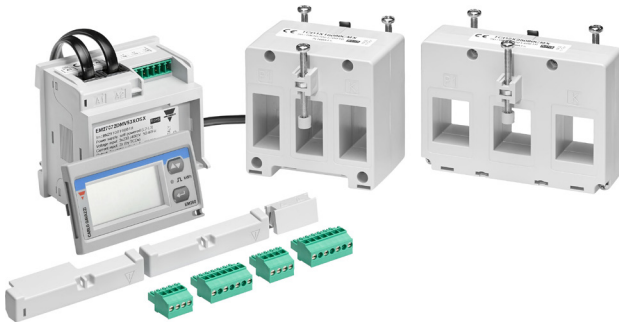


# EM270



## Multi-channel power analyzer



### Description

Multi-circuit power analyzer for single or three-phase systems installable on panels or DIN rails. Manages current input via two current transformer blocks connected with RJ-11 connectors. The EM270 is equipped with a LCD display with controls to display measurements and configure the system, a RS485 port and two pulse outputs or two RS485 ports for daisy chain connections.

### Benefits

- **Reduced installation time and errors.** Equipped with detachable terminals for all connections, with possibility of requesting pre-wired cables (optional). Connected to two current transformer blocks with two cables fitted with RJ-11 connectors. For connections in cascade of multiple EM270s the voltage reference is required only once.
- **Installation flexibility.** Suitable for panel or DIN rail mounting.
- **Granular analysis.** It provides total measurements or single circuit measurements (up to 2 three-phase circuits or up to 6 single-phase circuits).
- **Specific software.** The UCS proprietary configuration software enables rapid configuration and the display of all measurements. The software and subsequent updates are free.
- **Tamper-proof.** Configuration access can be locked. The terminals and display can be sealed.
- **Self detection** of primary current of the TCD (the dedicated current transformers).

### Applications

EM270 is connected directly to current sensors in switchboards for simultaneous monitoring of multiple single- or three-phase circuits in low voltage systems. Created for both commercial and industrial environments (e.g. data centers), this device guarantees quick and space-saving installations with just a few simple connections.

### Main functions

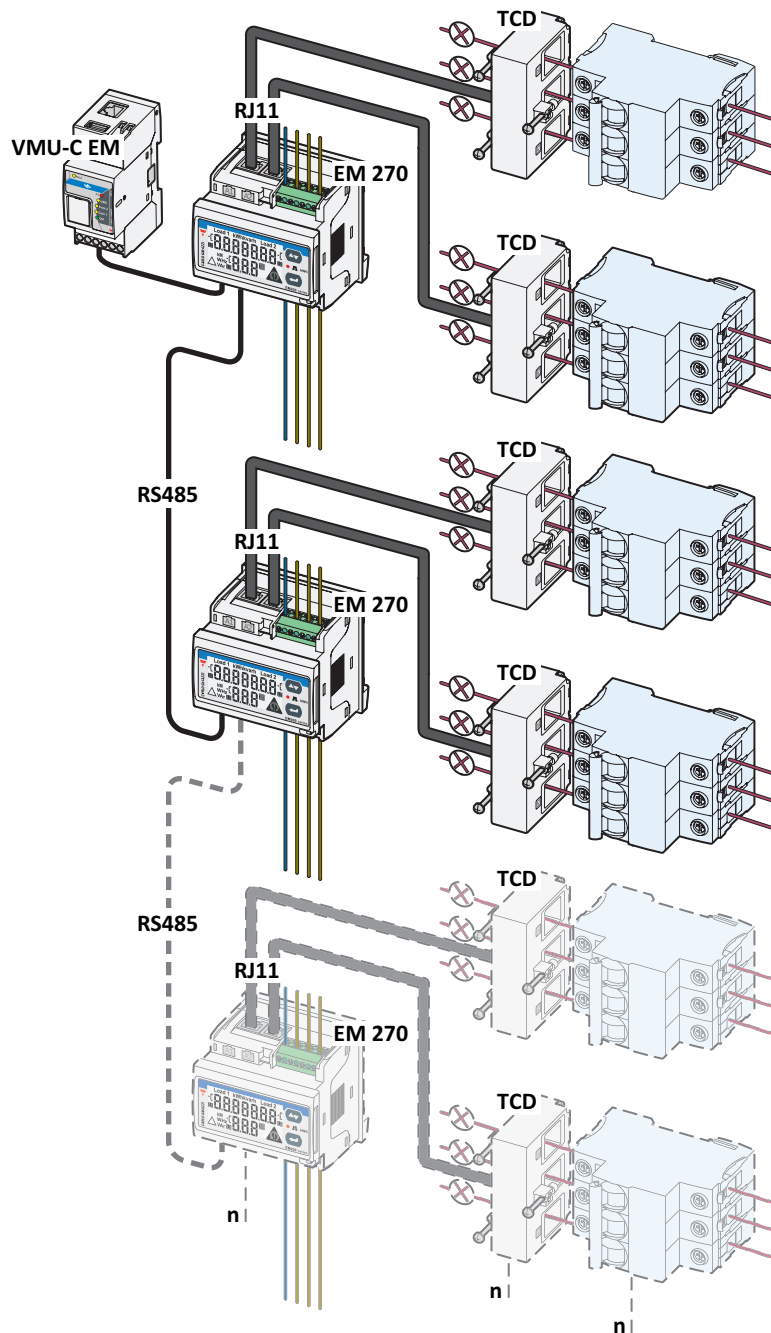
- Measurement of energy consumption and main electrical variables of single- or three-phase circuits.
- Display of single circuit measurements and total measurements.
- Transmission of data via serial communication.
- Transmission of power consumption via pulse output (optional).

