

MULTIPARAMETER PHOTOMETRIC UNIT FOR THE DETERMINATION OF Cl_2 , pH, ORP, $^{\circ}\text{C}$



TECHNICAL MANUAL

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1 GENERAL

1.1 INFORMATION ON THE MANUAL

This document contains reserved information. It may be subject to modifications and updates without any prior notice.

This manual is an integral part of the instrument. Upon initial installation of the equipment, the operator must carry out a careful control of the contents of the manual in order to check its integrity and completeness.

If for any reason it is ruined, incomplete or inadequate please contact the supplier in order to reintegrate or replace the non-compliant manual immediately.

The official versions of the machine, for which the supplier is directly responsible, are the ones in Italian and in English.

For countries of different languages from the ones indicated above, the official manual will remain the one in Italian. The supplier will not be held responsible for any possible translations in different languages made by distributors or users themselves.

Compliance with the operative procedures and the precautions described in this manual is an essential requirement for the correct operation of the instrument and to guarantee total operator safety.

The manual must be ready in all parts, in front of the instrument, before use so that all methods of operation are clear as well as the controls, connections to the peripheral equipment and precautions for a correct and safe use.

The user manual must be stored, integral and legible in all parts, in a safe place and at the same time it must be immediately accessible to the operator during installation, use and/or installation revision operations.

1.1.1 CONVENTIONS

The present user manual uses the following conventions:

NOTE



The notes contain important information to be highlighted compared with the rest of the text. They generally contain information that is useful to the operator to carry out and optimise operative procedures of the equipment in a correct manner.

CAUTION



Caution messages appear in the manual before procedures or operations that must be observed in order to avoid any possible losses of data or damages to the equipment.

CAUTION



Caution messages appear in the manual in correspondence to the description of procedures or operations that, if carried out incorrectly, may cause damages to the operator or users.

1.2 DECLARATION OF RESPONSIBILITY BY THE MANUFACTURER

The supplier will be held responsible for the safety, reliability and performance of the equipment only if used in compliance with the following conditions:

- Calibration, modifications or repairs must be carried out by qualified personnel, specifically authorised by supplier.
- Opening of the equipment and access to its internal parts may only be carried out by personnel qualified for maintenance and specifically authorised by supplier.
- The environment in which the equipment is used must comply with safety regulations.
- The electrical connections of the environment must be carried out according to regulations and must be perfectly efficient.
- Replacements that can be carried out on parts of the equipment and accessories must be done so with others of the same kind and of the same characteristics.
- The use and maintenance of the equipment and of relative accessories must be carried out in compliance with the instructions indicated in this manual.
- This manual must always be kept integral and legible in all parts.

1.3 LIMITS OF USE AND PRECAUTIONS FOR SAFETY

In order to guarantee safety of the operator together with the correct functioning of the equipment, it is important to work within the limits permitted and to adopt all of the precautions listed below:

CAUTION



Check before use to make sure that all safety requirements are fully satisfied. The equipment must not be powered or connected to other equipment until safety conditions are satisfied.

1.3.1 ELECTRICAL SAFETY

CAUTION



**All of the connections on the are isolated from the environment ground (mass is not isolated).
DO NOT connect any of these connections to earth.**

In order to guarantee conditions of utmost safety for the operator, we recommend that all of the indications listed in this manual are respected.

- **Power the equipment exclusively using network tension according to specifications (100 ÷ 240 Vac/dc 50-60 Hz)**
- **Replace damaged parts immediately.** Cables, connectors, accessories or other parts of the equipment that may be damaged or not working correctly must be replaced immediately. In this case contact your nearest authorised technical assistance centre.
- **Only use accessories and peripheries specified by supplier.** In order to guarantee all of the safety requirements, it is important to make exclusive use of the accessories specified in this manual which have been tested in combination with the equipment. The use of accessories and consumption materials of other manufacturers or not specifically recommended by supplier will not guarantee the safety and correct operation of the equipment. Only use peripherals that comply with the regulations of their specific categories.

1.3.2 SAFETY OF THE OPERATIVE ENVIRONMENT

- **The panel of the device is protected against the introduction of liquids.** Avoid subject the equipment to the risk of dripping water, sprays of water or immersion in water and the use in environments in which such risks may be present. Equipment in which liquids may have accidentally penetrated must be immediately switched off, cleaned and controlled by authorised and qualified personnel.
- Once programming has been carried out, we recommend that the transparent panel is closed.
- **Protection.**
Wall mounting
 - IP66 EN60529
 - EMI /RFI CEI EN55011 - 05/99
- **Use the equipment within the environmental limits of temperature, humidity and pressure specified.** The instrument has been developed to operate in the following environmental conditions:
 - Temperature of the working environment $0^{\circ}\text{C} \div +50^{\circ}\text{C}$
 - Temperature of storage and transportation $-25^{\circ}\text{C} \div +65^{\circ}\text{C}$
 - Relative humidity $10\% \div 95\%\text{RH}$ – not condensing



CAUTION

The water treatment plant in which the instrument is introduced must be developed in accordance with the functional requirements imposed by current legislation.

The apparatus must be inserted perfectly into the plant.

The plant must be kept operative in full compliance with the safety regulations provided.

The parameters indicated on the analyser must comply with current regulations.

Any signals of faults to the device must be positioned in an environment that is constantly controlled by operative personnel or plant assistants.







Non compliance with even just one of these conditions may lead the “logics” of the device to operate in a potentially dangerous manner for users of the service.

Therefore, we recommend that service personnel and/or maintenance personnel operate with the utmost care, pointing out any changes to the safety parameters immediately, in order to avoid the creation of any potentially dangerous situations.

As the considerations indicated above cannot be controlled by the product in question, the manufacturer will not be held responsible for any damages that these malfunctions may cause to people or things.

1.4 GRAPHIC SYMBOLS

The following table illustrates the drawings, the relative description and the position of all graphic symbols present on the equipment panels and on any other equipment or external devices to which they may be connected.

SYMBOL	DESCRIPTION	POSITION
	Danger symbol	A symbol located close to the clamps for connection to power.
  	Phase Neutral Earth protection	Symbols located close to the connections of the equipment to the electricity network
	Caution! Refer to the documentation attached	
	Symbol of separate collection of electrical and electronic equipment.	

1.5 CAUTION SYMBOL


The symbol illustrated below represents the **CAUTION** symbol and reminds the operator that he should read the user manual for important information, advice and suggestions for the correct and safe use of the equipment.



In particular, when it is positioned close to connection points to cables and peripherals, the symbol in question refers to careful reading of the user manual for instructions related to the nature of such cables and peripherals and the methods for correct and safe connections.

For the position of the CAUTION symbols on the equipment, refer to Chapter 2 “*Commands and Indicators, Connections*” and Chapter 3 “*Installation*” of this user manual. The reproductions of equipment panels, with relative commands, connections, symbols and labels are provided in this chapter. Each caution symbol is accompanied by a detailed explanation of its meaning.

1.6 PLATE DETAILS

	Mod.	_____
	SN.	XXXXXXX
	Volt	100-240 Vac/dc Hz 50/60
	SW Ver.	X.X

1.7 INFORMATION ON RECYCLING AND USE OF MATERIALS

The supplier, in accordance with specific European regulations, aims at constant improvement of development and of production procedures of its equipment with the objective of drastically reducing the negative impact on the environment caused by parts, components, consumption materials, packaging and the equipment itself at the end of its life cycle.

Packaging is conceived and produced to allow for its re-use or recovery, including recycling of the majority of the materials and to reduce the amount of waste or residues to be disposed of, to a very minimum. In order to assure a correct environmental impact the equipment has been designed with the smallest circuit possible, with the lowest differentiation possible of materials and components, with a selection of substances that guarantee utmost recycling and maximum reuse of the parts and waste disposal free from ecological risks.

The equipment is made in such a way as to guarantee the easy separation or dismantling of the materials containing contaminants compared with others, in particular during maintenance operations and the replacement of parts.

CAUTION



The disposal/recycling of packaging, of consumption materials and of the equipment itself at the end of its life cycle must be carried out in accordance with the norms and regulations that are currently valid in the country in which the equipment is used.

1.7.1 SPECIAL ATTENTION TO CRITICAL COMPONENTS

The instrument is fitted with an LCD liquid crystal display, which contains small amounts of toxic materials.

2 GENERAL DESCRIPTION

The analyser of this manual is made up of an electronic device plus a technical manual.

The device may be installed on an electrical board or to the wall at a maximum distance of 15 metres from the measuring Probe.

It is powered by the network ($85 \div 265 \text{ Vac/dc-50/60Hz}$) by a Switching feeder.

This equipment has been designed to analyse ON-LINE and pilot the dosage pumps for the treatment of water in pool applications.

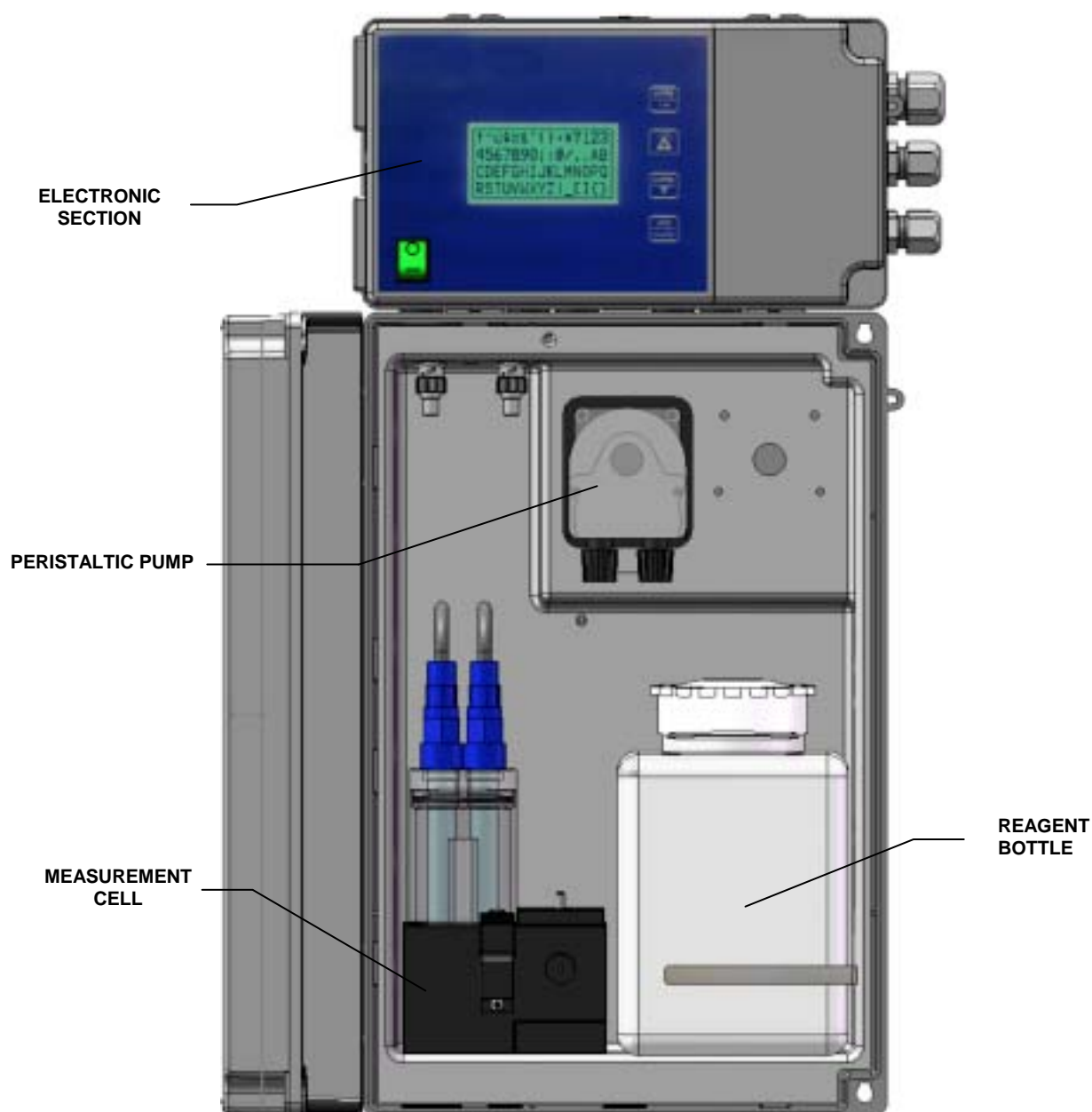


Figure 1 – Wall mounting residual Chlorine, pH / ORP and Temperature analyzer

2.1 PHOTOMETRIC CHLORINE MEASURE

Colorimetric reaction with D.P.D. (Diethyl-Paraphenylendiamina), it's the most selective and reliable method for chlorine measurement (see American Standard Methods) normally used in all the laboratories and by the public authority of environmental control

The DPD method has few (and all well known) chemicals interference substances, Flow variation in the water supply as soon as pH of the water have no influence in the measurement – as the sample to be measured is buffered by the first reagent (buffer solution)

It comes from the photometric process of measurement. Every measurement is done by two step: the “zero” with the sample water and the measurement with the same sample coloured by the reagents. At the end of the process the measuring cell is emptied and washed. This process avoid interference caused from colour or turbidity in the sample (Well! When the turbidity goes over a certain set point there is an optical check that stops the instrument and shows an alarm.)

The cleaning and substitution of the spares, like peristaltic hose and reagent bottles, can be done very easily also by people not really involved in the chemical instrumentations.

