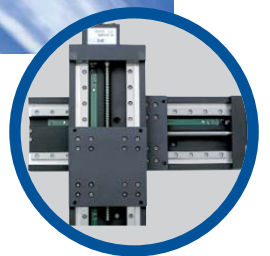
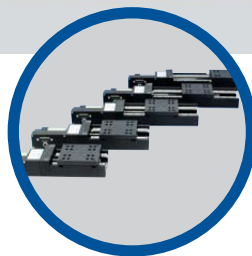
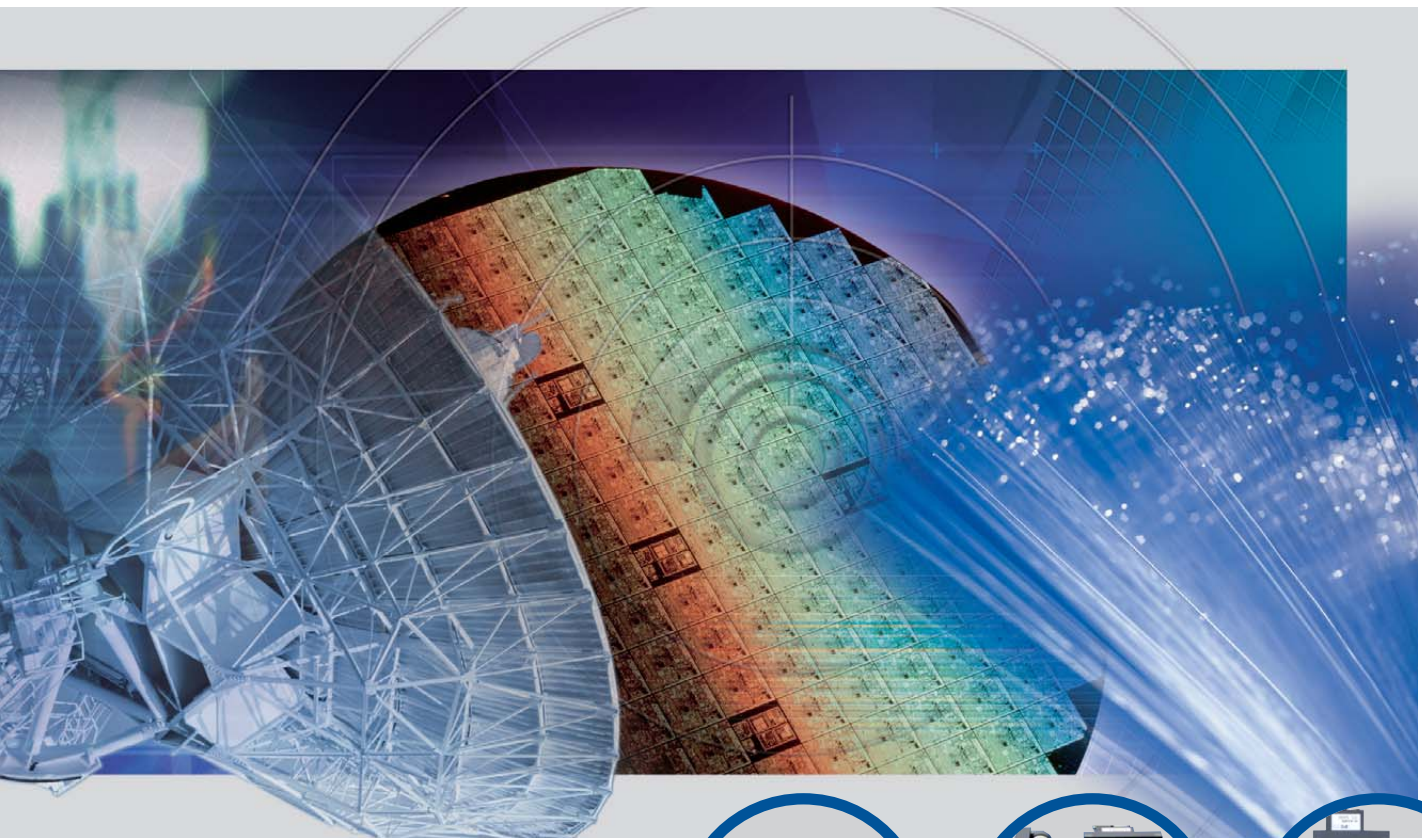


# Cost-Effective Precision Linear Slides

**M-403, M-404, M-413 and M-414**



# M-403 Linear Slides, Leadscrew-Type

## High-Resolution Leadscrew-Driven Translation Stages with Stepper and DC-Motors



- For Cost-Sensitive Applications
- Modular System M-403, M-404, M-413, M-414
- Preloaded Precision Leadscrew
- Travel Range 25 to 200 mm
- Min. Incremental Motion 0.2  $\mu\text{m}$
- Resolution to 0.017  $\mu\text{m}$
- Stress-Relieved Aluminum Base for Highest Stability

The optimum choice from a modular system of high-value, low-cost components makes the M-403 family of linear stages very attractive and economical. These stages are lead-screw-driven and provide a minimum incremental motion to 0.2  $\mu\text{m}$ . They are designed with a precision-machined, high-density, stress-relieved aluminum base for exceptional stability and minimum weight. M-403 stages are available with travel ranges from 25 mm to 200 mm.

### Application Examples

- Quality control
- Semiconductor test equipment
- Precision automation
- Metrology
- Data storage test
- Research & development

### High Load and Maintenance Free

All models of the M-403 family are equipped with high-precision linear guiding rails and recirculating ball bearings. Their high load capacity allows them to carry up to 20 kg and to push/pull up to 50 N. The recirculating ball bearings are maintenance free and immune to the cage migration which can plague crossed roller bearings.

### Three Motor Drives

The top-of-the-line M-403.xPD versions feature the high-performance ActiveDrive™ system. This design, developed by PI, has a high-efficiency PWM servo-amplifier mounted side by side with the DC-Motor and offers several advantages:

- Increased efficiency, by eliminating power losses between the amplifier and motor
- Reduced cost of ownership and improved reliability,

because no external driver is required

- Elimination of PWM amplifier noise radiation, by mounting the amplifier and motor together in a single, electrically shielded case

The M-403.xDG models are equipped with a DC-Motor with zero-backlash gearhead and a shaft-mounted optical encoder, providing a minimum incremental motion of 0.2  $\mu\text{m}$ .

The M-403.x2S models feature a direct-drive, 2-phase stepper motor, providing a resolution of 0.1  $\mu\text{m}$  per step and very smooth operation.

### Direction-Sensing Origin Switch

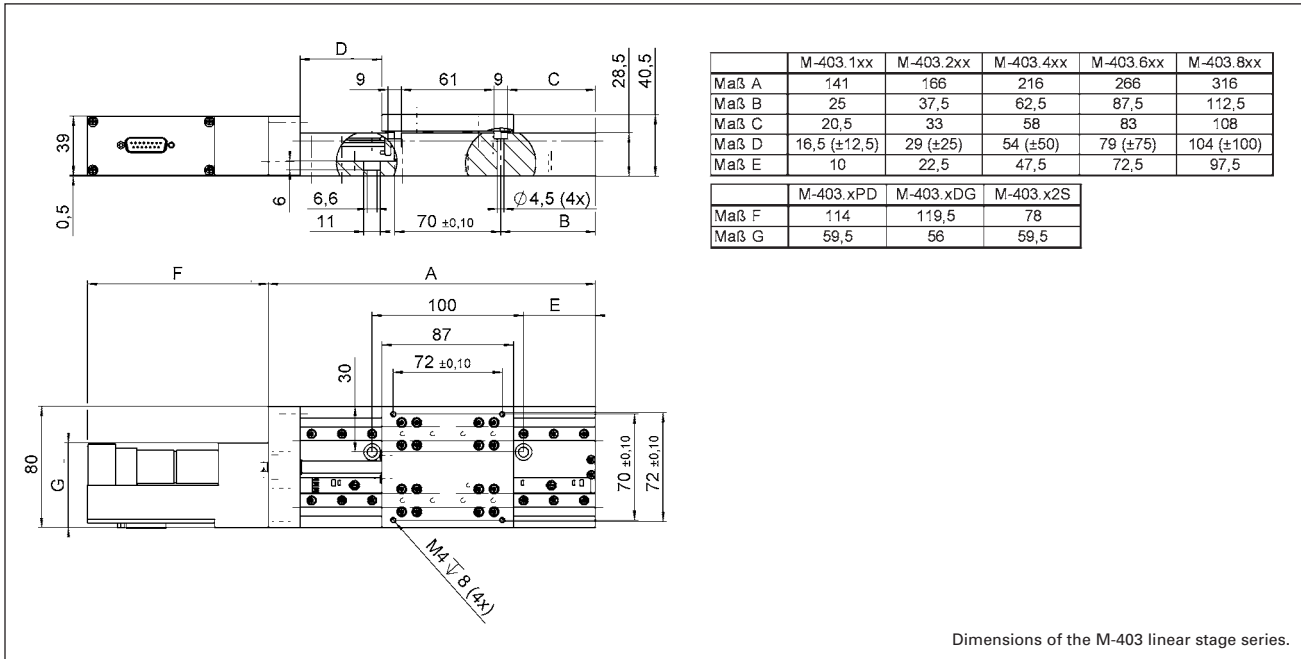
Integrated, high-precision, non-contact Hall-effect origin and limit switches with direction sensing on the origin switch protect your equipment and increase versatility in automation applications.

### Low Cost of Ownership

The combination of these stages with the networkable, single channel C-862 Mercury™ controller offers high performance for a very competitive price in both single and multi-axis configurations.

