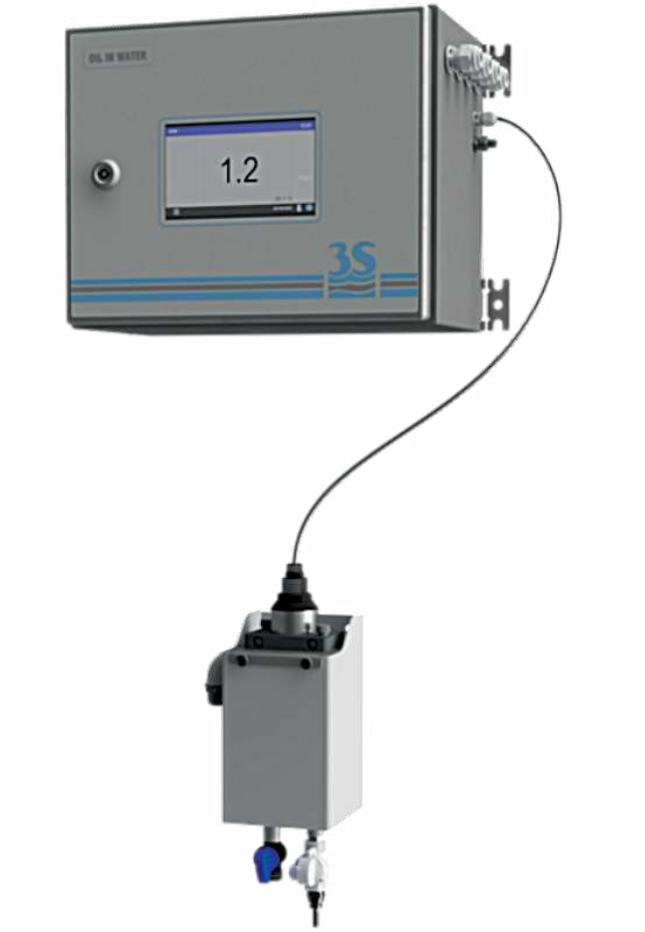
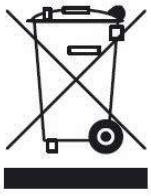
USER MANUAL



3S-PC1000

Probe controller with color touchscreen

3S Analyzers S.r.l. Italy www.3s-analyzers.eu October 2021



Electrical equipment marked with this symbol can not be disposed of through home or public waste disposal systems after 12 August 2005. In accordance with local and national European regulations (EU Directive 2002/96 / EC), users must return the equipment which is unsuccessful or can no longer be used to the manufacturer, which have to provide free of charge disposal.
Note: To return devices at the end of their useful life, accessories supplied by the manufacturer and all auxiliary items for recycling, contact the manufacturer or the vendor of the device to arrange proper disposal.

INDEX

1 - SAFETY INFORMATION

1.1 Warnings and safety information

Before installing and operating the analyzer, read this manual thoroughly. Please pay particular attention to all the labels applied to the analyser and to all the hazard information indicators in this manual.

This symbol indicates that you must refer to this manual for proper use of the equipment. Only qualified operators, properly trained on the use and maintenance of the analyzer can carry out service activities on the equipment.

This symbol indicates the existence of a risk of electric shock and/or electrocution.
Only operators qualified for these activities can perform maintenance and control operations on the equipment bearing this label, always after unplugging it.

Parts involved:
- input terminal block in the transmitter enclosure

The manufacturer shall not be held responsible under any circumstances for improper use of the equipment.
The head of department and the machine operator must comply with the following rules and with the provisions of current legislation on the safety and health of workers.
The use, maintenance, and repair of the instument are permitted only to persons authorised for such operations. These operators must be physically and mentally capable to perform such activities, which can not be performed under the influence of alcohol and drugs.
When the instrument is not being used it must be protected from voluntary or involuntary activation, after disconnecting the power supply.
Failure to follow the instructions given and/or failure to pay attention to the hazard indicators may cause serious risks of physical damage to operators and breaks or malfunctioning of the analyzer.
All the components of the instrument are placed within a panel closed by a door with a special key, supplied only to maintenance operators.
The instrument must then be used under operating conditions with the door closed.

2 - GENERAL INFORMATION

2.1 Technical specifications

Measure principle	Various sensors available: hydrocarbons/oil-in-water, PAH/ PAC, BTEX, CODeq, TOCeq
Number of channels (probes)	2
Analysis frequency	Continuous.
Power supply	110-230 VAC, 50/60 Hz, 80 VA
Temperature	5 - 45°C (41 - 113 °F)
Humidity	Max 85% RH
Case	Epoxy-coated stainless steel
Protection grade	IP65 (indoor only)
Mounting	Wall or rack mounting, in vertical position with fixing hinges
Dimensions	300 x 380 x 210 mm (11.8 x 14.8 x 8.3 in)
Weight	Approx. 10 Kg (22 lbs)
Output signals	Analog: 4-20 mA analog output Digital: ModBUS via Ethernet
Alarms	n. 4 NO relays for fault conditions and measure alarm
Datalogger	Integrated, with USB storage and download

2.2 Instrument description

The 3S-PC1000 is a controller/transmitter for 3S Analyzers online sensors. The controller is capable of managing up to two different sensors at a time. Each sensor has a dedicated analog output (4 - 20 mA) and two dedicated relays for fault conditions and high value alarm. Many different sensors are available, hydrocarbons/oil-in-water, BTEX, PAH/PAC, CODeq, TOCeq, BODeq, turbidity. The wide color touchscreen shows the measured values clearly. The design is compact and robust, the stainless steel case offer great protection against harsh industrial conditions. The features are completed by the elegant look, that makes the instrument a valuable laboratory accessory as well.

2.3 Applications

The instrument can be used to monitor the concentration of various parameters in aqueous samples and it finds application in civilian and industrial wastewater control, oil industry, hydrocarbons transport and storage and every other application that requires a fast and sensitive determination of possible pollutants.

2.4 Components description

All the electronic components are placed in a stainless steel enclosure to provide protection from the harsh conditions usually found in industrial environments, such as humidity and dust.

In the enclosure you can find the motherboard connecting together the power supply, the main microprocessor and the peripheral components. A series of terminals is available for user connections to inputs and outputs, see section 3.8 for explanations on the user terminal. Human-machine interface is provided by a touchscreen display installed on the front panel. A basic knowledge of the graphical interface is needed to operate and configure the analyzer. See chapter 4 for instructions on how to use the graphical interface.

The instrument needs at least one probe connected to it to work. Probes are to be purchased separately.

The probe can be installed in close proximity to the transmitter, preferably in the recirculating sample reservoir with probe holder (cod. A46U10020, to be purchased separately). Probes can also be installed directly in the sample reservoir with an appropriate support.

3 - INSTALLATION

3.1 Opening the package

Caution:
please take all the precautions required for handling and lifting the box containing the controller, the instrument weight is about 10 Kg (22 lbs).

For safety reasons, when removing the packaging of the equipment, please check for any visible defects and, if necessary, inform the supplier.

Parts inside the package apart from the user manual:

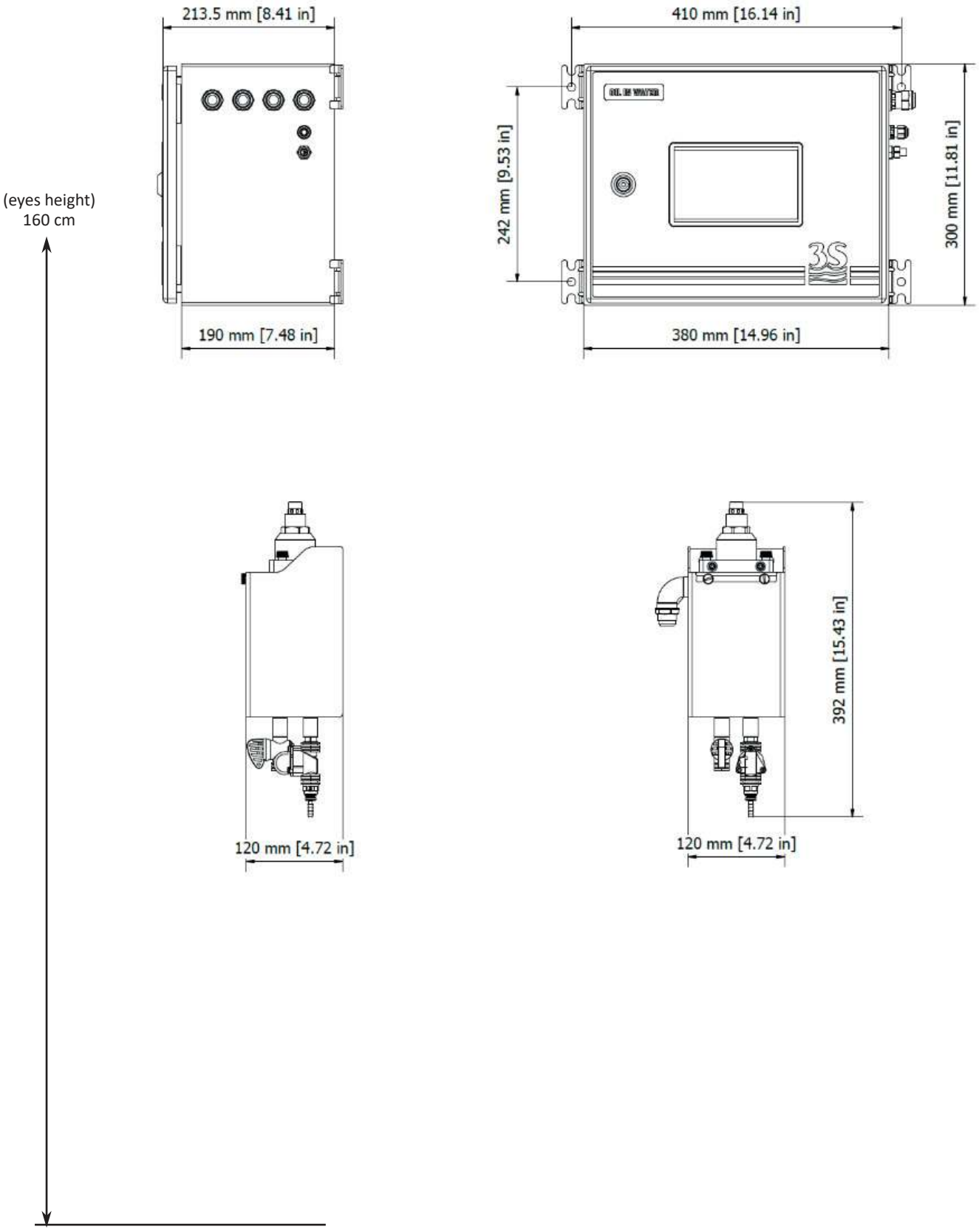
A	3S-PC1000 Probe controller with color touchscreen
B	Key of the instrument

