PiezoMike Miniature Actuators

HIGH RESOLUTION AND LONG-TERM STABILITY
**Closed Loop PiezoMike Linear Actuator**

*With Position Sensor for Closed-Loop Operation*

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**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.

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**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

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**Alignment of mechanical and optomechanical components**
<table>
<thead>
<tr>
<th>Preliminary Data</th>
<th>N-472.110; N-472.110Y / N-472.120; N-472.120Y</th>
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<th>N-472.210; N-472.210Y / N-472.220; N-472.220Y</th>
<th>N-472.21V; N-472.21VY / N-472.22V; N-472.22VY</th>
<th>Unit</th>
</tr>
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<tbody>
<tr>
<td>Active axis</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<td>Mechanical interface</td>
<td>M10×1 mounting thread (N-472.110; N-472.110Y) 9.5 mm shank (N-472.120; N-472.120Y)</td>
<td>M10×1 mounting thread or 9.5 mm shank, vacuum-compatible to 10⁻⁶ hPa</td>
<td>M10×1 mounting thread (N-472.210; N-472.210Y) 9.5 mm shank (N-472.220; N-472.220Y)</td>
<td>M10×1 mounting thread or 9.5 mm shank, vacuum-compatible to 10⁻⁶ hPa</td>
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<td>Motion and positioning</td>
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<tr>
<td>Travel range</td>
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<td>7.5</td>
<td>13</td>
<td>13</td>
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<td>&gt;100</td>
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<td>Feed force (active)</td>
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<td>22</td>
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<td>Drive properties</td>
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<td>PIShift piezo inertia drive</td>
<td>PIShift piezo inertia drive</td>
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<td>Operating temperature range</td>
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<td>10 to 40</td>
<td>10 to 40</td>
<td>°C</td>
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<td>Actuator: Sub-D 15 (m)</td>
<td>Actuator: Sub-D 15 (m)</td>
<td>Actuator: Sub-D 15 (m)</td>
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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

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
- 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_{pp}
- Self-locking when at rest, no heat generation

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

<table>
<thead>
<tr>
<th></th>
<th>N-412.50</th>
<th>N-412</th>
<th>Unit</th>
<th>Tolerance</th>
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<tr>
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<td>X</td>
<td>X</td>
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<tr>
<td>Mechanical interface</td>
<td>PIShift linear actuator, 9.5 mm shank</td>
<td>PIShift linear actuator, M10 x1 thread</td>
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## Motion and positioning

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<th>mm/s min.</th>
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<td>Step frequency *</td>
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<td>&gt;20</td>
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## Mechanical properties

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<th>N-412.50</th>
<th>N-412</th>
<th>N/μm ±20 %</th>
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<td>&gt;4</td>
<td>&gt;4</td>
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<td></td>
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<td>Push / pull force (active)</td>
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<td>Max. holding force (passive)</td>
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<td>N</td>
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## Drive properties

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## Miscellaneous

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<th>g ±5 %</th>
<th>m ±10 mm</th>
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<td>58 mm length, 15 mm diameter</td>
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<td>25</td>
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<td></td>
<td></td>
</tr>
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<td>1.5</td>
<td></td>
<td></td>
<td></td>
</tr>
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<td>Connector</td>
<td>DIN 4-pin</td>
<td>DIN 4-pin</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Recommended controller / driver</td>
<td>E-870 PIShift drive electronics</td>
<td>E-870 PIShift drive electronics</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Depending on the drive electronics
** Ceramic rod

