TURBIDITY ANALYSER

GENERAL INDEX

1 GENERAL INFORMATION

1.1 INFORMATION REGARDING THE MANUAL

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

This manual is an integral part of the instrument. At the time of the device's first installation, the operator must carefully check the contents of the manual in order to verify its integrity and completeness.

In order to guarantee the device's proper functionality and operator safety, it is fundamental that the operative procedures and precautions described in this manual be respected.

Before using the device, the manual must be read in all of its parts, in the presence of the device itself, in order to ensure that the operating modes, the controls, the connections to the peripheral equipment and the precautions for safe and correct use are clearly understood.

The user manual must be stored, integral and legible in all parts, in a safe place which can be quickly and easily accessed by the operator during installation, use and/or installation revision operations.

1.1.1 CONVENTIONS

This user manual makes use of the following conventions:

NOTE

The notes contain important information to be highlighted with respect to the rest of the text. They generally contain information that is useful to the operator for properly performing and optimising the device's operating procedures.

CAUTION

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

ATTENTION

Attention messages appear in the manual wherever procedures or operations are described which, if carried out incorrectly, could cause injury to the device's operator or users.

1.2 MANUFACTURER'S STATEMENT OF RESPONSIBILITY

The supplier shall only consider itself responsible for the safety, reliability and performance of the device if it is used in compliance with the following indications:

- All calibration, modification and/or repair operations must be performed by qualified and authorised personnel.
- Only qualified and duly authorised maintenance personnel must be permitted to open the device and access its internal components.
- The environment in which the device is to be utilised must comply with the current safety regulations.

- The installation environment's electrical system must comply with the current installation standards and must be perfectly efficient.
- Any replacements of the device's components and/or accessories must be performed using replacement parts of the same typology and with the same characteristics.
- The use and maintenance of the device, as well as its relative accessories, must be performed in compliance with the instructions contained within this manual.
- This manual must be kept integral and legible in all of its parts.

1.3 LIMITATIONS OF USE AND SAFETY PRECAUTIONS

In order to guarantee operator safety and correct device functionality, all of the usage limitations and precautions listed below must be respected:

ATTENTION

Make sure that all the safety requirements have been met before using the device. The device must not be powered on or connected to other devices until all of the safety conditions have been met.

1.3.1 ELECTRICAL SAFETY

ATTENTION

All of the control unit's connections are isolated from the grounding system (non-insulated grounding conductor).
DO NOT connect any of these connections to the grounding connector.

In order to guarantee maximum conditions of safety for the operator, it is recommended to follow all of the indications listed in this manual.

- **Only power the device using a mains power supply that complies with the device's specifications (85-265Vac 50/60Hz)**
- **Replace any damaged parts immediately.** Any cables, connectors, accessories or other parts of the device which are damaged or not functioning properly must be replaced immediately. In such cases, contact your nearest authorized technical assistance centre.
- **Only use specified accessories and peripherals.** In order to guarantee all of the safety requirements, the device must only be utilized in conjunction with the accessories specified in this manual, which have been tested for use with the device itself. The use of accessories and consumables produced by other manufacturers or not specifically indicated for use with this device will not guarantee the device's safety and proper functionality. Only use peripherals that comply with the regulations of their specific categories.

1.3.2 SAFETY OF THE OPERATING ENVIRONMENT

- The control unit's panel is resistant to liquids. The device must be protected against drips, sprays and/or immersion and should not be used in environments where such risks are present. Any devices into which liquids may have accidentally penetrated must be immediately shut off, cleaned and inspected by authorised and qualified personnel.
- The transparent panel should be closed once the device has been programmed.

- **Protection**

  For 4262 **Wall** mounting
  - IP66 EN60529
  - EMI /RFI   CEI EN55011 - 05/99

- **The device must be utilized within the specified environmental temperature, humidity and pressure limits.** The instrument is designed to operate under the following environmental conditions:
  - Temperature of the working environment $0°C \sim +50°C$
  - Storage and transport temperature $-25°C \sim +65°C$
  - Relative humidity $10\% \sim 95\%$ (without condensation)

ATTENTION

The device must be perfectly inserted into the system.

The system must be maintained operational in full compliance with the foreseen safety regulations.

The parameters set on the analyser's control unit must comply with the current regulations.

The control unit's malfunction signals must be located in an area that is constantly supervised by the system's maintenance personnel or operators.
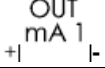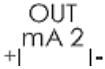
Failure to respect even just one of these conditions could cause the control unit's "logic" to operate in <u>a potentially dangerous manner for the users of the service.</u>

In order to avoid any potentially dangerous situations, therefore, the system's service and/or maintenance personnel are advised to work with the utmost care and to signal any alterations in the safety parameters in a timely fashion.

As the above issues cannot be monitored by the product in question, the manufacturer shall bear no responsibility for any property damage or personal injury which may result from such malfunctions.

1.4 GRAPHIC SYMBOLS

The following table illustrates the graphics, the descriptions and the positions of all the graphic symbols present upon the device's panels, as well as upon any other equipment or external devices to which it may be connected.

SYMBOL	DESCRIPTION	POSITION
⚡ (attention/lightning triangle)	**Attention symbol**	This symbol is located near the terminals for the device's connection to the mains power supply.
F	**Phase**	These symbols are located near the device's mains power supply connector
N	**Neutral**	
⏚	**Grounding wire**	
⚠ (triangle with !)	**Attention! Refer to the attached documentation**	This symbol is located near points for which the user Manual should be consulted for important information. (see the section entitled ATTENTION).
B- | |A+ RS485 HOST	**Positive**	POSITIVE pole of the RS485 connector (A+)
	Negative	Negative pole of the RS485 connector (B-)
OUT mA 1 +| |-	**Analogue output no.1**	0/4 -20mA galvanically separated
OUT mA 2 +| |-	**Analogue output no.2**	0/4 -20mA galvanically separated
♻ (crossed-out wheelie bin)	**Recycling symbol**	This symbol is located on the right hand side of the control unit

1.5 ATTENTION SYMBOL

The **ATTENTION** symbol, shown below, advises the operator to refer to the user's Manual for particularly important information, warnings and suggestions regarding the safe and proper use of the device.

In particular, when positioned near the connection points for cables and peripherals, this symbol advises the reader to carefully read the user manual for indications regarding the nature of these cables and peripherals and the methods for correctly and safely connecting them.

In order to determine the locations of the ATTENTION symbols on the device, refer to chapter 2 *"Controls and Indicators, Connections"* and chapter 3 *"Installation"* of this user manual. These chapters provide illustrations of the device's panels, with their relative controls, connections, symbols and labels. Each attention symbol is accompanied by a detailed explanation of its meaning.

1.6 DATA PLATE DETAILS

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┌─────────────────────────────────────────────┐
│          Mod.   4262                          │
│     ( (    SN.    XXXXXXX                      │
│      CE    Volt   100-240 Vac/dc   Hz  50/60  │
│            SW Ver.  X.X                        │
└─────────────────────────────────────────────┘
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1.7 INFORMATION REGARDING THE RECYCLING AND REUSE OF THE MATERIALS

In compliance with the specific European directives, and in order to minimize the negative environmental impact of the device's components, consumables and packaging, as well as the device itself at the end of its working life, the manufacturer is constantly working to improve the design and production procedures for its products.

The packaging is designed and manufactured to allow for the majority of the materials to be recovered, reused and/or recycled, as well as to minimize the amounts of waste and/or residues to be disposed of. In order to ensure minimal environmental impact, the device has been designed using the maximum possible circuit miniaturisation, with the smallest possible amount of material and component differentiation, with select materials that guarantee maximum recyclability, with maximum parts re-use and with disposal procedures free of environmental risks.

The device is manufactured in such a way so as to guarantee that any materials containing pollutant substances can be easily separated or disassembled from the others, particularly during maintenance and part replacement operations.

ATTENTION

The disposal/recycling of the packaging materials, the consumables and the device itself at the end of its working life must be carried out in compliance with the current regulations and directives of the country in which the device is utilised.

1.7.1 SPECIAL REQUIREMENTS FOR CRITICAL COMPONENTS

The device is equipped with a liquid crystal display (LCD), which contains small amounts of toxic materials.

2 GENERAL DESCRIPTION

The analyser described in this manual is comprised of an Electronic Control Unit and a Technical Manual

The control unit may be installed upon the electrical panel or else wall-mounted at a maximum distance of 15 metres from the probe.

It is powered by the mains electrical system (100 - 240 Vac/dc 50-60 Hz), with L7W consumption, through a switching Power Supply

This device has been designed for the ON-LINE analysis of the Turbidity conditions in various applications:

- Biological oxidation systems
- Industrial wastewater drainage and treatment
- Fish farming
- Primary or drinking water systems
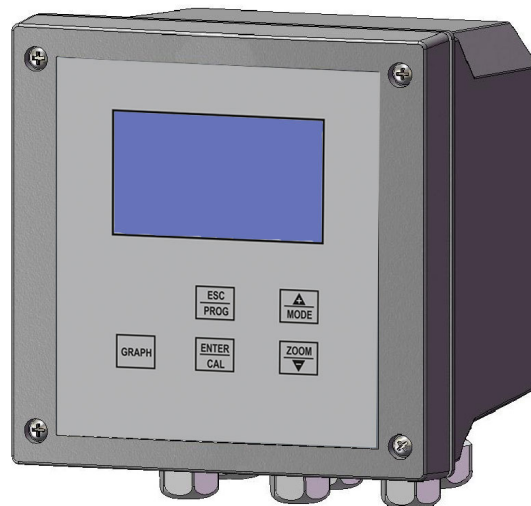
Figure 1 – Wall-mounted Turbidity analyser control unit

2.1 MEASUREMENT PRINCIPLES

Scattering:
Turbidity is intended as the portion of a scattered light beam that is deflected from its natural path due to impact with denser particles within the medium (i.e. solid particles).
The measurement is performed using 90° light scattering, as prescribed by the ISO 7027 / EN 27027 standard.
The measurement method is based on the Tyndall effect.
The turbidity of the medium is determined by the amount of "scattered" light. The transmitted beam of infrared light is scattered by the particles present within the medium.
The scattered beams of light are detected and processed by photo-receivers positioned at a 90° angle with respect to the transmitted light beam's guide.
The signals resulting from the scattered light are then converted into frequency signals.
These frequency signals are associated with corresponding turbidity and solid concentration values and are displayed as such.

90° light scattering measurement principle

$$I_s = I_0 \cdot A \cdot C \cdot f(\alpha)$$

I0 = Intensity of the transmitted light
IS = Intensity of the scattered light
A = Geometric factor
C = Molar concentration
f(α)= Angular correlation
P = Particle

Absorption:
Turbidity is the decrease in water transparency which results from the presence of suspended solid substances, made up of extremely fine particles, which are incapable of settling within a reasonably brief period of time. The particles in suspension cause an absorption of light radiation which is based on the number and size of the particles themselves. The turbidity value is determined by comparing the absorption of the sample in question with the values of a known calibration curve.

2.2   MAIN CHARACTERISTICS

- Turbidity measurement
- Programming keyboard with 5 embossed keys
- 128x68 Back-lit LCD Graphic Display
- Internal Data Logger (4 Mbit flash) with graphical and tabular measurement trend display
- PID Adjustment
- RS485 MOD BUS RTU Serial Output
- Data download to USB pendrive (optional)
- 2 Programmable Analogue Outputs
- 2 Relay Outputs for intervention thresholds
- 1 Relay Output for Instrument Malfunction Alarm
- 1 Relay Output for Probe Washing
- 1 Digital Input for dosage disabling

➢ *Main control unit hardware characteristics*

The hardware structure of this device is based on the use of state of the art 8-bit CMOS CPUs, which are designed specifically for so called "embedded" applications.

The board uses flash memories to store the historical data archives as well as the event LOG files.

The board is equipped with an RS485 serial port (opto-isolated) for local networks, which can be used to connect to local communications devices (Configuration Computers, Remote Terminals, etc.).

The board also has an integrated Real Time Clock (calendar clock) which allows the software to store the data in chronological order.

➢ *The control unit is manufactured with an IP66-rated panel.*

2.2.1   FUNCTIONAL CHARACTERISTICS

Power Supply	100 ~ 240 Vac/dc 50-60 Hz (optional 24 Vac/dc)
Consumption	< 7W

Relay outputs:

Time ON – OFF	00.00 ~ 20.00 / 000.0 ~ 200.0 / 0 ~ 2000 µS – 00.00~20.00NTU
Time ON – OFF	000 ~ 999 Seconds An exchange relay with a maximum switching current of 1 Amp at 230 VAC is employed for each set-point. Maximum switching power with a resistive load: 230 VA.

Alarm:

Function	Delay, Malfunctions and Min/Max
Delay time	00:00 ~ 99:99 min
Threshold disabling	Enabled / Disabled
Relay function	Closed / Open
Holding range	00.00 ~ 20.00 / 000.0 ~ 200.0 / 0 ~ 2000Δ µS – 00.00~20.00ΔNTU
Holding time	00:00~ 99:99 min A relay with normally open contacts with a maximum switching current of 1 Amp at 230 VAC is employed for the alarm and the wash outputs. Maximum switching power with a resistive load: 230 VA.

Digital input:

Input voltage	24 Vdc /ac
Consumption	10mA max

Analogue outputs:

Outputs	n.2 0/4-20mA Programmable
Maximum 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
Derived	0:00 – 5:00 min

2.3 CONTROLS, INDICATORS AND CONNECTIONS
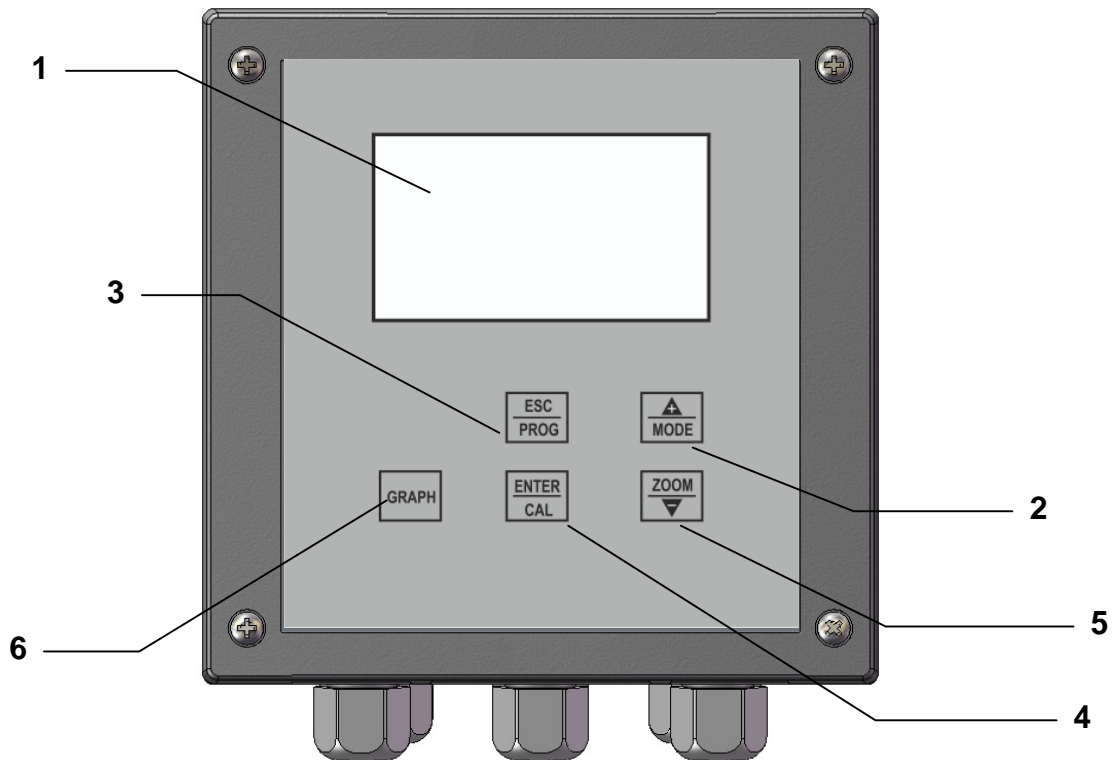
Figure 2 – Wall-mounted control unit, Front panel

1. LCD Display
2. UP Key
3. ESC Key
4. ENTER Key
5. DOWN Key
6. GRAPH Key
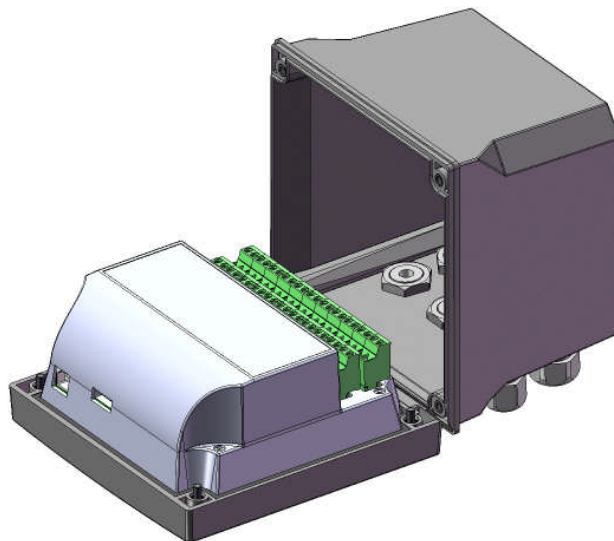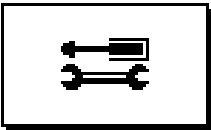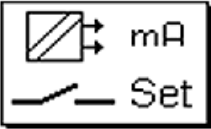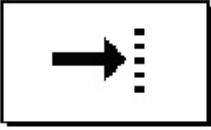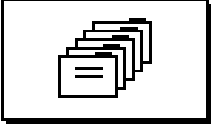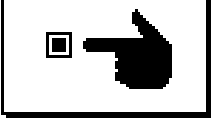
Figure 3 – Access to the terminal board

2.4 GRAPHIC DISPLAY

The graphic display offers access to the various menus, as well as to the programming and operating (run) display modes.

