

G6100

Water Monitoring System

Operation Manual

Document ID number.: 02480

Maritime

Program Menu Structure

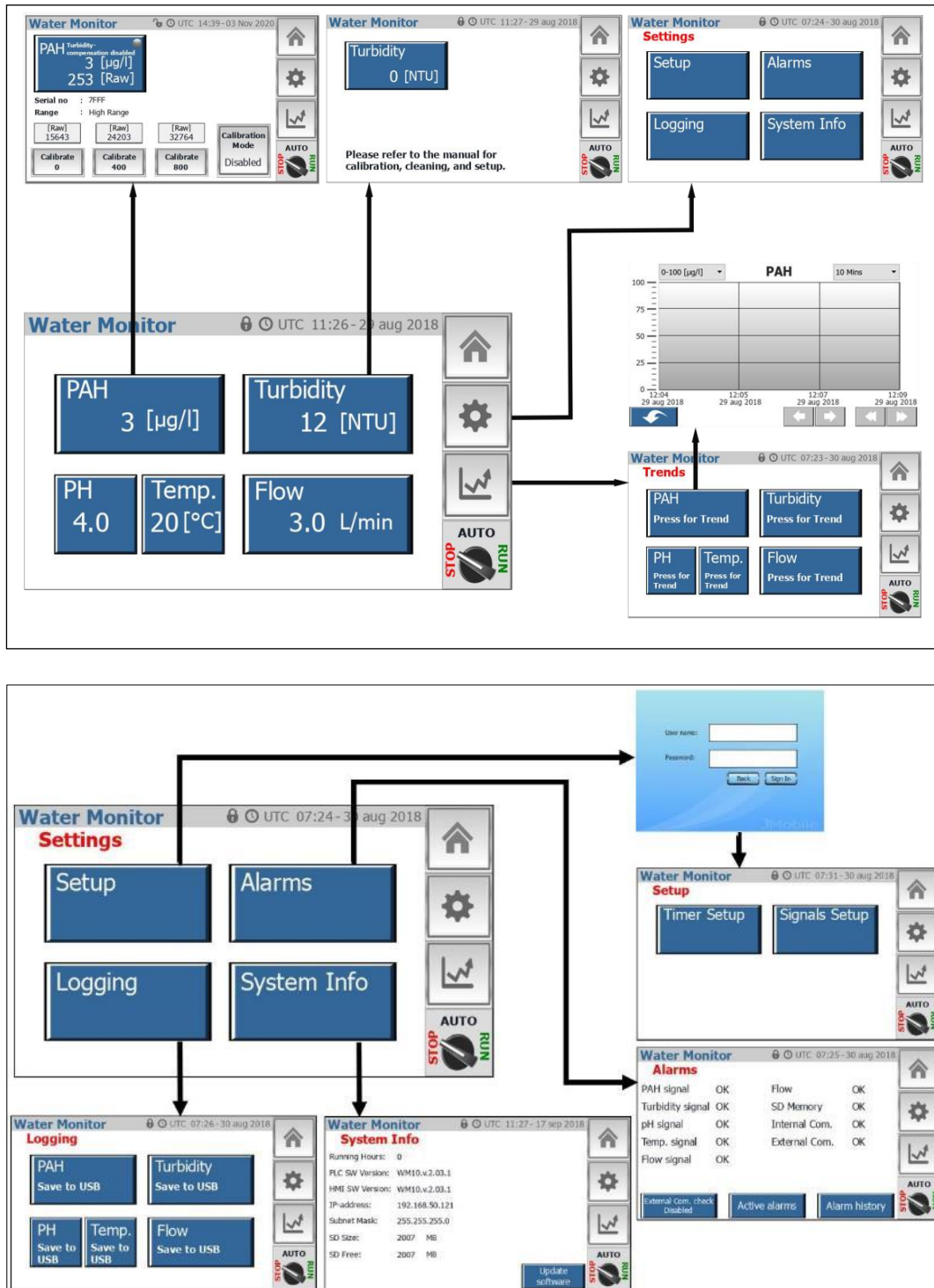


Figure 1-1: Program Menu Structure of the Water Monitoring System

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1 Introduction

1.1 About this Manual

This manual contains data and instructions for the operation of the water monitoring system. For the installation and maintenance of the water monitoring system, please refer to the installation manual and maintenance instructions.

Note

This manual reflects systems with serial number > 108000. For systems with system serial number < 108000 minor graphical deviations can be expected in Figure 1-1 and section 4.

All other aspects contained in this manual overrule corresponding aspects in the previous manuals.

The instructions & figures have been made in general terms and do not take into consideration specific installations. The figures used in this manual are only for general illustration purposes.

This manual is designed for the water monitoring system. The instructions for the operation of the water monitoring system, including sensor modules and sampling systems, will be described in this manual.

Note that each system is configured at the factory according to specifications. Therefore, please study this manual and the Technical Drawings for each system in their entirety for the operation of the system.

This manual does not describe all possible situations but only the most common and known situations and cannot replace the necessary education of the personnel. Should situations not described in the manual occur, which cannot be solved in accordance with normal known practice and good workmanship, the operator should contact Green Instruments A/S for instructions.

Attention

Before operation read all instructions and warnings within this manual and associated documentation. Improper use may cause personal injury and/or damage of equipment and may void the warranty.

Green Instruments A/S disclaims any responsibility for damage and/or injury caused by improper installation, use or maintenance of the equipment.

Green Instruments A/S reserves the right to minor alterations and improvements owing to developments without being obliged to enter the corresponding changes in this manual.

Green Instruments A/S reserves the copyright of the manual. Without prior written permission of Green Instruments A/S, the manual may not be copied and given to unauthorized people.

1.2 Inquiries and Feedback

All claims and inquiries for spares shall be addressed to Green Instruments A/S or our distributors. In all correspondence or when ordering spare parts, please carefully state the equipment type and serial number, which can be found on the label on the equipment.

Green Instruments A/S appreciates all feedback and suggestions for improvement. If any questions appear or any discrepancies are found in this manual, kindly contact Green Instruments:

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1.3 About the System

The water monitoring system is an operator station with an optional sampling system which supplies the integrated sensor modules. The sensor modules measure PAH, turbidity, pH and temperature in accordance with MEPC.184(59) and later MEPC.259(68). All necessary validations of the sensor modules can be done locally using certified calibration solutions which are fully compliant with IMO regulations.

The PAH Module measures the content of PAH in water as a phenanthrene equivalence as specified by MEPC.259(68). The technique used is UV induced fluorescence with the capability of detecting the PAH concentration in µg/l (ppb) in water. A special measuring arrangement ensures a reliable and repeatable measurement while keeping the need for cleaning at an absolute minimum. A unique feature is the local validation which ensures a reliable measurement of PAH.

The PAH measurement is compensated for the effects of turbidity by means of a turbidity compensation formula and input from the turbidity sensor module G6120.

The Turbidity Module measures the turbidity of water in accordance with MEPC. 259(68). The technique used is 90° IR Scattering in accordance with ISO7027. The Turbidity Module can detect sooth, particles, and suspended soil in the water. Special precaution is taken to avoid interference from dissolved gasses and bubbles and an integrated wiper keeps optical fouling at a minimum. Certified calibration solutions are used to perform a local calibration.

The pH/Temperature Module measures the pH value and temperature of the water. Temperature compensation and self-cleaning ensures accurate and reliable measurements in varying conditions. Calibration is simple and fast.

Download the product certificates at <https://greeninstruments.com/>.

2 Specifications

Water Monitoring System (WM)	
Function	Provides a monitoring/logging system which is fully compliant with IMO regulations MEPC. 259(68)
Electrical Specification	Please refer to the Electrical Drawings
Display	4" TFT LCD color display
External Communication	Modbus TCP/IP Optional: Modbus RTU (RS-485) via converter To be specified upon order
Connections	Refer to the P&ID and the Installation Layout
Recommended Sample Flow	1...6 l/m (Integrated flow sensor detects sample flow)
Sample Pressure	Max 3 bar (g)
Sample Temperature	0...50° C
Sample Purity	Particle size of max. 2 mm
Sample Condition	Avoid air and particles in the sampling system
Sample pH Limits	4...11 pH limit
Max Ambient Temperature	Class A (55 °C)
Humidity	Class B
Vibration	Class A
EMC	Class A
Enclosure & Material	Class B (IP54) AISI 1008 Painted
Dimensions & Weight	Refer to the Installation Layout

Supports Sensor Modules: G6110 - G6111 - G6120 - G6130

Sensor Modules

PAH Module – Type G6110/G6111

Legislation	Compliance towards MEPC. 259(68) has been demonstrated under the surveillance of various class societies.
Approvals	Refer to Green Instruments website

Measurement Technology	<p>The technique used is UV induced fluorescence with the capability of detecting the PAH concentration in µg/l (ppb).</p> <p>Excitation wavelength: 254 +/-10nm</p> <p>Detection wavelength: 360 +/- 50nm</p> <p>The PAH measurement is compensated for the effects of turbidity by means of a turbidity compensation formula and input from the turbidity sensor module G6120.</p>
Measurement Range	<p>Low range: 0...100 µg/l phenanthrene equivalence, or</p> <p>High range: 0...800 µg/l phenanthrene equivalence or</p> <p>Dual range: 0...100/800 µg/l phenanthrene equivalence</p> <p>To be specified upon order.</p>
Power Supply	Refer to Electrical Drawings
Wetted Materials	<p>G6110: AISI 316, acetal, Titanium gr.2, sapphire glass, PVDF and NBR</p> <p>G6111: PVC, fused silica glass, AISI 316, PVDF and NBR</p>
Signal	<p>G6110: RS-232 and Analog 4...20 mA (Active)</p> <p>G6111: RS-232 and Analog 0/4...20 mA (Active)</p>
Accuracy	<p>Max ±5% of sensor range or</p> <p>Max ±5% of the nominal standard test concentration, which value is not less than 80% of the sensor range.</p>

Turbidity Module – Type G6120

Legislation	Compliance towards MEPC. 259(68) has been demonstrated under the surveillance of various class societies.
Approvals	Refer to Green Instruments website
Measurement Technology	According to ISO 7027
Measurement range	0...400 NTU
Power Supply	Refer to Electrical Drawings
Wetted Materials	AISI 316, acetal, PVDF, NBR and glass
Signal	Analog 4...20 mA (Active)

Specifications

Accuracy	Max ± 2 NTU
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pH/Temperature Module – Type G6130

Legislation	Compliance towards MEPC. 259(68) has been demonstrated under the surveillance of various class societies
Approvals	Refer to Green Instruments website
Measurement Technology	According to BS EN ISO 60746-1 & BS EN ISO 60746-2:2003
Measurement Range	0...14 pH units; 0...50°C
Power Supply	Refer to Electrical Drawings
Wetted Materials	AISI 316 or PPS, glass, PVDF & PVC
Signals	2 Analog 4...20 mA (Passive)
Accuracy	Max ± 0.2 pH unit

Sampling Systems (Optional)

Pressure Reduction Cabinet – WMR

Equipment	20 mesh strainer, Pressure Reducing Valve, Relief Valve ON/OFF Valve, Flow Regulating Valve, De-bubbler, & Manometer
Connections	Refer to the PI diagram & the Installation Layout
Electrical Connections	Refer to the Electrical Drawings
Sample Temperature	0...50° C
Sample Purity	Particle size of max. 2 mm
Sample Condition	Avoid air and particles in the sampling system
Dimensions & Weight	Refer to the installation layout
Wetted Materials	AISI 316, Acetal, PTFE, PVDF, PC
Sample Pressure	2...10 bar
Enclosure Material	AISI 304 Painted or Polycarbonate

Pump Cabinet – WMP

Equipment	20 mesh strainer, Flow Regulating Valve, Pump Debubbler, and Manometer
-----------	--

Connections	Refer to the PI diagram & the Installation Layout
Electrical Connections	Refer to the Electrical Drawings
Sample Temperature	0...50° C
Sample Purity	Particle size of max. 2 mm
Sample Condition	Avoid air and particles in the sampling system
Pump Lifting Height	Lifetime reduces if pressure is above recommendation.
Type A	Recommendation: 0.8...1.5 bar (g)
Type B	Recommendation: 0.8...2.2 bar (g). Do not exceed 3 bar
Inlet Suction Pressure	Ensure positive suction pressure (0.1...0.8 bar (g))
Dimensions & Weight	Refer to the Installation Layout
Wetted Materials	AISI 316, Acetal, PTFE, PVDF, PMMA. Impeller materials: NBR (other materials upon request)
Enclosure Material	AISI 304 Painted or Polycarbonate

Hose Pump Cabinet – WMPH

Equipment	20 mesh strainer, Flow Regulating Valve, External Hose pump, Debubbler, and Manometer
Connections	Refer to the PI diagram & the Installation Layout
Electrical Connections	Refer to the Electrical Drawings
Sample Temperature	0...50°C
Sample Purity	Particle size of max. 2 mm
Sample Condition	Avoid air and particles in the sampling system
Pump Lifting Height	Note: lifetime reduces if pressure is above recommendation Recommendation: 0.8...2 bar (g). Do not exceed 3 bar
Inlet Suction Pressure	Ensure positive suction pressure (0.1...0.8 bar (g))
Dimensions & Weight	Refer to the Installation Layout
Wetted Materials	AISI 316, Acetal, PTFE, PVDF, PC, NBR-Nitrile
Enclosure Material	AISI 304 Painted or Polycarbonate

Turbidity Pressure Reduction Cabinet – WMRTU

Equipment	20 mesh Strainer, Pressure Reducing Valve, Pressure holding valve /Relief valve, ON/OFF Valve, Flow
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Specifications

	Regulating Valve, De-bubbler, and Manometer, Turbidity Sensor and Analyser
Connections	Refer to the PI diagram & the Installation Layout
Electrical Connections	Refer to the Electrical Drawings
Sample Temperature	0...50°C
Sample Purity	Particle size of max. 2 mm
Sample Condition	Avoid air and particles in the sampling system
Dimensions & Weight	Refer to the Installation Layout
Wetted Materials	AISI 316, Acetal, PTFE, PVDF, PC
Sample Pressure	2...10 bar
Enclosure material	AISI 304 Painted

Specifications are subject to changes without notice.

3 Safety Aspects

Before operating the system, read and understand the entire operating manual.

WARNING/ATTENTION



Follow the instructions.

- Please ensure correct connection of all power and signal cables before operating the water monitoring system.
- The PAH sensor module and Turbidity sensor modules use UV and IR light. Please do not stare into the lenses – it can cause damage to your eyes.

The pH/Temperature sensor uses an electrode which is stored inside the system in a separate container to maximize electrode lifetime. The electrode is delivered with a safety cap on to ensure the electrode is kept moist. The electrode will be damaged if it dries out. The cap must be removed prior to start-up of the system. The pH/temperature sensor is also fitted with a plug to prevent moisture from entering the electrical connection. The plug must be removed, and the electrode fitted prior to start-up.



- The suction line must not be blocked when the pump is running. The pump will be damaged if the suction line is blocked.
- Do not run pump dry.
- Avoid air in the sampling system due to risk of air lock leading to flow alarm and damage of the pump.
- Always ensure a positive suction pressure and keep discharge pressure as low as possible in order to maximize pump lifetime.
- Pay attention to the temperature of the pump. Time to cool down can be needed prior to attempting restart.
- Do not block the drain or outlet from a safety valve. Damage of components will occur.

- Check the function of the safety valve to ensure correct operation. Follow the planned maintenance program.
- The system is only suitable for installation in a safe, non-hazardous area and is not suitable for use with flammable sample liquids. Non-wetted components such as cabinet enclosure etc. must be kept dry and clean.
- It should be pointed out that installation and operation of this system and associated equipment must be carried out by skilled, trained, and certified personnel, and that Green Instruments A/S does not take any responsibility for the operation of the equipment and associated equipment whatsoever. Successful and safe operation of this equipment depends on proper handling, installation, operation, and maintenance.



The equipment must only be applied as described in this instruction manual. If the system is used in any other way not specified by Green Instruments A/S, equipment safety may become impaired and Green Instruments A/S cannot be held liable for any resulting damage or injury.

HAZARDOUS VOLTAGE!

Disconnect the power before installing or servicing the equipment. Ignoring this warning can result in severe personal injury or material damage. Read the instruction carefully to ensure correct connection of all power and signal leads.

Make sure that the correct voltage is connected to the system.

CIRCUIT BREAKER!

The installation must include a means of isolating electrical power by a clearly marked switch or circuit breaker external to the system. The external switch or circuit breaker shall be in close proximity to the system and within easy reach of the operator.

OVERLOAD PROTECTION!

For compliance with the safety requirements IEC 61010-1 (2010), the installation must include a means of overcurrent protection to provide protection against excessive energy being drawn from the power supply system in case of a fault in the equipment.

PROTECTIVE EARTH!

The system must be connected to protective earth.

INSTALLATION AND FAULT FINDING!

Electrical installation and fault finding on the system should only be undertaken by a suitably trained and qualified engineer.

EMC!

For compliance with the EMC product standard IEC 60533 (1999), the connection cables for the main supply and communication signals should be shielded or provided with equivalent protection.

SENSOR!

The sensor modules must be connected to the Water Monitor before powering up (risk of damage). As soon as the system is under voltage, the connection to the sensor modules must not be interrupted. Therefore, please disconnect the power when you need to connect or disconnect sensor modules. The equipment must not be exposed to strong mechanical shocks.

Pressure!

Do not shut-off the pipeline to or from the system when the system is in operation! Damage of components can occur.

Before removing any wetted components, please depressurize the system.

HARMFUL COMPONENTS!

The water can contain poisonous components that are potential harmful to humans and animals. Some calibration fluids contain high concentration of harmful components. Risk of chemical burns can occur. Protection must be worn whenever the risk of being in contact with water and/or calibration fluids can occur.

Please consult MSDS for further information.

RECYCLING!

Please do not dispose the equipment with regular disposal. Disposal should be in accordance with the requirements of the current statutory regulations.

Symbol identification!

Caution, risk of danger



Caution, risk of electrical shock



Chemical burns and etching



Protective earth



The CE mark proves the compliance of the instrument with the requirements of the relevant EU directives



Caution, hot surface

4 Menu Structure

Note

The instructions & figures have been made in general terms and do not take into consideration specific installations. The figures used in the manual are only for general illustration purposes.

The monitor unit uses an HMI module as a combined work and operating station.

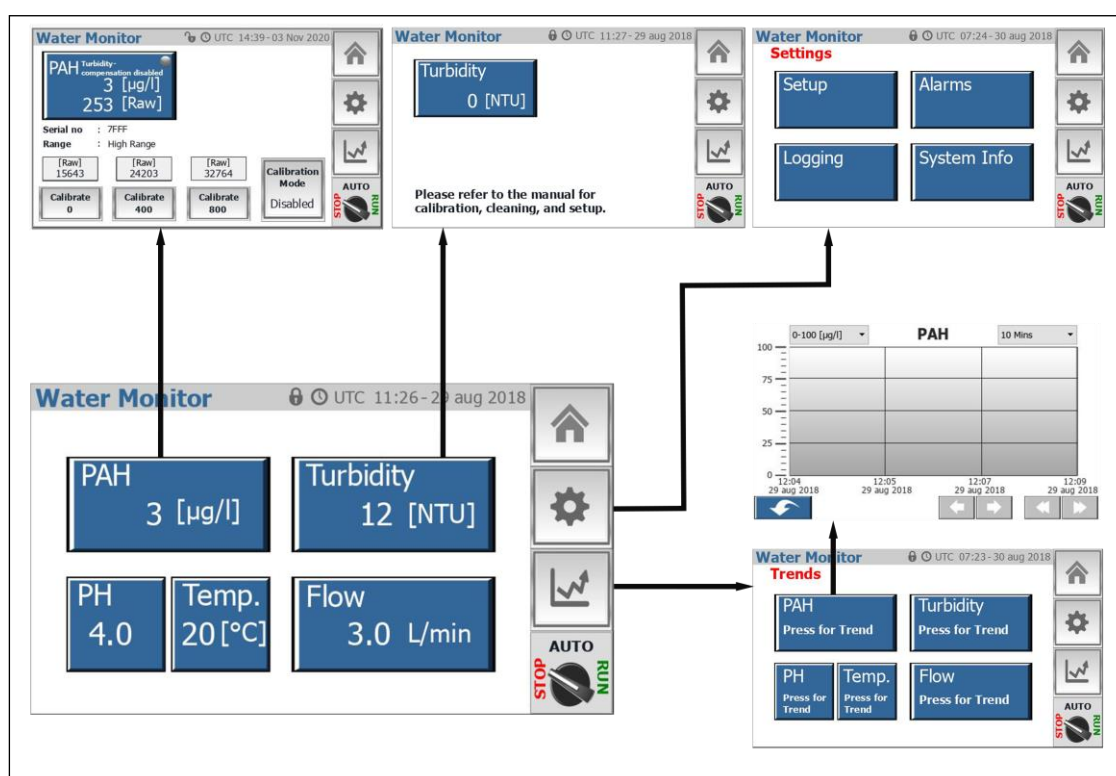





Figure 4-1: Menu Structure

4.1 Home

The 5 blue buttons of the home page show names, values, and units of up to 5 monitored parameters. Pressing one of the 5 blue buttons provides more information about the chosen parameter i.e. PAH, Turbidity, pH, Temperature and Flow.