- A) The instrument performs a continuous automatic rinsing of the cell, by opening the sample inlet solenoid.
- B) Expired the electronically programmed time, the solenoid allows the inlet of a pre-set sample quantity in the cell, on which the photometric zero is performed.
- C) Reagents are released through the peristaltic pump.
- D) After the necessary time for colorimetric reaction has lapsed, the instrument measures free residual or total chlorine as a comparison between the measured zero value and the colorimetric value.
- E) The cell is briefly rinsed.
- F) The above cycle is repeated

2.2 MAIN TECHNICAL FEATURES

Simultaneously measurement of: Free Chlorine, pH, Redox and Temperature
(Optional: Total Chlorine, Combined Chlorine)

Programming: through keyboard with 4 bubble keys

LCD STN 128x64 backlighted

Internal Data Logger Flash 4 Mbit storage equal to 16000 recordings with the possibility to visualise through tables and charts the measurement trend with the indication of minimum, maximum and average values of the period

Recording interval: 00:00 ÷ 99:99 min

Type: circular / filling

Visualisation: table/chart

P.I.D. Regulation for pH Output

RS485 Serial Output: MODBUS RTU protocol with programmable velocity 1200 ÷ 38400 Baud Rate. for set-up, Real Time condition, or data download

nr.4 analogue outputs :

Quantity: ppm Cl₂ pH, Redox , Temperature.

Typology: 0.00 / 4.00 ÷ 20.00 mA galvanically isolated

Limit programming: lower / higher / Inversion

Max load: 500 Ohm

Output alarm according to NAMUR 2.4 mA (with range 4/20mA)

1 Alarm Relay Output (lack of sample water, reagents exhaustion, burnt projector, dirty cell)

2 Relay Outputs of Set point 2 for Chlorine measurement

2 Relay Outputs of Set point 2 for pH measurement

1 Relay Output of Set point 2 for Redox measurement

1 Relay Outputs of Set point 2 for Temperature measurement (but also Total or Combined Chlorine on request)

➤ *Main hardware characteristics of the device*

The hardware structure of this periphery is based on the adoption of extremely new CPU CMOS with 16 bits developed specifically for the execution of the so-called “embedded” applications.

The card uses an EEPROM to store the Set-up data and flash memories for storage of the archives of historical data and LOG files of events.

The Card has 1 RS485 gate (opto-isolated) for local networks used for connections with local communication devices (configuration computer, terminals and remote controls etc).

The card integrates a Real Time Clock (clock with date) that allows the software to store figures in a chronological order.

2.2.1 TECHNICAL FEATURES

Multiparameter power unit for the determination of Free Chlorine with photometric method, pH, Redox and Temperature.	
Measurement range	Free chlorine: 00.00 ÷ 05.00ppm Cl ₂ - Resolution: 0.01ppm - Accuracy: 1% f.s. (colorimetric method with DPD) pH: 00.00 ÷ 14.00 pH - Resolution: 0.01 pH – Accuracy: 1%f.s. Redox: ± 1500 mV - Resolution: 1 mV – Accuracy: 1%f.s. Temp.: 00.0 ÷ 50.0 °C - Resolution: 0.1°C – Accuracy: 1% f.s.
Graphic display	LCD STN 128x64 backlighted. Visualisation of: measurements (simultaneous of 4 values + trend line) , Digital outputs condition, storage condition, malfunctions. Programming through keyboard with 4 bubble keys
Internal Data Logger (optional)	Flash 4 Mbit storage equal to 16000 recordings Recording interval: 00:00 ÷ 99:99 min Type: circular / filling Visualisation: table/chart
nr.4 analogue outputs	Quantity: ppm Cl ₂ pH, Redox , Temperature. Typology: 0.00 / 4.00 ÷ 20.00 mA galvanically isolated Limit programming: lower / higher / Inversion Max load: 500 Ohm Output alarm according to NAMUR 2.4 mA (with range 4/20mA) P.I.D. Regulation for pH Output
nr.4 Relay Outputs of Set point with 220Vac power for pump max power 100VA	nr. 2 for Chlorine + nr. 1 for pH + 1 for Redox + 1 for Alarm ON – OFF: 00.00 ÷ 05.00 ppm Cl ₂ / 00.00 ÷ 14.00 pH / ± 1500 mV Programming of Hysteresis and operational time: 000 ÷ 999 sec. Or daily activation on a hour basis: with programming of switching on and off hour ; Relay max resistive load 5A at 230Vac
Alarm Relay Output	ON-OFF cumulative for: Min/Max, set point delay, defects (lack of sample water, reagents exhaustion, burnt projector, dirty cell) Delay time: 00:00 ÷ 59:99 mm:ss at minimum step of 15 seconds Threshold disabling: active Relay functioning: closed / open Relays max resistive load 5A at 230Vac
2 Digital Input	Contact feed at free and 220Vac for dose disabling
Analogue Input (optional)	0/4 ÷ 20mA for auxiliary measurements
RS485 Serial Output (optional)	MODBUS RTU protocol with programmable velocity 1200 ÷ 38400 Baud Rate. for set-up, Real Time condition, or data download
Functioning conditions	Operational Temperature 0÷50°C; Storage and Transportation: 25÷65°C; Humidity 10-95% not condensed
Power Supply/Electric Protection	Power supply 100÷265Vac/dc 50-60Hz – Average absorption 66 W – Electric protection:

2.3 CONTROLS, INDICATORS AND CONNECTIONS

Following pictures show main controls, indicators and connections of device



Figure 2 – Electronic panel

1. Visualizer with LCD Display
2. ON/OFF Switch
3. ENTER / CAL key
4. UP key
5. DOWN / PUMP key
6. ESC / MODE key

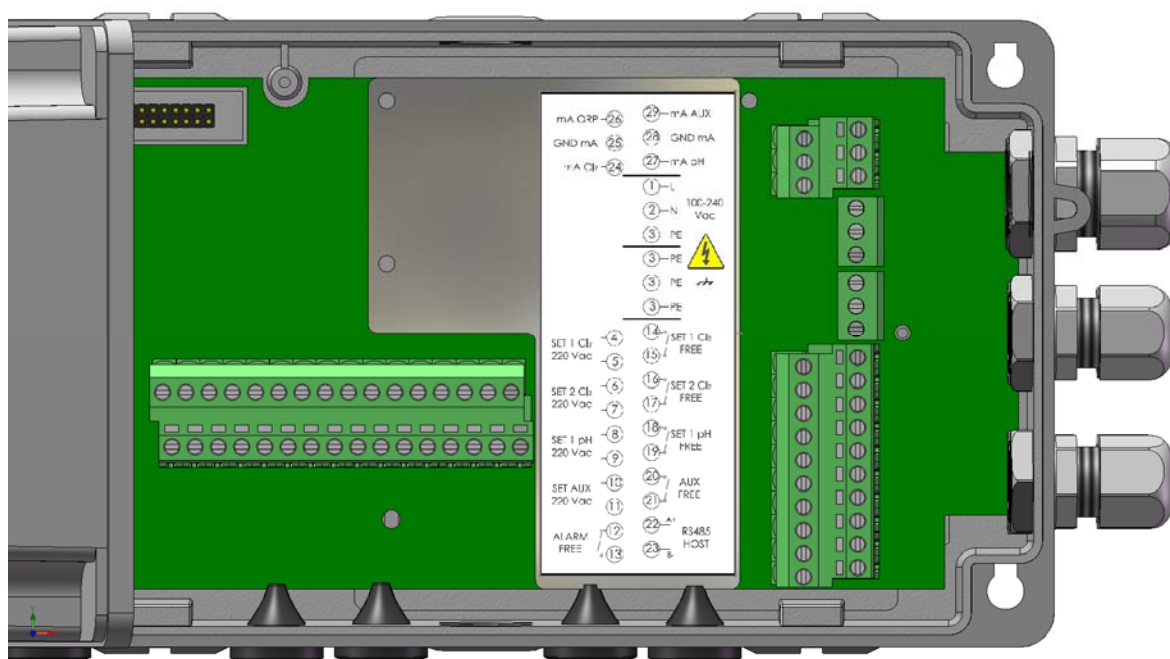
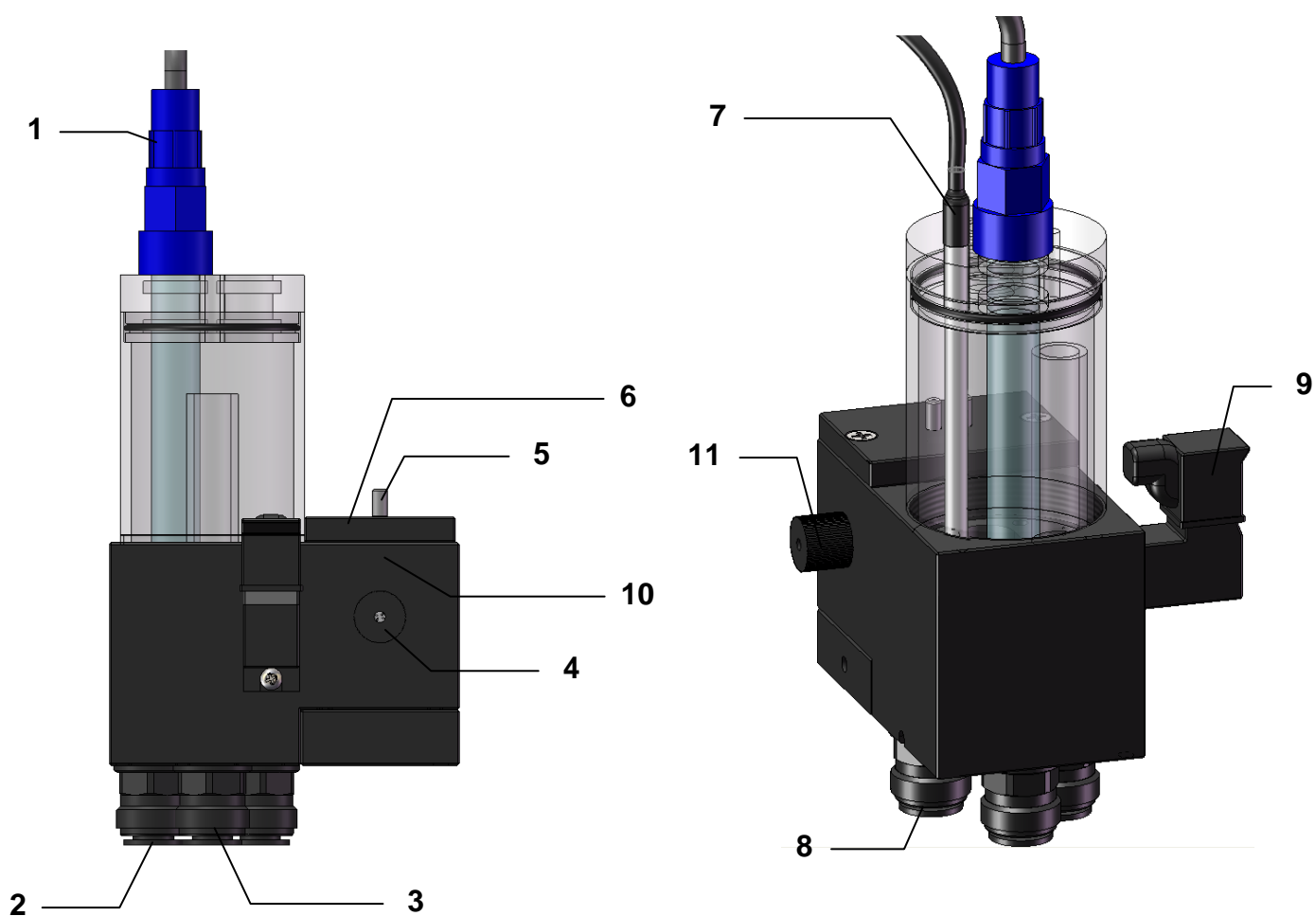
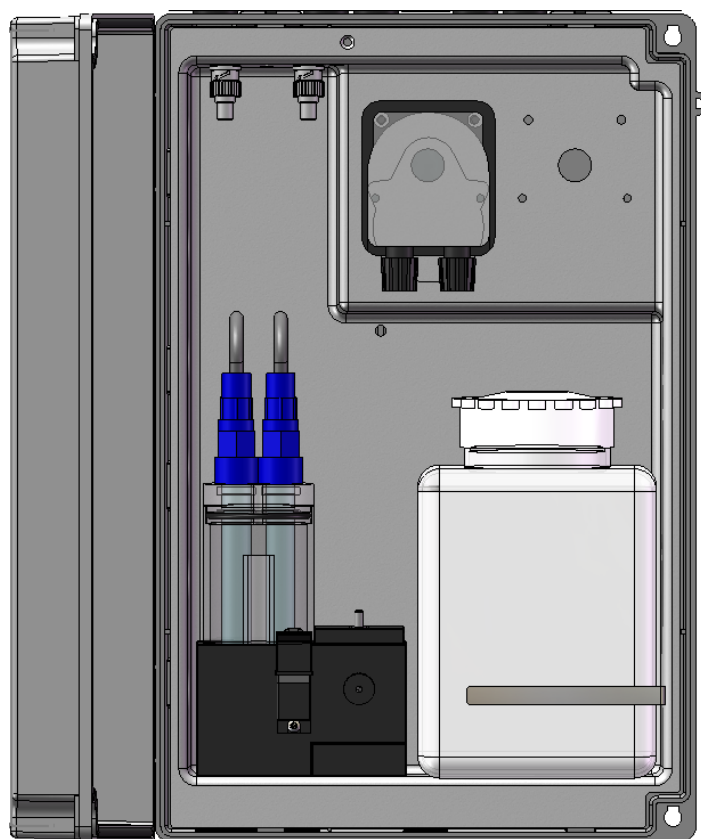
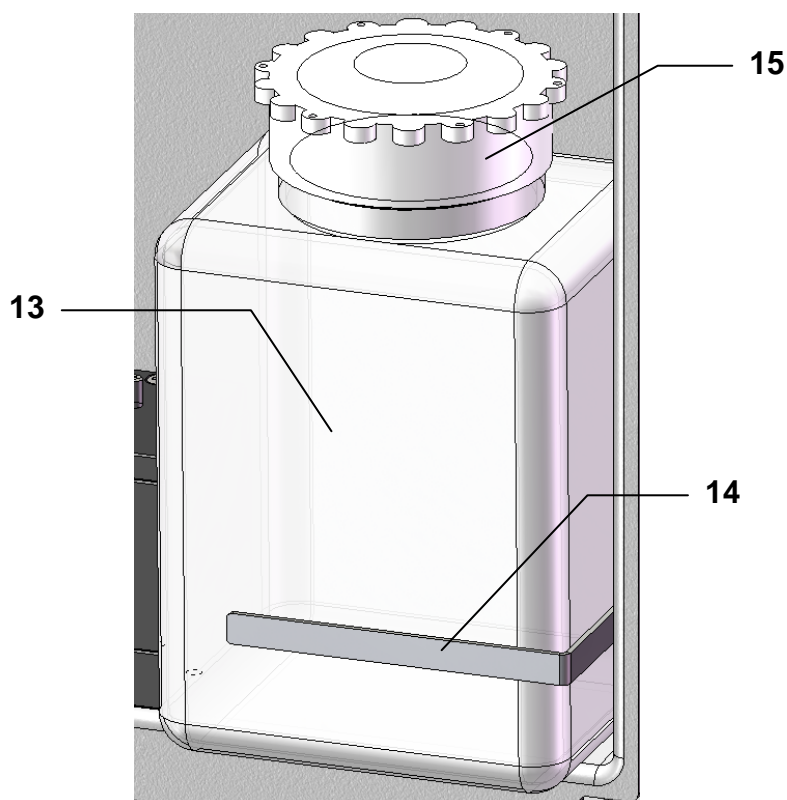
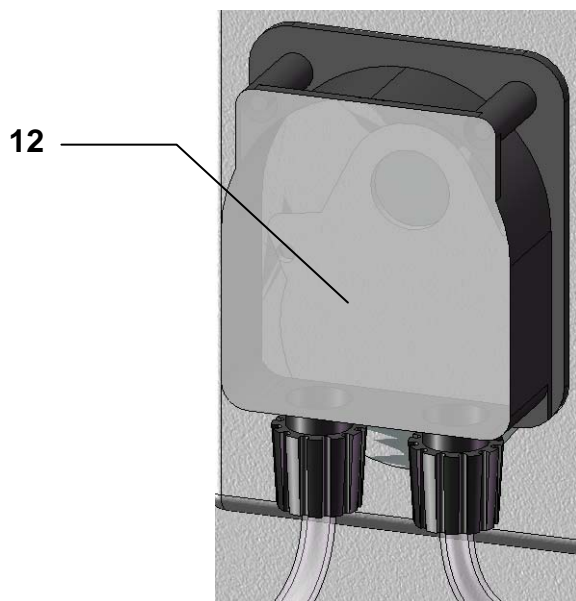


