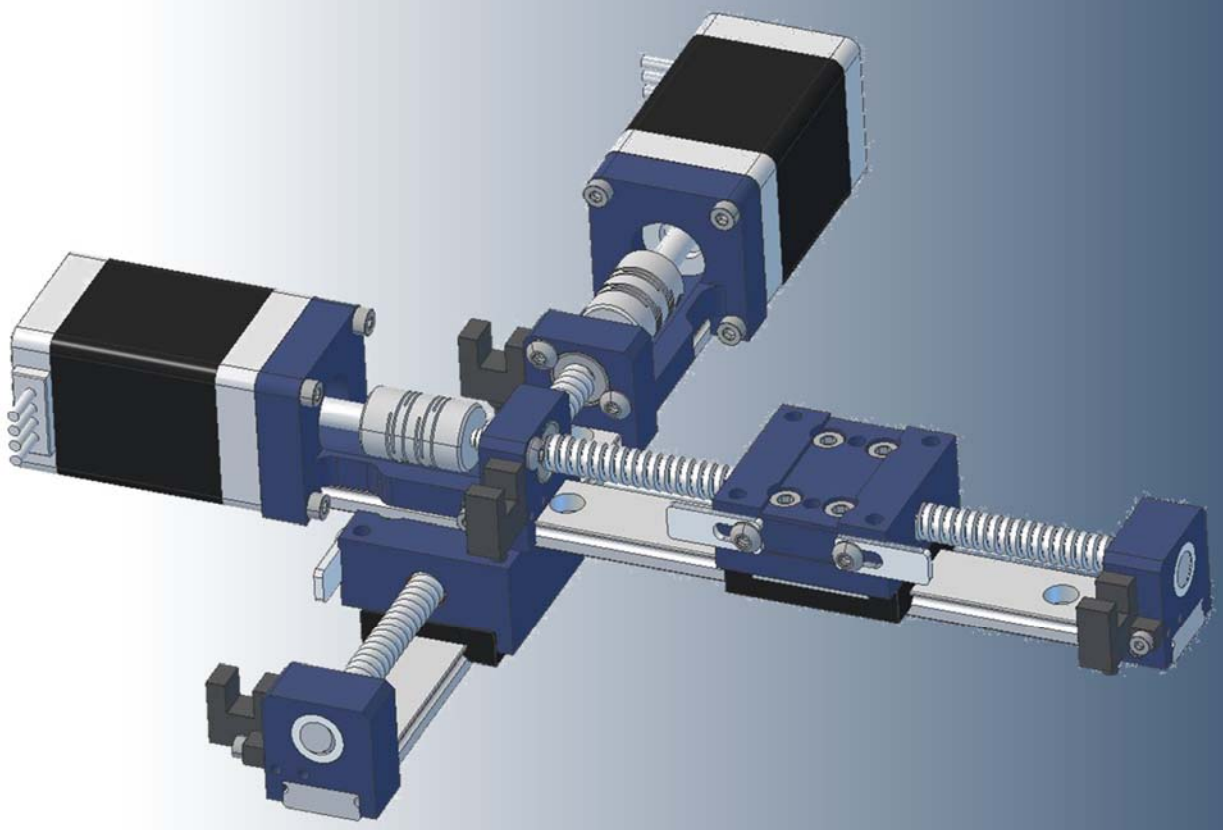
Minibot™ Series

Miniature Precision Actuator Family



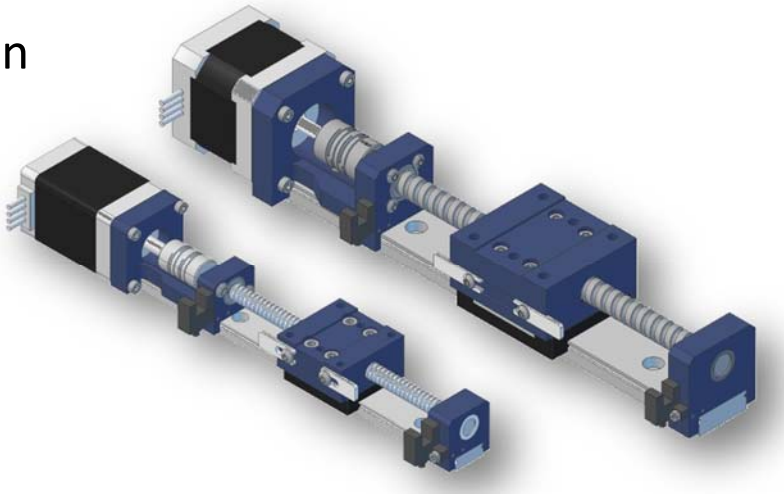
The Precision Alliance

www.tpa-us.com
www.linearpositioningsystems.com

Ph: 800-284-9784

Minibot™ Series

- Simple Low Cost Design
- Compact Package
- Highly Configurable
- Maintenance Free
- Long Life



Introduction

The proliferation of life science and medical instruments has driven demand for lower cost, miniature motion platforms. Instrument manufacturers are forced to design their own motion platforms because existing packaged actuators are either too expensive, too heavy, or too large.

The Precision Alliance's Minibot plat form is the answer to this need. The Minibot's "minimalist" design delivers everything needed in a positioning system without the burden of unwanted costs. The Minibot is able to delivery performance and compactness at a price point you can afford to design into your machine

Flexibility

The Minibot is a family of actuators built around industry standard linear guides and motor frame sizes. Each has travel selectable by the millimeter meaning you get exactly the travel needed without any extra length. Within each Minibot size there are options for various motor lengths, integrated controller/drives, various limit sensors depending on the controller type, and a variety of leadscrews and ballscrews for the speed and precision optimal for the application.

