EM271

Multi-channel power analyzer

Description

Multi-load power analyzer for single or three-phase systems installable on panels or DIN rails.
Manages current input via two groups of split-core current sensors connected with RJ-11 connectors.
The EM271 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.
Thanks to the SUM function, it also displays total load consumption values.

Benefits

- **Reduced installation time and errors.** Equipped with detachable terminals for all connections, with possibility of requesting pre-wired cables (optional). Connected to two groups of split-core current sensors with two cables fitted with RJ-11 connectors. For connections in cascade of multiple EM271s the voltage reference is required only once.
- **Installation flexibility.** It can be installed in new or existing single- and three-phase systems. Suitable for panel or DIN rail mounting .
- **Granular analysis.** It provides total measurements or single load measurements (up to 2 three-phase loads or up to 6 single-phase loads).
- **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 TCDxM (the dedicated current transformers).

Applications

EM271 is connected directly to current sensors in switchboards for simultaneous monitoring of multiple single- or three-phase loads 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.
Suitable for retro-fit applications and for new installations where more flexibility is required.

Main functions

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

Architecture
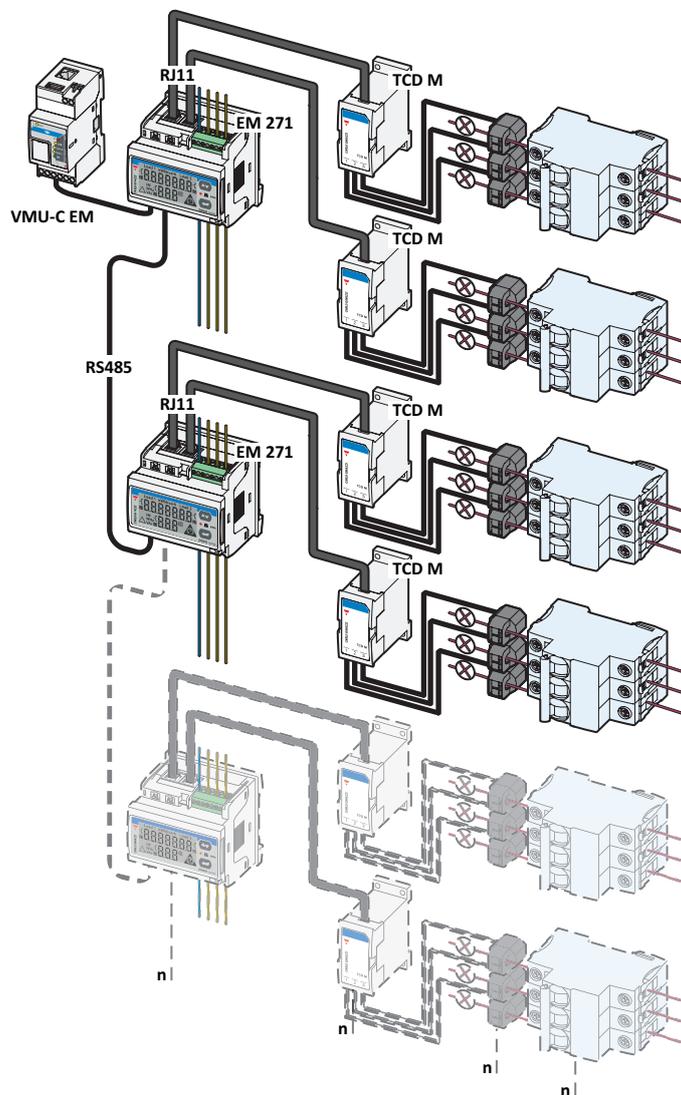
Main features

- Up to 2 three-phase loads or 6 single-phase loads managed simultaneously.
- Up to 400 A input current via pre-cabled groups of current sensors (TCDxM) or any primary current of current up to 10000 A sensor with 0.333 V secondary output (via connection adapter TCDMM).
- Three installation configurations: on DIN rails, mounted on panel of 72 x 72 or 96 x 96 (with optional adapter).
- Single load measurements: V, A, W/VA/var, kWh, kvarh. Total load measurements: W/VA/var, 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 analyzers EM271 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.

