

P-545 PI nano™ XYZ / PI nano™ XY Piezo Stage Systems

Low-Profile, Low-Cost Nanopositioning Systems for Super-Resolution Microscopy



PI nano™ series nanopositioning stages feature a very low profile of 20 mm (0.8), a large aperture for 3 x 1" slides and deliver highly accurate motion with sub-nanometer resolution in up to 3 axes. Slide / petri dish holders optional

- **Low Profile for Easy Integration: 20 mm (0.8")**
- **Up to 200 x 200 x 200 μm Travel Ranges**
- **Large Clear Aperture for 3 x 1" Slides**
- **Recessed Sample Holders for Maximized Utility Available**
- **Outstanding Lifetime Due to PICMA® Piezo Actuators**
- **Cost-Effective Design due to Piezoresistive Sensors**
- **Compatible w/ Leading Image Acquisition Software Package**
- **Closed-Loop Control for High Repeatability and Accuracy**
- **Millisecond Step Time, Ideal for Super-Resolution Microscopy**
- **24-Bit Controller w/ USB, Ethernet, RS-232 Interface and Analog Control**
- **Available Manual Long-Travel Stage with Motor Upgrade Option**

Long Travel, Low Profile, Optimized for Microscopy
PI nano™ XY and XYZ low-profile piezo scanning stages are optimized for easy integration into high-resolution micro-

Application Examples

- Super-resolution microscopy
- 3D Imaging
- Laser technology
- Interferometry
- Metrology
- Biotechnology
- Screening
- Micromanipulation

scopes. They feature a very low profile of 20 mm (0.8") and a large aperture designed to hold Petri dishes and standard slide holders. The long travel ranges of up to 200 x 200 x 200 μm with nanometer closed-loop resolution are ideal for leading-edge



microscopy and imaging applications.

Cost Effective Design, High Performance

PI nano™ series piezo positioning stages are designed to provide high performance at minimum cost. For highly-stable, closed loop operation, piezoresistive sensors are applied directly to the moving structure and precisely measure the displacement of the stage platform. The very high sensitivity of these sensors provides optimum position stability and responsiveness as well as nanometer resolution. A proprietary servo controller significantly improves the motion linearity compared to conventional piezoresistive sensor controllers.

High Reliability and Long Lifetime

The compact P-545 systems are equipped with preloaded PICMA® high-performance piezo actuators which are integrated into a sophisticated, FEA-modeled, flexure guiding system. The PICMA® actuators feature cofired ceramic encapsulation and provide better performance and reliability than conventional piezo actuators. Actuators, guidance and sensors are maintenance-free, not subject to wear and offer extraordinary reliability.

Ordering Information

P-545.2R7

Plnano™ XY Piezo Stage, Slide-Size Aperture, 200 x 200 μm, Piezoresistive Sensors, with USB Controller

P-545.3R7

Plnano™ XYZ Piezo Stage, Slide-Size Aperture, 200 x 200 x 200 μm, Piezoresistive Sensors, with USB Controller

Controller included

E-545.3RD

Plnano™ Multi-Channel Piezo Controller with High-Speed Digital Interface, 3 Channels, Piezoresistive Sensors, Sub-D Connectors

Accessories

M-545.2MO

XY Microscope Stage, 25 x 25 mm, Micrometer-Driven, High Stability, Compatible with PI® Piezo Stages, for Olympus Microscopes

M-545.2MN

XY Microscope Stage, 25 x 25 mm, Micrometer-Driven, High Stability, Compatible with PI® Piezo Stages, for Nikon Microscopes

M-545.2ML

XY Microscope Stage, 25 x 25 mm, Micrometer-Driven, High Stability, Compatible with PI® Piezo Stages, for Leica Microscopes

M-545.2MZ

XY Microscope Stage, 25 x 25 mm, Micrometer-Driven, High Stability, Compatible with PI® Piezo Stages, for Zeiss Microscope

