



# MPM-10 Piezo Translator

*For the DC3001 Motorized Micromanipulator*



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## **INSTRUCTION MANUAL**

Serial No. \_\_\_\_\_

1091

**World Precision Instruments**



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### Warranty

WPI (World Precision Instruments, Inc.) warrants to the original purchaser that this equipment, including its components and parts, shall be free from defects in material and workmanship for a period of one year\* from the date of receipt. WPI's obligation under this warranty shall be limited to repair or replacement, at WPI's option, of the equipment or defective components or parts upon receipt thereof f.o.b. WPI, Sarasota, Florida U.S.A. Return of a repaired instrument shall be f.o.b. Sarasota.

The above warranty is contingent upon normal usage and does not cover products which have been modified without WPI's approval or which have been subjected to unusual physical or electrical stress or on which the original identification marks have been removed or altered. The above warranty will not apply if adjustment, repair or parts replacement is required because of accident, neglect, misuse, failure of electric power, air conditioning, humidity control, or causes other than normal and ordinary usage.

To the extent that any of its equipment is furnished by a manufacturer other than WPI, the foregoing warranty shall be applicable only to the extent of the warranty furnished by such other manufacturer. This warranty will not apply to appearance terms, such as knobs, handles, dials or the like.

WPI makes no warranty of any kind, express or implied or statutory, including without limitation any warranties of merchantability and/or fitness for a particular purpose. WPI shall not be liable for any damages, whether direct, indirect, special or consequential arising from a failure of this product to operate in the manner desired by the user. WPI shall not be liable for any damage to data or property that may be caused directly or indirectly by use of this product.

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- Inspect all shipments upon receipt. Missing cartons or obvious damage to cartons should be noted on the delivery receipt before signing. Concealed loss or damage should be reported at once to the carrier and an inspection requested. All claims for shortage or damage must be made within 10 days after receipt of shipment. Claims for lost shipments must be made within 30 days of invoice or other notification of shipment. Please save damaged or pilfered cartons until claim settles. In some instances, photographic documentation may be required. Some items are time sensitive; WPI assumes no extended warranty or any liability for use beyond the date specified on the container.
- WPI cannot be held responsible for items damaged in shipment en route to us. Please enclose merchandise in its original shipping container to avoid damage from handling. We recommend that you insure merchandise when shipping. The customer is responsible for paying shipping expenses including adequate insurance on all items returned.
- Do not return any goods to WPI without obtaining prior approval and instructions (RMA#) from our returns department. Goods returned unauthorized or by collect freight may be refused. The RMA# must be clearly displayed on the outside of the box, or the package will not be accepted. Please contact the RMA department for a request form.
- Goods returned for repair must be reasonably clean and free of hazardous materials.
- A handling fee is charged for goods returned for exchange or credit. This fee may add up to 25% of the sale price depending on the condition of the item. Goods ordered in error are also subject to the handling fee.
- Equipment which was built as a special order cannot be returned.
- Always refer to the RMA# when contacting WPI to obtain a status of your returned item.
- For any other issues regarding a claim or return, please contact the RMA department.

**Warning: This equipment is not designed or intended for use on humans.**

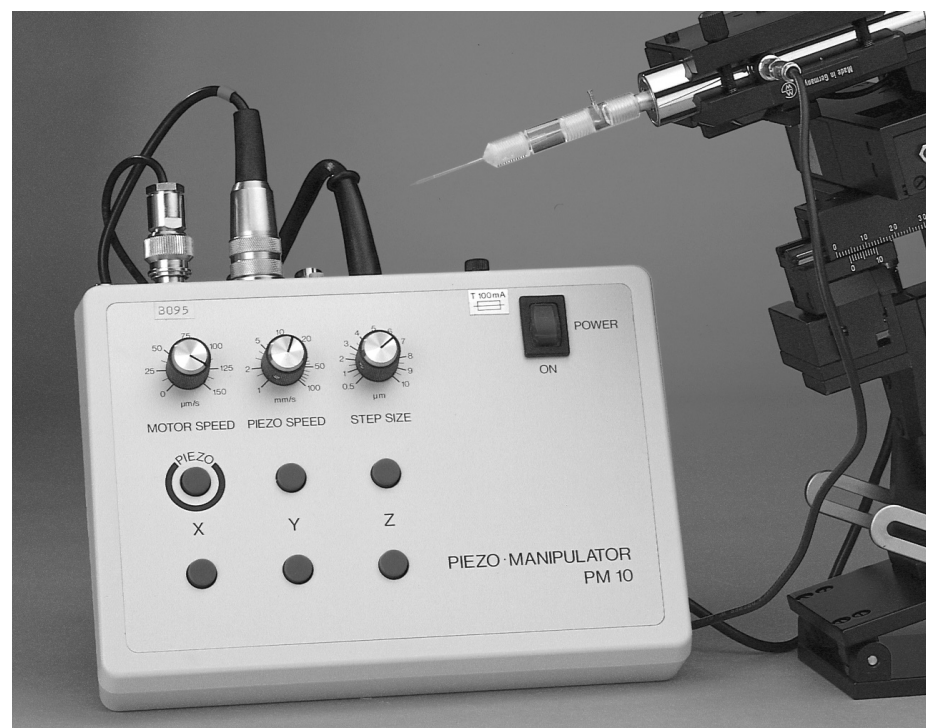
*\* Electrodes, batteries and other consumable parts are warranted for 30 days only from the date on which the customer receives these items.*

## Service

There are no user serviceable parts in this unit. The PM 6 microelectrode holder may be replaced if broken.

