

## MFT-X1 Multifunction tester



- True Loop™ test with patented Confidence Meter™
- CertSuite™ compatible Bluetooth® result transfer
- Next generation 2-wire and 3-wire non-trip loop testing
- User upgradeable operating system
- High resolution 0.001Ω loop test
- Automatic volt-drop measurement
- Stabilised insulation test voltage
- Configurable RCD and EV auto-sequence tests
- Fast switch rechargeable plug-in battery pack
- Full colour TFT bonded display
- Re-designed lead set and carry case solution
- IP54 operational housing

### DESCRIPTION

The MFT-X1 new electrical installation testing platform MFT-X1 is the first of a new generation of firmware upgradeable, full functionality multi-function testers for low voltage electrical installations.

Intended for use on all low voltage electrical installations including EV charge points and domestic photo-voltaic systems, the range of test capabilities allow for general commissioning of installations and periodic maintenance as well as detailed fault diagnostics.

### FEATURES

#### True Loop™

True Loop™ impedance testing is now a standard feature on the MFT-X1. The latest 3-wire non-trip loop testing technology, incorporated with the patented Confidence Meter™, offers an unmatched, reliable, accurate, stable and repeatable loop test solution to the user, allowing testing in the most hostile high noise conditions or close to the source of supply. The technology also removes the risk of RCD uplift whilst reducing typical test times – even on circuits protected 10 mA protective devices.

#### Patented Confidence meter technology

All loop impedance ranges are now supported by the Megger patented Confidence meter technology, reducing typical test times for non-trip loop testing to around 7 seconds on quiet circuits, and providing optimised test times for loop impedance testing in difficult noisy supplies. The Confidence meter shows the progress of the loop measurement and indicates the presence of noise on the circuit, removing erroneous values to give a stable and consistent result.

#### MFT-X1 result downloading and CertSuite

Test results can be tagged with circuit data and transferred to CertSuite, the latest cloud base electrical certification software package from Megger.

When paired to a mobile device using the low energy Bluetooth® mode, results can be sent directly from the MFT-X1 to an Android or IOS device running Megger CertSuite software. These results are also synchronised with the cloud-based application.

With a wide range of certification options, CertSuite is available as a monthly or yearly subscription package for electrical certification of installations taking results directly from the MFT whilst testing. CertSuite is suitable for multiple concurrent users and is optimised for use with the MFT-X1.

Results can be stored and reviewed remotely by users whilst on site from different locations, accessed by head office or other users with the relevant permission, with professional looking certification and reports.

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#### High resolution loop impedance testing

The MFT-X1 has extended the low end of the loop impedance range from 0.01 ohms to 0.001 ohms resolution and 50 kA current calculation. The True Loop impedance measurement using the patented confidence meter makes these low impedance measurements a realistic option, with two wire test connections and high current testing.

#### RCD custom testing

RCD testing can now be optimised with the RCD test configurator. Select a whole suite of tests or only those elements of the RCD you require. You can even add ramp testing to the sequence, optimising and simplifying testing.

#### EV Charge point testing

Suitable for both EV charger installation testing with either RCD Type B or RDC protected charge points. The MFT-X1 in conjunction with the Megger EVCA adaptor can test all known EV chargers for installation or maintenance.

#### Stabilised insulation test voltage

For the first time in any multifunction tester, the MFT-X1 incorporates a stabilised insulation test voltage, ensuring output voltage is accurate to within +/-3% +2 digits. This compares to the industry standard of +20% and so provides a more accurate test voltage without the risk of over-voltage damage to circuits or sensitive components.

#### Current measurement

The MFT-X1 uses current clamps for current measurement using the optional Megger MCC1010\* current clamp for measurement of AC currents from 1 mA to 1000 A.

\*Optional accessory

#### Customer upgradeable operating system

The operating system of the MFT-X1 range is upgradeable by the user, simply by downloading the latest operating system file (.BIN) from the Megger web site to a suitable microSD card.

Insert the updated microSD card and pressing TEST initiates an automatic update process without the need for further user intervention.

