

# VIP ENERGY - Three-phase energy analyzers

Volt  
Amp  
P.F.,  $\cos\phi$   
kW  
kVA  
kvar  
Hz  
Peak kVA  
Peak kW  
kWh  
kvarh  
kVAh  
 $\pm$ kWh  
 $\pm$ kvarh  
Average kW  
Average kVA  
Average kvar  
C.F. (1/THDF)  
Date  
Time

True RMS  
Single-phase and Three-phase Energy Meters  
(ALM model)  
Import/export COG4 option



## 43 instruments in 1

Versions with outputs for kWh, kvarh, kVAh, data transmission, alarms, demand control (load shedding), DIN rail mounting

### TOP PERFORMANCE IN A SMALL PLACE

- 43 Measuring functions in 157,5 mm of DIN rail (9 DIN modules):
  - Volts single-phase and three-phase (rms), Amp single-phase and three-phase (rms), P.F.  $\cos\phi$  single-phase and three-phase, W single-phase and three-phase, var single-phase and three-phase, VA single-phase and three-phase, Hz.
  - kWh, kvarh, energy meters; import/export kWh, kvarh (kWh, kVAh selecting STD2).
  - Storage of average, apparent and active power peaks average active, apparent, reactive powers.
  - True Rms measurements from 200 mW (7,5V 23mA) up to 999 GW (999999 V, 999999 A).
  - Unbalanced and distorted three-phase system measurements.
- Backlit display.
- Simple and easy to install and use.
- Fully programmable in the field by means of the keyboard.
- Signal outputs: available in a number of versions and with various configurations for expansion of VIP ENERGY functions up to industrial control level.

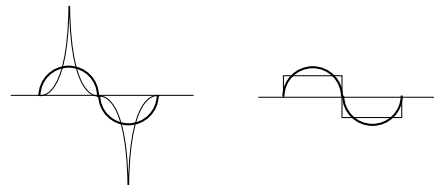


#### C.VIPENERGY

Frame for panel mount of VIP ENERGY

### POWER MEASUREMENT WHERE AND HOW YOU WANT THEM


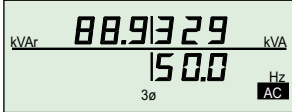
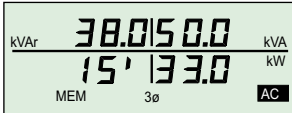
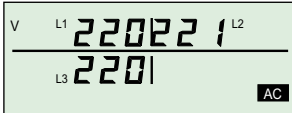
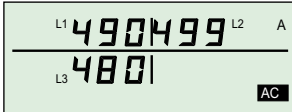
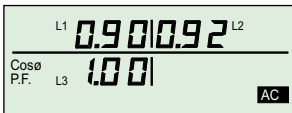
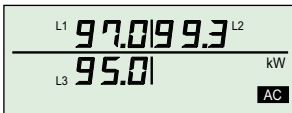
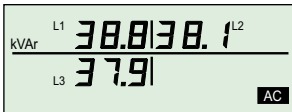
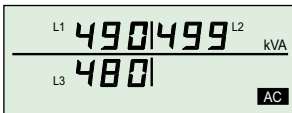
- WHERE: Installation in modular panel.
- HOW: The measurements give a full view of electrical consumption including storage of power peaks and consumption (Maximum demand of Active Power).
- High accuracy (class 1 IEC1036).
- Voltage input: Max. direct 550V or from 2 or 3 voltage transformers: primary value programmable from 1V to 999999V; secondary value selection from 57.7, 63.5, 100, 115, 120, 173, 190, 200, 220 Volt configuration.
- Current input: Direct 5A or through secondary of CT/5 or CT/2.5, CT/2, CT/1. Primary value of CT selectable from 1 to 999999 A). Accepts alternatively either 2 or 3 CTs.
- All the models are available with 30A current input.
- Automatic scale change.
- Average KVA: integration times of 1', 2', 5', 10', 15', 20', 30', 60'.
- Average KW: integration times of 1', 2', 5', 10', 15', 20', 30', 60'.
- Ampere Crest Factor (1/THDF = Transformer Harmonic Derating Factor):
  - >1 or <1 for DISTORTED signals
  - =1 for SINUSOIDAL wave forms

