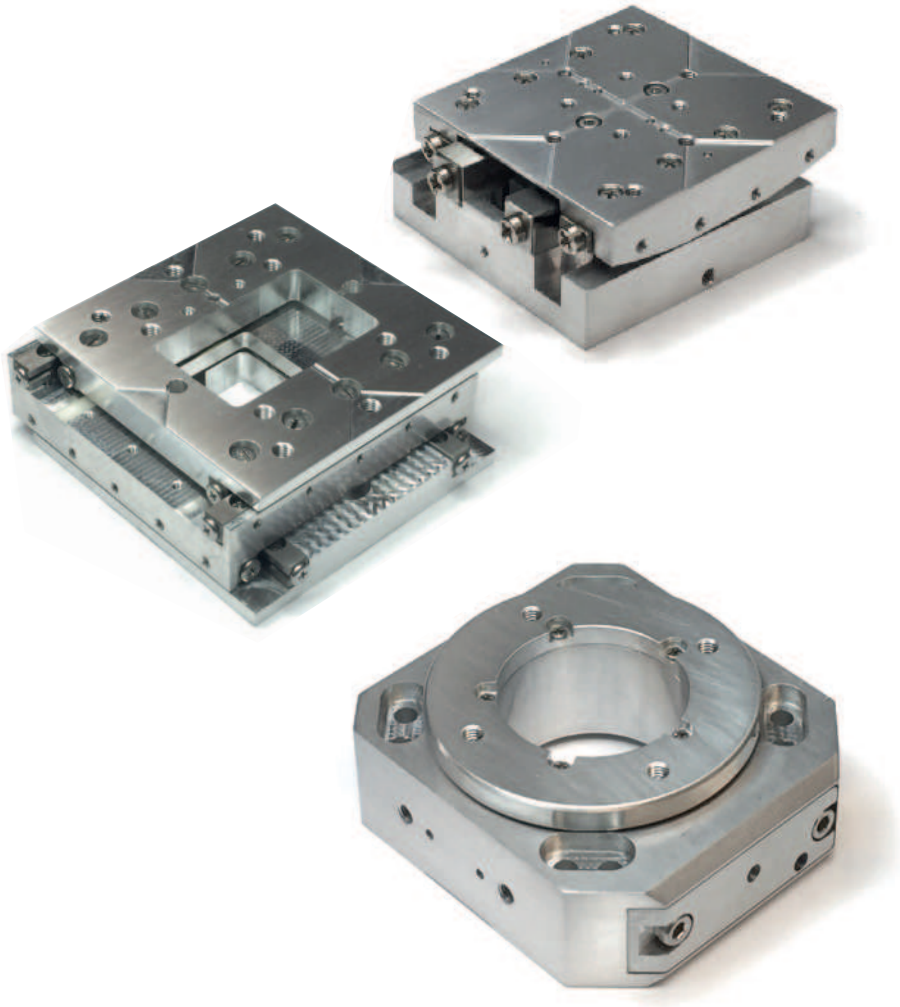
micronix USA
PRECISION MOTION SOLUTIONS



2015 Edition

Revision 2.0, January 2015
MICRONIX USA, LLC

ABOUT US

Founded in 2006, MICRONIX USA specializes in miniature micro- and nano-positioning components for the biomedical and research markets. In addition to our extensive standard product line, we provide rapid product development services ranging from customization of existing products to complete customized solutions.

Our products are configurable for especially demanding application environments such as:

- Vacuum compatibility down to 10^{-9} mbar
- Cryogenic environments down to 4 Kelvin
- Radiation tolerant requirements
- Non-magnetic requirements

We also provide system integration services for precision positioning applications of any size. Our team of experienced engineers is dedicated to help solve even the most demanding applications. We excel at assisting our customers in finding the best solution at a competitive price.

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AN INDUSTRY FIRST...

ANY *motor,* ***SAME*** *stage*

The following criteria are often of most concern among the multiple requirements that determine the selection of motion stages:

- Stage size
- Load capacity
- Resolution and repeatability
- Speed and acceleration

Many of these criteria are primarily determined by the chosen drive technology. Most commonly, users have a choice among:

- Lead screw or ball screw driven by a stepper or DC motor
- Linear motor
- Piezo motor

Each of these drive technologies has unique advantages and disadvantages, and is only suitable for specific application areas. However, many manufacturers try to fit square pegs into round holes by trying to sell the drive technology that is available in their designs rather than the optimal technology for a specific application.

MICRONIX USA is now able to offer its original miniature piezo line with both lead screw drive as well as a linear motor option. The basic stage design remains the same, but users are able to choose the preferred drive technology that meets their specific requirements.

Piezo Nano-Positioning Primer

Nano-positioning has become increasingly important in the motion control world due to ever shrinking dimensions in numerous applications. In recent years, long travel piezo driven stages have filled the technology void in nano-positioning with nanometer resolution and high position stability.

Historically, piezos were mostly used for very short actuation ranges in the µm to sub-mm range, which required hybrid stages for long travel at nano-meter resolutions. Most recently, piezo motors have emerged that allow unlimited linear and rotary travel. Most of these piezo motors are based on the friction principle, which allows the limited range of the piezo itself (µm range) to be extended to unlimited travel ranges.

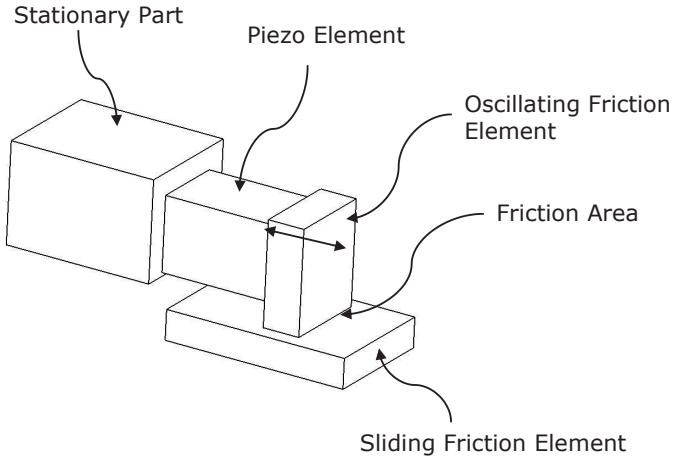
Generally, a piezo element actuates a friction element that moves a second friction element (such as a stage carriage). Friction-based piezo motors can be roughly separated into resonant and non-resonant types. **Resonant type piezo motors** exhibit high speed but are not usable at very high resolutions below tens of nm. **Non-resonant piezo motors** operate below the resonant frequency of the piezo and are therefore audible in most cases. However, they allow highly stable nm and sub nm resolutions while at the same time creating unlimited travel.

Some non-resonant piezo motors are based on a friction principle called the stick-slip principle, also sometimes referred to as inertial drive. This principle is explained in greater detail below.

Stick-Slip (Inertial) Piezo Motor

The basic principle of stick-slip inertial motion is the controlled use of friction in connection with the moving part's inertia. As shown in the drawing on the following page, an oscillating piezo element is connected to a friction element which moves the sliding friction element forward when the piezo extends due to an applied voltage. When the piezo is fully extended, which usually occurs after an extension of about 1 µm, a fast voltage transition

is applied that quickly contracts the piezo to its original position. The result is a fast backwards motion of the oscillating friction element. However, the inertia of the sliding friction element is too large to completely follow that backwards movement. Similar to a ratchet, this process is repeated until the sliding friction element, which is usually attached to the moving part of the stage, reaches its desired position.

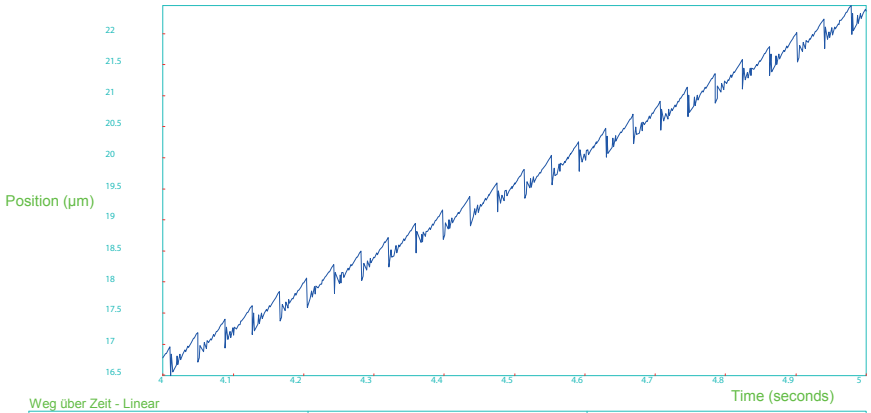


The **main problem with conventional stick-slip** piezo motors is that during the slip phase, the sliding friction element (moving part of the stage) follows the backwards movement to varying degrees. As a result, poor velocity regulation, induced vibration into the system and lost motion (slower velocity and lower efficiency) occur.

The following chart shows actual measured results of a commercially available product (motion in µm on the vertical axis and time on the horizontal axis). As can be seen, there is very large backwards motion during every slip phase. The backwards motion amounts to about 50% of the forward motion per cycle.

Traditional Stick-Slip Piezo Motor Performance

Position VS Time



Weg über Zeit - Linear

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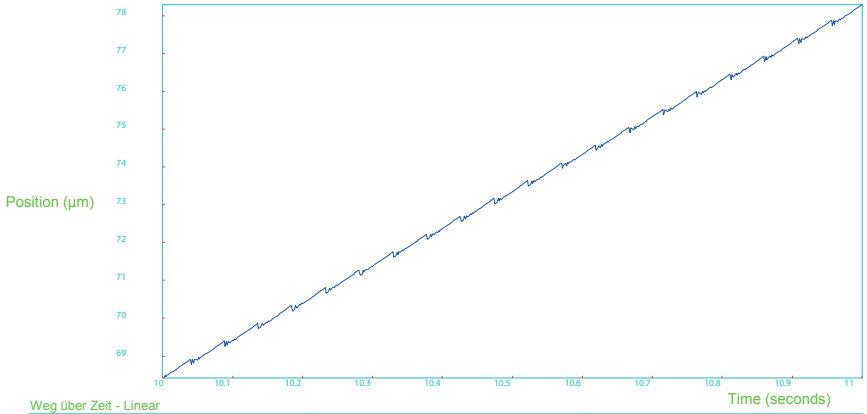
Seriennummer:	Kommentar:	bei: 4.9783
Datum:2010-07-06 16:41:3	File: Captured Data.	Min Wert: 16.49108
	Leserate: 10000 Hz	bei: 4.0112

MICRONIX *Multi-Phase* Piezo Motor Performance (Patented)

Position VS Time



Weg über Zeit - Linear

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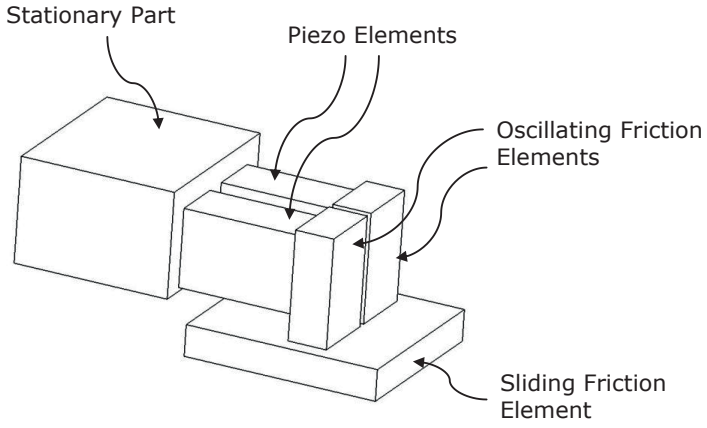
	Leserate: 10000 Hz	bei: 10.0018

The preceding chart shows the significant improvement achieved by using the **MICRONIX Multi-Phase Stick-Slip piezo motor.** This motor decreases or completely eliminates the backwards motion during the slip phase because it does not solely rely on the inertia of the moving part. Instead, the MICRONIX piezo motor utilizes at least two piezos and two friction elements that move in unison, but slip at different times. Using this method, the sliding friction elements slip at different times, so at least one element stays in the stick phase while the other one slips. As a result, the retract force and motion induced by the slip force onto the sliding element are reduced or completely eliminated.



Using the multi-phase principle results in significant performance improvements over single-phase motors, including:

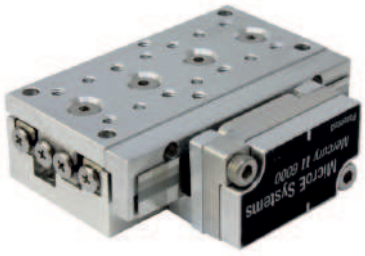
- Higher moving forces
- Better velocity regulation – smoother motion
- Less induced vibration
- More efficient motion

All products listed in this brochure take advantage of our new Multi-Phase Piezo Motor and therefore exhibit the superior performance outlined above.

Piezo Motor

Product Line

to scale


Micronic Systems
Mercury II 6000

Piezo Positioner | PP-12 Preliminary

The PP-12 is a low cost, ultra-compact linear piezo stage. Low profile and high load capacity are achieved through the use of a multi-phase piezo motor combined with a steel ball slide, which allows for smooth travel up to 4mm. The PP-12 can be directly X-Y mounted without the use of adapter plates. Vacuum versions are available. The PP-12 is compatible with the MMC-100 and MMC-110 controllers.

KEY FEATURES

- Travel range of up to 4 mm
- 1 nm resolution
- Load capacity up to 0.5 kg
- Steel ball slide
- Low profile, 7 mm height
- Vacuum versions available

TECHNICAL DATA

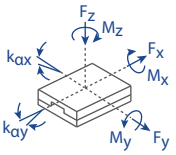
Travel range [mm]	**4**	
Straightness / Flatness [µm]	± 2	
Pitch [µrad]	± 150	
Yaw [µrad]	± 150	
Weight [g]	13	
Motor option	**Piezo Motor**	
Speed, max [mm/s]	2 (MMC-100), 10 (MMC-110)	
Encoder option	**None (open loop)**	**External**
Resolution, typical [nm]	1	50
Repeatability, bi-directional [nm]	n/a	± 200
Repeatability, uni-directional [nm]	n/a	200
Accuracy [µm]	-	± 2
Materials	aluminum body, steel bearing (other materials i.e. stainless steel, titanium, etc. available upon request)	

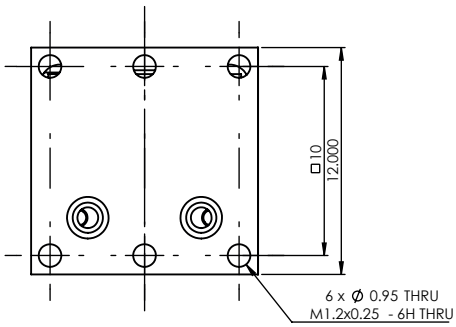
ORDERING INFORMATION

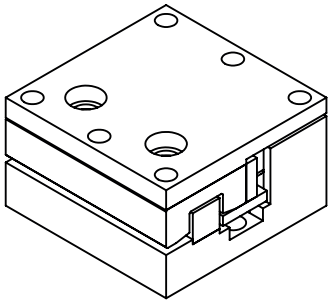
PP-12- | **1** | **1** | | **0** | |

DRIVE	Piezo Motor, PM-002	**1**
TRAVEL	4 mm	**1**
ENCODER	None	**0**
	External	**1**
LIMIT SWITCH	None	**0**
ENVIRONMENT	Atmospheric	**0**
	High Vacuum, 10^{-6} mbar	**6**
	Ultra High Vacuum, 10^{-9} mbar	**9**

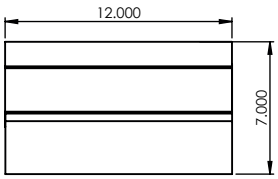
Load, max	F_x [N]	F_y [N]	F_z [N]	M_x [N·m]	M_y [N·m]	M_z [N·m]	$k_{\alpha x}$ [µrad/N·m]	$k_{\alpha y}$ [µrad/N·m]
PM-002	2	5	5	0.3	0.2	0.3	-	-

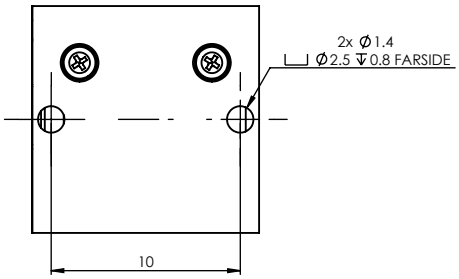






* all dimensions are in millimeters





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PRECISION MOTION SOLUTIONS

Precision Piezo Stage | PPS-20

The PPS-20 is a high-precision, long travel linear piezo stage. Miniature crossed roller bearings assure high stiffness and guiding accuracy for loads up to 20 N (horizontal orientation). It utilizes our patent-pending multi-phase piezo motor resulting in high speed (> 2 mm/s) and high blocking force (> 2 N). The PPS-20 is available in open loop or with an external encoder. Closed loop resolution of 2 nm is achievable. Versions capable of operation in vacuum (10^{-9} mbar) and/or cryo (4 Kelvin) are available. The PPS-20 is compatible with the MMC-100 and MMC-110 controllers.

KEY FEATURES

- Travel range of up to 51 mm
- 2 nm closed loop resolution
- Load capacity up to 2 kg
- Steel crossed roller bearing
- Low profile, 13 mm height (10 mm without carriage)
- Vacuum, cryo, and non-magnetic versions available

TECHNICAL DATA

Travel range [mm]	**12**	**18**	**26**	**51**
Straightness / Flatness [µm]	± 1	± 1.5	± 1.5	± 2.5
Pitch [µrad]	± 60	± 80	± 80	± 100
Yaw [µrad]	± 70	± 90	± 90	± 100
Weight [g]	17	24	34	68
Motor option	**Piezo Motor**			
Speed, max [mm/s]	2 (MMC-100), 10 (MMC-110)			
Encoder option	**None (open loop)**	**Analog (1 V_{pp})**		**Digital (RS-422)**
Resolution, typical [nm]	1	10		2
Repeatability, bi-directional [nm]	n/a	± 50		± 20
Repeatability, uni-directional [nm]	n/a	50		20
Accuracy [µm]	-	± 1		± 1
Materials	aluminum body, steel bearing (other materials i.e. stainless steel, titanium, etc. available upon request)			

ORDERING INFORMATION

PPS-20- | **1** | | | **0** | |

DRIVE
Piezo Motor, PM-002 ..... **1**

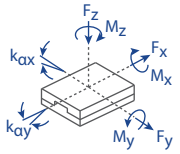
TRAVEL
12 mm **1**
18 mm **2**
26 mm **3**
51 mm **5**

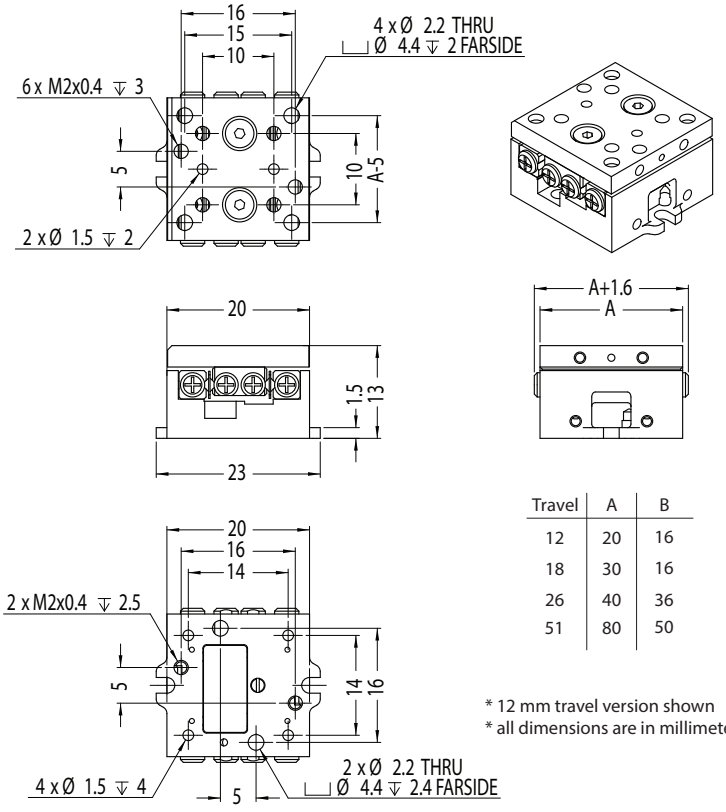
ENCODER
None **0**
Analog (1 V_{pp}) **2**
Digital (RS-422) **3**

LIMIT SWITCH
None **0**

ENVIRONMENT
Atmospheric **0**
High Vacuum, 10^{-6} mbar **6**
Ultra High Vacuum, 10^{-9} mbar **9**

Load, max	F_x [N]	F_y [N]	F_z [N]	M_x [N-m]	M_y [N-m]	M_z [N-m]	$k_{\alpha x}$ [µrad/N-m]	$k_{\alpha y}$ [µrad/N-m]
PM-002	2	20	20	0.7	0.7	0.7	-	-





Travel	A	B
12	20	16
18	30	16
26	40	36
51	80	50

* 12 mm travel version shown
* all dimensions are in millimeters

Precision Piezo Stage | PPS-28

The PPS-28 is a high-precision, long travel linear piezo stage. Miniature crossed roller bearings assure high stiffness and guiding accuracy for loads up to 50 N (horizontal orientation). It utilizes our patent-pending multi-phase piezo motor resulting in high speed (> 2 mm/s) and high blocking force (> 2 N). The PPS-28 is available in open loop or with an external encoder. Closed-loop resolution of 2 nm is achievable. Versions capable of operation in vacuum (10^{-9} mbar) and/or cryo (4 Kelvin) are available. The PPS-28 is compatible with the MMC-100 and MMC-110 controllers.