▶ **Structure**
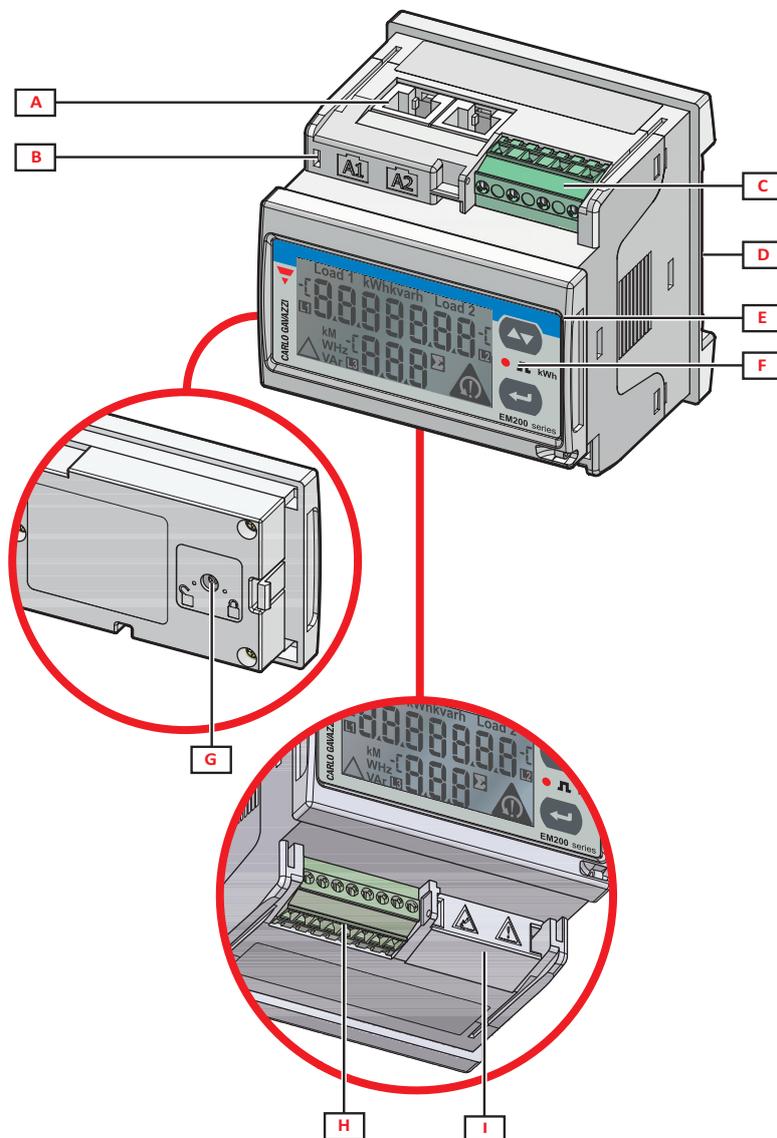
| Area	Description
A	RJ-11 connector for connection to transformer block.
B	Power supply status LED.
C	Detachable voltage input terminals.
D	Area for mounting on DIN rail or for housing the LCD display in the case of panel mounting.
E	LCD display and controls.
F	LED that blinks with frequency proportional 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

