



MI 3290 Earth Analyser

Earth testers

Earth Analyser MI 3290

MI 3290 Earth Analyser is a portable, battery or mains powered test instrument with excellent IP protection (IP 54 open case), intended for measurement of earth resistance, specific earth resistance and earth potential of various energetic and non-energetic objects.

The user can choose between different methods from classic 3 wire earth resistance measurement up to one or four clamp method for measurement of pylons. He has a choice of measurement methods with different frequency methods: single frequency or frequency sweep from 55 Hz to 15 kHz, HF method with 25 kHz and pulse method simulating the lightning strike. High electrical noise immunity makes this instrument best suited for industrial environment.

MI 3290 Instrument versions



Earth Analyser MI 3290 is delivered in 4 different sets.

A set is a selection of measurement functions and accessory

SET	MI 3290 GL Grounding and lightning	MI 3290 GP Grounding of pylons	MI 3290 GF Grounding and voltage funnel	MI 3290 GX all functions
MEASUREMENT FUNCTIONS				
2/3/4 pole				
Specific earth res. Venner/Schlumberger				
3pole + iron clamp				
stakeless, 2 iron clamp				
High freq. 25 kHz				
Pulse				
RMS Current with iron clamp				
1 - 4 flex clamp active				
1 - 4 flex clamp passive				
RMS Current with flex clamp				
Step & Contact				
Earth potential				
Milohm meter 7/200 mA DC				
Impedance meter AC				
ACCESSORY				
Licence key - different FW set, same SW set	GL	GP	GF	GX
TEST LEAD COAXIAL 75M ON REEL + G CLAMP				
3 x TEST LEAD 50M ON CABLE REEL				
2 x TEST LEAD 5M				
PROFESSIONAL EARTH SPIKES 2 x 50cm + 2 x 90 cm				
2 x Current clamp				
FLEXIBLE CURRENT CLAMP 50A 5M				
Step Contact Meter Set with plates				

MI 3290 Measurements

Earth resistance measurements

- Earth resistance 2,3,4-pole
- Selective earth resistance (1x Iron clamp)
- Earth resistance of multi-leg pylons with up to 4 flex clamps
- Earth resistance (2x iron clamps)
- HF-Earth resistance (25 kHz, acc. to IEEE_Std 81)
- Passive Flex clamp



MI 3290 Measurements

Earth resistance measurements

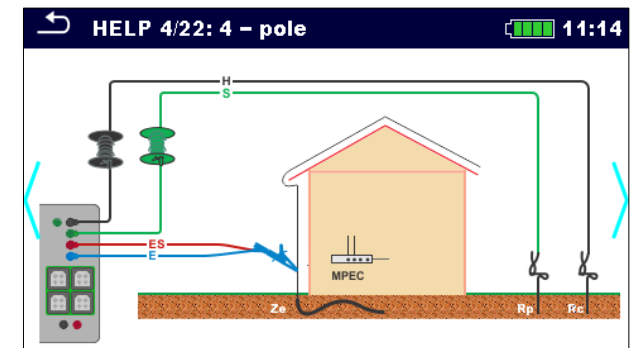
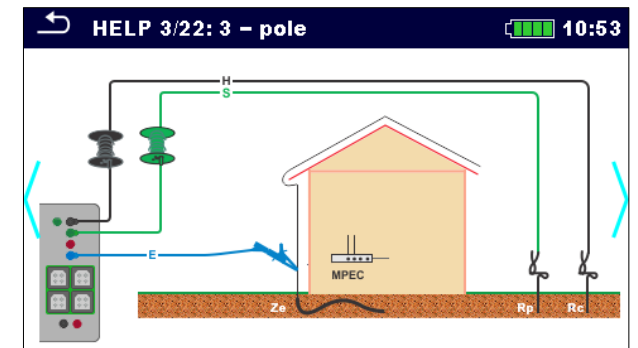
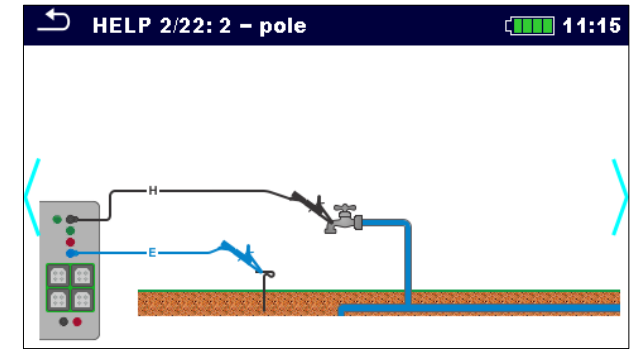
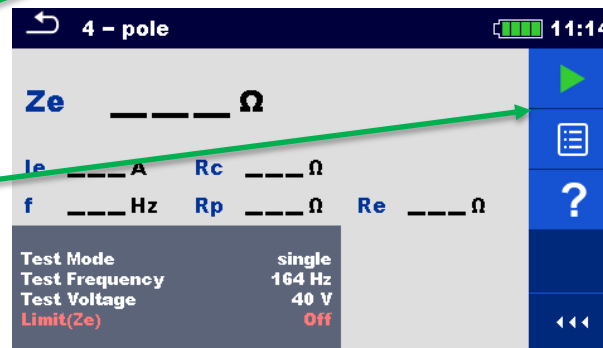
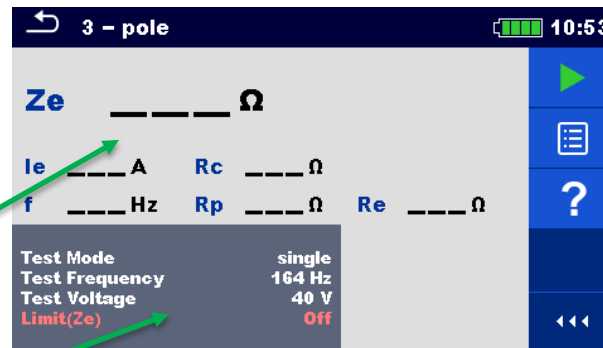
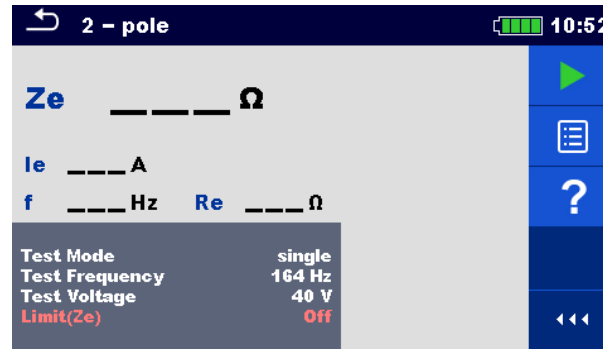
Classic, well known 2, 3 and 4 pole earth resistance measurements based on FoP (Fall of Potential) method.

