

M-110 • M-111 • M-112 Compact Micro-Translation Stage

Choice of Drives & Travel Ranges, XY(Z) Combinations Possible



M-112.2DG, M-111.2DG, M-110.2DG
(from front to back) providing 25 mm,
15 mm and 5 mm travel range

- Travel Ranges 5, 15 and 25 mm
- Very Cost Effective
- Min. Incremental Motion to 50 nm
- Max. Velocity 2 mm/s
- Closed-Loop DC Motors and Stepper Motors
- Non-Contact Limit and Reference Switches
- Optional Recirculating Ball Screw Drives Provide High Speeds & Long Lifetimes
- Vacuum-Compatible Versions Available to 10^{-6} hPa

M-110, M-111 and M-112 are ultra-high resolution motorized translation stages providing linear motion of 5 to 25 mm in an extremely compact package. They feature a precision lead-screw with sub-micron resolu-

tion and precision linear ball bearings guaranteeing $<0.5 \mu\text{m}$ straightness of travel.

Compact Dimensions, High Performance

To meet industrial demands, the M-11x.2 linear translation stages are equipped with a recirculating ball screw for precise motion with reduced friction. This allows 24/7 duty cycles. M-110, M-111 and M-112 can be combined to XY and XYZ systems for multiaxis alignment applications.

Stepper and Servo Motors

A miniature DC or stepper motor actuates motion via a backlash-compensated screw /

Ordering Information

Translation stage

- 0 Travel Range 5 mm
- 1 Travel Range 15 mm
- 2 Travel Range 25 mm

M-11

- 1 Leadscrew
- 2 Ball screw

- DG DC Motor Gearhead
- 2S Stepper Motor with Gearhead

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nut system and gearhead. Both drive options provide a cost-effective solution for industrial and OEM environments. To meet the most critical positioning demands, the DC motor is equipped with a high resolution encoder featuring resolution down to $0.007 \mu\text{m}$ per count.

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.

All stages include an integral 0.5 m cable with 15-pin sub-D connector and come with a 3 m extension cable. On the DC servo versions, the connector features integrated line drivers for cable lengths up to 10 meters between stage and controller (DC-motors only).

Low Cost of Ownership

The combination of these positioners with the networkable, single-channel C-863 Mercury™ (DC-Motor, see p. 4-114) or C-663 Mercury™ Step (see p. 4-112) controller offers high performance for a very competitive price in both single- and multiaxis configurations. For 3 or 4 axes, the C-843 PC plug-in board for DC motors (see p. 4-120) can also be recommended.



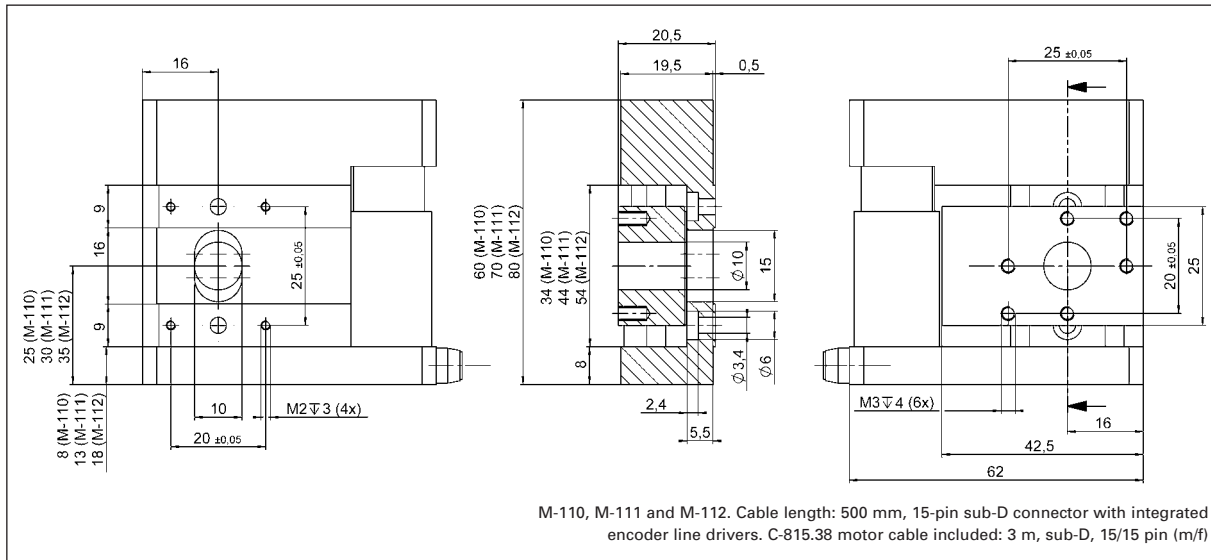
F-130 fiber alignment system consisting of an M-110 XYZ positioning system and a P-611 XYZ Piezo-Nano Positioning system. This combination can be operated by the C-880 controller or NI controllers (request our technote!)

