USER'S / INSTALLER'S MANUAL

Ranges

DOVIP847(R), OVIP835(R), DOV841(R), OV830(R)

RD827, PM800, CP800

2-Pole and 4 -Pole

USER'S/INSTALLER'S MANUAL

It is essential that the user/installer fully understand the present manual prior to using the unit. Should any doubt arise, please refer to the Authorised Distributor or the Manufacturer

Published in Spain by H.T. SISTEMAS, S.L. / GIJON (PRINCIPADO DE ASTURIAS) SPAIN

1st. Edition (May 2004)

INTRODUCTION - Description and Characteristics

ORION incorporates a highly advanced and innovatory technology for protection, metering, analysis and recording, programmable, with built-in motor-drive in the module itself, maintenance-free as such and protected by user code.

An outstanding feature is the incorporation of differential protection – the most advanced in the world - with very high-speed cut-off (2mS typical); intelligent automatic reset (conditioned); automatic sequential reset in the event of MCB tripping, differential and over-intensity.

There are also power meters and high-resolution energy counters along with inviolable event recorders, counters and totalisers.

ORION provides the user with a universal protection which monitors, evaluates, warns and makes automatic decisions. This small, compact unit for 35mm DIN rail, comes sealed from origin and all ready to be installed in a standard enclosure and used in any installation or sector whatsoever. These integrated protections are totally automatic and both these and other characteristics can be extended simply by linking up to other ORION modules.

There are THREE families of products, each of which is made up of different versions, thus permitting the most suitable configuration for each application.

a) **Mains metering and analysis (7 cm module)**
b) **Protection and reclosure**
c) **All-in-one (metering, recording, protection and reclosure)**

- Description

Presentation: standard (EN 50 022) enclosure for 35mm DIN rail. This is a compact unit monitored by a 16-Bit micro-computer. Highly stable due to its built-in double process monitor (Watchdog). It withstands permanent and transient overvoltage and low voltage and is capable of protecting multiple lines, both single and three-phase of up to 63A.

The unit provides diverse measurements and protections whose value and delay can be programmed:

- ◊ Differential protection with very high-speed cut-off:
- ◊ Protection against overvoltage by means of very high-speed physical cut-off
- ◊ Protection against low voltage
- ◊ Protection against over-intensity
- ◊ Measurement :True RMS and Peak of V, I, I∆n, W, VA, VarL, VarC, Kwh, etc.

Moreover, its constant supervision at the supply input permits its automatic, intelligent (conditioned) reset, i.e. it resets solely when the power supply returns to normal.

Certain models/versions have input and output Remote Control.

- Technical characteristics (please, refer to synoptical tables for characteristics of models and versions)

Voltage measurement - Peak L1, L2, L3	0V to 1000Vpk or 0V to 500Vpk (cf. version)
Voltage measurement - True RMS L1, L2, L3	0V to 500V or 0V to 350V (cf. version)
Intensity measurement peak in autoscale	0A to 20Apk and 0A to 100Apk or 0A to 40Apk and 0A to 200Apk (cf. version)
Intensity measurement - True RMS in autoscale	0A to 7A and 0A to 70A or 0A to 14A and 0A to 140A (cf. version)
Differential intensity measurement peak	0mA to 500mApk
Differential intensity measurement - True RMS	0mA to 350mA
6 input channels with continuous high-resolution, high-speed sampling	13 Bit at 10KS/sample (10,000 samples/second) each channel
Measurement of active power (W)	Four quadrants, resolution: 0,1 W
Measurement of apparent power (VA)	Four quadrants, resolution: 0,1 VA
Measurement of reactive inductive power	Four quadrants, resolution: 0,1 VArL
Measurement of reactive capacitive power	Four quadrants, resolution: 0,1 VArC
Measurement of Power Factor	0,000 to 1
Line frequency:	10.00Hz to 99,99Hz
Active energy counter in real time	000000,00001 kWh to 999999,99999 Kwh + 9-spiral counter
Reactive energy counter in real time	000000,00001 kWh to 999999,99999 KWh + 9-spiral counter
Typical measurement precision of module in intensity	0,5 %
Typical measurement precision of module in voltage	0,5 % DOVIP847(R) OVIP835(R) (1% DOV841(R) OV830(R))
Typical measurement precision of module in differential intensity	1 %
Typical measurement precision of module in active power (W)	1 %
Typical measurement precision of module in apparent power (VA)	1 %
Typical measurement precision of module in reactive power	(1 % + 0.4)
Typical measurement precision of module: specifications	1 year ± (% measurement + 4 digits + 0,1% de S.B.)) at 22°C ± 5 °C
Protection against overvoltage programmable in value and delay Peak	350Vpk to 400Vpk and 0.3mS to 5mS
Protection against overvoltage, value and delay programmable - True RMS	245V to 275V and 20mS to 5Secs
Protection against low voltage, value and delay programmable - True RMS	175V to 200V and 20mS to 5Secs
Protection against over-intensity, value and delay programmable - True RMS	5A to 63A and 20mS to 10Secs
Protection against over-intensity, value and delay programmable Peak	7Apk to 90Apk and 0.3mS to 5mS (Can be disabled)
Protection against diff. in. I∆n, value and delay programmable Peak	7mApk to 42mApk and 0.3mS to 5mS or 70mApk to 420mApk and 0.3mS to 5mS (cf. version)
Protection against differential intensity I∆n, value and delay programmable - True RMS	5mA to 30mA and 20mS to 160mS or 50mA to 300mA and 20mS to 160mS (cf. version)

Independent resets, programmable due to Differential I	0 to 10 resets and 3 to 240 minutes each
Independent resets, programmable due to over-intensity	0 to 10 resets and 3 to 240 minutes each
Independent resets, programmable due to MCB	0 to 10 resets and 3 to 240 minutes each
Real incremental protection test: differential intensity IΔn	Yes, exact protection and cut-off value
Real incremental protection test: overvoltage	Yes, exact protection and cut-off value
Real incremental protection test: low voltage	Yes, exact protection and cut-off value
Real incremental protection test: over-intensity	Yes, exact protection and cut-off value
Autotest: differential + toroidal transformer sensor	Yes
Autotest: external wiring, internal electronic system	Yes
Chronological event counter and protections of all alarms (value, hour, minute, day, month, year)	Yes
Totaliser – counter: cut-off time due to power failure	Yes
Independent cut-off counters of all alarms + accrued and historical total	Yes
Register of alarms and their history (maximum and minimum values)	Yes

Differential protection

• **$I_{\Delta N}$ alternating 50 Hz senoidal**	IΔn, value and delay programmable (True RMS and Peak)
• **alternating 50 Hz senoidal rectified**	1,4 x IΔn RMS, for pulsing senoidal currents (rectified alternating single wave)
• **preventive cut-off**	Due to power failure
Cut-off time	2mS typical (cf. "Cut-off. Tripping times")
Mechanical endurance ORION reclosure module	100,000 complete manoeuvres (on off)
Mechanical endurance Schupa MCB	20,000 complete manoeuvres (on off)
Mechanical endurance General Electric MCB	10.,000 complete manoeuvres (on off)
Consumption	1W at 230V
Input voltage (normal system)	230V AC ± 10% 50 Hz alternating senoidal
Input voltage (abnormal system)	up to 450V eff. AC 50 Hz alternating senoidal
Transient input voltage	1 KV max. (vp) / 1 sec.
Working temperature	0 to 40° C.
Dimensions: 2-pole	128mm (7 modules) height: 81mm 35mm DIN rail
Dimensions: 4-pole	163mm (9 modules) height: 81mm 35mm DIN rail
Weight: 2-pole	900 gr.
Weight: 4-pole	1.170 gr.
Weight of toroidal **(TRIT18 o TRDF18)**	185 gr.
Guarantee	3 years
Design in accordance to norms:	EN 61008-1 (CEI 1008-1) EN 61008-2-1 (CEI 1008-2) UNE 20-383-75 UNE 20-514-89 (CEI-65) UNE 20-553-90 (CEI-348) UNE 20-600-77 (CEI-278)

EMC European Norms	89336 (electromagnetic compatibility) en process of verification
Scale Base (S.B.) Voltage:	1000 V or 500 V (cf. version)
Scale Base (S.B.) Intensity:	20A and 100A or 40A and 200A (cf. version)
Scale Base (S.B.) Differential Intensity IΔn:	500mA or 50mA (cf. version)

- Description of display panel

1 – Display: 12-character, 3-row, alphanumeric, 5x7 dot-die
2 – LED: green indicator = WORKING. Indicates that the unit is in a metering and protection process
3 - LED: red indicator = ERROR. Indicates unit has detected alarm or anomaly.
4- Square yellow buttons: varies depending on context:

Button #1 MENU - ESC
Button #2 NEXT - UP
Button #3 TEST - DOWN
Button #4 OK – RESET

- Description of module's connection terminals

◊ A CONTROL OUT	OUTPUT VERY HIGH SPEED TRIPPING COIL TERMINAL A
◊ B CONTROL OUT	OUTPUT VERY HIGH SPEED TRIPPING COIL TERMINAL B
◊ L1 POWER 230V	SUPPLY: PHASE (LINE) 230V + INPUT METERING SENSOR INPUT L1
◊ N POWER 230V	SUPPLY: NEUTRAL + INPUT METERING SENSOR INPUT N
◊ L2 INPUT 2	INPUT METERING SENSOR L2 (LINE 2) 230V
◊ N INPUT 2	INPUT METERING SENSOR N (NEUTRAL)
◊ L3 INPUT 3	INPUT METERING SENSOR L3 (LINE 3) 230V
◊ N INPUT 3	INPUT METERING SENSOR N (NEUTRAL)
◊ I SENSOR 1	INPUT 1 INTENSITY SENSOR
◊ G SENSOR 1	COMMON 1, INTENSITY SENSOR
◊ T SENSOR 1	OUTPUT 1 TEST (WHERE APPLICABLE)
◊ I SENSOR 2	INPUT 2 DIFFERENTIAL INTENSITY SENSOR
◊ G SENSOR 2	COMMON 2, SENSOR and TEST
◊ T SENSOR 2	OUTPUT 2 DIFFERENTIAL INTENSITY TEST
◊ I SENSOR 3	INPUT 3 SENSOR (WHERE APPLICABLE)
◊ G SENSOR 3	COMMON 3, SENSOR and TEST (WHERE APPLICABLE)
◊ T SENSOR 3	OUTPUT 3 TEST(WHERE APPLICABLE)
◊ 4 REMOTE IN	REMOTE CONTROL: INPUT (OPTIONAL)
◊ 3 REMOTE +	COMMON REMOTE CONTROL (OPTIONAL)
◊ 2 REMOTE OUT	REMOTE CONTROL: OUTPUT (OPTIONAL)

SINGLE-PHASE MAINS METERS AND ANALYSERS

MODEL ORION		PM		CP
VERSION		800	800-2	800
Voltage measurement - True RMS and Peak	0V to 500Vpk	•	•	
Intensity measurement - True RMS and peak in autoscale	0A to 20Apk and 0A to 100Apk	•		
Intensity measurement - True RMS and peak in autoscale	0A to 40Apk and 0A to 200Apk		•	
Differential intensity measurement - True RMS and Peak	0mA to 500mApk			
Measurement of Active (W) and apparent (VA) power	4 quadrants, resolution: 0.1W, 0,1VA	•	•	
Measurement of reactive inductive power	4 quadrants, resolution: 0.1VArL	•	•	
Measurement of reactive capacitive power	4 quadrants, resolution: 0.1VArC	•	•	
Measurement of power factor and line frequency	0.001 to 1 and 10.00Hz to 100Hz	•	•	
Active energy counter in real time	000000,00001 kWh to 999999,99999 kWh + 9-spiral counter	•	•	•
Reactive energy counter in real time	000000,00001 kWh to 999999,99999 kWh + 9-spiral counter	•	•	
Autotest external wiring, internal electronic system		•	•	•
Register of maximum measurements		•	•	
Security configuration (programming of all parameters - solely with user code)		•	•	•
Programmable True RMS mean measurement: 20mS to 1000mS		•	•	
Change of user code		•	•	
Automatic/manual display (data screens scrolled)		•	•	•
Acoustic and luminous indicator		•	•	•
Active energy counter with programmable rate calculator in Euros (0.000 € to 0.999 €/kWh) Autoescale (13 Bit at 10KS/s) Intensity 0A to 12A and 12 to 70A RMS Max				•

Continuous high-speed high-resolution sampling 13 Bit at 10KS/s 10,000 samples/s per channel

THREE-PHASE MAINS METERS AND ANALYSERS

MODEL ORION		PM	
VERSION		800T	800T2
Voltage measurement - True RMS and Peak	0V to 500Vpk L1,L2,L3 independent	•	•
Compound voltage measurement - True RMS	0V to 500V L12,L23,L31 independent	•	•
Intensity measurement - True RMS and peak	0A to 100Apk L1,L2,L3 independent	•	
Intensity measurement - True RMS and peak	0A to 200Apk L1,L2,L3 independent		•
Measurement of active power (W)	4 quadrants, resolution: 0.1W L1,L2,L3 independent	•	•
Measurement of power consumed	4 quadrants, resolution: 0.1VarL L1,L2,L3 independent	•	•
Measurement of power returned	4 quadrants, resolution: 0.1VarC L1,L2,L3 independent	•	•
Measurement of apparent power (VA)	4 quadrants, resolution: 0.1VA L1,L2,L3 independent	•	•
Measurement of reactive inductive power	4 quadrants, resolution: 0.1VarL L1,L2,L3 independent	•	•
Measurement of reactive capacitive power	4 quadrants, resolution: 0.1VarC L1,L2,L3 independent	•	•
Measurement of power factor	0.001 to 1.000 L1,L2,L3 independent	•	•
Measurement of line frequency	10.00Hz to 100Hz L1,L2,L3 independent	•	•
Sum Σ active powers (W)	4 quadrants, resolution: 0.1W L1,L2,L3	•	•
Sum Σ apparent powers (VA)	4 quadrants, resolution: 0.1VA L1,L2,L3	•	•
Sum Σ powers returned	4 quadrants, resolution: 0.1VA L1,L2,L3	•	•
Active energy counter in real time	000000,00001 kWh to 999999,99999 kWh + 9-spiral counter L1,L2,L3 independent	•	•
Reactive energy counter in real time	000000,00001 kWh to 999999,99999 kWh + 9-spiral counter L1,L2,L3 independent	•	•
Sum Σ active energy counters	000000,00001 kWh to 999999,99999 kWh + 9-spiral counter	•	•
Sum Σ reactive energy counters	000000,00001 kWh to 999999,99999 kWh + 9-spiral counter	•	•
Autotest external wiring, internal electronic system		•	•
Register of maximum measurements		•	•
Security configuration (programming of all parameters - solely with user code)		•	•
Mean measurement on-screen - programmable - 20mS to 1000mS		•	•
Change of user code		•	•
Automatic/manual display (data screens scrolled)		•	•
Acoustic and luminous indicator		•	•

Continuous high-speed high-resolution sampling 13 Bit at 5KS/s 5,000 samples/s per channel

Continuous high-speed high-resolution sampling 13 Bit at 10KS/s 10,000 samples/s per channel

