



## PiezoMike Miniature Actuators

HIGH RESOLUTION AND LONG-TERM STABILITY

# Closed Loop PiezoMike Linear Actuator

With Position Sensor for Closed-Loop Operation



## N-472

- High stability and holding force >100 N
- Self-locking at rest even when closed-loop control is switched off
- Travel range 7.5 mm and 13 mm
- Compact design with integrated incremental encoder
- Encoder resolution up to <1 nm
- Feed force 22 N
- Lifetime >1,000,000,000 steps
- Versions with cable exit offset by 180°
- Nonmagnetic and vacuum-compatible operating principle

### PIShift piezomotors

Compact, low-cost inertia drive principle (stick-slip). When at rest, the drive is self-locking, requires no current and generates no heat. It holds the position with maximum force.

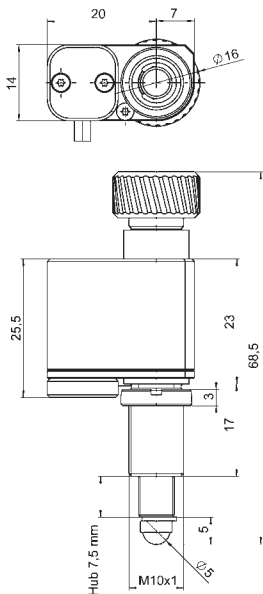
### Integrated position sensor

An incremental encoder measures the motion performed relative to a freely definable reference position. In combination with the E-871 motion controller, the encoder resolution is up to <1 nm.

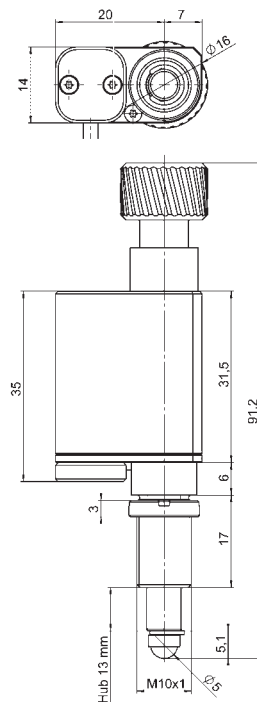
### Alignment of mechanical and optomechanical components

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  $10^{-6}$  hPa available.

Preliminary Data	N-472.110; N-472.110Y / N-472.120; N-472.120Y	N-472.11V; N-472.11VY / N-472.12V; N-472.12VY	N-472.210; N-472.210Y / N-472.220; N-472.220Y	N-472.21V; N-472.21VY / N-472.22V; N-472.22VY	Unit
Active axis	X	X	X	X	
Mechanical interface	M10x1 mounting thread (N-472.110; N-472.110Y) 9.5 mm shank (N-472.120; N-472.120Y)	M10x1 mounting thread or 9.5 mm shank, vacuum-compatible to 10 <sup>-6</sup> hPa	M10x1 mounting thread (N-472.210; N-472.210Y) 9.5 mm shank (N-472.220; N-472.220Y)	M10x1 mounting thread or 9.5 mm shank, vacuum-compatible to 10 <sup>-6</sup> hPa	
<b>Motion and positioning</b>					
Travel range	7.5	7.5	13	13	mm
Integrated sensor	Incremental, optical	Incremental, optical	Incremental, optical	Incremental, optical	
Sensor signal	Analog, 1	Analog, 1	Analog, 1	Analog, 1	V <sub>pp</sub>
Resolution	<1	<1	<1	<1	nm
Maximum velocity, open-loop	3.6	3.6	3.6	3.6	mm/min.
Recommended maximum velocity in continuous operation	2	2	2	2	mm/min.
<b>Mechanical properties</b>					
Holding force, de-energized	>100	>100	>100	>100	N
Feed force (active)	22	22	22	22	N
<b>Drive properties</b>					
Drive type	PIShift piezo inertia drive	PIShift piezo inertia drive	PIShift piezo inertia drive	PIShift piezo inertia drive	
Motor voltage	80	80	80	80	V <sub>pp</sub>
<b>Miscellaneous</b>					
Operating temperature range	10 to 40	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	Screw: Stainless steel Case: Aluminum	
Cable length	2	2	2	2	m
Connector	Actuator: Sub-D 15 (m)	Actuator: Sub-D 15 (m)	Actuator: Sub-D 15 (m)	Actuator: Sub-D 15 (m)	
Recommended controller / driver	E-871	E-871	E-871	E-871	



