Control

CARLO GAVAZZI

WM5-96

Smart Power Quality Analyzer

Instruction manual

ARM® POWERED

Thank you for choosing our products

WM5-96

Smart Power Quality Analyzer

WM5 96:

- High accuracy (class 0.2 A/V);
- High calculation performances (ARM® technology) for a fast analysis of the signal (FFT up to the 63rd harmonics);
- high connection capabilities (RS485 115.2 kbps, RS232, front optical port).

WM5 96 is the state-of-the-art tecnological answer to your needs of power quality analysis.

Moreover, you can count on a ISO9001/VISION 2000 certified company structure, an experience of many years and a wide-spread presence both in Europe and all over the world. All this in order to guarantee the customer with a **top-quality service** and the best products.

Welcome in Carlo Gavazzi and our compliments for your choice. You can evaluate the complete range of our products on the CARLO GAVAZZI web-site:
www.carlogavazzi.com/ac

CARLO GAVAZZI
Automation Components

Introduction

Getting aquainted with WM5

Programming WM5 96

Layout and list of modules

Installation

Wiring diagrams

Technical specifications

We suggest you to keep the original packing in case it is necessary to return the instrument to our Technical Service Department. In order to achieve the best results with your instrument, we recommend you to read this instruction manual carefully. If the instrument is used in a manner not specified by the producer, the protection provided by the instrument may be impaired. Maintenance: to keep the instrument clean, use a slightly damp cloth; do not use any abrasives or solvents. We recommend to disconnect the instrument before cleaning it.

This symbol indicates a particularly important subject or information.

This symbol indicates that more details are given on the current subject.

This symbol indicates a suggestion for the user.

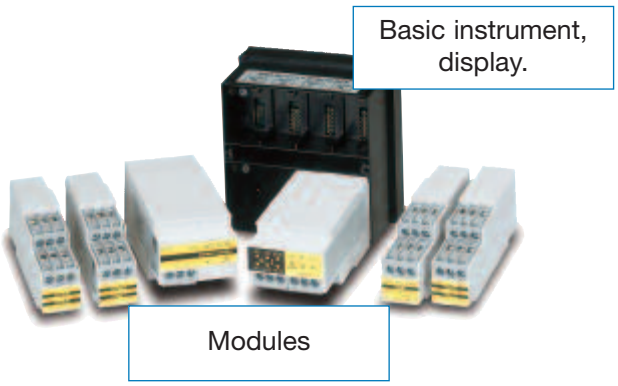
WM5 96 philosophy, ARM® technology

WM5 96 is a brand new instrument with a high level of performances and connection capability. Actually, WM5 96 is a synergy of digital components that, coordinated by an ARM® processor, allows the user to perform class 0.2 measurements for current and voltage, the management of 3 serial ports, 8 analogue outputs, 12 digital inputs, 16 alarms and a complete and functional management of the energy meters tariffs. The ARM® -based microprocessors are used in the up-to-date technology such as the palmtop computers: this makes of WM596 a real computer at the service of the electrical parameters analysis and of the electrical tariff management, even the more complex one.

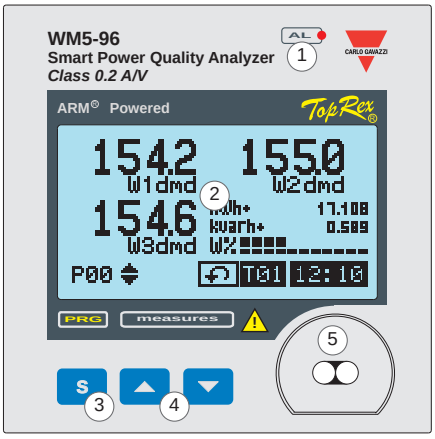
Optical port and communication

The front optical port allows a fast and practical communication between PC and instrument. Thanks to the WM5Soft software it'll be possible to read the measurements and programm the instrument even if the latter is already installed on the electrical board.

WM5 thanks to its great flexibility allows to set in the menu (pls see the relevant section) also the modules being installed in the base (display module). In order to make the programming of the modules easier, it is advisable to note the identification code (ex. AO2050) and the relevant installation slots (A, B, etc.): we suggest to fill in the special module on the last page of this manual.

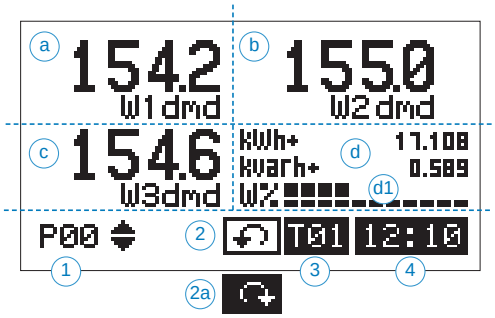


Front Panel Description



1. When switched on, the alarm LED will be active (blinking for a virtual alarm, fixed light for a real alarm).
2. Graphic display.
3. This key allows the user to access programming (only page 00) or the details of the measurement.
4. Keys allowing the user to scroll the measuring pages, display the details relating to the measurements: dmM=dmd maximum value, dmd=avg value, max=maximum value, min=minimum value. In the page relating to the meters it's possible to read the value of the energy counted per month (JAN...DEC), per tariff (T01...T12) and per phase (L1, L2, L3). The contemporaneous pressure of these keys also allows the adjustment of the display
5. Optical communication port (standard ANSI).

Main measuring page "00"



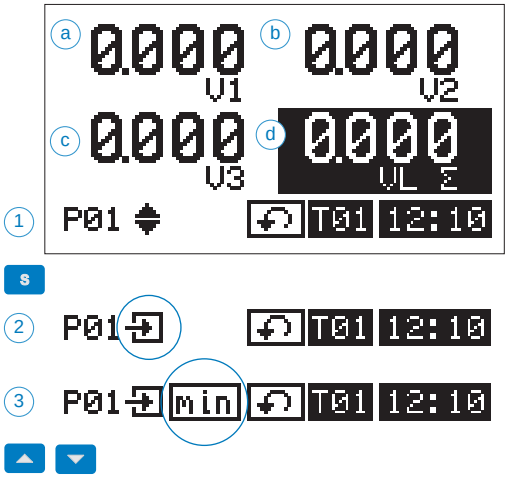
When the instrument is switched on, the operating system will be loaded; this implies a short waiting time (during this phase the display shows a sand glass which will stop moving only when the loading phase is completed). Then, the instrument will start measuring and will display the window on the left. This page, called "P00" page, is the only page which can be configured by the user who can choose, by means of the programming, which variables are to be displayed in the 3 sections (a, b, c) (see "display page" in the programming menu). The (d) section indicates the consumption of the measured energy (kWh and kvarh), a graphical indicator (d1) allows a quick reading of the % value relating to the active system power being used with reference to the installed power value previously set in the instrument. In the other measuring pages, the variable type displayed in the four sections (a, b, c, d) is pre-established and cannot be modified. The display of the lower part of the display is common to all measuring pages.

1. Shows the displayed measuring page, the displayed number will increase or decrease depending on the displayed page.
2. Shows the sequence of the phase rotation L1-L2-L3 or L3-L2-L1 (2a).
3. Shows the current tariff (T01, T02, T03, T04...T12) of the energy meters.
4. Shows the current time (only if this function has been enabled).

Adjustment of display contrast

To have a clear reading in every condition of visibility, properly adjust the display contrast. Press the "▲▼" keys contemporaneously: the contrast starts increasing; release the keys when the display contrast has been properly adjusted.

Measurements of instantaneous variables



The various measuring pages of WM5 96 display the necessary information for the quality analysis of the network. To scroll (1) the measuring pages, use the "▲▼" keys; to display the details of the measures, press the "S" key; to scroll the available details, use the "▲▼" keys (3); to exit the details displaying phase, press the "S" key.

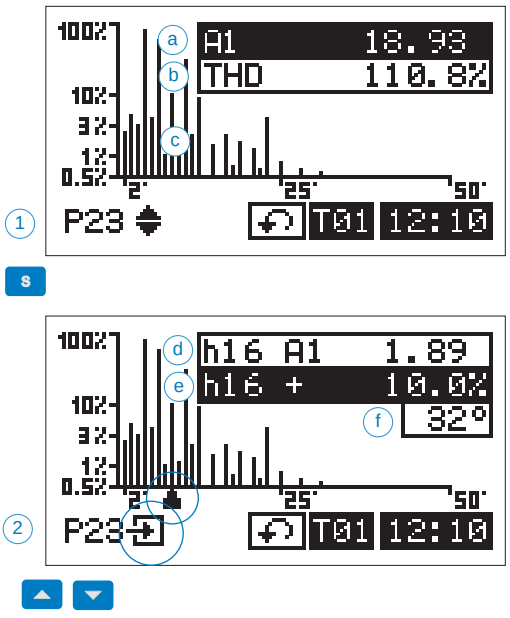
The details for the instantaneous variables are the following:

dmM= maximum dmd value,
dmd= dmd value,
max= maximum value,
min= minimum value.

For any information on the meaning of "dmd", see page 14.

Reset of details. Keeping the "S" key pressed for approx. 2 seconds, it's possible to reset each variable of the selected detail (dmM, dmd, max, min). The instrument displays a message confirming the user he has entered the reset mode: choose "YES" by means of the "▲▼" keys , confirm with the "S" key and then select the variable you want to reset by means of the "▲▼" keys, then press "S" to proceed with the reset; to exit the reset mode, keep the "S" key pressed for at least 2 seconds.

THD Measurements



Thanks to the powerful calculation capabilities of the ARM® technologies, WM5 96 allows an accurate analysis of the harmonics up to the 63rd.

a Voltage or current value referred to the relevant measured phase. (V1, V2, V3, A1, A2, A3).

b Total harmonic distorsion expressed as a percentage value.

c Histogram of the harmonics. To display the details of the harmonics, press the "S" key (2).

An arrow is displayed on the horizontal axis of the graph to identify the harmonics being examined. To scroll the harmonics one by one, use the "▲▼" keys (2).

d Harmonic order (from h1 to h 63), for single phase and the relevant absolute voltage or current value.

e Harmonic order (from h1 to h63), the detected conventional sign (-,o,+) and its relevant value expressed as a percentage.

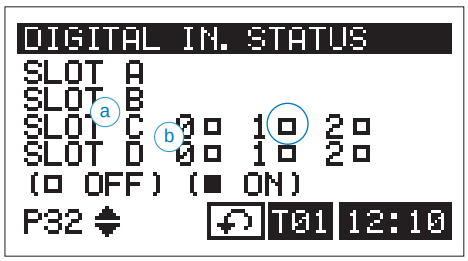
f Phase angle between the fundamental and the voltage and current harmonic of the same order: angle between 0° and 90° and between 270° and 360° corresponds to a generated harmonic, an angle between 90° and 180° and between 180° and 270° corresponds to an imported harmonic.

To exit the display of measurement details, press the "S" key.

Note: The display of histograms is available only up to the 50th harmonic (h50). For the other harmonics from h51 to h63 only the numeric values are available.

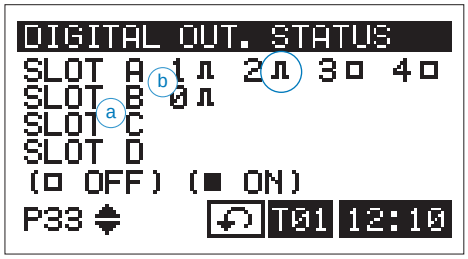
The phase angle (f) between the fundamental and the voltage and current harmonic of the same order will be displayed only if the measurements are taken in a three-phase system with neutral.

Digital input status



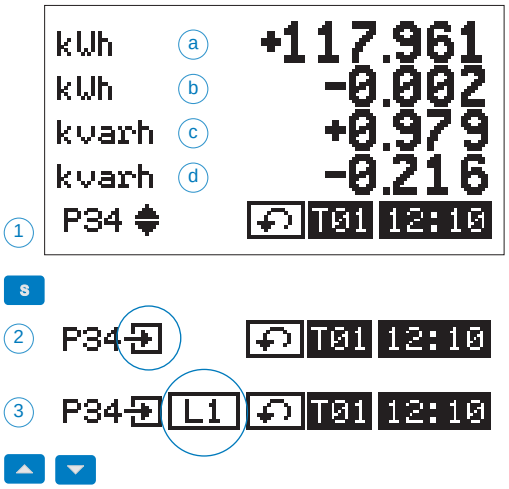
This page displays the status of the digital inputs (b) (0, 1, 2) corresponding to each slot (a). The "■" symbol will be shown on the right of a close contact, while the "□" symbol will be shown on the right of an open contact. The detail function is not available in this page.

Digital output status



This page displays the status of the digital outputs (b) (0, 1, 2, 3) corrsponding to each slot (a). If the contact or contacts are ON, the "■" symbol will be displayed. If the contact or contacts are OFF, the "□" symbol will be displayed. If the digital output is set as "pulse output", then the symbol "⎍" will be displayed. The detail function is not available in this page.

Energy meter page



This page displays the imported kWh (a), exported kWh (b), imported kvarh (c) and exported kvarh (d) energy meters. It's possible to enter the details of the meters by keeping the "S" key pressed (2), and scroll the details by keeping the "▲▼" keys pressed (3).

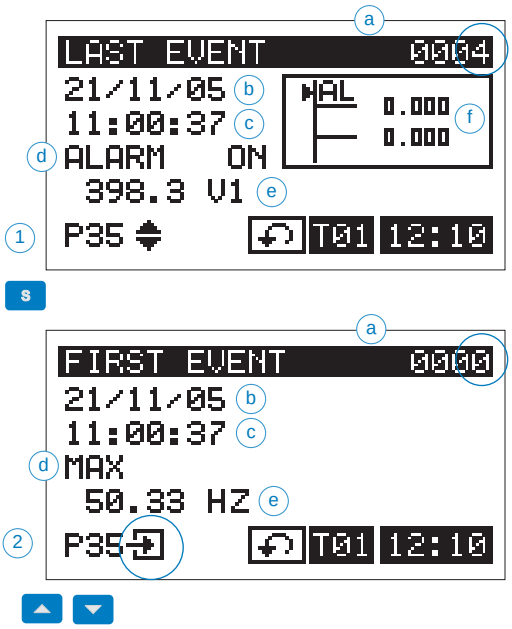
The countings of the energies can be scrolled divided by:

month (JAN...DEC),
tariff (T01...T12),
phase (L1, L2, L3).

To exit the display of the measurement details press the "s" key.

To enter the details of the meters starting from the division by phase, press the "▲" key first, to start from the division by month, press the "▼" key first.

Event logging page



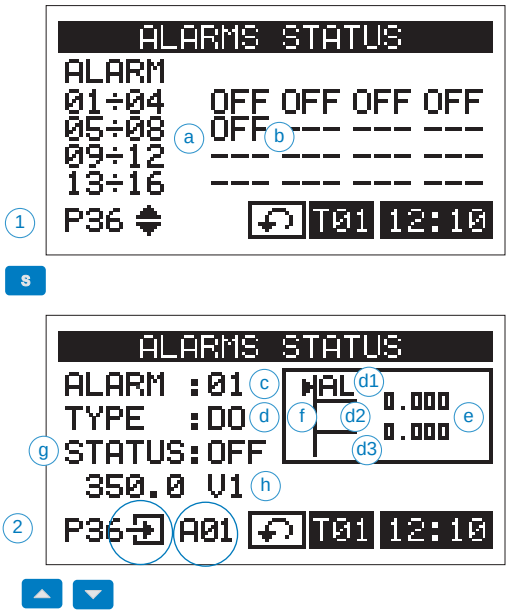
Thanks to the great logging capability of WM5 96, it's possible to log a great number of events and manage their displaying, one by one. The page always displays the last logged event which is given a progressive number (a). The page is complete with all the important information relevant to the logged event: date (b), time (c), type of event (alarm, min, max, etc.) (d), variable relevant to the event (e). Should the alarm refer to an alarm, a window (f) summing up all the set-point information (see also following paragraph "alarm status page").

To display all the logged events one by one, press the "S" (2) key, and scroll the events with the "▲▼".keys.

To exit the detailed display of the events, press the "S" key.

To display the first logged event, press, first press the "▲" key.

Alarm status page



Thanks to this page, it's possible to have the complete control of the set alarms: ON if enabled, OFF if disabled. For the alarms which are not enabled, the display shows two horizontal hiphens. The column under the "ALARM" indication identifies the alarm group, for example 01 to 04 represents the group of the first 4 alarms (from 1 to 4) and their status indicated on the right.

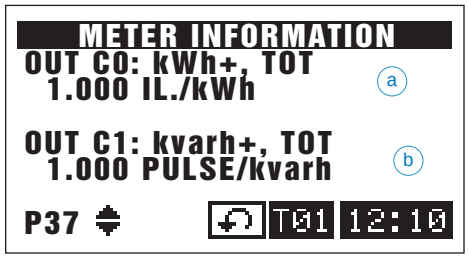
Press the "S" key to display the details (2) of each set alarm (c) (from 1 to 16):
the values of the programmed set points (e),
the alarm type (d): UP alarm if the "AL" symbol is in the (d1) position as shwon in the figure on the right, WINDOW alarm if the "AL" symbol is in the (d2) position or DOWN alarm if the "AL" symbol is in the (d3) position. Moreover, the display shows the alarm status (g) which can be ON or OFF and the value of the alarm variable (h).

To go from one alarm to the other, use the "▲▼" keys. To exit the display of the alarm status press the "S" key.

Further information on the alarms and the set-point adjustment is given in the "alarms programming" section of this manual.

To display the details of the 01 alarm, press the "▲" key first.

Info pages



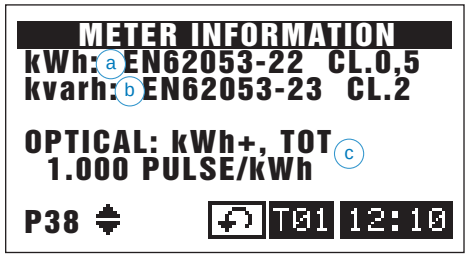
1

The last pages in the “display” mode show the main information relating to the programming of the instrument. These data are also available when the instrument is completely sealed. The first of the three pages (1) also displays the data relating to the C0 (a) and C1 (b) digital outputs.

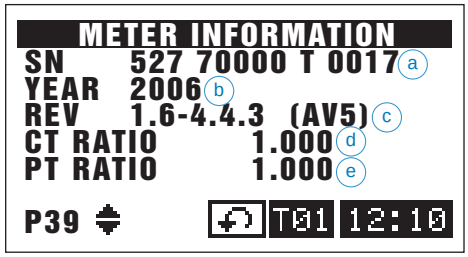
Warning: the instrument displays only the data relating to the C0 and C1 outputs. In the second page (2) only the standards to which the instrument refers (a, b) are displayed. In the same page also the output specifications of the (infrared light) optical port are displayed if this is used to retransmit the energy (c).

In the 3rd page (3) the following data are displayed:

- serial number of the instrument (a),
- production year (b),
- firmware revision (c),
- primary/secondary ratio of the used CT (current transformer) (d),
- primary/secondary ratio of the used VT (voltage transformer) (e).



2



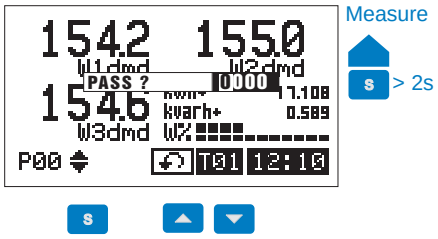
3

Programming keypad

The “S” (1) key is used to enter programming, confirm the selected or modified data and go back to the previous data if pressed for at least 2 seconds. The “▲▼” keys at N. 6 are used to scroll the menus and modify the selected values/data. To modify the values proceed as follows: the “▲” (2) key increases in a cyclical way the selected digit from 0 to 9, to move to the next digit, use the “▼” (3) key, also in this case the system is cyclical.

Example, enter the value 213: starting situation 000, press “▲” twice to increase the number up to 2, then press “▼” to go on to the next digit (on the right); the instrument displays 200, press “▲” once to increase the number to 1, then press “▼” to go on to the next digit (on the right); the instrument displays 210, press “▲” three times to increase the digit to 3, press “S” to confirm the value. If you do not want to confirm the value, but only to modifiy it, press the “▼” key.

Resets



By means of a single command and only from the “P00” page, you can carry out the reset of all the min. and max. values, the dmd and dmd max values, the reset of all the logged events and of the alarms with latch. To carry out this reset command you have to enter some numeric codes: press the “S” key, the instrument displays the “PASS?” indication. Enter by means of the “▲▼” keys the following numeric codes depending on the reset you want to carry out.

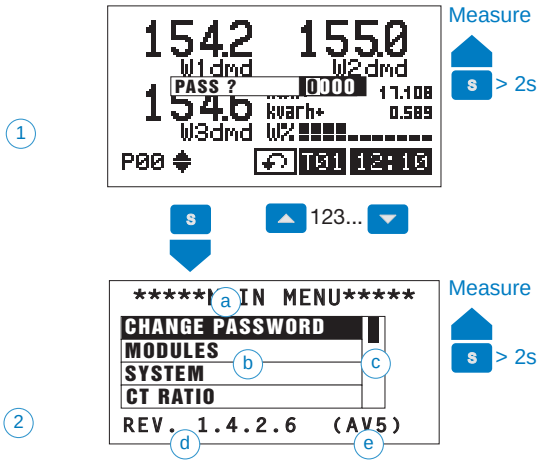
5784= reset of all the minimum and maximum values;

5785= reset of all the “dmd” and “dmM” (dmd max) values;

7239= reset of all the “events”;

9288= reset of the alarms with latch.

Access to programming

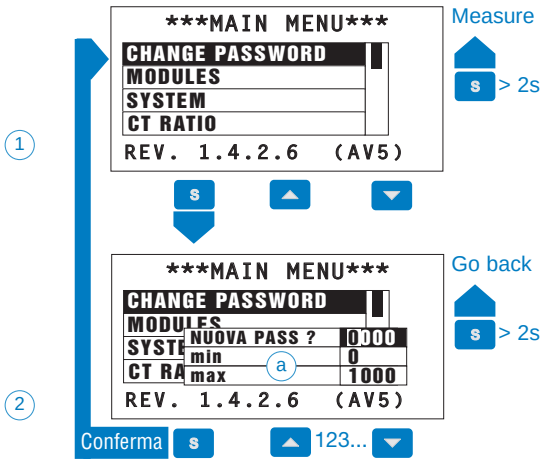


To access the programming menus from the measuring and display phase, press the “S” key (only from the “P00” page), when the password “PASS?” is requested, enter the correct PASSWORD value by means of the “▲▼” keys, then confirm by pressing the “S” key again. If the PASSWORD is correct (for all instruments the PASS value when they leave the factory is “0”), the instrument will enter the main menu.

To cancel the choice and go back to the measuring mode, press the “S” key for at least 2 seconds.

- a Menu title.
- b Menu.
- c Scroll bar.
- d Firmware revision of the instrument.
- e Type of measuring analogue output being mounted on the instrument.

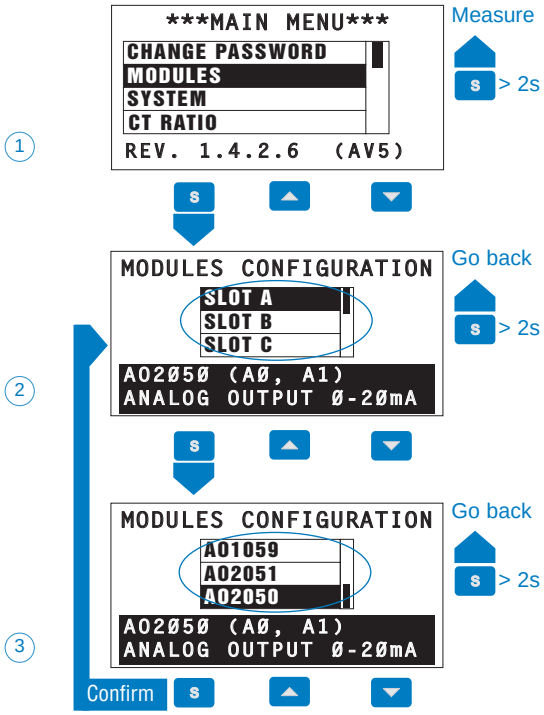
Change password



This function allows the user to modify the PASS value with a new value (from 0 to 1000). Press the “S” key and when the instruments requires a new PASS (2) enter the desired value by means of the “▲▼” keys and confirm the new value with the “S” key. The instrument goes back to the main menu.

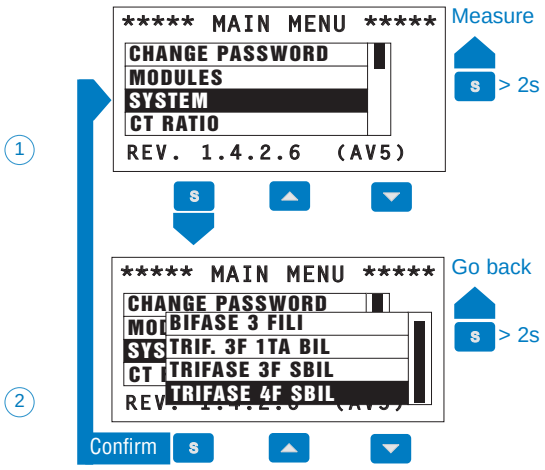
a The instrument shows the maximum and minimum limit of the value available for the password.

Modules



The WM5 96 does not support the automatic acknowledgment of the installed modules, therefore this information must be entered using the “MODULES” menu. Choose by means of the “▲▼” keys the modules menu, press “S” to confirm and then select by the “▲▼” keys the relevant slot A, B, C, D or E (where slot A is the first on the top right, watching it from the front of the instrument, and slot E refers to the central housing). Confirm the highlighted slot with the “S” key and then select the code of the module (the code is written on the module itself): the instrument will also display a brief description of the selected code. The code of the module is placed on the side label of the module itself. To confirm the code of the selected module, press the “S” key.

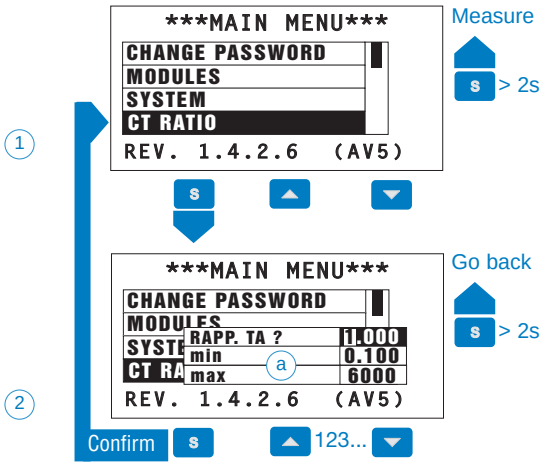
System



This function allows the user to select the type of electrical system choosing among:
1- single phase 2 wires (1-PHASE 2-WIRE),
2- dual phase 3 wires (2-PHASE 3-WIRE),
3- three phase 3 wires and 1 CT balanced load (3-PH 3W+1CT BAL.),
4- three phase 3 wires unbalanced load (3-PH 3W UNBAL.),
5- three phase 4 wires unbalanced load (3-PH 4W UNBAL.).

Choose by means of the "▲▼" key the SYSTEM function (1), press the "S" key to confirm, then select by means of the "▲▼" keys the desired system (2) and confirm the selection with the "S" key.

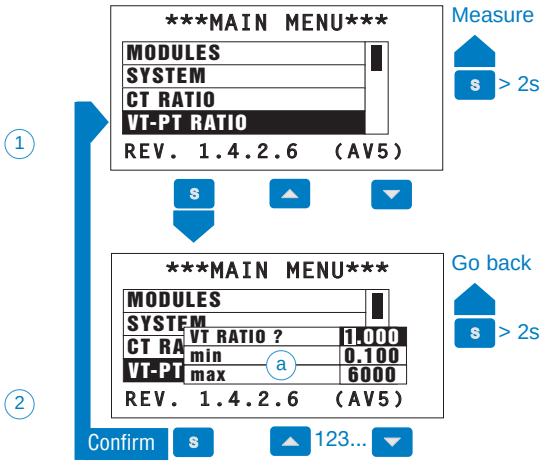
CT ratio



This function allows the user to select the value of the CT ratio (primary/secondary ratio of the current transformer being used). Example: if the CT primary (current transformer) has a current of 300A and the secondary a current of 5A, the CT ratio corresponds to 60 (obtained using the following calculation: 300/5). Choose the CT RATIO function (1) by means of the "▲▼" keys and confirm the selection with the "S" key. Then select the desired value by means of the "▲▼" keys (2) and confirm the value with "S".

a The instrument displays the maximum and the minimum value available for the CT ratio.

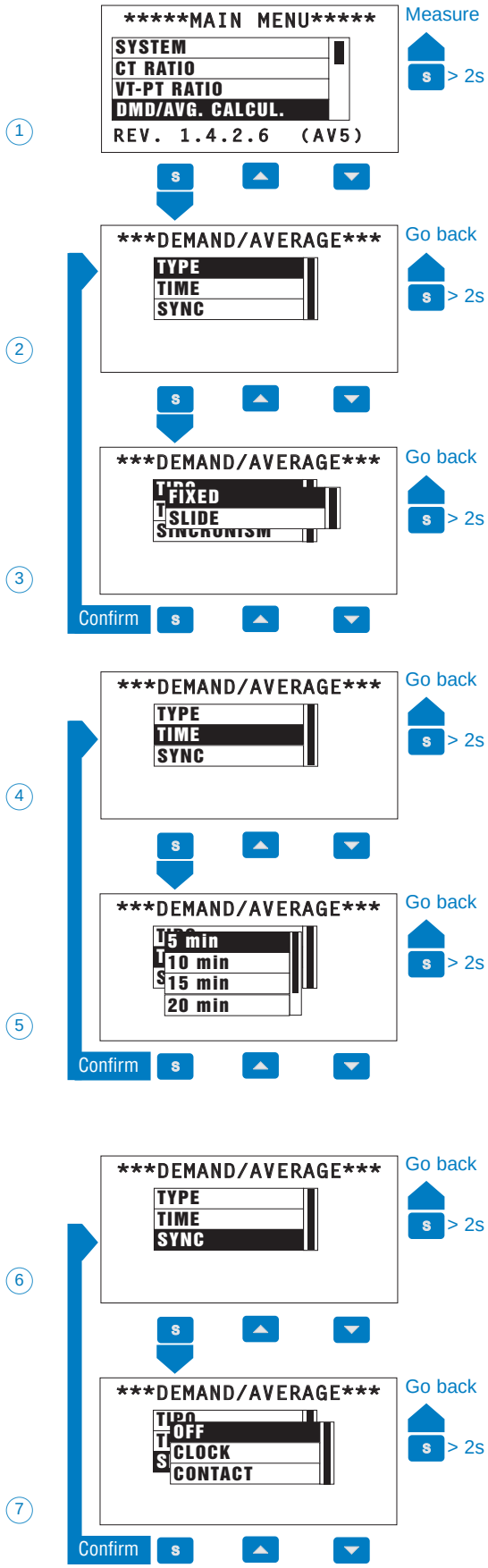
VT ratio



This function allows you to select the value of the VT-PT ratio (primary/secondary ratio of the voltage transformer being used).
Example: if the primary of the connected VT (voltage transformer) is 20kV and the secondary is 100V, then the VT-PT ratio corresponds to 200 (obtained carrying out the following calculation: 20000/100). Choose the VT-PT RATIO function (1) by means of the "▲▼" key and confirm the selection with "S". Then select by means of the "▲▼" key the desired value (2) and confirm the value with the "S" key.

a The instrument displays the maximum and minimum value available for the VT-PT ratio.

