



**4204**  
**FLOW METER**  
**With ULTRASOUND**  
**measurement sensor**



**TECHNICAL MANUAL**

**P/N: .....**  
**Rev. 5 Ver. 3.4**

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# 1 GENERAL

## 1.1 MANUAL INFORMATION

This document contains copyrighted information. They may be subject to modifications and updates without notice.

### Printing sequence

First edition: **μACP 4204 – Rev. 0 Ver 1.1**

This manual is integral part of the instrument. At first installation of the instrument, the operator must carry out an accurate verification of the content of the manual in order to verify its integrity and completeness.

In case it shows to be damaged, incomplete or unsuitable, please contact CHEMITEC in order to immediately integrate or replace the non-complying manual.

The official versions of the manual, for which CHEMITEC is directly responsible, are the Italian and English versions. For Countries with languages different than those versions above mentioned, the official manual is the one in Italian language. CHEMITEC shall not be held responsible for any translations in different languages carried out by distributors or users.

Compliance with the operating procedures and warnings described in the present manual is an essential requirement for the correct operation of the instrument and to guaranty safety for the operator.

Before installing/operating the instrument, the manual must be read in its entirety while standing in front of the same, in order to become very familiar with the operating procedures, controls, connections to peripheral instruments and precautions for the safe and correct use of it.

The user manual must be saved, integral and legible in all of its parts in a safe place and, at the same time, quickly accessible to the operator during installing operations, use and/or reviewing the installation

### 1.1.1 CONVENTIONS

This manual utilises the following printing conventions:

#### NOTE



The notes contain important information to be emphasised with respect to rest of the text. They generally contain information useful for the operator in order to execute correctly and optimise the operating procedures.

#### WARNING



Warning messages appearing in the manual before procedures or operations which must be respected in order to prevent possible loss of data or damages to the instrument.

#### CAUTION



Caution messages appear in the manual near descriptions of procedures or operations which, if carried out incorrectly, may cause damages to operators or users.

## 1.2 MANUFACTURER DECLARATION OF LIABILITY

CHEMITEC shall be liable for the safety, reliability and performance of the instrument only if utilised in compliance with the following conditions:

- Calibrations, modifications and repairs must be performed by personnel expressly qualified and authorised by CHEMITEC.
- Opening of the instrument and access to its internal parts must be performed solely by personnel qualified for the maintenance and appropriately authorised by CHEMITEC.
- The facility which the instrument operates, must conform to the safety requirements.
- The facility electrical system must be installed according to regulations and be perfectly efficient.
- The feasible replacement of parts of the instrument and accessories, must be done with others of the same type and specifications.
- Use and maintenance of the instrument and relative accessories must be carried out in compliance with instructions described in the present manual.
- The present manual must be kept integral and legible in all of its parts

## 1.3 LIMITS OF USE AND SAFETY PRECAUTIONS

In order to guaranty safety for the operator together with the correct operation of the instrument, it is necessary to operate within the admitted limits and implement all the precautions listed further:

### CAUTION



**Before operating the instrument, verify that all the safety requirements have been met. The instrument must not be powered-up or connected to other instruments until all safety conditions are met.**

### 1.3.1 ELECTRIC SAFETY

#### CAUTION



**All connections present on the instrument are insulated from the ground environment (ground not insulated).  
DO NOT connect any of these connections to the ground.**

In order to guaranty the maximum safety conditions for the operator, we recommend following faithfully all instructions listed in this manual.

- **Supply the instrument with line voltage according to the specification (85÷265V ac 50/60Hz).**
- **Replace immediately damaged parts.** Cables, connectors, accessories or other parts of the instrument found to be damaged or not operating correctly, must be immediately replaced. In such case, contact the nearest authorised technical service centre.
- **Utilise only accessories and peripherals specified by CHEMITEC.** To guaranty the meeting of all safety requirements, is necessary to utilise exclusively accessories specified in this manual, which have been tested together with the instrument. Use of other manufacturers' accessories and consumable materials or not specifically indicated by CHEMITEC, does not guaranty safety and correct operation of the instrument. Utilise exclusively peripherals that comply with the regulations of the category to which they belong.

### 1.3.2 SAFETY OF OPERATING ENVIRONMENT

- **The 4204 unit is watertight against any infiltration of liquids.** Avoid subjecting the equipment to risks of seepage, sprays or anything else and do not use in areas in which such risks are possible. Any power units in which liquids may have accidentally fallen should be immediately turned off, cleaned and checked by authorised and qualified personnel.
- Once programming has been completed, close the transparent panel.
- **Protection.**
  - 4204 **Wall** mounting
    - IP66 EN60529
    - EMI /RFI CEI EN55011 - 05/99
  - 4204 **144x144 Panel** mounting
    - IP10 EN60529
    - EMI /RFI CEI EN55011 - 05/99
- **Utilise the instrument within the specified environmental limits of temperatures and humidity.** The instrument is constructed to withstand operation in the following environmental conditions:
  - environmental operating temperature 0°C ÷ +50°C
  - storage and transporting temperature -25°C ÷ +65°C
  - relative humidity 10% ÷ 95%RH - non-condensing

### CAUTION



The plant, in which the instrument is introduced, must be constructed according the operating requirements provided by the current legislation.

The instrument must be perfectly introduced in the plant.

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

Any signals of faults to the power unit should be placed in an area constantly controlled by operative personnel or plant assistants.

Failure to comply with one of these conditions may cause the unit “logic” to operate in a potentially dangerous mode for the users of the service.

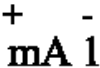
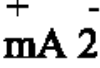
Therefore, we recommend to the servicing and/or maintenance personnel to operate with the utmost thoroughness, promptly signalling any variations of the safety parameters, in order to prevent the development of dangerous conditions or potentially dangerous conditions.

Because the above explained considerations do not fall under the possibilities of control by the instrument in the subject, the manufacturer shall not in any way or fashion be held responsible for any damages that such malfunctions may cause to persons or things.

## 1.4 GRAPHIC SIGNS

The following Table 1-1 indicates the drawings, relative descriptions and position of all the graphic signs placed on the instrument panel and on any other external instruments or devices to which it can be connected.

**Table 1-1 Graphic signs**

| SIGN                                                                                                                                                                                                                                                        | DESIGNATION                                        | POSITION                                                                                           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|----------------------------------------------------------------------------------------------------|
|                                                                                                                                                                            | <b>Danger sign</b>                                 | Sign placed near the terminals for the connection to line voltage (See Paragraph 1.4.1)            |
| <br><br> | <b>Phase</b>                                       | Signs placed near the connections of the instrument to the power supply line (See Paragraph 3.1.1) |
|                                                                                                                                                                                                                                                             | <b>Neutral</b>                                     |                                                                                                    |
|                                                                                                                                                                                                                                                             | <b>Grounding protection</b>                        |                                                                                                    |
|                                                                                                                                                                            | <b>Caution! Consult the attached documentation</b> | Symbol positioned in correspondence with the points in the manual that require special attention   |
|                                                                                                                                                                          | <b>Positive</b>                                    | Positive pole of the connector RS485                                                               |
|                                                                                                                                                                                                                                                             | <b>Negative</b>                                    | Negative pole of the connector RS485                                                               |
|                                                                                                                                                                                                                                                             | <b>Terminal</b>                                    | Sign placed near the cable shielding for RS485                                                     |
|                                                                                                                                                                          | <b>Analogue output no. 1</b>                       | 0/4 ÷20mA galvanic separation                                                                      |
|                                                                                                                                                                          | <b>Analogue output no. 2</b>                       | 0/4 ÷20mA galvanic separation                                                                      |

### 1.4.1 DANGER SIGN

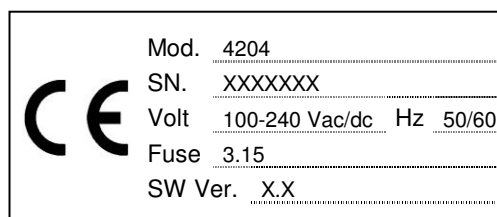
The  sign indicates DANGER for the operator. It is placed inside the instrument near the points where the voltages present may be dangerous.

We recommend paying maximum attention.

Especially when the sign, placed near the cable connections to peripherals, refers to the attentive reading of the user manual for a correct and safe connection.

## 1.5 PLATE DATA

The plate must be similar to the one reproduced in Figure 1-1.



**Figure 1-1 Configuration of the Unit Number Plate**

## 1.6 INFORMATION ON RECYCLING AND REUTILISATION OF MATERIALS

CHEMITEC objectives, in compliance with the specific European directives, including the directive 2002/95/CE, traditionally identified by RoHS, aims at continuously improving planning and manufacturing of its own instruments, in order to reduce to the minimum the negative impact on environment about handling the component parts, consumable materials, packing and instrument itself, at the end of its useful life.

Packing are conceived and produced in order to allow their reutilisation or recuperation, including recycling of most of the materials and to reduce to the minimum the amount of wastes and residuals to dispose of. To guaranty a correct environmental impact, the instrument has been planned with the utmost circuitry miniaturisation possible and with the least differentiation possible of materials and components, through selection of substances that guarantee maximum recyclability and the maximum reutilisation of the parts and a disposal of them devoid of ecological risks.

The instrument has been manufactured in a way to facilitate separation and disassembling of materials containing polluting substances with respect to the others, especially during maintenance and parts replacement operations, in accordance with the requirements of the Directive 2002/96/CE, traditionally identified by RAEE.

### WARNING



**Disposal/recycling of packing, consumable materials or instrument itself at the end of its useful life, must be carried out according to the provisions imposed by regulations and directives currently in force in the country in which the instrument is utilised.**

### 1.6.1 SPECIAL ATTENTION FOR CRITICAL COMPONENTS

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

## 2 GENERAL DESCRIPTION

The unit shown in Figure 2-1 is provided for wall installation.

It is supplied by the line (85÷265Vac-50/60Hz) through power supplier Switching.

This instrument has been conceived as flow metre through an ultrasound probe with automatic temperature compensation with display of the following at the same time:

- immediate flow (with a Bargraph percentage scale);
- total volume
- temperature
- status of the analogical outputs
- counters



Figure 2-1 – Ultrasounds level meter and regulator (4204)

### 2.1 MAIN FEATURES

- Ultrasound flow measurement
- Automatic temperature compensation
- Bubble 6 keys programming keyboard
- Graphic Display
- Serial Output RS485 MOD BUS RTU
- 2 Programmable Analogue Outputs
- 5 Relay output
- 1 Relay output for Eco loss alarm
- Total counter that cannot be reset
- Partial counter accessible operatively

## 2.2 UNIT HARDWARE MAIN FEATURES

- Internal Data logger (flash 4 Mbit) with possibility of graphic and table display of measurements trends.
- Five independent set points for threshold control, with programming of the work field (hysteresis).
- Digital alarm output for eco loss.
- Primary output 0/4,20mA with programmable limits for Flow/Temperature.
- Secondary output 0/4,20mA with programmable limits for temperature/flow/level.

The technical specifications of the instrument are listed in Table 2-1, while the operating specifications are listed in Table 2-2.

**Table 2-1 Technical Specifications**

| <b>Characteristics of dimensions</b>                                           |                                                                                                                                                                                                                                                                                    |
|--------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Measurement field                                                              | Flow 0 ÷ 9999 mc/h<br>Level 0.30 ÷ 5.00 mt. - Temperature: 0 ÷ 100 °C                                                                                                                                                                                                              |
| Precision                                                                      | ± 0.2% F.S.                                                                                                                                                                                                                                                                        |
| Unit of measurement                                                            | Flow: mc/h, lt/sec – Level: m, cm, mm – Temperature: °C                                                                                                                                                                                                                            |
| Decimals                                                                       | Flow: 3 – Level: 3                                                                                                                                                                                                                                                                 |
| Types of devices/exponents for each PMD calculation (primary measuring device) | RETTANG (rectangular spout) / TRAPEZ (Cipolletti spout) / VENTURI (Venturi channel) /<br>PARSHALL (Parshall channel) / LEOPOLD (Leopold Lagco channel) / STRAM. V (V spout) /<br>OTHER (freely programmable exponent)                                                              |
| 2 counters                                                                     | Absolute at 9 figures - saved on Flash PROM not re-settable – Partial at 9 figures re-settable                                                                                                                                                                                     |
| <b>Characteristics of the Hardware</b>                                         |                                                                                                                                                                                                                                                                                    |
| DISPLAY screen                                                                 | LCD STN Graphic 128x64 Backlit<br>Contemporary display of: Instant flow (absolute + bargraph for percentage of the scale), Volume counted, Temperature, Status of the digital outputs, alarm events.<br>In scrolling: Level, Status of the analogical outputs, Re-settable counter |
| Controls                                                                       | 6 Bubble Keys                                                                                                                                                                                                                                                                      |
| DATA LOGGER                                                                    | Internal with Flash 4 Mbit                                                                                                                                                                                                                                                         |
| Serial output                                                                  | n.1 RS485 Galvanic separated MODBUS RTU                                                                                                                                                                                                                                            |
| Analogue outputs                                                               | n.2 Programmable Galvanic Separated<br>1st Output: Flow / Temperature - 2nd output: Flow / Temperature / Level                                                                                                                                                                     |
| Relay Outputs                                                                  | n.5 in Exchange for Thresholds - n.1 in Exchange for Alarm– (max load 1A at 230V ac resistive)                                                                                                                                                                                     |
| Digital Input                                                                  | n.5 Programmable                                                                                                                                                                                                                                                                   |
| Power Supply                                                                   | 100÷240Vac/dc 50-60Hz – (Optional 24Vac/dc) – Transformer Insulation 4KV                                                                                                                                                                                                           |
| Average power draw                                                             | < 12W                                                                                                                                                                                                                                                                              |