N-472.110, dimensions in mm,  
Cable exit for N-472.XXXY versions offset by 180°



N-472.210, dimensions in mm,  
Cable exit for N-472.XXXY versions offset by 180°



N-480.210L0, PiezoMike mirror mount

# Fast Linear Actuator with PIShift Piezomotor

Cost-Effective and Easy to Integrate



## N-412

- Easy frontal mounting
- Silent: Operating frequency to >20 kHz
- Velocity over 5 mm/s
- Sub-micron resolution
- Holding force to 10 N
- Low operating voltage to 48 V<sub>pp</sub>
- Self-locking when at rest, no heat generation

### Piezomotor-based direct drive

OEM actuator without position sensor. Continuous motion with step frequencies in the ultrasound range. Frontal mounting with M10x1 thread or 9.5 mm shank.

### PIShift piezo inertia drive

Self-locking when at rest, no heat generation. Noiseless drive with operating frequencies beyond 20 kHz. Resolution in step mode approx. 300 nm, open-loop.

### Fields of application

Industry and research. Alignment of optical elements, micromanipulation, biotechnology, cell manipulation, medical technology.

### Recommended controllers / amplifiers

E-870 PIShift drive electronics.



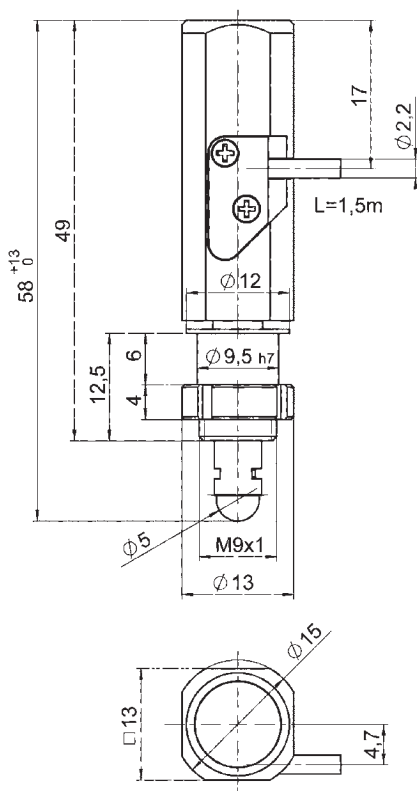
N-412 PIShift linear actuators with a kinematic mirror mount for the adjustment of optics

Preliminary Data	N-412.50	N-412	Unit	Tolerance
Active axes	X	X		
Mechanical interface	PIShift linear actuator, 9.5 mm shank	PIShift linear actuator, M10x1 thread		
<b>Motion and positioning</b>				
Travel range	13	13	mm	
Step frequency*	>20	>20	kHz	max.
Max. velocity*	5	5	mm/s	min.
<b>Mechanical properties</b>				
Stiffness in motion direction	>4	>4	N/ $\mu$ m	$\pm 20$ %
Push / pull force (active)	7	7	N	max.
Max. holding force (passive)	10	10	N	min.
<b>Drive properties</b>				
Drive type	PIShift piezo inertia drive	PIShift piezo inertia drive		
Operating voltage	48	48	V <sub>pp</sub>	max.
<b>Miscellaneous</b>				
Operating temperature range	0 to 50	0 to 50	$^{\circ}$ C	
Material**	Stainless steel	Stainless steel		
Dimensions	58 mm length, 15 mm diameter	58 mm length, 15 mm diameter		
Mass	25	25	g	$\pm 5$ %
Cable length	1.5	1.5	m	$\pm 10$ mm
Connector	DIN 4-pin	DIN 4-pin		
Recommended controller / driver	E-870 PIShift drive electronics	E-870 PIShift drive electronics		

Ask about custom designs!