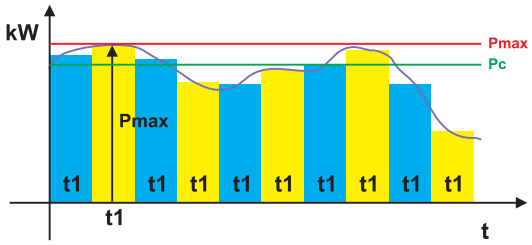
DMD/AVG calculation



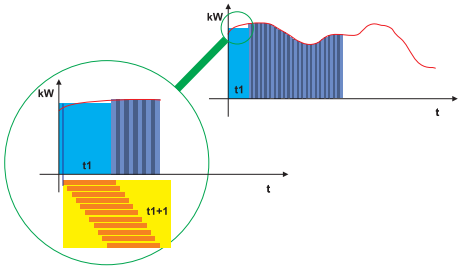
This function allows the user to select the calculation method of the DMD/AVG value of the selected variable. To access these functions select DMD/AVG CALCUL. from the main menu by means of the "▲▼" keys and confirm the selection with "S" (1).

TYPE (2): select the type of calculation mode to be used for the DMD/AVG calculation: FIXED or SLIDE (3). Select the desired type (3) by means of the "▲▼" keys and confirm with "S".

TIME (4): select the time interval for the DMD/AVG calculation (5, 10, 15, 20, 30, 60 minutes). Select the desired time (5) by means of the "▲▼" keys and confirm with "S".



FIXED SELECTION: if, for example, a time interval of 15 minutes has been selected, the instrument will calculate the AVD/DMD value of the measured variable and updates its value every 15 minutes.



SLIDING SELECTION: if for example a time interval of 15 minutes has been selected, the instrument calculates the AVG/DMD value and updates its value at the beginning after the first 15 values and then after every minute, thus generating a window whose width is of 15 minutes and that moves forward every minute.

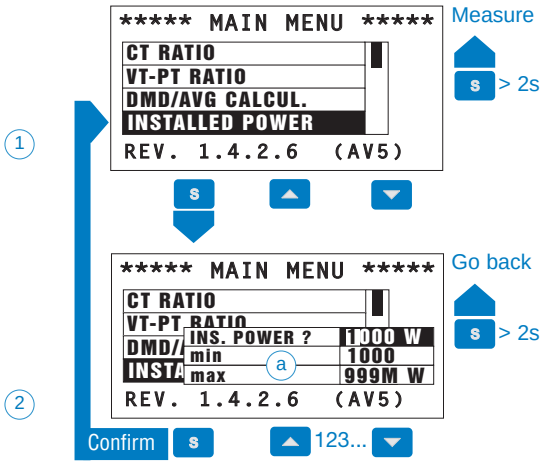
SYNCHRONISM (6): select the synchronization mode, that is the method that controls the calculation method of the average/demand according to the selected time. Select the type of desired synchronism (7) by means of the "▲▼" keys and confirm with "S".

OFF (7): the synchronization calculation starts when you switch the instrument on.

CLOCK (7): the synchronization starts as soon as the first selected integration time multiple expires. Example: by setting the integration time at 10 minutes and the current time at 10:25, the synchronization will start at 10:30.

CONTACT (7): the synchronization starts at the status modification (from ON to OFF or from OFF to ON) of one of the digital inputs programmed such as SYNCHRONIZATION or TARIFF (see "DIGITAL INPUTS"). A consequent status change produces the reset and then again the starting up of the synchronization.

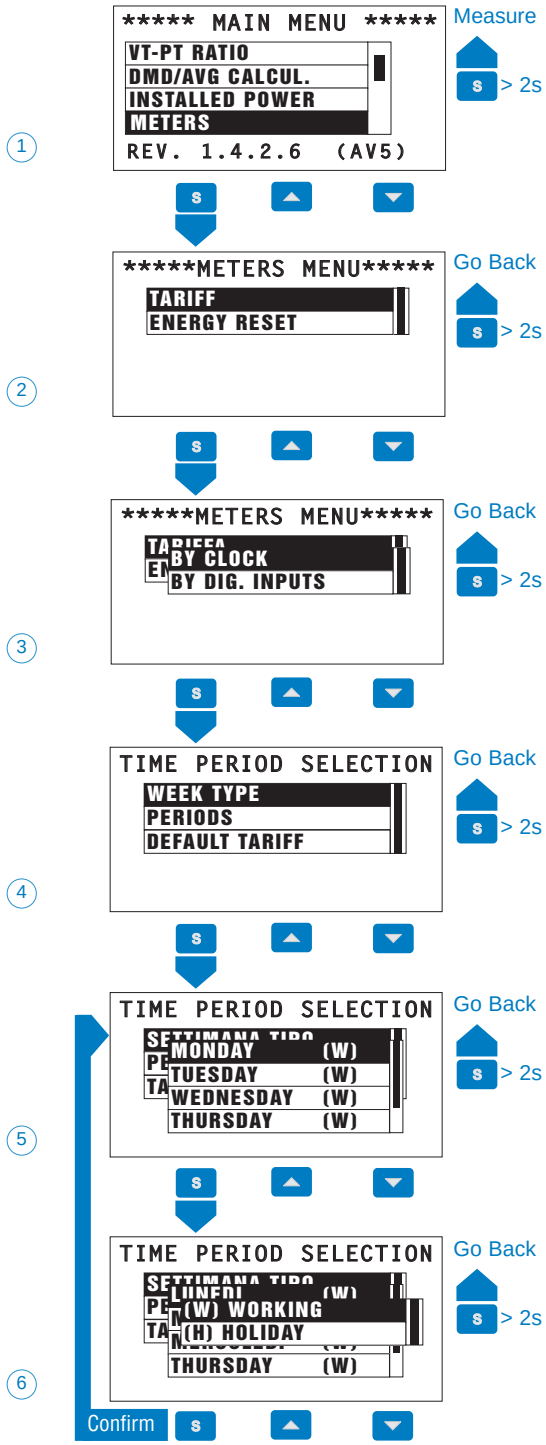
Installed power



This menu allows you to set a power value (installed power) that, in the measuring phase, will represent 100% of the graph indicator “W%” present in the “P00” page (in the fourth quadrant).
Select INS. POWER ? (1) by means of the “▲▼” keys and confirm with the “S” key. Then enter the full scale value by means of the “▲▼” keys and confirm with “S”.

a The instrument shows the maximum and minimum limit of the value available for the full scale of the W% graph.

Meters Menu



This menu allows the user to select/set all the parameters of the energy meters. From the main menu, select METERS by means of the "▲▼" keys and confirm with the "S" key to enter the METERS menu. Then choose by means of the "▲▼" keys if entering the programming of the TARIFF (2) or entering the "ENERGY RESET" menu to reset the meters (16); confirm the selection with S".

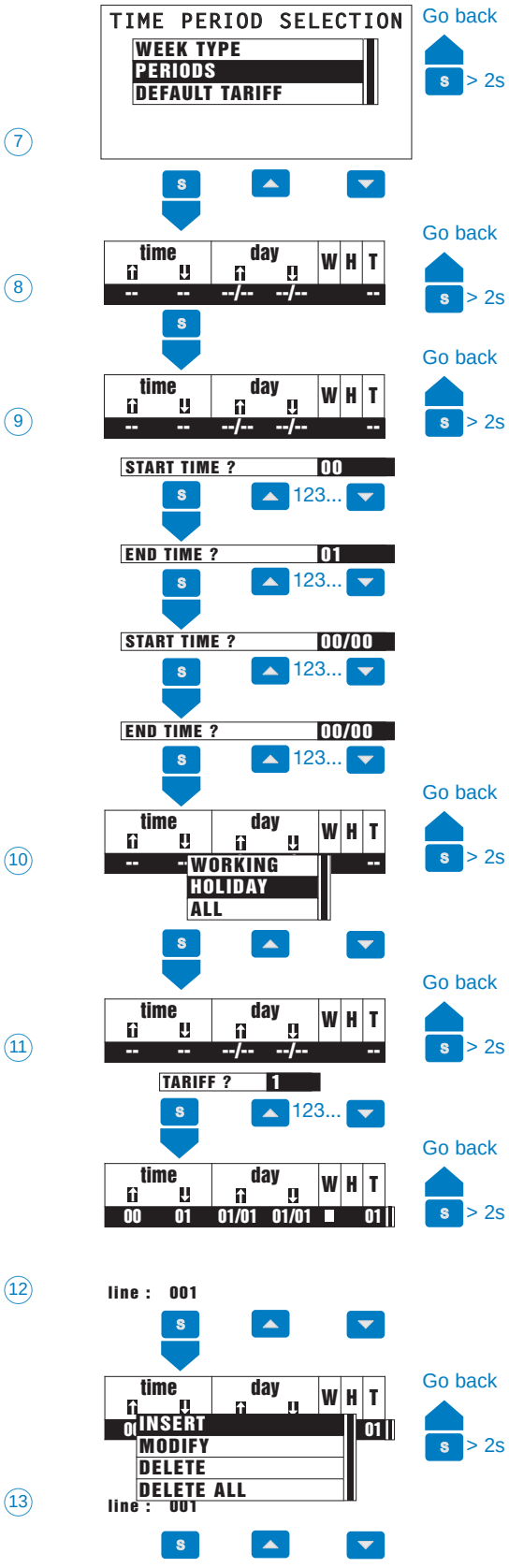
TARIFF (3): the instrument identifies two operating modes.

BY DIG. INPUTS (by digital inputs) (3): the instrument manages the tariff changes by means of the status changes of the digital inputs programmed as TARIFF (see the section dedicated to the digital inputs). Select BY DIG. INPUTS by means of the "▲▼" keys and confirm with the "S" key.

BY CLOCK (3): the instrument manages the tariffs by means of the clock integrated in the RS232 serial module. Select BY CLOCK by means of the "▲▼" keys and confirm with the "S" key, then set the following additional parameters:

WEEK TYPE (4): set the WEEK TYPE where for each day you can select if it's to be considered a working day or a holiday. The setting of the week type is very useful to simplify the following programming of the periods.
Select WEEK TYPE with the "▲▼" keys and confirm with the "S" key: you enter the window with the list of days (5), select the desired day with the "▲▼" keys and confirm with the "S" key, then choose by means of the "▲▼" keys if the day is to be considered as a (W) WORKING day or as a (H) HOLIDAY (6), and confirm with the "S" key. Proceed as above described with the remaining days. To conclude the operation and go back to step number (4), press the "S" for at least 2 seconds.

Warning: for the management of the tariffs with the "BY CLOCK" option, when counting the energy with WM5, the AR1039 (RS232 + RTC) option is to be installed. The tariff management "BY CLOCK" is however possible also without this module, but in this case the "CLOCK" function, instead of the "METERS" function is to be selected, and then the subfunction "WITHOUT BACKUP": in this case, remember that if, for any reason, the instrument is switched off, the current DATE and TIME will not be stored. These data will have to be set again every time the instrument is switched on.



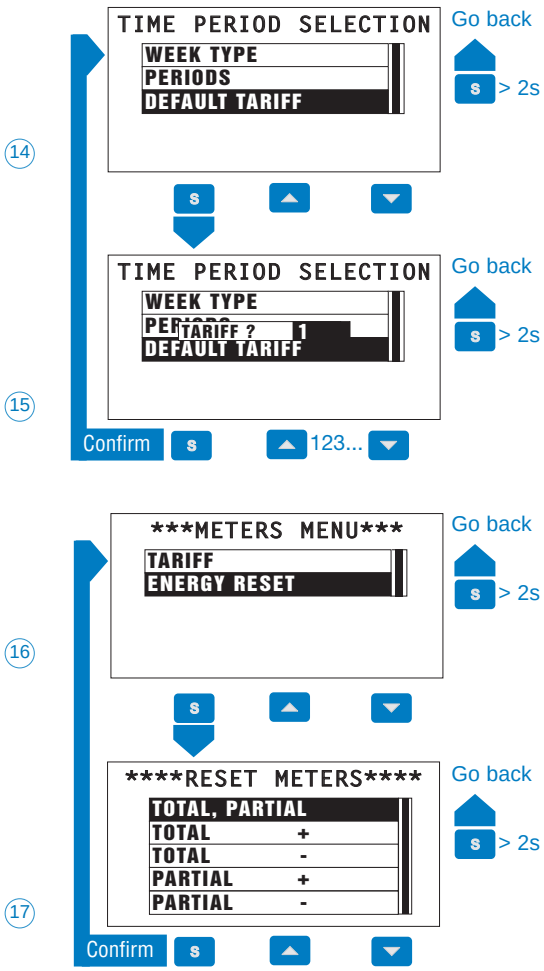
PERIODS (7): set the periods to which the tariffs are to be coupled. It's possible to divide each day into up to 24 periods. Up to 100 lines of period selection can be entered. Select PERIODS by means of the "▲▼" keys and confirm with the "S" key: a table (8) will be displayed which will be empty at the beginning and where the various programmed periods are to be entered. To set the START TIME of the period (9), press the "S" key; then, by means of the "▲▼" keys, select the time from 00 (00 AM) to 23 (11 PM); press "S" to confirm the selected time and go to the setting of the "END TIME": select the desired time by means of the "▲▼" keys, then press "S". Afterwards, set the START DATE of the period by means of the "▲▼" keys and confirm with the "S" key, then set the END DATE of the period by means of the "S" keys and confirm with "S". Once the time data have been set, the instrument will display a window (10) from which the period type can be selected, that is either WORKING, HOLIDAY or ALL (the ALL selection will not make any difference between WORKING day and HOLIDAY, that is the default TARIFF will be applied): select the desired mode by means of the "▲▼" keys and confirm with "S". As last setting, choose the TARIFF (11) to be coupled to the period, use the "▲▼" keys to select the desired tariff from 1 to 12 and confirm with the "S" key (up to 12 tariff if the management is carried out by means of internal clock, up to 4 tariffs if the management is carried out by means of the digital inputs).
A new line (12) relevant to the period which has just been programmed will be added to the table: it'll be possible to add up to 99 further lines. The following options (13) are also possible:

INSERT: enter a new line (new period); follow the instructions given from step (9) to step (11).

MODIFY: modify an existing period. Select the period to be modified by means of the "▲▼" keys, press the "S" key to display the relevant window (13), then choose MODIFY by means of the "▲▼" keys and confirm the choice with the "S" key. Afterwards follow the setting procedure as described from step (9) to step (11).

DELETE: delete an existing period. Select the period to delete with the "▲▼" keys, press the "S" key to display the relevant window (13) then choose DELETE by means of the "▲▼" keys and confirm with the "S" key. Before deleting the period, the instrument displays the following message: PAY ATTENTION, CURRENT LINE WILL BE DELETED!!!! WILL YOU CONTINUE? Choose YES to execute the command or NO to cancel the deleting.

DELETE ALL: delete all the existing periods. Press the "S" key to display the relevant window (13), then choose DELETE ALL by means of the "▲▼" and confirm with the "S" key. Before deleting all the periods, the instrument displays the following message: PAY ATTENTION, ALL LINES WILL BE DELETED!!! WILL YOU CONTINUE? Choose YES to execute the command or NO to cancel the deleting.



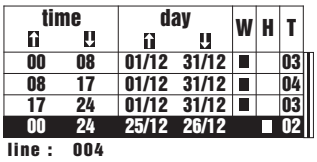
DEFAULT TARIFF (14): it is the tariff (from 1 to 12) which will be coupled to the meters if no other programming is made or for the days (periods) set as non-working. Select DEFAULT TARIFF with the "▲▼" keys and confirm with the "S" key. Then set by means of the "▲▼" keys the tariff (15) that will be set as DEFAULT TARIFF, and confirm with "S".

ENERGY RESET (16): reset the ENERGY METERS choosing among:
TOTAL, PARTIAL: resets all energy meters, both total and partial.
TOTAL +: resets the total meters of imported energy.
TOTAL -: resets the total meters of exported energy.
PARTIAL +: resets the partial meters of imported energy.
PARTIAL -: resets the partial meters of exported energy. To reset the meters, select ENERGY RESET from the METERS MENU (16) by means of the "▲▼" keys and confirm with "S"; then select the type of RESET to be carried out by means of the "▲▼" keys and confirm with "S". Before carrying out the selected reset, the instrument displays the following message: PAY ATTENTION, THE SELECTED METERS WILL BE RESET! WILL YOU CONTINUE?: choose YES to proceed with the reset or NO to cancel it.

Programming example of the tariff parameters

In the "time periods" table you have at least 100 selection rows available.

Let's for example take into consideration the following tariff plan decided by the energy supplier for December.
The working week is from Monday to Friday, while the weekend is made by Saturday and Sunday. During the working days there are two different tariffs with the following time periods: TARIFF 4 (T4) from 8 am to 5 pm, and TARIFF 3 from 5 pm to 8 am., while during the week end there is only one time period and therefore a single TARIFF (T2). The first thing to do is to program the week type (4 - 6), the working days will be indicated as follows: Monday (W), Tuesday (W), Wednesday (W), Thursday (W), Friday (W). While the weekend (Holidays) will be indicated as: Saturday (H), Sunday (H). As a consequence, the time periods relating to the working weeks will be divided into the following lines (8 - 13):
First line: START TIME = 00, END TIME = 8, START DATE = 01/12, END DATE = 31/12, then select "WORKING" and TARIFF "3".
Second line: START TIME = 8, END TIME = 17, START DATE = 01/12, END DATE = 31/12, then select "WORKING" and TARIFF "4".
Third line: START TIME = 17, END TIME = 24, START DATE = 01/12, END DATE = 31/12, then select "WORKING" and TARIFF"3". Moreover, a 4th line will be necessary to identify the NON-WORKING days other than the week end (Saturday and Sunday): for example December 25th and 26th.
Fourth line: START TIME = 00, END TIME = 24, START DATE = 25/12, END DATE = 26/12, then select "HOLIDAY" and TARIFF "2".

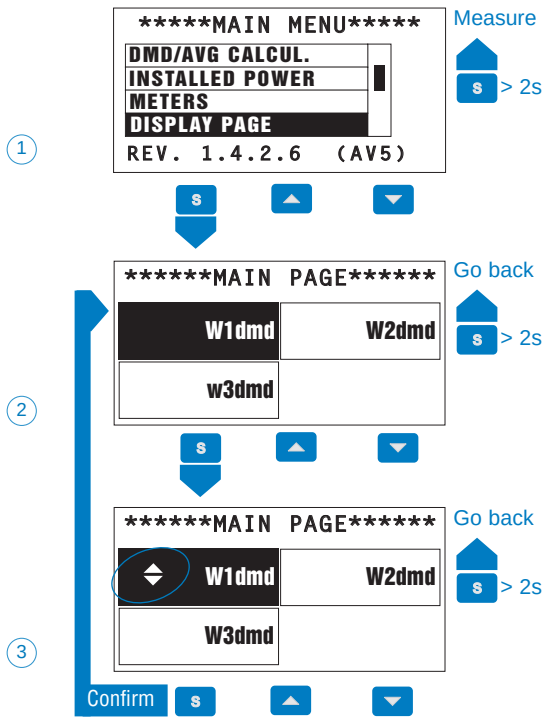


The periods are now programmed and the instrument will display the window on the left.

The periods programmed as above only refer to the month of December, therefore it's necessary to set a tariff referring to the remaining time period, which will be referred to as "T1". In this case you can refer to the default tariff (14) set as TARIFF "1", so that the instrument will automatically refer to TARIFF "T1" when no other programming is present.

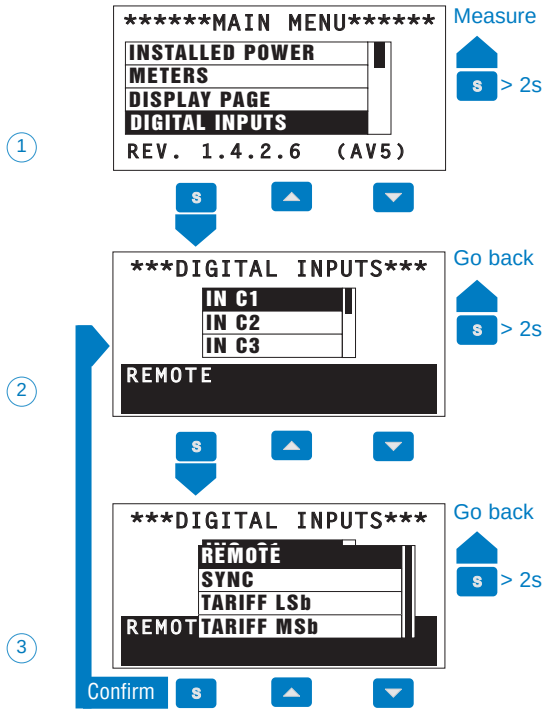
ENERGY SUPPLIER					SETTING WM5					
Month	Week	Time	Type	Selected Tariff	Start time	End time	Start date	End date	Type	Tariff
DECEMBER	from MONDAY to FRIDAY	from 8 to 17	Working	4	00	08	01/12	31/12	W	3
		from 17 to 8		3	8	17	01/12	31/12	W	4
					17	24	01/12	31/12	W	3
	from SATURDAY toSUNDAY	H24	Holiday	2	00	24	25/12	26/12	H	2
Rest of the year	All	H24	--	1	Default tariff 1					

Display Page



This function allows the user to select the variables to be displayed on page 00. Choose the DISPLAY PAGE function (1) by means of the "▲▼" keys and confirm with "S", then by means of the "▲▼" keys select the display line where the selected variable (2) is to be displayed and press "S". Afterwards select the variable to be displayed by means of the "▲▼" keys among those displayed by the instrument (3) and confirm with "S".

Digital Inputs



This function allows the operating modes selection of the digital inputs. Choose the function DIGITAL INPUTS (1) by means of the "▲▼" keys and confirm with the "S" key. (2) Select the digital input (ex.: A1=digital input 1 of slot A) by means of the "▲▼" keys, the instrument displays the function of the selected input (the inputs are set on REMOTE as default), press "S" to confirm the selected digital input. (3) From the list, select the operating mode to be coupled to the selected digital input by means of the "▲▼" keys, the functions are:

REMOTE (3): the status of the digital inputs is displayed from the instrument.

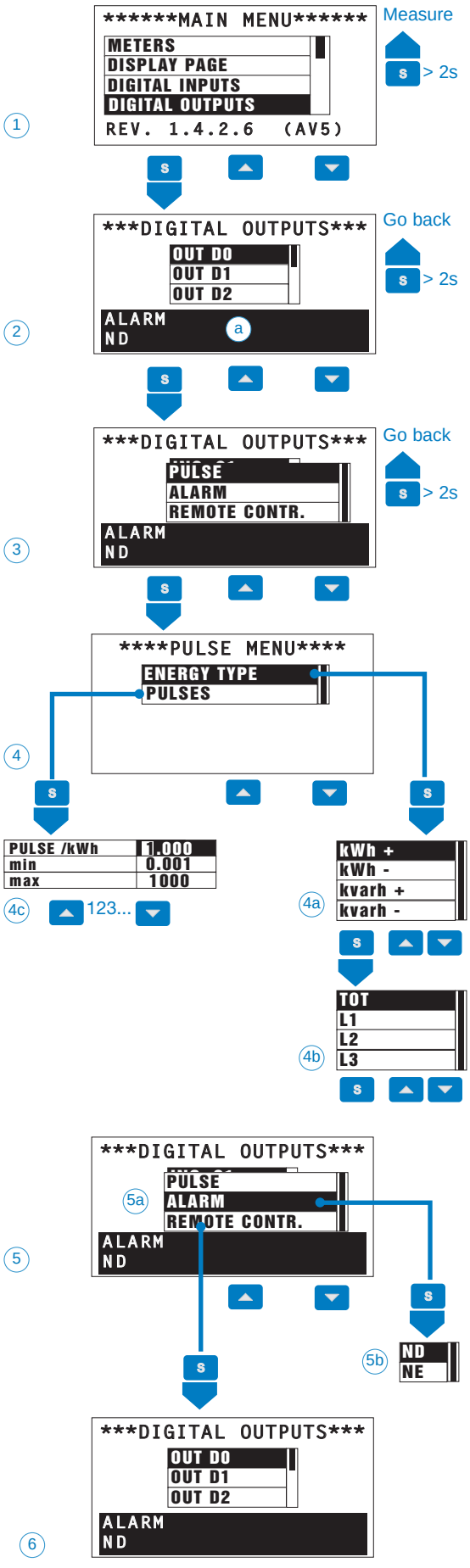
SYNCHRONISM (3): synchronises the calculation of the "dmd" power by means of an external signal.

TARIFF LSb and MSb (3): This function allows the digital inputs to control the tariffs in the energy metering. The combination of the input status manages the tariff change as specified in the table (18-1). If only the "MSb" (one digital input only) is selected, then the energy metering is possible with a maximum of 2 tariffs: the tariff change will only be possible between tariff 1 and tariff 3. If only the "LSb" is selected, then the tariff change occurs only between tariff 1 and tariff 2. The use of both digital inputs (MSb + LSb) allows the management of tariffs 1, 2, 3 and 4. Press "S" to confirm the selection. Proceed, if necessary, with the configuration of the other digital inputs.

MSb	LSb	Tariff
off	off	1
off	on	2
on	off	3
on	on	4

(18-1)

Digital outputs



This function allows the selected function to be coupled to the selected digital output: pulse, alarm, remote control. Select the DIGITAL OUTPUT function (1) by means of the "▲▼" keys and confirm with "S". (2) Select the digital output (ex.: D0=digital output 0 of slot D) by means of the "▲▼" keys, the instrument displays the function of the selected output (a), press "S" to confirm the selected digital output (3) select the operating mode to be coupled to the selected digital output by means of the "▲▼" keys. The functions are the following:

PULSE (3): the measured energy is retransmitted by the digital output by means of pulses. Choose the PULSE function by means of the "▲▼" keys and confirm with "S". Then select the type of energy to be retransmitted: select ENERGY TYPE by means of the "▲▼" keys and confirm with "S", the instrument displays the list of energies (4a), (kWh +, kWh-, kvarh +, kvarh-): select the desired energy by means of the "▲▼" keys and confirm with the "S" key: for each energy it's possible to retransmit the total energy metering (TOT) or the tariffs from T1 to T12 (4b), choose the desired energy detail by means of the "▲▼" keys and confirm with the "S" key. At the end of the procedure, the value of the pulse associated to the energy measured by the instrument is to be decided, that is the number of pulses generated by the digital output for each measured kWh+ (or kWh- or kvarh+ or kvarh-). Choose PULSES (4) by means of the "▲▼" keys and confirm with the "S" key, then (4c) set the desired value of the pulses by means of the "▲▼" keys, confirm the value with the "S" key.

ALARM (5): the digital output is enabled only if the expected alarm status occurs. Select the ALARM function by means of the "▲▼" keys and confirm with the "S" keys (5a).Then select "ND" (normally de-energized relay) or "NE" (normally energized relay) (5b) by means of the "▲▼" keys. To program the values of the set-points refer to the "alarm" menu.

REMOTE CONTR. (5): the digital output can be enabled by means of a command sent by means of serial port. Select the REMOTE CONTR. function by means of the "▲▼" keys, then press the "S" key to confirm.

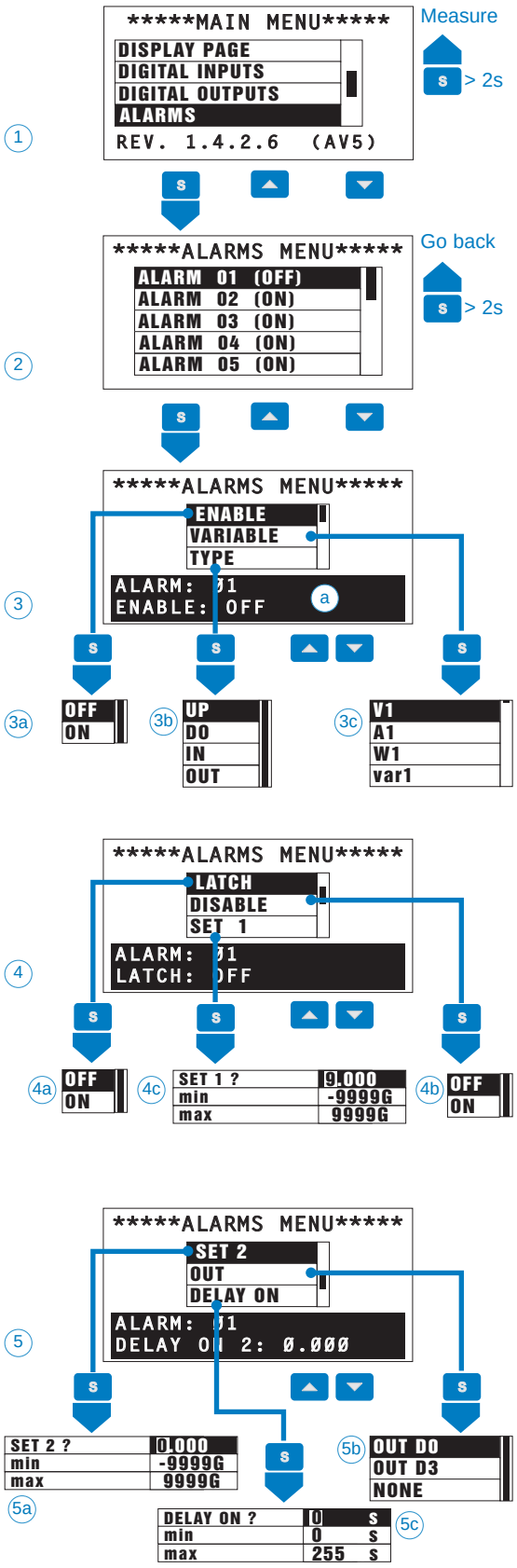
Proceed, if necessary, with the configuration of the other digital outputs (6).

The digital outputs highlighted in the below mentioned table, are subject to a self test that implies their brief activation when the instrument is switched on. Their use as pulse outputs is therefore not recommended.

(19-1)

Code	Description	Slot A				Slot B				Slot C				Slot D			
A01058	1 relay output	A0				B0				C0				D0			
A01059	1 open coll. output	A0				B0				C0				D0			
A01035	2 relay outputs	A0	A1			B0	B1			C0	C1			D0	D1		
A01036	2 open coll. outputs	A0	A1			B0	B1			C0	C1			D0	D1		
A01037	4 open coll. outputs	A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4	D1	D2	D3	D4

Alarm



This function allows you to set the alarm parameters. The instrument is able to manage up to 16 alarms (real or virtual). Select the ALARMS function (1) by means of the "▲▼" keys and confirm with "S". Then select the alarm to be programmed (2) by means of the "▲▼" keys and confirm with the "S" key, then set the following parameters:

ENABLE (3): enable (ON) or disable (OFF) the alarm; the instrument display the existing programming (a). Select the ENABLE function (3) by means of the "▲▼" keys and confirm with the "S" key. Then select ON (3a) to enable or OFF (3a) to disable the alarm by means of the "▲▼" keys, then confirm with the "S" key.

