



Combining Today's Best Technologies

For Tomorrow's Break Through Discoveries

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## XE Economy

### Linear Positioners

Catalog 2006/US



## Reliable, Cost Effective Positioning

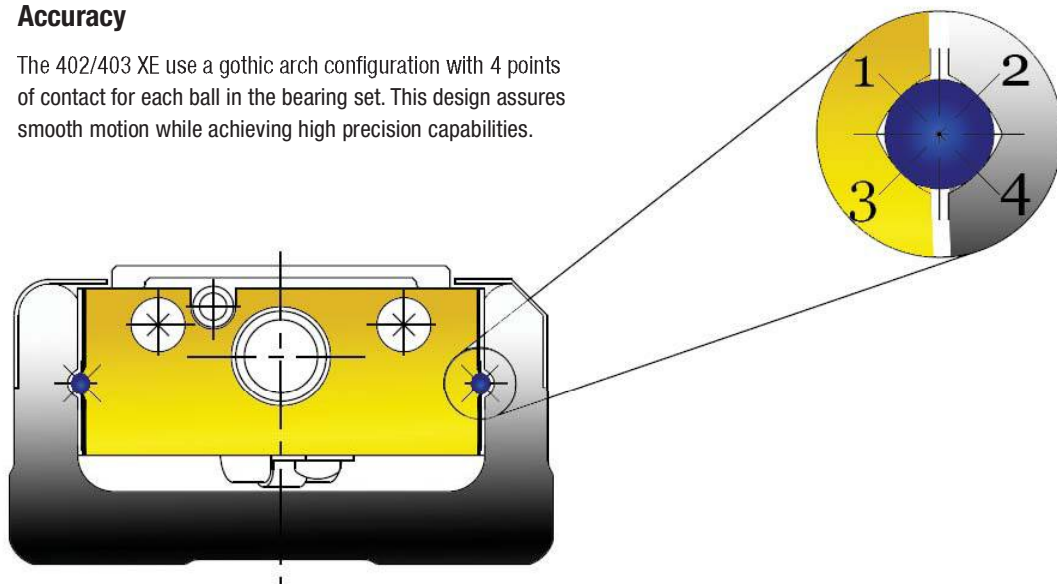
The 402/403XE series of positioners combine a rugged steel body construction with an integrated precision ball screw and bearing guide producing a highly accurate, cost effective line of positioners ideal for applications in the hard disk, semiconductor, medical, machine building and as well as many other industries.

### Features

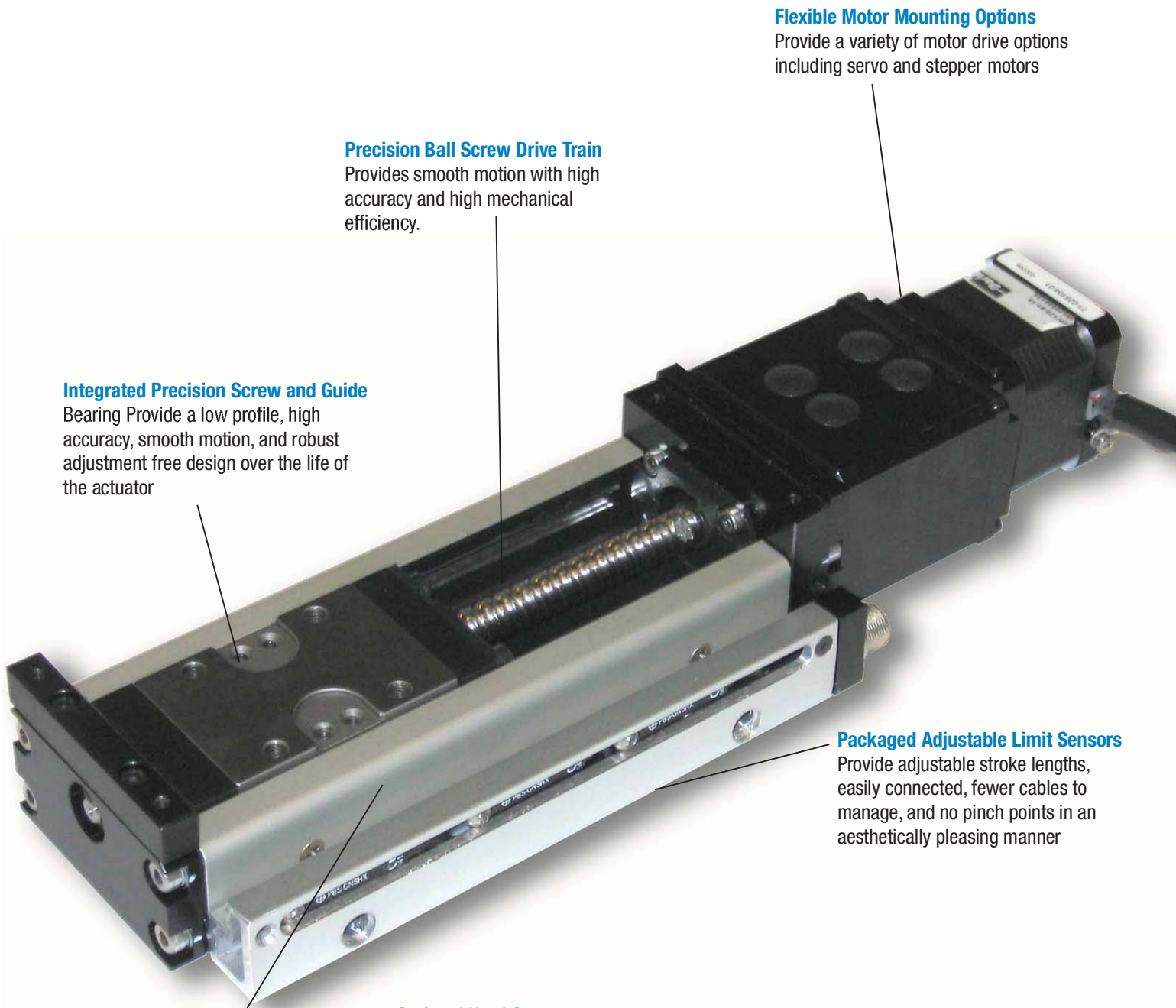
- Integrated Bearing
- Rigid Steel body
- Significant force per dollar value
- Easily integrated into multi-axis designs
- Adjustment free

### Accuracy

The 402/403 XE use a gothic arch configuration with 4 points of contact for each ball in the bearing set. This design assures smooth motion while achieving high precision capabilities.



