MEASUREMENT PROBE

T-UV-BCT

User manual

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Chapter 1
INTRODUCTION

1. INTRODUCTION

The *T-UV-BCT* is a multi-parameter online measurement probe for continous and independent quality control of water and effluent. It measures the SAC 254 and the SAC 560 directly. It also provides an estimation of the **TOC** or **COD** or **BOD** and the **suspended solids** through correlation of the SAC measurements and laboratory measurements.

1.1. PARAMETERS ANALYZED

- **TOC (mgC/L): Total Organic Carbon**
  Total quantity of organic carbon by chemical means.
- **COD (mgO2/L): Chemical Oxygen Demand**
  Total quantity of oxygen consumed by chemical means.
- **BOD (mgO2/L): Biochemical Oxygen Demand**
  Total quantity of oxygen consumed by chemical means.
- **Suspended Solids: (mg/L)**
  Mass of non-soluble particles found in the water with a dimension of between 1 and 100 mm.
- **SAC 254 (UA/m): Spectral Absorption Coefficient**
  Optical absorption of the effluent at a wavelength of 254 nm.
- **SAC 560 (UA/m): Spectral Absorption Coefficient**
  Optical absorption of the effluent at a wavelength of 560 nm.
- **COLOR (mgPt/l :** color measured at 560 nm.

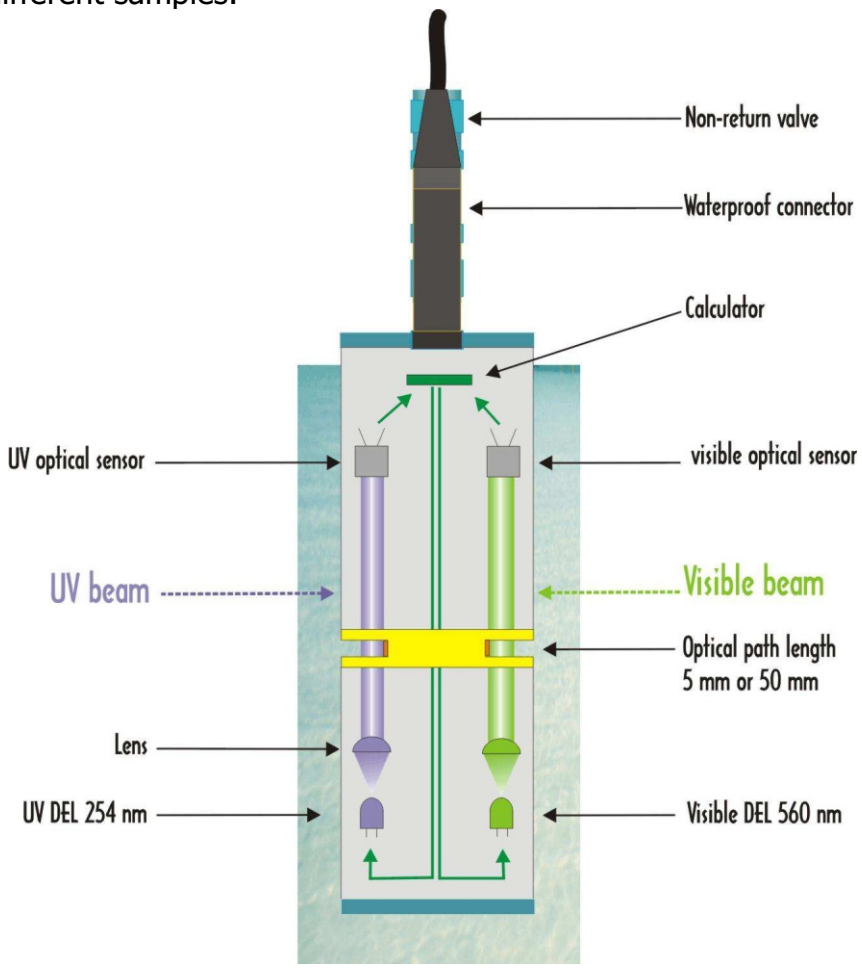
1.2. APPLICATION FIELDS

- Natural water
- Used water
- Industrial effluent

1.3. MEASUREMENT PRINCIPLE

The sample to be analyzed undergoes to separate radiations. The first is emitted in the ultra-violet range at a precise wavelength of 254 nm, thesecond is generated in the visible range of the electromagnetic spectrum at a wavelength of 560nm. Depending on its chemical composition, the sample will absorb different degre es of radiation at these two wavelengths. The quantity of light absorbed in the UV at 254 nm is termed the SAC 254 and the proportion of light absorbed at 560 nm is termed the SAC 560.

Beer-Lambert's law defines the relation between the measured absorption (SAC) and the sample concentration. The calibration is calculatedautomatically by the device which determines line of regression between the SAC and he tvalues obtained in a laboratory setting for the different samples.



1.4. EQUIPMENT DESCRIPTION

The *T-UV-BCT* system is made up of a measurement probe, a transmitter and an optional module for compressed air cleaning (E8492 - *T-UV-BCT Cleaning Box*).

1.4.1. The transmitter

This is an IP65 electronic box with dimensions of 130 x 130 x 100mm. It collects the digital signals coming from the probe and processes them in order to determine the SAC and the concentrations in COD and Suspended Solids.

The transmitter includes a "datalogger" function allowing several years' worth of data to be stored at the maximum measuring frequency. This data can easily be transferred to a USB flash drive.

The front panel of the transmitter features the following elements:

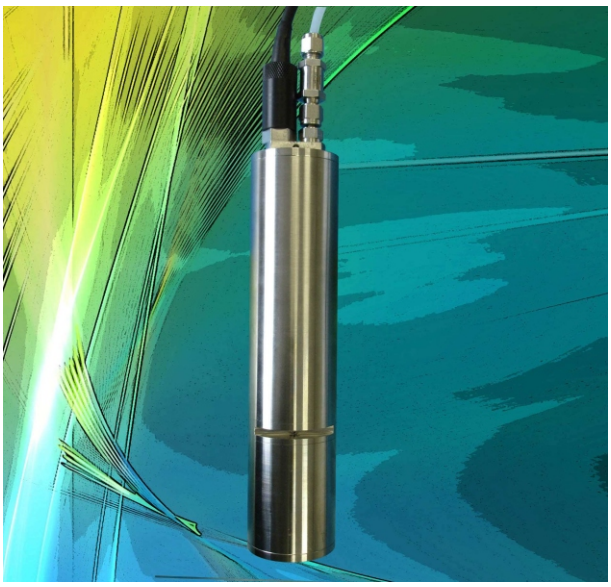
- a 132x64 rear-lit **LCD display** providing optimal visibility and displaying the results in large easy-to-read characters.
- two **alarm** lights that show red when an alarm threshold set up by the user is exceeded.
- a **tactile 8-key keypad** for setting up the parameters.

The **lower part** features 4 cable inputs equipped with cable glands for the following connections:

- the power supply (110V-220V)
- the measurement probe
- the optocoupled inputs and the relay outputs
- the 4-20mA current outputs
- the E8492 cleaning module

On the side, a hermetic USB port allows the user to retrieve the data recorded by the device quickly and easily using a USB flash drive.

1.4.2. The probe



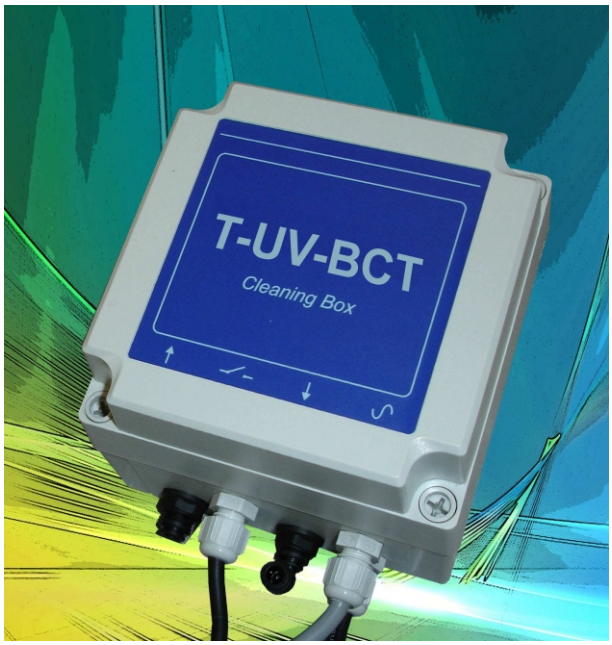
This is a 316L stainless steel tube that is 25 cm long and 55 mm wide.

The lower part has two grooves in which the liquid to do be analyzed will circulate. On the upper part there is an electric cable for connection to the transmitter and also a non-return valve. The valve serves as a connector for the E8492 compressed air cleaning module.

The optical measurements are carried out directly inside the probe by a microprocessor system. The optical signals are immediately converted into digital values and are relayed to the transmitter.

1.4.3. The cleaning module

Compressed air cleaning system is optional but recommended in order to keep the measurement optics clean the longest and minimize the maintenance frequency. The compressed air cleaning module offers two versions: E8492-P and E8492-E.



- **E8492-P**: this module features an independent compressed air generator system driven by the transmitter. This system is dedicated for installation without a compressed air network close by. Yet, the pressure of the generated compressed air cannot exceed 1.2 bar what limits the immersion depth of the probe to a maximum of 10 meters.

  Maximal pressure
  - Input: forbidden, must stay at atmospheric pressure.
  - Output: maximum pressure generated by the module: 1.2 bar.

- **E8492-E**: This model features a normally closed electrovalve driven by the transmitter during the cleaning periods/times. The module air Input is directly connected to the local compressed air network and at the output of the non-return valve on the probe.

  Maximal pressure
  - Input: 5 bar max
  - Output: 5 bar maxi

If you do not use the cleaning module E8492 (P or E), the maximum allowed pressure on the probe compressed air connection is 5 bar.

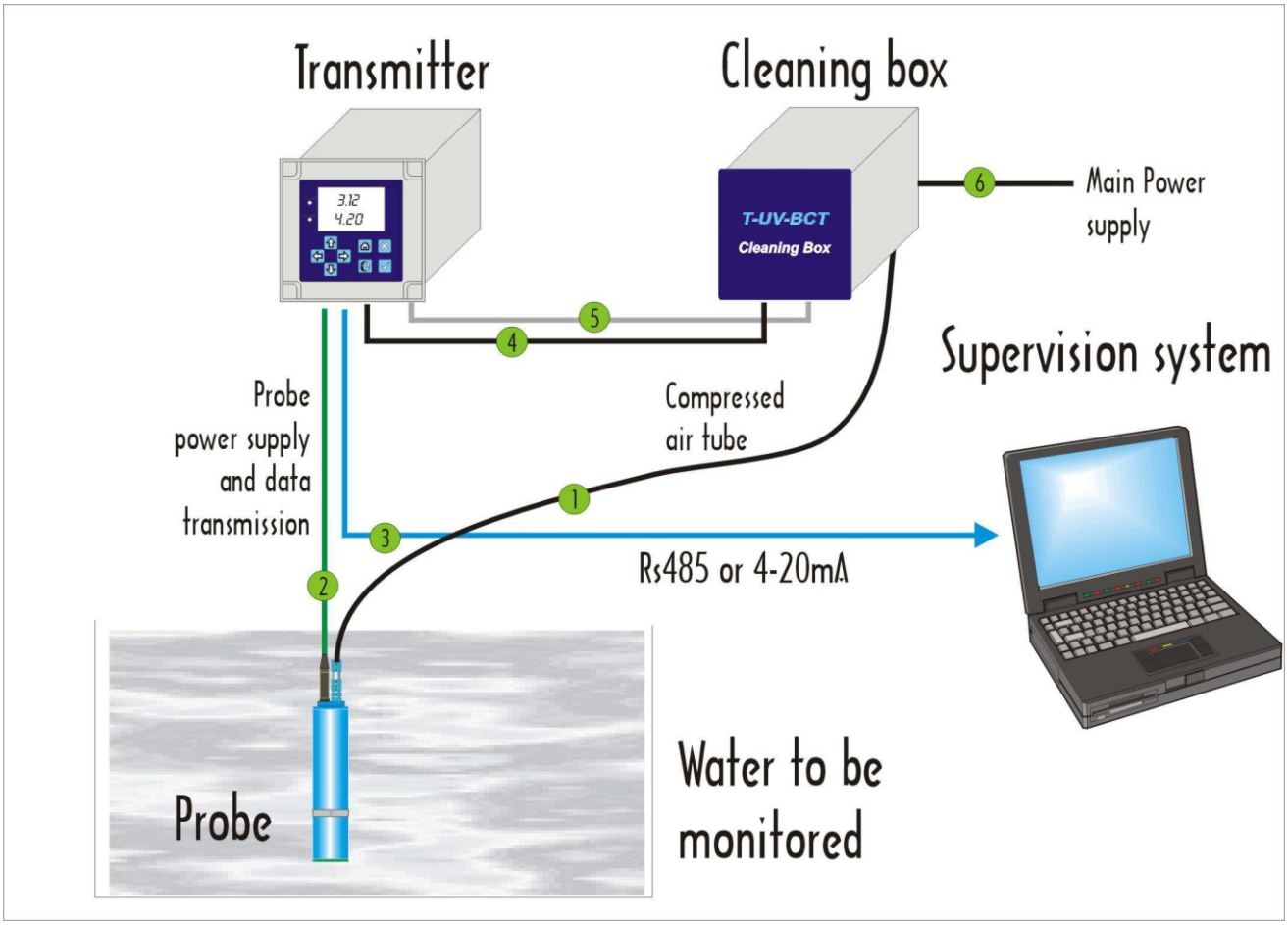
Chapter 2
INSTALLATION

2. INSTALLATION

List of material provided:

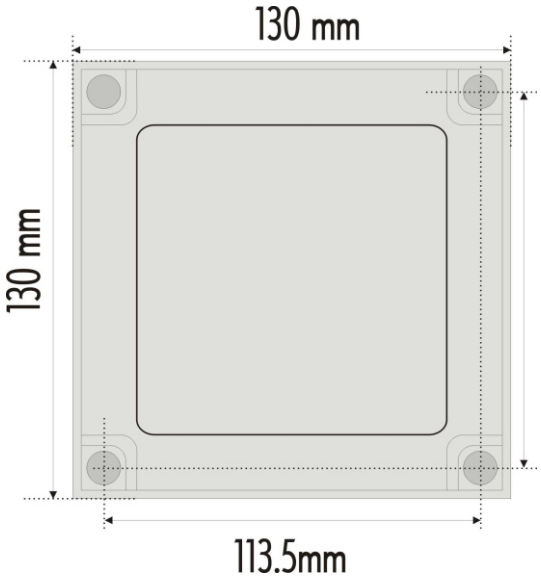
- an E8489 stainless steel probe complete with 10 metres of cable
- an E8490 transmitter
- an E8492 cleaning module (optional)
- 10 metres of plastic tubing for the compressed air (optional)
- the cabling connections
  - 3 x 2-pin female screw terminals,
  - 5 x 3-pin female screw terminals,
  - 1 x 4-pin female screw terminal
- a cleaning brush
- a USB flash drive
- a user manual

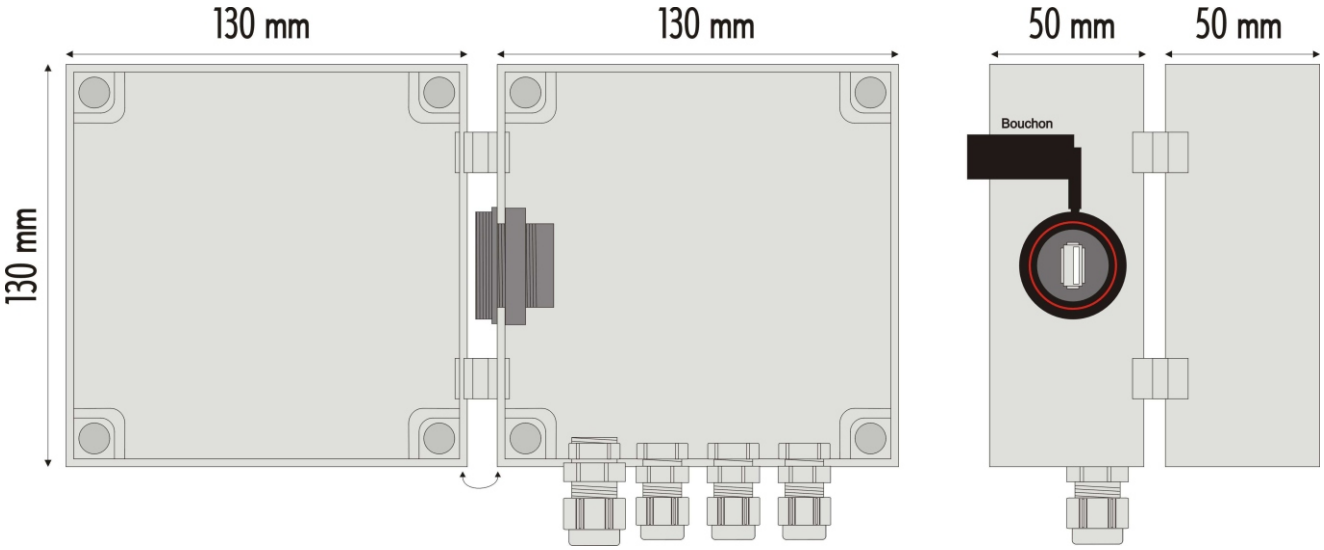
2.1. INSTALLATION SYNOPTIC



1	Compressed air tube	ø ext. 6 mm ø int. 4 mm	Type : Legris Ref : 8492-P01-V1	length : 10 m
2	Transmitter to probe link	ø ext. 8 mm max	Ref: E8489-C01-V2	length : 10 m
3	Communication link	RS485 link	Customer equipment	
4	Cleaning box command link	ø ext. 7,8 mm max 2x 1.5²	Ref: E8492-C01-V1	length : 400 mm
5	Main power cable to connect E8490	ø ext. 7,8 mm max 3G 1.5²	Ref: E8492-C02-V1	length : 400 mm
6	Main power cable	ø ext. 7,8 mm max	Customer equipment	

