured for the LXR
- ❑ Optimized for linear servo motors
- ❑ Convenient connectorized cabling
- ❑ Stable power-up operation
- ❑ Input power: 95–480 VAC



### Simple Configuration:

All digital drives shipped with the LXR product family come preconfigured with a motor file which includes electrical parameters to set continuous and peak currents, current loop compensation values, and default gain settings. Users will have the ability to override these parameters for special application requirements. Tuning is easy to use and intuitive for users and is available via a variety of methods. The motor and loading information must be known by the drive to determine the baseline tuning gains. These are simple parameter entries the user can complete with the help of standard Parker supplied front-end software tools.

## Gemini Series



The Gemini family offers a drive solution for every LXR, from the 404LXR to the 412LXR with iron core motor. Drives are offered so that power levels are available to match the continuous and peak current requirements of each LXR. The drive is easily configured using RS232/485 with a PC.

### GV Digital Servo Drive:

A4 A7 A40

- Sinusoidal commutation with hall sensors ensure proper phase shifting
- Integrated encoder feedback ensures precise positioning
- Approvals: UL Recognition, cUL, CE for LVD, CE for EMC
- Torque, velocity, step & direction, and encoder tracking modes available
- 120/240VAC input
- Digital notch filters provide the tools to eliminate mechanical resonance
- Simplified tuning and configuration
- Variable resolution for the encoder out as well as the command input
- PWM frequencies optimized for linear motor support

### GV Digital Controller/Servo Drive:

A5 A6 A8 A9 A41 A42

- Stand-alone servo controller and drive in one small package
- Control features such as registration, motion profiles, S-curve velocity profiling, electronic gearing, and conditional statements
- Program storage: Up to 32 programs or 190 lines of program code, expanded to 300KB for the GV6K
- Daisy chain up to 99 units
- Simplified configuration and tuning
- 8 programmable inputs and 6 programmable outputs
- Compatibility with RS 232 / 485
- Ethernet available as an option



## Aries Series



### Aries Digital Drive: [A62](#) [A63](#)

- 4 power levels available, matched for 404LXR, 406LXR, and 412LXR requirements
- 120/240VAC input
- 20 MHz (post-quadrature) encoder input
- Sinusoidal commutation with hall sensors ensure proper phase shifting
- Integrated encoder feedback ensures precise positioning
- Approvals: UL compliant, CE for LVD, CE for EMC
- +/-10 V torque control for use with any controller with a standard analog command output. Step and direction input available as an option.
- Standard high-density D-sub connectors for easy connectivity in any system
- Simplified tuning and configuration with easy to use front-end software
- Compact Design
- Status/fault LED indicators to confirm proper operation

The Aries family offers a robust and cost-effective servo drive by power matching the drive with the application requirements. Unlike the competition, the Aries family is designed with an open architecture in mind, so it can also be configured for use with any manufacturer's motion controller. Offered solely in a drive only configuration, the Aries provides a great value.

## Compax3 Series



- 480VAC optimized for the 412LXR iron core design
- Available in 120/240VAC for slotless LXR designs
- Family of drives is power matched to offer a solution for every 400LXR table
- Easy-to-use wizards-based configuration and programming via C3 ServoManager software package
- Full diagnostic, tuning, and 4-channel oscilloscope tools provided in the standard C3 ServoManager software
- Approvals: UL, cUL, CE for LVD, CE for EMC approval
- Configurable via RS232/485
- Status/fault LED indicators to confirm proper operation

### Drive Features: [A50](#)

- Base servo drive
- +/- 10 V analog
- Step and direction
- Torque/velocity control
- Position control
- Encoder tracking

### Indexer Features: [A51](#)

- Full-featured programmable drive/controller
- IEC61131-3 programming flexibility
- PLCopen, Parker motion function blocks
- Complex motion
- Profibus or CANopen options available

### Controller/Drive Features: [A52](#)

- Base indexer drive
- Up to 31 stored profiles
- Profile selected via digital inputs
- Multi-profile sequences
- Profibus or CANopen options available

With its high-performance and modular design, the Compax3 family of industrial servo drives and drive/controllers offers a new level of servo performance and flexibility. The modular capacity of the Compax3 family allows options such as intelligent motion controllers, fieldbus interfaces and industry standard motor feedback. In addition, numerous expansion options can be added to the standard product in order to optimize the capabilities required for today's demanding servo applications.



412LXR Cooling Options CL1 CL2 CL3 CL4

412LXR models with 24 pole iron core motors are offered with forced air or water cooling options to provide higher continuous force values than standard convection cooling. Maximum continuous force is increased from 750N to 970N with the forced air option and to 1720N with the watercooled option.

The CL1 convection cooling option utilizes conduction and convection to remove heat from the system. The CL2 forced air cooling option forces air movement inside the table body which enhances heat removal from the motor and critical electronic components. The CL3 and CL4 water cooling options circulate chilled water inside the motor to rapidly and efficiently remove heat. The CL3 option includes a motor prepared for water cooling with

0.375" water line quick disconnect termination points on the carriage. The CL4 option includes a motor prepared for water cooling with 0.375" water lines routed through a carrier system from the moving carriage to a fixed connection point on the base. This water cooling management system is a pre-engineered solution that eliminates the headaches associated with designing, procuring and installing water line management. Both water cooling options utilize Parker 0.375" tubing quick disconnects for easy connection. The minimum flow recommendation is 1.0 GPM with a water pressure not to exceed 50 psi. For closed loop cooling systems, a 2000 watt "chiller" is recommended.



CL2 forced air option

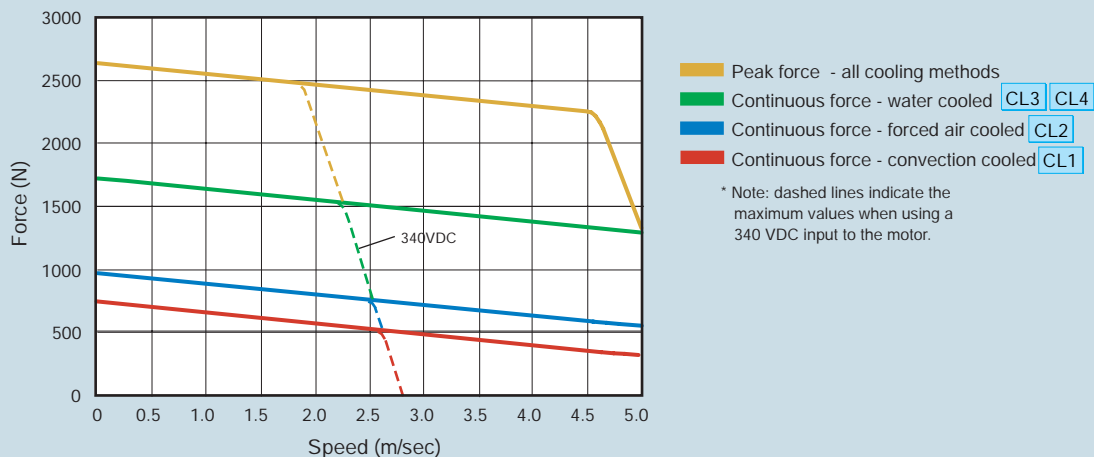


CL3 option - water cooling carriage connections



CL4 water cooled option showing water line management

675 VDC Speed/Force Chart\*



400LXR Cleanroom Preparation R2



404LXR with cleanroom class 10 modification

Cleanroom compatible linear tables are often required for laboratory and production applications in industries such as semiconductor, life science, electronics, and pharmaceuticals.

400LXR tables with cleanroom preparation, were tested in Parker's vertical laminar flow work station, which utilizes ULPA filters to produce an environment having a cleanliness of class 1 prior to testing. Tables were tested in a variety of orientations with sampling both below the table and at the carriage mounting surface. Laminar flow rate is 0.65 inches W.C.

Special cleanroom testing can be provided upon request. For more information on cleanroom testing, contact a Parker Applications Engineer at 800-245-6903.

