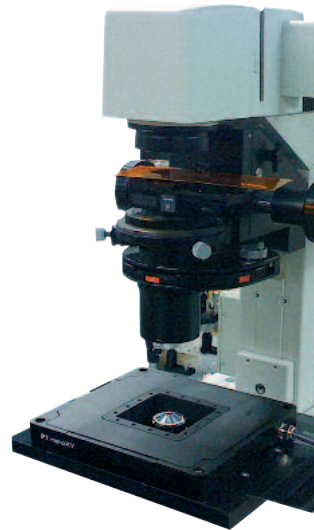
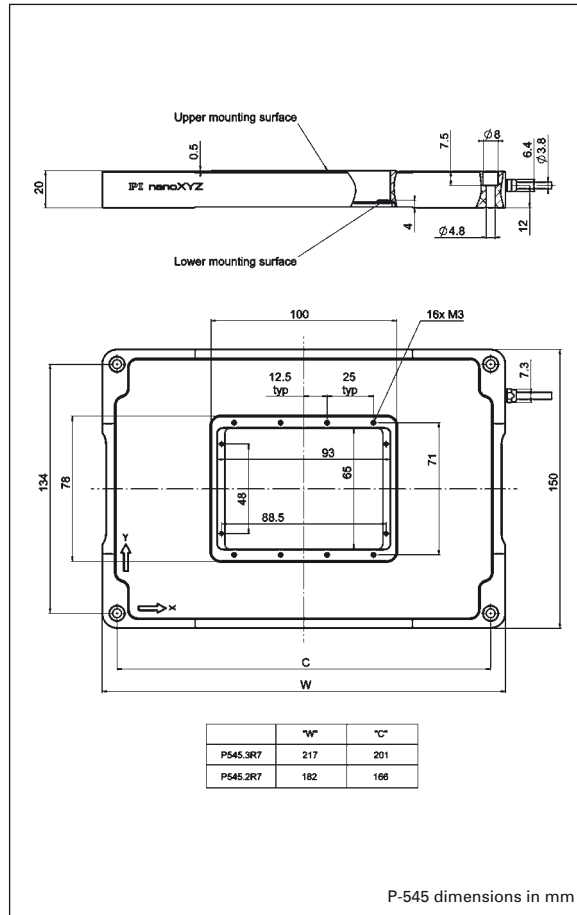
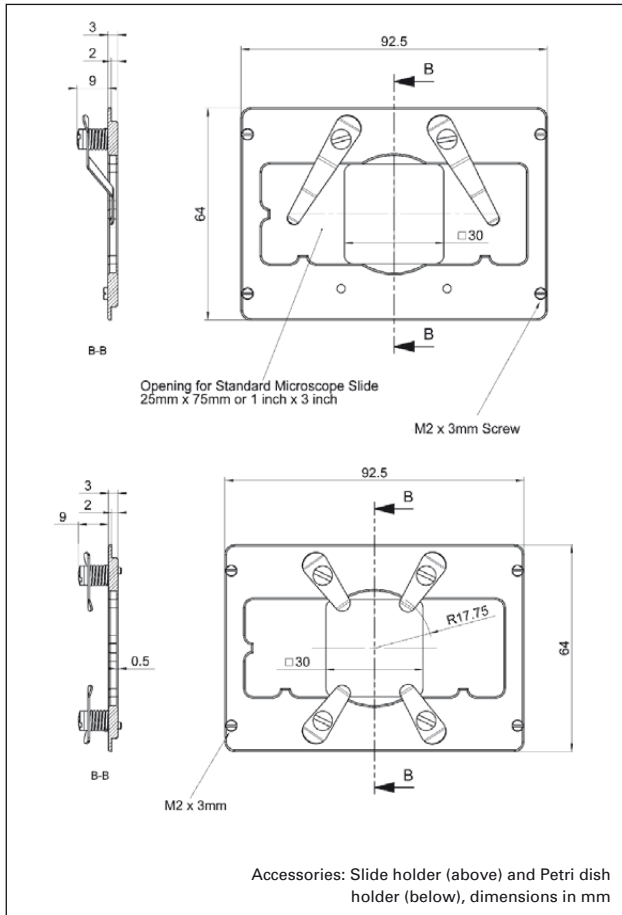


