ORION ITALIA

INSTRUCTION MANUAL

EVAR

Electrical variable analyzer relay

Software rev.: EVAR S 1.18
Manual P/N: EVAR GBM 30/07/2014

CE

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SAFETY NORMS AND GENERAL WARNINGS

For a proper installation of the unit the technicians must read carefully and understand the instructions provided by the Constructor.
All the installation operations must be carried out by suitably qualified technicians with adequate knowledge of the unit and of the content of this manual.

1. Check that the installation room (spaces, segregations and ambient) are suitable for the electrical and electronic apparatus and in particular that:
   - the room conditions are in compliance with the information contained in SPECIFICATION;
   - the rating of the unit (voltages, frequencies, and so on) are coherent with the features of the electric system.

2. Make sure that the Standard and Legal requirements are followed during installation, service and maintenance, in order to construct installations according to good technical and safety working practices.

The unit must be used EXCLUSIVELY for the purposes described in the Chapter GENERAL INFORMATION.

Disconnect the unit before carrying out any insulation tests on the installation.

Do not carry out any installation/maintenance operations requiring the disassembling and the removal of the unit from the panel on which it is mounted when the unit is live: make sure it has been disconnected.

For any requests, please contact:
ORION ITALIA ASSISTANCE SERVICE

PHONE.: ++39 0523 591161 **FAX**: ++39 0523 593898 **INTERNET**: www.orionitalia.com

SYMBOLS IN THE TEXT AND THEIR MEANINGS

It indicates an OBLIGATION, an operation that must be obligatory followed. Pay attention to the information signaled by this symbol, as it refers to situations which require CAUTION AND WARNING: any operations not in compliance with what is indicated could provoke damages to objects or people.

Pay particular ATTENTION to the parts indicated by this symbol: they are live.

It indicates a DANGER, a situation or operation requiring the MAXIMUM ATTENTION: any actions not in compliance with what is indicated could provoke really serious damages to objects and even mortal injuries to people.

It indicates INFORMATION or REMARKS that must be read with particular attention.

INDEX

1. General information

1.1 DESCRIPTION

The EVAR relay has been designed for the electrical parameters continuous monitoring in the medium or low-voltage 1-phase or 3-phase systems. It allows a direct or remote monitoring of the system general conditions as it immediately signals any fault. EVAR can also be used for controlling the production process thanks to the programmable contacts suitable for various applications.

1.2 APPLICATIONS

- Metering of distribution feeders, transformers, generators, capacitor banks and motors.
- Commercial & industrial utility.
- Flexible control for demand load shedding, power factor, etc.
- Power quality analysis.

1.3 PROTECTION AND FUNCTIONALITY

Configurable setpoints of:

- Phase Under & Over Current,
- Ground overcurrent,
- Phase Under & Over Voltage,
- Phase sequence,
- Current & Voltage Total harmonic distortion (THD),
- Under & Over frequency,
- Positive & Negative Active power,
- Positive & Negative Reactive power,
- Voltage & current Unbalance
- Power factor (leading or lagging)
- Demand readings for:
  - phase current ..... (A)
  - active power ..... (kW)
  - reactive power ..... (kvar)
  - apparent power ..... (kVA)

1.4 DIGITAL MEASUREMENT

1. True RMS Phase & Ground Current
2. True RMS Phase & Line voltage
3. Energy
4. Positive & negative Active power (kW) & Reactive power (kvar)
5. Last & Maximum Demand readings for:
   - phase current ..... (A)
   - active power ..... (kW)
   - reactive power ..... (kvar)
   - apparent power ..... (kVA)
6. Frequency ..... (Hz)
7. Voltage & Current Unbalance.
8. Voltage and current harmonic analysis up to the 13th K value measurement.
9. Event recorder.

EVAR is <u>not</u> intended to be an instrument aimed at the evaluation of the economic costs afforded for the power supply provided to the system monitored by this relay.

1.5 SIGNALLING AND PROGRAMMING

- LCD & LED display indication.
- Indication and storage of fault conditions and their values.
- Indication on the system status:
  - NORMAL
  - CURRENT FAULT
  - VOLTAGE FAULT
  - UNBALANCE FAULT
  - FREQUENCY FAULT
  - POWER FAULT
  - POWER FACTOR FAULT
  - DEMAND FAULT
  - THD FAULT

1.6 COMMUNICATION

- Remote communication using a PC or a PLC by 1 RS232 & 2 RS485 ports (Ethernet port on request).
- Remote programming of the setpoints.
- Protocol used: Modbus RTU.

1.7 SPECIFICATIONS

SUPPLY VOLTAGE
Standard Version: 24÷310 Vdc, –15%, +10%
24÷240 Vca, –15%, +10%, 50/60Hz
Ethernet Version: 48÷310 Vdc, –15%, +10%
48÷240 Vca, –15%, +10%, 50/60Hz

MAX. POWER CONSUPTION
Standard Version: 7 W or 12 VA (peak)
Ethernet Version: 8 W or 15 VA (peak)

TEMPERATURE RANGE
Operational: da 0 °C a +50 °C
Storage: da –20 °C a + 70 °C

RELATIVE HUMIDITY
Max. 90% (non condensing)

DIELECTRIC WITHSTAND VOLTAGE
2 KV 60 s

BURN IN
48 hours at 50 °C

ROOM FEATURES
The relay must be installed in a room with the following features:
- indoor,
- dry, not dusty not corrosive atmosphere.

OUTPUT CONTACT
Load: (f.p. = 1)
(f.p. = 0,4; L/R = 7ms)
Rated load: 250 Vca, 8 A or 30 Vcc, 8 A with f.p.=1
250 Vca, 5 A or 30 Vcc, 5 A with f.p.=0,4
Max. operating Voltage: 250 Vca, 125 Vcc
Max. operating Current: 8 A
Capacity: 2000 VA, 240 W with f.p.=1
1250 VA, 150 W with f.p.=0,4

CONSTRUCTION
According to VDE, UL, CEI norms.

SWITCH INPUT
Type: Dry contacts
Output: 24 Vdc or 12 Vdc, 10 mA (latched)

LED INDICATORS
Relay status: Alarm
AUX.1
AUX.2

System status: Normal.
Fault: Current, Voltage, Unbalance, Frequency, Power, Power Factor Demand, THD.

Display (LCD): 16 x 2 digits

COMMUNICATIONS
Type: 1 RS232 port + 2 RS485 ports, Half duplex, 1200 → 57600 baud
Protocol: Modbus RTU
Functions: Reading/Writing setpoints
Reading actual values
Executing command

TERMINAL BLOCK
Fixed, back connection terminals with 4-mm^2-section cable (10 AWG).

FRAME
In ABS auto-extinguish with frontal in polycarbonate (IP54).

ASSEMBLY
The relay has to be jointed to the structure fixing it with the help of the stirrup with screws.

DIMENSION
144 x 144 x 141 mm

FRONT PANEL CUTOUT
137 x 137 mm

WEIGHT
1.5 Kg

APPLICABILITY

System:	one and three and four-wire;
Frequency:	50 and 60 Hz;
Current:	max. 5000 A;
Voltage:	max. 69 KV

PHASE AND GROUND CT INPUTS

Source CT (In):	CT (In) 5 A to 5000 A, Steps: 5 A.
CT secondary:	CT 1 A or 5 A (specify with order).
Sampling:	True RMS, 32 sample/s.
CT burden:	0.25 VA per phase at rated secondary current.
Continuous:	10 Amps.
Current withstand capac.:	20 times In curr. value per 1 sec.
Range:	1 to 600% of In.
Frequency:	up to 13th harmonic.
Accuracy:	± 0.5% of full scale, true RMS.

VOLTAGE INPUT

Sampling:	True RMS, 32 samples/cycle.
VT input:	Secondary: 55 to 254 Vca, Steps: 1V; Primary (Un): 0.10 to 69 kV, Steps 0.01kV.
Input range:	10 to 400 Vca (direct)
VT burden:	1 VA max.
Max. Continuous:	320 Vca phase-neutral.
Range:	20 to 125% of Un.
Frequency:	up to 13th harmonic.
Accuracy:	± 0.5% of full scale, true RMS.

PHASE UNDERCURRENT MONITORING

Pickup level :	2% → 100% of In, Steps: 1%
Dropout level:	1% → 100% of In, Steps: 1%
Delay time:	0.5 s → 600.0 s, Steps: 0.5 s
Accuracy:	see: current input
Timing accuracy:	± 0.5 s

PHASE & GROUND OVERCURRENT MONITORING

Pickup level:	2% → 500% di In, Steps: 1%
Dropout level:	1% → 100% di In, Steps: 1%
Delay time:	0.5 s → 600.0 s, Steps: 0.5 s
Accuracy:	see: current input
Timing accuracy:	± 0.5 s

UNDERVOLTAGE MONITORING

Required voltage:	>20% Un, applied in all phases
Pickup level:	30% → 100% of Un, Steps: 1%
Dropout level:	1% → 100% of Un, Steps 1%
Delay time:	0.5 s → 600.0 s, Steps: 0.5 s
Phases:	Any one, any two, all three (programmable)
Accuracy:	see: voltage input
Timing accuracy:	± 0.5 s

OVERVOLTAGE MONITORING

Pickup level:	101% → 125% of Un, Steps: 1%
Dropout level:	1% → 25% of Un, Steps 1%
Delay time:	0.5 s → 600.0 s, Steps: 0.5 s
Phases:	Any one, any two, all three (programmable)
Accuracy:	see: voltage input
Timing accuracy:	± 0.5 s

CURRENT UNBALANCE MONITORING

Pickup level:	1% → 100% of In, Steps: 1%
Dropout level:	1% → 100% of In, Steps 1%
Delay time:	0.5 s → 600.0 s, Steps: 0.5 s
Accuracy:	±1% of full scale
Timing accuracy:	± 0.5 s

VOLTAGE UNBALANCE MONITORING

Pickup level:	1% → 100% of Un, Steps: 1%
Dropout level:	1% → 100% of Un, Steps 1%
Delay time:	0.5 s → 600.0 s, Steps: 0.5 s
Accuracy:	±1% of full scale
Timing accuracy:	± 0.5 s

CURRENT TOT. HARMONIC DISTORTION (THD) MONITORING

Pickup level:	0.5% → 100,0%, Steps: 0.5%
Delay time:	0.5 s → 600.0 s, Steps: 0.5 s
Accuracy:	±2% of full scale
Timing accuracy:	± 0.5 s

VOLTAGE TOT. HARMONIC DISTORTION (THD) MONITORING

Pickup level:	0.5% → 100.0%, Steps: 0.5%
Delay time:	0.5 s → 600.0 s, Steps: 0.5 s
Accuracy:	±2% of full scale
Timing accuracy:	± 0.5 s

UNDERFREQUENCY MONITORING

Required voltage:	>20% of Un, applied in phase A
Pickup level:	40.00Hz → 70.00 Hz, Steps:0.01Hz
Dropout level:	0.01 Hz → 5.00 Hz, Steps: 0.01 Hz
Delay time:	0.5 s → 600.0 s, Steps: 0.5 s
Accuracy:	±0.02 Hz

OVERFREQUENCY MONITORING

Required voltage:	>20% of Un, applied in phase A
Pickup level:	40.00 Hz → 70,00 Hz, Step:0.01 Hz
Dropout level:	0.01 Hz → 5.00 Hz, Steps: 0.01 Hz
Delay time:	0.5 s → 600.0 s, Steps: 0.5 s
Accuracy:	±0.02 Hz

PHASE REVERSAL MONITORING

Delay time:	0.5 s → 600.0 s, Steps: 0.5 s
Timing accuracy:	± 0.5 s

POWER FACTOR MONITORING

Required voltage:	>20% di Un, applied in phase A
Pickup level:	0.05 Lag → 0.05 Lead, Steps: 0,01
Dropout level:	0.01 → 1.00, Steps: 0.01

DEMAND MONITORING (Accuracies based on less than 6xIn and 125% Un inputs)

Measured values:	Phase A, B, C Current	[A]
	3ϕ Real power	[kW or MW]
	3ϕ Reactive power	[kvar or Mvar]
	3ϕ Apparent power	[kVA or MVA]
Measurement type:	Block interval	
	Time interval (programmable): 5 to 60 min.	

MEASURED PARAMETERS (Accuracies based on 100% In and 100% Un inputs)

Current:	Phase A, B, C Currents Accuracy: ± 0.5%
Voltage:	A-N (A-B), B-N (B-C), C-N (C-A) voltages, Accuracy: ± 0.5%
Voltage unbalance:	Range: 0 → 100% Accuracy: ± 1%
Current unbalance:	Range: 0 → 100% Accuracy: ± 1%
Frequency:	Across phase A-N (A-B) voltage. Range: 40.00 Hz → 70.00 Hz Accuracy: ± 0.02 Hz
3ϕ Real power:	-1000 MW → +1000 MW Accuracy: ±1%
3ϕ Reactive power:	-1000 Mvar → +1000 Mvar Accuracy: ±1%
3ϕ Apparent power:	0 MVA → +1000 MVA Accuracy: ±1%
Power factor:	Lag: 0,00 → 1.00 Lead: 0,00 → 1.00 Accuracy: ± 0.01
Watthours:	Total, 1 hour 0 GWh → 4200 GWh Accuracy: ±2%
Varhours:	Total, 1 hour 0 Gvahr → 4200 Gvarh Accuracy: ±2%
Demand	see: Demand Monitoring Range: 0 MW → 1000 MW 0 MVA →1500 MVA

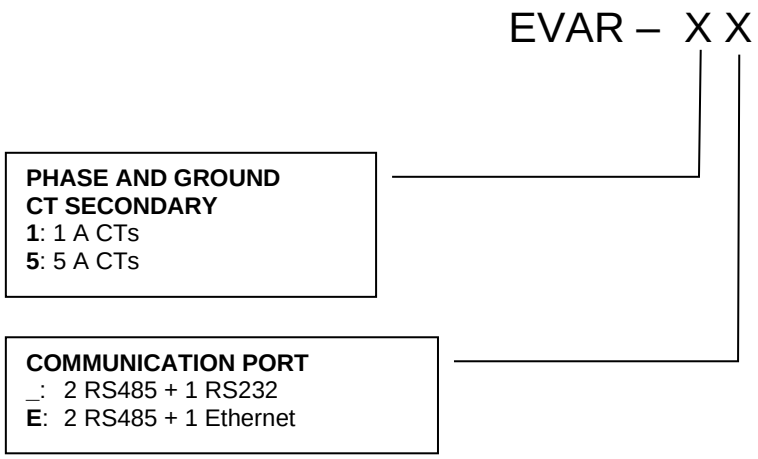
EMISSIONS TEST

1. **Radiated emissions**
   Reference norm: EN 55011; Port: enclosure;
2. **Conducted emissions**
   Reference norm: EN 55011; *Port:* AC mains;

IMMUNITY TESTS

1. **Conducted disturbances induced by RF field**
   References norm: EN 61000-4-6;
   Port: AC mains and signal lines.
2. **Radiated electromagnetic field**
   References norm: EN 61000-4-3; ENV 50204;
   Port: enclosure.
3. **Electrostatic discharge**
   References norm: EN 61000-4-2;
   Port: enclosure.
4. **Fast transients (Burst)**
   References norm: EN 61000-4-4;
   Port: AC mains and signal lines.
5. **Surge**
   References norm: EN 61000-4-5;
   Port: AC mains.
6. **Voltage dips and short interruptions**
   References norm: EN 61000-4-11;
   Port: AC mains.

