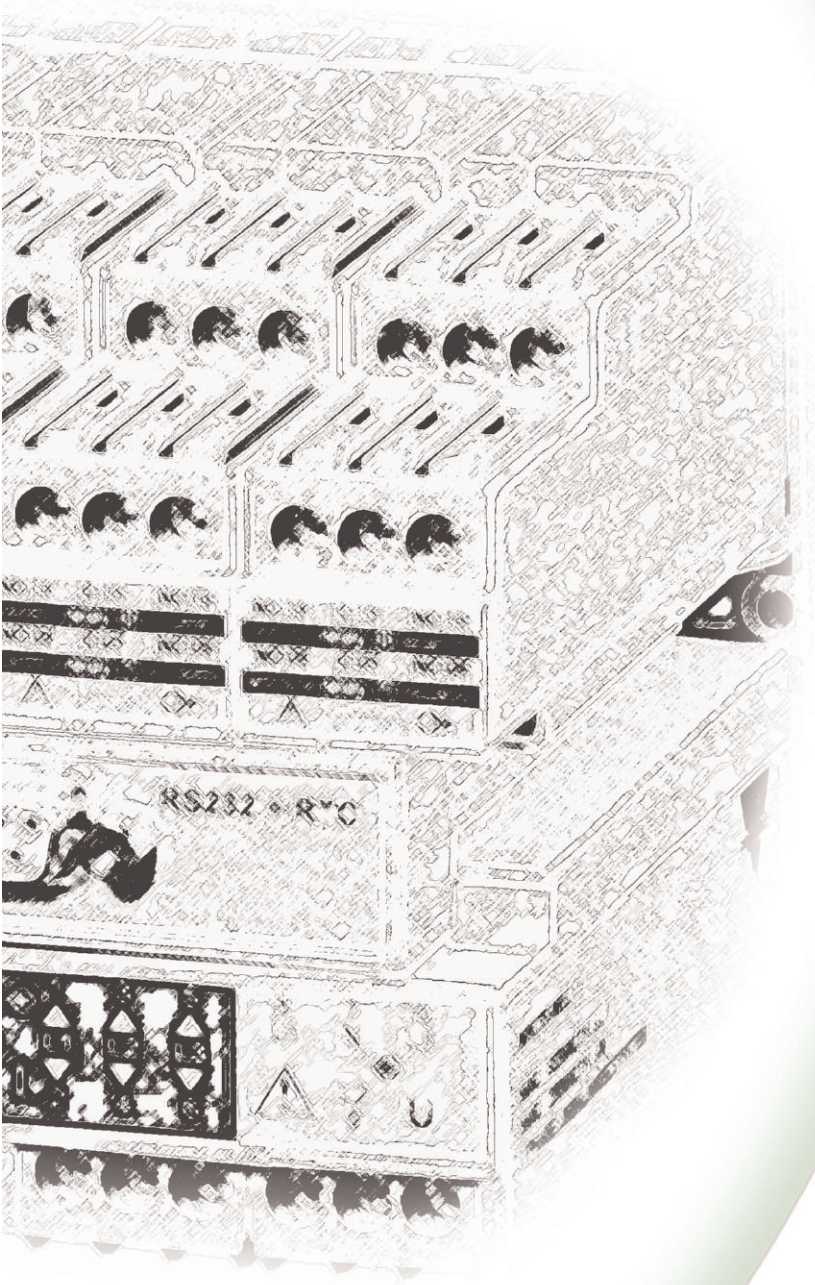
Control

CARLO GAVAZZI

PQT H

SMART Modular network power quality transducer

Instruction manual



ARM POWERED®

Thank you for choosing our products

PQT H

SMART Modular network power quality transducer

PQT H

- 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, ethernet port 10/100).

PQT H is the state-of-the-art tecnological answer to your needs of power quality analysis and transducing.

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

Index

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.

The images used in this manual are only useful to simplify the use of the instrument and may not correspond exactly to reality.

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.

PQT H philosophy, ARM® technology

PQT H is a brand new instrument with a high level of performances and connection capability.
Actually, PQT H 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 2 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 PQT H a real computer at the service of the electrical parameters analysis and of the electrical tariff management, even the more complex one.

PQT H, thanks to its great flexibility, allows to set in the menu (please see the relevant section) also the modules being installed in the base (holder module). In order to simplify the modules, it is advisable to take note of the identification code (eg. AO2050) and the relevant installation slots (A, B, etc.): we suggest to fill in the special module on the last page of this manual.

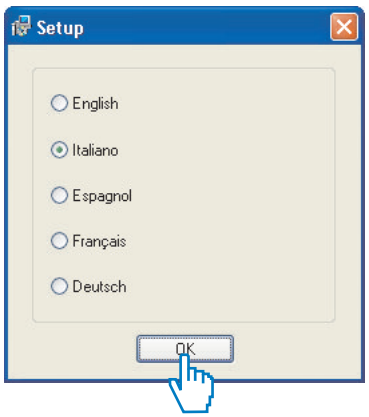
Installation of PQTHSoft

Since PQTH is a transducer, it doesn't have neither a display, nor a programming key-pad: for this reason a dedicated software is used (supplied with the instrument) with the aim to program the instrument directly from the PC, display the measured variables and download the stored data.

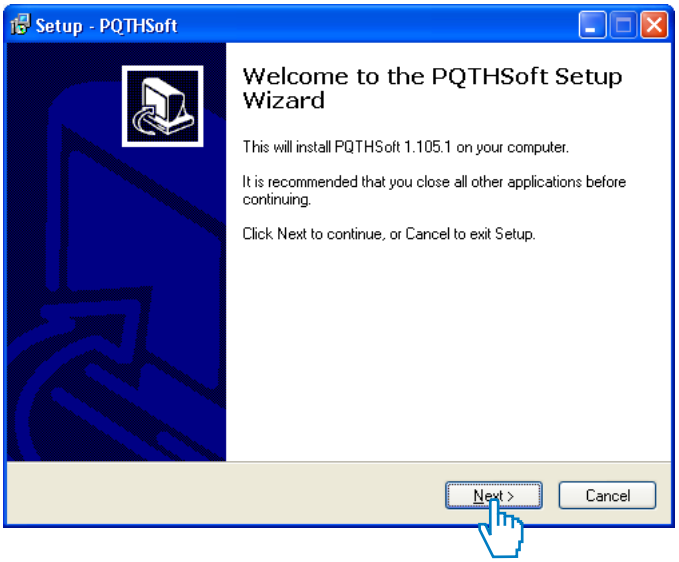
Proceed as described below for the installation of the software: the installation procedure will start automatically when the CD is inserted in the relevant drive (the option of automatic start up of the CD reader must be active); window (01) will be shown: choose the desired language and press OK, then follow the instructions that will be displayed in the installation windows (02).

If the installation procedure will not start automatically, then explore the CD and start manually the installation procedure by double clicking the "setup.exe" icon.

Compatibility: Windows Vista, Windows XP, Windows 98x.



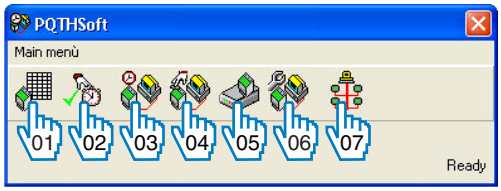
01



02


RS232
100V...240V AC/DC
power supply

Front panel description



01

After starting the software, the main frame (see figure on the left) will be shown. The meaning of the icons is the following:

01) Reading instantaneous variables: it allows the user to read all the instantaneous variables, the max and min values logged in the instrument as well as all the total and partial meters.

02) Setting up automatic monitoring: enables the download of the data of the instrument according to the configured settings. When this function is enabled, the main menu disappears and the program will continue to function in the background, this function is indicated by an icon on the tool bar.
To disable the automatic reading and restore the main menu, double click on the relevant icon.

03) Set up automatic data download: it allows the parameter configuration for the automatic data download.

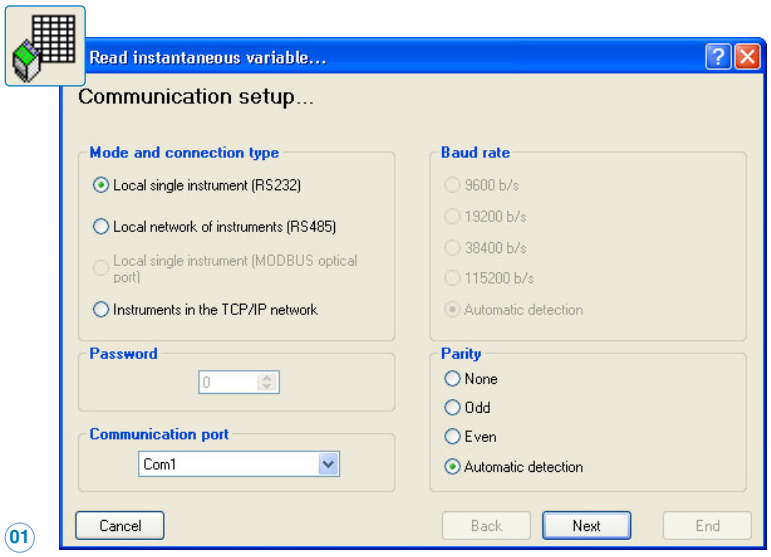
04) Set up manual data download: it allows the parameter configuration for the manual download of the data logged in the instrument according to what has been set in the relevant submenus.

05) Re-calibration: it allows to enter (after entering a protection password) the re-calibration procedure of the instrument.

06) Configuration and programming of the instrument: it allows to enter the next menu for the configuration and programming of the instrument.

07) Management of a list of instruments connected to the same ethernet network: it allows creating a list of instruments connected to an etherrnet network with the allocation of the relevant IP address.

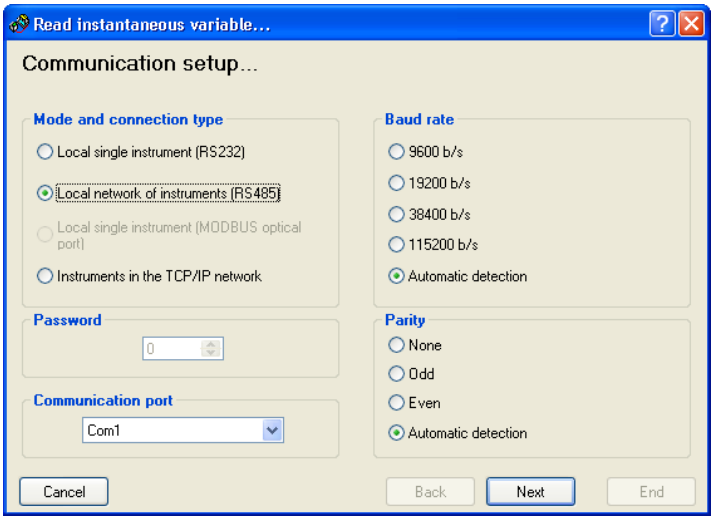
Read instantaneous variables...



01

If the icon for displaying the instantaneous variables on the computer screen has been selected, the window on the left will be shown where the user will select the required connection type, the communication port being used, the baud rate and parity type.

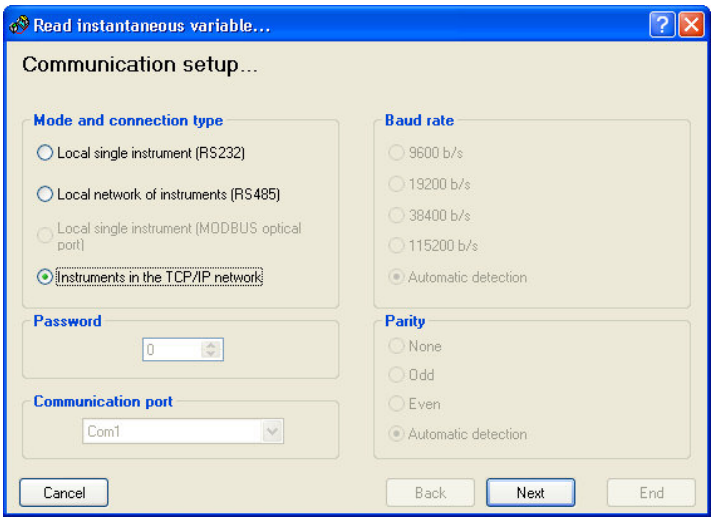
Press the “Next” button to go on to the following configuration page.



02

The window relevant to the selection of the baud rate is active only if an RS485 connection type has been selected.

Press the “Next” button to go on to the next configuration page.



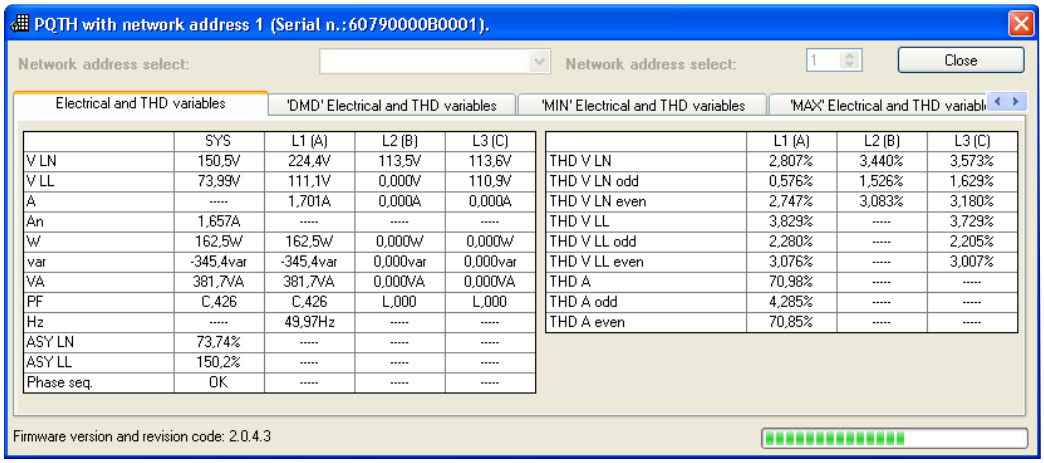
03

When the PC communicates with one or more instruments by means of the TCT/IP network, the windows relevant to the communication port, the baud rate and the parity control will be disabled.

Press the “Next” button to go on to the next configuration page.

04

To enable the communication with the instruments, press the “End” button.

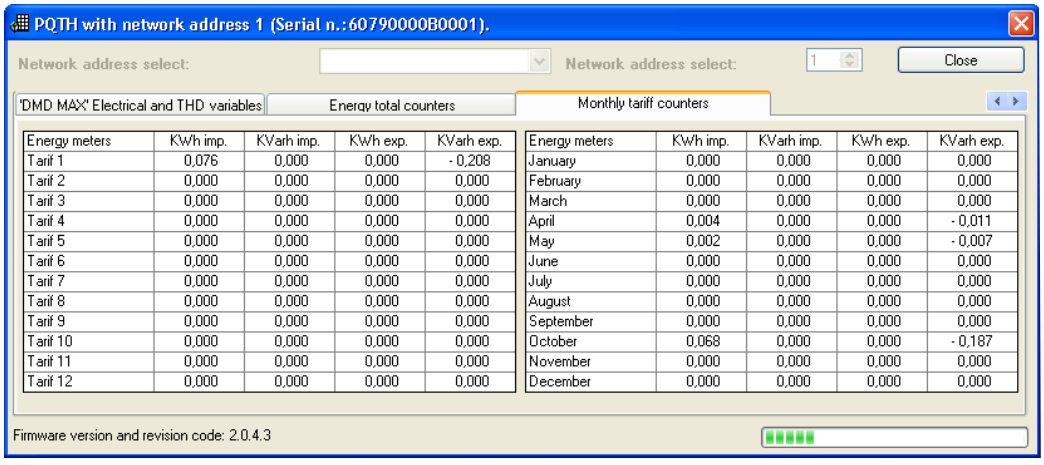


	SYS	L1 (A)	L2 (B)	L3 (C)
V LN	150,5V	224,4V	113,5V	113,6V
V LL	73,99V	111,1V	0,000V	110,9V
A	-----	1,701A	0,000A	0,000A
An	1,657A	-----	-----	-----
W	162,5W	162,5W	0,000W	0,000W
var	-345,4var	-345,4var	0,000var	0,000var
VA	381,7VA	381,7VA	0,000VA	0,000VA
PF	C,426	C,426	L,000	L,000
Hz	-----	49,97Hz	-----	-----
ASY LN	73,74%	-----	-----	-----
ASY LL	150,2%	-----	-----	-----
Phase seq.	OK	-----	-----	-----

	L1 (A)	L2 (B)	L3 (C)
THD V LN	2,807%	3,440%	3,573%
THD V LN odd	0,576%	1,526%	1,629%
THD V LN even	2,747%	3,083%	3,180%
THD V LL	3,829%	-----	3,729%
THD V LL odd	2,280%	-----	2,205%
THD V LL even	3,076%	-----	3,007%
THD A	70,98%	-----	-----
THD A odd	4,285%	-----	-----
THD A even	70,85%	-----	-----

05

The window on the left shows how the computer screen displays some instantaneous variables.