P-545.PD3

35mm Petri Dish Holder for P-545 Plnano™ Piezo Stages

P-545.SH3

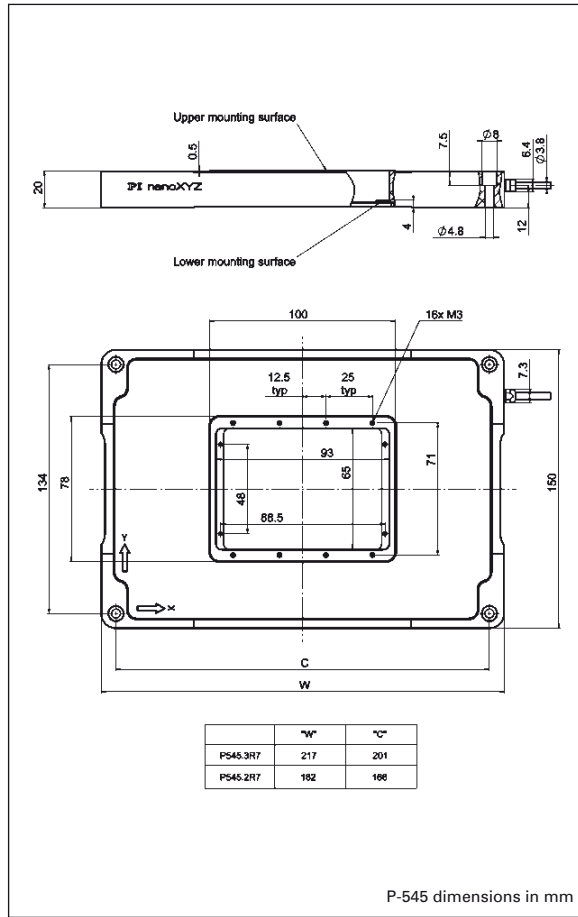
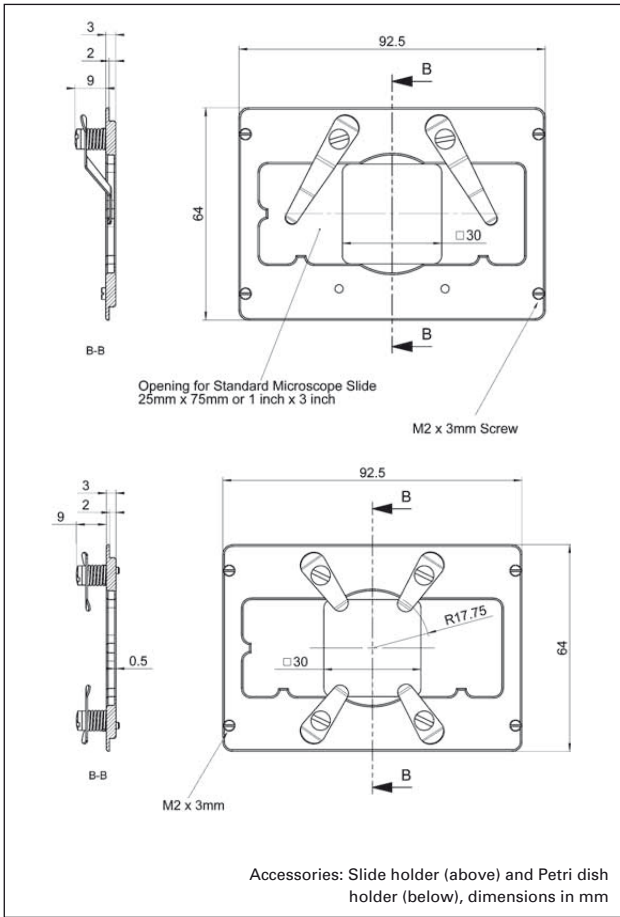
Microscope Slide Holder for Plnano™ Piezo Stages

P-545.PP3

Plain Plate for Accessories for Plnano™ Piezo Stages

Additional accessories on request.