Figure 3 – Access to the terminal box

2.4 HYDRAULIC SYSTEM



-
- | | |
|---|---|
| 1. pH Probe | 7. Temperature and lack of sample watersensor |
| 2. Sample inlet | 8. Drainage Continuous gravity drop dirty water |
| 3. Drainage Continuous gravity drop clean water | 9. Solenoid valve for washing cell |
| 4. Photometric Cell Photosensor | 10. Photosensor Photometric Cell |
| 5. Pipe fitting for reagents injection | 11. Photometric Cell spotlight with led |
| 6. Cell cap | |



- | | |
|----|--------------------|
| 12 | Peristaltic Pump |
| 13 | DPD Reagent bottle |




14. AISI 316 DPD Bottle Holder
15. Reagent bottle cap

2.5 GRAPHIC DISPLAY

The graphic display allows for visualization of the various programming menus and, in the measuring method (RUN), visualization of the measurements and of the state of operation.

2.5.1 LIST OF PRIMARY MENUS

The following table illustrates the symbols visualized on the display which represent the various programming menus.

VISUALIZATION ON THE GRAPHIC DISPLAY		DESCRIPTION
1	 SYSTEM SETUP	SYSTEM SETUP MENU All basic parameters for operation logics are set
2	 MEASURE SETUP	MEASURE STUP MENU Setting of measured parameters
3	 MANUAL CONTROL	MANUAL CONTROL MENU Manual control and activation of Inputs and Outputs

2.5.2 DIVISION OF THE GRAPHICAL DISPLAY INTO AREAS IN THE RUN METHOD

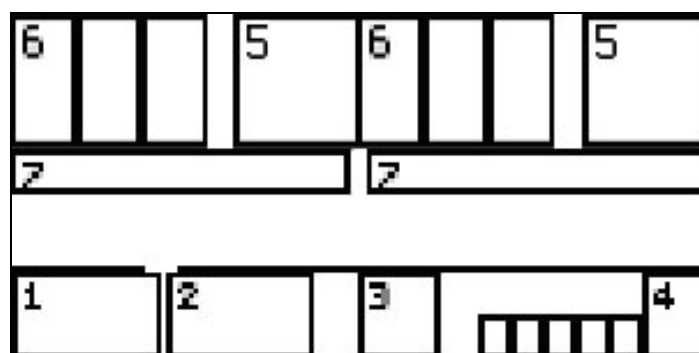










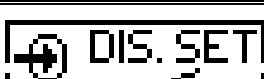















Figure 4 – Graphic display - divided up into areas

In the following table, for every area of the display indicated in figure 3, the symbols that may appear during functioning of the device in a measurement method (RUN) are represented and briefly described.

GRAPHIC ZONE	VISUAL REPRESENTATION	DESCRIPTION
1		Set1 - Open Relay
		Set1 - Closed Relay
		Set1 – Timed Active Threshold Relay Open
		Set1 – Timed Deactivated Threshold Relay Open
		Set1 - Timed Active Threshold Relay Closet
2		Set2 - Open Relay
		Set2 - Closed Relay
		Set2 - Timed Active Threshold Relay Open
		Set2 - Timed Deactivated Threshold Relay Open
		Set2 – Timed Active Threshold Relay Closed
1-2		Disabling Set Indicates digital entrance ON
		Stay time Probe frozen on a value
		Maximum Logical Set Exceeded
		Minimum Logical Set Exceeded
		Maximum dosage time exceeded

4		Value outlet n.1 (in mA)
		Value outlet n.2 of temperature (in mA)
		Value outlet n.2 auxiliary (in mA)
		Value outlet n.2 with PID function PID (in mA)
		Real temperature value (in Fahrenheit)
		Manual value of temperature (in Fahrenheit)
		Real temperature value (in Centigrades)
		Manual temperature value (in Centigrades)
		Alarm active – Alarm relay closed
5	- + 0123456789*	Numerical
6	O S1	State of relay 1
	O S2	State of relay 2
7	pH	pH measurement unit
	Rx mV	ORP measurement unit
	ppm	Chlorine measurement unit
	mg/l	Chlorine measurement unit
	SEC	Seconds during stabilization

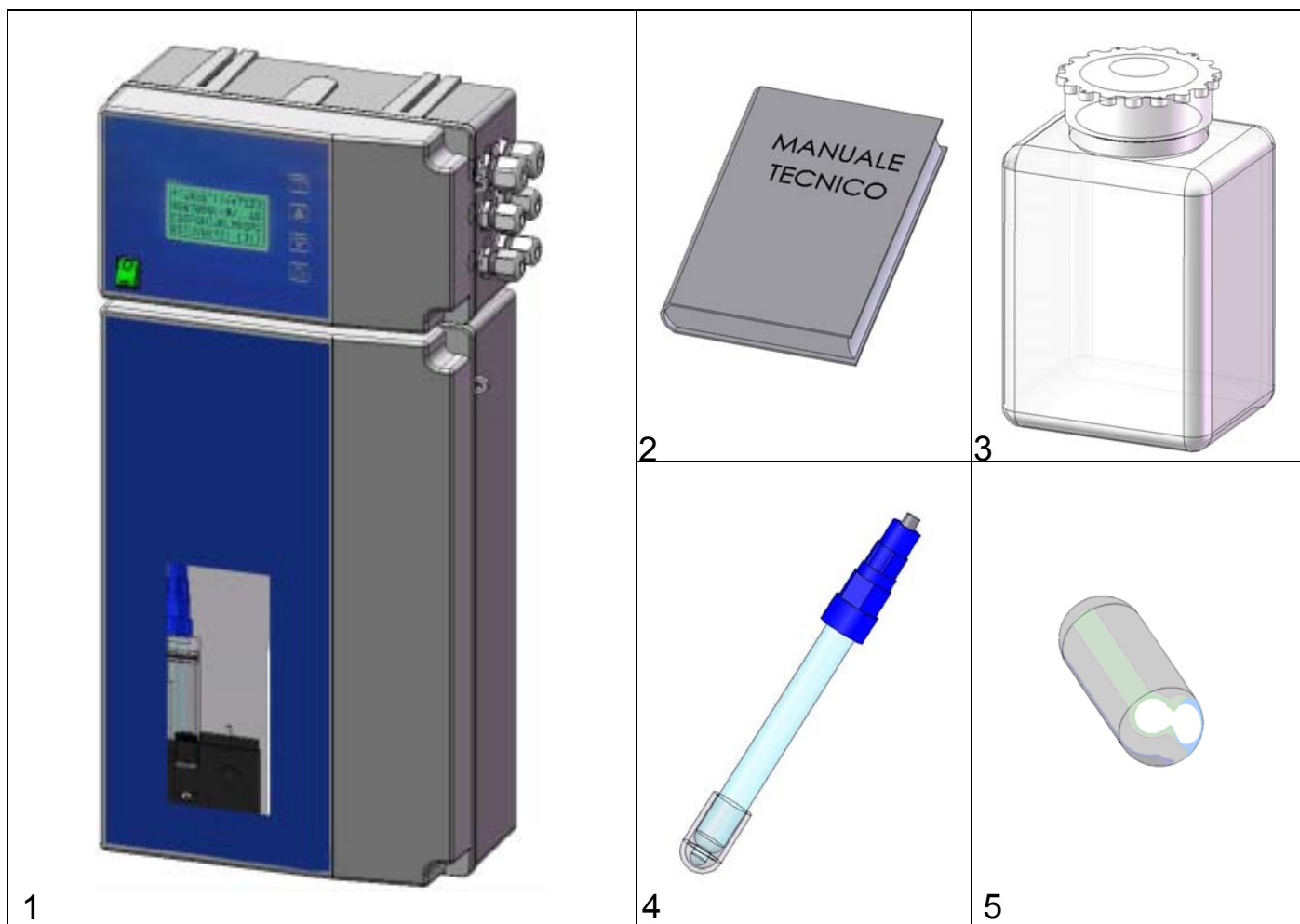
3 INSTALLATION

Before installing the device carefully read the instructions provided below.

3.1 COMPOSITION OF THE SUPPLY

The supply consists of just one package which contains the following parts:

1. 1 electrical control and command panel
2. 1 Technical Manual PN
3. 1 Bottle of DPD reagent for analysis
4. 1 pH probe
5. 1 magnetic anchor



3.1.1 INSTALLATION OF WALL MOUNTED DEVICE

The wall must be completely smooth in order to allow for perfect adhesion of the device.

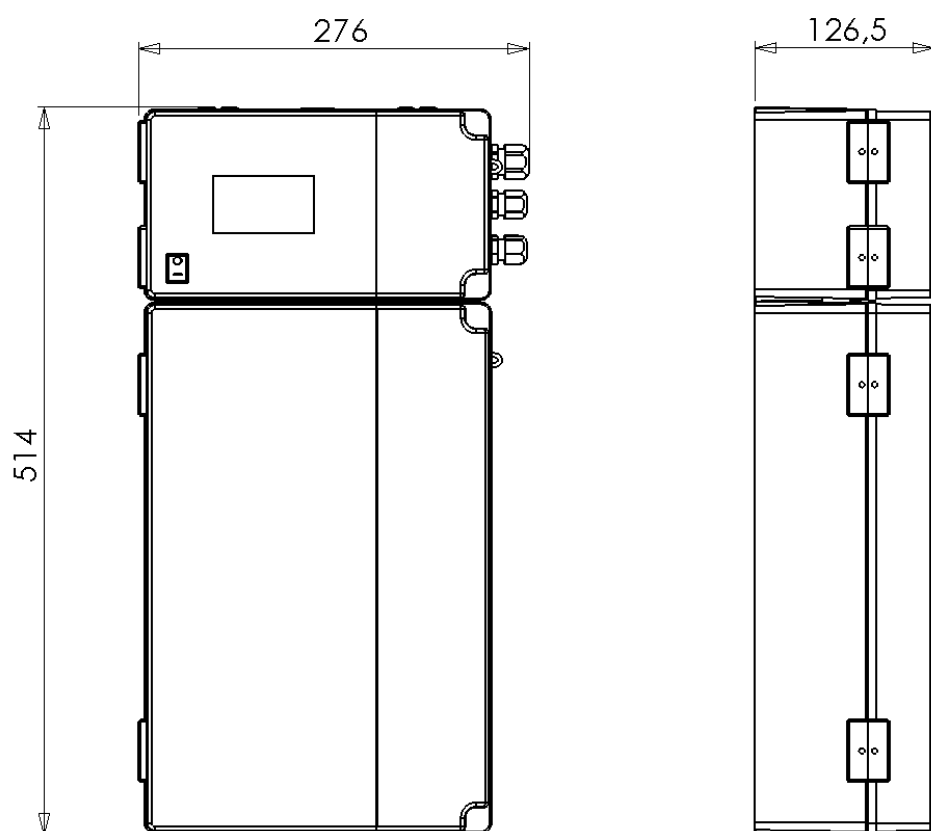


Figure 5 – Dimensions and encumbrance of the wall mounted device

Mechanical Dimensions	
Dimensions (L x H x P)	276x514x126,5mm
Fixing depth	126,5mm
Material	ABS Grey
Mounting	Wall
Weigth	4 Kg
Frontal Panel	Polycarbonate UV Resistant

Open the instrument, open the pre-shaped holes and fix the instrument itself to the wall.

On the bottom side there are two outputs for the drainage of the analysed water and the input of the water sampler and on the right side there are the core hitches for the connection to the other uses.

For an easy installing keep away the peripheric from probable prominences; out-distance from other apparatus (at least 40 cm) to simplify the electric and hydraulic connection.

