



## **DC EVSE Adapter**

A 1732

## **Instruction manual**

*Version 1.1.2, Code No. 20 753 435*



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# 1 General description


DC EVSE Adapter is a multi-function test adapter intended for safety and functional testing of DC and AC EVSEs (Electric vehicle supply equipment).

Main functions and features are:

- Simulation of electrical vehicle CCS, CHAdeMO and AC charging systems
- Simulation of faults on PE and control connections
- Monitoring of communication between charging station and adapter (via MI 3155)
- Test sockets for connection of safety testers
- Different safety and functional tests when connected with Metrel Eurotest MI 3155.





## 1.1 Warnings and notes

In order to maintain the highest level of operator safety while carrying out various tests and measurements Metrel recommends keeping your adapter in good condition and undamaged. When using the adapter, consider the following general warnings:

- › **The  symbol on the test equipment means »Read the Instruction manual with special care for safe operation«. The symbol requires an action!**
- › **If the test equipment is used in a manner not specified in this Instruction manual, the protection provided by the equipment could be impaired!**
- › **Follow the instructions in Instruction manual carefully, otherwise the use of the test equipment may be dangerous for the operator, the test equipment itself or for the tested object!**
- › **Do not use the test equipment or any of the accessories if any damage is noticed!**
- › **The test sockets are designed for connecting test instruments with the necessary safety ratings. The Metrel EurotestXD MI 3155 is suitable for this purpose. If you want to connect any other test devices, please contact Metrel or your distributor.**
- › **Consider measuring category of test equipment connected to the adapter**
- › **Consider power consumption of the adapter. The adapter should not be connected to low-current service or other mains sockets for special use.**
- › **Fan openings - The grids must be kept clean and uncovered during operation.**
- › **During operation the adapter is subjected to high AC and DC voltages. All normal safety precautions must be taken in order to avoid risk of electric shock!**
- › **Only adequately trained and competent persons may operate the equipment.**
- › **Service intervention or adjustment is only allowed to be carried out by competent authorized personnel!**

- **The CAN compartment must be always covered. Otherwise, the protection provided by the equipment will be impaired!**

### 1.1.1 Markings on the adapter:

	Read the Instruction manual with special care to safety operation«. The symbol requires an action!
	Mark on your equipment certifies that it meets requirements of all subjected EU regulations.
	Mark on your equipment certifies that it meets requirements of all subjected UK regulations.
	This equipment should be recycled as electronic waste.

### 1.1.2 Notes related to measurement functions

#### Simulation of faults

##### Notes

- Safety faults are simulated to verify the operation of charging station's protective measures.
- Some stations may enter service mode and become locked after detecting a specific fault. If there are concerns regarding this, the user should clarify in advance with the customer.

#### Cooling of the adapter (measurements with charging included)

##### Notes

- The internal circuit warms up during the charging phases.
- Fans are preventing the circuit from overheating.
- When the adapter is switched off, the fans are stopped. Due to internal accumulation of heat, the temperature on the front panel will temporarily increase for up to 15°C and then slowly decrease.

## 1.2 Standards applied

The adapter is manufactured and tested in accordance with the following regulations:

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### *Electromagnetic compatibility (EMC)*

<b>EN 61326 - 1</b>	Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements
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### *Safety (LVD)*

<b>EN 61010 - 1</b>	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements
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<b>EN 61010 - 2 - 030</b>	Safety requirements for electrical equipment for measurement, control and laboratory use - Part 2-030: Particular requirements for testing and measuring circuits
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<b>EN 61010 - 031</b>	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 031: Safety requirements for hand-held and hand-manipulated probe assemblies for electrical test and measurement
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### *Functional*

<b>EN 61851 - 1</b>	Electric vehicle conductive charging system Part 1: General requirements
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<b>EN 61851 - 23</b>	Electric vehicle conductive charging system - Part 23: DC electric vehicle supply equipment
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<b>ISO 15118-1</b>	Road vehicles -- Vehicle to grid communication interface -- Part 1: General information and use-case definition
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<b>DIN SPEC 70121</b>	Digital communication between an AC fast charging station and an electric vehicle for control of DC charging according to ISO/IEC 15118 and IEC 61851-24
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<b>CHAdeMO</b>	CHAdeMO communication protocol
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## 2 Accessories

The accessories consist of standard and optional accessories. Optional accessories can be delivered upon request. See *attached* list for standard configuration and options or contact your distributor or see the METREL home page: <http://www.metrel.si>.

