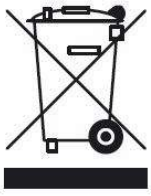
USER MANUAL

UV-ABSORPTION ORGANIC SUBSTANCES MONITOR

3S Analyzers S.r.l. www.3s-analyzers.eu Made in Italy - January 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

Before installing and operating the analyzer, read this manual thoroughly. Please pay particular attention to all the labels applied to the analyzer 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 upper box
- xenon lamp and its power wires in the lower liquid section

This symbol indicates the possible presence of UV radiation during certain phases of operation.
The xenon lamp must not be removed from its housing while the device is operated.

This symbol indicates the risk of burns and physical damage caused by the presence of hazardous chemical compounds.
Only operators qualified for these activities can handle and perform service operations that may involve the risk of contact with such compounds. Before carrying out any type of service activities on the analyzer, please read the safety data sheets of the different chemicals used and take all precautions specified therein.

Parts involved:
- cleaning reagent bottle
- cleaning reagent suction pump and the pipes connected to it

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 analyzer 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 analyzer 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 analyzer are placed within a panel closed by a door with a special key, supplied only to maintenance operators.
The analyzer must, then, be used under operating conditions with both lower and upper doors closed.

2 - GENERAL INFORMATION

2.1 Technical specification

Measured parameters	CODeq, DOCuv, TOCeq, BODeq, Abs254, SAC254, CODuv, TOCuv, BODuv, SAK254 (mg/l, cm^{-1}, m^{-1}, AU, mA.U.).
Measuring principle	Dual wavelength technique, 254 nm measuring and 590 nm as reference, with turbidity compensation
Measuring range	24 mm cell: 0.01 – 50 m^{-1} SAC - Correlated range (based on KHP): CODeq 0.15-100 mg/L , TOCeq 0.06-40 mg/L , BODeq 0.05-30 mg/L 16 mm cell: 0.01 – 100 m^{-1} SAC - Correlated ranges (based on KHP): CODeq 0.5 – 200 mg/l, TOCeq 0.2 – 80 mg/L , BODeq 0.2 – 65 mg/l 11 mm cell: 0.1 – 250 m^{-1} SAC - Correlated ranges (based on KHP): CODeq 1 – 500 mg/l, TOCeq 0.3 – 200 mg/L , BOD eq 0.25 – 160 mg/l Dilution: 0 – 10,000 m^{-1} SAC - Correlated ranges (based on KHP): CODeq 1 – 10,000 mg/l, TOCeq 0 – 6,000 mg/l, BODeq 0 – 4,800 mg/l
Reproducibility	± 2.5 % on the absorbance value for samples having torbidity below 100 NTU
Analysis Frequency	Freely programmable, batch near-continuous analysis. From 1 minute to 1 hour.
Cycle time	Less than 1 minute, including conditioning before analysis cycle and rinsing after measuring
Sample	Pressure: Atmospheric Temperature: 5 - 50 °C (41 - 122 °F) Flow Rate: 80 to 500 ml/min Connection: 6 mm (¼-in.)
Drain	Pressure-free, atmospheric drain Connection: 12 mm (½-in.)
N° of streams	Up to 2 with integrated switching valve
Dimensions (H x W x D)	604 x 380 x 242 mm (23.6 x 14.8 x 9.4 in)
Weight	Approx. 20 Kg (44 lbs)
Power Supply	Voltage: 100 - 240 VAC 50/60 Hz standard or 24 VDC (option) Power consumption: max. 80 VA
Outputs	2 x 4-20 mA outputs for measured data Modbus RTU RS485
Alarms	4 SPDT programmable potential free relays
Digital Input	Remote start/stop, start extra cycle, skip idle time, emergency stop
Operative Conditions	Temperature: 5 - 45 °C (41 - 113 °F) Humidity: 10 to 90% RH (indoor use only)
Installation	Wall mount (standard), bench top support or panel mount (options).
Protection Grade	IP54

2.2 Method description

The analyzer is sensitive to dissolved organic matter, through absorption measuring at a specific wavelength of 254 nm.
Most organic molecules in aqueous solution have spectral characteristics capable of absorbing a fraction of energy associated with a light beam to which it is exposed at a wavelength of 254 nm.
This characteristic is due to the presence of chromophore groups (aromatic bonds, double covalent bonds and triple bonds) which is typical of organic substances.
Therefore, the greater the amount of organic molecules dissolved in the volume of the measuring cell, the less the light intensity, with this specific wavelength, that will reach the detector.
The intensity absorbed at 254 nm is measured by using as a reference the intensity detected for another wavelength (590 nm) of the same light beam which is not influenced, however, by the presence of organic substances.
This photometric investigation method allows, using the Lambert-Beer law, to calculate the absorbance and after calculating a calibration curve, to determine the concentration of the organic substances expressed as TOC,DOC,COD, BOD or as SAC254 Absorption coefficient.
The related results are expressed in concentration units (mg/l, ppm) for cumulative parameters obtained by correlation or extinction per meter m (1/m) as required by DIN 38404-3 standard for SAC254. $^{-1}$
The ultraviolet light source of the analyzer is a high-stability xenon lamp and produces a light radiation which passes through the quartz cell containing the sample (24, 16 or 11 mm optical path) and is then fractionally divided into two rays by partial reflection (half mirror technique).
Two filters with a diameter of 12.5 mm are placed in front of the two photodiodes to read the Reference (590 nm) or the Sensor (254 nm).
Each measurement is calculated after a series of 21 flashes, to increase the reading stability.

2.3 Applications

The measurement of the dissolved organic load by UV absorption technique at 254 nm has many fields of application.
In surface water, environmental monitoring and potable water intakes, this technique is particularly recommended and preferred compared to other reagents, and where the presence of fulvic and humic acids makes it particularly difficult the determination by oxidative techniques.
Excellent results can be achieved in potable water treatment plants and control of the outlets of civilian waste treatment plants.
As for the control of organic load dissolved in civil activated sludge tanks, it is possible to operate after filtration, while for industrial wastewater treatment, reference should be made to the type of organic substances present to verify the possibility of a stable correlation between concentration and absorption at 254 nm.
Generally, in petrochemical processes, in paper mills, in the dairy industry, in the detection of leachate infiltrations, good results can be achieved.

3 - INSTALLATION

3.1 Opening the package

Caution:
please take all the precautions required for handling and lifting the box containing the analyzer.
The instrument weight is approx. 44 lbs (20 Kg)

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 UV254 analyzer	UV-254-X-X
B	Fast loop reservoir with level switch for sample	A46ERLS000
C	Start-up kit	A46KIT0050
D	Bottle (empty) for cleaning solution	A46H2SO4B1

These are the codes to identify the different configuration analysers

UV3-254 - X - X

Single stream analyzer, no dilution no autocalibration	0
Two valves analyzer (dual stream or single stream and autocalibration or single stream and dilution)	2
Three valves (dual stream and autocalibration or dual stream and dilution)	3

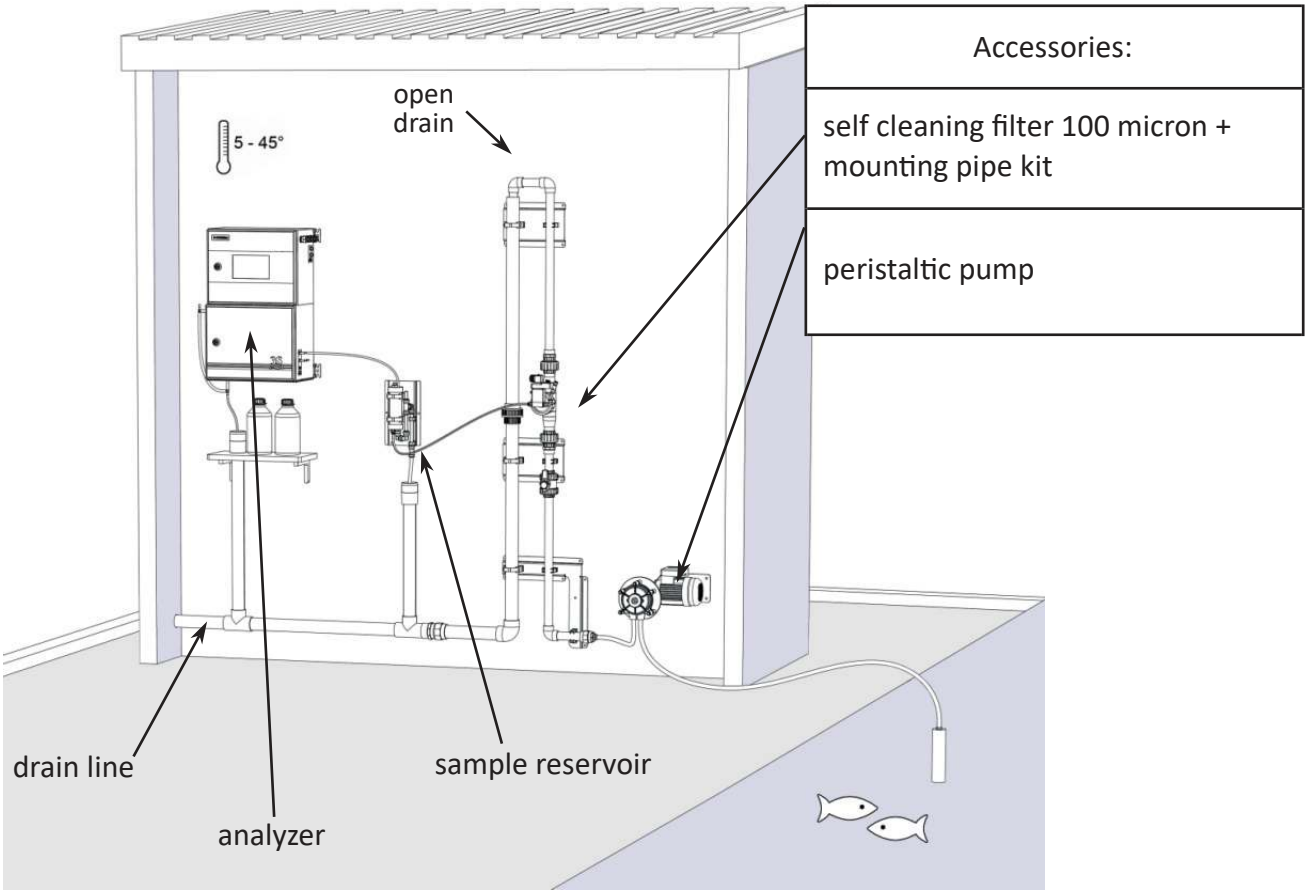
24 mm cell analyzer	UL
16 mm cell analyzer	L
11 mm cell analyzer	H

An optional component may be present, although not visible when opening the package because it is mounted inside the analyzer.

Dilution option (mounted inside the analyzer's case)	A46CLDM00

Optional accessories		
for Dual Stream option	Fast loop reservoir with level switch for the second sample	A46ERLS000
for Dilution option	Fast loop reservoir with level switch for the dilution water	A46DWLS000
for Autocal option	Bottle for standard solution	A46KHPB1

3.2 Example of sample suction 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.

A lower sample flow (filtered at 100 microns) comes out of the filter and recirculates inside the tank before being drained. The unfiltered sample portion is drained and transferred to the upper head of the filter to create the necessary pressure to allow the filtered liquid to spontaneously flow.

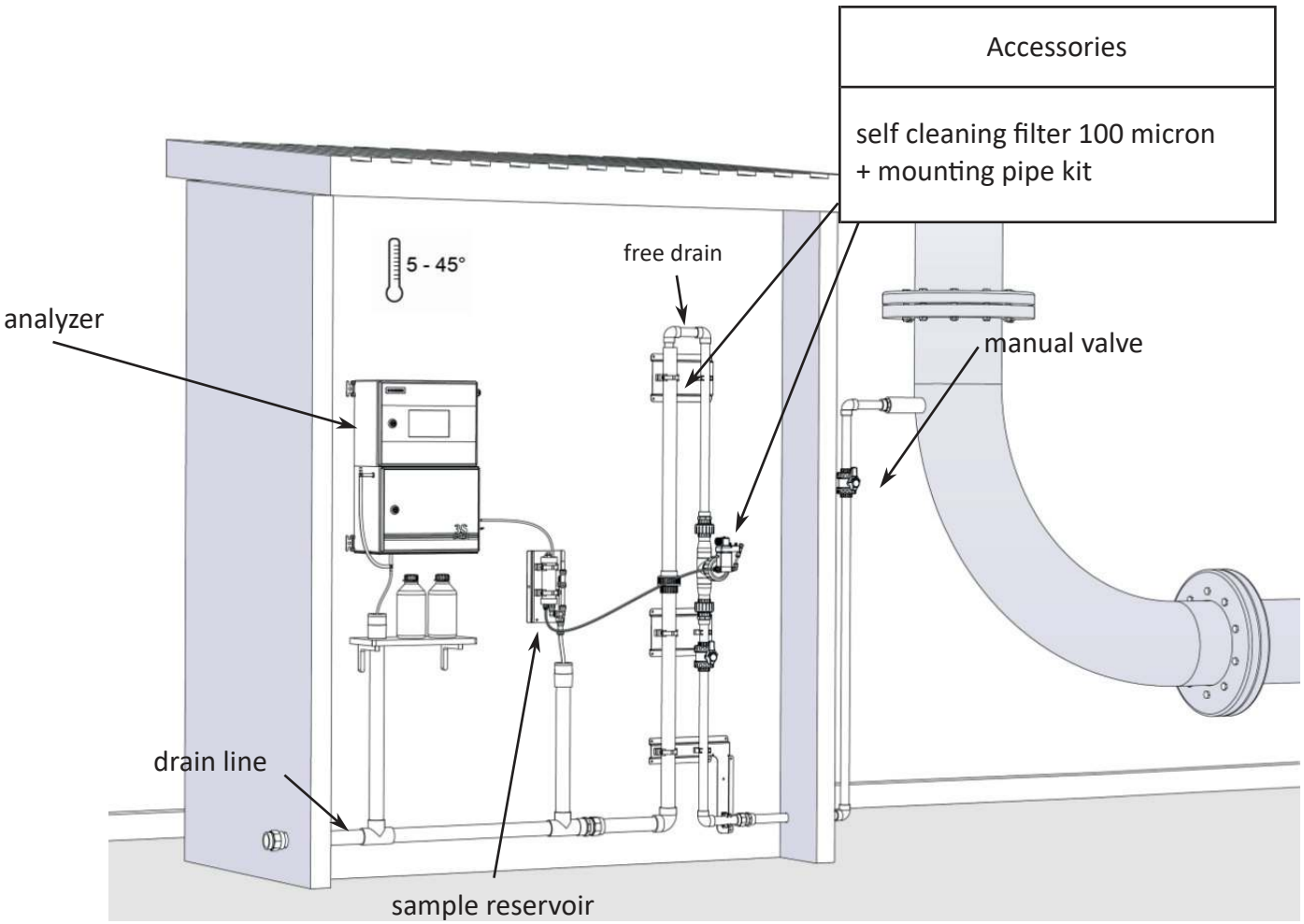
From the tank, according to the analysis timing set, the analyzer collects the sample to perform the analysis. If the filtered sample level in the cylinder is not reached, the level contact in the lowered position does not allow the calculation of the result and prevents the next cycle from restarting until the level returns to normal.

The sampling peristaltic pump can run continuously or only for a period of time before the analysis, driven in this case by the analyzer itself (control panel operated by the installer) through one of its potential free relay contacts.

The suction 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 analyzer and recirculation tank.

3.3 Example of sample from pressurized piping



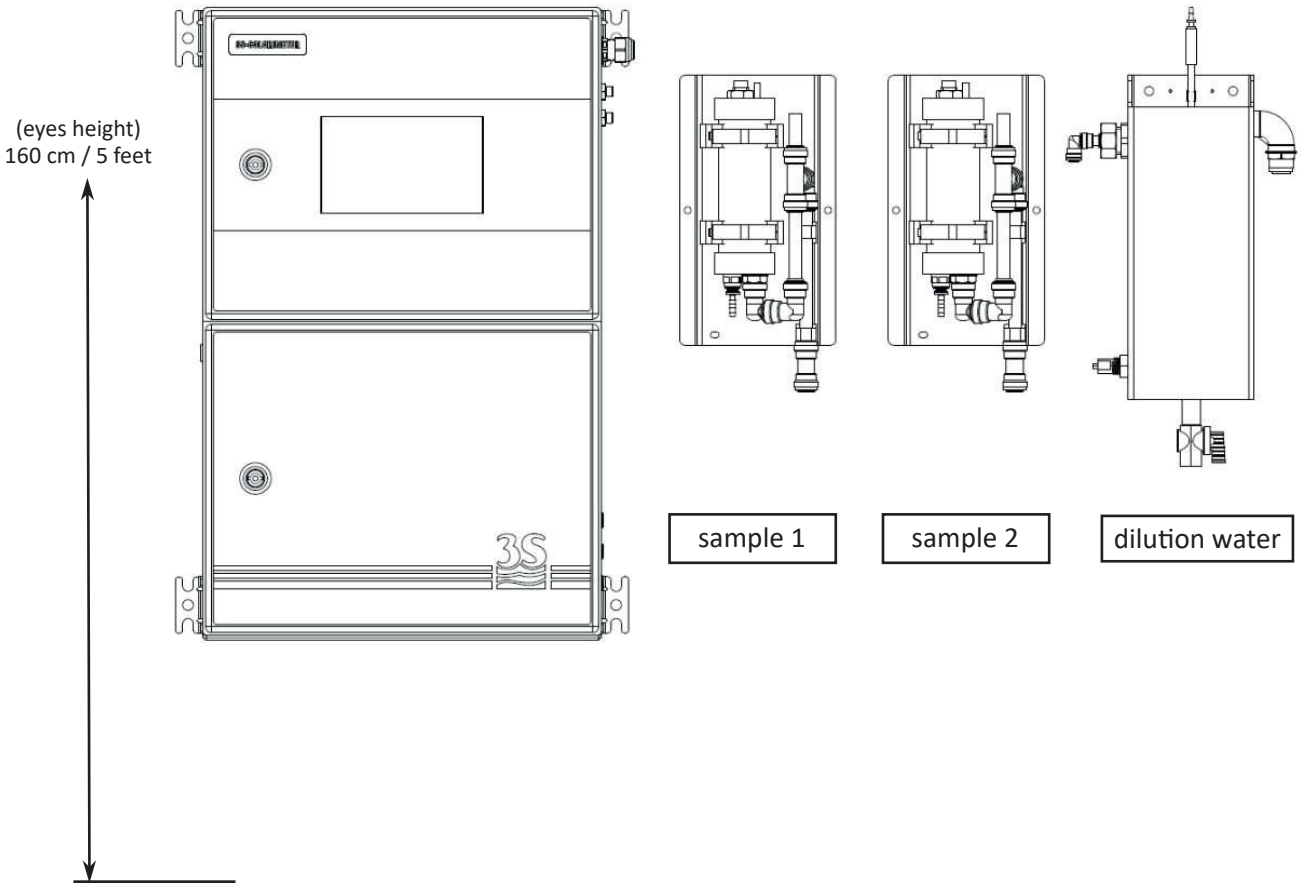
In this example, the sample is taken from a pressurized process pipe and a flow of 500-1000 l/h (adjusted by the sampling valve) crosses the self-cleaning filter to reach the drain line.
The conformation of the pipe where the filter is inserted produces a positive suction head (the drain is in the upper position compared to the height of the filter) which allows the fraction of filtered liquid to escape and reach the recirculation tank.
A filter must be mounted if there are any suspended solids greater than 500 microns.
If the filter is not needed, a sampling needle valve to adjust the maximum flow rate of 500 ml/min must be mounted, from the pipe to directly send liquid to the recirculation reservoir.

Also in this example, the installer shall implement a drain line, which, however, shall not create a backpressure to the free drain of the analyzer and recirculation tank.

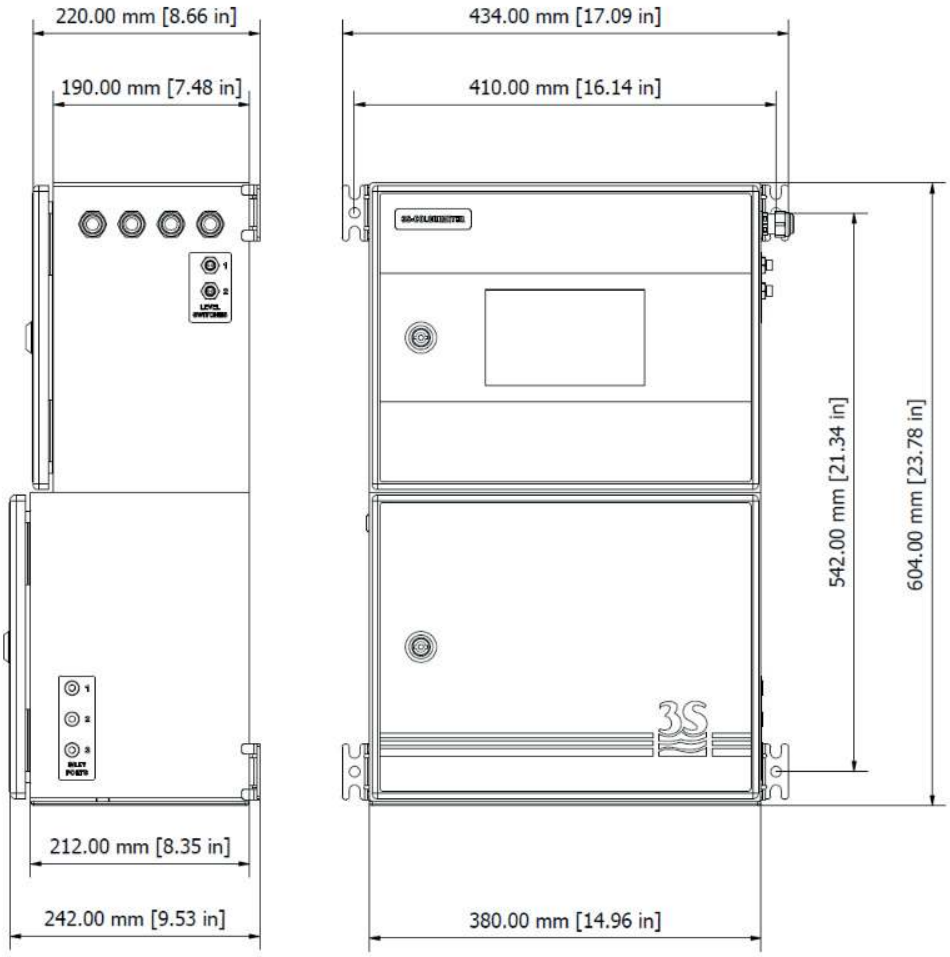
3.4 Mounting the instruments

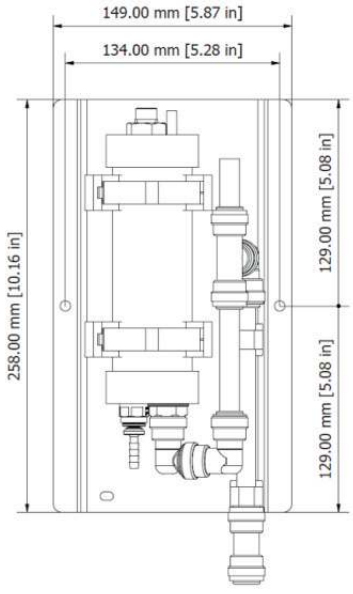
The analyzer and the sampling cylinder must be mounted vertically on a wall or support suitable for their weight and not subject to vibrations. Use suitable screws (not included in the supply) to fasten them only on the side brackets (ear clips) of the instrument and in the holes of the tank metal plate. Mount them so as to get the display at eye height (160 cm / 5 feet).
Since the sampling connections and level contact connectors are on the right side of the analyzer, install sample reservoir and dilution water sampling to the right of the instrument.
Please consider that the surrounding space must allow easy opening of the doors (upper and lower). The sampling reservoir can be monted below the analyzer also, if necessary.
A minimum distance of 10 cm (4 in) is required between the wall to the right of the instrument and the cylinder.