The 3 buttons to the right give access to Home , Settings , and Trend . The Stop/Auto/Run selector switch is used to operate the On/Off valve in WMR & WMRTU cabinets or to start/stop the pump in WMP & WMPH cabinets.

The switch also indicates from where the system is controlled. In normal operation, it must be switched to Auto. It is possible to navigate through the menus locally even when the selector switch is set to Auto, however controlling the system will be inhibited.

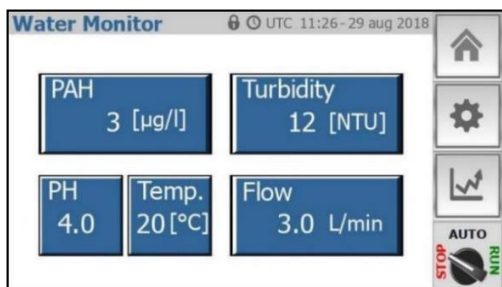


Figure 4-2: Home Page

4.1.1 PAH

Note

The PAH value shown in the Figure 4-2 Home Page is compensated for effects of turbidity. The same value can be found in the system log and is available via Modbus TCP/IP.

After pressing the blue PAH button, the PAH page will be shown as seen in Figure 4-2.

There are 3 different ranges available for PAH sensor modules G6110/G6111:

- Low Range: Measure PAH value with a range of 0-100 µg/l.
- High Range: Measure PAH value with a range of 0-800 µg/l.
- Dual (Auto) Range: Measure PAH value with a range of both 0 - 100/800 µg/l.

The Calibration Mode button is used when performing a calibration. A login is required.

- User: service
- Password: 1234

G6110/G6111 PAH LOW RANGE

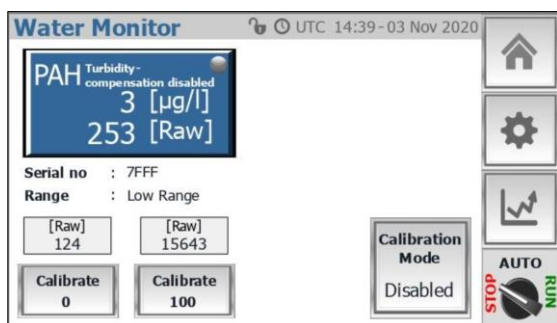


Figure 4-3: G6110/G6111 PAH Low Range

G6110/G6111 PAH HIGH RANGE

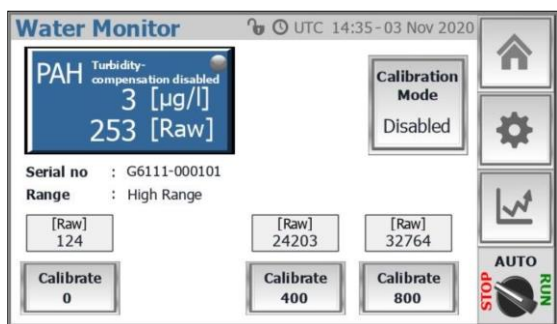


Figure 4-4: G6110/G6111 PAH High Range

G6110 PAH DUAL RANGE

On dual range systems: It is important to calibrate both low and high range. It is possible to switch between the ranges on the PAH calibration page. Please refer to Figure 4-5 to Figure 4-7.

When the sensor has been calibrated, it is important to re-activate the auto range mode.

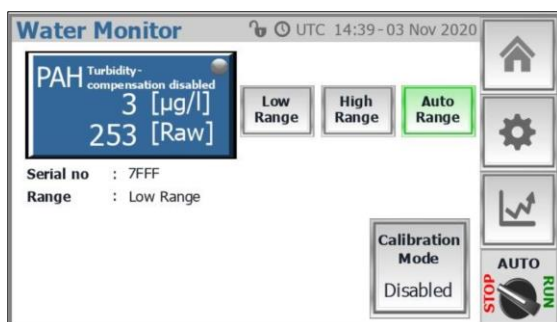


Figure 4-5: G6110 PAH Dual Range in Operation Mode

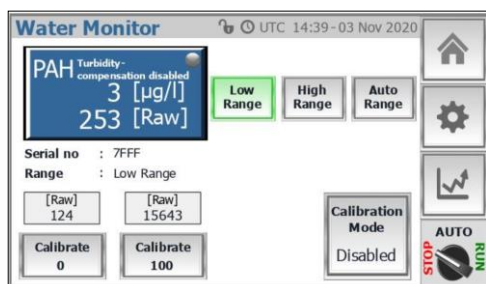


Figure 4-6: G6110 Dual Range - Low Range during Calibration

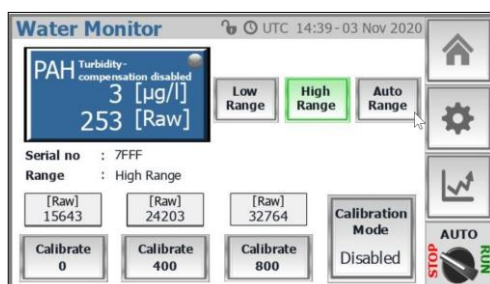


Figure 4-7: G6110 Dual Range - High Range during Calibration

G6111 PAH DUAL RANGE

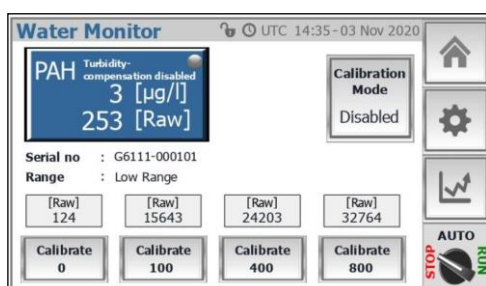


Figure 4-8: G6111 PAH Dual Range

4.1.2 Turbidity, pH/Temperature or Flow

After pressing the blue Turbidity, pH/Temperature or Flow buttons, a notice referring to this manual will appear as seen in Figure 4-9. Please see section 5 for Commissioning, section 6 for Validation/Calibration and section 8 for Routine Maintenance.

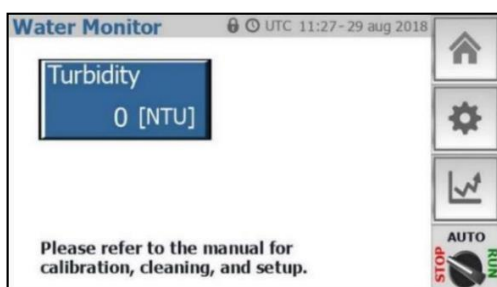



Figure 4-9: Turbidity Page

4.2 Settings

By pressing the  button, the Settings page will appear. Alarms and System Info can be entered without any password. The Setup page and the Logging page, however, require a password.

- User: service
- Password: 1234

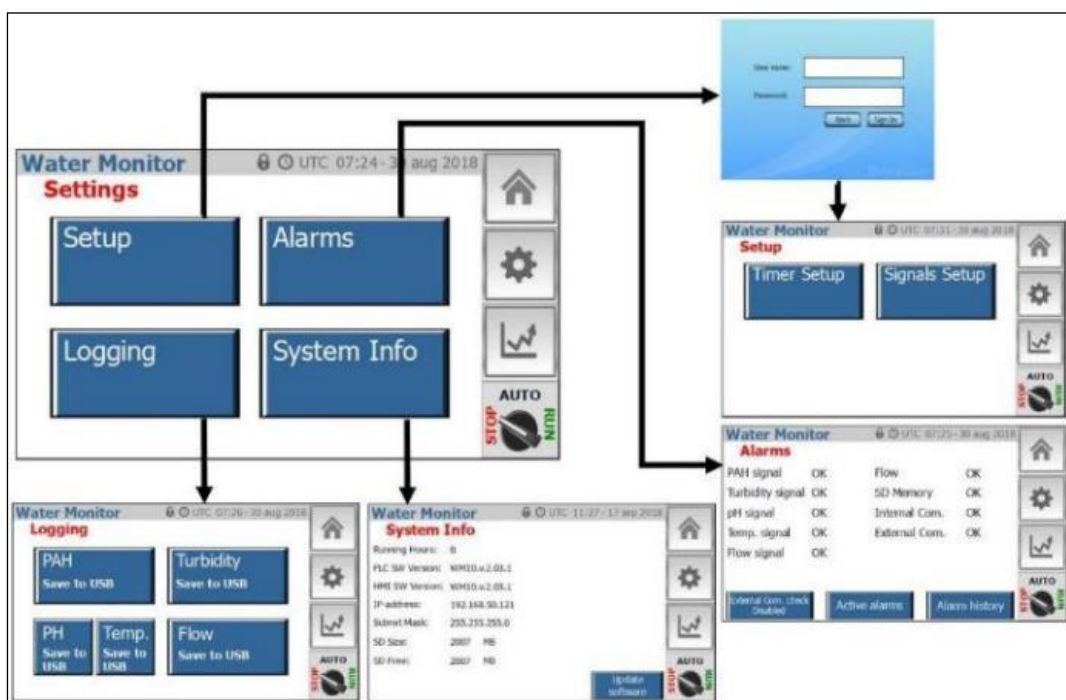
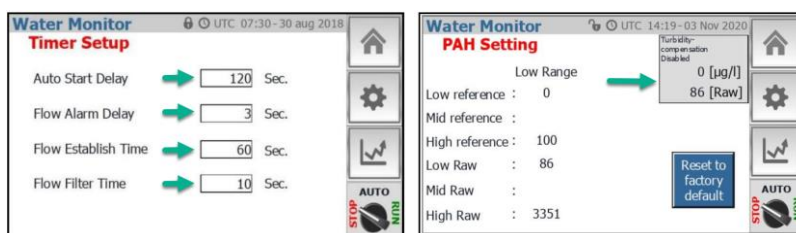


Figure 4-10: Settings Page

4.2.1 Setup

Note

It is only possible to adjust values framed with black boxes. For example, see the illustrations below.



The Setup page allows the user to change the settings of the timers and the signals.



Figure 4-11: Setup Page

TIMER SETUP

Auto Start Delay: During the scrubber start-up, air can be found in the scrubber's piping system. This timer protects the water monitoring system against air entering the system by delaying sampling during the start-up phase. The On/Off valve or the pump will first be turned ON after the Auto Start Delay.

Flow Alarm Delay: This timer allows small fluctuations of the flow without giving Flow Alarm. When the water monitoring system is sampling, this timer controls for how long the flow may be missing before the Flow Alarm is triggered. This timer provides dry run protection of the pump, hence changing the timer setting should be considered carefully.

Flow Establish Time: When the On/Off valve or the pump is activated, the water monitoring system starts sampling. This timer allows the water to travel from the On/Off valve or the pump to the flow sensor. If the flow sensor is triggered within the Flow Establish Time, then the water monitoring system will continue sampling. If flow sensor is not triggered (i.e. no flow) within the set time, then the Flow Alarm will trigger, and the system will stop sampling.

Flow Filter Time

The flow filter time controls the dampening effect of the flow signal. If the flow value is fluctuating, the setting of flow filter time must be increased.

The factory settings of these parameters can be found in the test and configuration sheet attached to each system.

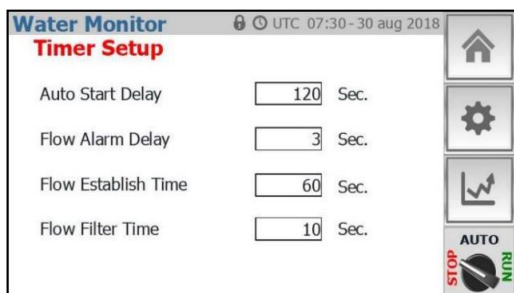


Figure 4-12: Timer Setup Page

SIGNAL SETUP

There are 5 signal setup pages: PAH, pH, Turbidity, Temperature and Flow. Each page allows the user to edit the settings for each signal.

G6110/G6111 PAH Setting Example

Please find the details of the PAH signal setup page below.

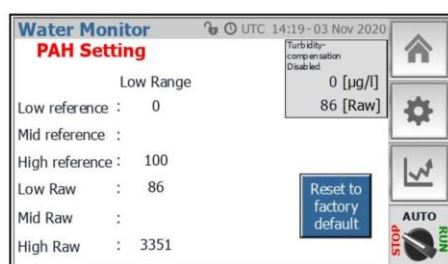


Figure 4-13: Signal Setup Page - Low Range PAH Setting

Low Reference: The Low ampoule used for PAH calibration.

High Reference: The High ampoule used for PAH calibration.

Low Raw: The RAW signal captured when performing the zero calibration.

High Raw: The RAW signal captured when performing the span calibration.

Refresh: Stores edited values.

Please note the system is calibrated at the factory. The factory calibration values can be found in the Test and Configuration Sheet included with each system. To recreate the factory settings, please use the values on the Test and Configuration Sheet. This can be done by entering the relevant value on the signal setup page.

Flow Setting Example

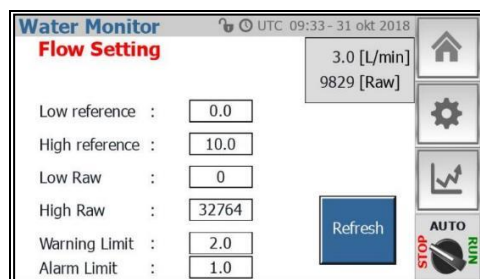


Figure 4-14: Signal Setup Page - Flow Setting

Low Reference: A fixed value determined by the range of flow sensor.

High reference: A fixed value determined by the range of flow sensor.

Low Raw: A fixed value.

High Raw: A fixed value.

Warning limit: A warning set point. The warning will be triggered if the flow drops below this set point. The setting can be adjusted if needed.

Alarm limit: An alarm set point. The alarm will be triggered if the flow drops below this set point. This will stop the pump or close the valve. Please note that the flow alarm acts as a dry run protection for the pump. The setting can be adjusted if needed.

4.2.2 Alarms

GENERAL NOTE

Alarms are given for general sensor errors, low flow, communication errors and memory status. The alarms are displayed in a log showing active alarms and the alarm history. Use the active alarm button or alarm history button for detailed diagnostic.



Figure 4-15: Alarm Page

G6111 PAH

Warnings/Alarms are given for:

- General sensor error
- Light source end of life
- Factory calibration validity expired.

4.2.3 External Communication Watchdog

The external communication check button is normally disabled upon delivery. The external communication check watchdog function can be activated if clients wish to make use of this functionality, it checks the communication line between the water monitoring system and the client data handling system. Please refer to the section “WM communication protocol” in the Installation Manual.

4.2.4 Logging

Note

This logging function cannot substitute the data recording and processing device according to IMO regulations MEPC 259(68).

The HMI must be equipped with an SD-card if the system is intended to handle logging. It is not allowed to remove the SD-card since the signals are being saved automatically to the SD-card. By entering the Logging page, the user can gain access to the logged data by exporting it to a USB-pen. The data format is .csv, thus allowing editing in Excel or similar program.



Figure 4-16: Logging Page for Exporting the Logged Data

4.2.5 IP Address Configuration

1. Touch an empty area of the touch screen for few seconds to show the Context Menu.
2. Press “show system settings” in the Context Menu.
3. Navigate to the Network menu.
4. A pop-up dialogue with keyboard will appear. Press and hold the pop-up to move it if necessary.
5. Select specify an IP address.
6. Change IP address, subnet mask and confirm by pressing the enter button.
NOTE: choose an IP address that is not used by other devices on the network.
7. Exit the context menu to return to the operating screen.

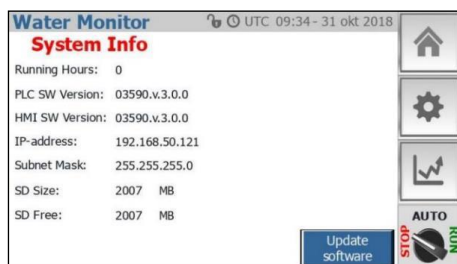
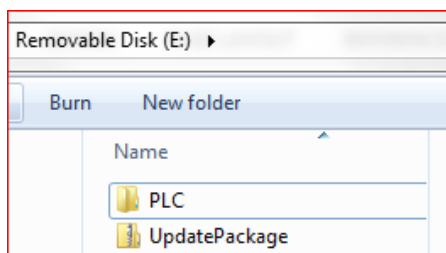


Figure 4-17: System Info Page

4.2.6 Software Update

1. You will be sent the relevant software by email.
2. The PLC folder and the UpdatePackage Zip folder must be copied to an empty USB-stick. The content of the USB stick should look like this:

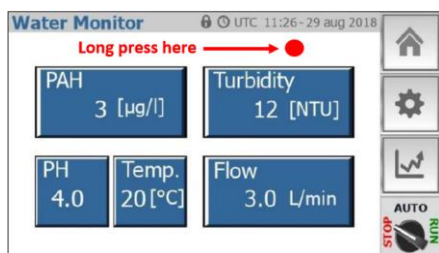


3. **Note:** the different software is used for different system configurations. The correct software version can be identified in the Test & configuration sheet.
4. Check that the calibration values on the Test & Configuration Sheet correspond with the values stored in the system settings. If this is not the case, then carefully write down the calibration values used for PAH and the Timer settings.

These values can be found in here: Settings —> Setup

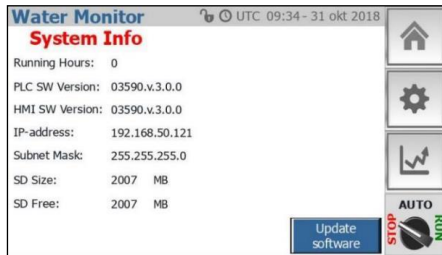
- User: service
- Password: 1234

5. Go to the System Info screen and note down the IP-address.
6. Plug the USB-stick into back of the HMI, while power is ON.
7. Press and hold an empty space on the HMI touch screen. Next, select “Update”. Select “Auto Select”. Press “Next”. Wait for at least 2 minutes.



8. Reboot the system by powering OFF and ON again. Wait for the system to start up.
9. Go to System Info screen and press the “Update software” button – Press “Yes” and wait for at least 2 minutes.

Menu Structure



10. Repeat step 9 one more time.

11. Go to the “System Info” screen and check that the software version for PLC and HMI has been updated.

12. Check the system IP-address corresponds to the IP address you noted down earlier. If it does not, change it to the IP address you noted down earlier. Refer to section 4.2.5.

Note: Step 13 to 21 are only relevant if system is configured with a G6110 PAH module

13. Go to Setting—> Setup —> Shift User

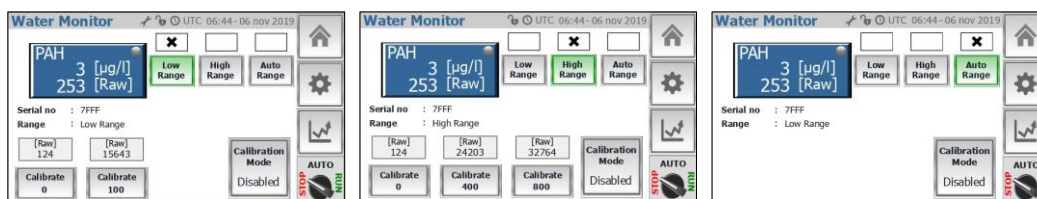
- User: admin
- Password: green

14. Go to Home screen —> Press PAH

15. Select the desired range setting by pressing the required **range box/field**.

16. Press the desired **range button**. The button should turn green after pressing the button.

17. Below is an overview of each range configuration.



18. Now go to —> Settings —> Setup —> Shift User

🔑 User: service

🔑 Password: 1234

19. Now go to —> Settings —> Setup —> Signal Setup —> PAH Setting

20. Enter the calibration data that you noted down earlier, or which is stated in the Test and configuration Sheet that was supplied with the sensor.

21. If calibration data is not available, carry out a new calibration or contact the equipment supplier.

4.3 Trend Selection


Press the Trend button  the below screen will appear.



Figure 4-18: Trend Page

Press one of the blue buttons, the trend graph for the chosen parameter will be shown.

