

# MYOGRAPH SYSTEM - 114PN

USER MANUAL, VOL. 3.7



# 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 Pressure Myograph System – Model 114PN

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# SAFETY

The Pressure 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.

## CAUTION:

- *DO NOT OPEN THE APPARATUS: THE ELECTRONICS POSE A RISK OF ELECTRICAL 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.*
- *ONLY USE SECURE INDUSTRY STANDARD CONNECTORS AND TUBING FOR PRESSURE CONNECTIONS. FAULTS, DEFECTS, AND MISTAKES DUE TO WRONG CONNECTIONS VOID WARRANTY. WE ARE NOT ACCOUNTABLE FOR RESULTS AND MISTAKES DUE TO INAPPROPRIATE PRESSURE HOOKUP.*
- *DO NOT INSTALL NEAR ANY HEAT SOURCE SUCH AS RADIATORS, HEAT REGISTERS, STOVES, OR OTHER APPARATUS THAT PRODUCE HEAT.*

The Pressure Myograph System is delivered with an external 100-240VAC to 24VDC adapter.

Protect the power adapter and 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.

# EC DECLARATION OF CONFORMITY

DMT A/S

Certify and declare that the following apparatus:

## **Pressure Myograph System - DMT114PN**

*Restrictive use: Only for laboratory use.*

Manufactured by:

DMT A/S

Rho 14

8382Hinnerup

Denmark

Conforms with the essential requirements of the EMC Directive 2004/108/EC.

Based on the following specifications applied by:

EN 61326-1:2006

EN 61326-2-6:2006 EN

61326-2-6/Corr.:2007

And with the LVD Directive 2006/95/EC.

Based on the following specifications applied by:

EN 61010-1:2010

EN 61010-2-030:2010

### **General warnings regarding EMC:**

Do not use this device in close proximity to sources of strong electromagnetic radiation (e.g. unshielded intentional RF sources), as these may interfere with the proper operation.