Instrument configuration	Fast loop reservoirs to install
Standard single stream	1 x A46ERLS000
Dual stream	2 x A46ERLS000
Single stream with dilution	1 x A46ERLS000 + 1 x A46DWLS000
Dual stream with dilution	2 x A46ERLS000 + 1 x A46DWLS000

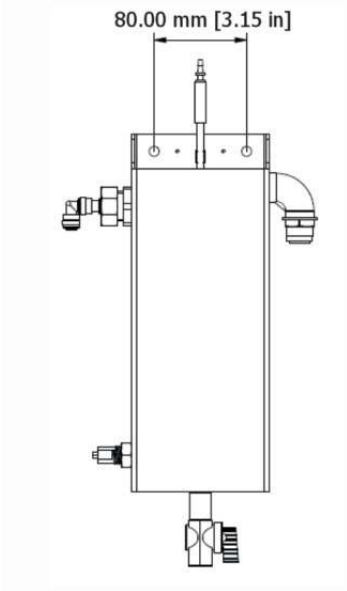


3.5 Wall mounting dimension





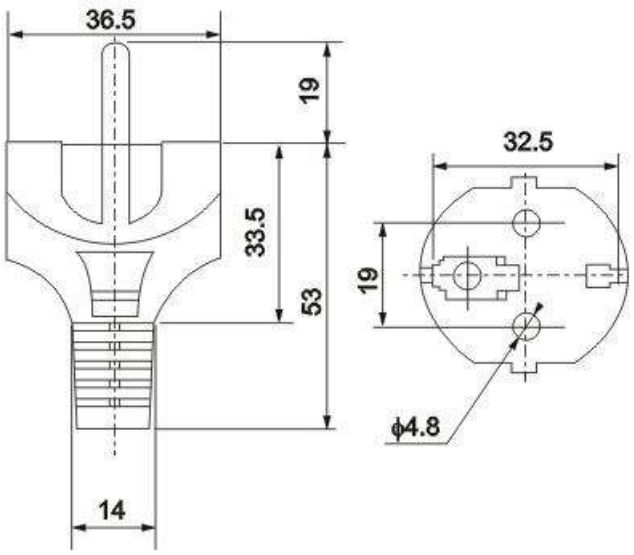
Fast loop reservoir with level switch
p/n A46ERLS000



dilution water reservoir
p/n A46DWLS000

3.6 Power supply connection

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



2.5 mt lenght

Color codes

- BROWN Phases
- BLUE Neutral
- GREEN/YELLOW - Protective earth/ground

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 (0.5 in) ;

- 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 (1/8 in) 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	- Remote input + Remote input	Connect to a SPDT contact
3 4	- 4-20 mA analogic signal channel 2 + 4-20 mA analogic signal channel 2	Max impedence 500 ohm protected by 50 mA fuse
5 6	- 4-20 mA analogic signal channel 1 + 4-20 mA analogic signal channel 1	
7 8 9	COMMON relay 1 and 2 Relay 1 Relay 2	Load max 5 A 250 VAC configurable as NC or NO SPDT or powered 24 VDC (jumpers setting)
10 11 12	Relay 3 Relay 4 COMMON relay 3 and 4	

Each contact relay can be set following the table below.

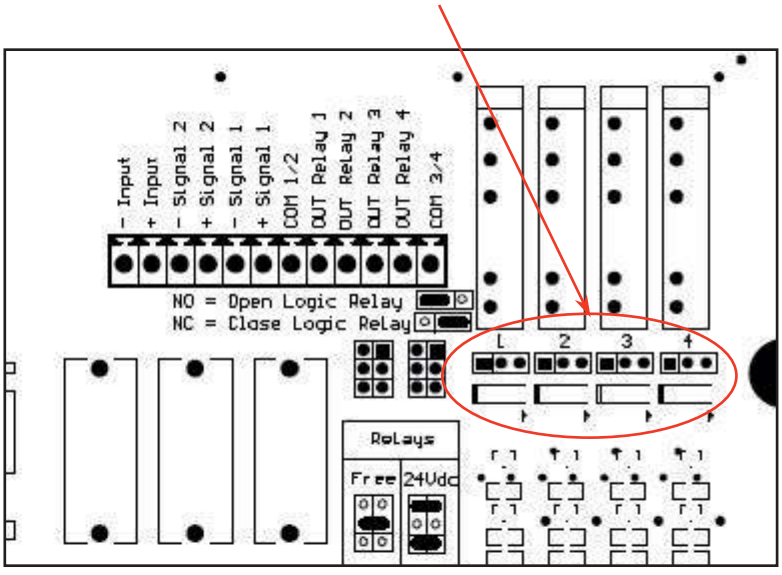
NORMALLY OPEN	When the relay is OFF the contact opens, while when the relay is ON the contact closes. In the case of loss of power, analyser OFF, the contact is open.
NORMALLY CLOSED	Normally the relay is ON and the contact closes, while when the relay is OFF for alarm condition the contact opens. In the case of loss of power, analyser OFF, the contact is opened.

To set one of the two conditions (default N.O. usually open) you must access the top by opening the door. Remove the cover protecting electronic parts (L-shaped metal sheet) by unscrewing the 5 screws holding it closed with a 1.5 mm hex key (Allen key).

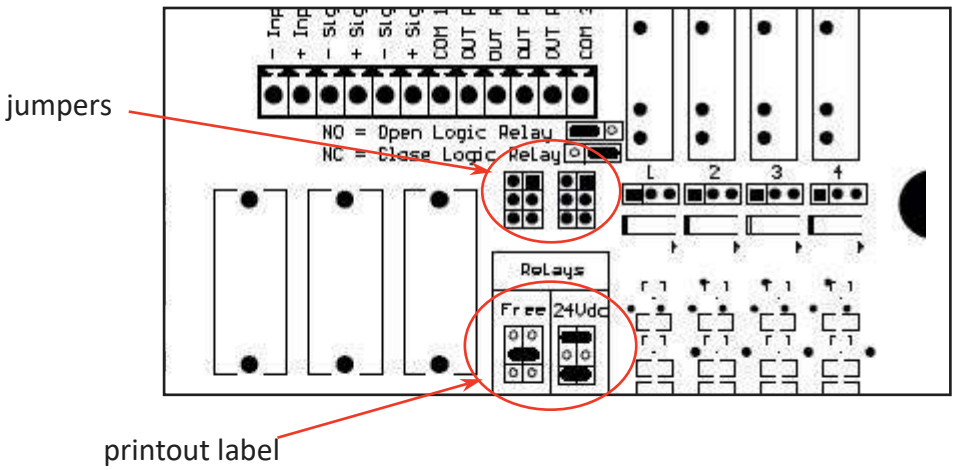
Unplug the power cord before operating!

Each relay can be set indipendently by placing the jumpers as follow

jumper right = N.O. normally open configuration
jumper left = N.C. normally closed configuration



Relays are divided into two groups (1-2 and 3-4) with a shared contact for each group.
They can be configured as voltage free (SPDT, free contact, etc.) or powered by 24VDC and protected by a 1 A shared fuse, depending on the position of the jumpers shown below:



The silk-screen print on the electronic board shows the position of the two jumpers (if the relay contacts are powered by 24 volts) or the single jumper (default condition) if the relay contacts are voltage free.
The setting will work for the two relays of the group, which can not be managed separately.

3.8 Modbus serial protocol

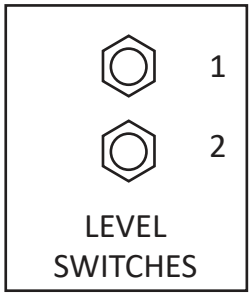
The analyzer exchanges information on the serial line via the Modbus RTU protocol or Modbus TCP (port 8000).
For the settings and the data exchange table, please follow the steps below.

Baud Rate	9600
Data bits	8
Parity	E
Stop bit	1
Analyzer I.D. (slave , node number)	The last two digits of the serial number i.e. s/n UV145 = I.D. no. 45)

Address	Format	Alias
900	32-bits float (CD-AB)	Result CH1
902	32-bits float (CD-AB)	Result CH2
800	bit	ONLINE condition
801	bit	SINGLE cycle active
802	bit	STOPPED condition
803	bit	EXTRA cycle running
806	bit	Loss of sample 1
807	bit	Loss of sample 2
808	bit	Optics alarm
809	bit	Calibration alarm

3.9 Connecting sample level sensor

The sample recirculation tanks positioned to the right of the device, have a level contact showing the presence or absence of the sample. The signal reaches the device through the connector-terminated cable to be plugged into its socket placed on the right side of the analyzer.
A label helps to identify the correct connection.



Below the contact logic :

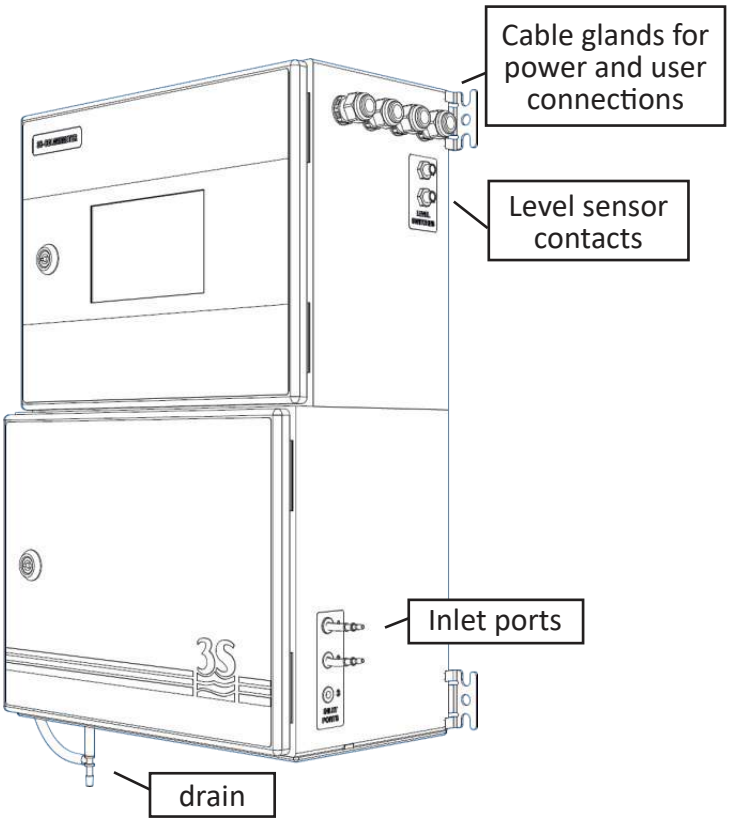
SAMPLE PRESENT	floating element UP	Contact OPEN
SAMPLE NOT PRESENT	floating element DOWN	Contact CLOSED

3.10 Sample/Dilution/Standard solution connection

The analyzer takes samples or standard solutions through a peristaltic pump.
The same pump can pick up to 3 different liquids through 3 clamp valves located in the hydraulic power unit.
The possible configurations are shown below:

CONFIGURATION	VALVES	CONNECTIONS
single channel without autocalibration or dilution	0	port 1: sample
single channel with autocal or dilution	2	port 1: sample port 2: autocal/val or dilution
dual channel without autocal or dilution	2	port 1: sample 1 port 2: sample 2
dual channel with dilution	3	port 1: sample 1 port 2: sample 2 port 3: dilution water
dual channel with autocal	3	port 1: sample 1 port 2: sample 2 port 3: standard solution

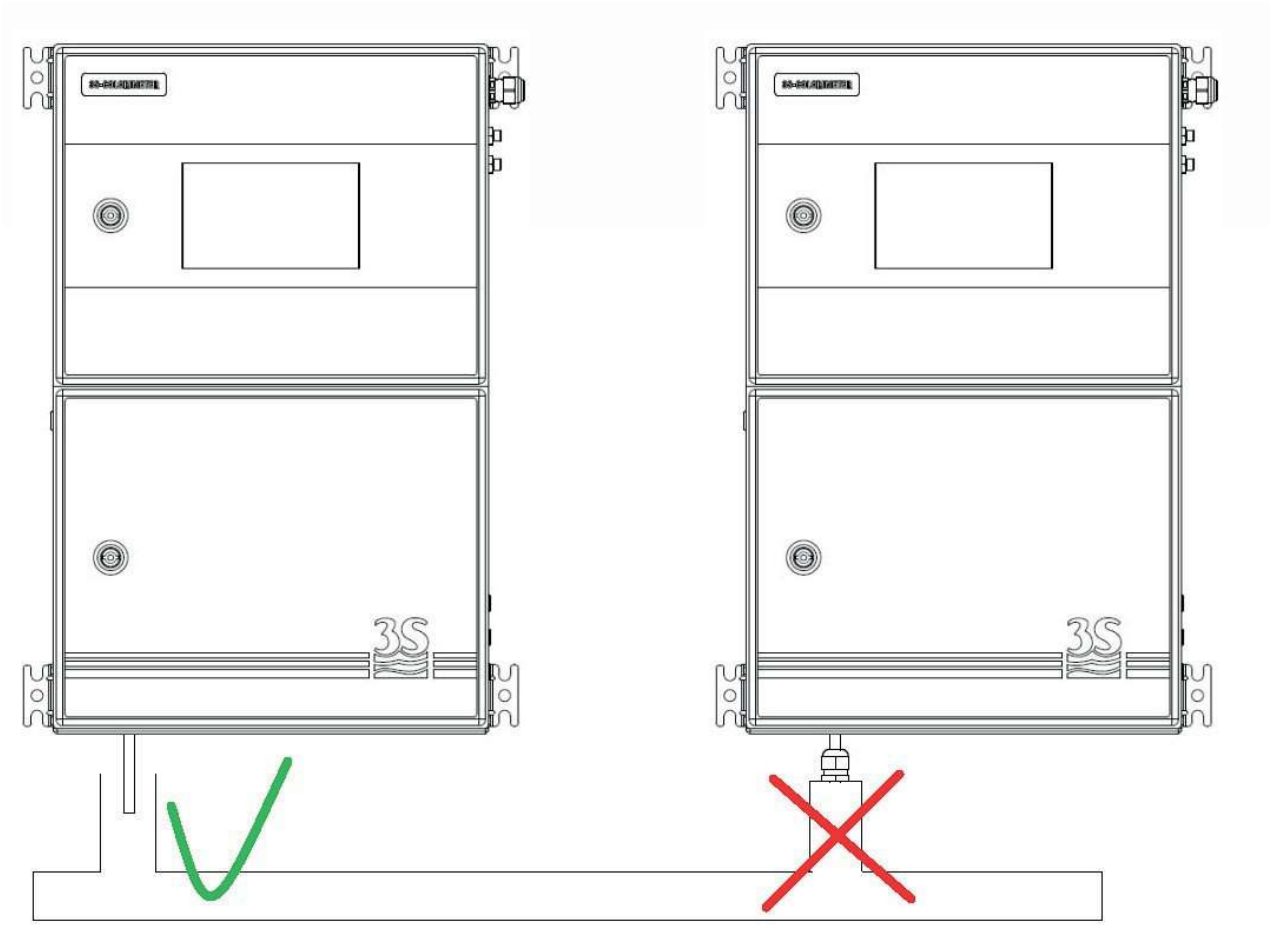
For the connection, identify the defined configuration and connect the pipes supplied with the start-up kit (norprene 1/4 OD) to its straight fittings coming out of the 3 inputs on the right side of the hydraulic power unit.



The pump head is designed so as to suck the sample and the calibration liquids contained in the bottles placed at the lower (head) level, and to suck even liquids from bottles placed on the ground.
The tanks can be placed both at the top and bottom of the suction port, while, to ensure dosage precision and prevent any undesired liquid spills onto the hydraulic unit, piping connections to pressure lines must be absolutely avoided if pressure exceeds 0.1 bar (1 meter of water column).

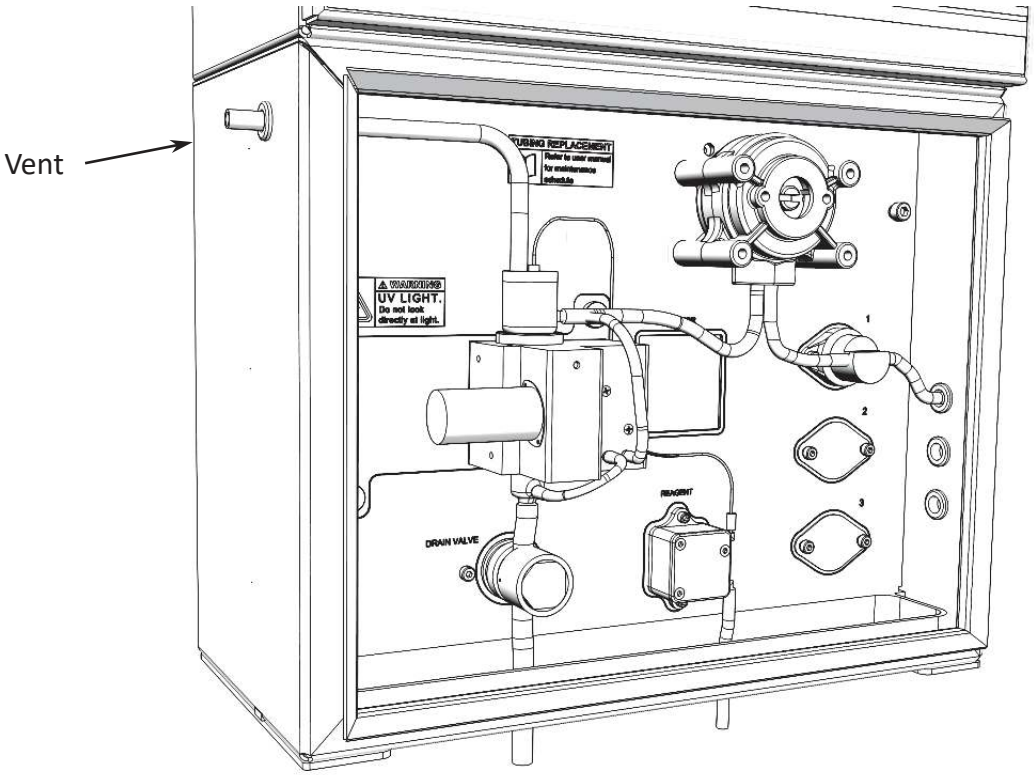
3.11 Reading cell - waste connection

Connection to the drain line is provided by the flexible tube 12 mm OD (0.5 in OD) provided with the start-up kit to be connected to the hose connector located below the analyzer.
Please note that the liquid must be drained by allowing its free fall, therefore any backpressure have to be avoided.



3.12 Reading cell - VENT connection

To ensure the free fall of the liquid contained the reading cell at the end of the analysis or during all rinsing operations, a hose connector is placed on the cell cap and, through a norprene tube 7/16 OD conveys any vapours outside the lower cabinet (left side).



This vent port can may be conveyed out through an extension tubing, preventing corrosion from gas coming from sample or cleaning solution, especially when the analyzer is mounted in a small cabinet

Be aware to avoid counter pression or condensation in the extension tube.

3.13 Cleaning solution connection

To connect the bottle containing the cleaning solution, use the rigid sampling pipe provided with the start-up kit.
The bottle should be placed below or next to the analyzer at the maximum distance equal to the length of the pipe.
No extension is provided for this pipe, to avoid that the small head of the peristaltic pump is not sufficient to suck the fluid from a too low level.

Please pay close attention when handling the pipe and the cleaning reagent bottle if this has already been filled, at least once, with corrosive liquid. Use protective gloves and goggles to prevent any spilled liquid from coming in contact with the eyes and skin.

3.14 Cleaning solution consumption

Consumption of the cleaning reagent and its 1 l bottle life depend on the analysis and cleaning frequency, which can be different based on the application and the sample.
In this regard, please consider the two examples below:

Example A : analysis carried out every 5 minute, an EXTRA cycle every 100 cycles
consumption per cleaning (Reagent = 100 sec.) : 5 ml
daily consumption: 15 ml
1 l bottle life : 60 days approximately

Example B : analysis carried out every 10 minutes, an EXTRA cycle every 100 cycles
daily consumption: 7.2 ml
1 l bottle life: 120 days approximately

3.15 Start up kit - material list

These are the material present in the start up kit:

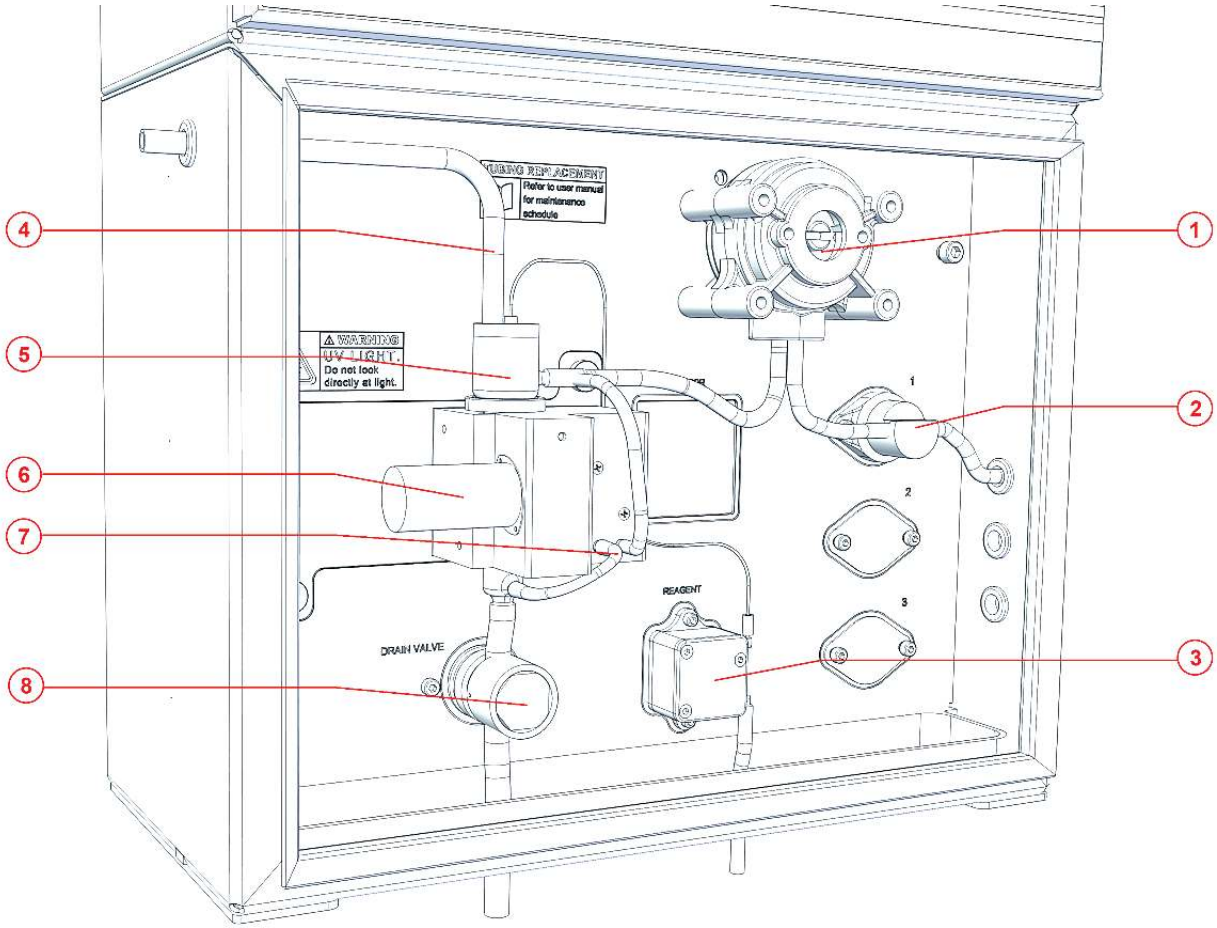
Silicon tubing 2 m (6.5 ft) for drain connection	1
Norprene tubing size 1/8 OD with 30 cm straw for cleaning/reagent	1
Norprene tubing 1 m (3.2 ft) size 1/4 OD for port 1 - - 3	3
Key for instrument door	1

4 - COMPONENTS

4.1 Knowledge of the standard components

Before using the analyzer you should be able to identify its standard components.
To do this, open the lower compartment.

