Piezo Motor Positioners

M-660 Ultrasonic Piezo Motor Rotary Positioning Stage

Fast Positioning, Ultra-Low Profile

The M-660 PILine® rotation stage allows high positioning speeds of up to 2 full turns/sec. The 36 mm Ø clear aperture offers flexible usage

- **Unlimited Travel Range**
- **Max. Velocity 720 °/s**
- **Low Profile: Only 14 mm in Height**
- **Self-Locking Ceramic Direct Drive: Energy Saving & High Position Stability**
- **Direct Metrology Linear Encoder, up to 4 µrad Resolution**
- **PILine® Direct Drive: Non-Magnetic and Vacuum-Compatible Working Principle**
- **Compact Combinations with Linear Stages**

M-660 precision rotation stages use PILine® ultrasonic piezo motors that act on a ceramic friction ring to drive the platform. This direct drive principle allows for the compact design and low profile of the stage. An integrated incremental encoder offers precision position control with up to 4 µrad resolution. The integrated U-164 PILine® linear motors provide a maximum torque of 0.3 Nm, independent from the direction of motion, and a maximum velocity of up to 720 °/sec. The maximum load is 2 kg.

M-660s can be built in different sizes or with other specifications, and they are available upon request as vacuum-compatible versions.

Applicatotion Examples

- Biotechnology
- Micromanipulation
- Microscopy
- Quality assurance testing
- Metrology
- Mass storage device testing
- R&D
- Photonics packaging

Advantages of PILine® Micropositioning Systems

Positioning systems equipped with ceramic ultrasonic drives of the PILine® series provide several advantages over positioners that apply classic drive technology:

- Smaller dimensions
- Higher holding force when powered down; no holding current
- Increased acceleration of up to 5 g
- Increased velocity of up to 500 mm/s or 720 °/s, resp.
- No leadscrews, gears or other mechanical components, no wear or maintenance
- No lubricants
- Non-magnetic and vacuum-compatible operating principle

Optimized Controller and Drive Electronics

For optimum performance, the highly specialized C-867 motion controller (s. p. 4-116) is recommended. This dedicated piezo motor controller also integrates the drive electronics which PILine® motors require to generate the ultrasonic oscillations on the piezoceramic element.

Furthermore, the controller has a number of special characteristics to address the requirements of ultrasonic motors, such as continuous automatic drive frequency adjustment, dynamic parameter switching for optimized high-speed motion and settling behavior. The broad-band encoder input (50 MHz) supports the outstanding high accelerations and velocities of PILine® drives at high resolutions.

Ordering Information

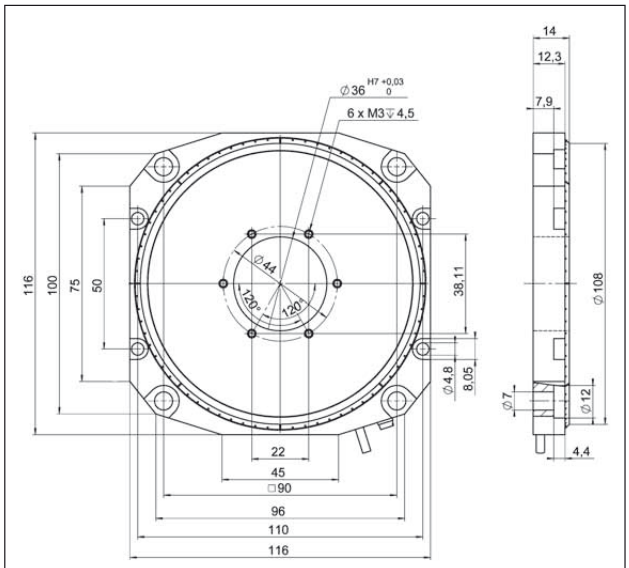
M-660.55
PILine® Rotation Stage, Ø 108 mm, 360°, 34 µrad Resolution

M-660.45
PILine® Precision Rotation Stage, Ø 108 mm, 360°, 4 µrad Resolution

Ask about custom designs!

Patented Technology

The products described in this document are in part protected by the following patents:
US Pat. No. 6,765,335
German Patent No. 10154526



M-660.55, dimensions in mm

Technical Data

Model	M-660.55 / M-660.45	Units	Tolerance
Active axes	Theta Z		
Motion and positioning			
Rotation range	No limit	°	
Integrated sensor	Incremental encoder		
Design resolution	34 (0.00195) / 4 (0.00023)	µrad (°)	typ.
Min. incremental motion	34 / 12	µrad	typ.
Bidirectional repeatability	±68 / ±24	µrad	
Max. velocity	720	°/s	
Mechanical properties			
Load capacity / axial force	20	N	max.
Holding force	0.3	Nm	max.
Max. torque cw/ccw (θ Z)	0.3	Nm	max.
Drive properties			
Motor type	2 x U-164 PILine® ultrasonic piezo drive		
Operating voltage	60 (RMS)*	V	
Current consumption**	0.3 (2 max.)	A	
Reference switch	optical		
Miscellaneous			
Operating temperature range	-20 to +50	°C	
Material	Al (black anodized)		
Mass	470	g	±5%
Cable length	1.3	m	±10 mm
Connector	MDR, 14-pin		
Recommended controller / driver	C-867 single-axis controller / driver		