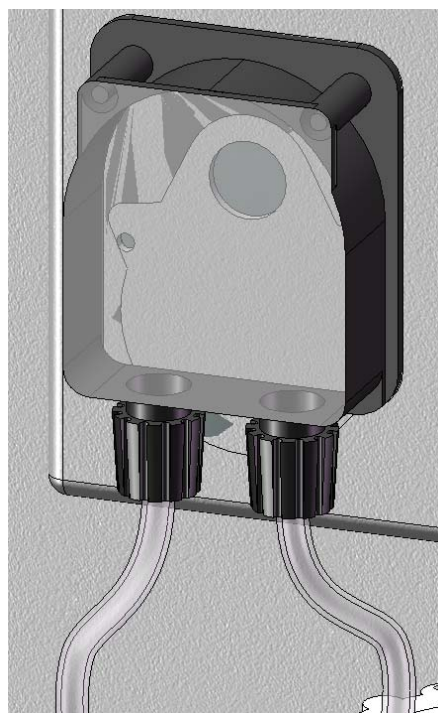
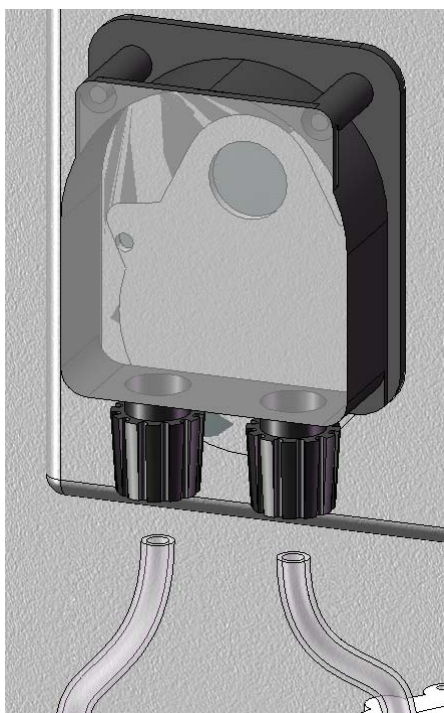
Keep away from water drips and/or sprays of water from adjacent areas in order to safeguard the instrument during programming or calibration stages.

Keep away from water drips and/or sprays of water from adjacent areas in order to safeguard the instrument during programming or calibration stages.

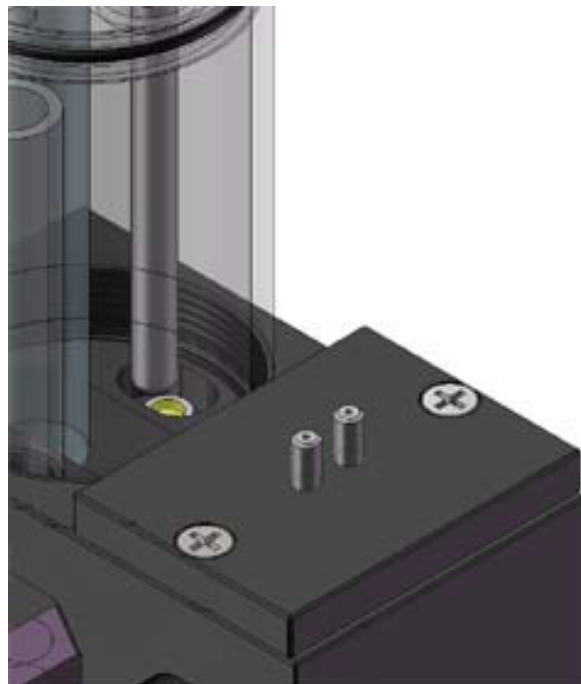
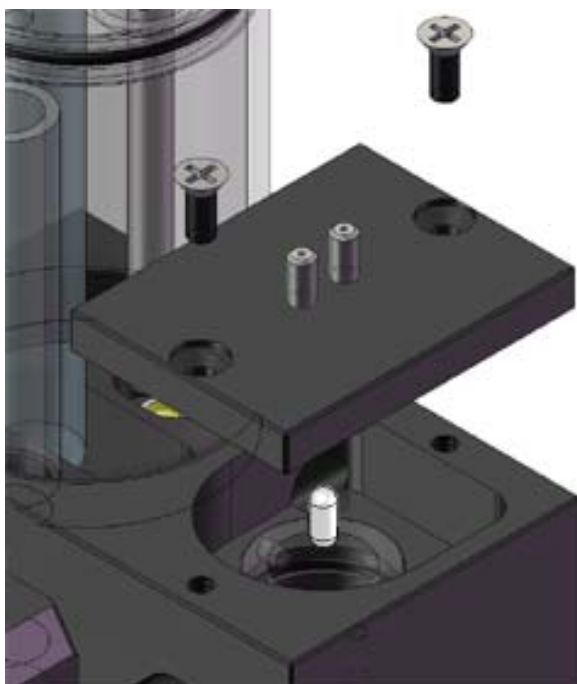
3.1.2 CONNECTIONS AND STARTING

After the fixing of the photometer to the wall, is necessary to follow these steps:

1. position the pipes of the peristaltic pump as showed below

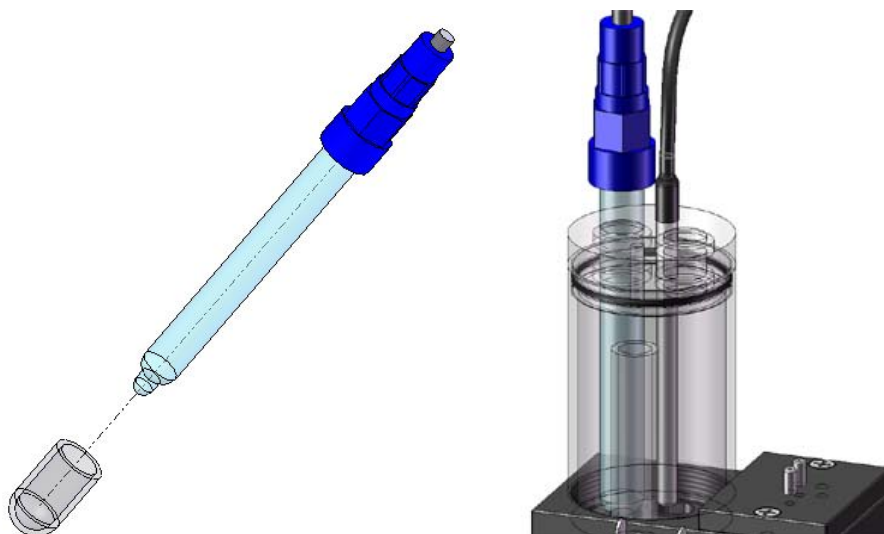


2. unscrew the screws M3 from the reactives' cap, introduce the magnetic anchor inside the slide and screw the cap as shown in the picture:

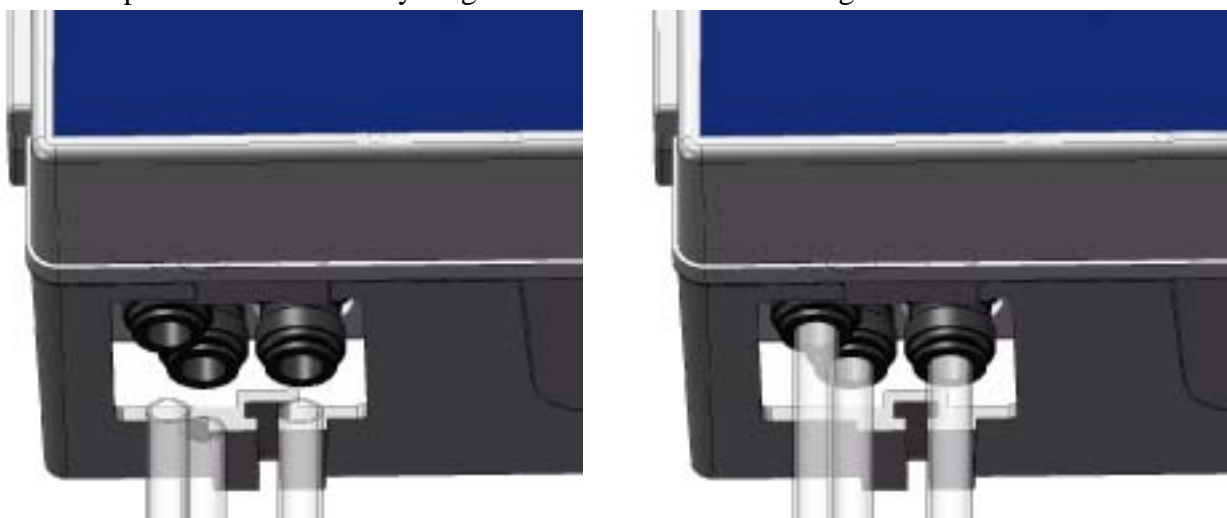


3. Prepare reagents by pouring the DPD sulfate powder in the dye reagent (DPD2).

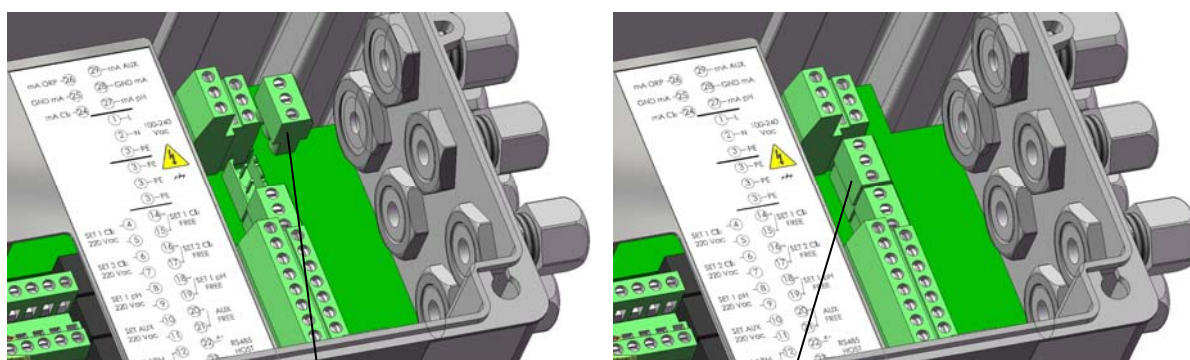
4. take off the pH probe's protection cap and introduce it in the suitable place showed in the picture taking care that the extremity doesn't touch the bottom of the cell



5. connect the sample pipe to the input of the cell (pipe fitting with clutch for pipes with diameter of 10mm). Water alimentation pressure must be stable. Regulate the inflow to make the water flowing from the clear pipe inside the cell. Connect two pipes to the 1/4" dump clutches for the dirty reagents and clean water discharge.



6. connect the electric alimentation respecting the indication on the terminal board



**Connector for electric
alimentation**

CAUTION



To access the 4 screws necessary to remove control panel, remove the plastic parts on the sides of the electronic box.

7. after the connection of the peripheric to the net press the DOWN button until the reactivities' pipes are completely full and proceed to the pH and Redox calibration following the instructions mentioned in the chapter MEASURE SETUP.

For a good running the flow rate must be included between 1 and 2 lt/min with pressure of 1 bar.

CAUTION



Cell' s discharges never must be connected to a pressurized pipe

3.1.3 CONNECTIONS TO THE POWER SUPPLY

If possible avoid any cables destined for high power use to be positioned close to the device as they may cause faults of an inductive nature to the analogical section of the instrument.

Apply a tension alternating between 100Vac and 240Vac 50/60 Hz or, according to details on the identification plate, the most stabilised tension possible. Avoid at all costs connections to power supplies that have been rebuilt, for example, with the help of transformers in which this rebuilt power supply will feed other systems beyond the device (perhaps of an inductive kind) because, in this way, high tension spikes will be created and once they are irradiated it becomes very difficult to block and/or eliminate them.

CAUTION



The electric line must be fitted with a suitable life-saving device and magneto-thermal, in compliance with correct installation norms.

In any case it is always best to check the quality of the Ground connection. It is very common to find Ground connections that are generators themselves of disturbances: in the case of any doubts on quality a connection to a rod dedicated to the device plant is recommended.

3.1.3.1 Electrical Connections to the dosage systems (Users)

CAUTION



Before starting connections between the Device and the external Users, make sure that the electrical panel is switched off and the cables from the Users are not under tension.

“Users” mean the outlets and relays used in the device

- (SET1) for the Dosage Pump or control command
- (SET2) for the Dosage Pump or control command
- (ALARM) the alarm command transmitted by the instrument to siren and/or flashing light
- (WASH) electrode washing command

CAUTION



Each relay contact can support, on a resistive load, a maximum current of 1 Ampere with a max. of 230V, therefore a total power of 230VA

In the case of higher levels of power it is best to carry out connections as indicated in the layout of fig. 7-b). If the load to be handed is of low power or of a resistive nature, use the layout in Fig. 7-a)

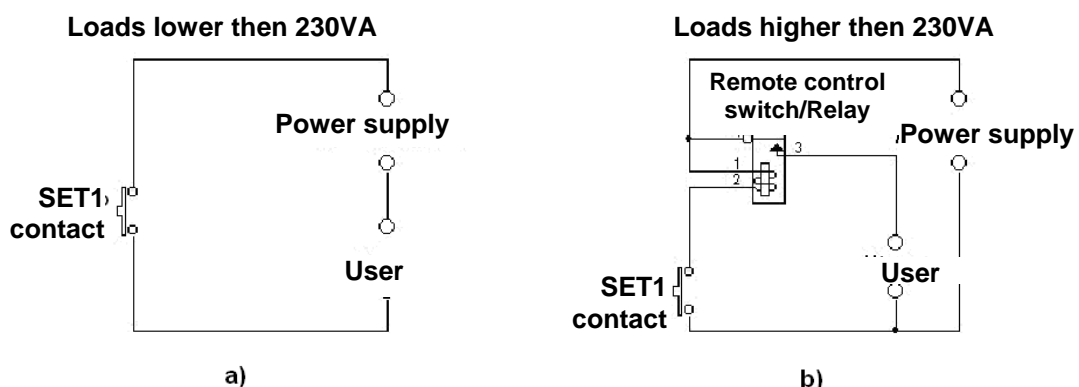


Figure 6 Examples of connection with users

NOTE



The layouts indicated above are typically indicative as details of all of the protection and safety devices necessary are missing.