### Main features

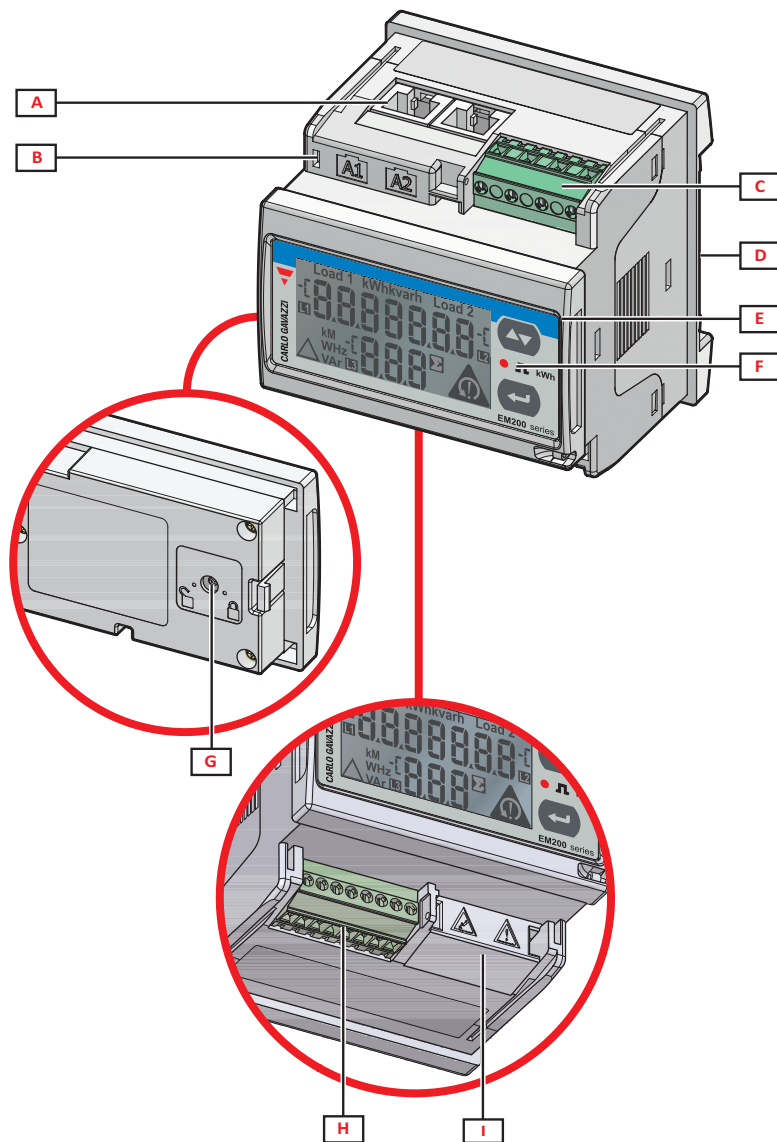
- Up to 2 three-phase circuits or 6 single-phase circuits managed simultaneously.
- Up to 630 A input current via solid-core current transformer blocks (TCDxX or TCD0W).
- Three installation configurations: on DIN rails, mounted on panel of 72 x 72 or 96 x 96 (with optional adapter).
- Single circuit measurements: V, A, W/VA/var, PF, kWh, kvarh. Virtual circuit (sum or difference) measurements: W/VA/var, PF, kWh, kvarh.
- Display of electrical variables: 3 digits. Display of energy meters: 7 digits.
- Accuracy: better than a combination of a class 1 meter and a class 0.5 current transformer.
- *Easy connection* function.
- Up to 20 EM270 connected in cascade.
- RS485 port.

- Optional outputs: additional RS485 port for chain connection or two pulse outputs.
- Self power supply via voltage inputs.
- Detachable terminals and sealable terminal caps.
- Configuration via keypad or UCS configuration software.

