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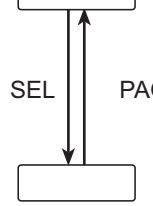
KEMA CERTIFICATE
ISO 9001:2000
DUTCH COUNCIL FOR ACCREDITATION C 013
Certificate n.2007399

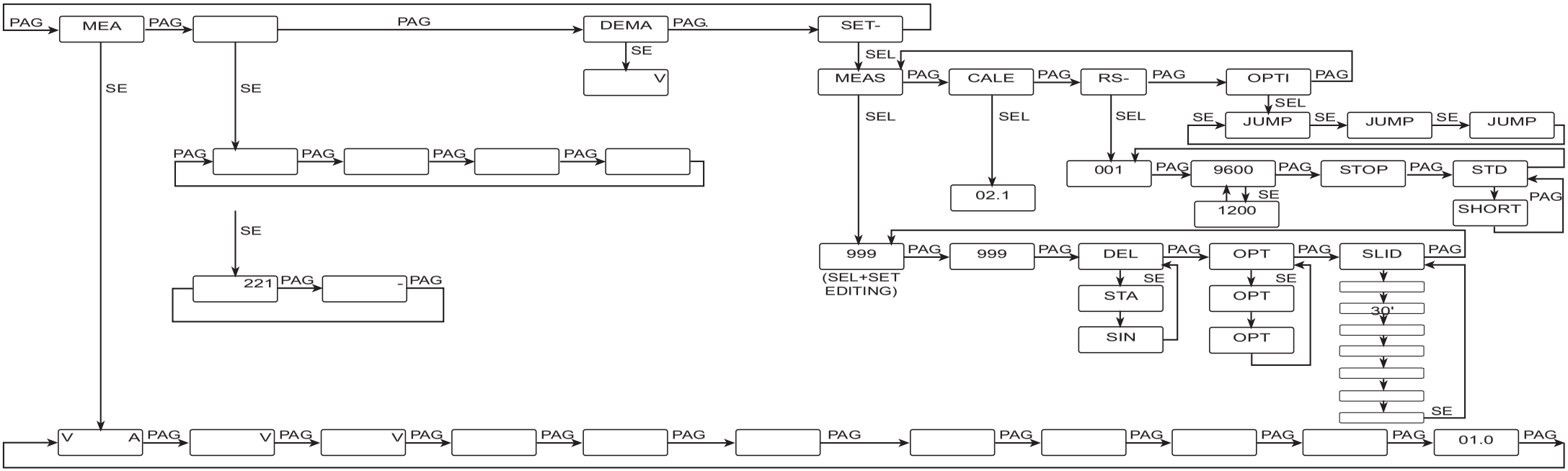
ENGLISH

VIP ENERGY

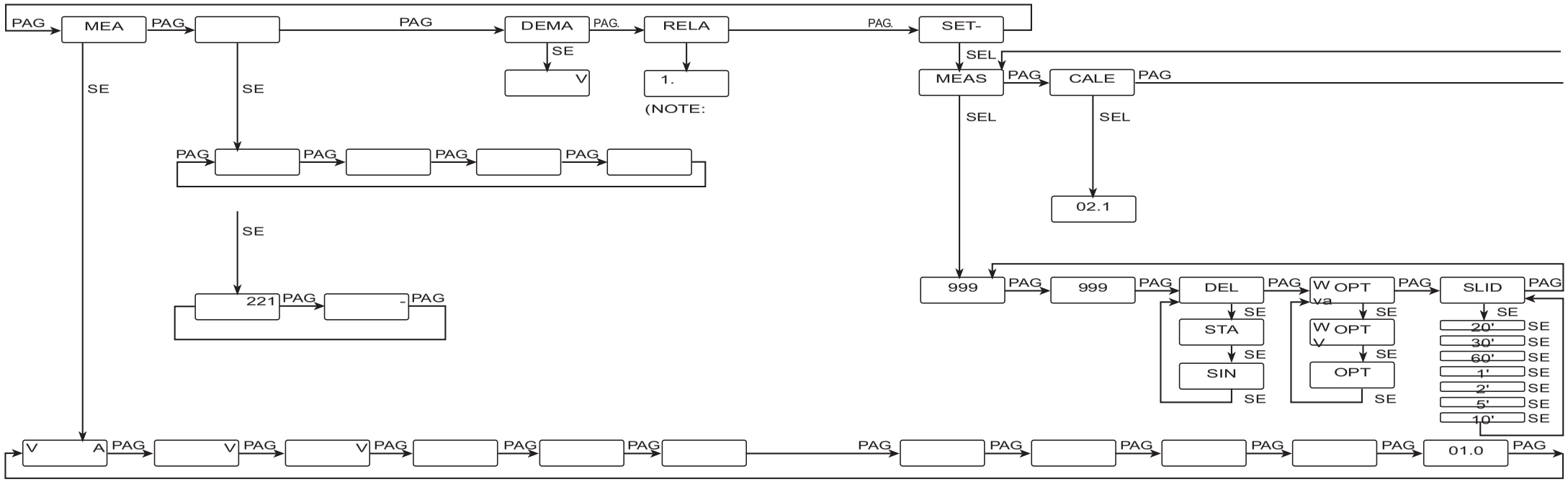
USER MANUAL

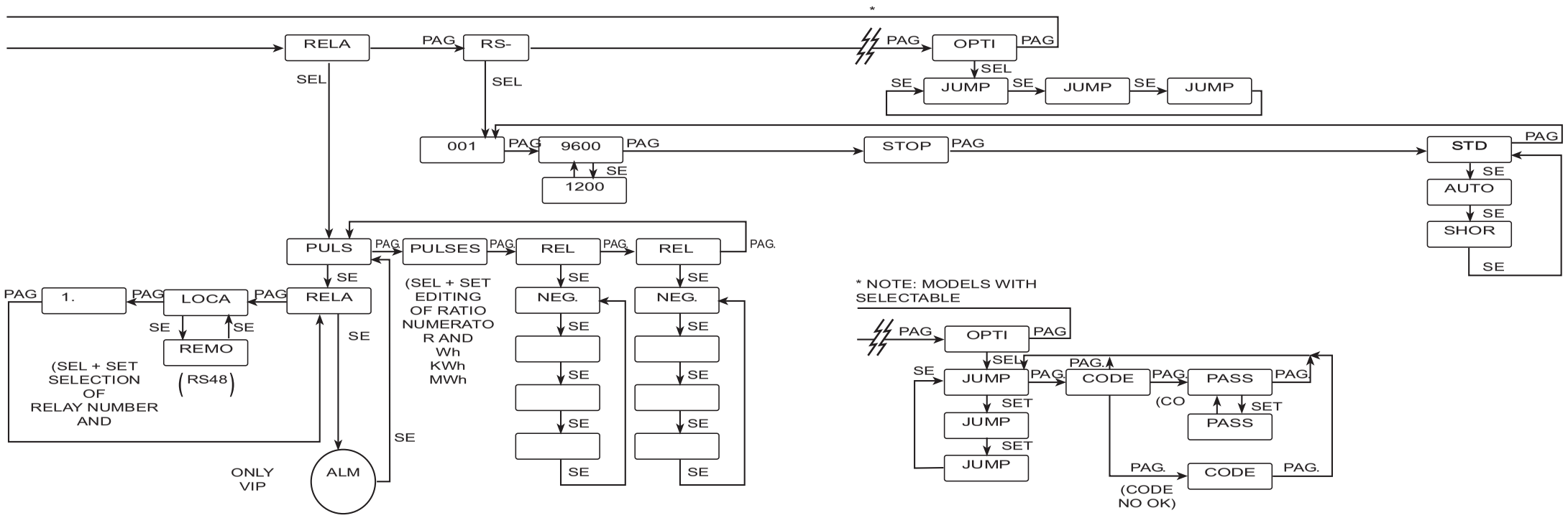
FUNCTION	PUSHBUTTONS TO BE USED
MOVING ON THE SAME MENU LEVEL	
PASSAGE TO A LOWER	
EDITING	SEL + SET SEL = select digit SET change
ESCAPE TO AN UPPER MENU LEVEL	PAGE/ENTE

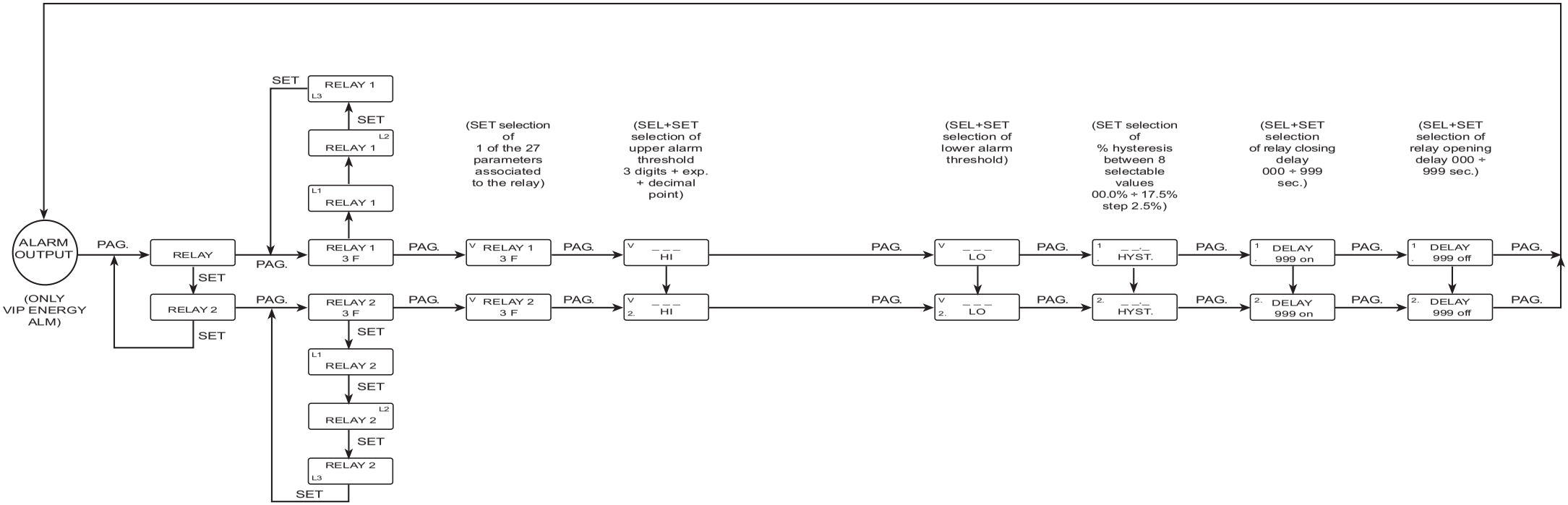
VIP ENERGY 485 MENU



VIP ENERGY RPQS-485 and ALM-485 MENU




*
RELA
PAG
RS-
SEL
SEL
PAG
OPTI
PAG
SEL
SE
JUMP
SE
JUMP
SE
JUMP
001
PAG
9600
PAG
SE
1200
STOP
PAG
STD
PAG
SE
AUTO
SE
SHOR
SE
PULS
PAG
PULSES
PAG
REL
PAG
REL
PAG.
SE
(SEL + SET
EDITING
OF RATIO
NUMERATO
R AND
Wh
KWh
MWh
NEG.
NEG.
PAG
1.
PAG
LOCA
PAG
RELA
SE
SE
REMO
(RS48)
(SEL + SET
SELECTION
OF
RELAY NUMBER
AND
SE
ONLY
VIP
ALM
SE
* NOTE: MODELS WITH
SELECTABLE
PAG
OPTI
PAG
SEL
SE
JUMP
PAG
CODE
PAG
PASS
PAG
PAG.
SET
JUMP
(CO
SET
PASS
SET
JUMP
PAG.
CODE
PAG.
(CODE
NO OK)