Energy meters	KWh imp.	KVarh imp.	KWh exp.	KVarh exp.
Tarif 1	0,076	0,000	0,000	- 0,208
Tarif 2	0,000	0,000	0,000	0,000
Tarif 3	0,000	0,000	0,000	0,000
Tarif 4	0,000	0,000	0,000	0,000
Tarif 5	0,000	0,000	0,000	0,000
Tarif 6	0,000	0,000	0,000	0,000
Tarif 7	0,000	0,000	0,000	0,000
Tarif 8	0,000	0,000	0,000	0,000
Tarif 9	0,000	0,000	0,000	0,000
Tarif 10	0,000	0,000	0,000	0,000
Tarif 11	0,000	0,000	0,000	0,000
Tarif 12	0,000	0,000	0,000	0,000

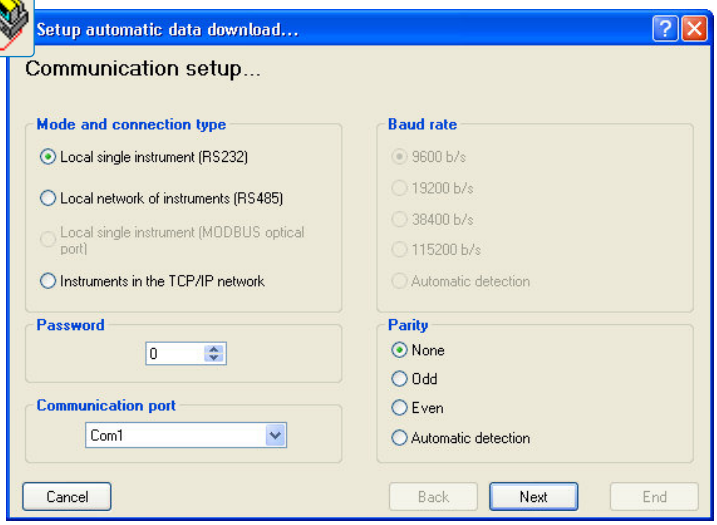
Energy meters	KWh imp.	KVarh imp.	KWh exp.	KVarh exp.
January	0,000	0,000	0,000	0,000
February	0,000	0,000	0,000	0,000
March	0,000	0,000	0,000	0,000
April	0,004	0,000	0,000	- 0,011
May	0,002	0,000	0,000	- 0,007
June	0,000	0,000	0,000	0,000
July	0,000	0,000	0,000	0,000
August	0,000	0,000	0,000	0,000
September	0,000	0,000	0,000	0,000
October	0,068	0,000	0,000	- 0,187
November	0,000	0,000	0,000	0,000
December	0,000	0,000	0,000	0,000

06

The window on the left shows how the computer screen displays the energy meters.

Setup automatic data download...

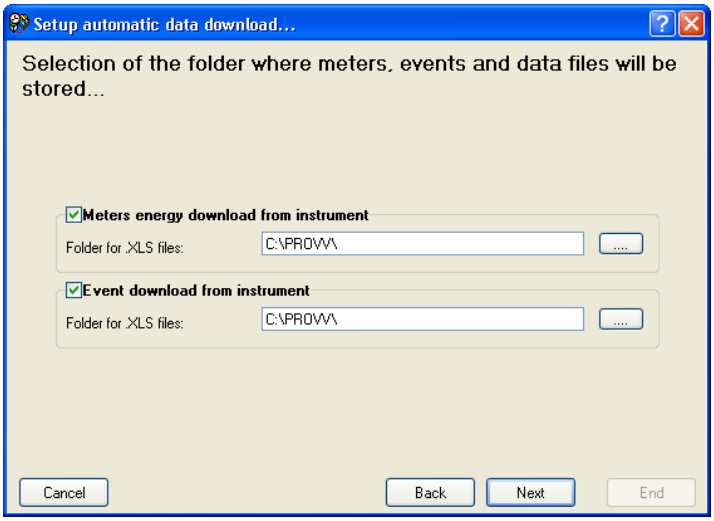
If the icon relevant to the setup of the parameters for the automatic download of the data logged in the instrument has been selected, the following windows will appear:



01

This window allows the selection of the communication type.

Press the “Next” button to go on to the following configuration page.

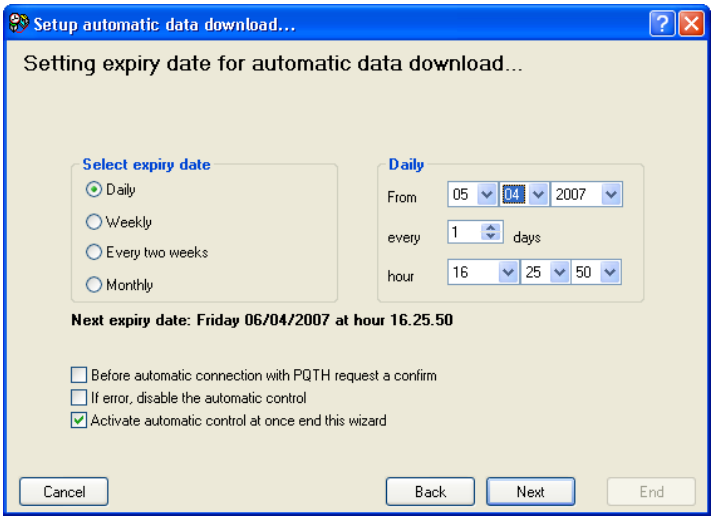


02

This window allows to select the type of download:
- Download of all energy meters from the instrument.
- Download of the events logged in the instrument (the instrument will log all the alarms with relevant date and time of activate/disactivate, plus all the max and min values of the selected variables).

For both the above selections, also the patch and the file name under which the data are to be logged, must be entered. It’s possible to choose either one or both selections.

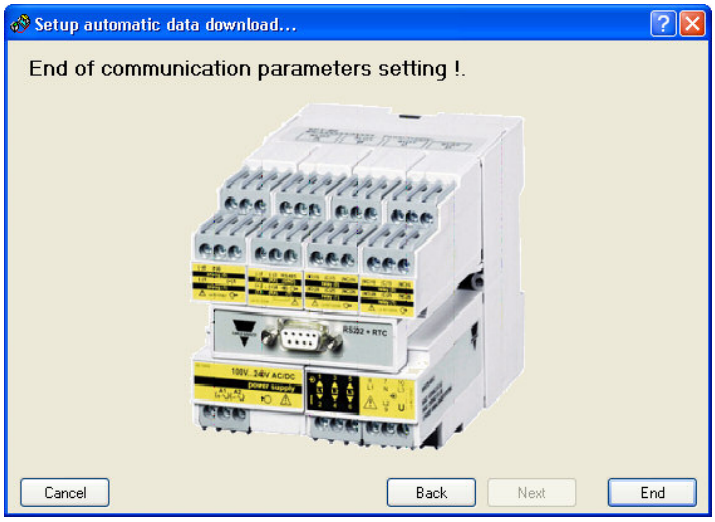
Press the “Next” button to go on to the following configuration page.



03

This window allows the user to set the expiry date for automatic data download (daily, weekly, ... monthly).
If the “daily” option is selected, then it is possible to set a customized time interval (for example every 10 days), setting the starting day, time interval and the time at which the download is required to be started. It is moreover requested to select other options for the data download:
- Before automatic connection with PQTH request a confirm...: the software will ask the user to confirm the operation before the automatic connection to the instrument.
- If error, disable the automatic control... : if an error occurs, the software will disable the data download of the next expiry dates.
- Activate automatic control at once end this wizard: the software will immediately activate the automatic control for the data download at the end of this wizard.

Press the “Next” button to go on to the following configuration page.

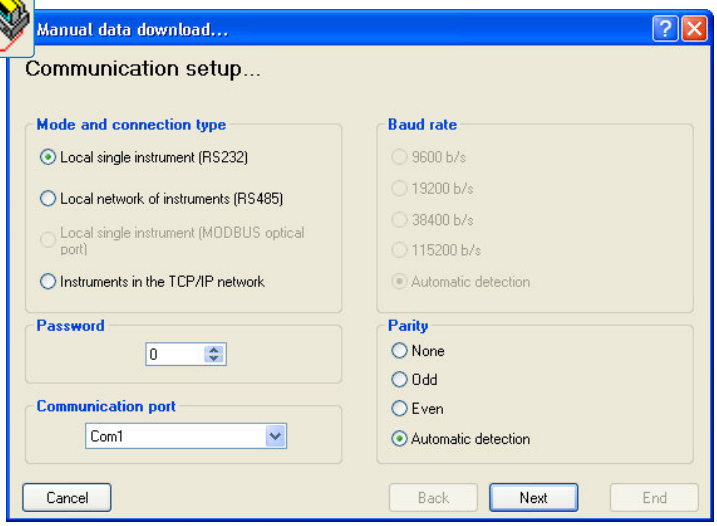


04

To end the Communication parameters setting, press the “End” button.

Manual data download

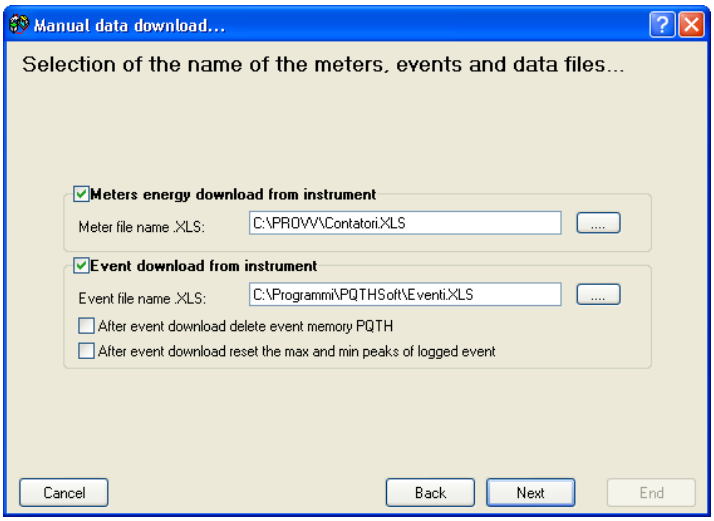
If the icon for the configuration of the manual data download has been selected, the following windows will be shown subsequently:



01

Window for the communication setup (RS232, RS485 or TCP/IP) with selection of the communication port (COM) used by the computer, if present, baud rate and parity type.

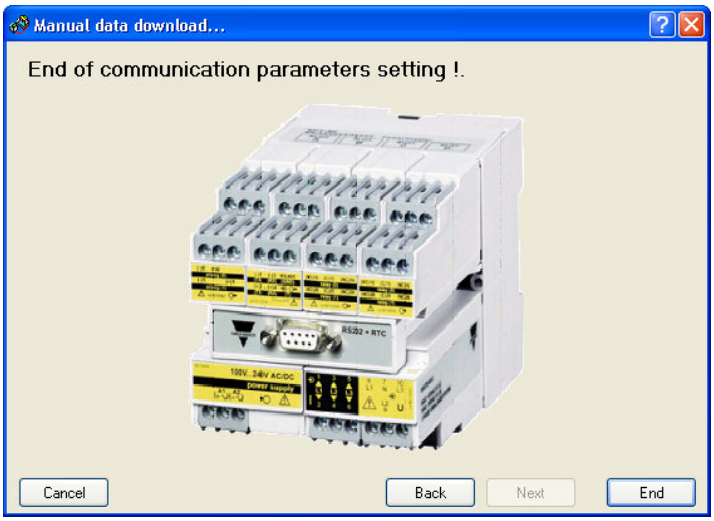
Press the “Next” button to go on to the next configuration window.



02

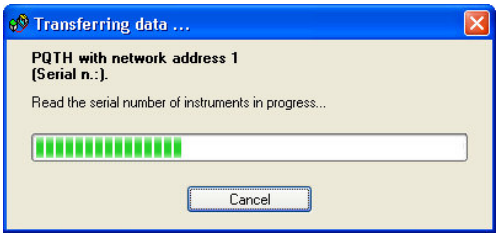
This window allows the user to select which parameters are to be downloaded (energy meters or logged event download).
For both the above selections, also the patch and the file name under which the data are to be logged, must be indicated. Since in this case, the computer does not manage the data download automatically, the user must also tick if, at the end of the download, the software is required to cancel the part of memory dedicated to the logging of the events and/or if the max./min. peaks of logged events are to be reset.

Press the “Next” button to go on to the next configuration window.



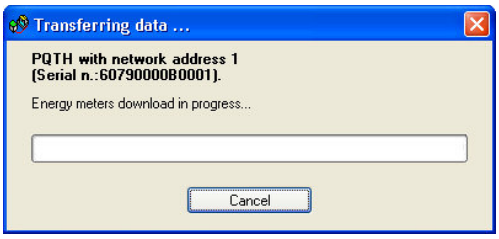
03

To end the procedure, press the “End” button.



04

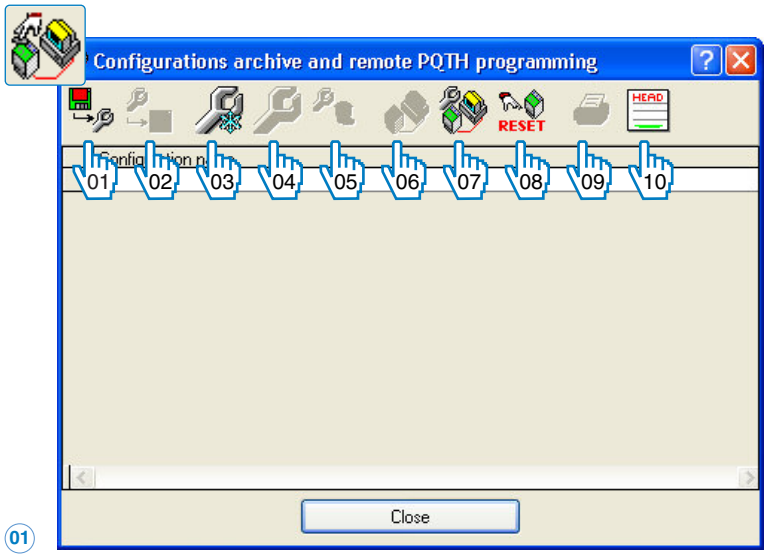
While reading/downloading the data, the PC screen shows a graphic bar illustrating the progress of the operation.



05

Configuration archive and remote PQT H programming

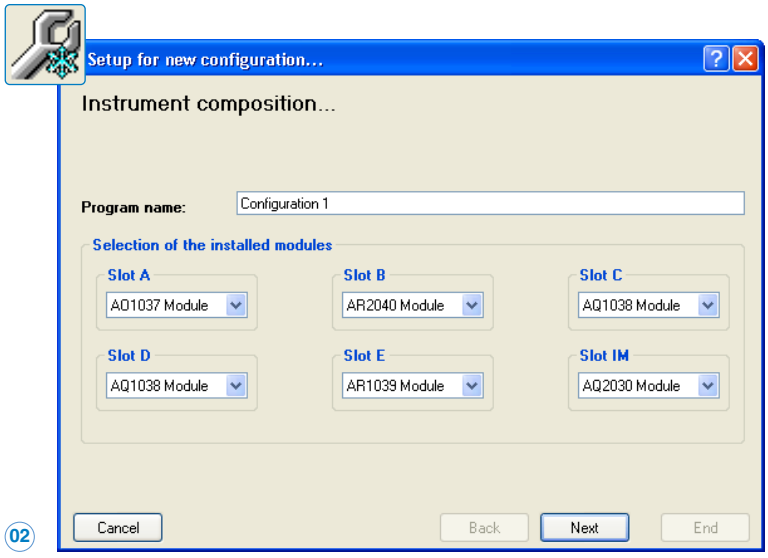
If the icon relevant to the configuration archive and remote PQT H programming has been selected, the following windows will be shown subsequently.



01

Windows for the configuration archive with the relevant function icons:
1) It allows to get a configuration from a file.
2) It allows to export the configuration on a file, which can be saved and then sent for example by email.
3) It allows the generation of a new configuration.
4) It allows the modification of a configuration present in the archive.
5) It allows to delete a configuration from the archive.
6) It allows to send the instrument a configuration present in the archive.
7) It allows a modification of the configuration of the instrument connected to the PC (the present configuration of the instrument is shown and can be modified).
8) It allows to RESET all the logged data (more details on page 34).
9) It allows the selected configuration to be printed.
10) It allows to define the printing configurations (more details on page 36).

