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**User's Manual
CT200 - ECO**

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Caution



- Switch off and disconnect the main power and the battery power before intervention in the system.



- This analyser uses an acid solution in water for its cleaning system. The cleaning solution should never be handled without protective clothes, gloves, glasses.
Before any manual operation on the analyser, always purge the cleaning circuit with pure water to avoid any hazardous projection.



- The lamp produces ULTRAVIOLET radiation which can be harmful to the eyes. Lamp must not be viewed directly without suitable approved eye protection being used.

Cleaning solution



C - Corrosif



When handling this product, or when working on the parts in contact where this product is present, wear protective glasses and gloves.

If this product comes into contact with eyes or skin, wash immediately with water for 10 minutes and call a doctor.

Any soiled clothing should immediately be removed.
In case of ingestion, call a doctor.

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1 Introduction

1.1 Delivery checking

The CT200-ECO analyser was delivered with all equipment and accessories allowing its immediate start-up. Check that all the spares are present:

| <i>Constitutive spares of the analyser</i> | <i>Quantity</i> |
|--|-----------------|
| Analysis housing: | 1 |
| Measurement cabinet (painted steel) | |
| Sampling peristaltic pump (option) | |
| Mains cable | 1 |
| User's manual | 1 |
| PE tank for cleaning solution | 1 |

1.2 Storage recommendation

1.2.1 Introduction

The CT200-ECO analyser was delivered in a cardboard packing that insures its protection during shipment and storage. However some precaution should be taken when storing the analyser for a long time in order to grant the security of the analyser.

The following recommendations are only valid if the analyser is stored in its dedicated packing.

1.2.2 Moisture

The analyser in its packing should be stored in a room that presents no risk of flood.

The cardboard packing does not prevent the analyser from water.

1.2.3 Hydraulic circuit

The CT200-ECO analyser should be stored with no water nor cleaning solution inside in order to prevent optical parts from damage.

Remove the cleaning solution tank.

Rinse the pumping circuit of the cleaning solution :

- Put the cleaning solution feeding pipe in a jug containing distilled water
- Press CLEAN.
- After 15 seconds withdraw the pipe from water and let it empty completely.
- Press STOP.

Rinse the flow cell of the analyser with distilled water :

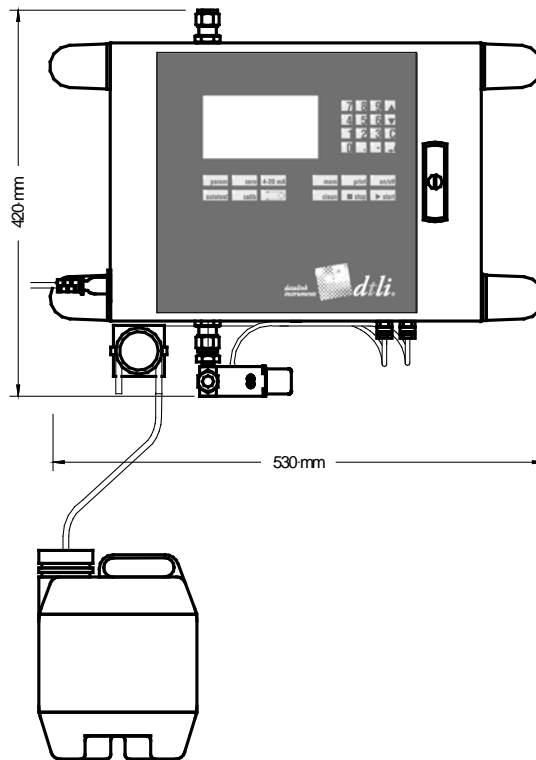
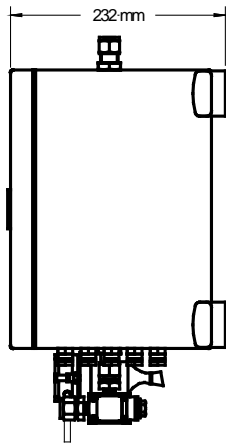
- If the analyser is not equipped with the optional sampling pump, install a water tank one metre upon the analyser's level. Put a silicon pipe in the jug and deflate the pipe in order to flow water in it. Connect the pipe to the analyser's input fitting.
- If the analyser is equipped with the optional sampling pump, put the sampling pipe in a jug containing distilled water.
- Press the PUMP key and select the #1 choice..
- After 30 seconds purge, withdraw the pipe from water and let it empty by pumping air for 30 seconds.
- Press STOP (if pump).

Open the sampling pump head (if installed).

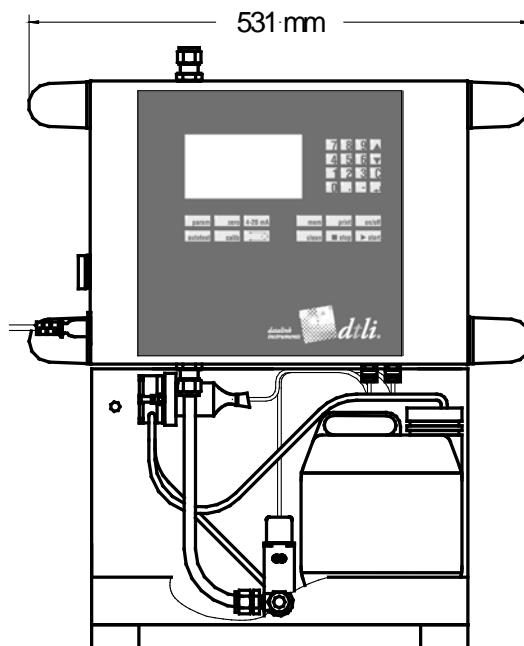
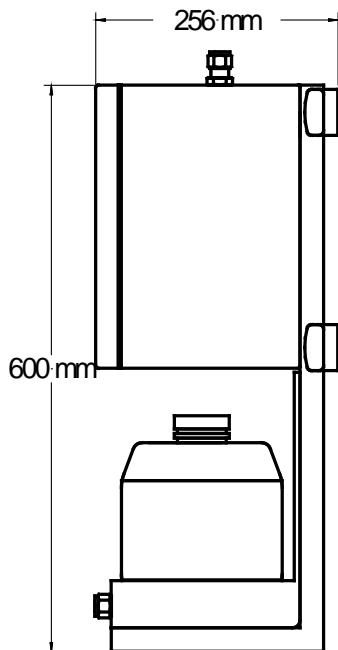
2 Analyser's presentation