SINGLE-PHASE (2-pole) PROTECTORS / METERS			WITH DIFFERENTIAL INTENSITY												NO INTENSITY	
MODEL ORION			DOVIP				DOV				RD		OVIP		OV	
VERSION			847R	847	848R	848	841R	841	842R	842	827	828	835R	835	830R	830
Voltage measurement - True RMS and Peak		0V to 1000Vpk					•	•	•	•	•	•			•	•
Voltage measurement - True RMS and Peak		0V to 500Vpk	•	•	•	•							•	•		
Intensity measurement - True RMS and peak in autoscale		0A to 20Apk and 0A to 100Apk	•	•	•	•							•	•		
Differential intensity measurement - True RMS and Peak		0mA to 500mApk	•	•	•	•	•	•	•	•	•	•				
Measurement of active (W) and apparent power (VA)		4 quadrants, resolution: 0.1W, 0,1VA	•	•	•	•							•	•		
Measurement of reactive inductive power		4 quadrants, resolution: 0.1VArL	•	•	•	•							•	•		
Measurement of reactive capacitive power		4 quadrants, resolution: 0.1VArC	•	•	•	•							•	•		
Measurement of power factor and line frequency		0.001 to 1 10.00Hz to 100Hz	•	•	•	•							•	•		
Active energy counter in real time		000000,00001 kWh to 999999,99999 kWh + 9-spiral counter	•	•	•	•							•	•		
Reactive energy counter in real time		000000,00001 kWh to 999999,99999 kWh + 9-spiral counter	•	•	•	•							•	•		
Protection due to overvoltage, value and delay programmable	True RMS Peak	245V to 275V and 20mS to 5Seg 350Vpk to 400Vpk and 0.3mS to 5mS	•	•	•	•	•	•	•	•			•	•	•	•
Protection due to low voltage, value and delay programmable	True RMS	175V to 200V and 20mS to 5Seg	•	•	•	•	•	•	•	•			•	•	•	•
Protection due to over-intensity, value and delay programmable (CAN BE DISABLED)	True RMS Peak	5A to 60A and 20mS to 10Seg 7Apk to 84Apk and 0.3mS to 5mS	•	•	•	•							•	•		
Protection due to Differential intensity IΔn, value and delay programmable	True RMS Peak	5mA to 30mA and 20mS to 160mS 7mApk to 42mApk and 0.3mS to 5mS			•	•			•	•		•				
Protection due to Differential intensity IΔn, value and delay programmable	True RMS Peak	50mA to 300mA and 20mS to 160mS 70mApk to 420mApk and 0.3mS to 5mS	•	•			•	•			•					
Independent programmable resets, due to I Differential		0 to 10 resets and 3 to 240 minutes each	•	•	•	•	•	•	•	•	•	•				
Independent programmable resets, due to over-intensity		0 to 10 resets and 3 to 240 minutes each	•	•	•	•							•	•		
Independent programmable resets, due to MCB		0 to 10 resets and 3 to 240 minutes each	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Real incremental protection test:		IΔn Differential	•	•	•	•	•	•	•	•	•	•				
Real incremental protection test:		Overvoltage	•	•	•	•	•	•	•	•			•	•	•	•
Real incremental protection test:		Low voltage	•	•	•	•	•	•	•	•			•	•	•	•
Real incremental protection test:		Over-intensity	•	•	•	•							•	•		
Autotest: Differential + toroidal transformer sensor			•	•	•	•	•	•	•	•	•	•				
Autotest: external wiring, internal electronic system			•	•	•	•	•	•	•	•	•	•	•	•	•	•
Chronological event counter and protections of all alarms (value, hour, minute, day, month, year)			•		•		•		•				•		•	
Totaliser – Counter for cut-off time due to power failure			•		•		•		•				•		•	
Independent cut-off counters of all alarms + accrued and historical total			•	•	•	•	•	•	•	•	•	•	•	•	•	•
Register of alarms and their history (maximum and minimum values)			•	•	•	•	•	•	•	•	•	•	•	•	•	•
Register of maximum measurements			•	•	•	•	•	•	•	•	•	•	•	•	•	•
Programmable start-up delay 0 to 999 sec.			•	•	•	•	•	•	•	•	•	•	•	•	•	•
Manual cut-off (reset - solely with user code)			•	•	•	•	•	•	•	•	•	•	•	•	•	•
Security configuration (programming of all parameters - solely with user code)			•	•	•	•	•	•	•	•	•	•	•	•	•	•
Mean measurement on-screen - programmable - 20mS to 1000mS			•	•	•	•	•	•	•	•	•	•	•	•	•	•
Change of user code			•	•	•	•	•	•	•	•	•	•	•	•	•	•
Alarm default configuration (value and delay)			•	•	•	•	•	•	•	•	•	•	•	•	•	•
Automatic/manual display (data screens scrolled)			•	•	•	•	•	•	•	•			•	•		
Clock, calendar - programmable			•		•		•		•				•		•	
“Info” function (Information on programming status of alarms)			•	•	•	•	•	•	•	•	•	•	•	•	•	•
Acoustic and luminous indicator			•	•	•	•	•	•	•	•	•	•	•	•	•	•

THREE-PHASE (4-pole) PROTECTORS / METERS			WITH I DIFFERENTIAL						NO I DIFFERENTIAL			
MODELO ORION			DOV				RD		OV		OVIP	
VERSION			841RT	841T	842RT	842T	827T	828T	830RT	830T	835RT	835T
Voltage measurement - True RMS and Peak	0V to 1000Vpk	L1,L2,L3 independent	•	•	•	•	•	•	•	•	•	•
Intensity measurement - True RMS and peak in autoscale	0A to 20Apk and 0A to 100Apk	L1,L2,L3 independent		•		•					•	•
Differential intensity measurement - True RMS and Peak	0mA to 500mApk		•	•	•	•	•	•				
Protection due to overvoltage True RMS	245V to 275V and 20mS to 5Seg	L1,L2,L3 independent	•	•	•	•			•	•	•	•
Protection due to overvoltage Peak	350Vpk to 400Vpk 0.3mS to 5mS	L1,L2,L3 independent	•	•	•	•			•	•	•	•
Protection due to low voltage True RMS	175V to 200V and 20mS to 5Seg	L1,L2,L3 independent	•	•	•	•			•	•	•	•
Protection due to over-intensity True RMS	5A to 60A and 20mS to 10Seg	L1,L2,L3 independent									•	•
Protection due to over-intensity Peak (CAN BE DISABLED)	7Apk to 84Apk and 0.3mS to 5mS	L1,L2,L3 independent									•	•
Protection due to Differential I True RMS	50mA to 300mA and 20mS to 160mS	L1,L2,L3 independent	•	•			•					
Protection due to Differential I Peak	70mApk to 420mApk 0.3mS to 5mS	L1,L2,L3 independent	•	•			•					
Protection due to Differential I True RMS	5mA to 30mA and 20mS to 160mS	L1,L2,L3 independent			•	•		•				
Protection due to Differential I Peak	7mApk to 42mApk 0.3mS to 5mS	L1,L2,L3 independent		•	•	•		•				
Real incremental protection test:	Differential I	0 to 10 resets and 3 to 240 minutes each	•	•	•	•	•					
Real incremental protection test:	Over-intensity										•	•
Real incremental protection test:	MCB		•	•	•	•	•	•	•	•	•	•
Real incremental protection test::	Test : differential intensity		•	•	•	•	•	•				
	Test : overvoltage V1		•	•	•	•			•	•	•	•
	Test : overvoltage V2		•	•	•	•			•	•	•	•
	Test : overvoltage V3		•	•	•	•			•	•	•	•
	Test : low voltage V1		•	•	•	•			•	•	•	•
	Test : low voltage V2		•	•	•	•			•	•	•	•
	Test : low voltage V3		•	•	•	•			•	•	•	•
	Test : over-intensity I1										•	•
	Test : over-intensity I2										•	•
	Test : over-intensity I3										•	•
Autotest: Differential + toroidal transformer sensor			•	•	•	•	•	•				
Autotest: external wiring, internal electronic system			•	•	•	•	•	•	•	•	•	•
Chronological event counter and protections of all alarms (value, hour, minute, day, month, year)			•		•				•		•	
Totaliser – Counter for cut-off time due to power failure			•		•				•		•	
Independent cut-off counters of all alarms + accrued and historical total			•	•	•	•	•	•	•	•	•	•
Register of alarms and their history (maximum and minimum values)			•	•	•	•	•	•	•	•	•	•
Register of maximum measurements			•	•	•	•	•	•	•	•	•	•
Programmable start-up delay 0 to 999 sec.			•	•	•	•	•	•	•	•	•	•
Manual cut-off (reset - solely with user code)			•	•	•	•	•	•	•	•	•	•
Security configuration (programming of all parameters - solely with user code)			•	•	•	•	•	•	•	•	•	•
Mean measurement on-screen - programmable - 20mS to 1000mS			•	•	•	•	•	•	•	•	•	•
Change of user code			•	•	•	•	•	•	•	•	•	•
Alarm default configuration (value and delay) and resets			•	•	•	•	•	•	•	•	•	•
Automatic/manual display (data screens scrolled)			•	•	•	•					•	•
Clock, calendar - programmable			•						•		•	
“Info” function (Information on programming status of alarms)			•	•	•	•	•	•	•	•	•	•
Acoustic and luminous indicator			•	•	•	•	•	•	•	•	•	•

Continuous high-speed high-resolution sampling 13 Bit at 10KS/s 10,000 samples/s per channel

PRECAUTIONS

◊ Despite this unit's being of maximum safety, both from a design and features standpoint, the utmost care must always be taken when using it. It must not be used until its characteristics and mode of operation have been fully understood.
◊ Generally speaking, the precautions to be taken with this unit do not differ from those taken with any other piece of electronic equipment connected to the mains. Nevertheless, special attention should be paid to the following:
◊ It must be borne in mind that the unit resets the ancillary circuit-breaker automatically and this fact could cause injury to a careless operator or user. In order to avoid this:
  - all up-stream conductors are to be disconnected. (by means of switches, sectionalisers or others.)
◊ The mission of the ancillary circuit-breaker element is not that of protecting the circuit-breaker, but rather that of acting as merely as an ancillary switch. The installation should, therefore, be equipped with elements of protection against over-intensity (i.e. circuit-breakers, fuses, etc...) The wiring of the installation must be foreseen for the maximum intensity of the protection elements.
◊ Do not apply current nor use the module until it has been correctly installed in a standard enclosure.
◊ Do not connect the unit up to voltages other than 230 V AC ± 10%.
◊ Do not connect up to installations which may supply intensities of over 10 KA. or 6 KA (depending on ancillary MCB)
◊ **Terminals A and B of "CONTROL OUT" must not be short-circuited** under any circumstance whatsoever. Should this occur, irreversible damage would be caused to the ORION module.
◊ Caution: The unit's connecting terminals are not insulated from the mains
◊ Do not expose to liquids or humidity.
◊ Do not drop, knock or expose to vibrations..
◊ Do not expose to sources of heat
◊ Do not expose to environmental temperatures below 0° C. or over 40°C.
◊ Do not expose to magnetic sources or emissions (electric motors and transformers, electro-magnets, magnets, etc.).
◊ Under no circumstance whatsoever must the unit be opened and the interior manipulated. The safety seals must remain intact. Should they be broken, the correct functioning of the unit could be jeopardised.
◊ In the event of any of the above occurring, the authorised technical service must be contacted immediately in order for the unit to be examined.
◊ The unit must be completely disconnected from the mains before cleaning. This is to be effected with a soft, dry brush and, f need be, with a slightly damp cloth. The unit must not be reconnected to the mains until having ascertained that it is completely dry.

◊ WARNING!

◊ This unit must be installed in a standard enclosure, the only part within access of the user being the display and command panel. Its application is restricted to industrial installations.

♦ Most important

◊ - Positioning of the transformer

The toroidal core is individually matched and adjusted to the corresponding module. Both the differential intensity and the intensity toroidals **must of necessity be positioned** as shown in the diagrams, the direction of the arrow indicating the position with respect to the wiring. Should this position not be duly observed, the measurement obtained for the protection would be inaccurate and operation would be abnormal. The length of the wire connecting the toroidal core to the ORION unit must not exceed 30 cm. Moreover, it is recommended that it be twisted.

◊ - Wiring

It is of the utmost importance that **the correct polarity is ensured upon connection of the ORION "L1" and "N" terminals. If this polarity is not respected, the high accuracy is lost originating errors in measurement and abnormal functioning of the protections.**

The main risk of the unit not functioning correctly could be originated principally by a an incorrect wiring up of the connection terminals. It is, therefore, of the utmost importance **that this wiring be carried out correctly in accordance with the following protocol:**

◊ an homologated "male pin" is to be incorporated in the naked core of the stripped pliable conductor.
◊ these terminals are placed in the corresponding grooves as far in as they will go
◊ ensure that the conductor lead is correctly fixed with the pertinent tightening torque, i.e. there must be no displacement of the terminal nor any damage to the screws on head, thread, fillet or washer, any of which would be to the subsequent detriment of the assemblies and screw connections.

The user must carry out the complete protection test periodically as is described in CHAPTER 3.

CHAPTER 1 - Installation

◊ Transport and handling

This being a highly sophisticated electronic unit, it must be transported and handled with care as per the precautions stipulated in the foregoing section "PRECAUTIONS".

◊ Installation

The installation must be carried out by responsible, competent and qualified technical personnel once the present manual has been fully understood.

The location of the unit must meet the requirements and respect the precautions stipulated in the chapter "PRECAUTIONS", especial attention being paid to those under the heading "Most important".

The unit must be installed in a standard single-phase installation, active phase and neutral having a difference of potential of 230 V AC, or a three-phase installation (3 phases + neutral) having a difference of potential from phases to neutral of 230 V AC, and also a protection conductor of operative earth. Moreover, the installation must have, at its main switch panel, appropriate circuit-breakers or fuses and differential switch.

Wiring

The unit is fitted with top quality connection terminals. Each terminal has notches to enable easier fixing of the wires and prevent accidental removal. Likewise, the clamping screws have a self-fixing system which avoids their falling out should they work loose.

Moreover, the serigraphy identifies the corresponding counter-positioned terminals on the fanning strip. The graphic indications are backed up by intuitive identifying colours.

1. Connect the POWER L1 terminals to line 1 (phase 1) and POWER N to neutral of the mains line, 230V senoidal alternating current, 50Hz.
2. Connect the remaining terminals as indicated for the chosen configuration. Please, refer to "Circuit diagrams".

It is imperative that the wiring of the terminals and the tightening of the screws in the fanning strip be effected correctly.

"Circuit diagrams" should be consulted. Should any doubt arise, the manufacturer or authorised distributor should be consulted.

CHAPTER 2 - PROGRAMMING AND USAGE GUIDE

FUNCTIONS OF THE BUTTONS

The user code constitutes a high measure of security for the owner, it being the only means by which the programmed parameters may be validated. Any modification of programmed values enters into force solely when said code has been entered. Likewise, it is always possible to return to the values pre-established in the factory (cf. “Default Configuration”).

Las buttons permit the user to navigate through the and act upon screen indications as per cursor or flashing figure. These buttons have different logical values depending on the context in which they are found, their usage being intuitive and “user friendly”.

We, therefore, recommend the user take some time to “play” with the unit and became familiar with the buttons and their functions.

Button 1 (MENU / ESC):

When this button is pressed, the unit enters into menu mode

Once in menu or submenu, it returns to the previous level

Button 2 (NEXT / UP ▲):

Outside the menu, the 7 screens scroll sequentially

Within the menu:

- goes to the next level
- increases a flashing value
- goes to the next screen

Button 3 (TEST / DOWN ▼):

Outside the menu:

- carries out differential Test (in those models incorporating said protection)
- access to test menu to select a test (in those models without differential protection)

Within the menu:

- returns to previous level
- decreases a flashing value

Button 4 (RESET / OK):

Outside the menu, the unit is reinitiated in the event of locking or during a counting

Within the menu, the unit enters into submenu and confirms changes

User code:

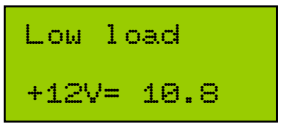
Made up of 8 digits, each from 1 to 4 (65535 codes possible).

Enter by pressing the corresponding button.

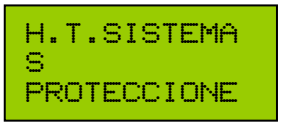
Default code activated at factory**: 1,2,3,4,1,2,3,4**

The user code can be changed if one is in possession of the current one

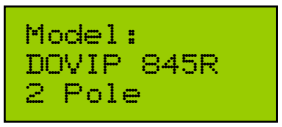
INITIAL SEQUENCE



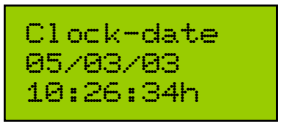
When the unit is connected up to 230V AC, its internal voltages of +12V DC,+5V DC, +3V3 DC, start to stabilise. Once the +12V±10% voltage is stabilised, the initiation protocol can commence. (duration ≅ 3,4 seg)



Introductory greeting (approx. 3 secs)

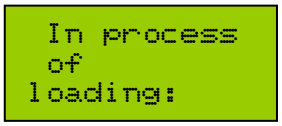


Model and version (approx. 3 secs)



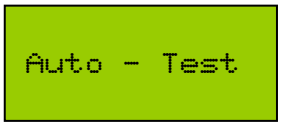
Screen is variable depending on model and version (approx. 3 secs)

Before resetting, the unit permits the user to enter into the configuration menu (approx. 5 secs). Here, the user has 3 minutes before the unit automatically reinitiates the initiation sequence.



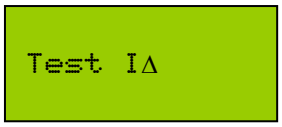
Loading process for the capacitors of the three main cut-off circuits. On-screen indication of the progress of the verification. The status of the load is monitored before the unit resets (duration from 0V ≅ 10 secs)

The protection models come from the factory with a start-up delay value of 3 seconds which can be programmed. The screen is displayed solely when the delay value is not zero.

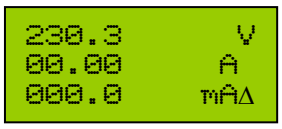


Initial self-test: the unit verifies the internal electronic system, the Differential Intensity toroidal core and the alarms. (approx. 3 secs)

Before resetting, the unit verifies that the Offset ≅ 0 and carries out an injection signal test in those models with intensity and/or differential intensity. (approx. 1.5 secs).