## Accessories

The PM 6 microelectrode holder can accommodate glass pipettes of 1.0 mm, 1.2 mm and 1.5 mm outer diameter. WPI provides several types of glass in these diameters. See the attached list of glass for a wide selection.



## Description

The MPM-10 Piezo Translator is specifically designed for ultra-fast advance of intracellular microelectrodes into tissues that are mechanically unsupported and for impaling cells of small diameter. The heart of the device is a cylindrical piezoelectric ceramic driver element in a sealed metal housing. Precise construction and special vibration stabilizers ensure the MPM-10's excellent puncture characteristics. Lateral deviation from the ideal axis of puncture (measured at the tip of the electrode holder) is  $\pm 5\%$  of the step size.

The MPM-10 is a complete system which is ready for use as received. It does require a 110 volt, 60 hertz outlet and pulled capillary tips or some other type of micro-electrode.

Because the range of travel of the piezo-translator is much too limited (single steps of 0.5 to 10 microns) for it to be useful independently it must be mounted on a micromanipulator. We suggest the use of WPI's DC3001 motorized micromanipulator which allows these two components to be electronically controlled from a single

control unit. When using this combination, the axis carrying the micropipette shoots forward at a predetermined rate when the piezo element is activated, then immediately returns (at a slower speed) to its starting position. As soon as the piezo element begins its reverse travel, the motorized manipulator starts to travel forward. The complimentary opposition of these two travel sequences allows the final position of the micropipette tip to remain inside the cell that has been penetrated.

## Equipment Set Up

### Contents

Each unit includes one of each of the following components:

- a. PM 10 Controller
- b. Piezo element
- c. Piezo element clamp
- d. PM 6 Microelectrode holder
- e. High voltage cable
- f. Instruction Manual

### Piezo Element Mounting

The piezo element should be mounted in an appropriate micromanipulator. If the WPI DC3001 or the M3301 is used the tool holder which is mounted on the micromanipulator must be removed by unscrewing the two retaining screws on the top. The piezo element clamp can then be mounted in place of the tool holder. Mount the clamp so that the piezo element hangs down beside the motorized axis of the manipulator. Depending on whether the micromanipulator is a right or left handed model only two of the holes will line up. The piezo element should have the end with the microelectrode holder attachment (male screw) facing in the direction of the work station. If it is not facing in the correct direction loosen one of the two knurled screws on the clamp and remove the other one. The piezo element will now slide out and can be replaced in the opposite direction. If the MMJ Joystick manipulator is used the piezo element should be removed from the holder and mounted directly into the tool holder on the manipulator. Remove the screw which secures the tool in the tool holder, turn the holder upside down so that the piezo element will fit, replace the screw and tighten the tool holder.

The high voltage cable can now be attached to the piezo element by screwing one end into the piezo element and connecting the other end to the high voltage connector on the back of the PM10 controller.

### Micro-electrode mounting

A micro-electrode should now be prepared and mounted in the PM 6 micro-electrode holder. Begin by unscrewing both pieces on the tip of the PM 6 and exposing most of the silver wire which is mounted inside the holder. The end of this wire (about one inch) should first be chlorided. Replace the first part of the tip. Now mount a pulled pipette tip over the wire and secure it by screwing the outer piece of the holder in place. The micro-electrode can be connected to a pre-amplifier or head stage by pulling apart the pin on the side of the PM 6 and soldering the removable male end to a short wire. Once the micro-electrode is prepared screw the holder onto the end of the piezo element and plug it into the pre-amplifier.

## Operation

Once the set-up is complete operation of the MPM10 is relatively straight forward. Select the desired step size and speed for the piezo element. If the Piezo translator is being used in conjunction with the DC3001 micro-manipulator select the motor speed for the manipulator. The three axes of the manipulator are operated by pressing the appropriate button on the PM 10 control box. The upper row of buttons activate the manipulator in the positive direction while the lower buttons activate the negative direction. A single press of any button will cause the manipulator to step one step the size of which is indicated by the step size setting. By pressing and holding a button down the manipulator will drive continuously until the button is released.

**CAUTION:** Each axis of the DC3001 micromanipulator has a range of only 10 mm, which can be controlled by reading the micrometer mounted inside each motorized axes. Driving out of range will damage the gearbox, especially at high speed.

The piezo element is activated by pressing and releasing the positive X button which is also marked PIEZO. This action will cause the piezo translator to move the micro-electrode forward a distance of and at the speed which is set on the PM 10 step size and piezo speed. Once the forward motion is complete the piezo element reverses direction and returns to its original position. Coincident with this return motion of the piezo element the DC3001 X-axis translates forward an equal amount effectively canceling the motion of the piezo-element. The result of this combination of motions is that the micro-electrode tip can penetrate a cell then remain in that location while the MPM10/DC3001 system resets for another forward step.