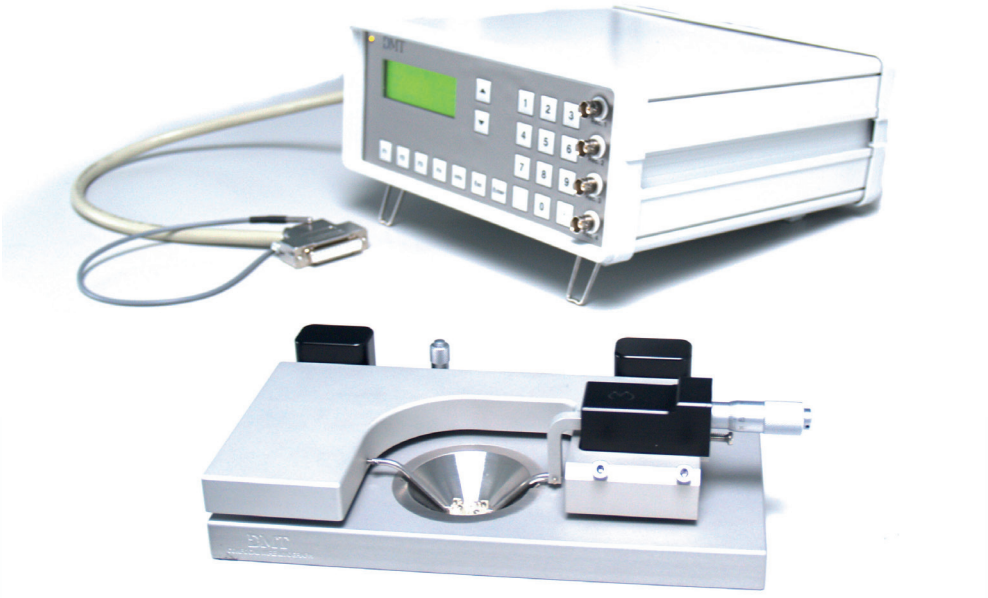
DMT
DANISH MYO TECHNOLOGY

CONFOCAL WIRE MYOGRAPH SYSTEM

MODEL 120CW



User Manual

Version 3.5

CONFOCAL WIRE MYOGRAPH SYSTEM
MODEL 120CW

TRADEMARKS

DMT reserves the right to alter specifications as required.
This document was, as far as possible, accurate at the time of printing.
Changes may have been made to the software and hardware it describes since then.
New information may be supplied separately.

This documentation is provided with the DMT Confocal Wire Myograph System – Model 120CW

Document Number: 120CW – UG3.3A

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CONTENTS

INTRODUCTION

The Confocal Wire Myograph System - 120CW is specially designed to provide very close optical access to the mounted artery segment. High-resolution images of fluorescent dyes or markers within the living tissues such as those by laser scanning microscopy (LSM) become possible. Combining LSM technology with myography allows simultaneous measurement of isometric force and dynamic intracellular events (such as changes in intracellular Ca^{2+}or pH) occurring in living cells in the wall of isolated blood vessels.

The unique design of the myograph combines the precision and stability of our conventional wire myographs with the added feature of precise Z-axis movement with a micrometer. This optimizes the use with different LSM's and various high magnification and high numerical aperture objective lenses.

The conical bath design on the underside of the chamber allows the high numerical aperture lenses used on inverted microscopes and also direct immersion lenses used on standard upright microscopes to come directly in contact with the coverslip of the chamber window. Also, by using special mounting supports designed specifically for vertical positioning, an isolated blood vessel can be positioned directly above or on the chamber window. This permits use of lenses with working distances smaller than 250 µm on an inverted LSM. This may be advantageous for simultaneous electrophysiological measurements. The chambers are supplied with custom covers for inverted or upright microscope systems with connections for suction, gassing or measurement electrodes (pH, NO, O_2 tension). The myograph are supplied with jaws for inverted scopes but can be used with conventional jaws on an upright system. For experimental work requiring electrical field stimulation a set of plastic jaws with attached platinum electrodes is available.

During the experiment, the circumference of the vessel is kept constant, i.e. the vessel is examined under isometric conditions. Compounds are added directly to the chamber and the resulting contractile changes in vessel force/tension are measured. While on the LSM, data acquired from the myograph such as force and temperature can be recorded continuously, either through the serial interface output or with the Myo-Interface analog outputs connected to an external data acquisition system.

SAFETY

The confocal wire myograph system has been designed for use only in teaching and research applications. It is not intended for clinical or critical life-care use and should never be used for these purposes: nor for the prevention, diagnosis, curing, treatment, or alleviation of disease, injury, or handicap.

- Do not open the unit: the internal electronics pose a risk of electric shock.
- Do not use this apparatus near water.
- To reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture. Objects filled with liquids should not be placed on the apparatus.
- Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.
- Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus that produce heat.
- Only use attachments and accessories specified by the manufacturer.
- Unplug this apparatus during lightning storms or when unused for long periods of time.
- This apparatus must be grounded.
- Use a three-wire grounding-type cord similar to the one supplied with the product.
- Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two flat blades, one being wider than the other. A grounding type plug has two blades and a third (round) grounding pin. The wide blade or the third prong is provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
- Be advised that different operating voltages require the use of different types of line cord and attachment plugs. Check the voltage in your area and use the correct type. See the table below:

Voltage	**Line plug according to standard**
110–125 V	UL817 and CSA C22.2 No. 42
220–230 V	CEE 7 page VII, SR section 107-2-D1/IEC 83, page C4
240 V	BS 1363 of 1984. Specification for 13A fused plugs and switched and unswitched socket outlets.

Protect the power cord from being walked on or pinched: particularly at power plugs and the point where they connect to the apparatus.
Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way; such as, the power-supply cord or plug is damaged, liquid has spilled onto or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.

EMC / EMI

This equipment has been tested and found to comply with the limits for a Class B Digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in residential installations. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception (which can be determined by monitoring the interference while turning the equipment off and on), the user is encouraged to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different to that which the receiver is connected to.
- Consult the dealer or an experienced radio/TV technician for help.

APPROVALS

Complies with the EMC standards:

EMC 89/336/EEC:	EN 61326-2-6:2005
	EN 61000-3-2.

Certified with the safety standards:

Directive 2006/95/EC:	EN 61010-1:2001
	EN 61010-1/Corr.1:2003
	EN 61010-1/Corr.1:2003
	EN 61010-2-101:2003

CERTIFICATE OF CONFORMITY

DMT A/S, Skejbyparken 152, 8200 Aarhus N., Denmark,
hereby declares its responsibility that the following product:

Confocal Wire Myograph System - Model 120CW

is covered by this certificate and marked with CE-label conforms with the following standards:

EN 61010-1:2001 EN61010-1/Corr.1:2003 EN 61010-1/Corr.1:2003	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements.
EN 61010-2-101:2003	Safety requirements for electrical equipment for measurement, control and laboratory use - Part 2-101: Particular requirements for in vitro diagnostic (IVD) medical equipment.
EN 61326-2-6:2005	Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 2-6: Particular requirements - In vitro diagnostic (IVD) medical equipment.
	With reference to regulations in the following directives: 2006/95/EC, 89/336/EEC

ABOUT THIS MANUAL

This manual contains a complete list of procedures describing how to install, maintain and using the Confocal Wire Myograph System – model 120CW.

Chapter 1 provides an overview of the construction and basic features of the Myo-Interface and the Confocal Wire Myograph unit.

Chapter 2 describe step by step how to set-up a complete Confocal Wire Myograph System, including connection to data acquisition.

Chapter 3 is a complete manual to the Myo-Interface. The chapter describes in detail the construction of the menu system and how to use all the features of the Confocal Wire Myograph System.

Chapter 4 contains procedures describing general as well as daily maintenance of the myograph unit; e.g. adjustment of supports, weight calibration of the force transducer and cleaning instructions.