1.8 MEANING OF THE ORDER CODE



2. Installing

2.1 IDENTIFICATION

On the label in the back side of the relay EVAR you can find the following information:

ORION ITALIA	Manufacturer
PIACENZA 29122	Manufacturer's address
TEL.: 0523 – 591161	
FAX: 0553 – 593898	
www.orionitalia.com	Internet
MADE IN ITALY	
MODEL: EVAR	Model name
SERIAL No.	Serial number of the relay
MFG. DATE	Date of manufacture
CURRENT CTs (SEC)	It indicates the phase CT installed: 1 A or 5 A
GROUNG CTs (SEC)	It indicates the ground CT installed: 1 A or 5 A

2.2 UNPACKING

The shipping container contains:

- the relay EVAR
- this instruction manual
- the fixing elements
- the Test certificate (if required)

Inspect the unit and inform ORION ITALIA of any damage.
If reshipment is required the original container and packing should be used.

2.3 MOUNTING

The mounting should be carried out as follows:

1. Install the relay in a place where the humidity and temperature are those for which it has been designed [→ § 1.7 – "Specification"] and away from high current conductors and sources of strong magnetic fields.
2. Put the relay inside a panel so that the keypad is easily accessible and the display is visible.
3. Make a cutout in the panelboard of 137 x 137 mm [→ Fig. 2.1] and fix the relay by using the fixing elements provided with the relay.

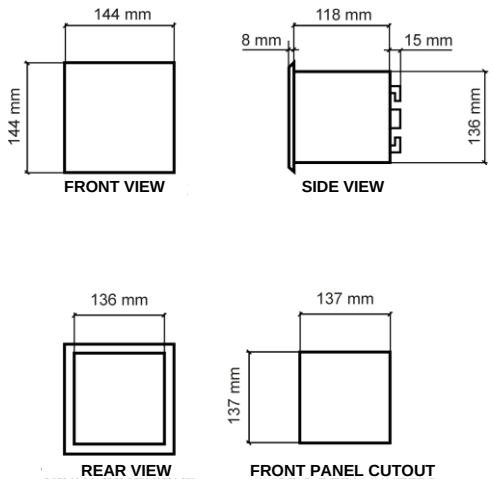
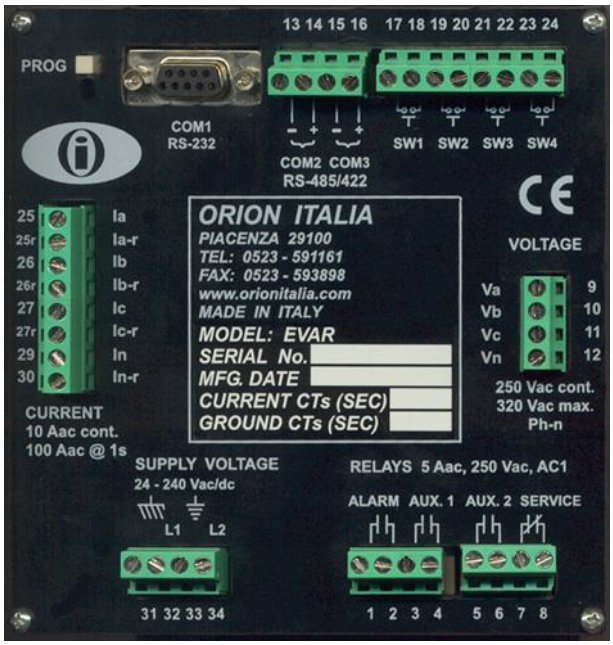


Figure 2.1 – **Overall dimensions**

2.4 WIRING – OUTPUT RELAY AND SWITCH INPUTS "SW"

Before carrying out the installation of the unit, it is necessary to read and understand the indications provided by the Constructor.
All the installation operations must be carried out by qualified personnel with adequate knowledge of the functioning of the unit and of the content of this manual.

The electrical connections are made by terminal blocks in the back side of the unit.



SWITCH INPUTS	TERMINALS No.
SW1	**17 –18**
SW2	**19 – 20**
SW3	**21 – 22**
SW4	**23 – 24**

Figure 2.2 – **Rear view**

RELAY (with dry contacts)	TERMINALS No.
ALARM	**1 –2**
AUX.1	**3 – 4**
AUX.2	**5 – 6**
SERVICE	**7 – 8**

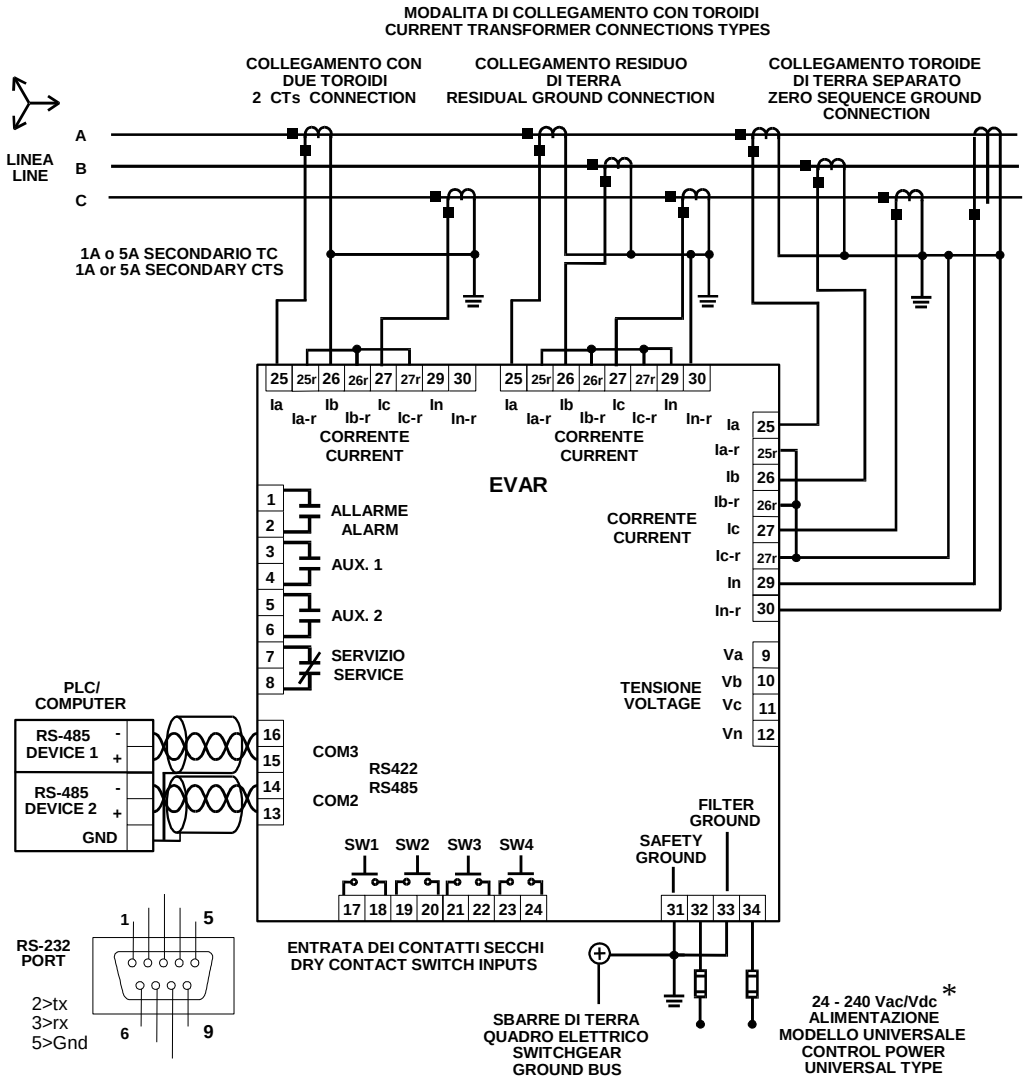
The relay **SERVICE** is fail-safe: the contact is in fact normally energized. Whenever EVAR detects an internal fault or if control power is lost this relay will de-energize.
The contact is in the status N. C. (Normally Closed).
Connect the relay **SERVICE** output to a warning device, such as, for instance, a SCADA monitor.

The switch inputs must be connected only to dry contact circuits so as to avoid damaging the relay EVAR.

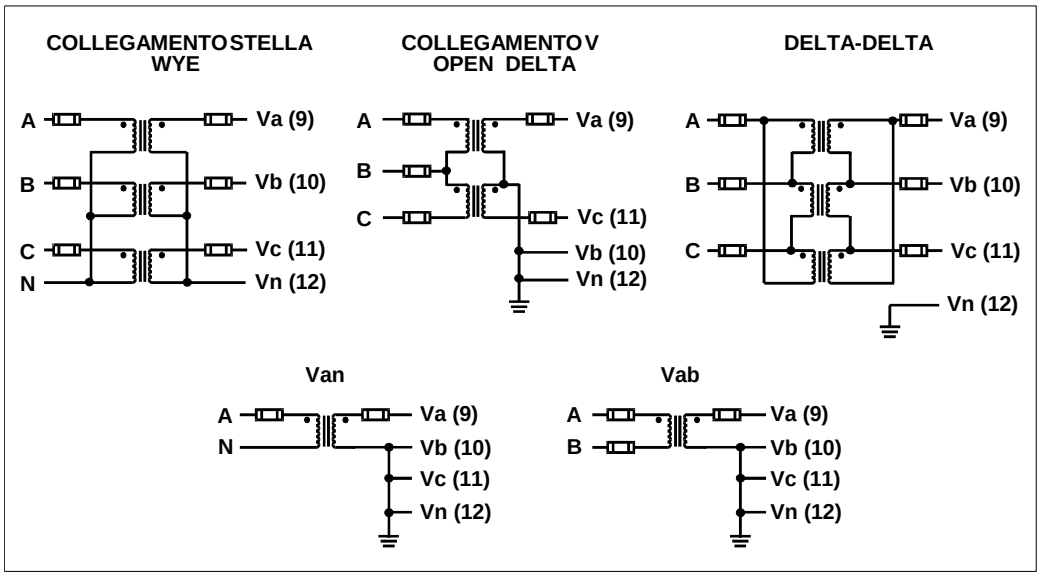
No external voltage should be applied to the corresponding terminals as they are energized internally from the relay EVAR and opto-coupled to the sensing circuitry.
Switch outputs should be isolated from each other for correct operation. The maximum input impedance to these switches outputs is 2 kΩ.

The control power must be connected to terminals **32** and **34**.

Further information: → § 1.7 – "Specification"



COLLEGAMENTO DI TV
VT WIRING DIAGRAM



* 48 – 240 Vac/dc for model with Ethernet

Figure 2.3 – **Wiring diagram**

2.5 CURRENT TRANSFORMERS (CT)

Current transformers should supply the required current to the total secondary load including also the burdens of:

- the CT inputs (= 0.1 VA)
- the connection wiring.

The current transformers (1, 2, 3 or 4) supply the relay with current proportional to the current in each of the phases of the system being protected.
For the connection to terminals from No. **25** to No. **30**, → Fig. 2.3.

Normally the relay is connected for residual ground current sensing, as shown in Fig. 2.3. More sensitive ground current detection can be achieved using a zero sequence detection method as shown in Fig. 2.3. For this configuration the three phase cables (plus neutral if 4 wire system) pass through the window of a separate CT which senses the zero sequence component of the three currents. If a ground shield is present in the 3 phase cable, it must also pass inside the window of the ground fault sensing CT.

Observe correct polarity when connecting the CT to the unit. The CT terminal with the Dot mark on it must be connected to one of the terminals marked with **Ia**, **Ib** or **Ic**. Each CT should have the same physical orientation with polarity connected as shown in Fig. 2.3. The sides of the CT which are not marked with polarity dot are connected together at terminals **30** and **27r** and grounded.

2.6 VOLTAGE TRANSFORMERS (VT)

The relay accepts input voltages from 0 Vac to 250 Vac, between the voltage inputs indicated by **Va**, **Vb**, **Vc** and voltage input indicated by **Vn**.

These inputs can be:
- directly connected;
- supplied via external VTs (*connection necessary for measuring voltages > 250 Vac*).

- When measuring line to line quantities using delta-delta connection, ensure that the voltage common input **Vn** is grounded.
- This input is used as a reference for measuring the voltage input.
- All internal calculations are based on information measured at the relay CT and VT inputs.
- The Accuracy specified in this manual assumes no error contribution from the external CTs and VTs.
- To ensure the greatest Accuracy, “Class 0.5” CTs and VTs are recommended.

- All connections to the relay voltage inputs should be connected using HRC fuses with a 2 A rating.

2.7 COMMUNICATIONS (for Ethernet version see Annex A)

Thanks to the serial port the monitoring and control of the relay can be made by a SCADA system, a PC or PLC.

Both ports are provided:
- **two-wire RS485** ⇒ 1 twisted pair which transmits and receives alternatively is used for the data TX and RX.

- **three-wire RS232** ⇒ a DB-9 terminal is used for the connection; [→ Fig. 2.3].

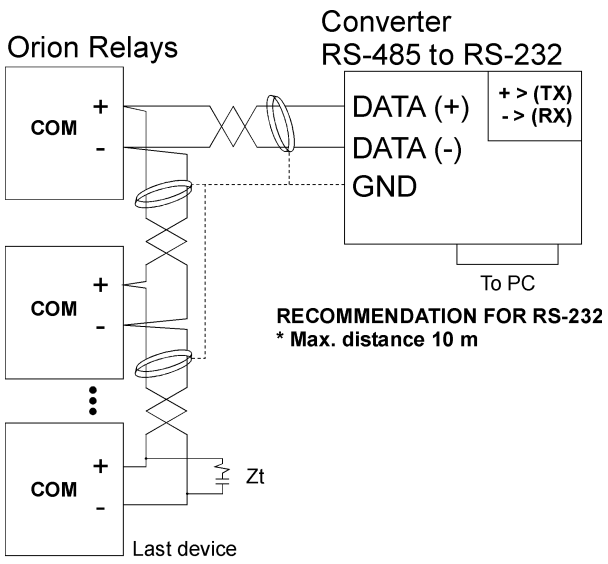
The ports can be used at the same time.

The serial port protocol is a subset of the AEG Modicon Modbus protocol.

For the RS-485 port use shielded, twisted pair connecting wire to minimize communications errors from noise.
A suitable type of wire is:
BELDEN#9841, **AWG 24** shielded and with an impedance of **120 Ω**.

Ground the shield at one point only [→ Fig. 2.4]
For the RS-485 port a maximum of 32 relays can be daisy chained together in parallel mode on a communication channel for a MAXIMUM DISTANCE OF 1000 METERS.
For larger systems, additional RS-485 channels must be added.

For increasing the number of relays on a single channel to more than 32, consult ORION ITALIA.



RECOMMENDATION FOR RS-485
*** Use shielded twisted cable**
*** Use only one (1) point of ground**
*** Place a Zt in the last device**
(resistance 250 Ω, condensator 1 nF)
*** Max. distance 1000 m**

Figure 2.4 – **Communications**

2.8 CONTROL POWER

- Voltage ranges for EVAR Standard ..... **20 Vdc → 341 Vdc**
  20 Vac → 260 Vac
  EVAR with Ethernet ..... **41 Vdc → 341 Vdc**
  41 Vac → 260 Vac

- Power supply connection terminals ..... **32** and **34**.

No internal or external adjustments are required to use any of the above supply voltages.
For the external protection, the relay EVAR has no internal fuses.

2.9 SYSTEM GROUNDING

On the back side of the relay there are two separate grounds [→ Fig. 2.2]:

- Internal metal chassis parts' safety ground terminal **31**

- Surge suppression components' ground terminal (grounded to separate filter ground) **33**

For reliable operation both grounds must be tied directly to the ground bus bars of the switchgear.

Do not connect the ground connection to a part of the metal switchgear enclosure because a low impedance to ground cannot be guaranteed.

