

Micromanipulator MUX2

Micromanipulator with motorized x- and z-axis

USER MANUAL



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1 INTRODUCTION

The Micromanipulator **MUX2** has been developed within the last decade in close cooperation with leading scientists, who are specialized in microsensor measurements. Please read carefully this manual before starting to use the device.

1.1 Packing List

Please check that all following items are included in your package:

- Micromanipulator base with motor unit for x-axis
- Micromanipulator base with motor unit for z-axis
- Mounting screws
- Power supply with exchangeable international plugs
- Data cable with separate or integrated USB connector (might look different than in the image)
- Adapter for mounting of thin microsensors

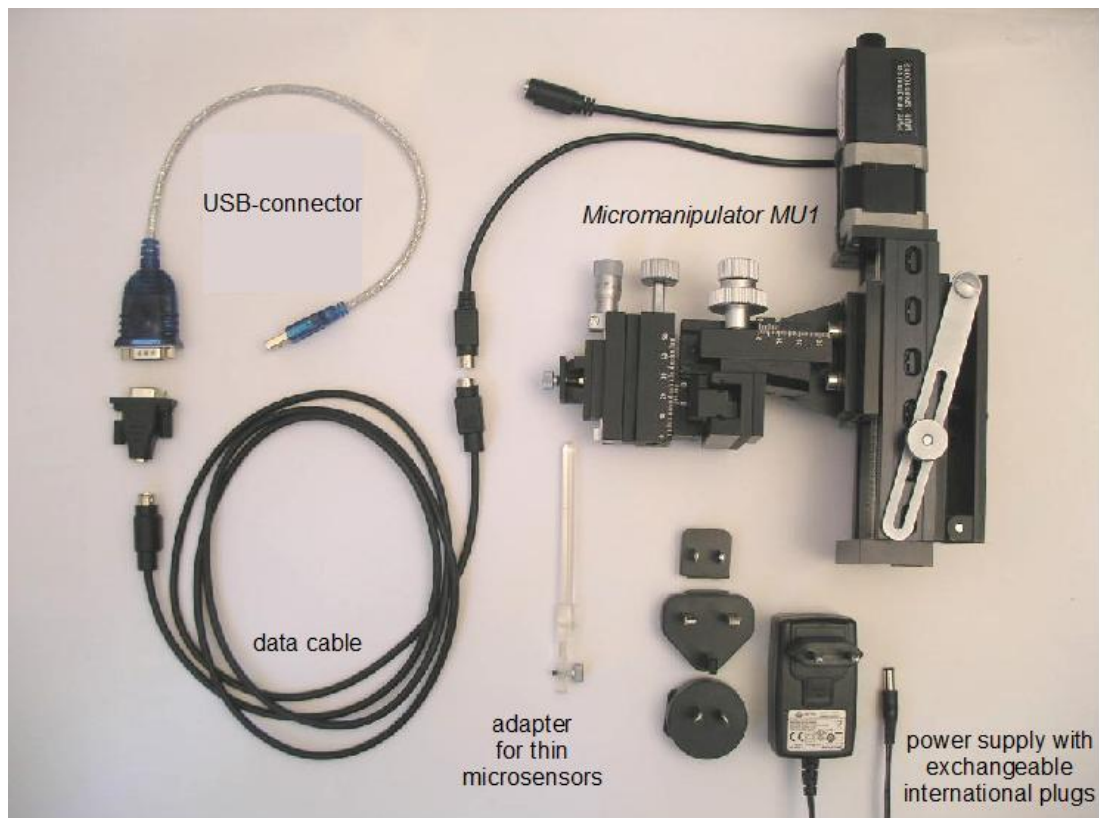
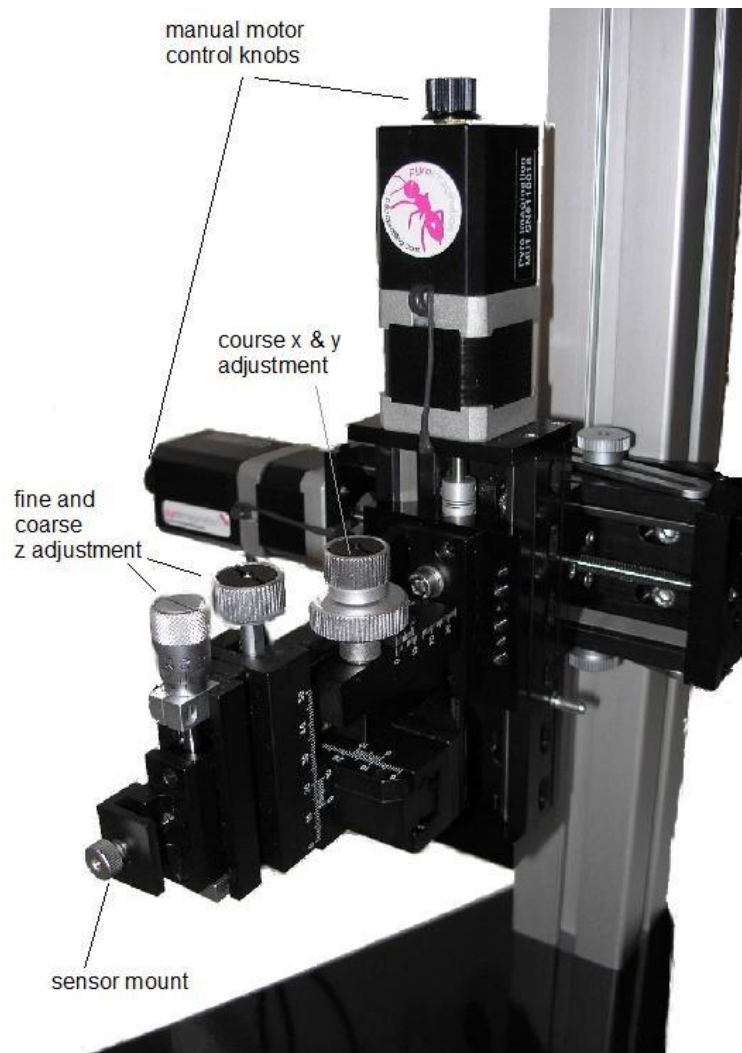


