

## TECHNICAL DATA

# Fluke FEV350 EV Charging Station Analyzer



### MAIN APPLICATIONS

- Safety testing of charging stations
- Functional testing of charging stations
- Troubleshooting/repair of charging stations

**Test the safety and functionality of AC electrical vehicle charging stations with the all-in-one tool that is safe, portable, and easy to use.**

The FEV350 is a complete solution for safety and performance testing of AC EV charging stations with Type 2 or Type 1 connectors. Designed for technicians required to perform and document multiple tests quickly and efficiently without carrying multiple tools. The FEV350 integrates seamlessly with the TruTest™ EV Charging software module for both documentation and reporting. Through wireless Bluetooth® connection, the FEV350 works alongside compatible Fluke multifunction installation testers, providing supporting measurements, wiring configuration diagrams, and information screens. With bi-directional communication, customized test plans can be created in TruTest™ and pushed directly to the FEV350, reducing setup time and eliminating re-entry of project data. Predetermined test plans and clear pass/fail indications simplify analysis and speed up testing, while full integration with TruTest™ ensures reliable reporting. The FEV350 EV Charging Station Analyzer is designed in accordance with IEC/EN 61851-1 and IEC/HD 60364-7-722.



### Available measurements:

- PE (protective) earth pre-test to ensure no dangerous voltage is present
- Visual inspection
- 30 mA RCD + 6 mA RDC-DD trip test
- Nominal voltage + phase sequence
- Auto control pilot (CP) with waveform analysis
- Proximity pilot
- Error testing

### Supported measurements with compatible Fluke multifunction testers:

- Earth bond
- Insulation
- Loop/line Impedance



### Color LCD display

On-screen instructions provide an easy walkthrough of tests and provide a Pass/Fail indication on all test results.

### Easily analyze EV charging performance

Auto Control Pilot simulates various vehicle states with on-screen feedback of nominal results and waveform analysis.

### Color screen with integrated interface

On-screen instructions provide an easy walkthrough of tests and provide a Pass/Fail indication on all test results.

### Easily analyze EV charging performance

Auto Control Pilot simulates various vehicle states with on-screen feedback of nominal results and waveform analysis.

### Expert Mode with streamlined workflow

Removes instructional pop-ups for faster testing by experienced users.

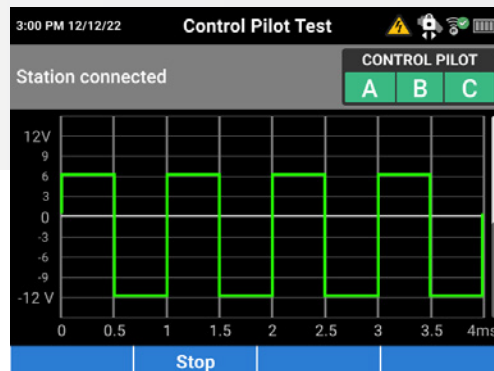
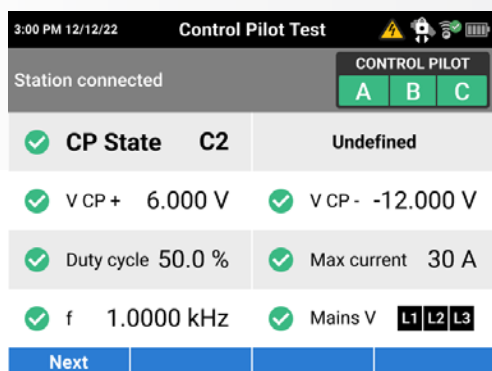
### Auto-Sequence with one-button testing

Runs all sub-tests within a measurement function automatically to save time.

### Broad electrical system compatibility

Supports diverse regional requirements for adaptable EVSE testing and reporting.