VARIABLE (3): set the variable to be coupled to the alarm. Select the VARIABLE submenu (3) by means of the "▲▼" keys and confirm with the "S" key. Then select the variable to be coupled to an alarm (the list of variables depends on the selected system) (3c) by means of the "▲▼" keys, then select with the "S" key.

TYPE (3): set the operating mode of the alarm. UP: up alarm, the alarm will be enabled if the measured value exceeds the set-point. DO: down alarm, the alarm will be enabled if the measured value goes below the set point. IN internal window alarm, the alarm will be activated if the value is within the two set points. OUT: the alarm will be activated if the value is outside the two set points. See details on next page "Logic and alarm parameters". Choose the TYPE (3) function by means of the "▲▼" and confirm with "S". Then, select by means of the "▲▼" keys the desired alarm mode (3b) and confirm with "S".

LATCH (4): set the latch function. The alarm will remain ON even if the cause that has generated it is not present any more. The alarm can be reset only manually after the user has noticed it. Choose the LATCH function by means of the "▲▼" keys and confirm with "S". Then select ON (4a) by means of the "▲▼" keys to enable the latch or OFF (4a) to disable it, then confirm with "S".

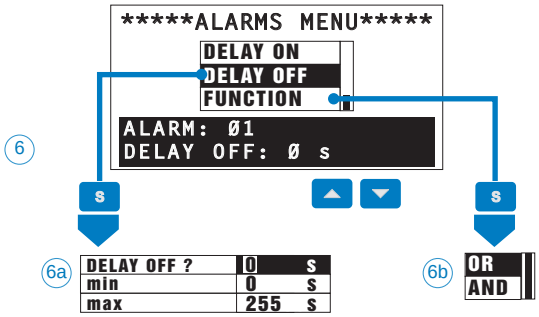
DISABLE: set the DISABLE function. When the instrument is switched on, the first alarm condition will be ignored (useful also in case of DO alarm). Choose the DISABLE function by means of the "▲▼" keys and confirm with "S". Then select ON (4b) to enable it or OFF (4b) to disable it by means of the "▲▼" keys and confirm with "S".

SET 1 (Set point 1) (4): set the first alarm set point of the variable. Choose SET 1 (4c) by means of the "▲▼" keys and confirm with "S". Then set the value by means of the "▲▼" keys and confirm with "S".

SET 2 (5): set the second alarm set point of the variable. Choose SET 2 (5a) by means of the "▲▼" keys and confirm with "S". Then set the value by means of the "▲▼" keys, then confirm with "S".

OUTPUT (5): select the output to be enabled also in case of alarm. The list will display all the outputs that in the menu "Digital outputs" have been set as "alarm". Choose the OUTPUT function by means of the "▲▼" keys and confirm with "S". Then select by means of the "▲▼" keys the desired output (5b) then confirm with "S".

DELAY ON (5): set a delay on activation of the alarm. Choose the function DELAY ON by means of the "▲▼" keys and confirm with "S". Then set the value in seconds (5c) by means of the "▲▼" keys quindi confermare con "S".



DELAY OFF (6): set a delay on deactivation of the alarm. Choose the DELAY OFF function by means of the "▲▼" keys and confirm with "S". Afterwards set its value in seconds (6a) by means of the "▲▼" keys then confirm it with "S".

FUNCTION (6): set its OR or AND logic. Choose FUNCTION by means of the "▲▼" keys and confirm with "S". Afterwards select by the "▲▼" keys the logic function to be coupled to the OR (6b) or AND (6b) alarm, then confirm with "S". See details in "Logic and alarm parameters". Proceed, if necessary, with the configuration of the other alarms (up to a maximum of 16 alarms).

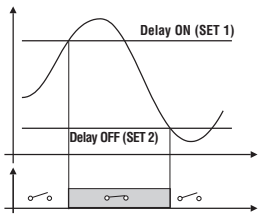
To exit the menu "digital outputs" keep the "S" key pressed for at least 2 seconds.

Logic and alarm parameters

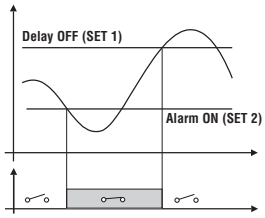
Each symbol includes all the settings described in the "alarm" paragraph and listed on the right:

- Enable.
- Variable
- Type
- Latch
- Disable
- Set 1
- Set 2
- OUT
- Delay on. Delay off.
- Function (and/or)

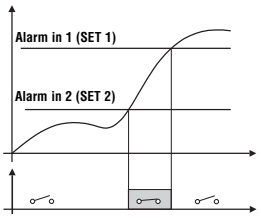
A, B, C... up to 16 locks to control parameters.



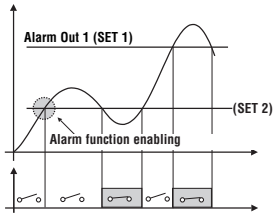
UP alarm
SET 1 > SET 2



DOWN alarm
SET 2 < SET 1

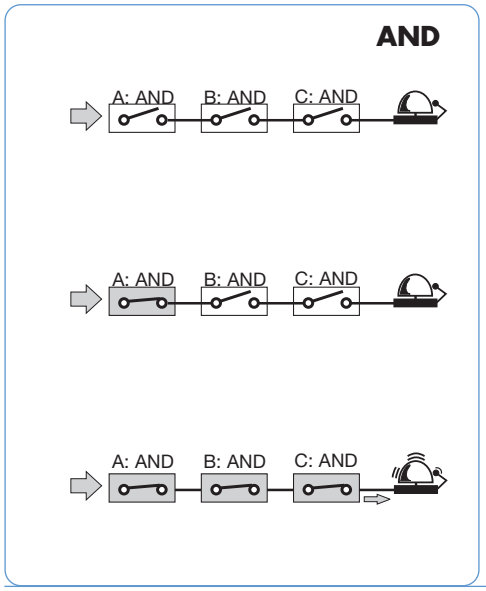


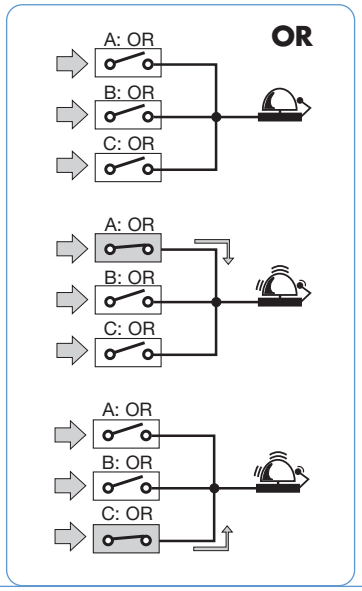
In-window alarm
Alarm is on when the value is between SET 1 and SET 2

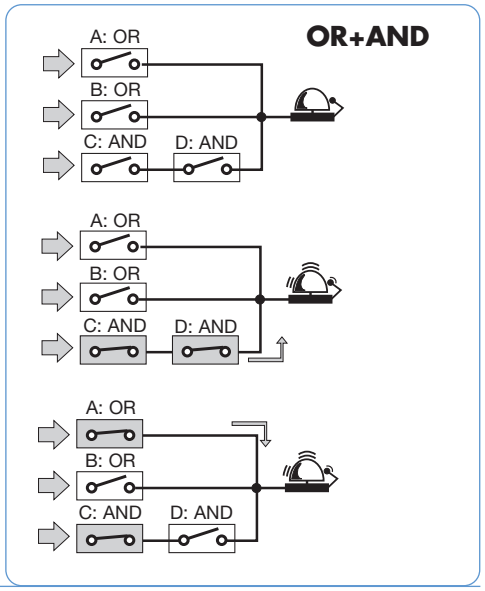


Ext. window alarm with disabling at power on
Alarm is on when value exceeds SET 1 or goes below SET 2

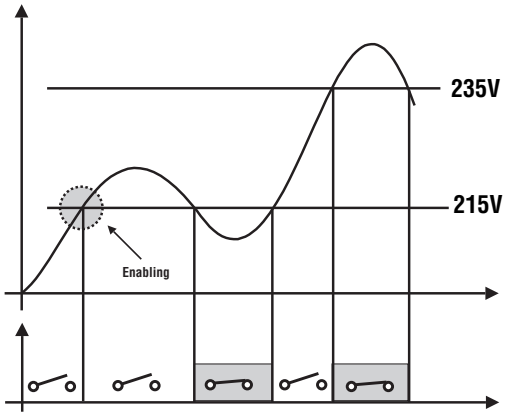
Example of AND/OR logic alarm:





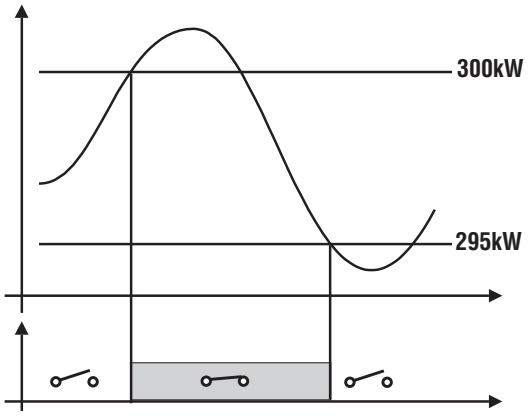


Example of alarm parameters programming



The enabling of an alarm is required when the system voltage VL1-N exceeds or is below the range 215V - 235VAC. The external window alarm is selected so that the output is enabled when the measured value exceeds 235V or is below 215V.

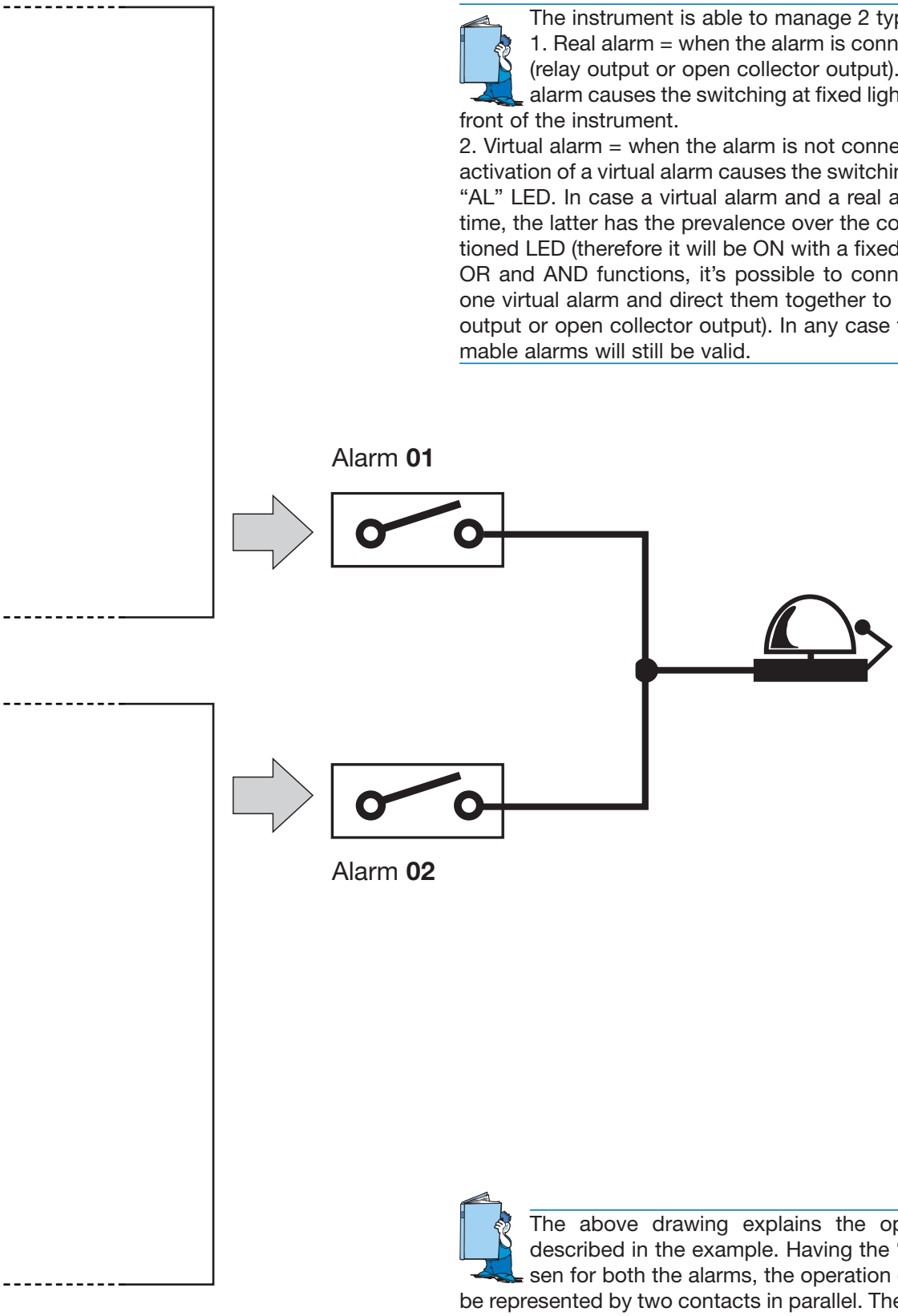
Here below you will find the recommended programming:
- Enabling of one of the 16 alarms (alarm example 01 ON)
- Choose the variable to be monitored: VL1-N= V1
- Choose the type of desired alarm: OUT
- Choose if the latch is to be enabled or not: OFF
- Choose if enabling or not the disabling of the first alarm status from the switching on of the instrument: ON.
- Set set-point 1: Set 1 = 235V
- Set set-point 2: Set 2 = 215V
- Choose to which digital output the alarm you are programming is to be addressed (the “C0” digital output is to be previously enabled to the “alarm” function; in the same menu it’s possible to select the desired type of output: “ND or NE”).
- Should a DELAY ON (delay on activation) be required, set the desired number of seconds: “5 seconds”.
- Should a DELAY OFF (delay on deactivation) be required, set the desired number of seconds: “5 seconds”
- Choose the kind of logic with which the alarm is to be treated: “OR” (see examples of logic alarm: AND/OR).



The disconnection of a load when a set value of absorbed power is required. For example when 300kW are exceeded, the alarm occurs and a set load is disconnected. An UP alarm is selected. Below you’ll find the recommended programming:
- Enabling of one of the 16 alarms (example: alarm 02 ON).
- Choose the variable to be monitored: W system (W∑)
- Choose the type of required alarm: “UP”
- Choose if the latch is to be enabled or not:“OFF”
- Choose if the disabling of the first alarm status from the switching of the instrument is to be enabled or not: “OFF”
- Set set-point 1: Set 1 = 300kW
- Set set-point 2: Set 2 = 295kW
- Choose to which digital output the alarm you are programming is to be addressed: “D0” (the “D0” digital output is to be previously enabled to the “alarm” function; in the same menu it’s possible to select the desired type of output: “ND or NE”).
- Should a DELAY ON (delay on activation) be required, set the desired number of seconds: “5 seconds”.
- Should a DELAY OFF (delay on deactivation) be required, set the desired number of seconds: “5 seconds”
- Choose the kind of logic with which the alarm is to be treated: “OR” (see examples of logic alarm: AND/OR).

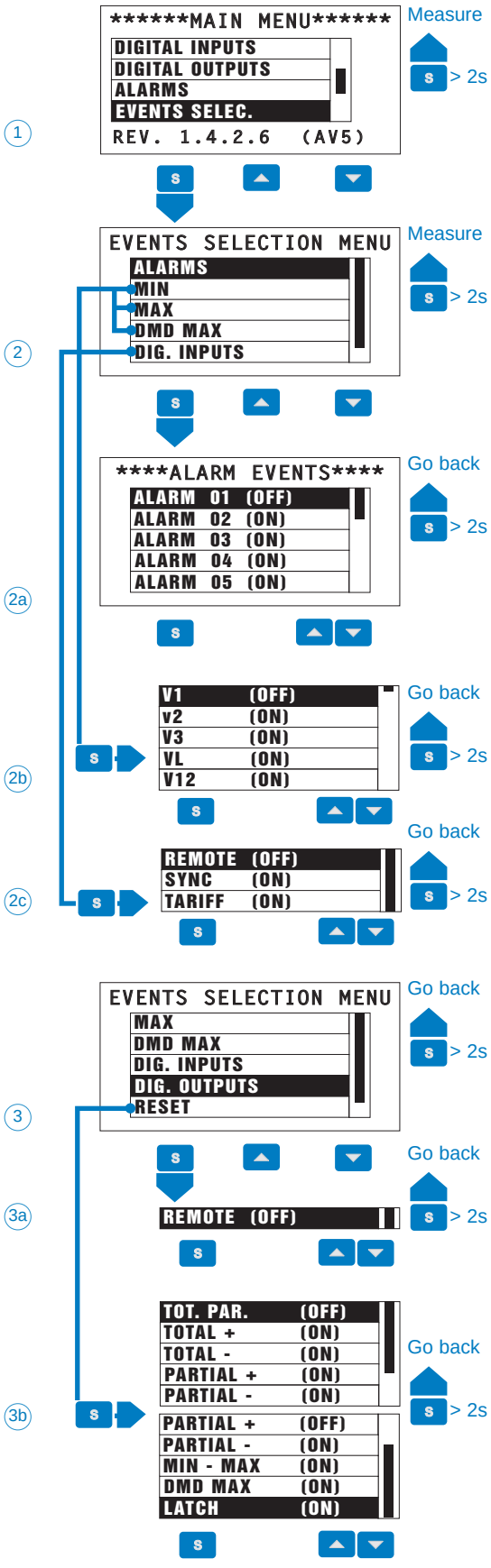
We suggest you to use a delay of a few seconds when disabling the alarms in order to avoid the consequence of a switching on and off of the output and the subsequent damaging of the contacts due to fluctuations of the measured signal with a value close to the selected alarm set-points.

The instrument is able to manage 2 types of alarms:
1. Real alarm = when the alarm is connected to a digital output (relay output or open collector output). The activation of a real alarm causes the switching at fixed light of the “AL” LED on the front of the instrument.
2. Virtual alarm = when the alarm is not connected to any output. The activation of a virtual alarm causes the switching at blinking light of the “AL” LED. In case a virtual alarm and a real alarm occur at the same time, the latter has the prevalence over the control of the above mentioned LED (therefore it will be ON with a fixed light). By exploiting the OR and AND functions, it’s possible to connect together more than one virtual alarm and direct them together to one digital output (relay output or open collector output). In any case the limit of 16 programmable alarms will still be valid.



The above drawing explains the operation of the alarms described in the example. Having the “OR function been chosen for both the alarms, the operation of the digital output can be represented by two contacts in parallel. The enabling of only one of the two alarms will enable also the digital output.

Events selection



This sub-menu allows the user to select which events are to be stamped. Choose the function EVENTS SELEC. (1) by means of the "▲▼" keys and confirm with "S". Afterwards proceed as follows:

ALARMS (2): select if the alarm events are to be stamped. Choose alarms by means of the "▲▼" keys and confirm with "S", then , alarm by alarm by means of the "▲▼" keys, decide whether the stamping is to be enabled "ON" or disabled "OFF", by pressing the "S" key.

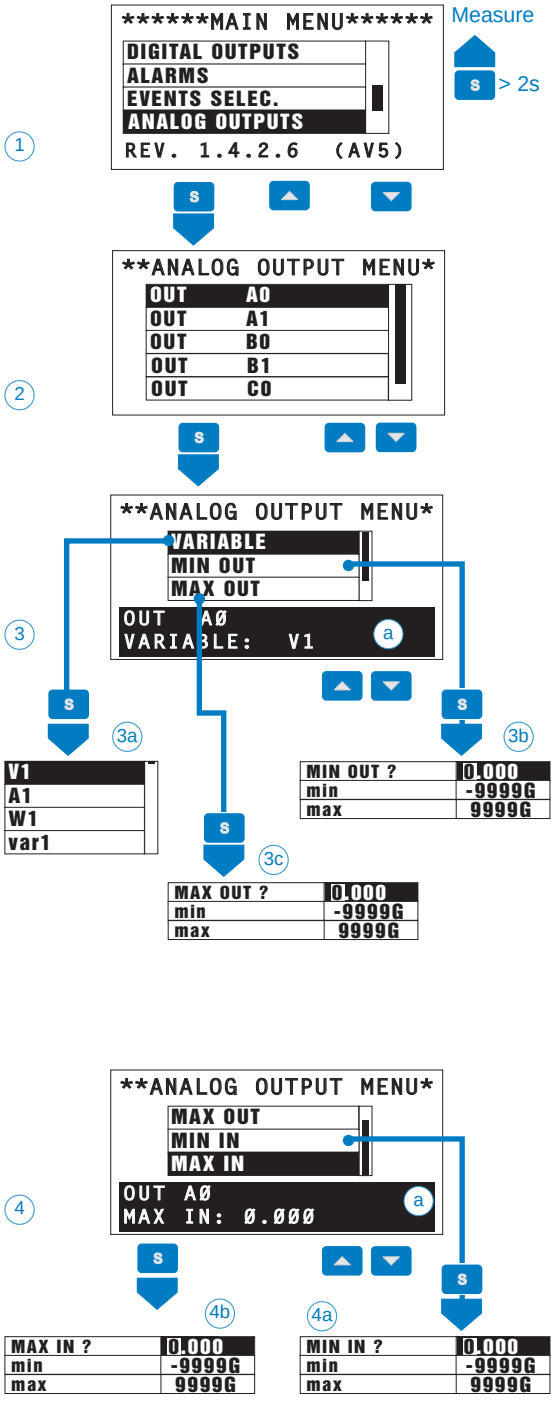
MIN, MAX, DMD MAX (2): select whether to store the minimum, maximum and dmd values for each variable measured by the instrument. Select the minimum, maximum or dmd maximum by means of the "▲▼" keys and confirm with "S", then select, variable by variable if the storing is to be carried out (2b), choose by means of the "▲▼" keys the desired variable and decide whether to enable the storing "ON" or disable the storing "OFF" by pressing the "S" key.

DIG. INPUTS (2): select whether to store the status variables of the digital inputs. Choose DIG. INPUTS by means of the "▲▼" keys and confirm with "S", then select one by one the digital inputs of which the storing is required (2c), choose by means of the "▲▼" keys the type of digital inputs (remote, synchronism, tariff), then confirm whether to enable the storing "ON" or disable it "OFF" by pressing the "S" key.

DIG. OUTPUTS (3): select whether to store the status variations of the digital outputs or not. Select the digital outputs by means of the "▲▼" keys and confirm with "S", then confirm whether to enable the storing "ON" or disable it "OFF" by pressing the "S" key.

RESET (3): select whether the resets which have been carried out are to be stored or not. Choose RESET by means of the "▲▼" keys, then select which resets are to be stored (3b), by means of the "▲▼" keys and select whether to enable the storing "ON" or disable it "OFF" by pressing the "S" key.

Analog outputs



The instrument can manage the following analog outputs combinations: Max n. 8 0-10VDC outputs; Max n.8 5/+5mADC outputs. Any combination of the two above mentioned types considering that each module manages up to 2 outputs. Max n.4 0/20mADC outputs. Max n.4 0/20mADC outputs + max n.4 0-10VDC outputs.

WARNING!!
ANALOG OUTPUTS NOT AVAILABLE! OK
This submenu allows the programming of the analog outputs (0-20mA, 0-10V, -5/+5mA). Select the function ANALOG OUTPUTS (1) by means of the "▲▼" and confirm with "S". Then select the output to be programmed by means of the "▲▼" keys (2) and confirm with "S"; afterwards set the following parameters:
VARIABLE (3): select the variable to be retransmitted by means of the analog output. Choose the function "VARIABLE" (3) by means of the "▲▼" keys and confirm pressing the "S" key. Then select by the "▲▼" keys the variable to be retransmitted (the list of the variables depends on the selected system) (3a) then confirm with "S".
MIN OUT (3): set the value expressed as % of the output range (0-20mA, 0-10V, -5/+5mA) to be coupled to the minimum measured value. The instrument displays also the maximum and minimum value which can be set (min, max). Select the function "MIN OUT" by means of the "▲▼" keys and confirm with "S". Then set the value (3b) by means of the "▲▼" keys and confirm with "S". **MAX OUT** (3): select the value expressed as % of the output range (0-20mA, 0-10V, -5/+5mA) to be coupled to the maximum measured value. The also instrument displays the maximum and minimum value which can be set (min, max). Select the MAX OUT function by means of the "▲▼" keys and confirm with "S". Afterwards set the value (3c) by means of the "▲▼" keys and confirm with "S".
MIN IN (4): minimum value of the variable input range to which the "MIN OUT" value, retransmitted by the analog output, will be coupled. The instrument also displays the maximum and minimum value which can be set (min, max) . Choose the function "MIN IN" by means of the "▲▼" keys and confirm with "S". Then set the value (4a) by means of the "▲▼" keys, then confirm with "S".
MAX IN (4): maximum value of the variable input range to which the "MAX OUT" value, retransmitted by the analog output, will be coupled. The instrument also displays the maximum and minimum value which can be set (min, max). Choose the MIN IN function by means of the "▲▼" and confirm with "S". Then set the value (4b) by means of the "▲▼" keys and confirm with "S".

Proceed, if possible, with the configuration of the other analog outputs (up to a maximum of 8 outputs). To exit the menu "analog outputs", keep the "S" key pressed for at least 2 seconds.

Programming examples of the analog outputs

Power retransmission by means of a 0-20mA analog output.

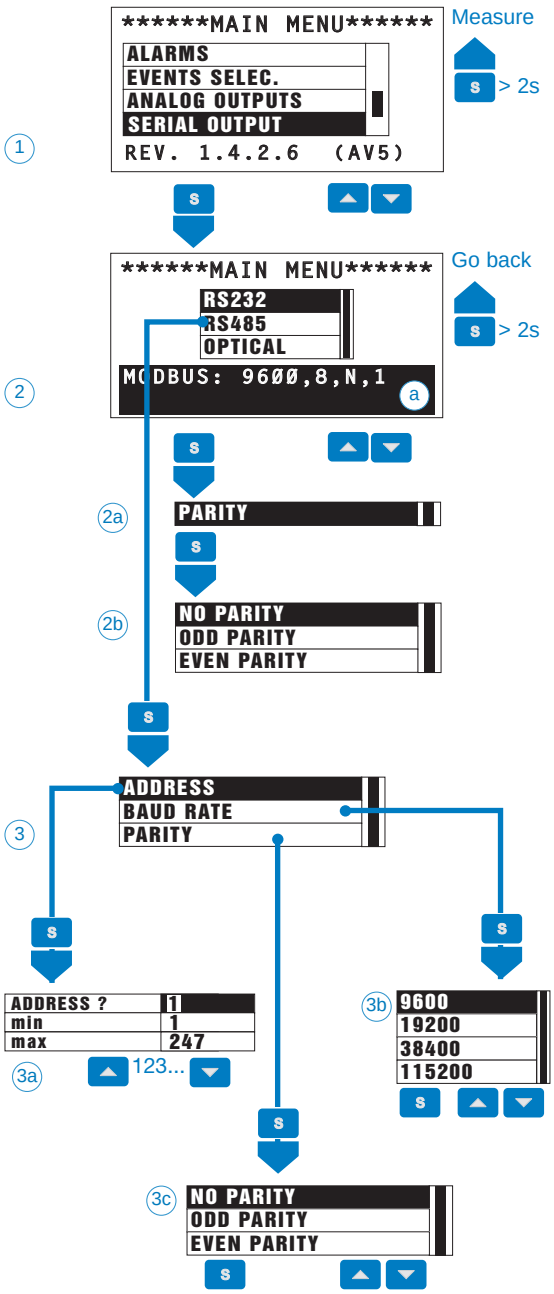
It's necessary to measure a consumed power up to 100kW and retransmit this value by means of a signal from 4 to 20 mA: the module to be used is AO2050 (2x from 0 to 20mA), the instrument is to be programmed as follows:
VARIABLE: W∑ (system active power).
MIN OUT: 20.0% means 4 mA the calculation to be carried out is the following: (100*minimum output) / fullscale output =100*4mA/ 20mA=20%.
MAX OUT: 100.0% means 20mA, the calculation to be carried out is: (100*maximum output) / fullscale output = 100*20mA/20mA= 100.
MIN IN: 0,0k; the multiple k,M,G can be selected on the instrument according to the chosen VT and CT values.
MAX IN: 100.0k; the k, M, G multiples can be selected on the instrument according to the selected VT and CT values.

Transmission of active consumed and generated power by means of -5/+5mA analog output.
It's necessary to measure both the consumed active power up to 100kW and the generated active power up to -100kW and retransmit this value by means of a signal from -5 to +5mA: the module to be used is AO2052 (2x from -5/+5mA), the instrument is to be programmed as follows:
VARIABLE: W∑ (system active power).
MIN OUT: -100% means -5mA, the calculation to be carried out is: (100*minimum output)/ fullscale output= 100*5mA/-5mA=-100%.
MAX OUT: 100,0% means 20mA, the calculation to be carried out is: (100*max output)/ fullscale output= 100*5mA/5mA= +100%.
MIN IN: -100,0k; the multiples k,M and G can be selected on the instrument on the basis of the VT and CT values.
MAX IN: 100,0k; the multiples K, M and G can be selected on the instrument depending on the VT and CT values being selected.

Retransmission of the POWER FACTOR (PF) by means of the 0-20mA analog output.
It's necessary to retransmit the whole range of the admitted values for the PF with a signal from 0 to 20mA. Particular attention must be paid to the value of the PF variable which may vary from C0,001 and L0,000 (for each phase): these values will be retransmitted and will then correspond to 0 and 20 mA. When the PF will have a value equal to 1, being in the middle between C0,001 and L0,000, the value of the output will correspond to the middle of the scale, that is 10mA. As a consequence, the instrument will have to be programmed as follows:

VARIABLE: PF L1 (or L2 or L3 or PF∑).
MIN OUT: 0,0%.
MAX OUT: 100,0%.
MIN IN: C0,001 (the C symbol shows a CAPACITIVE value).
MAX IN: L0,001 (the L symbol shows an INDUCTIVE value). L0,001 has been chosen as minimum value to be set in order to avoid any undesirable swifting of the repeated outputs.

Serial outputs



This function allows the user to set the RS232 and RS485 serial ports as well as the optical port. Choose the SERIAL OUTPUT function (1) by means of the "▲▼" keys and confirm with "S". Then choose the serial port to be set and the instrument will synthetically display the previously set parameters (a).

RS232 (2): set the parameters of the RS232 serial port (AR1039 module), if present, then select RS232 by means of the "▲▼" keys and confirm with "S", select the type of parity to be used (2a, 2b) with the "▲▼" keys and confirm the selection with the "S" key.

RS485 (2): set the communication parameters of the RS485 serial port (AR1034 module, max 9600 bps, AR2040 max, 115,2kbps), if present; select it by means of the "▲▼" keys and confirm with the "S" key. Then select the following:

ADDRESS (3): select the serial address to be given to the instrument (from 1 to 247). Enter the desired address (3a) by means of the "▲▼" keys and confirm with the "S" key.