3.2 Product code

The product code is an alphanumeric code that identify your 3S Analyzers product and its configuration. For the analyzer described in this manual the code is composed as follows:

3S-PC1000

3.3 Wall mounting dimensions

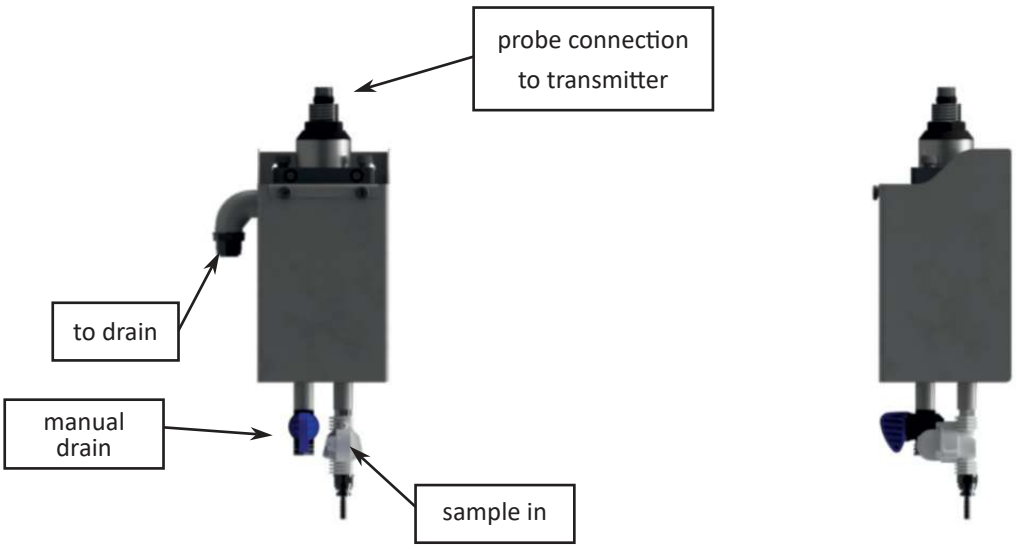


Recirculating sample reservoir cod. A46U10020 and probe are included in the scheme as a reference. Both items are to be purchased separately.

3.4 Mounting the instrument

The controller and the sample reservoir must be mounted vertically on a wall or support suitable for their weight and not subject to vibrations. Use suitable screws (not included in the supply) and fasten them only on the side brackets (ear clips) of the instrument and in the holes of the tank metal plate. Mount them so as to get the display at eye height (160 cm, 63 in).

Since the probe connections and flow sensor connectors are on the right side of the analyzer, install sample reservoir underneath the analyzer, in a way that is reachable from the right side. Please, also consider that the surrounding space must allow easy opening of the analyzer door and easy access to the sample reservoir for cleaning or mantainance.A minimum distance of 10 cm is required between the sides of the instrument and any other obstacle.

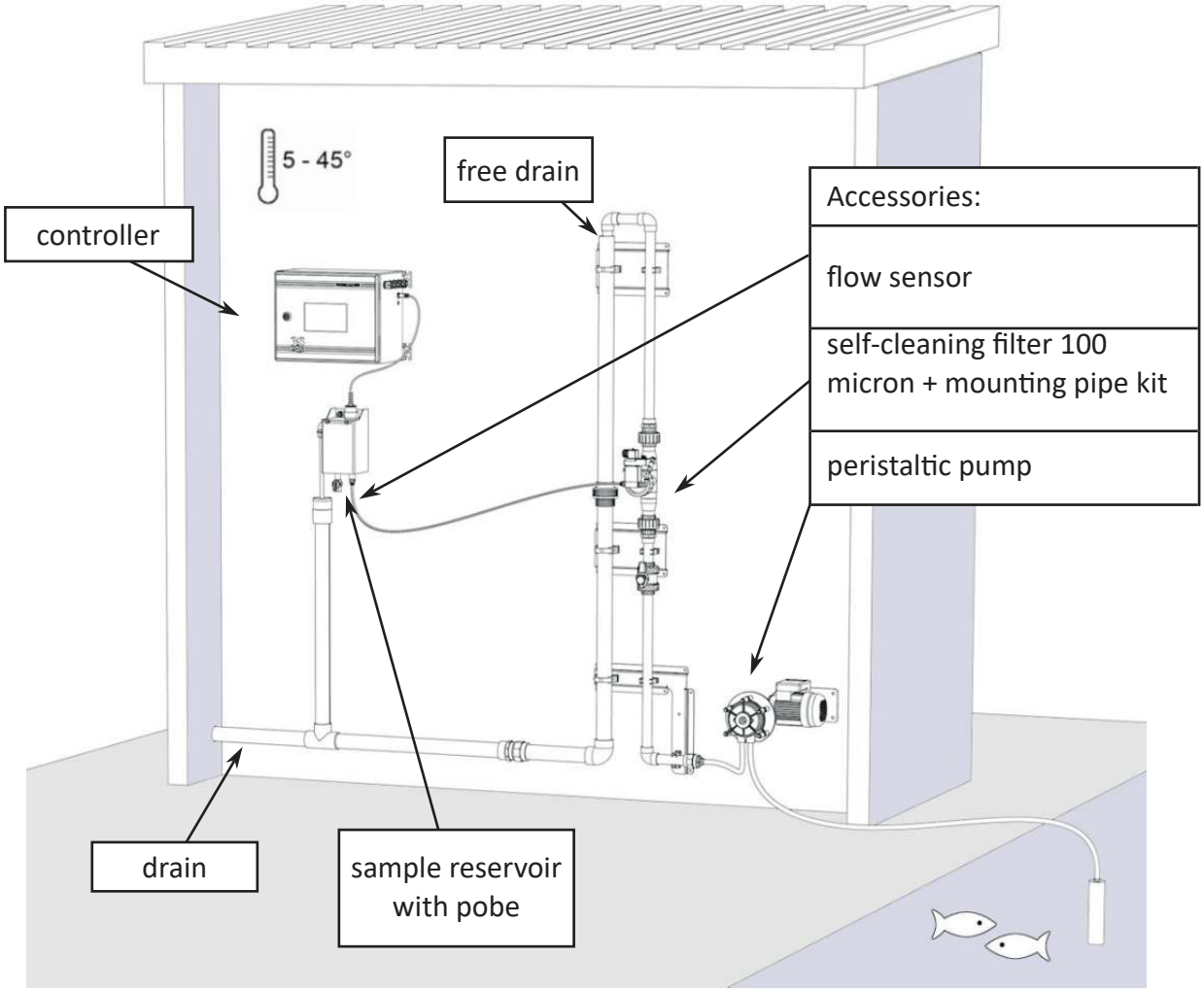


The sample reservoir can be mounted preferably under the instrument. The sample line must be connected to the inlet below the container, optionally a flow sensor can be installed on the same line to detect the presence of the sample.

The reservoir has a side arm to drain the excess liquid and to maintain a constant sample flow. The side arm must be connected to the drain.

When the container is installed in a proper position the probe can be inserted into its slot and secured with the clamp.
Finally, attach the probe connector to the analyzer.

3.5 Example of installation



In the example, a large sample quantity is sucked by a peristaltic pump from an underlying head and sent to a self-cleaning filter.

The filtration unit shape allows a small pressure to build-up, pushing the sample through the filter mesh, the unfiltered sample portion is drained. Part of the sample flow passes through the filter (10 - 500 microns) and recirculates inside the sample reservoir before being drained as well.

The analyzer's probe performs the measurements, according to the analysis timing set, directly in the sample reservoir. The sample is continuously renewed inside the reservoir by the flow coming from the filter.

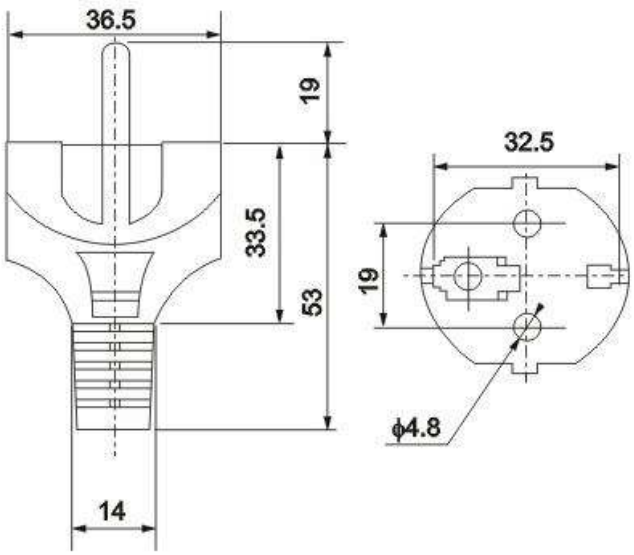
A flow sensor can be installed on the sample line underneath the reservoir to detect the presence of the sample flow and to prevent data acquisition until the flow returns to normal. The sensor must be plugged in the connector on the right side of the analyzer.

The sample line from the tank may need heat tracing to prevent occlusion due to negative temperatures.

The installer shall implement a drain line, which, however, shall not create a backpressure to the free drain of the recirculation tank.

3.6 Power supply connection

The electrical power is supplied by the analyzer's cable, 2.5 m length with a CEE7/7 SCHUKO Europe plug



The analyzer, in accordance with CEI EN 61010-1 standard on electrical safety, has passed the following factory safety tests:

-continuity test
-protective earth test
-insulation resist test
-high voltage test AC
-leakage current test

In addition to the tests carried out by the manufacturer, the installer shall:
- make sure that the power cord was not damaged when the packaging was removed or when the instrument was fixed by the installer;
- check the condition of the earthing conductor of the socket where the power cord will be connected;
- provide adequate protection against overloads and over-voltages in the line where the power cord of the device will be connected;
- check for compliance of the power line with any applicable safety standards.

3.7 Signal connection to the data acquisition system

To connect the signals and the contacts to the acquisition system, proceed as follows:

- use up to 2 cables with a maximum diameter (insulation included) of 12 mm;

- pass the cables into the two free PG13.5 cable glands on the top right side of the instrument;

- a hole with a diameter of 30 mm on the top wall (to the left of the cable glands) can be used as an alternative to the 2 PG13.5 cable glands for a larger size cable gland (not supplied);

- remove the electrical insulator from each wire and place it into the terminal making up the terminal block on the top of the instrument. Use a screwdriver with a 3 mm cutting width and make sure that the wire is secured inside the terminal;

- make sure that the cable glands are perfectly sealed to prevent dust and moisture infiltration;

Please refer to the connection diagram below.