| Material	Noryl, self-extinguishing V-0 (UL 94)
Protection degree	Front: IP40, Terminals: IP20
Terminals	Type: detachable Maximum section: 1.5 mm^2, Torque: 0.2/0.25 Nm
Overvoltage category	Cat. III
Pollution degree	2
Noise rejection (CMRR)	100 dB, from 48 to 62 Hz
Insulation	See "Input and output insulation"
Mounting	DIN rail Panel 72 x 72, Panel 96 x 96 (with optional adapter)
Weight	400 g (packaging included)
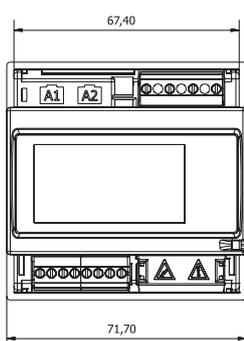
Fig. 1 *DIN rail*
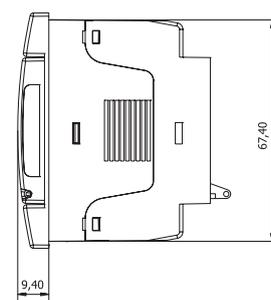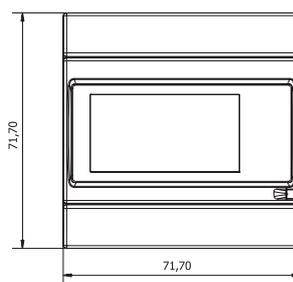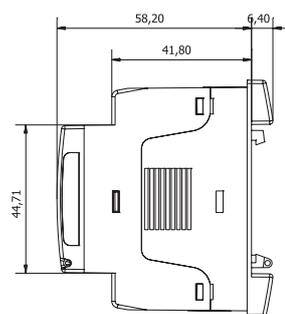
Fig. 2 *Panel 72 x 72*

Environmental specifications

Operating temperature	From -25 to +55 °C/from -13 to +131 °F
Storage temperature	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
Voltage input and self power supply	-	Reinforced *	Double **	Double **
Current inputs	Reinforced *	-	Double **	Double **
Pulse outputs	Double **	Double **	-	-
RS485 port	Double **	Double **	-	-

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

▶ **Conformity**

Directives	2014/30/EU (EMC - Electro Magnetic Compatibility) 2011/65/EU (Electric-electronic equipment hazardous substances)
Standards	Electromagnetic compatibility (EMC) - emissions and immunity: EN62052-11 Electrical safety: EN61010-1 Pulse outputs: IEC62053-31, DIN43864 Metrology: EN62053-21, EN62053-23
Approvals	C E c(UL)us LISTED

▶ **Electrical specifications**

Electrical system and loads

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

Voltage inputs

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

Current inputs

Current connection	Only via transformer block TCDxM or TCDMM
Rated current (In)	60 A: TCD0M 100 A: TCD1M 200 A: TCD2M 400 A: TCD3M Up to 10000 A: TCDMM
Minimum current (Imin)	0.02 In
Maximum current (Imax)	1.2 In
Start-up current (Ist)	0.002 In
Overload	Continuous: 1.2 In For 500 ms: 2 In
Input impedance	< 0.2 VA

CARLO GAVAZZI

Power supply

Power supply	Self powered, between L2 and L3
Consumption	2 W, ≤ 4 VA

Measurements

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

Available measurements

Three-phase loads

Energy	Active imported Reactive imported
Current	Phase 1 Phase 2 Phase 3
Voltage	Phase-phase Phase-neutral
Active power	Total load Average (dmd) Maximum dmd
Apparent power	Total load Average (dmd) Maximum dmd
Reactive power	Total load
Power factor	Total load

Single-phase loads

Energy	Active
Current	Phase
Voltage	Phase-neutral
Active power	Total load Average (dmd) Maximum dmd
Reactive power	Phase
Power factor	Phase

▶ **Measurement accuracy**

EM271

Current	
From 0.05 In to Imax	±(0.5% rdg)
From 0.02 In to 0.05 In	±(1.0% rdg)
Phase-phase voltage	
From (Un min -10%) to (Un max +10%)	±(0.5% rdg)
Phase-neutral voltage	
From (Un min -10%) to (Un max +10%)	±(1% rdg)
Active power (PF=1)	
From 0.05 In to Imax	±(1% rdg)
From 0.02 In to 0.05 In	±(1.5% rdg)
Active power (PF=0.5L, 0.8C)	
From 0.1 In to Imax	±(1% rdg)
From 0.05 In to 0.1 In	±(1.5% rdg)
Reactive power (sinϕ=1)	
From 0.05 In to Imax	±(2% rdg)
From 0.02 In to 0.05 In	±(2.5% rdg)
Reactive power (sinϕ=0.5 L or C)	
From 0.1 In to Imax	±(2% rdg)
From 0.05 In to 0.1 In	±(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