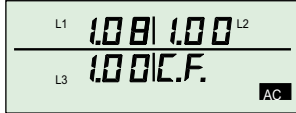
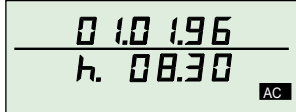
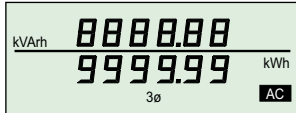
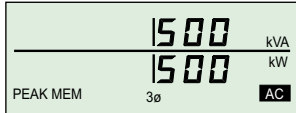
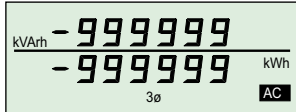
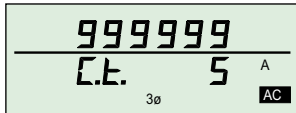
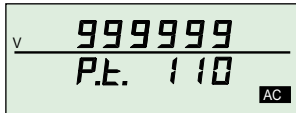
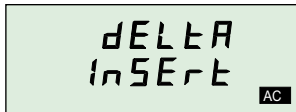
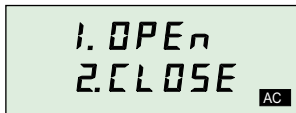


### COGENERATION PLANTS

All models can be used with option COG4, visualizing the absorption and the production of energy on the 4 displays.

## MEASUREMENT ON DISPLAY PAGES

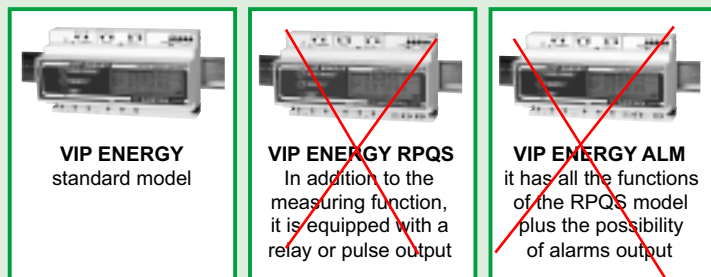
Volt	Phase-to-phase rms voltage (average of the 3 phases)	
Amp	Equivalent current rms of the three-phase system	
P.F. cosφ	Power factor of the three-phase system	
kWatt	Active power of the three-phase system	
kvar	Instantaneous reactive power of the three-phase system	
kVA	Instantaneous apparent power of the three-phase system	
Hz	Phase L1 voltage frequency	
kVAr	Average three-phase reactive power on 1, 2, 5, 10, 15, 20, 30, 60 min.	
kVA	Average three-phase apparent power on 1, 2, 5, 10, 15, 20, 30, 60 min.	
kW	Average three-phase active power on 1, 2, 5, 10, 15, 20, 30, 60 min.	
Volt L1	Rms voltage between phase L1 and neutral (STAR) or L1-L3 (DELTA)	
Volt L2	Rms voltage between phase L2 and neutral (STAR) or L2-L3 (DELTA)	
Volt L3	Rms voltage between phase L3 and neutral (STAR) or L1-L2 (DELTA)	
Amp L1	Phase L1 rms current	
Amp L2	Phase L2 rms current	
Amp L3	Phase L3 rms current	
P.F. cosφ L1	Phase L1 Power Factor	
P.F. cosφ L2	Phase L2 Power Factor	
P.F. cosφ L3	Phase L3 Power Factor	
kW L1	Phase L1 active power	
kW L2	Phase L2 active power	
kW L3	Phase L3 active power	
kVAr L1	Phase L1 instantaneous reactive power	
kVAr L2	Phase L2 instantaneous reactive power	
kVAr L3	Phase L3 instantaneous reactive power	
kVA L1	Phase L1 instantaneous apparent power	
kVA L2	Phase L2 instantaneous apparent power	
kVA L3	Phase L3 instantaneous apparent power	

