CARLO GAVAZZI
Automation Components

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WM24-96

Universal Utility Meter
Contatore Universale

USER MANUAL
MANUALE ISTRUZIONI

Control

Modular system

CARLO GAVAZZI
Automation Components

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WM24-96: Modular Universal Utility Meter and Power Analyzer

Plug and play module system; energy meters, gas and water meter. These are only a few among many other functions performed by your WM24-96. What's more, Carlo Gavazzi means ISO9001 certification, a working experience of many decades and a widespread presence all over the world. All this because we want our customers to have the ***top service and the top products****.*

Welcome in the Carlo Gavazzi world and compliments for your smart choice. Visit our website and evaluate our range of products: ***www.carlogavazzi.com***

THANK YOU FOR CHOOSING CARLO GAVAZZI

Plug and Play Modules

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CARLO GAVAZZI
WM24-96, modular universal utility meter and power analyzer
FW rev. 01

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.

HOW TO USE THE SYMBOLS

Go to the page where the previous main subject is described.

Go to the page where the next main subject is described.

Go to the page where the subject written on the top of the current page starts.

Go to the page where the subject written on the top of the current page ends.

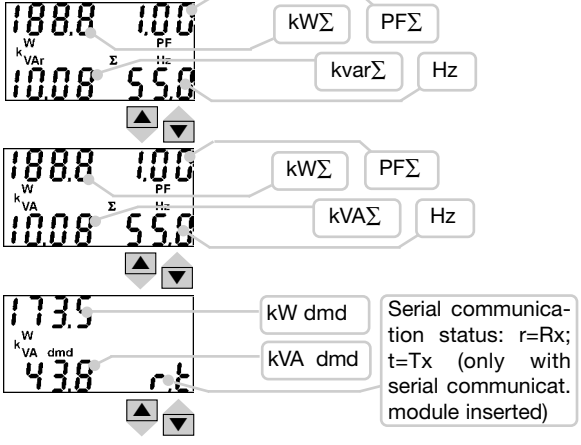
This symbol indicates a particularly important subject or information.

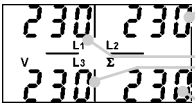
This symbol indicates that more details are given on the current subject.

■ *Front Panel Description*

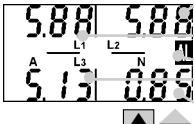
■ *List and Description of Displayed Measuring Pages*

When the instrument is switched on it shows the page below:





VL1-N | VL2-N | VL3-N | VΣ

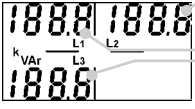


A L2 | A L1 | A L3 | A n

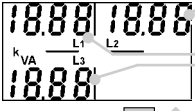
If displayed in the measuring mode it means: the alarm is ON.

W L1 | W L2 | W L3 | Multiplyer

PF L1 | PF L2 | PF L3 | PF Σ



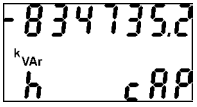
kvar L1 | kvar L2 | kvar L3



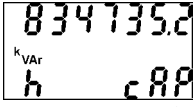
kVA L1 | kVA L2 | kVA L3

The energy meter pages are different according to the setting of the instrument (see energy meter menu on pag.13).

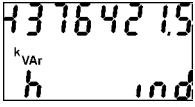
■ **If you choose "tot"** the instrument displays:



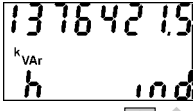
Generated capacitive reactive energy: integration of the sum of single phase reactive powers of quadrant 4 only.



Consumed capacitive reactive energy: integration of the sum of single phase reactive powers of quadrant 2 only.



Generated inductive reactive energy: integration of the sum of single phase reactive powers of quadrant 3 only.

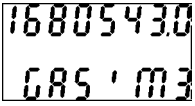


Consumed inductive reactive energy: integration of the sum of single phase reactive powers of quadrant 1 only.

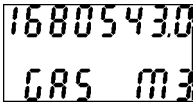
Generated active energy: integration of the sum of single phase negative active powers only.

Consumed active energy: integration of the sum of positive single phase active powers only.

■ **If you choose "tot-1.Cn"** the instrument displays all the pages displayed in the "tot" selection as well as:

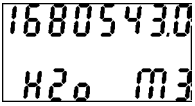


GAS meter as m^3, night tariff.

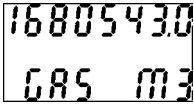


GAS meter as m^3, day tariff.

■ **If you choose "tot-2.Cn"** the instrument displays all the pages displayed in the "tot" selection as well as:

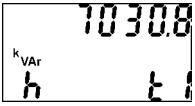


Total WATER meter as m^3.

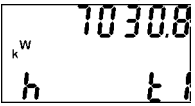


Total GAS meter as m^3.

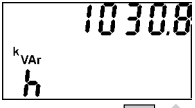
■ **If you choose "tot-Prd"** the instrument displays:



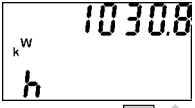
Reactive energy consumed during tariff 1: integration of the system active power only if positive (same is also for tariff 2, 3 and 4).



Active energy consumed during tariff 1: integration of the system active power only if positive (same is for tariff 2, 3 and 4).

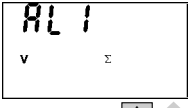


Consumed total reactive energy: integration of the system reactive power only if positive.



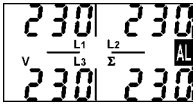
Consumed total active energy: integration of the system active power only if positive.