402/403XE Series



**Flexible Motor Mounting Options**  
Provide a variety of motor drive options including servo and stepper motors

**Precision Ball Screw Drive Train**  
Provides smooth motion with high accuracy and high mechanical efficiency.

**Integrated Precision Screw and Guide Bearing**  
Provide a low profile, high accuracy, smooth motion, and robust adjustment free design over the life of the actuator

**Packaged Adjustable Limit Sensors**  
Provide adjustable stroke lengths, easily connected, fewer cables to manage, and no pinch points in an aesthetically pleasing manner

**Optional Hard Cover**  
Clear anodized Provides protection from contamination falling into the positioner.

**Rigid Steel U-Channel Body**  
Provides structural rigidity for minimal deflection.





## 402XE Series Positioning Tables

Common Performance Specifications		
Repeatability	+/- 5	μ
Flatness	15	μ
Straightness	15	μ
Breakaway Torque	0.06	Nm
Maximum Input Speed	90	RPS
Maximum Normal Load	90	Kg
Maximum Inverted Load	90	Kg
Static Permissible Pitch Moment	46	N-m
Static Permissible Roll Moment	134	N-m
Static Permissible Yaw Moment	51	N-m
Torsional Pitch Stiffness	17.7	Arc Second/Nm
Torsional Yaw Stiffness	11.8	Arc Second/Nm
Torsional Roll Stiffness	5.9	Arc Second/Nm
Input Shaft Diameter	5	mm
Drive Screw Diameter	8	mm
Drive Screw Efficiency	90	%
Linear Bearing Coefficient of friction	0.01	



402XE WITH 2MM LEAD					
Specification	Unit	T01 (70MM)	T02 (120MM)	T03 (170MM)	T04 (220MM)
Accuracy over travel	μ	70	75	85	90
Input Inertia	Kg-m <sup>2</sup>	6.07E-07	7.64E-07	9.21E-07	1.08E-06
Moment of Inertia X of Guide Rail	mm <sup>4</sup>	1.44E+04	1.44E+04	1.44E+04	1.44E+04
Moment of Inertia Y of Guide Rail	mm <sup>4</sup>	1.37E+05	1.37E+05	1.37E+05	1.37E+05
Weight of Total Table	Kg	1.00+	1.21+	1.41+	1.61+
Weight of Carriage	Kg	0.14	0.14	0.14	0.14
402XE WITH 5MM LEAD					
Accuracy over travel	μ	70	75	85	90
Input Inertia	Kg-m <sup>2</sup>	6.96E-07	8.53E-07	1.01E-06	1.17E-06
Moment of Inertia X of Guide Rail	mm <sup>4</sup>	1.44E+04	1.44E+04	1.44E+04	1.44E+04
Moment of Inertia Y of Guide Rail	mm <sup>4</sup>	1.37E+05	1.37E+05	1.37E+05	1.37E+05
Weight of Total Table	Kg	1.00+	1.21+	1.41+	1.61+

Other Specifications	
Repeatability of home sensor	100 μ MAX
Maximum Acceleration	2g's
Allowable Duty Cycle	100%
IP Rating	20

## 402/403XE Series

### 403XE Series Positioning Tables

Common Performance		
Repeatability	+/- 5	μ
Breakaway Torque	0.15	Nm
Static Permissible Pitch Moment	101	N-m
Static Permissible Roll Moment	260	N-m
Static Permissible Yaw Moment	120	N-m
Input Shaft Diameter	6	mm
Drive Screw Diameter	10	mm
Drive Screw Efficiency	90	%
Linear Bearing Coefficient of friction	0.01	
Moment of Inertia X of Guide Rail	1.44E+04	mm <sup>4</sup>
Moment of Inertia Y of Guide Rail	1.37E+05	mm <sup>4</sup>



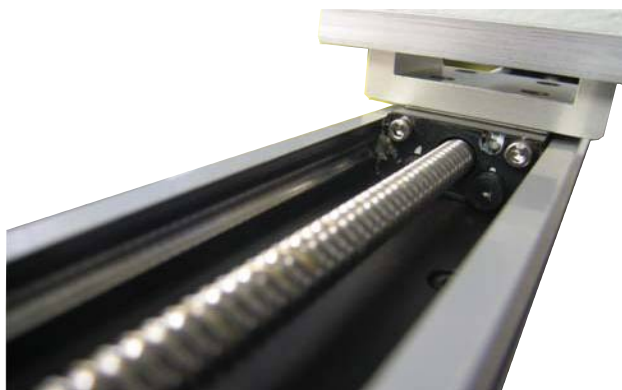
403XE WITH 5MM LEAD		T01 (55MM)	T02 (105MM)	T03 (205MM)	T04 (305MM)	T05 (405MM)	T06 (505MM)	T07 (605MM)	T08 (655MM)
Specification	Units								
Travel Accuracy	μ	70	80	90	95	100	110	120	
Flatness	μ	15	15	15	15	25	25	25	
Straightness	μ	15	15	15	15	25	25	25	
Maximum Input Speed	RPS	80	80	80	80	80	80	60	
Maximum Normal Load	Kg	160	160	160	160	160	160	160	Not Available
Maximum Inverted Load	Kg	160	160	160	160	160	80	80	
Input Inertia	Kg-m <sup>2</sup>	1.65E-06	2.03E-06	2.80E-06	3.56E-06	4.33E-06	5.10E-06	5.87E-06	
Weight of Carriage	Kg	0.3	0.3	0.3	0.3	0.3	0.3	0.3	
Weight of Total Table	Kg	1.6+	1.90+	2.6+	3.3+	3.9+	4.6+	5.2+	
403XE WITH 10MM LEAD									
Accuracy over travel	μ	70	80	90	95	100	110	120	130
Flatness	μ	15	15	15	15	25	25	25	25
Straightness	μ	15	15	15	15	25	25	25	15
Maximum Input Speed	RPS	80	80	80	80	80	80	60	42
Maximum Normal Load	Kg	160	160	160	160	160	160	160	90
Maximum Inverted Load	Kg	160	160	160	160	160	160	160	90
Input Inertia	Kg-m <sup>2</sup>	2.22E-06	2.61E-06	3.37E-06	4.14E-06	4.91E-06	5.67E-06	6.44E-06	6.82E-06
Weight of Carriage	Kg	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.14
Weight of Total Table	Kg	1.6+	1.90+	2.6+	3.3+	3.9+	4.6+	5.2+	5.6

Other Specifications	
Home sensor Repeatability	100 μ
Maximum Acceleration	2g's
Allowable Duty Cycle	100%
IP Rating	20



### Additional Options/Features

Flexibility with motor mounting options, hard cover options, application specific custom carriage plates, clean connectorized aesthetically pleasing limit sensors, a variety of standard stroke lengths, and pre-engineered ready to order transition plates for XY systems help make the XE a custom engineered solution for many linear positioning needs.



#### Low Profile Design

The highly integrated ball screw 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 402/403 XE is significantly stiffer than most aluminum body positioners. Savings from reduced support structure can be realized.