C.F. L1	L1 Current Crest Factor (1/THDF L1)	
C.F. L2	L2 Current Crest Factor (1/THDF L2)	
C.F. L3	L3 Current Crest Factor (1/THDF L3)	
DATE	DD MM YY	
TIME	HH MM	
kvarh	Consumption in kVarh of the three-phase system (or kVAh in VIP ENERGY ALM)	
kVAh		
kWh	Consumption in kWh of the three-phase system (and of L1, L2, L3 phases)	
kVA	Average apparent power peak of the three-phase system	
kW	Average active power peak of the three-phase system	
N.B. The VIP ENERGY displays and stores the peak values 15 minutes after it is activated and are up-dated every 3 minutes. Integration times other than 15 minutes can be programmed (10, 15, 20, 30 minutes).		
-kVarh	Reactive energy export (COG4 option)	
-kWh	Active energy export (COG4 option)	
kA	The VIP ENERGY has a page for selecting the CT.	
kV	The VIP ENERGY has a page for selecting the VT.	
STAR	4 wires L1, L2, L3, N (star)	
DELTA	3 wires L1, L2, L3 (delta)	
RELAY STATUS	Only RPQS, ALM	

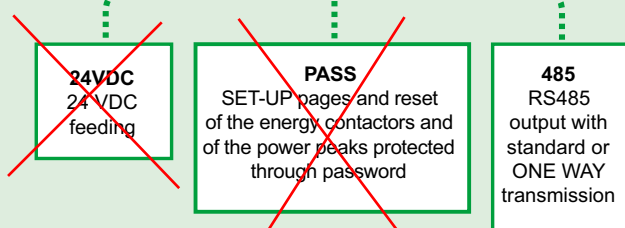
# VIP ENERGY - Models available

## Choice of the models

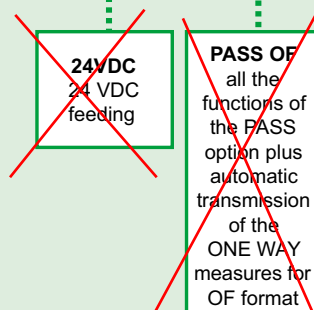
### BASIC MODELS



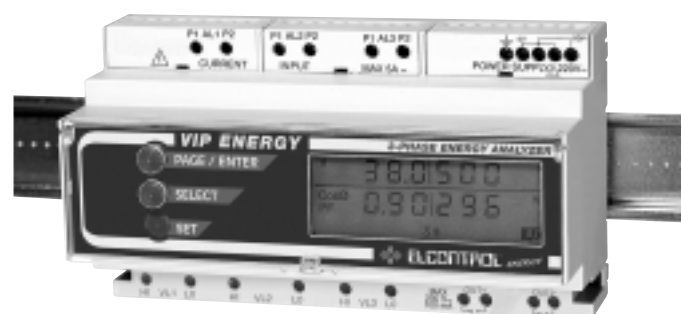
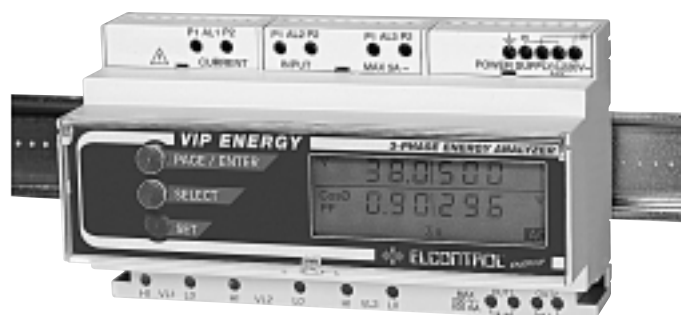
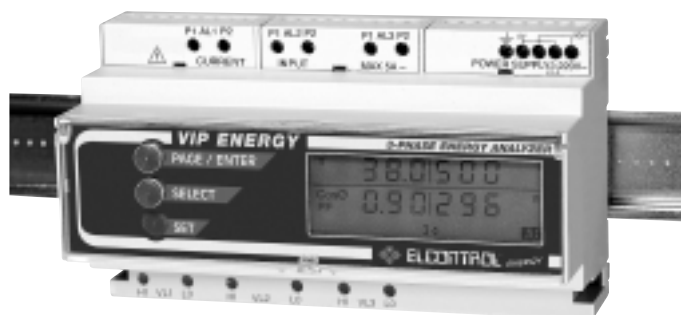
### OPTIONS



### FURTHER OPTIONS



All the models are available with 30A current input



this is the offered model

## VIP ENERGY, ~~VIP ENERGY 485~~

### Standard model for UNBALANCED THREE-PHASE systems

**Measurements on STAR (4 wires) or DELTA (3 wires).**

**For direct measurements up to 5A, 550V, or with external CT, PT up to 999999 A, 999999 V max.**

**All the models are available with 30A current input.**

Measures and displays Volts, Amps, W, P.F. cos $\phi$ , VAR, VA, Hz, kWh, kvarh, VA Peak, W Peak, Average kW, Average kVA, Average kvar, Crest Factor (1/THDF), Date, Time, replacing 43 instruments and using the space and connections of just one. LV, MV, HV measurements. Star and Delta connections.