### Ordering Information

- M-403.1PD**  
Linear Translation Stage, 80 mm Wide, 25 mm Travel Range, DC-Motor/ActiveDrive™
- M-403.1DG**  
Linear Translation Stage, 80 mm Wide, 25 mm Travel Range, DC-Motor
- M-403.12S**  
Linear Translation Stage, 80 mm Wide, 25 mm Travel Range, Stepper Motor
- M-403.2PD**  
Linear Translation Stage, 80 mm Wide, 50 mm Travel Range, DC-Motor/ActiveDrive™
- M-403.2DG**  
Linear Translation Stage, 80 mm Wide, 50 mm Travel Range, DC-Motor
- M-403.22S**  
Linear Translation Stage, 80 mm Wide, 50 mm Travel Range, Stepper Motor
- M-403.4PD**  
Linear Translation Stage, 80 mm Wide, 100 mm Travel Range, DC-Motor/ActiveDrive™
- M-403.4DG**  
Linear Translation Stage, 80 mm Wide, 100 mm Travel Range, DC-Motor
- M-403.42S**  
Linear Translation Stage, 80 mm Wide, 100 mm Travel Range, Stepper Motor
- M-403.6PD**  
Linear Translation Stage, 80 mm Wide, 150 mm Travel Range, DC-Motor/ActiveDrive™
- M-403.6DG**  
Linear Translation Stage, 80 mm Wide, 150 mm Travel Range, DC-Motor
- M-403.62S**  
Linear Translation Stage, 80 mm Wide, 150 mm Travel Range, Stepper Motor
- M-403.8PD**  
Linear Translation Stage, 80 mm Wide, 200 mm Travel Range, DC-Motor/ActiveDrive™
- M-403.8DG**  
Linear Translation Stage, 80 mm Wide, 200 mm Travel Range, DC-Motor
- M-403.82S**  
Linear Translation Stage, 80 mm Wide, 200 mm Travel Range, Stepper Motor



Piezo Actuators

Nanopositioning & Scanning Systems

Active Optics / Steering Mirrors

Tutorial: Piezo-electrics in Positioning

Capacitive Position Sensors

Piezo Drivers & Nanopositioning Controllers

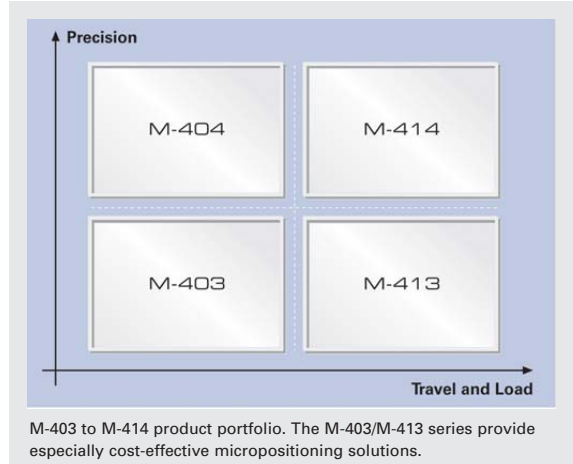
**Hexapods / Micropositioning**

Photonics Alignment Solutions

Motion Controllers

Ceramic Linear Motors & Stages

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# M-404 Linear Slides, Ball Screw-Type

## High-Precision Ball-Screw-Driven Translation Stages with Stepper and DC-Motors



M-404 linear stage versions (from front to back): the M-403.1PD, M-403.2PD, M-403.4PD, M-403.6PD and M-403.8PD provide travel ranges from 25 to 200 mm.

- **High-Precision Components**
- **Modular System M-403, M-404, M-413, M-414**
- **Recirculating Ball Screw Provides High Speed & Long Lifetime**
- **Travel Range 25 to 200 mm**
- **Min. Incremental Motion 0.1 μm**
- **Resolution to 0.012 μm**
- **Stress-Relieved Aluminum Base for Highest Stability**

The modular M-404 family of linear stages provides high-performance at a very attractive price. The integrated low-friction ball-screws combine high duty-cycles and velocities with minimum incremental motion of 0.1 μm. These stages are designed with a precision-machined, high-density, stress-relieved aluminum base for exceptional stability and minimum weight. Travel ranges from 25 mm to 200 mm are available.

### High Load and Maintenance Free

All models of the M-404 family are equipped with high-precision

linear guiding rails and recirculating ball bearings. Their high load capacity allows them to carry up to 20 kg and to push/pull up to 50 N. The recirculating ball bearings are maintenance free and immune to the cage migration which can plague crossed roller bearings.

### Three Motor Drives

The top-of-the-line M-404.xPD versions feature the high-performance ActiveDrive™ system. This design, developed by PI, has a high-efficiency PWM servo-amplifier mounted side by side with the DC-Motor and offers several advantages:

- Increased efficiency, by eliminating power losses between the amplifier and motor
- Reduced cost of ownership and improved reliability, because no external driver is required
- Elimination of PWM amplifier noise radiation, by mounting the amplifier and motor together in a single, electrically shielded case

The M-404.xDG models are equipped with a DC-Motor with zero-backlash gearhead and a shaft-mounted optical encoder, providing a minimum incremental motion of 0.1 μm.

The M-404.x2S models feature a direct-drive, 2-phase stepper motor with zero vibration, providing a resolution of 0.1 μm steps.

### Direction-Sensing Origin Switch

Integrated, high-precision, non-contact Hall-effect origin and limit switches with direction sensing on the origin switch protect your equipment and increase versatility in automation applications.

### Low Cost of Ownership

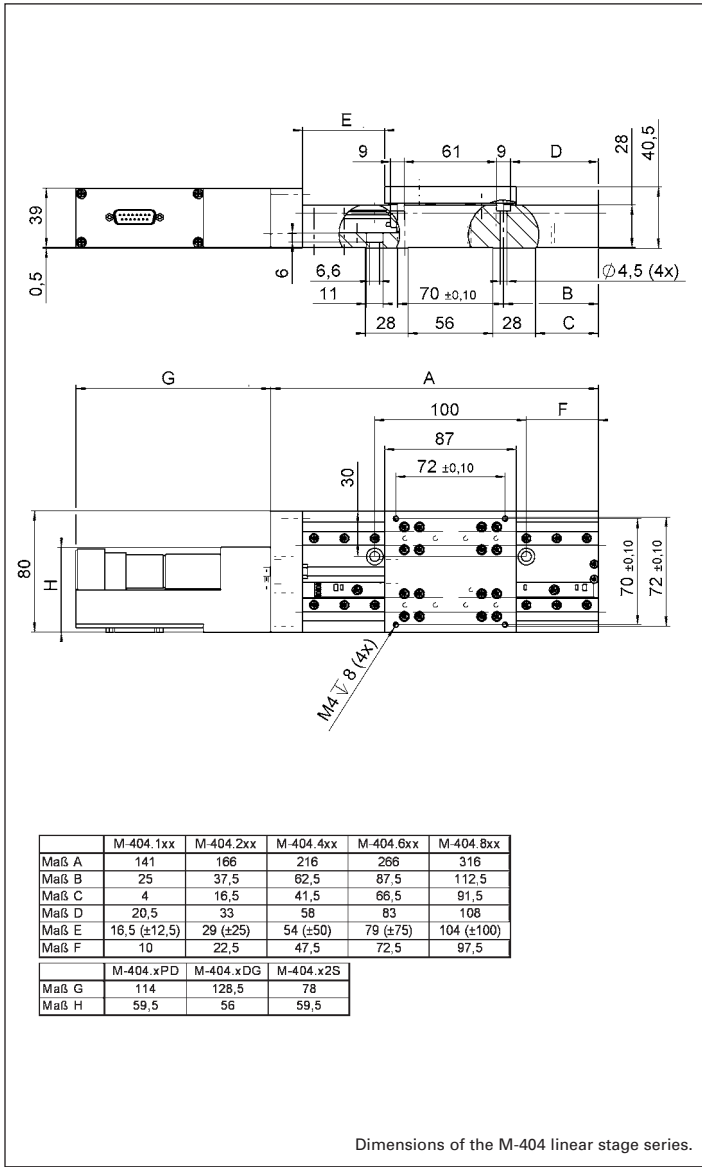
These PI stages are especially cost effective in high performance, high-duty-cycle applications, when combined with the with the networkable C-862 Mercury™ controller.

### Ordering Information

- M-404.1PD**  
Precision-Linear Stage, 80 mm Wide, 25 mm Travel Range, ActiveDrive™
- M-404.1DG**  
Precision-Linear Stage, 80 mm Wide, 25 mm Travel Range, DC-Motor
- M-404.12S**  
Precision-Linear Stage, 80 mm Wide, 25 mm Travel Range, Stepper Motor
- M-404.2PD**  
Precision-Linear Stage, 80 mm Wide, 50 mm Travel Range, ActiveDrive™
- M-404.2DG**  
Precision-Linear Stage, 80 mm Wide, 50 mm Travel Range, DC-Motor
- M-404.22S**  
Precision-Linear Stage, 80 mm Wide, 50 mm Travel Range, Stepper Motor
- M-404.4PD**  
Precision-Linear Stage, 80 mm Wide, 100 mm Travel Range, ActiveDrive™
- M-404.4DG**  
Precision-Linear Stage, 80 mm Wide, 100 mm Travel Range, DC-Motor
- M-404.42S**  
Precision-Linear Stage, 80 mm Wide, 100 mm Travel Range, Stepper Motor
- M-404.6PD**  
Precision-Linear Stage, 80 mm Wide, 150 mm Travel Range, ActiveDrive™
- M-404.6DG**  
Precision-Linear Stage, 80 mm Wide, 150 mm Travel Range, DC-Motor
- M-404.62S**  
Precision-Linear Stage, 80 mm Wide, 150 mm Travel Range, Stepper Motor
- M-404.8PD**  
Precision-Linear Stage, 80 mm Wide, 200 mm Travel Range, ActiveDrive™
- M-404.8DG**  
Precision-Linear Stage, 80 mm Wide, 200 mm Travel Range, DC-Motor
- M-404.82S**  
Precision-Linear Stage, 80 mm Wide, 200 mm Travel Range, Stepper Motor

### Application Examples

- Quality control
- Semiconductor test equipment
- Precision automation
- Metrology
- Data storage test
- Research & development