TERMINAL	CONNECTION	NOTES
1 2	N.C. N.C.	Not connected.
3 4	- 4 - 20 mA analog signal CH2 + 4 - 20 mA analog signal CH2	Max impedence 500 Ω protected by 50 mA Fuse
5 6	- 4 - 20 mA analog signal CH1 + 4 - 20 mA analog signal CH1	
7 8 9	COMS RELAYS A FAULT A WARNING A	Normally open (NO). Max load 5 A 250VAC SPDT or powered 24 VDC (jumpers setting)
10 11 12	FAULT B WARNING B COMS RELAYS B	

Unplug the power cord before operating!

3.8 Remote Input

Using this connection the user can remotely control some of the analyzer functions. These contacts works as a SPDT switch and expect a voltage free connection. Associated functions can be programmed from the graphical user interface (not available in version 1.0).

3.9 Analog output

The analyzer has two analog outputs representing the current value measured by two different probes. The output is a 4 - 20 mA active current loop (actively supplied by the analyzer itself). Connect the wires coming from you current reader/receiver/DCS system to the panel paying attention to the appropriate polarity. Analog outputs can be simulated for testing purposes, see Section 4.4.

3.10 Relays

Each of the four relays is configured as Normally Closed (NO). Normally the relay is OFF and the contact is open, while when the relay turns ON for an alarm condition the contact closes.
In the case of missing power, analyzer OFF, the contact is open.
Every channel (probe) has two relays associated with it. The two relays, named FAULT and WARNING, behave as follows:

FAULT	The relay will activate when the probe encounters a fault condition. When a fault occours the analyzer needs user intervention to proceed.
WARNING	The relay will activate when a non-critical condition is encountered. For example when the measured value exceeds a predefined threshold or when the sample is missing.

3.11 Connecting sample flow sensor

A flow sensor can be attached to the analyzer to acknowledge the presence of the sample. The flow sensor must be inserted on the sample line, before the sample ricirculating tank.
If the sample needed for the analysis is missing, the analyzer will put itself in standby. When the sample is present again the flow sensor send a signal to the instrument and online analyses are restarted automatically, without needing any external intervention.
The flow sensor is connected to the analyzer by a wire with a connector that must be plugged in a socket on the right side of the analyzer.
The socket is identified by a label:

FLOW SENSOR

3.12 ModBUS connection parameters

The instrument has a ModBUS/Ethernet interface for the transmission of measurement data and fault/warning conditions. Connect your data line to the RJ45 socket on th back of the display.
Configure your network using the following parameters:

IP	user defined
Port	502
Analyzer ID (slave, node number)	XXX

XXX = the last two digits of the serial number, 00 = 100
(i.e. s/n PC-1000-245 = ID 45, s/n PC-1000-400 = ID 100)

IP address and node number can be changed from the user interface. See Section 4.7.

The following register addresses are available:

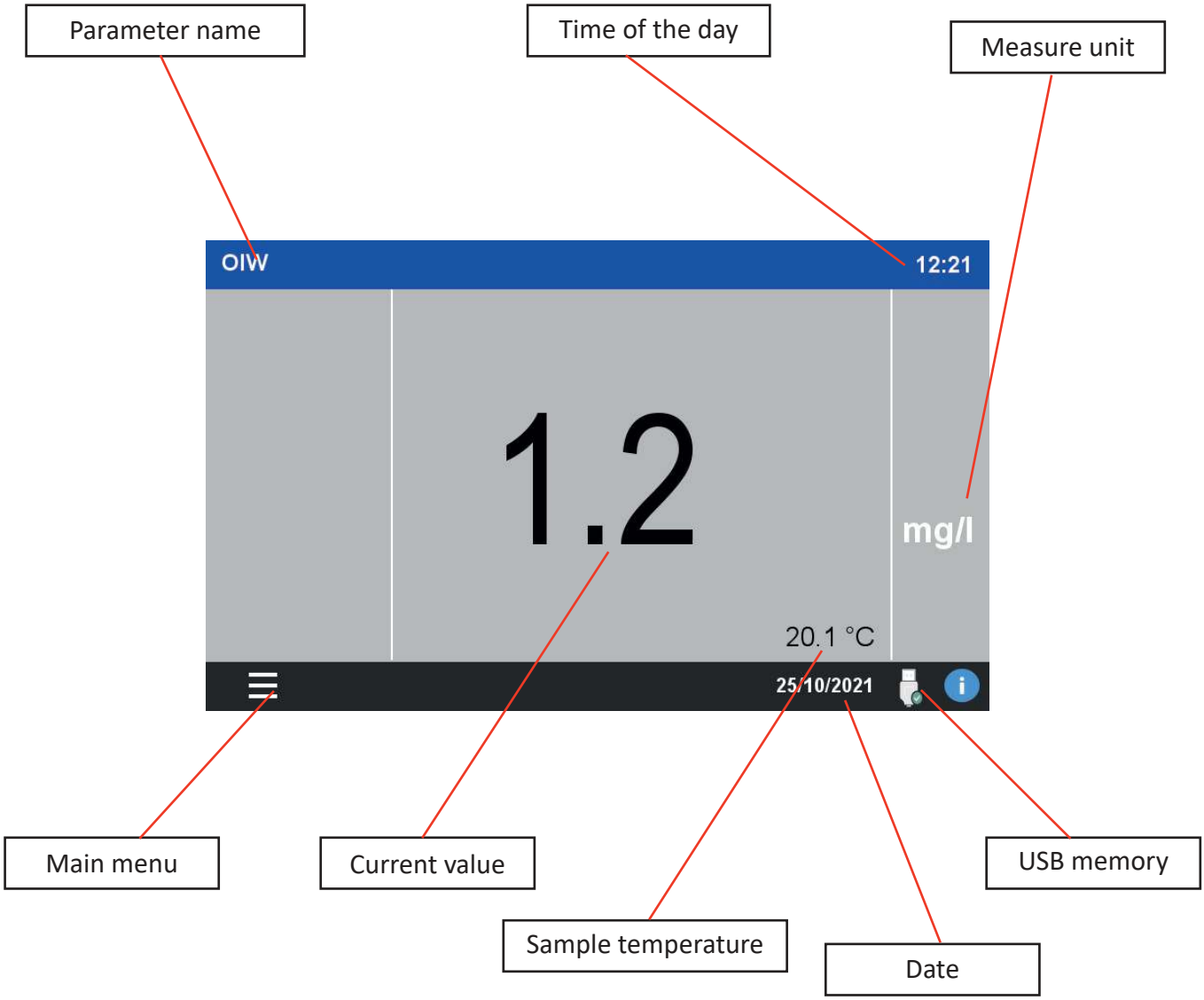
Address	Format	Alias
800	bit	Warning A
801	bit	Fault A
802	bit	Warning B
803	bit	Fault B
900	32 bit float (CD-AB)	Result A
902	32 bit float (CD-AB)	Temperature A
904	32 bit float (CD-AB)	Result B
906	32 bit float (CD-AB)	Temperature B
910	ASCII (6 words)	Parameter name A
916	ASCII (2 words)	Unit A
920	ASCII (6 words)	Parameter name B
926	ASCII (2 words)	Unit B

4 - USER INTERFACE

4.1 Power on

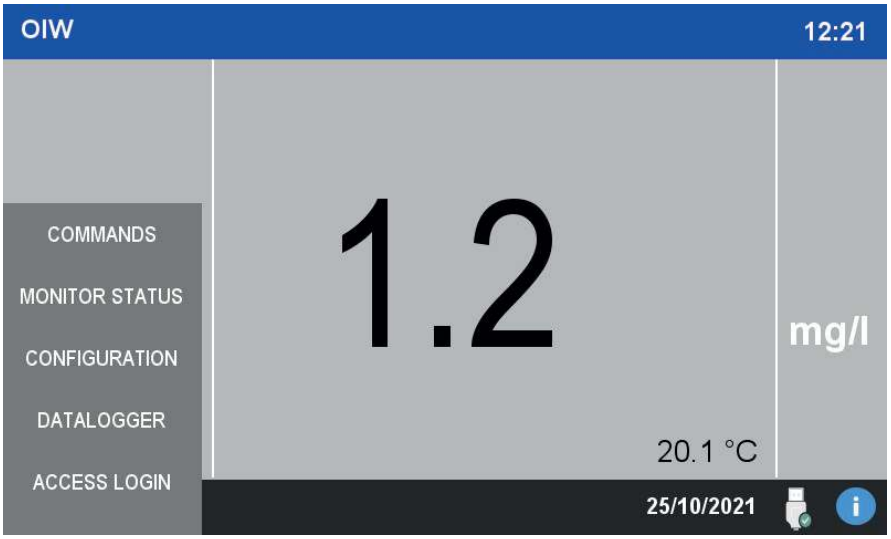
After a proper connections to the power mains is established, the user can turn the device on through the switch located inside the upper compartment.
The analyzer display takes a few seconds to turn on, during which a splash screen appears followed by the main screen.

You will se the following main page:



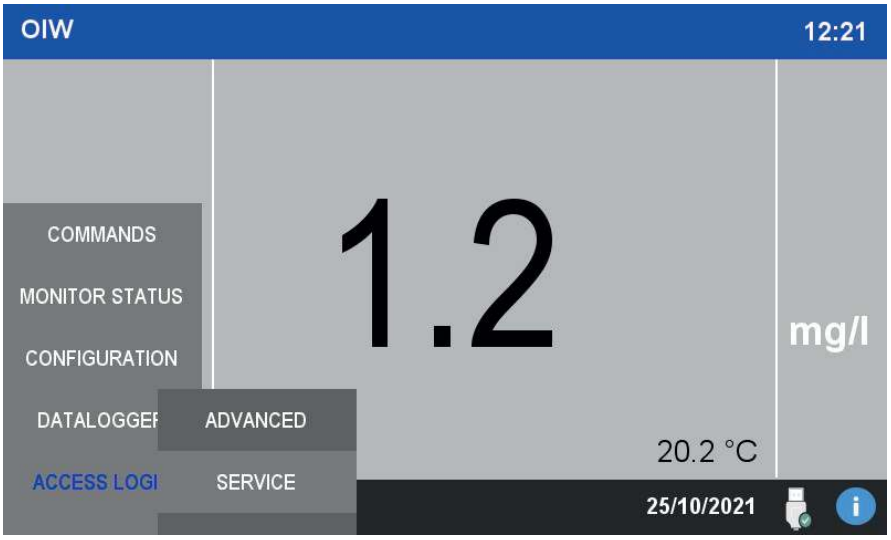
4.2 Main menu

Press on the MAIN MENU symbol to access all the analyzer functions. A brief description of the graphical user interface will follow in the next paragraphs.