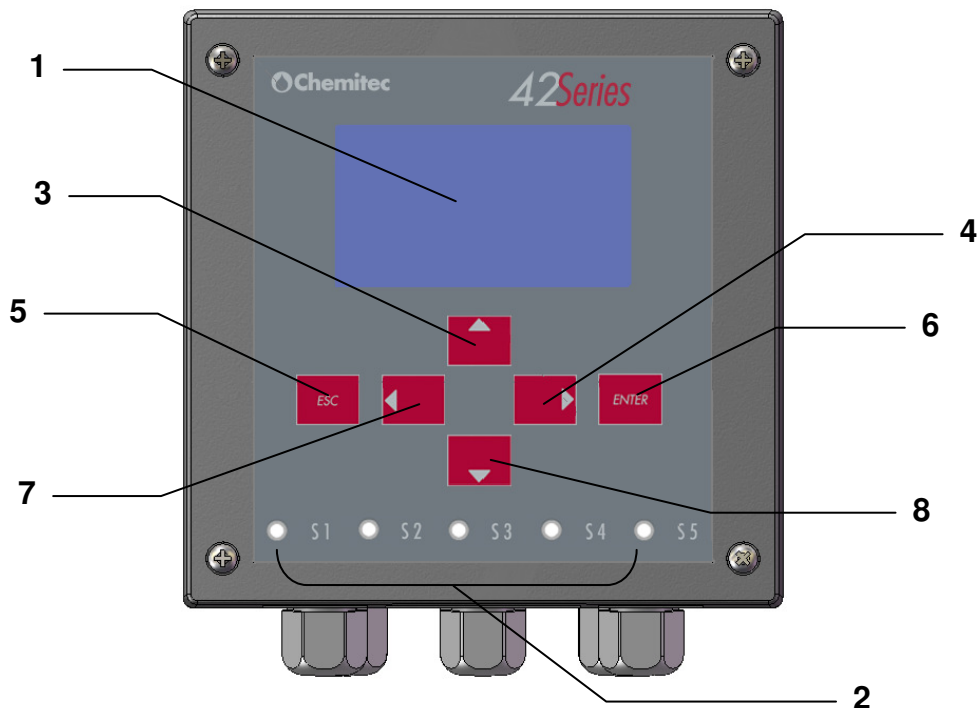
**Table 2-2 Operating Specifications**

| Measurement Recording           | Instant flow                                                                                      | Volume counted                                                  |
|---------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|
| Recordings Intervals            | 1/275/10/15/20/30/60 min                                                                          | 5/10/30 min. 1/2/6/12/24 h.                                     |
| Type                            | Circular /Filling                                                                                 | Circular / Filling                                              |
| Display                         | Graphic display of the minimum, maximum and average values of the period and of the Zoom function | Table                                                           |
| <b>Analogue Outputs</b>         | <b>Primary</b>                                                                                    | <b>Secondary</b>                                                |
| Quantity/Size                   | Flow / Temperature                                                                                | Flow / Level / Temperature                                      |
| Type                            | 0.00 ÷ 20.00 mA / 4.00 ÷ 20.00 mA                                                                 | 0.00 ÷ 20.00 mA / 4.00 ÷ 20.00 mA                               |
| Range                           | Limit Programming: Lower / Upper                                                                  | Limit Programming: Lower /Upper                                 |
| Maximum Load                    | 500 Ohm                                                                                           | 500 Ohm                                                         |
| Alarm Output according to NAMUR | 2.4 mA (with Range 4/20mA)                                                                        | 2.4 mA (with Range 4/20mA)                                      |
| <b>5 relay outputs</b>          |                                                                                                   |                                                                 |
| Function– selectable            | Threshold                                                                                         | Pulses                                                          |
| Programming                     | ON-OFF with hysteresis                                                                            | De-multiplier: 1,10,100mc/h<br>Duration: 250,500,1000,2000 msec |
| <b>Alarm</b>                    |                                                                                                   |                                                                 |
| Function                        | Eco loss alarm                                                                                    |                                                                 |
| Programming                     | Time Out ( eco loss time): 00:00 ÷ 24:00 h                                                        |                                                                 |
| Relay operation                 | Closed/Open                                                                                       |                                                                 |
| <b>Operating Conditions</b>     |                                                                                                   |                                                                 |
| Operating Temperature           | 0÷50°C                                                                                            |                                                                 |
| Transport and Storage           | -25÷65°C                                                                                          |                                                                 |
| Humidity                        | 10-95% non condensed                                                                              |                                                                 |
| Protection                      | Closed IP66 EN60529                                                                               |                                                                 |
| EMI / RFI                       | CEI-EN55011 – 05/99                                                                               |                                                                 |

## 2.3 CONTROLS AND INDICATORS

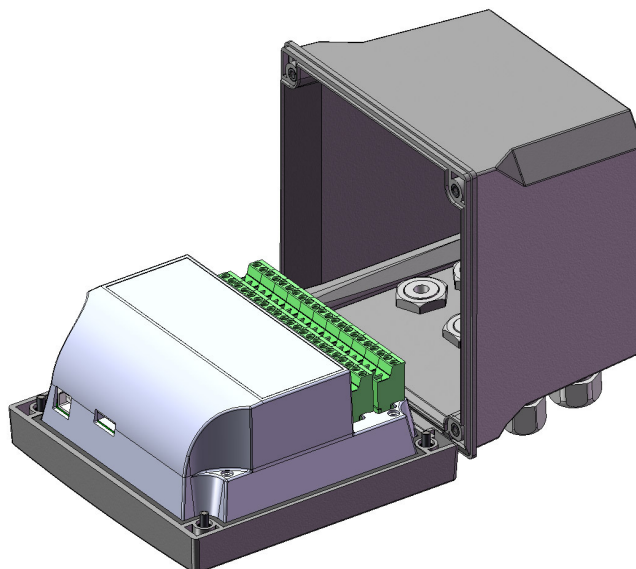
Controls and indicators are grouped on the front of the Unit so that they can be easily available for the operator.

Figure 2-2 identifies all the Unit controls and connecting devices.



1. LCD Display
2. S1÷S5
3. UP Key
4. RIGHT Key
5. ESC Key
6. ENTER Key
7. LEFT Key
8. DOWN Key

**Figure 2-2 – Frontal Panel, Unit Wall model**



**Figure 2-3 – Access to the terminal box**

## 3 INSTALLATION

Although the unit is suitable for installation in outdoor environments, it is recommended to avoid direct exposure to sun and weather. Before installing the **4204** carefully read the instructions provided below.

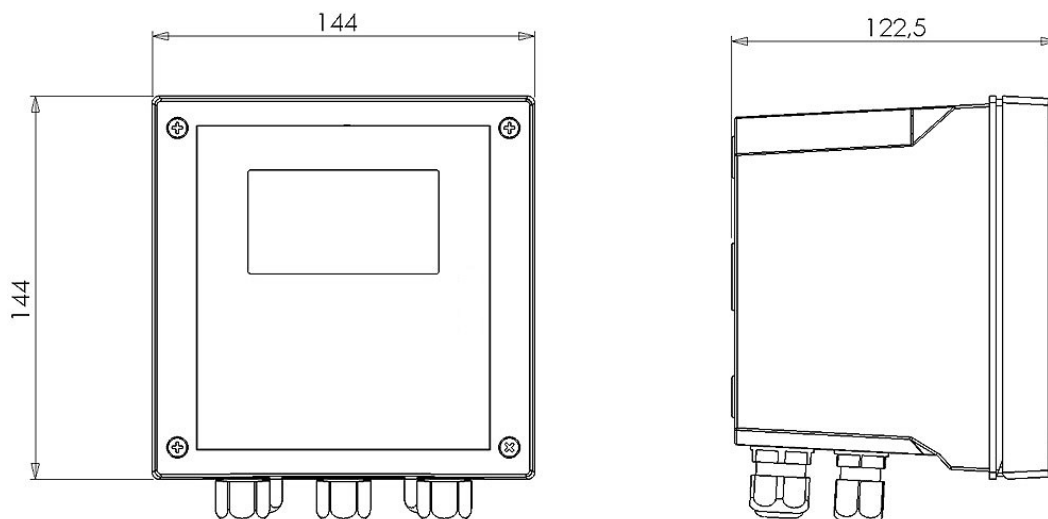
### 3.1 COMPOSITION OF THE SUPPLY

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 3-1 – Dimensions and encumbrance of the wall mounted device**

| Mechanical Dimensions  | 4204                       |
|------------------------|----------------------------|
| Dimensions (L x H x P) | 144x144x122,5mm            |
| Fixing depth           | 122,5mm                    |
| Material               | ABS Grey RAL 7045          |
| Mounting               | Wall                       |
| Weigth                 | 1 Kg                       |
| Frontal Panel          | Polycarbonate 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.

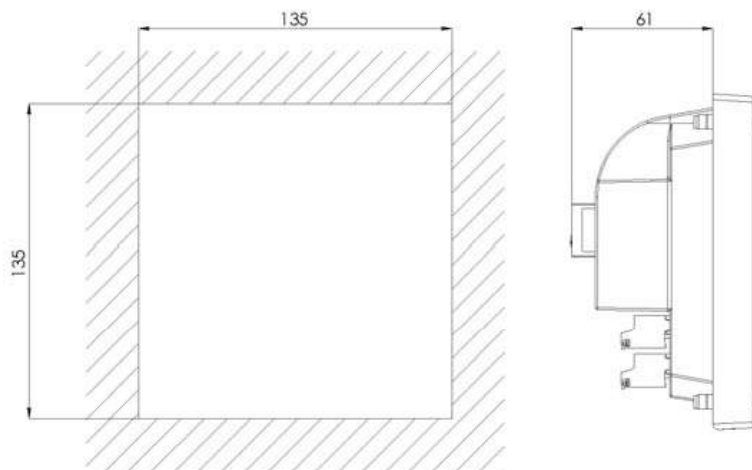
### 3.1.2 INSTALLATION OF 144X144 ELECTRICAL PANEL DEVICE

The wall must be perfectly smooth in order to allow for perfect adhesion of the electrical panel close to the device.

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

The thickness of the panel must not exceed 5 mm.

The perforation DIMA must comply with the following layout:



**Figure 3 – Encumbrance and Dima for perforation of the panel**

| Mechanical Dimensions  | 4204 144x144 Panel Mounted |
|------------------------|----------------------------|
| Dimensions (L x H x P) | 144x144x86,5mm             |
| Fixing depth           | 70mm                       |
| Material               | ABS Grey RAL 7045          |
| Mounting               | Panel                      |
| Weight                 | 0.7 Kg                     |
| Frontal Panel          | Polycarbonate UV Resistant |

The locking of the control unit to the panel is made through the mounting backplate, which is fixed to the panel on the inner side, using the apposite screws.

### 3.1.3 TERMINAL BOARD CONNECTIONS

The terminal board connections and the definitions of the Unit connections to the plant to be placed under control are shown in Figure 3-2 and 3-3 (depending by the connected probe).

It shows the connections diagram viewable on the cover of the connections housing.

