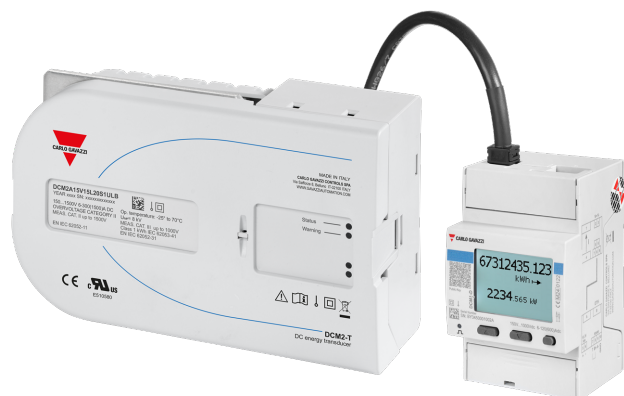


DCM2

Energy meter for DC systems



Description

DCM2 is a direct connection energy Meter for DC systems up to 1500 V dc and current up to 1500 A dc. Specifically designed for installation in battery energy storage systems and MCS fast chargers, it has two components: a transducer for voltage and current connection and a display unit featuring both Modbus RTU and Modbus TCP communication port.

Benefits

- **Secure and signed data transmission.** DCM2 is conceived to be secure and safe: sealable terminal caps prevent external intervention and tampering, while data authenticity is ensured by the digital signature and the OCMF file.
- **User-friendly interface.** The 128x96 matrix LCD with backlight display presents clearly readable information to the user. In addition, the interface can be easily programmed and customized, with a straightforward setting procedure using UCS software or the 3 mechanical keys.
- **Maximum connection flexibility.** The intelligent design of the DCM2 makes it easy to integrate inside energy storage systems and EV charger architecture: the display is detached from the measuring component and both Modbus RTU and Modbus TCP are in the same unit, allowing different connection layouts.
- **Temperature calibrated.** Able to work in an extremely wide temperature range thanks to the temperature drift compensation exploiting a calibration method based on two temperature sensors.
- **Clear and effective diagnostics.** Correct operation is immediately visible through the LEDs and the warning status icons on the display. Diagnostic alerts and real-time temperature values are also available via Modbus to permit constant monitoring.

Applications

DCM2 can be installed in any DC switchboard with a rated current up to 1500 A to monitor energy consumption or production and the main electrical variables. The main application is within battery energy storage systems (BESS) to monitor the DC output, verify overall system efficiency and prevent malfunctions.

Thanks to its high accuracy and resolution, DCM2 is suited for EV chargers addressed to the US market, where CTEP and cURus approvals are needed.

Both imported and exported energy are measured, making DCM2 the perfect solution also for vehicle to grid applications or DC distribution systems.