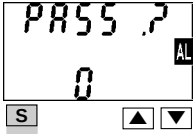
Once the energy meter pages are finished, the instrument will display some pages related to the variables connected to the alarm.



Display of alarm settings (AL1 and AL2 if both alarms have been set). It displays the variable connected to the alarm.

The scrolling of the measuring pages is cyclic, at the end of the cycle, you go back to the first page (see page 4).



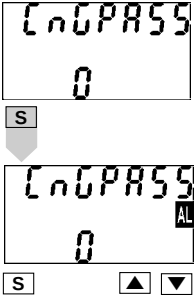


Access to the main menu

■ *Access to the main menu*

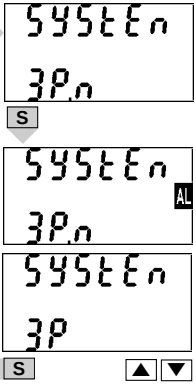
To access to the programming menus from the measuring and display phase, press the S key : when the instrument asks for the password, enter the correct PASS value by means of the ▲ and ▼ keys; afterwards confirm by means of the S key. If the password is correct (when the instrument is new, the password is 0), the instrument goes to the main functions menu.

When the "AL" box (normally used for the alarm indication) is active during the programming phase, it means that the displayed value can be modified. This rule applies to all the programming menus.



■ *Change Password*

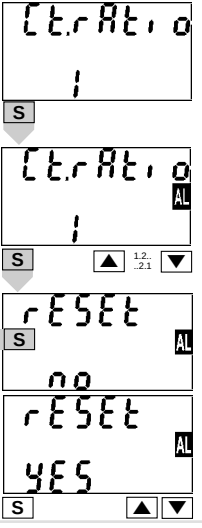
This function allows the operator to choose the desired password value (from 0 to 1000).
Choose the "CnG.PASS" function by means of the ▲ and ▼ keys, then press S to modify PASS, enter the desired value by means of the ▲ and ▼ keys and confirm the new value with the S key.



■ System

This function allows the operator to select the electrical system choosing between three-phase with neutral (3P.n) and three-phase without neutral (3P).

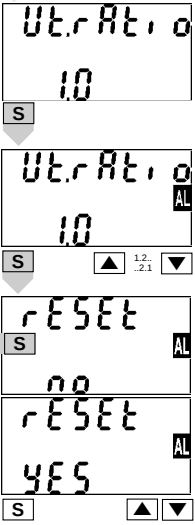
Choose by means of ▲ and ▼ the "SySTEn" function, press S to enter the menu; then, select the desired system by means of the ▲ and ▼ keys and confirm with S.



■ CT ratio

This function allows the user to select the value of the CT ratio. Example: if the CT primary (current transformer) has a current of 300A and the secondary has a current of 5A, the CT ratio corresponds to 60 (obtained by carrying out the following calculation: 300/5).

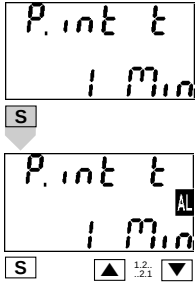
Choose the "Ct.rAtio" function by means of the ▲ and ▼ keys; to enter the menu press S; then select the desired value by means of the ▲ and ▼ keys and confirm the new value with S.



■ *VT ratio*

This function allows the user to select the value of the VT ratio. Example: if the primary of the connected VT (voltage transformer) is of 20kV and the secondary is 100V, the VT ratio will correspond to 200 (obtained by carrying out the following calculation: 20000/100).
Choose the "Vt.rAtio" function by means of the ▲ and ▼ keys; to enter the menu press S, then select the desired value by means of the ▲ and ▼ keys and confirm it with S .

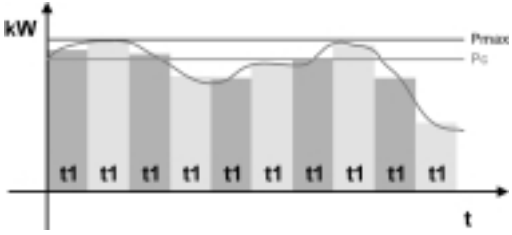
By changing the VT and CT ratio, the energy meters are reset.



■ *Dmd calculation*

This function allows the user to select the integration time of the W and VA demand value. To enter these functions select "P.int t" from the main menu by the ▲ and ▼ keys; to enter the menu press S. Set the minutes by means of the ▲ and ▼ keys and confirm the new value with S.

If, for example, you select the value “15 minutes”, the instrument calculates the demand value and updates the value every 15 minutes. See the diagram below.

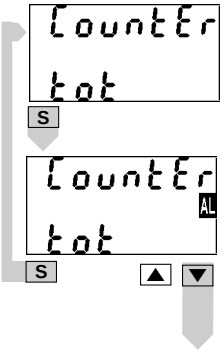


Where: Pc is the contractual power
t1 is the selected integration period

SYNCHRONIZATION OF THE POWER DEMAND CALCULATION

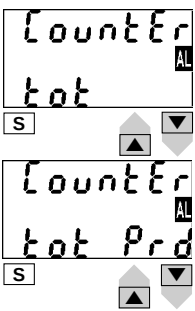
The synchronization enables the WM24-96, by means of the digital inputs, to start the integration of the power demand at the same time as the official watthour meter. The synchronization can be carried out in two ways:

- Without digital input module: the reset and the start of the energy integration are carried out when the instrument is switched on;
- With the digital input module: the synch. starts when one of the digital inputs changes status (that is to say when the tariff changes). Any following change of status resets and synchronizes again the calculation of the power demand.