4.3 Access Login

The analyzer has two levels of security, each level allows access to more advanced functions.



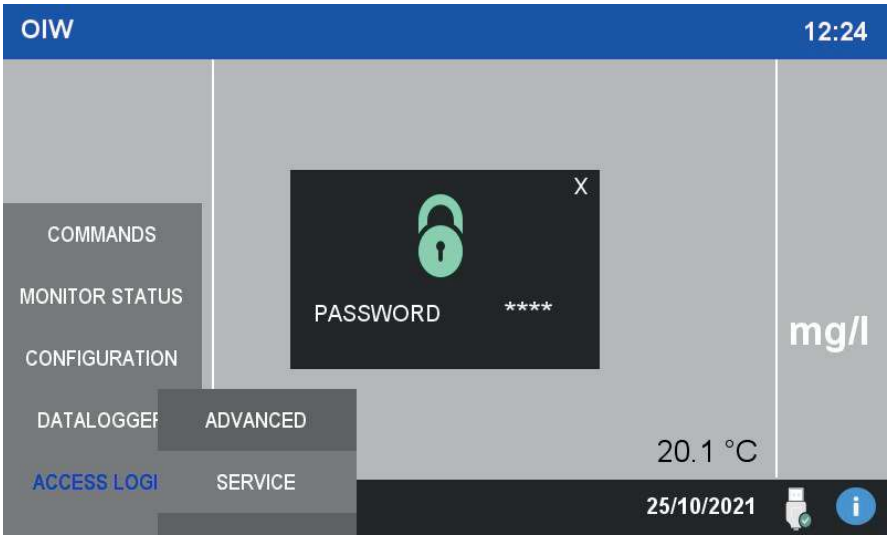
The two levels are:

ADVANCED	This level allows the user to perform calibrations and modify basic settings. The password for this level is **1111**
SERVICE	This level allows the user to perform calibrations and modify any settings. Operate cautiously when logged in with this password.

Contact the 3S Analyzers technical service or your local supplier to receive the service password for your analyzer. You can write it down below.

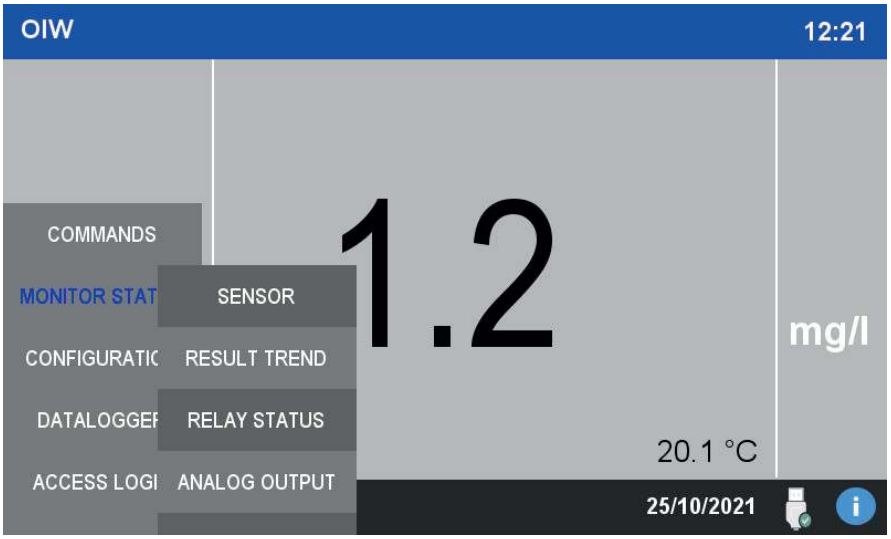
SERVICE PASSWORD _____

To access the analyzer menu with the required security level, tap on ACCESS LOGIN in the main menu, then choose between the three level options. A new window will appear, press on **** to display the numerical pad and enter your password. If the operation is successfull you will see the lock turn green.



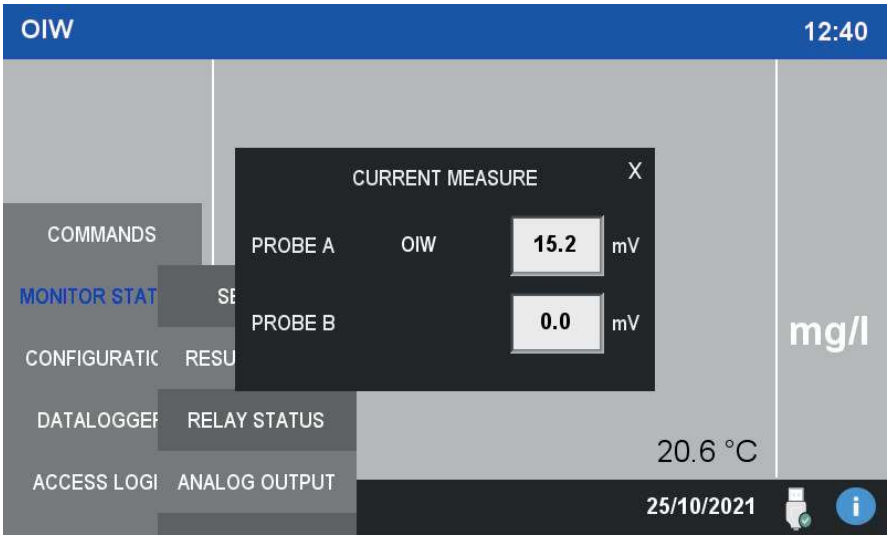
4.4 Monitor status

In the MONITOR STATUS menu the user can obtain informations about the current sensor readings and the status of the digital and analog outputs.



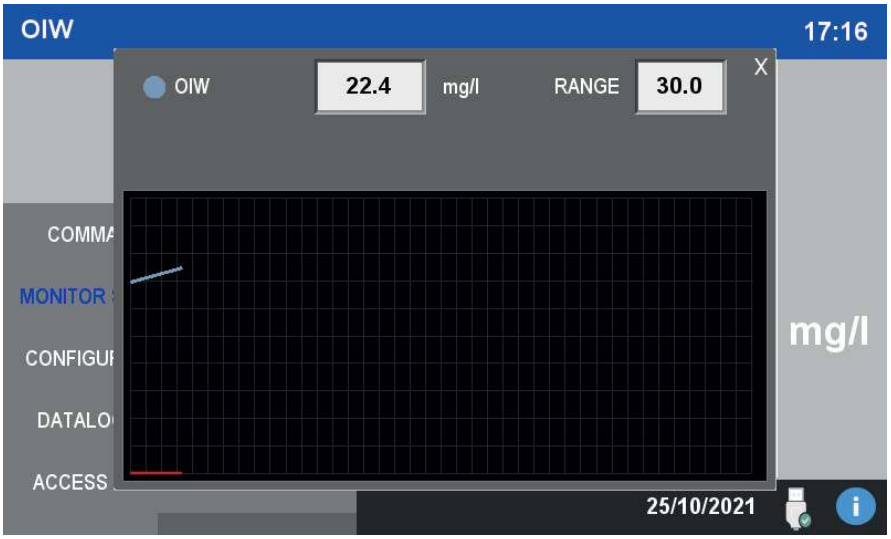
Sensor

By pressing this button the analyzer will show the sensor reading in mV. It is useful for servicing the analyzer and troubleshooting, but it's also neccessay when performing a calibration.



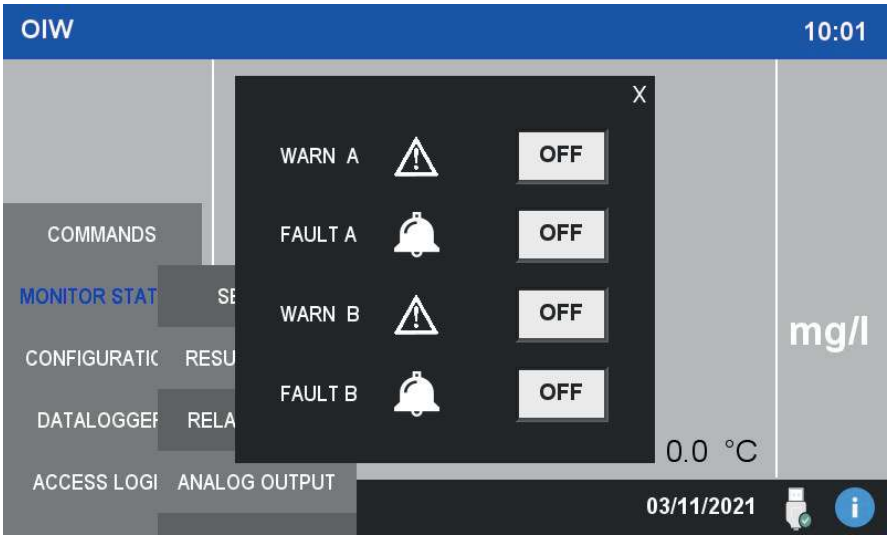
Result trend

The user can view the last set of data in graphical form. The current value and the maximum range of the analyzer are displayed. Every vertical division is 1/10th of the full scale, every horizontal division is 10 minutes.



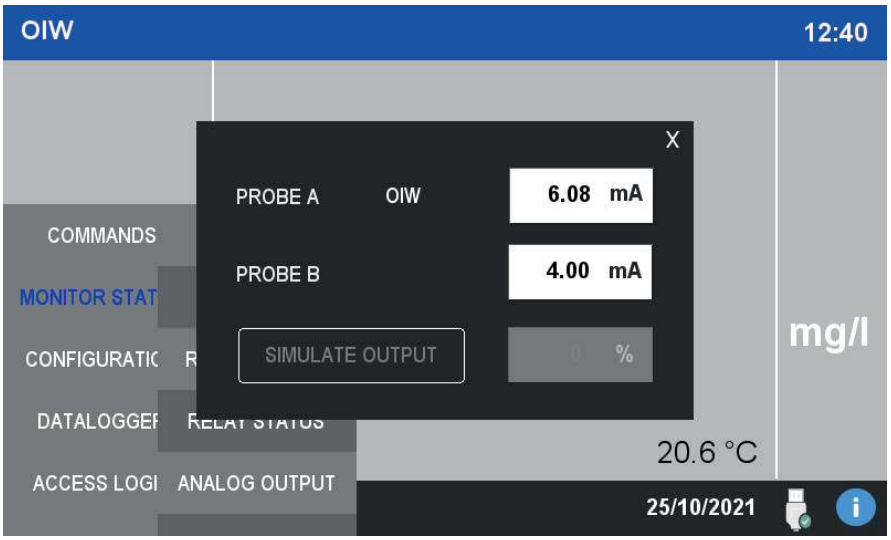
Relay status

The status of the two relays is shown in a window. Relay A can be linked to an internal alarm of the analyzer. See section 3.11 for a list of options.