Here is what you will see:

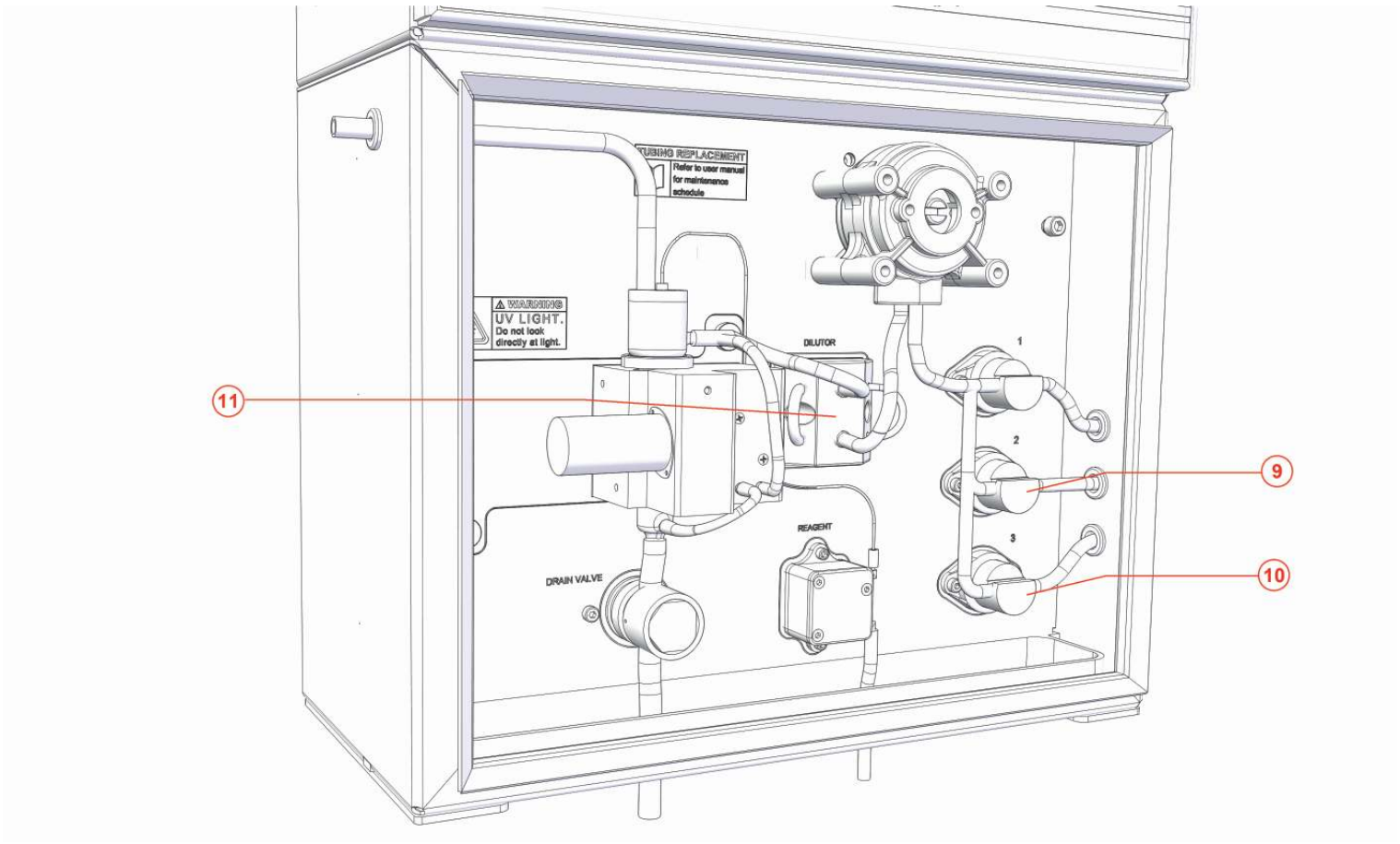


1	SAMPLING PUMP
2	SAMPLE SOLENOID VALVE
3	CLEANING/REAGENT PUMP
4	MEASURING CELL VENT TUBING
5	MEASURING CELL
6	XENON UV LAMP
7	MIXING PUMP
8	DRAIN PINCH VALVE

4.2 Optional components

Some optional components can be added in the lower hydraulic compartment depending on the application and the measuring range

Here is what you can eventually see:



9	VALVE 2 (for second stream, autocalibration or dilution water)
10	VALVE 3 (for autocalibration or dilution water inlet)
11	DILUTOR BLOCK

4.3 Take knowledge of the component function

The following operations can be performed by the analyzer.

Wait
No operation.

Rinse 1
The sampling pumps, valve 1, the mixer pump and the cell drain valve are activated so that the liquid connected to valve 1 can be sucked and drained through the cell. This helps conditioning the sample line 1 by removing any residual liquid in the tube.

Rinse 2
Operation similar to the one above, but through activation of valve 2.

Rinse 3
Operation similar to the one above, but through activation of valve 3.

Drain
The exhaust valve and the recirculation pump are opened to empty the measuring cell.

Sample 1
The sampling pump, valve 1 and the mixer pump are activated so as to suck the liquid of line 1 and fill the measuring cell.

Sample 2
Operation similar to the one above, but through activation of valve 2.

Sample 3
Operation similar to the one above, but through activation of valve 3.

Mix
The liquid in the reading cell is mixed and sucked from the bottom and sent back to the top.

Loop on
The dilutor valves are activated to retain the amount of liquid to be diluted in the sampling pipe section.

Loop off
The dilutor valves are turned off to release the liquid previously retained in the LOOP ON phase.

Lamp on
The sequence of 21 flashes at the end of which the results of the sensors are calculated is activated (min. 7 secs).

Reag
The cleaning pump is activated.

Result A
The data recorded during the analysis is elaborated and the result of channel A is shown on the screen.

Result B
The data recorded during the analysis is elaborated and the result of channel A is shown on the screen.

Calibration
The data recorded during the analysis is elaborated anda new calibration factor is calculated and stored in memory.

Blank
The data recorded during the analysis is elaborated anda new value for the blank is calculated and stored in memory.

Save data
The result for both channels is stored in the datalogger.

Relay 1
Relay 1 is turned on.

Relay 2
Relay 2 is turned on.

4.4 Manual activation of functions

After opening the lower door, it is possible to observe and distinguish the various operations by activating them manually.
This may help when turning on the analyzer for the first time or even later, during maintenance operations.

For example, it is advisable to use this procedure to verify the correct arrival of the sample, after connecting the different parts, or check the correct operation of the drain.

See section 6.4 for instructions to activate manual function through the graphical user interface.

5 - ANALYSIS CYCLE

5.1 Single cycle, online cycles and extra cycle

The instrument executes its analysis cycle by performing a sequence of operations listed in the analysis program. The program can be accessed from the graphical user interface and can be modified at any time to meet the requirements of the applications. Users are strongly encouraged to contact the 3S Analyzers technical service prior to commit any modification to the program. A program consists of a maximum of 25 individually configurable steps, every step defines a function, identified by a unique name (see 4.3), and an associated duration.

Using the graphical interface the user can arbitrarily call any function manually for testing or servicing purposes (see 6.4).

The instrument can perform a single analysis cycle or continuous (online) measurements. In the first case the analyzer will put itself in standby after the analysis cycle is completed while in the second case it will start another analysis after waiting for a predefined amount of time (cycle wait). The wait time between each analysis cycle can be set in the menu of the graphical user interface (see 6.6).

In any case, at the end of the cycle a new result value is calculated, shown and transferred out by mean of an analog output or by serial communication (Modbus RTU protocol).

During online operation an EXTRA cycle can be performed in between the standard analysis cycles, at a predefined frequency. The EXTRA cycle follows a different program and can be used for autocalibration or cleaning. The frequency of the EXTRA cycle can be set in the menu of the graphical user interface (see 6.6).

An analysis sequence in the 3S-UV254 analyzer would typically have the following structure.

After rinsing the colorimetric reaction cell, a constant amount of sample is grabbed. After mixing the sample to omogenize it the analyzer turn on the lamp to do the measurement.

5.2 Dilution

The 3S-UV254 does not usually need a diluted sample. However, in order to meet our customer requirements the instrument can be provided with the dilution option, in this way the maximum range can be increased to values that would be not possible without dilution. It is necessary to provide a dilution water line and connect it to the supplied external reservoir, the water must be pure and free from contaminants, preferably deionized/demineralized. See section 3.10 for the instruction to connect the analyzer to the dilution water line.

5.3 Dual stream analysis

If you have purchased the 3S-UV254 analyzer with the dual stream option you can run analyses on two different sample streams. In that case you have to connect the sample inlets to the respective external reservoirs.

The analysis cycle will contain the necessary step to sequencially run the two analyses. The two results will be displayed on the display at the end of the analysis.

The samples level sensors will operate independently and in the case one of the two sample is missing the analysis can still proceed on the available one.

The analyzer will come already configured to run dual stream analyses. A single stream analyzer can be converted in a dual stream one by purchasing the conversion kit, contact the 3S Analyzers customer service to request the kit and the related procedure.

5.4 Example of measuring and extra cycle programming

The measurement cycle is a sequence of 25 steps, and an operation (as well as a duration in seconds) is assigned to each of them in the cycle programming (ANALYSIS SETUP TABLE).
The same happens for an extra cycle which has a different programming (EXTRA SETUP TABLE).
Although some changes and customisation are allowed, with the help of the manufacturer's technical support, the programming (operation + duration in seconds) for the different types of measurement cycles is the following (default):

STEP	OPERATION	DURATION (sec)
1	DRAIN	5
2	RINSE 1	10
3	SAMPLE 1	9
4	DRAIN	5
5	SAMPLE 1	9
6	DRAIN	5
7	SAMPLE 1	9
8	MIX	10
9	WAIT	10
10	LAMP ON	10
11	RESULT A	2
12	SAVE DTLOG	2
13	DRAIN	5
14	SAMPLE 1	9
15	DRAIN	5
16	SAMPLE 1	9
17	WAIT	0
18	WAIT	0
19	WAIT	0
20	WAIT	0
21	WAIT	0
22	WAIT	0
23	WAIT	0
24	WAIT	0
25	WAIT	0

As you can see the cycle only uses 16 out of the 25 total possible steps, the remaining ones are left blank.

Below is the standard programming of dilution methods.

PLEASE NOTE THAT
In this example, filling times (in seconds) refer to the 12 mm cell (corresponding to 9 seconds).

STEP	OPERATION	DURATION (sec)
1	DRAIN	5
2	SAMPLE 1	9
3	DRAIN	5
4	SAMPLE 1	5
5	DRAIN	5
6	LOOP ON	2
7	RINSE 1	15
8	LOOP OFF	2
9	RINSE 2	20
10	LOOP ON	2
11	SAMPLE 2	7
12	LOOP OFF	2
13	LAMP ON	10
14	RESULT A	2
15	SAVE DATALOG	2
16	WAIT	0
17	DRAIN	5
18	SAMPLE 1	9
19	DRAIN	5
20	SAMPLE 1	9
21	WAIT	0
22	WAIT	0
23	WAIT	0
24	WAIT	0
25	WAIT	0

For an EXTRA cycle, even though it is usually characterised based on the sample, after a first operation period, to assess the frequency and dosage of the cleaning reagent, please refer to this default cycle below.
In the case of automatic calibration of the blank value, replace the CALIBRATION operation with the one referred to as BLANK.

STEP	OPERATION	DURATION (sec)
1	DRAIN	5
2	RINSE 1	25
3	SAMPLE 1	9
4	DRAIN	5
5	SAMPLE 1	9
6	WAIT	10
6	LAMP ON	9
7	CALIBRATION	2
8	DRAIN	5
9	SAMPLE 1	9
10	DRAIN	5
11	SAMPLE 1	9
12	WAIT	0
13	WAIT	0
14	WAIT	0
15	...	...

See section 6.6 for programming instructions.

5.5 Emergency stop

Any running cycle can be halted by the user by pressing the STOP! key on the COMMANDS page of the user interface, any operation will be immediately stopped. A physical emergency stop button can also be connected to the digital input to provide a way to externally stop the analyzer.
The analyzer operation must be then restored manually by pressing STOP RESET within the COMMANDS menu.

5.6 Loss of sample

The analyzer uses two level contacts to verify the presence of the sample (see 3.9) by means of level sensors.
In this way if the sample or dilution water needed for the analysis is missing, the analysis will not proceed and the analyzer will put itself in standby. When the sample fills the external reservoir again the level sensor floater will rise up and the analyzer will start online analyses again, without needing any external intervention.

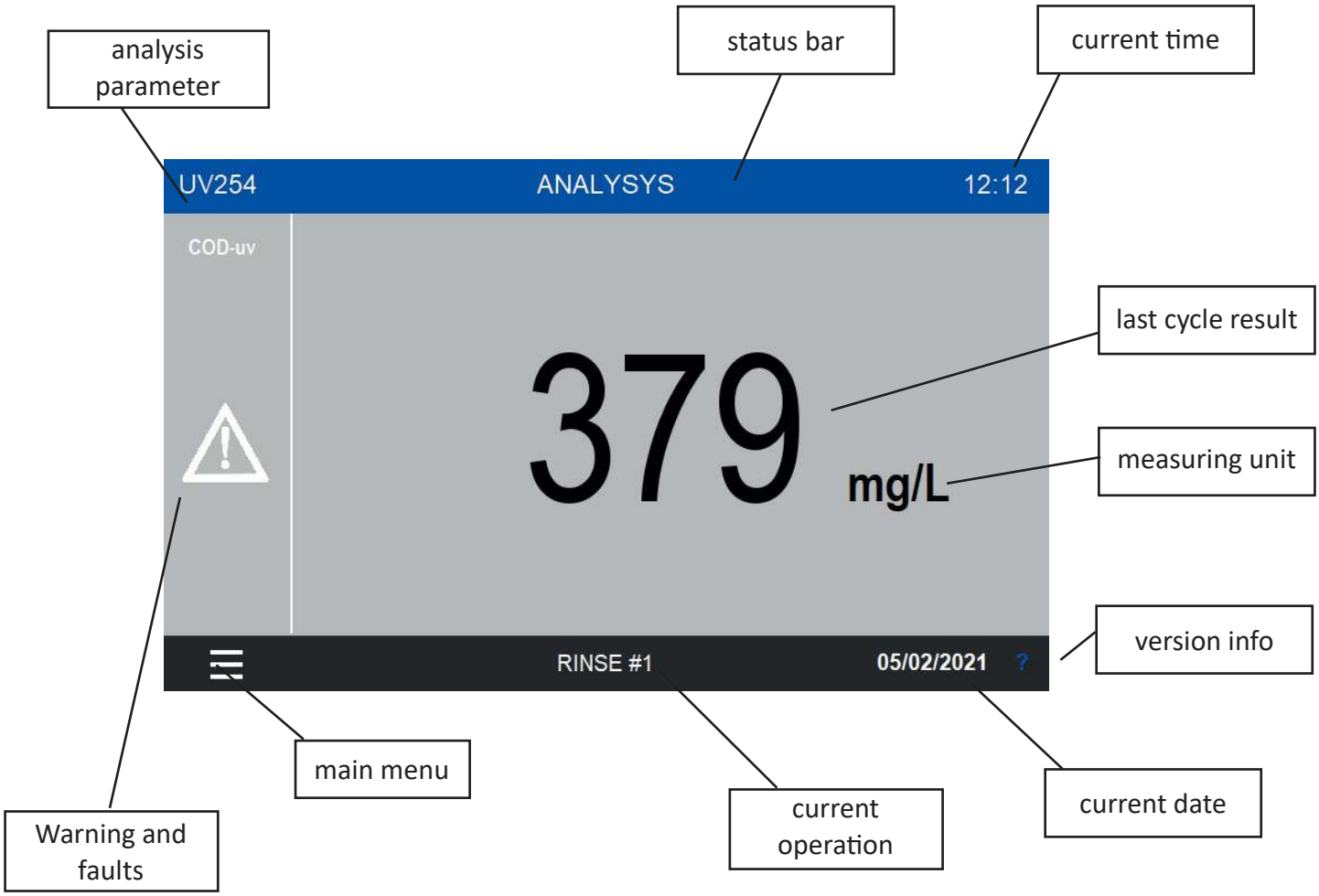
6 - USER INTERFACE

6.1 Power on

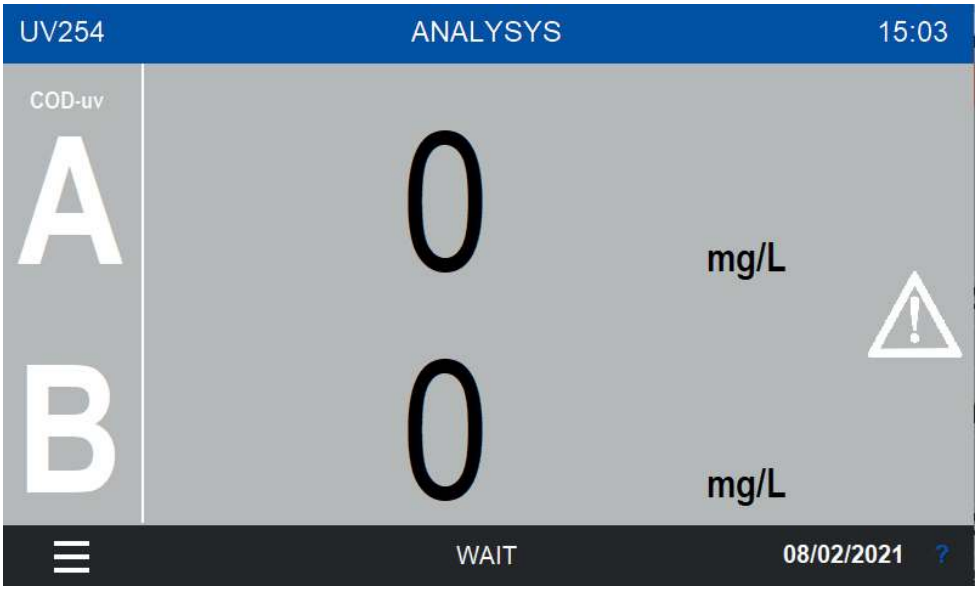
After checking for proper power supply, you can turn the device on through the switch located inside the upper compartment.
The analyzer display takes a few seconds to turn on, during which a splash screen appears followed by the main screen.

Please note that the device will restart continuing the same operation that was in course when it was turn off. If the previous shutdown had been caused by a power loss, and the analyser was set to ONLINE (continuous consecutive analysis cycles), when restarting the machine, the analysis cycles will continue from the same point.
If, on the other hand, the analyzer was set to Stand-by before being turned off, it will stay in stand-by.

You will se the following main page:



If the device was set to analyze 2 channels, you'll see an additional result value for channel B.



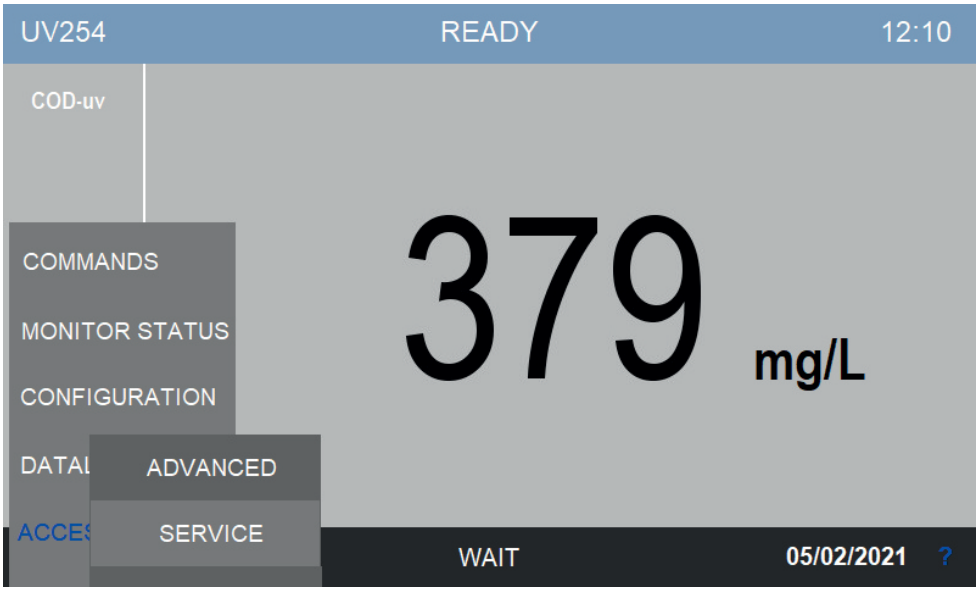
After some minutes of inactivity the screen will go black to save power.

6.2 Main menu

By tapping on the bottom left corner you will access the main menu. All the commands, options and configurations can be accessed from here.

6.3 Gaining access

To prevent undesired modifications to important configuration parameters, the access to the user interface is restricted on a login-based access menu. The user can log himself in by tapping on the ACCESS LOGIN entry of the main menu.



The analyzer has three levels of security, each level allows the user to access more advanced functions. The three levels are:

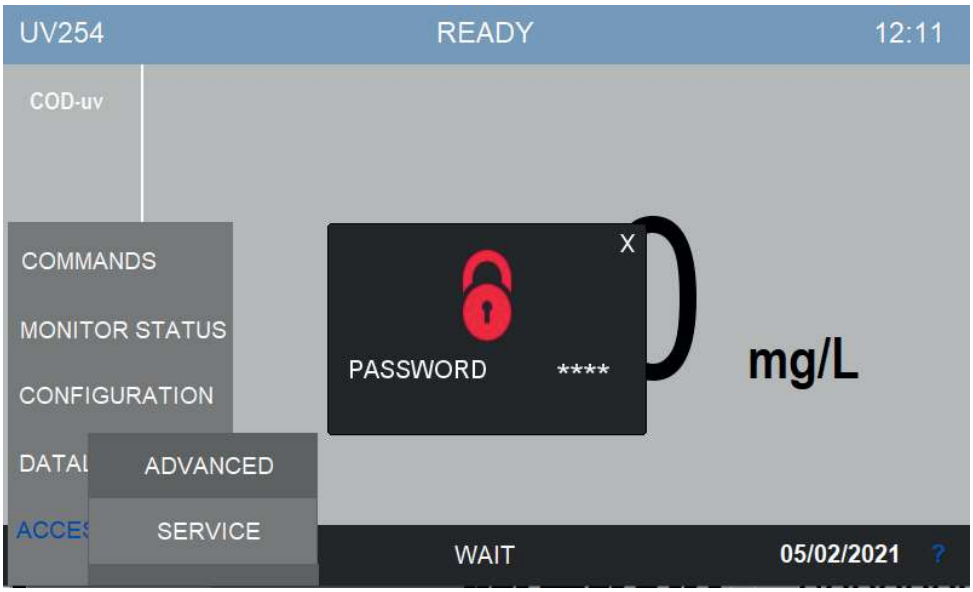
BASIC	This is the default level, the user can start or stop the analysis cycle and access data and trends but cannot modify calibrations or settings
ADVANCED	This level allows the user to perform calibrations and modify basic settings. The password for this level is **1111**
SERVICE	This level allows 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 password for your analyzer. You can write it down below.

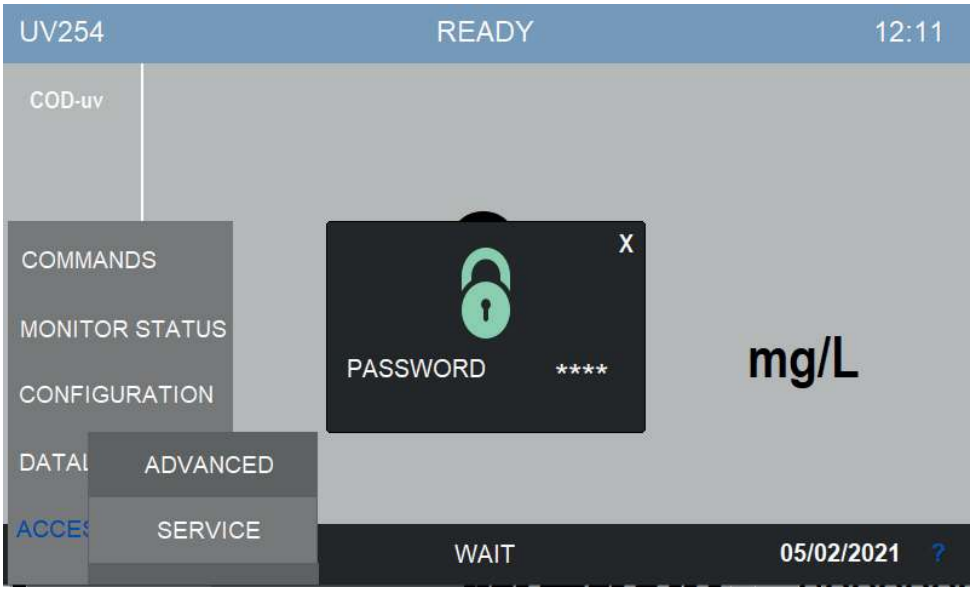
SERVICE PASSWORD _____

To access the analyzer menu with the required security level tap on ACCESS LOGIN in the main menu.

Press on **** to display the numerical pad and enter your password.