2.2. ASSEMBLING THE TRANSMITTER





2.3. POWER SUPPLY CONNECTION

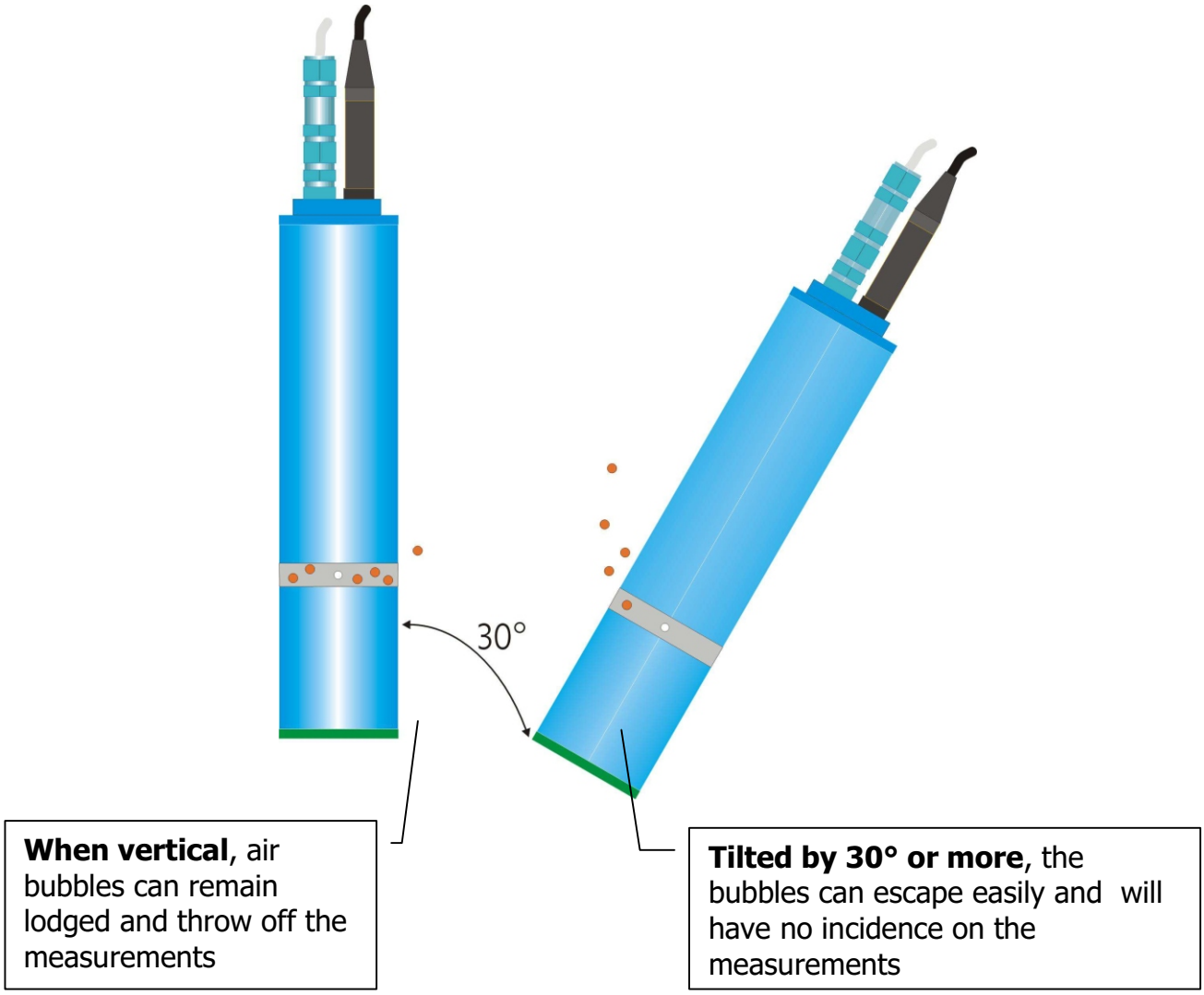
If both transmitter and cleaning box are used, main power should be connected first to the cleaning box. Then a second electrical cable must link the Cleaning box supply to the transmitter supply connector.

2.4. POSITIONING THE PROBE

IMPORTANT

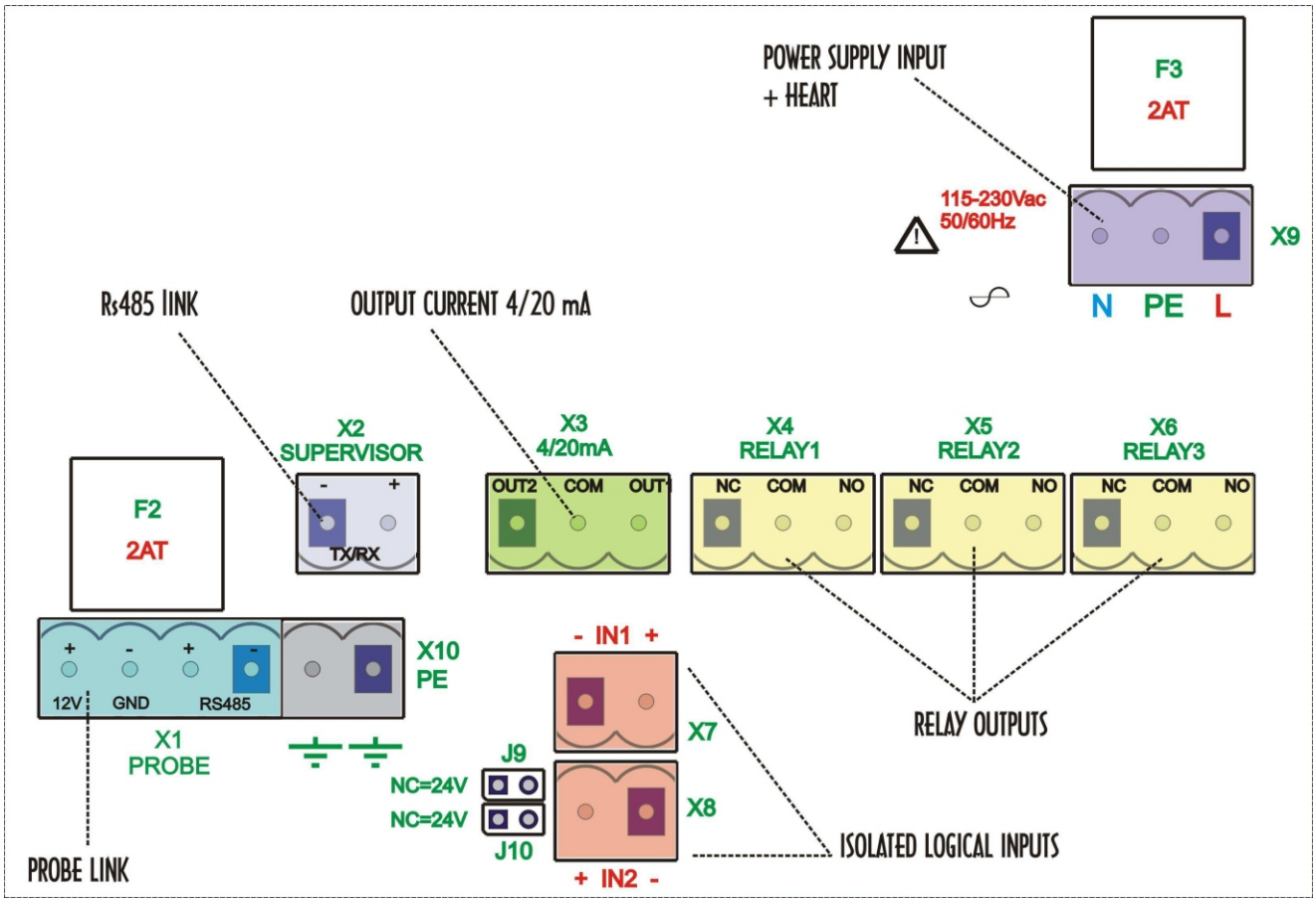
The probe carries out optical measurements so **it is important to protect the measurement head from direct light**. Sunlight or lamplight close to the measurement orifices may have an impact on the results.

When the cleaning module is used, it is recommended that the probe be inclined at least 30° degrees from its vertical position to prevent air bubbles from becoming trapped in the measurement grooves.



2.4.1. ELECTRIC CONNECTIONS

2.4.2. overall view of the connectors



X1	Link with the probe (E8490C01V1)
X2	RS485 link with the Supervisor PC
X3	Two 4/20mA current outputs
X4	Relay output 1
X5	Relay output 2
X6	Relay output 3(links with E8492)
X7	Opto-coupled input 1
X8	Opto-coupled input 2
X9	Mains + earth
X10	Earth
J9	Jumper to select logical input level (5V : ON or 24V : OFF)
J10	Jumper to select logical input level (5V : ON or 24V : OFF)
F3	Protective fuse on the mains input
F2	Protective fuse on the probe power supply

2.4.3. Mains connection

The transmitter requires an AC sinusoidal power supply (50 to 60Hz) of between 115V and 230V using connector X9.

X9 wiring		
Pin	Name	Description
1	Phase	Mains phase
2	Earth	Earth
3	Neutral	Mains neutral

2.4.4. ModBus Link

The ModBus link of the *T-UV-BCT* is designed for use in RS485 mode: 1 differential pair (2 wires).

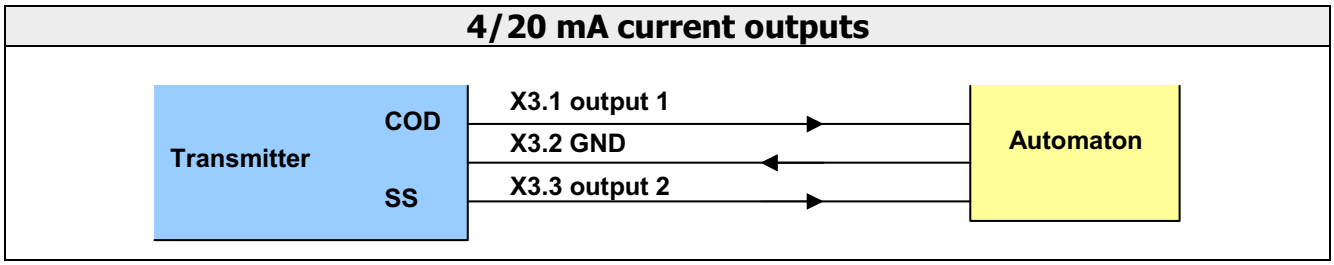
With 2-wire cabling, the same pair of wires is used to transmit requests from the supervisor to the *T-UV-BCT* and to transmit the devices responses.

	RS485 Supervisor	**Transmitter 1**	**Transmitter 2**	**Transmitter n**
	TX+ / RX+ (A)	TX+ / RX+	TX+ / RX+	TX+ / RX+
	TX- / RX- (B)	TX- / RX-	TX- / RX-	TX- / RX-
Terminal resistor	Yes	No	No	Yes
Terminal resistor	Une seule paire sur tout le réseau, généralement au niveau du superviseur.			

RS485 : 1 master (supervisor) and several slaves (transmitters)

X2 wiring		
Point	nom	Description
1	TX - / RX -	Negative signal
2	TX+ / RX+	Positive signal

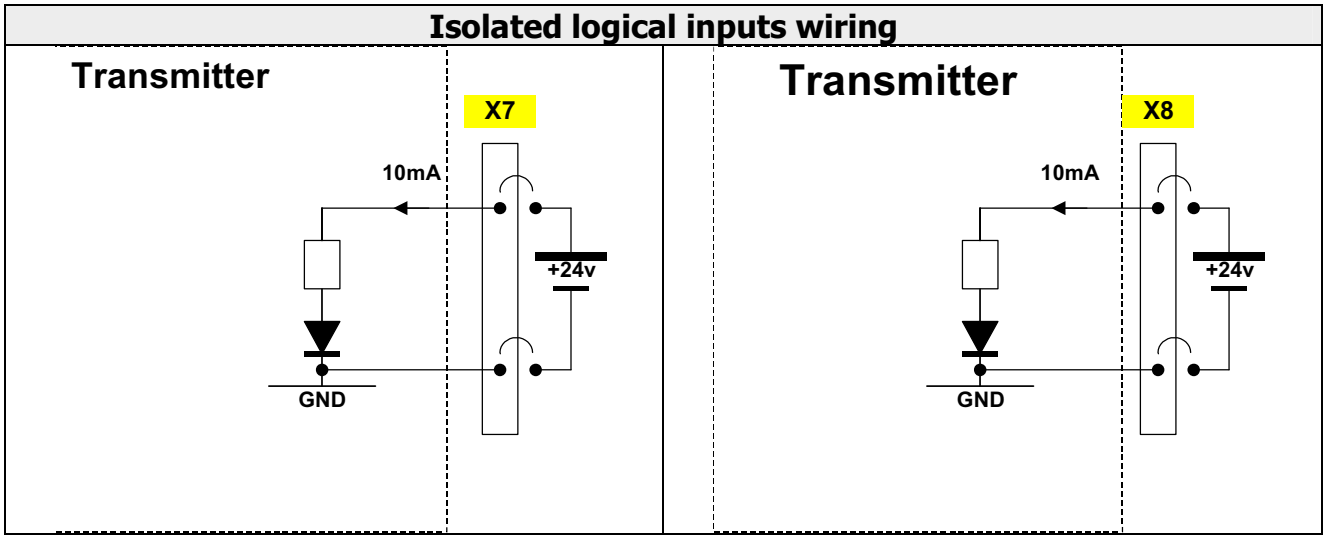
2.4.5. 4/20mA current ouputs



X3 wiring		
Pin	Name	Description
1	Output 1	Current loop output 1
2	GND	Current loop 1 and 2
3	Output 2	Current loop output 1

4-20mA outputs are isolated from the ground.

2.4.6. Isolated logical inputs



X7 wiring		
Pin	Name	Description
1	GND	Ground
2	IN1	24 V or 5 V input

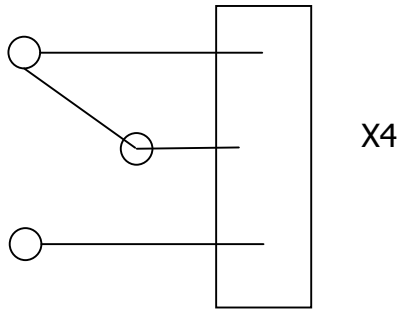
X8 wiring		
Pin	Name	Description
1	GND	Ground
2	IN1	24 V or 5 V input

Jumpers configuration		
J9	NC	24 V input
	C	5 V input
J10	NC	24 V input
	C	5 V input

2.4.7. Isolated relay outputs

The 3 *T-UV-BCT* relay outputs transmit alarms to the external world. Each threshold is settable independently. The 3 relays are isolated together. They can each short-circuit a line with 8 amps and 240 V AC maximum. The relay 3 is dedicated to the cleaning box. It starts and stops the cleaning following the setting.

Relay output wiring



X4 wiring		
1	NF	Normally closed contact
2	COM	Common
3	NO	Normally opened contact

X5 wiring		
1	NF	Normally closed contact
2	COM	Common
3	NO	Normally opened contact

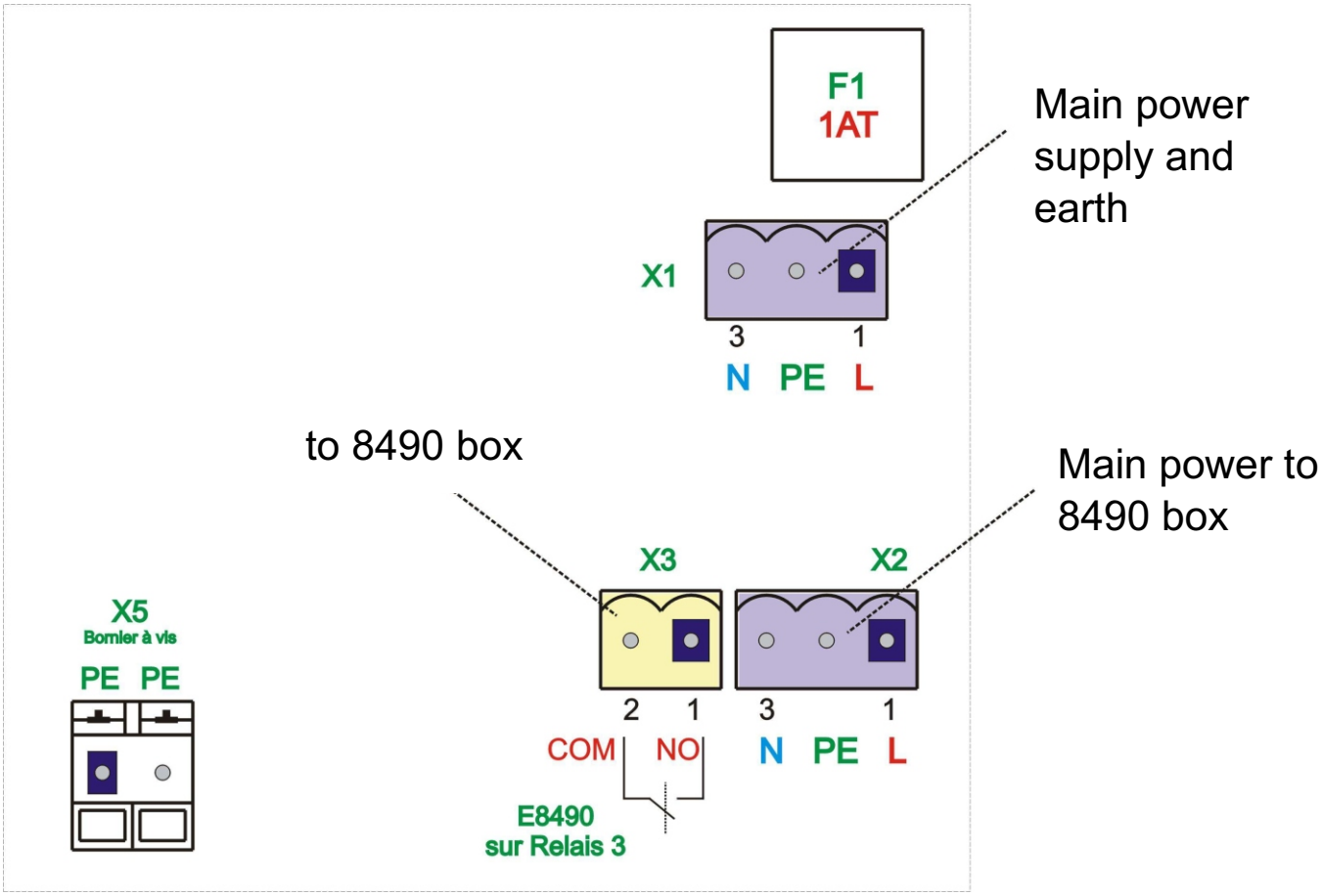
Relay output #3 is dedicated to the cleaning module driving n°3 (X6).