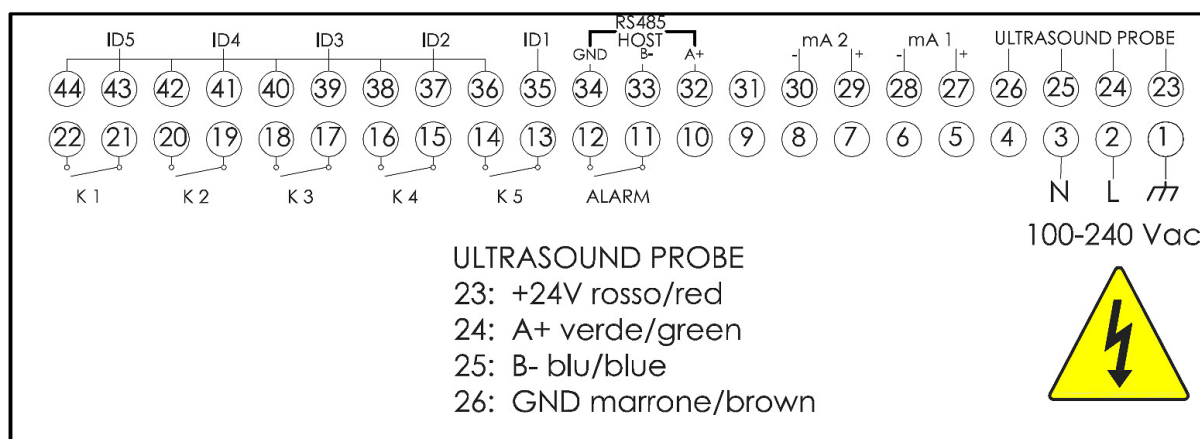


Figure 3-2 Electric connections for S425

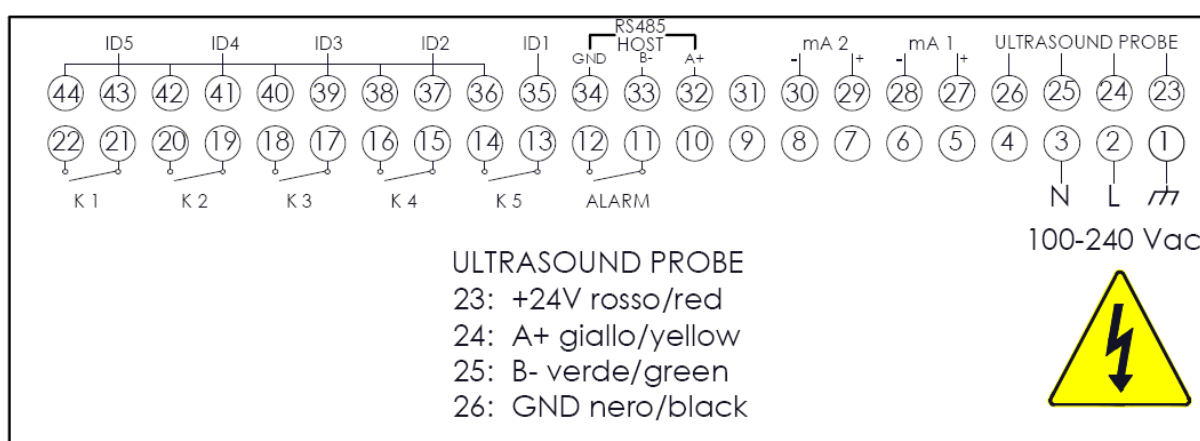


Figure 3-3 Electric connections for S425/C

## 3.2 CONNECTING POWER SUPPLY LINE

If all possible make sure that there aren't any cables assigned to the controls of other power drawing equipments near the unit or on the same path of the connecting cable, which could create inductive interferences for the instrument.

As much as possible, apply to the instrument stabilised power voltage according to the information on the plate.

Absolutely avoid connecting the instrument to indirect/ reconstructed power supplies, for example, through the use of transformers, where this reconstructed power goes to supply other systems besides the unit (i.e.: inductive type), because this procedures generate high voltage spikes which once they are radiated it's difficult to block and/or eliminate them.

### CAUTION



The electric line must be fitted with an appropriate circuit breaker and magnetothermic switch, in compliance with good rules of installation

In any case, it is always advisable to verify the quality of Grounding. Often Ground connections, found mostly within industrial environments, are themselves generators of interferences; where in doubt about the quality, it is preferable to connect it to a pole dedicated only to the unit plant.

### 3.2.1 ELECTRICAL CONNECTIONS TO THE SYSTEMS

#### CAUTION



**At the time pf starting the connections between the Unit and External Utilities, make sure that electric board is turned-off and the cables coming from the Utility are not live.**

- The Unit connections to the System must be carried out according the electric diagram of the terminal board shown in Paragraph 3.1.1. The Unit is electronically protected, therefore, besides the precautions on the power supply; it does not require special attentions.
- In reference to the sensor, it can be installed up to a distance of ~ 1000m from the Unit, without causing any appreciable loss of signal.
- The position of the sensor should be between the limits the defined in the Chapter "Installation".

### 3.2.2 INSTALLATION OF THE PROBE

- Protect the probe from direct sunlight and reverb
- Wait at least 30 minutes after the first power on before calibrating the distance
- Keep the probe closer to the maximum water swing + 30 cm to prevent the air between the projection and the water from assuming values that are too different from the probe

## 4 OPERATING MODE – GENERAL

This chapter describes the procedures that must be followed to enable all the functions of the programme. The description is distributed between text and Figures:

- The Figures show all the menus and submenus as they appear on the display when enabled.
- The text analyses all items of the various menus and showing, for each of them, the enabling procedures, functions they perform and range of values that can be set, whenever requested to enter numeric values.
- All settings under the control of the Programme are described in a specific paragraph listed in the index.

This editorial technique, even though makes numbering paragraphs complex, it offers a noticeable advantage of transforming the index in a simple and powerful tool for the search because it lists all the subjects and it indicates where they are discussed.

### 4.1 DISPLAYING SYSTEM

The displaying of the system is done through graphic displays, which allows viewing all the various programming menus and, in operating mode, ("RUN"), the display of operating settings inputted and their operating status.

- The operative methods related to activation of the System are described in Chapter 5.
- The operative methods related to the "RUN" menu are described in Chapter 6.
- The operative methods related to the "SETUP" menu are described in Chapter 7.

## 5 ENABLING THE SYSTEM

After installing the electronic central control unit, it is necessary to go on programming the software, which will allow for “personalising” the settings for a correct use of the instrument.

TURN-ON the instrument by supplying power to it. The unit is not equipped with a switch for power supply; it is activated automatically with connection to the network.

### 5.1 START

At the first System Start-up the system initialisations are carried out, which should occur during installation or in case of power interruption which, if not modified, will depend from the settings present on the flash disk.

During this phase a check of the flash disk is performed and, if errors are detected, the instrument is blocked and the following message is displayed:

“FLASH DISK ERROR”

In the presence of this kind of error, request intervention from technical assistants. If, on the contrary, everything runs smoothly, the programme will load the operative set-up parameters and will start to operate with them as a base.

During a parameter recall operation, memorisation errors may occur. If this is the case, the programme will cancel loading of these parameters and the intervention of technical assistants. If everything runs smoothly, the set-up parameters set by the operator will be loaded; if errors are encountered the following message will appear:

“DEFAULT SETUP LOADED”

indicating that the default parameters will be loaded (and used); to continue press the "ENTER" key. This message will also appear if programming has never been carried out before (therefore the set-up parameters in the flash disk have never been registered).

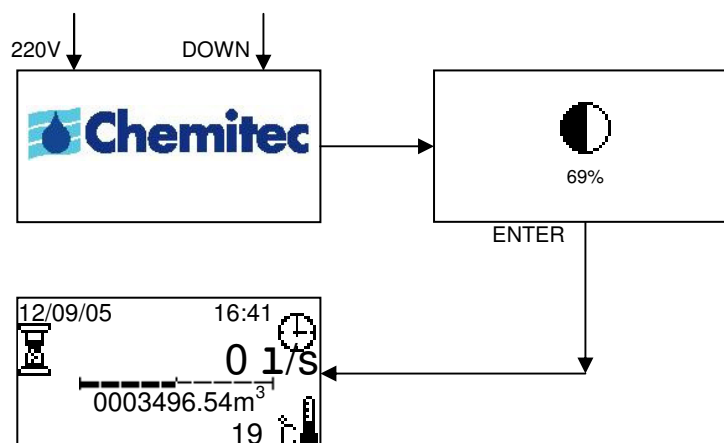
A bad quality of display may depend from an incorrect adjustment of the display contrast.

Contrast regulation may be set when the device is turned on by working with the "UP" or "DOWN" key at the same time as feeding of the power unit (Fig. 5-1).

The contrast reader will appear indicating the percentage value which, in standard conditions, should be between 65%÷70%. Once the best level of contrast has been achieved, press “ENTER”.

The programme will enter a "RUN" mode.

Contrast may be regulated operatively using the "CONTRAST" function as described in paragraph. 7.2.2.5.1.



**Figure 5-1 – Contrast Mode Flow-Chart**

## 6 RUN MODE

This mode keeps operation of the plant under control in real time.

The operative parameters are represented on the screen by the power unit, according to the symbols shown in Figure 6-1 and in Table 6-1.

Table 6-1 illustrates the operative symbols of the "RUN" mode, the meaning of which is as follows:

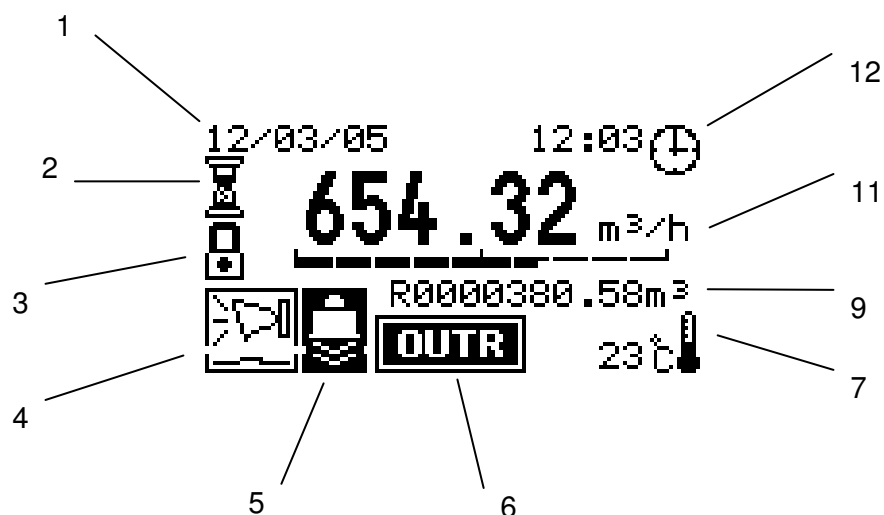
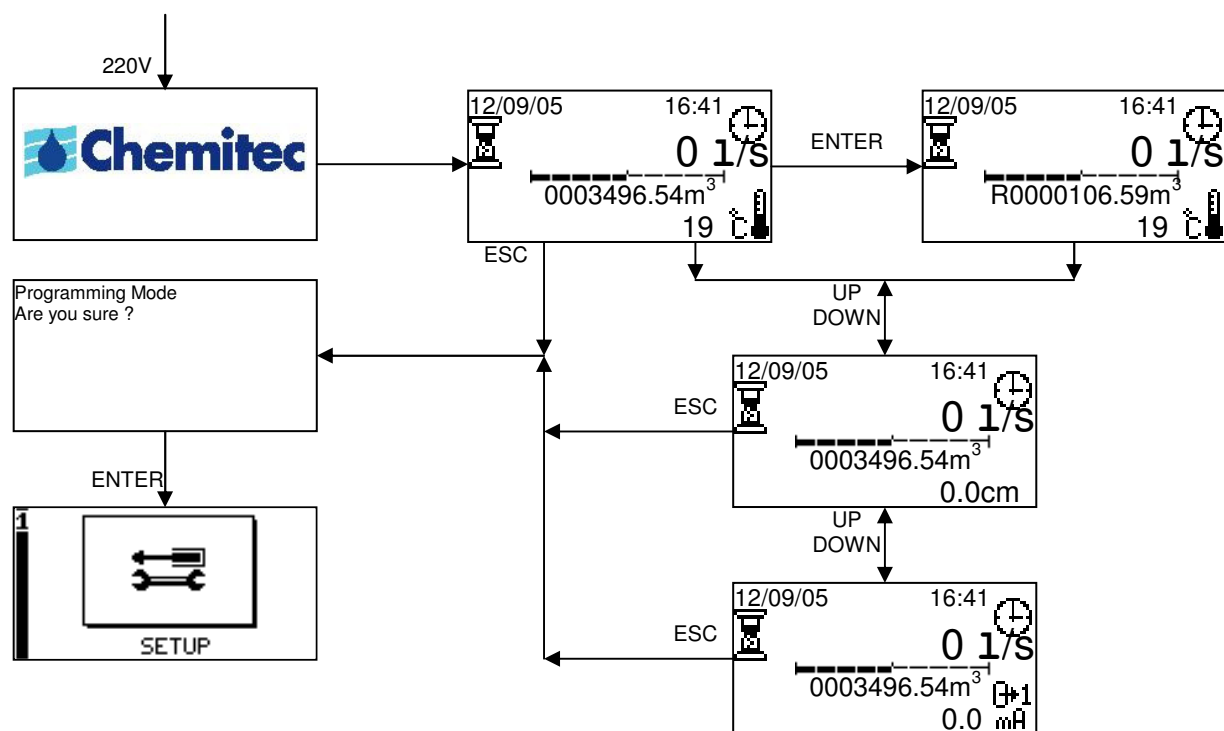


Figure 6-1 Typical Run Mode Displayed

**Table 6-1 Operating symbols**

|    | DISPLAY                                                                             | DESCRIPTION                                                                               |
|----|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| 1  | 12-04-05                                                                            | Syatem Date                                                                               |
| 2  |    | Wait- Freeze measurements and outputs phase                                               |
|    |    | Contrast                                                                                  |
| 3  |    | Password Enabled                                                                          |
| 4  |    | If communication is lost, "PROBE ERROR" will appear in the middle of the screen           |
| 5  |    | If the eco is lost for a period exceeding the period indicated, icon 4 will be activated. |
| 6  |   | Flashing icon - Maximum flow exceeding the maximum flow set                               |
| 7  |  | Output Value n.1 (in mA)                                                                  |
|    |  | Output Value n.2 (in mA)                                                                  |
|    |  | Actual Temperature Value (in Centigrade)                                                  |
|    | 0 cm                                                                                | Value of the level of the recess                                                          |
| 8  |  | Alarm indicating loss in connections with the probe                                       |
| 9  | 0000000.00 m <sup>3</sup>                                                           | primary counter                                                                           |
|    | R0000000.00 m <sup>3</sup>                                                          | re-settable counter                                                                       |
| 10 |  | 0% of the scale                                                                           |
|    |  | 100% of the scale                                                                         |
| 11 | 0.00 m <sup>3</sup> /h - 1/sec.                                                     | Hourly flow in the unit of measurement selected                                           |
| 12 |  | Solar time                                                                                |



**Figure 6-2 "RUN" Mode**

## 7 PROGRAMMING MODE

Apart from the "RUN" status, within which the System is fully operative, the programme of the power unit includes a second status identified in the "PROGRAMMING" mode, allowing for all of the parameters that specify the functionalities of the plant to be set.