ALARM OUTPUT
(ONLY VIP ENERGY ALM)
PAG.
RELAY
SET
RELAY 2
PAG.
SET
RELAY 1 L3
SET
RELAY 1 L2
SET
RELAY 1 L1
RELAY 1 3 F
PAG.
RELAY 2 3 F
SET
RELAY 2 L1
SET
RELAY 2 L2
SET
RELAY 2 L3
SET
(SET selection of 1 of the 27 parameters associated to the relay)
RELAY 1 3 F
RELAY 2 3 F
(SEL+SET selection of upper alarm threshold 3 digits + exp. + decimal point)
HI
(SEL+SET selection of lower alarm threshold)
LO
(SET selection of % hysteresis between 8 selectable values 00.0% ÷ 17.5% step 2.5%)
HYST.
(SEL+SET selection of relay closing delay 000 ÷ 999 sec.)
DELAY 999 on
(SEL+SET selection of relay opening delay 000 ÷ 999 sec.)
DELAY 999 off

Index

1 SAFETY

1.1 Introduction

This instrument has been constructed and tested in accordance with IEC 348 class 1 standards for operating voltages below 650 VACrms and in accordance with VDE 0110 group C isolation standards for operating voltages of 500 VACrms or less, IEC 1010 550V standards with regard to category III installation and level of protection 2 under IEC 664-664A, and left the production factory in perfect conditions of technical safety: in order to maintain these conditions and to ensure safe operation, the user must comply with the instructions and markings given in these manual.
Before installation ensure that the operating voltage and mains voltage set are the same.
The power lead must only be connected to a socket with ground wire.
The power lead must be connected before the measuring and control circuit is switched on.
Caution! Any interruption in the ground wire inside or outside the instrument, or disconnection of the ground wire, may make the instrument dangerous. Do not interrupt intentionally.
During opening of covers or the removal of pieces, except carried out by hand, live components may be stripped. The connection points may also be live. Before carrying out any compensation, servicing, repair or replacement or repair of pieces requiring the instrument to be opened, it must be disconnected from all power sources.
The capacitors inside the instrument may be charged even after the instrument has been disconnected from all power sources.
If the safe use of the instrument is no longer possible, it must be taken out of service and precautions taken against accidental use.

Safe operation is not possible in the following cases:
- when the instrument shows clearly visible damage;
- when the instrument no longer works;
- after lengthy storage in unfavorable conditions;
- after serious damage incurred during transport.

1.2 Operator safety

Read these pages carefully before installing and using the instrument.

The instrument described in this manual is intended for use by suitably trained staff only.
Maintenance and or repair operations must be carried out - exclusively - by qualified, authorised staff.
For proper, safe use of the instrument and/or repair it is essential that the person instructed to carry out the procedures follow normal safety precautions.

1.3 Symbols

Read the instructions

1.4 Precautions in case of break-downs

In case of suspicion that the instrument is no longer safe, for example because of damage incurred during transport or use, it muste be taken out of service and precautions taken to prevent accidental use. Contact authorized technicians for control and any repairs.

1.5 Installation instructions

1.5.1 Preliminary inspections

When the instrument is received, check that it is complete and has not been damaged during transport.
For any problems contact the ELCONTROL ENERGY after-sales service for repairs or replacements.

1.6 Safety instructions

1.6.1 Grounding

Before making any connections the instrument must be grounded.

1.6.2 Power supply voltage

The instrument can take a power supply voltage with range 100/120V-50/60 Hz or 200/240V-50/60Hz. Versions for 24VDC power supply are also available.

IMPORTANT
As the instrument is not fitted with a fuse on the power supply line, the installation engineer must ensure that the instrument supply is protected with a 100mA T fuse on the AC supply.

Since this is a permanently connected 3 phase instrument (see CEI EN61010-1 or IEC1010-1, 6.12.2.1), a circuit- breaker must be provided as required by these standards. This must be installed in the near vicinity of the instrument, must be within easy reach of the operator and must be marked as the equipment cut-off device.

1.6.3 Measurement voltage

The VIP ENERGY can measure phase-to-phase voltages up to 550 Vrms. However, the instrument has been constructed in accordance with IEC 348 class 1 for operating voltages below 650 VACrms and in accordance with VDE 0110 group C isolation standards for operating voltages of 500 VACrms or less, IEC 1010 550V standards with regard to category III installation and level of pollution 2 under IEC 664-664A.

1.7 Cleaning instructions

After ensuring that the instrument is isolated or disconnected from supply and measurement circuits, the outside of the container may be cleaned using a soft damp cloth (water only). Do not use abrasives or solvents. Never allow water to wet the terminals or enter the instrument.

2 PRESENTATION

2.1 General specifications

The VIP ENERGY is a measuring instrument in a 9 module DIN standard container allowing direct installation on a 35 mm. DIN Rail, prior to insertion in an EUROPA series container.
The instrument can be used in three-phase systems with 3 or 4 wires (2 voltage and 2 current or 3 voltage and 3 current) in low voltage systems or (by means of connection to a voltage transformer) in average and high voltage systems.

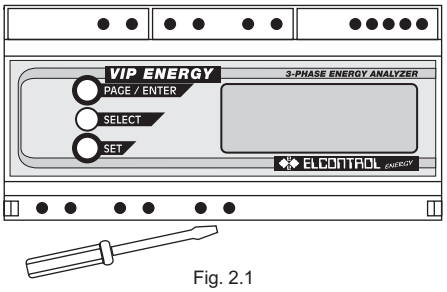


Fig. 2.1

The electrical parameters measurable are: Volt, Amp, Cosø P.F., kW, kVA, kVAr, Hz, kWh, KVArh, kVA Peak, kW Peak, Average KW, Average KVA, Average KVAr, THDF, Date, Time.
The instrument also supplies the active and apparent power peak values with an integration time of 10, 15, 20, 30, 60, 1, 2, 5 minutes. ELCONTROL ENERGY also supplies several models of the VIP ENERGY which are:
• **VIP ENERGY 485** for connection to RS 485 serial line for electrical energy monitoring networks,
• **VIP ENERGY RPQS** with pulsed output proportional to active, reactive and apparent power,
• **VIP ENERGY RPQS 485** with RS 485 serial output and possibility of remote control of 2 loads from PC,
• **VIP ENERGY ALM** with 2 relay outputs for MAXIMUM and MINIMUM alarms for 2 values to be selected among the 27 displayed ones,
• **VIP ENERGY ALM 485** with RS 485 serial output and all functions of ALM and RPQS 485 models.

2.2 Supply Kit

The VIP ENERGY can be panel mounted using the C.VIPD3 (Frame and accessories kit Cod. 4AAF2).

2.3 Power Supply and Connection

To attach the instrument to the DIN Rail, use a screw driver to lower the black plastic hook located at the base of the instrument and fit it onto the rail (Fig. 2.1).

The power supply of the instrument is for voltages of 110V~ ±10% 50-60 Hz, or 220V~ ±10% 50-60 Hz inserting the power supply cables into the the screw terminals (Max cable gauge 2,5 sq. mm) as shown in Fig. 2.2.
The instrument is supplied for power supplies of 200 ÷ 240V~.
Versions at 24VDC are also available.

Fig. 2.2

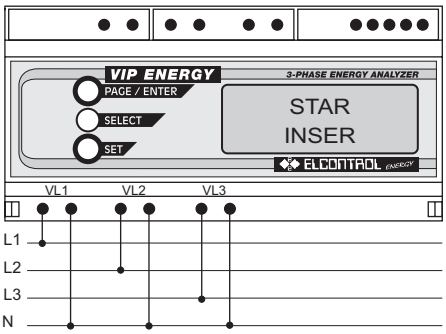


Fig. 2.3a

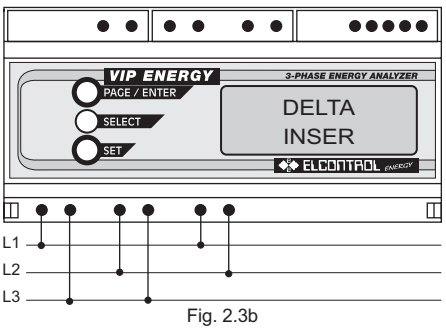


Fig. 2.3b

After the connection is carried out the first measurements page is displayed.
For the voltage connection use the appropriate terminals (Max cable gauge 2,5 sq. mm) as shown in Fig. 2.3a, 2.3b. In case of DELTA connection please take into consideration the note at page 38.
The VIP ENERGY can measure phase-to-phase voltages up to 550 Vrms. The instrument has been manufactured in accordance with IEC 348 class 1 standards for voltages up to 650 VACrms and group C VDE 0110 isolation standards for operating voltages up to a maximum of 500 VACrms, IEC 1010 550V standards with regard to category III installation and level of pollution 2 under IEC 664-664A.
For medium and high voltage measurements, the measuring transformers (see point 4.1) must be used. For current measurements, use the clips provided (max. wire gauge 2.5 sq. mm) as shown in Fig. 2.4.

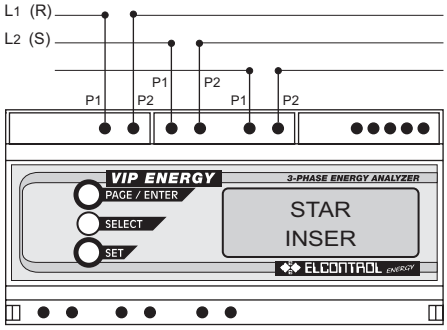


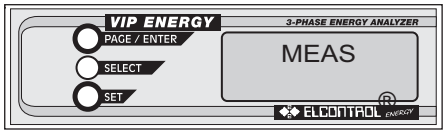
Fig. 2.4

Note: For direct measurements up to 5 Amps, mains cable can be directly connected (see Fig. 2.4). For indirect measurements, it is possible to select a CT with a 1, 2, 2.5 or 5 secondary up to a maximum of 999999A of primary. In this case, connect the CT secondary to the terminals of a current transformer (see Fig. 4.6).
For VIP ONE 30A, current cable should be passed through the transformer through hole (see Fig. 4.7).

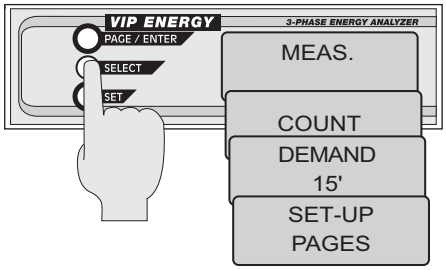
3 INSTRUMENT FUNCTIONS

3.1 PAGE/ENTER, SELECT, SET Pushbuttons

When switched on, the VIP ENERGY shows a measuring page. Press the PAGE key for 3 seconds to access the list of main menus. Press PAGE again to scroll through the menus.

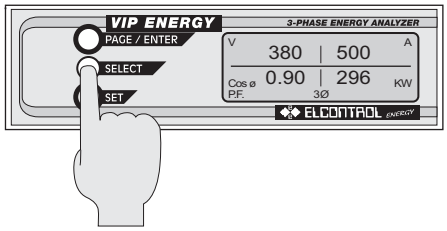


Press SEL to access the menus.



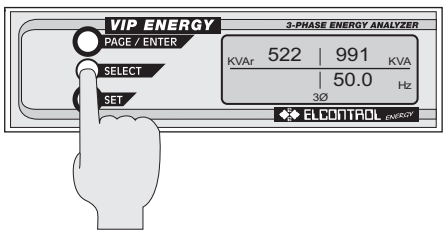
Press SELECT from the "MEAS. PAGES" menu to access the main measurements, contained in 11 pages. Press PAGE to scroll from one page to the next.
To exit from this menu, press PAGE for 3 seconds.