X6 wiring		
1	NF	Normally closed contact
2	COM	Common
3	NO	Normally opened contact

2.4.8. Probe connection (X1)

X1 wiring		
1	RX/TX-	Serial link (black)
2	RX/TX+	Serial link (white)
3	GND	Ground (red)
4	+12V	Probe power supply 12V DC (green)

2.4.9. Cleaning module wiring E8492

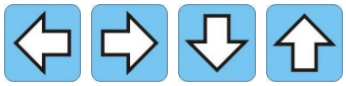


X1	Main power supply 115-230Vac
X2	Main power to E8490 via 3G1.5² cable reference **E8492C02V1**
X3	Cleaning box command connection, thanks to transmitter relay 3 and via **cable** reference **E8492C01V1**
X5	Earth connection
F1	Main power fuse 1AT

Chapter 3
CONFIGURATION

3. SETTING UP THE PROBE

3.1. NAVIGATING BETWEEN MENUS

The arrows  enable you to navigate between the menus to access a function, to move from one field to another or to adjust the value of a field.

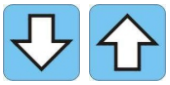
The  key enables you to access the sub-menus and to confirm values you have entered.

The  key enables you to quit the sub-menus or to cancel a value you have entered.

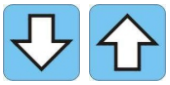
3.2. ENTERING NUMBERS AND LETTERS

Numbers are always entered in a special data entry box. A dialogue box will enable you to enter either just numbers or numbers and letters.

3.2.1. Entering numbers

	scroll through the digits 0 to 9 and the symbols "+" "-" and "."
	validates the entry.

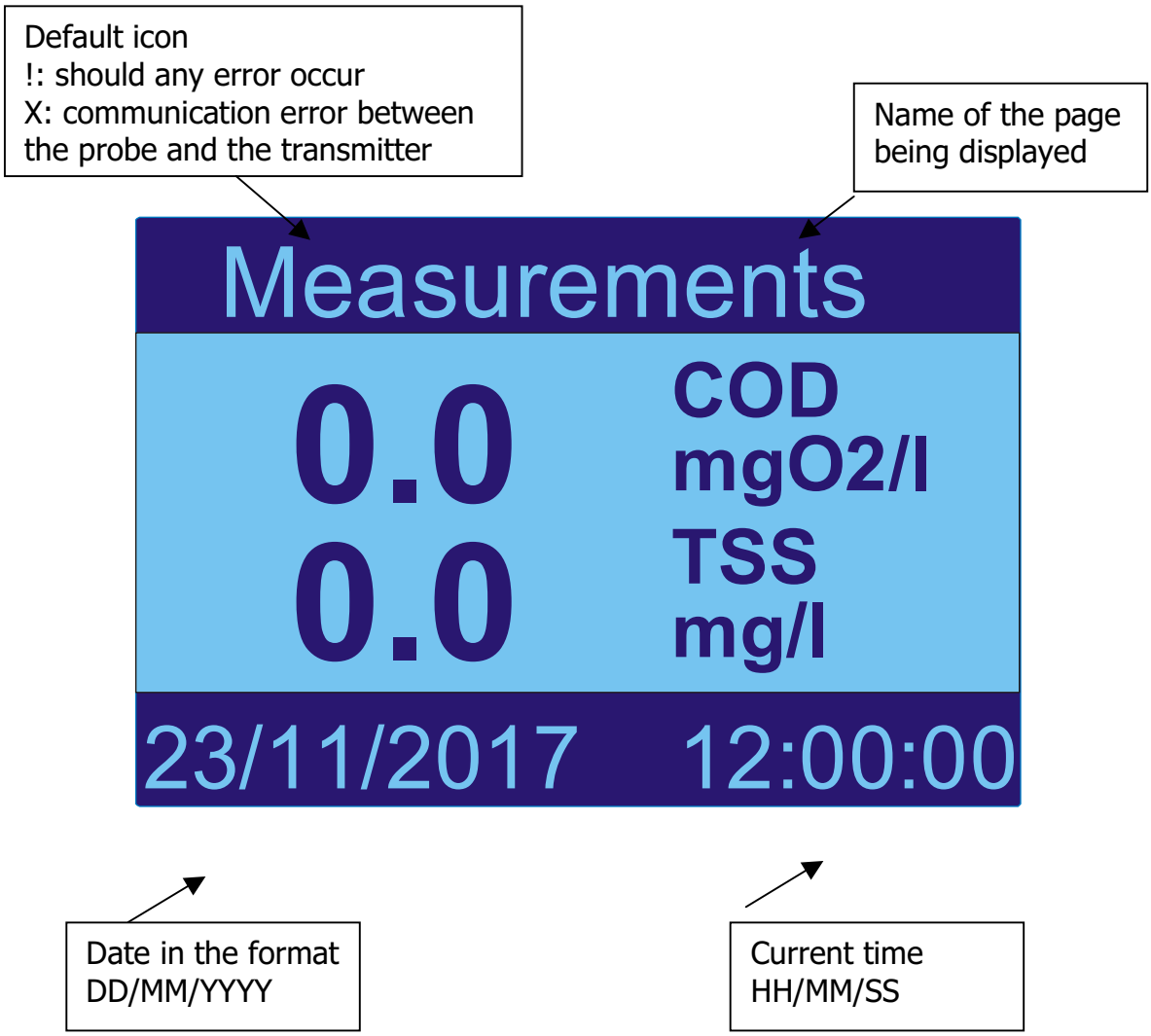
3.2.2. Entering numbers and letters

	scroll through the digits 0 to 9, the symbols "+" "-" "." and the letters A-Z
	validates the entry.

3.2.3. During data entry

	erases the last character entered, assuming that the entry box is not empty.
	moves on to the next character.
	cancels the parameter editing process if nothing has been entered in the box.
	confirms the data entry.

3.3. ICON BARS ON THE SCREEN



Press  then "**setup**"

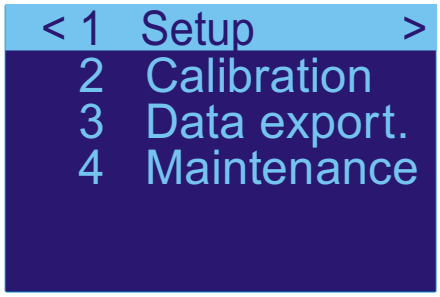
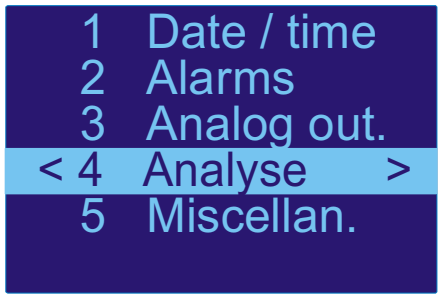
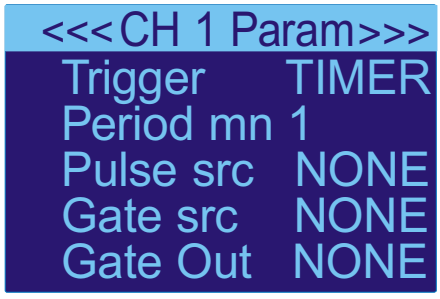
Once the probe has been installed, the probe must be set up in order to take into account all the specifics of the installation so as to obtain the best performance possible.

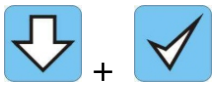
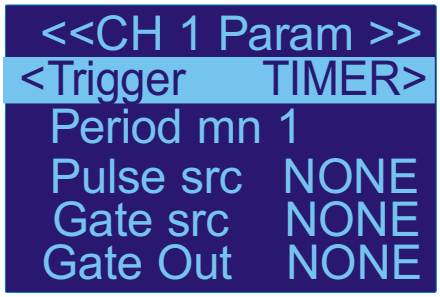
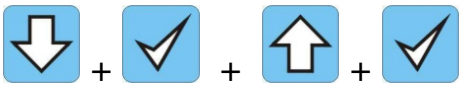
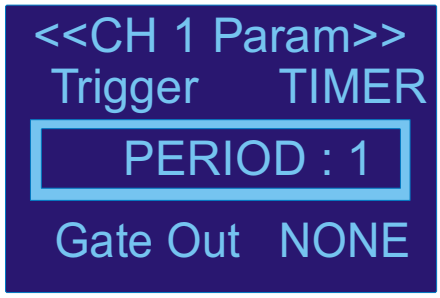
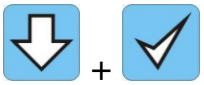
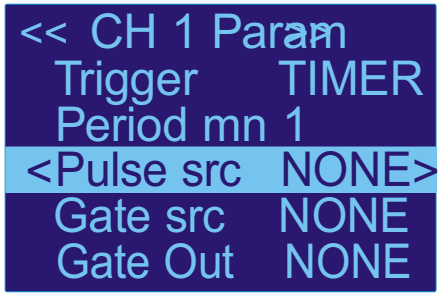
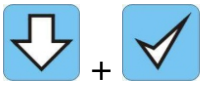
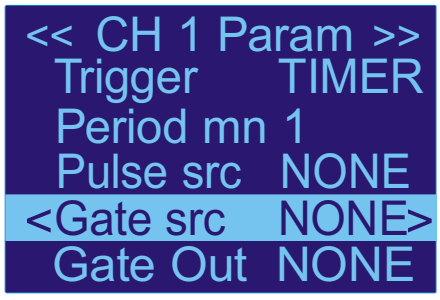
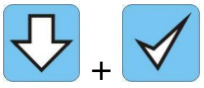
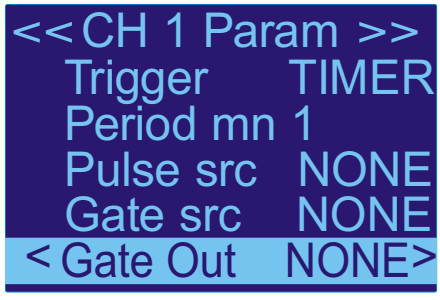
Similarly, we recommend verifying the set-up after software update so as to best take advantage of any new functions.

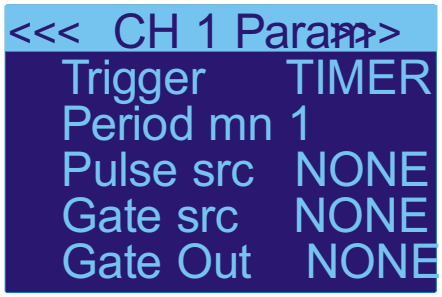
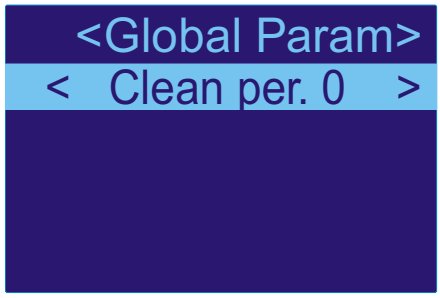
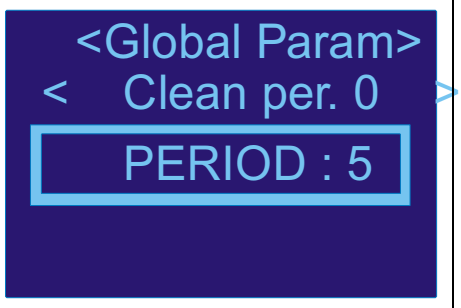
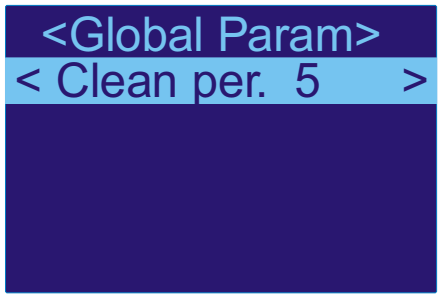
3.4. STEP BY STEP CONFIGURATION

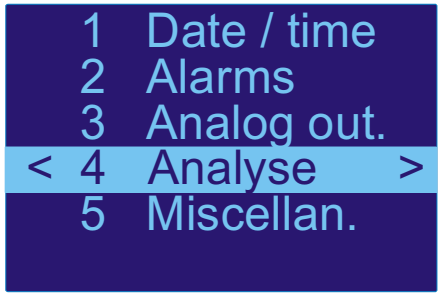
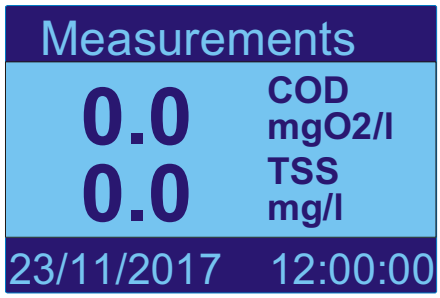
It is not necessary to set up all the parameters of the device since a large proportion of these parameters are the settings for the inputs/outputs, alarms and advanced functions. It is always possible to refine the set-up at a later date.

The "typical configuration" given below outlines the main parameters.

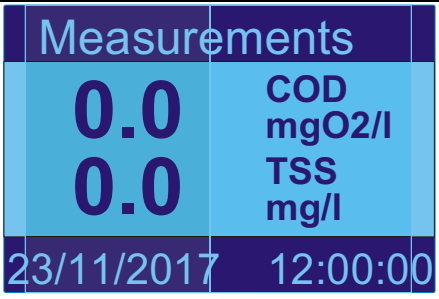
Once the device has been switched on, the set-up mode can be accessed from any measurement screen. • Press 	
• Choose **SETUP** from the menu 	
• Choose **ANALYSE** from the menu  and 	
	

• Set the parameter **TRIGGER** to **TIMER**  **(NONE-TIMER-PULSE).**	
• Set the **TIMER PERIOD** to the required measurement frequency (one analysis every minute in the example opposite). 	
• Set the **PULSE SOURCE** to NONE. 	
• Set the **GATE SOURCE** to NONE.  **(DI1 – DI2 - NONE)**	
• Set the **GATE OUT** to NONE.  **(DI1 – DI2 - NONE)**	

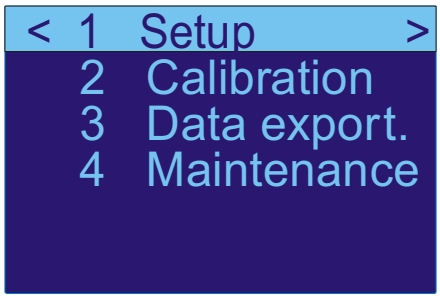
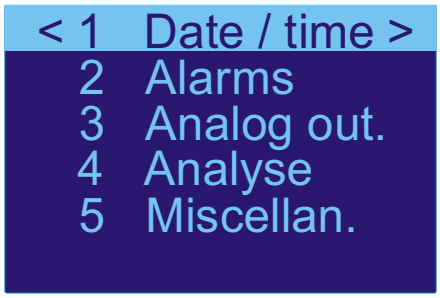
• Select the line **CHANNEL1 PARAMETERS** with ⇧ then validate with ✓ The set-up common to all the analysis channels is displayed.	
• Choose **CLEANING PERIOD** ⇩ + ✓	
• Set **CLEANING PERIOD** 5 mins. (for example one cleaning every 5 minutes). ⇧ + ✓	
	

• Press  to return to the ANALYSE menu	
• Press  to return to the SETUP menu	
• Press  to return to the MEASUREMENT screens. **Message "Saving parameters please wait ..."**	

3.5. CONTRAST SETTINGS

	
To change the contrast settings of the screen: • Hold down the  key • Adjust with the arrow keys  and  .	