2.1 Dimensions

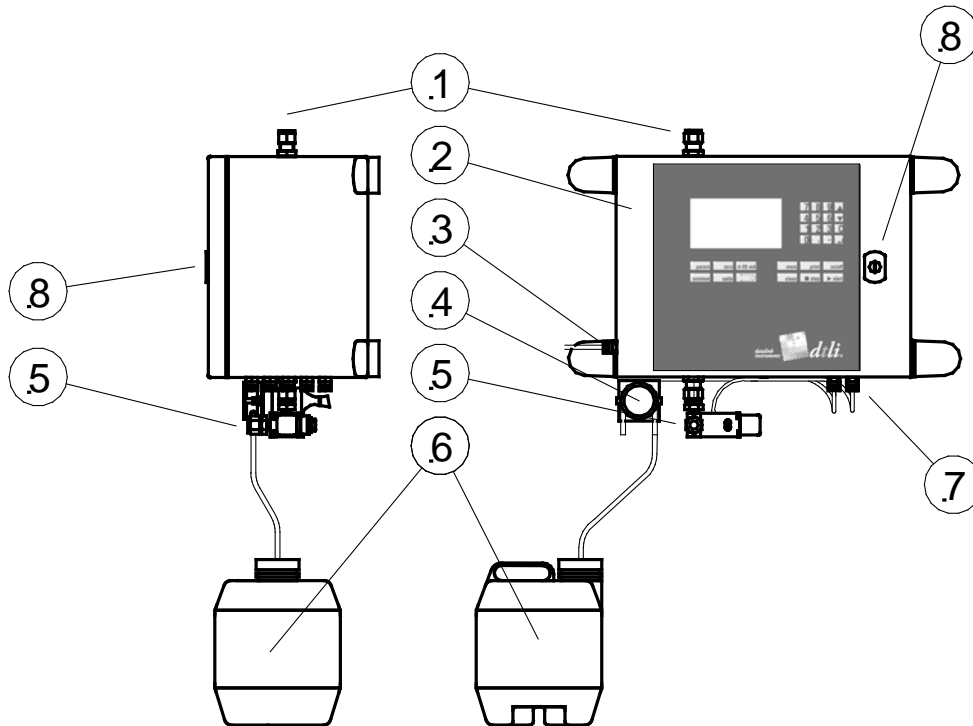
2.1.1 Without SS stands for demo



2.1.2 With SS stands



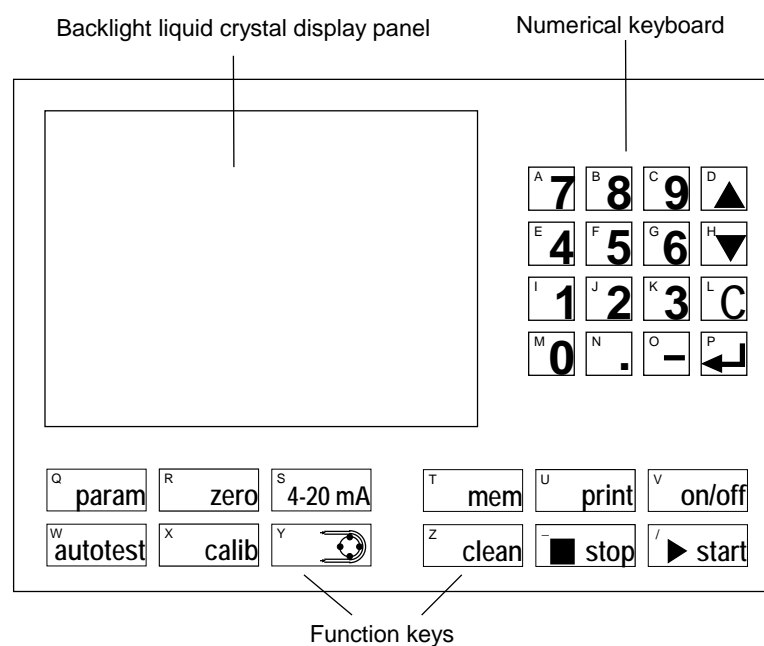
2.2 Description



- | | |
|-----------------------|---------------------------|
| 1. Water outlet | 5. EV for water inlet |
| 2. Electronic cabinet | 6. Cleaning solution tank |
| 3. Mains cable | 7. 4 – 20 mA glands |
| 4. Cleaning pump | 8. Locker |

2.3 Keyboard and display panel

2.3.1 Description



2.3.2 Backlight display panel

This screen displays different frames and information related to the operating mode of the analyser. **The contrast is automatically adjusted depending on ambient temperature.**

2.3.3 Function keys

By pressing any function key, the corresponding menu is activated. In this manual, one chapter is devoted to each menu.

2.3.4 Numerical keyboard

By pressing any numerical key, the corresponding number is entered. These keys are only active when numerical values are to be entered.

2.3.5 Alphabetical characters

Some keys have a letter in the upper left corner. These characters are only available when alphanumeric characters are to be entered.



To enter a numerical character or to type the D, H, L, P letters, keep the key pressed until the analyser beeps two times (about one second).

3 Start-up procedure

3.1 Analyser installation

3.1.1 Introduction

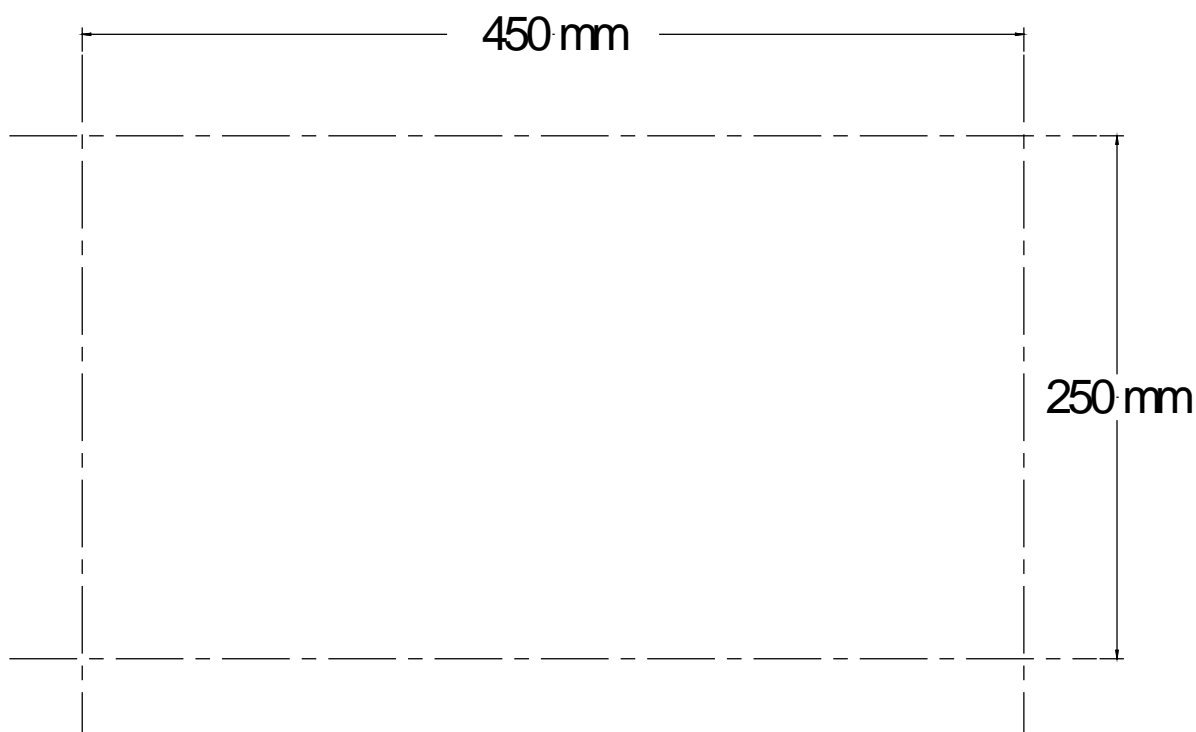
The analyser should be installed in a room or a shelter where ambient temperature is always higher than 0°C to prevent the system from freezing.

3.1.2 Drilling pattern

The analyser is equipped with brackets that allow a wall mounting. Drill four holes in the wall follow the pattern hereafter to hang the analyser.

Use 6 to 8 mm diameter screws for this purpose.

The analyser's weight is 15 kg, the wall and screws should be strong enough to stand this weight.



Cleaning solution installation

3.2 Cleaning solution installation

Cleaning solution



C - Corrosif



The cleaning solution contains up to 5% diluted **Sulphuric Acid**.

Before any manipulation, wear protective clothes, glasses and gloves.

In case of contact with skin, immediately wash during 10mn with clear water and call a doctor.

In case of contact with the eyes, immediately wash with clear water, call a doctor and continue to wash until the rescue arrival.

