

PILine® Linear Stage

Compact Linear Stage with Ultrasonic Piezo Motor



U-521

- Positions small loads quickly and with precision: Velocity to 200 mm/s, minimum incremental motion to 0.3 µm
- Space-saving: Only 35 mm in width and 15 mm in height
- Self-locking when switched off: Saves energy and reduces generation of heat
- Silent
- Customized versions on request

Precision-class linear positioning stage

PILine® stages are particularly suitable for applications that require fast precision positioning. When switched off, the self-locking drive holds the position of the stage mechanically stable. Energy consumption and heat generation are therefore considerably reduced. Applications with a low duty cycle that are battery-powered or heat-sensitive benefit from these characteristics. The position of the axis is measured by an encoder and an optical reference switch allows reliable repeatable motion. The piezomotor drive principle and its electrical operation are inexpensive and can be customized.

PILine® ultrasonic piezomotor

An integral part of a PILine® ultrasonic piezomotor is a piezo actuator that is preloaded against a movable, guided runner via a coupling element. The piezoceramic actuator is excited to ultrasonic oscillation by a high-frequency AC voltage between 100 and 200 kHz. Deformation of the actuator leads to periodic diagonal motion of the coupling element relative to the runner. The feed created is a few nanometers per cycle; the high frequencies lead to the high velocities. Preloading the piezoceramic actuator against the runner ensures self-locking of the drive when at rest and switched off.

Highly accurate position measuring with incremental encoder

Noncontact optical encoders measure the position directly at the platform with the greatest accuracy. Nonlinearity, mechanical play or elastic deformation have no influence on the measurement.

Fields of application

Micromanipulation, automation, biotechnology, sample manipulation, sample positioning, applications with limited space, vacuum applications to 10⁻⁶ hPa (optional).

Specifications

Motion	U-521.23	U-521.24	Unit	Tolerance
Active axes	x	x		
Travel range	18	18	mm	
Velocity, closed loop	200	200	mm/s	max.
Minimum incremental motion	2	0.3	μm	typ.
System resolution	0.4	0.1	μm	
Bidirectional repeatability	±2	±0.2	μm	
Linearity error (over the entire travel range)	8	4	μm	
Pitch	±300	±300	μrad	
Yaw	±300	±300	μrad	

Positioning	U-521.23	U-521.24	Unit	Tolerance
Sensor type	Incremental encoder	Incremental encoder		
Measuring principle	Optical	Optical		
Measuring method	Direct measuring	Direct measuring		
Sensor resolution	0.4	0.1	μm	typ.

Mechanical properties	U-521.23	U-521.24	Unit	Tolerance
Compressive stress capacity	2	2	N	max.
Pull force capacity	2	2	N	max.

Drive properties	U-521.23	U-521.24	Unit	Tolerance
Motor type	PILine® ultrasonic piezo motor, performance class 1	PILine® ultrasonic piezo motor, performance class 1		
Drive force	2	2	N	max.
Holding force	2	2	N	max.

Connectors	U-521.23	U-521.24	Unit	Tolerance
Motor / sensor	1 × Sub-D 15 (m)	1 × Sub-D 15 (m)		