#### Display and user interface

The user interface utilises the flexibility of the high contrast 480 x 272 colour, TFT bonded display, with a monochrome black on white mode designed specifically for use in difficult lighting conditions.

Enhancing the colour coded test selection rotary dial, range selection is now replicated on the instrument screen, ensuring easy use in poor lighting environments. Hot keys for second level functions are clearly shown across the top of each screen and the second control dial provides users with a further quick selection option of any highlighted feature, even if wearing protective gloves.

Relevant information is clearly shown on the display, both before and after each test, in full colour, and includes the Confidence Meter™ progress bar, RCD ramp test progress as well as the insulation and continuity measurement bar graph. The new Voltage Widget, displays the L-N, L-E and N-E voltages.

#### Li-ION Battery solution

The Megger MFT-X1 is powered by the Megger Li-ION battery pack. The unique 4 Ahr rechargeable Li-ION battery provides the fastest and most flexible battery change solution in the industry.

#### APPLICATIONS

The primary application is the testing of low voltage electrical installations in domestic, commercial, and industrial installations for single and three phase systems.

The wide range of test capabilities extend the use of the MFT-X1 to include:

- EV charge point testing
- Domestic PV testing
- Motor/Generator testing
- Machine testing
- Portable appliance safety testing
- Panel building and switchgear manufacturing
- Cable testing

#### Graphical assistance

The instrument has context help to provide graphical circuit connection guidance for each of the measurements.

#### Accessories

The MFT-X1 is shipped in a rugged, weather-proof carry case offering outstanding protection and flexible storage. Also included is a complete set of test leads to meet the wide range of connection challenges in modern electrical systems.

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#### FUNCTIONAL SUMMARY

| Voltage measurement               |   |
|-----------------------------------|---|
| Voltage range                     | 0.001 V to 2 V (mV range) 2 V to 600 V (V range), 1000 V DC (on-CAT rated circuits)                                 |
| Voltage type:                     | Trms, AC, DC  |
| Phase sequence                    | Automatic phase sequence testing on detection of valid three phase supplies   |
| Current measurement (non-contact) |   |
| AC Trms                           | Using optional accessories: MCC1010 current clamp   |
| Measurement Range                 | MCC1010: 1 mA to 300 A  |
| Continuity/Resistance             |   |
| Measurement range Digital display | 0.01 $\Omega$ to 999 k $\Omega$ Auto-ranging  |
| Measurement Range Analogue arc    | 0 $\Omega$ to 1 M $\Omega$ log scale  |
| Test voltage                      | 4 V DC to 5 V DC  |
| Test current (Nominal)            | >200 mA 0 $\Omega$ >< 2 $\Omega$<br>10 mA<br>Auto reduction on high resistance (actual current reported in display) |
| Test polarities                   | Forward polarity  |
| Buzzer resistance range           | > 0.01 $\Omega$ < 2 k $\Omega$  |
| Buzzer threshold                  | 0.3, 0.5, 1, 2, 3, 4, 5, 10, 20, 30, 40, 50, 100, 200 $\Omega$  |
| Insulation testing                |   |
| Measurement range Digital display | 0.001 M $\Omega$ to 999 M $\Omega$ Auto-ranging   |
| Measurement range Analogue arc    | 0.001 M $\Omega$ to >1000 M $\Omega$ log scale  |
| Insulation test voltages          | 50 V DC to 1000 V DC + Variable 50 V to 999 V   |
| Test current                      | 1 mA to 2 mA  |
| Stabilised output voltage         | Output test voltage stabilised to -0% +2% +2 V  |
| True Loop™ loop impedance testing |   |
| 2 Wire – all modes                |   |
| Test types                        | Mode 1: Non-Trip<br>Mode 2: High current<br>Mode 3: High resolution   |
| Resolution                        | Non-Trip: 0.01 $\Omega$<br>High current: 0.01 $\Omega$<br>High resolution: 0.001 $\Omega$                           |
| Voltage range                     | Non-trip: 48 V AC to 280 V AC<br>High current: 48 V AC to 550V AC<br>High resolution: 48 V AC to 550 V AC           |
| Frequency range                   | 45 Hz to 65 Hz (all modes)  |