4-quadrant energy counters kWh, kvarh Import/Export.

Free selection of transformers.

Possibility of automatic transmission type "ONE WAY" (RS422) each second.

Possibility of display of just the single phase measures.

~~The 485 version is equipped with a RS485 serial output.~~

## VIP ENERGY RPQS, VIP ENERGY RPQS 485

**In addition to the measuring function, they are equipped with pulse output for industrial monitoring**

**2 SOLID STATE RELAY OUTPUTS with pulse frequency proportional to 2 out of the P (P+ or P- with COG4 option), Q (Q+ inductive or Q- capacitive), S (active, reactive, apparent) powers selection by keyboard.**

In addition to the measuring function it is equipped with 2 solid state relay outputs, volt-free contacts (280VAC rms max. 100mA max.). They supply pulses with frequency proportional to the power measured.

A simple display menu and SELECT, SET push-buttons allow selecting 2 out of powers: active (P, P+ or P- with COG4 option selected), reactive (positive Q+ inductive, negative Q- capacitive), apparent (S) and different output frequencies according to requirements:

Min. 1 pulse= 1 MWh (Mvarh) (MVAh)

Max. 999 pulses= 1 Wh (varh) (VAh)

- RPQ (P+ or P- with COG4 option, Q+ or Q-) selection: supplies pulses proportional to the active energy (P=W) and reactive (Q=var) for measurements of active energy (kWh) and reactive (kvarh).
- RPS (P+ or P-) selection: supplies pulses proportional to the active energy (P=W) and apparent (S=VA) for measurements of active energy (kWh) and apparent (kVAh).
- RSQ (Q+ or Q-) selection: supplies pulses proportional to the apparent energy (S=VA) and reactive (Q=var) for measurements of apparent energy (kVAh) and reactive (kvarh).
- The functioning of the relay can also be set with static procedure, with opening and closing checked through keyboard or RS485.
- **In the RPQS-485 version it is possible a remote control (by PC) of 2 loads.**

## VIP ENERGY ALM, VIP ENERGY ALM 485

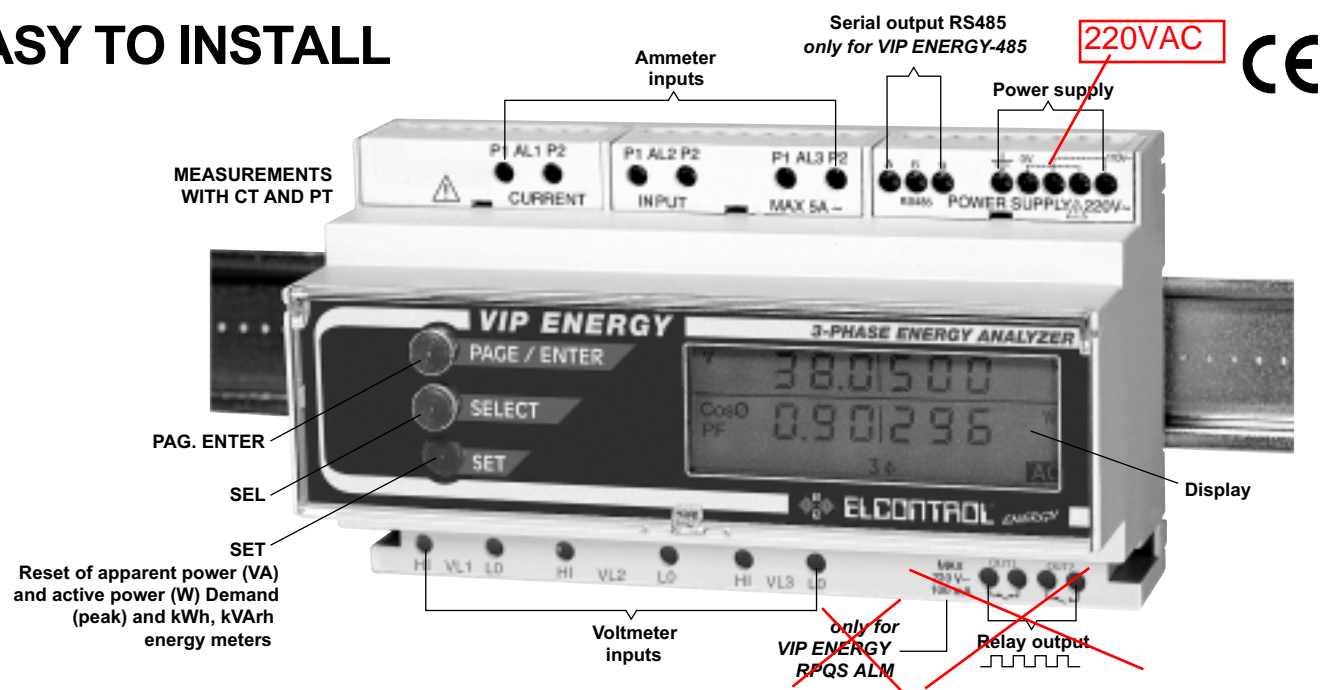
**In addition to the RPQS functions, they are equipped with RELAY OUTPUT for alarm and load control**

