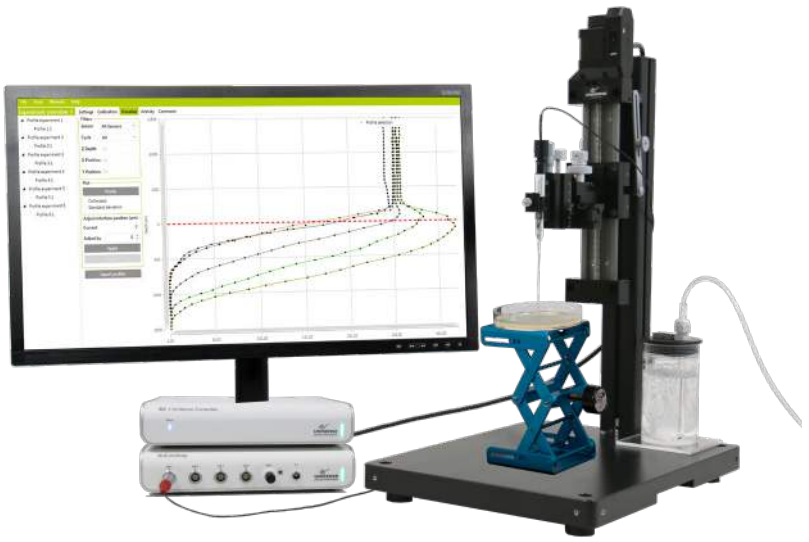
UNISENSE

MICROPROFILING SYSTEM USER MANUAL



Microprofiling system user manual

Version November 2023

MICROPROFILING SYSTEM USER MANUAL

UNISENSE A/S

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WARRANTY AND LIABILITY

Notice to Purchaser

This product is for research use only. Not for use in human diagnostic or therapeutic procedures.

Warning

Microsensors have very pointed tips and must be handled with care to avoid personal injury and only by trained personnel.
Unisense A/S recommends users to attend instruction courses to ensure proper use of the products.

Warranty and Liability

The MicroProfiling System is covered by a one year limited warranty.

The warranty does not include repair or replacement necessitated by accident, neglect, misuse, unauthorized repair, or modification of the product. In no event will Unisense A/S be liable for any direct, indirect, consequential or incidental damages, including lost profits, or for any claim by any third party, arising out of the use, the results of use, or the inability to use this product.

Unisense mechanical and electronic laboratory instruments must only be used under normal laboratory conditions in a dry and clean and environment. Unisense assumes no liability for damages on laboratory instruments due to unintended field use or exposure to dust, humidity or corrosive environments.

Repair or Adjustment

Sensors and electrodes cannot be repaired. Equipment that is not covered by the warranty will, if possible, be repaired by Unisense A/S with appropriate charges paid by the customer. In case of return of equipment please contact us for return authorization.
For further information please see the documents Conditions for Sale and Delivery for Unisense and Warranty and Shipping Information as well as the manuals for the respective products.

CONGRATULATIONS WITH YOUR NEW PRODUCT!

Support, ordering, and contact information

If you wish to order additional products or if you encounter any problems and need scientific/technical assistance, please contact our sales and support team. We will respond to your inquiry within one working day.

E-mail: sales@unisense.com

Unisense A/S
Tel: +45 8944 9500
Fax: +45 8944 9549

Further documentation and support is available at our website www.unisense.com.

REPLACEMENT OF SENSORS

Unisense will replace sensors that have been damaged during shipment provided that:

- *The sensors were tested immediately upon receipt in accordance with the delivery note and the manual*
- *The seal is still intact.*
- *The sensors are returned to Unisense for inspection within two weeks.*
- *The sensors are correctly packed for return to Unisense, in accordance with the note included in the sensor box.*

OVERVIEW

With its stability, precision, and eminent spatial resolution, the MicroProfiling System is an outstanding tool for microscale measurements for a variety of applications.

The optimal choice of sensors and equipment depends on what kind of experiment you want to perform.

You can perform manual or automated profiles. In manual profiles, the micromanipulator is operated by hand. For increased accuracy and automatic profiles, a motorized stage and motor controller can be used. This will increase microsensor positioning precision, extend the travelling distance, facilitate multiple automated profiles and free the scientist from the tedious manual micromanipulator operation.

This manual gives an overview of the components of a Unisense profiling measurement set-up and how to connect them. For details on each component, please consult the individual manuals.