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|                              |  |
|------------------------------|--|
| <b>3 Phase testing</b>       | Non-trip: Single phase only<br>High current: Three phase<br>High resolution: Three phase                       |
| <b>3 wire - non-trip</b>     |  |
| <b>Test types</b>            | RCD (non-trip)<br>RCD EV (non-trip on 6mA EV RDCs)   |
| <b>Resolution</b>            | 0.01 $\Omega$  |
| <b>Voltage range</b>         | 48 V AC to 280 V   |
| <b>Frequency range</b>       | 45 Hz to 65 Hz   |
| <b>3 Phase testing</b>       | Single phase only  |
| <b>Volt drop</b>             |  |
| <b>Volt drop calculation</b> | Requires Zref (Ze) and circuit current (I-vdrop)   |
| <b>Accuracy</b>              | Dependent on loop impedance accuracy   |
| <b>RCD testing</b>           |  |
| <b>RCD types supported</b>   | Type AC, A, B, AC(S), A(S), B(S)   |
| <b>Auto RCD sequence</b>     | 1/2x I $\Delta$ n, 1x I $\Delta$ n, 2x I $\Delta$ n, 5x I $\Delta$ n, Ramp, 0°/180°<br>(customer configurable) |
| <b>Ramp testing</b>          | 10 mA to 1000 mA   |
| <b>RDC testing</b>           | 6 mA RDC   |
| <b>Fault (Touch) voltage</b> | 0 V to 253 V   |
| <b>Earth testing</b>         |  |
| <b>2 wire</b>                | 2 wire earth resistance test   |



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### SPECIFICATIONS

#### Voltage measurement

| Function        | Range                     | Accuracy        |
|-----------------|---------------------------|-----------------|
| Voltage DC      | 0 V ... ±1000 V           | ±1% ± 3 digits  |
| Voltage AC/TRMS | 0 V – 600 V (15 – 500 Hz) | ±2% ± 1 digits  |
| Frequency       | 15 Hz – 99 Hz             | ±0.5% ± 2 digit |
|                 | 100 Hz – 500 Hz           | ±2.0% ± 2 digit |

#### Millivolt measurement

| Function   | Range                         | Accuracy       |
|------------|-------------------------------|----------------|
| mV AC/TRMS | 0 mV to ±1999 mV (50 / 60 Hz) | ±1% ± 3 digits |
| mV DC      | 0 mV to ±1999 mV              | ±1% ± 3 digits |

#### Live Earth detection

Indicates if the PE terminal is live when selecting the Loop or RCD test ranges. The relevant Loop or RCD test is inhibited.

#### Current

| Function               | Range                  | Accuracy      |
|------------------------|------------------------|---------------|
| Current AC/TRMS        | 0.001 A – 0.100 A      | ±2% ±3 digits |
|                        | 0.100 A – 2.000 A      | ±2% ±3 digits |
|                        | 2.00 A – 20.00 A       | ±2% ±3 digits |
|                        | 20.0 A – 300.0 A       | ±2% ±3 digits |
| Frequency Bandwidth    | 15 Hz – 500 Hz         |               |
| Influence of Frequency | 30 Hz – 500 Hz ≤0.25 % |               |

#### Resistance and Continuity

| Function             | Range           | Test Current             | Accuracy      |
|----------------------|-----------------|--------------------------|---------------|
| 200 mA               | 0.01 Ω – 99.9 Ω | (0 Ω – 2 Ω) 205 mA ±5 mA | ±3% ±2 digits |
| 10 mA                | 0.01 Ω – 99.9 Ω | 10 mA                    | ±3% ±2 digits |
|                      | 100 Ω – 999 kΩ  |                          | ±5% ±2 digits |
| Open circuit voltage | 4 V to 5 V      |                          |               |