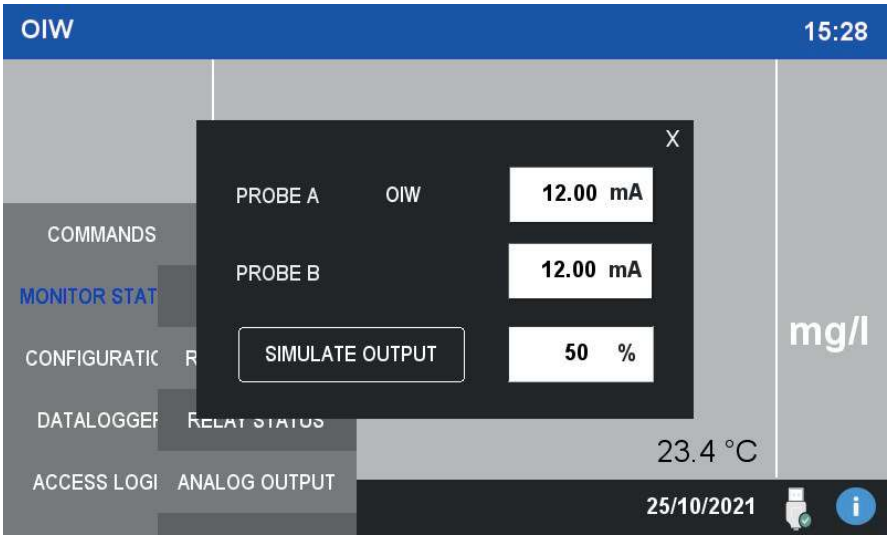


Analog output

The analyzer has an analog output representing the current measure value. The output is a 4-20 mA active current loop (actively supplied by the analyzer itself).
The current value of the analog output in mA is shown in this window.

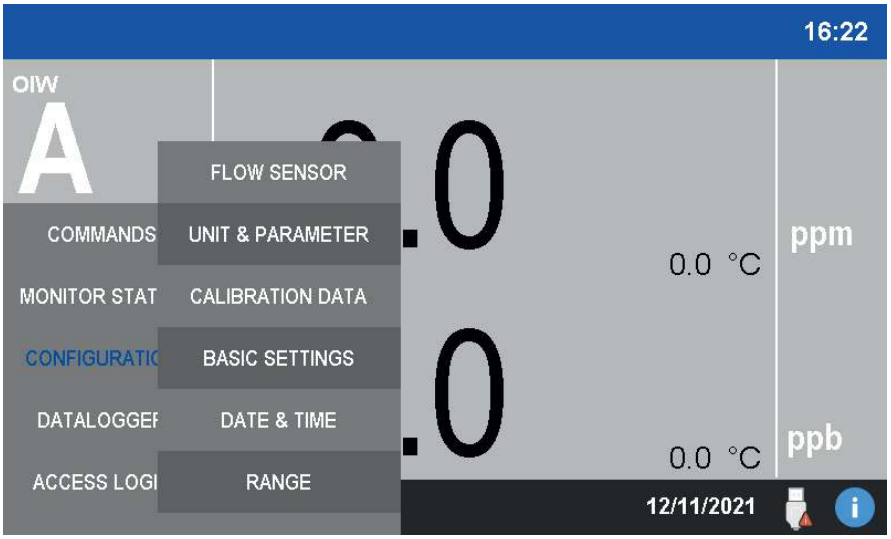


From this window the user can also simulate the analog output by inserting an arbitrary value in the SIMULATE OUTPUT field. This is useful for troubleshooting or mantainace purpose.



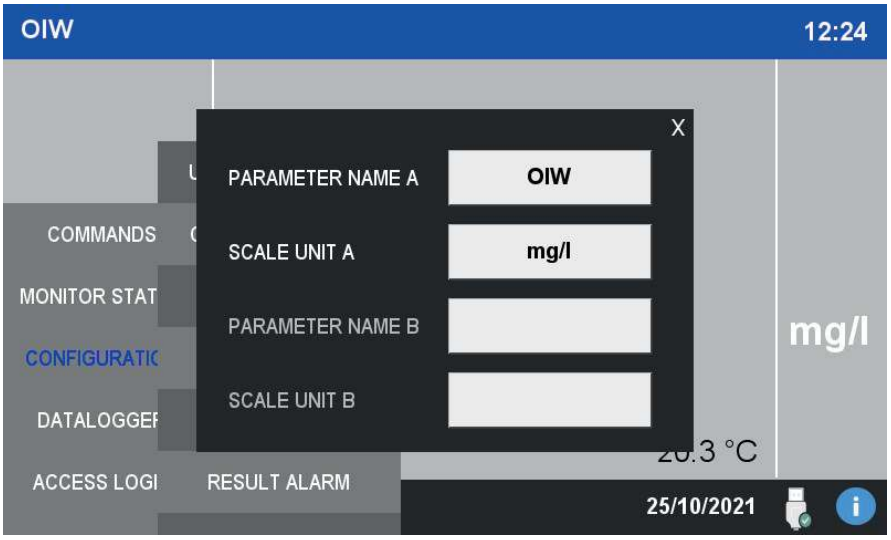
4.5 Configuration

This menu contains the main configurations of the analyzer as weel as the calibration curve



Unit & parameter

The measure unit together with the parameter name can be modified by accessing this menu.



Calibration data

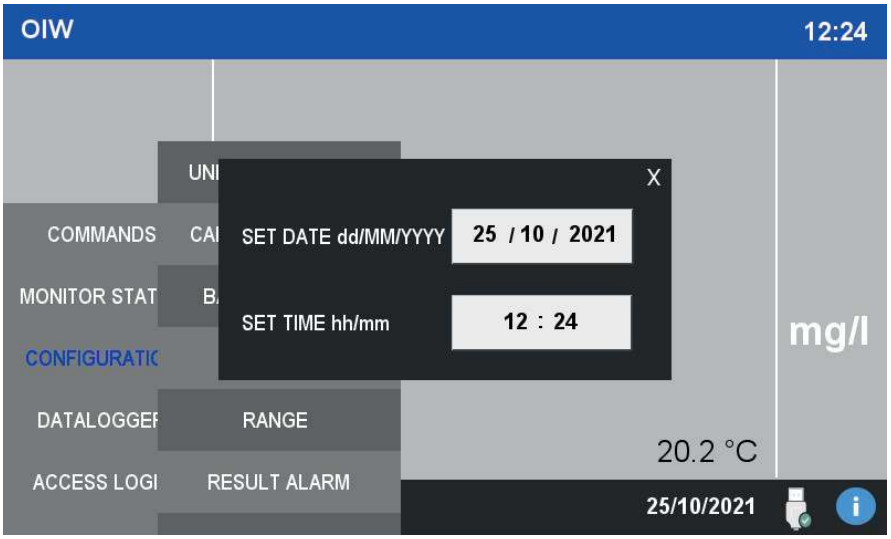
In this window the user can see or modify the current caliibration curve. See the next chapter for more informations.

Basic settings

In this window the user can modify various configurations.

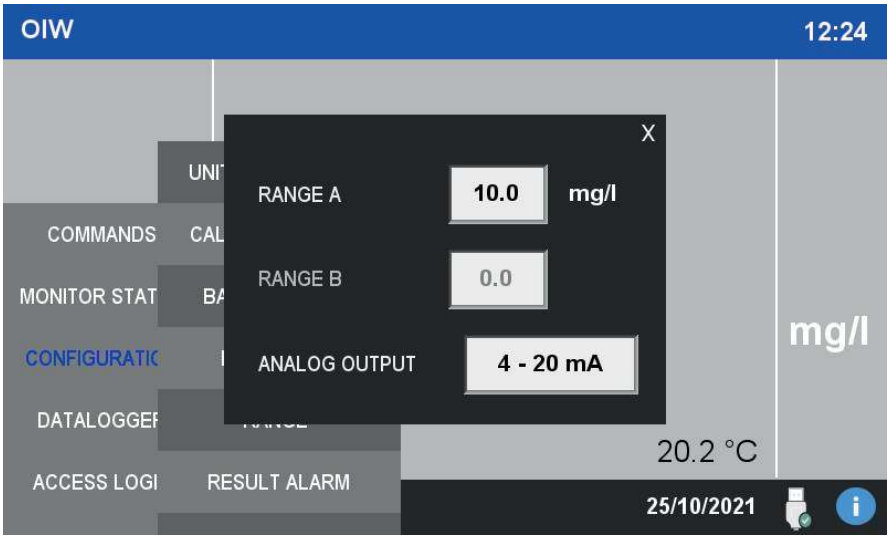
Date & time

The current date and time can be set in this window.



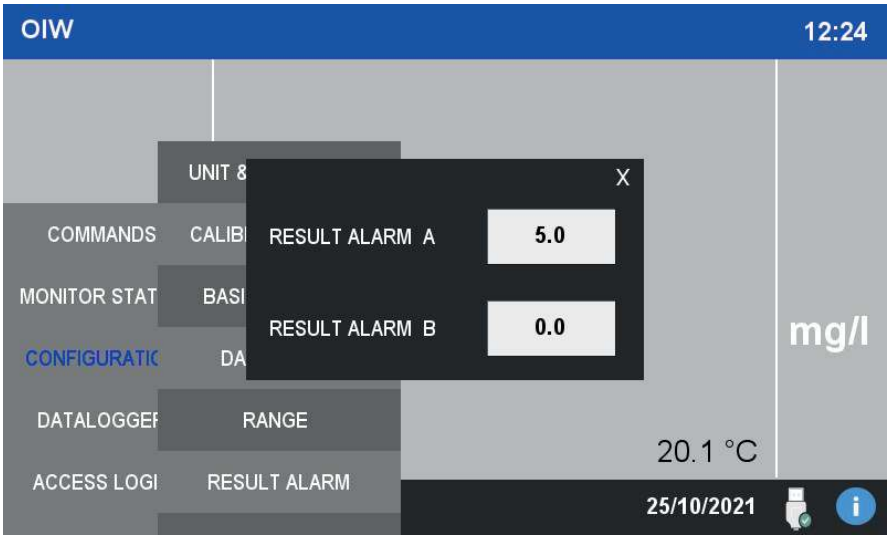
Range

In this menu you can set the range of the analyzer probe as well as the range of the analog output (0-20 mA or 4-20 mA)



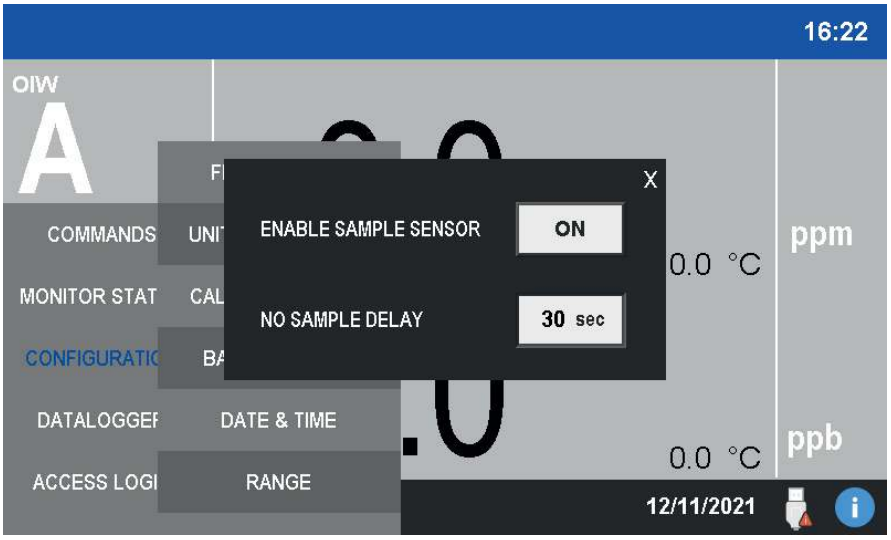
Result alarm

The threshold of the result alarm can be set in this menu. When the measured value is above this limit a visual warning will appear on the display and, if selected as option, the warning relay will turn on.