Standard test screens

with results field,

parameters field and

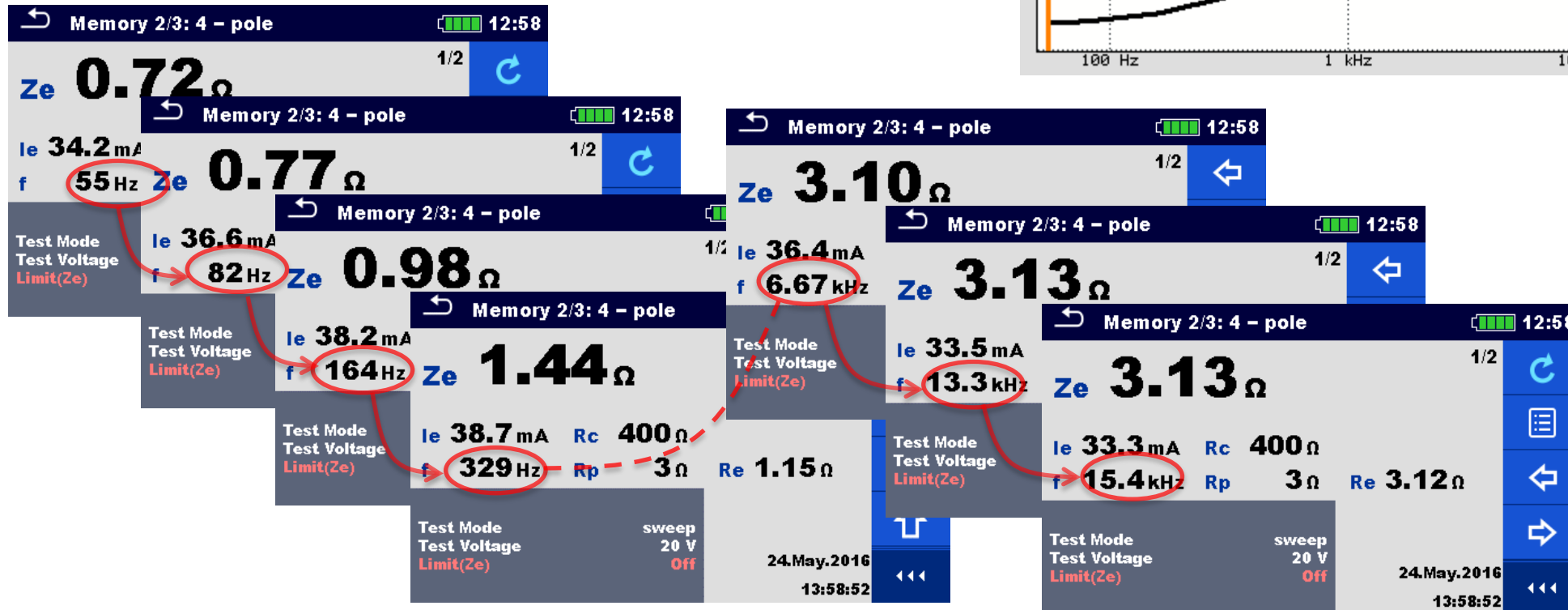
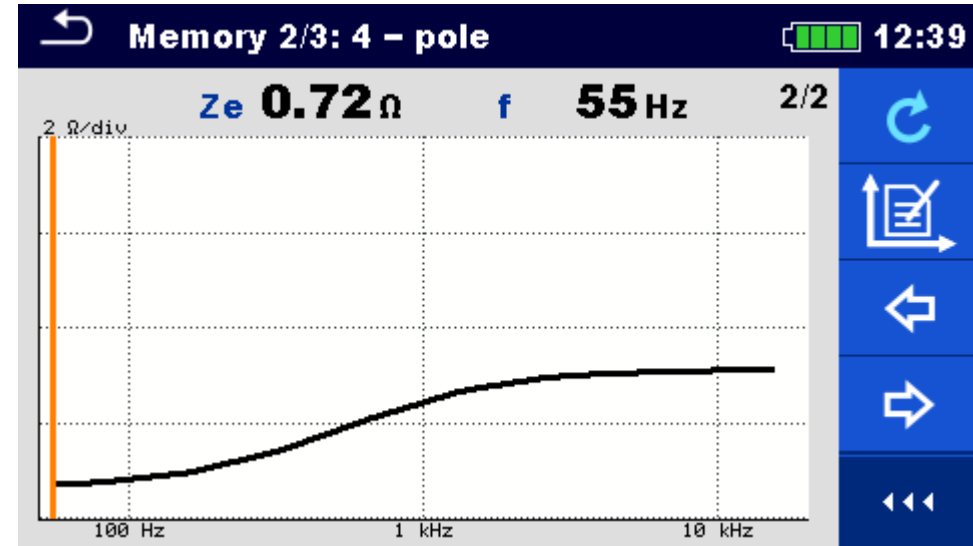
control panel.



MI 3290 Measurements

Fixed frequency or frequency sweep

If Swebp test mode is selected then results can be viewed in numerical or graphical mode