PI nano™

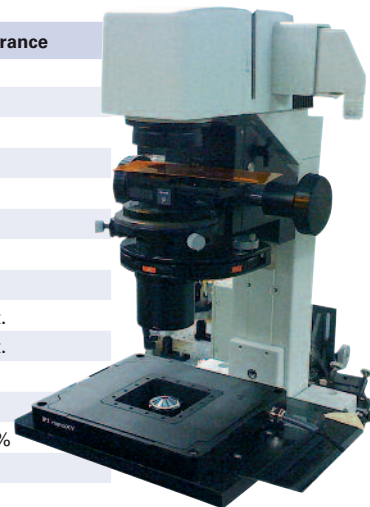
Nanopositioning Systems for Super-Resolution Microscopy





Technical Data

Model	P-545.2R7	P-545.3R7	Unit	Tolerance
Active axes	X, Y	X, Y, Z		
Motion and positioning				
Integrated sensor	piezoresistive	piezoresistive		
Closed-loop travel	200 x 200	200 x 200 x 200	μm	
Closed-loop resolution*	1	1	nm	typ.
Linearity	±0.1	±0.1	%	typ.
Repeatability	< 5	< 5	nm	typ.
Mechanical properties				
Push/pull force capacity	100 / 30	100 / 30	N	max.
Load	50	50	N	max.
Drive properties				
Ceramic type	PICMA® P-885	PICMA® P-885		
Electrical capacitance	6	6 (X, Y), 12 (Z)	μF	±20%
Miscellaneous				
Operating temperature range	-20 to 80	-20 to 80	°C	
Material	Aluminum	Aluminum		
Mass	1	1.2	kg	±5%
Cable length	1.5	1.5	m	±10 mm
Sensor / voltage connection	Sub-D, 25 pin	Sub-D, 25 pin		
Piezo controller (included in delivery)	E-545	E-545		

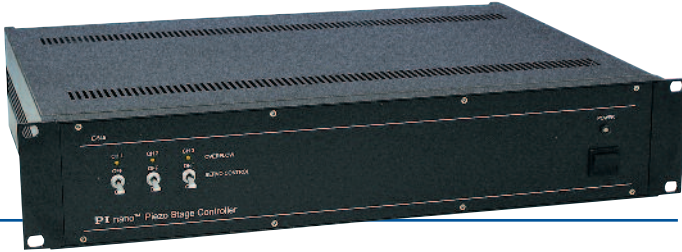


Due to its low profile height, the PI nano™ stage can easily be integrated into microscopy setups

* Resolution of PI Piezo Nanopositioners is not limited by friction or stiction. Value given is noise equivalent motion measured with interferometer.

E-545 PI nano™ Piezo Controller

3-Channels with USB & TCP/IP Interface



E-545 PI nano™ series nanopositioning stage controller

- Low-Noise 24-bit D/A Converter
- Sample Rate 25 kHz
- Linearization for Piezoresistive Sensors
- Notch Filter for Higher Bandwidth
- TCP/IP, USB and RS-232 Interfaces
- 3 x 14 W Peak Power
- Wave Generator with Programmable Trigger-I/O

The E-545 controller is ideally suited for the PI nano™ stage series P-545 for super-resolution microscopy. The controller meets all demands for this applications and provides useful additional functionality.

USB Interface

The microprocessor controlled interface is equipped with low-noise, 24-bit D/A converters and can be controlled through three digital interfaces: TCP/IP, USB and RS-232.

Alternatively, stand-alone operation is possible by uploading macro command sequences to the internal non-volatile memory.

Wave Generator

The integrated wave generator can output periodic motion pro-

Ordering Information

E-545.3RD

Multi-Channel Piezo Controller with High-Speed, 24 bit USB, TCP/IP & RS-232 Digital Interfaces, and analog interface, 3 Channels, Piezoresistive Sensors, Sub-D Connector

files. In addition to sine and triangle waves, arbitrary, user-defined motion profiles can be created and stored.