2.4.1 LIST OF THE MAIN MENUS

The following table illustrates the various menus available on the display.

DISPLAY ICON	DESCRIPTION
IMPOSTAZIONI	SETTINGS MENU Allows for the configuration of all the device's basic functioning parameters
USCITE	OUTPUTS MENU Analogue and digital output settings
CALIBRAZIONI	CALIBRATION MENU Electrode Calibration Procedure
ARCHIVIO	ARCHIVES MENU Data display and archiving mode settings
GRAFICI MISURE	MEASUREMENT GRAPHICS MENU Archive display in graphic format
CONTROLLO MANUALE	MANUAL CONTROL MENU Manual activation and control of the inputs and outputs

2.4.2 DIVISION OF THE GRAPHIC DISPLAY BY ZONES IN RUN MODE
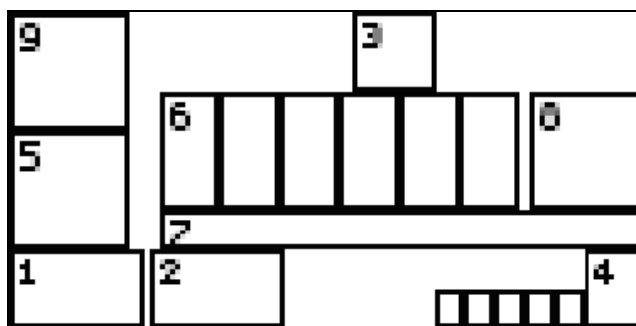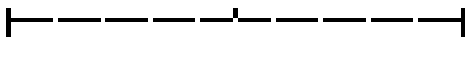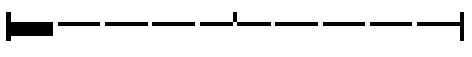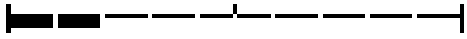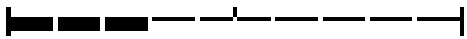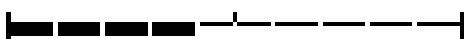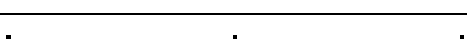
Figure 4 – Graphic display – Zone division

The following table provides a brief description of the various symbols that can appear in each zone of the graphic display (indicated in figure 3) while the measurement control unit is in function.

GRAPHIC ZONE	SYMBOL	DESCRIPTION
1	SET1	Set1 - Relay Open
	SET1	Set1 - Relay Closed
	S1	Set1 – Programmed, Timed, Threshold Enabled, Relay Open
	S1	Set1 – Programmed, Timed, Threshold Disabled, Relay Open
	S1	Set1 – Programmed, Timed, Threshold Enabled, Relay Closed
2	SET2	Set2 - Relay Open
	SET2	Set2 - Relay Closed
	S2	Set2 – Programmed, Timed, Threshold Enabled, Relay Open
	S2	Set2 – Programmed, Timed, Threshold Disabled, Relay Open
	S2	Set2 – Programmed, Timed, Threshold Enabled, Relay Closed
1-2	DIS. SET	Set Disabled Indicates digital input ON

GRAPHIC ZONE	SYMBOL	DESCRIPTION
	ER 01	Holding time Probe frozen on one value
	OUTR MAX	Max Logic Set The maximum logic set has been exceeded
	OUTR MIN	Min.bmp Logic Set The minimum logic set has been exceeded
	T.OUT SET	Relay Time Out The maximum dosage time has been exceeded
3	ALARM WASH	Wash Wash phase enabled
4	☐→1 mA	mA1 mA1 output value
	☐→2 mAт	mA2 mA2 temperature output value
	☐→2 mAa	mA2 auxiliary mA2 auxiliary output value
	☐→2 PID	mA2 PID Output value as PID
	↑F▮	Fahrenheit thermometer Automatic temperature in Fahrenheit
	▥▮ F	Manual Fahrenheit Thermometer Manual temperature in Fahrenheit
	↑C▮	Celsius thermometer Automatic temperature in Celsius
	▥▮ C	Manual Celsius Thermometer Manual temperature in Celsius
5	⧗	Waiting Freeze phase, measurements and outputs
6	–+0123456789*	Numeric values
7	├————·————┤	0% of the scale
	▬————·————┤	10% of the scale

GRAPHIC ZONE	SYMBOL	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	**NTU**	Turbidity Unit of measure
	FTU	Turbidity Unit of measure
	mg/L	Turbidity Unit of measure
	g/L	Turbidity Unit of measure
	SEC	Seconds during stabilisation
9	FULL	Archive full
		Saving Data saved

3   INSTALLATION

Carefully read the information below before installation.

3.1   COMPOSITION OF THE CONSIGNMENT

3.1.1   INSTALLATION OF THE WALL-MOUNTED CONTROL UNIT

The wall must be completely smooth in order to allow for the perfect adhesion of the control unit.
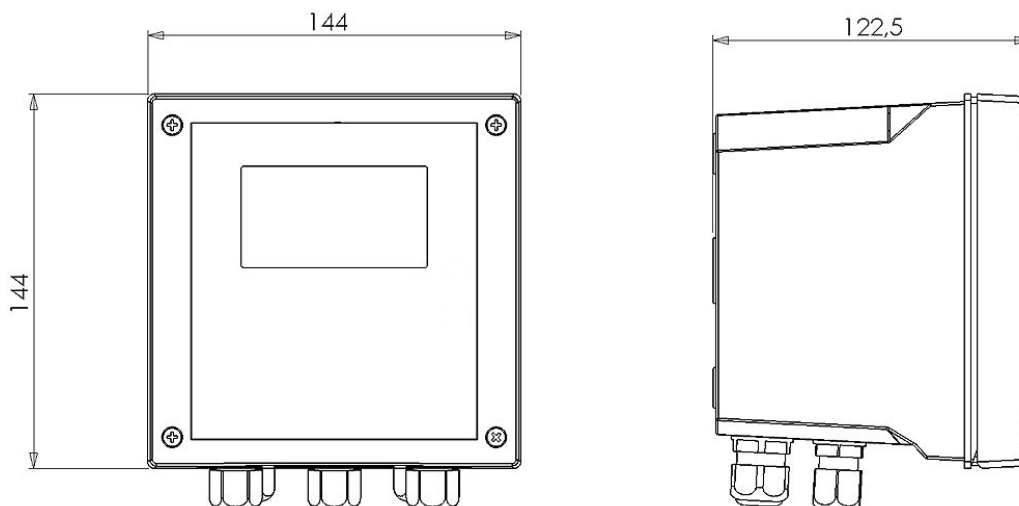
Figure 5 – Dimensions and encumbrance of the wall-mounted control unit

Mechanical Dimensions	
Dimensions (L x H x D)	144x144x122.5mm
Installation depth	122.5mm
Material	ABS Grey RAL 7045
Installation typology	Wall-mounted
Weight	1 Kg
Front Panel	UV resistant polycarbonate

Open the device, drill the indicated holes and fasten the device to the wall. Cover the holes internally using the relative caps, which come supplied along with the device.

The cable glands for the electrical connections are located on the lower portion of the control unit. In order to facilitate the connections, therefore, any other devices must be positioned at least 15 cm away.

Protect the device against any drips and/or sprays of water from adjacent areas during the programming and calibration phases.

3.1.2 INSTALLATION OF THE CONTROL UNIT IN THE ELECTRIC PANEL

The wall must be completely smooth in order to allow for the perfect adhesion of the electric panel where the control unit will be placed.

The usable depth of the panel must be at least 130 mm.

The thickness of the panel should not exceed 5 mm.

The drilling TEMPLATE must comply with the following diagram:
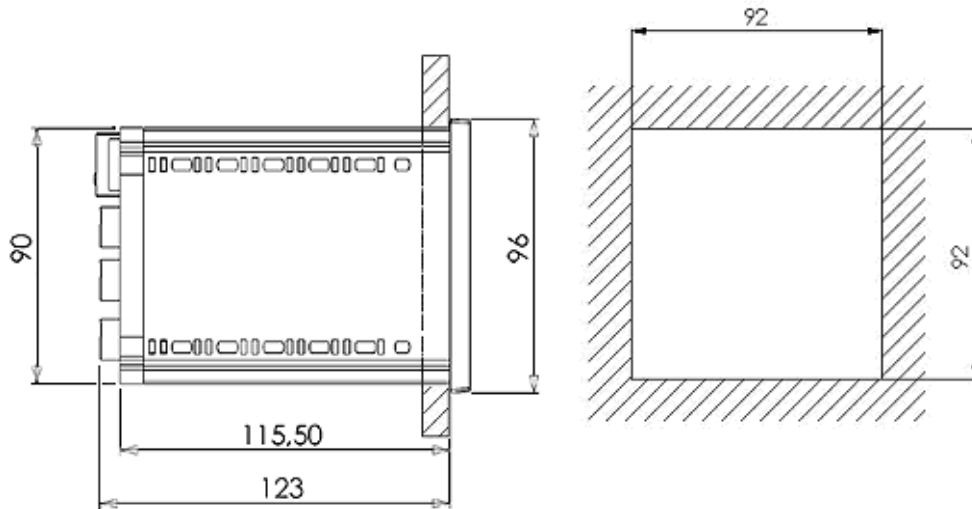
Figure 5 – Dimensions and drilling template for the panel

Mechanical Dimensions	
Dimensions (L x H x D)	96x96x115.5mm
Installation depth	130 mm
Material	black ABS
Installation typology	Panel
Weight	0.7 Kg
Front Panel	UV resistant polycarbonate

The control unit is secured to the panel using the two brackets (1) supplied, inserted in position (2) and locked using the relative screws (3).
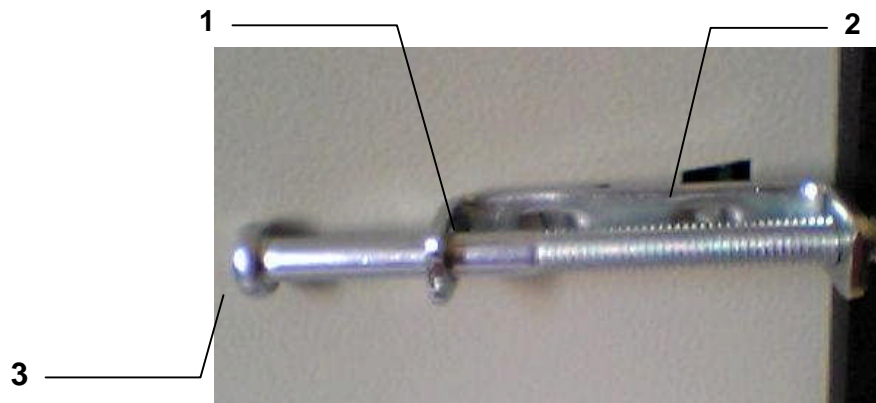
Figure 6 – Bracket securing the control unit to the panel

3.1.3   CONNECTION TO THE POWER SUPPLY

If possible, keep any high power cables away from the control unit and its connection cable, as these could cause inductive disturbances, especially for the analogical portion of the system.

Use an alternating 100Vac to 240Vac-50/60Hz power supply, based on that which is indicated on the device's data label. The power supply must be as stabilised as possible.

Absolutely avoid connecting the device to rebuilt power supplies, using transformers for example, where the same power supply is also used to power other systems (perhaps of an inductive typology). This could lead to the generation of high voltage spikes which, once emitted, are difficult to block and/or eliminate.

ATTENTION

The electrical line must be equipped with an appropriate circuit breaker, in compliance with the proper installation standards

It is nevertheless always a good idea to check the quality of the grounding connector. In industrial facilities, it is not uncommon to find grounding connectors that cause electrical disturbances instead of preventing them; wherever doubts should arise regarding the quality of the facility's grounding connectors, it is best to connect the control unit's electrical system to a dedicated grounding rod.

3.1.3.1   Electrical connections to the dosing systems (Utilities)

ATTENTION

Before connecting the analyser's control unit to the external utilities, make sure that the electrical panel is off and that the wires from the mains power supplies are not live.

The term "utilities" is intended to indicate the relay outputs used in the control unit

– (SET1) for controlling dosing or control pumps
– (SET2) for controlling dosing or control pumps
– (ALARM) alarm command transmitted by the instrument to the siren and/or flashing light
– (WASH) wash electrode command

CAUTION

With a resistive load, each relay contact can sustain a maximum current of 1 amp, at max. 230V, and therefore a total power of 230 VA.

In the case of higher power values, it is recommended to perform the utility connections based on the scheme provided in fig. 6-b)

If, on the other hand, the load is of a low power or resistive typology, the connection scheme in fig. 6-a) can be used
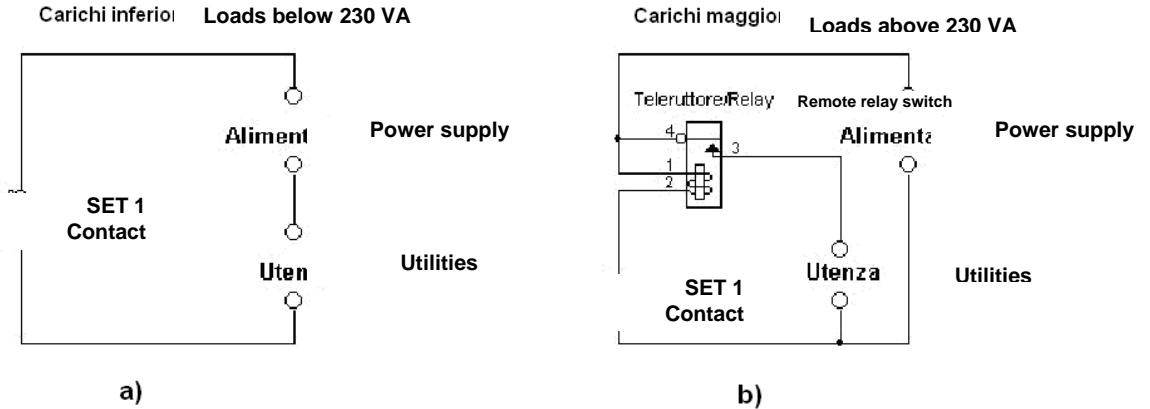
Figure 7 Examples of connections with the utilities

NOTE

The schemes shown above are indicative and do not contain the details regarding all of the necessary safety and protection devices.

