M-663

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

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M-663 with C-865 controller/driver.

- **Smallest Translation Stage with Closed-Loop Linear Motor Drive and Linear Encoder**
- **20 mm Travel Range**
- **Velocity up to 500 mm/s**
- **Accelerations up to 20 g**
- **Resolution to 0.1 µm**
- **Integrated Direct-Metrology Linear Encoder**
- **AutoLock Feature**
- **XY Combinations Available**
- **20,000 h MTBF**
- **Vacuum Versions Available**

PILine® – Ultimate Motion in the Smallest Package

PILine® M-663 micropositioning systems are the smallest piezo-motor-driven translation stages with linear encoders currently available on the market.

Application Examples

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

Working Principle

M-663 stages have a new, patented, ultrasonic drive developed by PI. The highly compact, integrated P-661 piezomotor drive can provide accelerations of up to 20 g and velocities of up to 500 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-663 stages are equipped with high-resolution, direct-measuring optical linear encoders. Two different models are available: The M-663.465 for operation with PI's C-865 controller (see page 10-22) and the M-663.485 for operation with conventional servo-controllers.

M-663.465 with C-865.161: Optimized for High Velocity and Fast Settling

The M-663.465 is designed for operation with the C-865.161 piezomotor controller. That specialized controller achieves speeds of up to 500 mm/s with very short settling times, and has integrated drive electronics for the M-663.465.

M-663.485 with C-185.161: For Operation with Conventional Servocontroller

The M-663.485 is designed for operation with conventional servo-controllers from different manufacturers such as GALIL, NI or DeltaTau, which also provide special options for piezo linear motors. This requires the C-185.161 external drive electronics which accepts a ±10 V analog signal from the controller. Please request more information from the corresponding supplier. With non-PI controllers, however, the maximum closed-loop velocity is limited to 400 mm/s because the encoder bandwidth of the M-663.485 is limited at 12 MHz.

Accessories

For the operation of PILine® stages and piezo linear motors, a special drive electronics is – either integrated in the C-865 controller or separate – required. The driver is necessary to create 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.

Ordering Information

M-663.465
PILine® Micropositioning Stage with P-661 Piezo Linear Motor, 20 mm Travel, 0.1 µm Linear Encoder, for C-865.161 Controller/Driver

M-663.485
PILine® Micropositioning Stage with P-661 Piezo Linear Motor, 20 mm Travel, 0.1 µm Linear Encoder, for C-185.161 Drive Electronics

Accessories

C-865.161
Piezomotor Controller with Drive Electronics, 1 Axis, for PILine® Systems with P-661 Motors

C-185.161
Analog Drive Electronics for PILine® P-661 Piezo Linear Motors or Translation Stages with P-661 Motors; with Power Supply

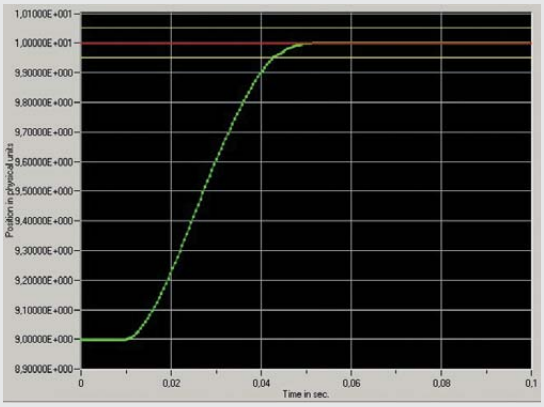
Ask about custom designs!

Notes

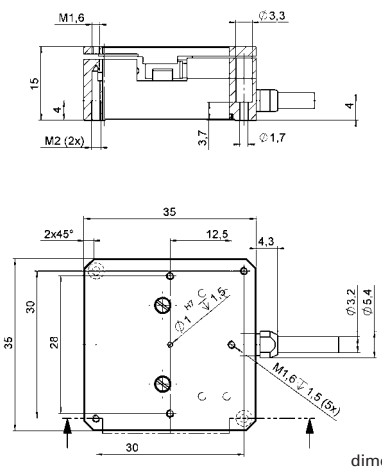
For more information on the advantages of PILine® systems, see page 10-5.

The products described in this datasheet are in part protected by the following patents:
US-Patent No. 6,765,335

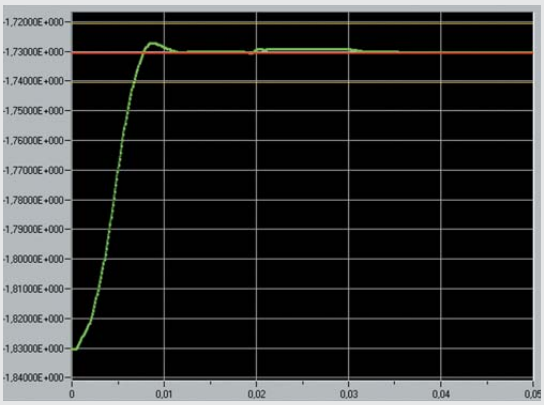
XY combination of two M-663s (one is a special version with side cable entry). CD for size comparison.



A 1 mm step performed by an M-663.465 stage with 300 g load controlled by a C-865 Controller/Driver reaches the end position in less than 40 ms.



M-663
dimensions in mm;
decimal places separated by commas.



An M-663.465 with 100 g load settles to 0.1 µm accuracy in 10 ms after a 100 µm step, measured with C-865 Controller/Driver.

Technical Data

Models	M-663.465	M-663.485	Units	Notes, see page 10-28
Travel range	20	20	mm	
Design resolution	0.1	0.1	µm	A3
Min. incremental motion	0.1	0.1	µm	A4
Bidirectional repeatability	±0.3	±0.3	µm	
Max. speed	500	400*	mm/s	
Max. load	5	5	N	B1
Max. push/pull force	1	1	N	B2
Max. holding force	2	2	N	
Operating voltage (drive electronics)	12	12	V	
Operating voltage (piezo)	60	60	V	
Integrated piezomotor	P-661	P-661		
Operating current	<500	<500	mA	
Weight	0.05	0.05	kg	
Dimensions (L x W x H)	35 x 35 x 15	35 x 35 x 15	mm	
Body material	Al	Al		L
MTBF	>20,000	>20,000	mm	
Recommended controller/driver	C-865	C-185 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 page 9-26). For GALIL controllers, the C-809.G40 Cable Adapter can be used.