If the icon relevant to the setup for new configuration has been selected, the following windows will be shown subsequently.

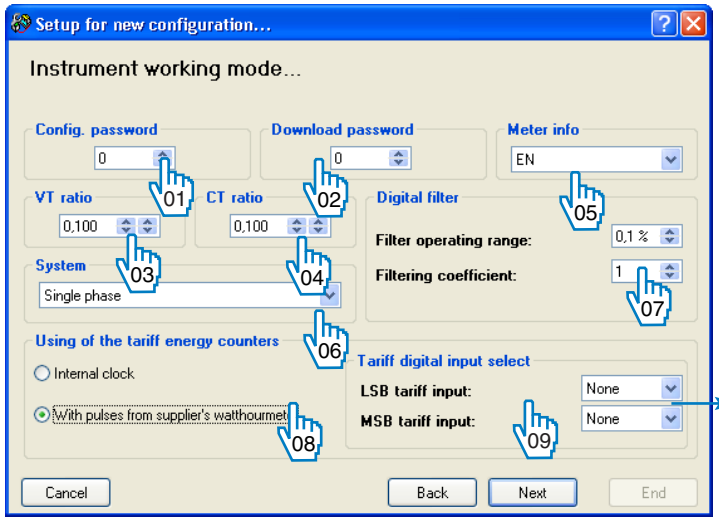


02

Instrument composition: in the “Program name” text box, it’s possible to name the configuration being created so as to recognize it for any other necessary operations.

Since the instrument is not supplied with the automatic detection function of the installed modules, these have to be selected manually from the list available for each slot (press the “drop down” box to enter the list of the modules which can be installed for each slot).

Press the “Next” button to go on to the next configuration window.



03

This window allows the selection of the instrument's main programming data:

1) It's possible to define a protection password against unintentional accesses to the programming data.
2) It's possible to define a protection password against a non-authorized downloading of the data.
3) Select the value of the primary/secondary ratio of the voltage transformer. Example: if the primary of the VT (voltage transformer) connected to the instrument is 20kV and the secondary is 100V, then the VT ratio corresponds to 200 (obtained carrying out the following calculation: 20000/100).
4) Select the value of the primary/secondary ratio of the current transformer. Example: if the primary of the CT (current transformer) being connected to the instrument is equal to 300A and the secondary is equal to 5A, then the CT ratio corresponds to 60 (obtained carrying out the following calculation: 300/5). Select the value of the primary/secondary ratio of the current transformer. Example: if the CT (current transformer) primary connected to the instrument is 300A and the secondary is 5A, the CT ratio corresponds to 60 (obtained carrying out the following calculation: 300/5).
5) In this dropdown box it's possible to define the standard to be applied in the displaying of the instrument info pages: EN= European Standard, CAN= Canadian Standard, ANSI= American Standard. Warning: this setting will also affect the choice of the signal sampling frequency.
6) Here the user can define the type of system to which the instrument is connected (Single phase, 2-phase, 3-phase, ...).
7) Define the working parameters of the digital filter (see examples on the following page).
8) Define how to use the tariff energy counter: from internal clock preceded by programming of the single tariff inputs or by means of external commands.
9) It's possible to assign to two digital inputs the "LSB" and "MSB" values representing the external commands with reference to the selection of the current tariff. The energy meters divided by tariff are thus increased in a selective way according to the status of the digital inputs (see figure "10"). These inputs are to be connected to signals with an open or close logic status sent by the energy supplier and allowing the automatic selection of the current tariff. The instrument has to know in advance the availability of the two AQ1042 and/or AQ1038 modules in order to be able to manage these signals. The management of a single signal allows the management of two tariffs only.

Press the "next" button to go on to the next configuration window.

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

10

Programming the digital filter - Examples

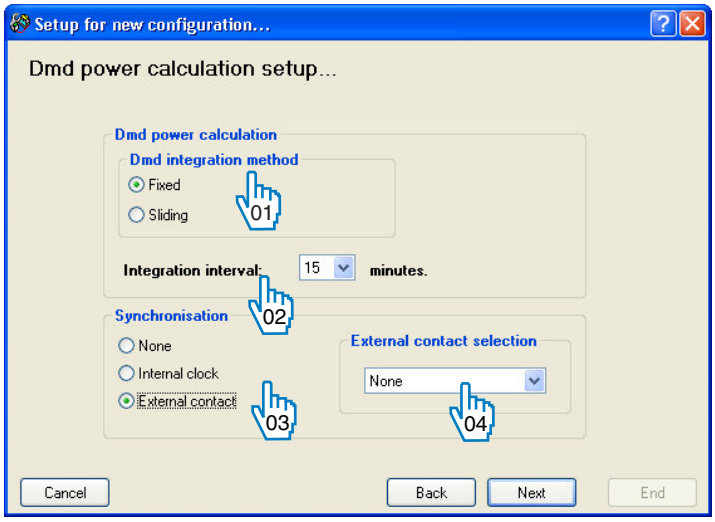
Example 1

It's necessary to stabilize the value of the variable shown on the-computer screen, that varies from 222V and 228V.
The parameters of the digital filter must be programmed as follows:
RANGE: the variable may have variations within the average amplitude value equal to ±0.75% of the rated value of the variable's full scale (calculated as follows: (228-222)/ 2= ±3V, and ±3*100/400V= ±0.75% where 400V is the rated value phase-neutral of an AV5 input). The parameter "range", that is the action range of the digital filter, will be set at a value which is slightly higher than the percentage amplitude of the fluctuation: e.g. 1.0%.
COEFFICIENT: if the new value acquired by the instrument is within the action range of the filter, the new displayed value is calculated by summing (algebraically) to the previous value the variation divided by the filtering coefficient. As a consequence, a higher value of this coefficient results in a higher settling time, that means a higher stability. The best result is generally obtained by setting the filtering coefficient at a value equal to at least 10 times the value of the range parameter. In the example: 1.0*10= 10. To enhance the stability, you may also increase the filtering coefficient (values within 1 and 32 only).

Example 2
It's necessary to stabilize the value of the System Active Power (W∑) shown by the computer screen, that varies from 300kW and 320kW (the load is connected to the instrument by means of a CT 300/5A and direct measurement of the voltage).
The parameters of the digital filter must be programmed as follows:
RANGE: the variable may have variations within the average amplitude equal to ±2.78% of the rated value of the variable's full scale (calculated as follows: (320-300)/ 2= ±10kW, and ±10*100/360kW= ±2.78% , where 360kW is the rated value of the active power of a system with AV5 input at the above mentioned conditions (CT ratio and VT ratio) and obtained by the following formula: "VLN * VT * IN * CT * 3" where VLN = voltage of the rated input (400V for the input type AV5), VT= primary/secondary ratio of the voltage transformer being used, IN = rated current (5A for input type AV5), CT = primary/secondary ratio of the current transformer being used (in this example "400*1*5*60*3=360kW).
The parameter "range", that is the action range of the digital filter, will be set at a value which is slightly higher than the percentage amplitude of the fluctuation: e.g. 3.0%.
COEFFICIENT: if the new value acquired by the instrument is within the action range of the filter, the new displayed value is calculated by summing (algebraically) to the previous value the variation divided by the filtering coefficient. As a consequence, a higher value of this coefficient results in a higher settling time, that means a higher stability. The best result is generally obtained by setting the filtering coefficient at a value equal to at least 10 times the value of the range parameter. In the given example: 3.0*10= 30. To enhance the stability, you may also increase the filtering coefficient (values within 1 and 32 only).

Example 3.
It's necessary to stabilize the value of the AL1 variable (phase 1 current) shown on the computer screen, that varies from 470V and 486V.
In order to manage the alarm function as best as possible, thus enabling and disabling the relay, this value must not be subject to continuous variations. In this example a 500/5A current transformer has been used. The parameters of the digital filter must be programmed as follows:
RANGE: the variable may have variations within the average amplitude value equal to ±1.60% of the rated value of the variable's full scale (calculated as follows: (486-470)/ 2= ±8A, and ±8*100/500V= ±1.60% where 500A is the rated value referred to the transformer being used). The parameter "range", that is the action range of the digital filter, will be set at a value which is slightly higher than the percentage amplitude of the fluctuation: e.g. 2.0%.
COEFFICIENT: if the new value acquired by the instrument is within the action range of the filter, the new displayed value is calculated by summing (algebraically) to the previous value the variation divided by the filtering coefficient. As a consequence, a higher value of this coefficient results in a higher settling time, that means a higher stability. The best result is generally obtained by 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 enhance the stability, you may also increase the filtering coefficient (values within 1 and 32 only).

Dmd power calculation setup



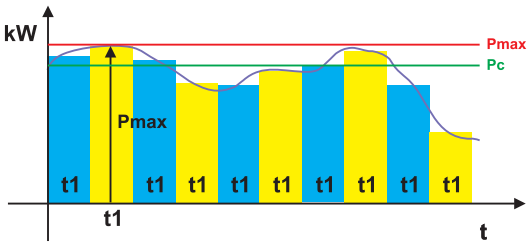
04

In this window it's possible to define which must be the method to be used for the calculation of the average power:

1) FIXED or SLIDING (see explanation below).
2) Enter the integration time relating to the DMD average calculation (DMD).
3) Indicate the method to be used by the instrument for the synchronisation of the integration period for the calculation of the "DMD" variables:
• NONE: the instrument starts the counting relating to the integration time at the switching on of the instrument itself and updates its values with the intervals defined at the previous point.
• INTERNAL CLOCK: the calculation for the integration of the DMD variables will start at the end of the first exact hour following the switching on of the instrument itself (example: if the instrument is switched on at 10.35, the calculation of the DMD values will start at 11.00) and the instrument will update the values with the intervals defined at point "2".
4) EXTERNAL CONTACT: the calculation for the integration of the DMD variables will start as soon as the instrument receives a pulse from an external command (by means of a digital input defined in windows n. 4); the instrument will update the values with the intervals defined at point "2". Every further pulse received from the instrument, will cause a re-synchronisation of the counting for the integration period.

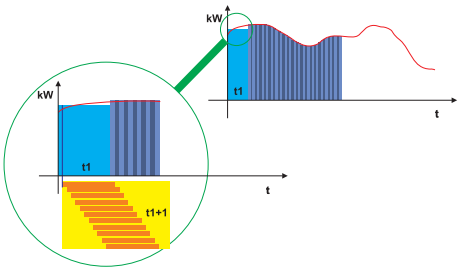
Press the "Next" button to go on to the following configuration window.

Fixed/sliding selection



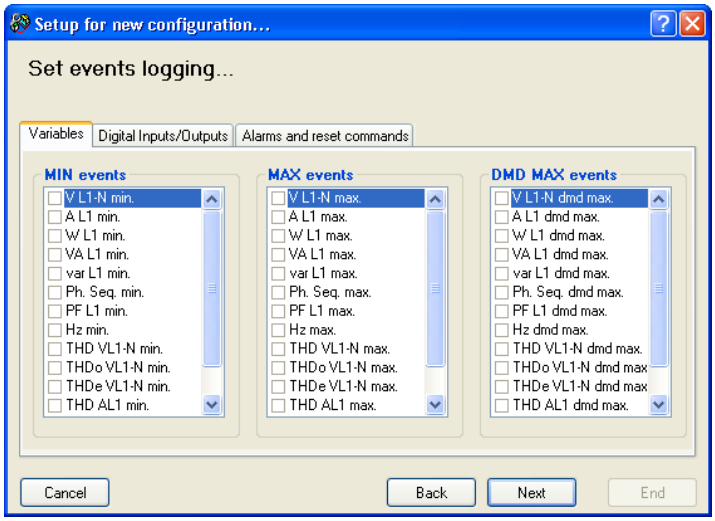
FIXED SELECTION: if for example a time interval of 15 minutes has been selected, the instrument calculates the dmd value of the measured variable and updates its value every 15 minutes.

Where:
Pmax is the maximum power,
Pc is the contractual power,
t1 is the time period selected for the calculation of the dmd value



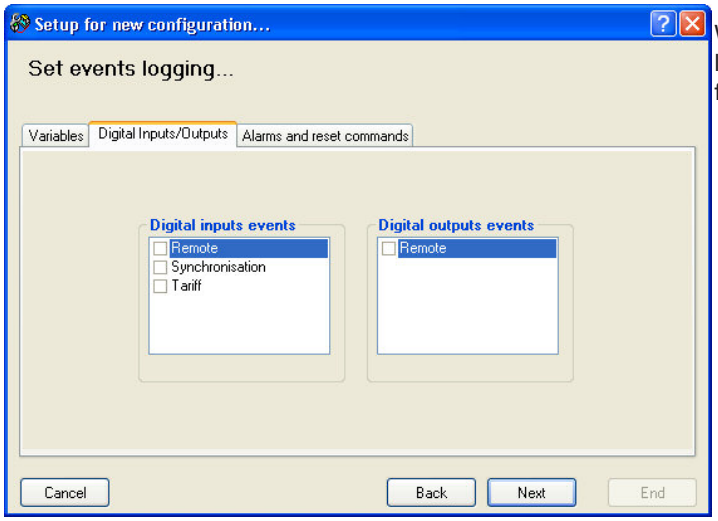
SLIDING SELECTION: if for example you have selected a time interval of 15 minutes, the instrument calculates the dmd value and updates it after the first 15 minutes, and then every minute, generating a 15-minute wide window moving onwards every 1 minute.

Set events logging...



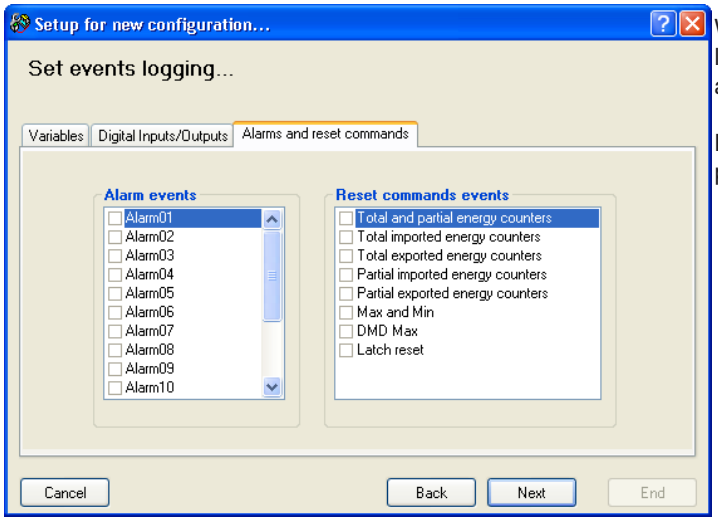
05

In this window it's possible to select which events are to be selected and logged in the instrument (the instrument is able to log up to 10000 events). Referring to the variables, it's possible to log up to 3 kind of events: MIN events / MAX events and DMD MAX events.



05

With reference to the digital inputs/outputs, it's possible to log any modification of the status, no matter what their function is (remote, synchronisation or tariff change).

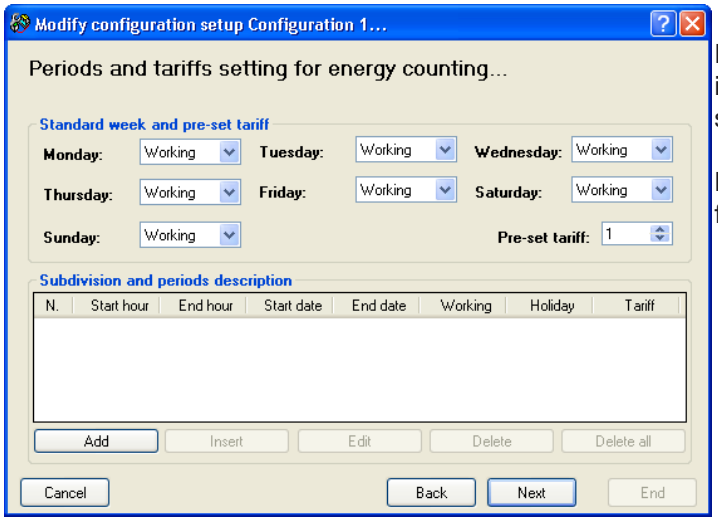


05

With reference to the alarms and/or reset commands, the logging of all the above mentioned events includes date and time relevant to the event itself.

Press the "Next" key to go on to the next configuration page.

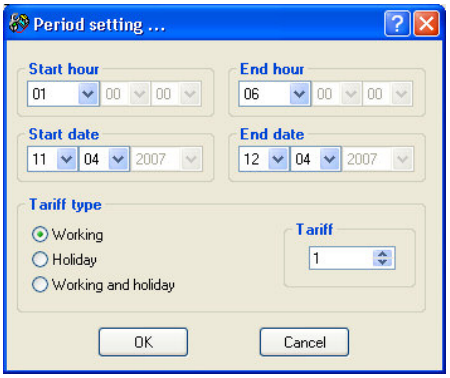
Tariff



06

In this window it's possible to set the desired tariff indicating for each day of the week if it is to be considered as a Working day or as a Holiday.