\* Depending on the drive electronics

\*\* Ceramic rod



N-412, dimensions in mm

# PiezoMike Miniature 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.

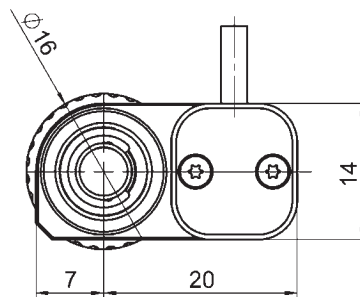
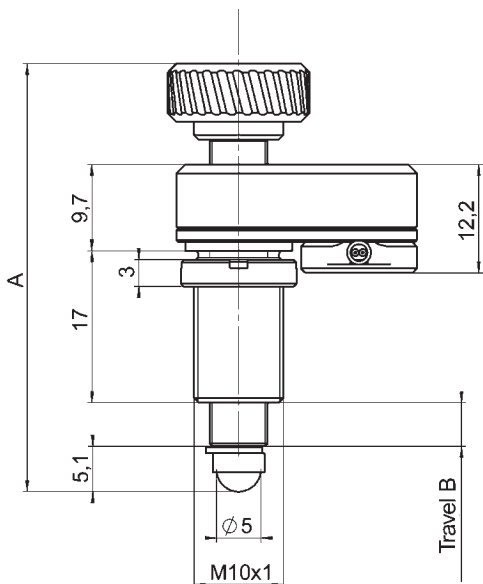
### Alignment of mechanical and optical components

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)	
<b>Motion and positioning</b>				
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
<b>Mechanical properties</b>				
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
<b>Drive properties</b>				
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
<b>Miscellaneous</b>				
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 PiezoMike Linear Actuator

High Forces, Stable Positioning, 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°

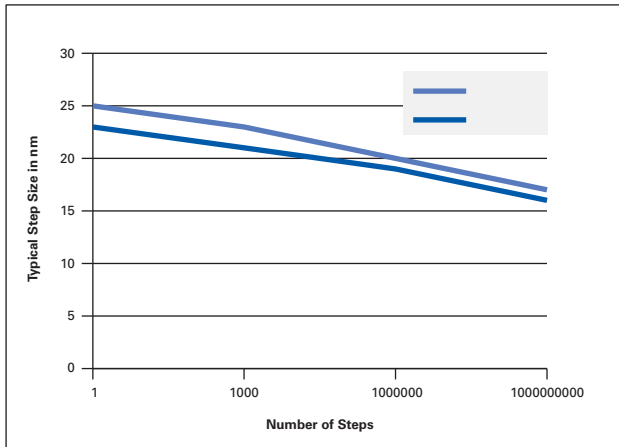


	N-470.11V; N-470.11U/ N-470.12V; N-470.12U	N-470.21V; N-470.21U/ N-470.22V; N-470.22U	N-470.41V; N-470.41U/ N-470.42V; N-470.42U	Unit
Active axes	X M10 × 1 mm mounting thread (N-470.11V/.11U) 9.5 mm shank (N-470.12V/.12U)	X M10 × 1 mm mounting thread (N-470.21V/.21U) 9.5 mm shank (N-470.22V/.22U)	X M10 × 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)	
<b>Motion and positioning</b>				
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
<b>Mechanical properties</b>				
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
<b>Drive properties</b>				
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
<b>Miscellaneous</b>				
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	



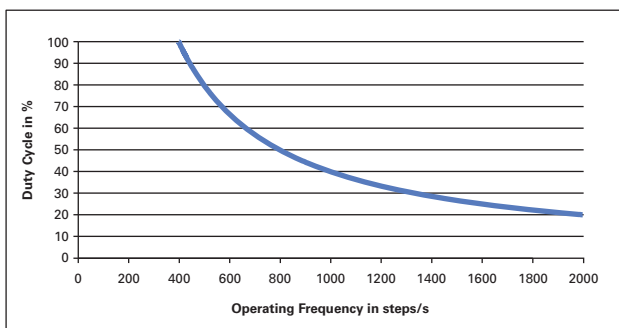
## PiezoMike Precision Actuators: Operation and Lifetime