4.3.1 Trend Graph

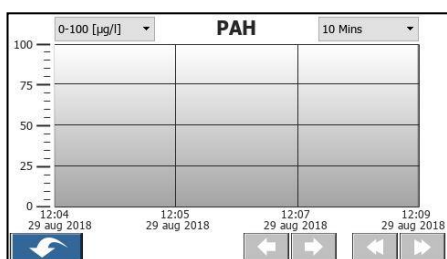





Figure 4-19: Trend PAH Page

The trend shows the historic trend of the chosen parameter and allows the user to scroll in time and zoom in/out. The system will require some time to update and visualize the logged data.

4.4 Run

The system control switch  in the bottom right corner controls the pump in the WMP/WMPH system or ON/OFF valve in a WMR system.

The switch can be operated directly at the display or remotely when it is switched to AUTO . In the case that low flow is detected, the flow alarm will be activated, and the system will stop .

After acknowledging the flow alarm on the alarm page, the control switch can be switched back to AUTO or RUN.

5 Commissioning

Before starting the water monitoring system for the first time after completing the installation, please check and confirm that all connections are installed according to the installation instruction.

After completing the installation, a verification of the installation & setup is required. Refer to the section that represents the system to be verified.

5.1 WM

Check points relevant for the installation of the WM system are described in this section.

- Verify the check list found in the section 7. Appendix in the installation manual has been filled out.
- Inlet and outlet hoses are connected as specified with reference to the installation layout.
- The flow paths to and from the system are not blocked.
- The power supply connection is as specified in the Electrical Drawings.
- Protective earth is connected.
- The communication connection is as specified in the Electrical Drawings.
- Verify that the pH Electrode is correctly installed and check that the rotary switch at the pH/temperature is set to “M”.
- Valve 1-4 is set to Run.
- Power up the system by switching on the automatic fuse. Observe the start-up of the water monitor and the sensor modules.
- Set IP-address following section 4.2.5.
- Verify that all functions described in the communication protocol found in the installation manual are working.

- Set the clock and date on the HMI display by pressing a random area of the screen for 5 seconds. A popup menu will appear. Choose Show System Settings and go to Time. Set the time and date and exit until the Home Page is displayed.

The water monitoring system will be now ready to operate. All sensors are delivered pre-calibrated and after having adjusted the flow, the system will now display the actual values of pH, Temperature, Turbidity, and PAH in the water.

5.2 WMR

Check points relevant for the installation of the WMR system are described in this section.

- Verify that the check list found in the section 7. Appendix in the installation manual has been filled out.
- Inlet and outlet hoses are connected as specified with reference to the installation layout.
- The flow paths to and from the system are not blocked.
- The power supply connections are as specified in the Electrical Drawings.
- Protective earth is connected.
- Cut off the small rubber tip on top of the manometer. However, do not remove the black rubber part.
- Open the flow regulator valve inside the WMR cabinet to the middle position (i.e. turn the valve to the outer position and turn the valve 4 turns in the opposite direction).
- Start sampling by pressing the RUN button in the bottom right corner of the home page on the WM system.
- The WMR pressure setting is delivered pre-adjusted. If flow alarm occurs during initial start-up, it indicates that the installation requires more pressure to create a higher flow. This can be done by increasing the pressure on the pressure reduction valve. Please look at the manometer to ensure that the maximum allowable pressure is not exceeded. Observe that a flow is established and that no flow alarm occurs.

5.3 WMRTU

Check points relevant for the installation of the WMRTU system are described in this section.

- Verify that the check list found in the section 7. Appendix in the installation manual has been filled out.
- Inlet and outlet hoses are connected as specified with reference to the installation layout.
- The flow paths to and from the system are not blocked.
- The power supply connections are as specified in the Electrical Drawings.
- Protective earth is connected.
- Cut off the small rubber tip on top of the manometer. However, do not remove the black rubber part.
- The communication connections are as specified in the Electrical Drawings.
- All internal valves are set to Open/Run position.
- Power up the system by switching on the automatic fuse. Observe the start-up of the water monitoring unit and the sensor modules.
- Set the IP-address following section 4.2.5.
- Verify that all functions described in the communication protocol found in the installation manual are working.
- Set the clock and date on the HMI display by pressing a random area of the screen for 5 seconds. A popup menu will appear. Choose Show System Settings and go to Time. Set the time and date and return to the Home Page.
- Open the flow regulator valve inside the WMRTU cabinet to the middle position (i.e. turn the valve to the outer position, then turn the valve 4 turns in the opposite direction).
- Start sampling by pressing the RUN button in at the bottom right corner of the home page on the WMRTU system.
- The WMRTU pressure setting is delivered pre-adjusted. If flow alarm occurs during initial start-up, it indicates that the installation requires more pressure to

trigger the flow sensor. This can be done by increasing the pressure on the pressure reducing valve. Please look at the manometer to ensure that the maximum allowable pressure is not exceeded. Observe that a flow is established, and no flow alarm occurs.

5.4 WMP

ATTENTION



- The suction line must not be blocked when the pump is running. The pump will be damaged if the suction line is blocked.
- Do not run pump dry. Avoid air in the sampling to prevent the risk of air lock leading to flow alarm and damage of the pump.
- Pay attention to the temperature of the pump. Time to cool down can be needed prior to attempting restart.
- If the motor is supplied with an ON/OFF switch, please pay attention to the position of this to avoid START issues. A local ON/OFF switch is standard for motors used for pump Type B.
- The motor for pump Type B also includes an inbuilt thermal protection which automatically switches off the pump in case of thermal overload. The thermal protection automatically resets itself when motor has cooled down.

Check points relevant for the installation of the WMP system are described in this section.



- Verify that the check list found in the section 7. Appendix in the installation manual has been filled out.
- Inlet and outlet hoses are connected as specified with reference to the installation layout.
- The flow path to and from the system are not blocked.
- The power supply connections are as specified in the Electrical Drawings.
- Protective earth is connected
- Cut off the small rubber tip on top of the manometer. However, do not remove the black rubber part.

- Open the flow regulator valve inside the WMP cabinet to the middle position (i.e. turn the valve to the outer position and turn the valve 4 turns in the opposite direction).
- Loosen the pump end cover, thereby allowing the pump to evacuate air in the system.
- Start the pump by pressing the Run button in the bottom right corner of the home page on the WM system. Carefully observe that the motor is turning and that the pump is running. Tighten the end cover when the pump is running. And observe the working pressure increasing on the manometer found on the de-bubbler.
- When the pump is started, it will run for 60 seconds in order to establish a flow. If a flow is not established within the time limit of 60 seconds, then the pump will stop, and an alarm will appear due to the missing flow. Please check if the flow path is blocked by any closed valves or by the protection cap on the pH sensor.
- If no blockage is found, the alarm could be caused by air in the system. In this case, the alarm can be reset, and the pump can be started again by pressing the RUN button.
- If the flow alarm occurs again, it indicates that the system requires a higher operating pressure. The operating pressure can be adjusted by pinching the flow regulating valve in the WMP.

5.5 WMPH

Check points relevant for the installation of the WMPH system are described in this section.

- Verify that the check list found in the section 7. Appendix in the installation manual has been filled out.
- Check the power supply connections are as specified in the Electrical Drawings.
- Check protective earth is connected
- Cut off the small rubber tip on top of the manometer. However, do not remove the black rubber part.
- Only switch on the pump if the front cover has been properly attached.
- Check the rollers are correctly fitted and fastened.

- Check the hose and rollers are thoroughly greased with silicone grease.
- Check the direction of rotation corresponds to the inlet/outlet connections. Inlet must be at the top connection and outlet must be at the bottom connection. Please refer to Diagram inside the junction box of the motor to change the direction of rotation.
- Note: The pump pressure should be as low as possible during operation to maximise the lifetime of the hose. Pressure and flow can be adjusted by means of the safety valve/pressure regulating valve in the WMPH cabinet.

Recommended pressure: 0.8...2.0 bar.

6 Validation & Calibration

How to perform a local validation and a local calibration

PH, Turbidity and PAH can all be validated using the certified standards. If the sensors have drifted out of the allowed tolerances, the sensors can also be calibrated locally using the certified standards.

Validation is a normal part of the maintenance of the sensor modules. A calibration will only be required if the displayed values during validation deviate more than the accuracy stated for the sensor module.

The calibration kit includes all consumables used to perform the validations and/or calibrations.

Refer to MSDS for further information.

System Preparation

Turn the selector switch on the screen from auto to stop, and the pump will stop if it was running.

For WM units turn VALVE 1 and 4 to STOP.

Refer to section 6.2 for WMRTU units.

6.1 Validation/Calibration of the pH Module

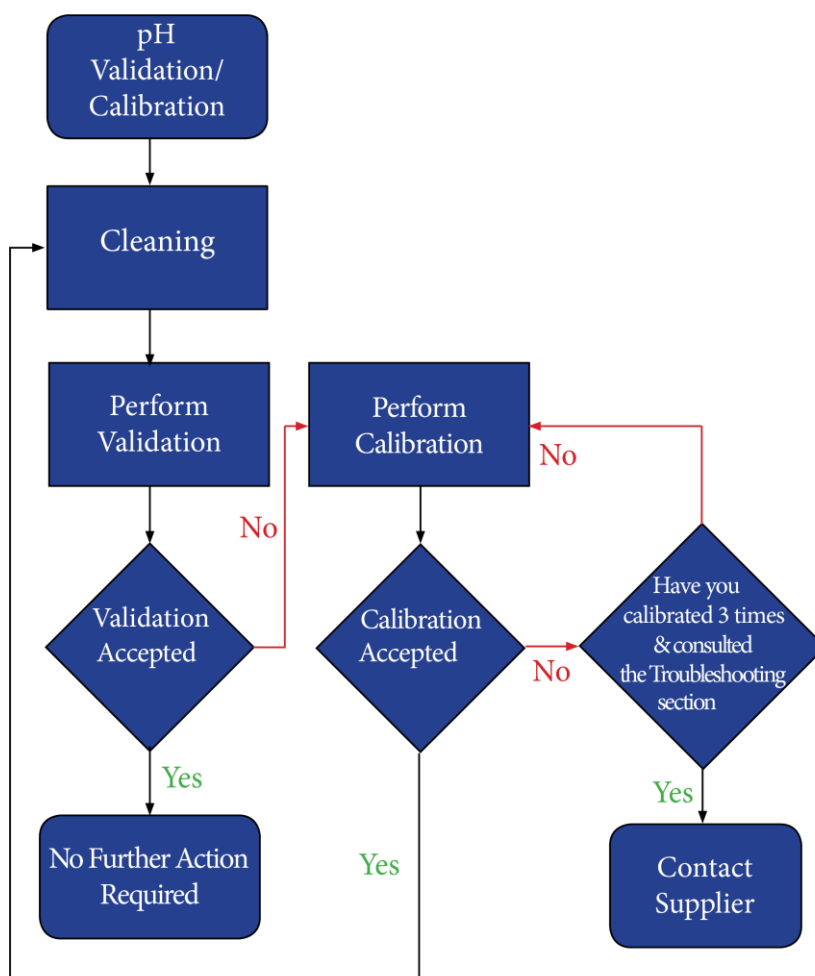


Figure 6-1: pH Validation/Calibration Procedure

Note

Validation procedure uses pH buffer 7.

Calibration procedure use pH buffer 4, 7 & 10.

1. Place a cup under the calibration fluid drain off to collect the discharge.
2. **VALVE 2** is in **STOP** position. Then set **VALVE 1** to **DRAIN** position.
3. Loosen the union nut by hand and park the sensor in the clamp.
4. **Clean** the electrode and clean the measuring chamber using a cleaning pad. If a cleaning pad is not available, use a clean, soft cloth.
5. **Validation procedure:** open a bag with the **pH 7 buffer**. Make sure that the sensor and the pH buffer liquid have the same temperature, and then place the sensor in the pH









- buffer. Stir the sensor around the bag and wait a few seconds for a stable reading. Make sure there is enough pH buffer to cover the tip of the electrode.
6. If the reading is within ± 0.2 of the pH buffer, the **validation** with pH is successful. When the validations are completed, go to step 14.
 7. If the reading is not within ± 0.2 of the pH buffer, the module must be calibrated.
 8. **Calibration procedure:** set the rotary switch from position **M** to the position that matches the used pH buffer. Wait for the red light to flash **three times**, then place the sensor in the pH buffer.
 9. Stir the sensor around and wait for a stable reading. Make sure there is enough pH buffer to cover the tip of the electrode.
 10. The calibration may take several minutes to complete. When the calibration is successful, the red-light will flash **twice**.
 11. The calibration procedure is finished once calibration has been carried out for all three pH buffers.
 12. Repeat step 5 & 6.
 13. Set **VALVE 1** to **STOP**
 14. Pour some water into the measuring chamber to keep the electrode moist.
 15. Put the sensor back to the measuring chamber and fasten the union.

6.2 Validation/Calibration of the Turbidity Module

Steps 1-8 and 25 describe the procedure to perform a validation of the Turbidity module.

Steps 9-24 describe the procedure to perform a local calibration of the Turbidity module.

1. Place a cup under the calibration fluid drain off to collect the discharge.
2. VALVE 3 is in STOP position and VALVE 2 to DRAIN position for WM units.
For WMRTU units, close the ball valve & turn the internal valve to Drain.
3. Loosen the union nut on the top and park the wiper unit in the clamp.
4. Observe the fluid draining off into the cup. Flush the measuring chamber with water until all the dirt and sand are cleaned out. Clean the measuring chamber with a cleaning pad, then turn VALVE 2 to STOP.
Note: turn counterclockwise to avoid sampling water to enter the system (do not go past RUN).
5. Pour Standard 0.0 NTU into the chamber until the lenses are covered. DO NOT FILL COMPLETELY.
6. Refit the wiper unit loosely. Observe the displayed value at the Turbidity analyzer.
7. If the displayed value is near 0.0 NTU (i.e. ± 0.2 NTU), the validation at Zero point is successful. Please repeat steps 2-7 but use standard 40 NTU and then 10 NTU to

- complete the validations. The display value shall be near the value of the standard used (i.e. +/- max.2 NTU). When the validation is completed, please jump to the step 24.
8. If the displayed value has drifted more than +/- 2 NTU a cleaning and/or a calibration is needed.
 9. For Calibration: Make sure that the measuring chamber is clean and filled with standard 0.0 NTU. DO NOT FILL COMPLETELY.
 10. On the Turbidity Analyzer: Press  followed by  x 2.
 11. Press  to select Formazine STD.
 12. Press  to begin Zero Calibration – observe “Calibrating Zero”.
- Note:** Pressing the  again will skip the zero calibration.
13. After approximately 1 minute the text “Fill Span Sol.” indicates a successful zero calibration and the system is ready for Span calibration.
 14. Loosen the union nut on the top – remove the wiper – park it.
 15. Turn VALVE 2 from STOP to DRAIN and back to STOP again when draining is done.
 16. Pour Standard 40 NTU into the chamber. DO NOT FILL COMPLETELY.
 17. Refit the wiper unit loosely.
 18. Use the ↑ and ↓ keys to adjust the value to 40 NTU. Press the  to confirm.
- Note: Pressing the  again will skip the span calibration.
19. After approximately 1 minute the text “CAL. Complete” indicates a successful span calibration. Press  until the turbidity value is displayed.
 20. Loosen the union nut on the top – remove the wiper – park it.
 21. Turn VALVE 2 for the WM unit (and the internal valve for the WMRTU) to DRAIN and back to STOP when draining is done.
 22. Pour Standard 10 NTU into the chamber. DO NOT FILL COMPLETELY.
 23. Refit the wiper unit and tighten the union nut and observe a 10 NTU value on the display.
 24. If the displayed value is within +/- 2 NTU, the calibration is successful.
 25. Drain the sensor & tighten the union nut by hand.
 26. Turn internal valves to RUN.

6.3 Validation/Calibration of the PAH Module

Validation is a part of the normal maintenance of the PAH module and is used to ensure the PAH module is functioning correctly. Calibration is used to correct PAH reading offsets. Figure 6-2 is a flow chart entailing the procedures that must be done to ensure a correct functioning PAH module.

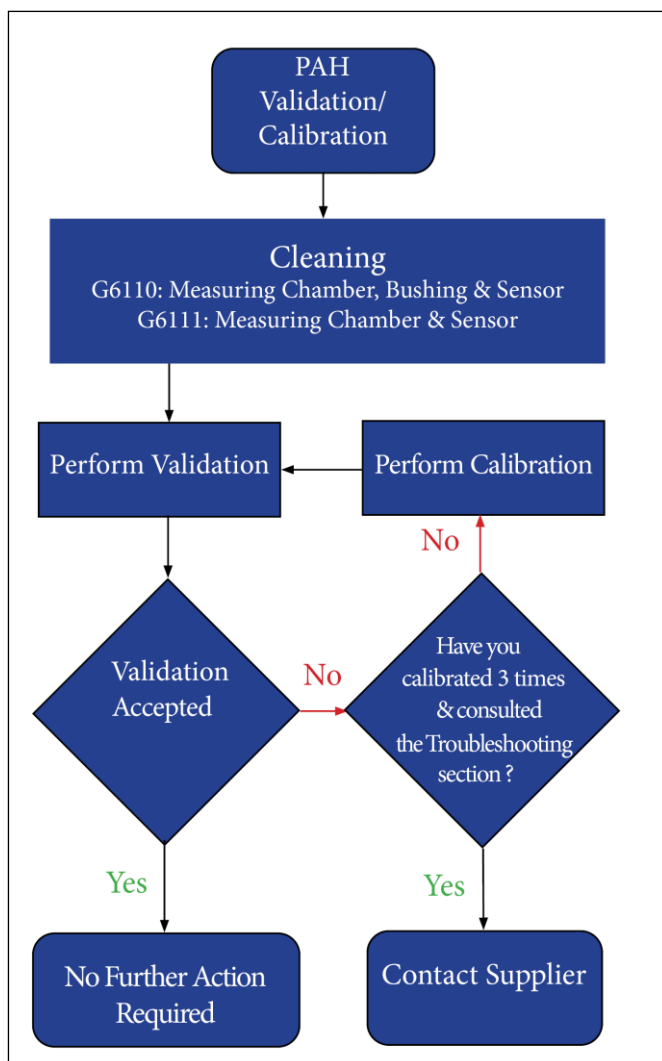


Figure 6-2: PAH Validation/Calibration Procedure

6.3.1 PAH Module Validation Methods

- PAH measuring chamber: Used for online measurements
- PAH calibration chamber: Used for calibration and validation

Note

G6110:

PAH calibration chamber and PAH chamber bushing tool are included in the Calibration Kit.

Always place the PAH chamber bushing inside the chamber type that is in use. See Figure 6-4.

G6111:

PAH calibration chamber is included in the Calibration Kit Refill.

G6110 & G6111:

It is possible to cross check sensor performance in measuring and calibration chamber by using e.g., bottled water as test media.

Validation routines must follow the planned maintenance schedule found in section 8 in this manual to ensure the correct performance of the PAH module.

Calibration of the PAH module is required when:

- The displayed validation value deviates more than $\pm 5\%$ of sensor range or
- The displayed validation value deviates more than $\pm 5\%$ of the nominal standard test concentration, whose value is not less than 80% of the sensor range.

6.3.2 PAH Sensor Ranges

There are 3 different ranges available for PAH sensor:

- Low Range: 0-100 $\mu\text{g/l}$.
- High Range: 0-800 $\mu\text{g/l}$.
- Dual Range: 0-100/800 $\mu\text{g/l}$.

Note

In dual range mode, the PAH sensor will automatically choose the range required.

6.3.3 Before Validation/Calibration

PAH SENSOR CHECK

1. Set VALVE 4 to VENT position.
2. Remove the locking plate and remove the PAH Sensor from its measuring chamber and park it.
3. Check the optic(s) is/are clean. This is vital, so please use a cleaning pad free from oil.

ATTENTION**Cleaning of the G6110 calibration chamber, PAH chamber bushing and the optic(s)**

It is crucial that the calibration chamber, PAH chamber bushing for G6110 and the optic(s) is/are clean prior to validation. Any contaminants present in the chamber, PAH chamber bushing or on the lens will result in a faulty validation/calibration.

It is vital to wipe the sensor dry prior to and between any validation & calibration attempt.

**VALIDATION/CALIBRATION LIQUID SELECTION**

Module Type		Calibration Liquid µg/l					Validation Liquid µg/l	
		Low Range Calibration		High Range Calibration			Low Range	High Range
		Low Calibration	High Calibration	Low Calibration	Middle Calibration	High Calibration		
G6110	Low Range	0	100	-	-	-	50	-
G6111								
G6110	High Range	-	-	0	400	800	-	400
G6111								
G6110	Dual Range	0	100	100	400	800	50	200
G6111				-				

Table 6-1: Validation/Calibration Liquid Selection

Validation Tolerance µg/l		
Standard Concentration	Lower Tolerance	Upper Tolerance
50	45	55
100	95	105
200	160	240
400	360	440
800	760	840

Table 6-2: Validation Tolerance Table

ATTENTION

Do not leave the sensor in the PAH calibration liquid more than 15 seconds since UV light degrades the PAH calibration liquid.