"MEAS. PAGES" MENU

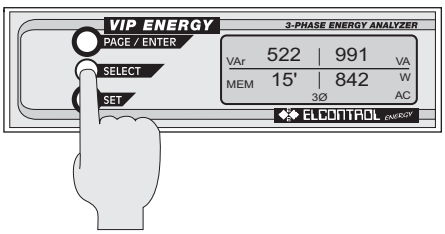


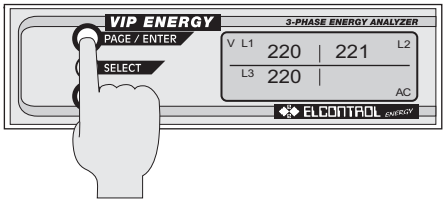
Page 1: THREE-PHASE MEASUREMENTS
• Three-phase V, A, P.F., W
max 999 kV and kA, 999 GW (MkW)
N.B. Volt Phase-Neutral (STAR)
Volt Phase-Phase (DELTA)

:2 egaP
• VAr, VA, FREQUENCY OF PHASE L1
max 999 GVAr, GVA (MkVAr, MkVA)

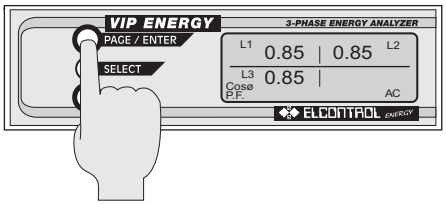


Page 3: THREE-PHASE AVERAGE MEASUREMENTS
• VAr, VA, Integration time, Watt
max 999 GVAr, GVA, GW (MkVAr, MkVA, MKW)

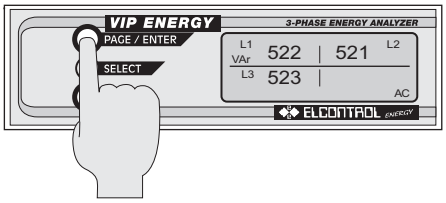




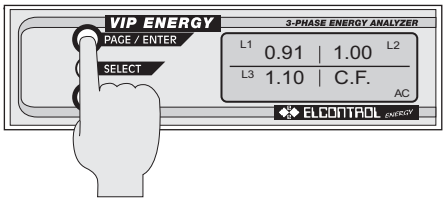
Page 4: PHASE-NEUTRAL VOLTAGE MEASUREMENTS
• Volt L1, Volt L2, Volt L3 (STAR)
• Volt L1-L3, Volt L2-L3, Volt L1-L2 (DELTA)



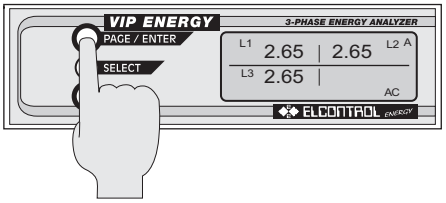
Page 6: PHASE POWER FACTOR MEASUREMENTS
• P.F. L1, P.F. L2, P.F. L3 (only STAR)



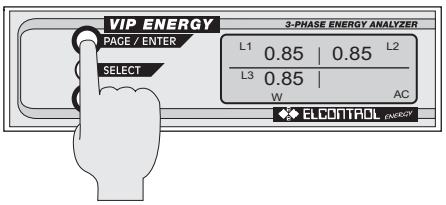
Page 8: PHASE REACTIVE POWER MEASUREMENTS
• Var L1, Var L2, Var L3 (STAR)
• Var L1-L3, Var L2-L3 (DELTA)



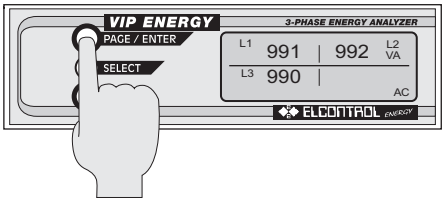
Page 10: PHASE C.F. (Crest Factor) MEASUREMENTS
• C.F. L1, C.F. L2, C.F. L3 (1/THDF)



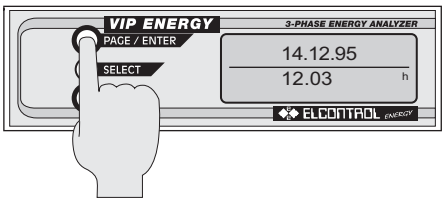
Page 5: PHASE CURRENT MEASUREMENTS
• Amps L1, Amps L2, Amps L3



Page 7: PHASE ACTIVE POWER MEASUREMENTS
• Watt L1, Watt L2, Watt L3 (STAR)
• Watt L1-L3, Watt L2-L3 (DELTA)

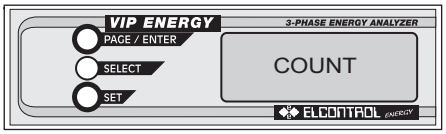


Page 9: PHASE APPARENT POWER MEASUREMENTS
• VA L1, VA L2, VA L3 (STAR)
• VA L1-L3, VA L2- L3 (DELTA)

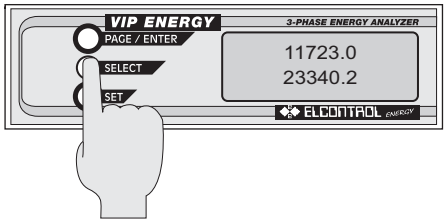


Page 11: CALENDAR CLOCK
Last page of the "MEAS. PAGES" menu.
To exit from the pages of this menu and return to the list of main menus, keep the PAGE Key pressed for 3 seconds.

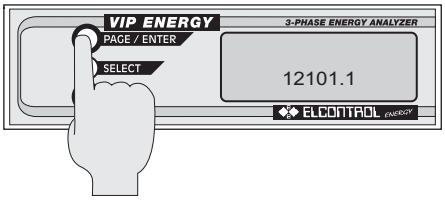
"COUNTS MENU"



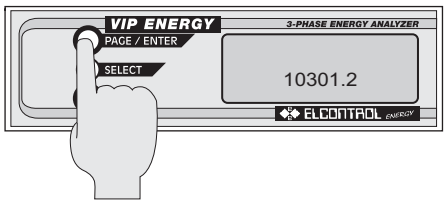
To access this menu, press the SELECT Key; to exit from this menu press the PAGE key for 3 seconds.



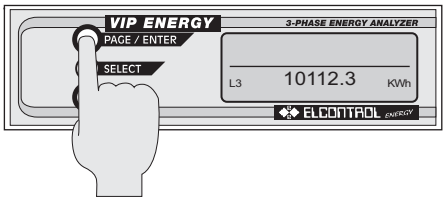
Three-phase kVArh and kWh counters. Max 999.999 Mvarh, MWh.



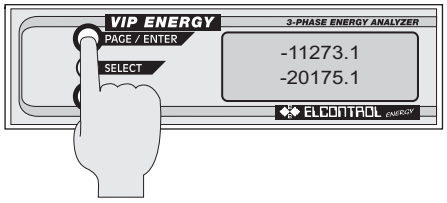
Phase L1 KWh counter (only STAR option, no COG4). Max 999.999 MWh.



Phase L2 KWh counter (only STAR option, no COG.4). Max 999.999 MWh.



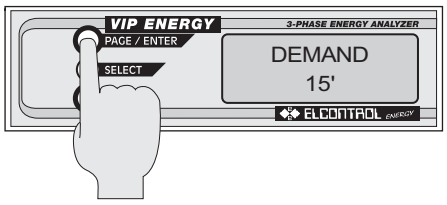
Phase L3 KWh counter (only STAR option, no COG.4).



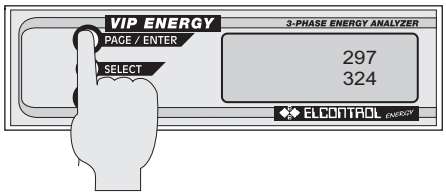
Option STAR, COG4 and DELTA only. Negative KWh and kVArh (generated). Max. 999.999 MWh, MVArh.

To exit from this menu press the PAGE key.

"DEMAND 15" MENU



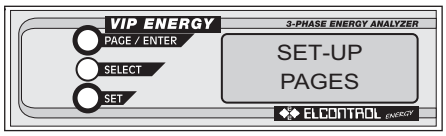
To access this menu, press the SELECT Key; to exit from this menu press the PAGE key for 3 seconds.



Three-phase apparent and active power peaks averaged over the integration time set.

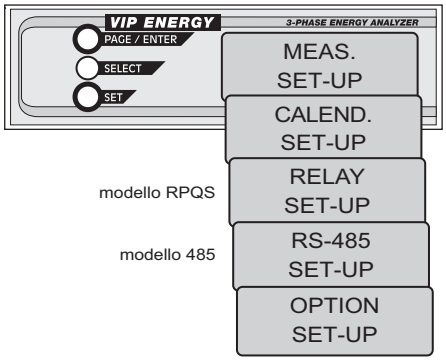
in the "MEAS. SET-UP" menu.
To exit from this menu press the PAGE key for 3 seconds.

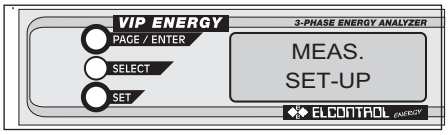
"SETUP-PAGES" MENU



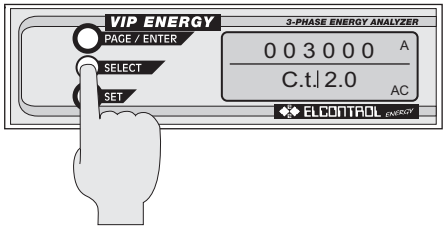
Press the SELECT key from this page to access the list of the SETUP menus, which include:
- MEAS. SET-UP
- CALEND. SET-UP
- RELAY SET-UP (only model RPQS)
- RS 485 (only model 485)
- OPTION SET-UP

Note: *If the PASSWORD is enabled, enter CODE 311299*

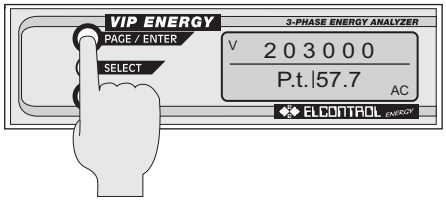




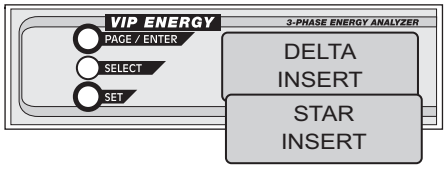
To exit from this menu, press the PAGE key for 3 seconds at any moment.



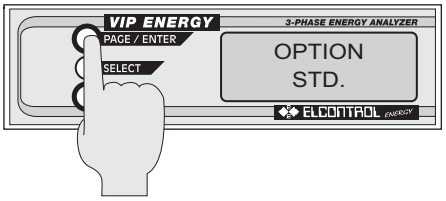
Page 1: Programming the current ratio.
On the first line, enter the value of the primary using the SELECT key to select the digit and SET to confirm. The value can be set freely between 1A and 999999A. On the second line, set the value of the secondary, by pressing SET, using a table inside the instrument which contains the values 1, 2, 2.5 and 5A.



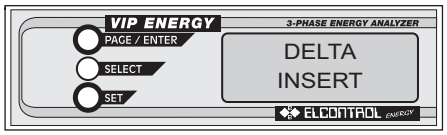
Page 2: Programming the voltage ratio.
On the first line, enter the value of the primary using the SELECT key to select the digit and SET to confirm. The value can be set freely between 1V and 999999V. On the second line, set the value of the seondary, by pressing SET, using a table inside the instruments which contains the values 57.7, 63.5, 100, 110, 115, 120, 173, 190, 200 and 220 V.