3.1.3.1.1 Terminal board for wall-mounted device
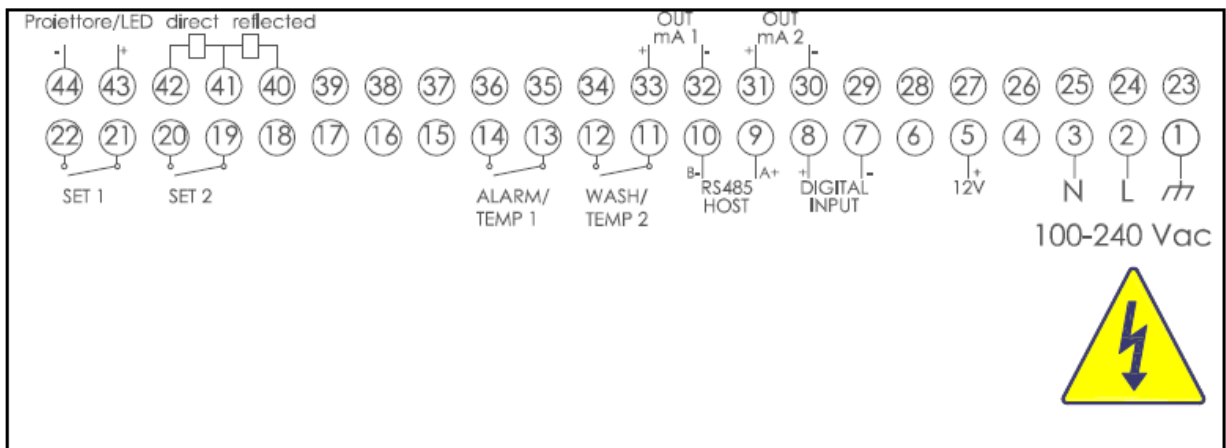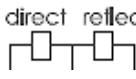
Figure 9 Connections for the wall-mounted model

TERMINAL NO.	SYMBOL	DESCRIPTION
1	⏚	Power supply (Ground)
2	**L**	Power supply (Phase)
3	**N**	Power supply (Neutral)
5	12V⁺	Probe power supply (+12V)
7	DIGITAL INPUT	Digital input (-)
8		Digital input (+)
9	RS485 HOST	RS485 (A+)
10		RS485 (B-)
11	WASH/ TEMP 2	Wash and Temp. Relay (N.C. contact)
12		Wash and Temp. Relay (N.O. contact)
13	ALARM/ TEMP 1	Alarm and Temp. Relay (N.C. contact)
14		Alarm and Temp. Relay (N.O. contact)

TERMINAL NO.	SYMBOL	DESCRIPTION
19	SET 2	Set Point 2 Relay (N.C. contact)
20		Set Point 2 Relay (N.O. contact)
21	SET 1	Set Point 1 Relay (N.C. contact)
22		Set Point 1 Relay (N.O. contact)
30	OUT mA 2	mA2 Output (-)
31	+| |-	mA2 Output (+)
32	OUT mA 1	mA1 Output (-)
33	+| |-	mA1 Output (+)
38	12V	S75… Probe power supply (+)
39	-| |+	S75… Probe power supply (-)
40		Direct resistance positive
41	direct reflected	Direct-reflected resistance common
42		Reflected resistance positive
43	Proiettore/LED	LED projector positive
44	-| |+	LED projector negative

3.1.3.1.2 Terminal board for panel-mounted device
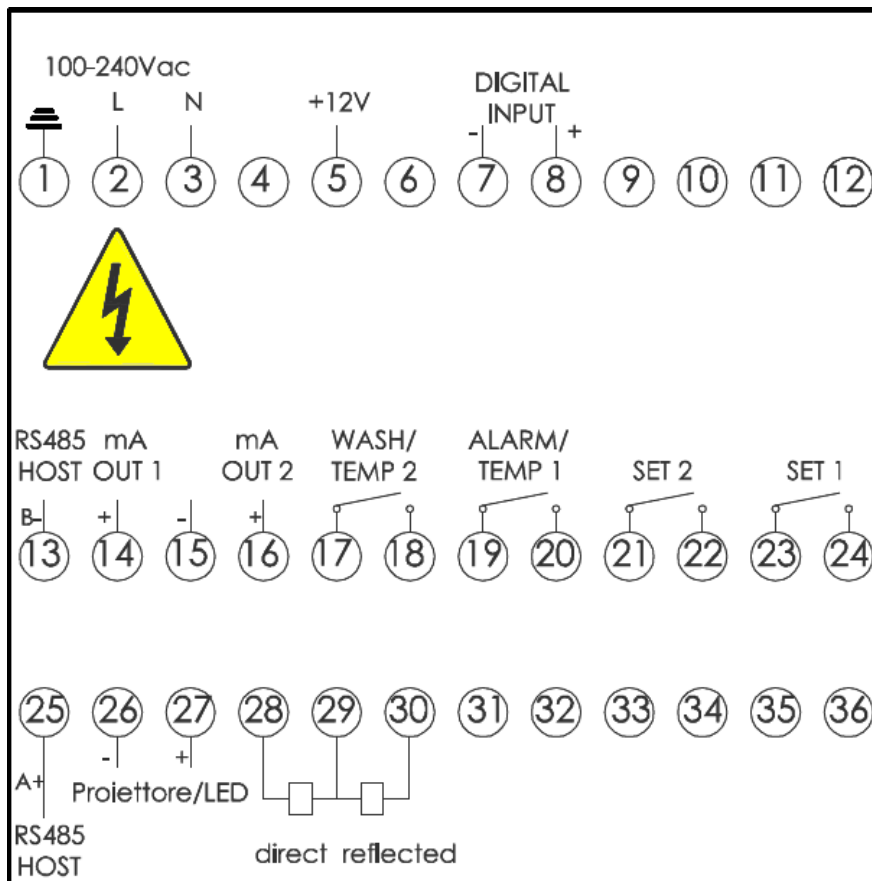
Figure 10 Connections for the panel-mounted model

TERMINAL NO.	SYMBOL	DESCRIPTION
1	⏚	Power supply (Ground)
2	**L**	Power supply (Phase)
3	**N**	Power supply (Neutral)

TERMINAL NO.	SYMBOL	DESCRIPTION
5	12V+	Probe power supply (+12V)
7	+| |- DIGITAL INPUT	Digital input (-)
8		Digital input (+)
13	B-| |A+ RS485 HOST	RS485 (B-)
25		RS485 (A+)
14	mA mA OUT 1 OUT 2 +| -| +|	mA1 Output (+)
15		mA1 - mA2 (-) output (common)
16		mA2 Output (+)
17	WASH/ TEMP 2	Wash and Temp. Relay (N.C. contact)
18		Wash and Temp. Relay (N.O. contact)
19	ALARM/ TEMP 1	Alarm and Temp. Relay (N.C. contact)
20		Alarm and Temp. Relay (N.O. contact)
21	SET 2	Set Point 2 Relay (N.C. contact)
22		Set Point 2 Relay (N.O. contact)
23	SET 1	Set Point 1 Relay (N.C. contact)
24		Set Point 1 Relay (N.O. contact)
26	Proiettore/LED -| |+	LED projector positive
27		LED projector negative
28	direct reflected	Direct resistance positive
29		Direct-reflected resistance common
30		Reflected resistance positive

3.1.3.2 Connections To The Electrical Network

After having verified that the mains voltage complies with the requirements set forth in the previous sections, connect the electrical cable to the indicated terminals and the ground wire to the terminal bearing the appropriate symbol.

3.1.4 CONNECTION OF THE TURBIDITY PROBES

Shut off the device.

Connect the electrode's cables to the terminals on the measuring device's terminal board following the colour-scheme illustrated on the label beneath the cover of the electrical compartment, or consult the manual.

4   METHODS OF USE

4.1   COMPOSITION OF THE MEASUREMENT SYSTEM

4.1.1   MINIMUM CONFIGURATION

100-240 Vac

Turbidity probe
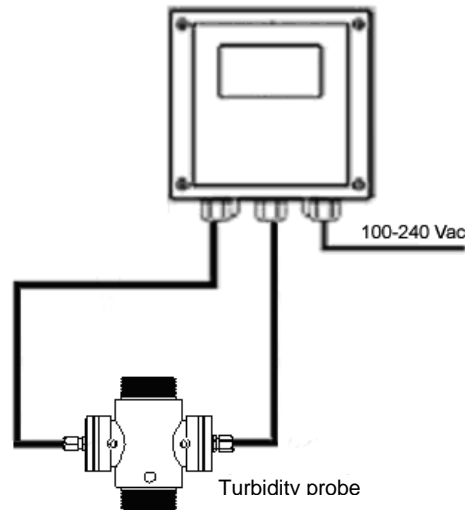
Figure 8 Minimum configuration

4.1.2   MAXIMUM CONFIGURATION

100-240 Vac

Turbidity probe
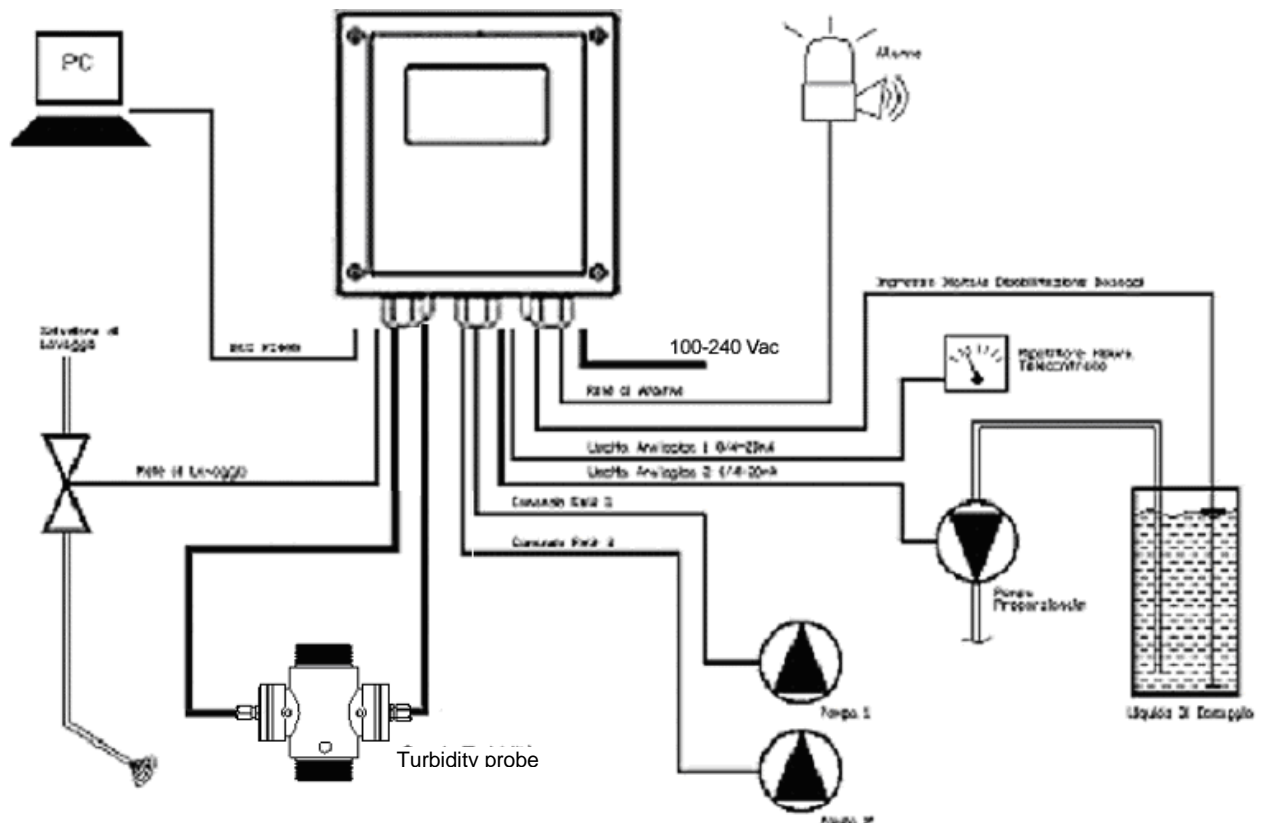
Figure 9 Maximum configuration

4.2   ACTIVATING THE SYSTEM

Once the electronic control unit and the measurement sensor have been installed, the software must be programmed in order to "customize" the parameters for the correct use of the equipment.

Turn on the device by activating its electrical power supply – the control unit is not equipped with a power switch.

4.2.1   MENU FUNCTIONS UPON ACTIVATION

Upon activating the device, certain keys can be used to access programming functions which are not present during SETUP.

4.2.1.1   Contrast adjustment

Press and hold down the DOWN key while turning on the device. Keep the key pressed until the message "Contrast control" appears on the display.

This will access the display's contrast adjustment screen.

NOTE

During this operation, release the DOWN button immediately once the first acoustic beep is heard. Otherwise, the display's contrast value will be brought to 0% and the screen will appear completely white. In order to restore the correct contrast level, press the UP key.

Use the **UP** and **DOWN** keys to adjust the contrast percentage.
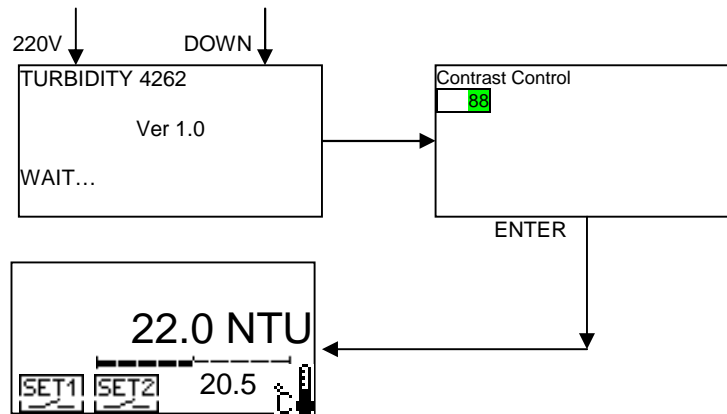
Figure 10 – Contrast Function Flow-Chart

When finished, press **ENTER** to activate the RUN mode view.

4.3   INTRODUCTION TO THE OPERATING PARAMETERS

In order to insert/modify the operating data and to perform the calibration procedures, use the 5 function keys on the control unit's front panel to select the desired menu on the display.

When turned on, the device automatically goes into measurement mode – RUN function. Press the ESC key to enter the programming mode. Next, press ENTER to access the various menus. In this manner, all of the outputs will be disabled. Use the UP and DOWN keys to scroll through the various menus and submenus and to modify the data (increase/decrease).

Use the ENTER key to access the data insertion submenus and to confirm any modifications.

Use the ESC key to return to the previous menu or function without saving any changes.

4.3.1 SETTINGS MENU (TEMPERATURE – SYSTEM SETUP)

```
┌───────────────┐
│      ⚙         │   ENTER
│               │   +
│   IMPOSTAZIONI │   DOWN
└───────────────┘
```

(A1)

1. 0 SETTINGS
Temperature
System Setup
Digital Input
Unit of Measure
Range

DOWN →
UP ←

(A2)

1. 0 SETTINGS
Temperature
System Setup
Digital Input
Unit of Measure
Range

ENTER

1.20 SYSTEM SETUP
System Date/time
Communication
Language
Password
Display

ENTER

1.10 TEMPERATURE
Comp.Temp.   AUT
Manual Temp.   +025°C
Unit of Measure   °C

ENTER

UP/DOWN

1.220 SYSTEM SETUP
System Date/time
Communication
Language
Password
Display
Serial Number

ENTER
DOWN

DATE/TIME
Day   09
Month   03
Year   2010
Hour   12
Minute   42

1.10 TEMPERATURE
Comp. Temp.   AUT
Manual Temp.   +025°C
Unit of Measure   °C

ENTER

1.220 COMMUNICATION
Instrument ID   01
Baud rate   9600

1.20 SYSTEM SETUP
System Date/time
Communication
Language
Password
Display
Serial Number

UP/DOWN
UP/DOWN

ENTER

1.23 SYSTEM SETUP
Language

English

ENTER

1.241 PASSWORD
Password Status

Password: 0

1.20 SYSTEM SETUP
System Date/time
Communication
Language
Password
Display
Serial Number

UP/DOWN

ENTER

1.240 PASSWORD
Password Status
New Password

ENTER
UP/DOWN

1.240 PASSWORD
Password Status
New Password

ENTER

1.20 SYSTEM SETUP
System Date/time
Communication
Language
Password
Display
Serial Number

UP/DOWN

ENTER

1.250 DISPLAY
Contrast   88
Backlighting   NO

1.242 PASSWORD
New Password

Password: 0

1.20 SYSTEM SETUP
System Date/time
Communication
Language
Password
Display
Serial Number

ENTER

1.26 SYSTEM SETUP
Serial Number

12345

A1) Temperature

The Unit of Measure function allows the user to select whether to display the temperature in Celsius or Fahrenheit. By default, temperature values are displayed in Celsius.

A2) System Setup

This programming step is divided into 5 functions which can be used to set the instrument's basic functioning parameters.

Function descriptions:

SYSTEM DATE/TIME

The system's DATE and TIME setting, which will be used for data archiving.

