

RESISTANCE IMPULSE METER



Resistance impulse meter IMR-5 is a portable device dedicated to measurement of earth electrode resistance. Unique advantage of the meter is two wires (probes) measurement method, where the current probe with known resistance is used (railway or tramway running rails, return shield of MV cables or neutral wire N of LV network). IMR injects a single probing impulse. Short duration of probing impulse in the order of dozen milliseconds does not introduce any interferences either to railway control-command and signalling systems or MV or LV networks. Two wires (probes) measurement method significantly improves reliability of earth electrode resistance measurement by eliminating errors related to the placement of voltage probe and reference earth. Meter IMR-5 is also capable for resistance measurement using three wires (probes) method, where voltage probe is required.

APPLICATION

- Earth electrode resistance measurements.
- Small resistance measurements.
- Power cables shielding and wires continuity tests with an indication of measured resistance value.
- Continuity and quality test of earthing and bonding.
- Earth loop resistance measurement.

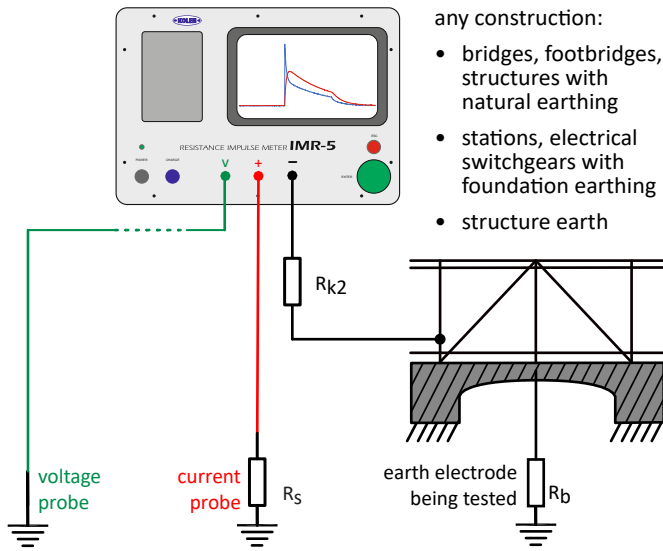
PARAMETERS

Measuring range	0.1 - 1000 Ω
Accuracy	$R < 100 \Omega$ 2.5 % or 0.02 Ω $R \geq 100 \Omega$ 10 %
Probing voltage	100 V
Power supply	internal Li-Ion battery
Dimensions	42 x 33 x 17 cm
Weight	5.6 kg
Accessories	battery charger test cables

BENEFITS

- Portable device.
- Current probe with known resistance is used in two probes method, therefore voltage probe and reference earth are eliminated.
- Resistance measurement is equivalent to voltmeter-ammeter method.
- Probing current value is comparable with small signal voltmeter-ammeter method.
- Unique calculation method eliminates impact of inductance, DC voltage level and harmonics of power supply network (50 Hz) existing in the measured circuit.
- Large and legible display simplifies measurement procedure.
- Probing impulse voltage and current waveforms are shown on the display.
- More than 50 tests can be performed with fully charged internal battery.





IMR-5 meter should be connected between the tested earth electrode and the earth electrode with known resistance (e.g. railway or tramway running rails, earth electrode of the HV/MV power station, MV/LV or neutral wire of the LV network). During the measurement, the meter injects a single current impulse with an amplitude of up to 100 A and a duration of several dozen milliseconds. Probing current reaches a value of up to 100 A for small resistances (milli ohms range) and is lower for higher resistance values. Based on recorded voltage and current waveforms, the resistance value is calculated. The computation algorithm eliminates effects of inductance, DC voltage and AC 50 Hz voltage harmonics. Results together with the date of the measurement are stored in internal memory and can be transferred to the computer for further analysis. Measurement of the earth's resistance taken by IMR-5 meter is equivalent to voltmeter-ammeter method.

Many years of experience with IMR meter and the use of running rails as a current probe with known resistance demonstrated that the return wire of MV cables or the neutral wire of the LV network can be used as a current probe. A lot of measurements of earth electrode resistance taken at various traction substations powered by MV cables (return wires earthed on both sides) showed results in the range of 0.2 - 0.4 Ω . Resistance measured in this case is the sum of running rails to earth resistance and the earthing resistance of the global power system connected with return wires to the substation earth electrode. This justifies the principle of using a global earthing for any earth electrode measurements using two wires (probes) method. Recently, sequence of measurements of earth electrode resistance has been taken with two probes method and the neutral wire N of the LV network. Decent results have been obtained for earth electrodes introducing several ohms of resistance.

The use of running rails during for measurement does not require powering-off of the traction power network, provided that the rails are not connected to the tested earth electrode. Earth electrode measurements of objects supplied from MV or LV network may be performed only when these objects are powered off. Testing other earth electrodes, that are not related to these objects can be performed without powering-off of the MV or LV voltage, unless the safety regulations state differently.

Experimental results of earthing resistance

- return wire of MV cables: 0.1 - 0.3 Ω
- running rails: 0.1 - 0.2 Ω
- neutral wire: 0.2 - 0.5 Ω with cable connection between power grid and MV/LV transformer
- neutral wire: < 1 Ω with overhead line connection between power grid and MV/LV transformer.