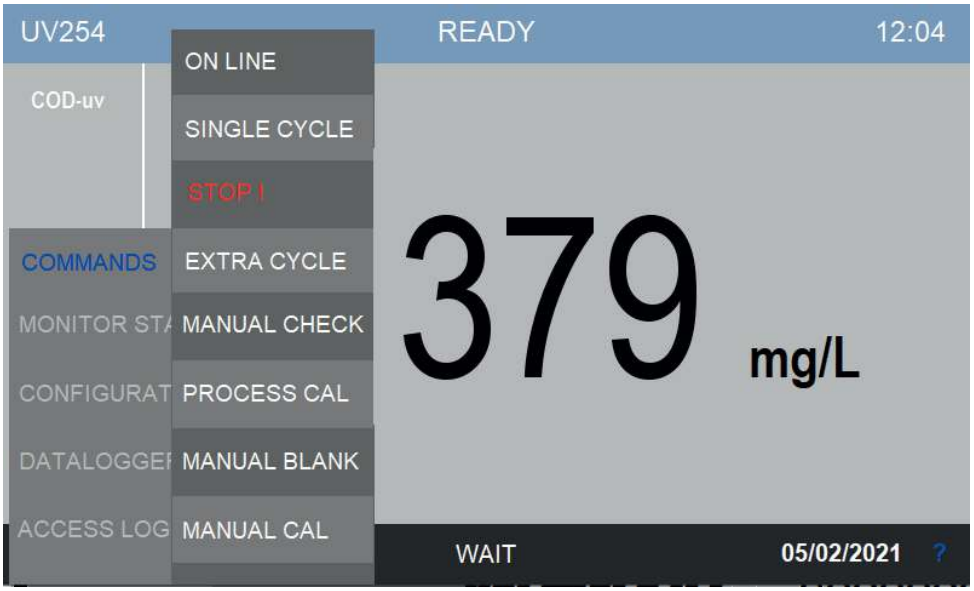


If the password for the selected access level is correct, the lock symbol becomes green.



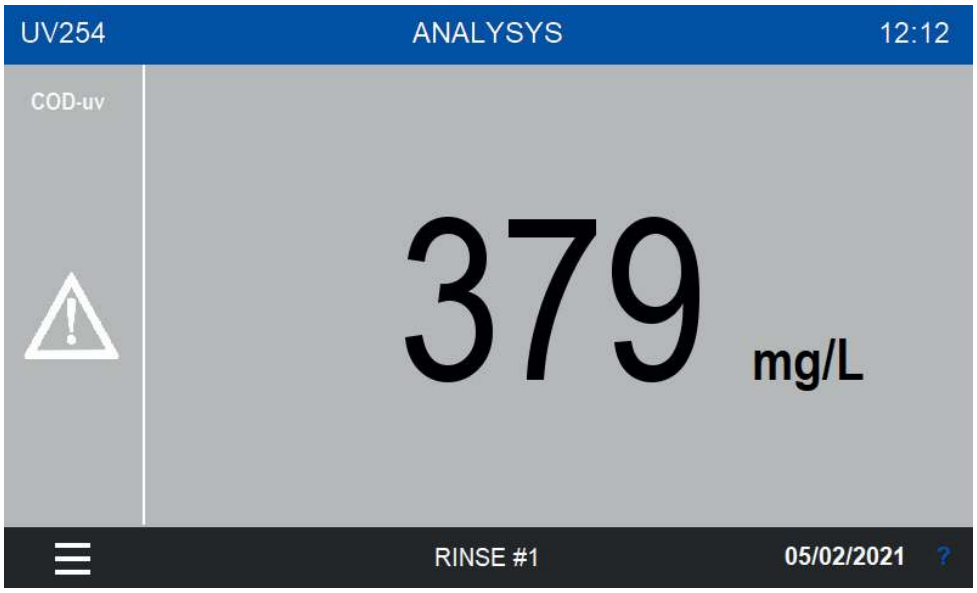
6.4 Commands

In the COMMANDS menu the user can give orders to the analyzer, such as starting a new analysis or perform calibrations.

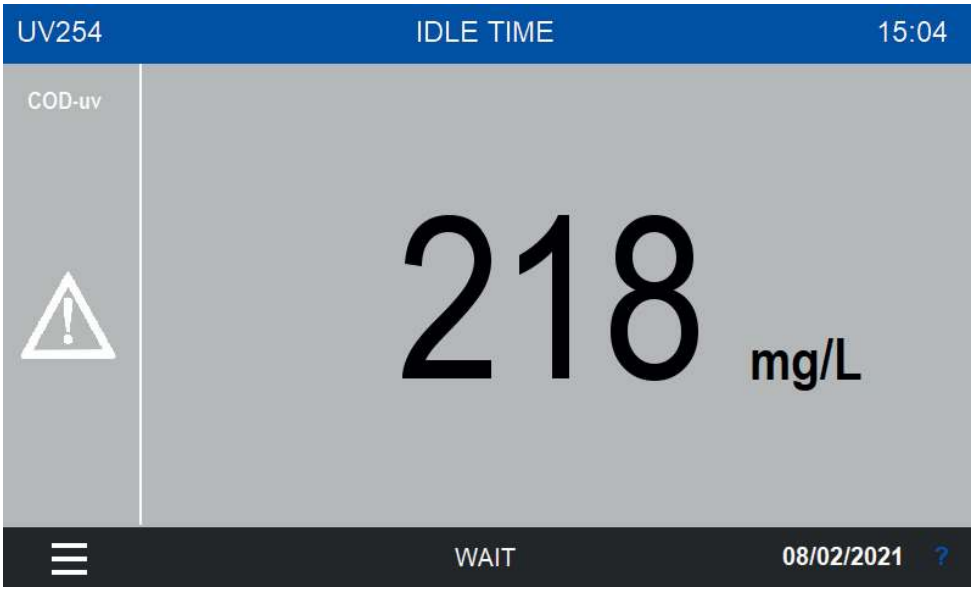


Start Online

By pressing this button the analyzer will start online analyses.
The ONLINE status is characterized by a dark blue top bar replacing the light blue of the standby mode. In the top bar the word ANALYSIS also indicates that the instrument is currently in the middle of an analysis run.

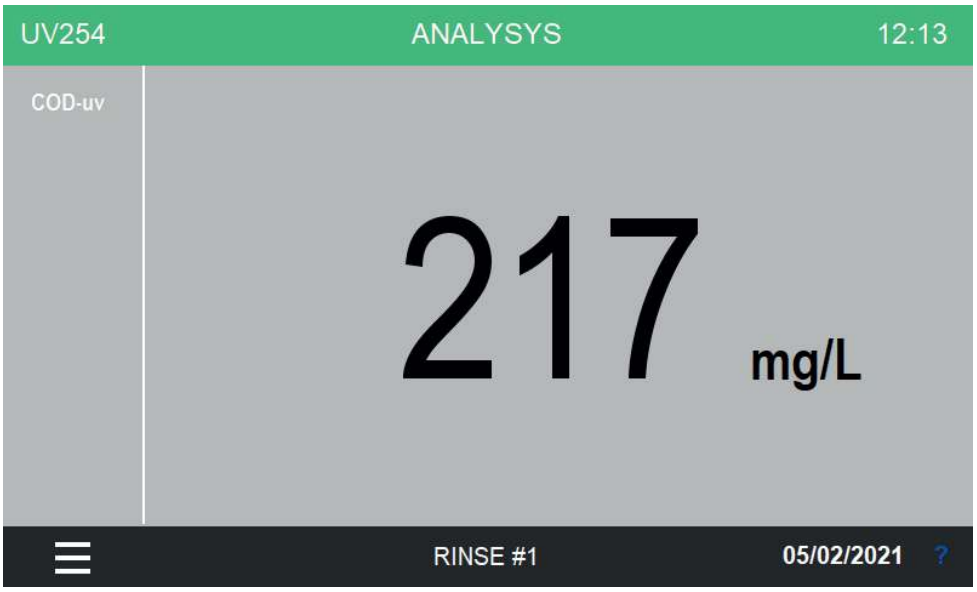


After the analysis cycle is completed the instrument will wait a predefined wait time before starting a new one. The top bar is still dark blue and the status is indicate by the word IDLE.



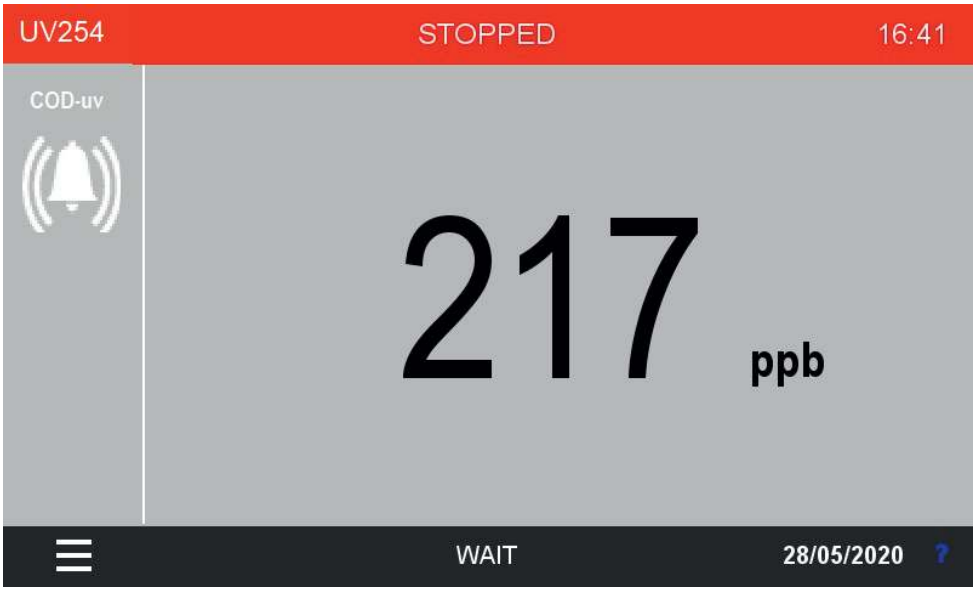
Single Start

A single analysis cycle can be started by pressing this button. After the measurement is completed the analyzer will stay in standby, ready to receive new orders. The top bar is now green.

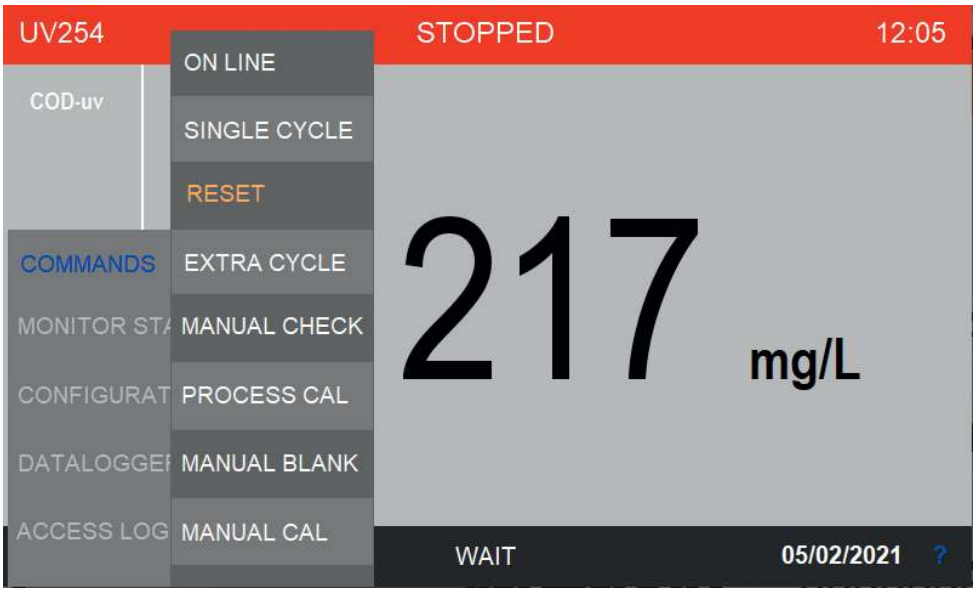


Stop!

Stop any operation and put the analyzer in the STOPPED status. This command is considered an emergency stop thus an alarm condition is raised.

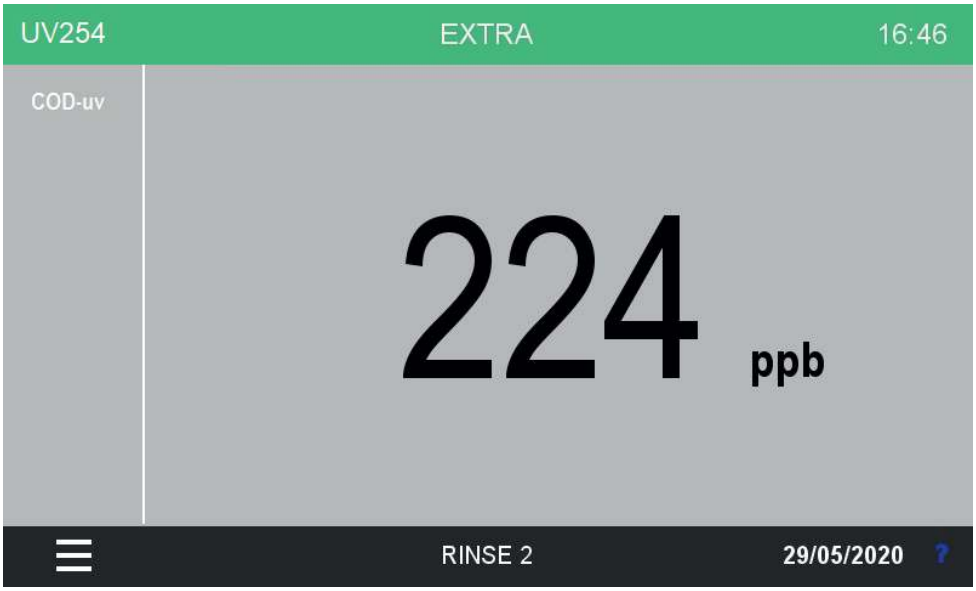


To restore the normal operation condition enter the COMMANDS menu and press STOP RESET.



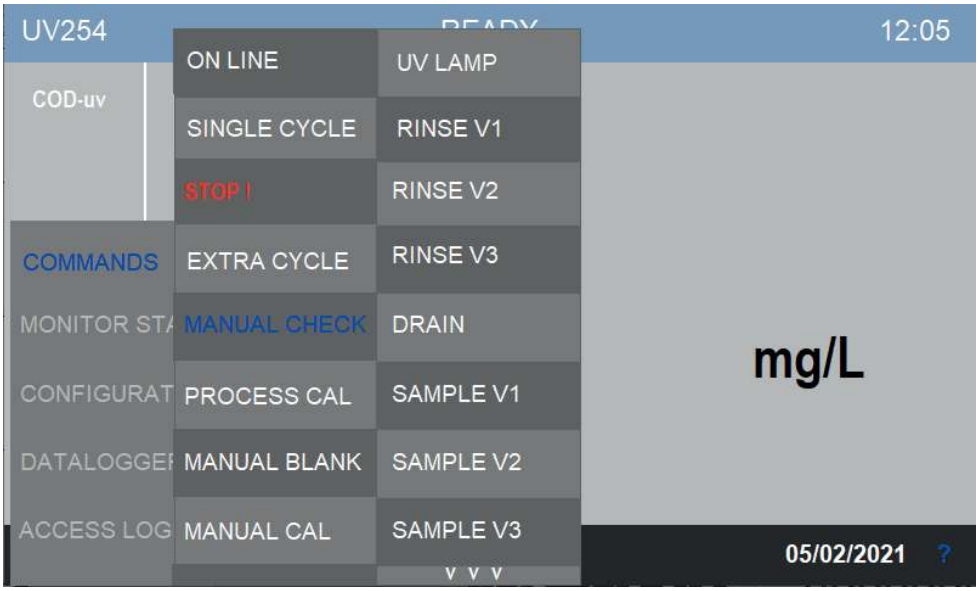
Extra cycle

Run an extra cycle immediately. The analyzer will run the program saved as Extra Cycle, usually an autocalibration or cleaning operation. The extra cycle execution can also be scheduled at a given frequency, see section 6.6 to configure the Extra Cycle settings.

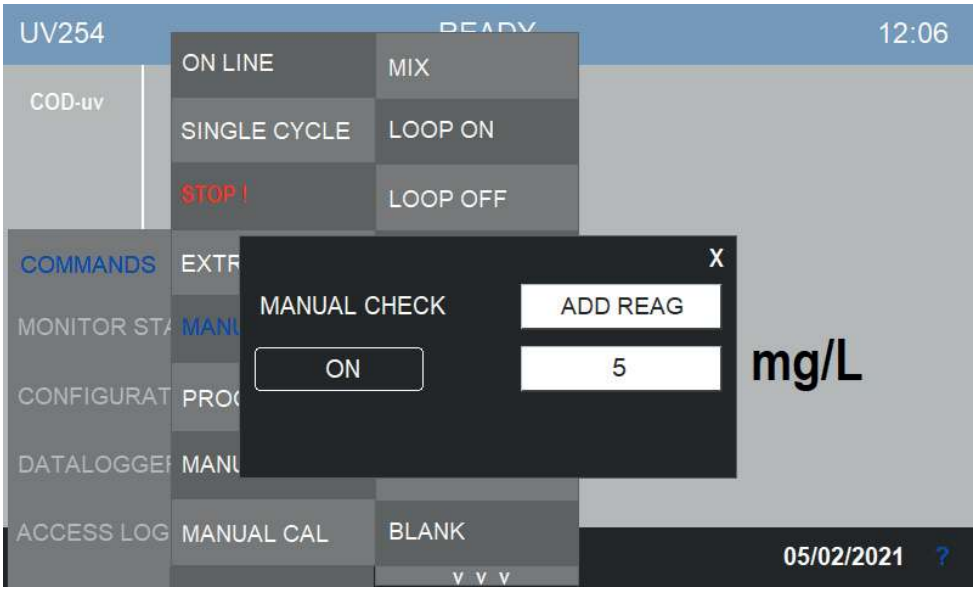


Manual checks

Press this button to access a submenu with the list of every function available to the analyzer. The user can then manually run any function/operation for a specified amount of time. This is usefule for testing or servicing purporses. See Section 4.3 for the list of the operations and their description.

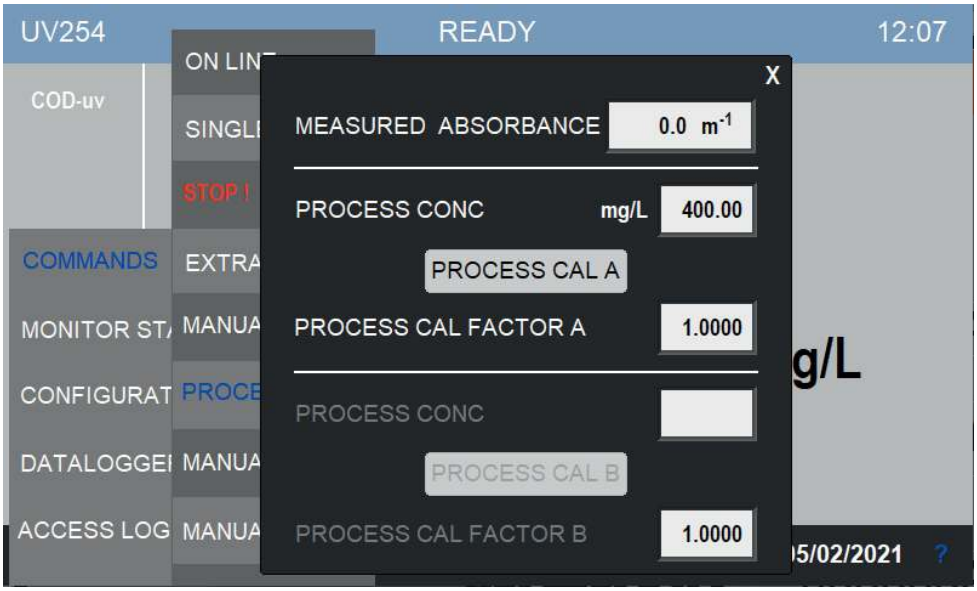


After selecting the desired operation you will be asked for the amount of seconds you want the function to stay on. Enter the value in the field and confirm with OK to run the function.



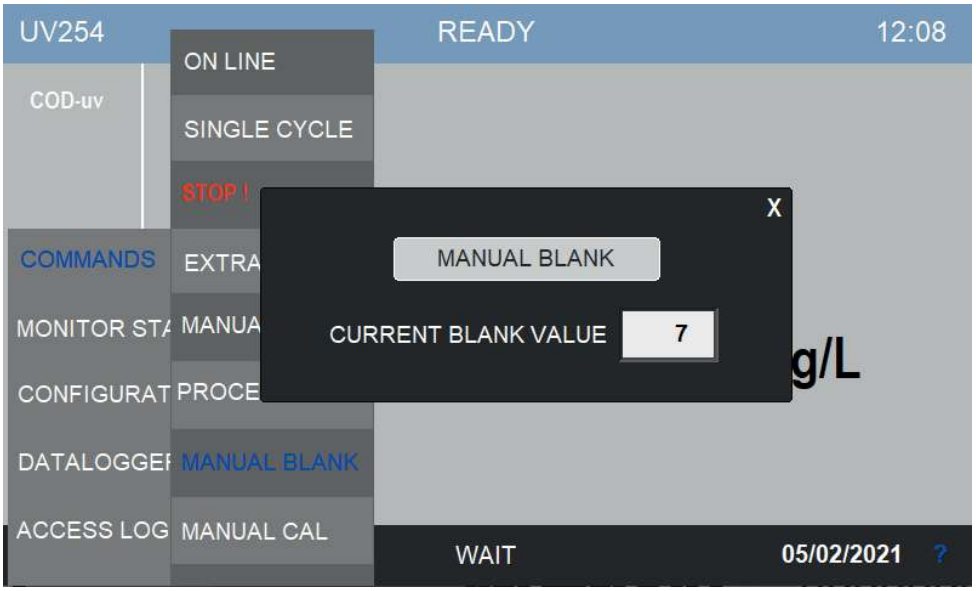
Process cal

In this menu the user can calibrate the instrument using a laboratory value. See Section 7 for the correct procedure to perform a process calibration.



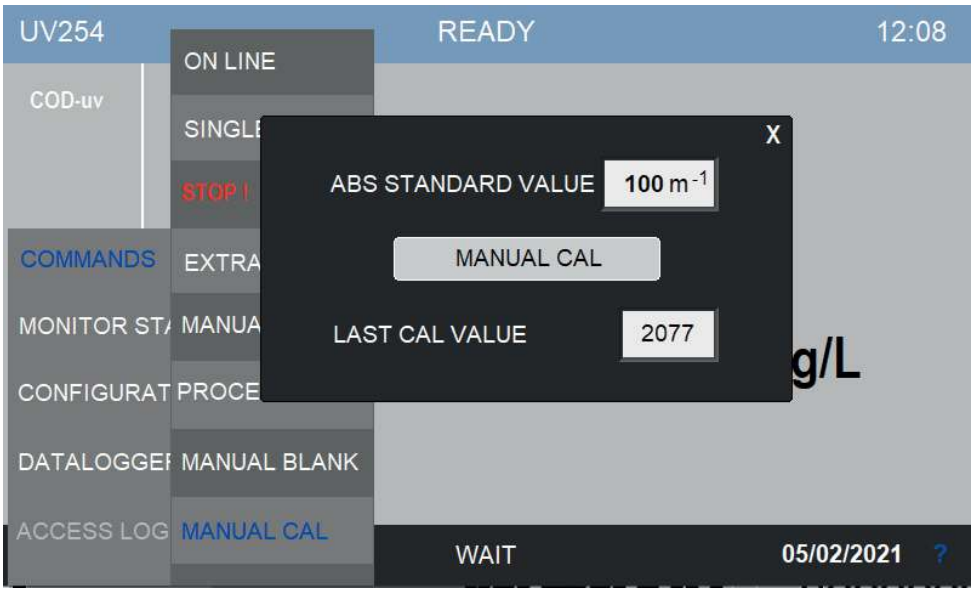
Manual blank

Store the last absorbance value as blank calibration. See Section 8 for more info on how to calibrate the instrument.



Manual cal

Perform the calibration of the instrument. If the calibration value falls out of the predefined boundaries, a calibration error will be raised.
See Section 7 for the correct procedure to perform a calibration.