3.6. SETTING THE DATE AND TIME

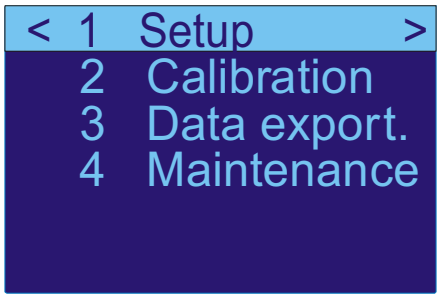
	
• Choose **SETUP** from the menu 	
• Choose **DATE / TIME** with 	
• Use the arrow keys  and  to move the cursor around • Adjust with the arrow keys  and  . • Validate with  .	

Don't forget to change the time on the transmitter for the hour change between summer and winter, where appropriate

3.7. SETTING UP THE ALARM THRESHOLDS

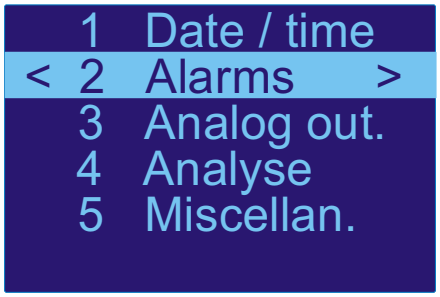
The *T-UV-BCT* can only monitor the parameters measured within a pre-determined range and will alert the user if this range is exceeded.

- Choose **SETUP** from the menu 



To set up this surveillance, select the parameter required and validate.

- Choose **ALARMS**  + 



ALARM SETTINGS

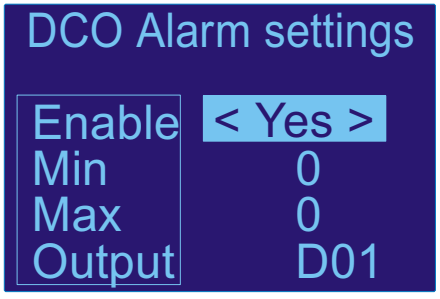
COD ALARM SETTINGS

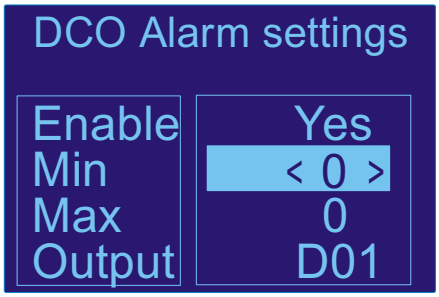
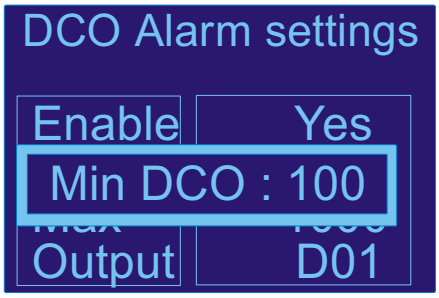
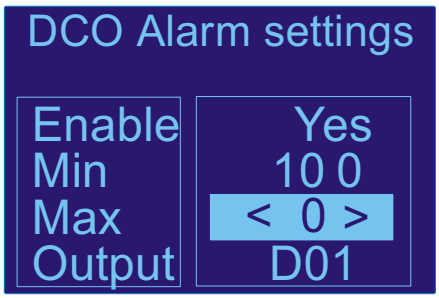
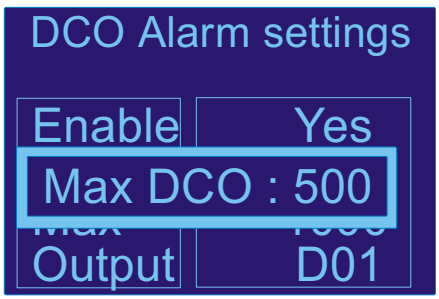
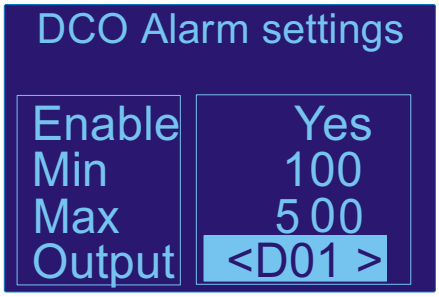
COD: Chemical Oxygen Demand

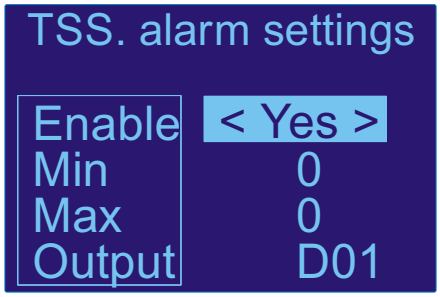
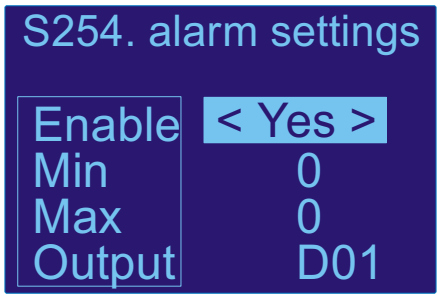
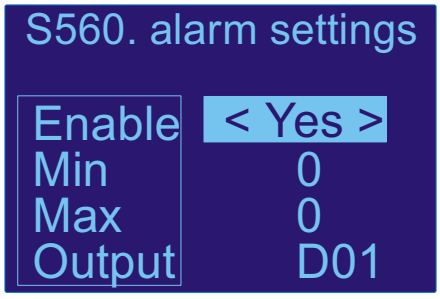
- Press the key 

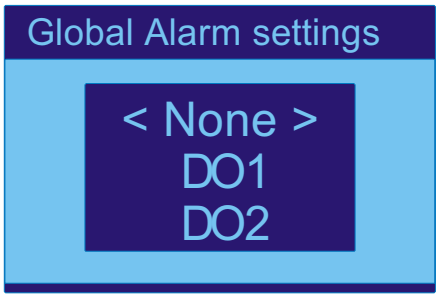
Enable: active surveillance YES, inactive NO.

- Use  to choose Yes or NO



Min: Minimum thresholds. • Press the keys ↓ + ✓	
• Press the keys ↑ and → • Validate with ✓	
Max: maximum thresholds. • Press the keys ↓ + ✓	
• Press the keys ↑ and → • Validate with ✓.	
Output: Relay output to be activated if a threshold is exceeded (min. or max.) • Press the keys ↓ • Use ✓ to choose DO1, DO2 or NONE	

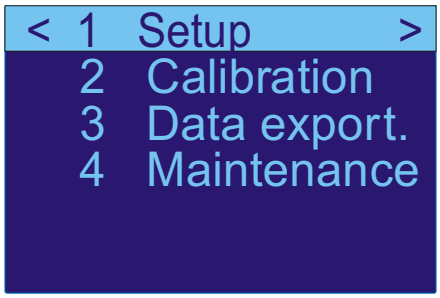
DCO ALARMS SETTINGS	
Alarm settings for DCO parameter - Mimimum: 100 - Maximum: 500 - Out: DO1 Quit this menu with 	
TSS ALARMS SETTINGS	
TSS = suspended solids TSS: mass of non soluble particles to be found in the water whose dimension is between 1 and 100 mm. • To setting up the TSS alarms, use the same procedure.	
S254 ALARMS SETTINGS	
SAC 254: Optical absorption of the effluent at a wavelength of 254 nm. • To setting up the SAC 254 alarms, use the same procedure.	
S560 ALARMS SETTINGS	
SAC 560: Optical absorption of the effluent at a wavelength of 560 nm. • To setting up the SAC 560 alarms, use the same procedure.	

GLOBAL ALARMS SETTINGS	
Global alarm : This function is used to assign the general error to one of the 4 relay outputs (any error arising from either the transmitter or the probe).	
• Use the keys and to choose between NONE, DO1 or DO2 • Validate with	

3.8. SETTING UP THE ANALYSIS CYCLES

Setting up the analysis cycles enables you to set up your transmitter according to your requirements and to your particular installation.

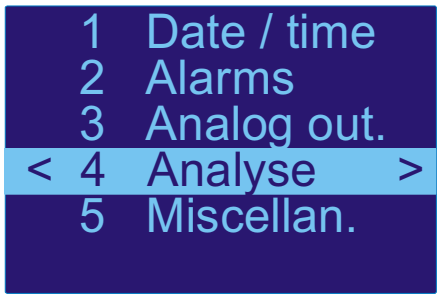
- Choose **SETUP** from the menu 



The main parameters concern:

- triggering the analyses: either periodically or via an external pulse.
- setting up the validation gate: authorizing and preventing measurements.
- cleaning cycle frequency.

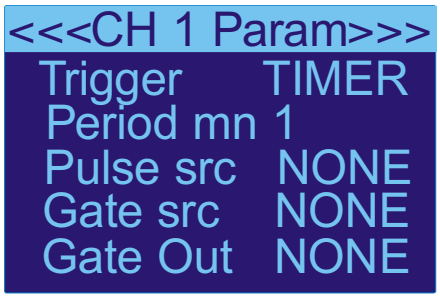
- Choose **ANALYSE**  + 



Channel selection: **CHANNEL**

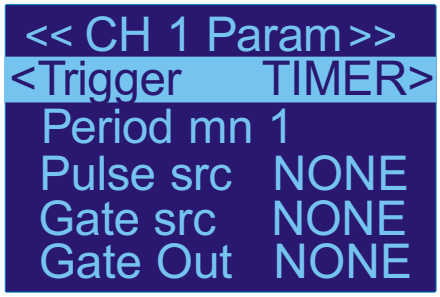
- Press  to scroll through the set-up pages for the input channels in turn, as well as the general parameters page.

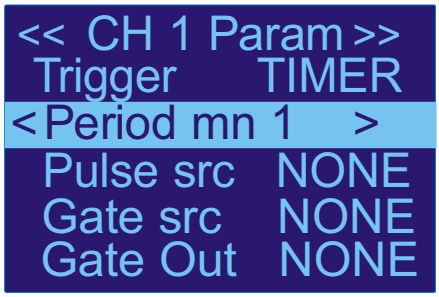
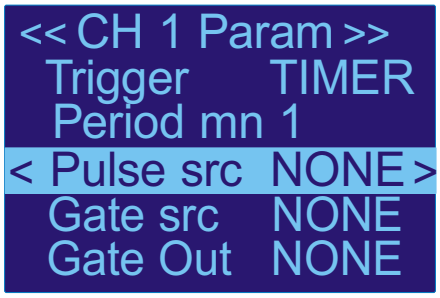
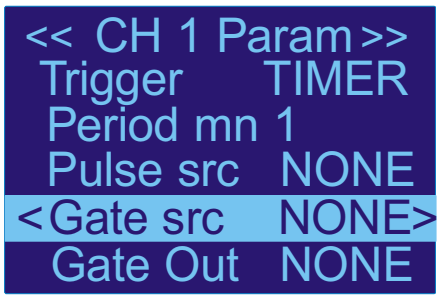
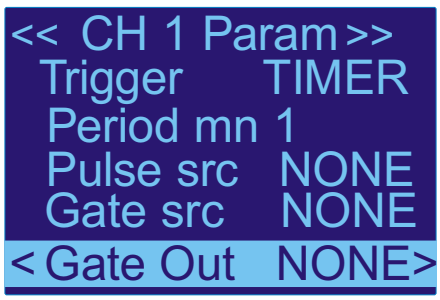
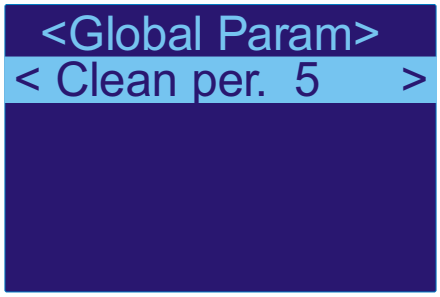
Each measurement channel can be set up separately.



Analysis triggering type: **TRIGGER**

NONE: no analysis of this channel.
TIMER: periodical analysis triggering.
PULSE: triggering via an external contact.

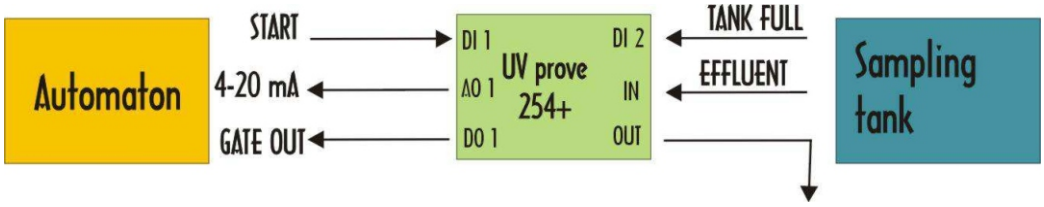


Measurement frequency: **PERIOD**. • Press ✓ to enter the analysis frequency of this measurement channel in minutes. this menu is only active if **Trigger** is set to **PERIOD**. The measurement frequency **PERIOD** cannot exceed 99 minutes.	
External triggering: PULSE SRC. • Press ✓ to scroll through the 2 On-Off inputs in turn. This menu is only active if **TRIGGER** is set to **PULSE**. See the chapter 2.4.6	
Validation gate: GATE SRC. • Press ✓ to scroll through the 2 inputs in turn. This function enables you to temporarily inhibit measurements on a channel depending on the status of an on-off input on the transmitter. See chapter 2.4.6	
Analysis relay outputs: GATE OUT. • Choose the relay output to be activated during the analysis cycles.	
Cleaning period: **CLEAN PER. (page 2)** • Choose the cleaning frequency of the measurement cell using compressed air.	

3.9. CONTROL SIGNALS

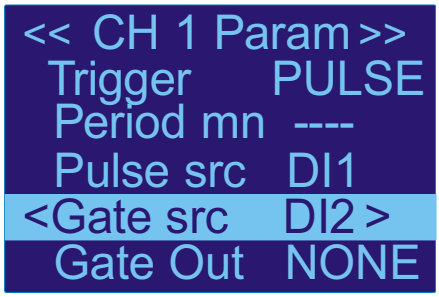
Example of how control signals are used.

Supposing that the probe is analyzing an effluent in a tank equipped with a dry contact level sensor. If the tank is empty, then the contact is open and the probe should not be measuring. The analyses are triggered by a dry contact output on the automated system every 30 minutes. The result of the COD measurement is transmitted to a 4-20mA output.



The three control signals used are:

- **PULSE SOURCE (DI1)**: input for triggering an analysis
- **GATE SOURCE (DI2)**: validation gate input of an analysis (takes priority over PULSE SOURCE)
- **ANALYSE GATE OUT (DO1)**: analysis gate output (active when an analysis is underway).
- **OUTPUT 4-20 N°1 (A01)**: monitoring of the COD measurement to the automated system.

Device set-up screens	
The output START of the automated system is connected to the input DI1 of the transmitter (Trigger = PULSE, PULSE SRC = DI1) and the signal indicating the presence of water to the input DI2 (GATE SRC = DI2).	
The automated system is informed that an analysis is underway by the signal GATE OUT which is directed to the output DO1 (ANALYSE GATE OUT = DO1).	

3.10. ANALOG OUTPUTS

The two analog outputs will enable you to transmit the measurements in analog form (current loop) to an external device (eg: an automated system).

Each output can be separately associated with one of the parameters being measured, in the range desired. If the measurement associated with a 4-20 mA output is not available, this output will indicate 4 mA.

The analog outputs are initialized at 4 mA:

- when the device starts up
- if a measurement error should occur

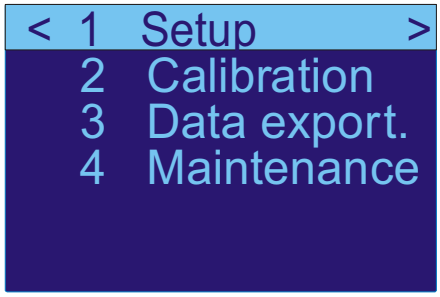
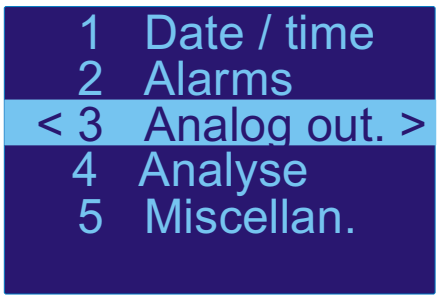
The analog outputs keep the same value:

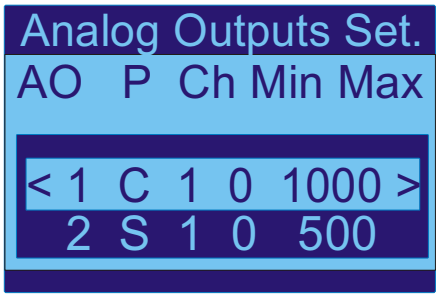
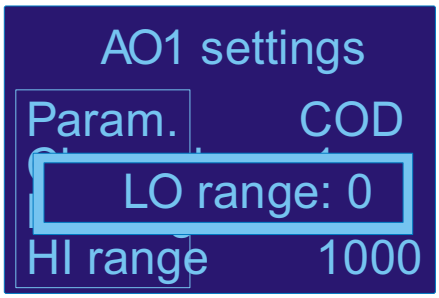
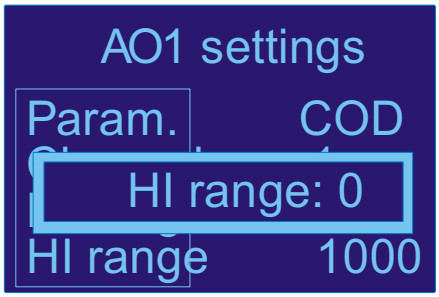
- during the measurement cycles
- during and after the cleaning cycles
- if an analysis gate is set up and the measurement is ignored.