KEY FEATURES

- Travel range of up to 102 mm
- 2 nm closed loop resolution
- Load capacity up to 5 kg
- Steel crossed roller bearing
- Low profile, 15 mm height (12 mm without carriage)
- Vacuum, cryo, and non-magnetic versions available

TECHNICAL DATA

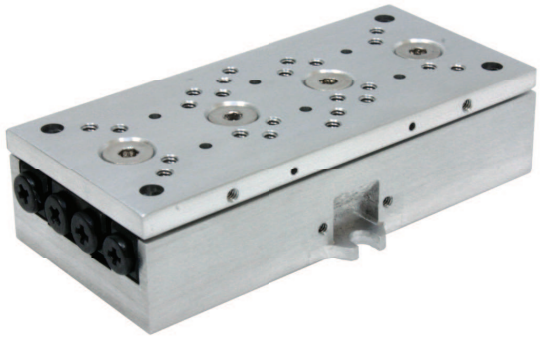
Travel range [mm]	**26**	**51**	**76**	**102**
Straightness / Flatness [µm]	± 1.5	± 2.5	± 3	± 3.5
Pitch [µrad]	± 50	± 70	± 80	± 100
Yaw [µrad]	± 60	± 75	± 90	± 100
Weight [g]	63	125	165	206
Motor option	**Piezo Motor**			
Speed, max [mm/s]	2 (MMC-100), 10 (MMC-110)			
Encoder option	**None (open loop)**	**Analog (1 V_{pp})**		**Digital (RS-422)**
Resolution, typical [nm]	1	10		2
Repeatability, bi-directional [nm]	n/a	± 50		± 20
Repeatability, uni-directional [nm]	n/a	50		20
Accuracy [µm]	-	± 1		± 1
Materials	aluminum body, steel bearing (other materials i.e. stainless steel, titanium, etc. available upon request)			

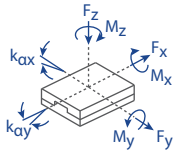
ORDERING INFORMATION

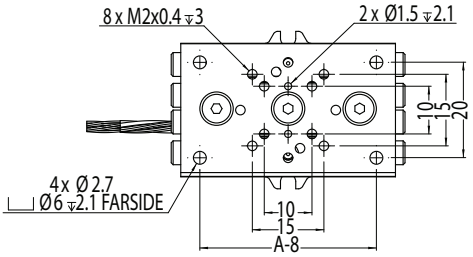
PPS-28- [1] [ ] [ ] [0] [ ]

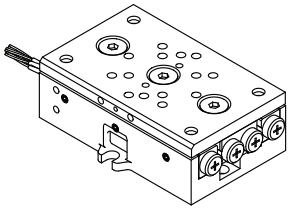
DRIVE	Piezo Motor, PM-002	**1**
TRAVEL	26 mm	**1**
	51 mm	**3**
	76 mm	**4**
	102 mm	**5**
ENCODER	None	**0**
	Analog (1 V_{pp})	**2**
	Digital (RS-422)	**3**
LIMIT SWITCH	None	**0**
ENVIRONMENT	Atmospheric	**0**
	High Vacuum, 10^{-6} mbar	**6**
	Ultra High Vacuum, 10^{-9} mbar	**9**

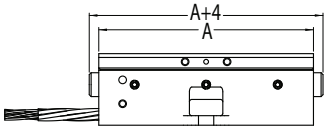
Load, max	F_x [N]	F_y [N]	F_z [N]	M_x [N-m]	M_y [N-m]	M_z [N-m]	$k_{\alpha x}$ [µrad/N-m]	$k_{\alpha y}$ [µrad/N-m]
PM-002	2	50	50	1	1	1	-	-

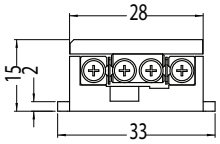


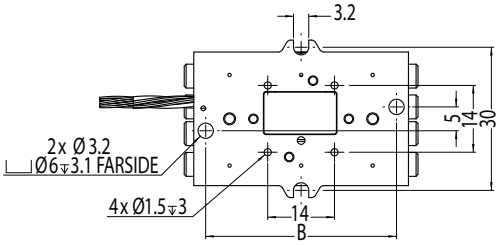












Travel	A	B
26	45	40
51	90	50
76	120	80
102	150	80

* 26 mm travel version shown
* all dimensions are in millimeters

Precision Positioning Stage | PPS-60

The PPS-60 is high-precision, long travel linear stage. It is available with piezo motor, linear motor or stepper motor drive. Ball bearings assure high stiffness and guiding accuracy for loads up to 150 N. The PPS-60 is available with an optional linear encoder for increased resolution and repeatability. PPS-60 stages can be mounted in XY without any adapter, and a Z-axis can be added with the use of a standard mounting bracket.

KEY FEATURES

- Travel ranges of up to 300 mm (longer travel available on request)
- 1.2 nm closed loop resolution
- Load capacity up to 15 kg
- Steel ball bearing
- Integrated mechanical limit switches
- Vacuum, non-magnetic & cryo versions available

TECHNICAL DATA

Travel range [mm]	**25**	**50**	**100**	**200**	**300**
Straightness / Flatness [µm]	± 2.5	± 4	± 6	± 8	± 10
Pitch [µrad]	± 50	± 75	± 100	± 125	± 150
Yaw [µrad]	± 50	± 75	± 100	± 125	± 150

Motor option	**Piezo Motor**				**Stepper Motor**				**Linear Motor**		
Speed, max [mm/s]	10 (MMC-110)				10 (*15)				100		
Encoder option	Open Loop	Analog (1 V_{pp})	Digital (RS-422)	Digital Low Cost	Open Loop	Analog (1 V_{pp})	Digital (RS-422)	Digital Low Cost	Analog (1 V_{pp})	Digital (RS-422)	Digital Low Cost
Resolution, typical [µm]	0.001	0.01	0.0012	0.5	0.1	0.1	0.05	0.5	0.01	0.002	0.5
Repeatability, bi-directional [µm]	-	±0.05	±0.02	±1	±4	±0.1	±0.1	±1	±0.05	±0.02	±1
Repeatability, uni-directional [µm]	-	0.05	0.02	1	0.2	0.1	0.1	1	0.05	0.02	1
Accuracy [µm]	-	±1	±1	±3	±10	±1	±1	±3	±1	±1	±3

Materials	aluminum body, steel bearing (other materials i.e. stainless steel, titanium, etc. available upon request)

*with external stepper motor

ORDERING INFORMATION

PPS-60- [ ] [ ] [ ] [ ] [ ]

DRIVE
- Piezo Motor, PM-003 ..... **1**
- Internal Stepper Motor, SM-001 ..... **2**
- Linear Motor, LM-002 ..... **3**
- External Stepper Motor, SM-004 ..... **4**

TRAVEL
- 25 mm **1**
- 50 mm **2**
- 100 mm **3**
- 200 mm **4**
- 300 mm **5**

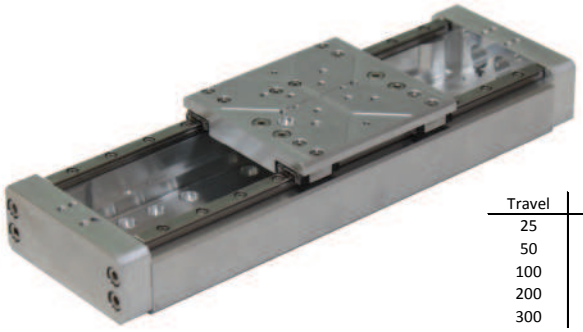
ENCODER
- None **0**
- Analog (1 V_{pp}) **2**
- Digital (RS-422) **3**
- Digital low cost, 0.5 µm **4**

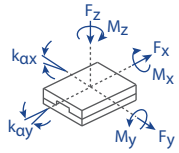
LIMIT SWITCH
- None **0**
- Mechanical **1**
- Optical **2**

ENVIRONMENT
- Atmospheric **0**
- High Vacuum, 10^{-6} mbar **6**
- †Ultra High Vacuum, 10^{-9} mbar **9**

† only available with Piezo Motor option or externally mounted UHV stepper Motor

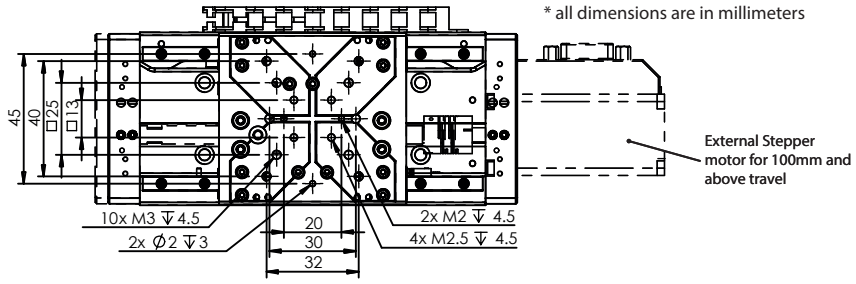
Load, max	F_x [N]	F_y [N]	F_z [N]	M_x [N·m]	M_y [N·m]	M_z [N·m]	$k_{\alpha x}$ [µrad/N·m]	$k_{\alpha y}$ [µrad/N·m]
PM-003	10	100	150	10	10	10	100	100
SM-001	10	100	150	10	10	10	100	100
LM-002	10	100	150	10	10	10	100	100
SM-004	10	100	150	10	10	10	100	100

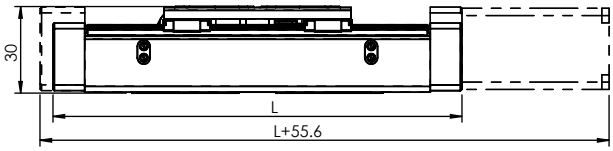


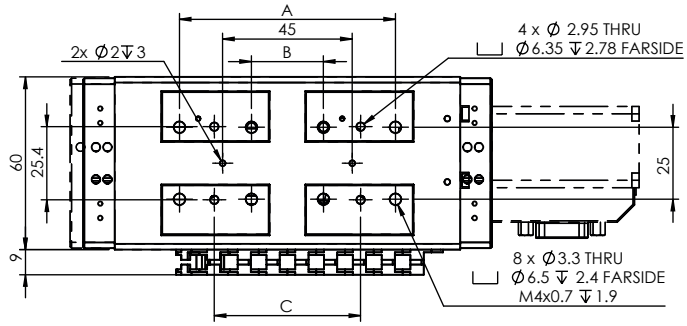


Travel	L	A	B	C
25	117	75	25	50.8
50	142	75	25	50.8
100	192	125	75	101.6
200	292	225	175	203.2
300	392	325	275	304.8

*50 mm travel version shown
* all dimensions are in millimeters







Precision Positioning Stage | PPS-110 NEW

The PPS-110 is a high-precision, long travel linear stage. It is available with piezo motor, linear motor, or ballscrew drives. Stainless steel recirculating ball bearings allow for smooth motion, and high guiding accuracy for loads up to 25kg. Closed loop resolution of 1.2nm is achievable with a high precision digital encoder.

KEY FEATURES

- Travel range of 300 mm
- Closed loop resolution of 1.2 nm
- Load capacity up to 25kg
- Recirculating Stainless Steel Ball Bearings
- Low profile, 40 mm height
- Vacuum versions available

TECHNICAL DATA

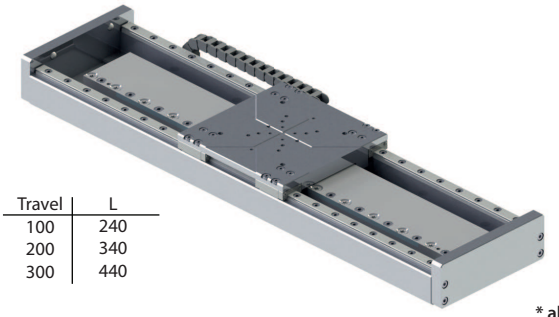
Travel range [mm]	**100 mm**	**200 mm**		**300 mm**	
Straightness / Flatness [µm]	± 3	± 4		± 5	
Pitch [µrad]	± 75	± 100		± 125	
Yaw [µrad]	± 75	± 85		± 100	
Motor option	**Linear Motor**	**Piezo Motor**		**Stepper Motor**	
Speed, max [mm/s]	250 (depending on load)	10 (MMC-110)		10	
Encoder option	**Digital (RS-422)**	**Open Loop**	**Digital**	**Open Loop**	**Digital**
Resolution, typical [µm]	0.0012	0.001	0.0012	0.1	0.05
Repeatability, bi-directional [µm]	± 0.02	n/a	± 0.02	± 2	± 0.1
Repeatability, uni-directional [µm]	0.02	n/a	0.02	0.2	0.1
Accuracy [µm]	± 1	n/a	± 1	-	± 1
Materials	aluminum body, steel bearing (other materials i.e. stainless steel, titanium, etc. available upon request)				

ORDERING INFORMATION

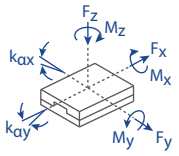
PPS-110- [ ] [ ] [ ] [ ] [ ]

DRIVE	Piezo Motor (PM-003)	**1**
	Stepper Motor (SM-004)	**2**
	Linear Motor (LM-004)	**3**
TRAVEL	100 mm	**1**
	200 mm	**2**
	300 mm	**3**
ENCODER	None (Open Loop)	**2**
	Digital (RS-422)	**3**
LIMIT SWITCH	None	**0**
	Mechanical	**1**
	Optical	**2**
ENVIRONMENT	Atmospheric	**0**
	High Vacuum, 10^{-6} mbar	**6**
	Ultra High Vacuum, 10^{-9} mbar	**9**

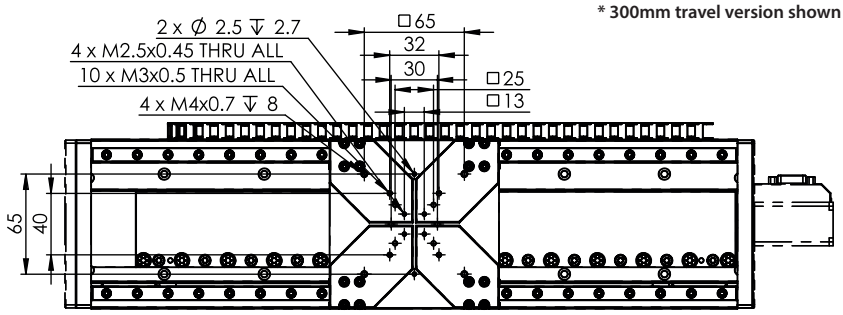
Load, max	F_X [N]	F_Y [N]	F_Z [N]	M_X [N·m]	M_Y [N·m]	M_Z [N·m]	k_{ax} [µrad/N·m]	k_{ay} [µrad/N·m]
LM-004	150 peak 50 continuous	150	250	60	30	35	50	50
PM-003	10	150	250	60	30	35	50	50
SM-004	30	150	250	60	30	35	50	50

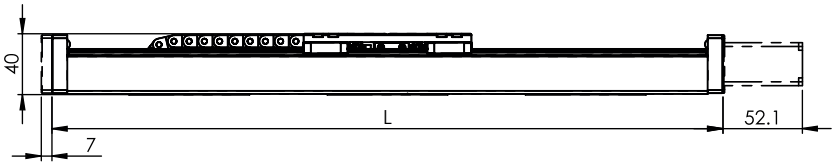


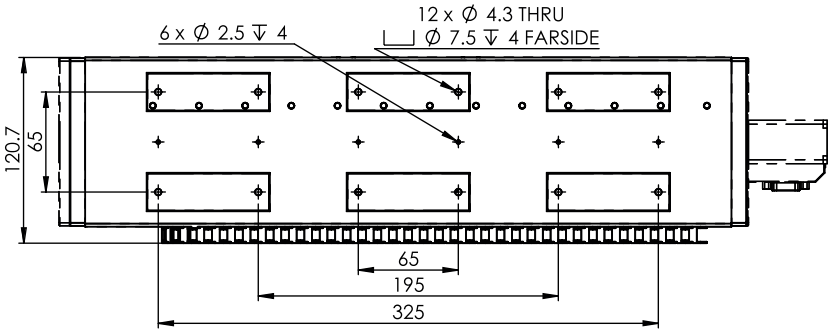
Travel	L
100	240
200	340
300	440



*** all dimensions are in millimeters**
*** 300mm travel version shown**







Piezo Cross Stage | PPX-32

The PPX-32 is a low profile, long travel, integrated XY stage with a height of only 14 mm. Four pre-loaded ball slides guarantee smooth and stable motion for loads up to 10 N. It utilizes a multi-phase piezo motor resulting in high speed (> 2 mm/s) and high blocking force (> 2 N). The PPX-32 is available in open loop or with a linear glass scale encoder. Closed-loop resolution of 10 nm is achievable. Versions capable of operation in vacuum (10^{-9} mbar) are available. The PPX-32 is compatible with the MMC-100 and MMC-110 controllers.