Architecture

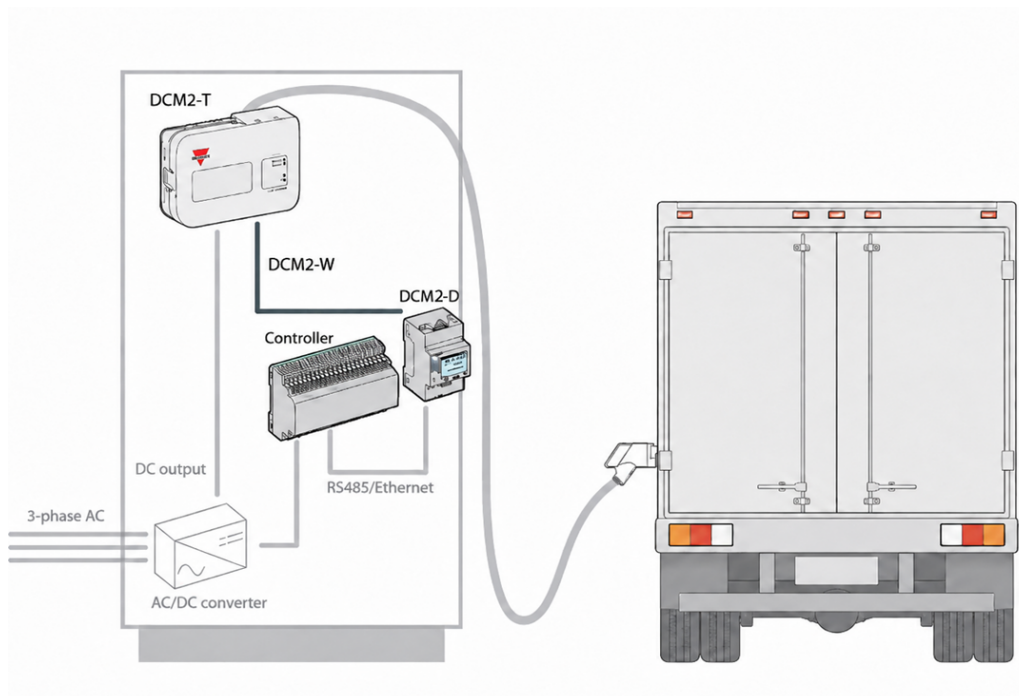


Fig. 1 Charging session

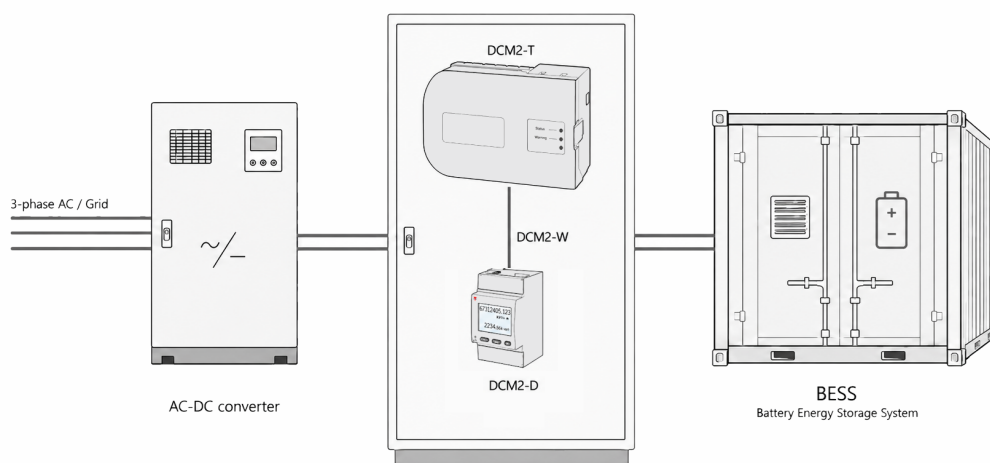


Fig. 2 Battery Energy Storage System

Main functions

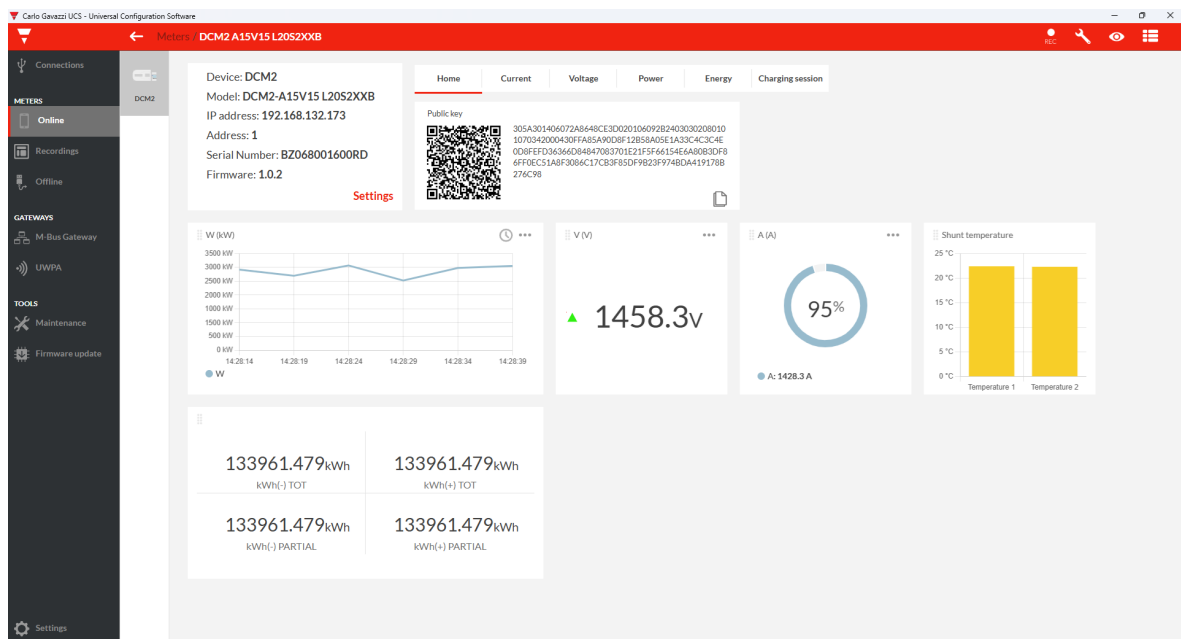
- Charging session management and automatic display update (XXB versions)
- Measure energy and ampere-hour
- Measure power, voltage and current
- Measure the load run hours and the total on-time
- Transmit data to controller or other systems through Modbus RTU or Ethernet port
- Internal temperature monitoring to ensure timely intervention in case of overheating
- Cable loss compensation