MI 3290 Measurements

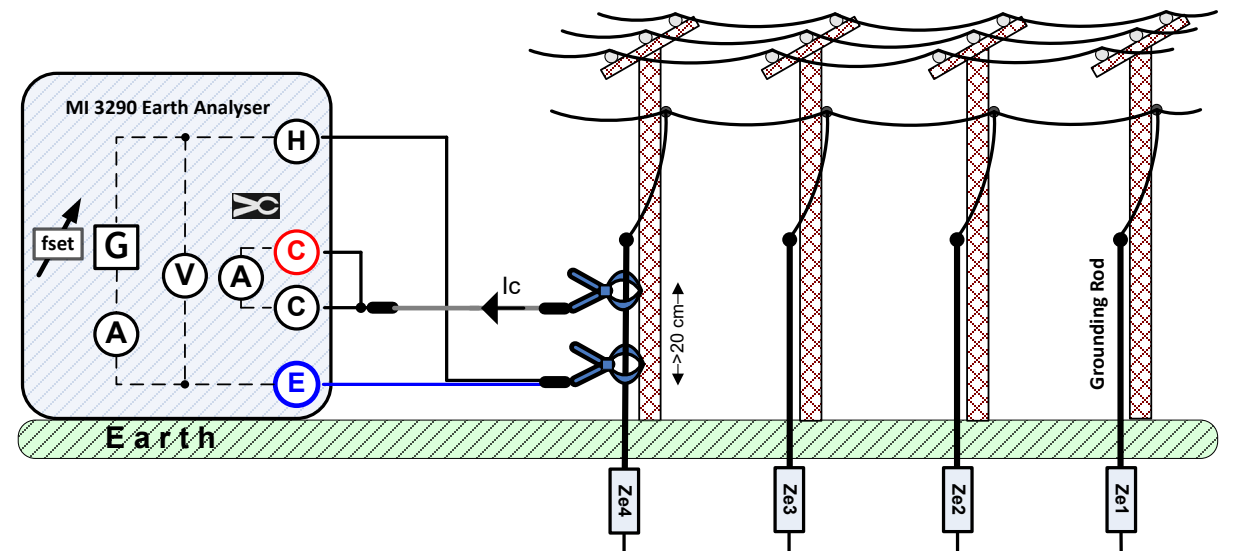
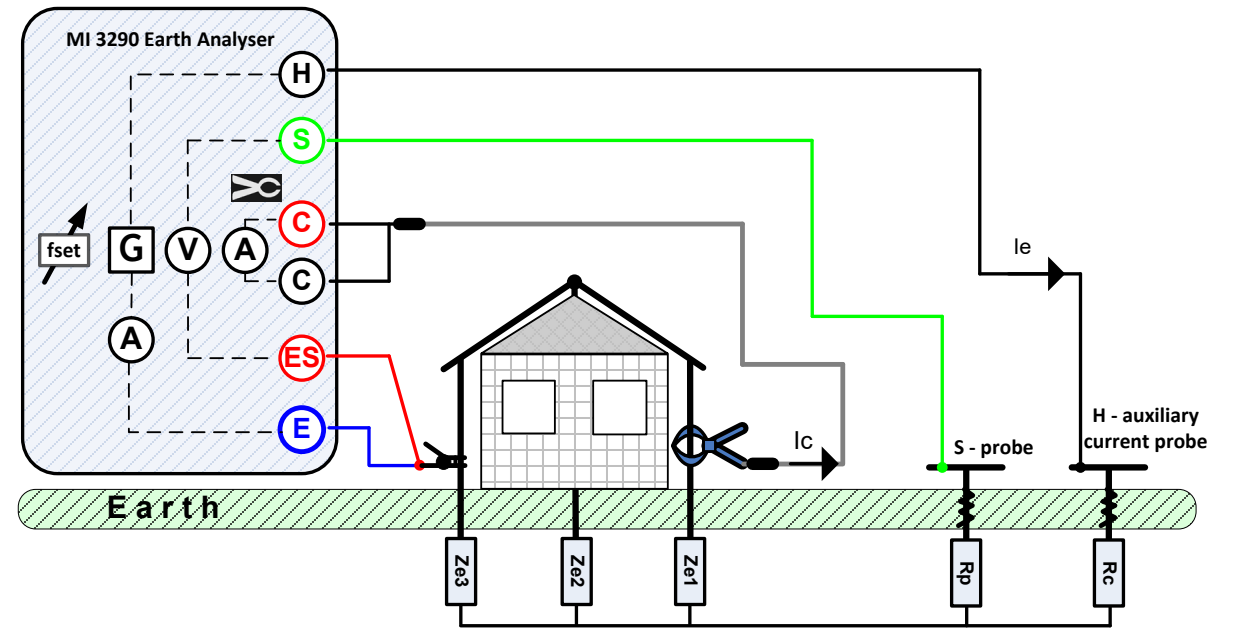
Earth resistance measurements

- Selective earth resistance (1x Iron clamp)
- Earth resistance (2x iron clamps) – stakeless method

The measuring method needs a closed loop to be able to generate the test currents. It is especially suitable for use in urban areas because there is no need to place the test probes.



Basically this method returns the value of the loop resistance, not the earth resistance of the tested rod. But in most cases this value is very close to it.



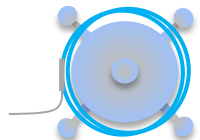
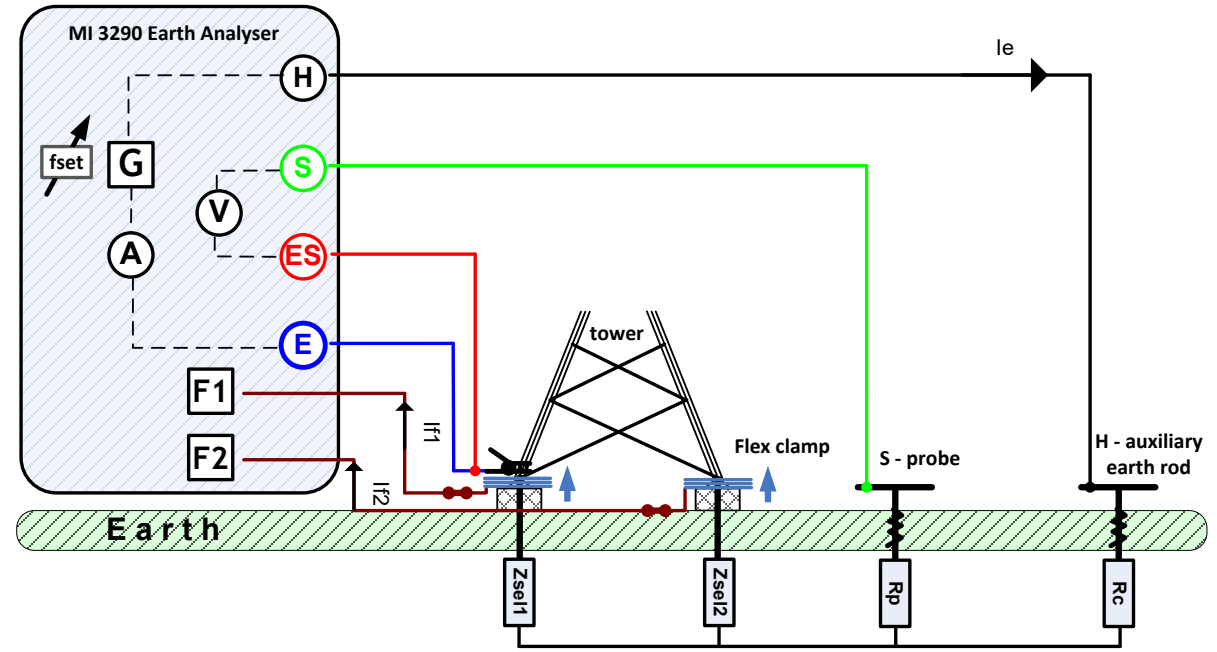


MI 3290 Measurements

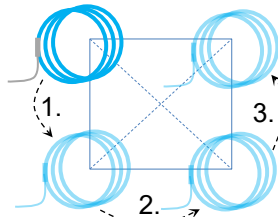
Earth resistance measurements

Earth resistance of mono or multi-leg pylons with overhead gronding wire (OHGW) with up to 4 flex clamps :

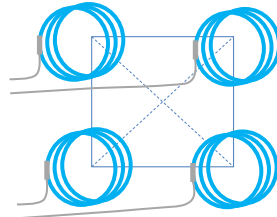
- Active or passive method
Passive methode does not need the H probe
- Different connection possibilities:



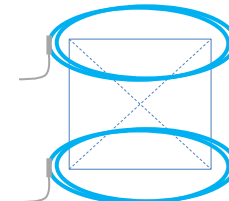
1 flex,
1 measurement
Circumference =
5m or 10m