6.3.4 Validation of G6110 PAH Module

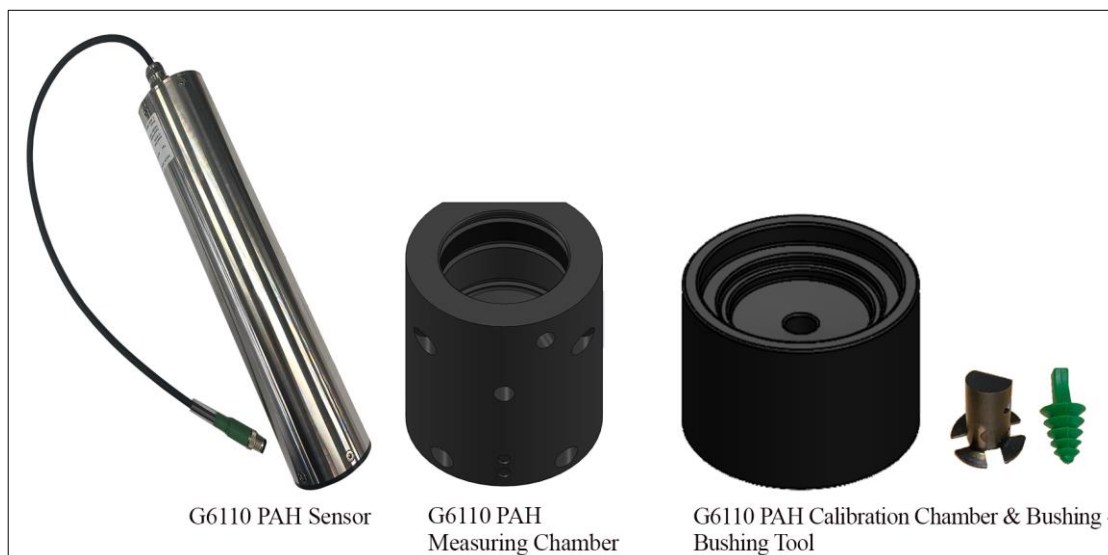


Figure 6-3: G6110 PAH sensor, measuring chamber & calibration chamber & bushing & bushing tool

1. Remove the PAH chamber bushing from the PAH measuring chamber using the PAH chamber bushing tool – Figure 6-4. Clean the bushing thoroughly.

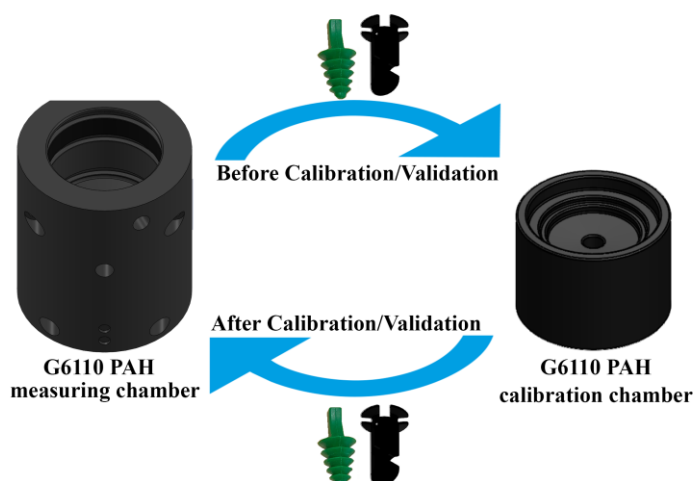


Figure 6-4: PAH Chamber Bushing Placement

2. Press the PAH area on the home screen. Press Calibration Mode – Login – press Calibration Mode again and wait until the status changes to “Calibration Mode Enabled”.

Based on the sensor range, please select the validation liquid according to Table 6-1.

3. Take the syringe and attach the needle. Break the neck of the ampoule – fill the syringe with the entire content.

4. Slowly inject the content into the PAH calibration chamber, taking care that no air is mixed into the validation liquid. Look into the chamber to check and remove air bubbles.
5. Insert the PAH chamber bushing into the PAH calibration chamber refer to Figure 6-4.
6. Place the cleaned PAH sensor in the calibration chamber in an upright position. Wait for the display of PAH value to approach the value of the used ampoule. If the displayed value is within the tolerance in Table 6-2, the validation is successful, and a calibration is not required. If the validation is not successful, please refer to Figure 6-2.
7. Remove and clean the PAH chamber bushing.
8. Empty out the validation liquid from the calibration chamber and wipe it dry with a new cleaning pad. Clean the PAH sensor.
9. **For Dual Range:** Repeat steps 3 to 9 until all “validation” liquids according Table 6-3 have been in use.
10. Place the PAH chamber bushing in the PAH measuring chamber again. Please refer to Figure 6-4.

6.3.5 Validation of G6111 PAH Module

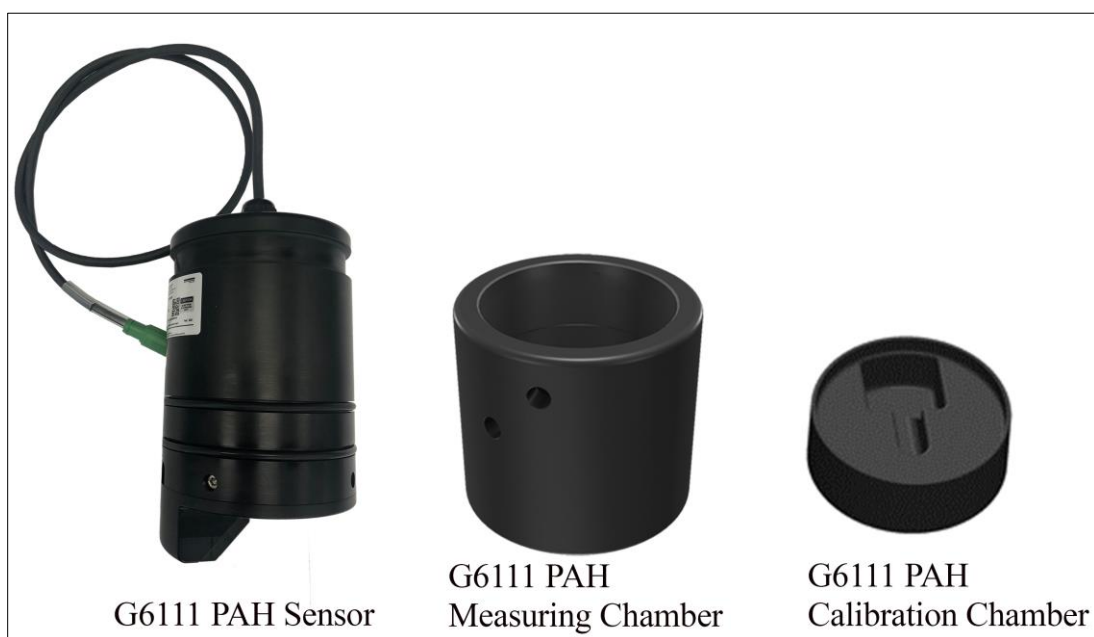


Figure 6-5: G6111 PAH Sensor, PAH measuring Chamber & PAH calibration Chamber

1. Press the PAH area on the home screen. Press Calibration Mode – Login – press Calibration Mode again and wait until the status changes to “Calibration Mode Enabled”.

Based on the sensor range, please select the validation liquid according to Table 6-1.

2. Take the syringe and attach the needle. Break the neck of the ampoule – fill the syringe with the entire content.
3. Slowly inject the content into the PAH calibration chamber, taking care that no air is mixed into the validation liquid. Look into the chamber to check and remove air bubbles.
4. Place the cleaned PAH sensor in the calibration chamber in an upright position. Wait for the display of PAH value to approach the value of the used ampoule. If the displayed value is within the tolerance in Table 6-2, the validation is successful, and a calibration is not required. If the validation is not successful, refer to Figure 6-2.
5. Empty out the validation liquid from the calibration chamber and wipe it dry with a new cleaning pad. Clean the PAH sensor.

6.4 Calibration of the PAH Module



ATTENTION

Do not leave the sensor in the PAH calibration liquid more than 15 seconds since UV light degrades the PAH calibration liquid.

Note

G6110: Normally all local calibrations are done using the PAH calibration chamber with the cleaned bushing installed. However, the PAH measuring chamber can be used if the PAH calibration chamber is missing.

Module Type		Calibration Liquid µg/l					Validation Liquid µg/l	
		Low Range Calibration		High Range Calibration			Low Range	High Range
		Low Calibration	High Calibration	Low Calibration	Middle Calibration	High Calibration		
G6110	Low Range	0	100	-	-	-	50	-
G6111								
G6110	High Range	-	-	0	400	800	-	400
G6111								
G6110	Dual Range	0	100	100	400	800	50	200
G6111				-				

Table 6-3: Validation/Calibration Liquid Selection

6.4.1 Storing a Calibration Point of G6110 PAH Module

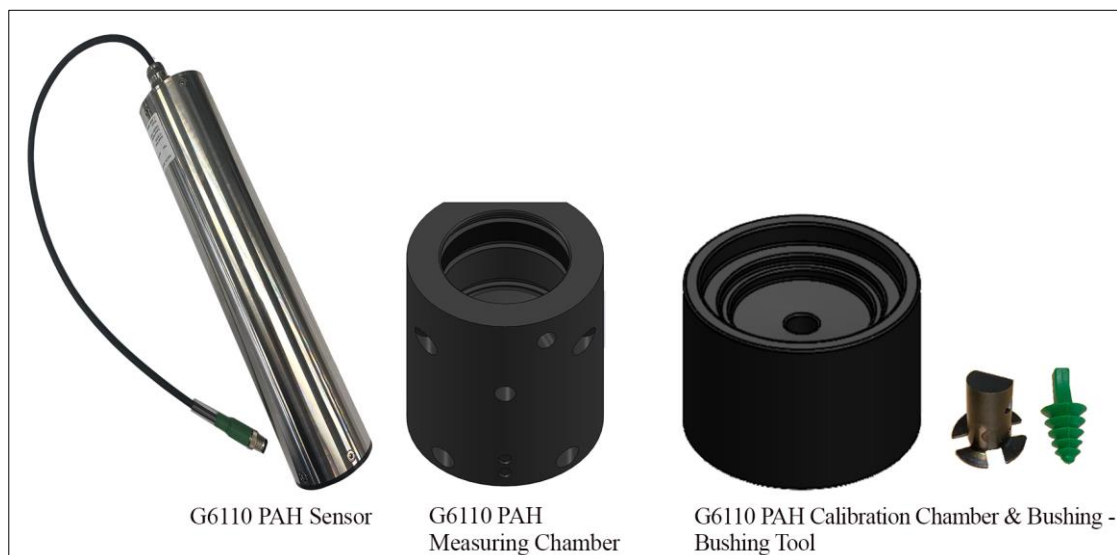


Figure 6-6: G6110 PAH sensor, measuring chamber & calibration chamber & bushing & bushing tool

1. Remove the PAH chamber bushing from the PAH measuring chamber using the PAH chamber bushing tool – Figure 6-7. Clean the bushing thoroughly.

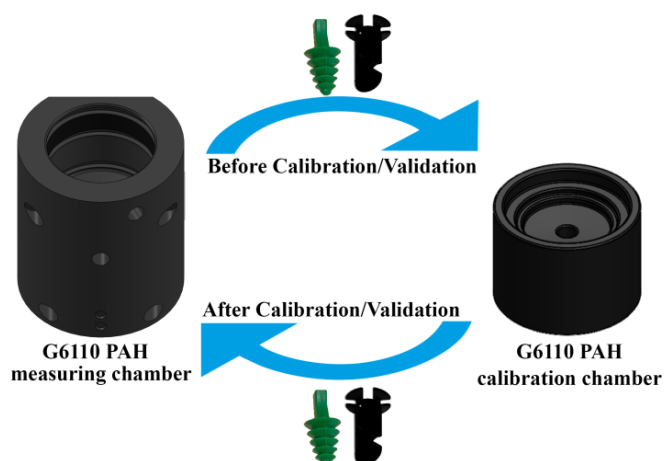


Figure 6-7: PAH Chamber Bushing Placement

2. Press the PAH area on the home screen. Press Calibration Mode – Login – press Calibration Mode again and wait until the status changes to “Calibration Mode Enabled”.

Based on the sensor range, please select the calibration liquid according to Table 6-3 have been in use.

3. Take the syringe and attach the needle. Break the neck of the ampoule – fill the syringe with the entire content.
4. Slowly inject the content into the PAH calibration chamber, taking care that no air is mixed into the calibration liquid. Look into the chamber to check and remove air bubbles.
5. Insert the PAH chamber bushing into the PAH calibration chamber.
6. Place the PAH sensor in the PAH calibration chamber in an upright position. Press the corresponding “Calibrate” button when the highest stable raw count appears. A calibration point has now been stored.
7. Remove and clean the PAH chamber bushing.
8. Empty out the “calibration” liquid from the calibration chamber and wipe it dry with a new cleaning pad. Clean the PAH sensor.
9. Repeat steps 3 to 9 until all relevant “calibration” liquids according to Table 6-3 have been in use.
10. have been used.
11. Place the PAH chamber bushing in the PAH measuring chamber again. Please refer to Figure 6-7.

6.4.2 Storing a Calibration Point of G6111 PAH Module

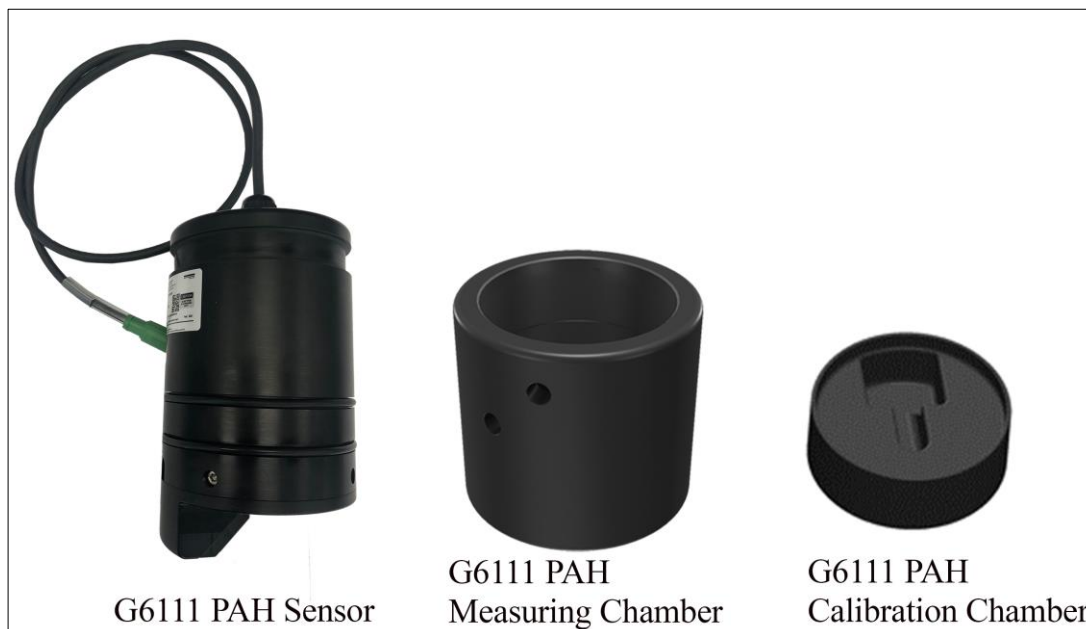


Figure 6-8: G6111 PAH Sensor, PAH measuring Chamber & PAH calibration Chamber

1. Press the PAH area on the home screen. Press Calibration Mode – Login – press Calibration Mode again and wait until the status changes to “Calibration Mode Enabled”.

Based on the sensor range, please select the calibration liquid according to Table 6-3 have been in use.

2. Take the syringe and attach the needle. Break the neck of the ampoule – fill the syringe with the entire content.
3. Slowly inject the content into the PAH calibration chamber, taking care that no air is mixed into the calibration liquid. Look into the chamber to check and remove air bubbles.
4. Place the PAH sensor in the PAH calibration chamber in an upright position. Press the corresponding “Calibrate” button when the highest stable raw count appears. A calibration point has now been stored.
5. Empty out the calibration liquid from the calibration chamber and wipe it dry with a new cleaning pad. Clean the PAH sensor.
6. Repeat steps 3 to 5 until all relevant calibration liquids according to Table 6-3 have been in use.

6.4.3 Factory Calibration

A periodically factory calibration is only required for the PAH sensors. This is to compensate for degradation of the internal light source intensity and check/change the light source. As a vital part of the factory calibration procedure new calibration curves are stored to compensate for hardware drift. Please refer to section 7 Services for further information.

The expiry date of the factory calibration is stated in the Test & Configuration Sheet.

ATTENTION

If the expiry date is overdue, it can affect the accuracy, performance, and functionality of the sensor, thus compromising the requirement(s) of the regulatory agencies and deem the system non-compliant.



7 Services

7.1 Factory Calibration & Sensor Replacement

Upon request, our service engineers can perform a full factory calibration onboard. For further inquiry – please refer to contact information in section 1.2.

7.1.1 G6110 PAH

The PAH sensor must be returned for factory check every 2 years. A reconditioned/exchange sensor can be ordered according to the spare parts list. The used sensor must be returned in clean and good condition. For further information of returning equipment, check section 11.

During the factory check, a full calibration will be carried out by the manufacturer or certified partner to comply with the requirement(s) of the regulatory agencies. A calibration certificate is issued accordingly covering the next period. For further inquiry – please refer to contact information in section 1.2.

ATTENTION



Failure to react upon the service interval requirement can affect the accuracy, performance, and functionality of the sensor which will compromise the requirement(s) of the regulatory agencies.

7.1.2 G6111 PAH

Please consult manufacture's spare part department 2 months in advance to the 3-year replacement interval to schedule sensor replacement.

Prior to deliver a full calibration is carried out by the manufacture to comply with the requirement(s) of the regulatory agencies. A calibration certificate is issued accordingly covering the next period of 26.280 hours of operation (3 years operation) or 4 years from factory calibration date whichever comes first. This is to provide customers with 1 year of shelf life. An LED warning will be activated approximately 3 months in advance to the 3-year operational replacement interval.

If the calibration certificate has expired, the validity of sensor will be compromised and thus, leaving the monitoring system uncompliant. In such case, a new replacement sensor will be needed.

ATTENTION

Failure to react upon the service interval requirement can affect the accuracy, performance, and functionality of the sensor which will compromise the requirement(s) of the regulatory agencies.



7.1.3 Turbidity

For the Turbidity Module a factory calibration is not required, however upon request, our service engineers can perform a full factory calibration in our factory or onboard the vessel. A new calibration certificate will be issued. For further inquiry – please refer to contact information in section 1.2.

7.1.4 PH/Temperature

For the PH/Temperature Module a factory calibration is not required, however upon request, our service engineers can perform a full factory calibration in our factory or onboard the vessel. A new calibration certificate will be issued. For further inquiry – please refer to contact information in section 1.2.

8 Routine Maintenance

WARNING/ATTENTION



- To avoid risk of corrosion, always clean up the water spill immediately.
- Do not use sharp or hard tools to clean the lenses. Use the cleaning pads for black fouling and use a tissue soaked with water to remove salt deposits.
- The PAH and Turbidity sensor modules use UV and IR light. Please do not stare into the lenses – it can cause damage to your eyes.

Note

The intervals stated below are only general guidelines and must be adjusted based on specific system experiences. The intervals are based on optimum conditions and failure to comply with system specifications can impact intervals.

