**Universal tele-programmable, tele-controllable protection and mains analysis unit with WebServer and Modbus TCP/IP**
**Automatic reclosures with built-in motor-drive. Graphic and numerical display in real time. RMS, Peak, AC and DC measurements**
**Differential I. protection and analysis, type A / B. RMS, Peak, AC and DC measurements. Auto-refreshing differential I. oscilloscope**
**Oscilloscope event-logger with pre-trigger, differential intensity channel (600-event built-in memory)**
**Oscilloscope event-logger with pre-trigger, voltaje and intensity channels (600-event built-in memory)**
**Oscilloscope and 64-harmonic spectrum, 7 auto-refreshing channels (distortion range in % and V – A, + THD value)**
**THD measurement and alarm as from 2-63, programmable by harmonic and harmonics bracket**
**Proactive measurements of 1600 electrical parameters + temperature and humidity**
**Relays with alarms, timers, time programmer, input control and manual control**
**Graphical history (months, days, hours and minutes) of energy, costs and emissions with built-in 3-year memory**
**Tele-management, sizing, surveillance, energy maintenance and I/O control. Precisions: (V, I): ±0.2% and ±0.4%**



**UNIVERSAL+ 7WR M1 Differential, type A**
**Built-in reclosure motor-drive command for MCB from 6 to 63A, 2 and 4-pole**

# Annex-manual - UNIVERSAL+ 7WR M1 Differential, type A

## Software: version V3.15

# Annexe to UNIVERSAL+ 7WR M1 Differential, type A user/installer 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**

**(Please, refer to UNIVERSAL+ 7WR M1, M2 and M3 Generic manual)**



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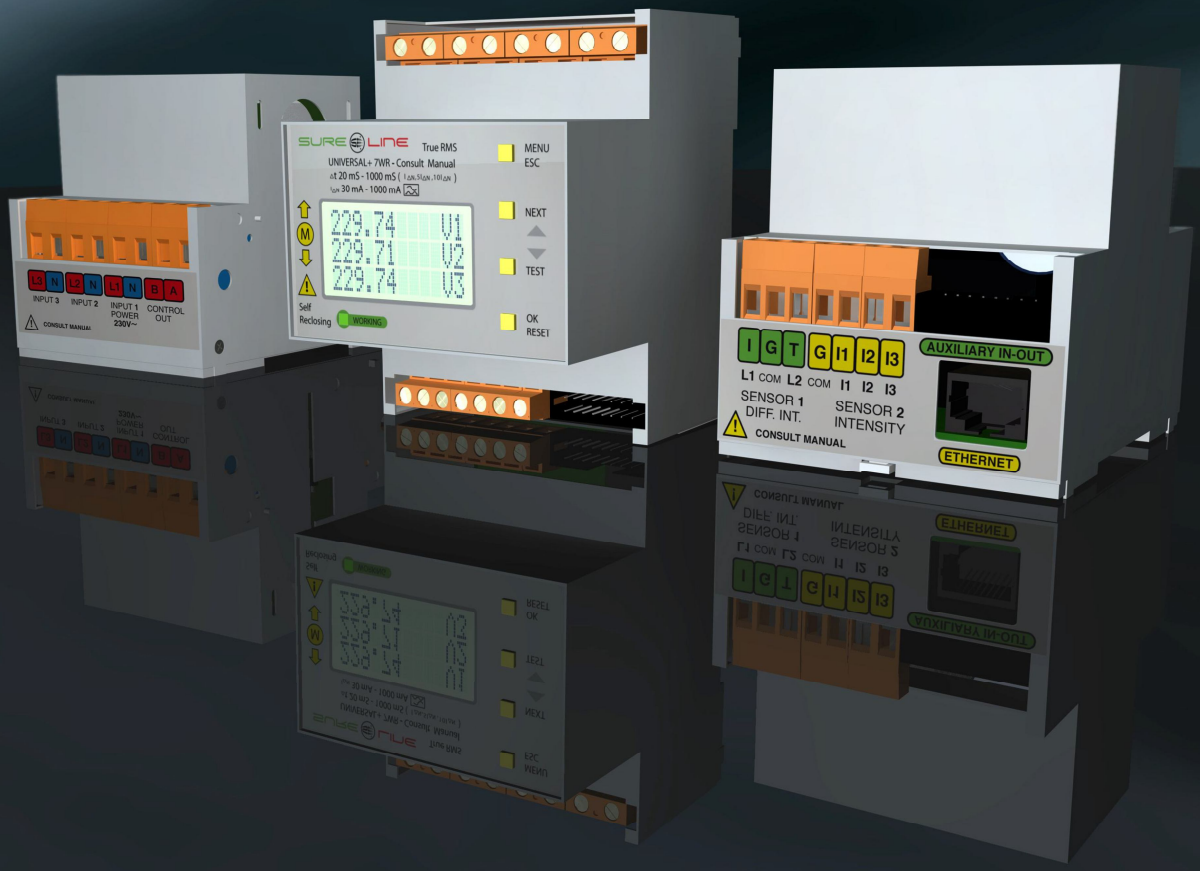



## Consult appended manuals for specific models:

**Generic UNIVERSAL+ 7WR M1, M2 and M3 manual**

**Manual Safeline Web Service**

**Instruction manual - DatawatchPro software**

**Instruction manual - UNIVERSAL+ 7WR IN OUT**

**Instruction manual - UNIVERSAL+ 7WR accessories**

**Command configuration (protection device upon power supply cut-off):**

**M1 =** Command 1 (Command built-in reclosure motor-drive for MCB from 6 to 63A, 2 and 4-pole, Icu up to 15kA)

**M2 =** Command 2 (Command external reclosure motor-drive, for external MCB)
Moulded case from 80 to 250A, 4-pole (Icu up to 100kA)
MCB from 10 to125A, 2 and 4-pole (Icu up to 50kA)
MCB from 6 to 63A, 2 and 4-pole (Icu up to 15kA)

**M3** = Command 3 (External reclosure relay/contactor command from 25 to 1250A, 2 and 4- pole)

**M5 =** Command 5 (Tripping of SHUNT TRIP DEVICE for external MCB, manual reclosure 2 and 4-pole)
Intensity depends on external MCB

# I N D E X

## Chapter 6 – Verification and start-up



## Chapter 7 – Description of protections



## Chapter 8 – Additional options



## Chapter 9 – Cut-off. Tripping times.



## Chapter 10 – Usage



## Chapter 11 – Description of basic components



## Chapter 12 – Technical service



## Chapter 13 – Maintenance



## Chapter 14 – Guarantee



## Chapter 15 – Wiring diagrams



## Chapter 16 – Modbus TCP/IP communication protocol , Port 502



## Chapter 17 – TCP/IP. HTTP communication protocol. WebServer.



**Important: Depending on the versions of the software and of the UNIVERSAL+ 7WR model and (consult these on the identifying label on the side of the unit and on its display and/or WebServer), different protections/alarms, measurements, connections and characteristics are included. These are to be found in the corresponding manuals and synoptic tables.**

# Chapter 1 – Introduction

## 1.1 Nomenclature - UNIVERSAL+ 7WR M1 Differential, type A:

| 7WR | [ M1 ] | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] | [ ] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | |

1- Command configuration (protection device for cut-off from mains)

[ **M1** ] = Command 1 (Built-in reclosure motor-drive command for MCB from 6 to 63A, 2 and 4-pole) , 0 - 70A
[ **M1 SR** ] = M1 + Automatic data dispatch to a remote server via Internet: Specially designed to work with "Safeline Web Service" administration software.

2 - Phases

[ **T** ] = Three-phase 4-pole
[ **M** ] = Single-phase 2-pole

3 – Differential intensity sensitivity

[ **A10-300mA** ] = IΔn 10-300mA. Timed differential type A.
Delay if value >35mA (Δt) from 80ms to 1000ms ($I_{\Delta N}$, 2 $I_{\Delta N}$, 5 $I_{\Delta N}$,10 $I_{\Delta N}$). Delay if value ≤35mA (Δt) 40ms ($I_{\Delta N}$), 10ms 5 $I_{\Delta N}$ (instantaneous)
[ **A30-1000mA** ] = IΔn 30-1000mA. Timed differential type A.
Delay if value >35mA (Δt) from 80ms to 1000ms ($I_{\Delta N}$, 2 $I_{\Delta N}$, 5 $I_{\Delta N}$,10 $I_{\Delta N}$). Delay if value ≤35mA (Δt) 40ms ($I_{\Delta N}$), 10ms 5 $I_{\Delta N}$ (instantaneous)
[ **A100-3000mA** ] = IΔn 100-3000mA. Timed differential type A.
Delay (Δt) from 100ms to 3000ms ($I_{\Delta N}$, 2 $I_{\Delta N}$, 5 $I_{\Delta N}$,10 $I_{\Delta N}$)
[ **N** ] = No measurement-differential intensity protection (do not select suffix in box 9 and14)

4 – Version: Voltage measuring scale (line neutral) AC

[ **250E** ] = full measuring scale line neutral 250V Pk
[ **500E** ] = full measuring scale line neutral 500V Pk
[ **1000E** = ] full measuring scale line neutral 1000V Pk

5 – Power supply-measurement frequency

[ **50Hz** ] = 50Hz (standard)
[ **60Hz** ] = 60Hz

6 – Supply voltage

[ **115V** ] = 115V AC (Line Neutral)
[ **230V** ] = 230V AC (Line Neutral) (standard)

7 – Version: Energy log with 3-year memory

[ ] No suffix = without energy log and without built-in 3-year memory
[ **G** ] = with energy log and without built-in 3-year memory

8 – Version: oscilloscope event-logger in waveform with pre-trigger, voltaje and intensity channels (built-in 600-event memory)

[ ] No suffix = without oscilloscope event-logger in waveform with pre-trigger, voltaje and intensity channels (built-in 600-event memory)
[ **W** ] = with oscilloscope event-logger in waveform with pre-trigger, voltaje and intensity channels (built-in 600-event memory)

9 – Version: oscilloscope event-logger in waveform with pre-trigger, differential intensity channel (built-in 600-event memory)

[ ] No suffix = without oscilloscope event-logger in waveform with pre-trigger, differential intensity channel (built-in 600-event memory)
[ **D** ] = with oscilloscope event-logger in waveform with pre-trigger, differential intensity channel (built-in 600-event memory)

10 – Version: basic precision - voltage and intensity

[ **HP0.2** ] = 0,2% precision in voltage and intensity
[ **HP0.4** ] = 0,4% precision in voltage and intensity

11 – Version: display

[ ] No suffix = Display with backlighting
[ **NZ** ] = Display without backlighting

12 – Power supply (Line Neutral)

[ ] No suffix = Not designed to allow reconnection of the new digital counters
[ **CT** ] = Designed to allow reconnection of the new digital counters

13 – Line intensity measurement toroidal transformer AC (single-phase:1 pc; three-phase: 3 pcs)

[ **TRIT14** ] = TRIT14 (internal ∅ 14 mm)
[ **TRIT18** ] = TRIT18 (internal ∅ 18 mm)

14 – Differential intensity measurement toroidal transformer AC (single-phase and three-phase: 1 pc)

[ **TRDF18** ] = TRDF18 (internal ∅ 18 mm)
[ **TRDF26** ] = TRDF26 (internal ∅ 26 mm)

15 – Ancillary MCB intensity

[ ] = 6A, 10A, 16A, 20A, 25A, 32A, 40A, 50A, 63A

16 – Ancillary MCB tripping curve

[ ] = C, B, D, K (C : standard)

17 – Ancillary MCB breaking capacity, in accordance with IEC 60947-2.

[ ] = 10kA, 15kA (10kA : standard)

**Example: UNIVERSAL+ 7WR M1 T A30-1000mA 500E 50Hz 230V G W D HP0.4 TRIT14 TRDF18 40A C 10kA**

**Attention:** Please, refer to the identifying label on the side of the unit.

# Chapter 2 – User's guide (front panel and display)

## 2.1 Functions of the keys

The contextual keys permit the user to surf the menu and follow on-screen, cursor and flashing figure indications. These intuitive, user-friendly keys have different logical value depending on the context.

MENU / ESC:
- Outside the menu:
  - enters menu mode
- Within the menu:
  - returns to previous level or quits menu mode
  - in process of modification of values (flashing), quits without modifying data

NEXT / (up):
- Outside the menu:
  - following measurement screen
- Within the menu:
  - goes to next level
  - increases a flashing value
  - goes to next screen

TEST / (down):
- Outside the menu:
  - returns to previous measurement screen
  - held down for more than one second, runs differential intensity test
- Within the menu:
  - Goes down one level
  - decreases a flashing value
  - goes to previous screen

RESET / OK:
- Outside the menu:
  - unit is reinitiated in the event of locking or during a counting process
  - general reset ( see section below)
- Within the menu:
  - enters submenus and confirms changes
  -

**GENERAL RESET**

Outside the menu and held down for more than 10 seconds, the unit undergoes a GENERAL RESET.

Very important:

The general reset of the unit is a total deletion of the recorded data, alarms detected and recorded and status of the unit, with the exception of:

- Manual shutdown of the unit
- Shutdown of the unit by time programmer
- Total accrued cut-off counter
- Alarm configurations
- User PIN
- Logged event counters

The general reset causes the ancillary MCB to cut off (OFF) and its subsequent switch-on (ON) provided that the unit is not in a state of manual shutdown or by time programmer and that there is no alarm to impede such action.

## 2.2 User PIN

The user PIN represents a high degree of security for the owner since this is the sole means whereby the programmed parameters can be validated. Any changes in programmed values only come into effect once said PIN has been entered.

Made up of 4 digits, each one from 0 to 9

- Default PIN enabled at factory: **1,2,3,4**
- The user PIN can be changed if one is in possession of the current one
- The PIN is one and the same for surfing Internet

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. It is recommended that this PIN be noted down and kept in a safe place.

## 2.3 Start-up sequence

1. Upon energy being supplied to the unit, the loading process of the condensers of the two main cut-off circuits commences. The screen indicates the progress of verification and monitoring of the state of this operation before the recloses (duration from 0V ≅ 20 secs).

2. Should the unit be without energy, off or locked, it would resume where it left off, in this informative screen

3. Should a connection delay be programmed, its corresponding informative screen appears indicating time left till reclosure.

4. Start-up test: automatically carries out a verification of the internal electronic system, of the differential intensity toroidal core and the differential alarm (approx. 3-10 secs.).
5. Immediately previous to the MCB reclosing, an on-screen warning appears along with acoustic signals which are repeated three times

## 2.4 Main display screens (please, refer to synoptical tables of characteristics)

There are **45** main screens. To change screen, press “NEXT” to scroll up or “TEST” to scroll down.

| **The order of the screens is as follows:** | **Nomenclature** |
|---|---|
| 1. RMS voltage measurements | V1, V2 and V3 |
| 2. Pk voltage measurements | VPk1, VPk2 and VPk3 |
| 3. V crest factor measurements | CFV1, CFV2 and CFV3 |
| 4. Composite voltage measurements | V12, V23, V31 |
| 5. Voltage unbalance measurements | %DesV1, %DesV2 and %DesV3 |
| 6. RMS intensity measurements | A1, A2 and A3 |
| 7. Pk intensity measurements | APk1, APk2 and APk3 |
| 8. I crest factor measurements | CFI1, CFI2 and CFI3 |
| 9. Line impedance measurements | Z1, Z2 and Z3 |
| 10. Differential intensity and | mA RMS, mAPk |
| neutral intensity measurements | An |
| 11. I unbalance measurements | %DesI1, %DesI2 and %DesI3 |
| 12. RMS line 1 measurements | V1, A1, and ID |
| 13. RMS line 2 measurements | V2, A2, and ID |
| 14. RMS line 3 measurements | V3, A3, and ID |
| 15. Voltage frequency measurements | Hz1, Hz2 and Hz3 |
| 16. Voltage THD measurements | %ThdV1, %ThdV2 and %ThdV3 |
| 17. Intensity THD measurements | %ThdI1, %ThdI2 and %ThdI3 |
| 18. Active power measurements | W1, W2 and W3 |
| 19. Requested power measurements | W1+, W2+ and W3+ |
| 20. Returned power measurements | W1-, W2- and W3- |
| 21. Power factor measurements | PF1, PF2 and PF3 |
| 22. Volt-Amper measurements | VA1, VA2 and VA3 |
| 23. Reactive inductive power measurements | rL1, rL2 and rL3 |
| 24. Reactive capacitive power measurements | rC1, rC2 and rC3 |
| 25. Summation of active powers | ∑W |
| summations of requested powers | ∑W+ |
| summations of returned powers | ∑W- |
| 26. Summations of Volt-Amper, | ∑VA |
| summations of reactive inductive powers | ∑rL |
| summations of reactive capacitive powers | ∑rC |
| 27. Active energy counter line 1 | KWh L1 |
| 28. Active energy counter line 2 | KWh L2 |
| 29. Active energy counter line 3 | KWh L3 |
| 30. Reactive energy counter line 1 | KQh L1 |
| 31. Reactive energy counter line 2 | KQh L2 |
| 32. Reactive energy counter line 3 | KQh L3 |
| 33. Summations of active energy counters | KWh L123 Active |
| 34. Summations of reactive energy counters | KQh L123 Reactive |
| 35. Status of relays A and B | |
| 36. Status of relays 1, 2, 3 and 4 of module 1 | |
| 37. Status of relays 1, 2, 3 and 4 of module 2 | |
| 38. Status of inputs 1, 2, 3 and 4 of module 1 | |
| 39. Status of inputs 1, 2, 3 and 4 of module 2 | |
| 40. Status of timers 1 and 2 of module 1 | |
| 41. Status of timers 3 and 4 of module 1 | |
| 42. Status of timers 1 and 2 of module 2 | |
| 43. Status of timers 3 and 4 of module 2 | |
| 44. Temperature and relative humidity measurements | ºC and %RH |
| 45. Day of the week, date and time | Day, dd/mm/yy, HH:MM:SS |
| 46. | |

**NOTE: The parameters displayed in inverted commas "-.-", indicate that the parameter and, therefore, its corresponding alarm are not implemented in this specific and, consequently, no operation is contemplated**

**NOTE: The temperature and humidity in inverted commas "-.-" indicate that the temperature/humidity probe is either not enabled in the menu or that it has not been installed.**
**NOTE: The logical status of the input/output modules displayed in inverted commas "-", indicates that the I/O modules are either not enabled in the menu or that they have not been installed.**

## 2.5 Display menu

To enter the menu, click "menu" in any main screen. Once inside the menu, the user can select a submenu by moving the main cursor up or down. To enter this menu, press "OK". The "ESC" (escape) key permits the user to quit the submenu or menu. In order to confirm the modification of a flashing value, press "OK".

NOTE: To save all changes in memory, press "ESC" until all submenus and the menu have been quitted. When "ESC" is pressed this last time, the unit asks whether one wishes to save the changes and requests the PIN. If the current PIN is not entered, the changes will not be saved. By defect, certain menus, such as deletion of registers or ex-factory configurations, request the PIN immediately.

NOTE: If more than 3 minutes elapse without any key having been pressed, the auto-quit from menu is activated. This means that the unit automatically quits the menu mode and returns to the last screen displayed.

NOTE: Should an alarm occur whilst surfing the menu, the auto-quit from menu is activated and the alarm is displayed.

All the unit's option configurations are to be found in the menu's submenus

The order of the submenus is as follows:

→ Shutdown of unit
Tests
Auto–manual, Sequential reclosures
Alarms. Configuration
Most recent cut-off
Most recent alarm
RMS visualisation mean
Alarm disconnect counters
Maximum measurements
Minimum measurements
Delete counters/measurements
Sequential reclosures
Connection delay
I measurement transformer ratio
I/O external module 1
I/O external module 2
Manual control relays
Unlocking and reset de reclosures
Remote input 1
Remote input 2
Temperature and humidity probe
TCP/IP configuration
Language
Change user PIN
Clock
Time programmer
General reset and default ex-factory configuration
Screen light
Beep (acoustic warning)
Version
Calibration

### 2.5.1 Shutdown of unit

Permits the user to order the voluntary shutdown of the ancillary MCB. When "OK" is pressed, two options are given:

→ OFF with PIN. Warning: only recloses with PIN
OFF without PIN

The first option permits shutdown of the unit. Start-up can only be done by entering the PIN.
The second option permits shutdown of the unit. Start-up does not require the PIN.

When "OK" is pressed in either of these two options, the units advises, both by an acoustic signal and on-screen, of the cut-off of the MCB and indicates "Motor OFF". Subsequently, it remains on warning standby and displays the following text:

Option 1: "OFF, unit OFF. Press reset key to enter PIN and reset".
Option 2: "OFF, unit OFF. Press reset key to reset".

### 2.5.2 Tests (please, refer to synoptical tables of characteristics)

Real incremental protection test. This test verifies the programmed alarms and provides the real cut-off value,

The following tests can be run:

| | | |
|---|---|---|
| → | ID (differential intensity) | Real incremental protection test. |
| | MCB | MCB cut-off test |
| | External WD (external Watchdog) | WD cut-off test |

The real incremental test injects a voltage or a r*eal, incremental value* sinusoidal intensity which is added onto the existent line measurement. This produces an alarm/cut-off due to the alarm threshold having been exceeded.

### 2.5.3 Auto–manual, automatic sequential reclosures

By sequential reclosure, one is to understand any reclosure subsequent to a disconnection caused by an alarm which disappears when the MCB is disconnected. In the present case, following the alarm, the unit enters the different cycles of sequential reclosures programmed for the different alarms since it cannot be known whether or not the alarm has disappeared until such time as the unit recloses again and the parameter can be measured.

Each alarm has its own table of sequential reclosures indicating:

- Foreseen number of reclosure attempts
- Interval between attempts

With a parameter which is common to all denominated "Number of reclosures reset to zero time".

If the alarm were permanent, every time the unit reclosed it would disconnect again, thus entering an infinite cycle. In order to avoid this, the automatic sequential reclosures table limits the number to one that the user/installer deems prudent/advisable.

When "OK" is pressed in this submenu, the following configurable option is displayed:

| | | |
|---|---|---|
| → | ☒Automatic | default, ex-factory |
| | ☐Manual | |

Option 1: Runs the automatic sequential reclosures sequence table corresponding to the alarm.

Option 2: This locks the unit and makes human intervention mandatory. The user can press "reset" to unlock and reset manually.

This submenu makes it easier for the user to transfer from automatic or manual mode without the need to edit the automatic reclosure tables again

NOTE: Another way to avoid generating sequential reclosures is to set the number of reclosures in one or various tables to “0” value.

### 2.5.4 Alarm configuration (please, refer to synoptical tables of characteristics)

When "OK" is pressed in "Alarms", a submenu group is displayed from which the alarm to be programmed can be selected.

The configurable parameters for each alarm, both RMS and Pk, are the alarm value and the time delay. An alarm occurs when the measurement value is equal or superior to the programmed value and remaining so during a time delay equal or superior to that programmed.

The submenus are:

| | | |
|---|---|---|
| → | OFF MCB enabled by alarm | |
| | RMS overvoltage | |
| | Pk overvoltage | |
| | RMS low voltage | |
| | RMS differential intensity | (See NOTE 1 below) |
| | Pk differential intensity | (See NOTE 2 below) |
| | RMS intensity | |
| | Pk intensity | |
| | Voltage unbalance | |
| | Intensity unbalance | |
| | Neutral intensity | |
| | Over-temperature | (OFF value must be > ON value ) |
| | Low temperature | (OFF value must be < ON value) |
| | Over-humidity | |
| | Low humidity | |
| | Voltage THD | |
| | Intensity THD | |
| | Over-frequency | |
| | Low frequency | |
| | Power factor | |
| | Phase sequence | |

Submenu OFF MCB enabled by alarm

The alarms which can be *programmed to cut off or not* the ancillary MCB, selectable and accessible on pressing "OK" in this submenu, are the following:

→ ☐ Intensity
☐ Neutral intensity
☐ Power factor
☐ Voltage THD
☐ Intensity THD
☐ Voltage unbalance
☐ Intensity unbalance
☐ Power 1 (W)
☐ Power 2 (W)
☐ Over-temperature
☐ Low temperature
☐ Over-humidity
☐ Low humidity
☐ Over-frequency
☐ Low frequency
☐ Phase sequence
☐ Remote input 1
☐ Remote input 2
☐ Time programmer

Submenus which indicate the name of the alarm. They permit the alarm delay and value to be configured.

| | |
|---|---|
| RMS overvoltage | |
| Pk overvoltage | |
| RMS low voltage | |
| RMS differential intensity | (See NOTE 1 below) |
| Pk differential intensity | (See NOTE 2 below) |
| RMS intensity | |
| Pk intensity | |
| Voltage unbalance | |
| Intensity unbalance | |
| Neutral intensity | |
| Over-temperature | (OFF value must be > ON value) |
| Low temperature | (OFF value must be < ON value) |
| Over-humidity | |
| Low humidity | |
| THD voltage | |
| Intensity THD | |
| Over-frequency | |
| Low frequency | |
| Power factor | |
| Phase sequence | |

**Value:** The value can be V, A, mA, %, ºC, RH, Hz, etc.
**Delay:** The delay can be RMS delay, Pk delay or delay in seconds.

The delays for the RMS alarms are **RMS delays** and, for the Pk alarms, **Pk delays.**
RMS delay = the frequency period. 1 cycle = 20mS (50Hz)
Pk delay = wave sampling speed. 1 sample = 156.25us (50Hz)

Common to the following submenus is that their time delay is programmed in RMS or Pk delays:

→ RMS overvoltage
Pk overvoltage
RMS low voltage
RMS differential intensity (see NOTE 1 below)
Pk differential intensity (see NOTE 2 below)
RMS intensity
Pk intensity

**Differential intensity alarm.** Differential intensity protection, RMS and Pk, example version IΔn 30-1000mA:
**NOTE 1:** RMS differential intensity, delay value is directly conditioned by the value of the alarm.
For values ≤ 35mA delay range set at 2 cycles (40ms). Delay RMS: 1 cycle = 20ms (50Hz)
For values > 35mA delay range from 4to 50 cycles (80ms to1000ms). Delay RMS: 1 cycle = 20ms (50Hz)

**NOTE 2:** the value of the Pk differential intensity alarm is automatically recalculated when it is modified and the value of the RMS value is saved as:
P alarm value = $\sqrt{2} \times$ RMS alarm value.

The value of the Pk delay is directly conditioned by the value of the Pk alarm. Pk delay: 1 sample = 156,25us (50Hz)
For values ≤ 50mA Pk delay range from 7 to 45 samples (1,09ms to 7,03ms). Permanently enabled alarm.
For values > 50mA Pk delay range from 7 to 58 samples (1,09ms to 9,06ms). Permanently disabled alarm.

**NOTE 3:** Exception: when the value of the RMS differential intensity alarm IΔn ≤ 35mA:
In this case, the Pk differential alarm is permanently auto-enabled and the Pk delay can only be programmed in a range of 7 to 45 samples (1,09mstoa 7,03ms).

**RMS differential intensity alarm:** Cannot be disabled in its configuration menu
**Pk differential intensity alarm if the RMS value ≤ 35mA:** permanently enabled. Cannot be disabled in its configuration menu.
**Pk differential intensity alarm if the RMS value > 35mA:** permanently disabled. Cannot be enabled in its configuration menu.

Common to the following submenus is that their time delay is programmed in seconds:

→ Voltage unbalance
Intensity unbalance
Neutral intensity
Over-temperature
Low temperature
Over-humidity
Low humidity
Voltage THD
Intensity THD
Over-frequency
Low frequency
Power factor
Phase sequence

### 2.5.5 Most recent cut-off

Displays the most recent known protection (alarm which *provoked* a cut-off). When "OK" is pressed, a second screen comes up indicating the date and time of said cut-off.
.

### 2.5.6 Most recent alarm

Displays the most recent known alarm (alarm which *did not provoke* a cut-off). When "OK" is pressed, a second screen comes up indicating the date and time of said cut-off.

### 2.5.7 Mean RMS display

Number of measurement means for on-screen display

When "OK" is pressed in this submenu, the following configurable option is displayed:

| | | | | |
|---|---|---|---|---|
| → | ☐ | 100ms | (Mean RMS - 5 cycles) | |
| | ☐ | 200ms | (Mean RMS - 10 cycles) | |
| | ☐ | 300ms | (Mean RMS - 15 cycles) | |
| | ☐ | 400ms | (Mean RMS - 20 cycles) | |
| | ☒ | 500ms | (Mean RMS - 25 cycles) | default, ex-factory |

NOTE: The mean measurements are: RMS voltage, RMS intensity, RMS differential intensity, composite voltages V12, V23 and V31, neutral intensity, W, W+, W-, VA, VARC, VARL powers and power factor.

### 2.5.8 Alarm disconnect counters (please, refer to synoptical tables of characteristics)

This submenu permits the user to consult which and how many alarms have occurred.