2.10 HIPOT TESTING

Hipot testing carried out by the Manufacturer:

- Voltage ..... **2000 Vca**
- Time (under voltage) ..... **1 minute**

Disconnect the communication terminals and filter ground during dielectric strength testing (hipot) or damages to the internal surge protection devices may occur.

If hipot testing is to be performed on an installed relay for insulation verification, all remaining terminals except for:

- Safety ground terminal **31**
- Switch inputs "SW" terminals ..... **17 → 24**
- Communications terminals ..... **13 → 16**

should be connected together.

The hipot potential is applied between the wired together terminals and the enclosure ground.
To effectively keep transient voltages at a level sufficient to protect the internal circuitry, the internal transient protection devices conduct below the hipot voltages used for insulation testing. Consequently, the filter ground terminal **33** must be floating for the test.

3. Using of the menu

3.1 MENU STRUCTURE

EVAR menu is a tree-structure type, consisting of:

- **PAGE** → function access;
- **LINE** → setpoints for selecting, entering and reading data.

3.2 MENU ACCESS

You can have access to the menu, by pressing one of the following keys:

□ **SET POINTS** ⇒ *It activates the menu to set functions and variables*.

□ **ACTUAL VALUES** ⇒ *It activates the menu to display or clear the parameters monitored or calculated by EVAR*.

3.3 MENU SURFING

For menu surfing, use one of the following keys:

▲PAGE ⇒ *Next page*.

▼PAGE ⇒ *Previous page.*

□ **LINE** ⇒ *Next Setpoint in the actual Page*.

3.4 SELECTING AND STORING KEYS

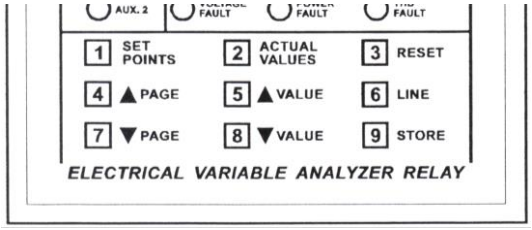
For selecting and storing data, use the following keys:

▲VALUE ⇒ *For scrolling up data in the actual Range.*

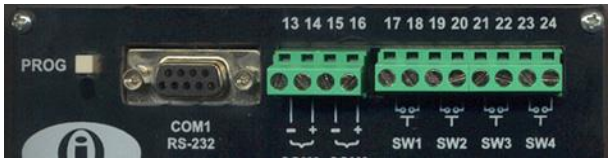
▼VALUE ⇒ *For scrolling down data in the actual Range*.

□ **STORE** ⇒

- *For storing the new entered data*.
- *For entering the default access code* (111).
- *It switches the keypad operation mode for entering the digits (1 to 9) positioned as shown in the figure*.



PROG push-button is located on the back of the EVAR. It can be used to enter new data in the setpoints of SETPOINTS or ACTUAL VALUES menu (range: YES/NO) <u>without entering access code</u>.



Press **PROG** key instead of: **ENTER ACCESS CODE XXX +** □ **STORE Key**

3.5 QUICK SURFING GUIDE

The operation mode of the **PAGE, LINE**, **VALUE** and **STORE** keys is described in details only in the description of the first PAGE of the SETPOINT Menu. As the mode is the same even for surfing in the other pages, the use of these keys, starting from the second PAGE of the Menu, will not be repeated.

The following summary is intended to be a QUICK SURFING GUIDE:

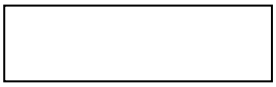
PAGE: these two keys allow to go from one PAGE to the next [▲] or to the previous one [▼].

LINE: this key allows to go from one SETPOINT to the next inside the same PAGE. At the last SETPOINT of the PAGE, it allows to go to the next PAGE.

VALUE: these two keys allow to select range values, decreasing [▼] or increasing [▲]**,** or to select two or more options [for example NO and YES].

STORE: this key allows to store the data and to enter the access code.
Any modifying not confirmed by **STORE** will be ignored.

3.6 SYMBOLS USED IN THE TEXT



The EVAR display is represented in this figure.

Next to each Setpoint, on the right side of the display, “RANGE:” will be displayed, followed by digits or options separated by the following symbols:

; ⇒ You can select only among the elements of the list that are all clearly listed and separated by the “semi-colon”.

÷ ⇒ You can select among all values included in the limits indicated.

FOR EXAMPLE:
RANGE: 2; 3; 6 ⇒ you can select only one of the three digits: **2**, or **3**, or **6**.

RANGE: 2 ÷ 6 ⇒ you can select **2**, or **3**, or **4**, or **5**, or **6**.

In the SETPOINT Pages (except for PAGE 1 and PAGE 3), the value indicated in this manual in the 2nd setpoint of the display has been set by the Manufacturer of the relay.

This symbol indicates the key that must be pressed.

3.7 MENU STRUCTURE

In the following page you can find the representation of the complete structure consisting of the EVAR Menu Pages.

The two menus represented can be activated by using the following keys:

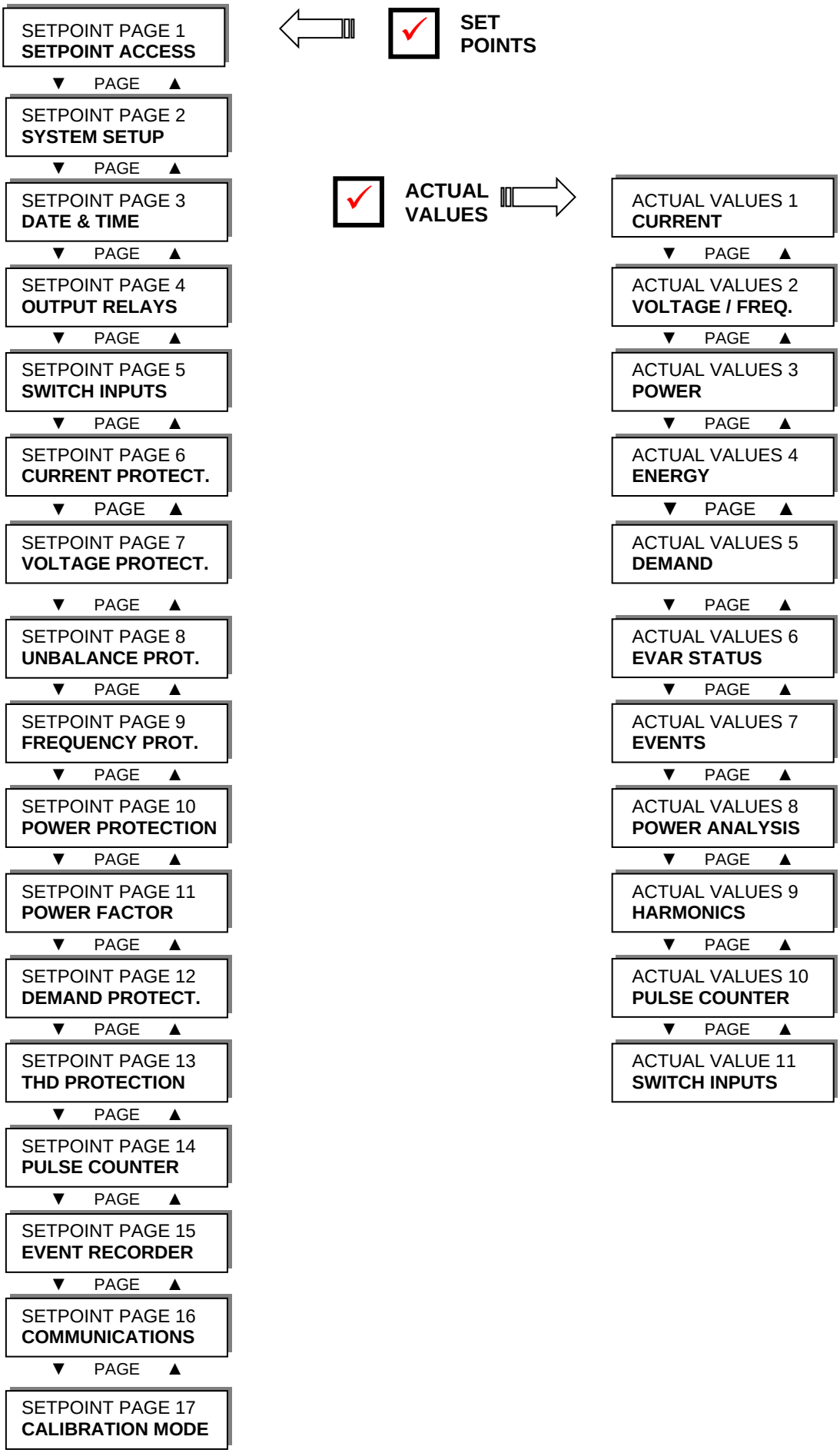
SET POINTS

⇒ It allows to program the relay by setting the parameter and the electrical variables values.

ACTUAL VALUES

⇒ This menu allows to display or clear some of the parameters monitored or calculated by the relay.

Before reading the map, study carefully the information in the previous paragraphs 3.1; 3.2; 3.3; 3.4; 3.5 and 3.6.


SETPOINT PAGE 1
SETPOINT ACCESS
▼ PAGE ▲
SETPOINT PAGE 2
SYSTEM SETUP
▼ PAGE ▲
SETPOINT PAGE 3
DATE & TIME
▼ PAGE ▲
SETPOINT PAGE 4
OUTPUT RELAYS
▼ PAGE ▲
SETPOINT PAGE 5
SWITCH INPUTS
▼ PAGE ▲
SETPOINT PAGE 6
CURRENT PROTECT.
▼ PAGE ▲
SETPOINT PAGE 7
VOLTAGE PROTECT.
▼ PAGE ▲
SETPOINT PAGE 8
UNBALANCE PROT.
▼ PAGE ▲
SETPOINT PAGE 9
FREQUENCY PROT.
▼ PAGE ▲
SETPOINT PAGE 10
POWER PROTECTION
▼ PAGE ▲
SETPOINT PAGE 11
POWER FACTOR
▼ PAGE ▲
SETPOINT PAGE 12
DEMAND PROTECT.
▼ PAGE ▲
SETPOINT PAGE 13
THD PROTECTION
▼ PAGE ▲
SETPOINT PAGE 14
PULSE COUNTER
▼ PAGE ▲
SETPOINT PAGE 15
EVENT RECORDER
▼ PAGE ▲
SETPOINT PAGE 16
COMMUNICATIONS
▼ PAGE ▲
SETPOINT PAGE 17
CALIBRATION MODE
SET
POINTS
ACTUAL
VALUES
ACTUAL VALUES 1
CURRENT
▼ PAGE ▲
ACTUAL VALUES 2
VOLTAGE / FREQ.
▼ PAGE ▲
ACTUAL VALUES 3
POWER
▼ PAGE ▲
ACTUAL VALUES 4
ENERGY
▼ PAGE ▲
ACTUAL VALUES 5
DEMAND
▼ PAGE ▲
ACTUAL VALUES 6
EVAR STATUS
▼ PAGE ▲
ACTUAL VALUES 7
EVENTS
▼ PAGE ▲
ACTUAL VALUES 8
POWER ANALYSIS
▼ PAGE ▲
ACTUAL VALUES 9
HARMONICS
▼ PAGE ▲
ACTUAL VALUES 10
PULSE COUNTER
▼ PAGE ▲
ACTUAL VALUE 11
SWITCH INPUTS

3.8 HOW TO USE SETPOINTS AND ACTUAL VALUES KEYS

SET POINTS

SETPOINT PAGE 1
SETPOINT ACCESS

⇩

LINE ⇨ ENTER ACCESS CODE: **X X X**

⇩

SETPOINT ACCESS ENABLED

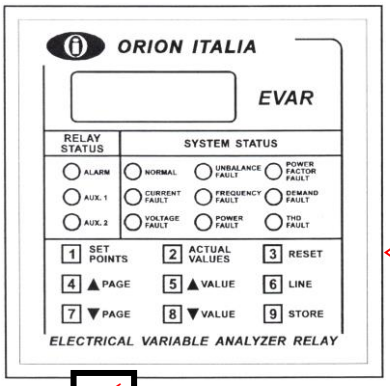
LINE

ENTER NEW ACCESS CODE: **Y/N** ⇨ Select: **NO** or **YES**

▲VALUE or **▼VALUE**

⇩

ENTER NEW ACCESS CODE: **X X X** ⇦ **STORE** (*)



PAY ATTENTION to position of digits!

LINE

EVAR RELAY:
EVAR – FIRMWARE

LINE

END OF PAGE
SETPOINT ACCESS

(*) By pressing the **STORE** key, all the nine keys on the front panelboard modify their functions and allow to enter the digits from 1 to 9, according to the correspondance represented in the diagram.

4. Menu "SETPOINTS"

Before carrying out the programming of the unit, it is necessary to read and understand the indications provided by the Constructor. All the programming must be carried out by qualified personnel with adequate knowledge of the functioning of the unit and of the content of this manual.

4.1 Setpoint page 1: SETPOINT ACCESS

SETPOINT PAGE 1 **SETPOINT ACCESS**	*It contains messages for Setpoint Access.* *Press **LINE** key: next Line will appear.*
ENTER ACCESS CODE: X X X	*Enter the three-digit access code [1 to 9] using the keyboard organized as explained before.* [→ § 3.8 -]. **Manufacturer code: 111.**
SETPOINT ACCESS ENABLED	*It indicates that the Setpoint Access has been enabled.*
ENTER NEW ACCESS CODE: NO	RANGE:.....NO; YES *It allows the user to enter his own customized access code.* • *to confirm the code programmed by the Constructor.* 1. *press **LINE** key to pass to **EVER RELAY: EVAR – FIRMWARE*** • *to replace the code programmed by the Constructor with the customized one:* 1. *press **▲VALUE** key→ **YES** will be displayed ;* 2. *press **STORE** key;* 3. *enter the new code that is automatically confirmed at the end of the entering;* 4. *press **LINE** key to pass to the following line.*
EVAR RELAY: EVAR – FIRMWARE	*It identifies the EVAR firmware revision.*
END OF PAGE **SETPOINT ACCESS**	*Last LINE of PAGE 1.* *Press **LINE** key or **▲PAGE** key, to pass to the first Line of PAGE 2.*

4.2 Setpoint page 2: SYSTEM SETUP

SETPOINT PAGE 2 **SYSTEM SETUP**	*You can enter the EVAR's parameter values for the system in which it will operate.*
PHASE CTs WIRING 2 or 3 CTs	RANGE: ..... 1 Current Transf; 2 or 3 CTs *Enter the no. of current transformers.*
SAMPLING FREQUENCY 50 Hz	RANGE:.....50Hz; 60 Hz *Enter the system frequency.*
PHASE CT RATING PRIMARY 100 A	RANGE:.....5 A ÷ 5000 A STEPS:.....5 A *Enter the primary current rating of the phase current transformers being used. This value is found on the transformer nameplate. In case your transformer has a rating outside this range, please contact ORION ITALIA.* *All three current transformers must have the same rating.*
GROUND SENSING RESIDUAL	RANGE:..... RESIDUAL; SEPARATE CT *It asks if your system uses a separate zero sequence CT or if the phase CTs are connected in a residual sensing configuration to detect ground current.*

GROUND CT RATING PRIMARY 100 A	RANGE: ..... 5 A ÷ 5000 A STEPS: ..... 5 A *Enter the primary current rating of the ground current transformers being used*
VT CONNECTION WYE	RANGE: ..... NONE, WYE, DELTA-DELTA, OPEN DELTA, Van, Vab, *Select the type of VT connection which you intend to use.* *If **NONE** is selected, voltage sensing will be disabled.*
VT NOMINAL SEC 100 Vac	RANGE: ..... 55 Vca ÷ 254 Vca STEPS: ..... 1 V *Enter the nominal value of the VT secondary voltage.*
VT PRIMARY VOLTS 10.00 KV	RANGE: ..... 0.10 KV ÷ 69 KV STEPS: ..... 0.01 KV *Enter the nominal value of the VT primary line voltage.*
END OF PAGE **SYSTEM SETUP**	*Last LINE of PAGE 2.* *Press **LINE** key or ▲**PAGE** key, to pass to the first Line of PAGE 3.*

4.3 Setpoint page 3: DATE & TIME

SETPOINT PAGE 3 **DATE & TIME**	*You can set Date and Time.*
Jun9, 2001 16:54:02:10	*Actual Date and Time are displayed.*
SET DATE & TIME? NO	RANGE: ..... YES; NO *You can set Date and Time:* • *<u>to confirm the actual data:</u>* 1. *press **LINE** key: **END PAGE DATE & TIME** will be displayed* • *<u>to set Date and Time</u>:* 1. *press ▲**VALUE** key→ **YES** will be displayed;* 2. *press **STORE** key and set the blinking data by pressing ▲**VALUE** e ▼**VALUE**;* 3. *press **LINE** key: next Lines will be displayed;* 4. *press **STORE** key to store the new set data.*
Jun 9, 2001 16:54:02:10	RANGE: ..... JAN ÷ DEC.
Jun **9**, 2001 16:54:02:10	RANGE: ..... 1 ÷ 31
Jun 9, **2001** 16:54:02:10	RANGE: ..... 2000 ÷ 2099
Jun 9, 2001 **16**:54:02:10	RANGE: ..... 0 ÷ 23
Jun 9, 2001 16:**54**:02:10	RANGE: ..... 0 ÷ 59
Jun 9, 2001 16:54:**02**:10	RANGE: ..... 0 ÷ 59
END OF PAGE **DATE & TIME**	*Last LINE of PAGE 3.* *Press **LINE** key or ▲**PAGE** key: the first Line of PAGE 4 will be displayed.*

4.4 Setpoint page 4: OUTPUT RELAYS

SETPOINT PAGE 4 OUTPUT RELAYS

You can set the features of output contacts to suit specific applications.