Planned Maintenance Program											
Description	If necessary	Weekly	Monthly	Quarterly	Every 6 month	Yearly	Every 2 years	Every 3 years	Every 4 years	Every 5 years	Maintenance Instruction Number
G6110 PAH sensor											
Validation of PAH sensor					x						
Calibration of PAH sensor	x										
Factory Calibration of PAH sensor							x				
Visual check to see if cleaning is needed: • PAH sensor • PAH measuring chamber & bushing		x									
Cleaning of PAH sensor, measuring chamber & bushing	x										
Internal Light Source Replacement at Factory									x		
PAH Chamber Replacement	x										MI6100-0017

Routine Maintenance

Planned Maintenance Program											
Description	If necessary	Weekly	Monthly	Quarterly	Every 6 month	Yearly	Every 2 years	Every 3 years	Every 4 years	Every 5 years	Maintenance Instruction Number
G6111 PAH sensor											
Visual check to see if cleaning is needed: • PAH sensor PAH measuring chamber		x									
Cleaning of PAH sensor and measuring chamber	x										
Validation of PAH sensor					x						
User Calibration	x										
PAH Sensor Replacement								x			
G6120 Turbidity sensor											
Validation of Turbidity sensor				x							
Calibration of Turbidity sensor	x										
Visual check to see if cleaning is needed: • Measuring chamber		x									
Cleaning of Turbidity measuring chamber	x										
Turbidity Wiper Blade Replacement	x										MI6100-0001
Turbidity Light Source Replacement										x	MI6100-0002
Turbidity O-ring Replacement	x										MI6100-0003
Turbidity Wiper Unit Replacement	x										MI6100-0004
Turbidity Analyzer Replacement	x										MI6100-0005
G6130 pH/Temp sensor											
Visual check to see if cleaning is needed • pH sensor • pH measuring chamber		x									
Cleaning of pH sensor & pH measuring chamber	x										

Planned Maintenance Program											
Description	If necessary	Weekly	Monthly	Quarterly	Every 6 month	Yearly	Every 2 years	Every 3 years	Every 4 years	Every 5 years	Maintenance Instruction Number
pH electrode Replacement						x					MI6100-0007
pH Replacement (without electrode)	x										MI6100-0013
Validation of pH sensor				x							
Calibration of pH sensor	x										
WMP pump Type A											
Inspect Pump Impeller, End Cover and Housing			x								
Replace Pump Impeller and End Cover					x						MI6100-0011
Replace Pump Shaft Seal	x										MI6100-0012
WMP pump Type B											
Inspect Pump Impeller, End Cover and Housing			x								
Replace Pump Impeller					x						MI6100-0015
Replace Pump Mechanical Seal	x										MI6100-0016
Mechanical seals & leakage check		x									MI6100-0022
WMPH pump											
Hose Replacement					x						MI6100-0014
Hose Lubrication			x								MI6100-0014
Pressure Reduction valve											
Function Test					x						MI6100-0009
Replacement	x										MI6100-0008
Pressure Holding/Relief valve											
Function Test					x						MI6100-0010
Replacement	x										MI6100-0008
Water Filter											
Visual check to see if cleaning is needed		x									
Cleaning	x										
Replacement	x										

Figure 8-1: Planned Maintenance Program for the Water Monitoring System

8.1 Inspection & Cleaning

8.1.1 General Notes

In general as a routine maintenance, please make sure that the sensors and measuring chambers are clean. Please follow the planned maintenance program in Figure 8-1. We recommend a visual inspection every week.

If the sensor measurement is static, seems unrealistic, or the response time is slow, cleaning of sensor and measuring chamber could be necessary

Another important routine maintenance is the validation of the sensors. Please follow the planned maintenance program in Figure 8-1.

The strainer must be inspected and cleaned. We recommend checking the strainer every week or more frequently. Make sure to integrate strainer check in the routine maintenance schedule according to achieved experience during operation.

8.1.2 WM

PAH

When inspecting the G6110/G6111 PAH chamber or G6110 bushing, it is important to check internal surfaces to verify that these are clean. Furthermore, pay close attention to the lenses which should be totally clean from oil and salt deposits. In order to clean and flush away solids manually, please attach the syringe to the CAL. INPUT of VALVE 4 and use the syringe to suck out any remaining water inside the measuring chamber. Clean chamber surfaces with a clean rag, pour clean water inside the chamber and suck out the water again – repeat this procedure until water and the rags appears clean.

TURBIDITY

The Turbidity Module is equipped with a wiper unit that effectively removes fouling from the optical parts. The flow through the chamber removes most solids and keeps them from settling. In order to clean and flush away solids manually, please turn VALVE 2 to DRAIN, then remove the wiper unit and pour clean water into the measuring chamber.

PH/TEMPERATURE

The pH electrode is kept cleaned by the flow of water. In order to clean and flush away solids manually, please turn VALVE 1 to DRAIN, then remove the pH/temperature sensor and pour clean water into the measuring chamber. Cleaning of the electrode is done using clean water until the glass tip of the electrode is free from fouling while ensuring that the tip of the electrode remains moist during the whole operation.

Be careful not to damage the glass tip of the electrode by mechanic impact.

8.1.3 WMP

When inspecting the impeller pump, please note that wear and tear inside the pump is normal due to the pump principle. The function of the pump will be OK until the wear and tear inside the pump will result in the pump pressure and/or flow being too low to trigger the flow sensor.

When this happens, the pump impeller and end cover will need to be replaced. Therefore, it is recommended to always have an impeller, end cover, wear plates and shaft seal in stock as spare parts.

8.1.4 WMPH

Check that the pump pressure is not unnecessarily high. High pressures will result in reduced lifetime of the pump hose. Pressure recommendation: 0.8...2.0 bar. Pressure and flow can be adjusted by means of the safety valve/pressure regulating valve in the WMPH cabinet.

Check that the rollers and the hose are sufficiently lubricated. If the rollers and hose are not sufficiently lubricated the lifetime of the pump hose will be reduced due to increased friction heat.

Service of the gear is not necessary.

For hose replacement, refer to maintenance instruction MI6100-014.

It is recommended to always have spare parts in stock.

9 Expected Lifetime

Note

The lifetime of the system and the components depends on installation circumstances and water quality, e.g. the amount of sand, particles, temperature, acidity, and air in the sample.

9.1 PAH

9.1.1 G6110 PAH

The lifetime of the PAH Sensor is mainly limited by the internal light source which must be changed every 4 years. This is done by returning the sensor to the manufacture. For further inquiry – please refer to contact information in section 1.2.

ATTENTION

Failure to react upon the service interval requirement can affect the accuracy, performance, and functionality of the sensor which will compromise the requirement(s) of the regulatory agencies.



9.1.2 G6111 PAH

The lifetime of the PAH Sensor is mainly limited by the internal light source. Before each sensor leaves the factory the remaining lifetime of the light source is determined. This is to ensure the functionality of the sensor until the next service. Please consult manufacturer 2 months in advance to the 3-year replacement interval to schedule sensor replacement. Various services can be offered. A calibration certificate is issued accordingly covering the next period.

For further inquiry – please refer to contact information in section 1.2.

ATTENTION

Failure to react upon the service interval requirement can affect the accuracy, performance, and functionality of the sensor which will compromise the requirement(s) of the regulatory agencies and deem the system non-compliant.



9.2 Turbidity

The lifetime of the Turbidity Sensor is mainly limited by the light source. The lifetime of the light source is around 5 years. It is possible to change the light source by loosening the endcap of the Emitter. Make sure not to touch the new light bulb and to secure the connector firmly. It is also possible to change the entire Emitter as well as the Receiver and the Wiper Unit. The wires must be connected as shown on Figure 9-1.

The lifetime of the wiper blades is according to water quality. It must be replaced when necessary.

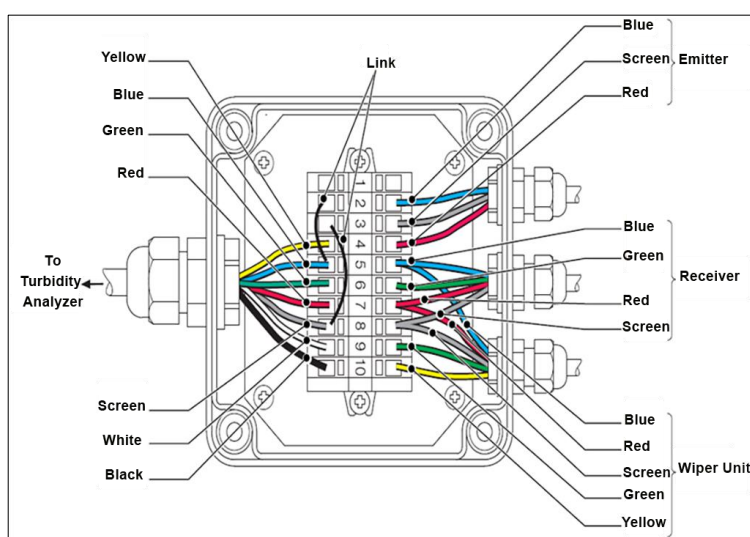


Figure 9-1: Wire connections for Emitter, Receiver and Wiper Unit

9.3 pH/Temperature

The lifetime of the pH/temperature sensor is mainly limited by the lifetime of the electrode. The electrode has a shelf life of 1 year at 25°C followed by an operating lifetime of approximately 1 year at 25°C. Electrode lifetime will be shortened at elevated temperature, elevated pressure and by pollution from the media. The electrode must always be kept moist. If the electrode dries out, it will not operate properly. Please refer to electrode trouble shooting section.

Changing of the Electrode is easily done by following the maintenance instruction MI6100-0007.

Note

It is recommended to keep an electrode in stock as a spare part.

9.4 Impeller Pump

The lifetime of the pump highly depends on the working condition and water quality. The pump cannot run dry. The pump will also be damaged if the sample line is blocked when the pump is running. High discharge pressure will reduce impeller lifetime. Chemicals in the pumped media can attack the impeller material resulting in swollen impeller which increases friction in the pump housing leading to premature failure.

If swollen impeller is noticed another impeller material must be chosen. The impeller can stick to the pump housing after stand still. It is important to ensure that the impeller is not stuck prior to attempting startup. The entire pump unit can be replaced, or the necessary spare parts can be fitted.

It is recommended to keep an impeller, end cover (for pump Type A), wear plates (for pump Type B) and shaft seal in stock as a spare part.

ATTENTION

Air and particles will reduce lifetime. Major particles can result in immediate breakdown. Special consideration must be taken in the following scenarios:



- The scrubber installation is intended for long duration in open loop operation in coastal waters.
- Soot blowing
- Major changes in static pressure e.g., draft condition
- Changes in scrubber operation mode e.g., valve switch over

Always consult installation manual.

9.5 Hose Pump

The operation lifetime of the pump hoses cannot be precisely specified because it is dependent on the running condition. For this reason, the possibility of fracture and consequential leakage of liquids must be accounted for. The most common reasons for reduced pump hose lifetime are:

- High operation pressure (Recommended pressure: 0.8...2.0 bar)
- Pump cavitation
- Insufficient lubrication of hose and rollers

The rollers of the hose pump must be properly adjusted to maximize the hose lifetime. Adjustment is done at our factory. However, it is important to check the roller adjustment and the hose wear at regular intervals. The hose pump is equipped with shims in order to adjust the roller pressure upon the hose, refer to Figure 9-2.

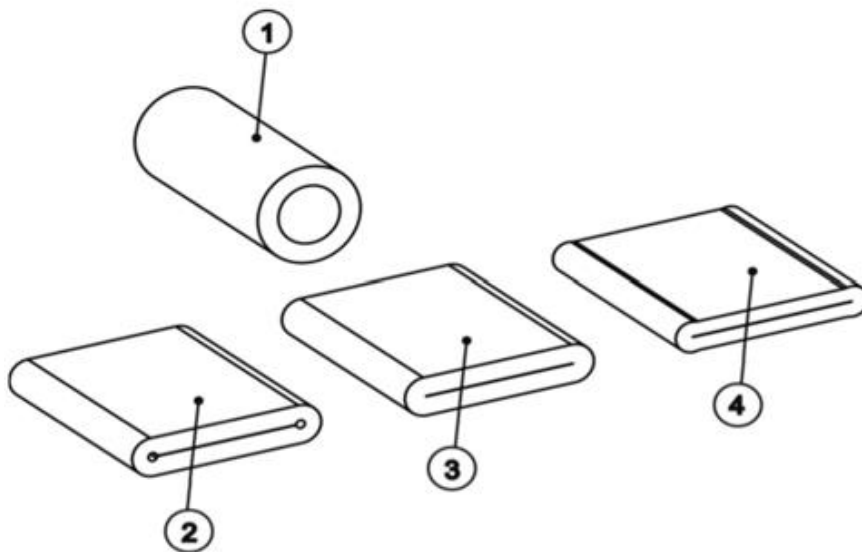


Figure 9-2: Squeezing the Hose

1. Hose in normal shape
2. Insufficient squeezing- too few shims
3. Perfect squeezing- shims perfect
4. Excessive squeezing- too many shims

10 Storage & Handling

Note

Proper handling and storage are important to the operation and maintenance of the system. These guidelines for handling and storage must be followed, when the system is in transit, stored or stopped for a long period.

10.1 Storage

The ambient temperature must be 0–45 °C, and the relative humidity must be 20–90 % RH.

See the Calibration Kit for how to store calibration liquids.

10.2 Long term inactivity

Notice

It is recommended that the following spare parts are kept in stock for when the system is used again after a long period of inactivity:

- Impeller
- Shaft seal
- End cover
- pH electrode

If the system is inactive for at least 30 days, carry out the following procedure:

- Isolate the system by shutting off the valves to and from the system.
- Set Valve 1 and Valve 2 to STOP to prevent water draining from the pH measurement chamber.
- Set power to OFF.
- Remove the pump impeller and secure it to the outside of the pump housing.
- Clean the strainer.

Preparing the unit for use again:

- Insert the pump impeller. Rotate the pump shaft by hand.
- Loosen the end cover prior to startup, to check that the impeller rotates and vents air. Remember to re-tighten the end cover afterwards.

- Open the valves to and from the system.
- Turn Valve 1 and Valve 2 to RUN.
- Set power to ON.

Start the unit while observing pump rotation and function and adjust the operating pressure.

10.3 Impeller Pump

If the pump is stored for longer periods, the impeller can stick to the inside of the pump housing. Also, the impeller flexibility can decrease during long term standstill. Therefore, it is recommended that the end cover of the pump is loosened during initial startup in order to check that the impeller is rotating and also to evacuate air.

10.4 pH Electrode

The electrode must be calibrated after storage if the recommended calibration interval is overdue. The electrode has a shelf life of approximately 12 months.

10.5 Calibration Kit

A date of expiration is marked on all liquids. The calibration kit has an expiration date of approximately 1 year from delivery.

Ideal storage of the calibration liquids is 5...25°C for long term storage. Temperatures below 0°C can damage the calibration liquids. Storage above 25°C can reduce the accuracy and expected expiry date.

When the calibration liquids are in transit temperatures of up to 35°C are allowed but only for a period of 7 days.

When using the calibration liquids, the temperature of the liquid must be around 20°C to obtain the highest accuracy.

11 Return of Equipment

Note

Return of equipment must be coordinated with manufacturer – please refer to contact information in section 1.2.

Use a secure transport container of appropriate type for return of equipment. All returned equipment must be free from any hazardous substances (such as acids, alkalis, solvents, etc.). Therefore, it is important to carefully clean the equipment prior to returning.

IMPORTANT: Clearly mark the equipment with system serial number.

IMPORTANT: Request and fill out a “Return form” prior to returning the equipment. Kindly send this form along with the item to be returned.

12 Troubleshooting

Note

For troubleshooting the system, please refer to the PI diagram of each system.

Troubleshooting should always be carried out by skilled personnel.

The water monitoring system is connected to hazardous electric voltages, which can cause personal injury or mechanical damage if not handled correctly and in accordance with normal safety regulations.

12.1 General

Trouble	Possible Cause → Action
Flow alarm, but operating pressure is high, while backpressure (measured with pump OFF) is low	→ Blocked flow path → Clean strainer, open blocked valves, check hoses are intact. → Check and adjust the flow regulating valve. → Air in system → evacuate air by disconnecting the relevant hoses.
Low flow	→ Check system for blockages – especially disassembly and clean the non-return valve.
Pump failure	→ Pump not running → check automatic fuse, remove end cover to observe impeller rotating.
Blocked valve	Attention: Moving parts. Check impeller and end cover condition. If the impeller is swollen another impeller material must be fitted. Replace impeller, end cover or pump if necessary. → Check the pressure holding, pressure reduction or relief valves. Clean if necessary. → Check the flow sensor. Clean it if necessary.
No display at all	→ Check the circuit breaker. → Check power supply – the power supply needs to be at correct voltage. → Check communication cable.

Trouble	Possible Cause → Action
No display despite power supply and circuit breaker are OK	→ The display is defect → Reboot, repair, or exchange the display.
Incorrect indication of pH value	→ Try to clean the sensor and chamber manually. → Try to validate the pH Sensor. → Change the pH Electrode.
Incorrect indication of Turbidity value	→ Try to clean the sensor and chamber manually. → Try to validate the Turbidity Sensor. → Water coloration might restrict light passing through the sample. Try to minimize the water coloration. → Check the wiring from the Turbidity sensor to the Turbidity Analyzer.
Incorrect indication of PAH value	G6110: Check/clean the sensor, bushing, and chamber thoroughly. G6111: Check/clean the sensor and chamber thoroughly. → Check expiration date of PAH sensor certificate → Validate the PAH Sensor → Check/remove bubbles in calibration liquid. → Check calibration liquid expiration date and temperature → Do not expose PAH calibration liquid to UV light for more than a few minutes since UV light degrades PAH molecules
Fluctuations of readings	→ Possibly caused by air bubbles. Check the sampling line. Check that the de-bubbler is functioning.
No data log No historical trend curve	→ Wait for the trend to generate the curves. → Check if the SD card is in position. → If yes, check the SD card's lock mode. → Replace the SD card if it is defect.
Increased pump temperature	→ Pump/motor rotation is hard. Maybe water in bearing or foreign material block pump → inspect motor and pump to identify reason for blockage or other factors that stops the motor or pump from rotating freely.

Trouble	Possible Cause → Action
Reduced flow or pressure	<p>→ Valves on discharge and/ or suction side completely or partially closed → open valves.</p> <p>→ Pump suction pressure is low → check pressure improves hose/routing.</p> <p>→ Partial blockage of the suction line → clean pipe.</p> <p>→ Insufficient diameter on the suction side → increase the diameter on the suction side, as much as possible.</p> <p>→ Suction line too long → shorten the suction line, as far as possible</p> <p>→ High viscosity of medium → reduce viscosity, as far much possible. Reduce speed and reconsider application.</p> <p>→ Air introduction in the suction connections → check connections and accessories for air tightness.</p>
Vibrations on pumps and pipelines	<p>→ The pipes are not correctly fastened → fasten pipes correctly (e.g. wall brackets).</p> <p>→ Pump speed too high → reduce pump speed</p> <p>→ Insufficient nominal width of the pipes → increase nominal width.</p> <p>→ Pump base plate loose → Fasten base plate</p>
Hose pump: Reduced operational lifetime of the hoses	<p>→ Chemical exposure → Check the compatibility of the hose with the liquid being conveyed, the cleaning fluid and the lubricant. If in doubt always consult the manufacturer.</p> <p>→ Wrong pump rotation direction → inlet must be at the top connection and outlet must be at the bottom connection.</p> <p>→ High pump speed → Reduce pump speed</p> <p>→ High conveying temperature → Reduce product temperature. If in doubt always consult the manufacturer.</p> <p>→ High operating pressure → Reduce operating pressure. If in doubt always consult the manufacturer.</p> <p>→ Pump cavitation → Check the suction conditions.</p> <p>If in doubt always consult the manufacturer.</p> <p>→ Abnormal elevation of temperature → Check rollers shaft mounting.</p> <p>→ Unsuitable lubricant → consult the manufacturer</p> <p>→ Insufficient lubrication → Lubricate hose with original lubricant.</p>

Trouble	Possible Cause → Action
Hose pump: Pump hose pulled into the pump housing	→ Too high inlet pressure → Reduce inlet pressure. → Pump hose filled with deposits → Clean or replace the pump hose. → Flange insufficiently tightened → Retighten flange → Insufficient grease → Top lubricant
The pump does not start up	→ Insufficient motor performance → Check motor and replace if necessary. → Blockage in the pump → Check power supply. Start occurs at a minimum of 10 Hz. → Blockage in the pump → Check if the suction or discharge side is blocked. Remove blockage.

12.2 PAH

Note

For system serial numbers < 103000 the PAH module interacts with the control and monitor unit via a 4...20 analog input.

- A G6110 module does not support any means of diagnostics via the 4...20 mA signal.
- A G6111 supports the following means of diagnostics via the 4...20 mA signal – Figure 12-1.