High Durability, Nanometer Resolution



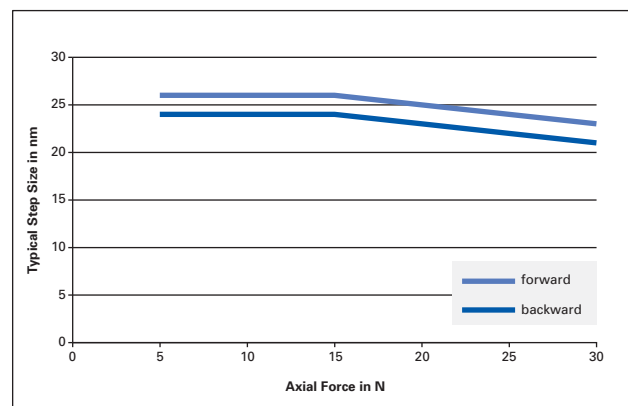
The step size of the PiezoMikes was measured during hundreds of millions of steps to determine the influence of wear. The following graph shows the step size in nanometers vs. the number of steps with and against an axial force of 22 N. Lifetime: The step size does not decrease below 70% of the initial step size (typically from 20 nm).

Frequency	Operation Time	Duty Cycle (max) / Waiting Time
2 kHz	60 (max. allowable)	20% / 4 minutes
2 kHz	10	20% / 40
1 kHz	110 (max. allowable)	40% / 165
1 kHz	10	40% / 15
400 Hz and slower	No limitation	No limitation

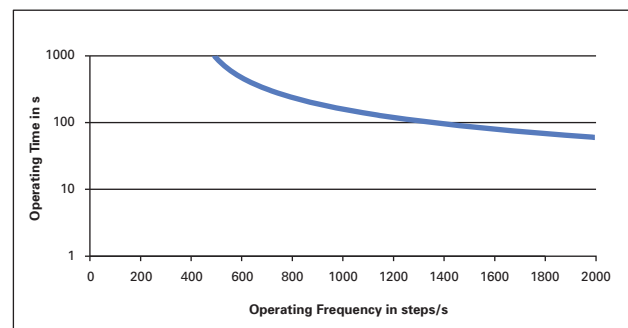


Recommendations for the duty cycle and operational frequency.

High frequency operation can create heat inside the piezoelectric actuator and the drive mechanics; the values are given for room temperature and standard air pressure of 1013 hPa.



The influence of the axial force on the typical step size is very low. Consequently the feed force is reliably high at velocities of typical 2 mm/minute.



# Motorized Mirror Mount with PiezoMike

With Kinematic Mirror Mount



## N-480

- High stability
- For optics with 0.5", 1" or 2" diameter
- Compact design with integrated incremental encoder
- Step size 1  $\mu$ rad
- Lifetime >1,000,000,000 steps
- Vacuum-compatible versions to  $10^{-6}$  hPa available

### Kinematic mirror mounts with PIShift piezomotors

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

### PIShift piezomotors

Compact, low-cost inertia drive principle (stick-slip). When at rest, the drive is self-locking, requires no current and generates no heat. It holds the position with maximum force.

