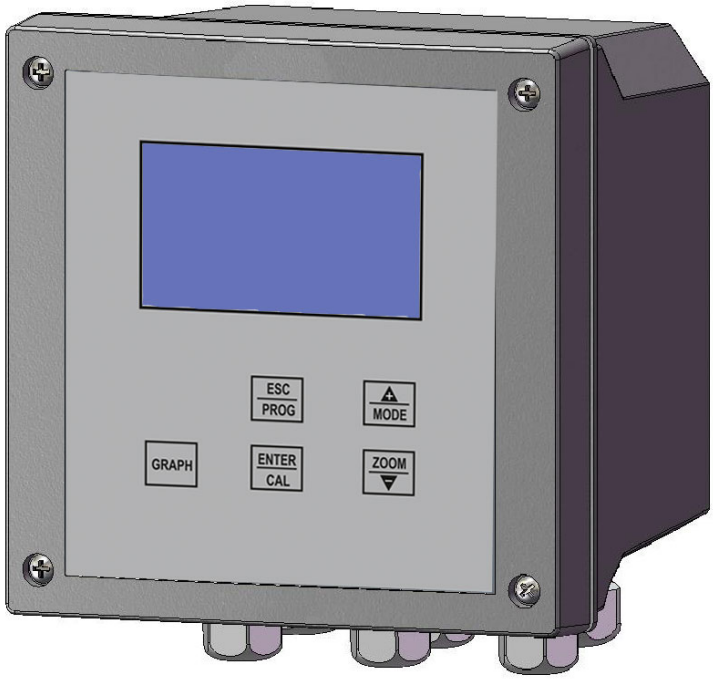
pH / ORP AND TEMPERATURE ANALYZER



TECHNICAL MANUAL

INDICE

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 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 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°C ÷ +50°C
  - Temperature of storage and transportation -25°C ÷ +65°C
  - Relative humidity 10% ÷ 95%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.

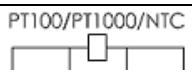
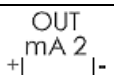
Non compliance with even just one of these conditions may lead the "logics" of the device to operate in a potentially dangerous manner for users of the service.

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.

SIMBOLO	DESCRIZIONE	POSIZIONE
	**Danger symbol**	A symbol located close to the clamps for connection to power.
	**Phase**	Symbols located close to the connections of the equipment to the electricity network
	Neutral	
	Earth protection	
	**Caution! Refer to the documentation attached**	A symbol located close to the points in which the user manual should be consulted for important information. (see paragraph CAUTION).
	**Positive**	POSITIVE pole of the connector RS485 (A+)
	Negative	NEGATIVE pole of the connector RS485 (B-)
	**Terminal Box - Probe**	pH / ORP sensor connection
	**PT100/1000**	Temperature sensor connection
	**Analogical output n.1**	0/4 ÷20mA separated galvanically
	**Analogical output n. 2**	0/4 ÷20mA separated galvanically
	**Symbol of separate collection of electrical and electronic equipment.**	Symbol placed on the top of the electronic box

1.5 CAUTION SYMBOL

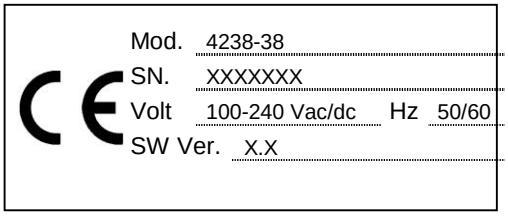
The symbol illustrated below represents the **CAUTION** symbol and reminds the operator that he should read the user manual for important information, advice and suggestions for the correct and safe use of the equipment.

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



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÷265Vac/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 different applications:

- Waste water treatment plant
- Treatment and Discharge of Industrial Water
- Fish farm
- Primary Water, Drinking Water

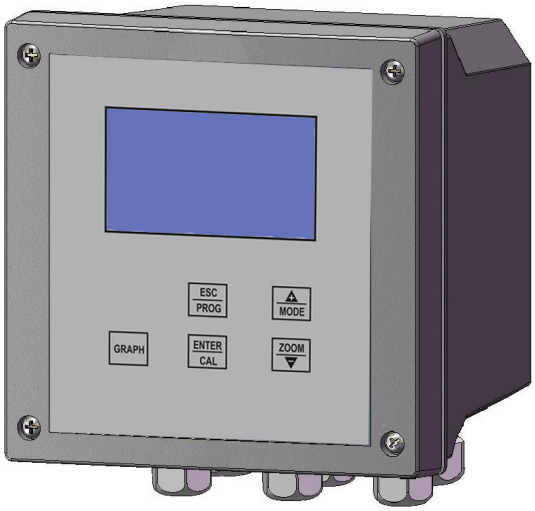


Figure 1 – pH / ORP and Temperature analyzer

2.1 MEASURING PRINCIPLES

2.1.1 PH MEASURER

It is an instrument designed to measure the level of acidity of a liquid, that is to say the property of a substance to be sent into an ion solution of Hydrogen (H^+). The unit of measurement of this property is pH (abbreviation of potential Hidrogenium) and it represents the opposite of the decimal logarithm of the concentration of H+ ions present in the solution. In the case of pure water at room temperature, the value indicated above is 7. Basic solutions are the ones with a pH value above 7 and acid solutions are the ones with a pH level below 7. The highest and lowest limits of the scale are pH=0 for pure acids and pH=14 for pure bases.

Electrochemical, exam strips, indicators or colour metres are the pH value measurers available. Out of all of these methods, just one electrochemical measuring provides well defined results.

This measuring is carried out using electrodes for the pH.

The electrode for the pH is an electrochemical sensor made up of a measuring reference electrode. With regards to the pH value of the solution examined, the tension on a membrane varies.

The electrodes for the pH value currently in use have been developed to indicate a pH value of 7 in the presence of a tension of 0 mV in the membrane. The more the value moves from pH=7, the greater the tension of the signal. The pH metre determines the pH value according to this signal.

2.1.2 REDOX MEASURER

An instrument to measure the potential of the Oxidation Reduction Potential (ORP) that indicates the ability to exchange electrons between a donor element (reducing) and an accepting element (oxidizing) measured through the potential undertaken by an indifferent electrode (platinum/gold) emerged in the solution containing the oxidized or reduced form, compared with an oxidize chosen by chance as a zero electrode. The unit of measurement is Volts, but one of its multiples, milli-volts ($mV = V \times 10^{-3}$) is often used.

Some application examples of this measurement are the control of de-nitrification of discharge waters (the determination of the number of oxidization), surveillance of the disinfections effect of drinking water or swimming pool water or even for decontamination in galvanic procedures.

Measuring is carried out using an electrode for oxidation reduction. As in the case of the electrode for the pH value, this sensor is made up of a measuring electrode and a reference electrode. The measuring function however is not carried out, in this case, by a glass membrane but by a platinum (or gold) membrane. The inclination of the ions in the solution to absorb or transmit electrons determines the potential of the platinum and consequently the tension of the electrode. Normal electrodes currently in use are fitted with a hydrogen electrode (UH), a silver/silver chloride electrode (UB) and this means that the tension indicated refers to this system.

2.2 MAIN CHARACTHERISTICS

- Measuring of the pH / ORP
- Measuring of Temperature using the PT100/PT1000 probe
- Automatic Compensation of Temperature
- Programming key pad with 4 keys
- LCD Graphic display 128x64 with background illumination
- Internal Data Logger (flash 4 Mbit) with the possibility of graphic and table visualisation of measurement trends
- PID adjustment
- Serial outlet RS485 MOD BUS RTU
- Data download on USB key (optional)
- 2 Programmable Analogical Outlets
- 2 Relay Outlets for intervention thresholds
- 1 Relay Outlet for Instrument Anomaly Alarm or Temperature Set Point
- 1 Relay Outlet for Probe Washing or Temperature Set Point
- 1 Digital Entrance for disabling of doses

➢ ***Main hardware characteristics of the electronic device***

The hardware structure of this periphery is based on the adoption of extremely new CPU CMOS with 8 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 storage figures in a chronological order.

2.2.1 TECHNICAL CHARACTERISTICS FOR PH MEASURING

The technical characteristics of the Analyser are listed in the following Table:

Measurement range	00.00 ÷ 14.00pH
Resolution	± 0.01pH
Precision	± 0.2% f.s.

2.2.2 TECHNICAL CHARACTERISTICS FOR REDOX MEASURING

Measurement range	± 1500mV
Resolution	± 1mV
Precision	± 0.2% f.s.

2.2.3 TECHNICAL CHARACTERISTICS FOR MEASURING OF SECONDARY TEMPERATURE

Sensor	PT100/PT1000
Measurement range	0 ÷ +50°C.
Resolution	± 0.1°C
Accuracy	± 1% F.S:

2.2.4 OPERATING FEATURES

Power supply	100 ÷ 240 Vac/dc 50-60 Hz (optional 24 Vac/dc)
Power consumption	< 7W
Relay outputs:	
Set Point ON – OFF	00.00 ÷ 2.00 / 5.00 / 10,00/ 20,00 / 200 / 500 / 2000 / 10000 100000 pH o mg/l
ON – OFF Time	000 ÷ 999 Seconds For every digital output a relay with contacts opened normally is used. The maximum current commutable is 1 Ampere, the maximum tension commutable is 230Vac, maximum power 230VA on a resistive load
Alarm:	
Function	Delay, Faults and Min./Max.
Delay time	00:00 ÷ 99:99 min
Threshold disabling	Enable / Disable
Relay function	Closed / Open
Holding range	00.00 ÷ 2.00 / 5.00 / 10,00/ 20,00pH
Holding time	00:00÷ 99:99 min For alarm end wash digital output, a relay with contacts opened normally is used. The maximum current commutable is 1 Ampere, the maximum tension commutable is 230Vac, maximum power 230VA on a resistive load

Digital input:

Input voltage	24 Vdc /ac
Absorption	10mA max

Analogic outputs:

Outputs	n.2 programmable outputs 0/4-20mA
Max. load	500 Ohm
NAMUR alarm output	2.4 mA (with range 4/20mA)
PID dosing function	P – PI – PID
Proportional band	0 – 500%
Integration	0:00 – 5:00 min
Derivative	0:00 – 5:00 min

2.3 CONTROLS, INDICATORS AND CONNECTIONS

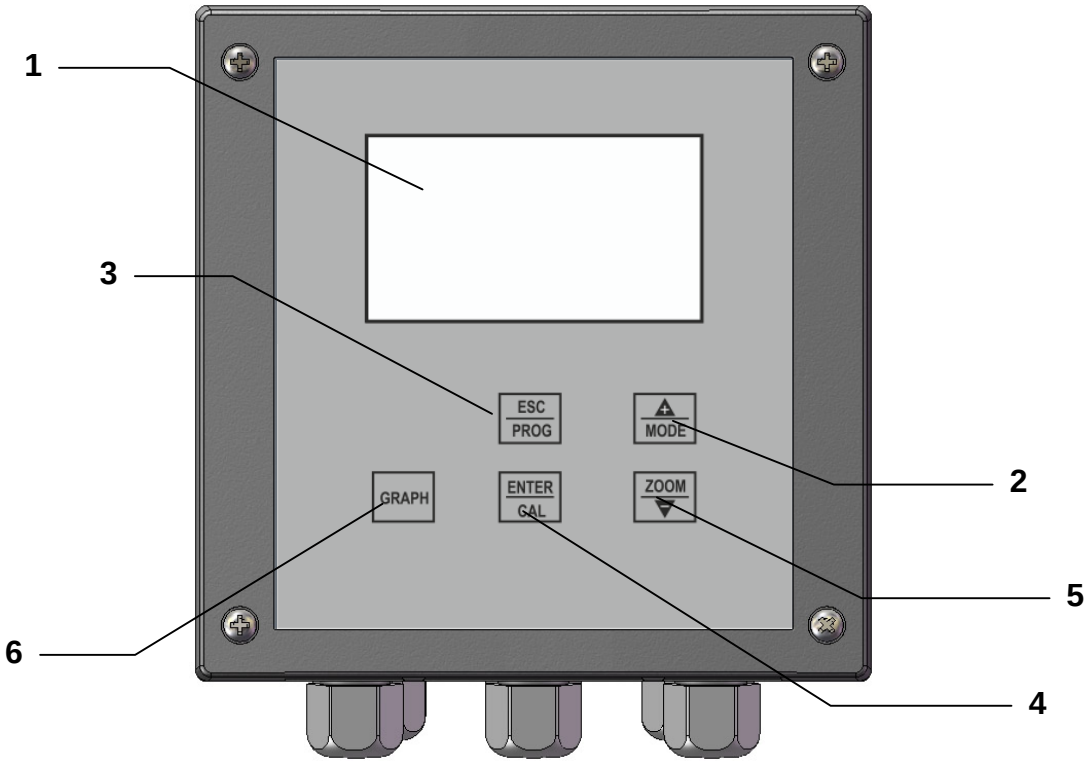


Figure 2 – Wall instrument, front panel

1. Visualizer with LCD Display
2. UP key
3. ESC key
4. ENTER key
5. DOWN key
6. GRAPH key

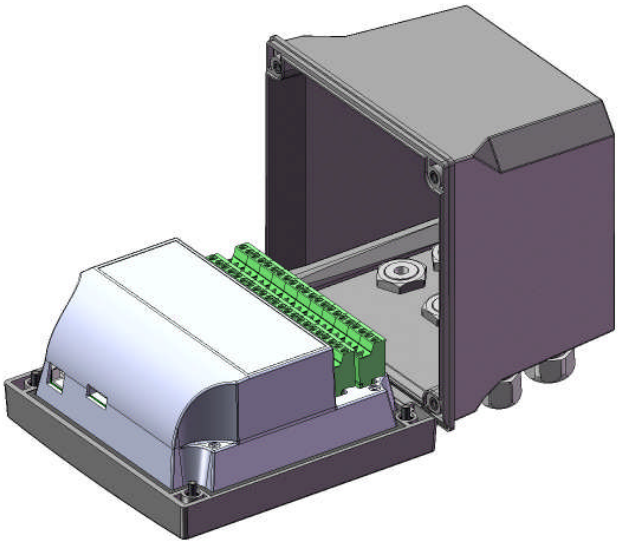


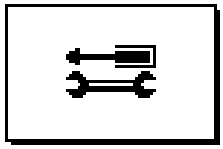
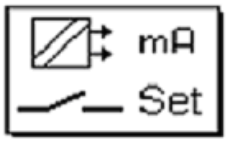
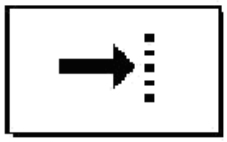
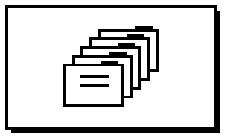
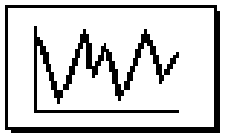
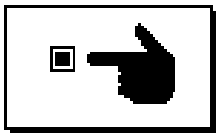
Figure 3 – Access to the terminal box

2.4 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.