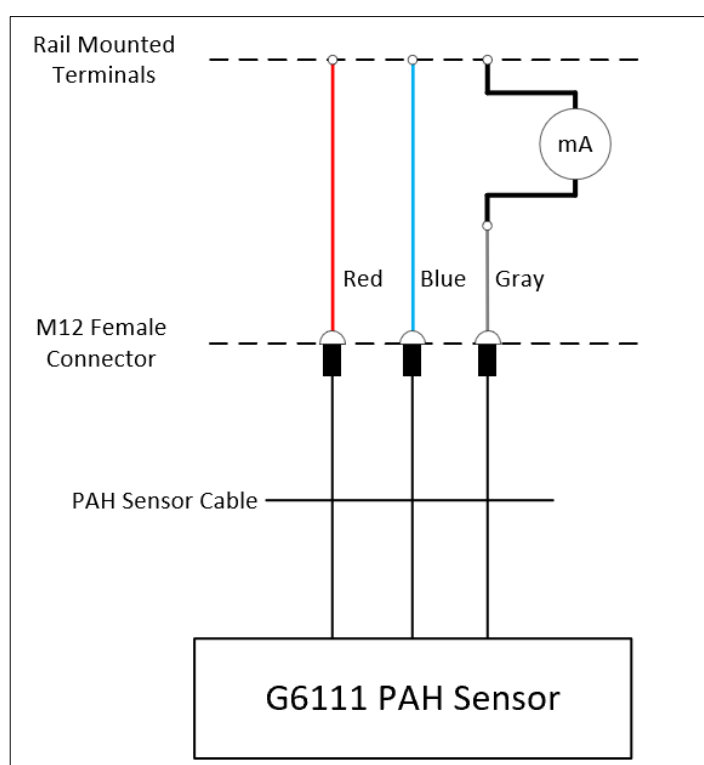


Figure 12-1: mA Measurement using Multimeter – G6111 PAH Sensor

Fault Description	Observation on HMI	Measured mA
Sensor Error/Lifetime Warning	Alarm = PAH Signal Error	2
Calibration Error	Alarm = PAH Signal Error	3
Low Input	-10	4
Out of range	PAH > Sensor Range	21

Table 12-1: Analog Diagnostic Table – G6111 PAH Sensor

ON SYSTEM SERIAL NO. > 103000

Sensor Error Code	Error Description	Solution
1	End of lifetime or hardware error	Replace sensor. Please contact service department
64	Calibration Error. Invalid calibration	Recalibrate the sensor.
Other codes	-	Please contact service department

Table 12-2: Alarm Handling Table – G6111 PAH Sensor

During operation, the Water Monitoring System will be exposed for fouling of components. In some cases, this can lead to inaccurate PAH readings. Depending on the media, the need for periodical cleaning will vary. It is important to follow the maintenance interval and guides found in section 8 in this manual.

In cases where severe fouling is suspected, it can be necessary to remove the measuring chamber from its position by disconnection hoses and bolts in order to thoroughly clean & flush the chamber. Please refer to cleaning guide below. After cleaning, the PAH chamber can be remounted.

Cleaning guide for G6110 PAH measuring chamber

1. Remove the PAH sensor
2. Dismount the PAH chamber by following maintenance instruction MI6100-0017 in section 14 in this operation manual.
3. Soak the entire chamber including the PAH chamber bushing and fittings in a solution of warm water and solvent.
4. Let the solution work for 10 minutes
5. Use a brush or rag to remove fouling from the PAH chamber & PAH chamber bushing.
6. Flush with clean water
7. Inspect O-rings
8. Use a new rag to dry and remount the PAH chamber & PAH chamber bushing.
9. Pay attention when connecting the hoses, to avoid leaks.
10. Mount the PAH sensor and secure it with the locking plate and locking pins.
11. Turn all valves to RUN and observe for leaks.

In severe cases where the residue is impossible to remove from the PAH chamber, a new chamber is needed to return the reading to an accepted level. This can be done by following the maintenance instruction MI6100-0017 found in section 14 in this operation manual.

Cleaning guide for G6111 PAH measuring chamber

1. Remove the PAH sensor
2. Soak the chamber in a solution of warm water and solvent
3. Let the solution work for 10 minutes
4. Use a brush or rag to remove fouling from the PAH chamber
5. Flush with clean water
6. Dry the PAH chamber with a new clean rag.
7. Inspect O-rings
8. Mount the PAH sensor and secure it with the locking plate and locking pins
9. Turn all valves to RUN and observe for leaks

12.3 PH/Temperature

RESETTING CALIBRATION OFFSET

The pH sensor and pH electrode must be calibrated together in order to represent a functional pH-meter. Calibration data is stored within the pH sensor while the pH electrode acts as the sensing element.

During field calibration, the factory calibration data within the sensor is updated/overwritten in order to compensate for the deterioration of the pH electrode. If a defective pH electrode has been replaced by a new electrode, then the calibration data must be overwritten. However, the field calibration data stored in the sensor will not match the new pH electrode – resulting in the new electrode giving measurements that are offset compared to expectations.

If the offset is too large, then the pH sensor will not accept the field calibration data as valid (**Error code:** The red LED on the PH sensor flashes every second). In order to remove the calibration offset, an intermediate buffer solution must be mixed – refer to example 1 + 2 in the following tables:

Example 1: pH Negative offset – Reading Too Low

Step	Description	Buffer solution	Observed pH	Calibration Data	Conclusion
Step 1	Initial test	7.0	6.5	Not accepted	Offset too big
Step 2	Reducing offset by mixing buffers	(90% buffer 7.0 + 10% buffer 10) = buffer 7.3	Before calibration: 6.8 After calibration: 7.0	Accepted. Red LED will flash 3 times	Offset reduced. Reading is 7.0 but real value should be 6.8
Step 3	Normal calibration (1 of 3)	7.0	6.7 Before calibration: 7.2 After calibration: 7.0	Accepted. Red LED will flash 3 times	Calibration Success. Offset Removed
Step 4	Normal calibration (2 of 3)	4.0	4.0	Accepted. Red LED will flash 3 times	Calibration Success
Step 5	Normal calibration (3 of 3)	10.0	10.1	Accepted. Red LED will flash 3 times	Calibration Success

Figure 12-2: pH Negative offset - Reading Too Low

Example 2: pH Positive Offset – Reading Too High

Step	Description	Buffer solution	Observed pH	Calibration Data	Conclusion
Step 1	Initial test	7.0	7.5	Not accepted	Offset too big
Step 2	Reducing offset by mixing buffers	(90% buffer 7.0 + 10% buffer 4) = buffer 6.7	Before calibration: 7.2 After calibration: 7.0	Accepted. Red LED will flash 3 times	Offset reduced. Reading is 7.0 but real value should be 7.2
Step 3	Normal calibration (1 of 3)	7.0	7.3 Before calibration: 6.8 After calibration: 7.0	Accepted Red LED will flash 3 times	Calibration Success Offset removed
Step 4	Normal calibration (2 of 3)	4.0	4.0	Accepted Red LED will flash 3 times	Calibration Success
Step 4	Normal calibration (3 of 3)	10.0	10.0	Accepted Red LED will flash 3 times	Calibration Success

Figure 12-3: pH Positive Offset – Reading Too High

Note: Use the measurement from the pH sensor when mixing the buffer solutions.

The following signs indicate an electrode reaching its end of lifetime. The electrode must be replaced whenever one of the below signs are identified:

- The pH/Temperature sensor is difficult to calibrate. Storing a calibration point should take max 180 seconds. The electrode must be replaced if longer time is required.
- The pH/Temperature sensor was calibrated successfully, but the output drifts within 15 minutes after the calibration. To test drift please immerse the sensor in e.g. clean tap water – note the initial displayed pH value – leave the sensor in the water for 15 minutes - then note the displayed value after 15 minutes.

Calculate drift:

Drift = “Initial value” ÷ “15-minute value”

Max drift allowed is +/-0.2 pH units

- The pH/Temperature sensor gives a fixed output of around pH 7
- The pH/Temperature sensor gives no output.
- The glass tip of the electrode is damaged.
- Water has entered the electrical connection of the electrode.
- If the pH sensor flashes every second, the calibration is not accepted.

Changing of the Electrode is easily done by following the maintenance instruction MI6100-0007.



Note

It is recommended to keep an electrode in stock as a spare part.








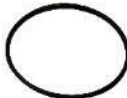

13 Spare Parts

Spare parts are not included in the standard delivery. Spare parts can be ordered when necessary. When ordering spare parts, mention the serial number of the system.

Part No.	Part Description	The specific appearance of the spare parts is subject change without notice; the function however will not change
WMR/WMP/WMPH/TYPE A		
02589	Pump - Type A	
103125	Start Capacitor – Pump Type A	
103126	Run Capacitor – Pump Type A	
03409	Pump Spare Part Kit Type A <ul style="list-style-type: none"> • 1 x pump Impeller • 1 x shaft seal • 1 x end cover • 1 x O-ring for end cover • 1 x Shaft V-ring 	
02607	Pump Impeller Type A Ø 40 mm	
02660	Shaft seal Type A	

Part No.	Part Description	The specific appearance of the spare parts is subject change without notice; the function however will not change
02663	End cover for pump Type A	
02661	O-ring for end cover Type A	
03408	Shaft V-ring Type A	
WMR/WMP/WMPH/TYPE B		
03613	Pump - TYPE B Version 2	
103007	Start Capacitor – Pump Type B	
103008	Run Capacitor – Pump Type B	
03629	Pump Spare Part Kit - TYPE B <ul style="list-style-type: none"> • 1 x Impeller for pump NBR Ø 55 mm • 1 x Mechanical seal • 1 x Wear plate without hole • 1 x Wear plate with punched hole st.s • 3 x O-Ring for impeller pump NBR 56-2 • 1 x Tape • 1 x Shaft Key • 1 x Sandpaper 	

Spare Parts

Part No.	Part Description	The specific appearance of the spare parts is subject change without notice; the function however will not change
102758	Shaft Key – Type B	
103151	Motor Shaft Seal – Type B	
03616	Impeller for pump NBR Ø 55 mm Type B	
03614	Mechanical seal - Type B	
03617	Wear plate without hole - Type B	
03618	Wear Plate With Punched Hole St.S Type B	
03615	O-Ring for Impeller Pump TYPE B	
02582	Manometer	
02505	De-Bubbler Complete (Without Fittings)	
02653	O-Ring For De-Bubbler Top	
02654	O-Ring for De-Bubbler Plexiglas Pipe (4 Pcs Needed for Overhaul)	
02381	Strainer	








Part No.	Part Description	The specific appearance of the spare parts is subject change without notice; the function however will not change
02435	Flow Regulating Valve	
02686	Ball Valve W.Actuator	
02703	Pressure Reduction Valve	
02687	Pressure Holding Valve /Relief Valve	
02438	Compression Ferrule OD 10 Mm	
02543	Compression Ferrule OD 12mm	
02809	Hose Pump 0.25 KW - 1x230V	
102970	NR Hose for Hose Pump ISI-16	
03636	Hose for Hose Pump -ISI- 16 NBR	
02835	Lubricant For ISI/IP Hose Pump	



Spare Parts




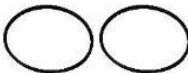

Part No.	Part Description	The specific appearance of the spare parts is subject change without notice; the function however will not change
WM		
02640	Flow Switch (Without Fitting)	
02968	Flow Sensor Upgrade Kit (Incl.part.no. 02966, 02967 & 01462)	
02966	Signal A/D Converter	
02967	Flow Sensor	
01462	Connection Cable,1.5m Female	
03558	Modbus TCP to RTU (RS-485) Converter	
00358	Selector Valve Sample/Test Gases	
02336	Inspection Window	
02579	Non-Return Valve	
02438	Compression Ferrule OD 10 Mm	
02543	Compression Ferrule OD 12mm	
02430	Stiffener Sleeve SO50003-10-08 10/8mm	

Part No.	Part Description	The specific appearance of the spare parts is subject change without notice; the function however will not change
02507	Stiffener Sleeve 12/10mm	
02237	Power Supply 24V	
00505	Fuse Automatic Fuse C 6KA 4A 2P	
02197	Fuse Automatic 6A	
03630	Automatic Fuse 3A 24V DC	
03552	Bus-Coupler Modbus RTU	
03631	Relay	
01989	Bus-Coupler Modbus TCP/IP	
03553	Serial Interface Module	
02015	Power Supply Module	
02401	2-CH Digital Input Module	
02402	4-CH Analog Input Module	

Spare Parts

Part No.	Part Description	The specific appearance of the spare parts is subject change without notice; the function however will not change
03647	2-CH Analog Input Module	
02404	2-CH Digital Output Module	
01992	End Module	
01887	HMI-Display (Configuration Needed)	
03554	Communication Cable SUB-D Male-Male 60cm	
02410	Isolation Amplifier Passive Output	
G6110 PAH Module		
02221	PAH Sensor Low Range	
02223	PAH Sensor High Range	
03550	PAH Sensor Dual Range 0-100/800 µg/l	

Part No.	Part Description	The specific appearance of the spare parts is subject change without notice; the function however will not change
03443	PAH Sensor 0-100 µg/l Reconditioned Only available if returning used PAH Sensor	
03444	PAH Sensor 0-800 µg/l Reconditioned Only available if returning used PAH Sensor	
03551	PAH Dual Range Sensor 0-100/800 µg/l Reconditioned Only available if returning used PAH Sensor	
02529	O-ring PAH Chamber (2 pcs needed for overhaul)	
02550	PAH Measuring Chamber Kit	
03250	G6110 PAH Calibration Chamber	
102767	PAH Chamber Bushing	
102603	PAH Chamber Bushing Tool	

Part No.	Part Description	The specific appearance of the spare parts is subject change without notice; the function however will not change
G6111 PAH Module		
102060	G6111 PAH sensor 0-100µg/l (Low range)	
102070	G6111 PAH sensor 0-800µg/l (High range)	
102100	G6111 PAH sensor 0-100/800µg/l (Dual range)	
103420	G6111 PAH Measuring Chamber	
102945	G6111 PAH Calibration Chamber	
102952	G6111 Exterior O-ring set (2 pcs)	
Turbidity Module		
02343	Turbidity Sensor	




Part No.	Part Description	The specific appearance of the spare parts is subject change without notice; the function however will not change
02342	Turbidity Analyzer	
02385	Turbidity Light Source	
02394	Turbidity Emitter	
02395	Turbidity Receiver	
02805	Turbidity Wiper Unit	
02386	Wiper Blade (only rubber part included – set of 4 pcs)	
02990	Wiper Arm including Wiper Blade	

Spare Parts



Part No.	Part Description	The specific appearance of the spare parts is subject change without notice; the function however will not change
02387	Turbidity O-ring set	
03264	Wiper Collar Kit	
PH Module		
02344	pH Sensor without Electrode	
02329	pH Chamber	
02389	Electrode for pH Sensor	
02755	Locking Nut & Gasket For pH Sensor	
02390	Gasket for pH sensor	

Part No.	Part Description	The specific appearance of the spare parts is subject change without notice; the function however will not change
Calibration Kit		
03215	Calibration Kit - Inlet (pH/Turbidity) <ul style="list-style-type: none"> • 4 x pH4 - 7 - 10 Buffer • 1 x Turbidity 0 - 10 - 40 NTU • 1 x Cleaning Pad • 1 x Validation/Calibration Guide 	
03973	Calibration Kit - Refill - Inlet (pH/Turbidity) <ul style="list-style-type: none"> • 4 x pH4 - 7 - 10 Buffer • 1 x Turbidity 0 - 10 - 40 NTU • 1 x Cleaning Pad • 1 x Validation/Calibration Guide 	
G6100 Calibration Kit		
02315	Calibration kit complete (PAH 0-100 µg/l)	
02590	Calibration kit complete (PAH 0-800 µg/l)	
03549	Calibration Kit Complete (PAH dual range 0-100/800 µg)	
02449	Calibration Kit Complete Refill (PAH 0-100 µg/l) Incl. relevant certificates <ul style="list-style-type: none"> • 4 x pH4 - 7 - 10 Buffer • 1 x Turbidity 0 - 10 - 40 NTU • 8 x PAH 0 - 50 - 100µg/l • 4 x Syringe & Cleaning Pad • 1 x PAH Calibration Chamber - PAH Chamber bushing - Tool - Needle - Validation/Calibration Guide 	

Part No.	Part Description	The specific appearance of the spare parts is subject change without notice; the function however will not change
02477	<p>Calibration Kit Complete Refill (PAH 0-800 µg/l) - Incl. relevant certificates</p> <ul style="list-style-type: none"> • 4 x pH4 - 7 - 10 Buffer • 1 x Turbidity 0 - 10 - 40 NTU • 8 x PAH 0 - 400 - 800µg/l • 4 x Syringe & Cleaning Pad • 1 x PAH Calibration Chamber - PAH Chamber bushing - Tool - Needle - Validation/Calibration Guide 	
03561	<p>Calibration Kit Complete Refill (PAH 0-100/800 µg/l) Incl. relevant certificates</p> <ul style="list-style-type: none"> • 4 x pH4 - 7 - 10 Buffer • 1 x Turbidity 0 - 10 - 40 NTU • 4 x PAH 0 - 100 - 400 - 800µg/l • 8 x PAH 50 - 200 µg/l • 4 x Syringe & Cleaning Pad • 1 x PAH Calibration Chamber - PAH Chamber bushing - Tool - Needle - Validation/Calibration Guide 	
03667	Calibration Kit (PAH/Turbidity)	
102767	PAH Chamber Bushing	

Part No.	Part Description	The specific appearance of the spare parts is subject change without notice; the function however will not change
102603	PAH Chamber Bushing Tool	
03250	PAH Calibration Chamber	
102600	PAH Chamber Upgrade Kit and Guide	

G6111 Calibration Kit



102949	<p>G6111 Calibration Kit Complete Refill (PAH 0-100 µg/l) - Incl. relevant certificates</p> <ul style="list-style-type: none"> • 4 x pH4 - 7 - 10 Buffer • 1 x Turbidity 0 - 10 - 40 NTU • 8 x PAH 0 - 50 - 100µg/l • 4 x Syringe & Cleaning Pad <p>1 x PAH Calibration Chamber - Needle - Validation/Calibration Guide</p>	
102950	<p>G6111 Calibration Kit Complete Refill (PAH 0-800 µg/l) - Incl. relevant certificates</p> <ul style="list-style-type: none"> • 4 x pH4 - 7 - 10 Buffer • 1 x Turbidity 0 - 10 - 40 NTU • 8 x PAH 0 - 400 - 800µg/l • 4 x Syringe & Cleaning Pad <p>1 x PAH Calibration Chamber - Needle - Validation/Calibration Guide</p>	

Spare Parts

Part No.	Part Description	The specific appearance of the spare parts is subject change without notice; the function however will not change
102951	G6111 Calibration Kit Complete Refill (PAH dual range 0-100/800 µg/l) Incl. relevant certificates • 4 x pH4 - 7 - 10 Buffer • 1 x Turbidity 0 - 10 - 40 NTU • 4 x PAH 0 - 100 - 400 - 800µg/l • 8 x PAH 50 - 200 µg/l • 4 x Syringe & Cleaning Pad 1 x PAH Calibration Chamber - Needle - Validation/Calibration Guide	
02259	pH 4 Buffer	
02260	pH 7 Buffer	
02261	pH 10 Buffer	
02256	Turbidity Standard 0,0 NTU	
02257	Turbidity Standard 10 NTU	

Part No.	Part Description	The specific appearance of the spare parts is subject change without notice; the function however will not change
02258	Turbidity Standard 40 NTU	
02253	PAH Solution 0 µg/l	
02255	PAH Solution 50 µg/l	
02316	PAH Solution 100 µg/l.	
02795	PAH Solution 200 µg/l.	
02459	PAH Solution 400 µg/l.	
02460	PAH Solution 800 µg/l.	
02263	Syringe	

Spare Parts

Part No.	Part Description	The specific appearance of the spare parts is subject change without notice; the function however will not change
02264	Needle	
02398	Cleaning Pad	
02480	Operation Manual	
102847	Validation & Calibration Guide	


Spare Parts Kits

02957	<p>Recommended Spare Parts Kit for WM and WMP Type A (02314 & 02559) for 1-year operation</p> <ul style="list-style-type: none"> • 2 x Pump Impeller • 1 x Shaft Seal • 2 x End Cover • 1 x O-ring for End Cover • 1 x Shaft V-ring • 1 x Wiper Blade • 1 x Electrode for pH Sensor • 1 x Gasket for pH Sensor • 2 x O-ring PAH Chamber • 1 x Turbidity O-ring 	
03658	<p>Recommended Spare Parts Kit for WM and WMP Type B (pn: 03627 & 03628) for 1 - year operation</p> <ul style="list-style-type: none"> • 2 x Impeller for Pump NBR Ø 55 mm • 1 x Mechanical Seal • 1 x Wear Plate without Hole • 1 x Wear Plate with Punched hole st.s • 3 x O-Ring for Impeller Pump • 1 x Tape • 1 x Shaft Key • 1 x Sandpaper • 1 x Wiper blade (set of 4 pcs.) 	