Appendix contain additional information such as fuse replacement and system specifications

UNPACKING THE MYOGRAPH SYSTEM

Please take a few minutes to carefully inspect your new Confocal Wire Myograph System for damage, which may have occurred during handling and shipping. If you suspect any kind of damage, please contact us immediately and we will take care of the problems as soon as possible. If the packing material appears damaged, please retain it until a possible claim has been settled.

We recommend that you store the packing material for any possible future transport of the Confocal Wire Myograph System. In case of transport and the original packing material is unavailable, please contact DMT Sales Department for advice and packing instructions.

After unpacking your new Confocal Wire Myograph System, please use the following list to check that the system is complete:

1. **Myo-Interface unit:**
   - Myograph connection cable with a temperature probe
   - Power cord (The shape of the AC plug varies by country; be sure that the plug has the right shape for your location)
   - Automatic voltage selector

2. **Confocal wire myograph unit:**
   - Calibration kit (including bridge, balance and 2 g weight)
   - Chamber cover
   - Vacuum valve (manual)

3. **Accessories**
   - 1 roll of 40 µm stainless steel wire
   - 1 tube of high vacuum grease
   - 1 tube of grease for linear slides
   - 4 spare screws for mounting of jaws
   - 10 extra myograph window glasses
   - 2 Allen keys
   - 1 small screwdriver
   - 40 mm funnel
   - Serial cable

4. **Manuals**
   - 1 CD with user manuals for Wire Myograph Systems
   - 1 CD with the manual “Procedures for investigation of small vessels using small vessel myograph”, by Professor M. J. Mulvany, Department of Pharmacology, Aarhus University, Denmark and the video “Dissection and mounting of small vessels in wire myographs”