2.4.1 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  SETUP	SETTINGS MENU All basic parameters for operation logics are set
2  OUTPUTS	OUTPUT MENU Setting of analogical and digital outputs
3  CALIBRATIONS	CALIBRATIONS MENU Calibration Procedure of the electrode
4  ARCHIVE	ARCHIVE MENU Setting of the data archive and visualization mode
5  GRAPHIC MEASUR.	GRAPHICAL MEASUREMENT MENU Visualization of archives in a graphical form
6  MANUAL CONTROL	MANUAL CONTROL MENU Manual control and activation of Inputs and Outputs

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

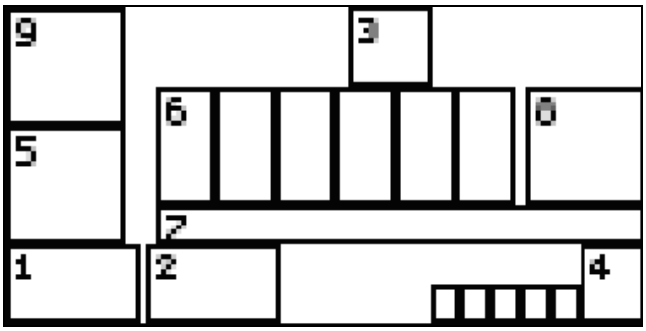
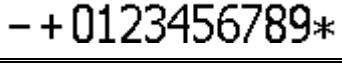
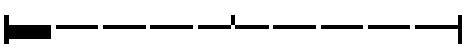
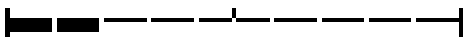
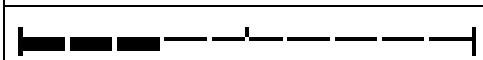
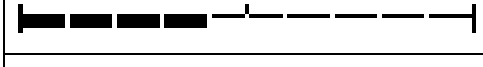
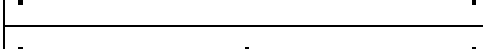
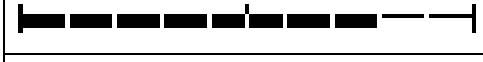


Figure 4 – Graphic display - divided up into areas

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

GRAPHIC ZONE	VISUAL REPRESENTATION	DESCRIPTION
		Stay time Probe frozen on a value
		Maximum Logical Set Exceeded
		Minimum Logical Set Exceeded
		Maximum dosage time exceeded
3		Washing stage active
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)
5		Alarm active – Alarm relay closed
6		Numerical
7		0% of the scale
		10% of the scale

GRAPHIC ZONE	VISUAL REPRESENTATION	DESCRIPTION
		20% of the scale
		30% of the scale
		40% of the scale
		50% of the scale
		60% of the scale
		70% of the scale
		80% of the scale
		90% of the scale
		100% of the scale
8		pH measurement unit
		ORP measurement unit
		Seconds during stabilization
9		Archive full
		Storage of Data

3 INSTALLATION

Before installing the 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 electrical control and command panel PN .....?????
- 1 Technical Manual PN .....?????

3.1.1 INSTALLATION OF WALL MOUNTED DEVICE

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

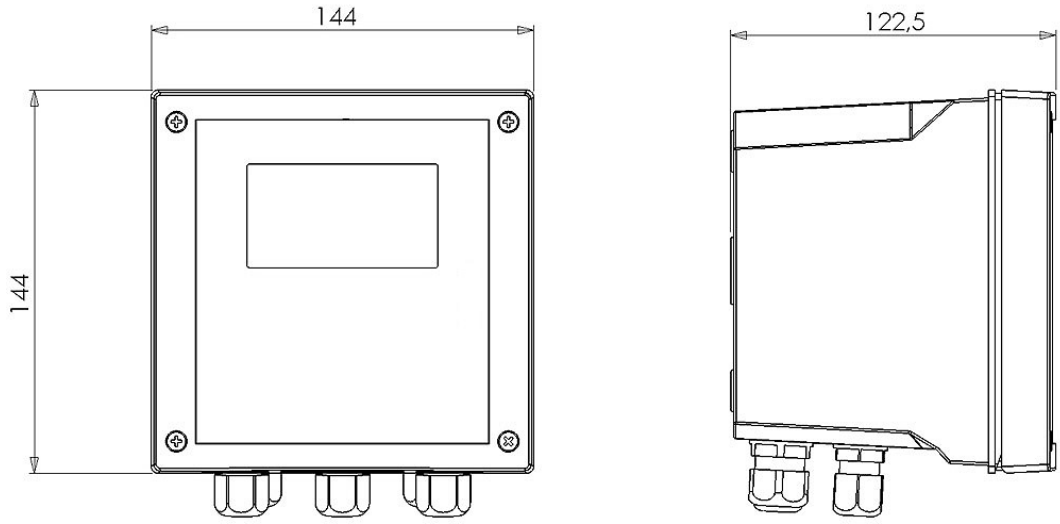


Figure 5 – Dimensions and encumbrance of the wall mounted device

Mechanical Dimensions	
Dimensions (L x H x P)	144x144x122,5mm
Fixing depth	122,5mm
Material	ABS Grey RAL 7045
Mounting	Wall
Weigth	1 Kg
Frontal Panel	Policarbonate UV Resistant

Open the instrument, open the pre-shaped holes and fix the instrument itself to the wall. Use the provided plastic caps to close the holes.

The terminal box for connections is located on the bottom of the gear case and it is necessary to keep it separated from other equipment by at least 15 cm. in order to make it easier to use. 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 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, mainly in industrial environments, 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.

3.1.2.1 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 the 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, the layout indicated in Fig. 7-a) can be used.

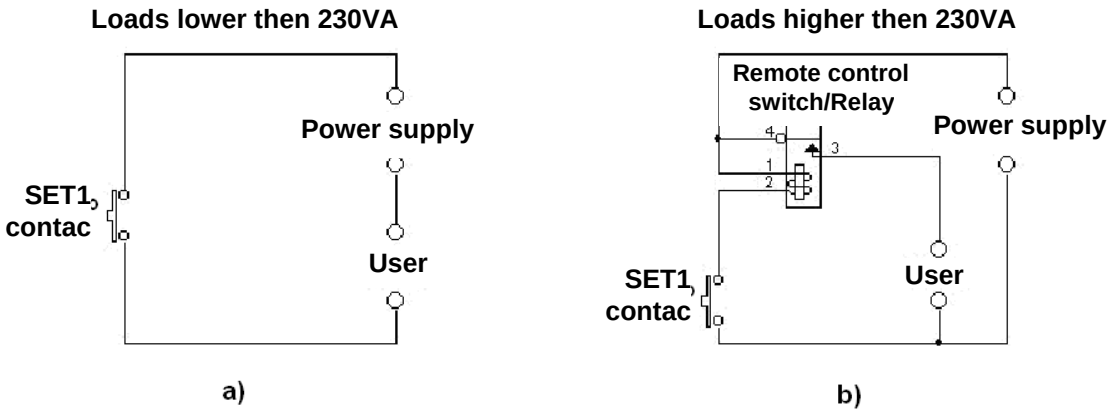


Figure 6 Examples of connection with users

NOTE

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

3.1.2.1.1 Connection terminal box for

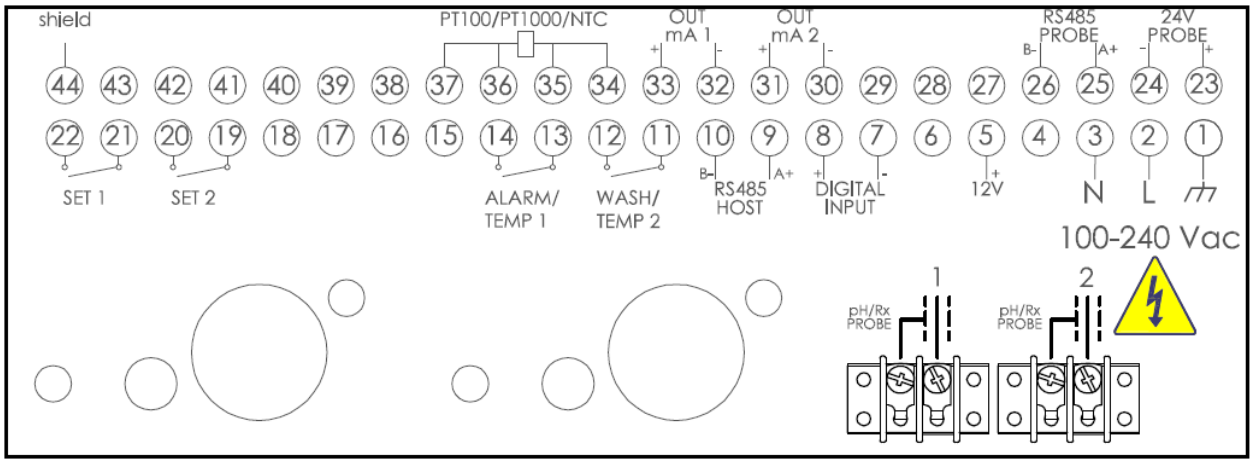
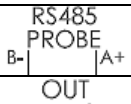
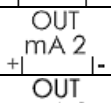
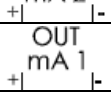
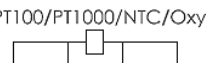


Figure 7 Connections terminal box

CLAMP Nr.	GRAPHIC	DESCRIPTION
1	⏚	Power supply (Earth)
2	L	Power supply (Neutral)
3	N	Power supply (Phase)
5	12V+	Probe Supply (+12V)
7	+| |- DIGITAL INPUT	Digital input (-)
8		Digital input (+)
9	B-| |A+ RS485 HOST	RS485 (A+)
10		RS485 (B-)
11	WASH/ TEMP 2	Relay for Wash and Temp (N.C. contact)
12		Relay for Wash and Temp (N.O. contact)
13	ALARM/ TEMP 1	Relay for Alarm and Temp (N.C. contact)
14		Relay for Alarm and Temp (N.O. contact)
19	SET 2	Relay for Set Point 2 (N.C. contact)
20		Relay for Set Point 2 (N.O. contact)

CLAMP Nr.	GRAPHIC	DESCRIPTION
21		Relay for Set Point 1 (N.C. contact)
22	SET 1	Relay for Set Point 1 (N.O. contact)
23		Differential Electrode Power Supply (+)
24		Differential Eelectrode Power Supply (-)
25		Differential Electrode connection (+)
26		Differential Electrode connection (-)
30		Output mA2 (-)
31		Output mA2 (+)
32		Output mA1 (-)
33		Output mA1 (+)
34		PT100 / PT1000 Common Cable
35		PT100 / PT1000 Signal Cable
36		PT100 / PT1000 Signal Cable
37		PT100 / PT1000 Common Cable
44	shield	Shield
Terminal Box		pH or ORP Analogyc probe connection, respect the clamp for the gear box and earth

3.1.2.2 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.

3.1.3 PH / ORP PROBE CONNECTION

Switch the instrument off.

Connect the electrode cables to the meter terminal board according to the colour codes on the adhesive label placed under the electronics container cover or referring to the manual (see sections 3.1.2.1.1).

The pH/ORP electrode cable max. length should not be longer than 15 metres. It is a good practice not placing the cable near high-power or inverter's cables, thus avoiding any interference when measuring the pH/ORP values.