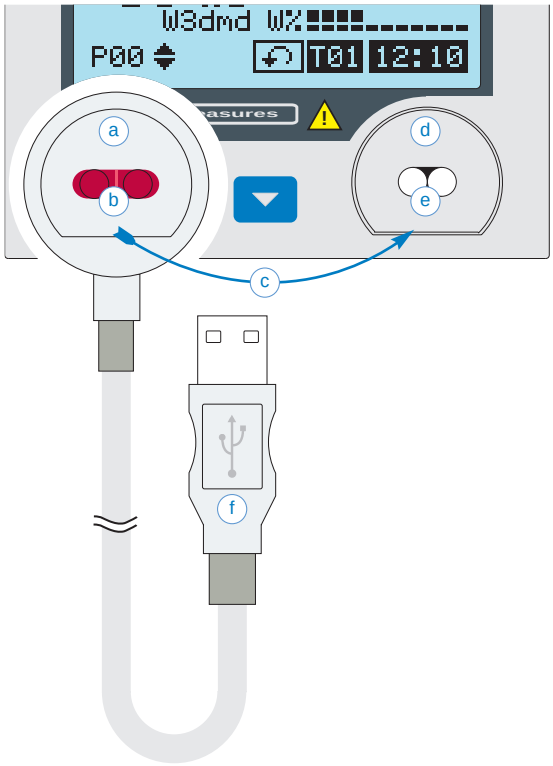
BAUD RATE (3): select the baud rate of the serial port. Select the desired baud rate value (3b) by means of the "▲▼" keys and confirm with the "S" key.

PARITY (3): select the type of parity of the serial port (3c) by means of the "▲▼" keys and confirm with the "S" key.

OPTICAL (2): set the parameters of the front optical port (see next paragraph "Optical port").

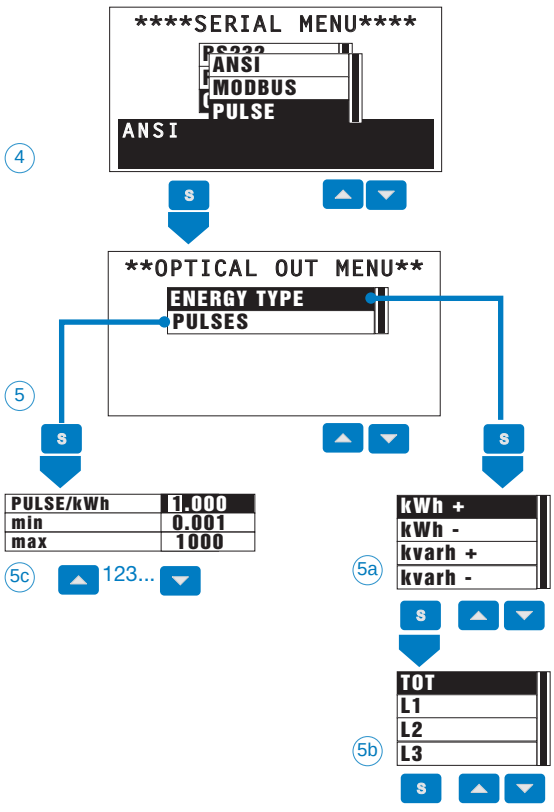
To exit the various menus and submenus, keep the "S" key pressed for at least 2 seconds.

Optical port



The serial optical port (d) transmits the data by means of an infrared device (e-b). The connection (c) to the PC through the relevant magnetic connector (a) is made by means of a USB port (f) or 232 serial port (depending on the model being used): the user will then be able to read, transmit or receive information on the WM5 programming (the WM5Soft software can be purchased on request).
The optical port makes it also possible to retransmit the energy metering by means of pulses . In this case the light generated by the optical port is not visible because it's within the infrared spectrum. Set the desired type of use of the optical port (energy transmission by means of pulses or MODBUS or ANSI serial communication) before using it.

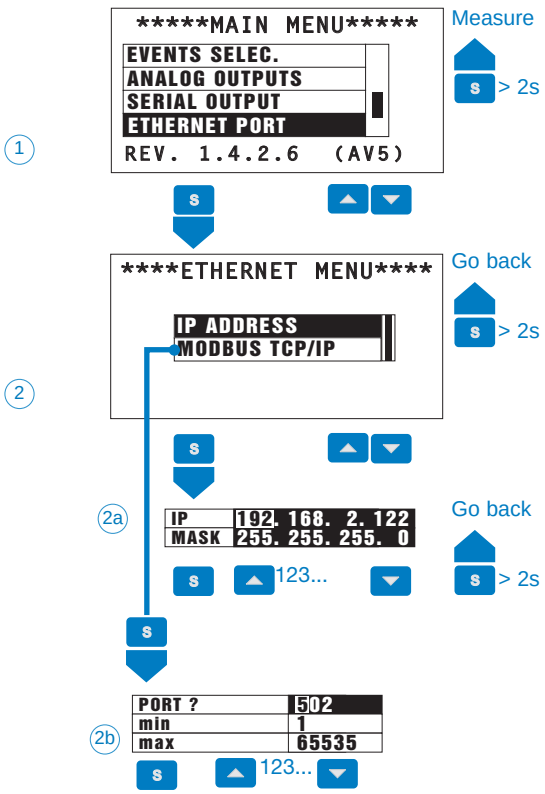
Follow steps (1) and (2) on the previous page, then select "OPTICAL" (2) by means of the "▲▼" keys and confirm with "S". Afterwards, select the type of protocol/communication mode (4) to be used:



ANSI (4): standard ANSI serial communication protocol. Choose the ANSI function by means of the "▲▼" keys and confirm with "S".
MODBUS (4): MODBUS serial communication protocol. Choose the MODBUS function by means of the "▲▼" keys and confirm with "S". Then set the relevant parameters such as baud rate and parity, see steps (3b) and (3c) on the previous page.
PULSE (4): the port will be enabled for the energy retransmission. Select the PULSE function by means of the "▲▼" keys and confirm with "S". Then select the energy type to be retransmitted (5), select ENERGY TYPE by means of the "▲▼" keys and confirm with "S". The instrument will display the list of available energies (5a) (kWh+, kWh-, kvarh+, kvarh-) (5a); select the desired energy by means of the "▲▼" keys and confirm with the "S" key: for each energy it's possible to choose if retransmitting the total energy metering (TOT) or by tariff from T1 to T12 (5b), choose the desired energy detail by means of the "▲▼" keys and confirm with "S". Finally, set the value of the pulse related to the measured energy, that is the number of pulses generated for each measured kWh+ (or kWh- or kvarh+ or kvarh-). Choose PULSE (5) by means of the "▲▼" keys and confirm with "S", then (5c) set the desired pulse value and confirm it by means of the "S" key.

Note: set the optical port in the MODBUS mode before using it related to the serial communication software "Wm5Soft".

Ethernet Port



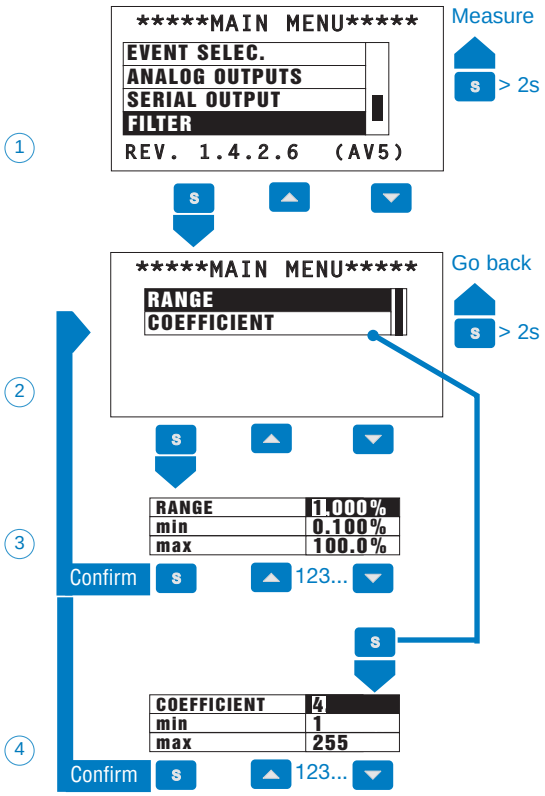
This function allows the user to set the Ethernet port. Choose the ETHERNET PORT function (1) by means of the "▲▼" keys and confirm with "S".

IP ADDRESS (2): set the IP parameters. Select IP ADDRESS by means of the "▲▼" keys and confirm with "S". Then select IP (IP address) or MASK (netmask) by means of the "▲▼" keys and confirm with "S". Set the value (2a) by means of the "▲▼" keys, where the "▲" key increases the value and the "▼" key switches to the following number. Confirm with "S".

MODBUS TCP/IP (2): to modify the default port of the Ethernet port (502), select MODBUS TCP/IP by means of the "▲▼" keys and confirm with "S". Set the value (2b), from 1 to 65535, by means of the "▲▼" keys and confirm with "S".

To exit the various menus and submenus, keep the "S" key pressed for at least 2 seconds.

Digital filter



Thanks to the digital filter, it's possible to stabilize the measurements which are too instable when displaying the relevant values.

By means of the "▲▼" keys, select FILTER and confirm with "S". Select the function to be set from the various submenus with the "▲▼" keys and confirm with "S":

RANGE (3): set the operating range of the digital filter. The value is expressed as a %. By means of the "▲▼" keys select RANGE and confirm with "S", then set the value as a percentage by means of the "▲▼" keys and confirm the value with the "S" key.

COEFFICIENT (4): set the filtering coefficient of the instantaneous measures. By increasing the value, also the stability and the settling time of the measures are increased. Select COEFFICIENT by means of the "▲▼" keys and confirm with the "S" key, then set the value by means of the "▲▼" keys and confirm the new value with the "S" key.

Digital filter programming
Examples

Example 1

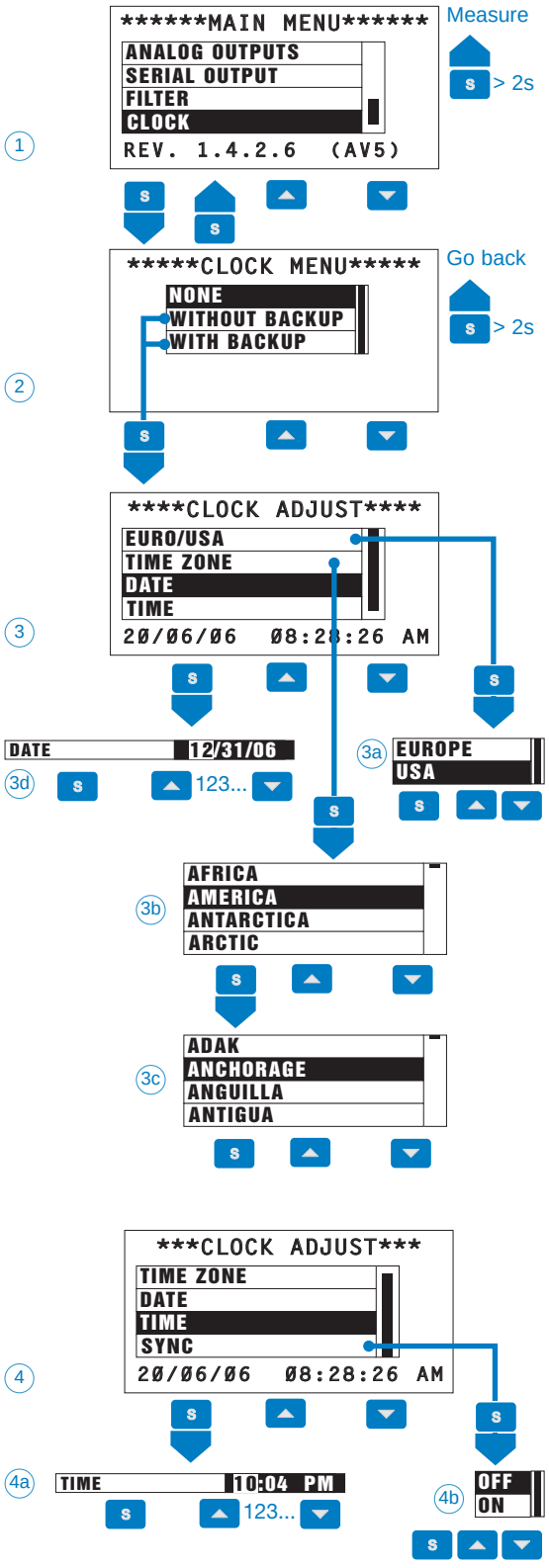
How to stabilize the value of the VL-N variable displayed on the display, fluctuating from 222V and 228V.
The parameters of the digital filter have to be programmed as follows:
RANGE: the variable has fluctuations within the mean value whose amplitude is equal to ±0,75% of the full scale rated value of the variable itself (obtained by the following calculation: (228-222)/ 2= ±3V, then ±3*100/400V= ±0,75% where 400V is the phase-neutral rated value of an AV5 input). The "range" parameter, representing the action range of the digital filter, is to be programmed to a value which must be slightly higher than the percentage amplitude of the fluctuation: ex. 1.0%.
COEFFICIENT: if the new value measured by the instrument is within the action range of the filter, the new displayed value is obtained by adding algebrically the previous value to the variation divided by the filtering coefficient. As a consequence, a value higher than this coefficient implies a longer settling time and therefore a better stability. You generally obtain the best result by setting the filtering coefficient to a value equal to at least 10 times the range parameter value.
In the following example: 1,0*10=10, the stability of the filtering coefficient can be improved by increasing the filtering coefficient, the admitted values are included within 1 and 255.

Example 2
How to stabilize the value of the displayed System Active Power (WΣ), fluctuating between 300kW and 320kW (the load is connected to the instrument by means of a 300/5A CT and a direct measure of the voltage).

The parameters of the digital filter must be programmed as follows:
RANGE: the variable has fluctuations within the mean value whose amplitude is equal to ±2,78% of the full scale rated value of this variable. This value is obtained by the following calculation: (320-300)/ 2= ±10kW, then ±10*100/360kW= ±2,78%, where 360kW is the rated value of the System Active Power of an AV5 input, at the above mentioned CT and VT ratios and obtained by means of the following formula: (320-300)/ 2= ±10kW, then ±10*100/360kW= ±2,78%, where 360kW is the rated value of the System Active Power of an AV5 input at the above mentioned CT and VT ratios and obtained by means of the following formula: "VLN * VT * IN * CT * 3" where VLN = rated input voltage (400V for the AV5 input), VT= primary/secondary ratio of the voltage transformer being used, IN = rated current (5A for the AV5 type input), CT = primary/secondary ratio of the voltage transformer being used (in this example "400*1*5*60*3=360kW).
The RANGE parameter, representing the digital filtering coefficient action range, is to be programmed to a value which must be slightly higher than the percentage of the fluctuation: ex. 3.0%.
COEFFICIENT: if the new value acquired by the instrument is within the filtering action range, the new displayed value is obtained by adding algebrically the previous value to the variation divided by the filtering coefficient. As a consequence, a value higher than this coefficient implies an higher settling time and therefore a better stability. Generally speaking the best result is obtained setting the filtering coefficient to a value equal to at least 10 times the value of the range parameters. In the example: 3.0*10=30. In order to improve the stability you can increase the filtering coefficient, the admitted values are included within 1 and 255.

Example 3.
It's necessary to stabilize the value of the displayed variable AL 1 (phase current 1), fluctuating within 470V and 486V.
To be able to manage the alarm function and following activation and deactivation of the relay, this value is not to be subject to continuous fluctuations. In this example we have considered using a 500/5A CT. The paramters of the digital filter is to be programmed as follows:
RANGE: the variable has fluctuations within the mean value whose amplitude is equal to ±1,60% of the full scale rated value of this variable (obtained by means of the calculation: (486-470)/ 2= ±8A, then ±8*100/500V= ±1,60% where 500A is the value referred to the primary of the transformer being used). The "range" parameter, which represents the action range of the digital filter, is to be programmed to a value slightly higher than the pourcentage amplitude of the fluctuation: for example 2.0%.
COEFFICIENT: if the new value acquired by the instrument is within the filtering action range, the new displayed value is calculated algebrically adding to the previous value the variation divided by the filtering coefficient. As a consequence, a higher value of this coefficient implies a higher settling time and therefore a better stability. Generally speaking, the best result is obtained setting the filtering coefficient at a value equal to at least 10 times the value of the range parameter. In the example: 2.0*10=20. To improve the stability you can increase the filtering coefficient, the admitted values are within 1 and 255.

Clock



In the clock menu the clock functions can be set. Choose the CLOCK (1) function by means of the "▲▼" keys and confirm with "S". The instrument displays three functioning modes.

NONE (2): WM5 is not supplied with a clock, therefore it will not be possible to manage the tariffs by means of TIME/CALENDAR (all functions which are linked to the presence of the clock will be deactivated). Choose the function NONE by means of the "▲▼" keys and press the "S" key to confirm.

WITHOUT BACKUP (2): WM5 will be able to manage date and time but, in case of power supply failure, it will not store neither time nor date. When the instrument will be switched on again, the correct date and time will have to be set again. Select the WITHOUT BACKUP function by means of the "▲▼" keys and confirm with "S".

WITH BACKUP (2): WM5 is supplied with a clock and the correct date and time will be stored also in case of power failure. Select the function "WITH BACKUP" by means of the "▲▼" keys and confirm with "S". The function "WITH BACKUP" can be selected only if the AR1039 module is used. Then all the information necessary to the clock are to be set.

EURO/USA (3): set the time format as 24h european (00:00) or 12h american (12:00 AM). Select the EURO/USA function by means of the "▲▼" keys and confirm with "S". Select EUROPE (3a), to set the time format as 24h, or choose USA (3a), to set the time format as 12h.

TIME ZONE (3): set the time zone related to the place where WM5 is installed, choose the correct time zone (3b) by means of the "▲▼" zone and confirm with "S". Then select by means of the "▲▼" keys the correct country (3c) and confirm with "S".

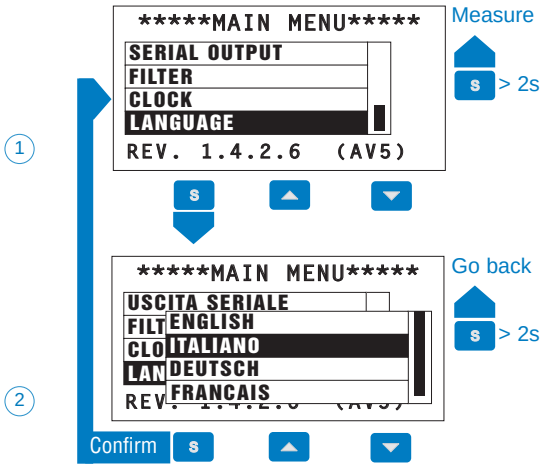
DATE (3): set the current date, choose the DATE function by means of the "▲▼" keys and confirm with "S". Then select the date by means of the "▲▼" keys , set the date (3d) and confirm with "S".

TIME (4): set the current time, select the TIME function by means of the "▲▼" keys and confirm with "S". Then set the time (4a) by means of the "▲▼" keys and confirm with the "S" key.

SYNC (4): enables or disables the synchronism of the clock with the digital inputs enabled as SYNC, the clock at each synchronization pulse will set to the multiple of the integration time nearer to the current time. Choose the SYNC function by means of the "▲▼" keys and confirm with "S". Then, by means of the "▲▼" keys, choose OFF (4b) to disable the synchronism or ON (4b) to enable it and confirm with "S".

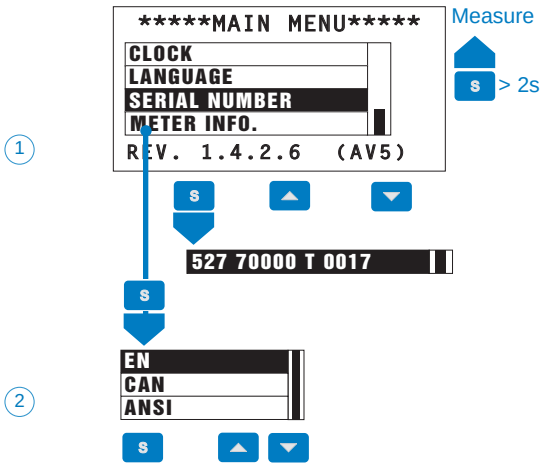
The backup of the time is only possible with the AR1039 module being installed.

Language



This function allows to set the language to be displayed by WM5. Choose the LANGUAGE function (1) by means of the "▲▼" keys and confirm with "S". Then select the desired language by means of the "▲▼" keys and confirm with "S".

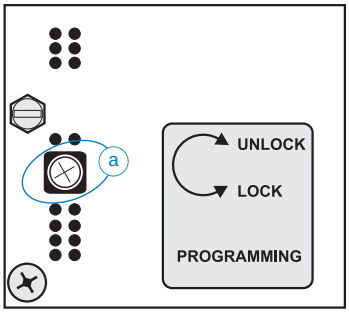
Serial number and Meter Info.



Selecting the SERIAL NUMBER function, the instrument displays the serial number of the instrument. Select the function SERIAL NUMBER (1) by means of the "▲▼" keys and confirm with "S".

Selecting the METER INFORMATION function, the instrument displays the information relevant to the reference standard used by the instrument. Select the function METER INFORMATION (1) by means of the "▲▼" keys and confirm with "S". Choose the desired standard by means of the "▲▼" keys and confirm with "S".
Note: the selected standard is displayed in the Info pages too.

Keypad lock, lock of access to programming and reset menu



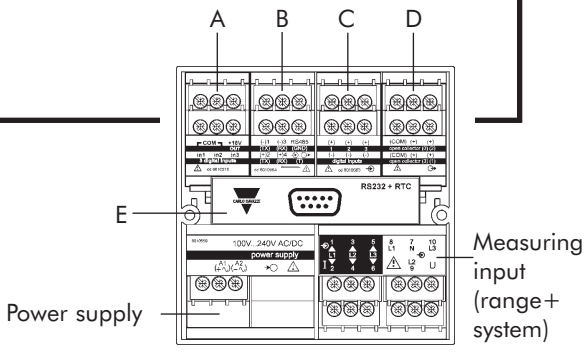
By turning the screwdriver anticlockwise to the end-of-stroke of the relevant trimmer, as shown in the figure on the left (a), it's possible to lock the access to the programming of the instrument both from keypad and from serial communication. Moreover, after locking the keypad it will not be possible to carry out the reset commands any more. However, it will be still possible to scroll all the display pages and the relevant details.

WM5 96 AV53 H XX XX XX XX XX

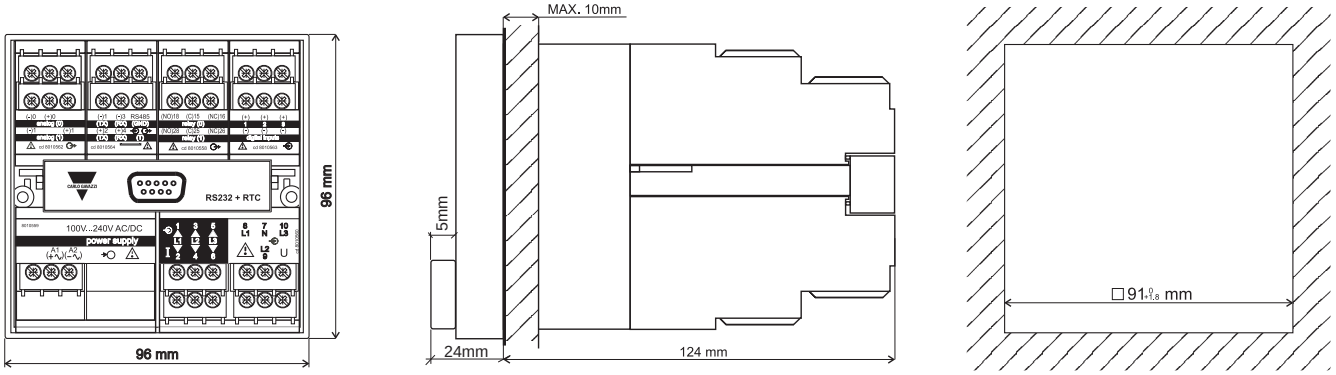
Description	Ch	Part No.	Legend
Model			
WM5-96 with optical port ANSI C12.18 type		AD2001	WM5 96
WM5-96 without optical port		AD2000	WM5 96
(Range code + system) measuring inputs			
400/690VL-L 1/5A (10A)		AQ2030	AV5.3
120/208VL-L 1/5A (10A)		AQ2031	AV6.3
Power supply			
18-60VAC/DC Power supply		AP1021	L
90-260VAC/DC Power supply		AP1020	H
SLOT A			
None			XX
Ethernet/Internet port	1	AR1061	E2
Digital inputs	3	AQ1038	D1
Digital inputs + aux	3	AQ1042	D2
Open collector output	4	AO1037	O4
Open collector output	2	AO1036	O2
Open collector output	1	AO1059	O1
Relay output	1	AO1058	R1
Analogue output 20mADC	2	AO2050	B1
Analogue output 10VDC	2	AO2051	W1
Analogue output +/-5mA	2	AO2052	B2
SLOT B			
None			XX
Digital inputs	3	AQ1038	D1
Digital inputs + aux	3	AQ1042	D2
Open collector output	4	AO1037	O4
Open collector output	2	AO1036	O2
Open collector output	1	AO1059	O1
Relay output	1	AO1058	R1
Analogue output 20mADC	2	AO2050	B1
Analogue output 10VDC	2	AO2051	W1
Analogue output +/-5mA	2	AO2052	B2
RS485 9600bps	1	AR1034	S1
RS485 115200bps	1	AR2040	S2
SLOT C			
None			XX
Digital inputs	3	AQ1038	D1
Digital inputs + aux	3	AQ1042	D2
Open collector output	4	AO1037	O4
Open collector output	2	AO1036	O2
Open collector output	1	AO1059	O1
Relay output	1	AO1058	R1
Relay output	2	AO1035	R2
Analogue output 10VDC	2	AO2051	W1
Analogue output +/-5mA	2	AO2052	B2
SLOT D			
None			XX
Digital inputs	3	AQ1038	D1
Digital inputs + aux	3	AQ1042	D2
Open collector output	4	AO1037	O4
Open collector output	2	AO1036	O2
Open collector output	1	AO1059	O1
Relay output	1	AO1058	R1
Relay output	2	AO1035	R2
Analogue output 10VDC	2	AO2051	W1
Analogue output +/-5mA	2	AO2052	B2
OPTIONS SLOT E			
Utility grade with optical port			XX
RS232 + RTC (utility grade)	1	AR1039	SX
Revenue approval. An "instrument setting" form must be properly filled in by the user.			XU
RS232+RTC + "XU" option	1	AR1039	SU
			YY
RS232 + RTC (utility grade) without optical port.	1	AR1039	SY

Examples of which modules to order for:
WM5-96 AV53 H B1 S1 R2 O2 SX

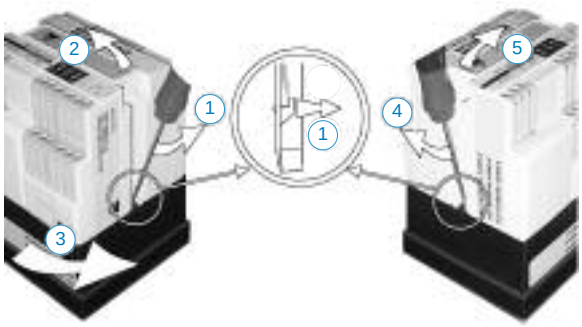
Material	Code
WM5 96	AD2001
AV53 measuring inputs (400/690VL-L)	AQ2030
90-260VAC/DC power supply	AP1020
20mA analogue output (2 channels)	AO2050
RS485 serial port at 9600 bps	AR1034
Relay output (2 channels)	AO1035
Open collector output (2 channels)	AO1036
RS232 serial port +RTC	AR1039

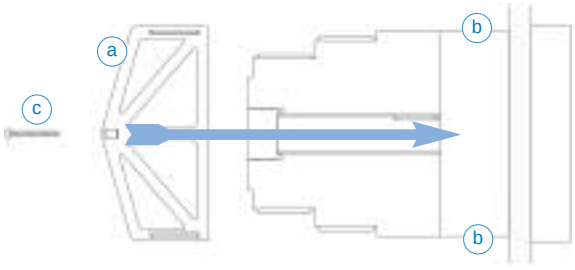


Panel cut-out and dimensions



Fixing, removing the modules and mounting the instrument to the panel





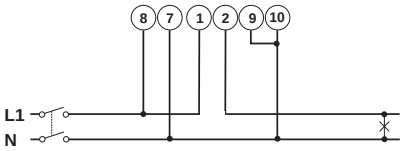
Mounting and removing the modules: the different modules (input, output and power supply) have been designed to be plugged in the available slots. To know in which slots they are to be mounted, refer to the table on the left. For a correct assembling of the instrument, first plug the modules into the relevant slots, then as last operation plug in the central module which can also be a blind module or an RS232 serial communication module. This module also locks the other modules in the relevant slots. To remove the modules use a screwdriver with a flattened tip and move the two fixing tabs to the side (1); then remove the central module from its slot by pressing your thumb towards points (2) and (5). Finally extract the central module.
Panel mounting: insert the instrument (holding its front side) into the panel and fasten it (from the back) by fixing the two lateral brackets being supplied (a) to the appropriate location (b), and then locking them by means of the two screws supplied with the instrument (c).

Sealing the instrument

The special sealing kit, made by two plastic “cuneiform” devices (c) is supplied with the instrument; these two devices will have to be inserted as shown in the figure on the left (a), then the seal is to be placed as indicated by the pointer (b).

