

# M-238 High-Load, High-Resolution Linear Actuator Forces to 400 N, Optional Direct Position Measurement



M-238.5PL Heavy-Duty Mike actuator (with CD for size comparison)

**Direct Metrology Linear** 

**Encoder to Compensate** 

The M-238.5PL model is

equipped with a non-contact,

optical, linear encoder (direct

lution of 0.1 µm. Because the

position of the non-rotating

actuator tip, drive-train errors

mations are eliminated. A

lower-cost version with a ro

tary encoder is available as model number M-238.5PG.

ActiveDrive<sup>™</sup> DC-Motor

DC motor drives offer several

dynamics, high torque at low

rotational speed, low heat

The ActiveDrive<sup>™</sup> design,

developed by PI, features a

and low vibration.

advantages, such as high

like backlash and elastic defor-

metrology) with an output reso-

**Mechanical Plav** 

- High Load Capacity to 400 N
- Travel Range 50 mm
- Resolution to 0.1 µm
- Max. Velocity 30 mm/s
- Preloaded Frictionless Ball Screw
- Optional 0.1 µm Direct-Metrology Linear Encoder for **Exceptional Precision**
- MTBF >20,000 h
- Vacuum-Compatible Versions Available for 10<sup>6</sup> hPa

The M-238 is a high-load, highprecision actuator providing linear motion up to 50 mm, a load capacity to 400 N and high velocity to 30 mm/s. It consists of a low-friction, heavy-duty ballscrew, driven by a closedloop, ActiveDrive<sup>™</sup> DC-Motor with gearbox. The M-238 is therefore well suited for high duty-cycle operation in industrial environments. An optional linear encoder provides exceptional accuracy and repeatability.

## **Application Examples**

- Quality assurance testing
- Testing equipment
- Precision machining
- Astronomy
- Flexible automation
- Metrology

high-efficiency PWM (pulse width modulation) servoamplifier mounted side-byside 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

# **Non-Rotating Tip**

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

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

The lateral guiding of the tip withstands lateral forces of up to 100 N.

#### **Ordering Information**

#### M-238.5PG

Heavy-Duty DC-Mike Actuator. 400 N, 50 mm, ActiveDrive™

M-238.5PL\*

Heavy-Duty DC-Mike Actuator, 400 N, 50 mm, ActiveDrive™, Direct-Metrology Encoder

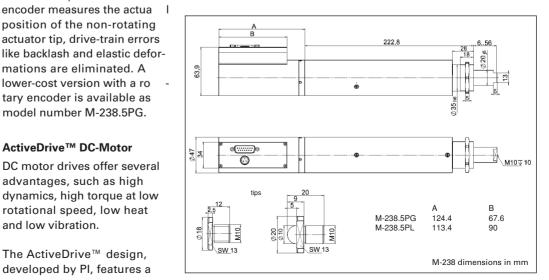
\*Ask for availability in your region

# Ballscrews for High Speed, **Precision and Lifetime**

The precision-ground ball screw is maintenance-free and preloaded to eliminate mecha nical play. Its significantly re duced friction, compared to conventional leadscrews, allows for higher velocity , lower power consumption and longer lifetime.

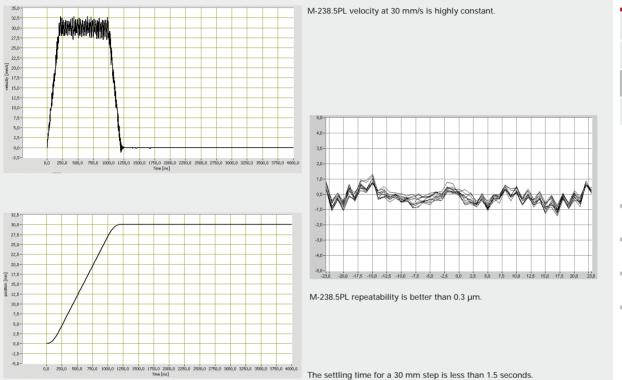
# Limit and Reference Switches

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









## **Technical Data**

Moving the NanoWorld\_|\_www.pi.ws

Model	M-238.5PG	M-238.5PL	Units	Tolerance
Active axes	Х	Х		
Motion and positioning				
Travel range	50	50	mm	
Integrated sensor	Rotary encoder	Linear encoder		
Sensor resolution	4000 cts/rev.	0.1 μm		
Design resolution	0.13	0.1	μm	typ.
Min. incremental motion	0.5	0.3	μm	typ.
Backlash	3	1	μm	typ.
Unidirectional repeatability	1	0.3	μm	typ.
Max. velocity	30	30	mm/s	
Origin repeatability	1	1	μm	±20 %
Mechanical properties				
Spindle pitch	2	2	mm/rev.	
Gear ratio	3.71:1	3.71:1		
Push/pull force	400	400	Ν	Max.
Lateral force	100	100	N	Max.
Drive properties				
Motor type	DC-motor, ActiveDrive™	DC-motor, ActiveDrive™		
Operating voltage	24 (PWM)	24 (PWM)	V	
Electrical power	80	80	W	nominal
Miscellaneous				
Operating temperature range	-10 to 50	-10 to 50	°C	
Material	AI (anodized), steel	AI (anodized), steel		
Mass	2.4	2.4	kg	±5 %
Cable length	3	3	m	±10 mm
Connector	D-Sub 15 (m)	D-Sub 15 (m)		
Recommended controller/driver	C-863, C-843	C-863 (p. 4-114), C-843 (p. 4-120)		

