



# 1300M Micropipette Beveler

*For beveling glass microelectrodes*

www.wpiinc.com

## INSTRUCTION MANUAL

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

032207

**World Precision Instruments**



# 1300M Micropipette Beveler

---

## Contents

Introduction .....	1
Safety .....	2
Installation.....	3
Controls, Indicators and Connectors.....	4
Operating Instructions.....	5
Maintenance.....	10
Specifications.....	11
Parts List.....	11
Warranty .....	12

*Copyright © 2001 by World Precision Instruments, Inc. All rights reserved. No part of this publication may be reproduced or translated into any language, in any form, without prior written permission of World Precision Instruments, Inc.*

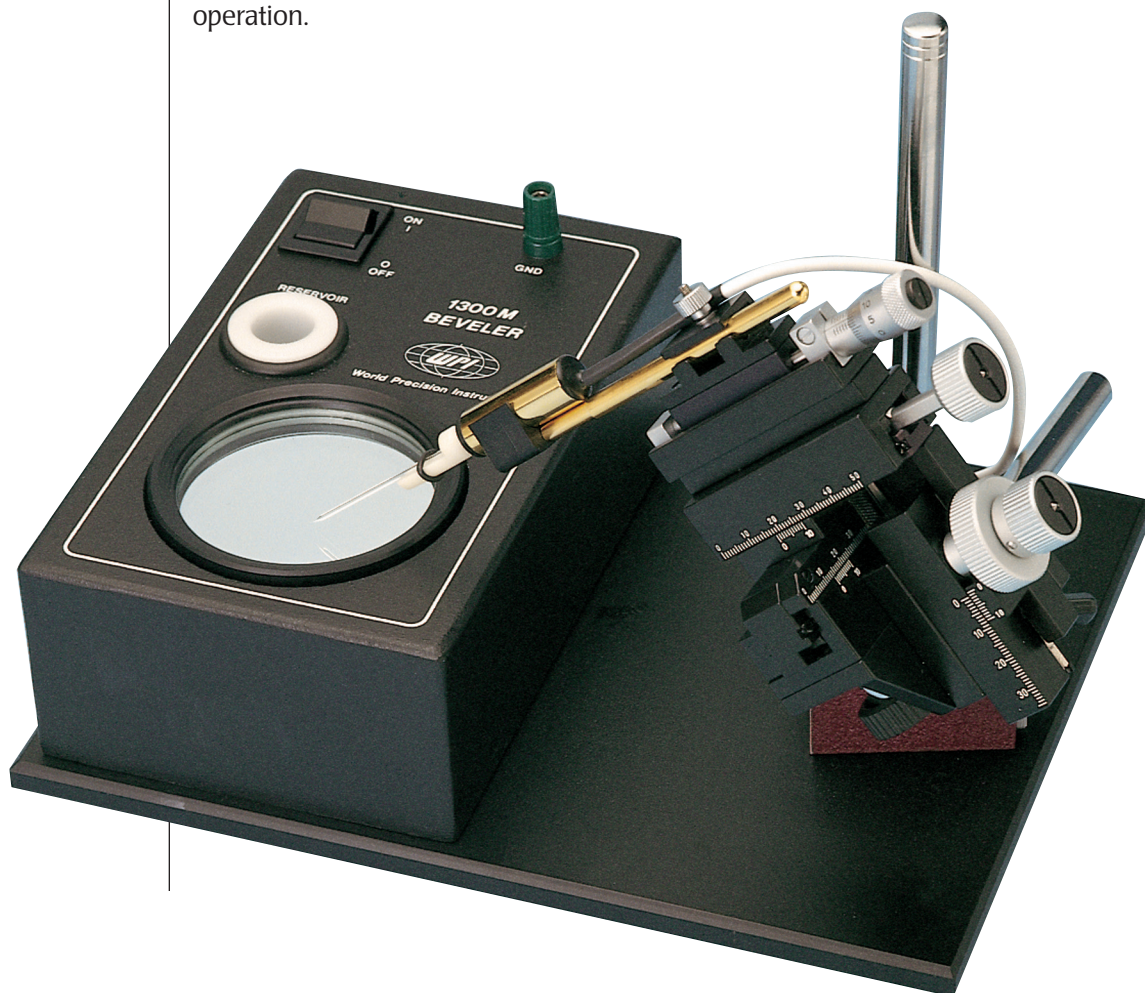


## 1300M Micropipette Beveler

### INTRODUCTION

The Model **1300M** Beveler is designed to bevel glass microelectrodes using a rotating surface covered with an abrasive slurry. The substrate surface is an optically flat, fully reflective 7.5 cm diameter glass disk. On the substrate a slurry containing 0.05  $\mu\text{m}$  alumina particles bevels the micropipette tip and lessens its electrical resistance. An AC motor drives the horizontal grinding surface at 50 RPM.

The Beveler is mounted on a 1.0 cm thick base plate, 22 cm by 28 cm in size, which provides a stable surface for a micropositioner with a magnetic base, such as the 1350M. An optically flat glass disk and 0.05  $\mu\text{m}$  alumina is supplied with the Beveler. Also included is a wetting wick and electrolyte reservoir for use as a reference electrode for the measurement of microelectrode resistance during the beveling operation.





# 1300M Micropipette Beveler

---

## SAFETY

### Terminology

**WARNING:** statements identify conditions or practices that could result in personal injury or loss of life.

**CAUTION:** statements identify conditions or practices that could result in damage to the equipment or other property. When marked on the instrument, it also indicates a personal injury hazard not immediately accessible as you read the marking.

### Power Source

This instrument is intended to operate from a power source that will not apply more than 250 volts rms between the supply (mains) conductors or between either supply conductor and ground. A protective (safety) ground connection by way of the grounding conductor (green with yellow stripe) in the power cord is essential for safe operation.