CHAPTER 1 - SYSTEM OVERVIEW

1.1 Confocal wire myograph unit

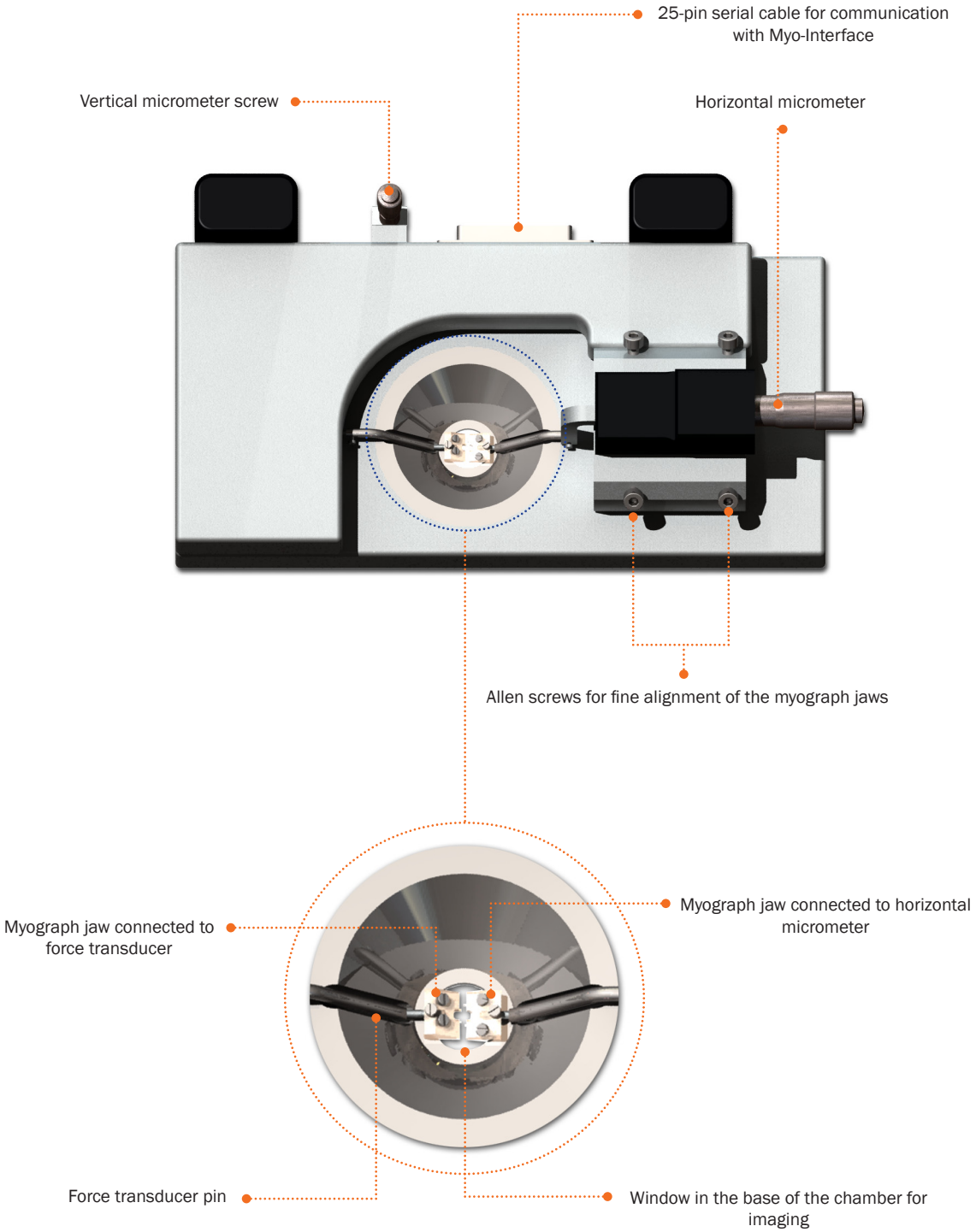


Figure 1.1 *The confocal wire myograph unit with close-up detail of the chamber*

1.2 Myo-Interface front panel

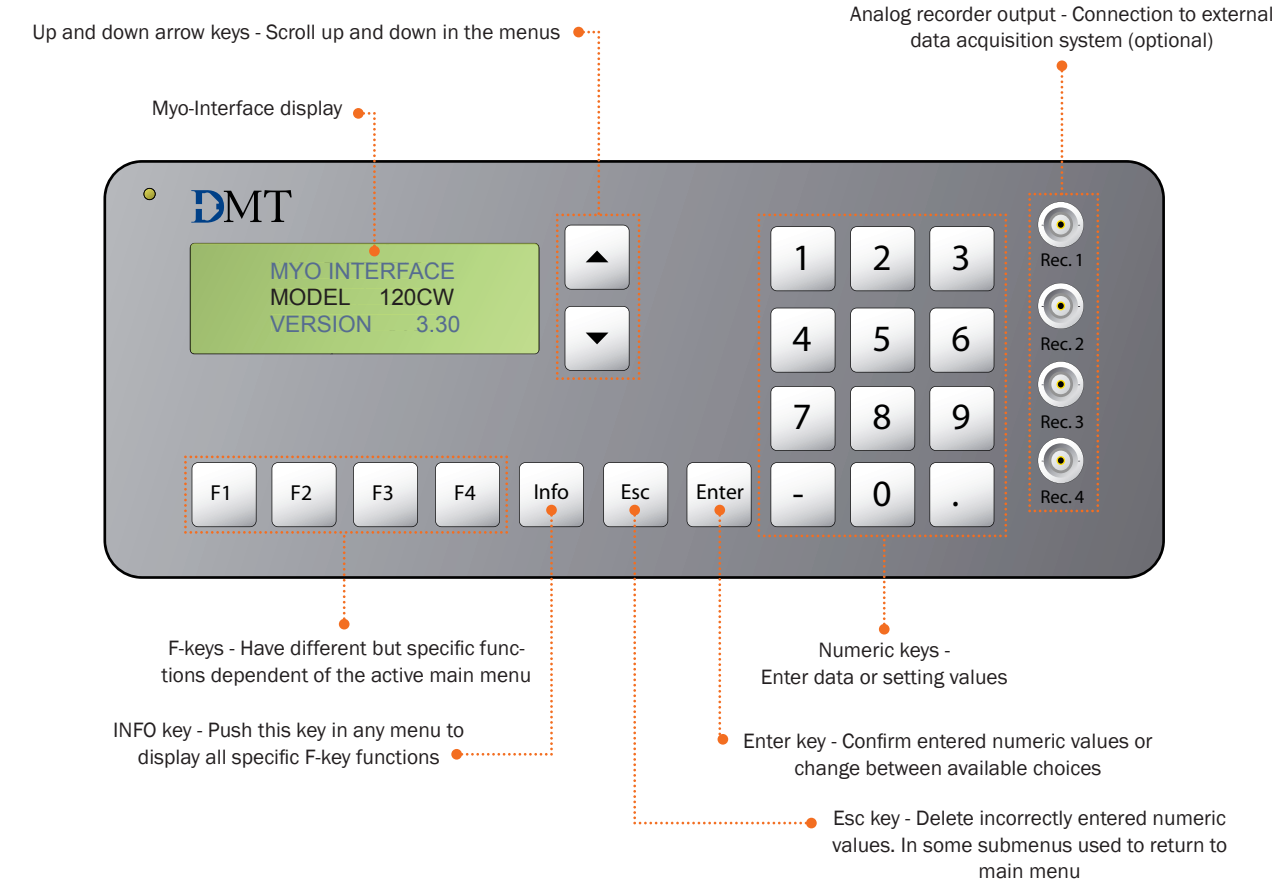


Figure 1.2 *Myo-Interface front panel*

1.3 Myo-Interface rear panel

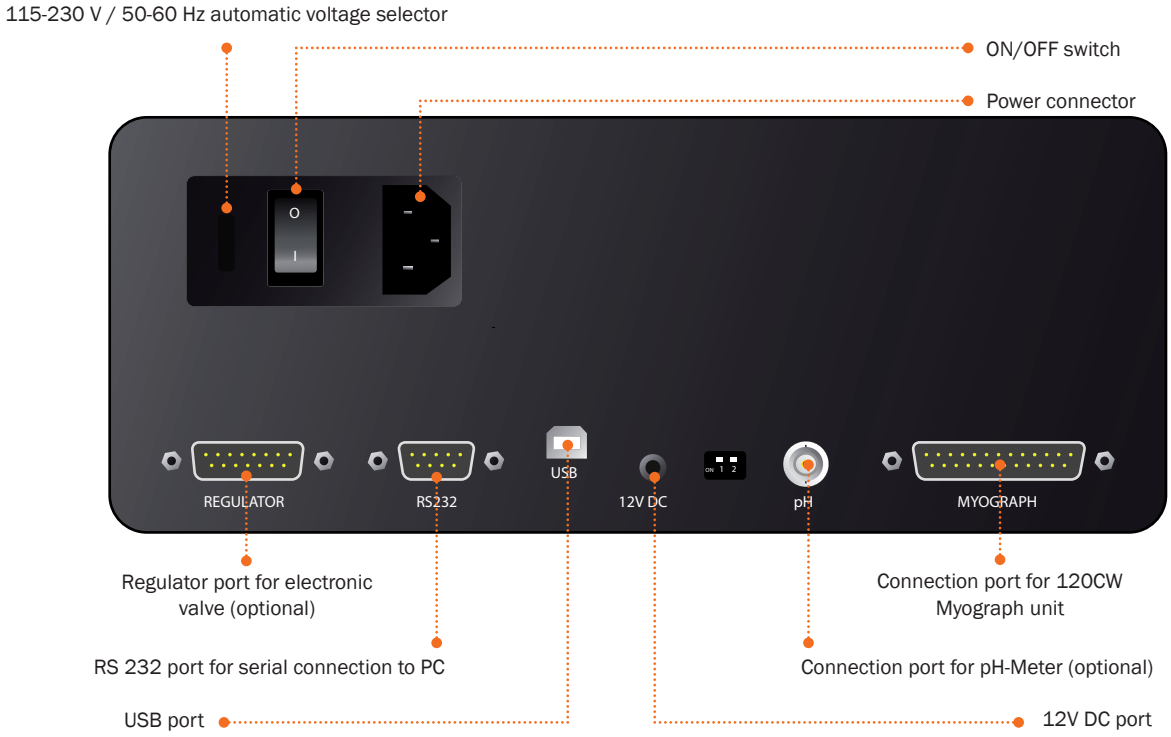


Figure 1.3 *Myo-Interface rear panel*

CHAPTER 2 - SETTING-UP

2.1 The complete Confocal Wire Myograph System - 120CW

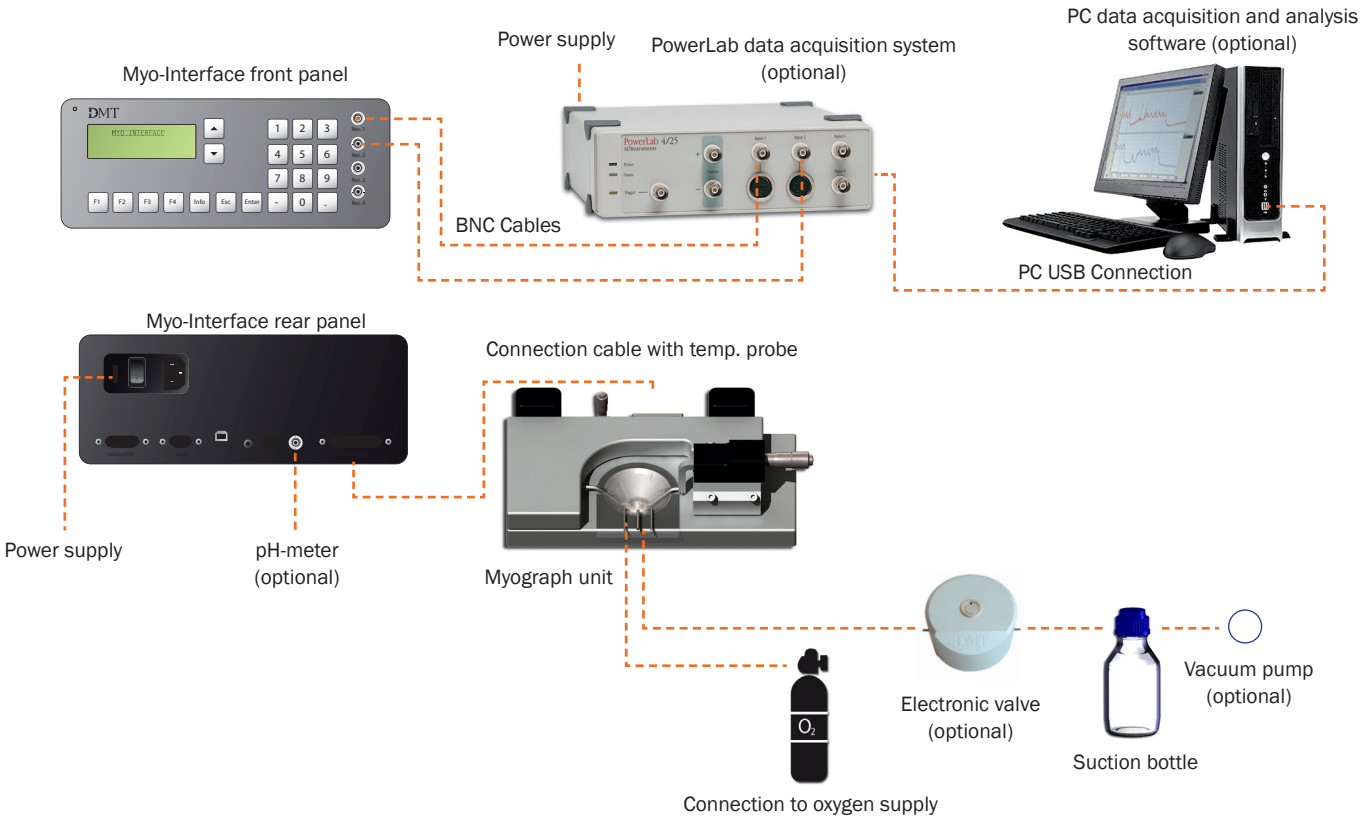


Figure 2.1 *The complete Confocal Wire Myograph System - 120CW*

2.2 Setting up step-by-step

The chapter contains a complete step-by-step description of how to set-up a complete myograph system as illustrated in figure 2.1 above.