Standard Cleanroom Preparation

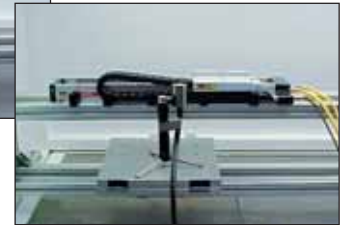
- Stringent cleaning and handling measures
- Cleanroom rated lubrication
- Strip seal replaced with hard shell cover

400LXR Cleanroom Compatibility

Table Velocity	Class	
	4.5" below table	At carriage surface
250 mm/sec	10	1
500 mm/sec	25	1
1000 mm/sec	50	5
2000 mm/sec	250	25
3000 mm/sec	500	100



Testing at 4.5 inches below table



Testing at carriage mounting surface

About Cleanrooms

A room in which the concentration of airborne particles is controlled within defined limits. Federal Standard 209E statistically defines the allowable number of particles per cubic foot of air.

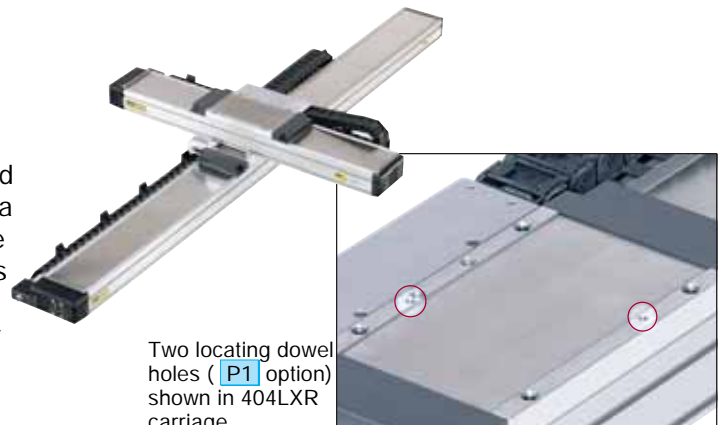
The chart (right) describes the conditions that must be maintained for the cleanroom to have a specific "class" rating.

Class	Number of Allowable Particles (Measured particle size in microns [µm])				
	0.1	0.2	0.3	0.5	5
1	35	7.5	3	1	0
10	350	75	30	10	0
100	n/a	750	300	100	0
1000	n/a	n/a	n/a	1000	7
10000	n/a	n/a	n/a	10000	70
100000	n/a	n/a	n/a	100000	700

Dowel Pinning P\_

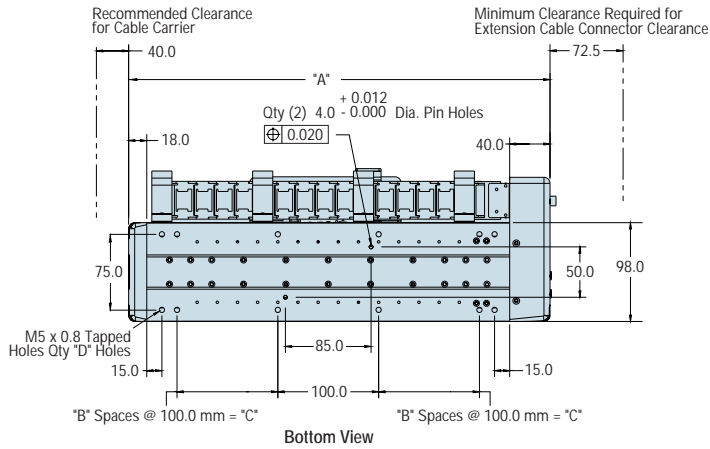
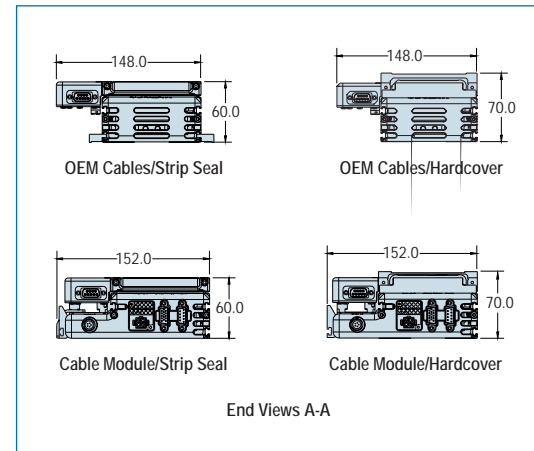
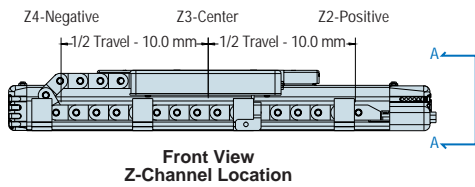
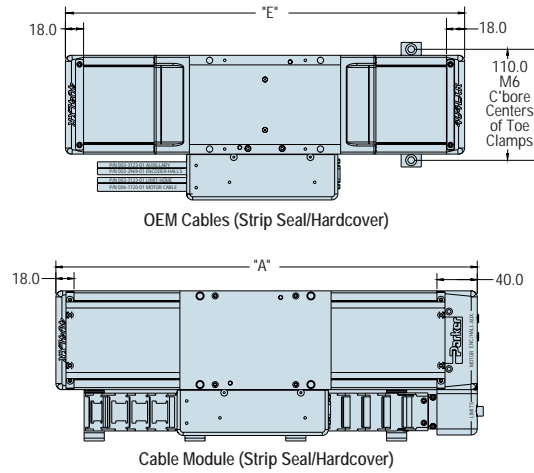
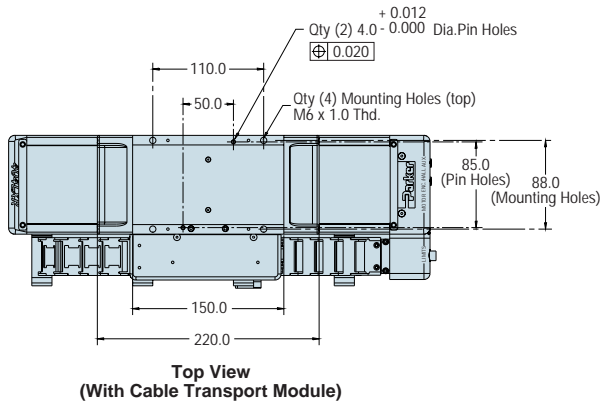
Standard dowel pin locating holes P1 are offered on all 400LXR units to facilitate repeatable mounting of tooling or payload.

In addition, pinning options P2 & P3 are offered for precise orthogonal mounting of the second axis in a multi-axis system. In this case, the bottom side of the table base is match drilled and reamed to the first axis to provide exact orthogonal location. This convenient option eliminates concerns regarding contamination or damage often associated with machining for locating pins in an assembled unit.