Piezo Actuators

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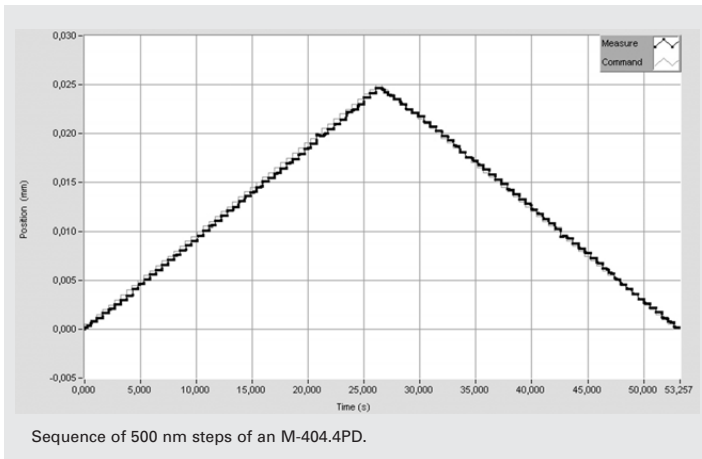
**Hexapods / Micropositioning**

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**Technical Data**

Models	M-403.1PD	M-403.1DG	M-403.12S	M-403.2PD	M-403.2DG	M-403.22S	M-403.4PD	M-403.4DG
Active Axes	X	X	X	X	X	X	X	X
<b>Motion and positioning</b>								
Travel range	25	25	25	50	50	50	100	100
Integrated sensor	Rotary encoder	Rotary encoder		Rotary encoder	Rotary encoder		Rotary encoder	Rotary encoder
Sensor resolution	4000	2000		4000	2000		4000	2000
Design resolution	0.25	0.0175	0.1	0.25	0.0175	0.1	0.25	0.0175
Min. incremental motion	0.25	0.2	0.2	0.25	0.2	0.2	0.25	0.2
Backlash	1	6	2	1	6	2	1	6
Unidirectional repeatability	1	1	1	1	1	1	1	1
Pitch	200	200	200	200	200	200	200	200
Yaw	200	200	200	200	200	200	200	200
Max. velocity	10*	2.5	3	10*	2.5	3	10*	2.5
Origin repeatability	1	1	1	1	1	1	1	1
<b>Mechanical properties</b>								
Spindle pitch	1	1	1	1	1	1	1	1
Gear ratio		28.444			28.444			28.444
Motor resolution			10000**			10000**		
Stiffness in motion direction	3500	3500	3500	3500	3500	3500	3500	3500
Load	200	200	200	200	200	200	200	200
Push-/Pullforce	50	50	50	50	50	50	50	50
Self inhibition	50	50	50	50	50	50	50	50
Lateral force	100	100	100	100	100	100	100	100
<b>Drive Properties</b>								
Drive type	DC-Motor, ActiveDrive™	DC-Motor, gearhead	2-phase stepper-motor	DC-Motor, ActiveDrive™	DC-Motor, gearhead	2-phase stepper-motor	DC-Motor, ActiveDrive™	DC-Motor, gearhead
Operating voltage	24	0-12	24	24	0-12	24	24	0-12
Electrical power	26	2.5		26	2.5		26	2.5
<b>Miscellaneous</b>								
Operating temperature range	-20 to +65	-20 to +65	-20 to +65	-20 to +65	-20 to +65	-20 to +65	-20 to +65	-20 to +65
Material	Al (black anodized)	Al (black anodized)	Al (black anodized)	Al (black anodized)	Al (black anodized)	Al (black anodized)	Al (black anodized)	Al (black anodized)
Mass	1.7	1.7	1.7	1.8	1.8	1.8	2	2
Cable length	3	3	3	3	3	3	3	3
Connector	Sub-D 15 (m)	Sub-D 15 (m)	Sub-D 15 (m)	Sub-D 15 (m)	Sub-D 15 (m)	Sub-D 15 (m)	Sub-D 15 (m)	Sub-D 15 (m)
Recommended controller/driver	C-843; C-862	C-843; C-862	C-630; C-600	C-843; C-862	C-843; C-862	C-630; C-600	C-843; C-862	C-843; C-862
Models	M-404.1PD	M-404.1DG	M-404.12S	M-404.2PD	M-404.2DG	M-404.22S	M-404.4PD	M-404.4DG
Active Axes	X	X	X	X	X	X	X	X
<b>Motion and positioning</b>								
Travel range	25	25	25	50	50	50	100	100
Integrated sensor	Rotary encoder	Rotary encoder		Rotary encoder	Rotary encoder		Rotary encoder	Rotary encoder
Sensor resolution	4000	2000		4000	2000		4000	2000
Design resolution	0.25	0.0116	0.1	0.25	0.0116	0.1	0.25	0.0116
Min. incremental motion	0.25	0.1	0.2	0.25	0.1	0.2	0.25	0.1
Backlash	0.5	2	2	0.5	2	2	0.5	2
Unidirectional repeatability	0.5	1	1	0.5	1	1	0.5	1
Pitch	75	75	75	75	75	75	75	75
Yaw	75	75	75	75	75	75	75	75
Max. velocity	50	1.5	3	50	1.5	3	50	1.5
Origin repeatability	1	1	1	1	1	1	1	1
<b>Mechanical properties</b>								
Spindle pitch	1	1	1	1	1	1	1	1
Gear ratio		42.92063			42.92063			42.92063
Motor resolution			10000**			10000**		
Stiffness in motion direction	3500	3500	3500	3500	3500	3500	3500	3500
Load	200	200	200	200	200	200	200	200
Push-/Pullforce	50	50	50	50	50	50	50	50
Self inhibition	40	50	50	40	50	50	40	50
Lateral force	100	100	100	100	100	100	100	100
<b>Drive Properties</b>								
Drive type	DC-Motor, ActiveDrive™	DC-Motor, gearhead	2-phase stepper-motor	DC-Motor, ActiveDrive™	DC-Motor, gearhead	2-phase stepper-motor	DC-Motor, ActiveDrive™	DC-Motor, gearhead
Operating voltage	24	0-12	24	24	0-12	24	24	0-12
Electrical power	26	2.5		26	2.5		26	2.5
<b>Miscellaneous</b>								
Operating temperature range	-20 to +65	-20 to +65	-20 to +65	-20 to +65	-20 to +65	-20 to +65	-20 to +65	-20 to +65
Material	Al (black anodized)	Al (black anodized)	Al (black anodized)	Al (black anodized)	Al (black anodized)	Al (black anodized)	Al (black anodized)	Al (black anodized)
Mass	1.8	1.8	1.8	1.9	1.9	1.9	2.2	2.2
Cable length	3	3	3	3	3	3	3	3
Connector	Sub-D 15 (m)	Sub-D 15 (m)	Sub-D 15 (m)	Sub-D 15 (m)	Sub-D 15 (m)	Sub-D 15 (m)	Sub-D 15 (m)	Sub-D 15 (m)
Recommended controller/driver	C-843; C-862	C-843; C-862	C-630; C-600	C-843; C-862	C-843; C-862	C-630; C-600	C-843; C-862	C-843; C-862

\* Max. recommendet velocity      \*\* 2-phase stepper; 10,000 microsteps with C-600/C-630 controller

M-403.42S	M-403.6PD	M-403.6DG	M-403.62S	M-403.8PD	M-403.8DG	M-403.82S	Units	Tolerance
X	X	X	X	X	X	X		
100	150	150	150	200	200	200	mm	
	Rotary encoder	Rotary encoder		Rotary encoder	Rotary encoder			
	4000	2000		4000	2000			
0.1	0.25	0.0175	0.1	0.25	0.0175	0.1	µm	typ.
0.2	0.25	0.2	0.2	0.25	0.2	0.2	µm	typ.
2	1	6	2	1	6	2	µm	typ.
1	1	1	1	1	1	1	µm	typ.
200	200	200	200	200	200	200	µrad	typ., over 100 mm
200	200	200	200	200	200	200	µrad	typ., over 100 mm
3	10*	2.5	3	10*	2.5	3	mm/s	
1	1	1	1	1	1	1	µm	typ.
1	1	1	1	1	1	1	mm/rev.	
		28.444			28.444			
10000**			10000**			10000**	Steps/rev.	
3500	3500	3500	3500	3500	3500	3500	N/mm	
200	200	200	200	200	200	200	N	Max.
50	50	50	50	50	50	50	N	
50	50	50	50	50	50	50	N	Min.
100	100	100	100	100	100	100	N	Max.
2-phase stepper-motor	DC-Motor, ActiveDrive™	DC-Motor, gearhead	2-phase stepper-motor	DC-Motor, ActiveDrive™	DC-Motor, gearhead	2-phase stepper-motor		
24	24	0-12	24	24	0-12	24	V	
	26	2.5		26	2.5		W	nominal
-20 to +65	-20 to +65	-20 to +65	-20 to +65	-20 to +65	-20 to +65	-20 to +65	°C	
Al (black anodized)	Al (black anodized)	Al (black anodized)	Al (black anodized)	Al (black anodized)	Al (black anodized)	Al (black anodized)		
2	2.2	2.2	2.2	2.5	2.5	2.5	kg	±5 %
3	3	3	3	3	3	3	m	±10 mm
Sub-D 15 (m)	Sub-D 15 (m)	Sub-D 15 (m)	Sub-D 15 (m)	Sub-D 15 (m)	Sub-D 15 (m)	Sub-D 15 (m)		
C-630; C-600	C-843; C-862	C-843; C-862	C-630; C-600	C-843; C-862	C-843; C-862	C-630; C-600		
M-404.42S	M-404.6PD	M-404.6DG	M-404.62S	M-404.8PD	M-404.8DG	M-404.82S	Units	Tolerance
X	X	X	X	X	X	X		
100	150	150	150	200	200	200	mm	
	Rotary encoder	Rotary encoder		Rotary encoder	Rotary encoder			
	4000	2000		4000	2000			
0.1	0.25	0.0116	0.1	0.25	0.0116	0.1	µm	typ.
0.2	0.25	0.1	0.2	0.25	0.1	0.2	µm	typ.
2	0.5	2	2	0.5	2	2	µm	typ.
1	0.5	1	1	0.5	1	1	µm	typ.
75	75	75	75	75	75	75	µrad	typ., over 100 mm
75	75	75	75	75	75	75	µrad	typ., over 100 mm
3	50	1.5	3	50	1.5	3	mm/s	
1	1	1	1	1	1	1	µm	±20 %
1	1	1	1	1	1	1	mm/rev.	
		42.92063			42.92063			
10000**			10000**			10000**	Steps/rev.	
3500	3500	3500	3500	3500	3500	3500	N/mm	±20 %
200	200	200	200	200	200	200	N	Max.
50	50	50	50	50	50	50	N	Max.
50	40	50	50	40	50	50	N	Min.
100	100	100	100	100	100	100	N	Max.
2-phase stepper-motor	DC-Motor, ActiveDrive™	DC-Motor, gearhead	2-phase stepper-motor	DC-Motor, ActiveDrive™	DC-Motor, gearhead	2-phase stepper-motor		
24	24	0-12	24	24	0-12	24	V	
	26	2.5		26	2.5		W	nominal
-20 to +65	-20 to +65	-20 to +65	-20 to +65	-20 to +65	-20 to +65	-20 to +65		
Al (black anodized)	Al (black anodized)	Al (black anodized)	Al (black anodized)	Al (black anodized)	Al (black anodized)	Al (black anodized)		
2.2	2.3	2.3	2.3	2.6	2.6	2.6	kg	±5 %
3	3	3	3	3	3	3	m	±10 mm
Sub-D 15 (m)	Sub-D 15 (m)	Sub-D 15 (m)	Sub-D 15 (m)	Sub-D 15 (m)	Sub-D 15 (m)	Sub-D 15 (m)		
C-630; C-600	C-843; C-862	C-843; C-862	C-630; C-600	C-843; C-862	C-843; C-862	C-630; C-600		