When "OK" is pressed in this submenu, all the alarm counters are displayed in diverse screens.
When "NEXT" or "TEST" (up or down) is pressed, either the following screen or the previous one is displayed. To quit the menu, press "ESC". Should one wish to delete the counters, press "OK" in any of the screens. They can also be deleted from the menu "delete counters and events".

| **These counters are:** | **Nomenclature** |
|---|---|
| overvoltage counters. | ST L1 =, ST L2 = y ST L3 = 65535 |
| low voltage counters | IT L1 =, IT L2 = and IT L3 = 65535 |
| intensity counters | I L1 =, I L2 = and I L3 = 65535 |
| differential intensity counter | ID = 65535 |
| neutral intensity counter | In = 65535 |
| voltage unbalance counters | DesV1 =, DesV2 = and DesV3 = 65535 |
| intensity unbalance counters | DesI1 =, DesI2 = and DesI3 = 65535 |
| voltage THD counters | THDV1 =, THDV2 = and THDV3 = 65535 |
| intensity THD counters | THDI1 =, THDI2 = and THDI3 = 65535 |
| over-temperature counter | STemp. = 65535 |
| low temperature counter | ITemp. = 65535 |
| over-humidity counter | SRH. = 65535 |
| low humidity counter | IRH. = 65535 |
| over-frequency counters | SHzV1 =, SHzV2 = and SHzV3 = 65535 |
| low frequency counters | IHzV1 =, IHzV2 = and IHzV3 = 65535 |
| power factor counters | PF L1 =, PF L2 = and PF L3 = 65535 |
| phase sequence counter | SPhase = 65535 |
| MCB counter | MCB = 65535 |
| time programmer counter | PROG.H. = 65535 |
| remote input 1 counter | ReIn1 = 65535 |
| remote input 2 counter | ReIn2 = 65535 |
| lock counter | Lock = 65535 |
| power OFF counter | Power = 65535 |
| total counter | Total = 65535 |
| accrued total counter (undeletable) | T.acum = 65535 |

### 2.5.9 Maximum measurements (please, refer to synoptical tables of characteristics)

This submenu permits the user to consult the maximum measurements. Only the measurement of highest value is memorised.
When "OK" is pressed in this submenu, all the registers of maximum measurements are displayed in diverse screens
When “NEXT” or “TEST” (up or down) is pressed, either the following screen or the previous one is displayed. To quit the menu, press "ESC". Should one wish to initialise the registers, press "OK" in any of the screens. They can also be initialised from the menu "delete counters and events". These values are not memorised when power is removed from unit.

Maximum measurement: voltage L1, L2 and L3
Maximum measurement: voltage unbalance L1, L2 and L3
Maximum measurement: intensity L1, L2 and L3
Maximum measurement: differential intensity
Maximum measurement: neutral intensity
Maximum measurement: intensity unbalance L1, L2 and L3
Maximum measurement: frequency V1, V2 and V3
Maximum measurement: voltage THD L1, L2 and L3
Maximum measurement: intensity THD L1, L2 and L3
Maximum measurement: active power L1, L2 and L3 (Maximeter programmable from 10 secs. to 15 mins.)
Maximum measurement: apparent power L1, L2 and L3
Maximum measurement: reactive inductive power L1, L2 and L3
Maximum measurement: reactive capacitive power L1, L2 and L3
Maximum measurement: temperature
Maximum measurement: humidity

### 2.5.10 Minimum measurements (please, refer to synoptical tables of characteristics)

This submenu permits the user to consult the minimum measurements. Only the measurement of lowest value is memorised.
When "OK" is pressed in this submenu, all the registers of minimum measurements are displayed in diverse screens.
When “NEXT” or “TEST” (up or down) is pressed, either the following screen or the previous one is displayed. To quit the menu, press "ESC". Should one wish to initialise the registers, press "OK" in any of the screens. They can also be initialised from the menu "delete counters and events". These values are not memorised when power is removed from unit.

Minimum measurement: voltage L1, L2 and L3
Minimum measurement: frequency V1, V2 and V3
Minimum measurement: temperature
Minimum measurement: humidity

### 2.5.11 Deletion of counters and registers

This submenu permits the user to reset all the counters to zero and to initialise all the unit’s registers of maximum and minimum measurements.

When “OK” is pressed in this submenu, four further submenus are displayed:

| | |
|---|---|
| Energy: | Resets the energy counters of all the main screens to zero. |
| Alarms : | Resets the cut-alarm counters to zero |
| Maximum measurements: | Initialises the maximum measurement registers |
| Minimum measurements: | Initialises the minimum measurement registers |

Using “NEXT” or “TEST” (up or down), situate the cursor on the submenu which one wishes to reset to zero or initialise. Then, press "OK".

### 2.5.12 Automatic sequential reclosures

This submenu permits the user to configure the sequential reclosure tables and the reset to zero time of the number of automatic sequential reclosures.

When “OK” is pressed in this submenu, five further submenus are displayed::

→ I. Differential
I.
I. neutral, THDI, DESI, PF, Power 1 and 2
MCB
Reset to zero time of reclosures

As their name indicates, the first four permit the user to configure the reclosure number table and the cycle time between reclosures corresponding to each group of alarms.

The last permits the user to configure the reclosure number counter’s reset to zero time in all the tables once the unit has reclosed successfully

If, between reclosure cycles, the unit resets and no longer detects the problem which originated the action, then the “Number of reclosures reset to zero time" or “Automatic self-start of reclosures” countdown begins. When the reset to zero time has elapsed, the reclosure number counters reset to zero. In this way, we are starting again from zero and the next time an anomaly occurs, the unit will once again dispose of the total number of automatic sequential reclosures.

NOTE: A way to avoid generating sequential reclosures is to set the number of reclosures in one or various tables to “0” value. This locks the unit and makes human intervention mandatory. The user can press "reset" to unlock and reset manually. On the other hand, should one wish to do this as a general rule, then goes to the “Auto-Manual, sequential reclosures” menu and configure in manual mode..

NOTE: During the course of a reclosure cycle or when the unit is locked due to the number of automatic sequential reclosures having been used up, the user can terminate this condition by pressing "reset". This action unlocks the unit and resets the reclosures Likewise, via Internet, using the option "unlocking and reset of reclosures" on WEB page “UNIT CONFIGURATION”

### 2.5.13 Connection delay

This submenu permits the user to configure diverse connection delays.

When "OK" is pressed, the following submenus are displayed:

→ Power failure
Voltage cut-off , frequency, voltage THD, voltage unbalance

Delaying the connection subsequent to a power failure (from 0 to 999s) can be useful in those installations having more than one unit. By distributing the line load among small, consecutive reclosures, one avoids a peak current in the main junction box which could otherwise cause the general MCB to trip. It can likewise be used subsequent to an alarm due to voltage, frequency, harmonic distortion of the voltage or voltage unbalance.

It can also be interesting to delay connection in the case of there being specialised equipment requiring an idle time subsequent to a cut-off. By doing so, short-time disconnections-connections would be avoided

### 2.5.14 I measurement transformer ratio

This submenu permits the user to program the ratio of the convolutions of the intensity measurement transformers for lines L1, L2 and L3.. Programmable from 50A / 5A, up to 10,000A / 5A (in5A steps).

**IMPORTANT:** For the UNIVERSAL+ 7WR M1 Differential, type A program only value 70 A / 5 A.

**Three-phase:**

| | | | | |
|---|---|---|---|---|
| 7WR M1 Differential, type A | 70A | Programming: | 70 A / 5 A | Only toroidals TRIT14, TRIT18 |

**Single-phase:**

| | | | | |
|---|---|---|---|---|
| 7WR M1 Differential, type A | 70A | Programming: | 70 A / 5 A | Only toroidals TRIT14, TRIT18 |

### 2.5.15-16 I/O external module 1 and I/O external module 2

These two submenus permit the I/O modules to be enabled

Example of module 1 (module 2 is the same)

When "OK" is pressed in Yes/No, the following configurable option is displayed:

→ ☐ Yes
☒ No default, ex-factory

### 2.5.17 Relay manual control

This submenu permits relays A and B and relays R1,R2, R3 and R4 of the external modules 1 and 2 to be enabled manually. When “OK” is pressed, display indicates:

→ ☐ Relay A
☐ Relay B
☐ Relay 1 M1
☐ Relay 2 M1
☐ Relay 3 M1
☐ Relay 4 M1
☐ Relay 1 M2
☐ Relay 2 M2
☐ Relay 3 M2
☐ Relay 4 M2

### 2.5.18 Unlocking and reset of reclosures (manually)

Unlocking of the unit in the event of its having been locked and/or reset to zero of the cycle counters of all the sequential reclosures tables. Disablement of the relays enabled by locking.

### 2.5.19-20 Remote input 1 and Remote input 2 (I/O external modules)

This submenu indicates to the unit the type of input signal which is to be connected to the remote control inputs. The unit is able to detect both normal and rocking input signals.

NORMAL:

A normal signal is one which has only two states. OFF(0) and ON(1). It is similar to a switch.

When OFF(0), remote control is disabled
When ON(1), remote control is enabled (Alarm)

ROCKING:

A rocking signal is one which goes from OFF(0) to ON(1) and then back to OFF(0). It is similar to a pushbutton.

At each to-and-fro signal, the unit goes from one state to the other. This means that if the remote control is disabled, on detecting a to-and-fro change in the signal, it becomes enabled. It remains in this state (alarm) until it detects another to-and-fro change in the input signal.

It can also be configured so that, upon the remote control being enabled, an automatic locking and reset of reclosures is generated.

When "OK" is pressed, two submenus are displayed:

→ Type
Action

When "OK" is pressed in “Type”, the following configurable option is displayed:

→ ☒ Normal default, ex-factory
☐ Rocking

When “OK” is pressed in “Action”, ”, the following configurable option is displayed:

→ ☐ Unlocking and reset of reclosures

NOTE: One can also configure it so that the unit shuts down when the remote control is enabled.

Please, refer to submenu “OFF MCB by:” in “Alarms” submenu

### 2.5.21 Temperature and humidity probe

This submenu indicates to the unit that a temperature and relative humidity measuring probe is connected.

When "OK" is pressed, the following configurable option is displayed:

→ ☐ Yes
☒ No default, ex-factory

NOTE The temperature and humidity measurements in inverted commas “-.-“ indicate that the temperature/humidity probe is either not enabled in the menu or that it has not been installed. Consult the accessories, I/O relay modules, temperature and humidity probe manual

### 2.5.22 TCP/IP configuration

This submenu permits the user to see the unit’s TCP/IP configuration, see the Lan LED, configure the default ex-factory parameters and **enable/disable the security protection which prevents the possibility of the unit’s parameters being modified via Internet (WebServer in display and read-only mode).**

When “OK” is pressed, the following submenus are displayed:

→ Information TCP/IP
LED Lan
Default configuration ex-factory
Disable Tcp/Ip programming?

When “OK” is pressed in “TCP/IP information ”, the following information is displayed (the parameters indicate are those ex-factory by default):

→ Port = 80 (clicking OK in this parameter, its value can be changed)
IP = 192.168.2.10 (clicking OK in this parameter, its value can be changed)
Gateway = 192.168.2.1 (clicking OK in this parameter, its value can be changed)
Mask = 255.255.255.000
MAC = xx.xx.xx.xx.xx.xx

When “OK” is pressed in “LED Lan”, “LED = Lan” is displayed on-screen. The green LED on the front panel acts as LED Lan. Press "ESC" to quit.

Press "OK" in “Default configuration” if you wish to restore the TCP/IP parameters to ex-factory values.

Press "OK" en “Disable Tcp/Ip programming?” if you wish to prevent the possibility of the unit’s parameters being modified via Internet (WebServer in read-only mode).

**NOTE: For security reasons, if the Tcp/Ip programming is disabled via Internet, it can only be enabled from the unit itself.**

### 2.5.23 Language

This submenu permits the user to change from Spanish to English or vice versa.

When "OK" is pressed in “Language”, the following configurable option is displayed:

| | | |
|---|---|---|
| → | ☒ Spanish | default, ex-factory |
| | ☐ English | |

### 2.5.24 Changing user PIN

The user PIN represents a high degree of security for the owner since this is the sole means whereby the programmed parameters can be validated. Any changes in programmed values only come into effect once said PIN has been entered.

Made up of 4 digits, each one from 0 to 9

- Default PIN enabled at factory: **1,2,3,4**
- The user PIN can be changed if one is in possession of the current one
- The PIN is one and the same for surfing Internet

NOTE: The 0,0,0,0 PIN is a special PIN which totally cancels request for same. The unit will not request it in any change in programming. The user can change any value either via the front panel or Internet (on condition that the latter is not in read-only mode). This PIN can be useful as a temporary measure during a training process or an overhaul or revision of the unit. However, its use is not recommended on a permanent basis in an installation due to problems which could be caused by unauthorised personnel.

**WARNING:** **For security reasons, no master PIN exists. In case of loss, the user must contact the manufacturer to have the unit re-programmed and thoroughly verified. It is recommended that this PIN be noted down and kept in a safe place.**

### 2.5.25 Clock

This submenu permits the user to configure the day of the week, date and time.
When “OK” is pressed in “Clock”, the current day of the week, date (dd/mm/yy) and time (HH:MM:SS) are displayed. Pressing “OK” and entering programming mode, one can modify the day of the week, date or time
Using “NEXT” or “TEST” (up or down), select the day of the week, date and/or time and press "OK". The value to be modified flashes indicating that this value can be changed. Press "OK" to validate.
The chronological register of the most recent alarm and most recent cut-off sets the date in these registers.

### 2.5.26 Time programmer

These submenus permit the user to enable the time programmer and configure it.

With the time programmer one can program the enablement/disablement of the relays of the external I/O modules and/or the ancillary MCB (circuit-breaker).

Each day of the week has 6 programs, allowing 6 different time frames to be established wherein any relay of the external I/O modules or the ancillary MCB can be enabled.
.

Programming is in HH:MM (hours:minutes) enablement and HH:MM disablement, plus an independent box per program in order to indicate which of these 6 possible daily programmes are enabled. All programmes whose box is not enabled/selected will be ignored.

**IMPORTANT:** If the time programmer is not associated to any relay or MCB, when a program runs out, nothing will happen. In order to associate the relays to the time programmer, please refer “Relay alarms” on the Web page.

When "OK" is pressed ", the following submenus are displayed:

| | | |
|---|---|---|
| → | Yes/No | |
| | Monday | Every day |
| | Tuesday | Saturdays and Sundays |
| | Wednesday | Monday to Friday |
| | Thursday | |
| | Friday | |
| | Saturday | |
| | Sunday | |

When "OK" is pressed in Yes/No, the following configurable option is displayed:

| | | |
|---|---|---|
| → | ☒ Yes | Time programmer enabled (default, ex-factory) |
| | ☐ No | Time programmer disabled. All programmes are ignored. |

When “OK” is pressed in a day of the week, the enabled/disabled state of the 6 daily programmes which have been selected (disabled ex-factory, by default):

| | | |
|---|---|---|
| → | ☐ P1 | (disabled ex-factory, by default) |
| | ☐ P2 | (disabled ex-factory, by default) |
| | ☐ P3 | (disabled ex-factory, by default) |
| | ☐ P4 | (disabled ex-factory, by default) |
| | ☐ P5 | (disabled ex-factory, by default) |
| | ☐ P6 | (disabled ex-factory, by default) |

Using “NEXT” or “TEST” (up or down), one situates oneself in the program one wishes to configure.

When “OK” is pressed in one of the 6 programmes, one enters a configuration submenu where 3 configurable options are displayed:

| | | |
|---|---|---|
| → | ☐ Px | Enabled/disabled, individually for each programme |
| | 00:00h ON | Enable/ON - for example, a relay and/or the MCB |
| | 00:00h OFF | Disable/OFF - for example, a relay and/or the MCB |

The 1st option indicates whether that specific program is active or not
The 2nd option permits the hour and minutes of ON to be configured
The 3rd option permits the hour and minutes of OFF to be configured

### 2.5.27 Total reset and default configuration ex-factory

This submenu restores the whole unit to its original ex-factory settings. All existent data is deleted, viz: information on unit status, alarms/cut-off counters (except accumulated total), event-logging counters, energy counters, maximum and minimum values, log, input/output status, manual control relays, unit configuration, relay alarms, relay timers, schedule programmer, harmonics, event-logger, kWh-kQh history, manual switch-off, relay-enabling alarms, resclosure cycles, locking due to reclosure conclusion, status of all relays, status of remote inputs, all editable names (except the unit’s itself), intensity transformer ratio, reclosures, etc.

Exception: Section “Access configuration”. The TCP/IP configuration, IS NOT restored to its default ex-factory values. Neither are they restored in the total accumulated alarms/cut-off counter, the user PIN and the unit’s editable name.

**ATTENTION:** Before executing this operation, the unit will cut OFF preventively. Once the unit has reset, it will automatically switch ON.
The user / installer must carry out anew the programming of the alarms and others if these differ from the default configuration ex-factory.

### 2.5.28 Screen light

This submenu permits the screen illumination mode to be selected. The default ex-factory mode is the timed one. When 30 seconds has elapsed after any key having been pressed, the screen light goes off. As long as keys are being pressed, the light remains on. The permanent mode keeps the light on all the time except for when a reclosure is imminent. When this is the case, the light goes off and, once the internal load values of the capacitors have been restored, it comes back on

| | | |
|---|---|---|
| → | ☒ Timed | default, ex-factory |
| | ☐ Permanent | |

### 2.5.29 Acoustic warnings (beep)

This submenu permits the acoustic warnings to be enabled/disabled.

| | | |
|---|---|---|
| → | ☒ Enabled | default, ex-factory |
| | ☐ Disabled | |

### 2.5.30 Version

This submenu permits the user to see the unit’s software model and version..
Warning: A change of the software version means a variation in the unit’s characteristics. These should be consulted in the manual for the specific version

### 2.5.31 Calibration

Solely at factory

## 2.6 Informative messages

The unit informs at all times what is happening both on the front screen panel and by accessing Internet

1. Upon start-up of the unit, when power is supplied for the first time or after one or various connections/disconnections, the following message may be displayed:

"Loading..."

along with a bar indicating the energy level of the internal capacitors

Just previous to reclosure, depending on the model, if the unit has differential intensity protection, it carries out a verification test of this protection.

“Test ID”

Once the test has finished, the message “Test OK” is displayed.
Three acoustic warnings with the messages:
Screen: “Warning reclosure I-ON”
WEB: “Reclosing...”
indicate the imminent reclosure of the ancillary MCB
Now, the unit is reclosed.
Screen: “I-ON”
WEB: “MCB-ON (reclosed)”

2. If the user shuts down the unit manually, one of the following messages is displayed:

Screen: "OFF, Unit shut down. Press reset to enter PIN and reclose manually"
"OFF, Unit shut down. Press reset to reclose manually"
"OFF from Internet. Manual shutdown by user (ON protected by PIN)"

WEB: "OFF from unit. Manual shutdown by user (ON protected by PIN)"
"OFF from unit. Manual shutdown by user (ON not protected by PIN)"
"OFF from Internet. Manual shutdown by user (ON protected by PIN)"

Or if shut down via the time programmer:

"OFF ordered by time programmer"

3. In the event of an alarm, the corresponding descriptive message and value are displayed on-screen during a short time. Moreover, this message can be consulted in the “most recent cut-off" and/or "most recent alarm" menus where the date and time are also included.

4. If there is an alarm which, in order to reclose again, uses the sequential reclosure tables, its corresponding reclosure cycle and time message is displayed.

"Reclosure cycle in progress R(x)"
“Alarm name” + "Time to next reclosure. Press RESET”
"10m:00s"

5. If, however, the unit becomes locked, due to either the reclosure cycles having been used up or to the reclosures being programmed in manual mode, the following message is displayed:

Screen: “Alarm name” + "UNIT LOCKED due to finalisation of reclosures. Press rest for manual reclosure."
“Alarm name” + "UNIT LOCKED. Reclosures in manual mode. Press rest for manual reclosure."

WEB: "UNIT LOCKED due to finalisation of reclosures. Unlock in "UNIT CONFIGURATION""
"UNIT LOCKED. Reclosures in manual mode. Unlock in \"UNIT CONFIGURATION\"

6. Other messages corresponding to connection delays are displayed when these are programmed to a value other than zero:

"Delay power failure, in progress. T =XXXs"
"Delay voltage, frequency, voltage THD, DesV, in progress. T =XXXs"

Lastly, the following **error messages** may be displayed:

7. If there is a power supply below limits:

"Failure, Vac energy OFF"
"Low VAC"

8. While a test (differential intensity) is being run and the expected alarm is not detected; The message "Test error” is displayed 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.

9. When the unit indicates the existence of a *non-existent*, due to a communication or supply lead having been disconnected, etc.

"Communication error, external module 1 not found"
"Communication error, external module 2 not found"
"Communication error, module Temp/RH not found"
"Communication error, I2C clock not found"

10. Anomaly in verification of RAM memory: "Error RAM"

## 2.7 Impedance measurement

Impedance measurement (Z) on the unit’s screen and WebServer,
When consumption is zero (I = 0) . impedance is infinite (Z = ∞).
Since the character screen does not have the infinity symbol (∞), this is shown as “0.00”. Therefore, when consumption is zero, impedance is infinite and is expressed as Z = 0.00. The same applies for measurements displayed via WebServer.
La impedance is calculated using the formula Vrms / Irms. Therefore,the value of Z is in ohmios (resistance)

## 2.8 Alarm delays

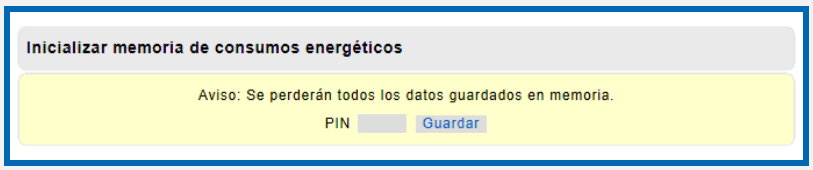
NOTE: The delays of the RMS alarms can vary additionally between 0 and 15ms depending on moment RMS is calculated
The delays of the peak alarms can vary additionally between 0 and 312uS due to conversion and calculation
The delays of the programming alarms can vary +/-1 second

## 2.9 Power measurements and power factor in the harmonics module

Soleley in precision versions HP0.2 and HP0.4
When making calculations in the harmonics module, one must bear in mind that the power and power factor measurements are merely a guidance. This is due to the fact that, in order to achieve a high resolutionand precision in the RMS measurements, the analogue-digital converter has to work with oversampling, thus generating a filtering of the native wave. This factor, therefore, has a negative effect on the accuracy of said power and power factor measurements in the harmonics module. The higher the chosen harmonics index, the more significant this will be.
This effect does not occur in the lower precision versions (those without the "HP" suffix).

## 2.10 Energy log with built-in 3-year memory

Memory: The unit has sufficient memory to store three years' monthly, daily, hourly and 5-minute frame consumptions. Once the 3-year memory is used up, no more data can be stored.
In order to store another 3-year cycle, the memory must be deleted after having entered the user pin.




**Attention: Update the time and date in the unit's clock in order to obtain correct data in the energy log manually or automatically.**

## 2.11 Oscilloscope event-logger in waveform with pre-trigger. (V – I / Differential I.)

NOTE: When an event occurs, the waveforms are recorded in a non-volatile memory.

The recording time for a V – I event (3-phase, 6-channel x 1024 resolution) takes between 620 ms and 720 ms (time to access non-volatile memory).
The recording time for a differential I. event I. (1-channel x 6144 resolution) takes between 620 ms and 720 ms (time to access non-volatile memory).

Streamed events of a different type of trigger will all be recorded only if there is an interval of ≥ 720ms between each and the next.
Repetitive events (of the same type of trigger) will be recorded every 10 secs (time alarm indicated)

Memories: the unit has two memories to store 600 V – I events and 600 differential intensity events. Once either 600-event memory is used up, no used up, no more data can be stored.
Should one wish to store another 600-event cycle, the memory must be deleted after having entered the user PIN.


**Attention: Update the time and date in the unit's clock in order to obtain correct data in the event logger manually or automatically.**

## 2.12 Clarification LOG

In the event of simultaneous alarms, only the first detected is logged.
In the event of various alarms going off in less than 1 second, only the first detected is logged.

## 2.13 Explanation differential intensity harmonics measurement

A low pass filter is included for the measurement of the differential intensity. Thus, the filter and the type of differential transformer have a bearing on the precision in the measurement of harmonics. Consequently, the measurement of harmonics is merely a guide.