# CHAPTER 1 - SYSTEM OVERVIEW

## 1.1 INTERFACE

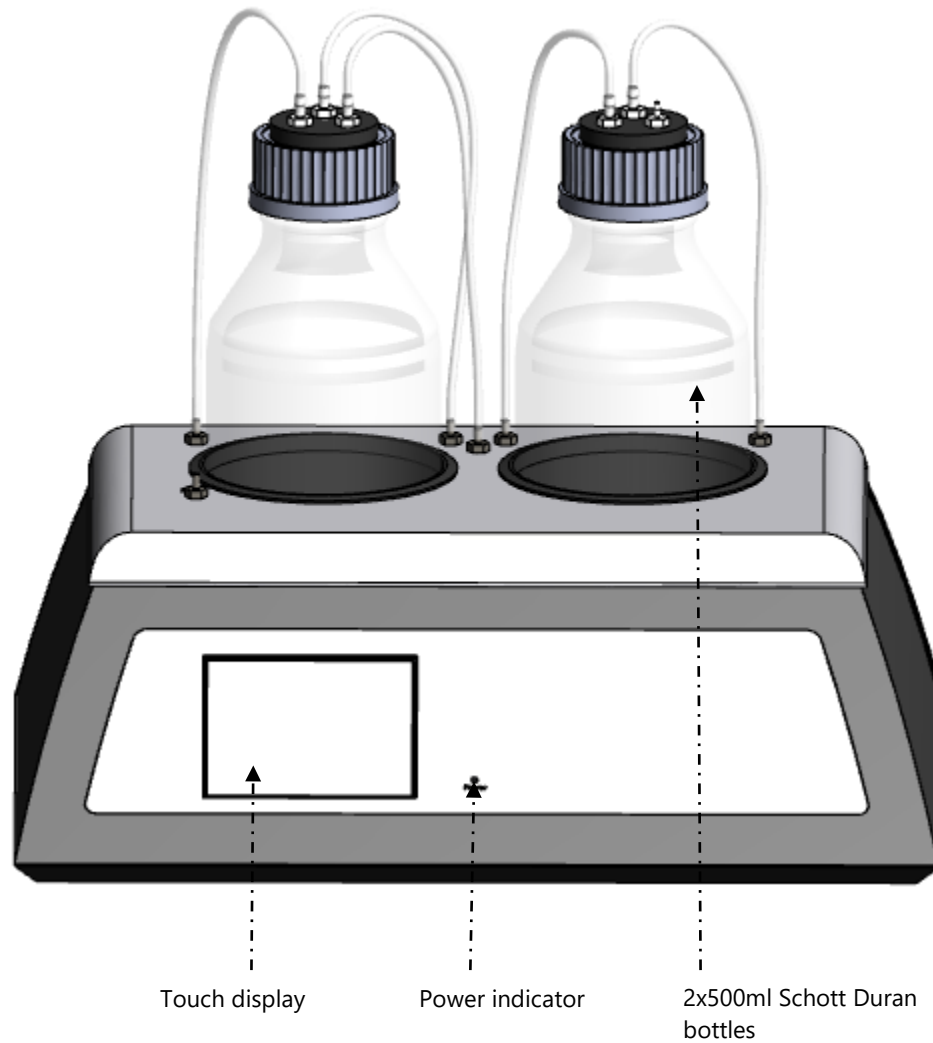


Figure 1.1 Pressure Interface - front

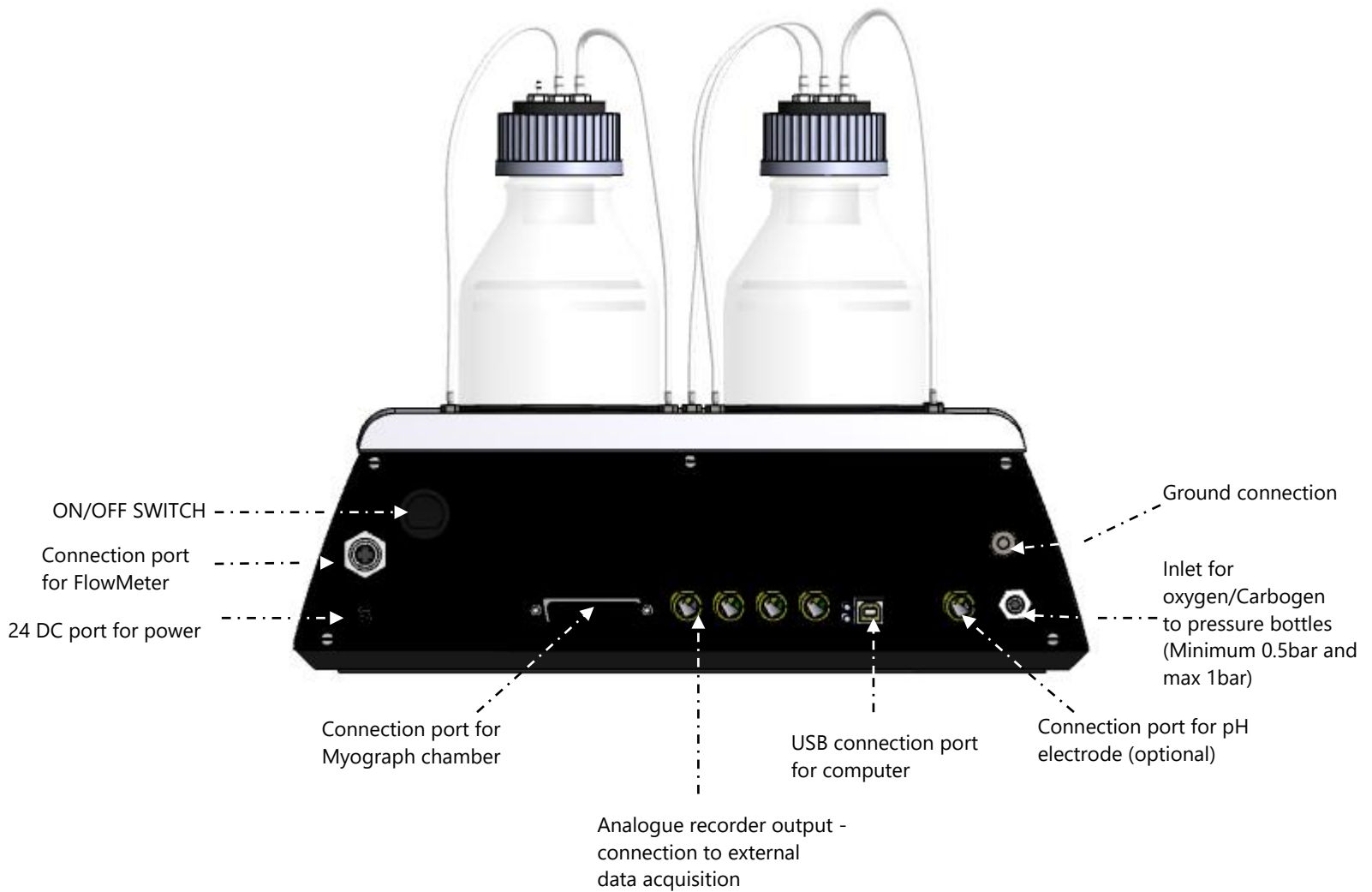


Figure 1.2 Pressure Interface - rear

## 1.2 114PN PRESSURE MYOGRAPHS

### 1.2.1 PRESSURE MYOGRAPH - 114PN Chamber

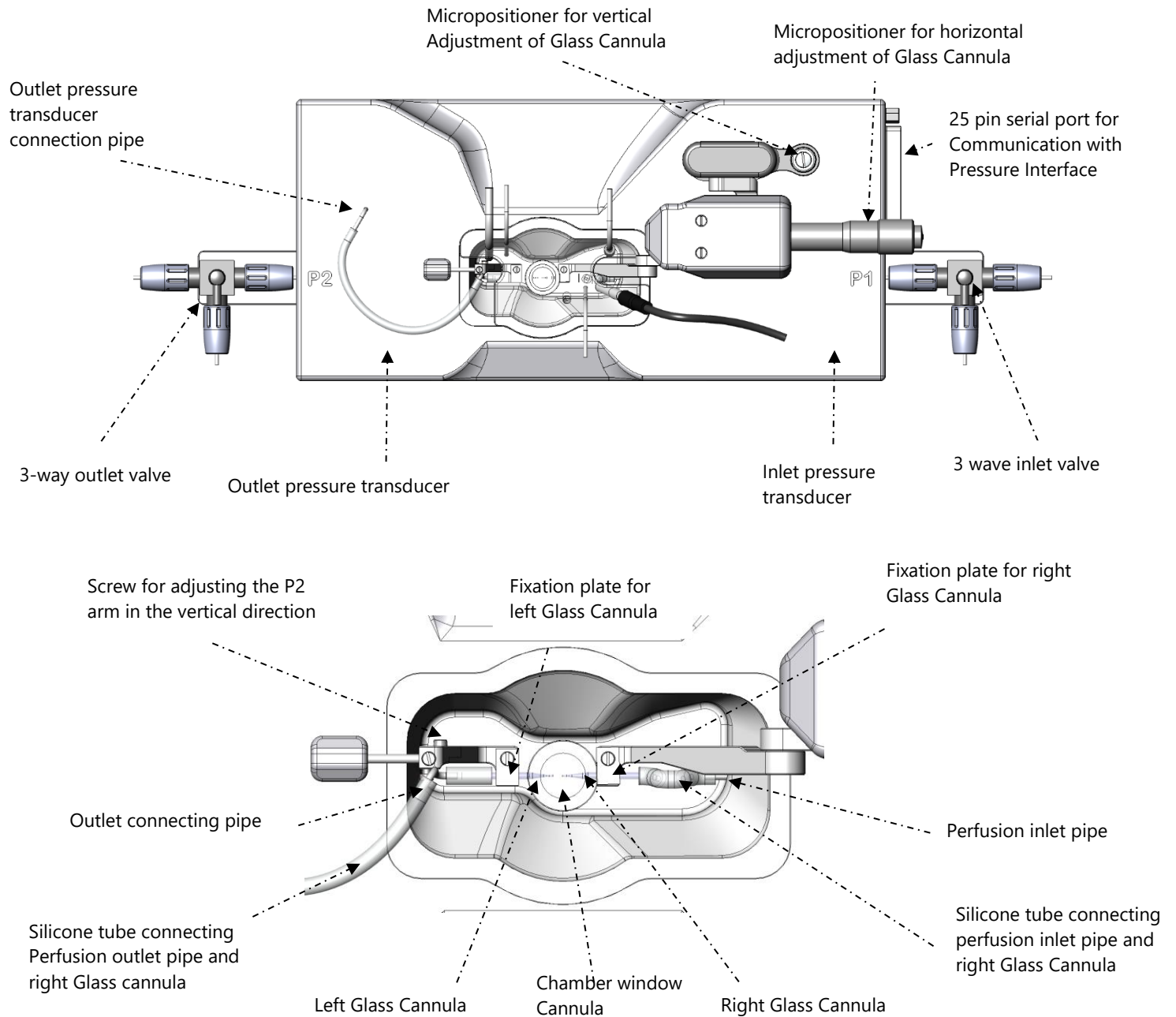


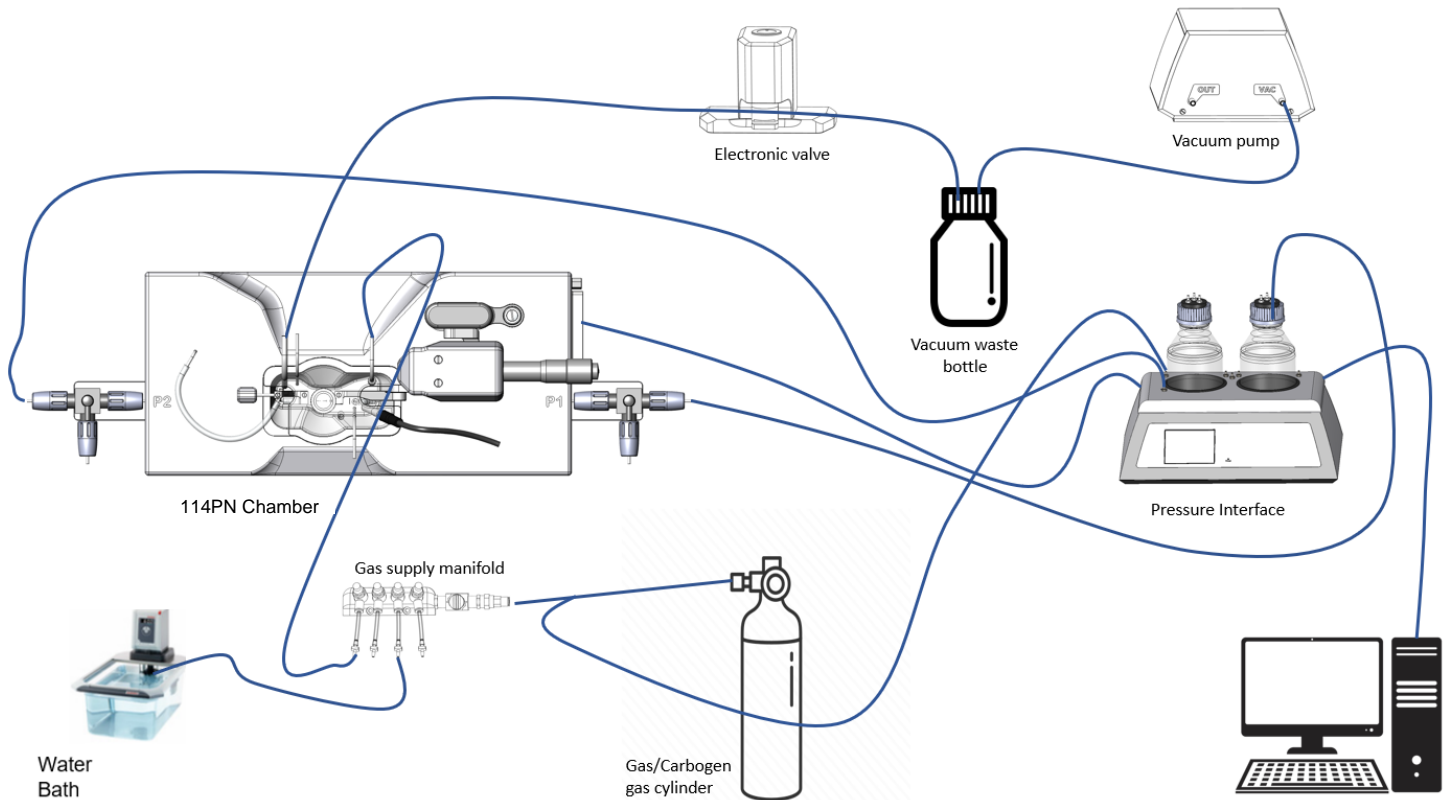
Figure 1.3 Pressure Myograph – 114PN with close-up detail of the chamber



# CHAPTER 2 - SETTING UP

## 2.1 SETTING UP THE COMPLETE PRESSURE MYOGRAPH SYSTEM

Figure 2.1 is an example of a complete set-up for the Pressure Myograph System. The overview includes optional equipment such as a peristaltic pump to enable superfusion flow and pH probes for measuring pH in the superfusion buffer. In addition, the overview also includes the DMT Flowmeter - 162FM. The Flowmeter enables flow measurements in the range of 15-4000 $\mu$ l/min. A detailed step-by-step description is provided in the remaining sections of chapter 2.



The Pressure Myograph System will work with a range of different microscopes: the DMT Microscope, the Zeiss Axio vert A1 or Nikon TS-100F.

*NOTE: THE MICROSCOPE IS ESSENTIAL FOR THE DIMENSIONAL ANALYSIS OF THE MOUNTED VESSELS.*

The DMT Microscope is a standard inverted microscope with a built-in digital CCD USB camera. The DMT Microscope is very effective and recommended in setups requiring standard image analysis.

The Zeiss Axio vert A1 is an inverted microscope that provides the highest degree of flexibility in image analysis. The Zeiss Axio vert A1, a Nikon TS-100F and Motic AE 2000 enable the use of a wide range of objectives and facilitate sophisticated fluorescence techniques. A camera mount is needed for the DMT USB camera.

Contact the DMT Sales Department for further product information and price on any optional equipment, including microscopes.

## **2.2 SETTING UP STEP-BY-STEP**

This section describes how to connect the cables in the Pressure Myograph System as illustrated in figure 2.1.

*NOTE: BEFORE PROCEEDING SETTING UP STEP-BY STEP MAKE SURE THAT THE PRESSURE INTERFACE, THE MICROSCOPE AND THE COMPUTER ARE SWITCHED OFF.*

1. Pressure Myograph chamber to Pressure Interface connection: Connect the Pressure Myograph chamber to the Pressure Interface by using the grey 25/44-pin connection cable. Then connect the cable with the temperature probe to the Pressure Myograph chamber.
2. Pressure Interface to computer connection: Using a USB cable, connect the Pressure Interface to USB port on the computer. The USB port on the Pressure Interface can be found on the back panel.
3. Pressure Interface and oxygen supply connection: Connect the "Oxygen" inlet on the back of the

Pressure Interface to an adjustable oxygen supply using the “Atlas Copco Cable-air hose” delivered with the Pressure Myograph System.

*IMPORTANT: MAKE SURE THAT THE HOSE IS SECURELY FASTENED TO THE “OXYGEN” INLET USING THE HOSE CLIP. THE PRESSURE FROM THE OXYGEN SUPPLY MUST BE MINIMUM 0.5BAR AND NOT EXCEED 1.0 BAR.*

4. Microscope/camera to computer connection:
  - A. DMT Inverted Microscope: Inside the DMT Microscope there is a USB camera wired to a USB cable and one USB cable to power the microscope light. Connect the two USB cables from the DMT Microscope to the computer USB ports.
  - B. Another microscope: Zeiss Axio vert A1, Nikon TS-100F, Motic AE 2000 etc. Connect the USB cable from the USB camera mounted on the microscope to the computer USB port.

*NOTE: IF YOU HAVE PURCHASED A COMPUTER FROM DMT WITH YOUR PRESSURE MYOGRAPH SYSTEM THEN MYOVIEW DATA ACQUISITION SOFTWARE HAS ALREADY BEEN INSTALLED WITH DRIVERS FOR THE DIGITAL USB CAMERA. FOLLOW THE NEXT PROCEDURE TO SETUP THE PRESSURE MYOGRAPH SYSTEM.*

*NOTE: IF YOU HAVE NOT PURCHASED A COMPUTER FROM DMT FOLLOW THE MYOVIEW QUICK INSTALLATION GUIDE TO INSTALL MYOVIEW ON YOUR OWN COMPUTER. PLEASE MAKE SURE THE COMPUTER HAS THE REQUIRED SPECIFICATIONS.*

5. Pressure Interface to external Data Acquisition System connection (optional): If you have not obtained the MyoVIEW software the four BNC ports on the rear of the Pressure Interface enables connection of an external data acquisition system for recording inlet pressure P1, outlet pressure P2, probe temperature, chamber temperature, flow ON/OFF, pressure ON/OFF, pH1 value.
6. Turn on the power: Turn the main power to the Pressure Interface on at the power switch. Then turn on the computer and the Pressure Myograph System is now ready to for use with MyoVIEW Data Acquisition Software.