■ *Access to the energy meters menu*

This function allows the user to choose the parameters for the management of the energy meters. Choose the function "COUntEr" by means of the ▲ and ▼ keys: to confirm the value and enter the submenu press S. By means of the ▲ and ▼ keys, it's possible to scroll all the functions relating to the energy meters that will be described in detail below.

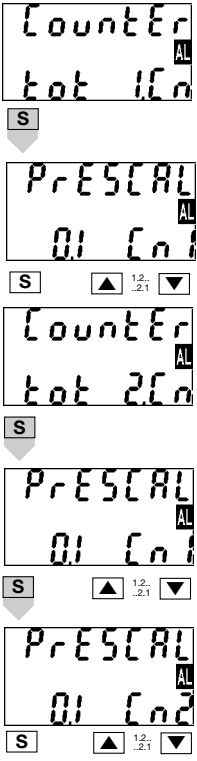


❑ *The functions of the Energy Meters submenu.*

Choose the desired function by means of the ▲ and ▼ keys, press S to confirm. It's possible to choose the following combinations:

tot: it enables the combination of total and partial meters (see page 6).

tot Prd: it enables the combination of total and partial meters: tariff t1, t2, t3 and t4 are managed by the digital inputs (see page 8);



tot 1.Cn: it enables the combination of total en. meters and day-time and night-time GAS meters (see also "Display pages" on page 7). Press [S] to select "PrESCAL Cn1", then enter by means of the [▲] [▼] keys the weight of every pulse of the IN2 digital input of the GAS meters and confirm with [S].
The same input IN2 increases alternatively the day-time and night-time GAS meters depending on the status of IN3.
tot 2.Cn: it enables the combination of total energy meters and Water and Gas meters (see also "Display pages" on page 7). Press [S] to select "PrESCAL Cn1" then enter by means of the [▲] [▼] keys the weight of every pulse of the IN3 digital input of the water meters, confirm with [S] and go to the "PrESCAL Cn2" submenu.

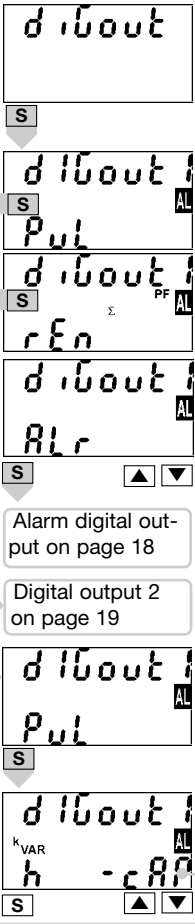
Enter by means of the [▲] [▼] keys the weight of every pulse of the IN2 digital input of the Gas meter, then confirm with [S].

The prescaler (PrESCAL) sets the weight of the input pulses of the digital input module; e.g.: by setting the prescaler at 10, for each received pulse the meter increases by 10 (10, 20, 30, etc.). The range of the prescaler varies from 0.1 to 100.0.

The increase of the Water, Gas meters, the selection of night/day tariff of the gas meters or the change of tariff (t1, t2 t3, t4) is carried out thanks to the combination of the input pulses to the AQ1038 or AQ1042 digital input module, according to the following table:

SETTING OF INSTRUMENT	DIGITAL INPUTS		RESULT
	IN 3	IN 2	
Setting **"tot Prd"** Display of total and partial multi-tariff energy meters.	ON	ON	Tariff 1
	OFF	ON	Tariff 2
	ON	OFF	Tariff 3
	OFF	ON	Tariff 4
Setting **"tot 1.Cn"** Display of total en. meters and GAS day/night tariff.	ON	Increase of GAS meters (*)	GAS night tariff
	OFF		GAS day tariff
Setting **"tot 2.Cn"** Display of total energy meters, GAS and WATER.	Increase of WATER meters (*)	Increase of GAS meters (*)	

(*) The pulse corresponds to an increase of the various meters by the pre-set weight.
If the IN 1 contact is closed (3 digital inputs module), the programming from key pad is inhibited.
The synchronisation starts at the status modification of the digital inputs (IN2 and IN3) when the instrument is set to "tot" or "tot-Prd".



■ *Digital Outputs*

❑ *Digital Output 1*

This function enables to set the parameters of the digital outputs. Choose the "diGout" function by means of the ▲ and ▼ keys, to enter the menu press S. Then, select one of the following options;

PUL: access to the retransmission functions of the totalized energy by means of pulses (see pulse digital output);

ALr: access to alarm functions (see alarm digital output); To enter to relevant menu press S;

rEn: enables the activation of the output by means of the serial communication. Confirm with S to enable the function.

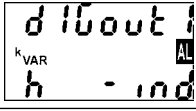
❑ *Pulse digital output*

Select "diGout1 PUL" by means of the ▲ and ▼ keys: press S to enter the relevant programming submenu, then choose the meter to be retransmitted among the available ones.

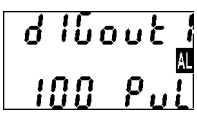
The list displaying the en. meters to be retransmitted varies depending on the chosen setting of the instrument, that is, depending on the "en. meter" selection chosen among: "tot", "tot-Prd", "tot-1.Cn", "tot-2.Cn", as reported in the table below:

IF THE SELECTION IS **tot, tot-1.Cn, tot-2.Cn:**	IF THE SELECTION IS **tot-Prd:**
kWh (consumed)	kWh tot (total energy meter)
kWh- (generated)	kvarh tot (total en. meter)
kvarh ind (cons. inductive)	kWh t1 (energy meter tariff 1)
kvarh -ind (gen. inductive)	kvarh t1 (energy meter tariff 1)
kvarh CAP (cons. capacitive)	and so on for the other
kvarh -CAP (gen. capacitive)	tariffs t2-t3-t4.