1. **Myograph unit – Myo-Interface connection:**
   Connect the myograph 120CW unit to the Myo-Interface using the grey 25-pin connection cable. The end of the cable with the temperature probe is placed into the myograph chamber to monitor actual temperature.

2. **Myo-Interface – PC connection:**
   Data acquisition is possible either by connecting the Myo-Interface directly to a PC or through a PowerLab data acquisition and analysis system (optional).

   I. **Direct PC connection:**
   Connect the Myo-Interface to one of the COM-ports on the PC using the serial cable delivered with the Confocal wire myograph 120CW system.

   II. **PowerLab (optional):**
   Connect the Myo-Interface to the PowerLab unit using BNC cables. Connect Rec 1 on the Myo-Interface to Input 1 on the PowerLab. Rec 2 to Input 2, and so forth. Connect the PowerLab unit to one of the USB-ports on the PC using the USB cable delivered with the PowerLab system.

3. **Oxygen supply:**
   Connect the small pipes on the myograph chamber cover to an adjustable oxygen supply using small silicone tubing (internal diameter 1.5 mm).

4. **Suction connection:**
   Connect the large pipe on the myograph chamber cover to a vacuum pump via a suction bottle and the vacuum valve as illustrated in figure 2.2 below. The internal diameter of rubber tubes for connection to the pipes on the chamber cover is 2 mm. An electronic vacuum valve is available from DMT.

5. **Electrode (optional):**
   Connect the pH electrode to the pH port on the backside of the Myo-Interface and install the software flash update as described in the provided procedure. Perform a pH calibration as described in chapter 3.

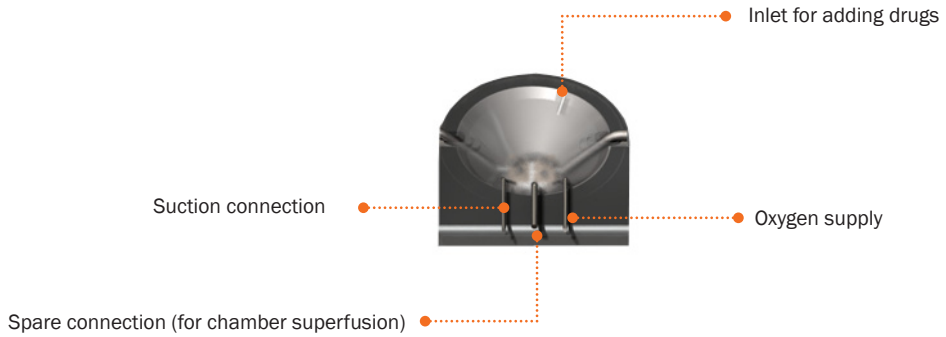


Figure 2.2 *Chamber cover*

2.3 The first force transducer calibration

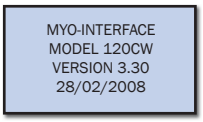
Prior to the shipment of the Confocal Wire Myograph System, has gone through two days of continuous testing including a force transducer calibration. However, in order to ensure that the myograph is operating at an optimum, DMT recommends that a new force transducer calibration is performed before the Confocal Wire Myograph System is used.

The force transducer calibration procedures are described in detail in chapter 4.

CHAPTER 3 - THE MYO-INTERFACE

3.1 Turning on the Myo-Interface

When the 120CW Myo-Interface is switched on, the display shows that the system is starting up and initializing, after which the start-up message depicted to the right is shown.



The display automatically shows the Main menu after several seconds. Otherwise, press F1 to proceed to the Main menu.

When the start-up message is active, the ▲ and ▼ keys can be used to adjust the display contrast setting.

3.2 Menus and submenus

The layout and relationship between the various menus and associated submenus in the Myo-Interface are depicted in the schematic figure 3.1 on next page.

General navigation

The following controls are used to display the various menus, choose varying menu options and change values :

F1	Change to the next menu
F2 – F4	Have varying functions depending on the current active menu
Info	Push this key in any menu to display all specific associated F-key functions
Numeric keys	Enter data or setting values
Enter	Confirm entered numeric values or change between available choices
Esc	Delete incorrectly entered numeric values. In some submenus used to return to main menu
▲ – ▼	Scroll up and down through the display, as only four lines are capable of being displayed at a time. Being in the top line of a submenu, use ▲ to change to the previous main menu.

The active line in the menu is indicated by a “>” symbol.

Main menu

The Main menu displays the current values from the force transducer, the actual temperature probe reading and heating setting (in °C), the heating status as well as the pH probe reading (optional).

Temperature

To change the temperature setting, move the Set. Temp line to the top of the display (the “>” symbol is displayed in that line). Use the numeric keys to enter a new temperature setting and press Enter to confirm.

Heating

To turn on the myograph heating move the Heat is line to the top of the display and use the Enter key to switch between on and off.
Press the Info key and the display shows the F-key options associated with the Main menu. Choose one of the F-keys to proceed with the following options or press Info again to return to the Main menu:

F1	Change to the next main menu (Recorder).
F2	Opens the Valve Activation submenu. An optional electronic vacuum valve is available for the system, which can be activated here.
F3	Opens the Zero Force submenu (press F1 to zero the force or F4 to cancel)
F4	Displays a condensed Main menu. Press F4 to toggle between the condensed and the normal view.

Recorder menu

The 120CW Myo-Interface has four analog output ports on the front panel for connection to a data acquisition system. These default settings for these output ports are:

Rec. 1 Myograph force (FORCE) output
Rec. 2 Temperature (TEMP.) output
Rec. 3 pH reading output (if, installed)
Rec. 4 No output.

The output order can be programmed to whatever order you desire. Make the recorder line of interest active (uppermost in display) and use the Enter key to toggle between the available signals.
The full-scale output from the Myo-Interface is one volt. In the Recorder menu it is possible to change the associated values for each analog output that correspond to 0 V (lo) and 1 V (hi).

Timer menu

The Timer menu makes it possible for the Myo-Interface to act as a timer: the interface can sound an alarm after a predefined countdown. To set the countdown time, move the line to be programmed (hour, minute or second) to the top of the display. Use the numeric keys to enter the time value and press Enter to confirm.
To control the timer function, press the Info key and the display shows the F-key options for the Timer menu. Choose one of the F-keys to proceed with the following options or press Info again to return to the Main menu:

F1 Proceed to the Setup menu.
F2 Start the countdown (the time values are entered in the Timer menu).
F3 Stop or pause the countdown.
F4 Reset the entered time values or to turn off the alarm.