MICROSENSOR AMPLIFIERS

It takes a specialized high-quality amplifier to amplify the signal from a microsensor.

Amperometric microsensors (e.g. O_2, H_2S, H_2) require either a versatile amplifier with adjustable polarization like the MultiChannel UniAmp fx-6 or fx-3 or a picoammeter with preset polarization like the O_2 UniAmp.

Potentiometric microsensors (e.g. pH and Redox) require a high-impedance millivoltmeter like the pH/Redox UniAmp or a MultiChannel UniAmp.

All Unisense amplifiers have an integrated A/D-converter unit, so they are connected to the computer directly.

Please see separate manuals for more detailed instruction and specifications.

MultiChannel UniAmp

SingleChannel UniAmp

MANUAL MICROMANIPULATORS

A microsensor must be positioned in the measuring environment with much more precision than is possible to achieve with an ordinary laboratory stand. Therefore, Unisense supplies manual micromanipulators with holders for one (MM33) or two sensors (MM33-2), which facilitate reliable measurements and minimize the risk of breaking the microsensor.

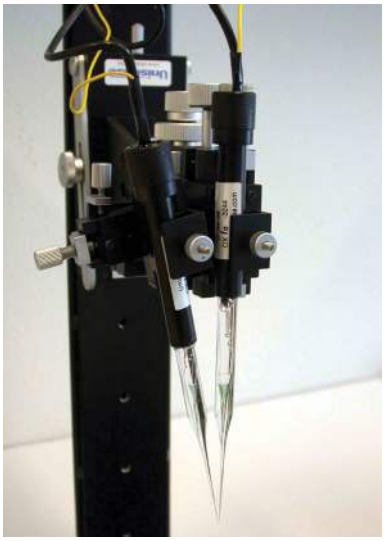
Mounted on a suitable laboratory stand (e.g. the Unisense LS), the micromanipulator provides a robust and precise tool for positioning microsensors with a z-axis precision of 10 microns. The x- and y-axis can be manipulated with a precision of 100 microns.

The MM33-2 offers the possibility for simultanous positioning of two sensors. It allows for extremely fine adjustment of the two microsensor tips relative to each other so that the two sensors measure practically at the same point.

Micromanipulator mounted on a Motor Stage

Specifications (MM33 and MM33-2)

- Weight: 1100 g (MM33), 1240 g (MM33-2)
- z-axis: 37 mm, resolution 100 µm
  - 10 mm, resolution 10 µm
  - 100 mm, resolution 0.5 µm, MMS
  - 300 mm, resolution 0.5 µm, MMS-30
- y-axis: 20 mm, resolution 100 microns
- x-axis: 25 mm, resolution 100 microns



Micromanipulator with two-sensor holder mounted with sensors

MOTORIZED SYSTEMS

For precision below 10 micron in the x-axis and for automated measurements, the MM33 (or MM33-2) can be mounted on a micromanipulator Motor Stage (MS-15), which is positioned via the PC data acquisition and motor control software (SensorTrace Suite) and a motor controller (MC-1, MC-2, or MC-3).
With multiple Motor Stages automated measurements can be performed in 2D or 3D with extreme precision it all directions.

Motorized sensor positioning is superior to manual positioning due to a higher level of precision, a longer operating distance, and ease of operation. A motorized unit consists of a micromanipulator (MM33/ MM33-2) mounted on a mechanical Motor Stage (MS-15) via a small adapter. The stage is controlled by PC software (SensorTrace Suite) via a motor controller (MC-1, MC-2, or MC-3).

A manual positioning system can always be upgraded to a motorized system. This requires a Motor Stage (MS-15) and a motor controller (MC-1, MC-2, or MC-3).

Motor Controller

Specifications for UniMotor Controller MC-1, MC-2, or MC-3

- AC power supply adaptor: In: 100-240 VAC, 60-50 Hz, 1.4 A Out: 24VDC, 5A, 120 W max
- Interface: USB
- Configured for: UniMotor Stage 15 cm (MS-15)
- Operating temperature: 0-70°C (32 to 158°F)
- <90% RH non-condencing

Micromanipulator mounted on a Motor Stage

Specifications for UniMotor Stage 15 cm MS-15 (with MC-1, MC-2, or MC-3)

- Movement in longitudinal axis: 150 mm
- Resolution of motorized micromanipulator stage: 0.5 µm
- Accuracy: 0.2%
- Maximum linear speed: 10 mm/sec
- Minimum linear speed: 1 µm/sec
- Maximum axial load: 5 kg (11 lbs)
- Motor type: Stepper motor

Motor control button – Functions

The Control Button on the motor housing (see picture right) has several functions:

- Rotate up or down to move the Stage Plate up or down. The motor speed increases with time, so short press for slow and precise movement, long press for fast and long movement.
- Pushing the wheel in has two functions:

  o Emergency stop if the motor is running.

  o Making the light on the Motor Controller blink for the channel this motor is connected to. This is useful to identify the X, Y, and Z axes in 2D and a 3D setup.