### CAUTION



If setting of the parameters clashes with the logic of the System, the programme will release an "alarm" signal.  
The meaning of the alarm is defined in paragraph 8.4.

### CAUTION



Activation of the "PROGRAMMING" mode excludes the "RUN" mode and blocks activation of the plant.

In order to enter the programming mode press "ESC"; a message will appear requesting further confirmation: if "ESC" is pressed again, it will return to the "RUN" mode; if "ENTER" is pressed all of the 4204 functions will be immediately disabled and it will move onto the "PROGRAMMING" mode.

If the programme includes use of a "PASSWORD" (paragraph 7.2.2), it will be requested and it should be inserted correctly otherwise the programme will not proceed.

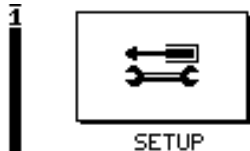
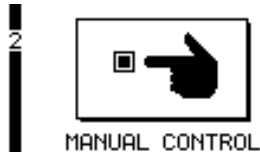
If the "PASSWORD" is disabled or inserted correctly, the programme will enable the programming menus.

From this position by pressing "UP/DOWN" you can scroll all five menus available of the function "PROGRAMMING", as shown in figure 7-1.

The menus are identified by a numerical code: it is indicated in the title of the corresponding text and also in the Figures.

By entering the "PROGRAMMING" mode, the System will automatically move to position [1], corresponding to:

"SETUP"

| VIEW ON THE GRAPHIC DISPLAY                                                         | DESCRIPTION                                                                       |
|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
|  | <p>"SETUP"</p> <p>Here are set all the basic settings for the operating logic</p> |
|  | <p>"MANUAL CONTROL"</p> <p>Manual control and enabling of outputs and inputs</p>  |

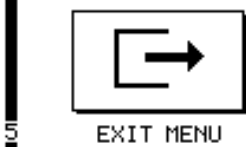
| VIEW ON THE GRAPHIC DISPLAY                                                       | DESCRIPTION                                                              |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------|
|  | <p>"ANALOGUE OUTPUT mA"</p> <p>Analogue outputs settings in current</p>  |
|  | <p>"ARCHIVE"</p> <p>Setting mode for filing and displaying data</p>      |
|  | <p>"EXIT MENU"</p> <p>Return to the measuring operating mode ("RUN")</p> |

Figure 7-1 Programming Menu

## NOTE



We strongly recommend that a test is carried out to set all of the parameters at least once according to a sequence of presentation in order to become familiar with the procedures. It is also important to remember that the operative methods are described only for paragraph 7.1; from paragraph 7.2 onwards they are proposed in a synthetic form, highlighting the specific aspects that characterise them from standard ones.

## 7.1 ACTIVATION OF FUNCTIONS

This paragraph defines the operations that should be carried out to select the functions available and to insert the parametric values necessary, in order to allow the power unit to operate in accordance with user demands.

The method of selection of the menus is equivalent for all of the programme: therefore it is sufficient to describe in detail, and only once, the procedure and refer to it systematically.

The objective of this paragraph is therefore to describe this procedure in a complete way by using part of the first "SETUP" programming menu purely as an example.

The initial situation of this example is therefore of an operator who follows the instructions indicated in Chapter 7 and has activated the "PROGRAMMING" method and therefore finds the "SETUP" icon (1) on the screen, being the one that the programme automatically proposes when it enters this phase.

- In order to select the programming menu, press the "UP" or "DOWN" keys. The icons shown in Figure 7-1 will appear. They are not only characterised by a different figure but also by a progressive number that forms the initial part of a position code which visualises the position reached within the structure in a very simple way.

Figure 7-2 shows the structures of all of the programming menus complete with the position codes. These codes are indicated (on the various screens and also in this manual) between

square brackets. In the case of this example, the menu corresponding to the following icon has been selected

"SETUP" [1]

- b) Press "ENTER" to activate the menu. The programme proposes the first of the operative programmes on the screen. The presentation consists of:
- the position code
  - the title
  - the roll-down menu presenting the possible alternatives at that level

In the following example, representation is the following:

```
CODE:           [1.0]
TITLE:          "SETUP"
SUBMENU:        "RELAYS"
                "SISTEM SETUP"
                "LEVEL"
                "FLOW"
                "RESET SETUP"
```

One of these instruments is always described as negative within a black string: this string identifies the item that can be activated.

- c) Press "UP" or "DOWN" to position the black string in the item of interest.

In the example, the black string is position on the 1st item, therefore on:

"RELAY OUTPUT"

- d) Press "ENTER" to activate the item selected. The programme will illustrate the relative screen, made up as follows:

```
CODE:           [1.1]
TITLE:          "RELAYS"
SUBMENU:        "RELAYS"
                "ALARM"
```

- e) With a similar procedure to the one described in c); d); select and activate, press "ENTER", the first submenu:

"RELAY"

- f) The programme will show the following screen:

```
CODE:           [1.11]
TITLE:          "RELAYS"
SUBMENU:        "K1÷K5"
```

Press "UP" or "DOWN" until reaching the black string on the relay chosen.

In the case in question, the relay chosen is K1. Press "ENTER" to activate it.

- g) The course of the alternatives, in this branch of the programme, is completed and we then move onto the parametric part, the part in which the System control data is intertwined.

Following these new requirements the screen is modified: apart from the usual elements such as title and code, it lists the parameters connected to this field of the programme with the relative parametric values currently set in the System. The titles and the codes are:

```
CODE:           [1.111]
TITLE:          "K1"
```

- h) Apart from the title and the code (see g), the presence of a black string will be shown above the wording:

"FUNC"

This representation mode indicates other screens apart from the one represented, that contain further parameters.

In order to visualise the alternatives available, proceed as follows:

- Position the black string on the item "FUNC" using the "UP" and "DOWN" keys, if it is present it is always the first in the menu.
- Press "ENTER"; the entire string will turn black and the wording will appear in a negative format.
- Using the "UP" and "DOWN" keys select the alternatives available that are highlighted with the alternating words within the string "FUNC".
- In this example, the alternatives available are:

"DISABLED"

"PULSES"

"ALARM"

- It is important to point out that the screen of this section of the programme is the one that has been activated immediately before.
- Press "ENTER" in correspondence with the one of interest. The black string will be reduced to the sole "FUNC" and the item selected will be shown in a positive format. At the same time the relative parameters are shown with the values set.

In this example the function "PULSES" has been selected, corresponding to the parameters :

"STEP"

"DURATION"

- i) Using the "UP" and "DOWN" keys position the string on the item of interest and press "ENTER".

The black string will extend until it includes the parametric value. In the example the following item has been selected:

"DURATION"

- Using the "UP" and "DOWN" keys choose the values available, which in the case of the example are 250-500-1000-2000.

Press "ENTER" in correspondence with the one to be inserted in the System.

The string will be reduced to the sole parameter and the value will be written in a positive format.

This indicates that the new value has been stored by the programme and, if confirmed when leaving the "PROGRAMMING" mode it will become operative.

- j) In order to exist the menu press "ESC". Every time it is pressed it will enable the programme to go back once. It will then return to the basic icon

"SETUP".

- k) To leave the "SETUP" method, select the following icon using the "UP" and "DOWN" keys:

"EXIT MENU" [5]

- Press "ENTER". The programme will request confirmation as follows:  
"SAVE?"

on the intention to replace the new data set with pre-existing data.

- By pressing “ENTER” once again, the pre-existing desire is confirmed.

Before making the new data operative the programme will perform a check on their validity. If the check turns out to be invalid, the programme will present an error message, specifying the parameter that is not acceptable.

This subject is discussed in paragraph 7-1 point b).

## 7.2 SETUP [1]

This menu allows for input and/or modification of all of the parameters that define the operative methods of the System. The items available are:

“RELAYS”  
“SYSTEM SETUP”  
“LEVEL”  
“FLOW”  
“RESET SETUP”

The single items can be selected by operating in accordance with the contents of par. 7-1. pt. b).

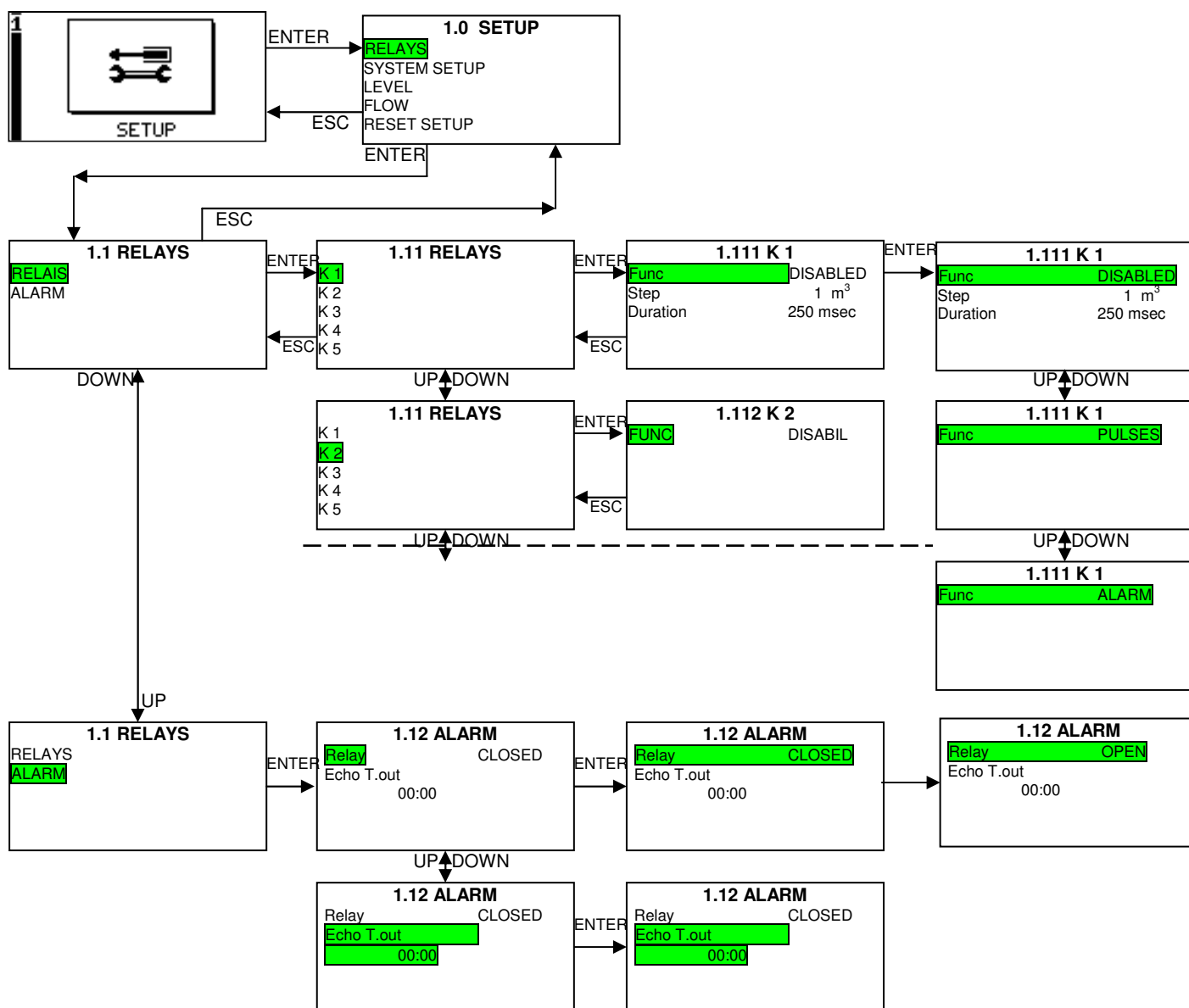


Figure 7-2 Menu “SETUP” (part one)

## 7.2.1 RELAYS [1.1] (FIG. 7-2)

The system has 6 relays with the first 5 (K1÷K5) that create the codes and transmit information on the flow of the plant, while the sixth one is an alarm relay that is activated if the maximum and minimum thresholds set are exceeded.

Move to "SETUP" [1.0] and select "RELAYS" [1.1]

The items available are:

"RELAYS" [1.11]

"ALARM" [1.12]

### 7.2.1.1 Relays [1.1]

This menu programmes operation of the five relays K1÷K5 one at a time.

- Select the relay K1÷K5 [1.111÷1.115] (see paragraph 7.1. point f) and define the methods of operation as described below.
- If the user wants to programme a second relay, press "ESC" until reach the position of relay selection: select another relay and repeat the operations described above.

#### 7.2.1.1.1 K1÷K5 [1.111÷1.115]

This function sets (see paragraph 7.1. point h/i) the operative methods of the relay.