# M-413 Linear Stage Series, Leadscrew-Type

## High-Load Leadscrew-Driven Translation Stages with Stepper and DC-Motors



M-413.2PD high-load linear stage with 200 mm travel range.

- For Cost-Sensitive Applications
- Modular System M-403, M-404, M-413, M-414
- Preloaded Precision Leadscrew
- Travel Range 100 to 300 mm
- Min. Incremental Motion 0.2 µm
- Resolution to 0.017 µm
- Stress-Relieved Aluminum Base for Highest Stability

The optimum choice from a modular system of high-value, low-cost components makes the M-413 family of linear stages very attractive and economical. These stages are lead-screw-driven and provide a minimum incremental motion to 0.2 µm. They are designed with a precision-machined, high-density, stress-relieved aluminum base for exceptional stability and minimum weight. M-413 stages are available with travel ranges from 100 mm to 300 mm.

### Application Examples

- Quality control
- Semiconductor test equipment
- Precision automation
- Metrology
- Data storage test
- Research & development

### High Load and Maintenance Free

All models of the M-413 family are equipped with high-precision linear guiding rails and recirculating ball bearings. Their high load capacity allows them to carry up to 50 kg and to push/pull up to 50 N. The recirculating ball bearings are maintenance free and immune to the cage migration which can plague crossed roller bearings.

### Three Motor Drives

The top-of-the-line M-413.xPD versions feature the high-performance ActiveDrive™ system. This design, developed by PI, has a high-efficiency PWM servo-amplifier mounted side by side with the DC-Motor and offers several advantages:

- Increased efficiency, by eliminating power losses between the amplifier and motor
- Reduced cost of ownership and improved reliability,

### Ordering Information

**M-413.1PD**  
Linear Translation Stage, 120 mm Wide, 100 mm Travel Range, ActiveDrive™

**M-413.1DG**  
Linear Translation Stage, 120 mm Wide, 100 mm Travel Range, DC-Motor

**M-413.12S**  
Linear Translation Stage, 120 mm Wide, 100 mm Travel Range, Stepper Motor

**M-413.2PD**  
Linear Translation Stage, 120 mm Wide, 200 mm Travel Range, ActiveDrive™

**M-413.2DG**  
Linear Translation Stage, 120 mm Wide, 200 mm Travel Range, DC-Motor

**M-413.22S**  
Linear Translation Stage, 120 mm Wide, 200 mm Travel Range, Stepper Motor

**M-413.3PD**  
Linear Translation Stage, 120 mm Wide, 300 mm Travel Range, ActiveDrive™

**M-413.3DG**  
Linear Translation Stage, 120 mm Wide, 300 mm Travel Range, DC-Motor

**M-413.32S**  
Linear Translation Stage, 120 mm Wide, 300 mm Travel Range, Stepper Motor

because no external driver is required

- Elimination of PWM amplifier noise radiation, by mounting the amplifier and motor together in a single, electrically shielded case

The M-413.xDG models are equipped with a DC-Motor with zero-backlash gearhead and a shaft-mounted optical encoder, providing a minimum incremental motion of 0.2 µm.

The M-413.x2S models feature a direct-drive, 2-phase stepper motor with zero vibration, providing a resolution of 0.1 µm

per step and very smooth operation.

### Direction-Sensing Origin Switch

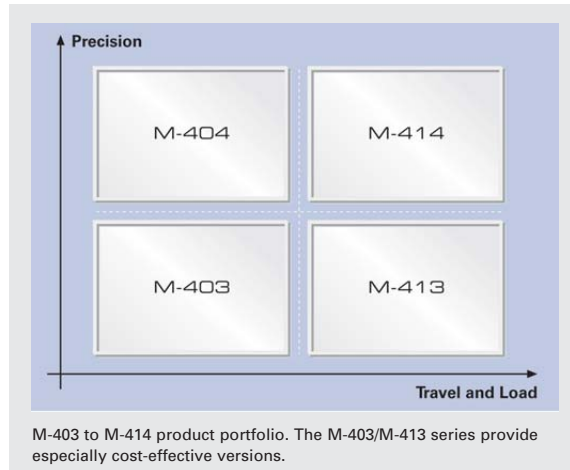
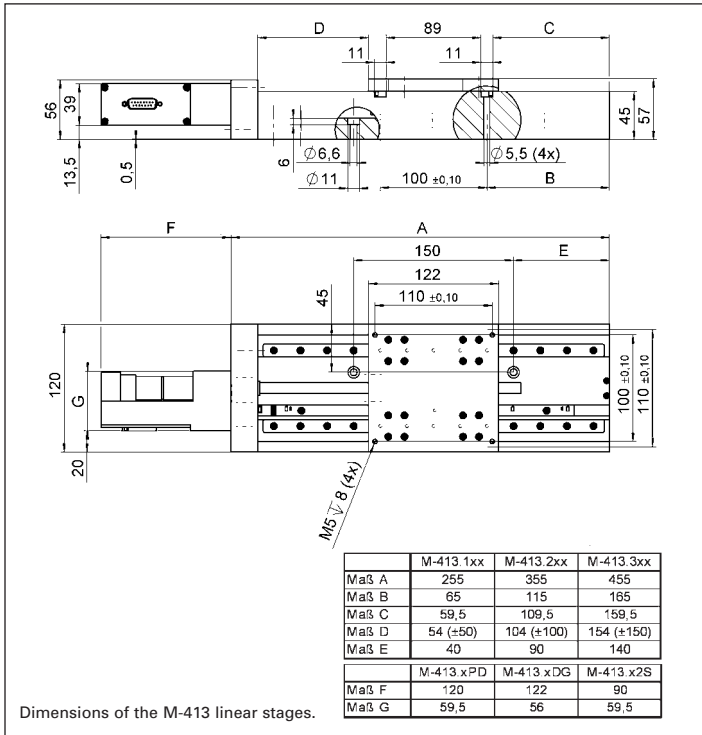
Integrated, high-precision, non-contact Hall-effect origin and limit switches with direction sensing on the origin switch protect your equipment and increase versatility in automation applications.

### Low Cost of Ownership

The combination of these stages with the networkable, single channel C-862 Mercury™ controller offers high performance for a very competitive price in both single and multi-axis configurations.

### Technical Data

Models	M-413.1PD
Active Axes	X
<b>Motion and positioning</b>	
Travel range	100
Integrated sensor	Rotary encoder
Sensor resolution	4000
Design resolution	0.25
Min. incremental motion	0.25
Backlash	2
Unidirectional repeatability	1
Pitch	300
Yaw	300
Max. velocity	10*
Origin repeatability	1
<b>Mechanical properties</b>	
Spindle pitch	1
Gear ratio	
Motor resolution	
Stiffness in motion direction	6000
Load	500
Push-/Pullforce	50
Self inhibition	50
Lateral force	200
<b>Drive Properties</b>	
Drive type	DC-Motor, ActiveDrive™
Operating voltage	24
Electrical power	42
<b>Miscellaneous</b>	
Operating temperature range	-20 to +65
Material	Al (black anodized)
<b>Mass</b>	
Cable length	3
Connector	Sub-D 15 (m)
Recommended controller/driver	C-843; C-862
* Max. recommendet velocity	



- Piezo Actuators
- Nanopositioning & Scanning Systems
- Active Optics / Steering Mirrors
- Tutorial: Piezo-electrics in Positioning
- Capacitive Position Sensors
- Piezo Drivers & Nanopositioning Controllers
- Hexapods / Micropositioning**
- Photonics Alignment Solutions
- Motion Controllers
- Ceramic Linear Motors & Stages
- Index

