Multifunctional analyzer
for electric vehicle charging stations

EVSE-100

index: WMGBEVSE100

MeasureEffect™

CP+ CP-
f D I_{max}
graphs

R_E
R_{ISO} Z_S R_{CONT}
complex measurements of installations

CAT III
300 V

IP54
closed cover

Li-Ion BATTERY

TOUCH SCREEN

BLUETOOTH

Diagnostics and measurements of stationary AC charging stations (EVCS)

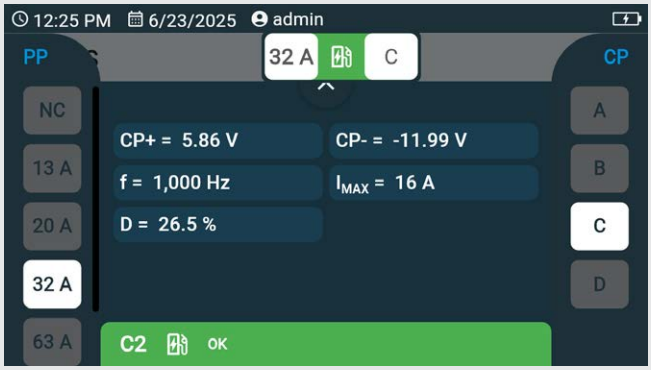
Diagnostics and measurements of portable AC charging stations (ICCB)

Testing of charging cables

Comprehensive charging station diagnostics with a single instrument

Capabilities

Multifunctional analyzer EVSE-100 is an instrument dedicated to diagnostics of electric vehicle charging stations and cables. Using a single device, we will perform a set of tests on these objects, ending with the generation of a professional report. Through appropriate simulation of CP and PP circuits, the meter can put the station into various operating states. This allows us to verify the correctness of the control system and perform measurements in the field of electric shock protection. We can complete the verification of functionality and safety by simulating errors on the power supply side, i.e. the charging station (ICCB), and charging side of the vehicle (CP circuit).



Sonel MeasureEffect™

The meter is a part of the **Sonel MeasureEffect™** platform. It is a comprehensive system that enables you to take measurements, store and manage data, and provides multi-level control of your instruments.

Applications

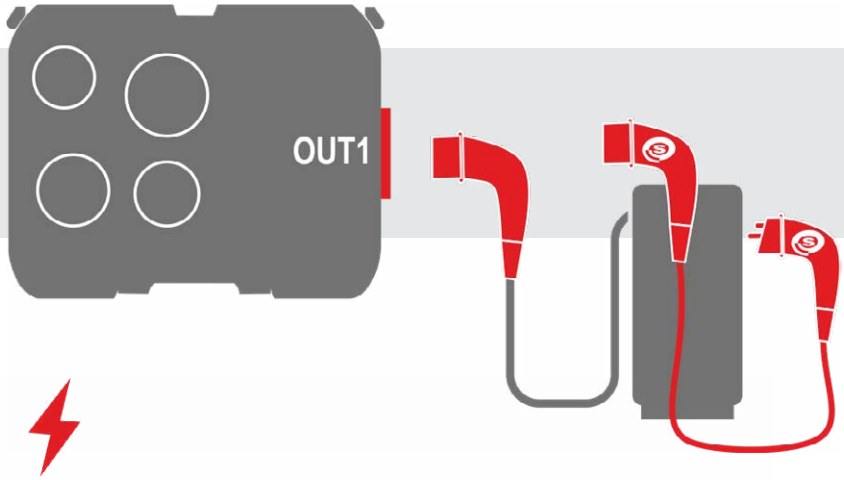
The meter makes it possible to carry out diagnostics on:

- AC electric vehicle charging stations with type 2 connector with socket or fixed charging cable (1-phase and 3-phase),
- portable electric vehicle charging stations with type 2 connector (1-phase and 3-phase),
- charging cables.