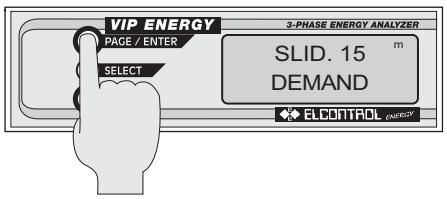


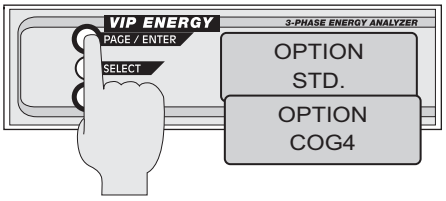
Page 3: Measurement connection and programming.
Press SET to preset the instrument for connection to DELTA or STAR electrical systems.



Page 4: Counter programming.
Press SET to preset the instrument for standard 1/2 counters or COG4 counters (kWh, -kWh, kvarh, -kvarh).In DELTA connection the counters are always of COG4 type.

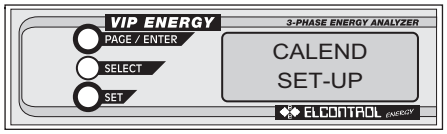




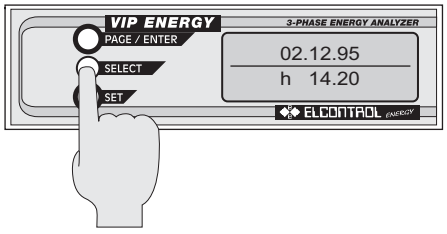


Page 5: Integration time programming.
Press SET to preset the instrument for one of the mean value integration times available in the table: 10, 15, 20, 30, 60, 1, 2, 5 minutes.

"CALEND SET-UP" MENU

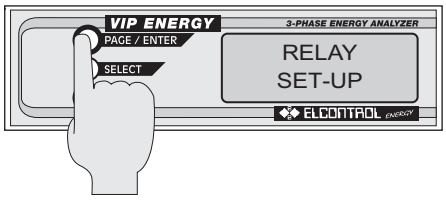


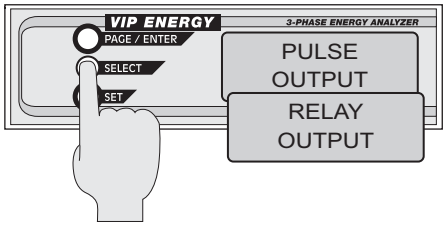
Press select to access this menu and program the clock. To exit from this menu, press the PAGE key for 3 seconds.



Page 1: Time and date programming.
On the first page, the Day, Month and Year can be programmed using SELECT to choose the digit and SET to confirm the value.
On the second line, use the same keys in the same way to set the Hours and Minutes.
This is the last page in this menu; to exit from this set-up function keep the PAGE key pressed for 3 seconds.

"RELAY SET-UP" MENU'
(model RPQS and RPQS-485 only)

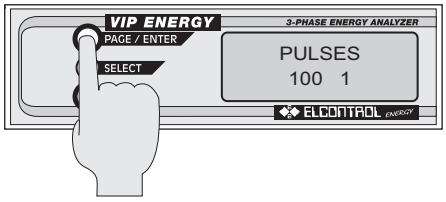




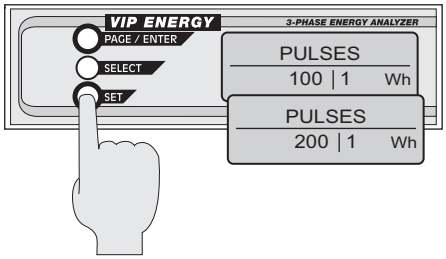
Press the SELECT key to access the RELAY SET-UP menu. Press the SET key to preset the instrument's two relay outputs as 2 pulsed outputs for metering the active, reactive and apparent power ("PULSE OUTPUT") or as two open/closed (off/on) outputs for controlling loads ("RELAY OUTPUT") in remote control mode (by RS485) or in local (manual) mode.

To access the PULSE OUTPUT submenu and select metering of active, reactive or apparent power values, press the PAG key.

To exit from this menu, press the PAG key for 3 seconds at any moment.

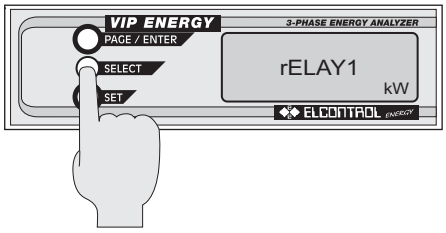


The SEL + SET keys can be used to select different frequencies for the output pulses: from 1 to 999 pulses per Wh, kWh or MWh.

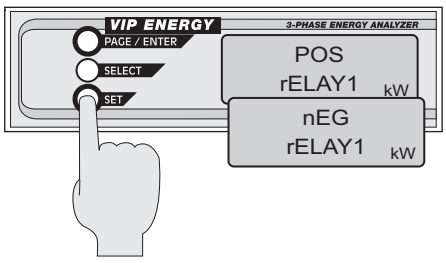


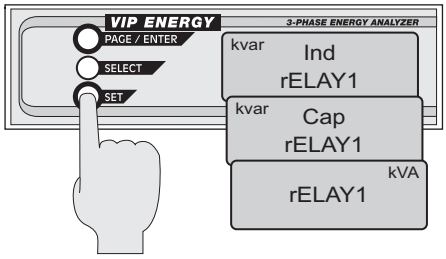
If the number of pulses programmed is higher than the maximum permitted (100,000 pulses/hour) the word PULSES and the measuring pages blink (also see Annex D).

When the PAG button is pressed to confirm the selection, the system moves on to selection of the RELAY1 output parameter.



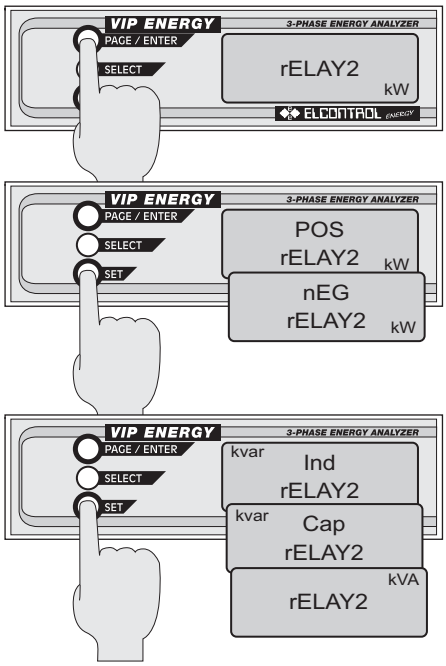
Use the SET button to select PPOS, PNEG, QPOS (IND), QNEG (CAP) or S.



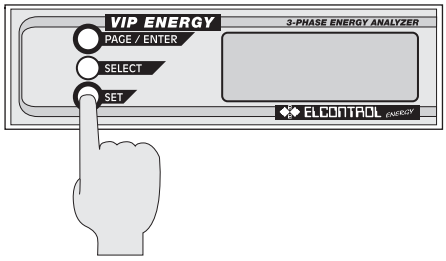


Press the PAG key to confirm the selection made and pass to the RELAY2 menu.

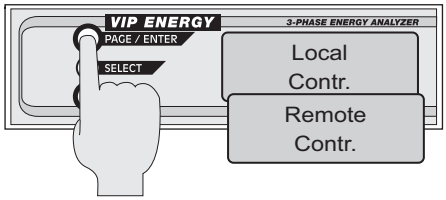
Repeat exactly the same procedure for RELAY2.



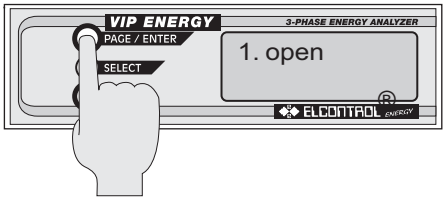
Press the SET key to pass from the PULSE OUTPUT page to the RELAY OUTPUT page.



Press the PAG key to select the 2 relay outputs for local control mode or remote control mode (RS 485).

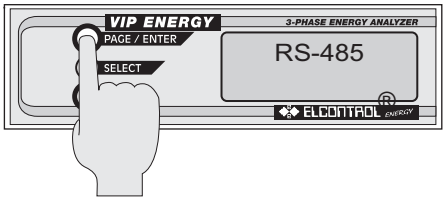


The SET key can be used to switch control of the open/closed status of the 2 output relays from LOCAL (manual) to REMOTE (RS 485).

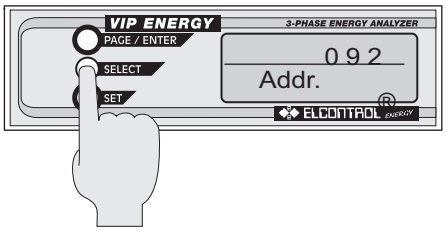


Press the PAG key from the LOCAL Cntrl page to access the page for local control of the two relays. Use the SEL key to select RELAY1 or RELAY2 and then the SET key to select open/closed status.
To confirm, press the PAG key, which returns the system to the RELAY OUTPUT page.

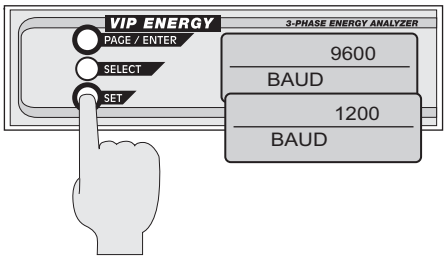
RS485 SETUP
(model VIP ENERGY 485 only)



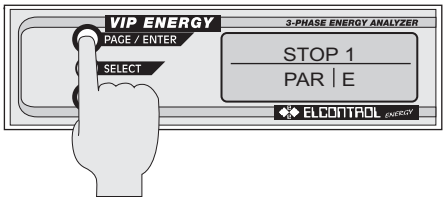
Press SELECT to access this menu and program RS 485 serial transmission.
To exit from this menu, press the PAG key for 3 seconds at any moment.



Page 1: Instrument address programming.
The 485 address is programmed on the first line. The address can be set from 1 to 247.
Use the SELECT key to choose the digit and SET to confirm the value.



Page 2: Transmission speed programming. Press SET to set the transmission speed, 9600 or 1200 baud.

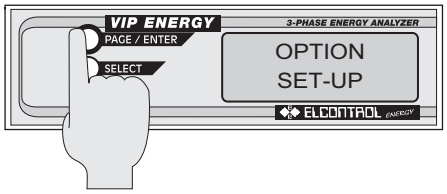


Page 3: stop bit and parity programming.
Press SELECT to choose between the number of STOP BITS (1 or 2) and the type of PARITY: no, odd or even.

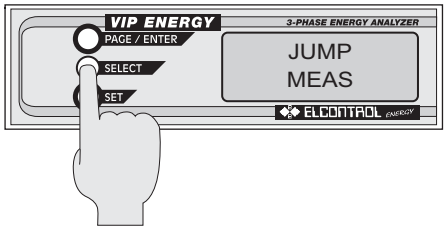
Press SET to confirm the number of stop bits and the type of parity bit.
This is the last page in this menu; to exit from these set-up pages keep the PAGE key pressed for 3 seconds.

"OPTION SET-UP" MENU

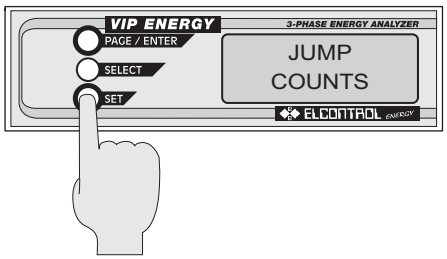
To access this menu, press the SELECT key.
To exit from this menu press the PAGE key for 3 seconds.