## Auto control pilot and waveform analysis



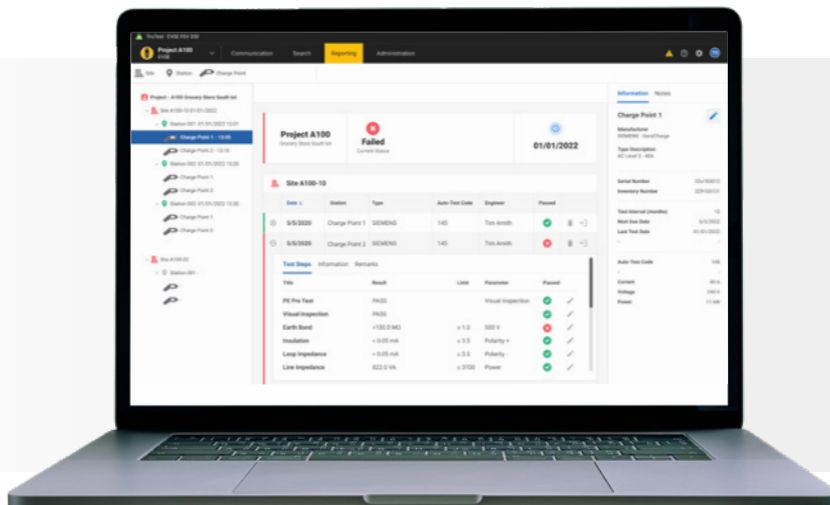
# TruTest™

## Data Management and Reporting Software with EVSE Module

### Spend less time processing test results and compiling reports

The reporting necessary to close out projects can be challenging and time-consuming. Cover all your certification and documentation needs through the modern, fast, and reliable software platform of TruTest™. TruTest™ allows for EV Charging asset management, data storage, and reporting on a single platform. Whether you are analyzing Control Pilot waveforms or safety testing the system, proper data management is critical for producing easy-to-understand reports for clients. Compatible with the Fluke FEV350 EV Charging Analyzer, TruTest™ Software allows you to quickly import measurement results directly from your EV charging analyzer to the computer, organize and analyze the data, compare individual asset data against previous measurements imported and provide a comprehensive and visual client report.

- Easily manage measurement data from EVSE inspections
- Quickly create inspections and reports
- Control Pilot waveform analysis with easy pass/fail visuals
- Compare site data to previous site data to see changes over time
- Quickly access the latest firmware to update your FEV350
- A free 60-day demo version of TruTest™ is available for download on fluke.com. Purchase a software key to unlock the Lite or Advanced version.



## Specifications

| General specifications        |                                                                                        |
|-------------------------------|----------------------------------------------------------------------------------------|
| Input electrical ratings      | 1 $\Phi$ : 250 V max, 3 $\Phi$ : 230/400V max, 50/60 Hz, max 1 A                       |
| Internal power consumption    | 3 W max                                                                                |
| Size (H x W x D)              | (263 mm x 123 mm x 63 mm), (10.35 in x 4.84 in x 2.48 in), without the TY1 or TY2 plug |
| Weight                        | 0.9 kg, without the TY1 or TY2 plug, 1.4 kg, with the TY1 or TY2 plug                  |
| Battery                       | 4 x AA/IEC LR6 alkaline or IEC HR6 NiMH                                                |
| Temperature                   |                                                                                        |
| Operating                     | -10 °C to 40 °C (14 °F to 104 °F)                                                      |
| Storage                       | -20 °C to 50 °C (-4 °F to 122 °F)                                                      |
| Relative Humidity             |                                                                                        |
| Operating                     | 10 % to 85 %, 0 °C to 40 °C, (32 °F to 104 °F), non-condensing                         |
| Storage                       | up to 95 %                                                                             |
| Wireless radio, Bluetooth 5.0 |                                                                                        |
| Frequency range               | 2400 MHz to 2483.5 MHz                                                                 |
| Output power                  | <100 mW                                                                                |
| Altitude                      | 3000 m                                                                                 |
| Safety                        | IEC 61010-1: Pollution Degree 2, IEC 61010-2-030, CAT II 300 V, Protection Class II    |
| Performance                   | IEC 61557-1, IEC 61557-6, IEC 61557-7, IEC 61557-10                                    |
| Ingress protection            | IEC 60529: IP40                                                                        |