M-413.1DG	M-413.12S	M-413.2PD	M-413.2DG	M-413.22S	M-413.3PD	M-413.3DG	M-413.32S	Units	Tolerance
X	X	X	X	X	X	X	X		
100	100	200	200	200	300	300	300	mm	
Rotary encoder		Rotary encoder	Rotary encoder		Rotary encoder	Rotary encoder			
2000		4000	2000		4000	2000			
0.0175	0.1	0.25	0.0175	0.1	0.25	0.0175	0.1	µm	typ.
0.2	0.2	0.25	0.2	0.2	0.25	0.2	0.2	µm	typ.
6	2	2	6	2	2	6	2	µm	typ.
1	1	1	1	1	1	1	1	µm	typ.
300	300	300	300	300	300	300	300	µrad	typ., over 100 mm
300	300	300	300	300	300	300	300	µrad	typ., over 100 mm
2.5	3	10*	2.5	3	10*	2.5	3	mm/s	
1	1	1	1	1	1	1	1	µm	±20 %
1	1	1	1	1	1	1	1	mm/rev.	
28.444			28.444			28.444			
	10000**			10000**			10000**	Steps/rev.	
6000	6000	6000	6000	6000	6000	6000	6000	N/mm	±20 %
500	500	500	500	500	500	500	500	N	Max.
50	50	50	50	50	50	100	100	N	Max.
50	50	50	50	50	50	100	100	N	Min.
200	200	200	200	200	200	200	200	N	Max.
DC-Motor, gearhead	2-phase stepper-motor	DC-Motor, ActiveDrive™	DC-Motor, gearhead	2-phase stepper-motor	DC-Motor, ActiveDrive™	DC-Motor, gearhead	2-phase stepper-motor		
0-12	24	24	0-12	24	24	0-12	24	V	
3.6	0	42	3.6	0	42	3.6	0	W	nominal
-20 to +65	-20 to +65	-20 to +65	-20 to +65	-20 to +65	-20 to +65	-20 to +65	-20 to +65	°C	
Al (black anodized)	Al (black anodized)	Al (black anodized)	Al (black anodized)	Al (black anodized)	Al (black anodized)	Al (black anodized)	Al (black anodized)		
		5.4	5.2	5.4				kg	±5 %
3	3	3	3	3	3	3	3	m	±10 mm
Sub-D 15 (m)	Sub-D 15 (m)	Sub-D 15 (m)	Sub-D 15 (m)	Sub-D 15 (m)	Sub-D 15 (m)	Sub-D 15 (m)	Sub-D 15 (m)		
C-843; C-862	C-630; C-600	C-843; C-862	C-843; C-862	C-630; C-600	C-843; C-862	C-843; C-862	C-630; C-600		

\*\* 2-phase stepper; 10,000 microsteps with C-600/C-630 controller

# M-414 Linear Slides, Ball Screw-Type

## High-Load Ball-Screw-Driven Precision-Translation Stages with Stepper and DC-Motors



M-414.2PD High load linear stage with 200 travel range.

- High-Precision Components
- Modular System M-403, M-404, M-413, M-414
- Recirculating Ball Screw Provides High Speed & Long Lifetime
- Travel Range 100 to 300 mm
- Min. Incremental Motion 0.2 µm
- Resolution to 0.023 µm
- Stress-Relieved Aluminum Base for Highest Stability

The modular M-414 family of linear stages provides high-performance at a very attractive price. The integrated low-friction ball-screws combine high duty-cycles and velocities with minimum incremental motion of 0.2 µm. These stages are designed with a precision-machined, high-density, stress-relieved aluminum base for exceptional stability. M-414 are available with travel ranges from 100 mm to 300 mm.

### High Load and Maintenance Free

All models of the M-414 family are equipped with high-precision linear guiding rails and recirculating ball bearings.

### Application Examples

- Quality control
- Semiconductor test equipment
- Precision automation
- Metrology
- Data storage test
- Research & development

Their high load capacity allows them to carry up to 50 kg and to push/pull up to 50 N. The recirculating ball bearings are maintenance free and immune to the cage migration which can plague crossed roller bearings.

### Three Motor Drives

The top-of-the-line M-414.xPD versions feature the high-performance ActiveDrive™ system. This design, developed by PI, has a high-efficiency PWM servo-amplifier mounted side by side with the DC-Motor and offers several advantages:

- Increased efficiency, by eliminating power losses between the amplifier and motor
- Reduced cost of ownership and improved reliability, because no external driver is required
- Elimination of PWM amplifier noise radiation, by mounting the amplifier and motor together in a single, electrically shielded case

### Ordering Information

**M-414.1PD**  
Precision-Linear Stage, 120 mm Wide, 100 mm Travel Range, ActiveDrive™

**M-414.1DG**  
Precision-Linear Stage, 120 mm Wide, 100 mm Travel Range, DC-Motor

**M-414.12S**  
Precision-Linear Stage, 120 mm Wide, 100 mm Travel Range, Stepper Motor

**M-414.2PD**  
Precision-Linear Stage, 120 mm Wide, 200 mm Travel Range, ActiveDrive™

**M-414.2DG**  
Precision-Linear Stage, 120 mm Wide, 200 mm Travel Range, DC-Motor

**M-414.22S**  
Precision-Linear Stage, 120 mm Wide, 200 mm Travel Range, Stepper Motor

**M-414.3PD**  
Precision-Linear Stage, 120 mm Wide, 300 mm Travel Range, ActiveDrive™

**M-414.3DG**  
Precision-Linear Stage, 120 mm Wide, 300 mm Travel Range, DC-Motor

**M-414.32S**  
Precision-Linear Stage, 120 mm Wide, 300 mm Travel Range, Stepper Motor

The M-414.xDG models are equipped with a DC-Motor with zero-backlash gearhead and a shaft-mounted optical encoder, providing a minimum incremental motion of 0.2 µm.

The M-414.x2S models feature a direct-drive, 2-phase stepper motor with zero vibration, providing a resolution of 0.1 µm steps.

### Direction-Sensing Origin Switch

Integrated, high-precision, non-contact Hall-effect origin and limit switches with direction sensing on the origin switch protect your equipment

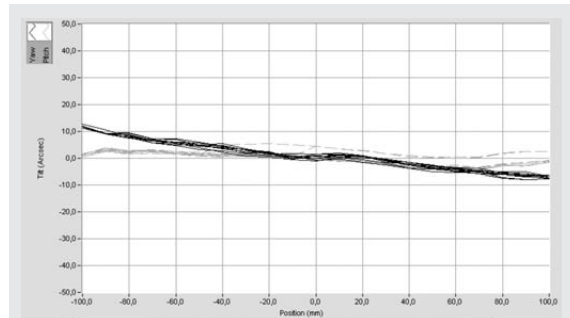
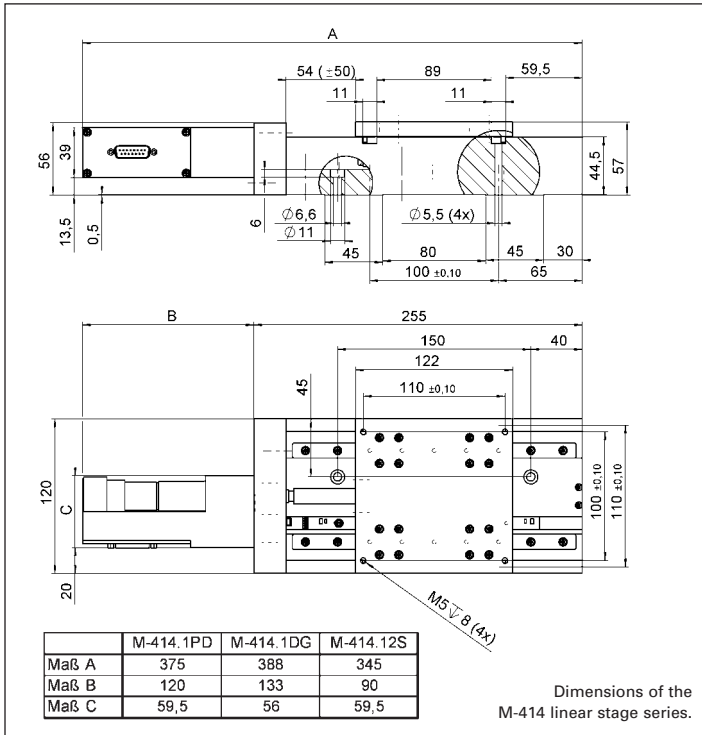
and increase versatility in automation applications.

### Low Cost of Ownership

These PI stages are especially cost effective in high performance, high-duty-cycle applications, when combined with the networkable C-862 Mercury™ controller.

### Technical Data

Models	M-414.1PD
Active Axes	X
<b>Motion and positioning</b>	
Travel range	100
Integrated sensor	Rotary encoder
Sensor resolution	4000
Design resolution	0.5
Min. incremental motion	0.25
Backlash	0.5
Unidirectional repeatability	0.5
Pitch	100
Yaw	100
Max. velocity	100
Origin repeatability	1
<b>Mechanical properties</b>	
Spindle pitch	2
Gear ratio	
Motor resolution	
Stiffness in motion direction	6000
Load	500
Push-/Pullforce	50
Self inhibition	50
Lateral force	200
<b>Drive Properties</b>	
Drive type	DC-Motor, ActiveDrive™
Operating voltage	24
Electrical power	42
<b>Miscellaneous</b>	
Operating temperature range	-20 to +65
Material	Al (black anodized)
<b>Mass</b>	
Cable length	3
Connector	Sub-D 15 (m)
Recommended controller/driver	C-843; C-862
* Max. recommendet velocity	



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M-414.1DG	M-414.12S	M-414.2PD	M-414.2DG	M-414.22S	M-414.3PD	M-414.3DG	M-414.32S	Units	Tolerance
X	X	X	X	X	X	X	X		
100	100	200	200	200	300	300	300	mm	
Rotary encoder		Rotary encoder	Rotary encoder		Rotary encoder	Rotary encoder			
2000		4000	2000		4000	2000			
0.0232	0.2	0.25	0.0175	0.1	0.25	0.0175	0.1	µm	typ.
0.1	0.2	0.25	0.1	0.2	0.25	0.1	0.2	µm	typ.
4	2	2	6	2	2	6	2	µm	typ.
1	1	0.5	1	1	0.5	1	1	µm	typ.
100	100	100	100	100	100	100	100	µrad	typ., over 100 mm
100	100	100	100	100	100	100	100	µrad	typ., over 100 mm
3	6	100	3	6	100	3	6	mm/s	
1	1	1	1	1	1	1	1	µm	±20 %
2	2	2	2	2	2	2	2	mm/rev.	
42.9206			42.9206			42.9206			
	10000**			10000**			10000**	Steps/rev.	
6000	6000	6000	6000	6000	6000	6000	6000	N/mm	±20 %
500	500	500	500	500	500	500	500	N	Max.
50	50	50	50	50	50	100	100	N	Max.
50	50	50	50	50	50	100	100	N	Min.
200	200	200	200	200	200	200	200	N	Max.
DC-Motor, gearhead	2-phase stepper-motor	DC-Motor, ActiveDrive™	DC-Motor, gearhead	2-phase stepper-motor	DC-Motor, ActiveDrive™	DC-Motor, gearhead	2-phase stepper-motor		
0-12	24	24	0-12	24	24	0-12	24	V	
3.6	0	42	3.6	0	42	3.6	0	W	nominal
-20 to +65	-20 to +65	-20 to +65	-20 to +65	-20 to +65	-20 to +65	-20 to +65	-20 to +65	°C	
Al (black anodized)	Al (black anodized)	Al (black anodized)	Al (black anodized)	Al (black anodized)	Al (black anodized)	Al (black anodized)	Al (black anodized)		
		5.4	5.2	5.4				kg	±%
3	3	3	3	3	3	3	3	m	±10 mm
Sub-D 15 (m)	Sub-D 15 (m)	Sub-D 15 (m)	Sub-D 15 (m)	Sub-D 15 (m)	Sub-D 15 (m)	Sub-D 15 (m)	Sub-D 15 (m)		
C-843; C-862	C-630; C-600	C-843; C-862	C-843; C-862	C-630; C-600	C-843; C-862	C-843; C-862	C-630; C-600		

\*\* 2-phase stepper; 10,000 microsteps with C-600/C-630 controller

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- Hexapods
- Micropositioners
- Positioning Systems for Fiber Optics, Photonics and Telecommunications
- Motor Controllers
- PLine® High-Speed Ceramic Linear Motors

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## Selection Guides: Hexapods, Translation Stages, Rotary Stages, Linear Actuators...