In addition to the many standard options, Minibots are easily assembled into multi-axis XY and XYZ systems or customized other ways. Customization may look like special carriage feature or the integration of payload features into the carriage, special motor windings, encoder feedback, stainless steel materials, etc.

"Everything you need in a motion platform and nothing else!"

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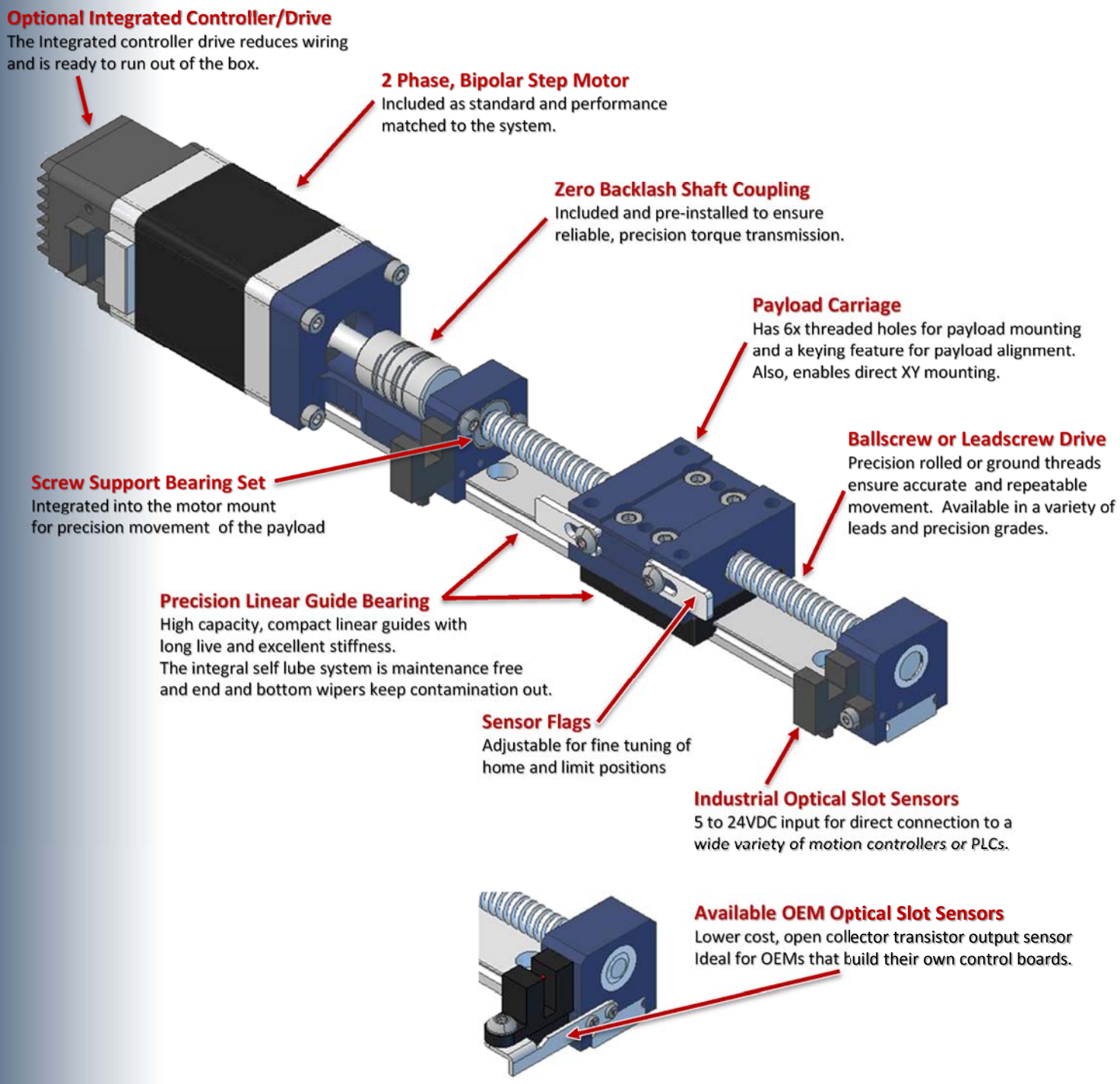
Minibot™ Series

Anatomy of a Minibot™ Positioner



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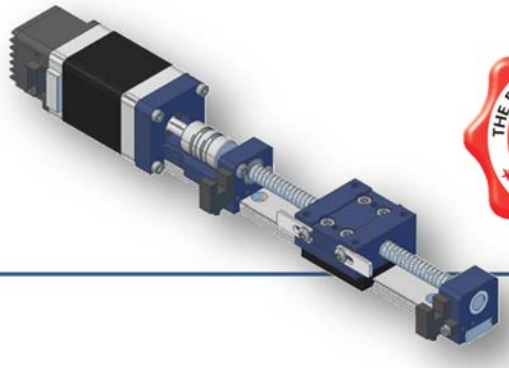
MB11 Series



Minibot Configurable:

MB11 - T300 - PS01 - M112 - L22 - Options

Travel

Actuator Travel (xxx = travel in mm)... Txxx

Leadscrew Drives

	Standard	Preloaded
Leadscrew: 1mm lead...	LS01	PS01
Leadscrew: 5mm lead...	LS05	PS05

Ballscrew Drives

	Rolled	Ground
Ballscrew: 1mm lead...	SR0401	SG0401
Ballscrew: 2mm lead...	SR0402	SG0402
Ballscrew: 4mm lead...	SR0504	SG0504
Ballscrew: 0.5mm lead...		SG0300.5

Motor Options

Standard Step Motor... M112

Integrated Step Motor/Drive/Control with RS485... MK112

End of Travel Sensor Options

OEM Optical Slot Sensors... L11

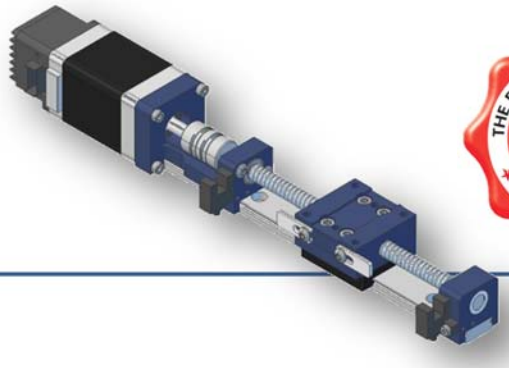
Industrial Optical Slot Sensors... L22

MB11 Performance Specifications

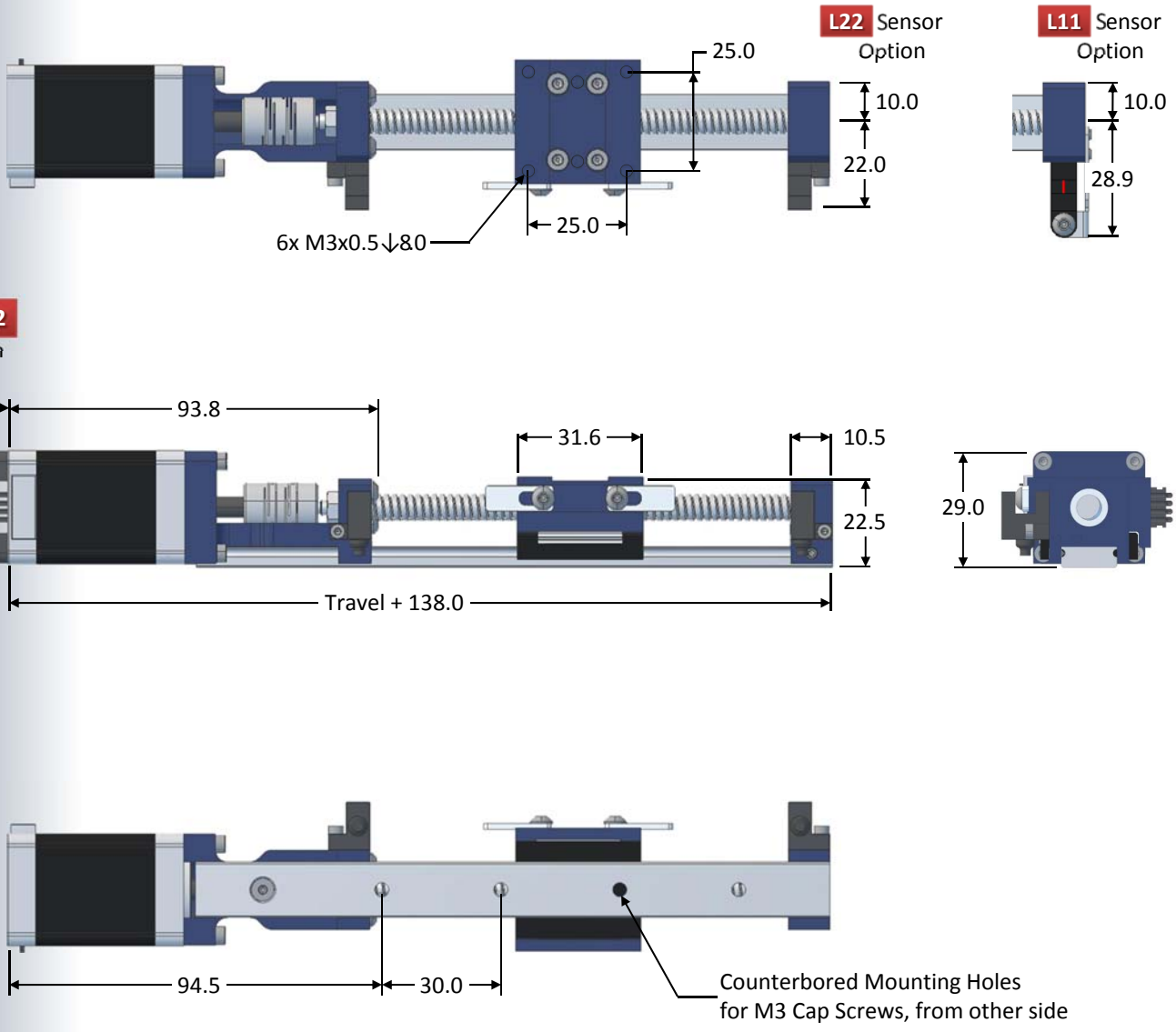
	LS01	PS01	LS05	PS05	SR0401	SG0401	SR0402	SG0402	SR0504	SG0504	SG0300.5
Screw Lead (mm/rev)	1	1	5	5	1	1	2	2	4	4	0.5
Max Travel (mm)[1]	300	300	300	300	300	150	300	150	300	150	300
Max Speed (mm/sec)[2]	15	15	75	75	15	15	30	30	60	60	7.5
Rated Thrust (N)	85	50	30	21	175	175	100	100	50	50	220
Lead Accuracy (µm/mm)	0.6	0.6	0.6	0.6	0.170	0.075	0.170	0.075	0.170	0.075	0.075
Repeatability (µm)	20	12	20	12	20	5	20	5	20	5	5
Theoretical Resolution[3]	0.00031	0.00031	0.00156	0.00156	0.00031	0.00031	0.00063	0.00063	0.00125	0.00125	0.00016
Straightness (µm)	Horizontal Plane: 25 µm Vertical Plane: 25 µm										
Load Capacity	Normal Load: 210 N Side Load: 210 N Roll: 1.5 Nm Yaw: 0.75 Nm Pitch: 0.75 Nm										