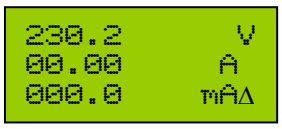


In those versions with differential intensity, before resetting, the unit automatically carries out a real incremental differential intensity test.
1 - this informative screen is displayed during 1.5 secs)

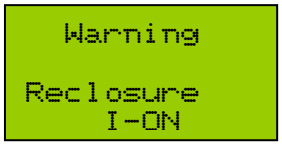


2 – the 1st True RMS voltage, True RMS intensity and True RMS Differential Intensity screen is displayed. The Differential Intensity measurement increases until the unit detects the alarm,

3 - test results are displayed (approx. 1.5 secs)



measurements are displayed before resetting (approx. 3 secs)



"WARNING" of imminent reset (approx. 3 secs)

Models with differential protection from 5mA to 30mA

DEFAULT ALARMS PROGRAMMED AT FACTORY

FAST

Alarm	Value range	Delay range	Default value	Default delay
OV True RMS	245V - 275V	20mS - 5000mS	265V	300mS
OV Peak	350Vpk - 400Vpk	0.3mS – 5mS	385Vpk	0.5mS
IT RMS	175V – 200V	20mS – 5000mS	180V	500mS
I∆n True RMS	5mA – 30mA	20mS – 160mS	30mA	20mS
I∆n Peak	7mApk – 42mApk	0.3mS – 5mS	42mApk	1mS
I True RMS	5A – 60A	20mS – 10000mS	40A	3000mS
I Peak	7Apk – 84Apk	0.3mS – 5mS	56Apk	2mS

MEDIUM (DEFAULT)

Alarm	Value range	Delay range	Default value	Default delay
OV True RMS	245V - 275V	20mS - 5000mS	265V	500mS
OV Peak	350Vpk - 400Vpk	0.3mS – 5mS	385Vpk	0.8mS
IT RMS	175V – 200V	20mS – 5000mS	180V	600mS
I∆n True RMS	5mA – 30mA	20mS – 160mS	30mA	40mS
I∆n Peak	7mApk – 42mApk	0.3mS – 5mS	42mApk	2mS
I True RMS	5A – 60A	20mS – 10000mS	40A	5000mS
I Peak	7Apk – 84Apk	0.3mS – 5mS	56Apk	3mS

SLOW

Alarm	Value range	Delay range	Default value	Default delay
OV True RMS	245V - 275V	20mS - 5000mS	265V	1000mS
OV Peak	350Vpk - 400Vpk	0.3mS – 5mS	385Vpk	1.2mS
IT RMS	175V – 200V	20mS – 5000mS	180V	700mS
I∆n True RMS	5mA – 30mA	20mS – 160mS	30mA	60mS
I∆n Peak	7mApk – 42mApk	0.3mS – 5mS	42mApk	3mS
I True RMS	5A – 60A	20mS – 10000mS	40A	8000mS
I Peak	7Apk – 84Apk	0.3mS – 5mS	56Apk	5mS

Models with differential protection from 50mA to 300mA

DEFAULT ALARMS PROGRAMMED AT FACTORY

FAST

Alarm	Value range	Delay range	Default value	Default delay
OV True RMS	245V - 275V	20mS - 5000mS	265V	300mS
OV Peak	350Vpk - 400Vpk	0.3mS – 5mS	385Vpk	0.5mS
IT RMS	175V – 200V	20mS – 5000mS	180V	500mS
I∆n True RMS	50mA – 300mA	20mS – 160mS	300mA	20mS
I∆n Peak	70mApk – 420mApk	0.3mS – 5mS	420mApk	1mS
I True RMS	5A – 60A	20mS – 10000mS	40A	3000mS
I Peak	7Apk – 84Apk	0.3mS – 5mS	56Apk	2mS

MEDIUM (DEFAULT)

Alarm	Value range	Delay range	Default value	Default delay
OV True RMS	245V - 275V	20mS - 5000mS	265V	500mS
OV Peak	350Vpk - 400Vpk	0.3mS – 5mS	385Vpk	0.8mS
IT RMS	175V – 200V	20mS – 5000mS	180V	600mS
I∆n True RMS	50mA – 300mA	20mS – 160mS	300mA	40mS
I∆n Peak	70mApk – 420mApk	0.3mS – 5mS	420mApk	2mS
I True RMS	5A – 60A	20mS – 10000mS	40A	5000mS
I Peak	7Apk – 84Apk	0.3mS – 5mS	56Apk	3mS

SLOW

Alarm	Value range	Delay range	Default value	Default delay
OV True RMS	245V - 275V	20mS - 5000mS	265V	1000mS
OV Peak	350Vpk - 400Vpk	0.3mS – 5mS	385Vpk	1.2mS
IT RMS	175V – 200V	20mS – 5000mS	180V	700mS
I∆n True RMS	50mA – 300mA	20mS – 160mS	300mA	60mS
I∆n Peak	70mApk – 420mApk	0.3mS – 5mS	420mApk	3mS
I True RMS	5A – 60A	20mS – 10000mS	40A	8000mS
I Peak	7Apk – 84Apk	0.3mS – 5mS	56Apk	5mS

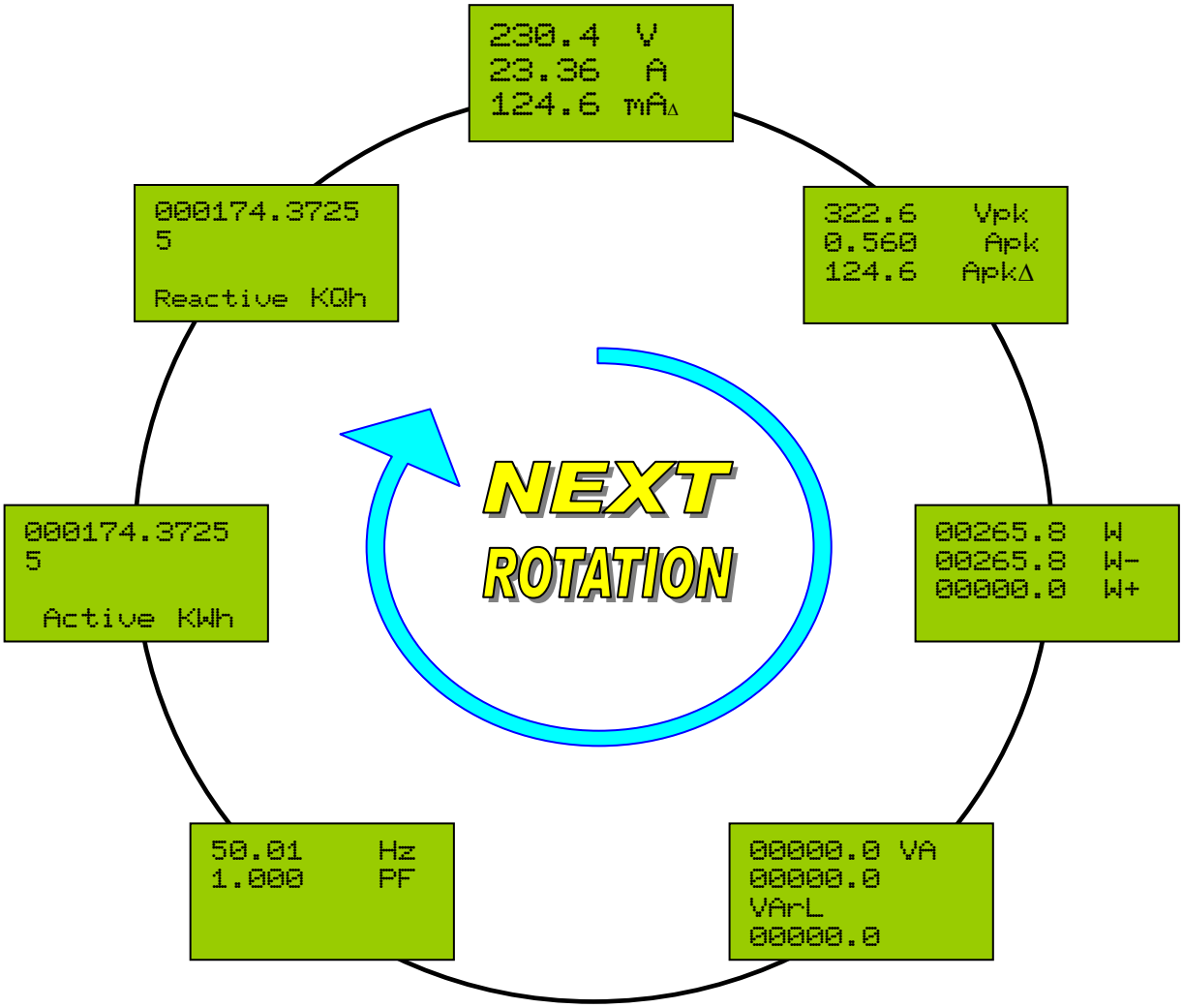
DEFAULT RESETS PROGRAMMED AT FACTORY

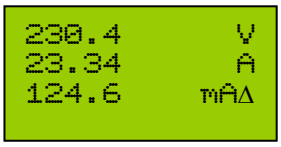
Alarm	Programming number of resets **X** = (de 0 a 10)	Programming time of each reset. **t** = (3 to 240 min)	
MCB	= 0	- -	Cuts off and DOES NOT RESET
	= 1	3 min	Cuts off **t** minutes and resets. If **X** unsuccessful attempts to reset, unit blocks and user must press RESET to unblock. cf.. "Resets"
	= 2	5 min	
	Default = **3**	10 min	
	= 4	30 min	
	= 5	60 min	
	= 6	120 min	
	= 7	30 min	
	= 8	30 min	
	= 9	30 min	
	= 10	30 min	
Intensity	= 0	- -	Cuts off and DOES NOT RESET
	= 1	3 min	Cuts off **t** minutes and resets. If **X** unsuccessful attempts to reset, unit blocks and user must press RESET to unblock. cf.. "Resets"
	= 2	5 min	
	Default = **3**	10 min	
	= 4	30 min	
	= 5	30 min	
	= 6	30 min	
	= 7	30 min	
	= 8	30 min	
	= 9	30 min	
	= 10	30 min	
Differential I	= 0	- -	Cuts off and DOES NOT RESET
	= 1	3 min	Cuts off **t** minutes and resets. If **X** unsuccessful attempts to reset, unit blocks and user must press RESET to unblock. cf.. "Resets"
	= 2	6 min	
	= 3	12 min	
	= 4	30 min	
	= 5	60 min	
	Default = **6**	120 min	
	= 7	30 min	
	= 8	30 min	
	= 9	30 min	
	= 10	30 min	

Reset to zero time of number of resets:
= 15 minutos (programmable from 3 to 240 min)

Delay – Start-up delay
= 3 Seconds (programmable from 0 a 999 sec)

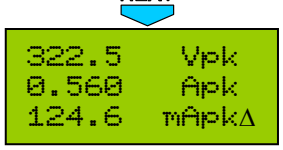
BUTTON #2 (NEXT / ▲)





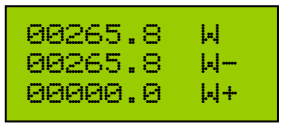
NEXT

SCREEN 1 : ➔ True RMS measurement of line voltage
➔ True RMS measurement of line intensity
➔ True RMS measurement of differential line intensity



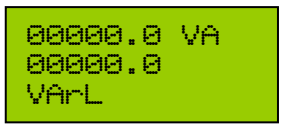
NEXT

SCREEN 2 : ➔ Measurement of peak line voltage
➔ Measurement of peak line intensity
➔ Measurement of peak differential line intensity



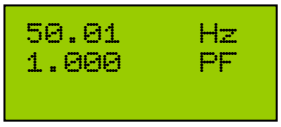
NEXT

SCREEN 3 : ➔ Measurements of active power
➔ Measurements de power returned to mains
➔ Measurements de power consumed



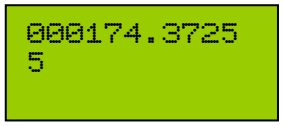
NEXT

SCREEN 4 : ➔ Apparent power
➔ Reactive power - inductive
➔ Reactive power - capacitive



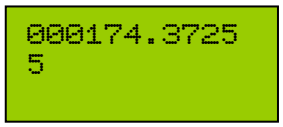
NEXT

SCREEN 5 : ➔ Line frequency
➔ Power factor



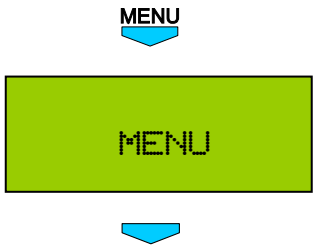
NEXT

SCREEN 6 : ➔ Active energy counter



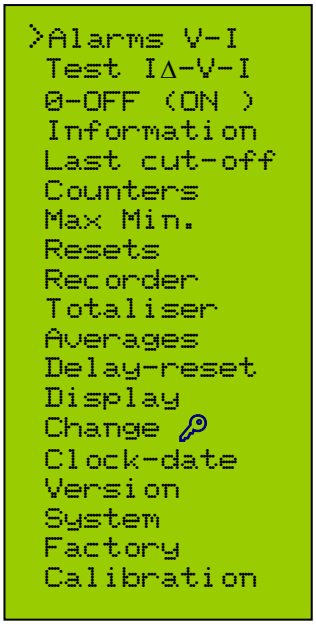
SCREEN 7 : ➔ Reactive energy counter

Button #1 (MENU / ESC)



➔ This MENU button can be used when in any of the 7 main screens.

Index



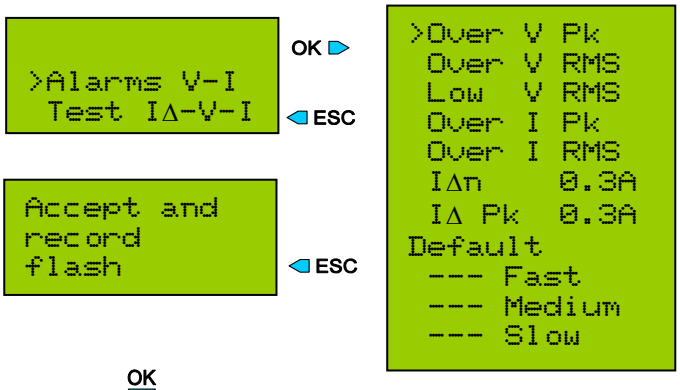
➔ Configuration of alarms
➔ Test: Differential I, Intensity and Voltage
➔ Switching off the unit. Reset solely with code
➔ Information on current alarm programming
➔ Information on most recent cut-off
➔ Energy and event counters
➔ Register of maximums and minimums
➔ Reset configuration
➔ Event recorder
➔ Power failure totaliser
➔ Display RMS mean
➔ Start-up delay
➔ Automatic or manual display
➔ To change user code
➔ Configuration of clock
➔ Version
➔ Energy levels of unit
➔ Factory
➔ Calibration
➔ Annex: trouble-shooting
➔Glossary

One can move through the MENU using buttons 2 and 3 (up and down ▲▼)

To enter into an option, place the cursor ">" on the option and accept with button 4 (OK)

Alarms V-I

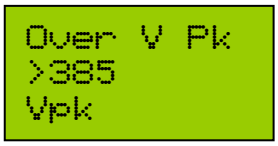
When OK is pressed in Alarms V-I, a submenu is displayed where the user can select the alarm he wishes to program. The configurable parameters of each alarm, both peak and RMS, are the value of the alarm and the delay. A cut-off occurs when the measurement value is equal value and is sustained for a delay equal or superior to that programmed.



➔ Peak overvoltage
➔ RMS overvoltage
➔ RMS low voltage
➔ Peak overintensity
➔ RMS overintensity
➔ RMS differential intensity
➔ Peak differential intensity
➔ Default configuration
normal environmental conditions
severe environmental conditions (config. ex

➔ When ESC is pressed in the Alarms V-I submenu, it is necessary to enter the code in order for the changes to be updated in the unit's flash memory.

e.g.: When the cursor is placed on "Over V Pk" and OK pressed:

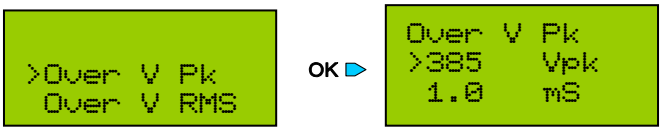


Using the up and down buttons (▲▼), the cursor ">" is placed on the option which one wishes to modify be it value or delay. If one accepts with OK, the value flashes and can be modified using the ▲▼ buttons and the accepted with OK.

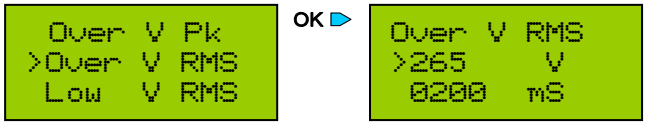
Should one wish to modify the time delay before the alarm value, when OK is pressed the unit, assuming that the alarm value is not to be modified, returns to the "Alarms V-I" menu. Should one subsequently wish to modify the alarm value, one can enter again.

Now one can either modify another alarm or press ESC. The unit offers to store all modifications in the flash memory.

