

# M-060 • M-061 • M-062 Precision Rotation Stage

## Unlimited Travel Range



M-060.PD, M-061.PD and M-062.PD  
from front to rear

- Continuous Rotation Range
- Ultra-High Resolution
- Max. Velocity 90 deg/sec
- Preloaded Worm Drive for Zero Backlash
- ActiveDrive DC-Servo, Stepper-Motor and Manual Drives
- Direction-Sensing Reference Switch

M-06x series rotation stages are equipped with ultra-precise, ultra-low-friction, spring-preloaded worm gear drives allowing unlimited rotation in either direction. Models M-060 feature a 60 mm diameter turntable, models M-061, a 100 mm table and models M-062, a 120 mm table.

### DC-Motor and Stepper-Motor Drive

One manual drive and three motor drives (four with M-062 models) are available:

### Application Examples

- R&D
- Semiconductor testing
- Mass storage device testing
- Metrology
- Photonics packaging
- Quality assurance testing

### M-06x.PD with ActiveDrive

This version features a direct-coupled motor/encoder. For superior dynamic performance, we integrated our unsurpassed ActiveDrive system. The ActiveDrive design, developed by PI, features a high-efficiency PWM (pulse width modulation) 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

### M-06x.DG with Zero-Backlash DC-Motor/Gearhead Drive

The M-06x.DG are equipped with 3-watt DC motors

### Ordering Information

Precision Rotation Stage, 360°

- 0 = Ø 60 mm
- 1 = Ø 100 mm
- 2 = Ø 120 mm

M-06

- PD = ActiveDrive DC Motor
- DG = Closed-Loop DC Motor Gearhead
- 2S = 2-Phase Stepper Motor
- M0 = Manual Drive
- V = Vacuum Compatible to 10<sup>-6</sup> hPa

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with zero-backlash gearhead and shaft-mounted encoders (2048 counts/rev.). The gear ratio of 29.6:1, provides higher resolution than the direct drive motors.

### M-60x.2S Stepper-Motor Drive

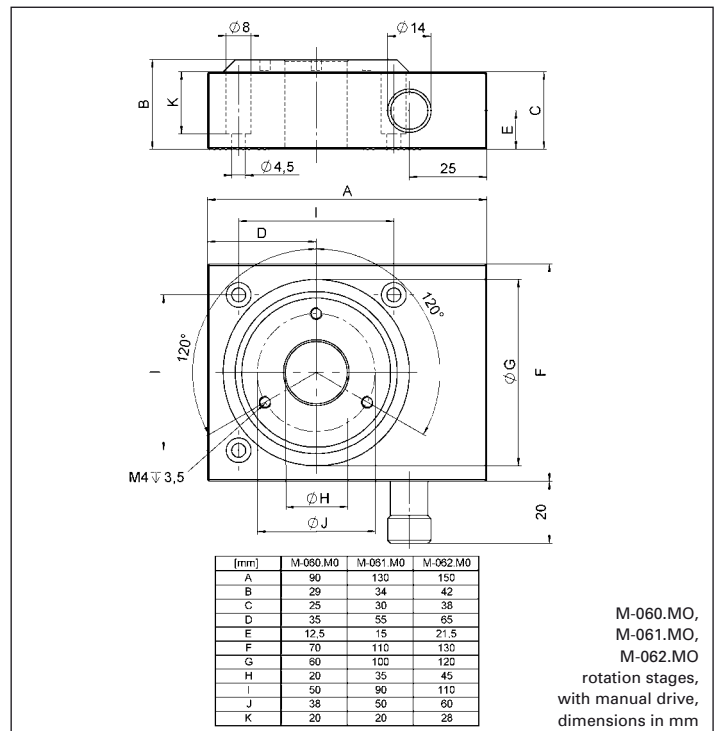
The M-060x.2S models feature a cost-effective direct-drive, 2-phase stepper-motor, providing very smooth operation and a resolution of 6400 steps/rev.