3.1.3.1.1 Connection terminal box

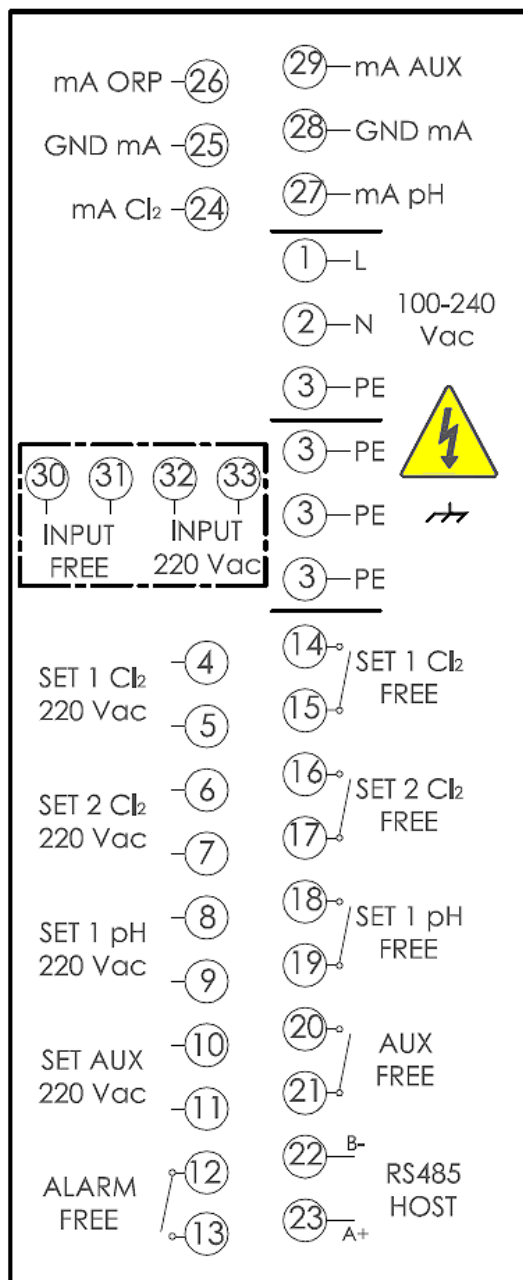


Figure 7 Connections terminal box

3.1.3.2 Connections to the Power Supply

Once you have made sure that the tension complies with the one indicated in the previous paragraphs, connect the electrical power line to the clamps marked by connecting the clamp with the relative symbol to earth.

CLAMP Nr.	GRAPHIC	DESCRIPTION
1	L	Power supply (Phase)
2	N	Power supply (Neutral)
3		Power supply (Earth)
4		Cl ₂ 220 Vac supplied contact (1)
5	SET 1 Cl ₂ 220 Vac Vac max 100VA	Cl ₂ 220 Vac supplied contact (1)
6	SET 2 Cl ₂ 220 Vac Vac max 100VA	Cl ₂ 220 Vac supplied contact (2)
7		Cl ₂ 220 Vac supplied contact (2)
8	SET 1 pH 220 Vac Vac max 100VA	pH 220 Vac supplied contact
9		pH 220 Vac supplied contact
10	SET AUX 220 Vac Vac max 100VA	AUX 220 Vac supplied contact
11		AUX 220 Vac supplied contact
12	ALARM FREE	Alarm potential-free contact
13		Alarm potential-free contact
14	SET 1 Cl₂ FREE	Cl ₂ potential-free contact (N.O.) (1)
15		Cl ₂ potential-free contact (N.C.) (1)
16	SET 2 Cl₂ FREE	Cl ₂ potential-free contact (N.O.) (2)
17		Cl ₂ potential-free contact (N.C.) (2)
18	SET 1 pH FREE	pH potential-free contact (N.O.)
19		pH potential-free contact (N.C.)
20	AUX FREE	AUX potential-free contact (N.O.)
21		AUX potential-free contact (N.C.)
22	RS485 HOST	RS485 (B-)
23		RS485 (A+)
24	mA Cl₂	mA Output Cl ₂
25	GND mA	GND mA
26	mA ORP	mA Output ORP
27	mA pH	mA Output pH
28	GND mA	GND mA
29	mA AUX	mA Output AUX
30	INPUT FREE	INPUT potential-free contact
31		INPUT potential-free contact
32	INPUT 220 Vac	INPUT 220 Vac
33		INPUT 220 Vac

4 METHODS OF USE

4.1 COMPOSITION OF THE MEASURING SYSTEM

4.1.1 MINIMUM CONFIGURATION

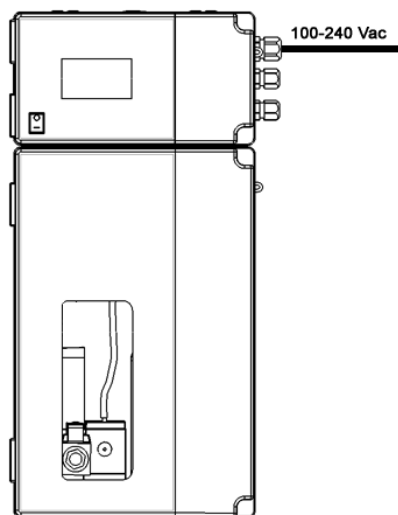


Figure 8 Minimum Configuration

4.1.2 MAXIMUM CONFIGURATION

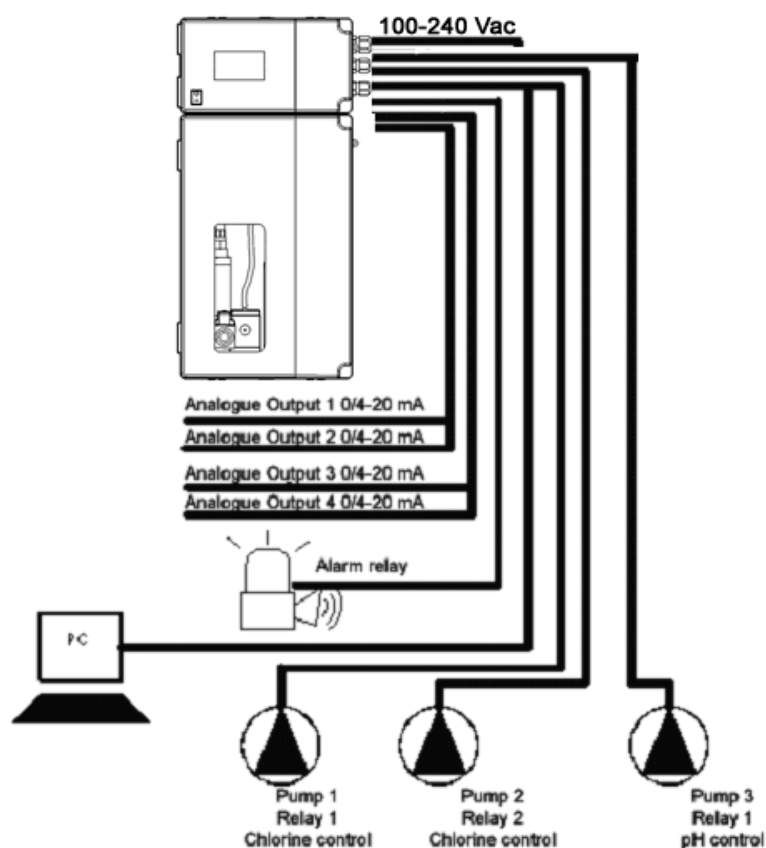


Figure 9 Maximum Configuration

4.2 START UP OF THE SYSTEM

Once the electronic device and the measuring probe (PH / ORP) have been connected, programming of the software must be carried out in order to determine “personalisation” of parameters for correct use of the equipment.

Turn on the equipment by connecting it to the mains, the device does not have a power supply switch.

4.2.1 STARTING THE SYSTEM

Connect the instrument to the power supply.

After the indication of the SW version number, the instrument will soon enter in run mode.

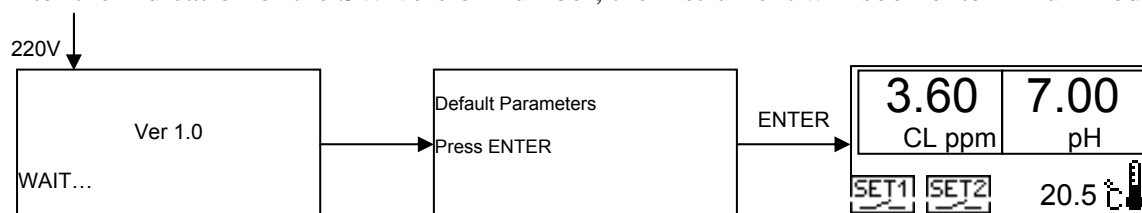


Figure 10 – Flow-Chart of Instrument Editing Function

4.2.1.1 Contrast adjustment

Using the same procedure, but keeping the **DOWN** button pressed, the display contrast adjustment window will appear.

NOTE



During this operation release the **DOWN** button immediately after the first acoustic beep, otherwise the contrast will go quickly to 0% and the display will be completely white. In order to reset the correct level, simply press the **UP** key to the desired value.

Using the **UP** and **DOWN** keys it is possible to adjust the contrast percentage.

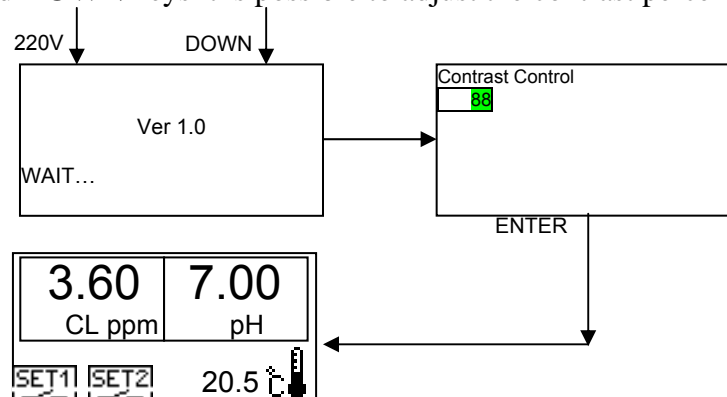


Figure 11 – Contrast Function Flow-Chart

Subsequently pressing **ENTER**, the RUN visualisation will be activated.

4.3 INTRODUCTION OF OPERATIVE PARAMETERS – THE USE OF KEYS

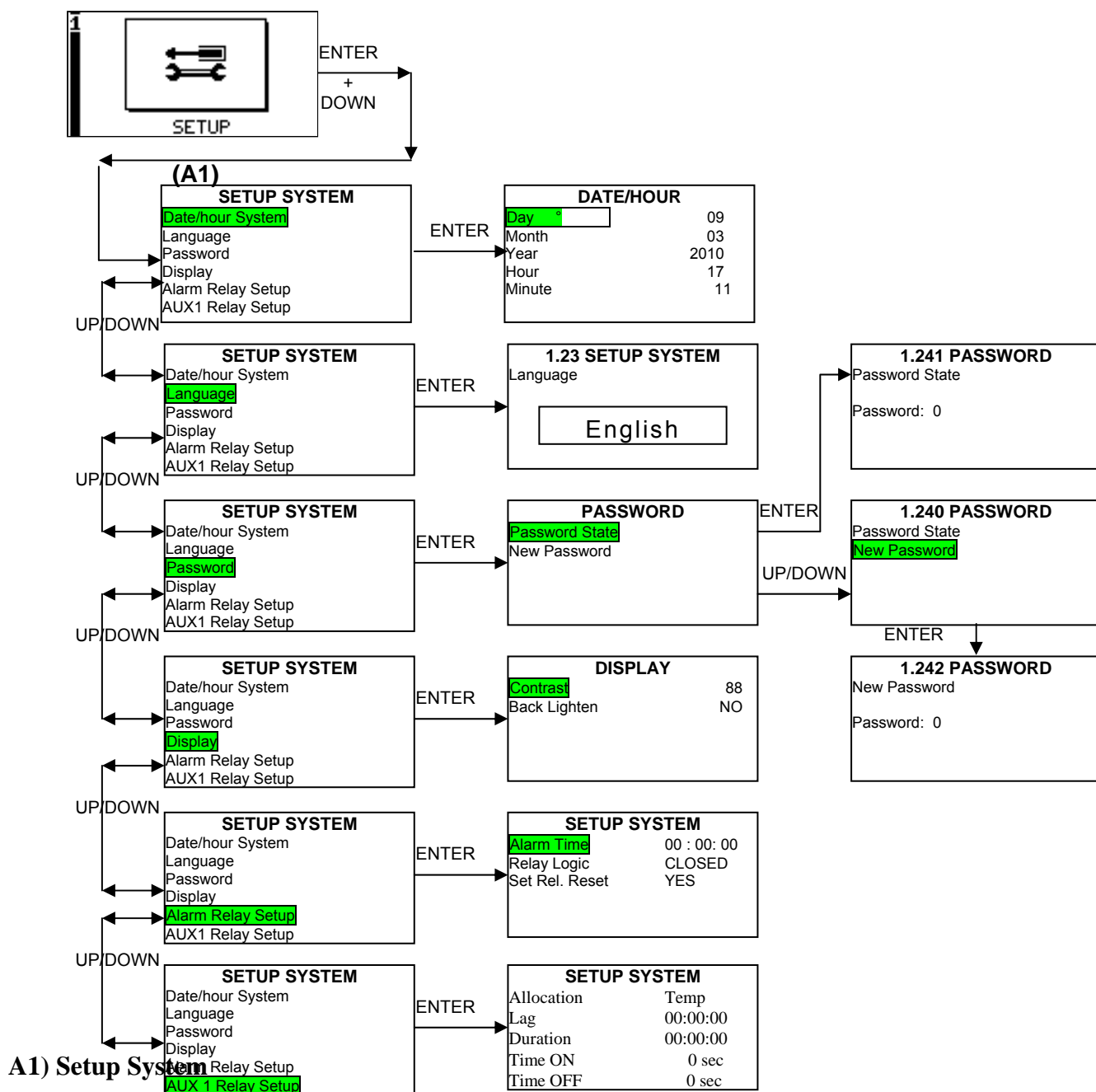
In order to introduce/modify operative figures and to carry out calibration procedures, use the menus visualised on the display through the 4 function keys located on the front panel of the device. When turned on the apparatus will automatically position itself in a measuring method – the RUN function. By pressing the ESC key the programming method will be available through the first menu “1 SETTINGS”.