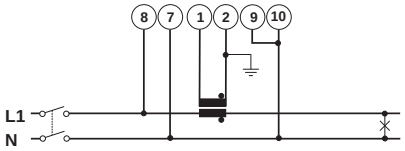
1-phase, 2-wire input connections, (1P)

Fig. 1



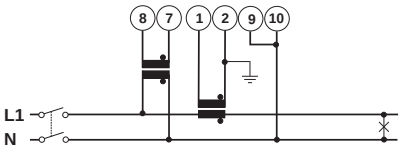
Direct connection

Fig. 2



CT connection

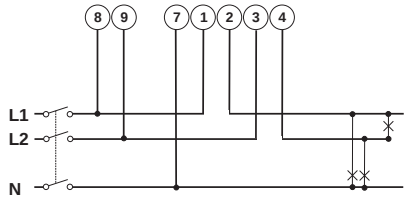
Fig. 3



CT and VT connection

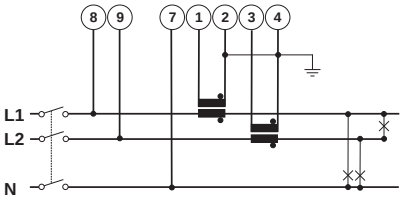
2-phase, 3-wire input connections (2P)

Fig. 4

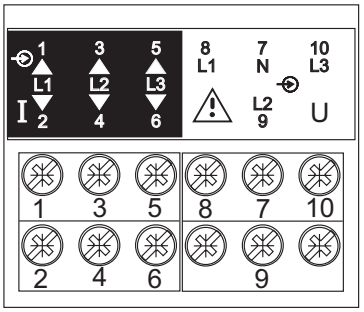


Direct connection

Fig. 5

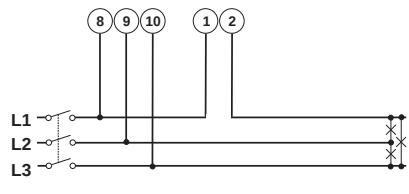


CT connection



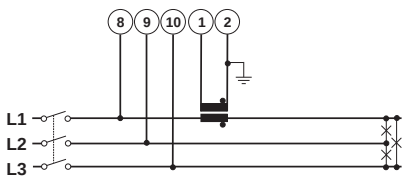
3-phase, 3 and 4-wire input connections - Balanced load (3P)

Fig. 6



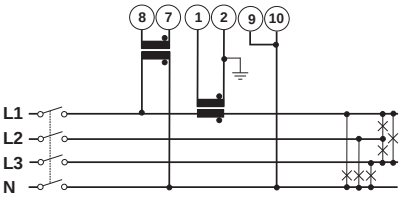
Direct connection (3-wire system)

Fig. 7



CT and VT connection (3-wire system)

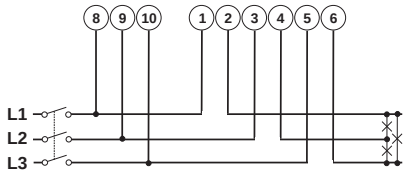
Fig. 8



CT and VT connection (4-wire system)

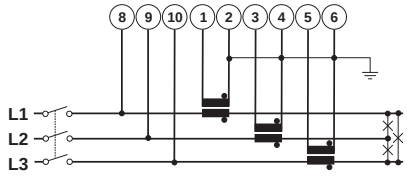
3-phase, 3-wire input connections - unbalanced load (3P)

Fig. 9



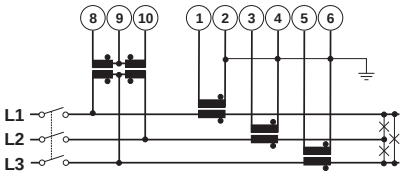
Direct connection (3-wire system)

Fig. 10



CT connection (3-wire system)

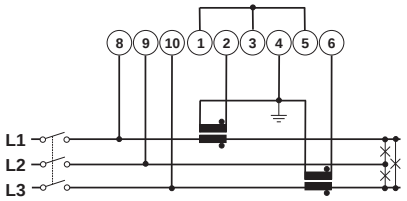
Fig. 11



CT and VT connection (3-wire system)

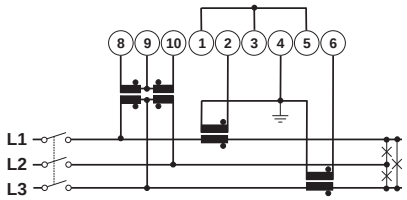
3-phase, 3-wire ARON input connections (3P)

Fig. 12

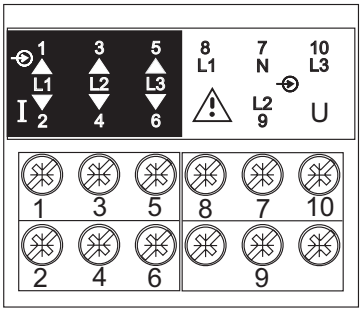


ARON connection (3-wire system)

Fig. 13

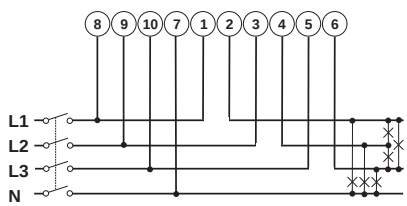


ARON and VT connection (3-wire system)



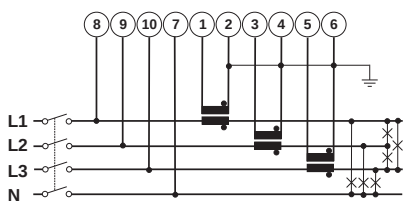
3-phase, 4-wire input connections - unbalanced load (3P+N)

Fig. 14



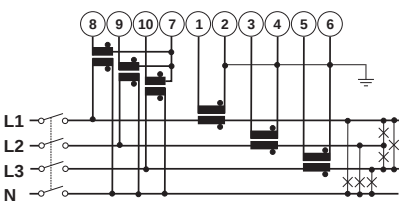
Direct connection (4-wire system)

Fig. 15



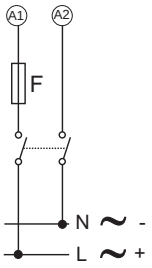
CT connection (4-wire system)

Fig. 16



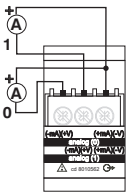
CT and VT connection (4-wire system)

Power supply, analogue and digital output modules

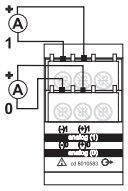


AP1020.
AP1021.
Power supply.

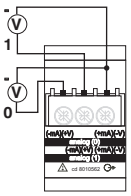
F= 1.25 A T



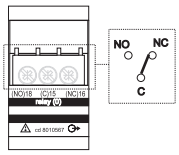
AO2050.
2 analogue outputs
0-20mA DC.



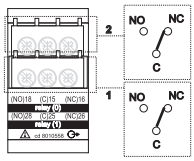
AO2052.
2 analogue outputs
-5/+5mA DC.



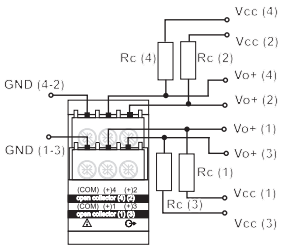
AO2051.
2 analogue outputs
10V DC.



AO1058.
1 relay output

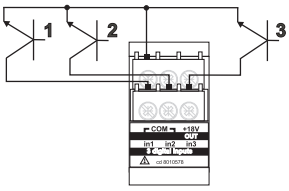


AO1035.
2 relay outputs

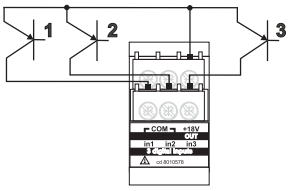


AO1037. 4 open collector outputs. This wiring diagram is also valid for the open collector modules with 1 or 2 outputs. The load resistances (Rc) must be designed so that the close contact current is lower than 100mA; the VDC voltage must be lower than or equal to 30VDC.

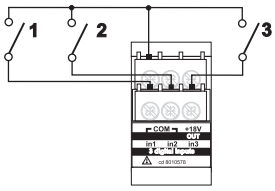
Digital inputs



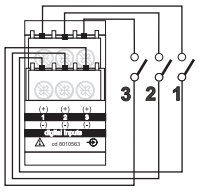
AQ1042.
Connection by means of
NPN transistors.



AQ1042.
Connection by means of
PNP transistors.

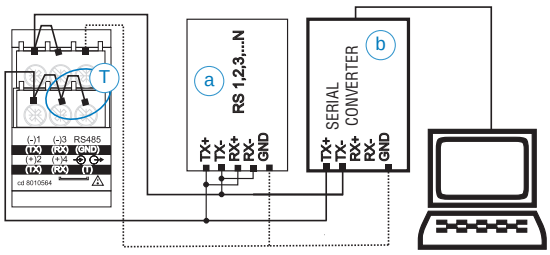


AQ1042.
Connection by means of
contacts.



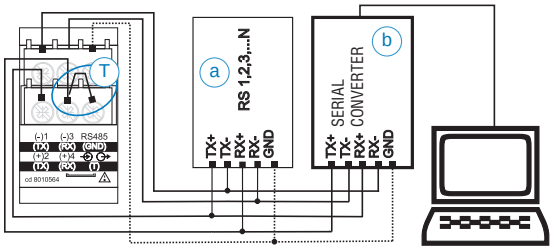
AQ1038.
Connection by
means of contacts.

RS485 serial port (AR1034 9600bps, AR2040 115200bps)



2-wire connection. Other WM5-96 (a) provided with RS485 are connected in parallel (b). Serial RS485-RS232 converter.

Termination of the serial port (T)**:** it's carried out only on the last instrument of the network, by means of a jumper between (Rx+) and (T).



4-wire connection. Other WM5-96 (a) provided with RS485 are collected in parallel (b). Serial RS485-RS232 converter.

Terminatio of the serial port (T)**:** it is carried out only on the last instrument of the network, by means of a jumper between (Rx+) and (T).

Input Specifications

Number of analogue inputs	
Current	1 (1-phase; system code: 3) 3 (3-phase; system code: 3)
Voltage	1 (1-phase; system code: 3) 4 (3-phase; system code: 3)
Digital inputs (on request)	Up to 12
AQ1038	No. of inputs: 3 (voltage-free)
Purpose	"dmd" measurements synchronisation. Tariff selection: energy. Contact status reading. Clock synchronisation.
Contact measuring current	<8mA/ 17.5 to 25VDC
AQ1042	Number of inputs: 3 + excitation output
Purpose	"dmd" measurements synchronisation. Tariff selection: energy. Contact status reading. Clock synchronisation.
Excitation output	16V<+Aux<24VDC Max15mA
Contact measuring current	15mA
Common characteristics	
Close contact resistance	Max 1kΩ
Open contact resistance	Min 100kΩ
Insulation	see "Insulation between inputs and outputs" table
Accuracy	(display, RS232, RS485) In: 5A, If.s.: 10A Un: see voltage ranges below
Current (A_{L1}, A_{L2}, A_{L3})	from 0.05In to Imax: (@20°C ±5°C, R.H. ≤75%) ±(0.2%RDG+2DGT) from 0.01In to 0.05In: ±(0.5%RDG+2DGT)
Current (A_n)	±0.5% RDG (0.2 to 2 In) from 40 to 100 Hz (@20°C±5°C, R.H.≤75%)
Voltage	
range AV5:	$400/690V_{L-L}$ AC V_{L-N}: from 185 V to 460 V V_{L-L}: from 320 V to 800 V ±(0.2%RDG+1DGT)
range AV6:	$120/208V_{L-L}$ AC V_{L-N}: from 45 V to 145 V V_{L-L}: from 78 V to 250 V ±(0.2%RDG+1DGT) Includes also: frequency, power supply and output load influences.
Frequency	±0.1% RDG (40 to 440 Hz)
Active power and apparent power (@ 20°C ± 5°C, R.H. ≤ 75%)	0.05In to Imax, PF 1: ±(0.5%RDG+1DGT) 0.01In to 0.05In, PF 1: ±(1%RDG+1DGT) 0.1In to Imax, PF 0.5L, PF 0.8C: ±(0.6%RDG+1DGT) 0.02In to 0.1In, PF 0.5L, PF 0.8C: ±(1%RDG+1DGT)
Reactive power (@ 20°C ± 5°C, R.H. ≤ 75%)	0.1In to Imax, senφ 0.5L/C: ±(2%RDG+1DGT) 0.05In ÷ 0.1In, senφ 0.5L/C: ±(2.5%RDG+1DGT) 0.05In ÷ Imax, senφ 1: ±(2%RDG+1DGT) 0.02In to 0.05In, senφ 1: ±(2.5%RDG+1DGT)
Energies (@ 20°C ± 5°C, R.H. ≤ 75%)	Active: class 0.5 according to EN62053-22, ANSI C12.20 Reactive: class 2 according to EN62053-23, ANSI C12.1
Harmonic distortion (@ 20°C ± 5°C, R.H. ≤ 75%)	In: 5A, Imax: 10A 0.1In: 500mA, Start-up current: 5mA Un: $400/690V_{L-L}$ (AV5) Un: $120/208V_{L-L}$ (AV6) 1% FS (FS: 100%) fase: ±2°; Imin: 5mA $_{RMS}$; Imax: 15Ap; Umin: $30V_{RMS}$; Umax: 500Vp
Temperature drift	≤200ppm/°C (A/V), ≤300ppm/°C (all other measurements)
Sampling rate	6400 samples/s @ 50Hz 7680 samples/s @ 60Hz
Display	Graph LCD, backlighted (128x64 dots). Read-out for instantaneous variables: 4x4 digit Total energies: 4x9 digit; Partial energies: 4x9 digit
Display refresh time	100ms
Max. and min. indication	Max. 9999 (999,999,999), Min. -9999 (–999,999,999)
Front LED	Red Blinking light in case of virtual alarm. Fixed light in case of digital output activation (alarm)
Measurements	Current, voltage, power, energy, power factor, frequency, harmonic distortion (see "Display pages"). TRMS measurement of a distorted wave (voltage/current).
Coupling type	Direct
Crest factor	< 3, max 10A peak
Input impedance	
$400/690V_{L-L}$ (AV5)	1.77 MΩ ±5%
$120/208V_{L-L}$ (AV6)	885 kΩ ±5%
Current	≤ 0.01Ω
Frequency	40 to 440 Hz
Overload (maximum values)	
Permanent: voltage/current	AV5: $460V_{LN}$, $800V_{LL}$/10A AV6: $145V_{LN}$, $250V_{LL}$/10A
For 500ms: voltage/current	AV5: $800V_{LN}$, $1380V_{LL}$/36A AV6: $240V_{LN}$, $416V_{LL}$/36A

Output specifications

Analogue outputs (on request)	
Number of outputs	Fino a 8 (max 4 x 20mA + 4 x 10VDC o 4 x 20mA o 8 x 10VDC o 8 x ±5mA)
Accuracy (@ 25°C ±5°C, R.H. ≤60%)	±0.1%FS (20mA o 10VCC) ±0.3%FS (±5mA), FS=10mA
Range	0 ÷ 20mA o 0 ÷ 10 VCC o ±5mA
Scaling factor:	Programmable within the whole range of retransmission; it allows the retransmission management of all values from: 0 and 20 mA, 0 and 10VDC, or -5mA and +5mA
Response time	400 ms typical (filter excluded)
Ripple	≤1% (according to IEC 60688-1, EN 60688-1)
Total temperature drift	≤ 500 ppm/°C
Load : 20 mADC	≤ 350 Ω
10 VDC	≥ 10kΩ
±5 mA	≤ 1400Ω
Insulation	see “insulation between inputs and outputs” table
Optical communication port	According to ANSI C12.18
RS422/RS485 port (on request)	Multidrop bidirectional (static and dynamic variables)
Connections	2 or 4 wires, max. distance 1000m, termination directly on the module . Addresses: from 1 to 247, selectable by key-pad.
Protocol	MODBUS RTU /JBUS,
Data (bidirectional)	
Dynamic (reading only)	All display variables (see also the table “List of the variables that can be connected to”...)
Static (writing only)	All configuration parameters, reset of energy, activation of digital output
Stored energy	(EEPROM) max. 999.999.999 kWh/kvarh
Data format	1-start bit, 8-data bit, no parity/even parity, odd parity, 1 stop bit
Baud rate	9.6k, 19.2k, 38.4k, 115.2k bit/s selectable bauds
Insulation	see “Insulation between inputs and outputs” table
RS232 port (on request)	Bidirectional (static and dynamic variables)
Connections	3 wires, max. distance 15m,
Data format	1-start bit, 8-data bit, no parity, even parity, odd parity, 1 stop bit
Baud-rate	9.6k bit/s
Protocol	MODBUS RTU /JBUS
Other data	as for RS422/485

Digital outputs (on request)	
Pulse type	
Number of outputs	Up to 16
Type	Programmable from 0.001 to 1000 pulses per kWh/kvarh (total and partial) Outputs connectable to the total and/or partial energy meters (Wh/varh)
Pulse duration ≥	100ms, < 120msec (ON), 100ms (OFF) according to EN62053-31
Alarm type	
Number of outputs	up to 16, independent
Alarm modes	Up alarm, down alarm, in window alarm, out window alarm. All of them can be used with start up deactivation function and/or latch. All the alarms can be connected to all variables (see the table “List of the variables that can be connected to”).
Set-point adjustment	from 0 to 100% of the electrical scale
Hysteresis	from 0 to full scale
On-time delay	0 to 255s
Output status	Selectable; normally de-energised and normally energised
Min. response time	≤200ms, filters excluded, Set-point on-time delay: “0 s”
Note	The 16 digital outputs can also work as combination of pulse outputs and alarm outputs.
Static (digital) outputs	**(on request)**
Purpose	For pulse outputs or for alarm outputs
Signal	V_{ON} 1.2 VDC/ max. 100 mA V_{OFF} 30 VDC max.
Insulation	see “Insulation between inputs and outputs” table
Relay (digital) outputs	**(on request)**
Purpose	For alarm outputs or for pulse outputs
Output type	Relay SPDT AC 1-8A, 250VAC DC 12-5A, 24VDC AC 15-2.5A, 250VAC DC 13-2.5A, 24VDC
Insulation	see “Insulation between inputs and outputs” table

Software functions

Password	Numeric code of max 4 digits from 0 to 1000; 2 protection levels of the programming data
1st level	Password “0”: no protection
2nd level	Password from 1 to 1000: all data are protected.
System selection	
System 1	1-phase (2 wires)
System 2, unbalanced	2-phase (3 wires)
System 3, balanced	3-phase (3 wires+1CT)
System 3, unbalanced	3-phase (3 wires) 3-phase (4 wires)
Transformer ratio	CT up to 60 kA (6000 max) VT (PT) up to 600 kV (6000 max)
Filters	
Filter operating range	0.1 to 100% of the input electrical scale.
Filtering coefficient	1 to 255
Filter action	Display, alarms, serial outputs (fundamental variables: V, A, W and their derived ones).
Alarms	
Working mode	“OR” or “AND” or “OR+AND” functions (see “Alarm parameter and logic” page). Freely programmable on up to 16 alarms. The alarms can be connected to any variables available in the table “List of the variables that can be connected to”

Reset	By means of the key-pad or of the configuration software, it is possible to reset the following data: - all the min, max, dmd, dmd-max values. - total and partial counters. - latch alarms. - all the events.
Data stamping	
Type of data	Alarm, min, max, digital input status, digital output status as remote control, resets. All events are stored with date (dd:MM:yy) and hour (hh:mm:ss) reference
Number of events	Up to 10.000
Data management type	FIFO
Data storage type	Data flash
Displaying	4 variables per page 1 page that can be laid out by the user Up to 36 pages
Energy meters	Up to 28 pages depending on the selected tariff mode. Displaying of the consumed energy of the previous 12 months.
Stored events	10,000 events.
Display language	Selectable: English, Italian, French, German, Spanish

Wm5Soft parameter programming and variable reading software

Wm5Soft	Multi-language software (Italian, English, French, German, Spanish) for variable reading, instrument calibration and parameters programming. The program runs under Windows/98/98SE/2000/NT/XP.
Working mode	Three different working modes can be selected: - management of local

	RS232 (MODBUS); - management of local optical port (MODBUS); - management of a local RS485 network (MODBUS);
Data Storing	In pre-formatted XLS files (Excel data base).
Data Transfer	Manual or automatic at programmable timings.

Time period management

Meters	
Total	4 (9-digit)
Partial and multitariff	48 (9-digit)
Tariffs	Up to 12
Time periods	
Number of periods	Up to 24 per day Up to 100 different days per year
Pulse output	Connectable to total and/or partial meters (multitariff)
Energy meter recording	Consumption history by recording of the monthly energy meters (12 previous months). Recording of total and partial energy meters. Energy meter recording (EEPROM) Max.999.999.999kWh/kvarh.

Energy Meters	
Total energy meters	4 (+kWh, +kvarh, -kWh, -kvarh) It is possible to divide each energy meter here above listed in 3 additional energy meters (1 for each phase "L1-L2-L3")
Monthly energy meters	48 (energy meters for each month: "+kWh, +kvarh, -kWh, -kvarh")
Partial energy meters	16 (using digital inputs: max 4 tariffs). 48 (using the internal clock: max 12 tariffs)

Harmonic distortion analysis

Analysis principle	FFT
Harmonic measurement	
Current	Up to the 63rd harmonic
Voltage	Up to the 63rd harmonic
Type of harmonics	THD (V_{L1} and V_{L1-N}) THD odd (V_{L1} and V_{L1-N}) THD even (V_{L1} and V_{L1-N}) The same for the other phases: L2, L3. THD (A_{L1}) THD odd (A_{L1}) THD even (A_{L1}) The same for the other phases: L2, L3.
Harmonic phase angle	The instrument measures the angle between the single harmonic of "V" and the single harmonic of "I" of the same order. According to the value of the electrical angle, it is possible to know if the distortion is absorbed or generated.

	Note: if the system has 3 wires the angle cannot be measured.
Harmonic details	The harmonic contents is displayed as a graph showing the whole harmonic spectrum. This value is also given as a numerical information: THD % / RMS value THD even % / RMS value THD odd% / RMS value single harmonics in % / RMS value
System	The harmonic distortion can be measured in single-phase, 3-wire or 4-wire systems. Tw: 0.02 sec@50Hz without filter

General Specifications

Operating temperature	-10° to +45°C (14° to 113°F) (R.H. < 90% non-condensing)
Limit range of operating temp.	-20° to +55°C (-4° to 131°F) (R.H. <90% non-condensing)
Storage temperature	-30° to +60°C (-4° to 140°F) (R.H. < 90% non-condensing)
Installation category	III
Pollution degree	2
Altitude	up to 2000m (6560 feet) above sea-level
Insulation reference voltage	300 V_{RMS} to ground (AV5 input)
Dielectric strength	4kVAC$_{RMS}$ (for 1 min)
Noise Rejection CMRR	100 dB, 48 to 62 Hz
EMC Emissions	EN61000-6-3, EN60688 residential environment, commerce and light industry
	ANSI/IEEE C37.90-1989 (surge, withstand and fast transient test)
Pulse voltage (1.2/50µs)	EN61000-4-5
Safety standards	IEC60664, IEC61010-1 EN60664, EN61010-1
Measurement standards ANSI C12.20, ANSI C12.1	IEC60688, EN60688, EN62053-22, EN62053-23,
Approvals	CE, cURus and CSA
Connections 5(6) A	Screw-type max. 2.5 mm^2 wires (2x 1.5mm^2)
Housing Dimensions Material	96x96x140 mm ABS, self-extinguishing: UL 94 V-0
Protection degree	Front: IP65 / NEMA 4x
Weight	Approx. 600 g (packing included)

Supply Specifications

AC/DC voltage	90 to 260V (standard) 18 to 60V (on request)
Power consumption	≤ 30VA/12W (90 to 260V) ≤ 20VA/12W (18 to 60V)

Revenue Approval Settings

- The access to the programming parameters via front key pad and/or serial communication ports is locked.
- The front key pad (up and down keys) allows the displaying of the variables only, while the communication ports allows the transmission of the variables only.
- A proper “instrument settings” form must be filled up by the user before equipment supplying.
- WM5-96 is supplied with the desired modules plugged and sealed in the proper slots.
- WM5-96 fulfils: the ANSI/IEEE C12.20-1998 requirements;
  the CAN3-C17-M84 requirements;
  and can be certified according to:
  C12.20-1998, class 0.5 (independent labs);
  AE-0924 Industry Canada Approval.

Function Description

Input and output scaling capability.
Working of the analogue outputs (y) versus input variables (x)

Figure A
The sign of measured quantity and output quantity remains the same. The output quantity is proportional to the measured quantity.

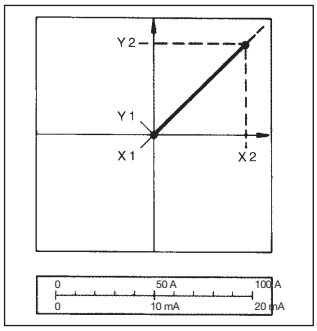


Figure B
The sign of measured quantity and output quantity changes simultaneously. The output quantity is proportional to the measured quantity.

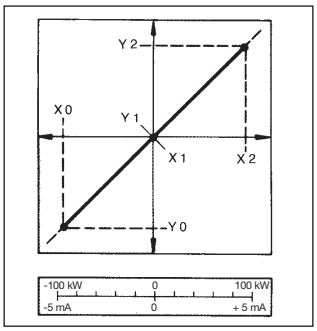


Figure C
The sign of measured quantity and output quantity remains the same. On the range X0...X1, the output quantity is zero. The range X1...X2 is delineated on the entire output range Y0 = Y1...Y2 and thus presented in strongly expanded form.

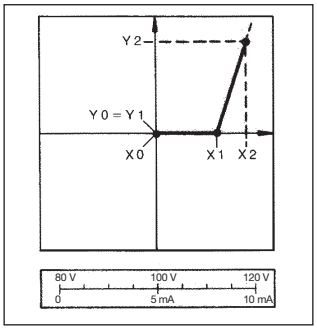


Figure D
The sign of measured quantity and output quantity remains the same. With the measured quantity being zero, the output quantity already has the value Y1 = 0.2 Y2.
Live zero output.

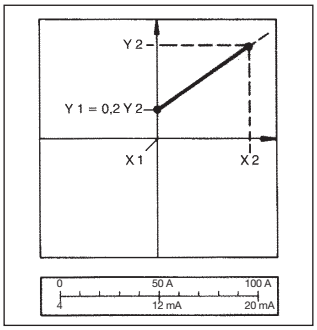


Figure E
The sign of the measured quantity changes but the one of the output quantity remains the same. The output quantity steadily increases from value X1 to value X2 of the measured quantity.

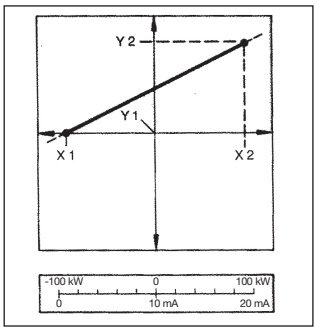
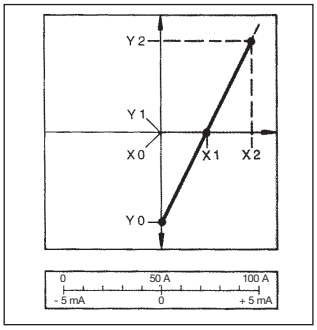


Figure F
The sign of the measured quantity remains the same, the one of the output quantity changes as the measured quantity leaves range X0...X1 and passes to range X1...X2 and vice versa.

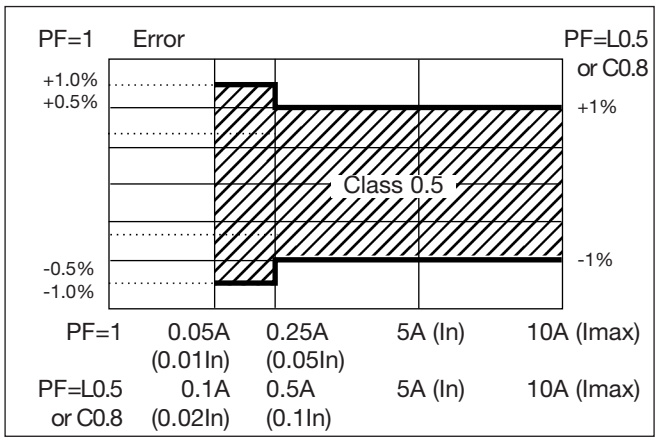


Insulation between inputs and outputs

	Meas. /digital inputs	Relay output	Open colllector	Analogue out. 10V, 20mA	Analogue out. ±5mA	AR1034	AR2040	AR1039	90-260VAC/DC	18-60VAC/DC
Meas. /digital inputs	-	4kV	4kV	2kV	2kV	4kV	2kV	4kV	4kV	4kV
Relay output	4kV	4kV (*)	4kV	4kV	4kV	4kV	4kV	4kV	4kV	4kV
Open collector	4kV	4kV	4kV (*)	4kV	4kV	4kV	4kV	4kV	4kV	4kV
Analogue out. 10V, 20mA	2kV	4kV	4kV	4kV (*)	4kV	4kV	4kV	4kV	4kV	4kV
Analogue out. ±5mA	2kV	4kV	4kV	4kV	200V (**)	4kV	4kV	4kV	4kV	4kV
AR1034	4kV	4kV	4kV	4kV	4kV	-	-	4kV	4kV	4kV
AR2040	2kV	4kV	4kV	4kV	4kV	-	-	4kV	4kV	4kV
AR1039	4kV	4kV	4kV	4kV	4kV	4kV	4kV	-	4kV	4kV
90-260VAC/DC	4kV	4kV	4kV	4kV	4kV	4kV	4kV	4kV	-	-
18-60VAC/DC	4kV	4kV	4kV	4kV	4kV	4kV	4kV	4kV	-	-

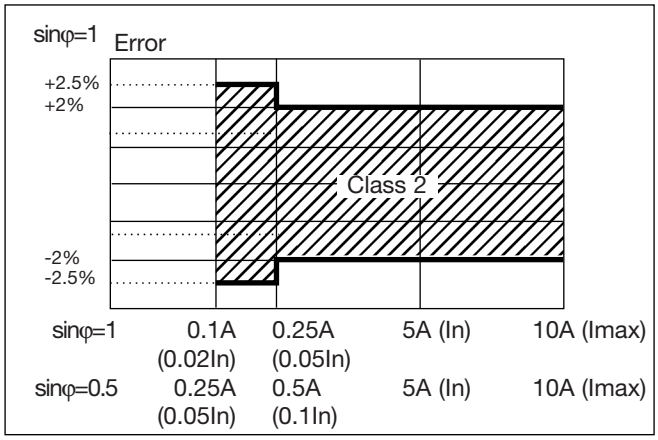
NOTE: In case of fault of first insulation the current from the measuring inputs to the ground is lower than 2 mA.
(*) The given insulation is granted among outputs plugged in different slots. The modules equipped with two or four outputs have therefore non insulation among the outputs. **(**)** Insulation between the 2 outputs of the same module is 200V for 1 min.

Accuracy



kWh, accuracy (RDG) depending on the current

Class 0.5 accuracy limits (active energy) EN62053-21
5(10A) start-up current: 5mA.



kvarh, accuracy (RDG) depending on the current

Class 2 accuracy limits (reactive energy) EN62053-23
5(10A) start-up current: 5mA.

Used calculation formulas

Phase variables

Instantaneous effective voltage

$$V_{1N} = \sqrt{\frac{1}{n} \cdot \sum_{1}^{n} (V_{1N})_i^2}$$

Instantaneous active power

$$W_1 = \frac{1}{n} \cdot \sum_{1}^{n} (V_{1N})_i \cdot (A_1)_i$$

Instantaneous power factor

$$\cos\phi_1 = \frac{W_1}{VA_1}$$

Instantaneous effective current

$$A_1 = \sqrt{\frac{1}{n} \cdot \sum_{1}^{n} (A_1)_i^2}$$

Instantaneous apparent power

$$VA_1 = V_{1N} \cdot A_1$$

Instantaneous reactive power

$$VAr_1 = \sqrt{(VA_1)^2 - (W_1)^2}$$

System variables

Equivalent three-phase voltage

$$V_\Sigma = \frac{V_{12} + V_{23} + V_{31}}{3}$$

Voltage asymmetry

$$ASY_{LL} = \frac{(V_{LL\,max} - V_{LL\,min})}{V_{LL\,\Sigma}}$$

$$ASY_{LN} = \frac{(V_{LN\,max} - V_{LN\,min})}{V_{LN\,\Sigma}}$$

Three-phase reactive power

$$VAr_\Sigma = (VAr_1 + VAr_2 + VAr_3)$$

Neutral current

$$An = \overline{A}_{L1} + \overline{A}_{L2} + \overline{A}_{L3}$$

Three-phase active power

$$W_\Sigma = W_1 + W_2 + W_3$$

Three-phase apparent power

$$VA_\Sigma = \sqrt{W_\Sigma^2 + VAr_\Sigma^2}$$

Three-phase power factor (TPF)

$$\cos\phi_\Sigma = \frac{W_\Sigma}{VA_\Sigma}$$

Energy metering

$$kWh_i = \int_{t_1}^{t_2} P_i(t)\,dt \cong \Delta t \sum_{n_1}^{n_2} P_{n,i}$$

$$kVarh_i = \int_{t_1}^{t_2} Q_i(t)\,dt \cong \Delta t \sum_{n_1}^{n_2} Q_{n,i}$$

Where:

i= considered phase (L1, L2 or L3)
P= active power; **Q**= reactive power;
t_1, t_2 =starting and ending time points of consumption recording; **n**= time unit;Δ**t**= time interval between two successive power measurements;
n_1, n_2 = starting and ending discrete time points of power recording

List of the variables that can be connected to:

Analogue outputs (all listed variables with the only exception of energies), alarm outputs (all listed variables with the only exception of energies), pulse outputs (only energies), communication (all listed variables).