## Architecture



## Structure



Area	Description
A	RJ-11 connector for connection to transformer block.
B	Power supply status LED.
C	Detachable voltage input terminals.
D	Area for mounting on DIN rail or for housing the LCD display in the case of panel mounting.
E	LCD display and controls.
F	LED that blinks with frequency proportional to active energy consumption, see "LED features".
G	Rotary selector to lock configuration.
H	RS485 port terminals and pulse outputs.
I	Plastic protection cover or terminals for voltage connection in cascade.

## Features

### General

<b>Material</b>	Noryl, self-extinguishing V-0 (UL 94)
<b>Protection degree</b>	Front: IP40, Terminals: IP20
<b>Terminals</b>	Type: detachable Maximum section: 1.5 mm <sup>2</sup> , Torque: 0.2/0.25 Nm
<b>Overvoltage category</b>	Cat. III
<b>Pollution degree</b>	2
<b>Noise rejection (CMRR)</b>	100 dB, from 48 to 62 Hz
<b>Insulation</b>	See "Input and output insulation"
<b>Mounting</b>	DIN rail Panel 72 x 72, Panel 96 x 96 (with optional adapter)
<b>Weight</b>	400 g (packaging included)

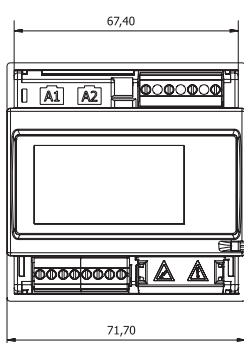


Fig. 1 DIN rail

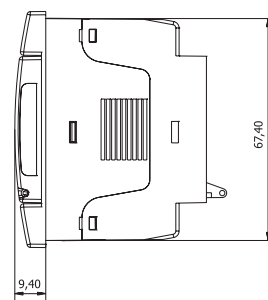
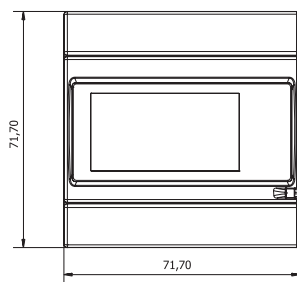
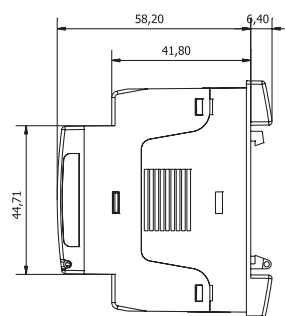


Fig. 2 Panel 72 x 72

### Environmental specifications

<b>Operating temperature</b>	From -25 to +55 °C/from -13 to +131 °F
<b>Storage temperature</b>	From -30 to +70 °C/from -22 to +158 °F

NOTE: R.H. < 90 % non-condensing @ 40 °C / 104 °F.



### Input and output insulation

Type	Voltage input and self power supply	Current inputs	Pulse outputs	RS485 port
<b>Voltage input and self power supply</b>	-	Reinforced *	Double **	Double **
<b>Current inputs</b>	Reinforced *	-	Double **	Double **
<b>Pulse outputs</b>	Double **	Double **	-	-
<b>RS485 port</b>	Double **	Double **	-	-

\*By limiting impedance

\*\*2.5 kV ac 1 min (4 kV pk 1.2/50 μs)+ limiting impedance

## Conformity

<b>Directives</b>	2014/30/EU (EMC - Electro Magnetic Compatibility) 2011/65/EU (Electric-electronic equipment hazardous substances)
<b>Standards</b>	Electromagnetic compatibility (EMC) - emissions and immunity: EN 62052-11 Electrical safety: EN 61010-1 Pulse outputs: IEC 62053-31, DIN 43864 Metrology: EN 62053-21, EN 62053-23
<b>Approvals</b>	 

## Electrical specifications

### Electrical system and circuits

<b>Managed electrical system</b>	Single-phase (2-wire) Three-phase without neutral (3-wire) Three-phase with neutral (4-wire)
<b>Number of circuits managed</b>	Single-phase systems: up to 6 single-phase circuits Three-phase systems: up to 2 three-phase circuits or up to 6 single-phase circuits

### Voltage inputs

	MV5	MV6
<b>Voltage connection</b>	Direct or via VT	
<b>Rated voltage L-N (from Un min to Un max)</b>	From 160 to 240 V	From 57.7 to 133 V
<b>Rated voltage L-L (from Un min to Un max)</b>	From 277 to 415 V	From 100 to 230 V
<b>Voltage tolerance</b>	-10%, +10%	
<b>Overload</b>	Continuous: 1.2 Un max For 500 ms: 2 Un max	
<b>Input impedance</b>	1600 kΩ	
<b>Frequency</b>	From 45 to 65 Hz	