KEY FEATURES

- Travel range of 18 x 18 mm
- 10 nm closed loop resolution
- Load capacity up to 1 kg
- Steel ball slides
- Low profile, 14 mm height
- Vacuum versions available

TECHNICAL DATA

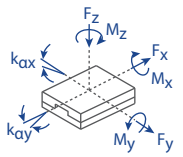
Travel range [mm]	**18 x 18**	
Straightness / Flatness [µm]	± 2.5	
Pitch [µrad]	± 200	
Yaw [µrad]	± 100	
Weight [g]	40	
Motor option	**Piezo Motor**	
Speed, max [mm/s]	2 (MMC-100), 10 (MMC-110)	
Encoder option	**None (open loop)**	**Analog (1 V_{pp})**
Resolution, typical [nm]	1	10
Repeatability, bi-directional [nm]	n/a	± 50
Repeatability, uni-directional [nm]	n/a	50
Accuracy [µm]	-	± 1
Materials	aluminum body, steel bearing (other materials i.e. stainless steel, titanium, etc. available upon request)	

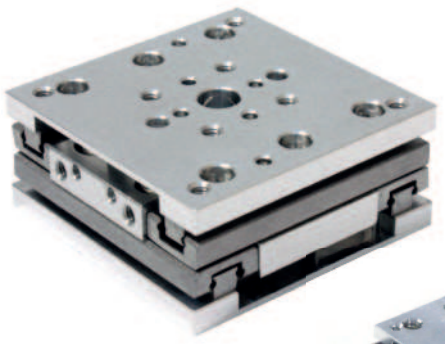
ORDERING INFORMATION

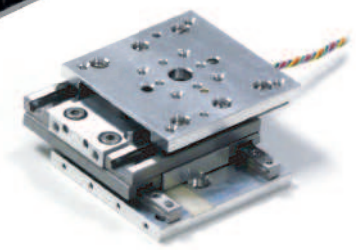
PPX-32- | **1** | **1** | | **0** | |

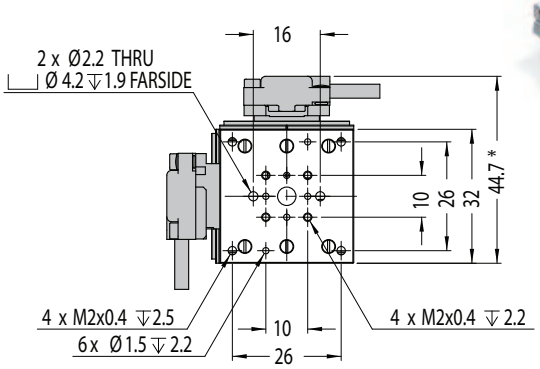
DRIVE	Piezo Motor, PM-002	**1**
TRAVEL	18 x 18 mm	**1**
ENCODER	None	**0**
	Analog (1 V_{pp})	**2**
LIMIT SWITCH	None	**0**
ENVIRONMENT	Atmospheric	**0**
	High Vacuum, 10^{-6} mbar	**6**
	Ultra High Vacuum, 10^{-9} mbar	**9**

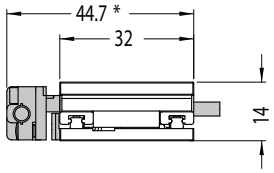
Load, max	F_x [N]	F_y [N]	F_z [N]	M_x [N·m]	M_y [N·m]	M_z [N·m]	$k_{\alpha x}$ [µrad/N·m]	$k_{\alpha y}$ [µrad/N·m]
PM-002	2	2	10	0.6	0.6	0.6	-	-

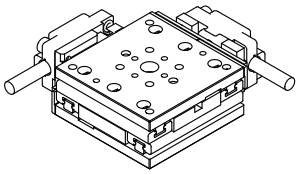




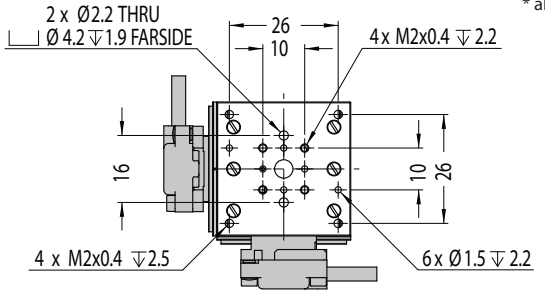








* grey parts for closed loop version only
* all dimensions are in millimeters



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Precision Piezo XY Stage | PPX-50 NEW

The PPX-50 is a low profile, long travel, integrated XY stage with an open aperture and a height of only 17.5 mm. Cross roller bearings guarantee smooth and stable motion for loads up to 30 N. It utilizes a multi-phase piezo motor resulting in high speed (> 10 mm/s) and high blocking force (> 2 N). The PPX-50 is available in open loop or with a linear encoder with a closed-loop resolution of 10 nm. Versions capable of operation in vacuum (10^{-9} mbar) are available. The PPX-50 is compatible with the MMC-100 and MMC-110 controllers.

KEY FEATURES

- Travel range of 30 x 30 mm
- Max open aperture 19 x19 mm, min 9.5 x 9.5 mm
- Closed loop resolution of 10 nm
- Load capacity up to 3 kg
- Steel cross roller bearings
- Low profile, 17.5 mm height
- Vacuum versions available

TECHNICAL DATA

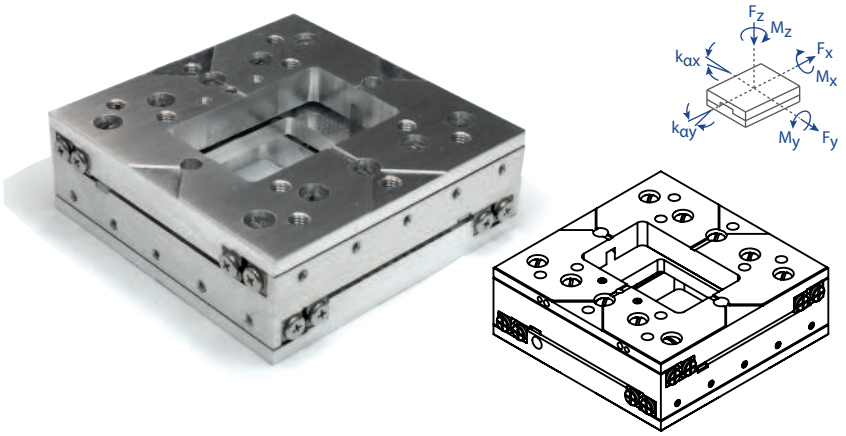
Travel range [mm]	**30 x 30**	
Straightness / Flatness [µm]	± 3.5	
Pitch [µrad]	± 200	
Yaw [µrad]	± 100	
Weight [g]	120	
Motor option	**Piezo Motor**	
Speed, max [mm/s]	2 (MMC-100), 10 (MMC-110)	
Encoder option	**None (open loop)**	**Analog (1 V_{pp})**
Resolution, typical [nm]	1	10
Repeatability, bi-directional [nm]	n/a	± 50
Repeatability, uni-directional [nm]	n/a	50
Accuracy [µm]	-	± 1
Materials	aluminum body, steel bearing (other materials i.e. stainless steel, titanium, etc. available upon request)	

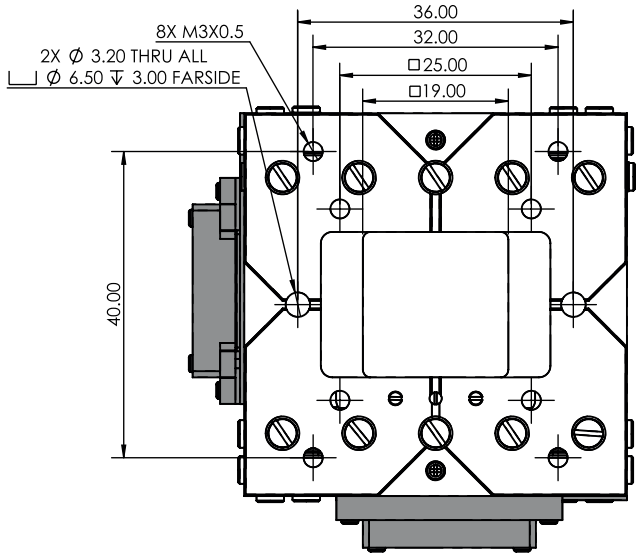
ORDERING INFORMATION

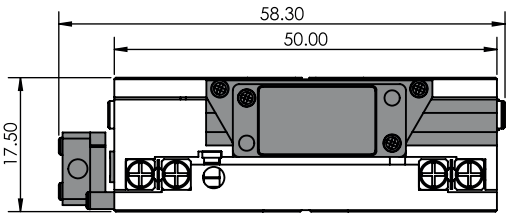
PPX-50- | **1** | **1** | | **0** | |

DRIVE	Piezo Motor, PM-002	**1**
TRAVEL	30 mm	**1**
ENCODER	None	**0**
	Analog (1 V_{pp})	**2**
LIMIT SWITCH	None	**0**
ENVIRONMENT	Atmospheric	**0**
	High Vacuum, 10^{-6} mbar	**6**
	Ultra High Vacuum, 10^{-9} mbar	**9**

Load, max	F_X [N]	F_Y [N]	F_Z [N]	M_X [N·m]	M_Y [N·m]	M_Z [N·m]	$k_{\alpha X}$ [µrad/N·m]	$k_{\alpha Y}$ [µrad/N·m]
PM-002	2	2	30	0.6	0.6	0.6	-	-







* all dimensions are in millimeters
* grey parts are for closed loop versions only

Piezo Rotation Stage | PR-20

The PR-20 is a low cost, ultra-compact rotational piezo stage. Low profile and high load capacity are achieved through the use of a multi-phase piezo motor combined with dual ceramic, mutually pre-loaded ball bearings, which allows for smooth, 360° travel. Vacuum versions are available. The PR-20 is compatible with the MMC-100 and MMC-110 controllers.

KEY FEATURES

- Continuous 360° motion
- Load capacity up to 0.5 kg
- Dual ceramic, mutually pre-loaded ball bearings
- Low profile, 12 mm height
- Vacuum versions available

TECHNICAL DATA

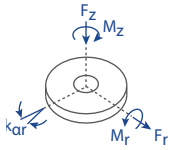
***Travel range** [°]*	**360°, limitless**	
Flatness (bearings) [µm]	± 5	
Eccentricity (bearings) [µm]	± 5	
Wobble [µrad]	± 200	
Weight [g]	13	
Motor option	**Piezo Motor**	
Speed, max [mm/s]	2 (MMC-100), 10 (MMC-110)	
Encoder option	**None (open loop)**	**Internal**
Resolution, typical [µ°]	500	500
Repeatability, bi-directional [µ°]	n/a	± 1000
Repeatability, uni-directional [µ°]	n/a	1000
Accuracy [µ°]	-	± 0.005
Materials	aluminum body, steel bearing (other materials i.e. stainless steel, titanium, etc. available upon request)	

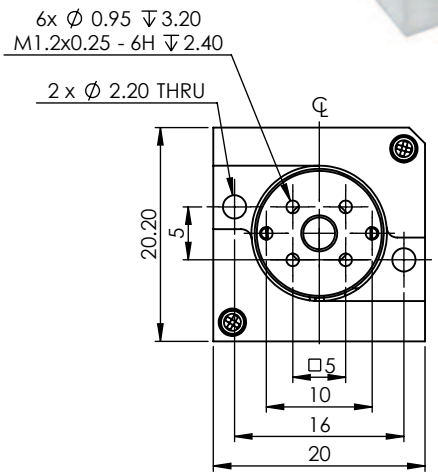
ORDERING INFORMATION

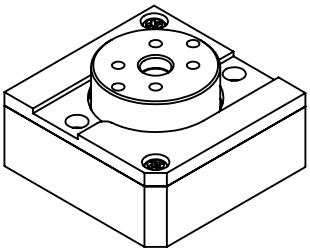
PR-20- | **1** | **1** | **0** | **0** | |

DRIVE	Piezo Motor, PM-002	**1**
TRAVEL	360° , continuous	**1**
ENCODER	None	**0**
LIMIT SWITCH	None	**0**
ENVIRONMENT	Atmospheric	**0**
	High Vacuum, 10^{-6} mbar	**6**
	Ultra High Vacuum, 10^{-9} mbar	**9**
	Non-Magnetic	**N**

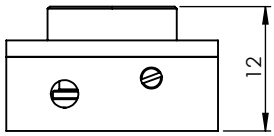
Load, max	F_r [N]	F_z [N]	M_r [N-m]	M_z [N-m]	k_{ar} [µrad/N-m]
PM-002	2	5	0.2	0.01	-

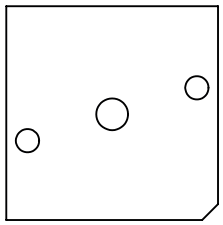






* all dimensions are in millimeters





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Piezo Rotation Stage | PR-32

The PR-32 is a compact rotation stage with unlimited travel. Two pre-loaded steel ball bearings ensure smooth motion and high stability. It utilizes our patent-pending multi-phase piezo motor resulting in high speed (> 6 °/s) and high blocking force. The PR-32 can be combined with the linear PPX-32 or with the PPS-series stages. Versions capable of operation in vacuum (10^{-9} mbar) are available. The PR-32 is compatible with the MMC-100 and MMC-110 controllers.

KEY FEATURES

- Continuous 360° motion
- Load capacity up to 1 kg
- Steel ball bearings
- Vacuum versions available

TECHNICAL DATA

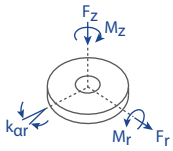
Travel range [°]	**360, Continuous**	
Flatness (bearings) [µm]	± 5	
Eccentricity (bearings) [µm]	± 5	
Wobble [µrad]	± 100	
Weight [g]	50	
Motor option	**Piezo Motor**	
Speed, max [°/s]	6 (MMC-100), 30 (MMC-110)	
Encoder option	**None (open loop)**	**Analog (1 V_{pp})**
Resolution, typical [µ°]	3.6	44
Repeatability, bi-directional [µ°]	n/a	± 220
Repeatability, uni-directional [µ°]	n/a	220
Accuracy [µ°]	-	-
Materials	aluminum body, steel bearing (other materials i.e. stainless steel, titanium, etc. available upon request)	

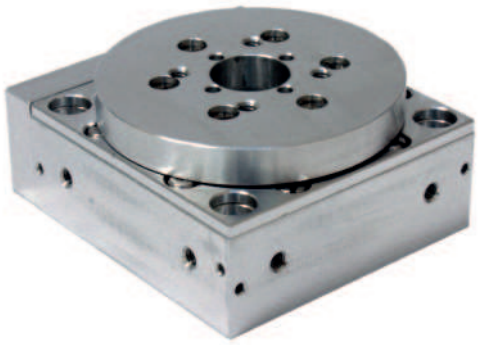
ORDERING INFORMATION

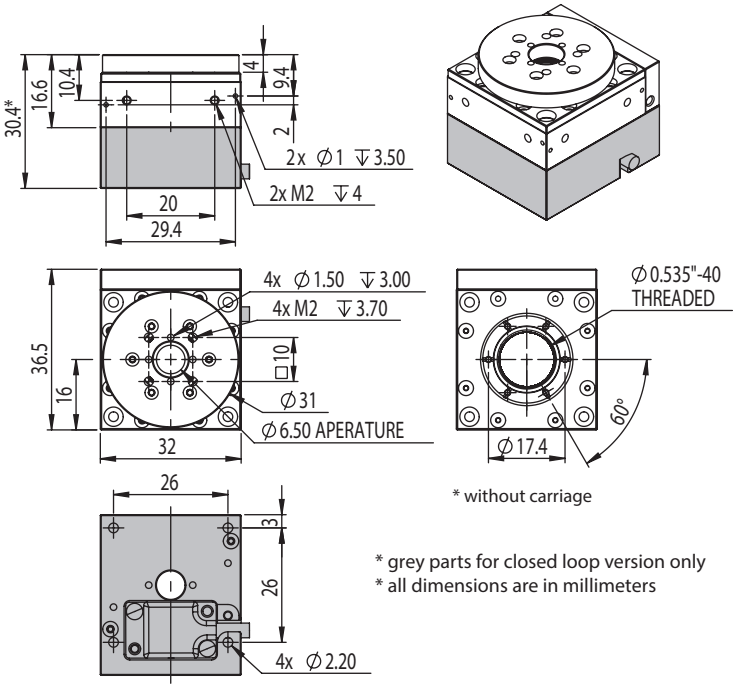
PR-32- | **1** | **1** | | **0** | |

DRIVE	Piezo Motor, PM-002R	**1**
TRAVEL	360°, Continuous	**1**
ENCODER	None	**0**
	Analog (1 V_{pp})	**2**
LIMIT SWITCH	None	**0**
ENVIRONMENT	Atmospheric	**0**
	High Vacuum, 10^{-6} mbar	**6**
	Ultra High Vacuum, 10^{-9} mbar	**9**

Load, max	F_r [N]	F_z [N]	M_r [N-m]	M_z [N-m]	$k_{\alpha r}$ [μrad/N-m]
PM-002R	10	10	0.5	0.025	-







* without carriage

* grey parts for closed loop version only
* all dimensions are in millimeters

Piezo Rotation Stage | PR-50

NEW

The PR-50 is a compact rotation stage with unlimited travel and a 1 inch aperture. Two pre-loaded steel ball bearings ensure smooth motion and high stability. It utilizes our patented multi-phase piezo motor resulting in high speed (> 25 °/s) and high blocking force. The PR-50 can be combined with the linear PPX-50, PPS-60, or VT-50 stages without an adapter bracket. Versions capable of operation in vacuum (10^{-9} mbar) are available. The PR-50 is compatible with the MMC-103 and MMC-110 controllers.

KEY FEATURES

- Continuous 360° motion
- Load capacity up to 3 kg
- Mutually pre-loaded ball bearings
- Low profile, 20 mm height
- Vacuum versions available

TECHNICAL DATA

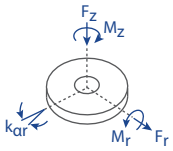
Travel range [°]	**360°, limitless**	
Flatness (bearings) [µm]	± 3	
Eccentricity (bearings) [µm]	± 3	
Wobble [µrad]	± 50	
Weight [g]	135	
Motor option	**Piezo Motor**	
Speed, max [°/s]	15 (MMC-103), 25 (MMC-110)	
Encoder option	**None (open loop)**	**Internal**
Resolution, typical [µ°]	1	100
Repeatability, bi-directional [µ°]	n/a	± 200
Repeatability, uni-directional [µ°]	n/a	200
Accuracy [µ°]	-	-
Materials	aluminum body, steel bearing (other materials i.e. stainless steel, titanium, etc. available upon request)	

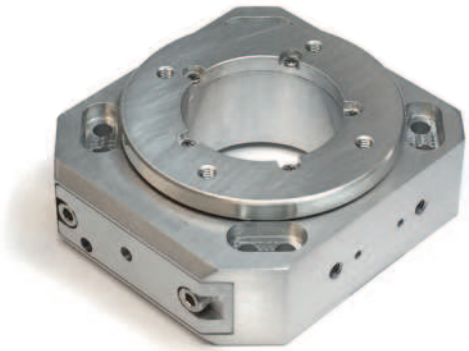
ORDERING INFORMATION

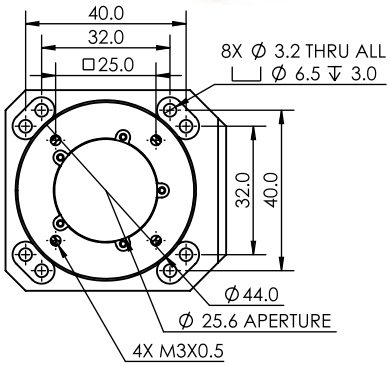
PR-50- | **1** | **1** | | | |

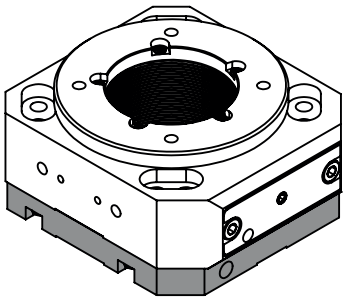
DRIVE	Piezo Motor, PM-003R	**1**
TRAVEL	360°	**1**
ENCODER	None	**0**
	Analog (1 V_{pp})	**2**
LIMIT SWITCH	None	**0**
ENVIRONMENT	Atmospheric	**0**
	High Vacuum, 10^{-6} mbar	**6**
	Ultra High Vacuum, 10^{-9} mbar	**9**

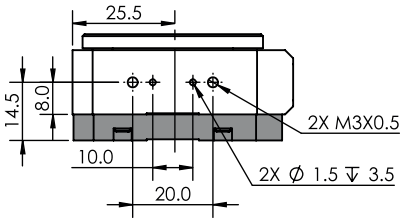
Load, max	F_r [N]	F_z [N]	M_r [N·m]	M_z [N·m]	k_{ar} [µrad/N·m]
PM-003R	20	30	5	0.1	150

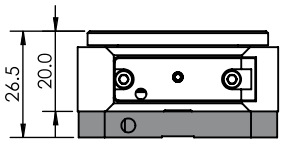




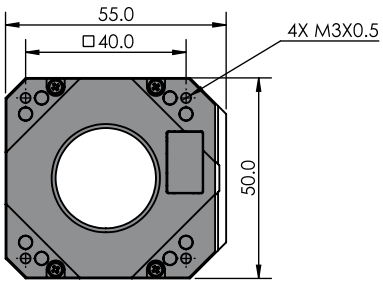








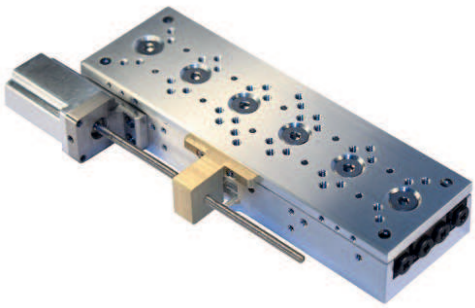
* all dimensions are in millimeters
* grey parts for closed loop version only



Stepper Motor

Product Line

to scale



Translation Stage | VT-21S

The low cost VT-21S linear stage excels in applications with very limited space due to its compact design. The stage utilizes a 2-phase stepper motor and is equipped with two mechanical limit switches. A pre-loaded ball slide creates high stiffness and superior performance. The VT-21S is available with an optional linear encoder with 50 nm resolution. The stages can be mounted in XY or XYZ configuration in a space-saving arrangement. Versions capable of operation in vacuum (10^{-6} mbar) are available. The VT-21S is compatible with the MMC-200 controller.