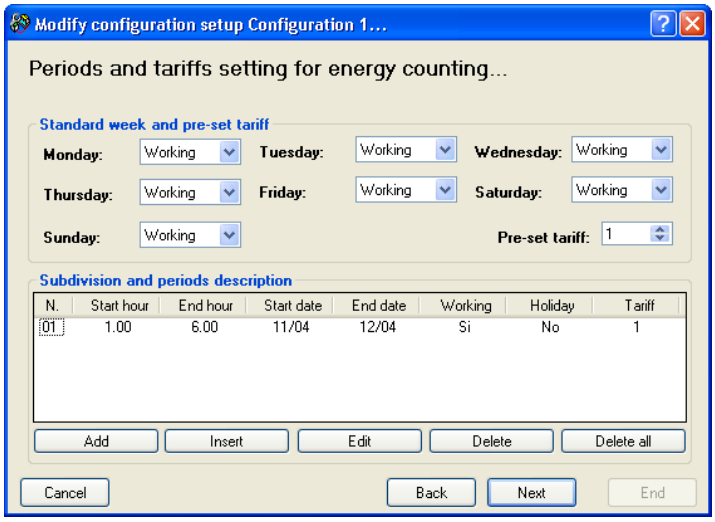
Press the "Next" button to go on to the following configuration window.



07

For each tariff type the user will have to define: start hour, end hour and relevant start and end dates of each period. Also the tariff type to be coupled to the above mentioned period is to be indicated.

Press the "OK" button to confirm.



08

The following operations are available:

- ADD : it allows the user to create a new tariff.
- INSERT : it allows the user to insert a new tariff in a well defined position.
- EDIT : it allows the modification of a previously inserted tariff.
- DELETE : it allows to delete the selected tariff.
- DELETE ALL : it allows to delete the configuration of the previously inserted tariffs.

Press the "Next" button to go on to the following configuration window.

Example of tariff programming

Eg.: the energy supplyer company sets the following tariffs for December: the working week starts from Monday to Friday and the Weekend includes Saturday and Sunday. In the working days there are two different tariffs: from 8 am to 5 pm in tariff “T4” and from 5 pm to 8 am in tariff “t3”; in the weekends there is a single tariff “T2”.

Step one: programme the standard week.
The working days will be indicated as follows:
Monday (W), Tuesday (W), Wednesday (W), Thursday (W), Friday (W).
The holidays will be indicated as follows:
Saturday (H), Sunday (H).

Step two: programme the rows displaying the tariffs division for the working days:

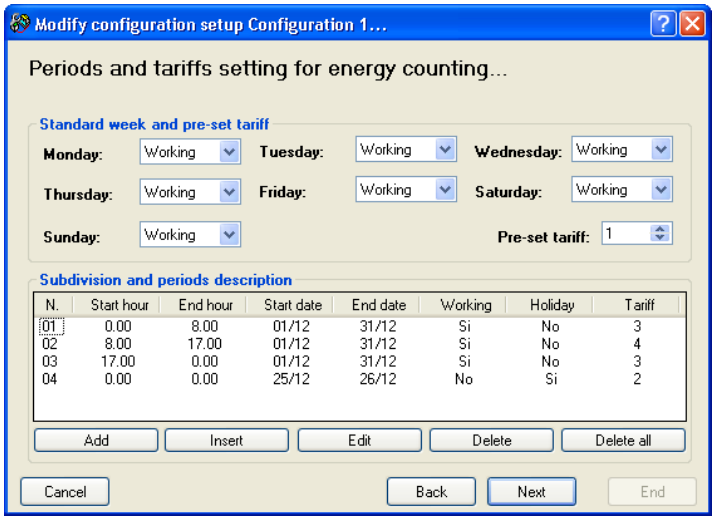
In the tariff table there are max. 100 rows to be selected.

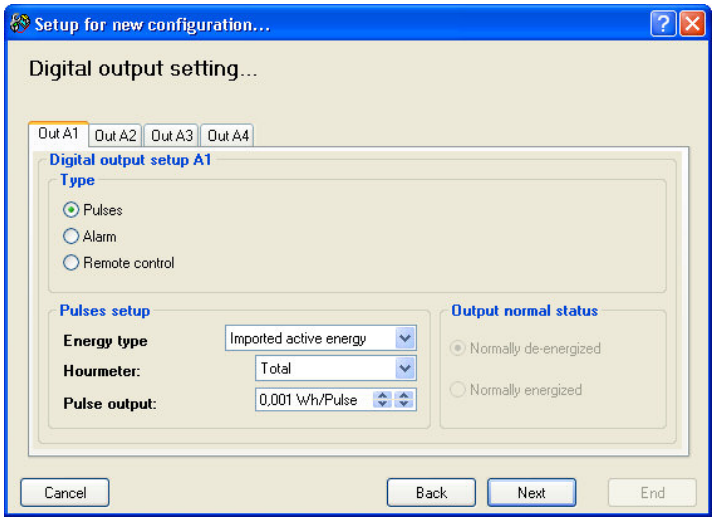
First row: Start hour = 00, End hour = 8, Start date = 01/12, End date = 31/12, then select “Working” and Tariff “3”.
Second row: Start hour = 8, End hour = 17, Start date = 01/12, End date = 31/12, then select “Working” and Tariff “4”.
Third row: Start hour = 17, End hour = 24, Start date = 01/12, End date = 31/12, then select “Working” and Tariff “3”.
The fourth row will identify the holidays other than Saturday and Sunday (for example December 25th and 26th).
Fourth row: Start hour = 00, End hour = 24, Start date = 25/12, End date = 26/12, then select “Holidays” and Tariff “2”.

The tariffs have thus been programmed and the instrument will display the window shown below.

Since the tariffs above programmed refer only to the month of December, it is necessary to set a tariff referring to the rest of the year, named “T1”.

In this case, the pre-set tariff is to be used, and it is to be set to “1”: the instrument will thus automatically use the “T1” tariff when there are no other programmings.

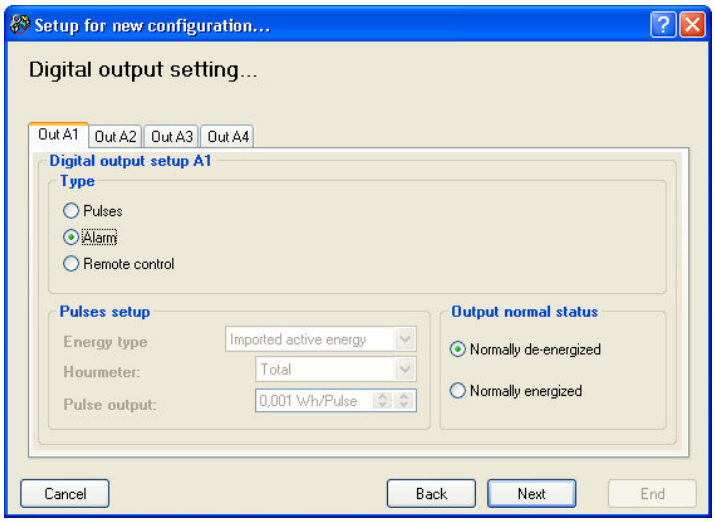




09

This window allows to define the function of each single digital output present in the instrument (if installed). Each function can be selected as:

• PULSES: to retransmit the energy by means of digital pulses; in this case the user is required to indicate the energy type to be coupled to this output (imported or exported energy, active or reactive energy, total or partial energy) and the pulse output value (the number of Wh for each single pulse).



09

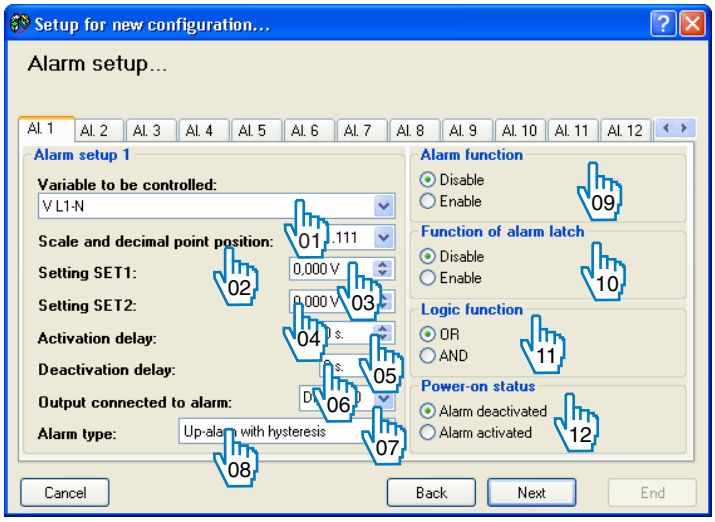
• ALARMS: the digital output will be energized and/or de-energized according to the alarm status to which the output is connected. The output normal status (normally energized or normally de-energized) is also to be defined.

Press the “Next” button to go on to the following configuration window.

The digital outputs shown in the below table (see yellow boxes only) are submitted to a short self test when the instrument is switched on, and are thus energized for a short period. They're therefore not recommended to be used as pulse outputs.

Code	Description	Slot A				Slot B				Slot C				Slot D			
AO1058	1 relay output	**A0**				B0				C0				D0			
AO1059	1 open coll. output	**A0**				B0				C0				D0			
AO1035	2 relay outputs	**A0**	**A1**			B0	**B1**			C0	C1			D0	D1		
AO1036	2 open coll. outputs	**A0**	**A1**			B0	**B1**			C0	C1			D0	D1		
AO1037	4 open coll. outputs	**A1**	**A2**	**A3**	**A4**	**B1**	**B2**	B3	**B4**	**C1**	**C2**	C3	C4	**D1**	**D2**	D3	D4

Alarm set up



10

This window allows the user to set all the alarms. The instrument can manage up to 16 alarms which can be connected to the digital outputs present in the instrument either one-to-one (1 output = 1 alarm) or by groups using the “OR” or “AND” logic function. The programming of each alarm is to be carried out as follows (the numbers refer to the figure on the left):

1) Selection of the variable to be controlled.
2) Definition of the variable’s multiplying factor to be controlled and the position of the decimal point.
3) Set-up of set-point 1.
4) Set-up of set-point 2.
5) Set-up of a delay time in seconds relevant to the activation of the alarm starting when a condition of the variable requiring the activation of the alarm occurs.
6) Set-up of a delay time in seconds relevant to the disactivation of the alarm occurring when the variable exits from the alarm condition.
7) Connection of the alarm to a specific digital output (more than one alarm can be connected to the same digital output).
8) Define the alarm type:
- Up-alarm with hysteresis
- Down-alarm with hysteresis
- In-window alarm
- Out-window alarm

9) Enable or disable each single alarm.
10) Enable or disable the latch function, if enabled, when the alarm is deactivated (the deactivation of the alarm is automatic). If this function is enabled, to disable the alarm condition a manual reset command will be required.
11) Defines the logic function to which the alarm has to answer (see example on the following page).
12) Defines the alarm status at the switching on of the instrument: if the function is active, the first alarm condition monitored by the instrument will be ignored and the alarm will not be activated.

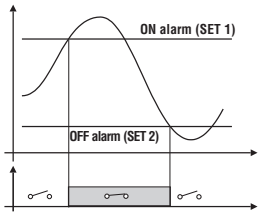
Press the “Next” button to go on to the following configuration window.

Alarm logic and parameters

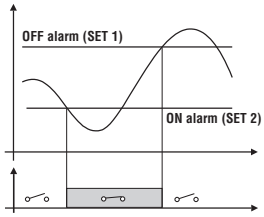
Each symbol includes all the settings described in the "alarm" paragraph and listed on the right:

- Activation
- Variable
- Alarm type
- Latch
- Deactivation
- Set point 1
- Set point 2
- Output
- Activation delay - Deactivation delay
- Function (AND/OR)

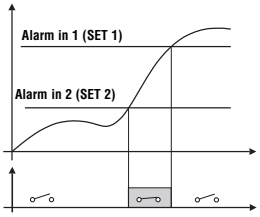
A, B, C... up to 16 blocks of parameters control.



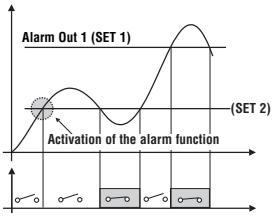
UP alarm
SET 1 > SET 2



DOWN alarm
SET 2 < SET 1

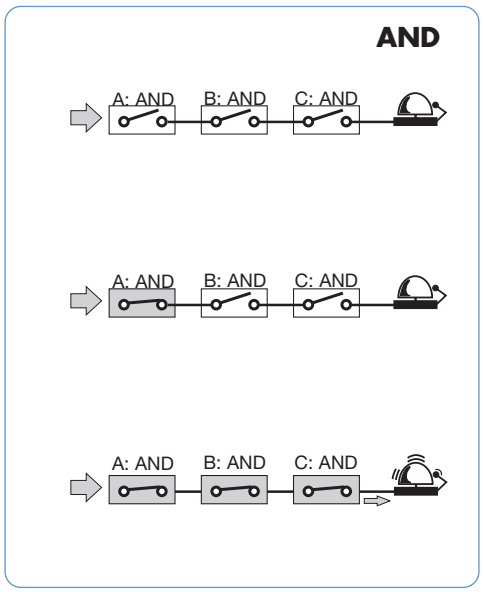


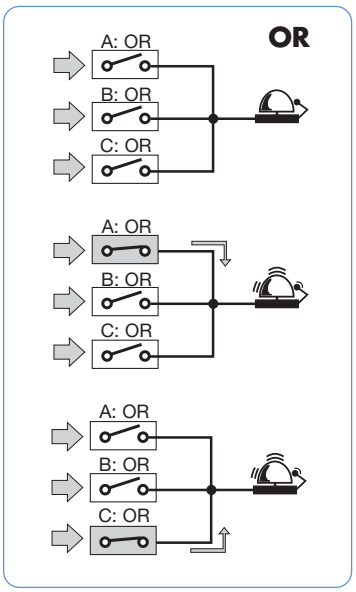
In-window Alarm
In alarm between SET 1 and SET 2

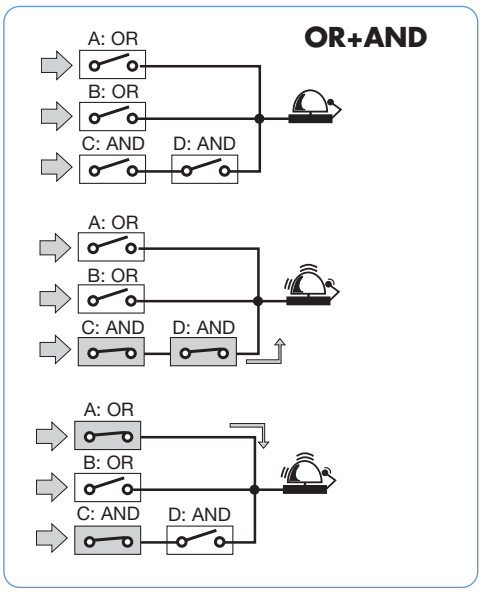


Out window alarm with disabling at power on
In alarm over SET 1 and below SET 2

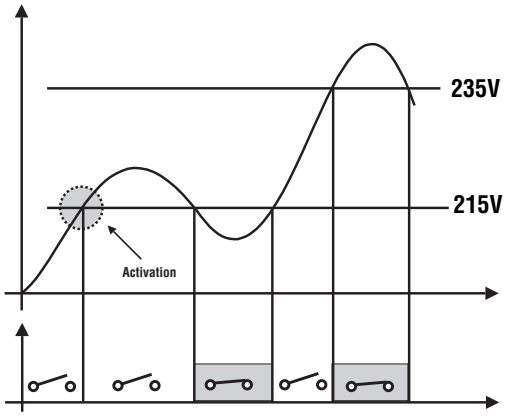
Examples of AND/OR logic alarms:



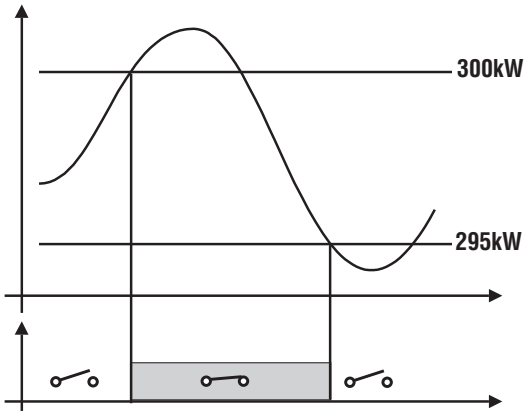




Programming examples of the alarm parameters.