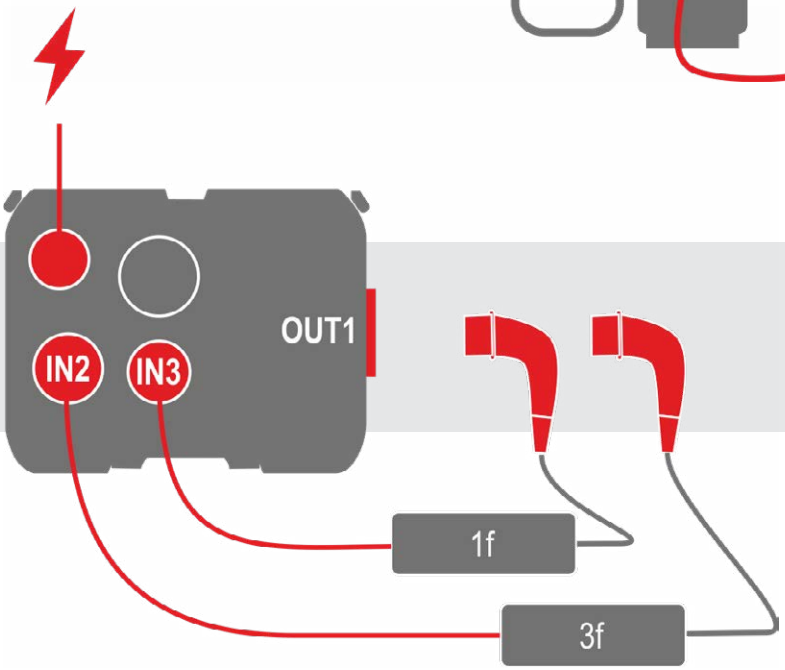
Basic functions of the device

- Simulation of PP cable parameters:
  - open circuit,
  - 13 A, 20 A, 32 A, 63 A, 80 A.
- Simulation of CP communication:
  - state A – vehicle not connected,
  - state B – vehicle connected, not charging,
  - state C – vehicle connected, charging without ventilation.
  - state D – vehicle connected, charging with ventilation.
- Safety measurements:
  - measurement of short circuit loop Z,
  - measurement of parameters of RCD circuit breakers (AC, A, B, 6 mA DC),
  - measurement of insulation resistance R_{ISO},
  - measurement of R_{CONT},
  - phase sequence indication,
  - resistance of coding resistor R_C,
  - measurements of grounding R_E.
- EVSE analysis – diagnostics:
  - CP+, CP- voltage,
  - frequency f (PWM),
  - signal filling D (PWM),
  - maximum charging current I_{MAX},
  - graph of CP+, CP-, f, D, I_{MAX},
  - t_{off} off time,
  - t_{on} on time.
- EVSE analysis – simulation of errors (ICCB, EVCS):
  - CPsh – short circuit of CP to PE,
  - Dsh – diode short circuit,
  - PEop – interruption in PE.
- EVSE analysis – simulation of power supply circuit faults (ICCB):
  - L1op – interruption in phase L1,
  - L2op – interruption in phase L2,
  - L3op – interruption in phase L3,
  - Nop – interruption in N,
  - PEop – interruption in PE,
  - L↔PE – interchanged L and PE wires,
  - U_{EXT}(PE) – voltage on PE wire.
- EVSE analysis – transition time between states.

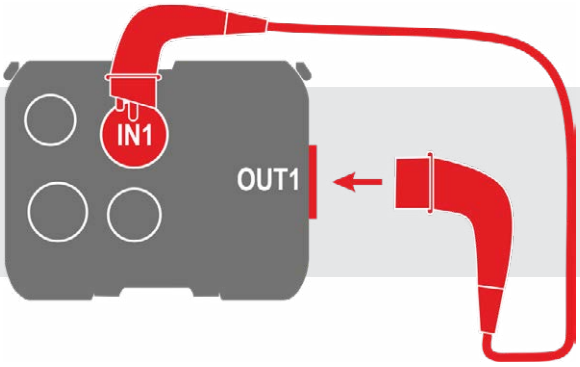
Diagnostics and measurements of stationary, pillar-type and wall-box AC charging stations (EVCS)