### 2.1 Standard set

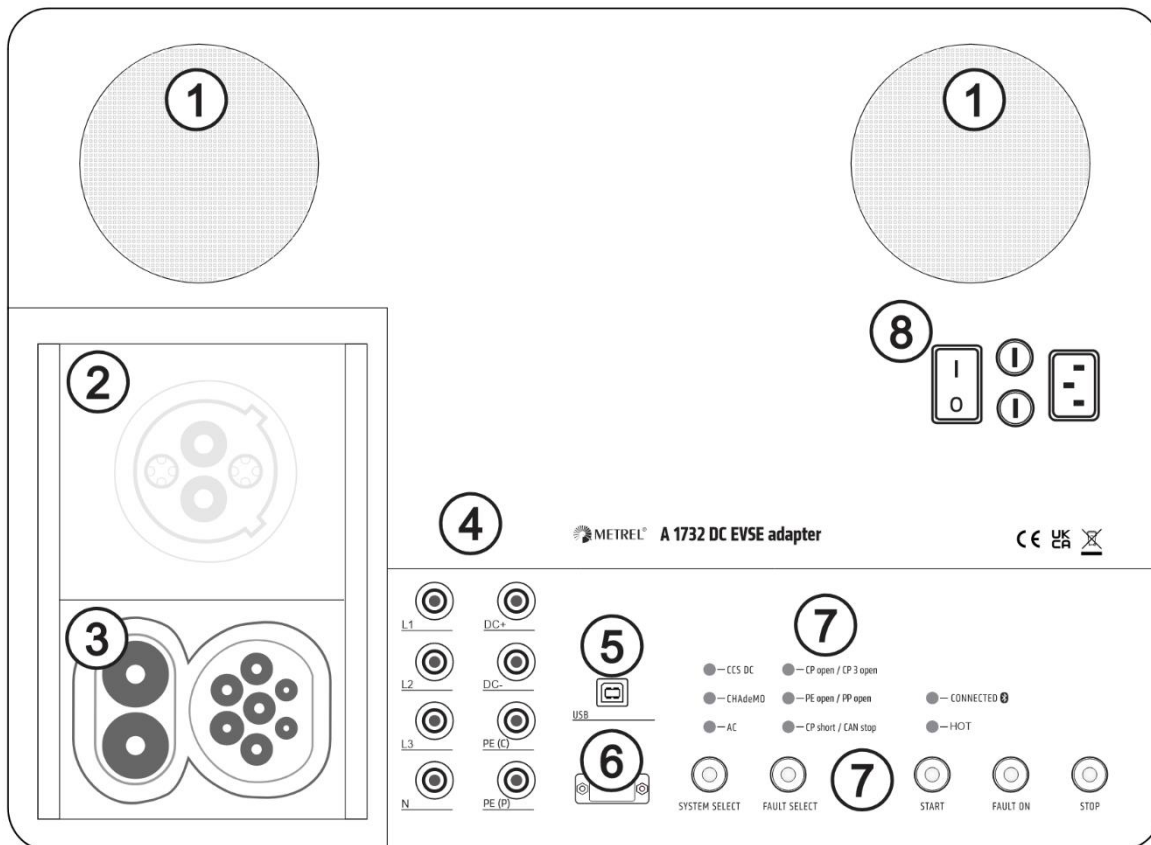
- › DC EVSE Adapter A 1732
- › Mains supply cord
- › 3-wire test lead 3 x 1.5 m, A 1781
- › USB cable
- › Instruction manual
- › Calibration certificate

### 2.2 Optional accessories

See the attached sheet for a list of optional accessories that are available on request from your distributor.

### 3 Adapter description

#### 3.1 Front panel



1	Cooling fans
2	CHAdeMO socket
3	CCS2 socket
4	DC+ / DC- / PE (C, P) / L1 / L2 / L3 / N safety sockets for connection with a safety tester
5	USB port
6	Cover for access to internal CAN port (for service only)
7	Keys and LEDs fields
8	Mains power supply inlet (CEE 16 A), switch and fuse compartments. For changing the fuses refer to chapter Fuses.



## 4 Adapter operation

### 4.1 Function of keys and LEDs

Keys	Function
System select	Selects the charging system (CCS, CHAdeMO or AC).
Start	Starts charging sequence.
Stop	Stops charging sequence.
Error select	Selects type of fault.
Error on	Perform error.