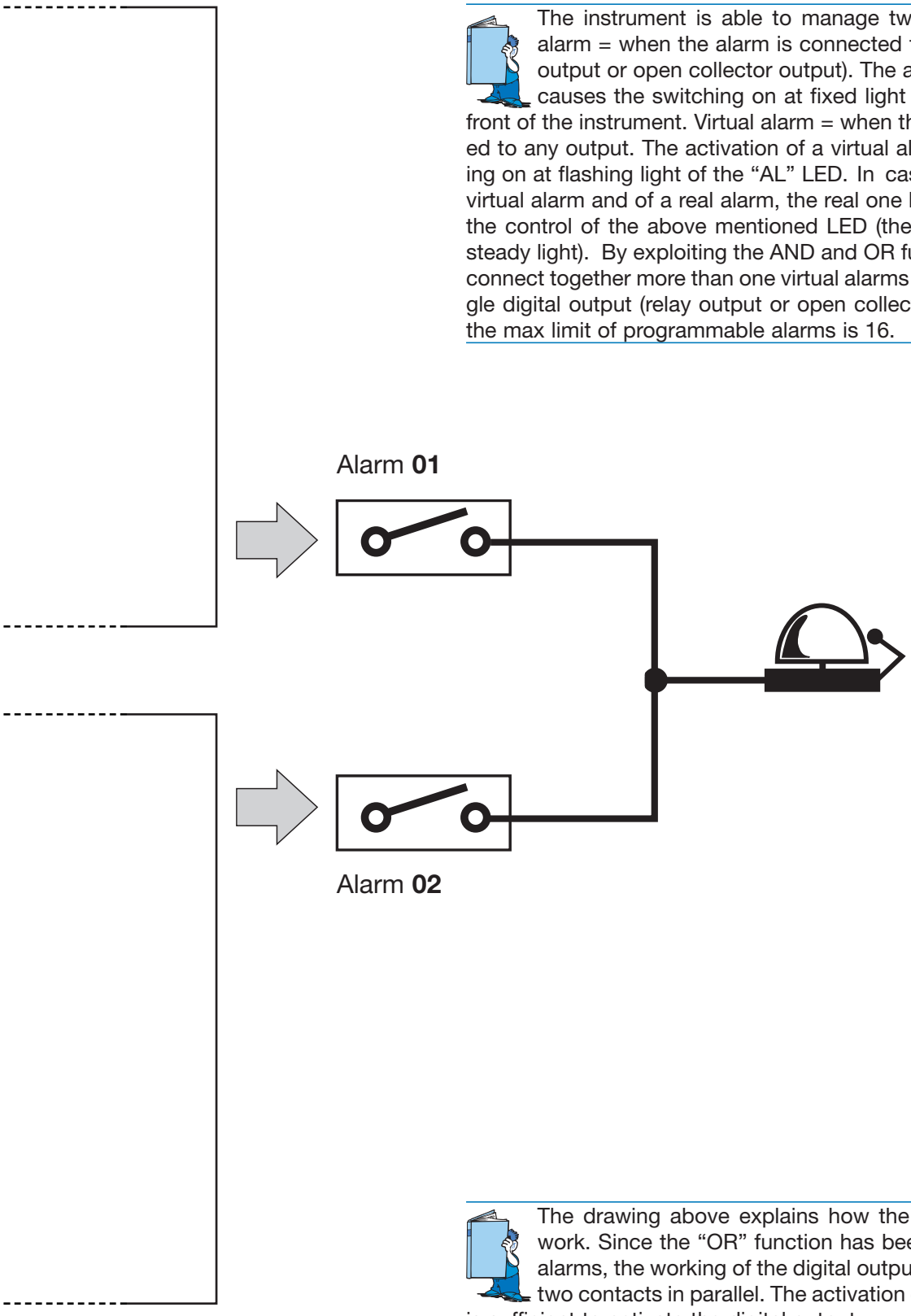
Activation of an alarm when the network voltage VL1-N is outside the window 215V – 235VAC.
Select the out-window alarm so that the output is activated when exceeding 235V and going below 215V.
The recommended programming is as follows:
- Activation of one of the 16 alarms (example alarm 01 ON)
- Select the variable to be controlled: VL1-N= V1
- Select the desired type of alarm: OUT
- Select if enabling or not the latch: OFF
- Select if enabling or not the deactivation of the first alarm status starting from the switching on of the instrument: ON
- Set set-point 1 = 235V
- Set set-point 2 = 215V
- Select to which digital output the alarm being programmed is to be addressed to (the digital output must have been previously enabled to the “alarm” function; in the same menu, the user can select the required type of output: “ND or NE”).
- If a delay on activation is required, set the number of seconds: e.g. “5 seconds”.
- If a delay on deactivation is required, set the number of seconds: e.g. “5 seconds”.
- Select the type of logic with which the alarm is to be managed: “OR” (see example: AND/OR logic alarm).



Disconnection of a load when exceeding a predefined value of consumed power: for example, when exceeding 300kW, the alarm has to be activated and disconnect a predefined load. An “UP” alarm is selected. The recommended programming is as follows:
- Activation of one of the 16 alarms (example alarm 02 ON)
- Select the variable to be controlled: W system (WΣ)
- Select the desired type of alarm: “UP”
- Select if enabling or not the latch: “OFF”
- Select if enabling or not the deactivation of the first alarm status starting from the switching on of the instrument: “OFF”
- Set set-point 1 = 300kW
- Set set-point 2 = 295kW
- Select to which digital output the alarm being programmed is to be addressed to (the digital output must have been previously enabled to the “alarm” function; in the same menu, the user can select the required type of output: “ND or NE”).
- If a delay on activation is required, set the number of seconds: e.g. “5 seconds”.
- If a delay on deactivation is required, set the number of seconds: e.g. “5 seconds”.
- Select the type of logic with which the alarm is to be managed: “OR” (see example: AND/OR logic alarm).

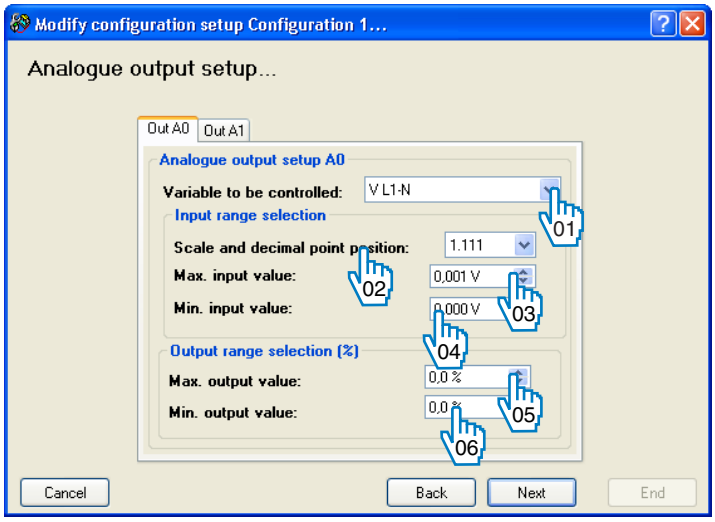
We recommend to delay of a few seconds the alarm deactivation in order to avoid the swinging effect of the output and therefore the possible damage of the contact due to fluctuations of the measured signal with a value near the selected alarm set points.

The instrument is able to manage two types of alarms: 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 on at fixed light of the “AL” LED on the front of the instrument. Virtual alarm = when the alarm is not connected to any output. The activation of a virtual alarm causes the switching on at flashing light of the “AL” LED. In case of coincidence of a virtual alarm and of a real alarm, the real one has the prevalence over the control of the above mentioned LED (therefore it switches on at steady light). By exploiting the AND and OR functions, it’s possible to connect together more than one virtual alarms and send them to a single digital output (relay output or open collector output). In any case the max limit of programmable alarms is 16.



The drawing above explains how the alarms in the example work. Since the “OR” function has been selected for both the alarms, the working of the digital output can be represented by two contacts in parallel. The activation of one of the two alarms is sufficient to activate the digital output.

Analog output



11

This window allows the user to set the parameters relevant to the single analogue outputs:
1) Allows the user to select the variable to be retransmitted by means of an analogue output.
2) Allows the user to define the variable's multiplying factor and the decimal point position.
3) Allows the user to set the max. value of the variable to be retransmitted. This value will be connected to the max value of the analogue output.
4) Allows the user to set the minimum value of the variable to be retransmitted. This value will be connected to the min. value of the analogue output.
5) Allows the user to set the value expressed as % of the full scale of the output range (20mA, 10V, etc.) that will be generated in correspondence with the max. input value set above.
6) Allows the user to set the value expressed as % of the full scale of the output range (20mA, 10V, etc.) that will be generated in correspondence with the min. input value set above.

NOTE : in the measuring range defined at N. "3" and "4", the instrument will see that the linearization of the output signal (20mA, 10V, etc) from the min. value defined at N. "6" to the max. value defined at N. "5".

Press the "Next" button to go on to the following configuration window.

The instrument manages the following combinations of analogue outputs: max. N. 8 outputs 0-10VDC; Max N. 8 outputs -5/+5mADC. Any combination of the two above mentioned types considering that every module manages 2 outputs. Max n. 4 outputs 0/20mADC. Max n. 4 outputs 0/20mADC + max n.4 outputs 0-10VDC.

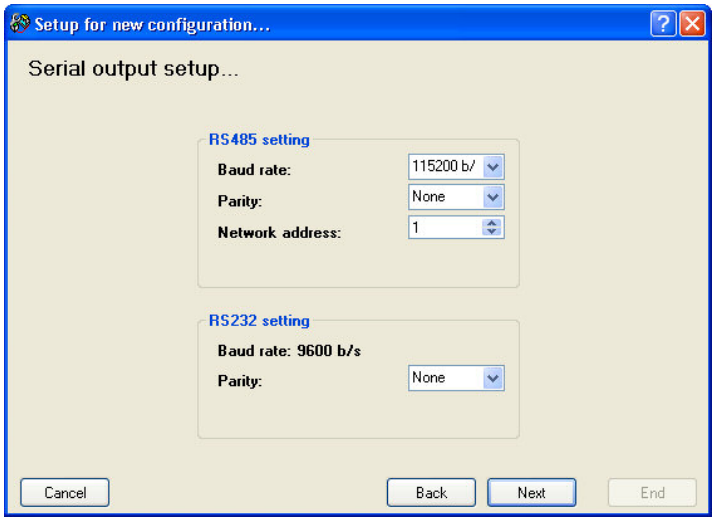
Programming examples of the analogue outputs

Retransmission of the power by means of a 0-20mA analogue output.
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 VAL OUT: 20.0% for 4mA, calculated as follows: (100*min output)/ fullscale output = 100*4mA/20mA=20%.
MAX VAL OUT: 100.0% for 20mA, calculated as follows: (100*max. out)/ fullscale output= 100*20mA/20mA= 100.
MIN VAL INP: 0.0k; the multiples k,M,G can be selected on the instrument according to the VT and CT values being selected.
MAX VAL INP: 100.0k; the multiples k,M,G can be selected on the instrument according to the VT and CT values being selected.

Retransmission of the consumed and generated active power by means of a -5/+5mA analogue output.
Measure both the consumed active power up to 100kW and the generated power up to -100kW and retransmit this value by means of a signal from -5 to +5 mA: 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 VAL OUT: -100% for -5mA, calculated as follows: (100*min output)/ fullscale output= 100*5mA/-5mA=-100%.
MAX VAL OUT: 100.0% for 20mA, calculated as follows: (100*max output)/ fullscale output= 100*5mA/5mA= +100%.
MIN VAL INP: -100.0k; the multiples k,M,G can be selected on the instrument according to the VT and CT values being selected.
MAX VAL INP: 100.0k; the multiples k,M,G can be selected on the instrument according to the VT and CT values being selected.

Retransmission of the POWER FACTOR (cosφ) by means of analogue output 0-20mA.
Retransmit the whole range of the values admitted for the PF(cosφ) with signal from 0 to 20mA. The max. attention must be paid because the values of the PF variable (cosφ) can be included between C0.001 and L0.000 (for each phase) that after retransmission will have the values included between 0 and 20mA. When the PF (cosφ) has a value equal to 1 being included exactly in the middle between C0.001 and L0.000, the output will have the value of the middle of the scale, that is 10mA. As a consequence, the instrument is to be programmed as follows:
VARIABLE: PF L1 (or L2 or L3 or PF∑).
MIN VAL OUT: 0.0%.
MAX VAL OUT: 100.0%.
MIN VAL INP: C0.001 (the symbol C shows that the value is CAPACITIVE).
MAX VAL INP: L0.001 (the L symbol shows that the value is INDUCTIVE). The min. value which can be set is L0.001 in order to avoid undesired fluctuations of the analogue outputs.

The serial output setup



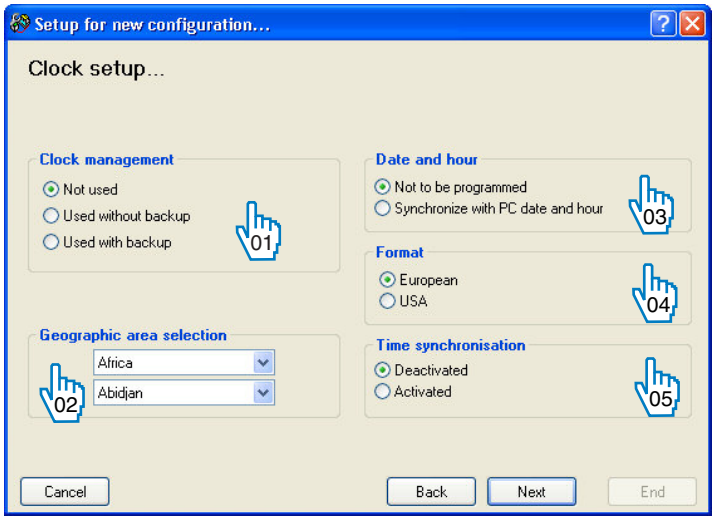
12

In this window it's possible to set the parameters of the serial output.

NOTE: if you are using the RS485 module code AR034, the max baud-rate value which can be set is 9600. If the AR2040 module is used, then the max baud-rate value is 115200.

Press the "Next" button to go on to the following configuration window.

Clock setup...



13

In this window it's possible to set the parameters relating to the internal clock:
1) Clock usage:
• NOT USED: the instrument will not be able to manage any function requiring the clock; no information on date and time will be available.
• USED WITHOUT BACKUP: at every new switching of the instrument, the setting of the complete date and hour will be required.
• USED WITH BACKUP: once date and hour will be set, the instrument will keep date and hour updated also in case of switching off of the instrument itself.

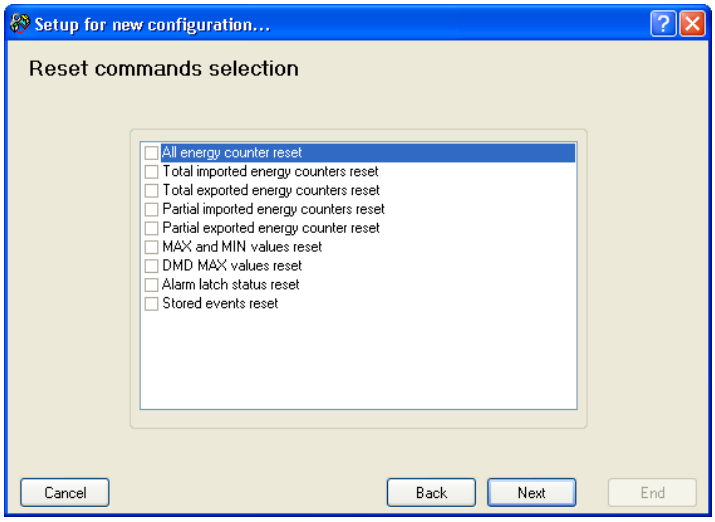
NOTE: in order to select this option, the AR1039 module must be installed in the instrument.

2) Allows the user to set the geographic area where the instrument is installed.

3) Allows the user to decide if synchronizing date and time of the instrument with the date and time of the PC, at the end of the programming, or not.

Press the "Next" button to go on to the following configuration window.