EXAMPLE OF DISPLAY

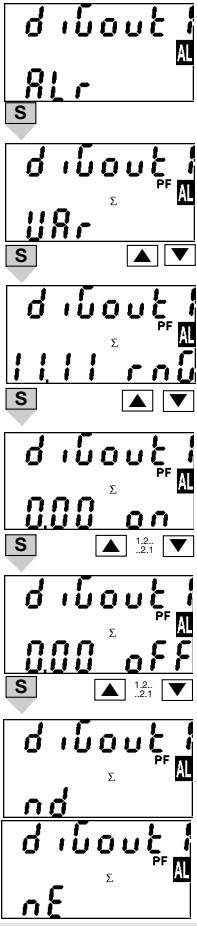


Scroll the energy meters displayed by means of ▲ ▼ and choose the desired one by means of S, then the instrument displays the page where the pulses to be associated to the energy are indicated.



Select the number of pulses by means of ▲ ▼ (pulses/kWh from 1 to 100) and confirm with S. The programming continues for digital output 2.

Digital output 2 on page 19



❑ *Alarm Digital Output*

This function allows the user to set the parameters of the alarm digital output. Choose the "diGout1- ALr" function by means of the ▲ ▼ keys: to enter the menu press S. Then, set the following parameters:

VAr: choose the variable to be associated to the alarm activation by means of the ▲ and ▼ keys and confirm with S.

rnG: choose the decimal point position.

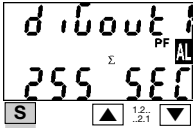
on: activation set-point, value of the variable over which the alarm is activated. Select the value of the variable by means of the ▲ and ▼ keys and confirm it with S;

oFF: deactivation set-point, value of the variable over which the alarm is deactivated. Select the value of the variable by means of the ▲ and ▼ keys and confirm it with S;

nd: normally de-energized output when there is no alarm.

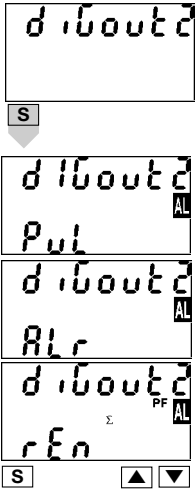
nE: normally energized output when there is no alarm.

Select the output status by means of the ▲ and ▼ keys and confirm it with S;



Digital output 2

SEC: delay time from the detection of the alarm and the activation of the output. Choose the value of the delay time in seconds by means of the ▲ and ▼ keys (up to 255 seconds) and confirm with S.

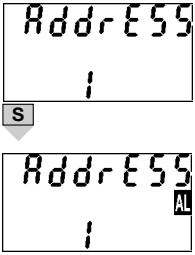


❑ *Digital Output 2*

PUL: access to the retransmission functions of the totalized energy by means of pulses (see pulse digital output on page 16).

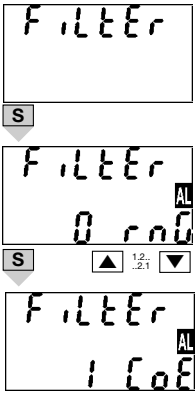
ALr: access to alarm functions (see alarm output on page 18). To enter the relevant menu press S;

rEn: enables the activation of the output by means of the serial communication. Confirm with S to enable the function.



■ *RS422/485 Serial port address*

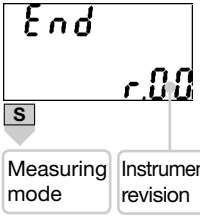
Select "AddrESS" from the main menu by means of the ▲ and ▼ keys; to enter the menu press S, then set the desired serial address value (from 1 to 255) by means of the ▲ and ▼ keys and confirm it with S.



■ *Digital Filter*

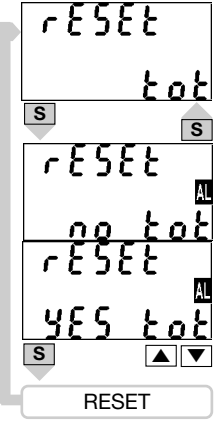
Select "FiLtEr" by means of the ▲ and ▼ keys: to enter the menu press S. Select the parameters to be set with the ▲ and ▼ keys, to enter the menu press S.
There are two parameters:
- rnG, sets the operating range of the digital filter. The value is expressed as % of the full scale value: set the desired value (from 0 to 100%) by means of the ▲ and ▼ keys and confirm it with S;

- Coe, sets the filtering coefficient of the instantaneous measurements. Set the desired value (from 1 to 16) by means of the ▲ and ▼ keys and confirm it with S. By increasing the value both the stability and the settling time of the measurements are increased.
See also "Example 2" in Useful Information on page 23.



■ *End of programming*

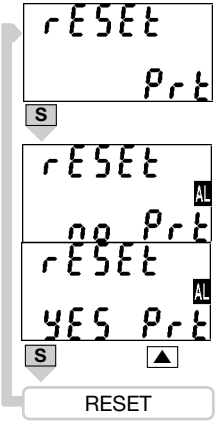
To exit from programming and go back to the measuring mode, select "End" from the main menu by means of the ▼ and ▲ keys, confirm it with S.



■ *Reset of total meters*

Select "rESEt tot" from main menu by means of the ▲ ▼ keys, then confirm with S. When the instrument asks for the reset, choose, by means of the ▲ ▼ keys:
"no" to avoid the reset or
"yes" to confirm it.