4 METHODS OF USE

4.1 COMPOSITION OF THE MEASURING SYSTEM

4.1.1 MINIMUM CONFIGURATION

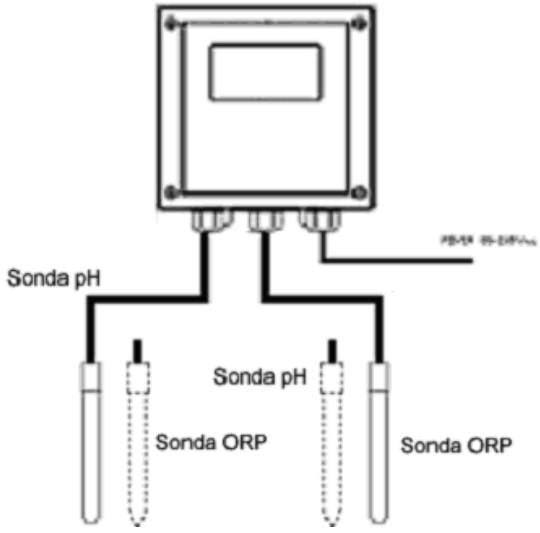


Figure 8 Minimum Configuration

4.1.2 MAXIMUM CONFIGURATION

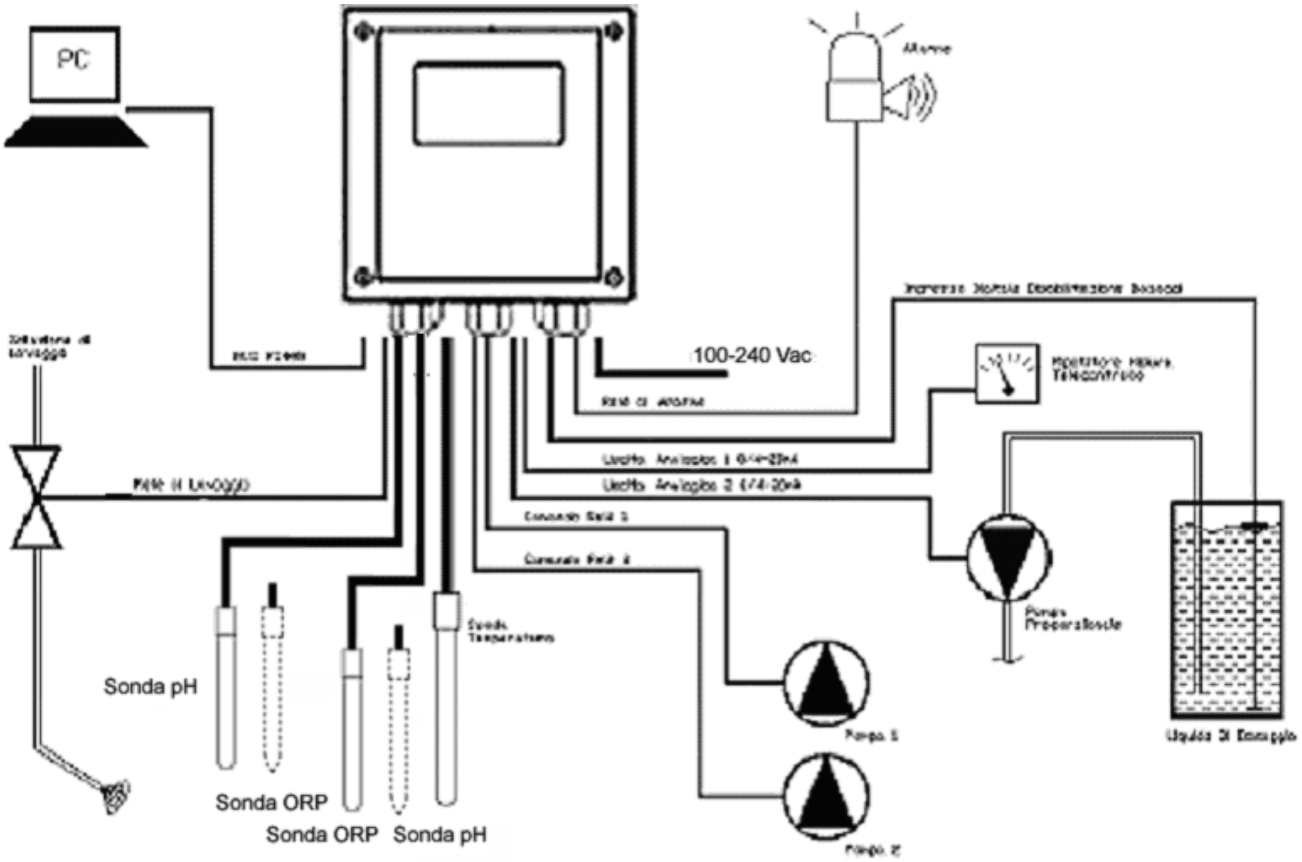


Figure 9 Maximum Configuration

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 MENU FUNCTIONS AT START

When the equipment is turned on, it is possible to use some keys to intervene on programming functions not present in the SETUP.

(See paragraphs 4.3.1; 4.3.2; 4.3.3)

4.2.1.1 Type of measurement selection (configuration pH or Redox)

Press the **UP** and **DOWN** keys together before turning the equipment on, then turn on and keep them pressed down for at least 5 seconds.

After the logo of supplier and indication of the SW version number, the window for the choice of configuration of the ORP or pH instrument will appear on the window, with the consequent cancellation of the parameters, see fig. 10.

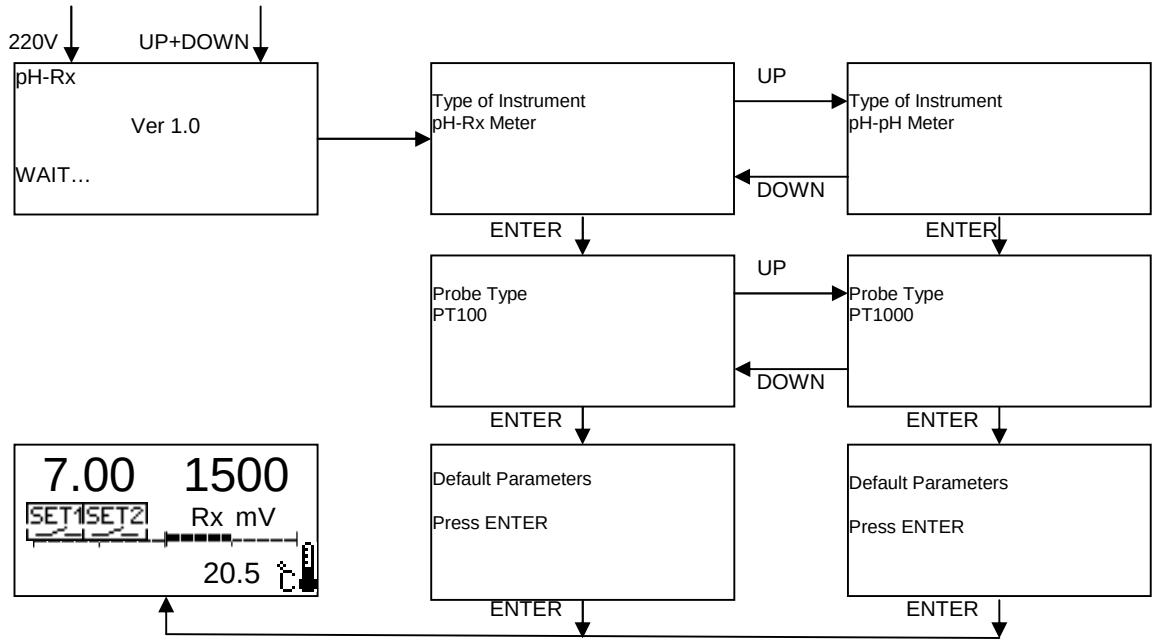


Figure 10 – Flow-Chart of Instrument Editing Function

4.2.1.2 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.

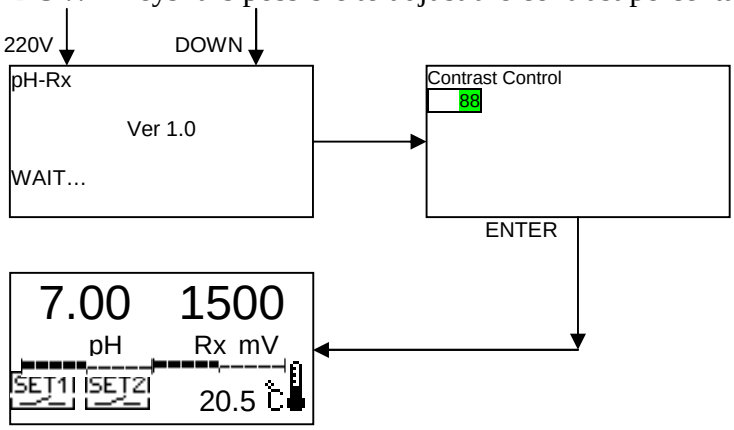


Figure 11 – Contrast Function Flow-Chart

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.

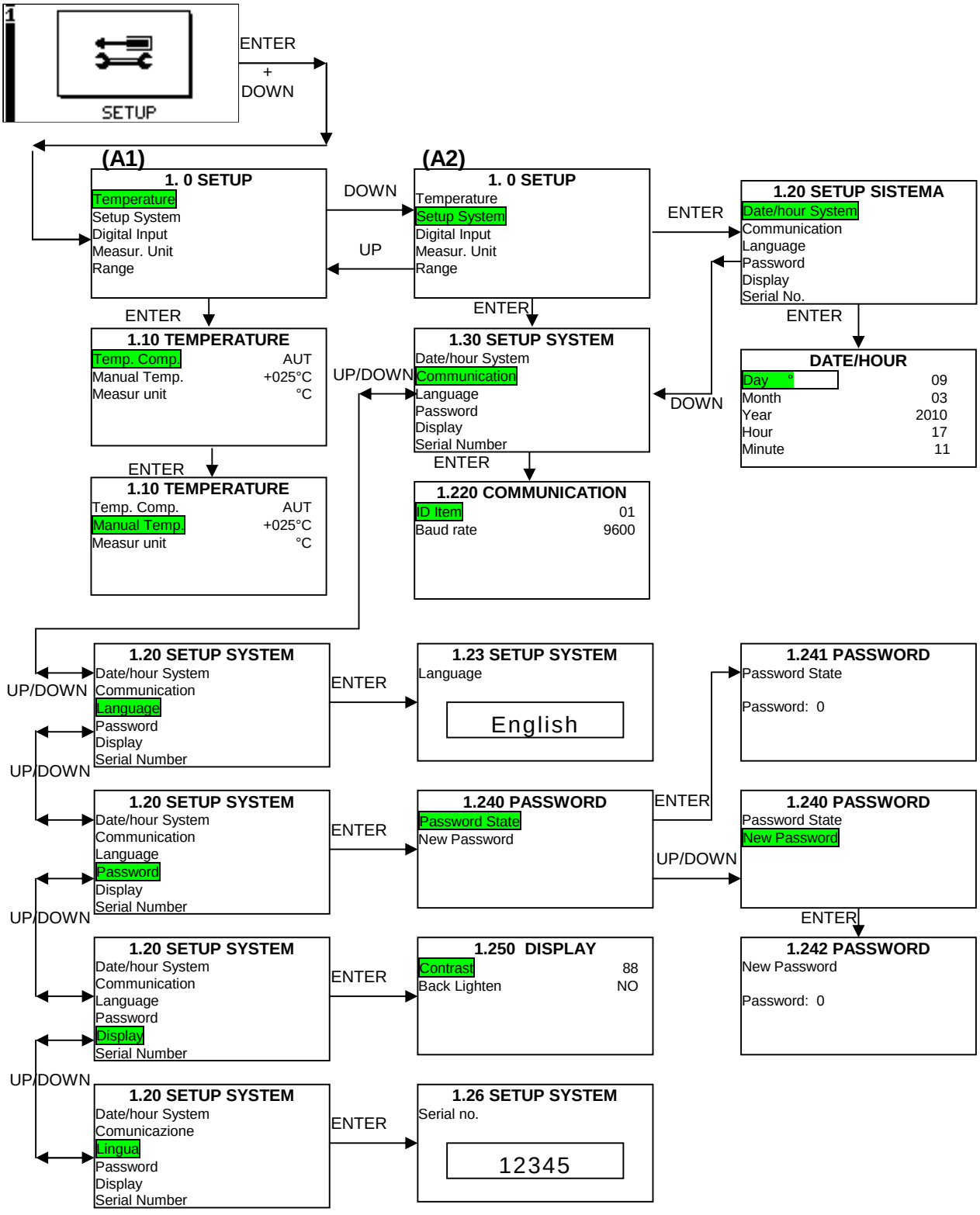
When turned on the apparatus will automatically position itself in a measuring method – the RUN function. By pressing the ESC key the programming method will be available through the first menu " 1 SETTINGS".

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 (TEMPERATURE – SYSTEM SETUP)



A1) Temperature

The Unit of Measurement function allows for the value of the temperature to be visualised in Centigrade or Fahrenheit. Centigrades are set as a default.

A2) Setup System

In this part of the programme which is divided up into 5 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.

COMMUNICATION

The instrument has a serial port in RS485 which is separated galvanically and can be used for dialogue with a HOST system using the standard protocol MOD BUS RTU. Through the serial port it is possible to visualise the real time status, programme all of the Set-Up and downloading all of the archives of the instrument.

The Communication Set-up function is used to programme the serial port and is divided up into two settings:

ID Instrument: A numerical address from 1 to 99 to which the instrument will reply. The default is 01.

Baud Rate: Speed of the RS485 serial which can be programmed at between 1200 and 38400. The default is 9600.

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. The default is 2002 which will always remain active even if a new password is programmed.

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.

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.

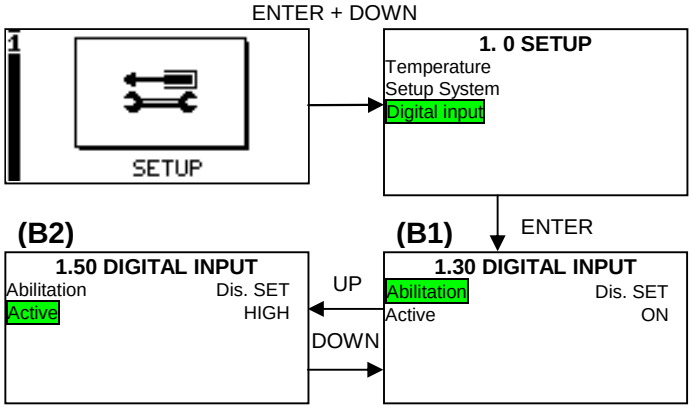
Background illumination: At this stage you can decide whether or not to maintain background illumination or to switch it off one minute after having released the key.

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

SERIAL NO.

In this part of the programme the serial number of the instrument is shown.