### Non-Contact Limit and Reference Switches

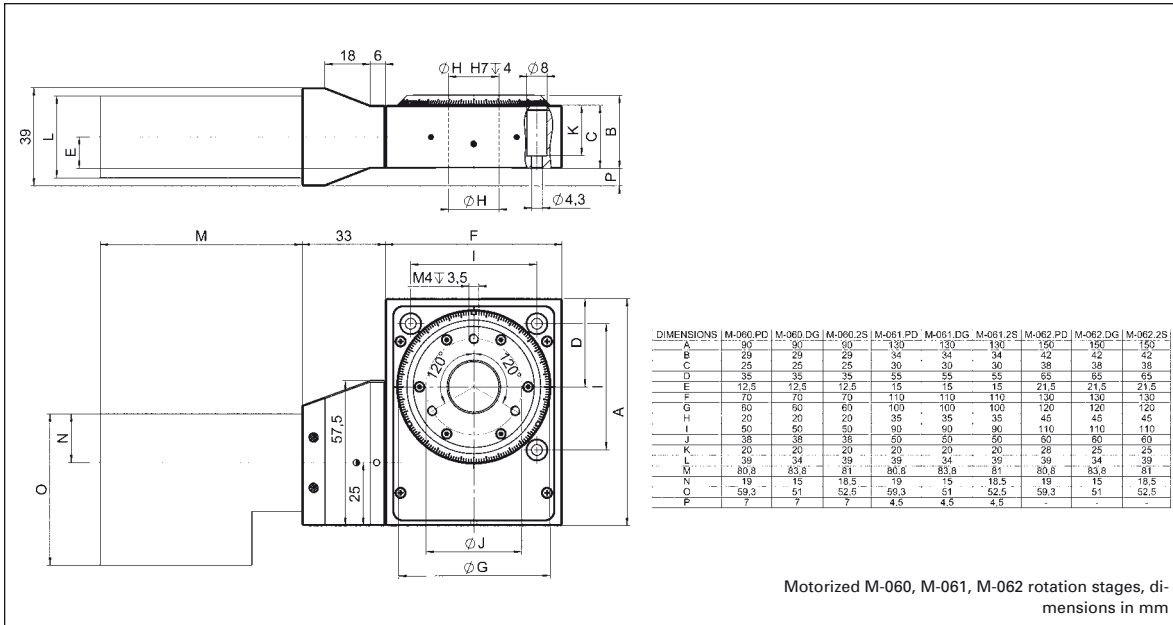
Motorized models are equipped with an integrated Hall-effect origin switch. To protect your

equipment and increase versatility in automation applications, the rotary stage can optionally be equipped with Hall-effect limit switches. Travel can be limited to a range between 0° and 268° ±2°.

Coarse position can be read from an adjustable scale ring on the outer edge of the turntable graduated in 2 degree increments. The manual versions also feature a drive-shaft-mounted indicator with 0.1-degree graduations.



M-060.MO,  
M-061.MO,  
M-062.MO  
rotation stages,  
with manual drive,  
dimensions in mm



Motorized M-060, M-061, M-062 rotation stages, dimensions in mm

### Technical Data

Model	M-060.M0 / M-061.M0 / M-062.M0	M-060.PD / M-061.PD / M-062.PD	M-060.DG / M-061.DG / M-062.DG	M-060.2S / M-061.2S / M-062.2S	Units
Active axes	Rotation	Rotation	Rotation	Rotation	
<b>Motion and positioning</b>					
Rotation range	>360	>360	>360	>360	°
Integrated sensor	–	Rotary encoder	Rotary encoder		
Sensor resolution	–	4000	2000		Cts./rev.
Design resolution	–	32 (0.0018) / 17.5 (0.001) / 15 (0.0008)	2.1 (0.00012) / 1.2 (6.9 × 10 <sup>-5</sup> ) / 0.96 (5.5 × 10 <sup>-5</sup> )	19.7 (0.0011) / 10.9 (0.00063) / 8.9 (0.00051)*	μrad (°)
Min. incremental motion	–	32 / 17.5 / 15	6.3 / 6 / 5	40 / 20 / 18*	μrad
Backlash	–	200 / 200 / 240	200 / 200 / 240	200 / 200 / 240	μrad
Unidirectional repeatability	–	50 / 50 / 60	50 / 50 / 60	50 / 50 / 60	μrad
Max. velocity	–	90	16 / 9 / 7.3	36 / 20 / 16	°/s
<b>Mechanical properties</b>					
Worm gear ratio	50:1 / 90:1 / 110:1	50:1 / 90:1 / 110:1	50:1 / 90:1 / 110:1	50:1 / 90:1 / 110:1	
Gear ratio	–	–	(28/12) <sup>4</sup> : 1 ≈ 29.6:1	–	
Motor resolution	–	–	–	6400*	steps/rev.
Axial force	±500 / ±550 / ±650	±500 / ±550 / ±650	±500 / ±550 / ±650	±500 / ±550 / ±650	N
Max. torque $\theta_x, \theta_y$	±6 / ±6 / ±7	±6 / ±6 / ±7	±6 / ±6 / ±7	±6 / ±6 / ±7	Nm
Max. torque $\theta_z$	±4 / ±6 / ±8	±4 / ±6 / ±8	±4 / ±6 / ±8	±4 / ±6 / ±8	Nm
<b>Drive properties</b>					
Motor type	–	ActiveDrive DC-Motor	DC-Motor, gearhead	2-phase Stepper-Motor**	
Operating voltage	–	24 (PWM)	12 differential	24	V
Electrical power	–	30	3	–	
Reference switch	Hall-effect	Hall-effect	Hall-effect	Hall-effect	
<b>Miscellaneous</b>					
Operating temperature range	-20 to +65	-20 to +65	-20 to +65	-20 to +65	°C
Material	Aluminum	Aluminum	Aluminum	Aluminum	
Mass	0.42 / 1.36 / 2.24	0.94 / 1.88 / 2.76	0.94 / 1.88 / 2.76	0.96 / 1.9 / 2.78	kg
Recommended controller/driver		C-863 single-axis C-843 PCI board, for up to 4 axes	C-863 single-axis (p. 4-114) C-843 PCI board (p. 4-120), for up to 4 axes	C-663 single-axis (p. 4-112)	

\*with C-663 stepper-motor controller

\*\*2-phase stepper-motor, 24 V chopper voltage, max. 0.8 A/phase, 400 full steps/rev  
Data for vacuum versions may differ.