### Grounding the Instrument

This instrument is grounded through the grounding conductor of the power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle before connecting to the instrument input and output terminals. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

**WARNING: YOU MUST NOT REMOVE OR IN ANY WAY BYPASS THE GROUNDING PIN OF THE POWER CORD.**

### Use the Proper Power Cord

Use only the power cord specified for your instrument and locale. Use only a power cord that is in good condition.

### Use the Proper Fuse

To avoid a fire hazard, use only the fuse specified for your instrument. Replacement fuses shall be identical in type, voltage rating, and current rating. Line fuses must match the selected voltage source of AC power and must be changed when the nominal voltage range is changed.



# 1300M Micropipette Beveler

---

## **Do Not Operate in Explosive Atmospheres**

To avoid explosion, do not operate this instrument in an atmosphere of explosive gases.

## **Do Not Remove Covers or Panels**

To avoid personal injury, do not remove covers or panels from this instrument. Do not operate the instrument without properly installed covers or panels.

## **INSTALLATION**

### **Input Power**

This instrument operates from either a 120V or 240V nominal AC power source. The rear panel is marked at the factory with the user's expected mains power. Before connecting the power cord, verify that, in fact, the correct mains power setting was provided and the appropriate line fuse is installed. The line voltage is set at the factory and may not be changed by the user.

### **Line Fuse**

**WARNING: BEFORE ATTEMPTING FUSE REPLACEMENT, DISCONNECT THE INSTRUMENT FROM THE AC POWER SOURCE.**

The instrument contains one fuse, located in the fuseholder on the back panel. The fuseholder is opened by inserting a screwdriver in the slot, pressing lightly, and twisting the cap 1/8-turn counterclockwise. Verify that the fuse contained in the fuseholder matches the desired line voltage. If necessary, replace the fuse with the type and rating specified on the back panel.



## 1300M Micropipette Beveler

---

### CONTROLS, INDICATORS & CONNECTORS

#### Front Panel

**POWER Switch** A two-position switch used to apply mains power to the instrument.

#### Rear Panel

**Connector** Polarized, 3-conductor, IEC320/CEE-22 connector is used for line (mains) power input to the instrument. A removable cordset, terminated with a NEMA 5-15P connector, is standard. An alternate cordset may be supplied when local circumstances dictate different mains voltages and connections.