They are:

"DISABLE"

"PULSES"

"ALARM"

##### 7.2.1.1.1.1 Disable

By selecting this item, the relay is excluded from the System. No other fields are present.

##### 7.2.1.1.1.2 PULSES [follows 1.111÷1.115]

If this item is chosen, the relay is inserted into the System and the led of the same name (Fig. 2-2 pt.2) is illuminated.

The relay becomes a flow counter as it generates an impulse in correspondence with a specific quantity of m<sup>3</sup> passed through the plant.

The characteristics of the impulse that can be set are (see paragraph 7.1. point h/i):

"STEP" It defines the total m<sup>3</sup> required to generate the impulse. The operator may select the generation of an impulse every 1/10/100 m<sup>3</sup>

"DURATION" It determines the duration of the impulse, therefore the activation time of the relay.

The operator may select a duration of the impulse of 250/500/1000/2000 msec.

##### 7.2.1.1.1.3 Alarm [follows 1.111÷1.115]

If this item is chosen, the relay is inserted into the System and the led of the same name is illuminated (Fig. 2-2 pt.2).

The relay becomes a control/alarm measuring the flow, as it is activated if the minimum or maximum thresholds are exceeded. The programme accepts threshold limits that are lower or equivalent to "FLOW MAX" set (see paragraph 7.2.4.2.1).

By setting the "Q ON"/"Q OFF" values, the following operation logics can be achieved:

- |                |                                                                                                                                                                                   |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| "Q ON > Q OFF" | The relay is activated when the value of the instant flow exceeds "Q ON" and it is disabled when it falls below "Q OFF".<br>Therefore it is defined as a maximum alarm.           |
| "Q ON < Q OFF" | The relay is activated when the value of the instant flow falls below "Q OFF" and it is disabled when it exceeds the "Q ON" value.<br>Therefore it is defined as a minimum alarm. |

The measurement is carried out by using the instant Q flow as a reference and comparing it with the threshold values "Q ON"/"Q OFF" expressed in accordance with the unit of measurement of flow set: m<sup>3</sup>; h; 1/sec (see Par. 7.2.4.1.1).

### 7.2.1.2 Alarm [1.12]

Functionality of the probe is constantly controlled in terms of its connection to the System and in terms of receipt of the eco by the power unit.

Select from "RELAY" [1.1] the item "ALARM" [1.12].

The items available are:

"RELAYS"  
"ECHO TOUT"

For the method of selection: (see paragraph. 7.1 pt. d).

#### 7.2.1.2.1 Loss of sensor connection

If, for any reason whatsoever, communications with the probe are interrupted, the programme will generate an alarm signal with the following effects:

- Activation of the alarm relay
- Activation of the alarm icon on the display (see Fig. 6-1 pt. 4)
- Display in the centre of the screen of the following message:

"PROBE ERROR"

#### 7.2.1.2.2 Relay activation [follows 1.12]

It defines whether or not the alarm relay, when an alarm is registered, must operate in a "CLOSED" or "OPEN" condition.

Select the "RELAYS" and choose the condition required, according to the contents of paragraph 7-1 h).

#### 7.2.1.2.3 Eco loss [follows 1.12]

For a limited period of time, the System may lose the eco signal without creating any specific problems. Once this interval has been overcome, the System will issue an alarm signal as follows:

- Activation of the alarm relay
- Display of the alarm icon (see Fig. 6-1 pt. 4)
- Display of the eco loss icon (see Fig. 6-1 pt. 5)

The critical nature of the loss of eco is a direct function of the plant type and should be provided for during the development stages of the plant itself.

Select "TOUT ECO" and set this value to 00.01 h. at 23,59 h. at steps of 1' by operating in accordance with the contents of paragraph 7-1 pt. i). By setting 00.00 the control function on the loss of eco is excluded.

## 7.2.2 SYSTEM SETUP[1.2]

It is the second menu of the icon "SETUP" (see Fig. 7-3).

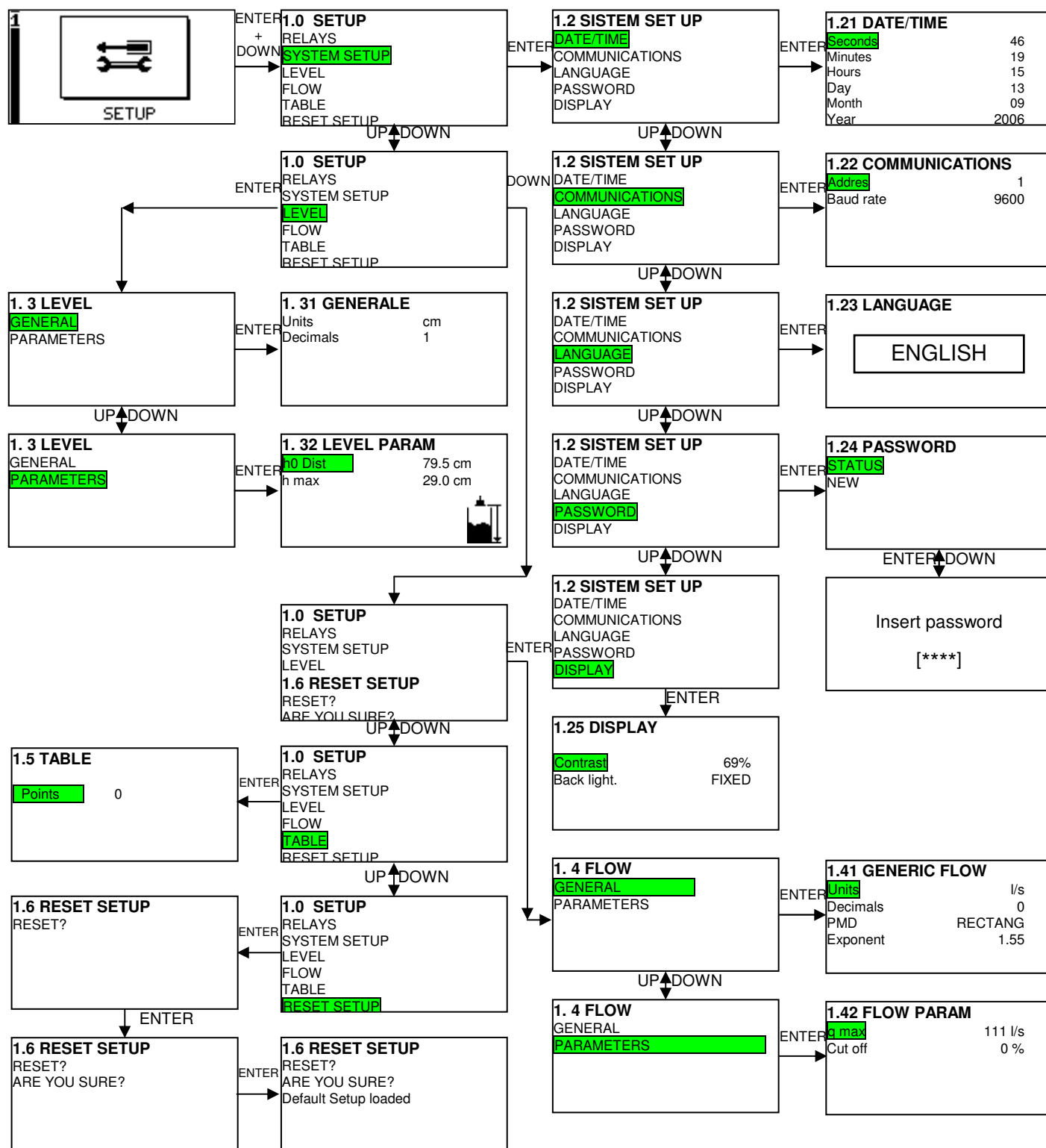


Figure 7-3 "SETUP" Menu (part two)

The Set-Up system [1.2] defines the methods of communication of the System. Move to "SETUP" [1.0] and select the "SYSTEM SETUP" [1.2]. The following items are available:

"DATE/TIME" [1.21]  
"COMMUNICATIONS" [1.22]  
"LANGUAGE" [1.23]  
"PASSWORD" [1.24]  
"DISPLAY" [1.25]

#### 7.2.2.1 Date/Time [1.21]

The calendar time is expressed in:

"SECOND"  
"MINUTES"  
"HOURS"  
"DAY"  
"MONTH"  
"YEAR"

The clock within the System is not synchronised to daylight time. Therefore the operator must remember to modify it and check the archives in correspondence with the time change.

In order to set the data, follow the instructions indicated in point 7-1 i).

#### 7.2.2.2 Communications [1.22]

It allows for the power unit to be connected within a telematic data transmission System.

Move to "SYSTEM SETUP" and select "COMMUNICATIONS" [1.22].

Follow the instructions indicated in paragraph 7-1 [1.2] and set the data as specified in point 7-1 i).

The fields that can be specified are the following:

"ADDRESS"  
"BAUD RATE"

##### 7.2.2.2.1 Address [segue 1.22]

An address value of between 0 - 99 can be set in steps of "1".

##### 7.2.2.2.2 Baud rate[1.22]

The transmission speed of the data can be set by selecting one of the following values: 9600 – 19.200 – 38.400 bps

#### 7.2.2.3 Language [1.23]

It allows for setting of the language used in the power unit, from a choice of:

"ITALIAN"  
"ENGLISH"

For the selection, move to "SYSTEM SETUP" [1.2]; select "LANGUAGE" [1.23] and make your choice (see paragraph 7-1 d), i).

#### 7.2.2.4 Password [1.24]

Access to the functions of the power unit may be granted through the use of a Password. This section of the programme defines the methods of activation and the methods of modification of the password itself.

The possible selections include:

"STATUS" [1.241]

"NEW" [1.242]

#### 7.2.2.4.1 **Status [1.241]**

This function activates the password. The specific operative methods of this function include:

- In pos. "PASSWORD" [1.24], activate "STATUS"
- Insert the current "Password" and press "ENTER"
- The programme moves to a "STATUS PASSWORD" mode [1.241]. A rectangular appears in the centre of the screen, indicating:

"DISABLE"

or

"ENABLE"

according to which one is active.

- Using the "UP" and "DOWN" keys select the condition requested and press "ENTER".  
The programme will return to the "PASSWORD" position [1.24], and will conclude the operation.

#### 7.2.2.4.2 **New [1.242]**

The programme allows for modifications to be made or the input of a password, as follows:

- In the "PASSWORD" position [1.24] select "NEW" [1.242]
- Insert the existing password. If it has not been inserted before, the default value is "0".
- The programme will move onto "NEW PASSWORD" [1.242]. A request for a "NEW PASSWORD" will appear in the middle of the screen.
- Insert a new "PASSWORD"  
[ \* \* \* \* \* ]

Numerical values between 1 ÷ 9999 may be inserted.

Press "ENTER". The programme will return to the "PASSWORD" position and conclude the operation.

If confirmed, when leaving the "SETUP" mode, the new "PASSWORD" is the operative one.

#### 7.2.2.5 **Display [1.25]**

This function of the programme allows for definition of contrast and back light.

In order to activate it, move to "SYSTEM SETUP"; select "DISPLAY"; according to the contents of paragraph 7-1 d), and operate as follows.

##### 7.2.2.5.1 **Contrast**

Contrast on the representation may vary between 0% and 100%, operating as specified in point 7-1 i). The standard conditions are between 87÷96%.

Contrast may be set even when the power unit is activated, as specified in paragraph 5-1.

##### 7.2.2.5.2 **Back light**

The back light of the screen may be:

|         |                                                                                                                      |
|---------|----------------------------------------------------------------------------------------------------------------------|
| "FIXED" | it remains constantly active                                                                                         |
| "AUTO"  | it is activated when any test is pressed and is disabled after more than 15 seconds if none of the keys are touched. |

### 7.2.3 LEVEL [1.3]

This segment of the programme allows for the calculation System to acquire the parameters related to positioning of the probe, with reference to the level (recess) of the fluid.

Move to "SETUP" [1.0] and select "LEVEL" [1.3] (See Fig. 7.3).

The programme has two items, which are:

- "GENERAL" [1.31]
- "PARAMETER" [1.32]

#### 7.2.3.1 Level Param[1.31]

This segment of the programme sets the metric units of measurement used for all remote measurements.

Move to "LEVEL" [1.3]; select "GENERAL" [1.31]

Using the function "UNITS" the operator can ask the programme to represent the data in:

- "M"
- "cm"
- "mm"

The ratio is created according to the contents of paragraph 7.1 i).

Using the function "DECIMAL", the operator can define the number of decimals that follow the unit. The maximum value that can be set is "3".

It is important to remember that the maximum value set is a function of the unit of measurement. The programme operates internally on a reference in "mm", therefore the maximum number of decimals permitted is:

| UNITS | DECIMAL |
|-------|---------|
| m     | 3       |
| cm    | 1       |
| mm    | 0       |

#### 7.2.3.2 Parameters [1.32]

Using the functions, the following should be inserted into the programme:

- the height of the probe compared with the corresponding point for flow "0"
  - For spout applications, the distance will be between the "face" of the transducer and the spout threshold
  - For Venturi channel applications or similar, the distance will be between the "face" of the transducer and the bottom of the channel.
- the maximum height of the water channel (hydraulic recess) at the maximum flow, compared with point zero. (*This value should be calculated using the specific formula for the type of spout or channel used*)

Move to "LEVEL" [1.3] and select "PARAMETERS" [1.32]

The items that can be inserted are:

- "h0 DIST"
- "h. MAX"

#### 7.2.3.2.1 *h 0 Dist*

At this stage the metric value of the distance (in height) should be inserted between the position of the probe and the level used as the "0" value of the recess. The maximum value that can be set is 5mm (corresponding to the maximum field of the probe)..