Main features

- Real time variables (V, A, W)
- Quick setup wizard
- 3 mechanical push buttons
- Data refresh time: ≤ 200 ms both in Modbus RTU and Ethernet port
- Continuous sampling of voltage and current
- CTEP compliant
- cURus approved (UL 61010)
- Class 1 accuracy according to EN IEC 62053-41
- 128x96 Matrix LCD display with backlight
- 0.0001 kWh resolution via Modbus communication
- Secure direct mounting on busbars with wedge-lock washers, ensuring resistance to loosening during transport.

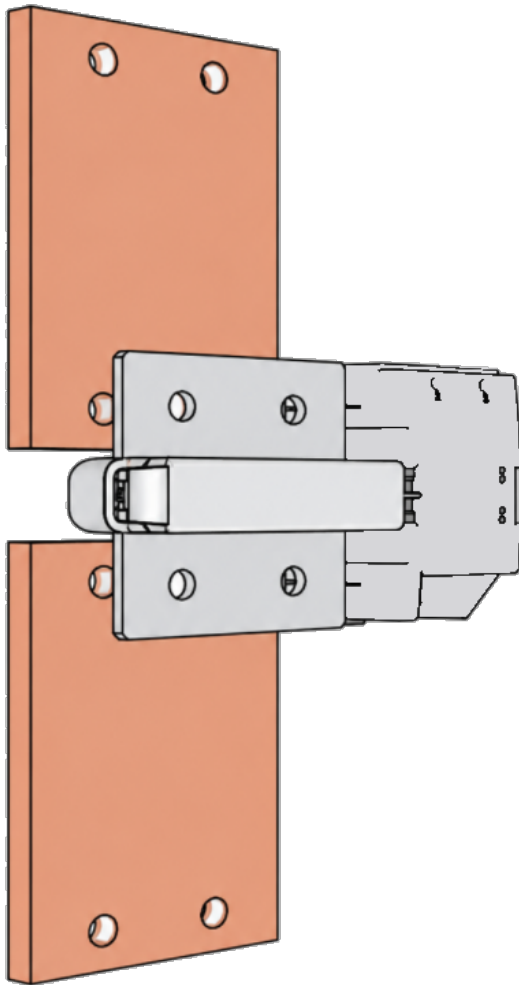
UCS software

- Free download from Carlo Gavazzi's website
- Configuration through RS485 from PC or through UWP3.0/UWP4.0 via LAN or the web (UWP Secure Bridge function)
- Setups can be saved offline for serial programming with a single command
- Real time data view for testing and diagnostics



Installation flexibility

DCM2-T is designed for mounting directly on bus-bars. In this way, it allows an easy and flexible installation in many different designs.