No.	1-phase	2-ph. 3-wire system	3-ph. 4-wire system	3-ph. 3-wire bal. (1 CT)	3-ph. 4-wire unbal. sys.	Notes unbal. sys.	
1	V L1	x	x	x	o	x	
2	V L2	o	x	x	o	x	
3	V L3	o	o	x	o	x	
4	V L-N sys	o	x	x	o	x	Sys = system = Σ
5	V L1-2	o	x	x	x	x	
6	V L2-3	o	o	x	x	x	
7	V L3-1	o	o	x	x	x	
8	V L-L sys	o	o	x	x	x	Sys = system = Σ
9	A L1	x	x	x	x	x	
10	A L2	o	x	x	x	x	
11	A L3	o	o	x	x	x	
12	An	o	x	x	o	x	An=neutral current
13	W L1	x	x	x	x	x	
14	W L2	o	x	x	x	x	
15	W L3	o	o	x	x	x	
16	W sys	o	x	x	x	x	
17	var L1	x	x	x	x	x	
18	var L2	o	x	x	x	x	
19	var L3	o	o	x	x	x	
20	var sys	o	x	x	x	x	Sys = system = Σ
21	VA L1	x	x	x	x	x	
22	VA L2	o	x	x	x	x	
23	VA L3	o	o	x	x	x	
24	VA sys	o	x	x	x	x	Sys = system = Σ
25	PF L1	x	x	x	x	x	
26	PF L2	o	x	x	x	x	
27	PF L3	o	o	x	x	x	
28	PF sys	o	x	x	x	x	Sys = system= Σ
29	Hz	x	x	x	x	x	
30	ASY VL-N	o	x	x	o	x	Asymmetry of phase-neutral
31	ASY VL-L	o	o	x	x	x	Asymmetry of phase-phase
32	THD V1	x	x	x	o	x	
33	THD V2	o	x	x	o	x	
34	THD V3	o	o	x	o	x	
35	THD V1-2	o	x	x	x	x	
36	THD V2-3	o	o	x	x	x	
37	THD V3-1	o	o	x	x	x	
38	THD A1	x	x	x	x	x	
39	THD A2	o	x	x	x	x	
40	THD A3	o	o	x	x	x	
41	THDo V1	x	x	x	o	x	
42	THDo V2	o	x	x	o	x	
43	THDo V3	o	o	x	o	x	
44	THDo V1-2	o	x	x	x	x	
45	THDo V2-3	o	o	x	x	x	
46	THDo V3-1	o	o	x	x	x	
47	THDo A1	x	x	x	x	x	
48	THDo A2	o	x	x	x	x	
49	THDo A3	o	o	x	x	x	
50	THDe V1	x	x	x	o	x	
51	THDe V2	o	x	x	o	x	
52	THDe V3	o	o	x	o	x	
53	THDe V1-2	o	x	x	x	x	
54	THDe V2-3	o	o	x	x	x	
55	THDe V3-1	o	o	x	x	x	
56	THDe A1	x	x	x	x	x	
57	THDe A2	o	x	x	x	x	
58	THDe A3	o	o	x	x	x	
59	Phase seq.	o	o	x	x	x	Phase sequence

(x) = available (o) = not available

WM5-96 User's Page

Customer's data:

Serial number WM5 96:

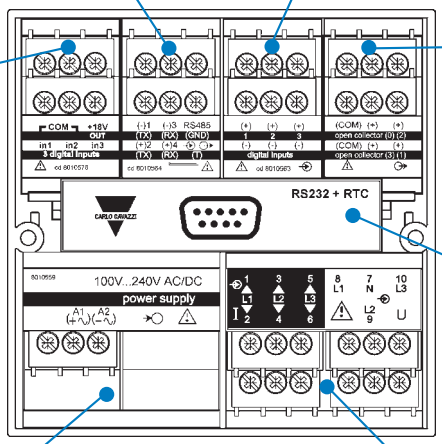
Note:

Slot A
- ☐ Empty
- ☐ AQ1038
- ☐ AQ1042
- ☐ AO1037
- ☐ AO1036
- ☐ AO1059
- ☐ AO1058
- ☐ AO2050
- ☐ AO2051
- ☐ AO2052

Slot B
- ☐ Empty
- ☐ AQ1038
- ☐ AQ1042
- ☐ AO1037
- ☐ AO1036
- ☐ AO1059
- ☐ AO1058
- ☐ AO2050
- ☐ AO2051
- ☐ AO2052
- ☐ AR1034
- ☐ AR2040

Slot C
- ☐ Empty
- ☐ AQ1038
- ☐ AQ1042
- ☐ AO1037
- ☐ AO1036
- ☐ AO1059
- ☐ AO1058
- ☐ AO1035
- ☐ AO2051
- ☐ AO2052

Slot D
- ☐ Empty
- ☐ AQ1038
- ☐ AQ1042
- ☐ AO1037
- ☐ AO1036
- ☐ AO1059
- ☐ AO1058
- ☐ AO1035
- ☐ AO2051
- ☐ AO2052



Slot E
- ☐ Empty
- ☐ AR1039

Power supply
- ☐ AP1021
- ☐ AP1020

Measuring inputs
- ☐ AQ2030
- ☐ AQ2031

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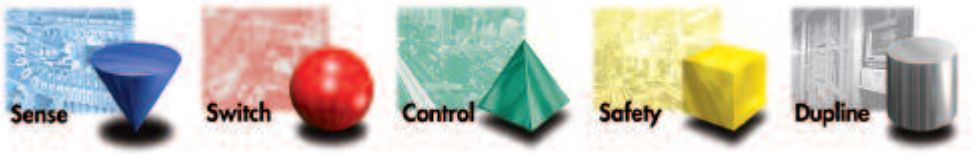

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WM5 96 PQT90 H

Three Phase power analyser
Input output instruction sheet

WM5 96 PQT90 H
IM ML CONN 040706
Cod. 8020688

Carlo Gavazzi Controls SpA,
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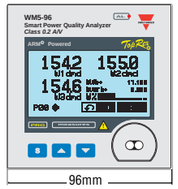

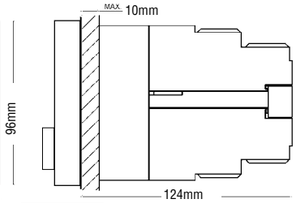

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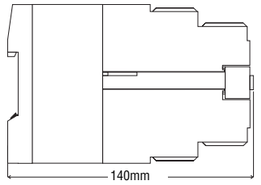

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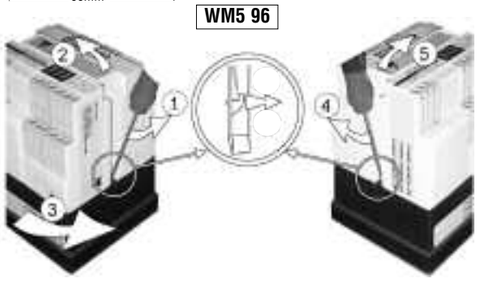

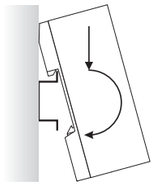

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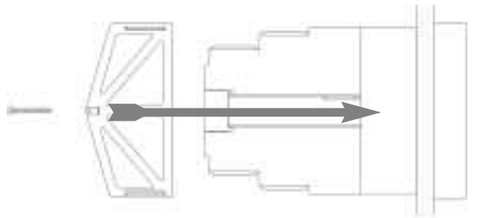

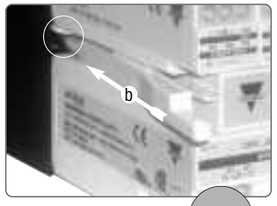

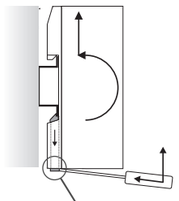

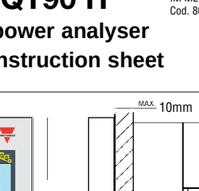

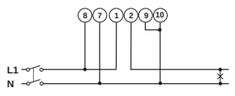

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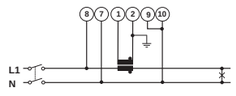

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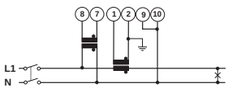

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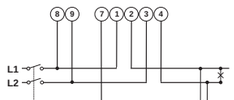

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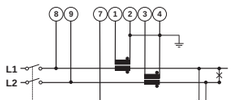

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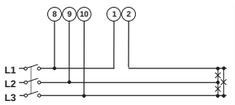

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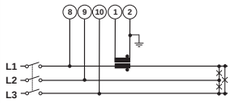

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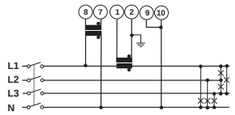

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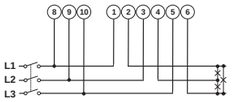

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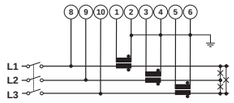

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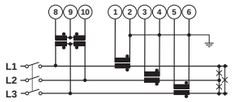

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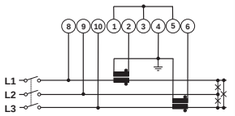

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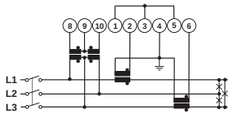

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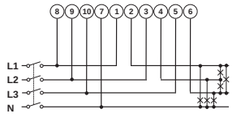

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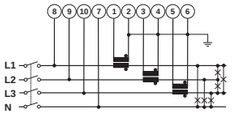

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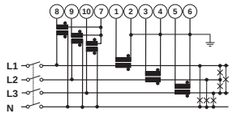

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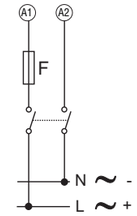

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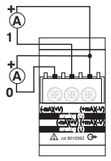

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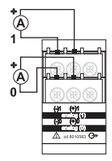

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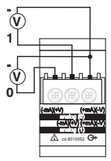

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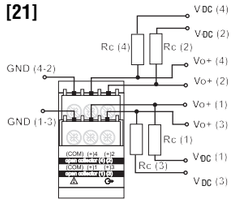

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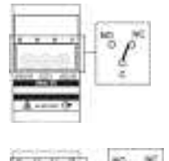

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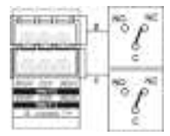

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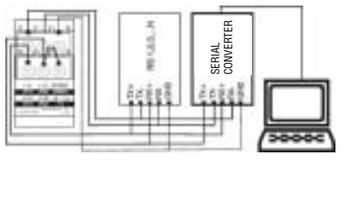

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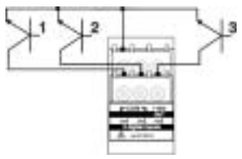

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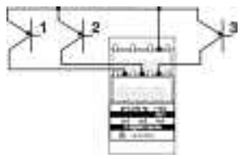

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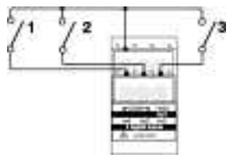

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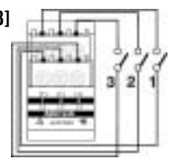

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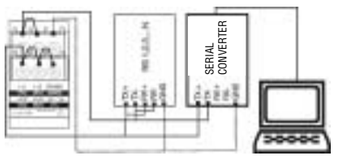

[24b]

ENGLISH

1-phase, 2-wire input connection (1P):
[1]-Direct connection; **[2]**- CT connection; **[3]**- CT and VT connections
2-phase, 3-wire input connections (2P):
[4]-Direct connection; **[5]**- CT connection
3-phase, 3-wire input connections - Balanced load (3P):
[6]-Direct connection; **[7]**- CT connections;
3-phase, 4-wire input connections - Balanced load (3P+N):
[8]-CT and VT connections
3-phase, 3-wire input connections - unbalanced load (3P):
[9]-Direct connection; **[10]**- CT connection; **[11]**-CT and VT connections
[12]-ARON connection from CT; **[13]**- ARON connections from CT and VT
3-phase, 4 wires input connections - Unbalanced load (3P+N):
[14]-Direct connection; **[15]**- CT connection; **[16]**-CT and VT connections

[17]- Power supply connection (F=1.25A T)
[18]- 2 analogue outputs (0-20mA)
[19]- 2 analogue outputs (+/-5mA)
[20]- 2 analogue outputs (10V)
[21]- 4 open collector output connection AO1037: This wiring diagram is valid also for the open collector module with one or two outputs. The load resistances (Rc) must be designed so that the close contact current is lower than 100mA; the VDC voltage must be lower than or equal to 30VDC.
[22]- 1 relay output
[23]- 2 relay outputs
[24a]- 4-wire connection of RS485 serial port **[24b]**- 2-wire connection of RS 485 serial port. **Note:** RS422/485 additional devices provided with RS422/485 (that is RS 1, 2, 3...N) are connected in parallel. The termination of the serial output is carried out only on the last instrument of the network, by means of a jumper between (RX+) and (T).
[25]- Digital input AQ1042 NPN connection
[26]- Digital input AQ1042 PNP connection
[27]- Digital input AQ1042 contacts connection
[28]- Digital input AQ1038 contacts connection

[A]- To seal the instrument, first insert the locking devices (b) as shown in figure "A", then apply the seals (c).

ITALIANO

Connessione monofase 2 fili (1P):
[1]-connessione diretta; **[2]**- connessione da TA; **[3]**- connessione da TA e TV
Connessione bifase, 3 fili (2P):
[4]-connessione diretta; **[5]**- connessione da TA;
Connessione trifase 3 fili - Carico bilanciato:
[6]-connessione diretta; **[7]**- Connessione da TA;
Connessione trifase, 4 fili - Carico bilanciato (3P+N):
[8]-connessione CT e TV
Connessione trifase 3 fili - Carico sbilanciato (3P):
[9]-connessione diretta; **[10]**- connessione da TA; **[11]**- connessione da TA e TV
[12]-connessione ARON da TA; **[13]**- connessione ARON da TA e TV
Connessione trifase 4 fili - Carico sbilanciato (3P+N):
[14]-connessione diretta; **[15]**- connessione da TA; **[16]**- connessione da TA e TV

[17]- Alimentazione (F=1,25A T)
[18]- Doppia uscita analogica (0-20mA)
[19]- Doppia uscita analogica (+/-5mA)
[20]- Doppia uscita analogica (10V)
[21]- 4 uscita a collettore aperto AO1037: questo schema è valido anche per i moduli a collettore aperto con meno uscite. Le resistenze di carico (Rc) devono essere dimensionate in modo che la corrente a contatto chiuso sia inferiore a 100mA; la tensione VCC deve essere minore o uguale a 30VCC.
[22]- 1 uscita a relè
[23]- Doppia uscita a relè
[24a]- connessione a 4 fili porta seriale RS485 **[24b]**- connessione a 2 fili porta seriale RS485. **Note:** ulteriori dispositivi provvisti di porta RS485 (indicato come RS1,2,3...N) sono collegati in parallelo. La terminalizzazione della porta seriale viene eseguita solo sull'ultimo strumento della rete, tramite ponticello tra (Rx+) e (T).
[25]- Ingresso digitale AQ1042 connessione NPN
[26]- Ingresso digitale AQ1042 connessione PNP
[27]- Ingresso digitale AQ1042 connessione a contatti
[28]- Ingresso digitale AQ1038 connessione a contatti

[A]- Per la sigillatura dello strumento infilare gli appositi dispositivi di bloccaggio (b) come mostrato in figura "A", quindi applicare i sigilli (c).

DEUTSCH

1-Phasen, 2 Leiteranschluss (1P):
[1]-Direkter Anschluss; **[2]**- St.W. Anschluss; **[3]**- St.W. und Sp.W. Anschluss
2-Phasen, 3 Leiteranschluss (2P):
[4]-Direkter Anschluss; **[5]**- St.W. Anschluss;
3-Phasen, 3 Leiter - symmetrische Last:
[6]-Direkter Anschluss; **[7]**- St.W. Anschluss;
3-Phasen, 4 Leiter- symmetrische Last (3P+N):
[8]-St.W. und Sp.W. Anschluss;
3-Phasen, 3 Leiter unsymmetrische Last (3P):
[9]-Direkter Anschluss; **[10]**- St.W. Anschluss; **[11]**- St.W. und Sp.W. Anschluss
[12]- ARON, St.W. Anschluss; **[13]**- ARON, St.W. und Sp.W. Anschluss
3-Phasen, 4 Leiter - unsymmetrische Last (3P+N):
[14]-Direkter Anschluss; **[15]**- St.W. Anschluss; **[16]**- St.W. und Sp.W. Anschluss

[17]- Stromversorgung (F=1,25A T)
[18]- Zweifach analog Ausgangsmodul (0-20mA)
[19]- Zweifach analog Ausgangsmodul (+/-5mA)
[20]- Zweifach analog Ausgangsmodul (10V)
[21]- 4fach open Kollektor Ausgang AO1037: dieser Schaltplan ist auch für Module mit weniger Ausgängen gültig. Die Lastwiderstände (RC) müssen so ausgelegt sein, dass der Strom des geschlossenen Ausgangs kleiner als 100mA ist; die VDC-Spannung muss kleiner oder gleich 30VDC sein.
[22]- 1 Relaisausgang
[23]- Zweifach Relaisausgang
[24a]- 4-Leiter RS485 Anschluss **[24b]**- 2-Leiter RS485 Anschluss. **Hinweis:** zusätliche an RS485 (d.h. 1,2,3...N) angeschlossenen Geräte werden parallel geschaltet. Das Ende des seriellen Ausgangs wird erst am letzten Gerät des Netzwerks mittels eines Jumpers zwischen (Rx+) und (T) eingerichtet.
[25]- AQ1042 digitale Eingangsmodule, NPN Anschluss
[26]- AQ1042 digitale Eingangsmodule, PNP Anschluss
[27]- AQ1042 digitale Eingangsmodule, Anschluss mittels Kontakten
[28]- AQ1038 digitale Eingangsmodule, Anschluss mittels Kontakten

[A]- Um das Instrument zu versiegeln, zuerst Verriegelungsvorrichtung (b) einsetzen, wie in Abbildung "A" gezeigt, danach Siegel anbringen (c).

FRANÇAIS

Connexion d'entrée, 1 Phase, 2 fils (1P):
[1]-Connexion directe; **[2]**- Connexion TI; **[3]**- Connexion TI et TT
Connexion d'entrée, 2 Phases, 3 fils (2P):
[4]-Connexion directe; **[5]**- Connexion TI;
Connexion d'entrée, 3 Phases, 3 fils - Charge équilibrée:
[6]-Connexion directe; **[7]**- Connexion TI;
Connexion d'entrée, 3 Phases, 4 fils - Charge équilibrée (3P+N):
[8]-Connexion TI et TT
Connexion d'entrée, 3 Phases, 3 fils - Charge déséquilibrée (3P):
[9]-Connexion directe; **[10]**- Connexion TC; **[11]**- Connexion TI et TT
[12]-Connexion ARON TI; **[13]**- Connexion ARON TI et TT
Connexion d'entrée, 3 Phases, 4 fils - Charge déséquilibrée (3P+N):
[14]-Connexion directe; **[15]**- Connexion TI; **[16]**- Connexion TI et TT

[17]- Module d'alimentation (F=1,25A T)
[18]- Sortie analogique double (0-20mA)
[19]- Sortie analogique double (+/-5mA)
[20]- Sortie analogique double (10V)
[21]- 4 sortie à collecteur ouvert AO1037: ce schéma est aussi valable pour le module à une ou deux sorties à collecteur ouvert. Les résistances de charge (Rc) doivent être calculées de manière que le courant de fermeture des contacts soit inférieure à 100 mA; la tension VCC doit être inférieure ou égale à 30VCC.
[22]- 1 sortie relais
[23]- 2 sorties relais
[24a]- Connexion à 4 fils port série RS485 **[24b]**- Connexion à 2 fils porte série RS485. **Remarque:** les périphériques complémentaires fournis avec RS485 (soit RS1,2,3...N) sont raccordés en parallèle. La sortie série est bouclé exclusivement sur le dernier instrument du réseau, au moyen d'un cavalier monté entre (Rx+) et (T).
[25]- Entrée logique AQ1042, connexion NPN
[26]- Entrée logique AQ1042, connexion PNP
[27]- Entrée logique AQ1042, connexion par contacts
[28]- Entrée logique AQ1038, connexion par contacts

[A]- Pour sceller l'instrument, insérer en premier les tiges métalliques (b), comme indiqué sur le dessin "A" puis appliquer les plombs (c).

ESPAÑOL

Conexión de entrada, sistema monofásico, 2 hilos (1P):
[1]-conexión directa; **[2]**- conexión mediante CT; **[3]**- conexión mediante CT y VT
Conexión de entrada, sistema bifásico, 3 hilos (2P):
[4]-conexión directa; **[5]**- conexión mediante CT;
Conexión de entrada, sistema trifásico, 3 hilos - Carga equilibrada:
[6]-conexión directa; **[7]**- conexión mediante CT;
Conexión de entrada, sistema trifásico, 4 hilos - Carga equilibrada (3F+N):
[8]-conexión mediante CT y VT
Conexión de entrada, sistema trifásico, 3 hilos - Carga desequilibrada (3F):
[9]-conexión directa; **[10]**- conexión mediante CT; **[11]**- conexión mediante CT y VT
[12]-conexión ARON mediante CT; **[13]**- conexión ARON mediante CT y VT
Conexión de entrada, sistema trifásico, 4 hilos - Carga desequilibrada (3F+N):
[14]-conexión directa; **[15]**- conexión mediante CT; **[16]**- conexión mediante CT y VT

[17]- Módulo de alimentación (F=1,25A T)
[18]- Módulo con dos salidas analógicas (0-20mA)
[19]- Módulo con dos salidas analógicas (+/-5mA)
[20]- Módulo con dos salidas analógicas (10V)
[21]- 4 salidas de colector abierto AO1037: este diagrama de conexiones vale también para los módulos de colector abierto con una o dos salidas. Las resistencias de carga (RC) deben estar calculadas de manera que la intensidad a contacto cerrado sea inferior a 100 mA; la tensión VCC debe ser inferior o igual a 30VCC.
[22]- 1 salida de relé
[23]- 2 salidas de relé
[24a]- Conexión 4 hilos puerto serie RS485 **[24b]**- Conexión 2 hilos puerto serie RS485. **Nota:** Los equipos con conexión RS485 (RS1,2,3...N) se conectan en paralelo y únicamente es necesario realizar un puente entre (Rx+) y (T).
[25]- Entrada digital AQ1042 conexión NPN
[26]- Entrada digital AQ1042 conexión PNP
[27]- Entrada digital AQ1042 conexión mediante contactos
[28]- Entrada digital AQ1038 conexión mediante contactos

[A]- Para precintar el instrumento, primero inserte los dispositivos de cierre (b) como se muestra en la figura A, a continuación coloque los precintos (c).

ENGLISH

Read carefully the instruction manual. If the instrument is used in a manner not specified by the producer, the protection provided by the instrument may be impaired. **Maintenance:** make sure that the connections are correctly carried out in order to avoid any malfunctioning or damage to the instrument. To keep the instrument clean, use a slightly damp cloth; do not use any abrasives or solvents. We recommend to disconnect the instrument before cleaning it.

INPUT SPECIFICATIONS.

Number of analogue inputs: Current 1 (1-phase; system code: 3); 3 (3-phase; system code: 3); Voltage 1 (1-phase; system code: 3); 4 (3-phase; system code: 3). **Digital inputs (on request):** Up to 12. AQ1038 No. of inputs: 3 (voltage-free). Purpose: “dmd” measurements synchronisation. Tariff selection: energy. Contact status reading. Clock synchronisation. Contact measuring current <8mA/ 17.5 to 25VDC. AQ1042. Number of inputs: 3 + excitation output. Purpose: “dmd” measurements synchronisation. Tariff selection: energy. Contact status reading. Clock synchronisation. Excitation output: 16V<+Aux<24VDC Max 15mA. Contact measuring current: 15mA. Common characteristics: Close contact resistance: Max 1kΩ. Open contact resistance: Min 100kΩ. Insulation: see “Insulation between inputs and outputs” table. **Accuracy:** (display, RS232, RS485). In: 5A, If.s.: 10A; Un: see voltage ranges below. Current (A_{L1}, A_{L2}, A_{L3}) from 0.05In to Imax, (@20°C ±5°C, R.H. ≤75%); ±(0.2%RDG+2DGT) from 0.01In to 0.05In, ±(0.5%RDG+2DGT), Current (A_n) ±0.5% RDG (0.2 to 2 In); @ 40 to 100 Hz, Voltage (@20°C±5°C, R.H.≤75%); range AV5: 400/690V_{L-L} AC (V_{L-N}: 185 V to 460 V); (V_{L-L}: 320 V to 800 V): ±(0.2%RDG+1DGT); range AV6: 120/208V_{L-L} AC; (V_{L-N}: 45 V to 145 V) (V_{L-L}: 78 V to 250 V): ±(0.2%RDG+1DGT). Includes also: frequency, power supply and output load influences. Frequency: ±0.1% RDG (40 to 440 Hz). Active power and apparent power: 0.05In to Imax, PF 1: ±(0.5%RDG+1DGT); (@ 20°C ± 5°C, R.H. ≤ 75%); 0.01In to 0.05 In, PF 1: ±(1%RDG+1DGT); 0.1In to Imax, PF0.5L, PF 0.8C: ±(0.6%RDG+1DGT); 0.02In to 0.1In,PF0.5L, PF 0.8C: ±(1%RDG+1DGT). Reactive power: (@ 20°C ± 5°C, R.H. ≤ 75%); 0.1In to Imax, senφ 0.5L/C: ±(2%RDG+1DGT), 0.05In to 0.1In, senφ 0.5L/C: ±(2.5%RDG+1DGT); 0.05In to Imax, senφ 1: ±(2%RDG+1DGT); 0.02In to 0.05In, senφ 1: ±(2.5%RDG+1DGT). Energies: (@ 20°C ± 5°C, R.H. ≤ 75%). Active: class 0.5 according to EN62053-22, ANSI C12.20 . Reactive: class 2 according to EN62053-23, ANSI C 12.1 . In: 5A, Imax: 10A; 0.1In: 500mA, Start-up current: 5mA, Un: 400/690V_{L-L} (AV5), Un: 120/208V_{L-L} (AV6). Harmonic distortion: 1% FS (FS: 100%), (@ 20°C ± 5°C, R.H. ≤ 75%), phase: ±2°; Imin: 5mA_{RMS}; Imax: 15Ap; Umin: 30V_{RMS}; Umax: 500Vp. **Temperature drift:** 200ppm/°C (A/V), ≤300ppm/°C (all the other measurements). **Sampling rate:** 6400 samples/s @ 50Hz ; 7680 samples/s @ 60Hz. Display: Graph LCD backlighted (128x64 dots). Read-out for the instantaneous variables: 4x4 digit. Total energies: 4x9 digit; Partial energies: 4x9 digit. **Display refresh time**: 100ms. Max. and min. indication: Max. 9999 (999,999,999), Min. -9999 (–999,999,999). Front LED: Red; Blinking light in case of virtual alarm; Fixed light in case of digital output activation (alarm). **Measurements:** Current, voltage, power, energy, power factor, frequency, harmonic distortion (see “Display Pages”). TRMS measurement of a distorted wave (voltage/current) . Coupling type: Direct. Crest factor: < 3, max 10A peak. **Input impedance:** 400/690V_{L-L} (AV5), 1.77 MΩ ±5%, 120/208V_{L-L} (AV6), 885 kΩ ±5%, Current:≤0.01Ω. Frequency: 40 to 440 Hz. **Overload protection:** (max values). Continuous voltage/current: AV5: 460V_{LN}, 800V_{LL}/10A. AV6: 145V_{LN}, 250V_{LL}/10A. For 500ms: voltage/current AV5: 800V_{LN}, 1380V_{LL}/36A; AV6: 240V_{LN}, 416V_{LL}/36A.

OUTPUT SPECIFICATIONS.

Analogue Outputs (on request): Number of outputs: up to 8 (max 4 x 20mA + 4 x 10VDC or 4 x 20mA + 4 x ±5mA or 8 x 10VDC or 8 x ±5mA). Accuracy (@ 25°C ±5°C, R.H. ≤60%); ±0.1%FS (20mA or 10VDC); ±0.3%FS (±5mA), FS=10mA. Range: 0 to 20mA or 0 to 10 VDC or ±5mA. Scaling factor: programmable within the whole range of retransmission; it allows the retransmission management of all values from: 0 and 20 mA, 0 and 10VDC, or -5mA and +5mA . Response time: 400 ms typical (filter excluded). Ripple: 1% (according to IEC 60688-1, EN 60688-1). Total temperature drift: 500 ppm/°C. Load: 20 mADC, 350 Ω, 10 VDC, 10kΩ±5 mA 1400Ω. Insulation: see “Insulation between inputs and outputs” table. **Optical communication port:** according to ANSI C12.18; **RS422/RS485 port** (**on request**). Multidrop: bidirectional (static and dynamic variables). Connections: 2 or 4 wires, max. distance 1000m, termination directly on the module. Addresses: 1 to 247, selectable by key-pad. Protocol: MODBUS RTU /JBUS, Data (bidirectional): Dynamic (reading only): All display variables (see also the table, “List of the variables that can be connected to”...). Static (writing only): all configuration parameters, reset of energy, activation of digital output. Stored energy (EEPROM) max. 999.999.999 kWh/kvarh. Data format: 1-start bit, 8-data bit, no parity/even parity, odd parity, 1 stop bit. Baud-rate: 9.6k, 19.2k, 38.4k, 115.2k bit/s selectable bauds. Insulation: see “Insulation between inputs and outputs” table.

RS232 output (on request): Bidirectional (static and dynamic variables). Connections: 3 wires, max. distance 15m, Data format: 1-start bit, 8-data bit, no parity, even parity, odd parity, 1 stop bit. Baud-rate: 9.6k bit/s. Protocol: MODBUS RTU /JBUS. Other data: as for RS422/485.