### Alignment of 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  $10^{-6}$  hPa available.



N-480.210RU, PiezoMike mirror mount for ultra high vacuum



N-480.220C0 and N-480.210C0, PiezoMike mirror mount for 2 inch and 1 inch optics

Preliminary Data	N-480.205C0; N-480.205CV / N-480.205CU	N-480.210C0; N-480.210CV / N-480.210CU	N-480.210L0; N-480.210LV / N-480.210LU	N-480.210R0; N-480.210RV / N-480.210RU	N-480.220C0; N-480.220CV / N-480.220CU	N-480.220L0; N-480.220LV / N-480.220LU	N-480.220R0; N-480.220RV / N-480.220RU	Unit
Active axis	$\theta_{x'}$ , $\theta_y$	$\theta_{x'}$ , $\theta_y$	$\theta_{x'}$ , $\theta_y$	$\theta_{x'}$ , $\theta_y$	$\theta_{x'}$ , $\theta_y$	$\theta_{x'}$ , $\theta_y$	$\theta_{x'}$ , $\theta_y$	
Mechanical interface	0,5" optics, closed frame V: Vacuum to $10^{-6}$ hPa U: Vacuum to $10^{-9}$ hPa	1" optics, closed frame V: Vacuum to $10^{-6}$ hPa U: Vacuum to $10^{-9}$ hPa	1" optics, right-hand V: Vacuum to $10^{-6}$ hPa U: Vacuum to $10^{-9}$ hPa	1" optics, left-hand V: Vacuum to $10^{-6}$ hPa U: Vacuum to $10^{-9}$ hPa	2" optics, closed frame V: Vacuum to $10^{-6}$ hPa U: Vacuum to $10^{-9}$ hPa	2" optics, right-hand V: Vacuum to $10^{-6}$ hPa U: Vacuum to $10^{-9}$ hPa	2" optics, left-hand V: Vacuum to $10^{-6}$ hPa U: Vacuum to $10^{-9}$ hPa	
<b>Motion and positioning</b>								
Tilt angle	+/-8	+/-8	+/-8	+/-8	+/-8	+/-8	+/-8	°
Step size	1	1	1	1	1	1	1	μrad
<b>Mechanical properties</b>								
Holding force, de-energized	>100	>100	>100	>100	>100	>100	>100	N
Feed force (active)	22	22	22	22	22	22	22	N
<b>Drive properties</b>								
Drive type	PIShift piezo inertia drive	PIShift piezo inertia drive	PIShift piezo inertia drive	PIShift piezo inertia drive	PIShift piezo inertia drive	PIShift piezo inertia drive	PIShift piezo inertia drive	
Motor voltage	80	80	80	80	80	80	80	V <sub>pp</sub>
<b>Miscellaneous</b>								
Operating temperature	10 to 40	10 to 40	10 to 40	10 to 40	10 to 40	10 to 40	10 to 40	°C
Material	Screw: Stainless steel Holder: Aluminum	Screw: Stainless steel Holder: Aluminum	Screw: Stainless steel Holder: Aluminum	Screw: Stainless steel Holder: Aluminum	Screw: Stainless steel Holder: Aluminum	Screw: Stainless steel Holder: Aluminum	Screw: Stainless steel Holder: Aluminum	
Cable length	2	2	2	2	2	2	2	m
Connector	Mini DIN 4-pin	Mini DIN 4-pin	Mini DIN 4-pin	Mini DIN 4-pin	Mini DIN 4-pin	Mini DIN 4-pin	Mini DIN 4-pin	
Recommended controller	E-870	E-870	E-870	E-870	E-870	E-870	E-870	



N-480.210R0, PiezoMike mirror mount, left hand



N-480.210L0, PiezoMike mirror mount, right hand

# PIShift Drive Electronics

Versatile and Cost-Effective



## E-870

- For PIShift and PiezoMike piezo inertia drives
- Ideal for OEM applications
- One to four actuators, serial control (through demultiplexing)
- With digital USB interface
- Host software and LabVIEW driver included

### Drive electronics for one to four axes

OEM module with solder pins, OEM board with connectors and terminal strips or bench-top device. For open-loop PIShift piezo drives and PiezoMike linear actuators.

### Operating modes

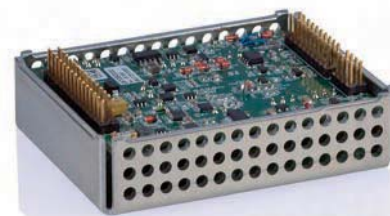
Max. piezo voltage 0 to 100 V (configurable). Stepping mode and analog operation. Various command modes. Configuration of the operating parameters can be programmed via USB or via hardware settings. Serial control of up to 4 actuators by one unit.

### Interfaces

USB for control, configuration and for firmware updates. Interfaces for TTL and analog control. Optional SPI interface.

### Fields of application

Lab automation, medical technology, handling.



E-870.10: Single-channel driver for piezo inertia drives (to be plugged in or soldered)



The E-870.41 allows the serial control of up to four PIShift or PiezoMike actuators through demultiplexing, OEM board version