Structure DCM2-D

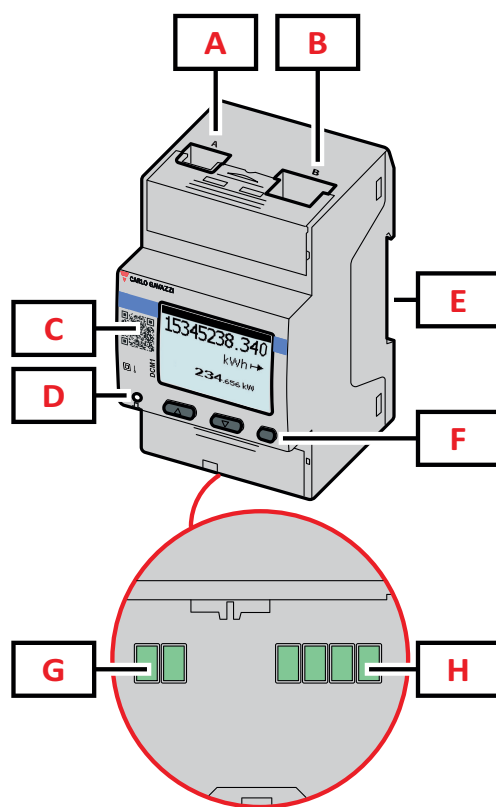


Fig. 3 DCM2-D Display

Area	Description
A	DCM2-W cable port
B	Ethernet port
C	Display
D	LED
E	DIN-rail mounting bracket
F	Browsing and configuration buttons
G	Power supply
H	RS485 port

Structure DCM2-T

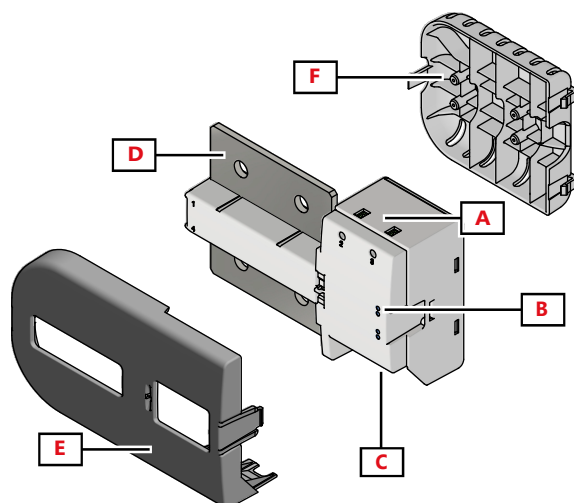


Fig. 4 DCM2-T

Area	Description
A	Voltage inputs
B	LEDs
C	DCM2-W cable port
D	Current inputs
E	Front cover
F	Back cover

Structure DCM2-W

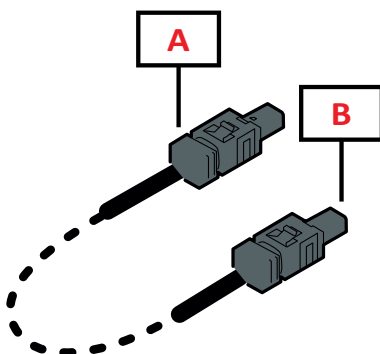
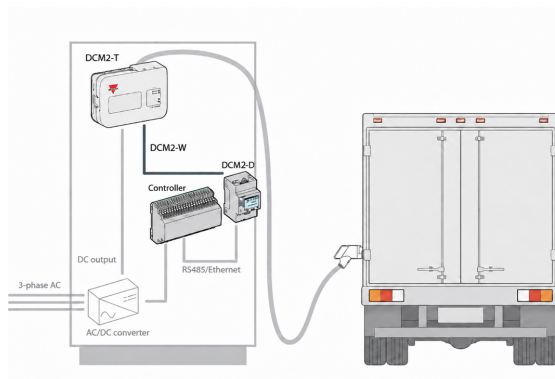


Fig. 5 DCM2-W

Area	Description
A	Connector for DCM2-D
B	Connector for DCM2-T

Charging Session management (XxB versions)



DCM2 connects to the controller via Modbus communication. All relevant information about the charging session is displayed on the screen and recorded in the OCMF file.