KEY FEATURES

- Travel range of 10 mm
- 50 nm closed loop resolution
- Load capacity up to 1 kg
- Steel ball slide
- Integrated mechanical limit switches
- Vacuum versions available

TECHNICAL DATA

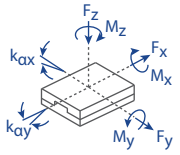
Travel range [mm]	**10**		
Straightness / Flatness [µm]	± 2.5		
Pitch [µrad]	± 150		
Yaw [µrad]	± 150		
Weight [g]	100		
Motor option	**2-Phase Stepper Motor**		
Speed, max [mm/s]	5		
Encoder option	**None (open loop)**	**Analog (1 V_{pp})**	**Digital (RS-422)**
Resolution, typical [µm]	0.5	0.05	0.05
Repeatability, bi-directional [µm]	± 4	± 0.2	± 0.2
Repeatability, uni-directional [µm]	0.5	0.2	0.2
Accuracy [µm]	± 10	± 1	± 1
Materials	aluminum body, steel bearing (other materials i.e. stainless steel, titanium, etc. available upon request)		

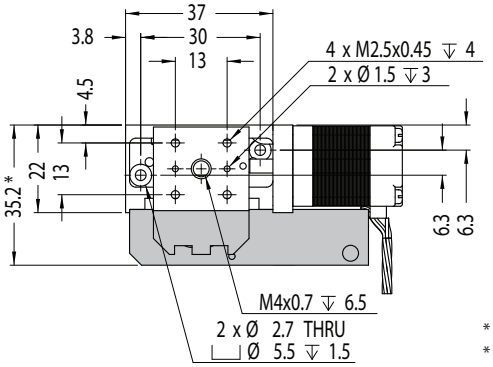
ORDERING INFORMATION

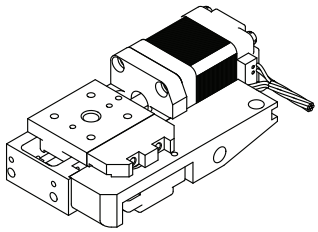
VT-21- | **1** | **1** | | **1** | |

DRIVE	Stepper Motor, SM-001	**1**
TRAVEL	10 mm	**1**
ENCODER	None	**0**
	Analog (1 V_{pp})	**2**
	Digital (RS-422)	**3**
LIMIT SWITCH	Mechanical	**1**
ENVIRONMENT	Atmospheric	**0**
	High Vacuum, 10^{-6} mbar	**6**

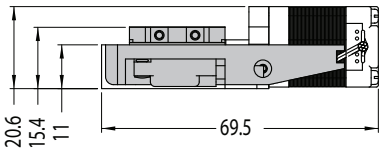
Load, max	F_X [N]	F_Y [N]	F_Z [N]	M_X [N-m]	M_Y [N-m]	M_Z [N-m]	$k_{\alpha X}$ [µrad/N-m]	$k_{\alpha Y}$ [µrad/N-m]
SM-001	10	10	10	0.4	0.6	0.5	-	-

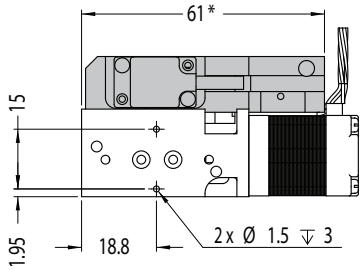






* grey parts for closed loop version only
* all dimensions are in millimeters





Translation Stage | VT-21L

The low cost VT-21L linear stage excels in applications with very limited space due to its compact design. The stage utilizes a 2-phase stepper motor and is equipped with two mechanical limit switches. A pre-loaded ball slide creates high stiffness and superior performance. The VT-21L is available with an optional linear encoder with 50 nm resolution. The stages can be mounted in XY or XYZ configuration in a space-saving arrangement. Versions capable of operation in vacuum (10^{-6} mbar) are available. The VT-21L is compatible with the MMC-200 controller.

KEY FEATURES

- Travel range of 26 mm
- 50 nm closed loop resolution
- Load capacity up to 1 kg
- Steel ball slide
- Integrated mechanical limit switches
- Vacuum versions available

TECHNICAL DATA

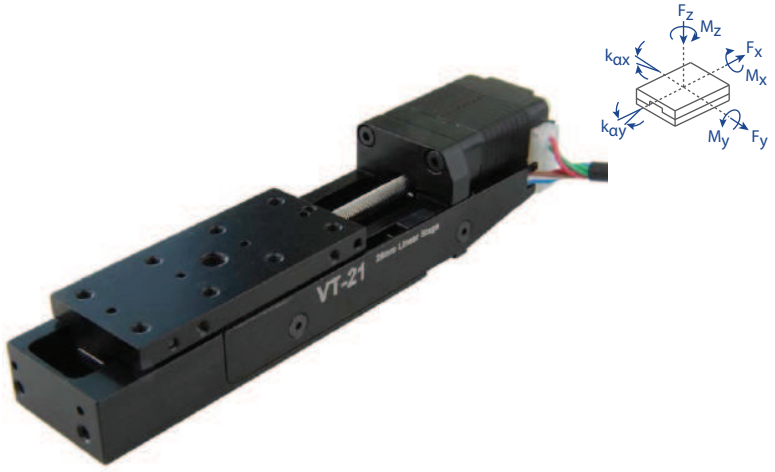
Travel range [mm]	**26**		
Straightness / Flatness [µm]	± 3		
Pitch [µrad]	± 180		
Yaw [µrad]	± 180		
Weight [g]	120		
Motor option	**2-Phase Stepper Motor**		
Speed, max [mm/s]	5		
Encoder option	**None (open loop)**	**Analog (1 V_{pp})**	**Digital (RS-422)**
Resolution, typical [µm]	0.5	0.05	0.05
Repeatability, bi-directional [µm]	± 4	± 0.2	± 0.2
Repeatability, uni-directional [µm]	0.5	0.2	0.2
Accuracy [µm]	± 10	± 1	± 1
Materials	aluminum body, steel bearing (other materials i.e. stainless steel, titanium, etc. available upon request)		

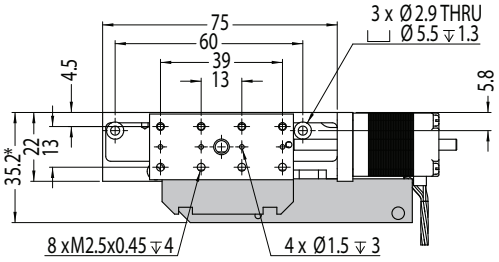
ORDERING INFORMATION

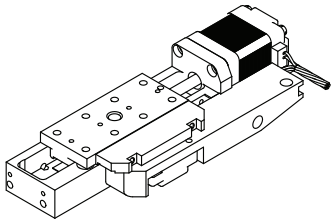
VT-21- | **1** | **2** | | **1** | |

DRIVE	Stepper Motor, SM-001	**1**
TRAVEL	26 mm	**2**
ENCODER	None	**0**
	Analog (1 V_{pp})	**2**
	Digital (RS-422)	**3**
LIMIT SWITCH	Mechanical	**1**
ENVIRONMENT	Atmospheric	**0**
	High Vacuum, 10^{-6} mbar	**6**

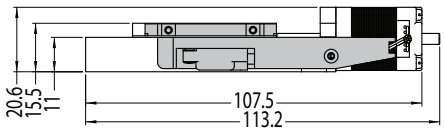
Load, max	F_X [N]	F_Y [N]	F_Z [N]	M_X [N-m]	M_Y [N-m]	M_Z [N-m]	$k_{\alpha x}$ [µrad/N-m]	$k_{\alpha y}$ [µrad/N-m]
SM-001	10	10	10	0.4	0.6	0.5	-	-

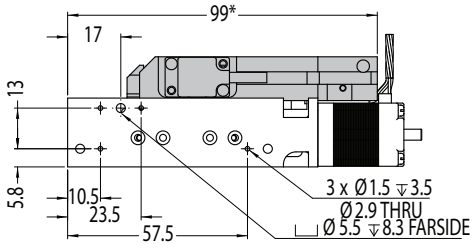






* grey parts for closed loop version only
* all dimensions are in millimeters





Precision Positioning Stage | PPS-20SM

The PPS-20 Stepper Motor version is suitable for applications requiring high speed and high blocking force. Miniature crossed roller bearings assure high stiffness and guiding accuracy for loads up to 20 N (horizontal orientation). It utilizes a 2-phase stepper motor resulting in high speed (> 4 mm/s) and high blocking force (> 10 N). The PPS-20SM is available in open loop or with an external encoder. Resolutions of 100 nm are achievable. Versions capable of operation in vacuum (10^{-6} mbar) are available. The PPS-20SM is compatible with the MMC-200 controller.

KEY FEATURES

- Travel range of up to 51 mm
- 100 nm resolution
- Load capacity up to 20N
- Steel crossed roller bearing
- Low profile, 13 mm height
- Vacuum versions available

TECHNICAL DATA

Travel range [mm]	**12**	**18**	**26**	**51**
Straightness / Flatness [µm]	± 1	± 1.5	± 1.5	± 2.5
Pitch [µrad]	± 60	± 80	± 80	± 100
Yaw [µrad]	± 70	± 90	± 90	± 100
Weight [g]	-	-	-	-
Motor option	**2-Phase Stepper Motor**			
Speed, max [mm/s]	4			
Encoder option	**None (open loop)**	**Analog (1 V_{pp})**	**Digital (RS-422)**	
Resolution, typical [µm]	0.1	0.1	0.1	
Repeatability, bi-directional [µm]	± 4	± 0.2	± 0.2	
Repeatability, uni-directional [µm]	0.5	0.2	0.2	
Accuracy [µm]	± 10	± 1	± 1	
Materials	aluminum body, steel bearing, stainless steel bracket, brass nut (other materials i.e. stainless steel, titanium, etc. available upon request)			

ORDERING INFORMATION

PPS-20- **2** [ ] [ ] [ ] [ ]

DRIVE
- Stepper Motor, SM-002 ..... **2**

TRAVEL
- 12 mm **1**
- 18 mm **2**
- 26 mm **3**
- 51 mm **5**

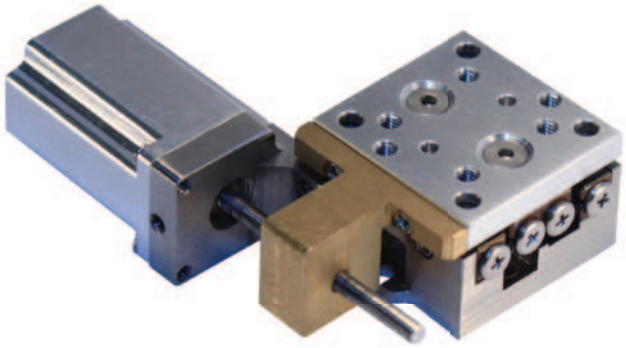
ENCODER
- None **0**
- Analog (1 V_{pp}) **2**
- Digital (RS-422) **3**

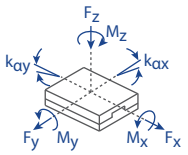
LIMIT SWITCH
- None **0**
- Magnetic **1**
- Optical† **2**

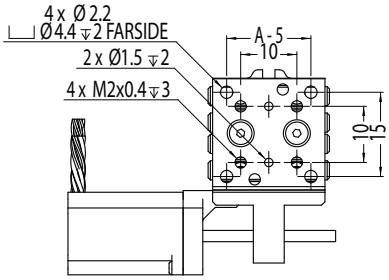
ENVIRONMENT
- Atmospheric **0**
- High Vacuum, 10^{-6} mbar **6**

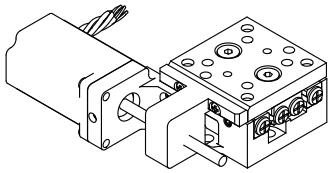
† only available with Digital Encoder option

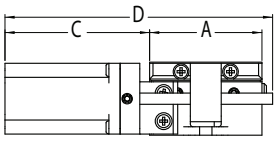
Load, max	F_x [N]	F_y [N]	F_z [N]	M_x [N·m]	M_y [N·m]	M_z [N·m]	$k_{\alpha x}$ [µrad/N·m]	$k_{\alpha y}$ [µrad/N·m]
SM-002	10	20	20	0.7	0.7	0.7	-	-

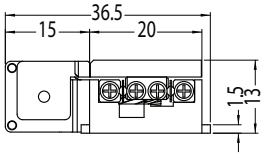


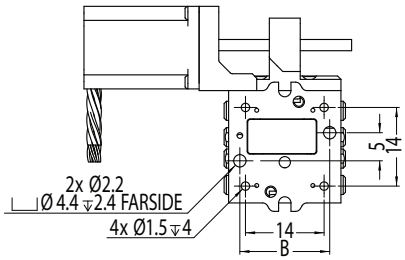












Travel	A	B	C	D
12	20	16	25.75	47.65
20	30	16	25.75	57.65
26	40	36	20.25	61.05
51	80	50	15.75	96.55

* 12 mm travel version shown
* all dimensions are in millimeters

Precision Positioning Stage | PPS-28SM

The PPS-28 Stepper Motor version is suitable for applications requiring high speed and high blocking force. Miniature crossed roller bearings assure high stiffness and guiding accuracy for loads up to 50 N (horizontal orientation). It utilizes a 2-phase stepper motor resulting in high speed (> 5 mm/s) and high blocking force (> 10 N). The PPS-28SM is available in open loop or with an external encoder. Resolutions of 100 nm are achievable. Versions capable of operation in vacuum (10^{-6} mbar) are available. The PPS-28SM is compatible with the MMC-200 controller.

KEY FEATURES

- Travel range of up to 102 mm
- 100 nm resolution
- Load capacity up to 5 kg
- Steel crossed roller bearing
- Low profile, 15 mm height
- Vacuum versions available

TECHNICAL DATA

Travel range [mm]	**26**	**51**	**76**	**102**
Straightness / Flatness [µm]	± 1.5	± 2.5	± 3	± 3.5
Pitch [µrad]	± 50	± 70	± 80	± 100
Yaw [µrad]	± 60	± 75	± 90	± 100
Weight [g]	-	-	-	-
Motor option	**2-Phase Stepper Motor**			
Speed, max [mm/s]	5			
Encoder option	**None (open loop)**	**Analog (1 V_{pp})**	**Digital (RS-422)**	
Resolution, typical [µm]	0.1	0.1	0.1	
Repeatability, bi-directional [µm]	± 4	± 0.2	± 0.2	
Repeatability, uni-directional [µm]	0.5	0.2	0.2	
Accuracy [µm]	± 10	± 1	± 1	
Materials	aluminum body, steel bearing, stainless steel bracket, brass nut (other materials i.e. stainless steel, titanium, etc. available upon request)			

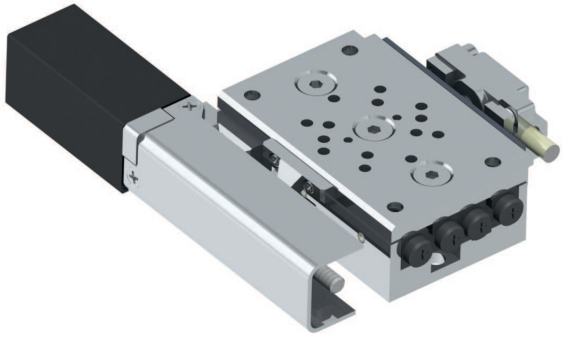
ORDERING INFORMATION

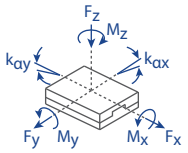
PPS-28- **2** [ ] [ ] [ ] [ ]

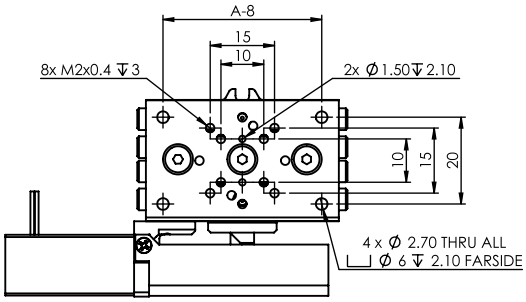
DRIVE	Stepper Motor, SM-002	**2**
TRAVEL	26 mm	**1**
	51 mm	**3**
	76 mm	**4**
	102 mm	**5**
ENCODER	None	**0**
	Analog (1 V_{pp})	**2**
	Digital (RS-422)	**3**
LIMIT SWITCH	None	**0**
	Magnetic	**1**
	Optical†	**2**
ENVIRONMENT	Atmospheric	**0**
	High Vacuum, 10^{-6} mbar	**6**

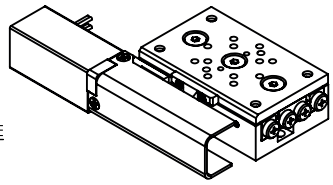
† only available with Digital Encoder option

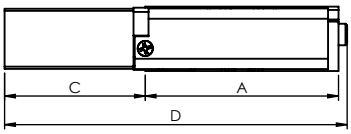
Load, max	F_X [N]	F_Y [N]	F_Z [N]	M_X [N·m]	M_Y [N·m]	M_Z [N·m]	$k_{\alpha X}$ [µrad/N·m]	$k_{\alpha Y}$ [µrad/N·m]
SM-002	10	50	50	1	1	1	-	-

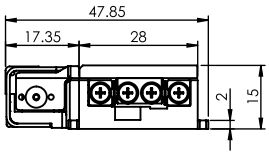


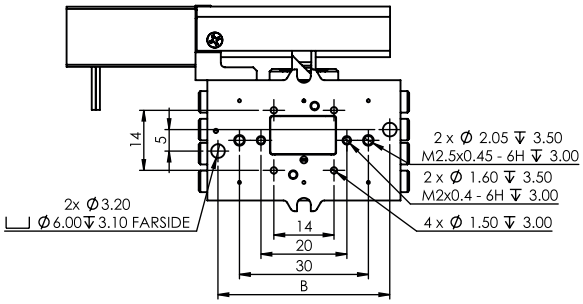












Travel	A	B	C	D
26	45	40	32.75	79.75
51	90	50	19.25	111.25
76	120	80	22.25	144.25
102	150	80	13.25	165.25

* 26 mm travel version shown
* all dimensions are in millimeters

Translation Stage | VT-50L

The low cost VT-50 linear stage excels in applications with very limited space due to its compact design. The stage utilizes a 2-phase stepper motor and is equipped with two mechanical limit switches. A pre-loaded ball bearing (optional cross-roller bearing) creates high stiffness and superior performance. The VT-50 is available with an optional linear encoder with 50 nm resolution. VT-50 stages can be mounted XY without any adapters, and a Z-axis can be added with the use of a standard mounting bracket. For elevation travel ranges of 10mm or less the VT-50 can be combined with the ES-50 elevation stage without the use of adapter plates.Versions capable of operation in vacuum (10^{-6} mbar) are available. The VT-50 is compatible with the MMC-200 controller.