Two locating dowel holes ( P1 option) shown in 404LXR carriage

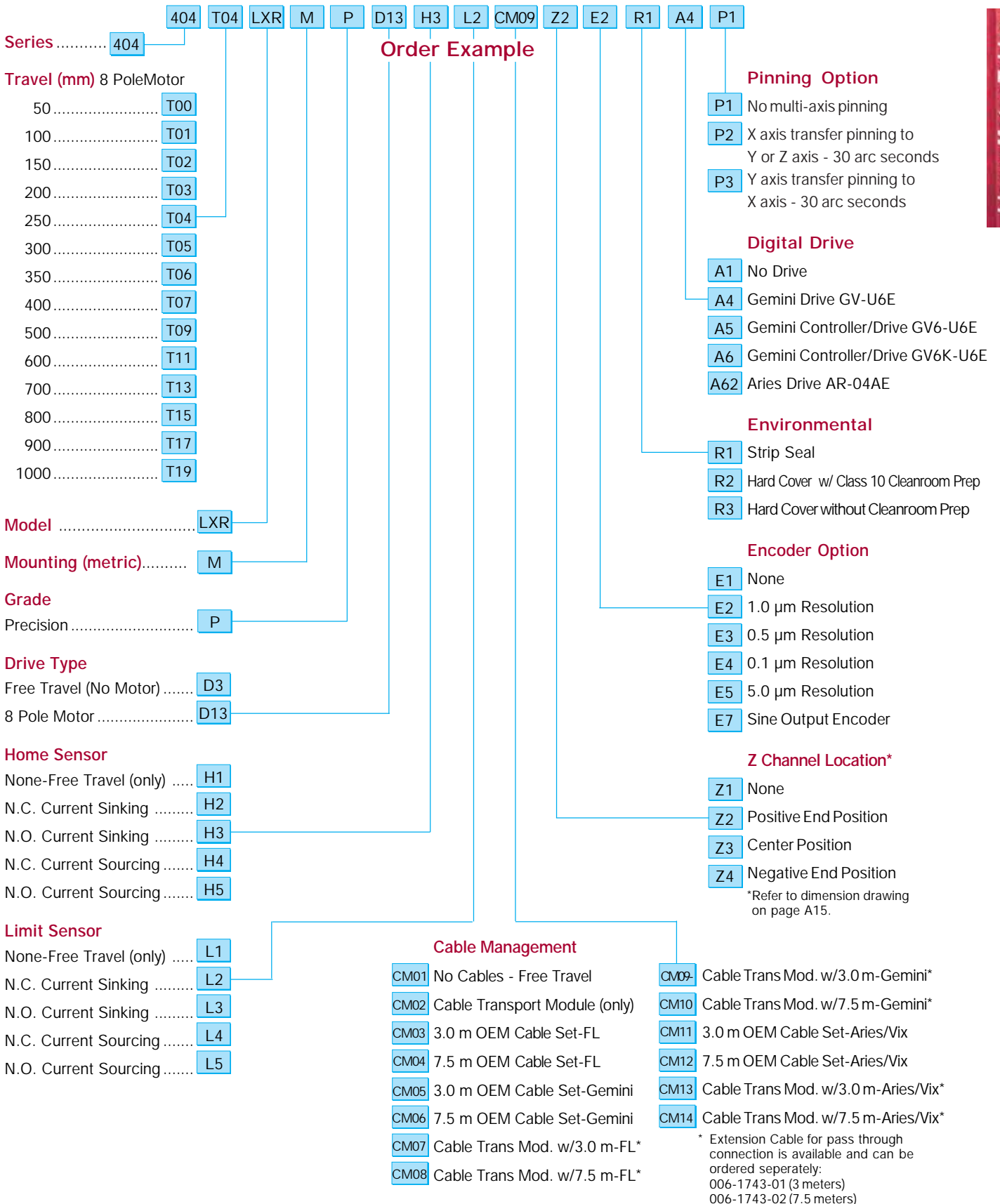
404LXR Series Dimensions (mm)



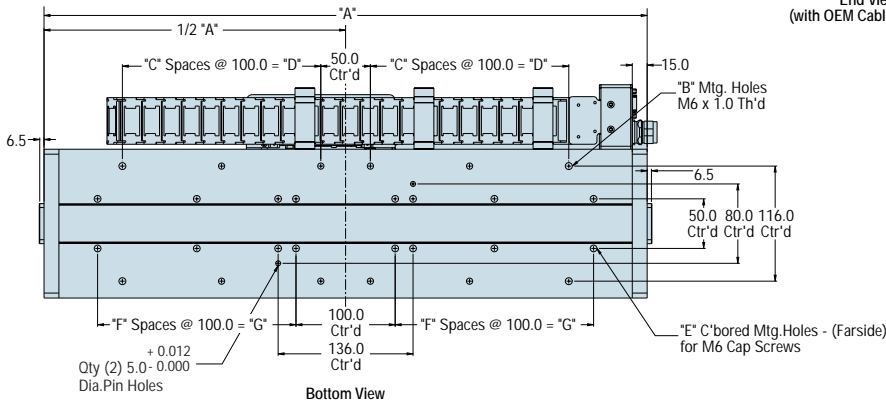
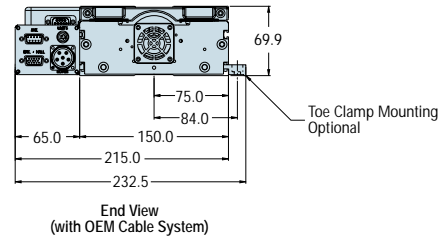
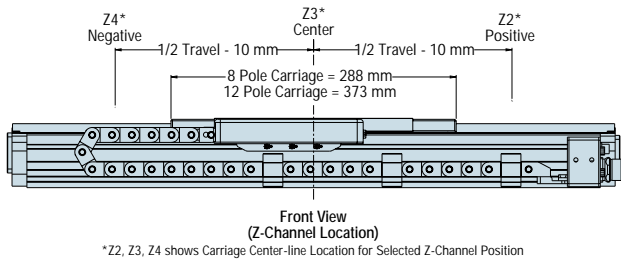
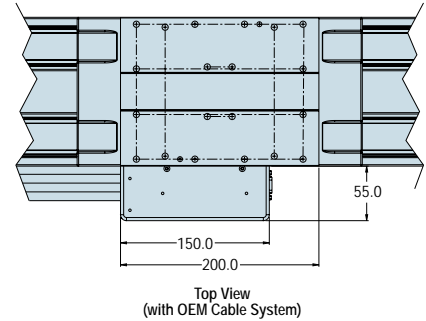
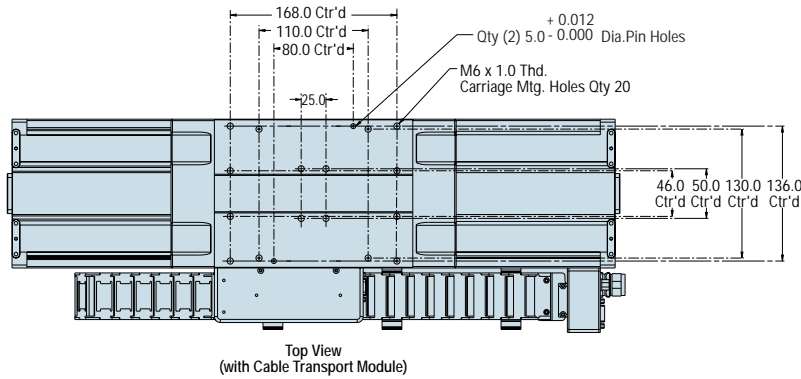
Model	Travel (mm)	Dim A	B	C	D	E
404T00LXR	50	368.0	1	100.0	12	346.0
404T01LXR	100	418.0	1	100.0	12	396.0
404T02LXR	150	468.0	1	100.0	12	446.0
404T03LXR	200	518.0	1	100.0	12	496.0
404T04LXR	250	568.0	1	100.0	12	546.0
404T05LXR	300	618.0	2	200.0	16	596.0
404T06LXR	350	668.0	2	200.0	16	646.0
404T07LXR	400	718.0	2	200.0	16	696.0
404T09LXR	500	818.0	3	300.0	20	796.0
404T11LXR	600	918.0	3	300.0	20	896.0
404T13LXR	700	1018.0	4	400.0	24	996.0
404T15LXR	800	1118.0	4	400.0	24	1096.0
404T17LXR	900	1218.0	5	500.0	28	1196.0
404T19LXR	1000	1318.0	5	500.0	28	1296.0



404LXR - How to Order



406LXR Series Dimensions (mm)  
 12 Pole Slotless Motor



Model	Travel (mm) 8 Pole	Travel (mm) 12 Pole	A	B	C	D	E	F	G
406T01LXR	50	N/A	408	8	1	100.0	12	1	100.0
406T02LXR	150	50	508	8	1	100.0	12	1	100.0
406T03LXR	250	150	608	12	2	200.0	16	2	200.0
406T04LXR	350	250	708	12	2	200.0	16	2	200.0
406T05LXR	450	350	808	16	3	300.0	20	3	300.0
406T06LXR	550	450	908	16	3	300.0	20	3	300.0
406T07LXR	650	550	1008	20	4	400.0	24	4	400.0
406T08LXR	750	650	1108	20	4	400.0	24	4	400.0
406T09LXR	850	750	1208	24	5	500.0	28	5	500.0
406T10LXR	950	850	1308	24	5	500.0	28	5	500.0
406T11LXR	1200	1100	1558	32	7	700.0	32	6	600.0
406T12LXR	1450	1350	1808	36	8	800.0	40	8	800.0
406T13LXR	1700	1600	2058	40	9	900.0	44	9	900.0
406T14LXR	1950	1850	2308	44	10	1000.0	48	10	1000.0

406LXR - How to Order

**Order Example** 406 T09 LXR M P D13 H2 L2 CM09 Z2 E2 R1 A4 P1

**Series** ..... 406

**Travel (mm)**

8 Pole Motor	12 Pole Motor	
50	n/a	T01
150	50	T02
250	150	T03
350	250	T04
450	350	T05
550	450	T06
650	550	T07
750	650	T08
850	750	T09
950	850	T10
1200	1100	T11
1450	1350	T12
1700	1600	T13
1950	1850	T14

