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PCS-5300N - January 17, 2019

Item # PCS-5300N was removed from our e-commerce site on January 17, 2019. For informational purposes, this is a copy of the website content at that time and is valid only for the stated product.

MANUAL PATCH-CLAMP MICROMANIPULATORS

- **Manual Micromanipulator Assemblies with Precision Control**
- **Ideal for Gibraltar™ Microscope Platforms**
- **Position Pipette or Electrode Along Three Different Axes**

PCS-5300

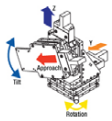
Application Idea

Two PCS-5400 Micromanipulators Mounted on Our Gibraltar GMHB-BX Platform

Hide Overview

OVERVIEW

Features



Click to Enlarge

- Manual Micromanipulators with Mechanical or Piezoelectric Translation
- Minimal Drift During Experiments: <1 µm/hr
- Translation Along Three Axes:
  - 25 mm Coarse Travel (Micrometer)
  - 150 or 300 µm Fine Travel (Piezoelectric)
- Repeatably Set Approach Angle and Rotation Using Adjustable Stop Rings
- Headstage and Pipette Adapters Sold Separately
- Available with or without 60 V Power Supply

Common Micromanipulator Specifications			
Control Type	**Fine (Piezo)**		**Coarse**
Travel	150 µm	300 µm	25 mm
Resolution	<60 nm	<120 nm	32 TPI
Speed	Directly Proportional to Rate of Knob Turns		N/A
Drift	<1 µm/hr		
Operator Interface	Axis Control Unit		Micrometer
Manipulator Dimensions (L × W × H)	5.0" × 6.2" × 7.5" (127 mm × 157 mm × 190.5 mm)		

Thorlabs' Manual Micromanipulators offer excellent control of pipette manipulation for electrophysiology and life sciences research. These manual micromanipulators use mechanical or piezoelectric (PZT) control of translation stages to provide smooth and precise movement of the pipette head. Additionally, an all-mechanical option, the PCS-520N Micromanipulator Assembly, is also available for customers who do not require piezoelectric actuation for their application. When combined with our Gibraltar Platforms, these micromanipulators achieve unparalleled stability and control.

The micromanipulator can move along three different axes (shown in the image to the right). Coarse translation is controlled using mechanical screw and produces a displacement of 25 mm at 32 TPI. Fine control on the micromanipulators is achieved with piezoelectric flexure mounts that provide a displacement of either 150 µm or 300 µm along each axis. Two adjustable stop rings enable the user to set an approach angle and rotational orientation for fast alignment

during pipette swapping (see the *Micromanipulator* tab for more information).

Adapters for positioning a headstage or pipette at steep or shallow approach angles can be purchased separately below. These adapters allow for more flexibility during experiments and minimize mechanical clashing with microscopy objectives or other experimental apparatus. A close-approach headstage and pipette adapter is also available that allows pipettes and headstages to be positioned closer to a sample without interference from the micromanipulator.

Piezoelectric Control
Piezoelectric control is used to achieve superior positioning compared to hydraulic manipulators, mechanical manipulators, or motorized lead screws. Piezoelectric control provides smooth and predictable movement with no backlash and minimal drift (<1 µm/hr with temperature control). An axis control unit is included with each piezoelectric micromanipulator (see the *Control Unit* tab). Each axis is controlled by an independent knob on the control unit and provides a displacement of 150 µm or 300 µm (depending on model). Three turns on the control unit corresponds to the full piezo travel range, resulting in a resolution of 0.04% of the total travel.

Power Supply
The PCS-5200, PCS-5300, and PCS-5400 assemblies include an axis control unit and 60 V power supply (See the *Control Unit* tab) which can support up to two micromanipulator assemblies. Since a single power supply can support two of our micromanipulators, we also offer the PCS-5200N, PCS-5300N, and PCS-5400N assemblies without a power supply.

For questions and ordering details please contact Tech Support.