COMMUNICATION

The instrument is equipped with a galvanically-separated RS485 serial port, which can be used for communicating with a HOST system over a standard MOD BUS RTU protocol. The serial port can be used to view the system's real time status, program all of the setup parameters and download the device's entire archive.

The Communication Setup function contains two settings which can be used to program the serial port:

Instrument ID: The numeric address from 1 to 99 to which the instrument will respond. The default value is 01.

Baud Rate: The speed of the RS485 serial port, which can be programmed from 1200 to 38400. The default value is 9600.

LANGUAGE

This function allows for the software's interface language to be selected from amongst: Italian, English, French, Spanish and German.

PASSWORD

This function allows for a device access password to be enabled and programmed. Once enabled, the access password will be requested every time the user attempts to access the programming mode.

The password is made up of a 4-digit number. The default password is 2002. This password will always remain valid even if a new password is programmed.

The existing password is required to access the "Password Status" or "New Password" screens before inserting a new password.

DISPLAY

Contrast: This function allows for the display's contrast to be increased or decreased based on the temperature in which the instrument is operating.

Backlighting: This function allows the user to decide whether the display's backlighting should always remain on or should automatically shut off one minute after the last key has been pressed.

Select YES for fixed backlighting and NO for automatic shutoff. By default, this value is set to NO.

SERIAL NO.

This function displays the serial number of the device in use.

4.3.2 SETTINGS MENU (DIGITAL INPUT – UNIT OF MEASURE)
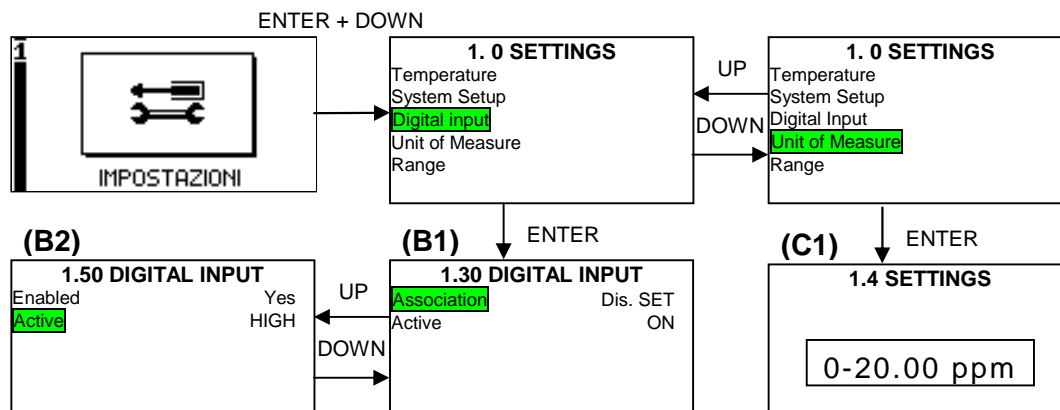
B1) Digital input: Association

This function allows the user to assign a function to the digital input.
Select "Dis. SET" to associate the digital input with the disabling of the SET POINTS.
Select "WASH" to associate the digital input with the wash.

B2) Digital input: Enabled

Determines the direction of the input, or rather whether it is enabled when it goes HIGH or when it goes LOW.
Select "HIGH" to enable the digital input when the input itself is powered on.
Select "LOW" to enable the digital input when the input itself is not powered on.

C1) Unit of Measure

Allows for the selection of the Turbidity unit of measure. The user can choose between NTU, FTU and ppm.

4.3.3 SETTINGS MENU (RANGE)
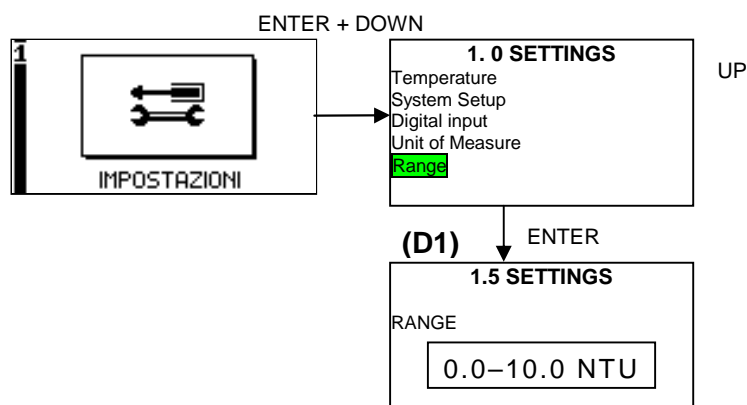
D1) Range

This function allows for the instrument's operating range to be selected from amongst the following:

- **0-1 NTU**
- **0-10 NTU**
- **0-100 NTU**

4.3.4 OUTPUTS MENU (RELAY OUTPUTS – SET POINT 1)
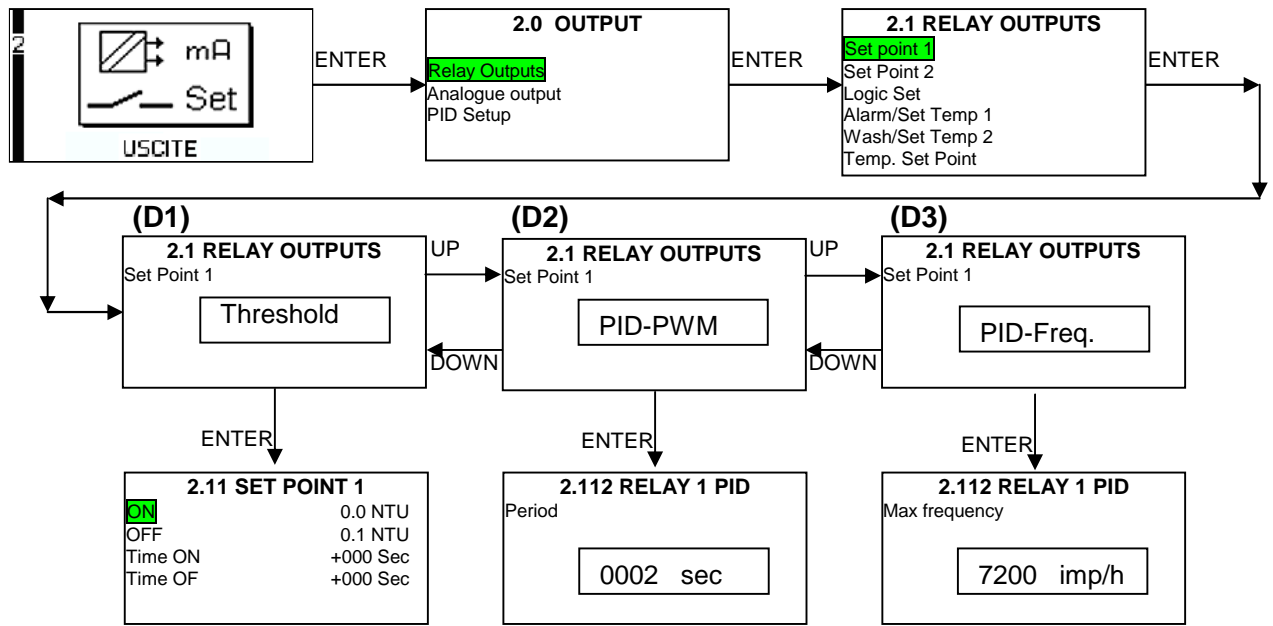
The programming parameters of Set Point 1 determine the functioning logic of a Relay 1. The logic of Relay 1 can be programmed in the following manners:

D1) Threshold

By setting the Set Point as Threshold, the Relay can be programmed to *ON* (relay activation) or *OFF* (relay deactivation). The free programming of these two values allows the user to create a hysteresis suitable for any type of application.

By programming an *ON* value higher than the *OFF* value (fig. 11.a), an *UPWARD* threshold functionality can be obtained: (when the value exceeds the value of *ON*, the relay is enabled and remains active until the value descends below the value of *OFF*).

By programming an *OFF* value higher than the *ON* value (fig. 11.b), a DOWNWARD threshold functionality can be obtained (when the value descends below the value of *ON*, the relay is enabled and remains active until the value exceeds the value of *OFF*). See fig.11.
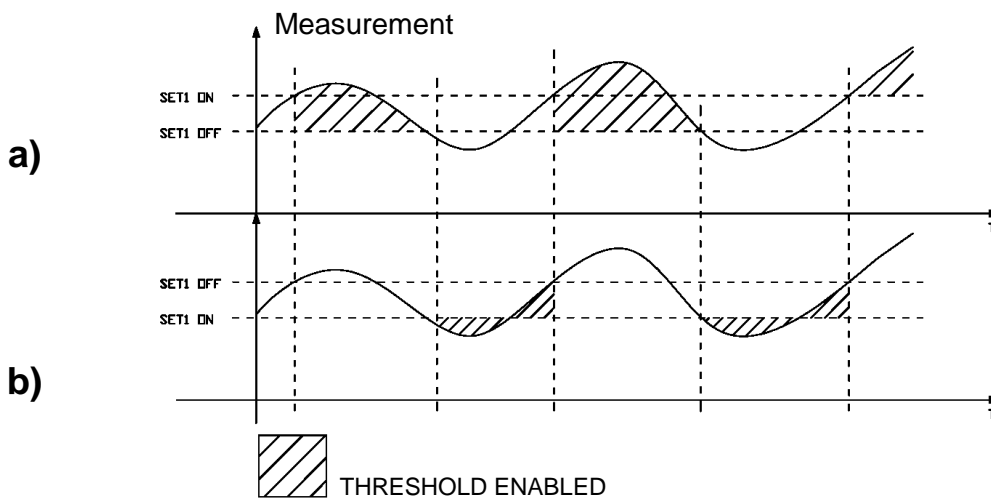
Figure 11 – Threshold functionality

The *Time ON* and *Time OFF* parameters can also be used to set a *DELAY* time or a *TIMING* function for Relay 1 during its activation.

The ON and OFF times can be programmed with either negative or positive values. (fig. 12)

If *Negative Times* are programmed, the *DELAY* function is enabled:

Ex. ON Time: –5sec , OFF Time -10sec. (fig. 12.a)

When the threshold is enabled, the relay will close after 5 seconds (**ON Time**) and will remain closed for the entire time in which the threshold is enabled. Once the threshold is disabled, the relay will remain closed for another 10 seconds (**OFF Time**) before opening.

If *Positive Times* are programmed, the *TIMING* function is enabled:

Ex. ON Time: 5sec , OFF Time 10sec. (fig. 12.b)

When the threshold is enabled, the relay will alternate between its open and closed positions based on the programmed times. In the case of the example, the relay will close for 5 seconds (**ON Time**) and will subsequently open for 10 seconds (**OFF Time**). This cycle will continue until Threshold 1 is disabled.
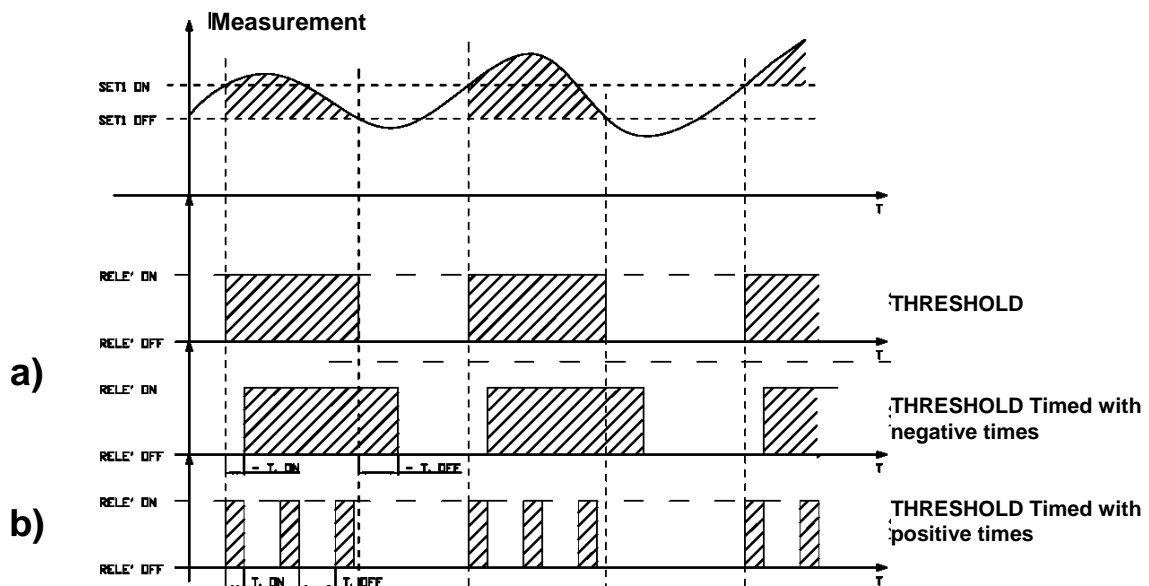
Figure 12 – Relay 1 functionality

D2) PID-PWM

If the Set Point is set as PID-PWM, Relay 1 can be used to operate a pump with ON/OFF commands as if it were to be in proportional adjustment. This function requires the time (in seconds) within which the PWM adjustment will be subsequently calculated to be programmed. Maximum programmable time: 999 sec. with increments of 1 second. In order to prevent abrupt measurement variations, it is recommended to start with shorter times and to subsequently increase them. For the Relay's functionality with the PID-PWM function, see fig. 13.b
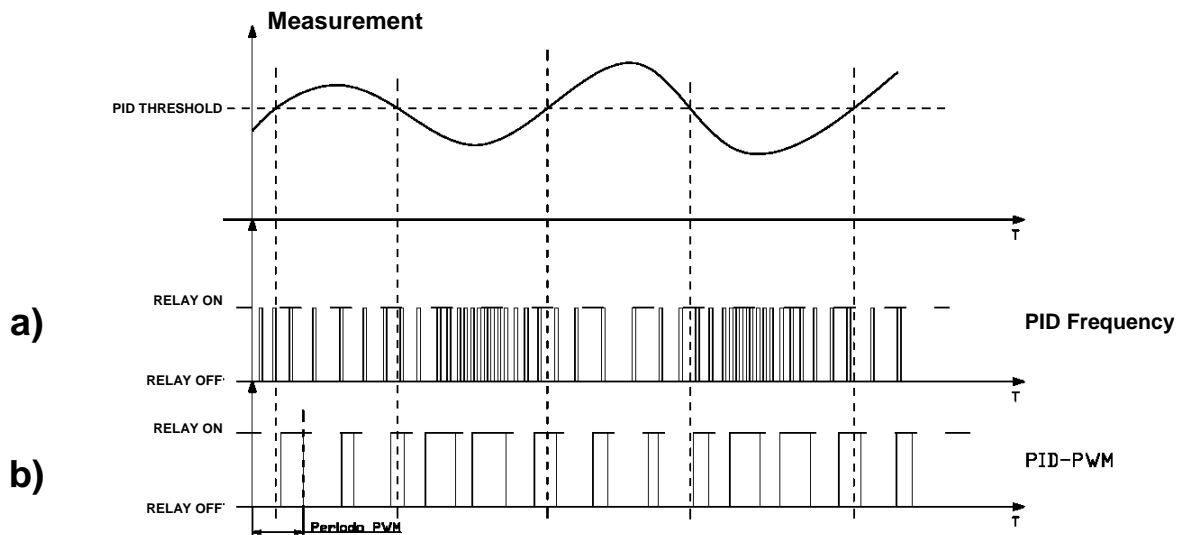
Figure 13 – Relay 1 functionality as PID

D3) PID-Frequency

If the Set Point is set as PID-Frequency, Relay 1 can be used to directly control a pump with a pulsed input. This function requires the number of the maximum impulses/hour that the pump is capable of accepting to be programmed. Maximum number: 7200 imp/h with increments of 200. The time of the ON and OFF impulse is fixed and is equal to 250msec. For the Relay's functionality with the PID-Frequency function, see fig. 13.a.

NOTE

This function is associated with the PID programming parameters found in menu 2.31 (sec.4.2.8). It is therefore recommended to check the PID programming parameters before programming this function.