Charging session management

DCM2 features a charging session management function that organizes the charging process into three distinct phases: the start of the charging session, the charging mode, and the end of the charging mode. During this process, users can view:

- Accurate current date and time, thanks to the clock synchronization function implemented in the product;
- Precise measurement of the imported and/or exported energy.
- General information about the transaction and the EV charger, including the start and end of the process, transaction ID, and EV charger ID.
- User-activated/deactivated data, such as system power, actual duration of the charging session, and tariff information.
- Fully customizable content, allowing users to write strings up to 250 characters.

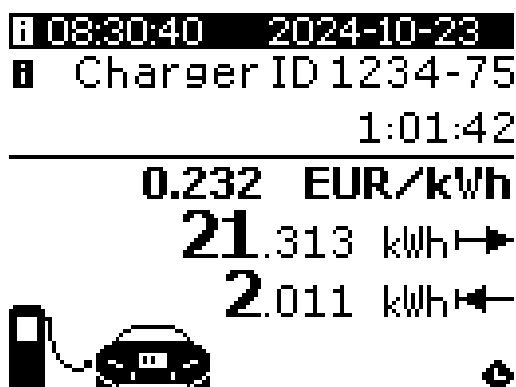


Fig. 6 example of the screen during the charging mode status, with a long string specifying the charger ID, tariff and duration activated and real time data about date and time, imported and exported energy.

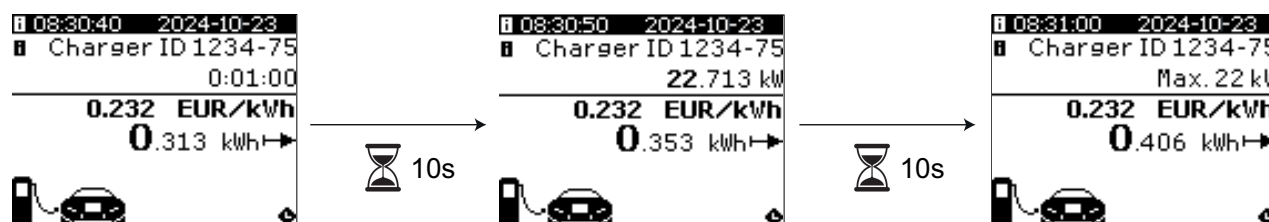


Fig. 7 Charging session in progress, with TT field, system power, custom string 1 and 2 active. Time trigger is set to 10 seconds.

OCMF file

The Open Charge Metering Format is an independent and generally usable data format for recording meter readings from charging stations that are relevant under calibration law. In addition, it permits the implementation of the evaluation and signature verification of the format by the Transparency Software. The file, written in JSON format, is compiled and saved on the cloud or local server once the charging session ends.

