

# DCT1

## Energy transducer for DC systems



### Benefits

- **Easy and robust mounting.** DIN rail mounting permits easy positioning before fixing DCT1 on the back panel using standard screws.
- **Tamper proof.** The protection cover can be sealed to avoid access to both current/voltage connections and to communication terminals.
- **Secure and signed data transmission.** Transmitted data can't be corrupted thanks to the embedded signature algorithm that ensures data source authenticity. The public key can be read easily via Modbus RTU or by the QR code printed on the front.
- **Quick configuration.** Easy configuration via Modbus RTU using the UCS configuration software, available for download free of charge.
- **Accurate measuring.** DCT1 complies with the precision International standard EN IEC 62053-41 guaranteeing the highest accuracy from 1% to 100 % of the measuring range.
- **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 warning and status LEDs, and real-time diagnostics via Modbus. They control over range and overtemperature.

### Description

DCT1 is a direct connection energy transducer for DC systems up to 1000 V dc and current up to 600 A dc, equipped with Modbus RTU or SML communication port. Dedicated versions of the DCT1, provided with evaluation certificate, implementing 256-bit or 384-bit signature on Modbus RTU or 384-bit signature on SML, are suitable for installation on electric vehicle chargers that requires Eichrecht certification.

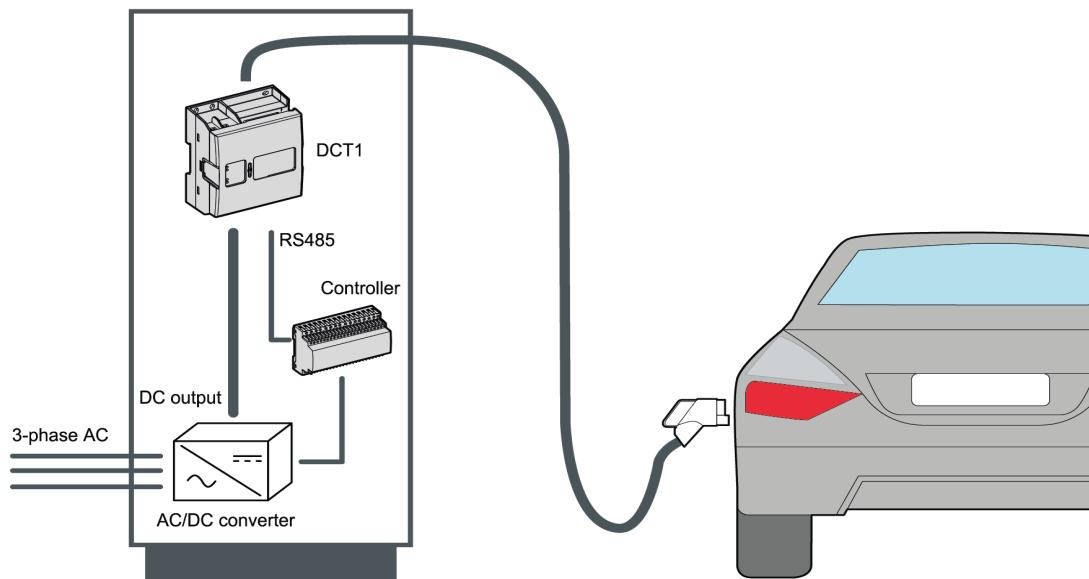
### Applications

DCT1 can be installed in any DC switchboard with a rated current up to 600 A to monitor energy consumption or production and the main electrical variables. The main application is within a DC fast charger for electric vehicles, thanks to the 70 °C / 158 °F maximum ambient temperature and allowed maximum current and voltage.

With the evaluation certificate according to EN IEC 62052-11, EN IEC 62052-31, VDE-AR-E 2418-3-100 Annex A, WELMEC 7.2 and the signed data transmission able to guarantee data source authenticity, application for Eichrecht certification, required for EV charger by the German law, is easily possible.

Cable loss compensation is able to calculate the losses due to the cable resistance from DCT1 to the connection point to measure only the energy actually provided to the car.