4.3.5 OUTPUTS MENU (RELAY OUTPUTS – SET POINT 2, ETC.)
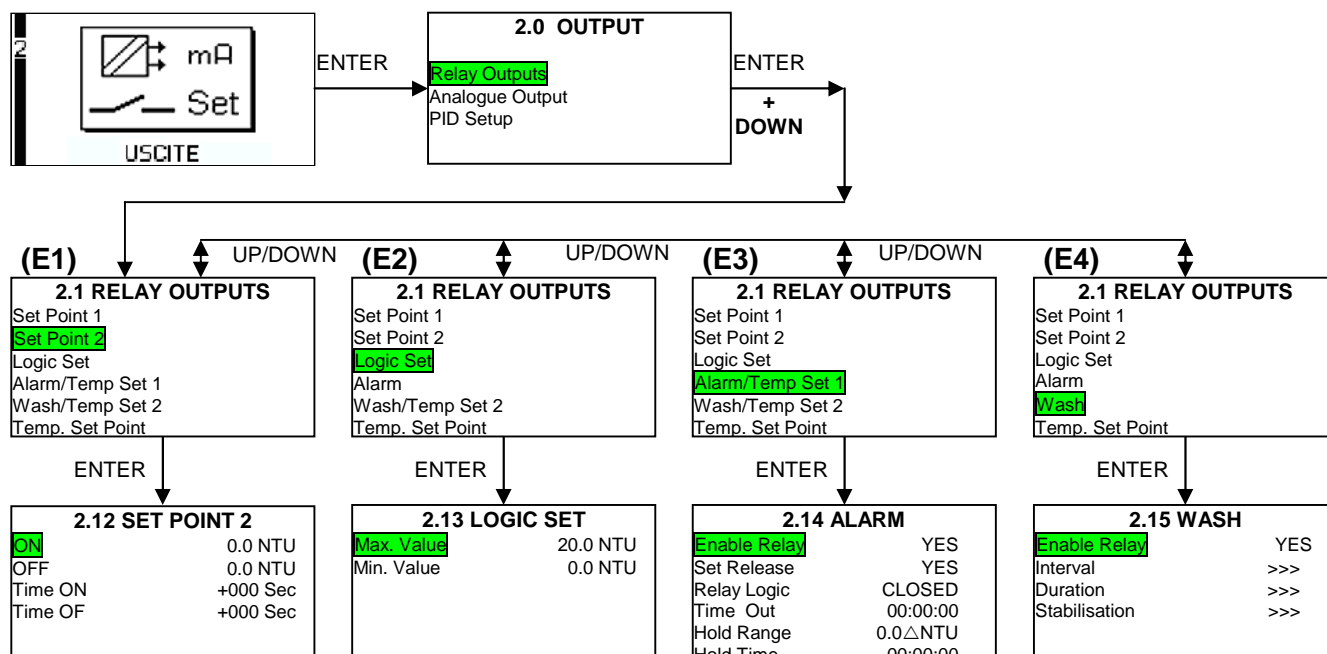
E1) Set Point 2

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

This Relay can only be programmed as a Threshold. The procedure for programming Threshold 2 is identical to that which has already been described for programming Threshold 1.

E2) Logic Set

The parameters of the Logic Set determine the functionality of the Alarm Relay. By default, this function is disabled.

This function allows for an alarm to be activated whenever the measurement values are outside of a certain range. In fact, the user can set minimum and maximum values, beyond which the instrument will generate an alarm.

This Logic Set is useful for monitoring any system anomalies, such as dosing pump malfunctions, etc.

E3) Alarm/Set Temp. 1

This function determines the basic settings of the Alarm Relay which are associated with all of the malfunction conditions both inside and outside of the instrument itself.

Given the importance of this Relay, we recommend connecting it to a visual and acoustic signalling device that will be constantly monitored by the system's operators in order to allow for immediate intervention in the event of a signal.

The programming of the Alarm relay is comprised of 5 functions which allow for both the external malfunctions (measurement electrode and dosing systems) and the internal device malfunctions to be constantly monitored. Function descriptions:

ENABLE RELAY

This function allows the user to assign a function to the relay.

If enabled, it functions as an alarm relay. If disabled, it automatically functions as a temperature relay.

SET RELEASE

This function allows the user to enable or disable dosing in the event of an alarm.

If set to YES, the contacts of Relays 1 and 2 will immediately open and analogue outputs 1 and 2 will be immediately zeroed in the event of an alarm.

If set to NO, the contacts of the relays and the analogue outputs will not change their positions, even in the event of an alarm.

RELAY LOGIC

The Alarm relay is an ON/OFF relay. This function allows the user to program its opening/closing logic. By default, the relay is set to CLOSED.

When set to "CLOSED", the Alarm relay will be open during normal operating conditions and will close in the event of an alarm.

When set to "OPEN", it does the opposite. The Alarm relay will be closed during normal operating conditions and will open in the event of an alarm.

By setting the relay to OPEN, the user can also monitor anomalies such as loss of electrical power and/or malfunctions within the instrument itself, which will cause the Relay to immediately open.

TIME OUT

This function allows the user to set a maximum activation time for Set Points 1 and 2, *which will cause an alarm to be activated if exceeded.* This allows for the status of the dosing pumps to be constantly monitored.

By default, this function is disabled (time 00:00.00). The maximum programmable time is 60 minutes, with increments of 15 seconds.

HOLDING RANGE – HOLDING TIME

This function allows the measurement sensor's operating status to be constantly monitored.

In the event that the measurement should remain within a certain interval for a period of time greater than that which has been inserted, the instrument will generate an alarm.

In order to activate this function the following settings must be applied:

Insert the minimum measurement oscillation interval (delta Turbidity) under "HOLDING RANGE"

Insert the maximum time within which the variation must take place under "HOLDING TIME".

If the measurement constantly remains within the selected interval during the programmed period of time, the instrument will activate the alarm.

By default, this function is disabled, with the delta set to 0 and the time set to 00:00.00. The maximum programmable time is 99 hours, with increments of 15 minutes.

E4) Wash/Set Temp. 2

The instrument is equipped with a relay that, if selected as the Wash relay, controls a solenoid valve for washing the measurement electrode. The Relay can also be configured as a temperature relay.

The wash phase lasts for a total of 1 minute, which includes 15 seconds for solenoid valve control (closure of the wash relay) and 45 seconds for sensor stabilisation.

ENABLE RELAY

This function allows the user to assign a function to the relay.

If enabled, it functions as a wash relay. If disabled, it automatically functions as a temperature relay.

INTERVAL

This function allows the user to set the time interval between one wash phase and the next.

Prior to initiating the wash phase, the instrument saves the measurement values, the status of Relays 1 and 2 and the values of the analogue outputs and "freezes" them for the entire duration of the wash phase.

During the wash phase, an hourglass symbol will appear on the display and a counter indicating the seconds remaining until the end of the wash phase will appear in place of the measurement value.

By default, this function is disabled, with the time set to 00 hours and 00 minutes. The maximum programmable time is 24 hours, with increments of 5 minutes.

DURATION

This function allows the user to program the duration (in seconds) of the wash phase.

STABILISATION

This function allows the user to program the time required (in seconds) for the stabilization of the wash.

4.3.6   OUTPUTS MENU (TEMP. SET POINT)
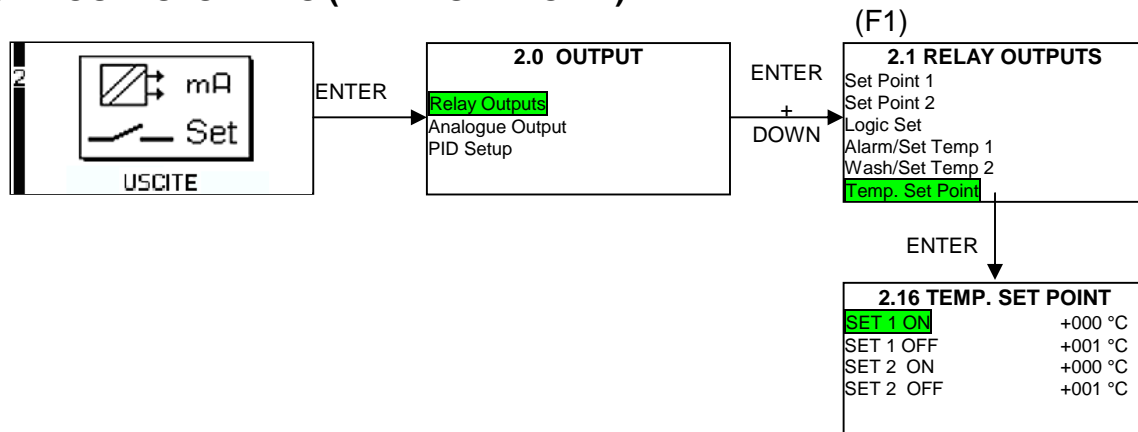
F1) Temp. Set Point

If at least one of the two relays indicated in points **F3** and **F4** is enabled as a temperature relay, this step allows the user to configure its relative Set Point.

4.3.7 OUTPUTS MENU (ANALOGUE OUTPUT)
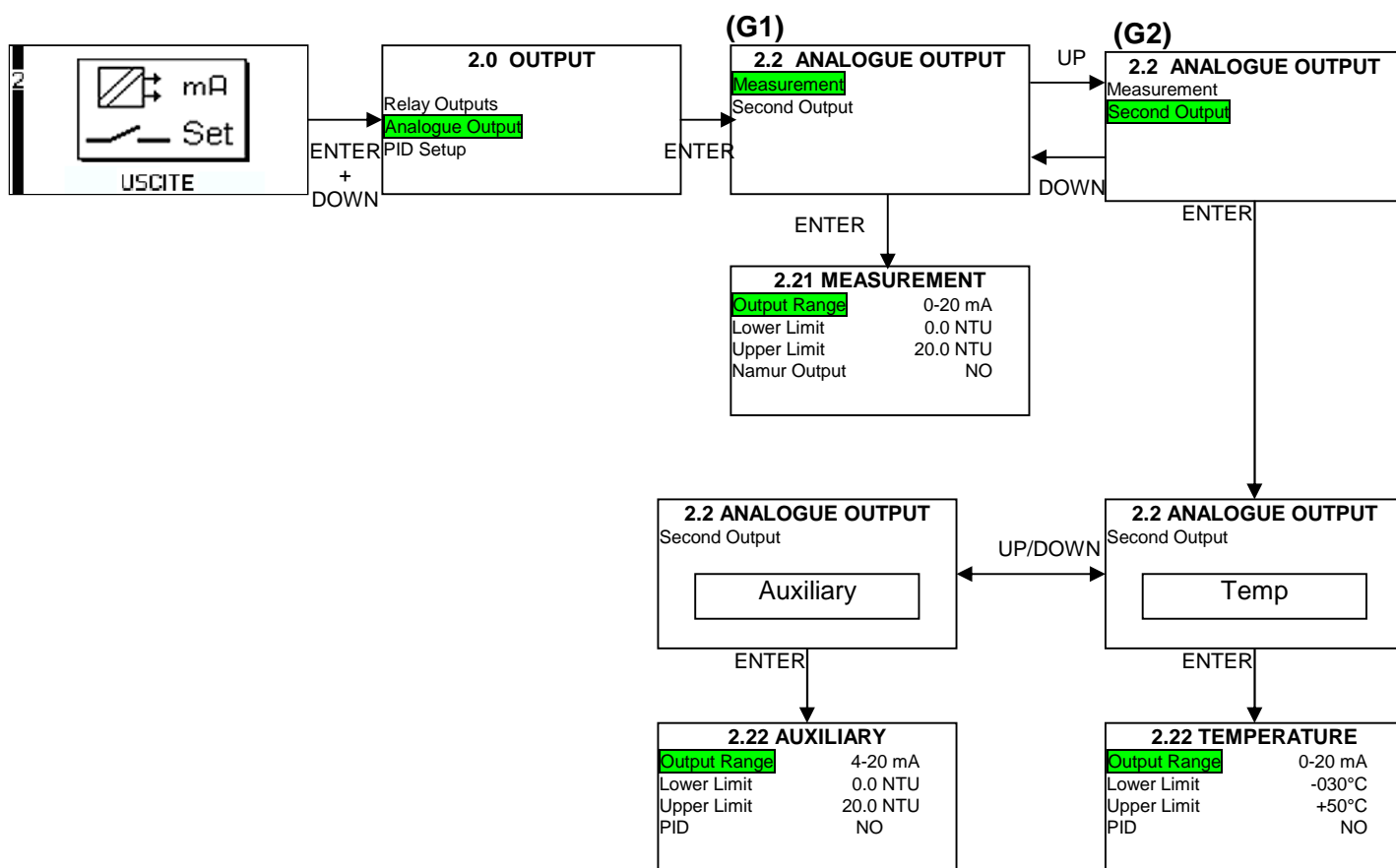
The instrument is equipped with two galvanically-separated and independent current analogue outputs. The first output is associated with the primary measurement and is therefore proportional to the measured Turbidity. The second, on the other hand, can be programmed as either Temperature or Cond.

G1) Measurement
This programming step allows for 4 functions to be configured:

OUTPUT RANGE:
Can be set to either 0-20mA or 4-20mA. By default this range is set to 0-20mA.

LOWER LIMIT:
A Turbidity value of 0 or 4mA can be attributed to the current output. By default, this value is set to 0NTU.

UPPER LIMIT:
A Turbidity value of 20mA can be attributed to the current output. By default, this value is set to 1.0NTU.

The value of the upper limit corresponds to the maximum of the range in relation to the selected unit of measure (i.e. If the unit of measure is FTU and the selected range is 0-100, the value of the upper limit will be 100FTU).

The adjustment of the Upper and Lower Limit functions allows for the scale of the analogue output to be increased or decreased. They also allow for the output to be inverted to 20-0mA or 20-4mA

NAMUR OUTPUT:

This function is only enabled if the Output Range is set to 4-20mA. If this function is enabled, the value of the current output will be brought to 2.4mA according to the NAMUR standard in the event of an alarm. By default, this function is disabled.

G2) Second Output

The second output can be programmed as either Temperature or COND.

If it is programmed as **Temperature**, the range and the limits must also be set, as in the case of the primary output. (see E1). By default, the values are set as follows: Range 0-20mA, Lower Limit – 30°C and Upper Limit +140°C.

If it is programmed as **Cond.**, the Turbidity measurement will be repeated. However, the range and limits can be set to different values than the first. By default, the values are set as follows: Range 4-20mA, Lower Limit 0.00NTU (0mg/L or 0%SAT) and Upper Limit 20.0NTU (20.0mg/L or 200%SAT).

Whether this output is set as Temperature or as Cond, it can be programmed as **PID**; see the following section for the other PID settings.

4.3.8   OUTPUTS MENU (PID SETUP)
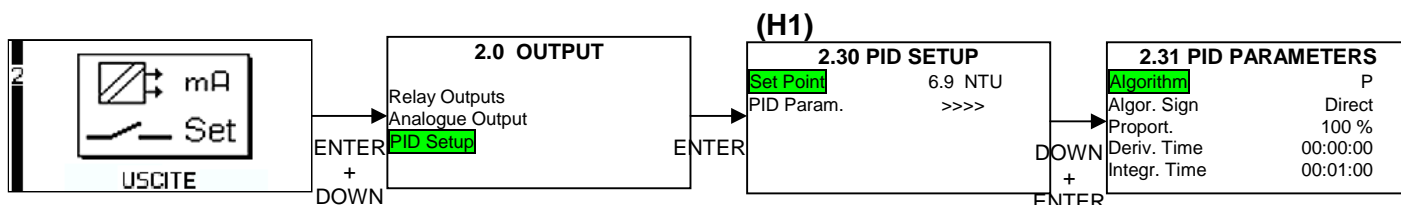
H1) PID Setup

This programming step deals with programming the parameters for PID functionality. The PID adjustment output is both analogue and digital and both can be enabled simultaneously. The PID outputs are: Analogue Output 2 and Relay 1.

The PID function allows for the elimination of oscillations due to ON/OFF dosing. It also allows for the desired threshold to be reached and maintained with excellent precision. PID adjustment is a complex adjustment that must take into account all of the system variables. This PID has been designed for general applications with fast system retroactivity. In fact, the maximum programmable integral and derived times are of 5 minutes.

The PID function provides for three adjustments for managing the dosage.

The PROPORTIONAL (P) adjustment allows for the increased or decreased amplification of the output quantity

The DERIVATIVE (D) function allows for the system to be rendered more or less reactive to variations in the measured quantities

The INTEGRATIVE (I) function allows for the mediation of the oscillations resulting from the derivative part

Function descriptions:

SET POINT

This function is used to set the value of the PID threshold that should be maintained stable

PID SETUP

ALGORITHM

The types of algorithms managed by the instrument include: P = Proportional ; PI = Proportional – Integral and PID = Proportional – Integral – Derivative

The algorithm is selected based on the required application. By default, the algorithm is set to P

ALGORITHM SIGN

This function is used to program the PID sign. If set to DIRECT, the PID value will decrease as the measured value increases with respect to the set threshold. If set to INVERSE, on the other hand, the PID value will increase as the measured value increases with respect to the set threshold. By default, the algorithm sign is set to DIRECT.

