FLUKE®

FEV500

Fast DC EV Charging Station Analyzer

Product Specifications

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General Specifications

Case

Material	Rugged, wheeled hardcase
Dimensions	65 cm x 50.8 cm x 30 cm (25.6 in x 20 in x 11.8 in)
Weight	26 kg (57 lb)
Display	7-in TFT, 1024 x 600 pixels with capacitive touch that supports operation with PPE gloves Ultra-bright, sunlight-readable display with up to 1,700 cd / m² Brightness adjustment with ambient light sensor
Human Interface	Keys: Power on/off, Backlight, Stop Test Power LED: Power, Battery Status, Charging

Power

Battery	RRC2040-2 Li-ion 10.8 V dc, 6.8 Ah, 73.44 Wh, customer replaceable
Runtime	Typ. 10 h (battery recharges during test)
Charging Time	Typ. 3 h with USB-C Power Delivery (PD) charger with 65 W
Backup Duration	Up to 6 months before recharge

Interfaces

Wireless Connectivity[1]	Integrated Wi-Fi (802.11b/g/n) and Bluetooth 5.2 module TX/RX Frequency Range: 2400 MHz to 2483.5 MHz Transmit Operating Power: <100 mW Encryption: WPA2-AES (WiFi), AES-CCM (Bluetooth)
USB-C	USB 2.0 high-speed for data download to PC-software TruTest™ and calibration Charging battery with USB-C Power Delivery (PD) charger 2.0 or higher with 9 V dc 1.8 A dc USB-C flash drive support for firmware updates Max. supply current: 900 mA
GPS	Global navigation satellite receiver with internal antenna for time synchronization
Fuse	11 A (not customer replaceable)
Warranty	FEV500 without battery: 2 years Accessories and battery: 1 year

Environmental Specifications

Operating Temperature	-20 °C to 50 °C (-4 °F to 122 °F)[2] Battery Charging: 0 °C to 45 °C (32 °F to 113 °F)
Storage Temperature	-20 °C to 60 °C (-4 °F to 140 °F) Recommended: 0 °C to 30 °C (32 °F to 86 °F)

[1] Activation subject to firmware support. Refer to release notes for availability.
[2] The 50 °C (122 °F) limit applies to either ambient air temperature or the hard case surface temperature when exposed to direct sunlight, whichever is higher.

Operating Humidity	IEC 60721-3-3: 3K6 ≤100 % @ -25 °C to 30 °C (-13 °F to 86 °F) 55 % @ 40 °C (104 °F) 35 % @ 50 °C (122 °F)
Operating Altitude	≤3000 m
Storage Altitude	≤12 000 m
Vibration	IEC 60721-3-3 / 3M2
Ingress Protection	IEC 60529
Lid closed and latched	IP54 (protected against dust and splashing water)
Lid opened	Electrical compartment: IP40 (protected against objects ≥1 mm) Air-cooling plenum: IP20 (protected against objects ≥12.5 mm) No protection against water ingress.
Safety	IEC 61010-1: Pollution Degree 2 IEC 61010-2-034: Measurement Category II, 300 V

Electrical Specifications

Auto-Test Sequence

Performed Tests	CSS Low-Level Communication and SLAC Test, Continuity Test, Insulation Resistance Test, Load Test including Cable Check Voltage Measurement, IMD Test, Residual Voltage Test

Continuity Test (RLO)

Measurement	Resistance between remote probe and PE pin of CCS 1/2 socket
Open-Loop Voltage	Max. 5 V dc
Test Current	Max. 10 A dc (up to 0.2 Ω)
Test Method	DC test with alternating polarity
Live Circuit Detection	Inhibits test if test probe voltage >60 V dc
Test Probe Zeroing	Select Zero in user interface to zero the test probe resistance.
Standard	IEC 61557-4

Parameter	Range	Resolution	Accuracy[1]
Resistance R_{LO}	2 Ω	<1 Ω: 0.1 mΩ ≥1 Ω: 0.0001 Ω	≤20 mΩ: ±(8 % rdg + 8 mΩ) ≤200 mΩ: ±(4 % rdg + 10 mΩ) >200 mΩ: ±(4 % rdg + 40 mΩ)

[1] with Fluke TP165x Remote Control Probe

Insulation Resistance Test (RISO)

Measurements..... Insulation Resistance DC+ to PE and DC- to PE

Test Voltage ..... Max. EVSE Voltage ≤500 V dc: 500 V dc +10 % / -0 %
Max. EVSE Voltage >500 V dc: 1000 V dc +10 % / -0 %