**EN61557-4 Measurement Range:** 0.10 Ω to 999 kΩ.

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#### Insulation test

| Function              | Range  | Accuracy      |
|-----------------------|--|---------------|
| 1000 V                | 0.001 – 999 MΩ                                 | ±3% ±2 digits |
| 500 V                 | 0.001 – 500 MΩ                                 | ±3% ±2 digits |
|                       | > 500 MΩ                                       | ±10%          |
| 250 V                 | 0.001 – 250 MΩ                                 | ±3% ±2 digits |
|                       | > 250 MΩ                                       | ±10%          |
| 100 V                 | 0.001 – 100 MΩ                                 | ±3% ±2 digits |
|                       | > 100 MΩ                                       | ±10%          |
| 50 V                  | 0.001 – 50 MΩ                                  | ±3% ±2 digits |
|                       | > 50 MΩ  | ±10%          |
| VAR                   | Leakage current > 1 mA                         | ±3% ±2 digits |
| 50 V – 999 V          | Leakage current < 1 mA                         | ±10%          |
| Leakage current       | 0.1 μA – 1.99 mA                               | ±10%          |
| Output voltage        | -0% +2% +2 V at rated load or less             |               |
| Voltage display       | ±1% ± 3 V                                      |               |
| Short circuit current | 1.5 mA nominal                                 |               |
| Test current on load  | 1 mA at min pass values of insulation          |               |
| Maximum capacitance   | 2 μF for a stable reading, 5 μF absolute limit |               |

**EN61557-2 Measurement Range:** 0.10 MΩ to 999 MΩ.

#### Loop 2-Wire - No RCD (L-PE, L-N or L-L)

| Function         | Range           | Accuracy       |
|------------------|-----------------|----------------|
| 2-Wire HR        | 0.001 – 9.999   | ±2% ±0.030 Ω   |
| 2-Wire           | 0.01 Ω - 9.99 Ω | ±2% ±5 digits  |
|                  | 10.0 Ω - 99.9 Ω | ±10% ±5 digits |
|                  | 100 Ω - 1999 Ω  | ±10% ±5 digits |
| Supply Voltage   | 48 V – 550 V    |                |
| Supply Frequency | 45 Hz – 65 Hz   |                |

Can be used to measure supply source resistance quickly and reliably between Line and PE or two Live conductors up to 550 V.

**EN61557-3 Measurement Range:** 0.30 Ω to 1999 Ω

#### Loop 2-Wire L-PE with RCD

| Function         | Range           | Accuracy       |
|------------------|-----------------|----------------|
|                  | 0.01 Ω - 1999 Ω | ±10% ±5 digits |
| Supply Voltage   | 48 V – 280 V    |                |
| Supply Frequency | 45 Hz – 65 Hz   |                |

**Note:** Uses the Megger Confidence Meter to measure the supply source impedance of circuits protected with an RCD rated  $\geq 30$  mA when there are only two connections possible. When a neutral is available the three-wire test will provide a quicker, more accurate result.

**Note:** RCD may trip if there are high leakage currents in the circuit under test. This measurement is immune to the effect of inductance found in some RCDs as it measures resistance (RCD Uplift).

**EN61557-3 Measurement Range:** 1.00 Ω to 1999 Ω

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#### Loop 3-Wire L-PE with RCD

| Designation | Test Current | Application  |
|-------------|--------------|--|
| RCD         | 15 mA        | For circuits protected by an RCD rated $\leq 30$ mA                            |
| RDC EV      | 3 mA         | For EV charger circuits protected by a RDC and a Type A RCD rated $\leq 30$ mA |

| Function         | Range                          | Accuracy                  |
|------------------|--------------------------------|---------------------------|
|                  | 0.01 $\Omega$ - 9.99 $\Omega$  | $\pm 2\%$ $\pm 5$ digits  |
|                  | 10.0 $\Omega$ - 199.9 $\Omega$ | $\pm 10\%$ $\pm 5$ digits |
| Supply Voltage   | 48 V – 280 V                   |                           |
| Supply Frequency | 45 Hz – 65 Hz                  |                           |

**Note:** Uses the Megger Confidence Meter to measure the supply source impedance of circuits protected with an RCD when three connections are possible. The L-N Loop resistance needs to be less than 12  $\Omega$ . The resistances of the L-PE, L-N and N-PE loops are all shown, and the accuracy of the L-PE resistance depends on the maximum resistance displayed. When the neutral is not available the two-wire test must be used.

