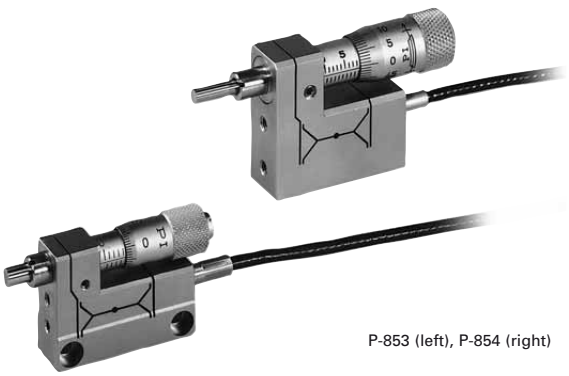
P-853 · P-854 Piezoelectric Micrometer Drive

Hybrid PiezoMike Provides Sub-Nanometer Resolution



P-853 (left), P-854 (right)

- **Alternative for Standard Micrometer Drives**
- **Manual Travel to 18 mm**
- **Piezoelectric High-Resolution Travel to 25 µm**
- **Sub-Nanometer Resolution**
- **Dynamic Operation to 10 Hz**

P-853/P-854 PiezoMikes are micrometer drives with integrated high-resolution piezo linear drives. They can be operated manually, like standard micrometer drives. Sensitivity of the micrometer is 1 µm. By controlling the piezo voltage, the micrometer tip is automatically moved in and out (up to 25 µm) relative to the manually set position. Resolution of the piezoelectric motion is in the sub-nanometer range. The PiezoMike can therefore be used as a remotely controlled fine positioning element.

Working Principle

A sophisticated wire EDM (electric discharge machining) flexure motion amplifier doubles the displacement of a piezo linear actuator. It also serves as a linear guide to the micrometer drive, which is moved back and forth when the piezo drive voltage is changed. This design is compact and mechanically stable.

Ordering Information

P-853.00
PiezoMike, Piezoelectric Micrometer Drive, 6 mm, 25 µm

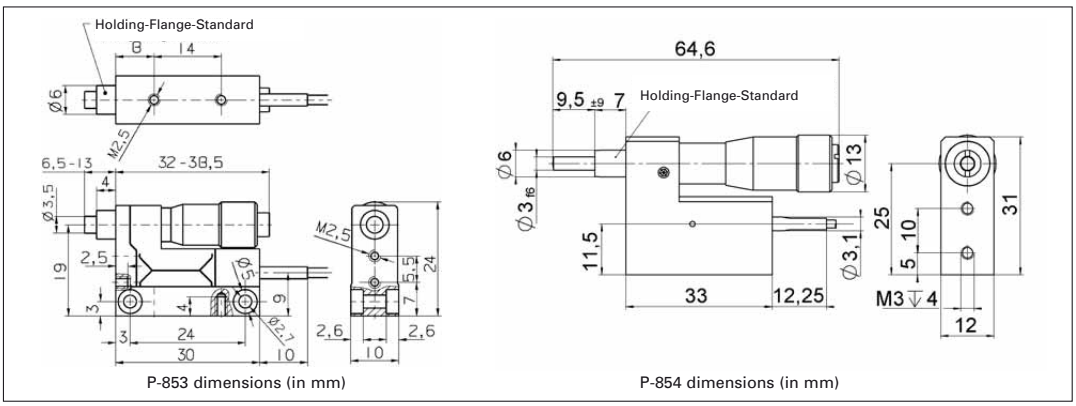
P-854.00
PiezoMike, Piezoelectric Micrometer Drive, 18 mm, 25 µm

Ask about custom designs!

PiezoMike Applications

The PiezoMike can be mounted like a micrometer drive by clamping around the sleeve.

The P-853.00 is equipped with a 6 mm holding flange and can be directly attached to M-311 miniature translation stages (see www.pi.ws). The P-854 can be attached to the M-105 linear positioners (see p. 4-50).