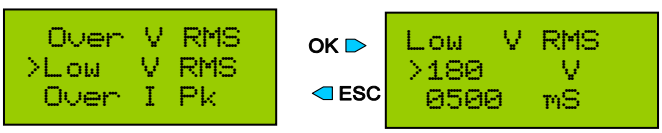
Examples:



➔ Type of alarm to be programmed.
➔ Alarm value.
➔ Delay

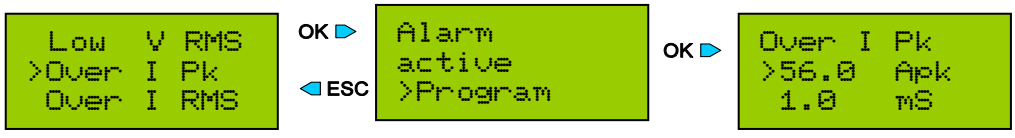


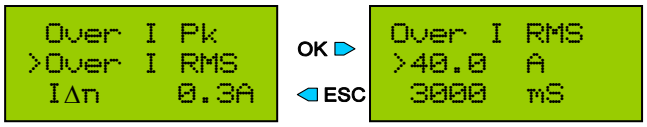
➔ Type of alarm to be programmed.
➔ Alarm value.
➔ Delay



➔ Type of alarm to be programmed.
➔ Alarm value.
➔ Delay

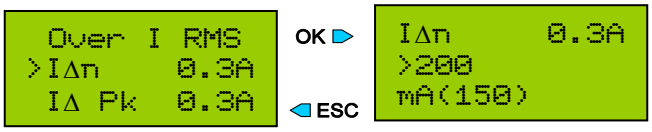
(only in alarm peak I)



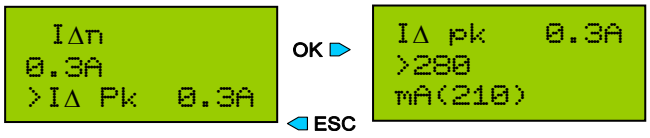


➔ Type of alarm to be programmed.
➔ Alarm value.
➔ Delay

The norm stipulates that a differential must cut off between 50% and 100% of its programmed IΔn value. As in normal practice among differential manufacturers, the threshold of this unit is in the centre of this range. i.e. 25% below than the original programmed IΔn value. On screen this calculation is shown within brackets.



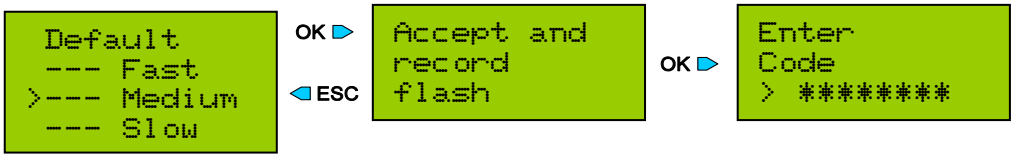
➔ Type of alarm to be programmed.
➔ Alarm value.
➔ Delay



➔ Type of alarm to be programmed.
➔ Alarm value.
➔ Delay

• Default (Default configuration):

Restores the configuration of the alarms to their original values ex-factory.



Test IΔ-V-I

Real incremental Test of protections. This type of test injects a **real** senoidal intensity or voltage, of incremental value, which is added to the existent line measurement. As the alarm threshold is surpassed, this test originates an alarm/cut-off.

- In this way, one can know the ***exact value*** of protection and cut-off.
- The overvoltage test injects voltage into the input amplifier of line voltage.
- The overintensity test injects voltage into the input amplifier of line intensity.
- The differential intensity test injects an intensity into the toroidal transformer itself which measures the differential intensity of the line.

When it effects an intensity, differential intensity or voltage test, the unit compares the cut-off value and the programmed value. If the cut-off value is within the margins calculated by the unit, the test is correct. Cut-off value = programmed value +% of foreseen margin. The unit calculates the percentage to be added on depending on the alarm delay :

- Peak alarms : voltage and intensity
  Delay ≤ 2mS ➔ +5%
  Delay > 2mS ➔ +15%

  : differential intensity
  Delay ≤ 2mS ➔ +15%
  Delay > 2mS ➔ +30%

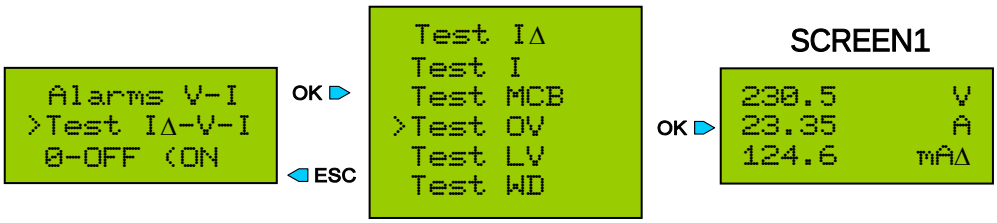
- RMS alarms due to overvoltage and low voltage:
  Delay ≤ 100mS ➔ +5%
  Delay > 100mS ➔ +15%
  Delay > 1000mS ➔ does not compare.

• RMS alarms due to differential over-intensity:

Delay ≤ 100mS ➔ +15%
Delay > 100mS ➔ +35%

• RMS alarms due to over-intensity:

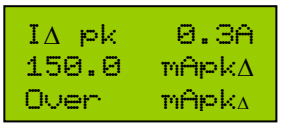
Delay ≤ 100mS ➔ +5%
Delay > 100mS ➔ +25%
Delay > 1000mS ➔ does not compare.



- **Test IΔ:**

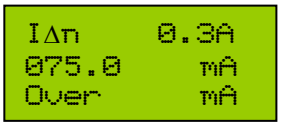
When OK is pressed in "Test IΔ" SCREEN1 appears and displays the progressive increase in the differential intensity until the differential alarm is set off.

When the peak differential alarm goes off, there appears the following informative screen:



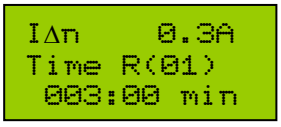
➔ Alarm causing cut-off is diagnosed
➔ Cut-off value
➔ Current line value (xxx.x mA or Over depending on maximum injectable)

When the True RMS differential alarm goes off, there appears the following informative screen:



➔ Alarm causing cut-off is diagnosed
➔ Cut-off value
➔ Current line value (xxx.x mA or Over depending on maximum injectable)

The Peak or the RMS alarms go off depending on the value and delay which have been programmed. After 20 seconds displaying information relevant to the alarm, there appears the following screen regarding the reset and the unit proceeds to carry out the corresponding reset cycle:



(For further details regarding the reset cycle, see " Resets")

- **Test V – I (Voltage and Intensity)**

The same procedure as for the fore-mentioned "**Test IΔ"**

ERROR:

When effecting an intensity, differential intensity or voltage test, the unit can detect two errors, viz;:

A- Error due to injection not having been generated

B- Error when cut-off value compared with value programmed in flash memory.

Error A:

The unit disconnects and indicates "Test error" along with a long intermittent beep. There is an anomaly in the unit and it must be revised immediately. Do not use the unit. Consult the technical service.

Should you decide to reinitiate the unit, press RESET. Once reinitiated and reset, the unit indicates periodically that there has been a "Test error" , thus reminding the user that the test must be carried out again. This message will persist until satisfactory results have been obtained from this test.

Error B:

When effecting an intensity, differential intensity or voltage test, provided that the alarm delay is equal or inferior to 1000mS, the unit compares the cut-off value and the programmed value. If the cut-off value is within the margins calculated by the unit, the test is correct. Should this not be the case, the unit indicates "Test error" during 10 seconds along with a short intermittent beep. The informative screen regarding the alarm cut-off is now displayed. There is an anomaly in the unit and it must be revised immediately. Do not use the unit. Consult the technical service.

Should you decide to reinitiate the unit, press RESET. Once reinitiated and reset, the unit indicates periodically that there has been a "Test error" , thus reminding the user that the test must be carried out again. This message will persist until satisfactory results have been obtained from this test.

•MCB Test:

When OK is pressed in "Test MT", the unit cuts off the MCB remotely, quits the menu and returns to SCREEN1.

The protection system detects when the MCB trips and proceeds to carry out the MCB's reset cycle as if it were an alarm. Please refer to Programming MCB reset cycle.

If the unit detects an error, it disconnects and indicates "Test error" along with a long intermittent beep. There is an anomaly in the unit and it must be revised immediately. Do not use the unit. Consult the technical service.

Should you decide to reinitiate the unit, press RESET. Once reinitiated and reset, the unit indicates periodically that there has been a "Test error" , thus reminding the user that the test must be carried out again. This message will persist until satisfactory results have been obtained from this test.

•Watchdog Test (external Watchdog):

Cut-off circuits

The unit has three independent cut-off circuits, viz:

1 – High-speed cut-off circuit for the MCB by means of a coil. It has it's own exclusive built-in energy storage which permits it to disconnect the MCB even when there is no mains supply.

2 - Cut-off circuit by means of a motor. It has it's own exclusive built-in energy storage which permits it to disconnect and connect the MCB even when there is no mains supply.

3 – Emergency cut-off circuit. It is independent of the main circuit and has its own energy which permits it to disconnect the MCB via the motor and orders circuit #1 to cut off the MCB via the coil. It can only be verified by the Watchdog test which should be effected on a regular basis as in the case of the protection tests.

The external Watchdog, which acts upon the third of the three independent cut-off circuits built into the unit, monitors the status of the micro-computer and the power supply. In the event of power failure or of not receiving a pulse cycle of the pre-established status and time, it cuts off.

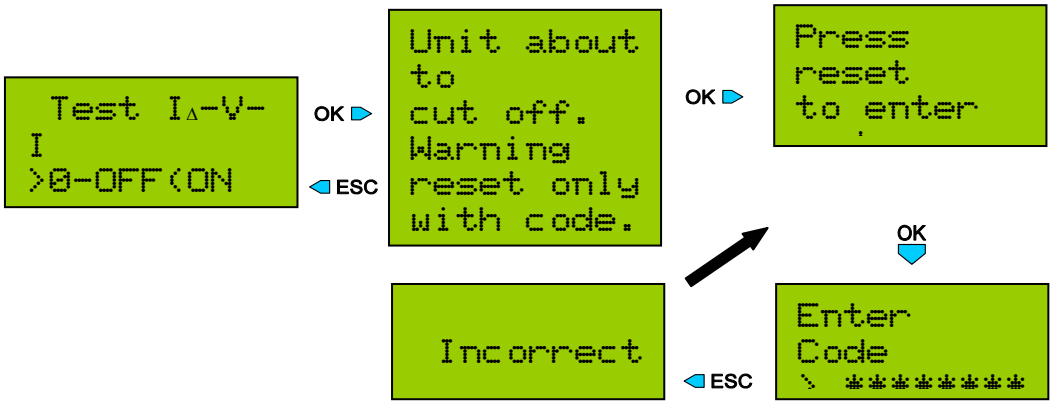
In order to verify the operativity of the external Watchdog, press OK in "Test WD". The unit ceases to generate the corresponding cycle during 3 seconds which produces this circuit to cut off. It regenerates the cycle, charges the exclusive energy storage during about 10 seconds and resets. If all is correct, it then carries out a second cut-off and reinitiates the unit. If it is not correct, the screen will display the message that there is an error in the external Watchdog.

If the unit detects an error, it disconnects and indicates "Test error" along with a long intermittent beep. There is an anomaly in the unit and it must be revised immediately. Do not use the unit. Consult the technical service.

Should you decide to reinitiate the unit, press RESET. Once reinitiated and reset, the unit indicates periodically that there has been a "Test error" , thus reminding the user that the test must be carried out again. This message will persist until satisfactory results have been obtained from this test.

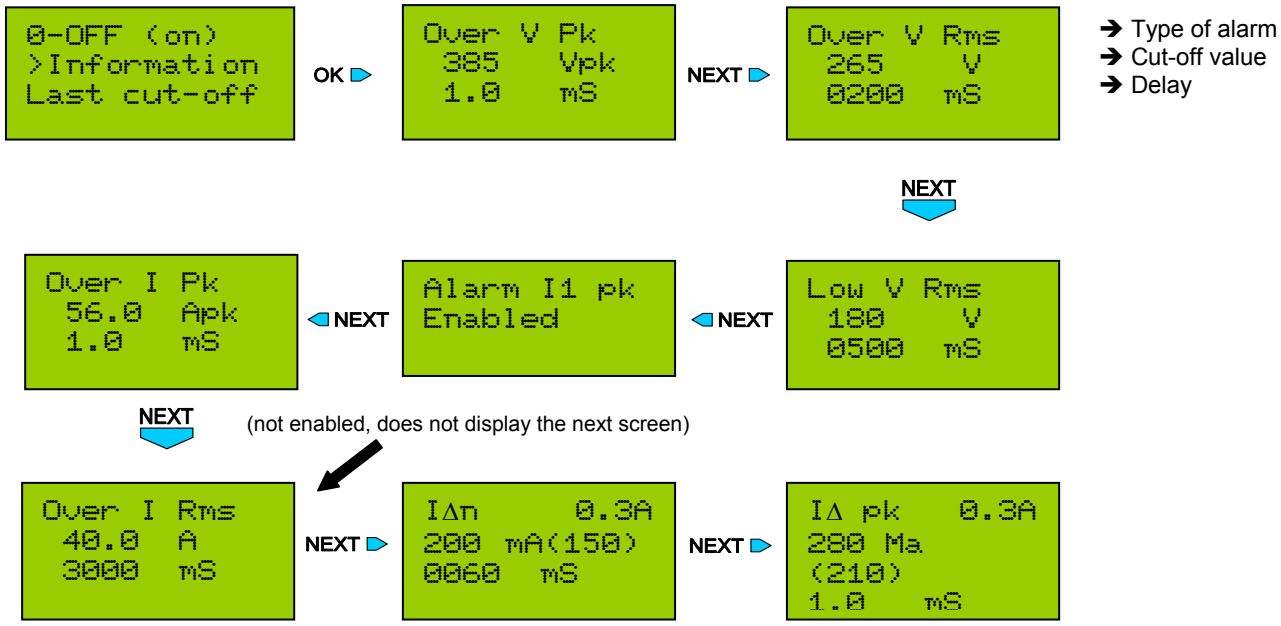
0-OFF (I-ON with code)

This is used to order a voluntary cut-off of the unit's MCB (since this cannot be effected manually). The unit warns before cut-off that it is necessary to enter the user code in order to reset.



Information

Displays sequentially the current programming of all the alarms together with their values and delays (with no possibility of modification).



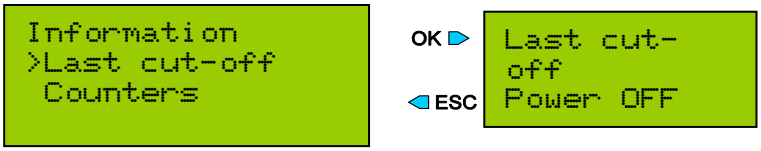
➔ Type of alarm
➔ Cut-off value
➔ Delay

Press ESC when in any of these screens, to return to the main menu.

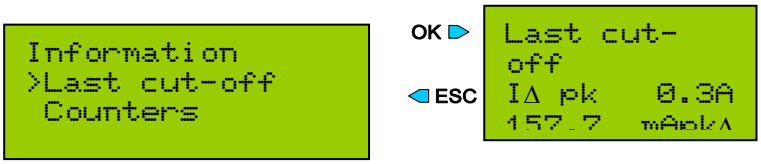
Last cut-off

Displays the most recent cause of cut-off, including diagnosis of alarm and cut-off value. It can be due to over- or low voltage, both peak and RMS; to over-intensity, both peak and RMS; to differential intensity, both peak and RMS; to MCB, REMOTE IN or Power OFF (power failure).

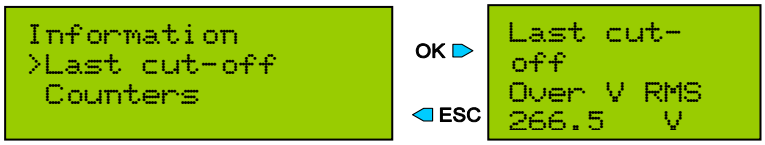
Example:



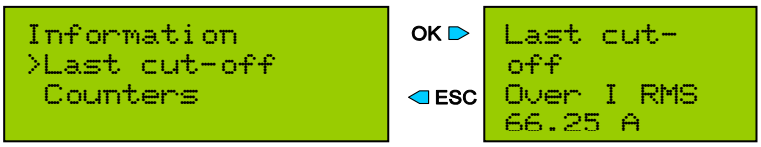
➔ Most recent cause of cut-off
➔ Power failure.



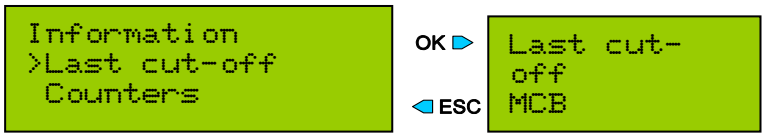
➔ Most recent cause of cut-off
➔ Peak differential intensity.
➔ Cut-off value.