**Fuseholder** Used for protective fuse in series with the high side (brown or black wire) of the mains. Holder accepts 1/4 by 1-1/4 inch (6.35mm by 31.8mm) fuses of the type indicated on the rear panel.



## 1300M Micropipette Beveler

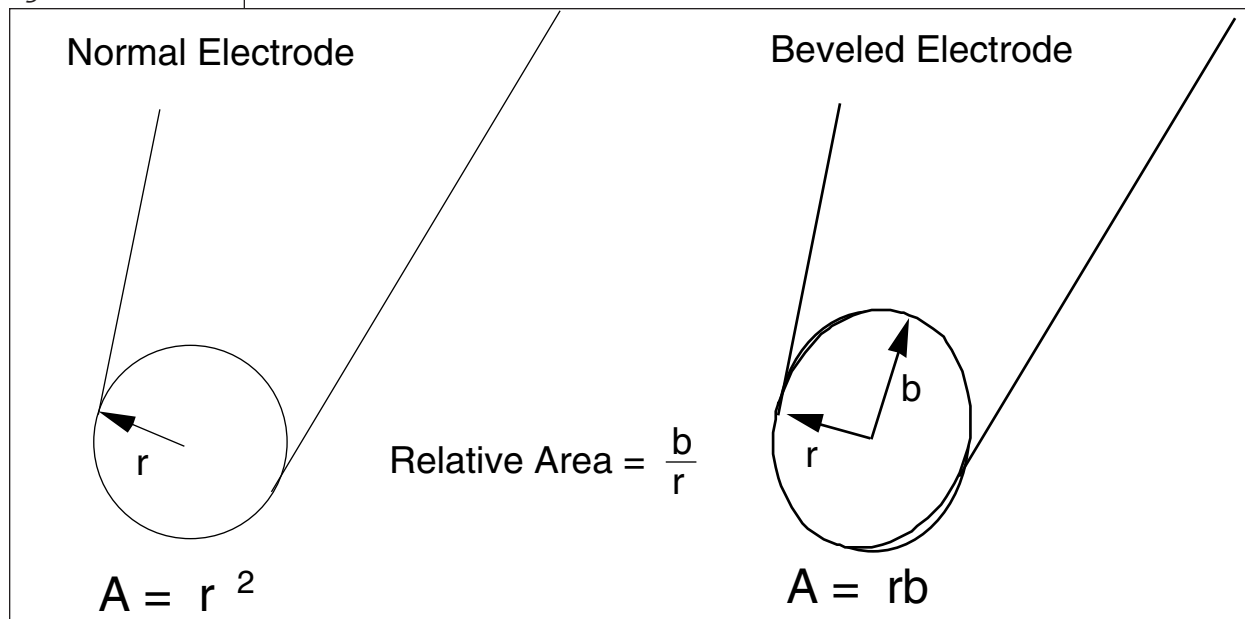
### OPERATING INSTRUCTIONS

#### General

Beveling of fluid filled glass micropipette electrodes is a technique that constitutes a significant improvement in microelectrode technology. The direct benefits are:

1. Electrode tip resistance for a given diameter is significantly reduced resulting in lower electrode noise and faster response time owing to the reduced input time constant at the amplifier input.
2. Cell impalement is easier and less damage is caused by the electrode penetration of cell walls as evidenced by the recording of consistently larger cell potentials.
3. The voltage versus current characteristics of beveled electrodes are more linear, that is, more ohmic. This linearization considerably improves single bridge techniques wherein current is injected intracellularly while simultaneously recording the cell potential drop. Dyes such as Procion Yellow and drugs are more easily iontophoresed from beveled electrodes because of the larger effective area of the electrode tip. These improvements derive from the fact that the effective cross sectional area of the electrode tip is increased as suggested in Figure 1. Beveling sharpens the electrode tip similar to the way in which a hypodermic needle is ground.