## Test function specifications

The operational error specification reference for digit counts is defined as  $\pm(\%$  of reading + digit counts). The operational error for other specifications that reference a % are defined as the % of the reading unless otherwise specified. The operational error specification reference temperature for all readings is 23 °C  $\pm$ 5K temperature coefficient of 0.1 %/°C.

| Test/function                      | Display range                 | Measurement range | Operational error                        | Nominal values                           |
|------------------------------------|-------------------------------|-------------------|------------------------------------------|------------------------------------------|
| PE pre-test                        |                               |                   |                                          |                                          |
| Touch voltage, safe range          | $\leq 50$ V AC/DC             |                   | -50 %                                    | –                                        |
| Touch voltage, dangerous range     | >50 V AC/DC                   |                   | -50 %                                    | –                                        |
| Visual inspection                  | See checklist                 |                   |                                          |                                          |
| Earth bond, $R_{LO}^{[1]}$         |                               | –                 |                                          | @ >200 mA $I_{test}$                     |
| Insulation, $R_{INS}^{[1]}$        |                               | –                 |                                          | @ 500 V $U_{nom}$                        |
| Loop/Line impedance <sup>[1]</sup> |                               | –                 |                                          | no trip loop                             |
| RCD/RDC-DD pre-test                |                               |                   |                                          |                                          |
| $U_f$                              | 5 V to 110 V                  |                   | -(0 % + 0 digits),<br>+(10 % + 3 digits) | @ $I_{test}$<br>0.33 x $I_{\Delta N}$ AC |
| $R_e$                              | 166 $\Omega$ to 3667 $\Omega$ |                   | -10 % to +15 %                           |                                          |