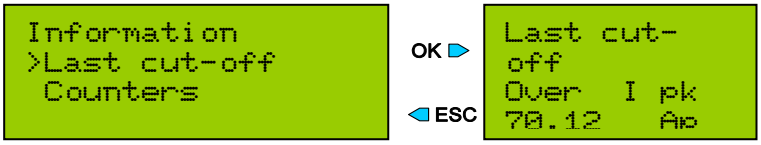
➔ Most recent cause of cut-off
➔ RMS overvoltage.
➔ Cut-off value.



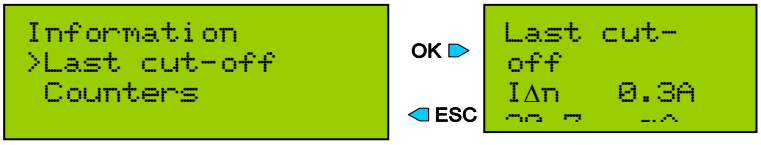
➔ Most recent cause of cut-off
➔ Over-intensity RMS.
➔ Cut-off value.



➔ Most recent cause of cut-off
➔ MCB



➔ Most recent cause of cut-off
➔ Peak over-intensity
➔ Cut-off value.

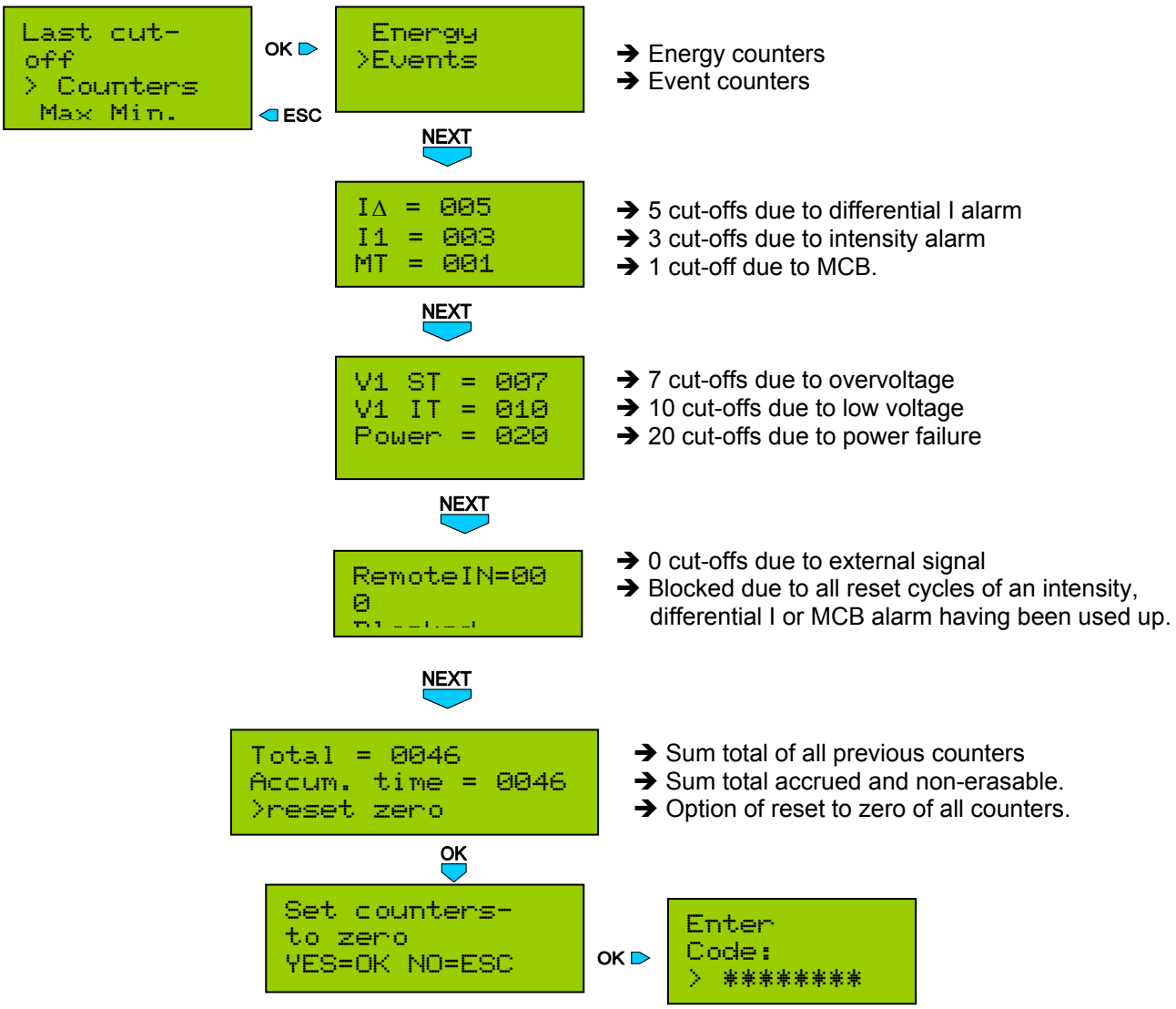


➔ Most recent cause of cut-off
➔ RMS differential intensity.
➔ Cut-off value.

Counters

• Event counters:

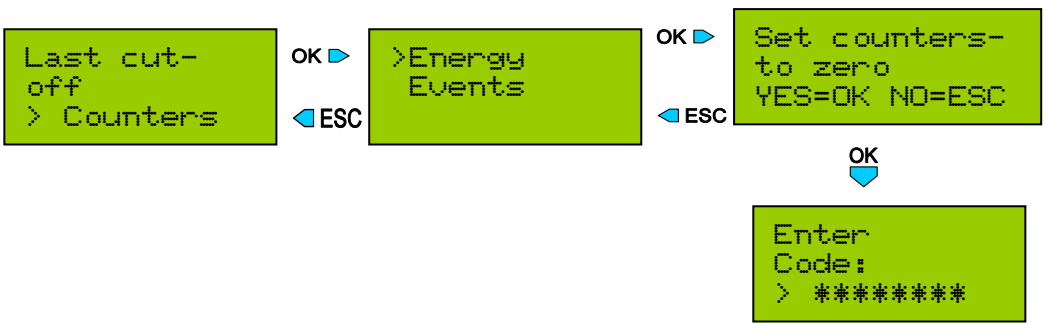
When OK is pressed in “Events”, the unit displays sequentially the individual counters for cut-off due to: overvoltage, low voltage, differential intensity, over-intensity, MCB, REMOTE IN or Power OFF (power failure) and, finally, the cursor offers the option of resetting to zero. The screens can be scrolled manually by pressing NEXT. Reset to zero is only possible with the user code.



Press ESC when in any of these screens, to return to the main menu.

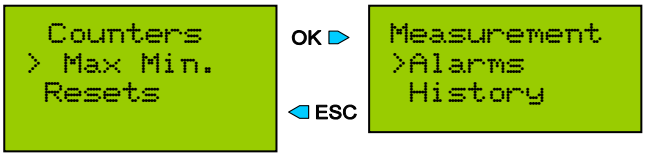
• Energy counters (active and reactive):

When OK is pressed in “Energy”, these counters can be reset to zero solely using the user code.



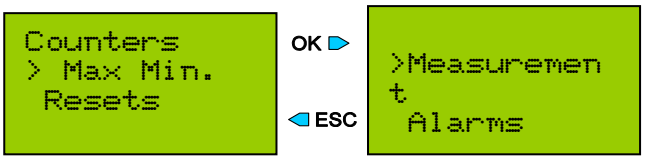
Max Min. (Maximums and minimums)

Used to consult the maximums measured, maximums of alarms, and the history of maximums of alarms, non-erasable.

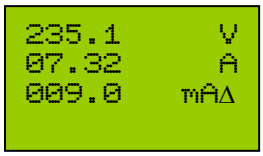


➔ Maximum measurements
➔ Maximum values measured, reason for cut-off
➔ History. Same as for “Alarms” but non-erasable

- **Measurement:**

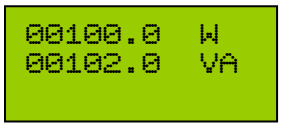


OK



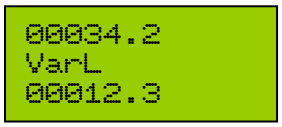
➔ Maximum measurement 235V RMS.
➔ Maximum measurement 7A RMS.
➔ Maximum measurement 9mA differential RMS

NEXT



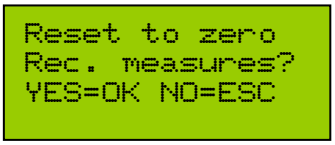
➔ Maximum measurement 100W.
➔ Maximum measurement 102VA

NEXT



➔ Maximum measurement 34 VarL.
➔ Maximum measurement 12 VarC.
(VarL = Reactive inductive Voltamperes).
(VarC = Reactive capacitive Voltamperes).

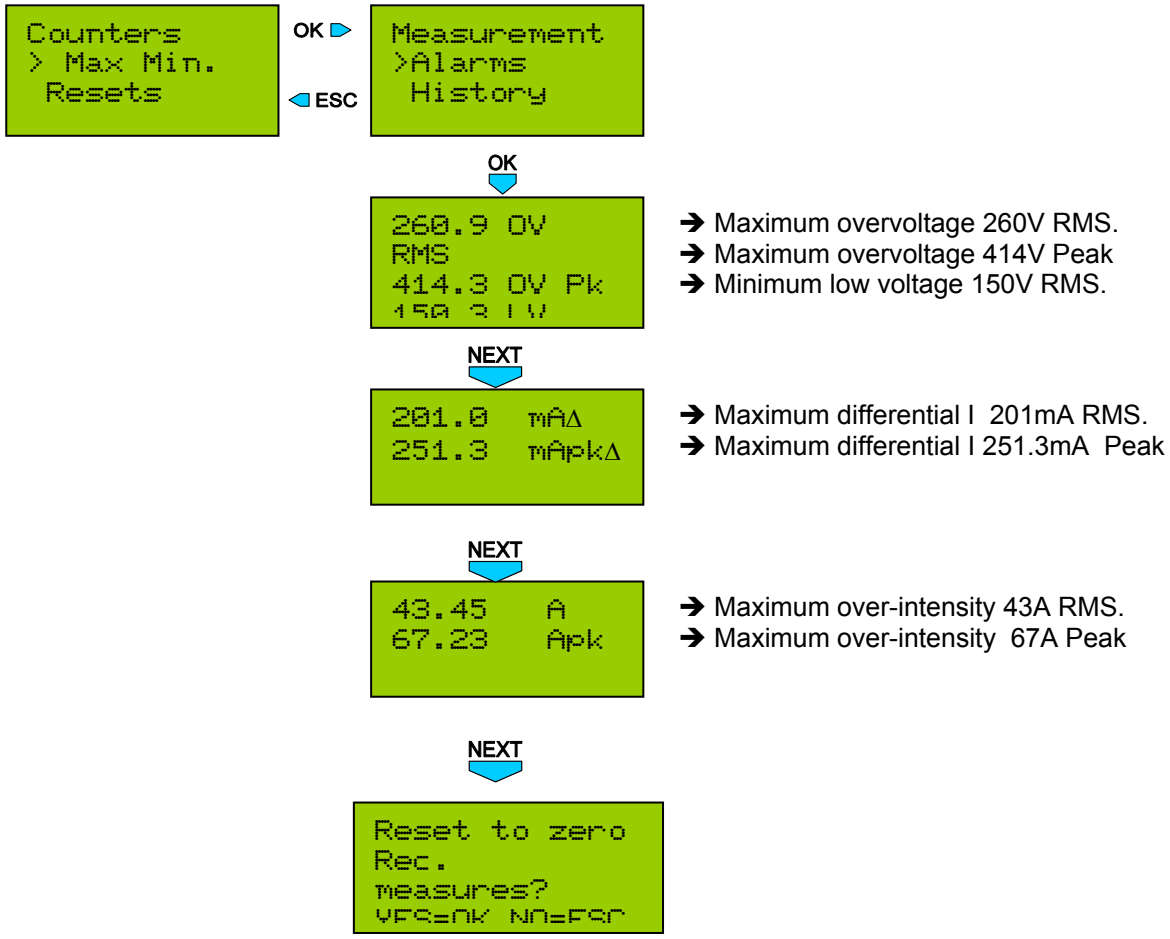
NEXT



Press ESC when in any of these screens, to return to the main menu.

- **Alarms:**

Memorises only the alarm of highest value.



➔ Maximum overvoltage 260V RMS.
➔ Maximum overvoltage 414V Peak
➔ Minimum low voltage 150V RMS.

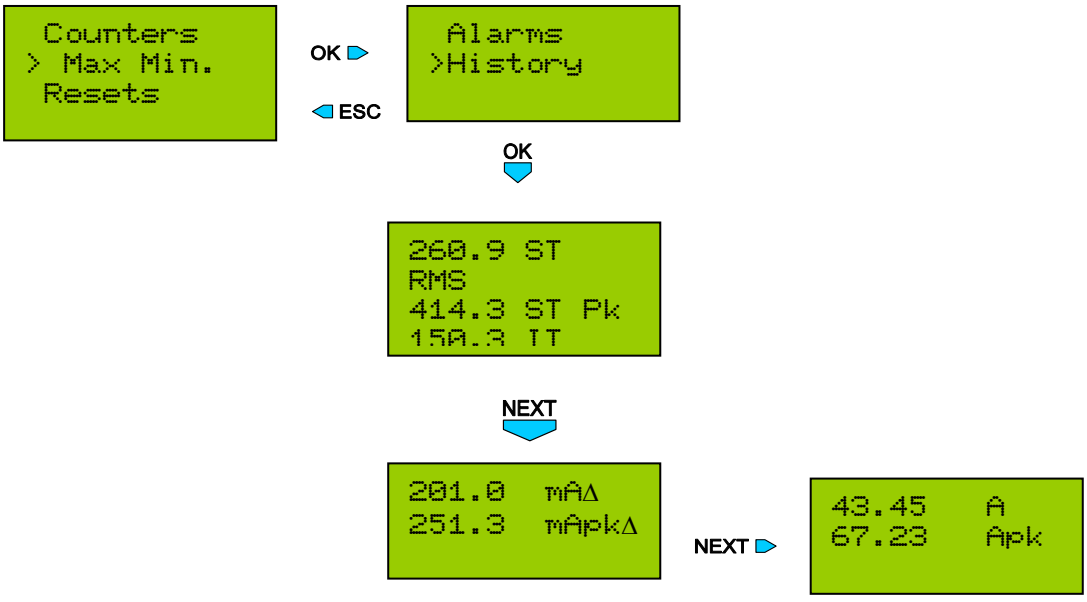
➔ Maximum differential I 201mA RMS.
➔ Maximum differential I 251.3mA Peak

➔ Maximum over-intensity 43A RMS.
➔ Maximum over-intensity 67A Peak

Press ESC when in any of these screens, to return to the main menu.

- **History:**

This section is an exact replica of “Alarms” but is non-erasable.



RESETS (Intelligent and Sequential)

The unit offers protective action by means of very high speed cut-offs, thus aborting the problem at the outset and giving an on-screen diagnosis of the motive of the cut-off.

The unit has an exclusive **Intelligent Automatic Reset** in the event of overvoltage and low voltage **(resetting solely when the anomaly has disappeared).**

It also has an **Automatic Sequential Self-initiated Reclosure** (with reset to zero conditional to its counter), It is **totally programmable**, for cut-offs due to **differential, MCB and over-intensity**.

Automatic reclosure subsequent to action by:	**Resets programmable**	**Times programmable** specific for each reset	**Self-initiating nbr. of resets (Default reset to zero = 15 mins in ON position. programmable 3 to 240 mins)**
Differential	0 to 10	3 to 240 minutes	Resets blocked if used up or reset to zero if the anomaly has been resolved
MCB	0 to 10	3 to 240 minutes	Resets blocked if used up or reset to zero if the anomaly has been resolved
Intensity	0 to 10	3 to 240 minutes	Resets blocked if used up or reset to zero if the anomaly has been resolved

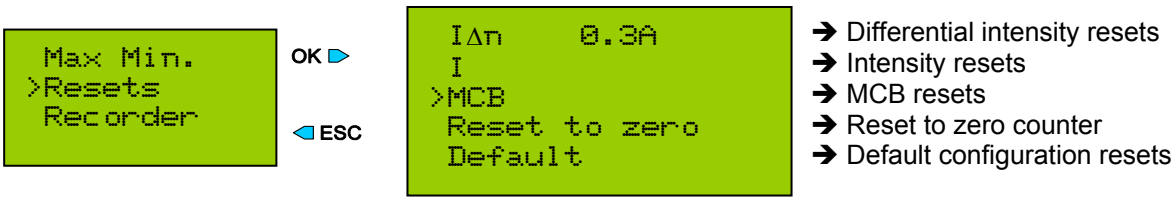
It is to be observed that the Intelligent Automatic Reset does not have to determine the number of resets nor times since the unit resets once the anomaly has disappeared.