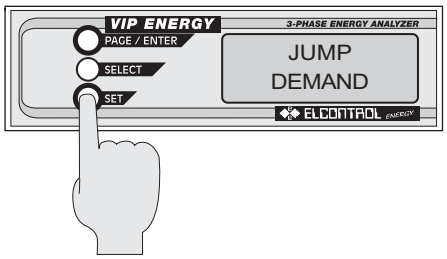
Press SET to select the measuring pages block to which the VIP ENERGY will jump when switched on.



Select "MEAS" if you wish the VIP ENERGY to display the main measurement pages after POWER ON.

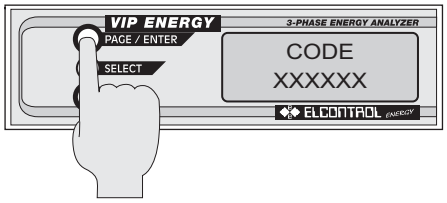


Select "COUNTS" if you wish the VIP ENERGY to display the counter pages after POWER ON.



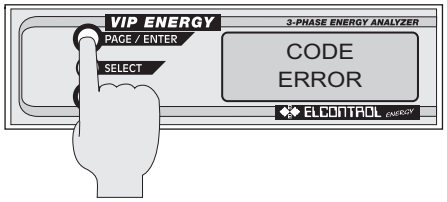
Select "DEMAND" if you wish the VIP ENERGY to display the peak pages after POWER ON.

In the model with the PASSWORD, press the PAG. key to diaplay the page on which the PASSWORD must be entered.

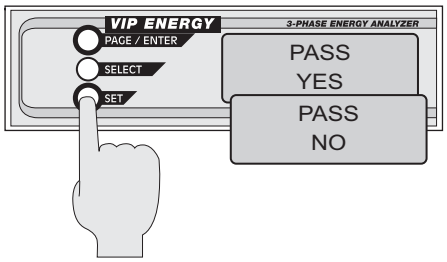


Enter the code 311299 (fixed) through SEL+SET keys and press the PAG. key to enter the page Enable/Disable PASSWORD.

By pressing the PAG key if no code or the wrong code is entered, the page is displayed.



Press again the PAG key to return to the JUMP selection page.



The PASSWORD for Counters RESET, Peaks RESET and SETUP MENU can be enabled/disabled through the SET key.

3.2 The RESET functions of the SET button

Press the button in the relative measurement page to reset the energy counters (kVARh and kWh); zeros appear on the display (see Fig. 3.1).

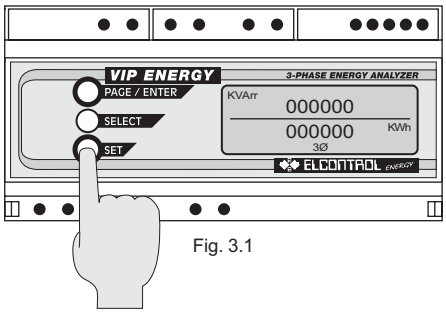


Fig. 3.1

Note: In the models with PASSWORD, if the PASSWORD is enabled enter CODE 311299 (fixed) and press the PAG. key to reset.

Press the button in the relative measurement page to reset the active power peak values and the apparent power average three-phase values and also the buffer which is utilised to calculate the averages.
Therefore the measurement is not valid for a period of time equal to the programmed integration time.

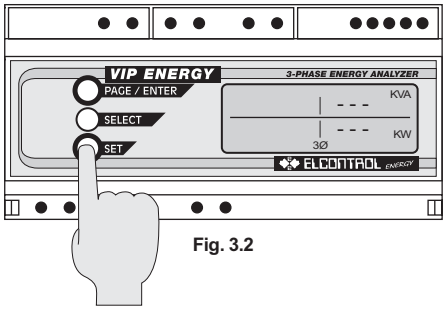


Fig. 3.2

Once the reset has been carried out, press the PAGE button to exit from this menu.

4 CONNECTION OF THE VIP ENERGY

4.1 Voltage Connection

Direct connection to three-phase network with neutral.

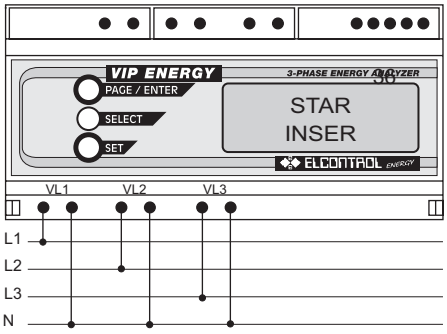


Fig. 4.1

Direct connection to three-phase network without neutral.

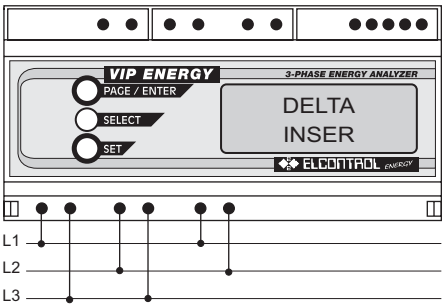


Fig. 4.2

Connection between two voltage transformers

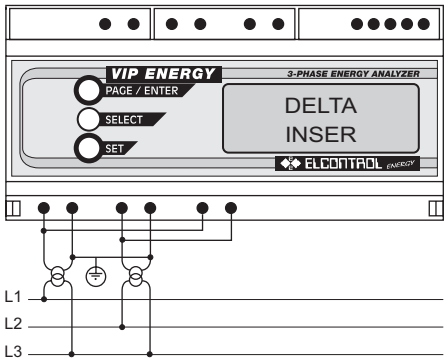


Fig. 4.3

Connection by means of 3 star voltage transformers with one phase of the secondary

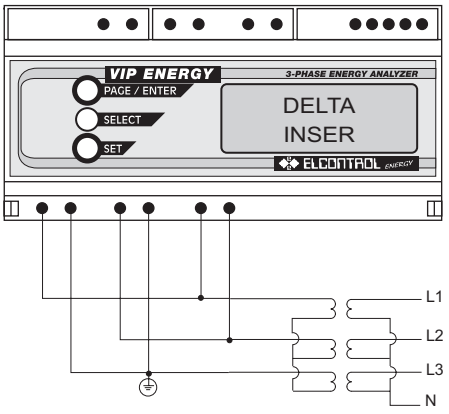


Fig. 4.4

4.2 Current connection

Direct connection to three-phases and three currents.

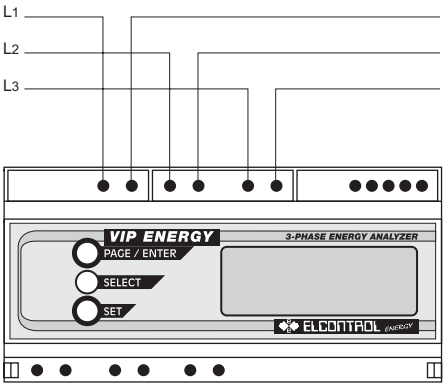


Fig. 4.5

Connection to three-phases and three CTs.

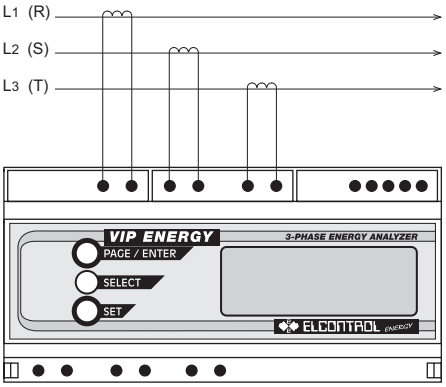


Fig. 4.6

Current connection utilizing only two CTs.

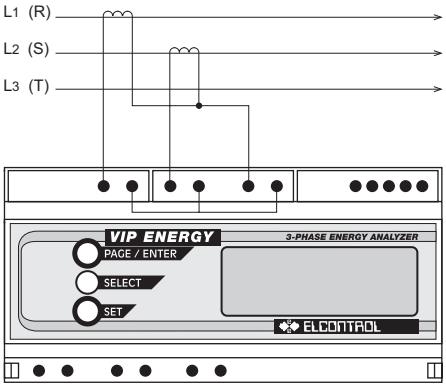


Fig. 4.7

5 TECHNICAL DATA

5.1 General specifications

- Inputs: L1-N, L2-N, L3-N max 550 Vrms (STAR connection) L1-L3, L2-L3, L1-L2 max 550 Vrms (DELTA connection) from 20 to 600 Hz. Current inputs: 5A from 20 to 600 Hz.
- Voltage input overload: peak voltage 2000 Vrms (60 seconds).
- Current input overload: 20 times the full scale value - 1 sec. (with an overload cut-out trigered at the limit values)
- Number of scales: 2 voltage scales; 3 current scales.
- Automatic scale change: scale response time: 1.2 sec; passage to the scale above occurs at 105% of the scale activated; passage to the scale below occurs at 20% of the scales activated.
- Weight: 1 kg.
- Degree of protection: instrument IP20; front panel IP40.
- Data back-up is guaranteed by means of the internal EEPROM (1.000.000 write cycles min.) 40 years.

5.2 Service and testing conditions

- Ambient service conditions: ambient temperature range: from -10 °C to +60 °C; relative humidity (U.R.): from 20% to 80%.
- Storage temperature: from -20 to +70 °C.
- Condensation: not permitted.
- Insulation to VDE 0110 group C for operating voltage - 500 VAC rms.
- Insulation resistance ³ 500 Mý between input terminals and outer casing.
- Insulation voltage between input connectors: testing at 2000 Vrms at 50 Hz for 60 sec. Between each connector and the container: testing at 3000 Vrms for 60 sec.
- Safety reference standards: IEC 348, VDE 411, class 1 for operating voltage - 650 VAC rms; IEC 1010 550 V.
- EMC reference standards: EN 50081-1, EN 50082-2, EN 55011, EN 55022.
- Dimensions: length= 157.5 mm (9 DIN modules); Height= 90 mm; Depth= 73 mm
- Battery: lithium battery: 3V, 280 mAh

5.3 Power supply

- Mains: 110/220V~ ±10% 50/60 Hz.
- Instrument consumption: 8 VA.
- Immunity to voltage microints: 0.1 sec.

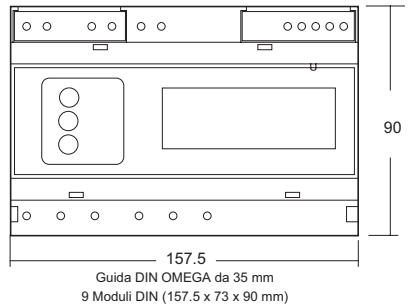
5.4 Measurements of primary parameters

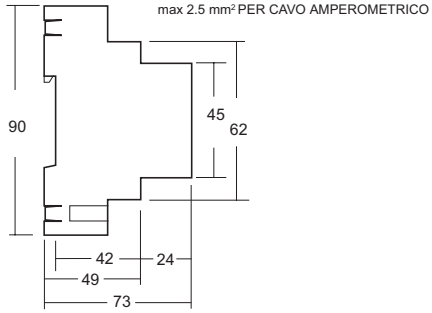
- Measuring method: fixed sampling and analog/digital conversion.
- Sampling frequency: 1.25 KHz.
- Number of samples for phase: 125 (100 msec).
- Measuring interval: 1.2 sec.
- Zero self-correction: every 1.2 sec.

5.5 Measurement accuracy for primary parameters

- Measuring error in ambient from 18°C to 25°C (after 30' warm-up) - see the tables
- Measuring error outside this temperature range: ± 0.02% F.S. for each °C out of range.
- Sensitivity and accuracy in voltage measurements:
  direct input with max voltage = 550 Vrms at Full Scale; Input voltage crest factor ³1.6; 0.03 VA for each phase.