#### Linear Actuators & Motors

PiezoWalk® Motors / Actuators

PILine<sup>®</sup> Ultrasonic Motors

## **DC-Servo & Stepper Actuators**

Piezo Actuators & Components Guided / Preloaded Actuators Unpackaged Stack Actuators

Patches/Benders/Tubes/Shear..

#### Nanopositioning / Piezoelectrics

Nanometrology

Micropositioning

Index



# M-228 · M-229 Stepper Motorized Precision Linear Actuator Series High-Load, Compact and Highly Cost-Efficient, with Limit Switches



M-228 and M-229 series linear actuators are driven by powerful direct-drive stepper motors, or are equipped with more compact, gearhead stepper motors: M-229.26S, M-228.11S, M-229.25S, M-228.10S (from left)

- Highly Cost-Efficient, Compact Design
- 10 and 25 mm Travel Range
- High Load Capacity to 80 N
- Gearhead Version: 46 nm Resolution (with C-663 Controller)
- Direct Drive: Max. Velocity 5 mm/s
- Non-Rotating Tip

### Non-Contact Limit and Reference Switches

M-228 and M-229 series linear actuators provide a travel range of 10, resp. 25 mm, and are equipped with high-resolution stepper motors. The stepper mikes can push or pull loads up to 80 N, and provide speeds up to 5 mm/s. Models featuring gearhead/stepper motor combinations offer the same stroke in a more compact package.

## **Application Examples**

- Quality assurance testing
- Testing equipment
- Alignment of secondary mirrors
- Automation
- Metrology
- Precision machining

## **Cost-Effective Design**, Valuable Features

The cost-effective design offers many useful features such as a non-rotating tip, limit and reference switches and a mechanical position display.

A spherical tip and a 3 m extension cable are included in the delivery. The more compact gearhead versions include an additional flat tip.

# **Non-Rotating Tip**

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

- Elimination of torqueinduced positioning errors
- Elimination of sinusoidal motion errors
- Elimination of wear at the contact point

Elimination of tip-angledependent wobble

# Limit and Reference Switches

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

## Low Cost of Ownership

The combination of these actuators with the networkable C-663 Mercury Step controller (s.p. 4-112) offers high performance for a very competitive price in both single and multi-axis configurations.

## **Ordering Information**

#### M-228,10S

Stepper-Mike Linear Actuator, 10 mm, Stepper Motor, Gearhead, Limit Switches

#### M-228.11S

Stepper-Mike Linear Actuator, 10 mm, Stepper Motor, Direct Drive, Limit Switches

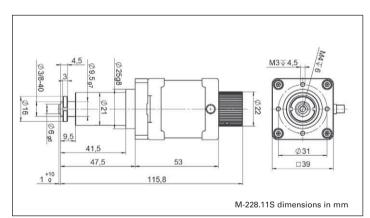
#### M-229.25S

Stepper-Mike Linear Actuator, 25 mm, Stepper Motor, Gearhead, Limit Switches

#### M-229.26S

Stepper-Mike Linear Actuator, 25 mm, Stepper Motor, Direct Drive, Limit Switches

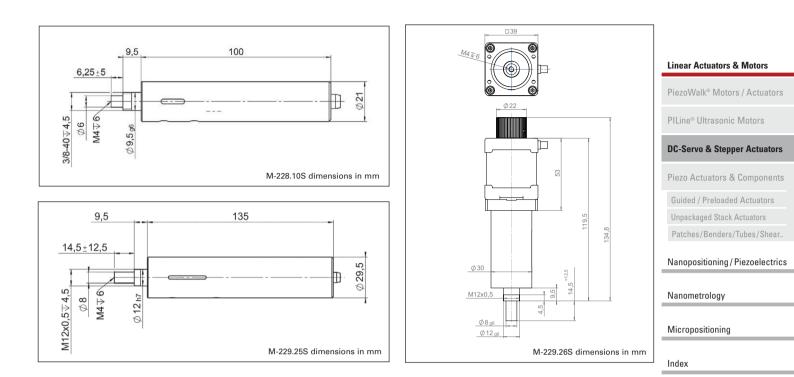
Ask about custom designs!











# **Technical Data**

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