## 2.3 THE FIRST PRESSURE CALIBRATION

Prior to shipping the Pressure Myograph System has gone through two days of continuous testing, including final pressure calibration. However, in order to ensure that the Pressure Myograph System is working at highest performance, DMT recommends that a new pressure calibration is performed before the first use. The pressure calibration procedure is described in detail in chapter 3.7.1.

## 2.4 EXTERNAL PRESSURE MYOGRAPH CONNECTIONS

This section illustrates how to connect the perfusion circuit, the superfusion circuit, oxygen supply, pressure supply and suction device on to the Pressure Myograph.

### 2.4.1 CONNECTING PERFUSION FLOW AND PURGING THE SYSTEM WITH BUFFER

The Pressure Interface controls the perfusion flow. Instructions on how to control the perfusion flow are provided in chapter 3.4. To connect the Pressure Interface to the Pressure Myograph, use the silicone tubing (internal diameter 1mm) delivered with the Pressure Myograph System.

- Connect the “perfusion inlet” at P1 on the Pressure Myograph (see figure 2.2) to the P1 outlet on the cap of the Pressure Interface bottle (see figure 2.3).
- Connect the “perfusion outlet” at P2 on the Pressure Myograph (see figure 2.2) to the P2 inlet on the Pressure Interface (see figure 2.3).

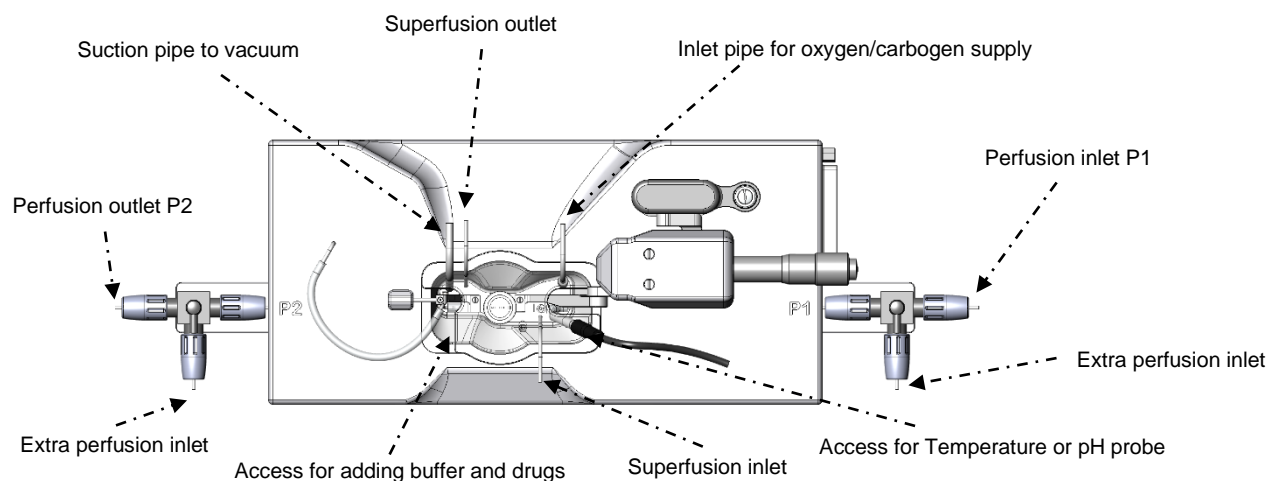


Figure 2.2 External connections for Pressure Myograph 114P

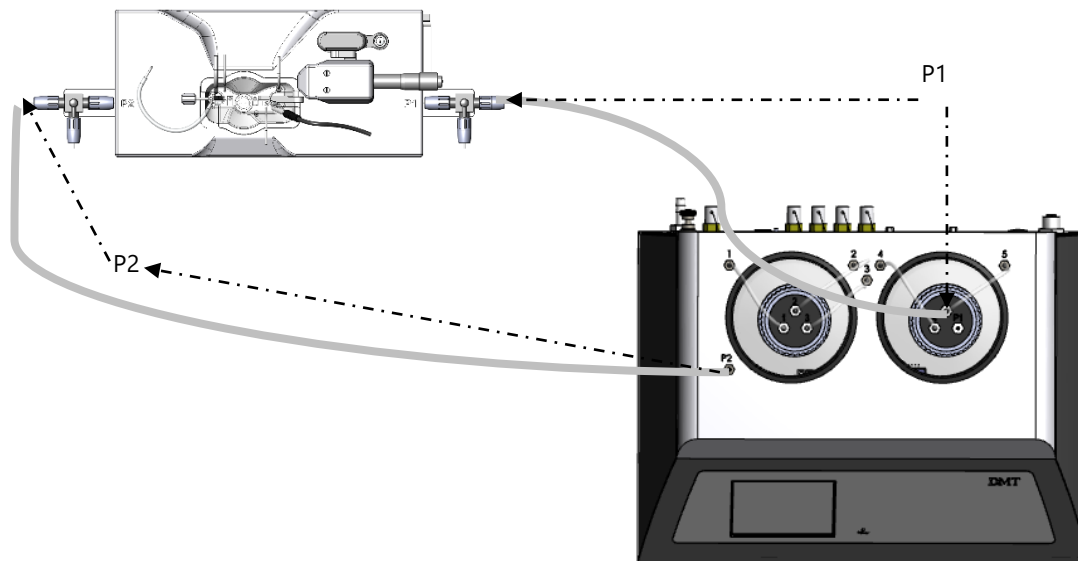
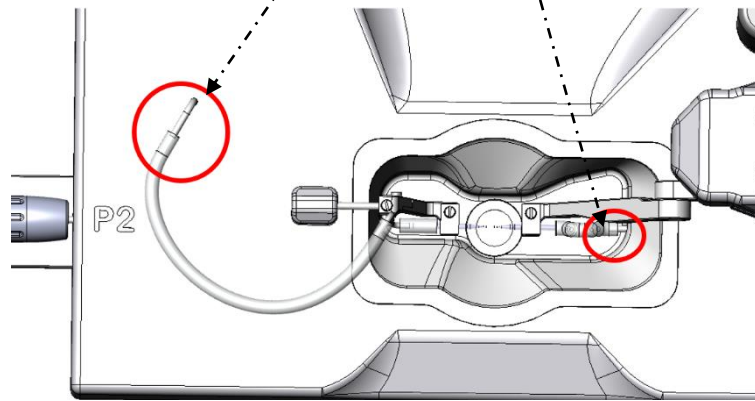


Figure 2.3 External connections for Pressure Myograph - 114PN

NOTE: TO FILL THE TUBING AND AVOID AIR BUBBLES, MOUNT THE CALIBRATION SHUNT (RESISTANCE TUBE) AS SHOWN BELOW AND DESCRIBED IN CHAPTER 3.7.2.1.

Calibration shunt tubes attached the two steel pipes marked with red circles (delivered in a small box with the system)



Calibration shunt tube connected

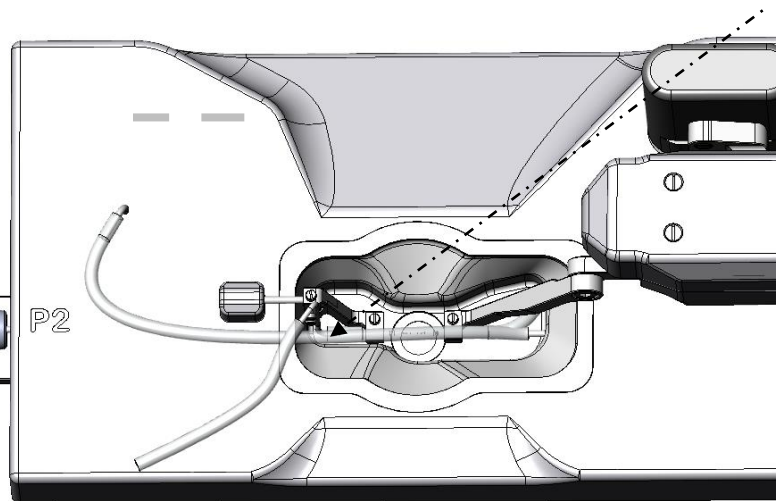


Figure 2.4 Calibration Shunt tube attached in the 114PN chamber to purge the system with buffer

Fill the P1 Schott bottle with a maximum of 300 ml pre-warmed buffer aerated with carbogen.

NOTE: It is very important that the buffer is prewarmed to 37°C and aerated with carbogen to avoid air bubbles in the silicone tubing during an experiment.

In the pressure interface menu set the pressure P1 and P2 as follow:

P1 = 150mm Hg

P2 = 70mm Hg

Set the Pressure ON

Set Flow ON

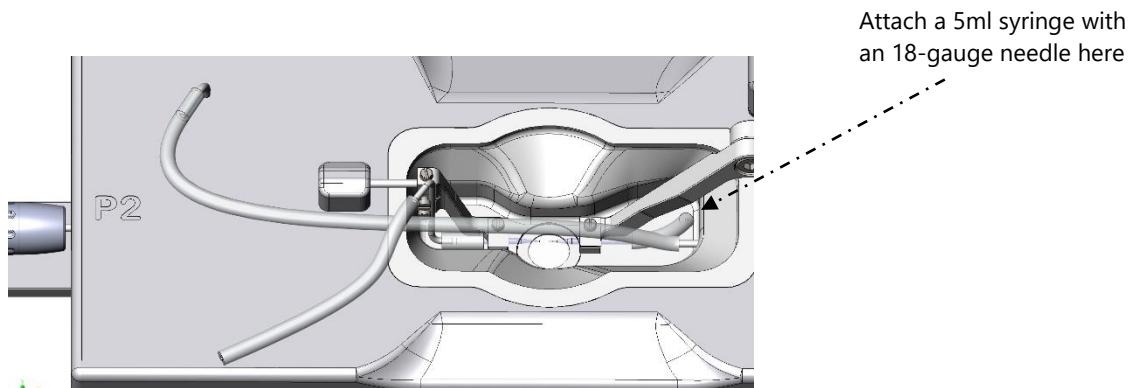
*IMPORTANT:*

- *LET THE PRESSURE REGULATOR RUN UNTIL NO AIR BUBBLES ARE VISIBLE IN THE PERFUSION CIRCUIT.*
- *NEVER RUN AIR BUBBLES THROUGH A MOUNTED VESSEL AS THIS MAY DAMAGE IT.*
- *NEVER FILL THE BUFFER BOTTLE WITH MORE THAN 300 ML AS HIGHER VOLUMES MAKES PRECISE CONTROL OF THE PRESSURE MORE DIFFICULT.*

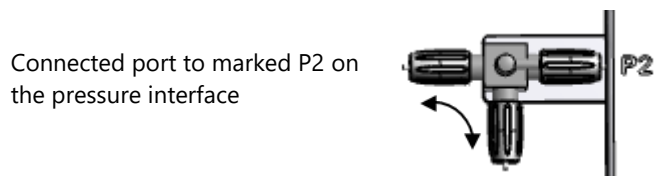
1. When no air is seen in the tubing turn of the flow and close the P1 3-way valve to the chamber as shown below.