Then, press S to carry out the command.

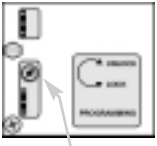


■ *Reset of partial meters*

Select "rESEt Prt" from the main menu by means of the ▲ ▼ keys, then confirm with S. When the instrument asks for the reset, choose, by means of the ▲ ▼ keys:
"no" to avoid the reset or
"yes" to confirm it.

Then, press S to carry out the command.

■ *How to prevent the programming by key-pad*

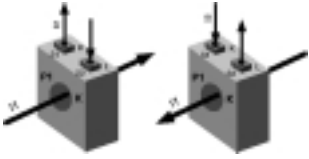


It is possible to prevent any access to programming by modifying the switch in the power supply slot (see the drawing on the left), or closing the contact N 1 of the digital input module if present.

Turn the switch using a little screwdriver.

- **Free** programming.
- **Lock** programming.

The variables measured by the instrument are correct if the polarities of the inputs have been observed (as shown in the figure below); if not, measuring and retransmission errors may occur due to the wrong direction of the current flowing in the primary / secondary of the connected current transformer.



Example 2 "Use of digital filter": it's necessary to stabilize the displayed value of the VL1-N variable that varies between 222V and 228V. The parameters of the digital filter are to be set as follows:

- rnG: the variable varies within the average value, the amplitude of which is equal to ±1.3% of the variable's rated value, calculated as follows:

(228-222)/2=±3V, then ±3*100/231V=±1.3%, where 231V is the phase-neutral rated value of a 400V input range. The "range" parameter, that corresponds to the action range of the digital filter, is set at a value which is slightly higher than the percentage amplitude of the fluctuation: e.g. 2%.

- CoE: if the new value acquired by the instrument is within the filter's action range, then the new displayed value is calculated by summing algebraically to the previous value the variation divided by the filtering coefficient. As a consequence, a value which is higher than this coefficient implies a longer settling time and therefore improves the stability. The latter can also be improved by increasing the filtering coefficient: the admitted values are within 1 and 16. Enter the value in consecutive attempts until you reach the desired stability.

■ What is ASY

The ASY variable allows the user to control the symmetry of the delta voltages (for systems without neutral) and star voltages (for systems with neutral). The variable is calculated according to the following formula:

$$ASY = \frac{Vmax - Vmin}{Vavg} * 100$$

Where: Vmax is the max. value among VL1-N, VL2-N, VL3-N
Vmin is the min. value among VL1-N, VL2-N, VL3-N
Vavg is the average: (VL1-N, VL2-N, VL3-N)/3

The variable is not displayed by the instrument, but can be retransmitted by the analogue or RS422 / 485 output and can be controlled by means of the alarm.

■ Retransmitted variables

N°	Variable	3-ph with neutral	3-ph without neutral	Notes
1	V L-NΣ	x		Σ = system
2	V L-LΣ	x	x	Σ = system
3	WΣ	x	x	Σ = system
4	varΣ	x	x	Σ = system
5	VAΣ	x	x	Σ = system
6	PFΣ	x	x	Σ = system
7	PF	x	x	
8	VA dmd	x	x	
9	W dmd	x	x	
10	ASY	x	x	asymmetry
11	The energy meters as per table on page 17			
12	All instantaneous variables (powers, currents, voltages)			

Alarm digital output

The activation of the alarm can be up or down depending on how the ON and OFF parameters have been set, as per the following table:

ON-OFF VALUES STATUS	ALARM TYPE
ON ≥ OFF	UP
ON < OFF	DOWN

Displaying of programming menu

It may be useful to know that the menus displayed by the instrument depend on its configuration; e.g.: the instrument will not display the menu relevant to the digital outputs if the optional module is not inserted.

It is important that the instrument is switched off when you plug-in or disconnect the modules.

■ *Preliminary operations*

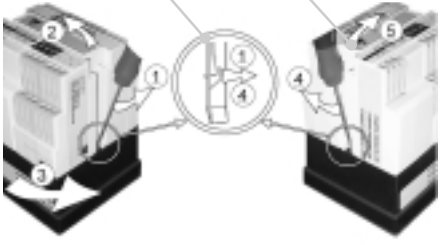
Before switching the instrument on, make sure that the power supply voltage corresponds to what is shown on the side label of the relevant module.

■ *Before mounting the modules*

To know in which slot every module is to be mounted, refer to the figure on page 28. For a correct mounting of the instrument, insert the modules in the relevant slots, then, at the end, enter the central module, which can be a blind type module or an RS232 communication module. The central module will help fixing also the other modules in the relevant slots. To remove the modules use a screwdriver as shown in the picture below.

1 Gently depress the two fixing tabs. Directions 1-4.

2 Remove the central module from its slot: press your thumb towards points 2-5.

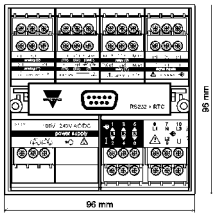


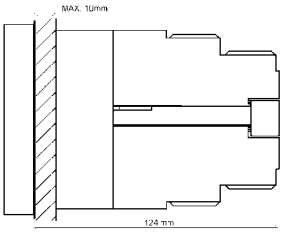
Extract the central module.

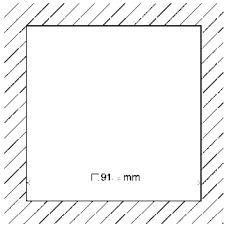
3

Any other slots that are not used must be filled with the relevant blind plug modules supplied with the instrument.