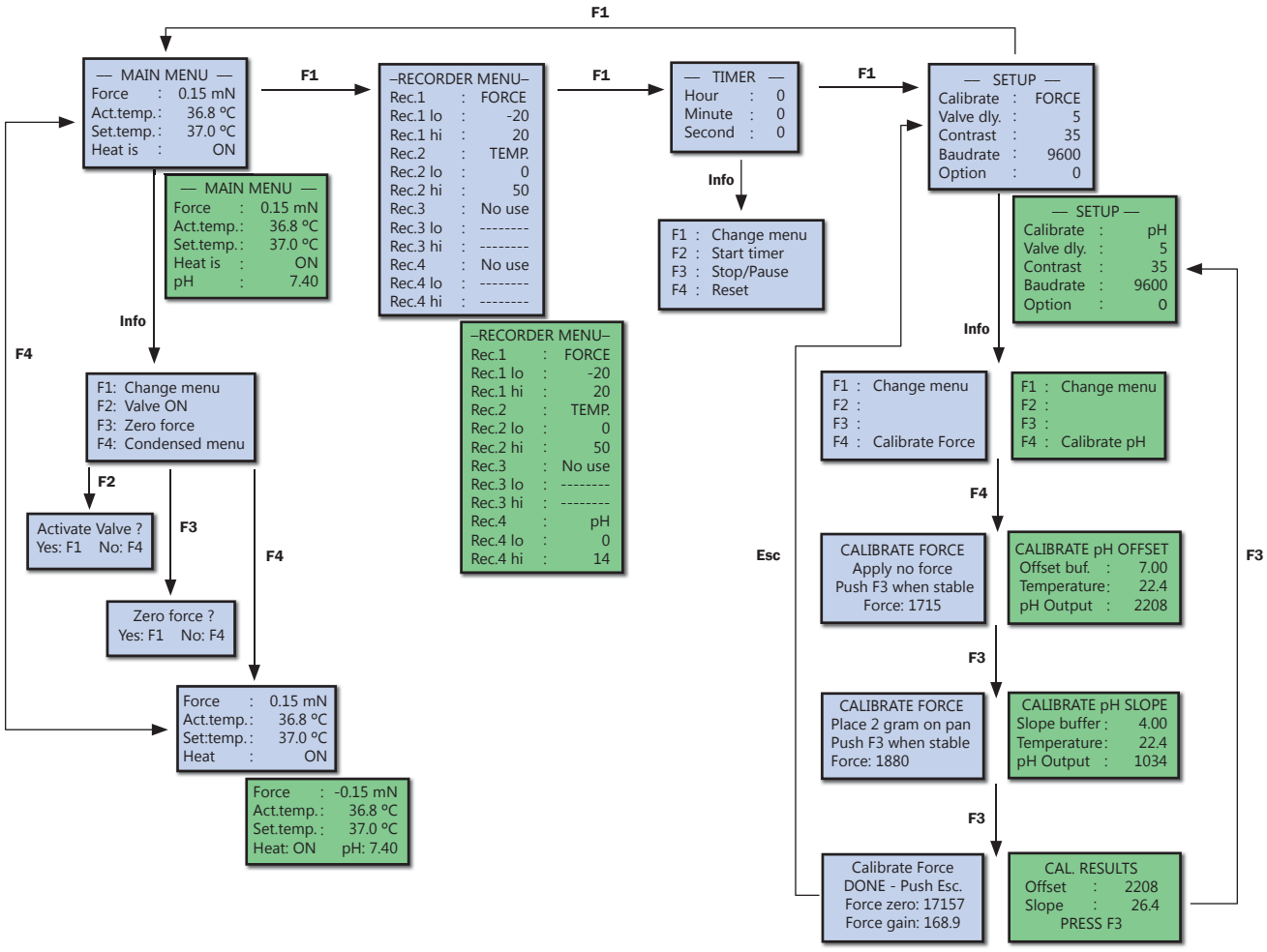


Figure 3.1 *Menu overview: the green panels indicate the menu appearance/options when the optional pH-meter is installed.*

Setup menu

Calibrate	Displays the signal to be calibrated (either force or pH).
Valve dly	The time in seconds that the electronic valve (optional to the system) remains open when activated.
Contrast	The actual contrast setting in the display.
Baudrate	Data transmission rate from the Myo-Interface to a PC via the RS-232.
Option	The option line allows access to submenus using specific access codes.

Use the numeric keys to change the valve delay or display contrast settings and press Enter to confirm.
Press the Info key and the display shows the F-key options available for the Setup menu. Press Info again to return to the Setup menu or one of the F-keys to proceed with one of these options.

F1	Press F1 to proceed to the Main menu.
F4	Calibrate Force (or pH)

Having chosen in the Setup menu which signal to calibrate, press F4 to initiate the calibration process. Press Esc to return to the Setup menu if you do not wish to calibrate.

Force calibration

This procedure is described in detail in Chapter 4.

pH calibration (optional)

Having chosen to calibrate the pH settings, press F4 to initiate the calibration. In the Calibrate pH Offset display, the first line shows the value of the offset buffer (first buffer solution), which is always 7.00. The second line shows the temperature of the buffer solution. The temperature is an important parameter in the calibration formula and is obtained automatically by placing the myograph temperature probe in the buffer solution. The third line shows the output from the pH probe as raw data from the A-D converter.

Place the pH-meter electrode and temperature probe in the offset buffer solution and turn on stirring. When the relative pH output in the bottom line is stable, press F3 to proceed.
The first line now displays the value of the slope buffer (second buffer solution), which is always 4.00. Place the pH and temperature probes in the slope buffer solution and turn on stirring. When the relative pH output in the bottom line is stable, press F3 to proceed.
The pH calibration is now finished. The parameters are stored in the internal memory of the Myo-Interface. Press F3 to return to the Setup menu.

CHAPTER 4 - THE CONFOCAL WIRE MYOGRAPH UNIT

Chapter 4 contains a complete explanation of how to adjust, calibrate and maintain the Confocal wire myograph unit to ensure the equipment is always performing to its highest standard.

4.1 Adjustment of supports

A successful mounting of any kind of tubular tissue segment in the confocal wire myograph is very dependent on perfectly matching supports. The supports are matched prior to the shipment but daily use of the myograph system and greasing of the transducer pinhole will over time create a need for an adjustment of the supports.

Adjustment of the supports is performed using the following step-by-step procedure. Please note that the amount of force on the screws should be very little to avoid breaking the threads. The procedure is illustrated in figure 4.1 on next page

1. Carefully loosen screw (A) on the top of the support connected to the force transducer. Align the horizontal support and carefully tighten the screw again.

2. Loosen screw (B) on the top of the support connected to the linear slide. Align the horizontal support matching the force transducer connected support as carefully as possible and gently tighten the screw again.

3. Loosen screw (C) on the linear slide to roughly match the linear slide support to the force transducer support in the horizontal plane as illustrated in figure 4.1 on next page. Tighten the screw before proceeding with step 4).

4. The plate on which the linear slide is mounted is balanced on top of a small stainless steel ball making it possible to finely adjust the linear slide support in all vertical and horizontal planes using the four Allen screws (D). Use the four Allen screws to make the final horizontal and vertical (figure 4.1 on next page) adjustments to match the linear slide support to the force transducer support. The correct matching of the supports is illustrated in figure 4.1.1 on next page.

IMPORTANT:
BE CAREFUL NOT ONLY TO CONTINUOUSLY TIGHTEN THE ALLEN SCREWS WHEN DOING THE FINAL ADJUSTMENTS. ALWAYS REMEMBER TO LOOSEN THE ALLEN SCREW PLACED DIAGONAL TO THE ALLEN SCREW BEING TIGHTENED OTHERWISE THERE IS A HIGH RISK OF DAMAGING THE MYOGRAPH FRAME.

Special designed jaws:

The myograph are supplied with jaws for inverted scopes but can be used with normal stainless steel jaws to mount small vessels on an upright system. For experimental work requiring electrical field stimulation a set of plastic jaws with attached platinum electrodes is available.

Chamber:

The chamber has a conical shape and can thus be used with a small amount of buffer liquid. The chamber can be customized to operate with volumes of 3 mL or less.
The conical milling on the bottom outside of the chamber allows objectives on inverted microscopes to be raised to the thin glass window to accommodate very low working distance objectives.