EM271+TCD0M, TCD1M, TCD2M or TCD3M

Current	
From 0.2 In to Imax	±(0.75% rdg)
From 0.05 to 0.2 In	±(1% rdg)
From 0.02 In to 0.05 In	±(1.25% rdg)
Active power (PF=1)	
From 0.2 In to Imax	±(1.25% rdg)
From 0.05 to 0.2 In	±(1.5% rdg)
From 0.02 In to 0.05 In	±(2% rdg)
Reactive power (sinϕ=1)	
From 0.2 In to Imax	±(2.25% rdg)
From 0.05 to 0.2 In	±(2.5% rdg)
From 0.02 In to 0.05 In	±(3% rdg)

 Display

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

 Digital outputs

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

 RS485 port

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

 Special functions

- Display of total loads connected in relation to energy consumption and power measurements (SUM function)
- Measurements independent from direction of current (Easy connection function)
- Resetting of active energy meters of single and total loads
- 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.
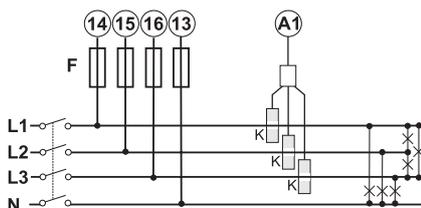
Fig. 3 *Three-phase system, one three-phase load.*
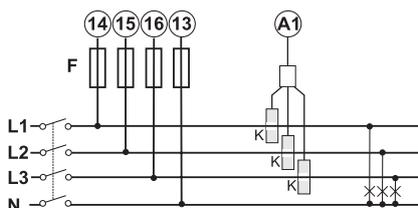
Fig. 4 *Three-phase system, three single-phase loads.*
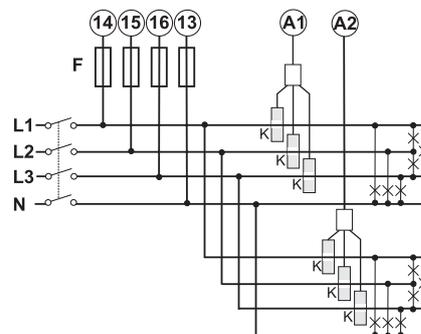
**Fig. 5** *Three-phase system, two three-phase loads.*
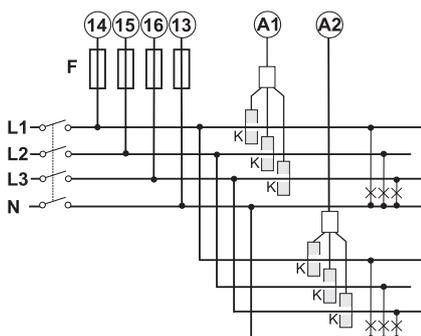
**Fig. 6** *Three-phase system, six single-phase loads.*
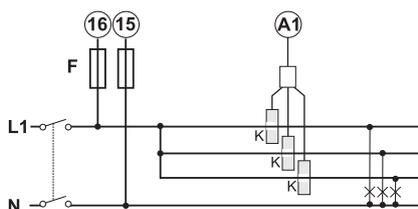
**Fig. 7** *One-phase system, three single-phase loads.*
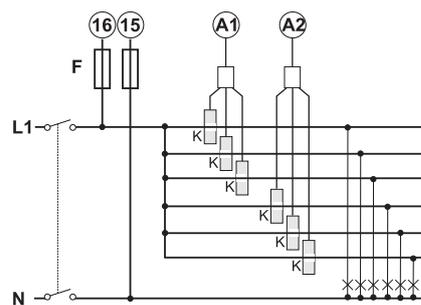
**Fig. 8** *One-phase system, six single-phase loads.*
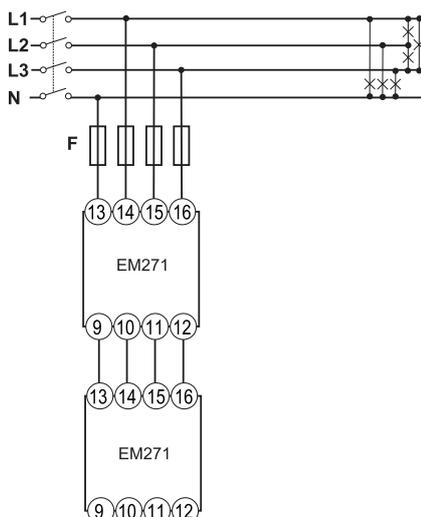
**Fig. 9** *Example of connection of multiple EM271s in cascade.*
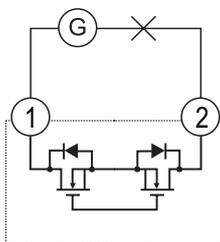
Fig. 10 *Pulse output 1.*
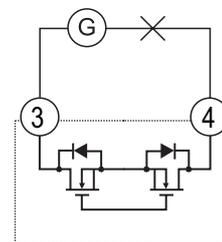
Fig. 11 *Pulse output 2.*
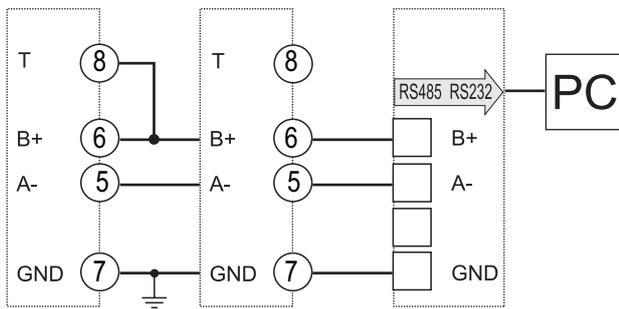
Fig. 12 *RS485 port.*
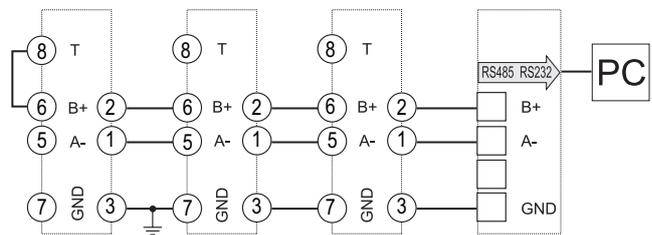
Fig. 13 *Double RS485 port for daisy chain connection.*