PROPORTIONAL

This function represents the Proportional Range of the PID adjustment with respect to the bottom of the instrument's scale.

Example: for Turbidity with a Range of 0-20NTU, if Proportional 100% is programmed, this means there will be an adjustment range of ±20NTU with respect to the set threshold. Therefore, the proportional value is inversely proportional to the output amplification, or rather, increasing the proportional percentage decreases the effects on the output.

The proportional value can be adjusted from 1 to 500%, in increments of 1%. By default, this value is set to 100%.

DERIVED TIME

This function sets the Derivative part. The higher the programmed time, the more the system will be ready for measurement variations. The derived time can be programmed from 0 to 5 minutes, in increments of 5 seconds. By default, this value is set to 0 minutes.

INTEGRAL TIME

This function sets the Integrative part. The higher the programmed time, the more the system will mediate the measurement oscillations. The derived time can be programmed from 0 to 5 minutes, in increments of 5 seconds. By default, this value is set to 1 minute.

4.3.9   CALIBRATION MENU

This programming step allows for the instrument to be calibrated with the utilised electrode. Calibration must absolutely be performed:

- − Upon the first activation of the instrument / electrode measurements chain
- − Each time the electrode is replaced
- − Upon startup following long periods of disuse
- − Whenever discrepancies are encountered with respect to a known value

The possibility of calibrating Turbidity or Suspended Solids depends on the probe which has been connected and selected through the Settings -> Measurement Setup –> Probe Typology menu. In addition to the cases cited above, the instrument must also be calibrated or recalibrated periodically in order to guarantee its proper functionality.

The frequency of this operation must be established by the user, keeping in mind the type of application and the type of electrode being utilized.

NOTE
Before performing any inspections or recalibrations, the electrodes must be carefully rinsed with clean water and allowed to stabilize for at least 30 minutes in air, or else in a solution of known titre.
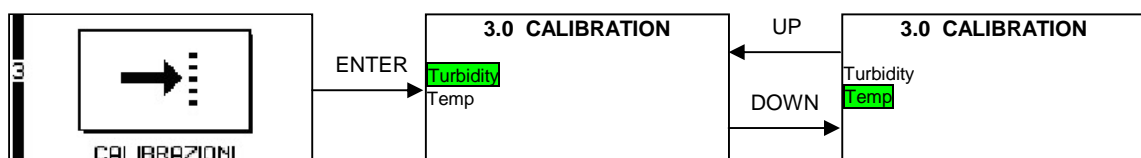
The calibration functions are illustrated on the following page:

Calibration function descriptions:
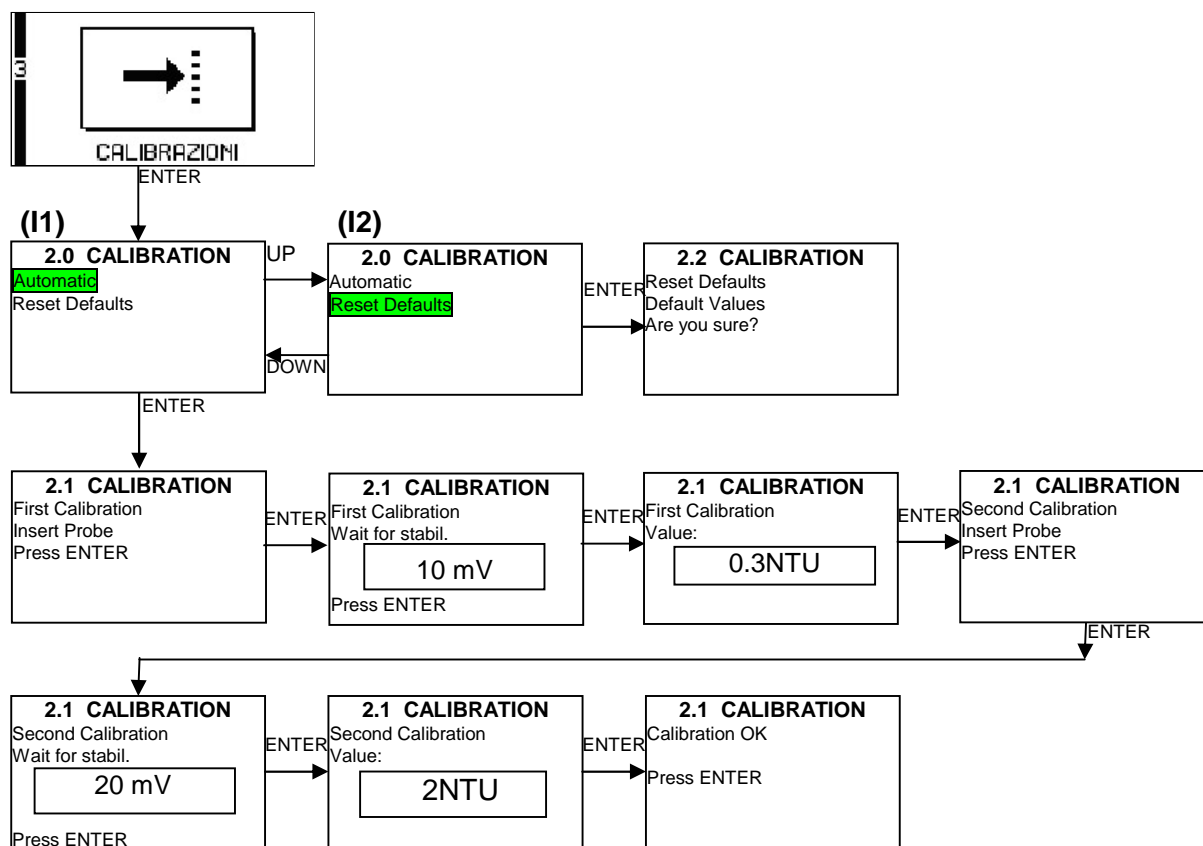
I1) **Automatic**

The calibration of the 4262 Turbidity analyser requires two points of calibration.

I.1.1) These two points can be separately calibrated to any turbidity value. It is even possible to separately perform the calibration of the first or second point, again to any desired turbidity value.

I.1.2) Wait for the displayed value in mV, detected by the sensor, to stabilise and then press ENTER.

I.1.3) The instrument will automatically display the value of 0000FTU. Insert the value of the solution present within the measurement cell. At this point press ENTER.

I.1.4) and **I.1.5)** Perform the calibration of the second point using the same procedure as that which was utilised for the first, inserting a different turbidity value, however, with respect to the previously set calibration value.

In order to select the calibration solutions, it is recommended to refer to the operating range in which the measurement system will normally be working. For example: if the operating range is between 5 and 10 FTU, use a solution of approximately 7-8 FTU.

NOTE

During the calibration procedure, the measurement cell must always be full of liquid and no air bubbles should be present
For the zero calibration, the liquid must be stationary within the cell and the calibration must be performed after it has been allowed to sit for at least 15 minutes.

Once the second point has been calibrated, the instrument will verify the consistency of the calibration data. If the data is correct, the message "Calibration OK" will appear on the instrument's display, otherwise the message "Calibration Error" will appear.

If the message "Calibration Error" is displayed, we recommend:

- Verifying the physical integrity of the sensor and the projector;
- Verifying the integrity of the cable and its proper connection to the instrument;
- Verifying the characteristics of the calibration solutions.

I2) Reset Defaults

This programming step restores the calibration factors to the factory settings. This step can be utilized to cancel incorrect calibrations.
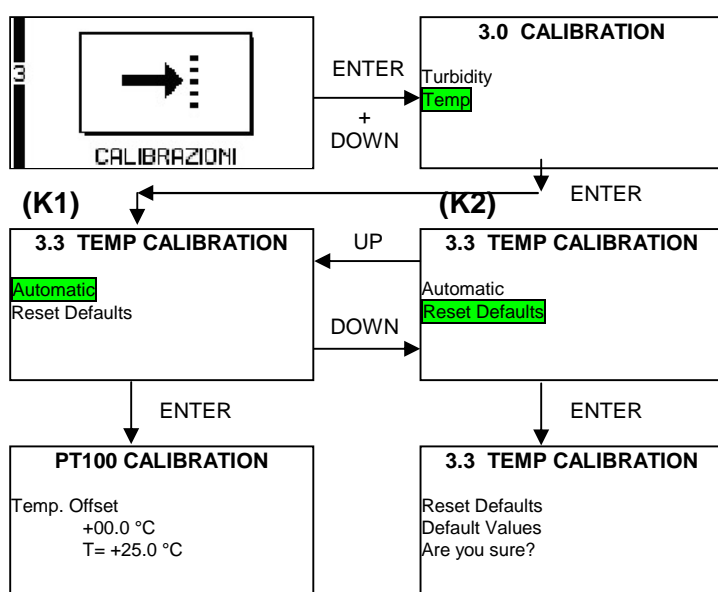
The calibration of the temperature allows for the values detected by the temperature sensor to be aligned with the actual analysis values; this procedure should only be performed if the operator encounters slight differences between the values detected by the instrument and the actual operating values.

K1) Automatic calibration

This calibration consists in increasing or decreasing an offset value in order to bring the detected value to the correct measurement.

K2) Reset Defaults

As described in step J2), this programming step restores the temperature calibration factors to the factory settings.

4.3.10   ARCHIVES MENU

The instrument is equipped with a data logger that is capable of storing up to 16,000 records.

Each record contains: the date, the time, the Turbidity value, the temperature value, the values of Thresholds 1 and 2, the status of Relays 1 and 2 and the status of the Alarm Relay.

The archive can be of a Cyclical typology, in which once its full capacity has been reached, the oldest records will be progressively overwritten with the new records, or else of a FILL typology, in which once the archive is full, storage will cease and an "archive full" icon will appear on the display.
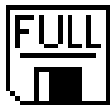
The archive can be displayed on the instrument in tabular or graphic format or else transferred to an external computer by means of the RS485 serial port over a MOD BUS RTU protocol.
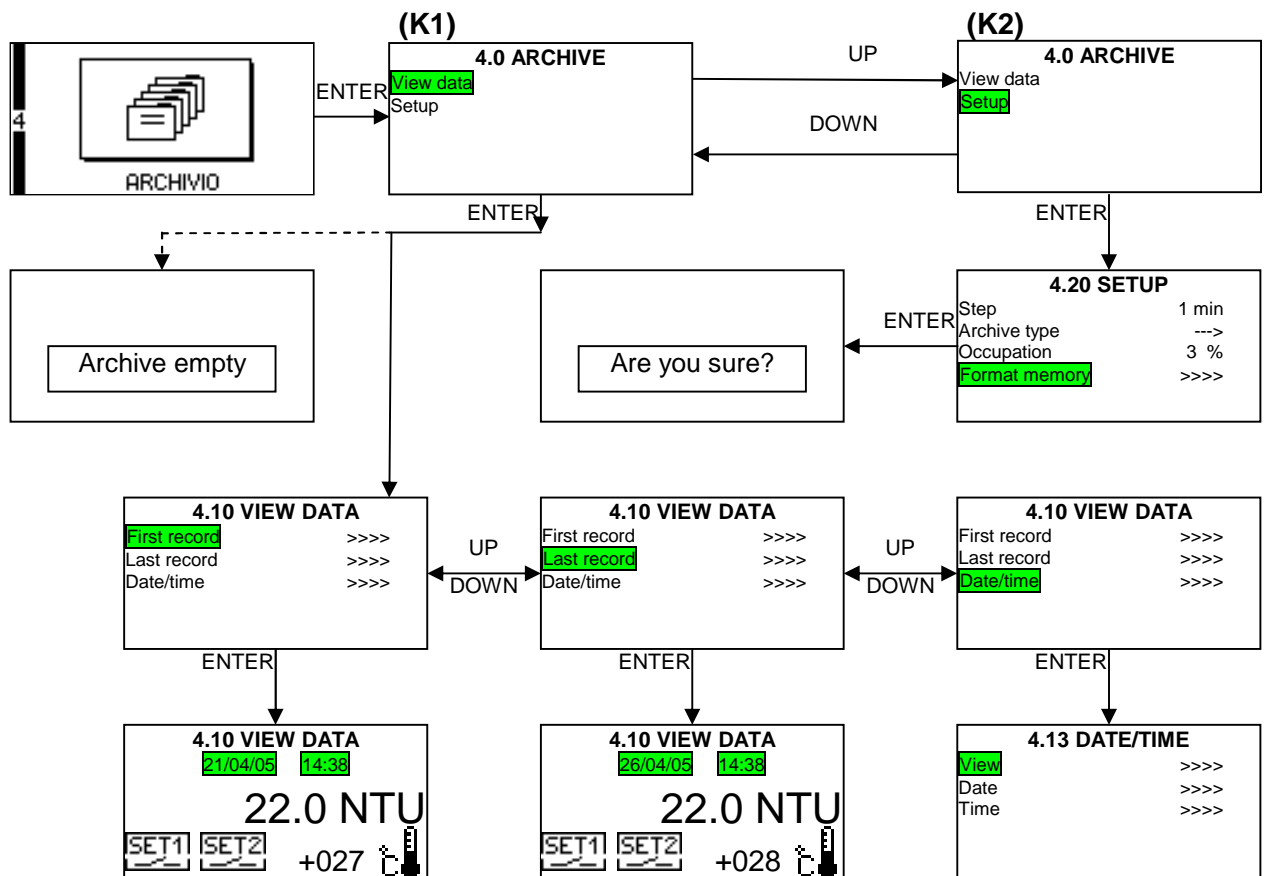
K1) View data

This programming step allows the user to view the data in tabular format, as long as the archive is not empty. Three options are available:

First record>>>   The data will be displayed starting with the first saved record and listed in chronological order

Last record>>>   The data will be displayed starting with the last saved record and listed in reverse chronological order

Date/Time>>>   The data will be displayed starting from a date and time set by the user

Use the UP and DOWN arrows to scroll through the archive. The scrolling will stop once the first or last record has been reached.

K2) Setup

This programming step uses 4 functions to establish the data saving logic:

STEP

This function defines the saving interval and can be programmed from 0 to 99 minutes, in increments of 1 minute. By default, this value is set to 0 minutes, and is therefore disabled.

ARCHIVE TYPOLOGY

Cyclical "⇄ " Archive: once full, the oldest records will be overwritten with the new records
Fill "--⇥" Archive: once full, record storage will cease

OCCUPATION

Indicates the percentage of memory which is already occupied by saved data.

FORMAT MEMORY

Deletes all of the data stored in memory.

CAUTION

Performing this operation will delete all of the archived measurements.

4.3.11   MEASUREMENT GRAPHICS MENU
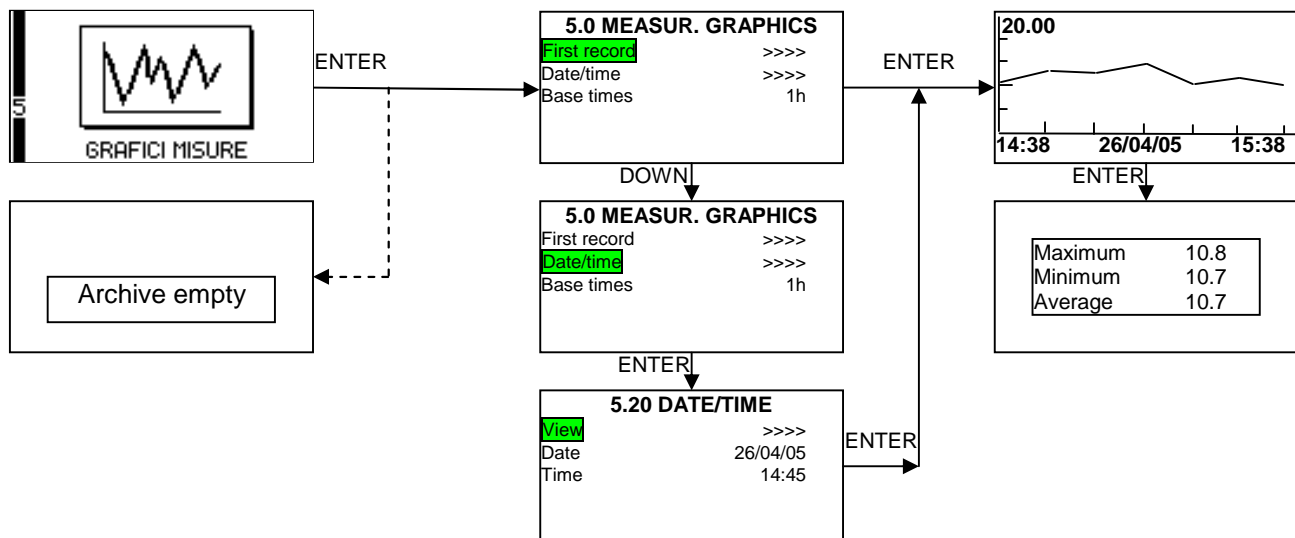
This programming step allows the user to view the data in graphic format, as long as the archive is not empty. Two options are available:

First record>>>   The data will be displayed starting with the first saved record and listed in chronological order

Date/Time>>>   The data will be displayed starting from a date and time set by the user

Use the UP and DOWN arrows to scroll through the archive. The scrolling will stop once the first or last record has been reached.