4.3.2 SETUP MENU (DIGITAL INPUT- MEASURING UNIT)



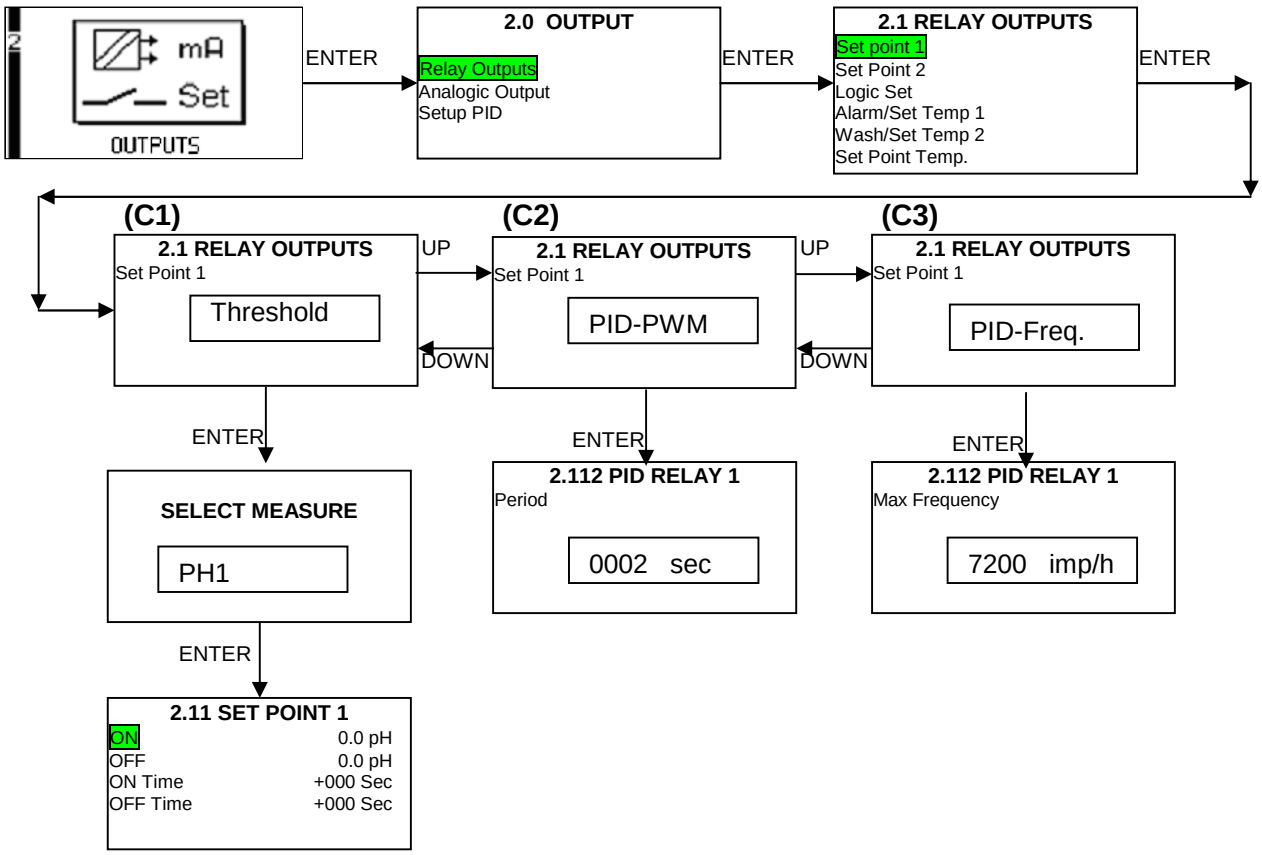
B1) Digital input: Abilitation

In this function it is possibile to assign the digital input.
Setting “Dis. SET” the digital input is assigned to the SET POINT disabilitation.
Setting “WASH” the digital input is assigned to the WASH.

B2) Digital input: Active

Set the directio of the input, if active when the input goes HIGH Or LOW.
Setting “HIGH” the digital input is active when the input itself is powered.
Setting “LOW” the digital input is active when the input itself is not powered.

4.3.3 OUTPUTS MENU (RELAY OUTPUTS – SET POINT 1)



The programming parameters of Set Point 1 establish the working logic of Relay 1. Once the measuring parameter is selected, it is possible to programme using the logics of Relay 1 in the following ways:

C1) Threshold

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 (fig. 12.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 (fig. 12.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 fig.13.

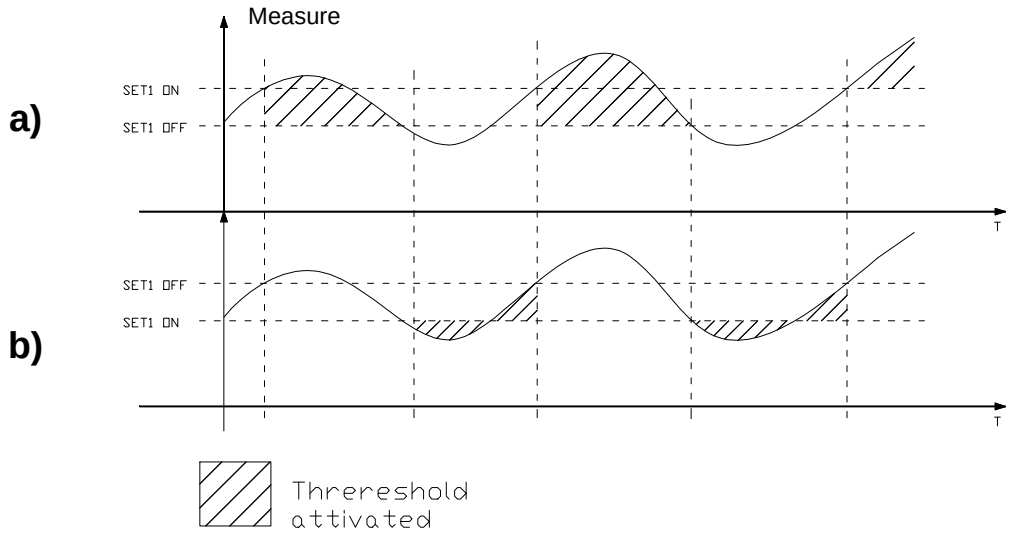


Figure 12 – Threshold operation

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 of positive ON and OFF Times can be defined. (fig. 13)

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

Eg. Time ON: –5sec , Time OFF -10sec. (fig. 13.a)

When the threshold is activated, the relay will close after 5 seconds (***ON time***) and it will remain closet for the entire period in which the threshold is active. When the threshold is deactivated 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. (fig. 13.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.

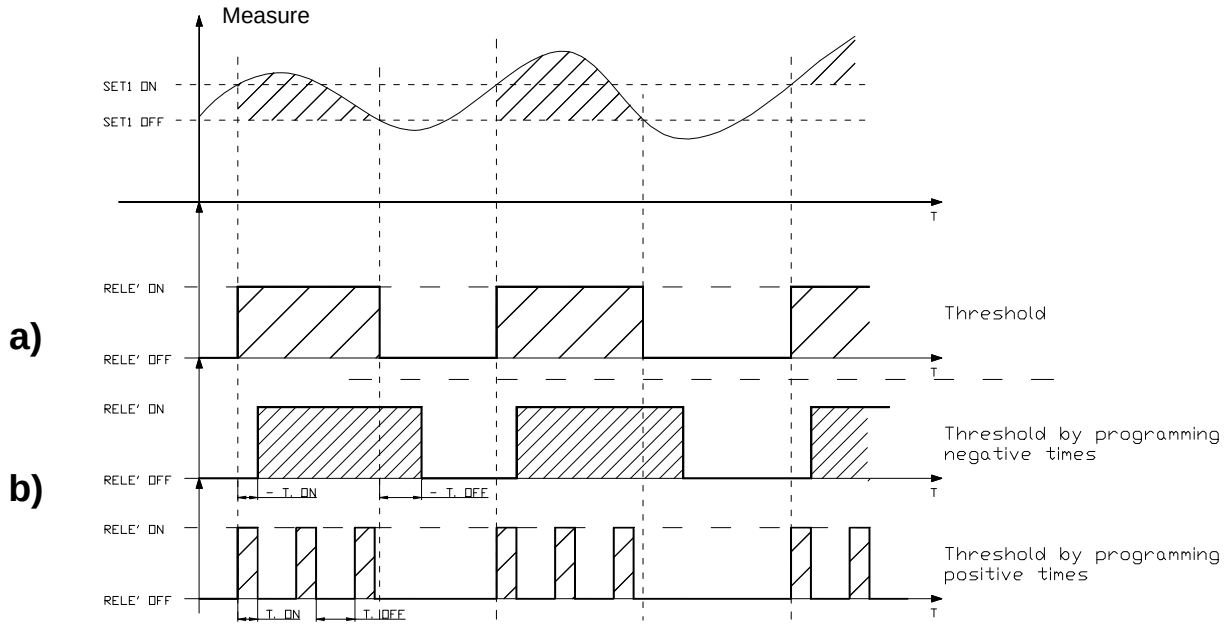


Figure 13 – Operation of Relay 1

C2) PID-PWM

By defining the Set Point as PID-PWM, through Relay 1, it is possible to activate a pump with an ON/OFF command almost as if it had a proportional adjustment. For this function the time period must be programmed (in seconds) within which the calculation of the PWM adjustment will come about. The maximum time that can be programmed is 999 seconds with a 1 second step. We recommend starting with short periods of time and increasing them gradually in order to avoid drastic variations in measuring. For operation of the Relay in a PID-PWM function see fig. 13.b.

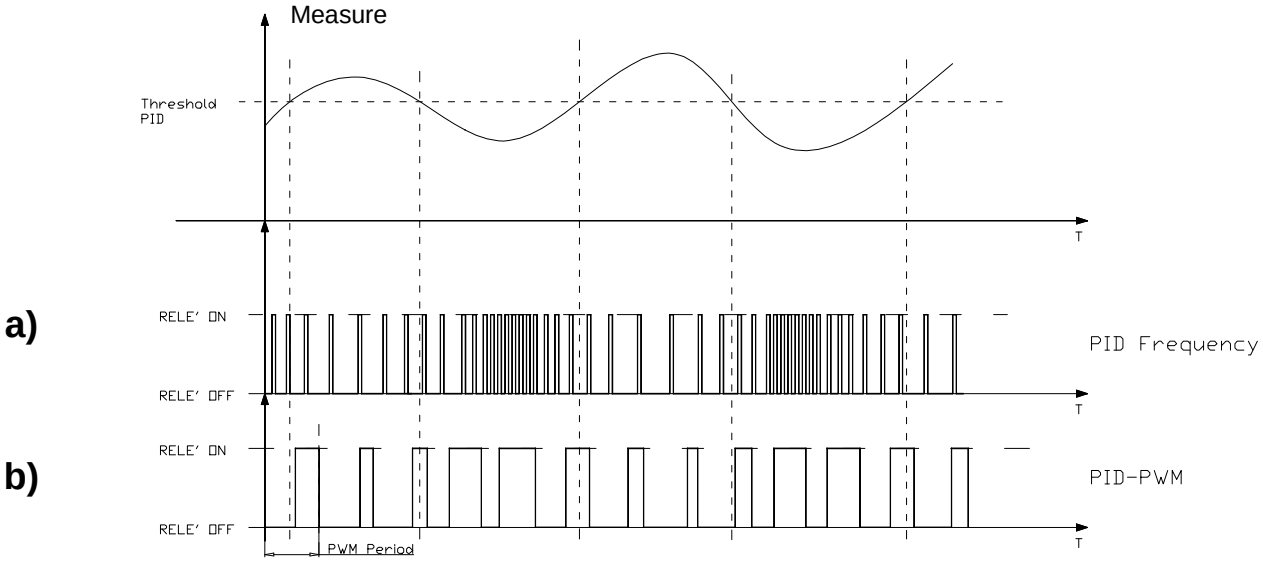


Figure 14 – Operation of Relay 1 as PID

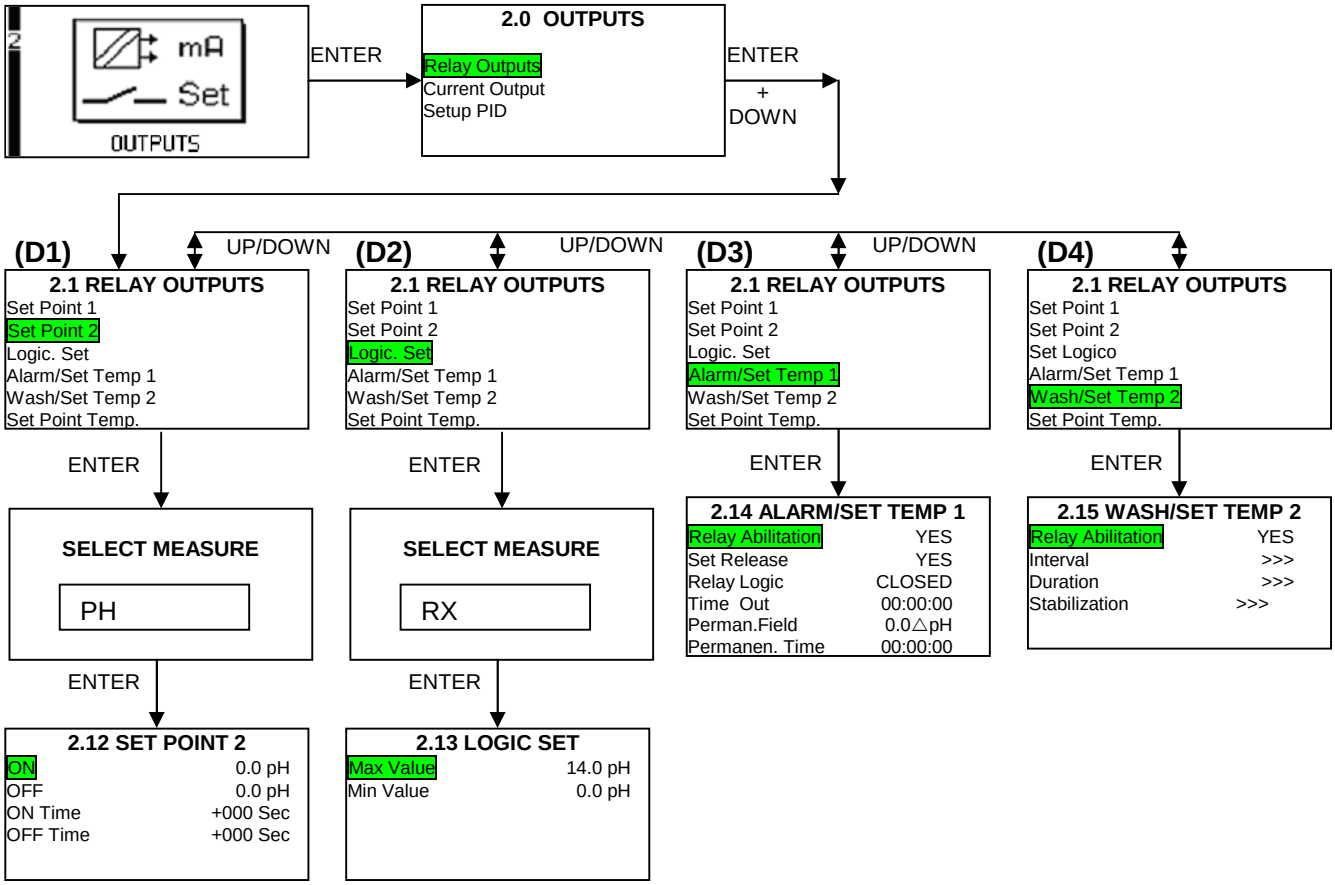
C3) PID-Frequency

By setting the Set Point as PID-Frequency it is possible, through Relay 1, to control a pump directly with impulse inputs. The maximum number is 7200 imp/h with steps of 200. The ON and OFF impulse time is fixed at 250mSec. For operation of the Relay in a PID-Frequency see fig. 14.a.