* The operating voltage is supplied by the drive electronics
** For drive electronics

Ultrasonic Piezo Motor Positoner Linear Stage

Low-Profile High-Speed with Ultrasonic Piezo Linear Drives & Direct Position Measurement

Fast and compact M-664 piezo translation stage with linear encoder

- **Travel Range 25 mm**
- **Max. Velocity 400 mm/s**
- **Ultra-Low Profile, 15 mm**
- **Direct Metrology Linear Encoder with 0.1 µm Resolution**
- **High Guiding Accuracy with Crossed Roller Bearings**
- **Compact XY Combinations**
- **Piezo Linear Motor with 4 N Drive Force**
- **Self Locking at Rest**

M-664 micropositioning systems are low-profile, high-accuracy translation stages with linear encoders. The M-664 stage is next-larger in the series of piezomotor-driven stages of which the M-663 (see p. 4-28) is the smallest. For improved guiding accuracy, the M-664 uses two crossed roller bearings mounted on ground aluminum profiles. The integrated P-664 PILine® linear motor can generate forces up to 4 N and maximum closed-loop velocities to 400 mm/s over a 25 mm travel range.

Application Examples

- Biotechnology
- Micromanipulation
- Microscopy
- Quality assurance testing
- Metrology
- Mass storage device testing
- R&D
- Photonics packaging

Advantages of PILine® Micropositioning Systems

The ultrasonic piezoceramic drives used in PILine® micropositioners have a number of advantages over classical drives:

- Higher Accelerations, up to 5 g
- Speeds up to 500 mm/s
- Small Form Factor
- Self-Locking When Powered Down
- No Shafts, Gears or Other Rotating Parts
- Non-Magnetic and Vacuum-Compatible Drive Principle

Optimized Controller and Drive Electronics

PILine® motors require a special drive electronics to generate the ultrasonic oscillations for the piezoceramic element. For optimum performance the highly specialized C-867 motion controller (see p. 4-116) is recommended. This sophisticated controller also integrates the drive electronics. Furthermore, the controller has a number of special features, including dynamic parameter switching for an optimized high-speed motion and settling behavior to take into account the motion characteristics typical of piezomotors. The broad-band encoder input (50 MHz) supports the outstanding high accelerations and velocities of PILine® drives at high resolutions.

Ordering Information

M-664.164
PILine® Micro Positioning Stage with P-664 Piezo Linear Motor, 25 mm, 4 N

M-664.AP1
Adapter plate for XY-mounting of M-664, 4 mm high

Ask about custom designs!

Optionally, for use with third party servo controllers, the C-185 analog drive electronics (stand-alone unit, see p. 1-36) is available. It controls the motor speed by an analog ±10 V signal. For optimum performance this driver must be tuned together with the stage and should be ordered at the same time as the motor/stage.

Notes

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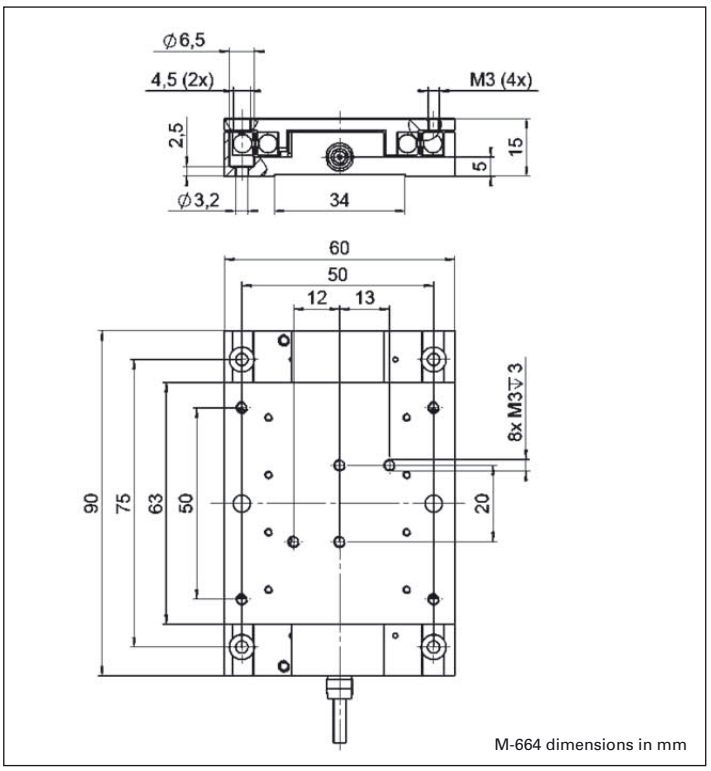
US Pat. No. 6,765,335
German Patent No. 10154526



M-664 dimensions in mm

PILine® Micropositioning stages: M-682, M-664 and M-663 (from left)