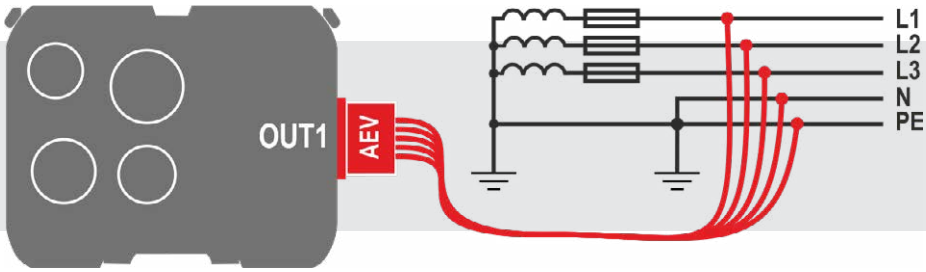
Diagnostics and measurements of portable AC charging stations (ICCB)



Testing of charging cables



Complex measurements of installations



Specifications

Measurement functions	Measurement range	Display range	Resolution	Accuracy ±(% m.v. + digits)
Measurements of mains parameters				
Voltage	0 V...500 V	0 V...500 V	from 0.1 V	from ±(2% m.v. + 2 digits)
Frequency	45.0...65.0 Hz	45.0...65.0 Hz	0.1 Hz	±(0.1% m.v. + 1 digit)
Fault loop impedance				
Fault loop Z_{L-PE}, Z_{L-N}, Z_{L-L}	from 0.13 Ω...1999 Ω acc. to EN IEC 61557	0.00 Ω...1999 Ω	from 0.01 Ω	±(5% m.v. + 3 digits)
Fault loop Z_{L-PE} in RCD mode	from 0.5 Ω...1999 Ω acc. to EN IEC 61557	0.00 Ω...1999 Ω	from 0.01 Ω	±(6% m.v. + 5 digits)
Measurements of RCD parameters				
RCD tripping test and measurement of tripping time t_A measuring current 0.5 $I_{\Delta n}$, 1 $I_{\Delta n}$, 2 $I_{\Delta n}$, 5 $I_{\Delta n}$				
general and short-time delay RCD	0 ms...300 ms	0 ms...300 ms	1 ms	from ±(2% m.v. + 2 digits)
selective RCD	0 ms...500 ms	0 ms...500 ms	1 ms	from ±(2% m.v. + 2 digits)
6 mA DC EV RCD and RCM	0 ms...10.0 s	0 ms...10.0 s	from 1 ms	±(2% m.v. + 3 digits)
Measurement of RCD tripping current I_A measuring current 0.2 $I_{\Delta n}$...2.0 $I_{\Delta n}$				
for sinusoidal residual current (AC type)	3.0 mA...500 mA	3.0 mA...500 mA	from 0.1 mA	±5% $I_{\Delta n}$
for unidirectional residual current and unidirectional with the 6 mA DC bias (type A)	3.5 mA...420 mA	3.5 mA...420 mA	from 0.1 mA	±10% $I_{\Delta n}$
for direct residual current (type B)	1.0 mA...600 mA	1.0 mA...600 mA	from 0.1 mA	from ±6% $I_{\Delta n}$
Earth resistance				
3-pole method	0.85 Ω...1999 Ω acc. to EN IEC 61557-5	0.00 Ω...1999 Ω	from 0.01 Ω	from ±(3% m.v. + 5 digits)
Auxiliary electrodes resistance	0 Ω...1.99 kΩ	0 Ω...19.9 kΩ	from 1 Ω	±(5% (R_S+R_E+R_H) + 8 digits)
Insulation resistance				
Measuring voltage 50 V	50 kΩ...49.9 MΩ acc. to EN IEC 61557-2	0 kΩ...49.9 MΩ	from 1 kΩ	±(5% m.v. + 8 digits)
Measuring voltage 100 V	100 kΩ...99.9 MΩ acc. to EN IEC 61557-2	0 kΩ...99.9 MΩ	from 1 kΩ	±(5% m.v. + 8 digits)
Measuring voltage 250 V	250 kΩ...199.9 MΩ acc. to EN IEC 61557-2	0 kΩ...199.9 MΩ	from 1 kΩ	±(5% m.v. + 8 digits)
Measuring voltage 500 V	500 kΩ...599.9 MΩ acc. to EN IEC 61557-2	0 kΩ...599.9 MΩ	from 1 kΩ	±(5% m.v. + 8 digits)
Measuring voltage 1000 V	1000 kΩ...599.9 MΩ acc. to EN IEC 61557-2	0 kΩ...599.9 MΩ	from 1 kΩ	±(8% m.v. + 8 digits)
Resistance of protective conductors and equipotential bondings				
Measurement of resistance of protective conductors and equipotential bondings with ±200 mA current	0.12 Ω...400 Ω acc. to EN IEC 61557-4	0.00 Ω...400 Ω	from 0.01 Ω	±(2% m.v. + 3 digits)
Continuity testing of EV cable wires L1, L2, L3, N, PE, CP	0.20 Ω...400 Ω acc. to EN IEC 61557-4	0.00 Ω...400 Ω	from 0.01 Ω	±(3% m.v. + 5 digits)
Phase sequence indication	in the same direction (correct), opposite direction (incorrect), U_{L-L} voltage: 100 V...440 V (45 Hz...65 Hz)			
Resistance of coding resistor R_c				
Resistor resistance (PP-PE) – IN PEop socket	0.32 Ω...6000 Ω acc. to EN IEC 61557-4	0.00 Ω...6000 Ω	from 0.01 Ω	±(3% m.v. + 8 digits)
Resistor resistance (PP-PE) – OUT PEpp socket	0.32 Ω...6000 Ω acc. to EN IEC 61557-4	0.00 Ω...6000 Ω	from 0.01 Ω	±(3% m.v. + 8 digits)