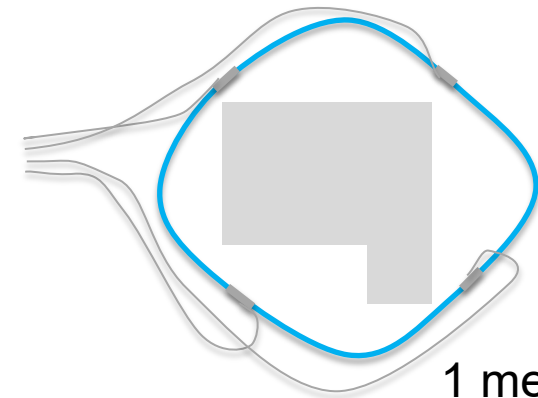
1 flex,
4 measurements
Circumference = 5m



4 flex,
1 measurement
Circumference = 5m



2 flex,
1 measurement
Circumference =
5m or 10m



4 flex,
1 measurement
Circumference =
4 x 5m = 20m

MI 3290 Measurements

Earth resistance measurements

- High frequency (25 kHz) method

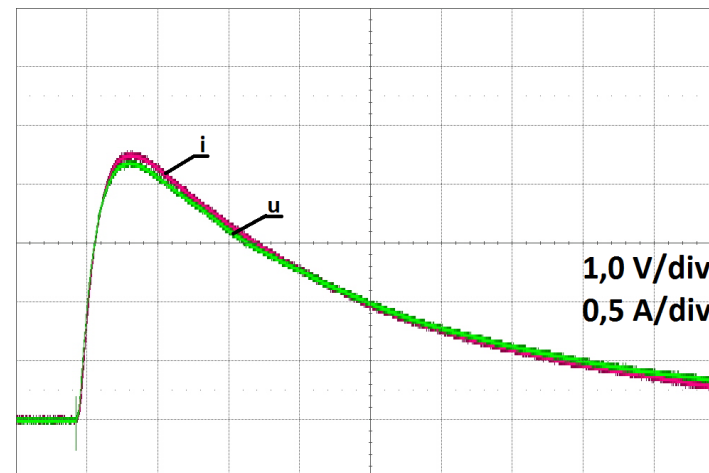
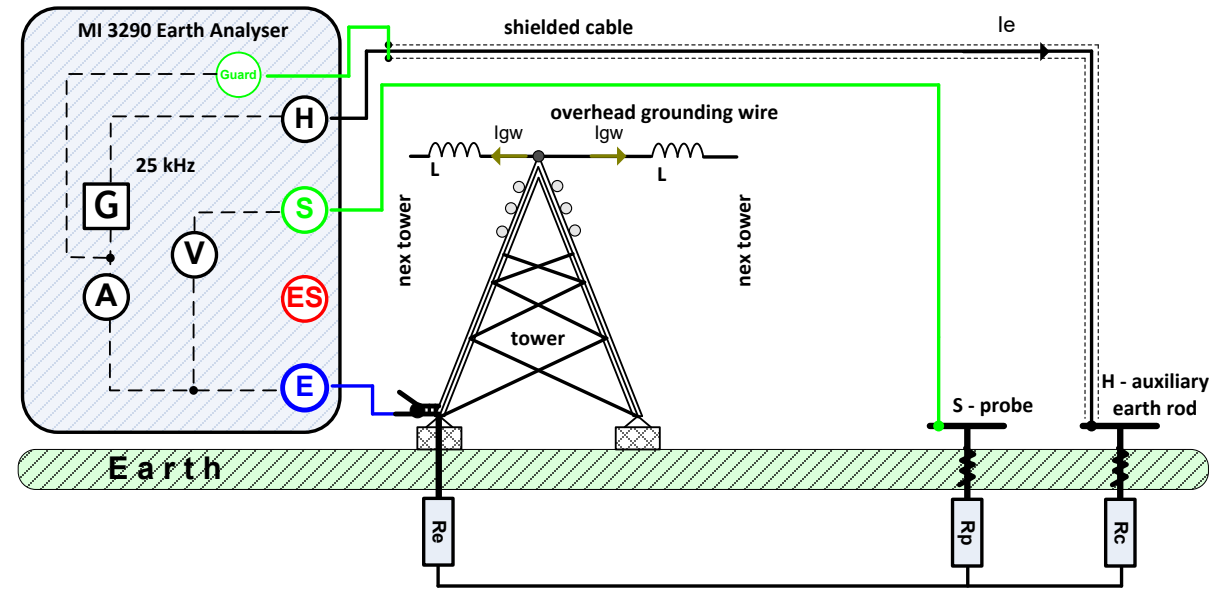
$$I_{gw}(25 \text{ kHz}) \ll I_{Re} \quad I_e = I_{Re}$$