MICROMANIPULATOR STANDS

The LS is a highly stable, corrosion-protected laboratory stand, which makes it possible to maintain the precision of the MM33, MM33-2 and the motorized micromanipulator stage.

The in situ stand IS19 is a light-weight micromanipulator stand for field use in soft substrates such as mud or sediments. It consists of a pointed angular aluminum pole, and its tip is pushed into the substrate to provide a robust support for micromanipulators and sensors during in situ experiments. It can be used under water as well as in air.

Specifications Laboratory stand LS:

- Weight: 12 kg (26.5 lbs)
- Dimensions: 40 cm x 30 cm x 54 cm (15.7" x 11.8" x 21.3") assembled.
- Surface treatment: anodized

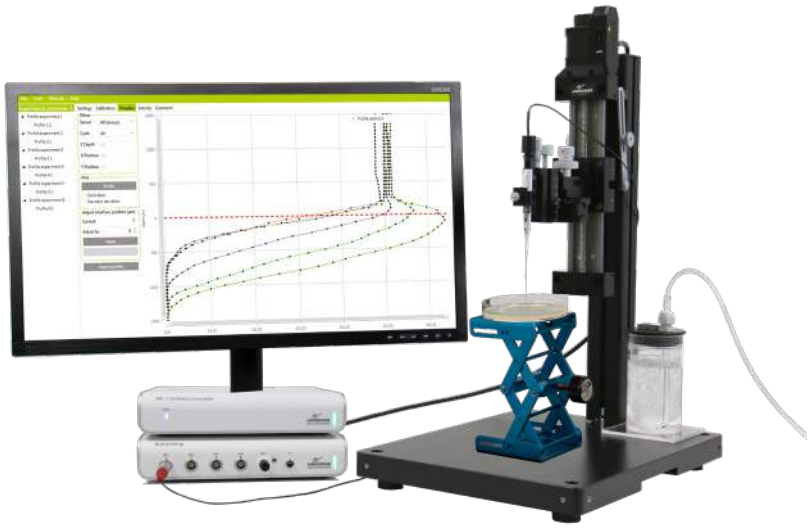
Specifications In situ stand IS19

- Weight: 2.5 kg (5.5 lbs)
- Height: 70 cm (28")
- Fixation holes: thread M6, spacing between holes 5 cm (2")
- Surface treatment: anodized

SETTING UP

The following section will describe a typical profiling set-up.
Please consult separate manuals for the individual components for further details.

1. Install the Unisense SensorTrace Suite software.
2. Place the laboratory stand LS on a stable and smooth surface. Adjust the feet to prevent the stand from rocking. If the sample is not to be placed on the stand plate, the stand should be placed at an appropriate distance from the sample to allow space for the micromanipulator.
3. Mount the micromanipulator or assembled motorized system (see below for instructions) on the stand with the fixation screw at a suitable height so that the lower side of the sensor holder is positioned about 12.5 cm/5" above the top of the sample, when the microsensor z-axis is completely retracted.
4. If motorized, connect the motor port of the motor controller to the motor stage(s) using the motor cable(s).
5. Connect the the motor controller to the PC using the USB (USB - mini USB) cable. In the SensorTrace Profiling software setup screen each connected motor controller can be assigned to a specific axis. Clicking the controller on the setup screen will cause the green light on the motor controller to blink for identification. See the SensorTrace Suite User Manual for details.
6. Place the microsensor amplifier(s) near the stand (0.5m/1.5ft)
7. Connect the amplifiers to the PC using the USB cable.
8. Place the sample to be investigated under the micromanipulator
9. Place a microsensor in the holder of the micromanipulator with the tip a few centimetres above the sample. Move the sensor horizontally to the desired location with the x- and y-controls. Be careful not to break the microsensor tip!
10. Make measurements with the sensors according to the manuals for the sensors and software.