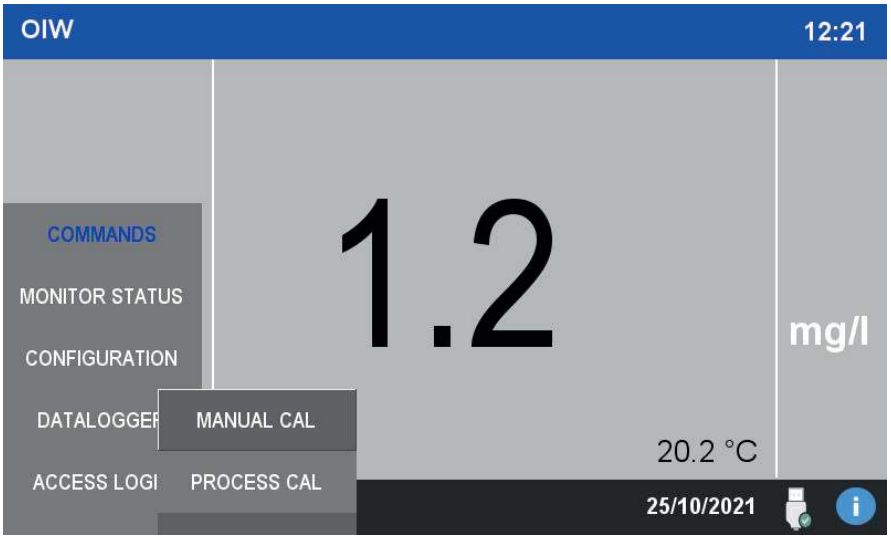
Flow sensor

In this window the user can set the options for the sample sensing feature. A pulse flow sensor must be attached to the instrument as explained in Section 3.11.



4.6 Commands

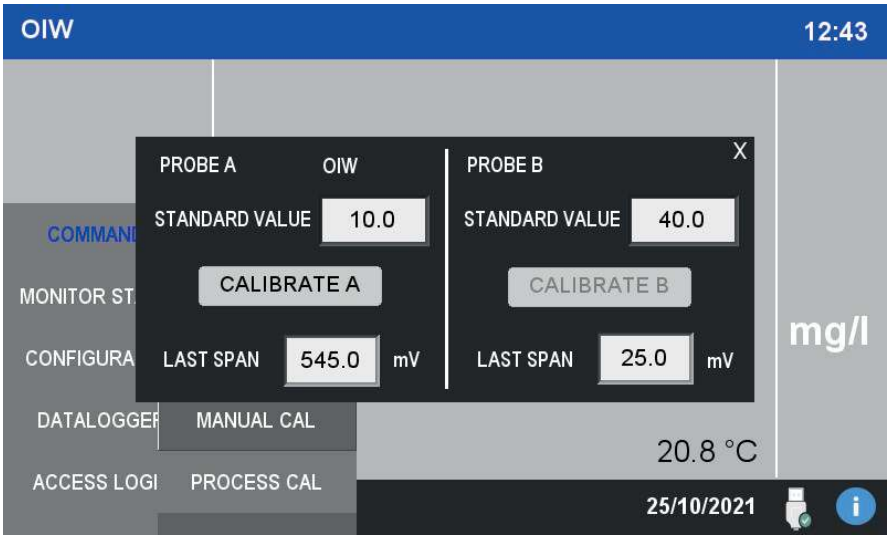
The COMMANDS menu contains the two commands to perform the calibrations. Both MANUAL CAL and PROCESS CAL will be discussed in details in the next chapter.



The COMMANDS menu contains the two commands to perform the calibrations. Both MANUAL CAL and PROCESS CAL will be discussed in details in the next chapter.

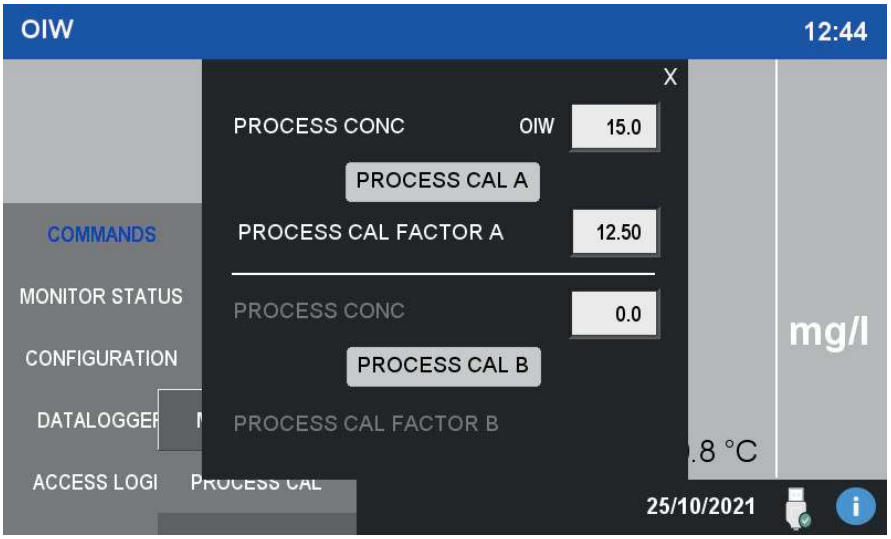
Manual cal

This page allows the user to perform the standardization of the calibration curve.



Process cal

The process cal applies a response factor to the final measurement of the instrument. In this way a calibration curve made with a standard solution can be aligned to the laboratory value.



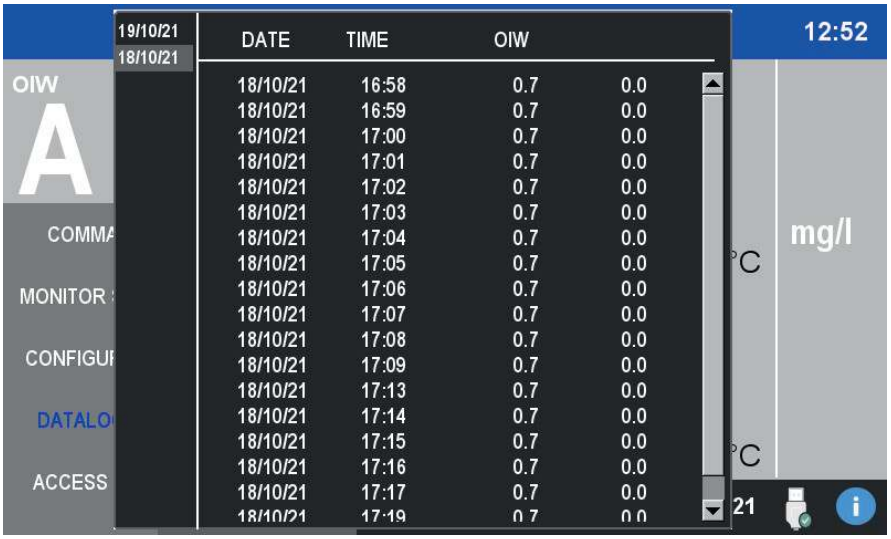
4.7 Datalogger

The instrument is provided with an internal datalogger. The datalogger records the analysis value every 10 minutes. A maximum of one month of measurements can be stored in the datalogger, after that time the new values will overwrite the previous ones with a first-in-first-out logic

Result log

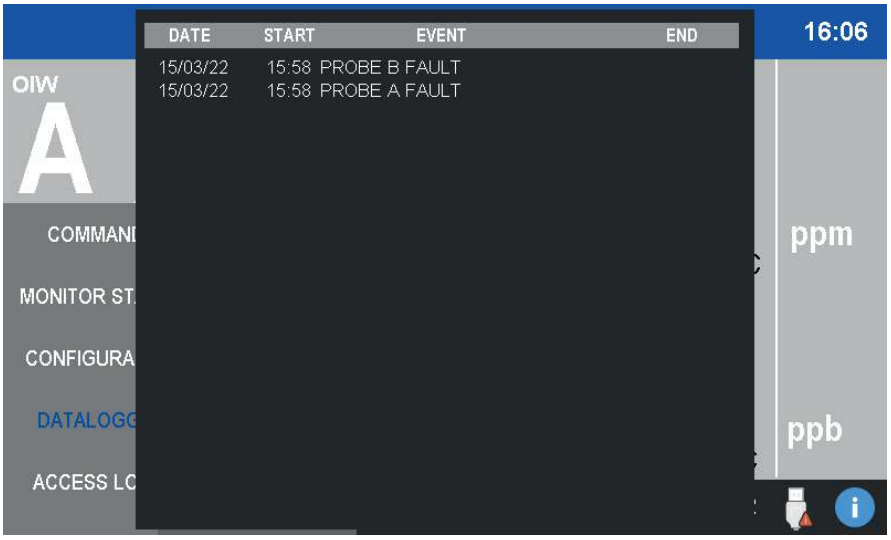
The data is permanently stored in the USB memory stick located on the back of the HMI display. If the memory is removed no data will be saved.

Press RESULT LOG to access datalogger data. Select the date on the last panel to show the measurement data.