References

▶ **Order code**

👉 **EM271 72D MV ☐ 3X ☐ ☐ (16 total characters)**

Enter the code, replacing the symbol ☐ with the selected option (e.g.: EM271 72D MV5 3X **OS X**).

Code	Options	Description
E	**-**	-
M	**-**	-
2	**-**	-
7	**-**	-
1	**-**	-
7	**-**	-
2	**-**	-
D	**-**	-
M	**-**	-
V	**-**	-
☐	**5**	230 V L-N, 400 V L-L ac, connection via TCD_M or TCDMM
	6	120 V L-N, 230 V L-L ac, connection via TCD_M or TCDMM
3	**-**	-
X	**-**	-
☐	**OS**	RS485 port and double digital output
	2S	Double RS485 port for daisy chain connection
☐	**X**	Standard configuration
	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 ☐	Replacing the symbol ☐ with the cable length. Lengths available: **30, 60, 90, 150, 200** cm.	Pre-wired cables for voltage connection (one terminal block).
EM270WS V 2T ☐	Replacing the symbol ☐ with the cable length. Lengths available: **30, 60, 90, 150, 200** cm.	Pre-wired cables for voltage connection (two terminal blocks).
EM270WS S 2T ☐	Replacing the symbol ☐ with the cable length. Lengths available: **60, 90, 120, 180, 230** 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 ADAPT-ER	-	Adapter to 96 x 96 panel mounting.