Figure 1





## 1300M Micropipette Beveler

### Electrode Resistance Monitoring

Key to successful beveling is the ability to monitor electrode resistance while beveling. Alternating current rather than DC is used by choice to avoid the errors introduced by polarization potentials using DC for measurement. A low frequency (20 to 100 Hz) non-line frequency related sine or square wave current can be used. The resulting voltage drop across the electrode is monitored with an oscilloscope. Several ways of making the resistance measurement are:

1. WPI Model **Omega-Tip Z**. This instrument has been specifically designed for this application. The AC drive signal is provided internally and the digital readout displays resistance directly. The voltage developed across the electrode can be monitored on an oscilloscope.
2. WPI Model **773**. This microprobe system can easily perform the resistance measurement using the STIMULUS INPUT feature. The X1 output sensitivity will be 1 mV per MW of electrode resistance per 20 mV of drive at the STIMULUS INPUT. It is suggested that a 22.5 Hz square wave be used. The X1 output would be viewed on an oscilloscope. Capacitive neutralization can be used if desired. Figure 2 illustrates the instrument interconnections required.

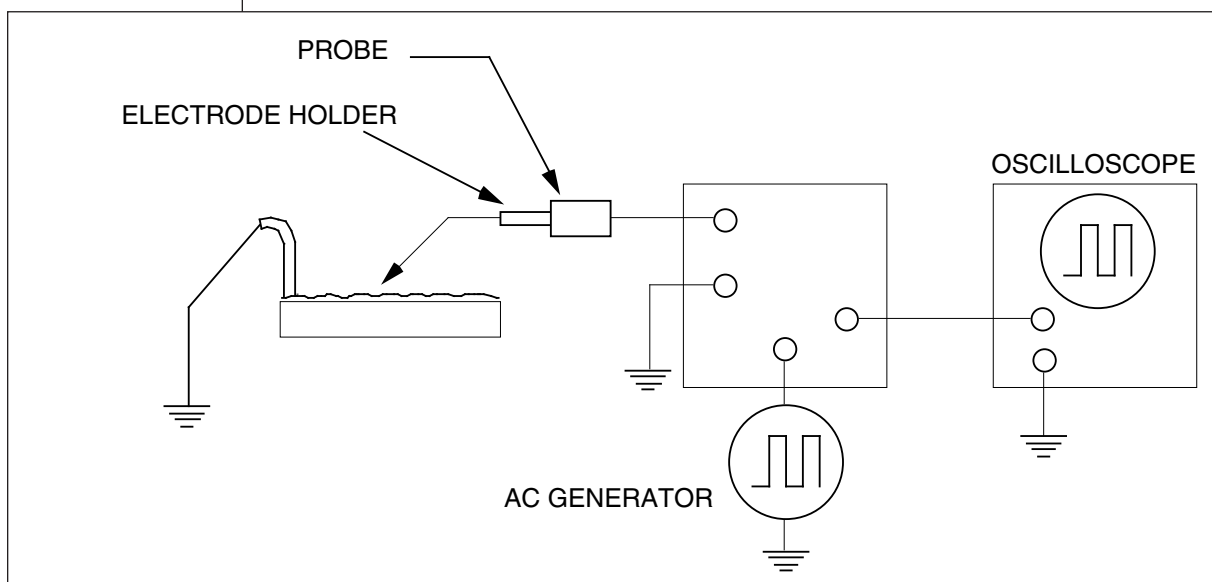


Figure 2





## 1300M Micropipette Beveler

3. High Input Impedance Electrometer/Follower. The circuit shown in figure 3 illustrates a simple method for electrode resistance measurement. A high impedance electrometer/follower and oscilloscope are required. If the amplitude of the AC voltage is adjusted such that the peak-to-peak voltage across a dummy electrode of 20 MW is 100 mV peak-to-peak, then the measuring system will be calibrated to read 5 mV/MW. The same precautions must be taken with regard to line voltage induction that is normally used for intracellular recording, since a large amount of line frequency interference will obscure the resistance signal.