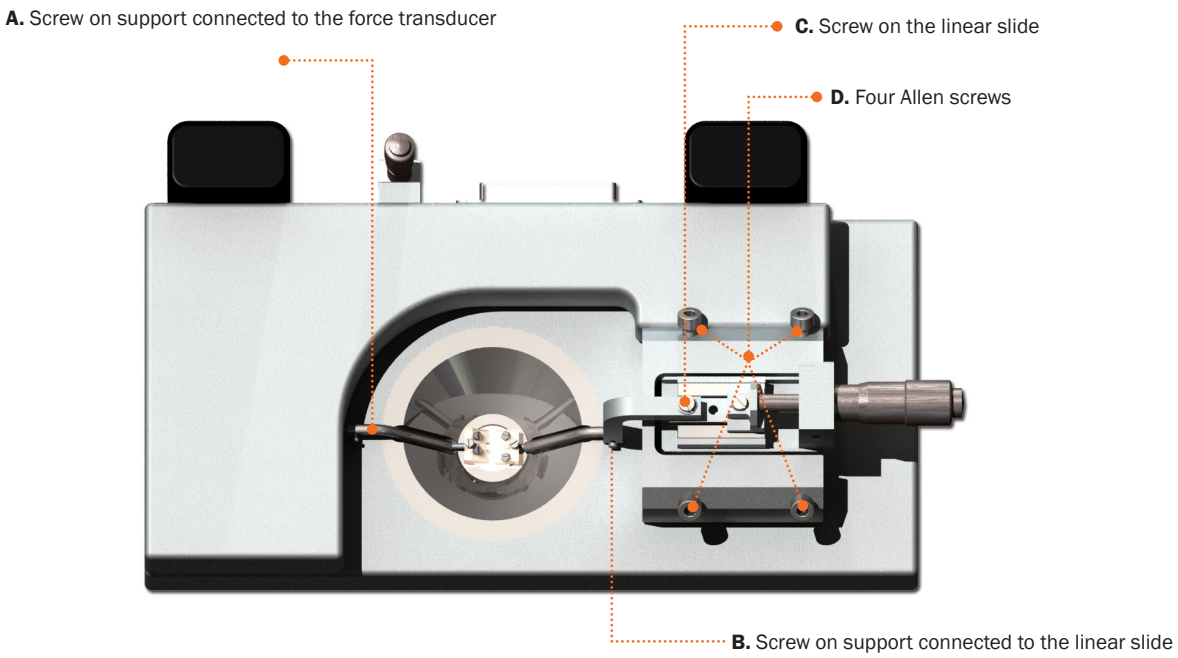


Figure 4.1 *Illustration of how to adjust the supports*

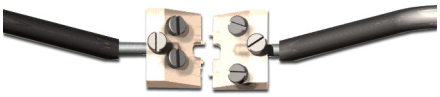


Figure 4.1.1 *Illustration of the reverse supports*

4.2 Calibration of force transducer

As a part of the general maintenance of the myograph, DMT recommends that the myograph is weight calibrated at least once every month. DMT also recommends that the myograph is weight calibrated every time the system has been moved or has not been used for a long period of time.

4.2.1 Weight calibration procedure

The section contains a complete step-by-step description of how to weight calibrate the force transducer.

1. Fill the myograph chamber with double distilled water and move the jaws apart. Mount a 40 µm stainless steel wire on the jaws connected to the force transducers.

2. Place the calibration bridge, balance and weight randomly on the myograph unit allowing it to be warmed up together with the myograph unit. Turn on the heating in the Main menu on the Myo-Interface.

3. After approximately 20-30 minutes the whole system will have reached the target temperature (normally 37° C). Place the warmed calibration bridge and balance on the myograph unit as illustrated in figure 4.3 below.

   NOTE: THE WEIGHT SHOULD NOT BE PLACED ON THE BALANCE YET.

4. Make sure that the tip of the transducer arm on the balance is placed in the gap between the wire and the jaw as illustrated in figure 4.4 on next page. Carefully move the calibration bridge until the tip of the transducer arm is placed freely in the gap, which means it does not touch either the wire or the jaw.

5. Go to the Setup menu on the Myo-Interface and choose to calibrate the myograph force transducer. Press F4 to start calibration.

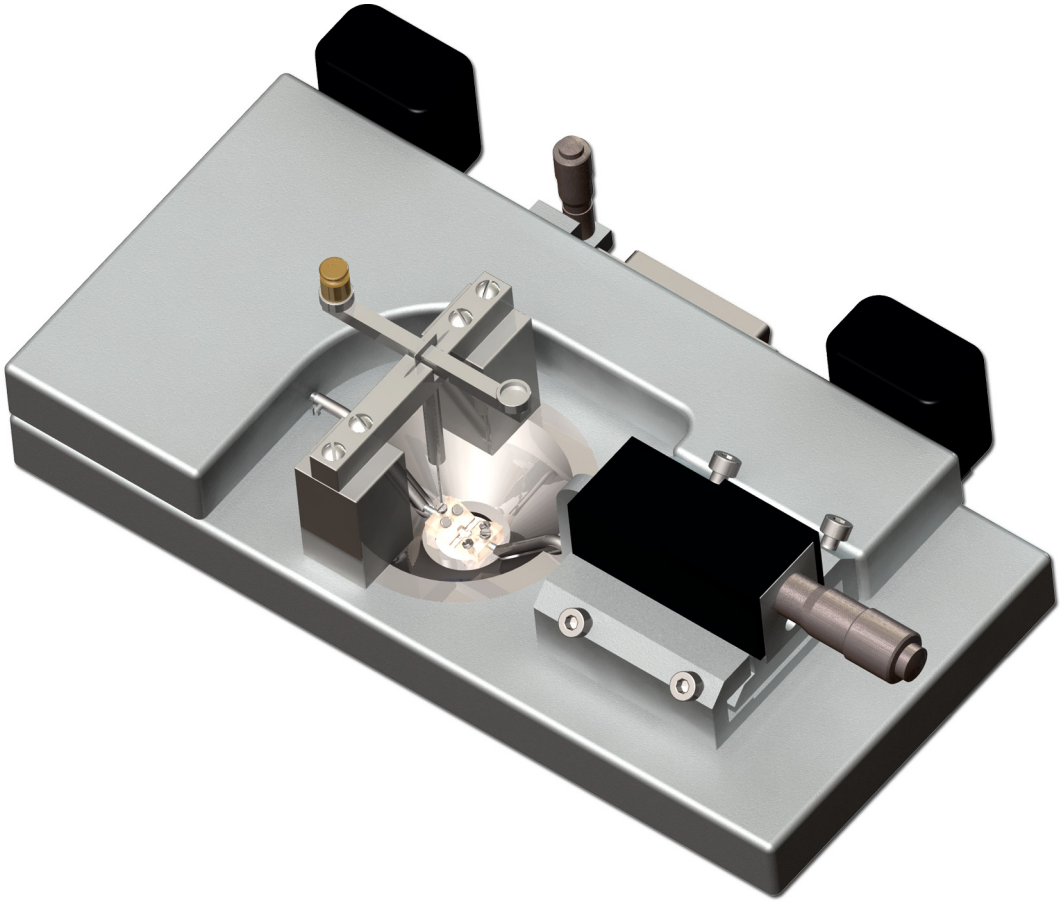


Figure 4.3 *Weight calibration setup - showing placement of the calibration bridge and balance (with weight in place)*

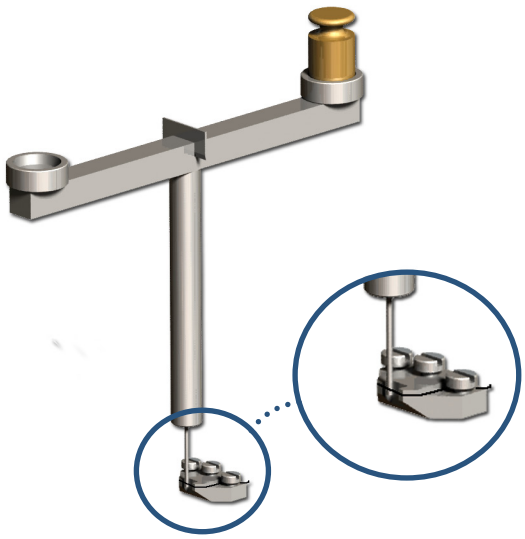


Figure 4.4 *Illustration of how to fit the balance between the wire and the gap in the support*

6. Make sure that absolutely no force is applied on the force transducer by checking that the tip of the transducer arm is not touching either the wire or jaw. Also check that the relative force reading in the display is stable. Press F3 to proceed with calibrating.