KEY FEATURES

- Travel range of 50 to 300 mm (longer travel available on request up to 500 mm)
- 50 nm closed loop resolution
- Load capacity up to 20 kg
- Steel ball bearing
- Integrated mechanical limit switches
- Vacuum versions available

TECHNICAL DATA

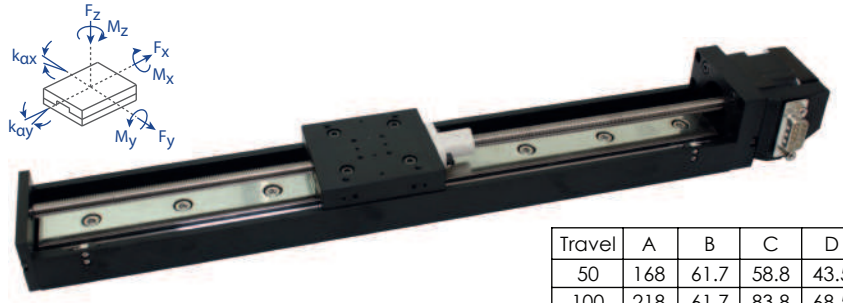
Travel range [mm]	**50**	**100**	**200**	**300**
Straightness / Flatness [µm]	± 5	± 7	± 10	± 12
Pitch [µrad]	± 100	± 125	± 150	± 200
Yaw [µrad]	± 100	± 125	± 150	± 200
Weight [g]	-	-	-	-
Motor option	**2-Phase Stepper Motor**			
Speed, max [mm/s]	10			
Encoder option	**None (open loop)**	**Analog (1 V_{pp})**	**Digital (RS-422)**	
Resolution, typical [µm]	0.1	0.05	0.05	
Repeatability, bi-directional [µm]	± 10	± 0.2	± 0.2	
Repeatability, uni-directional [µm]	10	0.2	0.2	
Accuracy [µm]	± 20	± 3	± 3	
Materials	aluminum body, steel bearing (other materials i.e. stainless steel, titanium, etc. available upon request)			

ORDERING INFORMATION

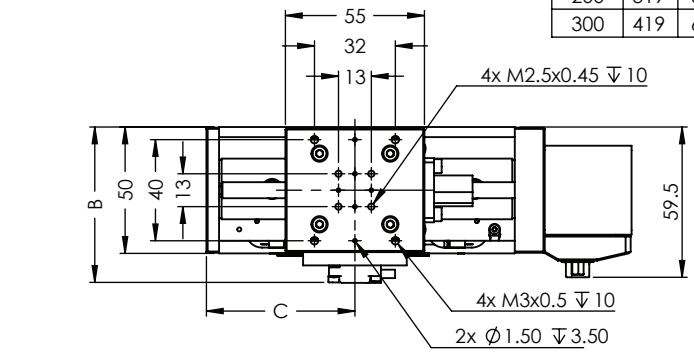
VT-50L- | **1** | | | **1** | |

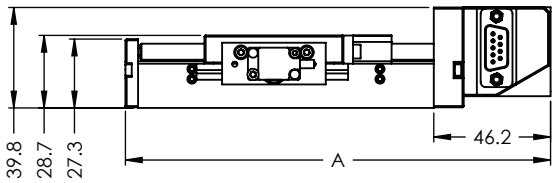
DRIVE	Stepper Motor, SM-003	**1**
TRAVEL	50 mm	**1**
	100 mm	**2**
	200 mm	**3**
	300 mm	**4**
ENCODER	None	**0**
	Analog (1 V_{pp})	**2**
	Digital (RS-422)	**3**
LIMIT SWITCH	Mechanical	**1**
ENVIRONMENT	Atmospheric	**0**
	High Vacuum, 10^{-6} mbar	**6**

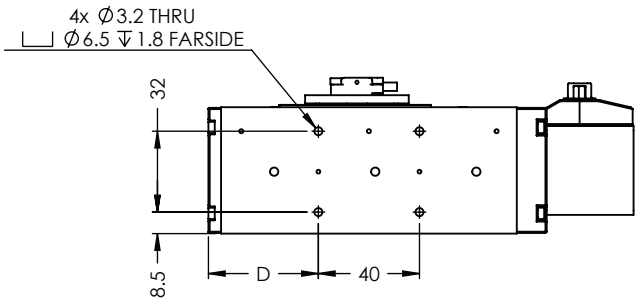
Load, max	F_x [N]	F_y [N]	F_z [N]	M_x [N-m]	M_y [N-m]	M_z [N-m]	k_{ax} [µrad/N-m]	k_{ay} [µrad/N-m]
SM-003	50	200	200	10	10	10	100	100



Travel	A	B	C	D
50	168	61.7	58.8	43.5
100	218	61.7	83.8	68.5
200	319	63.3	134.3	119
300	419	63.3	184.3	169







Elevation Stage | ES-50

The ES-50 elevation stage is designed for applications with limited space conditions. The ES-50 stage is driven by a 2-phase stepper motor and is equipped with two mechanical limit switches. Two pre-loaded ball slides assure smooth motion and high stiffness. The ES-50 allows for a highly rigid XZ or XYZ setup without the need for adapter brackets when combined with the VT-50 series of linear stages. Versions capable of operation in vacuum (10^{-6} mbar) are available. The ES-50 is compatible with the MMC-200 controller.

KEY FEATURES

- Travel range of 10 mm
- 50 nm closed loop resolution
- Load capacity up to 2 kg
- Steel ball slides
- Integrated mechanical limit switches
- Vacuum versions available

TECHNICAL DATA

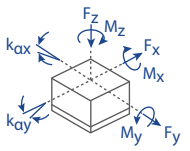
Travel range [mm]	**10**		
Straightness / Flatness [µm]	± 4		
Pitch [µrad]	± 300		
Yaw [µrad]	± 300		
Weight [g]	110		
Motor option	**2-Phase Stepper Motor**		
Speed, max [mm/s]	5		
Encoder option	**None (open loop)**	**Analog (1 V_{pp})**	**Digital (RS-422)**
Resolution, typical [µm]	0.5	0.05	0.05
Repeatability, bi-directional [µm]	± 2	± 0.2	± 0.2
Repeatability, uni-directional [µm]	0.5	0.2	0.2
Accuracy [µm]	-	± 1	± 1
Materials	aluminum body, steel bearing (other materials i.e. stainless steel, titanium, etc. available upon request)		

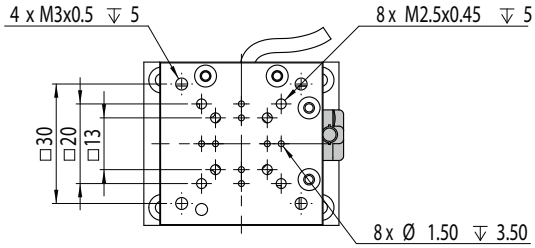
ORDERING INFORMATION

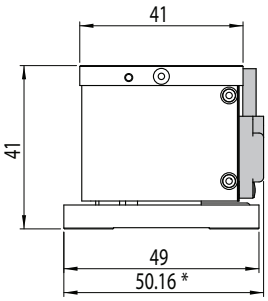
ES-50- | **1** | **1** | | **1** | |

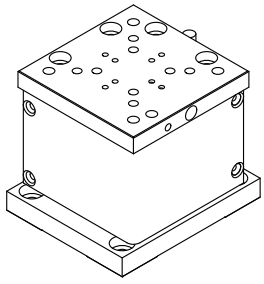
DRIVE	Stepper Motor, SM-001	**1**
TRAVEL	10 mm	**1**
ENCODER	None	**0**
	Analog (1 V_{pp})	**2**
	Digital (RS-422)	**3**
LIMIT SWITCH	Mechanical	**1**
ENVIRONMENT	Atmospheric	**0**
	High Vacuum, 10^{-6} mbar	**6**

Load, max	F_x [N]	F_y [N]	F_z [N]	M_x [N-m]	M_y [N-m]	M_z [N-m]	$k_{\alpha x}$ [µrad/N-m]	$k_{\alpha y}$ [µrad/N-m]
SM-001	5	5	10	1	1	1	-	-

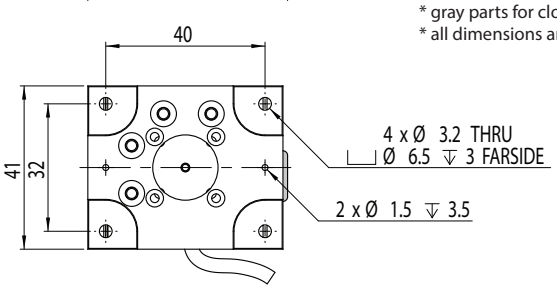








* gray parts for closed loop versions only
* all dimensions are in millimeters



Elevation Stage | PZS-90

The PZS-90 elevation stage is designed for applications with limited space conditions. Pre-loaded cross roller bearings assure smooth motion and high stiffness. The PZS-90 allows for a highly rigid XZ or XYZ setup without the need for adapter brackets when combined with the VT-50L series & PPS-60 series of linear stages. The PZS-90 stage is driven by a 2-phase stepper motor and is equipped with two mechanical limit switches. An optional linear encoder provides higher accuracy versus the open loop option. Versions capable of operation in vacuum (10-6 mbar) are available. The PZS-90 is compatible with the MMC-200 controller.

KEY FEATURES

- Travel range of 35 mm
- 100 nm closed loop resolution
- Load capacity up to 15 kg
- Steel cross roller bearing
- Integrated mechanical limit switches
- Vacuum versions available

TECHNICAL DATA

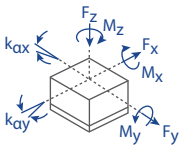
Travel range [mm]	**35**			
Straightness / Flatness [µm]	± 3			
Pitch [µrad]	± 200			
Yaw [µrad]	± 200			
Weight [kg]	1.145			
Motor option	**2-Phase Stepper Motor**			
Speed, max [mm/s]	10			
Encoder option	**None (open loop)**	**Analog (1 V_{pp})**	**Digital (RS-422)**	**Digital Low Cost (RS-422)**
Resolution, typical [µm]	0.5	0.1	0.1	0.5
Repeatability, bi-directional [µm]	± 2	± 0.1	± 0.1	± 1
Repeatability, uni-directional [µm]	0.5	0.1	0.1	1
Accuracy [µm]	± 15	± 1	± 1	±3
Materials	aluminum body, steel bearing (other materials i.e. stainless steel, titanium, etc. available upon request)			

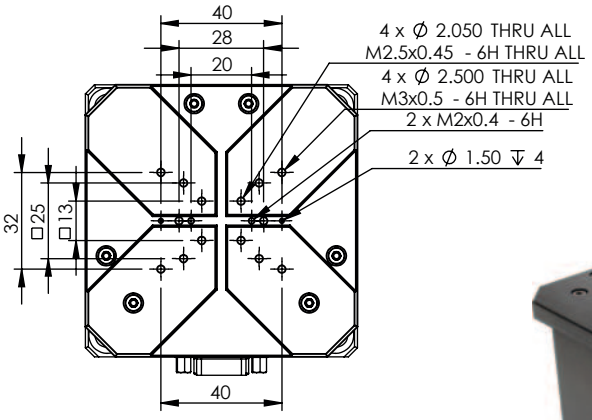
ORDERING INFORMATION

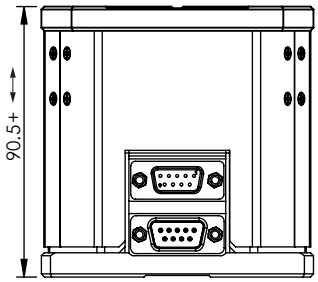
PZS-90- | **1** | **1** | | **1** | |

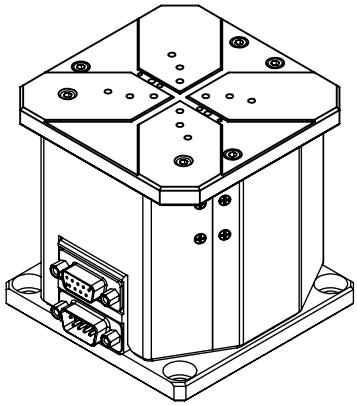
DRIVE	Stepper Motor, SM-003	**1**
TRAVEL	35mm	**1**
ENCODER	None	**0**
	Analog (1 V_{pp})	**2**
	Digital (RS-422)	**3**
	Digital low cost, 0.5µm	**4**
LIMIT SWITCH	Mechanical	**1**
ENVIRONMENT	Atmospheric	**0**
	High Vacuum, 10^{-6} mbar	**6**

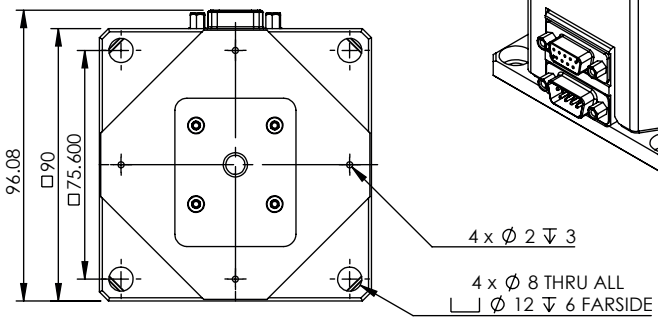
Load, max	F_x [N]	F_y [N]	F_z [N]	M_x [N·m]	M_y [N·m]	M_z [N·m]	$k_{\alpha x}$ [µrad/N·m]	$k_{\alpha y}$ [µrad/N·m]
SM-003	75	75	150	50	50	100	50	50











Precision Rotation Stage | PR-50SM

NEW

The PR-50 rotary stage excels where fast rotation speeds are needed. The stage utilizes a direct drive stepper motor combined with dual mutually pre-loaded ball bearings, which allow for smooth, 360° travel. Vacuum versions are available. The PR-50 is compatible with the MMC-200.

KEY FEATURES

- Continuous 360° motion
- Load capacity up to 2 kg
- Mutually pre-loaded ball bearings
- Low profile, 34 mm height
- Vacuum versions available

TECHNICAL DATA

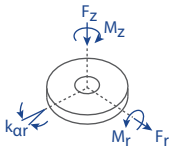
***Travel range** [°]*	**360°, limitless**	
Flatness (bearings) [µm]	± 3	
Eccentricity (bearings) [µm]	± 3	
Wobble [µrad]	**± 50**	
Weight [g]	**257**	
Motor option	**Direct Drive Stepper Motor**	
Speed, max [°/s]	1800 (5 rev/sec)	
Encoder option	**None (open loop)**	**Internal**
Resolution, typical [µ°]	0.01	0.005
Repeatability, bi-directional [µ°]	± 0.05	± 0.01
Repeatability, uni-directional [µ°]	0.05	0.01
Accuracy [µ°]	-	-
Materials	aluminum body, steel bearing (other materials i.e. stainless steel, titanium, etc. available upon request)	

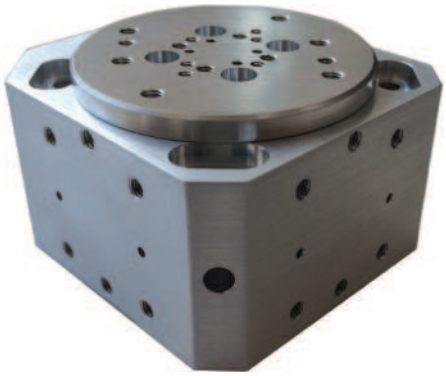
ORDERING INFORMATION

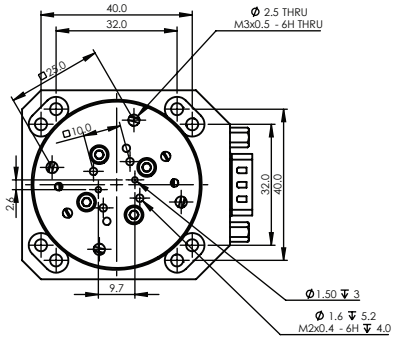
PR-50- | **2** | **1** | | **0** | |

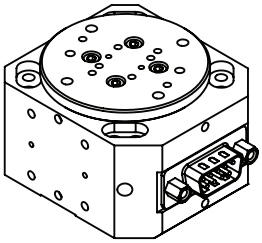
DRIVE	Stepper Motor, SM-006	**2**
TRAVEL	360°	**1**
ENCODER	None	**0**
	Analog	**2**
	Digital	**3**
LIMIT SWITCH	None	**0**
ENVIRONMENT	Atmospheric	**0**
	High Vacuum, 10^{-6} mbar	**6**
	Ultra High Vacuum, 10^{-9} mbar	**9**

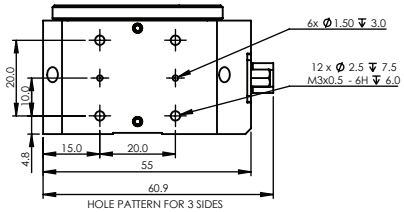
Load, max	F_r [N]	F_z [N]	M_r [N-m]	M_z [N-m]	k_{ar} [µrad/N-m]
SM-006	10	20	5	0.04	150

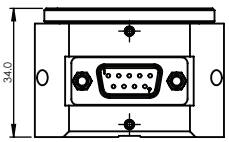




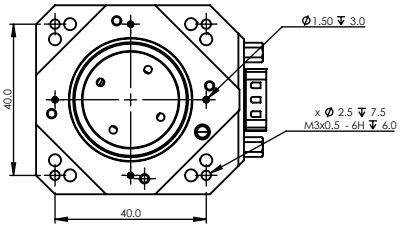








* all dimensions are in millimeters



micronix USA
PRECISION MOTION SOLUTIONS

Precision Gonio Stage | PG-50SM

NEW

The PG-50 gonio stage performs best in limited space applications due to its compact design. High stiffness motion is achieved through pre-loaded crossed-roller bearings and a precision worm drive. These stages may be mounted in an orthogonal, space-saving arrangement to achieve pitch and roll adjustment. Versions capable of operation in vacuum (10^{-6}) are available. The PG-50 is compatible with the MMC-200 controller.