Preliminary data	E-870.10	E-870.11/ E-870.1G	E-870.21/ E-870.2G	E-870.41/ E-870.4G
Function	Drive electronics for PIShift linear drives, OEM circuit board with solder pins	Drive electronics for PIShift linear drives, E-870.11: OEM circuit board with connectors E-870.1G: Bench-Top Device	Drive electronics for PIShift linear drives, E-870.21: OEM circuit board with connectors E-870.2G: Bench-Top Device	Drive electronics for PIShift linear drives E-870.41: OEM circuit board with connectors E-870.4G: Bench-Top Device
Axes	1	1	2 serial control through demultiplexing	4 serial control through demultiplexing
<b>Amplifier</b>				
Channels	1	1	1 serial control of 2 axes through demultiplexing	1 serial control of 4 axes through demultiplexing
Output voltage	0 to 100 V	0 to 100 V	0 to 100 V	0 to 100 V
Peak output power	30 W	30 W	30 W	30 W
Output current/channel (<5 ms)	±650 mA	±650 mA	±650 mA	±650 mA
<b>Interface and operation</b>				
Communication interfaces	USB 2.0 Solder pins	USB 2.0 Terminal strip (E-870.11) HD Sub-D 26 (f) (E-870.1G)	USB 2.0 Terminal strip (E-870.21) HD Sub-D 26 (f) (E-870.2G)	USB 2.0 Terminal strip (E-870.41) HD Sub-D 26 (f) (E-870.4G)
Actuator connection	Solder pins	DIN 4-pin	DIN 4-pin	DIN 4-pin
Analog and digital inputs	Analog Interface, ±10 V, 10 bit ADC, Digital SPI interface, 12 TTL inputs for commanding and configuration			
Digital output	4 TTL outputs (overtemperature protection, status piezo voltage, error status, general output)			
Command set	PI GCS 2			
User software	Configuration and operation tool: E-870 Control			
Software drivers	LabVIEW driver, shared libraries for Windows			
Supported functionality	Step mode (full-step motion cycles, default), linear mode (analog signal). Alternative command modes: pulse-controlled, pulse slope-controlled, quadrature decoder control, analog velocity control			
Display	–	LED for operation, error status (E-870.11 only) and overtemperature protection (E-870.11 only)	LED for operation, error status (E-870.21 only) and overtemperature protection (E-870.21 only)	LED for operation, error status (E-870.41 only) and overtemperature protection (E-870.41 only)
Manual control	–	Integrated pushbutton control forwards/backwards (E-870.11 only), joystick via USB	Integrated pushbutton control forwards/backwards (E-870.21 only), joystick via USB	Integrated pushbutton control forwards/backwards (E-870.41 only), joystick via USB
<b>Miscellaneous</b>				
Operating temperature range	0 to 50 °C	0 to 50 °C	0 to 50 °C	0 to 50 °C
Overtemp protection	Deactivation at 75 °C	Deactivation at 75 °C	Deactivation at 75 °C	Deactivation at 75 °C
Dimensions	76 mm × 61 mm × 20 mm	92.5 mm × 105 mm × 36 mm (E-870.11) 97 mm × 105 mm × 36 mm (E-870.1G)	92.5 mm × 105 mm × 36 mm (E-870.21) 97 mm × 105 mm × 36 mm (E-870.2G)	92.5 mm × 105 mm × 36 mm (E-870.41) 97 mm × 105 mm × 36 mm (E-870.4G)
Mass	100 g	170 g (E-870.11) 310 g (E-870.1G)	190 g (E-870.21) 330 g (E-870.2G)	200 g (E-870.41) 340 g (E-870.4G)
Operating voltage	12 to 24 V (power supply not included in the scope of delivery)	12 to 24 V (power supply included in the scope of delivery for E-870.1G)	12 to 24 V (power supply included in the scope of delivery for E-870.2G)	12 to 24 V (power supply included in the scope of delivery for E-870.4G)
Max. power consumption	35 W	35 W	35 W	35 W

Ask about custom designs!

# Networkable Servo Controller for Stick-Slip Piezo-Motors

Closed-Loop for Positioners with PIShift Inertia Drives



## E-871

- Broadband encoder input
- Macro programmable for stand-alone functionality
- Data recorder
- Non-volatile EEPROM for macros and parameters

### Digital servo controller for PIShift piezomotors

1 channel. Integrated power amplifier and voltage generator for PIShift piezo inertia drives. Point-to-point motion, actuator mode for nanometer-precise positioning to target position.

### Extensive functionality

Powerful macro command language. Non-volatile macro storage, e. g. for stand-alone functionality with autostart macro. Data recorder. ID chip for quick start-up, parameter changes on-the-fly. Extensive software support, e. g. for LabVIEW, shared libraries for Windows and Linux.