▶ **Further reading**

Information	Document	Where to find it
Instruction manual	Instruction manual - EM271	www.productselection.net

▶ **CARLO GAVAZZI compatible components**

Purpose	Component name/code key	Notes
Current measurement accessories (mandatory)	TCD0M TCD1M TCD2M TCD3M TCDMM	See next chapter
Configure analyzer via desktop application	UCS configuration software	Available for free download at: www.productselection.net
Monitor data from several analyzers	VMU-C EM	See relevant datasheet

TCD_M family

TCD0M, TCD1M, TCD2M, TCD3M for EM271

Main features

- 3 split core current sensors
- Primary current from 60 A to 400 A (depends on the model)
- Hole diameter from 9.6 mm to 20.5 mm (depends on the model)
- Connection to the EM271 with cable with RJ-11 connector
- DIN rail mounting
- Primary current self-detection

Description

3-channel split core current transformer block for power analyzer EM271.

It manages primary current from 60 A to 400 A (depends on the model) and the value is read automatically by the EM271 to eliminate the need for configuration and calibration by the user.

It is equipped with RJ-11 connectors for simple connection to the EM271.

Main functions

- Conversion of current for input to the power analyzer EM271.

Structure
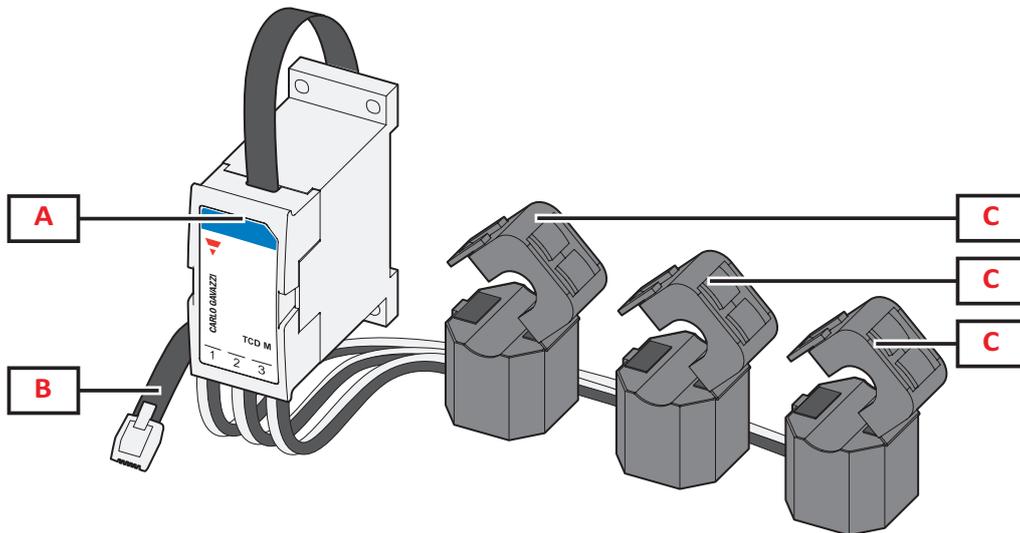
Area	Description
A	Integrator
B	Cable with RJ-11 connectors for connection to the EM271
C	Split core current sensors

Features

Material	PC, PA66
Protection degree	IP20
Terminals	RJ-11 connector
Overvoltage category	Cat. III
Pollution degree	2
Insulation	60s 1500 V ac (RJ connectors to housing)
Mounting	DIN rail
Weight (packaging included)	TCD0M: 290 g TCD1M: 360 g TCD2M: 535 g TCD3M: 885 g