Prepare the cleaning solution:

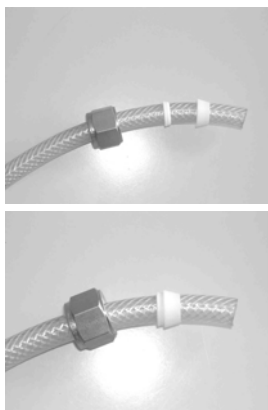
1. In a ventilated shelter, add 250 ml of pure sulphuric acid to 4.75 litres of distilled water. 98%.

WARNING! NEVER PUT WATER IN ACID. ALWAYS PUT ACID IN WATER. THE EXOTHERMAL REACTION COULD PRODUCE VERY DANGEROUS PROJECTIONS THAT MAY INDUCE SEVERE INJURY.

3.3 Sample input installation

3.3.1 Sample input installation if no sampling pump is present

The input connection fitting is a double ring one. It is dedicated for 12 mm outer diameter pipes. A silicone pipe could be connected to it by using an inner rigid adapter.



1. Place the fitting screw on the pipe.
2. Place the small ring on the pipe, the bigger diameter should be located towards the screw.
3. Place the big ring on the pipe as shown on the picture.
4. Plug the pipe in the fitting and tighten with the end until it is blocked. Finish with a 22 mm wrench by operating one round and a half.

3.3.2 Input pipe installation in the sampling pump (if equipped)

Warning! Only use silicone tubing for peristaltic pumps of 1.6 mm thickness (except specific applications)

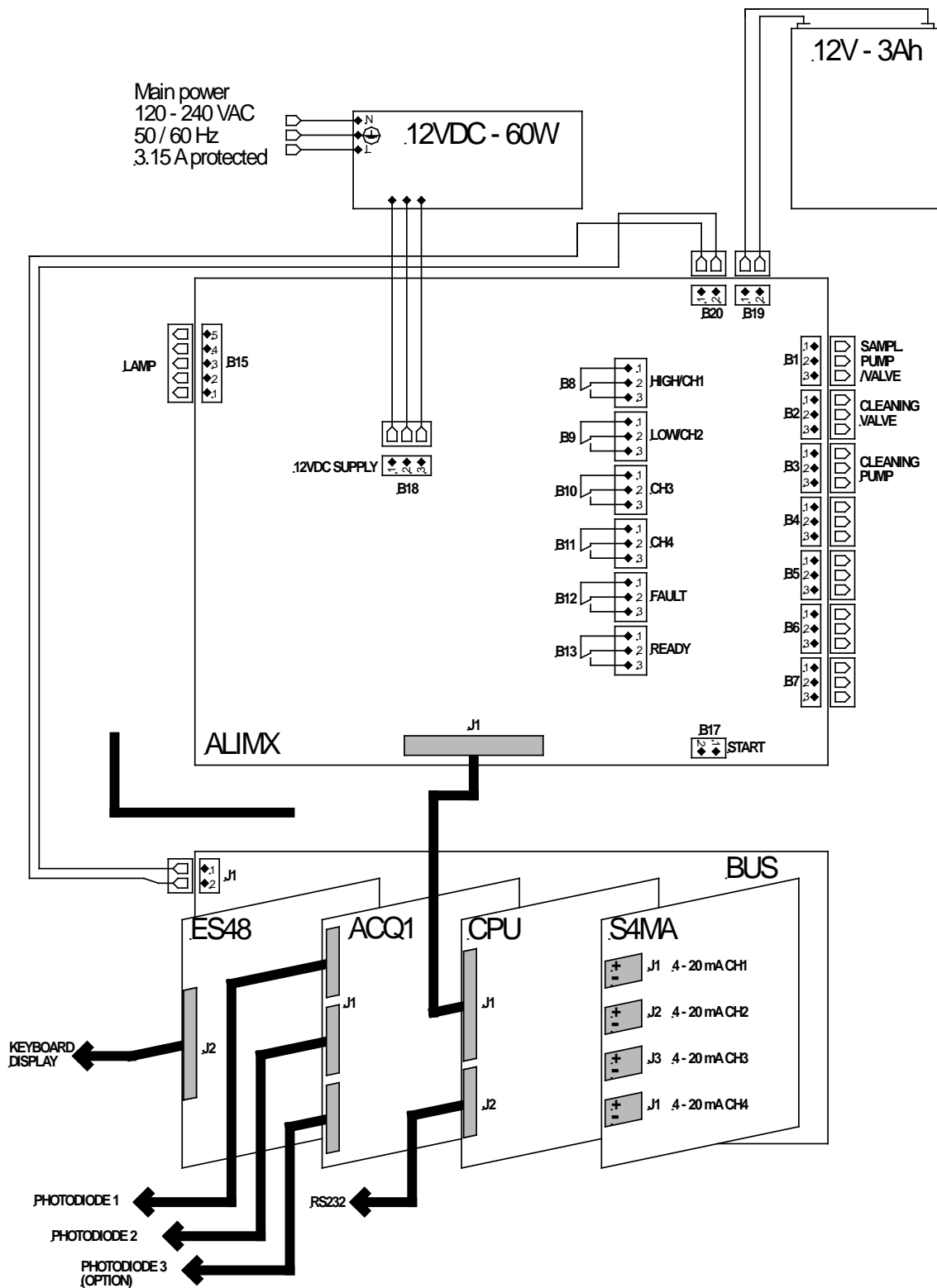


1. Open the sampling pump head.
2. Adjust the pipe pinches to the pipe diameter.
3. Insert the pipe in the pump head. The pumping flow is oriented from the front of the analyser to the rear.
3. Close the pump head and check that the pipe is correctly inserted in the pinches.

3.4 Sample output installation

Simply connect a silicone pipe to the output fitting.

3.5 Electric drawing of CT200-ECO



(*) As an option, a 12V DC-DC converter may be installed inside the analyser in place of the optional 12VDC battery.

3.6 Plugging the CT200-eco to mains

Break the main power supply down before any operation.

The mains voltage should be fixed within 120 to 240VAC 50/60Hz. It should meet the European standards.

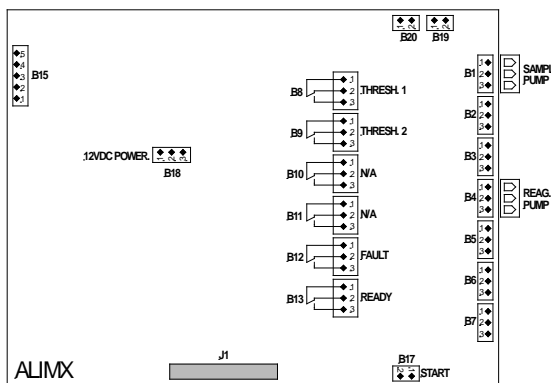
The earth connection is ensured by the mains plug. The mains supply should provide the earth security line.

The mains line should be protected by a 6A/30mA breaker.

3.7 Alarm relays wiring

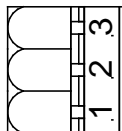
For the alarm relays wiring, only use shielded cable with a 1 mm² max section.

The CT200-ECO analyser has two threshold relays and one fault relay located on the power board. If the 2 streams multiplexing option is installed the threshold alarm relays are disabled.




- Location of the threshold relays.CH1 to CH4 on the power supply board.

The relays offer two operating modes: Normally open (NO) or normally closed (NC). The selection of the operating mode is made by the choice of the connection terminals as follows:



- NC mode: Terminals 2 et 3
- NO mode: Terminals 1 et 2
- Connect the cable shield to the housing of the analyser. The other extremity of the shield should not be connected to the earth.

The adjustment of threshold values is explained in the chapter **Parameters setting**.