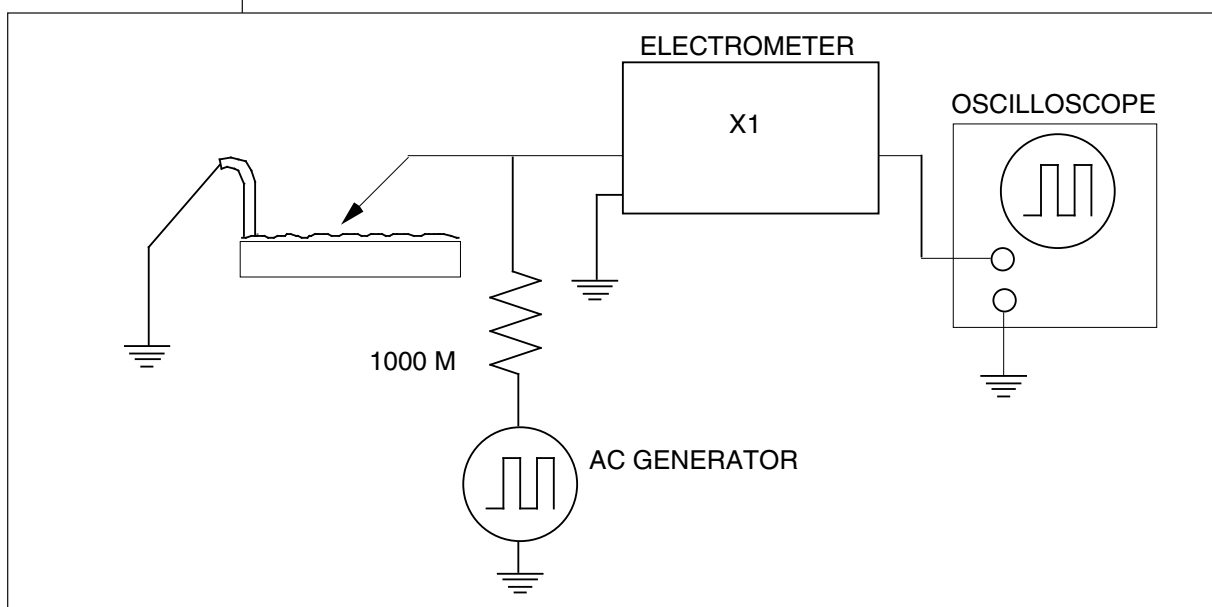


Figure 3

### Beveling

The abrasive surface of the Beveler is an optically flat mirror which has been covered with a thick slurry of powdered alumina. To make the slurry take 10 ml of 0.5 M KCl solution, add a drop of detergent to decrease the surface tension, and add alumina powder (about 5% by weight) with stirring until a suspension with a milk-like color is formed. Place the disk on the rotating support table and fit the rubber seal gently around the periphery of the disk and under the lip of the support table. Completely cover the disk with a few drops of the stirred alumina slurry. Position the electrolyte reservoir above the table as shown in Figure 4.

Adjust and position the bottom of the wick so that it just touches the abrasive disk