Digital outputs (on request): Pulse type: Number of outputs: up to 16. Type: programmable from 0.001 to 1000 pulses per kWh/kvarh (total and partial). Outputs connectable to the total and/or partial energy meters (Wh/varh). Pulse duration: 100ms, < 120msec (ON), ≥100ms (OFF) according to EN62053-31. Alarm type: Number of outputs: up to 16, independent. Alarm modes: up alarm, down alarm, in window alarm, out window alarm. All of them can be used with start up deactivation function and/or latch. All the alarms can be connected to all variables (see the table “List of the variables that can be connected to”). Set-point adjustment : from 0 to 100% of the electrical scale. Hysteresis: from 0 to full scale. On-time delay: 0 to 255s. Output status: Selectable; normally de-energised and normally energised. Min. response time: 200ms, filters excluded, Set-point on-time delay: “0 s”. **Note**: the 16 digital outputs can also work as combination of pulse outputs and alarm outputs. **Static (digital) outputs (on request):** Purpose: For pulse outputs or for alarm outputs. Signal: V_{ON} 1.2 VDC/ max. 100 mA; V_{OFF} 30 VDC max. Insulation: see “Insulation between inputs and outputs” table. **Relay (digital) outputs (on request)**: Purpose: For alarm outputs or for pulse outputs. Output type: Relay SPDT: AC 1-8A, 250VAC; DC 12-5A, 24VDC; AC 15-2.5A, 250VAC; DC 13-2.5A, 24VDC Insulation: see “Insulation between inputs and outputs” table.

SOFTWARE FUNCTIONS

Password: Numeric code of max 4 digits from 0 to 1000; 2 protection levels of the programming data: 1st level: password “0”: no protection; 2nd level: Password from 1 to 1000: all data are protected. System selection: System 1: 1-phase (2 wires); System 2, unbalanced: 2-phase (3 wires); System 3, balanced: 3-phase (3 wires+1CT); System 3, unbalanced: 3-phase (3 wires); 3-phase (4 wires). **Transformer ratio:** CT up to 30 kA (6000 max) VT (PT) up to 600 kV (6000 max). **Filters:** Filter operating range: 0.1 to 100% of the input electrical scale. Filtering coefficient: 1 to 255. Filter action: Display, alarms, serial outputs (fundamental variables: V, A, W and their derived ones). **Alarms**: Working mode: “OR” or “AND” or “OR+AND” functions (see “Alarm parameter and logic” page). Freely programmable on up to 16 alarms. The alarms can be connected to any variables available in the table “List of the variables that can be connected to”. Reset: By means of the key-pad or of the configuration software, it is possible to reset the following data: - all the min, max, dmd, dmd-max values. - total and partial counters. - latch alarms. - all the events. **Data stamping:** Type of data: Alarm, min, max, digital input status, digital output status as remote control, resets. All events are stored with date (dd:MM:yy) and hour (hh:mm:ss) reference. Number of events: Up to 10,000. Data management type: FIFO. Data storage type: Data flash. **Displaying:** 4 variables per page, 1 page that can be laid out by the user; Up to 36 pages. Energy meters: Up to 28 pages depending on the selected tariff mode. Displaying of the consumed energy of the previous 12 months. Stored events: 10,000 events. **Display language:** Selectable: English, Italian, French, German, Spanish. **Harmonic Analysis:** Analysis principle: FFT. Harmonic measurement. Current: Up to the 63rd harmonic. Voltage: Up to the 63rd harmonic.

GENERAL SPECIFICATIONS

Operating temperature: -10° to +45°C (14° to 113°F) (R.H. < 90% non-condensing). **Limit range of operating temp**.: -20° to +55°C (-4° to 131°F) (R.H. <90% non-condensing). **Storage temperature**: -30° to +60°C (-4° to 140°F) (R.H. < 90% non-condensing). **Installation category**: III. **Pollution degree:** 2. **Altitude:** up to 2000m (6560 feet) above sea-level. **Insulation reference voltage:** 300 VRMS to ground (AV5 input). **Dielectric strength:** 4$kVAC_{RMS}$ (for 1 min). **Noise Rejection:** CMRR, 100 dB, 48 to 62 Hz. **EMC**: Emissions EN61000-6-3, EN60688 residential environment, commerce and light industry. Immunity: EN61000-6-2 industrial environment. ANSI/IEEE C37.90-1989 (surge, withstand and fast transient test) **Pulse voltage (1.2/50μs)** EN61000-4-5. **Safety standards:** IEC60664, IEC61010-1, EN60664, EN61010-1. **Measurement standards:** IEC60688, EN60688, EN62053-22, EN62053-23, ANSI C12.20, ANSI C12.1 **Approvals:** CE, cURus and CSA. **Connections**: 5(6) A, Screw-type: max. 2.5 mm^2 wires (2x1.5mm^2)· **Housing:** Dimensions: 96x96x140 mm. Material: ABS, self-extinguishing: UL 94 V-0 **Protection degree**: Front: IP65 / NEMA 4x. **Weight**: Approx. 600 g (packing included). **Connections:** 5(10)A. Screw-type max. 2.5 mm^2 wires (2x 1.5mm^2). **Housing**: dimensions 96x96x140mm. Material ABS, self-extinguishing: UL 94 V-0. **Protection degree:** front: IP65 / NEMA 4x. Weight Approx. 600 g (packing included).

POWER SUPPLY

AC/DC voltage: 90 to 260V (standard),18 to 60V (on request); **Power consumption:** 30VA/12W (90 to 260V); 20VA/12W (18 to 60V).

ITALIANO

Leggere attentamente il manuale di istruzioni. Qualora l’apparecchio venisse adoperato in un modo non specificato dal costruttore, la protezione prevista dall’apparecchio potrebbe essere compromessa. **Manutenzione:** Per mantenere pulito lo strumento usare un panno inumidito; non usare abrasivi o solventi. Si consiglia di scollegare lo strumento prima di eseguire la pulizia.

CARATTERISTICHE D’INGRESSO.

Numero di ingressi analogici: Corrente 1 (monofase; cod. sistema: 3); 3 (trifase; cod. sistema: 3); Tensione1 (monofase; cod. sistema: 3); 4 (monofase; cod. sistema: 3); **Ingressi digitali (a richiesta):** Fino a 12. AQ1038No. ingressi: 3 (liberi da tensione). Utilizzo: Sincronizzazione misure “dmd”. Selezione tariffa: energia. Lettura stato del contatto. Sincronizzazione dell’orologio. Corrente di lettura contatti: <8mA/ 17.5 ÷ 25VCC. AQ1042: Numero ingressi: 3 + alimentazione AUX. Utilizzo sincronizzazione misure “dmd”. Selezione tariffa: energia. Lettura stato del contatto. Sincronizzazione dell’orologio. Alimentazione AUX: 16V<+Aux<24VCC Max 15mA. Corrente di lettura contatti: 15mA. Caratteristiche comuni: Resistenza per contatto: Max 1kΩ chiuso. Resistenza per contatto: Min 100kΩ aperto. Isolamento: vedere tabella “Isolamento tra ingressi ed uscite”. **Precisione**: (display, RS232, RS485). In: 5A, If.s.: 10A. Un: vedere sotto. Corrente (A_{L1}, A_{L2}, A_{L3}) da 0.05In a Imax: (@20°C ±5°C, U.R. ≤75%); ±(0.2% RDG+2DGT) da 0.01In a 0.05In: ±(0.5%RDG+2DGT). Corrente (A_n): ±0.5% RDG (0.2 ÷ 2 In) da 40 a 100 Hz. Tensione (@20°C±5°C, U.R.≤75%); campo AV5: 400/690V_{L-L} CA . V_{L-N}: da 185 V a 460 V; V_{L-L}: da 320 V a 800 V ±(0.2%RDG+1DGT). Campo AV6: 120/208V_{L-L} CA. V_{L-N}: da 45 V a 145 V. V_{L-L}: da 78 V a 250 V ±(0.2%RDG+1DGT). Sono incluse le influenze di: frequenza, alimentazione e carico di uscita. Frequenza: ±0.1% RDG (40 ÷ 440 Hz). Potenza attiva e 0.05In ÷ Imax, cosφ 1: potenza apparente: ±(0.5% RDG+1DGT); (@ 20°C ± 5°C, U.R. ≤ 75%); 0.01In ÷ 0.05In, cosφ 1: ±(1%RDG+1DGT); 0.1In ÷ Imax, cosφ 0.5L, cosφ 0.8C: ±(0.6% RDG+1DGT); 0.02In ÷ 0.1In, cosφ 0.5L, cosφ 0.8C: ±(1%RDG+1DGT); Potenza reattiva (@ 20°C ± 5°C, U.R. ≤ 75%); 0.1In ÷ Imax, senφ 0.5L/C: ±(2%RDG+1DGT) 0.05In ÷ 0.1In, senφ 0.5L/C: ±(2.5%RDG+1DGT) 0.05In ÷ Imax, senφ 1: ±(2%RDG+1DGT) 0.02In ÷ 0.05In, senφ 1: ±(2.5%RDG+1DGT). Energie: (@ 20°C ± 5°C, U.R. ≤ 75%). Attiva: classe 0.5 secondo EN62053-22, ANSI C12.20 Reattiva: classe 2 secondo EN62053-23, ANSI C12.1 In: 5A, Imax: 10A 0.1In: 500mA, Corrente di avviamento: 5mA Un: 400/690V_{L-L} (AV5); Un: 120/208V_{L-L} (AV6). Distorsione armonica: 1% FS (FS: 100%); (@ 20°C ± 5°C, U.R. ≤ 75%); fase: ±2°; Imin: 5mA_{RMS}; Imax: 15Ap; Umin: 30V_{RMS}; Umax: 500Vp. Deriva termica: 200ppm/°C (A/V), ≤300ppm/°C (tutte le altre misure). **Campionamento:** 6400 campioni/s @50Hz 7680 campioni/s @ 60Hz . Display: LCD grafico retroilluminato (128x64 punti). Visualizzazione delle variabili istantanee: 4x4 digit. Energie totali: 4x9 digit; Energie parziali: 4x9 digit **Tempo di aggiornamento display**: 100ms Indicazione Max. e Min. Max. 9999 (999,999,999), Min. -9999 (–999,999,999). LED frontale: Rosso. Lampeggiante nel caso di allarme virtuale. Luce fissa in caso di uscita digitale attiva (allarme fisico). Misure: Corrente, tensione, potenza, energia, fattore di potenza, frequenza, distorsione armonica (vedere “specifiche display”). Misura in TRMS di forme d’onda distorte. Accoppiamento Diretto. Fattore di cresta: <3, max 10A picco. **Impedenze di ingresso:** 400/690V_{L-L} (AV5); 1.77 MΩ ±5%; 120/208V_{L-L} (AV6); 885 kΩ ±5%. Corrente: 0.01Ω; Frequenza: 40 ÷ 440 Hz. **Sovraccarico** (valori massimi). Permanente: tensione/corrente AV5: 460V_{LN}, 800V_{LL}/10A AV6: 145V_{LN}, 250V_{LL}/10A. Per 500ms: tensione/corrente AV5: 800V_{LN}, 1380V_{LL}/36A AV6: 240V_{LN}, 416V_{LL}/36A.

CARATTERISTICHE D’USCITA.

Uscite analogiche (a richiesta). Numero di ingressi: Fino a 8 (max 4 x 20mA + 4 x 10VDC o 4 x 20mA + 4 x ±5mA o 8 x 10VDC o 8 x ±5mA). Precisione (@ 25°C ±5°C, U.R. ≤60%) ±0.1%FS (20mA o 10VCC) ±0.3% FS (±5mA), FS =10mA. Campo: 0 ÷ 20mA o 0 ÷ 10 VCC o ±5mA. Fattore di scala: programmabile all’interno di tutto il campo di ritrasmissione; permette la gestione della ritrasmissione di tutti i valori da: 0 e 20 mA, 0 e 10 VDC, o -5mA e +5mA; Tempo di risposta: 400 ms tipico (filtro escluso). Ripple: 1% (secondo IEC 60688-1, EN 60688-1); Deriva termica totale: 500 ppm/°C; Carico: 20 mACC, 350 Ω 10VCC, ≥10kΩ±5 mA ≤1400Ω. Isolamento vedere tabella “isolamento tra ingressi ed uscita”; **Porta ottica: Secondo ANSI C12.18**; **Porta RS422/RS485 (a richiesta)**. Multidrop bidirezionale (variabili statiche e dinamiche); Collegamenti: 2 o 4 fili, distanza max. 1000m, terminazione effettuabile sul modulo. Indirizzi: da 1 a 247, programmabile da tastiera. Protocollo: MODBUS RTU /JBUS, Dati (bidirezionale); Dinamici (solo lettura) tutte le variabili visualizzabili (vedere anche la tabella, “Lista delle variabili associabili”...); Statici (solo scrittura); Tutti i parametri di configurazione, reset energia, attivazione delle uscite digitali. Memorizzazione energia: (EEPROM) max. 999.999.999 kWh/kvarh; Formato dati 1 bit start, 8 bit start, nessuna parità/parità dispari, parità pari, 1 bit di stop; Velocità di comunicazione: 9.6k, 19.2k, 38.4k, 115.2k bit/s selezionabile; Isolamento: vedere tabella “Isolamento tra ingressi ed uscite”; **Porta RS232 (a richiesta)**; Bidirezionale (variabili statiche e dinamiche); Collegamenti: 3 fili, distanza max. 15m; Formato dati: 1 bit start, 8 bit start, nessuna parità/parità dispari, paritàpari, 1 bit di stop; Velocità di comunicazione 9.6k bit/s; Protocollo: MODBUS RTU /JBUS; Altre caratteristiche: come per RS422/485. **Uscite digitali (a richiesta):** come impulsi; Numero uscite: fino a 16. Tipo: Programmabile da 0.001 a 1000 impulsi per kWh/kvarh (totali e parziali). Uscite abbinabili a contatori totali e/o parziali (Wh/varh); Durata impulsi: ≥100ms, <120msec (ON), 100ms (OFF) secondo EN62053-31. Come allarmi. Numero di uscite: fino a 16, indipendenti. Tipo di allarme: in salita, in discesa, a finestra interna, a finestra esterna. Tutti possono essere usati con la funzione “disattivazione all’accensione”, e/o con la funzione di ritenuta. Tutti gli allarmi possono essere abbinati a tutte le variabili (vedere tabella “Lista delle variabili associabili a”). Impostazione soglia da 0 a 100% della scala elettrica. Isteresi: da 0 a fondo scala. Ritardo all’eccitazione: da 0 a 255s. Stato del relè: selezionabile: normalmente eccitato e normalmente diseccitato. Tempo minimo di risposta: ≤200ms, filtri esclusi, ritardo all’eccitazione: “0 s”. **Note**: Le 16 uscite digitali possono funzionare anche come combinazione di uscite impulsi e di allarme. **Uscite statiche (digitali): (a richiesta)**. Utilizzo: Per le uscite impulsi o le uscite allarmi. Segnale: V_{ON} 1.2 VCC/ max. 100 mA; V_{OFF} 30 VCC max. Isolamento: vedere “Isolamento tra ingressi ed uscite”. **Uscite a relè (digitali): (a richiesta).** Utilizzo: per uscite allarmi o uscite impulsi. Tipo di uscita: Relè: SPDT; AC 1-8A, 250VCA; DC 12-5A, 24VCC; AC 15-2.5A,250VCA; DC 13-2.5A, 24VCC. Isolamento: vedere “Isolamento tra ingressi ed uscite”.

FUNZIONI SOFTWARE.

Password: Codice numerico di massimo 4 digit da 0 a 1000; 2 livelli di protezione dei dati di programmazione : 1° livello: password “0”: non protetto; 2° livello: password da 1 a 1000: tutti i dati sono protetti. **Selezione del sistema:** sistema 1: monofase (2 fili); Sistema 2, sbilanciato, bifase (3 fili); Sistema 3, bilanciato, trifase (3 fili+1TA); Sistema 3, sbilanciato trifase (3 fili), trifase (4 fili). **Rapporto di trasformazione**: TA fino a 30 kA (6000 max); TV fino a 600 kV (6000 max). **Filtri**: campo di funzionamento da 0.1 a 100% della scala elettrica di ingresso. Coefficiente di filtro: da 1 a 255. Azione del filtro: Display, allarmi, porte seriali (variabili fondamentali: V, A, W e variabili calcolate). **Allarmi:** Modo di funzionamento: “OR” o “AND” o “OR+AND”. Fino a 16 allarmi liberamente programmabili. Gli allarmi possono essere associati ad ogni variabile disponibile, vedere tabella “Variabili associabili”. **Reset:** mediante tastiera frontale o software di configurazione è possibile eseguire il reset dei seguenti dati: tutti i valori min, max, dmd, dmd-max; contatori totali e parziali. Gli allarmi con ritenuta, tutti gli eventi. **Memorizzazione eventi**: Tipo di dato: allarme, min, max, stato ingressi digitali, stato uscite digitali se comandate in modo remoto, reset. Tutti gli eventi sono registrati con riferimento a data (gg:MM:aa) e ora (hh:mm:ss) . Numero degli eventi registrabili: fino a 10.000. Gestione della memoria: FIFO. Tipo memoria: Flash. **Visualizzazione**: 4 variabili per pagina. Per un totale di 36 pagine. La pagina “00” puo essere personalizzata dall’utente. Contatori di energia Fino a 28 pagine a seconda dalla modalità di tariffa selezionata. Visualizzazione dell’energia consumata nei 12 mesi precedenti. Eventi registrati: 10.000 eventi. **Lingua display** selezionabile: Inglese, Italiano, Francese, Tedesco, Spagnolo.

CARATTERISTICHE GENERALI.

Temperatura di funzionamento: -10° ÷ +45°C (14° ÷ 113°F), (U.R. < 90% senza condensa). **Limiti temp. di funzionamento:** -20° ÷ +55°C (-4° ÷ 131°F), (U.R. <90% senza condensa). **Temperatura di immagazzinamento:** 30° ÷ +60°C (-4° ÷ 140°F), (U.R. < 90% senza condensa). **Categoria di installazione**: III. **Grado di inquinamento**: 2. **Altitudine**: fino a 2000m (6560 piedi) sul livello del mare. **Tensione di riferimento per l isolamento** (ingresso AV5): 300 VRMS verso terra. **Rigidit dielettrica:** 4$kVCA_{RMS}$ (per 1 minuto). **Reiezione**: CMRR 100 dB, 48 ÷ 62 Hz. **EMC:** Emissioni: EN61000-6-3, EN60688 ambiente residenziale, commercio ed ind. leggera. Immunità: EN61000-6-2 ambiente industriale. ANSI/IEEE C37.90-1989 . **Tensione impulsi (1.2/50μs):** EN61000-4-5**. Norme di sicurezza:** IEC60664, IEC61010-1 EN60664, EN61010-1. **Norme di misura:** IEC60688, EN60688, EN62053-22, EN62053-23, ANSI C12.20, ANSI C12.1 **Approvazioni:** CE, cURus e CSA. **Connessioni 5(6) A:** A vite: max. 2.5 mm^2 (2x 1.5mm^2)· **Custodia:** Dimensioni: 96x96x140 mm. Materiale: ABS, autoestinguenza: UL 94 V-0. **Grado di protezione** frontale: IP65 / NEMA 4x. **Peso:** Circa 600 g (imballo incluso).

Alimentazione

Tensione CA/CC: 90 ÷ 260V (standard); 18 ÷ 60V (a richiesta); **Consumo energia:** 30VA/12W (90 ÷ 260V);≤20VA/12W (18 ÷ 60V).

DEUTSCH

Die Betriebsanleitung aufmerksam lesen. Sollte das Gerät nicht gemäss der Herstellerangaben verwendet werden, könnte der vom Gerät vorgesehene Schutz beeinträchtigt werden. **Wartung:** Das Gerät mit einem feuchten Tuch reinigen; keine Scheuer- oder Lösemittel verwenden. Das Gerät vor der Reinigung ausschalten.

TECHNISCHE DATEN EINGANG.

Anzahl analoger Eingänge: Strom: 1 (einphasig; Systemcode: 3); 3 (dreiphasig; Systemcode: 3); Spannung: 1 (einphasig; Systemcode: 3): 4 (dreiphasig; Systemcode: 3). **Digitale Eingänge (auf Anfrage):** bis zu 12. AQ1038: Anz. der Eingänge: 3 (spannungsfrei); Zweck: "dmd"-Messungen. Synchronisation. Tarifauswahl: Energie. Kontaktstatusanzeige. Uhrsynchronisation. Kontakt Messstrom: <8mA/ 17,5 bis 25VDC . AQ1042: Anzahl der Eingänge: 3 + Erregerleistung. Zweck: "dmd"-Messungen. Synchronisation. Tarifauswahl: Energie. Kontaktstatusanzeige. Uhrsynchronisation. Erregerleistung: 16V<+Aux<24VDC Max 15mA. Kontakt Messstrom: 15mA. Allgemeine Eigenschaften. Widerstand geschlossener Kontakt: Max 1kΩ. Widerstand geöffneter Kontakt: Min 100kΩ. Isolierung: siehe Tabelle "Isolierung zwischen Ein- und Ausgängen". **Genauigkeit:** (Anzeige, RS232, RS485). In: 5A, If.s.: 10A; Un: Siehe Spannungsbereich unten Strom (A_{L1}, A_{L2}, A_{L3}) von 0,05In bis Imax: (@20°C ±5°C, L.F. ≤ 75%); ±(0,2%BE+2DGT) von 0,01In bis 0,05In: ±(0,5%BE+2DGT). Strom (A_n): ±0,5% BE (0,2 bis 2 In) @ 40 bis 100 Hz. Spannung: (@20°C±5°C,L.F. ≤ 75%). Bereich AV5: 400/690V_{L-L} AC ; V_{L-N}: 185 V bis 460 V; V_{L-L}: 320 V bis 800 V; ±(0,2%BE+1DGT). Bereich AV6: 120/208V_{L-L} AC; V_{L-N}: 45 V bis 145 V; V_{L-L}: 78 V bis 250 V; ±(0,2%BE+1DGT) einschließlich auch: Frequenz, Stromversorgung und Einfluß über Ausgangslast. Frequenz: ±0,1% BE(40 bis 440 Hz). Wirkleistung und Scheinleistung: 0,05In bis Imax, LF 1: ±(0,5%BE+1DGT); (@ 20°C ± 5°C, L.F. ≤ 75%); 0,01In bis 0,05In, LF 1: ±(1%BE+1DGT); 0,1In bis Imax, LF0,5L, LF 0,8C: ±(0,6%BE+1DGT); 0,02In bis 0,1In,LF0,5L, LF 0,8C: ±(1%BE+1DGT). Blindleistung: (@ 20°C ± 5°C, L.F.≤ 75%). 0,1In bis Imax, senφ 0,5L/C: ±(2%RDG+1DGT); 0,05In bis 0,1In, senφ 0,5L/C: ±(2,5%RDG+1DGT). 0,05In bis Imax, senφ 1: ±(2%RDG+1DGT); 0,02In bis 0,05In, senφ 1: ±(2,5%RDG+1DGT). Energien: (@ 20°C ± 5°C, L.F. ≤ 75%); Wirk: Klasse 0,5 gemäß EN62053-22, ANSI C12.20 . Blind: Klasse 2 gemäß EN62053-23, ANSI C12.1 . In: 5A, Imax: 10A, 0.1In: 500mA, Startstrom: 5mA. Un: 400/690V_{L-L} (AV5). Un: 120/208V_{L-L} (AV6). Harmonische Verzerrung: 1% VB (VB: 100%); (@ 20°C ±5°C, L.F. ≤ 75%); Phase: ±2°; Imin: 5mA_{RMS}; Imax: 15Ap; Umin: 30V_{RMS}; Umax: 500Vp. **Temperaturdrift:** ≤ 200ppm/°C (A/V), ≤300ppm/°C (alle anderen Messungen). **Abtastrate:** 6400 Abtastwertes/s @ 50Hz; 7680 Abtastwertes/s @ 60Hz. **Anzeige:** Graph LCD Hintergrundbeleuchtung (128x64 Punkte). Anzeige für die Momentanmessgrößen: 4x4 Ziffern. Gesamtenergien: 4x9 Ziffern; Teilenergien: 4x9 Ziffern. **Abtastzeit**: 100ms. **Max. und min. Anzeige**: Max. 9999 (999.999.999), Min. -9999 (–999.999.999). **Front-LED**: Rot. Blinklicht bei virtuellem Alarm: Durchgehendes Licht bei Aktivierung des digitalen Ausgangs (Alarm). **Messungen:** Strom, Spannung, Leistung, Energie, Leistungsfaktor, Frequenz, Harmonische Verzerrung, (siehe "Seitenanzeige") echter Effektivwert-Messung einer verzerrten Welle (Spannung/Strom). Verbindungstyp: direkt . Scheitelfaktor: < 3, max 10A Spitze. **Eingangsimpedanz**: 400/690V_{L-L} (AV5); 1,77MΩ ±5%; 120/208V_{L-L} (AV6); 885kΩ ±5%. Strom: ≤0,01Ω. **Frequenz:** 40 bis 440 Hz. **Überlastungsschutz**: (Höchstwert). Dauerspannung/Strom: AV5: 460V_{LN}, 800V_{LL}/10A; AV6: 145V_{LN}, 250V_{LL}/10A. Für 500ms: Spannung/Strom: AV5: 800V_{LN}, 1380V_{LL}/36A: AV6: 240V_{LN}, 416V_{LL}/36A.

TECHNISCHE DATEN AUSGANG

Analoge Ausgänge (auf Wunsch): Anzahl der Ausgänge: Bis zu 8 (max 4 x 20mA + 4 x 10VDC oder 4 x 20mA + 4 x ±5mA oder 8 x 10VDC oder 8 x ±5mA). Genauigkeit (@ 25°C ±5°C, L.F. ≤ 60%); ±0,1%FS (20mA oder 10VDC); ±0,3%FS (±5mA), FS=10mA. Bereich: 0 bis 20mA oder 0 bis 10 VDC oder ±5mA. Skalierungsfaktor: Programmierbar innerhalb des gesamten Bereichs der Weiterübertragung; gestattet die Verwaltung der Weiterübertragung aller Werte von: 0 und 20 mA, 0 und 10VDC, oder -5mA und +5mA Ansprechzeit : ≤ 400 ms typisch (Filter ausgeschlossen). Wellenstrom: ≤ 1% (gemäß IEC 60688-1, EN 60688-1). Temperaturdrift insgesamt: ≤ 500 ppm/°C. Last: 20 mADC, ≤ 350 Ω, 10 VDC, ≥ 10kΩ, ±5mA, ≤1400Ω. Isolierung: siehe Tabelle "Isolierung zwischen Ein- und Ausgängen”. **Optische Kommunikations-schnittstelle:** gemäß ANSI C12.18. **RS422/RS485 Schnittstelle** (**auf Anfrage**): Mehrpunkt: bidirektional (statische und dynamische Messgrößen). Anschlüsse: 2 oder 4 Leiter, max. Abstand 1000m, Ende direkt auf dem Modul. Adressen: 1 bis 247, auswählbar über Tastatur. Protokoll MODBUS RTU /JBUS, Daten (bidirektional): Dynamisch (schreibgeschützt). Alle Anzeigemessgrößen (siehe auch Tabelle "Liste der Messgrößen, die angeschlossen werden können"…). Statisch (nur Schreiben). Alle Konfigurationsparameter, Energierückstellung, Aktivierung digitaler Ausgänge Gespeicherte Energie (EEPROM): max. 999.999.999 kWh/kvarh. Datenformat: 1-Startbit, 8-Datenbits, keine Parität/gerade Parität, ungerade Parität, 1 Stoppbit. Baudrate: 9,6k, 19,2k, 38,4k, 115,2k bit/s Auswählbare Bauds. Isolierung: siehe Tabelle "Isolierung zwischen Ein- und Ausgängen”. **RS232 Ausgang (auf Anfrage):** Bidirektional (statische und dynamische Messgrößen). Anschlüsse: 3 Leiter, max. Abstand 15m, Datenformat: 1-Startbit, 8-Datenbits, keine Parität, gerade Parität, ungerade Parität, 1 Stoppbit. Baudrate: 9,6k bit/s. Protokoll: MODBUS RTU/JBUS. Andere Daten: wie für RS422/485. **Digitale Ausgänge (auf Anfrage):** Impulstyp: Anzahl der Ausgänge: Bis zu 16. Typ: Programmierbar von 0,001 bis 1000 Impulse pro kWh/kvarh (gesamt und partiell). Ausgänge an Gesamt- und/oder Teilenergiezähler anschließbar (Wh/varh). Impulsdauer: ≥100ms, <120msec (ON), ≥100ms (OFF) gemäß EN62053-31. Alarmtyp: Anzahl der Ausgänge bis zu 16, unabhängig. Alarmmoden: Überschreitung, Unterschreitung, int. Fenster-alarm, ext. Fenster-alarm. Alle können mit Start-up Deaktivierung verwendet werden und/oder mit Verriegelung. Alle Alarme können an alle Messgrößen angeschlossen werden (siehe Tabelle "Liste der Messgrößen, die angeschlossen werden können"). Sollwerteinstellung: von 0 bis 100% der elektrischen Skala. Hysterese: von 0 bis Skalenendwert. Einschaltverzögerung: 0 bis 255s. Ausgangsstatus: wählbar, normal aberregt und normal erregt. Min. Ansprechzeit: ≤200ms, Filter ausgeschlossen, Sollwert Einschaltverzögerung: "0 s" **Hinweis**: die 16 digitalen Ausgänge können auch eine Kombination von Impuls- und Alarmausgän-gen sein. **Statische (digitale) Ausgänge (auf Anfrage)**. Zweck: Für Impuls- oder Alarmausgänge Signal: V_{ON} 1,2 VDC/ max. 100 mA; V_{OFF} 30 VDC max. Isolierung: siehe Tabelle "Isolierung zwischen Ein- und Ausgängen". **Relais (digitale) Ausgänge (auf Anfrage)**. Zweck: Für Alarm- oder Impulsausgänge Ausgangstyp: Relais SPDT AC 1-8A, 250VAC; DC 12-5A, 24VDC; AC 15-2.5A, 250VAC; DC 13-2.5A, 24VDC. Isolierung: siehe Tabelle "Isolierung zwischen Ein- und Ausgängen".

SOFTWAREFUNKTIONEN

Passwort: Numerischer Code mit max. 4 Stellen von 0 bis 1000; 2 Schutzebenen der Programmierdaten; 1. Ebene **Pass**wort "0": keine Schutz ; 2. Ebene **Pass**wort von 1 bis 1000: alle Daten sind geschützt.

Systemauswahl: System 1 einphasig (2 Leiter); System 2, unsymmetrische zweiphasig (3 Leiter); System 3, symmetrische dreiphasig (3 Leiter+1CT); System 3, unsymmetrische dreiphasig (3 Leiter); dreiphasig (4 Leiter). **Wandlerverhältnis:** CT bis zu 30 kA (6000 max); VT (PT) bis zu 600 kV (6000 max). **Filter:** Filter Betriebsbereich: 0,1 bis 100% der elektrischen. Eingangsskala. Filterkoeffizient: 1 bis 255. Filterwirkung: Anzeige, Alarme, serielle Ausgänge (grundlegende Messgrößen: V, A, W und Abzweigungen). **Alarme:** Betriebsmodus: "OR" oder "AND" oder "OR+AND"-Funktionen (siehe Seite "Alarmparameter und Logik). Frei programmierbar auf bis zu 16 Alarmen. Die Alarme können an jegliche in der Tabelle "Liste der Variabeln, die angeschlossen werden können" aufgeführten Messgrößen angeschlossen werden. **Rückstellung:** Mittels Tastatur oder Konfigurationssoftware können die folgenden Daten zurückgestellt werden: - alle min., max., dmd-max. Werte. - Gesamt- und Teilzähler. - Verriegelungsalarme. - alle Ereignisse. **Datenausdruck:** Datentyp Alarm, min., max., Status digitale Eingänge, Status digitale Ausgänge als Fernbedienung, Rückstellungen. Alle Ereignisse werden mit Bezugsdatum (tt:MM:jj) und -Uhrzeit (ss:mm:ss) gespeichert Anzahl Ereignisse Bis zu 10.000 Art Datenverwaltung: FIFO Datenspeicherung Dataflash **Anzeige:** 4 Messgrößen pro Seite . 1 Seite, die vom Benutzer gestaltet werden kann. Bis zu 36 Seiten Energiezähler. Bis zu 28 Seiten je nach Auswahl des Tarifmodus. Anzeige des Energieverbrauchs des vorherigen 12 Monaten. Gespeicherte Ereignisse 10.000 Ereignisse. **Anzeigesprache** Auswahl: Englisch, Italienisch, Französisch, Deutsch, Spanisch.

