TECHNICAL DATA

Fluke FEV100 Adapter Kit for Electric Vehicle Charging Stations

VEHICLE SIMULATION
CP Control Pilot state simulation tests different charging states

GROUNDING PROTECTION
PE Pre-Test for dangerous voltage

GFCI TESTING
Stay protected from and check risk of electric shock

COMPATIBILITY
Integrates into Fluke portfolio of test and measurement tools

SAE J1772
Complies with North American standards

Test the functionality and safety of electrical vehicle charging stations, easily and reliably

Test the safety and performance of type 1, level 1 or level 2 electric vehicle ac charging stations (EVSEs) with the Fluke FEV100. This test adapter simulates the presence of an electrical vehicle, allowing you to conduct tests in combination with appropriate test instruments such as a digital multimeter or oscilloscope. Use the FEV100 to verify an EVSE is working properly after install and during periodic maintenance, or troubleshoot an EVSE if it is not delivering the appropriate charge.

Safety

EVSE charging cables may become damaged over the course of use, increasing electric shock risks to users. Stay protected from and check risk of electric shock with the GFCI trip test. This function verifies the breaker of the EVSE is connected by detecting ground faults. Additionally, the PE grounding protection pre-test verifies that there is no presence of dangerous voltage at the ground terminal.

Simplicity and convenience

Perform a variety of tests including ground fault checks, insulation of wires, measuring voltage and duty cycle to see max current available for charging all with one adapter that safely integrates with the Fluke portfolio of test and measurement tools. There is no need to bring an electric vehicle onsite for EVSE troubleshooting: the adapter acts as an electric vehicle when connected to an EVSE for easy performance and maintenance testing.

How to test a charging station

Once an EVSE recognizes it is connected to a "car" and is ready for charging, the adapter tests if the EVSE is performing the way it should be.

1. Perform the safety grounding protection pre-test to verify that no dangerous voltage is present in the grounding circuit. If the indicator lights up, it is possible that the electrical wiring has been set up improperly or there is a grounding malfunction. In this instance stop further testing immediately and check for a possible wiring fault of the ground conductor.
2. Verify station output voltage using an additional meter, such as the 87V digital multimeter.
3. Verify station maximum preset charge current using CP terminals and a meter with a duty cycle function or an oscilloscope.
4. Simulate the error states as described in the SAE J1772 standard: CP error "E", GFCI trip test, and grounding error.

CP error "E" simulation

The standard SAE J1772 defines Error "E" as a state when charging station is: disconnected from vehicle, disconnected from utility, there is a loss of utility power or control pilot is short to control pilot reference (ground). This error simulation tests the station to ensure that if there is an issue with the CP of the vehicle, the station and utility will not supply a charge to the vehicle.

GFCI

Each EVSE is required to be equipped with GFCI protection. On many stations, the GFCI protection is fully automatic and does not need a manual reset after the GFCI circuit is tripped.

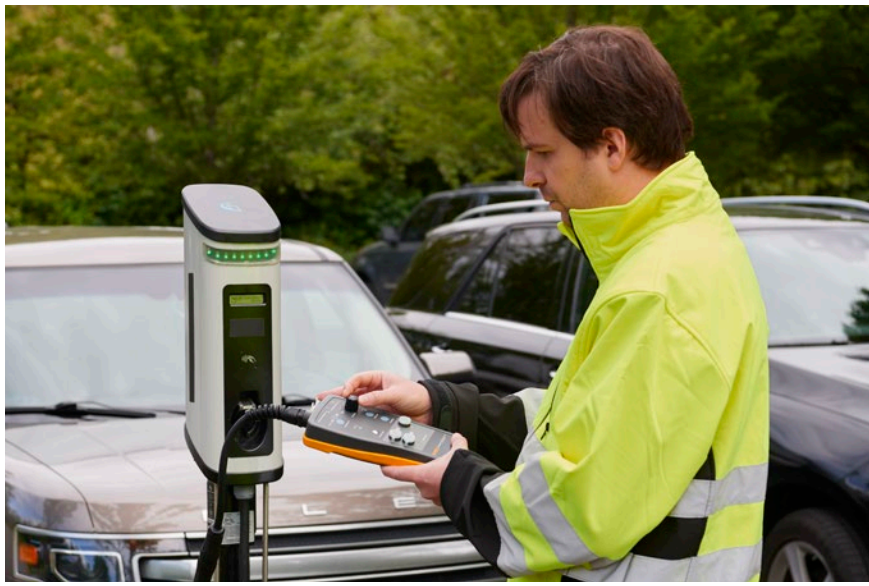
Ground Error (Ground Fault) simulation

The Ground Error button simulates an interruption of the ground conductor. As a result, the pending charging process is aborted and new charging processes are prevented.