1) Based on 15 rps motor speed. Higher speed possible. 2) Consult factory for longer travels. 3) Based on 3200 steps/rev. Actual minimum step size will vary.

MB11 Series



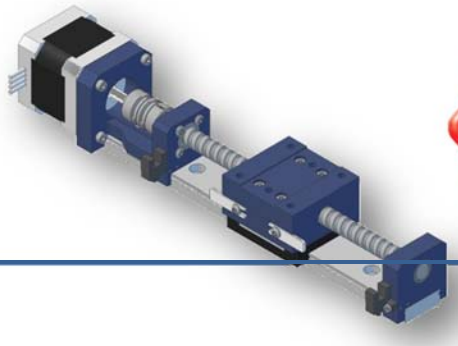
MB11 Dimensions (mm)



3D Models available at

www.linearpositioningsystems.com/cad

MB17 Series



Minibot Configurable:

MB17 - T300 - PS01 - M112 - L22 - Options

Travel

Actuator Travel (xxx = travel in mm)... **Txxx**

Leadscrew Drives

	Standard	Preloaded
Leadscrew: 1mm lead...	LS01	PS01
Leadscrew: 5mm lead...	LS05	PS05

Ballscrew Drives

	Rolled	Ground
Ballscrew: 1mm lead...	SR0801	SG0801
Ballscrew: 2mm lead...	SR0802	SG0802
Ballscrew: 5mm lead...	SR0805	SG0805
Ballscrew: 12mm lead...	SR0812	SG0812

Motor Options

Standard Step Motor... **M172**

Integrated Step Motor/Drive/Control with USB... **MJ172**

Integrated Step Motor/Drive/Control with RS485... **MK172**

End of Travel Sensor Options

OEM Optical Slot Sensors... **L11**

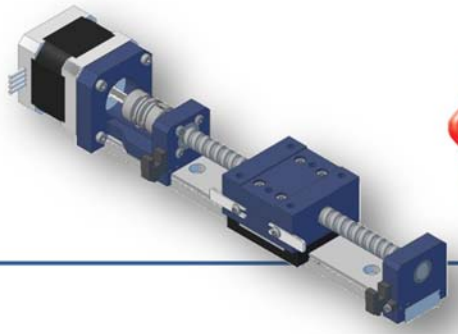
Industrial Optical Slot Sensors... **L22**