**Model** ..... LXR

**Mounting (metric)** ..... M

**Grade**

Precision ..... P

**Drive Type**

Free Travel (No Motor)

8 Pole Carriage (no mtr.) ... D3

12 Pole Carriage (no mtr.) ... D5

Linear Motor

8 Pole Motor Carriage ..... D13

12 Pole Motor Carriage ..... D15

**Home Sensor**

None - Free Travel (only) ... H1

N.C. Current Sinking ..... H2

N.O. Current Sinking ..... H3

N.C. Current Sourcing ..... H4

N.O. Current Sourcing ..... H5

**Limit Sensor**

None - Free Travel (only) ... L1

N.C. Current Sinking ..... L2

N.O. Current Sinking ..... L3

N.C. Current Sourcing ..... L4

N.O. Current Sourcing ..... L5

**Cable Management**

CM01	No Cables - Free Travel	CM09	Cable Trans Mod. w/ 3.0 m-Gemini*
CM02	Cable Transport Module (only)	CM10	Cable Trans Mod. w/ 7.5 m-Gemini*
CM03	3.0 m OEM Cable Set-FL	CM11	3.0 m OEM Cable Set-Aries
CM04	7.5 m OEM Cable Set-FL	CM12	7.5 m OEM Cable Set-Aries
CM05	3.0 m OEM Cable Set-Gemini	CM13	Cable Trans Mod. w/ 3.0 m-Aries*
CM06	7.5 m OEM Cable Set-Gemini	CM14	Cable Trans Mod. w/ 7.5 m-Aries*
CM07	Cable Trans Mod. w/ 3.0 m-FL*		
CM08	Cable Trans Mod. w/ 7.5 m-FL*		

**Pinning Option**

P1 No multi-axis pinning

P2 X axis transfer pinning to Y or Z axis - 30 arc seconds

P3 Y axis transfer pinning to X axis - 30 arc seconds

**Digital Drive**

A1 No Drive

A4 Gemini Drive GV-U6E

A5 Gemini Controller/Drive GV6-U6E

A6 Gemini Controller/Drive GV6K-U6E

A62 Aries Drive AR-04AE

**Environmental**

R1 Strip Seal

R2 Hard Cover w/ Class 10 Cleanroom Prep

**Encoder Option**

E1 None

E2 1.0 µm Resolution

E3 0.5 µm Resolution

E4 0.1 µm Resolution

E5 5.0 µm Resolution

E7 Sine Output Encoder

**Z Channel Location\***

Z1 None

Z2 Positive End Position

Z3 Center Position

Z4 Negative End Position

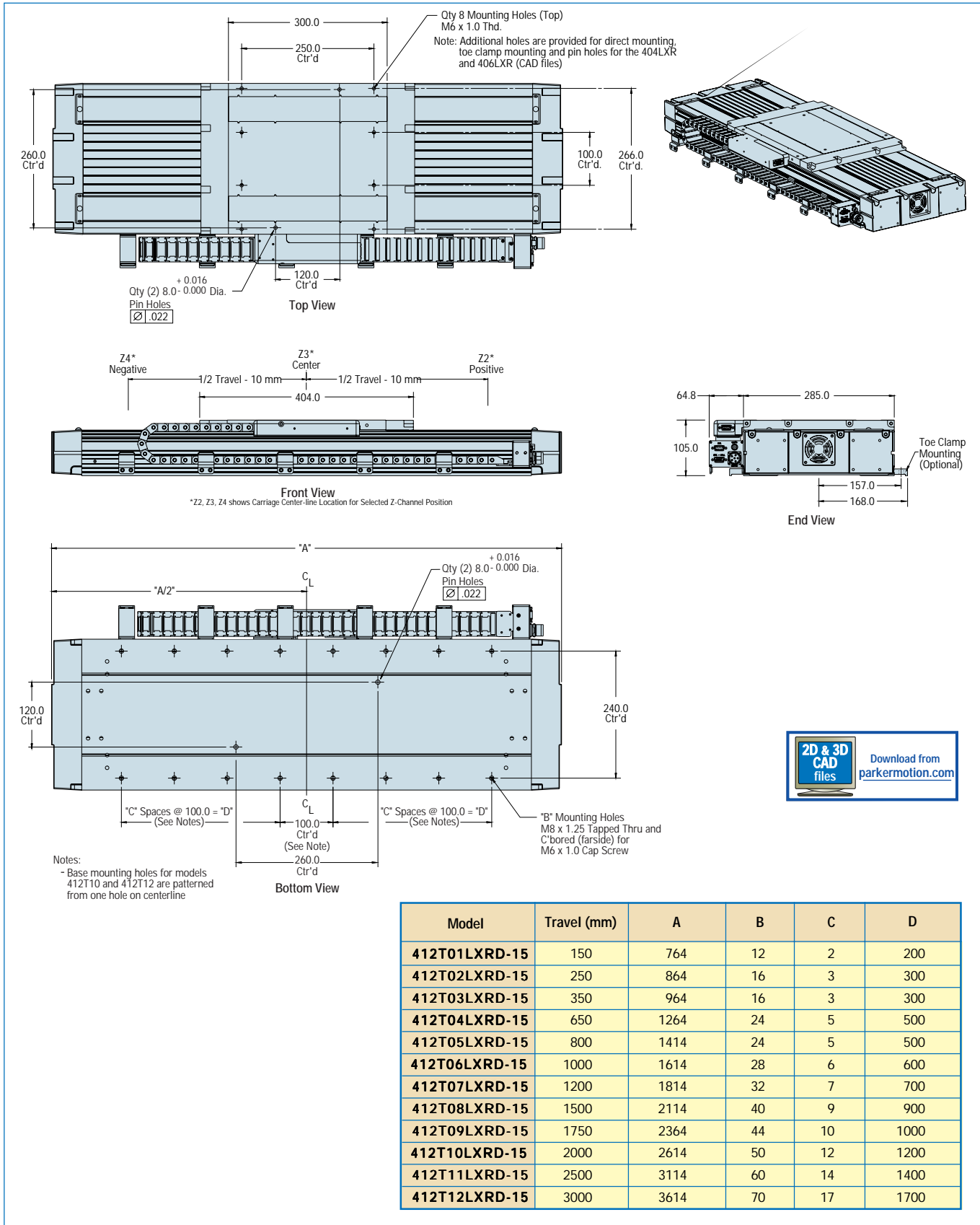
\*Refer to dimension drawing on page A17

\* Extension Cable for pass through connection is available and can be ordered separately: #006-1743-01 (3 meters); #006-1743-02 (7.5 meters).





412LXR-D15 Series Dimensions (mm)  
12 Pole Slotless Motor



Model	Travel (mm)	A	B	C	D
412T01LXRD-15	150	764	12	2	200
412T02LXRD-15	250	864	16	3	300
412T03LXRD-15	350	964	16	3	300
412T04LXRD-15	650	1264	24	5	500
412T05LXRD-15	800	1414	24	5	500
412T06LXRD-15	1000	1614	28	6	600
412T07LXRD-15	1200	1814	32	7	700
412T08LXRD-15	1500	2114	40	9	900
412T09LXRD-15	1750	2364	44	10	1000
412T10LXRD-15	2000	2614	50	12	1200
412T11LXRD-15	2500	3114	60	14	1400
412T12LXRD-15	3000	3614	70	17	1700

412LXR - How to Order  
 12 Pole Slotless Linear Motor

**Order Example**  
 412 T09 LXR M P D15 H3 L3 CM09 Z2 E2 R1 A7 P1

**Series** ..... 412

**Travel (mm) 12 Pole Motor**

150 ... T01	1200 ... T07
250 ... T02	1500 ... T08
350 ... T03	1750 ... T09
650 ... T04	2000 ... T10
800 ... T05	2500 ... T11
1000 ... T06	3000 ... T12