LEDs	Action	Meaning
Mains	on	Adapter is on and ready to use and connected via Bluetooth to Metrel instrument.
	blinking	Adapter is on and ready to use. No connection to Metrel instrument.
CCS	on	CCS system is selected.
	blinking	Charging sequence in progress.
CHAdeMO	on	CHAdeMO system is selected.
	blinking	Charging sequence in progress.
AC	on	AC system is selected.
	blinking	Charging sequence in progress.
CP open / CP 3 open	on	Fault CP open (CCS, AC) or CP3 open (CHAdeMO) is selected.
	blinking	Fault activated.
PE open / PE open	on	Fault PE (PP) open* (CCS, AC) or PE open (CHAdeMO) is selected.
	blinking	Fault activated
CP short / CAN stop	on	Fault CP short (80 $\Omega$ ) (CCS, AC) or CAN communication stopped (CHAdeMO) is selected.
	blinking	Fault activated
Hot	blinking	Internal circuit is hot. Charging sequence can be restarted after the circuit cools down (mains = on).

### 4.2 Autonomous operation

With the adapter alone it is possible:

- › to carry out complete charging sequences
- › to simulate some typical connection Errors.

### 4.3 Operation in combination with MI 3155 EurotestXD

In combination with the test instrument MI 3155 EurotestXD, the adapter offers additional measurements.

See *MI 3155 EurotestXD Instruction manual* for more information.

#### 4.3.1 CCS, CHAdeMO

For operation with the instrument the adapter must be connected to the instrument via Bluetooth. See *MI 3155 EurotestXD Instruction manual* for more information.

##### Note

- The Bluetooth connection is active if a measurement for testing EVSE is selected on the instrument.

#### 4.3.2 AC

Standard safety tests can be carried out with the instrument MI 3155 EurotestXD (L1, L2, L3, N and PE outputs on the adapter). Bluetooth connection is not required.

For EVSE functional test and EVSE Error measurements, the adapter must be connected via Bluetooth with the instrument. See *MI 3155 EurotestXD Instruction manual* for more information.

##### Note

- The Bluetooth connection is active if a measurement for testing EVSE is selected on the instrument.

#### 4.3.3 Limitations on adapter when controlled by the instrument

While measurements controlled by the instrument are carried out, only the STOP key on the adapter is active.

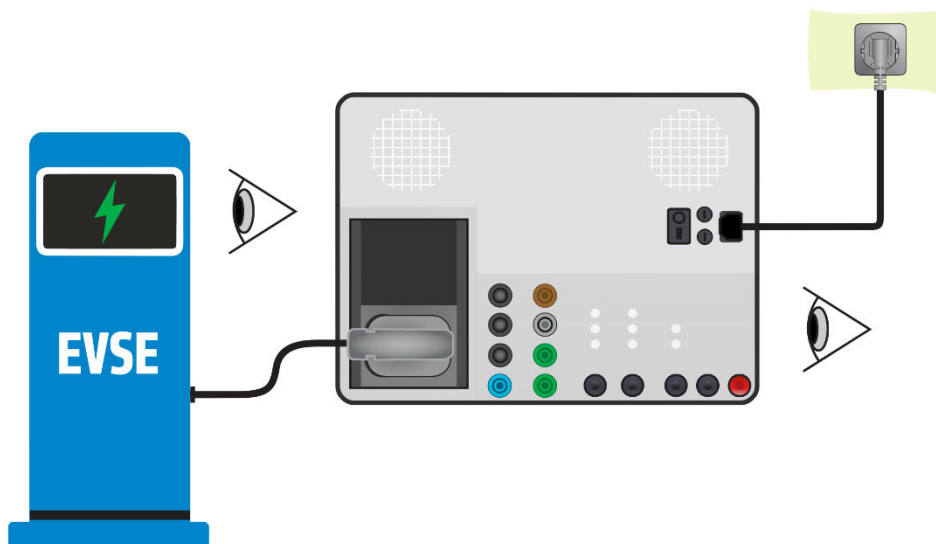
##### Note

- STOP on the adapter does not have the same function as STOP on the instrument.
  - STOP on the instrument will regularly conclude the measurement.
  - STOP on the adapter will stop the EVSE immediately. The measurement on the instrument will proceed, and the results may be incorrect.