P-853 dimensions (in mm)

P-854 dimensions (in mm)

Technical Data

Model	P-853.00	P-854.00	Units
Travel range (micrometer drive)	6	18	mm
Piezo fine travel range (@ 0 to 100 V)	25	25	µm ±20%
Min. incremental motion (piezo drive)	<1	<1	nm
Micrometer sensitivity	1	1	µm
Max. axial push/pull force	10 / 5	20 / 5	N
Micrometer drive	M-619.10	M-626.10	
Micrometer pitch	0.5	0.5	mm/rev.
Stiffness	1	1.5	N/µm
Electrical capacitance (piezo)	0.45	1.5	µF
Electrical connection	LEMO Cable: coaxial FFA.00.250, male. RG 178, Teflon coated, 1 m	LEMO Cable: coaxial, FFA.00.250, male. RG 178, Teflon coated, 1 m	
Mass	0.05	0.1	kg
Body material	N -S	N -S	
Recommended piezo driver	E-660, E-610, E-500 System	E-660 (p. 2-116), E-610 (p. 2-110), E-500 (p. 2-142) System	

M-313.80 XYZ miniature stage with P-853 PiezoMikes and optional fiber holder

PiezoMike Linear Actuator

MINIMUM DIMENSIONS, HIGH FORCES, STABLE POSITIONING

N-470

- Holding force >100 N
- Step size 20 nm
- Travel range 7.4 mm to 26 mm
- Compact design
- Feed force 22 N
- Lifetime >1.000.000.000 steps
- Mounting thread or shank
- Versions with cable exit offset by 180°

Linear actuator with PIShift piezomotor

Linear screw-type actuator with PIShift piezo inertia drive for high-resolution and stable positioning. Open-loop operation

PIShift piezomotors

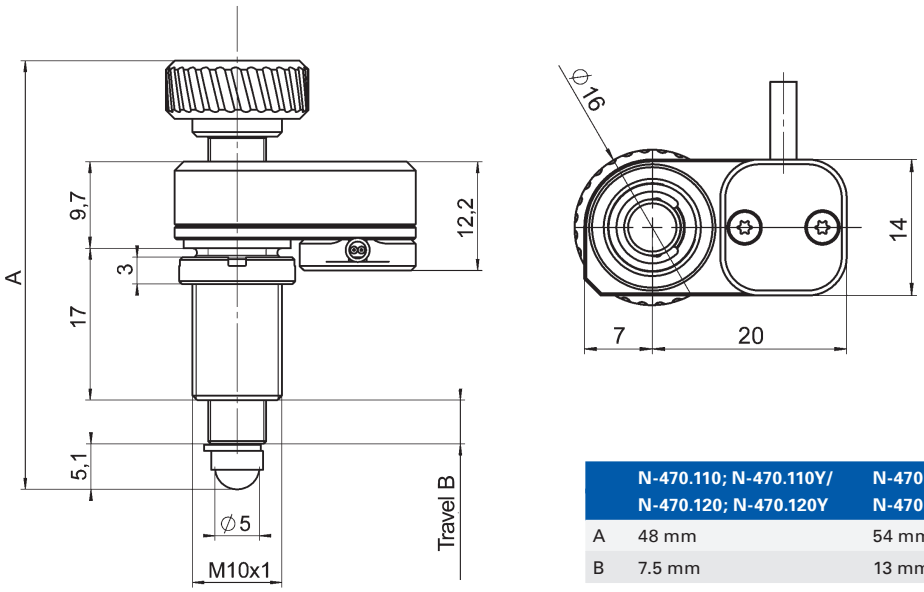
Compact, cost-effective inertia drive (Stick-Slip). When at rest, the drive is self-locking and therefore requires no current and generates no heat. It holds the position with maximum force

Alignment of mechanical and optical components

Stable alignment of optical paths. Long-term positioning stability: High stability in target position, reliable start-up even after longer downtimes. High holding force and resolution by combining piezo actuators with mechanical thread translation. Vacuum-compatible versions to 10^{-9} hPa available

PiezoMike linear actuators replace manual micrometer screws in tip/tilt mirror mechanics