Figure 1: Overview of the parts included in the package. Note that the exact appearance of some delivered items might differ to this photograph.

1.2 Overview



The Micromanipulator **MUX2** has been developed for performing automatized microprofile measurements with microsensors. It consists of a compact manual micromanipulator for the x-, y-, and z-axis, supplemented with a high-precision motorized slides (0.1 μm resolution) for x-axis (left-right) and the z-axis (up-down). Versatile control software is provided by **PyroScience** as freeware. If no computer is connected, the motorized slide can be operated by a control knobs integrated the motor housings. For best operation conditions, the micromanipulator **MUX2** should be mounted on the **Heavy Stand HS1** from **PyroScience**. Alternatively, it can be mounted on any flat surface providing a M6 mounting hole.

2 SAFETY GUIDELINES

PLEASE READ THESE INSTRUCTIONS CAREFULLY BEFORE STARTING TO WORK WITH THIS DEVICE

- Before connecting the device to the mains voltage, please ensure that the operating voltage stated on the power supply corresponds to the mains voltage.
- Ensure that the device is only operated under the climatic conditions specified in the chapter "Technical Specifications" in this instruction manual.
- Maintenance, modifications and repair work must only be carried out by a suitable, qualified technician, trained by **PyroScience**.
- If there is any reason to assume that the instrument can no longer be employed without a risk (especially regarding any electrical parts), it must be set aside and appropriately marked to prevent any further use.
- The safety of the user may be endangered, e.g. if the instrument a) is visibly damaged, b) no longer operates as specified, c) has been stored under adverse conditions for a longer period.
- If there is any problem, contact **PyroScience** and send the micromanipulator back for repair.
- The user has to ensure the following laws and guidelines:
 - EEC directives for protective labor legislation
 - National protective labor legislation
 - Safety regulations for accident prevention
- **This device is not protected against water spray**
- **This device is not water-proof**
- **This device must not be used under environmental conditions which cause water condensation**
- **This device must not be opened**

THIS DEVICE MAY ONLY BE OPERATED BY QUALIFIED PERSONAL:

This device is only intended for use in the laboratory by qualified personal according to this instruction manual and these safety guidelines!

Keep this device out of the reach of children!

Keep away from moving parts of the device!

This device is not intended for medical or military purposes!