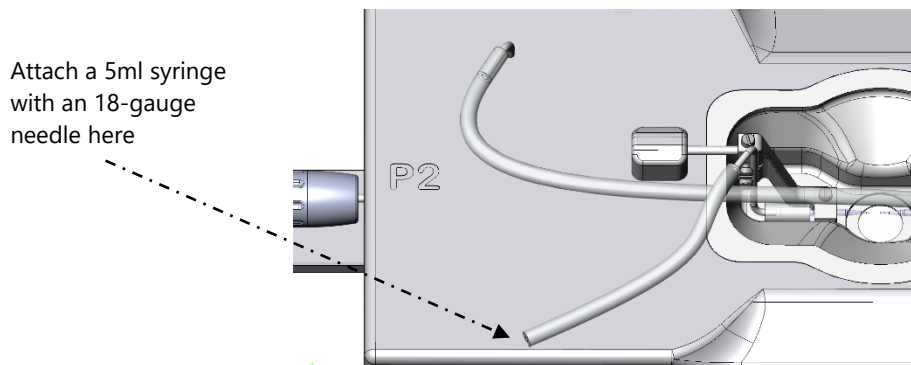
2. Fill the 114PN chamber with 6ml pre-heated buffer.



3. Attach a 5ml syringe with an 18-gauge needle to the short silicone tubing on the P1 glass cannula and use the syringe to draw buffer into the P1 glass cannula and silicone tube. When all air is removed, re-connect the short silicone tube to the steel pipe inside the chamber again.
4. Close the P2 3-valve towards the chamber as shown below

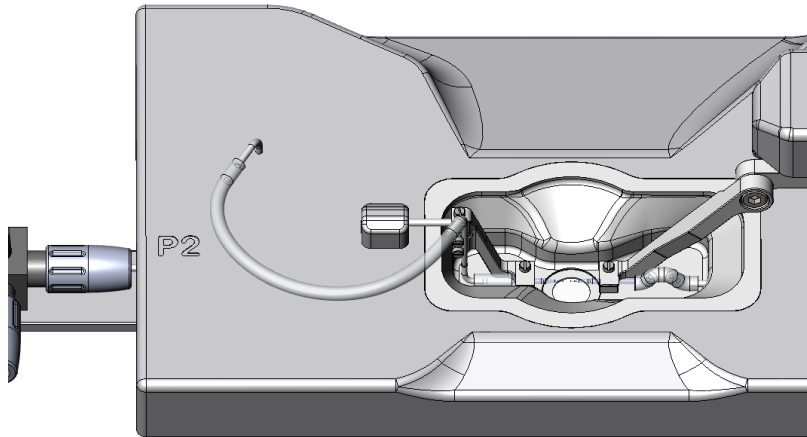


5. Attach a 5ml syringe with an 18-gauge needle to the silicone tube (Shown in the figure below) on the P2 side and use the syringe to draw buffer into the P2 glass cannula and silicone tube.

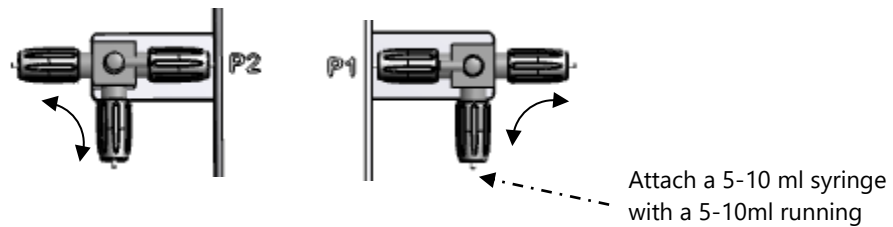




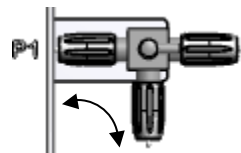
6. When all air is removed, re-connect the silicone tube to the steel pipe on the 114PN chamber, see figure below.



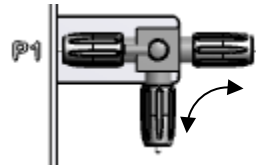
7. Inspect the glass cannulas and the silicone tubing in the chamber for air bubbles using a dissection microscope. If no air bubbles are visible, then continue with the mounting of the artery (See USER GUIDE). If not then try to repeat the above until all air bubbles are removed. If an air bubble is located on the P1 side, then try to remove it as described in step 8-10, otherwise skip these steps.
8. Close the 3-way valves toward the chamber at the P1 and P2 side. Detach the silicone tubing to the P1 and P2 reservoir bottles at the 3-way valves.



9. Attach a 5-10ml syringe at the extra P1 perfusion Inlet and push a small volume of buffer through the 3-way valve to remove air in the valve. Then close the 3-way valve toward the P1 buffer flask as shown below.



10. Now very gently with the syringe push buffer into the chamber (MONITOR the P1 Pressure on the Pressure Interface screen and DO NOT exceed 200mmHg). Make sure the chamber is connected to the interface with the myograph cable. Push minimum 1ml into the chamber and P1 cannula to remove air. Close the 3-way valve toward the chamber as shown below.

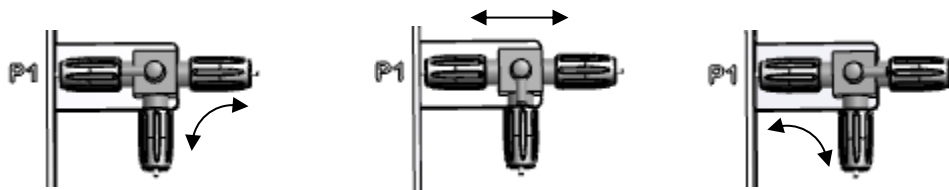


11. The 114PN chamber can now be moved to a dissection microscope for mounting of the vessel in the chamber by detaching the silicone tubes connected to the P1 and P2 3-way valves

*NOTE: ARTERY MOUNTING PROCEDURE SEE "PRESSURE MYOGRAPH -114PN USER GUIDE.*

#### 2.4.2 EXTRA PERFUSION INLET/OUTLET

The extra perfusion inlet/outlet 3-way valves on the Pressure Myograph allow the introduction of special agents or reagents to the perfusion circuit during an experiment. They are placed at P1 and P2 on the Pressure Myograph and the small handle on top of the valves controls the flow direction. See figure 2.5.



*Figure 2.5 3-way valve flow settings at P1.  
The arrows indicate the flow directions.*

#### 2.4.3 CONNECTING SUPERFUSION FLOW(OPTIONAL)

Creating a superfusion flow in the Pressure Myograph chamber requires an external peristaltic pump,

which is not part of the basic Pressure Myograph System. Contact DMT for further information about recommended perfusion pump models, specifications, and prices. The superfusion circuit is connected to the Pressure Myograph cover lid steel pipes as illustrated in figure 2.7.

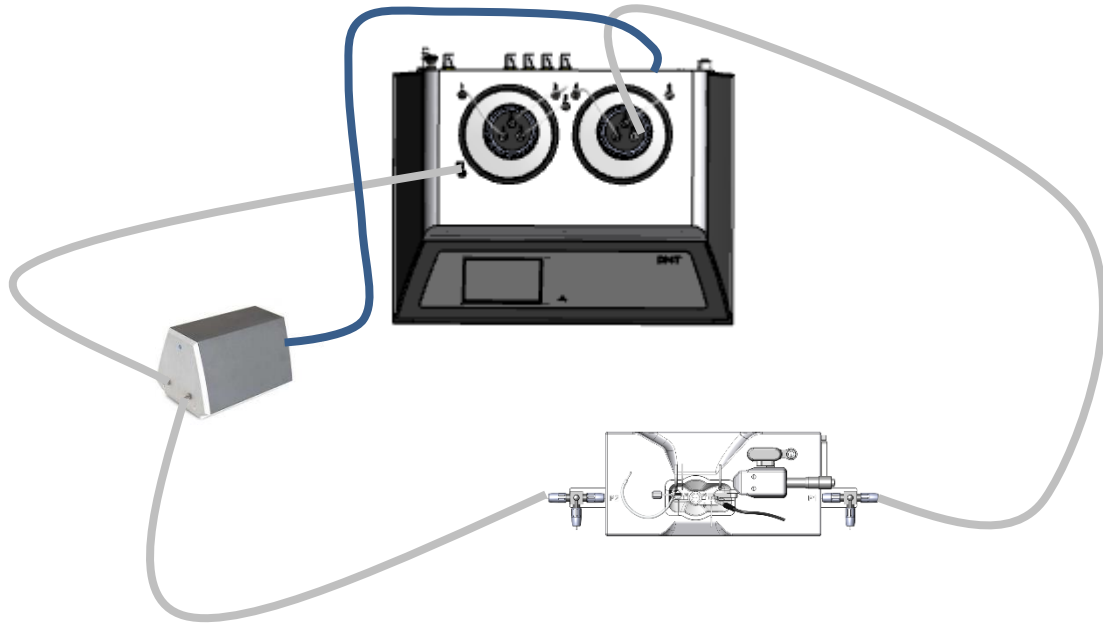
#### **2.4.4 CONNECTING THE FLOWMETER - 162FM (OPTIONAL)**

The FlowMeter – 162FM is optional for flow measurements and measures flow in the range of 15 – 4000 $\mu$ l/min. The FlowMeter is easily combined with any Pressure Myograph System as illustrated in figure below. The 162FM Flowmeter can be obtained as a stand-alone Flowmeter.

Use of the FlowMeter permits control of intravascular pressure, pressure gradient and flow conditions with high accuracy. This enables in vitro studies on vessel segments under conditions very close to those found in vivo. Adding the FlowMeter to the Pressure Myograph System also enables measurement of flow rate as a parameter. The FlowMeter data will make it possible to record live traces of the flow dependent parameters as shear stress and vascular resistance due to changes in vessel structure and function in various physiological and pharmacological studies.