**Model** ..... LXR

**Mounting (metric)** ..... M

**Grade**

Precision ..... P

**Drive Type**

Free Travel (No Motor) ..... D5

12 Pole Motor ..... D15  
 Refer to page A22 for 24 pole iron core motor drive.

**Home Sensor**

None-Free Travel (only) ..... H1

N.C. Current Sinking ..... H2

N.O. Current Sinking ..... H3

N.C. Current Sourcing ..... H4

N.O. Current Sourcing ..... H5

**Limit Sensor**

None-Free Travel (only) ..... L1

N.C. Current Sinking ..... L2

N.O. Current Sinking ..... L3

N.C. Current Sourcing ..... L4

N.O. Current Sourcing ..... L5

**Cable Management**

No Cables - Free Travel	CM01		
Cable Transport Module (only)	CM02		
3.0 m OEM Cable Set-FL	CM03	Cable Trans Mod. w/ 3.0 m-Gemini*	CM09
7.5 m OEM Cable Set-FL	CM04	Cable Trans Mod. w/ 7.5 m-Gemini*	CM10
3.0 m OEM Cable Set-Gemini	CM05	3.0 m OEM Cable Set-Aries	CM11
7.5 m OEM Cable Set-Gemini	CM06	7.5 m OEM Cable Set-Aries	CM12
Cable Trans Mod. w/ 3.0 m-FL*	CM07	Cable Trans Mod. w/ 3.0 m-Aries*	CM13
Cable Trans Mod. w/ 7.5 m-FL*	CM08	Cable Trans Mod. w/ 7.5 m-Aries*	CM14

**Pinning Option**

P1 No multi-axis pinning

P2 X axis transfer pinning to Y or Z axis - 30 arc seconds

P3 Y axis transfer pinning to X axis - 30 arc seconds\*  
 \*P3 Option includes a required 15 mm thick adapter.

**Digital Drive**

A1 No Drive

A7 Gemini Drive GV-U12E

A8 Gemini Controller/Drive GV6-U12E

A9 Gemini Controller/Drive GV6K-U12E

A63 Aries Drive AR-08AE

**Environmental**

R1 Class 1000, Strip Seals

R2 Class 10 Cleanroom Prep

**Encoder**

E1 None

E2 1.0 µm Resolution Linear

E3 0.5 µm Resolution Linear

E4 0.1 µm Resolution Linear

E5 5.0 µm Resolution Linear

E7 Sine Output Encoder

**Z Channel Location\***

Z1 None

Z2 Positive End Position

Z3 Center Position

Z4 Negative End Position  
 \*Refer to dimension drawing on page A19.

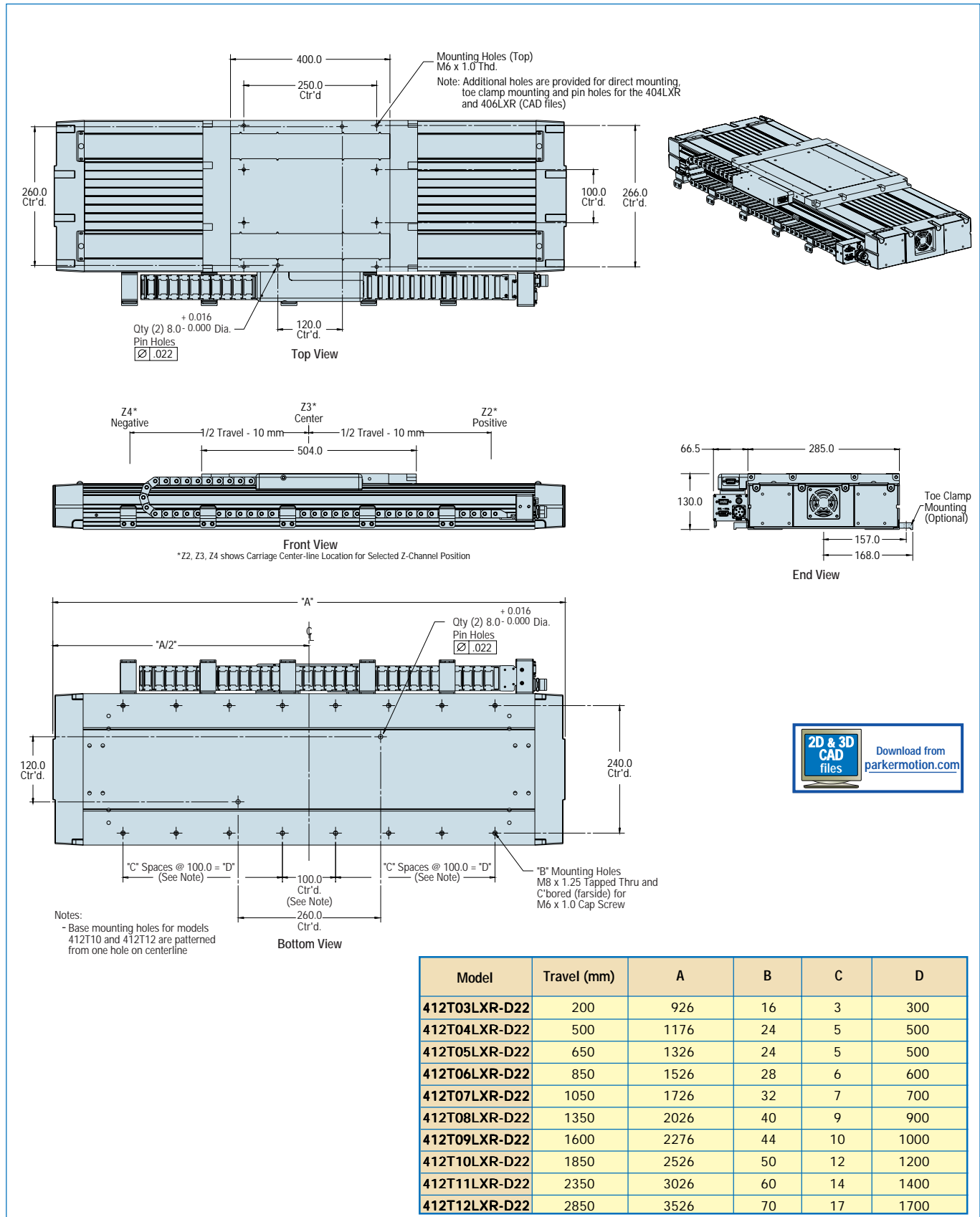


\* Extension Cable for pass through connection is available and can be ordered separately:  
 #006-1743-01 (3 meters); #006-1743-02 (7.5 meters).



412LXR-D22 Series Dimensions (mm)

24 Pole Iron Core Motor



412LXR - How to Order - 24 Pole Iron Core Motor

**Order Example**  
 412 T09 LXR M P D22 H3 L3 CM02 Z3 E2 R1 A40 P1 CL1

**Series** ..... 412

**Travel (mm)** 24 Pole Motor

200 ... T03    1600 ... T09  
 500 ... T04    1850 ... T10  
 650 ... T05    2350 ... T11  
 850 ... T06    2850 ... T12  
 1050 ... T07  
 1350 ... T08

**Model** ..... LXR

**Mounting (metric)** ..... M

**Grade**

Precision ..... P

**Drive Type**

Free Travel (No Motor) D6  
 24 Pole Motor ..... D22  
Refer to page A20 for 12 pole slotless motor drive.

**Home Sensor**

None-Free Travel (only) H1  
 N.C. Current Sinking .... H2  
 N.O. Current Sinking .... H3  
 N.C. Current Sourcing ... H4  
 N.O. Current Sourcing ... H5

**Limit Sensor**

None-Free Travel (only) L1  
 N.C. Current Sinking .... L2  
 N.O. Current Sinking .... L3  
 N.C. Current Sourcing ... L4  
 N.O. Current Sourcing ... L5

**Cable Management**

No Cables - Free Travel ..... CM01  
 Cable Transport Module (only) ..... CM02  
 3.0 m OEM Cable Set-FL ..... CM03  
 7.5 m OEM Cable Set-FL ..... CM04  
 3.0 m OEM Cable Set-Gemini..... CM05  
 7.5 m OEM Cable Set-Gemini..... CM06  
 Cable Trans Mod. w/3.0 m-FL\* ..... CM07  
 Cable Trans Mod. w/7.5 m-FL\* ..... CM08  
 Cable Trans Mod. w/3.0 m-Gemini\*... CM09  
 Cable Trans Mod. w/7.5 m-Gemini\*... CM10  
 3.0 m OEM Cable Set-Compax ..... CM20  
 7.5 m OEM Cable Set-Compax ..... CM21  
 Cable Trans Mod. w/3.0 m-Compax\* CM22  
 Cable Trans Mod. w/7.5 m-Compax\* CM23

**Cooling**

CL1 Convection cooling  
 CL2 Forced air cooling  
 CL3 Water cooling  
 CL4 Water cooling with external ass'y.

