

# First thing first checking continuity

Electrical safety is one of the fastest changing areas in electrical testing and measuring industry and one of the most scrutinized by the legal apparatus. Any errors are therefore costly in more ways than just one and only comprehensive training and dependable and easy to use testing equipment ensure quality, safe and time efficient work in any testing environment.

One of the first actions an electrician or inspector should perform before doing any testing or measuring is visually checking the general state of facilities, with emphasis on electrical installations and systems and all metal or other conductors that could come into contact with individuals or animals. That usually includes machinery and appliance housings, pipes, valves, faucets, baths and similar objects. Besides looking for obvious signs of wear and tear and damage, especially that of electrical nature, attention should also be given to safe operation of connected electrical devices.

But, qualitative examination offers only superficial insight into the state of electrical installations and protective systems – a more comprehensive approach is needed, such as testing continuity of protective conductors, insulation resistance and polarity and many more. In short, everything covered in IEC 60364-6 standard and national standards, derived from it. Among the aforementioned tests, one especially stands out, since it is in a way a basis for all other tests and measurements.



## Continuity testing

The most basic of electrical installation safety tests is also the most important, since any subsequent inspection and testing can potentially put the tester, both individual and the instrument, in harm's way. The purpose of continuity testing is in general checking if current flows from one point of a conductor to the other. In case of electrical safety that entails measuring resistance of protective conductors – unusually high resistance indicates bad contact or a complete break between the protected object and conductor.

### Technical note: Resistance compensation

As continuity testing measures very low resistances, inherent test lead resistance can lead to substantial errors if not properly accounted for before taking measurements. Both MI 3155 EurotestXD and MI 3152 EurotestXC offer an easy solution of touching the test leads together and pressing a single key – the instrument measures their resistance, stores the value and automatically subtracts it from end result. This procedure can be repeated at user's discretion, when using new/ other test leads or when there is a possibility of test lead resistance change (significant temperature swings).

### Field note: In the ground

One of the most common mistakes even experienced electrical test engineers, electrical inspectors and electricians make is only checking continuity of protective conductors to neutral ones inside inspected premises, without inspecting if neutral has maybe been switched with the phase wire (at the distribution board). Such situations are rare due to more stringent regulations and the increasing use of RCD switches, but can still happen by accident (unqualified repairs, modifications of existing installations etc.). Therefore, it's good practice to check continuity of protective conductors to non-energized objects, which likewise have to be grounded (gas pipes etc.) and in the end quickly verify that they themselves are properly grounded.

### Metrel edge: Continuity (re) testing

MI 3155 EurotestXD and MI 3152 EurotestXC have intuitive workspace managers that enable fast and easy execution of initial and periodic re-testing of facilities and installations, including continuity testing. Users can save new and previous results for specific objects under both names and graphical symbols, all nestled inside a hierarchically arranged workspace, enabling easy browsing with a few finger swipes or keystrokes. Or they can prepare the entire workspace structure beforehand in Metrel ES Manager PC software and further cut the time spend testing in the field.



Keep in mind that continuity testing should only be performed on de-energized objects (not in operation) and be especially careful when dealing with devices and installations of more capacitive character (wait for discharge). MI 3155 EurotestXD and MI 3152 EurotestXC also have a built-in protective feature that prevents continuity test execution if the instrument detects more than 10 V (AC or DC) between the test terminal and the ground. Also, be aware that this warning feature is engaged only when the user is in contact with the ground potential (eg. not using special, well insulated footwear or standing on a ladder). Instrument will also (audibly and visually) signal when the result is higher or lower than pre-set limit value.

The value itself is determined by testing standards for the specific installation or testing environment and is up to the user to decide. When testing low voltage domestic installations (those with a RCD switch) in accordance with the IEC 60364-6 standard that limit is usually up to 2  $\Omega$  (recommended 1  $\Omega$ ) – in others it may be less or more (calculated for specific fuse rating), but the value should always be low. Anything above indicates potentially dangerous situations in case of a faulty appliance, improper installation wiring, thermal and mechanical damages to connection cables etc.