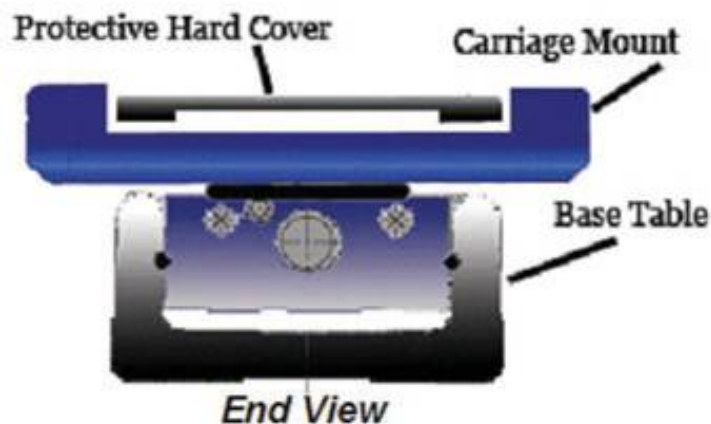
#### Motor Mounting Flexibility

With standard options for the Nema 17, Nema 16, Nema 23, and other Parker Automation motors, the 402/403 XE 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 most other manufacturers motors as well.



#### Hard Cover Protection

For added protection to the bearing system and drive train an optional hard cover is available. This will bring the positioner to an IP 20 rating and prevent large particles from entering and damaging the screw or bearings.



#### Cleanroom & Raydent Coatings

When ordered with the cleanroom option the XE will come factory prepared for most cleanroom applications. Along with the cleanroom lubrication, the XE offers an optional Raydent surface coating which protects against rust on the steel components for more than 10 years.

## 402/403XE Series

### Limit Sensors

#### Packaged Limit Sensors

Flexibility in limit switch options allows the customer to choose between a complete limit switch kit assembly and a standard limit switch kit mounted on the side of the tables. This flexibility is further extended with NPN, PNP, normally open, and normally closed limit options. With our unmatched design no pinch points exist between the limit sensors and target. The 402/403XE limit sensor kit design allows the limits to be adjustable along the travel length of the positioner.

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 (N.O.), normally closed (N.C.), current sinking (NPN) and current sourcing (PNP) variations are selectable with the product. 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.

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

	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.O.	N.O.	N.C.	N.O.
Logic	NPN	NPN	PNP	PNP	NPN	NPN	PNP	PNP
Operating Voltage	10-30 VDC							
Voltage Drop	2.5 VDC Max							
Continuous Current	100 mA							
Repeatability	100 $\mu$ Max							
Reverse Polarity Protection	Yes							
Short Circuit Protection	Yes							
Power-Up Pulse Suppression	Yes							
Enclosure Rating	IP67							
Operating Temperature	-25°C to +75°C							
Cable Length	3.0 m from Switch				3.0 m from end of Sensor Pack			

#### 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

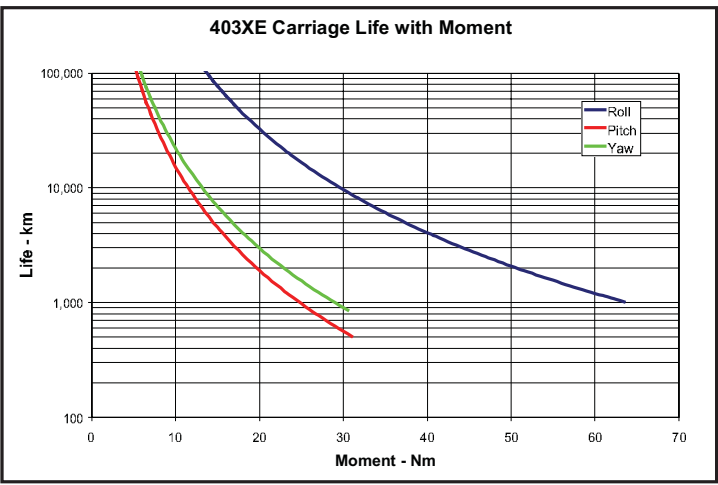
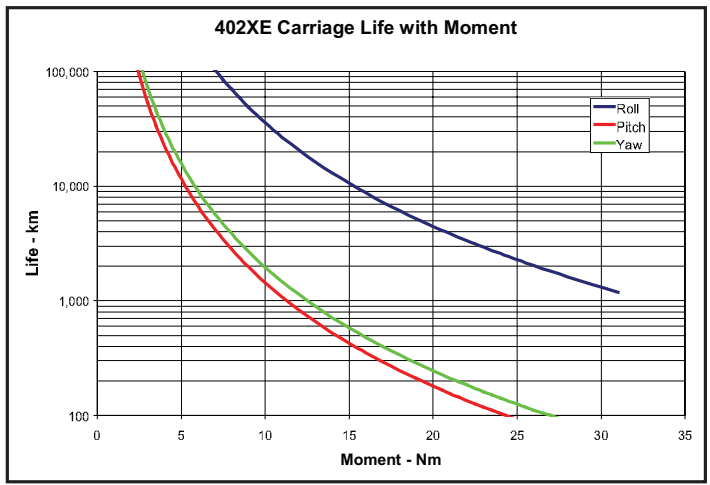
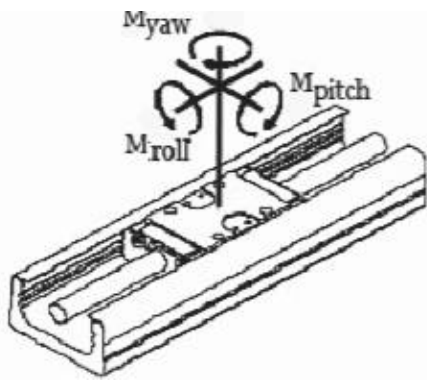
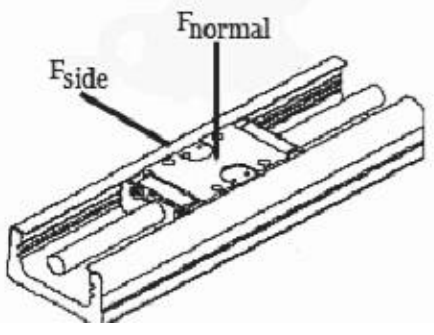
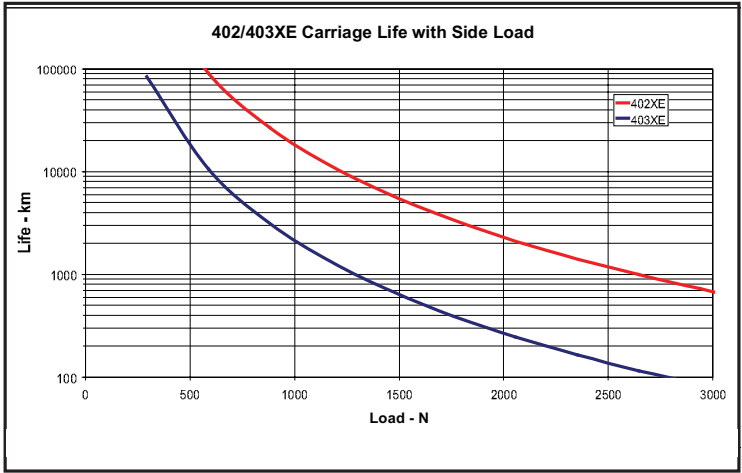
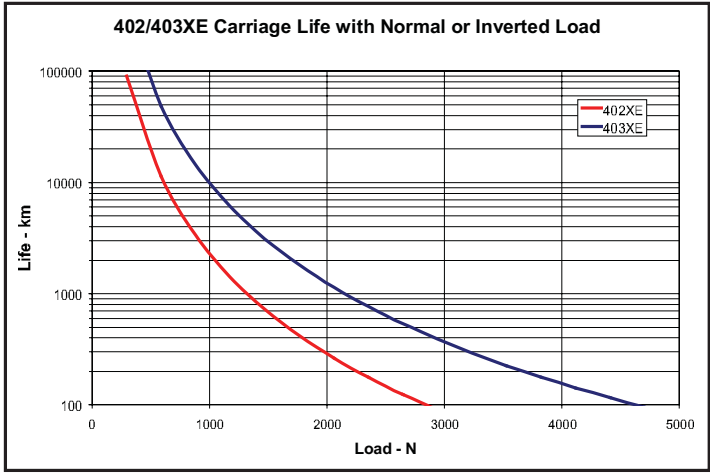
Input Power	10-30VDC
Voltage Drop	$\leq$ 2.5V
Cnt. Current	100mA
Electrical Protection	Short Circuit, Reverse Polarity, and Power Up Pulse Suppression
Enclosure	IP67 Rated Polyamide Housing with PVC Cable Jacket
Wire Colors	Brown – Power (+) Black – Signal Blue – Ground (-)
Cable Length	3.0 meter to flying leads