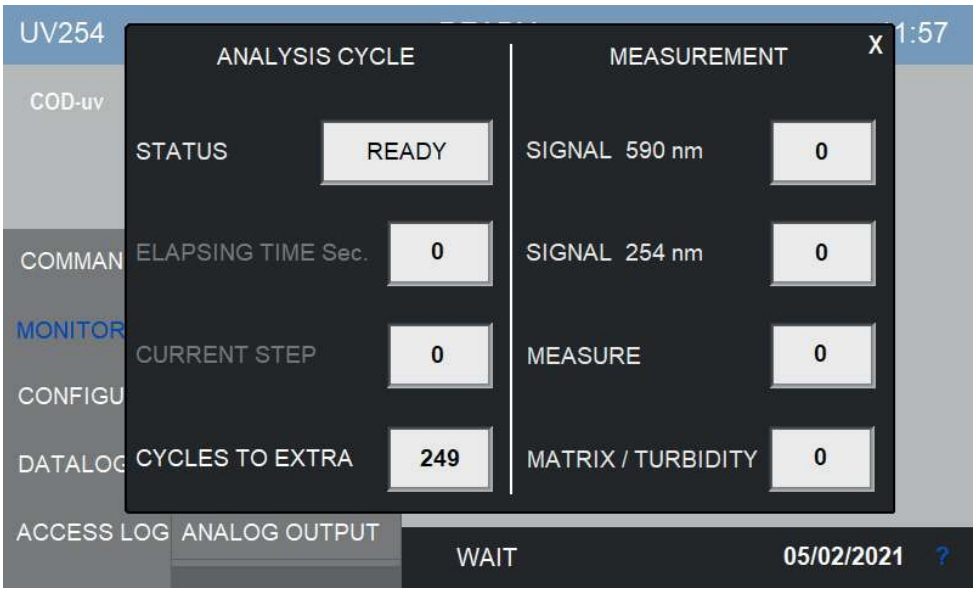


6.5 Monitor status

This menu contains the data representation in grafical form as well as important diagnostic information on the analyzer status.

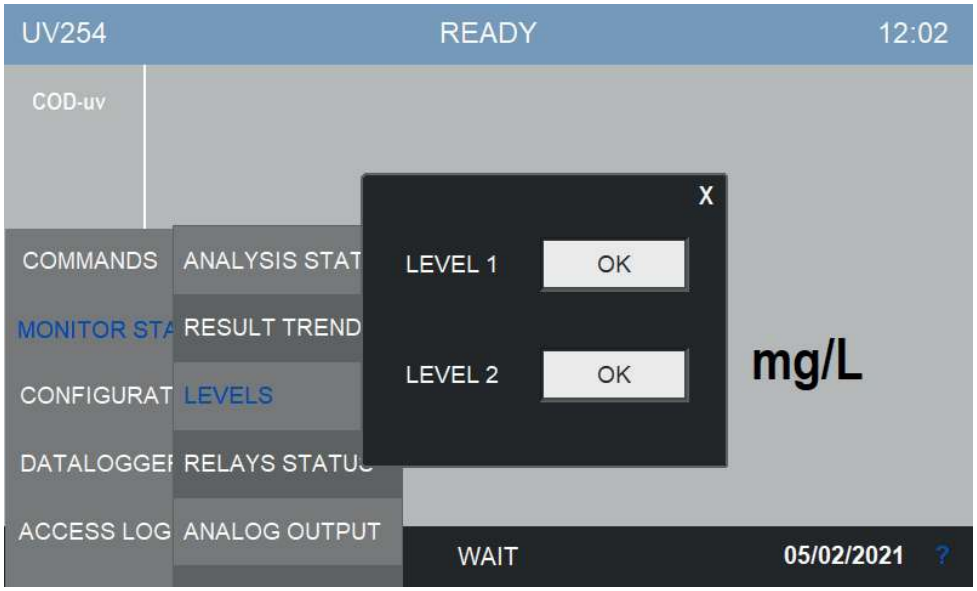
Analysis Status

This window will report data on the current analyzer status.
On the left column the user can find the status of the analyzer (READY, ANALYSIS, IDLE TIME, STOPPED), the number of the step currently running and its elapsing time, and the waiting time between on analysis cycle and the following on (CYCLES TO EXTRA).
On the right colum there is the signal at 590 nm and 254 nm, the current analysis result, and the matrix/turbidity value of the sample.



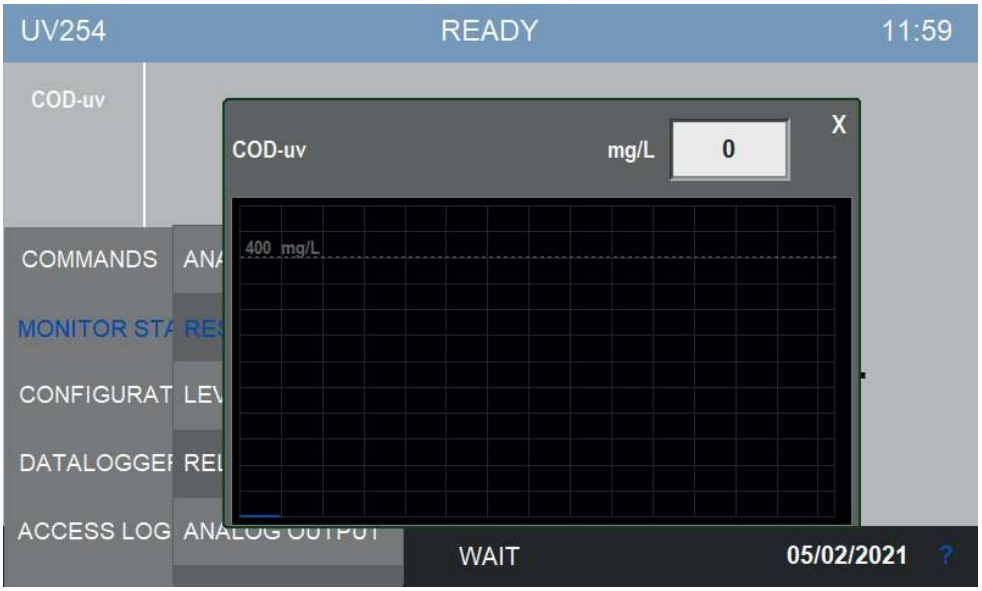
Levels

In this window the user can check the status of the two level switches.
The level switches detect the presence of the sample in the inlet streams (1 or 2 depending on the configuration). They must be connected to the level sensors of the external reservoirs in order to operate correctly, see Section 3.9.



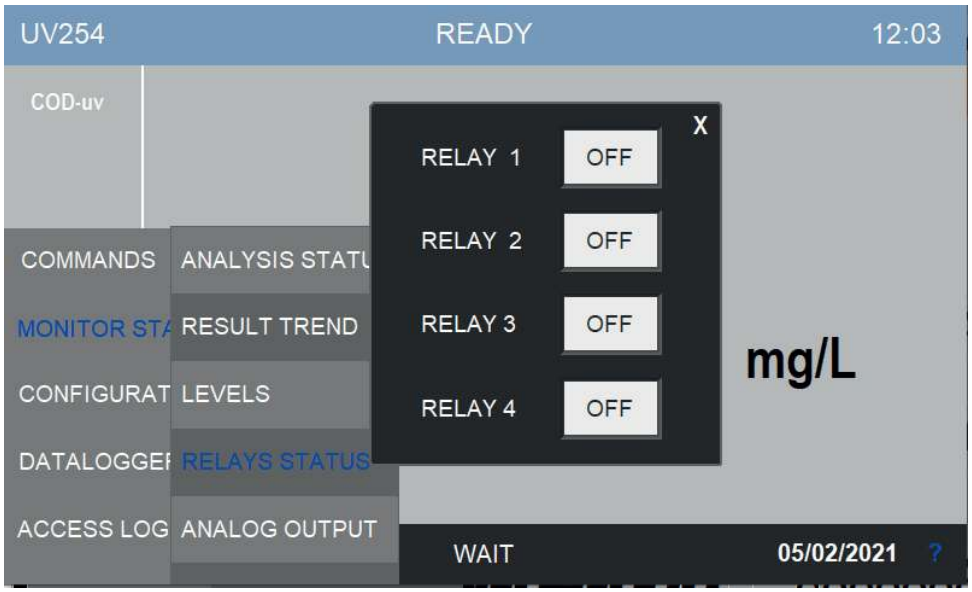
Result trend

This window shows the plot of the most recent analysis results.



Relays status

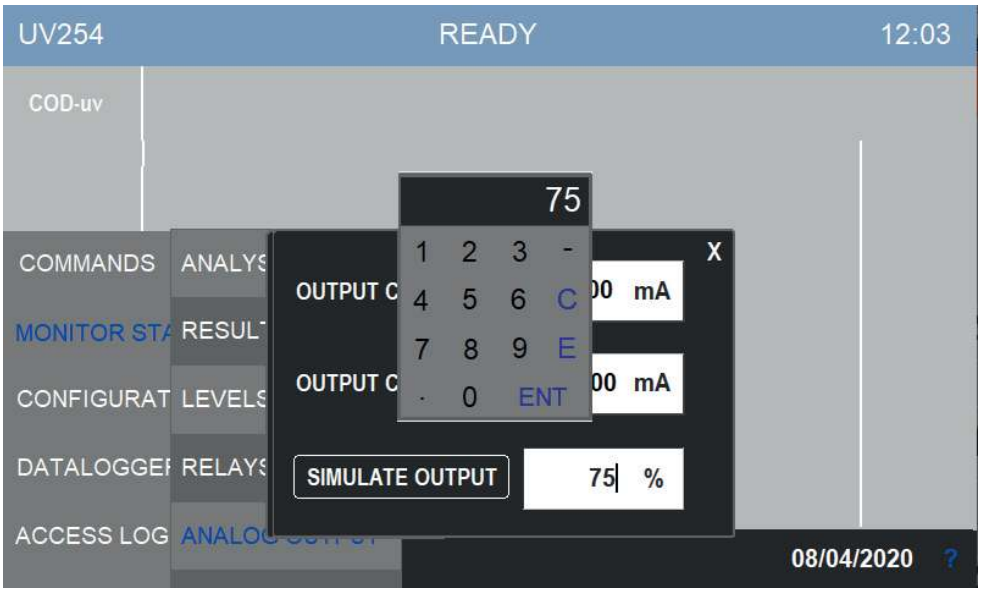
The analyzer is provided with four output relays to signal anomalies in the analyzer behavior. Relays can be configured to be activated by various events. See the explanation of the CONFIGURATION menu.



Analog output

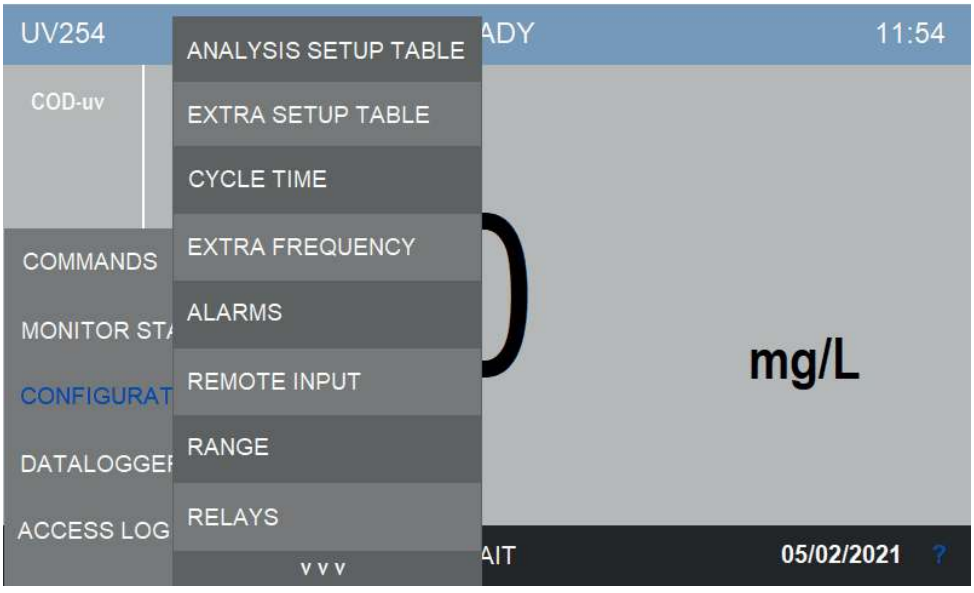
The analyzer is provided with two 4-20 mA analog outputs, one for each channel (up to two), the current output value can be monitored in this window.

From the same window is also possible to simulate the output, this is useful to test a new installation or for servicing purposes.
To start the simulation press SIMULATE OUTPUT, a numerical pad will appear allowing the user to enter the value as a percentage of the full scale.
Remember to disable the simulation when you have done with it!



6.6 Configuration

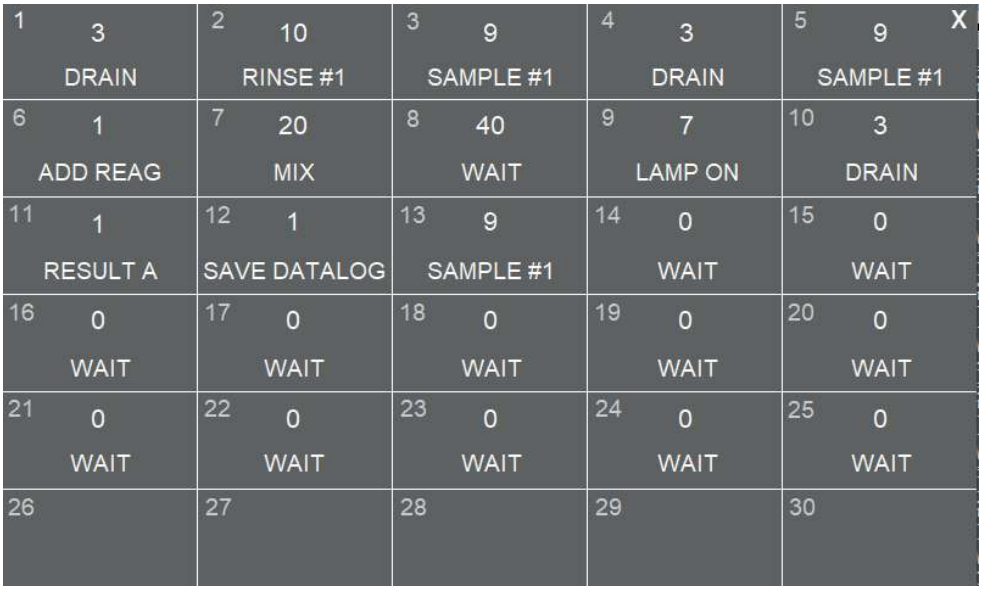
This menu contains the configuration parameters of the analyzer.



Analysis setup table

The instrument perform the analysis as a sequence of individual steps. Depending on the analysis parameter, up to 25 steps can be programmed. The analysis cycle is already programmed and usually does not require modifications, anyway it is recommended to request assistance from 3S Analyzers before making any change.

After accessing the menu button the following window appears:



Any step can be reprogrammed individually by pressing the correspondig square.

Steps 30 to 60 can be found in the next page, accessed by pressing the > symbol in the bottom right corner.

After selecting the desired function, press on the number to set the duration time

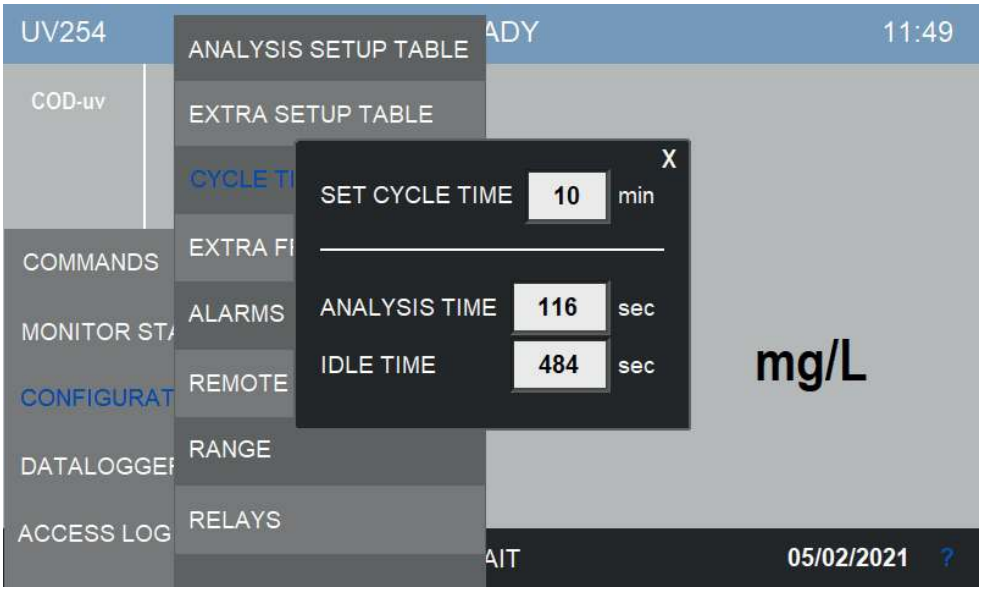
Extra setup table

In the same way it is possible to program the sequence of steps for the extra cycle (up to 15 steps).

E1 3 DRAIN	E2 10 RINSE #2	E3 9 SAMPLE #2	E4 3 DRAIN	E5 9 SAMPLE #2 X
E6 1 ADD REAG	E7 20 MIX	E8 40 WAIT	E9 7 LAMP ON	E10 2 WAIT
E11 1 CALIBRATION	E12 3 DRAIN	E13 9 SAMPLE #1	E14 0 WAIT	E15 0 WAIT
E16	E17	E18	E19	E20
E21	E22	E23	E24	E25
E26	E27	E28	E29	E30

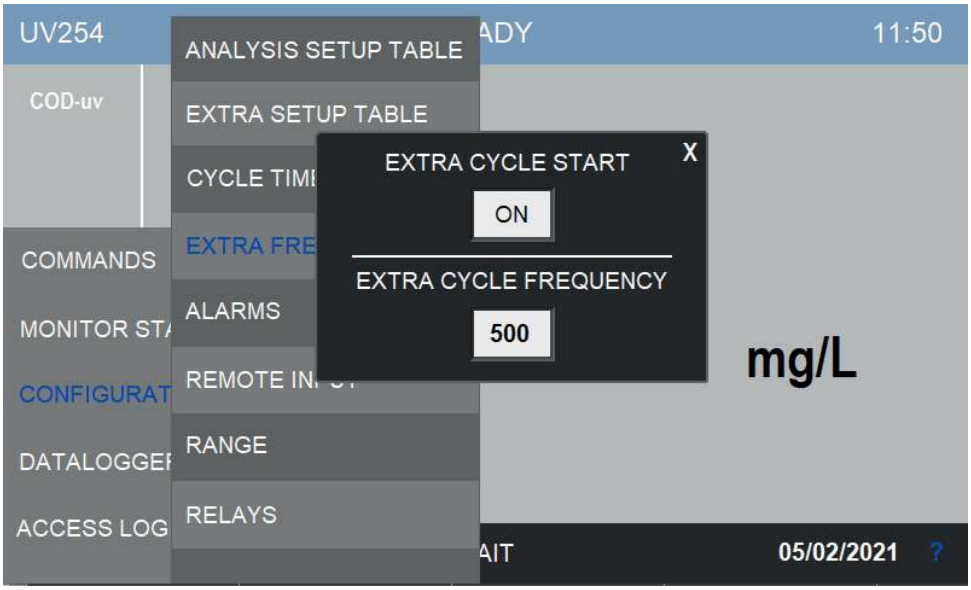
Cycle time

The instrument is able to run batch analysis continuously but it is also possible to set up an arbitrary analysis frequency. In this window the user can set a cycle time that comprises the analysis time and an idle time that the instrument waits before continue to the next analysis. In this way the analysis frequency can be controlled precisely.



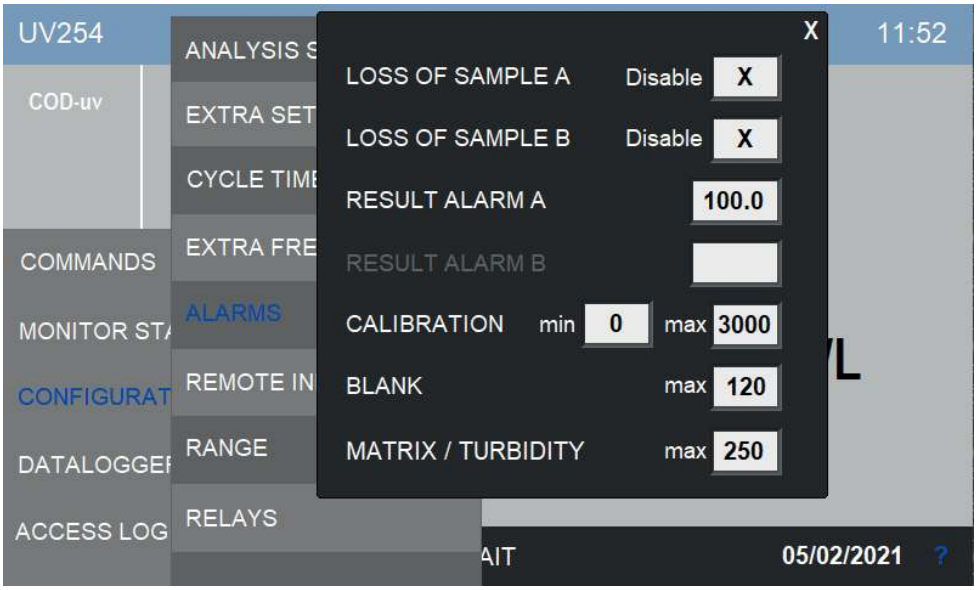
Extra cycle frequency

In this window the user can set up the extra cycle frequency. In the following example the instrument will perform an extra cycle every 500 analysis cycles.



Alarms

The analyzer can incour into events that require user attention or user intervention. In this window the user can bind an event either to a warning or to a fault, or even disable the event completely. The warning or fault will be displayed on the screen and communicated externally through one of the two relays. In the case of fault, the analyzer will completely stop every operation until user intervention.



The following events are available:

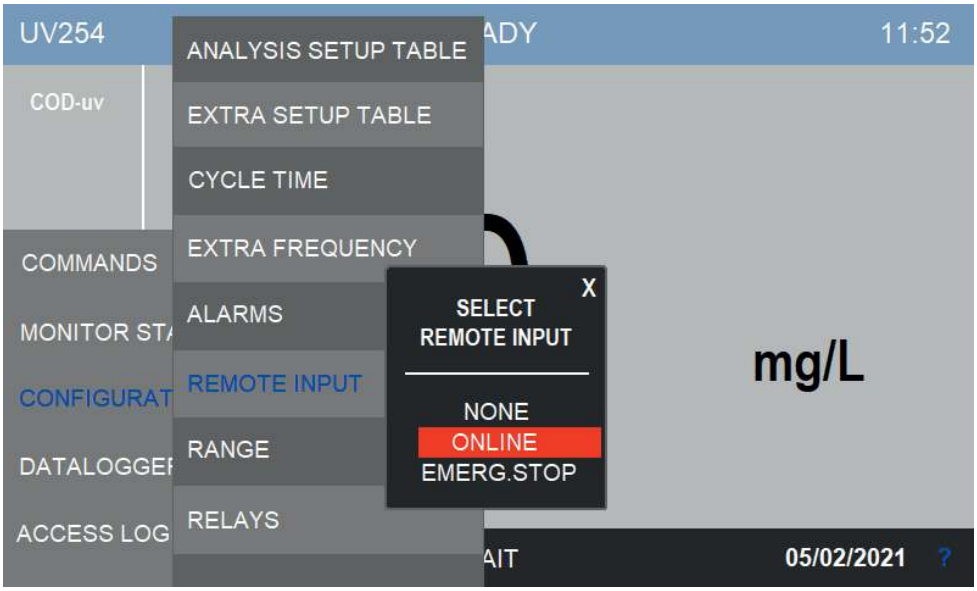
LOSS OF SAMPLE A, B	The relay is activated when the level sensor of the recirculating tank indicates the absence of a sample (A or B). They can be disabled although is not advised.
RESULT ALARM A, B	The relay is activated when the last measured value exceeds the preset limits. Once the value returns within the limits, the alarm is reset.
REAGENT LOW	The relay is activated when the amount of reagents left is below the threshold.
CALIBRATION ALARM A	The relay is activated when a calibration falls outside of the limits.
BLANK	The relay is activated when a BLANK calibration is above the threshold.
MATRIX/TURBIDITY	The relay is activated when the turbidity of the sample is above the threshold.