The analog outputs are refreshed pro-rata with the associated measurement:

- at the end of each measurement cycle
- always before the end of the signal "**analyse Gate out**" (if used)

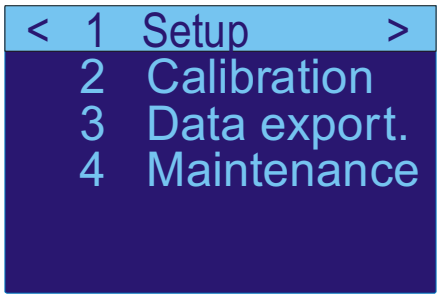
If necessary, use the output "**analyse Gate out**" to synchronize your external equipment with the analysis cycle.

• Choose **SETUP** from the menu 	
• Choose **ANALOG OUT**	

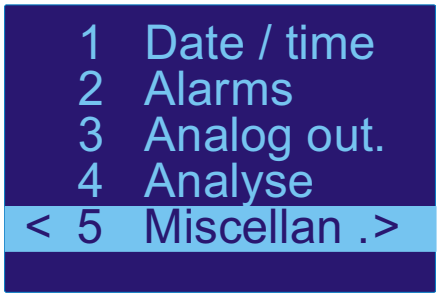
The analog outputs are respectively associated with the COD and TSS measurements of channel 1. The output range will represent the ranges 0-1000 for the COD and 0-500 for the suspended solids. **AO: output 1 or 2** **P**: measurement assigned to the 4/20mA output. **Ch**: use the measurements from channel 1. **Min**: COD value for 4mA. **Max**: COD value for 20mA.	
• Use  to select between DCO, suspended solids …	
• Select LO range with  • Enter the value with  and  • Valid with 	
• Select HI range with  • Enter the value with  and  • Valid with 	

3.11. MODBUS LINK

- Choose **SETUP** from the menu 

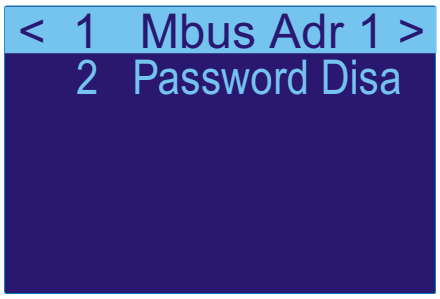


- Choose **MICELLANEOUS**

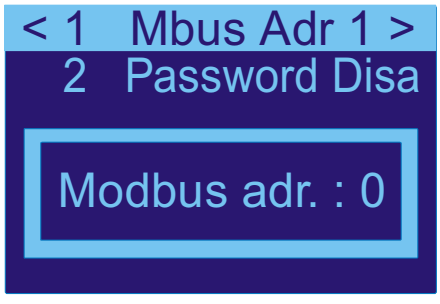


Setting up the ModBus RS485 link.

ModBus Address: address of the probe on the ModBus network. This address must be unique on the ModBus network.



Communication settings:
- Modbus RTU protocol
- 9600 bauds
- 8 bits data
- 1 stop bit
- even parity



A supervisor software must use MODBUS function code03 to read the data and code 16 to write the data.

Refer to Modicon Modbus Reference Guide for complete information about Modbus communication standard.

All registers are **READ ONLY** and encoded as 32 bits floating datas. This means that two 16 bits registers are used to encode one 32 bits data. (For more information, refer to IEEE Standard for Floating-Point Arithmetic (IEEE 754) which is a technical standard established by the Institute of Electrical and Electronics Engineers (IEEE) and the most widely used standard for floating-point computation).

EXAMPLE:

To display COD value, supervisor as to read 16 bits registers 5 and 6.
Register 5 contains the 16 LSB of the floating data and register 6 contains the 16 MSB of the floating data.

Register 5 value: 0x0000
Register 6 value: 0x4120

32 bits floating register is: 0x41200000 which represent IEEE754 decimal value 10.0

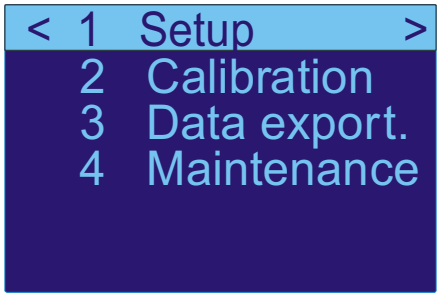
MODBUS REGISTER TABLE				
Address		Acces (*)	Unit	Function
DEC	HEX			
0	0	R		Reserved
1	1	R		Global_alarm (0=no alarm 1=alarm)
2	2	R		Reserved
3	3	R		Reserved
4	4	R		Reserved

5	5	R	(mg/l)	COD ® 16 LSB
6	6	R	(mg/l)	COD ® 16 MSB
7	7	R	(mg/l)	TSS ® 16 LSB *(see page 44)*
8	8	R	(mg/l)	TSS ® 16 MSB
9	9	R	UA/cm	SAC 254 ® 16 LSB *(see page 58)*
10	A	R	UA/cm	SAC 254 ® 16 MSB
11	B	R	UA/cm	SAC 560 ® 16 LSB *(see page 58)*
12	C	R	UA/cm	SAC 560 ® 16 MSB
13	D	R		Reserved
14	E	R		Reserved
15	F	R		Reserved
149	95	R		Mode (0=measurements 1=settings)

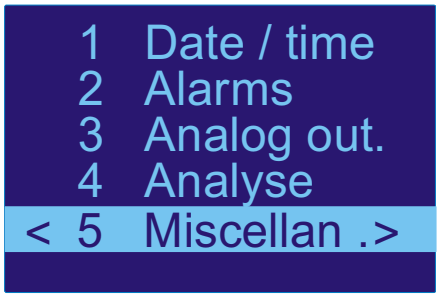
(*) R = Read W = Write

3.12. PASSWORD PROTECTION

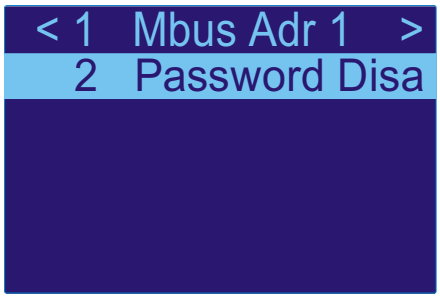
You can choose to limit access to the set-up functions of the device by using a password. This will allow any user to visualize the measurements while restricting access to complex functions except for qualified personnel.



- Choose **SETUP** from the menu 



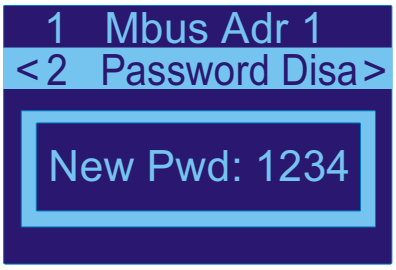
- Choose **MICELLANEOUS** 



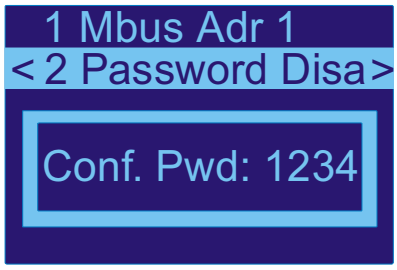
- Press the keys  +  to choose **PASSWORD**

The password is a 4-digit number.
Example of a password: 1234

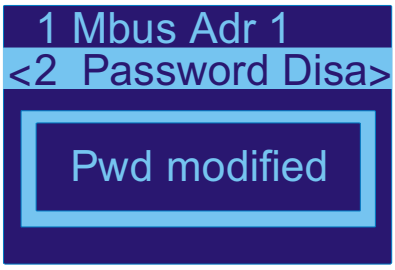
3.12.1. Enter a password



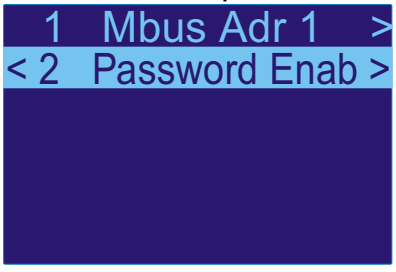
1- enter the password



2- confirm the password

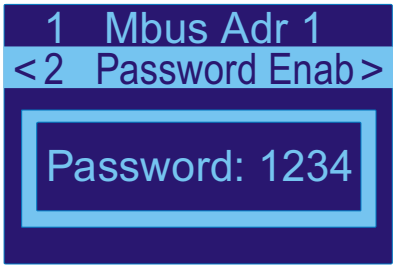


3- password modified

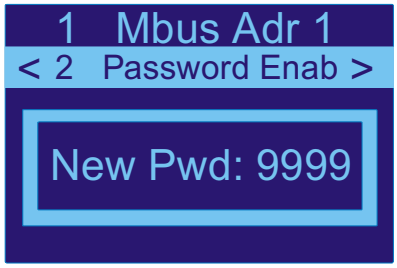


4 – password enabled

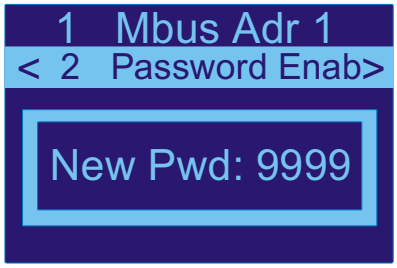
3.12.2.Modify a password



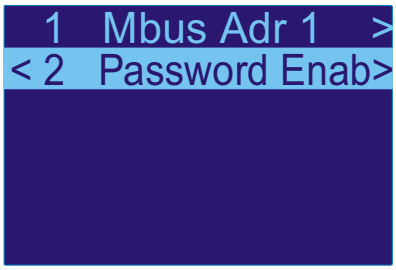
Enter the initial password



Enter a NEW password

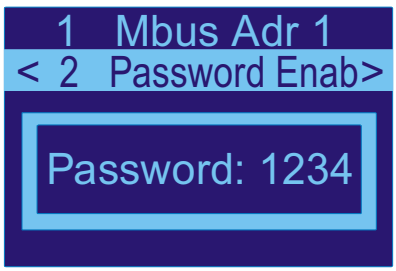


Confirm the new password

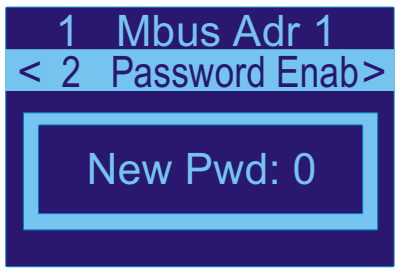


Password Enab is displayed

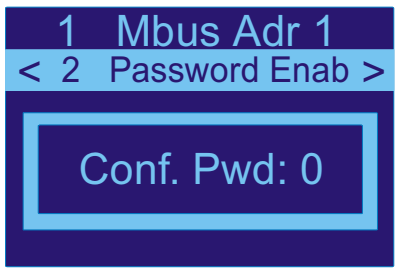
3.12.3.Invalidate a password



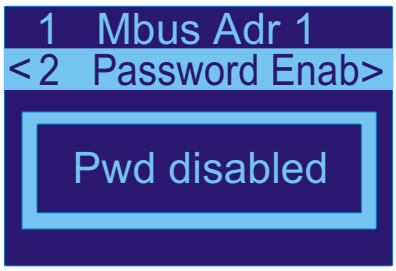
Enter the initial password



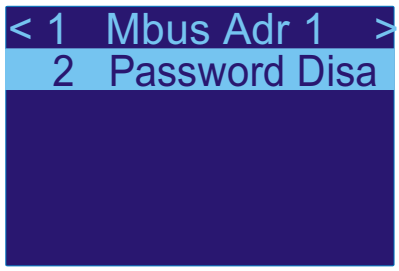
Enter 0 as a password.



confirm 0 as the password



The password is invalided



Password Disa is displayed

Chapter 4

CALIBRATION - procedure N°1

4. CALIBRATION - PROCEDURE N°1

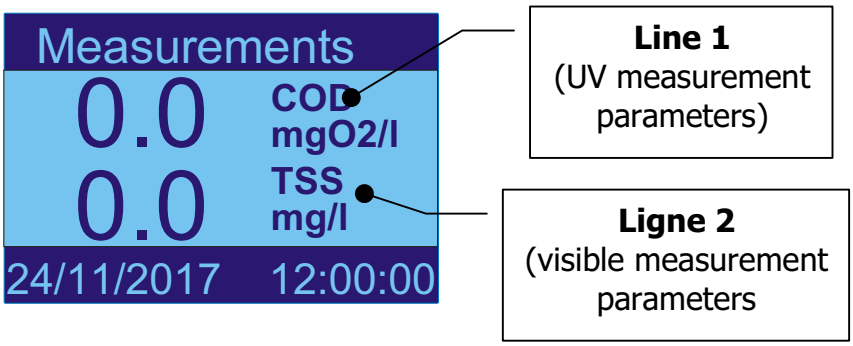
4.1. PRINCIPLE

The calibration procedure is what allows the correlation coefficients to be determined between the optical measurements **CAS 254** and **CAS 560** and the overall pollution measurements **TOC, COD, BOD** and **TSS**.

The *T-UV- BCT* measures the concentration in organic matter of theeffluent and from this calculates the equivalent in COD. This correlation depends on the composition of the samples analyzed. The calibration procedure allowsthe device to calculate this relationship (calibration coefficients) for your effluent bypcomaring the optical measurements to laboratory measurements.

> This calibration should be carried out at least once after the device has been installed and may be repeated from time to time to ensure that the system is working properly. Before beginning, check the *T-UV- BCT* probe set-up and that it is working normally.

This procedure is used to calibrate parameters displayed on "MEASUREMENT" screen
Parameters are chosen before ordering. • one parameter between TOC, COD, BOD (line 1) • The TSS parameter (line 2)



Parameters	Parameters displayed
TOC: Total Organic Carbon	**= TOC**
COD: Chemical Oxygen Demand	**= COD**
BOD: Biochemical Oxygen Demand	**= BOD**
TSS: Suspended Solids	**= TSS**
CAS 254: Spectral Absorption Coefficient	**= SAC 254**
CAS 560: Spectral Absorption Coefficient	**= SAC 560**
COLOR	**= COLOR**

4.2. EQUIPMENT REQUIRED

- a container filled with 2 litres of clear water for rincing the probe
- a sample of approximately 5 litres of the effluent
- an appropriate container for the sample that will go to the laboratory.

4.3. CALIBRATION PROCEDURE

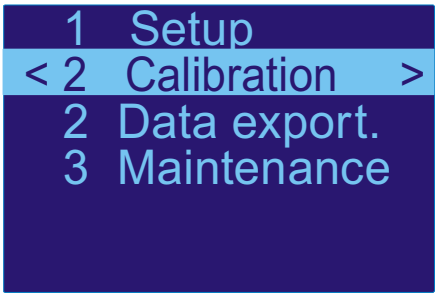
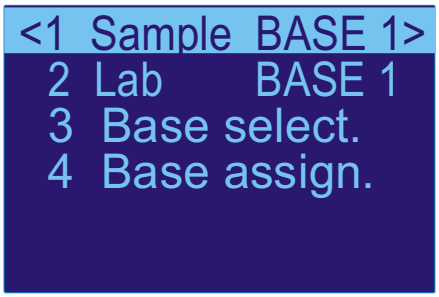
The calibration procedure can be broken down into 4 steps:

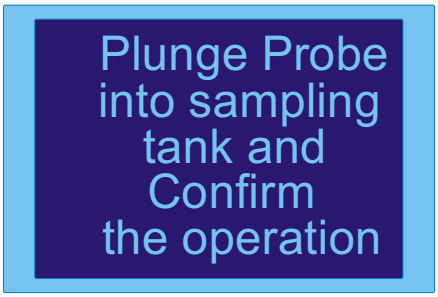
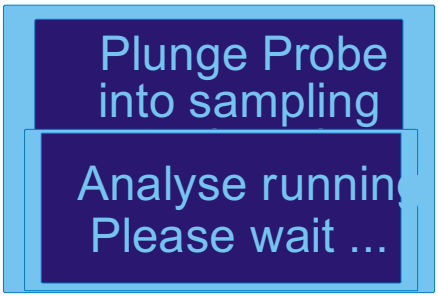
Step 1	**Sampling the effluent to be analyzed.** • Take a sample of the effluent as close as possible to the *T-UV- BCT* . This sample will be used both for the laboratory measurements and the probe measurements (take 2 litres for the probe plus the volume necessary for the laboratory. • Verify that the sample is homogenous: if necessary, shake the container gently without creating an emulsion.
Step 2	**Laboratory analysis of the sample.** • Put the quantity required for the laboratory analysis into an appropriate container. • If the analysis cannot be carried out quickly, maintain the sample at temperature of 4°C.
Step 3	**Analysis by the *T-UV- BCT* of the sample.** • The remainder of the sample will be analyzed by the *T-UV- BCT* : follow the procedure outlined in chapter 4.4.
Step 4	**Enter the laboratory measurement.** • Enter the measurement obtained from the laboratory into the *T-UV- BCT* : follow the procedure outlined in chapter 4.5.

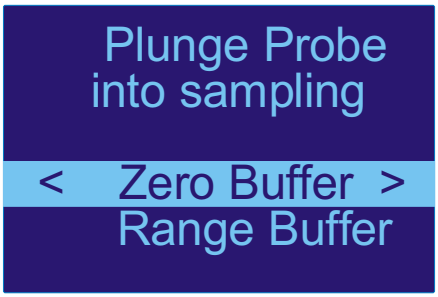
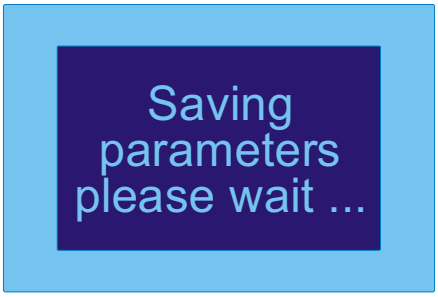
4.4. SAMPLE ANALYSIS

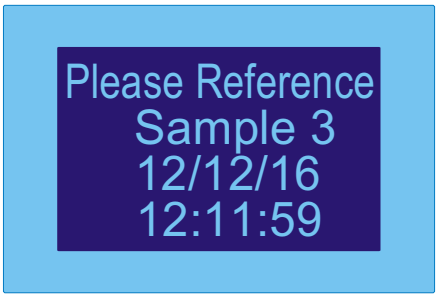
Before starting to analyze a sample, make sure that you have followed the right calibration procedure.