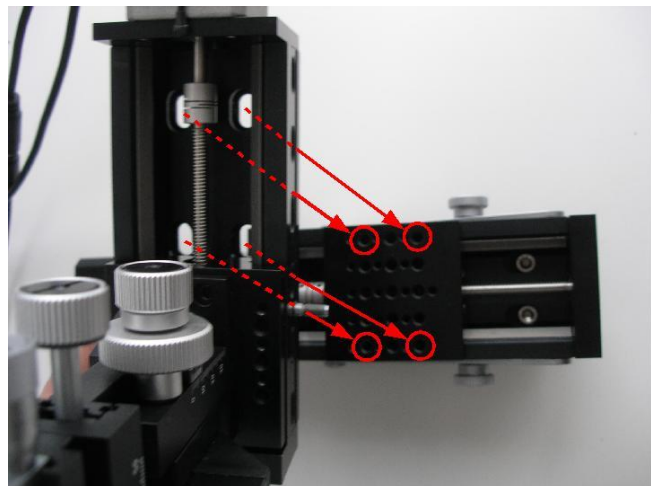
3 Installation and Operation

PRECAUTION: The Micromanipulator **MUX2** comprises high-precision mechanics which can easily be damaged by improper or harsh treatment. **Handle with care!**

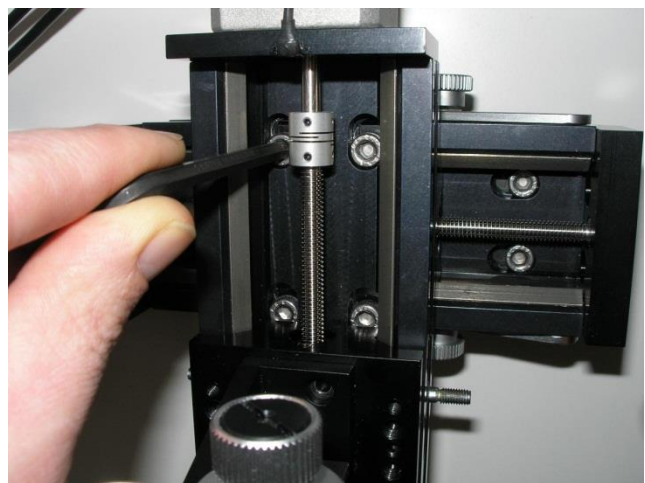
3.1 Assembly and Mounting

Please follow these steps for assembling the Micromanipulator **MUX2**:

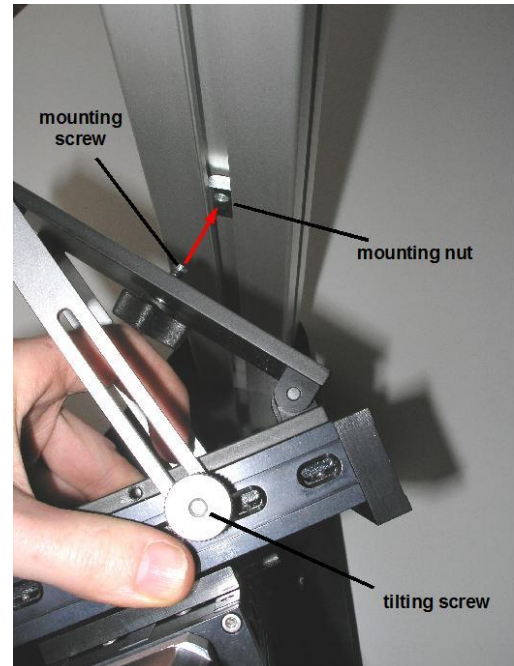
1. Position the 4 mounting holes of the micromanipulator head on top of the 4 mounting threads (red circles) in the micromanipulator base. If the 4 mounting holes are hidden by the motor slide, you can turn the lead screw of the slide manually until all 4 holes are visible as shown in the image



2. Fasten the micromanipulator head with the 4 screws to the micromanipulator base. The screws and an appropriate tool are included in the package.



3. Release the *tilting screws* and open the tilting mechanism. Screw the *mounting screw* carefully into the *mounting nut* of the Heavy Stand **HS1** (if the spring-loaded mounting nut is not exactly centred within the groove, move it back into position with your fingers).



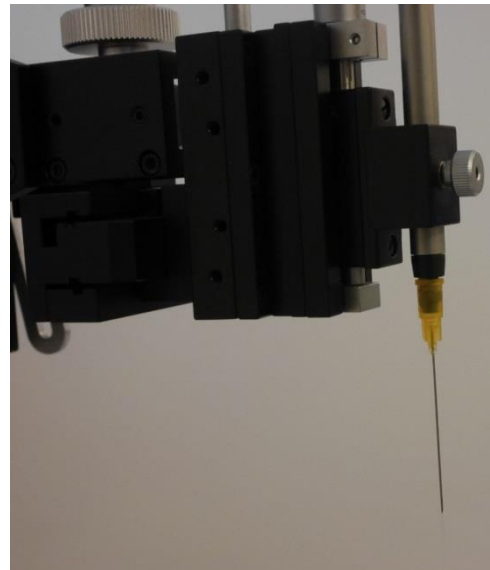
4. Fasten the *mounting screw*.