Note

See "Accessories" (see p. 4-89 ff) for adapters, brackets, etc.

Application Examples

- Fiber optics testing
- Fiber positioning
- Metrology
- Micromachining
- Photonics packaging
- Quality assurance testing
- Testing equipment



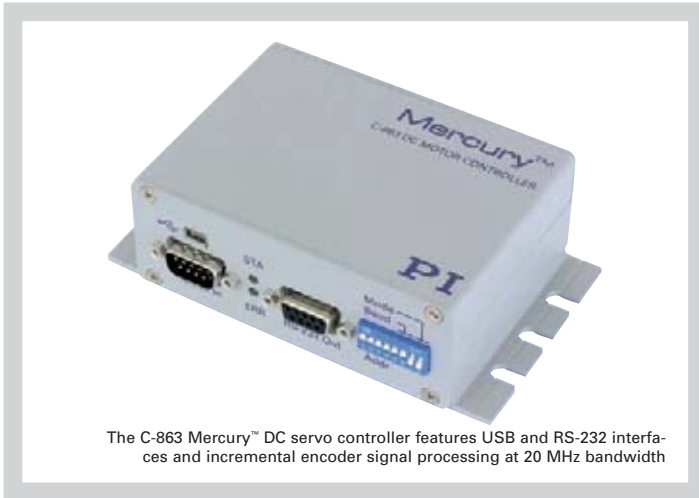
Technical Data

Model	M-110.1DG / M-111.1DG / M-112.1DG	M-110.12S / M-111.12S / M-112.12S	M-110.2DG / M-111.2DG / M-112.2DG	M-110.22S / M-111.22S / M-112.22S	Units
Motion and positioning					
Travel range	5 / 15 / 25	5 / 15 / 25	5 / 15 / 25	5 / 15 / 25	mm
Integrated sensor	Rotary encoder	–	Rotary encoder	–	
Sensor resolution	2048		2048		Cts./rev.
Design resolution	0.0069	0.038*	0.0086	0.046*	µm
Min. incremental motion	0.05	0.05	0.2	0.2	µm
Backlash	2	2	4	4	µm
Unidirectional repeatability	0.1	0.1	0.5	0.5	µm
Pitch / Yaw	±50 / ±150 / ±150	±50 / ±150 / ±150	±50 / ±150 / ±150	±50 / ±150 / ±150	µrad
Max. velocity	1 / 1.5 / 1.5	1 / 1 / 1	1.5 / 2 / 2	1 / 1 / 1	mm/s
Mechanical properties					
Drive screw	Leadscrew	Leadscrew	Recirculating ballscrew	Recirculating ballscrew	
Thread pitch	0.4	0.4	0.5	0.5	mm
Gear ratio	28.44444:1	28.44444:1	28.44444:1	28.44444:1	
Motor resolution*	–	384*	–	384*	
Max. load	30 / 30 / 20	30 / 30 / 20	30 / 30 / 20	30 / 30 / 20	N
Max. push / pull force	10	10	10	10	N
Max. holding force	10	10	10	10	N
Max. lateral force	15 / 10 / 10	15 / 10 / 10	15 / 10 / 10	15 / 10 / 10	N
Drive properties					
Motor type	DC-motor, gearhead	2-phase stepper motor	DC-motor, gearhead	2-phase stepper motor	
Operating voltage	0 to ±12	24	0 to ±12	24	V
Electrical power	0.52 / 1.75 / 1.75	1.5	0.52 / 1.75 / 1.75	1.5	W
Current consumption	160 / 320 / 320**		160 / 320 / 320**		mA
Limit and reference switches	Hall-effect	Hall-effect	Hall-effect	Hall-effect	
Miscellaneous					
Operating temperature range	-20 to +65	-20 to +65	-20 to +65	-20 to +65	°C
Material	Al (black anodized)	Al (black anodized)	Al (black anodized)	Al (black anodized)	
Mass	0.3 / 0.4 / 0.5	0.3 / 0.4 / 0.5	0.3 / 0.4 / 0.5	0.3 / 0.4 / 0.5	kg
Recommended controller/driver	C-863 single-axis C-843 PCI board, for up to 4 axes	C-863 single-axis	C-863 single-axis C-843 PCI board, for up to 4 axes	C-863 single-axis	

*2-phase stepper motor, 24 V chopper voltage, max. 0.25 A/phase, 24 full steps/rev., motor resolution with C-663 stepper motor controller

**thermally limited

C-863 Mercury™ Servo Controller 1-Axis DC-Servo-Motor Controller with Network Feature



The C-863 Mercury™ DC servo controller features USB and RS-232 interfaces and incremental encoder signal processing at 20 MHz bandwidth

- High Performance at Low Cost