Remote input

Some operations of the instrument can be controlled remotely through a digital input, physically located in the screw terminals inside the electrical compartment of the analyzer.
To select the operation controlled by the remote input open the window REMOTE INPUT of the CONFIGURATION menu.

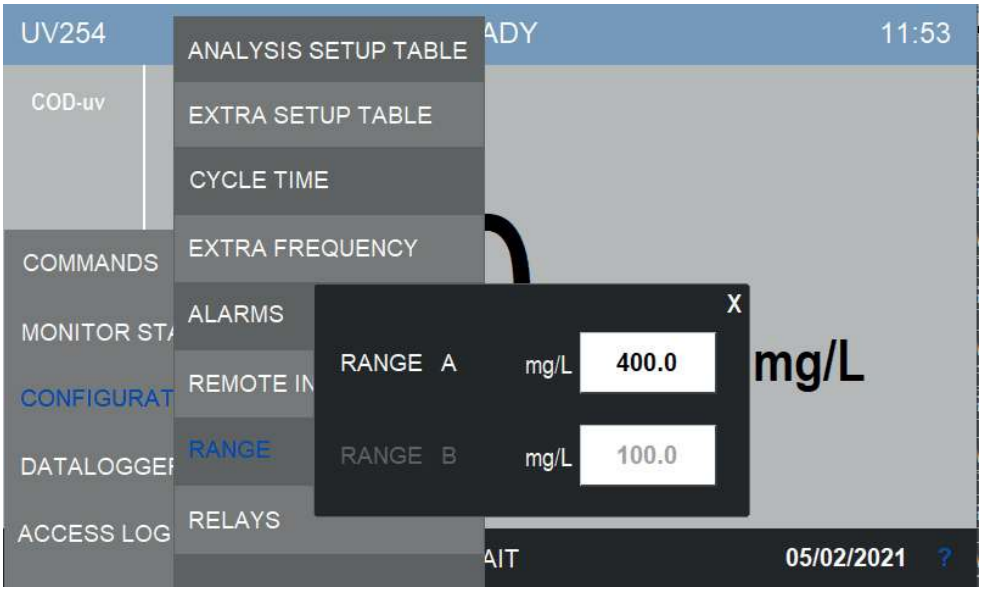
Four operations are possible:

NONE	Remote input disabled.
ONLINE	The analyzer will start continuous analysis.
EMERG. STOP	All operations are halted and the instrument is stopped.



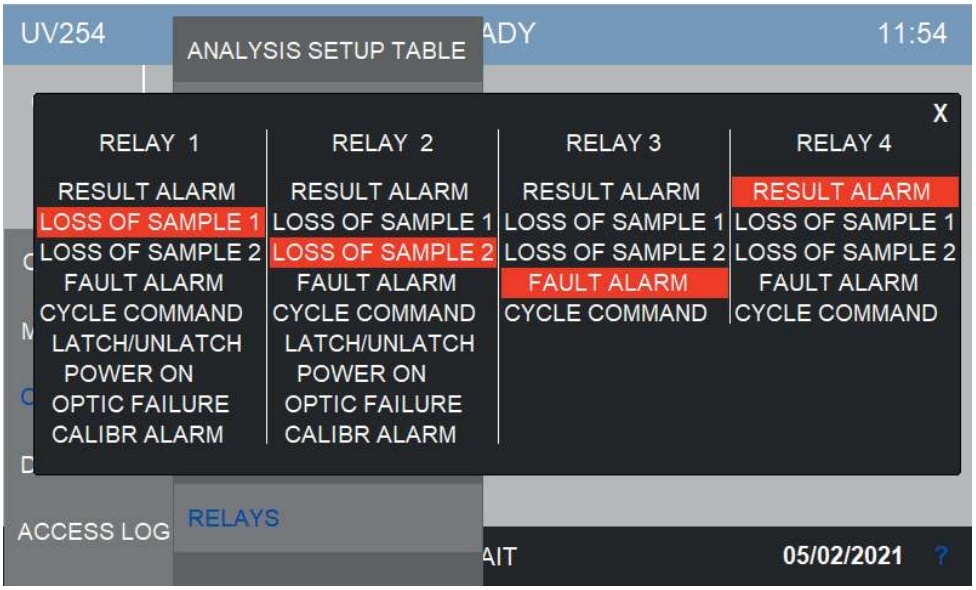
Range

In this window the user can configure the range of the analyzer. In the case of a dual channel analyzer the two ranges can be configured independently.

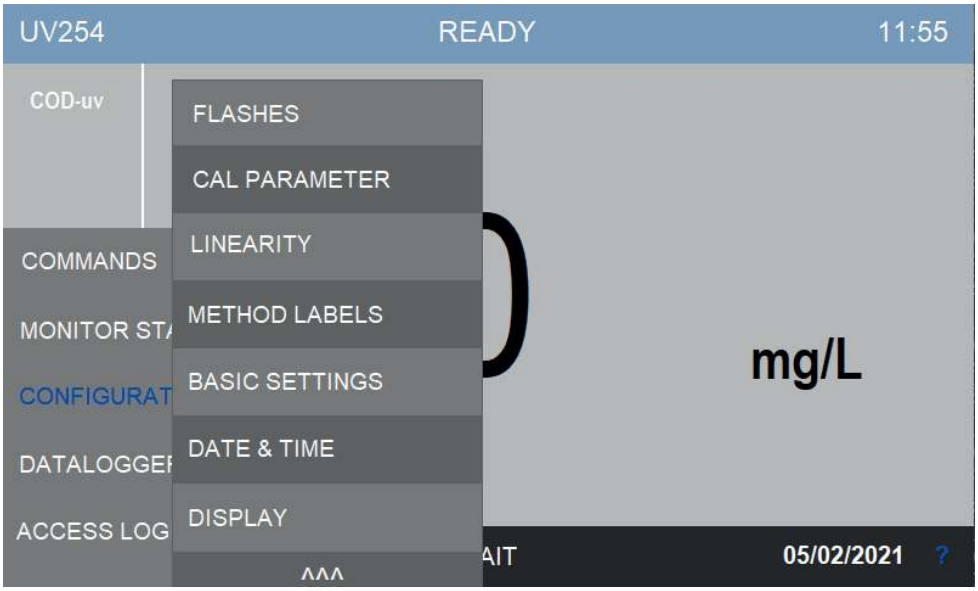


Relays

The user can configure the four relays arbitrarily. Every relay can be bound to an event and be activated consequently. Additionally the relays can be activated by the steps in the analysis cycle table (or extra cycle table). The latter option is useful to operate external equipment (valves, pumps etc.) during the cycle.



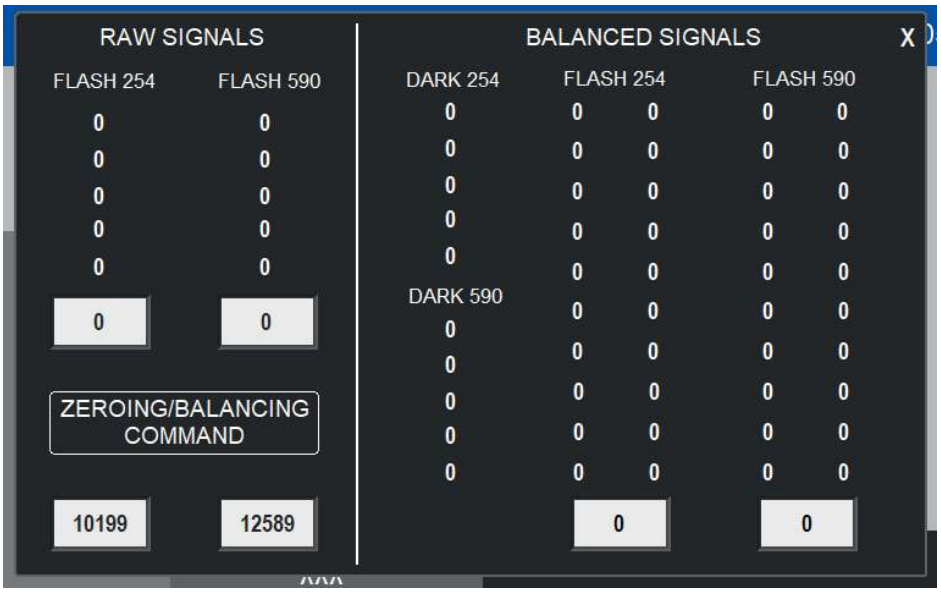
By pressing the arrows at the bottom of the menu you can access a second page:



Flashes

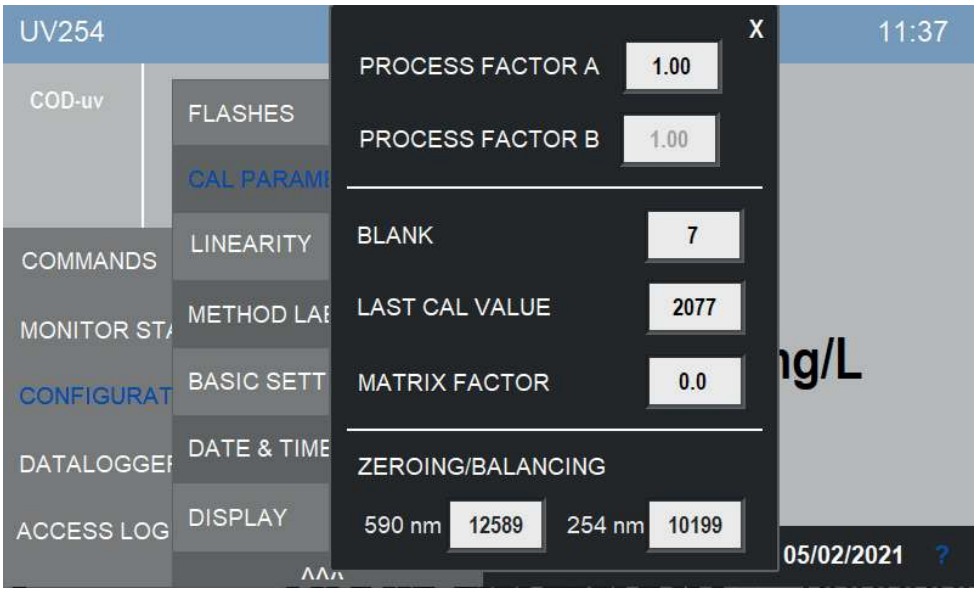
The analyzer uses an UV lamp for the measuring process. The lamp emits 21 flashes every analysis and each flash is measured by the two photodiodes. The photodiodes signals are collected in this page.

This page is reserved for troubleshooting/servicing purposes.



Cal Parameters

In this window you can view the calibration parameters. See Section 7 for instructions on how to calibrate the instrument.

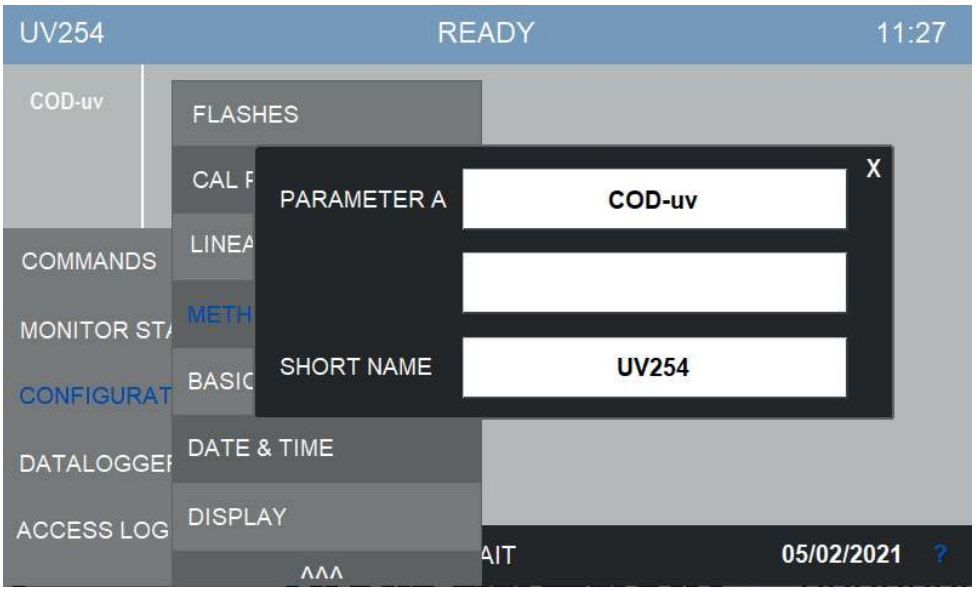


Linearity

In this window you can view the calibration curve. See Section 7 for instructions on how to calibrate the instrument and modify the calibration curve.

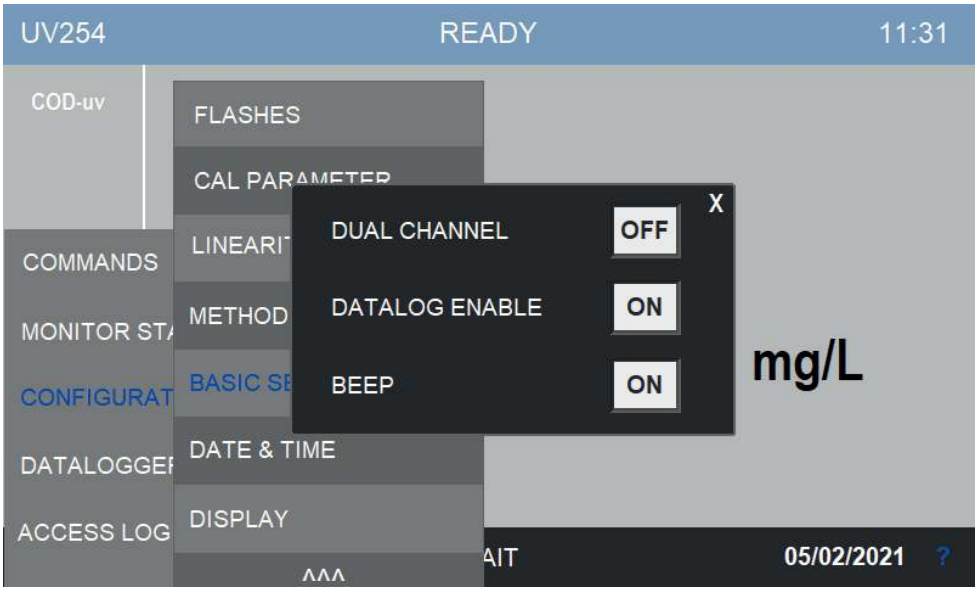
Method labels

In this window you can set new labels for the parameter/method. These labels will be shown on the main page.



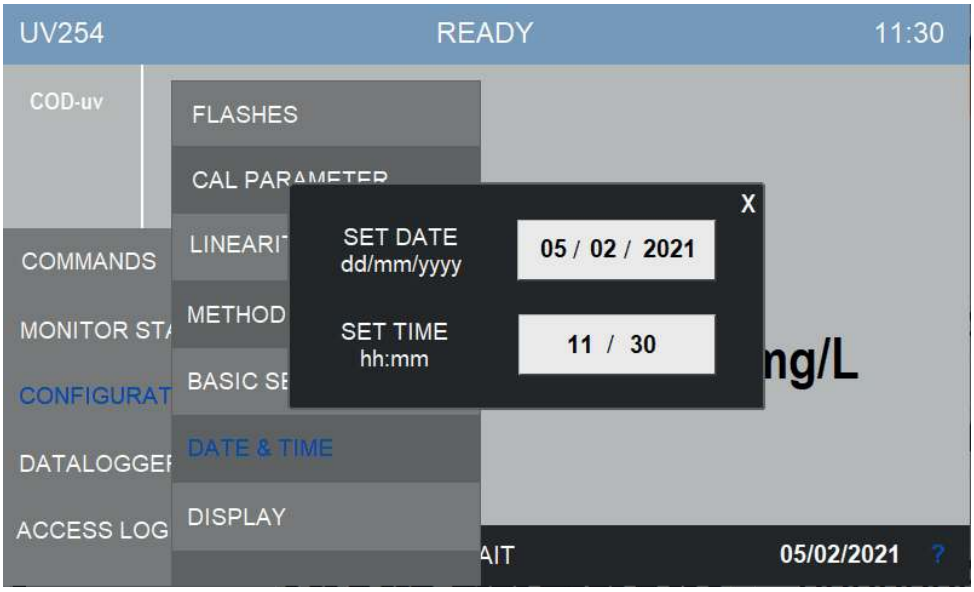
Basic Settings

In this window the user can change some basic settings, like enabling the dual channel mode, enabling the datalogger and the acoustic alerts.



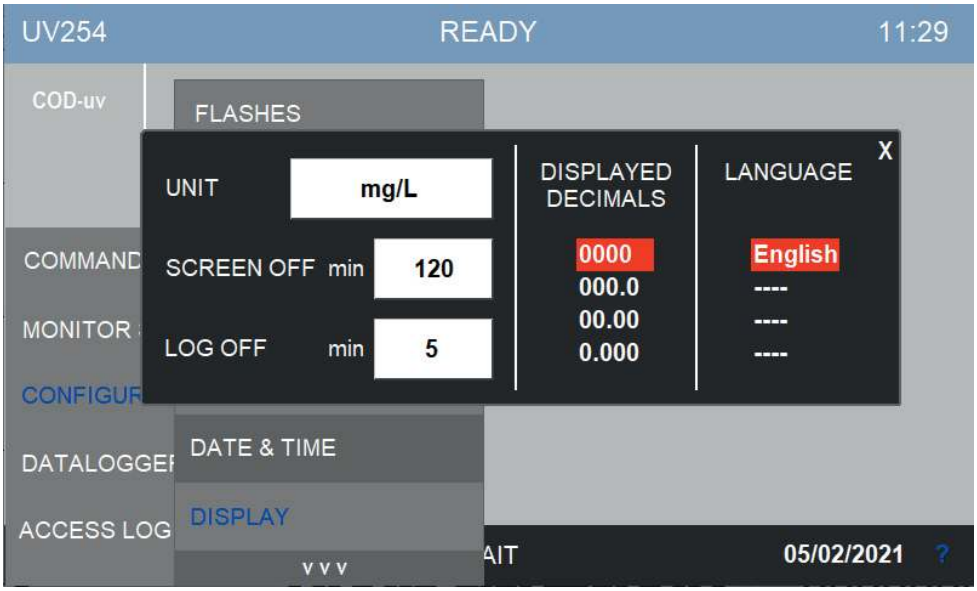
Date & Time

In this window the user can modify the date and the time.



Display

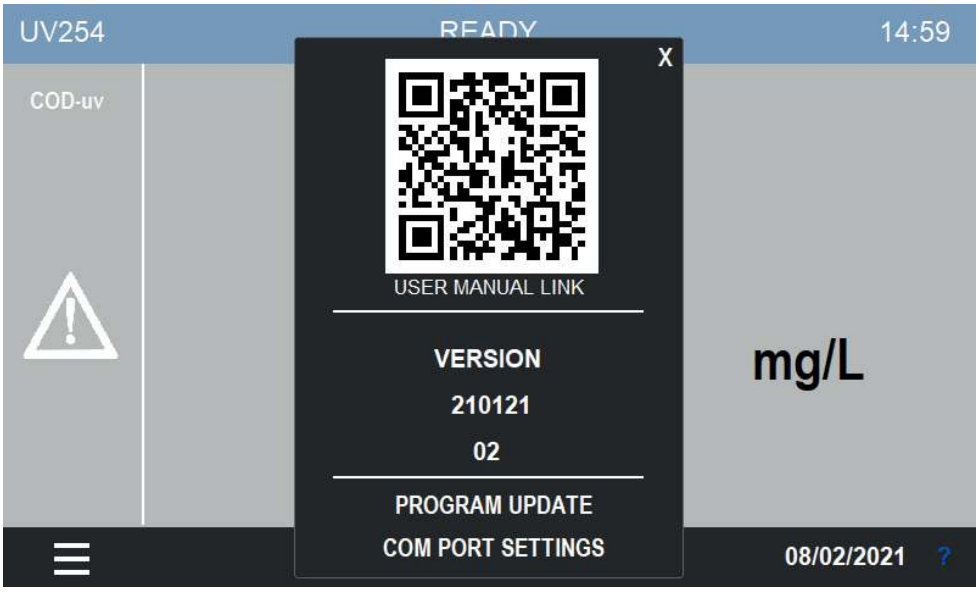
We can n this window the user can change the measurement units, displayed decimals and the language. The SCREEN OFF and LOG OFF options turn off the screen and log the user off after some inactivity time.



Version Info

By tapping on the ? symbol on the bottom left screen next to the date, you can access a page with the software version in use. You can also access the COM PORT SETTINGS and enable/ disable the program update.

The QR code contains a link to download the instruction manual (this manual).



7 - CALIBRATION

7.1 About the method

The analyzer is manufactured and delivered to measure the absorbance at a 254nm wavelength.
Therefore, the value resulting from the analysis is expressed in Absorbance (ABS) with measurement units of 1/m or m^{-1}.
The machine is calibrated at the factory using an organic substance (Potassium Phthalate, KHP) in accordance with DIN 38404 C3 for SAC254 (Spectral Absorbance Coefficient @ 254nm) measurement. To calculate the absorbance, a reference filter at 590nm (namely in the visible field) is used, as the sample colour can be a source of interference.
The instrument is calibrated using a standard two-point calibration (blank + span) is used, however, many organic substances have spectral characteristics which are different from those of KHP, so a process calibration is required after on-site installation, especially when measuring a value other than absorbance, like in cumulative measurements of organic matter such as COD, TOC and BOD.
After defining a correlation ratio (process factor), you can see the CODuv, BODuv or TOCuv label, and set the unit of measurement in mg/l.

7.2 Autocalibration

The analyzer can be programmed to execute a calibration operation automatically. The calibration must be programmed as an EXTRA cycle. The EXTRA cycle must be switched on and its frequency defined, you can do this in the CONFIGURATION > EXTRA FREQUENCY menu of the user interface. The calibration will then run automatically after the defined amount of analysis cycle. Both the zero and the span calibration can be executed automatically via the EXTRA cycle.
The user can also trigger a calibration cycle at any time by pressing COMMANDS > EXTRA CYCLE.
Of course an appropriate standard solution must be connected to the secondary inlet port of the analyzer (see 3.10). Also see section 5.4 for an example of a calibration cycle.

7.3 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 analyzer tubing and the reaction cell before starting with the calibration.

Proceed in the following way:

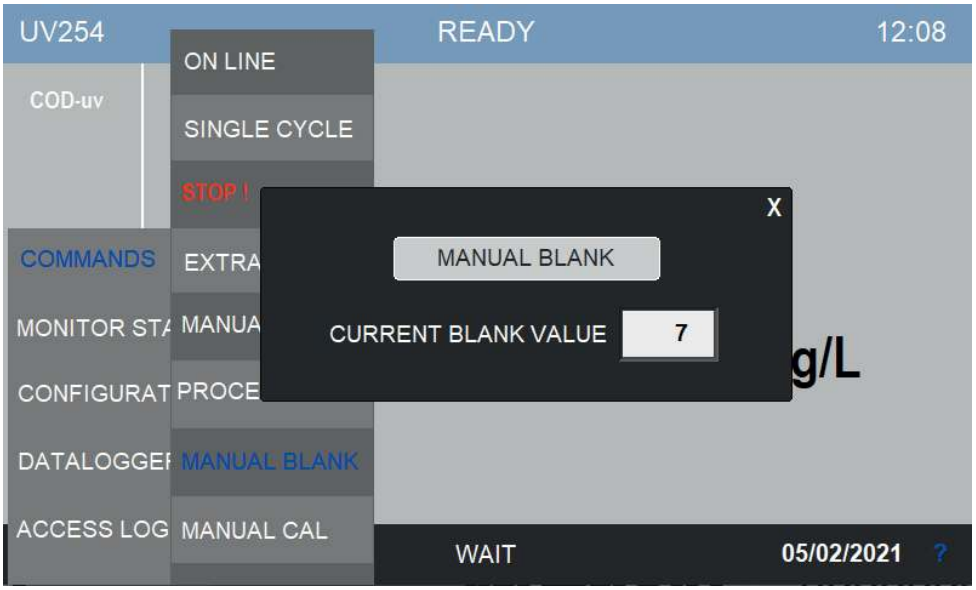
1. Stop any analyzer operation by pressing STOP! on the COMMANDS menu of the user interface. Reset the STOP condition within the same menu.