classic 3 pole method can be used

- Pulse method

Impulse 10/350 μ s: a typical shape of the lightning strike

This are two further methodes for measuring the pylons with OHGW

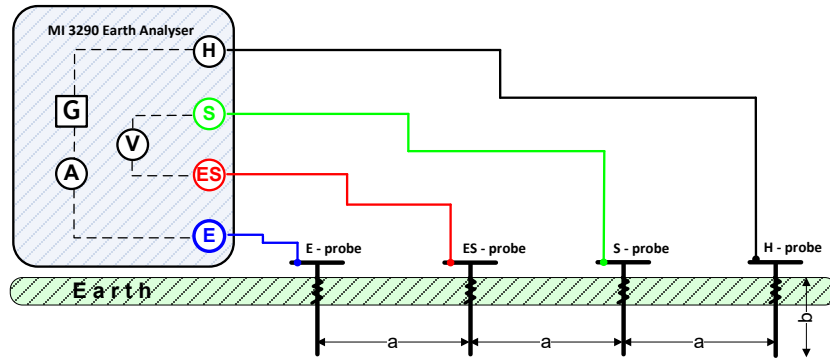


MI 3290 Measurements

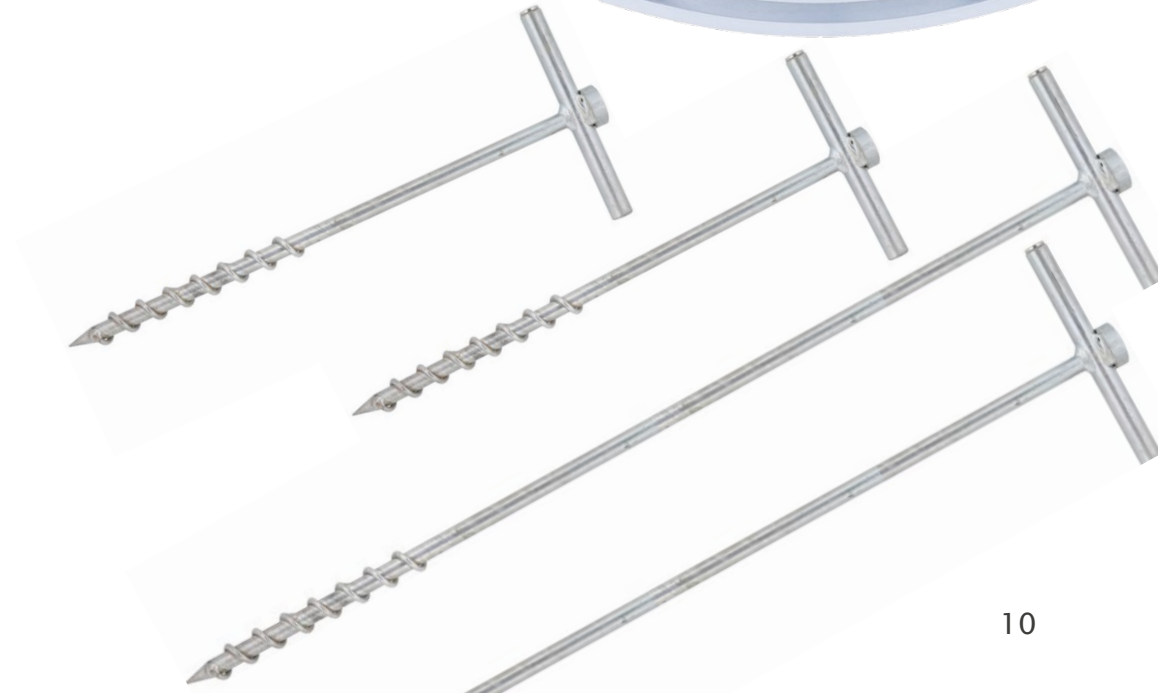
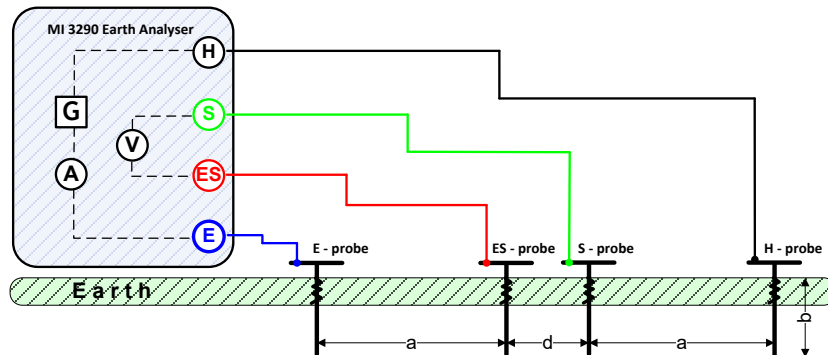
Specific earth resistance measurements

Supported methods:

- Wenner: $a = a = a$



- Schlumberger: $a \neq d \neq a$



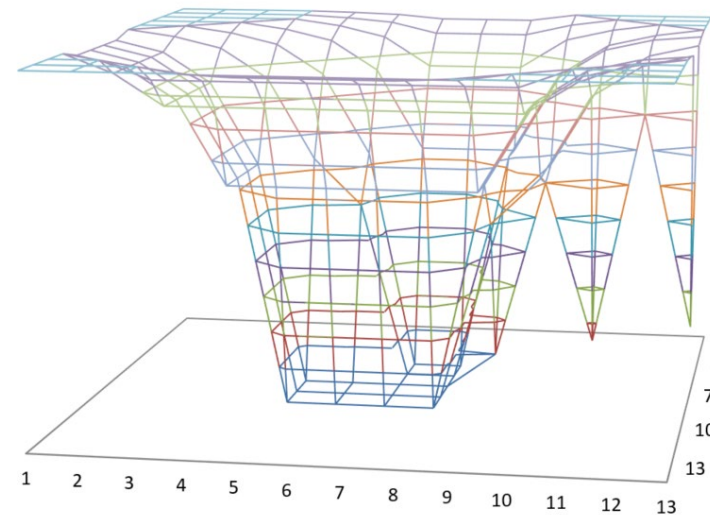
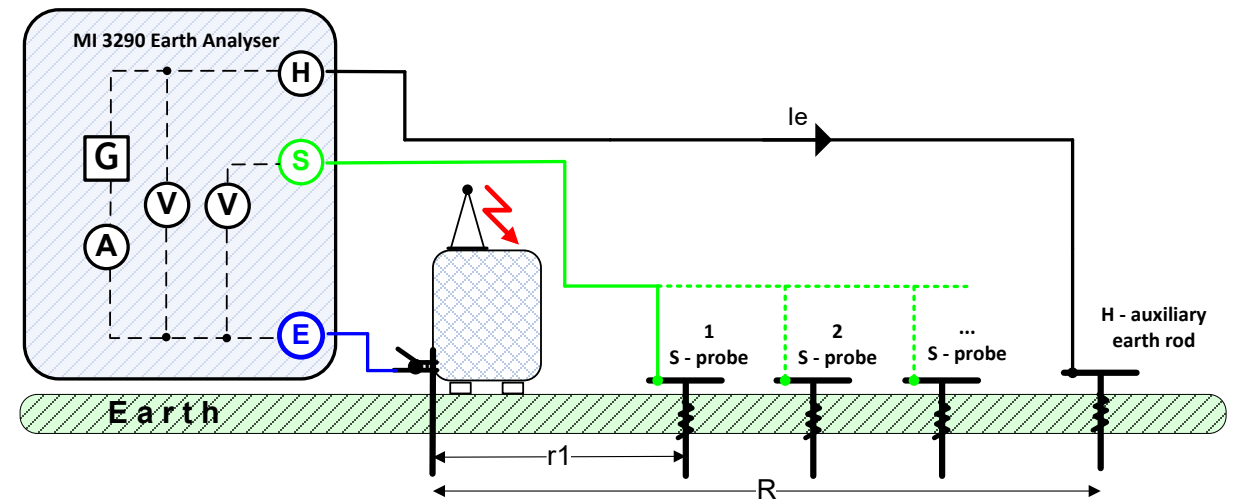
MI 3290 Measurements

Earth potential measurements

The earthing resistance (R_e) is not concentrated in one point but is distributed around the electrode.

In case of fault (lightening strike or short circuit to ground) the voltage drop on R_e is distributed around the grounded object.

A typical voltage distribution occurs around the electrode (the “voltage funnel”).



MI 3290 Measurements

Step and contact voltage measurements

Step Voltage

The measurement is performed between two ground points at a distance of 1 m.