### Current inputs

<b>Current connection</b>	Only via transformer block TCDxX or TCD0W
<b>Rated current (In)</b>	65 A: TCD0W 160 A: TCD1X 250 A: TCD2X 630 A: TCD3X
<b>Minimum current (Imin)</b>	0.02 In
<b>Maximum current (Imax)</b>	1.2 In
<b>Start-up current (Ist)</b>	0.002 In
<b>Overload</b>	Continuous: 1.2 In For 500 ms: 2 In
<b>Input impedance</b>	< 0.2 VA

## Power supply

<b>Power supply</b>	Self powered, between L2 and L3
<b>Consumption</b>	2 W, ≤ 4 VA

## Measurements

<b>Method</b>	TRMS measurements of distorted waveforms
<b>Sampling</b>	1600 samples/s @50 Hz 1900 samples/s @60 Hz

## Available measurements

### Three-phase circuits

<b>Energy</b>	Active imported Reactive imported
<b>Current</b>	Phase 1 Phase 2 Phase 3
<b>Voltage</b>	Phase-phase Phase-neutral
<b>Active power</b>	Total circuit Average (dmd) Maximum dmd
<b>Apparent power</b>	Total circuit Average (dmd) Maximum dmd
<b>Reactive power</b>	Total circuit
<b>Power factor</b>	Total circuit

### Single-phase circuits

<b>Energy</b>	Active imported
<b>Current</b>	Phase
<b>Voltage</b>	Phase-neutral
<b>Active power</b>	Phase Average (dmd) Maximum dmd
<b>Reactive power</b>	Phase
<b>Power factor</b>	Phase

## Measurement accuracy

EM270

Current	
From 0.05 I <sub>n</sub> to I <sub>max</sub>	±(0.5% rdg)
From 0.02 I <sub>n</sub> to 0.05 I <sub>n</sub>	±(1.0% rdg)
Phase-phase voltage	
From (U <sub>n</sub> min -10%) to (U <sub>n</sub> max +10%)	±(0.5% rdg)
Phase-neutral voltage	
From (U <sub>n</sub> min -10%) to (U <sub>n</sub> max +10%)	±(1% rdg)
Active power (PF=1)	
From 0.05 I <sub>n</sub> to I <sub>max</sub>	±(1% rdg)
From 0.02 I <sub>n</sub> to 0.05 I <sub>n</sub>	±(1.5% rdg)
Active power (PF=0.5L, 0.8C)	
From 0.1 I <sub>n</sub> to I <sub>max</sub>	±(1% rdg)
From 0.05 I <sub>n</sub> to 0.1 I <sub>n</sub>	±(1.5% rdg)
Reactive power (sinφ=1)	
From 0.05 I <sub>n</sub> to I <sub>max</sub>	±(2% rdg)
From 0.02 I <sub>n</sub> to 0.05 I <sub>n</sub>	±(2.5% rdg)
Reactive power (sinφ=0.5 L or C)	
From 0.1 I <sub>n</sub> to I <sub>max</sub>	±(2% rdg)
From 0.05 I <sub>n</sub> to 0.1 I <sub>n</sub>	±(2.5% rdg)
Active energy	
Equivalent to class 1 (EN62053-21)	
Reactive energy	
Equivalent to class 2 (EN62053-23)	
Frequency	
From 45 to 65 Hz	±1 Hz

EM270+TCD0W, TCD1X, TCD2X or TCD3X

Current	
From 0.2 I <sub>n</sub> to I <sub>max</sub>	±(0.75% rdg)
From 0.05 to 0.2 I <sub>n</sub>	±(1% rdg)
From 0.02 I <sub>n</sub> to 0.05 I <sub>n</sub>	±(1.25% rdg)
Active power (PF=1)	
From 0.2 I <sub>n</sub> to I <sub>max</sub>	±(1.25% rdg)
From 0.05 to 0.2 I <sub>n</sub>	±(1.5% rdg)
From 0.02 I <sub>n</sub> to 0.05 I <sub>n</sub>	±(2% rdg)
Reactive power (sinφ=1)	
From 0.2 I <sub>n</sub> to I <sub>max</sub>	±(2.25% rdg)
From 0.05 to 0.2 I <sub>n</sub>	±(2.5% rdg)
From 0.02 I <sub>n</sub> to 0.05 I <sub>n</sub>	±(3% rdg)

## Display

<b>Type</b>	LCD
<b>Refresh time</b>	1 s
<b>Description</b>	2 rows: 1 <sup>st</sup> : 7 digits (7 mm) 2 <sup>nd</sup> : 3 digits (7 mm)
<b>Variable readout</b>	Electrical variables: 3 digits, min: 0.00, max: 999 Energy meters: 7 digits, min: 0.0, max: 9 999 999