KEY FEATURES

- Smooth, continuous ± 5° motion
- Load capacity up to 2 kg
- Steel crossed roller bearings
- Low profile, 22 mm height
- Vacuum versions available

TECHNICAL DATA

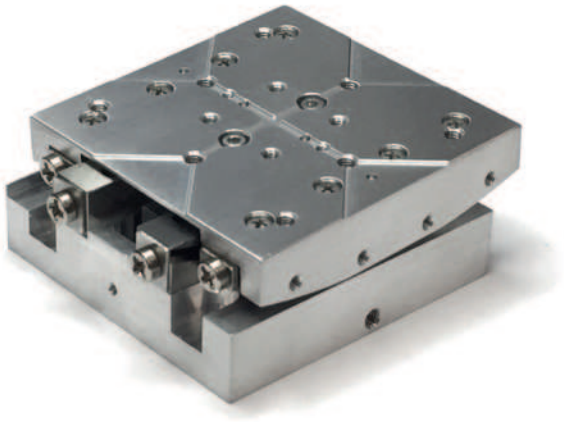
Travel range about center of rotation [°]	± 5	
Rotational Center Accuracy [mm]	< 0.1	
Wobble (Bearings) [µrad]	± 120	
Weight [g]	70	
Motor option	**Stepper Motor (2 phase)**	
Speed, max [°/s]	5	
Encoder option	**None (open loop)**	**Digital (RS-422)**
Resolution, typical [°]	0.001	0.001
Repeatability, bi-directional [°]	± 0.01	± 0.002
Repeatability, uni-directional[°]	0.01	0.002
Accuracy [°]	-	-
Materials	aluminum body, steel bearing (other materials i.e. stainless steel, titanium, etc. available upon request)	

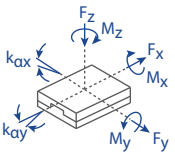
ORDERING INFORMATION

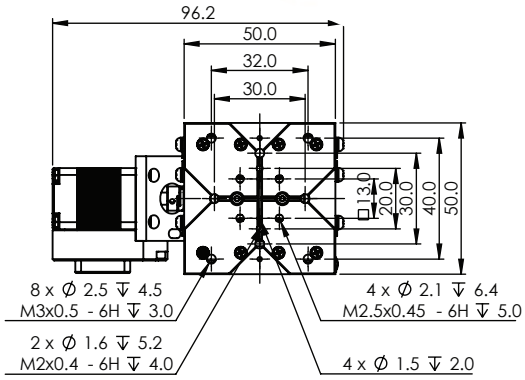
PG-50- | **2** | **1** | | | |

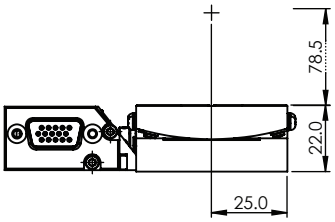
DRIVE	Stepper Motor, SM-001	**2**
TRAVEL	± 5°	**1**
ENCODER	None	**0**
	Digital (RS-422)	**1**
LIMIT SWITCH	None	**0**
	Magnetic	**1**
ENVIRONMENT	Atmospheric	**0**
	High Vacuum, 10^{-6} mbar	**6**

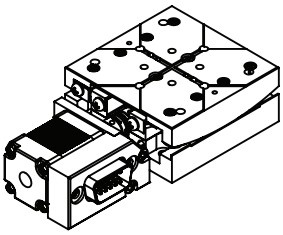
Load, max	F_x [N]	F_y [N]	F_z [N]	M_x [N·m]	M_y [N·m]	M_z [N·m]	$k_{\alpha x}$ [μrad/N·m]	$k_{\alpha y}$ [μrad/N·m]
SM-001	15	15	20	0.75	4	4	80	80



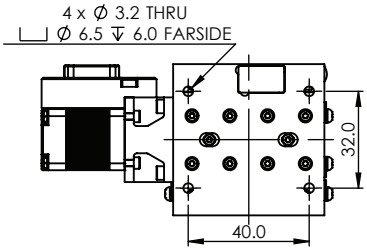








* all dimensions are in millimeters



micronix USA
PRECISION MOTION SOLUTIONS

Micro Pusher | MP-21

The MP-21 linear actuator is designed for applications with very limited space conditions. Typical applications include actuation of manual drive stages and mirror mounts. It utilizes a 2-phase stepper motor and a mechanical limit switch for homing. Versions capable of operation in vacuum (10^{-6} mbar) are available. The MP-21 is compatible with the MMC-200 controller.

KEY FEATURES

- Travel range of 12 and 25 mm
- 0.1 µm resolution
- Maximum force of 40 N
- Ball spline with low backlash, non-rotating tip
- Integrated mechanical limit switch
- Vacuum versions available

TECHNICAL DATA

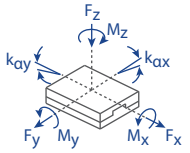
Travel range [mm]	**12**	**25**
Straightness / Flatness [µm]	-	-
Pitch [µrad]	-	-
Yaw [µrad]	-	-
Weight [g]	140	170
Motor option	**2-Phase Stepper Motor**	
Speed, max [mm/s]	5	
Encoder option	**None (open loop)**	
Resolution, typical [µm]	0.1	
Repeatability, bi-directional [µm]	± 0.5	
Repeatability, uni-directional [µm]	0.4	
Accuracy [µm]	-	
Materials	aluminum body, stainless steel ball spline (other materials i.e. stainless steel, titanium, etc. available upon request)	

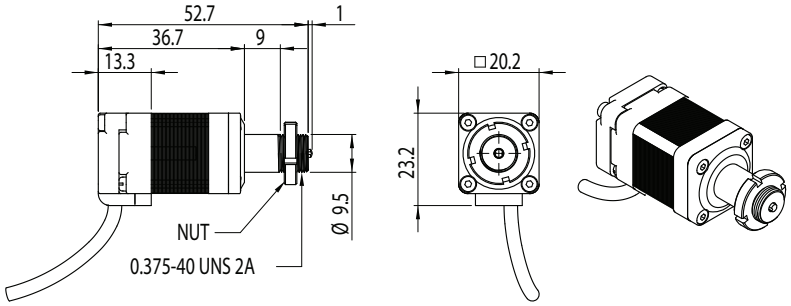
ORDERING INFORMATION

MP-21- | **1** | | **0** | **1** | |

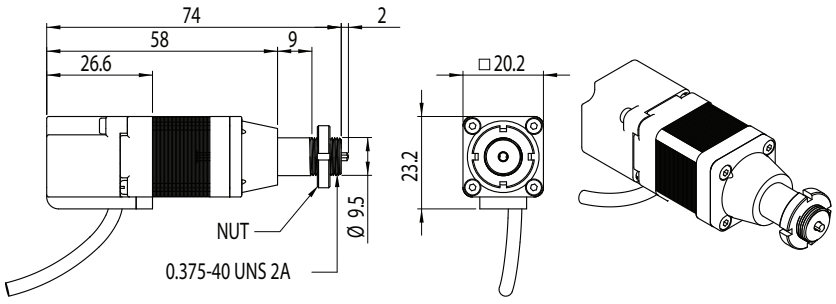
DRIVE	Stepper Motor, SM-001	**1**
TRAVEL	12 mm	**1**
	25 mm	**2**
ENCODER	None	**0**
LIMIT SWITCH	Mechanical	**1**
ENVIRONMENT	Atmospheric	**0**
	High Vacuum, 10^{-6} mbar	**6**

Load, max	F_x [N]	F_y [N]	F_z [N]	M_x [N-m]	M_y [N-m]	M_z [N-m]	$k_{\alpha x}$ [µrad/N-m]	$k_{\alpha y}$ [µrad/N-m]
SM-001	40	0	0	-	-	-	-	-





* 12 mm travel version shown above
* 25 mm travel versions shown below
* all dimensions are in millimeters



Micro Precision Actuator, UHV | MPA-20

The MPA-20 linear actuator is designed for ultra high vacuum environments. Typical applications include actuation of manual drive stages and mirror mounts. It utilizes a 2-phase stepper motor and two hermetically sealed mechanical limit switches. The MPA-20 is compatible with the MMC-200 controller.

KEY FEATURES

- Travel range of 12mm
- 0.5mm pitch lead screw
- 200 steps/rev stepper motor with 4:1 gear reduction
- Load capacity up to 10 kg
- Preloaded spline for low backlash
- Hermetically sealed limit switches, UHV compatible

  Integrated thermal couple

TECHNICAL DATA

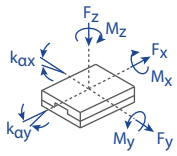
Travel range [mm]	**12**
Motor option	**2-Phase Stepper Motor**
Encoder option	**None (open loop)**
Resolution, typical [µm]	0.1
Repeatability, bi-directional [µm]	±1
Repeatability, uni-directional [µm]	1
Accuracy [µm]	10
Materials	stainless steel body and bearings, phosphor bronze nut aluminum limit switch brackets

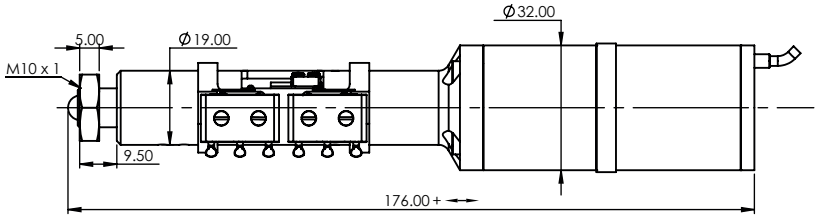
ORDERING INFORMATION

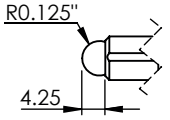
MPA-20- **1** **1** **0** **1** **9**

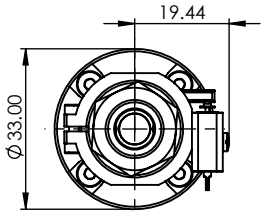
DRIVE	Stepper Motor, SM-005	**1**
TRAVEL	12 mm	**1**
ENCODER	None	**0**
LIMIT SWITCH	Mechanical	**1**
ENVIRONMENT	Ultra High Vacuum, 10^{-9} mbar	**9**

Load, max	F_x [N]	F_y [N]	F_z [N]	M_x [N-m]	M_y [N-m]	M_z [N-m]	$k_{\alpha x}$ [µrad/N-m]	$k_{\alpha y}$ [µrad/N-m]
SM-005	100	10	10	-	-	-	-	-





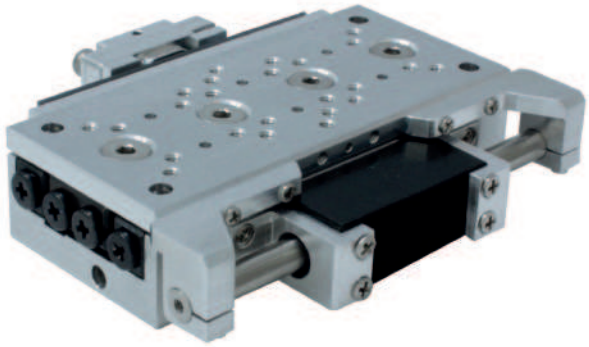




Linear Motor

Product Line

to scale



Precision Positioning Stage | PPS-20LM

The PPS-20 Linear Motor version is suitable for applications requiring very fast speeds. Miniature crossed roller bearings assure high stiffness and guiding accuracy for loads up to 20 N (horizontal orientation). Closed loop resolution of 2 nm is achievable. The PPS-20LM is compatible with the MMC-300 controller.

KEY FEATURES

- Travel range of up to 25 mm
- 100 nm resolution
- Load capacity up to 20N
- Steel crossed roller bearing
- Low profile, 13 mm height

TECHNICAL DATA

Travel range [mm]	**11**	**18**	**25**
Straightness / Flatness [µm]	± 1	± 1.5	± 1.5
Pitch [µrad]	± 60	± 80	± 80
Yaw [µrad]	± 70	± 90	± 90
Weight [g]	-	-	-
Motor option	**Voice Coil Linear Motor**		
Speed, max [mm/s]	100		
Encoder option	**Analog (1 V_{pp})**	**Digital (RS-422)**	
Resolution, typical [nm]	10	2	
Repeatability, bi-directional [µm]	± 0.05	± 0.02	
Repeatability, uni-directional [µm]	0.05	0.02	
Accuracy [µm]	± 1	± 1	
Materials	aluminum body, steel bearing, stainless steel bracket, brass nut (other materials i.e. stainless steel, titanium, etc. available upon request)		

ORDERING INFORMATION

PPS-20- | **3** | | | | **0** |

DRIVE
Linear Motor, LM-003 ..... **3**

TRAVEL
11 mm **1**
18 mm **2**
25 mm **3**

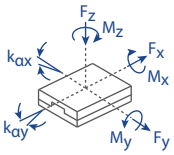
ENCODER
Analog (1 V_{pp}) **2**
Digital (RS-422) **3**

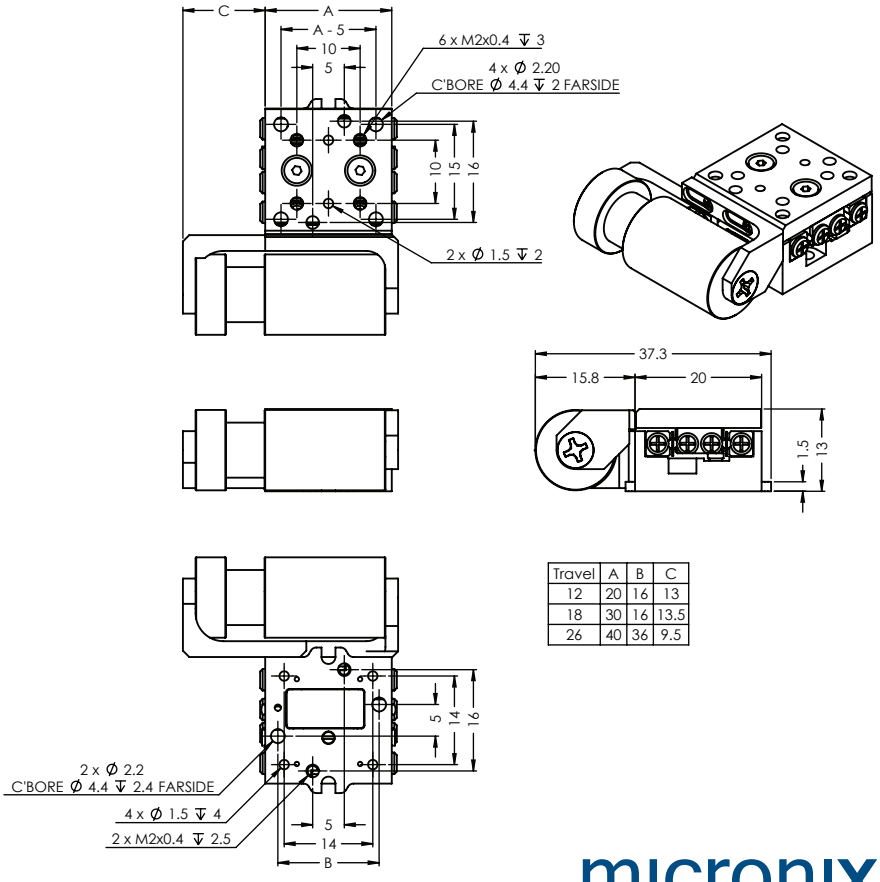
LIMIT SWITCH
None **0**
Magnetic **1**
Optical† **2**

ENVIRONMENT
Atmospheric **0**

† only available with Digital Encoder option

Load, max	F_X [N]	F_Y [N]	F_Z [N]	M_X [N·m]	M_Y [N·m]	M_Z [N·m]	$k_{\alpha x}$ [µrad/N·m]	$k_{\alpha y}$ [µrad/N·m]
LM-003	1	20	20	0.7	0.7	0.7	-	-





Travel	A	B	C
12	20	16	13
18	30	16	13.5
26	40	36	9.5

Precision Positioning Stage | PPS-28LM

The PPS-28 Linear Motor version is suitable for applications requiring very fast speeds. Miniature crossed roller bearings assure high stiffness and guiding accuracy for loads up to 50 N (horizontal orientation). Closed loop resolution of 2 nm is achievable. The PPS-28LM is compatible with the MMC-300 controller.

KEY FEATURES

- Travel range of 26, 51 and 102 mm (other travel lengths available upon request)
- 2 nm closed loop resolution
- Load capacity up to 5 kg
- Steel crossed roller bearing
- Low profile, 15 mm height

TECHNICAL DATA

Travel range [mm]	**26**	**51**	**100**
Straightness / Flatness [µm]	± 2	± 2.5	± 3.5
Pitch [µrad]	± 60	± 70	± 100
Yaw [µrad]	± 70	± 75	± 100
Weight [g]	-	-	-
Motor option	**Linear Motor**		
Speed, max [mm/s]	100 (dependent on load)		
Encoder option	**Analog (1 V_{pp})**	**Digital (RS-422)**	
Resolution, typical [nm]	10	2	
Repeatability, bi-directional [nm]	± 50	± 20	
Repeatability, uni-directional [nm]	50	20	
Accuracy [µm]	± 1	± 1	
Materials	aluminum body, steel bearing (other materials i.e. stainless steel, titanium, etc. available upon request)		

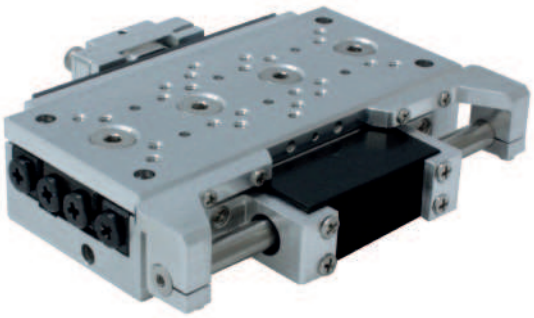
ORDERING INFORMATION

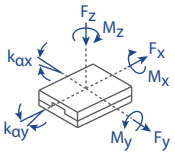
PPS-28- | **3** | | | | **0** |

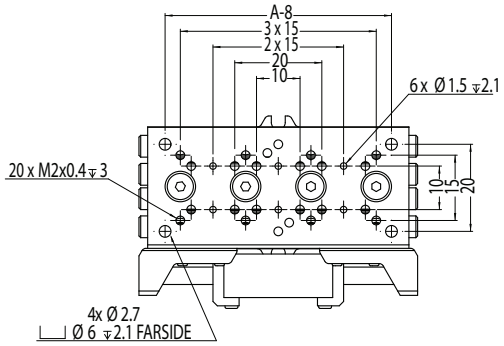
DRIVE	Linear Motor, LM-001	**3**
TRAVEL	26 mm	**1**
	51 mm	**3**
	102 mm	**5**
ENCODER	Analog (1 V_{pp})	**2**
	Digital (RS-422)	**3**
LIMIT SWITCH	None	**0**
	Magnetic	**1**
	Optical†	**2**
ENVIRONMENT	Atmospheric	**0**

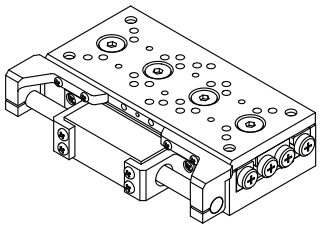
† only available with Digital Encoder option

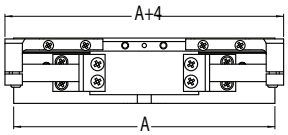
Load, max	F_x [N]	F_y [N]	F_z [N]	M_x [N-m]	M_y [N-m]	M_z [N-m]	$k_{\alpha x}$ [µrad/N-m]	$k_{\alpha y}$ [µrad/N-m]
LM-001	1	50	50	1	1	1	-	-