#### 7.2.3.2.2 *h max.*

At this point the metric value of the distance between the value used as value "0" and the maximum level that will be achieved by the hydraulic recess should be introduced.

The maximum value that can be set is 4.70 m. (Considering that a "DEAD ZONE" of 30cm is located close to the probe).

### 7.2.4 FLOW [1.4]

This segment of the programme, accessible from the "SETUP [1.0]" icon, allows for the input of the parameters related to the instant flow.

The items available are (see Fig. 7-3):

"GENERAL" [1.41]

"PARAMETER" [1.42]

#### 7.2.4.1 Generic Flow [1.41]

The parameters related to the instant flow should be set here.

Move to "FLOW" [1.4] and select "GENERAL" [1.41].

The following fields are available:

"UNITS"

"DECIMALS"

"PMD"

"ESPONENT"

##### 7.2.4.1.1 *Units*

It specifies the unit of measurement for the flow: *mc/h* or *l/s*

##### 7.2.4.1.2 *Decimal*

It indicates the number of decimals with which the value of the flow is visualised: 0, 1, 2 or 3.

The maximum number of decimals permitted is a function of the flow (*Q\_Max*); it may be re-set automatically by the programme, if necessary.

##### 7.2.4.1.3 *PMD*

The device type (channel or spout) that will be inserted at the bottom of the measuring probe should be inserted here. Specific calculation formulas allow for the exact definition of the dimensions and the distance at which the measuring probe should be positioned. In accordance with these prescriptions during a plant engineering stage, it is possible to achieve the correct measurement of the flow according to the variation in height of the recess. The following types are available:

- Rectang ("Francis" rectangular spout)
- Trapez ("Cipolletti" trapeze spout)
- Venturi (Venturi channel)
- Parshall (Parshall channel)
- Leopold (Leopold channel)

- Stram. V (A triangular V "Thompson" spout)
- Other (a freely programmable exponent)

The last type (Other) refers to a non standard exponential device and therefore the exponent may be freely programmed by the user.

#### 7.2.4.1.4 **Exponent**

It defines the exponent used for calculations, related to the PMD selected. This field can only be modified if PMD = OTHER has been selected: for standard PMD's it is set automatically and in display only (this indicates the exponent value defined by the PMD itself).

#### 7.2.4.2 **Flow Param [1.42]**

It allows for setting of the field of measurement of the flow.

Move to "FLOW" [1.4] and select "PARAMETERS" [1.42].

The following fields are available:

"Q MAX"

"CUT OFF"

They can be selected according to the contents of paragraph 7.1 i).

##### 7.2.4.2.1 **Q Max**

In this field "Q MAX" the maximum value of the instant flow corresponding to the maximum recess should be inserted (see paragraph 7.2.3.2.2. max h<sub>max</sub>).

The maximum value that can be set is 9999 mc/h; if it is set as a unit of measurement "l/s", the maximum value will be 2777 l/s).

##### 7.2.4.2.2 **Cut off**

The "CUT OFF" field specified the threshold (0-99% of instant flow) below which the volume should not be counted.

#### 7.2.5 **TABLE [1.5]**

Press ENTER to access to the "Points" menu.

If "Points"=0 the empirical function is not used (and the flow is calculated using the analytical function); in this case in 1.32 LEVEL PARAM the "h.MAX" (maximum height) field is shown and in 1.42 FLOW PARAM the "q.MAX" (flow value at h<sub>max</sub> that defines the FS) field is shown.

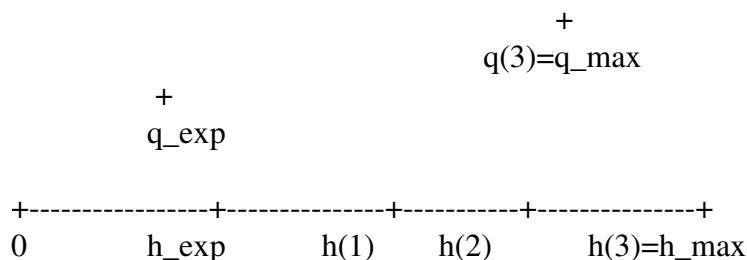
If "Points"=N (N between 1 and 130) the empirical function is used; in this case in 1.32 LEVEL PARAM the "h.exp" field is shown and in 1.42 FLOW PARAM the "q.exp" field is shown; the h<sub>exp</sub>/q<sub>exp</sub> parameters define the analytic part of the flow calculation (from h=0 to h=h<sub>exp</sub>); if h has a value between h<sub>exp</sub> and h(N) the flow will be calculated with a linear interpolation of the defined points. In this case the FS of the flow is defined by q(N) (the last point of the table).

If, for example, <Points>=3 the first 3 points of the table can be edited (using the UP/DOWN keys):

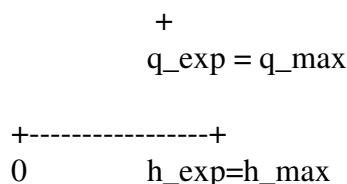
h(1) is the height of the 1-st point

q(1) is the flow of the 1-st point

At h(3) (the very last point of this example) the h<sub>max</sub> value is shown and at q(3) the q<sub>max</sub> value is shown: these are useful to remember that if the table is on, the FS are defined from the last point of the table itself:



If the table is off:



Note that if in 1.41 GENERIC FLOW "PMD"=OTHER and "ESPONENT"=1.00 are set, the analytic function is now a line from (0;0) to (h\_max; q\_max), so the function is now only tabular with height values:

0, h\_exp, h(1), h(2), ...

### 7.2.5.1 Set up for the "Bazin" type overflow

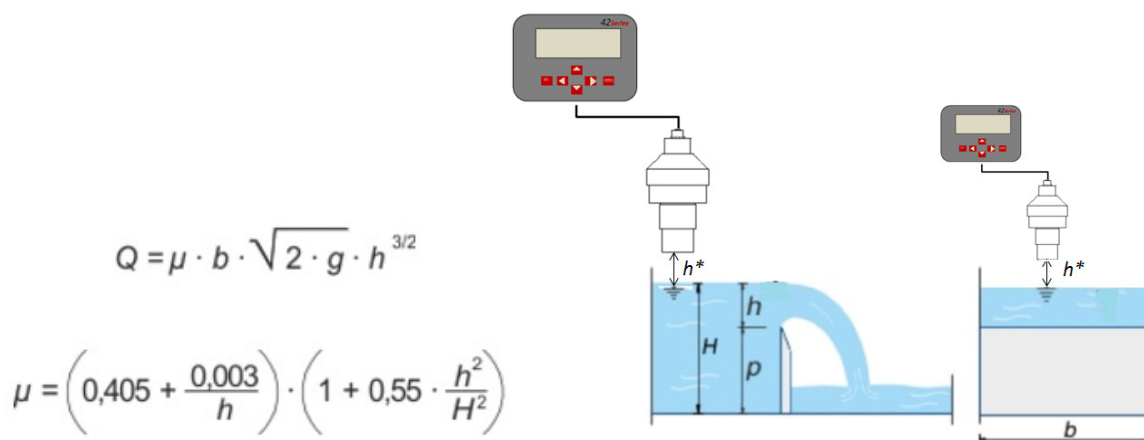


Figure 7-4 Scheme and calculation of the flow rate of a Bazin overflow

**Q** = [m<sup>3</sup>/s] Effluent flow rate by a thin wall (Bazin overflow)

**b** = [mm] Width of the thin wall section (weir)

**p** = [mm] Height of the thin wall section (weir)

**H** = [mm] Total height of the fluid upstream of the thin wall

**h** = [mm] Height of the fluid on the thin wall

**h\*** = [mm] Height of the position of the probe. This must be at least 30cm higher than the maximum swing h

**μ** = discharge coefficient

The 4204\_Livello\_Flow Rate device connected to a S425/C probe (ultrasound level probe), allows to know the extent effluent by a thin wall or weir Bazin by updating firmware "Flow Meter 5.7".

In order to set the flow measurement for a Bazin overflow you must enable this feature by 4204 instrument "Enable = Yes" (Figure 7-5) and set the following parameters specific to this overflow:

- **Bazin Height (Fig. 7-5 g)** = mm (Height of the thin wall section).
- **Larghezza Bazin (Fig. 7-5 g)** = mm (channel/wall width).
- **Dist  $h_0$  ( Fig. 7-5 d)** = mm (this is the distance between the transducer face and the water head at zero flow. The value in mm is given by  $h+h^*$  (Fig. 7-4)
- **Qmax Bazin ( Fig. 7-5 g)** =  $m^3/h$  (defines the maximum measurement threshold of flow rate by the device, this value is only used to define the maximum value of the output current and the bargraph on the display).

Follow this scheme to set these parameters:

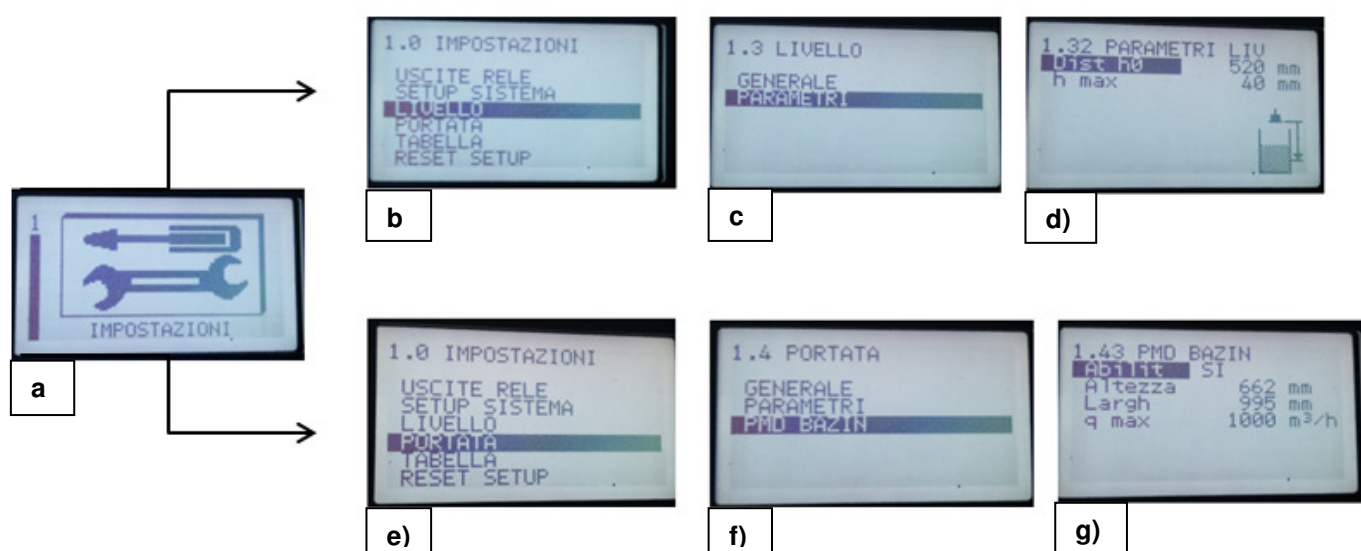


Figure 7-5 Diagram for setting the parameters for a Bazin overflow

## 7.2.6 RESET SETUP [1.6]

Re-set of the set-up defines operation parameters at their default values. One single reset request is carried out after which if YES is pressed, it will carry out the reset indicated by a message "DEFAULT SETUP LOADED"; at this point all of the functions of the instrument are disabled and must be programmed again.

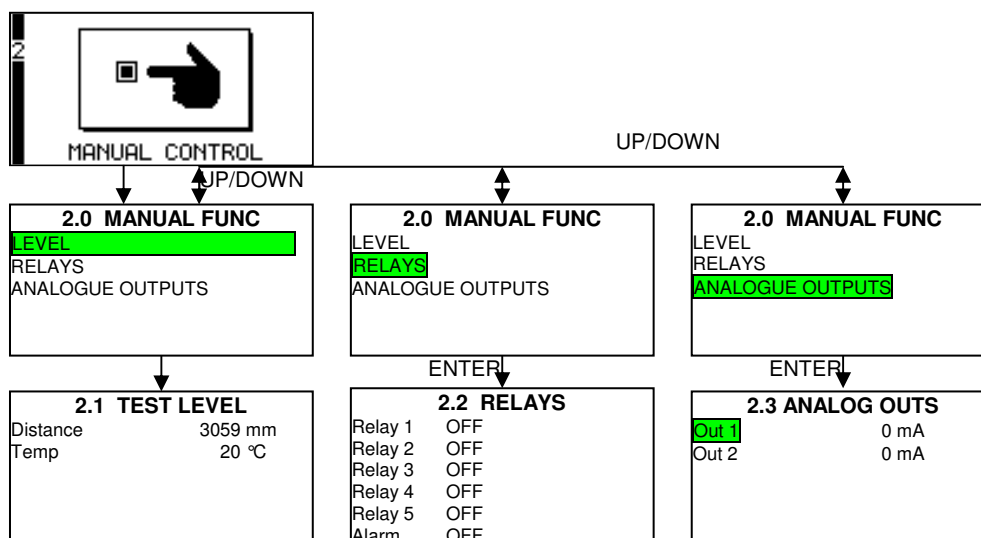
### NOTE



The current set-up parameters, after a reset, are not lost altogether: if the operator is asked whether or not he wants to save the parameters, if he decides not to save them, the original parameters will be reloaded (the value they had when programming began).