To add the stand-alone FlowMeter to the Pressure Myograph System the cable from the FlowMeter is attached to the flowmeter port marked on the backside of the Pressure Interface. MyoVIEW will recognize the FlowMeter as soon as it is connected to the Pressure Interface and will be ready for use immediately. If the FlowMeter is purchased later than the pressure system, a new license code for MyoVIEW is supplied when opening the flow parameters.

The External DMT 162FM Flowmeter is connected at the P2 side of the 114PN chamber using the applied silicone tubing with an internal diameter of 1mm. Connect the P2 outlet from the 114PN chamber with the DMT 162FM Flowmeter Inlet and then connect the DMT 162FM Flowmeter outlet with The P2 connection on the Pressure Interface (see figure 2.6).



*Figure 2.6 Position of the 162FM Flow meter in the 'flow-line' between the P2 3-way valve and the steel pipe on the interface marked P2*

#### 2.4.6 CONNECTING A SUCTION DEVICE

Connect the "large" pipe on the Pressure Myograph chamber cover (see figure 2.7) to a vacuum pump via a suction bottle and a vacuum valve as illustrated in figure 2.1. The internal diameter of the silicone tube used for this connection must be 2 mm. (a 2 mm tube is not included with the Pressure Myograph System).

The Vacuum Package (#101018/#101052) contain the electronic valve, waste bottle, vacuum pump and all the tubing and fittings.

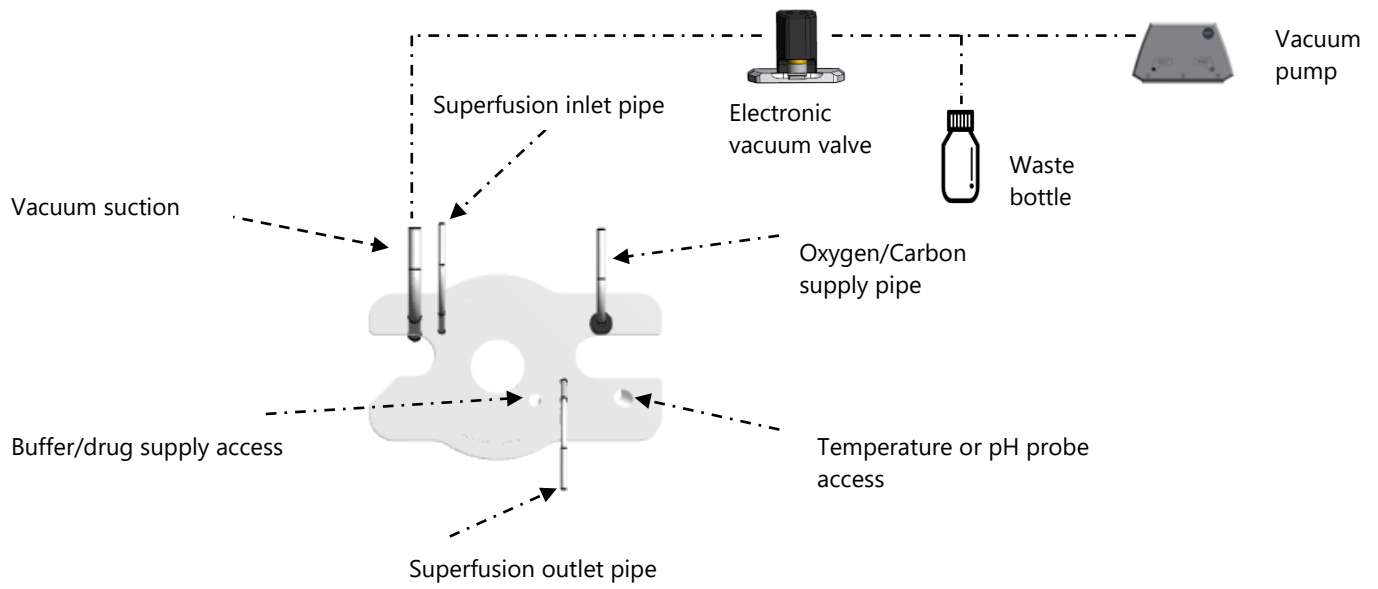


Figure 2.7 Description of coverlid functions for the 114PN chamber

# CHAPTER 3 - PRESSURE INTERFACE MENUS

This chapter contains a detailed description of how to navigate the touch screen menus and how to use the special features of the Pressure Interface.

## 3.1 GENERAL DESCRIPTION OF HOW TO NAVIGATE THE TOUCH SCREEN

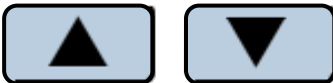
Menus on the Pressure Interface are all accessible by a touch screen. To access a menu, simply touch the screen. When a setting needs to be changed, press SELECT beside the line to be changed.



The line selected will turn blue, indicating that the Pressure Interface is in edit mode and waiting for input. When DEFAULT is chosen, a default value will be displayed.



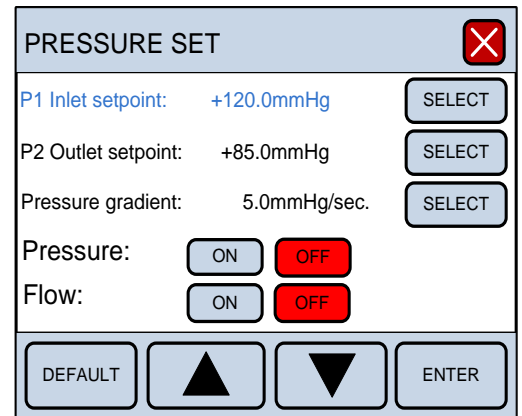
To change the numeric value for the selected parameter, touch the UP or DOWN arrows.



Once the desired setting has been chosen, pressing ENTER will save the selection, and the new value will be stored in memory. The selected line will turn black.



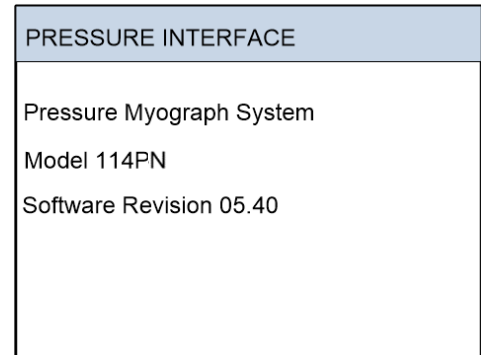
Pressing the white X in the red box will exit the menu and take you automatically to the Main Menu.



### 3.2 POWER-UP SCREEN

After turning on the Pressure Interface, an introduction screen appears. It displays the software version number. While this screen is displayed the system is auto-initializing.

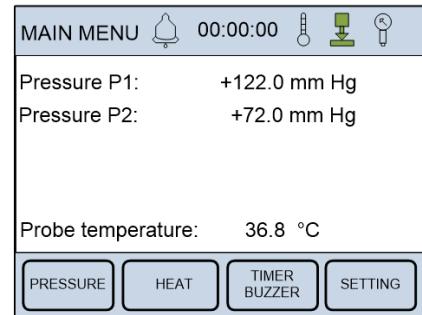
After a few seconds, the Main Menu display will appear, showing the firmware version of the system.



### 3.3 MAIN MENU

The Main Menu gives a good overall picture of how the Pressure Interface is working. It displays values for the input pressure, output pressure, pH (Optional), probe temperature and time, and the status of systems including the time, heat, flow and pressure.

Four sub-menus are accessible from the Main Menu screen: Pressure Menu, Heat Menu, Timer Buzzer Menu and Setting Menu.



Icon for Pressure ON/OFF  
 Icon for FLOW ON/OFF  
 Icon for Heater ON/OFF  
 Timer  
 Icon for Buzzer ON/OFF

*\*If ON the icon is green*

Pressure Menu  
 Heat menu  
 Timer/Buzzer menu  
 Settings Menu

MAIN MENU			00:00:00			
Pressure P1:	+122.0 mm Hg					
Pressure P2:	+72.0 mm Hg					
Probe temperature:		36.8 °C				
PRESSURE		HEAT		TIMER BUZZER		SETTING



Buzzer icon:

This icon indicates the status on the buzzer. If the icon is grey the buzzer is OFF.

If the icon is green the buzzer is ON (active) and will make a sound when the timer reaches zero.

**OFF**

**ON**

Timer:

The Timer is a countdown timer that can be set to maximum 24 hours. If the Buzzer is activated, it will buzz when the timer reaches zero.

**00:00:00**

Heat icon:

This icon indicates the status of the chamber heat. If the icon is grey the heat is OFF.

If the icon is green the heat is ON (active).

**OFF**

**ON**

Flow valve icon:

This icon indicates the status on the flow valve.

If the icon is grey the flow valve is OFF (NO flow). If the icon is green the flow valve is ON (active).

**OFF**

**ON**

Pressure icon:

This icon indicates the status of the pressure regulation. If the icon is grey the pressure regulation is OFF.

If the icon is green the pressure regulation is ON (active).

Zero:

Is used to zero the output from the force transducer. Pressing ZERO will reset the baseline of the chart traces without affecting the calibrations.



**OFF**



**ON**



### 3.4 PRESSURE MENU

The pressure is controlled from this menu. Use SELECT to select the line to be changed. When selected the line changes to blue (edit mode). Use DEFAULT or UP and DOWN arrows to change the setpoint value. Pressing ENTER will save the new setpoint.

P1 Inlet setpoint is the pressure value that the regulator is setting on the inlet side of the Pressure Myograph. Pressure range is 0-250mmHg.

P2 Outlet setpoint is the pressure value that the regulator is setting on the outlet side of the Pressure Myograph. Pressure range is 0-250mmHg.

Pressure gradient set the speed at which the regulator modifies the pressure. The pressure change range is 1-10mmHg/sec.

The screenshot shows a control interface titled "PRESSURE SET" with a close button (red X) in the top right corner. The interface contains the following elements:

- P1 Inlet setpoint:** +120.0mmHg (text is blue), with a "SELECT" button to its right.
- P2 Outlet setpoint:** +85.0mmHg, with a "SELECT" button to its right.
- Pressure gradient:** 5.0mmHg/sec., with a "SELECT" button to its right.
- Pressure:** Two buttons, "ON" (grey) and "OFF" (red).
- Flow:** Two buttons, "ON" (grey) and "OFF" (red).
- At the bottom, there are four buttons: "DEFAULT", an up arrow, a down arrow, and "ENTER".