## Digital outputs

<b>Connection type</b>	Detachable terminals
<b>Maximum number of outputs</b>	2
<b>Type</b>	Opto-mosfet
<b>Function</b>	Pulse output. Each output transmits the consumption of a single three-phase circuit or the total consumption of three single-phase circuits.
<b>Features</b>	$V_{ON}$ : 2.5 V ac/dc, 70 mA max $V_{OFF}$ : 40 V ac/dc max
<b>Configuration parameters</b>	Pulse weight (from 0.01 to 9.99 kWh per pulse) Pulse duration (40 or 100 ms)
<b>Configuration mode</b>	Via keypad or UCS software

## RS485 port

<b>Protocol</b>	Modbus RTU
<b>Devices on the same bus</b>	Max 160 (1/5 unit load)
<b>Communication type</b>	Multidrop, bidirectional
<b>Connection type</b>	Detachable terminals, 2 wires, maximum distance 1000 m
<b>Configuration parameters</b>	Modbus address (from 1 to 247) Baud rate (9.6 / 19.2 / 38.4 kbps) Parity (None / Even)
<b>Configuration mode</b>	Via keypad or UCS software

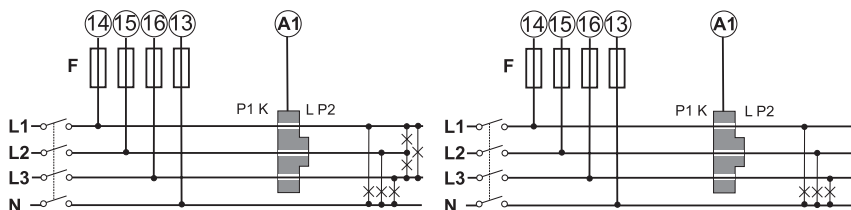
## Special functions

- Display of virtual circuits connected in relation to energy consumption and power measurements (VIRT function, sum or difference)
- Measurements independent from direction of current (Easy connection function)
- Resetting of active energy meters of single and total circuits
- Resetting of maximum values within set active and apparent power interval
- Password protected settings menu



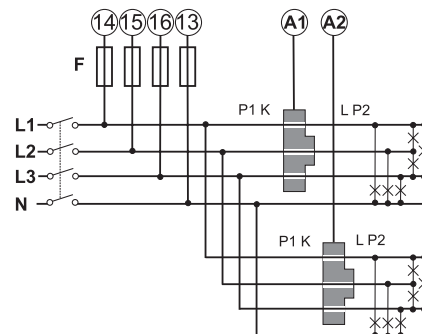
# Connection Diagrams

Note: for three-phase systems without neutral (3 wires) do not consider the connection to neutral **N**.  
 Note: fuses **F** of 315 mA, if required by local law.

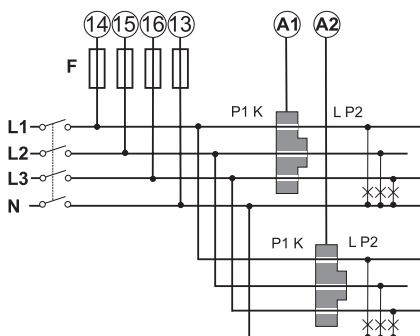


**Fig. 3** Three-phase system, one three-phase circuit.

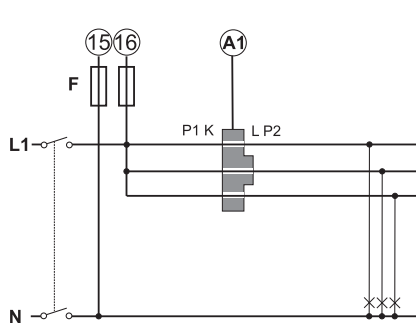
**Fig. 4** Three-phase system, three single-phase circuits.



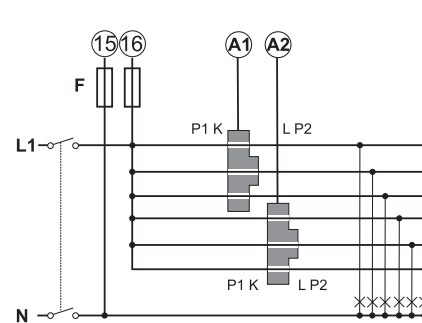
**Fig. 5** Three-phase system, two three-phase circuits.