Part No.	Part Description	The specific appearance of the spare parts is subject change without notice; the function however will not change
	<ul style="list-style-type: none"> • 1 x Electrode for pH Sensor • 1 x Gasket for pH Sensor • 2 x O-ring PAH Chamber • 1 x Turbidity O-ring 	
02958	Recommended Spare Parts Kit for WM and WMR for 1-year operation <ul style="list-style-type: none"> • 1 x Wiper Blade (set of 4 pcs.) • 1 x Electrode for pH Sensor • 1 x Gasket for pH Sensor • 2 x O-ring PAH Chamber • 1 x Turbidity O-ring 	
02959	Recommended Spare Parts Kit for WM30 Type A for 1-year operation <ul style="list-style-type: none"> • 1 x Pump Impeller • 1 x Shaft Seal • 1 x End Cover • 1 x O-Ring For End Cover • 1 x Shaft V-Ring • 1 x Electrode for pH Sensor • 1 x Gasket for pH Sensor 	
03964	Recommended Spare Parts Kit for WM30 Type B for 1-year operation <ul style="list-style-type: none"> • 1 x Impeller for pump NBR Ø 55 mm • 1 x Mechanical seal • 1 x Wear plate without hole • 1 x Wear plate with punched hole st.s • 3 x O-Ring for impeller pump • 1 x Tape • 1 x Shaft Key • 1 x Sandpaper • 1 x Electrode for pH Sensor • 1 x Gasket for pH Sensor 	

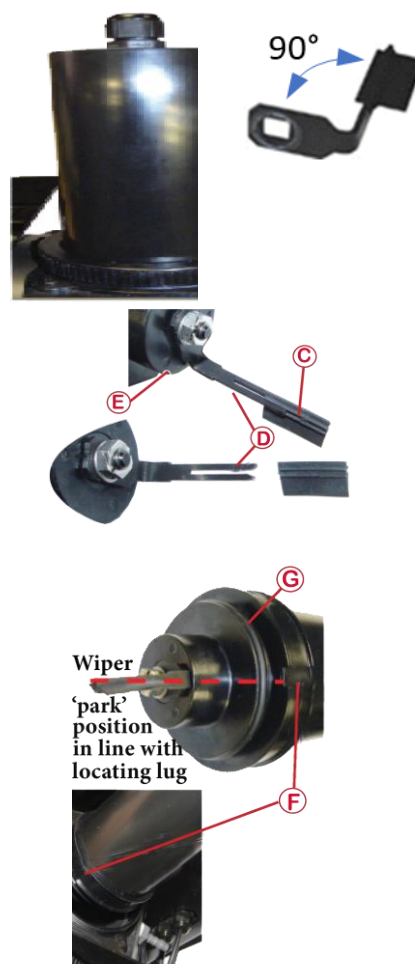
14 Appendix

MI6100-0001


System Type	Water Monitoring System		MI6100-0001
Task:	Turbidity Wiper Blade Replacement		
Task description:	This instruction identifies the location and replacement of the Wiper Blade. Wiper Blade replacement must be carried out by a trained technician.		
Difficulty 1-5	Overhaul Interval		Estimated Time Consumption
	If necessary		5 min
Spare Parts			Tools
Part no:	Description:	Qty.	Item:
02386	Wiper blade spare part set of 4pcs	1	None

Instructions**Steps**

1. Turn OFF the turbidity sensor by switching OFF all automatic fuses in the monitoring unit (refer to el-documents).
2. Place a cup under the calibration fluid drain off to collect the discharge (underneath the cabinet).
3. Turn VALVE 3 to STOP position and VALVE 2 to DRAIN position for WM units. Turn INTERNAL VALVE to DRAIN position and CLOSE the BALL VALVE for WMRTU units.
4. Loosen the black union nut (A) on the top and remove the wiper unit (B) – park it.
5. Pull wiper blade (C) out of slot (D) in wiper arm (E) and discard the wiper blade
6. Ensure wiper arm is undamaged & at a 90° angle to the bottom surface of the wiper unit. Ensure slot (D) is straight and parallel.
7. Taking care not to damage the new wiper blade, slide it into the wiper arm slot (D), ensuring blade edge is facing outwards.
8. Turn ON the turbidity sensor by switching ON all automatic fuses.
9. Observe the wiper arm (E) rotating and stopping at the cut-out position(F).
10. Ensure that the O-ring (G) is undamaged and positioned correctly.
11. Refit the wiper unit (B) making sure that it is orientated at the cut-out position (F) and tighten the black union (A) by hand.
12. Turn VALVE 3 to Run position and VALVE 2 to Run position for WM units. Turn INTERNAL VALVE to RUN position & OPEN the BALL VALVE for WMRTU units.

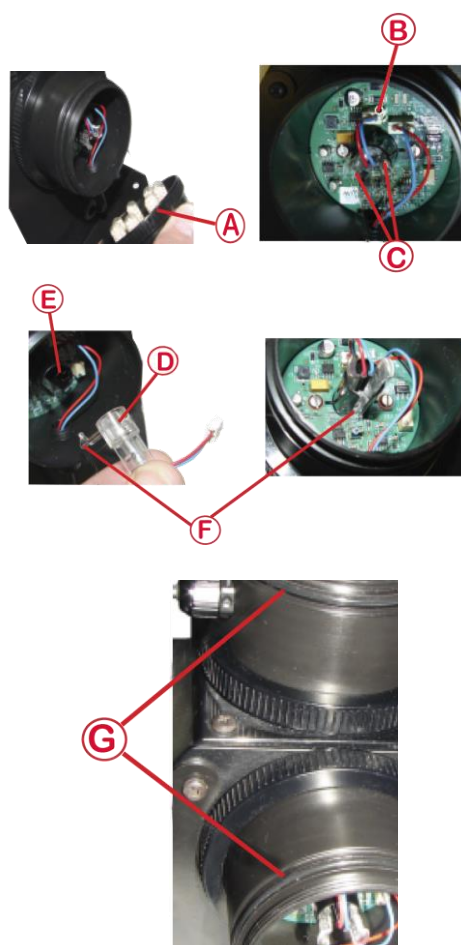
Photos:**Notes:**

MI6100-0002


System Type	Water Monitoring System		MI6100-0002
Task:	Turbidity Light Source Replacement		
Task description:	This instruction identifies the location and replacement of the Turbidity Sensor Light Source. Light Source replacement must be carried out by a trained technician.		
Difficulty 1-5	Overhaul Interval		Estimated Time Consumption
	Every 5th year		10 min
Spare Parts			Tools
Part no:	Description:	Qty.	Item:
02385	Light Source	1	None

Instructions**Steps**

1. Turn OFF the turbidity sensor by switching OFF all automatic fuses.
2. Loosen the black end cover on the emitter (A)
3. Disconnect the emitter light source connector (B) from receptacle J2 on the print.
4. Gently squeeze the retaining tabs (C) together and pull to withdraw the light source (D) from its housing (E).
5. Carefully remove the replacement light source from its packaging – be careful not to touch the light bulb itself.
6. Insert replacement light source (D) into the housing (E). Ensure the tab on the light source (F) enters the slot in the housing. Press until the light source clicks into place.
7. Connect the light source connector (B) to receptacle J2 on the print – make sure the connector tap is orientated correctly
8. Ensure that the end cap O-rings (G) are undamaged and in correct position.
9. Refit end caps on emitter and receiver.
10. Now a calibration procedure must be performed – please follow the calibration instructions in the operation manual.

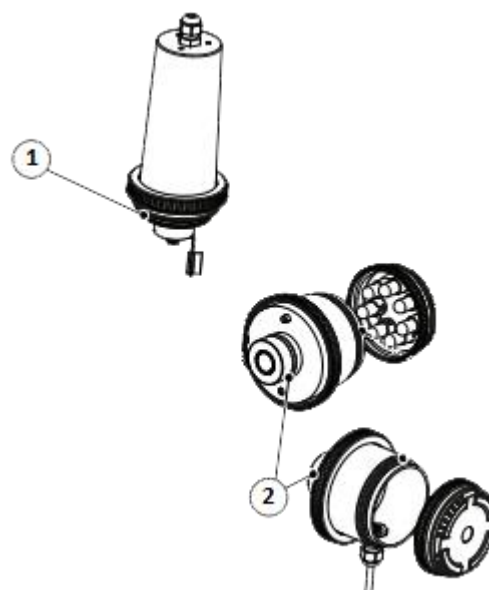
Photos:**Notes:**

MI6100-0003


System Type	Water Monitoring System		MI6100-0003
Task:	Turbidity O-ring Replacement		
Task description:	This instruction identifies the locations of the Turbidity Sensors O-rings. O-ring seal replacement must be carried out by a trained technician.		
Difficulty 1-5	Overhaul Interval		Estimated Time Consumption
	If necessary		10 min
Spare Parts			Tools
Part no:	Description:	Qty.	Item:
02387	Turbidity O-ring set	1	None

Instructions**Steps**

Replace the O-ring indicated in the photo

Photos:**Notes:**

MI6100-0004

System Type	Water Monitoring System	MI6100-0004	
Task:	Turbidity Wiper Unit Replacement		
Task description:	This instruction describes the replacement of the Turbidity Wiper Unit. The wiper unit replacement must be carried out by a trained technician.		
Difficulty 1-5	Overhaul Interval	Estimated Time Consumption	
	When necessary	15 min	
Spare Parts		Tools	
Part no:	Description:	Qty.	Item:
02805	Turbidity Wiper Unit		Small size flat headed screwdriver
			Medium size flat headed screwdriver
			2 x 8mm spanners

Instructions**Steps**

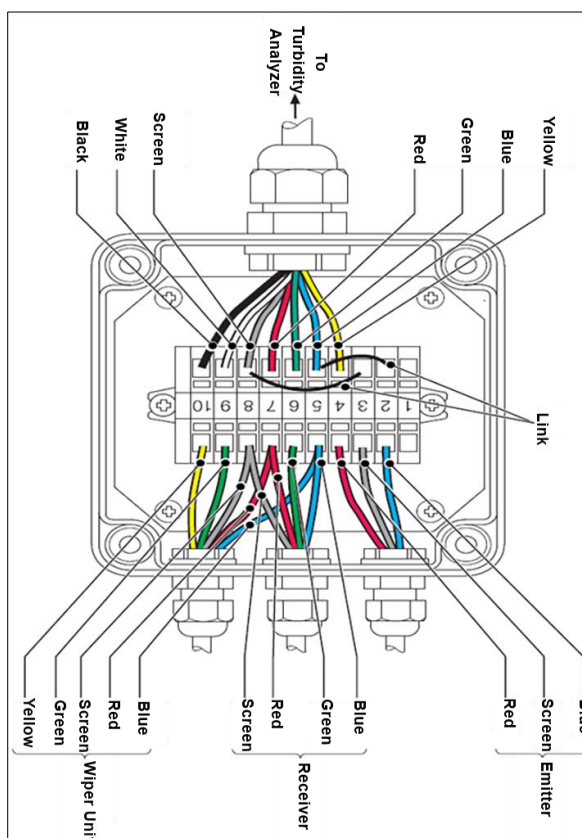
Make sure the power supply is cut off prior to replacing the wiper unit.

This is done by switching off the main automatic fuse found inside the control cabinet.


Remember to install the wiper unit nut prior to installing the cable.

**Photos:**

Wiper unit electrical connections

**Notes:**

MI6100-0005

System Type	Water Monitoring System	MI6100-0005	
Task:	Turbidity Analyzer Replacement		
Task description:	This instruction describes the replacement of the Turbidity Analyzer. The replacement must be carried out by a trained technician.		
Difficulty 1-5	Overhaul Interval	Estimated Time Consumption	
	When necessary	30 min	
Spare Parts		Tools	
Part no:	Description:	Qty.	Item:
02342	Turbidity Analyzer	1	Small size flat headed screwdriver
			1 x allen key
			2 x 19mm spanners

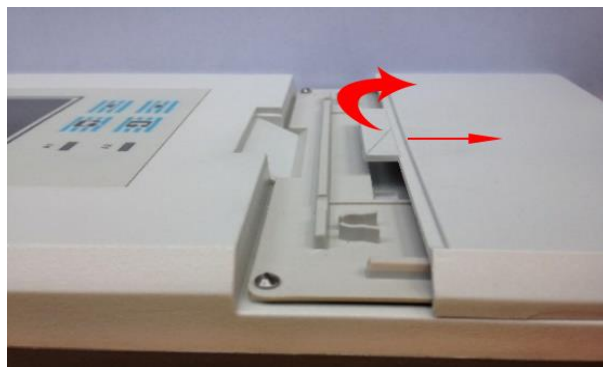
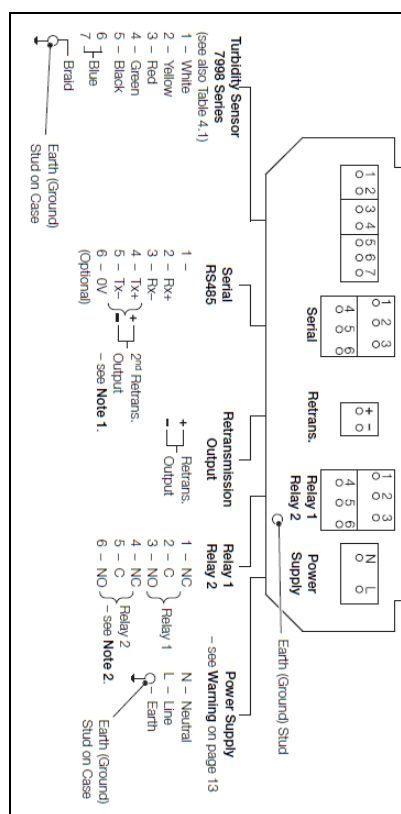
Instructions**Steps**

Note: Make sure the power supply is switched off prior to replacing the wiper unit.


This is done by switching off the main automatic fuses found inside the monitoring unit.

Remember to check correct termination prior to switching power ON. Refer to the illustration (on the right side)

After installation of the Turbidity Analyzer, the system must be calibrated following the calibration instruction in the operation manual.

**Photos:****Notes:**

MI6100-0007

System Type	Water Monitoring System		MI6100-0007
Task:	pH Electrode Replacement		
Task description:	This instruction identifies the location and replacement of the pH electrode. pH electrode Replacement must be carried out by a trained technician.		
Difficulty 1-5	Overhaul Interval	Estimated Time Consumption	
	Yearly	10 min	
Spare Parts			Tools
Part no:	Description:	Qty.	Item:
02389	Electrode for pH sensor		

Instructions**Steps**

1. Make sure the power supply is switched off prior to replacing the wiper unit. This is done by switching off the main automatic fuse found inside the control cabinet. Failing to do so may damage the pH electrode and/or sensor.

2. Unscrew the grey nut on the pH sensor and pull up the sensor from the measuring chamber. (A)

3. Unscrew the old pH electrode by turning it counterclockwise. (B)

4. If present, unscrew the shipping plug by turning it counterclockwise. (C)

5. Warning: The new electrode must always be kept moist. If the electrode dries out, it will not work properly. (D) (E)

6. Before refitting the new pH electrode to the sensor, remove any tape or other packing material without removing the protective cap. (E)


7. Before reinstalling the pH sensor make sure that the measuring chamber is half filled with water.

8. Remove the protective cap just before reinstalling the pH sensor in the measuring chamber. (F)

Note: make sure the pH chamber contains water in order to keep the electrode moist.

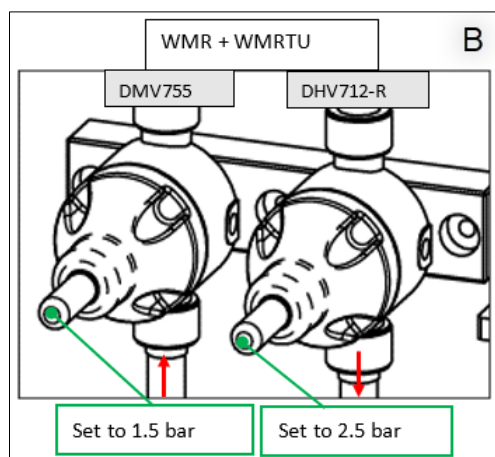
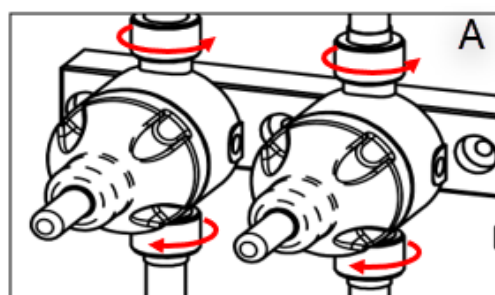
Photos:**Notes:**

MI6100-0008


System Type	Water Monitoring System	MI6100-0008	
Task:	Pressure Reduction Valve & Pressure Holding/Relief Valve Replacement		
Task description:	This instruction identifies the location and replacement of the pressure holding/relief & pressure reduction valve. The replacement must be carried out by a trained technician.		
Difficulty 1-5	Overhaul Interval	Estimated Time Consumption	
	When necessary	10 min	
Spare Parts		Tools	
Part no:	Description:	Qty.	Item:
02703	Pressure Reduction Valve	1	1 x 5mm Allen Key
02687	Pressure Holding/Relief Valve	1	

Instructions**Steps**

1. **Warning:** make sure to orientate the valves correctly according to the flow direction, see arrow on the side of the valves.
2. Make sure that the system is unpressurised and all connecting valves are closed.
3. Unscrew all the fittings connecting the valve(s) to the system. (A)
4. Unscrew all the bolts holding the valve(s) in place. (A)
5. Remove the old valve(s) and replace with the new valve(s) of the same type.
6. Reassemble in reverse order.

Photos:**Notes:**

MI6100-0009


System Type	Water Monitoring System		MI6100-0009
Task:	Pressure Reduction Valve Function Test		
Task description:	This instruction identifies the location and how to test the pressure reduction valve (DMV755). The test must be carried out by a trained technician.		
Difficulty 1-5	Overhaul Interval	Estimated Time Consumption	
	Every 6 month	2 min	
Spare Parts			Tools
Part no:	Description:	Qty.	Item:
02703	Pressure Reduction Valve		1 x 13mm Spanner

Instructions**Steps**

- 1.Remove protective black plastic cap. (A)
- 2.Unscrew locking nut. (B)
- 3.The function test is done by adjusting the pressure to achieve the normal working pressure. This is done by turning the pressure adjusting screw clockwise to lower the pressure and anticlockwise to increase the pressure. (B)
- 4.If the valve is not working properly, the valve must be replaced.

Photos:**Notes:**

MI6100-0010


System Type	Water Monitoring System	MI6100-0010
Task:	Pressure Holding/Relief Valve Function Test	
Task description:	This instruction identifies the location and how to test the pressure holding/relief valve. The test must be carried out by a trained technician.	
Difficulty 1-5	Overhaul Interval	Estimated Time Consumption
	Every 6 months	2 min
Spare Parts		Tools
Part no:	Description:	Qty. Item:
02687	Pressure Holding/Relief valve	1 x 13mm spanner

Instructions**Steps**

- Warning:** Do not change the opening pressure setting on the holding/relief valve. The holding/relief valve pressure must be set to 2.5 bar. A higher opening pressure could result in system damage.
- The function test of the pressure holding/relief valve is done by adjusting the pressure in the system by means of the pressure reduction valve.
- Remove protective black plastic cap on the pressure reduction valve. (B)
- Unscrew locking nut. (C)
- Turn the pressure adjusting screw counterclockwise to increase the pressure in the system. If the pressure holding/relief valve is working properly, the pressure should not be able to increase to more than 2.5 bar, which is the pressure holding/relief valve opening pressure. (C)
- If the pressure doesn't increase to more than 2.5 bar, the test is done and the pressure reduction valve can be lowered to 1.5 bar.
- If the pressure in the system rises above 2.5 bar, the valve is not working properly.
- Solution:** Readjust the opening pressure on the pressure relief valve by turning the adjusting screw counterclockwise until the valve opens at 2.5 bar.
- If the solution doesn't work, the valve should be replaced.