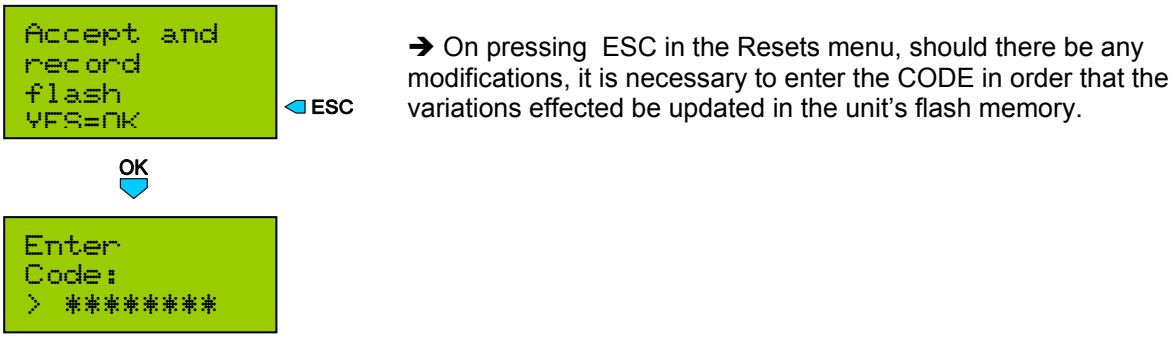
On the other hand, the Automatic Sequential Self-initiated Reclosure allows the user to program up to 10 resets of the differential, MCB or intensity. If the user programs "zero" resets for the differential, obviously the unit does not reset subsequent to a differential action. Nonetheless, it will reset the programmed number of times for the other reasons.

The reset times can be programmed, *in all cases,* from 3 to 240 minutes.

The unit blocks and does not reset if any of the types of reset has been used up. i.e. if, once all the resets have been used up, the anomaly persists.

In order to avoid untimely blocking, the unit resorts to its automatic self-start-up (conditional reset to zero of the counter), which occurs when unit resets correctly subsequent to any of its resets and once a time has elapsed which is superior to that which has been programmed in the programmable counter of "Reset to zero". **(Default reset to zero time of number of resets = 15 minutes in ON position. Programmable from 3 to 240 minutes)**

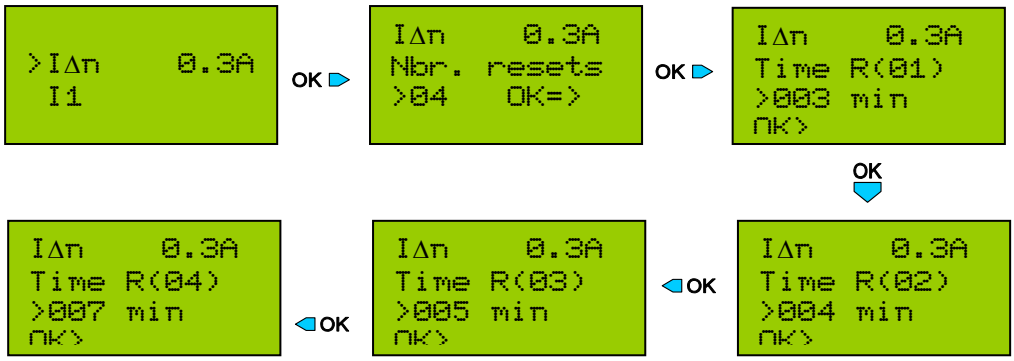




- **Resets: IΔn xxx mA**

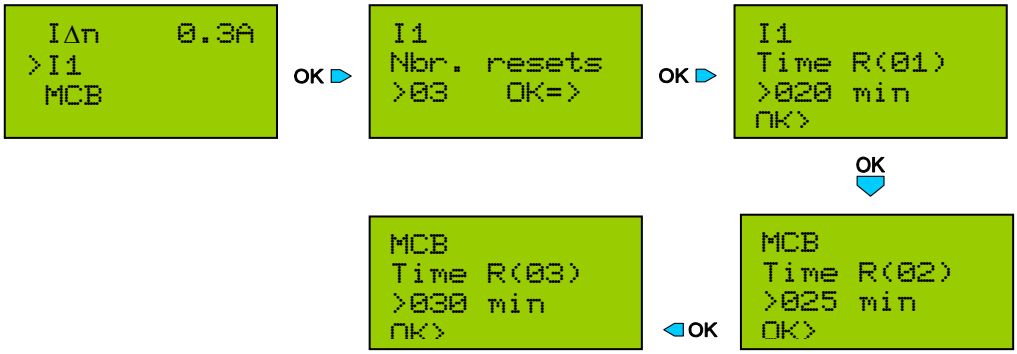
Example of configuration of 4 resets, each being of 3, 4, 5, 7 minutes.

1 - Press OK in "IΔn 0.3A"
2 - Using buttons 2 and 3 (▲▼) increase or decrease the flashing digits until value 4 appears. Press OK to accept and continue (the time of the 4 cycles to be programmed will be requested sequentially).
3 – The cycle time of reset 1 "R(01)" will be requested. Press buttons 2 and 3 (▲▼) to increase or decrease the flashing digits until value 3 appears. Press OK to accept and proceed to configure the cycle time of reset 2 "R(02)" and subsequent, in which the process is repeated.



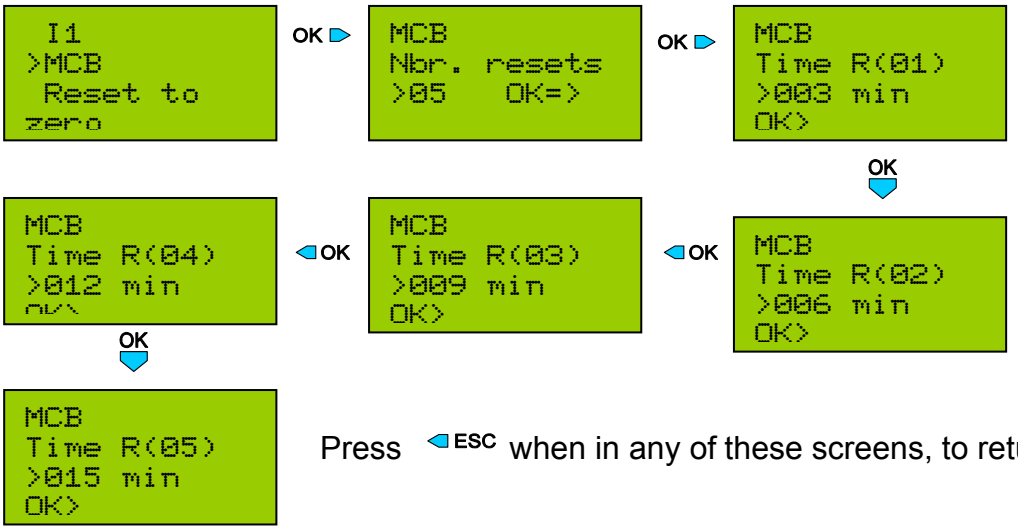
- **Resets: I1:**

Example of configuration of 3 resets, each being of 20, 25, 30 minutes



- **Resets: MCB:**

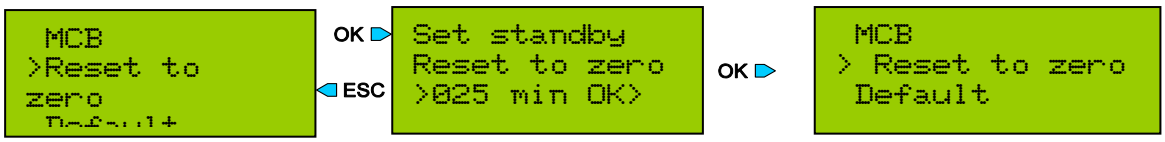
Example de configuration of 5 resets, each being of 3, 6, 9, 12, 15 minutes



Press ESC when in any of these screens, to return to the main menu.

- **Programming delay time for the reset to zero of the number of reset (3-240 mins):**

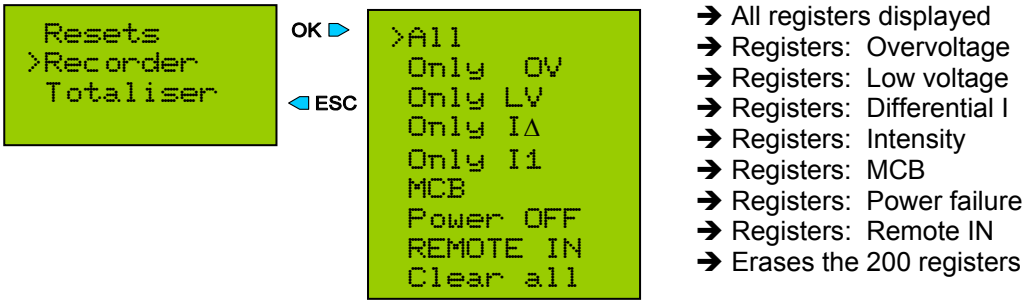
Should the unit reset between reset cycles and not detect the problem which originated the protective action, countdown commences of its **automatic self-start-up (conditional reset to zero of the counter)** of the reset cycles. Once the reset to zero time has elapsed, the reset cycle counters return to zero. Thus, one starts anew from zero and disposes once again of the total number of resets the next time the anomaly arises.



Registers

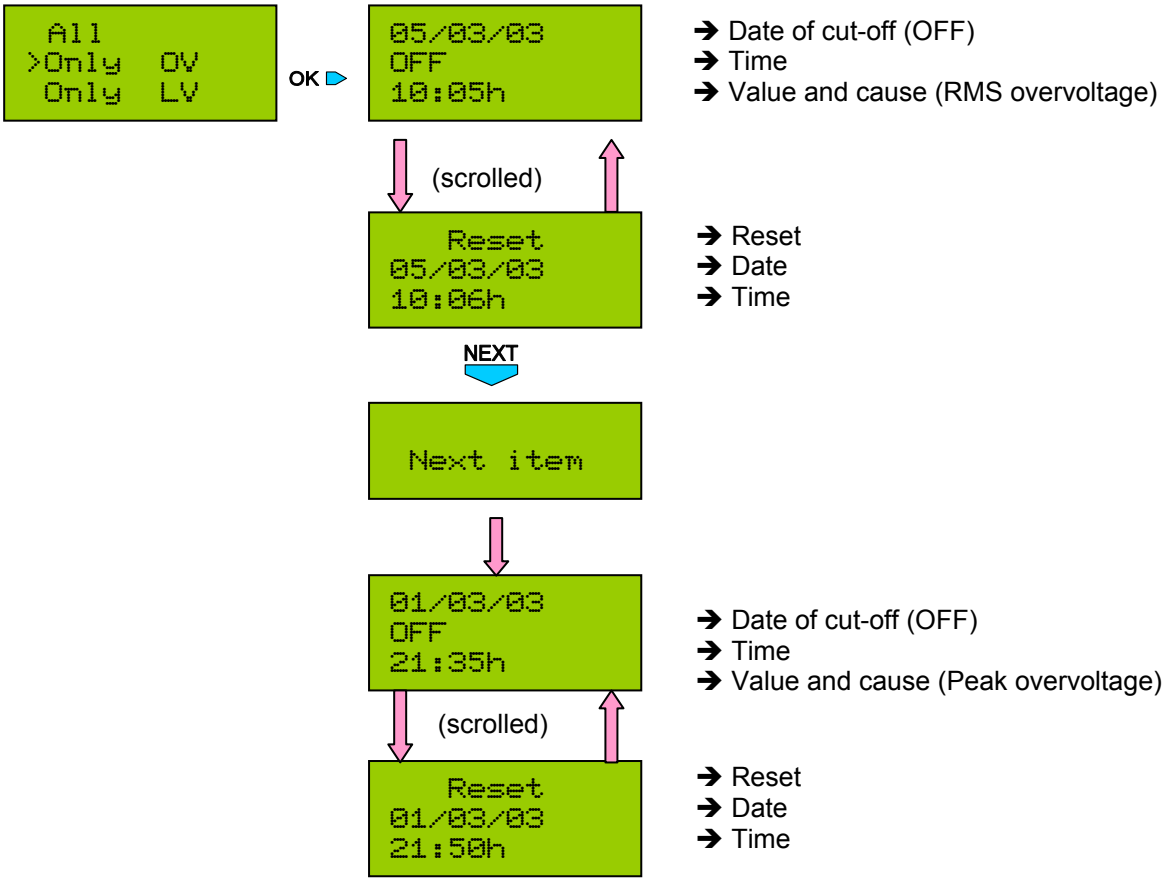
- **All:**

The 200 most recent events are recorded chronologically together with their diagnosis of cut-off alarm, value, hour, minute, day, month, year. Display is by fields or total. All events originated by a user's test are identified by the word "test".



➔ All registers displayed
➔ Registers: Overvoltage
➔ Registers: Low voltage
➔ Registers: Differential I
➔ Registers: Intensity
➔ Registers: MCB
➔ Registers: Power failure
➔ Registers: Remote IN
➔ Erases the 200 registers

- **Only OV (protections against overvoltage). Example:**



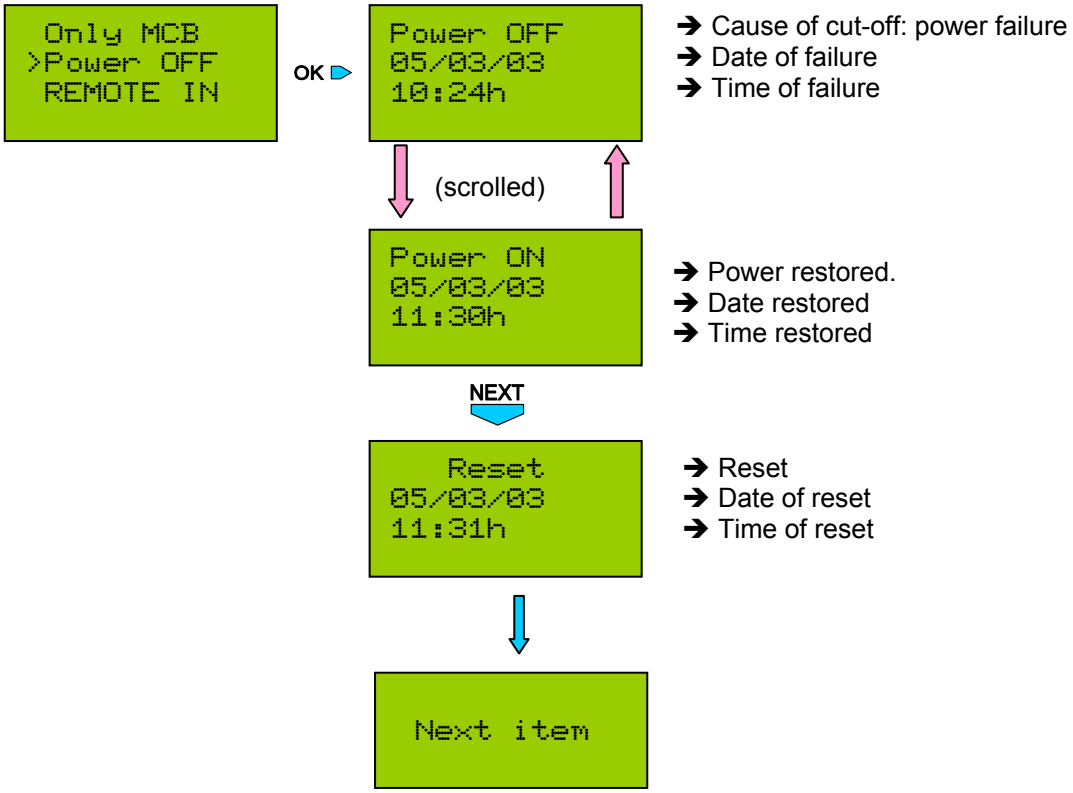
➔ Date of cut-off (OFF)
➔ Time
➔ Value and cause (RMS overvoltage)

➔ Reset
➔ Date
➔ Time

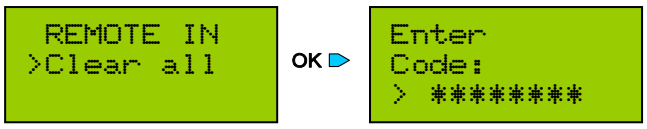
➔ Date of cut-off (OFF)
➔ Time
➔ Value and cause (Peak overvoltage)

➔ Reset
➔ Date
➔ Time

- **Power OFF (control of power failures). Example:**

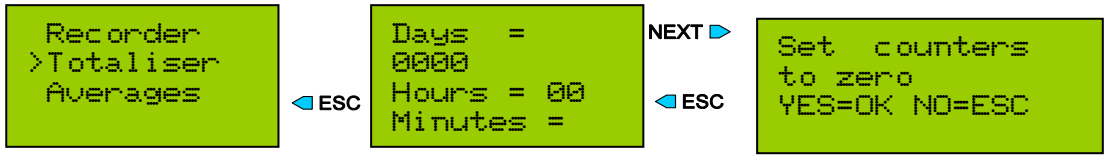


- **Clear all (erases the 200 registers):**



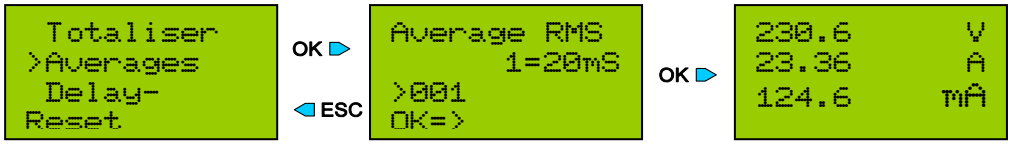
Totaliser

Counts downtime due to power failure. Calculates the sum total of time elapsed (in days, hours and minutes) from Power OFF (power failure) to Power ON (power restored after each power cut taking into account calendar and leap years.