## 1300M Micropipette Beveler

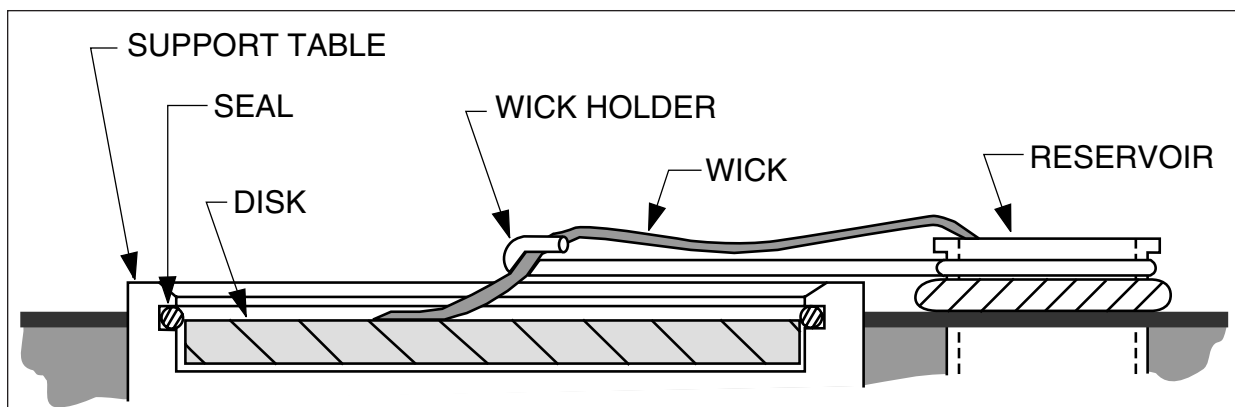


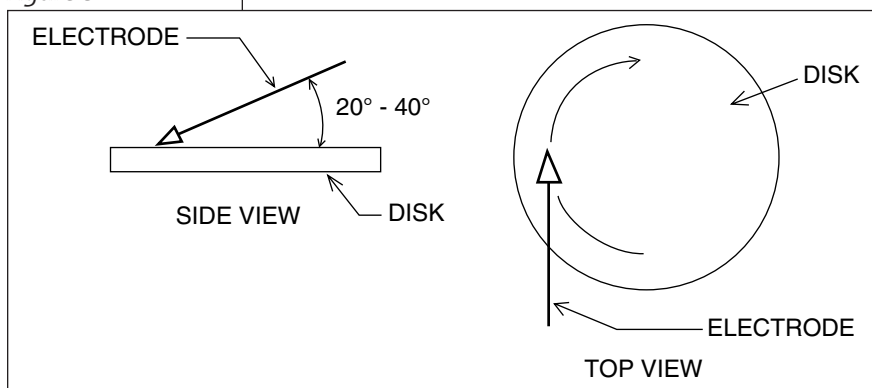
Figure 4

at its center. It may be necessary to initially saturate the wick with solution also. When measuring resistance the reference half-cell may be placed in the reservoir bath. Using a micropositioner and a low power binocular microscope, position the electrode as shown in Figure 5 at about 20 to 40 degrees with respect to the horizontal and parallel to the motion of the circumference of the abrasive disk.

### Micropositioning

The recommended micropositioner to be used with 1300M Beveler is the Model **1350M**, which consists of a micromanipulator and magnetic stand. Position the magnetic stand to the right rear of the 1300M baseplate and turn the stand magnet on. The manipulator should have the adjustment knobs to the right and the Vernier scales facing forward. Vertical motion is controlled by the large lower knob, while lateral motion is controlled by the small one. The middle knob is the coarse adjustment for forward motion and the upper knob is the corresponding fine adjustment.

Figure 5



The electrode may be held on the positioner in any number of ways. The WPI Model **EHB1** Electrode Holder is a simple silver wire and plug adapter designed for use with the WPI electrometer microprobes. It allows for quickly changing electrodes while beveling. Advance the electrode until



## 1300M Micropipette Beveler

---

it is just in contact with the surface solution and monitor the electrode resistance. The mirrored surface of the abrasive disk allows one to view the reflection of the electrode as the disk is being approached. Beveling should begin at this point. Typically the resistance will decrease at a rate of 1 MW every few seconds.

Raise the electrode promptly when the resistance has diminished to an appropriate value. A sudden drop in resistance signals electrode breakage. What is desired is a gradual decrease of electrode resistance in a somewhat monotonic fashion. With practice one will develop a feel for the proper beveling technique. Cutting speed increases as the electrode is positioned more radially outward from the center of the disk. Thus the beveling time can be varied by beveling at different radii with respect to the center of the disk.