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



### Engineering Reference Section

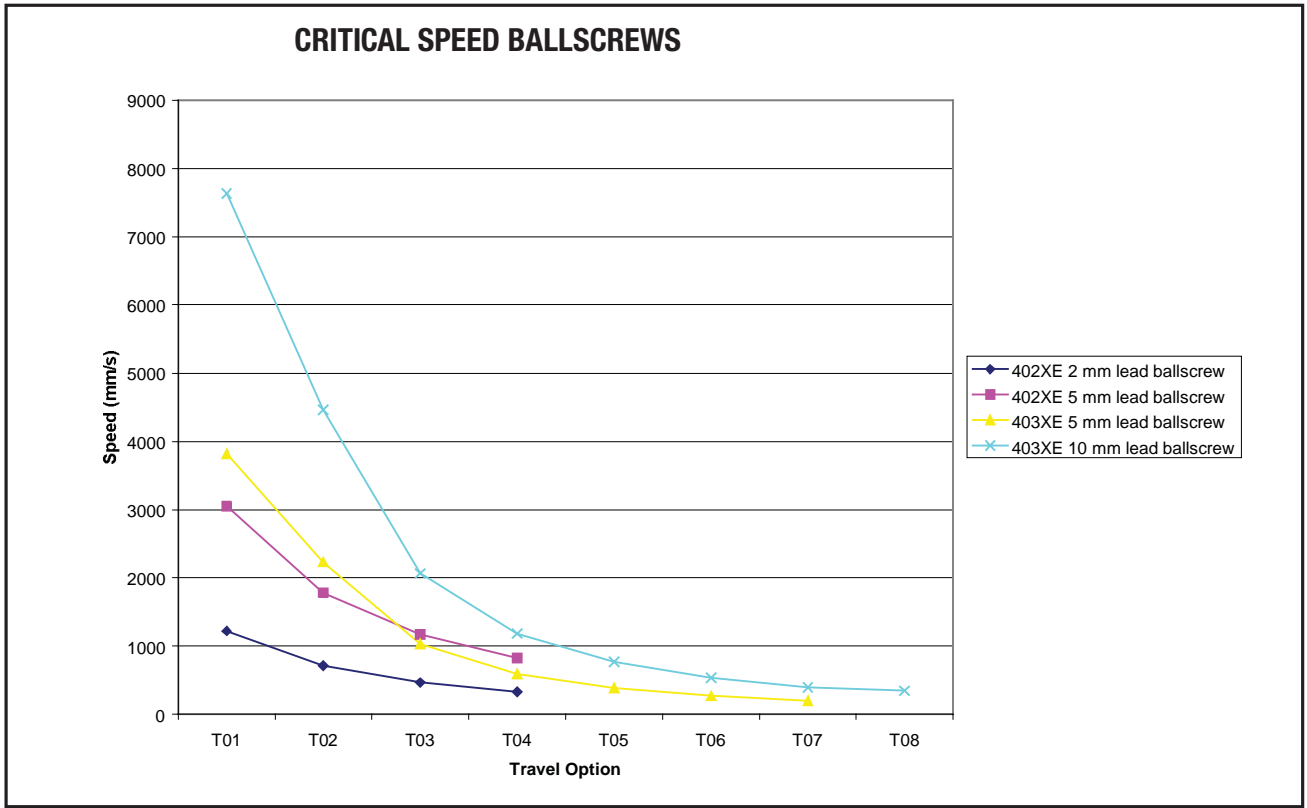
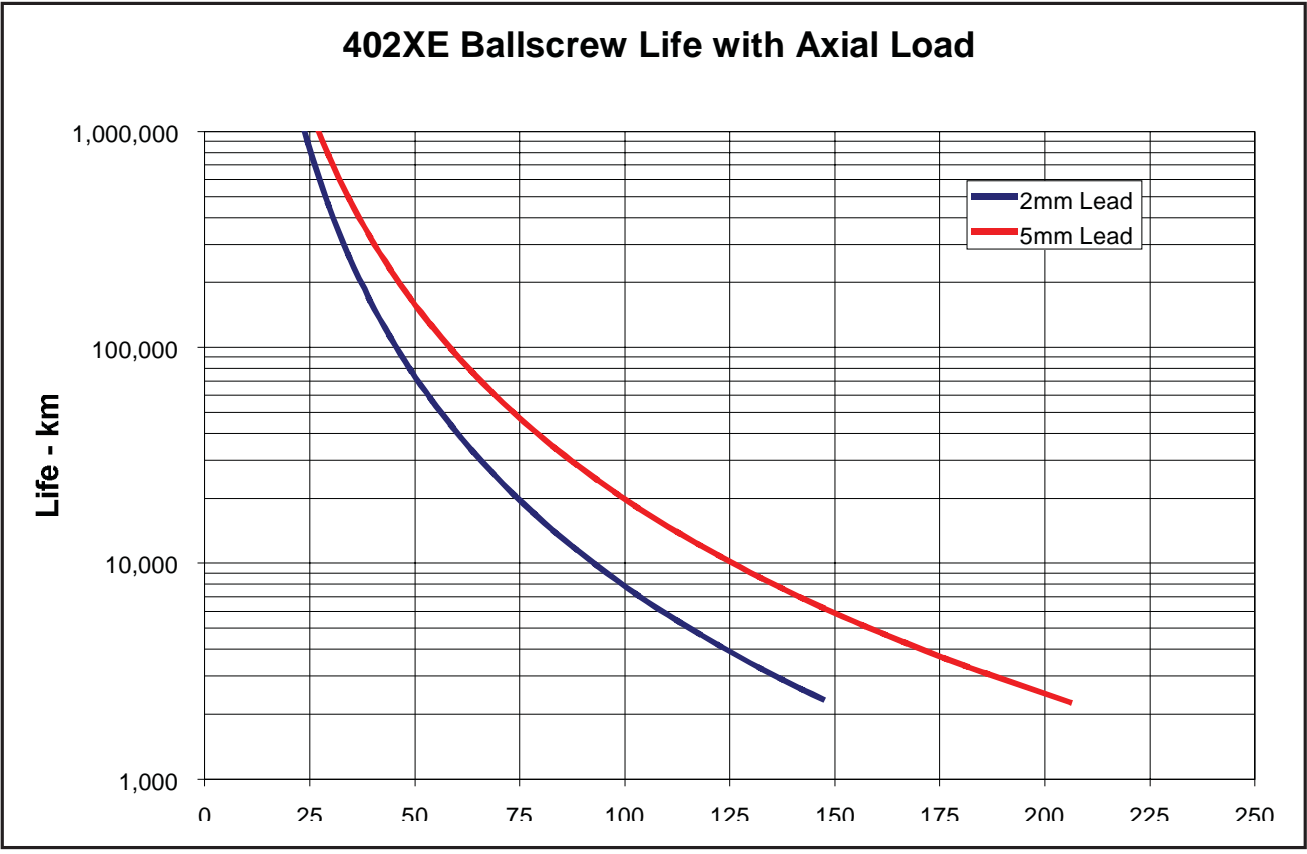
The following performance information is provided as a supplement to the product specification pages. The following graphs are used to establish the table life relative to the applied loads. The useful life of a linear table at full catalog specifications is dependent on the forces acting upon it. These forces include both static components resulting from payload weight, and dynamic components due to acceleration/deceleration of the load. In multi-axes applications, the primary positioner at the bottom of the stack usually establishes the load limits for the combined axes. When determining life/load, it is critical to include the weight of all positioning elements that contribute to the load supported by the primary axis.