**IMPORTANT:**

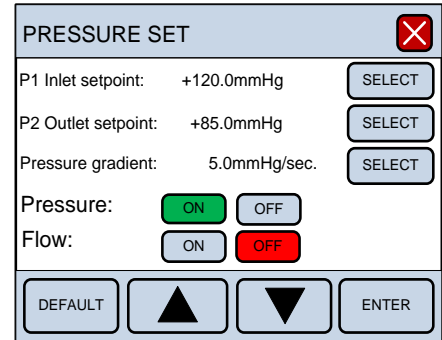
- *P1 INLET SETPOINT SHOULD BE HIGHER THAN P2 OUTLET SETPOINT TO CREATE FLOW.*
- *P1 INLET SET POINT CANNOT BE LOWER THAN P2 OUTLET SET POINT. THIS IS TO PREVENT BACKFLOW IN THE SYSTEM.*
- *IF FLOW IS ON, P1 INLET SET POINT HAS TO BE HIGHER THAN P2 OUTLET SET POINT. THE SYSTEM WILL AUTOMATICALLY MAKE THE CORRECTION IF A SMALLER DIFFERENCE IS ENTERED.*
- *IF NO-FLOW IS WANTED, TURN FLOW OFF. SETTING P1 EQUAL P2 IS NOT POSSIBLE WITH FLOW ON. (SEE NEXT PAGE)*

The pressure regulator and the flow are also controlled from this menu. To turn the pressure regulator on press ON outside the line for Pressure. When activated it turns green.

In Main Menu the pressure icon also turns green when pressure regulation is on.



**ON**

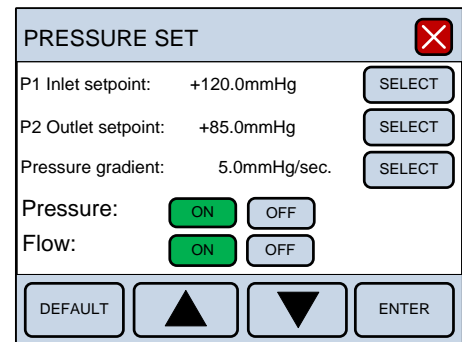


To turn the flow on press ON outside the line for Flow. When activated it changes green.

In Main Menu the flow icon also turns green when flow is on. Turning flow on will demand that the P1 is equal or higher than P2 pressure set point. The pressure interface will automatically make the correction when P1 is set to the same value as P2 if P1 is lower than P2. Turn flow OFF to simulate a “blind sac” experiment. Do not set P1 equal P2 because risk of backflow.



**ON**



### 3.5 HEAT MENU

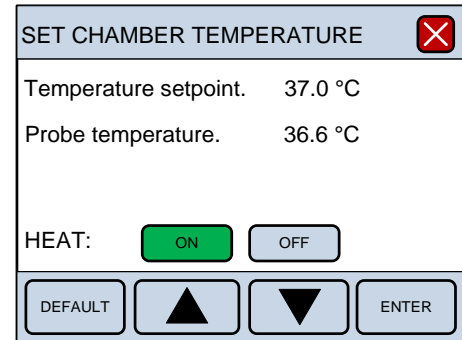
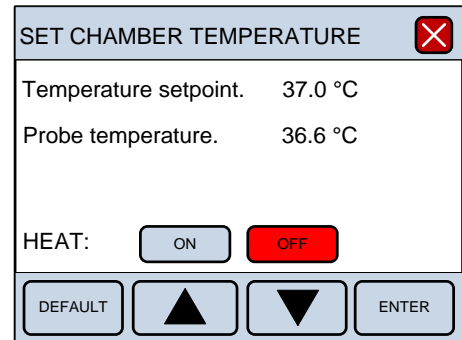
The chamber and bottle heating temperature are controlled from this menu. To turn the heat on, or to change the temperature for the system, press the HEAT in the Main Menu. The display will enter the Heat Menu and allow the user to change the system temperature, as well as turn heat on or off. Pressing DEFAULT will automatically reset the temperature setpoint to 37°C. Manually change the temperature by pressing the UP or DOWN arrows. Pressing ENTER will save the new temperature setpoint.

To turn the heat on, press ON and it will turn green. The system will heat to the desired temperature setpoint.

In Main Menu the thermometer icon turns green when the heat is on.



**ON**



### 3.6 TIMER AND BUZZER MENU

The timer and buzzer are controlled from this menu.

Use SELECT to program the timer. The timer can be programmed in intervals from 0 to 23:59:59 (Hours: minutes: seconds). When Set Timer is selected press the UP and DOWN arrows to program the timer. The hours are programmed first, and then use the RIGHT arrow to get to the minutes and then the seconds.

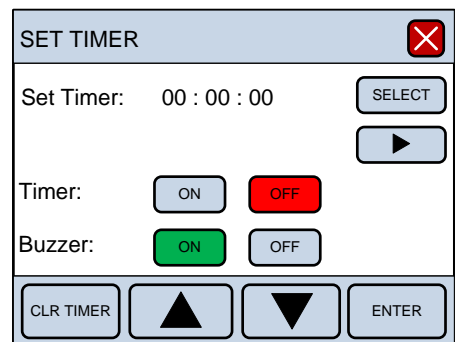
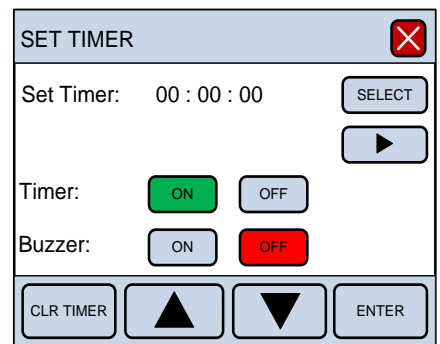
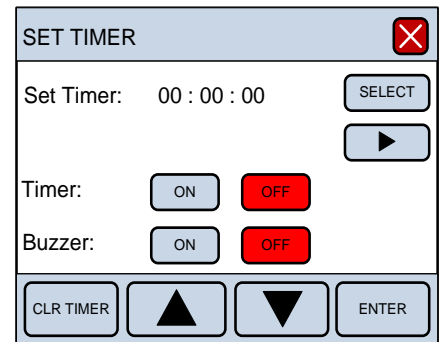
Pressing ENTER will save the programmed time.

To start the timer, press the Timer ON and it will turn green. When the timer reaches zero it automatically switches to OFF. If the buzzer is set ON it will make a tone when the timer reaches zero

To activate the buzzer, press ON and it will turn green. In Main Menu the bell icon also turns green.



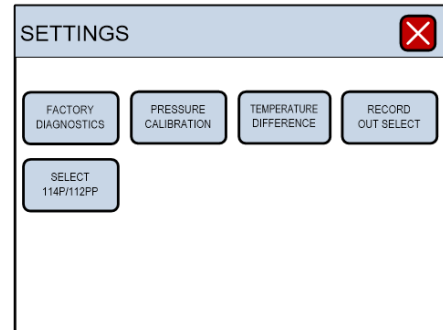
**ON**



### 3.7 SETTING MENU

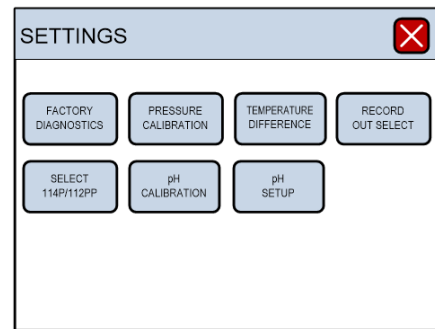
The Settings Menu for the 114P system contains several sub-menus. These sub- menus include:

- Pressure Calibration
- Temperature difference
- Record select out
- Select 114P/112PP
- Factory diagnostics



The Settings Menu for the 114PN with pH electrode module

- Pressure Calibration
- Temperature difference
- Record select out
- Select 114P/112PP
- pH calibration
- pH setup
- Factory diagnostics