Extensive Software Support

The controllers are delivered with Windows operating software. Comprehensive DLLs, LINUX and LabVIEW drivers are available for automated control.

Technical Data

Model	E-545.3RD
Function	Piezo Servo-Controller for PI nano™ stages
Axes	3
Sensor	
Servo characteristics	P-I (analog), notch filter
Sensor type	Piezoresistive sensors
Amplifier	
Min. output voltage	-20 to 120 V
Peak output power, < 5 ms	14 W
Average output power	6 W
Peak current, < 5 ms	140 mA
Average current	60 mA
Current limitation	Short-circuit-proof
Voltage gain	10 ±0.1
Interfaces and operation	
Interface / communication	Ethernet (TCP/IP), USB, RS-232
Piezo system connector	Sub-D 25
Command set	PI General Command Set
User software	PIMikroMove™
Supported functionality	Wave generator, data recorder, macro programming
Miscellaneous	
Operating temperature range	+5 to +50 °C
Overheat protection	Deactivation at 85°C
Operating Voltage	12 to 30 V DC, stabilized
Current consumption	2 A

M-545 Open-Frame Microscope Stage

Long-Range Motion for Sample Positioning



M-545 manual XY microscopy stage with 25 x 25 mm travel shown with optional PI nano™ piezo nanopositioner (200 µm motion in X, Y und Z) on top. The M-545 stage was designed to provide a stable basis for piezo stages, especially when the highest step-and-settle performance is required

- **Stable Platform for P-545 PI nano™ Piezo-Nanopositioniersysteme**
- **Low Profile for Easy Integration: 30 mm**
- **25 mm x 25 mm Travel Range**
- **Micrometer Screws, Motor Upgrade Available**
- **For Nikon, Zeiss, Leica and Olympus Mikroskopes**

The M-545, 25 x 25 mm microscope stage, is designed to provide a stable platform for piezo scanning stages of the P-545 PI nano™ series. These high-speed, high-resolution XY / XYZ piezo stages allow nanometer-precision adjustment of the specimen holder in up to three dimensions over 200 µm. The M-545 is also compatible with the following capacitive-feedback type piezo stages: P-733, P-5x7, P-5x8, P-54x and P-56x (s. p. 2-72).

The basic M-545 model is equipped with manual micrometers.

Motorizing for Automated Tasks

The M-545 XY-stage can be supplemented with motorized actuators M-229 (s.p. 1-44). The product number M-545.USC comprises the complete package of two stepper linear actuators with controller and joystick. M-545.USG includes two stepper linear actuators with mounting hardware.

Ordering Information

M-545.2MO

PI nano™ Manual XY Open-Frame Stage, 25 x 25 mm, for Olympus Microscopes

M-545.2MN

PI nano™ Manual XY Open-Frame Stage, 25 x 25 mm, for Nikon Microscopes

M-545.2ML

PI nano™ Manual XY Open-Frame Stage, 25 x 25 mm, for Leica Microscopes

M-545.2MZ

PI nano™ Manual XY Open-Frame Stage, 25 x 25 mm, for Zeiss Microscopes

Versions for other microscopes on request.

Accessories

M-545.USC

Upgrade Kit with Stepper-Mikes, Controller and Joystick for M-545 PI nano™ Manual XY Open-Frame Stage

M-545.USG

Upgrade Kit with Stepper-Mikes, for M-545 PI nano™ Manual XY Open-Frame Stage

M-545.SHP

Adapter Plate for Sample Holders for M-545 PI nano™ Manual XY Open-Frame Stage

Accommodates the following PI nanopositioning stage series:

P-517/518/527/528, P-541/542, P-560 PIMars™ and P-545 PI nano™

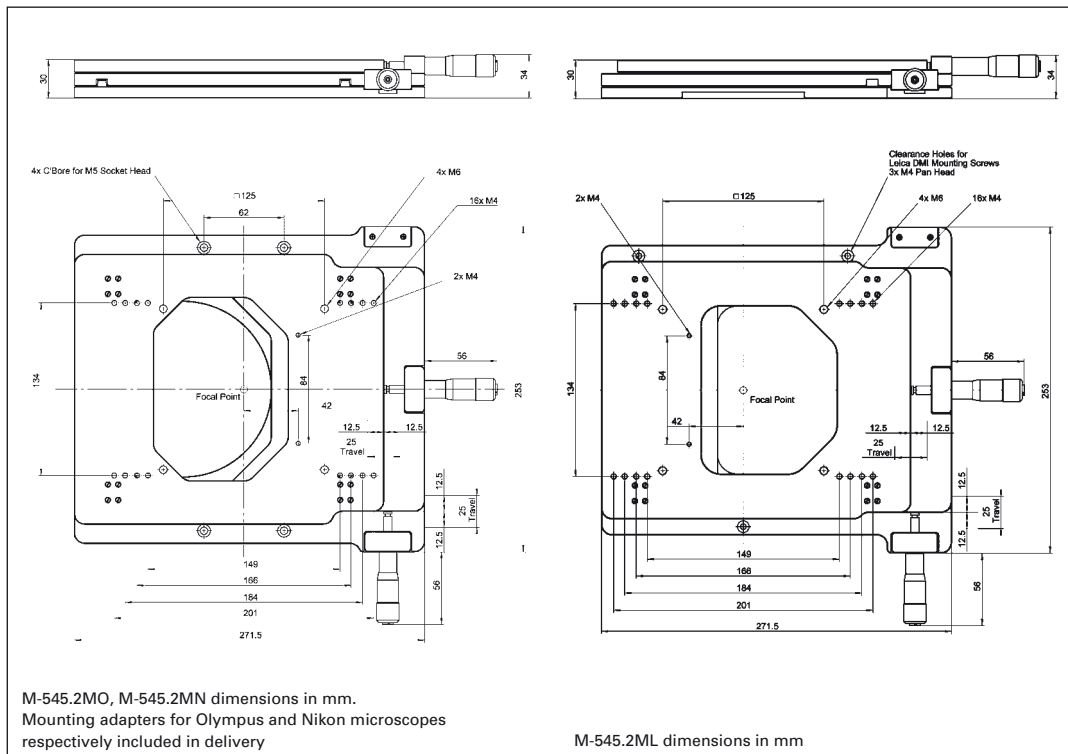
Adapter available for P-733 nanopositioners:

P-733.AP1

Adapter Plate for Mounting of P-733 Stages on M-545 PI nano™ Manual XY Open-Frame Stage

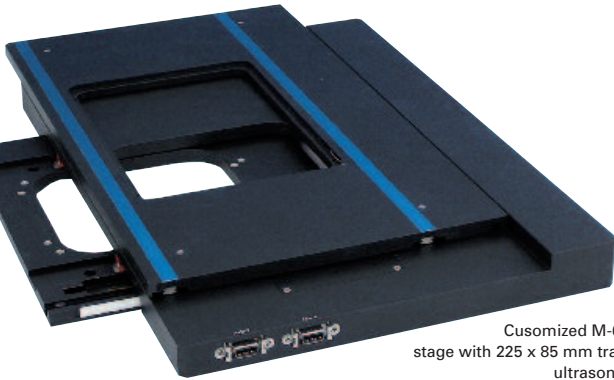
Additional accessories on request.

Ask about custom designs!



M-686K Customized Long-Range Positioner / Scanner

Low Profile and High Velocity with PLine® Ultrasonic Piezo Motors



Customized M-686 microscopy stage with 225 x 85 mm travel and PLine® ultrasonic piezo motors

- Low 27-mm-profile
- Velocity 100 mm/s
- Large Clear Aperture to Accomodate Specimen Holders or P-737 PIFOC® Specimen-Focusing Z-Stage
- Travel Range 25 x 25 mm, 130 x 85 mm or 225 x 85 mm
- Up to 7 N Force Generation
- Direct Metrology Linear Encoder with 0.2 μm Resolution
- PLine® Ceramic Motors: Non-Magnetic and Vacuum-Compatible Working Principle
- Self Locking at Rest

