

M-665

PILine® Low-Profile Translation Stages with Closed-Loop Ultrasonic Piezo Linear Motors

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Low-Profile PILINE® M-665 piezo linear motor stage with integrated linear encoder.

- 50 mm Travel
- Low-Profile, only 26.5 mm
- Velocity to 400 mm/s
- Acceleration to 20 g
- 0.1 µm Linear Encoder (Direct-Motion Metrology)
- AutoLock Feature
- XY Combinations Available
- 20,000 h MTBF
- Vacuum Versions to 10⁻⁸ hPa Available

PILine® – Ultimate Motion in the Smallest Package

PILine® M-665 micropositioning systems are low-profile, high-accuracy piezo-motor-driven

translation stages with linear encoders and high-precision guidings.

Working Principle

M-665 stages have a new, patented, ultrasonic drive developed by PI. The highly compact, integrated P-665 piezomotor drive can provide accelerations of up to 20 g and velocities of up to 400 mm/s, together with high resolution and holding force. Because the ceramic stator is pressed against a slider in the stage, piezomotors resist motion with an intrinsic holding force when the stage is at rest. The result is very high position stability without the heat dissipation common with conventional

linear motors. Furthermore, there are no gears, leadscrews or other mechanical components to contribute play or backlash.

Direct-Motion Metrology with 0.1 µm Resolution

M-665 stages are equipped with high-resolution direct-measuring optical linear encoders. Two different models are available: The M-665.265 for operation with PI's C-865 controller (see page 10-22) and the M-665.285 for operation with conventional servo-controllers.

M-665.265 with C-865.165: Optimized for High Velocity and Fast Settling

The M-665.265 is designed for operation with the C-865.161 piezomotor controller. That specialized controller achieves speeds of up to 400 mm/s with very short settling times, and has integrated drive electronics for the M-665.265.

M-665.285 with C-185.165: For Operation with Conventional Servo-Controllers

The M-665.285 is designed for operation with conventional servo-controllers. This requires the C-185.165 external drive electronics, which accepts a ±10 V analog signal from the controller, for example controllers from different manufacturers such as GALIL, NI or DeltaTau, which also provide special options for piezo linear motors. Please request more information from the corresponding supplier. With non-PI controllers, the maximum closed-loop velocity depends on the design.

Accessories

For the operation of PILINE® stages and piezo linear motors, a drive electronics is required. The driver is necessary to create

Ordering Information

M-665.265
PILine® Low-Profile Translation Stage with P-665 Piezo Linear Motor, 50 mm Travel, 0.1 µm Linear Encoder, for C-865.165 Controller/Driver

M-665.26V
Vacuum-Compatible Version of the M-665.265 to 10⁻⁸ hPa

M-665.285
PILine® Low-Profile Translation Stage with P-665 Piezo Linear Motor, 50 mm Travel, 0.1 µm Linear Encoder, for C-185.165 Drive Electronics

Accessories

C-865.165
Piezomotor Controller with Drive Electronics, 1 Axis, for PILINE® Systems with P-665 Motors

C-185.165
Analog Drive Electronics for PILINE® P-665 Piezo Linear Motors or Translation Stages with P-665 Motors; with Power Supply

the ultrasonic oscillations of the piezoceramic actuator of the motor. The choice of the drive electronics depends on the application and the motion controller used and is therefore not part of delivery of a PILINE® stage or motor. The unit with the drive electronics, however, must be ordered at the same time as the stage, so that they can be tuned for optimum performance with each other.