Hide Micromanipulator

MICROMANIPULATOR

Micromanipulator Assembly

Thorlabs' Micromanipulator Assembly is composed of three linear translation stages, two rotary stages with lockable stops, one set of angle brackets, and headstage mounting plate. The cross roller bearings of this assembly form a stiff and precise single-axis bearing system with high load capacity and minimal friction. The piezoelectric actuators provide 60 nm resolution, virtually no heating, zero backlash, and negligible drift (<1 µm/hr).


Click to Enlarge
Micromanipulator Assembly

The headstage mounting plate easily accommodates headstages and pipettes. Note that the Axon CV-203B and HEKA EPC-9 headstages may be directly bolted to the headstage mounting plate. Other headstages may be mounted to the mounting plate by adding the appropriate mounting holes.

The headstage pivot allows for simple optimization of the pipette angle of approach on either an inverted or upright microscope. Additionally, the PCS-500-SSH Steep/Shallow Headstage Adapter or MIS-PHM Pipette Holder may be used in applications requiring very steep or shallow angles. Due to the symmetric design of our micromanipulator assembly, this system can be easily modified for a left-sided or orthogonal approach axis without needing a special adapter kit.

Adjustable Stop Ring


Click to Enlarge
Adjustable Stop Ring with Pin and Brass Block with Locking Thumbscrew

These micromanipulators include two adjustable stop rings that allow a user to repeatedly and accurately set the approach angle and horizontal rotational orientation (see image to the left). Once an appropriate angle or rotation is established, tighten the thumbscrew on the brass block to lock the mount in position. Loosen the two setscrews on either side of the pin using a 0.05" (1.3 mm) balldriver or hex key. Rotate the ring until the protruding pin is in physical contact with the brass block. To lock the ring, tighten the exposed setscrew, then loosen the thumbscrew to allow the mount to rotate freely.

The adjustable stop rings in combination with the headstage adapter or pipette holder (sold separately below) provide a convenient mechanism for quickly changing pipettes and returning to the last position during an experiment, minimizing position readjustments and increasing efficiency. To do this, the user can set the adjustable stop ring to remember the approach angle and rotation, move the pipette away from the sample using the slide assembly on the adapters, rotate the stage away to exchange the pipette, and then quickly return to same approach angle and rotation as before.

Hide Control Unit

CONTROL UNIT

Axis Control Unit

Click to Enlarge Axis Control Unit

The axis control unit allows the user to adjust pipette placement by hand with smooth and repeatable movement. Each of the three stages that comprise our micromanipulator assembly can connect to one of the potentiometer knobs on the axis control unit. For convenience during system configuration, the user may choose any knob to control any particular stage. This allows the user to set the axis control unit in the most intuitive configuration for the system.

Each knob controls a three-turn potentiometer, which regulates voltage to the piezo flexure assembly and thus its position. Three turns correspond to the full travel range of the piezo assembly, yielding a resolution that is 0.04% of the total piezo travel range. For example, a 150 µm piezo stage will have a 60 nm resolution provided by the axis control unit. Additionally, the user may set the potentiometer friction to suit experimental needs.

Click to Enlarge 60 V Power Supply

Power Supply

Our micromanipulator power supply provides a regulated, low noise, 60 V output for the axis control unit. Two voltage outputs enable the power supply to regulate two axis control units. This allows the user to run two micromanipulation assemblies from the same power source, saving both money and space. This power supply accepts an input power range of 100 – 240 V at 50/60 Hz.

Hide Micromanipulators with Power Supply

Micromanipulators with Power Supply

These micromanipulator assemblies include a 60 V power supply. A single power supply can support two micromanipulators; customers can purchase additional micromanipulators without the power supply separately below.

Item #	Power Supply	Coarse Travel[a]	Fine Travel[b]			Description
		All Axes	Y Axis	Z Axis	Approach Axis	
PCS-5200	Yes	25 mm	150 µm	150 µm	150 µm	150 µm PZT Travel in All Axes
PCS-5300	Yes	25 mm	150 µm	150 µm	300 µm	Recommended for working in slices where longer PZT travel on the approach axis is required.
PCS-5400	Yes	25 mm	300 µm	300 µm	300 µm	Recommended for working in thick slices where maximum flexibility is needed.