m.v. - measured value

Specifications

Measurement functions	Measurement range	Display range	Resolution	Accuracy ±(% m.v. + digits)
Simulation of PP cable parameters				
NC	Open circuit	Open circuit	-	-
13 A	1500 Ω	1500 Ω	-	±2%
20 A	680 Ω	680 Ω	-	±2%
32 A	220 Ω	220 Ω	-	±2%
63 A	100 Ω	100 Ω	-	±2%
80 A	56 Ω	56 Ω	-	±3%
Simulation of CP communication				
State A – vehicle not connected	Open circuit	Open circuit	-	-
State B – vehicle connected, not charging	2740 Ω	2740 Ω	-	±1%
State C – vehicle connected, charging without ventilation	882 Ω	882 Ω	-	±1%
State D – vehicle connected, charging with ventilation	246 Ω	246 Ω	-	±1%
$EVSE_{DIAG}$ diagnostics				
Voltage CP+, CP-	-19.99 V...19.99 V	-19.99 V...19.99 V	0.01 V	±(1% m.v. + 8 digits)
Frequency f (PWM)	950 Hz...1050 Hz	800 Hz...1200 Hz	1 Hz	±1 digit
Duty cycle D (PWM)	3%...97%	1.0%...99.0%	0.1%	±3 digits
Maximum charging current I_{MAX}	0 A...80 A	0 A...80 A	1 A	-
Simulation of ERR OUT errors (ICCB, EVCS)				
CPsh – short circuit of CP to PE	0...3100 ms	0...3100 ms	1 ms	±(3% m.v. + 3 digits)
Dsh – diode short circuit	0...3100 ms	0...3100 ms	1 ms	±(3% m.v. + 3 digits)
PEop – interruption in PE	0...1000 ms	0...1000 ms	1 ms	±(3% m.v. + 3 digits)
Simulation of ERR IN errors (ICCB)				
L/L1op – interruption in phase L/L1	as in $EVSE_{DIAG}$	as in $EVSE_{DIAG}$	-	as in $EVSE_{DIAG}$
L/L2op – interruption in phase L/L2	as in $EVSE_{DIAG}$	as in $EVSE_{DIAG}$	-	as in $EVSE_{DIAG}$
L/L3op – interruption in phase L/L3	as in $EVSE_{DIAG}$	as in $EVSE_{DIAG}$	-	as in $EVSE_{DIAG}$
Nop – interruption in N	as in $EVSE_{DIAG}$	as in $EVSE_{DIAG}$	-	as in $EVSE_{DIAG}$
PEop – interruption in PE	as in $EVSE_{DIAG}$	as in $EVSE_{DIAG}$	-	as in $EVSE_{DIAG}$
L1↔PE – interchanged L1 and PE wires	as in $EVSE_{DIAG}$	as in $EVSE_{DIAG}$	-	as in $EVSE_{DIAG}$
L2↔PE – interchanged L2 and PE wires	as in $EVSE_{DIAG}$	as in $EVSE_{DIAG}$	-	as in $EVSE_{DIAG}$
L3↔PE – interchanged L3 and PE wires	as in $EVSE_{DIAG}$	as in $EVSE_{DIAG}$	-	as in $EVSE_{DIAG}$
U_{EXT}(PE) – voltage on PE wire	as in $EVSE_{DIAG}$	as in $EVSE_{DIAG}$	-	as in $EVSE_{DIAG}$
Transition time between states				
A → C, B → C, A → D, B → D	0...3100 ms	0...3100 ms	1 ms	±(3% m.v. + 3 digits)
C → A, C → B, D → A, D → B	0...1000 ms	0...1000 ms	1 ms	±(3% m.v. + 3 digits)