Dimension (in mm)





5.6 Displayed values

	Volt	Ampère	Watt	VA	Var	cosØ, PF	THDF (A)	Max demand (peak) KW	Max demand (peak) KVA	Average KW	Average KVA	Average Kvar	Hz	KWh	Kvarh	KWh Import/export	Kvarh Import/export	Date	Time
L1	•	•	•	•	•	•	•						•	•				•	•
L2	•	•	•	•	•	•	•							•					
L3	•	•	•	•	•	•	•							•					
3Ø	•	•	•	•	•	•		•	•	•	•	•		•	•	•	•		

Alternating voltage sensitivity, Full scale and accuracy			
Nominal Range	Sensitivity	Full Scales	e from 20% F.S. to 100%F.S.
			VIP ENERGY
140 Vrms	111 mV	140 V	0.3% F.S. + 0.3% Rdg
550 Vrms	480 mV	550 V	0.3% F.S. + 0.3% Rdg

Alternating current sensitivity, Full scale and accuracy			
Nominal Range	Sensitivity	Full Scales	e from 20% F.S. to
			VIP ENERGY
0.30 A	0.2 mA	0.30 A	0,5%F.S. + 0,5% Rdg
1.50 A	1 mA	1.50 A	0,3%F.S. + 0,3% Rdg
5.00 A	3.2 mA	5.00 A	0,3%F.S. + 0,3% Rdg

Sensitivity and accuracy in current measurements.
Direct input with max. 5A at Full Scale. 0.07W Burden for each current transformer.
Input current crest factor ³ 1,6.
Accuracy in voltage and current measurements in relation to frequency: for signal frequencies in the range 20÷90 Hz no error in addition to those indicated in the tables above.
Precision in measurement of secondary parameters: measurements (single-phase or three-phase), of power, CosØ, active energy: Class 1 IEC 1036.
Frequency measurement accuracy: 20 ÷ 99 Hz ± 0.1 Hz - 100 ÷ 600 Hz ± 1 Hz + 0.5% Rdg.
Measurements of other secondary parameters: the error is expressed by the formula which defines the parameter in relation to V, I W.

5.7 Formulae used for single-phase measurements

Insatantan.rms voltage	$V_{1N}= \sqrt{\frac{1}{n}\cdot\sum_{1}^{n}(V_{1N})_i^2}$
Instantan.active power	$W_1= \frac{1}{n}\cdot\sum_{1}^{n}(V_{1N})_i\cdot(A_1)_i$
Instantan.power factor	$\cos\varnothing_1= \frac{W_1}{VA_1}$
Instantan.rms current	$A_1= \sqrt{\frac{1}{n}\cdot\sum_{1}^{n}(A_1)_i^2}$
Instantan.apparent power	$VA_1= V_{1N}\cdot A_1$
Instantant.reactive power	$VAr_1= \sqrt{(VA_1)^2 - (W_1)^2}$
Crest Factor (1/Transformer Harmonic Derating Factor)	$C.F.1= \frac{I_{peak}}{\sqrt{2}\ I_{RMS}}$

5.8 Formulae used for three-phase measurements

Three-phase voltage	$V_Y= \frac{VL1+VL2+VL3}{\sqrt{3}}$ STAR $\quad V_Y= \frac{V_{12}+V_{23}+V_{31}}{3}$ DELTA
Three-phase reactive power	$VAr_Y= VAr_1 + VAr_2 + VAr_3$
Three-phase current	$A_Y= \frac{VA_Y}{\sqrt{3}\bullet V_Y}$
Three-phase active power	$W_Y= W_1 + W_2 + W_3$
Three-phase apparent power	$VA_Y= \sqrt{W_Y^2 + VAr_Y^2}$
Three-phase power factor	$\cos\varnothing_Y= \frac{W_Y}{VA_Y}$

ANNEX A

A.1 Positive and negative energies and powers

Measuring active and reactive energy and power correctly using a conventional instrument requires great care and specialist personnel.
The voltage and current measurement connections must be made in the right direction; otherwise, the active power absorbed by a typical load (positive by convention) will appear with an incorrect negative sign. The corresponding energy counter, which only moves on for positive (i.e. actually absorbed) power, will not be increased, and consumption levels will appear to be nil even for very high absorption.
The same applies to reactive power; in case of inductive reactive power (positive by convention) incorrect connection would lead to negative readings and failure to increase the relative counter. Therefore a strongly inductive load would appear to have a perfect power factor, with serious economic consequences. The standard setting allows the operator not to worry about the clip connection direction, since the instrument assumes that it is measuring a load which absorbs power from the mains and thus automatically provides a positive active power reading, modifying the power factor and reactive power in consequence.

A.2 The cogeneration option COG4

There are a series of applications in which it is useful to preserve the real sign of the active power; in other words, all cases where the characteristics of a generator supplying power to the network have to be measured.
In cases of this kind, the VIP ENERGY active power counter is increased for both absorbed and generated power, meaning that the reading is not correct. Use of the COG4 (COGENERATION) option allows correct measurement even in these cases. The operator has to make the voltage and current measurement connections correctly, checking their direction to ensure that when a load is measured, the active power is positive (or negative in the case of a generator). In case of mixed use (for example, a lift where power is absorbed during ascent and generated during descent), the COG4 option allows measurements of both the active power absorbed and the power generated and supplied to the network (the origin of the term COGENERATION).

In the COG4 version, the instrument displays the energy consumption and energy production counts simultaneously in the two consecutive power count pages, indicating them with positive and negative sign respectively (see Fig. A.1).

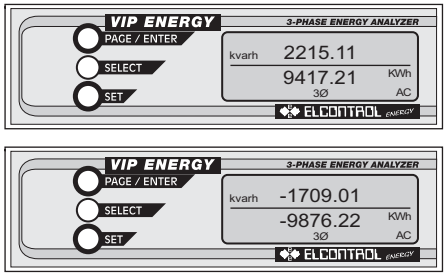


Fig. A.1

The COGENERATION option also offers the Pulse Output option (RPQS); in this case, an extra parameter can be selected as pulsed output, as follows:

	Standard version	COGENERATION version
	P	P+
	Q+	P-
	Q-	Q+
	S	Q-
		S

where:
P + = active power consumed
P - = active power produced
Q + = inductive reactive power
Q - = capacitive reactive power

Note: *The DELTA connection is always of COG4 type; therefore it is necessary to make the voltage and current connections as described in A.2 paragraph.*

ANNEX B

B.1 The VIP ENERGY-485 and the local network VIPNET-485 instruments

ELCONTROL ENERGY solves the problem of price and dependability with it's VIPNET-485 (monitoring network), a complete electrical energy measurement and control system, by connecting the VIP ENERGY-485, VIP ONE 485 to a Personal Computer which has installed the VIPVIEW software for use in a Windows environment and VIPLOAD software for use in a DOS environment.
The network connection of the RS485 instruments data lines is carried out by a normal shielded twisted pair, which is suitable for this type of connection (see page 114).
The network is based on the EIA RS485 electrical standard, while the communication protocol respects the MODBUS industrial standard. According to this standard it is possible to address and manage up to 247 instruments.
These instruments are distributed on at least 8 lines interconnected by REPEATER-485 signal repeaters.
Each line can contain a maximum of 32 devices, subdivided into VIP ENERGY, VIP ONE and REPEATER-485.
The first line can contain 31 instruments plus the PC485 BOARD (a RS232/RS485 internal converter for personal computer) or the PC485-BOX external converter.

ELCONTROL ENERGY has optoisolated the data lines of its VIP ENERGY-485 instruments and has equipped the electrical interface circuits with a galvanically isolated power supply, so as to enable the VIPNET-485 networks to be able to operate both in industrial environments with strong interfences and in the presence of severe events such as atmospheric discharges. The instantaneous overvoltage allowable is 2500 VAC for 1 minute.

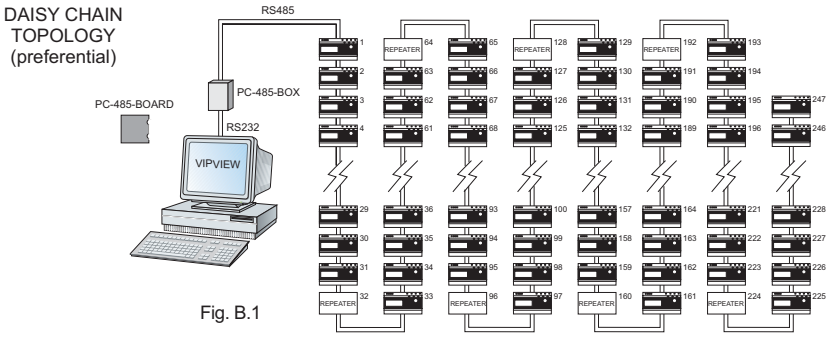


Fig. B.1

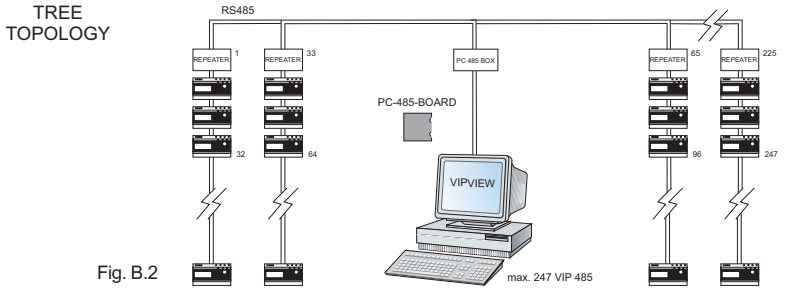


Fig. B.2

B.2 External connections and setup of the RS485 option

The VIP ENERGY-485 can be connected to a Personal Computer with a 2-pole shielded cable with maximum lenght 1200 meters. Other devices can be connected to the same line (VIP ENERGY-485, VIP ONE 485 or REPEATER-485 signal repeaters) up to a maximum of 31 units. By utilizing REPEATER-485 signal repeaters other groups of 32 units can be added, up to a maximum of 247 VIP ENERGY-485, and VIP ONE 485.
Every VIP ENERGY-485 is identified by its own address, which can be set on the display by means of a selection video page.

The connection of VIP ENERGY-485 to the network is by means of a shielded bi-polar cable connected to the terminals located in the top of the instrument, next to the power supply terminals.

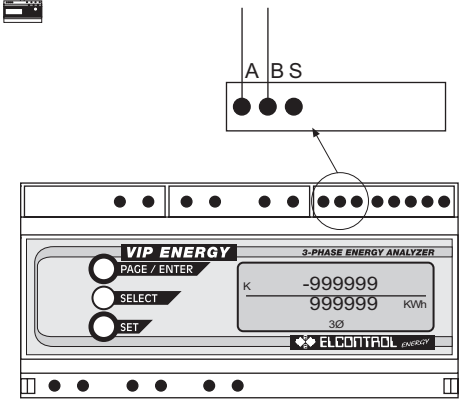
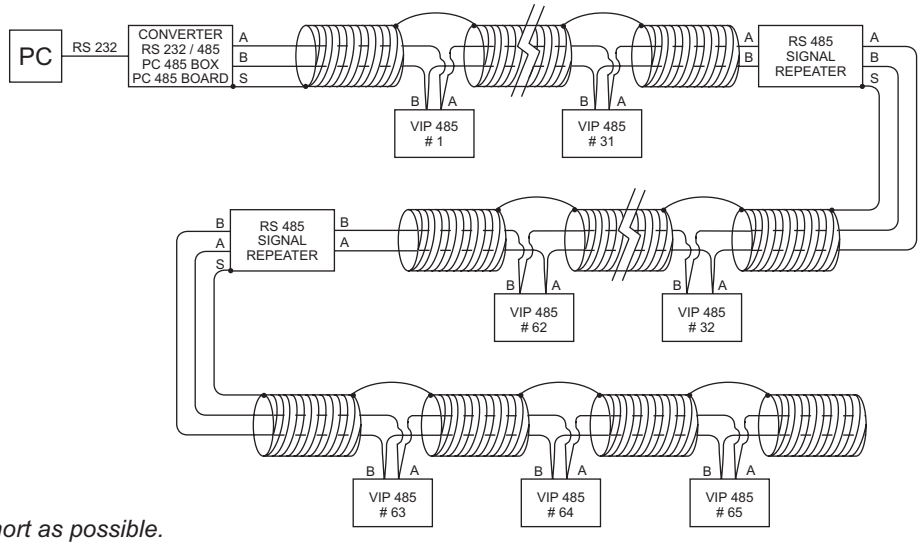


Fig. B.2

Where:
A = Positive
B = Negative
S = Shield (not connected)

Example of shielded twisted pair connection.