Fig. 14 *Integrator (mm)*
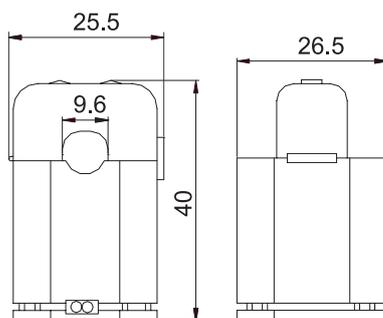
Fig. 15 *TCD0M (mm)*
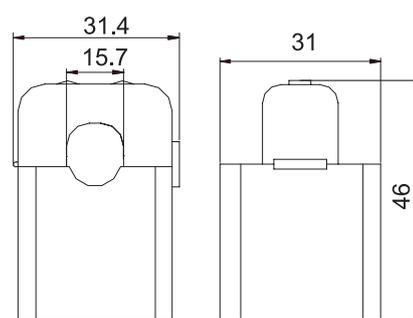
Fig. 16 *TCD1M (mm)*
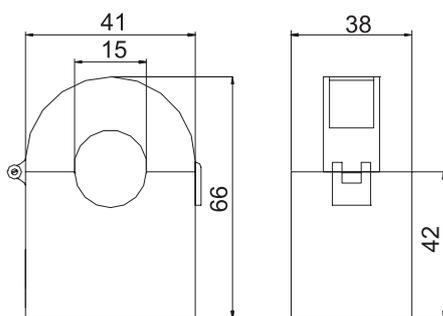
Fig. 17 *TCD2M (mm)*
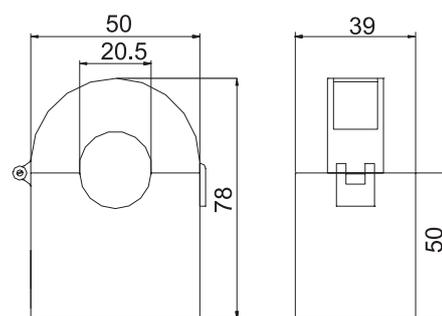
Fig. 18 *TCD3M (mm)*

![Environmental specifications]

Environmental specifications

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

Electrical specifications

Primary current (In)	60 A: TCD0M 100 A: TCD1M 200 A: TCD2M 400 A: TCD3M
Maximum current (continuous)	1.2 In
Maximum system voltage	0.72 kV ac
Frequency	From 45 to 65 Hz
Accuracy	0.5%
Phase error	≤4°

Connection Diagrams
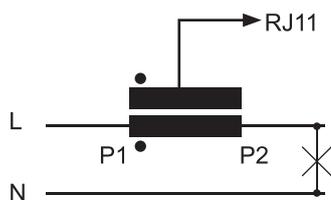
Fig. 19 *Current connection*
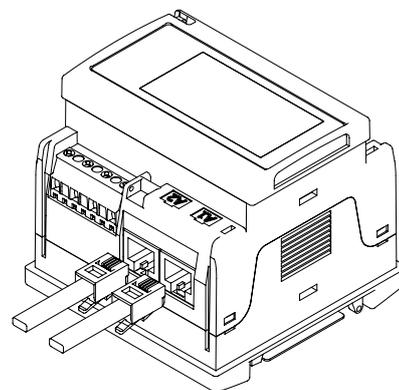
Fig. 20 *RJ11 connections*

References

▶ **Order code**

☞ **TCD ☐ ☐ 80 CM X**

Enter the code, replacing the symbol ☐ with the selected option (e.g.: TCD 0 M 60 80 CM X)

Code	Options	Description
T	-	-
C	-	-
D	-	-
☐	0M60	60 A Primary current
☐	1M100	100 A Primary current
☐	2M200	200 A Primary current
☐	3M400	400 A Primary current
8	-	-
0	-	-
C	-	-
M	-	-
X	-	-

▶ **Further reading**

Information	Document	Where to find it
Instruction manual	Instruction manual - TCD_M	www.productselection.net

▶ **CARLO GAVAZZI compatible components**

Purpose	Component name/code key	Notes
Measure and display consumption of connected loads	EM271	-

TCDMM

3-phase adapter for EM271

Main features

- Suitable for 3 current sensors (0.333 V)
- Primary current up to 10000 A
- Connection to the EM271 with cable with RJ-11 connector
- DIN rail mounting
- Screwless terminals

Main functions

- Conversion of current for input to the power analyzer EM271.