- Mechanical Control Using Micrometer
- Piezoelectric Control Using Axis Control Unit

Part Number	Description	Price	Availability
PCS-5200	**Micromanipulator Assembly, 150 µm Travel for X, Y, and Approach**	**$7,950.00**	**Today**
PCS-5300	**Micromanipulator Assembly, 150 µm Travel for X & Y, 300 µm Travel for Approach**	**$8,450.00**	**Lead Time**
PCS-5400	**Micromanipulator Assembly, 300 µm Travel for X, Y, and Approach**	**$9,250.00**	**Today**

Hide Micromanipulators without Power Supply

Micromanipulators without Power Supply

These micromanipulator assemblies do not come with a power supply. They either do not require external power to operate (Item # PCS-520N) or can be purchased to be used in a pair with one of the micromanipulators sold above.

Item #	Power Supply	Coarse Travel[a]	Fine Travel[b]			Description
		All Axes	Y Axis	Z Axis	Approach Axis	
PCS-520N	No	25 mm	-	-	-	Mechanical Version; No PZT Actuators or Motors.
PCS-5200N	No	25 mm	150 µm	150 µm	150 µm	150 µm PZT Travel in All Axes
PCS-5300N	No	25 mm	150 µm	150 µm	300 µm	Recommended for working in slices where longer PZT travel on the approach axis is required.
						Recommended for working in thick slices

PCS-5400N	No	25 mm	300 µm	300 µm	300 µm	where maximum flexibility is needed.

- Mechanical Control Using Micrometer
- Piezoelectric Control Using Axis Control Unit

Part Number	Description	Price	Availability
PCS-520N	Micromanipulator Assembly, Manual Only, No Power Supply	$4,119.78	Lead Time
PCS-5200N	Micromanipulator Assembly, 150 µm Piezo Travel in X, Y, and Approach, No Power Supply	$7,450.00	Lead Time
PCS-5300N	Micromanipulator Assembly, 150 µm Piezo Travel in X & Y, 300 µm Piezo Travel Approach, No Power Supply	$7,950.00	Lead Time
PCS-5400N	Micromanipulator Assembly, 300 µm Piezo Travel in X, Y, and Approach, No Power Supply	$8,750.00	Lead Time

Hide Micromanipulator Headstage Adapter and Pipette Holder Mounts

Micromanipulator Headstage Adapter and Pipette Holder Mounts

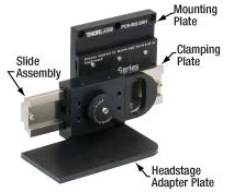
- Mount Headstages or Pipettes onto Manual or Motorized Micromanipulator Assemblies
- Three Options Available:
  - PCS-500-SSH: Two Dovetails with a Mounting Platform for Large Axon or HEKA Headstages
  - PCS-AXN-ADP: Single-Dovetail, Close-Approach Adapter for Smaller Headstages
  - MIS-PHM: Two Dovetails with Pipette Mount that Provides 360° Rotational Positioning
- Smooth Motion Allows Orientation of Headstage or Pipette at Very Steep (>45°) or Very Shallow (<25°) Angles
- Multiple Mounting Position Options Provide Extra Clearance Near Objectives

Click to Enlarge
The PCS-500-SSH can be mounted for steep (left) or shallow (right) approach angles.

These adapters for the micromanipulator assemblies provide a flexible platform for mounting a headstage or pipette; see the table below for details. Each adapter alows the mounted headstage or pipette to be positioned at steep or shallow approach angles. Steep approach angles are often desired in electrophysiology experiments in order to minimize the length of the electrode in solution, ensuring that electrical noise is kept to a minimum. In contrast, slice electrophysiology experiments often use electrodes positioned nearly parallel (15° to 25° angle) to the experimental surface to allow the pipette tip to be moved in a straight line over the sample chamber. Shallow approach angles also enable users to stack multiple pipettes or headstages in close proximity. In both these cases, extra clearance for steep or shallow approach angles is needed to prevent interference with the microscope or other experimental apparatus.