Using the UP and DOWN keys the various menus and submenus can be scrolled and information can be modified (increase/reduction).

Using the ENTER key access will be provided to the submenus for the input of information and the variations made will be confirmed.

By pressing the ESC key the screen will go back to the menu or to the previous function and any variations made will be cancelled.

4.3.1 SETUP MENU



In this part of the programme which is divided up into 6 functions, the basic functioning parameters of the instrument are set.

Description of the functions:

DATE/HOUR SYSTEM

Setting of the DATE and TIME of the system that will be memorised every time that figures are viewed in a historical perspective.

LANGUAGE

It is possible to select the language used by the Software between: Italian, English, French, Spanish and German.

PASSWORD

At this stage it is possible to activate and programme for access to the instrument. Once activated, each time that the programming stage is accessed the access password will be requested.

The password is made up of a 4 figure number.

In order to access the step “Password Status” or “New Password”, the existing password must be inserted and then the new input can be carried out. The first password is “00000”

DISPLAY

Contrast: It allows for the definition of a greater or lower contrast of the display according to the temperature in which the instrument is operating.

Background illumination: At this stage you can decide whether or not to maintain background illumination or to switch it off one minute after having released the key.

By programming YES the background illumination stays on, by programming ON it switches off automatically. NO is programmed as a default.

ALARM RELAY SETUP

It allows to set the RELAY ALARM functioning logic.

Alarm conditions are: Set point withdrawing delay, Logic Set overcoming, missing measurement water, burnt projector, exhausted reagents, dirty cell, missing signal from measurement cell.

By setting the alarm Time is possible to set a maximum activation time of Set Points *after which time the alarm will be activated*. This allows for the state of the dosage pumps to be kept under control.

By setting Relay Logic is possible to set which is the normal position of the Alarm Relay.

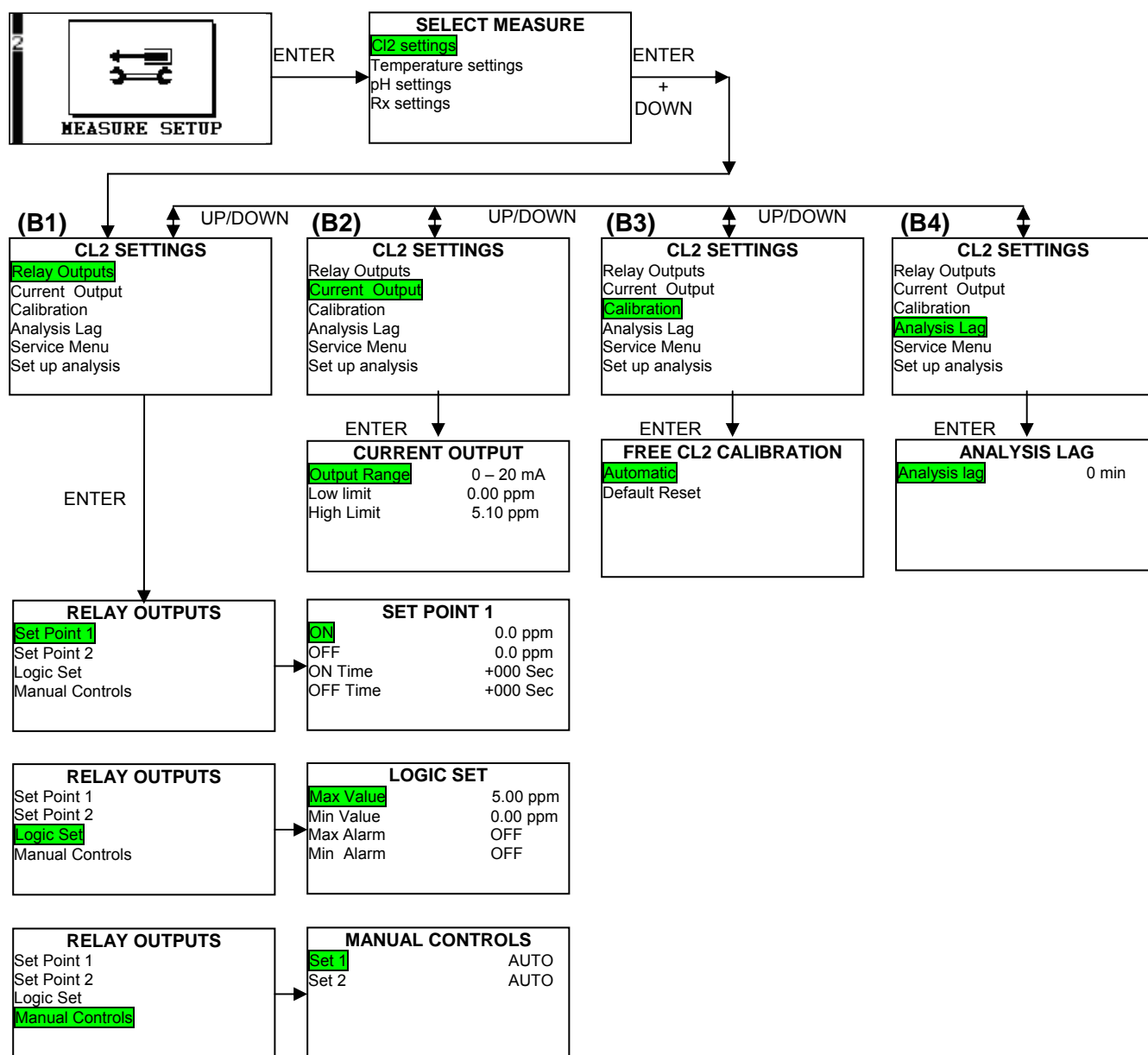
In alarm condition the Alarm Relay will modify its position in the opposite one

By setting Set Rel. Reset is decided if, in alarm condition, Set Point relays must become open.

AUX 1 RELAY SETUP

It allows to activate the AUX 1 (auxiliary) relay, making a correlation with Temperature, for example.

4.3.2 MEASURE SETUP MENU (CL2 SETTINGS: RELAY OUPUTS, CURRENT OUTPUT, CALIBRATION, ANALYSIS LAG)



B1) Relay Outputs

In this step of the program the following functions can be set:

SET POINT 1, SET POINT 2:

By programming the Set Point for this function, we can activate the relay as a Threshold by programming an **ON** value (relay activation) and an **OFF** value (relay deactivation). The free programming of these two values will allow for the creation of a hysteresis suitable for any kind of application.

By programming the **ON** value higher than the **OFF** one (Pict. 6.a) an **UPWARD** threshold will be achieved: (When the value exceeds the **ON** value, the relay is activated and remains active until the value falls below the **OFF** value).

By programming the **OFF** value higher than the **ON** one (Pict. 6.b) a **DOWNWARD** threshold will be achieved: (When the value falls below the **ON** value, the relay is activated and remains active until the value exceeds the **OFF** value). See Pict.6.

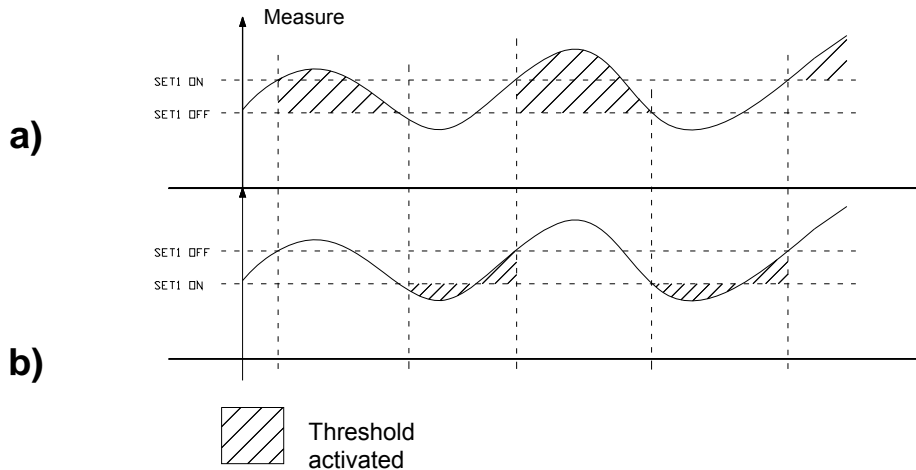


Fig 12 - Threshold operation

Furthermore by acting on the **Time ON** and **Time OFF** parameters it is possible to define a **DELAY** time or a **TIMED** operation of the Relay during its activation.

Negative or positive ON and OFF Times can be defined. (Pict. 7)

By programming **Negative Times** the **DELAY** function is activated:

Eg. **Time ON: -5sec** , **Time OFF -10sec**. (Pict. 7.a)

When the threshold is activated, the relay will close after 5 seconds (**ON time**) and it will remain closed for the entire period in which the threshold is active. When the threshold is not activated the relay will remain closed for another 10 seconds (**OFF time**) after which time it will open.

By programming **Positive Times** the **TIME** function will be activated:

Eg. **Time ON: 5sec** , **Time OFF 10sec**. (Pict. 7.b)

When the threshold is activated the relay will alternate between an open/closed position according to the times programmed. In the case of the example the relay will close for 5 seconds (**ON time**) after which time it will remain open for 10sec (**OFF time**). This cycle will continue until Threshold 1 is not deactivated.

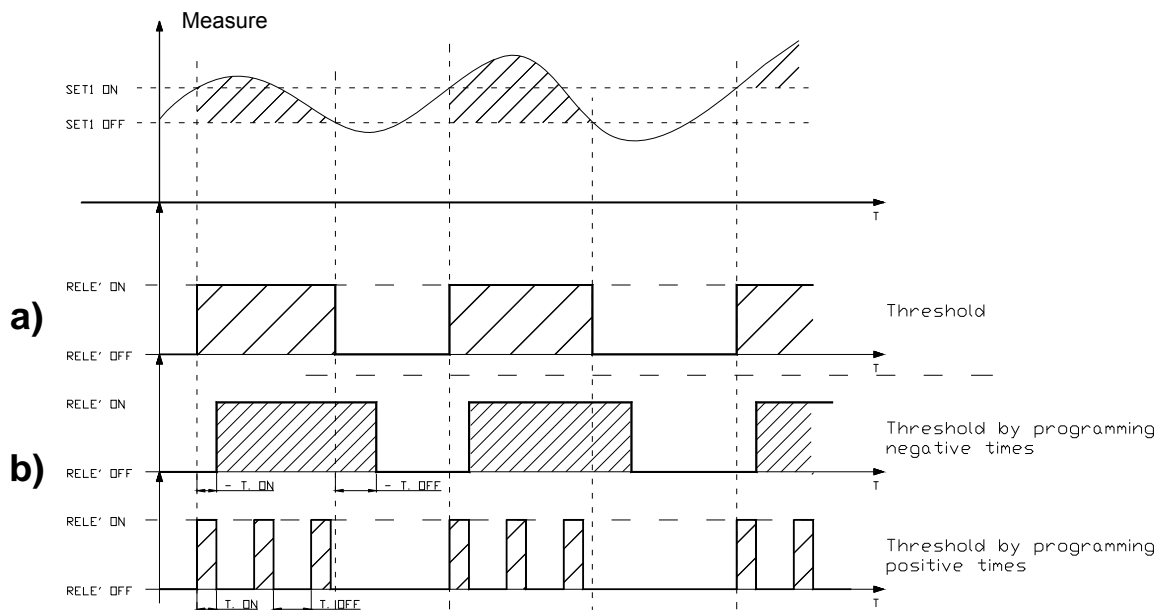


Fig 7 - Operation of Relay 1

By acting on the **Start** e **Stop** parameters is possible to set a time lag (on 24 daily hours) to make the relays open or closed *INDIPENDENTLY FROM THE MEASURED CHLORINE VALUE*

Start ON sets the time in which the Relay closing lag starts

Start OFF sets the time in which the Relay closing lag has to be stopped

Stop ON sets the time in which the Relay opening lag starts

Stop OFF sets the time in which the Relay opening lag stops

Using Relay Mode is possible, pushing ENTER and then DOWN, to do a PFM modulation (leaving the settino on THRES the dosages are executed using the previously set ON and OFF values) of the relay and then of the chlorine dosage.

Set point PFM: allows to set the threshold value.

Range PFM: allows to set the measuring range in which the PFM modulation will be executed.

MIN/MAX PFM: allows to evaluate if the instrument is adding (MIN) or subtracting (MAX) chlorine. Fmax PFM: shows the highest commutation frequency of the relay in impulse/min.

LOGIC SET:

This function activates an alarm when the measuring values are located outside of a specific “window”. It is, in reality, possible to programme a minimum value and a maximum value and once they are exceeded the instrument will generate an alarm. This function will allow an alarm to be activated if the measure values are over a certain “range”. In fact, it is possible to program a minimum and a maximum value: when exceeded, the equipment will generate an alarm.

This Logical Set is useful to control any possible faults to the system, eg. Defects in the dosage pumps etc.

N.B.: Indipendently from this function the system will generate an alarm (will close the ALARM relay and open the SET POINT relay) when the following condition happens:

if, after 3 consequently measurements, the chlorine value is still 0,00ppm, before the following measurement, the device will actuate the peristaltic pump for 30’ (to obtain a consistent reagents afflux in the measurement cell) then it will do the fourth measurement

if also the fourth consequently measurement gives 0,00 ppm, the device considers an alarm event and, independently from others settings, closes the ALARM relay and opens the SET POINT one.

MANUAL CONTROLS:

It is possible to set the manual controls of the SET POINTS 1 and 2. It is possible to choose between AUTO, OPEN, CLOSE.

B2) Current Output

In this step of the programme can be setted the following functions:

OUTPUT RANGE:

A selection can be made between 0-20mA or 4-20mA. The default is programmed at 0-20mA.

LOWER LIMIT:

A Chlorine value at 0 to 4mA of outward current can be set. The default is set at 0,00 ppm.