Technical Data

Model	M-664.164	Tolerance
Active axes	X	
Motion and positioning		
Travel range	25 mm	
Integrated sensor	Linear encoder	
Sensor resolution	0.1 µm	
Min. incremental motion	0.3 µm	typ.
Bidirectional repeatability	0.2 µm	typ.
Unidirectional repeatability	0.2 µm	typ.
Pitch	±50 µrad	typ.
Yaw	±50 µrad	typ.
Max. velocity	400 mm/s	
Reference switch repeatability	1 µm	typ.
Mechanical properties		
Max. load	25 N	
Max. push/pull force	4 N	
Max. holding force	3 N	
Drive properties		
Motor type	P-664 PILine® ultrasonic piezo drive	
Operating voltage	168 V (peak-to-peak) * 60 V (RMS) *	
Electrical power	10 W **	nominal
Current	800 mA **	
Limit and reference switches	Hall-effect	
Miscellaneous		
Operating temperature range	-20 to +50 °C	
Material	Al (black anodized)	
Dimensions	90 x 60 x 15 mm	
Mass	0.190 kg	±5 %
Cable length	1.5 m	±10 mm
Connector	MDR, 14-pin	
Recommended controller/driver	C-867.164 single-axis controller/driver C-185.164 drive electronics	

*The stage supply power is drawn from the drive electronics, which runs on 12 V.
**For drive electronics

Ultrasonic Piezo Motor Positoner Linear Stage

Low-Profile & High-Speed with Ultrasonic Piezomotors, Direct Position Metrology

M-683.2U4 (50 mm) low-profile translation stage with integrated high-speed ceramic linear motors

- **Max. Velocity 350 mm/s**
- **Low Profile: Only 21 mm Height**
- **Compact XY Combination Possible**
- **Up to 6 N Force Generation**
- **Direct Metrology Linear Encoder, 0.1 µm Resolution**
- **Travel Range 50 mm**
- **Excellent Guiding Accuracy Through Crossed Roller Bearings**
- **PILine®: Non-Magnetic and Vacuum-Compatible Working Principle**
- **Self Locking at Rest**

M-683 precision micropositioning stages make use of PILine® ultrasonic piezo linear motors enabling a compact design and low profile. An integrated linear encoder enables closed-loop control with 0.1 µm resolution. The M-683 translation stages use paired crossed-roller bearings mounted on ground-aluminum profiles for better guiding accuracy. Integrated U-164 PILine® linear motors provide push forces to 6 N and a maximum velocity of up to 350 mm/s. A vacuum version is available. The stages can be arranged to form compact XY systems. If an additional Z-axis is required, the M-110 microstage series (see page 4-22) is recommended due to its higher holding force. The M-683 design is scalable and can be extended to provide longer travel ranges to 300 mm.

Application Examples

- Biotechnology
- Micromanipulation
- Microscopy
- Quality assurance testing
- Metrology
- Semiconductor testing
- Mass storage device testing
- R&D
- Photonics packaging

Limit and Reference Switches

For the protection of your equipment, non-contact limit and reference switches are installed. The reference switch supports advanced automation applications with high precision.

Advantages of PILine® Micro Positioning Systems

PILine® ultrasonic ceramic drives provide several advantages over classical motors and drivers:

- Higher Acclerations, up to 5 g
- Speeds up to 500 mm/s
- Small Form Factor
- Self-Locking when Powered Down
- No Shafts, Gears or Other Rotating Parts
- No Lubricants
- Non-Magnetic and Vacuum Compatible Operating Principle

Optimized Controller and Drive Electronics

For optimum performance the highly specialized C-867 motion controller (see page 4-116) is recommended. This dedicated piezo motor controller also integrates the drive electronics which PILine® motors require to generate the ultrasonic oscillations for the piezoceramic element.

Furthermore, the controller has a number of special characteristics, including continuous automatic drive frequency adjustment, dynamic parameter switching for optimized high-speed motion and settling behavior and some other features to address the requirements of ultrasonic motors. The broad-band encoder input (50 MHz) supports the outstanding high accelerations and velocities of PILine® drives at high resolutions.

Optionally, for use with third party servo controllers, the C-185 analog drive electronics (stand-alone unit) (see page 1-36) is available. It accepts an analog ±10 V signal to control the motor velocity. For optimum performance the driver must be tuned together with the mechanics and should be ordered at the same time as the motor/stage.

Ordering Information

M-683.2U4
PILine® High-Speed Linear Stage, 50 mm, 6 N

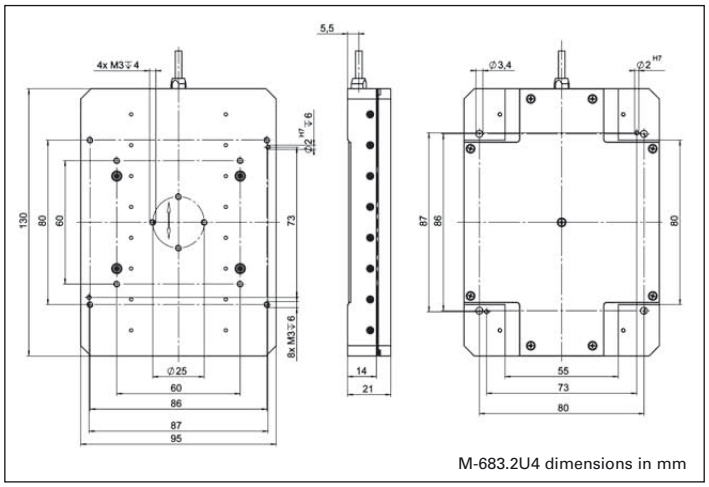
M-683.2V4
PILine® High-Speed Linear Stage, 50 mm, 6 N, Vacuum Compatible to 10^{-6} hPA