Overall dimensions and panel cut-out

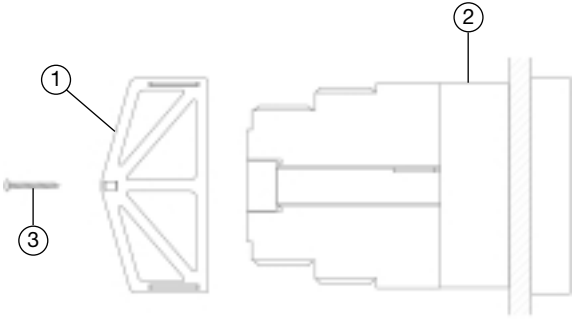




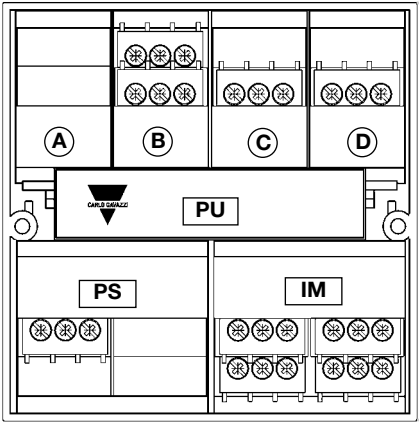


❑ *Mounting*

Insert the instrument (holding its front) and fasten it (from the back) by fixing the two lateral brackets (1) (supplied with the instrument) to the appropriate location (2), using the two screws (3) supplied with the instrument.

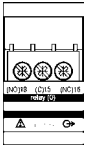


■ *Position of the slots and relevant modules*

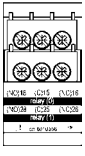


■ *Available modules*

❑ *Relay digital output modules*



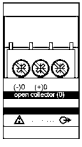
AO1058
Single relay
output



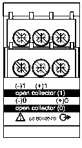
AO1035
Dual relay
output

DESCRIPTION	A	B	C	D	PU	PS	IM
RS485/RS422 serial port		✓					
RS232 serial port					✓		
Single relay output			✓	✓			
Single open collector output			✓	✓			
Dual relay output			✓	✓			
Dual open coll. output			✓	✓			
3 digital inputs			✓				
3 digital inputs +AUX			✓				
Power supply						✓	
Measuring inputs							✓

❑ *Open collector digital output modules*

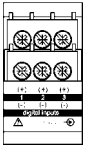


AO1059
Single open
collector output

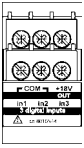


AO1036
Dual open
collector output

❑ *Digital input modules*

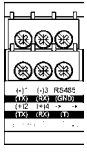


AQ1038
3 digital
inputs



AQ1042
3 digital inputs +
aux

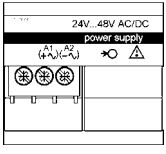
❑ *Serial port modules*



AR1034
RS485/422
serial port

AR1039
RS232 serial port

❑ *Power supply modules*

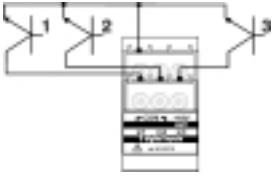


AP1020
90-260 VAC/DC Power supply
AP1021
18-60VAC/DC Power supply

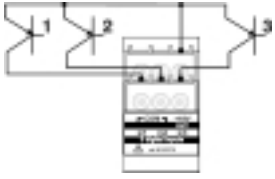
AP1025
24VAC Power supply
AP1024
48VAC Power supply
AP1023
115VAC Power supply
AP1022
230VAC Power supply

■ *Optional module connections*

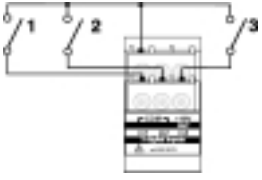
❑ *Digital inputs*



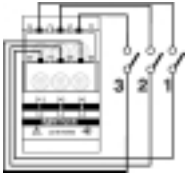
Connection by NPN transistor. AQ1042 Digital input module.



Connection by PNP transistor. AQ1042 Digital input module.

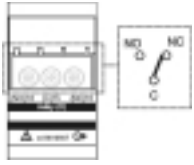


Connection by contacts. AQ1042 Digital input module.

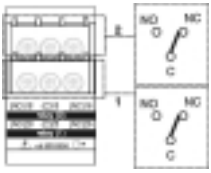


Connection by contacts. AQ1038 Digital input module.

❑ *Relay output*

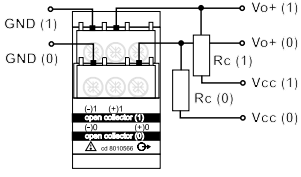


AO1058
Single relay output



AO1035
Dual relay output

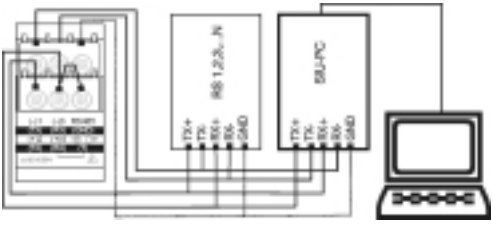
❑ *Open collector output*



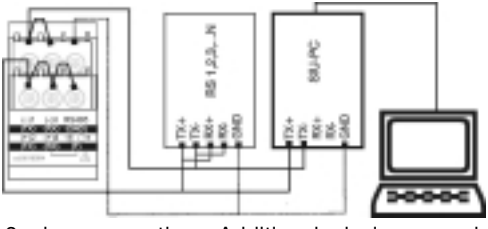
AO1059
Single open collector output
AO1036
Dual open collector output

This diagram is valid also for the single output open collector module.
The value of the load resistances (Rc) must be chosen so that the short-circuit current is lower than 100mA; the VDC voltage must be lower than or equal to 30 VDC.