ALARM NON-OP. STATE: DE-ENERG.

RANGE:.....DE-ENERG. ENERG.

You can select the Non-Oper. state of the alarm relay contacts. The wiring diagram in Chapter 2 shows the relay contacts without control power.

If the non-oper. state of the relay is programmed to be DE-ENERG.:

⇒ *state of the relay contacts: as shown in the wiring diagram.*

If the non-oper. state of the relay is programmed to be ENERG.:

⇒ *state of the relay contacts: opposite to the one shown in the wiring diagram.*

ALARM ACTIVATION TYPE: LATCHED

RANGE:.....LATCHED; UNLATCHED

*You can select one of the following **ALARM** contact operating modes:*

***UNLATCHED** operation:*

⇒ *after relay programming, output contacts change and hold on their state until a control/alarm is on.*
Once the control/alarm condition disappears:
*1. **ALARM** led turns off;*
*2. **ALARM** contact automatically clears.*

***LATCHED** operation:*

⇒ *after relay programming, output contacts change and hold on their state until an alarm condition is in progress.*
This mode is used for alarms which must be acknowledged or to provide a "lockout" function.
*Return to **NON-OP.** state by:*
*- pressing the **RESET** key, or*
- a computer RESET command with the "REMOTE RESET" logic input selected.

AUX. 1 NON-OP. STATE: DE-ENERG.

RANGE:..... DE-ENERG.; ENERG.

*You can select the NON-OP. state of the **AUX. 1** relay contacts.*
*For further information, see **ALARM NON-OP. STATE** [→ in this page].*

AUX. 1 ACTIVATION TYPE: LATCHED

RANGE:.....LATCHED; UNLATCHED

*You can select one of the following **AUX. 1** relay operating modes:*

***UNLATCHED** operation:*

⇒ *after relay programming, output contacts change and hold on their state until the variable value drops below the set level; then the contact and the indicator AUX.1 automatically clear.*

***LATCHED** operation:*

⇒ *after relay programming, output contacts change and hold on their state if a control/alarm condition occurs.*
This mode is used for alarms which must be acknowledged or to provide a "lockout" function.
*Return to **NON-OP.** state by:*
*- pressing the **RESET** key, or*
- entering the "REMOTE RESET" logic input, or
- using a computer RESET command.

AUX. 2 NON-OP. STATE: DE-ENERG.

RANGE:..... DE-ENERG.; ENERG.

*You can select the NON-OP. state of the **AUX. 2** relay contacts.*
*For further information, see **ALARM NON-OP. STATE** [→ in this page].*

AUX. 2 ACTIVATION TYPE: LATCHED

RANGE:.....LATCHED; UNLATCHED

*You can select the one of the **AUX 2** operating modes: UNLATCHED o LATCHED.*
*For further information, see **AUX. 1 ACTIVATION TYPE** [→ in this page] replacing **AUX 1 → AUX 2**.*

END OF PAGE OUTPUT RELAY

Last LINE of PAGE 4.
*Press **LINE** key or ▲**PAGE** key: the first Line of PAGE 5 will be displayed.*

4.5 Setpoint page 5: SWITCH INPUTS

SETPOINT PAGE 5
SWITCH INPUTS

You can set switch inputs features to suit specific applications.

ALARM

When the alarm contact is assigned to one of the switch inputs, a change in the switch status will produce an alarm condition and the alarm contact will activate.

AUX. 1/2

When the AUX contact is assigned to one of the switch inputs, a change in the switch status will produce a control condition and the AUX contact will activate.

COUNTER

When a switch input is assigned as a counter the EVAR will count the number of transitions:

- from OPEN to CLOSED
  if the input is set in **OPEN TO CLOSED** *mode*
- from CLOSED TO OPEN
  if the input is set in **CLOSED TO OPEN** *mode*

The minimum pulse width must be 50 ms-long for EVAR to read. Therefore, for the EVAR to read one pulse, the switch input must be in its inactive status (closed/open) for a minimum of 50 ms and in its active status (open/closed) for 50 ms.

NEW DMD PERIOD

The EVAR can be used for load shedding by assigning a switch input to new demand period. This allows the EVAR demand period to be synchronized with the utility meter. One of the billing parameters used by a utility is peak demand. By synchronizing the EVAR to the utility meter, the EVAR can monitor the demand level read by the utility meter and can perform load shedding to prevent the demand from reaching the penalty level. The utility meter provides a dry contact output which can be connected to one of the EVAR's switch inputs. When the EVAR senses a contact closure, it will start a new demand period.

REMOTE RESET

When a switch input is assigned as REMOTE RESET, the switch input closing activates a reset command on the EVAR.

SWITCH 1 FUNCT.:
NONE

RANGE: ..... NONE; ALARM; AUX. 1; AUX. 2; COUNTER; NEW DMD PERIOD; REMOTE RESET

It allows to select the required function for SW1 input.

- *If* ***NONE*** *is selected, next Line will not be displayed!*

SWITCH 1 TRANS.:
OPEN TO CLOSED

RANGE: ..... OPEN TO CLOSED; CLOSED TO OPEN

It determines the operating sequence of the SW1 input.

OPEN TO CLOSED ⇒ *enabling the switch input SW1 transition in open to closed mode.*

CLOSED TO OPEN ⇒ *enabling the switch input SW1 transition in closed to open mode.*

SWITCH 2 FUNCT.:
NONE

RANGE: ..... NONE; ALARM; AUX. 1; AUX. 2; COUNTER; NEW DMD PERIOD; REMOTE RESET

It allows to select the required function for SW2 input.

- *If* ***NONE*** *is selected, next Line will not be displayed!*

SWITCH 2 TRANS.:
OPEN TO CLOSED

RANGE: ..... OPEN TO CLOSED; CLOSED TO OPEN

It determines the operating sequence of the SW2 input.

OPEN TO CLOSED ⇒ *enabling the switch input SW2 transition in open to closed mode.*

CLOSED TO OPEN ⇒ *enabling the switch input SW2 transition in closed to open mode*.

SWITCH 3 FUNCT.:
NONE

RANGE: ..... NONE; ALARM; AUX. 1; AUX. 2; COUNTER; NEW DMD; PERIOD; REMOTE RESET

It allows to select the required function for SW3 input.

- *If* ***NONE*** *is selected, next Line will not be displayed.*

SWITCH 3 TRANS.: OPEN TO CLOSED	RANGE: ..... OPEN TO CLOSED; CLOSED TO OPEN *It determines the operating sequence of the SW3 input.* *OPEN TO CLOSED ⇒ enabling the switch input SW3 transition in open to closed mode.* *CLOSED TO OPEN ⇒ enabling the switch input SW3 transition in closed to open mode.*
SWITCH 4 FUNCT.: NONE	RANGE: ..... NONE; ALARM; AUX. 1; AUX. 2; COUNTER; NEW DMD; PERIOD; REMOTE RESET *You can select the SW4 function.* • *If **NONE** is selected, next Line will not be displayed.*
SWITCH 4 TRANS.: OPEN TO CLOSE	RANGE: ..... OPEN TO CLOSED; CLOSED TO OPEN *It allows to select the required function for SW3 input.* *OPEN TO CLOSED ⇒ enabling the switch input SW4 transition in open to closed mode.* *CLOSED TO OPEN ⇒ enabling the switch input SW4 transition in closed to open mode.*
END OF PAGE SWITCH INPUTS	*Last LINE of PAGE 5.* *Press **LINE** key or ▲**PAGE** key: the first Line of PAGE 6 will be displayed.*

4.6 Setpoint page 6: CURRENT PROTECT.

SETPOINT PAGE 6 CURRENT PROTECT.	*You can enter the setpoints which determine the phase and ground current protections.*
Ph. UNDERCURRENT RELAY: NONE	RANGE: ..... NONE; ALARM; AUX. 1; AUX. 2 *Phase undercurrent condition can be associated with the activation of the ALARM; AUX 1; AUX 2 contact or disabled.* ***NONE**: ..... disabling;* • *If **NONE** is selected, by pressing the **LINE** key, **Ph. OVERCURRENT RELAY** will be displayed.*
Ph. UNDERCURRENT LEVEL: 50% CT	RANGE: ..... 2% ÷ 100% STEPS: ..... 1% *Enter the minimum phase current intervention value. The set value is in percentage of the CT value.* *The minimum phase current is determined by the **DETECT UNDERCUR. BELOW 2% CT** setpoint; when this setpoint is set to **NO**, any current must be greater than 2% CT before this function will operate.*
Ph. UNDERCURRENT DROPOUT 2%	RANGE: ..... 1% ÷ 100% STEPS: ..... 1% *It allows to enter the phase undercurrent dropout level as a percentage of the intervention value.*
Ph. UNDERCURRENT DELAY 1.0 SEC	RANGE: ..... 0.5 s ÷ 600.0 s STEPS: ..... 0.5 s *If phase current ≤ **Ph. UNDERCURRENT LEVEL** setpoint value, for the time programmed in this setpoint, a phase undercurrent condition will occur.*
DETECT UNDERCUR. BELOW 2% CT	RANGE: ..... YES; NO ***NO:** ⇒ any one of the current inputs < 2% CT is not considered as minimum phase current.* ***YES:** ⇒ if an indication is required for loss of current.*

Ph. OVERCURRENT RELAY: NONE

RANGE: ..... NONE; ALARM; AUX. 1; AUX. 2
Phase overcurrent condition can be associated with the activation of the ALARM; AUX 1; AUX 2 contact or disabled.
***NONE**: disabling;*

- *If **NONE** is selected, by pressing the **LINE** key, **Gnd. OVERCURRENT RELAY** will be displayed.*

Ph. OVERCURRENT LEVEL 110% CT

RANGE: ..... 2% ÷ 500%
STEPS: 1%
Enter the phase overcurrent intervention value.

Ph. OVERCURRENT DROPOUT 2%

RANGE: ..... 1% ÷ 100%
STEPS: 1%
It allows to enter the phase overcurrent dropout level as a percentage of the intervention current.

Ph. OVERCURRENT DELAY 1.0 SEC

RANGE: ..... 0.5 s ÷ 600.0 s
STEPS: ..... 0.5 s
*If phase current ≥ **Ph. OVERCURRENT LEVEL** setpoint value , for the time programmed in this setpoint, a phase overcurrent condition will occur.*

Gnd. OVERCURRENT RELAY NONE

RANGE: ..... NONE; ALARM; AUX. 1; AUX. 2
Ground overcurrent condition can be associated with the activation of the ALARM; AUX 1; AUX 2 contact or disabled.
***NONE**: disabling;*

- *If **NONE** is selected, by pressing the **LINE** key, **END OF PAGE CURRENT PROTECT.** will be displayed.*

Gnd. OVERCURRENT LEVEL 10% CT

RANGE: ..... 2% ÷ 500%
STEPS: 1%
Enter the ground overcurrent intervention value.

Gnd. OVERCURRENT DROPOUT 2%

RANGE: ..... 1% ÷ 100%
STEPS: 1%
It allows to enter the ground overcurrent dropout level as a percentage of the intervention current.

Gnd. OVERCURRENT DELAY 1.0 SEC

RANGE: ..... 0.5 ÷ 600.0 s
STEPS: ..... 0.5 s
*If ground current ≥ **Gnd. OVERCURRENT LEVEL** setpoint value, for the time programmed in this setpoint, a ground overcurrent condition will occur.*

END OF PAGE CURRENT PROTECT.

Last LINE of PAGE 6.
*Press **LINE** key or **▲PAGE** key: the first Line of PAGE 7 will be displayed.*

4.7 Setpoint page 7: VOLTAGE PROTECT.

SETPOINT PAGE 7 VOLTAGE PROTECT.

You can enter the setpoints which determine the phase voltage protections.

UNDERVOLTAGE RELAY:NONE

RANGE: ..... NONE; ALARM; AUX. 1; AUX. 2

Undervoltage condition can be associated with the activation of the ALARM; AUX 1; AUX 2 contact or disabled.

***NONE**: disabling;*

- *If **NONE** is selected, by pressing the **LINE** Key, **OVERVOLTAGE RELAY** will be displayed.*

UNDERVOLTAGE LEVEL: 90% VT

RANGE: ..... 30% ÷ 100%

STEPS: 1%

Enter the undervoltage intervention value on 1, 2 or 3 phases. The set value is in percentage of the VT value. For the protection calculation the line value is considered (except for a monophase system).

*The number of phases required is determined by the **PHASES FOR U/V OPER.** setpoint [→ in this page].*

UNDERVOLTAGE DROPOUT: 5% VT

RANGE: ..... 1% ÷ 100%

STEPS: 1%

It allows to enter the phase undervoltage dropout level as a percentage of the intervention value.

UNDERVOLTAGE DELAY:1.0 SEC

RANGE: ..... 0.5 s ÷ 600.0 s

STEPS: ..... 0.5 s

*If voltage ≤ **UNDERVOLTAGE LEVEL** setpoint value, for the time programmed in this setpoint, an undervoltage condition will occur.*

PHASES FOR U/V OPER.: ANY ONE

RANGE: ..... ANY ONE; ANY TWO, ALL THREE

You can select the phases on which the undervoltage condition must be detected:

ANY ONE

ANY TWO

ALL THREE.

DETECT UNDERVOLT BELOW 20% VT NO?