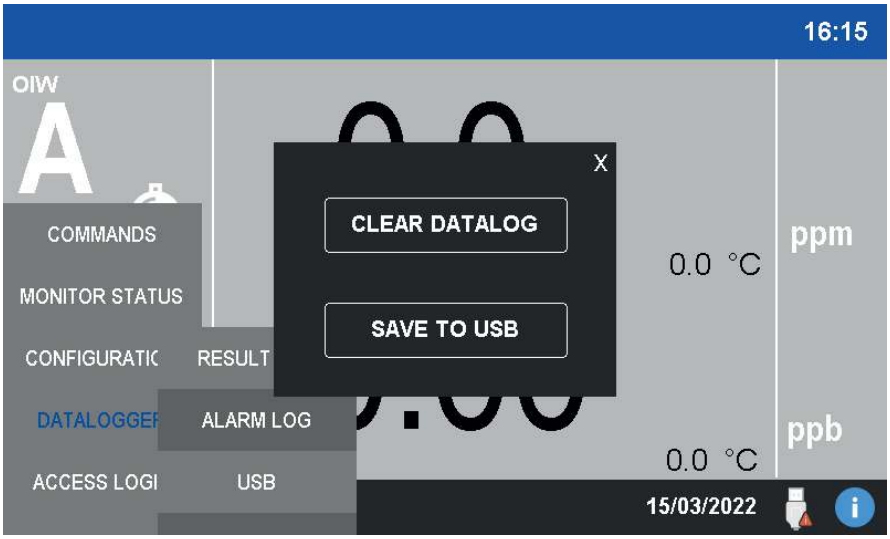
Alarm log

Alarm log data is saved on the internal memory and does not need an external USB memory to work. Alarms and warning are displayed here.



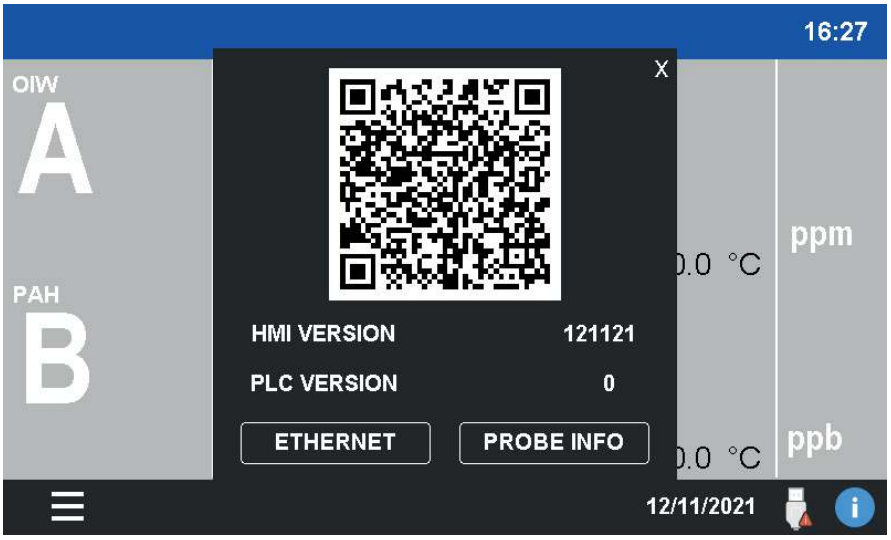
USB

To retrieve the data, access the USB window, then press and hold SAVE TO USB. The data will be saved in a text files as comma-separated values (CSV), every file contains the data of a single day and is named accordingly.
To clear all datalogger entries, press and hold the CLEAR DATALOGGER button.



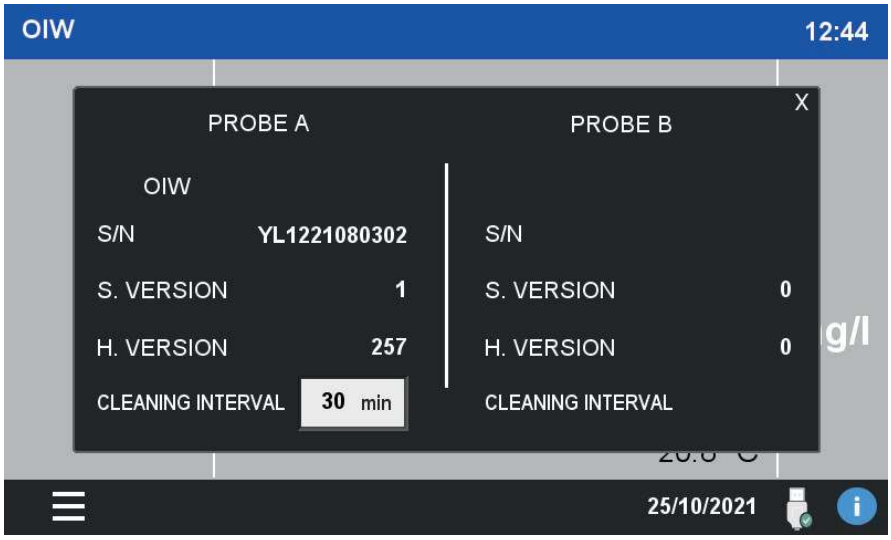
4.8 Info window

By pressing the (i) icon in the bottom right corner you can access further information about the analyzer. The QR code contains a link to download the instructions manual of the instrument (this manual).



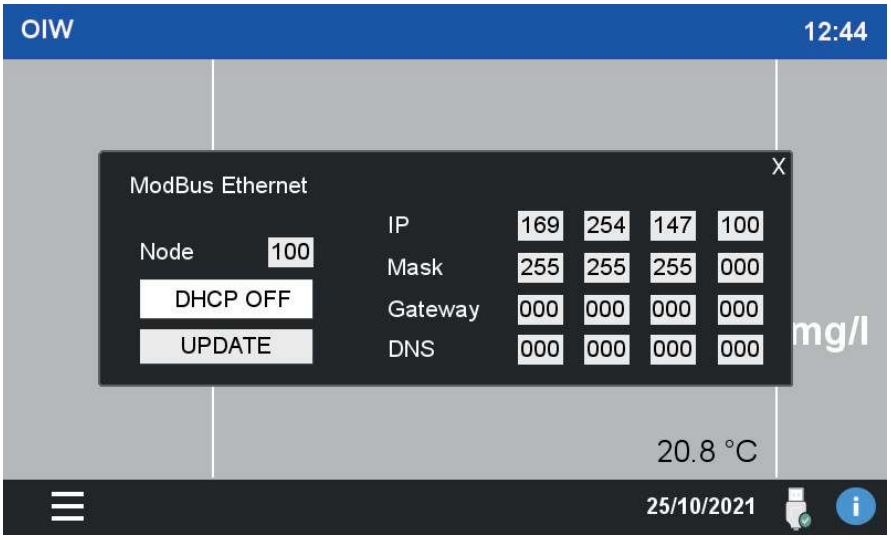
Probe info

Various information about the installed probes are shown on this page.
In the CLEANING INTERVAL input field the user can set the frequency of the probe autoclean.



Ethernet

The parameter for the MoBUS/Ethernet connection can be set on this page.



5 - CALIBRATION

5.1 About the method

The probes are calibrated using standard solutions which are analyzed in the same way as the sample.
In order to ensure correct measurement performance, the probes should be calibrated periodically, best results are obtained if they have been recently cleaned and serviced.
Due to the nature of some analtycal methods the concentration/signal plot is not linear in the whole range of our interest. Therefore the analyzer uses a multi-point calibration curve. The first point is the blank (zero), which is usually done by analyzing demineralized water. A part from the blank, other four points are needed for the calibration curve, covering the whole range of interest.
The multi-point calibration curve will be already calculated in the factory, we then provide a method to automatically recalibrate the whole curve using only a single point.

5.2 Blank calibration

The blank calibration is simply performed by analyzing demineralized water. The blank calibration is particularly sensitive to impurities so is advisable to thoroughly clean the probe before starting the calibration.
To perform a blank calibration, submerge the probe in pure water. If the results are stable go to COMMANDS > BLANK CALIBRATION and press and hold the MANUAL BLANK button for three seconds.

5.3 Span calibration

The calibration curve will be already calculated during our factory testing specifically for your unit. Users are not required to modify the original calibration curve manually (even if they are free to do so, see the following paragraphs) as we provide a method to rescale the whole curve using only a single value.
Only a standard solution with a concentration equal to the full scale value of the analyzer is needed.
Proceed as follows:

1. Prepare a standard solution of a concentration equal to the full scale of the analyzer. If in doubt you can check the full scale value by pressing COMMANDS > MANUAL CAL. It's not possible to change the value of the full scale.

2. Submerge the probe in the standard solution. When the results are stable go to COMMANDS > MANUAL CALIBRATION then press and hold the MANUAL CAL A or B button for three seconds. Each channel must be calibrated separately.

After the calibration is completed you can see the new curve in the page CONFIGURATION > CALIBRATION CURVE.

5.4 Modifying the calibration curve

The instrument is calibrated using a multi-point calibration. The current calibration data can be found in the CONFIGURATION > CALIBRATION DATA menu. The calibration data consists of 5 points including the blank.
Some probes require a non-linear calibration. In that case we need to make measurements at different concentrations to draw the calibration curve.
If the probe response is linear only one point is necessary. Middle points can be easily estrapolated.
As an example the next paragraph describes a 5-point calibration of an oil-in-water probe using the oil of interest as standard.

Since different substances can have very different response, it is recommended to calibrate the analyzer using the specific oil we want to monitor. Also, to minimize matrix effects, it is important to dilute the oil in the same water present at the installation site.
To perform a multi-point calibration, proceed as follow:

Chemicals

- Isopropanol
- A sample of oil we have to detect

Instrumentation

- A 1000 uL automatic pipette
- 2 L glass beacker
- 10 mL volumetric flask
- 1000 mL measuring cylinder
- Magnetic stirrer

Stock solution

Prepare a stock solution (10000 ppm) of the oil. Take 100 uL of oil using the pipette and insert it into the 10 mL volumetric flask, fill the flask with isopropanol upto the flask mark.

Blank

The blank is measured using the an oil-free water, as similar as possible to the water that we will found on the site of the application. If such water is not available, use tap water. The blank is the first point of our calibration curve.

Standard

We need other four points in addition to the blank. The four points must be equal to 25%, 50%, 75% and 100% of the full scale. The easiast procedure is to operate with the method of the standard additions, in this way you don't have to prepare all the calibration solution beforehand. We will start with a water sample and adding small aliquote of analite to it, increasing its concentration for each point measured.