MINIMUM and MAXIMUM alarms on any 2 measurements chosen by the user from 27 of those displayed, with selection of the ON and OFF delay time (from 0 to 999 seconds) and of the MINIMUM and MAXIMUM threshold hysteresis (from 0 to 17.5% in steps of 2.5%) for each of the two relays which can be connected to the alarms.

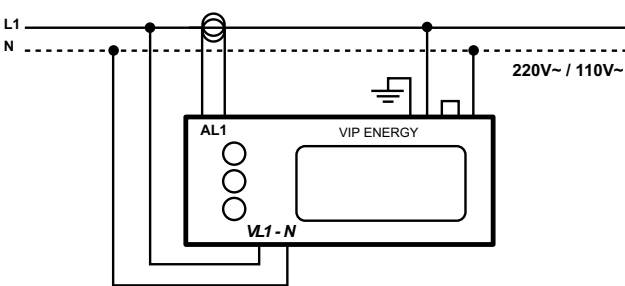
**The VIP ENERGY ALM-485 also has all the functions of the VIP ENERGY RPQS-485.**

# VIP ENERGY - Technical specifications

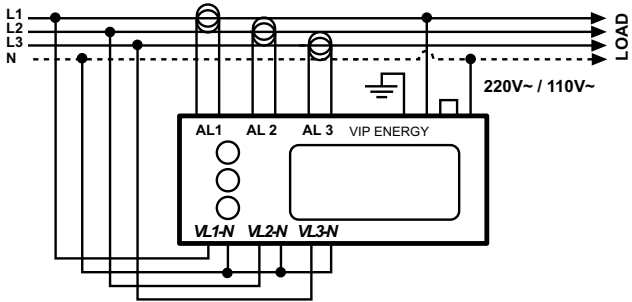
## EASY TO INSTALL



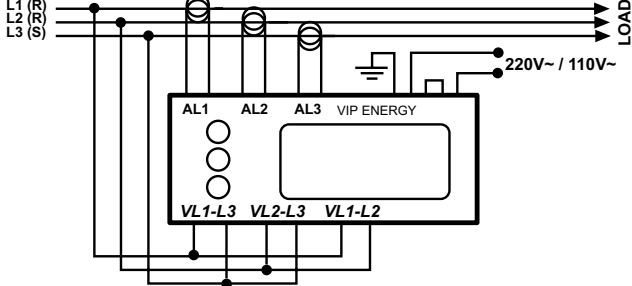
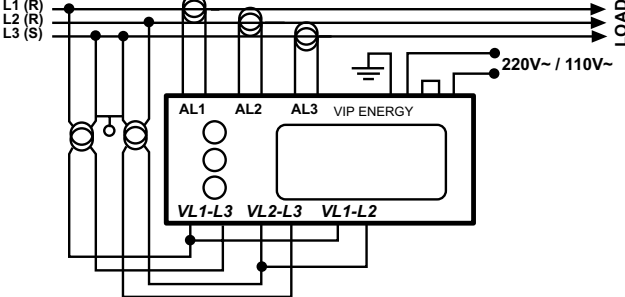
### SINGLE-PHASE CONNECTION: 1 phase - 2 wires