Accessories:

M-110.05
Adapter bracket for vertical mount of M-110 stages on M-683 stages

Patent Protection

The products described in this document are in part protected by the following patents:
US Pat. No. 6,765,335
German Patent No. 10154526



M-683.2U4 dimensions in mm

Technical Data

Model	M-683.2U4	Tolerance
Active axes	X	
Motion and positioning		
Travel range	50 mm	
Integrated sensor	Linear encoder	
Sensor resolution	0.1 µm	
Min. incremental motion	0.3 µm	typ.
Bidirectional repeatability	±1 µm	typ.
Unidirectional repeatability	0.2 µm	typ.
Pitch	±150 µrad	typ.
Yaw	±50 µrad	typ.
Max. velocity	350 mm/s	
Reference switch repeatability	1 µm	typ.
Mechanical properties		
Max. load capacity	50 N	
Max. push / pull force	6 N	
Max. holding force	6 N	
Drive properties		
Motor type	2 x U-164 PILine® ultrasonic piezo drive	
Operating Voltage	60 V_{rms}*	
Electrical power	15 W**	nominal
Power consumption	1.5 A**	
Reference Switch	optical	
Limit Switches	Hall-effect	
Miscellaneous		
Operating temperature range	0 to +50 °C	
Material	Al (black anodized)	
Dimensions	130 x 95 x 21 mm	
Mass	0.65 kg	±5 %
Cable length	1.5 m	±10 mm
Connector	MDR, 14-pin	
Recommended controller	C-867 PILine® controller incl. drive electronics	

*Power to the motor is supplied by the drive electronics, which runs on 12 V DC, or by the controller (24 V).
**For drive electronics
Data for vacuum version may differ. M-683.2V4: Delivery includes 1 m cable (vacuum), feedthrough an 1.5 m cable (air).

XY Ultrasonic Piezo Motor Linear Positioning Stages

Fast, Low Profile and Large Aperture with Direct Position Measurement

The M-686.D64 open-frame stage with closed-loop piezo motors provides 25 x 25 mm travel range

- **Integrated Closed-Loop Piezomotor Drives Provide High Speed to 100 mm/s**
- **Travel Ranges 25 x 25 mm**
- **Integrated Linear Encoders with 0.1 µm Resolution**
- **Compact Design: 32 mm Profile Height, 170 x 170 mm Footprint**
- **Clear Aperture 78 x 78 mm, 66 x 66 mm in Extreme Position**
- **Self-Locking at Rest**
- **Compatible with PI Piezo Nanopositioning / Scanning Stages**

M-686 open-frame piezomotor stages are mainly designed for automated positioning applications in microscopy . The optimized form factor with a low profile height of only 32 mm and the standardized mounting pattern allows the combination with many PI standard nanopositioning systems.

Application Examples

- Biotechnology
- Microscopy
- Scanning microscopy
- Confocal microscopy
- Semiconductor testing
- Handling

Space Saving Piezomotors

Compared to conventional motorized translation stages, the M-686 provides a lower profile and smaller footprint. The compact PILine® piezoelectric linear motors and high-resolution linear encoders make both, the lead screw duct and the flanged, bulky stepper motor employed in traditional stages obsolete. In addition, the piezomotors are self-locking at rest and hold the stage in a stable position without heating up.

Compatibility to PI Nanopositioning and Scanning Stages

A number of standard PI piezo flexure stages (150 x 150 mm footprint) can be mounted directly on the M-686 open-frame stage. Depending on the application, these highly specialized, ultra-precise nanopositioning systems are available as fast XY scanners (for fluorescence microscopy), as vertical Z positioners (3D imaging), or with up to 6 degrees of freedom.

Limit and Reference Switches

For the protection of your equipment, non-contact Hall-effect limit and reference switches are installed. The direction-sensing reference switch supports advanced automation applications with high precision.

Advantages of PILine® Micropositioning Systems

The ultrasonic piezoceramic drives used in Plline ® micropositioners have a number of advantages over classical drives:

- Higher Accelerations, up to 5 g
- Speeds up to 500 mm/s
- Small Form Factor
- Self-Locking When Powered Down
- No Shafts, Gears or Other Rotating Parts
- Non-Magnetic and Vacuum-Compatible Drive Principle

Ordering Information

M-686.D64
XY Open-Frame Stage with Closed-Loop PILine® Piezomotor Drives, 25 x 25 mm, 7 N, 0.1 µm Linear Encoder

Ask about custom designs!