## ► Architecture



## ► Main functions

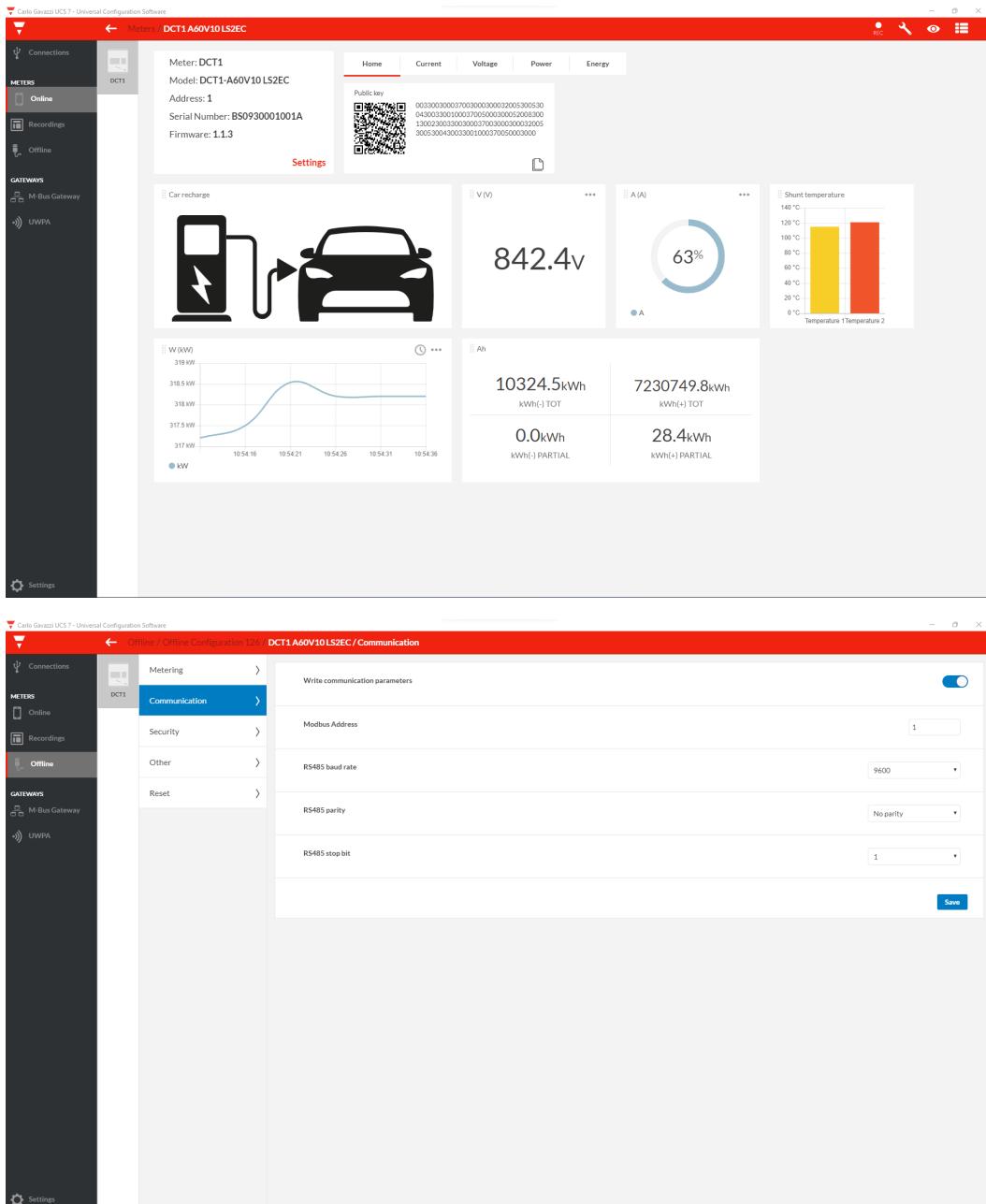
- Measure energy and ampere-hour
- Measure power, voltage and current
- Measure the load run hours and the total on-time
- Transmit data to controller or other systems through Modbus RTU or SML
- Signed data transmission (certified versions)
- Monitor internal temperature to help controller avoiding over-heating of the DCT1 and the power cables
- Cable loss compensation