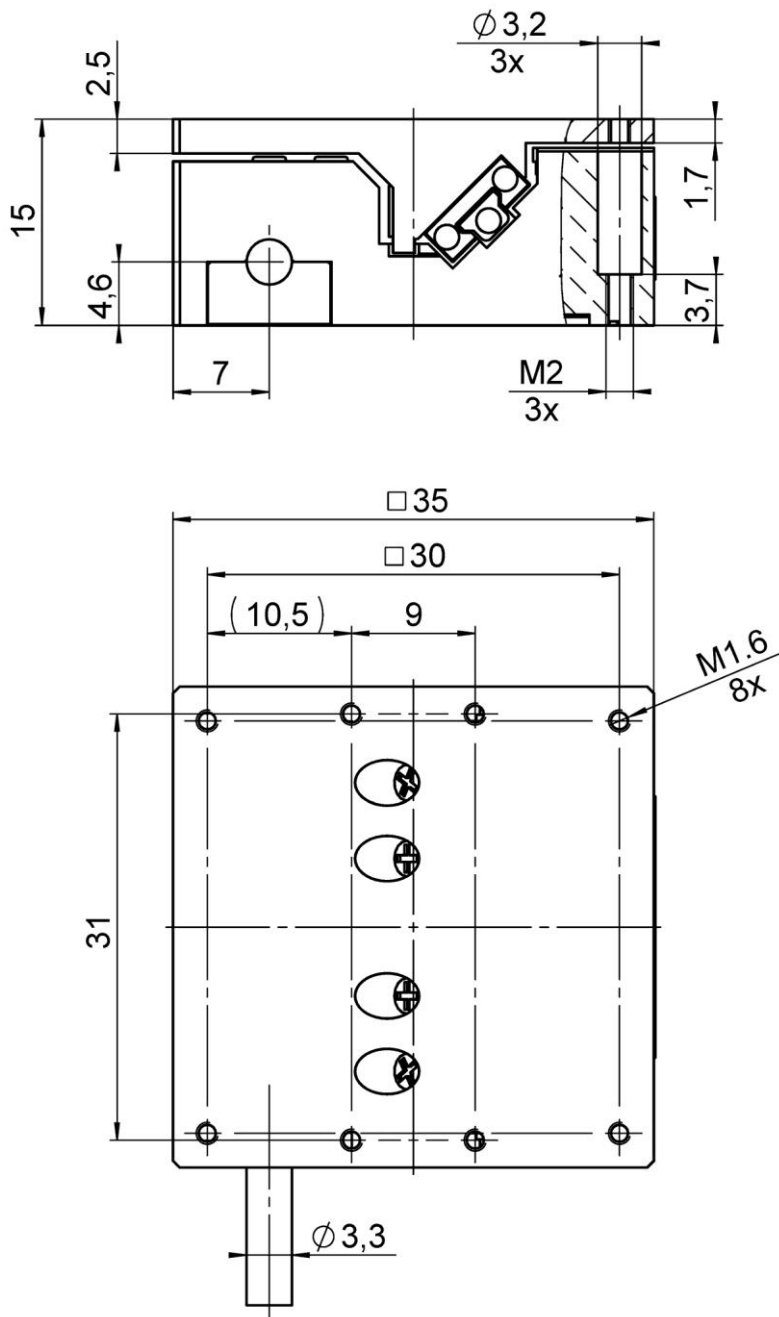
Miscellaneous	U-521.23	U-521.24	Unit	Tolerance
Reference point switch	Optical	Optical		
Operating temperature	0 to 40	0 to 40	°C	
Material	Aluminum, anodized	Aluminum, anodized		
Mass (stage without cable and connector)	40	40	g	
Mass (stage with cable and connector)	160	160	g	
Cable length	1.5	1.5	m	typ.
Recommended electronics	C-867.1U	C-867.1U		

Specifications determined with the C-867.1U controller.

All specifications based on room temperature (22 °C ±3 °C).

Vacuum versions to 10⁻⁶ hPa available on request. Specifications for vacuum versions can differ.

Drawings / Images



U-521, Dimensions in mm



Multi-axis setup consisting of two U-521 linear stages and a U-624 rotation stage, without adapter plate

Ordering Information

U-521.23

Small linear stage with PLine® ultrasonic piezo motors, 35 mm width, 2 N drive force, 18 mm travel range. direct position measurement with incremental encoder, 0.4 µm resolution, Sub-D connector

U-521.24

Small linear stage with PLine® ultrasonic piezo motors, 35 mm width, 2 N drive force, 18 mm travel range. direct position measurement with incremental encoder, 0.1 µm resolution, Sub-D connector

U-521.23V

Small linear stage with PLine® ultrasonic piezo motors, 35 mm width, 2 N drive force, 18 mm travel range. direct position measurement with incremental encoder, 0.4 µm resolution, Sub-D connector, vacuum compatible to 10⁻⁶ hPa

U-521.24V

Small linear stage with PLine® ultrasonic piezo motors, 35 mm width, 2 N drive force, 18 mm travel range. direct position measurement with incremental encoder, 0.1 µm resolution, Sub-D connector, vacuum compatible to 10⁻⁶ hPa

Accessories

U-600.A01

Extension cable for PLine®, Sub-D 15-pin, 1 m

U-600.A03

Extension cable for PLine®, Sub-D 15-pin, 3 m

U-600.A05

Extension cable for PLine®, Sub-D 15-pin, 5 m