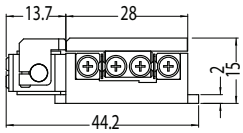


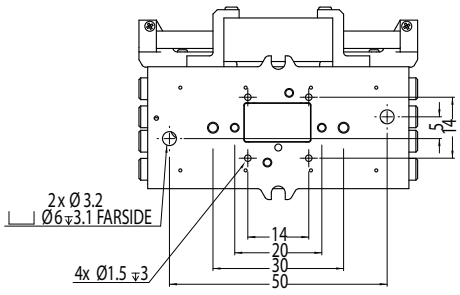










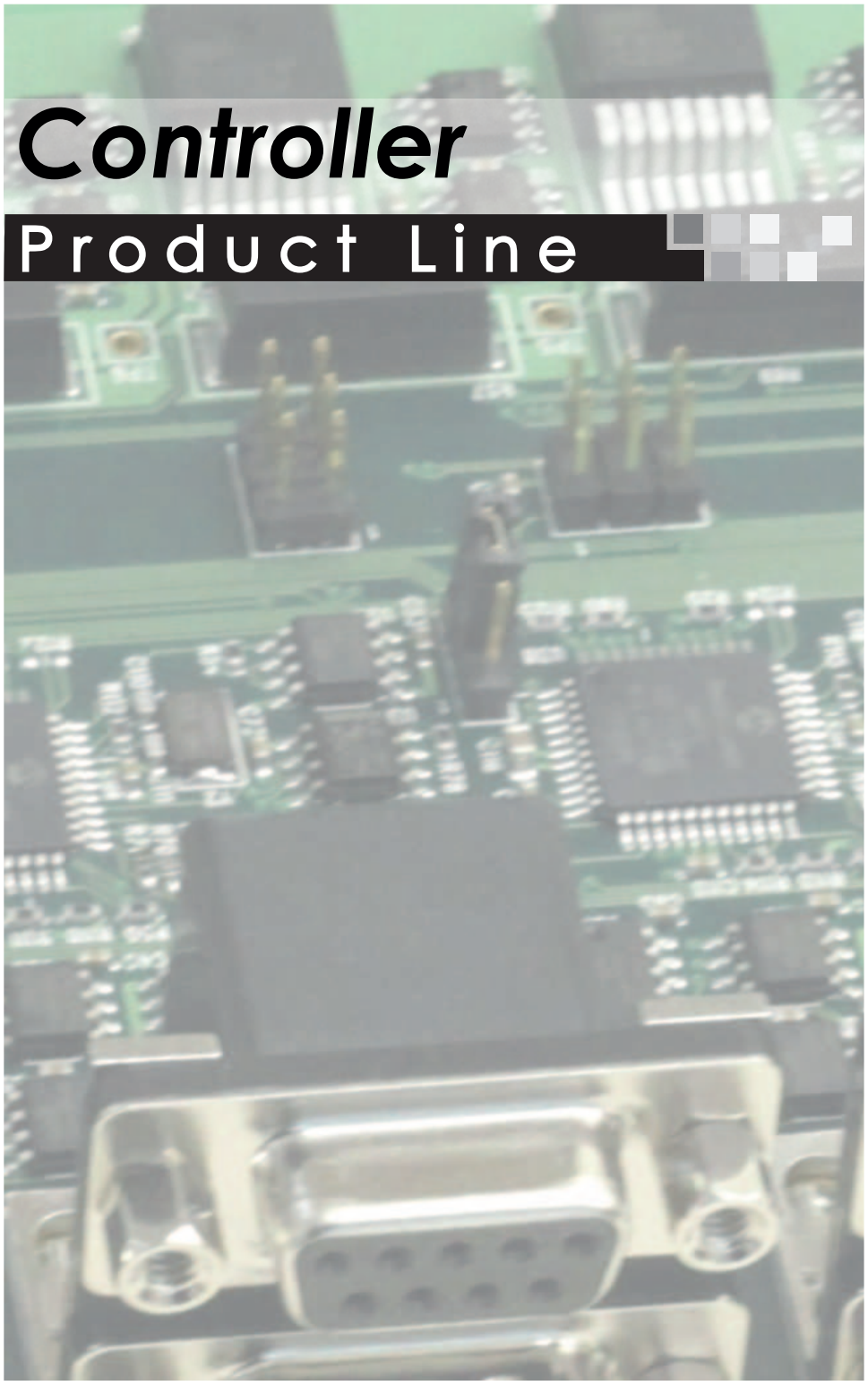


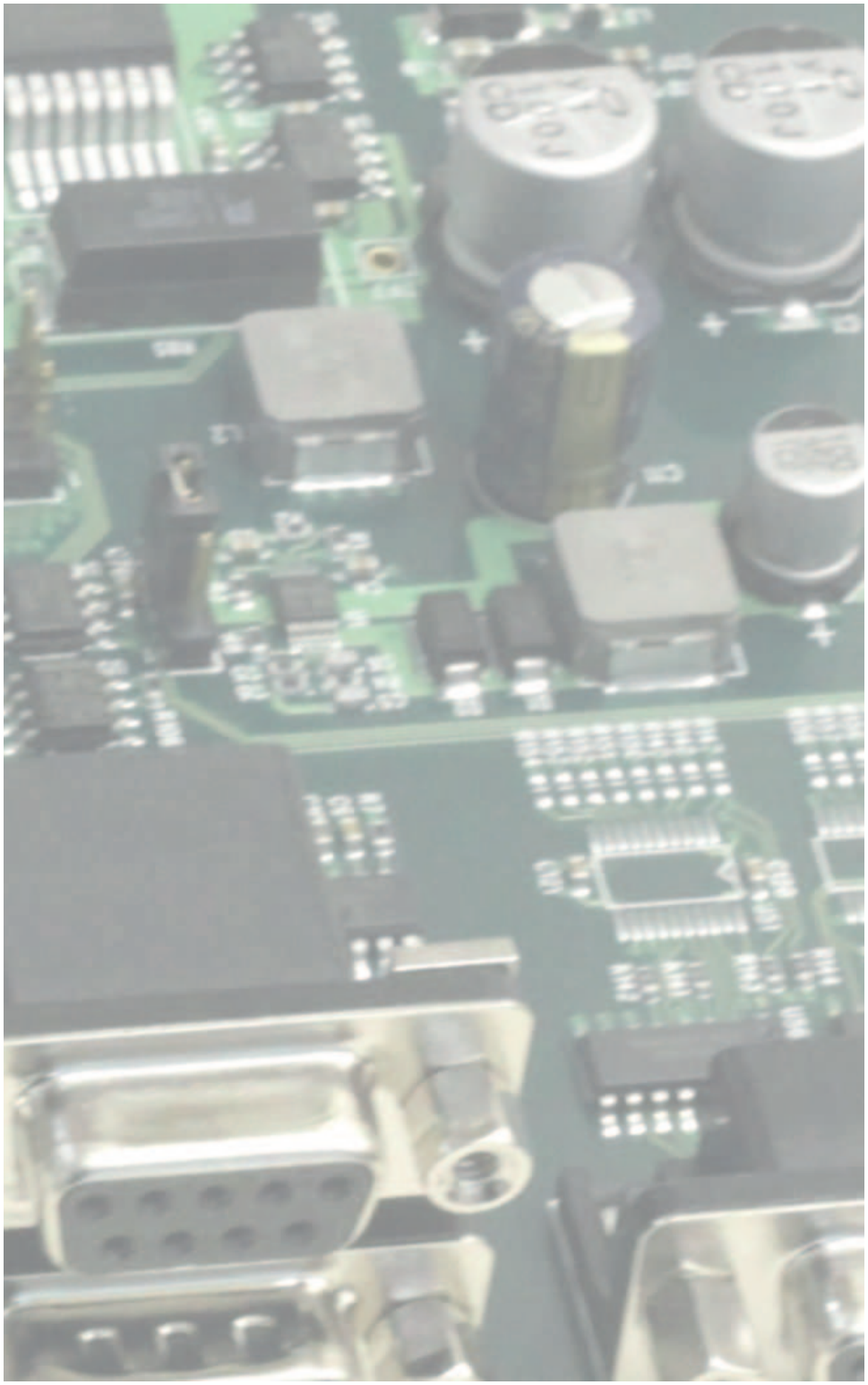
Travel	A
26	60
51	90

* 26 mm travel, internal encoder version shown
* all dimensions are in millimeters

Controller

Product Line





Modular Motion Controller | MMC-100

The MMC-100 is a high performance piezo motor controller. It allows speeds beyond 2 mm/s with our patent-pending multi-phase piezo motor at resolutions of 1 nm. Multiple units can be stacked as a compact multi-axis module and interface with a computer via a single USB or RS-485 cable. MICRONIX Motion Control Language allows for easy programming through simple ASCII commands.

KEY FEATURES

- Integrated controller for stick-slip, multi-phase piezo stages
- Compact, modular design allows for bench-top or 2U height rack mounting
- Open loop resolution down to 1 nm
- Closed loop resolution down to 2 nm (dependent on encoder)
- A quad B differential or sin/cos analog encoder feedback
- USB 2.0 or RS-485 interface (one interface for up to 99 axes)
- Windows GUI, and LabVIEW VI

TECHNICAL DATA

Axes	1, stackable up to 99
Motor type	Piezo Motor, PM-002
Interface	USB 2.0, RS-485
Commands	ASCII commands
Power supply	Regulated 5 V DC (1 A per axis)
Speed, max	2 mm/s
Resolution	1 nm (open loop), 2 nm (closed loop)
Trajectory mode	Trapezoidal velocity profile
Trajectory update frequency	1 kHz
Servo clock frequency	10 kHz
Program storage	16 storable programs
Enclosure dimensions	L145 x W85 x H25 mm
Software	Windows GUI, LabVIEW VI

ORDERING INFORMATION

MMC-100- **0** [ ] [ ] [ ] **0**

AXES

1 Axis **1**
:
6 Axes† **6**

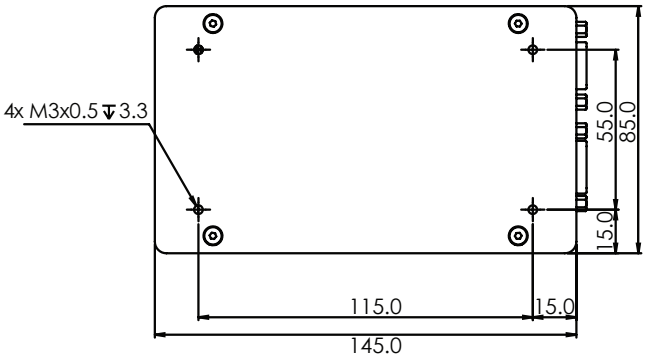
POWER SUPPLY

5 W **0**
25 W **1**
36 W **2**

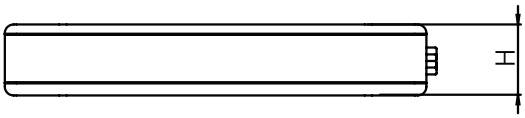
ENCODER INTERFACE

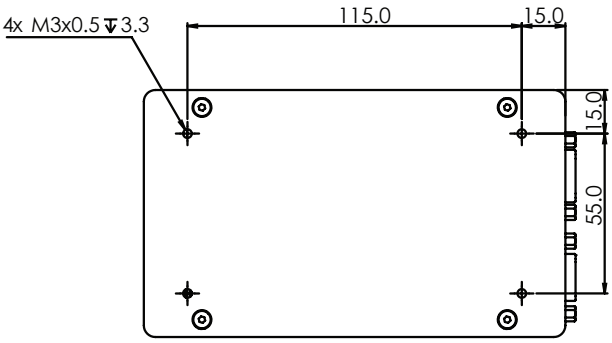
Analog (1 V_{pp}) **0**
Digital (RS-422) **1**

† please contact support for larger stacks



Axes	H
1	24.4
2	41.2
3	58
4	74.8
5	91.6
6	108.4





Specifications are subject to change without notice.

micronix USA
PRECISION MOTION SOLUTIONS

Modular Motion Driver | MMD-100

The MMD-100 is a multi-phase piezo driver with a pulse-direction input. It allows speeds beyond 2 mm/s. Open and closed loop operations are available. The modular design of the MMD-100 allows for a mixed module stack with the MMC-100 controller that can interface with a computer via a single USB or RS-485 cable. MICRONIX Motion Control Language allows for easy programming through simple ASCII commands.

KEY FEATURES

- Compact, modular design allows for bench-top or 2U height rack mounting
- MMD-100 and MMC-100 modules can be mixed in a stack
- Open loop resolution down to 1 nm
- Closed loop resolution down to 2 nm (dependent on encoder)
- A quad B differential or sin/cos analog encoder feedback
- Industry standard pulse and direction input signals via mini-DIN connector

TECHNICAL DATA

Axes	1, stackable up to 99
Motor type	Piezo Motor, PM-002
Interface	USB 2.0 or RS-485 (configuration), mini-DIN (driver signals)
Commands	ASCII commands
Power supply	Regulated 5 V DC (1 A per axis)
Speed, max	2 mm/s
Resolution	1 nm (open loop), 2 nm (closed loop)
Servo clock frequency	20 kHz
Enclosure dimensions	L145 x W85 x H25 mm

ORDERING INFORMATION

MMD-100- **0** [ ] [ ] [ ] **0**

AXES

1 Axis **1**
:
6 Axes† **6**

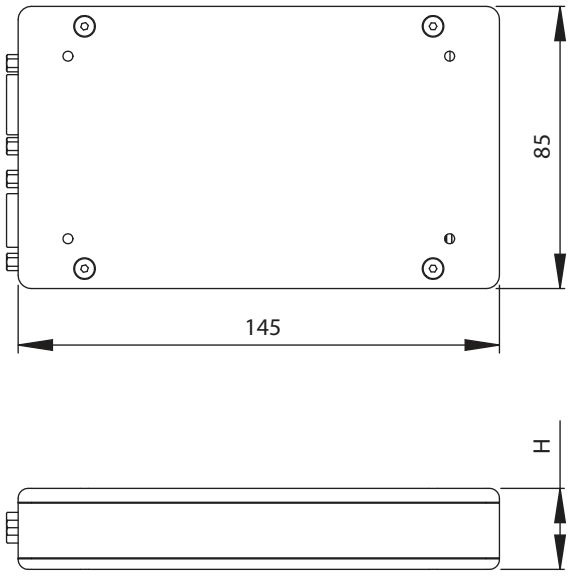
POWER SUPPLY

5 W **0**
25 W **1**
36 W **2**

ENCODER INTERFACE

Analog (1 V_{pp}) **0**
Digital (RS-422) **1**

† please contact support for larger stacks



Axes	H
1	24.4
2	41.2
3	58
4	74.8
5	91.6
6	108.4

Modular Motion Controller | MMC-103

The MMC-103 is a high performance integrated piezo motor controller/driver designed to be used as a standalone 3 axis unit. The MMC-103 is capable of driving 3 piezo motors up to 3mm/s in open loop with a resolution of down to 1nm. The closed loop resolution is dependent on the resolution of the encoder (typically 2nm). MICRONIX Motion Control Language allows for easy programming through simple ASCII commands.

KEY FEATURES

- Integrated controller for piezo motor stages
- Open loop resolution down to 1 nm
- Closed loop resolution down to 2 nm (dependent on encoder)
- A quad B differential or sin/cos analog encoder feedback
- USB 2.0 or RS-485 interface
- Windows GUI, and LabVIEW VI

TECHNICAL DATA

Axes	3
Motor type	2-Phase Piezo Motor
Interface	USB 2.0, RS-485
Commands	ASCII commands
Power supply	Regulated 48V DC
Speed, max	3 mm/s
Resolution	1 nm (open loop), 2 nm (closed loop)
Trajectory mode	Trapezoidal velocity profile
Trajectory update frequency	1 kHz
Servo clock frequency	10 kHz
Program storage	16 storable programs per axis
Enclosure dimensions	L191 x W102 x H30 mm
Software	Windows GUI, LabVIEW VI

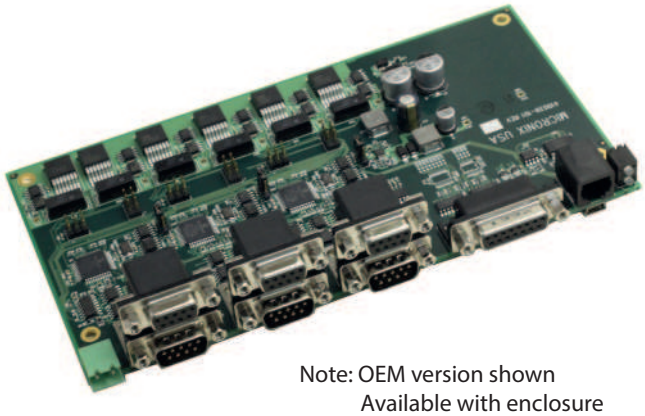
ORDERING INFORMATION

MMC-103- | **0** | **1** | **0** | | **0** |

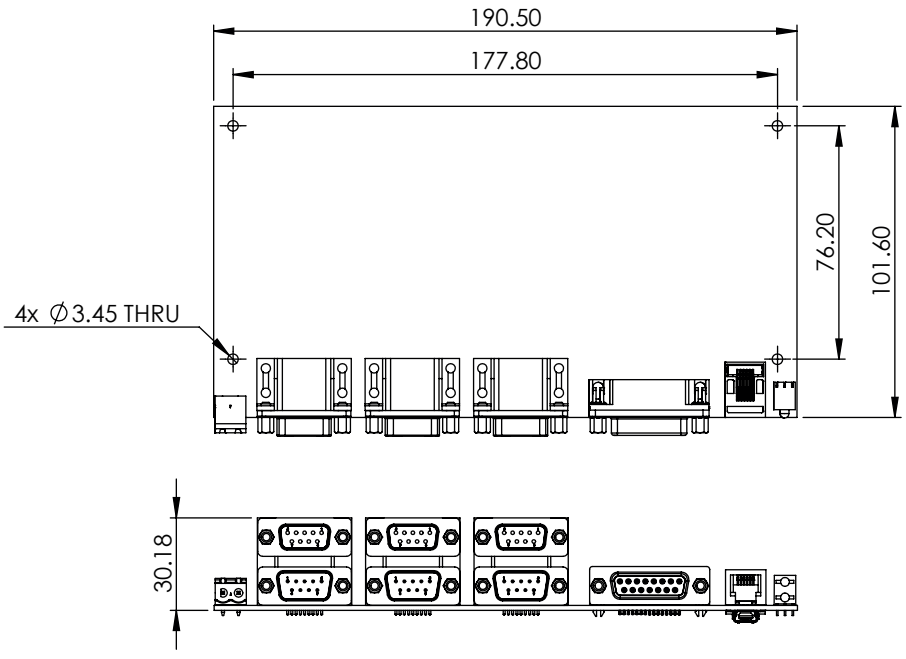
AXES
3 Axis **1**

POWER SUPPLY
60 W **0**

ENCODER INTERFACE
Analog (1 V_{pp}) **0**
Digital (RS-422) **1**



Note: OEM version shown
Available with enclosure



Modular Motion Driver | MMD-103

The MMD-103 is a piezo motor driver with a pulse-direction input designed to be used as a standalone 3 axis unit. The MMD-103 is capable of driving 3 piezo motors up to 3mm/s in open loop with a resolution of down to 1nm. The MMD-103 can be driven using differential step and direction inputs. MICRONIX Motion Control Language allows for easy setup through simple ASCII commands.

KEY FEATURES

- Integrated controller for piezo motor stages
- Open loop resolution down to 1 nm
- Closed loop resolution down to 2 nm (dependent on encoder)
- A quad B differential or sin/cos analog encoder feedback
- USB 2.0 or RS-485 interface
- Differential step/direction inputs

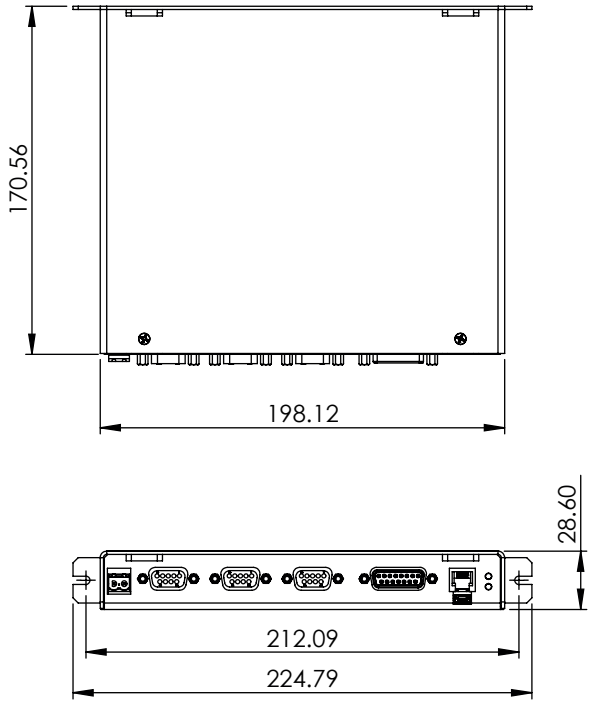
TECHNICAL DATA

Axes	3
Motor type	2-Phase Piezo Motor
Interface	USB 2.0 or RS-485 (configuration), 15-pin D-sub (driver signals)
Commands	ASCII commands
Power supply	Regulated 48V DC
Speed, max	3 mm/s
Resolution	1 nm (open loop), 2 nm (closed loop)
Servo clock frequency	20 kHz
Enclosure dimensions	L198 x W171 x H29 mm

ORDERING INFORMATION

MMD-103- | **0** | **1** | **0** | | **0**

AXES	3 Axis **1**
POWER SUPPLY	60 W..... **0**
ENCODER INTERFACE	Analog (1 V_{pp}) ..... **0** Digital (RS-422) **1**



Modular Motion Controller | MMC-200

The MMC-200 is a low cost stepper motor controller. It allows speeds beyond 5 mm/s with closed loop resolutions down to 50 nm. Multiple units can be stacked as a compact multi-axis module and interface with a computer via a single USB or RS-485 cable. MICRONIX Motion Control Language allows for easy programming through simple ASCII commands.