RANGE: ..... YES, NO

NO: ⇒ *any one of the voltage inputs < 20% VT is not considered as undervoltage.*

YES: ⇒ *if an indication is required for loss of voltage.*

OVERVOLTAGE RELAY: NONE

RANGE: ..... NONE; ALARM; AUX. 1; AUX. 2

Overvoltage condition can be associated with the activation of the ALARM; AUX 1; AUX 2 contact or disabled.

***NONE**: disabling;*

- *If **NONE** is selected, by pressing the **LINE** Key, **PHASE REVERSAL RELAY** will be displayed.*

OVERVOLTAGE LEVEL: 110% VT

RANGE: ..... 101% ÷ 125%

STEPS: 1%

Enter the overvoltage intervention value on 1, 2 or 3 phases. The set value is in percentage of the VT value. For the protection calculation the line value is considered (except for a monophase system).

*The number of phases required is determined by the **PHASES FOR O/V OPER.** setpoint [→ page 4.8]*

OVERVOLTAGE DROPOUT: 2% VT

RANGE: ..... 1% ÷ 25%

STEPS: 1%

It allows to enter the phase overvoltage dropout level as a percentage of the intervention value.

OVERVOLTAGE DELAY:1.0 SEC

RANGE: ..... 0.5 s ÷ 600.0 s
STEPS: ..... 0.5 s
If:
1. *voltage ≥ **OVERVOLTAGE LEVEL** setpoint value,*
2. *this condition remains in this way for the time delay programmed in this setpoint,*

⇒ *an overvoltage condition will occur.*

PHASES FOR O/V OPER.: ANY ONE

RANGE: ..... ANY ONE; ANY TWO; ALL THREE
You can select the phases on which the overvoltage condition must be detected:
ANY ONE
ANY TWO
***ALL THREE**.*

PHASE REVERSAL RELAY: NONE

RANGE: .....NONE; ALARM; AUX.1; AUX. 2
Under normal operating conditions, the EVAR expects to see the voltages connected with 1-2-3 or A-B-C sequence. If the voltages are connected with the wrong sequence 1-3-2 or A-C-B, a phase reversal condition will occur.
A minimum of 20% VT applied to the EVAR must exist on all inputs before the phase reversal feature will operate.
Phase reversal condition can be associated with the activation of the ALARM; AUX 1; AUX 2 contact or disabled.
***NONE**: ..... disabling*

- *If **NONE** is selected, by pressing the **LINE** Key, **END OF PAGE VOLTAGE PROTECT.** will be displayed.*

PHASE REVERSAL DELAY: 1.0 SEC

RANGE: ..... 0.5 ÷ 600.0 s
STEPS: ..... 0.5 s
If a sequence reversal exists for the time programmed in this setpoint, a phase reversal condition will occur.

END OF PAGE VOLTAGE PROTECT.

Last LINE of PAGE 7.
*Press **LINE** key or ▲**PAGE** key**:** the first Line of PAGE 8 will be displayed.*

4.8 Setpoint page 8: UNBALANCE PROT.

SETPOINT PAGE 8
UNBALANCE PROT.

You can enter the setpoints which determine the current and voltage unbalance protections.

- *If **1 CURRENT TRANSF.** has been selected in **PHASE CTs WIRING**, by pressing the **LINE** Key, **VOLT UNBALANCE DELAY** will be displayed.*

An unbalance condition will occur if the maximum deviation from average divided by average, time 100%, exceeds the setpoint value for the specified time.

CURRENT UNBALAN.
RELAY: NONE

RANGE: ..... NONE; ALARM; AUX. 1; AUX. 2
Current unbalance condition can be associated with the activation of the ALARM; AUX 1; AUX 2 contact or disabled.
***NONE**: ..... disabling;*

- *If **NONE** is selected, by pressing the **LINE** Key, **VOLTS UNBALANCE RELAY** will be displayed.*

CURRENT UNBALAN.
LEVEL: 10% CT

RANGE: ..... 1% ÷ 100%
STEPS: 1%
Current unbalance is calculated as the maximum deviation from the average divided by the average three phase current.
Enter the current unbalance intervention value.

CURRENT UNBALAN
DROPOUT: 2%

RANGE: ..... 1% ÷ 100%
STEPS: 1%
It allows to enter the current unbalance dropout level as a percentage of intervention value.

CURRENT UNBALAN
DELAY:1.0 SEC

RANGE: ..... 0.5 s ÷ 600.0 s
STEPS: ..... 0.5 s
If:
1. *maximum current unbalance ≥ **CURRENT UNBALANCE LEVEL** setpoint value,*
2. *this condition remains in this way for the time delay programmed in this setpoint,*

⇒ *a current unbalance condition will occur.*

VOLTS UNBALANCE
RELAY: NONE

RANGE: ..... NONE; ALARM; AUX. 1; AUX. 2
Voltage unbalance condition can be associated with the activation of the ALARM; AUX 1; AUX 2 contact or disabled.
***NONE**: ..... disabling;*

- *If **NONE** is selected, by pressing the LINE Key, **END OF PAGE UNBALANCE PROT.** will be displayed*

VOLTS UNBALANCE
LEVEL: 3%

RANGE: ..... 1% ÷ 100%
STEPS: 1%
Voltage unbalance is calculated as the maximum deviation from the average divided by the average three phase voltage.
Enter the voltage unbalance intervention value.

VOLTS UNBALANCE
DROPOUT: 1%

RANGE: ..... 1% ÷ 100%
STEPS: 1%
It allows to enter the voltage unbalance dropout level as a percentage of intervention value.

VOLTS UNBALANCE
DELAY: 1.0 SEC

RANGE: ..... 0.5 s ÷ 600.0 s
STEPS: ..... 0.5 s
If a voltage unbalance occurs, for the time programmed in this setpoint, a voltage unbalance condition will occur.

END OF PAGE
UNBALANCE PROT.

Last LINE of PAGE 8.
*Press **LINE** key or ▲**PAGE** key**:** the first Line of PAGE 9 will be displayed.*

4.9 Setpoint page 9: FREQUENCY PROT.

SETPOINT PAGE 9
FREQUENCY PROT.

You can enter the setpoints which determine the frequency protections.

- *If **NONE** has been selected in **VT CONNECTION** [→SETPOINT PAGE 2], by pressing the LINE Key, **END OF PAGE FREQUENCY PROT.** will be displayed*

UNDERFREQUENCY
RELAY:NONE

RANGE: ..... NONE; ALARM; AUX. 1; AUX. 2
Underfrequency condition can be associated with the activation of the ALARM; AUX 1; AUX 2 contact or disabled.
***NONE**: disabling;*

- *If **NONE** is selected, by pressing the **LINE** Key, **OVERFREQUENCY RELAY** will be displayed.*

UNDERFREQUENCY
LEVEL: 49.00 Hz

RANGE: ..... 40 Hz ÷ 70 Hz
STEPS: ..... 0.01 Hz
Enter the underfrequency intervention value.

UNDERFREQUENCY
DROPOUT: 0.50 Hz

RANGE: ..... 0.01 Hz ÷ 5.00 Hz
STEPS: ..... 0.01 Hz
It allows to enter the underfrequency dropout level in relation to the intervention value.

UNDERFREQUENCY
DELAY:10.0 SEC

RANGE: ..... 0.5 s ÷ 600.0 s
STEPS: ..... 0.5 s
If:
1. *measured frequency ≤ **UNDERFREQUENCY LEVEL** setpoint value,*
2. *this condition remains in this way for the time delay programmed in this setpoint,*

⇒ *an underfrequency condition will occur.*

OVERFREQUENCY
RELAY: NONE

RANGE: ..... NONE; ALARM; AUX. 1; AUX. 2
Overfrequency condition can be associated with the activation of the ALARM; AUX 1; AUX 2 contact or disabled.
***NONE**: disabling,*

- *If **NONE** is selected, by pressing the **LINE** Key, **END OF PAGE FREQUENCY PROT.** will be displayed.*

OVERFREQUENCY
LEVEL: 51.00 Hz

RANGE: ..... 40 Hz ÷ 70 Hz
STEPS: ..... 0.01 Hz
Enter the overfrequency intervention value.

OVERFREQUENCY
DROPOUT: 0.50 Hz

RANGE: ..... 0.01 Hz ÷ 5.00 Hz
STEPS: ..... 0.01 Hz
It allows to enter the overfrequency dropout level in relation to the intervention value.

OVERFREQUENCY
DELAY: 10.0 SEC

RANGE: ..... 0.5 s ÷ 600.0 s
STEPS: ..... 0.5 s
If:
1. *measured frequency ≥ **OVERFREQUENCY LEVEL** setpoint value,*
2. *this condition remains in this way for the time delay programmed in this setpoint,*

⇒ *an overfrequency condition will occur.*

END OF PAGE
VOLTAGE PROTECT.

Last LINE of PAGE 9.
*Press **LINE** key or **▲PAGE** key: the first Line of PAGE 10 will be displayed.*

4.10 Setpoint page 10: POWER PROTECT.

SETPOINT PAGE 10
POWER PROTECT.

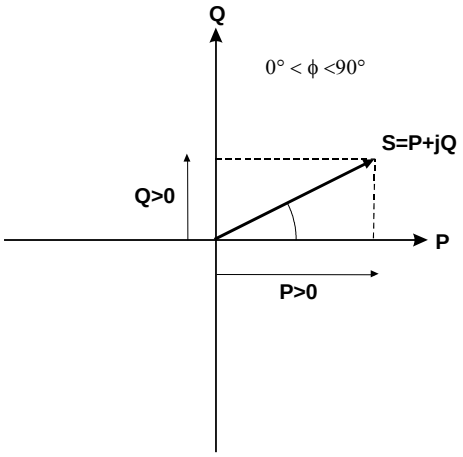
You can enter the setpoints which determine the positive and negative power protections.

- *If NONE has been selected in **VT CONNECTION** [→ SETPOINT PAGE 2], by pressing the **LINE** Key, **END OF PAGE POWER PROT.** will be displayed.*

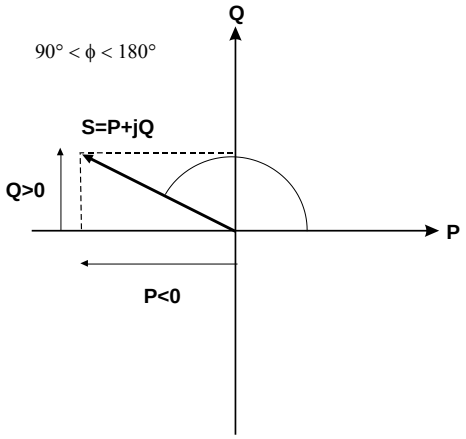
The following is an explanation of power flow designation used in the EVAR.

S = P+jQ

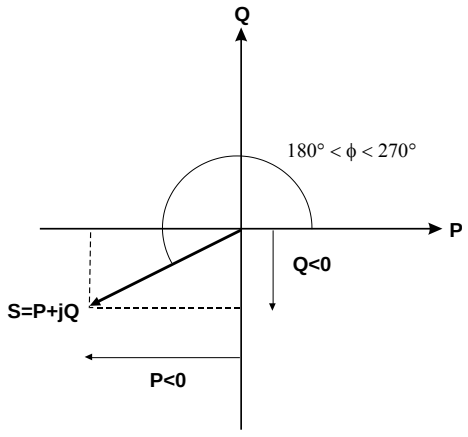
S = apparent power
P = active power = VIcosϕ
Q = reactive power = VIsenϕ
ϕ = the phase angle by which I lags V



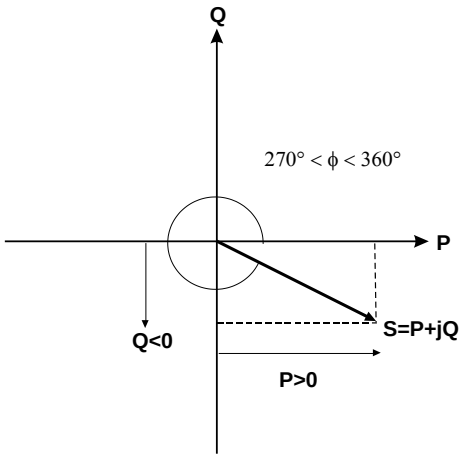
Power factor lagging
P (Watt): is being absorbed by the load.
Q (Var): is being absorbed by the load.



Power factor leading
P (Watt): is being supplied by the load.
Q (Var): is being absorbed by the load.



Power factor lagging
P (Watt): is being supplied by the load.
Q (Var): is being supplied by the load.



Power factor leading
P (Watt): is being absorbed by the load.
Q (Var): is being supplied by the load.

POSITIVE KW
RELAY: NONE

RANGE: ..... NONE; ALARM; AUX. 1; AUX. 2
Positive real power condition can be associated with the activation of the ALARM; AUX 1; AUX 2 contact or disabled.
***NONE**: ..... disabling;*

- *If **NONE** is selected, by pressing the **LINE** Key, **NEGATIVE KW** will be displayed.*

POSITIVE KW
LEVEL: 10000 KW

RANGE: ..... 10 ÷ 10000 kW, STEPS:..... 10 kW
RANGE: ..... 10000 ÷ 100000 kW, STEPS:..... 100 kW
RANGE: ..... 100000 ÷ 650000 kW, STEPS:..... 1000 kW
Enter the positive real power intervention value.

POSITIVE KW
DELAY: 10.0 SEC

RANGE: ..... 0.5 s ÷ 600.0 s
STEPS: ..... 0.5 s
If:
1. *positive real power ≥ **POSITIVE kW LEVEL** setpoint value,*
2. *this condition remains in this way for the time delay programmed in this setpoint,*

⇒ *an excess positive real power condition will occur.*

NEGATIVE KW
RELAY: NONE

RANGE: ..... NONE; ALARM; AUX. 1; AUX. 2
Negative real power condition can be associated with the activation of the ALARM; AUX 1; AUX 2 contact or disabled.
***NONE**: ..... disabling;*

- *If **NONE** is selected,by pressing the **LINE** Key, **POSITIVE kvar RELAY: NONE** will be displayed.*

NEGATIVE KW
LEVEL: 10000 KW

RANGE: ..... 10 ÷ 10000 kW, STEPS:..... 10 kW
RANGE: ..... 10000 ÷ 100000 kW, STEPS:..... 100 kW
RANGE: ..... 100000 ÷ 650000 kW, STEPS:..... 1000 kW
Enter the negative real power intervention value.

NEGATIVE KW
DELAY: 10.0 SEC

RANGE: ..... 0.5 s ÷ 600.0 s
STEPS: ..... 0.5 s
If:
1. *|negative real power| ≥ |**NEGATIVE kW LEVEL**| setpoint value,*
2. *this condition remains in this way for the time delay programmed in this setpoint,*

⇒ *an excess negative real power condition will occur.*

POSITIVE KVAR
RELAY: NONE

RANGE: ..... NONE; ALARM; AUX. 1; AUX. 2
Positive reactive power condition can be associated with the activation of the ALARM; AUX 1; AUX 2 contact or disabled.
***NONE**: ..... disabling;*

- *If **NONE** is selected, by pressing the **LINE** Key, **NEGATIVE KW** will be displayed.*

POSITIVE KVAR
LEVEL: 10000 KVAR

RANGE: ..... 10÷10000 kvar, STEPS:..... 10 kvar
RANGE: ..... 10000÷100000 kvar, STEPS:..... 100 kvar
RANGE: ..... 100000÷650000 kvar, STEPS:..... 1000 kvar
Enter the positive reactive power intervention value.