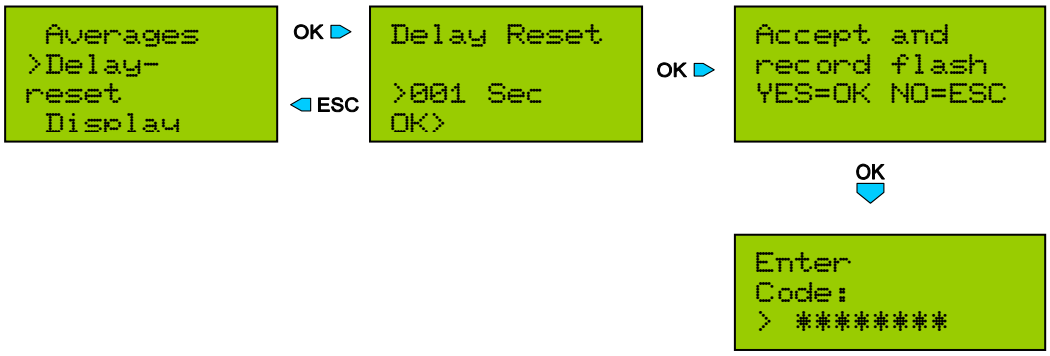
Averages

Mean True RMS measurement programmable from 20mS to 1000mS.
When OK is pressed, one quits the menu and returns to the main measurement screen



Delay – Reset

Programmable start-up delay: subsequent to a cut-off due to power failure. If the power supply is restored the unit can delay the connection from 0 to 999 secs. (this time does not affect the totaliser).

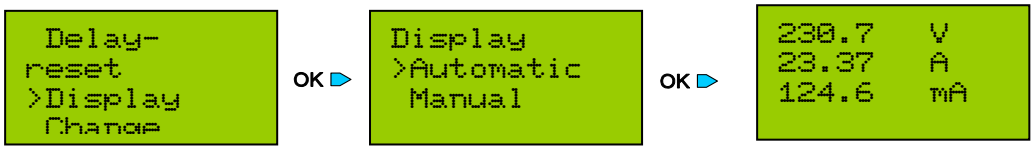


Display

Permits the user to program the manual or automatic display of the 7 main screens.

- Automatic: scrolls sequentially at 4-second intervals
- Manual: scrolls to following screen each time button 2 (NEXT) is pressed

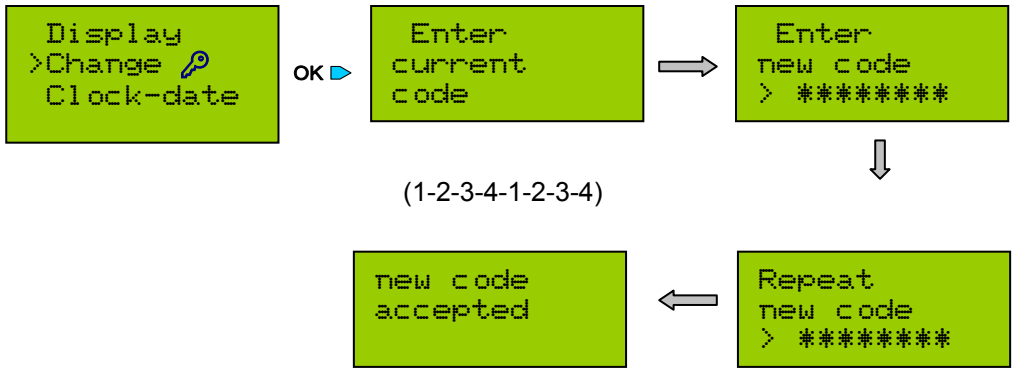
When OK is pressed, one quits the menu and returns to the main measurement screen



To change (To change User code)

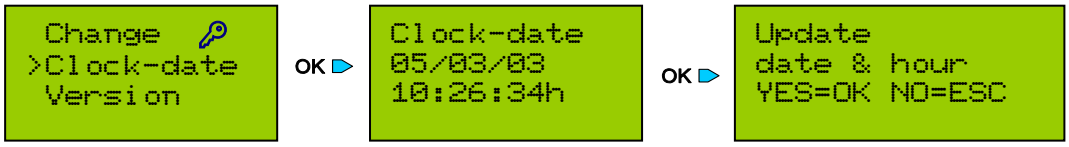
In order for all variations effected in the menu to be updated and recorded in the flash memory of the unit, it is necessary to enter the user code. This is made up of 8 digits, each from 1 to 4 (65535 codes possible). On leaving the factory, the **default code: 1,2,3,4,1,2,3,4** is enabled. The user code can be changed if one knows the current one.

- **WARNING: For security reasons, no master code exists. In case of loss, the user must contact the manufacturer to have the unit re-programmed and thoroughly verified.**

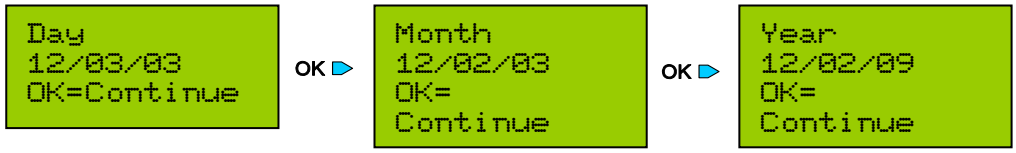


Clock - Date

To display and/or program date and time:



Example: Press OK to update everything at 12/02/09 11:08h. Use buttons 2 and 3 (▲▼) to increase or decrease the digits which flash until the desired value is obtained. Press OK to accept and continue (all data to be programmed will be requested sequentially).

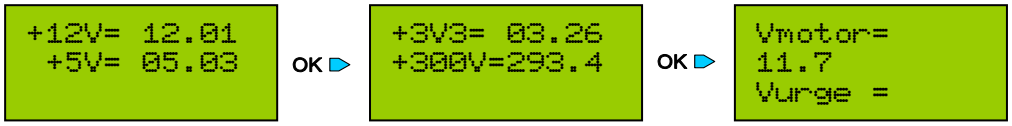


Version

Version and Web site are displayed

System

Internal voltages of the unit are displayed



Factory

Only at factory

Calibration

Only at factory

ANNEX : INFORMATION AND TROUBLE-SHOOTING

Diagnoses

1. ➔ Error in positioning (orientation), wiring or anomaly in the toroidal core
2. ➔ Error in connection
3. ➔ Error in cut-off
4. ➔ Error in test
5. ➔ Error in power supply
6. ➔ Recording error in the flash memory
7. ➔ Error in non-permitted (or out-of-range) values of alarms in the RAM memory
8. ➔ Error in verification of the flash memory (checksum)
9. ➔ Error in verification of the RAM memory (checksum)
10. ➔ Offset error in differential intensity
11. ➔ Offset error in intensity
12. ➔ Error reading Date-Time of the real-time clock

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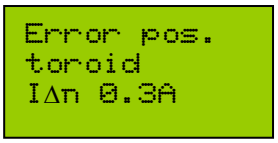
1. ➔ Error in positioning, wiring or anomaly in the toroidal core

The differential Autotest verifies the constant validity of the protection. Every 1.5 seconds, 10mA is injected in the toroidal core during 40mS to verify whether the unit detects it correctly. The following eventual anomalies are detected:

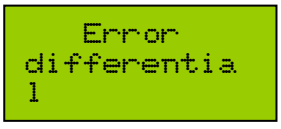
a) Error in positioning of the toroidal core

A correct positioning or orientation of the toroidal core is imperative in order to avoid errors in measurement and an anomalous operation. Once wired up, should the unit detect that the direction of the differential intensity in the toroidal core has been inverted, a long warning beep will be heard and the message “Error pos. toroidal” will be displayed during approximately 4 seconds. This will be repeated until the anomaly is resolved. The positioning is only detected when there exists a leakage superior to 10 mA.



b) Anomaly in the toroidal core

The anomalies which can be detected may be due to: error in wiring, absence of or defect in the toroidal core, a fault in the electronic amplification circuit, in the filtering and/or rectification, in the analog-digital conversion and conversion or the detection software. In these cases, the unit disconnects and does not reset, emitting a warning beep and displaying the message “Error differential”.



When a certain time has elapsed, the unit reinitiates thus verifying the differential again. If the anomaly persists, the unit does not reset and the message is repeated. The unit has an anomaly and must be revised immediately. It must not be used and the technical service consulted.

2. ➔ Error in connection

Due to an imperfect manoeuvre

An emergency cut-off is effected and the situation is stored in memory.

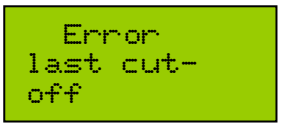
The unit makes up to 3 attempts to reset and, if the same error is detected, it blocks emitting a continuous beep and displaying the message:

The unit has an anomaly and must be revised immediately. It must not be used and the technical service consulted.

Should one opt for reinitiating the unit, press RESET.

3. ➔ Error in cut-off

An anomaly is detected in the course of **cut-off**.
The error is memorised in the flash memory and, when the unit reconnects, the following message is displayed and the unit effects a verification cut-off.



Should the error persist, the unit blocks and displays the warning message:

The unit has an anomaly and must be revised immediately. It must not be used and the technical service consulted. Should one opt for reinitiating the unit, press RESET. In this case, or if the unit switches off and then on, when it reconnects, it effects a verification cut-off.

4. ➔ Error in test

On carrying out an intensity, differential intensity or voltage test, the unit may detect two errors, viz;

a) Error due to non-generation of injection

b) Error when comparing the cut-off value with the value programmed in the flash memory

a) Error due to non-generation of injection

The unit disconnects and indicates on screen “Test error” along with a long, intermittent beep. The unit has an anomaly and must be revised immediately. It must not be used and the technical service consulted.

Should one opt for reinitiating the unit, press RESET. Once reinitiated and reset, the unit indicates periodically that there has been a “Test error” , thus reminding the user that the test must be carried out again. This message will persist until satisfactory results have been obtained from this test.

b) Error when comparing the cut-off value with the value programmed in the flash memory

When effecting an intensity, differential intensity or voltage test, provided that the alarm delay is equal or inferior to 1000mS, the unit compares the cut-off value and the programmed value. If the cut-off value is within the margins calculated by the unit, the test is correct. Should this not be the case, the unit indicates “Test error” during 10 seconds along with a short intermittent beep. The informative screen regarding the alarm cut-off is now displayed. The unit has an anomaly and must be revised immediately. It must not be used and the technical service consulted.

Should one opt for reinitiating the unit, press RESET. Once reinitiated and reset, the unit indicates periodically that there has been a "Test error" , thus reminding the user that the test must be carried out again. This message will persist until satisfactory results have been obtained from this test.

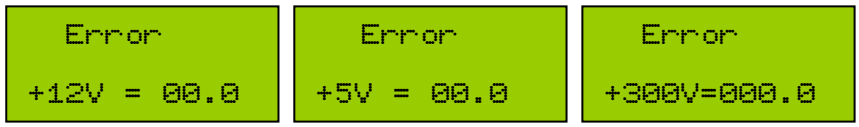
Watchdog Test (external Watchdog)

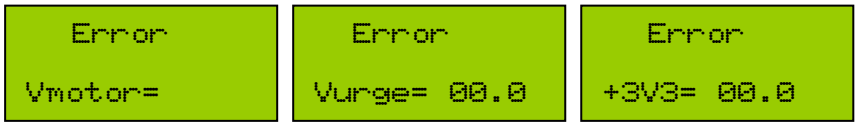
Please refer to this paragraph in the corresponding section TEST.

5. ➔ Error in power supply

An anomaly is detected in the power supply ±12V, ±5V, +300V, +3,3V, Vmotor, Vurgencia

If the error is detected while the unit is in reset (I-ON), the unit disconnects and indicates "Error" (power supply), and displays the erroneous voltage value during 20 seconds. It then proceeds to reinitiate and if the error in power supply persists, the message will continue to be displayed until it detects that the voltage is correct.



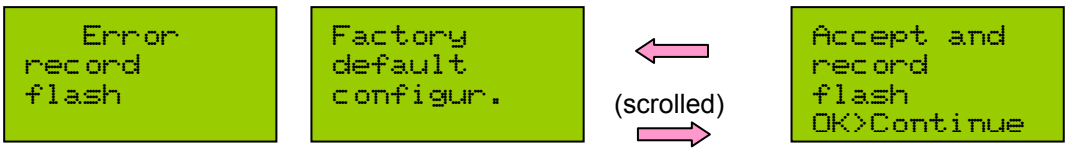


6. ➔ Recording error in the flash memory

An anomaly is detected during the process of recording in the flash memory of the unit.

If, after having effected changes programming the alarms, resets, etc. an error occurs while recording in the flash memory (a value has been recorded incorrectly), the unit carries out a further 5 recordings. Should the error persist after the fifth recording, the unit indicates "Error record flash".

The only course of action is to press RESET. The unit now offers the option of recording the default configuration from the factory. If, once accepted, the error persists, the unit repeats the message "Error record flash".



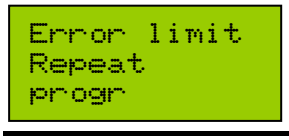
The technical service should be consulted for an immediate revision of the unit.

7. ➔ Error in non-permitted (or out-of-range) values of alarms in the RAM memory

A- Initially
B- During a programming process

In **case A**, this indicates to the user that there is an error in the alarm limit and that he must press RESET in order to continue and thus record the default values from factory.

In **case B**, before recording the changes while programming the alarms, the data is verified to ensure it is correct. Should any value of the RAM memory have been erroneously modified, then the complete contents of RAM memory of alarms is relinquished and the unit indicates "Error limit, Repeat progr" OK > continue"



8. ➔ Error in verification of the flash memory (checksum)

Each time the unit reinitiates, the contents of the program are verified. If incorrect, the information de the flash memory could be corrupt, in which case, for safety reasons, the unit becomes inoperable.

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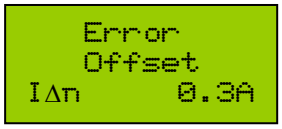
9. ➔ Error in verification of the RAM memory (checksum)

Each time the unit reinitiates, the RAM memory is verified. Should any damaged position be detected, for safety reasons, the unit becomes inoperable

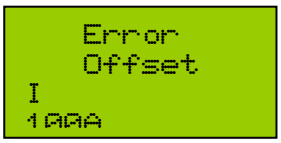
10.➔ Offset error in differential intensity

During the start-up process, the MCB is in the 0-OFF position . The unit cannot measure any type of intensity and, therefore, measures and verifies that the offset voltage is within the optimum parameters. Should this not be the case, “Error offset” is indicated for approximately 4 seconds and then the process repeated until the correct parameters are obtained in this offset.



11.➔ Offset error in intensity

During the start-up process, the MCB is in the 0-OFF position The unit cannot measure any type of intensity and, therefore, measures and verifies that the offset voltage is within the optimum parameters. Should this not be the case, “Error offset” is indicated for approximately 4 seconds and then the process repeated until the correct parameters are obtained in this offset.



12.➔ Error reading Date-Time of the real-time clock

If, while reading the date and time, there is an error in communication or if the real-time clock displays an incorrect date and time, the unit solicits the time up to 5 times. Should the anomaly persist, the unit reinitiates the clock with the following date and time. It does not inform of this correction.

Glossary:

Δ	Differential
A	Amperes
A pk	Peak Amperes
Autoscale	Automatic system for the adoption of the pertinent scale
Checksum	Totalising check
Delay	Time delay
LCD	Liquid crystal display
Fp	Power Factor
Hz	Line frequency V1
IT	Low voltage
I	Intensity
IΔ	Differential intensity
IΔn	Rated Differential intensity
kW	Kilowatt (1KW =1000W)
kWh	Kilowatts hour
kQh	Reactive Kilowatts hour
mA	Milliamperes
mA pk	Peak Milliamperes
mS	Milliseconds (1mS = 1second/1000)
mAΔ	Differential Milliamperes
mApΔ	Peak Differential Milliamperes
Offset	Parameter margins
ST	Overvoltage
V	Voltage
VA	Voltamperes
VAr	Reactive Voltamperes
VArI	Reactive Inductive Voltamperes
VArC	Reactive Capacitive Voltamperes
V pk	Peak Voltage
Value RMS	Integral of a 20mS wave cycle
Value pk	Maximum punctual value on the crest of the wave
W	Active power
W+	Power consumed
W-	Power supplied
Watchdog	Process monitoring system

Formulas:

Voltage: $V = \sqrt{\{(1/M \sum_{S=0}^{M-1} (Us^2)\}}$

Intensity: $I = \sqrt{\{(1/M \sum_{S=0}^{M-1} (Is^2)\}}$

Reactive power: $Q = 1/M \sum_{S=0}^{M-1} \{Us \times Is(s + m/4)\}$

Active power: $P = 1/M \sum_{S=0}^{M-1} (Us \times Is)$

Apparent power: $VA = V \times I$

CHAPTER 3 - Verification and start-up

Start-up

Connect all up-stream conductors (by means of switches, sectionalisers or others.)