7. Carefully place the 2 g weight on the pan as illustrated in figure 4.3 on previous page and figure 4.4 above. The force applied on the force transducer should mimic the stretch created by the contraction of a mounted ring preparation. Wait until the relative force reading is stable. Press F3 to finish the calibration.

8. Press Esc and go to the Main menu on the Myo-Interface. The force reading on the Myo-Interface should now be very close to 9.81 mN. Carefully remove the weight and proceed from step 3 to calibrate the other myograph.

   If the force reading is different from 9.81 mN then try to calibrate the force transducer once again starting with step 3.

9. After calibrating, carefully remove weight, balance and calibration bridge. The myograph is now ready for use.

4.3 Checking the force transducer

The myograph force transducer is a strain gauge connected in a Wheatstone bridge. The force transducer is placed in a separate compartment on top of the Wire myograph unit. The separate compartment provides some mechanical protection for the force transducer but the transducer is still very vulnerable to applied forces exceeding 1 newton (100 gram) or fluid running into the transducer compartment due to insufficient greasing of the transducer pinhole.

This section describes how to check the force transducer for any kind of damage.

4.3.1 Simple force transducer check

1. If the force reading on the Myo-Interface appears unstable, then first check that the Myo-Interface and the Confocal Myograph Unit are properly connected through the 25-pin grey cable.

2. If the force reading still appears unstable, then perform a new weight calibration of the force transducer as described earlier in this chapter.

During the weight calibration, monitor the relative force reading values in the Calibration menu on the Myo-Interface:

- If the value is 0 or above 6500, then the force transducer is broken and needs to be changed.

- If the reading is between 1–499 or 3001–6250 then contact Danish Myo Technology for further instructions.

4.4 Changing myograph window glass

The glass in the myograph chamber window is fixed in place and kept waterproof by a thin layer of high vacuum grease on the circular edge between the glass and the myograph chamber base. Daily use of the myograph objectives that require water or other immersion solvents will mean that the glass needs to be replaced daily prior to mounting.

The following procedure describes how to change the myograph window glass:

1. Carefully loosen the glass from the myograph chamber edge using small forceps or similar tool.

2. Clean the edge at the bottom of the myograph chamber to remove any remaining old grease.

3. Carefully apply a small amount of high vacuum grease around the edge using a wood stick or similar equipment. Take a new window glass using forceps and gently push it into place. Before starting a new experiment make sure that the complete edge is sealed up with high vacuum grease to keep the myograph window waterproof.

4.5 Myograph maintenance

The Confocal Wire Myograph System 120CW is a very delicate and sophisticated piece of research equipment. In order to keep it working at its best, DMT recommend that the following sections are read carefully and the instructions are followed at all times.

4.5.1 Myograph chamber pipes

To prevent the pipes from being blocked by buffer salt deposits after an experiment, use the chamber cover to remove the cleaning solutions used and described later in this Chapter. Afterwards, remove the cover from the myograph chamber and turn on the vacuum pump for about 10 seconds. Wait to turn off the oxygen supply until turning off the vacuum pump. Wipe off any buffer remaining on the outside of the pipes using a piece of paper.

4.5.2 Force transducer

The force transducer is the most delicate and fragile component of the myograph system. Therefore careful handling is necessary.
One of the jaws is connected to the transducer pin. To prevent the buffer from running into the transducer house the hole is filled with high vacuum grease.
As part of the daily maintenance, it is very important to inspect the greasing of the transducer hole before starting any experiment. Insufficient greasing causes damage and malfunction of the force transducer.

IMPORTANT:

DMT RECOMMENDS THAT THE HIGH VACUUM GREASE SEALING THE TRANSDUCER PINHOLE IS CHECKED AND SEALED AT LEAST ONCE A WEEK, ESPECIALLY IF THE MYOGRAPH SYSTEM IS USED FREQUENTLY.

DMT TAKES NO RESPONSIBILITIES FOR THE USE OF ANY OTHER KINDS OF HIGH VACUUM GREASE THAN THE ONE TO BE PURCHASED FROM DMT.

DMT TAKES NO RESPONSIBILITIES FOR ANY KIND OF DAMAGE APPLIED TO THE FORCE TRANSDUCER.

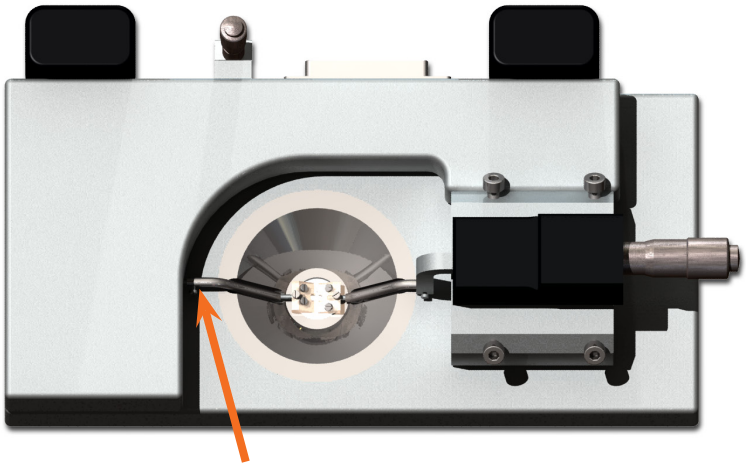


Figure 4.6 *Transducer pin hole to be sealed up with high vacuum grease*

4.5.3 Linear slides

Check the linear slides (underneath the black cover) for grease at least once a week. In case of insufficient lubrication, grease the slides with the original enclosed grease for linear slides at the places marked by the arrows in figure 4.7 below.

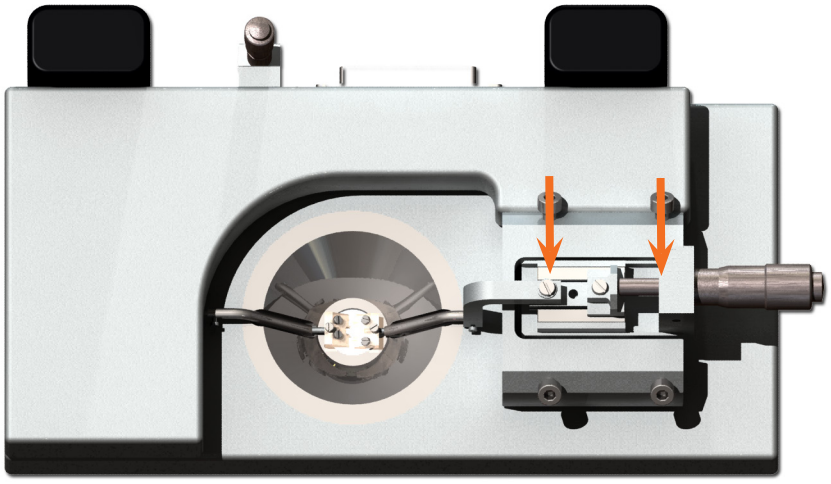


Figure 4.7 *Greasing points on the linear slides*
(NOTE: only use the grease marked with "Grease for linear slides")

4.5.4 Myograph cleaning

DMT STRONGLY RECOMMENDS THAT THE MYOGRAPH CHAMBER AND SURROUNDINGS BE CLEANED AFTER EACH EXPERIMENT.

