M-014 Linear Slide

Ultra-High-Precision, Side-Drive Linear Stage with Magnetic-Kinematic Bearings

M-014.D01 translation stage

- **Travel Range 25 mm**
- **Compact Side Drive**
- **Straightness/Flatness ≤ 0.3 µm**
- **PZT Drive for Scanning and Tracking Applications**
- **0.1 µm Resolution w/ Closed-Loop DC Motor**
- **5 nm Resolution with Closed-Loop PZT Drive**
- **30 mm Ø Clear Aperture**

M-014 ultra-high-precision magnetically coupled stages use the force of integrated magnets to preload the bearing. This magnetic preload results in extremely uniform and smooth motion with minimum friction. Unlike conventional stages, where two bearings with limited parallelism guide the carriage (inducing runout and rotational errors) in M-014 stages, only one of the two linear bearings has a guiding function (V-groove) while the second bearing is for support only (U-groove).

Ultra-Straight Motion

The coupling between the stage and the space-saving side drive units (DC-motor drives, PZTs, micrometer drives) is not rigid but via magnets. This design allows only on-axis forces (drive direction) to be transmitted to the stage; torque-induced positioning errors induced by non-parallelism between the drive axis and the guiding axis are eliminated.

Six Different Versions

The basic version, the M-014.00, is equipped with a precision manual micrometer providing a sensitivity of 1 µm. M-014.D01 is equipped with a closed-loop DC-motor drive providing 0.1 µm minimum incremental motion.

High-Resolution Piezo Option

For both the manual and motorized version, closed-loop and open-loop piezo drives are available. They provide 5 nm minimum incremental motion over a travel range of 45 µm and allow for dynamic operation such as scanning and tracking. The closed-loop piezo drive provides repeatability of 90 nm (see the "Piezo Actuators" section for further details on piezo actuators and recommended controllers).

All stages can be cross stacked and combined with the M-053.10 (manual versions) and M-053.20 (motorized versions) Z-axis mounting bracket to provide multi-axis motion. Vertical use of the M-014 is only permitted with loads less than 0.5 kg. For vertical positioning with loads in excess of 0.5 kg we recommend M-126 stages (see page 7-40) and the 125.90 Z-axis mounting bracket.

Upgrades

M-014 stages without PZT or DC-motor drives can be upgraded at a later date (see ordering information).

Notes

See "Accessories", page 7-92 *ff.* for adapters, brackets, etc.

Ordering Information

M-014.00
Translation Stage, 25 mm

M-014.P0
Translation Stage, 25 mm, Manual + PZT Drive

M-014.PS
Translation Stage, 25 mm, Manual + Closed-Loop PZT Drive

M-014.D01
Translation Stage, 25 mm, DC-Motor Drive

M-014.DP1
Translation Stage, 25 mm, DC-Motor + PZT Drive

M-014.DS1
Translation Stage, 25 mm, DC-Motor + Closed-Loop PZT Drive

Upgrades

M-014.U0
Upgrade Kit with Open-Loop PZT Drive

M-014.US
Upgrade Kit with Closed-Loop PZT Drive

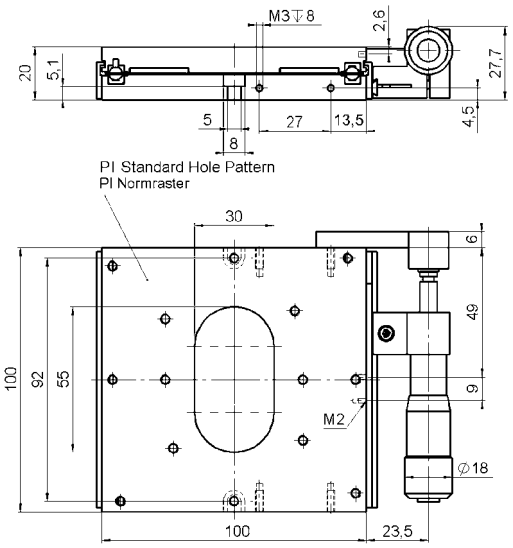
M-014.UD
Upgrade Kit with DC-Motor Drive and Limit Switches (Factory Installed)

Ask about custom designs!