**Pinning Option**

P1 No multi-axis pinning  
 P2 X axis transfer pinning to Y or Z axis - 30 arc seconds  
 P3 Y axis transfer pinning to X axis - 30 arc seconds\*  
\*P3 Option includes a required 15 mm thick adapter.

**Digital Drive**

A1 No Drive  
 A40 Gemini Drive GV-H20E  
 A41 Gemini Controller/Drive GV6-H20E  
 A42 Gemini Controller/Drive GV6K-H20E  
 A50 Compax Drive S150-V4-F12-I10-T10  
 A51 Compax Indexer S150-V4-F12-I11-T11  
 A52 Compax Controller /Drive S150-V4-F12-I10-T30

**Environmental**

R1 Class 1000, Strip Seals  
 R2 Class 10 Cleanroom Prep

**Encoder Option**

E1 None  
 E2 1.0 µm Resolution - Optical  
 E3 0.5 µm Resolution - Optical  
 E4 0.1 µm Resolution - Optical  
 E5 5.0 µm Resolution - Optical  
 E7 Sine Output - Optical

**Z Channel Location\***

Z1 None  
 Z2 Positive End Position  
 Z3 Center Position  
 Z4 Negative End Position

\*Refer to dimension drawing on page A21.

Linear Motor Tables





## DXL Series Dual Carriage Linear Motor Table

### Features

- ❑ Independently driven dual carriages
- ❑ Outstanding carriage to carriage co-planar motion
- ❑ Ultra precise velocity control and responsiveness
- ❑ Selectable encoder resolutions down to 20 nanometers
- ❑ Tooling reference surface and dowel holes on each carriage



The DXL dual carriage positioning table provides a precision platform for controlled translation and positioning of two independent carriages on the same linear travel path. The DXL ensures superior carriage to carriage flatness and coplanar motion by providing a common precision ground base and bearing ways for both carriages. Each carriage is independently driven by a cogfree, ironless linear motor to minimize velocity ripple and optimize responsiveness to match a complex motion profile (refer to chart on page A25). Extremely high resolution linear encoders provide the critical position data that allows superior velocity control and responsiveness necessary to optimize the precision control of the moving carriages. The twin carriages can be programmed to move in tandem, in opposing directions or independently with or without any ratio between the carriages.

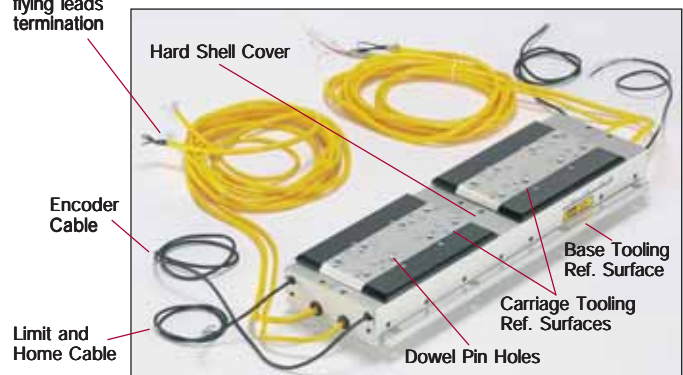
The DXL can be used in many precision motion applications but is especially effective for fiber optic industry applications where smooth, highly controlled velocity and motion path is employed for fusing fibers. Other applications include medical device manufacturing and imaging applications where focal distance must be precisely controlled.

Loaded with "ease of use" features, the DXL is designed to save time and effort. The DXL base includes a tooling edge parallel to the travel path. User tooling can be precisely located within 25 microns of the actual travel path of the positioner using the tooling reference features. A unique cover design prevents contamination (such as small fiber strands) from entering the positioner. The DXL is available with preconfigured digital servo drives that are compatible with all industry standard motion controllers. All DXL units ship complete with performance certification and laser interferometer test reports.

### Key Attributes

- Cogfree linear motors with no moving cables
- One base and bearing way sets - common to both carriages
- Extremely high resolution optical encoders with digital output
- Hardshell cover protects internal components (IP30)
- Home sensor aligned to encoder reference marker for precise homing
- Adjustable end of travel sensors
- Tooling reference surface is aligned within 25 microns of the actual travel path
- Cleanroom compatible

Motor and Hall effect cable with flying leads termination



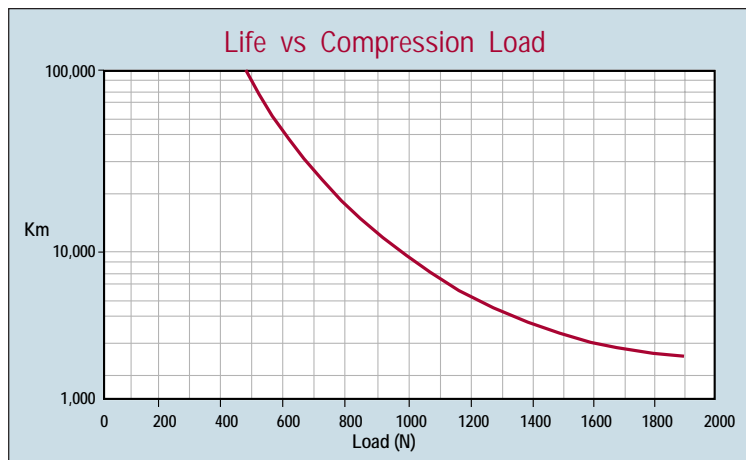
Specifications

Travel (Z-axis)	35 mm (per carriage – limit to limit)
Rated Load Capacity	150 Kg
Maximum Acceleration	2 Gs
Peak Force	44 N
Continuous Force	19 N
<b>Resolution</b>	
E2	1.0 µm digital encoder
E3	0.5 µm digital encoder
E4	0.1 µm digital encoder
E5	5.0 µm digital encoder
E7	Sine Output encoder
E8	0.02 µm digital encoder
<b>Positional Accuracy<sup>(1,2,4)</sup></b>	3 µm
<b>Positional Repeatability<sup>(1,2)</sup></b>	
1.0 µm digital encoder	+/-2 µm
0.5 µm digital encoder	+/-1 µm
0.1 µm digital encoder	+/-0.5 µm
5.0 µm digital encoder	+/-10 µm
Sine Output encoder	(interpolation dependent)
0.02 µm digital encoder	+/-0.3 µm
<b>Maximum Velocity</b>	
1.0 µm digital encoder	500 mm/sec <sup>(3)</sup>
0.5 µm digital encoder	500 mm/sec <sup>(3)</sup>
0.1 µm digital encoder	300 mm/sec
5 µm digital encoder	500 mm/sec
Sine Output encoder	500 mm/sec <sup>(3)</sup>
0.02 µm digital encoder	100 mm/sec
<b>Duty Cycle</b>	100%
<b>Linear Bearing – Coeff. of Friction</b>	0.01
<b>Flatness</b>	+/-2 µm
<b>Straightness</b>	+/-2 µm
<b>Unit Weight</b>	7.1 Kg
<b>Carriage Weight</b>	1.6 Kg
<b>Limit/Home Sensors</b>	Refer to page B15