## 1300M Micropipette Beveler

---

### MAINTENANCE

#### Cleaning

**CAUTION:** Do not use alcohol, aromatic hydrocarbons or chlorinated solvents for cleaning. They may adversely react with plastic materials used to manufacture the instrument.

The exterior of this instrument may be cleaned periodically to remove dust, grease and other contamination. There is no need to clean the inside. Use a soft cloth dampened with a mild solution of detergent and water. Do not use abrasive cleaners.

1. Use a moist tissue or soft paper towel to gently blot up the solution remaining on the beveling surface. Do not rub.
2. Clean the rubber gasket seal with moist tissue. Blot remaining water on beveling surface and allow to dry.
3. Do not allow any solution or water to run down on the outside of the support table or on to the mechanism housing.



## 1300M Micropipette Beveler

---

### SPECIFICATIONS

<b>Beveling Surface</b>	7.5 cm diameter reflective glass, flat to within 2.5 $\mu$ m
<b>Abrasive Material</b>	Alumina, 0.05 micron diam
<b>Speed of Rotation</b>	50 rpm
<b>Motor</b>	AC synchronous
<b>Power Requirements</b>	120 volts, 60 Hz or 240 volts, 50 Hz, 20VA
<b>Physical Dimensions:</b>	
<b>Base Plate</b>	22 cm x 28 cm x 1 cm thick
<b>Overall Height</b>	Approx. 8 cm
<b>Height of Abrasive Surface Above Base Plate</b>	
	Approx. 7 cm
<b>Shipping Weight</b>	13 kg

### PARTS LIST

The WPI Model 1300M beveler has been designed to provide years of trouble free operation. Most parts will not require replacement under normal operating conditions. The following items may require replacements:

<b>PART NUMBER</b>	<b>DESCRIPTION</b>
<b>2479</b>	"O" Ring for Mirror
<b>1574</b>	"O" Ring for Motor Drive
<b>2478</b>	Mirror Disk
<b>3531</b>	0.05 $\mu$ m Alumina Powder (5 g)



# 1300M Micropipette Beveler

## 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.

## Claims and Returns

- 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

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

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

## World Precision Instruments, Inc.

International Trade Center, 175 Sarasota Center Blvd., Sarasota FL 34240-9258

Tel: 941-371-1003 • Fax: 941-377-5428 • E-mail: sales@wpiinc.com

**UK:** Astonbury Farm Business Centre • Aston, Stevenage, Hertfordshire SG2 7EG • Tel: 01438-880025 • Fax: 01438-880026 • E-mail: wpiuk@wpi-europe.com

**Germany:** Liegnitzer Str. 15, D-10999 Berlin • Tel: 030-6188845 • Fax: 030-6188670 • E-mail: wpide@wpi-europe.com



**WORLD PRECISION INSTRUMENTS, INC.**

175 Sarasota Center Boulevard  
Sarasota, FL 34240-9258 USA  
Telephone: (941) 371-1003 Fax: (941) 377-5428  
e-mail wpi@wpiinc.com

**DECLARATION OF CONFORMITY**

We: World Precision Instruments, Inc.  
175 Sarasota Center Boulevard  
Sarasota FL 34240-9258  
USA

as the manufacturers of the apparatus listed, declare under sole responsibility that the product(s):

**Title: 1300M**

to which this declaration relates is/are in conformity with the following standards or other normative documents:

**Safety:** EN 61010-1:1993 (IEC 1010-1:1990)

**EMC:** EN 50081-1:1992  
EN 50082-1:1992

and therefore conform(s) with the protection requirements of Council Directive 89/336/EEC relating to electromagnetic compatibility and Council Directive 73/23/EEC relating to safety requirements.

**Issued on: 18<sup>th</sup> February 2000**

**Dr. Mark P. Broderick  
President and COO**

**World Precision Instruments, Inc.  
175 Sarasota Center Boulevard  
Sarasota, FL 34240-9258 USA**

**Mr. Glen Carlquist  
Production Manager**

**World Precision Instruments, Inc.  
175 Sarasota Center Boulevard  
Sarasota, FL 34240-9258 USA**