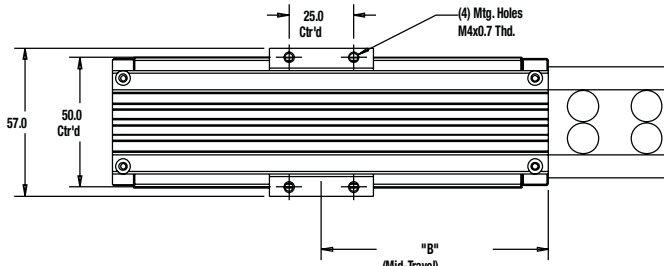


402/403XE Series

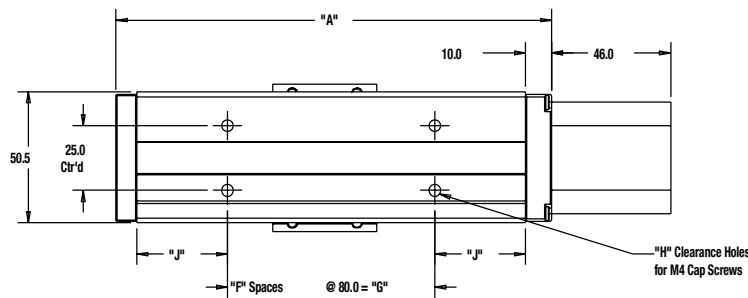
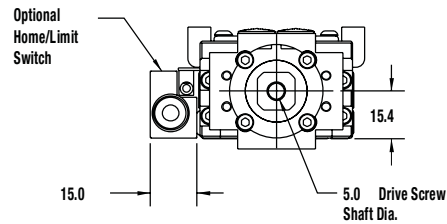
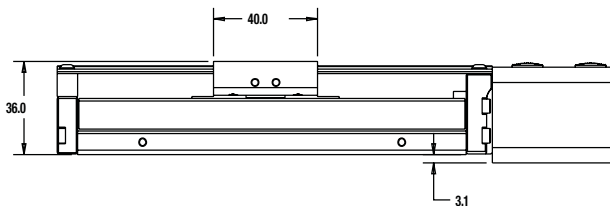
Engineering Reference Section



## 402 Dimensions

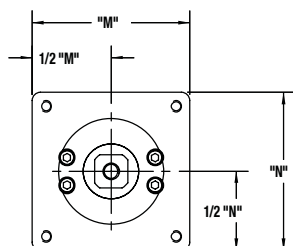
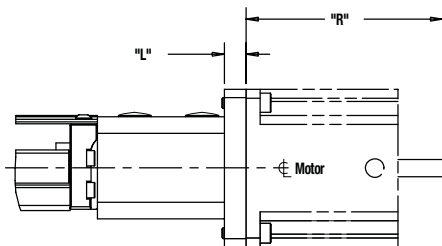
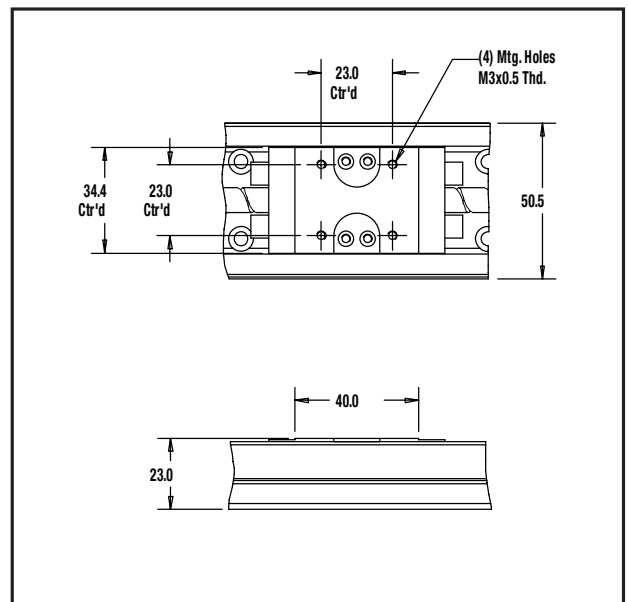