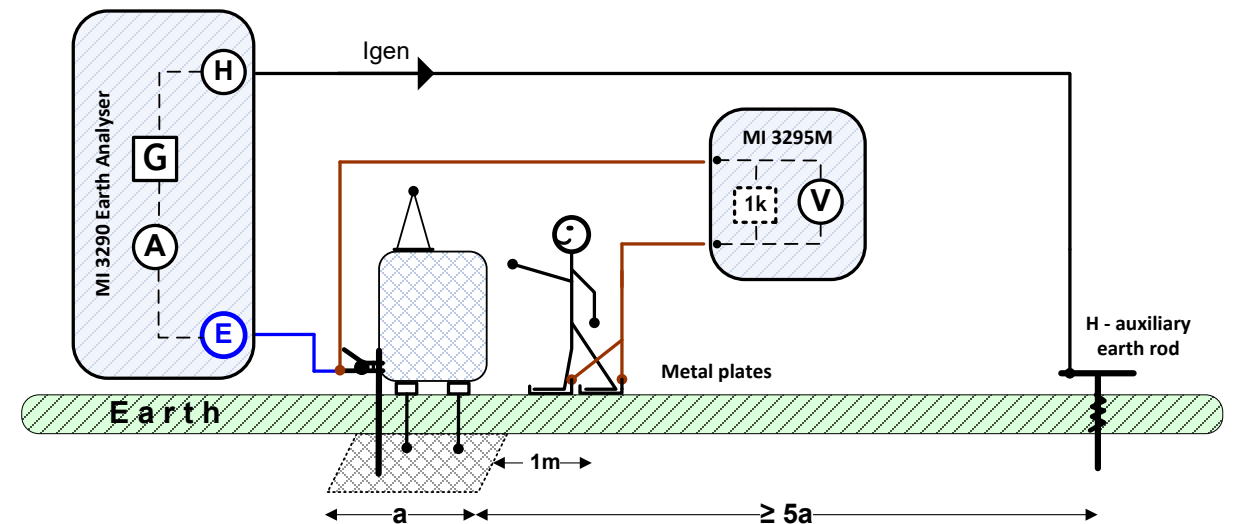
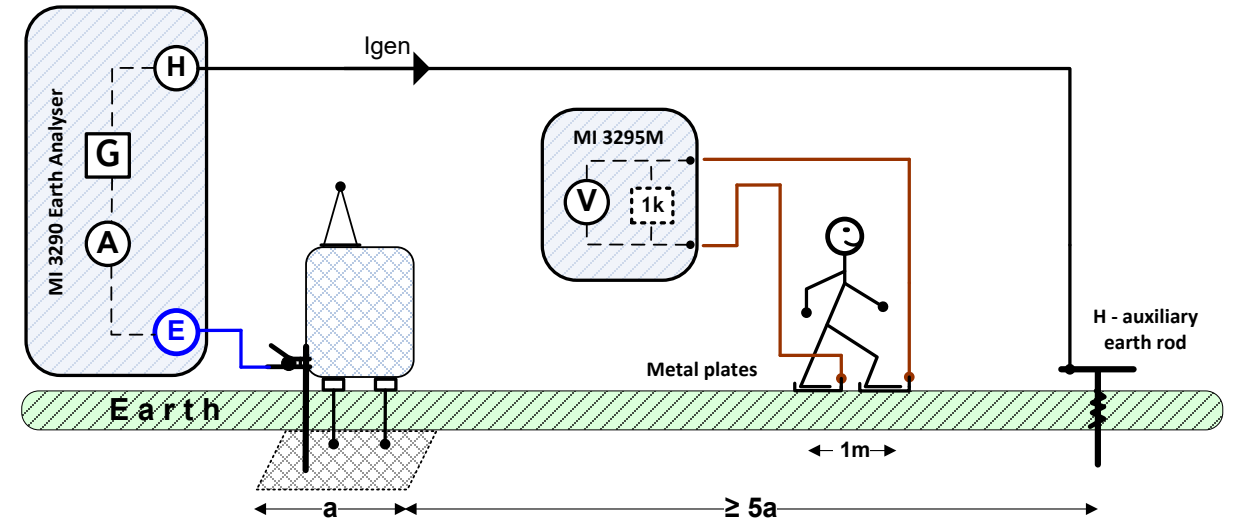
The voltage is measured with a voltmeter (MI 3295M) with an internal resistance of 1k Ω that simulates the body resistance

Touch Voltage

The measurement is performed between an earthed accessible metal part and ground 1 m apart.

The measured voltages are up scaled according to following equation:

$$U_{s,t} = U_m (\text{MI 3295M}) \cdot \frac{I_{\text{fault}}}{I_{\text{gen}} (\text{MI 3290})}$$

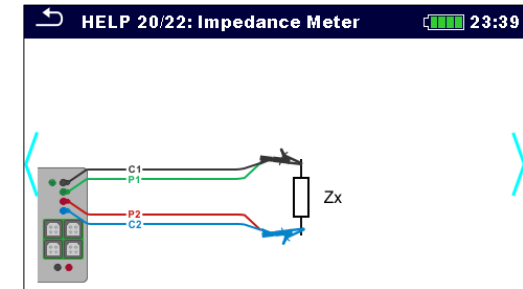
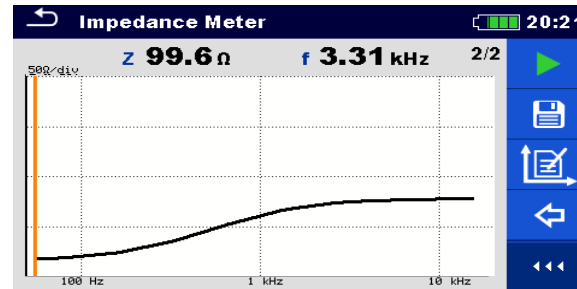
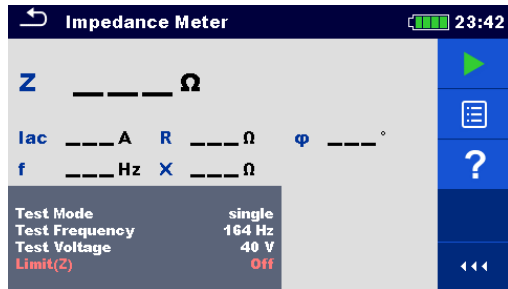


MI 3290 Measurements

Impedance measurement (AC)

Test method: single or sweep

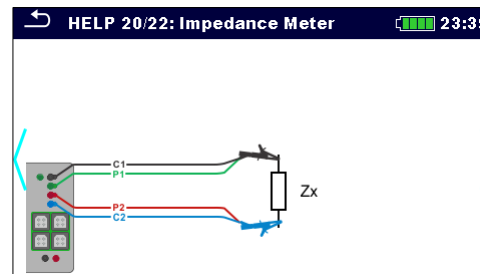
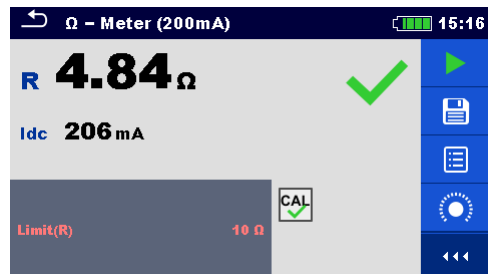
Measurement range: 0 ... 20 k Ω



Resistance measurement (200 mA DC)