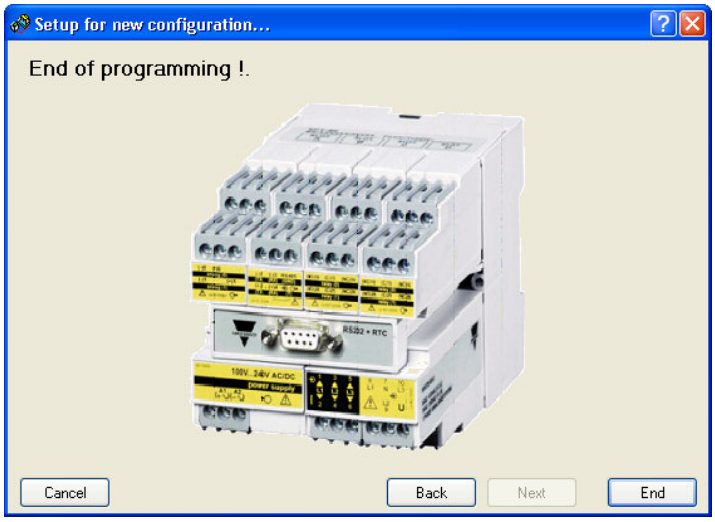
Reset



14

This window allows the user to select which reset commands are to be carried out automatically at the end of the programming procedure.

Press the “Next” button to go on to the following configuration window.

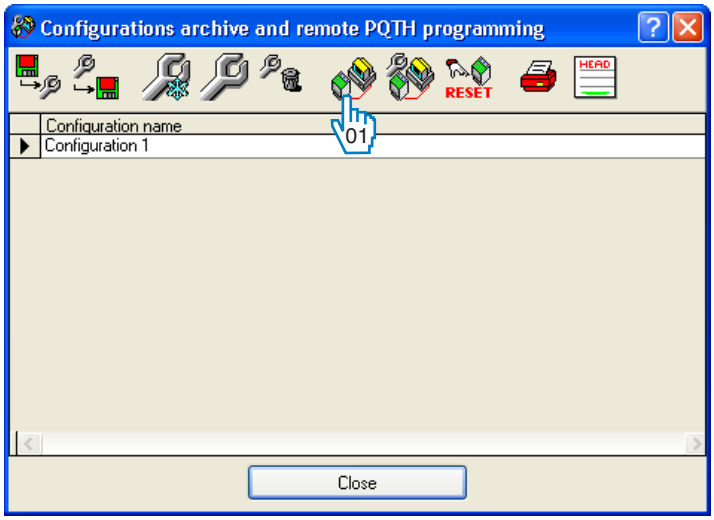


15

To complete the configuration setup, press the “End” button.

NOTE: For each one of the previously described windows, the CANCEL button allows the user to cancel all the settings made until that moment: the starting window will then appear on the screen. Pressing the BACK button, the user goes back to the previous page.

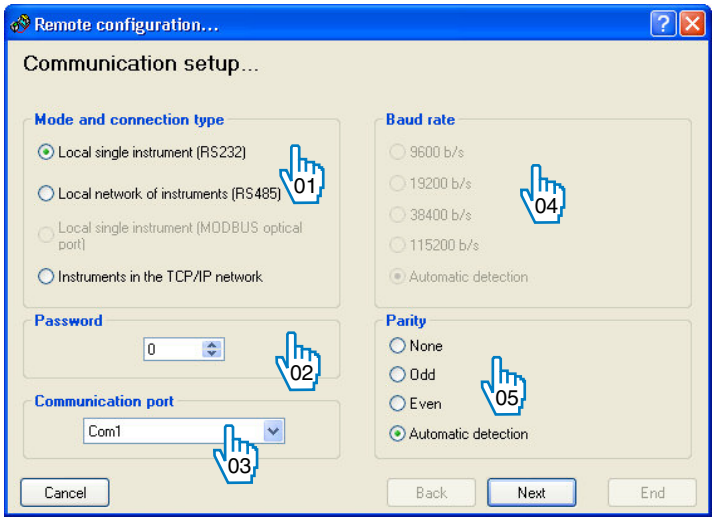
Configuration archive



01

At this stage, the user is required to select the configuration to be transmitted to the instrument and enable the transmission procedure clicking the icon shown in figure (1).

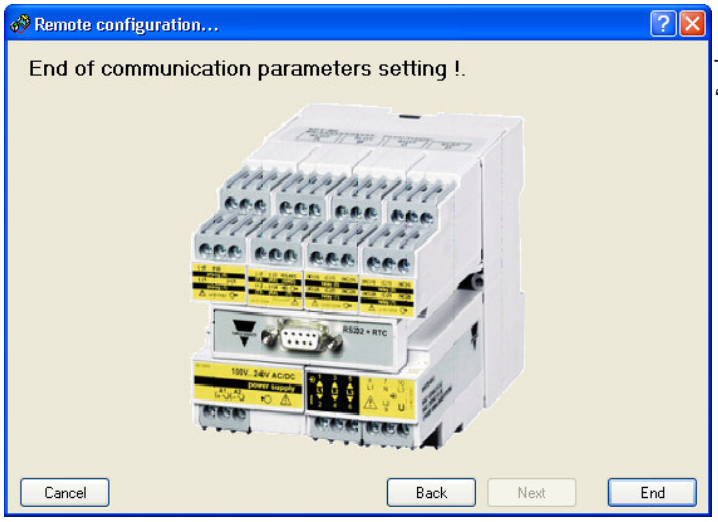
Transmitting the configuration to the instrument (remote configuration)



02

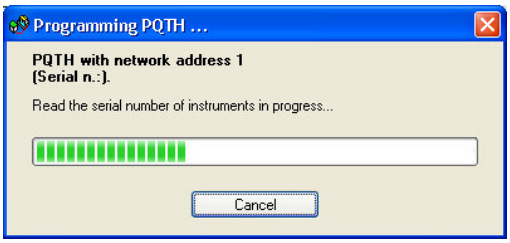
This window allows the user to define the parameters for the serial communication by which the configuration is to be transmitted:
1) Select the mode and type of the connection used between PC and instrument.
2) Select the password allowing the access to the programming of the instrument (default value is 0).
3) Select the communication port used by the PC.
4) In case of RS485 serial communication, select the baudrate value.
5) Select the parity. Should this value not be known, the user may set “Automatic detection”: in this case the software will search automatically which is the value set on the instrument.

Press the “Next” button to go on to the following configuration window.



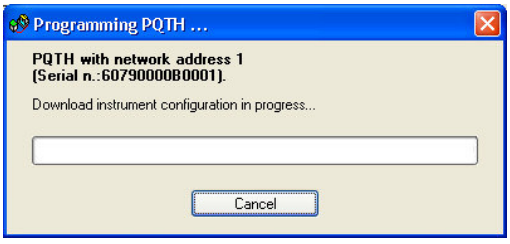
03

To start the programming of the instrument, press the "END" button.



03

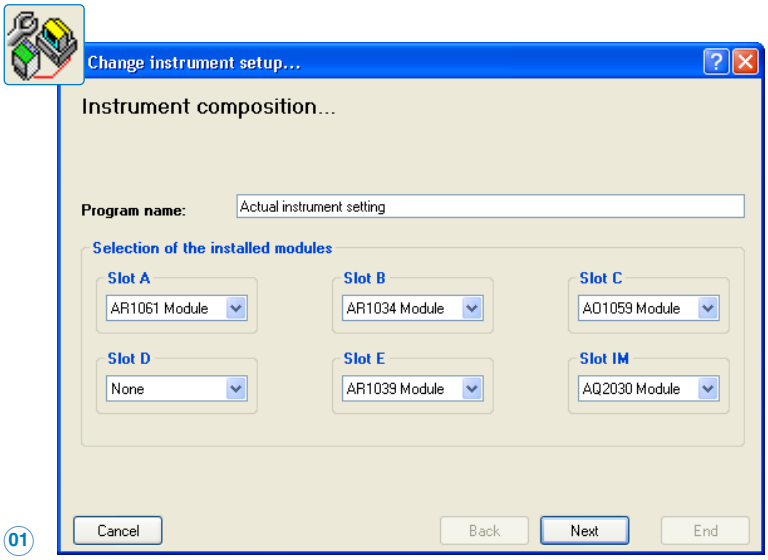
During the programming phase of the instrument, a graphic bar will show its progress, step by step. When the bar is full, the programming has finished.



03

During the download, the software will show both the progress on the graphic bar and some data relating to the instrument, such as network address and serial number.

Change instrument setput...

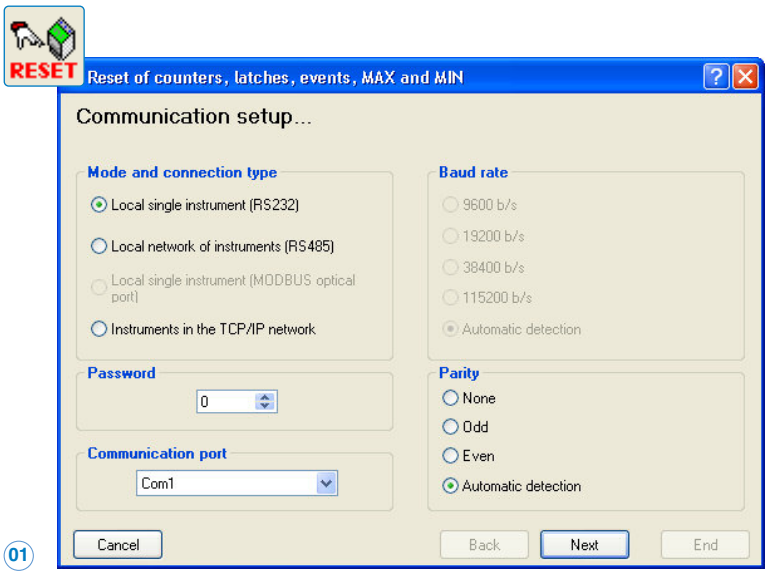


01

From the main window of the PQTSoft, clicking the icon shown on the left of figure 1, it's possible to change the programming of the instrument by displaying on the PC its present configuration and thus allowing the user to modify the parameters. Before displaying the configuration, the software asks the user to select which are the modules installed in the instrument since the software cannot identify them.

Proceed with the setup changing procedure, following the same instructions given on page 14, number (2).

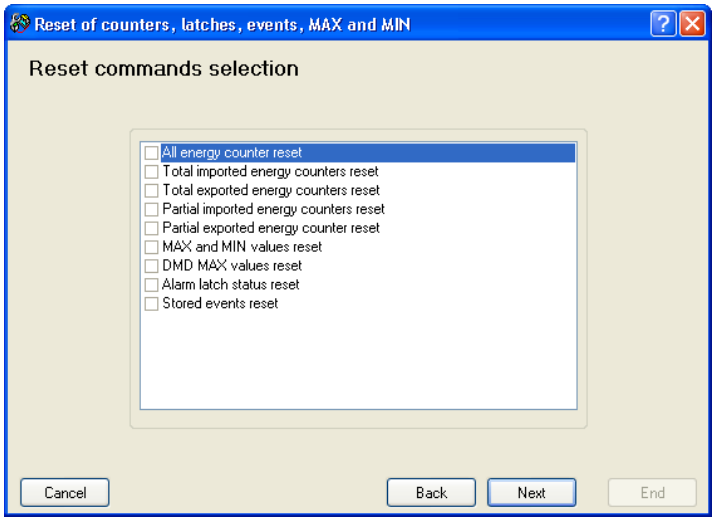
Reset



01

From the main window of the software, clicking the icon on the left of figure 01 (RESET), the user can start the reset procedure of the meters and/or events. In this window, the user selects the communication modes (RS485, RS232, etc.) and the relevant parameters (password, communication port, baud rate and parity).

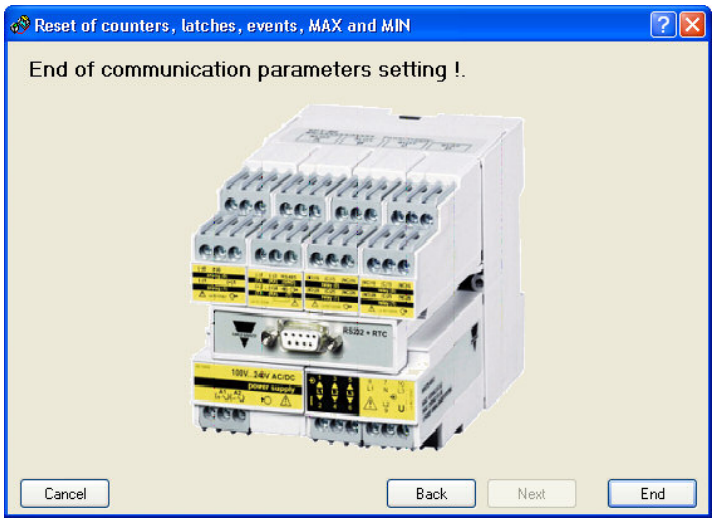
Press the "Next" button to go on to the following configuration window.



02

This window allows the user to select the RESET COMMANDS to be carried out.

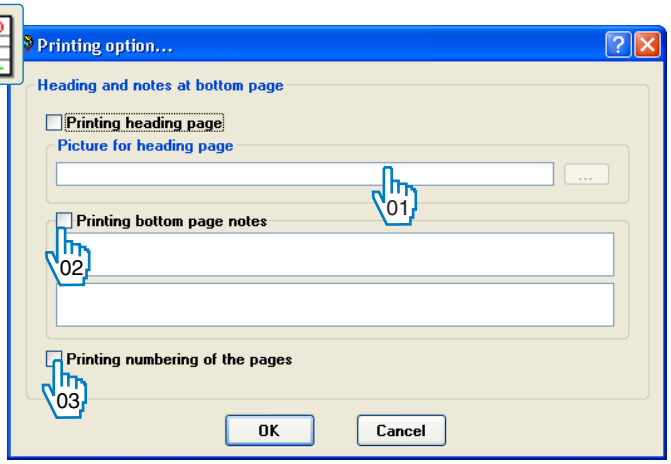
Press the “Next” button to go on to the following configuration window.



02

Press the END button to start the RESET procedure.

Printing Setup



01

From the main window of the software, clicking the icon on the top left of figure 1, the user enters the setup procedure of the printing options relating to the “List of the instruments configuration parameters” where all the data set on the instrument are listed (see example on the following page):

1) Type the name of the image file (bitmap or jpeg) to be printed as heading of the page itself. The dimension of the image cannot exceed 790 pixel width and 180 pixel height
2) To add bottom page notes, tick box N. 2 on the left and type on the two below boxes the required text.
3) To print the numbering of the pages tick the box “Printing numbering of the pages”.

Press the “OK” button to confirm the set values.

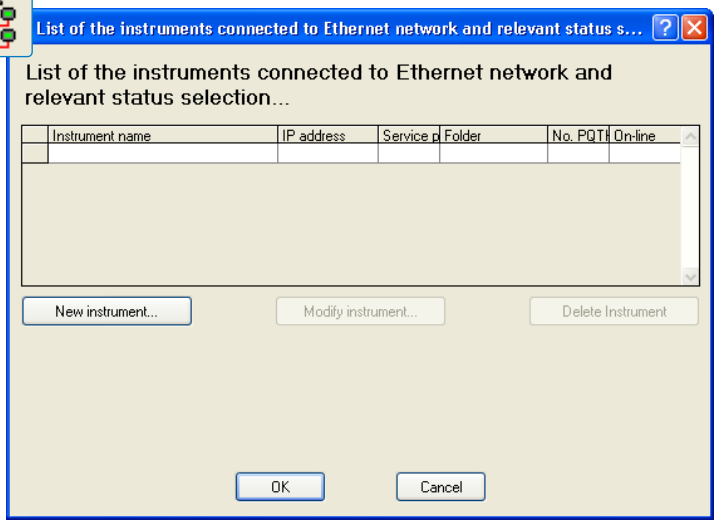
Configuration report (example)

Modello strumento: _____

Note: _____

ELENCO DEI PARAMETRI DI CONFIGURAZIONE DELLO STRUMENTO	
DENOMINAZIONE PARAMETRO	*VALORE PARAMETRO*
Nome programma	*Configurazione 1*
Slot A	*Modulo AO1037*
Slot B	*Modulo AR2040*
Slot C	*Modulo AQ1038*
Slot D	*Modulo AQ1038*
Slot E	*Modulo AR1039*
Slot IM	*Modulo AQ2030*
Password config.	*0*
Password scarico dati	*0*
Info contatore	*EN*
Rapporto TV	*0,100*
Rapporto TA	*0,100*
Sistema	*Monofase*
Campo di intervento del filtro	*0,1%*
Coefficiente di filtraggio	*1*
Gestione contatori energia di tariffa	*Con impulsi dal fornitore di energia*
Ingresso tariffa LSB	*DigInC1*
Ingresso tariffa MSB	*DigInD2*
Calcolo potenza media (Metodo di integrazione)	*Fissa*
Calcolo potenza media (Tempo di integrazione)	*15 minuti.*
Sincronizzazione	*Contatto esterno (DigInC3)*
Eventi MIN	*VA L1 min.*
Eventi MIN	*Hz min.*
Eventi MAX	*W L1 max.*
Eventi MAX	*var L1 max.*
Eventi DMD MAX	*THDo VL1-N dmd max.*
Eventi DMD MAX	*THDe VL1-N dmd max.*
Eventi allarme	*Allarme04*
Eventi allarme	*Allarme06*
Eventi comandi azzeramento	*Contatori totali energia importata*
Eventi comandi azzeramento	*Contatori parziali energia importata*

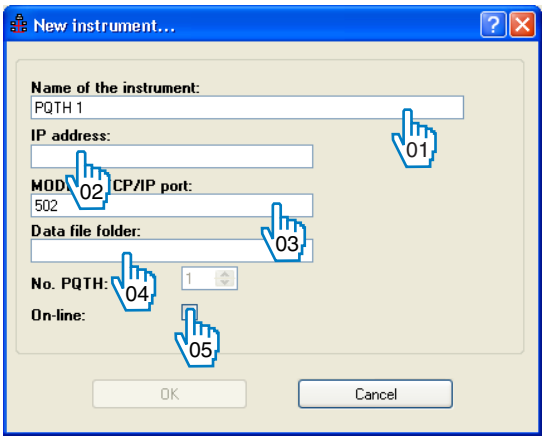
List of the instruments connected to an Ethernet network



01

From the main window of the software, clicking the icon indicated on the top left of the figure on the left, the user enters the new window where all the ethernet addresses of the instruments connected to the same network are shown.