### STAR CONNECTION (STAR): 3 phases - 4 wires



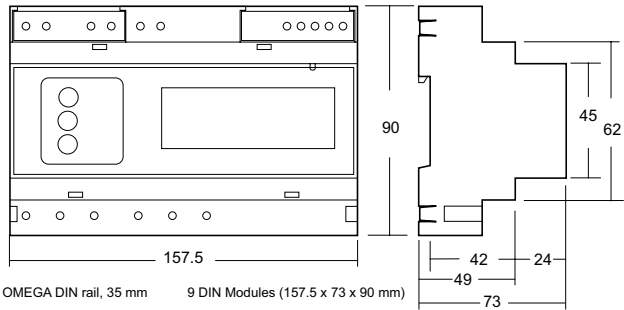
### DELTA CONNECTION (DELTA): 3 phases - 3 wires



## DISPLAYED VALUES

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

## DIMENSIONS (in mm)





## GENERAL SPECIFICATIONS

- **Inputs:**
  - Voltmeter: L1-N, L2-N, L3-N max 550 Vrms (STAR)
  - L1-L3, L2-L3, L1-L2 max 550 Vrms (DELTA)
  - from 20 to 600 Hz.
- Ammeter: 5A or 30A from 20 to 600 Hz.
- **Voltmeter input overload:** peak voltage 2000 Vrms (60 sec.).
- **Ammeter input overload:** 20 times Full Scale value / 1 sec. (with overload cut-out tripped at limit values).
- **Number of scales:** 2 voltage scales; 3 current scales.
- **Automatic scale change:** response time at scale change: 1.2 sec; passage to scale above occurs at 105% of scale activated; passage to scale below occurs at 20% of scale activated.
- **Dimensions:** length= 157.5 mm (9 DIN modules); height= 90 mm; Depth= 73 mm
- **Lithium battery:** 3 V; 280 mAh
- **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.

## SERVICE AND TESTING CONDITIONS

- Ambient service conditions:
  - ambient temperature range: from -10°C to +60°C.
  - relative humidity (R.H.) range: from 20% to 80%.
- Storage temperature: from -20°C to +70°C.
- Condensation: not permitted.
- Insulation to VDE 0110 group C for operating voltage - 500 VAC rms.
- Insulation resistance  $\geq 500$  M $\Omega$  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 1010-1, EN 61010-1, 550V.
- EMC reference standards: EN 50081-1, EN 50082-2, EN 55011, EN 55022.

## POWER SUPPLY

- Mains: 110/220V $\sim$   $\pm$ 10%, 50/60 Hz. Available also at 24VDC under request.
- Instrument consumption: 8 VA
- Immunity to voltage microints: 0.1 sec.

## MEASUREMENT OF PRIMARY PARAMETERS

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

## 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:  $\pm 0.02\%$  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  $\geq 1.6$ ;
  - 0.03 VA for each phase.

### Alternating voltage sensitivity, Full scale and accuracy

Nominal Range	Sensitivity	Full Scales	$\epsilon$ from 20% F.S. to 100%F.S.
VIP ENERGY			
140 Vrms	111 mV	140 V	0,3% F.S. + 0,3% L.t.
550 Vrms	480 mV	550 V	0,3% F.S. + 0,3% L.t.

- Sensitivity and accuracy in current measurements.
  - Direct input with max. 5A at Full Scale. 0.07 $\Omega$  burden for each current transformer.
  - Input current crest factor  $\geq 1.6$ .

### Alternating voltage sensitivity, Full scale and accuracy

Nominal Range	Sensitivity	Full Scales	$\epsilon$ from 20% F.S. to 100%F.S.
VIP ENERGY			
0,30 A	0,2 mA	0,30 A	0,5% F.S. + 0,5% L.t.
1,50 A	1 mA	1,50 A	0,3% F.S. + 0,3% L.t.
5,00 A	3,2 mA	5,00 A	0,3% F.S. + 0,3% L.t.

- 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, Cos $\phi$ , active energy: Class 1 IEC 1036.
- Frequency measurement accuracy: 20+99 Hz  $\pm$ 0.1 Hz; 100+600 Hz  $\pm$ 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.