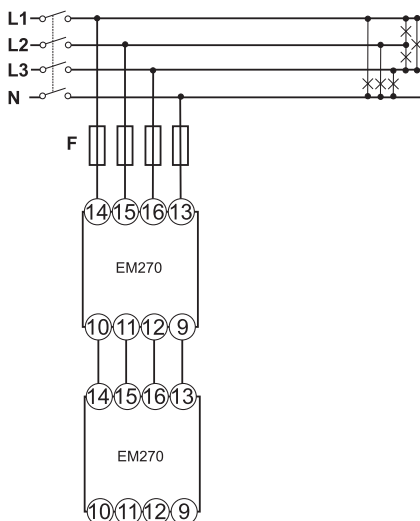
**Fig. 6** Three-phase system, six single-phase circuits.



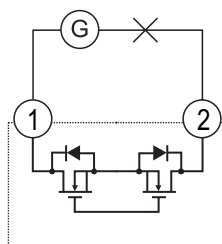
**Fig. 7** One-phase system, three single-phase circuits.



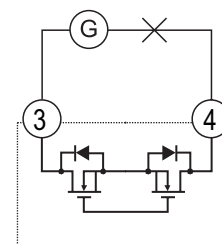
**Fig. 8** One-phase system, six single-phase circuits.



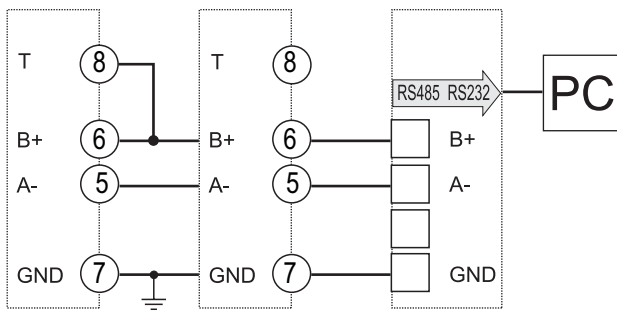
**Fig. 9** Example of connection of multiple EM270s in cascade.



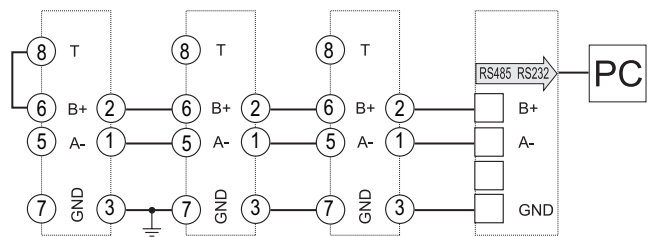
**Fig. 10** Pulse output 1.



**Fig. 11** Pulse output 2.



**Fig. 12** RS485 port.



**Fig. 13** Double RS485 port for daisy chain connection.

## References



EM270 72D MV  3X   (16 total characters)

Enter the code, replacing the symbol  with the selected option (e.g.: EM270 72D MV5 3X OS X).

Code	Options	Description
E	-	-
M	-	-
2	-	-
7	-	-
0	-	-
7	-	-
2	-	-
D	-	-
M	-	-
V	-	-
<input type="checkbox"/>	5	230 V L-N, 400 V L-L ac, connection via TCD_X or TCD0W
	6	120 V L-N, 230 V L-L ac, connection via TCD_X or TCD0W
3	-	-
X	-	-
<input type="checkbox"/>	OS	RS485 port and double digital output
	2S	Double RS485 port for daisy chain connection
	X	Standard configuration
<input type="checkbox"/>	N	"Naked" configuration. With respect to the standard configuration, the "naked" version does NOT include: detachable terminals for voltage connections, detachable terminals for daisy chain connection via RS485 port (only for option 2S).

### Accessories: order codes

Code	Options	Description
EM270WS V 1T <input type="checkbox"/>	Replacing the symbol <input type="checkbox"/> with the cable length. Lengths available: <b>30, 60, 90, 150, 200</b> cm.	Pre-wired cables for voltage connection (one terminal block).
EM270WS V 2T <input type="checkbox"/>	Replacing the symbol <input type="checkbox"/> with the cable length. Lengths available: <b>30, 60, 90, 150, 200</b> cm.	Pre-wired cables for voltage connection (two terminal blocks).
EM270WS S 2T <input type="checkbox"/>	Replacing the symbol <input type="checkbox"/> with the cable length. Lengths available: <b>60, 90, 120, 180, 230</b> cm.	Pre-wired cables for RS485 connection (two terminal blocks).
EM270WS T V	-	20 detachable terminal blocks for voltage connections.
EM270WS T C	-	20 plastic protection covers for voltage output.
EM270WS T S	-	20 detachable terminal blocks for daisy chain connection of RS485 port.
EM200-96 ADAPTER	-	Adapter to 96 x 96 panel mounting.