## 5 Single tests

### 5.1 Running a charging sequence

#### Test circuit



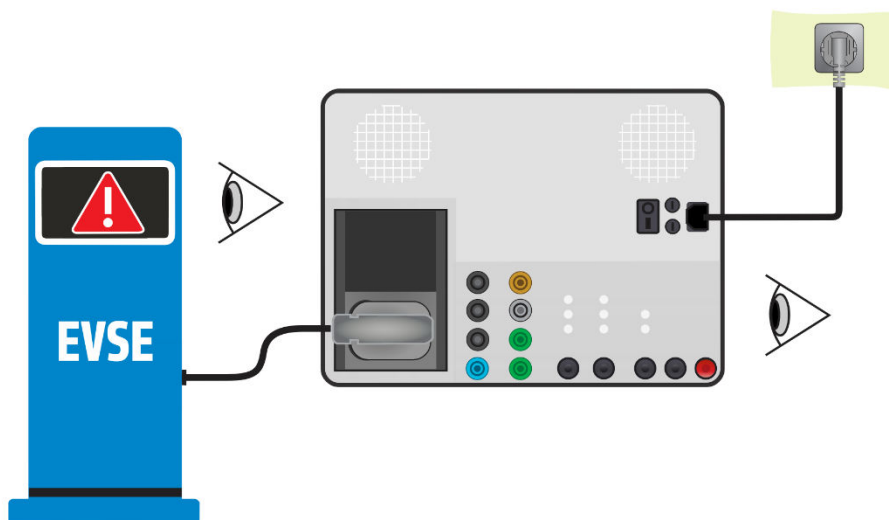
#### Measurement procedure

- › Set charging system on the adapter.
- › Insert charging plug in the charging inlet.
- › Authorize and follow instructions on the EVSE.
- › Press START key on the adapter.
- › Press START on the EVSE, (if needed).
- › Check progress of the charging sequence on the EVSE and the LEDs on the adapter.
- › CCS / CHAdeMO: The charging process will be stopped automatically after 20 s. Press STOP key to stop it earlier.
- › AC: Press STOP key to end charging.
- › Check that the EVSE went through all steps of the charging sequence successfully.

## 5.2 Simulation of faults

This test is intended for simulation of errors that must cause an immediate shutdown of the EVSE.

### Test circuit



### Measurement procedure

- › Set correct charging system.
- › Set the error to be simulated (Error select key).
- › Insert charging plug in the adapter inlet.
- › Authorize and follow instructions on the EVSE.
- › Press START key on the adapter.
- › Press START on the EVSE, (if needed).
- › Check progress of the charging sequence on the EVSE and the LEDs on the adapter.
- › After the EVSE starts charging, make the fault anytime within 20 s for DC charging system, for AC charging system there is no time limitation.
- › Check the response of the EVSE – charging sequence must be stopped and appropriate Error message must be shown on EVSE.
- › For AC charging system manual press STOP button is needed, to finish procedure and start a new one.

If no fault was triggered the charging will stop automatically after 20 s for DC charging system, for AC charging system manual stop is needed. It can be stopped earlier by pressing STOP key.

### WARNING

- **EVSE may become locked.**  
See chapter *Notes related to measurement functions* for details.

## 6 Upgrading the adapter

The adapter can be upgraded from a PC via the USB communication port. This enables to keep the adapter up to date even if the standards or regulations changes. Download the latest firmware on the Metrel download centre: <https://www.metrel.si/en/downloads/>

### Procedure

- › Connect adapter to PC with USB cable
- › Special upgrading software - **FlashMe** will guide you through the upgrading procedure.

## 7 Maintenance

### 7.1 Periodic calibration

It is essential that all measuring instruments are regularly calibrated in order for the technical specification listed in this manual to be guaranteed. We recommend an annual calibration.

### 7.2 Fuses

The adapter has two replaceable fuses:

F1, F2: T 10 A / 500 V / (32 × 6) mm / 1500 A: intended for general adapter protection.

#### WARNING

- **Switch off the adapter and disconnect all test accessories, mains cord and EVSE from the adapter, before replacing the fuses.**
- **Replace blown fuses with the same type as defined in this document.**

### 7.3 Service

For repairs under or out of warranty please contact your distributor for further information.

Unauthorized person is not allowed to open the adapter. There are no user replaceable parts inside the adapter.

### 7.4 Cleaning

Fan openings - The grids must be kept clean. Ensure that the fan grids are free from dust and debris.

Use a soft, slightly moistened cloth with soap water or alcohol to clean the surface of adapter. Leave the adapter to dry totally before using it.

#### Notes

- Do not use liquids based on petrol or hydrocarbons!
- Do not spill cleaning liquid over the adapter!