Max breaking voltage : 48V (AC), 48V (DC)
 Max breaking current: 3A (AC), 3A (DC).
 Max breaking power : 150 VA

3.8 4 – 20 mA outputs wiring

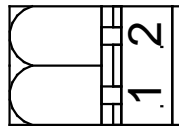
Four 4–20mA outputs are available on the S4MA board.

Each one is an isolated active output to be connected to a measurement loop whose the maximum impedance should be 500 ohm max. The maximum available voltage is 15V.

All of 4-20 mA outputs have a common connection on the hot point. The reading system should have a separated ground point for each channel.

Respect carefully the polarity of the connection.

Always use a shielded cable for the 4-20mA connection.



- Terminal (+) as 2
- Terminal (-) as 1

A milliamp-meter can be connected to the output for checking.

The 4-20mA output should be set to the correct values as explained in the Parameters setting chapter.

In case of fault, the output drops down to 0mA.

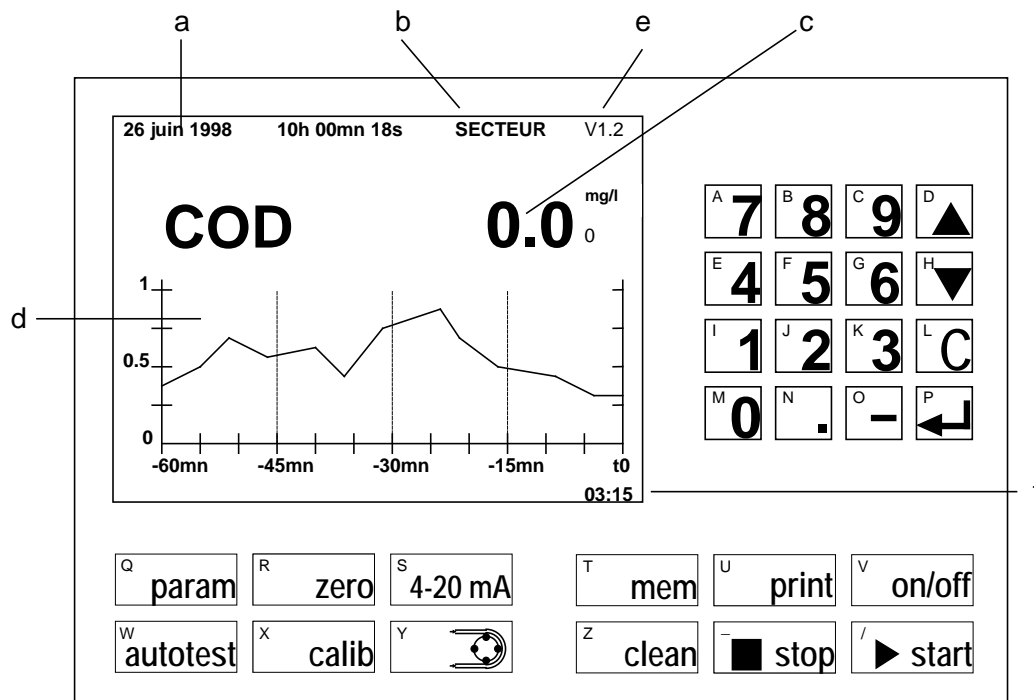


Max voltage : 15V

Max loop impedance: 500 Ohm.

4 Operation of CT200-ECO

4.1 Idle screen



The **Idle screen** appears as soon as the analyser is switched on. It remains displayed until a menu is activated by using any function key, or until an automatic measurement is started.

This screen displays:

- Current date and time.
- Analyser powering mode (MAINS or BATTERY).
- The value of the last measurements.
- A graph of the last measurements. Several time scales are available : the last hour, the current day, the current week, the current year.
- The software version.
- The time remaining before the next measurement.

4.2 Measurement

The measurement of the concentration of COD is activated either manually or automatically. In the automatic mode, the time interval between each measurement can be pre-set depending on the operator's requirements.

4.2.1 Automatic measurement mode




Parameter : Measurement period
Function : *Starts the measurement automatically according to the pre-set time period*


- ▶ To activate the automatic mode, define the required measurement time period in the parameter **MEASUREMENT TIME PERIOD** (see "**Parameter modification**"). Each automatic measurement result is memorized and displayed on the **Idle screen**
 A value of 0 means that no automatic measurement is performed.
 A value of -1 set the continuous measurement mode.

4.2.2 Manual measurement



Key: **Start**
Function: *Starts the manual measurement with.*

- ▶ Manual measurement procedure:
 1. Press the  key.
 2. Change the pumping time if necessary. For a sample located very close to the analyser, 10 seconds of pumping is sufficient.
 3. Validate the pumping time by pressing the  key or just press the  key if the proposed circulation time is correct.

 A manual measurement can be carried out between two automatic measurements. The time period of automatic measurements is independent of manual measurements.
 If an automatic measurement is to occur during a manual measurement, the automatic one is delayed until the manual cycle is completed.

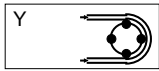
4.2.3 Measurement cycle description

The different steps of a measurement cycle are as follows:



1. **PUMPING or sample FLOW**. The duration of this step depends on the parameter setting.
2. **LAMP** activation
3. Concentration calculation and display.
4. The 4-20 mA output is updated.

4.3 Manual pumping of sample

The input valve (or sampling pump if installed) and the reagent pump may be manually operated at any time.




Key : Pumping
Function : Opens the pumping menu: Sample or Reagent.

- ▶ Sample pumping:
 1. Press .
 2. The sample is flown into the analyser.
- ▶ To stop the sample pumping press .

4.4 Manual measurement recording in the memory (not available in ECO version)

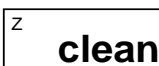


Key: Storing in memory
Function: Records the last measurement value in the memory



- ▶ Press the  key. The measured value, date and time of the end of the measurement are recorded in the memory.

4.5 Automatic cleaning

The cleaning cycle is automatically operated by the analyser depending on the pre-set cleaning period. A manual command of the cleaning cycle is possible at any time y operating as follows.



Key: Cleaning cycle
Function: Starts a cleaning cycle.

- ▶ Press .
- ▶ To abort a cleaning cycle, press .


To change the cleaning frequency, see the **Parameter modification** chapter that describes how to modify the cleaning period.

4.6 Autotest



Key: Autotest
Function: Starts the self-test menu.


THIS MENU CAN ACTIVATE ANY PERIPHERIC OF THE ANALYSER WITHOUT ANY SECURITY. ALWAYS REMOVE CLEANING SOLUTION AND WTARE FROM THE SYSTEM BEFORE ENTERING THIS MENU.

- ▶ To start the autotest:
 1. Press the  key. The first screen of the autotest sequence appears.
 2. Follow the instructions displayed on the screen. The first sequence of the autotest runs, then the second screen appears.