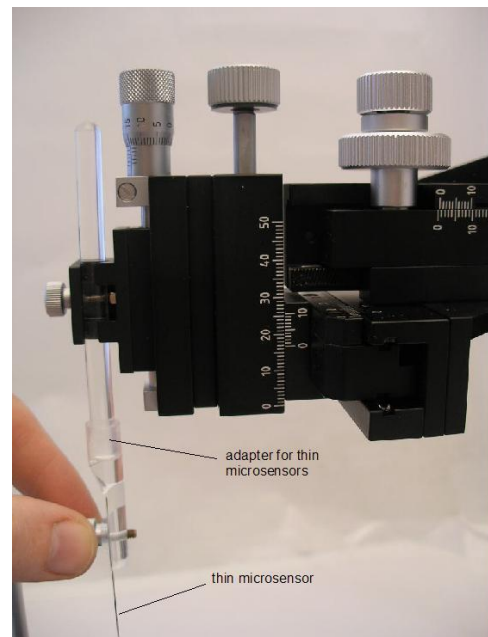
5. Fasten the *tilting screws*.



6. Microsensors with diameters from 6.5 mm to 12 mm can be mounted directly to the *sensor mount*.



7. For mounting microsensors with diameters from 0.5 mm up to 3 mm use the included *adapter for thin microsensors*. The adapter can hold two thin microsensors simultaneously.



PRECAUTION: The motor exerts considerable forces when moving. Keep any parts of your body (especially fingers and hairs!) out of the mechanics!

3.2 Power Supply and Manual Motor Control

1. Connect all cables as shown in the image.



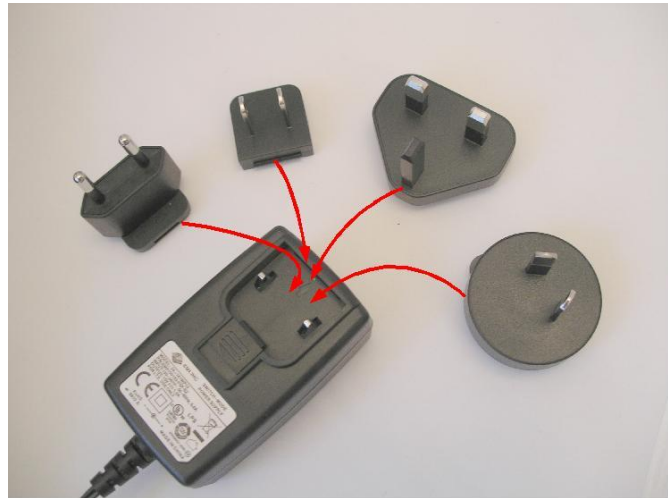
2. Ensure that the *manual control* knobs for both x- and z-axis!) are in their centre positions (feel the slight "click"!)). Otherwise the motor might start moving, when the power supply is plugged in.



3. Plug in the power supply connector. This can be done at either motor housing (x- or z-axis). The other motor is then powered through the data cable.



4. Choose the right mains plug according to your country, and connect it to the mains supply. Now the green LED on on both motor housings of the Micromanipulator **MUX2** should light up, indicating proper power supply.



5. Turn the control knobs in order to move the motors for the x- or z-axis. The motor speed is proportional to the turning angle. In order to stop again, turn the knobs back into its centre position. The motor will automatically stop if it reaches either end of the slide.

After power-up, both motor slides have to be moved to the very top-position (z-axis) and very left-position (x-axis). Otherwise they cannot be moved over the full range of the slides



IMPORTANT: Each time the power supply is switched off and on, the motor has to be "homed", otherwise it will not be possible to move over the full range. Turn the control knob counter-clockwise, and let the motor move upwards until it stops at the upper limit. Now the motor can be moved along the full distance of the slide.

3.3 Computer-Controlled Operation

1. Establish the power supply connections and cabling as described in the last section.

2. Install **Profix** on your PC.

The versatile control software **Profix** is available by download from the **PyroScience** homepage (<https://www.pyroscience.com>). For further instructions, please refer to the installation guidelines and manuals of **Profix**.



3. Connect the USB plug of the **MUX2** to the PC. If the **Profix** installation was successful, the PC should automatically install the correct USB-driver for the **MUX2**.

4. Start **Profix**.

IMPORTANT: Before connecting the USB-plug for the first time to the USB-port of your computer, first install the control software **Profix**! The installer package of **Profix** will install all needed USB-drivers.

4 MAINTENANCE

PRECAUTION: The performance of the **MUX2** depends strongly on the conditions of its precision mechanics. Ensure that its parts are kept free from dirt, dust, liquids and other contaminants!