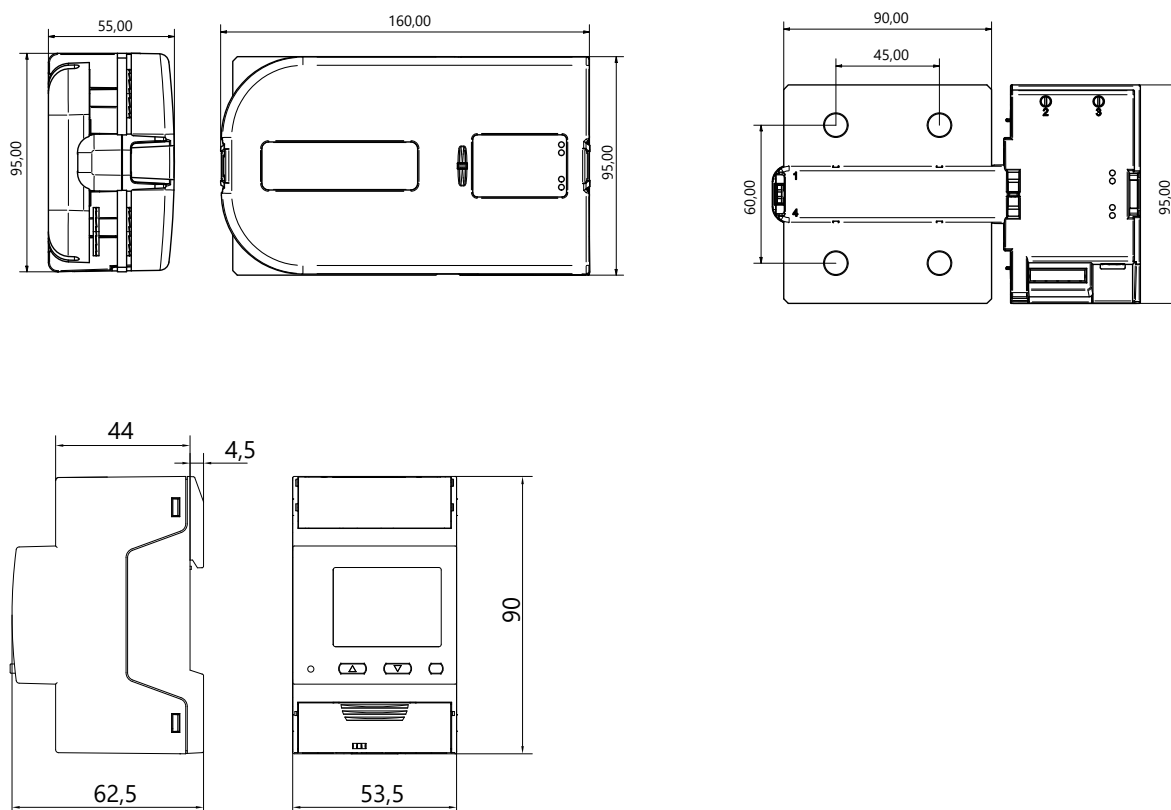
Further readings

Information	Where to find it
OCMF format	https://github.com/SAFE-eV/OCMF-Open-Charge-Metering-Format/blob/master/OCMF-en.md
Transparency software	https://safe-ev.org/en/transparency-software/e-mobilists/

Features

General

Component	DCM2-T	DCM2-D
Material	PBT	Housing: PBT Transparent cover: polycarbonate
UL flammability class	UL-94 V0	
Protection degree	Front: IP00	Terminal : IP20 Front: IP40
Protective class	II	
Terminals	Current inputs: busbar. Max: 100x10 mm; M10 hole; recommended torque: 20 Nm / 4.43 lbin Voltage input: 0.5 to 2.5 mm ² / 13 to 20 AWG, max 0.5 Nm / 4.43 lbin	Power supply and RS485 port: 0.5 to 2.5 mm ² / 13 to 20 AWG, max 0.5 Nm / 4.43 lbin
Overvoltage category	Cat. II	
Rated impulse voltage	8 kV	
Pollution degree	2	
Mounting	DIN rail and back panel by screw terminals	DIN Rail
Weight	1150 g / 2.53 lb (package included)	



Environmental specifications

Operating temperature*	Up to 1400 A: from -25 to +70 °C / From -13 to +158 °F From 1400 to 1500 A: from -25 to +65 °C / From -13 to 149 °F
Storage temperature	From -40 to +85 °C / From -40 to +185 °F
Max temperature on shunt	DCM2-T: 100 °C / 212 °F
Mechanical environmental condition	M2

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

Input and output insulation

Type	Measurement inputs	Power supply	RS485 serial port	Ethernet
Measurement inputs	-	Double/Reinforced	Double/Reinforced	Double/Reinforced
Power supply	Double/Reinforced	-	-	-
RS485 serial port	Double/Reinforced	-	-	-
Ethernet	Double/Reinforced	-	-	-

Compatibility and conformity

European directives	2014/35/EU (LVD - Low Voltage) 2014/30/EU (EMC - Electro Magnetic Compatibility) 2011/65/EU, 2015/863/EU (Electric-electronic equipment hazardous substances)
Standards	EMC - Electro Magnetic Compatibility: EN IEC 61000-6-3, EN IEC 61000-6-2, EN IEC 62052-11 Electrical Safety: EN IEC 61010-1 Metrology: EN IEC 62053-41 SW security: WELMEC 7.2
Approvals	 