Description

3-phase adapter for power analyzer EM271.
This manages 3 current sensor (0.333 V output) and the primary value is set by the user via keypad or via software.
It is equipped with RJ-11 connectors for simple connection to the EM271.

Structure
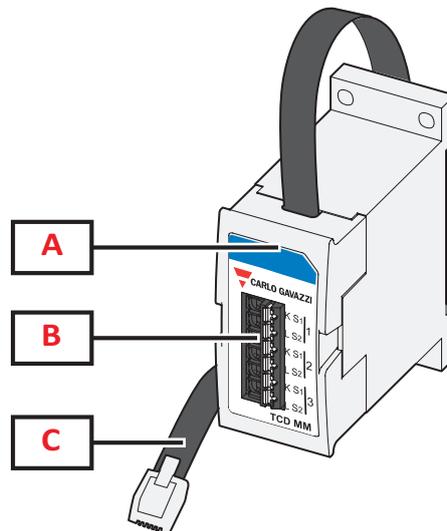
Area	Description
A	Integrator
B	Push-in wire connector
C	Cable with RJ-11 connectors for connection to the EM271

Features

▶ **General**

Material	PC, PA66
Protection degree	IP20
Terminals	RJ-11 connector
Overvoltage category	Cat. III
Pollution degree	2
Mounting	DIN rail
Weight (packaging included)	80 g
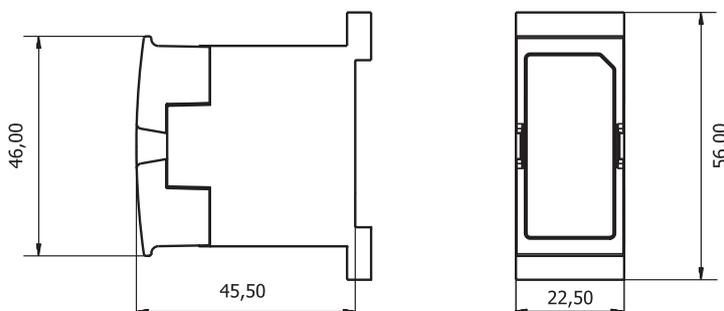
Fig. 21 *(mm)*

▶ **Environmental specifications**

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

▶ **Electrical specifications**

Primary current (In)	3x 0.333V
Maximum current (continuous)	1.2 In
Maximum system voltage	0.72 kV ac
Frequency	From 45 to 65 Hz

Connection Diagrams
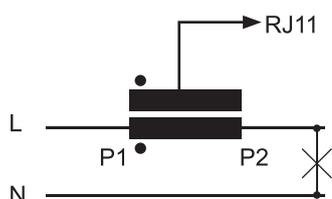
Fig. 22 *Current connection*
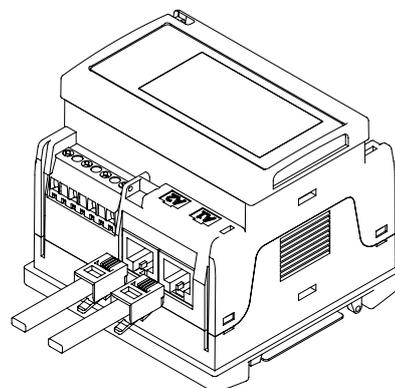
Fig. 23 *RJ11 connections*

References

▶ **Order code**

☞ **TCDMM XXX 80CM X**

▶ **Further reading**

Information	Document	Where to find it
Instruction manual	Instruction manual - TCDxM	www.productselection.net

▶ **CARLO GAVAZZI compatible components**

Purpose	Component name/code key	Notes
Measure and display consumption of connected loads	EM271	-
Current sensors 0.333 V secondary output	CTV1X, CTV2X, CTV3X, CTV4X, CTV8X	-