The calibration of the *T-UV-BCT* is based on the comparison between the laboratory measurements and those of the probe. The analysis of the sample is an essential step in the calibration process. The system will guide you through the different phases so as to reduce as much as possible the risk of user error.

• Choose **CALIBRATION** from the menu	
This command allows you to analyze a sample and obtain the values measured by the device. In this example, the analysis of the sample will be added to the correlation base number 1 • Choose **SAMPLE BASE1** from the menu	
The *T-UV-BCT* numbers the samples automatically. This number increases each time a new sample analysis is added. • Confirm the analysis  or abandon with  .	

The measurement of the « white » takes a few seconds.	
Analyze the sample • Place the probe in the tank containing the sample to be analyzed, • then validate the analysis with ✓.	
The sample analysis takes a few seconds.	

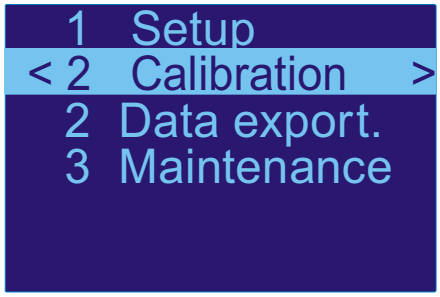
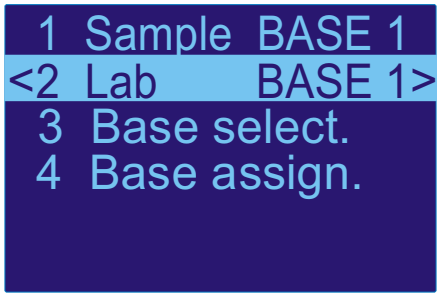
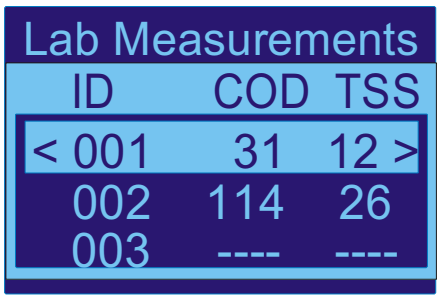
Reference the sample If the measurement is carried out correctly, the device will ask you to specify whether the sample analyzeds a reference solution for calibrating the zero setting or a point of a known concentration.	
	

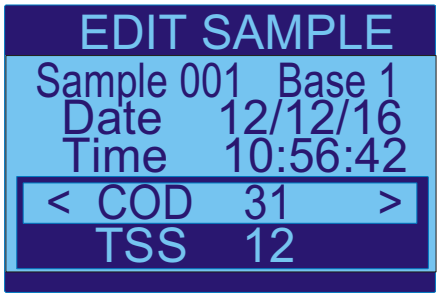
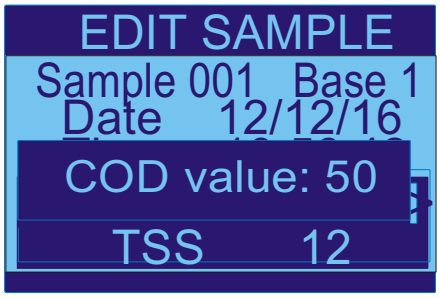
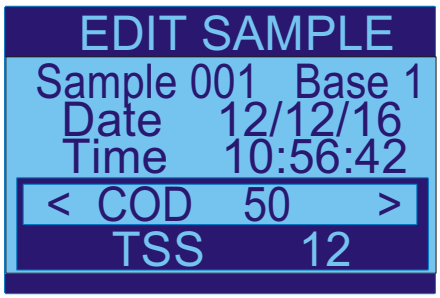
After the analysis and with the exception of zero setting, the *T-UV-BCT* displays the references of the sample. This is made up of a number, and the date and time of the analysis. Make a note of this information because it will make it easier to find this particular analysis in the list of measurements when you enter the laboratory measurements. • Finish with 	

If the absorption of the sample is too high to allow a correct measurement (saturation), the *T-UV-BCT* will indicate this with an error message. The sample must then be diluted in order to carry out the calibration.

4.5. ENTERING THE LABORATORY MEASUREMENTS

After analyzing a sample of your *T-UV-BCT*, you must enter the "laboratory" measurements corresponding to the sample.

• Choose **CALIBRATION** from the menu Press the keys ↓ + ✓	
• Choose **LAB BASE1** from the menu Press the keys ↓ + ✓	
• From the list, choose the sample whose information you are adding and valid with ✓ *In the example opposite, the laboratory values of COD and TSS have been entered for samples 1 and 2.*	
• Press ✓ to select **Edit**	

• Enter the laboratory measurements of COD and SS corresponding to the sample. If a field is left empty, it will not be taken into account in the correlation.	
• Enter COD value then validate 	
• To quit, Press  .	

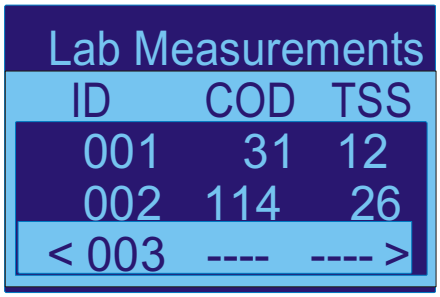
4.6. DELETING A SAMPLE

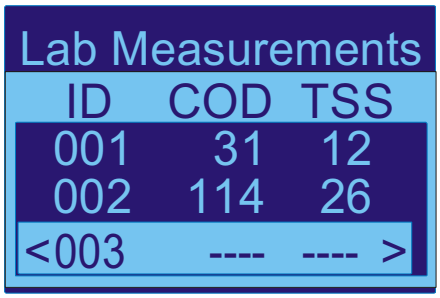
If necessary, you can delete the measurements of a sample analyzed by the *T-UV-BCT* .

This procedure may be necessary for deleting a test sample, eliminating a sample that is not representative of the effluent, doing the correlation again of the device at the beginning. You can work with two independent correlation bases. Each one can contain up to 10 samples.

It is preferable to change the correlation base in the following cases, rather than deleting the samples if your goal is to:

- Calibrate the device for a different effluent.
- Compensate for a temporary change in the nature of the effluent.

• Choose the sample you wish to delete from the list	
• Select "**Delete**". **ATTENTION**: the deletion of a sample is definitive.	
• Once you have confirmed that you wish to delete, the sample is removed from the list.	

Analysis 003 has been deleted.	

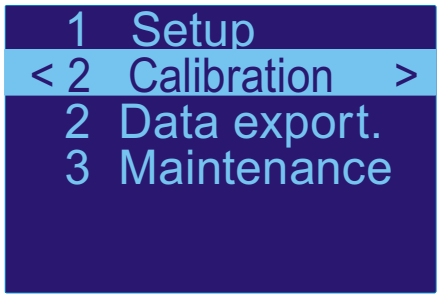
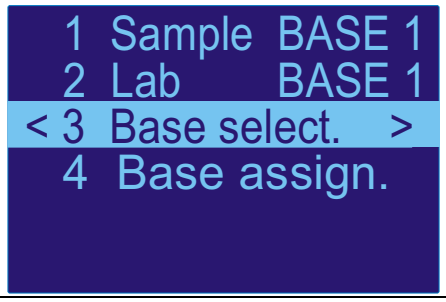
4.7. MANAGING THE CALIBRATION BASES

The *T-UV-BCT* allows you to work with 2 independent calibration bases. In this way, you can calibrate your device for two different types of effluent or use a different calibration depending on the time of year.

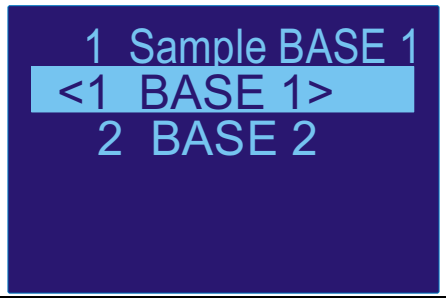
The active base is the one in which all the results of the sample analyses will be placed, which you will then be able to edit using the menu **Lab measurements**.

The calibration used during automatic mode analyses Is independent of the active base. See chapter 4.10 .

4.8. SELECTING THE ACTIVE CALIBRATION BASE

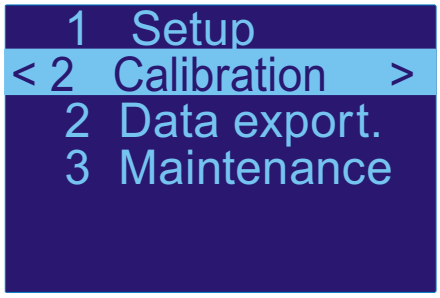
	
• Choose **CALIBRATION** from the menu	
• Select the calibration base to be used for the sample analyses and for entering the laboratory measurements and choose **Select**	

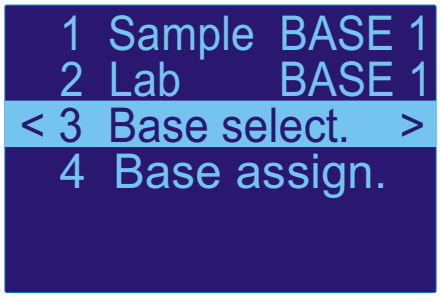
NOTE: this base will be the one used for the sample analyses and for entering the lab measurements, but it will not modify the calibration base used for the measurement cycles.

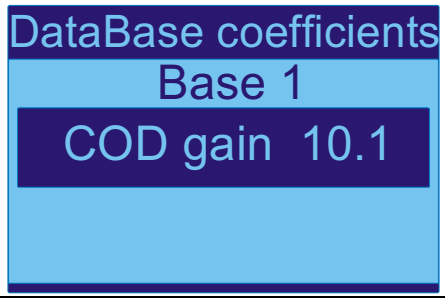
	
	

4.9. MANUAL ENTRY OF CALIBRATION COEFFICIENTS

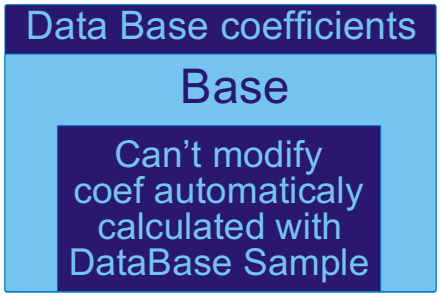
<table>
<tr><td>  </td><td></td></tr>
<tr><td>• Choose CALIBRATION from the menu

Press the keys  +  </td><td>  </td></tr>
<tr><td>• Select the base you wish to edit and choose Edit.

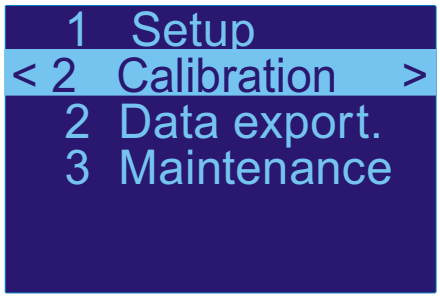
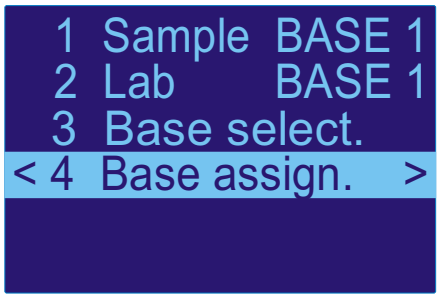
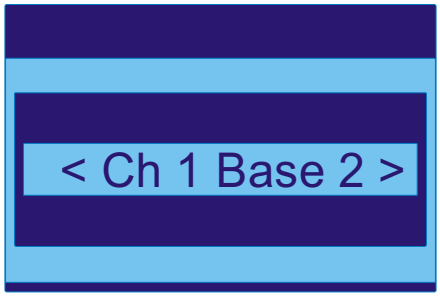
Press the keys  +  </td><td>  </td></tr>
<tr><td>• For example, choose BASE 1</td><td>  </td></tr>
<tr><td>• Press  to select Edit</td><td>  </td></tr>
</table>

In this way, you can visualize or modify manually the calibration coefficients of this base. • Select the coefficient you wish to modify (COD or TSS coefficient) • validate with  .	
	

You cannot modify a coefficient calculated by the device using sample analyses and laboratory measurements.

In order to enter a coefficient manually, there must be no laboratory measurements for this parameter in the calibration base. • The calibration is either **automatic**: in this case, the coefficients between the sample analyses and the laboratory measurements are calculated by the *T-UV-BCT* , • or the calibration is **manual**: you enter the coefficients for each parameter manually.	

4.10. ASSIGNING CALIBRATION BASES TO MEASUREMENT CHANNELS

	
• Choose **CALIBRATION** from the menu	
• Choose which calibration base should be used by the measurement probe.	
• In the example opposite, the T-UV-BCT is using the no. 2 calibration base. • Then validate with 	

Chapter 5
CALIBRATION – procedure n°2

5. CALIBRATION - PROCEDURE N°2

5.1. PRINCIPE

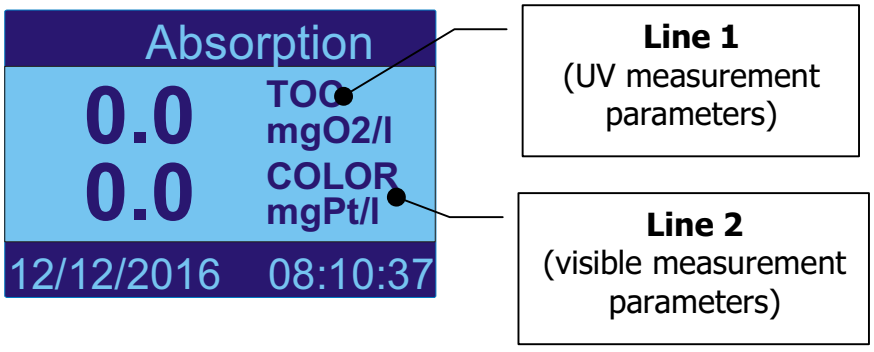
The calibration procedure is what allows the correlation coefficients to be determined between the optical measurements SAC 254 and SAC 560 and the overall pollution measurements **COD or BOD or TOC and COLOR.**

> This calibration should be carried out at least once after the device has been installed and may be repeated from time to time to ensure that the system is working properly. Before beginning, check the *T-UV-BCT* probe set-up and that it is working normally.

For measurements SAC254 and SAC560, no calibration is needed. Only measurements **TOC, COD, BOD** ou **COLOR** needs calibration.

Unlike calibration 1 procedure which determines calibration coefficients automatically, coefficients are calculated manually.

This procedure is used to calibrate parameters displayed on "ABSORPTION" screen.
Parameters are chosen before ordering. • one parameter between TOC / COD / BOD / SAC 254 parameter • one parameter between SAC 560 / COLOR / TSS parameter.



Parameters	Parameters displayed
TOC: Total Organic Carbon	**= TOC**
COD: Chemical Oxygen Demand	**= COD**
BOD: Biochemical Oxygen Demand	**= BOD**
TSS: Suspended Solids	**= TSS**
SAC 254: Spectral Absorption Coefficient	**= SAC 254**
SAC 560: Spectral Absorption Coefficient	**= SAC 560**
COLOR	**= COLOR**

5.2. EQUIPMENT REQUIRED

- a container filled with 2 litres of clear water for rincing the probe
- a sample of approximately 5 litres of the effluent
- an appropriate container for the sample that will go to the laboratory.

5.3. CALIBRATION PROCEDURE

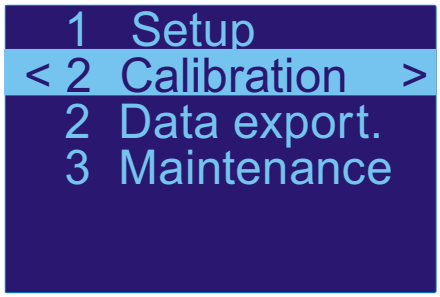
The calibration procedure can be broken down into 4 steps:

Step 1	**Before starting calibration, coefficients must be set to 1.** • Set to value 1.0 the calibration gain on the third and fourth line. *Use the the procedure on the next page*

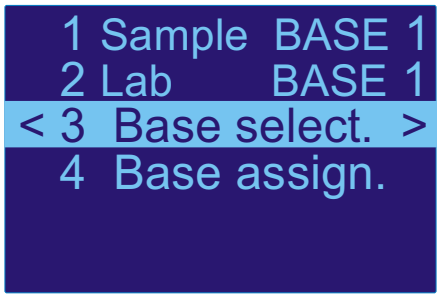
Step 2	**Sampling the effluent to be analyzed.** • Take a sample of the effluent as close as possible to the *T-UV-BCT* . This sample will be used both for the laboratory measurements and the probe measurements (take 2 litres for the probe plus the volume necessary for the laboratory. • Verify that the sample is homogenous: if necessary, shake the container gently without creating an emulsion.
Step 3	**Laboratory analysis of the sample.** • Put the quantity required for the laboratory analysis into an appropriate container. If the analysis cannot be carried out quickly, maintain the sample at temperature of 4°C.
Step 4	**Analysis by the *T-UV-BCT* of the sample.** • Plunge the probe into the sample and let the probe make several measurements in normal mode operation (1 measurement each 2 minutes). Record date and time. If you have several samples, repeat the analyze for each sample.

calibration base selection Edit

- Choose **CALIBRATION** from the menu.
- Press the keys +



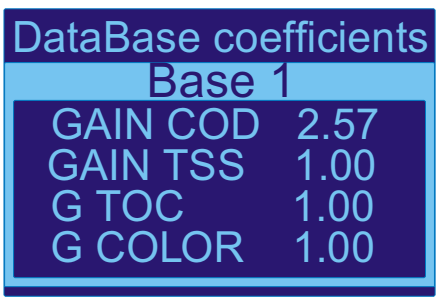
- Select the base to edit
- Press the keys +

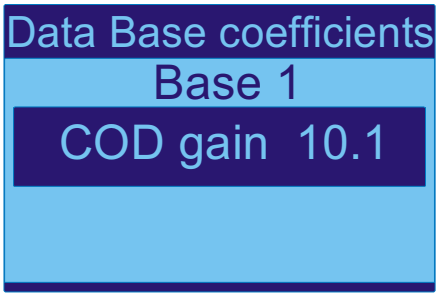


- For example, choose the BASE 1

- Use to choose **Edit**

You can visualize or modify manually the calibration coefficient for this procedure.