❑ *RS485/422* (AR1034) *serial port*



4-wire connection. Additional devices provided with RS485/RS422 (that is RS 1,2,3...N) are connected in parallel.

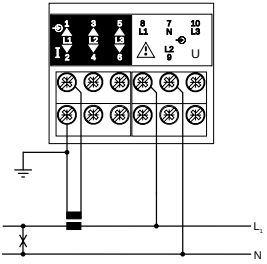


2-wire connection. Additional devices provided with RS485/RS422 (that is RS 1, 2, 3 ...N) are connected in parallel.

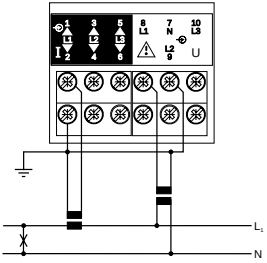
The termination of the serial output is carried out only on the last instrument of the network, by means of a jumper between (Rx+) and (T).
We recommend you to use the 4-wire connection: by means of the serial port the data are exchanged faster.

■ *Electrical diagrams*

❑ *Single-phase connection*

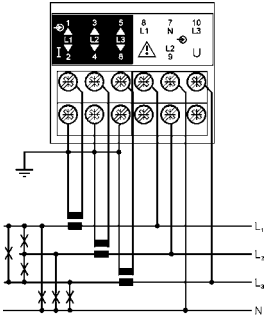


CT connection

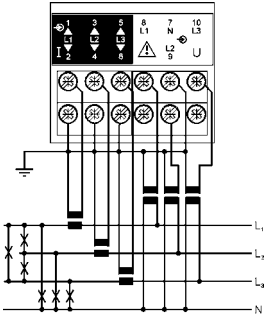


CT and VT connections

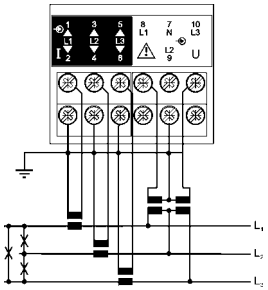
❑ *Three-phase, 4-wire, unbalanced load*



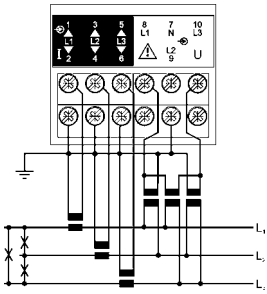
CT connection
(4-wire system)



CT and VT connections
(4-wire system)

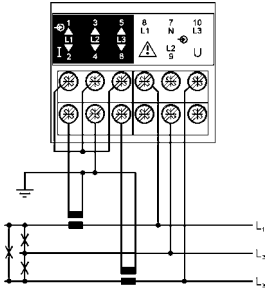


CT and VT connections
(3-wire system)

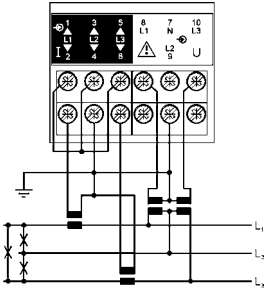


3 CT and 3 VT connections
(3-wire system)

❑ *ARON connection, 3-phase, 3-wire, unbalanced load*



CT connection
(3-wire system) ARON



CT and VT connections
(3-wire system) ARON

■ *Number of inputs*

Current: 3; Voltage: 4

■ *Accuracy* (display, RS232, RS485) In=5A; Pn= In* Un

Current: 0.003Ib to 0.2Ib: ±(0.5% rdg + 3DGT);
0.2Ib to Imax: ±(0.5 rdg + 1DGT);
Phase-neutral voltage: Un range: ±(0.5% rdg + 1DGT)
Frequency: ±0.1% Hz
Active power/energy: class 1 according to EN61036
Reactive power/energy: class 2 according to EN61268
Apparent power/energy: ±(1% Pn+2dgt), (@25°C ±5°C, R.H. ≤60%)

■ *Temperature drift*

≤ 200ppm/°C

■ *Display refresh time*

700ms

■ *Display*

Back-lighted LCD 70 x 38mm

4x3 1/2 dgt: instantaneous variables;

1x7 1/2 dgt: energy meters.

■ *Measurements*

Current, voltage, power, power factor, frequency, energies.
TRMS measurements of distorted waves.
Coupling type: direct.

■ *Input impedance*

208VLL 5(6)AAC (AV4): >200 kΩ (phase-neutral)
400VLL 5(6)AAC (AV5): >900 kΩ (phase-neutral)
100VLL 5(6)AAC (AV6): >200 kΩ (phase-neutral)
660VLL 5(6)AAC (AV7): >900 kΩ (phase-neutral)

■ *Input/Output modules technical features*

RS422/RS485 (on request)
Multidrop bidirectional (static and dynamic variables)

Connections: 2 or 4 wires, max. distance 1200m, termination directly on the instruments.
Addresses: from 1 to 255, selectable by key-pad
Protocol: MODBUS/JBUS (RTU)
Data (bidirectional) Dynamic (reading only)
System and phase variables: see "display pages" on page 41
All configuration parameters, activation of the static output.
Data format: 1 start bit, 8-data bit, no parity,1 stop bit. Baud-rate: 9600.
Insulation: By means of optocouplers, 4000 V_{RMS} between output and measuring input, 4000 V_{RMS} between output and power supply input.