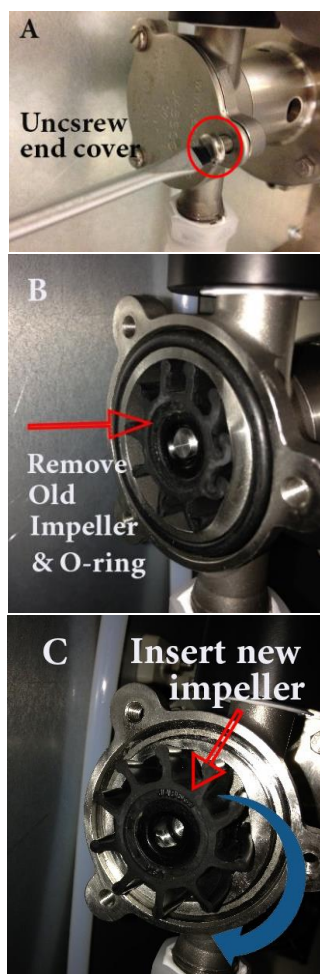
Photos:**A Pressure Holding/Relief Valve****B Pressure Reduction Valve****C Pressure Reduction Valve****Notes:**

MI6100-0011


System Type	Water Monitoring System		MI6100-0011
Task:	Pump Impeller & End Cover Replacement (TYPE A)		
Task description:	This instruction identifies the location and replacement of the Pump Impeller & End Cover. This replacement must be carried out by a trained technician.		
Difficulty 1-5	Overhaul Interval		Estimated Time Consumption
	Every 6 month		15 min
Spare Parts			Tools
Part no:	Description:	Qty.	Item:
03409	Pump Spare Parts Kit	1	Flat-headed screwdriver

Instructions**Steps**

1. Unscrew the end cover. (A)
2. Remove old impeller and O-ring without damaging the pump housing. (B)
3. Insert new impeller while rotating it clockwise so that the impeller is properly mounted as shown on the photos. (C)
4. Insert new O-ring & refit the end cover.

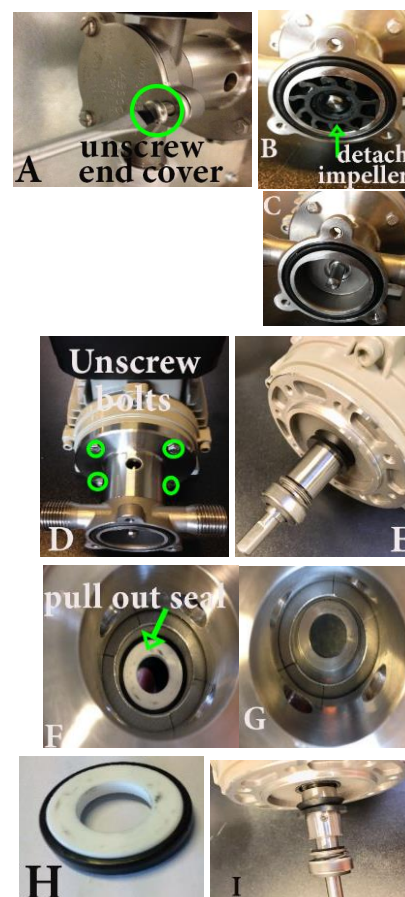
Photos:**Notes:**

MI6100-0012


System Type	Water Monitoring System	MI6100-0012
Task:	Pump Shaft Seal Replacement (TYPE A)	
Task description:	This instruction identifies the location and replacement of the Pump Shaft Seal. Pump Shaft Seal Replacement must be carried out by a trained technician.	
Difficulty 1-5	Overhaul Interval	Estimated Time Consumption
	If necessary	30 min
Spare Parts		Tools
Part no:	Description:	Qty. Item:
03409	Pump Spare Parts Kit	Flat Headed Screwdriver
		8 mm spanner

Instructions**Steps**

1. Unscrew end cover and detach impeller. (A) (B) (C)
2. Unscrew the four M8 bolts holding the impeller/shaft housing. (D)
3. Pull the pump/shaft housing away from the electrical motor, which exposes the part of the seal that sits on the shaft itself. (D) (E)
4. Gently remove the part of the seal that sits on the shaft without damaging the shaft. Also, remove O-ring from shaft if present. (E)
5. Pull out the part of the seal that sits in the impeller/shaft housing. (F) (G)
6. Check that the motor shaft rotates freely. If this is not the case, water has damaged the bearing and replacement is needed.
7. **Warning:** When handling the new seal, one must be very careful not to damage the ceramic part of the seal! Check the ceramic surface after mounting.
8. Gently fit the new seal (H) in the impeller/shaft housing, the other part of the seal on the shaft and a new O-ring (I).
9. Gently reconnect the impeller/shaft housing to the electrical motor without damaging the ceramic seal.
10. Reinstall the impeller by turning it clockwise on to the shaft. (B)
11. Reinstall the pump end cover. (A)

Photos:**Notes:**

MI6100-0013

System Type	Water Monitoring System	MI6100-0013
Task:	pH Sensor Replacement	
Task description:	This instruction identifies the replacement of the pH sensor. pH sensor replacement must be carried out by a trained technician.	
Difficulty 1-5	Overhaul Interval	Estimated Time Consumption
	When necessary	5 min
Spare Parts		Tools
Part no:	Description:	Qty. Item:
02344	pH sensor without electrode	Small flat headed screwdriver
		17-19 mm Spanner

Instructions**Steps**


1. Take photos or notes on how the existing pH sensor is installed. This will make it easy to install the replacement sensor.
2. Uninstall the old pH sensor using a small flat headed screwdriver to disconnect the pH sensor wiring inside the monitoring unit. Use the 17-19 mm spanner to loosen the cable gland, then pull out the cable.
3. Install the replacement pH sensor in the same way the old was installed or according to the electrical drawing. If the replacement pH sensor does not have the same wiring color as the old, then refer to the pH sensor cable color codes in the conversion table below.

Photos:

pH Sensor Cable Color Codes		
Serial No. < A147847	Serial No. > A147847	
Color code:	Color code:	Description:
Shield	Shield	PE
Black 1	Red	Power Supply 24 Vdc
Grey	White	
Black 2	Black	pH signal
Brown	Grey	Temp. signal

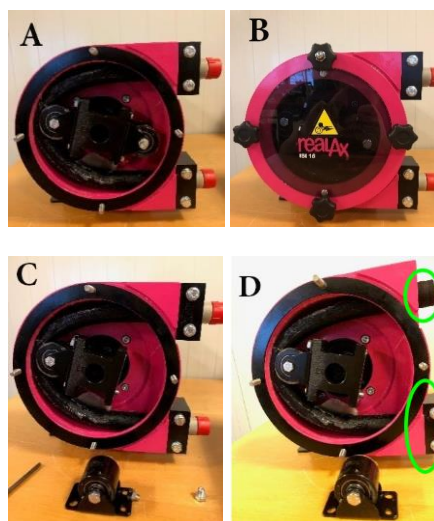
Notes:

MI6100-0014


System Type	Water Monitoring System		MI6100-0014
Task:	Maintenance for Hose Pump (Part no. 02809)		
Task description:	This instruction identifies cleaning or replacement of the hose pump. Cleaning or replacement of the hose pump must be carried out by a technician.		
Difficulty 1-5	Overhaul Interval		Estimated Time Consumption
	Hose replacement: Every 6 month Hose lubrication: Monthly		25 min
Spare Parts			Tools
Part no:	Description:	Qty.	Item:
03636	Hose for hose pump	1	Spanner nr.13, Allan key nr.5
02835	Lubricant for hose pump	1	Cross-point Screwdriver

Instructions**Steps**

1. Close off all valves. Power down the system, taking care that the pump cannot be accidentally started.
2. Dismantle the pump pipes from both the inlet and the outlet.
3. Remove the front cover. (A)
4. Remove the roller that is not touching the pump hose. (C)
5. Remount the front cover. (B)
6. Turn the rotor with the help of the motor so that the remaining roller is not pressing against the pump hose.
7. Dismount the front cover. (A)
8. Remove the press flange (D) from the pump housing. Be careful not to drop any shim plates.
9. Remove the pump hose to be exchanged.
10. Dismantle the hose connections (Part no. 04163) from both pump hose ends. Inspect and replace if necessary.
11. Clean the interior surfaces of the pump housing.
12. Lubricate the internal surfaces for the pump housing at the contact surfaces for the pump hose with original silicon grease.
13. Check the rollers. Ensure that the roller surfaces are not damaged.
14. Attach the hose connections at both hose ends.
15. Install the pump hose into the pump housing.
16. Fasten the press flange to the pump house. Be sure to install the shim plates.
17. Mount the front cover.
18. Turn the rotor with the help of the motor so that the remaining roller presses against the pump hose.
19. Dismount the front cover.
20. Reattach the second roller with shim plates back onto the rotor.
21. Lubricate the pump hose and the rollers.
22. Attack the front cover to the pump housing.
23. Mount the pipes from both the inlet and outlet.
24. Open all valves.

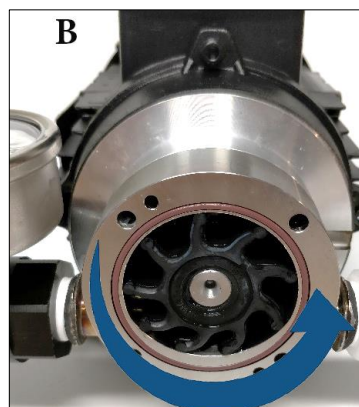


MI6100-0015



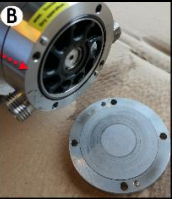


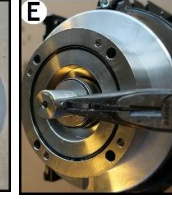


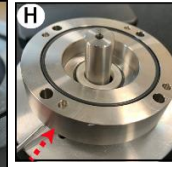
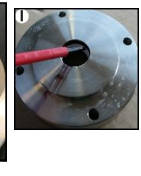

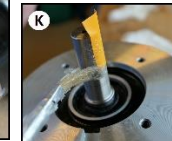
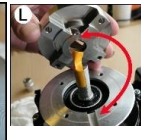

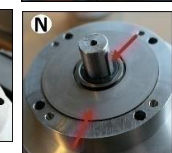

System Type	Water Monitoring System		MI6100-0015
Task:	Pump Impeller Replacement (TYPE B)		
Task description:	This instruction identifies the location and replacement of the Pump Impeller. This replacement must be carried out by a trained technician.		
Difficulty 1-5	Overhaul Interval	Estimated Time Consumption	
	Every 6 month	15 min	
Spare Parts		Tools	
Part no:	Description:	Qty.	Item:
03616	Impeller for pump NBR Ø 55 mm	1	Allen key No. 4
03615	O-Ring for impeller pump NBR 56-2	3	

Instructions**Steps**


1. Unscrew the end cover. (A)
2. Remove old impeller and O-rings without damaging the pump housing.
Note: when the end cover is removed, the pump is not attached to the motor and is only fixed by the impeller and motor shaft.
3. Insert new impeller while rotating it counterclockwise so that the impeller is properly mounted as shown on the photo. (B)
4. Insert new O-rings and refit the end cover.
Note: It's important to align the cylindric taps in the housing and end cover to assemble the pump correctly.
When refitting the cover and screws, be cautious not to push the wear plates out of place.
If this happens the pump will not seal properly.
The wear plates are located in the end cover and in the back part of the pump behind the impeller.

Photos:**Notes:**

MI6100-0016

System Type	Water Monitoring System		MI-G6100-0016
Task:	Mechanical Seal Replacement (TYPE B)		
Description:	This instruction identifies the location and replacement of the Mechanical Seal. The mechanical Seal Replacement must be carried out by a trained technician.		
Difficulty 1-5	Overhaul Interval	Estimated Time Consumption	
	If necessary	30 min	
Spare Parts			Tools
Part no:	Description:	Qty.	Item:
03614	Mechanical seal	1	Allan key no. 4
03617	Wear plate without hole	1	Small screwdriver
03618	Wear plate with punched hole st.s	1	Torque Tools = 8 Nm
Instructions		Photos	
<ol style="list-style-type: none"> 1. Unscrew and remove the front cover, (A) (B) 2. Remove the pump housing. It is not necessary to remove the impeller. (C) 3. Inspect the wear plates. Change it if it requires. (D) 4. Remove the feather key from its seat on the shaft. (E) 5. Remove Spacer disk if it presents. (F) <p>Note: This part is no longer required and shall not be used during reassembly!</p> <ol style="list-style-type: none"> 6. Remove the mechanical seal rotating face: Note that the mechanical seal consists of two parts, a stationary and a rotating part. (G) 7. Remove the rear plate (H), -And push the stationary seal out i.e. using a screwdriver (I) 8. Gently fit the new stationary seal in the rear plate. Apply a light coating of grease to the seat wall of the rear plate. 10. Lightly sand the keyways edges, only to the end of the feather keyhole, & clean it with compressed air or a towel (J) 11. Apply a piece of tape over the entire key seat area to protect the mechanical seal. 12. Apply light coating of grease on the tape and shaft. (K) 13. Remount the rear plate with the stationary seal onto the motor flange. Note the leak channels must fit for both parts (L) 14. Mount the mechanical seal and remove the tape (M) 15. Gently mount the feather key and wear plate (N). 16. Mount pump housing. It is important to align the cylindric taps in the housing and the holes in the pump back plate to assemble the pump correctly. (B) 17. Refit the end cover. (A) Insert the screws and cross fasten with the torque Tools for 8 Nm (O). 		              	
<p>Notes: It is important to align the cylindric taps in the housing and end cover to assemble the pump correctly. If this happens the pump will not seal properly.</p> <p>Spacer disk picture (F) - This part is no longer required and shall not be used during reassembly!</p>			

MI6100-0017


System Type	Water Monitoring System	MI6100-0017
Task:	PAH Chamber Replacement	
Task description:	This instruction identifies the location and replacement of the PAH Chamber. PAH Chamber Replacement must be carried out by a trained technician.	
Difficulty 1-5	Overhaul Interval	Estimated Time Consumption
	When necessary	10 min
Spare Parts		Tools
Part no:	Description:	Qty. Item:
02550	PAH Chamber Kit	1 Allen key 5 mm
		14 mm spanner
		22 mm spanner
		3 Teflon Tape

Instructions**Steps**

1. Turn Valve 3 and Valve 4 to STOP position.
2. To avoid mix-up, note/mark the upper hoses left/right position. The tube for right side is a bit longer (B1+B2).
3. Loosen the 3 hose fittings and unscrew the 4 M6 bolts (B4).
4. Unscrew the short hose connecting Valve 3 to the PAH chamber. Keep the nuts and compression rings (B3+B5). Remove the PAH chamber.
5. Unscrew and remove old gasket from the thread of the 2 upper fittings from the used PAH chamber (B1+B2). Note: Leave the nut and ring on the hose. Apply Teflon tape (D) to the thread of the 2 elbow fittings and screw them into the new PAH chamber. Note orientation (B2).
6. Insert the 4 black supports into the back of the new PAH Chamber (C1).
7. Insert the 2 new O-rings in the new PAH chamber in the upper 2 grooves (E).
8. Use Teflon tape (D) to the metal fitting (A3) and screw it into the bottom of the new PAH chamber.
9. Adjust length of the new hose to match the old hose (F1).
10. Onto the new hose, insert nut, stiffener tube and compression ring in this order. Then tighten the hose to the metal fitting (A3 + F2).
11. Install the new PAH chamber. Fasten the bottom.
12. Remember to insert the PAH chamber bushing in the PAH measuring chamber (G).

Photos:**Notes:**

MI6100-0021

System Type	Water Monitoring System		MI6100-0021
Task:	Pump Type B version 2 Replacement		
Task description:	This instruction identifies the replacement of the Pump Type B. Pump Type B replacement must be carried out by a skilled technician.		
Difficulty 1-5	Overhaul Interval	Estimated Time Consumption	
			20 - 30 min
Spare Parts			Tools
Part no:	Description:	Qty.	Item:
03613	Pump Type B version 2	1	

Instructions

Note: To avoid damage, it is important to follow the instructions in this guide, during pump replacement.

Make sure the power supply is **Off** prior to replacing the pump.

Tools to be used:

- Hose cutter or knife
- Small screwdriver
- Allen key
- Spanner 13, 19 & 24 mm

A. Disassembly of the existing Pump

1. Disconnect Pump Wires - Illustration 1.
2. Loosen Fitting Unions - Illustration 2.
3. Loosen the left bolt & **completely unscrewed & remove right bolt in Strainer** - Illustration 3.
4. Lift PTFE tube carefully without bending it - Illustration 4.
5. **Loosen bolts for the pump & make sure to support the pump by hand** and keep pump straight to the backplate to avoid damage of pump socket - Illustration 5.
6. Lift pump from Fitting Union & remove the pump.

Photos:

Illustration 1



Illustration 2



Illustration 3



Illustration 4



Illustration 5

B. Assembly of the new Pump

7. Lift the new pump & ensure below fitting connect in T-piece connection approx. 4 mm from hose end to bottom of the fitting - Illustration 6 & 7.
8. Install 1 bolt in the pump, wait to fasten it until step 11 is done - illustration 6.
9. Adapt the PTFE tube 12/10 mm before mounting. It is recommended that PTFE tube must be **min 4 mm** deep in the fitting - illustration 7.
10. Mount the below Fitting Union.
Attention: It is important to hold the tube and fitting straight - no twisting, while fasten fitting - illustration 8.
Mount the Fitting Union (T piece) - Illustration 9.
11. Screw 1 left bolt & 1 right bolt in the Strainer - illustration 9.
12. Install other 3 bolts in the pump & fasten them all.
13. Connect Pump wires - according to wiring diagram - illustration 10. The replacement of the Pump Type B version 2 is done.
14. For instruction of pump starts up, refer to section 5.4, 8.1.3 & 9.4 in this manual.



Illustration 6

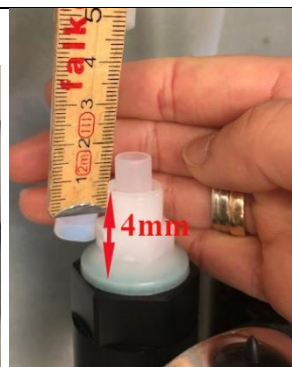


Illustration 7

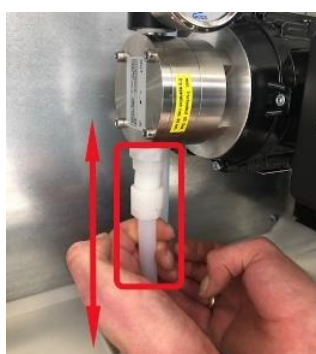


Illustration 8



Illustration 9




Illustration 10



Notes:

MI6100-0022

System Type	Water Monitoring System		MI6100-0022
Task:	Pump type B – mechanical seals & leakage check		
Task description:	This instruction identifies the mechanical seals & leakage of the Pump Type B. This task must be carried out by a skilled technician.		
Difficulty 1-5	Overhaul Interval		Estimated Time Consumption
	Weekly		15 min
Part no:	Description:	Qty.	Item:
03613	Pump - TYPE B Version 2	1	

Signs of acceptable leakage

If there is a coating of salt around the seal area on the rear cover of the pump with no visible leakage this is acceptable – illustration 1-2.

It is recommended to flush this area with clean tap water when a coating of salt is present – illustration 3.

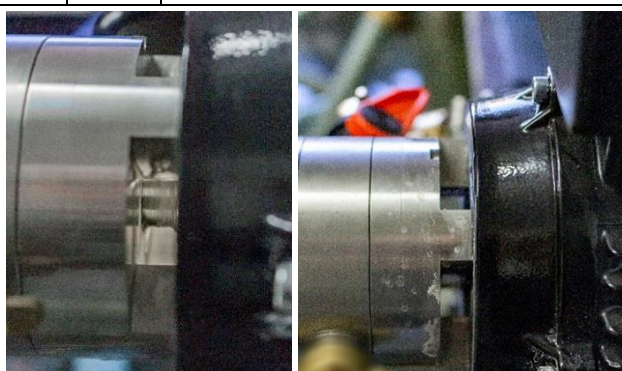


Illustration 1

Illustration 2

Signs of unacceptable leakage / seal failure - illustration 4.

If there is a coating of salt around the seal area on the rear cover of the pump with **no visible leakage but bridging has occurred** (salt extending along the shaft towards the motor), the unit must be shut-off immediately and a new mechanical seal must be installed in the pump - refer to MI6100-0016.

If there is a coating of salt around the seal area on the rear cover of the pump with **visible leakage but bridging has occurred** (salt extending along the shaft towards the motor), the unit must be shut-off immediately and a new mechanical seal must be installed in the pump - refer to MI6100-0016.



Illustration 3

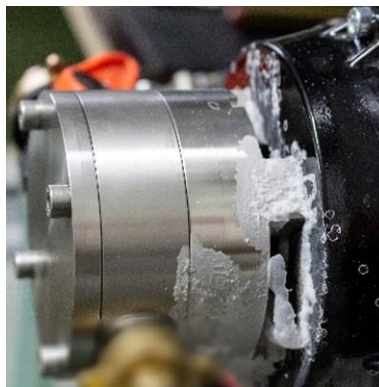


Illustration 4

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