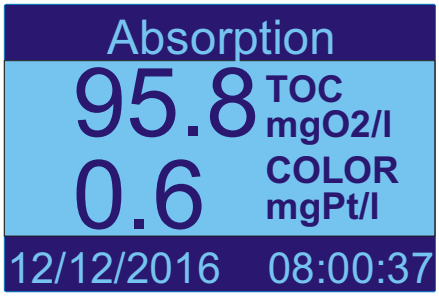
• Select the coefficient you want to modify (DCO coefficient or suspended solid), • Validate with  .	

5.4. COEFFICIENTS DETERMINATION

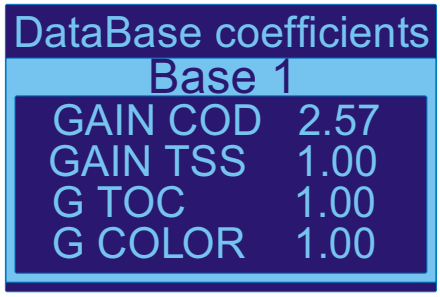
1 - export measurement data file and read samples measurements values

date	hour	channel	COD (mg02/l)	TSS (mg/L)	TOC (mgO2/L)	COLOR (mgPt/L
27/10/2016	14:18:52	1	244.7	0.6	95.931	0.555
27/10/2016	14:20:51	1	244.7	0.6	95.939	0.579
27/10/2016	14:22:51	1	244.6	0.6	95.929	0.575
27/10/2016	14:24:51	1	244.4	0.6	95.839	0.567

Sample



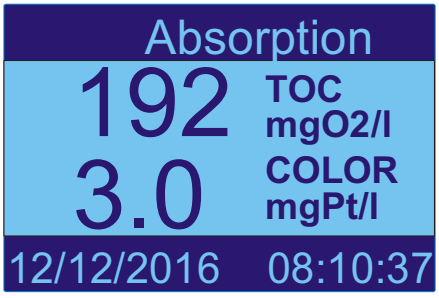
2 - enter gain coefficients for each parameter



Here, for example, we enter gain of 2 for TOC and gain of 5 for COLOR.

date	hour	channel	COD (mg02/l)	TSS (mg/L)	TOC (mgO2/L)	COLOR (mgPt/L
27/10/2016	14:18:52	1	244.7	0.6	95.931	0.555
27/10/2016	14:20:51	1	244.7	0.6	95.939	0.579
27/10/2016	14:22:51	1	244.6	0.6	95.929	0.575
27/10/2016	14:24:51	1	244.4	0.6	95.839	0.567
27/10/2016	14:29:34	1		0.6	191.693	2.804
27/10/2016	14:31:34	1		0.6	191.658	2.886
27/10/2016	14:33:34	1		0.6	191.458	2.959

Calibrated values



Chapter 6
USE

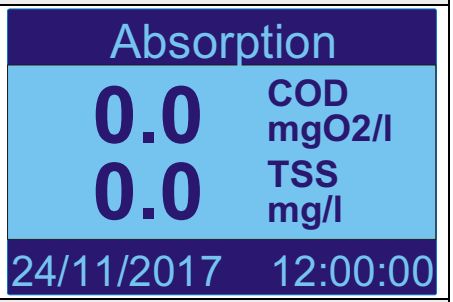
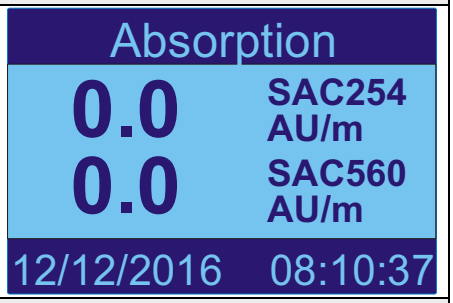
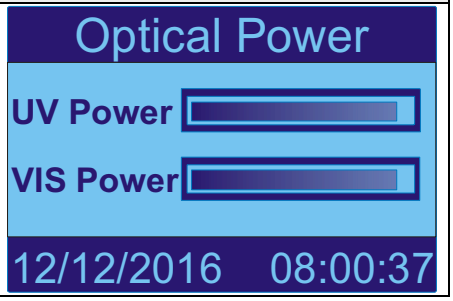
6. USING THE TRANSMITTER

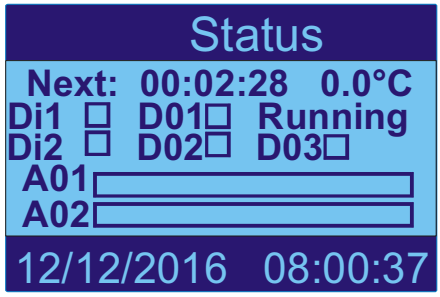
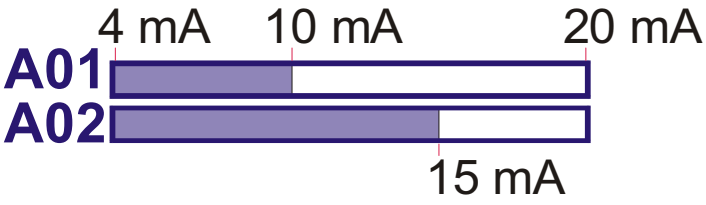
6.1. MEASUREMENT DISPLAYS

Once switched on, the T-UV-BCT displays measurement page 1.The measurements of the probe cover 4 pages.

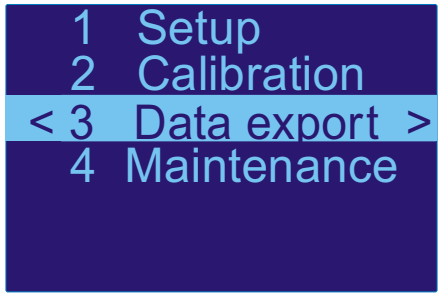
- To **change the active page**, use  and 
- To **choose the measurement channel** to be displayed, use  and. 

Page 1: overall parameters	
COD (mgO2/l): **C**hemical **O**xygen **D**emand **TSS: S**uspended **S**olids Each measurement displayed on screen "measurement" must be calibrated using "Calibration 1 procedure.	
Page 2: Absorptions	
SAC 254: absorption of the effluent by cm in the UV zone. **SAC 560**: absorption of the effluent by cm in the visible zone. Each measurement displayed on screen "Absorption" must be calibrated using "Calibration 2 procedure.	
Page 3: Optical Power	
UV Power indicates the power of the UV LED **VIS Power** indicates the power of the Visible LED.	

Page 4: Status	
Information on the system status are displayed on this page: - time of the next analysis - temperature of the probe in °C - wait mode, analysis or cleaning (waiting, running, cleaning) - date and time	
- status of the on-off inputs DI1 and DI2 DI1 ■ activated, DI2 □ not activated	
- Status of the relay outputs DO1, DO2, DO3 ✓ DO1 ■ activated, ✓ DO2 ■ activated, ✓ DO3 □ not activated	
- bar graph indicating the level of the 4-20mA outputs Example AO1 : 10 mA AO2 15 mA 	

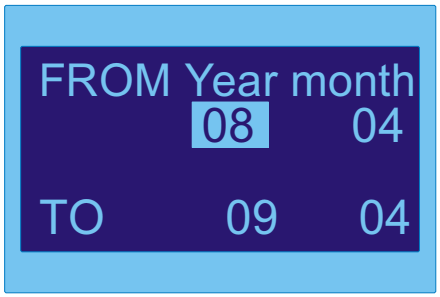
6.2. SAVING MEASUREMENTS TO A USB FLASH DRIVE

The data exportation function allows you to save the data from the ***T-UV-BCT*** onto a USB flash drive in order to work on them with a PC.
The ***T-UV-BCT*** can store several years' worth of measurements. We recommend that copying these measurements regularly onto a USB flash drive.



- Choose **DATA EXPORT** from the menu

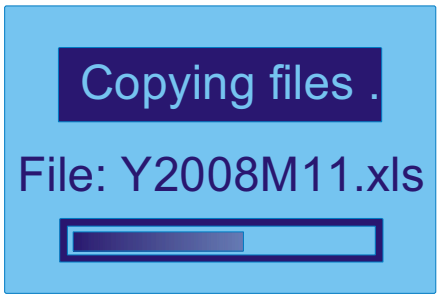
- Define the period of measurements you wish to save onto the USB flash drive (start and end date).



- Insert the flash drive into the port situated on the left hand side of the transmitter, then validate with  .

- The data will be copied onto the flash drive.
  The device creates a data file for each month so as to avoid files becoming to voluminous.

  The file names are given in the format **Y2008M11.xls**. They can be used directly with Microsoft Excel © or a compatible spreadsheet.

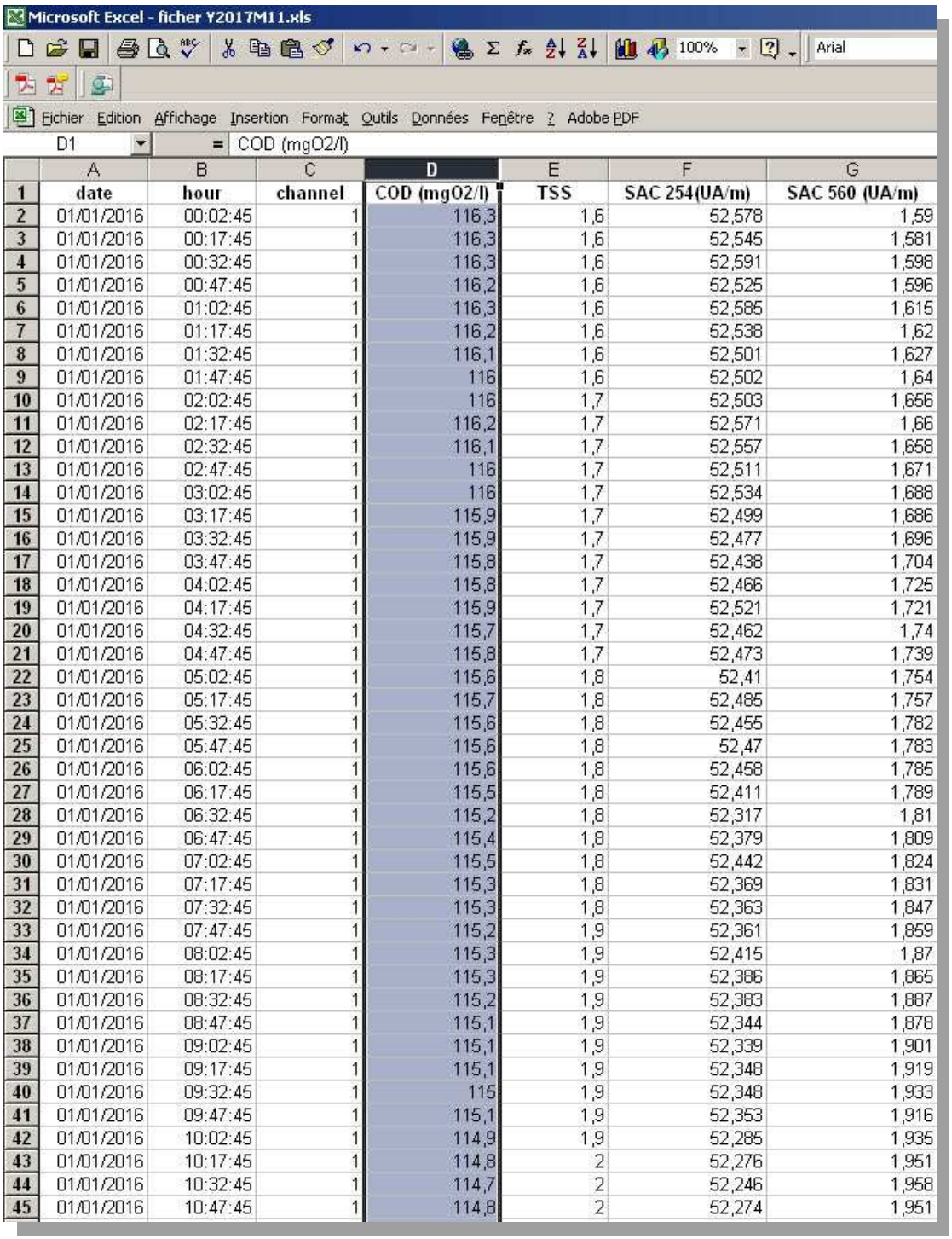


If the data is not recognized by your computer, verify the configuration of the decimal point.

6.3. DISPLAYING THE DATA USING MICROSOFT EXCEL©

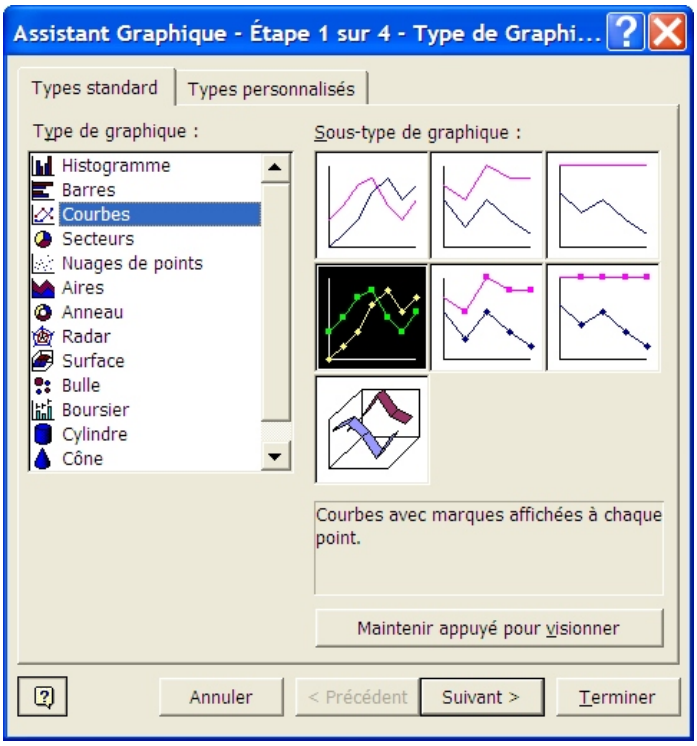
To display the data in a curve using Microsoft Excel:

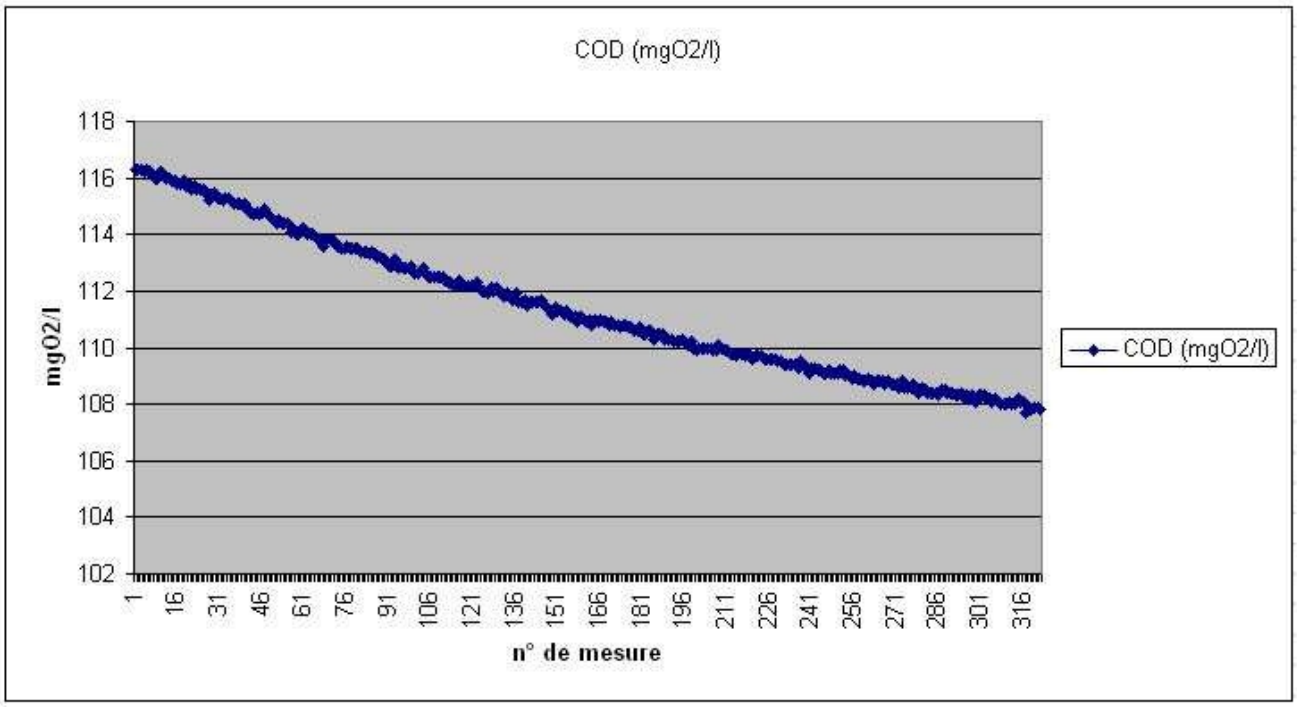
- Open the data file and click on column **D** (COD).