Notes

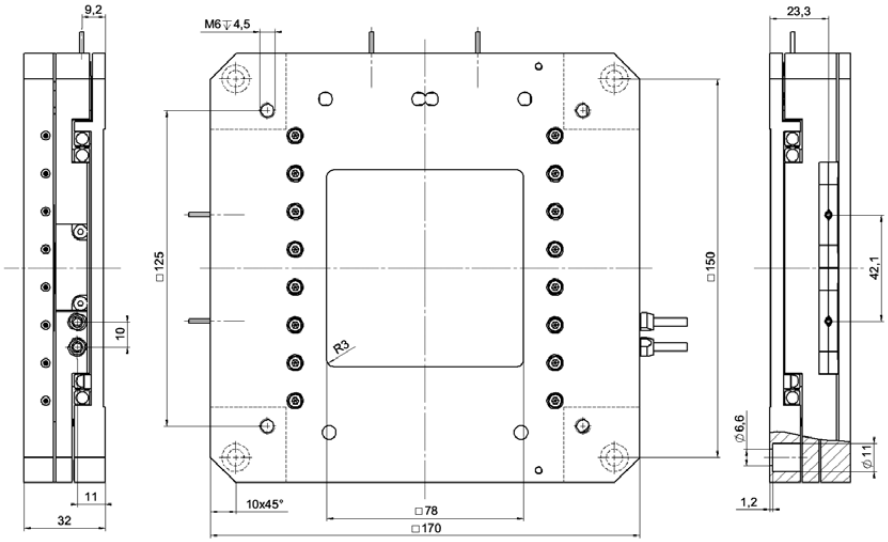
Nanopositioning stages that fit directly on the M-686:

P-561 to P-563
PIMars™ XYZ Nanopositioning systems with up to 300 µm travel

P-541.2 to P-542.2
Low-profile microscopy XY scanners

P-541.Z
Low-profile Z/tip/tilt piezo nanopositioning stages for microscopy

Customized M-686 stage with a bigger footprint, to sink the piezo Z scanner. The system height together with the P-541 piezo scanner is reduced to only 33 mm



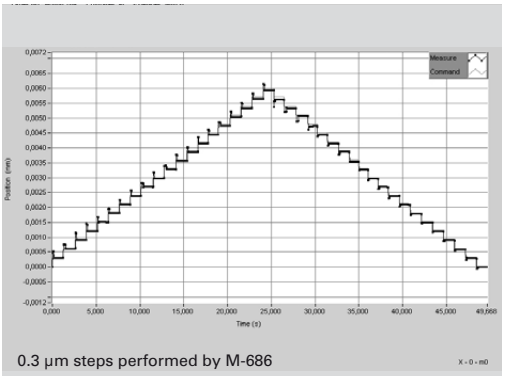
M-686.D64, dimensions in mm. The minimum aperture is 66 x 66 mm with both axes at the maximum position

Technical Data

Model	M-686.D64
Active axes	XY
Motion and positioning	
Travel range	25 x 25 mm
Integrated sensor	Linear encoder
Sensor resolution	0.1 µm
Design resolution	0.1 µm
Min. incremental motion	0.3 µm
Bidirectional repeatability	0.3 µm
Pitch / yaw	±50 µrad
Max. velocity	100 mm/s
Mechanical properties	
Load Capacity*	50 N
Max. push/pull force	7 N
Max. lateral force	4 N
Drive properties	
Motor type	2 x PILine® P-664 per axis
Operating voltage	190 V (Peak-Peak)** 67 V (RMS)**
Electrical power	10 W / axis***
Miscellaneous	
Operating temperature range	-20 to +50 °C
Material	Aluminium (black anodized)
Mass	1.2 kg
Cable length	1.5 m
Connector	2 x MDR connector, 14-pin
Recommended controller/driver	2 x C-867.D64 single-axis controller / driver 2 x C-185.D64 single-axis drive electronics for external servo-controllers (p. 4-116, p. 1-36)

*10 N for max. velocity
**The operating voltage or the piezomotor is supplied by the drive electronics which requires 12 VDC
***For drive electronics

M-686 open-frame stage with P-541.2DD piezo scanner on top, providing a resolution of 0.1 nm and a scanning range of 30 x 30 µm. The system height of the combination with the P-541 XY (or Z) piezo scanner is only 48 mm



0.3 µm steps performed by M-686

Compact Ultrasonic Piezo Motor Positioner

Compact, Fast, with Ultrasonic Piezo Linear Drives, Direct Position Measurement

PILine® M-663 micropositioning stages with integrated linear encoder and C-867 controller/driver in the background

- **Smallest Translation Stage with Closed-Loop Linear Motor and Encoder**
- **Travel Range 19 mm**
- **Max. Velocity 400 mm/s**
- **Acceleration up to 10 g**
- **Direct Metrology Linear Encoder**
- **0.1 µm Resolution**
- **XY Combination Possible**
- **Vacuum-Compatible Versions Available**

PILine® M-663 micropositioning systems offer high velocities of up to 400 mm/s and travel ranges of 19 mm in a compact package. The M-663 is the smallest closed-loop translation stage with piezomotor drives currently on the market. Its square footprint makes it suitable for use in compact XY configurations.