# Chapter 3 – Technical characteristics (please, refer to synoptical tables of characteristics 3.2)

## 3.1- Technical characteristics - UNIVERSAL+ 7WR M1 Differential, type A

| Technical characteristics - UNIVERSAL+ 7WR M1 Differential, type A<br>(power: L-N 230V AC ± 15% 50Hz sinusoidal alternating) Single-phase 2-pole (M) only L1 / Three-phase 4-pole (T) L1, L2, L3 | | | | |
|---|---|---|---|---|
| **Measurement: True RMS voltage L1, L2, L3** (line neutral) | from 50,00V to 350,00V (version: 500E = full scale 500V Pk)<br>from 100,00V to 700,00V (version: 1000E = full scale 1000V Pk) | | | |
| **Measurement: Peak voltage L1, L2, L3** (line neutral) | from 70,00V to 500,00Vpk (version: 500E = full scale 500V Pk)<br>from 140,00V to 1000,00Vpk (version: 1000E = full scale 1000V Pk) | | | |
| **Measurement: True RMS voltage between phases L1 L2, L2 L3, L3 L1** | from 100,00V to 500,00V (version: 500E = full scale 500V Pk)<br>from 200,00V to 1000,00V (version: 1000E = full scale 1000V Pk) | | | |
| **Measurement: AC voltage L1, L2, L3** (line neutral) | from 50,00V to 350,00V (version: 500E = full scale 500V Pk)<br>from 100,00V to 700,00V (version: 1000E = full scale 1000V Pk) | | | |
| **Measurement: DC voltage L1, L2, L3** (line neutral) | from 0,00V to 450,00V (version: 500E = full scale 500V Pk)<br>from 0,00V to 900,00V (version: 1000E = full scale 1000V Pk) | | | |
| **Measurement: True RMS intensity and AC intensity** | from 0,05A to 70,00A | | | |
| **Measurement: Peak intensity and DC intensity** | from 0,07A to 98,99Apk | | | |
| **Measurement: Neutral intensity** | from 0,50A to 70,00A | | | |
| **Measurement: Differential intensity, Version –Sensitivity: IΔn 10-300 mA** | **RMS differential I.** from 1,6mA to 300,0mA<br>**Pk differential I.** from 2,3mA to 424,3mA | | **AC differential I.** from 1,6mA to 300,0mA<br>**DC differential I.** from 0,0mA to 424,3mA | |
| **Measurement: Differential intensity, Version –Sensitivity: IΔn 30-1000 mA** | **RMS differential I.** from 5mA to 1000,0mA<br>**Pk differential I.** from 7,1mA to 1414,2mA | | **AC differential I.** from 5mA to 1000,0mA<br>**DC differential I.** from 0,0mA to 1414,2mA | |
| **Measurement: Differential intensity, Version –Sensitivity: IΔn 100-3000 mA** | **RMS differential I.** from 15mA to 3000,0mA<br>**Pk differential I.** from 21,2mA to 4242,7mA | | **AC differential I.** from 15mA to 3000,0mA<br>**DC differential I.** from 0,0mA to 4242,7mA | |
| **Measurement: Active power (W) L1, L2, L3, ∑L123** | Resolution: 0,1W | | | |
| **Measurement: Apparent power (VA) L1, L2, L3, ∑L123** | Resolution: 0,1VA | | | |
| **Measurement: Reactive inductive power L1, L2, L3, ∑L123** | Resolution: 0,1VarL (from an FP of 0.997) | | | |
| **Measurement: Reactive capacitive power L1, L2, L3, ∑L123** | Resolution: 0,1VarC (from an FP of 0.997) | | | |
| **Measurement: Requested power L1, L2, L3, ∑L123** | Resolution: 0,1 +W | | | |
| **Measurement: Returned power L1, L2, L3, ∑L123** | Resolution: 0,1 -W | | | |
| **Measurement: Power factor L1, L2, L3** | from 0,000 a 1,000 | | | |
| **Measurement: Active power W L1, L2, L3.** | Maximeter (power integration) programmable from 10 secs to 15 mins | | | |
| **DC power (Wdc) de L1, L2, L3 and AC power (Wac) de L1, L2, L3** | Resolution: 0,1VA (Depending on external intensity transformer) | | | |
| **Counter: Active imported energy L1, L2, L3, ∑L123** | from 0000000,00001 kWh to 9999999,99999 kWh | | | |
| **Counter: Active exported energy L1, L2, L3, ∑L123** | from 0000000,00001 kWh to 9999999,99999 kWh | | | |
| **Counter: Reactive energy L1, L2, L3, ∑L123** | from 0000000,00001 kQh to 9999999,99999 kQh (from an FP of 0.997) | | | |
| **Measurement: Voltage unbalance L1, L2, L3** (line neutral) | % | | | |
| **Measurement: Intensity unbalance L1, L2, L3** | % | | | |
| **Measurement: Voltage crest factor L1, L2, L3** (line neutral) | | | | |
| **Measurement: Intensity crest factor L1, L2, L3** | | | | |
| **Measurement: Line impedance L1, L2, L3** (line neutral) | Z | | | |
| **Measurement: line frequency L1, L2, L3** (line neutral) | 45,0Hz to 55,0Hz | | | |
| **Measurement: Temperature** | from -40,0 ºC to +100,0 ºC | | | |
| **Measurement: Humidity** | from 0,0% to 100,0% RH | | | |
| **Measurement: Total Harmonic Distortion (THD 63 harmonics) 50Hz**<br>In voltage L1, L2 and L3 (line neutral). In intensity L1, L2 and L3 | from 0,1 to 999,9% % Measurement precision : 1%<br>1 year ± (% measurement precision + 2 digits + 0.05% of F.E.) 22°C ± 5 °C, 30 a 75% HR | | | |
| **% Measurement precision in: RMS voltage L1, L2, L3 (line neutral)** | 0.2 % Version HP 0.2 | | 0.4 % Version HP 0.4 | |
| **% Measurement precision in: DC (Vdc) voltage L1, L2, L3 (line neutral)** | 0.2 % Version HP 0.2 | | 0.4 % Version HP 0.4 | |
| **% Measurement precision in: AC (Vac) voltage L1, L2, L3 (line neutral)** | 0.2 % Version HP 0.2 | | 0.4 % Version HP 0.4 | |
| **% Measurement precision in: RMS intensity L1, L2, L3** | 0.2 % Version HP 0.2 | | 0.4 % Version HP 0.4 | |
| **% Measurement precision in: DC (Idc) intensity L1, L2, L3** | 0.2 % Version HP 0.2 | | 0.4 % Version HP 0.4 | |
| **% Measurement precision in: AC (Iac) intensity L1, L2, L3** | 0.2 % Version HP 0.2 | | 0.4 % Version HP 0.4 | |
| **% Measurement precision in: differential intensity RMS, AC, DC** | 1.0 % Version HP 0.2 | | 1.0% Version HP 0.4 | |
| **% Measurement precision in: Active power (W)** | % Precision: V+I (RMS)+0.1 | | | |
| **% Measurement precision in: Apparent power (VA)** | % Precision: V+I (RMS)+0.1 | | | |
| **% Measurement precision in: Reactive power** | % Precision: V+I (RMS)+1 | | | |
| **% Measurement precision in: DC (Wdc) power** | % Precision: V+I (RMS)+0.1 | | | |
| **% Measurement precision in: AC (Wac) power** | % Precision: V+I (RMS)+0.1 | | | |
| **Specifications of typical precision and conditions for the module at:** | 1 year ± (% measurement precision + 2 digits + 0.2% of F.E.)<br>with 22°C ± 5 °C, humidity 30 to 75% HR, range: 10-90%, 50Hz sinusoidal | | | |
| **Alarms programmable in value and delay** | | | | |
| ΔV Pk (voltage difference) L1, L2, L3 (line neutral) | from 20V to 200V | Delay: 156,25 µs | | |
| ΔV RMS (voltage difference) L1, L2, L3 (line neutral) | from 1V to 300V | Delay: 20ms | | |
| RMS overvoltage L1, L2, L3 (line neutral) | from 245V to 276V | Delay: from 20ms to 5000ms (version F.E. 500V Pk) | | |
| RMS overvoltage L1, L2, L3 (line neutral) | from 245V to 276V | Delay: from 20ms to 5000ms (version F.E. 1000V Pk) | | |
| Pk overvoltage L1, L2, L3 (line neutral) | from 350VPk to 450VPk | Delay: from 0,156ms to 9,06ms (version F.E. 500V Pk) | | |
| Pk overvoltage L1, L2, L3 (line neutral) | from 350VPk to 450VPk | Delay: from 0,156ms to 9,06ms (version F.E. 1000V Pk) | | |
| RMS low voltage L1, L2, L3 (line neutral) | from 180V to 210V | Delay: from 20ms to 10000ms (version F.E. 500V Pk) | | |
| RMS low voltage L1, L2, L3 (line neutral) | from 180V to 210V | Delay: from 20ms to 10000ms (version F.E. 1000V Pk) | | |
| RMS overvoltage L1, L2, L3 (line neutral) | Set at >300V ± 5% | Delay: 1000ms | | |
| RMS overvoltage L1, L2, L3 (line neutral) | Set at >350V ± 5% | Delay: 260ms | | |
| RMS overvoltage L1, L2, L3 (line neutral) only version F.E. 1000V Pk | Set at >400V ± 5% | Delay: 80ms | | |
| RMS intensity L1, L2, L3 | from 1A to 63A | Delay: from 20ms to 10000ms | | |
| Pk intensity L1, L2, L3 | from 2APk to 89Pk | Delay: from 0,46ms to 9,06ms | | |
| Neutral intensity | from 1A to 63A | Delay: from 2S to 180S | | |
| Power 1 W L1, L2, L3 | from 1 to 9999999 W | Delay: from 1S to 999S | | |
| Power 2 W (Maximeter-integration programmable from 10 secs to 15 mins.) | from 1 to 9999999 W | L1, L2, L3 | | |
| Power factor L1, L2, L3 | from 0,99 to 0,01 | Delay: from 1S to 180S | | |
| Voltage THD L1, L2, L3. As from harmonic 2–63, programmable by harmónic and harmonics bracket | from 1% to 90% | Delay: from 2S to 180S | | |
| Intensity THD L1, L2, L3. As from harmonic 2–63, programmable by harmónic and harmonics bracket | from 1% to 90% | Delay: from 2S to 180S | | |
| Over-frequency L1, L2, L3 (line neutral) | from 51Hz to 55Hz | Delay: from 1S to 180S | | |
| Low frequency L1, L2, L3 (line neutral) | from 45Hz to 49Hz | Delay: from 1S to 180S | | |
| Phase sequence | - | Delay: from 1S to 180S | | |
| Phase failure | | | | |
| Voltage unbalance L1, L2, L3 (line neutral) | from 5% to 100% | Delay: from 1S to 180S | | |
| Intensity unbalance L1, L2, L3 | from 5% to 100% | Delay: from 1S to 180S | | |
| Over-temperature | de -40,0 ºC to +100,0 ºC | Delay: from 1S to 180S | | |
| Low temperature | de -40,0 ºC to +100,0 ºC | Delay: from 1S to 180S | | |
| Over- humidity | from 10% to 90% | Delay: from 1S to 180S | | |
| Low humidity | from 10% to 90% | Delay: from 1S to 180S | | |
| Protection by MCB, 2 or 4-pole | Value, depending on ancillary MCB | | | |
| Preventive cut-off due to AC power failure | Yes (by means of built-in reclosure motor-drive and tripping coil) | | | |

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| **Oscilloscope event-logger in waveform with pre-trigger and autoscale V – I channel, 6 channels V1, V2, V3, I1, I2, I3, with captures for each event (optional)**<br>**Six modes of log length in 6 channels. 160ms, 320ms and 640ms (pre-trigger 40ms, 80ms and 160ms) and 20s, 40s y 80s (pre-trigger 5s, 10s and 20s)**<br>**600-event storage in built-in memory. Display via WebServer and DataWatchPro.**<br>**Trigger for alarms which can be enabled and are programmable in value and delay. Chronological record for each type of alarm.**<br>**Display via WebServer with horizontal zoom functions. Multi-channel measurement, value and time cursor, 3 mathematical V*I channels, etc.**<br>**Display via DataWatchPro with offset functions, amplitude, time base, horizontal shift zoom, value and time cursor,** | |
| Alarm: ΔV Pk (voltage difference) L1, L2, L3 | |
| Alarm: ΔV RMS (voltage difference) L1, L2, L3 | |
| Alarm: RMS overvoltage L1, L2, L3 | |
| Alarm: Pk overvoltage L1, L2, L3 | |
| Alarm: RMS intensity L1, L2, L3 | |
| Alarm: Pk intensity L1, L2, L3 | |
| Alarm: Voltage THD L1, L2, L3 | |
| Alarm: Intensity THD L1, L2, L3 | |
| Alarm: Over-frequency L1, L2, L3 | |
| Alarm: Low frequency L1, L2, L3 | |
| Remote input 1 and Remote input 2 (digital inputs). **External trigger** | |
| Sampling 6 channels, log length 160ms pre-trigger 40ms | 6,4KHz per channel. Native resolution (1024 points in 160ms) |
| Sampling 6 channels, log length 320ms pre-trigger 80ms | 6,4KHz per channel. Resolution /2 (1024 points in 320ms) |
| Sampling 6 channels, log length 640ms pre-trigger 160ms | 6,4KHz per channel. Resolution /4 (1024 points in 640ms) |
| Sampling 6 channels, log length 20,48s pre-trigger 5,12s | Native resolution (1024 RMS samples, 20ms in 20s) |
| Sampling 6 channels, log length 40,96s pre-trigger 10,24s | Resolution /2 (1024 RMS samples, 20ms in 40s) |
| Sampling 6 channels, log length 81,92s pre-trigger 20,48s | Resolución /4 (1024 RMS samples, 20ms in 80s) |
| **Other** | |
| Independent sequential reclosures, programmable in number and time:<br>Differential intensity<br>Intensity<br>Ancillary MCB<br>Neutral I and/or power factor and/or THDI and/or I unbal. and/or power1 and/or power2 | <br>from 0 to 30 reclosures from 00m:00s to 99m:59s<br>from 0 to 10 reclosures from 03m:00s to 99m:59s<br>from 0 to 10 reclosures from 03m:00s to 99m:59s<br>from 0 to 10 reclosures from 03m:00s to 99m:59s |
| Real incremental test of protections: Differential intensity IΔn<br>Ancillary MCB tripping test | Yes, value of cut-off **(differential tester)**<br>Yes |
| Real incremental autotest of protections: Differential<br>Autotest: Differential Version (IΔn 10-300 mA)<br>Autotest: Differential Version (IΔn 30-1000 mA)<br>Autotest: Differential Version (IΔn 100-3000 mA) | Yes, prior to reclosure of ancillary MCB<br>Yes, every 1 second if IΔn < 3,3mA<br>Yes, every 1 second if IΔn < 10mA<br>Yes, every 1 second if IΔn < 30mA |
| Cut-off time (2-pole MCB)<br>Cut-off time (2-pole MCB) **version with "L" suffix** | 2-5ms typical (cf.: "Cut-off. Tripping times")<br>5-10ms typical (cf.: "Cut-off. Tripping times") |
| Non-response time upon power failure<br>Non-response time upon power failure | Upon total 230V AC power failure, three-phase 4-pole version: 500 ms<br>Upon total 230V AC power failure, single-phase 2-pole version: 500 ms |
| Mechanical endurance: Sureline reclosure module | 100,000 complete manoeuvres (ON OFF) |
| Programmable, independent start-up delays | Upon mains power failure and protection of voltage, frequency, THDV, voltage unbalance |
| Delay remote inputs 1 and 2 | 5 ms |
| Programmable acoustic warnings | Enabled or disabled |
| Chronological logger of most recent alarm and most recent cut-off | with value and year, month, day, hour and minute. |
| Screen with programmable illumination | Timed or permanent |
| Remote inputs 1 and 2 programmable: Programmable input signal, normal or rocking. | With programmable unlocking option and reset of reclosures upon enablement. |
| Individual alarm counter | cf synoptic tables of characteristics |
| Registers maximum and minimum measurements | cf synoptic tables of characteristics |
| Alarm central, telecontrol and automation | 10 logical outputs (relays) and 10 logical inputs. With individual programmable enablement |
| Time programmer with high-precision clock: | 6 programs per day, programming in hours and minutes, enablement of 10 logical outputs (relays) |
| Working temperature L-N 230V AC ± 15 % | $0^{o}$ to $+45^{o}$ C. Standard version<br>$-10^{o}$ to $+55^{o}$ C. Industrial version :models with "TI" suffix<br>$-25^{o}$ to $+70^{o}$ C. Extended industrial version :models with "TE" suffix |
| Full scale (F.E.): Differential intensity | 500 mA, version: IΔn 10-300 mA |
| Full scale (F.E.): Differential intensity | 1400 mA, version: IΔn 30-1000 mA |
| Full scale (F.E.): Differential intensity | 4200 mA, version: IΔn 100-3000 mA |
| Full scale (F.E.): Voltage L1, L2, L3: | 500V, version: 500E = full scale 500V Pk |
| Full scale (F.E.): between phases L1 L2, L2 L3, L3 L1 | 900V, version: 500E = full scale 500V Pk |
| Full scale (F.E.): Voltage L1, L2, L3: | 1000V, version: 1000E = full scale 1000V Pk |
| Full scale (F.E.): between phases L1 L2, L2 L3, L3 L1 | 1800V, version: 1000E = full scale 1000V Pk |
| Full scale (F.E.): Intensity L1, L2, L3: | 100A, in 70A version |
| Full scale (F.E.): Active power L1, L2, L3: | Intensity full scale, by voltage full scale (Max. 9999999,9 W) |
| Full scale (F.E.): Apparent power L1, L2, L3: | Intensity full scale, by voltage full scale (Max. 9999999,9 W) |
| Full scale (F.E.): Reactive power L1, L2, L3: | Intensity full scale, by voltage full scale (Max. 9999999,9 W) |
| Full scale (F.E.): DC and AC power L1, L2, L3: | Intensity full scale, by voltage full scale (Max. 9999999,9 W) |
| Full scale (F.E.): Harmonic distortion | 999,9 % |
| Dimensions complete unit: UNIVERSAL+ 7WR M1 + 2-pole MCB | 128 mm (7 modules), height: 81mm, 35mm DIN rail |
| Dimensions complete unit: UNIVERSAL+ 7WR M1 + 4-pole MCB | 163 mm (9 modules), height: 81mm, 35mm DIN rail |
| Weight complete unit: UNIVERSAL+ 7WR M1 + 2-pole MCB | 900 grs. |
| Weight complete unit: UNIVERSAL+ 7WR M1 + 4-pole MCB | 1.170 grs. |
| Weight toroidal transformer (TRIT14), (TRIT18 or TRDF18), (TRIT26 or TRDF26) | 70, 185, 300 gr. |
| Guarantee | 3 years |
| Configurable languages | Spanish and English |
| Manual cut-off | 2 options: ON again with or without PIN |
| Auto/manual mode | Auto: automatic sequential reclosures enabled. Manual: sequential reclosures disabled. |
| In accordance with standards: **Version sensitivity IΔn 10-300 mA Differential, type A**<br>**Version sensitivity IΔn 30-1000 mA Differential, type A**<br>**Version sensitivity IΔn 100-3000 mA Differential, type A** | EN 60947-2 (annexe B):2018, IEC 60947-2 (annexe B), UNE 20-600-77(IEC-278), EN 50550:2011*<br>EN 60947-2 (annexe B):2018, IEC 60947-2 (annexe B), UNE 20-600-77(IEC-278), EN 50550:2011*<br>EN 60947-2 (annexe B):2018, IEC 60947-2 (annexe B), UNE 20-600-77(IEC-278), EN 50550:2011*<br>* Adapt parameters according to standard (cf. "Adaptation to standard EN 50550:2011") |
| Precision in accordance with standards | UNE-EN 62053-22:2003 (IEC 62053-22:2003) CLASE 0,5S<br>UNE-EN 62053-23:2003 (IEC 62053-23:2003) CLASE 2 |
| WebServer (Version: HTML 4.01 Transitional, IPV4, connection RJ45 8 pin 10 BASE-T). Modbus TCP/IP, Port 502, and TCP/IP. HTTP communication protocol . WebServer. | |
| **7-channel oscilloscope with autoscale and 3 mathematical V*I channels. Includes instantaneous value measurement cursor in all channels** (display in WebServer) | |
| **7-channel oscilloscope with autoscale and offset control functions, amplitude, time base, delay/advance in degrees, multi-channel measurement cursor, Measurement of RMS, Pk, THD, etc.** Sampling 7 channels 6,4KHz per channel (display in DataWatchPro) | |
| **Análysis of harmonics spectrum with autoscale (V1, V2, V3, I1, I2 y I3 with 64 harmonics). Measurements of 64 harmonics (range in % and V–A value). Display with continuous refreshment (every 1,5 secs.). Includes measurement cursor** (display via WebServer) | |
| **Analysis of 7-channel harmonics spectrum with autoscale (up to harmonic 63, range in % and RMS value).**<br>**Multi-channel measurement cursor and simultaneous analysis of 1, 2, 3, 4, 5, 6 and 7 channels** (display via DataWatchPro). | |
| DWP (DataWatchPro): Professional software for PC with database and graphic analysis. | |

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| **300-register graphic logger, 12 channels (46 measurements) with autoscale and variable refreshment (1-600 secs) with temporary max., min. and avg. measurements** | |
| Current value of 46 measurements and Difference in value between maximum and minimum (Max value – Min value) of 46 measurements | |
| Temporary maximum value (300 registers, 1-600 Secs.) of 46 measurements | |
| Temporary minimum value (300 registers, 1-600 Secs.) of 46 measurements | |
| Temporary average value (300 registers, 1-600 Secs.) of 46 measurements | |
| **Graphic energy log, costs and emissions with built-in 3-year memory (optional). Active and reactive energy consumption log. Includes measurement cursor.** | |
| Graphic bar and line display in WebServer for months, days, hours and 5-minute frames. | |

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| **AC/DC measurements** | |
| DC voltage (Vdc) de L1, L2, L3 (line neutral) | Range: from 0,00V to 450,00V (version: 500E = full scale 500V Pk) |
| DC voltage (Vdc) de L1, L2, L3 (line neutral) | Range: from 0,00V to 900,00V (version: 500E = full scale 1000V Pk) |
| AC voltage (Vac) de L1, L2, L3 (line neutral) | Range: from 50,00V to 350,00V (version: 500E = full scale 500V Pk) |
| AC voltage (Vac) de L1, L2, L3 (line neutral)) | Range: from 100,00V to 700,00V (version: 1000E = full scale 1000V Pk) |
| DC intensity (Idc) de L1, L2, L3 | Depending on external intensity transformer |
| AC intensity (Iac) de L1, L2, L3 | Depending on external intensity transformer |
| DC power (Wdc) de L1, L2, L3 and AC power (Wac) de L1, L2, L3 | Resolution: 0,1VA (Depending on external intensity transformer) |
| AC and DC differential intensity measuremet | Depending on external differential intensity transformer |
| **64-harmónic spectrum with distortion, range in % and V–A value, + THD<br>THD alarm and measurement as from harmonic 2–63, programmable by harmonic and harmonics bracket** | |
| %HDF (harmonic distortion) voltage L1, L2, L3 from harmonic k0 to 63 (64 harmonics) | 64 harmonics, range from 0,1 to 999,9% |
| %HDF (harmonic distortion) intensity L1, L2, L3 from harmonic k0 to 63 (64 harmonics) | 64 harmonics, range from 0,1 a 999,9% |
| Voltage L1, L2, L3, from harmonic k0 to 63 (64 harmonics) | 64 harmonics |
| Intensity L1, L2, L3, from harmonic k0 to 63 (64 harmonics) | 64 harmonics |

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| **Differential protection type A** | | |
| $I_{\Delta N}$ 50Hz alternating sinusoidal (AC) | 1 x IΔn Delay if value ≤35mA (Δt): 40ms ($I_{\Delta N}$), 10ms 5 $I_{\Delta N}$ (instant)<br>1 x IΔn Delay if value >35mA (Δt): from 80ms to 1000ms ($I_{\Delta N}$, 2 $I_{\Delta N}$, 5 $I_{\Delta N}$,10 $I_{\Delta N}$) | |
| Alternating 50Hz rectified sinusoidal (AC) | 1,41 x IΔn RMS, for pulsing sinusoidal currents (rectified alternating single wave) | |
| Preventive cut-off | Upon low voltage, insufficient power and AC power failure | |
| **Version (IΔn 10-300 mA) RMS** differential intensity: IΔn RMS | Programmable from 10mA up to 300mA | Delay if value ≤35mA (Δt): 40ms ($I_{\Delta N}$, 2 $I_{\Delta N}$, 5 $I_{\Delta N}$,10 $I_{\Delta N}$)<br>Delay if value >35mA (Δt): from 80ms to 1000ms ($I_{\Delta N}$, 2 $I_{\Delta N}$, 5 $I_{\Delta N}$,10 $I_{\Delta N}$) |
| **Version: (IΔn 10-300 mA) Pk** differential intensity: IΔn Pk | Programmable from 14mA up to 423mA | Delay if value ≤50mA (Δt): from 1,09ms to 7,03ms<br>Delay if value >50mA (Δt): from 1,09ms to 9,06ms (Alarm not active) |
| **Version: (IΔn 30-1000 mA) RMS** differential intensity: IΔn RMS | Programmable from 30mA up to 1000mA | Delay if value ≤35mA (Δt): 40ms ($I_{\Delta N}$, 2 $I_{\Delta N}$, 5 $I_{\Delta N}$,10 $I_{\Delta N}$)<br>Delay if value >35mA (Δt): from 80ms to 1000ms ($I_{\Delta N}$, 2 $I_{\Delta N}$, 5 $I_{\Delta N}$,10 $I_{\Delta N}$) |
| **Version: (IΔn 30-1000 mA) Pk** differential intensity: IΔn Pk | Programmable from 42mA up to 1414mA | Delay if value ≤50mA (Δt): from 1,09ms to 7,03ms<br>Delay if value >50mA (Δt): from 1,09ms to 9,06ms (Alarm not active) |
| **Version: (IΔn 100-3000 mA) RMS** differential intensity: IΔn RMS | Programmable from 100mA up to 3000mA | Delay (Δt): from 80ms to 3000ms ($I_{\Delta N}$, 2 $I_{\Delta N}$, 5 $I_{\Delta N}$,10 $I_{\Delta N}$) |
| **Version: (IΔn 100-3000 mA) Pk** differential intensity: IΔn Pk | Programmable from 141mA up to 4242mA | Delay (Δt): from 1,09ms to 9,06ms (Alarm not active) |

**Oscilloscope event-logger in waveform with pre-trigger and autoscale differential intensity channel (optional)**
1 capture channel for each event: ID. 1 record length mode set at 960ms with pre-trigger at 840ms. Storage capacity for 600 events in built-in memory, display via WebServer. Trigger by alarms whose value and delay can be enabled and programmed. Chronological register per type of alarm.
display via WebServer with horizontal zoom functions. Value and time measurement cursor.

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| Per RMS differential intensity alarm (IDn RMS) | |
| Per Pk differential intensity alarm (ID Pk) | |
| Per Remote input 1 (digital input). **External trigger** | |
| Per Remote input 2 (digital input). **External trigger** | |
| Sampling 1 channel record length 960ms, pre-trigger 840ms | 6,4KHz per channel. Native resolution (6144 points in 960ms) |

**Differential analysis. RMS, Peak, AC and DC measurements. Differential intensity oscilloscope.**
Graphic and numerical display. RMS, Peak, AC and DC measurements. Differential intensity oscilloscope with autoscale and automatic or manual Y axis scale. Includes measurement cursor. Continuously refreshed display (every 1.5 secs.). "Real-time" chart recorder for 300 registers with autoscale and automatic or manual Y axis scale, with temporary maximum, minimum and average measurements. Includes measurement cursor. Continuously refreshed display (every 1.5 secs.).

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| **Version: L-N 230V AC 50Hz power supply. Version: 1000E = full scale measurement line neutral 1000V Pk** | |
| Consumption: POWER L1-N | **1,8W at** 230V AC RMS 50Hz alternating sinusoidal |
| Input voltage: POWER L1-N (normal conditions) | 230V AC - 20 % + 30% RMS 50Hz alternating sinusoidal |
| Input voltage: POWER L1-N (abnormal conditions - maximum limit) | from 300V up to 425V AC RMS 50Hz alternating sinusoidal |
| Transient input voltage L-N (peak voltage) | 1 KV max. (vp) / 300 ms |
| Input voltage: RMS phase neutral (INPUT 1 L1-N) | up to 425V RMS AC 50Hz |
| Input voltage: Pk phase neutral (INPUT 1 L1-N) | up to 600V Pk |
| Input voltage: RMS phase neutral (INPUT 2 L2-N) | up to 425V RMS AC 50Hz |
| Input voltage: Pk phase neutral (INPUT 2 L2-N) | up to 600V Pk |
| Input voltage: RMS phase neutral (INPUT 3 L3-N) | up to 425V RMS AC 50Hz |
| Input voltage: Pk phase neutral (INPUT 3 L3-N) | up to 600V Pk |
| Input voltage: RMS between phases L1 and L2, L1 and L3, L2 and L3 | up to 700V RMS AC 50Hz |
| Input voltage: Pk between phases L1 and L2, L1 and L3, L2 and L3 | up to 990V Pk |
| **Version: L-N 230V AC 50Hz power supply. Version: 500E = full scale measurement line neutral 500V Pk** | |
| Consumption: POWER L1-N | **1,8W at** 230V AC RMS 50Hz alternating sinusoidal |
| Input voltage: POWER L1-N (normal conditions) | 230V AC - 20 % + 30% RMS 50Hz alternating sinusoidal |
| Input voltage: POWER L1-N (abnormal conditions - maximum limit) | from 300V up to 425V AC RMS 50Hz alternating sinusoidal |
| Transient input voltage L-N (peak voltage) | 1 KV max. (vp) / 300 ms |
| Input voltage: RMS phase neutral (INPUT 1 L1-N) | up to 425V RMS AC 50Hz |
| Input voltage: Pk phase neutral (INPUT 1 L1-N) | up to 600V Pk |
| Input voltage: RMS phase neutral (INPUT 2 L2-N) | up to 425V RMS AC 50Hz |
| Input voltage: Pk phase neutral (INPUT 2 L2-N) | up to 600V Pk |
| Input voltage: RMS phase neutral (INPUT 3 L3-N) | up to 425V RMS AC 50Hz |
| Input voltage: Pk phase neutral (INPUT 3 L3-N) | up to 600V Pk |
| Input voltage: RMS between phases L1 and L2, L1 and L3, L2 and L3 | up to 500V RMS AC 50Hz |
| Input voltage: Pk between phases L1 and L2, L1 and L3, L2 and L3 | up to 700V Pk |

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| **Version: L-N 115V AC 50Hz power supply. Version: 250E = full scale measurement line neutral 250V Pk** | |
| Consumption: POWER L1-N | **1,8W at** 115V AC RMS 50Hz alternating sinusoidal |
| Input voltage: POWER L1-N (normal conditions) | 115V AC - 20 % + 30% RMS 50Hz alternating sinusoidal |
| Input voltage: POWER L1-N (abnormal conditions - maximum limit) | from 150V up to 225V AC RMS 50Hz alternating sinusoidal |
| Transient input voltage L-N (peak voltage) | 500 V máx. (vp) / 300 ms |
| Input voltage: RMS phase neutral (INPUT 1 L1-N) | up to 225V RMS AC 50Hz |
| Input voltage: Pk phase neutral (INPUT 1 L1-N) | up to 317V Pk |
| Input voltage: RMS phase neutral (INPUT 2 L2-N) | up to 225V RMS AC 50Hz |
| Input voltage: Pk phase neutral (INPUT 2 L2-N) | up to 317V Pk |
| Input voltage: RMS phase neutral (INPUT 3 L3-N) | up to 225V RMS AC 50Hz |
| Input voltage: Pk phase neutral (INPUT 3 L3-N) | up to 317V Pk |
| Input voltage: RMS between phases L1 and L2, L1 and L3, L2 and L3 | up to 250V RMS AC 50Hz |
| Input voltage: Pk between phases L1 and L2, L1 and L3, L2 and L3 | up to 350V Pk |
| **Version: L-N 115V AC 50Hz power supply. Version: 500E = full scale measurement line neutral 500V Pk** | |
| Consumption: POWER L1-N | **1,8W at** 115V AC RMS 50Hz alternating sinusoidal |
| Input voltage: POWER L1-N (normal conditions) | 115V AC - 20 % + 30% RMS 50Hz alternating sinusoidal |
| Input voltage: POWER L1-N (abnormal conditions - maximum limit) | from 150V up to 225V AC RMS 50Hz alternating sinusoidal |
| Transient input voltage L-N (peak voltage) | 500 V máx. (vp) / 300 ms |
| Input voltage: RMS phase neutral (INPUT 1 L1-N) | up to 225V RMS AC 50Hz |
| Input voltage: Pk phase neutral (INPUT 1 L1-N) | up to 317V Pk |
| Input voltage: RMS phase neutral (INPUT 2 L2-N) | up to 225V RMS AC 50Hz |
| Input voltage: Pk phase neutral (INPUT 2 L2-N) | up to 317V Pk |
| Input voltage: RMS phase neutral (INPUT 3 L3-N) | up to 225V RMS AC 50Hz |
| Input voltage: Pk phase neutral (INPUT 3 L3-N) | up to 317V Pk |
| Input voltage: RMS between phases L1 and L2, L1 and L3, L2 and L3 | up to 250V RMS AC 50Hz |
| Input voltage: Pk between phases L1 and L2, L1 and L3, L2 and L3 | up to 350V Pk |

## Built to allow reconnection of the new digital counters

**With the “CT” option, the unit’s power supply goes into a high impedance state after a set time of a power cut. This function allows the new new digital counters to be reconnected subsequent to a cut-off due to over-consumption.**

## 3.2 – Synoptic tables of characteristics, UNIVERSAL+ 7WR M1, M2 and M3

| UNIVERSAL+ 7WR (3-year guarantee) | 7WR | | | | | | |
|---|---|---|---|---|---|---|---|
| Command configuration (protection device) | M1 | | M2 | | M3 | | |
| Single-phase 2-pole (M) only L1 / Three-phase 4-pole (T) L1, L2, L3 | M | T | M | T | M | T | |
| **Oscilloscope event-logger in waveform with pre-trigger and autoscale. 6 channels V1, V2, V3, I1, I2, I3, with captures for each event** Option "W"<br>**Three modes of record length in 6 channels 160ms, 320ms and 640ms (pre-trigger: 40ms, 80ms and 160ms)**<br>**+ three modes of record length in 6 channels 20s, 40s y 80s (pre-trigger 5s, 10s y 20s)**<br>**600-event storage in built-in memory. Display via WebServer and DataWatchPro**<br>**Trigger for alarms which can be enabled and are programmable in value and delay. Chronological record for each type of alarm.**<br>**Display via WebServer with horizontal zoom functions. Multi-channel measurement, value and time cursor, 3 mathematical V*I channels, etc.**<br>**Display via DataWatchPro with offset control functions, amplitude, time base, horizontal shift zoom, multi-channel measurement, value and time cursor, etc.** | | | | | | | |
| Alarm: ΔV Pk (voltage difference) L1, L2, L3, set delay (transients and fast micro-cuts) | ● | ● | ● | ● | ● | ● | |
| Alarm: ΔV RMS (voltage difference) L1, L2, L3, set delay (transients and dips) | ● | ● | ● | ● | ● | ● | |
| Alarm: RMS overvoltage L1, L2, L3 | ● | ● | ● | ● | ● | ● | |
| Alarm: Pk overvoltage L1, L2, L3 | ● | ● | ● | ● | ● | ● | |
| Alarm: RMS intensity L1, L2, L3 | ● | ● | ● | ● | ● | ● | |
| Alarm: Pk intensity L1, L2, L3 | ● | ● | ● | ● | ● | ● | |
| Alarm: Voltage THD (total harmonic distortion) L1, L2, L3 | ● | ● | ● | ● | ● | ● | |
| Alarm: Intensity THD (total harmonic distortion) L1, L2, L3 | ● | ● | ● | ● | ● | ● | |
| Alarm: Over-frequency L1, L2, L3 and Alarm: Low frequency L1, L2, L3 | ● | ● | ● | ● | ● | ● | |
| Remote input 1 and Remote input 2 (digital inputs). **External trigger** | ● | ● | ● | ● | ● | ● | |
| **Historical logger LOG, connection, disconnection and alarm information log** (connection and disconnection log)<br>**Alarm and disconnection/connection chronological logger. With measurement value and year, month, day, hour and minute.** | | | | | | | |
| RMS overvoltage L1, L2, L3 and Pk overvoltage L1, L2, L3L1, L2, L3 | ● | ● | ● | ● | ● | ● | |
| RMS low voltage L1, L2, L3 | ● | ● | ● | ● | ● | ● | |
| RMS intensity L1, L2, L3 and Pk intensity L1, L2, L3 | ● | ● | ● | ● | ● | ● | |
| RMS differential intensity (IDn RMS) and Pk differential intensity (ID Pk) | ● | ● | ● | ● | ● | ● | |
| Neutral intensity | | ● | | ● | | ● | |
| Power1 W L1, L2, L3 | ● | ● | ● | ● | ● | ● | |
| Power2 W L1, L2, L3 (MDI, programmable from 10 secs. to 15 mins.) | ● | ● | ● | ● | ● | ● | |
| Power factor L1, L2, L3 | ● | ● | ● | ● | ● | ● | |
| Voltage THD (total harmonic distortion ) L1, L2, L3 and Intensity THD ( total harmonic distortion) L1, L2, L3 | ● | ● | ● | ● | ● | ● | |
| Voltage unbalance L1, L2, L3 and Intensity unbalance L1, L2, L3 | | ● | | ● | | ● | |
| Phase sequence | | ● | | ● | | ● | |
| Over-temperature and Low temperature | ● | ● | ● | ● | ● | ● | |
| Over-humidity and Low humidity | ● | ● | ● | ● | ● | ● | |
| Over-frequency L1, L2, L3 and Low frequency L1, L2, L3 | ● | ● | ● | ● | ● | ● | |
| Remote input 1 and Remote input 2 (digital inputs) | ● | ● | ● | ● | ● | ● | |
| Time programmer | ● | ● | ● | ● | ● | ● | |
| AC power failure (Power OFF) and Connection AC supply (Power ON) | ● | ● | ● | ● | ● | ● | |
| **7-channel oscilloscope with autoscale and offset control functions, amplitude, time base, delay/advance in degrees, multi-channel measurement cursor, Measurement of RMS, Pk, THD, etc.** (display in DataWatchPro)<br>**7-channel oscilloscope with autoscale** and automatic or manual Y axis scale and 3 mathematical V*I. channels. Includes instantaeous value measurement cursor in all channels. Continuously refreshed display (every 1.5 secs.). (Display via Webserver) | | | | | | | |
| Voltage V1, Intensity I1 (Display on WebServer and DataWatchPro) | ● | ● | ● | ● | ● | ● | |
| Voltage V2, Intensity I2 (Display on WebServer and DataWatchPro) | | ● | | ● | | ● | |
| Voltage V3, Intensity I3 (Display on WebServer and DataWatchPro) | | ● | | ● | | ● | |
| Differential intensity ID (Display on WebServer and DataWatchPro) | ● | ● | ● | ● | ● | ● | |
| **Analysis of 7-channel harmonics spectrum with autoscale (63 harmonics, range en % and value V - A).**<br>**Multi-channel measurement cursor and simultaneous analysis of 1, 2, 3, 4, 5, 6 and 7 channels.** (display in DataWatchPro)<br>**Analysis: harmonics spectrum with autoscale (V1, V2, V3, I1, I2, I3 and differential I. with 64 harmonics, range in % and value V - A).**<br>**Display with continuous refreshment (every 1.5 secs.). Includes measurement cursor** (display on WebServer) | | | | | | | |
| Voltage V1, Intensity I1 (Display on WebServer and DataWatchPro) | ● | ● | ● | ● | ● | ● | |
| Voltage V2, Intensity I2 (Display on WebServer and DataWatchPro) | | ● | | ● | | ● | |
| Voltage V3, Intensity I3 (Display on WebServer and DataWatchPro) | | ● | | ● | | ● | |
| Differential intensity ID (Display on WebServer and DataWatchPro) | ● | ● | ● | ● | ● | ● | |
| **Modbus TCP/IP, Port 502, and TCP/IP. HTTP communication protocol . WebServer.** | | | | | | | |
| Measurements (Reading) | ● | ● | ● | ● | ● | ● | |
| Oscilloscope event-logger counters (Reading) | ● | ● | ● | ● | ● | ● | |
| Alarm counters (Reading) and Energy counters (Reading) | ● | ● | ● | ● | ● | ● | |
| Maximum and minimum measurements (Reading) | ● | ● | ● | ● | ● | ● | |
| Digital outputs (relays) (Reading / Writing of 10outputs) and Digital inputs (Reading of 10 inputs) | ● | ● | ● | ● | ● | ● | |
| | | | | | | | |
| **Graphic energy log, costs and emissions with (optional) built-in memory. Graphicactive and reactive energy bar and line display in WebServer. Includes measurement cursor.** Option "G"<br>**Energy log (L1 single-phase or ∑L1,2 and 3 three-phase) with built-in 3-year memory** | | | | | | | |
| 5-minute interval active and reactive energy consumption log (3-year memory storage) | ● | ● | ● | ● | ● | ● | |
| Hourly active and reactive energy consumption log (3-year memory storage) | ● | ● | ● | ● | ● | ● | |
| Daily interval active and reactive energy consumption log (3-year memory storage) | ● | ● | ● | ● | ● | ● | |
| Monthly interval active and reactive energy consumption log (3-year memory storage) | ● | ● | ● | ● | ● | ● | |
| **Oscilloscope event-logger in waveform with pre-trigger and autoscale differential intensity channel** Option "D"<br>One capture channel for each event: Id. One record length mode set at 960ms with pre-trigger at 840ms. 600-event storage capacity in built-in memory. Display via WebServer. Trigger by alarms whose value and delay can be enabled and programmed. Chronological register by type of alarm. Display via WebServer with horizontal zoom functions, Value and time measurement cursor. | | | | | | | |
| Alarm: Differential intensity - RMS (IDn RMS) | ● | ● | ● | ● | ● | ● | |
| Alarm: Differential intensity - Pk (ID Pk) | ● | ● | ● | ● | ● | ● | |
| Remote input 1 ( digital input ). **External trigger** | ● | ● | ● | ● | ● | ● | |
| Remote input 2 (digital input). **External trigger** | ● | ● | ● | ● | ● | ● | |
| **Multi-interaction between remote units via Internet/Intranet for UNIVERSAL+ 7WR range, M1, M2, M3, M4, MINI M4, 4LOG, 4REM, 6LIR, 6PHAR and 6PHR. They are totally autonomous and, once configured, can communicate remotely with each other via Internet/Intranet to enable or disable their relays A, B, C and D when a programed event occurs.** | | | | | | | |
| **WebServer in real time, display with continuous refreshment (every 1.5 secs.) of measurements, max/min measurements, energy counters, alarm counters, input/output status, event log (LOG), unit information and clock – for UNIVERSAL+ 7WR M1, M2, M3, M4 and MINI M4 units** | | | | | | | |
| **Alarm central, Tele-control and automation via 10 logical outputs (relays) and 10 logical inputs. For the whole UNIVERSAL+ 7WR M1 range, M2 and M3 units, by means of a range of external modules.** | | | | | | | |

| UNIVERSAL+ 7WR (3-year guarantee) | 7WR | | | | | | |
|---|---|---|---|---|---|---|---|
| **Command configuration (protection device)** | M1 | | M2 | | M3 | | |
| **Single-phase 2-pole (M) only L1 / Three-phase 4-pole (T) L1, L2, L3** | M | T | M | T | M | T | |
| **Differential protection and analysis, type A / B. RMS, Peak, AC and DC measurements. Differential intensity oscilloscope.** | | | | | | | |
| Graphic and numerical display. RMS, Peak, AC and DC measurements<br>Differential intensity oscilloscope with autoscale and automatic or manual Y axis scale.<br>Includes measurement cursor<br>Continuously refreshed display (every 1.5 secs.) | • | • | • | • | • | • | |
| "Real-time" chart recorder for 300 registers with autoscale and automatic or manual Y axis scale, with temporary maximum, minimum and average measurements.<br>Includes measurement cursor.<br>Continuously refreshed display (every 1.5 secs.). | • | • | • | • | • | • | |
| **Differential, type A**. Alternating sinusoidal and rectified alternating sinusoidal | • | • | • | • | • | • | |
| | | | | | | | |
| **Differential, type B**. Alternating senoidal up to 3kHz, alternating senoidal rectified and direct current DC | • | • | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| **Built to allow reconnection of the new digital counters** | • | • | • | • | | | |
| **WebServer in real time, display refreshed every 1.5 seconds for variable parameters** | • | • | • | • | • | • | |
| | | | | | | | |

| **300-event graphic logger, 12 channels (46 measurements) with autoscale and variable refreshment (1-600 secs.) with temporary max. min. avg. measurements** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Current value for 46 measurements | • | • | • | • | • | • | |
| Temporary maximum value (300 events, 1-60 secs.) for 46 measurements | • | • | • | • | • | • | |
| Temporary minimum value (300 events, 1-60 secs.) for 46 measurements | • | • | • | • | • | • | |
| Temporary average value (300 events, 1-60 secs.) for 46 measurements | • | • | • | • | • | • | |
| Difference in value between maximum and minimum (Max value – Min value) of 46 measurements | • | • | • | • | • | • | |
| **Automatic data dispatch to a remote server via Internet** Option "SR" | | | | | | | |
| By enabling "Remote server TCP/IP configuration", the unit automatically dispatches the data file (Slist.json) to a remote server. This file is dispatched every 5 minutes (in sync with the internal clock) | • | • | • | • | • | • | |

| **Measurements** | | | | | | | |
|---|---|---|---|---|---|---|---|
| True RMS and Pk voltage L1, L2, L3 | • | • | • | • | • | • | |
| True RMS voltage between phases L1-2, L2-3, L3-1 | | • | | • | | • | |
| True RMS and Pk intensity with autoscale L1, L2, L3 | • | • | • | • | • | • | |
| Neutral intensity | | • | | • | | • | |
| True RMS and Pk differential intensity with autoscale | • | • | • | • | • | • | |
| Voltage THD (total harmonic distortion) L1, L2, L3 and Intensity THD (total harmonic distortion) L1, L2, L3 | • | • | • | • | • | • | |
| Voltage THD L1, L2, L3 of intensity L1, L2, L3 as from harmonic 2 – 63, programmable by harmonic and harmonic range | • | • | • | • | • | • | |
| Voltage unbalance L1, L2, L3 | | • | | • | | • | |
| Intensity unbalance L1, L2, L3 | | • | | • | | • | |
| Voltage crest factor L1, L2, L3 | • | • | • | • | • | • | |
| Intensity crest factor L1, L2, L3 | • | • | • | • | • | • | |
| Temperature, relative humidity | • | • | • | • | • | • | |
| Relative temperature and humidity of 6 remote UNIVERSAL+ 7WR TH sensors via Internet/Intranet | • | • | • | • | • | • | |
| Line frequency L1, L2, L3 | • | • | • | • | • | • | |
| Line impedance L1, L2, L3 | • | • | • | • | • | • | |
| Apparent power L1, L2, L3, ∑L123 | • | • | • | • | • | • | |
| Active power L1, L2, L3, ∑L123 | • | • | • | • | • | • | |
| Requested power L1, L2, L3, L123 and Returned power L1, L2, L3, ∑L123 | • | • | • | • | • | • | |
| Reactive inductive power L1, L2, L3, ∑L123 and Reactive capacitive power L1, L2, L3, ∑L123 | • | • | • | • | • | • | |
| Power factor L1, L2, L3 | • | • | • | • | • | • | |
| Active power W L1, L2, L3, (Maximeter-integration programmable from 10 secs. to 15 mins.) | • | • | • | • | • | • | |
| Active imported energy counters L1, L2, L3, ∑L123 from 0000000,00001 to 9999999,99999 kWh | • | • | • | • | • | • | |
| Active exported energy counters L1, L2, L3, ∑L123 from 0000000,00001 to 9999999,99999 kWh | • | • | • | • | • | • | |
| Reactive energy counters L1, L2, L3, ∑L123 from 0000000,00001 to 9999999,99999 kQh | • | • | • | • | • | • | |
| DC voltage (Vdc) L1, L2, L3 | • | • | • | • | • | • | |
| AC voltage (Vac) L1, L2, L3 | • | • | • | • | • | • | |
| DC intensity (Idc) L1, L2, L3 | • | • | • | • | • | • | |
| AC intensity (Iac) L1, L2, L3 | • | • | • | • | • | • | |
| DC power(Wdc) L1, L2, L3 | • | • | • | • | • | • | |
| AC power (Wac) L1, L2, L3 | • | • | • | • | • | • | |
| Differential intensity DC (IDdc) | • | • | • | • | • | • | |
| Differential intensity AC (IDac) | • | • | • | • | • | • | |
| Voltage %HD (harmonic distortion) L1, L2, L3 of harmonic k 0 to 63 (64 harmonics) | • | • | • | • | • | • | |
| Intensity %HD (harmonic distortion) L1, L2, L3, of harmonic k 0 to 63 (64 harmonics) | • | • | • | • | • | • | |
| Voltage L1, L2, L3, of harmonic k 0 to 63 (64 harmonics) | • | • | • | • | • | • | |
| Intensity L1, L2, L3, of harmonic k 0 to 63 (64 harmonics) | • | • | • | • | • | • | |

| UNIVERSAL+ 7WR (3-year guarantee) | 7WR | | | | | | |
|---|---|---|---|---|---|---|---|
| Command configuration (protection device) | M1 | | M2 | | M3 | | |
| Single-phase 2-pole (M) only L1 / Three-phase 4-pole (T) L1, L2, L3 | M | T | M | T | M | T | |
| **Protections/alarms: programmable in value and delay with automatic reclosure/intelligent reclosure** (only commands 1,2 and 3)<br>**Alarms: programmable in value and delay** (commands 1,2,3 and 4) | | | | | | | |
| RMS overvoltage L1, L2, L3 | • | • | • | • | • | • | |
| Set overvoltage: >300V RMS L1, L2, L3 (Progressive voltage/time trip curve - EN 50550 Standard) | • | • | • | • | • | • | |
| Set overvoltage: >350V RMS L1, L2, L3 (Progressive voltage/time trip curve - EN 50550 Standard) | • | • | • | • | • | • | |
| Set overvoltage: >400V RMS L1, L2, L3 (Progressive voltage/time trip curve - EN 50550 Standard) | • | • | • | • | • | • | |
| Pk overvoltage L1, L2, L3 | • | • | • | • | • | • | |
| RMS low voltage L1, L2, L3 | • | • | • | • | • | • | |
| RMS intensity L1, L2, L3 | • | • | • | • | • | • | |
| Pk intensity L1, L2, L3 | • | • | • | • | • | • | |
| RMS differential intensity (IDn RMS) | • | • | • | • | • | • | |
| Pk differential intensity (ID Pk) | • | • | • | • | • | • | |
| Neutral intensity | | • | | • | | • | |
| Power1 W L1, L2, L3 | • | • | • | • | • | • | |
| Power2 W L1, L2, L3 (Maximeter-integration programmable from 10 secs to 15 mins.) | • | • | • | • | • | • | |
| Power factor L1, L2, L3 | • | • | • | • | • | • | |
| Voltage and Intensity L1, L2, L3<br>From 2-63, programmable by harmonic and harmonics bracket. | • | • | • | • | • | • | |
| Voltage unbalance L1, L2, L3 | | • | | • | | • | |
| Intensity unbalance L1, L2, L3 | | • | | • | | • | |
| Over-temperature | • | • | • | • | • | • | |
| Low temperature | • | • | • | • | • | • | |
| Over-humidity | • | • | • | • | • | • | |
| Low humidity | • | • | • | • | • | • | |
| Over-frequency L1, L2, L3 | • | • | • | • | • | • | |
| Low frequency L1, L2, L3 | • | • | • | • | • | • | |
| Phase sequence | | • | | • | | • | |
| Remote input 1 (digital input) | • | • | • | • | • | • | |
| Remote input 2 (digital input) | • | • | • | • | • | • | |
| Time programmer | • | • | • | • | • | • | |
| Preemptive cut-off in the event of AC power failure – insufficient supply (not programmable) | • | • | • | • | • | • | |
| Phase failure L1, L2, L3 (not programmable) | | • | | • | | • | |
| | | | | | | | |
| **Individual MCB cut-off counters** | | | | | | | |
| Event-counter for waveform logger L1, L2, L3. | • | • | • | • | • | • | |
| Overvoltages V1, V2, V3. | • | • | • | • | • | • | |
| Low voltages V1, V2, V3. | • | • | • | • | • | • | |
| Intensity I1, I2, I3. | • | • | • | • | • | • | |
| Differential intensity | • | • | • | • | • | • | |
| Neutral intensity. | | • | | • | | • | |
| Power1 L1, L2, L3 | • | • | • | • | • | • | |
| Power2 W L1, L2, L3 (Maximeter-integration programmable from 10 secs to 15 mins.) | • | • | • | • | • | • | |
| Voltage unbalance V1, V2, V3. | | • | | • | | • | |
| Intensity unbalance I1, I2, I3. | | • | | • | | • | |
| Voltage THD (total harmonic distortion) V1, V2, V3. | • | • | • | • | • | • | |
| Intensity THD (total harmonic distortion) I1, I2, I3. | • | • | • | • | • | • | |
| Over-temperature and Low temperature. | • | • | • | • | • | • | |
| Over-humidity and Low humidity. | • | • | • | • | • | • | |
| Over-frequency V1, V2, V3. | • | • | • | • | • | • | |
| Low frequency V1, V2, V3. | • | • | • | • | • | • | |
| Power factor L1, L2, L3. | • | • | • | • | • | • | |
| Time programmer. | • | • | • | • | • | • | |
| Phase sequence. | | • | | • | | • | |
| MCB (circuit-breaker). | • | • | • | • | | | |
| Remote input 1 (digital input) | • | • | • | • | • | • | |
| Remote input 2 (digital input) | • | • | • | • | • | • | |
| Locking | • | • | • | • | • | • | |
| Power OFF ( AC power failure) | • | • | • | • | • | • | |
| Total counter | • | • | • | • | • | • | |
| Total accumulated counter (undeletable) | • | • | • | • | • | • | |
| | | | | | | | |
| **Precisions available in ±0.2% and ±0.4% , in intensity and voltage** | | | | | | | |
| Basic precision: ± 0.2% | • | • | • | • | • | • | |
| Basic precision: ± 0.4% | • | • | • | • | • | • | |
| **Measurements for 64 harmonics, distortion factor, harmonic distortion (rango in % and valor V – A) +THD** | | | | | | | |
| **Graphic and numerical display in WebServer**. | • | • | • | • | • | • | |

| UNIVERSAL+ 7WR (3-year guarantee) | 7WR | | | | | | |
|---|---|---|---|---|---|---|---|
| **Command configuration (protection device)** | M1 | | M2 | | M3 | | |
| **Single-phase 2-pole (M) only L1 / Three-phase 4-pole (T) L1, L2, L3** | M | T | M | T | M | T | |
| **Real, incremental, test of differential (perform routinely)** | | | | | | | |
| Real, incremental, manual test of differential **(differential tester)** | • | • | • | • | • | • | |
| Incremental autotest of differential **(before reclosing)** | • | • | • | • | • | • | |
| Autotest of differential every 1 sec. | • | • | • | • | • | • | |
| Circuit-breaker trip test | • | • | • | • | | | |
| **Maximum and minimum measurement logs** | | | | | | | |
| Maximum: voltage L1, L2 and L3 | • | • | • | • | • | • | |
| Maximum: voltage unbalance L1, L2 and L3 | | • | | • | | • | |
| Maximum: intensity L1, L2 and L3 | • | • | • | • | • | • | |
| Maximum: differential intensity | • | • | • | • | • | • | |
| Maximum: neutral intensity | | • | | • | | • | |
| Maximum: intensity unbalance L1, L2 and L3 | | • | | • | | • | |
| Maximum: frequency V1, V2 and V3 | • | • | • | • | • | • | |
| Maximum: voltage THD (total harmonic distortion) L1, L2 and L3 | • | • | • | • | • | • | |
| Maximum: intensity THD (total harmonic distortion) L1, L2 and L3 | • | • | • | • | • | • | |
| Maximum: active power L1, L2 and L3 (Maximeter programmable from 10 secs to 15 mins.) | • | • | • | • | • | • | |
| Maximum: apparent power L1, L2 and L3 | • | • | • | • | • | • | |
| Maximum: reactive inductive power L1, L2 and L3 | • | • | • | • | • | • | |
| Maximum: reactive capacitive power L1, L2 and L3 | • | • | • | • | • | • | |
| Maximum: temperature | • | • | • | • | • | • | |
| Maximum: humidity | • | • | • | • | • | • | |
| Minimum: voltage L1, L2 and L3 | • | • | • | • | • | • | |
| Minimum: frequency V1, V2 and V3 | • | • | • | • | • | • | |
| Minimum: temperature | • | • | • | • | • | • | |
| Minimum: humidity | • | • | • | • | • | • | |
| **Alarms. Programmable enablement/disablement of 10 relays + 4 relays A, B, C and D of a remote UNIVERSAL+ 7WR unit via Internet/Intranet by one or more alarms** | | | | | | | |
| Differential lock | • | • | • | • | • | • | |
| MCB lock (Circuit-breaker) | • | • | • | • | | | |
| Intensity lock | • | • | • | • | • | • | |
| Lock upon neutral I, PF, THDI, I unbalance, Power 1 W and Power 2 W | • | • | • | • | • | • | |
| Overvoltage | • | • | • | • | • | • | |
| Low voltage | • | • | • | • | • | • | |
| MCB (Circuit-breaker) | • | • | • | • | | | |
| Intensity | • | • | • | • | • | • | |
| Differential intensity | • | • | • | • | • | • | |
| Neutral intensity | | • | | • | | • | |
| Power factor | • | • | • | • | • | • | |
| Voltage THD (total harmonic distortion) | • | • | • | • | • | • | |
| Intensity THD (total harmonic distortion) | • | • | • | • | • | • | |
| Voltage unbalance | | • | | • | | • | |
| Intensity unbalance | | • | | • | | • | |
| Manual OFF from front panel | • | • | • | • | • | • | |
| Manual OFF via Internet/Intranet | • | • | • | • | • | • | |
| Over-temperature and Low temperature | • | • | • | • | • | • | |
| Over-humidity and Low humidity | • | • | • | • | • | • | |
| Over-frequency and Low frequency | • | • | • | • | • | • | |
| Phase sequence | | • | | • | | • | |
| Remote input 1 (digital input) | • | • | • | • | • | • | |
| Remote input 2 (digital input) | • | • | • | • | • | • | |
| Time programmer | • | • | • | • | • | • | |
| Timer 1, 2, 3 and 4 of module 1 (digital input IN1, IN2, IN3 and IN4 of module 1) | • | • | • | • | • | • | |
| Timer 1, 2, 3 and 4 of module 2 (digital input IN1, IN2, IN3 and IN4 of module 2) | • | • | • | • | • | • | |
| Power1 W | • | • | • | • | • | • | |
| Power2 W (Maximeter-integration programmable from 10 secs to 15 mins.) | • | • | • | • | • | • | |
| **Reception of TCP/IP commands from other remote UNIVERSAL+ 7WR units via Internet/Intranet.** | | | | | | | |
| For the enablement/disablement of relays A and B | • | • | • | • | • | • | |
| **Outstanding characteristics** | | | | | | | |
| True RMS, Peak (Pk), AC and DC measurements (DC in intensity with DC)ine transformers) | • | • | • | • | • | • | |
| Averaged RMS display, programmable 100, 200, 300, 400 and 500ms | • | • | • | • | • | • | |
| Very high-speed MCB cut-off (2P=2ms, 4P=5ms) | • | • | • | | | | |
| Intelligent reclosures and sequential reclosures | • | • | • | • | • | • | |
| Sequential, automatic or manual reclosures | • | • | • | • | • | • | |
| Backlit,12x3-character screen. Intuitive menus. Long texts: easy to read scroll-down | • | • | • | • | • | • | |
| Chronological log of last cut-off. With value and year, month, day, hour and minute | • | • | • | • | • | • | |
| Chronological log of last alarm. With value and year, month, day, hour and minute | • | • | • | • | • | • | |
| Control external I/O modules: up to14 logical outputs (relays) and 10 logical inputs, temperature and humidity probe, controls for logical inputs (Remotes In) programmable signal-action. | • | • | • | • | • | • | |
| WebServer display, programming and remote control via Internet/Intranet | • | • | • | • | • | • | |
| Independent programmable connection delays: in the event of cut-off by voltage alarms and cut-off in the event of power failure (delay from 0 to 999 s) | • | • | • | • | • | • | |
| Manual connection and disconnection | • | • | • | • | • | • | |
| 4-digit protection PIN | • | • | • | • | • | • | |
| Programmable acoustic warnings (enabled or disabled) | • | • | • | • | • | • | |
| Ex-factory default configuration | • | • | • | • | • | • | |
| High-precision time programmer in hours and minutes | • | • | • | • | • | • | |
| Language: configurable in Spanish or English | • | • | • | • | • | • | |
| **DataWatchPro:** Professional software for PC with database ,graphic data analysis , etc. | • | • | • | • | • | • | |

### 3.3 Description of connection terminals- UNIVERSAL+ 7WR M1 Differential, type A

| Description of connection terminals- UNIVERSAL+ 7WR M1 Differential, type A | |
|---|---|
| A CONTROL OUT | OUTPUT TRIPPING COIL HIGH-SPEED DISCONNECTOR TERMINAL A |
| B CONTROL OUT | OUTPUT TRIPPING COIL HIGH-SPEED DISCONNECTOR TERMINAL B |
| L1 POWER 230V | SUPPLY TO PHASE L1 (LINE1) 230V L1-N AC + INPUT METERING SENSOR INPUT L1 |
| N POWER 230V | SUPPLY TO NEUTRAL + INPUT METERING SENSOR INPUT N |
| L2 INPUT 2 | INPUT2 METERING SENSOR L2 (LINE 2) 230V L2-N AC |
| N INPUT 2 | INPUT2 METERING SENSOR N (NEUTRAL) |
| L3 INPUT 3 | INPUT3 METERING SENSOR L3 (LINE 3) 230V L3-N AC |
| N INPUT 3 | INPUT3 METERING SENSOR N (NEUTRAL) |
| | |
| I SENSOR 1 | INPUT DIFFERENTIAL INTENSITY SENSOR1 |
| G SENSOR 1 | COMMON DIFFERENTIAL INTENSITY and TEST SENSOR1 |
| T SENSOR 1 | OUTPUT DIFFERENTIAL INTENSITY TEST SENSOR1 |
| G SENSOR 2 | COMMON INTENSITY SENSOR2 (max. intensity: 0,1A RMS) |
| I1 SENSOR 2 | INPUT INTENSITY SENSOR2 L1(max. intensity: 0,1A RMS) |
| I2 SENSOR 2 | INPUT INTENSITY SENSOR2 L2(max. intensity: 0,1A RMS) |
| I3 SENSOR 2 | INPUT INTENSITY SENSOR2 L3(max. intensity: 0,1A RMS) |
| AUXILIARY IN-OUT | CONNECTION TO OF INPUT/OUTPUT RELAY MODULES<br>TEMPERATURE/HUMIDITY PROBE, REMOTE IN1, IN2<br>USE ONLY SUPPLIED CABLE AND CONNECTORS<br>**(Consult the UNIVERSAL+ 7WR IN OUT and accessories, I/O relay modules, temperature and humidity probe manuals)** |
| ETHERNET | ETHERNET RJ45 CONNECTION |

### 3.4 Description of display panel

1 – Display: 12 characters in three alpha-numeric lines, 5x7 dot-matrix
2 – Green indicator LED (WORKING), slow flashing (1 Hz), indicates measurement and protection in progress
4 – Green indicator LED (WORKING), fast flashing (1/2 Hz), indicates an alarm has been detected
5 – Square yellow push-buttons: function depends on context:
MENU - ESC
NEXT (up)
TEST (down)
OK – RESET – (General Reset when held down more than 10 secs.)

## 3.5 Default alarm values ex-factory - UNIVERSAL+ 7WR M1 Differential, type A
## Configuration: 230V 50Hz AC between phase and neutral, 400V AC 50Hz between phases

**Alarm values which are restored when "Total reset and default configuration ex-factory" is executed in the menu**
**Version: voltage measurement scale (Line Neutral): 500E and 1000E = full scale measurement line neutral 500V Pk and 1000v Pk**
**Single-phase 2-pole (M) only L1 / Three-phase 4-pole (T) L1, L2, L3**

| Alarm | Range Value | Value | Range Nbr Delay | Delay |
|---|---|---|---|---|
| ΔV Pk L1, L2, L3 (voltage difference Pk) | from 20 V to 200 V | 40 V | Set | 156,25 µs |
| ΔV RMS L1, L2, L3 (RMS voltage difference) | from 1 V to 300 V | 25 V | Set | 20 ms |
| RMS overvoltage L1, L2, L3 | 245 – 276 V | 265 V | (1 - 250) x 20 ms = (20 – 5000) ms | 49 = 980 ms |
| Single-phase Pk overvoltage L1<br>Three-phase Pk overvoltage L1, L2, L3 | 350 – 450 V Pk<br>350 – 450 V Pk | 400 V Pk<br>400 V Pk | (1 - 58) x 0,15625 ms = (0,156 – 9,062) ms<br>(1 - 58) x 0,15625 ms = (0,156 – 9,062) ms | 15 = 2,343ms<br>22 = 3,437ms |
| RMS low voltage L1, L2, L3 | 180 – 210 V | 185 V | (1 - 500) x 20 ms = (20 – 10000) ms | 250 = 5000 ms |
| RMS overvoltage L1, L2, L3 | Set | >300 V | Set | 1000 ms |
| RMS overvoltage L1, L2, L3 | Set | >350 V | Set | 260 ms |
| RMS overvoltage L1, L2, L3 | Set | >400 V (only version F.E. 1000V Pk) | Set | 80 ms |
| RMS intensity L1, L2, L3 | 1 – 63 A | 63 A | (1 - 500) x 20 ms = (20 – 10000) ms | 250 = 5000 ms |
| Pk intensity L1, L2, L3 | 2 – 89 A Pk | 89 A Pk | (3 - 58) x 0,15625 ms = (0,46 – 9,06) ms | 55 = 8,593 ms |
| Neutral intensity | 1 – 63 A | 40 A | 2 – 180 seconds | 10 s |
| Power1 W L1, L2, L3 | 1 – 9999999 W | 1000 W | 1 – 999 seconds | 10 s |
| Power2 W L1, L2, L3 | 1 – 9999999 W | 1000 W | Maximeter programmable from 10 secs to 15 mins | 15 min. |
| Power factor L1, L2, L3 | 0,99 – 0,01 | 0.4 | 2 – 180 seconds | 10 s |
| Unbalance V L1, L2, L3 | 5 – 100 % | 50 % | 2 – 180 seconds | 10 s |
| Unbalance I L1, L2, L3 | 5 – 100 % | 90 % | 2 – 180 seconds | 10 s |
| Voltage THD L1, L2, L3 | 1 – 90 % | 10 % | 2 – 180 seconds | 10 s |
| Intensity THD L1, L2, L3 | 1 – 90 % | 80 % | 2 – 180 seconds | 10 s |
| Over-temperature | -40 a +100 ºC | Alarm OFF >= +50 ºC<br>NO alarm ON < +45 ºC<br>Value of OFF must be > value of ON | 2 – 180 seconds | 10 s |
| Low temperature | -40 a +100 ºC | Alarm OFF < -10 ºC<br>NO alarm ON >= -5 ºC<br>Value of OFF must be < value of ON | 2 – 180 seconds | 10 s |
| Over- humidity | 10 – 90 % | Alarm OFF >= 90 %<br>NO alarm ON < 80 % | 2 – 180 seconds | 10 s |
| Low humidity | 10 – 90 % | Alarm OFF < 10 %<br>NO alarm ON >= 20 % | 2 – 180 seconds | 10 s |
| Over-frequency L1, L2, L3 | 51 – 55 Hz | Alarm OFF >= 55 Hz<br>NO alarm ON < 54 Hz | 2 – 180 seconds | 10 s |
| Low frequency L1, L2, L3 | 45 – 49 Hz | Alarm OFF < 45 Hz<br>NO alarm ON >= 46 Hz | 2 – 180 seconds | 10 s |
| Phase sequence | - | - | 2 – 180 seconds | 10 s |
| Remote input 1 | Normal or rocking | Normal | - | 5 ms |
| Remote input 2 | Normal or rocking | Normal | - | 5 ms |
| **Version: sensitivity IΔn 10-300 mA Differential, type A** | | | | |
| **Alarm** | **Range Value** | **Value** | **Range Nbr Delay (50Hz RMS 1 = 20ms PK 1 = 0,15625 ms)** | **Delay** |
| **RMS differential intensity** | 10 – 300 mA | **10 mA** | If value ≤ 35 mA (2) x 20 ms = (40) ms<br>If value > 35 mA (4 - 50) x 20 ms = (80 – 1000) ms | **2 = 40 ms** |
| **Pk differential intensity<br>Enables ex-factory by default** | 14 – 424 mA Pk | **14 mA Pk** | If value ≤ 50 mA (7 - 45) x 0,15625 ms = (1,09 – 7,03) ms<br>If value > 50 mA (7 - 58) x 0,15625 ms = (1,09 – 9,06) ms | **45 = 7,03 ms** |
| **Version: sensitivity IΔn 30-1000 mA Differential, type A** | | | | |
| **RMS differential intensity** | 30 – 1000 mA | **30 mA** | If value ≤ 35 mA (2) x 20 ms = (40) ms<br>If value > 35 mA (4 - 50) x 20ms = (80 – 1000) ms | **2 = 40 ms** |
| **Pk differential intensity<br>Enables ex-factory by default** | 42 – 1414 mA Pk | **42 mA Pk** | If value ≤ 50 mA (7 - 45) x 0,15625 ms = (1,09 – 7,03) ms<br>If value > 50 mA (7 - 58) x 0,15625 ms = (1,09 – 9,06) ms | **45 = 7,03 ms** |
| **Version: sensitivity IΔn 100-3000 mA Differential, type A** | | | | |
| **RMS differential intensity** | 100– 3000 mA | **100 mA** | (4 - 150) x 20 ms = (80 – 3000) ms | **5 = 100 ms** |
| **Pk differential intensity<br>Disables ex-factory by default** | 141 – 4242 mA Pk | **141 mA Pk** | (7 - 58) x 0,15625 ms = (1,09 – 9,06) ms | **45 = 7,03 ms** |
| **Functions** | | | | |
| Auto-Manual | Auto-manual | Auto | | |
| Delays connection | 0 – 999 s | 0 s | | |
| Time programmer | ON / OFF | ON | | |
| External module 1 | YES / NO | NO | | |
| External module 2 | YES / NO | NO | | |
| Temp./Humidity probe | YES / NO | NO | | |

## Attention: important

**The RMS differential intensity alarm is pre-programmed at the factory:**
**IDn 10-300mA version: at 10 mA and 40 ms delay**
**This pre-programming is customized as per the user's request at 100 mA, 200 mA and 300 mA (delay RMS 80 ms)**
**IDn 30-1000mA version: at 30 mA and 40 ms delay**
**This pre-programming is customized as per the user's request at 300 mA, 500 mA and 1000 mA (delay RMS 80 ms)**
**IDn 100-3000mA version: at 100 mA and 100 ms delay**
**This pre-programming is customized as per the user's request at 300 mA, 1000 mA and 3000 mA (delay RMS 100 ms)**

**Note example version IΔn 30-1000mA: When the RMS differential intensity alarm is programmed to a value IΔn ≤ 35 mA, the Pk alarm is automatically enabled permanently. In this case, the Pk alarm cannot be disabled in its configuration menu.**
**The Pk alarm must be permanently enabled in order to comply with the IEC 60947-2-B standard.**

**Note: example with the IΔn 30-1000mA versión. When the RMS differential intensity alarm is programmed to a value IΔn > 35 mA, the Pk differential intensity alarm is permanently disabled and cannot de enabled in its configuration menu.**
**The Pk alarm must be permanently disabled in order to comply with the IEC 60947-2-B standard.**

**Differential intensity alarm.** RMS and Pk differential intensity protection , example version IΔn 30-1000mA:

**NOTE 1:** RMS differential intensity, delay value is directly conditioned by the value of the alarm
For values ≤ 35mA delay range set at 2 cycles (40ms). Delay RMS: 1 cycle = 20ms (50Hz)
For values > 35mA delay range de 4 a 50 cycles (80ms a 1000ms). Delay RMS: 1 cycle = 20ms (50Hz)

**NOTE 2:** the value of the Pk differential intensity alarm is automatically recalculated when it is modified and the value of the RMS value is saved as:
P alarm value = $\sqrt{2} \times$ RMS alarm value.

The value of the Pk delay is directly conditioned by the value of the Pk alarm. Pk delay: 1 sample = 156,25us (50Hz)
For values ≤ 50mA Pk delay range from 7 to 45 samples (1,09ms to 7,03ms). Permanently enabled alarm.
For values > 50mA Pk delay range from 7 to 58 samples (1,09ms to 9,06ms). Permanently disabled alarm.

**NOTE 3:** Exception: when the value of the RMS differential intensity alarm IΔn ≤ 35mA:
In this case, the Pk differential alarm is permanently auto-enabled and the Pk delay can only be programmed in a range of 7 to 45 samples (1,09mstoa 7,03ms).
.

**IMPORTANT:** For safety reasons, the standard establishes that a differential must cut off between 50% and 100% of its programmed IΔn value. This unit is situated at midpoint in this range. This means that the I threshold is established 25% below the original programmed IΔn value.

**RMS differential intensity alarm:** Cannot be disabled in its configuration menu

**Pk differential intensity alarm if the RMS value ≤ 35mA:** permanently enabled. Cannot be disabled in its configuration menu.

**Pk differential intensity alarm if the RMS value > 35mA:** permanently disabled. Cannot be enabled in its configuration menu.

## 3.6 Alarms which cut off the MCB/circuit-breaker of the UNIVERSAL+ 7WR M1 module. Differential, type A

| **Alarm**<br>**Single-phase 2-pole (M) only L1 / Three-phase 4-pole (T) L1, L2, L3** | **Disconnects MCB/circuit-breaker** | Can be enabled/disabled in configuration menu |
|---|---|---|
| RMS overvoltage L1, L2, L3 | YES | NO |
| Pk overvoltage L1, L2, L3 | YES | NO |
| RMS low voltage L1, L2, L3 | YES | NO |
| RMS intensity L1, L2, L3 | Selectable (YES / NO) | NO |
| Pk intensity L1, L2, L3 | Selectable (YES / NO) | YES |
| RMS differential intensity (IDn RMS) | YES | NO |
| Pk differential intensity (ID Pk) | YES (IΔn ≤35 mA), NO (IΔn >35 mA) | NO |
| Preemptive cut-off in the event of AC power failure | YES | NO |
| Phase failure L1, L2, L3 | YES | NO |
| Manual OFF from front panel | YES | NO |
| Manual OFF via Internet/Intranet | YES | NO |
| Neutral intensity | Selectable (YES / NO) | YES |
| Power 1 W | Selectable (YES / NO) | YES |
| Power 2 W (Maximeter programmable from 10 secs to 15 mins.) | Selectable (YES / NO) | YES |
| Power factor L1, L2, L3 | Selectable (YES / NO) | YES |
| Voltage THD L1, L2, L3 | Selectable (YES / NO) | YES |
| Intensity THD L1, L2, L3 | Selectable (YES / NO) | YES |
| Voltage unbalance L1, L2, L3 | Selectable (YES / NO) | YES |
| Intensity unbalance L1, L2, L3 | Selectable (YES / NO) | YES |
| Over-temperature | Selectable (YES / NO) | YES |
| Low temperature | Selectable (YES / NO) | YES |
| Over-humidity | Selectable (YES / NO) | YES |
| Low humidity | Selectable (YES / NO) | YES |
| Over-frequency L1, L2, L3 | Selectable (YES / NO) | YES |
| Low frequency L1, L2, L3 | Selectable (YES / NO) | YES |
| Phase sequence | Selectable (YES / NO) | YES |
| Remote input 1 | Selectable (YES / NO) | NO |
| Remote input 2 | Selectable (YES / NO) | NO |
| Time programmer | Selectable (YES / NO) | YES |

### 3.7 Default alarm status (enabled/disabled) ex-factory - UNIVERSAL+ 7WR M1 Differential, type A

| Alarm states which are restored when "Total reset and default configuration ex-factory" is executed in the menu | | |
|---|---|---|
| **Alarm**<br>**Single-phase 2-pole (M) only L1 / Three-phase 4-pole (T) L1, L2, L3** | **Enabled ex-factory by default** | **Can be enabled/disabled in configuration menu** |
| RMS overvoltage L1, L2, L3 | YES | NO |
| Pk overvoltage L1, L2, L3 | YES | NO |
| RMS low voltage L1, L2, L3 | YES | NO |
| RMS intensity L1, L2, L3 | YES | NO |
| Pk intensity L1, L2, L3 | NO | YES |
| RMS differential intensity (IDn RMS) | YES | NO |
| Pk differential intensity (ID Pk) version: **(IΔn 10-300 mA)** | YES (IΔn ≤35 mA) | NO |
| Pk differential intensity (ID Pk) version: **(IΔn 30-1000 mA)** | YES (IΔn ≤35 mA) | NO |
| Pk differential intensity (ID Pk) version: **(IΔn 100-3000 mA)** | NO | NO |
| Preventive cut-off upon AC power failure | YES | NO |
| Phase failure L1, L2, L3 | YES | NO |
| Neutral intensity | NO | YES |
| Power 1 W | NO | YES |
| Power 2 W (Maximeter programmable from 10 secs to 15 mins.) | NO | YES |
| Power factor L1, L2, L3 | NO | YES |
| Voltage THD L1, L2, L3 | NO | YES |
| Intensity THD L1, L2, L3 | NO | YES |
| Voltage unbalance L1, L2, L3 | NO | YES |
| Intensity unbalance L1, L2, L3 | NO | YES |
| Over-temperature | NO | YES |
| Low temperature | NO | YES |
| Over- humidity | NO | YES |
| Low humidity | NO | YES |
| Over-frequency L1, L2, L3 | NO | YES |
| Low frequency L1, L2, L3 | NO | YES |
| Phase sequence | NO | YES |
| Remote input 1 | YES | NO |
| Remote input 2 | YES | NO |
| Time programmer | YES | YES |

### 3.8 Alarms with programmable enablement/disablement of output relays (via one or more alarms)

| Alarm | Enablement/disablement of output relays (10 relays) and relays A, B, C and D of a remote unit via Internet/Intranet |
|---|---|
| Differential lock | Yes, programmable |
| Circuit-breaker lock | Yes, programmable |
| Intensity lock | Yes, programmable |
| Lock upon neutral I, PF, THDI, I unbalance | Yes, programmable |
| Overvoltage | Yes, programmable |
| Low voltage | Yes, programmable |
| Circuit-breaker | Yes, programmable |
| Intensity | Yes, programmable |
| Differential intensity | Yes, programmable |
| Neutral intensity | Yes, programmable |
| Power 1 W | Yes, programmable |
| Power 2 W (Maximeter programmable from 10 secs to 15 mins.) | Yes, programmable |
| Power factor | Yes, programmable |
| Voltage THD | Yes, programmable |
| Intensity THD | Yes, programmable |
| Voltage unbalance | Yes, programmable |
| Intensity unbalance | Yes, programmable |
| Manual OFF from front panel | Yes, programmable |
| Manual OFF via Internet/Intranet | Yes, programmable |
| Over-temperature | Yes, programmable |
| Low temperature | Yes, programmable |
| Over-humidity | Yes, programmable |
| Low humidity | Yes, programmable |
| Over-frequency | Yes, programmable |
| Low frequency | Yes, programmable |
| Phase sequence | Yes, programmable |
| Remote input 1 | Yes, programmable |
| Remote input 2 | Yes, programmable |
| Time programmer | Yes, programmable |
| Timer 1 module 1 (digital input IN1 module 1) | Yes, programmable |
| Timer 2 module 1 (digital input IN2 module 1) | Yes, programmable |
| Timer 3 module 1 (digital input IN3 module 1) | Yes, programmable |
| Timer 4 module 1 (digital input IN4 module 1) | Yes, programmable |
| Timer 1 module 2 (digital input IN1 module 2) | Yes, programmable |
| Timer 2 module 2 (digital input IN2 module 2) | Yes, programmable |
| Timer 3 module 2 (digital input IN3 module 2) | Yes, programmable |
| Timer 4 module 2 (digital input IN4 module 2) | Yes, programmable |

## 3.9 Default automatic reclosure values ex-factory

Reset to zero time of all the counters for number of reclosures (3–240 mins): Default time ex-factory: **15 minutes**

| In the event of cut-off due to **differential intensity** | |
|---|---|
| Reclosures | 00min:00sec. – 99min:59sec. |
| R1 | **03:00** |
| R2 | **06:00** |
| R3 | **12:00** |
| R4 | **30:00** |
| R5 | **60:00** |
| R6 | **90:00** |
| R7 | **90:00** |
| R8 | **90:00** |
| R9 | **90:00** |
| R10 | **90:00** |
| R11 | 90:00 |
| R12 | 90:00 |
| R13 | 90:00 |
| R14 | 90:00 |
| R15 | 90:00 |
| R16 | 90:00 |
| R17 | 90:00 |
| R18 | 90:00 |
| R19 | 90:00 |
| R20 | 90:00 |
| R21 | 90:00 |
| R22 | 90:00 |
| R23 | 90:00 |
| R24 | 90:00 |
| R25 | 90:00 |
| R26 | 90:00 |
| R27 | 90:00 |
| R28 | 90:00 |
| R29 | 90:00 |
| R30 | 90:00 |
| Nbr of reclosures: 0–30 **10 reclosures** ex-factory, by default | |

| In the event of cut-off due to **MCB / Circuit-breaker** | |
|---|---|
| Reclosures | 03min:00sec. – 99min:59sec. |
| R1 | **03:00** |
| R2 | **10:00** |
| R3 | **30:00** |
| R4 | 60:00 |
| R5 | 90:00 |
| R6 | 90:00 |
| R7 | 90:00 |
| R8 | 90:00 |
| R9 | 90:00 |
| R10 | 90:00 |
| Nbr of reclosures: 0–10 **3 reclosures ex-factory, by default** | |

| In the event of cut-off due to **intensity** | |
|---|---|
| Reclosures | 03min:00sec. – 99min:59sec. |
| R1 | **03:00** |
| R2 | **10:00** |
| R3 | **30:00** |
| R4 | 60:00 |
| R5 | 90:00 |
| R6 | 90:00 |
| R7 | 90:00 |
| R8 | 90:00 |
| R9 | 90:00 |
| R10 | 90:00 |
| Nbr of reclosures: 0–10 **3 reclosures** ex-factory, by default | |

| In the event of cut-off due to **neutral intensity, power factor, THDI, I unbalance, Power1 and Power2** : | |
|---|---|
| Reclosures | 03min:00sec. – 99min:59sec. |
| R1 | **03:00** |
| R2 | **10:00** |
| R3 | **30:00** |
| R4 | 60:00 |
| R5 | 90:00 |
| R6 | 90:00 |
| R7 | 90:00 |
| R8 | 90:00 |
| R9 | 90:00 |
| R10 | 90:00 |
| Nbr of reclosures: 0–10 **3 Reclosures** ex-factory, by default | |

NOTE: If the number of reclosures = 0 or the number of automatic sequential reclosures has been exhausted, the unit blocks. Press RESET to unblock it.

NOTE: The total estimated time between the MCB/circuit-breaker/ancillary contactor cutting off and the subsequent reclosure is:

10 secs. Displaying alarm + reclosure cycle time + capacitor charge-uptime (0– 20 secs.) + 10 secs. start-up sequence.

# Chapter 4 – User's/installation guide

## 4.1 Precautions / warnings for the user / installer

- 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.
- 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 user/installer must program the parameters of the protections in the value and delay most suited to the type of installation and in accordance with the laws, directives and standards of the location/place/country.
- The user/installer must program the parameters of the sequential reclosures in number of reclosures (0 does not reclose) and time best adapted to the type of installation and in accordance with the laws, directives and standards of the location/place/country.
- The installation should be equipped with elements of protection against over-intensity (suitable fuses) The maximum intensity of the intensity measurement transformers must not be exceeded.
- The wiring of the installation and the installation itself must be foreseen so as to support the maximum intensity of the protection elements.
- Do not apply current nor use the unit until all its connections have been connected up and it has been correctly installed in a standard enclosure. Due to an eventual risk of breakage, once current has been supplied to the unit, its connections must not be disconnected/connected except in the case of supply for same (230V AC).
- Do not connect the unit to any voltages/frequencies other than those indicated. (please, refer to technical characteristics).
- Do not connect up to installations which may supply intensities of over 25 KA 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 module
- Caution: The unit's connecting terminals and the AUX. IN-OUT connector are not insulated from the mains. The Ethernet connector, however, does have insulation from the mains.
- Caution: do not use connecting terminals 12 and 14 of the General Electric TELE L-1 CA 24/60V disconnection coil.
- In the event of electrostatic discharges or electromagnetic emissions, the LCD screen might go blank (with no monitoring). This does not affect the unit's functioning. In order to reset the screen, press MENU. Nevertheless, the unit resets cyclically every 15 minutes.
- Do not exceed the electrical endurance of the magnetoterm (MCB) and tripping coil.
- Do not drop, knock or expose to vibrations. Do not expose to liquids or humidity. Do not expose to sources of heat
- Do not expose to environmental temperatures, depending on version, below $0^{o}$, $-25^{o}$ C. or over $40^{o}$, $50^{o}$, $70^{o}$ C.
- Do not expose to magnetic sources or emissions (electric motors and transformers, electro-magnets, radio frequency emitters, 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 checked.
- The unit must be completely disconnected from the mains before cleaning with a soft, dry cloth or brush.
- For security reasons, change the ex-factory PIN for a personalised one and *note it down in a safe place.*
- For safety reasons, it is recommended that the security protection be enabled to avoid any modification of the unit's parameters via Internet (WebServer in display and read-only mode).

**ATTENTION - IMPORTANT!**
This unit (MCB + shunt-trip, UNIVERSAL+ 7WR M1 module and eventual accessories) must be installed in a closed, standard enclosure, the only part within access of the user being its display and command panel.

**The parameters displayed in inverted commas "-.-", indicate that the parameter and, therefore, its corresponding alarm are not implemented in this specific and, consequently, no operation is contemplated**
**The temperature and humidity in inverted commas "-.-" indicate that the temperature/humidity probe is either not enabled in the menu or that it has not been installed.**
**The logical status of the input/output modules displayed in inverted commas "-", indicates that the I/O modules are either not enabled in the menu or that they have not been installed.**

**Important** **- Positioning of the intensity toroidal transformers and individualised adjustment to their module**
The toroidal transformers, be they differential intensity or intensity, are individually matched and adjusted to their corresponding Sureline module for L1, L2 and L3. Therefore, these elements can, under no circumstance whatsoever, be interchanged with others bearing the same reference and from other Sureline modules . Were these to be interchanged, the measurement obtained would be erroneous and operation in protections would be abnormal. . Only the transformers supplied for the specific Sureline module can be installed. Each transformer indicates the model and serial number of the Sureline module for which it has been specifically matched and adjusted. For current transformers (L1, L2, L3) the line is specified on their label.
The toroidal transformer must of necessity be positioned as shown in the "Wiring diagrams", the direction of the arrow indicating the position with respect to the wiring. The length of the wire connecting the toroidal core to the SURELINE unit must not exceed 25cms.

**- WIRING. PRECAUTIONS/WARNINGS FOR THE USER/INSTALLER**

By way of a protective cover and to avoid contact and dust, the male connector, AUXILIARY IN/OUT, is fitted ex-factory covered with another female connector. This female connector is a protective cover and is not to be removed if not in use.

To remove this connector and connect in its turn the wired connector to the I/O modules, cut off the AC supply, remove this connector and replace it with the new wired female connector (only that supplied by the manufacturer). This connector cannot be manipulated with the unit live. Consult the UNIVERSAL+ 7WR IN OUT and accessories, I/O relay modules, temperature and humidity probe manuals.

All the connection terminals must be handled and connected with the unit totally disconnected from the AC supply and no interconnection can be effected with the unit live. It is of the utmost importance that **the correct polarity is ensured upon connection of the "L1, L2, L3" and "N" Sureline terminals.** If this polarity is not respected, the high accuracy is lost originating errors in measurement and abnormal functioning of the protections.

One 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 periodically carry out the complete protection test as described in the section "Tests".**

### 4.2 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 / warnings".

### 4.3 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/warnings" and most especially the section "Very important"..
The unit must be installed in a standard single-phase installation, active phase and neutral having a difference of potential of 230V AC or a three-phase installation (3 phases + neutral) having a difference of potential from phases to neutral of 230V AC, and also a protection conductor of operative earth. Moreover, the installation must have, at its main switch panel, appropriate protections against over-intensities (fuses).

### 4.4 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.
Connect terminals POWER L1 to line 1 (phase 1) and POWER N to the neutral of the 230V mains line, 50Hz sinusoidal alternating current-
Connect the remaining terminals as indicated for the typical or chosen configuration. Please, refer to "Wiring diagrams"
It is imperative that the wiring of the terminals and the tightening of the screws in the fanning strip be effected correctly.
"Wiring diagrams" should be consulted. Should any doubt arise, the manufacturer or authorised distributor should be consulted.

## Chapter 5 – Diagnoses and trouble-shooting

### 5.1 Diagnosis and solution

**1. Error, detection of differential intensity toroidal transformer**

The detectable anomalies can be: absence or failure of the toroidal core, fault in amplification electronic circuit, filtering, the analogical digital detection and conversion system differential intensity sensor circuit. In these cases, the unit shuts off and does not reclose, emitting a warning beep and displaying "Intensity toroidal not detected"There is an anomaly in the unit and it must be revised immediately. Do NOT use the unit. Consult the technical service. In order for this differential test to function correctly, the connections of the differential measurement toroidal to the module's terminals (leads I, G, T) must respect the wiring diagrams.

**2. Test error (differential intensity test IΔn)**

The unit shuts off and "Test error" is displayed on-screen accompanied by 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.
After "Error test" is indicated on-screen, this is followed by"Test Error ID. Consult manual" and the unit will remain in a cut-off state.
In order for this differential test to function correctly, the connections of the differential measurement toroidal to the module's terminals (leads I, G, T) must respect the wiring diagrams.

**3. Communication error real time clock**

The unit indicates "Communication error, I2C clock not found,
There is an anomaly in the real-time clock module and must be checked immediately.
Do NOT use. Consult the technical service.

**4. Communication error temperature and humidity probe**

Verify the wiring of the temperature and humidity probe, cut off the supply to the unit and then switch on again. Go to the submenu "temperature and humidity probe", disable the probe and then enable it again.
There is an anomaly in the temperature and humidity probe. Do NOT use it. Consult the technical service.

**5. Communication error external modules**

Verify the wiring of the external modules, cut off the supply to the unit and to the modules and then switch the unit on again. Go to the submenu "External module I/O x" and disable the communications of the modules and then enable again.
There is an anomaly in one or both the external modules. Do NOT use them. Disable them and consult the technical service.

**6. "Incorrect user pin"**

The user has entered the PIN incorrectly prior to pressing "Save" or "Send".

**7. "Remote unit not found. Check configuration."**

Some parameter in "Remote unit TCP/IP configuration" is not correct.

**8. "Warning, command sent with pin error. Check configuration."**

Some parameter in "Remote unit TCP/IP configuration" is not correct.

**9. "Remote server not found. Check configuration."**

Some parameter in "Remote unit TCP/IP configuration" is not correct.

10. **"SST error"**

Failure upon detection of physical memory for data storage.

11. **"Warning, incoming command received with PIN error."**

A command/order received from another unit or automated system with incorrect user PIN.

# Chapter 6 – Verification and start-up

## 6.1 Start-up

When starting up the installation, the unit's ancillary MCB is in the OFF position.

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.
Run the Differential Protection Test and verify its correct operation.

## 6.2 "Real incremental" differential intensity test (IΔn)

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

- The differential intensity test injects an intensity into the line differential Intensity measurement toroidal core itself.

Before using the unit, the complete Protection Test must be run. 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 (section "Tests"), 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 and cut-off value. Moreover, the user must verify the threshold value at the moment of cut-off and the cut-off value, both of which must correspond to the programmed values.

The unit resets automatically once the sequential reclosures cycle is finalised. The user can press "reset" in order to reset manually.

In order for this differential test to function correctly, the connections of the differential measurement toroidal to the module's terminals (leads I, G, T) must respect the wiring diagrams.

## 6.3 Differential test with rated threshold

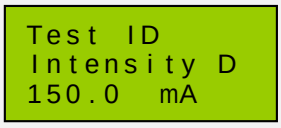
When "TEST $I_{\Delta N}$", is enabled, a real defect current of incremental value is generated in the measurement toroidal core. This is added to the existent differential leakage in the line. The test produces an alarm/cut-off when the alarm threshold is surpassed. In this way, the user can know cut-off value.
***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 Standard tolerated margins and provoke a defect current 125% superior to the rated value. Moreover, adding to that, the existent differential leakage in the line, 150% could easily be reached which *does not constitute any proof that these differentials will function at said rated value.*

## 6.4 Differential intensity test - IΔn (differential tester)

When "TEST $I_{\Delta N}$", is enabled, a real defect current of incremental value is generated in the measurement toroidal core. 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 cut-off value. Functioning is correct when, once the Test button is pressed, the unit cuts off and emits the corresponding diagnosis and cut-off value.
"Test" injects a real incremental value signal in the differential toroidal core (A type). This action checks out the toroidal core, the electronic amplification and filtering circuit and the analogic digital detection and conversión system.

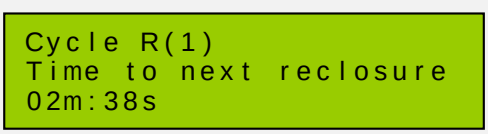
Verification by the user himself of the cut-off value. This must correspond approximately to that programmed.
It is recommended that the test be carried out with an 80mS delay of the differential alarm, or lower if the value is <36mA.
Depending on the delay of the differential alarm, the cut-off value increases (the longer the delay, the greater the increase)
With an 80mS delay, the approximate increase is +2% to +15% depending on the programmed (the greater the value, the smaller the increase)

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




➔ Diagnosis of alarm causing cut-off
➔ Cut-off value to be verified

10 seconds after alarm informing, the following screen appears concerning reclosure. The unit proceeds with the corresponding reclosure cycle.




Should one not wish to wait the reclosure time (3mins), press RESET and then OK/RESET and the unit will carry out the reboot sequence and will reclose the ancillary circuit-breaker (For further details regarding reclosure cycles, please, refer to "Sequential reclosures")

In order for this differential test to function correctly, the connections of the differential measurement toroidal to the module's terminals (leads I, G, T) must respect the wiring diagrams.

## 6.5 External WD (Watchdog) test

When this TEST is enabled, the unit cuts off. Should the unit not cut off, this means there is an anomaly and the unit must be revised immediately. Do NOT use it and contact the technical service. The test is functioning correctly when the unit cuts off and then recloses.

## 6.6 MCB (circuit-breaker) test

When I this TEST is enabled, the unit cuts off. Should the unit not cut off, this means there is an anomaly and the unit must be revised immediately. Do NOTuse it and contact the technical service. The test is functioning correctly when the unit cuts off and then enters into the reclosure cycle (MCB). It will then reset. The user can press “reset” in order to reset manually.

## 6.7 “Real incremental” autotest of differential protection

**The unit automatically carries out a ”real incremental” test of the differential protection before each reconnection**. It verifies that the operativity is currently valid as regards the toroidal, amplification, filtering and detection. In order for this differential test to function correctly, the connections of the differential measurement toroidal to the module’s terminals (leads I, G, T) must respect the wiring diagrams.

## 6.8 Autotest of differential

The unit automatically carries out a test of the differential protection every second if I$\Delta$n < 10mA. It verifies that the operativity is currently valid as regards the toroidal, amplification, filtering and detection. If I$\Delta$n > 10mA, this check is not carried out since it considers that the toroidal, amplification, filtering and detection are all currently operative. In order for this differential autotest to function correctly, the connections of the differential measurement toroidal to the module’s terminals (leads I, G, T) must respect the wiring diagrams.

When the autotest detects an anomaly, it cuts off and diagnoses. If the anomaly is subsequently resolved, then the unit recloses automatically. 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.

## 6.9 Diagnosis of cut-off

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

## 6.10 Redundant cut-off devices

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

- Device #1: *high-speed* cut-off, by means of a tripping coil
- Device #2: cut-off by means of a built-in motor-drive

Moreover, in order to command the dual cut-off device, the unit has **two independent cut-off circuits**, viz:

1 - *High-speed* cut-off circuit for the MCB by means of a tripping coil. It has its 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-drive. Permits disconnection and connection of the ancillary MCB. 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.

- NOTE1: The ancillay MCB (circuit-breaker) is cut off by means of a double cut-off device of all the protections/alarms. In the event of several simultaneous alarms, the ancillary MCB will cut off firstly via device 1 (tripping coil) and then 10 seconds later (time alarm indicated on display) also via device 2 (reclosure motor).
- NOTE 2: If the unit includes the option of having the oscilloscope event-logger, cut-off of the ancillary circuit-breaker is carried out by means of a dual cut-off in all the protections/alarms except in the case of an alarm or alarms acting on the circuit-breaker and the event-logger at one and the same time. In this case, cut-off is first effected by device #1 (tripping coil) and, 10 seconds later (indication time of the alarm), it cuts off by means of device #2 (reclosure motor-drive).

# Chapter 7 – Description of protections

## 7.1 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 surpassed, 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 rated value. Sureline 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).

## 7.2 Protection against permanent and transient overvoltage (Progressive performance curve Voltage/Time RMS-Pk)

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

The unit withstands permanent overvoltages of 425V RMS (L-N) and transient (300mS) 1000V peak voltages (L-N).

From 1000V L-N Peak upwards, the unit protects itself by means of a built-in fuse. Prolonged use in higher-rank voltages (300-425V L-N) is not recommended. The unit will reset automatically when the anomalous condition desists. Whilst there exists an overvoltage, the unit will not reset (Automatic Intelligent Reclosure).

- ***Adjustment of the suitable level of voltage protection:*** It is that level which does not surpass the maximum limits withstood by the receivers (loads, equipment…..) in the installation, as established by the manufacturers. The great majority of manufacturers of devices and equipment declares 265V L-N to be the *maximum withstandable supply level.*. In consequence, the user must establish and program a maximum level of protective performance equal or inferior to 265V L-N as suitable in order to ensure an efficient protection. One should consult the manuals of the receiving devices and regulate the threshold and delay in accordance with the manufacturers’ specifications.

## 7.3 Adaptation to Standard EN 50550:2011

In order to adapt the voltage and delay values to those stipulated in Standard EN 50550:2011, the threshold and delay for RMS overvoltage protection must be programmed to a value of 275V and delay = 150 (3000 ms). Moreover, the threshold and delay for peak (Pk) overvoltage protection must be programmed to a value of 450V and delay = 45 (7,03 ms).

Thus, the progressive performance voltage/time curve will be as follows:

| | | | |
|---|---|---|---|
| RMS overvoltage L1, L2, L3 | >275V | 3000ms | |
| RMS overvoltage L1, L2, L3 | >300V | 1000ms | |
| RMS overvoltage L1, L2, L3 | >350V | 260ms | |
| RMS overvoltage L1, L2, L3 | >400V | 80ms | (only version F.E. 1000V Pk) |
| Pk overvoltage L1, L2, L3 | >450VPk | 7,03ms | |

***In such cases, ensure that the receivers connected to the installation withstand said levels.***

## 7.4 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 ***high speed*** cut-off via the tripping coil and the motor-drive. Whilst there exists a low voltage, the unit will not reset (Automatic Intelligent Reclosure).

## 7.5 Protection against MCB tripping

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

## Chapter 8 – Additional options

The new universal range of protection, metering, register and automation/telecontrol units share the SURELINE 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 SURELINE 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 Sureline's. Please, consult Safeline

### 8.1 Protection against intense transient overvoltages of *very short* duration (nS and µS)

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

This specific protection against these powerful but very brief transient (KV/µS) is provided by a module based on varistors, surge-arresters....

Albeit the protection method based on varistors is effective only in the event of very short-duration (µS) transients, it does, however, constitute the ideal complement to the protections provided by the Sureline units.

The varistor affords a high derivation capacity together with a rapid response time which, thus, reduces the high values of the fore-mentioned transients.

## Chapter 9 – Cut-off. Tripping times.

### 9.1 Total cut-off time of the MCB (circuit-breaker)

In the event of the protections being called into play, the cut-off of the ancillary MCB is effected in a typical time of between 2mS and 5mS in the 2-pole units (depending on the model and make of the MCB and coil employed). In the "L" version, the typical cut-off time is between 5mS and 10mS in the 2-pole units.

Available separately upon request, measurement protocol and also the corresponding graphics for the cut-off times of the different models and makes of ancillary 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 5mS). Moreover, one must also bear in mind the ionisation effect at the moment of disconnection between the contacts of the ancillary cut-off element. 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 loads (inductive, capacitive or resistive).

## Chapter 10 – Usage

Given the automatic nature of the diverse protections of the unit, 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 previous chapters.

Before using the unit, the complete Protection Test must be carried out, including the Watchdog 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 immediately.

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

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).

## Chapter 11 – Description of basic components

### 11.1 Differential intensity toroidal transformers (AC) TRDF18 and TRDF26 (Differential, type A)

**Attention:** They are individually matched and adjusted to the corresponding Sureline module and must under NO circumstance whatsoever, be interchanged with others.

Toroidal core (high magnetic permeability and low loss). Precision +/- 1.5%.

TRDF18 : internal ∅: 18mm

TRDF 26 : internal ∅: 26mm
- Other dimensions: Consult Safeline

### 11.2 Intensity toroidal transformers (AC) TRIT14 and TRIT18

**Attention:** They are individually matched and adjusted to the corresponding Sureline module and must under NO circumstance whatsoever, be interchanged with others. **For current transformers (L1, L2, L3) the line is specified on their label.**

Toroidal core (high magnetic permeability and low loss). Precision +/- 1%.

TRIT14 : internal ∅: 14mm

TRIT18 : internal ∅: 18mm
- Other dimensions: Consult Safeline

### 11.3 Ancillary MCB switch, 2 and 4-pole - Schupa (Gewiss Group)

| | |
|---|---|
| Brand name: | Schupa (Gewiss Group) |
| Type: | NLS10 ó NLS6 |
| Curve: | C |
| Intensities | 6, 10, 16, 25, 32, 40, 50, 63A |
| Breaking capacity | 10kA or 6kA |
| Mechanical endurance: | MCB 2 and 4-pole: 20.000 complete manoeuvres (ON OFF) |

For further information, consult the manufacturer

### 11.4 Cut-off device (tripping coil) - Schupa (Gewiss Group)

| | |
|---|---|
| Brand name: | Schupa (Gewiss Group) |
| Type: | NLS-F1 12/60V |

For further information, consult the manufacturer

### 11.5 Ancillary MCB switch, 2 and 4-pole - AEG / G.E.

| | |
|---|---|
| Brand name: | General Electric |
| Type: | EP 60 (breaking capacity 10KA IEC 60947-2 or 6KA IEC 60898) |
| Type: | EP 100 (breaking capacity 15KA IEC 60947-2 or 10KA IEC 60898 |
| Curve: | C (standard), B, D, K |
| Intensities | 6, 10, 16, 25, 32, 40, 50, 63A |
| Electrical endurance: | MCB 4-pole: 9,000 complete manoeuvres (ON OFF) |
| Electrical endurance: | MCB 2-pole: 8,000 complete manoeuvres (ON OFF) |

For further information, consult the manufacturer

### 11.6 Cut-off device (tripping coil) - AEG / G.E.

| | |
|---|---|
| Brand name: | General Electric |
| Type: | TELE L-1 CA 24/60V |
| Electrical endurance: | 9,000 complete manoeuvres (ON OFF) |

For further information, consult the manufacturer

## CHAPTER 12 – TECHNICAL SERVICE

### 12.1 Technical service

AUTHORISED TECHNICAL SERVICE: SOLELY BY THE MANUFACTURER

## CHAPTER 13 – MAINTENANCE

### 13. 1 Maintenance

Before using the unit, the complete Protection Test must be carried out as described in the section “Tests”. 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".

**Do not exceed the electrical endurance of the magnetoterm (MCB) and tripping coil.**

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.

La electrical endurance of the General Electric 2-pole ancillary MCB is 9,000 complete manoeuvres (ON/OFF). It is recommended that the MCB, the tripping coil and the lever be changed pre-emptively after 7,000 manoeuvres.

La electrical endurance of the General Electric 4P ancillary MCB is 8,000 complete manoeuvres (ON/OFF). It is recommended that the MCB, the tripping coil and the lever be changed pre-emptively after 6,000 manoeuvres.

NOTE: Consult “Cut-off counters”.

Total accrued counter (undeletable) T.acum =07,000

# Chapter 14 – Guarantee

## 14.1 Guarantee card

GUARANTEE CARD (photocopy or print and send to Safeline)

Sureline model .....
Serial nbr .....
Date of purchase .....

Stamp of establishment where unit purchased (with complete address)

……

……

……

Complete name and address of purchaser

……

……

……

e-mail ……

Main use to which the Sureline unit is to be put .....

Notes .....

.....

I hereby authorise Safeline to keep me periodically informed ☐ Yes ☐ No

### GUARANTEE

SAFELINE, 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 SURELINE unit.

Period of guarantee: three years as from date of purchase.
Conditions and application of the SURELINE guarantee: Your SURELINE 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 SURELINE elements
- Incorrect usage due to non-observance of the recommendations given in the SURELINE manual.

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

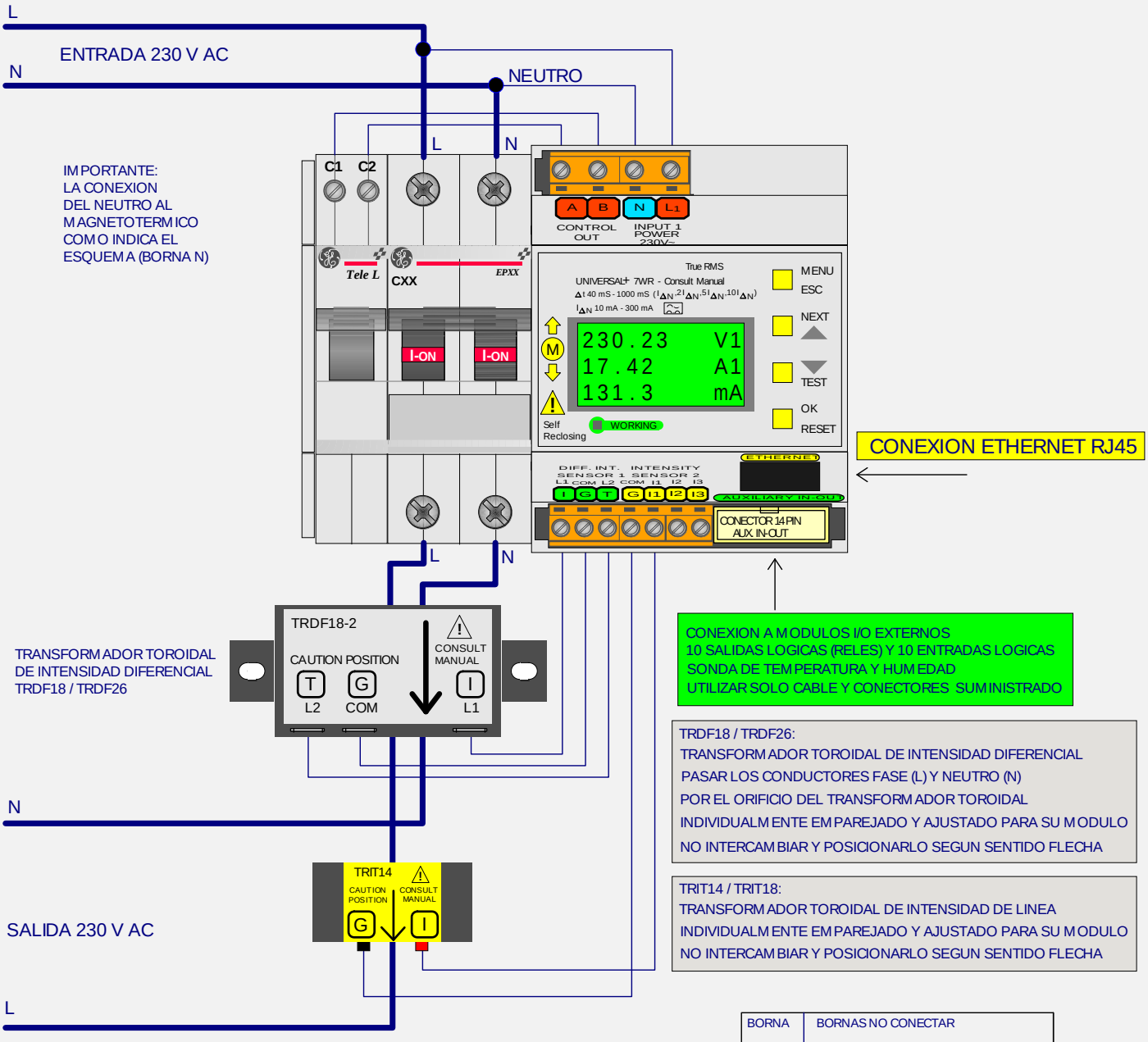
## Chapter 15 – Wiring diagrams
### 15.1 Wiring diagrams

# UNIDAD UNIVERSAL+ 7WR M1
# VERSION INTENSIDAD DIFERENCIAL TIPO A

MODELO UNIVERSAL+ 7WR - M1 - M

CONFIGURACION MONOFASICA 2 POLOS 6, 10, 16, 20, 25, 32, 40, 50, 63A.

VERSION INTENSIDAD DIFERENCIAL TIPO A



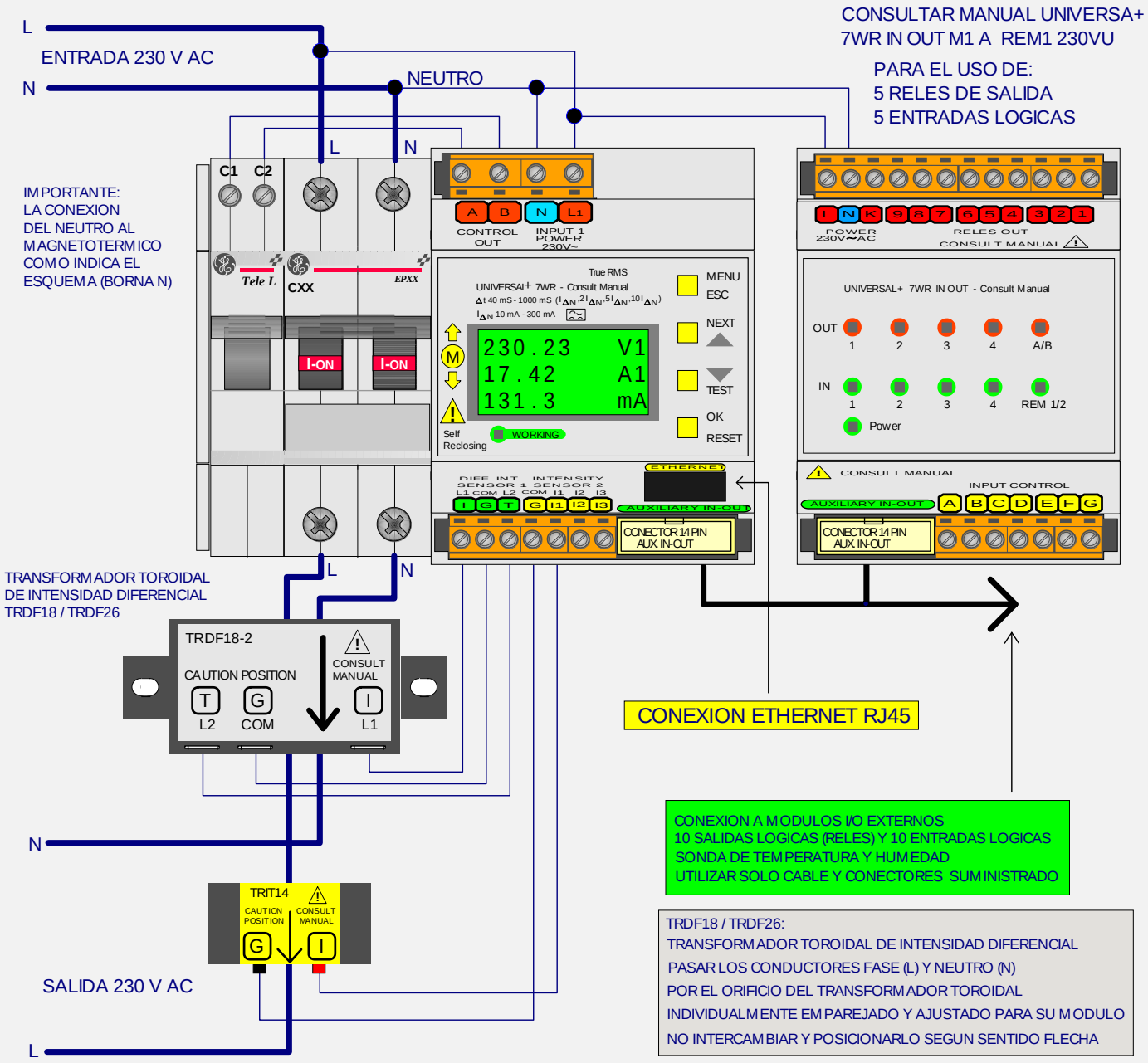

| BORNA | BORNAS NO CONECTAR |
|---|---|
| I2 | BORNA NO CONECTAR |
| I3 | BORNA NO CONECTAR |

CONSULTAR MANUAL DE INSTRUCCIONES

# UNIDAD UNIVERSAL+ 7WR M1
# VERSION INTENSIDAD DIFERENCIAL TIPO A
# CON UNIVERSAL+ 7WR IN OUT (5 RELES DE SALIDA Y 5 ENTRADAS LOGICAS)

MODELO UNIVERSAL+ 7WR - M1 - M

CONFIGURACION MONOFASICA 2 POLOS 6, 10, 16, 20, 25, 32, 40, 50, 63A.



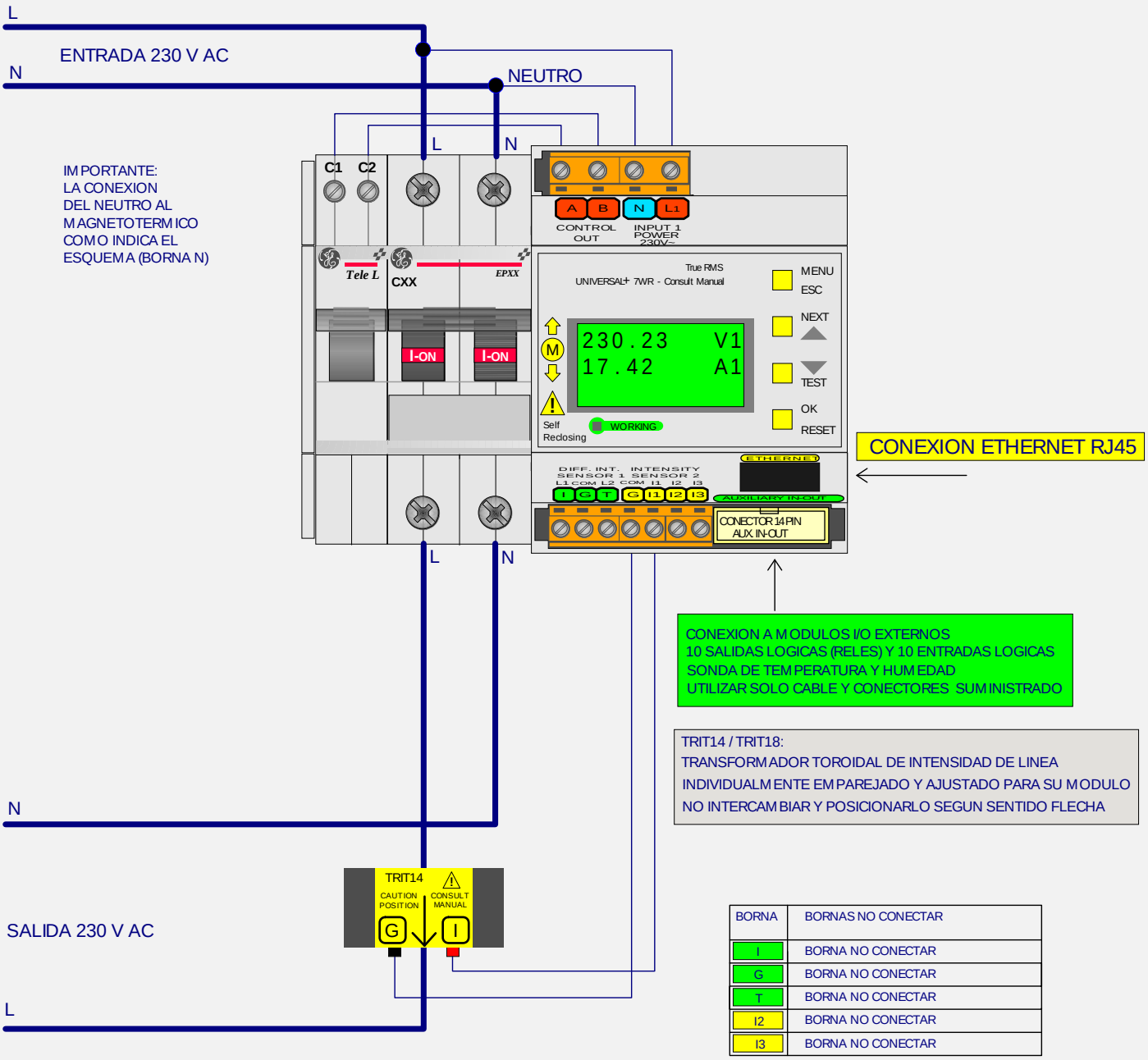

| BORNA | BORNAS NO CONECTAR |
|---|---|
| I2 | BORNA NO CONECTAR |
| I3 | BORNA NO CONECTAR |

CONSULTAR MANUAL DE INSTRUCCIONES

# UNIDAD UNIVERSAL+ 7WR M1

MODELO UNIVERSAL+ 7WR - M1 - M - N

CONFIGURACION MONOFASICA 2 POLOS 6, 10, 16, 20, 25, 32, 40, 50, 63A.




| BORNA | BORNAS NO CONECTAR |
|---|---|
| I | BORNA NO CONECTAR |
| G | BORNA NO CONECTAR |
| T | BORNA NO CONECTAR |
| I2 | BORNA NO CONECTAR |
| I3 | BORNA NO CONECTAR |

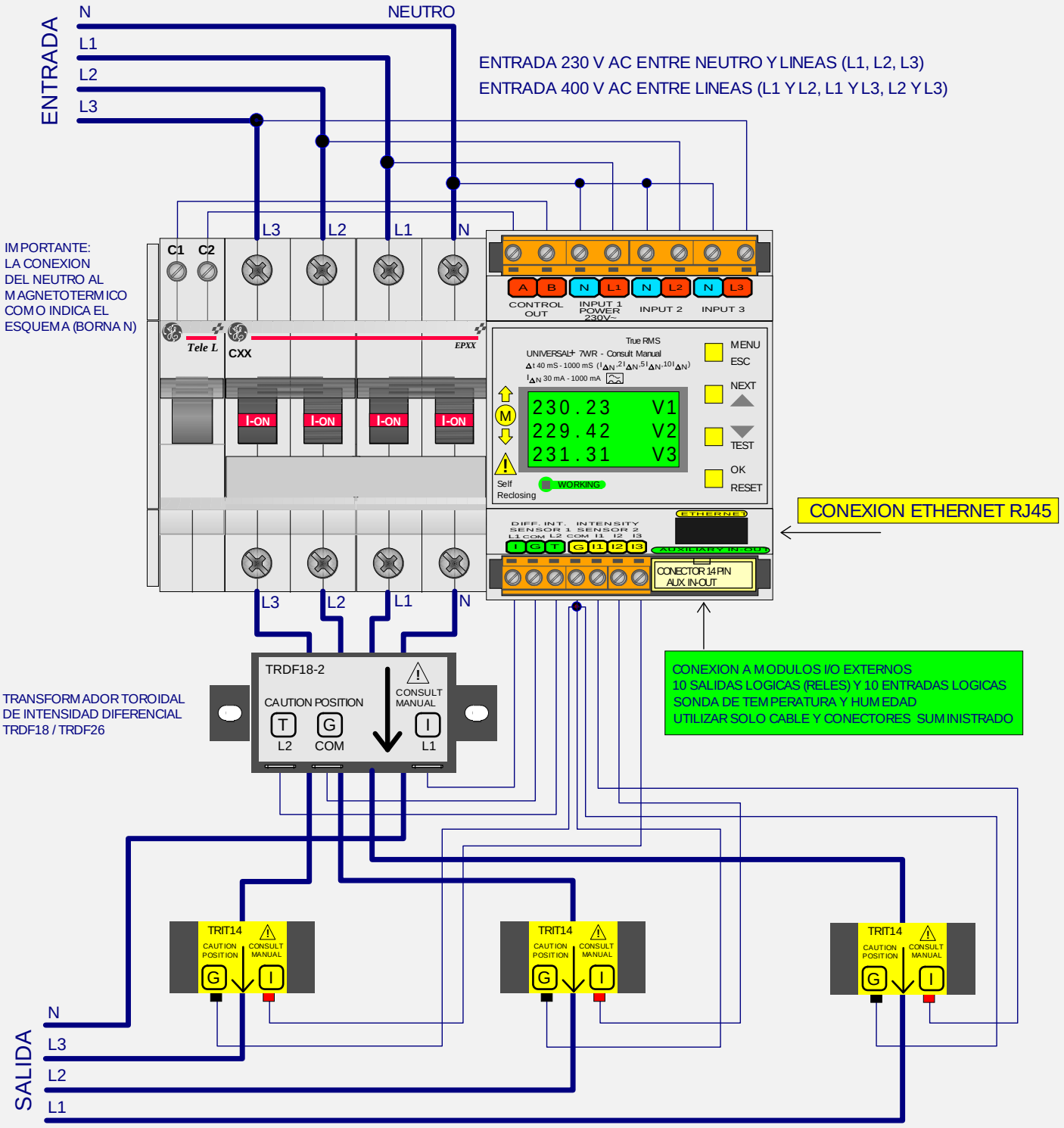
CONSULTAR MANUAL DE INSTRUCCIONES

# UNIDAD UNIVERSAL+ 7WR M1
# VERSION INTENSIDAD DIFERENCIAL TIPO A

MODELO UNIVERSAL+ 7WR - M1 - T

CONFIGURACION TRIFASICA 4 POLOS 6, 10, 16, 20, 25, 32, 40, 50, 63A.

VERSION INTENSIDAD DIFERENCIAL TIPO A




TRDF18 / TRDF26:
TRANSFORMADOR TOROIDAL DE INTENSIDAD DIFERENCIAL
PASAR LOS CONDUCTORES L1, L2, L3 Y NEUTRO
POR EL ORIFICIO DEL TRANSFORMADOR TOROIDAL
INDIVIDUALMENTE EMPAREJADO Y AJUSTADO PARA SU MODULO
NO INTERCAMBIAR Y POSICIONARLO SEGUN SENTIDO FLECHA

TRIT14 / TRIT18:
TRANSFORMADOR TOROIDAL DE INTENSIDAD DE LINEA
INDIVIDUALMENTE EMPAREJADO Y AJUSTADO PARA SU MODULO
NO INTERCAMBIAR Y POSICIONARLO SEGUN SENTIDO FLECHA

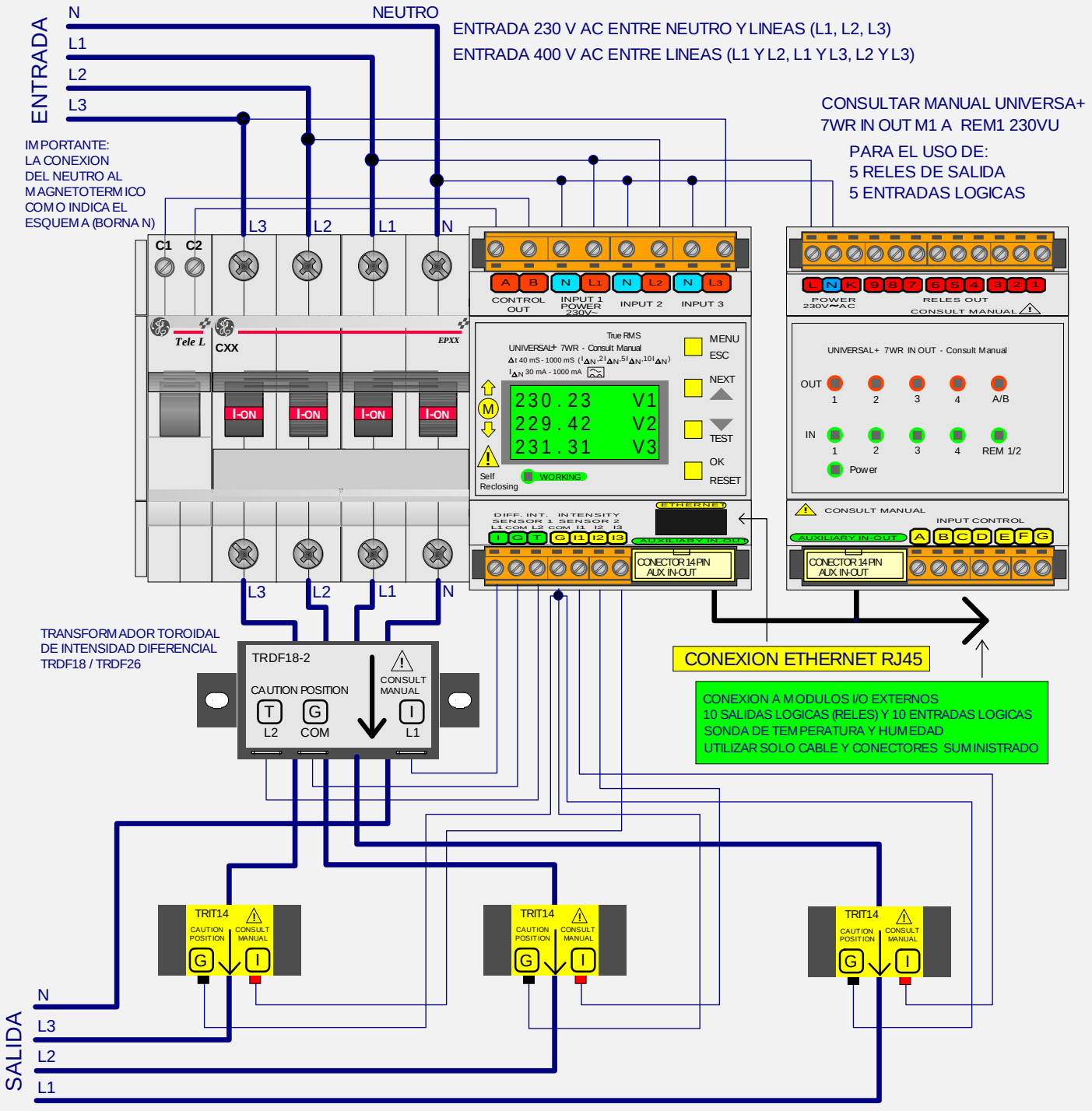
CONSULTAR MANUAL DE INSTRUCCIONES

# UNIDAD UNIVERSAL+ 7WR M1
# VERSION INTENSIDAD DIFERENCIAL TIPO A
# CON UNIVERSAL+ 7WR IN OUT (5 RELES DE SALIDA Y 5 ENTRADAS LOGICAS)

MODELO UNIVERSAL+ 7WR - M1 - T

CONFIGURACION TRIFASICA 4 POLOS 6, 10, 16, 20, 25, 32, 40, 50, 63A.

VERSION INTENSIDAD DIFERENCIAL TIPO A




TRDF18 / TRDF26:
TRANSFORMADOR TOROIDAL DE INTENSIDAD DIFERENCIAL
PASAR LOS CONDUCTORES L1, L2, L3 Y NEUTRO
POR EL ORIFICIO DEL TRANSFORMADOR TOROIDAL
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NO INTERCAMBIAR Y POSICIONARLO SEGUN SENTIDO FLECHA

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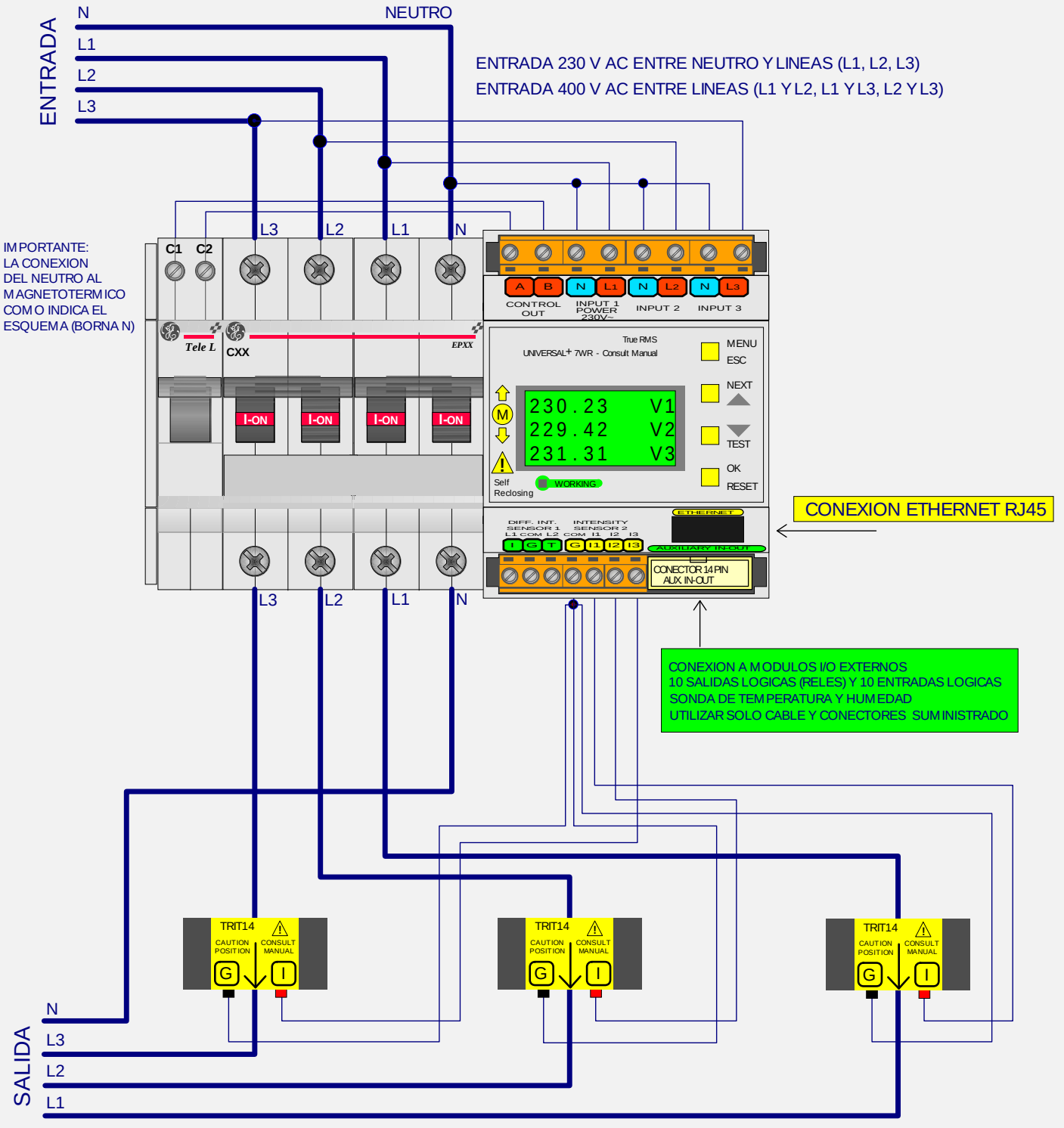
INDIVIDUALMENTE EMPAREJADO Y AJUSTADO PARA SU MODULO
NO INTERCAMBIAR Y POSICIONARLO SEGUN SENTIDO FLECHA

CONSULTAR MANUAL DE INSTRUCCIONES

# UNIDAD UNIVERSAL+ 7WR M1

MODELO UNIVERSAL+ 7WR - M1 - T - N

CONFIGURACION TRIFASICA 4 POLOS 6, 10, 16, 20, 25, 32, 40, 50, 63A.



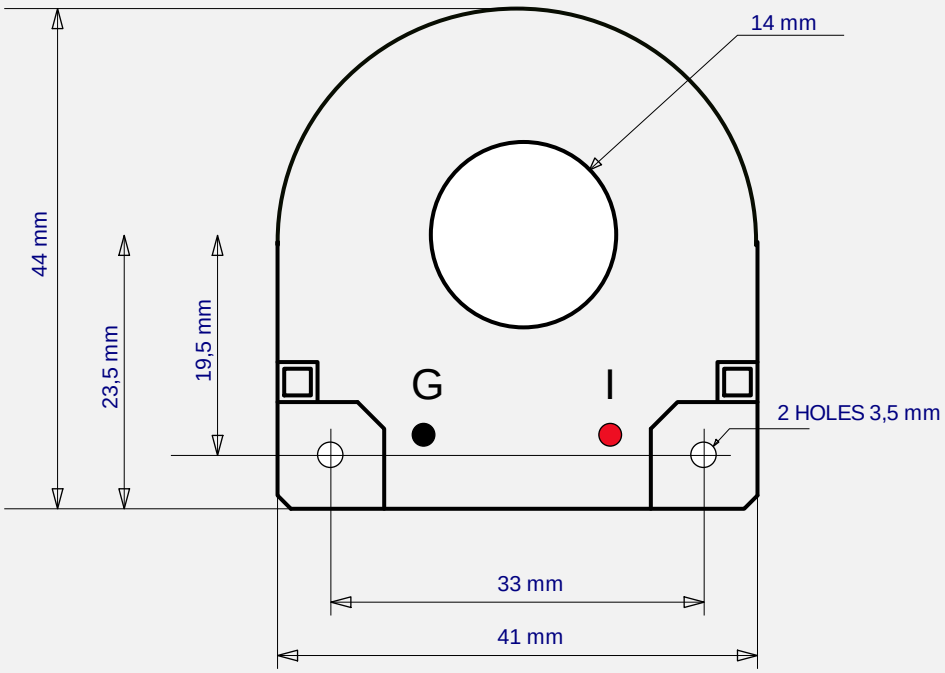

| BORNA | SENSOR 1<br>BORNAS NO CONECTAR |
|---|---|
| I | BORNA NO CONECTAR |
| G | BORNA NO CONECTAR |
| T | BORNA NO CONECTAR |

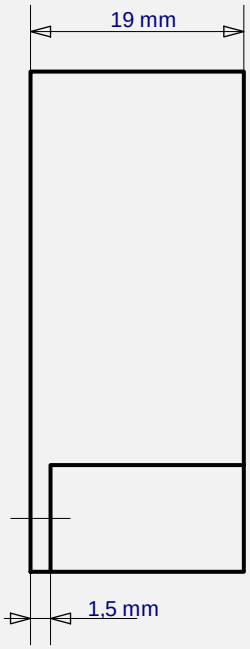
TRIT14 / TRIT18:
TRANSFORMADOR TOROIDAL DE INTENSIDAD DE LINEA
INDIVIDUALMENTE EMPAREJADO Y AJUSTADO PARA SU MODULO
NO INTERCAMBIAR Y POSICIONARLO SEGUN SENTIDO FLECHA

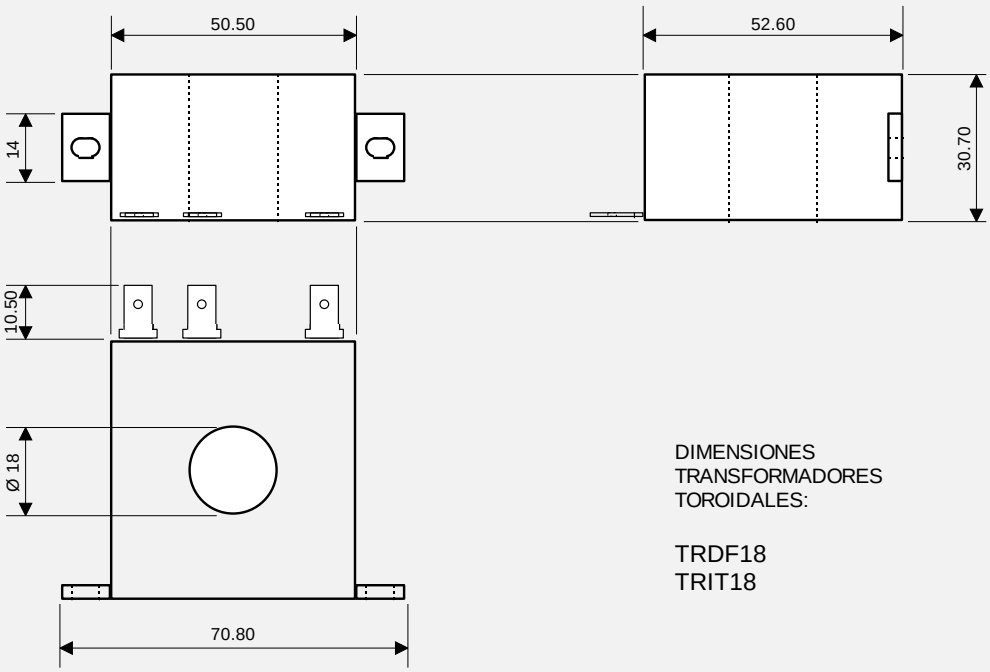
CONSULTAR MANUAL DE INSTRUCCIONES

## DIMENSIONES TRASFORMADOR TOROIDAL DE INTENSIDAD DE LINEA

# TRIT14

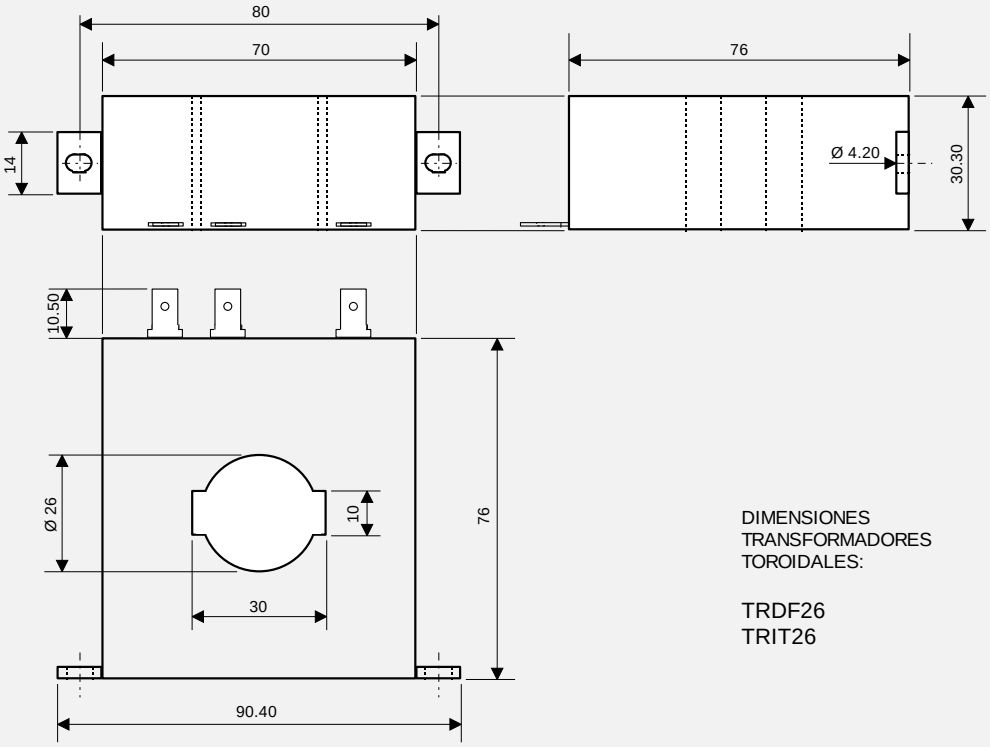





DIMENSIONES
TRANSFORMADORES
TOROIDALES:

TRDF18
TRIT18




DIMENSIONES
TRANSFORMADORES
TOROIDALES:

TRDF26
TRIT26

## Chapter 16 – Modbus TCP/IP communication protocol , Port 502 (please, refer to synoptical tables of characteristics)

### Modbus TCP/IP:

Modbus is a communication protocol located at layer 7 of the OSI Model, based on the master/slave o client/server architecture designed in 1979 by Modicon for its range of programmable logic controllers (PLC's). It has become a "de facto" standard within the industrial manufacturing environment and is the most widely used for the connection of industrial electronic devices.

The Modbus TCP/IP protocol transmits via Ethernet port 502.

For further information, consult the specifications and guidelines at "The Modbus Organization" website: http://www.modbus.org/.

1. Modbus messaging on TCP/IP implementation guide V1.0b
2. Modbus application protocol specification V1.1b3

### Modbus supported commands

| | |
|---|---|
| 01 (0x01h) | **Read Coils** / Reading of digital outputs status |
| 02 (0x02h) | **Read Discrete Inputs** / Reading of digital inputs status |
| 04 (0x04h) | **Read Input Registers** / Reading of a register |
| 05 (0x05h) | **Write Single Coil** / Writing of the status of a digital output |
| 06 (0x06h) | **Write Single Register** / Writing of a register |

### Modbus tables

| | | | |
|---|---|---|---|
| 0:0001 | Digital outputs (relays) | Commands: 01 and 05 | Read / write |
| 1:0001 | Digital inputs | Command: 02 | Read |
| 3:0001 | General measurements and values | Command: 04 | Read |
| 4:0001 | Command | Command: 06 | Write only |

### Types of data

| | |
|---|---|
| Bit | Refers to binary |
| UWord16 | Hexadecimal number, 16-bit unsigned integer, uses 1 memory address. Register with 2 bytes of memory in **big-endian** format.<br>Example: 1234h will be sent as 12, 34. The most significant byte first. |
| Word16 | Hexadecimal number, 16-bit signed integer, uses 1 memory address. Register with 2 bytes of memory in **big-endian** format.<br>Example: 1234h will be sent as 12, 34. The most significant byte first. |
| UWord32 | Hexadecimal number, 32-bit unsigned integer, uses 2 memory addresses. Register with 4 bytes of memory (2-word) in **little-endian** format.<br>Example: 12345678h will be sent as 56, 78, 12, 34. The least significant word first. |
| UWord48 | Hexadecimal number, 48-bit unsigned integer, uses 3 memory addresses. Register with 6 bytes of memory (3-word) in **little-endian** format.<br>Example: 112233445566h will be sent as 55, 66, 33, 44, 11, 22. The least significant word first. |
| BCD16 | Decimal number, 16-bit binary-coded, uses 1 memory address. Register with 2 bytes of memory in **big-endian** format.<br>Used solely for writing user PIN. Varies from 0000 to 9999 decimal.<br>Example: User PIN = 1234d, 1234h in BCD. Will be sent as 12, 34. The most significant byte first. |

**Table 3:0001,** *accessible with function code 0x04h (Read input registers).*

| Modbus registers (Dec) | Modbus addresses (Hex) | Nbr. of registers | Type of data | Description | Scaling | Units |
|---|---|---|---|---|---|---|
| **Temperature and relative humidity** | | | | | | |
| 1 | 0000 | 1 | Word16 | TEMP, Temperature | 1/100 | ºC |
| 2 | 0001 | 1 | UWord16 | HUME, Relative humidity | 1/100 | %Hr |
| **Measurements** | | | | | | |
| 3 | 0002 | 2 | UWord32 | VRMS1, RMS voltage L1 | 1/100 | V |
| 5 | 0004 | 2 | UWord32 | VRMS2, RMS voltage L2 | 1/100 | V |
| 7 | 0006 | 2 | UWord32 | VRMS3, RMS voltage L3 | 1/100 | V |
| 9 | 0008 | 2 | UWord32 | VPk1, Pk voltage L1 | 1/100 | V |
| 11 | 000A | 2 | UWord32 | VPk2, Pk voltage L2 | 1/100 | V |
| 13 | 000C | 2 | UWord32 | VPk3, Pk voltage L3 | 1/100 | V |
| 15 | 000E | 1 | UWord16 | ID, RMS differential intensity | 1/10 | mA |
| 16 | 000F | 1 | UWord16 | IDPk, Pk differential intensity | 1/10 | mA |
| 17 | 0010 | 2 | UWord32 | V12, RMS voltage phases L1 and L2 | 1/100 | V |
| 19 | 0012 | 2 | UWord32 | V23, RMS voltage phases L2 and L3 | 1/100 | V |
| 21 | 0014 | 2 | UWord32 | V31, RMS voltage phases L3 and L1 | 1/100 | V |
| 23 | 0016 | 2 | UWord32 | I1, RMS intensity L1 | 1/100 | A |
| 25 | 0018 | 2 | UWord32 | I2, RMS intensity L2 | 1/100 | A |
| 27 | 001A | 2 | UWord32 | I3, RMS intensity L3 | 1/100 | A |
| 29 | 001C | 2 | UWord32 | IPk1, Pk intensity L1 | 1/100 | A |
| 31 | 001E | 2 | UWord32 | IPk2, Pk intensity L2 | 1/100 | A |
| 33 | 0020 | 2 | UWord32 | IPk3, Pk intensity L3 | 1/100 | A |
| 35 | 0022 | 1 | UWord16 | HZ1, Frequency L1 | 1/10 | Hz |
| 36 | 0023 | 1 | UWord16 | HZ2, Frequency L2 | 1/10 | Hz |
| 37 | 0024 | 1 | UWord16 | HZ3, Frequency L3 | 1/10 | Hz |
| 38 | 0025 | 2 | UWord32 | W1, Active power L1 | 1/10 | W |
| 40 | 0027 | 2 | UWord32 | W2, Active power L2 | 1/10 | W |
| 42 | 0029 | 2 | UWord32 | W3, Active power L3 | 1/10 | W |
| 44 | 002B | 2 | UWord32 | W123, Sum L1+L2+L3 | 1/10 | W |
| 46 | 002D | 2 | UWord32 | WP1, Requested power L1 | 1/10 | W |
| 48 | 002F | 2 | UWord32 | WP2, Requested power L2 | 1/10 | W |
| 50 | 0031 | 2 | UWord32 | WP3, Requested power L3 | 1/10 | W |
| 52 | 0033 | 2 | UWord32 | WP123, Sum L1+L2+L3 | 1/10 | W |
| 54 | 0035 | 2 | UWord32 | WN1, Returned power L1 | 1/10 | W |
| 56 | 0037 | 2 | UWord32 | WN2, Returned power L2 | 1/10 | W |
| 58 | 0039 | 2 | UWord32 | WN3, Returned power L3 | 1/10 | W |
| 60 | 003B | 2 | UWord32 | WN123, Sum L1+L2+L3 | 1/10 | W |
| 62 | 003D | 2 | UWord32 | VA1, Apparent power L1 | 1/10 | VA |
| 64 | 003F | 2 | UWord32 | VA2, Apparent power L2 | 1/10 | VA |
| 66 | 0041 | 2 | UWord32 | VA3, Apparent power L3 | 1/10 | VA |
| 68 | 0043 | 2 | UWord32 | VA123, Sum L1+L2+L3 | 1/10 | VA |
| 70 | 0045 | 2 | UWord32 | VARL1, Reactive inductive power L1 | 1/10 | Var |
| 72 | 0047 | 2 | UWord32 | VARL2, Reactive inductive power L2 | 1/10 | VAr |
| 74 | 0049 | 2 | UWord32 | VARL3, Reactive inductive power L3 | 1/10 | VAr |
| 76 | 004B | 2 | UWord32 | VARL123, Sum L1+L2+L3 | 1/10 | VAr |
| 78 | 004D | 2 | UWord32 | VARC1, Reactive capacitive power L1 | 1/10 | VAr |

| | | | | | | |
|---|---|---|---|---|---|---|
| 80 | 004F | 2 | UWord32 | VARC2, Reactive capacitive power L2 | 1/10 | VAr |
| 82 | 0051 | 2 | UWord32 | VARC3, Reactive capacitive power L3 | 1/10 | VAr |
| 84 | 0053 | 2 | UWord32 | VARC123, Sum L1+L2+L3 | 1/10 | VAr |
| 86 | 0055 | 1 | UWord16 | PF1, Power factor L1 | 1/1000 | % |
| 87 | 0056 | 1 | UWord16 | PF2, Power factor L2 | 1/1000 | % |
| 88 | 0057 | 1 | UWord16 | PF3, Power factor L3 | 1/1000 | % |
| 89 | 0058 | 1 | UWord16 | DESV1, Voltage unbalance L1 | 1/10 | % |
| 90 | 0059 | 1 | UWord16 | DESV2, Voltage unbalance L2 | 1/10 | % |
| 91 | 005A | 1 | UWord16 | DESV3, Voltage unbalance L3 | 1/10 | % |
| 92 | 005B | 1 | UWord16 | DESI1, Intensity unbalance L1 | 1/10 | % |
| 93 | 005C | 1 | UWord16 | DESI2, Intensity unbalance L2 | 1/10 | % |
| 94 | 005D | 1 | UWord16 | DESI3, Intensity unbalance L3 | 1/10 | % |
| 95 | 005E | 2 | UWord32 | IN, neutral intensity | 1/100 | A |
| 97 | 0060 | 1 | UWord16 | CFV1, Crest factor V1 | 1/1000 | |
| 98 | 0061 | 1 | UWord16 | CFV2, Crest factor V2 | 1/1000 | |
| 99 | 0062 | 1 | UWord16 | CFV3, Crest factor V3 | 1/1000 | |
| 100 | 0063 | 1 | UWord16 | CFI1, Crest factor I1 | 1/1000 | |
| 101 | 0064 | 1 | UWord16 | CFI2, Crest factor I2 | 1/1000 | |
| 102 | 0065 | 1 | UWord16 | CFI3, Crest factor I3 | 1/1000 | |
| 103 | 0066 | 2 | UWord32 | Z1, Impedance L1 | 1/100 | |
| 105 | 0068 | 2 | UWord32 | Z2, Impedance L2 | 1/100 | |
| 107 | 006A | 2 | UWord32 | Z3, Impedance L3 | 1/100 | |
| 109 | 006C | 2 | UWord32 | Maximeter W1 | 1/10 | W |
| 111 | 006E | 2 | UWord32 | Maximeter W2 | 1/10 | W |
| 113 | 0070 | 2 | UWord32 | Maximeter W3 | 1/10 | W |
| **Measurements with harmonics** *(cf. Table 4:0001 to select channel and harmonic k)* | | | | | | |
| 115 | 0072 | 1 | UWord16 | THDV1, Harmonic distortion V1 | 1/10 | % |
| 116 | 0073 | 1 | UWord16 | THDV2, Harmonic distortion V2 | 1/10 | % |
| 117 | 0074 | 1 | UWord16 | THDV3, Harmonic distortion V3 | 1/10 | % |
| 118 | 0075 | 1 | UWord16 | THDI1, Harmonic distortion I1 | 1/10 | % |
| 119 | 0076 | 1 | UWord16 | THDI2, Harmonic distortion I2 | 1/10 | % |
| 120 | 0077 | 1 | UWord16 | THDI3, Harmonic distortion I3 | 1/10 | % |
| 121 | 0078 | 1 | UWord16 | FP1(k), Power factor harmonic k L1. CosΦ1 if k=1. | 1/1000 | % |
| 122 | 0079 | 1 | UWord16 | FP2(k), Power factor harmonic k L1. CosΦ2 if k=1. | 1/1000 | % |
| 123 | 007A | 1 | UWord16 | FP3(k), Power factor harmonic k L1. CosΦ3 if k=1. | 1/1000 | % |
| 124 | 007B | 2 | UWord32 | W1(k), Power harmonic k L1 | 1/10 | W |
| 126 | 007D | 2 | UWord32 | W2(k), Power harmonic k L2 | 1/10 | W |
| 128 | 007F | 2 | UWord32 | W3(k), Power harmonic k L3 | 1/10 | W |
| 130 | 0081 | 2 | UWord32 | W123(k), Sum L1+L2+L3 | 1/10 | W |
| 132 | 0083 | 2 | UWord32 | V1(k), Voltage harmonic k L1 | 1/100 | V |
| 134 | 0085 | 2 | UWord32 | V2(k), Voltage harmonic k L2 | 1/100 | V |
| 136 | 0087 | 2 | UWord32 | V3(k), Voltage harmonic k L3 | 1/100 | V |
| 138 | 0089 | 2 | UWord32 | I1(k), Intensity harmonic k L1 | 1/100 | A |
| 140 | 008B | 2 | UWord32 | I2(k), Intensity harmonic k L2 | 1/100 | A |
| 142 | 008D | 2 | UWord32 | I3(k), Intensity harmonic k L3 | 1/100 | A |
| 144 | 008F | 2 | UWord32 | S1(k), Apparent power harmonic k L1 | 1/10 | Var o S |
| 146 | 0091 | 2 | UWord32 | S2(k), Apparent power harmonic k L2 | 1/10 | Var o S |
| 148 | 0093 | 2 | UWord32 | S3(k), Apparent power harmonic k L3 | 1/10 | Var o S |
| 150 | 0095 | 64 | UWord16 * 64 | HDF, Factor de harmonic distortion. k = (0...63). *(depending on channel selected)* | 1/10 | % |

| | | | | | | |
|---|---|---|---|---|---|---|
| **AC-DC measurements – voltage, intensity and power** (Please, go to end of table for differential intensit) | | | | | | |
| 214 | 00D5 | 2 | UWord32 | V1dc, DC voltage L1 | 1/100 | V |
| 216 | 00D7 | 2 | UWord32 | V2dc, DC voltage L2 | 1/100 | V |
| 218 | 00D9 | 2 | UWord32 | V3dc, DC voltage L3 | 1/100 | V |
| 220 | 00DB | 2 | UWord32 | I1dc, DC intensity L1 | 1/100 | A |
| 222 | 00DD | 2 | UWord32 | I2dc, DC intensity L2 | 1/100 | A |
| 224 | 00DF | 2 | UWord32 | I3dc, DC intensity L3 | 1/100 | A |
| 226 | 00E1 | 2 | UWord32 | V1ac, AC voltage L1 | 1/100 | V |
| 228 | 00E3 | 2 | UWord32 | V2ac, AC voltage L2 | 1/100 | V |
| 230 | 00E5 | 2 | UWord32 | V3ac, AC voltage L3 | 1/100 | V |
| 232 | 00E7 | 2 | UWord32 | I1ac, AC intensity L1 | 1/100 | A |
| 234 | 00E9 | 2 | UWord32 | I2ac, AC intensity L2 | 1/100 | A |
| 236 | 00EB | 2 | UWord32 | I3ac, AC intensity L3 | 1/100 | A |
| 238 | 00ED | 2 | UWord32 | P1dc, DC power L1 | 1/10 | W |
| 240 | 00EF | 2 | UWord32 | P2dc, DC power L2 | 1/10 | W |
| 242 | 00F1 | 2 | UWord32 | P3dc, DC power L3 | 1/10 | W |
| 244 | 00F3 | 2 | UWord32 | P1ac, AC power L1 | 1/10 | W |
| 246 | 00F5 | 2 | UWord32 | P2ac, AC power L2 | 1/10 | W |
| 248 | 00F7 | 2 | UWord32 | P3ac, AC power L3 | 1/10 | W |
| **Maximum temperature and relative humidity** | | | | | | |
| 250 | 00F9 | 1 | Word16 | MAX_TEMP, Maximum TEMP | 1/100 | ºC |
| 251 | 00FA | 1 | UWord16 | MAX_HUME, Maximum HUME | 1/100 | %Hr |
| **Maximum measurements** | | | | | | |
| 252 | 00FB | 2 | UWord32 | MAX_V1, Maximum V1 | 1/100 | V |
| 254 | 00FD | 2 | UWord32 | MAX_V2, Maximum V2 | 1/100 | V |
| 256 | 00FF | 2 | UWord32 | MAX_V3, Maximum V3 | 1/100 | V |
| 258 | 0101 | 1 | UWord16 | MAX_ID, Maximum ID | 1/10 | mA |
| 259 | 0102 | 2 | UWord32 | MAX_I1, Maximum I1 | 1/100 | A |
| 261 | 0104 | 2 | UWord32 | MAX_I2, Maximum I2 | 1/100 | A |
| 263 | 0106 | 2 | UWord32 | MAX_I3, Maximum I3 | 1/100 | A |
| 265 | 0108 | 2 | UWord32 | MAX_IN, Maximum IN | 1/100 | A |
| 267 | 010A | 1 | UWord16 | MAX_HZ1, Maximum HZ1 | 1/10 | Hz |
| 268 | 010B | 1 | UWord16 | MAX_HZ2, Maximum HZ2 | 1/10 | Hz |
| 269 | 010C | 1 | UWord16 | MAX_HZ3, Maximum HZ3 | 1/10 | Hz |
| 270 | 010D | 2 | UWord32 | MAX_MAXW1, Maximum Maximeter W1 | 1/10 | W |
| 272 | 010F | 2 | UWord32 | MAX_MAXW2, Maximum Maximeter W2 | 1/10 | W |
| 274 | 0111 | 2 | UWord32 | MAX_MAXW3, Maximum Maximeter W3 | 1/10 | W |
| 276 | 0113 | 2 | UWord32 | MAX_VA1, Maximum VA1 | 1/10 | VA |
| 278 | 0115 | 2 | UWord32 | MAX_VA2, Maximum VA2 | 1/10 | VA |
| 280 | 0117 | 2 | UWord32 | MAX_VA3, Maximum VA3 | 1/10 | VA |
| 282 | 0119 | 2 | UWord32 | MAX_VARC1, Maximum VARC1 | 1/10 | VAr |
| 284 | 011B | 2 | UWord32 | MAX_VARC2, Maximum VARC2 | 1/10 | VAr |
| 286 | 011D | 2 | UWord32 | MAX_VARC3, Maximum VARC3 | 1/10 | VAr |
| 288 | 011F | 2 | UWord32 | MAX_VARL1, Maximum VARL1 | 1/10 | VAr |
| 290 | 0121 | 2 | UWord32 | MAX_VARL2, Maximum VARL2 | 1/10 | VAr |
| 292 | 0123 | 2 | UWord32 | MAX_VARL3, Maximum VARL3 | 1/10 | VAr |
| 294 | 0125 | 1 | UWord16 | MAX_DESV1, Maximum DESV1 | 1/10 | % |
| 295 | 0126 | 1 | UWord16 | MAX_DESV2, Maximum DESV2 | 1/10 | % |
| 296 | 0127 | 1 | UWord16 | MAX_DESV3, Maximum DESV3 | 1/10 | % |

| | | | | | | |
|---|---|---|---|---|---|---|
| 297 | 0128 | 1 | UWord16 | MAX_DESI1, Maximum DESI1 | 1/10 | % |
| 298 | 0129 | 1 | UWord16 | MAX_DESI2, Maximum DESI2 | 1/10 | % |
| 299 | 012A | 1 | UWord16 | MAX_DESI3, Maximum DESI3 | 1/10 | % |
| 300 | 012B | 1 | UWord16 | MAX_THDV1, Maximum THDV1 | 1/10 | % |
| 301 | 012C | 1 | UWord16 | MAX_THDV2, Maximum THDV2 | 1/10 | % |
| 302 | 012D | 1 | UWord16 | MAX_THDV3, Maximum THDV3 | 1/10 | % |
| 303 | 012E | 1 | UWord16 | MAX_THDI1, Maximum THDI1 | 1/10 | % |
| 304 | 012F | 1 | UWord16 | MAX_THDI2, Maximum THDI2 | 1/10 | % |
| 305 | 0130 | 1 | UWord16 | MAX_THDI3, Maximum THDI3 | 1/10 | % |
| **Minimum temperature and relative humidity** | | | | | | |
| 306 | 0131 | 1 | Word16 | MIN_TEMP, Minimum TEMP | 1/100 | ºC |
| 307 | 0132 | 1 | UWord16 | MIN_HUME, Minimum HUME | 1/100 | %Hr |
| **Minimum measurements** | | | | | | |
| 308 | 0133 | 2 | UWord32 | MIN_V1, Minimum V1 | 1/100 | V |
| 310 | 0135 | 2 | UWord32 | MIN_V2, Minimum V2 | 1/100 | V |
| 312 | 0137 | 2 | UWord32 | MIN_V3, Minimum V3 | 1/100 | V |
| 314 | 0139 | 1 | UWord16 | MIN_HZ1, Minimum HZ1 | 1/10 | Hz |
| 315 | 013A | 1 | UWord16 | MIN_HZ2, Minimum HZ2 | 1/10 | Hz |
| 316 | 013B | 1 | UWord16 | MIN_HZ3, Minimum HZ3 | 1/10 | Hz |
| **Energy counters** | | | | | | |
| 317 | 013C | 3 | UWord48 | KWH1+, Active imported energy counter L1 | 1/100000 | kWh1+ |
| 320 | 013F | 3 | UWord48 | KWH2+, Active imported energy counter L2 | 1/100000 | kWh2+ |
| 323 | 0142 | 3 | UWord48 | KWH3+, Active imported energy counter L3 | 1/100000 | kWh3+ |
| 326 | 0145 | 3 | UWord48 | KWH123+, Sum L1+L2+L3 | 1/100000 | kWh+ |
| 329 | 0148 | 3 | UWord48 | KWH1-, Active exported energy counter L1 | 1/100000 | kWh1- |
| 332 | 014B | 3 | UWord48 | KWH2-, Active exported energy counter L2 | 1/100000 | kWh2- |
| 335 | 014E | 3 | UWord48 | KWH3-, Active exported energy counter L3 | 1/100000 | kWh3- |
| 338 | 0151 | 3 | UWord48 | KWH123+, Sum L1+L2+L3 | 1/100000 | kWh- |
| 341 | 0154 | 3 | UWord48 | KQH1, Reactive energy counter L1 | 1/100000 | kQh1 |
| 344 | 0157 | 3 | UWord48 | KQH2, Reactive energy counter L2 | 1/100000 | kQh2 |
| 347 | 015A | 3 | UWord48 | KQH3, Reactive energy counter L3 | 1/100000 | kQh3 |
| 350 | 015D | 3 | UWord48 | KQH123, Sum L1+L2+L3 | 1/100000 | kQh |
| **Cut-off counters by type** *(Alarm counters in Command 1)* | | | | | | |
| 353 | 0160 | 1 | UWord16 | CN_STEMP, Over-temperature cut-off counter | | |
| 354 | 0161 | 1 | UWord16 | CN_ITEMP, Low temperature cut-off counter | | |
| 355 | 0162 | 1 | UWord16 | CN_SHUME, Over-humidity cut-off counter | | |
| 356 | 0163 | 1 | UWord16 | CN_IHUME, Low humidity cut-off counter | | |
| 357 | 0164 | 1 | UWord16 | CN_ST1, Cut-off counter over V1 | | |
| 358 | 0165 | 1 | UWord16 | CN_ST2, Cut-off counter over V2 | | |
| 359 | 0166 | 1 | UWord16 | CN_ST3, Cut-off counter over V3 | | |
| 360 | 0167 | 1 | UWord16 | CN_IT1, Cut-off counter low V1 | | |
| 361 | 0168 | 1 | UWord16 | CN_IT2, Cut-off counter low V2 | | |
| 362 | 0169 | 1 | UWord16 | CN_IT3, Cut-off counter low V3 | | |
| 363 | 016A | 1 | UWord16 | CN_I1, Cut-off counter I1 | | |
| 364 | 016B | 1 | UWord16 | CN_I2, Cut-off counter I2 | | |
| 365 | 016C | 1 | UWord16 | CN_I3, Cut-off counter I3 | | |
| 366 | 016D | 1 | UWord16 | CN_ID, Cut-off counter ID | | |
| 367 | 016E | 1 | UWord16 | CN_DESV1, Cut-off counter DESV1 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 368 | 016F | 1 | UWord16 | CN_DESV2, Cut-off counter DESV2 | | |
| 369 | 0170 | 1 | UWord16 | CN_DESV3, Cut-off counter DESV3 | | |
| 370 | 0171 | 1 | UWord16 | CN_DESI1, Cut-off counter DESI1 | | |
| 371 | 0172 | 1 | UWord16 | CN_DESI2, Cut-off counter DESI2 | | |
| 372 | 0173 | 1 | UWord16 | CN_DESI3, Cut-off counter DESI3 | | |
| 373 | 0174 | 1 | UWord16 | CN_INEUTRO, Cut-off counter INEUTRO | | |
| 374 | 0175 | 1 | UWord16 | CN_VA1, Cut-off counter POTENCIA VA1 | | |
| 375 | 0176 | 1 | UWord16 | CN_VA2, Cut-off counter POTENCIA VA2 | | |
| 376 | 0177 | 1 | UWord16 | CN_VA3, Cut-off counter POTENCIA VA3 | | |
| 377 | 0178 | 1 | UWord16 | CN_W1, Cut-off counter POTENCIA W1 | | |
| 378 | 0179 | 1 | UWord16 | CN_W2, Cut-off counter POTENCIA W2 | | |
| 379 | 017A | 1 | UWord16 | CN_W3, Cut-off counter POTENCIA W3 | | |
| 380 | 017B | 1 | UWord16 | CN_THDV1, Cut-off counter THDV1 | | |
| 381 | 017C | 1 | UWord16 | CN_THDV2, Cut-off counter THDV2 | | |
| 382 | 017D | 1 | UWord16 | CN_THDV3, Cut-off counter THDV3 | | |
| 383 | 017E | 1 | UWord16 | CN_THDI1, Cut-off counter THDI1 | | |
| 384 | 017F | 1 | UWord16 | CN_THDI2, Cut-off counter THDI2 | | |
| 385 | 0180 | 1 | UWord16 | CN_THDI3, Cut-off counter THDI3 | | |
| 386 | 0181 | 1 | UWord16 | CN_SHZ1, Cut-off counter over HZ1 | | |
| 387 | 0182 | 1 | UWord16 | CN_SHZ2, Cut-off counter over HZ2 | | |
| 388 | 0183 | 1 | UWord16 | CN_SHZ3, Cut-off counter over HZ3 | | |
| 389 | 0184 | 1 | UWord16 | CN_IHZ1, Cut-off counter low HZ1 | | |
| 390 | 0185 | 1 | UWord16 | CN_IHZ2, Cut-off counter low HZ2 | | |
| 391 | 0186 | 1 | UWord16 | CN_IHZ3, Cut-off counter low HZ3 | | |
| 392 | 0187 | 1 | UWord16 | CN_PF1, Cut-off counter PF1 | | |
| 393 | 0188 | 1 | UWord16 | CN_PF2, Cut-off counter PF2 | | |
| 394 | 0189 | 1 | UWord16 | CN_PF3, Cut-off counter PF3 | | |
| 395 | 018A | 1 | UWord16 | CN_SF, Cut-off counter: phase sequence | | |
| 396 | 018B | 1 | UWord16 | CN_MCB, Cut-off counter: MCB | | |
| 397 | 018C | 1 | UWord16 | CN_PH, Cut-off counter: time programmer | | |
| 398 | 018D | 1 | UWord16 | CN_RIN1, Cut-off counter: Remote input 1 | | |
| 399 | 018E | 1 | UWord16 | CN_RIN2, Cut-off counter: Remote input 2 | | |
| 400 | 018F | 1 | UWord16 | CN_BLOCK, Block counter | | |
| 401 | 0190 | 1 | UWord16 | CN_POFF, Cut-off counter: power failure 230Vac | | |
| 402 | 0191 | 1 | UWord16 | CN_TOTAL, Sum of all the counters | | |
| 403 | 0192 | 1 | UWord16 | CN_ACCUM, Cut-off counter (undeletable) | | |
| **Counters: transients/dips per line** | | | | | | |
| 404 | 0193 | 1 | UWord16 | CN_TH_L1, Counter; transients/dips in L1 | | |
| 405 | 0194 | 1 | UWord16 | CN_TH_L2, Counter; transients/dips in L2 | | |
| 406 | 0195 | 1 | UWord16 | CN_TH_L3, Counter; transients/dips in L3 | | |
| **Status digital outputs, internal relays A and B** *(Also accessible from table 0:0001, read/write)* | | | | | | |
| 407 | 0196 | 1 | UWord16 | Bit 0, Status of relay A<br>Bit 1, Status of relay B | | |
| **Status digital outputs, external modules 1 and 2** *(Also accessible from table 0:0001, read/write)* | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 408 | 0197 | 1 | UWord16 | Bit 0, Status of relay 1 external module 1<br>Bit 1, Status of relay 2 external module 1<br>Bit 2, Status of relay 3 external module 1<br>Bit 3, Status of relay 4 external module 1<br>Bit 4, Status of relay 1 external module 2<br>Bit 5, Status of relay 2 external module 2<br>Bit 6, Status of relay 3 external module 2<br>Bit 7, Status of relay 4 external module 2 | | |
| **Status digital inputs, external modules 1 and 2** *(Also accessible from table 1:0001, read)* | | | | | | |
| 409 | 0198 | 1 | UWord16 | Bit 0, Status of input 1 external module 1<br>Bit 1, Status of input 2 external module 1<br>Bit 2, Status of input 3 external module 1<br>Bit 3, Status of input 4 external module 1<br>Bit 4, Status of input 1 external module 2<br>Bit 5, Status of input 2 external module 2<br>Bit 6, Status of input 3 external module 2<br>Bit 7, Status of input 4 external module 2 | | |
| **Status digital inputs, remote inputs 1 and 2** *(Also accessible from table 1:0001, read)* | | | | | | |
| 410 | 0199 | 1 | UWord16 | Bit 0, Status remote input 1<br>Bit 1, Status remote input 2 | | |
| **AC-DC measurements – differential intensity** | | | | | | |
| 411 | 019A | 1 | UWord16 | ID, differential intensity - AC | 1/10 | mA |
| 412 | 019B | 1 | UWord16 | ID, differential intensity - DC | 1/10 | mA |

**Table 4:0001,** *accessible with function code 0x06h (**Write** single register).*

Writing in logs 2 to 10 will only be effective if the user PIN has been previously written in log 1 otherwise the function will show error with exception code 0x01h. In order to delete the user PIN, re-write log 1 as a value of 0x0000h.

| Modbus registers (Dec) | Modbus addresses (Hex) | Nbr Registers | Type data | Description |
|---|---|---|---|---|
| **User PIN** | | | | |
| 1 | 0000 | 1 | BCD16 | User PIN / Password |
| **Commands** | | | | |
| 2 | 0001 | 1 | UWord16 | = 0x0000h, Reset maximum measurements and maximeters W1 W2 W3 |
| 3 | 0002 | 1 | UWord16 | = 0x0000h, Reset minimum measurements |
| 4 | 0003 | 1 | UWord16 | = 0x0000h, Reset to zero of energy counters |
| 5 | 0004 | 1 | UWord16 | = 0x0000h, Reset to zero of cut-off counters |
| 6 | 0005 | 1 | UWord16 | = 0x0000h, Unblocking and reset of reclosures |
| 7 | 0006 | 1 | UWord16 | Selector harmonic k. 0x0000h ≤ k ≤ 0x003Fh<br>Measurement V, I, W and FP/Cosfi(k=1) of harmonic k. |
| 8 | 0007 | 1 | UWord16 | Selector channel measurement harmonic distortion factor<br>V1=00h, V2=02h, V3=04h, I1=06h, I2=08h, I3=0Ah.<br>Measurement of all harmonics from 0 to 63 |
| 9 | 0008 | 1 | UWord16 | Bit 0 = 1, Disable internal relay A<br>Bit 1 = 1, Disable internal relay B<br>Bit 2<br>Bit 3<br>Bit 4<br>Bit 5<br>Bit 6<br>Bit 7<br>Bit 8 = 1, Enable internal relay A<br>Bit 9 = 1, Enable internal relay B<br>Bit A<br>Bit B<br>Bit C<br>Bit D<br>Bit E<br>Bit F |

| | | | | |
|---|---|---|---|---|
| 10 | 0009 | 1 | UWord16 | Bit 0 = 1, Disable relay 1 of external module 1<br>Bit 1 = 1, Disable relay 2 of external module 1<br>Bit 2 = 1, Disable relay 3 of external module 1<br>Bit 3 = 1, Disable relay 4 of external module 1<br>Bit 4 = 1, Disable relay 1 of external module 2<br>Bit 5 = 1, Disable relay 2 of external module 2<br>Bit 6 = 1, Disable relay 3 of external module 2<br>Bit 7 = 1, Disable relay 4 of external module 2<br><br>Bit 8 = 1, Enable relay 1 of external module 1<br>Bit 9 = 1, Enable relay 2 of external module 1<br>Bit A = 1, Enable relay 3 of external module 1<br>Bit B = 1, Enable relay 4 of external module 1<br>Bit C = 1, Enable relay 1 of external module 2<br>Bit D = 1, Enable relay 2 of external module 2<br>Bit E = 1, Enable relay 3 of external module 2<br>Bit F = 1, Enable relay 4 of external module 2 |

**Table 0:0001,** *accessible with function code 0x01h (**Read** Coils) and 0x05h (**Write** Single Coil).*

Writing in registers from 1 to 16 will only be effective if the user PIN has previously been written in register 1 of table 4:0001. If this is not done, then the function returns error with exception code 0x01h.
In order to delete the user PIN, re-write log 1 as a value of 0x0000h.

| Modbus registers (Dec) | Modbus addresses (Hex) | Nbr registers | Type data | Description |
|---|---|---|---|---|
| **Digital outputs, internal relays A and B** | | | | |
| 1 | 0000 | 1 | Bit | Internal relay A |
| 2 | 0001 | 1 | Bit | Internal relay B |
| 3 | 0002 | 1 | Bit | Reserved ( Bit at 0) |
| 4 | 0003 | 1 | Bit | Reserved ( Bit at 0) |
| 5 | 0004 | 1 | Bit | Reserved ( Bit at 0) |
| 6 | 0005 | 1 | Bit | Reserved ( Bit at 0) |
| 7 | 0006 | 1 | Bit | Reserved ( Bit at 0) |
| 8 | 0007 | 1 | Bit | Reserved ( Bit at 0) |
| **Digital outputs, external modules 1 and 2** | | | | |
| 9 | 0008 | 1 | Bit | Relay 1 external module 1 |
| 10 | 0009 | 1 | Bit | Relay 2 external module 1 |
| 11 | 000A | 1 | Bit | Relay 3 external module 1 |
| 12 | 000B | 1 | Bit | Relay 4 external module 1 |
| 13 | 000C | 1 | Bit | Relay 1 external module 2 |
| 14 | 000D | 1 | Bit | Relay 2 external module 2 |
| 15 | 000E | 1 | Bit | Relay 3 external module 2 |
| 16 | 000F | 1 | Bit | Relay 4 external module 2 |

**Table 1:0001,** *accessible with function code 0x02h (**Read** Discrete Input).*

| Modbus registers (Dec) | Modbus addresses (Hex) | Nbr registers | Type data | Description |
|---|---|---|---|---|
| **Status digital inputs, remote inputs 1 and 2** | | | | |
| 1 | 0000 | 1 | Bit | Remote input 1 |
| 2 | 0001 | 1 | Bit | Remote input 2 |
| 3 | 0002 | 1 | Bit | Reserved ( Bit at 0) |
| 4 | 0003 | 1 | Bit | Reserved ( Bit at 0) |
| 5 | 0004 | 1 | Bit | Reserved ( Bit at 0) |
| 6 | 0005 | 1 | Bit | Reserved ( Bit at 0) |
| 7 | 0006 | 1 | Bit | Reserved ( Bit at 0) |
| 8 | 0007 | 1 | Bit | Reserved ( Bit at 0) |

| Status digital inputs, external modules 1 and 2 | | | | |
|---|---|---|---|---|
| 9 | 0008 | 1 | Bit | Input 1 external module 1 |
| 10 | 0009 | 1 | Bit | Input 2 external module 1 |
| 11 | 000A | 1 | Bit | Input 3 external module 1 |
| 12 | 000B | 1 | Bit | Input 4 external module 1 |
| 13 | 000C | 1 | Bit | Input 1 external module 2 |
| 14 | 000D | 1 | Bit | Input 2 external module 2 |
| 15 | 000E | 1 | Bit | Input 3 external module 2 |
| 16 | 000F | 1 | Bit | Input 4 external module 2 |

## Chapter 17 – TCP/IP. HTTP communication protocol. WebServer.

There are numerous TCP/IP commands which can be sent to a remote unit from the address bar of any browser or via a software program customised to the owner's requirements. These commands must be sent to the address and IP port of the remote unit and, in order to be effective, must include the user PIN configured for the remote unit to which these commands are destined

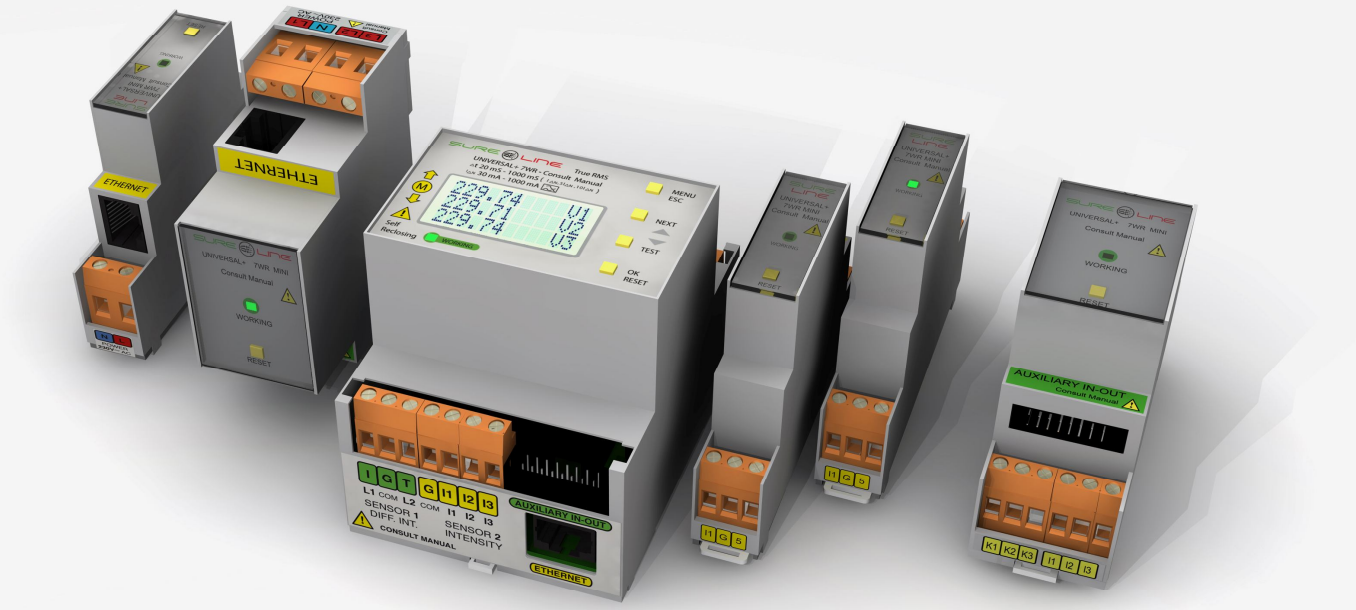
1. Receive complete list of measurements , LOG and I/O status in .txt format

2. Enable / disable internal relays A and B

3. Enable / disable relays 1,2,3,4 of external module 1

4. Enable / disable relays 1,2,3,4 of external module 2

Please refer to appendix "TCP/IP. HTTP communication protocol. WebServer".





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