	A	B	C	D	E	F	G
1	date	hour	channel	COD (mgO2/l)	TSS	SAC 254(UA/m)	SAC 560 (UA/m)
2	01/01/2016	00:02:45	1	116,3	1,6	52,578	1,59
3	01/01/2016	00:17:45	1	116,3	1,6	52,545	1,581
4	01/01/2016	00:32:45	1	116,3	1,6	52,591	1,598
5	01/01/2016	00:47:45	1	116,2	1,6	52,525	1,596
6	01/01/2016	01:02:45	1	116,3	1,6	52,585	1,615
7	01/01/2016	01:17:45	1	116,2	1,6	52,538	1,62
8	01/01/2016	01:32:45	1	116,1	1,6	52,501	1,627
9	01/01/2016	01:47:45	1	116	1,6	52,502	1,64
10	01/01/2016	02:02:45	1	116	1,7	52,503	1,656
11	01/01/2016	02:17:45	1	116,2	1,7	52,571	1,66
12	01/01/2016	02:32:45	1	116,1	1,7	52,557	1,658
13	01/01/2016	02:47:45	1	116	1,7	52,511	1,671
14	01/01/2016	03:02:45	1	116	1,7	52,534	1,688
15	01/01/2016	03:17:45	1	115,9	1,7	52,499	1,686
16	01/01/2016	03:32:45	1	115,9	1,7	52,477	1,696
17	01/01/2016	03:47:45	1	115,8	1,7	52,438	1,704
18	01/01/2016	04:02:45	1	115,8	1,7	52,466	1,725
19	01/01/2016	04:17:45	1	115,9	1,7	52,521	1,721
20	01/01/2016	04:32:45	1	115,7	1,7	52,462	1,74
21	01/01/2016	04:47:45	1	115,8	1,7	52,473	1,739
22	01/01/2016	05:02:45	1	115,6	1,8	52,41	1,754
23	01/01/2016	05:17:45	1	115,7	1,8	52,485	1,757
24	01/01/2016	05:32:45	1	115,6	1,8	52,455	1,782
25	01/01/2016	05:47:45	1	115,6	1,8	52,47	1,783
26	01/01/2016	06:02:45	1	115,6	1,8	52,458	1,785
27	01/01/2016	06:17:45	1	115,5	1,8	52,411	1,789
28	01/01/2016	06:32:45	1	115,2	1,8	52,317	1,81
29	01/01/2016	06:47:45	1	115,4	1,8	52,379	1,809
30	01/01/2016	07:02:45	1	115,5	1,8	52,442	1,824
31	01/01/2016	07:17:45	1	115,3	1,8	52,369	1,831
32	01/01/2016	07:32:45	1	115,3	1,8	52,363	1,847
33	01/01/2016	07:47:45	1	115,2	1,9	52,361	1,859
34	01/01/2016	08:02:45	1	115,3	1,9	52,415	1,87
35	01/01/2016	08:17:45	1	115,3	1,9	52,386	1,865
36	01/01/2016	08:32:45	1	115,2	1,9	52,383	1,887
37	01/01/2016	08:47:45	1	115,1	1,9	52,344	1,878
38	01/01/2016	09:02:45	1	115,1	1,9	52,339	1,901
39	01/01/2016	09:17:45	1	115,1	1,9	52,348	1,919
40	01/01/2016	09:32:45	1	115	1,9	52,348	1,933
41	01/01/2016	09:47:45	1	115,1	1,9	52,353	1,916
42	01/01/2016	10:02:45	1	114,9	1,9	52,285	1,935
43	01/01/2016	10:17:45	1	114,8	2	52,276	1,951
44	01/01/2016	10:32:45	1	114,7	2	52,246	1,958
45	01/01/2016	10:47:45	1	114,8	2	52,274	1,951

- Click on the icon  ,
- Select [Courbes] and Validate by clicking on [terminer].





Chapter 7
MAINTENANCE

7. MAINTENANCE

Maintenance operations are necessary to keep the device functioning correctly. They ensure that the measurements made are sound as well as prolonging the lifespan of the device.

The *T-UV- BCT* only requires minimum maintenance.

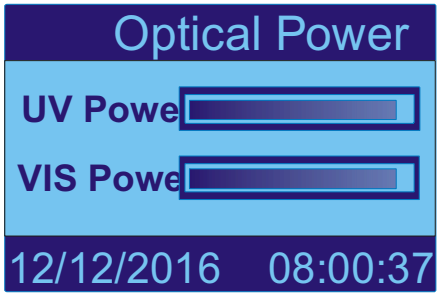
7.1. ROUTINE MAINTENANCE

Care of the measurement head

- Remove the probe from the liquid in which it is immersed
- Rinse the probe with clean water
- Clean the measurement windows with a fine brush
- Reposition the probe

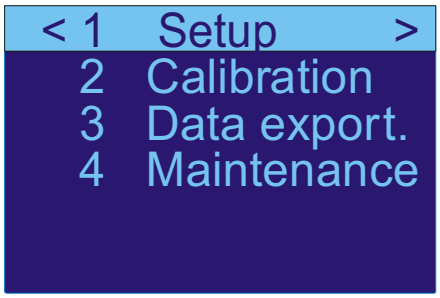
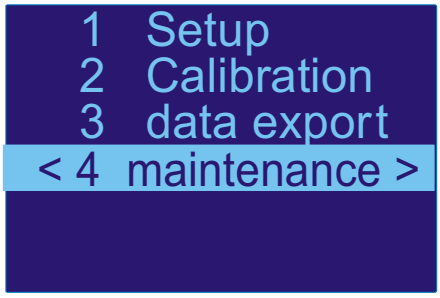
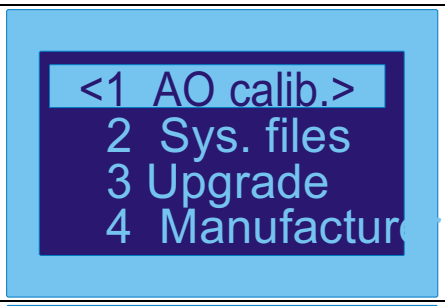
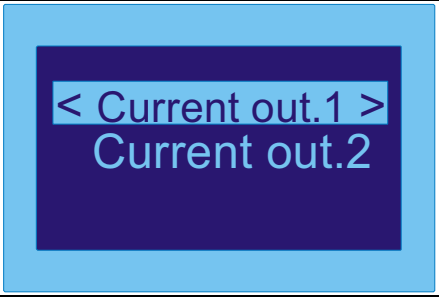
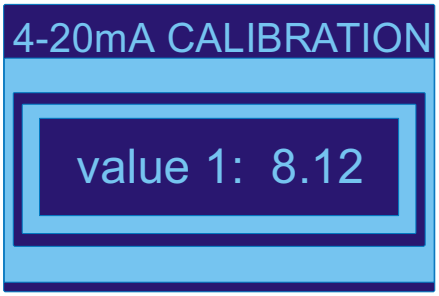
Condition of the UV LED and the Visible LED

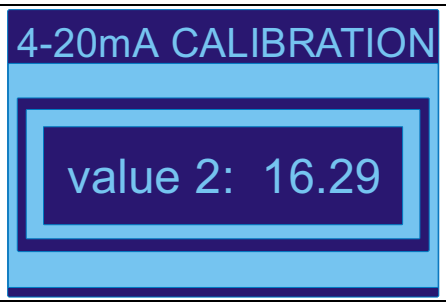
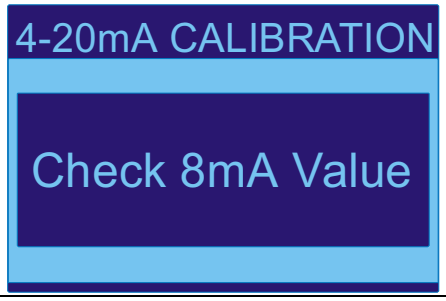
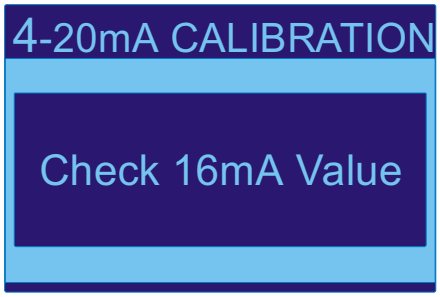
The luminosity levels of the LEDs should be verified every two months to ensure that they do not need replacing. To do this, access the STATUS pag of the measurement menu.



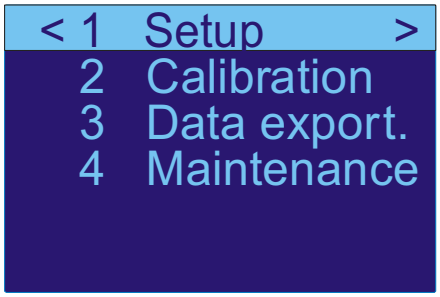
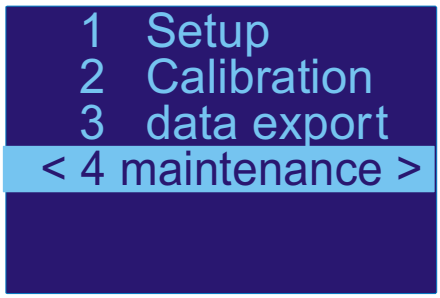
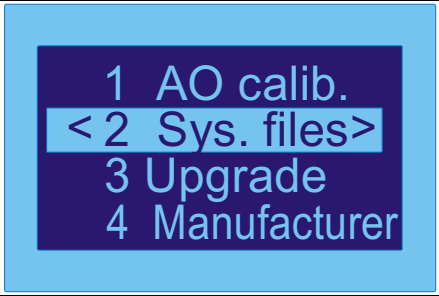
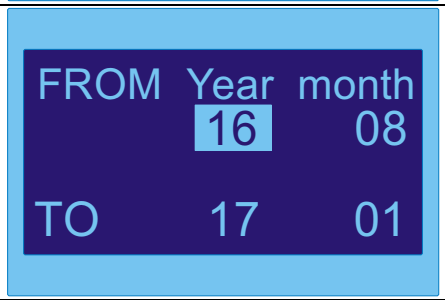
The "UV Power" level bar indicates the power of the UV LED.
The "VIS Power" level bar indicates the power of the VIS LED.

7.2. CURRENT OUTPUT CALIBRATION

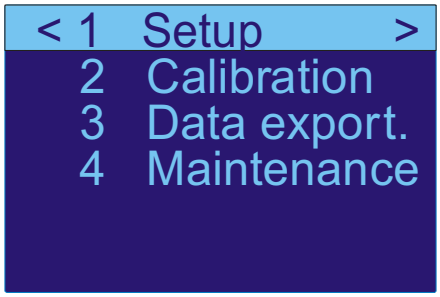
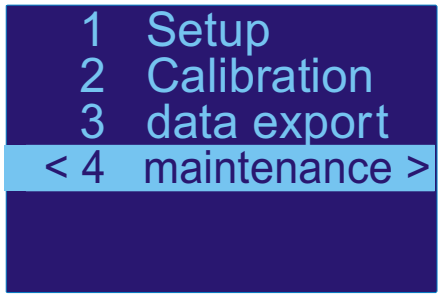
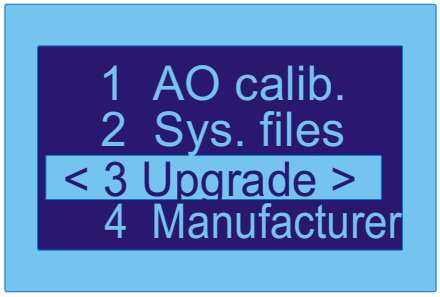
• Choose **SETUP** from the menu	
• Choose **MAINTENANCE**	
• Choose **AO CALIB.**	
• Choose the **CURRENT OUTPUT NO.**1 or **CURRENT OUTPUT NO.2.**	
Once the channel has been selected, the transmitter generates a first current value close to 8mA on the output. • Measure this current with an ammeter and enter the exact value into the dialogue box.	

The transmitter will then generate a second current of close to 16 mA on the output. • Measure this current with an ammeter and enter the exact value into the dialogue box to 2 decimal places	
Once the two values of the currents measured have been entered, the device calculates the calibration and asks for verification. • Verify the 8 mA value	
• Verify the 16 mA value - If the two points are correct, then the calibration is finished. - If there is too large a gap (> – 0.04mA) between the value measured and the value displayed by the transmitter, the calibration procedure must be repeated.	

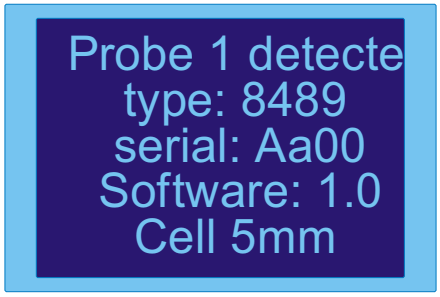
7.3. SYSTEM FILES

• Choose **SETUP** from the menu	
• Choose **MAINTENANCE**	
• Choisir **SYS. FILES.** Le menu SYS. FILES. menu is used to generate a file that will be used by TOSHCON in case of maintenance operation.	
• Enter the start and end date of the file	
• Insert the flash drive into the port situated on the left hand side of the transmitter, then validate with  .	

7.4. SOFTWARE UPGRADES

<table>
<tr><td>  </td><td></td></tr>
<tr><td>• Choose SETUP from the menu</td><td> 
</td></tr>
<tr><td>• Choose MAINTENANCE</td><td> 
</td></tr>
<tr><td></td><td> 
</td></tr>
<tr><td>Steps involved in an update:

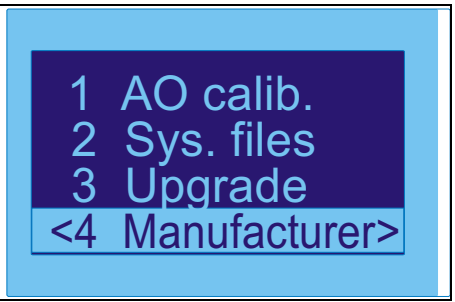
1. the system reinitializes
2. the transmitter searches for a USB flash drive containing the update file (during this phase, the alarm 1 signal light flashes at approximately twice a second).
3. if the flash drive is not present or if the update file is not found on the flash drive, the system restarts as usual with the same version of the software.
4. if the flash drive is detected and the update file is found, the update begins (during the update process, the alarm signal lights 1 and 2 flash alternately several times a second).
5. when the update is complete, the system restartswith the new version of the software.</td><td> 
</td></tr>
</table>

Note 1: When you start up the transmitter, you can find out which version of the software is being used. The version is shownat the bottom right of the start-up screen.

Note 2: When starting up, the transmitter also detects the presence of the measurement probe and indicates its characteristics.

7.5. MANUFACTURER

Function reserved to TOSHCON.	

Chapter 8
APPENDICES

8. APPENDICES

8.1. TECHNICAL SPECIFICATIONS

	Min	Typical	Max	Unit
Relay outputs				
Maximum current			8	Amp
Maximum voltage			250	Volt AC
24V or 5V inputs				
Voltage contact open (depending on jumper position J9/J10)		24/5	30/8	V
Current contact closed		13		mA
4-20mA Outputs				
Output current	4		20	mA
Output voltage			7	V
Load	0	250	350	ohms
ModBus Liaison				
Theoretical range at 9600bps on an adapted twisted pair		1000		metres
Line termination impedance (can be disactivated)	20	1	Ohms	
Line polarization impedance (can be disactivated)		470		Ohms
Housing				
Height		130		mm
Width		130		mm
Depth		100		mm
Weight		1kg		Kg
Protection IP66 (NEMA 4X)				
Probe				
Height		250		mm
Diameter		55		mm
Weight		5		Kg
Protection IP68 16 bars			10	bars
Measurement range				
Measurement range	0		2500	/m
Absorption resolution		0.1		/m
COD measurement range on solution KC8H5O4	0 g/l		1000	m
COD resolution on solution KC8H5O4		1.0		mg/l
Environment				
Ambient temperature	5	25	45	°C
Power supply				
Current	110		230	V AC
Voltage	50		60	Hz

Information pertaining to a probe T-UV-BCT equipped with software version 1.00. The characteristics of the equipment, as well as its documentation may be modified by the manufacturer without prior consultation.

8.2. MAINTENANCE SHEET

Intervention						
Maintenance date						
User name						
Serial number of the T-UV-BCT						
Verifications						
Transmitter condition		Good		Average		Problem
Probe linking cable condition		Good		Average		Problem
Cleanliness of probe head		Good		Average		Problem
Cleanliness of measurement cell		Good		Average		Problem
Cleaning module condition		Good		Poor		Problem
UV LED level		Good		Poor		Problem
VISIBLE LED Level		Good		Poor		Problem
Cleaning						
Probe head cleaning		Yes		No		
Long term disuse						
		Yes		No		
Notes						
		Yes		No		

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