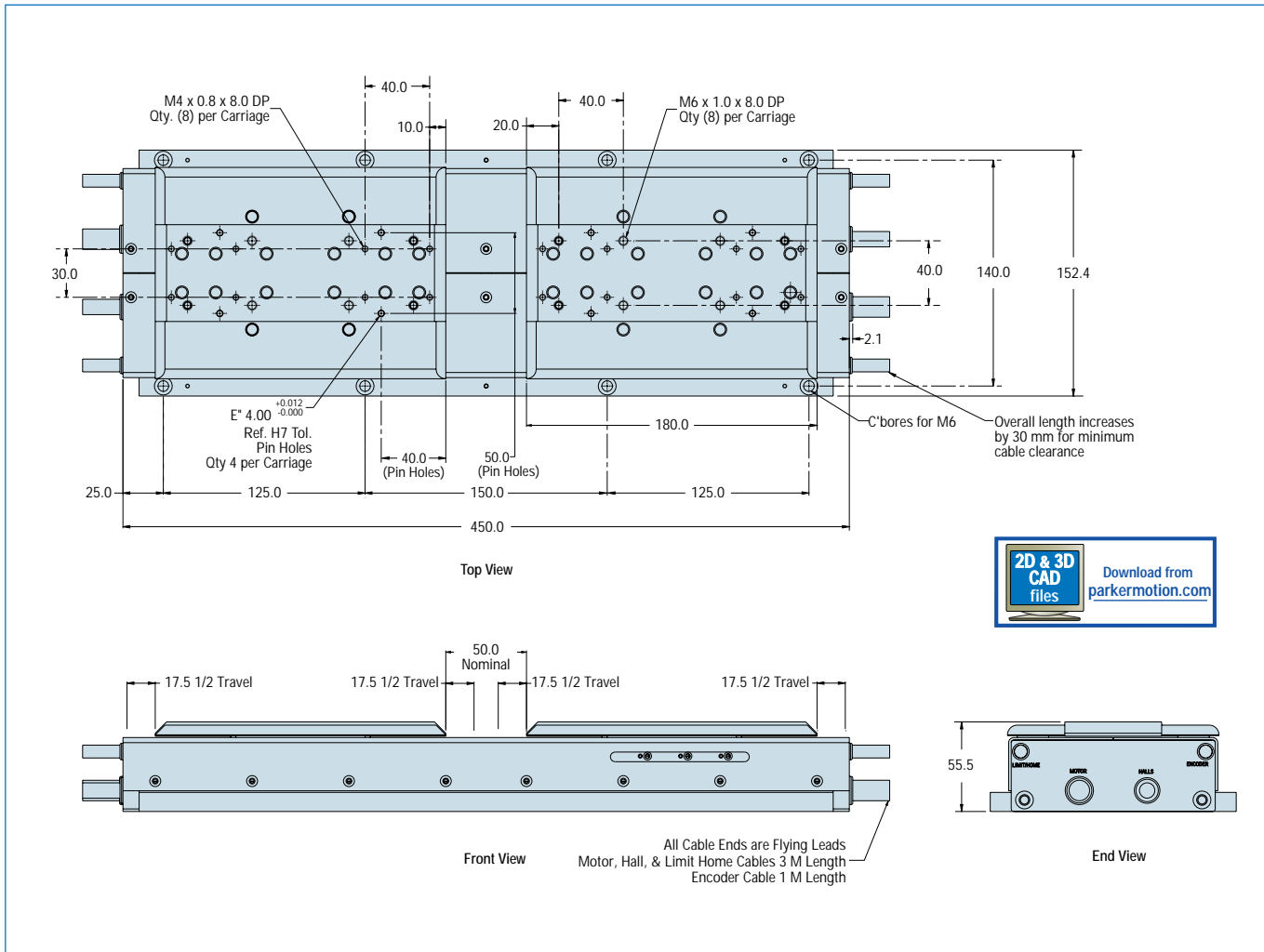
- 1 Measured at the carriage center, 35 mm off mounting surface.
- 2 With slope correction value provided.
- 3 Speed is limited due to acceleration limit (2g's) and total travel of stage (35 mm).  
 Higher speeds can be commanded but constant velocity will not be reached due to required acceleration distance.
- 4 Based on 0.1 micron or finer encoder resolution.

Table Life/Load Chart  
 Compression (normal load)

The graphs provide a preliminary evaluation of the support bearing life/load characteristics. The curves show the life/load relationship when the applied load is centered on the carriage, normal (perpendicular) to the carriage mounting surface. For final evaluation of life vs load, including off center, tension, and side loads refer to the charts and formulas found on pages B13 and B14.



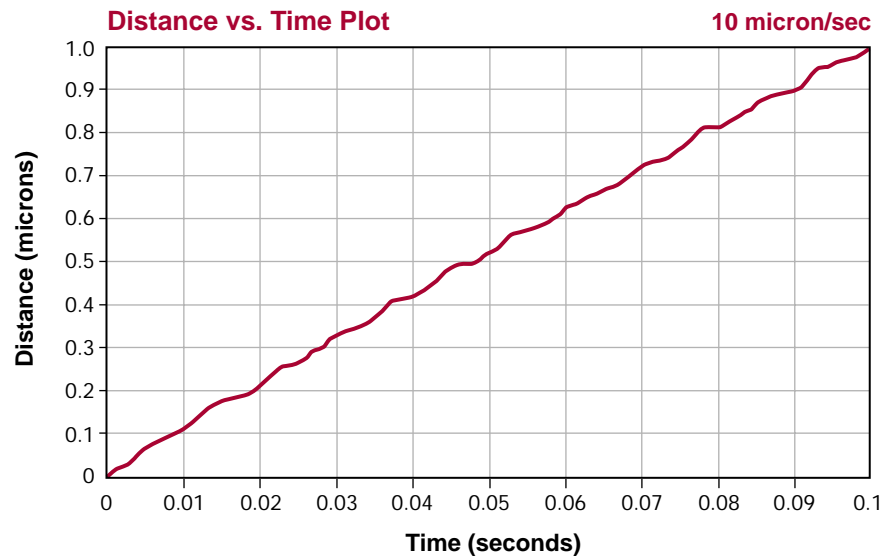
DXL Series Dimensions (mm)



Time/Distance Chart

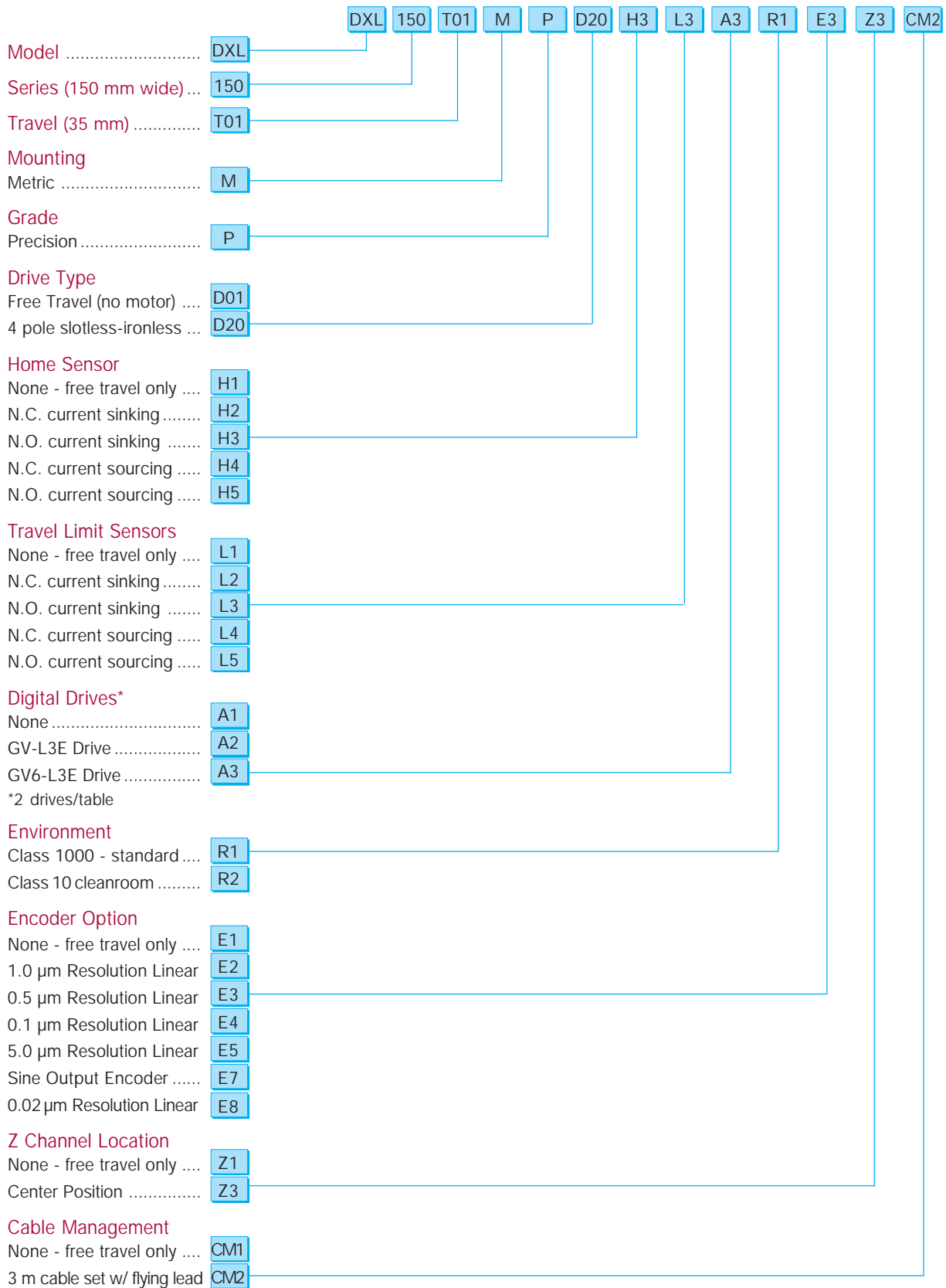
Distance against time (linear)

The linearity of this plot illustrates the precision constant velocity of the DXL150. Moving at a velocity of only 10 mm/second, the maximum position error does not exceed 40 nanometers. This plot shows displacement of 1 mm with a data capture rate of 1000 hz.