Ask about custom designs!
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

**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°

PiezoMike linear actuators replace manual micrometer screws in tip/tilt mirror mechanics
<table>
<thead>
<tr>
<th></th>
<th>N-470.110; N-470.110Y/ N-470.120; N-470.120Y</th>
<th>N-470.210; N-470.210Y/ N-470.220; N-470.220Y</th>
<th>N-470.410; N-470.410Y/ N-470.420; N-470.420Y</th>
<th>Unit</th>
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<tbody>
<tr>
<td>Active axes</td>
<td>X M10 × 1 mm mounting thread (N-470.110; N-470.110Y) 9.5 mm shank (N-470.120; N-470.120Y)</td>
<td>X M10 × 1 mm mounting thread (N-470.210; N-470.210Y) 9.5 mm shank (N-470.220; N-470.220Y)</td>
<td>X M10 × 1 mm mounting thread (N-470.410; N-470.410Y) 9.5 mm shank (N-470.420; N-470.420Y)</td>
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</tr>
<tr>
<td>Motion and positioning</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Travel range</td>
<td>7.5</td>
<td>13</td>
<td>26</td>
<td>mm</td>
</tr>
<tr>
<td>Max. step size</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>nm</td>
</tr>
<tr>
<td>Typical step size</td>
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<td>nm</td>
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<td>Max. step frequency</td>
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<td>2000</td>
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<tr>
<td>Max. velocity in full-step mode</td>
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<td>3</td>
<td>3</td>
<td>mm/minute</td>
</tr>
<tr>
<td>Typical velocity in full-step mode</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>mm/minute</td>
</tr>
<tr>
<td>Mechanical properties</td>
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</tr>
<tr>
<td>Stiffness in motion direction</td>
<td>15.5</td>
<td>15.5</td>
<td>15.5</td>
<td>N/μm</td>
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<tr>
<td>Feed force (active)</td>
<td>22</td>
<td>22</td>
<td>22</td>
<td>N</td>
</tr>
<tr>
<td>Holding force (passive)</td>
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<td>&gt;100</td>
<td>&gt;100</td>
<td>N</td>
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<tr>
<td>Permissible lateral force</td>
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<td>N</td>
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<td>Drive properties</td>
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<td>PIShift piezomotor</td>
<td>PIShift piezomotor</td>
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<td>V</td>
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<td>W</td>
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<td>Miscellaneous</td>
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</tr>
<tr>
<td>Operating temperature range</td>
<td>10 to 40</td>
<td>10 to 40</td>
<td>10 to 40</td>
<td>°C</td>
</tr>
<tr>
<td>Dimensions</td>
<td>14 mm × 28 mm × 48 mm</td>
<td>14 mm × 28 mm × 54 mm</td>
<td>14 mm × 28 mm × 68.5 mm</td>
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</tr>
<tr>
<td>Mass</td>
<td>80</td>
<td>85</td>
<td>95</td>
<td>g</td>
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<tr>
<td>Cable length</td>
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<td>m</td>
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<td>Connector</td>
<td>DIN 4-pin</td>
<td>DIN 4-pin</td>
<td>DIN 4-pin</td>
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<tr>
<td>Recommended driver</td>
<td>E-870 PIShift drive electronics</td>
<td>E-870 PIShift drive electronics</td>
<td>E-870 PIShift drive electronics</td>
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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**

<table>
<thead>
<tr>
<th></th>
<th>N-470.11V; N-470.11U/ N-470.12V; N-470.12U</th>
<th>N-470.21V; N-470.21U/ N-470.22V; N-470.22U</th>
<th>N-470.41V; N-470.41U/ N-470.42V; N-470.42U</th>
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<tbody>
<tr>
<td><strong>Active axes</strong></td>
<td>X M10 × 1 mm mounting thread (N-470.11V/.11U) 9.5 mm shank (N-470.12V/.12U)</td>
<td>X M10 × 1 mm mounting thread (N-470.21V/.21U) 9.5 mm shank (N-470.22V/.22U)</td>
<td>X M10 × 1 mm mounting thread (N-470.41V/.41U) 9.5 mm shank (N-470.42V/.42U)</td>
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<tr>
<td><strong>Motion and positioning</strong></td>
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</tr>
<tr>
<td>Travel range</td>
<td>7.5</td>
<td>13</td>
<td>26</td>
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<tr>
<td>Max. step size</td>
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<td>30</td>
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<tr>
<td>Typical step size</td>
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<td>Max. velocity in full-step mode</td>
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<td><strong>Mechanical properties</strong></td>
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<tr>
<td>Stiffness in motion direction</td>
<td>15.5</td>
<td>15.5</td>
<td>15.5</td>
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<tr>
<td>Feed force (active)</td>
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<tr>
<td>Holding force (passive)</td>
<td>&gt;100</td>
<td>&gt;100</td>
<td>&gt;100</td>
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<tr>
<td>Permissible lateral force</td>
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<tr>
<td><strong>Drive properties</strong></td>
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<td>PIShift piezomotor</td>
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<td>10 to 40 °C</td>
<td>10 to 40 °C</td>
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<td>Dimensions</td>
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<td>14 mm × 28 mm × 54 mm</td>
<td>14 mm × 28 mm × 68.5 mm</td>
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<tr>
<td>Mass</td>
<td>80 g</td>
<td>85 g</td>
<td>95 g</td>
</tr>
<tr>
<td>Cable length / Connector</td>
<td>1 m in vacuum chamber, stranded wires; 2 m outside of vacuum chamber, stranded wires to Mini DIN 4-pin</td>
<td>1 m in vacuum chamber, stranded wires; 2 m outside of vacuum chamber, stranded wires to Mini DIN 4-pin</td>
<td>1 m in vacuum chamber, stranded wires; 2 m outside of vacuum chamber, stranded wires to Mini DIN 4-pin</td>
</tr>
<tr>
<td>Recommended driver</td>
<td>E-870 PIShift drive electronics</td>
<td>E-870 PIShift drive electronics</td>
<td>E-870 PIShift drive electronics</td>
</tr>
</tbody>
</table>
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).