2. Remove the sample inlet tube from the sample recirculation tank and attach an additional piece of norprene tube (to keep it clean from impurities and dust) from which the calibration liquids will be sucked

3. Place the tube in demineralized water

4. Press START SINGLE within the COMMANDS menu of the user interface, a single cycle will start. Repeat the analysis at least three times

5. If the results are stable, press the MANUAL BLANK button in the COMMANDS menu



Press MANUAL BLANK to calibrate the instrument.
In case of a dual channel analyzer you don't have to also calibrate the second channel, the value is the same.

7.4 Absorbance calibration

The standard used for calibration of the absorbance is prepared with KHP, potassium hydrogen phthalate ($C_8H_5KO_4$, CAS 877-24-7), according to the following proportions:

$$100\ m^{-1} = 0.127\ g/l \text{ of KHP}$$

It is advisable to prepare a highly concentrated mother solution, which ensures long-term preservation in the fridge, possibly acidified with 1 to 2 drops of sulfuric acid, and dilute it as required to reach the above-mentioned value. It is recommended to use pure water free from organic substances and clean glassware.
After preparing the standard solution, calibration operations can be performed by following these steps:

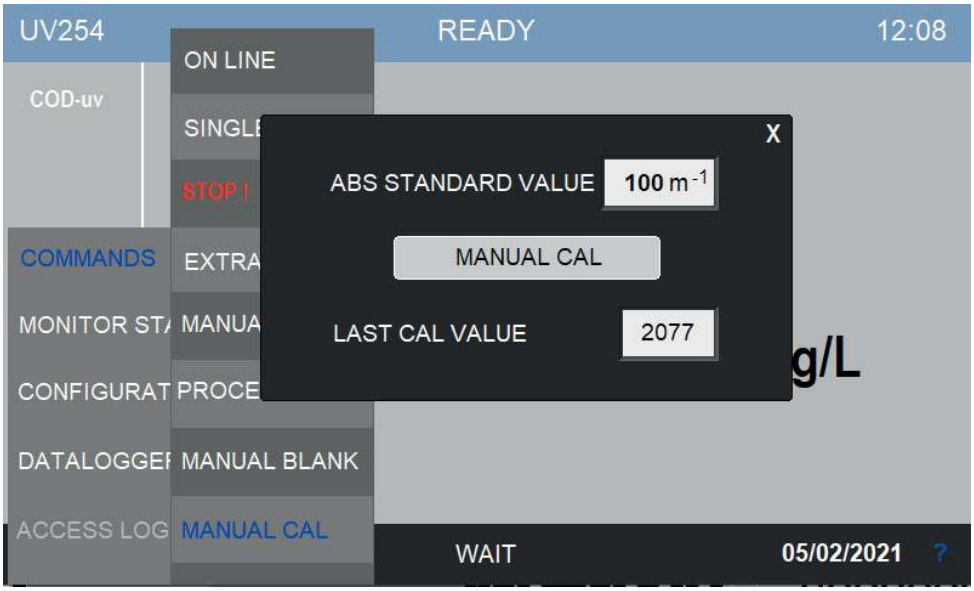
1. Stop any analyzer operation by pressing STOP! on the COMMANDS menu of the user interface. Reset the STOP condition within the same menu.

2. Remove the sample inlet tube from the sample recirculation tank and attach an additional piece of norprene tube (to keep it clean from impurities and dust) from which the calibration liquids will be sucked.

3.Place the tube in the standard solution container.

4. Press START SINGLE within the COMMANDS menu of the user interface, a single cycle will start. Repeat the analysis at least three times.

5. If the results are stable you can proceed with the calibration. Press the MANUAL CAL button within the COMMANDS menu. Check the value of STANDARD CONC and change it accordingly if required.



7.5 Modifying the calibration curve

The calibration curve of the analyzer has been already calculated during the factory testing right before shipping. The end user does not have to recalculate all the five points each time: by performing a calibration at the full scale value, the curve can be recalculated automatically. Anyway it is possible to recalculate the curve to maximize the analyzer accuracy or to compensate matrix deviations after on-site installation.
To do so, follow these steps:

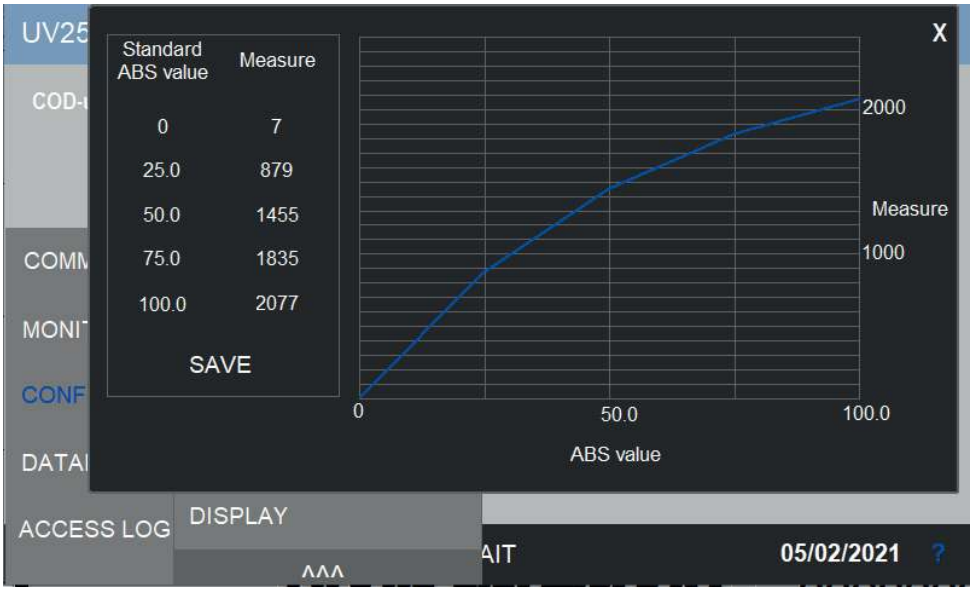
1. Prepare a set of standard solutions at the following concentrations:

- 25 % of full scale
- 50 % of full scale
- 75 % of full scale
- Full scale

2. Perform blank calibration as describe in section 7.3

3. Make an analysis for each one of the standard solutions. You can proceed as in the two-point calibration but do not press the calibrate button at the end of the analysis, instead go to MONITOR STATUS > ANALYSIS STATUS and take note of the mAbs value. Do this for every point to be measured. Repeating and averaging the analysis is not mandatory but advised.

4. Go to CONFIGURATION > LINEARITY. You will see the following page:



7.6 Process value correlation

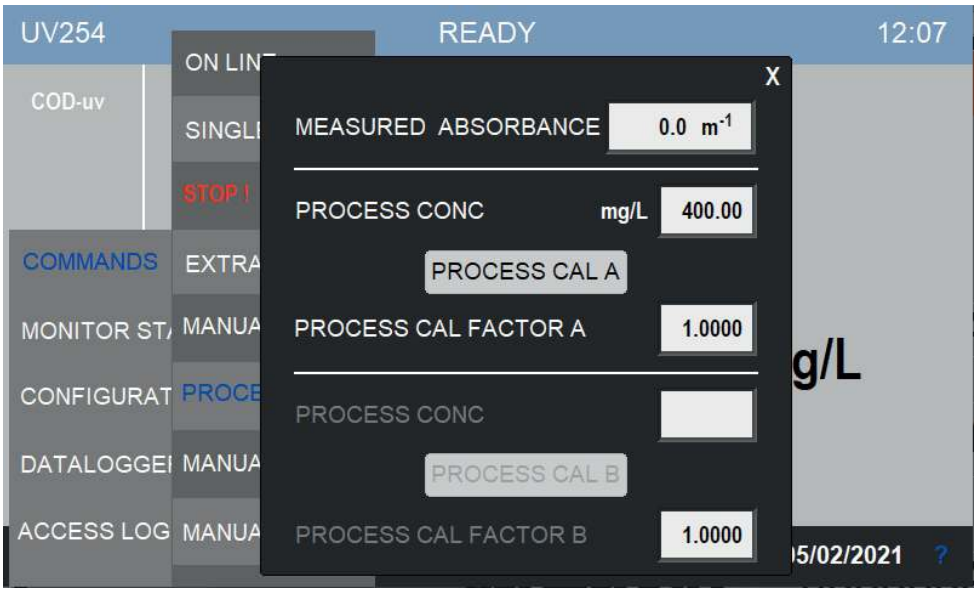
Until now we used an absorption standard and instructed the instrument to measure an absorption value. If the value of the absorption at 254 nm (SAC254) is everything you need, the calibration is completed. However, in many cases the absorbance has to be related to a cumulative parameter for organic substances such as COD, TOC or BOD, therefore an additional calibration (process value correlation) is necessary:

1. Take at least 1 liter of sample following good sampling practices.

2. Perform a laboratory analysis of the parameter of interest (COD, TOC etc.).

3. Feed the same sample to the analyzer and perform at least three measurements, or until the value is stable.

4. Go to COMMANDS > PROCESS CAL



5. Insert result of the laboratory analysis in the PROCESS CONC field then press PROCESS CAL A (or PROCESS CAL B to calibrate channel B in a dual channel analyzer).

To get more reliable result you can also collect a series of data and average it. For example:

Sample day 1	instrument reading = 55	laboratory (COD) = 80 mg/l
Sample day 2	instrument reading = 63	laboratory (COD) = 105 mg/l
Sample day 3	instrument reading = 62	laboratory (COD) = 101 mg/l
Sample day 4	instrument reading = 52	laboratory (COD) = 78 mg/l

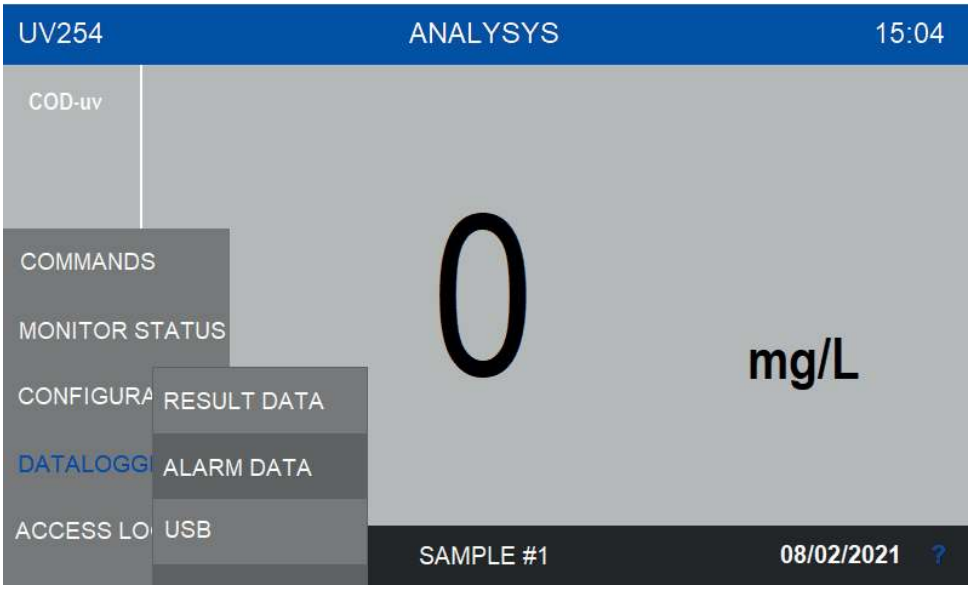
Average ratio = 1.56

Insert the calculate value directly in the PROCESS CAL FACTOR A or PROCESS CAL FACTOR B.

8 - DATA STORAGE

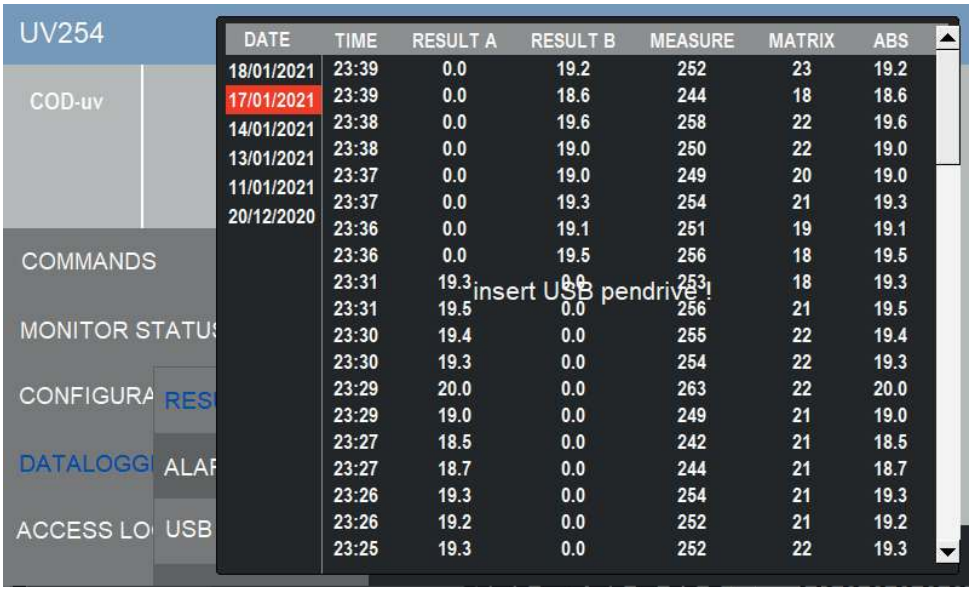
8.1 Datalogger Page

The instrument has an integrated datalogger functionality. At the end of each analysis cycle the results are logged together to the time and date of the analysis.
The data is stored on a removable USB device that must be plugged in on the the back of the HMI display. To reach it, open the electronics compartment and look at the bottom of the display. If the storage unit is removed the data is not saved and the datalogger functionality will not be available. A warning will be displayed on the screen the first time the instrument tries to log a result and the device is not present. No further warnings will be raised.
To access the datalogger press DATALOGGER on the main menu of the graphic interface.



Result Data

This is the main datalogger page where the analysis results are shown.

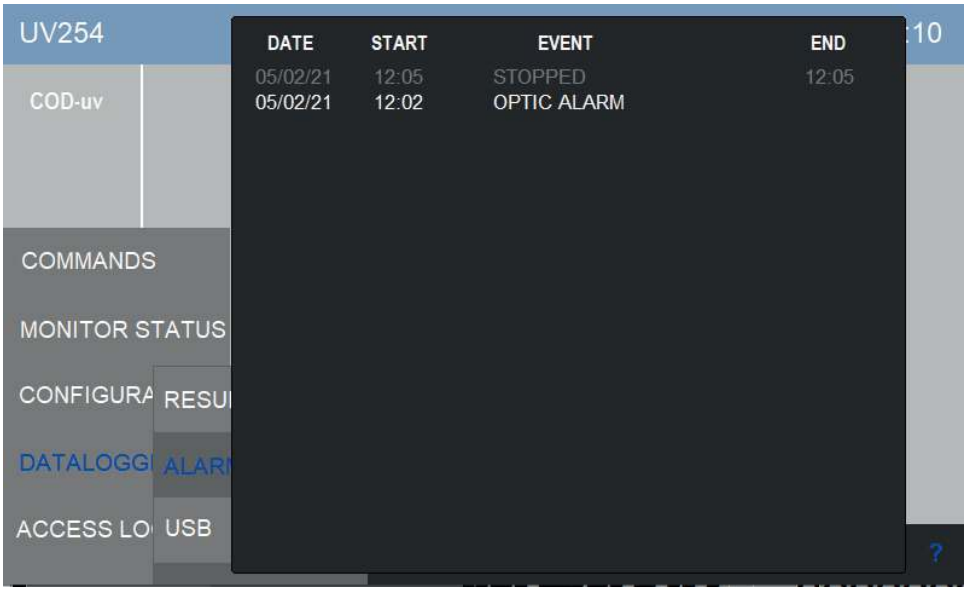


In the leftmost column there are the dates the data has been recorded on. By selecting a day the corresponding lists of measures will be displayed. The time column indicates the analysis time whiile the other two columns contains the data for both channels. In the picture the last column is empty because the analyzer has not recorded any data on the second channel. This is the case of a single channels analyzer.

Alarm Data

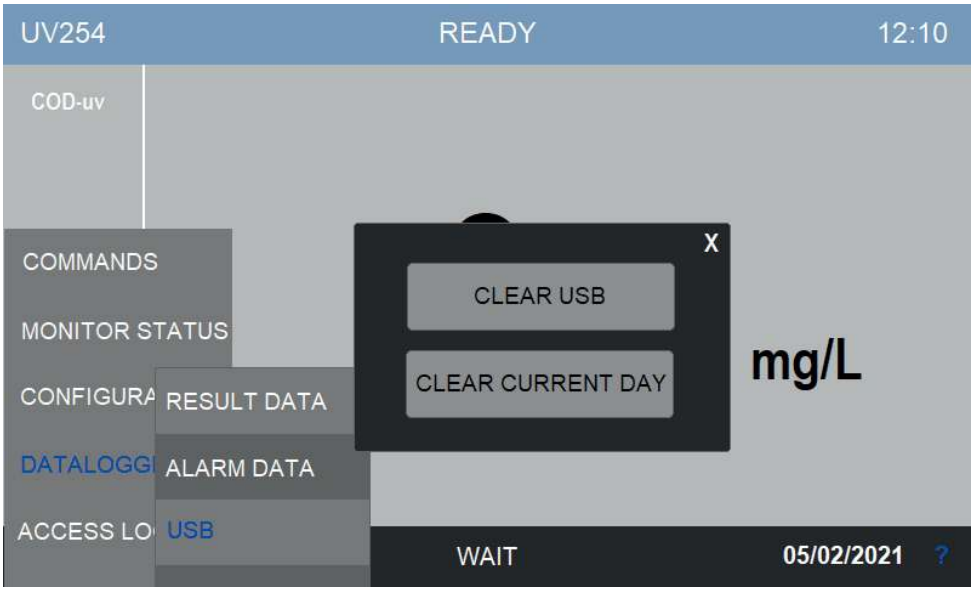
In this page the analyzer alarm conditions are collected. The column on the left shows the date, the START column show the time the alarm condition started, the EVENT column describe the alarm. When the alarm condition is resolved the corresponding line will be grayed out and the time will be recorded on the END column.

The data present in the Alarm Data page are stored on the analyzer internal memory and wll be recorded even if the exteral storage is removed.



USB

In this page you can clear the data on the external USB device. Is it possible to completely erase the logged data or to selectively erase the data for the current day.



9 - MAINTENANCE

9.1 Maintenance operation

Here below the list of the preventive maintenance operations:

COMPONENT	OPERATION	FREQUENCY
DRAIN VALVE	tubing replacement	every 4 months
VALVE 1	tubing replacement	every 4 months
VALVE 2	tubing replacement	every 4 months
VALVE 3	tubing replacement	every 4 months
CLEANING PUMP	tubing and rollers replacement	every 8-12 months depending on duty
SAMPLE PUMP	tubing replacement	every 4 months
MEASURE CELL	accurate cleaning	depending on process conditions

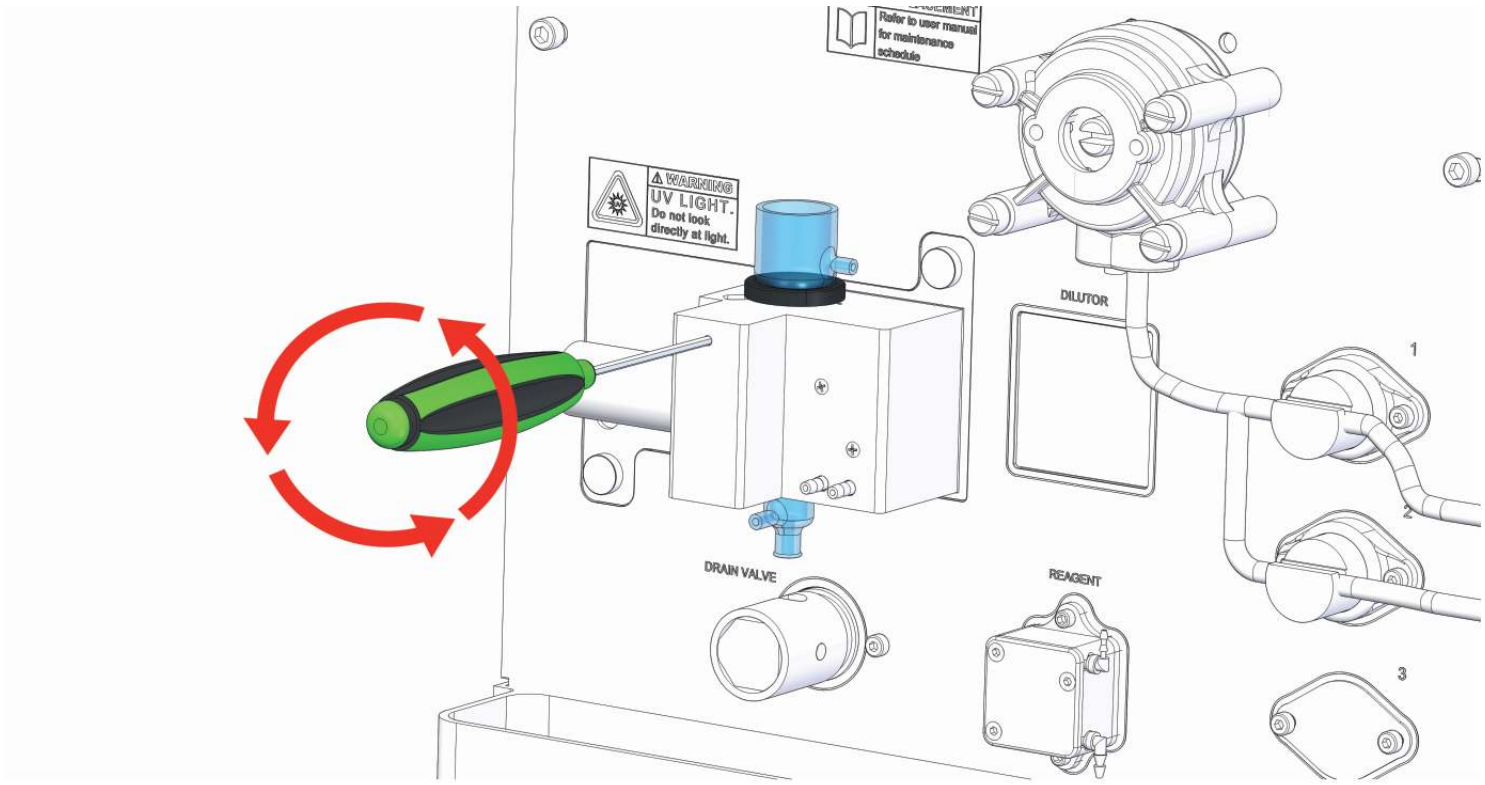
The frequency of listed maintenance operations can be modified in the case of heavy applications due to the nature of the material of the tubes, such as presence of sand grains or solvents in the sample.

Important: to replace pinch and peristaltic valve tubing, use only spare parts provided by the manufacturer to ensure proper sealing.

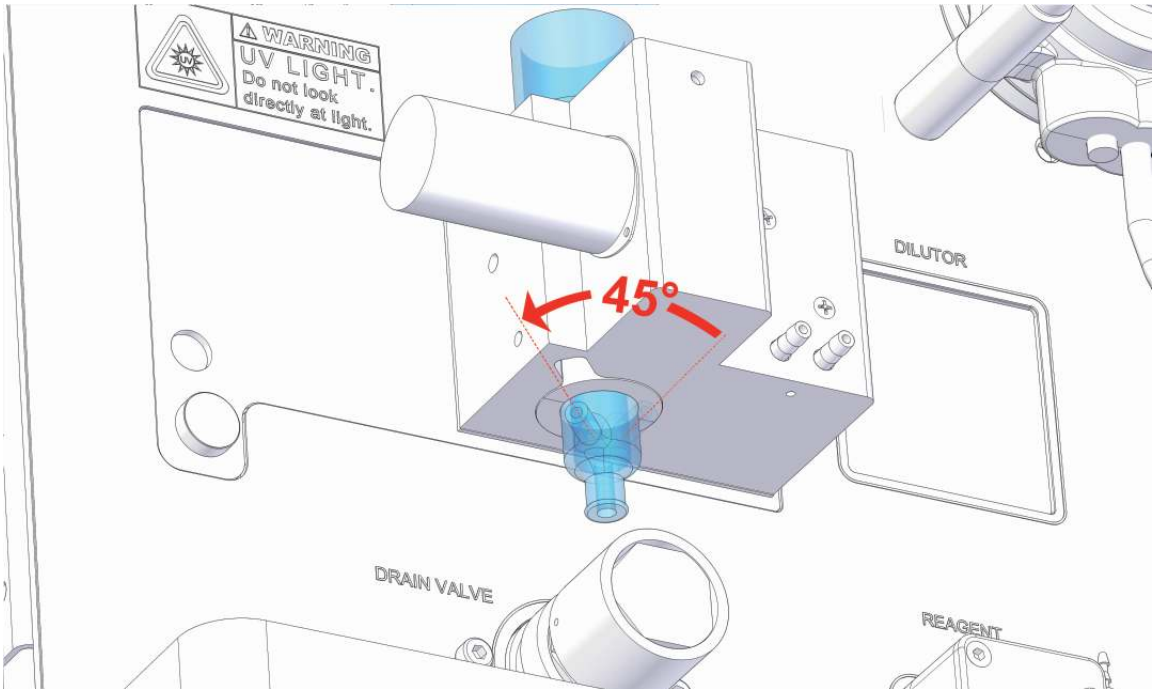
9.2 Dismounting the measure cell

This operation is necessary when the cell is dirty, for example when reading a high matrix value with clean water.
If the cell is often dirty and requires frequent manual cleaning, change time and frequency of the cleaning reagent, or the same chemical of the reagent used.