Background: the piezo controller is included and comes with a 24-bit resolution USB port as well as ethernet, RS-232 and analog interface. Foreground: The optional M-545 manual XY stage provides a stable XY stage provides a stable Custom stage version shown



Linear Actuators & Motors

Nanopositioning/Piezoelectrics

Piezo Flexure Stages / High-Speed Scanning Systems

Linear

Vertical & Tip/Tilt

2- and 3-Axis

6-Axis

Fast Steering Mirrors / Active Optics

Piezo Drivers / Servo Controllers

Single-Channel

Multi-Channel

Modular

Accessories

Piezoelectrics in Positioning

Nanometrology

Micropositioning

Index

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	50 / 30	50 / 30	N	max.
Recommand load**	0,5	0,5	kg	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		

* Resolution of PI Piezo Nanopositioners is not limited by friction or stiction. Value given is noise equivalent motion measured with interferometer.
** for optimum dynamics. Less load = higher dynamics.

P-545 Plnano™ Trak High-Speed Piezo Tracking Stage

Fastest XY(Z) Microscope Stage to Enable Use of Full Turret Motion



The low profile of 20 mm and special design to allow for a full slide to be mounted at the bottom set Plnano™ piezo microscope stages apart. The Plnano™ Trak version shown above is optimized for extremely fast motion and provides sub-nanometer resolution in up to three axes

- **Fast Response < 5 ms: Ideal for Tracking**
- **Sub-Nanometer Resolution**
- **Low Profile for Easy Integration: 20 mm (0.8")**
- **Countersunk Insertion Frame: Ideal for Inverted Microscopy**
- **Revolving Nosepiece Freely Rotatable Without Additional Z Motion**
- **Travel Ranges up to 70 x 70 x 50 µm**
- **Cost-Effective Design due to Piezoresistive Sensors**
- **Compatible w/ Leading Image Acquisition Software Package**
- **Position Servo-Control for Repeatable Sub-Nanometer Resolution**
- **Ideal for Super-Resolution Microscopy**
- **Controller Included**
- **Available Long-Travel Stage**

Cost Effective Design, High Performance

Plnano™ series piezo positioning stages are designed to provide high performance at minimum cost. For highly-stable, closed-loop operation, piezoresistive sensors are applied directly to the moving structure and precisely measure the displacement of the stage platform. The very high sensitivity of these sensors provides optimum position stability and responsiveness as well as sub-nanometer resolution. A proprietary servo controller significantly improves the motion linearity compared to conventional piezoresistive sensor controllers.

High Reliability and Long Lifetime

The compact P-545 systems are equipped with preloaded piezo actuators which are integrated into a sophisticated, FEA-modeled, flexure guiding system. The PICMA® actuators feature cofired ceramic encapsulation and provide better performance and reliability than conventional piezo actuators. Actuators, guidance and sensors are maintenance-free, not subject to wear and offer extraordinary reliability.

Ordering Information

P-545.2D7

Plnano™ High-Dynamics XY Piezo Stage System, Slide-Size Aperture, 70 x 70 µm, Direct Drive, Piezoresistive Sensors, with Controller

P-545.3D7

Plnano™ High-Dynamics XYZ Piezo Stage System, Slide-Size Aperture, 70 x 70 x 50 µm, Direct Drive, Piezoresistive Sensors, with Controller

Accessories

M-545.2MO

XY Microscope Stage, 25 x 25 mm, Micrometer Drive, High Stability, Compatible with PI Piezo Stages, for Olympus Microscopes

M-545.2MN

XY Microscope Stage, 25 x 25 mm, Micrometer Drive, High Stability, Compatible with PI Piezo Stages, for Nikon Microscopes

M-545.2ML

XY Microscope Stage, 25 x 25 mm, Micrometer Drive, High Stability, Compatible with PI Piezo Stages, for Leica Microscopes

M-545.2MZ

XY Microscope Stage, 25 x 25 mm, Micrometer Drive, High Stability, Compatible with PI Piezo Stages, for Zeiss Microscopes

P-545.PD3

35 mm Petri Dish Holder for Plnano™ Piezo Stages

P-545.SH3

Microscope Slide Holder for Plnano™ Piezo Stages

P-545.PP3

Plain Plate for Accessories for Plnano™ Piezo Stages

Additional accessories on request. Ask about custom designs!