Max. Short Circuit Current..... 2 mA, max. capacitance: 10 µF

Standard..... IEC 61557-2

Test Voltage	R_{ISO} Range[1]	Resolution	Accuracy
500 V dc	10 kΩ to 20 MΩ	0.01 MΩ	±(5 % rdg + 2 digits)
1000 V dc	10 kΩ to 20 MΩ	0.01 MΩ	±(5 % rdg + 2 digits)

CCS Communication Test

Control Pilot (CP)

Parameters..... Voltage CP high, Voltage CP low, Frequency, Duty Cycle

Simulation of States[2]..... A, B, C, D, E

Digital Protocol ..... DIN SPEC 70121, ISO 15118

Parameter	Range	Resolution	Accuracy
CP High, CP Low	-15 V dc to +15 V dc	0.01 V dc	-1.99 V dc to 1.99 V dc: ±(0.4 % rdg + 2 digits) ±(2.00 V dc to 15.00 V dc): ±0.4 % rdg
Frequency	DC, 900 Hz to 1100 Hz	1 Hz	±0.1 % rdg or ±1 digit
Duty Cycle	2 % to 98 %	0.1 %	±5 digits
SLAC	0 dB to 20 dB	1 dB	

Proximity Pilot (PP)

Parameter	Range	Resolution	Accuracy
PP Resistor	50.0 Ω to 499.9 Ω 500 Ω to 5000 Ω	0.1 Ω 1 Ω	±0.5 %

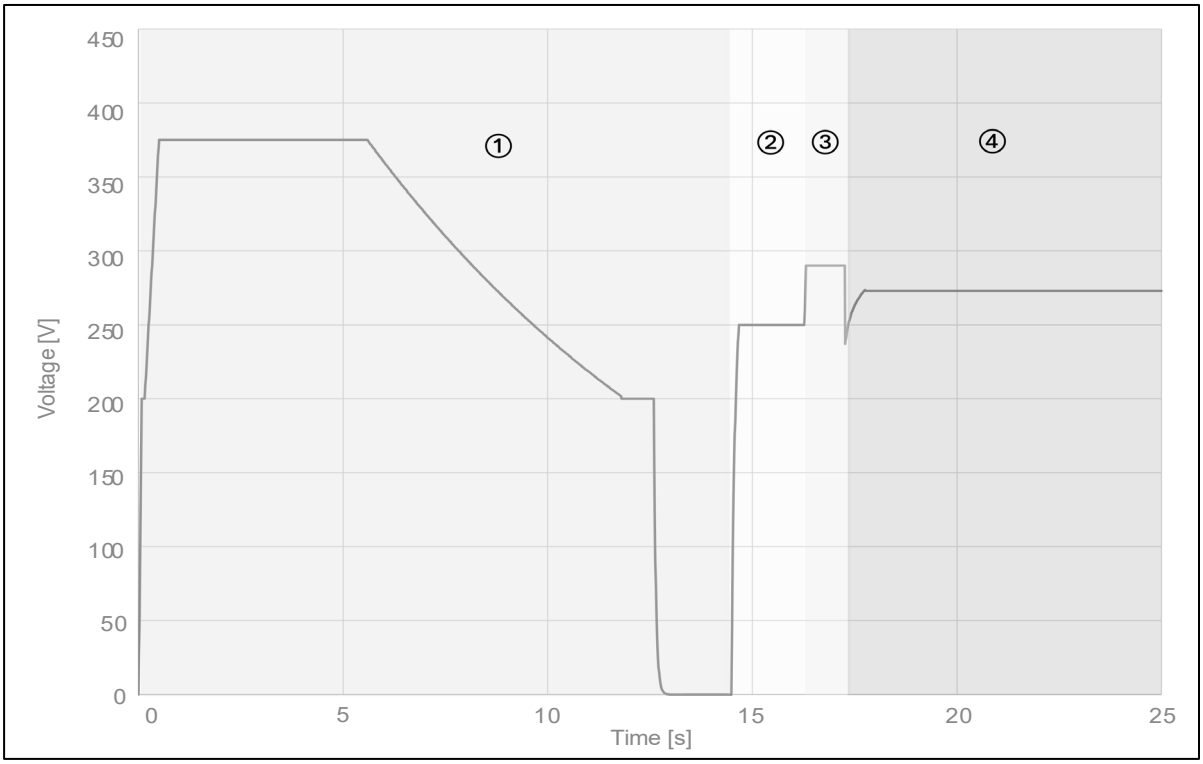
Load Test

Parameters..... Cable Check Voltages: DC+ to PE, DC- to PE
Load Test: Voltage DC+ to DC-, Current, Power, Duration