## ► Main features

- Variables (V, A, W)
- Energy resolution 0.0001 kWh
- Data refresh time: 200 ms (Modbus RTU), automatic data push every 200 ms in SML version
- Continuous sampling of voltage and current
- Evaluation certificate for Eichrecht approval
- cULus approved


**UCS software**

- Free download from Carlo Gavazzi 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



**Carlo Gavazzi UCS™ - Universal Configuration Software**

**Meters** DCT1

**Meter: DCT1**  
 Model: DCT1-A60V10 LS2EC  
 Address: 1  
 Serial Number: BS0930001001A  
 Firmware: 1.1.3

**Settings**

**Car recharge**

**V (V)** 842.4v

**A (A)** 63%

**Shunt temperature**

**W (kW)**

**AP**

10324.5kWh  
 kWh(-) TOT

7230749.8kWh  
 kWh(+) TOT

0.0kWh  
 kWh(-) PARTIAL

28.4kWh  
 kWh(+) PARTIAL

**Carlo Gavazzi UCS™ - Universal Configuration Software**

**Offline / Offline Configuration** DCT1 A60V10 LS2EC / Communication

**Meters** DCT1

**Communication**

**Write communication parameters**

**Modbus Address** 1

**RS485 baud rate** 9600

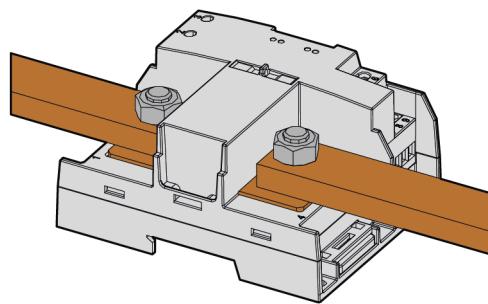
**RS485 parity** No parity

**RS485 stop bit** 1

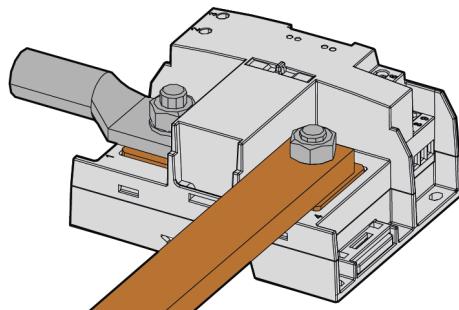
**Save**

## ► Installation flexibility

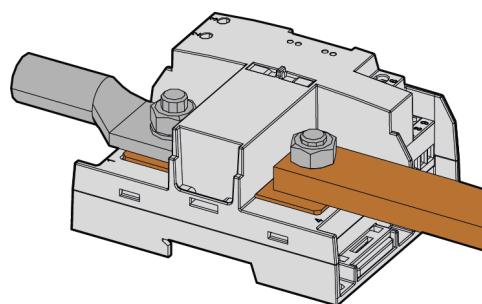
DCT1 is designed to achieve maximum installation flexibility. Here you can see 3 examples:



*Fig. 1 Bar-bar mounting*

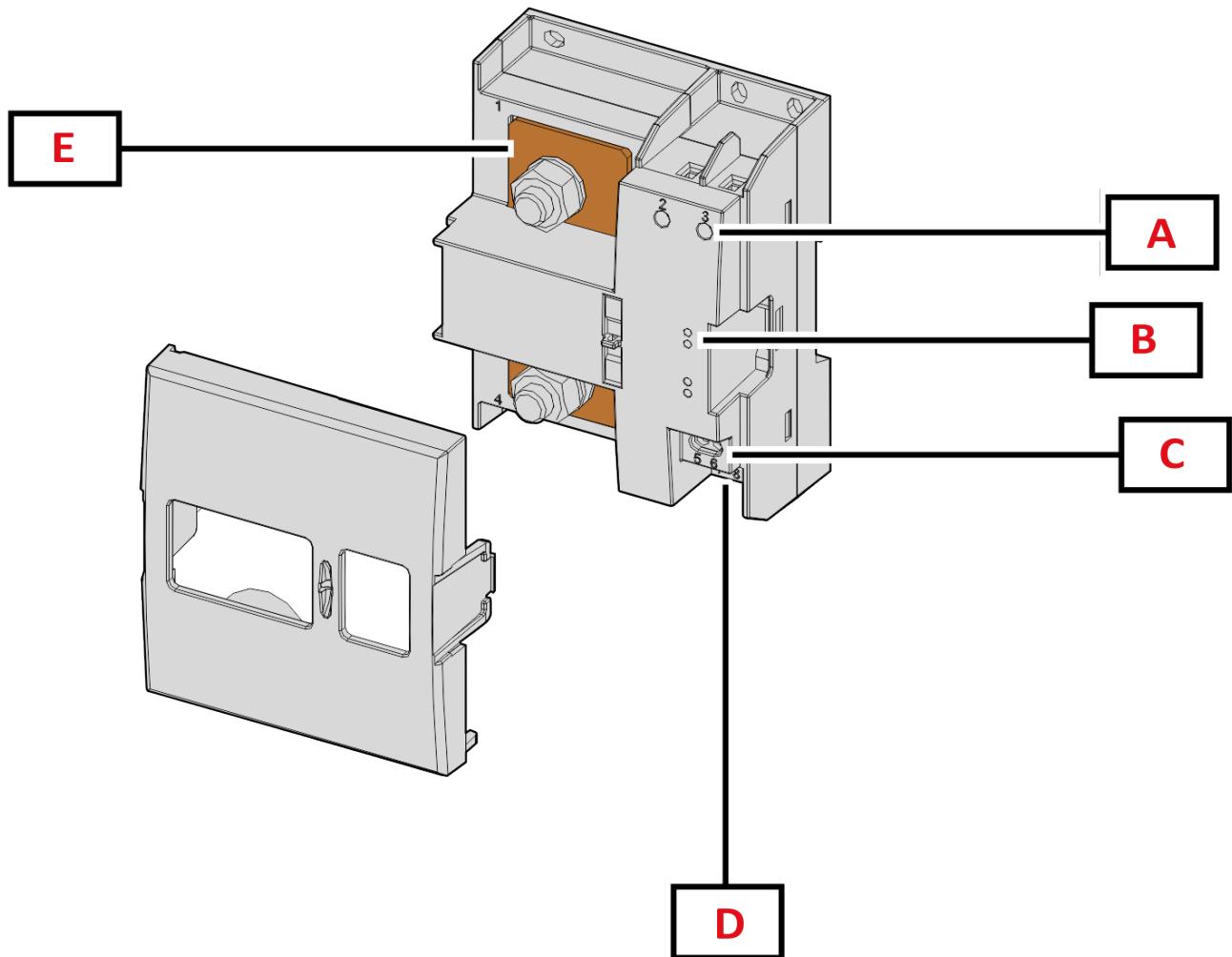


*Fig. 2 Horizontal screw-bar mounting*



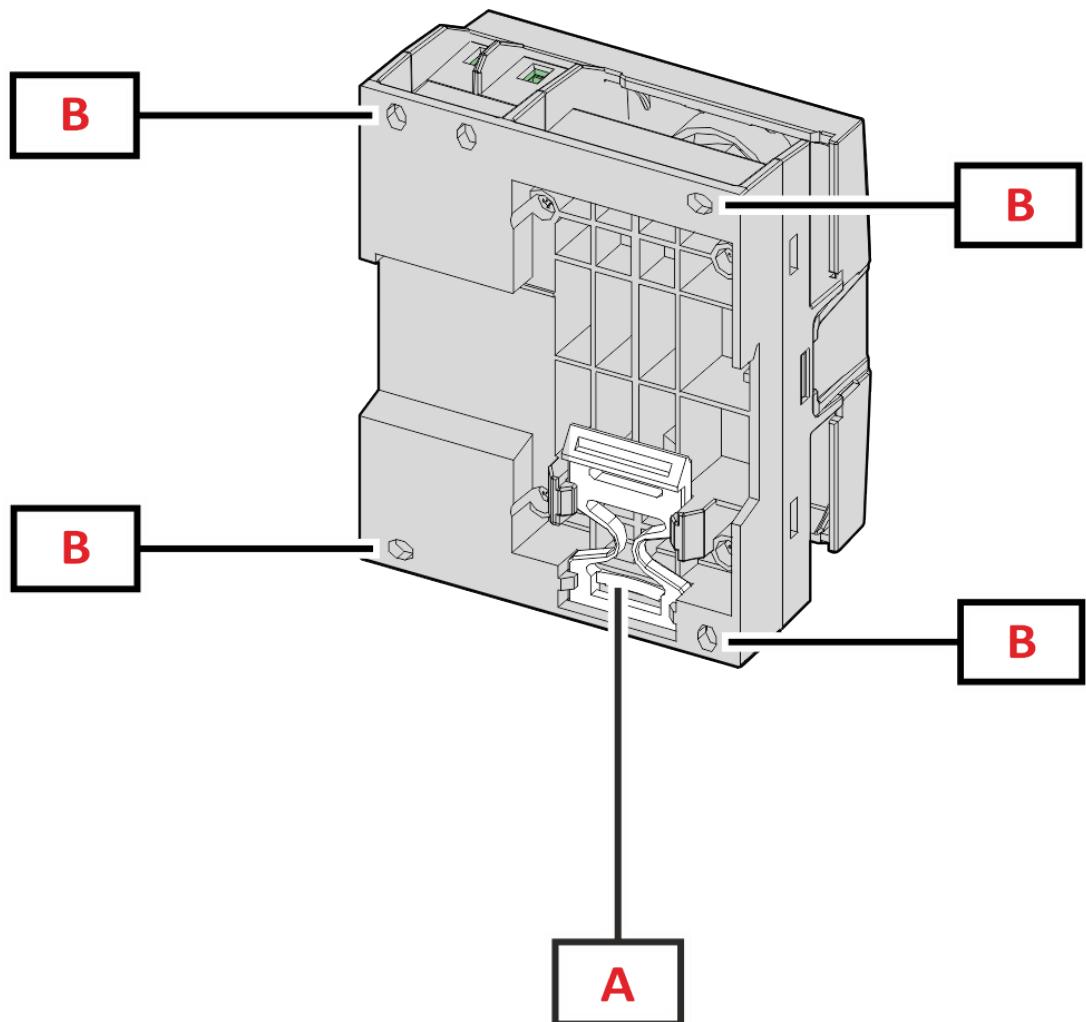
*Fig. 3 Vertical screw-bar mounting*

## Structure



*Fig. 4 Front*

Area	Description
A	Voltage inputs
B	LEDs
C	Power supply
D	RS485 port
E	Current inputs



*Fig. 5 Back*

Area	Description
A	Bracket for DIN rail mounting (optional)
B	Holes for back panel mounting by screw terminals (mandatory)

# Features

## General

<b>Material</b>	Housing: PBT
<b>Protection degree*</b>	IP10
<b>Protective class</b>	II
<b>Terminals</b>	Current inputs: cable or lug. Max: 50x10 mm; M10 hole; recommended torque: 20 Nm / 177 lbin Voltage, power supply and RS485 port: from 0.5 mm <sup>2</sup> to 2.5 mm <sup>2</sup> / from 13 to 20 AWG, 0.5 Nm / 4.4 lbin max
<b>Overvoltage category</b>	Cat. II
<b>Rated impulse voltage</b>	6kV
<b>Pollution degree</b>	2
<b>Mounting</b>	DIN rail and back panel by screw terminals
<b>Weight</b>	565 g / 1.25 lb (package included)

**\*Note:** the product can only be installed inside a cabinet with IP54 degree of protection for outdoor installation and IP51 for indoor installation.