Order Code	Travel	"A"	"B"	"F"	"G"	"H"	"J"
T01	70mm	168.0	87.5	1	80.0	4	35.0
T02	120mm	218.0	112.5	2	160.0	6	20.0
T03	170mm	268.0	137.5	2	160.0	6	45.0
T04	220mm	318.0	162.5	3	240.0	8	30.0



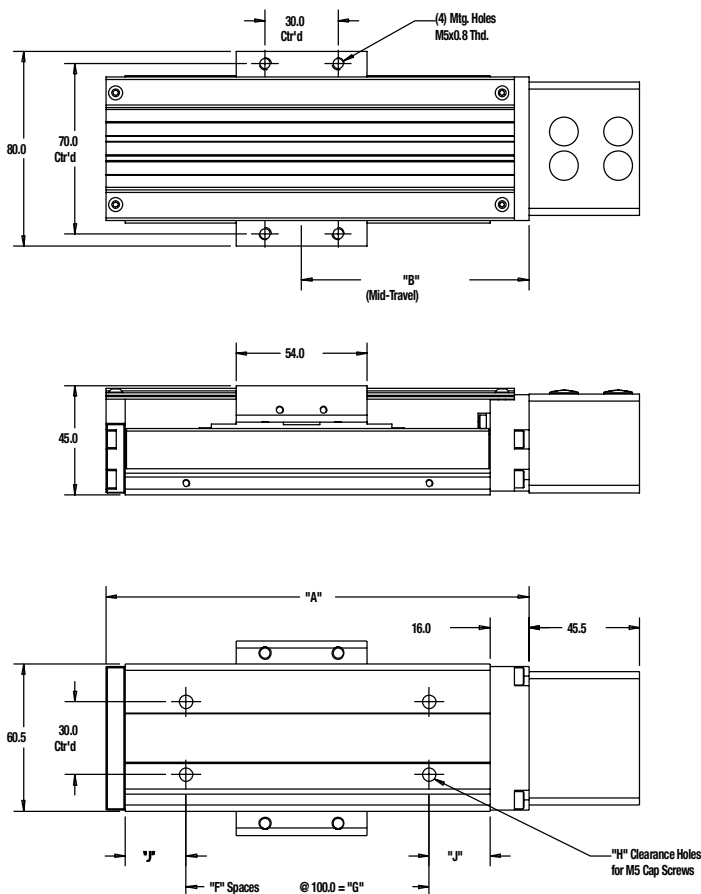
Motor Option	Motor or Motor Size	L	M	N	R
M2	SM16/BE16	8.0	40.6	40.6	N/A
M3	NEMA23/SM23	8.0	57.2	57.2	N/A
M37	NEMA17	8.0	55.0	40.6	N/A
M41	SM162AQ-NPSN	8.0	40.6	40.6	136.7
M46	HV232-02-10	8.0	57.2	57.2	71.1
M61	BE23	15.0	57.2	57.2	N/A

Without Hardcover

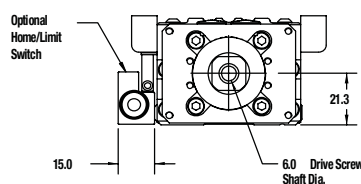


402/403XE Series

403 Dimensions

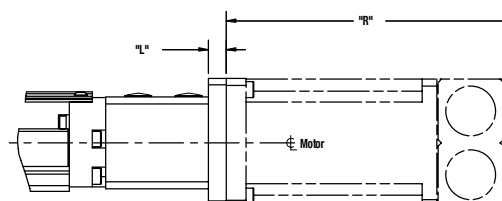
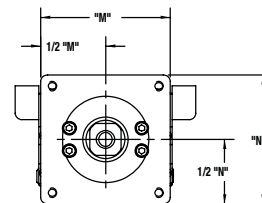
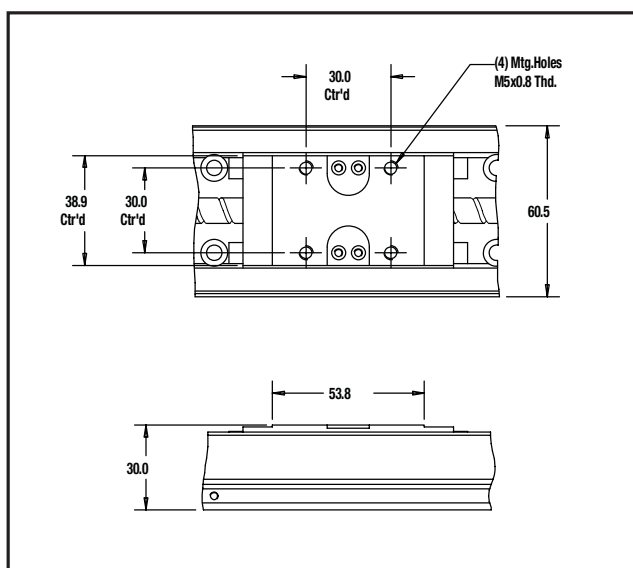


Order Code	Travel	"A"	"B"	"F"	"G"	"H"	"J"
T01	55mm	174.0	93.5	1	100.0	4	25.0
T02	105mm	224.0	118.5	1	100.0	4	50.0
T03	205mm	324.0	168.5	2	200.0	6	50.0
T04	305mm	424.0	218.5	3	300.0	8	50.0
T05	405mm	524.0	268.5	4	400.0	10	50.0
T06	505mm	624.0	318.5	5	500.0	12	50.0
T07	605mm	724.0	368.5	6	600.0	14	50.0
T08	655mm	774.0	393.5	7	700.0	16	25.0



Motor Option	Motor or Motor Size	L	M	N	R
M2	SM16/BE16	8.0	40.6	40.6	N/A
M3	NEMA23/SM23	8.0	57.2	57.2	N/A
M37	NEMA17	8.0	55.0	40.6	N/A
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	N/A