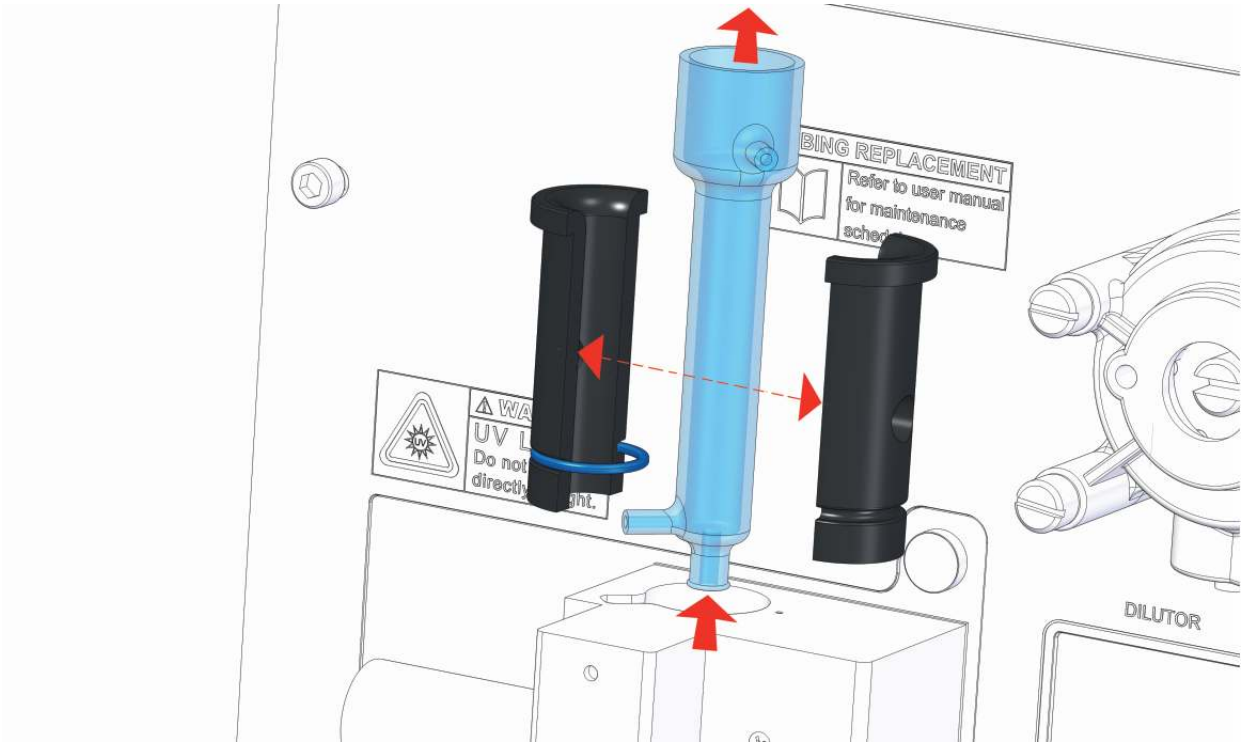
To disassemble the cell proceed as follows:



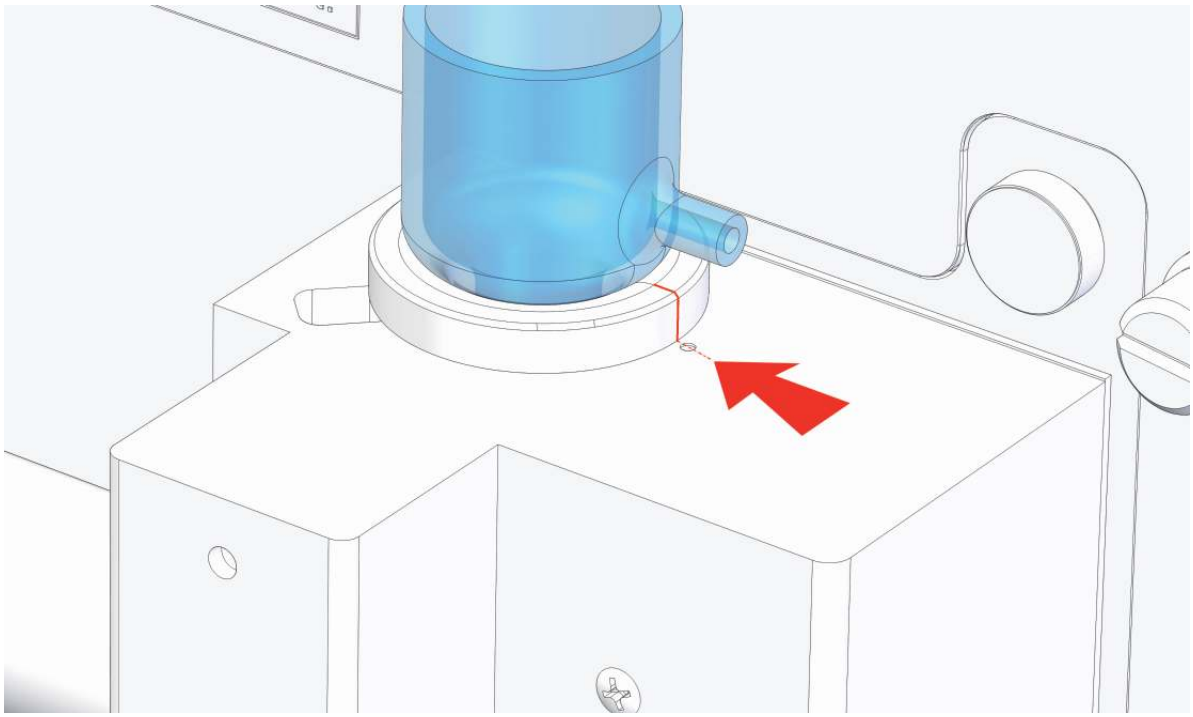
1 After removing any liquid from the cell, carefully remove the cell cap and all pipes connected to it.
Unlock the black plastic round cell holder using a 1 mm hex key inserted as shown. Unscrew to unlock the clamping pressure.



2 Rotate the quartz cell to align the side tang to the slot in the cell block, as shown.



3 Remove the quartz cell by lifting it. Then open the two plastic shells after loosening the O-ring that keeps them sealed on the cell.



4 After cleaning the cell, reassemble the shells and the O-ring, place them back in the cell holder block and align the windows of the optical path, as shown above. The separation line between the two black shells should be aligned with the reference point in the cell holder block, otherwise the light will not pass through the liquid as it should.

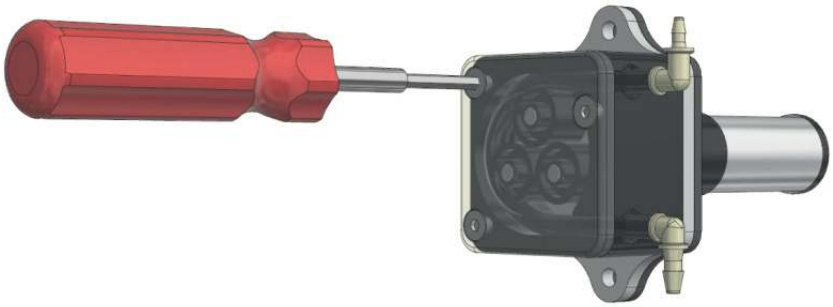
5 Fix the grub screw with a hexagonal wrench, while exerting a slight pressure so as not to force the plastic shells, but enough to prevent them from rotating.

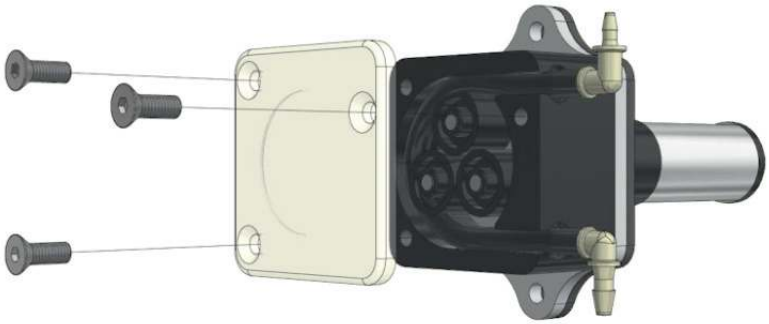
6 Reconnect the tubes and put the cell cap where it was.

9.3 Cleaning reagent pump maintenance

This operation is necessary for the replacement of the cleaning reagent pump tube and rollers.
Although the tube ensures at least 70 hours of operation (it is possible to calculate the operating time considering the frequency of analysis and the operation intervals required by the cycle program), therefore it must be maintained and/or replaced at least every 8-12 months.
Use only the tube provided with the REAGENT PUMP KIT
The kit includes 3 spare tubes and one spare roller.

Proceed as follows:





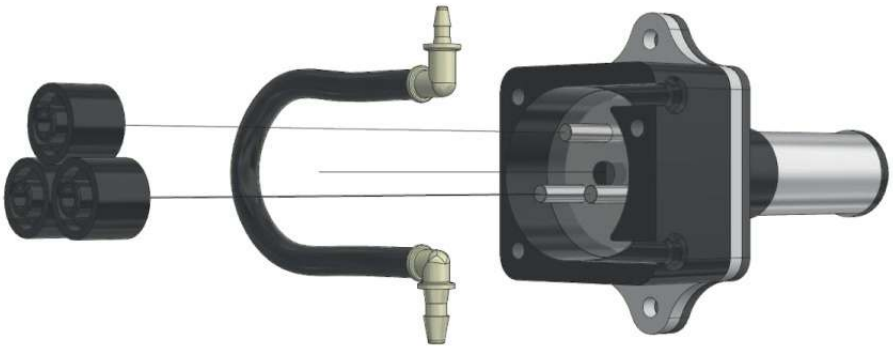
1 Remove the transparent cover by unscrewing the 3 fixing screws with a hexagonal screwdriver

---

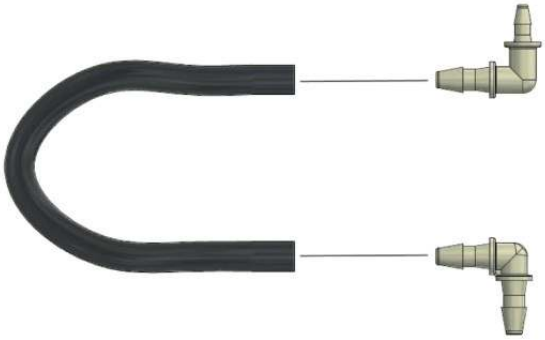
PAY ATTENTION TO THE LIQUID

CONTAINED IN THE TUBE WHILE

REMOVING CONNECTIONS

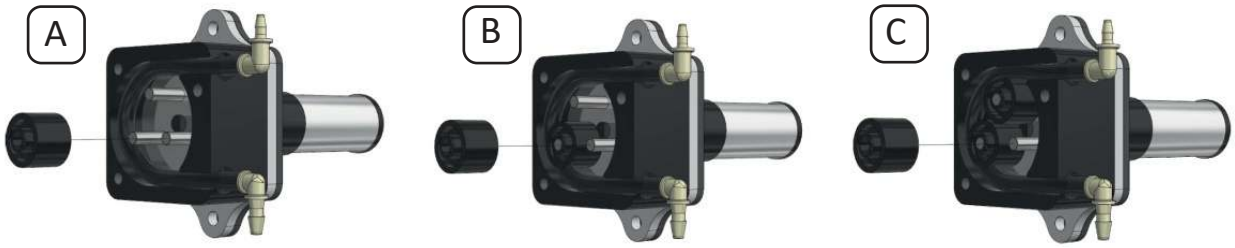


2 Remove the rollers and the tube to be replaced

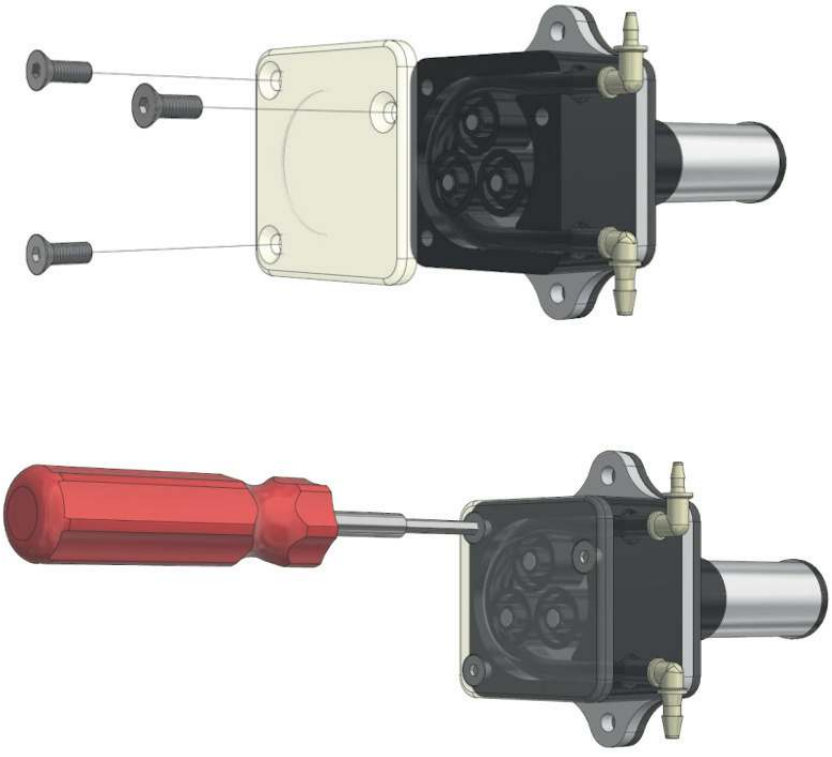


3 Disconnect the fittings and, if necessary, clean or replace them with those provided with the maintenance kit.

4 Insert the new tube using the fitting (pay attention to the size and direction)



5 Insert the first roller, then operate the pump in manual mode for 1 second (COMMANDS > MANUAL CHECK page, see paragraph 6.4) and insert the second roller. Repeat the same operation for the third roller



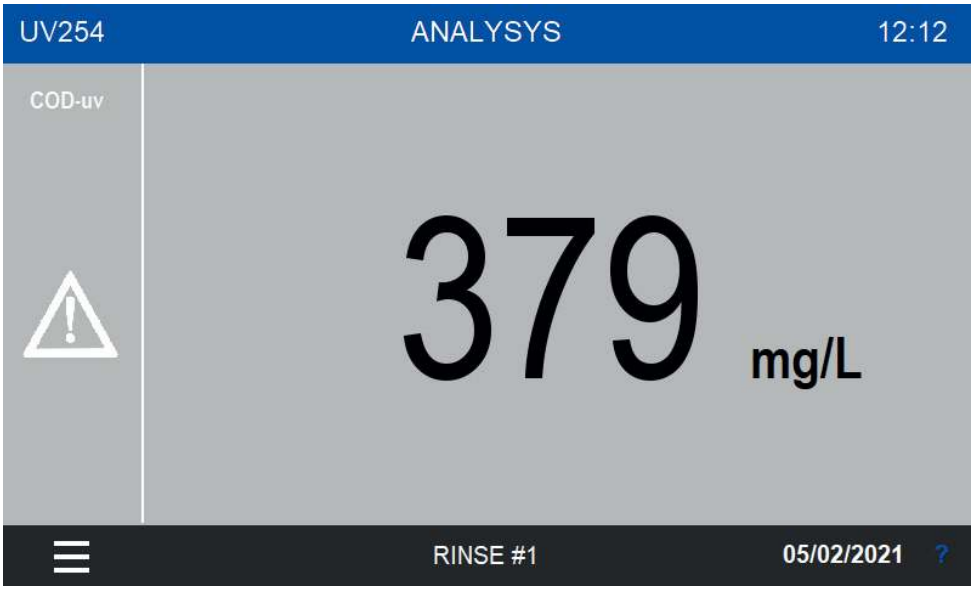
6 Close the transparent cover with the screws.

Reconnect the tubes and operate the pump in manual mode to fill the tube with the cleaning liquid coming from the bottle. Make sure that the liquid reaches the cell.

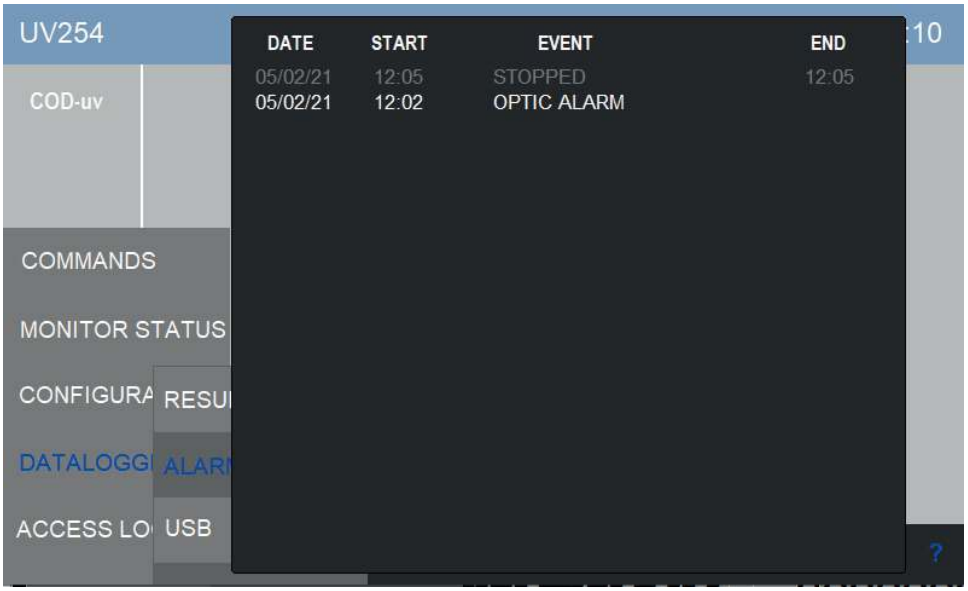
9.4 Alarms and troubleshooting

The analyzer diagnostic messages can be displayed in 3 different modes/levels.

1 - On the main page warning symbol appears for each occurring event



2 - On the datalogger page ALARM DATA the error events are logged.



SIGNAL	GROUP	EFFECT
Result Alarm CH1	Result Alarm	only screen report/relay
Result Alarm CH2	Result alarm	only screen report/relay
Loss of sample 1	No flow	waiting/relay
Loss of sample 2	No flow	waiting/relay
Emergency Stop	Fault alarm	analyzer stopped
Optic alarm	Optic alarm	analyzer stopped
Calibration and blank alarm	Fault alarm	analyzer stopped
Turbidity alarm	Optic alarm	only screen report/relay
Version alarm	Fault alarm	analyzer stopped

Below are the possible corrective actions required for the different alarm messages

Optic alarm	Try resetting the analyzer from the RUN window, and run a clean water cycle. If necessary, check the cell cleanliness or align the cell shell. If the problem persists, contact the manufacturer's technical support, perhaps by attaching a photo of the DISPLAY page.
Result alarm CH1 Result alarm CH2	High reading values, exceeding the limits set on the SETTINGS page. Verify with a comparison analysis if the sample is really exceeding the limits.
Turbidity alarm	The Matrix value is higher than the upper limit. Causes can be: - the sample is actually too turbid - Non-liquid reading within the cell or leaking cell drain. After identifying the cause, you can remove it if possible or raise the alarm threshold, aware that the measurement error will be high.
Version alarm	This signalling can only occur when the firmware version of the PLC is incompatible with the display software. Contact the manufacturer.

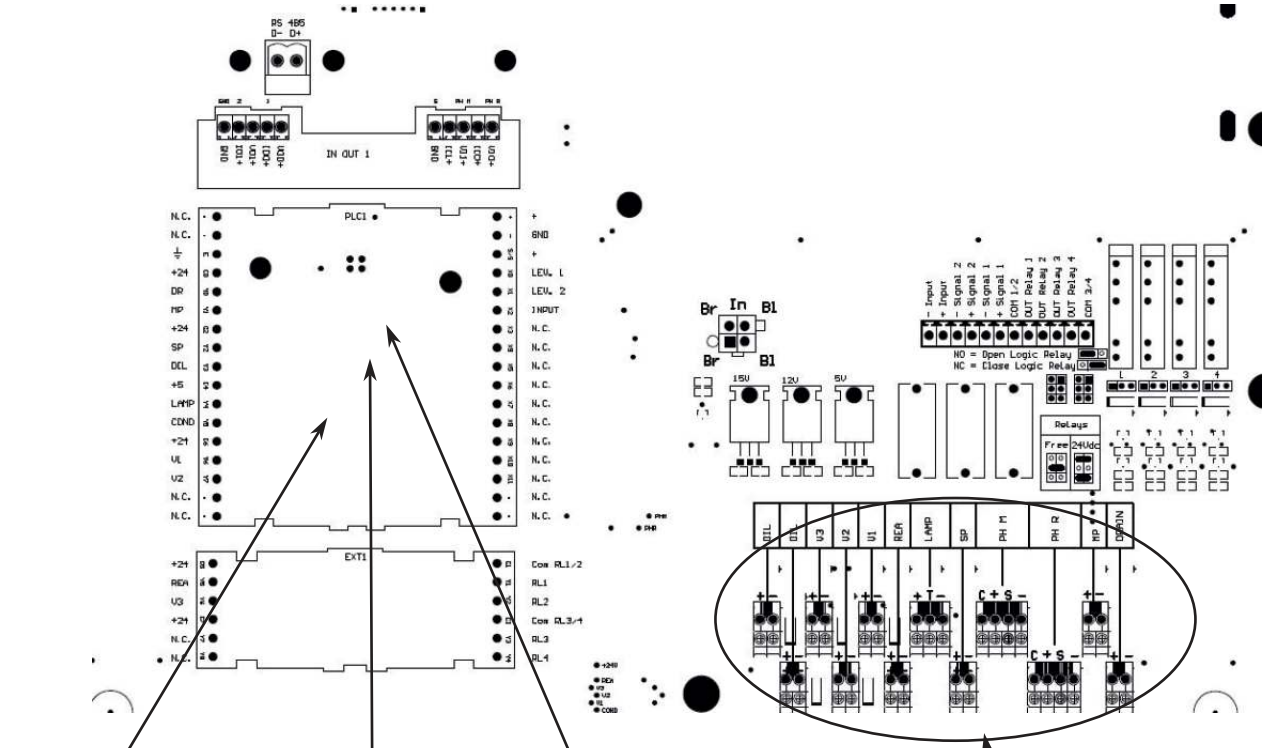
Calibration and blank alarm	Calibration that exceeded the maximum or minimum threshold. Check the standard used, the presence of liquid in the cell when performing the calibration and try manual calibration once again (see Section 7).
Loss of sample 1 Loss of sample 2	Try to identify the cause of the signalling by checking the presence of water, the level switch contacts, or the wrong setting of the level alarm disable key on the SETTINGS page.
Emergency stop	The analyzer has been manually stopped for some reason. In absence of any other problem, the analyzer can be restarted.
**** values	Whenever a value shown exceeds his range a **** appears. Try to understand the reason why the value has reached that condition. Contact the manufacturer support if necessary.

9.5 Electronics checks

When the metal cover is opened by removing the five screws it's possible to check a few indicator LEDs, as show below.

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

LED CHECKS - NORMAL CONDITION



Red LED POWER always lit

Green RUN LED blinking rapidly

function LED area, lit when the labeled component is active

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