Motorized 1D profiling set-up with fx-6 UniAmp, one motor controller, single sensor, CAL300 and computer (not provided)

ASSEMBLY PROCEDURE 1D MOTORIZED SYSTEM

1. Connect the Motor Stage, MS-15, to the UniMotor Controller, MC-1, and connect this to power.
2. Use the hex key to separate the Tilting Base from the Micromanipulator itself (Fig. 1).
3. Mount the u-shaped spacer on the tilting base using the provided bolts (Fig. 2).
4. Place the MS-15 on the u-shaped spacer (Fig. 3a & b). The Tilting Base and Motor stage should be oriented as shown in Fig. 3. This reduces the risk of sensor damage due to accidentally loosening the two nuts holding the tilt function.
5. Mount the MS-15 on the u-shaped spacer with four bolts (red arrows in Fig. 4). There are eight holes in the back of the MS-15 so the MS-15 can be mounted in one of three positions, centred on the Tilting Base or high or low. To get access to the holes in the MS-15 back, move the Stage Plate up or down using the Motor Control Button on the motor housing (Fig. 5). Rotate the button up or down to make the motor move the Stage Plate up or down to reveal the holes for the bolts. Insert the bolts and tighten gently.
6. Mount the Micromanipulator, MM33 or MM33-2, on the Stage Plate and fix it using the bolts removed in step 2 above (Fig. 6).
7. Mount the MS-15 - Micromanipulator assembly on the Laboratory Stand, using the Elongated Nut and the Knurled Bolt (Fig. 7). Put the Knurled Bolt through the hole in the centre of the Tilting Base and mount the Elongated Nut on the bolt a couple of turns. Slide the Elongated Nut down the groove on the Laboratory Stand (Fig. 8). Tighten the Knurled Nut using the metal rod (Fig. 9).