UPPER LIMIT:

A Chlorine value of 20mA can be set for outward current. The default is set at 5,00 ppm.

The regulation of Lower and Upper Limit functions allows to amplify the scale of analogical outputs. Furthermore, the output can be inverted to 20-0mA o 20-4mA.

B3) Calibration

This step of the programme is dedicated to the calibration of the instrument by using a solution with known Chlorine concentration (or another reference measurement system).

AUTOMATIC

By selecting this function and pressing the button ENTER the system activate a complete measurement cycle. When the cycle is over the device shows an apparent value based on a previous calibration values.

Now, by using the buttons UP and DOWN is possible to introduce another value and confirm this pressing ENTER.

In this way the system calculates a new “gain” that can be applied on all measurement scale.

RESET DEFAULT

By selecting this function and pressing the push button ENTER the system resets the Default calibration values.

B4) Analysis lag

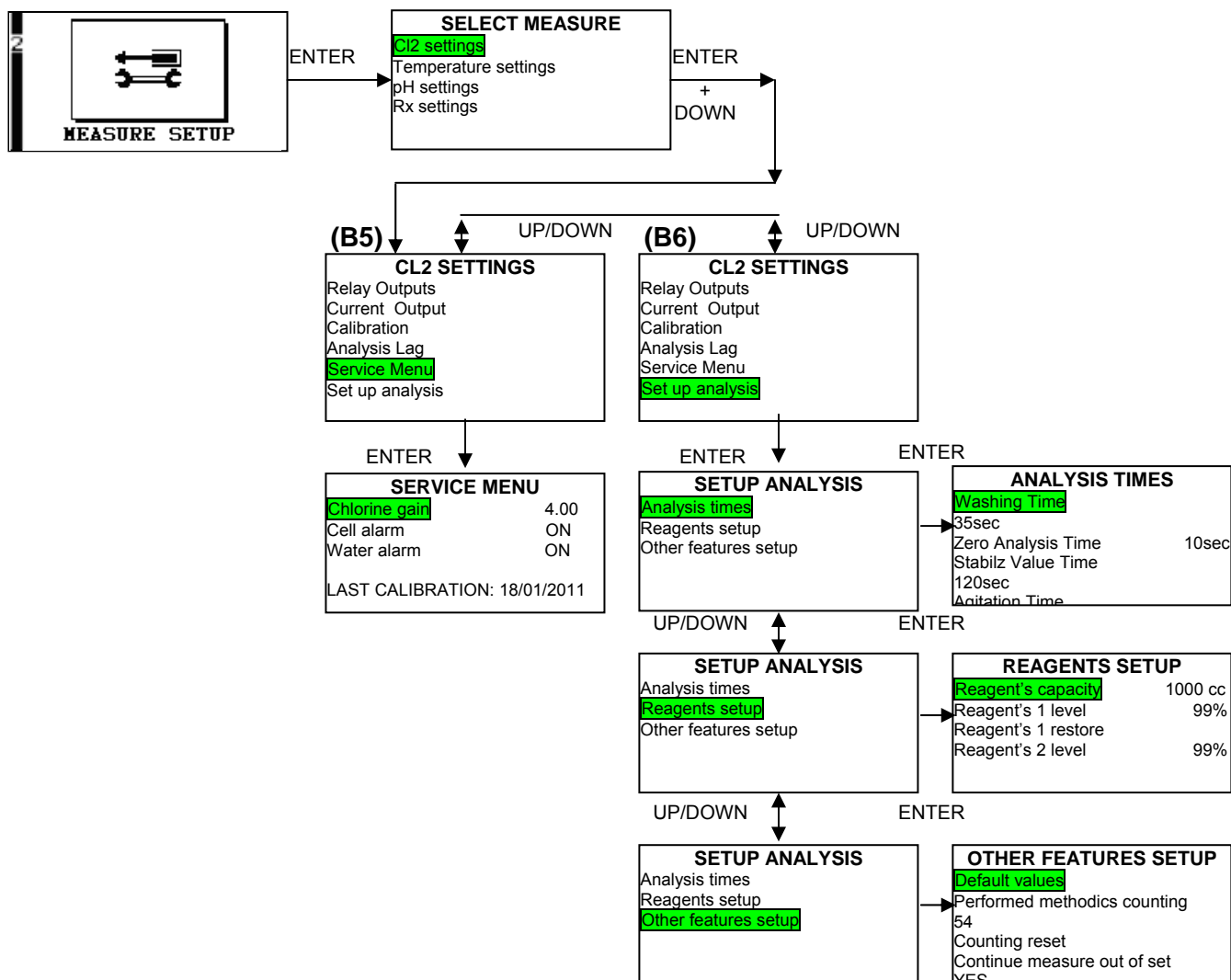
This function allows to set the time lag between a measurement and another.

NOTE



whatever is the setted value, if the measured value exceeds the set point values the system resets automatically the minimum time lag (about 3 min.) and repeats the measurements with the default settings until the value will be in the right range. Then the device comes back to consider the time lag setted by the operator.

4.3.3 MEASURE SETUP MENU (CL2 SETTINGS: SERVICE MENU, SETUP ANALYSIS)



B5) Service menu

This step of program is used by supplier staff for particular functions.

B6) Setup Analysis

This function allows to the skilful operator to modify the measurement cycle standard settings.

ANALYSIS TIMES

This function allows to set the times of the analysis.

Washing time: duration of the rinsing phase of the measurement cell.

Zero analysis time: duration of zero phase – Residence time of the sample in the measurement cell without reagents.

Stabilization value time: duration of the reaction between reagents and sampler.

Agitation time: duration of the agitation.

Reagent inlet time: working time of the peristaltic pump, which defines how much reagent has to be dosed in the measurement cell.

REAGENTS SETUP

This function allows to set the reagents parameters, such as capacity and levels.

OTHER FEATURES SETUP

This function allows to set many other parameters.

Default values: resets the initial setup.

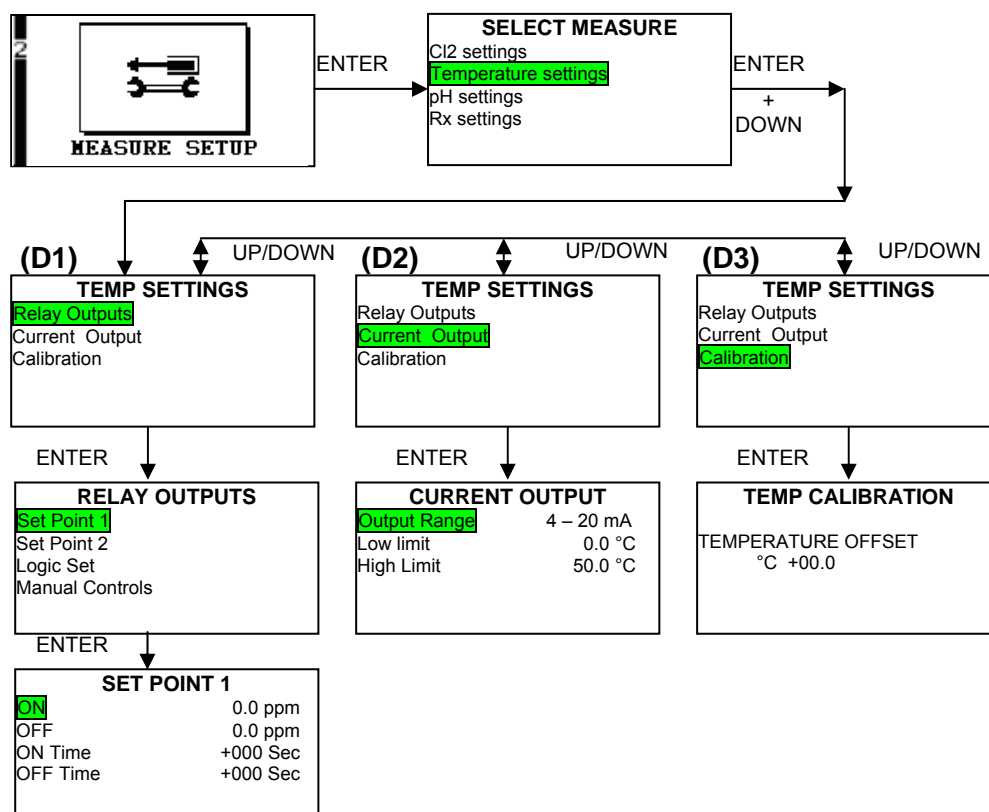
Performed methodics counting: allows to count the methodics performed by the instrument.

Counting reset: allows to reset the counting of the performed methodics.

Continue measure out of set: setting this value on “YES” allows the instrument to perform continue methodics under the set point value. Setting this value on “NO” allows the instrument to perform methodics during the time range set by the user, irrespective of the set point value.

Max number of measures at 0: allows to set the maximum number of measures on top of which the relay opens and stops the dosage.

4.3.4 MEASURE SETUP MENU (TEMPERATURE SETTINGS)



D1) Relay Outputs

For this setting see par. 4.3.2.

D2) Current Output

For this setting see par. 4.3.2.

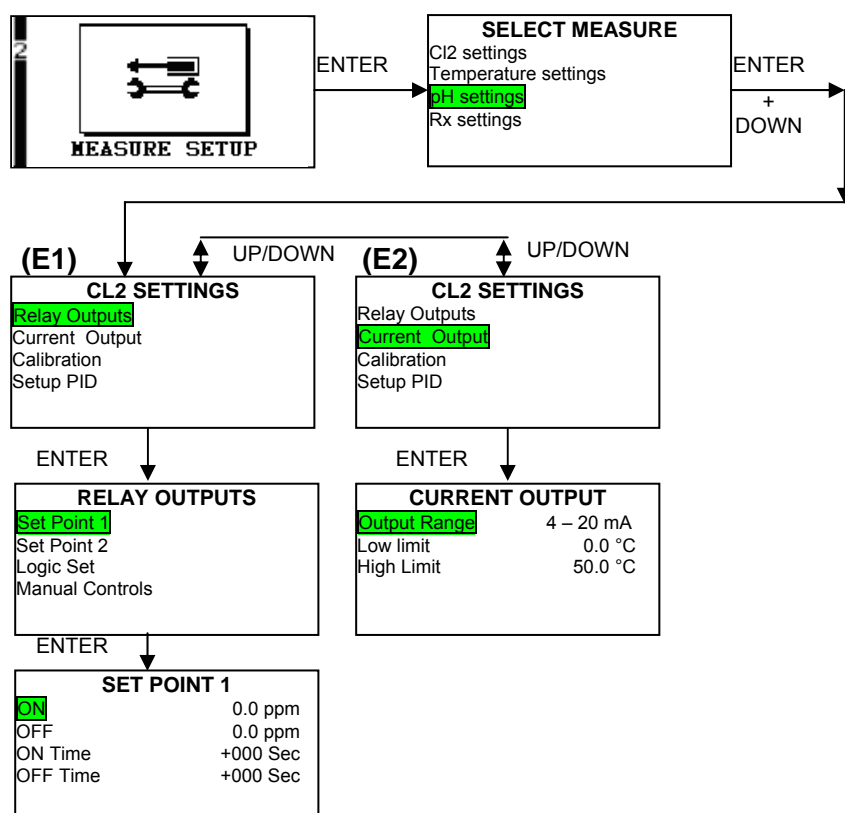
D3) Calibration

This function allows to align the measure by using another reference system:

Selecting this function and pushing the ENTER key it is possible to insert a temperature value by using these keys UP and DOWN and confirming with this one ENTER.

So that the System calculates a new “gain” and applies this gain to all the measure scale.

4.3.5 MEASURE SETUP MENU (PH SETTINGS: RELAY OUTPUTS, CURRENT OUTPUT)



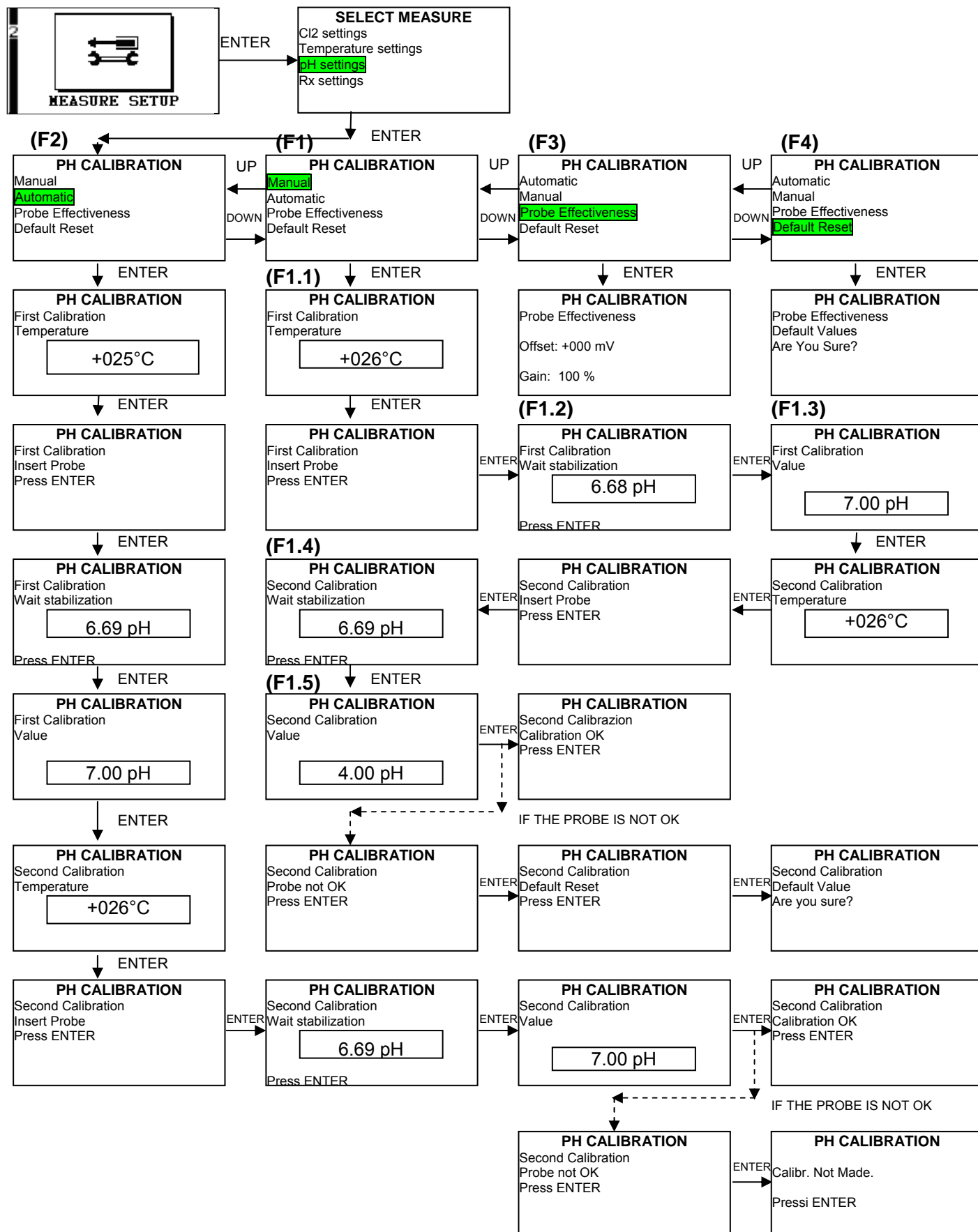
E1) Relay Outputs

For this setting see par. 4.3.2.