### Further reading

Information	Document	Where to find it
Instruction manual	Instruction manual - EM270	<a href="http://www.productselection.net">www.productselection.net</a>

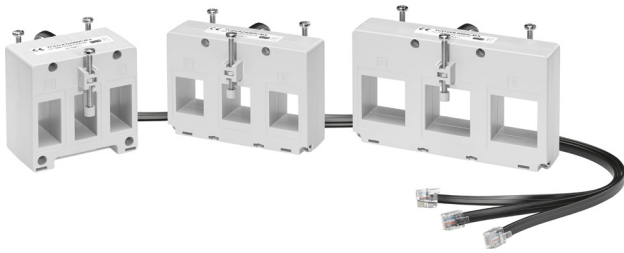
### CARLO GAVAZZI compatible components

Purpose	Component name/code key	Notes
Current measurement accessories (mandatory)	TCD0W TCD1X TCD2X TCD3X	See next chapter
Configure analyzer via desktop application	UCS configuration software	Available for free download at: <a href="http://www.productselection.net">www.productselection.net</a>
Monitor data from several analyzers	VMU-C EM	See relevant datasheet

# TCD0W and TCD\_X family



## TCD0W, TCD1X, TCD2X, TCD3X for EM270



### Main features

- 3 solid core current sensors
- Primary current from 65 A to 630 A (depends on the model)
- Hole diameter from 8.5 to 31 mm (depends on the model)
- Connection to the EM270 with cable with RJ-11 connector
- DIN rail mounting
- Primary current self-detection

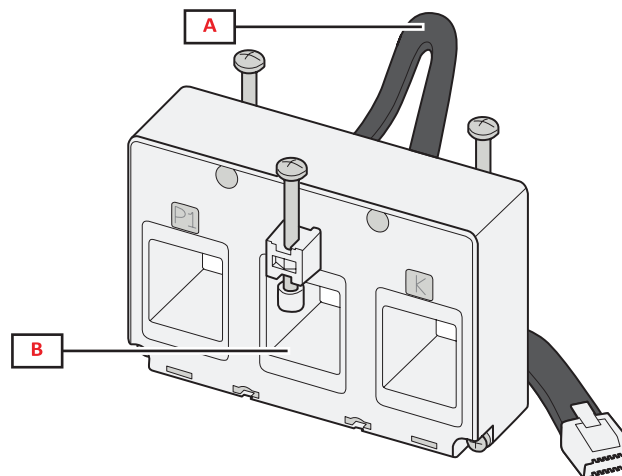
### Description

3-channel solid-core current transformer block for power analyzer EM270.  
This manages primary current from 65 A to 630 A (depends on the model) and the value is read automatically by the EM270 to eliminate the need for configuration and calibration by the user.  
It is equipped with RJ-11 connectors for simple connection to the EM270.

### Main functions

- Conversion of current for input to the power analyzer EM270.

### Structure



Area	Description
A	Cable with RJ-11 connectors for connection to the EM270
B	Solid core current transformer block

# Features

## General

<b>Material</b>	PPO self-extinguishing V-0
<b>Protection degree</b>	IP20
<b>Terminals</b>	RJ-11 connector
<b>Overvoltage category</b>	Cat. III
<b>Pollution degree</b>	2
<b>Insulation</b>	60s 1500 V ac (RJ connectors to housing) (4 kV ac / 1 min)
<b>Mounting</b>	DIN rail or panel
<b>Weight (packaging included)</b>	TCD0W: 190 g TCD1X: 290 g TCD2X: 370 g TCD3X: 500 g

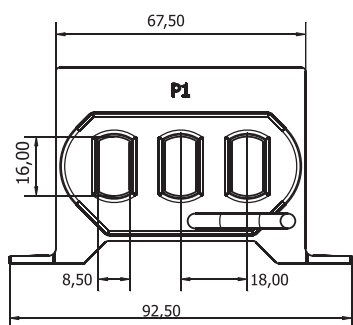


Fig. 14 TCD0W (mm)

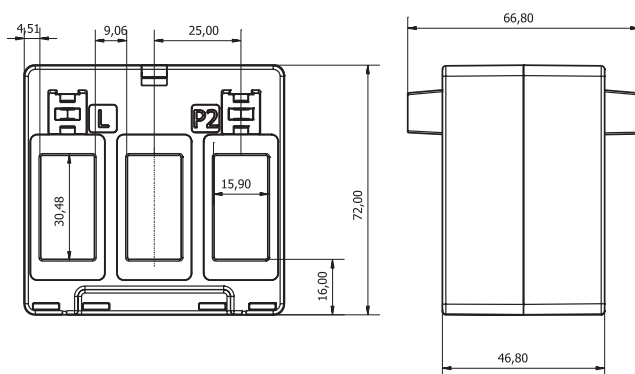


Fig. 15 TCD1X (mm)