Base Times

The base times serve to establish the time interval for the graphic view. By default this value is set to 1 hour, but the user may select from 1, 6 or 24 hours.

NOTE

Once the graphic has been viewed, press the ENTER key to display a table indicating the Minimum, Maximum and Average measurement values in the time interval associated with that screen. Press the ENTER key again to display the progressive measurement details with reference to the minimum and maximum values. Press the ENTER key once again to return to the initial view.

The ZOOM function allows for slight variations in Turbidity to be recognized.

4.3.12   MANUAL CONTROL MENU
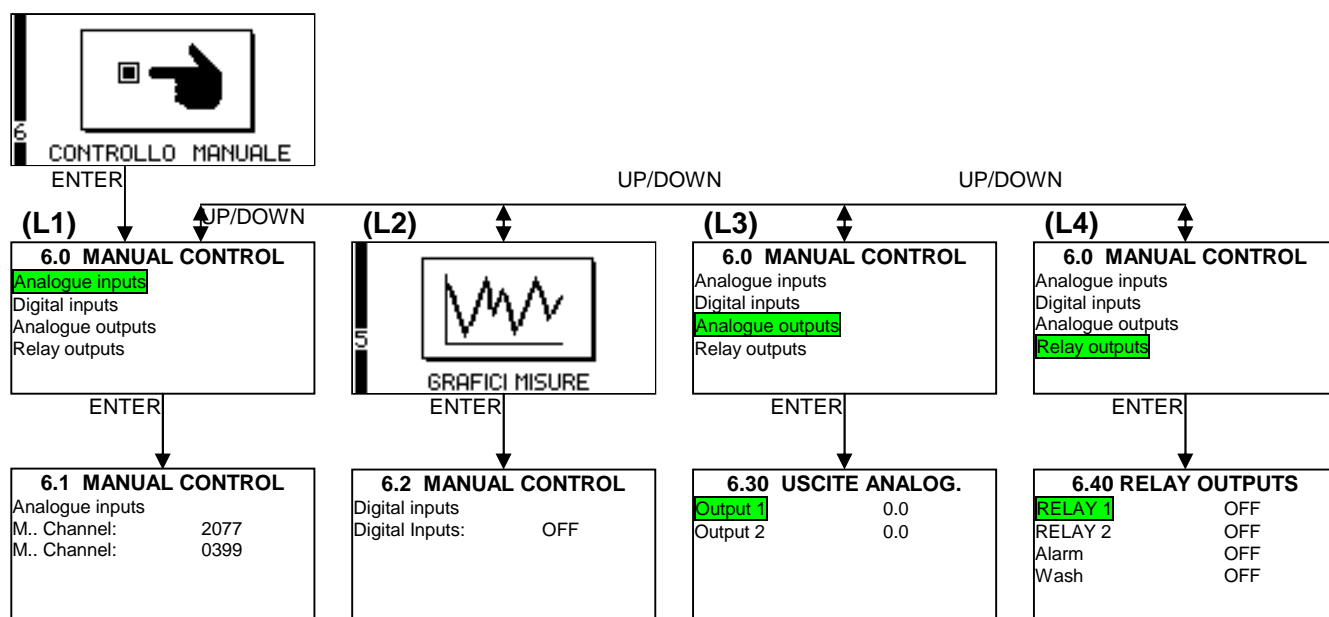
This programming step is useful for all of the functional verifications that are required upon starting up the measurement and dosing system, as it allows for the instrument's outputs and inputs to be manually activated and displayed.

L1) Analogue Inputs

This function allows the user to directly view the values detected by the analogue/digital converter in relation to the measurement of the Turbidity and Temperature.

This allows the user to determine whether the instrument's analogue acquisition stage is functioning properly.

L2) Digital Inputs

The instrument is equipped with a galvanically-separated passive digital input which allows for dosing to be disabled, both on the Relay as well as on the Analogue outputs. This step allows for this input's functionality to be verified.

If the relay contact is open, OFF should be displayed. If, on the other hand, voltage is applied to its terminals according to the device's specifications, ON should be displayed.

L3) Analogue Outputs

This function allows for both of the current Analogue Outputs to be manually modified. The variation of the outputs takes place at intervals of 0.1mA.

L4) Relay Outputs

This function allows for the status of the Relay Outputs to be manually modified.

ATTENTION

In order to exit the settings menu and return to the RUN screen, press the ESC key and confirm the operation by pressing the ENTER key. In this manner, any modifications made to the settings will be saved

4.3.13   FUNCTIONS IN RUN MODE

```
         ┌─────────────────┐                      ┌─────────────────┐
         │  ⊕ 16:41        │      ESC              │1                │
         │    1.0 NTU      │ ──────────────────►  │   [tools icon]  │
         │ ▄▄▄▄ ▄▄▄▄        │                      │  IMPOSTAZIONI   │
         │ SET1 SET2  +026 ▐│                      └─────────────────┘
         └─────────────────┘
              │     │         UP        (M2)
              │     │    ──────────────► ┌─────────────────────────┐
              │     │                    │      EDITING RUN         │
              │     │                    │ Set Point    1      ON   │
              │     │                    │ Set Point    1      OFF  │
              │     │                    │ relay Set Point  1       │
              │     │                    │ Set Point    2      ON   │
              │     │                    │ Set Point    2      OFF  │
              │     │                    │ relay Set Point  2       │
              │     │                    └─────────────────────────┘
              │     │
              │     │      ENTER          ┌─────────────────┐  ENTER   (M3)
              │     │  ────────────────►  │   22.0 NTU      │ ──────► ┌─────────────────┐
              │     │                     │ ▄▄▄ ▄▄▄          │         │    22.0 NTU     │
              │     │                     │ SET1 SET2 10.0 ⊡1│         │ ▄▄▄ ▄▄▄         │
              │     │                     │            mA    │         │ SET1 SET2  6.6 ⊡2│
              │     │                     └─────────────────┘         │            mAⴕ  │
              │     │                                                 └─────────────────┘
              │     │       (M4)
              │     │      DOWN          ┌─────────────────┐
              │     │  ────────────────► │                 │
              │     │                    │    22.0 NTU     │
              │     │                    │                 │
              │     │                    └─────────────────┘
              │     │       (M5)
              │     │      GRAPH         ┌─────────────────┐
              │     │  ────────────────► │5                │
              │     │                    │  [graph icon]   │
              │     │                    │ GRAFICI MISURE  │
              │     │                    └─────────────────┘
              │     │
              │     │                    ┌─────────────────┐
              │     │  GRAPH (HOLD DOWN) │ PENDRIVE BACKUP  │
              │     │  ────────────────► │                 │
              │     │                    │                 │
              │     │                    └─────────────────┘
              │     │                              │
              └─────┴──────────────────────────────┘  ENTER
```
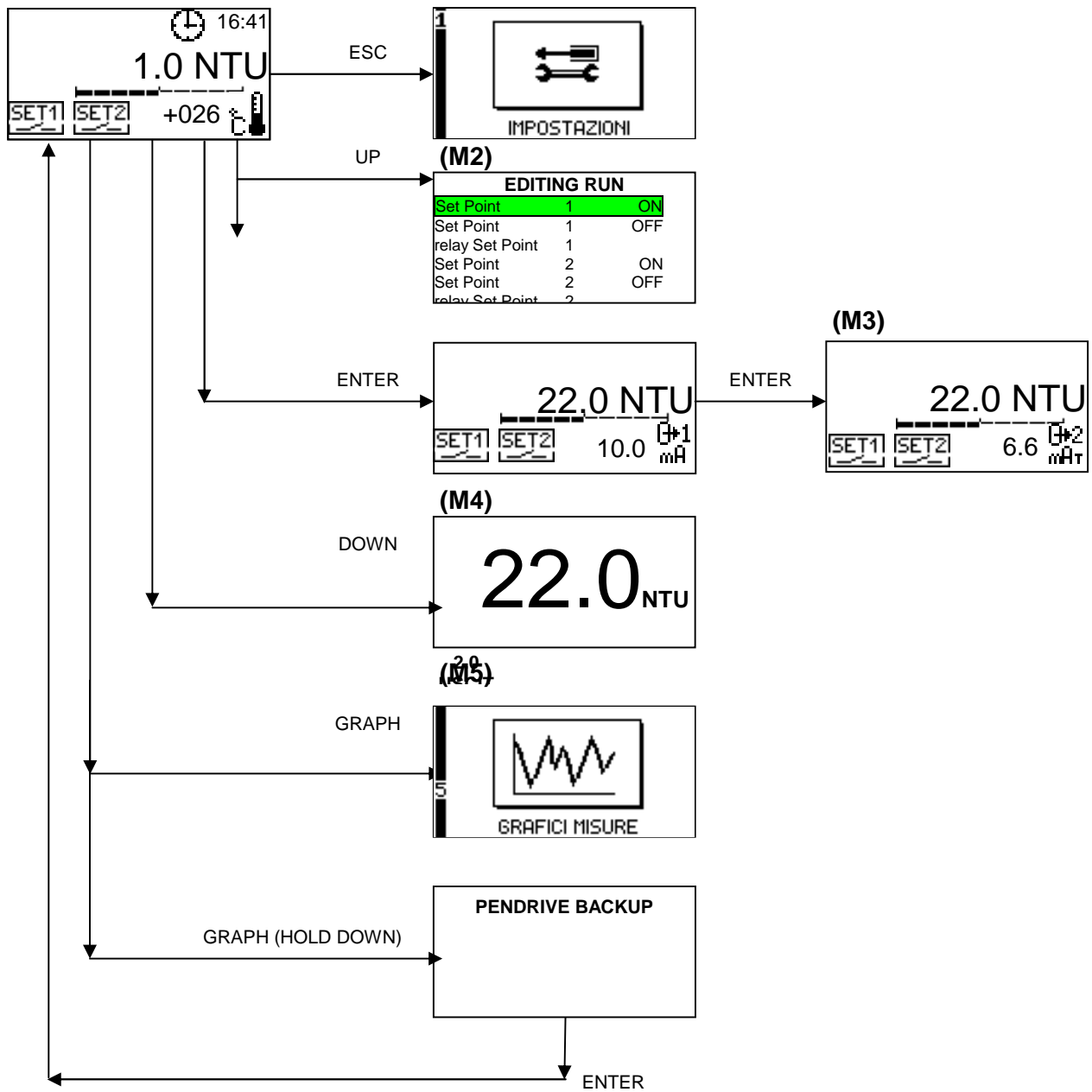
The measurement phase (RUN) screen displays the following information:

- Turbidity Measurement
- Percentage value with respect to the bottom of the scale (bar graph)
- System Time
- The status and type of programming for Relays 1 and 2
- The Status of the Digital Input
- The Status of the Alarm Relay
- The Status of the Wash Relay
- The Status of the Password
- The status of measurement and output freezing
- The value of the Temperature or of Analogue Output 1 or Analogue Output 2
- System Errors
- Archive Data Storage
- Archive Full

M1) Pressing the ESC key during the measurement phase

Use this key to access the programming phase. All of the measurement and dosing functions will be disabled. Attention: the instrument does not exit this phase automatically.

Serial communication is also disabled during the Programming phase.

M2) Pressing the UP key during the measurement phase

Use this key to view the status and the values of Set Points 1 and 2 without blocking the instrument's functionality or stopping the pumps.

M3) Pressing the ENTER key during the measurement phase

Use this key to display the Temperature value or the value of Analogue Output 1 or Analogue Output 2 on the lower portion of the screen.

M4) Pressing the DOWN key during the measurement phase

Use this key to view the ZOOM of the primary measurement.

M5) Pressing the GRAPH key during the measurement phase

Use this key to display the MEASUREMENT GRAPHICS menu directly.

OPTIONAL: Pressing the GRAPH key FOR 3-4 seconds during the measurement phase

Use this function to access the PENDRIVE BACK UP menu (Optional) and download data to a USB pendrive.

5   USER MAINTENANCE

5.1   SPECIAL REQUIREMENTS FOR CRITICAL COMPONENTS

The device is equipped with a liquid crystal display (LCD), which contains small amounts of toxic materials.

Observe the following instructions carefully in order to avoid personal injury and to prevent environmental pollution:

LCD Display:

- The electronic control unit's LCD display is fragile (glass) and must be handled with care. For this reason, it is recommended to protect the device with its original packaging during transport or whenever it is not in use.
- In the event that the glass of the LCD display should break and liquid should come out, be careful not to touch it. Carefully wash every part of your body that may have come into contact with the liquid for at least 15 minutes. If any abnormal symptoms should arise after this operation has been performed, seek immediate medical attention.

6 CORRECTIVE MAINTENANCE

Shut off the machine for every operation

6.1 COMPOSITION OF THE S 462 PVC TURBIDITY MEASUREMENT CELL

The following diagrams illustrate the cell's composition in order to allow for proper assembly in the event of any parts replacements or repairs.
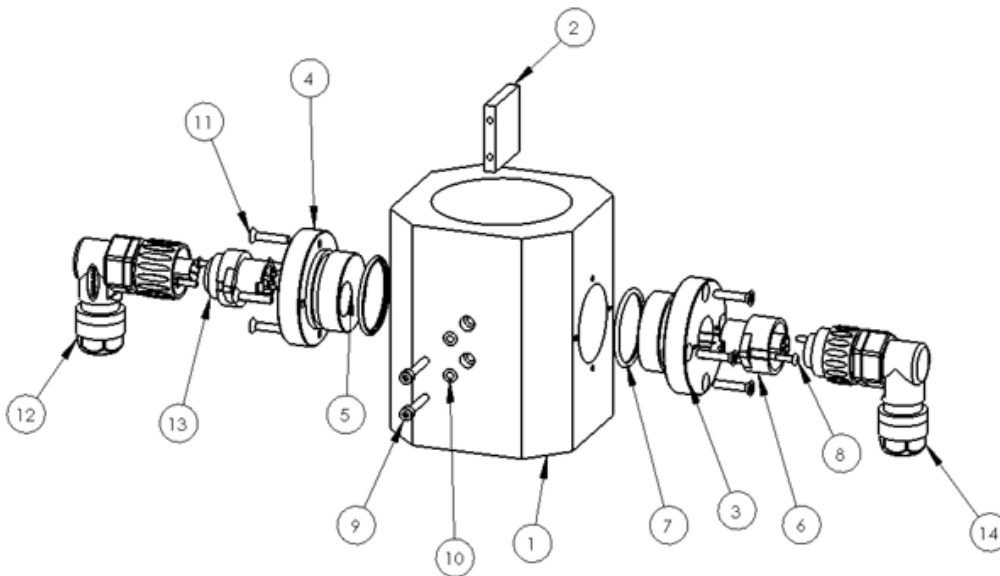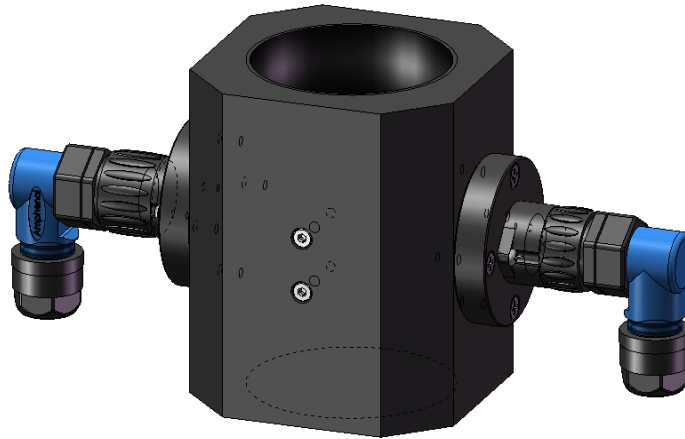

| 1	Body of the S462 cell in PVC	8	TCC M3x10 stainless steel screw (4)
2	Shutter for the S462 cell in PVC	9	TCEI M4x25 stainless steel screw (2)
3	Receiver support for the S462 cell in PVC	10	Viton O-ring 2015 (2)
4	Projector support for the S462 cell in PVC	11	TSC M4x20 stainless steel screw (8)
5	Sight glass for the S462 cell in PVC (3)	12	7-pole female 90° lead connector
6	7-pole female panel connector	13	7-pole male panel connector
7	O-ring 3143 (2)	14	7-pole male 90° lead connector

