

# M-511 · M-521 · M-531 Linear Slide

## Heavy-Duty Linear Stages with Linear Guiding Rails and Recirculating Ball Bearings



- Travel Ranges 102, 204 and 306 mm (4", 8", 12")
- Max. Velocity 125 mm/s with ActiveDrive™ Motors
- Optional 0.1 μm Linear Encoder for Highest Accuracy
- Load Capacity of 100 kg
- Stress-Relieved Aluminum Base for Highest Stability
- Zero-Backlash Recirculating Ballscrews
- Non-contact Limit and Reference Switches
- XY & XYZ Combinations (Special Z-Stages Available)
- MTBF >20,000 h

M-5x1-series translation stages are designed to meet the most demanding positioning requirements and are available in a number of different models. They boast an extremely low profile design to allow multiaxis combinations (see also see page 7-56 and page 7-58) and

feature a precision-machined base of high-density, stress-relieved aluminum for exceptional stability and minimum weight.

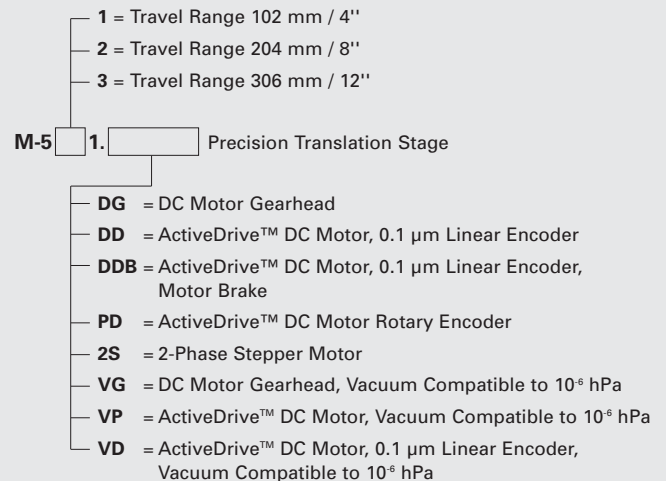
### Heavy Duty and Maintenance Free

The stages are equipped with high-precision linear guiding rails with recirculating ball bearings to guarantee 1 μm/100 mm straightness and flatness. Precision-ground recirculating ball screws with preloaded nuts provide low-friction, maintenance-free and backlash-free positioning. This equipment provides high load capacity and guiding accuracy with long lifetime.

### Four Drive Options

Maximum dynamic performance is possible with versions featuring the highly efficient

### Ordering Information



ActiveDrive™ direct-drive system, which can achieve speeds of up to 125 mm/s.

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

The M-5x1.PD version provides velocities up to 125 mm/sec and resolution of 0.5 μm. It is equipped with an ActiveDrive™ DC motor and rotary encoder.

The M-5x1.DD models provide superior accuracy by means of an integrated non-contact optical linear encoders (direct metrology eliminates drive-train errors such as backlash and elastic deformation). A

motor brake which assures maintenance of the stage position after power-down is also available.

The M-5x1.DG versions feature closed-loop DC motors with shaft-mounted position encoders and precision gearheads providing minimum incremental motion to 0.1 μm with velocities up to 6 mm/s.

The M-5x1.2S versions models feature a cost-effective direct-drive, 2-phase stepper motor, providing very smooth operation and a resolution of 0.1 μm.