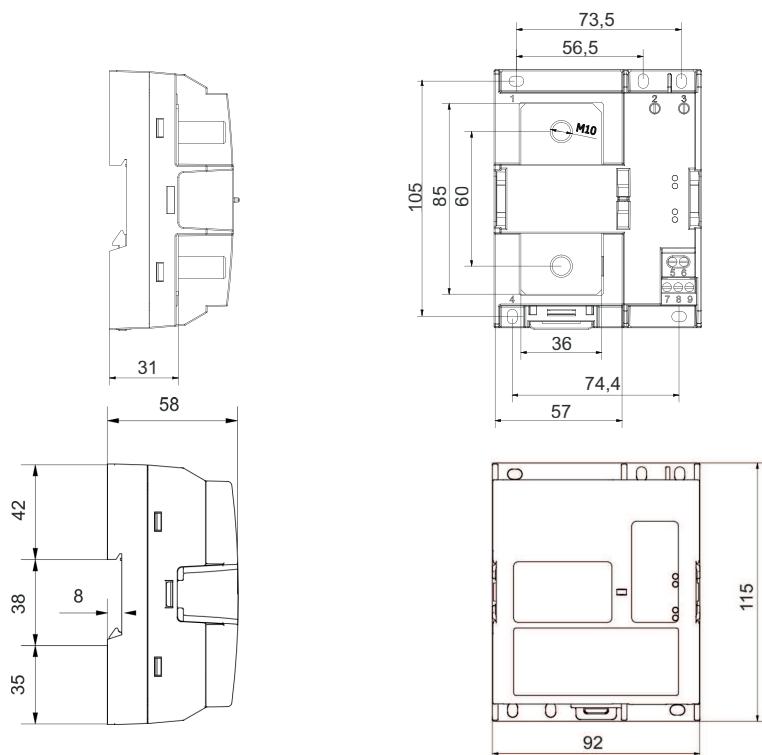


Fig. 6

## ► Environmental specifications

<b>Operating temperature*</b>	From -25 to +70 °C / from -13 to +158 °F
<b>Storage temperature</b>	From -40 to +85 °C / from -40 to +185 °F
<b>Max temperature on shunt</b>	120 °C / 248 °F
<b>Mechanical environmental condition</b>	M2

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

**\*Note:** All the tests required by CE and cURus compliance have been performed in the above stated operating temperature range. In addition, communication functionality and measurement accuracy have been tested without anomalies at temperature down to -40°C / -40 °F.

## ► Input and output insulation

Type	Measurement inputs	RS485 serial port	Power supply
<b>Measurement inputs</b>	-	Double/Reinforced	Double/Reinforced
<b>RS485 serial port</b>	Double/Reinforced	-	Functional
<b>Power supply</b>	Double/Reinforced	Functional	-

According to: EN 61010-2-030. Overvoltage category III with 600 V mains, category II with 1000 V mains. Pollution degree 2.

## ► Compatibility and conformity

<b>European directives</b>	2014/35/EU (LVT - Low Voltage) 2014/30/EU (EMC - Electro Magnetic Compatibility) 2011/65/EU, 2015/863/EU(Electric-electronic equipment hazardous substances)
<b>Standards</b>	<b>Electromagnetic compatibility (EMC) - emissions and immunity:</b> EN IEC 61000-6-2, EN IEC 61000-6-3, EN IEC 62052-11 <b>Electrical safety:</b> EN IEC 61010-1, EN IEC 62052-31, UL 61010-1, UL 61010-2-030, CAN/CSA-C22.2 No. 61010-1-12, CSA C22.2 No. 61010-2-030 <b>Metrology:</b> EN IEC 62053-41*, VDE Anwendungsregel VDE-AR-E 2418-3-100 Annex A (Accuracy class A) <b>Security:</b> WELMEC 7.2 (SW)
<b>Approvals</b>	     

\* Except for durability test


**Evaluation certificate**

The evaluation certificate is provided by an independent notify body, which performs tests and verifications to fulfill the following standards:

Standard	Description
<b>EN IEC 62052-11</b>	Electricity metering equipment (AC) - General requirements, tests and test conditions - Part 11: Metering equipment
<b>EN IEC 62052-31</b>	Electricity metering equipment (AC) - General requirements, tests and test conditions - Part 31: Product safety requirements and tests
<b>EN IEC 62053-41*</b>	Electricity metering equipment - Particular requirements - Part 41: Static meters for DC energy (classes 0,5 and 1)
<b>VDE-AR-E 2418-3-100 Annex A</b>	Electric mobility - Measuring systems for charging stations
<b>WELMEC 7.2</b>	Software Guide (Measuring Instruments Directive 2014/32/EU)

\* Except for durability test


**Electrical specifications**

Electrical system	
Managed electrical system	DC

Voltage inputs	
<b>Voltage connection</b>	Direct
<b>Rated voltage (U<sub>n</sub>)</b>	150 to 1000 V
<b>Voltage tolerance</b>	From 0.8 to 1.15 U <sub>n</sub>
<b>Input impedance</b>	3.2 MΩ

Current inputs	300 A	600 A
<b>Current connection</b>	Direct	Direct
<b>Base current (I<sub>b</sub>)</b>	50 A	120 A
<b>Minimum current (I<sub>min</sub>)</b>	2.5 A	6 A
<b>Threshold current (I<sub>tr</sub>)</b>	5 A	12 A
<b>Maximum current (I<sub>max</sub>)</b>	300 A	600 A
<b>Start-up current (I<sub>st</sub>)</b>	0.2 A	0.48 A
<b>Input impedance</b>	0,05 mΩ	0,025 mΩ

## ► Power supply

Type	Auxiliary power supply
Consumption	< 0.9 W
Voltage	12 to 24 V dc

## ► Measurements

Method	TRMS measurements of distorted waveforms
Energy update rate	10 ms

## ► Available measurements

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

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

Run hour meter	Unit
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 L-L	V
Current	A
Power	W

Shunt temperature	Unit
Upstream	°C
Downstream	°C

 **Energy metering**

Energy metering depends on the measurement type you chose (selectable in non-certified models, according to the model in certified models).

**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**

Current	IEC 62053-41*	VDE-AR-E 2418-3-100 Annex A
From $I_{tr}$ to $I_{max}$	$\pm 0.5\%$ rdg	$\pm 1\%$
From $I_{min}$ to $I_{tr A}$	$\pm 1\%$ rdg	$\pm 1.5\%$

Voltage	IEC 62053-41*	VDE-AR-E 2418-3-100 Annex A
From $U_n$ min -20% to $U_n$ max +15%	$\pm 0.5\%$ rdg	$\pm 0.5\%$

Power	IEC 62053-41*	VDE-AR-E 2418-3-100 Annex A
From $I_{tr}$ to $I_{max}$	$\pm 1\%$ rdg	$\pm 2\%$
From $I_{min}$ to $I_{tr A}$	$\pm 1.5\%$ rdg	$\pm 2.5\%$

Energy	IEC 62053-41*	VDE-AR-E 2418-3-100 Annex A
Class	class 1	class A

\* Except for durability test

 **Measurement resolution**

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

 **LED**

<b>Front</b>	<p>Green. Status: power on and communication Amber. Warning: overrange (temperature, current or voltage) or fatal error Red kWh+. Pulse weight: proportional to energy consumption: 0.001 kWh per pulse Red kWh-. Pulse weight: proportional to exported energy: 0.001 kWh per pulse</p>
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## Communication ports

### ► Modbus RTU (S1, S2, S3 versions)

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

### ► SML (K1 version)

<b>Protocol</b>	SML
<b>Devices on the same bus</b>	Max 247 (1/8 unit load)
<b>Communication type</b>	Multidrop, bidirectional
<b>Connection type</b>	2 wires
<b>Parameters</b>	Modbus address (from 1 to 247) Baud rate (115.2 kbps) Parity (None)
<b>Refresh time</b>	200 ms
<b>Configuration mode</b>	Modbus commands entering maintenance mode