3. Follow the instructions on the screen until you reach the end of the tests.

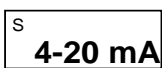
The tested parts are:

- the xenon lamp
- the 12 Volts output for the peristaltic pumps and electric valves
- the relays (high and low thresholds, multiplexing, fault, ready)
- the temperature probes
- the remote command

► To abort the autotest at any moment, press the  **stop** key

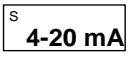
4.7 4-20mA loop display

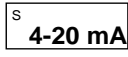
4.7.1 Current value display

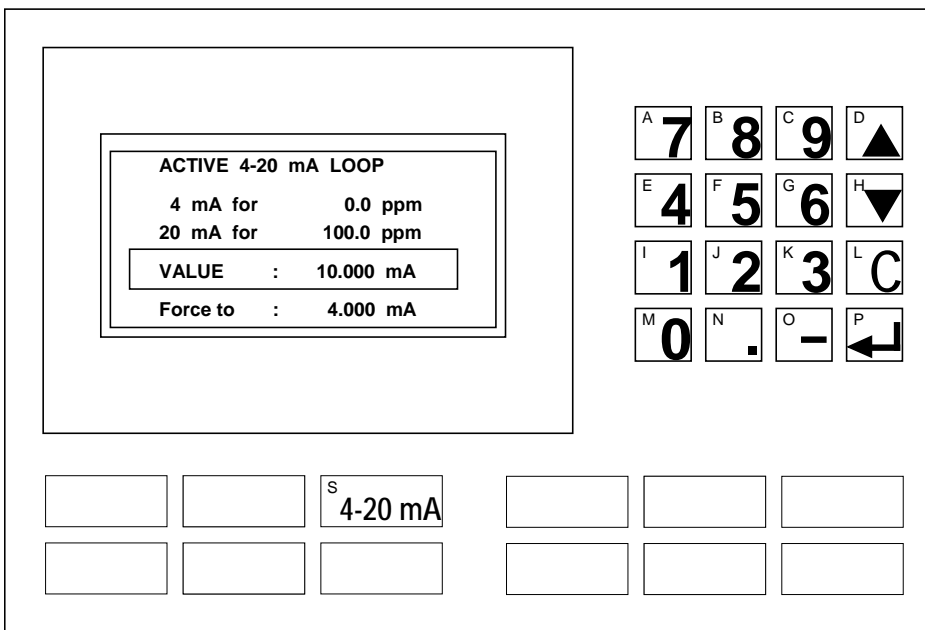


Key: 4-20 mA
Function: Displays the *current loop screen*.

► To display the **current loop screen**:

1. Press the  key
2. Select the 4-20 output to be displayed.

► To return to the **idle screen**, press the  key again.




From the top to the bottom the **Current loop screen** displays:

- A reminder of the kind of current loop (active) generated by the analyser.
- The concentration values corresponding to 4 mA and 20 mA of the current loop output.

- The current value of the current loop output representing the last measurement performed.
- The instruction **Force to** allows the operator to test the output value by assigning a defined value to the loop (see next paragraph).

4.7.2 4-20mA loop testing

- ▶ To assign a precise value to a current loop output:
 1. Enter the desired value by using the numerical key board.
 Minimum value: 0
 Maximum value: 20
 2. Validate the value entered by pressing the  key.

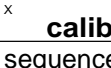


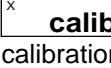
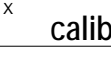

The current loop output will automatically return to its previous value when you exit the **current loop screen**.

4.8 Calibration



| | |
|-----------------|---|
| Key | : Calibration |
| Function | : <i>Starts the calibration sequence of the analyser.</i> |

Prior to calibrate the analyser, check the zero with distilled water. If not correct, adjust the zero.

- ▶ To start the calibration sequence:
 1. Press the  key. After the password is entered, the first screen of the calibration sequence appears.
 2. Press the  key. A new screen appears.
 3. Select the channel to calibrate
 4. Enter the standard solution value and then press the  key. A measurement cycle starts (see **Measurement**).
 5. At the end of the measurement cycle, the measured value of the standard solution is displayed below the theoretical value entered earlier. The percentage variation is also displayed.
 6. Press the  key to validate the calibration. The screen indicating the end of the calibration appears.
 7. Press the  key. The **idle screen** appears.
- ▶ To abort the calibration at any moment, press the  key.

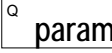
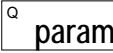









Avoid using too low concentration standard solutions when calibrating the analyser. Measurement fluctuations may induce calibration errors.

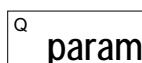
5 CT200-ECO parameters setting

The parameters modification can be carried out using the **keyboard**.

► To modify a parameter:

1. Press the  key. After the password has been entered the first parameter appears. If the parameter you want to modify is not on this page, press the  key again. The next screens will appear. A maximum of three parameters screens are available.
2. Press the  or   keys as many times as necessary to position the cursor on the line of the parameter you want to modify.
3. Enter the parameter's new value.
4. Validate the value entered by pressing the  or   keys.
5. To return to the **idle screen**, press the  key.

5.1 Parameters modification keys



Key : Parameter
Function : Displays the parameters modification screen.
 Press this key once to display the first parameter screen.
 Press this key a second time to display the second parameter screen.
 Press this key a third time to return to the idle screen.



Key : Numerical/alphabetical
Function : Enters a numerical or alphabetical character.
 To go from numerical to alphabetical input, press the key three times. Depending on the parameter you are about to modify, priority is given either to alphabetical or to numerical input.



Key : Decimal point
Function : Enters the decimal point.



Key : Validation
Function : Validates the value entered and positions the cursor on the following parameter. At the end of the first screen, this key displays the next screen. At the end of the second screen, this key calls the **idle screen**.



Key : Minus
Function : Assigns a minus sign to the displayed value.



Key : Correction
Function : Deletes the character indicated by the cursor.

5.2 Parameters description

5.2.1 Main parameters

| PARAMETRES | |
|-------------------------|-------------------|
| CIRCULATION TIME | : 10 seconds |
| MEASUREMENT PERIOD | : 15 minutes |
| NEST MEAS.. | : 20/02/13 11 :18 |
| CLEANING PERIOD | : 24 hours |
| NEXT CLEAN. | : 21/02/13 01 :18 |
| STANDBY (YES=1/NO=0) | : 0 |
| AUTO-ZERO (OUI=1/NON=0) | : 0 |
| PURGE (YES=1/NO=0) | : 0 |
| PURGE TIME | : 0 seconds |
| CONTINUE | PARAM |
| STOP | STOP |

5.2.1.1 Circulation time (if no multiplexing option)

Time during which the water sample is pumped before a measurement is made. This value should be defined depending on the length of the sample feeding pipe.

Value: 5 to 900 seconds.

- ▶ To define your pumping time:
 1. Purge the circuit.
 2. Manually pump the sample (see "**Manual pumping**").
 3. Measure the time taken by the liquid to reach the analyser.
 4. Enter this value as the **PUMPING TIME** parameter after having increased this value by a safety margin of 30%.



If the pumping time is too short, the measurement is distorted because of incomplete purging of the previous sample.

5.2.1.2 Measurement period

Interval time between two automatic measurements.

Value : 1 to 720 minutes (12 hours). If 0, no automatic measurement will be performed. If -1 the measurement is continuous (This leads to a higher reagent consumption).

5.2.1.3 Next measurement

Date and time of the next automatic measurement cycle to be operated. The following ones will take place according the measurement period set.

5.2.1.4 Cleaning period

Time interval between two automatic cleaning cycles.

Value: -1 to 24. If 0, no cleaning cycle will be performed. Between 1 and 24, the parameter indicates the time between two cleaning cycles. The value -1 will produce a cleaning cycle after each measurement cycle (to be used in the case of very dirty water).

This parameter is only valid when the automatic cleaning option is present.

5.2.1.5 Next cleaning cycle

Date and time of the next automatic cleaning cycle to be operated. The following ones will take place according the cleaning period set.

5.2.1.6 Standby

If the STAND-BY parameter is activated, the analyser will go down to the stand-by mode in the case of a mains breakdown.


If 1 : The analyser will shut down.

SI 0 : The analyser will stay ON.

5.2.1.7 Auto zero

Operates a zero adjustment of the analyser after a cleaning cycle. This is done using the cleaning solution as a zero solution.

Value: 0, 1. If 0, no auto zero will be performed.



If an auto-zero is pre-set, the cleaning solution should be free of any trace of organic compounds that would produce wrong result.
Moreover, the cleaning solution tank must be kept full.