MB17 Performance Specifications

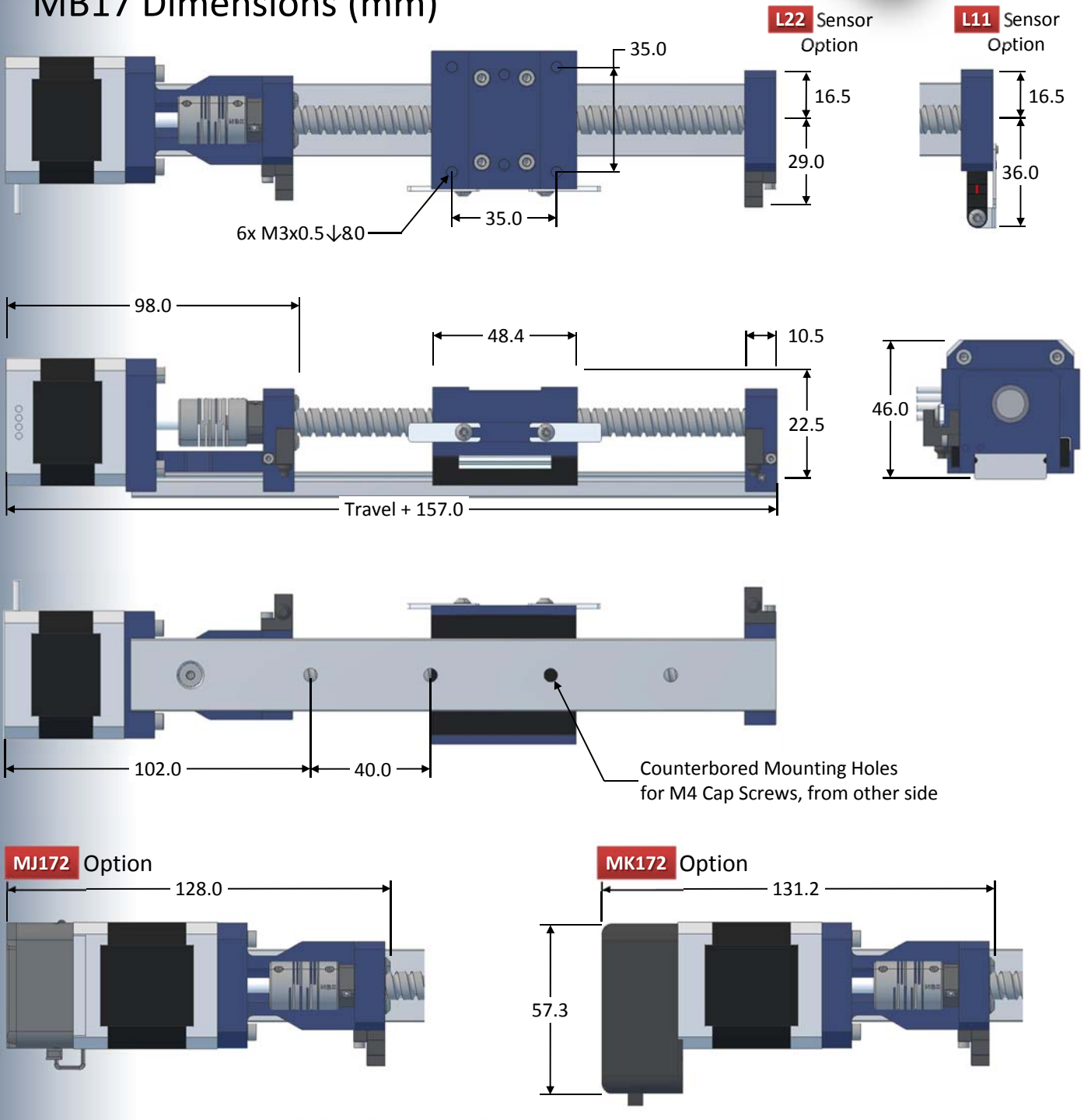
	LS01	PS01	LS05	PS05	SR0801	SG0801	SR0802	SG0802	SR0805	SG0805	SR0812	SG0812
Screw Lead (mm/rev)	1	1	5	5	1	1	2	2	5	5	12	12
Max Travel (mm)[1]	500	500	500	500	300	150	300	150	300	150	300	150
Max Speed (mm/sec)[2]	10	10	50	50	10	10	20	20	50	50	120	120
Rated Thrust (N)	195	135	70	50	430	430	240	240	100	100	45	45
Lead Accuracy (µm/mm)	0.6	0.6	0.6	0.6	0.170	0.075	0.170	0.075	0.170	0.075	0.170	0.075
Repeatability (µm)	20	12	20	12	20	5	20	5	20	5	20	5
Theoretical Resolution[3]	0.00031	0.00031	0.00156	0.00156	0.00031	0.00031	0.00063	0.00063	0.00156	0.00156	0.00375	0.00375
Straightness (µm)	Horizontal Plane: 25 µm Vertical Plane: 25 µm											
Load Capacity	Normal Load: 520 N Side Load: 520 N Roll: 6.5 Nm Yaw: 2.5 Nm Pitch: 2.5 Nm											

1) Based on 10 rps motor speed. Higher speed possible. 2) Consult factory for longer travels. 3) Based on 3200 steps/rev. Actual minimum step size will vary.

MB17 Series



MB17 Dimensions (mm)