Application Examples

- Super-resolution microscopy
- 3D Imaging
- Laser technology
- Interferometry
- Metrology
- Biotechnology
- Screening
- Micromanipulation

High Speed, Long Travel, Low Profile, Ideal for Single Molecule Tracking

The new Plnano™ Trak XY and XYZ high-speed piezo scanners are designed for extremely fast response such as required for single molecule tracking applications. The special low-profile design with a large aperture and recessed full size slide mount at the bottom of the stage allows easy integration into high-resolution inverted microscopes.

Plnano[®] Cap XY(Z) Piezo System

CAPACITIVE POSITIONING MEASUREMENT FOR SUPER-RESOLUTION MICROSCOPY



P-545.xC7

- Highest stability and repeatability
- Travel ranges up to 200 x 200 x 200 μm
- Sub-nanometer resolution
- ms-response times
- Low Profile for easy integration: 20 mm
- Recessed slide holder, free rotation of turret

Reference-class system: high-resolution piezo stage for 3x1" object slides

USB controller and software included

PICMA[®] high-performance piezo drive

Frictionless flexure guiding system, FEM-optimized flexure joints. Piezo actuators with ceramic insulation for outstanding lifetime. High-dynamics system with millisecond response times

Direct-metrology capacitive sensors

Significantly improved stability and repeatability compared to piezoresistive sensors

Easy implementation

Large clear aperture. For standard object slides (25 x 75 mm). Optional: object slide holder, further accessories and with M-545 microscope stage mountable on most microscopes of leading manufacturers

Application fields

Super-resolution microscopy, screening, confocal microscopy, biotechnology. High reliability even under permanent high-humidity conditions

Related Products

P-721 PIFOC[®] High-Precision Objective Scanner

P-726 PIFOC[®] High-Load Objective Scanner

P-737 PIFOC[®] Sample Focusing System

Accessories

M-545.2MO XY Microscope Stage, 25 x 25 mm, Micrometer Drive, High Stability, Compatible with PI Piezo Stages, for Olympus Microscopes

M-545.2MN XY Microscope Stage, 25 x 25 mm, Micrometer Drive, High Stability, Compatible with PI Piezo Stages, for Nikon Microscopes

M-545.2ML XY Microscope Stage, 25 x 25 mm, Micrometer Drive, High Stability, Compatible with PI Piezo Stages, for Leica Microscopes

M-545.2MZ XY Microscope Stage, 25 x 25 mm, Micrometer Drive, High Stability, Compatible with PI Piezo Stages, for Zeiss Microscopes