5.2.1.8 Purge

Declares the presence of an optional purge pump.

If installed, this pump is activated after each measurement or cleaning cycle in order to empty the flow cell.

If 1 : Pump enabled.

If 0 : Pump disabled.

5.2.1.9 Purge time

Purge duration in seconds.

5.2.2 Clock parameters

| PARAMETERS | |
|----------------------------------|--------------|
| STATION | : GRENOBLE |
| PASSWORD | : 0 |
| CLOCK DAY | : 1 |
| CLOCK MONTH | : 1 |
| CLOCK YEAR | : 5 |
| CLOCK HOUR | : 12 |
| CLOCK MINUTE | : 0 |
| CLOCK SECOND | : 0 |
| RS232 SPEED | : 9600 BAUDS |
| RS232 : MICRO=0/MINIT=1/MODBUS=2 | : 0 |
| RS232 : SLAVE NUMBER | : 1 |
| LANGUAGE FRENCH (1) ENGLISH (2) | : 2 |

5.2.2.1 Station

A text of a maximum of 20 alphanumeric characters may be entered in this parameter to identify the site.

Alphabetical keys are activated by default. To enter a number or for using the D, H, L, P letters, keep the corresponding numerical key pressed until you hear second beep tone (about 1 second).

5.2.2.2 Password

Defines the numerical password which will limit access to parameters (maximum of 4 characters).

5.2.2.3 Clock

Six lines allow the real time clock of the analyser to be set.


Leap years are automatically taken into account.

5.2.2.4 RS232 baud rate (not available on ECO version)

Communication speed of the RS232 port.

Values : 75, 150, 300, 600, 1200, 2400, 4800, 9600, 19200 baud

You must choose one of these values. If you do not, the analyser would retain its former value.



Recommended value for a personal computer : 9600 bauds.

5.2.2.5 RS232 (not available on ECO version)

Communication mode with the analyser.

Values :

0 when communicating with a personal computer

1 when communicating with a Minitel (In France only)

2 when communicating using the MODBUS mode.

5.2.2.6 RS232 MODBUS slave number (not available on ECO version)

Slave number assigned to the analyser when used in the MODBUS mode. This value must be set between 1 and 255.

5.2.2.7 Languages

Choice of language for screen display.

1: French

2: English

5.2.3 Parameters dedicated to measured species

```

CHANNEL SELECTION

      1      : COD
      2      : SIGNAL
      1      :
      2      :

CHANNEL      : 1
    
```

| PARAMETRES CH1 | | |
|-----------------------|---|-------|
| HIGH ALARM 1 | : 100 mg/l | |
| HIGH ALARM 2 | : 200 mg/l | |
| VALUE FOR 20 mA | : 300 mg/l | |
| VALUE FOR 4 mA | : 0 mg/l | |
| UNIT (NH4=0 / N=1) | : 0 | |
| AVERAGING (WITHOUT=1) | : 1 meas. | |
| CONTINUE | <table border="1"><tr><td>PARAM</td></tr></table> | PARAM |
| PARAM | | |
| STOP | <table border="1"><tr><td>STOP</td></tr></table> | STOP |
| STOP | | |

5.2.3.1 HIGH ALARM 1 / 2

Measurement alarm thresholds.

Any crossing of high thresholds would produce:

- Alarm 1 or 2 contact activation.
- Message written in the record of events.
- Phone call if the analyser is equipped with a modem board or with a remote modem set.

5.2.3.2 Value for 20mA

Value of concentration corresponding to the maximum value of the current loop (20 mA).

Value: 0.1 to 10,000

5.2.3.3 Value for 4 mA

Value of concentration corresponding to the minimum value of the current loop (4 mA).

Value: 1 to 10,000

5.2.3.4 Unit

Changes the measurement result UV ABS unit (0) or correlated COD (1).

5.2.3.5 Averaging

Number of measurements used to calculate an average. This average is calculated on the last 1 to 5 measurements according to the number set. This enhances the resolution of the analyser by suppressing the measurement noise. The 4 - 20 mA output is proportional to this averaged value.



Those parameters may be modified the same way on channels (CH2 to CH4) if they have been activated.

6 Zero adjustment



Always use distilled water for zero checking..

6.1 Zero Checking

- ▶ To check zero:
 1. Prepare 1 litre of distilled water.
 2. Operate a manual measurement on distilled water (see **Manual Measurement**).

If the result is within +/-0.2% of the full scale (typical with clean flow cell) the zero is OK.

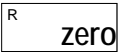


Zero fluctuations are typically within +/-5 mg/l of COD.

6.2 Zero adjustment

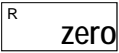
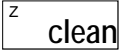
The zero adjustment can be made using three different ways depending on the analyser's equipment.

- **With sampling pump**
- **With cleaning solution pump**
- **On cleaning solution itself**

▶ Zero with sampling pump:

1. Put the inlet pipe in distilled water.
2. Press  zero.
3. Press .
4. Enter the pumping time (20 to 30 sec).
5. Validate .

▶ Zero with cleaning pump:

1. Put the deep tube of cleaning solution tank in distilled water.
2. Press  zero.
3. Press  clean.

▶ Zero on cleaning solution itself

1. Declare an automatic zero in the parameter setting menu (see **Parameter setting**).
2. Make you sure that cleaning solution contains no nitrates nor organic compounds.
3. Start a cleaning cycle (see **Cleaning system**).

7 Calibration procedure

7.1 Calibration checking

Prepare 60 mg/l hydrogen phthalate (C₈H₅KO₄) solution in water.

- ▶ To prepare the solution:
 1. Weigh 60 mg of C₈H₅KO₄.
 2. Dilute it in one litre of distilled water (18 to 20 °C). The solution is ready.
- ▶ To verify the calibration of the analyser:
 1. Check the zero of the analyser on distilled water.
 2. Measure the standard solution (see **Manual measurement**).

The measurement result of UV absorbance must be 45.3+/- 1 ABS/m units. If not, see the calibration chapter.

7.2 Calibration adjustment

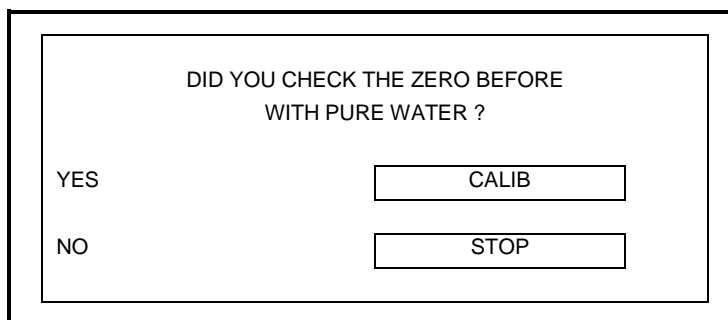
7.2.1 Calibration menu



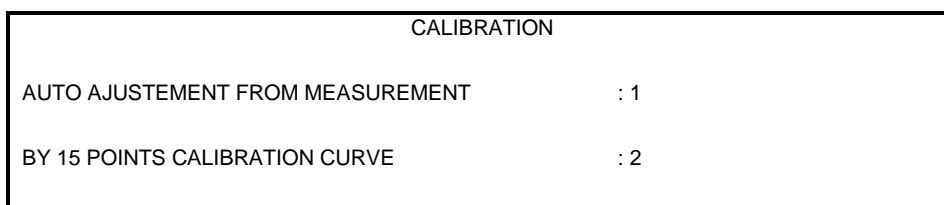
Key : Calibration
Function : Opens the calibration menu.

Prior to calibration adjustment, always check the zero on distilled water. If not correct proceed to a zero adjustment.