Advanced tests such as insulation resistance, power quality, analysis of the control pilot waveform and loop impedance can also be done using the adapter in conjunction with appropriate test and measurement equipment.

Verifying charging voltage with vehicle simulation

The CP state rotary switch selector simulates various vehicle states when the test adapter is connected to the charging station. Vehicle states are simulated with different resistances connected between CP and PE conductors.



Marking of vehicle state	Electric Vehicle (EV) State	Resistance between CP and PWE	Voltage at CP terminal
A	EV not connected	Open (∞)	±12 V 1 kHz
B	EV connected, not ready to charge	2.74 kΩ	±9 V/–12 V 1 kHz
C	EV connected, ventilation required, ready to charge	882 Ω	+6 V/–12 V 1 kHz
D	EV connected, ventilation required, ready to charge	246 Ω	±12 V 1 kHz

Correlation between resistance and vehicle states

FLUKE®

Specifications

General specifications	
Input voltage	UL1/N = 120 V, UL2/N = 120 V, UL1/L2 = 208 V, 60 Hz (three-phase system) or UL1/N = 120 V, UL2/N = 120 V, UL1/L2 = 240 V, 60 Hz (single-phase system), ±10 % voltage fluctuations from nominal 2
EV connector (EVC-13)	SAE J1772 socket, 16 A (type 1, 5P single-phase)
Internal power consumption	2 W max.
Operating temperature	-4 °F to 104 °F (-20 °C to 40 °C)
Storage temperature	-4 °F to 122 °F (-20 °C to 50 °C)
Operating humidity range	10 % to 85 % relative humidity non-condensing
Storage relative humidity	0 % to 85 % non-condensing
Operating altitude	6561 ft (2000 m) max.
Dimensions (H × W × D)	Approx. 8.66 x 4.33 x 1.77 in (220 x 110 × 45 mm) without cable assembly
Weight	Approx. 4.4 lb (2 kg)
Safety standards	IEC 61010-1, Pollution Degree 2 IEC 61010-2-030
Measurement category	CAT II 250 V
IP protection class	IP54
Electromagnetic Compatibility (EMC)	
International	IEC 61326-1: Basic Electromagnetic Environment CISPR 11: Group 1, Class A Group 1: Equipment has intentionally generated and/or uses conductively-coupled radio frequency energy that is necessary for the internal function of the equipment itself. Class A: Equipment is suitable for use in all establishments other than domestic and those directly connected to a low-voltage power supply network that supplies buildings used for domestic purposes. There may be potential difficulties in ensuring electromagnetic compatibility in other environments due to conducted and radiated disturbances. Caution: This equipment is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments.
USA (FCC)	47 CFR 15 subpart B. This product is considered an exempt device per clause 15.103.
Functions	
CP States	A, B, C, D
CP Error "E"	On/off
PE Error	On/off
GFCI Test	Yes, test resistor of 2 kΩ connected between L1 and PE, time limitation 40 ms
PE Pre-Test (typical)	Visible indication >30 V on PE conductor
Outputs (for test purpose only)	
Measuring terminals L1, L2/N, PE	Max. 250 V 50/60 Hz, CAT II 250 V
CP signal output terminals	Approx. ±12 V (under normal conditions), in case of wrong wiring or error of the charging station these terminals can be hazardous ≥ max. 250 V against PE

Ordering information

Fluke FEV100 Adapter Kit for Electric Vehicle Charging Stations

Included

- Fluke FEV100/BASIC Test Adapter
- Fluke FEV-CON/TY1 Type 1 Connector & Cable
- Soft Carrying Case
- User Manual
- 3-year warranty

Visit www.fluke.com to get complete details on these products or ask your local Fluke sales representative.

The FEV100 is compatible with the Fluke portfolio of test and measurement tools. Take critical measurements such as voltage, waveform, loop impedance and resistance.

Recommended tools for use with the FEV100

- 87V Industrial Multimeter
- 376 FC True-RMS Clamp Meter with iFlex
- 1587 FC Insulation Multimeter
- 1738 Three-Phase Power Quality Logger
- 1630-2 FC Earth Ground Clamp
- BT521 Advanced Battery Analyzer
- 1664 FC Installation Multifunction Testers
- 125B Industrial ScopeMeter® Handheld Oscilloscope