

# P-652 Piezo Motor Linear Slide

## PILine® Micro Piezomotor Linear Stage



- Cost-Effective, High-Volume-Production Drive
- Piezo Micromotor: 9 x 5.7 x 2.2 mm
- Velocity to 80 mm/s
- Generated Forces up to 0.2 N
- Self-Locking
- Travel Range 3.2 mm

P-652 PILine® OEM piezomotor drives are ideal for OEM applications where space is limited and moved masses are small. These minute linear positioners can be used to replace classical drive elements like miniaturized motor/spindle systems or other linear motors, which P-652 outclasses with its speed of up to 80 mm/s. The basic advantages PILine® piezo linear motors offer compared to classical drives are:

- High velocities
- Compact design
- High push/pull and holding forces relative to the drive size

The integration of P-652 in an application is simple, because the moving slider and the piezo actuator are delivered assembled as a unit. All that remains is to provide for mounting the

stator, affixing the load to the slider and making the electrical connections.

The motors are designed for moving small objects such as glass fibers, optical, micro- or electro-mechanical elements fast and precisely.

### Working Principle

P-652 drives employ a new, patented, ultrasonic piezomotor drive developed by PI. The highly compact, integrated piezomotor can provide accelerations of up to 2.5 g and velocities of up to 80 mm/s together with high position resolution and—considering its length of only 9 mm—high holding force. Because the ceramic stator is pressed against the slider, piezomotor drives resist motion with an intrinsic holding force when the unit is at rest. The result is very high position stability

### Ordering Information

**P-652**  
Miniature PILine® OEM-Drive  
**Custom versions on request**

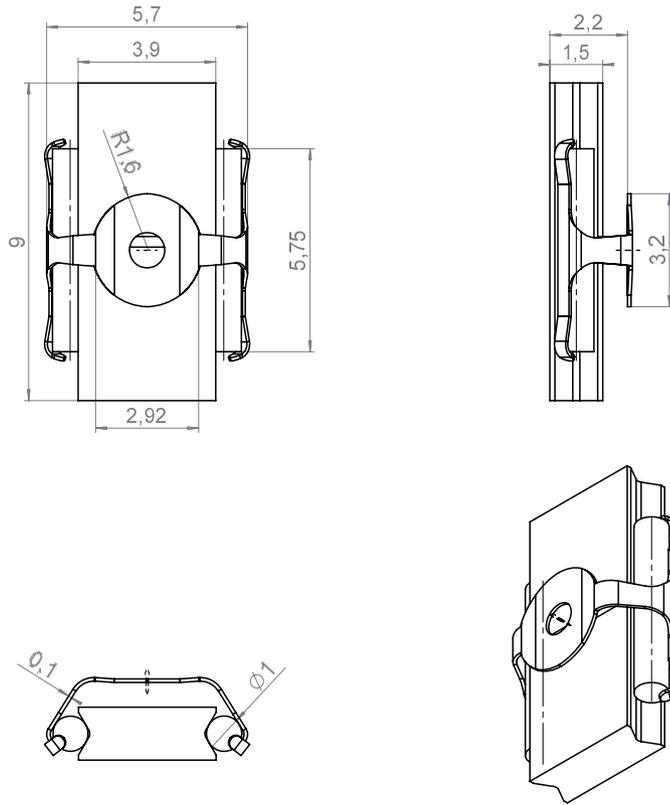
without the heat dissipation common in conventional linear motors. During operation, the oscillating piezoceramic moves the slider over the length of the motor. There are no gears, leadscrews or other mechanical components to contribute play or backlash.

### Operation with conventional controllers

The high-frequency oscillations for the PILine® motors are created by driver electronics, which can in turn be controlled by short pulses as low as 3 V. The output frequency of the driver electronics self-adjusts to the resonant frequency of the motor ceramic, so no individual tuning is necessary.

### Notes

The products described in this document are in part protected by the following patents:  
German Patent  
No. 102004059429  
International Patent  
No. WO2006/027031A1



P-652.01 OEM-Drive, dimensions in mm.

## Technical Data

	P-652	
<b>Motion and positioning</b>		
Travel range	3.2 mm	X
Minimum incremental motion, open-loop	0.1 $\mu\text{m}^*$	typ.
Typ. step size, open-loop	13 $\mu\text{m}^{**}$	typ.
Max. velocity	80 mm/s	max.
Typ. velocity	25 mm/s <sup>**</sup>	typ.
<b>Mechanical properties</b>		
Holding force when powered down	0.2 N	max.
Push / pull force	0.11 N <sup>*</sup>	max.
<b>Drive properties</b>		
Resonant frequency	470 kHz	
Integrated piezo motor	PILine <sup>®</sup> P-652	
Driver electronics operating voltage	2.8–5.0 V	
Driver electronics, max. elec. power consumption	500 mW	
Driver electronics, current consumption	55 mA	
<b>Miscellaneous</b>		
Operating temperature range	-20 to +50 °C	
Mass	0.6 g	±5%
Recommended controller/driver	C-180K001, dimensions 25 x 10 x 3 mm	
Dimensions	9 x 5.7 x 2.2 mm	

\* The minimum incremental motion cited is a typical value that can be achieved in open-loop mode. To reach this specification, it is important to follow the mounting guidelines for these motors.

\*\* Pulsed operation, 1 ms pulse length, 50% on time