(The reinitiation sequence will automatically be carried out. The ancillary MCB will then reset and the unit will be operative).

Carry out all the protection tests including the Watch Dog test.

"Real incremental" test of protections (Test IΔ-V-I):

This type of test injects a real senoidal intensity or voltage, of incremental value, which is added to the existent line measurement. As the alarm threshold is surpassed, this test originates an alarm/cut-off. **In this way, one can know the exact value of protection and cut-off.**

- The differential intensity test injects an intensity into the toroidal transformer itself which measures the differential intensity of the line.
- The overvoltage test injects voltage into the input amplifier of line voltage.
- The overintensity test injects voltage into the input amplifier of line intensity.

Before using the unit, the complete Protection Test must be carried out, including the Watch Dog test. If the unit is to be put to permanent use, testing must be done as a matter of routine. Once the test has been completed, should the results not be correct, the unit must not be used under any circumstance whatsoever. The Authorised Technical Service must be contacted at once.

Functioning is correct when, once the Test button is pressed the unit cuts off and emits the corresponding diagnosis. When the Test has finished, the unit resets automatically.

When it effects an intensity, differential intensity or voltage test, the unit compares the cut-off value and the programmed value. If the cut-off value is within the margins calculated by the unit, the test is correct. Cut-off value = programmed value + % of foreseen margin. The unit calculates the percentage to be added on depending on the alarm delay :

- Peak alarms : voltage and intensity

  Delay ≤ 2mS ➔ +5%
  Delay > 2mS ➔ +15%

  differential intensity

  Delay ≤ 2mS ➔ +15%
  Delay > 2mS ➔ +30%

- RMS alarms due to overvoltage and low voltage:

  Delay ≤ 100mS ➔ +5%
  Delay > 100mS ➔ +15%
  Delay > 1000mS ➔ does not compare.

- RMS alarms due to differential over-intensity:

  Delay ≤ 100mS ➔ +15%
  Delay > 100mS ➔ +35%

- RMS alarms due to over-intensity:

  Delay ≤ 100mS ➔ +5%
  Delay > 100mS ➔ +25%
  Delay > 1000mS ➔ does not compare.

Differential Test with rated threshold

When "TEST $I_{\Delta N}$" is enabled, a real defect current is generated in the toroidal measuring the incremental value. This is added to the existent differential leakage in the line. The test produces an alarm/cut-off when the alarm threshold is surpassed. In this way, the user can know exact protection and cut-off value.

Such a high degree of precision requires that the measurement toroidal indicate the direction in which the wiring be passed through. This ensures that the defect intensities which circulate throughout the installation are added to the Test intensity rather than be deducted which could otherwise be the case.

This differential **permits an "ideal" test to be carried out in a "normal" installation** (with the habitual existent leakage). Other differentials, on the other hand, stick strictly to the legally tolerated margins and provoke a defect current 250% superior to the rated value. Moreover, adding to that the existent differential leakage in the line, 350% could easily be reached which does not constitute any proof that these differentials will function at said rated value.

Autotest: differential

The unit automatically tests itself for differential protection every 1.5 seconds. **21,000,000 times a year it checks the constant operativity** of: toroidal, wiring of same, amplification, filtering and detection. The user must check the performance and its threshold (cut-off value) manually by means of "TEST $I_{\Delta N}$" since this involves a disconnection.

When the autotest detects that the differential protection is not valid, it cuts off and diagnoses. In this way, one is totally assured of the constant validity of the extraordinary degree of protection afforded by this differential and the fact that it makes for easy inspection.

Diagnosis of cut-off

The causes of cut-off are stored in memory and displayed on-screen.

Redundant cut-off devices

As a redundant security measure, the unit has a built-in **double cut-off device** for the ancillary MCB, viz:

- Cut-off device #1, by means of a very high-speed tripping coil
- Cut-off device #2, by means of a built-in motor-drive

Moreover, in order to command the double cut-off device, the unit has three independent cut-off circuits, viz:

1 - High-speed cut-off circuit for the MCB by means of a coil. It has it's own exclusive built-in energy storage which permits it to disconnect the MCB even when there is no mains supply.

2 - Cut-off circuit by means of a motor. It has it's own exclusive built-in energy storage which permits it to disconnect and connect the MCB even when there is no mains supply.

3 - Emergency cut-off circuit. It is independent of the main circuit and has its own energy which permits it to disconnect the MCB via the motor and orders circuit #1 to cut off the MCB via the coil even when there is no mains supply.

CHAPTER 4 - Description of Protections

Differential protection

By "defect currents which derive, or leak to earth", one is referring to those currents which derive to earth causing a difference in intensity between the live output conductors (phases and neutral).

If the leakage or derivation closes the circuit between phases and/or neutral of the live output conductors, there is no difference in intensity between phase and neutral. In this case, the differential protections do not act but then neither would any receiver being supplied from phase to neutral.

The functioning of the protection devices against defect currents which derive or leak to earth (differentials) is based on the measurement of the difference in intensity between the live conductors (phase and neutral). Once the pre-established threshold has been exceeded, the cut-off elements of the device come into play.

The differential is a standard element of protection. It measures defect currents to earth in order to cut off should this leakage exceed certain pre-established values.

For safety reasons, the norm stipulates that a differential must cut off within 50% and 100% of its programmed IΔn value. This unit is situated midway in this range, i.e. the threshold is established at 25% below the original programmed IΔn value. As a norm, all differential manufacturers establish this margin in the same way (25% below the original programming value).

Over recent years, there has been a steadily growing proliferation of electrical receiver equipment which relies on electronics in order to increase its performance and cut down on energy. For example, tools and domestic appliances with speed regulation, electronics in general, etc... which operate with rectified or pulsing currents.

The derivations or defect currents of these currents constitute a risk which has been taken into account. Hence, the inclusion of protections against derivations from pulsing currents

The ORION differential protection differentiates itself from others because of its high precision, high speed and its constant self-verification.

Protection against untimely tripping of the differential

All equipment and installations have inevitable leakage to earth. Therefore, differentials have values made to withstand a limited amount of leakage before tripping. The most common is 30mA which is tared at around 22.5mA. Typical times for magnetisation of the core and cut-off of differentials are between 6 and 30mS.

A rise in voltage makes for a proportional increase in existing leakage thus causing the subsequent untimely and undesirable tripping of the differential if the threshold has been exceeded.

On the contrary, In a question of microseconds, the ORION detects the onset of an overvoltage and aborts it at the outset by cutting off in only 2mS. The final voltage is zero and, therefore, there is no leakage. Thus, untimely tripping of the differential due to overvoltage is avoided, both downstream (0V = 0 leakage) and upstream (separated from the sector where there is leakage).

Protection against permanent and transient overvoltage

In the event of a permanent or transient overvoltage of a value superior to that programmed, the unit engineers a very high speed cut-off via the tripping coil and the motor-drive.

The unit withstands permanent overvoltages of 450 V RMS and transient (1 second) 1000V peak voltages. In the event of peak voltages of over 1100 V, the unit protects itself by means of a built-in 315mA T fuse. Prolonged use in higher-rank voltages is not recommended. The unit will reset automatically when the anomalous condition desists.

Whilst there exists an overvoltage, the unit will not reset.

Protection against permanent and transient low voltage

In the event of a permanent or transient low voltage of a value inferior to that programmed, the unit engineers a very high speed cut-off via the tripping coil and the motor-drive.

Whilst there exists a low voltage, the unit will not reset.

Protection against tripping of the MCB

The ORION unit is equipped with an Automatic Sequential Reset of the ancillary MCB (programmable).

CHAPTER 5 - Cut-off. Tripping times

In the event of the protections being called into play, the cut-off of the ancillary MCB disconnection is effected in a typical time of between 2mS and 3mS in the single-phase units (depending on the model and make of the coil).

Available upon request, measurement protocol and also the corresponding graphs for the cut-off times of the different models and makes of MCB's and tripping coils.

TOTAL CUT-OFF TIME OF THE MCB

In order to calculate the total cut-off time in the event of protection acting, the additional programmed delay time of the alarm must be added to that shown on the graphs (typical cut-off time between 2mS and 3mS). Moreover, one must also bear in mind the ionisation effect at the moment of disconnection between the contacts of the ancillary cut-off element (MCB). Even though the starting point of the extinction of the intensity does not vary, the ionisation does prolong the duration. The factors which increase this time are directly proportional to the intensity and the voltage as well as the nature of the load (inductive, capacitive and resistive).

CHAPTER 6 - Mode of Use

Given the automatic nature of its diverse protections, after having read and fully understood the present manual and having started up the unit, the user may then proceed to connect up the elements of consumption to the protected line and the unit will operate as described in CHAPTERS 3 and 4.

Before using the unit, the complete Protection Test must be carried out, including the Watch Dog test. If the unit is to be put to permanent use, testing must be done as a matter of routine. Once the test has been completed, should the results not be correct, the unit must not be used under any circumstance whatsoever. The Authorised Technical Service must be contacted at once.

Should the user wish to disconnect the line and the unit, the circuit-breaker switch at the main switchboard may be tripped manually (upstream).

◊ It must be borne in mind that the unit resets the ancillary circuit-breaker automatically and this fact could cause injury to a careless operator or user. In order to avoid this:

- all up-stream conductors are to be disconnected. (by means of switches, sectionalisers or others.)

REMOTE CONTROL

The REMOTE IN and OUT terminals are an invaluable tool which provide characteristics such as: MULTIPOWER, MULTICOMBINATION and INTERACTION with other elements whether these be part of the ORION range or others.

They provide the user with a modular expansion architecture. If one connects the REMOTE OUT of module A to the REMOTE IN of module B, the former controls and governs the latter. If the connection is made inversely, then module B controls module A. If one connects the OUT and the IN of A to the IN and OUT respectively of B, an interaction is obtained.

The REMOTE also enables the ORION modules to be governed by programmable automats, by computers or by other means. Likewise, it permits incidents to be recorded in the computer.

Another outstanding aspect of the ORION philosophy is the possibility of providing an installation with peerless levels of protection without the installation itself having to be modified nor elements substituted despite their being the customary ones. The ORION philosophy is based on the simple annexing of protection characteristics in the form of the pertinent ORION modules in order to meet any present or future need which may arise.

The following examples should provide the user with some ideas which ought to stimulate his own creativity and imagination:

- Linked up to other ORION modules
- Linked up to other automatic systems (detectors, sensors...)
- Linked up to programmable automats, computers, **etc.**

CHAPTER 7 - Description of basic components

Toroidal differential intensity transformer TRDF18

(individually matched and adjusted to its module)

Toroidal core of mumetal (high magnetic permeability and low loss) Precision 1 %

- internal ∅ 18mm
- other dimensions

Toroidal intensity transformer TRIT18

(individually matched and adjusted to its module)

Toroidal core of mumetal (high magnetic permeability and low loss) Precision 1 %

- internal ∅ 18mm
- other dimensions

Ancillary MCB 2 and 4-pole

Manufacturer: SCHUPA (GEWISS GROUP)
Type: NLS10 ó NLS6
Curve C
Intensities 16, 25, 32, 40, 50, 63A
Cut-off power 10KA or 6KA
For further information, please consult the manufacturer

High-speed disconnector (tripping coil)

Manufacturer: SCHUPA (GEWISS GROUP)
Type: NLS-F1 12/60V
For further information, please consult the manufacturer

Ancillary MCB 2 and 4-pole

Manufacturer: General Electric
Type: GTI 10000 ó G6000
Curve C
Intensities 16, 25, 32, 40, 50, 63A
Cut-off power 10KA or 6KA
For further information, please consult the manufacturer

High-speed disconnector (tripping coil)

Manufacturer: AEG
Type: F4 16/60V
For further information, please consult the manufacturer

Other MCB's and disconnectors : Please, consult ORION

CHAPTER 8 - Trouble-shooting and diagnosis

Consult Authorised Technical Service

AUTHORISED TECHNICAL SERVICE: SOLELY BY THE MANUFACTURER

H.T. SISTEMAS, S.L.
c/ FUENTE DEL REAL, 41 (Esq. RAMIRO I)
33209 GIJON (PRINCIPADO DE ASTURIAS) SPAIN
Tel. +34 985387309 Fax +34 985340342
E-mail: info@htsistemas.com

For further information, please consult WEB site: **http://www.htsistemas.com**

CHAPTER 9 - Maintenance

ORION requires no maintenance as such. Nevertheless, before using the unit, the complete test operation must be carried out as described in CHAPTER 3. If the unit is to be put to permanent use, testing must be done as a matter of routine.

Once the protection test has been completed, should the results not be correct, the unit must not be used under any circumstance whatsoever. The Authorised Technical Service must be contacted at once. This is also the case in the event of the eventualities described in the chapter "PRECAUTIONS".

Notwithstanding, on a minimal yearly basis, the user must check that the measurements of the electrical parameters of the unit coincide with those stipulated in the technical characteristics, To this end, competent technical personnel at the factory will revise the unit and proceed to calibrate it if need be.

CHAPTER 10 - Additional options

The new range of protection, measurement and registering share the ORION philosophy and are extraordinarily versatile. So much so that they permit multiple configurations thanks to their modular expansion architecture not only with present and future ORION elements but also with others available on the market. Thus, they complement and are complemented by other characteristics and features regardless of whether or not they are ORION. Please, consult ORION.

♦ Protection against intense transient overvoltages of short duration

Thanks to its high physical cut-off speed and its wide voltage range, which ensure a constant supervision, along with its intelligent reset feature and multicombination nature, the ORION units are able to protect a vast gamut of situations. Nevertheless, there exist certain specific situations where there arise powerful but brief transient overvoltages. In such a situation, the ORION unit should be complemented with a specific protection.

This specific protection against extremely powerful and brief (KV/µS) peaks, is to be found in a module form which ORION considers particularly apt as well as being complementary to its own modules. The module in question is based on varistors and acts as a discharger in this kind of overvoltages.

Despite the varistor-based protection system being efficient solely in the event of transient overvoltages of brief duration, it is, nonetheless, the perfect complement for the protections offered by the ORION unit.

The zinc oxide varistor offers a high derivation capacity (maximum, 40kA 8/20) along with a rapid response time (<25 nS), thus diminishing the high values of the fore-mentioned transient overvoltages.

GUARANTEE (owner's copy)

H.T. SISTEMAS, S.L., as a leader in the field of electrical and electronic safety equipment endeavours to maintain an extensive service along with up-dated information to the users of its products. To this end, it is indispensable that the user fills out and returns the present guarantee further to purchase of his ORION unit.

Period of guarantee: three years as from date of purchase

Conditions and application of your ORION guarantee: Your ORION unit is guaranteed against any defect of manufacture or original components as determined by our Technical Service. Any repair or substitution does not extend the guarantee period.

- The guarantee covers:

- Reception of the unit for its repair or servicing.
- Cost of all components, replacements and labour on original components.

- The guarantee does not cover:

- Transport
- Breakdown caused by non-original components or devices.
- Defects caused by incorrect installation.
- Damage caused by incorrect usage, or errors arising from repairs and internal manipulation by unauthorised persons.
- Consumables: fuses, thermal fuses, varistors and labour involved in replacement of same

- The guarantee is automatically forfeited in the event of:

- Breakage or deterioration of the seals of any of the original ORION elements.
- Incorrect usage due to non-observance of the recommendations given in the ORION manual.
- Non-reception of the completed guarantee card within 30 days as from date of purchase. H.T. SISTEMAS, S.L.will acknowledge receipt of the guarantee card).

- Repair service: All repair service, both within and outside of the guarantee period, is by H.T. SISTEMAS, S.L. and its Authorised Technical Assistance Services.

NOTES

NOTES (We suggest your noting the serial number of your unit and other information of interest).

GUARANTEE CARD (to be photocopied and returned to ORION)

ORION Model.....

Serial Nbr.....

Date of purchase.....

Stamp of establishment where unit purchased

(complete address)

Purchaser's **complete** name and address

E-mail: (I hereby authorise ORION to keep me periodically informed)

Principal use to which unit is to be put.....

Notes.....

GUARANTEE

H.T. SISTEMAS, S.L., as a leader in the field of electrical and electronic safety equipment endeavours to maintain an extensive service along with up-dated information to the users of its products. To this end, it is indispensable that the user fills out and returns the present guarantee further to purchase of his ORION unit.

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- Defects caused by incorrect installation.
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