POSITIVE KVAR
DELAY: 10.0 SEC

RANGE: ..... 0.5 s ÷ 600.0 s
STEPS: ..... 0.5 s
If:
1. *positive reactive power ≥ **POSITIVE kvar LEVEL** setpoint value,*
2. *this condition remains in this way for the time delay programmed in this setpoint,*

⇒ *an excess positive reactive power condition will occur.*

NEGATIVE KVAR RELAY: NONE

RANGE: ..... NONE; ALARM; AUX. 1; AUX. 2
Negative reactive power condition can be associated with the activation of the ALARM; AUX 1; AUX 2 contact or disabled.
***NONE**: disabling;*

- *If **NONE** is selected, by pressing the **LINE** Key, **END OF PAGE POWER PROTECTION** will be displayed.*

NEGATIVE KVAR LEVEL: 10000 KVAR

RANGE: ..... 10÷10000 kvar, STEPS: ..... 10 kvar
RANGE: ..... 10000÷100000 kvar, STEPS: ..... 100 kvar
RANGE: ..... 100000÷650000 kvar, STEPS: ..... 1000 kvar
Enter the negative reactive power intervention value.

NEGATIVE KVAR DELAY: 10.0 SEC

RANGE: ..... 0.5 s ÷ 600.0 s
STEPS: ..... 0.5 s
If:

1. *|negative reactive power| ≥ |**NEGATIVE kvar LEVEL**| setpoint value,*
2. *this condition remains in this way for the time delay programmed in this setpoint,*

⇒ *an excess negative reactive power condition will occur.*

END OF PAGE POWER PROTECTION

Last LINE of PAGE 10.
*Press **LINE** key or ▲**PAGE** key: the first Line of PAGE 11 will be displayed.*

4.11 Setpoint page 11: POWER FACTOR

SETPOINT PAGE 11 POWER FACTOR

You can enter the setpoints which determine the power factor protections.

- *If **NONE** has been selected in **VT CONNECTION** [→ SETPOINT PAGE 2], by pressing the **LINE** Key, **END OF PAGE POWER FACTOR** will be displayed.*

Power factor
It is generally desirable for a system operator to maintain the power factor as close as possible to unity to minimize both costs and voltage excursions. Since the power factor is variable on common non-dedicated circuits, it is advantageous to compensate for low (lagging) power factor values by connecting a capacitor bank to the circuit when required. The relay allows two stages of capacitance switching for power factor compensation.

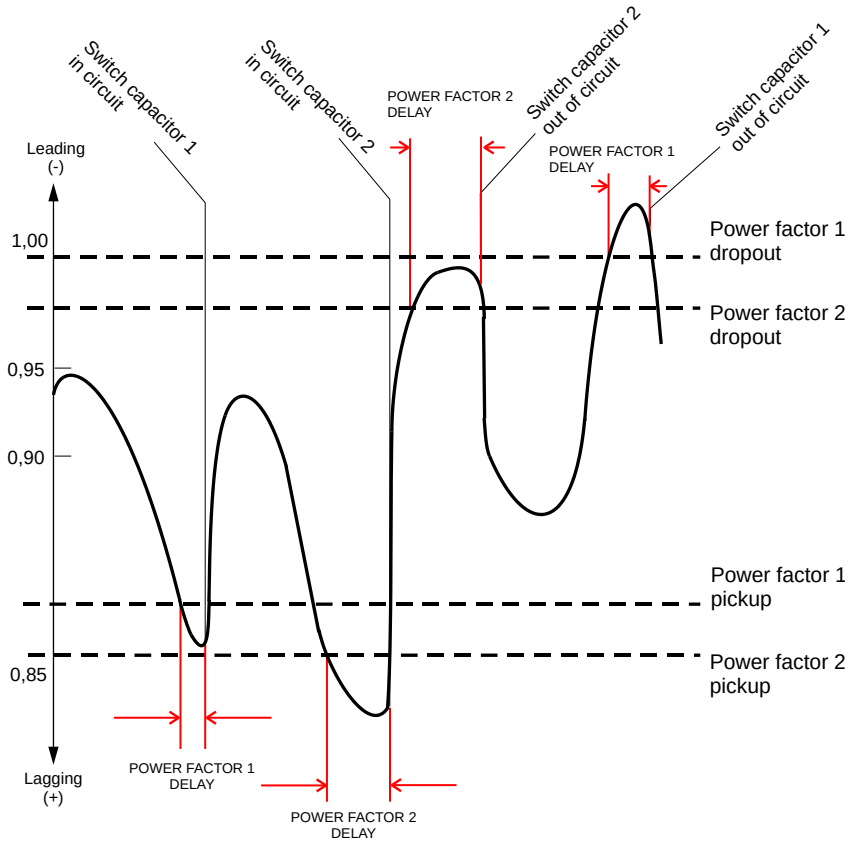
Two independent elements are available for monitoring power factor, POWER FACTOR LEVEL 1 and POWER FACTOR LEVEL 2, each having a pickup level and a dropout level.

Power factor < Pickup level ⇒ *For each element, when the measured power factor becomes more lagging than the pickup level, the relay will operate an user-selected output contact. This output can be used to control a switching device which connects capacitance to the circuit, or to signal an alarm to the system operator.*

When the power factor becomes less lagging than the power factor dropout level, namely:

Power factor > Dropout level ⇒ *the relay will reset the output contact to the "non-operated" status.*

Both power factor 1 and 2 features are inhibited from operating unless of 3 voltages are above 20% of nominal value and one or more currents are above 0.
Power factor 1 and 2 delay timers will only be enabled to time when the 20% threshold is exceeded on all phases and the power factor remains outside the programmed pickup and dropout levels.
In the same way, when the three phase voltages fall below the 20% nominal value.



P.F. LEADING 1 RELAY:NONE

RANGE: ..... NONE; ALARM; AUX. 1; AUX. 2

Power factor leading – level 1 condition can be associated with the activation of the ALARM; AUX 1; AUX 2 contact or disabled.

***NONE**: ..... disabling;*

- *If **NONE** is selected, by pressing the **LINE** Key, **P.F. LAGGING 1 RELAY: NONE** will be displayed.*

P.F. LEADING 1 PICKUP: 0.92

RANGE: .....0.05 ÷ 1.00

STEPS: 0.01

Enter the power factor leading - level 1 intervention value.

P.F. LEADING 1 DROPOUT: 0.02

RANGE: .....0.01 ÷ 1.00

STEPS: 0.01

It allows to enter the power factor leading – level 1 dropout level in relation to the intervention value.

P.F. LEADING 1 DELAY:10.0 SEC

RANGE: ..... 0.5 s ÷ 600.0 s

STEPS: .....0.5 s

If:

1. *power factor ≤ **P.F. LEADING 1 PICKUP** setpoint value,*
2. *this condition remains in this way for the time programmed in this setpoint,*

⇒ *the power factor leading – level 1 condition will occur.*

P.F. LAGGING 1 RELAY: NONE

RANGE: .....NONE; ALARM; AUX. 1; AUX. 2

Power factor lagging – level 1 condition can be associated with the activation of the ALARM; AUX 1; AUX 2 contact or disabled.

***NONE**: ..... disabling;*

- *If **NONE** is selected, by pressing the **LINE** Key, **P.F. LEADING 2 RELAY: NONE** will be displayed.*

P.F. LAGGING 1 PICKUP: 0.92

RANGE: .....0.05 ÷ 1.00

STEPS: 0.01

Enter the power factor lagging – level 1 intervention value.

P.F. LAGGING 1
DROPOUT: 0.02

RANGE: ..... 0.01 ÷ 1.00
STEPS: 0.01
It allows to enter the power factor lagging – level 1 dropout level in relation to the intervention value.

P.F. LAGGING 1
DELAY: 10.0 SEC

RANGE: ..... 0.5 s ÷ 600.0 s
STEPS: ..... 0.5 s
If:
1. *power factor ≤* ***P.F. LAGGING 1 PICKUP*** *setpoint value,*
2. *this condition remains in this way for the time programmed in this setpoint*,

⇒ *the power factor lagging - level 1 condition will occur.*

P.F. LEADING 2
RELAY:NONE

RANGE: ..... NONE; ALARM; AUX. 1; AUX. 2
Power factor leading – level 2 condition can be associated with the activation of the ALARM; AUX 1; AUX 2 contact or disabled.
NONE*: ..... disabling;*

- *If* ***NONE*** *is selected, by pressing the* ***LINE*** *Key,* ***P.F. LAGGING 2 RELAY: NONE*** *will be displayed.*

P.F. LEADING 2
PICKUP: 0.92

RANGE: ..... 0.05 ÷ 1.00
STEPS: 0.01
Enter the power factor leading – level 2 intervention value.

P.F. LEADING 2
DROPOUT: 0.02

RANGE: ..... 0.01 ÷ 1.00
STEPS: 0.01
It allows to enter the power factor leading – level 2 dropout level in relation to the intervention value.

P.F. LEADING 2
DELAY:10.0 SEC

RANGE: ..... 0.5 s ÷ 600.0 s
STEPS: ..... 0.5 s
If:
1. *power factor ≤* ***P.F. LEADING 2 PICKUP*** *setpoint value,*
2. *this condition remains in this way for the time delay programmed in this setpoint,*

⇒ *the power factor leading – level 2 condition will occur.*

P.F. LAGGING 2
RELAY: NONE

RANGE: ..... NONE; ALARM; AUX. 1; AUX. 2
Power factor lagging – level 2 condition can be associated with the activation of the ALARM; AUX 1; AUX 2 contact or disabled.
NONE*: disabling;*

- *If* ***NONE*** *is selected, by pressing the* ***LINE*** *Key,* ***END OF PAGE POWER FACTOR*** *will be displayed.*

P.F. LAGGING 2
PICKUP: 0.92

RANGE: ..... 0.05 ÷ 1.00
STEPS: 0.01
Enter the power factor lagging – level 2 intervention value.

P.F. LAGGING 2
DROPOUT: 0.02

RANGE: ..... 0.01 ÷ 1.00
STEPS: 0.01
It allows to enter the power factor lagging - level 2 dropout level in relation to the intervention value.

P.F. LAGGING 2
DELAY: 10.0 SEC

RANGE: ..... 0.5 s ÷ 600.0 s
STEPS: ..... 0.5 s
If:
1. *power factor ≤* ***P.F. LAGGING 2 PICKUP*** *setpoint value,*
2. *this condition remains in this way for the time delay programmed in this setpoint,*

⇒ *the power factor lagging - level 2 condition will occur.*

END OF PAGE
POWER FACTOR

Last LINE of PAGE 11.
Press ***LINE*** *key or ▲****PAGE*** *key****:*** *the first Line of PAGE 12 will be displayed.*

4.12 Setpoint page 12: DEMAND PROTECT.

SETPOINT PAGE 12
DEMAND PROTECT.

You can enter the setpoint which set up the demand metering functions of:
1. *current demand phase and ground*
2. *three-phase demand for real, reactive and apparent power.*

Demand time period
Once DEMAND PERIOD, or PHASE CT RATING PRIMARY [→ SETPOINT PAGE 2], or VT PRIMARY and SECONDARY, etc., has been set up, the relay will begin sampling kWs, kvars, kVA and current every 5 seconds.

Demand calculation
*The Current and Voltage Demands are calculated on the basis of the values read in the related time intervals which are set in **DEMAND TIME PERIOD**. This method calculates a linear average of the RMS current, the real power, the reactive power or the apparent power over the programmed demand time period. Each new value of demand becomes available at the end of each time period.*

$$\bar{M} = \frac{\int_{t_1}^{t_2} f(t)dt}{t_2 - t_1}$$ *Demand calculation in [t_1; t_2]*

AMPS DEMAND TIME PERIOD 5 MIN

RANGE: ..... 5 ÷ 60 min
STEPS: ..... 1 min
You can specify AMPS Demand Time Period. This value is essentially the number of RMS current values used to determine the current demand.

Ph-A AMPS DEMAND RELAY: NONE

RANGE: ..... NONE; ALARM; AUX. 1; AUX. 2
Phase A current demand condition can be associated with the activation of the ALARM; AUX 1; AUX 2 contact or disabled.
***NONE**: disabling;*

- *If **NONE** is selected, by pressing the **LINE** Key, **Ph-B AMPS DEMAND RELAY** will be displayed.*

Ph-A AMPS DEMAND LEVEL 110% CT

RANGE: ..... 2% ÷ 500%
STEPS: 1%
Enter the phase A current demand intervention value.

Ph-B AMPS DEMAND RELAY: NONE

RANGE: ..... 2% ÷ 500%
STEPS: 1%
Phase B current demand condition can be associated with the activation of the ALARM; AUX 1; AUX 2 contact or disabled.
***NONE**: disabling;*

- *If **NONE** is selcted, by pressing the **LINE** Key, **Ph-C AMPS DEMAND RELAY** will be displayed.*

Ph-B AMPS DEMAND LEVEL 110% CT

RANGE: ..... 2% ÷ 500%
STEPS: 1%
Enter the phase B current demand intervention value.

Ph-C AMPS DEMAND RELAY: NONE

RANGE: ..... NONE; ALARM; AUX. 1; AUX. 2
Phase C current demand condition can be associated with the activation of the ALARM; AUX 1; AUX 2 contact or disabled.
***NONE**: disabling;*

- *If **NONE** is selected, by pressing the **LINE** Key, **Gnd AMPS DEMAND RELAY** will be displayed.*

Ph-C AMPS DEMAND LEVEL 110% CT

RANGE: ..... 2% ÷ 500%
STEPS: 1%
Enter the phase C current demand intervention value.

Gnd AMPS DEMAND RELAY: NONE	RANGE: ..... NONE; ALARM; AUX. 1; AUX. 2 *Ground current demand condition can be associated with the activation of the ALARM; AUX 1; AUX 2 contact or disabled.* ***NONE**: disabling;* • *If **NONE** is selected, by pressing the **LINE** Key, **POWER DEMAND T. PERIOD** will be displayed.*
Gnd AMPS DEMAND LEVEL 20% CT	RANGE: ..... 2% ÷ 500% STEPS: ..... 1% *Enter the ground current demand intervention value.*
POWER DEMAND T. PERIOD 5 MIN	RANGE: ..... 5 ÷ 60 min STEPS: ..... 1 min *You can specify kW Demand time period.*
KW DEMAND RELAY: NONE	RANGE: ..... NONE; ALARM; AUX. 1; AUX. 2 *Real power demand condition can be associated with the activation of the ALARM; AUX 1; AUX 2 contact or disabled.* ***NONE**: disabling;* • *If **NONE** is selected, by pressing the **LINE** Key, **KVAR DEMAND RELAY** will be displayed.*
KW DEMAND LEVEL: 10000 KW	RANGE: ..... 10÷10000 kW, STEPS: ..... 10 kW RANGE: ..... 10000÷100000 kW, STEPS: ..... 100 kW RANGE: ..... 100000÷650000 kW, STEPS: ..... 1000 kW *Enter the real power demand intervention value.*
KVAR DEMAND RELAY: NONE	RANGE: ..... NONE; ALARM; AUX. 1; AUX. 2 *Reactive power demand condition can be associated with the activation of the ALARM; AUX 1; AUX 2 contact or disabled.* ***NONE**: disabling;* • *If **NONE** is selected, by pressing the **LINE** Key, **END OF PAGE DEMAND PROTECT** will be displayed.*
KVAR DEMAND LEVEL: 10000 KVAR	RANGE: ..... 10÷10000 kvar, STEPS: ..... 10 kvar RANGE: ..... 10000÷100000 kvar, STEPS: ..... 100 kvar RANGE: ..... 100000÷650000 kvar, STEPS: ..... 1000 kvar *Enter the reactive power demand intervention value.*
KVA DEMAND RELAY: NONE	RANGE: ..... NONE; ALARM; AUX. 1; AUX. 2 *Apparent power demand condition can be associated with the activation of the ALARM; AUX 1; AUX 2 contact or disabled.* ***NONE**: ..... disabling;* • *If **NONE** is selected, by pressing the **LINE** Key, **END OF PAGE DEMAND PROTECT** will be displayed.*
KVA DEMAND LEVEL: 10000 KVAR	RANGE: ..... 10÷10000 kVA, STEPS: ..... 10 kVA RANGE: ..... 10000÷100000 kVA, STEPS: ..... 100 kVA RANGE: ..... 100000÷650000 kVA, STEPS: ..... 1000 kVA *Enter the apparent power demand intervention value.*
END OF PAGE DEMAND PROTECT.	*Last LINE of PAGE 12.* *Press **LINE** key or ▲**PAGE** key**:** the first Line of PAGE 13 will be displayed.*

4.13 Setpoint page 13: THD PROTECTION

SETPOINT PAGE 13
THD PROTECTION.