ALLGEMEINE DATEN

Angegebene: -10° bis +45°C (14° bis 113°F); Betriebstemperatur: (L.F. <90% ohne Kondensation); Grenzbereich der Betriebstemp.: -20° bis +55°C (-4° bis 131°F); (L.F. <90% ohne Kondensation); Lagertemperatur: -30° bis +60°C (-4° bis 140°F); (L.F. <90% ohne Kondensation) Installationskategorie: III; Verschmutzungsgrad: 2; Höhe: bis zu 2000m (6560 Fuß) über dem Meeresspiegel Isolierung Bezugsspannung: 300VRMS zur Erdung (AV5 Eingang); Durchschlagfestigkeit 4$kVAC_{RMS}$ (für 1 min) Rauschunterdrückung: CMRR 100 dB, 48 bis 62 Hz. EMC: Emissionen EN61000-6-3, EN60688 Wohngebiet, Gewerbe und Leichtindustrie Immunität: EN61000-6-2 Industriegebiet. ANSI/IEEE C37.90-1989 (Wellen-, Belastungs- und schneller Transienttest). **Impulsspannung (1,2/50μs):** EN61000-4-5. **Sicherheitsnorm:** IEC60664, IEC61010-1; EN60664, EN61010-1; **Messnorm:** IEC60688, EN60688, EN62053-22, EN62053-23, ANSI C12.20, ANSI C12.1. **Kennzeichnungen:** CE, cURus und CSA. **Anschlüsse 5(6) A:** geschraubt max. 2.5 mm^2 Leiter (2x 1,5mm^2) . **Gehäuse:** Abmessungen 96x96x140 mm. Werkstoff. ABS, selbstlöschend: UL 94 V-0. **Schutzgrad**: Vorderseite: IP65 / NEMA 4x. **Gewicht.** Ca. 600 g (einschließlich Verpackung).

Stromversorgung

AC/DC Spannung: 90 bis 260V (Standard); 18 bis 60V (auf Anfrage). **Stromverbrauch:** ≤ 30VA/12W

FRANÇAIS

Lire attentivement le manuel de l’utilisateur. Si l’appareil est utilisé dans des conditions différentes de celles spécifiées par le fabricant, le niveau de protection prévu par l’instrument peut être compromis. **Entretien:** Pour nettoyer l’instrument, utiliser un chiffon humide; ne pas utiliser d’abrasifs ou de solvants. Il faut déconnecter le dispositif avant de procéder au nettoyage.

CARACTÉRISTIQUES D'ENTRÉE

Nombre d'entrées analogiques: Courant: 1 (1-phase ; code système : 3); 3 (3-phase; code système : 3); Tension: 1 (1-phase ; code système : 3); 4 (3-phase ; code système : 3). **Entrées logiques (sur demande):** Jusqu'à 12. AQ1038: Nombre d'entrées : 3 (exemptes de tension). Fonction: Synchronisation des mesure: "dmd.". Choix du tarif: energie. Lecture de l'état des contacts. Synchronisation horloge. Courant de mesure des contacts: <8mA/ 17,5 à 25VCC; AQ1042. Nombre d'entrées: 3 + sortie excitation. Fonction: synchronisation des mesure: "dmd.". Choix du tarif: energie. Lecture de l'état des contacts. Synchronisation horloge. Sortie excitation: 16V<+Aux<24VCC Max 15mA. Courant de mesure des contacts: 15mA. Caractéristiques communes. Résistance des contacts fermés: Max 1kΩ. Résistance des contacts ouverts: Min 100kΩ. Isolement: Voir le tableau "Isolement entre entrées et sorties". **Précision:** (afficheur, RS232, RS485): In: 5A, If.s.: 10A. Un: voir les plages de tension ci-dessous. Courant (A_{L1}, A_{L2}, A_{L3}): 0,05In à Imax: (@20°C ±5°C, H.R. ≤75%); ±(0,2%LCT+2DGT); 0,01In à 0,5In: ±(0,5%LCT+2DGT). Courant (A_n): ±0,5% LCT (0,2 à 2 In) @ 40 à 100 Hz. Tension: (@20°C±5°C,H.R. ≤75%) plage AV5: 400/690V_{L-L} CA ; V_{L-N}: 185 V à 460 V; V_{L-L}: 320 V à 800 V; ±(0,2%LCT+1DGT); plage AV6: 120/208V_{L-L} CA ; V_{L-N} : 45 V à 145V; V_{L-L} : 78 V à 250 V; ±(0,2%LCT+1DGT). Inclut également: les influences de la fréquence, de l'aliment. et de la charge de sortie. Fréquence: ±0,1% RDG (40 à 440 Hz). Puissance active et apparente: 0,05 In à Imax; PF 1: puissance: ±(0,5%LCT+1DGT); (@ 20°C ± 5°C, H.R. ≤75%). 0,01In à 0,05In, PF 1: ±(1%LCT+1DGT). 0,1In à Imax, PF0,5L, PF 0,8C: ±(0,6% LCT+1DGT). 0,02In à 0,1In,PF0.5L, PF 0,8C: ±(1%LCT+1DGT). Puissance réactive: (@ 20°C ±5°C, H.R. ≤75%); 0,1In à Imax, senφ 0,5L/C: ±(2%LCT+1DGT). 0,05In à 0,1In, senφ 0,5L/C: ±(2,5%LCT+1DGT); 0,05In à Imax, senφ 1: ±(2%LCT+1DGT). 0,02In à 0,05In, senφ 1: ±(2,5% LCT+1 DGT). Energies: (@ 20°C ± 5°C, H.R. ≤ 75%). Active: classe 0,5 selon EN62053-22, ANSI C12.20. Réactive: classe 2 selon EN62053-23, ANSI C12.1. In: 5A, Imax: 10A. 0,1In: 500mA. Courant de démarrage: 5mA. Un: 400/690V_{L-L} (AV5). Un: 120/208V_{L-L} (AV6). Distorsion harmonique: Imax: 15Ap; Umin: 30V_{EFF}; Umax : 500Vp. **Dérive de température**: ≤ 200ppm/°C (A/V), ≤300ppm/°C (toute autre mesure). **Taux d'échantillonnage:** 6400 échantillons/s @ 50Hz, 7680 échantillons/s @ 60Hz. Affichage: Afficheur graphique LCD rétro éclairé (128x64 pixels). Lecture des variables instantanées: 4x4 digits. Energies totales: 4x9 digits; Energies partielles: 4x9 digits. Taux de refraîchissement: 100ms. Indication maxi et mini. Max. 9999 (999.999.999), Min. -9999 (–999.999.999). Témoin lumineux en face avant: Rouge, lumière clignotante en cas d'alarme virtuelle. Lumière fixe en cas d'activation de la sortie logique (sortie d'alarme). Mesures: courant, tension, puissance, energie, facteur de puissance, fréquence, distorsion harmonique (voir "Pages affichées "). Mesure TRMS d'onde distordue (tension/courant). Type de couplage: Direct. Facteur de crête: <3, pic max 10A. **Impédance d'entrée:** 400/690V_{L-L} (AV5); 1,77 MΩ ±5%; 120/208V_{L-L} (AV6); 885 kΩ ±5%. Courant: 0,01Ω. Fréquence: 40 à 440Hz. **Protection surcharge:** (valeurs maximales). En continu: tension/courant. AV5: 460V_{LN}, 800V_{LL}/10A; AV6: 145V_{LN}, 250V_{LL}/10A. Pendant 500ms: tension/courant. AV5: 800V_{LN}, 1380V_{LL}/36A AV6: 240V_{LN}, 416V_{LL}/36A**n.**

CARACTÉRISTIQUES DE SORTIE

Sorties analogiques (sur demande). Nombre de sorties: Jusqu'à 8 (max 4 x 20mA + 4 x 10VCC ou 4 x 20mA + 4 x ±5mA ou 8 x 10VCC ou 8 x ±5mA). Précision: (@ 25°C ±5°C, H.R. ≤60%); ±0,1%PE (20mA ou 10VCC); ±0,3%PE (±5mA), PE=10mA. Plage: 0 à 20mA ou 0 à 10 VCC ou ±5mA. Facteur d'échelle: programmable dans toute la plage de retransmission; il permet de gérer la retransmission de toute valeur à partir de : 0 et 20 mA, 0 et 10VCC, ou -5mA et +5mA . Temps de réponse: ≤ 400ms typique (filtres). Dérive de température totale: ≤500ppm/°C. Charge: 20mACC ≤350W; 10VCC ≥10kW, ±5 mA, 1400W. Isolement: Voir le tableau "Isolement entre entrées et sorties". **Port de communication de type optique**: selon ANSI C12.18. **RS422/RS485 port (sur demande).** Multidrop bidirectionnel (variables statiques et dynamiques). Raccordements: 2 ou 4 conducteurs, distance maximale 1000m, bouclage directement sur le module. Addresses: 1 à 247, sélectionnables par clavier. Protocole: MODBUS RTU/JBUS, Données: (bidirectionnelles): dynamiques (lecture seulement): toute les variables d'affichage (voir aussi le tableau: " Liste des variables pouvant être affectées à "...). Statiques (écriture seulement): tous les paramètres de configuration, RAZ (remise à zéro) de l'énergie, activation de la sortie logique. Energie stockée (EEPROM) max. 999.999.999 kWh/kvarh. Format des données: 1 bit de départ, 8 bits de données, pas de parité, parité paire, parité impaire, 1 bit de stop. Vitesse de transmission: 9,6k, 19,2k, 38,4k, 115,2k bit/s. Valeurs de vitesse sélectionnables: Isolement: Voir le tableau "Isolement entre entrées et sorties". **Sortie série RS232 (sur demande):** bidirectionnel (variables statiques et dynamiques). Raccordements: 3 conducteurs, dist. max. 15m, Format des données: 1 bir de départ, 8 bits de données,pas de parité, parité paire, parité impaire, 1 bit de stop. Vitesse de transmission 9,6k bit/s. Protocole: MODBUS RTU /JBUS. Autres données: Comme dans le cas du port série RS422/485. **Sorties logiques (sur demande).** Types d’impulsions: Nombre de sorties: Jusqu'à 16. Type: Programmable de 0,001 à 1000 impulsions par kWh/kvarh (énergie totale et partielle) . Sorties raccordables aux compteurs d'énergie totale et/ou partielle (Wh/varh). Durée d'impulsion: ≥100ms < 120msec (ON), ≥ 100ms (OFF) selon EN62053-31. Type d’alarme. Nombre de sorties: Jusqu'à 16, indépendantes. Modes d'alarme: alarme haute, alarme basse, alarme à fenêtre interne, alarme à fenêtre externe. Toutes ces types d'alarme peuvent être utilisées avec la fonction de désactivation au démarrage et/ou de verrouillage. Toutes les alarmes puevent être connectées à toutes les variables (voir le tableau "Liste des variables pouvant être affectées à"). Réglage du point de consigne : 0 à 100% de l'échelle électrique. Hystérésis: 0 à pleine d'échelle. Temporisation: 0 à 255s. Etat sortie: sélectionnable; normalement désactivé et normalement activé. Temps de réponse minimum: ”200ms, filtres exclus, Point de consigne sur temporisation activé: " 0 s ". **Remarque**: Les 16 sorties logiques peuvent aussi fonctionner en tant que combinaison de sorties impulsions et sorties alarme. **Sorties statiques (logiques) (sur demande)**: Type d'emploi: Pour sorties impulsions ou pour sorties alarme. Signal: V_{ON} 1,2 VCC/ max. 100 mA; V_{OFF} 30 VCC max. Isolement: Voir le tableau "Isolement entre entrées et sorties “**Sorties relais (logiques) (sur demande)**: Type d'emploi: pour sorties alarme ou pour sorties impulsions. Type de sortie: Relais, type INV.: AC 1-8A, 250VCA; DC 12-5A, 24VCC; AC 15-2,5A, 250VCA; DC 13-2,5A, 24VCC. Isolement: Voir le tableau "Isolement entre entrées et sorties".

FONCTIONS LOGICIELLES

Mot de passe: Code logique sur 4 chiffres maximum, de 0 à 1000; 2 niveaux de protection des données de programmation. Mot de passe niveau 1: Mot de passe "0": pas de protection. Mot de passe niveau 2. Mot de passe de 0 à 1000: toutes les données sont protégées. **Sélection du système.** Système 1: 1-phase (2 conducteurs); Système 2, déséquilibré, 2-phase (3 conducteurs); Système 3, équilibré; 3-phase (3 conducteurs+1TI); Système 3, déséquilibré 3-phase (3 conducteurs); 3-phase (4 conducteurs). **Ratio du transformateur**: TI jusqu'à 30 kA (6000 max); TT jusqu'à 600 kV ; (6000 max). **Filtres:** Plage de fonctionnement: 0,1 à 100% de l'échelle électrique d'entrée. Coefficient de filtrage: 1 à 255. Action du filtre: Afficheur, alarmes, sorties série (variables fondamentales: V, A, W et leurs dérivée). **Alarmes:** Mode de fonctionnement: Fonctions "OR" ou "AND" ou "OR+AND" (voir la page "Paramètres et logique d'alarme"). Programmable librement jusqu'à 16 alarmes. Les alarmes peuvent être connectées à n'importe quelles variables disponibles dans le tableau "Liste des variables pouvant être affectées à". **Remise à zéro:** par clavier ou par logiciel de configuration, il est possible de réinitialiser les données suivantes: - Tous les valeurs min., max., "max., dmd." (charge maximale) - Compteurs d'énergie totale et partielle. - Alarmes de verrouillage. - Tout événement. **Enregistrement des données.** Type de données: Alarme, mini., maxi., état des entrées logiques, état des sorties logiques du point de vue du contrôle à distance, réinitialisations. Tous les événements sont stockés avec date (jj :MM :aa) et heure (hh :mm :ss) de référence. Nombre d'événements: Jusqu'à 10.000 Système de gestion des données: FIFO (First In, First Out - premier entré, premier sorti). Système de stockage des données. Mémoire données de type flash. **Affichage**: Jusqu'à 4 variables par page: 1 page qui peut être créée et configurée directement par l'utilisateur jusqu'à 36 pages. Compteurs d'énergie: Jusqu'à 28 pages selon le mode tarifaire sélectionné. Affichage de l'énergie consommée dans les 12 mois précédents. Evénements stockés: 10.000 événements. **Langue d'affichage.** Sélectionnable: Anglais, Italien, Français, Allemand, Espagnol.

CARACTÉRISTIQUES GÉNÉRALES

Température de fonctionnement: -10° à +45°C (14° à 113°F); (H.R. < 90% sans condensation). **Plage limite de température de fonctionnement:** -20° à +55°C (-4° à 131°F); (H.R. <90% sans condensation); **Température de stockage:** -30° à +60°C (-4° à 140°F); (H.R. < 90% sans condensation). **Catégorie d'installation**: III; **Niveau de pollution**: 2; **Altitude**: Jusqu'à 2000m (6560 pieds) au-dessus du niveau de la mer. **Tension d'isolement de référence:** 300 VEFF par rapport à la terre (entrée AV5). **Résistance diélectrique**: 4kVCAEFF (pendant 1 minute). **Rejet de bruit**: CMRR: 100 dB, 48 à 62 Hz. **EMC.** Emissions: EN61000-6-3, EN60688 environnement résidentiel, commerce et petite industrie. Immunité: EN61000-6-2 environnement industriel. ANSI/IEEE C37.90-1989 (test de résistance aux surtensions et de transitoire rapide). **Tension d'impulsion (1,2/50μs)**: EN61000-4-5. **Normes de sécurité:** IEC60664, IEC61010-1; EN60664, EN61010-1. **Normes de mesure:** IEC60688,EN60688, EN62053-22, EN62053-23, ANSI C12.20, ANSI C12.1. **Homologations:** CE, cURus et CSA. **Connexions 5(6) A:** A vis. Conducteurs de max. 2,5 mm^2 (2x 1,5mm^2). **Boîtier.** Dimensions: 96x96x140 mm. Matériau: ABS, auto-extincteur: UL 94 V-0. **Indice de protection.** Face avant : IP65 / NEMA 4x. **Poids:** 600 g environ (emballage compris).

CARACTÉRISTIQUES D'ALIMENTATION

Tension CA/CC: 90 à 260V (standard), 18 à 60V (sur demande). **Puissance consommée:**≤30VA/12W (90 à 260V); ≤ 20VA/12W (18 à 60V).

ESPAÑOL

Lea atentamente el manual de instrucciones. Si el instrumento se usa de modo distinto al indicado por el fabricante, la protección de seguridad ofrecida por el instrumento podrá resultar dañada. **Mantenimiento:** para limpiar el equipo utilizar siempre un trapo ligeramente humedecido, nunca productos abrasivos o disolventes. Se recomienda desconectar siempre el instrumento antes de limpiarlo.

ESPECIFICACIONES DE ENTRADA

Número de entradas analógicas: Intensidad: 1 (monofásico; cód. sistema: 3); 3 (trifásico; código sistema: 3). Tensión: 1 (monofásico; cód. sistema: 3); 4 (trifásico; código sistema: 3). **Entradas digitales (opcional):** Hasta 12. AQ1038. Nº entr.: 3 (libres de tensión). Aplicación: Sincroniz. de medidas “dmd”. Selección de tarifa: energía. Lectura de estado contactos. Sincronización de reloj. Intens. de medida contacto: <8mA/ 17,5 a 25VCC. AQ1042. Nº de entradas: 3 + salida de excitación. Aplicación: Sincroniz. de medidas “dmd”. Selección de tarifa: energía. Lectura de estado contactos. Sincronización de reloj. Salida de excitación: 16V<+Aux<24VCC Máx. 15mA. Intens. de medida contacto: 15mA. Características comunes. Resist. contacto cerrado: Máx. 1kΩ. Resist. contacto abierto: Mín. 100kΩ. Aislamiento: Ver tabla “Aislamiento entre entradas y salidas”. Precisión (display, RS232, RS485): In: 5A, I f.e.: 10A. Vn: ver escalas de tensión. Intensidad: (A_{L1}, A_{L2}, A_{L3}). De 0,05 In a Imax: (@20°C ±5°C, H.R. ≤75%); ±(0,2% lec. +2 díg.) de 0,01 In a 0,05 In: ±(0,5% lec. +2 díg.). Intensidad (A_n): ±0,5% lec. (0,2 a 2 In) @ 40 - 100 Hz. Tensión (@20°C±5°C, H.R. ≤ 75%); escala AV5: 400/690VL-L CA; V_{L-N}: 185 V a 460 V; V_{L-L}: 320 V a 800 V; ±(0,2% lec. +1 díg.); escala AV6: 120/208V_{L-L} CA ; V_{L-N}: 45 V a 145 V; V_{L-L}: 78 V a 250 V; ±(0,2% lec. +1 díg.). También incluye: frecuencia, alimentación e influencias de carga de salida. Frecuencia: ±0,1% lec. (40 a 440Hz). Potencia activa y potencia aparente: 0,05In a Imax, PF1: ±(0,5% lec. +1 díg.); (@ 20°C ± 5°C, H.R. ≤ 75%); 0,01 a 0,05 In, PF 1: ±(1% lec. +1 díg.); 0,1 In a Imax, PF 0,5L, PF 0,8C: ±(0,6% lec. +1 díg.). 0,02 a 0,1 In, PF 0,5L, PF 0,8C: ±(1% lec. +1 díg.). Potencia reactiva: (@20°C ± 5°C, H.R. ≤ 75%): 0,1 In a Imax, senφ 0,5L/C: ±(2% lec. +1 díg.), 0,05 a 0,1 In, senφ 0,5L/C: ±(2,5% lec. +1 díg.), 0,05 In a Imax, senφ 1: ±(2%lec. +1 díg.), 0,02 a 0,05 In, senφ 1: ±(2,5% lec. +1 díg.). Energías: (@ 20°C ± 5°C, H.R. ≤ 75%). Activa: clase 0.5 según normas EN62053-22, ANSI C12.20 . Reactiva: clase 2 según normas EN62053-23, ANSI C12.1. In: 5A, Imax: 10A; 0,1In: 500mA, Intens. de arranque: 5mA; Vn: 400/690V_{L-L} (AV5). Vn: 120/208V_{L-L} (AV6). Distorsión armónica: 1% f.e. (f.e.: 100%). (@ 20°C ± 5°C, H.R. ≤75%) , fase: ±2°; Imin: 5mA_{RMS}; Imax: 15Ap; Vmin: 30V_{RMS}; Vmax: 500Vp. Deriva térmica: ≤200ppm/°C (A/V), ≤300ppm/°C (todas las demás medidas). **Frecuencia de muestreo:** 6400 lecturas/s @ 50Hz; 7680 lecturas/s @ 60Hz . Display: LCD gráfico iluminado (128x64 puntos). Lectura para las variables instantáneas: 4x4 dígItos. Energías totales: 4x9 díg.; Energías parciales: 4x9 díg. **Tiempo de refresco del display**: 100ms. Indicación de máx. y mín.; Máx. 9999 (999,999,999), Mín. -9999 (–999,999,999). LED frontal: Rojo; Luz parpadeante en el caso de alarma virtual; Luz fija en el caso de activación de la salida digital (alarma). Medidas: Intensidad, tensión, potencia, energía, factor de potencia, frecuencia, distorsión armónica (ver “Tablas Display”). Medida TRMS de tensión/intensidad de una onda distorsionada. Tipo de conexión: Directa. Factor de cresta: <3, pico máx. 10A. **Impedancia de entrada**: 400/690V_{L-L} (AV5); 1,77 MΩ ±5%; 120/208V_{L-L} (AV6); 885 kΩ ±5%. Intensidad:≤0,01Ω. Frecuencia: 40 a 440 Hz. **Protección contra sobrecargas** (valores máx.). Continua: tensión/intensidad: AV5: 460V_{LN}, 800V_{LL}/10A; AV6: 145V_{LN}, 250V_{LL}/10A. Durante 500ms: tensión/intensIdad AV5: 800V_{LN}, 1380V_{LL}/36A; AV6: 240V_{LN}, 416V_{LL}/36A.

ESPECIFICACIONES DE SALIDA

Salidas analógicas (opcional). Número de salidas: Hasta 8 (máx. 4 x 20mA + 4 x 10VCC o 4 x 20mA + 4 x ±5mA o 8 x 10VCC o 8 x ±5mA). Precisión (@ 25°C ±5°C, H.R. ≤60%): ±0,1%f.e. (20mA o 10VCC); ±0,3% f.e. (±5mA), f.e.=10mA. Escala: de: 0 a 20mA, 0 a 10 VCC o ±5mA. Factor de escala:programable en toda la escala de retransmisión; permite controlar la retransmisión de todos los valores desde: 0 a 20 mA, 0 a 10VCC o -5 a +5mA . Tiempo de respuesta: ≤400 ms típico (filtro excluido). Ondulación: ≤1% (según normas IEC 60688-1, EN 60688-1). Variación total de temperatura: ≤500 ppm/°C. Carga: 20mACC ≤350Ω; 10 VCC ≥10k Ω ±5 mA; ≤1400Ω. Aislamiento: ver tabla “Aislamiento entre entradas y salidas”. Puerto de comunicacion óptico. Conforme con ANSI C12.18. Puerto: RS422/RS485 (**opcional**): Multiterminal bidireccional (variables estáticas y dinámicas). Conexiones: 2 o 4 hilos, distancia máx. 1000m, terminación directa en el módulo. Direcciones: de 1 a 247, seleccionable en el teclado. Protocol: MODBUS RTU /JBUS, datos (bidireccionales). Dinámicos (sólo lectura). Todas las variables del display, ver también la tabla “Lista de variables conectadas”. Estáticos (sólo escritura). Todos los parámetros de configuración puesta a cero de energías, activación de salidas digitales. Energía almacenada (EEPROM) máx. 999.999.999 kWh/kvarh. Formato de datos: 1 bit de arranque, 8 bits de datos, sin paridad/paridad par/paridad impar, 1 bit de parada. Velocidad en baudios: 9,6k, 19,2k, 38,4k, 115,2k bit/s selec. en baudios. Aislamiento: ver tabla “Aislamiento entre entradas y salidas”. Salida RS232 **(opcional)**: bidireccional (variables estáticas y dinámicas). Conexiones: 3 hilos, distancia máx. 15m, formato de datos: 1 bit de arranque, 8 bits de datos, sin paridad/paridad par/paridad impar, 1 bit de parada. Velocidad en baudios: 9,6k bit/s. Protocolo: MODBUS RTU/JBUS. Otros datos: Igual que para RS422/485. Salidas digitales (opcional). Tipo pulso. Número de salidas: hasta 16. Tipo: programable: de 0,001 a 1000 pulsos por kWh/kvarh (total y parcial). Salidas conectables a los contadores de energía total y/o parcial (Wh/varh). Duración de pulso: ≥100ms <120ms (ON), ≥100ms (OFF) según norma EN62053-31. Tipo de alarma. Número de salidas: hasta 16, independientes. Modos de alarma: alarma de máx., alarma de mín., alarma de banda, alarma de fuera de banda. Todas ellas pueden ser usadas con función de desactivación a la conexión y/o con enclavamiento. Todas las alarmas pueden ser conectadas a todas las variables (ver la tabla “Lista de las variables que pueden ser conectadas”). Ajuste de alarma: de 0 a 100% de la escala eléctrica. Histéresis: de 0 a la escala completa. Retardo a la conexión: De 0 a 255s. Estado de salida: seleccionable; normalmente desactivada y normalmente activada. Tiempo mín. de respuesta: ≤ 200ms, filtro excluido, Retardo activación alarma: “0 s”. **Nota**: las 16 salidas digitales pueden funcionar también como una combinación de salidas de pulso y salidas de alarma. **Salidas estáticas (digitales) (opcional)**. Aplicación: Para salidas de alarma o para salidas de pulso. Señal: V_{ON} 1,2 VCC/ máx. 100 mA; V_{OFF} 30 VCC máx. Aislamiento: ver tabla “Aislamiento: entre entradas y salidas”. **Salidas de relé (digitales) (opcional)**. Aplicación: para salidas de alarma o para salidas de pulso. Tipo de salida: relé SPDT; CA 1-8A, 250VCA; CC 12-5A, 24VCC; CA 15-2,5A, 250VCA; CC 13-2,5A, 24VCC. Aislamiento: ver tabla “Aislamiento entre entradas y salidas”.

FUNCIONES DEL SOFTWARE

Clave: código numérico de 4 díg. máx. de 0 a 1000; 2 niveles de protección de los datos de programación 1er nivel. Clave “0”: sin protección. 2º nivel. Clave de 1 a 1000: todos los datos están protegidos. **Selección del sistema.** Sistema 1. Monofásico (2 hilos). Sistema 2, carga desequilibrada. Bifásico (3 hilos). Sistema 3, carga equilibrada. Trifásico (3 hilos+1CT); Sistema 3, carga desequil. Trifásico (3 hilos). Trifásico (4 hilos). **Relación del transformador:** CT hasta 30 kA (6000 máx.). CT = trafo de intensidad; VT (PT) hasta 600 kV ; VT = trafo de tensión (6000 máx.) Filtros. Escala operativa del filtro: 0,1 a 100% de la escala eléctrica de entrada. Coeficiente de filtrado: 1 a 255. Acción del filtro: display, alarmas, salidas serie,(variables fundamentales V, A, W y sus derivadas). Alarmas. Modo de funcionamiento: Funciones “OR” o “AND” o “OR+AND” (ver “Página de parámetros y lógica de alarmas”. Hasta 16 alarmas libremente programables. Las alarmas pueden ser conectadas a cualquiera de las variables de la tabla “Lista de variables que pueden ser conectadas para..”. **Puesta a cero:** a través del teclado o por medio del software de configuración, pueden ponerse a cero los siguientes datos: - todos los valores mín., máx., dmd-máx. - contadores totales y parciales - alarmas de enclavamiento - todos los eventos. Registro de datos**.** Tipo de datos: alarmas, mín., máx., estado de entrada digital, estado salida digital como control remoto, puesta a cero. Todos los eventos almacenados con referencia de fecha (dd:MM:yy) y hora (hh:mm:ss). **Número de eventos:** hasta 10.000. Tipo de gestión de datos: FIFO. Tipo de almacenamiento datos: memoria flash. **Visualización:** 4 variables por página: 1 página que puede ser configurada por el usuario. Hasta 36 páginas. Contadores de energía: Hasta 28 páginas según el modo de tarifa seleccionado. Visualización de la energía consumida los 12 meses antes de la fecha actual. Eventos almacenados: 10.000 eventos. **Idioma del display:** seleccionable: ingles, italiano, francés, alemán, español.

ESPECIFICACIONES GENERALES

Temperatura de funcionamiento: -10° a +45°C (14° a 113°F); (H.R. < 90% sin condensación). **Rango límite de temperatura de funcionamiento:** -20° a +55°C (-4° a 131°F); (H.R. <90% sin condensación). **Temperatura de almacenamiento**: -30° a +60°C (-4° a 140°F); (H.R. <90% sin condensación). **Categoría de instalación:** III. **Grado de polución**: 2. **Altitud:** hasta 2000m (6560 pies) por encima del nivel del mar. **Tensión de referencia para el aislamiento:** 300 VRMS a tierra (entrada AV5). **Rigidez dieléctrica:** 4kVCARMS (durante 1 minuto); **Rechazo al ruido:** CMRR. 100 dB, 48 a 62 Hz. EMC (Compatibilidad electromag.): emisiones EN61000-6-3, EN60688 entornos industriales, comercio e industria ligera. Inmunidad: EN61000-6-2 entornos industriales. ANSI/IEEE C37.90-1989 (prueba de sobreintensidad y transitorios rápidos). **Tensión de pulso (1,2/50μs)**: EN61000-4-5. **Normas de seguridad:** IEC60664, IEC61010-1, EN60664, EN61010-1. **Normas de medida:** IEC60688, EN60688, EN62053-22, EN62053-23, ANSI C12.20, ANSI C12.1. **Homologaciones:** CE, cURus y CSA. **Conector 5(6) A:** A tornillo, hilos de 2,5 mm^2 máx. (2x 1,5mm^2). **Caja:** Dimensiones: 96x96x140 mm. Material: ABS, autoextinguible: UL 94 V-0. **Grado de protección:** Panel frontal: IP65 / NEMA 4x. **Peso:** Aprox. 600 g (embalaje incluido).

ESPECIFICACIONES DE ALIMENTACIÓN

Alimentación CA/CC: 90 a 260V (estándar); 18 a 60V (opcional). **Consumo de potencia**: ≤30VA/12W (90 a 260V); ≤ 20VA/12W (18 a 60V).