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[Collapse Micropositioning Selection Guide Tables \(quick overview\)](#)

### Hexapods (6D Parallel Kinematics)

Click Image for Data Sheet	*Models	Description	Load Capacity [kg]	Travel Range [mm]	Drive
	<a href="#">F-206.S</a>	HexAlign™ 6-Axis micro alignment system. very accurate, optional photometer.	2	to 12 mm / 6°	DC-Servo
	<a href="#">M-824</a>	Vacuum compatible compact Hexapod.	10	to 45 mm / 25°	DC-Servo
	<a href="#">M-840</a>	HexaLight™ Hexapod, fast, medium load capacity, optional photometer.	10	to 100 mm / 60°	DC-Servo
	<a href="#">M-850</a>	High-load hexapod, optional photometer.	200	to 100 mm / 60°	DC-Servo
	<a href="#">P-911k</a>	NEXLINE® Custom, nonmagnetic Piezo-Hexapod high-load 6-axis nanopositioning system	>50	to 10 mm / 6°	PiezoWalk®, Linear Scale
	<a href="#">M-850 Ultra High Load</a>	Hexapod ultra high-load 6-axis positioner for astronomy applications and other alignment tasks	1000	to 24 mm / 60°	DC-Servo
	<a href="#">P-587</a>	6-Axis piezo-nanopositioning system, parallel metrology, extremely accurate.	5	to 800 µm / 10 mrad	Piezo / capacitive sensor

[Hexapods Brochure \(PDF\)](#) [More on Hexapods](#)

### Micro-Stage Series, Motorized (Linear and Rotation)

Click Image for Data Sheet	*Models	Description	Load Capacity [kg]	Travel Range [mm]	Drive
	<a href="#">M-122</a>	Fast miniature translation stage w/ linear encoder, direct drive, ballscrew.	5	25	DC-Servo Direct / Linear Encoder
	<a href="#">M-110.1, M-111.1, M-112.1</a>	Miniature translation stage with leadscrew drive, for laboratory and research use.	3	5, 15, 25	DC-Servo / stepper motor
	<a href="#">M-110.2, M-111.2, M-112.2</a>	Miniature translation stage with ballscrew drive, for industrial use.	3	5, 15, 25	DC-Servo / stepper motor

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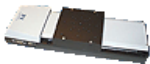
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- >> [Semi Award for Piezo Motor](#)




	<a href="#">M-116</a>	Miniature rotation stage, compatible with M-110, M-111, M-112 linear stages. Compact, clear aperture, high resolution.	1.5	> 360 °	DC-Servo / stepper motor
<b>&gt;&gt; Translation Stages (DC-Servo, Stepper Motor, Manual)</b>					
Click Image for Data Sheet	<b>*Models</b>	<b>Description</b>	<b>Load Capacity [kg]</b>	<b>Travel Range [mm]</b>	<b>Drive</b>
	<a href="#">M-311</a>	Manual translation stages. PiezoMike option, ultra-compact, stainless steel.	4	6	Manual / PiezoMike upgrades avail.
	<a href="#">M-105,</a> <a href="#">M-106</a>	Manual translation stages with motor and piezo options, crossed roller bearings.	10	6, 18	Manual / Piezo and motor upgrades avail.
	<a href="#">M-011</a>	Side-drive, magnetic-kinematic bearings Low profile, excellent guidance, 10 nm resolution with piezo option.	1	15	Manual / DC-servo / Piezo, upgrades avail.
	<a href="#">M-110.1,</a> <a href="#">M-111.1,</a> <a href="#">M-112.1</a>	Miniature translation stage with leadscrew drive, for laboratory and research use.	3	5, 15, 25	DC-servo /stepper motor
	<a href="#">M-110.2,</a> <a href="#">M-111.2,</a> <a href="#">M-112.2</a>	Miniature translation stage with ballscrew drive, for industrial use.	3	5, 15, 25	DC-servo /stepper motor
	<a href="#">M-122</a>	Fast miniature translation stage w/ linear encoder, direct drive, ballscrew.	5	25	DC-Servo Direct / Linear Encoder
	<a href="#">M-014</a>	Side-drive, magnetic-kinematic bearings Low profile, excellent guidance, 10 nm resolution with piezo option.	5	25	Manual / DC-servo / Piezo, upgrades avail.
	<a href="#">M-126</a>	Compact, crossed roller bearings, very high resolution, optional ActiveDrive™ motor.	20	25	DC-servo / stepper motor / manual
	<a href="#">M-405,</a> <a href="#">M-410,</a> <a href="#">M-415</a>	Translation stages, crossed roller bearings, very high resolution, optional ActiveDrive™ motor.	50	50, 100, 150	DC-servo / stepper motor
	<a href="#">M-403</a>	Low-cost translation stages. Leadscrew drive.	20	25 - 200	DC-servo / stepper motor
	<a href="#">M-404</a>	Low-cost translation stages. Ballscrew Drive.	20	25 - 200	DC-servo / stepper motor
	<a href="#">M-413</a>	Low-cost translation stages. Leadscrew drive.	50	100 - 300	DC-servo / stepper motor
	<a href="#">M-414</a>	Low-cost translation stages. Ballscrew Drive.	50	100 - 300	DC-servo / stepper motor
	<a href="#">M-605</a>	Translation stages with integrated linear encoder, very high accuracy, compact, protective bellows.	20	25, 50	DC-servo
	<a href="#">M-505</a>	Translation stages with ballscrew drive, compact, long lifetime, optionally with ActiveDrive™.	100	25, 50, 100, 150	DC-servo / stepper motor
	<a href="#">M-5x1</a>	Translation stages with ballscrew drive, compact, high load capacity and lifetime, optionally with linear encoder and ActiveDrive™.	100	102, 204, 306	DC-servo / stepper motor, very high accuracy

	<a href="#">M-511.HD</a>	Hybrid translation stages with DC motors and piezo drives. Extremely accurate. 4 nm Linear Encoder.	100	102	DC-servo + piezo drives
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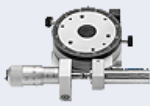



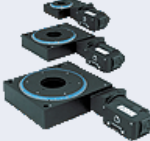
>> **Linear Actuators and Micrometers**


Click Image for Data Sheet	*Models	Description	Load Capacity [kg]	Travel Range [mm]	Drive
	<a href="#">M-227</a>	DC-Mike, high resolution, non-rotating tip.	4	10, 25, 50	DC-servo, piezo option
	<a href="#">M-230</a>	DC / Stepper Mike, limit switches, compact, high resolution, non-rotating tip.	7	10, 25	DC-servo, stepper motor
	<a href="#">M-235</a>	DC / Stepper Mike, high load capacity and lifetime, ballscrew drive, limit switches.	12	20, 50	DC-servo, stepper motor
	<a href="#">M-238</a>	Heavy duty DC-Mike actuators. Optional linear encoder.	40	50	DC motor with gearbox
	<a href="#">M-231</a>	DC / Stepper Mike, compact, high resolution, limit switches.	4	17	DC-servo, stepper motor
	<a href="#">M-232</a>	Extra-compact DC / stepper motor-mike, folded drive train, high resolution, limit switches.	4	17	DC-servo, stepper motor
	<a href="#">M-168</a>	Stepper Mike, high resolution, non-rotating tip, very good repeatability.	5	10, 25, 50	Stepper motor, piezo option
	<a href="#">P-853,</a> <a href="#">P-854</a>	PiezoMike, sub-nanometer resolution.	1	6, 18	PiezoMike
	<a href="#">M-631 -</a> <a href="#">M-633</a>	Precision micrometer, non-rotating tip, compact, very good repeatability.	10	10, 25, 50	Manual
	<a href="#">M-619 -</a> <a href="#">M-626</a>	Manual micrometers.	2 - 5	6, 10, 15, 18, 25	Manual
	<a href="#">M-653,</a> <a href="#">M-655</a>	Differential micrometer 0.1 µm resolution, compact.	2	6, 20	Manual

>> **Vertical Stage (Z-Stage) Overview**





Click Image for Data Sheet	*Models	Description	Load Capacity [kg]	Travel Range [mm]	Drive
	<a href="#">M-501</a>	Vertical stage, ballscrew drive, high resolution, fast.	10	12.5	DC-servo
	<a href="#">M-451</a>	Vertical stage, wedge drive, high stiffness.	12	12.5	DC-servo
	<a href="#">M-714</a>	Hybrid Z-stage. DC-servo + piezo drive. Extremely Accurate. 2 nm Linear Encoder.	10	7	DC + piezo




>> [For Piezoelectric Ultra-Precision Z-Stages click here](#)