S-334 Miniature Piezo Tip / Tilt-Mirror

Fast Steering Mirror with up to 120 mrad Deflection



- Miniature Design
- Optical Beam Deflection to 120 mrad ($\sim 6.8^\circ$)
- Coplanar Axes & Fixed Pivot Point Eliminate Polarization Rotation
- Factory Installed Mirror
- Millisecond Response, Resolution to 0.5 μrad
- Closed-loop Position Servo-Control for High Accuracy
- For Mirrors up to 12.5 mm (0.5") Diameter
- Frictionless, High-Precision Flexure Guiding System
- Parallel Kinematics for Enhanced Dynamics and Better Multi-Axis Accuracy

P-737 PIFOC® Well Plate Scanner / Specimen-Focusing Z Stage

Low-Profile, Long-Range Piezo Z Nanopositioner for Microscopy Samples



P-737 piezo Z-stage for high-resolution microscopy

- High-Speed Piezo Z-Motion with Travel Ranges up to 500 μm
- Resolution in the Nanometer Range
- Clear Aperture to Accomodate Specimen Holders
- Perfect Mechanical Fit with XY OEM Manual or Motorized Stages
- Sub-Millisecond Response Times

P-725 PIFOC® Long-Travel Objective Scanner

High-Precision Positioner / Scanner for Microscope Objectives



P-725.2CL with QuickLock option P-721.12Q for W0.8 x 1/36" threads and objective (QuickLock adapter and objective not included)

- Travel Ranges to 460 μm
- Significantly Faster Response and Higher Lifetime than Motorized Z-Stages
- Scans and Positions Objectives with Sub-nm Resolution
- Direct Metrology with Capacitive Sensors for Highest Linearity
- Parallel Precision Flexure Guiding for Better Focus Stability
- Compatible with Metamorph™ Imaging Software
- Outstanding Lifetime Due to PICMA® Piezo Actuators
- QuickLock Adapter for Easy Attachment

Technical Data

Model	P-725.1CL P-725.1CD	P-725.2CL P-725.2CD	P-725.4CL P-725.4CD	Units
Active axes	Z	Z	Z	
Closed-loop travel	100	250	400	μm
Closed-loop resolution	0.65	0.75	1.25	nm
Linearity, closed-loop	0.03	0.03	0.03	%
Unloaded resonant frequency	470	330	230	Hz
Resonant frequency @ 150 g	185	140	120	Hz

P-721K PIFOC® Nosepiece Nanopositioner

Compact Design, Sub-Nanometer Resolution



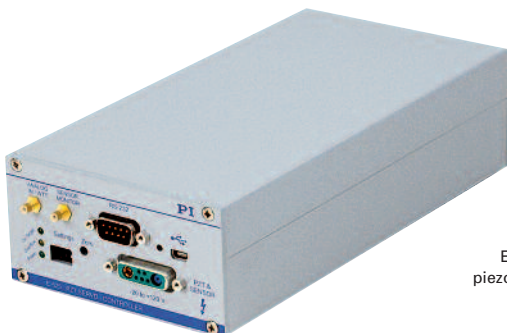
P-721KTPZ Compact Nosepiece Nanopositioner

- Positioning and Scanning of Microscope Turrets
- Direct-Metrology Capacitive Sensors for Highest Linearity, Stability and Control Dynamics
- Frictionless, High-Precision Flexure Guiding System for Better Focus Stability
- Outstanding Lifetime Due to PICMA® Piezo Actuators

Model	Travel	Closed-loop / open-loop resolution	Resonant frequency (fully loaded)	Dimensions (W x L x H)
P-721KTPZ Turret-PIFOC®	80 μm	10 / 0.5 nm	215 Hz	44.5 x 42 x 53 mm (W x L x H)

E-625 Piezo Servo-Controller & Driver

Compact Bench-Top Device with High-Speed Interface



E-625.CR compact piezo servo-controller

- Integrated 24-Bit USB Interface
- Network Capability with up to 12 Channels
- 12 W Peak Power
- Position Control with Strain Gauge or Capacitive Sensor
- Notch Filter for Higher Bandwidth
- Table for User-Defined Curves
- Additional Analog Interface

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- Motor Controllers
- Hexapod 6-Axis Alignment Systems

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- Aeronautics
- Astronomy
- Adaptive Optics
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