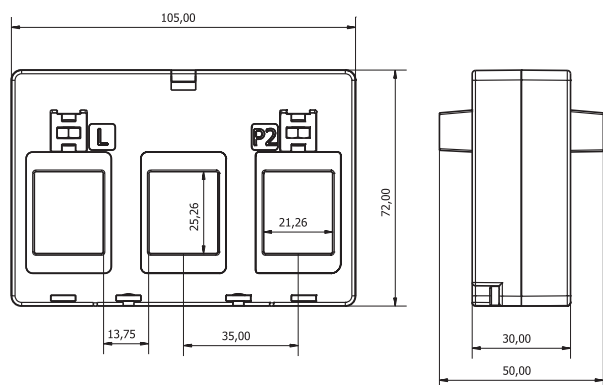


Fig. 16 TCD2X (mm)

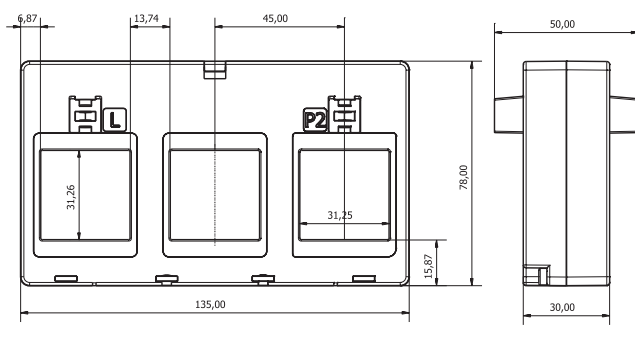


Fig. 17 TCD3X (mm)

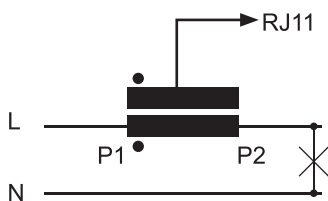
## Environmental specifications

<b>Operating temperature</b>	From -25 to +55 °C/from -13 to +131 °F
<b>Storage temperature</b>	From -30 to +70 °C/from -22 to +158 °F

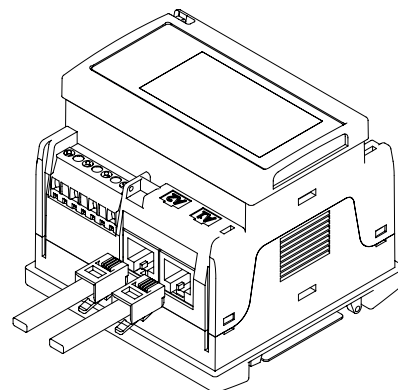
**Electrical specifications**

<b>Primary current (In)</b>	65 A: TCD0W 160 A: TCD1X 250 A: TCD2X 630 A: TCD3X
<b>Maximum current (continuous)</b>	1.2 In
<b>Maximum system voltage</b>	0.72 kV ac
<b>Frequency</b>	From 45 to 65 Hz
<b>Accuracy</b>	0.5%
<b>Phase error</b>	≤4°

## Connection Diagrams



**Fig. 18** Current connection



**Fig. 19** RJ11 connections

## References

### TCD □ □ X

Enter the code, replacing the symbol □ with the selected option (e.g.: TCD 1X160 80 CM X)

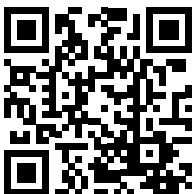
Code	Options	Description
T	-	-
C	-	-
D	-	-
□	0W65	65 A Primary current
	1X160	160 A Primary current
	2X250	250 A Primary current
	3X630	630 A Primary current
□	80CM	80 cm cable
	150CM	150 cm cable
	200CM	200 cm cable
X	-	-

### Further reading

Information	Document	Where to find it
Instruction manual	Instruction manual - TCD_X	<a href="http://www.productselection.net">www.productselection.net</a>
Instruction manual	Instruction manual - TCD0W	<a href="http://www.productselection.net">www.productselection.net</a>

### CARLO GAVAZZI compatible components

Purpose	Component name/code key	Notes
Measure and display consumption of connected circuits	EM270	-



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[MFI6R4](#) [WM1496AV53CX](#) [WM1496AV63CX](#) [WM1496AV63DS](#) [WM30AV53H](#) [WM30AV63H](#) [WM30AV63L](#) [WM40AV53H](#)  
[WM50AV53HBC](#) [CS-BB3-04](#) [58250-1852](#) [58250-1853](#) [TOL-18585](#) [WM1596AV53XOSPFB](#) [WM1596AV53XOSX](#)  
[WM1596AV53XOXPFB](#) [WM1596AV53XOXX](#) [EM24DINAV53DISX](#) [EM28072DMV53X2SX](#) [EM28072DMV63X2SX](#)  
[EM50DINAV53HR SX](#) [EM50DINRG53HR SX](#) [EM50DINMV53HR SX](#) [WM1496AV53HDG](#) [WM14-96AV63CS](#) [58430-1286](#)