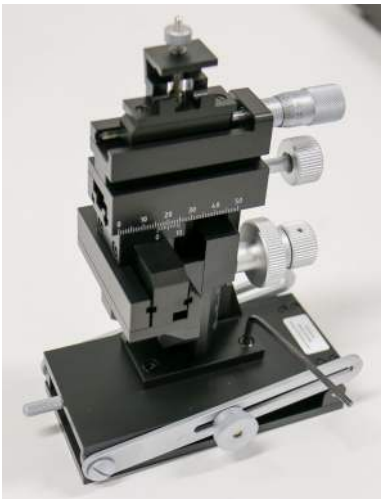


Fig. 1

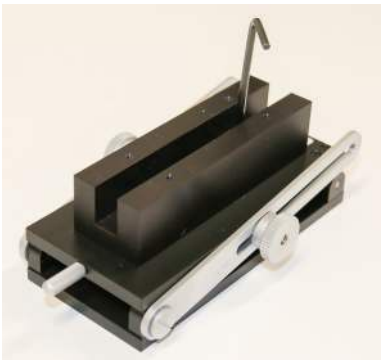


Fig. 2

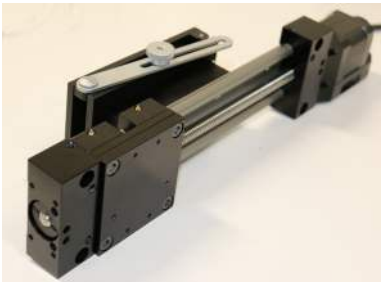


Fig. 3a

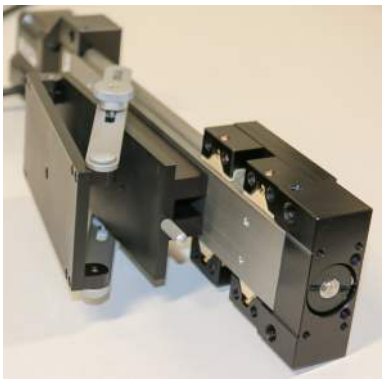


Fig. 3b

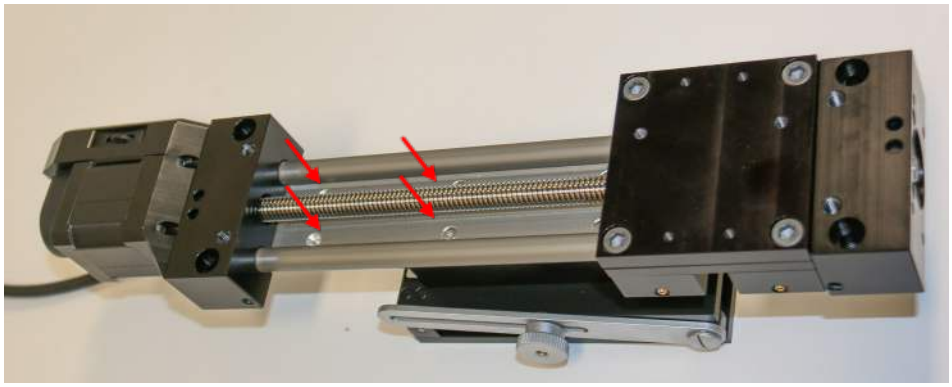


Fig. 4

Fig. 5

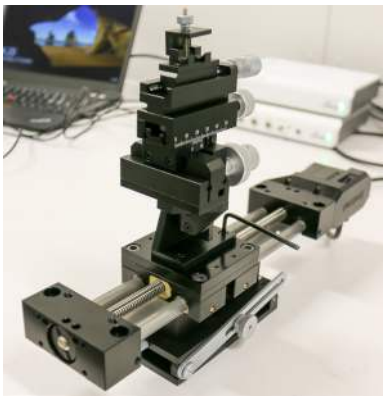


Fig. 6

Fig. 7

Fig. 8

Fig. 9

ASSEMBLY PROCEDURE 2D MOTORIZED SYSTEM (BEFORE NOVEMBER 2023)

1. Follow step 1 and 2 from the 1D assembly procedure.
2. Mount one motor stage **across** the U-profile (see picture). Move the stage plate completely down by turning the spindle joint with a finger and mount two of the provided large screws in the two upper of the four central holes in the back of the stage as shown below. Then turn the spindle to move the stage plate completely in the opposite direction and mount two of the provided large screws in the bottom holes.

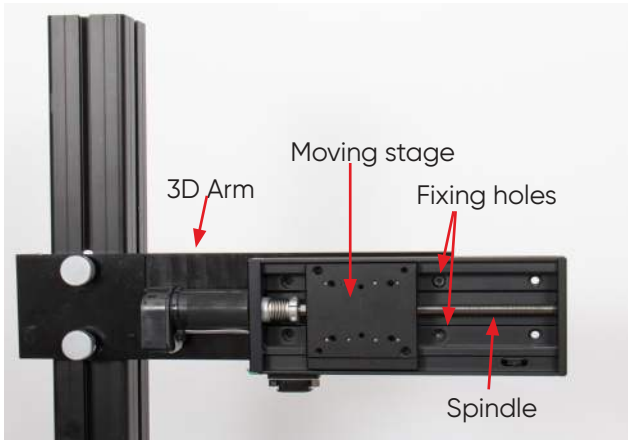
3. Place the second motor stage on the first one. The second stage must be perpendicular to the first one. Orient the second stage so that the motor points in the direction where the tilting plate is hinged (see step 3 in the 1D assembly procedure above). Move the stage plate completely down by turning the spindle joint with a finger and mount two of the provided screws in the two upper of the four central holes in the back of the stage. Then turn the spindle to move the stage plate completely in the opposite direction to mount two of the provided screws in the bottom holes.
4. The provided square plate has four holes: two center holes near the middle and two corner holes near the corners. With the 1D MMS neck (controller connection) pointing **upwards**, mount the plate with the two center holes located just right of the middle. Use the large screws (see picture under 1D motor mounting)

5. Mount the MM33 or MM33-2 on the plate using the two screws from step 1 in the 1D assembly procedure.

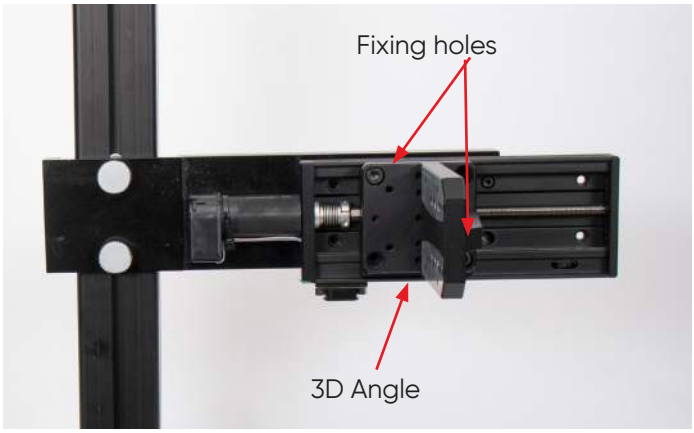
ASSEMBLY PROCEDURE 3D MOTORIZED SYSTEM (BEFORE NOVEMBER 2023)

1. Mount the 3D arm on the vertical post of the Laboratory Stand. To do this, put the aluminium finger bolts into the holes on the 3D arm and mount the elongated nuts by one to two rounds. Slide the nuts into the groove of the stand. Position the arm horizontally and tighten the aluminium finger bolts well with the provided tool.

