

# M-235 Heavy-Duty Precision Linear Actuator

## High-Dynamics, Stroke to 50 mm, Forces to 120 N



M-235.2DG (top) and  
M-235.5DG (bottom) high-resolution  
DC-Mike, ballscrew

- Travel Range 20 & 50 mm
- Min. Incremental Motion to 0.1  $\mu\text{m}$
- High-Speed Direct Drive Option
- Push/Pull Load 120 N
- Lateral Force 100 N
- Recirculating Ballscrew Drives Provide High Speeds & Long Lifetimes
- Closed-Loop DC Motors and Stepper Motors
- Non-Contact Limit and Reference Switches
- MTBF >20.000 h
- Vacuum-Compatible Versions Available to  $10^{-6}$  hPa

The M-235 is an ultra-high-resolution linear actuator providing linear motion of up to 50 mm with sub-micron resolution in a compact package. It consists of a preloaded ultra-low-friction, heavy-duty ballscrew which is driven by a 2-phase stepper motor or a closed-loop DC motor with motor-shaft-mounted, high-resolution encoder (2048 counts/rev.).

### Three Different Drives

The M-235 is available with three different motor drives:

#### Application Examples

- Fiber positioning
- Automation
- Metrology
- Photonics packaging
- Quality assurance testing
- Testing equipment

The M-235.5DD version is equipped with a direct drive motor for high-speed positioning applications. The DC-motor models provide a minimum incremental motion of 100 nm only and are equipped with high-resolution rotary encoders for position control. The M-235.x2S versions have a high-power, low-vibration 2-phase stepper motor.

### Non-Rotating Tip

Compared to conventional rotating-tip micrometer drives, the non-rotating-tip design offers several advantages:

- Elimination of torque-induced positioning errors
- Elimination of sinusoidal motion errors
- Elimination of wear at the contact point
- Elimination of tip-angle-dependent wobble

### Ballscrews for High Speed and Long Lifetime

The recirculating ballscrew is maintenance-free and pre-loaded to eliminate mechanical play. Its significantly reduced friction, compared to conventional lead screws, allows for higher velocity, lower power consumption and longer service life. Thus, a bidirectional repeatability of 1  $\mu\text{m}$  is made possible!

### 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.

### Integrated Line Drivers

All actuators include an integral 0.5 m cable with 15-pin sub-D connector and come with a 3 m extension cable. On the DC servo versions, the connector features integrated line drivers for cable lengths up to 10 meters between actuator and controller (DC-motors only).

A screw-in ball tip and a flat tip are included.