Note: the quantities are indicated in parentheses

6.2   INSTALLATION PRECAUTIONS

The device may be installed in a horizontal or vertical configuration, as long as the following precautions are respected:
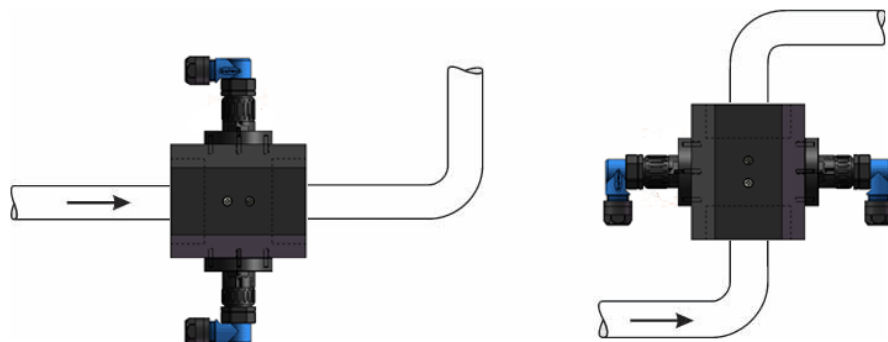
The installation must not be performed in such a way so that the cell may be emptied following a discharge. For proper installation, make sure that the tube is always full:
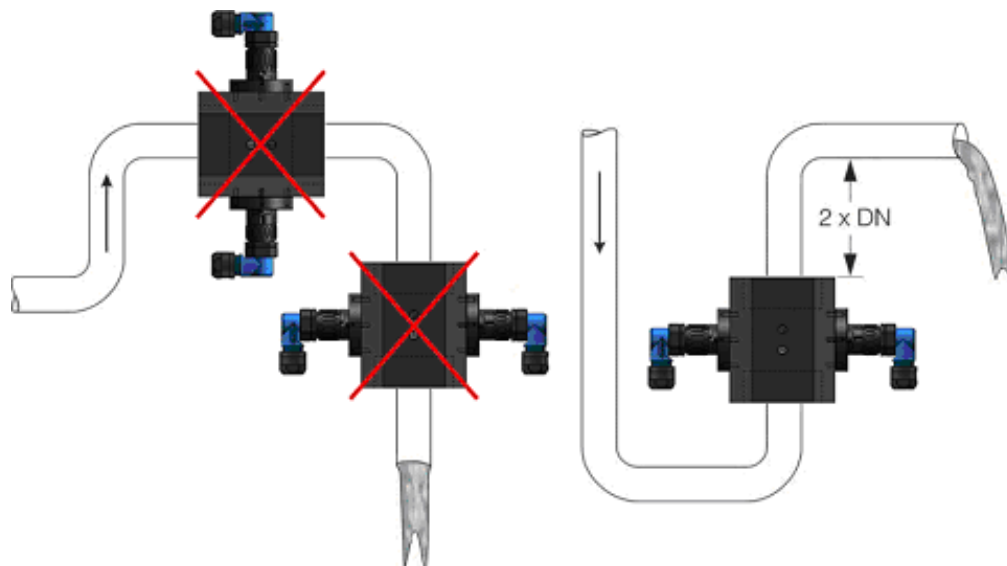
In order to prevent the accumulation of air bubbles, the cell must not be installed as shown in the diagram on the left below. The correct configuration is shown on the right.
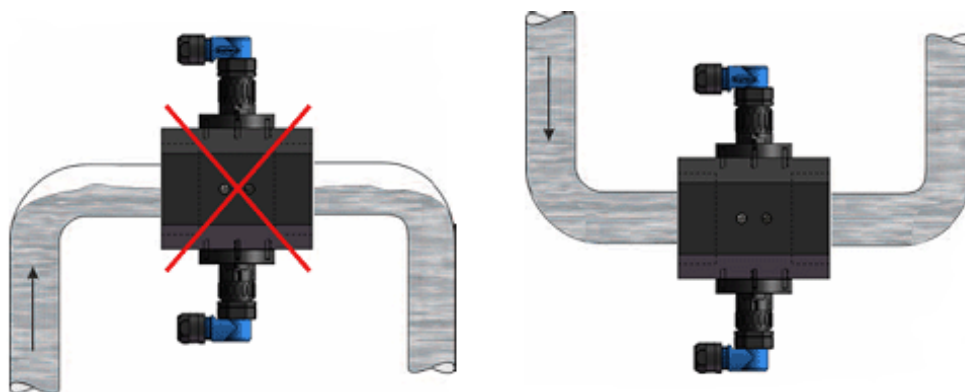
7   MODBUS PROTOCOL

Characteristics
- Standard RTU type MODBUS protocol
- Physical layer: Two wire RS485 (half-duplex)
- Alternative physical layer: USB
- 8 bit, Parity N, 1 Stop bit
- Baud-rate: from 300 to 38400 bps, configurable from the menu
- **Card ID**: from **1** to **255**, configurable from the menu

Function 01 (Read Coil Status)
```
00  Physical status relay RL0-K1 (Set 1)
01  Physical status relay RL1-K2 (Set 2)
02  Physical status relay RL2-K5 (Alarm / Set Temp. 1)
03  Physical status relay RL3-K6 (Wash / Set Temp. 2)
04  Status Set Point 1
05  Status Set Point 2
06  Flag Alarm Time Out Set Point 1
07  Flag Alarm Time Out Set Point 2
08  Flag Alarm Logic Set Min
09  Flag Alarm Logic Set Max
10  Flag for wash or stabilisation in progress
```

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=Enabled) (namur_flag)
03  Flag for release on alarm (0=release, 1=no release) (alrel_flag)
04  Flag for Temperature type (0=°C, 1=°F) (fahren_flag)
05  Algorithm sign PID (0=Direct, 1=Inverse) (pid_cnsgn)
06  Alarm Relay Logic in ON (0=Closed, 1=Open) (alrlog_flag)
07  Functionality Analogue Out 2 (0=Proportional, 1=PID) (pid2_flag)
08  Archive type (0=Fill, 1=Cyclical) (reg_typ)
09  Temperature compensation (0=Automatic, 1=Manual) (tmpc_flag)
10  --------------
11  Assignment Analogue Out 2 (0=Main measurement, 1=Temp)
12  Assignment Relay RL2 (0=Alarm, 1=Set Point 1 Temperature)
13  Assignment Relay RLe (0=Wash, 1=Set Point 2 Temperature)
```

Function 03 (Read Holding Registers)
2 consecutive registers relative to the 4 bytes which make up the floating point variable (with the exception of the address 00, which is relative to the class of the instrument and is made up of 4 ASCII characters).
Since each value is on two Modbus registers (4 bytes) and the values begin on registers of equal addresses, a verification has been implemented to ensure that the Starting Addresses of the required registers are equal and that the numbers of the required registers are equal as well. Otherwise an address error will be returned. (if using the program Modbus Poll, view in "Float Inverse" mode)

```
00  Instrument class ('4262') 4 bytes ASCII
02  Instrument serial number (0...65535)
04  Main Value (FTU/NTU/ppm)
06  Temperature value in °C
08  Analogue Output 1 value in mA
10  Analogue Output 2 value in mA
12  Set 1 ON (set1_on)
14  Set 1 OFF (set1_off)
16  Set 2 ON (set2_on)
18  Set 2 OFF (set2_off)
```

```
20  Set Max (set_max)
22  Set Min (set_min)
24  Low Limit Analogue Out 1 (Main Measurement) (clim1_low)
26  High Limit Analogue Out 1 (Main Measurement) (clim1_high)
28  Low Limit Analogue Out 2 (Main Measurement / Temperature) (clim2_low)
30  High Limit Analogue Out 2 (Main Measurement / Temperature) (clim2_high)
32  Set Temperature 1 ON (set1T_on)
34  Set Temperature 1 OFF (set1T_off)
36  Set Temperature 2 ON (set2T_on)
38  Set Temperature 2 OFF (set2T_off)
40  PID: threshold value (set_pid)
42  PID: proportional range (pid_prange)
44  PID: minutes for Derived (pid_tvmin)
46  PID: seconds for Derived (step 5 sec) (pid_tvsec)
48  PID: minutes for Integral (pid_tnmin)
50  PID: seconds for Integral (step 5 sec) (pid_tnsec)
52  PID: algorithm type PID (0=P, 1=PI, 2=PID)(pid_cntyp)
54  Compensation temperature in manual (tmp_com)
56  Wash interval hours (wash_hour)
58  Wash interval minutes (wash_min)
60  Wash duration seconds (wash_length)
62  Minutes for timed alarm (alr_min)
64  Seconds for timed alarm (alr_sec)
66  Duty for Set1 ON (duty1_on)
68  Duty for Set1 OFF (duty1_off)
70  Duty for Set2 ON (duty2_on)
72  Duty for Set2 OFF (duty2_off)
74  Holding range (meas_perm)
76  Holding Time hours (cpalr_hour)
78  Holding Time_min (step 15min)(cpalr_hour)
80  Archive saving interval (reg_min)
82  Day
84  Month
86  Year (extended format with century)
88  Hour
90  Minutes
92  Relay 1 logic (0=Threshold, 1=PWM, 2=Frequency)(set1_typ)
94  Period of PWM max 999 sec (set1_pid_period)
96  MAX Frequency imp/h (max. 7200 regulation at 200 steps)(set1_pid_freq)
98  Measurement Range (0=1 , 1=10, 2=100) (ran_ind)
100 Unit of Measure (0=FTU, 1=NTU, 2=ppm)(unit_ind)
```

Function 04 (Read Input Registers)

2 consecutive registers relative to the 4 bytes that make up the floating point variable.
Since each value is on two Modbus registers (4 bytes) and the values begin on registers of equal
addresses, a verification has been implemented to ensure that the Starting Addresses of the required
registers are equal and that the numbers of the required registers are equal as well. Otherwise an
address error will be returned. (if using the program Modbus Poll, view in "Float Inverse" mode)

```
00  Main Value (FTU/NTU/ppm)
02  Temperature value in °C
04  Analogue Output 1 value in mA
06  Analogue Output 2 value in mA
```

Function 05 (Force Single Coil)

```
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=Enabled) (namur_flag)
03  Flag for release on alarm (0=release, 1=no release) (alrel_flag)
04  Flag for Temperature type (0=°C, 1=°F) (fahren_flag)
```

```
05  Algorithm sign PID (0=Direct, 1=Inverse) (pid_cnsgn)
06  Alarm Relay Logic in ON (0=Closed, 1=Open) (alrlog_flag)
07  Functionality Analogue Out 2 (0=Proportional, 1=PID) (pid2_flag)
08  Archive type (0=Fill, 1=Cyclical) (reg_typ)
```

Function 16 (Preset Multiple Registers)

2 consecutive registers relative to the 4 bytes that make up the floating point variable.
Since each value is on two Modbus registers (4 bytes) and the values begin on registers of equal addresses, a verification has been implemented to ensure that the Starting Addresses of the required registers are equal and that the numbers of the required registers are equal as well. Otherwise an address error will be returned.

```
00  -----
02  Instrument serial number (0...65535)
04  -----
06  -----
08  -----
10  -----
12  Set 1 ON (set1_on)
14  Set 1 OFF (set1_off)
16  Set 2 ON (set2_on)
18  Set 2 OFF (set2_off)
20  Set Max (set_max)
22  Set Min (set_min)
24  Low Limit Analogue Out 1 (Main Measurement) (clim1_low)
26  High Limit Analogue Out 1 (Main Measurement) (clim1_high)
28  Low Limit Analogue Out 2 (Main Measurement / Temperature) (clim2_low)
30  High Limit Analogue Out 2 (Main Measurement / Temperature) (clim2_high)
32  Set Temperature 1 ON (set1T_on)
34  Set Temperature 1 OFF (set1T_off)
36  Set Temperature 2 ON (set2T_on)
38  Set Temperature 2 OFF (set2T_off)
40  PID: threshold value (set_pid)
42  PID: proportional range (pid_prange)
44  PID: minutes for Derived (pid_tvmin)
46  PID: seconds for Derived (step 5 sec) (pid_tvsec)
48  PID: minutes for Integral (pid_tnmin)
50  PID: seconds for Integral (step 5 sec) (pid_tnsec)
52  PID: algorithm type PID (0=P, 1=PI, 2=PID)(pid_cntyp)
54  Compensation temperature in manual (tmp_com)
56  Wash interval hours (wash_hour)
58  Wash interval minutes (wash_min)
60  Wash duration seconds (wash_length)
62  Minutes for timed alarm (alr_min)
64  Seconds for timed alarm (alr_sec)
66  Duty for Set1 ON (duty1_on)
68  Duty for Set1 OFF (duty1_off)
70  Duty for Set2 ON (duty2_on)
72  Duty for Set2 OFF (duty2_off)
74  Holding range (meas_perm)
76  Holding Time hours (cpalr_hour)
78  Holding Time_min (step 15min)(cpalr_hour)
80  Archive data saving interval (reg_min)
82  Day
84  Month
86  Year (extended format with century)
88  Hour
90  Minutes
92  Relay 1 logic (0=Threshold, 1=PWM, 2=Frequency)(set1_typ)
```

94 PWM Period max 999 sec (set1_pid_period)
96 MAX Frequency imp/h (max. 7200 adjustment at 200 steps)(set1_pid_freq)
Download archives to blocks of records

Sequence:

1. Single record length request.
2. Number of records present request.
3. Current record request
4. Record acquisition cycle
   a. If previous request was successful → Request next record
   b. If previous request was NOT successful → Request current record
   c. If number received less than total → Repeat cycle.
5. Disconnection.

> Note The request for the number of records present resets the pointer to the sent record and therefore any subsequent send record requests will begin from the first saved record

List of Functions:
Single record length [HIST_ARC_REC_LEN = 0x41]

Download records [HIST_ARC_REC_FN = 0x44]
        Sub Functions:
        Number of records in archive [BHIST_ARC_NUM_REC = 0x03]
        Send current block of records [BHIST_ARC_BLOCK_CURRENT = 0x04]
        Send next block of records [BHIST_ARC_BLOCK_NEXT = 0x05]

Reset archive [HIST_ARC_RESET = 0x45]

Functions descriptions:

Single record length request
Request

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

Response

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

Number of records present request (with pointer reset)
Request

Byte	Description
0	Peripheral Slave Number
1	BHIST_ARC_FN = 0x44 (Function)
2	BHIST_ARC_NUM_REC = 0x03 (Sub function)
3	CRC (lo)

4	CRC (hi)

Response

Byte	Description
0	Peripheral Slave Number
1	BHIST_ARC_FN = 0x44 (Function)
2	BHIST_ARC_NUM_REC = 0x03 (Sub function)
3	Number of Records (lo)
4	Number of Records (hi)
5	CRC (lo)
6	CRC (hi)

Current record request

Request

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

Response

Byte	Description
0	Peripheral Slave Number
1	BHIST_ARC_FN = 0x44 (Function)
2	BHIST_ARC_BLOCK_CURRENT = 0x04 (Sub function)
3	Data Length (lo)
4	Data Length (hi)
5	Data …
.	
n	
.	
6+n	CRC (lo)
7+n	CRC (hi)

Next record request

Request

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

Response

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

If Data Length=0 : a record has been requested beyond the number of records present

Archive reset request

Request

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

Response

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

Record length

Every record is 33 bytes long (= RECORDSIZE)

Record format

Offset	variable	Description	No. 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_val	Measurement value (FTU/NTU/ppm)	4	float
9	set1_on	Value of Set 1 ON	4	float
13	set1_off	Value of Set 1 OFF	4	float
17	set2_on	Value of Set 2 ON	4	float
21	set2_off	Value of Set 2 OFF	4	float
25	tp_val	Temperature	4	float
29		Relays status (*)	1	char
30		Spare	1	char
31		Spare	1	char
32		Checksum (8 bit sum of the previous 32 bytes)	1	char

(*) Relay Status Bit

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