Electrical specifications

Electrical system	
Managed electrical system	DC

Voltage inputs	
Voltage connection	Direct
Rated voltage (U_n)	From 150 to 1500 V
Voltage tolerance	From 0.8 to 1.15 U_n
Input impedance	3.2 M Ω

Current inputs	IEC 62053-41
Start-up current (I_{st})	1.2 A
Minimum current (I_{min})	15 A
Threshold current (I_{tr})	-
Rated current (I_n)	300 A
Maximum current (I_{max})	1500 A
Input impedance	3.9 $\mu\Omega$

Power supply

Type	Auxiliary power supply
Consumption	1.6 W
Power supply range (V)	From 12 to 24 V dc $\pm 20\%$

Measurements

Method	Average
Energy update rate	200 ms

Available measurements

Active energy	Unit	Communication	Display
Imported (+) Total	kWh+	•	•
Imported (+) partial	kWh+	•	-
Exported (-) Total	kWh-	•	•
Exported (-) partial	kWh-	•	-

Ampere-hour	Unit	Communication	Display
Imported (+) Total	Ah+	•	•
Imported (+) partial	Ah+	•	-
Exported (-) Total	Ah-	•	•
Exported (-) partial	Ah-	•	-

Run hour meter	Unit	Communication	Display
Total (kWh+)	hh:mm	•	•
Partial (kWh+)	hh:mm	•	-
Total (kWh-)	hh:mm-	•	•
Partial (kWh-)	hh:mm-	•	-
Total ON time	hh:mm	•	•
Partial ON time	hh:mm	•	-

Electrical variable	Unit
Voltage	V
Current	A
Active power	W

Shunt temperature	Unit
Upstream	°C
Downstream	°C

Charging session measurements (XXB versions)

Active energy	Unit
Imported (+) Total	kWh+
Exported (-) Total	kWh-
Duration	hh:mm:ss

Energy metering

Energy metering depends on the measurement type (according to the selected model).

Easy connection

Easy connection function: irrespective of the current direction, the power always has a plus sign that increases the positive energy meter. The negative energy meter is not available.

Bidirectional

Bidirectional: voltage, current, and power are measured using the proper sign. The positive or the negative energy increases according to the power sign.

Measurement accuracy

Voltage

From U_n min -20% to
 U_n max +15%

$\pm 0.5\%$ rdg

Power

From I_{tr} to I_{max} A

$\pm 1\%$ rdg

From I_{min} to I_{tr} A

$\pm 1.5\%$ rdg

Energy

Class

Class 1 according to EN IEC 62053-41

Display

Type	Graphical matrix display
Refresh time	500 ms
Description	128x96 pixel backlit LCD
Variable readout	Instantaneous: 5+1 dgt or 5+3 dgt Energy: 7+3 dgt

Display icons

The table reports the icons that can appear on the display and explains their meaning.

Symbol	Description
	Current overrange, the measured value is still displayed
	Voltage overrange, the measured value is still displayed
	Temperature on the shunt overrange
	Communication: reading or writing command is addressed to DCM2
	Clock synchronized
	Internal failure

Measurement resolution

Variable	Resolution by serial communication	Display resolution
Energy	0.0001 kWh	0.001 kWh
Ampere-hour	0.001 Ah	0.001 Ah
Power	0.001 kW	0.001 kW
Current	0.001 A	0.001 A
Voltage	0.1 V	0.1 V
Run-hour meter	1 s	1 m
Shunt temperature	0.1 °C	0.1 °C

 LED

	DCM2-T	DCM2-D
Function	Green colour, power on and communication; Amber colour, warning overrange (temperature, current, voltage) or fatal error	Red colour, proportional to energy consumption or energy export, according to the selected Display page (see user manual)
Constant	-	100 pulse/kWh

Symbols

The table reports the symbols that can appear on the device and in the related documents.