Test method: unidirectional

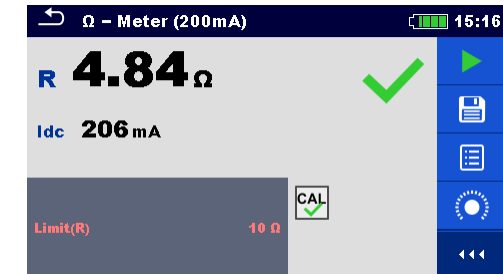
Measurement range: 0 ... 2 k Ω



Resistance measurement (7mA DC)

Test method: unidirectional

Measurement range: 0 ... 2 k Ω

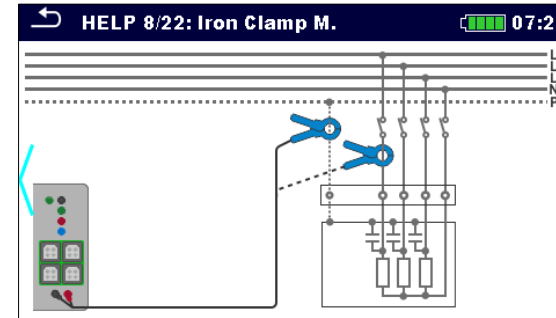
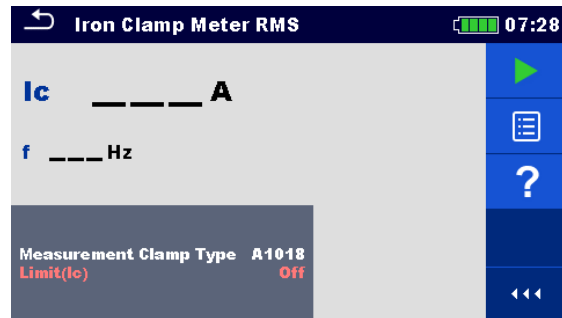


MI 3290 Measurements

Current measurement (Iron clamp)

Test method: single or sweep

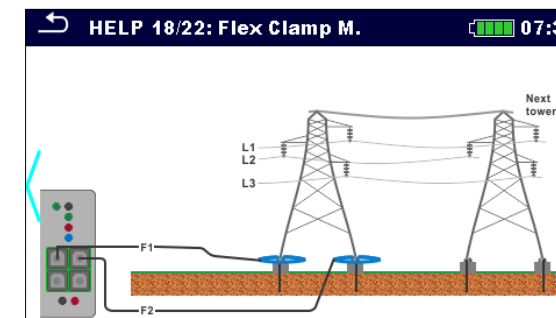
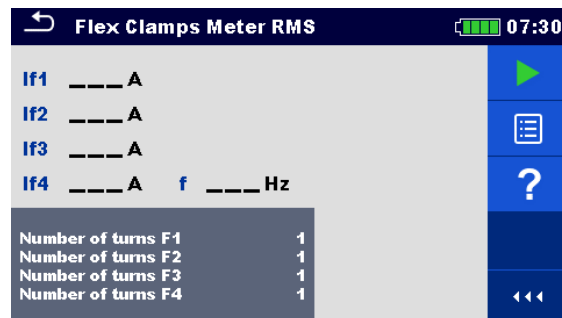
Measurement range: 1 mA ... 8 A



Current measurement (Flex clamp)

Test method: continuous

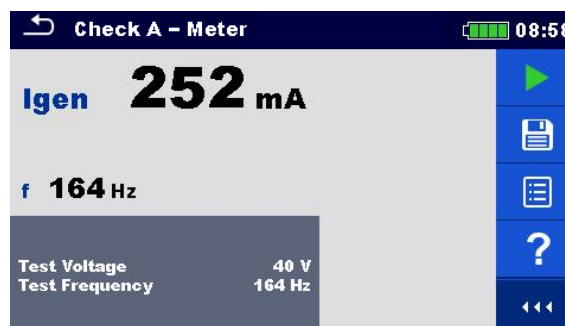
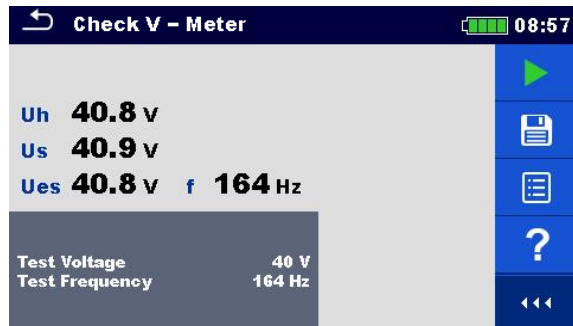
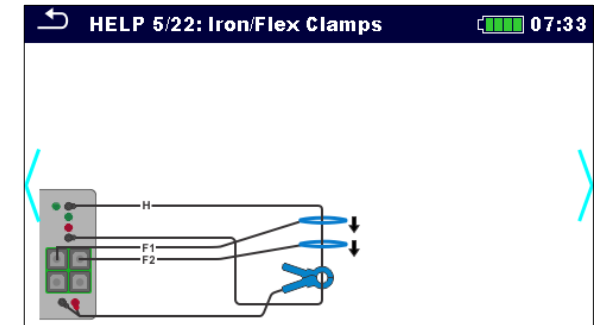
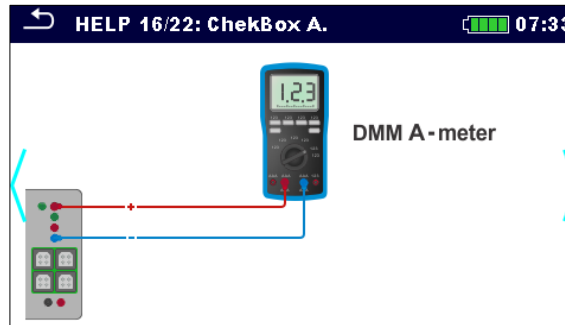
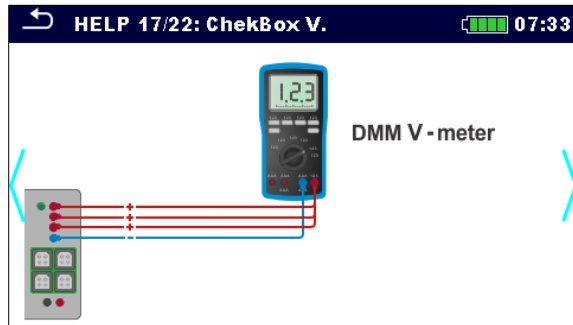
Measurement range: 10 mA ... 50 A