NOTE

Functions C2) and C3) are related to the programming of the PID parameters to be found in the menu 2.30 (Par. 4.3.7). Therefore, before programming this function we recommend that you check the programming of the PID parameters.

4.3.4 OUTPUTS MENU (RELAY OUTPUTS – SET POINT 2, ETC.)



D1) Set Point2

The programming parameters of Set Point 2 determine the functioning logic of Relay 2.

This Relay may only be programmed as a Threshold. Programming of threshold 2 is identical to the one described for Threshold 1. Even in this case it is possible to select the parameter to measure (pH/ORP).

D2) Logical Set

The parameters of the Logical Set determine the functioning of the Alarm Relay. This function is deactivated by default.

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.

D3) Alarm/Set Temp. 1

With this function the basic settings of the Alarm Relay are defined, all of which are handled by the anomaly conditions inside and outside of the instrument.

Considering the importance of this Relay, we recommend that it is connected to a visual and acoustic signal which should always be kept under control by personnel in charge of running the plant, in order to intervene immediately in the case of a signal.

Programming of the Alarm Relay is articulated into 6 functions, therefore allowing for external anomalies (measuring electrode and dosage systems) as well as internal anomalies to be kept under control. Description of the functions:

RELAY ABILITATION

Within this function, it is possibile to assign the relay.

Setting "YES" means that the relay works as an alarm. Setting "NO", the relay is automatically assigned as temperature.

SET RELEASE

With this function it is possible to deactivate or activate dosages in the case of an alarm.

By programming YES, when any kind of alarm is activated, the Relay 1 and 2 contacts will open up immediately and the analogical outlets 1 and 2 will be cancelled.

By programming NO, even in the case of activation of the alarm, the Relay contacts and the analogical outlets will not change their position.

YES is set as a default.

RELAY LOGICS

The Alarm relay is an ON/OFF alarm and with this function it is possible to programme its opening/closing logic. CLOSED is set as a default.

By setting "CLOSED", the Alarm relay will be opened in normal working conditions and will close in the event of an alarm.

By setting "OPEN" it will work in exactly the opposite way. The Alarm relay will close in normal working conditions and will open in the event of an alarm.

Furthermore, by setting OPEN it is also possible to control the anomaly of the absence of power tension which will lead to the immediate opening of the relay.

TIME OUT

With this function it is possible to set a maximum activation time of Set Point 1 and 2 *after which time the alarm will be activated.* This allows for the state of the dosage pumps to be kept under control.

By default this function is deactivated (time 00:00.00). The maximum time that can be programmed is 60 minutes, at steps of 15 seconds.

PERMANENCE FIELD – PERMANENCE TIME

This function allows for the state of functioning of the measuring probe to be kept under control.

If the measurement is stabilised within a certain interval for a period of time that exceeds the time set, the instrument will generate an alarm.

In order to activate this function, the following must be set:

in the "PERMANENCE FIELD" step the minimum oscillation interval of measuring (delta pH / ORP)

in the "PERMANENCE TIME" the maximum time in which excursion must come about.

If, during the period of time programmed, measuring is always within the interval programmed, the instrument will set off an alarm.

By default this function is deactivated as a delta 0 and a time of 00:00:00 has been programmed. The maximum time that can be programmed is 99 hours at steps of 15 minutes.

D4) Wash/Set Temp. 2

The instrument is fitted with a Washing Relay that can control a solenoid valve for washing of the measuring electrode.

The washing stage lasts 1 minute altogether and it includes 15 seconds for control of the solenoid valve (closing of the washing relay) and 45 seconds for stabilisation of the probe.

RELAY ABILITATION

Within this function, it is possibile to assign the relay.

Setting "YES" means that the relay works as wash. Setting "NO", the relay is automatically assigned as temperature.

INTERVAL

With this function it is possible to set the interval of time between one washing stage and the next. Immediately before it starts, the instrument memorizes the values of the measurements, the state of Relay 1 and 2 and the values of the analogical outlets and it keeps them "frozen" for the entire duration of the washing cycle.

This situation is highlighted on the display using an hourglass and, furthermore, instead of the measuring value a counter appears indicating how many seconds are left until the washing stage is completed.

By default this function is deactivated as a time of 00 hours and 00 minutes is programmed. The maximum interval that can be programmed is 24 hours at steps of 15 minutes.

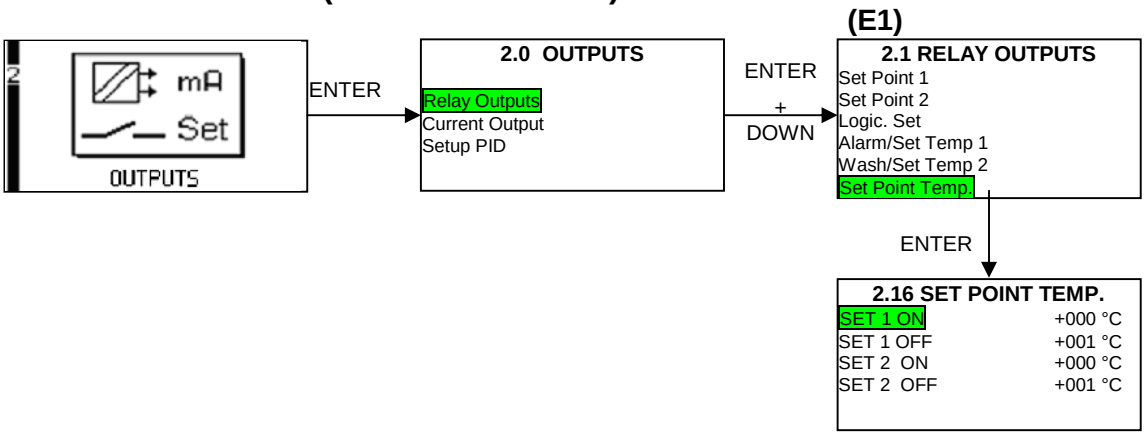
DURATION

Within this function it is possibile to set the duration (in seconds) of the washing period.

STABILIZATION

Within this function it is possibile to set the time (in seconds) needed to the stabilize the wash.

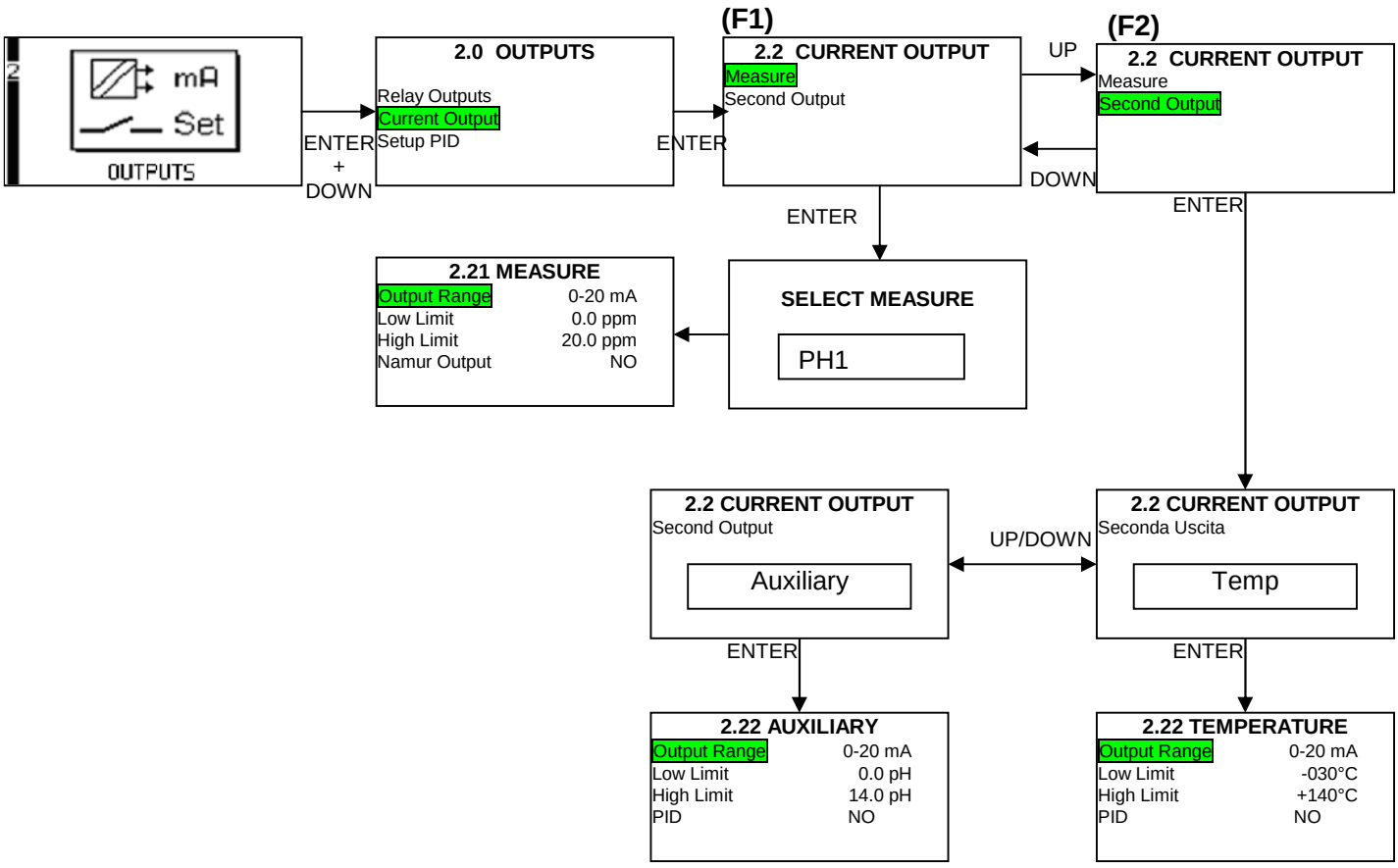
4.3.5 OUTPUTS MENU (SET POINT TEMP.)



E1) Set Point Temp.

If at least one of the two relays in points **D3), D4)** is set as temperature relay, within this step it is possibile to set up the Set Point.

4.3.6 OUTPUTS MENU (CURRENT OUTPUT)



The instrument is fitted with two analogical outlets in a current that is separated galvanically and are independent of each other. The first outlet refers to the primary measuring therefore proportional to the PH/ORP measured. The second, however, can be programmed between Temperature, pH or ORP.

F1) Measuring

In this step of the programme 4 functions can be set:

OUTPUT RANGE:

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

LOWER LIMIT:

A pH or ORP value at 0 to 4mA of outward current can be set. The default is set at 0pH o –1500mV

UPPER LIMIT:

A pH or ORP value of 20mA can be set for outward current. The default is set at 14pH o +1500mV

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

NAMUR OUTPUT:

This function is only activated if chosen as an Outlet Range of 4-20mA. If this function is activated in the case of an alarm, the outward value of the current will be 2.4mA according to the NAMUR standard. The default of this function is deactivated.

F2) Second Output

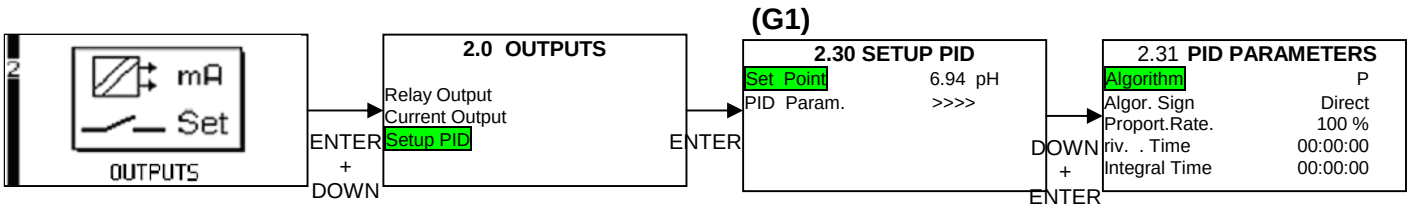
The second output can be set as Temperature, Auxiliary or PID.

If set as Temperature a Range between 0-20mA or 4-20mA can be chosen, the Lower and Upper limits of the Temperature value. For a detailed description of how to set them, refer to point 5.1 Measuring of Analogical Outlet. The default Range is 0-20mA, the Lower Limit is –30°C and the Upper Limit is +140°C.

If set as Auxiliary on the second output also, the pH or ORP measurement is repeated. But the Range of between 0-20mA or 4-20mA, the Lower limit and the Upper limit of the pH or ORP values can be chosen, different to the previous ones. For a detailed description of how to set them refer to point 5.1 Measuring of Analogical Outlet. The default Range is 0-20mA, the Lower Limit is 0ppm and Upper Limit is 20.0ppm, 200%SAT o 20.0mg/L.