3D Models available at

www.linearpositioningsystems.com/cad

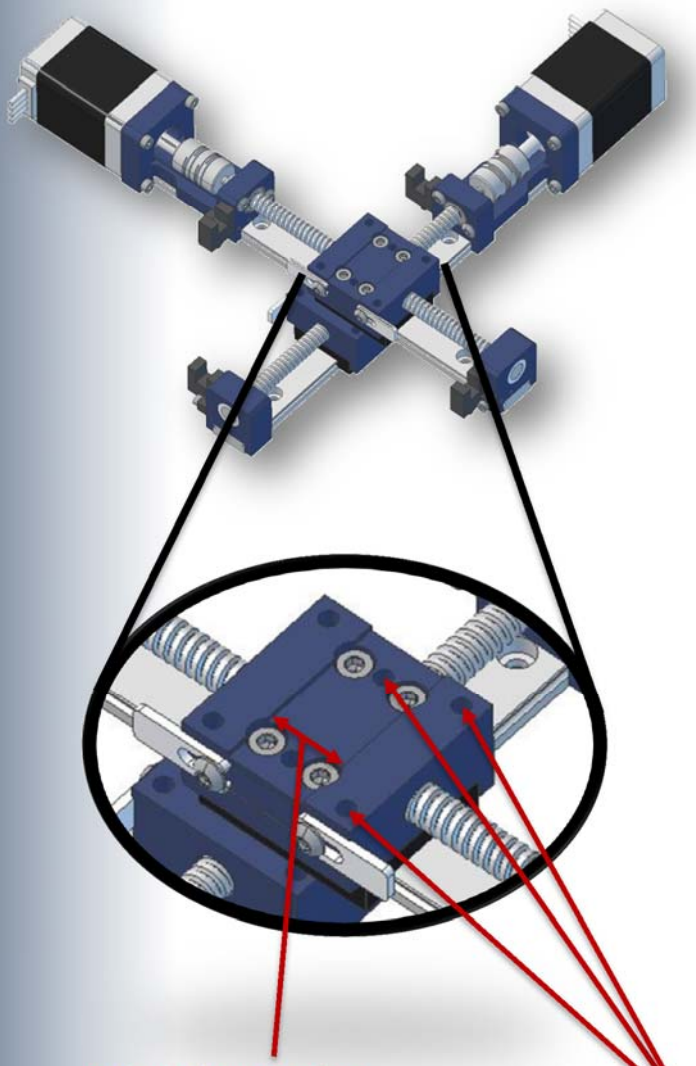
Minibot™ Series

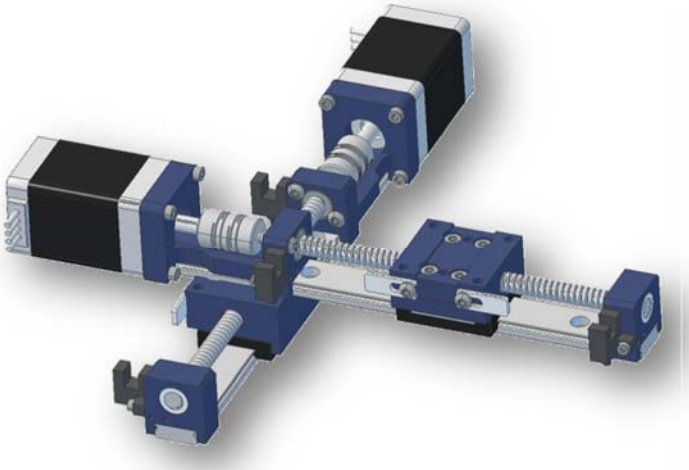
Multi-axis Systems

The Minibot™ Family is designed from the start for multi-axis configurations. Both the MB11 and MB17 directly mate with another actuator of the same frame size (MB11 to MB11 or MB17 to MB17). Each carriage includes a recessed slot and threaded holes for alignment and attachment.

The XY configuration can place the Y-axis motor at 3 o'clock or 9 o'clock and center the Y-axis travel about the X-Axis or cantilever it fully to one side. A simple XY Option Code added to the part number denotes how the axes mount together.

Z-axis brackets for XZ and XYZ configurations are also available. Contact TPA for details.





Payload Alignment Slot
Controls orthogonality of the Y-Axis or payload. The slot is 1mm deep and 14mm (MB11) or 24mm (MB17) wide.

Payload Mounting Holes
Threaded holes are placed in the 4 corners of the carriage and in the alignment slot.

3D Models available at
www.linearpositioningsystems.com/cad

Minibot™ Series

Special Modifications

Especially for OEMs, sometimes the catalog product is not exactly what is needed due to space, environmental, or other reasons; and getting it exactly the way you need it is critical for optimizing cost, and minimizing time to market. In these instances, TPA is here to help. For OEMs with special requirements, we can modify our standard Minibot™ design or even design a completely new product to precisely fit your application.

The following are some of the modifications we have or can do for you. If you do not see what you need, let us know.

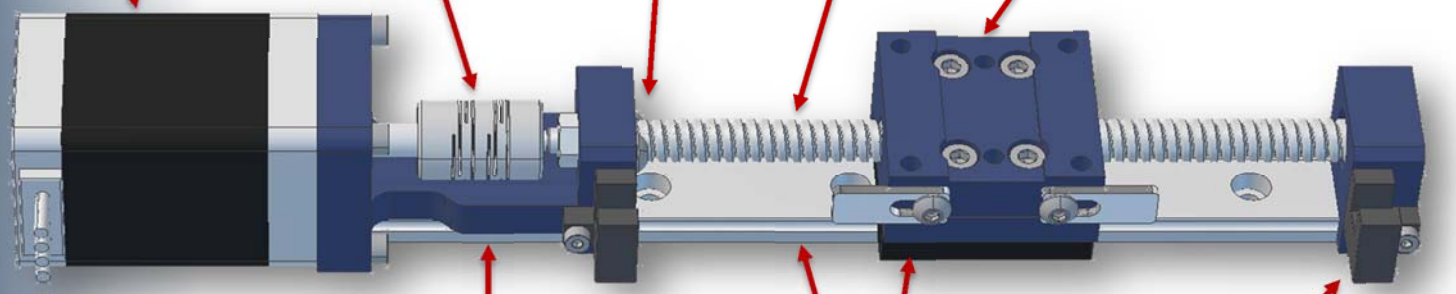
Motors
- Customer specified step motor
- Integrated motor/drive/control
- Special motor windings
- Servo or DC motors

Shaft Coupling
- High stiffness coupling
- Vibration damping coupling
- Stainless steel materials

Bearings
- High precision angular contact bearings
- Cleanroom grease

Drive Screws
- Special leadscrews
- Ultra fine leadscrews (0.2mm lead)
- Precision ground ballscrews
- Stainless steel ballscrews

Carriage
- Dual carriages
- Special payload mounting features
- Dowel holes



Cables and Connectors
- Customer specified connectors
- Cable carriers
- Special wiring harnesses

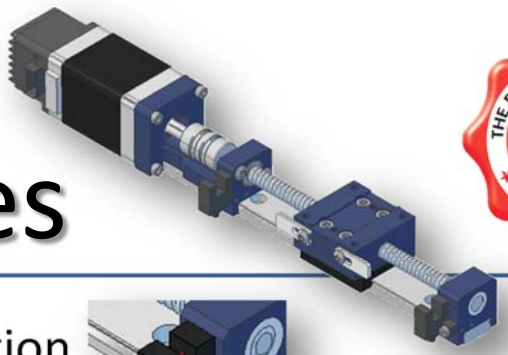
Motor Mount
- Custom motor mount pattern
- Extra short motor block
- Special plating
- Stainless steel materials