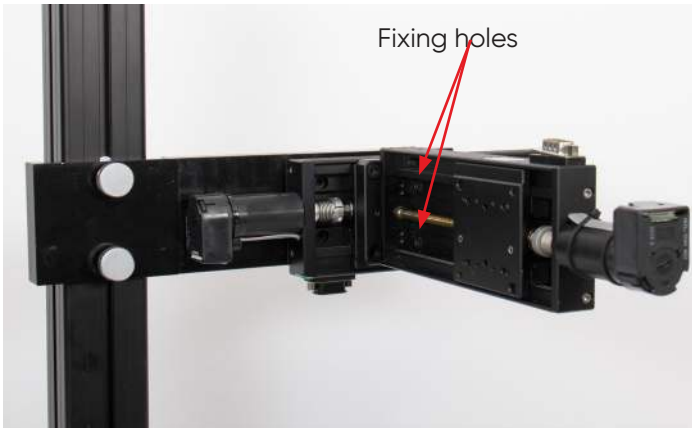
2. Mount the first Motor Stage (MMS) on the 3D arm using 4 of the long 4 mm bolts. Move the moving stage on the MMS to one side by rotating the spindle by hand. This will expose two of the fixing holes (see picture). Mount the 2 bolts and move the moving stage to the other side to expose the other two fixing holes and mount the bolts.



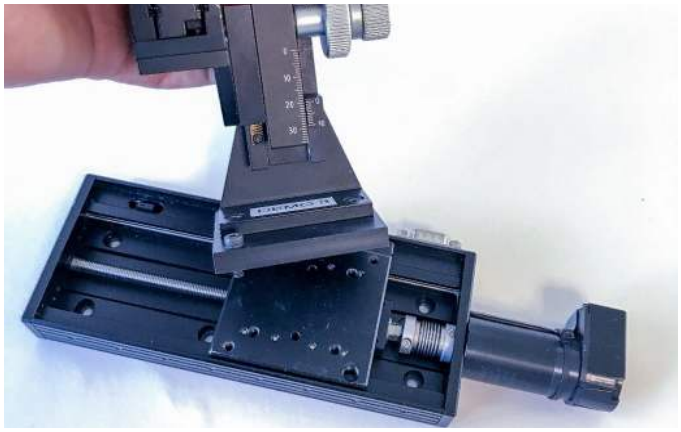
3. Mount the 3D angle on the first MMS. This is fixed using two 6 mm bolts as indicated in the picture.



4. Mount the second MMS on the 3D angle using two long 4 mm bolts (see picture). Make sure the second stage is horizontal and tighten the bolts well.



5. Mount the micromanipulator on the third MMS. First remove the tilting base from the micromanipulator, mount the square plate on the micromanipulator with 2 short 4 mm bolts. Then mount the square plate to the moving stage of the MMS with two long 4 mm bolts (see picture and Assembly procedure 1D motorized system above).



6. Mount the third MMS with micromanipulator on the second MMS with the spindles on the two perpendicular to each other (see picture). The third MMS must be fixed with 4 of the short 4 mm bolts. To get access to the fixing holes, move the moving stage to one side, rotating the spindle by hand. Then mount the two bolts and move the moving stage to the other side and mount the last two bolts.

7. Connect the motors to the motor controllers using the supplied cables (see Setting up above)

STORAGE AND MAINTENANCE

Unisense recommends that the micromanipulator, lab stand, and in situ stand are protected with silicone spray before use. This will help to keep the surfaces clean and will prolong the lifetime of the unit.

Rinse the micromanipulator and stands with distilled water if salt or other corrosive material have been deposited on them.

Keep the micromanipulator and motor free of sand and dust.

WARNING

Do not spray the MMS with silicone

IMPORTANT

If you encounter problems that cannot be solved from the troubleshooting sections of the individual manuals, please contact sales@unisense.com for support (we will try to answer you within one workday)

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