| RCD test (IΔN 30 mA)                            |                                                                              |                                               |                                                                                                        |                                                                                                 |                                    |
|-------------------------------------------------|------------------------------------------------------------------------------|-----------------------------------------------|--------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|------------------------------------|
| RCD type A, B/B+, RDC-PD                        | –                                                                            |                                               |                                                                                                        | @ mains<br>100 V AC to<br>253 V AC                                                              |                                    |
| RCD trip time with AC, half wave, DC (0°, 180°) |                                                                              |                                               |                                                                                                        |                                                                                                 |                                    |
| x0.5 (30 mA)                                    | 0 ms to 510 ms                                                               |                                               | ±(2 % + 3 ms)                                                                                          |                                                                                                 |                                    |
| x1 (30 mA)                                      | TN: 0 ms to 310 ms<br>TT @120 V: 0 ms to 310 ms<br>TT @230 V: 0 ms to 210 ms |                                               |                                                                                                        |                                                                                                 |                                    |
| x5 (30 mA)                                      | 0 ms to 50 ms                                                                |                                               |                                                                                                        |                                                                                                 |                                    |
| Ramp current (0°, 180°)                         |                                                                              |                                               |                                                                                                        |                                                                                                 |                                    |
| AC @RCD type B/B+                               | 12.0 mA to 36.0 mA, 17 steps with 1.5 mA                                     |                                               | ±1.5 mA                                                                                                |                                                                                                 |                                    |
| AC half wave @RCD ±1.5 mA type A and RCD-PD     | 7.5 mA to 48.0 mA, 28 steps with 1.5 mA                                      |                                               |                                                                                                        |                                                                                                 |                                    |
| DC @RCD type B/B+                               | 12.0 mA to 66.0 mA, 37 steps with 1.5 mA                                     |                                               |                                                                                                        |                                                                                                 |                                    |
| RDC-DD test (IΔN +6 mA EV)                      |                                                                              |                                               |                                                                                                        |                                                                                                 |                                    |
| Trip time (0°, 180°)                            |                                                                              |                                               | ±(2 % + 3 ms)                                                                                          |                                                                                                 | @ mains<br>100 V AC to<br>253 V AC |
| +3 mA DC                                        | 0.000 s to 10.100 s                                                          |                                               |                                                                                                        |                                                                                                 |                                    |
| +6 mA DC                                        |                                                                              |                                               |                                                                                                        |                                                                                                 |                                    |
| +60 mA DC                                       | 0 ms to 310 ms                                                               |                                               |                                                                                                        |                                                                                                 |                                    |
| +200 mA DC                                      | 0 ms to 110 ms                                                               |                                               |                                                                                                        |                                                                                                 |                                    |
| Ramp current (0°, 180°)                         | smooth ramp 2.0 mA to 6.0 mA                                                 |                                               | ±0.6 mA                                                                                                |                                                                                                 |                                    |
| Mains voltage                                   |                                                                              |                                               |                                                                                                        |                                                                                                 |                                    |
| L-N, L-PE, N-PE                                 | 0 V to 280 V                                                                 | 0 V to 253 V                                  | ±(3 % + 3 digits)                                                                                      | RIN L-N:<br>>30 MΩ, RIN L-PE:<br>>10 MΩ, 40 Hz to 70 Hz,<br>crest factor 2,<br>Vmax peak: 560 V |                                    |
| L-L                                             | 0 V to 490 V                                                                 | 0 V to 440 V                                  |                                                                                                        | RIN L-L: >30 MΩ,<br>40 Hz to 70 Hz,<br>crest factor 2,<br>Vmax peak: 980 V                      |                                    |
| Frequency                                       | 40.00 Hz to 70.00 Hz                                                         |                                               | ±0.20 Hz                                                                                               | –                                                                                               |                                    |
| Phase sequence                                  | right, left, none                                                            | –                                             | voltage imbalance:<br><20 % voltage<br>difference between<br>phases,<br>phase imbalance:<br>120° ± 10° | 50 V to 280 V<br>phase to N                                                                     |                                    |
| CP signal analysis                              |                                                                              |                                               |                                                                                                        |                                                                                                 |                                    |
| Voltage                                         | -15.000 V to 15.000 V                                                        | -15.000 V to -2.000 V,<br>2.000 V to 15.000 V | ±0.5 %                                                                                                 | RIN 1 MΩ<br>0.9000 kHz to 1.1000 kHz;<br>UCP+ >2.000 V,<br>UCP- <-2.000 V                       |                                    |
| PWM duty cycle                                  | 2.0 % to 98.0 %                                                              | 3.0 % to 97.0 %                               | ±5 digits                                                                                              |                                                                                                 |                                    |
| Current indication                              | 0.0 A to 80.0 A                                                              | –                                             | Based on duty cycle <sup>[3]</sup>                                                                     |                                                                                                 |                                    |
| Frequency                                       | 0.9000 kHz to 1.1000 kHz                                                     |                                               | 0.1 %                                                                                                  |                                                                                                 |                                    |
| CP state indication                             | A, B, C, D                                                                   | –                                             | Based on voltage <sup>[2]</sup>                                                                        |                                                                                                 |                                    |
|                                                 | x1, x2                                                                       | –                                             | Based on frequency <sup>[2]</sup>                                                                      |                                                                                                 |                                    |