If set as PID the Output range of between 0-20mA or 4-20mA must be set. For settings of the PID see part C3.

4.3.7 OUTPUTS MENU (SETUP PID)



G1) Setup PID

In this step of the programme, the programming of parameters for PID functioning is carried out. The outlet of PID adjustment is analogical as well as digital and they can both be activated at the same time. The PID outlets are: Analogical Outlet 2 and Relay 1.

The PID function allows for all of the swings due to ON/OFF dosages to be eliminated. Furthermore, it allows for the threshold desired to be maintained and reached with extreme precision. The PID adjustment is a complicated adjustment that must take into account all system variables. This PID has been designed for those general applications with a fast retroactivity of the system. In reality, the maximum integral and derived times are 5 minutes.

The PID function allows for three adjustments to handle the dose.

The PROPORTIONAL (P) Adjustment allows for the outward dimension to be more or less amplified.

The DERIVATIVE (D) function allows for our system to become more or less reactive to variations of the sizes measured.

The INTEGRATIVE (I) function allows for the swings to be regulated due to the derivative part.

Description of functions:

SET POINT

The value of the PID threshold that we want to maintain stable.

PID SETUP

ALGORITHM

The kinds of algorithms handled by the instrument are: P = Proportional ; PI = Proportional – Integral and PID = Proportional – Integral – Derivative

The type of algorithm will be chosen according to the application requested. The P regulation will be set as a default.

THE ALGORITHM SIGN

In this function the PID sign is programmed. If we programme DIRECT it means that as the value measured is increased compared with the threshold defined, the PID value will decrease. However, if we programme OPPOSITE, as the value measured increases compared with the threshold defined, the PID value will increase. DIRECT is set as a default.

PROPORTIONAL

The Proportional Range of the PID regulation compared with the bottom of the scale for the instrument.

Eg. For a pH / ORP with a range of 0-20, if a 100% Proportional is programmed it means having a range of ±20ppm of regulation compared with the threshold set. Therefore the value of the proportional is inversely proportional to the outlet, that is to say as the percentage of the proportional is increase the effects on the outlet decrease. Regulation of the proportional may vary between 1 and 500% in steps of 1%. The default is set at 100%.

DERIVATIVE TIME

The Derivative part is set. The more the programmed time increases, the more the system will be ready for variations to the measurement. The derivative time can be programmed between 0 and 5 minutes at steps of 5 seconds. The default is programmed at 0 minutes.

INTEGRAL TIME

The Integrative part is set. The more the programmed time increases, the more the system will mediate with the measuring swings. The derivative time can be programmed between 0 and 5 minutes at steps of 5 seconds. The default is programmed at 1 minute.

4.3.8 CALIBRATIONS MENU

This programme phase allows for the instrument calibration with the electrode used. Calibration must be carried out:

- When starting the measure instrument / electrode chain the first time
- Every time the electrode is replaced
- When starting the instrument after a long inactivity period
- In the case of any discrepancies compared with the known value

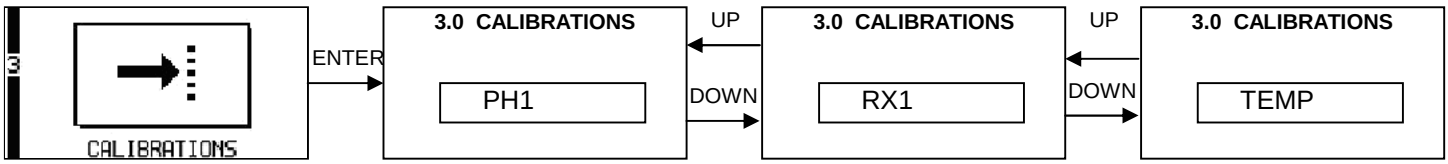
For granting a proper working, further to the above mentioned conditions, it will be required to check the calibration of or to recalibrate the instrument periodically.

User will determine the frequency of this operation, keeping into account the application and the electrode use.

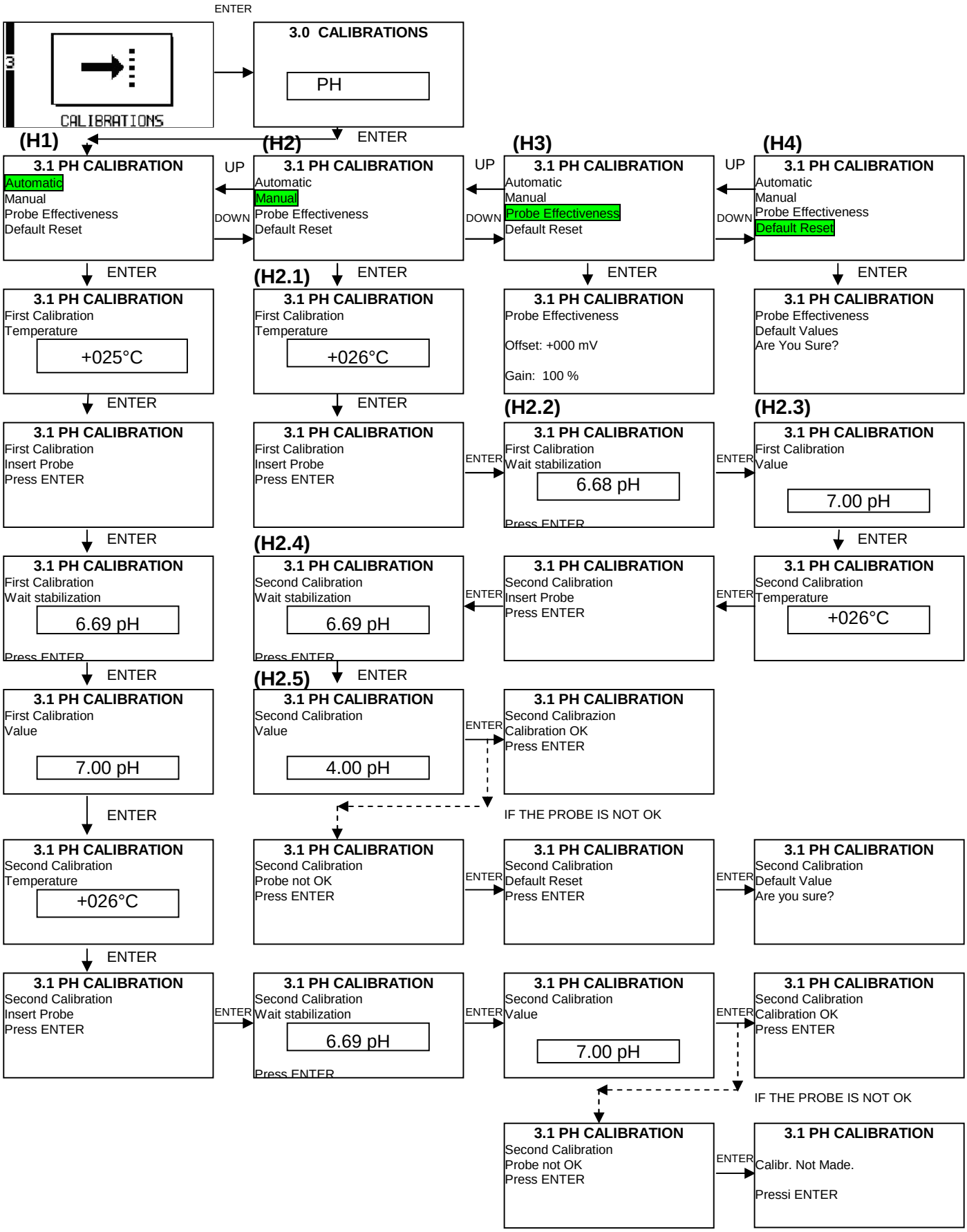
NOTE

We remind you that before carrying out any checks or recalibrations, the electrode must be cleaned thoroughly with clean water, making it stabilizing for at least 30 minutes on the atmosphere or into the known title solution.

Descriptions of the calibration functions:



From this menu it is possible to choose pH-ORP or Temperature calibration.


ENTER
3
CALIBRATIONS
3.0 CALIBRATIONS
PH
ENTER
(H1)
(H2)
(H3)
(H4)
3.1 PH CALIBRATION
Automatic
Manual
Probe Effectiveness
Default Reset
UP
DOWN
ENTER
(H2.1)
First Calibration
Temperature
+025°C
+026°C
Probe Effectiveness
Offset: +000 mV
Gain: 100 %
Default Values
Are You Sure?
(H2.2)
(H2.3)
Insert Probe
Press ENTER
Wait stabilization
6.68 pH
Value
7.00 pH
(H2.4)
Second Calibration
6.69 pH
Second Calibrazion
Calibration OK
4.00 pH
(H2.5)
IF THE PROBE IS NOT OK
Probe not OK
Default Reset
Default Value
Are you sure?
Calibr. Not Made.
Pressi ENTER

H1) 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.

H2) Manual

The pH calibration includes two calibration points, while the ORP just one.

pH calibration:

H.2.1) 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.

H.2.2) Wait till the displayed value read by the probe stabilizes, then press the ENTER key.

H.2.3) The instrument automatically recognises the solution and display the pH7 buffer value; press the ENTER key.

H.2.4) and **K.2.5**) 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.

ORP calibration:

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.

H3) Probe Effectiveness

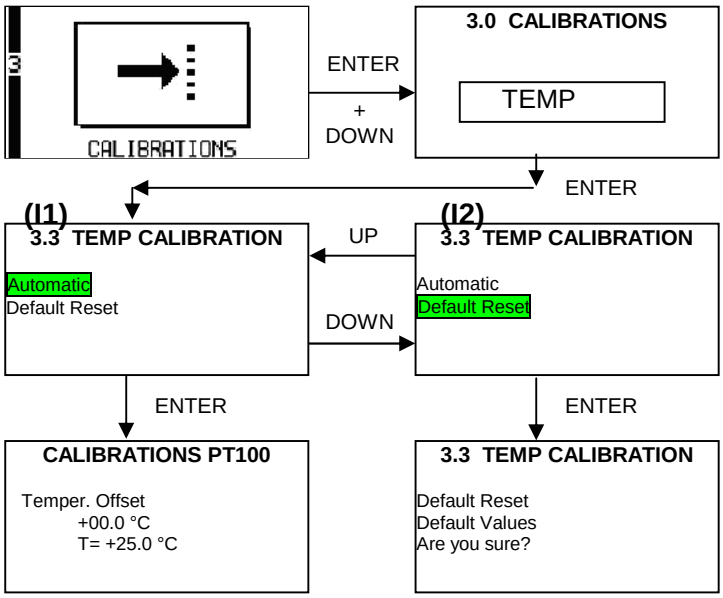
These parameters inform the user about the pH or ORP probe and refer to the latest calibration.

As to the pH probes, when the OFFSET value is above ±100mV 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 ±100mV, it means that the electrode needs to be regenerated or replaced.

H4) 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.



The calibration of Temperature allows to align the values given by the temperature sensor to the real analisys values; this step must be done only if the operator finds a few differences between the values given by the instrument and the real temperature.

I1) Automatic Calibration

The calibration consists in adding or subtracting an offset in order to bring back the value given by the instrument to the correct measure.

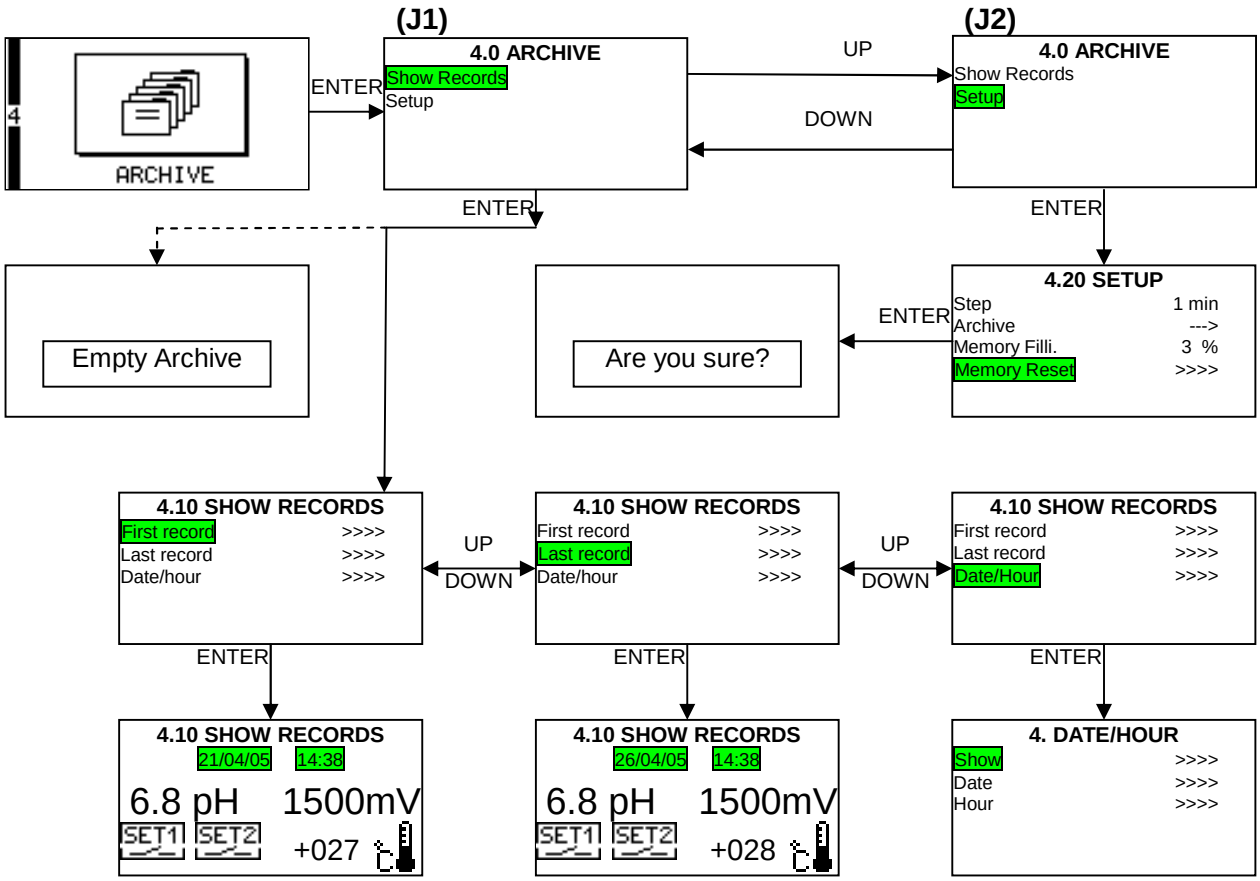
I2) Reset Default

As shown in H4) step, this step of the programme allows for the calibration factors to be reset to the original factory ones..