Parameter	Range[3]	Resolution	Accuracy
Voltage	1000 V dc	0.1 V dc	±(0.2 % rdg + 4 digits)
Current	10 A dc	0.01 A dc	±(0.5 % rdg + 5 digits)
Power	0 to 10 kW	0.001 kW	Typ. ±(0.7 % rdg + 15 digits)

[1] Minimum R_{ISO} with set test voltage applied: 380 kΩ at 500 V dc, 760 kΩ at 1000 V dc. Lower resistance reduces test voltage due to current limit.
[2] Activation subject to firmware support. Refer to release notes for availability.
[3] Refer to the Test Limits section for details on voltage, current, and power levels during the load test.

Figure 1. Performing Load Test



	Sequence	Description	Remarks
①	Cable Check	EVSE applies a test voltage and the IMD verifies safe isolation before energy transfer begins.	FEV500 captures the EVSE test voltages DC+ to PE and DC- to PE.
②	Pre-charge	Pre-charge voltage is a controlled DC voltage applied to gradually charge the vehicle's input capacitors before closing the main contactors.	FEV500 shows live value of the DC+ to DC- voltage.
③ + ④	Power Delivery	Ramp up of the voltage and applying the load for the power delivery.	FEV500 shows live values of voltage, current, and power. The load test result values are the average of the last 15 s.

Insulation Monitoring Device (IMD) Test

Auto-Test ..... No trip test, trip test

Test Resistor ..... No trip test: 250 kΩ (DC+ to PE)
Trip test (DC- to PE):
95 kΩ (max. EVSE Voltage >500 V dc)
45 kΩ (max. EVSE Voltage ≤500 V dc)

Duration ..... Max. 15 s for each test

Test Resistor Range[1] ..... 19.5 kΩ to 3 MΩ, 256 values

Standard ..... IEC 61557-8 / IEC 61557-18

[1] Activation subject to firmware support. Refer to release notes for availability.

Test Limits

	Limit	Normative Reference	Remarks
Continuity R_{LO}			
Test Limit	0.1 Ω	IEC 61851-23	
Insulation Resistance R_{ISO}			
Test Limit	100 kΩ	IEC 61851-23	Note: Test limit matches insulation status “fault” threshold of IEC 61851-23 Ed. 2 Target: >5 MΩ according to IEC 62196-1 Ed. 4, clause 21 Measuring DC-side cable insulation per IEC 62196-1 typically requires IMD disconnection.
CCS Low-Level Communication			
State A	11 V dc to 13 V dc	IEC 61851-1:2020 Table A.4	Typ. 12 V dc
State B	High level: 8 V dc to 10 V dc Low level: -13 V dc to -11 V dc		B1: typ. 9 V dc B2: typ. 9 V dc / -12 V dc (oscillator on)
State C	High level: 5 V dc to 7 V dc Low level: -13 V dc to -11 V dc		C1: typ. 6 V dc C2: typ. 6 V dc / -12 V dc (oscillator on)
State D	High level: 2 V dc to 4 V dc Low level: -13 V dc to -11 V dc		D1: typ. 3 V dc D2: typ. 3 V dc / -12 V dc (oscillator on)
State E	-1 V dc to 1 V dc		Typ. 0 V dc
State F	-13 V dc to -11 V dc		Typ. -12 V dc
Frequency	980 Hz to 1020 Hz	IEC 61851-1:2020, Table A.2	Typ. 1000 Hz
Duty cycle	3 % to 7 %	IEC 61851-1:2020, Table A.8	Typ. 5 %
PP Resistor			
CCS1	135 Ω to 165 Ω	IEC 61851-23	Typ. 150 Ω
CCS2	1455 Ω to 1545 Ω	IEC 61851-23	Typ. 1500 Ω
Digital Communication (ISO 15118, DIN SPEC 70121)			
SLAC	0 dB to 20 dB		Target: 0 dB to 10 dB
Load Test			
Station Test Voltage	No limit in V1.0		Voltage applied by EVSE during Cable-Check
Voltage	Max. 330 V dc		Typ. 270 V dc to 300 V dc
Current	Max. 10 A dc		Typ. 7 A dc
Power	Max. 3.3 kW		Typ. 2 kW
IMD Test			
No trip test duration	15 s		
Max. trip test duration	15 s	IEC 61851-23 Ed.2 CC.4.1.6	
Residual Voltage Test			
Voltage	<60 V dc within 1 s		