Steep/Shallow Headstage Adapter

The PCS-500-SSH Steep/Shallow Angle Headstage Adapter features a flexible mounting platform for Axon CV-5, Axon CV-203B, and HEKA EPC-9 headstages. The adapter consists of the headstage adapter plate, the slide assembly with a dovetail on the back, a clamping plate, and a mounting plate (shown in the image to the right). Using the adapter, users can quickly exchange pipettes during an experiment.



Click to Enlarge
PCS-500-SSH Headstage Adapter Components

The mounting plate provides two possible dovetail grooves for securing the slide. For shallow approach angles, the slide is placed within the lower dovetail bracket, while for steep approach angles, the slide is placed in the upper dovetail bracket (see the image above to the right). Mounting in this manner provides maximum clearance above the micromanipulator when it is rotated for a steep angle approach.

To install the adapter, attach the mounting plate to the micromanipulator using the included 4-40 screws (3/32" hex). Secure the slide assembly in one of the dovetail grooves by installing the clamping plate with the included 2-56 cap screws and 5/64" (2 mm) hex key. The user can loosen the clamping plate and position the entire slide assembly; this determines the stop locations that correspond to the fully extended and fully retracted positions of the pipette. At least 1" of the slide assembly should be held by the clamping plate to ensure stability of the mount. To adjust the slide position, turn the locking handle to loosen, then move the slide to the desired location, and retighten the locking handle.

Click for Details
The PCS-AXN-ADP Close-Approach Adapter Secured to a Micromanipulator

Close Approach Headstage Adapter

The PCS-AXN-ADP Headstage Adapter is a compact solution for the close approach mounting of a smaller headstage or pipette mount (sold separately). This compact solution provides more clearance room for other equipment.

It is attached to the micromanipulator using the headstage adapter plate included with the micromanipulator and the included 2-56 cap screws and 5/64" (2 mm) hex key. When mounted to this adapter, the PCS-AXN-ADP will be offset from the micromanipulator body, allowing it to be used in closer proximity to the experiment while reducing mechanical clashing. Please see the manual for detailed mounting instructions.

A single dovetail groove is provided to hold a headstage or pipette mount. The groove is the same width as the other headstage adapters, making it compatible with the headstage adapter plate included with the PCS-500-SSH and the pipette mount included

Click to Enlarge
MIS-PHM Pipette Holder Mount Secured to Micromanipulator

with the MIS-PHM.

Pipette Holder Mount

The MIS-PHM Pipette Holder Mount can hold pipettes up to Ø4 mm and position them at steep or shallow approach angles. It uses the same mounting plate and dovetail clamping mechanism as the PCS-500-SSH Headstage Adapter, which allows for positioning of the slide position and two mounting locations. The pipette clamp can freely rotate 360°, allowing for coarse control of the pipette rotation angle. Fine control of the approach angle is accomplished using the micromanipulator itself.

For users who have an older pipette holder, please contact Tech Support for information on replacement options.

Item #	Compatibility		Approach Angles[b]	Mounting
	Headstage	Pipette Mount[a]		
PCS-500-SSH	Axon CV-203B Axon CV-5 HEKA EPC-9	Yes (Not Included)	Smooth Motion for Steep (>45°) or Shallow (<25°)	Mounts Directly to Micromanipulator
PCS-AXN-ADP	Axon CV-203B Axon CV-7B	Yes (Not Included)		Close Approach, Requires Headstage Adapter Plate (Included with Micromanipulators)
MIS-PHM		Yes (Included)		Mounts Directly to Micromanipulator

- A pipette mount is included with the MIS-PHM. It is compatible, but not included, with the PCS-AXN-ADP and PCS-500-SSH.
- Steep and shallow approach angles can be achieved using the PCS-500-SSH and MIS-PHM by using the top or bottom dovetail on the back plate.

Part Number	Description	Price	Availability
PCS-500-SSH	**Steep/Shallow Headstage Adapter**	**$780.30**	**Today**
PCS-AXN-ADP	**Close Approach Headstage Adapter**	**$208.08**	**Today**
MIS-PHM	**Pipette Holder Mount**	**$802.74**	**Today**