KEY FEATURES

- Integrated controller for stepper motor stages
- Compact, modular design allows for bench-top or 2U height rack mounting
- Closed loop resolution down to 50 nm (dependent on encoder)
- A quad B differential or sin/cos analog encoder feedback
- USB 2.0 or RS-485 interface (one interface for up to 99 axes)
- Windows GUI, and LabVIEW VI

TECHNICAL DATA

Axes	1, stackable up to 99
Motor type	Stepper Motor
Interface	USB 2.0, RS-485
Commands	ASCII commands
Power supply	Regulated 24 V DC (1 A per axis)
Speed, max	5 mm/s
Resolution	100 nm (open loop), 50 nm (closed loop)
Trajectory mode	Trapezoidal velocity profile
Trajectory update frequency	1 kHz
Servo clock frequency	10 kHz
Program storage	16 storable programs
Enclosure dimensions	L145 x W85 x H25 mm
Software	Windows GUI, LabVIEW VI

ORDERING INFORMATION

MMC-200- | **0** | | **1** | | **0**

AXES

1 Axis **1**
:
6 Axes† **6**

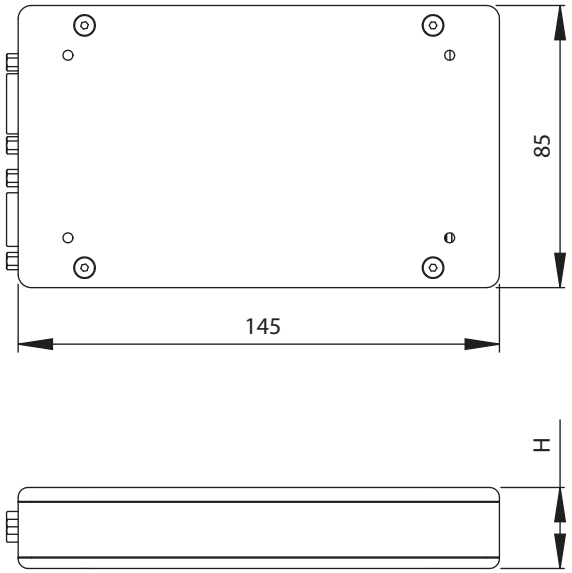
POWER SUPPLY

25 W **1**

ENCODER INTERFACE

Analog (1 V_{pp}) **0**
Digital (RS-422) **1**

† please contact support for larger stacks



Axes	H
1	24.4
2	41.2
3	58
4	74.8
5	91.6
6	108.4

Modular Motion Controller | MMC-203

The MMC-203 is a high performance integrated stepper motor controller/driver designed to be used as a standalone 3 axis unit. The MMC-203 is capable of driving 3 stepper motors with a resolution as fine as 2000 microsteps per fullstep in open loop and a closed loop resolution of 50nm. Other resolutions are available upon request. MICRONIX Motion Control Language allows for easy programming through simple ASCII commands.

KEY FEATURES

- Integrated controller for stepper motor stages
- Closed loop resolution down to 50 nm (dependent on encoder)
- A quad B differential or sin/cos analog encoder feedback
- USB 2.0 or RS-485 interface
- Windows GUI, and LabVIEW VI

TECHNICAL DATA

Axes	3
Motor type	Stepper Motor
Interface	USB 2.0, RS-485
Commands	ASCII commands
Power supply	Regulated 24 V DC (1 A per axis)
Speed, max	5 mm/s
Resolution	100 nm (open loop), 50 nm (closed loop)
Trajectory mode	Trapezoidal velocity profile
Trajectory update frequency	1 kHz
Servo clock frequency	10 kHz
Program storage	16 storable programs per axis
Enclosure dimensions	L145 x W85 x H25 mm
Software	Windows GUI, LabVIEW VI

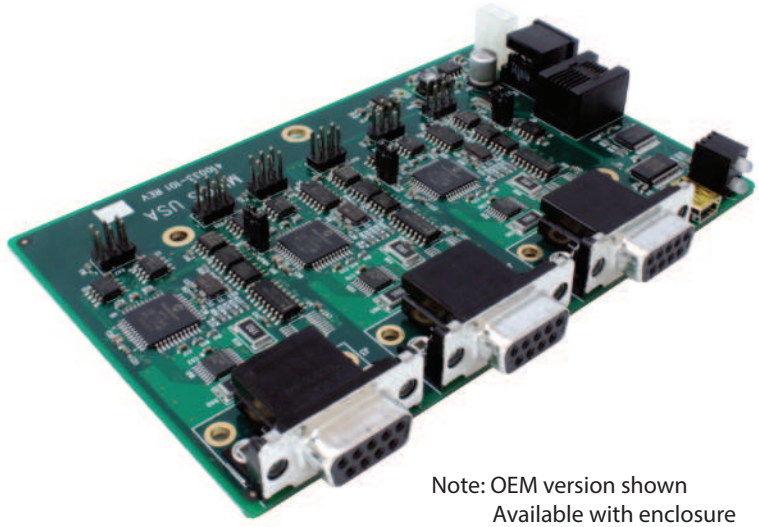
ORDERING INFORMATION

MMC-203- | **0** | **1** | **1** | | **0** |

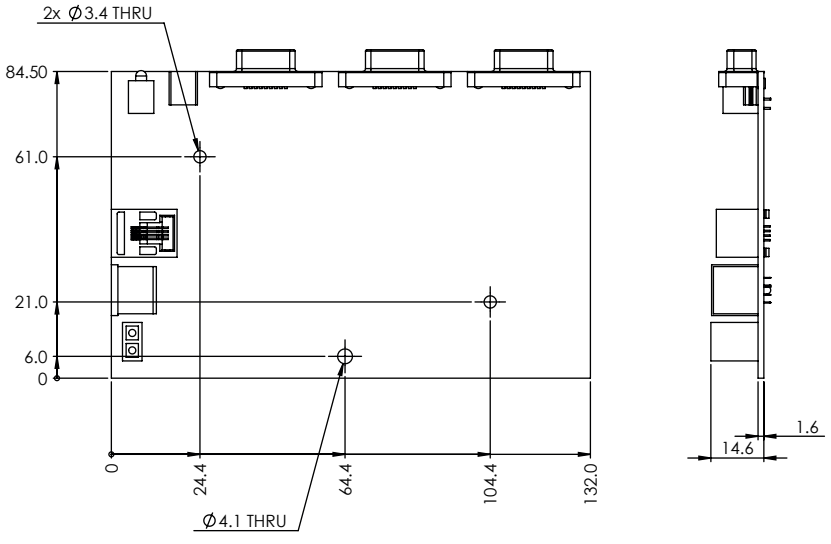
AXES
3 Axis **1**

POWER SUPPLY
40 W **1**

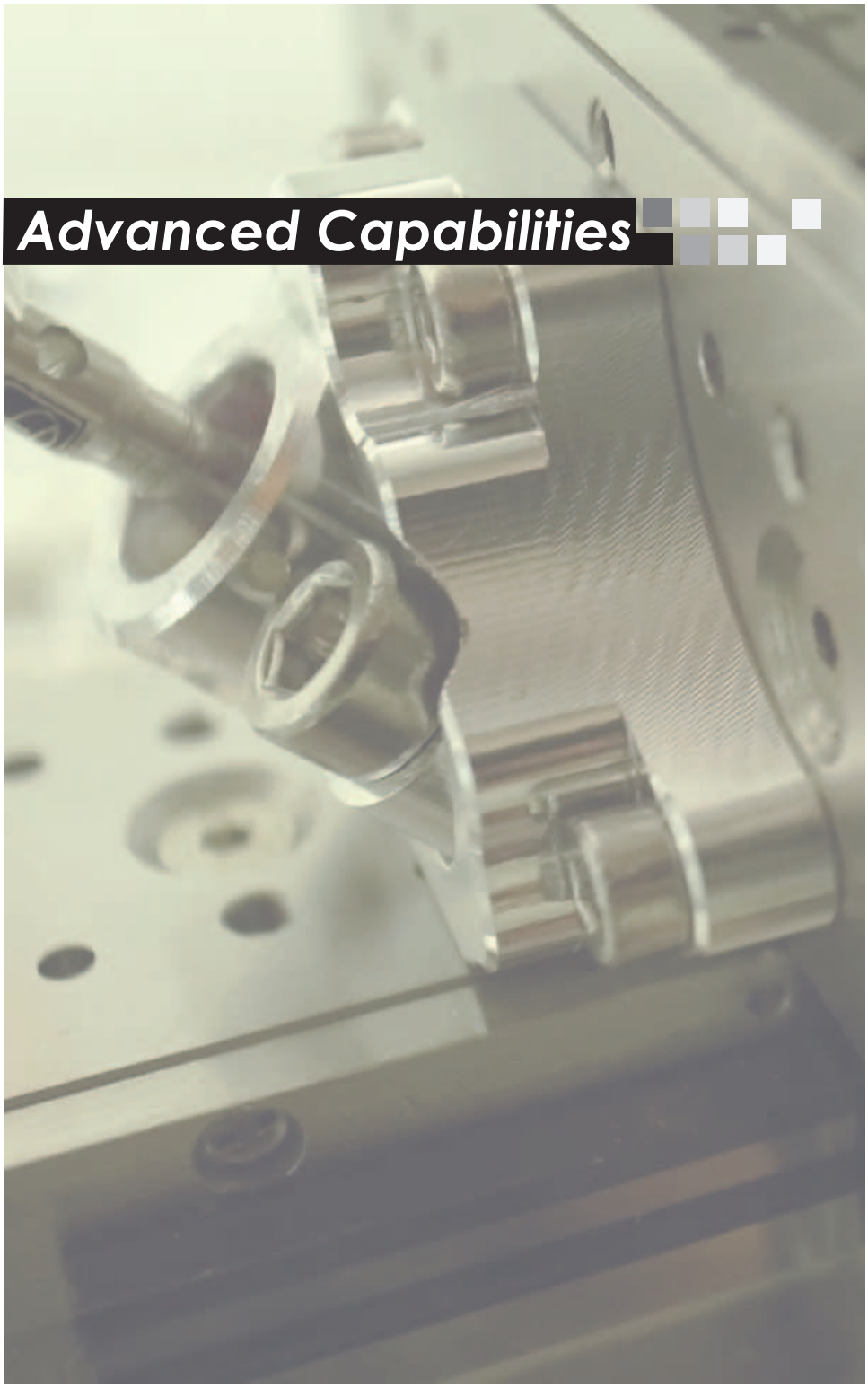
ENCODER INTERFACE
Analog (1 V_{pp}) **0**
Digital (RS-422) **1**



Note: OEM version shown
Available with enclosure



Advanced Capabilities




000103

Vacuum Capabilities

Operating a motion system or positioner in vacuum is a design challenge. Issues such as outgassing, contamination, and lack of air cooling complicate the system design. Fortunately, MICRONIX USA has engineered solutions that address each of these problems. Specialized components have been utilized in adapting a given system to a vacuum or otherwise-specified environment. Most of our standard products have been developed with vacuum compatible versions as specified in each product datasheet.

Operational Parameters for Vacuum:

Two standard vacuum preparation levels
- ‡ High Vacuum (HV), 10^{-6} mbar
- ‡ Ultra High Vacuum (UHV), 10^{-9} mbar

Ultra low-outgassing motors

Lubrication Options:
- ‡ Special vacuum-compatible grease
- ‡ Ceramic balls with no grease

High Vacuum (HV), 10^{-6} mbar

- Vacuum motor (10^{-6} mbar)
- Linear encoder for use in vacuum
- Cables with teflon wires and silver plated copper shield
- Standard limit switches
- All parts left un-anodized
- Stainless steel screws
- Bearings, drive screws lubricated with vacuum grease
- All holes are vented where possible
- 100ºC baking temperature, 48 hours

Ultra High Vacuum (UHV), 10^{-9} mbar

- Vacuum motor (10^{-9} mbar)
- Linear encoder for use in UHV vacuum
- Glass scale
- Cables with teflon wires and silver plated copper shield. Kapton wires optional
- Sealed limit switches (10^{-9} mbar)
- All parts left un-anodized
- Stainless steel screws
- Bearings, drive screws lubricated with UHV vacuum grease or ceramic balls
- All holes are vented where possible
- 100ºC baking temperature, 48 hour

Other Capabilities

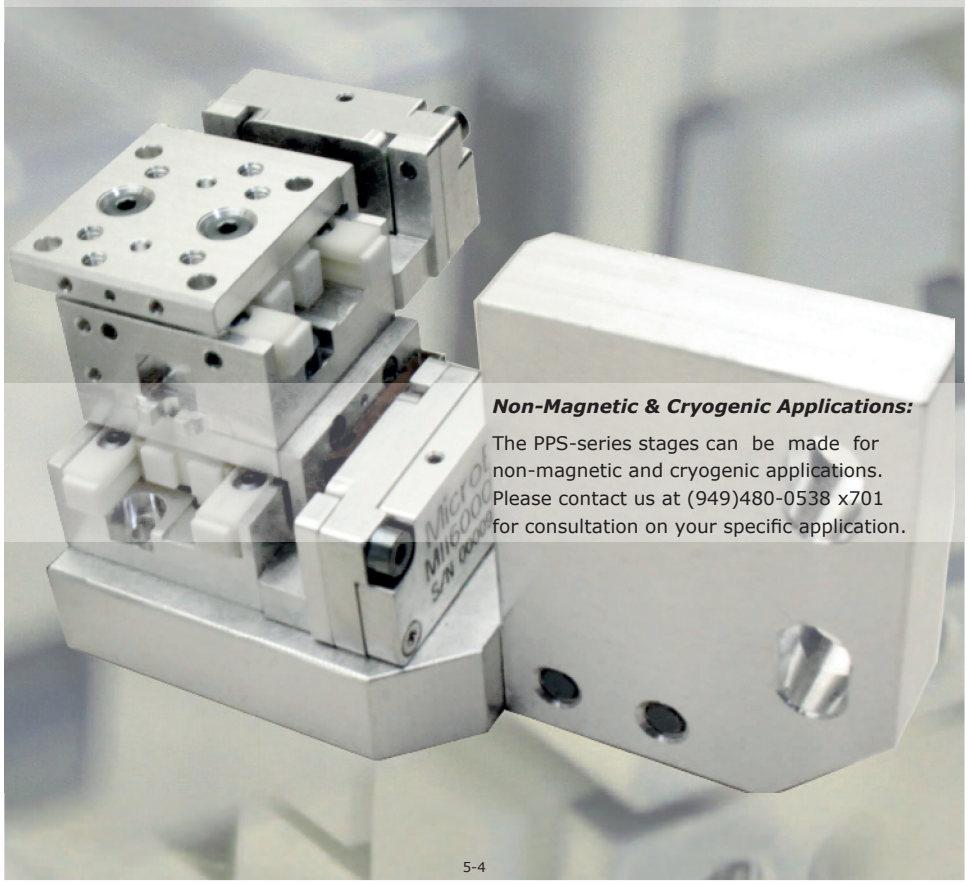
Operational Parameters for Cryogenic Conditions:

Cryogenic temperature down to 4K

Vacuum preparation down to 10^{-9} mbar

Lubrication

- ‡ Ceramic balls with no grease (preferred)
- ‡ Dry lube (e.g. Dicronite)

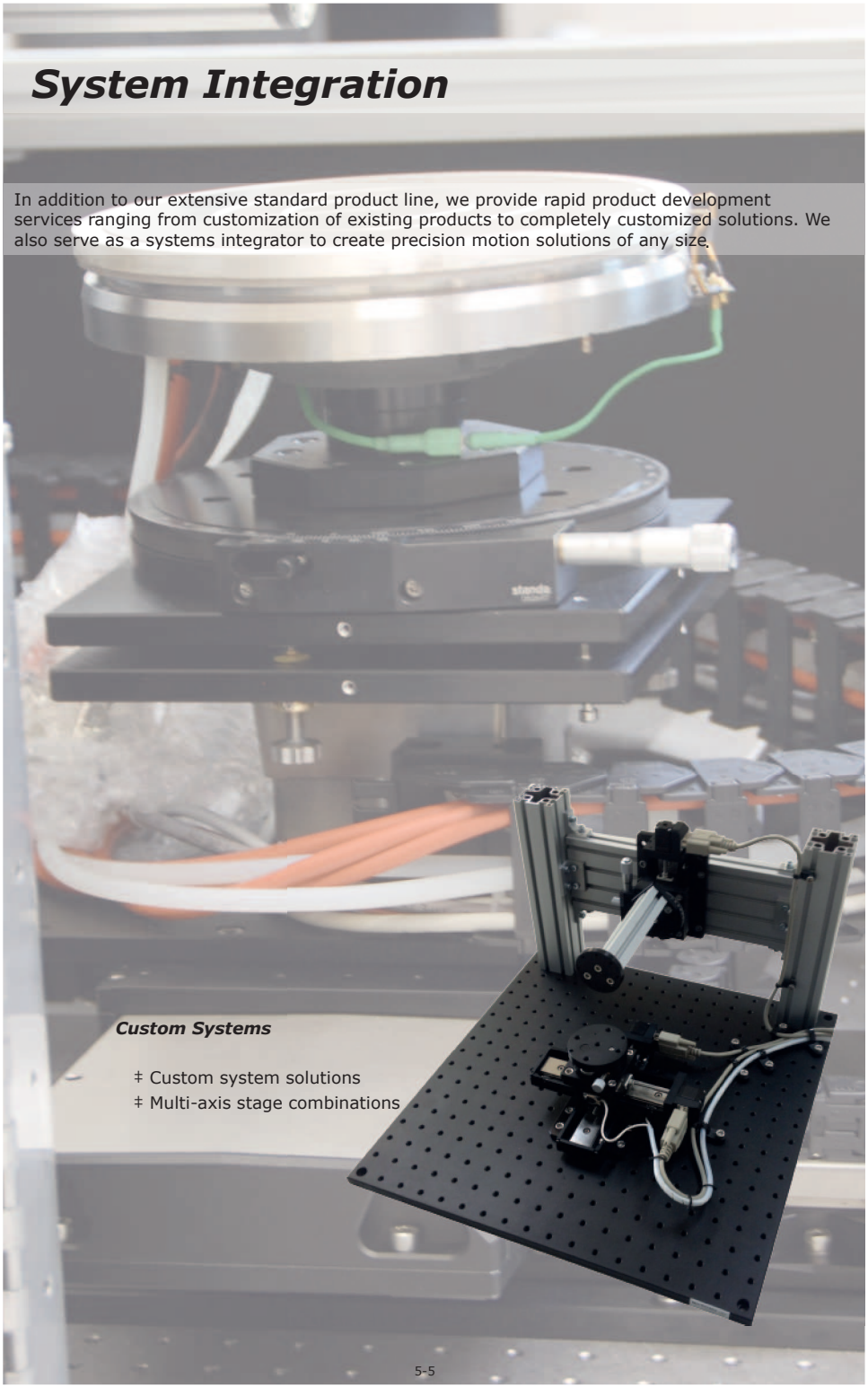


Non-Magnetic & Cryogenic Applications:

The PPS-series stages can be made for non-magnetic and cryogenic applications. Please contact us at (949)480-0538 x701 for consultation on your specific application.

System Integration

In addition to our extensive standard product line, we provide rapid product development services ranging from customization of existing products to completely customized solutions. We also serve as a systems integrator to create precision motion solutions of any size.



Custom Systems

‡ Custom system solutions
‡ Multi-axis stage combinations

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