Without Hardcover



## 402XE How to order



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

**Model Series**

402 (50 mm)..... **402**

**Travel**

70 mm..... **T01**<sup>2</sup>

120 mm..... **T02**

170 mm..... **T03**

220 mm..... **T04**

**Family**

XE Series..... **XE**

**Grade**

Standard Grade..... **S**

**Drive Srew**

5 mm..... **D2**

2 mm..... **D9**

**Home Sensor**

No home sensor ..... **H1**

N.C. sinking, flying leads ..... **H2**

N.O. sinking, flying leads ..... **H3**

N.C. sourcing, flying leads ..... **H4**

N.O. sourcing, flying leads ..... **H5**

N.C. sinking, sensor pack ..... **H11**<sup>1</sup>

N.O. sinking, sensor pack ..... **H12**<sup>1</sup>

N.C. sourcing sensor pack ..... **H13**<sup>1</sup>

N.O. sourcing sensor pack ..... **H14**<sup>1</sup>

**Limit Sensor**

None..... **L1**

N.C. sinking, flying leads ..... **L2**

N.O. sinking, flying leads ..... **L3**

N.C. sourcing, flying leads ..... **L4**

N.O. sourcing, flying leads ..... **L5**

N.C. sinking, sensor pack ..... **L11**

N.O. sinking, sensor pack ..... **L12**

N.C. sourcing sensor pack ..... **L13**

N.O. sourcing sensor pack ..... **L14**

**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

**Environmental Options**

**R11** Hard Cover

**R12** Hard Cover, Cleanroom prep

**R13** No Cover

**R14** No Cover, Cleanroom prep

**Motor Coupling**

**C1** Not required

**C2** 0.25" Oldham

**C3** 0.25" Bellows

**C24** 5mm Oldham

**C25** 5mm Bellows

see pricelist for complete list of options

**Motor Mount**

**M1** MTR Block coupling housing only

**M2** MTR Block assembly SM16

**M3** MTR Block assembly NEMA 23

**M37** MTR Block assembly NEMA 17

**M41** SM162AQ-NPSN motor mounted

**M46** HV232-02-10 Stepper motor mounted

**Notes:**

1. Must Be Ordered with L11, L12, L13, or L14 Limit Option
2. Limited to H1L2, H1L3, H1L4, H1L5, H1L1, or H2L1, H3L1, H4L1, or H5L1 Home and Limit Options

402/403XE Series

403XE How to order

Order Example:

403 T04 XE S D2 H3 L4 M4 C3 R13 P1

<b>Model Series</b>	
403 (60 mm).....	<b>403</b>
<b>Travel</b>	
55 mm.....	<b>T01</b> <sup>3</sup>
105 mm.....	<b>T02</b> <sup>3</sup>
205 mm.....	<b>T03</b>
305 mm.....	<b>T04</b>
405 mm.....	<b>T05</b>
505 mm.....	<b>T06</b>
605 mm.....	<b>T07</b>
655 mm (only D3).....	<b>T08</b> <sup>1</sup>
<b>Family</b>	
XE Series.....	<b>XE</b>
<b>Grade</b>	
Standard .....	<b>S</b>
<b>Drive Screw</b>	
5 mm.....	<b>D2</b>
10 mm.....	<b>D3</b>
<b>Home Sensor</b>	
No home sensor .....	<b>H1</b>
N.C. sinking, flying leads .....	<b>H2</b>
N.O. sinking, flying leads .....	<b>H3</b>
N.C. sourcing, flying leads .....	<b>H4</b>
N.O. sourcing, flying leads.....	<b>H5</b>
N.C. sinking, sensor pack .....	<b>H11</b> <sup>2</sup>
N.O. sinking, sensor pack .....	<b>H12</b> <sup>2</sup>
N.C. sourcing sensor pack .....	<b>H13</b> <sup>2</sup>
N.O. sourcing sensor pack .....	<b>H14</b> <sup>2</sup>
<b>Limit Sensor</b>	
None.....	<b>L1</b>
N.C. sinking, flying leads .....	<b>L2</b>
N.O. sinking, flying leads .....	<b>L3</b>
N.C. sourcing, flying leads .....	<b>L4</b>
N.O. sourcing, flying leads .....	<b>L5</b>
N.C. sinking, sensor pack .....	<b>L11</b>
N.O. sinking, sensor pack .....	<b>L12</b>
N.C. sourcing sensor pack .....	<b>L13</b>
N.O. sourcing sensor pack .....	<b>L14</b>

**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

**Environmental Optional**

- R11** Hard Cover
- R12** Hard Cover, Cleanroom prep.
- R13** No Cover
- R14** No Cover, Cleanroom prep.

**Motor Coupling**

- C1** Not required
- C2** 0.25" Oldham
- C3** 0.25" Bellows
- C4** .375 Oldham
- C5** .375 Bellows
- C24** 5mm Oldham
- C25** 5mm Bellows

**Motor Mount**

- M1** MTR Block coupling housing only
- M2** MTR Block assembly SM16
- M3** MTR Block assembly NEMA 23
- M37** MTR Block assembly NEMA 17
- M41** SM162AQ-NPSN motor mounted
- M46** HV232-02-10 Stepper motor mounted
- M61** BE23 Motor mount

**Notes:**

1. Only Available with D3 Drive Option
2. Must Be Ordered with L11, L12, L13, or L14 Limit Option
3. Limited to H1L2, H1L3, H1L4, H1L5, H1L1, or H2L1, H3L1, H4L1, or H5L1 Home and Limit Options

## Offer of Sale

The items described in this document and other documents or descriptions provided by Parker Hannifin Corporation, its subsidiaries and its authorized distributors are hereby offered for sale at prices to be established by Parker Hannifin Corporation, its subsidiaries and its authorized distributors. This offer and its acceptance by any customer ("Buyer") shall be governed by all of the following Terms and Conditions. Buyer's order for any such item, when communicated to Parker Hannifin Corporation, its subsidiary or an authorized distributor ("Seller") verbally or in writing, shall constitute acceptance of this offer.

1. **Terms and Conditions of Sale:** All descriptions, quotations, proposals, offers, acknowledgments, acceptances and sales of Seller's products are subject to and shall be governed exclusively by the terms and conditions stated herein. Buyer's acceptance of any offer to sell is limited to these terms and conditions. Any terms or conditions in addition to, or inconsistent with those stated herein, proposed by Buyer in any acceptance of an offer by Seller, are hereby objected to. No such additional, different or inconsistent terms and conditions shall become part of the contract between, Buyer and Seller unless expressly accepted in writing by Seller. Seller's acceptance of any offer to purchase by Buyer is expressly conditional upon Buyer's assent to all the terms and conditions stated herein, including any terms in addition to, or inconsistent with those contained in Buyer's offer. Acceptance of Seller's products shall in all events constitute such assent.

2. **Payment:** Payment shall be made by Buyer net 30 days from the date of delivery of the items purchased hereunder. Amounts not timely paid shall bear interest at the maximum rate permitted by law for each month or portion thereof that the Buyer is late in making payment. Any claims by Buyer for omissions or shortages in a shipment shall be waived unless Seller receives notice thereof within 30 days after Buyer's receipt of the shipment.

3. **Delivery:** Unless otherwise provided on the face hereof, delivery shall be made F.O.B. Seller's plant. Regardless of the method of delivery, however, risk of loss shall pass to Buyer upon Seller's delivery to a carrier. Any delivery dates shown are approximate only and Seller shall have no liability for any delays in delivery.