RS232 (optional)
Bidirectional (static and dynamic variables)
Connections: 3 wires, max. distance: 15m.
Data format: 1 start bit, 8 data bit, no parity, 1 stop bit.
Baud-rate: 9600 bauds. Protocol: MODBUS (JBUS)
Other features: as per RS422/485

Pulse outputs (optional)
Number of outputs: Up to 2
Type: from 1 to 100 programmable pulses V_{ON} 1.2 VDC/ max. 100 mA. V_{OFF} 30 VDC max.
The outputs can be connected to total and/or partial en. meters.
Pulse duration: ON=220 ms, OFF≥ 220 ms according to DIN43864
Insulation: By means of opto-couplers, 4000 V_{RMS} between output and measuring input, 4000 V_{RMS} between output and power supply input.
Notes: outputs can be open collector or relay type (for the relay output refer to the technical features described in the alarms).

Alarm outputs (optional)
Number of outputs: up to 2, independent
Alarm type: up or down alarm, phase asymmetry
Control on the variables: All variables listed in the paragraph "retransmitted variables" on page 24 can be controlled.
Alarm set-point: can be modified from 0 to 100% of the displayed electrical scale.
Hysteresis: From 0 to 100% of the displayed scale
On-time delay: from 0 to 255 sec
Relay status: selectable, normally disabled or normally enabled.
Output type: Relay, SPDT AC 1-8A, 250VAC; DC 12-5A, 24VDC; AC 15-2.5A, 250VAC; DC 13-2.5A, 24VDC
Min. response time: ≤ 150 ms, filters excluded, FFT excluded, on-time delay: "0"
Insulation: 4000 V_{RMS} between output and measuring input, 4000 V_{RMS} between output and power supply input.
Notes: Outputs can be open collector type or relay type (for the open collector type refer to the technical features described in the pulse outputs).
Digital inputs
AQ 1038: N. of inputs: 3 (free-of-voltage)
Reading voltage: 24VDC/1mA
AQ1042: N. of inputs: 3 + power supply inputs
Power supply inputs:
output voltage: 16V<+Aux<24VDC;
output current: Max 15mA.
Input frequency: Max 20Hz, duty cycle 50%
Close contact resistance: Max 1kΩ
Open contact resistance: Min 100kΩ
Insulation: 4000VRMS
Use of contact 1: lock of the programming from key-pad (when the contact is closed).

Contacts 2-3: to be used in one of the following ways:
- tariff selection (t1-t2-t3-t4) and synchronization;
- total meters for day-night GAS tariffs;
- total GAS and WATER meters ;

■ *Software functions*

Password: Numerical code of 4 dgts; 2 protection levels of the programming data
1st level: Password "0", no protection
2nd level: Password from 1 to 1000, all data are protected
Transformer ratio: CT from 1 to 5000
VT from 1.0 to 1999, with CT x VT ≤10000 max
Power dmd: Integration time programmable from 1 to 30 min
Filter: operating range: from 0 to 100% of the electrical input scale
Filtering coefficient: 1 to 16
Filtering action: measurements, alarms, serial output
Display: up to 4 variables per page, 3-phase system with neutral:

Page 1: V L1, V L2, V L3, V LN∑
Page 2: AL1, AL2, AL2
Page 3: W L1, W L2, W L3
Page 4: VA L1, VA L2, VA L3
Page 5: var L1, var L2, var L3
Page 6: PF L1, PF L2, PF L3, PF ∑
Page 7: W ∑, var ∑, PF ∑, Hz
Page 8: W ∑, VA ∑, PF ∑, Hz
Page 9: W dmd, VA dmd
Counter pages depending on the instruments setting:
Wh+ tot, Wh- tot, Wh tot, varh tot, varh L+ tot, varh L-, varh C+, varh C-, m3 day GAS, m3 night GAS, m3 GAS, m3 WATER, Wh t1, Wh t2, Wht 3, Wht4, varht1, varht2, varht3, varht4.

■ *Power supply specifications*

90 to 260 VDC/VAC;18 to 60VDC/VAC;
24 VAC -15%+10% 50-60Hz; 48 VAC -15%+10% 50-60Hz;
115VAC -15%+10% 50-60Hz; 230 VAC -15%+10% 50-60Hz

■ *General features*

Operating temperature:
0 to +50°C (32 to 122°F) (H.R. < 90% non condensing)
Storage temperature:
-10 to +60°C (14 to 140°F) (HR. < 90% non-condensing)
Installation category: Cat. III (IEC 664)
Key-pad lock: by means of switch placed behind the display or by means of contact (if module 3 - input contacts - is present).
Insulation: 4000 V_{RMS} between inputs/outputs and ground
Dielectric strength: 4000 V_{RMS} for 1 minute

■ *EMC*

Emissions: EN50082-1 (class A) residential, commercial and light industry environment. **Immunity:** EN 61000-6-2 (class A) industrial environment.

■ *Other standards*

Safety: IEC 61010-1, EN 61010-1
Product: IEC 60688-1, EN 60688-1
Approvals: CE
5(6)A connections: screw-type, max. section 2.5 mm^2 (2 x 1.5mm^2)
Housing: Dimensions: 96x96x140 mm
Material: ABS, NORYL, PC (front); self-extinguishing: UL 94 V-0
Protection degree: Front: IP65
Connections: IP20
Weight: approx. 400 g (packing included)

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