Application Examples

- Biotechnology
- Micromanipulation
- Microscopy
- Quality assurance testing
- Metrology
- Mass storage device testing
- R&D
- Photonics packaging

Working Principle

PILine® motors have a new, patented, ultrasonic drive developed by PI. The core piece of the system is a piezoceramic plate, which is excited to produce high-frequency eigenmode oscillations. A friction tip attached to the plate moves along an inclined linear path at the eigenmode frequency. Through its contact with the friction bar, the moving part of the mechanics drives forward or backwards. With each oscillatory cycle, the mechanics executes a step of a few nanometers; the macroscopic result is smooth motion with a virtually unlimited travel range.

Advantages of PILine® Micropositioning Systems

The ultrasonic piezoceramic drives used in PILine® micropositioners have a number of advantages over classical drives:

- Higher Accelerations, up to 5 g
- Speeds up to 500 mm/s
- Small Form Factor
- Self-Locking When Powered Down
- No Shafts, Gears or Other Rotating Parts
- Non-Magnetic and Vacuum-Compatible Drive Principle

Optimized Controller and Drive Electronics

PILine® motors require a special drive electronics to generate the ultrasonic oscillations for piezoceramic element. For optimum performance the highly specialized C-867 (see p. 4-116) motion controller is recommended. This sophisticated controller also inte-grates the drive electronics. Furthermore, the controller has a number of special features, including dynamic parameter switching for an optimized high-speed motion and settling behavior to take into account the motion characteristics typical of piezomotors. The broad-band encoder input (50 MHz) supports the outstanding high accelerations and velocities of PILine® drives at high resolutions.

Optionally, for use with third party servo controllers, the C-185 analog drive electronics (stand-alone unit) is available. It controls the motor speed by an analog ±10 V signal. For optimum performance the driver must be tuned together with the mechanics and should be ordered at the same time as the motor/stage.

Ordering Information

M-663.465
PILine® Translation Stage, 19 mm, Linear Encoder, 0.1 µm Resolution

M-663.Y65
PILine® Translation Stage, 19 mm, Linear Encoder, 0.1 µm Resolution, turned cable outlet, XY mountable

M-663.46V
PILine® Translation Stage, 19 mm, Linear Encoder, 0.1 µm Resolution, Vacuum Compatible to 10^{-6} hPa

Accessories:

C-867.161
Piezomotor Controller with Drive Electronics, 1 Channel, for PILine® Systems with P-661 Motors

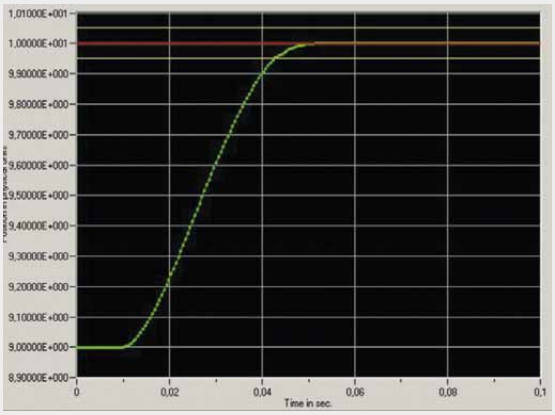
Driver for use with separate controller:

C-185.161
Analog Stand-Alone Drive Electronics with Power Supply for PILine® P-661 Motors

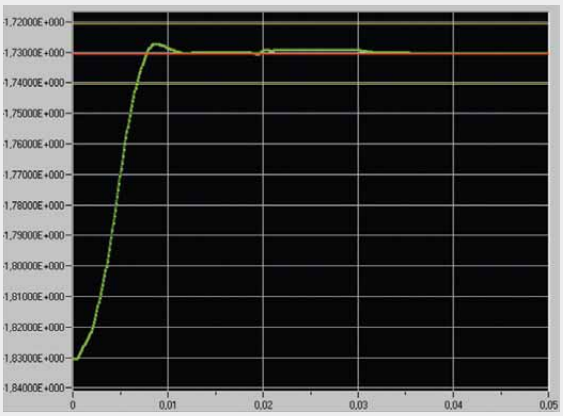
Note

The products described in this document are in part protected by the following patents:
US Pat. No. 6,765,335
German Patent No. 10154526

XY combination of two M-663s; CD for size comparison



A 1 mm step performed by an M-663 stage with 300 g load controlled by a C-867 controller/driver reaches the end position in less than 40 ms

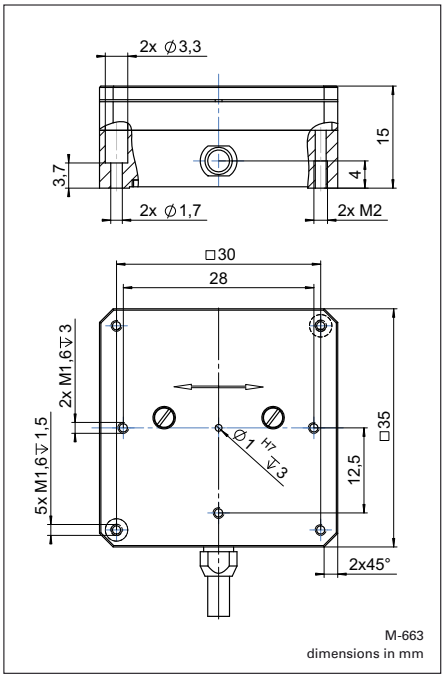


An M-663 with 100 g load settles to 0.1 µm accuracy in 10 ms after a 100 µm step, measured with C-867 controller/driver