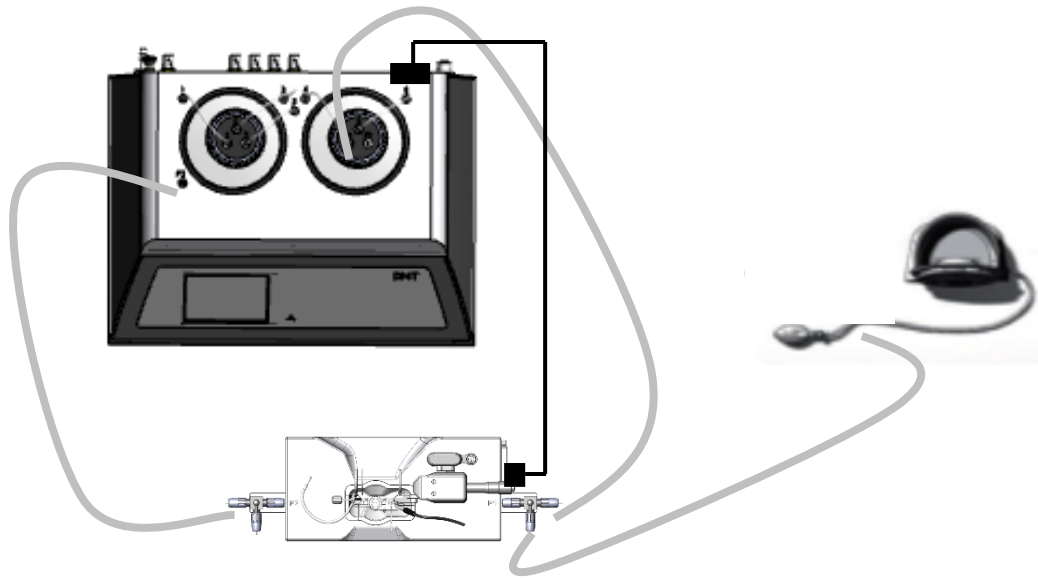


#### 3.7.1 PRESSURE CALIBRATION MENU

##### 3.7.1.1 Set-up the pressure calibration procedure

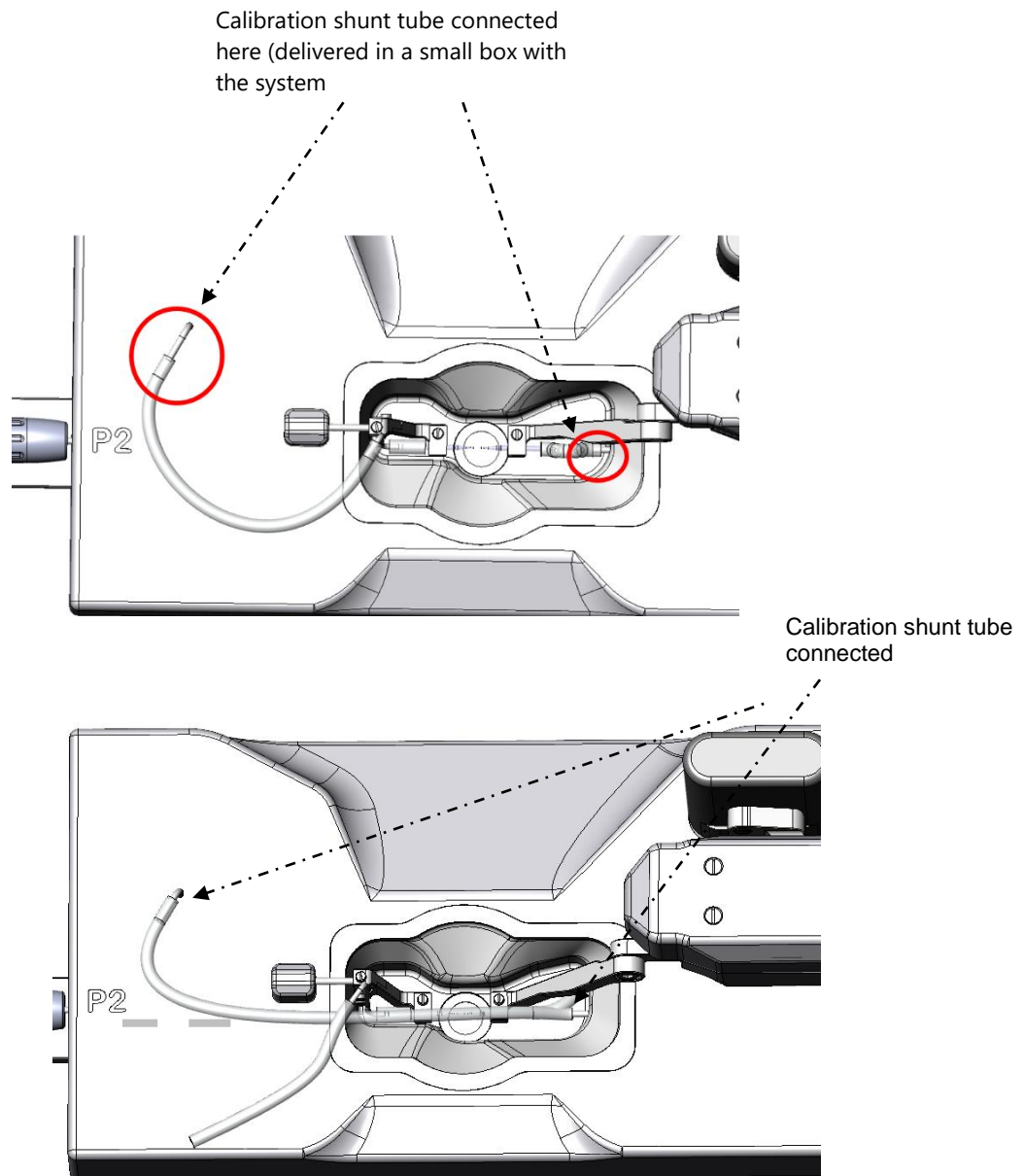
Press Settings in the Main Menu and then press Pressure Calibration. The set-up to perform the pressure transducer calibration procedure is illustrated in figure 3.3 Carefully follow the procedure described below to calibrate the Pressure Myograph System. The calibration procedure is listed in 5 individual steps and needs to be performed one at a time to calibrate the system.

## PRESSURE CALIBRATION PROCEDURE FOR PRESSURE MYOGRAPH 114PN



*Figure 3.3 Illustration of proper set up for pressure calibration.*

1. Connect the Pressure Interface with the Pressure Myograph chamber.
2. Connect the Big Ben Pressure Manometer to the 3-way valve at P1 on the Pressure Myograph as illustrated in figure 3.3.
3. Inside the Pressure Myograph chamber, on the right hand side, is a small stainless steel pipe, which is connected to the right glass cannula via a small silicone tube , see figure 3.4. Carefully disconnect the silicone tube from the stainless steel pipe.
4. Carefully disconnect the silicone tube between the “outlet connecting pipe” and the “outlet pressure transducer connecting pipe”, see figure 3.4.
5. Mount the enclosed calibration shunt (resistance tube) to the outlet connecting pipe and the stainless steel pipe as illustrated in figure 3.5.



*Figure 3.4 Mounting of calibration shunt (resistance tube) in the 114PN chamber*



6. Close the P1 3-way valve towards the P1 bottle on the Pressure Interface normal inlet way, see figure 3.5. The inlet to P1 now comes from the pressure manometer and the Pressure Myograph system is now ready for a calibration procedure.

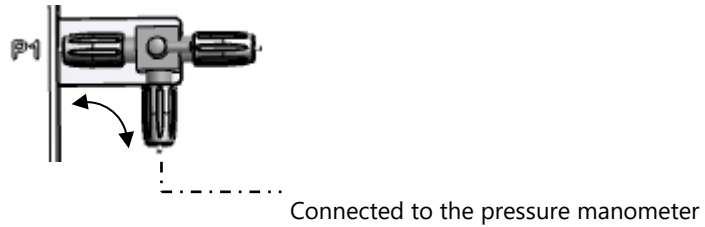
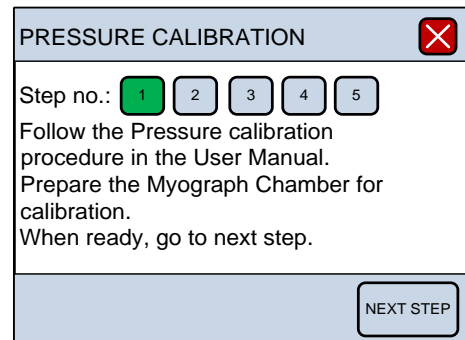


Figure 3.5 Three-way valve flow setting at P1

### 3.7.1.2 Set-up the pressure calibration on the Pressure Interface for the 114PN System

Press Settings in the Main Menu and then press Pressure Calibration. Carefully follow the procedure described below to calibrate the Pressure Myograph System. The calibration procedure is listed in 5 individual steps and needs to be performed one at a time to calibrate the system.

Step 1 - Press NEXT STEP when the system is ready.



Step 2 - Apply a pressure of 50mmHg on the Pressure Myograph using the Big Ben Pressure Manometer. When the 3 blue lines of relative values stabilize, go to NEXT STEP.

The relative values should be between 3300 to 3900

PRESSURE CALIBRATION

Step no.: 1 2 3 4 5

Apply 50 mmHg pressure on the Myograph. When the pressure reading is stable, go to next step.

Pressure P1: 3672  
Pressure P2: 3615  
Pressure P3: 3676

BACK NEXT STEP

Step 3 - Apply a pressure of 125mmHg to the Pressure Myograph using the Big Ben Pressure Manometer. When the 3 blue lines of relative values stabilize, go to NEXT STEP.

The relative values should be between 3900 to 4500.

PRESSURE CALIBRATION

Step no.: 1 2 3 4 5

Apply 125 mmHg pressure on the Myograph. When the pressure reading is stable, go to next step.

Pressure P1: 4293  
Pressure P2: 4203  
Pressure P3: 4211

BACK NEXT STEP

Step 4 - Apply a pressure of 200mmHg to the Pressure Myograph using the Big Ben Pressure Manometer. When the 3 blue lines of relative values stabilize, go to NEXT STEP.

The relative values should be between 4600 to 5200.

PRESSURE CALIBRATION

Step no.: 1 2 3 4 5

Apply 200 mmHg pressure on the Myograph. When the pressure reading is stable, go to next step.

Pressure P1: 4905  
Pressure P2: 4788  
Pressure P3: 4784

BACK NEXT STEP

Step 5 - The calibration is now finished. The readings in the three bottom lines are the actual pressure on all three pressure sensors. The values must be 200.0 +/-1.0mmHg. Select NEXT STEP.

Carefully remove the calibration shunt tube and reconnect the tubing to the glass cannulas.

PRESSURE CALIBRATION

Step no.: 1 2 3 4 5

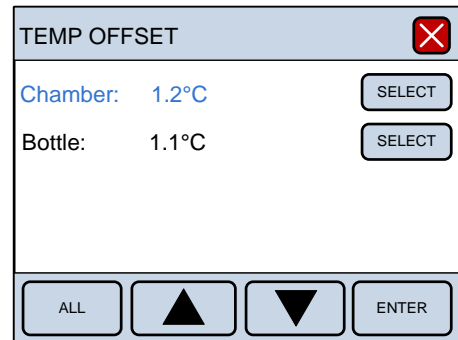
If the readout is 200.0 +/-1.0 mm Hg the calibration is OK. Otherwise repeat the calibration.

Pressure P1: 200.0 mm Hg  
Pressure P2: 200.0 mm Hg  
Pressure P3: 200.0 mm Hg

BACK NEXT STEP

### 3.7.2 Temperature Difference (offset)

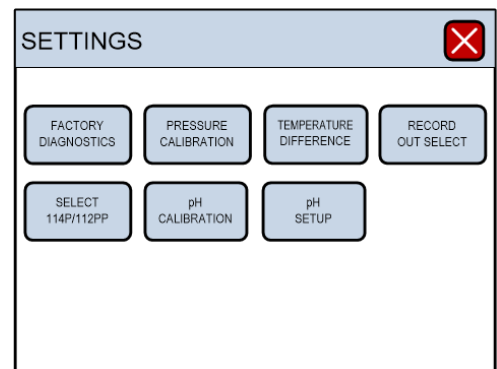
The temperature difference function allows the user to fine-tune the temperature setpoint of the system. Although the temperature setpoint for the system can be set in the Heat Menu, the actual temperature for the system may not heat to the exact setpoint. This function allows the user to adjust the temperature of the chamber and bottle individually, so the exact temperatures can be reached. This is referred to as a temperature offset (“TEMP OFFSET” on chamber). Pressing SELECT or ALL have the same function in this menu as



*NOTE: REMEMBER TO PRESS THE ENTER KEY TO SAVE THE LINE CHANGES TO MEMORY.*

### 3.7.3 RECORD SELECT OUT (OPTIONAL)

The Record Select Out menu determines which data is sent to the BNC analog outputs (REC 1, REC 2 REC 3, REC 4) at the back of the Pressure Interface, four in total. Each output is individually programmable. Any changes made to the analog output will only affect the data collected by the external data acquisition system. Therefore, it is important to check the data acquisition setup when a change is made. The analog output works in range of -2,5V to +2,5V.