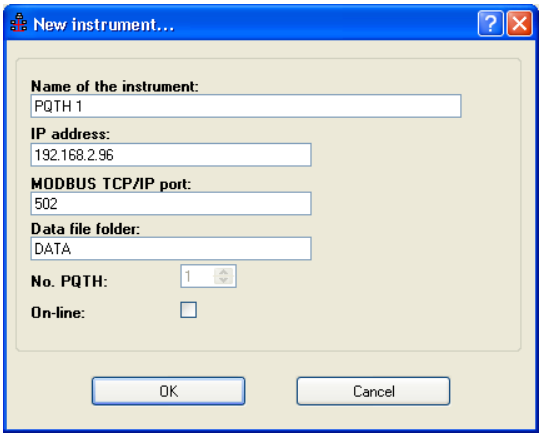
Clicking on the “New Instrument” button, you enter the window allowing the user to type the data of a new instrument.



02

1) Each instrument must be given a name so that it can be identified
2) Set the relevant IP address
3) Set the MODBUS TCP/IP port
4) Type the data file folder including the files of the meters, of the events and the data of the instrument.
5) Tick this box if the instrument is on line.

NOTE: for the data at N. 2 and 3, it is recommended to contact the network administrator.



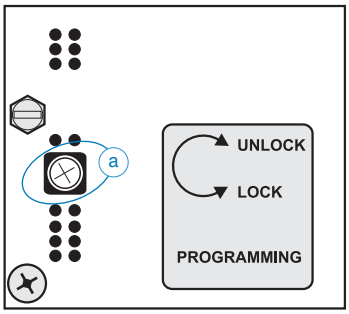
03

Clicking the “Modify Instrument” button, the user may modify the data relating to N. 1 to 5 of the selected instrument.

Clicking the DELETE INSTRUMENT button, the selected instrument can be modified.

Press the OK button to end the procedure.

Locking access to programming and reset



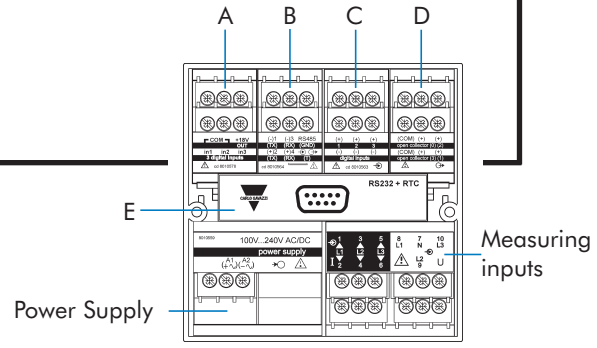
Turning the relevant trimmer with a screw driver, up to end-stroke and anticlockwise (see drawing on the left (a)), the access to the programming of the instrument is locked from the serial port. Moreover, the RESET commands cannot be executed any longer. However, it will still be possible to scroll all the display pages and the relevant details.

PQT H AV53 H XX XX XX XX XX

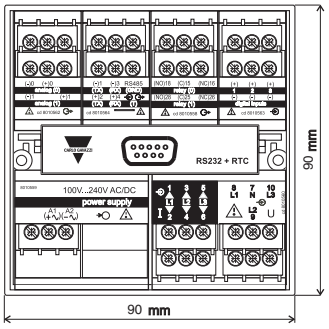
Description	Ch	Code	Legend
Model			
PQT H base		AD2020	PQT H
Measuring inputs			
400/690VL-L 1/5A (10A)		AQ2030	AV5.3
120/208VL-L 1/5A (10A)		AQ2031	AV6.3
Power supply			
Power supply 18-60VAC/DC		AP1021	L
Power supply 90-260VAC/DC		AP1020	H
SLOT A			
None			XX
Ethernet/Internet port	1	AR1061	E2
Digital 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	xx
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			
Non-certified measures			XX
RS232 + RTC (Non certified measures)	1	AR1039	SX
Certified measures: a "device document" has to be filled in by the user.			XU
RS232 + RTC + option "XU"	1	AR1039	SU

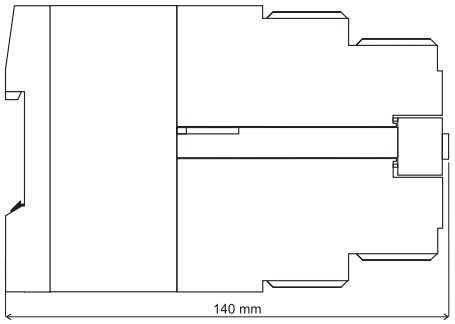
Code example:
PQT-H AV53 H B1 S1 R2 O2 SX

Material	Code
PQT-H	AD2020
AV53 measuring inputs (400/690VL-L)	AQ2030
90-260VAC/DC power supply	AP1020
Analog output 20mA (2 channels)	AO2050
Serial port RS485 at 9600 bps	AR1034
Relay output (2 channels)	AO1035
Open collector output (2 channels)	AO1036
Serial port RS232+RTC	AR1039

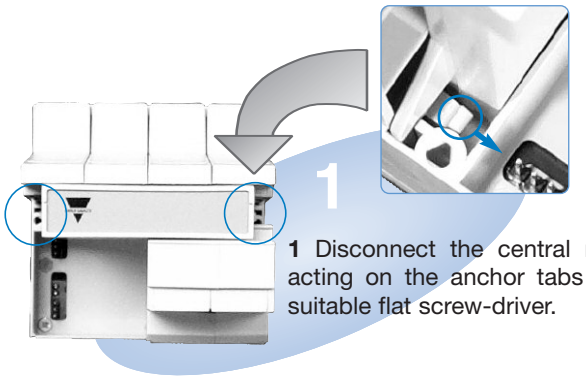


Dimensions and panel cutout

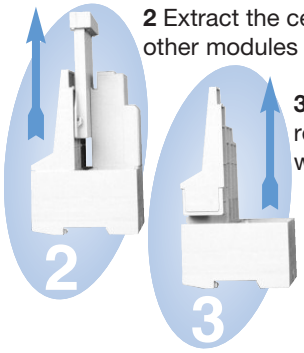




Inserting, removing and mounting the modules to the panel



1 Disconnect the central module acting on the anchor tabs with a suitable flat screw-driver.



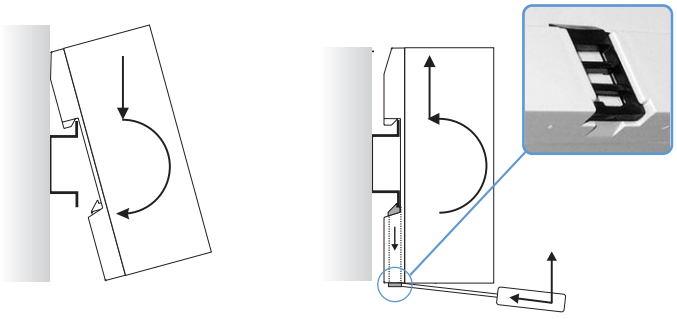
2 Extract the central blind module, so that all the other modules are free.

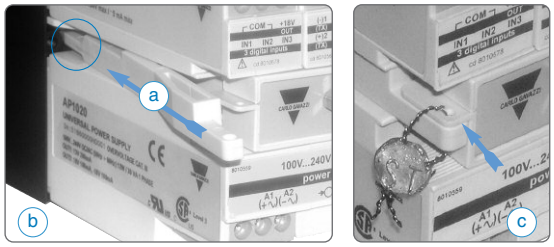
3 Extract the blind modules and replace them where necessary with the plug and play modules.

4 The last module to be inserted will be the central one having also the function to lock all the other modules.

Make sure that the modules supplied with the instrument are inserted in the correct slot as shown by the stickers placed on the modules themselves and as described in the table on the right.
If the instructions are not followed carefully, the instrument may be damaged. The plug and play modules are only to be inserted and extracted when the instrument is not connected to the mains and when the measuring inputs are disconnected. Before connecting the power supply of the instrument to the network, make sure that the power supply voltage corresponds to the data shown on the label of the power suppply module.

DIN-rail mounting

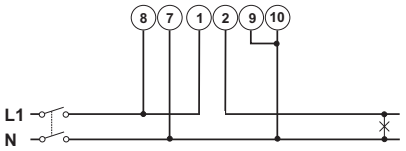




The relevant sealing kit is supplied together with the instrument. It is made by two wedge-shaped plastic devices (a) that will have to be inserted as shown by figure (b); then place the seal as indicated by figure (c).

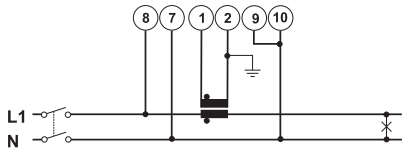
1-phase, 2-wire input connections (1P)

Fig. 1



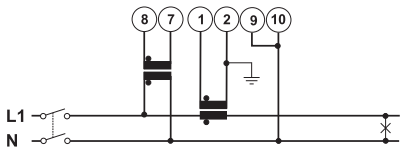
Direct connection

Fig. 2



CT connection

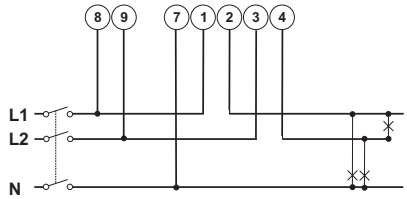
Fig. 3



CT and VT connection

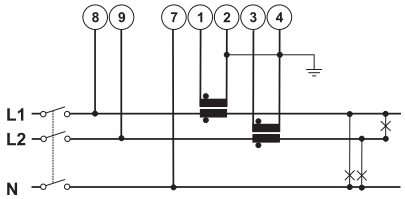
2-phase, 3-wire input connections (2P)

Fig. 4

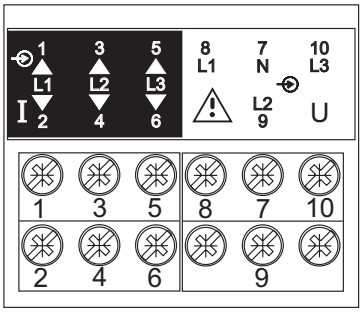


Direct connection

Fig. 5

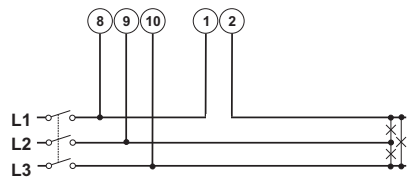


CT connection



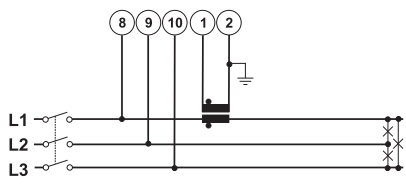
3-phase, 3 and 4-wire input connections, balanced load (3P)

Fig. 6



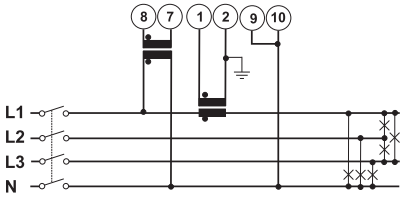
Direct connection (3-wire system)

Fig. 7



CT and VT connection (3-wire system)

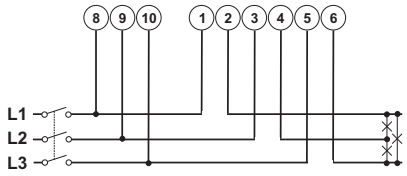
Fig. 8



CT and VT connection
(4-wire connection)

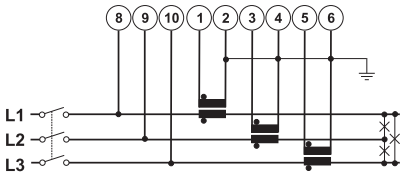
3-phase, 3-wire input connections, unbalanced load (3P)

Fig. 9



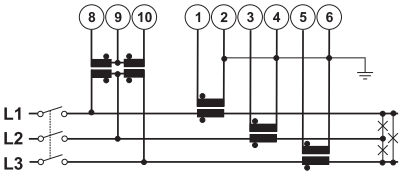
Direct connection (3-wire system)

Fig. 10



CT connection (3-wire system)

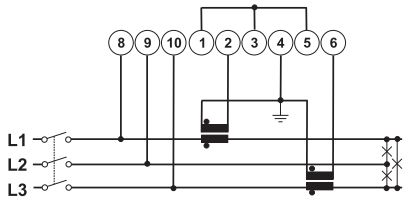
Fig. 11



CT and VT connection (3-wire system)

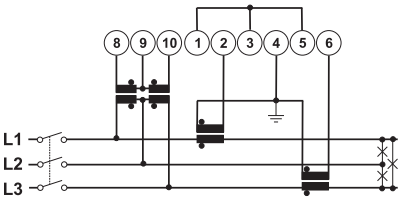
3-phase, 3-wire ARON input connections, unbalanced load (3P)

Fig. 12

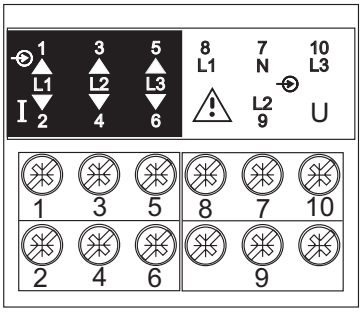


ARON connection (3-wire system)

Fig. 13

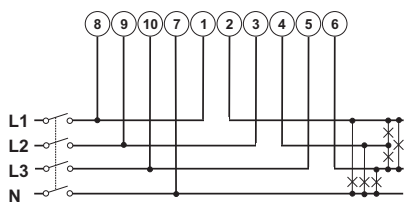


ARON and VT connection (3-wire system)



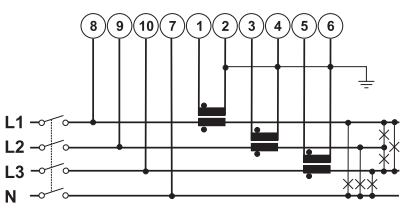
3-phase, 4-wire, unbalanced load input connections (3P+N)

Fig. 14



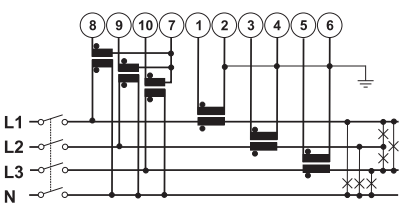
Direct connection (4-wire system)

Fig. 15



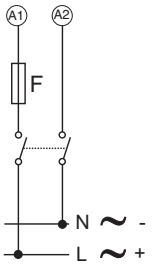
CT connection (4-wire system)

Fig. 16



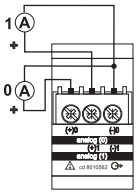
CT and VT connection (4-wire system)

Power supply, analogue and digital output modules

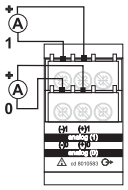


AP1020.
AP1021.
Power supply

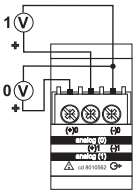
F= 1,25 A T



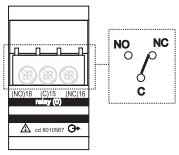
AO2050.
2 analogue outputs
0-20mA DC.



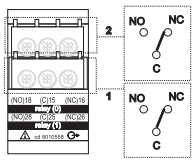
AO2052.
2 analogue outputs
-5/+5mA DC.



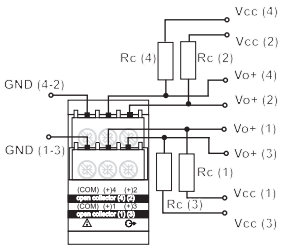
AO2051.
2 analogue outputs
10V DC.