- ▶ To open calibration menu:
 1. Press . After entering the password, a warning screen appears



2. Press , the calibration menu appears



7.2.2 Span calibration using auto adjustment from measurement



Key : Auto-adjustment from measurement
Function : Selects the one point calibration menu.

Prepare a standard solution of known concentration.
Run the one point calibration menu.

► To operate the One point calibration menu using a reference solution:

1. The last calibration value is displayed on the screen.

| | |
|---------------------------------------|--------------------------------------|
| LAST CALIBRATION 10/02/13 10h 30mn | |
| CORRECTION : 0.5 % | |
| CONTINUE | <input type="button" value="CALIB"/> |
| QUIT | <input type="button" value="STOP"/> |

2. Press **calib.**

| |
|-------------------------|
| REFERENCE VALUE : 100.0 |
|-------------------------|

3. Enter the standard solution concentration, then validate.

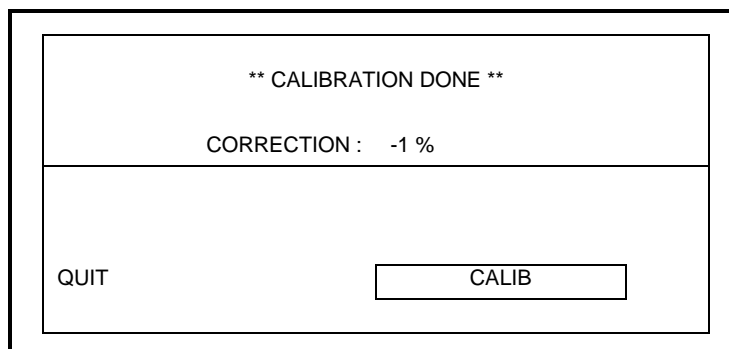
4. Choose the way of circulation. START for measurement on-line, CLEAN for circulation using the cleaning circuit..


| | |
|---------------------------|--------------------------------------|
| CIRCULATION TIME : 10 sec | |
| ON-LINE | <input type="button" value="START"/> |
| SAMPLE | <input type="button" value="CLEAN"/> |

5. At the end of the measurement, the value is displayed below the theoretical concentration. The ratio between the two values is calculated in percentage.

| | |
|---|--------------------------------------|
| REFERENCE : 100.0 MEASUREMENT : 99.1 | |
| SHIFT : -1 % | |
| CALIBRATE | <input type="button" value="CALIB"/> |
| QUIT | <input type="button" value="STOP"/> |

5. Press  **calib** to accept the calibration correction.



6. Press  **calib**. To exit the calibration menu.

► To abort the calibration menu at any time, press  **stop**.



The difference between the standard value and the measured value should not exceed $\pm 30\%$. If not, see **Maintenance**.



Do not calibrate using too low concentration standard solutions. This could produce excessive inaccuracy.

7.2.3 Calibration adjustment using lab measurement.

- To calibrate on the basis of a laboratory measurement
1. Take one liter of process water.
 2. Operate the calibration menu as described in 7.2.1. Using the lab measurement value as standard concentration.
 3. Perform a calibration checking using the standard solution. The result should be within $\pm 10\%$.

7.2.4 Calibration using 15 points correlation curve

2

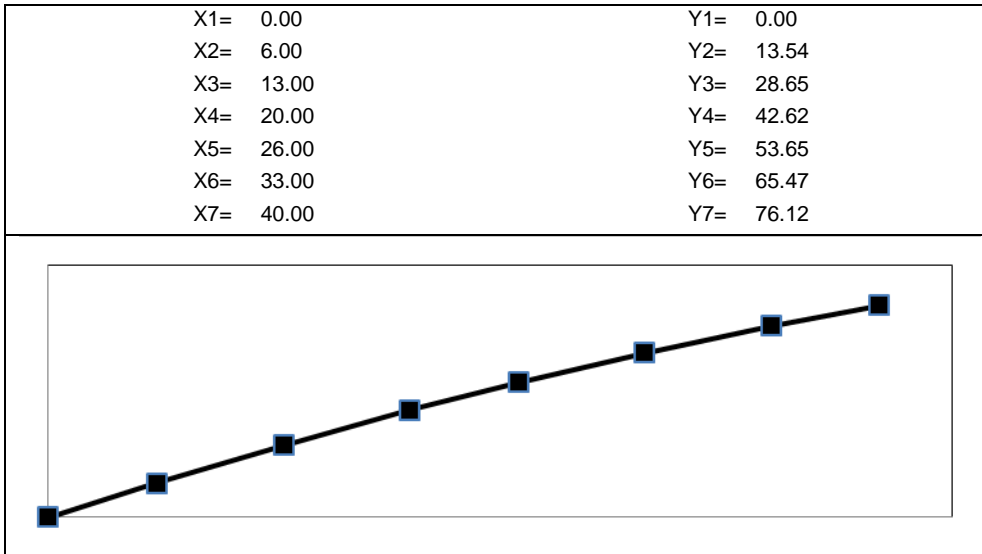
Key : **15 points correlation curve**
Function: *opens the 15 points calibration curve menu.*

This menu is available if the COD unit or any other correlated unit only has been set in the parameter menu.

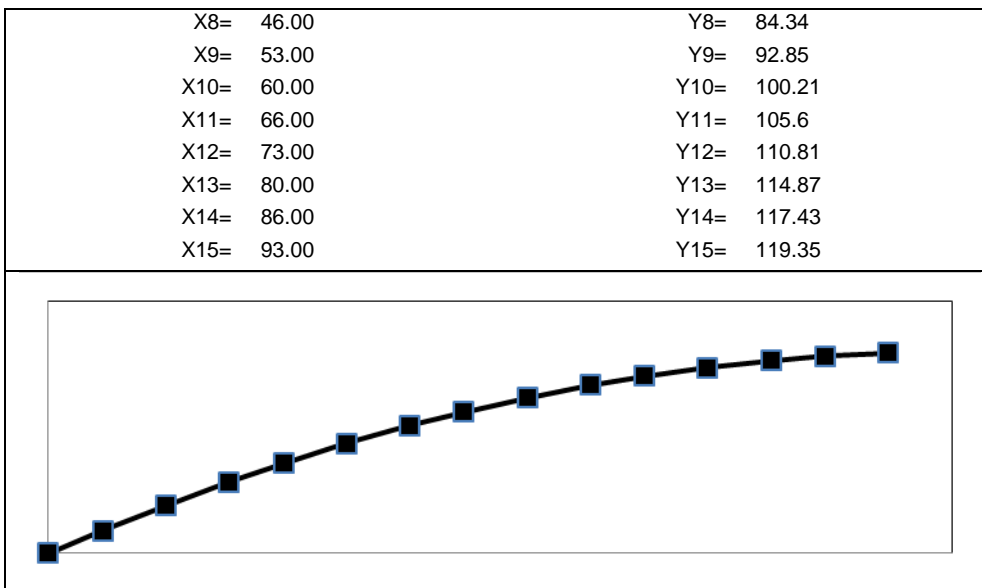
15 standard solutions (or less) are necessary to build-up the correlation curve. The concentration values should be within the range of the analyser.

To establish the standard values, measure each standard in the UV range with the CT200 and operate a lab measurement on these standards. One obtain for each standard a reference value and a UV absorbance value.

In the first screen of the menu enter the 7 first points in ascending order. The Y_i values are the UV absorbance values and the X_i values are the reference values.



By pressing x **calib** the 8 following points are available.



8 Maintenance

8.1 Recommendations for the maintenance operations

8.1.1 Monthly control

8.1.1.1 Description

Any measurement system or automatic on-line analysis must be checked out regularly without a corrective operation is necessarily carried out.