Note: *Shield's opening must be as short as possible.*
Connect the shield only at one end.
Multiple connections can generate dangerous ground loop currents.

ELCONTROL ENERGY VIPNET 485 NETWORK CABLES
The EIA RS-485 standard envisages a transmission speed of over 1 Mbaud for a distance of 1.2 km. The ELCONTROL ENERGY instrumentation allows transmission at up to a maximum of 9600 bit/sec. This offers better margins of protection against the risk of disturbance and loss of signal power. However, cables specially designed for this type of protocol should be used.
We recommend:

BELDEN CABLES:
type 3105A for RS485
specific for the EIA RS-485 standard, high quality, impedance 120 ohm, gauge 22AWG, twist pitch 5 cm, recommended for VIPNET applications covering large distances and/or for environments with strong electromagnetic disturbances.
type 9841 for RS485
like the 3105A but with gauge 24 AWG. Recommended for environments where the electromagnetic disturbances are not particularly strong.
type 1599A
data transmission cable specifically for LAN and not for RS485, low cost with performance levels good enough to assure VIPNET network communications in environments free from electromagnetic disturbances.

VIP ENERGY with power supply at 24 VDC
The various VIP ENERGY models are available with power supply at 24 VDC, with the following specifications:
• Power supply 24 VDC (15-30 VDC), 3VA
• Automatic reversal of power supply connection
• Any RS485 serial output insulated to 3000 V.

B.3 The REPEATER-485 signal repeater

Power supply 220 VAC ± 10% or 110 VAC ± 10%. The REPEATER-485 signal repeater is a bidirectional amplifier which is connected to the VIPNET-485 network according to the following diagram:

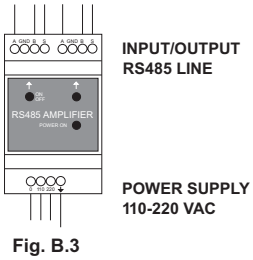


Fig. B.3

Depending on the type of system, the REPEATER-485 can be utilized in various network configurations, linear type (Linear Bus Topology Daisychain) - Fig. B.1 - for long areas and "tree" type (Tree Topology) - Fig. B.2 - for more extended areas.

B.5 The PC485-BOX external converter

The PC485-BOX, an RS232/485 external converter, is also available powered by the power suppliers of the Personal Computer or externally by a power supply 220V ± 10%, 110 VAC ± 10%.

B.6 Characteristics of the VIP ENERGY 485 serial communications software protocol (including RPQS/ALM options)

The software communications protocol complies with the MODBUS standard (RS 485) with a master represented by the PC485 BOARD internal RS232-RS485 conversion board for personal computer (or the PC 485 BOX external RS232-RS485 converter) and a maximum of 247 VIP ENERGY-485 slaves.

- Selected transmission mode: ASCII
- Coding system: HEX (uses printable ASCII characters: 0-9, A-F).
- Error detection mode: LRC
- Serial protocol characteristics:
  - Baud rate: 9600/1200
  - Data bits: 7
  - Parity bits: None/Odd/Even
  - Stop bits: 1/2

The commands implemented by the MODBUS protocol are:

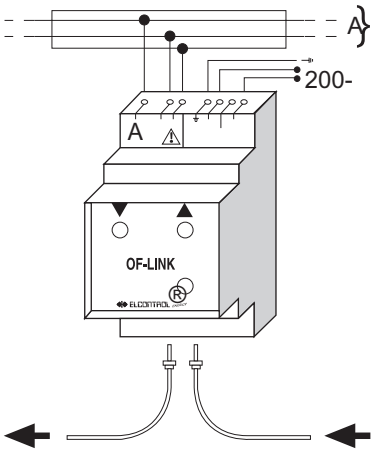
• Reading of all measurements
• Date and time reading
• Disabling/enabling of the keyboard
• Power peaks and averages reset
• Energy meters reset
• Programming of current transformer ratios
• Programming of voltage transformer ratios
• Selection of the measurement page to be displayed at power-on
• Selection of the switching type:
STAR/DELTA/SINGLE-PHASE
• Selection of option: STANDARD1, STANDARD2, COGENERATION4
• Programming of the integration time for average values
• Data and time programming
• Selection of the relay output type of RPQS/ALM models: Pulse, Relay, Alarm
• Programming of pulse weight for RPQS
• Selection of parameters associated to the RPQS pulse outputs
• Selection of Local mode/Remote mode for Relay output

• On-off control of relays 1 and 2 of models RPQS/ALM
• Programming of the setup of the ALM relay outputs
• Programming of the ALM alarm thresholds
• Programming of the ALM relay activation and disactivation time.

See file VIP ENERGY 485 PROTOCOL ENG.PDF

ANNEX C

C.1 "PC 485 OF-LINK" and "VIP 485 OF-LINK" Converters



Power supplied at 220VAC ±10% or at 110VAC ±10%, VIP 485 OF-LINK and PC 485 OF-LINK
interfaces RS485 twisted pair cable and 2 (TX and RX) optic fibres in EMI high polluted environment. Up to 70 mt. (plastic fibre) or 500 mt. (glass fibre).
The VIP 485 OF-LINK is designed for connection to the RS485 leading out of a VIP ONE 485 or from a VIP ENERGY 485.
The PC 485 OF-LINK is intended for connection to the RS485 - PC side. Up to 32 VIP ONE 485 or VIP ENERGY 485 instruments can be connected to the RS485 side of a single VIP 485 OF-LINK converter (see diagram). Any number of VIP 485 OF-LINK can be connected to the OF side: the only constraint is that of 247 instruments max with RS485 (see Fig. C.1).

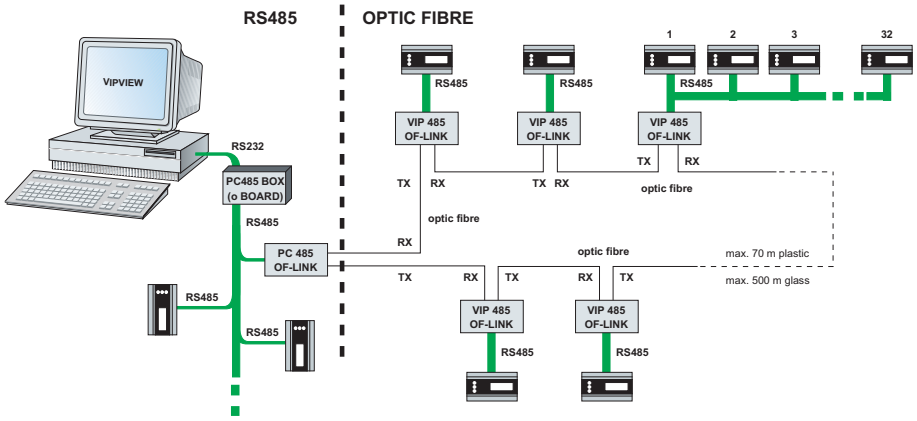


Fig. C.1

C.2 Fibre Optic Preparation Procedure

To connect the Fibre Optic to the PC 485 OF-LINK or VIP 485 OF-LINK is necessary to wire the connector to the cable:

1) Strip the plastic cable with a plastic cutter, uncovering approximately a 7 mm section of the Fibre Optic (see Fig. C.2)

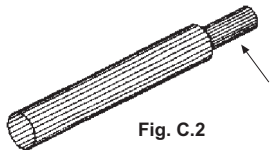


Fig. C.2

2) Insert the crimping ring on the connector, as in Fig. C.3.

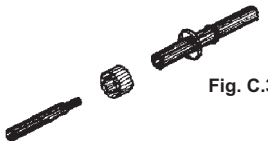


Fig. C.3

3) Insert the cable in the connector until it protrudes at least 1.5 mm on the other side (see Fig. C.4)

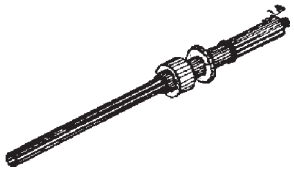


Fig. C.4

4) Crimp the ring on the connector using suitable pliers.

C.3 Cleaning Procedure of the Fibre Optic

Obtain the cleaning kit before carrying out the following operations.
Place the abrasive paper on a flat surface and insert the connector in the cleaning device.
Press the connector on the abrasive paper making figure 8 movements as shown in Fig. C.5 below until it is lined up with the cleaning device.

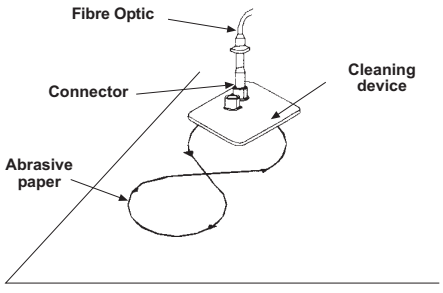


Fig. C.5

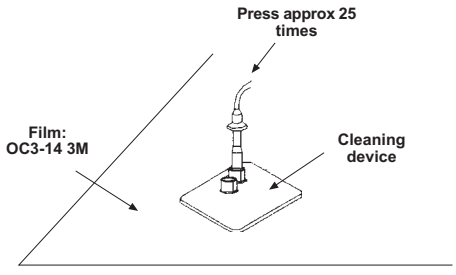


Fig. C.6

Extend the lapping film on the surface and position the cleaning device with the connector inserted. Press at several different points approximately 25 times.

Now the Fibre Optic is ready to be used.
Insert the Fibre Optic connector in the proper opening of the instrument.

C.4 Specifications of the Fibre Optic to be used

The Fibre Optic to be used must comply with the following specifications:
- Internal Diameter = 1 mm
- Max.external diameter = 2.2 mm
- Attenuation at 25 °C < 0.25 dB/m (650 nm.)
- Ambient temperature from: -40 °C to +70 °C
- Max traction - 8 Kg
- Curvature radius > 9 mm

Inside the instrument there is a female connector for plastic fibre Optic, serial number H.P. HFBR-1523.
To carry out the transmission it is necessary to perform the preparation operations and cleaning of the fibre optic described in the previous section using the components distributed by ELCONTROL ENERGY.

OFP (Ref. 4AAHL):
Plastic fiber optic, single without head, sold by the meter.The tests carried out on the instruments grant the use of a fibre optic with the above-listed specifications for a distance of up to 75 m.

OFP-CM (Ref. 4AAHM):
with crimping ring for terminating the plastic fibre optic.

OFP-Polish (Cod. 4AAHN):
cleaning kit for plastic fibre optic.Must be used with OFP-CM, sufficient for approximately 20 terminations.

Crimping tool to be selected from those in the ELCONTROL ENERGY catalogue
(Ex: crimping tool YAC3 - Cod. YDAAY).