## Connection Diagrams

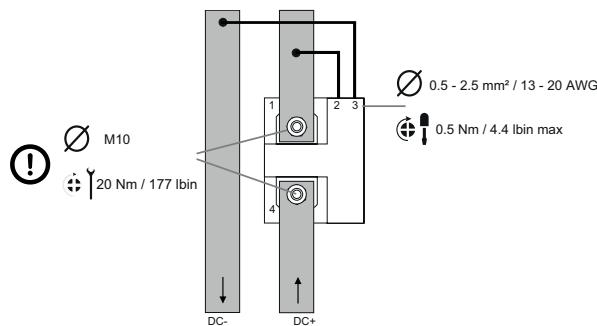


Fig. 7 Current (option A) and voltage inputs

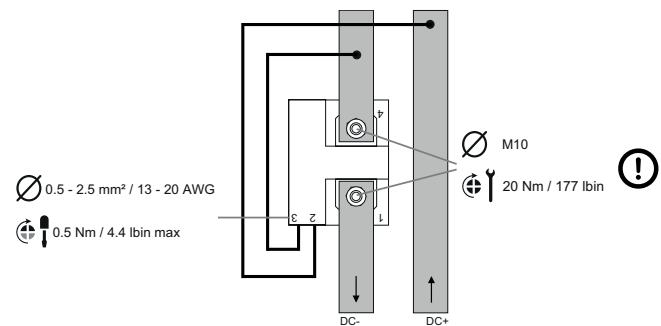


Fig. 8 Current (option B) and voltage inputs

### Communication and power supply

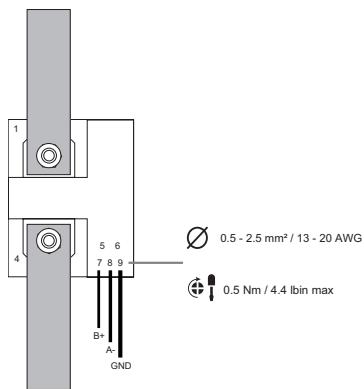


Fig. 9 RS485 Modbus or SML port

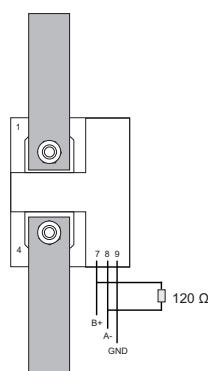


Fig. 10 RS485 terminalization.  
Last device on RS485

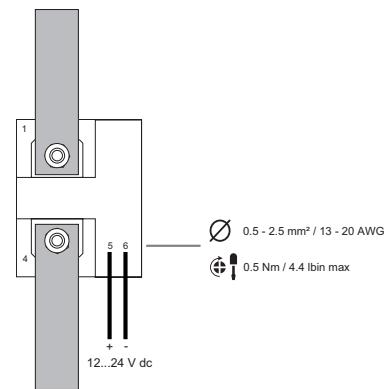


Fig. 11 Power supply

## References

### ► Order code

 **DCT1 □ V10 L S1 X**

Enter the code option instead of □

Code	Options	Description
<b>DCT1</b>	-	Model
<input type="checkbox"/>	<b>A30</b>	Max current: 300 A
	<b>A60</b>	Max current: 600 A
<b>V10</b>	-	Max voltage: 1000 V
<b>L</b>	-	Power supply: 12 - 24 V dc
<b>S1</b>	-	RS485 Modbus RTU
<b>X</b>	-	Standard model

 **DCT1 □ V10 L □ EC**

Enter the code option instead of □

Code	Options	Description
<b>DCT1</b>	-	Model
<input type="checkbox"/>	<b>A30</b>	Max current: 300 A
	<b>A60</b>	Max current: 600 A
<b>V10</b>	-	Max voltage: 1000 V
<b>L</b>	-	Power supply: 12 - 24 V dc
<input type="checkbox"/>	<b>S2</b>	RS485 Modbus RTU ( 256-bit signature)
	<b>S3</b>	RS485 Modbus RTU ( 384-bit signature)
	<b>K1</b>	SML
<b>EC</b>	-	Evaluation certificate according to EN IEC 62052-11, EN IEC 62052-31, EN IEC 62053-41*, VDE-AR-E 2418-3-100 Annex A and WELMEC 7.2

\* Except for durability test

 **CARLO GAVAZZI compatible components**

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



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