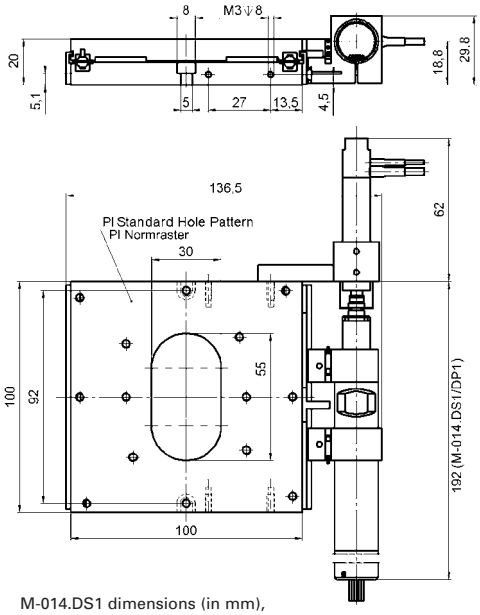
Application Examples

- Microscopy
- Quality control
- Metrology


M-014.00 translation stage



M-014.00 dimensions (in mm),
see p. 7-93 for PI Standard Hole Pattern.



M-014.DS1 dimensions (in mm),
see p. 7-93 for PI Standard Hole Pattern.

Piezo Actuators
Nanopositioning & Scanning Systems
Active Optics / Steering Mirrors
Tutorial: Piezoelectrics in Positioning
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Technical Data

Models	M-014.00	M-014.P0	M-014.PS	M-014.D01	M-014.DP1	M-014.DS1	Units	Notes see page 7-106
Travel range	25	25	25	25	25	25	mm	
Piezo fine travel range		45	45		45	45	µm	
Min. incremental motion (piezo drive)	-	0.005	0.005	-	0.005	0.005	µm	A4
Repeatability (piezo drive)	-	-	0.09	-	-	0.09	µm	
Design resolution (DC Motor)	-	-	-	0.0035	0.0035	0.0035	µm	A3
Min. incremental motion	1	1	1	0.1	0.1	0.1	µm	A4
Unidirectional repeatability	-	-	-	0.1	0.1	0.1	µm	
Bidirectional repeatability	-	-	-	2	2	2	µm	
Backlash	-	-	-	2*	2*	2*	µm	
Straightness / flatness per 5 mm	0.1	0.1	0.1	0.1	0.1	0.1	µm	
Straightness / flatness full travel	0.3	0.3	0.3	0.3	0.3	0.3	µm	
Max. normal load capacity	5	5	5	5	5	5	kg	B1
Max. velocity (motor)	-	-	-	1	1	1	mm/sec	
Max. push/pull force	15/5	15/5	15/5	15/5	15/5	15/5	N	B2
Max. lateral force	10	10	10	10	10	10	N	
Drive	M-624	M-624	M-624	M-227.25	M-227.25	M-227.25		
Piezo drive	-	P-840.30	P-841.30	-	P-840.30	P-841.30		D1
Encoder resolution	-	-	-	2048	2048	2048	counts/rev.	
Drive screw pitch	0.5	0.5	0.5	0.5	0.5	0.5	mm/rev.	
Gear ratio	-	-	-	69.12:1	69.12:1	69.12:1		
Nominal motor power	-	-	-	2	2	2	W	
Motor voltage	-	-	-	12	12	12	V	
Weight	0.72	0.78	0.8	0.98	1.04	1.06	kg	
Body material	Al, St	Al, St	Al, St	Al, St	Al, St	Al, St		L
Recommended piezo controller (codes explained see page 6-11)	-	A, C, G	D, H	-	A, C, G	D, H		
Recommended motor controller	-	-	-	C-843, C-848, C-862	C-843, C-848, C-862	C-843, C-848, C-862		D2

* gearhead