E2) Current Output

For this setting see par. 4.3.2.

4.3.6 MEASURE SETUP MENU (PH SETTINGS: CALIBRATION)



F1) Manual

The pH calibration includes two calibration points..

F.1.1) First calibration must be carried out using pH7 buffer!! After inserting the temperature compensation value of the calibration solution (if the temperature probe is connected, the temperature will be read automatically) press the ENTER key and dip the pH electrode into the pH7 buffer solution, then press the ENTER key once again.

F.1.2) Wait till the displayed value read by the probe stabilizes, then press the ENTER key.

F.1.3) The instrument automatically recognises the solution and display the pH7 buffer value; press the ENTER key.

F.1.4) and F.1.5) Carry out the second point calibration as with the first one. In this phase, acid buffers (pH4) or alkaline buffers (pH9) can be used; the instrument will recognise them automatically. pH buffers different from 4 or 9 can be also used by modifying the buffer value displayed by pressing the UP and DOWN keys.

For choosing between acid and alkaline buffer, please refer to the probe working range, i.e.: if the working range is between 4 and 8 pH, use a pH4 as the second calibration point.

Once the calibration of the second point has been completed, the instrument will control the calibration data consistency and if everything is Ok the message "Calibration OK" or "Correct probe" will be displayed on the instrument.

If the calibration is correct, the probe Effectiveness values will be displayed on the instrument.

If "Faulty Probe" is displayed, we recommend:

- To check the electrode physical integrity and the protection cap removing
- To assure the cleaning of the porous plug, if not, dip the electrode into a regenerant solution (Chloridric acid 3-4% solution) for some minutes
- To check the cable integrity, the correct connection to the instrument and on the electrode.

F2) Automatic

The automatic calibration is very similar to the manual celibration described in the following lines; the main difference is that in this function the instrument is able to automatically recognize standard buffer solutions, assigning at the measured value the corresponding standard buffer value. The instrument can recognize the following standard buffer solutions for pH calibration: pH 7.00, pH 4.01, pH 10.00. The instrument can also recognize a buffer solution of 465 mV for the ORP automatic calibration.

F3) Probe Effectiveness

These parameters inform the user about the pH or ORP probe and refer to the latest calibration.

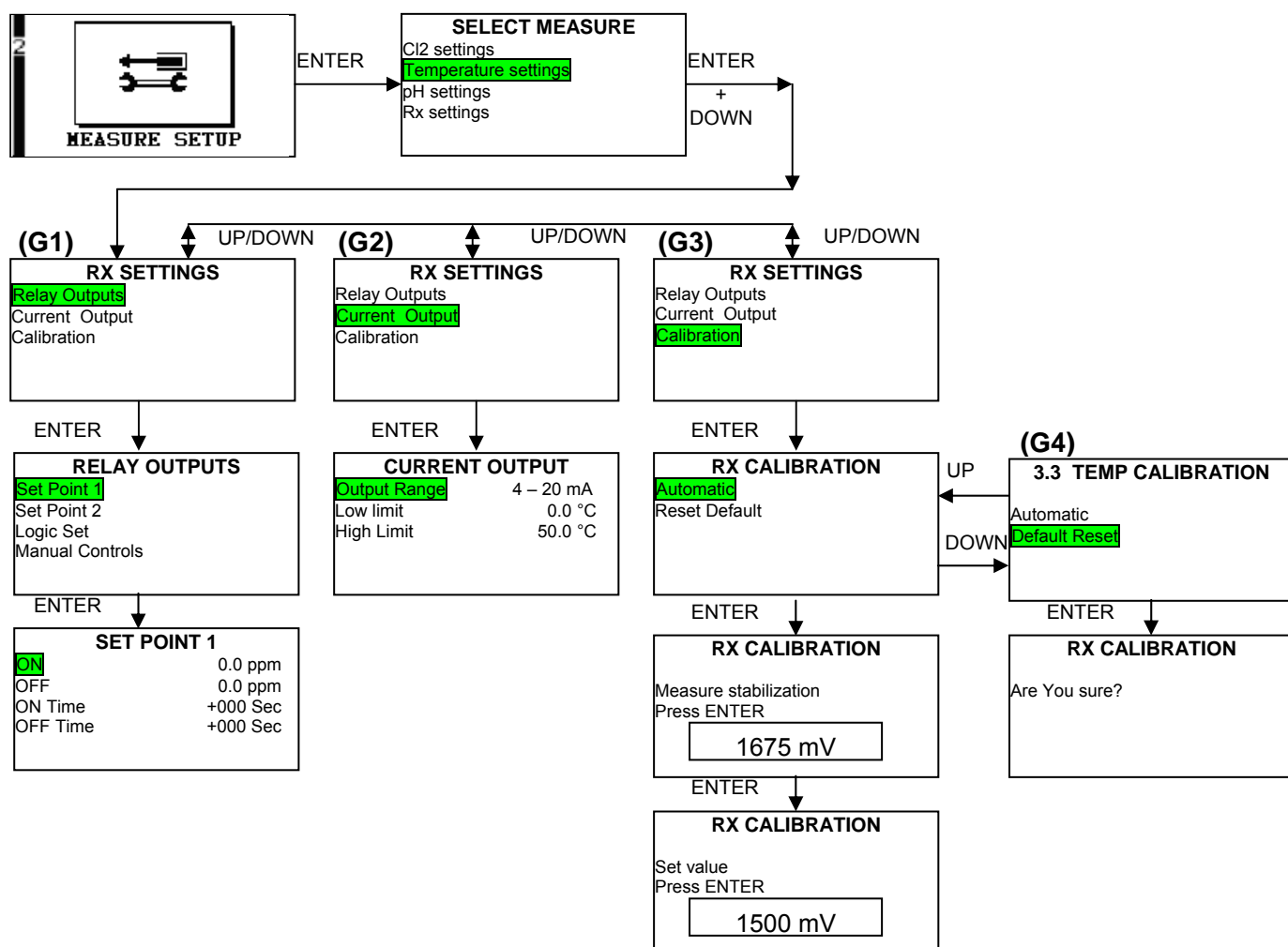
As to the pH probes, when the OFFSET value is above $\pm 100\text{mV}$ and the Gain falls to below 50%, it means that the electrode needs to be regenerated or replaced.

As to ORP probes, when the OFFSET value is above $\pm 100\text{mV}$, it means that the electrode needs to be regenerated or replaced.

F4) Default Reset

This programme step allows for the calibration factors to be reset to the original factory ones. To be used when incorrect calibrations are confirmed hese parameters inform the user about the pH or ORP probe and refer to the latest calibration.

4.3.7 MEASURE SETUP MENU (RX SETTINGS)



G1) Relay Outputs

For this setting see par. 4.3.2.

G2) Current Output

For this setting see par. 4.3.2.

After inserting the calibration solution temperature compensation value (if the Temperature probe is connected the temperature will be read automatically), press the ENTER key and dip the ORP electrode into the calibration solution, then press the ENTER key once again.

Wait till the displayed value, read by the probe, stabilise, then press the ENTER key.

The instrument will automatically display a value in mV which may be modified in relation to the value of the solution used, by pressing the UP or DOWN arrow. Press the ENTER key.

The instrument will then verify the calibration data. If they are correct, the message "Calibration OK" will be displayed, otherwise the message "Faulty Probe" will be shown.

If the calibration is correct, the Probe Effectiveness value will be displayed on the instrument.

If "Faulty Probe" is displayed, we recommend to complete the controls as per the pH electrode.

G3) Automatic

The automatic calibration is very similar to the manual calibration described in the following lines; the main difference is that in this function the instrument is able to automatically recognize standard buffer solutions, assigning at the measured value the corresponding standard buffer value. The instrument can recognize the following standard buffer solutions for pH calibration: pH 7.00, pH 4.01, pH 10.00. The instrument can also recognize a buffer solution of 465 mV for the ORP automatic calibration.

G3) Probe Effectiveness

These parameters inform the user about the pH or ORP probe and refer to the latest calibration.

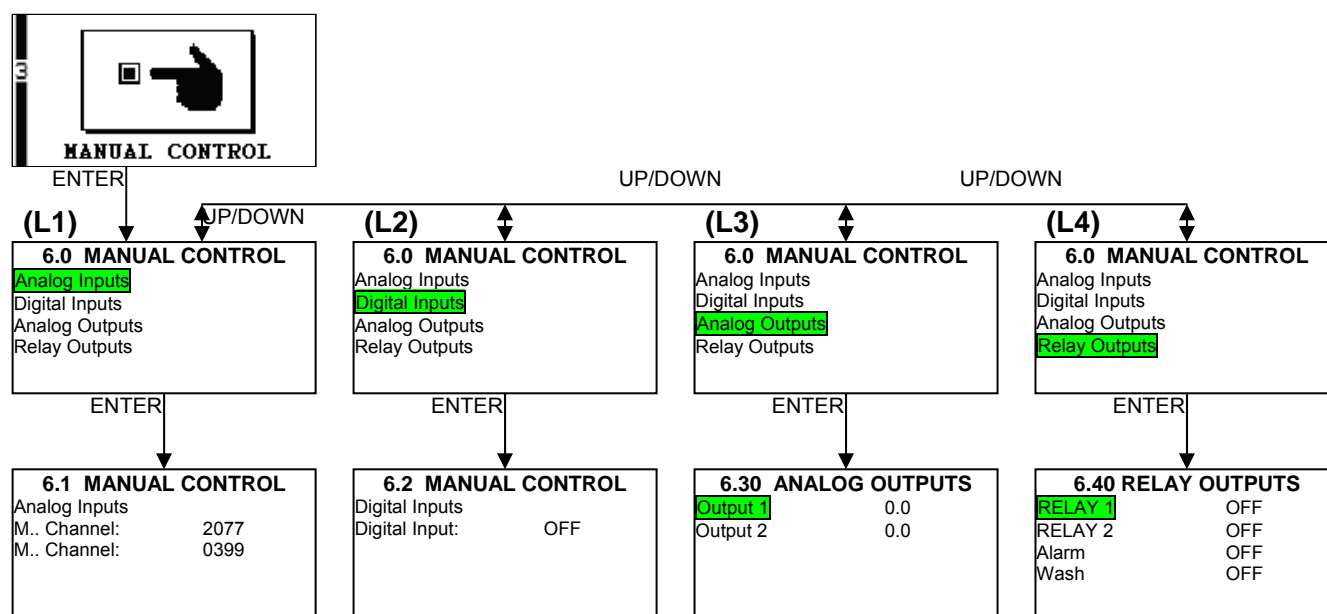
As to the pH probes, when the OFFSET value is above $\pm 100\text{mV}$ and the Gain falls to below 50%, it means that the electrode needs to be regenerated or replaced.

As to ORP probes, when the OFFSET value is above $\pm 100\text{mV}$, it means that the electrode needs to be regenerated or replaced.

G4) Default Reset

This programme step allows for the calibration factors to be reset to the original factory ones. To be used when incorrect calibrations are confirmed.

4.3.8 MENU MANUAL CONTROL (ANALOG INPUTS, DIGITAL INPUTS; ANALOG OUTPUTS, RELAY OUTPUTS)



This step of the programme is useful for all functional controls eg. Upon installation to check functioning of the entire system.

L1) Analogical Inputs

This function allows for the values read by the digital analogical converter related to the PH / ORP and temperature measuring to be seen directly.

This allows you to understand if the level of analogical acquisition of the instrument works correctly.

L2) Digital Inputs

The instrument is fitted with a passive digital input, separated galvanically, which allows for the doses to be deactivated, on the Relay and also on the Analogical Outlets. This step allows you to

check whether or not the digital input of dosage deactivation works correctly. If it is Open it must indicate OFF and if, however, tension is applied to the clamps, according to specifications, the instrument should indicate ON.

L3) Analogical Outputs

It allows for manual simulation of both the Analogical Outputs under current. The variations of the outputs have a pass of 0.1mA.

L4) Relay Outputs

It allows for manual activation of the Relay Outputs

CAUTION



When exiting from the “MANUAL CONTROL” function, all the possible manual settings will be reset.

5 USER MAINTENANCE

5.1 SPECIAL CAUTIONS FOR CRITICAL COMPONENTS

An LCD (Liquid Crystal Display) is incorporated into the equipment and it contains small amounts of toxic materials.

In order to avoid damages to people and to limit the negative effects on the environment, comply with the following instructions:

Display LCD:

- The LCD display of the electronic device is fragile (it is made of glass) and therefore should be handled with extreme care. For this reason we recommend that the device is protected in its original packaging during transport or when not in use.
- If the glass of the LCD breaks and liquid spills out, make sure that you do not touch it. Wash every part of the body that may have come into contact with the liquid for at least 15 minutes. If, once this operation has been carried out, you notice any symptoms consult a doctor immediately.