P-545.PD3 35 mm Petri Dish Holder for Plnano[®] Piezo Stages

P-545.SH3 Microscope Slide Holder for Plnano[®] Piezo Stages

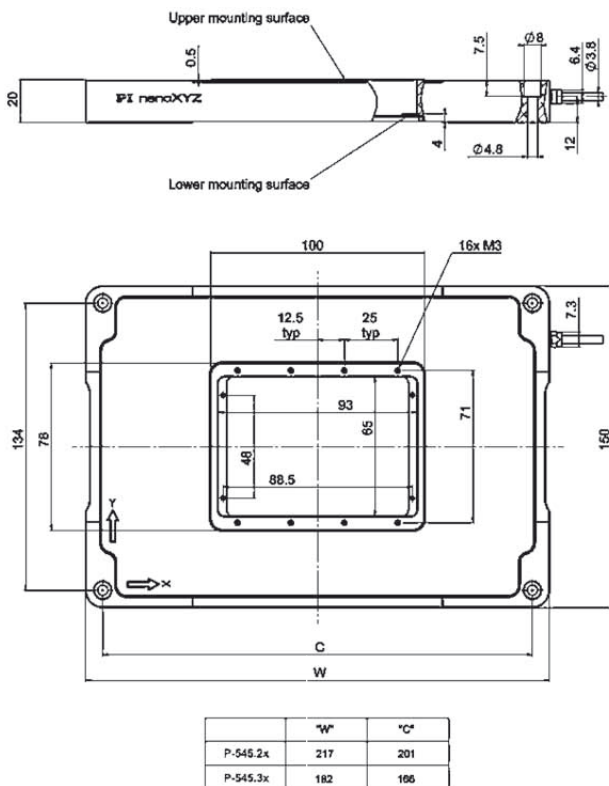
P-545.PP3 Plain Plate for Accessories for Plnano[®] Piezo Stages

Additional accessories on request.

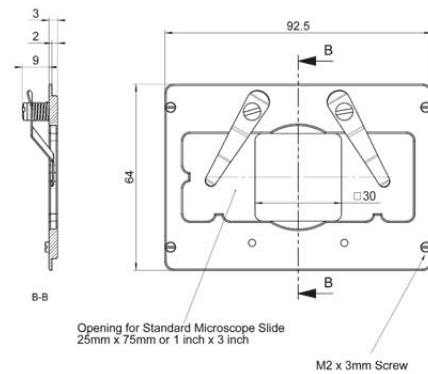
	P-545.2C7	P-545.3C7	Units	Tolerance
Active axes	XY	XYZ		
Motion and positioning				
Integrated sensor	Capacitive	Capacitive		
Closed-loop travel	200 x 200	200 x 200 x 200	μm	
Closed-loop resolution*	< 1	< 1	nm	typ.
Mechanical properties				
Push / pull force capacity	100 / 30	100 / 30	N	max.
Recommended load**	0.5	0.5	kg	max.
Drive properties				
Piezo ceramics	PICMA® P-885	PICMA® P-885		
Electrical capacitance	6 (X, Y)	6 (X, Y), 12 (Z)	μF	± 20 %
Miscellaneous				
Material	Aluminum	Aluminum		
Mass	1	1.2	kg	± 5 %
Cable length	1.5	1.5	m	± 10 mm
Piezo Controllers				
	E-545 (included in delivery)			
Communication interfaces	Ethernet (TCP/IP), USB, RS-232			
Control input socket	BNC			
Command set	PI General Command Set (GCS)			
User software	PIMikroMove			
Software drivers	LabVIEW drivers, shared libraries for Windows and Linux			
Supported functionality	Wave generator, data recorder, macro programming, auto zero, trigger I/O, MetaMorph, μManager, MATLAB			
Operating temperature range	+5 to +50 °C			
Controller dimensions	450 x 88 x 343 + mounting rails			

* With flexure guiding system resolution is not limited by friction or stiction. Value given is noise equivalent motion measured with interferometer.
 ** For dynamic operation. Higher dynamics is possible with a reduced load.

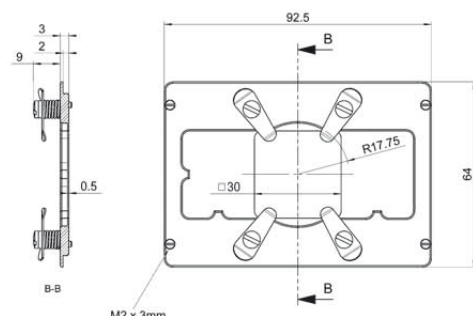
Ask about custom designs!



P-545, dimensions in mm



Accessories: sample holder, dimensions in mm



Accessories: Petri dish holder, dimensions in mm