4.3.9 ARCHIVE MENU

The instrument is fitted with a Data Logger that allows for 16,000 records to be stored. Each record contains: the date, the time and the PH / ORP value, the temperature value, the value of the Threshold 1 and 2, the state of the Relays 1 and 2 and the state of the Alarm Relay. The archive must be of a Circular kind, therefore once filled the next data will overwrite the oldest one and so on until it is completely FILLED, that is to say once it is filled storage is blocked and the full archive icon will appear.

The archive can be examined directly through the instrument in the form of a table or drawing. The archive may be downloaded using a RS485 serial port with the MOD BUS RTU protocol.



J1) Visualise data

In this part of the programme it is possible to visualise data in the form of a table as long as the archives are not empty. In order to decide on where to start and examine the table, there are three options:

First Data >>> You will start by examining the archive of the first data stored and move forward

Last Data >>> You will start by examining the archive of the last data stored and move backwards

Date/Time>>> You will start by examining the archive from a specific date and time

In order to move backwards and forwards use the UP and DOWN keys and once you reach the first or last data it will stop.

J2) Set-up

In this part of the programme the storage parameters are set using 4 functions:

STEP

It indicates the registration step and it can be programmed at between 0 and 99 minutes. The default is 0 minutes, therefore deactivated, and it can be increased by 1 minute at a time.

ARCHIVE TYPE

Circulation of "⇄ "of the Archive once it is full and it will write over the first data

Filling "--⇨" Once it is full it will stop storage

SPACE USED

It indicates the amount of memory used up by the data stored.

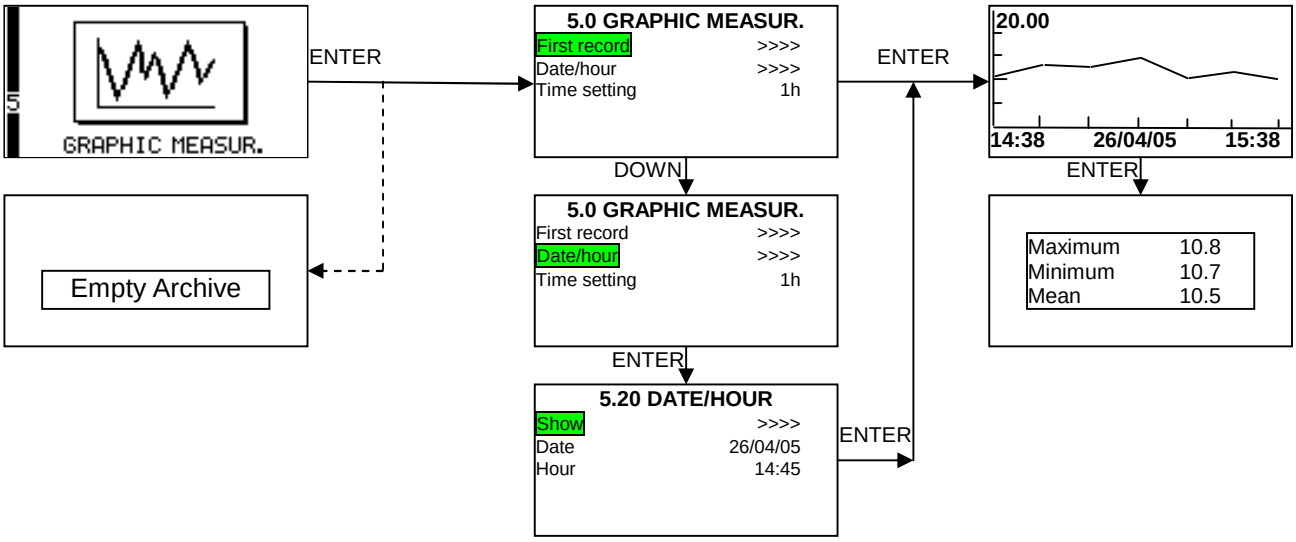
MEMORY RE-SET

It is used to clean the memory.

CAUTION

Once this operation is carried out all measurements stored will be lost.

4.3.10 MENU OF MEASURING GRAPHICS



In this step of the programme you can see data in a graphic form, as long as the archive is not empty. In order to decide from where to start to examine the graphics and tables, there are two options:

First Data >>> You will start by examining the archive of the first data stored and move forward

Date/Time>>> You will start by examining the archive from a specific date and time

In order to move backwards and forwards use the UP and DOWN keys and once you reach the first or last data it will stop.

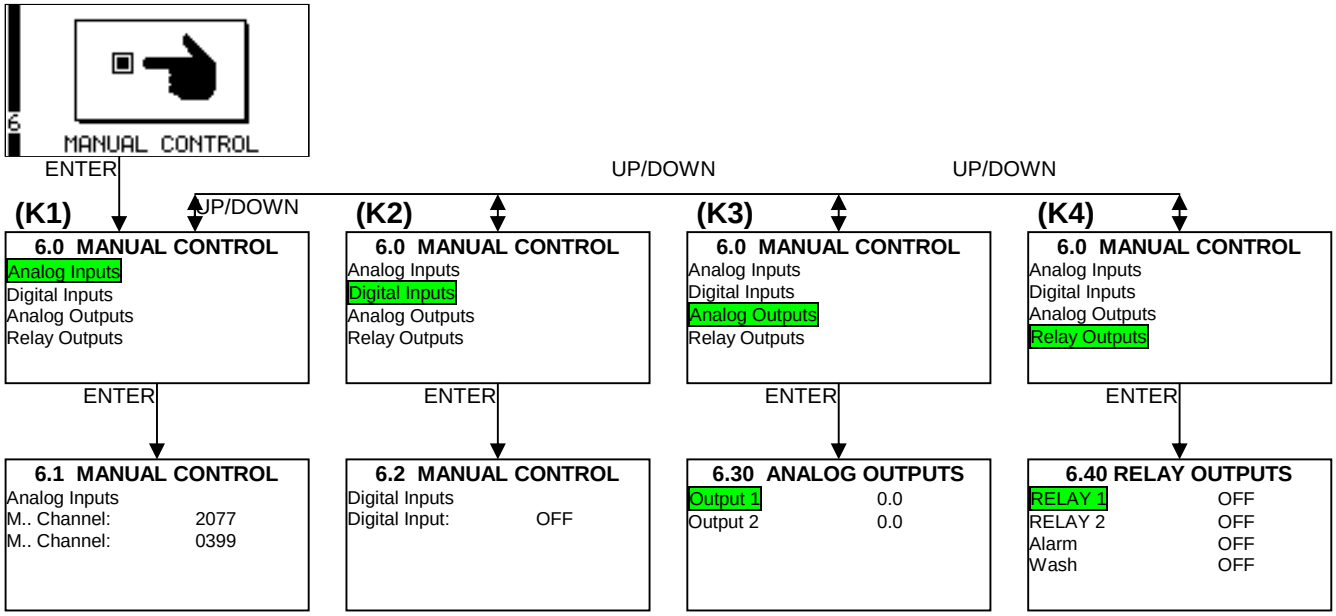
The Times item indicates for how many hours we want to visualise the drawing. The default is 1 hour but we can choose from 1, 6 or 24 hours.

NOTE

Once the drawing is visualised, if the ENTER key is pressed a table will appear indicating the Minimum, Maximum and Average value of the measurements visualised on the screen. Furthermore, if the ENTER key is pressed again, a ZOOM of the data visualised will appear. If the ENTER key is pressed again, it will return to the initial visualisation.

The ZOOM allows for a clearer evaluation of small pH / ORP variation..

4.3.11 MENU MANUAL CONTROL



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

K1) 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.

K2) 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.

K3) 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.

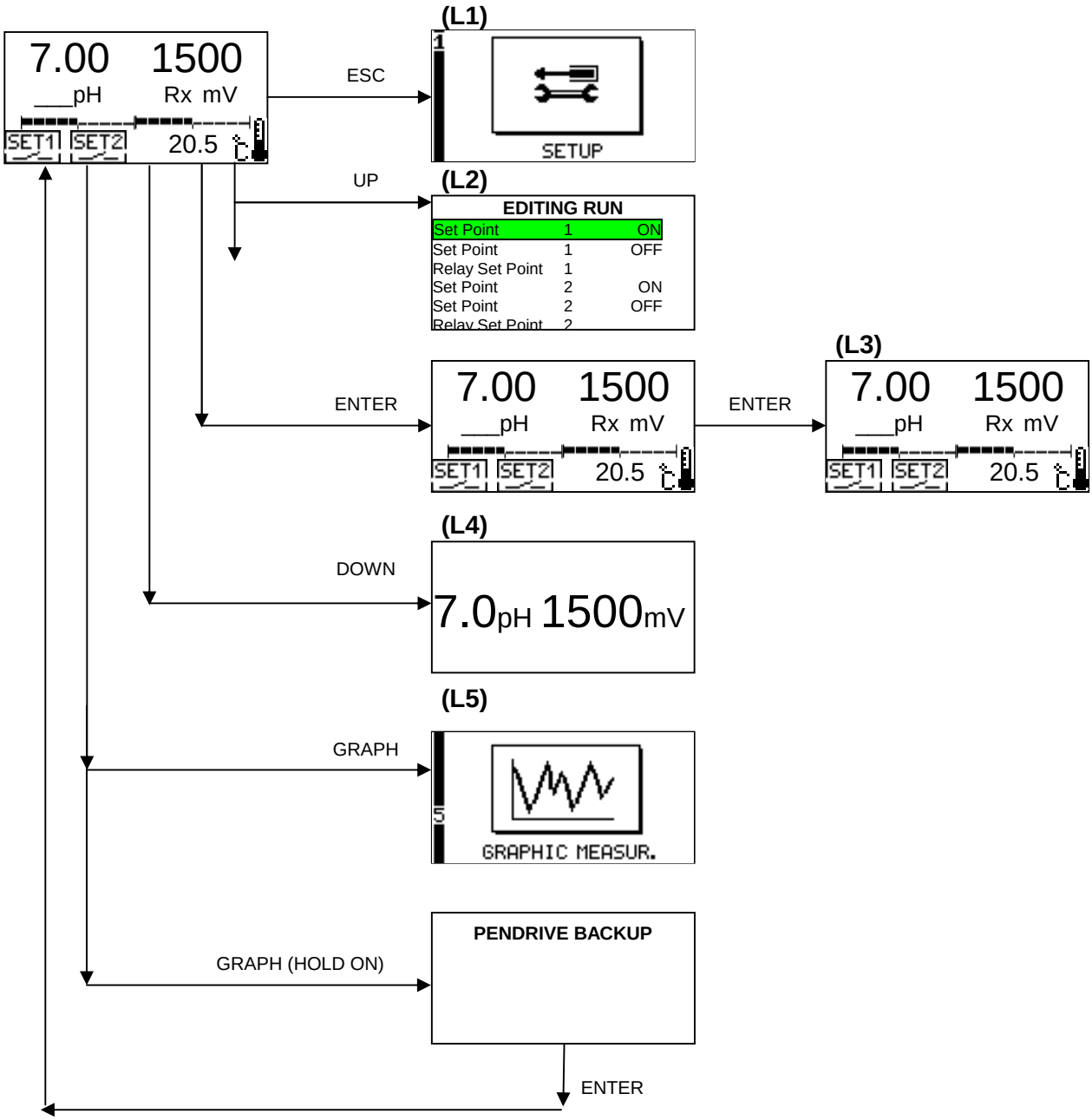
K4) Relay Outputs

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.

4.3.12 FUNCTIONS IN RUN



In the RUN screen the following things can be seen:

- pH / ORP Measure
- Percent value compared to full scale (bargraph)
- the system time
- the status and type of programming of Relays 1 and 2
- Status of Digital Input
- Status of the Alarm Relay
- Status of the Washing Relay
- Status of the Password
- Status of measuring and outlet freezing
- Value of the Temperature or of the Analogical Outlet 1 or of the Analogical Outlet 2
- System errors
- Storage of Data in the Archive
- Archive Full

L1) Pressing the ESC key

By pressing this key you will enter the Instrument Programming stage and all measuring and dosage functions will be deactivated. Caution: the instrument will not leave this stage automatically and therefore if it is left in the Instrument Set-up it will never carry out any operation.

In the Instrument Set-up stage, serial communication is also deactivated.

L2) The UP key

It visualises the status and the value of the Set Point 1 and 2 without blocking the operation of the instrument or stopping the pump.

L3) The ENTER key

It visualises the value of Temperature of the value of the Analogical outlet 1 or the value of the Analogical outlet 2 at the bottom of the display.

L4) The DOWN key

It is possible to ZOOM on the primary measure.

L5) The GRAPH key

It is possibile to visualise directly the GRAPHIC MEASURE menu.

OPTIONAL: Holding the GRAPH key for 3-4 seconds during the run functions

It visualises the PENDRIVE BACK UP menu (Optional), through which it is possible to download data on an USB stick.

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.