Technical Data

Model	M-663.465	Units	Tolerance
Active axes	X		
Motion and positioning			
Travel range	19	mm	
Integrated sensor	Linear encoder		
Sensor resolution	0.1	µm	
Min. incremental motion	0.3	µm	typ.
Bidirectional repatability	±0.3	µm	typ.
Unidirectional repeatability	0.2	µm	typ.
Pitch	300	µrad	typ.
Yaw	300	µrad	typ.
Max. velocity	400	mm/s	
Reference switch repeatability	1	µm	typ.
Mechanical properties			
Max. load	5	N	
Max. push/pull force	2	N	
Max. holding force	2	N	
Drive properties			
Motor type	P-661 PILine® ultrasonic piezomotor		
Motor voltage range	120 (peak-peak)* 42 (RMS)*	V	
Electrical power	5**	W	nominal
Current	400**	mA	
Reference switch	Hall-effect		
Miscellaneous			
Operating temperature range	-20 to +50	°C	
Material	Al (black anodized)		
Dimensions	35 x 35 x 15	mm	
Mass	40	g	±5 %
Cable length	1.5	m	±10 mm
Connector	MDR, 14-pin		
Recommended controller/driver	C-867.161 Single-axis controller/driver (p. 4-116) C-185.161 Drive electronics (p. 1-36)		

*Power is supplied by the drive electronics which runs on 12 V DC
**For drive electronics



M-663
dimensions in mm

Miniature Ultrasonic Piezo Motor Positioner, Open-Loop

With Ultrasonic Piezo Linear Drives

PILine® M-662 (left side) and M-661 stages are the smallest piezo-motor -driven translation stages available on the market that achieve speeds of up to 500 mm/s

- **Smallest Translation Stages with Linear Motor Drive**
- **Travel Ranges to 20 mm**
- **Max. Velocity 500 mm/s**
- **Acceleration to 5 g**
- **Incremental Motion to 50 nm**
- **Self Locking at Rest**
- **XY-Combination Possible**
- **MTBF 20.000 h**
- **Vacuum Versions to 10^{-7} hPa**

M-661 and M-662 PILine® translation stages offer acceler ations to 5 g with millisecond response and velocities to 500 mm/sec in an extremely compact package. Providing travel ranges to 20 mm, they are among the smallest motorized translation stages currently on the market. Both models are designed for open-loop operation (a similar closed-loop stage with linear encoder is available as model M-663. The M-662, with its square footprint, is also suitable for use in XY confi gurations. For applications where the smallest dimensions are essential, the P-652 micro stage is offered.

Application Examples

- Biotechnology
- Micromanipulation
- Microscopy
- Quality assurance testing
- Semiconductor testing
- Metrology
- Mass storage device testing
- R&D
- Photonics packaging

Working Principle

PILine® piezo motors use a new, patented, ultrasonic drive developed by PI. A the heart of the system is a piezo ceramic plate, which is excited with high-frequency eigen mode oscillations. A friction tip attached to the plate moves along an inclined linear path at the eigenmode frequency . Through its contact with the friction bar, the moving part of the mechanics drives forward or backwards. With each oscillatory cycle, the mech anics execute a step of a few nanometers; the macro scopic result is smooth motion with a virtually unlimited travel range.

Advantages of PILine® Micropositioning Systems

The ultrasonic piezoceramic drives used in PILine® micropositioners have a number of advantages over classical drives:

- Higher Accelerations, up to 5 g
- Speeds up to 500 mm/s
- Small Form Factor
- Self-Locking When Powered Down
- No Shafts, Gears or Other Rotating Parts
- Non-Magnetic and Vacuum-Compatible Drive Principle

Choice of Drive Electronics

Special driver electronics are required to create the ultrasonic oscillations for PILine® piezo-motors. The driver controls the motor speed as a function of an analog ±10 V signal. The driver is not included, as it is available in different versions, from the low-priced C-184.161 OEM-board to the C-185.161 bench-top unit. The stage and the driver electronics, however, must be ordered together , so that they can be tuned to one-another for optimum perform ance.

Ordering Information

M-661.370
PILine® Translation Stage, 18 mm, Open-Loop

M-662.470
PILine® Translation Stage, 20 mm, Open-Loop, XY Mountable

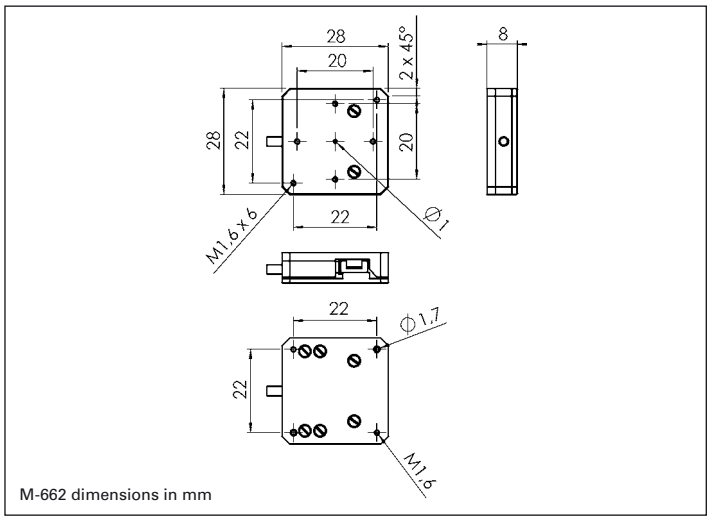
Accessories:

C-184.161
Analog OEM Driver Board for PILine® P-661 Motors

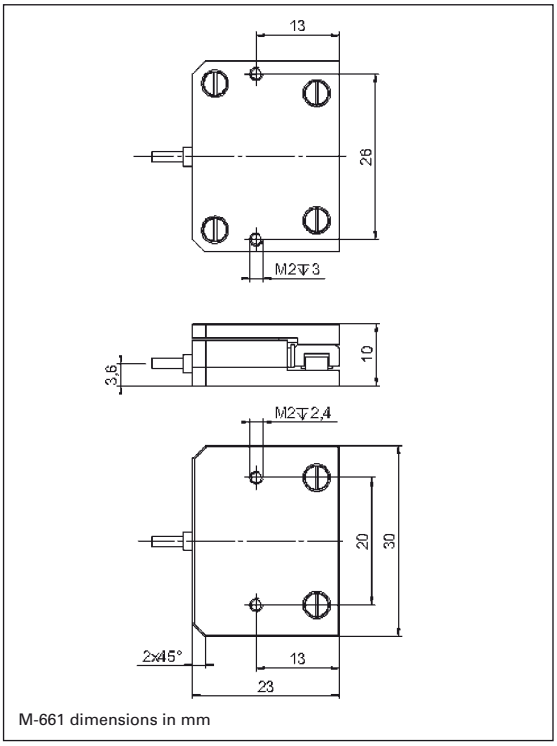
C-185.161
Analog Stand-Alone Drive Electronics with Power Supply for PILine® P-661 Motors

Notes

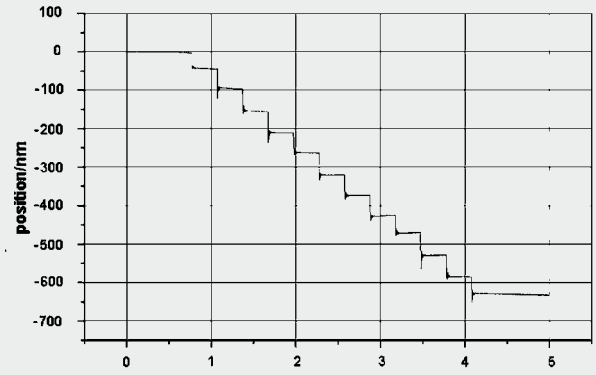
The products described in this document are in part protected by the following patents:
US Pat. No. 6,765,335
German Patent No. 10154526



M-662 dimensions in mm



M-661 dimensions in mm



50 nm steps created with a system incorporating an M-662.470 open-loop piezo linear motor stage

Technical Data

Model	M-661.370	M-662.470	Units	Tolerance
Motion and positioning				
Travel range	18	20	mm	
Min. incremental motion	0.05*	0.05*	µm	typ.
Max. velocity	500	500	mm/s	
Mechanical properties				
Max. load	5	5	N	
Max. push/pull force	1	1	N	
Max. holding force	2	2	N	
Drive properties				
Motor type	P-661 PILine® ultrasonic piezomotor drive	P-661 PILine® ultrasonic piezomotor drive		
Operating voltage	120 (Peak-Peak)** 42 (RMS)**	120 (Peak-Peak)** 42 (RMS)**	V	
Electrical power	5***	5***	W	nominal
Current 400***		400***	mA	
Miscellaneous				
Operating temperature range	-20 to +50	-20 to +50	°C	
Material	Al (black anodized)	Al (black anodized)		
Dimensions	30 x 23 x 10	28 x 28 x 8		
Mass	0.03	0.03	kg	±5 %
Cable length	1.5	1.5	m	±10 mm
Connector	LEMO connector	LEMO connector		
Recommended controller/driver	C-184.161 OEM board C-185.161 Bench-top	C-184.161 OEM board C-185.161 Bench-top (p. 1-36)		

*The minimum incremental motion is a typical value that can be achieved in the open-loop mode of a piezomotor stage. To obtain it, it is important to follow the mounting guidelines in the motor documentation.
**The stage supply power is drawn from the drive electronics, which runs on 12 VDC.
***For drive electronics.

Program Overview

- Piezo Ceramic Actuators & Motors
- Piezo Nanopositioning Systems and Scanners
- Active Optics / Tip-Tilt Platforms
- Capacitive Nanometrology Sensors
- Piezo Electronics: Amplifiers and Controllers
- Hexapod 6-Axis Positioners / Robots
- Micropositioning Stages & Actuators
- Photonics Alignment Systems, Solutions for Telecommunications
- Motor Controllers
- Ultrasonic Linear Motors

Request or download the complete PI Nanopositioning & Piezo Actuator Catalog

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