The CT200-ECO analyser is equipped with a system of self-monitoring making it possible to alert a teleprocessing centre by the activation of a default relay. This relay will act if the physical and electronic conditions of realization of a correct measurement are not met.

The automatism discharges the operators from the repetitive operations, but a human control remains however essential.

It breaks up as follows:

- Visual checking of the water pipes state (clogging) and glass stripping chamber
- Visual checking of the flow cell. Any trace of coloration should be removed and cleaned.
- Starting a manual cleaning cycle
- Visual checking of the possible presence of traces of condensation in the protective quartz tube. If present, call service.
- Refilling the tank of cleaning solution.
- Replacement of the section of the water pipe which is in the jaws of the peristaltic pump.
- Zero checking and correction if necessary.

8.1.1.2 Periodicity

1 time per month.

8.1.1.3 Duration

Less than 15 minutes.

8.1.1.4 Intervening

Local operator.

8.1.2 Calibration control

8.1.2.1 Description

This operation is added to the intervention of current control. It consists in taking a manual measurement on a sample of known value or a standard solution of known COD in water. In the event of variation higher than the accepted limit, it is necessary to correct the calibration of the analyser by using the sample known as standard. This last operation is not very probable concerning the CT200-ECO, which by design only presents very weak drift of sensitivity.

8.1.2.2 Periodicity

1 time every 6 to 12 months.

8.1.2.3 Duration

Less than 15 minutes.

8.1.2.4 Intervening

Local operator.

8.1.3 Preventive annual maintenance

8.1.3.1 Description

This operation is optional but strongly recommended. If controls described above are regularly carried out, the performances of analysis of the instrument will be maintained.

From our experience, we notice that the instruments which are subjected to this annual intervention have a greater reliability as the electronic and optical parameters are then readjusted with their initial values. Moreover breakdowns can be prevented (acid pump default for example).

A detailed attention is given to the pumps and pipes during this intervention.

8.1.3.2 Periodicity (optional)

1 time per year, after the period of two years warantee.

8.2 Operational limits

8.2.1 Electromagnetic compliance

The design of the CT200-ECO analyser was tested in bench of test taking into consideration its immunity in industrial circle. The current standards concerning electromagnetic compatibility are respected. The connection of the relays and 4 - 20 mA must be done with armoured wire, whose shielding must be necessarily connected to the carcass of the analyser or automat.

8.2.2 Temperature

The CT200-ECO analyser is designed to work on liquid water whose temperature must necessarily be between 1 and 60°C. Apart from this range of temperature, measurements will be less reliable.

Freezing in the piping of evacuation can lead to a water exhaust clogging situation. A risk of water excess in the analyser is to be feared under such conditions. It is important to channel water of evacuation so that it does not remain in piping.

8.3 Optical bench cleaning

If no preventive maintenance is operated we strongly recommend that the optical bench should be cleaned at least once a year.

Switch the power off to avoid any UV insolation during operation.

Remove the optical bench

Using a wipe and alcohol, clean up the quartz bulb of the UV lamp.

Put the bench back in place and adjust the zero.

8.4 Operation failures

| Faults | Main causes | Solutions |
|--|--|--|
| The screen remains black (no display, no back light) after the ON/OFF key has been pressed. | <ul style="list-style-type: none"> ■ Flat battery and/or electrical main power disconnected. ■ Power fuse has blown. | <ul style="list-style-type: none"> ■ Check with a voltmeter the presence of 12 V voltage at the output of the battery. If the voltage is lower, the battery should be charged by connecting the analyser to the mains. ■ If the main power supply is connected the red LED on the main supply board must be illuminated. If not, check the fuse. ■ Check the display panel cable. |
| The back light is present but no message is displayed. | <ul style="list-style-type: none"> ■ The central unit board CPU2 or the display board does not work correctly. | <ul style="list-style-type: none"> ■ Check that boards are correctly plugged. ■ Check that EPROM memories are correctly connected on the CPU2. |
| No sample flow after the START key has been pressed. | <ul style="list-style-type: none"> ■ The silicone pipe is stuck to the pump. ■ The silicone pipe is blocked. ■ The pump is disconnected or the pump command circuit has failed. | <ul style="list-style-type: none"> ■ Check the silicone pipe. ■ Check the pump connection on the power board. |
| Measurement result too low. | <ul style="list-style-type: none"> ■ Bad calibration. ■ Insufficient sample quantity ■ Bad zero. | <ul style="list-style-type: none"> ■ Check the last calibration by pressing the CALIB. key. The deviation from the original calibration must not exceed $\pm 10\%$. ■ Increase the pumping time to reduce the memory effect of the previous sample. ■ Check the zero value on a zero solution. If negative, adjust the zero by performing a zero cycle on a zero solution. |
| Measurement result too high. | <ul style="list-style-type: none"> ■ Bad calibration. ■ Insufficient sample quantity ■ Bad zero. | <ul style="list-style-type: none"> ■ Check the last calibration by pressing the CALIB. key. The deviation from the initial calibration should not exceed $\pm 10\%$. ■ Increase the pumping time to reduce the memory effect of the previous sample. ■ Check the zero value on a zero solution. If positive, adjust the zero by performing a zero cycle on a zero solution. |

| Faults | Main causes | Interventions |
|--|---|---|
| Zero deviation when compared with distilled water. | <ul style="list-style-type: none"> ■ Wrong zero. | <ul style="list-style-type: none"> ■ Clean the flow cell then perform a new zero. ■ Check the absence of organic matter in the cleaning solution. |
| The lamp does not produce flash. | <ul style="list-style-type: none"> ■ Bad connection. ■ Power board fault. | <ul style="list-style-type: none"> ■ Check the cable terminals of the lamp. ■ Check connections on the power board. |
| Error 1 | <ul style="list-style-type: none"> ■ Acquirement board fault. | <ul style="list-style-type: none"> ■ Check that the boards are correctly plugged. |
| Error 2 | <ul style="list-style-type: none"> ■ Detector 1 overflow. | <ul style="list-style-type: none"> ■ Check electrical connection of the detector. |
| Error 3 | <ul style="list-style-type: none"> ■ Detector 2 overflow. | <ul style="list-style-type: none"> ■ Check electrical connection of the detector. |
| Error 4 | <ul style="list-style-type: none"> ■ Detector 3 overflow. | <ul style="list-style-type: none"> ■ Check electrical connection of the detector. |
| Error 5 | <ul style="list-style-type: none"> ■ Signal too weak on detector 1. | <ul style="list-style-type: none"> ■ The COD or UV abs of water is out of range. ■ The turbidity is too high. ■ The flow cell is dirty. Start a cleaning cycle. ■ Something obstructs the optical path. ■ Check electrical connection of the detector. ■ Electronic failure, contact field service. |
| Error 6 | <ul style="list-style-type: none"> ■ Signal too weak on detector 2. | <ul style="list-style-type: none"> ■ The turbidity is too high. ■ The flow cell is dirty. Start a cleaning cycle. ■ Something obstructs the optical path. ■ Check electrical connection of the detector. ■ Electronic failure, contact field service. |
| Error 7 | <ul style="list-style-type: none"> ■ Signal too weak on detector 3. | <ul style="list-style-type: none"> ■ The turbidity is too high. ■ The nitrate concentration of water is out of range. ■ The flow cell is dirty. Start a cleaning cycle. ■ Something obstructs the optical path. ■ Check electrical connection of the detector. ■ Electronic failure, contact field service. |

| Faults | Main causes | Interventions |
|----------|--|---|
| Error 10 | <ul style="list-style-type: none">■ Water presence alarm.■ No more cleaning solution. | <ul style="list-style-type: none">■ Check that water flows in the cell..■ This error appears when the cleaning solution tank is empty and an automatic zero correction is set. |