Linear Bearings
- Extra long travel
- Dual linear bearings
- High precision crossed roller bearings
- Cleanroom lubrication
- Long bearing trucks

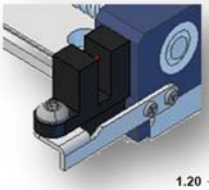
Limit Sensors
- Customer specified sensors
- Custom length sensor flags
- Connectors

3D Models available at www.linearpositioningsystems.com/cad

Minibot™ Series

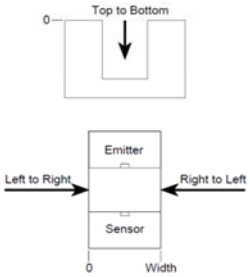


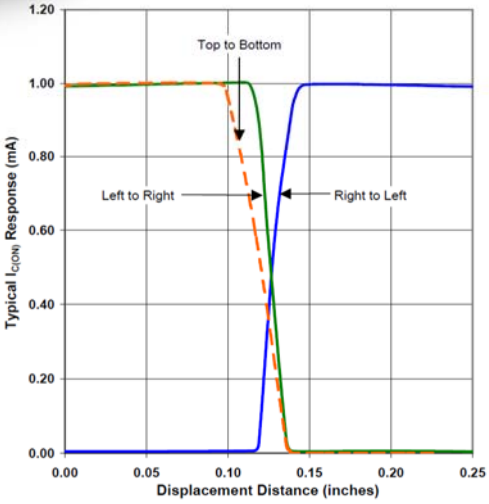
L11 – OEM Slot Sensor Information

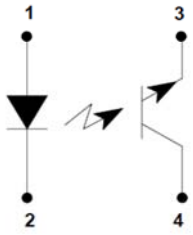


Ideal for OEMs that build their own control boards

Sensor	Optek OPB880-P51Z
Input LED	Forward DC Current: 50mA Max Reverse DC Voltage: 2V Max Power Dissipation: 75mW Max V_F=1.3V @ I_F=20mA
Output Transistor	Collector-Emitter Voltage: 30V Max Emitter-Collector Voltage: 5V Max Collector DC Current: 30mA Max Power Dissipation: 100mW Max $V_{(BR)CEO}$=30V MIN @ I_C=1mA $V_{(BR)ECO}$=5V MIN @ I_E=100µµA I_{CEO}=100nA Max @ V_{CE}=10V, I_F=0, E_E=0
Coupled	$V_{CE(SAT)}$=0.4V Max @ I_C=400µA, I_F=20mA $I_{C(ON)}$=0.5mA Min @V_{CE}=10V, I_F=20mA
Environmental	-40 to +85°C Non-condensing Humidity
Leads	26 AWG, 24" Long
Material	Polysulfone IR Transmissive Shell
Mounting Fastener	M3x6 SHCS to Bracket M2x4 Phillips Cross Recess to Body

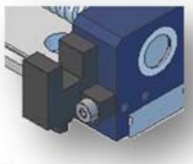






1	RED – Emitter Anode
2	BLACK – Emitter Cathode
3	GREEN – Transistor Emitter
4	WHITE – Transistor Collector

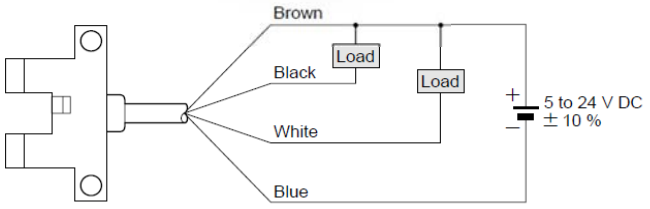
L22 – Industrial Slot Sensor Information



Ideal for wiring to motion controllers and PLCs

Power	5 to 24VDC +/-10% 15mA or less
Output	NPN Open Collector Transistor Max Sink Current: 50mA Applied Voltage: 30VDC or less Residual Voltage (0.7V at 50mA) (0.4V at 16mA)
Repeatability	Unidirectional: 0.03mm or better Bidirectional: 0.05mm or better Response Time: 100µs or less
Environmental	-25 to +55°C, non-condensing humidity
Material	PBT and Polycarbonate
Mounting Fastener	M2x6 Socket Head Cap Screw

Wiring diagram



Output operation

	Color code	Output operation
Output 1	Black	Light-ON
Output 2	White	Dark-ON

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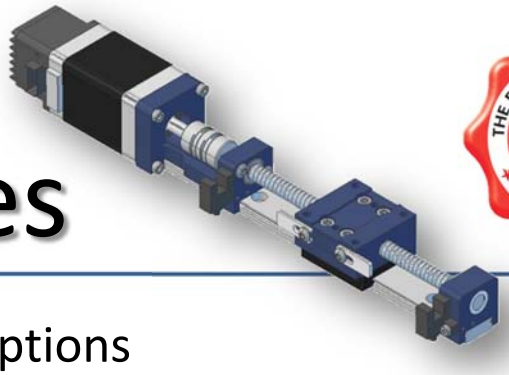