**Note:** RCD may trip if there are high leakage currents in the circuit under test. This measurement is immune to the effect of inductance found in some RCDs as it measures resistance.

**EN61557-3 Measurement Range:** 1.00  $\Omega$  to 1999  $\Omega$

#### RCD Tests

##### Types A and AC

|   |  |
|---|--|
| RCD Types                                   | AC, A, AC(S), A(S)   |
| RCD Rated Current ( $I_{\Delta n}$ )        | 10 mA, 30 mA, 100 mA, 300 mA, 500 mA, 650 mA, 1000 mA, VAR |
| $\frac{1}{2}$ I no-trip Test Current        | -10% – +0% 0.5 $I_{\Delta n}$                              |
| 1 I, 2 I, 5 I trip test – AC current        | -0% – +10% $M \cdot I_{\Delta n}$                          |
| 1 I, 2 I, 5 I trip test – pulsed DC current | -0% – +10% 1.4 • $M \cdot I_{\Delta n}$                    |
| Trip time                                   | $\pm 10\%$   |
| Ramp trip test current                      | $\pm 5\%$  |
| Fault Voltage (0 V – supply)                | +5% +15% $\pm 0.5$ V                                       |
| Supply Voltage                              | 48 V – 280 V   |
| Supply Frequency                            | 45 Hz – 65 Hz  |

##### Type B

|                                      |                                  |
|--------------------------------------|----------------------------------|
| RCD Types                            | B, B(S)                          |
| RCD Rated Current ( $I_{\Delta n}$ ) | 10 mA, 30 mA, 100 mA, 300 mA     |
| $\frac{1}{2}$ I no-trip Test Current | -10% – +0% (0.5 $I_{\Delta n}$ ) |
| 1 I, 2 I, 5 I trip test Current      | -0% – +10% (2 $I_{\Delta n}$ )   |
| Trip time                            | $\pm 10\%$                       |
| Trip current (ramp)                  | $\pm 5\%$                        |
| Fault Voltage (0 V – supply)         | +5% +15% $\pm 0.5$ V             |
| Supply Voltage                       | 48 V – 280 V                     |
| Supply Frequency                     | 45 Hz – 65 Hz                    |



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#### RDC (Type EV) with a 30 mA Type A RCD

|                              |   |
|------------------------------|---|
| Test current                 | 2.0 mA increasing to 6.3 mA over 2s, before being held at that current for 10s. |
| Trip time                    | ±1% ±1 ms   |
| Trip current (ramp)          | ± 5%  |
| Fault Voltage (0 V – supply) | +5% +15% ±0.5 V   |
| Supply Voltage               | 48 V – 280 V  |
| Supply Frequency             | 45 Hz – 65 Hz   |

#### Earth

| Function                               | Range           | Accuracy      |
|--|-----------------|---------------|
| 2-Wire test                            | 0.01 Ω – 1999 Ω | ±2% ±3 digits |
| Test Frequency                         |                 | 128 Hz        |
| Test Current                           |                 | 4.5 mA        |
| Maximum auxiliary electrode resistance |                 | 5 kΩ          |

**Note:** The 2-wire earth test measures resistance between the blue and green terminals using a 128 Hz square wave; the result includes the resistance of test leads.

**EN61557-5 Measurement Range:** 1 Ω to 1999 Ω.

#### Power supply

|                          |   |
|--------------------------|---|
| Li-ION rechargeable      | 7.2 V DC 4400 mAh* (non-serviceable) + charge status indication           |
| Battery charger (Li-ion) | Input: 110 V/ 230 V AC 50/60Hz 1.3 A<br>Output: 3 A 8.4 V DC              |
| Battery Life             | Li-ion: 4400 mAh = >15 hrs*<br>*times based on typical daily test profile |
| Battery Charging Time    | Li-ion: 2.5 to 3 hrs (ambient temperature dependent)                      |