- DC Servo-Motor Controller Supplies up to 30 W
- 20 MHz Encoder Input for High Speed & Resolution
- Macro Programmable Stand-Alone Functionality
- Network Capability for Multi-Axis Applications
- Non-Volatile EEPROM for Macros and Parameters
- Digital I/O Lines (TTL)
- Motor-Brake Control
- USB and RS-232 Interface
- Optional Joystick for Manual Control
- Works with All PI Micropositioners

The latest generation Mercury™ C-863 servo motor controller is even more powerful and versatile than its predecessors. Easy data interchange with laptop or PC is possible via the USB interface. The RS-232 interface provides for easy integration in industrial applications. The compact design with its integrated amplifier makes it ideal for building high-performance,

cost-effective micropositioning systems.

Flexible Automation

The Mercury™ offers a number of features to achieve automation and handling tasks in research and industry in a very cost-effective way. Programming is facilitated by the high-level mnemonic command language with macro and compound-command functionality. Macros can be stored in the non-volatile memory for later recall.

Stand-alone capability is provided by a user-programmable autostart macro to run automation tasks at power up (no runtime computer communication required!).

For easy synchronization of motion with internal or external trigger signals four input and four output lines are provided.

Multi-Axis Control, Combination of DC & Stepper Motors

Up to 16 C-863 Mercury™ DC servo controllers and C-663 stepper motor controllers can be daisy-chained and addressed via the same interface.

The networking feature allows the user to start out with one controller and add more units later for multiaxis setups.

Easy Programming

All servo and stepper motor controllers of the Mercury™ family can be operated using the PI general command set (GCS). PI-GCS allows networking of different controller units, both for piezo-based and motorized positioning units, with minimal programming effort. In addition, the C-863 can be programmed using the native command set of previous Mercury™ controllers.

Cost-Saving Due to Integrated Amplifier and PWM Outputs

The unique Mercury™ concept combines a high-performance motion controller and an integrated power amplifier in a small package. Additional PWM control outputs allow the direct operation of any DC-motor-driven PI micro-positioning system—even high-speed stages such as the M-500 ActiveDrive™ Translation Stages—reducing costs, increasing reliability and simplifying the setup.