Procedure

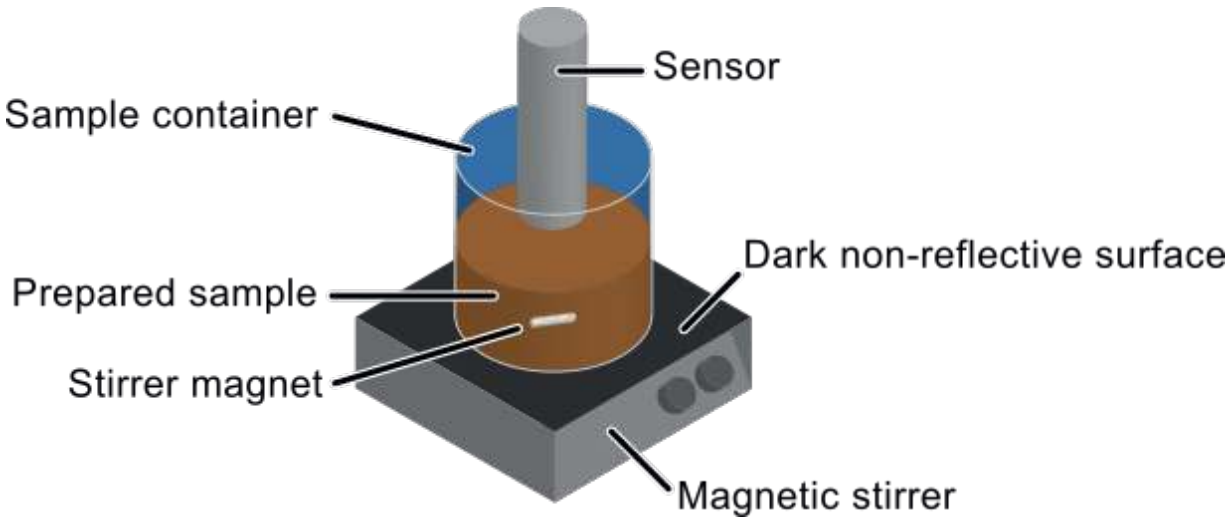
The instrument can be easily calibrated using the method of the standard additions.

Fill the 2 L beaker with 800 mL of the blank water and place it on the magnetic stirrer, add the magnetic bar.

Clean the probe with a clean cloth and a drop of isopropanol. Place the probe into the beacker, dipped 2-3 cm into the solution, at least 5 cm from the container walls. You can use a stand to help the probe stay in position. Make sure no air bubbles are trapped below the sensor. Be also sure to place a dark, non reflective sheet on the stirrer plate, under the beaker.

Turn on the stirrer at 500 rpm and wait at least 90 seconds for the sensor to give a stable reading. On the analyzer display press MONITOR STATUS > SENSOR and take note of the reading, this is your blank.

Now, using the micropipette take the amount of stock solution that, diluted in 800 mL of water gives the concentration of the first point. For example, if you want to prepare a 5 ppm solution take 400 uL of stock solution and add it to the 800 mL of water you have in the beacker. After waiting at least 90 seconds, take note of the sensor response in the SENSOR window, this is your first point. For the other points, continue to add amount of stock solution to the same beaker, keeping it well stirred. For each point check the sensor voltage response and take note of it.



The following table will give you an example of four points made with this technique.

Total concentration (ppm)	Volume addition (uL)	Total volume (mL)
0	0	800
5	400	800
10	400	801
15	400	801
25	800	802

The total volume change after each addition is not significant, thus the volume variation can be ommitted.

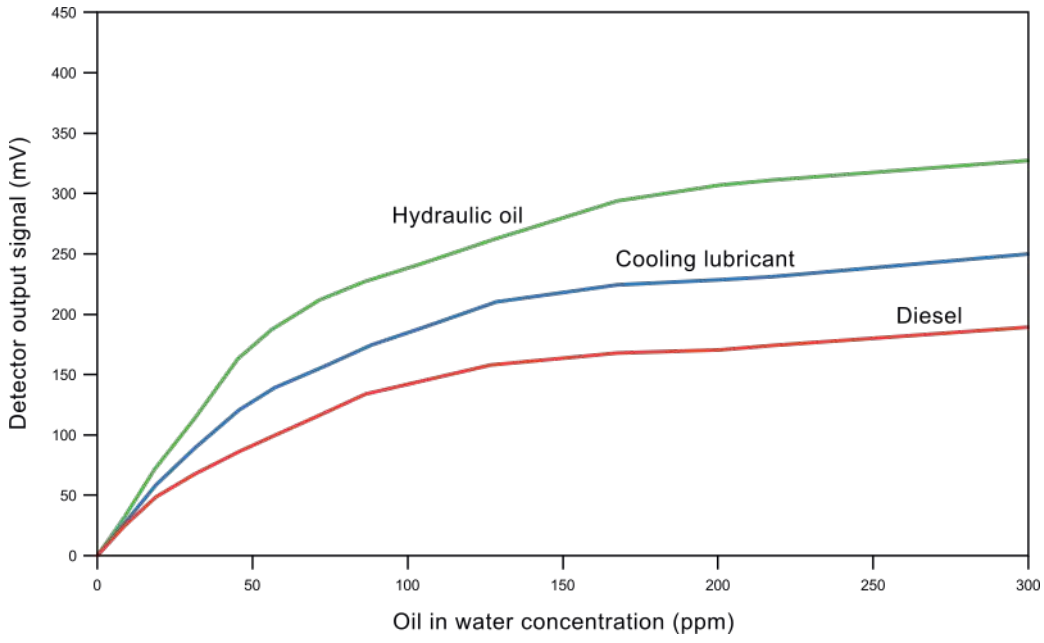
After collecting the measurements for each standard solution it's time to store the calibration curve of the analyzer.
Go to CONFIGURATION > CALIBRATION DATA, you will see the following window.

You can fill the table with the data you have just collected. The calibration is now completed.

5.5 Process cal

Different substances can have different response factors, therefore you should expect your calibration curves to be dependent on the substance you use for the calibration.
For this reason it is recommended to choose a calibration standard which is as similar as possible to the compound of interest. Your target compound itself is of course the best standard choice.
In many cases though, it is more convenient to use a common standard to calibrate the instrument on site and then align the results with laboratory data.
This can be done with process calibrations. The process calibration applies a scale factor to the measurement to align it to the value of the actual sample.
The process calibration can be performed through the following steps:

1. Take a sample representative of the water stream to be analyzed, at least 1 liter. Follow good sampling techniques to have reliable results.
2. Determine the concentration of the analite of interest using a reference instrument or a laboratory analysis of the sample .
3. Submerge the probe in the sample and wait for a stable result.
4. Go to COMMANDS > PROCESS CAL (see section 4.6) and press the PROCESS CAL A or B button, depending on the origin of the sample taken.
5. The calibration is now over, the following measurements will be calculated with the new process factor.



6 - MAINTENANCE

The 3S-PC1000 does not require maintanance. The only serviceable parts in the instrument enclosure are the fuses. Please replace the fuses with appropriate sized ones. Refer to the PCB silkscreen for the rating of each fuse.

6.1 Cleaning of the probes

Probes with the autoclean function does not requires additional cleaning. Please refer to your probe user manual for information about the cleaning of the probe and the replacement of the brush.

6.2 Alarms and troubleshooting

The analyzer displays three different errors/alarms:

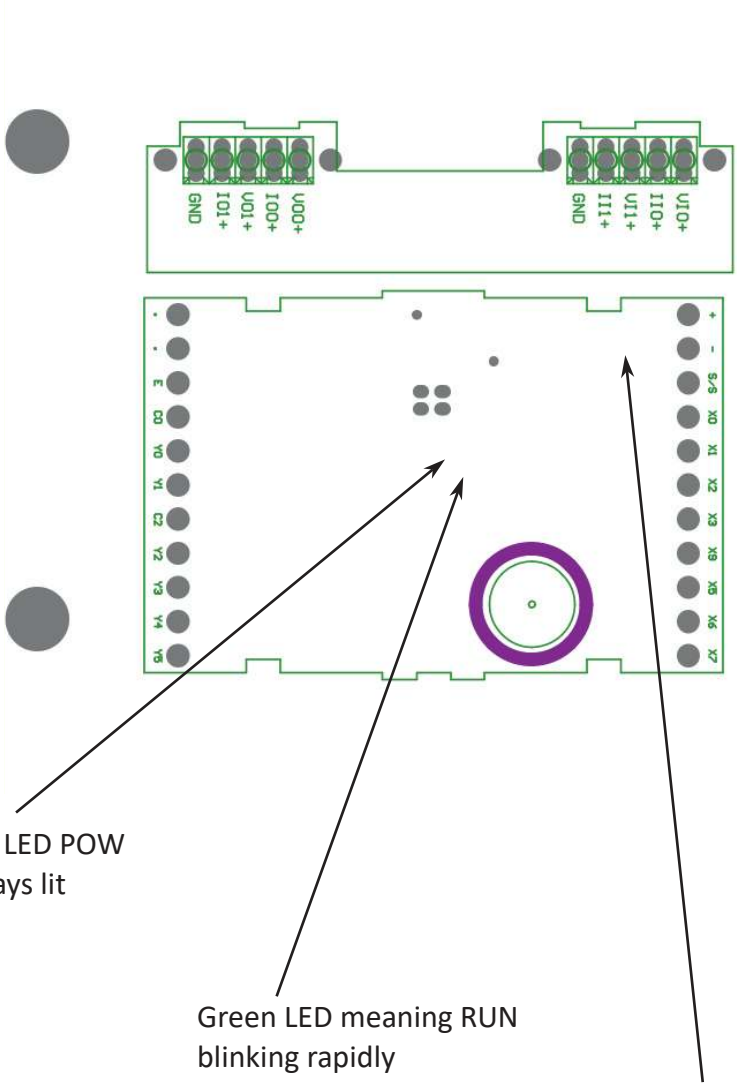
ERROR	MEANING
FAULT ALARM	The analyzer has a major technical problem, contact customer assistance
WARNING ALARM	The value measured by the analyzer is over the predefined alarm threshold
NO FLOW	The sample flow to the reservoir is missing, the analyzer is waiting for new sample

6.3 Electronics checks

When the metal cover is open by removing the five fixing screws, then it's possible to check a few indicator LEDs, as indicated below

After removing the cover, do not touch the device with your hands or tools without removing the power supply! Switch on without the cover is only allowed for visual inspection.

LED checks - normal condition



Red LED POW always lit

Green LED meaning RUN blinking rapidly

Green LED and red LED alternate and fast blinking showing the serial communication with the touchscreen panel

Note: the electronic board is equipped with internal battery that can last up to a year.
The instrument must be connected to a power supply once every year for 15 minutes in order to keep its programming.
3S Analyzers disclaims any kind of responsability about memory loss due to incorrect storage of the elettronic board.

Probe connection check

Make sure the probes wires are connected as follows on the main PCB. The probes need 12 VDC for power and serial connection for data transmission. Follow the PCB markings to connect the probes with the right polarity, probes wires are marked as well.