### Mercury class motion controller

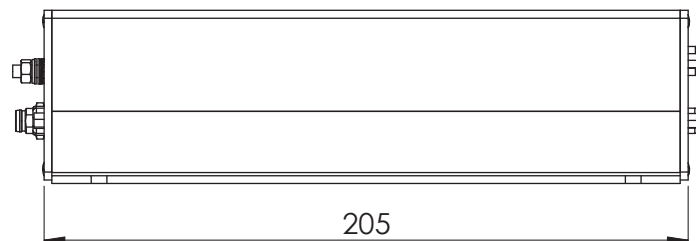
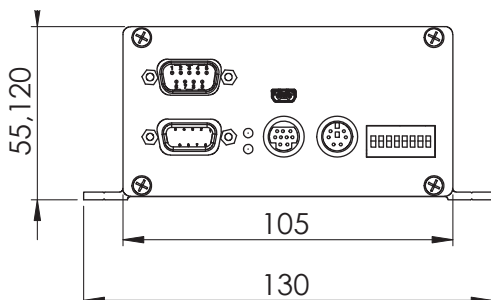
Daisy-chain networking for up to 16 axes operated via a common computer interface.

Interfaces: USB and RS-232 for commands. A/B (quadrature) encoder input. TTL inputs for limit and reference point switches. I/O ports (analog/digital) for automation. Interface for analog joystick.

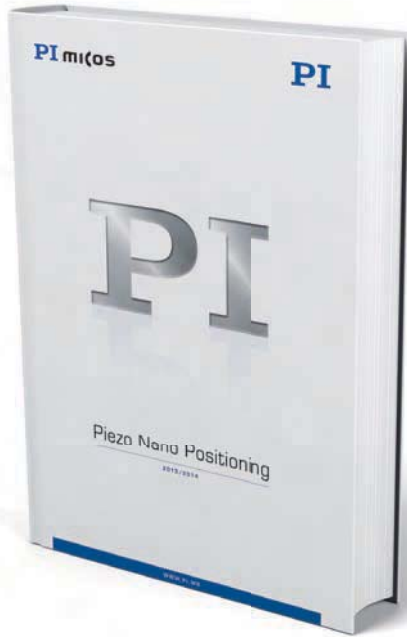
Delivery scope including wide-range power supply, USB and RS-232 cable, daisy-chain network cable.

E-871.1A1	
Function	Piezomotor controller for PIShift drives and positioning systems
Channels	1
<b>Motion and control</b>	
Servo characteristics	PID controller, parameter changes on-the-fly
Encoder input	Analog encoder input sine-cosine, interpolation selectable up to 20000; Interpolation circuit for differential transmission 1 V <sub>pp</sub> and 2.5 V offset of the encoder signal
Stall detection	Servo off
Input limit switch	2 × TTL (pull-up/pull-down, programmable)
Input reference switch	1 × TTL and Zero+ & Zero- for integrated reference in the encoder
<b>Electrical properties</b>	
Max. output power	30 W
Output voltage	0 to 100 V, drive-dependent selection
Max. operating current	1.5 A
<b>Interface and operation</b>	
Communication interfaces	USB, RS-232 (9-pin (m) Sub-D)
Motor connector	HD Sub-D 15-pin (f)
Sensor connection	HD Sub-D 15-pin (m)
Controller network	Up to 16 units on single interface*
I/O ports	4 analog/digital in, 4 digital out
Command set	PI General Command Set (GCS)
User software	PIMikroMove, PITerminal
Software drivers	LabVIEW driver, shared libraries for Windows and Linux
Supported functionality	Point-to-point motion, start-up macro, data recorder for recording parameters as motor input voltage, position or position error; internal safety circuitry: watchdog; ID chip
Manual control (optional)	Pushbutton box, joystick (for 2 axes), Y-cable for 2-D motion
<b>Miscellaneous</b>	
Operating voltage	24 V; included: external power supply, 24V; 2.0 A
Operating temperature range	0 to 50°C
Mass	1.1 kg
Overtemp protection	75°C
Dimensions	205 mm × 130 mm × 55 mm (incl. mounting rails)

\* 16 units via USB; 6 units via RS-232.



E-871, dimensions in mm



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