### 7.3 MANUAL CONTROL [2.0]

Item 2 of the main menu grants access to the test functions of the 4204Flow (see Fig. 7-6)



**Figure 7-6 Menu “MANUAL CONTROL”**

The functions available are:

"LEVEL"

## "RELAYS"

## "ANALOGUE OUTPUT"

They can be selected according to the contents of Par. 7.1 b).

### 7.3.1 TEST LEVEL [2.1]

The distance value is visualised ("DISTANCE") and the temperature value ("TEMP") of the probe.

In the event of an error (communication, absence etc.) the following are visualised:

" ? ? ? ? ? ? "

### 7.3.2 RELAYS [2.2]

It performs a manual relay test, including control of their functionality.

In order to excite or de-excite a relay, turn the bar to its negative colour and press YES.

If the relay operates, it should change status every time it is pressed. When exiting, all of the relays are automatically forced to OFF.

### 7.3.3 ANALOG OUTS [2.3]

It allows for out mA tests to be carried out. By pressing YES the value of the output current will increase by 1 mA; when 20 mA are reached it will return to 0 mA.

## 7.4 MA ANALOGUE OUTPUT [3.0]

Item 3 of the main menu allows for definition of the parameters in current (see Fig. 7-7).

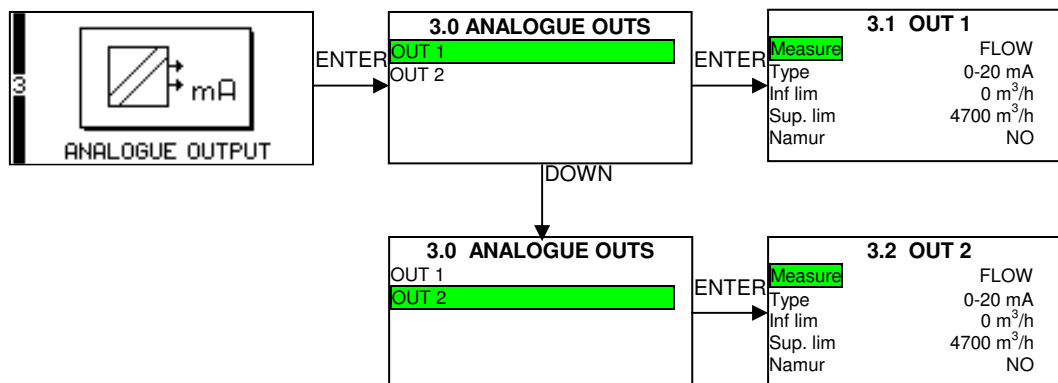


Figure 7-7 Menu "ANALOGUE OUTS"

The programme has two parameters:

"OUT 1"

"OUT 2"

They can be selected according to the contents of paragraph 7.1 b).

### 7.4.1 OUT 1

|                                                                                                                                            |                                                                                                                   |
|--------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| It defines the outward parameters mA 1.<br>The "MEASURE" field selects the size to be used:                                                | <ul style="list-style-type: none"> <li>▪ "FLOW" or</li> <li>▪ "TEMPERAT."</li> </ul>                              |
| The field "TYPE" defines the output type:                                                                                                  | <ul style="list-style-type: none"> <li>▪ 0-20 mA or</li> <li>▪ 4-20 mA.</li> </ul>                                |
| The field "INF LIM" defines the value of the size at 0 or 4 mA if it has been chosen, respectively:                                        | <ul style="list-style-type: none"> <li>▪ "TYPE"=0-20 mA or</li> <li>▪ "TYPE"=4-20 mA.</li> </ul>                  |
| The field "SUP LIM" defines the value of the size to:                                                                                      | <ul style="list-style-type: none"> <li>▪ 20 mA</li> </ul>                                                         |
| The field "NAMUR" is only important if:<br>and it undertakes the values "NO" or "YES"; in the second case the current output is forced to: | <ul style="list-style-type: none"> <li>▪ "TYPE"=4-20 mA</li> <li>▪ 2.40 mA in the presence of an alarm</li> </ul> |
| Every time the field "FLOW" (par. 7.2.4.2.) is modified, all of the default values are reset for:                                          | <ul style="list-style-type: none"> <li>▪ "INF LIM"</li> <li>▪ "SUP LIM"</li> </ul>                                |

### 7.4.2 OUT 2

|                                                                                            |                                                                                                                  |
|--------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| It defines the output parameters mA 2.<br>The field "MEASURE" selects the size to be used: | <ul style="list-style-type: none"> <li>▪ "FLOW" or</li> <li>▪ "TEMPERAT"</li> <li>▪ "LEVEL" (recess).</li> </ul> |
| The field "TYPE" defines the type of output:                                               | <ul style="list-style-type: none"> <li>▪ 0-20 mA or</li> <li>▪ 4-20 mA.</li> </ul>                               |

|                                                                                                                                         |                                                                                                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| The field "INF LIM" defines the value of the size from 0 or 4 mA if it has been chosen, respectively:                                   | <ul style="list-style-type: none"> <li>"TYPE" = 0-20 mA or</li> <li>"TYPE" = 4-20 mA.</li> </ul>                |
| The field "SUP LIM" defines the value of the size to:                                                                                   | <ul style="list-style-type: none"> <li>20 mA</li> </ul>                                                         |
| The field "NAMUR" is only important if: and it undertakes the values "NO" or "YES"; in the second case the current output is forced to: | <ul style="list-style-type: none"> <li>"TYPE" = 4-20 mA</li> <li>2.40 mA in the presence of an alarm</li> </ul> |
| Everytime the field "FLOW" (par. 7.2.4.2.) is modified, the default values are automatically reset for:                                 | <ul style="list-style-type: none"> <li>"INF LIM"</li> <li>"SUP LIM"</li> </ul>                                  |

## 7.5 ARCHIVE [4.0]

Item 4 of the main menu allows for display of the data included in the archive and in the flow archive as well as their relative set-ups.

The following sub-menu is presented (see Figure 7-8):

"TOTALIZER" [4.1]

"FLOW" [4.2]

They can be selected according to the contents of paragraph 7.1 b).

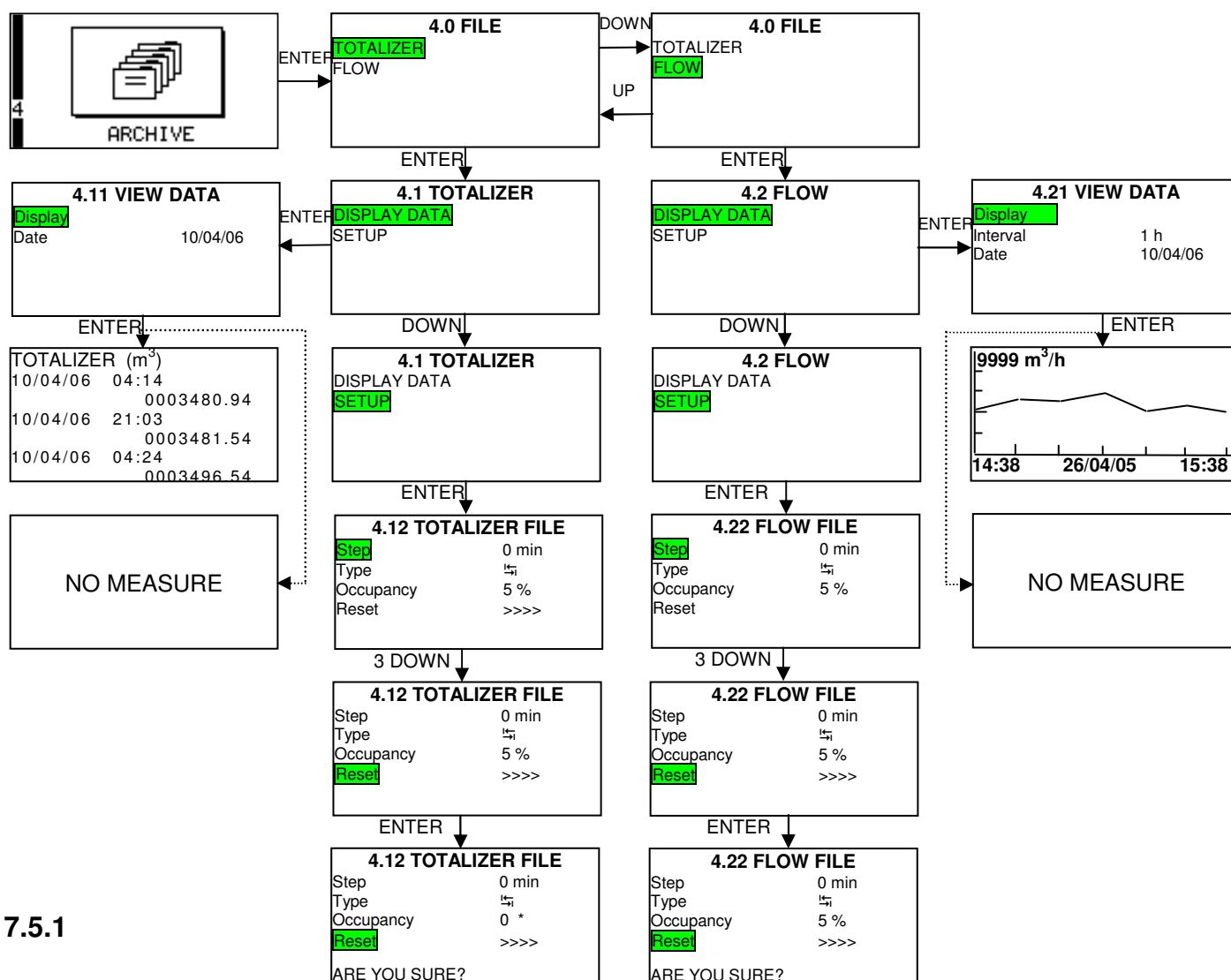


Figure 7-8 "ARCHIVE" menu

## TOTALIZER

The sub-menu "TOTALIZER" [4.1] carries out all operations related to the archive of the totalizer and it includes the following items:

"DISPLAY DATA" [4.11]

"SETUP" [4.12]

They can be selected according to the contents of paragraph 7.1 b).

### 7.5.1.1 Display Data [4.11]

The field "DISPLAY DATA" [4.11] allows for programming of the methods of representation of the data on the screen of the power unit.

The field "DATA" defines the day in which consultation of the archives will begin: 4 arrow keys are available for editing: the "UP" and "DOWN" keys are used to scroll the days, the "RIGHT" and "LEFT" keys are used to scroll 30 day periods. The current day is always shown at the beginning.

By pressing "VIEW DATA" the operator will move onto data display. Every screen shows 3 records: for each record the time (DD/MM/YY HH:MM) and value of the primary totalizer are shown (during registration).

### 7.5.1.2 Totalizer File [4.12]

By selecting the item "SETUP" (4.12) from the "TOTALIZER" menu[4.1], the methods of management of the System archive can be set.

The field "STEP" defines the registration step of the data that can be selected between 0', 5', 10', 30', 1 h, 2 h, 6 h, 12 h and 24 h; the value "0'" disables registrations.

The field "TYPE" defines the type of archive: linear (filling) or circular. In the first case the registrations end when the archive is full: in the second case (circular) when the archive is full a new registration overwrites the oldest one.

The item "OCCUPANCY" indicates the percentage of occupation of the memory.

The item "RESET" >>> allows for removal of all data in the archive: by pressing YES, the operator is asked whether or not he is sure that he wants to carry out the reset, if he presses YES again the archive will be emptied (at this point all data will be lost for good)

## 7.5.2 FLOW [4. 2]

The sub-menu "FLOW" [4.2] from the menu "ARCHIVE" [4.0] allows for all operations related to the capacity archive to be carried out and includes the following items:

"DISPLAY DATE" [4.21]

"SETUP" [4.22]

### 7.5.2.1 Visualise Data [4.21]

The field "DATE" defines the date in which graphic consultation of the archives will begin: 4 arrow keys are available for editing: the "UP" and "DOWN" keys are used to scroll the days, the "RIGHT" and "LEFT" keys are used to scroll 30 day periods. The current date is always shown at the beginning.

The field "INTERVAL" defines the interval of time for every single screen and can be chosen between 1, 6 or 24 hours.

With the "DISPLAY" item, the operator will move onto data display. In correspondence with the period of times, the date is indicated DD/MM/YY (in the middle) and the interval limits of display in the format HH:MM. The value 00:00 on the right hand side refers to the following day: for example if Interval = 6 h the measurements of the day 12/10/05 are shown in the 4 screens.:

"00:00 12/10/05 06:00" (1^ screen)  
 "06:00 12/10/05 12:00" (2^ screen)  
 "12:00 12/10/05 18:00" (3^ screen)  
 "18:00 12/10/05 00:00" (4^ screen)

Scrolling is carried out using the "LEFT" and "RIGHT" keys. In the top left hand corner the scale is shown for flow ("Q\_MAX").