MI 3290 Measurements

Checkbox

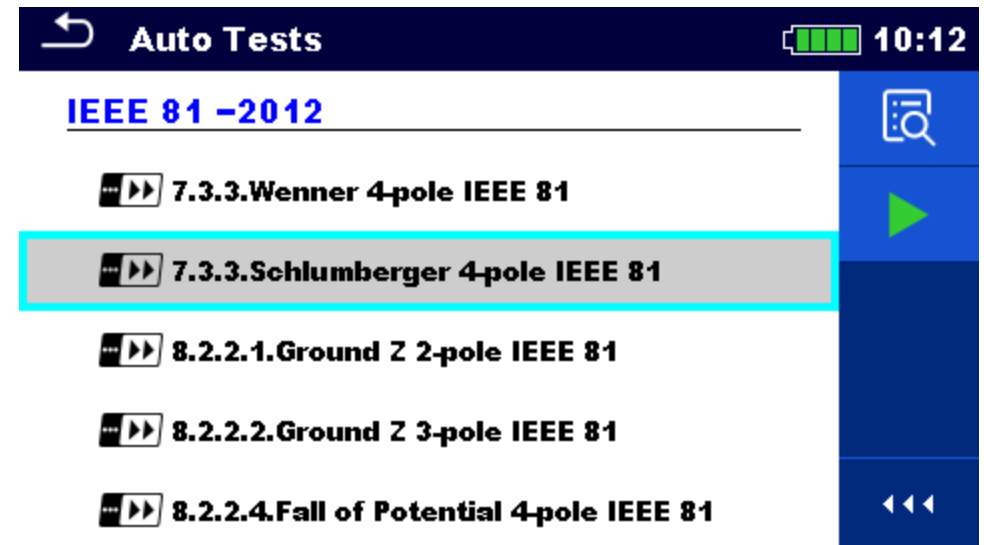
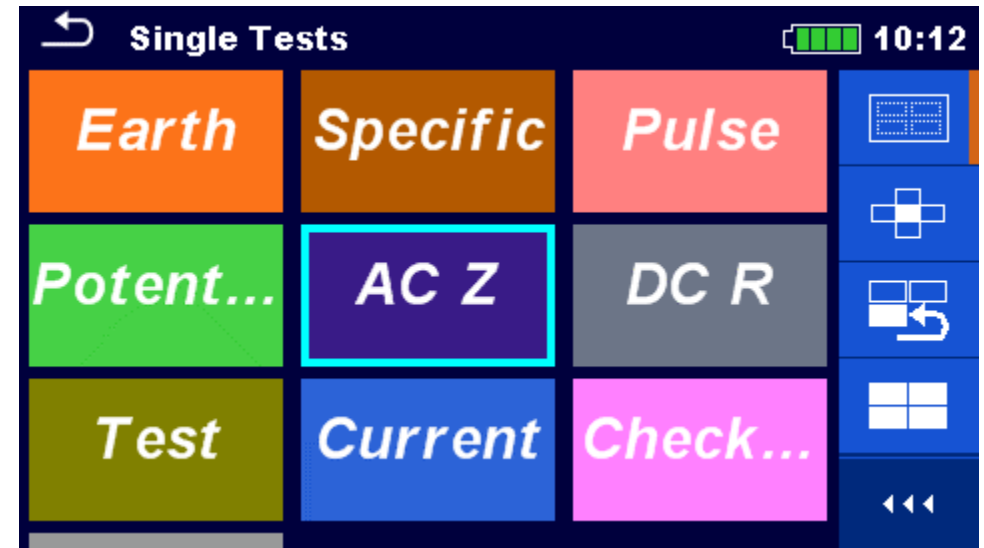
The Checkbox feature should be used to ensure that the meter is reading correctly between calibrations but should not be regarded as a substitute for a full manufacturer's calibration on the unit.



MI 3290 Single tests and Auto tests

User can perform single tests one after other. But if sequence is always the same, he can put that sequence of single test into one auto test and additionally equip with comprehensive instructions which can contain text and pictures.

Auto tests can be defined and edited with the help of PC SW Metrel ES Manager (MESM).



MI 3290 Single tests and Auto tests

A typical auto test flow:

The image displays a sequence of overlapping screenshots from the MI 3290 device's software interface, illustrating a typical auto test flow for the Schlumberger 4-pole IEEE method. The screenshots are arranged in a cascading manner, showing the progression from the test menu to the final results screen.

Screen 1: Auto Tests Menu
Title: Auto Tests
Time: 10:12
List of tests:

- IEEE 81 - 20...
- 7.3.3.W
- 7.3.3.S (highlighted)
- 8.2.2.1
- 8.2.2.2
- 8.2.2.4

Screen 2: Schlumberger 4-pole IEEE Method
Title: 7.3.3.Schlumberger 4-pole IEEE ...
Time: 07:42
Text: Spacing 'a' to outer rods and 'd' to inner rods according to ...
Distance 'a' - Inner rods spacing
Distance (d) - d = 0.3 m (1 ft)
Use 4 rods a - Outer rods to a = 0.6 m (2 ft)

Screen 3: Schlumberger Method
Title: Schlumberger Method
Time: 07:42
Results:

- ρ 0.00
- I_e 0.00 A
- f 0.00 Hz
- ρ 608 Ωm

Screen 4: Schlumberger Method
Title: Schlumberger Method
Time: 20:18
Test Settings:

- Test Voltage: 40 V
- Distance (a): 2.0 m
- Distance (d) a > 2*d: 2.0 m
- Limit(ρ): Off

Screen 5: Schlumberger Method
Title: Schlumberger Method
Time: 20:18
Test Settings:

- Test Voltage: 34.2 mA
- R_c : 1.01 k Ω
- f : 164 Hz
- R_p : 1.00 k Ω

MI 3290 Visual inspection

Visual inspections are added to enable the tester to put into protocol all the needed safety activities before and after test.

The screenshot displays the MI 3290 mobile application interface, which is used for visual inspections. The interface is divided into several sections:

- Top Bar:** Shows the time as 09:20 and 09:14, along with battery status icons.
- Left Panel:** Contains a list of safety hazards under the heading "SAFETY HAZARDS DURING TEST". The items are:
 - Avoid ungrounded ends of test leads.
 - Surge arrester can approach line potential
 - Never disconnect the ground.
 - Lightning or switching currents can be discharged into the ground.
 - A system fault can occur if a surge arrester fails during testing.
- Main Panel:** Displays the "IEEE 81tm /5 SAFETY PRECAUTIONS" section. It includes a checklist of safety activities, each with a green checkmark icon:
 - Ground electrode tests precautions
 - Reduced the hazards associated with handling test leads by wearing gloves and dielectrically rated footwear.
 - Exposed test leads and electrodes are isolated from workers and the general public prior.
 - Short test periods assured and all test leads promptly removed after the test is completed.
- Right Panel:** Shows a vertical list of tasks with status indicators (green checkmarks, red X, and blue squares) and a search icon.
- Bottom Panel:** Displays a task list with timestamps:
 - SAFETY HAZARDS DURING T... 09:15
 - AFTER TEST REMINDER 09:16
 - IEEE 81tm /5 SAFETY PRECAU... ...
 - SAFETY PRECAUTIONS BEFO... 09:17
- Bottom Bar:** Shows the location "TT VP1" and a power icon.

MI 3290 Single tests and Auto tests

Auto test is a sequence of flow commands and single tests:

