



## A single module for three-phase measurements and electrical panels protection

### Overview

The CPM device has been designed to protect electrical panels and plants, in particular power factor regulation and filtering plants, by mean of continuous monitoring of line voltage, line current (amplitude and harmonics) and temperature.

The voltage value is compared with a threshold value programmable, giving an alarm when exceeded.

Current value is processed to calculate the RMS amplitude and the total harmonic distortion THD: when a maximum short-circuit and current distortion threshold is exceeded, an alarm output is generated.

The temperature value is monitored to activate cooling devices (fan, etc...) when a programmable pre-alarm threshold is exceeded and to produce an alarm if a programmable maximum value is exceeded.

All measurements and alarms are displayed on the front panel display. Working parameters setup is accomplished using 4 functional keys.

Small size (DIN 96x96 mm) and low cost make CPM ideal to use in all industrial and civil electrical plants.

### Technical specifications

- Power Supply: 115/230/400 Vac (depending on model)  $\pm 10\%$ , 50/60 Hz
- Consumption: 4 VA
- Size: 96 x 96 x 60 mm. DIN 43700
- Weight: 450 g
- Voltage input: 3 inputs 400 V  $\pm 10\%$  phase to phase, 50/60 Hz
- Voltage input impedance:  $> 1 \text{ M}\Omega$
- Current input: 3 inputs from external CT /5A
- Current overload: 20% permanent
- Current circuit consumption:  $< 0.25 \text{ VA}$
- Voltage accuracy:  $\pm 1\%$  f.s.
- Current accuracy:  $\pm 1\%$  f.s.
- Current resolution: 10 mA x CT/5
- Current THD accuracy:  $\pm 1\%$  f.s. for  $I_{rms} > 10\%$  f.s;  $\pm 5\%$  f.s. for  $I_{rms} < 10\%$  f.s
- Temperature accuracy:  $\pm 1^\circ \text{C}$
- Frequency accuracy: 0.2% f.s.
- Timing accuracy:  $\pm 1 \text{ sec}$ .
- Cooling device relay contacts: 5 A 250 V NO
- Alarm relays contacts: 5 A 250 V NO and NC
- Wirings: removable terminals
- RS232 Communication: requires specific external adapter
- Working temperature: from  $0^\circ \text{C}$  to  $+55^\circ \text{C}$
- Storage temperature: from  $-10^\circ \text{C}$  to  $+70^\circ \text{C}$
- Humidity: 95% uncondensed

## Visualizzazione e tasti

MEASURE LEDS	
→ V, I, THD%, Iharm, Hz, T	They indicate the currently displayed quantity: linked voltage, phase current, phase current THD, harmonic phase current, network frequency, panel temperature
→ L1, L2, L3	They indicate the phase of the currently displayed quantity. For voltages, the simultaneous illumination of 2 leds indicates the phases of linked voltage (e.g. L1-L2 indicates V12 voltage).
→ x 1000	Currently displayed quantity x1000 multiplier.

STATUS LEDS	
→ FAN	It indicates the overcoming of the first temperature threshold and the activation of the control relay of the cooling device.
→ MANUAL RESET	ON: manual alarm reset mode selected. OFF: automatic alarm reset mode selected. It activates only when alarm condition stops (apart from overheat alarm).
→ ALARM	It blinks with the alarmed quantity to indicate an alarm condition of one or more quantities.

KEYS	
RESET/PHASE	In display mode, when pressed for a short time, it selects the measure phase to display; when pressed for 5 seconds it resets the current alarms and min / max values.
▲ /MAX	In programming mode, it forces the default value of the current parameter. In display mode, it shows the maximum value of the currently displayed measure.
▼ /MIN	In programming mode, it increases the parameter value. In display mode, it shows the minimum value of the currently displayed measure.
SCROLL	In programming mode, it decreases the parameter value. In display mode, it selects the measure to be shown on the display. In programming mode, it selects the parameter to be programmed.
SPECIAL KEYS	<b>(two keys pressed simultaneously)</b>
SCROLL together with ▲/MAX	If pressed for 10 seconds, they activate the parameters programming mode.
SCROLL together with ▼/MIN	If pressed in display mode, they store the current measure as default measure displayed when the device is turned on.
▲/MAX together with ▼/MIN	If pressed in display mode, they activate (for three-phase quantities) the cyclic phase scansion. It stops at the first press of a key
RESET/PHASE together with SCROLL	If pressed during turning on, they reverse the connection mode (single-phase or three-phase).
RESET/PHASE together with ▲/MAX	They manually enable the control relay of cooling device.
RESET/PHASE together with ▼/MIN	They manually disable the control relay of cooling device.

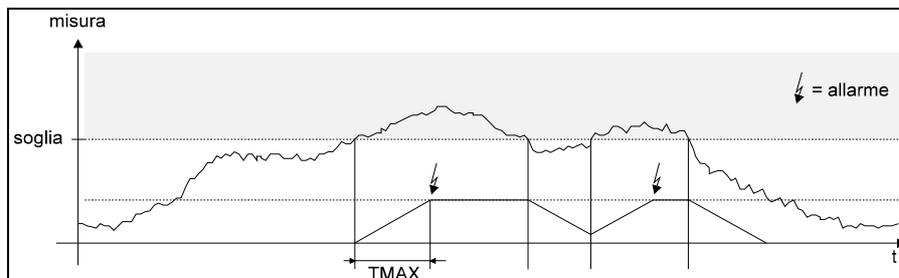
## Operation mode

- **Voltage protection:** the input line voltage, measured in true RMS, is compared with the threshold value programmed. If the voltage exceeds the threshold for a time longer than 30 minutes, an alarm is produced (voltage and alarm leds blinking) and the alarm relay is opened.
- **Current protection:** the input current, measured in true RMS, is compared with the reference value set at 120% of nominal value (the primary current of CT). If the current exceeds the threshold for a time longer than 3 seconds, an alarm is produced (current and alarm leds blinking) and the alarm relay is opened.
- **THD protection:** the current signal is processed to extract the total distortion value. Such value is compared with the programmed threshold: if the THD value exceeds the actual threshold (THD% High Current Threshold or THD% Low Current Threshold) for a time longer than programmed, an alarm is produced (THD and alarm leds blinking) and the alarm relay is opened
- **Temperature protection:** temperature value is compared with the temperature threshold programmed: if the temperature value exceeds the threshold for a time longer than 10 seconds, the FAN led is lighted and the FAN relay is closed. If the temperature exceeds the sum of threshold and deltaT, an alarm is produced (T and alarm leds blinking), the alarm relay is opened.



In temperature alarm conditions, the FAN relay is opened.

- **Operating timing:** all protections have integral times, i.e. they keep into account the previous times of alarm thresholds exceeding, as indicated in the following figure:



The alarm integral time can be cleared manually by pressing the RESET/PHASE key (for 5 seconds) or automatically after that a time longer than the trigger time is elapsed without alarm occurrences.

- **Alarms RESET:** when an alarm occurs, the instrument signals the condition with the blinking of the alarm led and of the led related to the measure on alarm, and then the alarm relay is opened. Till the alarm condition persists, the device automatically displays, after 10 sec. of inactivity, the measure that caused it.  
Three alarm resets are possible: manual reset (MAN) by pressing the RESET/PHASE key (for 5 seconds), or automatic (AU1 or AU2) reset when the alarm condition disappears. In this case, if more than 3 alarms occur within one hour, a manual reset is requested, to notify a possible fault into the electrical system (this is not true for voltage alarm in AU2 mode, the only difference compared to AU1 mode). The over-temperature alarm always needs a manual reset.

## Setup and operative parameters predispositions

Connect the device to the plant following the wiring diagrams and power it up: the device automatically sets on measure mode and displays the default measure.

To access to parameters programming functions, press simultaneously the SCROLL and the ▲MAX keys for 10 seconds: the device now shows with leds the parameters to program and blinks their current value on the display. The threshold values are unique and valid for the 3 phases. The connection between parameters and leds is:

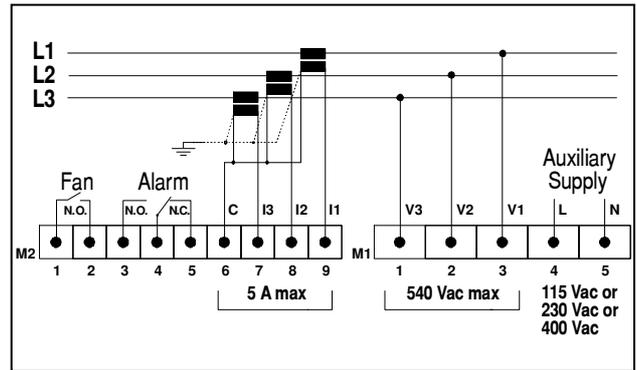
### Parameter / Led

- Voltage threshold: V led
- CT primary current: I led
- THD% threshold for high current: THD% led
- THD delay: THD% led together with lharm led
- T threshold: T led
- Delta T: Led T together with lharm led
- Reset type (Automatic/Manual): all leds off
- TV ratio: blinking V led
- Quad. Low I – Quad. High I current threshold: blinking I led
- THD% threshold for low current: blinking THD% led
- Temperature setup parameter: blinking T led

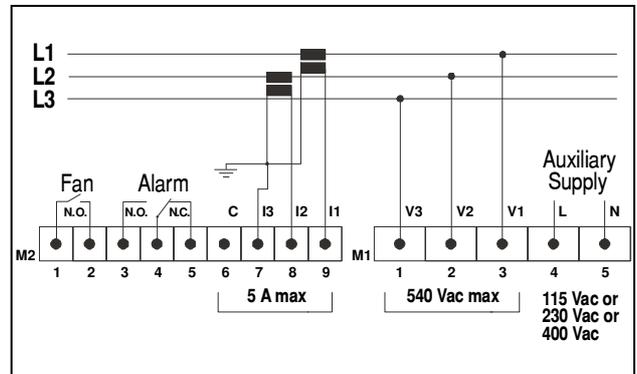
Use the ▲MAX and ▼MIN keys to modify the displayed parameter and the SCROLL key to pass to next parameter. By pressing the RESET/PHASE key for 5 seconds, it's possible to force the current value as default.

To exit from programming mode, wait 10 seconds without pressing any button: the device automatically switches to measure mode.

## Insertion diagrams



3 Currents wiring diagram



2 Currents (Aron) wiring diagram

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