You can enter the setpoints which determine the current and voltage THD protections.

CURRENT THD
RELAY: NONE

RANGE: ..... NONE; ALARM; AUX. 1; AUX. 2
Current THD condition can be associated with the activation of the ALARM; AUX 1; AUX 2 contact or disabled.

- *If **NONE** is selected, by pressing the **LINE** Key, **VOLTAGE THD RELAY** will be displayed.*

CURRENT THD
LEVEL 2.0% CT

RANGE: ..... 0.5% ÷ 100%
STEPS: 0.5%
Enter the phase or ground current THD distortion intervention value.

CURRENT THD
DELAY: 20.0 SEC

RANGE: ..... 0.5 s ÷ 600.0 s
STEPS: ..... 0.5 s
If:

1. *maximum phase or ground current THD ≥ **CURRENT THD LEVEL** setpoint value,*
2. *this condition remains in this way for the time delay programmed in this setpoint,*

⇒ *a current THD condition will occur.*

VOLTAGE THD
RELAY: NONE

RANGE: ..... NONE; ALARM; AUX. 1; AUX. 2
Voltage THD demand condition can be associated with the activation of the ALARM; AUX 1; AUX 2 contact or disabled.

- *If **NONE** is selected, by pressing the **LINE** Key: **END OF PAGE THD PROTECTION** will be displayed.*

VOLTAGE THD
LEVEL 1.0% CT

RANGE: ..... 0.5% ÷ 100%
STEPS: 0.5%
Enter the voltage THD distortion intervention value.

VOLTAGE THD
DELAY: 10.0 SEC

RANGE: ..... 0.5 s ÷ 600.0 s
STEPS: ..... 0.5 s
If:

1. *maximum phase voltage THD ≥ **VOLTAGE THD LEVEL** setpoint value,*
2. *this condition remains in this way for the time delay programmed in this setpoint,*

⇒ *a voltage THD condition will occur.*

END OF PAGE
THD PROTECTION

Last LINE of PAGE 13.
*Press **LINE** key or **▲PAGE** key**:** the first Line of PAGE 14 will be displayed.*

4.14 Setpoint page 14: PULSE COUNTER

SETPOINT PAGE 14
PULSE COUNTER

You can enter the setpoints which determine the pulse counter protections.

PULSE COUNTER
RELAY: NONE

RANGE: ..... NONE; ALARM; AUX. 1; AUX. 2
Any of the EVAR's switch inputs can be assigned to count pulse inputs.

- *If **NONE** is selected,by pressing the **LINE** key, **END OF PAGE PULSE COUNTER** will be displayed.*

PULSE COUNTER
LEVEL 65000

RANGE: ..... 1 ÷ 65000
STEPS: 1
Enter the number of pulses counted to close the associated contact.

PULSE COUNTER DELAY: 30.0 SEC	RANGE: ..... 0.5 s ÷ 600.0 s STEPS: ..... 0.5 s *You can use this setpoint to set a time delay between when a programmed number of pulses has occurred and when an output relay is energized.*
END OF PAGE **PULSE COUNTER**	*Last LINE of PAGE 14.* *Press **LINE** key or ▲**PAGE** key: the first Line of PAGE 15 will be displayed.*

4.15 Setpoint page 15: EVENT RECORDER

SETPOINT **EVENT RECORDER**	*You can enable/disable the recording of selected events. All events, up to 20 max., will be stored in a memory buffer operating in FIFO (First-In, First-Out) mode. Once 20 events are stored, the oldest event is cleared by the new one occurred.*
SWITCH INPUTS EVENTS: OFF	RANGE: ..... ON; OFF *It enables/disables Switch Inputs Events Recording.*
CURRENT PROTECT. EVENTS: OFF	RANGE: ..... ON; OFF *It enables/disables Current Protection Events Recording.*
VOLTAGE PROTECT. EVENTS: OFF	RANGE: ..... ON; OFF *It enables/disables Voltage Protection Events Recording.*
UNBALANCE PROT. EVENTS: OFF	RANGE: ..... ON; OFF *It enables/disables Unbalance Protection Events Recording.*
FREQUENCY PROT. EVENTS: OFF	RANGE: ..... ON; OFF *It enables/disables Frequency Protection Events Recording.*
POWER PROT. EVENTS: OFF	RANGE: ..... ON; OFF *It enables/disables Power Protection Events Recording.*
POWER FACTOR EVENTS: OFF	RANGE: ..... ON; OFF *It enables/disables Power Factor Events Recording.*
DEMAND PROTECT. EVENTS: OFF	RANGE: ..... ON; OFF *It enables/disables Demand Protection Events Recording.*
THD PROTECTION EVENTS: OFF	RANGE: ..... ON; OFF *It enables/disables THD Protection Events Recording.*
PULSE COUNTER EVENTS: OFF	RANGE: ..... ON; OFF *It enables/disables Pulse Counter Events Recording.*
OUTPUT RELAYS EVENTS: OFF	RANGE: ..... ON; OFF *It enables/disables Output Relay Events Recording.*
END OF PAGE **EVENT RECORDER**	*Last LINE of PAGE 15.* *Press **LINE** key or ▲**PAGE** key: the first Line of PAGE 16 will be displayed.*

4.16 Setpoint page 16: COMMUNICATIONS

SETPOINT PAGE 16 COMMUNICATIONS	*This page contains setpoints controlling the EVAR communications with other devices.*
MODBUS ADDRESS 1	*Enter the logic address.*
COM1 RS-232 BAUDRATE 9600	RANGE: ..... 1200; 2400; 4800; 9600; 19200; 38400; 57600 *(Do not change this value in Ethernet model)*
COM2 RS-485 BAUDRATE 9600	RANGE: 1200; 2400; 4800; 9600; 19200; 38400; 57600
COM3 RS-485 BAUDRATE 9600	RANGE: 1200; 2400; 4800; 9600; 19200; 38400; 57600
END OF PAGE COMMUNICATIONS	*Last LINE of PAGE 16.* *Press **LINE** key or ▲**PAGE** key: the first Line of PAGE 17 will be displayed.*

4.17 Setpoint page 17: CALIBRATION MODE

SETPOINT PAGE 17 CALIBRATION MODE	*You can test the operation of the switch inputs and the output contacts.*
RELAYS TEST NONE	RANGE: ..... NONE; ALARM; AUX. 1; AUX. 2; SERVICE; ALL *You can test the operation of the contacts. Carry out the following steps.* *1 – Select the contact and test it by using the VALUE keys. (ALL – all contacts)* *2 – Press STORE to carry out the test.* *3 – Press RESET to stop the test.*
INPUT SWITCH 1 STATUS OPEN	RANGE: ..... OPEN; CLOSED *It allows to display the switch input SW1 status.*
INPUT SWITCH 2 STATUS OPEN	RANGE: ..... OPEN; CLOSED *It allows to display the switch input SW2 status.*
INPUT SWITCH 3 STATUS OPEN	RANGE: ..... OPEN; CLOSED *It allows to display the switch input SW3 status.*
INPUT SWITCH 4 STATUS OPEN	RANGE: ..... OPEN; CLOSED *It allows to display the switch input SW4 status.*
END OF PAGE CALIBRATION MODE	*Last LINE of PAGE 17.*

5. Menu "ACTUAL VALUES"

5.1 Actual values 1: CURRENT

ACTUAL VALUES 1 CURRENT	*This page gives information on the system phase and ground currents being monitored by the EVAR relay.*
A: 0.00 B: 0.00 C: 0.00 Amp	*It displays the RMS value of phase A, B and C phase currents.* *This message will only be displayed if **2 or 3 CTs** has been selected in **PHASE CTs WIRING** [→ **SETPOINT PAGE 2**].*
AVERAGE CURRENT 0.00 Amp	*It displays the average of the three phase current.* *This message will only be displayed if **2 or 3 CTs** has been selected in **PHASE CTs WIRING** [→ **SETPOINT PAGE 2**].*
CURRENT UNBALAN. 0.0 %	*It displays the current unbalance of the three phase A, B and C.* *This message will only be displayed if **2 or 3 CTs** has been selected in **PHASE CTs WIRING** [→ **SETPOINT PAGE 2**].*
GROUND CURRENT 0.00 Amp	*It displays the ground RMS current.*
ACTUAL VALUES 1 END OF PAGE	*Last LINE of PAGE 1.* *Press **LINE** key or ▲**PAGE** key: the first Line of PAGE 2 will be displayed.*

5.2 Actual values 2: VOLTAGE/FREQ.

ACTUAL VALUES 2 VOLTAGE/FREQ.	*This page gives values of the voltage and frequency of the three phase system being monitored by the EVAR.*
VOLTAGE / FREQ. SEQUENCE A-B-C	RANGE:..... NO SEQUENCE; SEQUENCE A-B-C *It displays the phase sequence of VT voltages.*
AN: 0.0 BN: 0.0 CN: 0.0 Volts	*It displays the RMS value of phase A-N, B-N and C-N voltages.*
AB: 0.0 BC: 0.0 CA: 0.0 Volts	*it displays the RMS value of the A-B, B-C and C-A voltages.*
SYSTEM FREQUENCY 0.00 Hz	*It displays the system frequency value (Hz). EVAR calculates frequency from VT input (A-N voltage)*
LINE VOLTAGE AVG 0.0 Volts	*It displays the average of the three line voltages.*
VOLTS UNBALANCE 0.0 %	*It displays the voltage unbalance.*
ACTUAL VALUES 2 END OF PAGE	*Last LINE of PAGE 2.* *Press **LINE** key or ▲**PAGE** key: the first Line of PAGE 3 will be displayed.*

5.3 Actual values 3: POWER

ACTUAL VALUES 3 POWER

It displays the values of:
- *total RMS three phase real power as well as the individual phase real power (only for WYE system);*
- *total RMS three phase reactive power as well as the individual phase reactive power (only for WYE system);*
- *total RMS three phase apparent power as well as the individual phase apparent power (only for WYE system);*
- *three phase power factor as well as the individual phase power factor (only for WYE system).*

REAL POWER
0.00 KW

It displays the total RMS three phase real power.

REACTIVE POWER
0.00 KVAR

It displays the total RMS three phase reactive power.

APPARENT POWER
0.0 KVA

It displays the total RMS three phase apparent power.

POWER FACTOR
V=0 AND/OR I=0

RANGE: .....LAGGING 0.00 ÷ LEADING 0.00; V=0 AND/OR I=0
V=0 AND/OR I=0 is only displayed if the three-phase currents and/or the three-phase voltages to neutral phase one are zero.

The following will be displayed only if **WYE** has been selected in **VT CONNECTION** [→**SETPOINT PAGE 2**].

Phase A
0.00 KW

It displays the individual phase A real power.

Phase A
0.00 KVAR

It displays the individual phase A reactive power.

Phase A
0.00 KVA

It displays the individual phase A apparent power.

Phase A P.F
V=0 AND/OR I=0

RANGE: .....LAGGING 0.00 ÷ LEADING 0.00; V=0 AND/OR I=0
It displays the individual phase A power factor.

Phase B
0.00 KW

It displays the individual phase B real power.

Phase B
0.00 KVAR

It displays the individual phase B reactive power.

Phase B
0.00 KVA

It displays the individual phase B apparent power.

Phase B P.F
V=0 AND/OR I=0

RANGE: .....LAGGING 0.00 ÷ LEADING 0.00; V=0 AND/OR I=0
It displays the individual phase B power factor.

Phase C
0.00 KW

It displays the individual phase C real power.

Phase C
0.00 KVAR

It displays the individual phase C reactive power.

Phase C
0.00 KVA

It displays the individual phase C apparent power.

Phase C P.F V=0 AND/OR I=0	RANGE:..... LAGGING 0.00 ÷ LEADING 0.00; V=0 AND/OR I=0 *It displays the individual phase C power factor.*
ACTUAL VALUES 3 **END OF PAGE**	*Last LINE of PAGE 3.* *Press **LINE** key or ▲**PAGE** key, the first Line of PAGE 4 will be displayed.*

5.4 Actual values 4: ENERGY

ACTUAL VALUES 4 **ENERGY**	*It displays the value of:* *- positive and negative kWh;* *- positive and negative kvarh.*

The following setpoints will be only displayed if **NONE** has not been selected in **VT CONNECTION** [→**SETPOINT PAGE 2**].

POS REAL ENERGY 0 Kwh	*It displays the positive real energy (in Wh, kWh or MWh) starting from the latest energy data clearing.*
NEG REAL ENERGY 0 Kwh	*It displays the negative real energy (in Wh, kWh or MWh) starting from the latest energy data clearing.*
POS REACT ENERGY 0 Kvrh	*It displays the positive reactive energy (in varh, kvarh or Mvarh) starting from the latest energy data clearing.*
NEG REACT ENERGY 0 Kvrh	*It displays the negative reactive energy (in varh, kvarh or Mvarh) starting from the latest energy data clearing.*
LAST ENERGY CLR. Date & Time	**STORE** ..... Mar 9, 2000 22:01:00.0 *It displays date and time of the latest data clearing.*
CLEAR ALL ENERGY VALUES? NO	*It allows to clear the stored energy data. After having selected YES by the ▲ **VALUE** key, press the **STORE** key to enter the access code and to confirm clearing.*
ACTUAL VALUE 4 **END OF PAGE**	*Last LINE of PAGE 4.* *Press **LINE** key or ▲**PAGE** key: the first Line of PAGE 5 will be displayed.*

5.5 Actual values 5: DEMAND

ACTUAL VALUE 5 DEMAND	*You can read the demand of currents and powers.*
PHASE A CURRENT DEMAND 0.00 A	*It displays the phase A current demand.*
PHASE B CURRENT DEMAND 0.00 A	*It displays the phase B current demand.*
PHASE C CURRENT DEMAND 0.00 A	*It displays the phase C current demand.*
GROUND CURRENT DEMAND 0.00 A	*It displays the ground current demand.*
PHASE A CURRENT MAX DMD 0.00 A	*It displays the maximum demand reached by phase A current. Press STORE to display date and time of the maximum demand.* **STORE** ..... Mar 9, 2000 22:01:00.0
PHASE B CURRENT MAX DMD 0.00 A	*It displays the maximum demand reached by phase B current. Press STORE to display date and time of the maximum demand.*
PHASE C CURRENT MAX DMD 0.00 A	*It displays the maximum demand reached by phase C current. Press STORE to display date and time of the maximum demand.*
GROUND CURRENT MAX DMD 0.00 A	*It displays the maximum demand reached by ground current. Press STORE to display date and time of the maximum demand.*
CLEAR CURR. DMD VALUE? NO	*You can clear the data of the maximum demand reached by currents.*
REAL POWER DEMAND 0.00 KW	*It displays the real power demand.*
REACTIVE POWER DEMAND 0.00 KVR	*It displays the reactive power demand.*
APPARENT POWER DEMAND 0.00 KVA	*It displays the apparent power demand.*
REAL POWER MAX DMD 0.00 KW	*It displays the maximum demand reached by real power. Press STORE to display date and time of the maximum demand.* **STORE** ..... Mar 9, 2000 22:01:00.0
REACTIVE POWER MAX DMD 0.00 KVR	*It displays the maximum demand reached by reactive power. Press STORE to display date and time of the maximum demand.*
APPARENT POWER MAX DMD 0.00 KVA	*It displays the maximum demand reached by apparent power. Press STORE to display date and time of the maximum demand.*
CLEAR POWER DMD VALUE? NO	*You can clear the data of the maximum demand reached by powers.*
ACTUAL VALUES 5 END OF PAGE	*Last LINE of PAGE 5.* *Press **LINE** key or ▲**PAGE** key: the first Line of PAGE 6 will be displayed.*

5.6 Actual values 6: EVAR STATUS

ACTUAL VALUES 6
EVAR STATUS

It displays the relay status.