Contents of Delivery

Each controller is delivered with a wide-range power sup-

Ordering Information

C-863.10
Mercury™ DC-Motor Controller, 1 Channel, with Wide-Range Power Supply

C-819.20
2-Axis Analog Joystick for Mercury™ Controller

C-819.20Y
Y-Cable for Connecting 2 Controllers to C-819.20

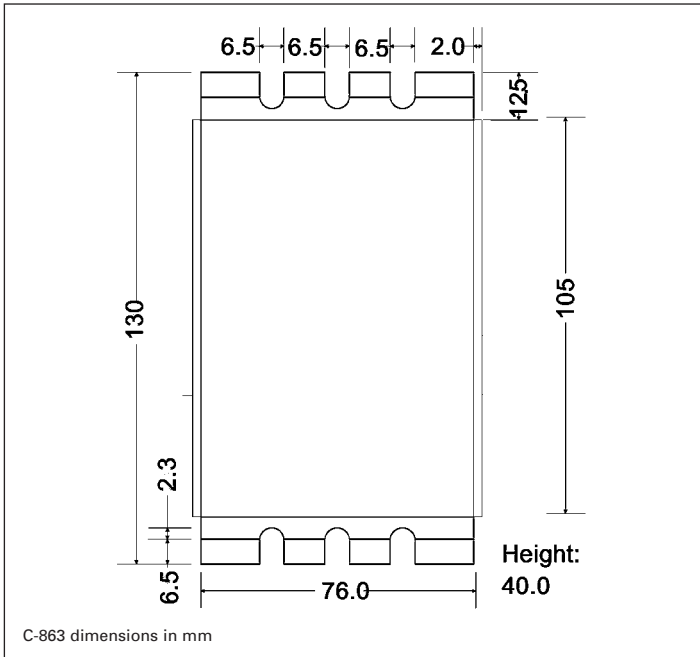
C-170.IO
I/O Cable, 2 m, Open End

C-170.PB
Push Button Box, 4 Buttons and 4 LEDs

ply, RS-232 communication cable, a daisy-chain network cable and a comprehensive software package.

Application Examples

- Fiber positioning
- Automation
- Photonics / integrated optics
- Quality assurance testing
- Testing equipment



Technical Data

Model	C-863.10
Function	DC-servo-motor controller, 1 channel
Motion and control	
Servo characteristics	P-I-D servo control, parameter change on-the-fly
Trajectory profile modes	Trapezoidal, point-to-point
Encoder input	AB (quadrature) single-ended or differential TTL signal, 20 MHz
Stall detection	Servo off, triggered by programmable position error
Input limit switch	2 x TTL (pull-up/pull-down, programmable)
Input reference switch	1 x TTL
Motor brake	1 x TTL, software controlled
Electrical properties	
Output power	max. 30 W (PWM)
Output voltage	0 to 15 V
Current	80 mA + motor current (3 A max.)
Interfaces and operation	
Communication interfaces	USB, RS-232 (9-pin [m] sub-D)
Motor connector	15-pin (f) sub-D
Controller network	Up to 16 units on single interface
I/O ports	4 analog/digital in, 4 digital out (TTL)
Command set	Mercury Command Set, GCS (via DLL)
User software	PIMikroMove®, MMCRun
Software drivers	GCS (PI General Command Set)-DLL, LabVIEW drivers, native Mercury™ DLL
Supported functionality	Start-up macro; internal safety circuitry: watchdog timer
Manual control (optional)	2-axis joystick, Y-cable for 2D motion, pushbutton box
Miscellaneous	
Operating voltage	15 to 30 V included: external power supply, 15 V / 2 A
Operating temperature range	+5 to +50 °C
Mass	0.3 kg
Dimensions	130 x 76 x 40 mm