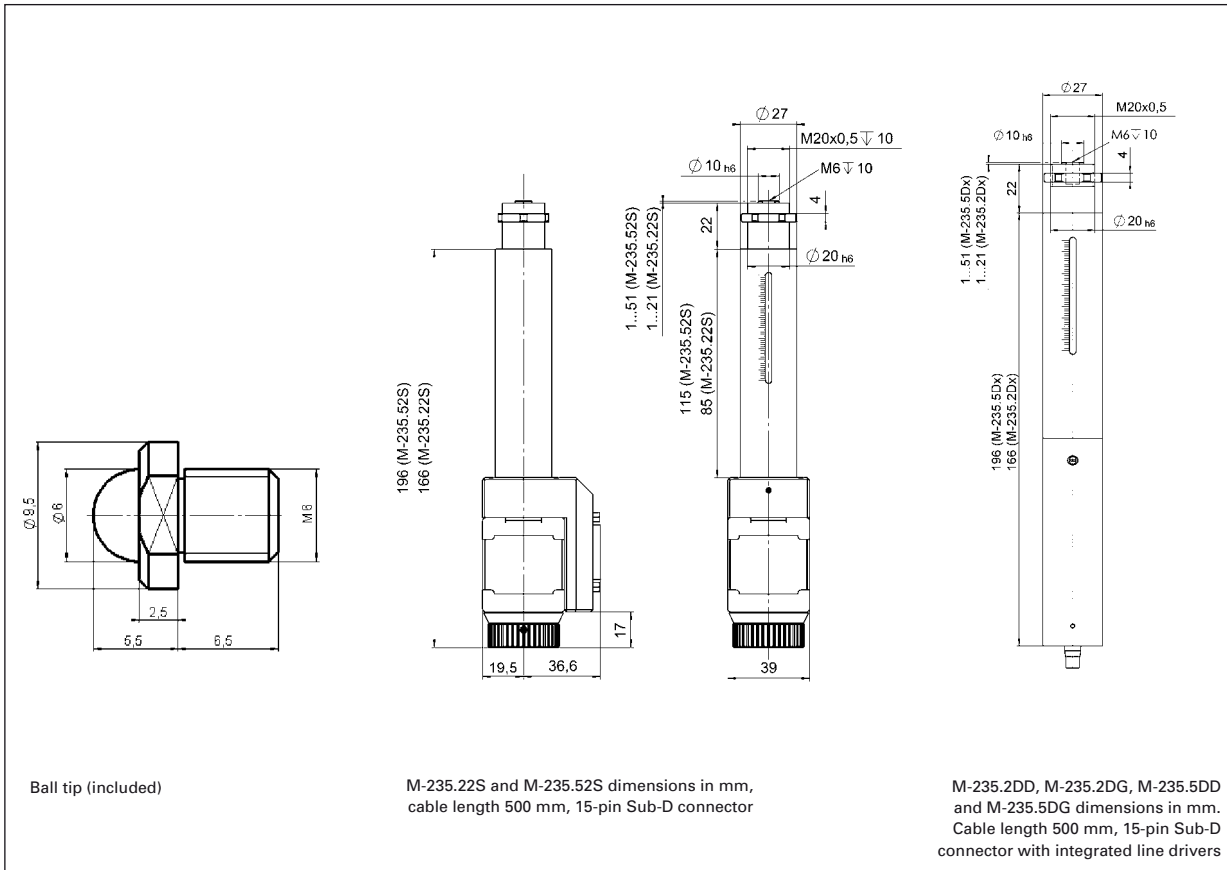


M-235.22S high-resolution Stepper-Mike,  
20 mm travel range, ballscrew

### Ordering Information

- M-235.2DD**  
High-Power Linear Actuator,  
20 mm, Ballscrew,  
Direct-Drive DC Motor
- M-235.2VD**  
Vacuum Version of M-235.2DD
- M-235.2DG**  
High-Power Linear Actuator,  
20 mm, Ballscrew,  
DC Motor Gearhead
- M-235.2VG**  
Vacuum Version of M-235.2DG
- M-235.22S**  
High-Power Linear Actuator,  
20 mm, Ballscrew, Stepper Motor
- M-235.5DD**  
High-Power Linear Actuator,  
50 mm, Ballscrew,  
Direct-Drive DC Motor
- M-235.5VD**  
Vacuum Version of M-235.5DD
- M-235.5DG**  
High-Power Linear Actuator,  
50 mm, Ballscrew,  
DC Motor Gearhead
- M-235.5VG**  
Vacuum Version of M-235.5DG
- M-235.52S**  
High-Power Linear Actuator,  
50 mm, Ballscrew, Stepper Motor

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Unpackaged Stack Actuators

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## Nanopositioning / Piezoelectrics

Nanometrology

Micropositioning

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## Technical Data

Model	M-235.2DG	M-235.2DD	M-235.22S	M-235.5DG	M-235.5DD	M-235.52S	Units
Active axes	X	X	X	X	X	X	
<b>Motion and positioning</b>							
Travel range	20	20	20	50	50	50	mm
Integrated sensor	Rotary encoder	Rotary encoder		Rotary encoder	Rotary encoder		
Sensor resolution	2.048	2.048		2.048	2.048		Cts./rev.
Design resolution	0.016	0.5	0.156	0.016	0.5	0.156	µm
Min. incremental motion	0.1	0.5	0.1	0.1	0.5	0.1	µm
Unidirectional repeatability	0.1	0.5	0.2	0.1	0.5	0.2	µm
Bidirectional repeatability	1	1	1	1	1	1	µm
Max. velocity	2.6	>30	20	2.6	>30	20	mm/s
<b>Mechanical properties</b>							
Gear ratio	29.6:1			29.6:1			
Motor resolution*			6,400*			6,400*	steps/rev.
Max. push/pull force	120	50	100**	120	50	100**	N
Max. lateral force	100	100	100	100	100	100	N
<b>Drive properties</b>							
Motor type	DC-motor, gearhead	DC-motor	2-phase stepper motor*	DC-motor, gearhead	DC-motor	2-phase stepper motor*	
Operating voltage	0 to ±12	0 to ±12	24	0 to ±12	0 to ±12	24	V
Electrical power	4	17	4.75	4	17	4.75	W
Limit and reference switches	Hall-effect	Hall-effect	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	-20 to +65	-20 to +65	°C
Material	Al (anodized), steel	Al (anodized), steel	Al (anodized), steel	Al (anodized), steel	Al (anodized), steel	Al (anodized), steel	
Mass	0.55	0.5	0.65	0.7	0.65	0.8	kg
Recommended controller/driver	C-863 single-axis C-843 PCI board, for up to 4 axes	C-863 single-axis C-843 PCI board, for up to 4 axes	C-663 single-axis	C-863 single-axis C-843 PCI board, for up to 4 axes	C-863 single-axis (p. 4-114) C-843 PCI board, for up to 4 axes (p. 4-120)	C-663 single-axis (p. 4-112)	

\*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

\*\*at up to 10 mm/sec

Data for vacuum versions may differ.