After an experiment use the following procedure to clean the myograph chamber and supports:

1. Fill the myograph chamber to the edge with an 8% acetic acid solution and allow it to stand for a few minutes to dissolve calcium deposits and other salt build-up. Use a swab stick to mechanically clean all chamber surfaces.
2. Remove the acetic acid and wash the myograph chamber and jaws several times with double distilled water.
3. If any kind of hydrophobic reagent have been used, which might be difficult to remove using step 1 and 2, then try incubating the chamber and jaws with 96% ethanol or a weak detergent solution.
4. To remove more resistant or toxic chemicals, incubate the myograph chamber and glass cannulas with 1M HCl for up to 1 hour. In exceptional cases incubate the chamber and supports with a up to 3M HNO_3 solution for about 15 minutes.
5. Wash the myograph chamber and supports several times with double distilled water.

IMPORTANT NOTES:

- **BE VERY CAREFUL USING STEP 3 AND 4 REPEATEDLY AS STRONG REAGENTS CAN CAUSE EXTREME DAMAGE TO THE MYOGRAPH UNIT.**
- **BE VERY CAREFUL NOT TO EXERT ANY FORCE ON THE MYOGRAPH JAWS DURING THE CLEANING PROCEDURE.**
- **AFTER CLEANING, ALWAYS CHECK THAT THE GREASING AROUND THE TRANSDUCER PIN IS SUFFICIENT TO KEEP OUT THE BUFFER SOLUTION FROM THE TRANSDUCER COMPARTMENT.**

In cases of red or brown discolorations appearing on the chamber sides, the following cleaning procedure will work in most cases:

1. Incubate the myograph chamber for 30 minutes with 20µl of a 2 mM T-1210 Tetrakis-(2-pyridylmethyl)-ethylenediamine solution dissolved in double distilled water.

2. Use a swab-stick to mechanically clean all the affected surfaces during the last 15 minutes of the incubation period.

3. Wash the myograph chamber several times with double distilled water.

4. Incubate the myograph chamber with 96% ethanol for 10 minutes while continuing the mechanical cleaning with a swab-stick.

5. Remove the ethanol solution and wash a few times with double distilled water. Incubate the myograph chamber with an 8% acetic acid solution for 10 minutes and continue the mechanical cleaning with a swab-stick.

6. Wash the myograph chamber several times with double distilled water.

IMPORTANT NOTES:

IN EXCEPTIONAL CASES IT MAY BE NECESSARY TO REMOVE THE SUPPORTS FOR INDIVIDUAL CLEANING TO MAKE SURE THAT ALL SURFACES ARE CLEAN.

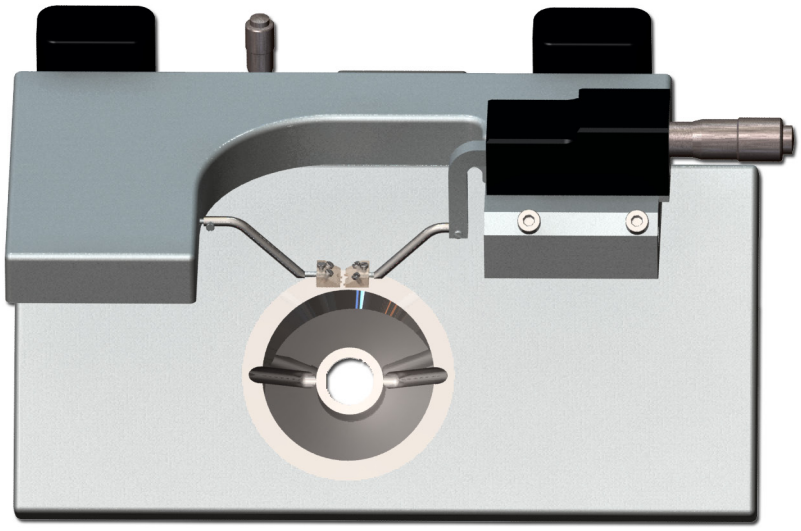


Figure 4.8 *The top part of the myograph can be tilted for easier access when cleaning.*

APPENDIX 1 - FUSE REPLACEMENT

The main fuse of the myograph system is placed inside the power inlet on the Myo-Interface. If the fuse blows it is easily changed using the following procedure.

When a fuse blows and needs to be changed, it is imperative that the replacement fuse is equal to the one blown.

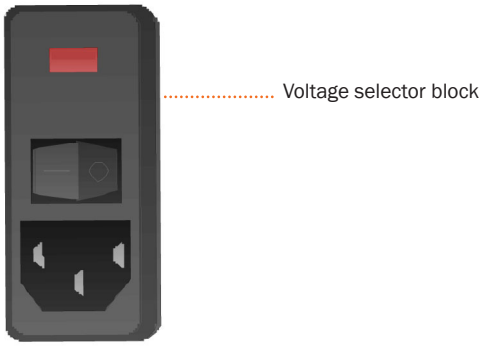
The 120CW system uses: T1.6A / 250 V, 6.3 x 32 mm

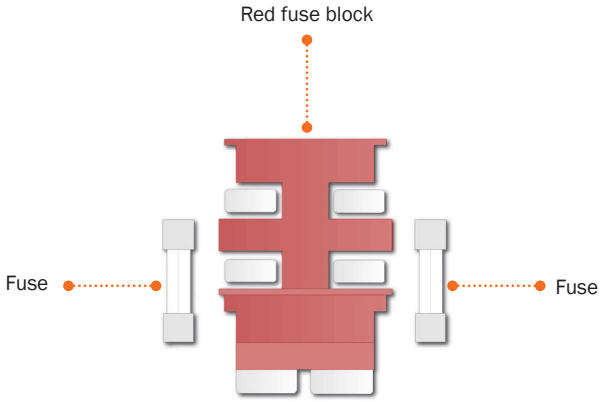
DMT recommends that both fuses in the fuse block are changed at the same time, as it can be difficult to determine which fuse is blown.

To replace the fuses:

1. Use a small screwdriver to open the voltage selector block.
2. Remove the red fuse block.
3. Remove the existing fuses.
4. Insert the new fuses.
5. Replace the fuse block back into the voltage selector block

NOTE:
ENSURE THAT THE CORRECT VOLTAGE FOR YOUR COUNTRY IS DISPLAYED.





APPENDIX 2 - SYSTEM SPECIFICATIONS

Technical specifications

Vessel size:	>60 µm
Vessel alignment:	Manually X, Y & Z settings
Chamber:	Single bath/conical shape
Chamber material:	Acid-resistant stainless steel
Chamber volume:	Max. 10 ml
Chamber suction:	No
Chamber cover:	With connections for suction and gassing
Chamber gassing:	Yes
Force range:	-100 to +200mN
Force resolution:	0.1mN
Micropositioners:	Manually operated precision micrometers
Weight calibration:	Manual
Heating:	Built into chamber, independent of superfusion
Temp. range:	Ambient temp. - 50°C
Temp. resolution:	0.1°C
Temp. probe:	External
Output reading:	Force (mN)
Analogue output:	Up to four outputs, 1.0V full scale for all acquired signals, user defined
Serial output:	Serial interface - RS232/RS485
Voltage:	100 to 240 VAC (auto) 50/60Hz
Ambient temp.:	15-30°C

Optional accessories

Enable pH-meter on the interface

- range pH:	0 - 14
- temp. correction:	0 - 50°C

NOTES

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