m.v. - measured value

Other technical data

Technical data	
Display type	LCD 5” 1280 x 720 px
Power supply	mains: 220…240 V / 380…415 V, 50…60 Hz rechargeable battery: Li-Ion 7.2 V 9.8 Ah
Safety and work conditions	
Measuring category according to EN IEC 61010-2-030	
Altitude ≤2000 m a.s.l.	CAT III 300 V
Altitude ≤3000 m a.s.l.	CAT II 300 V
Ingress protection	
Open cover	IP20
Closed cover	IP54
Type of insulation according to EN 61010-1 and EN IEC 61557	double
Dimensions	429 x 328 x 236 mm
Weight	8.7 kg
Operating temperature	-10…+45°C
Storage temperature	-20…+70°C
Humidity	20…90%
Nominal temperature	+23°C ± 2°C
Reference humidity	40%…60%
Memory and communication	
Memory of measurement results	9999 records
Data transmission	USB, RJ-45, Bluetooth, Wi-Fi
Other information	
Quality standard - development, design and production	ISO 9001 ISO 14001 ISO 45001
The product meets the EMC (emission for industrial environment) requirements according to standards	EN IEC 61326-1 EN IEC 61326-2-2

Standard accessories

	AEV-100 adapter WAADAAEV100	1
	Test lead 1.2 m (banana plugs) blue / yellow / black WAPRZ1X2BUBB / WAPRZ1X2YEBB / WAPRZ1X2BLBB	1 / 1 / 1
	BNC transmission cable WAPRZBNC	1
	Pin probe 1 kV (banana socket) blue / yellow / black WASONBUOGB1 / WASONYEOGB1 / WASONBLOGB1	1 / 1 / 1
	Crocodile clip 1 kV 20 A yellow WAKROYE20K02	1
	EVCAB cable 2.2 m (type 2 male/type 2 female) WAKABEVT2T2	1
	Mains cable 230 V (16 A 5P socket) WAPRZZAS16P	1
	L-4 carrying case WAFUTL4	1
	USB cable WAPRZUSB	1
	Factory calibration certificate	1

Optional accessories

CMP-100 leakage current digital clamp meter

WMGBCMP100

Crocodile clip, blue, 1 kV, 20 A

WAKROBU20K02

Crocodile clip, black, 1 kV, 20 A

WAKROBL20K01

Earth contact test probe (rod), 25 cm

WASONG25

Test lead 15 m, blue (banana plugs, on H-frame reel)

WAPRZ015BUBBN

Test lead 30 m, red (banana plugs, on H-frame reel)

WAPRZ030REBBN

Three-phase mains cable (16 A 5P socket)

WAPRZZAS16P3F

Sonel Reader software

WAPROREADER

Sonel Reports Plus software

WAPROREPORTSPLUS

Calibration certificate with accreditation