M11x and M17x Step Motor Options

	M112	M111	M113	M172	M171	M173
Rated Current	0.67 A_{RMS}	0.67 A_{RMS}	0.67 A_{RMS}	1.68 A_{RMS}	1.33 A_{RMS}	1.68 A_{RMS}
Resistance	6.8 ohms ±10%	5.6 ohms ±10%	9.2 ohms ±10%	1.65 ohms ±10%	2.1 ohms ±10%	1.65 ohms ±10%
Inductance	4.9 mH ±20%	4.2 mH ±20%	7.2 mH ±20%	3.2 mH ±20%	2.5 mH ±20%	2.8 mH ±20%
Rated Voltage	4.56 V	3.8 V	6.2 V	2.8 V	2.8 V	2.8 V
Step Angle	1.8° ± 5%, Rotation CW from front					
Temperature	Ambient: -20°C to +50°C Max Rise: 80°C					
Rotor Inertia	12E-7 Kg-m^2	9E-7 Kg-m^2	18E-7 Kg-m^2	5.4E-8 Kg-m^2	3.5E-8 Kg-m^2	6.8E-8 Kg-m^2
Weight	0.14 Kg	0.11 Kg	0.20 Kg	0.28 Kg	0.22 Kg	0.35 Kg
Length	44.5 mm	31.5 mm	50.5 mm	40 mm	34 mm	48 mm
Mounting Fastener	M2.5 x 12 SHCS			M3 x 14 SHCS		
Wires	4x Leads, AWG26, 300mm Long; A+ (RED), A- (BLUE), B+ (BLACK), B- (GREEN)					

MK112, MK172, MJ172 Integrated Controller/Drive Options

	MK112	MK172	MJ172
Communications	RS485	RS485/RS232	USB 2.0
Power	12 to 24 VDC, 1.5 A max	12 to 35 VDC, 2.5 A max	12 to 24 VDC, 2.0 A max
Inputs	Limit+, Limit-, Home 12 to 24 VDC, NPN, 0.45 mA	Limit+, Limit-, Home, 6x Digital Inputs 12 to 24 VDC, NPN, 0.45 mA	Limit+, Limit-, Home, 2x Digital Inputs 12 to 24 VDC, NPN, 0.45 mA
Output	1x Opto-isolated PNP Output +24 VDC Max; 90 mA Max	3x Opto-isolated NPN Outputs +24 VDC Max; 90 mA Max	2x Opto-isolated NPN Outputs +24 VDC Max; 45 mA Max
Resolution	3200 Steps/rev max	3200 Steps/rev max	3200 Steps/rev max
Max Speed	15 rps	15 rps	15 rps
Encoder	Integrated 256 count/rev (Optional: Single Turn Absolute)	Integrated 4000 count/rev	N/A
Operating Temp	0°C to +70°C	0°C to +70°C	0°C to +85°C
Length	65.5 mm	65.5 mm	63 mm
Mounting Fastener	M2.5 x 12 SHCS	M3 x 14 SHCS	M3 x 14 SHCS

Contact TPA for additional details and product manuals

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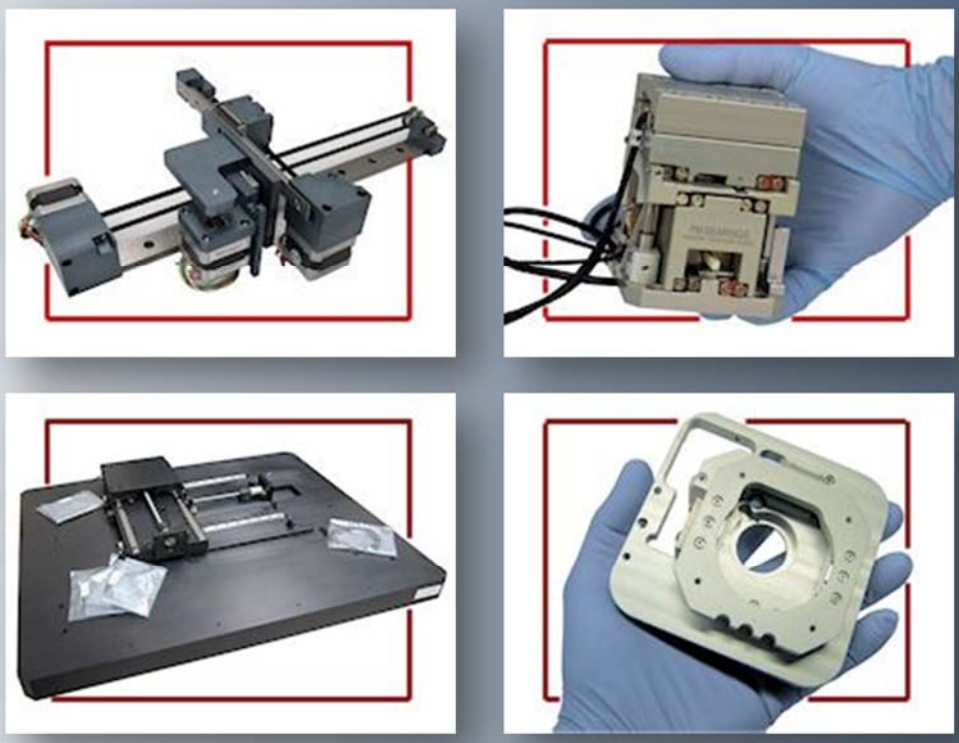

Learn more about TPA's special systems capabilities and Instrument Motion Platforms at www.linearpositioningsystems.com

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