Use SELECT to select the channel number to be changed. Then press ENTER to go to the output set-up.

Uε      *NOTE: REMEMBER TO PRESS THE ENTER KEY TO SAVE THE LINE CHANGES TO MEMORY.*  
D(

The following parameter in the Pressure Interface can be selected as output on the analog channel for 114PN:

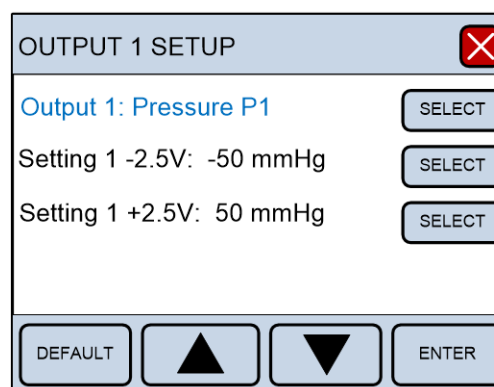
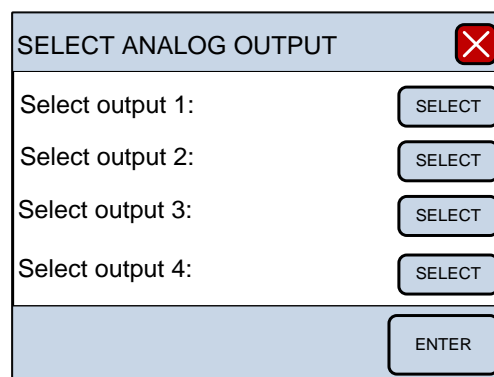
Probe temperature, chamber temperature, pH1, pressure regulation ON/OFF, Flow ON/OFF, (Optional: Digital output 1, Digital output 2, Digital input 1, Digital input 2), Pressure P1, Pressure P2.

When the parameter is selected press ENTER to save the value.

**Example:**

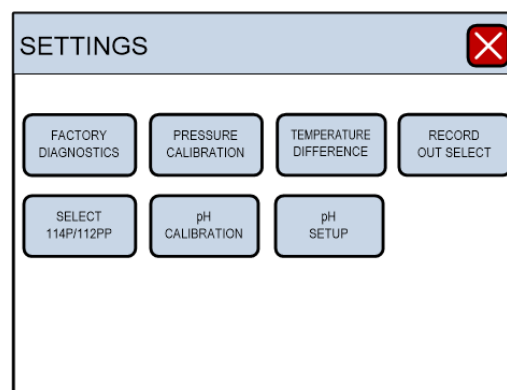
The output range is -2,5V to +2,5V. The user can select the parameter value that gives -2,5V and the value that gives +2,5V. In this example -50mmHg is -2,5V and +50mmHg is +2,5V.

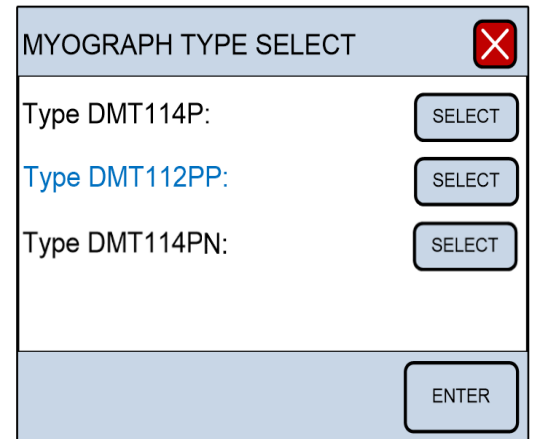
Selecting asymmetrical values is also valid. They can be -2,5V = 0mmHg and +2,5V = 50mmHg.



**3.7.4 SELECT 114P/112PP/114PN**

The Select 114P/112PP Menu is only for users that have an 114P and a Pulsatile Pressure 112PP chamber. Using this menu, the user can change the 114P Pressure Interface to an 112PP Pulsatile Pressure interface or vice versa.





### 3.7.5 PH MENU (OPTIONAL)

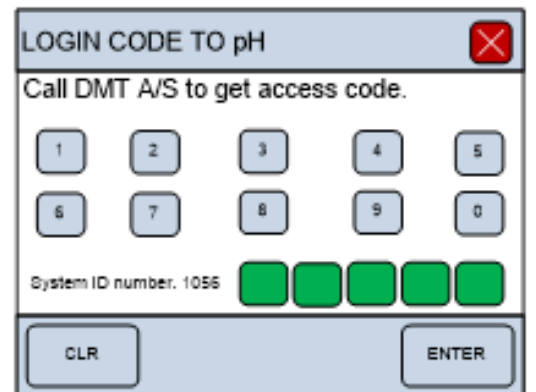
The pH Module menu in the 114PN is only visible for users that have bought a pH electrode and pH module at DMT.

By ordering the pH sensor from DMT the pH sensor is delivered with the unlocking code and a quick guide how to do it. Entering the code will the pH Calibration menu visible and usable.

The 114P/112PP system has a built-in pH meter and a pH-meter electrode plug-in port marked PH on the back side of the 114P/112PP interface.

The pH electrode can be ordered at DMT by contacting your sales representative or emailing sales@dmtdk.

The pH calibration procedure is listed in 4 individual steps and needs to be performed one at a time.



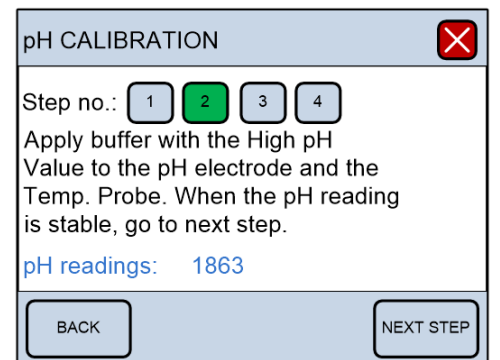
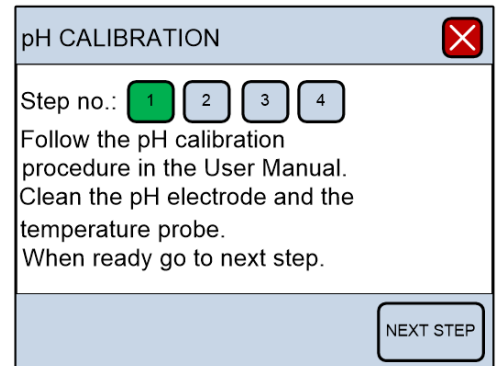
*NOTE: BEFORE THE PH CALIBRATION IS PERFORMED BE SURE TO SELECT THE WAY THE PH ELECTRODE IS TO BE USED. SEE THE SUB-MENU UNDER PH SET-UP UNDER INTERFACE SETTINGS*

### 3.7.5.1 pH Calibration menu

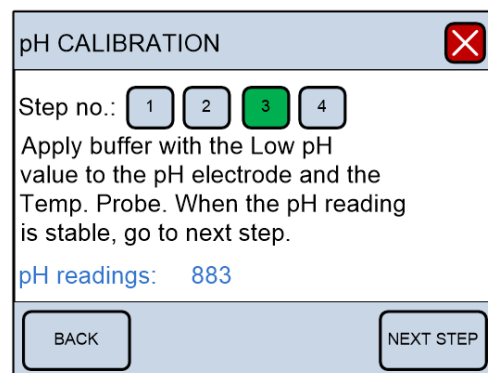
The pH calibration procedure is listed in 4 individual steps and needs to be performed one at a time.

Step 1 - Step 1 involves cleaning the pH electrode and the temperature probe with double distilled water. When ready Press NEXT STEP.

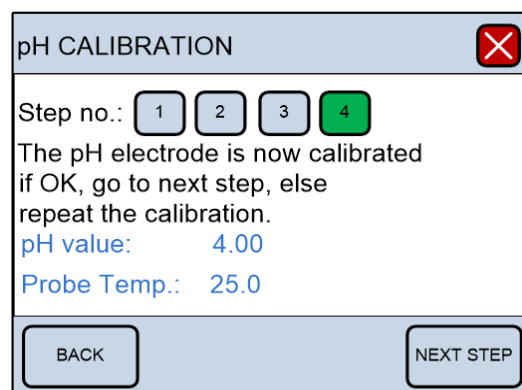
Step 2 - Place the pH electrode and temperature probe in the high buffer solution (here pH 7) and turn on stirring of the high buffer solution. When the relative pH output in the blue line is stable, go to NEXT STEP.



Step 3 - Place the pH electrode and temperature probe in the low buffer solution (here pH 4) and turn on stirring of the low buffer solution. When the relative pH output in the blue line is stable, go to NEXT STEP.



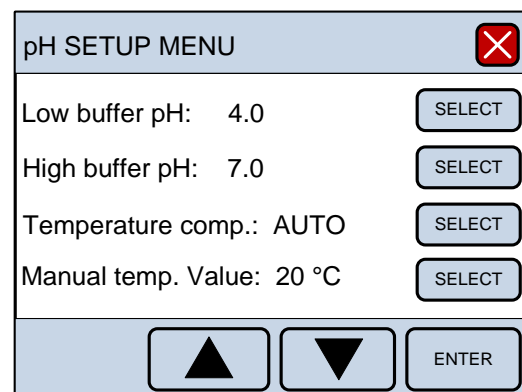
Step 4 - The calibration is now finished. The values in the two bottom lines are the actual pH and temperature reading.



### 3.7.6 pH Set-up Menu

Before the pH calibration is performed be sure to select the way the pH electrode is to be used. See the sub-menu pH Set-up.

The temperature is an important parameter in the calibration formula and is obtained automatically if AUTO is selected in the temperature compensation, as shown below. If MANUAL is chosen, the manual temperature is used in the pH calibration formula, and the temperature probe is deactivated. In the MANUAL mode, the temperature of the calibration buffers is



measured with a thermometer and entered manually in the Manual temp. Value line.

### 3.7.7 Factory Diagnostics

Entering Factory Diagnostics will display the Login code to diagnostics window. This window is for trained technicians and is used for diagnostics and troubleshooting purposes. The general user will not have access to this window. However, entering the proper five-digit login code, will give the trained technician access to diagnostics panels that will provide information during a malfunction, or mechanisms to change other settings controlled by the on-board computer.

LOGIN CODE TO DIAGNOSTICS

Type login code to get acces

1 2 3 4 5

6 7 8 9 0

Code init value. 51761

CLR ENTER



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