## 8 Technical specifications

### 8.1 General data

#### Mains supply

Supply voltage, frequency.....205 ... 254 V AC, 50 Hz / 60 Hz

Max. power consumption.....2000 VA

Mains supply overvoltage category ..... CAT II / 300V

Altitude..... $\leq$  2000 m

#### Measuring category

Measuring category.....Cat III / 300 V

#### Protection classifications

Power supply .....Class I

Pollution degree .....2

Degree of protection .....IP 40

Case .....Shock proof plastic / portable

#### Communication

USB 2.0 .....Standard USB Type B

Bluetooth .....v4.2 BR/EDR and BLE specification

#### EMC

Emission .....Class B (Group 1)

Immunity .....Industrial environment

#### Reference conditions

Reference temperature range: .....15 °C ... 35 °C

Reference humidity range:.....35 % ... 65 % RH

#### Operation conditions

Operation .....Outdoor use

Working temperature range: .....-10 °C ... +40 °C

Maximum relative humidity: .....85 % RH (0 °C ... 40 °C), non-condensing

**Storage conditions**

Temperature range:.....-20 °C ... +60 °C  
 Maximum relative humidity:.....90 % RH (-10 °C ... +40 °C)  
 80 % RH (40 °C ... 60 °C)

**General**

Dimensions (w×h×d): .....50 cm × 25 cm × 41 cm  
 Weight .....16.2 kg

**Communication standards**

CHAdeMO: .....Versions 0.9.1 and higher  
 CCS (DC):.....ISO 15118-1or DIN SPEC 70121  
 ISO by default, DIN otherwise  
 CCS (AC).....EN 61851-1 low level

**Simulated EV battery**

Voltage: .....280 V to 310 V  
 Load (charging) current.....ca 4.9 A at 300 V

**Input resistance**

DC+/DC-: .....24 MΩ  
 DC+/PE, DC-/PE: .....> 200 MΩ

**8.2 Measurements****Note**

- Measurements below are measured on the adapter and are displayed on the test instrument; for example, MI 3155 EurotestXD.

**8.2.1 Voltage and Current****Voltage DC+ DC-**

Measuring range (V)	Resolution (V)	Accuracy
0 ... 550	1	±(3 % of reading + 2 digits)

Used for results: U<sub>max</sub> (Iso), U<sub>max</sub> (charge), U

**Charging Current**

Measuring range (A)	Resolution (A)	Accuracy
0.0 ... 6.9	0.1	±(3 % of reading + 2 digits)

Used for results: I<sub>max</sub> (charge), I.



## 8.2.2 Discharging time

**t**

Measuring range (s)	Resolution (s)	Accuracy
0.00 ... 9.99	0.01	±(5 % of reading + 10 digits)

### Test method

Time interval from the moment the simulated EV contactor in adapter opens until the voltage  $U_{DC+,DC-}$  is < 60 V. The time from the shutdown command to the start of voltage decreasing is not included in this measurement interval.

### Ures – Residual voltage

Measuring range (V)	Resolution (V)	Accuracy
0.0 ... 99.9	0.1	±(5 % of reading + 5 digits)
100 ... 550	1	

## 8.2.3 Error

Simulated errors CCS: ..... CP open, PE (PP) open\*, CP short (80 Ω)

Simulated errors CHAdeMO: ..... CP 3 open, PE open, CAN stop

Simulated errors AC: ..... CP open, PE (PP) open\*, CP short (80 Ω)

\* - when PE open, PE of PP circuit is also disconnected

**toff**

Measuring range (s)	Resolution (s)	Accuracy
0.01 ... 9.99	0.01	±(2 % of reading + 2 digits)
10.0 ... 19.9	0.1	±2 % of reading

### Test method

Time interval from making the error until the charging voltage  $U_{DC+,DC-}$  drops to < 60 V.

### PP resistance range

Values: ..... Error, 100 Ω, 220 Ω, 680 Ω, 1500 Ω

### Duty cycle

Measuring range (%)	Resolution (%)	Accuracy
0 ... 100	1	±1 %

## Appendix A - Charging sequence states

### Note

- The charging sequence states are shown on the MI 3155 EurotestXD.

### A.1 CCS DC

State	Note
Default	No communication with EVSE
Initialization	
Authentication	
Parameter	
Isolation	
Pre-charge	
Charge	Charging with 300 V, 5 A
Stop charge	
Session stop	
Shutoff	
Error	
SLAC	

### A.2 CHAdeMO

State	Note
Default	No communication with EVSE
Vehicle unconnected A	
Initialization B1	
Initialization B2	
Initialization B3	
Energy transfer C	Charging with 300 V, 5 A
Shutdown B1	
Shutdown B2	
Shutdown B3	
Shutdown B4	
Error initialization B	
Error E	

## A.3 AC

### Low level communication

State	Note
State A	No communication with EVSE / vehicle not connected
State B	Ready for charge / vehicle connected
State C	Charging
Error	Error