AO1058.
1 relay output

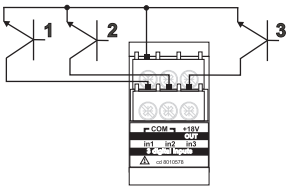


AO1035.
2 relay outputs

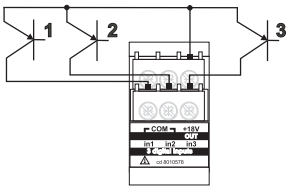


AO1037. 4 open collector outputs. This drawing is also valid for the open collector modules with less outputs. The load resistances (Rc) must be designed so that the close contact current is lower than 100mA; the VDC voltage must be lower than or equal to 30VDC.

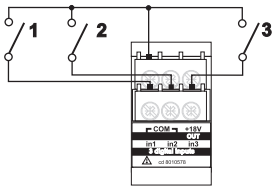
Digital inputs



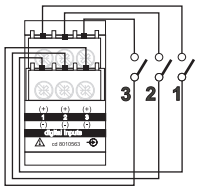
AQ1042.
NPN transistor type connection.



AQ1042.
NPN transistor type connection.

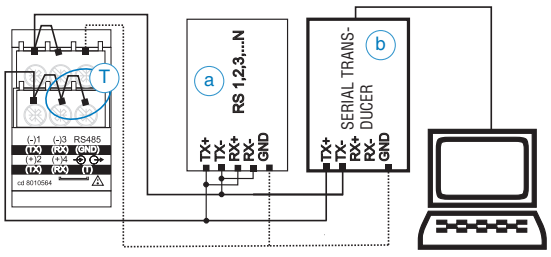


AQ1042.
Contact connection



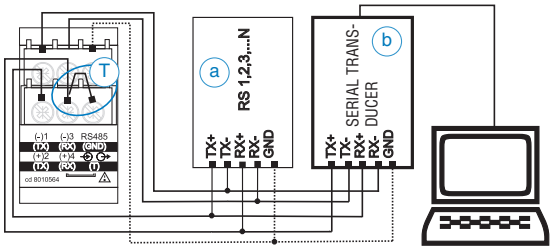
AQ1038.
Contact connection

RS485 Serial Port (AR1034 9600bps, AR2040 115200bps)



2-wire connection. Some more WM5-96 (a) provided with RS485 are connected in parallel. (b) RS485-RS232 serial transducer.

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



4-wire connection. Some more WM5-96 (a) provided with RS485 are connected in parallel. (b) Serial transducer RS485-RS232.

Serial port termination (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 a 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, H.R. ≤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
Voltage (@20°C±5°C, R.H.≤75%)	
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, cosφ 1: ±(0.5%RDG+1DGT) 0.01In to 0.05In, cosφ 1: ±(1%RDG+1DGT) 0.1In to Imax, cosφ 0.5L, cosφ 0.8C: ±(0.6%RDG+1DGT) 0.02In to 0.1In, cosφ 0.5L, cosφ 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 C12.1 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 (@ 20°C ± 5°C, R.H. ≤ 75%)	1% FS (FS: 100%) phase: ±2°; Imin: 5mA_{RMS}; Imax: 15Ap; Umin: 30V_{RMS}; Umax: 500Vp
Temperature drif	≤ 200ppm/°C (A/V), 300ppm/°C (all the other measurements)
Sampling rate	6400 samples/s @ 50Hz 7680 samples/s @ 60Hz
Measurement format	(serial communication)
Instantaneous variables	Floating point according to IEEE-754 at 32bit.
Energies	Unsigned 64bit (minimum resolution 1Wh)
Measurements	Current, voltage, power, energy, power factor, frequency, harmonic distortion (see "list of the variables that..."). 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
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 PqtHSoft
Protocol	MODBUS RTU /JBUS,
Data (bidirectional)	
Dynamic (reading only)	See 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

Ethernet/Internet port	
Protocols	Modbus TCP
IP configuration	Static IP
TCP port	Selectable (default 502)
Client connections	Max 5 simultaneously
Connections	RJ45 10/100 BaseTX
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
Electrical life	$\geq 10^5$ operations (@ 8A, 250V, PF=1)
Mechanical life	$\geq 30 \times 10^6$ operations

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 wire)
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	Alarms, serial outputs (fundamental variables: V, A, W and their derived ones).
Alarms	
Working mode	“OR” or “AND” or “OR+AND” 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 PqtHSoft (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

PqtHSoft parameter programming and variable reading software

PqtHSoft	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	Two different working modes can be selected:

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

General Specifications

Operating temperature	-10° to +45°C (14° to 113°F) (H.R. < 90% non-condensing)
Limit range of operating temp.	-20° to +55°C (-4° to 131°F) (H.R. <90% non-condensing)
Storage temperature	-30° to +60°C (-22° to 140°F) (H.R. < 90% non-condensing)
Installation category	III
Pollution degree	2
Altitude	Up to 2000m (6560 feet) above sea-level
Insulation reference voltage	(AV5 input) 300 V_{RMS} to ground
Dielectric strength	4kVAC_{RMS} (for 1 minute)
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
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 (2x 1.5mm^2) Max screws tightening torque: 0.5Nm
Housing Dimensions Material	90x90x140 mm ABS, self-extinguishing: UL 94 V-0
Protection degree	IP20
Weight	Approx. 600 g (packing included)

Supply specifications

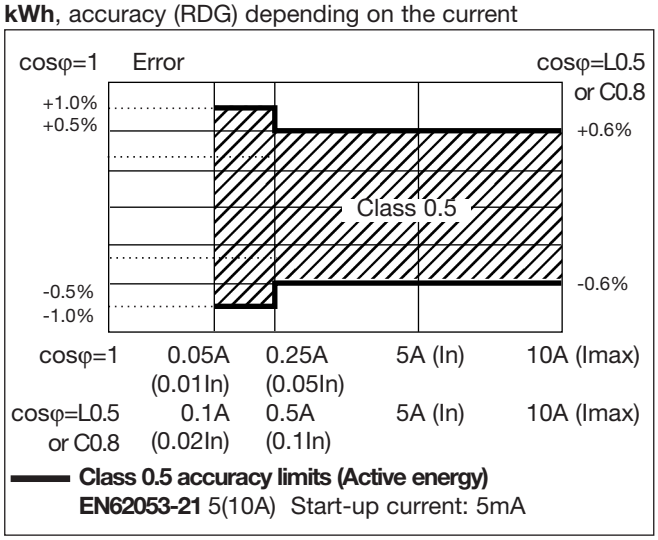
AC/DC voltage	90 to 260V (standard) 18 to 60V (on request)
Power consumption	≤30VA/12W (90 to 260V) ≤20VA/12W (18 to 60V)

Revenue approval settings

- The access to the programming parameters via serial communication ports is locked.
- The communication port only allows the transmission of the variables.
- The “instrument settings” form must be filled in by the user before the instrument itself is installed and supplied.
- PQT-H is supplied with the required modules plugged and sealed n the proper slots.
- PQT-H fulfils: ANSI/IEEE C12.20-1998 requirements;
  CAN3-C17-M84 requirements.
  and can be certified according to:
  C12.20-1998, class 0.5 (independent labs);
  AE-0924 Industry Canada Approval.

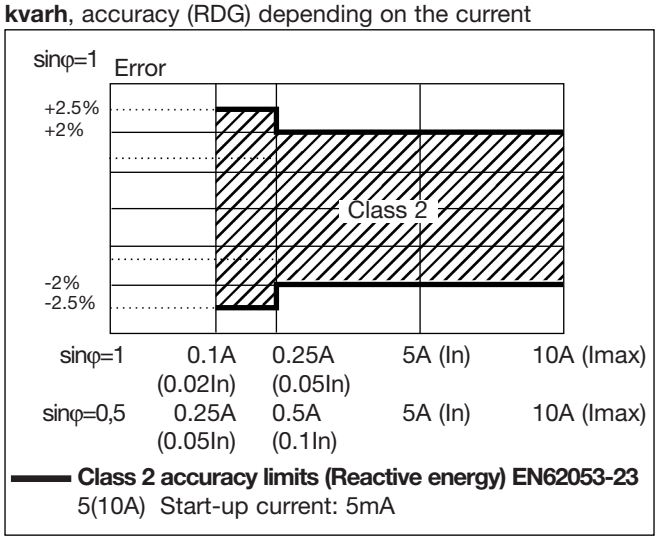
Accuracy

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;
$\mathbf{t_1}$, $\mathbf{t_2}$ =starting and ending time points of consumption recording; **n**= time unit;Δ**t**= time interval between two successive power measurements;
$\mathbf{n_1}$, $\mathbf{n_2}$ = 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	Variable	1-phase system	2-ph. 3-wire system	3-ph. 4-wire bal. (1 CT)	3-ph. 3-wire unbal. sys.	3-ph. 4-wire unbal. sys.	Notes
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	cosφ L1	x	x	x	x	x	
26	cosφ L2	o	x	x	x	x	
27	cosφ L3	o	o	x	x	x	
28	cosφ 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	Fase seq.	o	o	x	x	x	Phase sequence

(x) = available (o) = not available

Insulation between inputs and outputs

	Meas. /digital inputs	Relay output	Open collec-tor output	Analogue out. 10V, 20mA	Analogue out. ±5mA	AR1034	AR2040	AR1039	Power Supply 90-260VAC/DC	Power Supply 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 coll.out.	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
Power Supply 90-260VAC/DC	4kV	4kV	4kV	4kV	4kV	4kV	4kV	4kV	-	-
Power Supply 18-60VAC/DC	4kV	4kV	4kV	4kV	4kV	4kV	4kV	4kV	-	-

NOTE: In case of fault of the first insulation, the current from the measuring inputs to the ground is lower than 2 mA.
(*) The given insulation is granted among outputs plugged into different slots. The modules equipped with two or four outputs do not have therefore any insulation among the outputs. **(**)** Insulation between the 2 outputs of the same module is 200V for 1 min.

PQT H User's Page

Customer's data:

Serial number of PQT H:

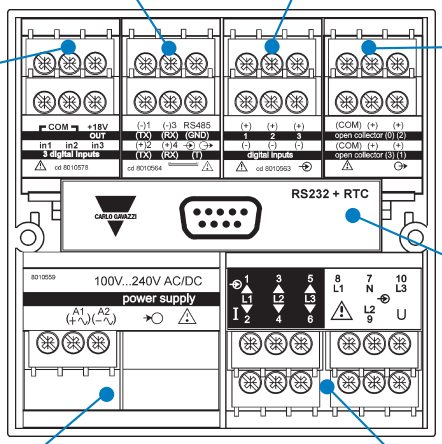
Notes:

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

Power supply
- ☐ AQ2030
- ☐ AQ2031

OUR SALES NETWORK IN EUROPE

AUSTRIA - Carlo Gavazzi GmbH
Ketzergasse 374, A-1230 Wien
Tel: +43 1 888 4112
Fax: +43 1 889 10 53
office@carlogavazzi.at

BELGIUM - Carlo Gavazzi NV/SA
Schaarbeeklei 213/3, B-1800 Vilvoorde
Tel: +32 2 257 4120
Fax: +32 2 257 41 25
sales@carlogavazzi.be

DENMARK - Carlo Gavazzi Handel A/S
Over Hadstenvej 42, DK-8370 Hadsten
Tel: +45 89 60 6100
Fax: +45 86 98 15 30
handel@gavazzi.dk

FINLAND - Carlo Gavazzi OY AB
Petaksentie 2-4, FI-00630 Helsinki
Tel: +358 9 756 2000
Fax: +358 9 756 20010
myynti@carlogavazzi.fi

FRANCE - Carlo Gavazzi Sarl
Zac de Paris Nord II, 69, rue de la Belle Etoile, F-95956 Roissy CDG Cedex
Tel: +33 1 49 38 98 60
Fax: +33 1 48 63 27 43
french.team@carlogavazzi.fr

GERMANY - Carlo Gavazzi GmbH
Rudolf-Diesel-Strasse 23,
D-64331 Weiterstadt
Tel: +49 6151 81000
Fax: +49 6151 81 00 40
kontakt@carlogavazzi.de

GREAT BRITAIN - Carlo Gavazzi UK Ltd
7 Springlakes Industrial Estate,
Deadbrook Lane, Hants GU12 4UH,
GB-Aldershot
Tel: +44 1 252 339600
Fax: +44 1 252 326 799
sales@carlogavazzi.co.uk

ITALY - Carlo Gavazzi SpA
Via Milano 13, I-20020 Lainate
Tel: +39 02 931 761
Fax: +39 02 931 763 01
info@gavazziacbu.it

NETHERLANDS - Carlo Gavazzi BV
Wijkermeerweg 23,
NL-1948 NT Beverwijk
Tel: +31 251 22 9345
Fax: +31 251 22 60 55
info@carlogavazzi.nl

NORWAY - Carlo Gavazzi AS
Melkeveien 13, N-3919 Porsgrunn
Tel: +47 35 93 0800
Fax: +47 35 93 08 01
gavazzi@carlogavazzi.no

PORTUGAL - Carlo Gavazzi Lda
Rua dos Jerónimos 38-B,
P-1400-212 Lisboa
Tel: +351 21 361 7060
Fax: +351 21 362 13 73
carlogavazzi@carlogavazzi.pt

SPAIN - Carlo Gavazzi SA
Avda. Iparraguirre, 80-82,
E-48940 Leioa (Bizkaia)
Tel: +34 94 480 4037
Fax: +34 94 480 10 61
gavazzi@carlogavazzi-sa.es

SWEDEN - Carlo Gavazzi AB
Nattvindsgatan 1, S-65221 Karlstad
Tel: +46 54 85 1125
Fax: +46 54 85 11 77
gavazzi@carlogavazzi.se

SWITZERLAND - Carlo Gavazzi AG
Verkauf Schweiz/Vente Suisse
Sumpfstrasse 32,
CH-632 Steinhausen
Tel: +41 41 747 4535
Fax: +41 41 740 45 40
verkauf_vente@carlogavazzi.ch

OUR SALES NETWORK IN NORTH AMERICA

USA - Carlo Gavazzi Inc.
750 Hastings Lane,
USA-Buffalo Grove, IL 60089,
Tel: +1 847 465 6100
Fax: +1 847 465 7373
sales@carlogavazzi.com

CANADA - Carlo Gavazzi Inc.
2660 Meadowvale Boulevard,
CDN-Mississauga Ontario L5N 6M6,
Tel: +1 905 542 0979
Fax: +1 905 542 22 48
gavazzi@carlogavazzi.com

CANADA - Carlo Gavazzi LTEE
3777 Boulevard du Tricentenaire
Montreal, Quebec H1B 5W3
Tel: +1 514 644 2544
Fax: +1 514 644 2808
gavazzi@carlogavazzi.com

OUR SALES NETWORK IN ASIA AND PACIFIC

SINGAPORE - Carlo Gavazzi Automation
Singapore Pte. Ltd.
No. 178 Paya Lebar Road
#04-01/05 409030 Singapore
Tel: +65 67 466 990
Fax: +65 67 461 980

MALAYSIA - Gavazzi Automation
Sdn Bhd.
54, Jalan Rugbi 13/30,
Tadisma Business Park Seksyen13
40100 Shah Alam, Selangor
Tel: +60 3 55 121162
Fax: + 60 3 55 126098

CHINA - Carlo Gavazzi Automation
(China) Co. Ltd.
No. 1001 Shangbu Middle Road,
Futian, Shenzhen
Tel: +86 755 83699500
Fax: +86 755 83699300

HONG KONG - Carlo Gavazzi
Automation Hong Kong Ltd.
Unit 3 12/F Crown Industrial Bldg.,
106 How Ming St., Kowloon,
Hong Kong
Tel: +852 23041228
Fax: +852 23443689

OUR PRODUCTION SITES

Carlo Gavazzi Industri A/S
Hadsten - **DENMARK**

Uab Carlo Gavazzi Industri Kaunas
Kaunas - **LITHUANIA**

Carlo Gavazzi Ltd
Zejtun - **MALTA**

Carlo Gavazzi Automation
(Kunshan) Co., Ltd.
Kunshan - **CHINA**

Carlo Gavazzi Controls SpA
Controls Division
Belluno - **ITALY**

Carlo Gavazzi Controls SpA
Sensors Division
Castel Maggiore (BO) - **ITALY**

HEADQUARTERS

Carlo Gavazzi Automation SpA
Via Milano, 13 - I-20020
Lainate (MI) - **ITALY**
Tel: +39 02 931 761
info@gavazzi-automation.com
www.carlogavazzi.com/ac

CARLO GAVAZZI
Automation Components

Further information on **www.carlogavazzi.com/ac**

CARLO GAVAZZI