ANNEX D

D.1 The VIP ENERGY RPQS

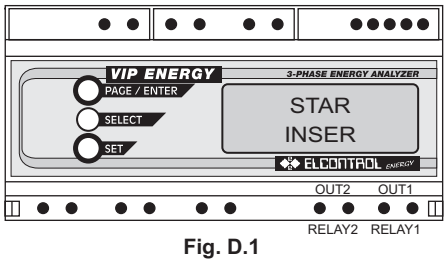


Fig. D.1

100ms = TON = TCLOSE ("LONG PULSE")
17ms = TON = TCLOSE ("SHORT PULSE")

Fig. D.2

17ms = TOFF = TOPEN ("SHORT PULSE")
100ms = TOFF = TOPEN ("LONG PULSE")

Characteristics of the output pulses provided by OUT1 and OUT2.

The VIP ENERGY RPQS is equipped with two solid state relay outputs with voltage-free contacts (280 VAC ms max., 100 mA ms max.) - Fig. D.1 - They supply pulses with the characteristics shown in Fig. D.2 and with frequency proportional to any 2 of the parameters active power P, or P+(POS) and P-(NEG) with option COG4 selected, apparent power (S), or reactive power Q+(POS) inductive, negative Q- capacitive, selected using the keyboard by means of the menu page provided.
The number of pulses/KWh (or kvarh or kVAh) can be set from the keyboard from 1 to 999 pulses per Wh, kWh or MWh (min. 1 pulse/MWh, max. 999 pulses/Wh). If the maximum of 100,000 pulses/hour (short pulse) or 17,000 pulses/hour (long pulse) is exceeded, the measuring and RPQS setup pages blink and the relay outputs are locked in OFF (open) status.

D.2 The VIP ENERGY RPQS-485

The VIP ENERGY RPQS-485 is also available with RS485 output. This model features additional MODBUS commands for reading and setting of the RPQS pulsed outputs.
It is also possibe to control the status of the two relay outputs from a PC, by means of the RS485, thus permitting remote control of two loads. As an alternative, with local mode selected, it is possible to set the opn/closed status of the two output relays manually (see RELAY SETUP menu).

ANNEX E

E.1 The VIP ENERGY ALM

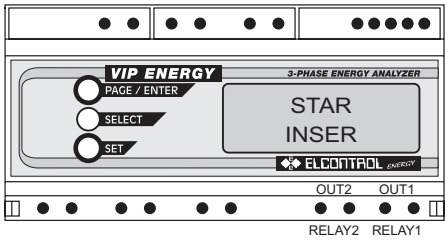


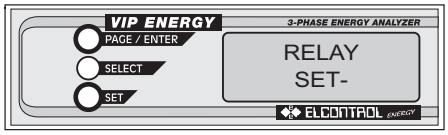
Fig. E.1

The VIP ENERGY ALM is equipped with 2 solid state relay outputs with voltage-free contacts (280 VAC rms max., 100 mA rms max.) - Fig. E.1. A maximum threshold and a minimum threshold of a parameter chosen from 27 of the 43 measurements made by the instrument can be associated to each of them.
For each relay, the user can set an opening delay time and a closing delay time from 0 to 999 seconds and a percentage hysteresis variable from 0 to 17.5% in steps of 2.5% (see RELAY SETUP MENU for this model).

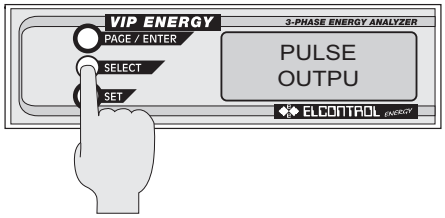
E.2 The VIP ENERGY ALM-485

The VIP ENERGY ALM-485 is also equipped with an RS 485 serial output.
This model has additional MODBUS commands for reading and setting the minimum and maximum alarm thresholds for each of the 2 relays, the opening and closing delay times, and the percentage hysteresis value.
All the functions found on the VIP ENERGY RPQS-485 model are also present and can be selected.

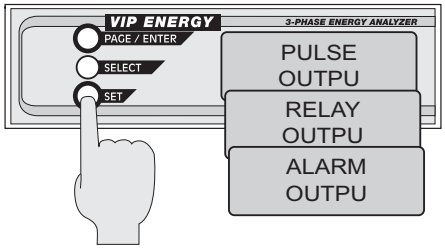
E.3 RELAY SETUP MENU



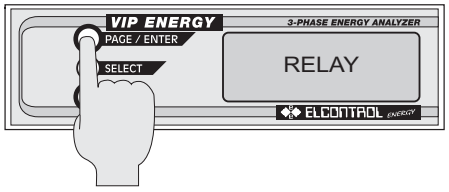
The SEL key gives access to the menu branch for selection of the type of OUTPUT.



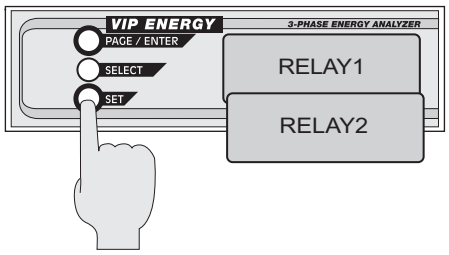
Using the SET key the user can select: PULSE OUTPUT, RELAY OUTPUT or ALARM OUTPUT.



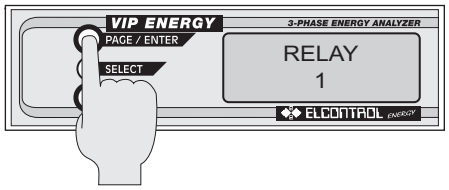
From the ALARM OUTPUT page, the PAG key gives access to the menu for setting the alarm thresholds, the delays and the hysteresis for operation of RELAY 1.



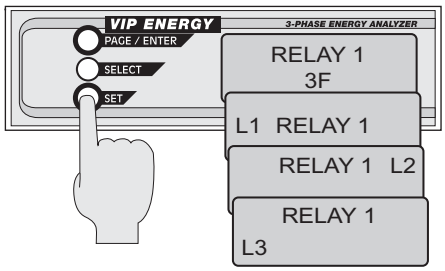
The SET key can be pressed to pass from the menu branch relating to RELAY 1 to that for RELAY 2 and vice-versa.



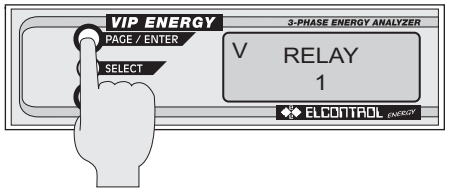
The PAG key gives access to the menu branch for setup of the phase covered by the alarm.



Use SET to select the phase: 3F, L1, L2 and L3.

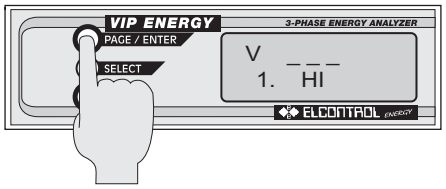


Use the PAG key to access the menu branch for selecting the parameter associated to the relay.
Press SET to select 1 from 27 of the 43 possible parameters.

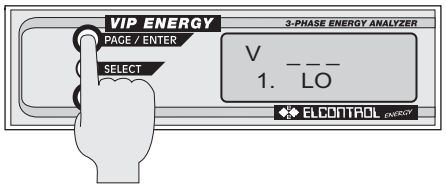


The 27 parameters which can be selected using the SET key are:
• 3F: V, P.F., W, var, VA, Avr. Var, Avr.VA, Avr.W
• L1: V, P.F., W, var, VA, A, Hz
• L2: V, P.F., W, var, VA, A
• L3: V, P.F., W, var, VA, A

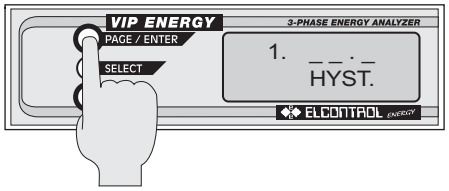
The PAG key gives access to the page for selection of the lower alarm threshold.
Use SEL + SET to select the 3 figure value, plus exponent, plus decimal point (0 = NO ALARM).



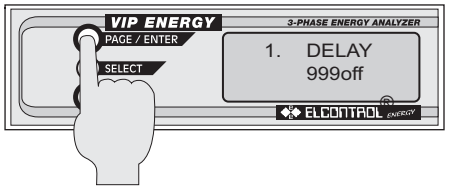
The PAG key gives access to the page for selection of the upper alarm threshold.
Use SEL + SET to select the 3 figure value, plus exponent, plus decimal point (0 = NO ALARM).



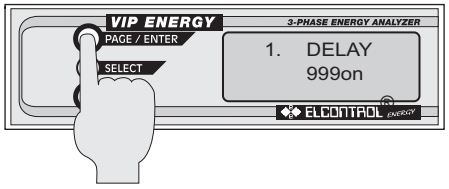
The PAG key gives access to the page for selection of the hysteresis.
Use SET to select the % value (choice of 8 values) from 00.0% to 17.5% in steps of 2.5%.



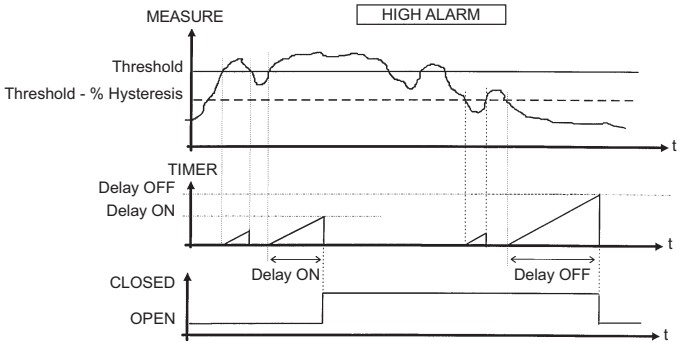
The PAG key gives access to the page for selecting the delay time for opening of the relay.
Use SEL + SET to select the value of the RELAY opening delay (from 1 to 999 seconds).



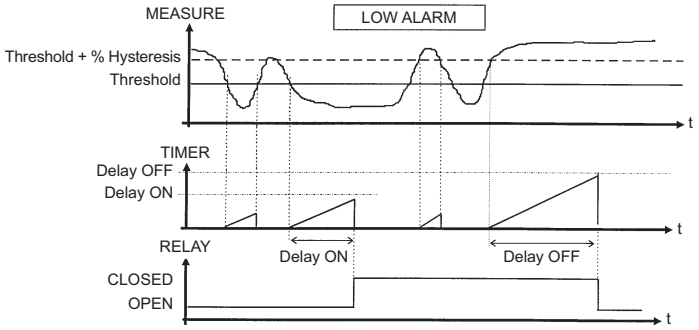
The PAG key gives access to the page for selecting the delay time for closure of the relay.
Use SEL + SET to select the value of the RELAY closing delay (from 1 to 999 seconds).
Press PAG again to return to the ALARM OUTPUT page.



E.4 VIP ENERGY ALM alarm diagrams



Threshold: occurrence threshold set on VIP ENERGY. For alarms of the “high” type, as soon as the measurements is higher than the threshold, relay closing timer starts counting.
Delay ON: the relay will close only if the measurements is steadily over the threshold for the set Delay ON time.
Hystheresis: the opening mechanism will start only if the measurements goes under the Threshold-%Hystheresis value.
Delay OFF: the relay will open only if the measurements is steadily under the Threshold -%Hystheresis value for the set Delay OFF time.



Threshold: occurrence threshold set on VIP ENERGY. For alarms of the “low” type, as soon as the measurements is lower than the threshold, relay closing timer starts counting.
Delay ON: the relay will close only if the measurements is steadily under the threshold for the set Delay ON time.
Hystheresis: the opening mechanism will start only if the measurements goes over the Threshold+%Hystheresis value.
Delay OFF: the relay will open only if the measurements is steadily over the Threshold+%Hystheresis value for the set Delay OFF time.