	N-470.110; N-470.110Y/ N-470.120; N-470.120Y	N-470.210; N-470.210Y/ N-470.220; N-470.220Y	N-470.410; N-470.410Y/ N-470.420; N-470.420Y	Unit
Active axes	X M10 × 1 mm mounting thread (N-470.110; N-470.110Y) 9.5 mm shank (N-470.120; N-470.120Y)	X M10 × 1 mm mounting thread (N-470.210; N-470.210Y) 9.5 mm shank (N-470.220; N-470.220Y)	X M10 × 1 mm mounting thread (N-470.410; N-470.410Y) 9.5 mm shank (N-470.420; N-470.420Y)	
Motion and positioning				
Travel range	7.5	13	26	mm
Max. step size	30	30	30	nm
Typical step size	20	20	20	nm
Max. step frequency	2000	2000	2000	Hz
Max. velocity in full-step mode	3	3	3	mm/minute
Typical velocity in full-step mode	2	2	2	mm/minute
Mechanical properties				
Stiffness in motion direction	15.5	15.5	15.5	N/µm
Feed force (active)	22	22	22	N
Holding force (passive)	>100	>100	>100	N
Permissible lateral force	1	1	1	N
Drive properties				
Drive type	PIShift piezomotor	PIShift piezomotor	PIShift piezomotor	
Max. operating voltage	80	80	80	V
Max. power consumption	6.4	6.4	6.4	W
Miscellaneous				
Operating temperature range	10 to 40	10 to 40	10 to 40	°C
Material	Screw: Stainless steel, Case: Aluminum	Screw: Stainless steel, Case: Aluminum	Screw: Stainless steel, Case: Aluminum	
Dimensions	14 mm × 28 mm × 48 mm	14 mm × 28 mm × 54 mm	14 mm × 28 mm × 68.5 mm	
Mass	80	85	95	g
Cable length	2	2	2	m
Connector	DIN 4-pin	DIN 4-pin	DIN 4-pin	
Recommended driver	E-870 PIShift drive electronics	E-870 PIShift drive electronics	E-870 PIShift drive electronics	



	N-470.110; N-470.110Y/ N-470.120; N-470.120Y	N-470.210; N-470.210Y/ N-470.220; N-470.220Y	N-470.410; N-470.410Y/ N-470.420; N-470.420Y
A	48 mm	54 mm	68.5 mm
B	7.5 mm	13 mm	26 mm

N-470, dimensions in mm,
Cable exit for N-470.XXXY versions offset by 180°

VACUUM-COMPATIBLE

N-470.V/N-470.U

- Holding force >100 N
- Step size 20 nm
- Travel range 7.4 mm to 26 mm
- Compact design
- Feed force 22 N
- Lifetime >1.000.000.000 steps
- Mounting thread or shank
- Versions for 10^{-6} hPa and 10^{-9} hPa
- Versions with cable exit offset by 180°

	N-470.11V; N-470.11U/ N-470.12V; N-470.12U	N-470.21V; N-470.21U/ N-470.22V; N-470.22U	N-470.41V; N-470.41U/ N-470.42V; N-470.42U	Unit
Active axes	X M10 × 1 mm mounting thread (N-470.11V/.11U) 9.5 mm shank (N-470.12V/.12U)	X M10 × 1 mm mounting thread (N-470.21V/.21U) 9.5 mm shank (N-470.22V/.22U)	X M10 × 1 mm mounting thread (N-470.41V/.41U) 9.5 mm shank (N-470.42V/.42U)	
Vacuum Range	10^{-6} hPa (N-470.11V/.12V) 10^{-9} hPa (N-470.11U/.12U)	10^{-6} hPa (N-470.21V/.22V) 10^{-9} hPa (N-470.21U/.22U)	10^{-6} hPa (N-470.41V/.42V) 10^{-9} hPa (N-470.41U/.42U)	
Motion and positioning				
Travel range	7.5	13	26	mm
Max. step size	30	30	30	nm
Typical step size	20	20	20	nm
Max. step frequency	2000	2000	2000	Hz
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Permissible lateral force	1	1	1	N
Drive properties				
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Max. operating voltage	80	80	80	V
Max. power consumption	6.4	6.4	6.4	W
Miscellaneous				
Operating temperature range	10 to 40	10 to 40	10 to 40	°C
Material	Screw: Stainless steel, Case: Aluminum	Screw: Stainless steel, Case: Aluminum	Screw: Stainless steel, Case: Aluminum	
Dimensions	14 mm × 28 mm × 48 mm	14 mm × 28 mm × 54 mm	14 mm × 28 mm × 68.5 mm	
Mass	80	85	95	g
Cable length / Connector	1 m in vacuum chamber, stranded wires; 2 m outside of vacuum chamber, stranded wires to Mini DIN 4-pin	1 m in vacuum chamber, stranded wires; 2 m outside of vacuum chamber, stranded wires to Mini DIN 4-pin	1 m in vacuum chamber, stranded wires; 2 m outside of vacuum chamber, stranded wires to Mini DIN 4-pin	
Recommended driver	E-870 PIShift drive electronics	E-870 PIShift drive electronics	E-870 PIShift drive electronics	