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Operation Time</th>
<th>Duty Cycle (max) / Waiting Time</th>
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</thead>
<tbody>
<tr>
<td>2 kHz</td>
<td>60 (max. allowable)</td>
<td>20% / 4 minutes</td>
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<td>2 kHz</td>
<td>10</td>
<td>20% / 40</td>
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<tr>
<td>1 kHz</td>
<td>110 (max. allowable)</td>
<td>40% / 165</td>
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<tr>
<td>1 kHz</td>
<td>10</td>
<td>40% / 15</td>
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<tr>
<td>400 Hz and slower</td>
<td>No limitation</td>
<td>No limitation</td>
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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.
Motorized Mirror Mount with PiezoMike

With Kinematic Mirror Mount

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

N-480
- High stability
- For optics with 0.5", 1" or 2" diameter
- Compact design with integrated incremental encoder
- Step size 1 μrad
- Lifetime >1,000,000,000 steps
- Vacuum-compatible versions to 10⁻⁶ hPa available

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

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

<table>
<thead>
<tr>
<th>Active axis</th>
<th>( \theta_x ), ( \theta_y )</th>
<th>( \theta_x ), ( \theta_y )</th>
<th>( \theta_x ), ( \theta_y )</th>
<th>( \theta_x ), ( \theta_y )</th>
<th>( \theta_x ), ( \theta_y )</th>
<th>( \theta_x ), ( \theta_y )</th>
<th>( \theta_x ), ( \theta_y )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical interface</td>
<td>0.5&quot; optics, closed frame V: Vacuum to 10(^{-6}) hPa U: Vacuum to 10(^{-9}) hPa</td>
<td>1&quot; optics, closed frame V: Vacuum to 10(^{-6}) hPa U: Vacuum to 10(^{-9}) hPa</td>
<td>1&quot; optics, right-hand V: Vacuum to 10(^{-6}) hPa U: Vacuum to 10(^{-9}) hPa</td>
<td>2&quot; optics, closed frame V: Vacuum to 10(^{-6}) hPa U: Vacuum to 10(^{-9}) hPa</td>
<td>2&quot; optics, right-hand V: Vacuum to 10(^{-6}) hPa U: Vacuum to 10(^{-9}) hPa</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Motion and positioning

<table>
<thead>
<tr>
<th>Tilt angle</th>
<th>+/-8</th>
<th>+/-8</th>
<th>+/-8</th>
<th>+/-8</th>
<th>+/-8</th>
<th>+/-8</th>
<th>+/-8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step size</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

### Mechanical properties

| Holding force, de-energized | >100 | >100 | >100 | >100 | >100 | >100 |
| Feed force (active)         | 22   | 22   | 22   | 22   | 22   | 22   |

### Drive properties

<table>
<thead>
<tr>
<th>Drive type</th>
<th>PIShift piezo inertia drive</th>
<th>PIShift piezo inertia drive</th>
<th>PIShift piezo inertia drive</th>
<th>PIShift piezo inertia drive</th>
<th>PIShift piezo inertia drive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor voltage</td>
<td>80 Vpp</td>
<td>80 Vpp</td>
<td>80 Vpp</td>
<td>80 Vpp</td>
<td>80 Vpp</td>
</tr>
</tbody>
</table>