By pressing the ENTER key a window containing the maximum, average and minimum values of the values in this interval of time are shown (this window does not appear if this interval of time does not include any measurement): by pressing YES once again, the same screen will be visualised using the values "MAX" and "MIN" as the limits.

### 7.5.2.2 Capacity Archive [4.22]

The field "STEP" defines the registration step of the data that can be selected between 0', 1', 2', 5', 10', 15', 20', 30' and 60' minutes; the value "0'" disables registrations.

The field "TYPE" defines the type of archive: linear (filling) or circular. In the first case the registrations end when the archive is full: in the second case (circular) when the archive is full a new registration overwrites the oldest one.

The item "OCCUPANCY" indicates the percentage of occupation of the memory.

The item "RESET" >>> allows for removal of all data present in the archive: by pressing YES the operator is asked whether or not he wants to carry out the reset, if YES is pressed again the archive is emptied (at this point all data is lost once and for all).

## 7.6 EXIT MENU [5.0]

Item 5 (See figure 7-9) of the main menu allows the operator to exit the programming mode asking him whether or not to save the settings. If the operator decides to save, a validity check of the parameters will be carried out: this check is carried out as there are correlations between the values assigned.



Figure 7-9 Menu "EXIT MENU"

If values not permitted are included, an error message will appear. The following errors are permitted:

|           |                      |                                                                                                                       |
|-----------|----------------------|-----------------------------------------------------------------------------------------------------------------------|
| "Err 3":  | "UNDEFINED LOGIC "   | It refers to the thresholds set for operation of the relays as an alarm: the values Q ON and Q OFF must be different. |
| "Err 5":  | "OUTPUT LIMITS"      | mA 1" LIM INF < LIM SUP is requested for the output in current 1                                                      |
| "Err 6":  | "OUTPUT LIMITS mA 2" | LIM INF < LIM SUP is requested for the output in current 2                                                            |
| "Err 10": | "FLOW (Q MAX) "      | Not permitted q_max = 0                                                                                               |

"Err 18": "MAX DISTANCE LEVEL 1" A value of the distance of the recess of  $0 > 5$  m has been registered .

"Err 19": "RANGE LIV (h max) " h\_max value not permitted.

## 8 MAINTENANCE

### 8.1 SPECIAL ATTENTION FOR CRITICAL COMPONENTS

The instrument includes a LCD (Liquid Crystal Display) display that includes a bit of toxic agents. In order to avoid the risk for personal damages and limit the environmental negative impact, it is important to comply with the following instructions:

#### LCD display:

- The LCD display of the unit is fragile (glass) and must be carefully handled. For this reason, during the transport or when it is not used, it is recommended to protect the device under its original packaging.
- If the LCD glass breaks and some liquid comes out, pay attention not to come in contact with it. Carefully wash in water for at least 15 minutes the body parts being in contact with the liquid. Immediately contact a physician if after doing this operation, you feel any symptom.

## 9 MODBUS PROTOCOL

Protocol type: serial modbus RTU

Speed: 9600, 19200, 38400 bps

This document contains:

Holding registers

User function for data download

---

### HOLDING REGISTERS

The MSB of the 16-bit value of a register is shown before the LSB (MSB-1st encoding)

In the case of 32-bit integers, 2 contiguous registers are used. In the following list if a parameter is associated with 2 contiguous registers means that this parameter has a 32-bit value.

The registers are identified by its address (add):

reg add

- 0 Fw ver: MSB = higher N., LSB = lower N.
- 1 Device Id = 4204
- 6 Records currently in the local archive (max 29999)
- 7 State of I/O [1]
- 8 Level value (mm) [2]
- 10 Temperature in °C (with bias of 30000: e.g. 30023 means 23°C)
- 11 Measured distance from the probe (mm)
- 12-13 Current time of the RTC [3]
- 16-17 Time ON rele K1 (in minuti)
- 18-19 Time ON rele K2 (in minuti)
- 20-21 Time ON rele K3 (in minuti)
- 22-23 Time ON rele K4 (in minuti)
- 24-25 Time ON rele K5 (in minuti)
- 26 N. of commutations of relais K1
- 27 N. of commutations of relais K2
- 28 N. of commutations of relais K3
- 29 N. of commutations of relais K4
- 30 N. of commutations of relais K5
- 36-37 Time of last alarm[3]
- 38 Code of last alarm [4]

Note:

[1] You have the following correspondence:

- bit 13 dig inp 5
- bit 12 dig inp 4
- bit 11 dig inp 3
- bit 10 dig inp 2
- bit 9 dig inp 1

bit 5 rele K5  
bit 4 rele K4  
bit 3 rele K3  
bit 2 rele K2  
bit 1 rele K1  
bit 0 rele allarme

[2] The value of the level is encoded with shift of 100000: for example, if the registers 8-9 contain the value 112340, it means level = 12340 mm (in this example the register 8 contains 1 and the register 9 contains 46804)

[3] These times are expressed as n. of seconds since 1/1/2000 0:00:00

[4] Code of the most recent alarm that has occurred, a zero value means that no alarm was never registered.

---

## DATA DOWNLOAD

Download of the data in the local store is done through the function user-defined 66 (not editable)

The transfer starts with the following transaction:  
(session opening, subfunc = 0xF0):

query (6 bytes):

pos bytes

|   |   |                    |
|---|---|--------------------|
| 0 | 1 | Device address     |
| 1 | 1 | function = 66      |
| 2 | 1 | subfunction = 0xF0 |
| 3 | 1 | REQ_CODE [1]       |
| 4 | 2 | CRC                |

response (14 bytes):

pos bytes

|    |   |                    |
|----|---|--------------------|
| 0  | 1 | Device address     |
| 1  | 1 | function = 66      |
| 2  | 1 | subfunction = 0xF0 |
| 3  | 1 | 0x00               |
| 4  | 1 | ver fw higher n.   |
| 5  | 1 | ver fw higher n.   |
| 6  | 2 | Device ID = 4204   |
| 8  | 1 | 0x00               |
| 9  | 1 | 0x00               |
| 10 | 2 | RECORDS [3]        |
| 12 | 2 | CRC                |

Note:

[1] REQ\_CODE must have 0 or 1 value.

[3] RECORDS is the total number of records that will be downloaded during the session (this is the number when calling)

The records are required with the following transaction  
(reading of a record, subfuncnt = 0xF1):

query (6 bytes):

pos bytes

|   |   |                    |
|---|---|--------------------|
| 0 | 1 | Device address     |
| 1 | 1 | function = 66      |
| 2 | 1 | subfunction = 0xF1 |
| 3 | 1 | PACK_NUM [1]       |
| 4 | 2 | CRC                |

response (114 bytes):

pos bytes

|     |    |                    |
|-----|----|--------------------|
| 0   | 1  | Device address     |
| 1   | 1  | function = 66      |
| 2   | 1  | subfunction = 0xF1 |
| 3   | 1  | RECCOUNT [2]       |
| 4   | 12 | Rec#1 [3]          |
| 16  | 12 | Rec#2              |
| 28  | 12 | Rec#3              |
| 40  | 12 | Rec#4              |
| 52  | 12 | Rec#5              |
| 64  | 12 | Rec#6              |
| 76  | 12 | Rec#7              |
| 88  | 12 | Rec#8              |
| 100 | 12 | Rec#9              |
| 112 | 2  | CRC                |

Note:

[1] PACK\_NUM must have 0 or 1 value

[2] RECCOUNT is the number of records currently in the response. If RECCOUNT = 9  
9 records are present; if, for example, RECCOUNT = 3 only the first 3 records  
are valid (rec#1, rec#2, rec#3)

[3] Every record is 12 bytes and has the following format:

bytes

|   |                                                                           |
|---|---------------------------------------------------------------------------|
| 4 | Time: seconds since 1/1/2000 0:00:00 (integer unsigned<br>32-bit MSB-1st) |
| 2 | Not used                                                                  |
| 1 | State of the relais                                                       |
| 1 | Not used                                                                  |
| 4 | Level in mm: integer with sign 32-bit MSB-1st                             |

### Data download execution

The instrument maintains a pointer to the archive (current position): in a  
session of data download the records are transferred from current position to the end of the archive.

In the download session opening:

If REQ\_CODE = 0 the current position won't be edited, if REQ\_CODE = 1 the current position will become the start of the archive (in this case, the entire archive will be downloaded)

In the records request:

The first requested record must have PACK\_NUM = 1, the second PACK\_NUM = 0, the third PACK\_NUM = 1, and so on ... that is: to ask for the next record, the value of PACK\_NUM must change; if you send the query without changing the value of PACK\_NUM the device will transmit the same record.

Esempio di sessione di scarico dati

device

master

```
<----- subfun=0xF0 REQ_CODE=0 ----- [1]
----- subfun=0xF0 -----> OK
<----- subfun=0xF1 PACK_NUM=1 ----- request of first block of records [2]
----- subfun=0xF1 RECCOUNT=9 -----> OK: 9 record received
<----- subfun=0xF1 PACK_NUM=0 ----- request of following block of records
----- subfun=0xF1 RECCOUNT=9 -----> OK: 9 record received
<----- subfun=0xF1 PACK_NUM=1 ----- request of following block of records
----- subfun=0xF1 RECCOUNT=9 -----> OK: 9 record received
<----- subfun=0xF1 PACK_NUM=0 ----- request of following block of records
----- ??? -----> ERR [3]
<----- subfun=0xF1 PACK_NUM=0 ----- request of block retransmission [4]
----- subfun=0xF1 RECCOUNT=9 -----> OK: 9 record received
<----- subfun=0xF1 PACK_NUM=1 ----- richiesta blocco di records successivo
----- subfun=0xF1 RECCOUNT=9 -----> OK: 9 record received
<----- subfun=0xF1 PACK_NUM=0 ----- richiesta blocco di records successivo
----- subfun=0xF1 RECCOUNT=7 -----> OK: 7 record received (end) [5]
```

Commenti:

[1] The session opens with REQ\_CODE = 0, so the transfer starts from the current position.

[2] The first requested block (after the session opening) must have PACK\_NUM = 1

[3] No response received (timeout) or the response is faulted

[4] Since it was not received a valid response, a retransmission of the block is requested by sending the query with the same value of PACK\_NUM

[5] 7 records were received; these are the last records, because RECCOUNT = 7 all the records have been transferred and the session can be completed (the session could be ended when You receive a block with RECCOUNT < 9).

In the given example,  $5 \cdot 9 + 7 = 52$  records were transferred.

## 10 WARRANTY

Chemitec s.r.l. will replace or repair at its own sole option, those parts that may eventually manifest defects in manufacturing or operating, despite of a diligent and proper use by the customer.

The defective product, or considered such, must be sent free of charge to the Chemitec Factory, via I. Newton 28, 50018 Scandicci, Florence (Italy) and will be returned, after the reparation, at purchaser's expense. In order to activate the warranty, a detailed written request should be sent to Chemitec s.r.l., specifying failures or disruptions complained within 12 (twelve) months from the date of installation with a maximum of 18 (eighteen) months from date of shipment.

Are excluded from the warranty, then at purchaser's charge, the costs of performance of our staff for operations offsite, except the hours of work. The travel's time and expenses, meals, etc. will be charged according to ANIE rates.

Components subject of natural wear and glass-parts are excluded from the warranty. The warranty lapses only if the equipment were manipulated by someone not belonging to our company or without our explicit authorization.

THE EQUIPMENT 'S TESTING IS PERFORMED AT THE CHEMITEC SRL COMPANY OF SCANDICCI (FI).

MODELLO/MODEL \_\_\_\_\_

NUMERO DI SERIE/SERIAL NUMBER \_\_\_\_\_

TESTING DATE \_\_\_\_\_

NOTE: \_\_\_\_\_

CHEMITEC SRL

\_\_\_\_\_

## 11 REQUEST FOR SERVICE

### 11.1 PROCEDURE FOR SERVICE REQUEST

In case of the instrument being damaged or in case of partial or wrong working that cannot be solved by the ordinary maintenance operations described on this manual or on the attached documents, we recommend to contact one of the CHEMITEC offices or branches or the nearer authorized dealer / service centre.

#### CAUTION



If the instrument is damaged or starts wrong working, not in compliance with the instruction of this use manual, in particular referring to the safety, **IMMEDIATELY STOP USING** the instrument and contact the service dept. Never use the instrument till all the safety requirement are checked and reset.

#### NOTE



In order to accelerate all the service starting procedures and to make the problem detection easier by the qualified technical staff, please fill in the following form already from the first phone call.  
The instrument data can be kept from the relevant plate data.

#### REQUEST FOR SERVICE

Instrument/system name .....  
Code/catalogue number .....  
Unit number (SN).....  
Present software version (Rel) .....

### 11.2 MAIN CHEMITEC OFFICES

#### OPERATING OFFICES

CHEMITEC s.r.l.  
Operating office:  
Via Isaac Newton, 28  
50018 Scandicci  
**FLORENCE**

Tel. 0039 55 7576801 - Fax 0039 55 756697  
E-mail sales@chemitec.it  
Web site: www.chemitec.it