6 MODBUS PROTOCOL

Characteristics

- Standard MODBUS Protocol RTU type
- Physical Layer: two wires RS485 (half-duplex)
- Alternative Physical Layer: USB
- 8 bit, Equality N, 1 Stop bit
- Baud-rate: from 300 to 38400 bps, selectable from menu
- Card ID: from **1** to **255**, selectable from menu

Function 01 (Read Coil Status)

```
00 Physical state of relay RL0-K1 (Set 1)
01 Physical state of relay RL1-K2 (Set 2)
02 Physical state of relay RL2-K5 (Allarme / Set Temp. 1)
03 Physical state of relay RL3-K6 (Wash / Set Temp. 2)
04 State of Set Point 1
05 State of Set Point 2
06 Flag Alarm Time Out Set Point 1
07 Flag Alarm Time Out Set Point 2
08 Flag Alarm Set Min Logic Set
09 Flag Alarm Max Logic Set
10 Flag for ongoing washing or stabilization
```

Function 02 (Read Input Status)

```
00 Output Type mA1 (0=0-20 mA, 1=4-20 mA) (out1_typ)
01 Output Type mA2 (0=0-20 mA, 1=4-20 mA) (out2_typ)
02  Namur Output (0=Disabled, 1=Active) (namur_flag)
03 Flag per sgancio su allarme (0=sgancio, 1=non sgancio) (alrel_flag)
04 Flag per tipo di Temperatura (0=°C, 1=°F) (fahren_flag)
05 Segno Algoritmo PID (0=Diretta, 1=Inversa) (pid_cnsgn)
06 Logica Relè Allarme in ON (0=Chiuso, 1=Aperto) (alrlog_flag)
07 Funzionamento Analog Out 2 (0=Proporzionale, 1=PID) (pid2_flag)
08 Tipo Archivio (0=Riempimento, 1=Circolare) (reg_typ)
09 Compensazione della temperatura (0=Automatica, 1=Manuale) (tmpc_flag)
10 --------
11 --------
12 Assegnazione relè  RL2 (0=Allarme, 1=Set Point 1 Temperatura)
13 Assegnazione relè  RL3 (0=Wash, 1=Set Point 2 Temperatura)
```

Function 03 (Read Holding Registers)

2 consecutive registers of the 4 bytes that make up the floating point variable (except address 00 that indicates the instrument name and is composed by 4 ASCII digits).
Dato che ogni valore è su due registri Modbus (4 bytes) e che i valori iniziano su registri di indirizzo pari, è stato introdotto un controllo che lo Starting Address dei registri richiesti sia pari e che il numero dei registri richiesti sia anch'esso pari. Altrimenti si ottiene una risposta con errore di indirizzamento.
(se si utilizza il programma Modbus Poll, visualizzare in modalità "Float Inverse")

```
00 Instrument name ('3838') 4 bytes ASCII
02 Instrument Serial Number (0...65535)
04 Main Value 1 (pH or ORP depends by the instrument type)
06 Main Value 2 (pH or ORP depends by the instrument type)
08 Temperature value in °C
10 Analog output1 value in mA
12 Analog output2 value in mA
14 Set 1 ON (set1_on)
16 Set 1 OFF (set1_off)
18 Set 2 ON (set2_on)
20 Set 2 OFF (set2_off)
```

```
 22 Set Max (set_max)
 24 Set Min (set_min)
 26 Low Limit Analog Out 1 (Main Measure) (clim1_low)
 28 High Limit Analog Out 1 (Main Measure) (clim1_high)
 30 Low Limit Analog Out 2 (Main Measure / Temperature) (clim2_low)
 32 High Limit Analog Out 2 (Main Measure / Temperature) (clim2_high)
 34 Set Temperature 1 ON (set1T_on)
 36 Set Temperature 1 OFF (set1T_off)
 38 Set Temperature 2 ON (set2T_on)
 40 Set Temperature 2 OFF (set2T_off)
 42 PID: Threshold value (set_pid)
 44 PID: proportional range (pid_prange)
 46 PID: minutes for Derivative (pid_tvmin)
 48 PID: seconds for Derivative (step 5 sec) (pid_tvsec)
 50 PID: minutes for Integer (pid_tnmin)
 52 PID: seconds for Integer (step 5 sec) (pid_tnsec)
 54 PID: algorithm type PID (0=P, 1=PI, 2=PID)(pid_cntyp)
 56 Manual compensation Temperature(tmp_com)
 58 Hours for washing interval (wash_hour)
 60 Minutes for washing interval (wash_min)
 62 Washing seconds (wash_lenght)
 64 Minutes for temporized alarm (alr_min)
 66 Seconds for temporized alarm (alr_sec)
 68 Duty for Set1 ON (duty1_on)
 70 Duty for Set1 OFF (duty1_off)
 72 Duty for Set2 ON (duty2_on)
 74 Duty for Set2 OFF (duty2_off)
 76 Permanence field (meas_perm)
 78 Permanence time hours (cpalr_hour)
 80 Permanence time min (step 15min)(cpalr_hour)
 82 Archive registrations range (reg_min)
 84 Day
 86 Month
 88 Year (extended century format)
 90 Hour
 92 Minutes
 94 Logic of Relay 1 (0=Threshold, 1=PWM, 2=Frequency)(set1_typ)
 96 Period of PWM max 999 sec (set1_pid_period)
 98 MAX Frequency imp/h (max. 7200 regolazione a 200 step)(set1_pid_freq)
100 Instrument Type (0=PH-RX, 1=PH-PH, 2=RX-RX) (str_typ)
```

Function 04 (Read Input Registers)

2 consecutive registers of the 4 bytes that make up the floating point variable.
Because each value has two Modbus registers (4 bytes) and that the values begin to even address registers, was introduced a control that the Starting Address of registers required is even and that the number of registers required is even itself. Otherwise you get a response addressing error. (If you use the program Modbus Poll, see in "Float Inverse")

```
00 Main Value 1 (pH or ORP depends by the instrument type)
02 Main Value 2 (pH or ORP depends by the instrument type)
04 Temperature value in °C
06 Analog output1 value in mA
08 Analog output2 value in mA
```

Function 05 (Force Single Coil)

```
00 Output mA1 type(0=0-20 mA, 1=4-20 mA)(out1_typ)
01 Output mA2 type (0=0-20 mA, 1=4-20 mA)(out2_typ)
02 Namur Output (0=Disabled, 1=Active)(namur_flag)
03 Flag per sgancio su allarme (0=sgancio, 1=non sgancio) (alrel_flag)
```

```
04 Flag per tipo di Temperatura (0=°C, 1=°F) (fahren_flag)
05 Segno Algoritmo PID (0=Diretta, 1=Inversa) (pid_cnsgn)
06 Logica Relè Allarme in ON (0=Chiuso, 1=Aperto) (alrlog_flag)
07 Funzionamento Analog Out 2 (0=Proporzionale, 1=PID) (pid2_flag)
08 Archive type (0=Fullfilling, 1=Circular) (reg_typ)
```

Function 16 (Preset Multiple Registers)

2 consecutive registers of the 4 bytes that make up the floating point variable.
Because each value has two Modbus registers (4 bytes) and that the values begin to even address registers, was introduced a control that the Starting Address of registers required is even and that the number of registers required is even itself. Otherwise you get a response addressing error.

```
00 -----
02 Matricola strumento (0...65535)
04 -----
06 -----
08 -----
10 -----
12 -----
14 Set 1 ON (set1_on)
16 Set 1 OFF (set1_off)
18 Set 2 ON (set2_on)
20 Set 2 OFF (set2_off)
22 Set Max (set_max)
24 Set Min (set_min)
26 Low Limit Analog Out 1 (Main Measure) (clim1_low)
28 High Limit Analog Out 1 (Main Measure) (clim1_high)
30 Low Limit Analog Out 2 (Main Measure / Temperature) (clim2_low)
32 High Limit Analog Out 2 (Main Measure / Temperature) (clim2_high)
34 Set Temperature 1 ON (set1T_on)
36 Set Temperature 1 OFF (set1T_off)
38 Set Temperature 2 ON (set2T_on)
40 Set Temperature 2 OFF (set2T_off)
40 PID: Threshold value (set_pid)
44 PID: proportional range (pid_prange)
46 PID: minutes for Derivative (pid_tvmin)
48 PID: seconds for Derivative (step 5 sec) (pid_tvsec)
50 PID: minutes for Integer (pid_tnmin)
52 PID: seconds for Integer (step 5 sec) (pid_tnsec)
54 PID: algorithm type PID (0=P, 1=PI, 2=PID)(pid_cntyp)
56 Manual compensation Temperature(tmp_com)
58 Hours for washing interval (wash_hour)
60 Minutes for washing interval (wash_min)
62 Washing seconds (wash_lenght)
64 Minutes for temporized alarm (alr_min)
66 Seconds for temporized alarm (alr_sec)
68 Duty for Set1 ON (duty1_on)
70 Duty for Set1 OFF (duty1_off)
72 Duty for Set2 ON (duty2_on)
74 Duty for Set2 OFF (duty2_off)
76 Permanence field (meas_perm)
78 Permanence time hours (cpalr_hour)
80 Permanence time min (step 15min)(cpalr_hour)
82 Archive registrations range (reg_min)
84 Day
86 Month
88 Year (extended century format)
90 Hour
92 Minutes
```

```
 94 Logic of Relay 1 (0=Threshold, 1=PWM, 2=Frequency)(set1_typ)
 96 Period of PWM max 999 sec (set1_pid_period)
 98 MAX Frequency imp/h (max. 7200 regolazione a 200 step)(set1_pid_freq)
```

Archive download at record blocks

Sequency:

1. Single record size request.
2. Existing record number request.
3. Current record request
4. Record acquiring cycle
    a. If previous request goes well → Request next record
    b. If previous request DOESN'T go well → Request current record
    c. If total received number is less than total number → Repeat cycle.
5. Connection end.

N.B. La richiesta del numero di record presenti resetta il puntatore al record inviato per cui la successive richiesta di invio record riparte dal primo record memorizzato

Functions' list:

Single record size [HIST_ARC_REC_LEN = 0x41]

Records download [HIST_ARC_REC_FN = 0x44]
Subfunctions:
Records number in archive [BHIST_ARC_NUM_REC = 0x03]
Enter current records block [BHIST_ARC_BLOCK_CURRENT = 0x04]
Enter next records block [BHIST_ARC_BLOCK_NEXT = 0x05]

Reset archive [HIST_ARC_RESET = 0x45]

Function description:

Single record size request

Request

Byte	Description
0	Device Slave Number
1	HIST_ARC_REC_LEN = 0x41 (Function)
2	CRC (lo)
3	CRC (hi)

Answer

Byte	Description
0	Device Slave Number
1	HIST_ARC_REC_LEN = 0x41 (Function)
2	'2' data size
3	Record size (lo)
4	Record size (hi)
5	CRC (lo)
6	CRC (hi)

Existing record number request (with pointer reset)

Request

Byte	Description
0	Device Slave Number
1	BHIST_ARC_FN = 0x44 (Funzione)
2	BHIST_ARC_NUM_REC = 0x03 (Sottofunzione)
3	CRC (lo)
4	CRC (hi)

Answer

Byte	Description
0	Device Slave Number
1	BHIST_ARC_FN = 0x44 (Function)
2	BHIST_ARC_NUM_REC = 0x03 (Sottofunzione)
3	Numero Records (lo)
4	Numero Records (hi)
5	CRC (lo)
6	CRC (hi)

Current record request

Request

Byte	Description
0	Device Slave Number
1	BHIST_ARC_FN = 0x44 (Function)
2	BHIST_ARC_BLOCK_CURRENT = 0x04 (Subfunction)
3	CRC (lo)
4	CRC (hi)

Answer

Byte	Description
0	Device Slave Number
1	BHIST_ARC_FN = 0x44 (Function)
2	BHIST_ARC_BLOCK_CURRENT = 0x04 (Subfunction)
3	Lunghezza Dati (lo)
4	Lunghezza Dati (hi)
5	Dati …
.	
n	
.	
6+n	CRC (lo)
7+n	CRC (hi)

Following record request

Request

Byte	Description
0	Device Slave Number
1	BHIST_ARC_FN = 0x44 (Function)
2	BHIST_ARC_BLOCK_NEXT = 0x05 (Subfunction)
3	CRC (lo)
4	CRC (hi)

Answer

Byte	Description
0	Device Slave Number
1	BHIST_ARC_FN = 0x44 (Function)
2	BHIST_ARC_BLOCK_NEXT = 0x05 (Subfunction)
3	Data size (lo)
4	Data size (hi)
5	Data …
.	
n	
.	
6+n	CRC (lo)
7+n	CRC (hi)

If Data size=0 : a record over than the the existings has prompted

Reset archive request

Request

Byte	Descrizione
0	Device Slave Number
1	HIST_ARC_RESET = 0x45 (Function)
2	CRC (lo)
3	CRC (hi)

Answer

Byte	Descrizione
0	Device Slave Number
1	HIST_ARC_RESET = 0x45 (Function)
2	CRC (lo)
3	CRC (hi)

Record size

Every record is 33 bytes long (= RECORDSIZE)

Formato record

Offset	*variable*	*Description*	*N°Bytes*	*Format*
0	AA	Year (binary 0…99)	1	char
1	MM	Month (binary 1…12)	1	char
2	GG	Day (binary 1…31)	1	char
3	hh	Hour (binary 0…23)	1	char
4	mm	Minute (binary 0…59)	1	char
5	main_val1	Measure 1 value (pH or ORP, depends by the type)	4	float
9	main_val2	Measure 2 value (pH or ORP, depends by the type)	4	float
13		Spare	4	float
17		Spare	4	float
21		Spare	4	float
25	tp_val	Temperatura	4	float
29		Relays status (*)	1	char
30		Spare	1	char
31		Spare	1	char
32		Checksum (8 bit sum of previous 32 bytes)	1	char

(*) Bit of Relay status

bit0 = RL0 (Set Point 1)
bit1 = RL1 (Set Point 2)
bit2 = RL2 (Alarm / Set Point Temperature 2)
bit3 = RL3 (Wash / Set Point Temperature 1)