### Miscellaneous

<table>
<thead>
<tr>
<th>Operating temperature</th>
<th>10 to 40</th>
<th>10 to 40</th>
<th>10 to 40</th>
<th>10 to 40</th>
<th>10 to 40</th>
<th>10 to 40</th>
<th>10 to 40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable length</td>
<td>2 m</td>
<td>2 m</td>
<td>2 m</td>
<td>2 m</td>
<td>2 m</td>
<td>2 m</td>
<td>2 m</td>
</tr>
<tr>
<td>Connector</td>
<td>Mini DIN 4-pin</td>
<td>Mini DIN 4-pin</td>
<td>Mini DIN 4-pin</td>
<td>Mini DIN 4-pin</td>
<td>Mini DIN 4-pin</td>
<td>Mini DIN 4-pin</td>
<td>Mini DIN 4-pin</td>
</tr>
<tr>
<td>Recommended controller</td>
<td>E-870</td>
<td>E-870</td>
<td>E-870</td>
<td>E-870</td>
<td>E-870</td>
<td>E-870</td>
<td>E-870</td>
</tr>
</tbody>
</table>

---

N-480.210R0, PiezoMike mirror mount, left hand

N-480.210L0, PiezoMike mirror mount, right hand
PIShift Drive Electronics

Versatile and Cost-Effective

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
- 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

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

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

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.

- Delivery scope including wide-range power supply, USB and RS-232 cable, daisy-chain network cable.
<table>
<thead>
<tr>
<th><strong>E-871.1A1</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Function</strong></td>
</tr>
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<td><strong>Channels</strong></td>
</tr>
<tr>
<td><strong>Motion and control</strong></td>
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<tr>
<td><strong>Servo characteristics</strong></td>
</tr>
<tr>
<td><strong>Encoder input</strong></td>
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<tr>
<td><strong>Stall detection</strong></td>
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<tr>
<td><strong>Input limit switch</strong></td>
</tr>
<tr>
<td><strong>Input reference switch</strong></td>
</tr>
<tr>
<td><strong>Electrical properties</strong></td>
</tr>
<tr>
<td><strong>Max. output power</strong></td>
</tr>
<tr>
<td><strong>Output voltage</strong></td>
</tr>
<tr>
<td><strong>Max. operating current</strong></td>
</tr>
<tr>
<td><strong>Interface and operation</strong></td>
</tr>
<tr>
<td><strong>Communication interfaces</strong></td>
</tr>
<tr>
<td><strong>Motor connector</strong></td>
</tr>
<tr>
<td><strong>Sensor connection</strong></td>
</tr>
<tr>
<td><strong>Controller network</strong></td>
</tr>
<tr>
<td><strong>I/O ports</strong></td>
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<tr>
<td><strong>Command set</strong></td>
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<tr>
<td><strong>User software</strong></td>
</tr>
<tr>
<td><strong>Software drivers</strong></td>
</tr>
<tr>
<td><strong>Supported functionality</strong></td>
</tr>
<tr>
<td><strong>Manual control (optional)</strong></td>
</tr>
<tr>
<td><strong>Miscellaneous</strong></td>
</tr>
<tr>
<td><strong>Operating voltage</strong></td>
</tr>
<tr>
<td><strong>Operating temperature range</strong></td>
</tr>
<tr>
<td><strong>Mass</strong></td>
</tr>
<tr>
<td><strong>Overtemp protection</strong></td>
</tr>
<tr>
<td><strong>Dimensions</strong></td>
</tr>
</tbody>
</table>

* 16 units via USB; 6 units via RS-232.
PI Catalog – Finding the Right Solution, Quickly and Reliably

Request Now!

The PI catalog 2014/2015 displays the PI Group’s technical expertise in all precision positioning sectors on 270 pages. Here PI presents its wide range of high-performance precision positioning systems: Different drive technologies based on piezo elements as well as electrical and magnetic principles and their integration in positioning systems with up to six axes.

Get important background knowledge: Technical tutorials give you detailed information about the technologies used in the broad and deep product portfolio of PI (Physik Instrumente), PI miCos and PI Ceramic, expert in piezo technology.

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