|                                                |                                       |   |                                                                                                                                                |                        |
|------------------------------------------------|---------------------------------------|---|------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| CP state simulation                            | A                                     | – | >900 kΩ ±0.2 %                                                                                                                                 | –                      |
|                                                | B                                     | – | Upper level: 4610 Ω<br>±0.2 % <sup>[2]</sup><br>Nominal level: 2740 Ω<br>±0.2 % <sup>[2]</sup><br>Lower level: 1870 Ω<br>±0.2 % <sup>[2]</sup> | –                      |
|                                                | C                                     | – | Upper level: 1723 Ω<br>±0.2 % <sup>[2]</sup><br>Nominal level: 1300 Ω<br>±0.2 % <sup>[2]</sup><br>Lower level: 909 Ω<br>±0.2 % <sup>[2]</sup>  | –                      |
|                                                | D                                     | – | Upper level: 448 Ω<br>±0.2 % <sup>[2]</sup><br>Nominal level: 270 Ω<br>±0.2 % <sup>[2]</sup><br>Lower level: 140 Ω<br>±0.2 % <sup>[2]</sup>    | –                      |
| PP state simulation                            | open                                  | – | >900 kΩ                                                                                                                                        | –                      |
|                                                | 13 A                                  |   | 1500 Ω±1.5 % <sup>[2]</sup>                                                                                                                    |                        |
|                                                | 20 A                                  |   | 220 Ω±1.5 % <sup>[2]</sup>                                                                                                                     |                        |
|                                                | 32 A                                  |   | 220 Ω±1.5 % <sup>[2]</sup>                                                                                                                     |                        |
|                                                | 63 (70) A                             |   | 100 Ω±1.5 % <sup>[2]</sup>                                                                                                                     |                        |
|                                                | Error                                 |   | <60 Ω (56 Ω±5 %)                                                                                                                               |                        |
| Fault simulation                               | PE error<br>(earth fault/PE open)     | – | –                                                                                                                                              | –                      |
|                                                | CP error E @ 0 Ω<br>or 120 Ω          |   | -0 Ω/ +2 Ω,<br>120 Ω±1.5 % <sup>[2]</sup>                                                                                                      |                        |
|                                                | Diode short                           |   | –                                                                                                                                              |                        |
|                                                | Error D                               |   | –                                                                                                                                              |                        |
| PP voltage measurement<br>(Type 2 with socket) | 0.10 V to 15.00 V                     |   | ±(1.0 % + 3 digits)                                                                                                                            | R <sub>IN</sub> : 1 MΩ |
| PP resistor measurement                        |                                       |   |                                                                                                                                                |                        |
| Type 2 with cable (R <sub>c</sub> )            | 50.0 Ω to 499.9 Ω,<br>500 Ω to 5000 Ω |   | ±1.0 %                                                                                                                                         | –                      |
| Type 1 with cable (S3, R6, R7)                 |                                       |   |                                                                                                                                                |                        |
| CP resistor measurement (R1)                   | 800 Ω to 1200 Ω                       |   | ±1.0 %                                                                                                                                         | –                      |

[1] The test requires a multi-function tester (MFT). See the documentation of the MFT for the display range, measurement range, and operational error or accuracy values.

[2] According to IEC 61851-1.

[3] According to table A.8 of IEC 61851-1.

## Included in test adapter kits

|                              | FEV350/TY2 | FEV350/<br>TY2 PRO | FEV350<br>TY2/TY1 | FEV350<br>TY2/TY1 PRO | FEV350/KIT |
|------------------------------|------------|--------------------|-------------------|-----------------------|------------|
| FEV350/BASIC Test Analyzer   | •          | •                  | •                 | •                     | •          |
| FEV300-CON-TY1               |            |                    | •                 | •                     |            |
| FEV300-CON-TY2               | •          | •                  | •                 | •                     | •          |
| Zero Adapter/TY1             |            |                    | •                 | •                     |            |
| Zero Adapter/TY2             | •          | •                  | •                 | •                     | •          |
| TPAK Magnetic Hanger         | •          | •                  | •                 | •                     | •          |
| Soft Carrying Bag            | •          | •                  | •                 | •                     | •          |
| TruTest™ Software License    |            | •                  |                   | •                     |            |
| 1664 FC Multifunction Tester |            |                    |                   |                       | •          |

## Ordering information

FLK-FEV350/TY2

FLK-FEV350/TY2 PRO

FLK-FEV350/TY2/TY1

FLK-FEV350/TY2/TY1 PRO

FLK-FEV350/KIT

Suggested test equipment:

Fluke 1664 FC Installation Multifunction Tester

Visit [www.fluke.com](http://www.fluke.com) to get complete details on these products or ask your local Fluke sales representative.



FLK-FEV350/TY2 PRO



FLK-FEV350/TY2/TY1 PRO