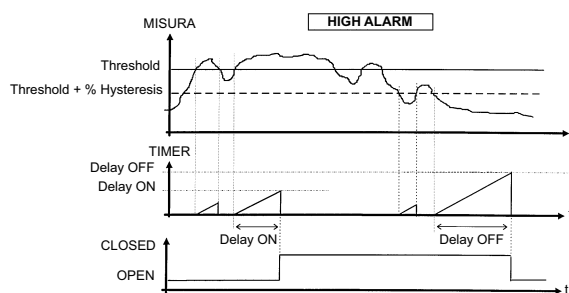
## Formulae used for single-phase and three-phase measurements

Instantan. rms voltage	$V_{1N} = \sqrt{\frac{1}{n} \sum_{i=1}^n (V_{1Ni})^2}$	Three-ph. Voltage	$V_i = \frac{V_{L1} + V_{L2} + V_{L3}}{\sqrt{3}}$ STAR $V_i = \frac{V_{L2} + V_{L3} + V_{L1}}{3}$ DELTA
Instantan. active power	$W_1 = \frac{1}{n} \sum_{i=1}^n (V_{1Ni} \cdot I_{1i})$	Three-phase reactive power	$VAR_i = VAR_1 + VAR_2 + VAR_3$
Instantan. power factor	$\cos \phi_i = \frac{W_1}{VA_i}$	Three-phase current	$A_i = \frac{VA_i}{\sqrt{3} \cdot V_i}$
Instantan. rms current	$A_i = \sqrt{\frac{1}{n} \sum_{i=1}^n (A_{1i})^2}$	Three-phase active power	$W_T = W_1 + W_2 + W_3$
Instantan. apparent power	$VA_i = V_{1N} \cdot A_i$	Three-phase apparent power	$VA_T = \sqrt{W_T^2 + VAR_T^2}$
Instantan. reactive power	$VAR_i = \sqrt{(VA_i)^2 - (W_i)^2}$	Three-phase power factor	$\cos \phi_T = \frac{W_T}{VA_T}$
Crest Factor (1/Transformer Harmonic Derating Factor) $C.F.1 = \frac{I_{peak}}{\sqrt{2} \cdot I_{rms}} = 1/THDF1$			

## SIGNAL OUTPUT

- **RS-485** - Isolated serial output for shielded twisted pair cable up to 1.2 Km, 9600/1200 baud, 7 data, 1 o 2 stop bit, parity, NO/E/O parity bit, JBUS/MODBUS ASCII protocol, up to 247 slave instrument.
- **Pulses** - 2 terminal outputs 280 VAC Rms 100 mA insulated (insulation 1500 Vrms), selectable frequency from 1 imp./1KWh to 999 imp./Wh.
- **Optic fibre** - By means of external converter PC 485 OF-LINK, VIP485 OF-LINK and 2 optic fibres (HFBR or VERSATILE LINK HP type connector) plastic fibre up to 70 m (plastic fibre), glass fibre up to 500 m.
- **Alarms**

## VIP ENERGY ALM ALARM DIAGRAMS

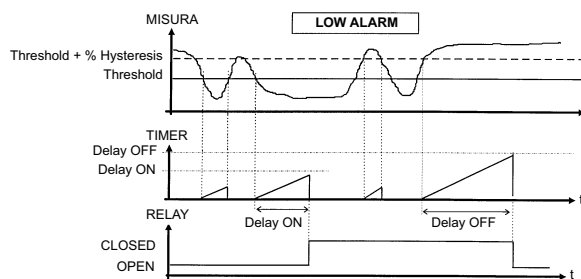


**Threshold:** occurrence threshold set on VIP ENERGY. For alarms of the "high" type, as soon as the measurements is higher than the threshold, relay closing timer starts counting.

**Delay ON:** the relay will close only if the measurements is steadily over the threshold for the set Delay ON time.

**Hysteresis:** the opening mechanism will start only if the measurements goes under the Threshold-%Hysteresis value.

**Delay OFF:** the relay will open only if the measurements is steadily under the Threshold-%Hysteresis 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.

**Hysteresis:** the opening mechanism will start only if the measurements goes over the Threshold+%Hysteresis value.

**Delay OFF:** the relay will open only if the measurements is steadily over the Threshold+%Hysteresis value for the set Delay OFF time.