<b>&gt;&gt; Rotational Stages (Rotary Stages)</b>					
Click Image for Data Sheet	*Models	Description	Load Capacity [kg]	Travel Range [mm]	Drive
	<a href="#">M-116</a>	Miniature rotation stage, compatible with M-110, M-111, M-112 linear stage, compact, clear aperture, high resolution.	1.5	> 360	DC-servo / stepper motor
	<a href="#">M-035</a>	Tangent-arm drive, manual, with motor and piezo options, very high resolution, 60 mm diameter.	30	19	Manual / piezo / DC-servo
	<a href="#">M-036</a>	Tangent-arm drive, manual, with motor and piezo options, very high resolution, 100 mm diameter.	40	21	Manual / piezo / DC-servo
	<a href="#">M-037</a>	Continuous travel range, compact, clear aperture, high resolution, 60 mm diameter.	30	> 360	Manual / DC-servo / stepper motor
	<a href="#">M-038</a>	Continuous travel range, compact, clear aperture, high resolution, 100 mm diameter.	40	> 360	Manual / DC-servo / stepper motor
	<a href="#">M-060 - M-062</a>	Continuous travel range compact, clear aperture, high resolution, 60 to 120 mm diameter.	50 - 65	> 360	Manual / DC-servo / stepper motor







<b>&gt;&gt; Tip/Tilt Stages</b>					
Click Image for Data Sheet	*Models	Description	Load Capacity [kg]	Travel Range [mm]	Drive
	<a href="#">M-041 - M-044</a>	Tip & tip/tilt stages, high resolution, piezo option.	4, 5	±9	Manual / DC-servo / piezo

**>> For Piezoelectric Ultra-Precision Tip /Tilt / Z-Stages click here**


<b>&gt;&gt; Piezo Linear Motor Stages</b>					
Click Image for Data Sheet	*Models	Description	Load Capacity [kg]	Travel Range [mm]	Drive
	<a href="#">P-652</a>	Miniature Piezo Linear Motors for OEMs: 9.0 x 6.5 x 2.4 mm <sup>3</sup>	0.005	3.2	PILine® ultrasonic motor
	<a href="#">M-661, M-662</a>	Smallest stage with linear motor drive available, speed to 500 mm/s, 0.1 µm resolution.	0.5	20	PILine® ultrasonic motor
	<a href="#">M-674</a>	RodDrive Piezo Linear Motor Pusher for OEMs	0.7	100	PILine® ultrasonic motor
	<a href="#">M-663</a>	Smallest stage with linear motor drive and linear encoder, speed to 500 mm/s, 0.1 µm resolution. XY-combinations possible.	0.5	20	PILine® ultrasonic motor

	<a href="#">M-664</a>	M-664 micropositioning systems are low-profile, high-accuracy translation stages with piezo linear encoders.	0.5	25	PILine® ultrasonic motor
	<a href="#">M-682</a>	M-682 translation stages are low-profile, high-accuracy positioning systems based on the M-674 RodDrive ultrasonic linear motor actuator.	5	50	PILine® ultrasonic motor
	<a href="#">M-686</a>	Linear motor-driven XY stage with linear encoder, 0.1 µm resolution	5	25	PILine® ultrasonic motor

>> **Piezo Linear Motor Drives**

Click Image for Data Sheet	*Models	Description	Load Capacity [kg]	Travel Range [mm]	Drive
	<a href="#">P-652</a>	Miniature Piezo Linear Motors for OEMs: 9.0 x 6.5 x 2.4 mm <sup>3</sup>	0.005	3.2	PILine® ultrasonic motor
	<a href="#">P-661</a>	OEM Ultrasonic piezo linear motor, small, light, very fast.	-	-	Piezo linear motor
	<a href="#">M-674</a>	RodDrive Piezo Linear Motor Pusher for OEMs	0.7	100	PILine® ultrasonic motor
	<a href="#">N-111</a>	NEXLINE® nano drive, subnanometer resolution.	8	5	Piezo-Walk®
	<a href="#">N-214,</a> <a href="#">N-215</a>	NEXLINE® high-load nano drive, subnanometer resolution.	60	20	Piezo-Walk®
	<a href="#">N-310</a>	NEXACT® Ultra-compact piezo stepping drive, subnanometer resolution.	1	20	Piezo-Walk®

>> **Fast Scanning Stages with Voice Coil Drive**

Click Image for Data Sheet	*Models	Description	Load Capacity [kg]	Travel Range [mm]	Drive
	<a href="#">V-106</a>	Voice-coil scanner, fast, with PC-card controller.	0.1	6, 20	Voice coil linear motor

>> **Piezo Scanning Stages**

\* Ask about custom designs.

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## Selection Guides: Piezo Flexure Nanopositioning Stages & Scanners, Piezo Systems

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[Collapse Nanopositioning Selection Guide Tables \(Quick Overview\)](#)

### >> Compact Open-Loop Stages



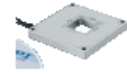
Click Image for Data Sheet	Models*	Description	Axes	Travel [µm]	Sensor
	<a href="#">P-713</a>	Compact XY-scanner, fast.	XY	15	-
	<a href="#">P-280</a>	Nanopositioning stage, XY and XYZ combinations.	X	30, 50, 100	-
	<a href="#">P-290</a>	Nanopositioning Z-stage. Long travel range	Z	1000	-
	<a href="#">P-601</a>	Open & closed loop lever amplified Z-actuators / stages.	Z	110, 300, 400	- / SGS
	<a href="#">P-287</a>	Z-stage and tilt nanopositioning stage, long travel range.	Z, $\theta_x$	700, 12 mrad	-
	<a href="#">P-772</a>	Ultracompact Flexure Guided System	X	10	-

### >> Microscopy Z-Stages / Objective Nanofocusing Systems

Click Image for Data Sheet	Models*	Description	Axes	Travel [µm]	Sensor
	<a href="#">P-725</a>	PIFOC® objective nanofocusing system, compact, light-weight, long travel ranges, QuickLock mounting system, direct metrology.	Z	100, 250, 400	Capacitive
	<a href="#">P-721.CDQ</a> <a href="#">P-721.LLQ</a>	PIFOC® objective nanofocusing system, very fast and accurate, with QuickLock mounting system, direct metrology.	Z	100	Capacitive / LVDT
	<a href="#">P-720</a>	PIFOC® objective nanofocusing system, very compact, without sensors.	Z	100	-
	<a href="#">P-737</a>	PIFOC® Z-axis microscopy piezo stage for high-resolution sample positioning and scanning	Z	to 250 µm	SGS
	<a href="#">P-541.Z</a>	Low-profile Z-stage, 80 x 80 mm aperture.	Z ( $\theta_x\theta_y$ )	100	Capacitive / SGS

### >> Closed-Loop 1- and 2-Axis Stages with Strain Gauge Sensors



- >> Piezo-Z Microscope Stage
- >> Open-Frame XY Piezo-Motor Stage
- >> Ultra Low Profile PiezoStage
- >> NEXACT® Nanopositioning Motor
- >> Fast Steering Mirrors
- >> Nanometers over Millimeters
- >> Ultra High Load Hexapod
- >> Fast Piezo Flexure Actuators
- >> Micro Piezo Motor Slide
- >> Low-Cost Piezo Z-Stage / Nanofocussing
- >> Semi Award for Piezo Motor





Click Image for Data Sheet	Models*	Description	Axes	Travel [µm]	Sensor
	<a href="#">P-611.1</a> , <a href="#">P-611.2</a>	Compact, low-cost X and XY nanopositioning stages.	X, XY	100	SGS
	<a href="#">P-611.ZS</a> , <a href="#">P-611.XZS</a>	Compact, low-cost X and XY nanopositioning stages.	Z, XZ	100	SGS
	<a href="#">P-714</a>	Ultracompact XY- scanner, fast	XY	15	SGS

>> **Closed-Loop Single-Axis Stages with Direct Metrology (Direct Metrology = Higher Accuracy)**

Click Image for Data Sheet	Models*	Description	Axes	Travel [µm]	Sensor
	<a href="#">P-783</a>	Nanopositioning Z-stage, long travel range, closed-loop, compact.	Z	300	LVDT
	<a href="#">P-620.Z -</a> <a href="#">P-622.Z -</a>	PIHera® Z-axis nanopositioners, compact, very accurate, long travel range.	Z	50, 100, 250	Capacitive
	<a href="#">P-772</a>	Nanopositioning stage, very compact, fast and accurate	X	10	-
	<a href="#">P-780</a>	Nanopositioning stage, compact, fast, stainless steel	X	80	LVDT
	<a href="#">P-750</a>	High-load nanopositioning stage, very good guidance, high stiffness.	X	75	Capacitive / LVDT
	<a href="#">P-752</a>	Nanopositioning stage. Very fast and accurate, outstanding guiding accuracy.	X	15, 30	Capacitive
	<a href="#">P-753</a>	Nanopositioning stage and actuator in one, very compact, fast and accurate.	Z & X	12, 25, 38	Capacitive
	<a href="#">P-620.1 -</a> <a href="#">P-629.1</a>	PIHera® piezo nanopositioners, compact, very accurate, long travel ranges, excellent value	X (XY, Z)	50, 100, 250, 500, 1000, 1800	Capacitive
	<a href="#">M-714</a>	Hybrid Z-stage. DC-servo + piezo drive. Extremely Accurate. 2 nm Linear Encoder.	Z	7	Incremental
	<a href="#">M-511.HD</a>	Hybrid translation stages with DC motors and piezo drives. Extremely accurate. 4 nm Linear Encoder.	X	100	Incremental

>> **Multi-Axis Stages, Modular Stages (Serial Kinematics)**

Click Image for Data Sheet	Models*	Description	Axes	Travel [µm]	Sensor
	<a href="#">P-281 /</a> <a href="#">P-282</a>	Compact open-loop, modular, nanopositioning stages.	XY, XYZ	30, 50, 100	-
	<a href="#">P-612.2</a>	Compact, low-cost, XY stage. 100 x 100 µm travel, clear aperture.	XY	100 x 100	SGS