#### Environmental

| Conditions              | Range  |
|-------------------------|--|
| Operating Temperature   | -10 °C to +55 °C   |
| Storage Temperature     | -25 °C to +70 °C   |
| Operating Humidity      | 90% R.H. at +40 °C max   |
| Ingress Protection      | IEC 60529: IP 54 : Equipment is protected against ingress of dust and water splashes and is suitable for indoor and outdoor use. |
| Vibration               | MIL-PRF-28800F:class 2   |
| Max. operating altitude | 2000 m   |
| Pollution degree        | 2  |

#### Mechanical

|                          |                   |
|--------------------------|-------------------|
| Length                   | 274 mm (10.79 ")  |
| Width                    | 96 mm (3.78 ")    |
| Depth                    | 143 mm (5.63 ")   |
| Weight – Instrument only | 1.57 kg (3.46 lb) |
| Shipping weight          | 5.6 kg (12.35 lb) |



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#### ORDERING INFORMATION

| Description   | Part number | Description | Part number |
|---|-------------|-------------|-------------|
| MFT-X1-BS Multifunction tester BS1363                 | 1012-223    |             |             |
| MFT-X1-SC Multifunction tester Schuko                 | 1012-225    |             |             |
| MFT-X1-CH Multifunction tester Switzerland            | 1012-229    |             |             |
| MFT-X1-AU Multifunction tester AUS/NZ                 | 1012-230    |             |             |
| <b>Included accessories</b>                           |             |             |             |
| Switched test probe SP5                               |             |             |             |
| Red test lead, probes, clips and grabbers             |             |             |             |
| Blue test lead, probe, clips and grabbers             |             |             |             |
| Green test lead, probe, clips and grabbers            |             |             |             |
| Earth test spike and leads kit                        |             |             |             |
| Li-ion battery 4400 mAh                               |             |             |             |
| Li-ion battery charger                                |             |             |             |
| SIA10 MAINS socket interface adaptor UK (boxed)       |             |             |             |
| Neck strap  |             |             |             |
| Multipurpose hard base carry case                     |             |             |             |
| Quick start guide                                     |             |             |             |
| Calibration certificate                               |             |             |             |
| <b>Optional and replacement accessories</b>           |             |             |             |
| Multipurpose hard base carry case                     |             | 1014-985    |             |
| Blow moulded carry case (Polypropylene)               |             | 1013-453    |             |
| Switched test probe SP5                               |             | 1002-774    |             |
| Neck strap replacement                                |             | 1013-454    |             |
| Li-ion battery 4400 mAh                               |             | 1013-450    |             |
| SIA10 MAINS socket interface adaptor UK (boxed)       |             | 1014-300    |             |
| SIA20 Mains socket interface adaptor AU               |             | 1007-170    |             |
| SIA40 Mains socket interface adaptor SCHUKO           |             | 1007-171    |             |
| SIA45 Bipolar Mains socket interface adaptor SCHUKO   |             | 1007-158    |             |
| SIA50 Mains socket interface adaptor CH               |             | 1007-164    |             |
| SIA60 Mains socket interface adaptor USA              |             | 1007-087    |             |
| Li-ion battery charger                                |             | 1013-451    |             |
| 3 lead set RD/GN/BU non-fused (boxed)                 |             | 1014-291    |             |
| 3 lead pro set RD/GN/BU non-fused (boxed)             |             | 1014-292    |             |
| 3 lead set RD/GN/BU fused 10 A (boxed)                |             | 1014-295    |             |
| 3 piece grabber set RD/GN/BU (boxed)                  |             | 1014-299    |             |
| 7 piece probe and clip set RD/GN/BU (boxed)           |             | 1014-301    |             |
| 3 lead RD/GN/BU fused 10 A (boxed) – fused leads only |             | 1014-304    |             |
| Earth test spike and leads kit                        |             | 1001-810    |             |
| MCC1010 Current clamp                                 |             | 1010-516    |             |
| MVC1010 Voltage clamp                                 |             | 1010-518    |             |
| MSA1363 socket adaptor UK                             |             | 1013-837    |             |
| MTF230 – Schuko (Type-F) Socket adaptor               |             | 1013-838    |             |
| LA-KIT Lamp adaptor kit                               |             | 1014-833    |             |
| UKAS Calibration certificate                          |             | 1013-460    |             |

#### SALES OFFICE

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