DXL Series How to Order

Order Example



Linear Motor Tables





## DM 1004 Direct Drive Rotary Tables

### Features

- Maximum velocity: 2.5 revs per second
- Axial and radial run-out of 0.01 mm
- Load capacity of 350 kg (770 lb.)
- Positional repeatability of 3 arc-sec.
- Faster settling time than a traditional servo motor and speed reducer system
- Smooth rotation at slow speeds
- Ability to operate in a position, speed or torque control mode
- Built-in test mode simplifies optimum tuning
- Class 10 cleanroom option



Parker's DM 1004 is a high performance direct drive rotary servo system which provides high accuracy and torque without the need of speed reducers. It consists of a brushless direct drive motor, a cross roller support bearing system, an integral optical encoder, a microprocessor-based drive, power supply, and a 10-foot motor-to-drive cable.

The highly efficient direct drive brushless motor design eliminates the need for a gear drive or other mechanical drive train. The result is long life, maintenance free operation. The cross roller bearing design can support up to 350 kg (770 lb) of compression load and 3,3 kg-m (24.4 ft-lb) of overhung load.

### Specifications

Units	DM1004B	DM1004C		
Performance				
Peak torque	ft-lbs (N-M)	3 (4)	3 (4)	
Rated speed	115 VAC	rps	2.5	2.5
	230 VAC	rps	2.5	2.5
Static axial load** (max)	Compression	lbs (kg)	440 (200)	770 (350)
	Tension	lbs (kg)	154 (70)	770 (350)
Static overhung load**	ft-lb (kg-m)	20 (2.7)	24.4 (3.3)	
Rotor inertia	oz-in <sup>2</sup> x 10 <sup>2</sup> (kgm <sup>2</sup> x 10 <sup>-3</sup> )	3.01 (5.5)	1.37 (2.5)	
Steps/rev (max)		655,360	655,360	
Motor weight*	lbs (kg)	6.6 (3)	6.6 (3)	
Repeatability		3 arc-sec (0.00139°)		
Accuracy		±60 arc-sec (0.0167°) standard ±20 arc-sec (0.00556°) (version available)		
Max. stepping rate		1,572,000 steps/sec		
Power		115 VAC 1-phase, or 230 VAC 1-phase, 50/60Hz		
Volts				
Range		+10% to -15%		
Current		5 amps max.		
Encoder output		400 kHz max.		
Inputs				
Command interface		Low going low pulse,		
Step input		8.5		
Direction		Logic high = CW rotation Logic high = CCW rotation		
Analog input		±10V velocity signal; ±8V torque signal		
Outputs		A/B encoder output 393 kHz max. Z-channel – 124 pulses/rev		
Encoder output				

#### Options:

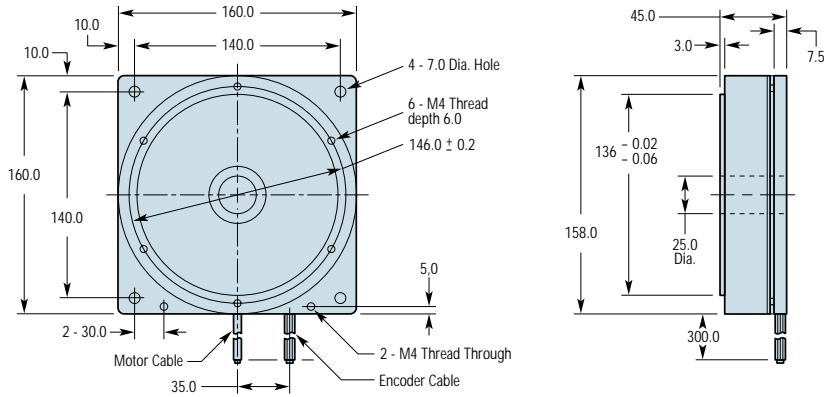
- Line filter for CE installations
- Interface cable for use with Parker motion controllers.
- Class 10 Cleanroom Preparation

\*Drive weight is 4 lb (1.8 kg).  
 \*\*Static loads should be derated as shown under the following conditions:  
 smooth rotary motion: 1/3  
 intermittent press loading: 1/5  
 repetitive shock loads: 1/10

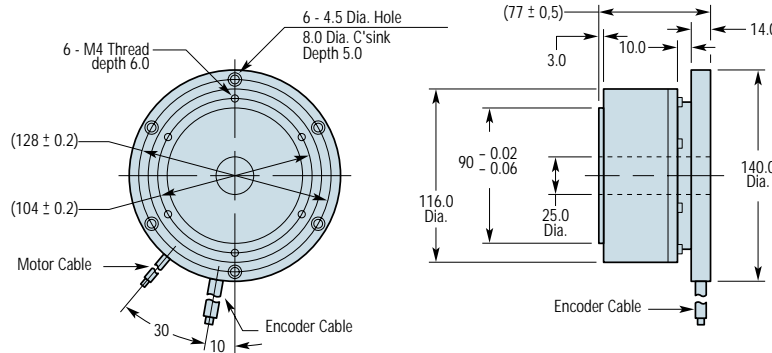
Dimensions



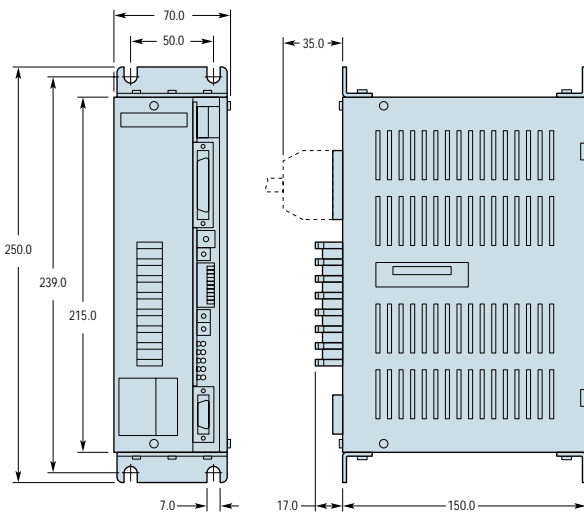
DM1004B  
 Dimensions (mm)



DM1004C  
 Dimensions (mm)

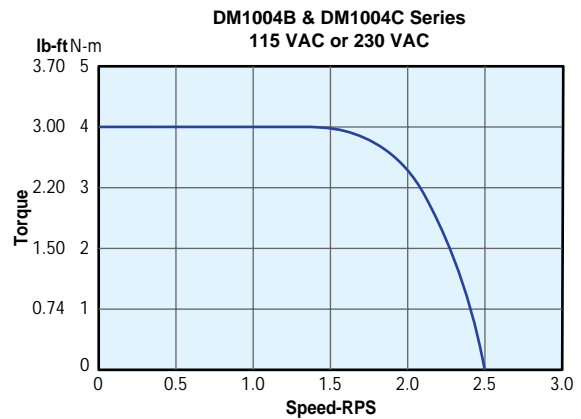


DM1004B & DM1004C Drive Dimensions  
 Dimensions (mm)



Speed/Torque Curve

The speed/torque curves represent peak torque available; continuous torques are approximately 2/3 of the peak value.



For additional specifications or information on other Parker direct drive "Dynaserv" rotary units, go to [www.parkermotion.com](http://www.parkermotion.com)