Be aware, that aquariums aerated with bubble stones will deposit a fine spray of water drops in the surrounding. Ensure that the **Micromanipulator MUX2** is shielded from this spray! Especially seawater is very aggressive, causing rapid corrosion of metallic parts!

The mechanical performance of the **Micromanipulator MUX2** depends strongly on the condition of its precision mechanics. Periodically you might carefully clean the gear wheels, gear racks, and the lead screw (Figure 3). For cleaning, first remove contaminants and old grease with ethanol. Then apply a **small** amount of silicon based grease to the gear wheels, gear racks, and the lead screw. In order to protect all other parts of the **MUX2** against contaminants, you might coat them **thinly** with a Teflon spray.

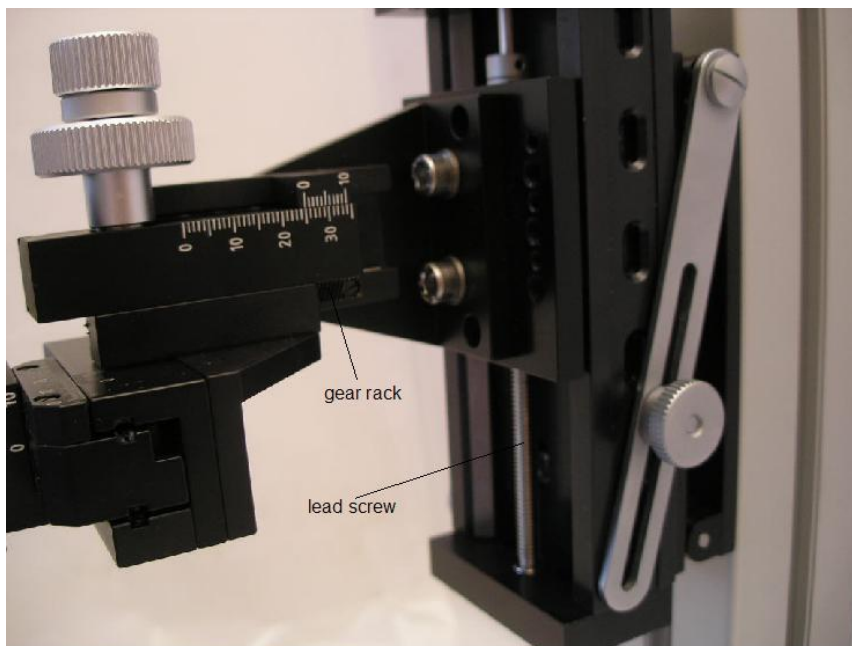


Figure 3: The performance of the **MUX2** depends strongly on the conditions of its precision mechanics. Ensure that especially the gear racks and lead screws are kept free from dirt, dust and other contaminants! (Image shows Micromanipulator **MU1**)

Under conditions with increased relative humidity it is important to avoid water condensation in the housing of the **MUX2**. Condensing water might cause irreparable damage to the electronics. Under humid conditions you should leave the power supply connected (green LED on) even if you do not perform any measurements. That way the motor will provide a constant heating within the housing of the **MUX2**, lowering the risk of water condensation.

If you follow these guidelines, the **Micromanipulator MUX2** will operate reliably for many years.

5 TECHNICAL SPECIFICATIONS

Feature	Specification
Dimensions	275 mm x 95 mm x ca. 220 mm
Weight	1.9 kg
Travel range x-axis (manual)	25 mm
Travel range y-axis (manual)	20 mm
Travel range z-axis (manual)	37 mm + 10 mm fine adjustment
Travel range z-axis (motor)	75 mm (on request 150, 300, 450 mm)
Max. motor velocity	2 mm/s
Min. motor velocity	0.1 $\mu\text{m/s}$
Motor resolution	0.1 μm
Motor repeatability	<2.5 μm
Maximum force	100 N
Maximum cantilever load	100 N cm
Operating temperature	0 to +75°C
Max. relative humidity	up to 95% (non-condensing conditions)
Power Supply	12 to 16 VDC (2.1 mm plug, centre positive)
Mains adaptor	100-240 VAC 50-60 Hz (exchangeable international plugs are included)
Power consumption	ca. 4 W
Computer interface	USB

Control software	Freeware download Profix : https://www.pyroscience.com
Mounting adapter	M6 screw, 10 mm length
Sensor mount	Clamp for microsensors from 6.5 mm to 12 mm
Adapter for thin sensors	Clamp for two microsensors from 0.5 mm to 3 mm

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