### Limit and Reference Switches

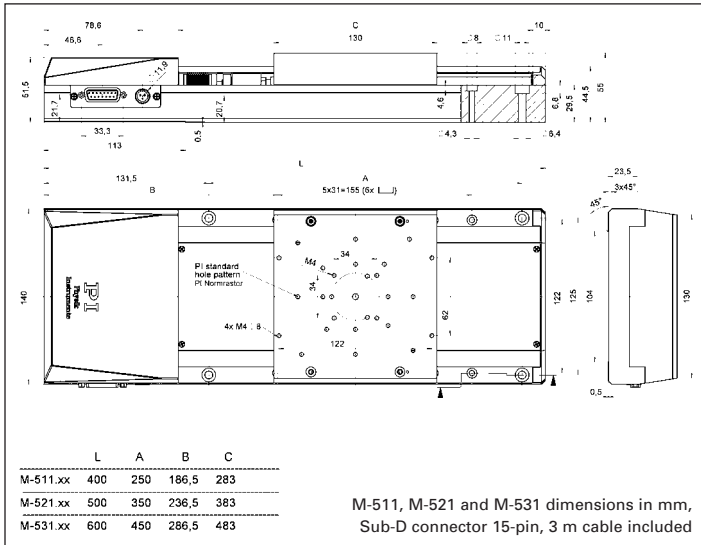
For the protection of your equipment, non-contact Hall-effect limit and reference switches are installed. The direction-sensing reference switch supports advanced automation applications with high precision.

### Precision Assembly

The stages are individually tested and optimized using a laser interferometer.

### Notes

For adapters, bracket, etc. see page 7-92 ff.



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Motors & Stages

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## Technical Data

Models	M-511.DD / M-521.DD / M-531.DD	M-511.PD / M-521.PD / M-531.PD	M-511.DG / M-521.DG / M-531.DG	M-511.2S / M-521.2S / M-531.2S	Unit
Active axes	X	X	X	X	
<b>Motion and positioning</b>					
Travel range	102 / 204 / 306	102 / 204 / 306	102 / 204 / 306	102 / 204 / 306	mm
Integrated sensor	Linear encoder	Rotary encoder	Rotary encoder	-	
Sensor resolution	0.1 $\mu$ m	4000	2048	-	cts./rev.
Design resolution	0.1	0.5	0.033	0.31	$\mu$ m
Min. incremental motion	0.1	0.5	0.1	0.1	$\mu$ m
Unidirectional repeatability	0.1	0.5	0.2	0.2	$\mu$ m
Bidirectional repeatability	0.2	1	1	1	$\mu$ m
Accuracy	0.2	2	2	2	$\mu$ m
Pitch	50	50	50	100	$\mu$ rad
Yaw	50	50	50	80	$\mu$ rad
Straightness	1	1	1	1	$\mu$ m
Flatness	1	1	1	1	$\mu$ m
Max. velocity	100	125	6	20	mm/s
Origin repeatability	1	1	1	1	$\mu$ m
<b>Mechanical properties</b>					
Drive screw	Recirculating ballscrew	Recirculating ballscrew	Recirculating ballscrew	Recirculating ballscrew	
Thread pitch	2	2	2	2	mm
Gear ratio	-	-	(28/12) <sup>1</sup> :1 ~ 29.6:1	-	
Motor resolution*	-	-	-	6400*	steps/rev.
Max. load	1000	1000	1000	1000	N
Max. push/pull force	80 / 80	80 / 80	80 / 80	80 / 80	N
Max. lateral force	200	200	200	200	N
<b>Drive properties</b>					
Motor type	ActiveDrive™ DC Motor	ActiveDrive™ DC Motor	DC-motor, gearhead	2-phase stepper motor*	
Operating voltage	24 (PWM)	24 (PWM)	0 to $\pm$ 12	24	V
Electrical power	30	30	3		W
Limit and reference switches	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	$^{\circ}$ C
Material	Al (black anodized)	Al (black anodized)	Al (black anodized)	Al (black anodized)	
Mass	5 / 6.1 / 7.2	5 / 6.1 / 7.2	4.9 / 6 / 7.1	4.9 / 6 / 7.1	kg
Recommended controller/driver	C-862 (single-axis) C-843 PCI board (up to 4 axes)	C-862 (single-axis) C-843 PCI board (up to 4 axes)	C-862 (single-axis) C-843 PCI board (up to 4 axes)	C-663 (single-axis)	

\* 2-phase stepper motor, 24 V chopper voltage, max. 0.8 A/phase, 400 full steps/rev., motor resolution with C-663 stepper motor controller