4. **Warranty:** Seller warrants that the items sold hereunder shall be free from defects in material or workmanship for a period of 18 months from date of shipment from Parker Hannifin Corporation. THIS WARRANTY COMPRISES THE SOLE AND ENTIRE WARRANTY PERTAINING TO ITEMS PROVIDED HEREUNDER. SELLER MAKES NO OTHER WARRANTY, GUARANTEE, OR REPRESENTATION OF ANY KIND WHATSOEVER. ALL OTHER WARRANTIES, INCLUDING BUT NOT LIMITED TO, MERCHANTABILITY AND FITNESS FOR PURPOSE, WHETHER EXPRESS, IMPLIED, OR ARISING BY OPERATION OF LAW, TRADE USAGE, OR COURSE OF DEALING ARE HEREBY DISCLAIMED.

NOTWITHSTANDING THE FOREGOING, THERE ARE NO WARRANTIES WHATSOEVER ON ITEMS BUILT OR ACQUIRED WHOLLY OR PARTIALLY, TO BUYER'S DESIGNS OR SPECIFICATIONS.

5. **Limitation of Remedy:** SELLER'S LIABILITY ARISING FROM OR IN ANY WAY CONNECTED WITH THE ITEMS SOLD OR THIS CONTRACT SHALL BE LIMITED EXCLUSIVELY TO REPAIR OR REPLACEMENT OF THE ITEMS SOLD OR REFUND OF THE PURCHASE PRICE PAID BY BUYER, AT SELLER'S SOLE OPTION. IN NO EVENT SHALL SELLER BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES OF ANY KIND OR NATURE WHATSOEVER, INCLUDING BUT NOT LIMITED TO LOST PROFITS ARISING FROM OR IN ANY WAY CONNECTED WITH THIS AGREEMENT OR ITEMS SOLD HEREUNDER, WHETHER ALLEGED TO ARISE FROM BREACH OF CONTRACT, EXPRESS OR IMPLIED WARRANTY, OR IN TORT, INCLUDING WITHOUT LIMITATION, NEGLIGENCE, FAILURE TO WARN OR STRICT LIABILITY.

6. **Changes, Reschedules and Cancellations:** Buyers may request to modify the designs or specifications for the items sold hereunder as well as the quantities and delivery dates thereof, or may request to cancel all or part of this order, however, no such requested modification or cancellation shall become part of the contract between Buyer and Seller unless accepted by Seller in a written amendment to this Agreement. Acceptance of any such requested modification of cancellation shall be at Seller's discretion, and shall be upon such terms and conditions as Seller may require.

7. **Special Tooling:** A tooling charge may be imposed for any special tooling, including without limitation, dies, fixtures, molds and patterns, acquired to manufacture items sold pursuant to this contract. Such special tooling shall be and remain Seller's property notwithstanding payment of any charges by Buyer. In no event will Buyer acquire any interest in apparatus belonging to Seller which is utilized in the manufacture of the items sold hereunder, even if such apparatus has been specially converted or adapted for such manufacture and notwithstanding any charges paid by Buyer. Unless otherwise agreed, Seller shall have the right to alter, discard or otherwise dispose of any special tooling or other property in its sole discretion at any time.

8. **Buyer's Property:** Any designs, tools, patterns, materials, drawings, confidential information or equipment furnished by Buyer, or any other items which become Buyer's property, may be considered obsolete and may be destroyed by Seller after two (2) consecutive years have elapsed without Buyer placing an order for the items which are manufactured using such property. Seller shall not be responsible for any loss or damage to such property while it is in Seller's possession or control.

9. **Taxes:** Unless otherwise indicated on the face hereof, all prices and charges are exclusive of excise, sales, use, property, occupational or like taxes which may be imposed by any taxing authority upon the manufacture, sale or delivery of the items sold hereunder. If any such taxes must be paid by Seller or if Seller is liable for the collection of such tax, the amount thereof shall be in addition to the amounts for the items sold. Buyer agrees to pay all such taxes or to reimburse Seller therefore upon receipt of its invoice. If Buyer claims exemption from any sales, use or other tax imposed by any taxing authority, Buyer shall save Seller harmless from and against any such tax, together with any interest or penalties thereon which may be assessed if the items are held to be taxable.

10. **Indemnity For Infringement of Intellectual Property Rights:** Seller shall have no liability for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights except as provided in this Part 10. Seller will defend and indemnify Buyer against allegations of infringement of U.S. patents, U.S. trademarks, copyrights, trade dress and trade secrets (hereinafter 'Intellectual Property Rights'). Seller will defend at its expense and will pay the cost of any settlement or damages awarded in an action brought against Buyer based on an allegation that an item sold pursuant to this contract infringes the Intellectual Property Rights of a third party. Seller's obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of such allegations of infringement, and Seller having sole control over the defense of any allegations or actions including all negotiations for settlement or compromise. If an item sold hereunder is subject to a claim that it infringes the Intellectual Property Rights of a third party, Seller may, at its sole expense and option, procure for Buyer the right to continue using said item, replace or modify said item so as to make it noninfringing, or offer to accept return of said item and return the purchase price less a reasonable allowance for depreciation. Notwithstanding the foregoing, Seller shall have no liability for claims of infringement based on information provided by Buyer, or directed to items delivered hereunder for which the designs are specified in whole or part by Buyer, or infringements resulting from the modification, combination or use in a system of any item sold hereunder. The foregoing provisions of this Part 10 shall constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Right.

If a claim is based on information provided by Buyer or if the design for an item delivered hereunder is specified in whole or in part by Buyer, Buyer shall defend and indemnify Seller for all costs, expenses or judgments resulting from any claim that such item infringes any patent, trademark, copyright, trade dress, trade secret or any similar right.

11. **Force Majeure:** Seller does not assume the risk of and shall not be liable for delay or failure to perform any of Seller's obligations by reason of circumstances beyond the reasonable control of Seller (hereinafter 'Events of Force Majeure'). Events of Force Majeure shall include without limitation, accidents, acts of God, strikes or labor disputes, acts, laws, rules or regulations of any government or government agency, fires, floods, delays or failures in delivery of carriers or suppliers, shortages of materials and any other cause beyond Seller's control.

12. **Entire Agreement/Governing Law:** The terms and conditions set forth herein, together with any amendments, modifications and any different terms or conditions expressly accepted by Seller in writing, shall constitute the entire Agreement concerning the items sold, and there are no oral or other representations or agreements which pertain thereto. This Agreement shall be governed in all respects by the law of the State of Ohio. No actions arising out of the sale of the items sold hereunder of this Agreement may be brought by either party more than two (2) years after the cause of action accrues.



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