Symbol	Description
	Dangerous voltage
	Danger, live parts
	Caution
	Provides essential information on completing the task that should not be neglected
	Manual symbol
	Safety sign notice
	The product is not to be discarded with normal household waste
	Single phase
	Double insulation

Communication ports

Modbus RTU

Protocol	Modbus RTU
Devices on the same bus	Max 247 (1/8 unit load)
Communication type	Multidrop, bidirectional
Connection type	2 wires
Configuration parameters	Modbus address (1-247) Baud rate (9.6/19.2/38.4/115.2 kbps) Parity (None/ Even)
Refresh time	≤ 200 ms
Configuration mode	Via keypad or UCS software

Ethernet port

Protocol	Modbus TCP/IP
Devices on the same bus	Maximum 5 TCP connections simultaneously
Connection type	RJ45 connector (10 Base-T, 100 Base-TX) maximum distance 100 m
Configuration parameters	IP address Subnet mask Gateway TCP/IP port DHCP enabling
Refresh time	≤ 200 ms
Configuration mode	Via keypad or UCS software

Connection Diagrams

Voltage and current

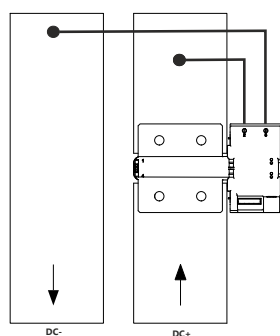


Fig. 8 Current (option A) and voltage inputs

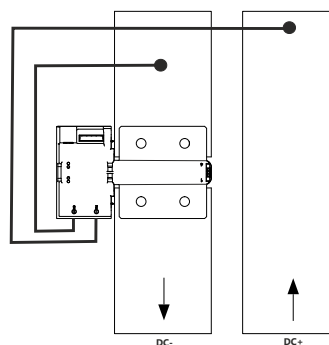


Fig. 9 Current (option B) and voltage inputs

Communication and power supply

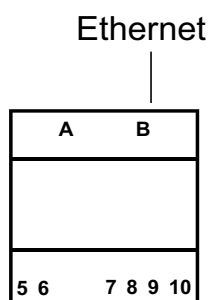


Fig. 10 Ethernet

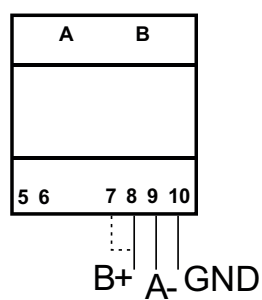


Fig. 11 RS485 terminalization.
Last device on RS485

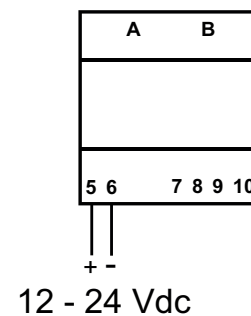


Fig. 12 Power supply

References

Order code

 **DCM2 A15 V15 L 20 S1 ULB**

Enter the code option instead of ☐

Code	Options	Description
DCM2	-	Model
A15	-	Max current: 1500 A
V15	-	Max voltage: 1500 V
L	-	Power supply: 12-24 V dc
20	-	200 cm cable length
S1	-	Ethernet Modbus TCP + RS485 Modbus RTU (no signature)
ULB	-	cURus + CTEP compliance (Bidirectional)

 **DCM2 A15 V15 L 20 ☐ XXB**

Enter the code option instead of ☐

Code	Options	Description
DCM2	-	Model
A15	-	Max current: 1500 A
V15	-	Max voltage: 1500 V
L	-	Power supply: 12-24 V dc
20	-	200 cm cable length
☐	S2	Ethernet Modbus TCP + RS485 Modbus RTU (256-bit signature)
	S3	Ethernet Modbus TCP + RS485 Modbus RTU (384-bit signature)
XXB	-	CE, cURus + CTEP compliance (Bidirectional), charging session management

 CARLO GAVAZZI compatible components

Purpose	Component name/code key	Notes
Configure analyzer via desktop application	UCS software	Available for free download at: www.gavazziautomation.com
Aggregate, store and transmit data to other systems	UWP 3.0, UWP 4.0	See relevant datasheet at: www.gavazziautomation.com



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