	<a href="#">P-611.1</a> , <a href="#">P-611.2</a>	Compact, low-cost X and XY nanopositioning stages.	X, XY	100	SGS
	<a href="#">P-611.ZS</a> , <a href="#">P-611.XZS</a>	Compact, low-cost X and XY nanopositioning stages.	Z, XZ	100	SGS
	<a href="#">P-611.3</a>	NanoCube® XYZ piezo alignment system, compact, very cost-effective.	XYZ	100	SGS
	<a href="#">P-620.2 -</a> <a href="#">P-629.2</a>	PIHera® XY piezo nanopositioners, Very compact & accurate (direct metrology), long travel range.	XY (Z, XYZ)	50, 100, 250, 500, 1000, 1800	Capacitive

**>> Multi-Axis Stages, Parallel Kinematics / Parallel Metrology**  
(Parallel kinematics and parallel metrology allow active trajectory control, better dynamics and higher multi-axis precision)



Click Image for Data Sheet	Models*	Description	Axes	Travel [µm]	Sensor
	<a href="#">P-714</a>	Compact XY scanner, low profile 45 x 45 x 6 mm.	XY	15	SGS
	<a href="#">P-615</a>	NanoCube® 350C XYZ piezo alignment system, clear aperture, ideal for fiber alignment.	XYZ	to 350 / Axis	Capacitive
	<a href="#">P-363</a>	PicoCube® high-precision system for AFM, SPM, nanomanipulation; 50 picometer resolution.	XY, XYZ	5 / Axis	Capacitive
	<a href="#">P-541</a> <a href="#">P-542</a>	Low profile XY scanning piezostage 80 x 80 mm aperture.	XY	to 200 in XY	Capacitive
	<a href="#">P-733</a>	XY(Z) piezo scanning piezostage 50 x 50 mm aperture, vacuum versions available.	XY(Z)	100 x 100 (x 10)	Capacitive
	<a href="#">P-733.2DD /</a> <a href="#">P-733.3DD</a>	High-speed scanning piezostage, XY and XYZ versions, ideal for tasks like scanning microscopy.	XY, XYZ	30 x 30 (x10)	Capacitive
	<a href="#">P-734</a>	XY nanoscanning piezostage, extremely flat and straight (1 – 2 nm); 56 x 56 mm clear aperture..	XY	100 x 100	Capacitive
	<a href="#">P-770</a>	XY nanopositioning piezostage, 200 x 200 mm clear aperture.	XY	200 x 200	LVDT
	<a href="#">P-517 -</a> <a href="#">P-527</a>	Multi-axis piezostage 66 x 66 mm clear aperture, custom model with 6 degrees of freedom available.	XY, XYZ, XYθ <sub>z</sub>	to 200 in XY, 10 in Z, to 2 mrad	Capacitive
	<a href="#">P-561.3DD</a>	PIMars™ XYZ scanning stages, faster, direct drive, excellent guidance, 66 x 66 mm clear aperture.	XY, XYZ	45 XY, 11 Z	Capacitive
	<a href="#">P-561 -</a> <a href="#">P-563</a>	PIMars™ multi-axis piezostage; travel range to 300 x 300 x 300 µm , 66 x 66 mm clear aperture, custom model with 6 degrees of freedom available.	XY, XYZ	to 300 x 300 x 300	Capacitive
	<a href="#">P-518 -</a> <a href="#">P-558</a>	Z-axis and tip/tilt piezostage platforms clear aperture	Z, θ <sub>x</sub> θ <sub>y</sub>	to 200 in Z, 4 mrad	Capacitive
	<a href="#">P-587</a>	6-axis-nanopositioning stage.	XYZ, θ <sub>x</sub> θ <sub>y</sub> θ <sub>z</sub>	up to 800 / 10 mrad	Capacitive

**>> Z-Axis and Tip/Tilt Platforms**    **>> For Fast Steering Platforms: click here**

Click Image for Data Sheet	Models*	Description	Axes	Travel [µm]	Sensor
	<a href="#">P-737</a>	PIFOC® Z-axis microscopy piezo stage for high-resolution sample positioning and scanning	Z	to 250 µm	SGS
	<a href="#">P-541.Z</a>	Low-profile Z-stage, 80 x 80 mm aperture.	Z & Z, Tip/Tilt	100	Capacitive / SGS
	<a href="#">P-518 - P-558</a>	Z-axis and tip/tilt piezostage platforms 66 x 66 mm clear aperture	Z & Z, Tip/Tilt	to 200 in Z, 4 mrad	Capacitive
	<a href="#">P-732.ZC</a>	High-Dynamics Vertical Nanopositioning/Scanning Stage	Z	15	Capacitive
	<a href="#">P-612.Z</a>	Compact, Low-Cost, Z Stage	Z	100	SGS
	<a href="#">P-620.Z - P-622.Z</a>	PIHera® Z-axis nanopositioners, compact, very accurate, long travel range.	Z	50, 100, 250	Capacitive
	<a href="#">P-611.ZS, P-611.XZS</a>	Compact, low-cost Z and XY nanopositioning piezostage	Z, XZ	100	SGS
	<a href="#">P-783</a>	Nanopositioning Z-stage. Long travel range, compact.	Z	300	LVDT
	<a href="#">P-601</a>	Closed-loop, with flexure guidance	Z	110, 300, 400	SGS
	<a href="#">P-290</a>	Nanopositioning Z-stage, very long travel range, open-loop.	Z	1000	-
	<a href="#">P-287</a>	Z-axis and tip/tilt nanopositioning piezostage, long travel range, open-loop.	Z, $\theta_x$	700, 12 mrad	-
	<a href="#">M-714</a>	Hybrid Nanopositioning Z-stage, ultra-long travel range, high load, DC-servo + piezo drives.	Z	7000	Glass scale




**>> For Tip/Tilt Mirror Platforms click here**

**>> Scanning (Microscopy) Piezo-Stage Systems with Clear Aperture**

Click Image for Data Sheet	Models*	Description	Axes	Travel [µm]	Sensor
	<a href="#">P-725</a>	PIFOC® objective nanofocusing system, compact, light-weight, long travel ranges, QuickLock mounting system, direct metrology	Z	100, 250, 400	Capacitive
	<a href="#">P-721.CDQ P-721.LLQ</a>	PIFOC®. objective nanofocusing system, very fast and accurate, with QuickLock mounting system, direct metrology.	Z	100	Capacitive / LVDT

	<a href="#">P-737</a>	PIFOC® Z-axis microscopy piezo stage for high-resolution sample positioning and scanning	Z	to 250 µm	SGS
	<a href="#">P-732.ZC</a>	High-Dynamics Vertical Nanopositioning/Scanning Piezostage	Z	15	Capacitive
	<a href="#">P-612.Z</a>	Compact, Low-Cost, Z Stage	Z	100	SGS
	<a href="#">P-541.Z</a>	Low-profile Z-stage, 80 x 80 mm aperture	Z & Z, Tip/Tilt	100	Capacitive / SGS
	<a href="#">P-518 - P-558</a>	Z-axis and tip/tilt platforms clear aperture, Tip/Tilt	Z & Z	to 200 in Z, 4 mrad	Capacitive
	<a href="#">P-714</a>	Ultracompact XY- scanner, fast	XY	15	SGS
	<a href="#">P-612.2</a>	Compact, low-cost, XY stage. 100 x 100 µm travel, clear aperture.	XY	100 x 100	SGS
	<a href="#">P-541 P-542</a>	Low profile XY scanning stage, 80 x 80 mm aperture, high-speed direct drive version available.	XY	to 200 in XY	Capacitive / SGS
	<a href="#">P-733</a>	XY(Z) piezo scanning piezostage, 50 x 50 mm aperture, vacuum versions available.	XY(Z)	100 x 100 (x 10)	Capacitive
	<a href="#">P-733.2DD. P-733.3DD</a>	High-speed scanning piezostage, XY and XYZ versions, ideal for tasks like scanning microscopy	XY, XYZ	30 x 30 (x10)	Capacitive
	<a href="#">P-734</a>	XY nanoscanning stage, extremely flat and straight (1 – 2 nm); 56 x 56 mm clear aperture.	XY	100 x 100	Capacitive
	<a href="#">P-770</a>	XY nanopositioning piezostage. 200 x 200 mm clear aperture.	XY	200 x 200	LVDT
	<a href="#">P-517, P-527</a>	Multi-axis stage 66 x 66 mm clear aperture, custom model with 6 degrees of freedom available.	XY, XYZ, XYθ <sub>2</sub>	to 200 in XY, 20 in Z, to 4 mrad	Capacitive
	<a href="#">P-561 - P-563</a>	PIMars™ multi-axis piezostage, travel range to 300 x 300 x 300 µm , 66 x 66 mm clear aperture, custom model with 6 degrees of freedom available	XY, XYZ	to 300 x 300 x 300	Capacitive

>> **NEXLINE® / NEXACT® Long Travel Nanopositioning / Picopositioning Drives**

Click Image for Data Sheet	Models*	Description	Load Capacity [kg]	Travel [mm]	Drive
	<a href="#">N-111</a>	NEXLINE® PiezoWalk® nanopositioning drive, subnanometer resolution.	8	5	Piezo-Walk®
	<a href="#">N-214</a>	NEXLINE® PiezoWalk® high-load nanopositioning drive, subnanometer resolution.	60	20	Piezo-Walk®
	<a href="#">N-310</a>	NEXACT® Ultra-compact nanopositioning drive, subnanometer resolution.	1	20	Piezo-Walk®

>> **6-Axis Parallel Kinematics Stages**

Click Image for Data Sheet	Models*	Description	Axes	Travel [ $\mu\text{m}$ ]	Sensor
	<a href="#">P-587</a>	6-axis-nanopositioning Piezostage	XYZ, $\theta_x, \theta_y, \theta_z$	up to 800 / 10 mrad	Capacitive
	<a href="#">P-911k</a>	NEXLINE® Piezo-Hexapod High-Load 6-Axis Nanopositioning System	XYZ, $\theta_x, \theta_y, \theta_z$	to 10 mm / 6 deg.	Linear Scale

[Further Information on 6-Axis Hexapod Systems](#)

\* Ask about custom sizes, sensors or special designs. Capacitive and LVDT sensors are direct metrology devices. Capacitive sensors provide the highest accuracy, bandwidth and linearity.

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