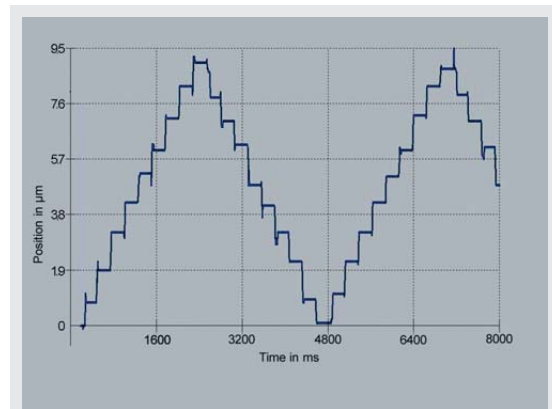
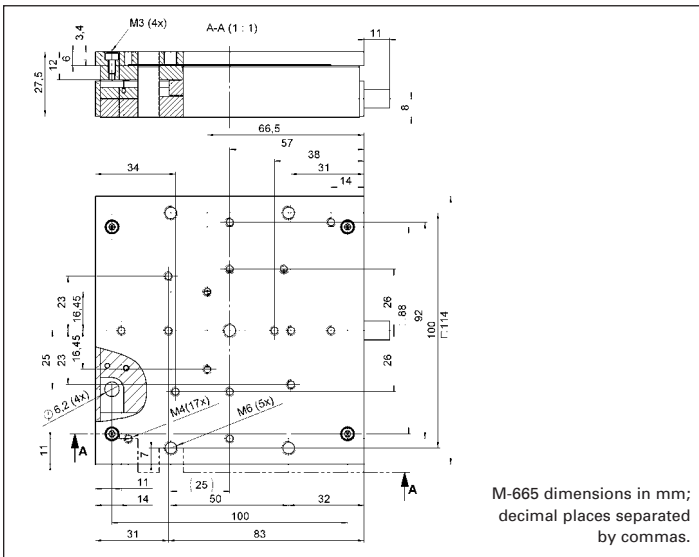
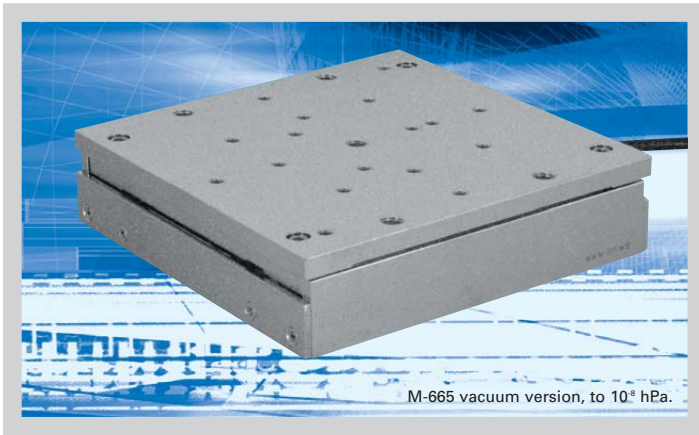
Notes

For more information on the advantages of PILINE® systems, see page 10-5.

The products described in this datasheet are in part protected by the following patents:
German Patent No. 19945042

Application Examples

- Biotechnology
- Micromanipulation
- Microscopy
- Quality control
- Semiconductor test equipment
- Metrology
- Mass storage testing
- R&D
- Photonics packaging



PILine® Piezo linear motor stage performing 1 μm steps. Piezomotors are self-locking. After a stable position is reached, there is no servo dither as common with other linear motors.

Technical Data

Models	M-665.265	M-665.285	Units	Notes see p. 10-28
Travel range	50	50	mm	
Design resolution	0.1	0.1	μm	A3
Min. incremental motion	0.2	0.2	μm	A4
Unidirectional repeatability	±0.3	±0.3	μm	
Pitch θ_x	70	70	μrad	
Yaw θ_y	70	70	μrad	
Encoder bandwidth	32	12	MHz	
Max. speed	400	400*	mm/s	
Max. load	50	50	N	B1
Max. push/pull force	4	4	N	B2
Max. holding force	5	5	N	
Integrated piezomotor	P-665	P-665		
Operating current	<800	<800	mA	
Weight	0,8	0,8	kg	
Body material	Al	Al		L
Recommended controller/driver	C-865.165	C-185.165 drive electronics + separate controller**		see p. 10-22 ff.

* Depends on controller.

** If using an NI controller, we recommend the C-809 Motion Interface (see p. 9-26). With GALIL controllers, the C-809.G40 cable adapter can be used.

Piezo Actuators

Nanopositioning & Scanning Systems

Active Optics / Steering Mirrors

Tutorial: Piezo-electrics in Positioning

Capacitive Position Sensors

Piezo Drivers & Nanopositioning Controllers

Hexapods / Micropositioning

Photonics Alignment Solutions

Motion Controllers

Ceramic Linear Motors & Stages

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