ALL
ALARMS INACTIVE

It displays the alarms status.

ACTUAL VALUES 6
END OF PAGE

Last LINE of PAGE 6.
*Press **LINE** key or ▲**PAGE** key: the first Line of PAGE 7 will be displayed.*

5.7 Actual values 7: EVENTS

ACTUAL VALUES 7
EVENTS

It displays the events [→ Chapter 6 – EVENT RECORDER].

LAST EVENT
NUMBER 1

It displays the number of stored events (max. 20).

Event 1
UNDERVOLTAGE

*Press STORE to display date and time of the event. Press the **VALUE** keys to display the events.*

✓ **STORE** ..... Mar 9, 2000
22:01:00.0

LAST EVENT CLEAR
DATE & TIME

✓ **STORE** ..... Mar 9, 2000
22:01:00.0

It displays date and time of the latest clearing.

CLEAR ALL EVENTS
NO

You can clear all stored events.

ACTUAL VALUES 7
END OF PAGE

Last LINE of PAGE 7.
*Press **LINE** key or ▲**PAGE** key: the first Line of PAGE 8 will be displayed.*

5.8 Actual values 8: POWER ANALYSIS

ACTUAL VALUES 8 POWER ANALYSIS	*You can find information on the harmonics.*
A: 0.0 B: 0.0 C: 0.0 % THD AMP	*It displays the calculated THD for each current input RMS.*
GROUND CURRENT THD 0.0%	*It displays the calculated THD for ground current.*
AN: 0.0 BN: 0.0 CN: 0.0% THD V	*It displays the calculated THD for each phase voltage input.*
AB: 0.0 BC: 0.0 CA: 0.0% THD V	*It displays the calculated THD for each A-B, B-C and C-A voltage input.*
A: 0.00 B: 0.00 C: 0.00 K FACTOR	*It displays the K factor: overdimension factor due to the distortions.*
ACTUAL VALUES 8 END OF PAGE	*Last LINE of PAGE 8.* *Press **LINE** key or ▲**PAGE** key: the first Line of PAGE 9 will be displayed.*

5.9 Actual values 9: HARMONICS

ACTUAL VALUES 9 HARMONICS	*You can select the 13 harmonics related to the phase and ground current.*
Ia: 0.0 Ib: 0.0 Ic: 0.0% 1st	*It displays phase current values on the basis of the harmonic selected by the ▲**VALUE** or ▼**VALUE** keys.*
GROUND CURRENT 0.0% 1st	*It displays ground current values on the basis of the harmonic selected by the ▲**VALUE** or ▼**VALUE** keys.*
AN: 0.0 BN: 0.0 CN: 0.0 % 1st	*It displays phase voltage values on the basis of the harmonic selected by the ▲**VALUE** or ▼**VALUE** keys.*
AB: 0.0 BC: 0.0 CA: 0.0 % 1st	*It displays A-B, B-C and C-A voltage input on the basis of the harmonic selected by the ▲**VALUE** or ▼**VALUE** keys.*
ACTUAL VALUES 9 END OF PAGE	*Last LINE of PAGE 9.* *Press **LINE** key or ▲**PAGE** key: the first Line of PAGE 10 will be displayed.*

5.10 Actual values 10: PULSE COUNTER

ACTUAL VALUES 10 **PULSE COUNTER**	*It displays the information on the pulse counter monitored by the relay.*
PULSE COUNTER 0	*It displays the total number of pulses starting from the latest data clearing.*
PULSE COUNTER CLEAR? NO	*You can clear the data stored in the pulse counter.*
ACTUAL VALUES 10 **END OF PAGE**	*Last LINE of PAGE 10.* *Press **LINE** key or ▲**PAGE** key: the first Line of PAGE 11 will be displayed.*

5.11 Actual values 11: SWITCH INPUTS

ACTUAL VALUES 11 **SWITCH INPUTS**	*It displays the switch inputs status.* **CLOSED** → terminal contact status: closed. **OPEN** → terminal contact status: open.
INPUT SWITCH 1 STATUS OPEN	*It displays the status of the input switch SW1.*
INPUT SWITCH 2 STATUS OPEN	*It displays the status of the input switch SW2.*
INPUT SWITCH 3 STATUS OPEN	*It displays the status of the input switch SW3.*
INPUT SWITCH 4 STATUS OPEN	*It displays the status of the input switch SW4.*
ACTUAL VALUES 11 **END OF PAGE**	

6. Event recorder

6.1 GENERAL INFORMATION

EVAR is provided with an Event Recorder which stores the data concerning:

- Alarm conditions
- Control conditions

occurred while EVAR is operating.

All events, up to 20 max., will be stored in a memory buffer operating in FIFO (First-In, First-Out) mode. Once 20 events are stored, the oldest event is cleared by the new one occurred.

6.2 ALARM AND CONTROL EVENTS

ALARM / **CONTROL** events are generated by one of the following conditions:

- Current value > Setpoint ⇒ *Phase or Ground Overcurrent*
- Current value < Setpoint ⇒ *Phase or Ground Undercurrent*
- Phase-to-phase or Phase-to-neutral Voltage > Setpoint ⇒ *Overvoltage*
- Phase-to-phase or Phase-to-neutral Voltage < Setpoint ⇒ *Undervoltage*
- Phase reversal
- Phase unbalance ⇒ *Current or voltage deviation from setpoints*
- Frequency > Setpoint ⇒ *Overfrequency*
- Frequency < Setpoint ⇒ *Underfrequency*
- Positive or negative kW value exceeded
- Positive or negative kvar value exceeded
- Lagging power factor below setpoint
- Leading power factor below setpoint
- Demand values that exceed setpoints (current, kW, kvar, kVA)
- Current THD that exceed setpoint
- VoltageTHD that exceed setpoint
- Switch inputs

7. Troubleshooting

- **EVAR CANNOT TURN ON**
  ⇒ Check the supply voltage at terminals block 32 and 34.

- **VOLTAGES ARE NOT DISPLAYED**
  ⇒ Check the connections and fuses of voltage inputs.

- **CURRENTS ARE NOT DISPLAYED**
  ⇒ Check the CTs wiring.
  Check the terminal for short-circuiting.

- **SWITCH INPUTS MALFUNCTIONING**
  ⇒ Check for proper operating following SETPOINT PAGE 17 instructions.

- **OUTPUT RELAYS (TERMINALS no. 1 → 8) MALFUNCTIONING**
  ⇒ Check for proper operating following SETPOINT PAGE 17 instructions.

8. Warranty

ORION ITALIA warrants that the materials and the labouring of every relay produced have no faults with normal use and working conditions for a period of 12 months starting from the date of shipping from the manufacturer.

In case of fault included in the warranty conditions, ORION ITALIA takes full responsibility for repairing or replacing the product without any extra fees for the buyer. The warranty is always considered free-port until our head office in Piacenza.

The costs for the buyer are the following:

- the round-trip shipping and the repairing or the overhauling of the relay;
- the travelling expenses of the technician in charge of the repairing and the overhauling.

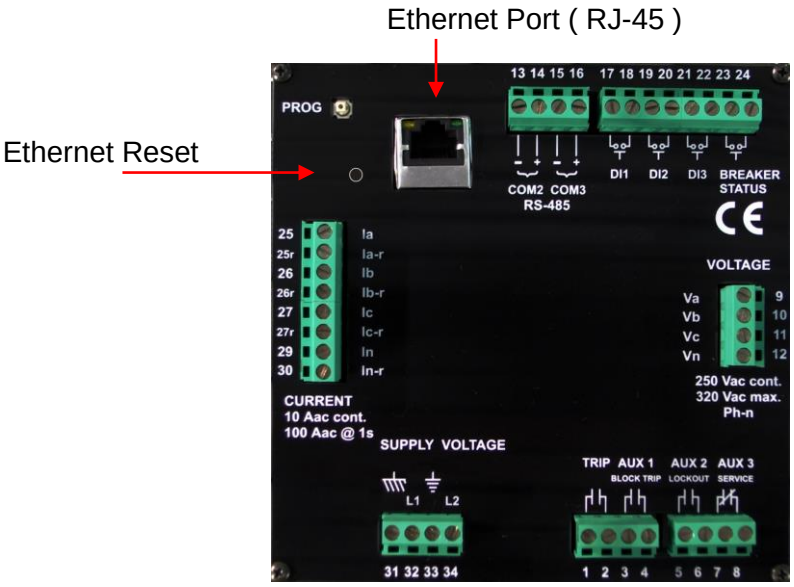
These costs are calculated on the basis of the ANIMA, Col.C. fees. In case of controversy, the place of jurisdiction is the one of Piacenza.

This warranty is not valid for any relay that has been subject to incorrect use, negligence, accidents, incorrect installation or that has not been used in accordance with the instructions, or for any relay tampered outside the factory. ORION ITALIA will not be responsible for the consequences of any damages, even indirect, for the loss of gain or for the eventual costs deriving from any malfunctioning or from any incorrect use or setting of our relays.

ORION ITALIA reserves the right to modify the relay and/or replace what is described in this manual without any previous notice.

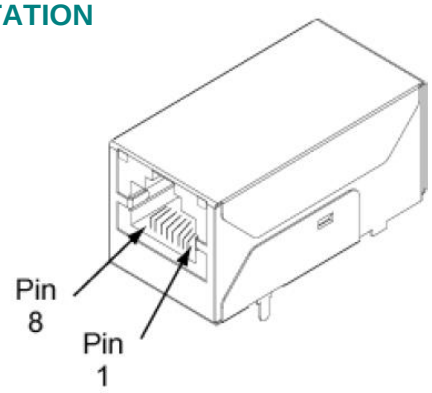
ANNEX A: ETHERNET INTERFACE
(for Ethernet version only)

A1. General information



*Note: Depending on the model, the protection relay represented in the photo could be different.

ETHERNET INTERFACE PIN ORIENTATION



Ethernet Interface Pin Assignments							
Pin 1	**Pin 2**	**Pin 3**	**Pin 4**	**Pin 5**	**Pin 6**	**Pin 7**	**Pin 8**
TXD+	TXD-	RXD+	N.U.	N.U.	RXD-	N.U.	N.U.
Transmit Data +	Transmit Data -	Receive Data +			Receive Data -		

CONNECTIONS

Use an Ethernet cable STP (cat-5 or cat-5e, shielded) with shielded RJ-45 terminal connectors. Connect the relay to an industrial Hub or Switch that guarantees the grounding of the shield.
Keep the Ethernet network away from power cables or sources that generate electromagnetic disturbances (like contactors, fluorescent lamp ballast, high power motor, circuit breaker …..).

LED DESCRIPTION

The module has two LEDs that are located near the upper corners of the Ethernet port (see the figure). The following table describes the LED operation:

LED Behaviors	
Yellow	Network link status: Off = no link has been detect On = a link has been detect
Green	Network activity: Off = the channel is idle Blinking = data is transmitted or received

Ethernet RESET

On the back panel of relay there is a small hole. By this it is possible to reach the ETHERNET RESET BUTTON.
Use this button only after following the troubleshooting paragraph of this guide.
In any case, this button do not reset to the factory defaults.

A2. Software:

All the necessary setup/configuration tools are available in a “zip” file downloadable from Orion Italia web site.
The “zip” file contains:

- cfgwiz.exe

that allows you to searching the Orion Italia protection relay on the LAN and change/set the following parameters:
IP address
Subnet Mask
Gateway
Setting of serial communication port:
Baud Rate
Data Bits
Parity
Stop Bit
Flow control

- **OI_DISCOVER.bat**

that gives you another way to search the Orion Italia protection relay on the LAN and indicate the MAC Address of each device.

- **IPchange.bat**

that gives you another way to change the IP address and the Subnet Mask of the protection relay.

A3. IP Address and Subnet Mask

The protection relay is set with a default address so the customers have to change it.
During the configuration of the IP Address of many relays on the same lan, in order to avoid address conflicts, connect only one relay at the same time and change its default IP address:
- Once connected the LAN to the protection relay by the RJ-45 connector, be sure to have the Yellow led = ON (this may require in some cases up to 20 seconds)
- Launch the “OI DISCOVER” application and verify the new relay IP address and MAC address.

- Searching for devices. Please wait...
-
- IP Address | MAC Address | Model
- ----------+----------+----------
- 192.168.1.51 | 00:40:9D:2C:2A:F9 | Digi Connect ME4
- ----------+----------+----------

- Launch the IPchange application and:
  - insert the MAC address of the relay you want to change the address and press enter (insert the MAC address without any “:”,
  - insert the IP address yyy.yyy.yyy.yyy press enter,
  - insert the Subnet Mask xxx.xxx.xxx.xxx and press Enter

If the operation has been carried out successfully, the window showed is:

- insert the MAC ADDRESS (without any ":") 00409d2d0317
- insert the IP address yyy.yyy.yyy.yyy 192.168.1.250
- insert Subnet Mask xxx.xxx.xxx.xxx 255.255.255.0 (if required)
- Digi Connect Programmer
- Version 1.2.15.0
- Copyright 2003-2004 Digi International Inc.
- Locate device 00:40:9D:2D:03:17: SUCCESS
- Device has been rebooted.
- IP address has been changed.

It is possible to change the IP address and the Subnet Mask by using the Configuration Wizard application cfgwiz.exe.

A4. Serial communication port

In order to establish a correct communication, it is necessary to configure the relay and Ethernet port as follow:

Ethernet port: Baud Rate = 9600
Data Bits = 8
Parity = None
Stop Bits = 1
Flow control = Software (or None in case of communication problems)
These settings can be set by the Configuration Wizard application cfgwiz.exe.

Protection Relay: Setpoint *COMMUNICATIONS* , line *COM1 RS-232 Baudrate* =9600

A5. Electrical Insulation

The insulation voltage of the Ethernet port is 2000 Vdc

A6. Troubleshooting

PROBLEM	SOLUTION	REFERENCE
The Yellow Led on the Ethernet port is OFF	1. Check the connection of the Ethernet cable. 2. Check the connections of RJ-45 connector according to the "Ethernet Interface pin orientation".	Chapter 1: General Information - ETHERNET INTERFACE PIN ORIENTATION
The OI_DISCOVER or the CFGWIZ application can not find the device.	1. Check the yellow LED on the Ethernet port 2. Check the addresses of each relay on the LAN in order to avoid conflict problems.	Chapter 3: IP Address and Subnet Mask
The Ethernet port seems to work properly but the Orion Italia relay does not communicate	1. Check the Serial port RS232 COM1 configuration on the Orion Italia HMI at SETPOINT "COMMUNICATIONS" 2. Check the serial communication settings of the Ethernet port by the cfgwiz.exe tools.	Chapter 4: Serial communication port
The Ethernet port stops to work after a modification of the settings or a power supply problems	1. Press the ETHERNET RESET button.	Chapter 1: General Information - RESET

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