



### Risk Assessment of Earthing and Short-Circuiting Devices

Every electrician knows the Five Safety Rules:

- Disconnect from the power supply
- Protect against accidental reconnection
- Verify absence of voltage
- Connect earthing and short-circuiting device
- Protect neighbouring live parts by covers and barriers

Application of these rules only offers an effective protection when devices and auxiliary material used in that process are in faultless condition.

Special importance has the earthing and short-circuiting device, as it has to master appearing currents reliably, and to discharge them towards earth.

How can one examine in a simple and secure way whether an earthing and short-circuiting device is still short circuit-proof? Which defects are acceptable and which defects have to exclude the device from further use?

With the help of the following checklist one can decide during a visual inspection at site whether the earthing and short-circuiting device is still safe. Questions are given in a way that in case of a reply with "no", further use of the device must be excluded or can be allowed only under reserve.

Use under reserve means that the earthing and short-circuiting device may be used again temporarily. Immediately afterwards it must be withdrawn from use for further examination (repair, scrapping)!

#### Checklist for examination:

Criteria for examination	Use under reserve	Further use excluded
Is the earthing and short-circuiting device approved for the job (for instance by a visible inspection marking)?		X
Is a work instruction available and is it known to the operating persons?		X
Is the earthing and short-circuiting device complete (including earthing rod)? Depending on construction, the device may consist of a different number of parts!		X
Is the instruction for use attached or available at the location (in paper or electronic form)?		X
Is the insulation on cables and connection cluster sufficiently transparent to be able to inspect the copper strands?	X	
Is the insulation on cables and connection clusters free of superficial damages (scratches, abrasion)?	X	
Is the insulation on cables and connection clusters free of severe damages (fissures, holes, bare copper strands)		X
Is the insulation on cables and connection clusters free of damages from heating (heat penetration, discolouring, burning)?		X
Are the copper strands free of discolouring? Discolouring may indicate corrosion (see following text)!		X
Are the copper strands, as far as visible, free of breakages?		X
Is the cross-section marking on the cables clearly visible?		X
Is the manufacturer's brand name clearly visible on the earthing and short-circuiting device?	X	
Is a type number and year of production clearly visible on the earthing and short-circuiting device?	X	
Are all undetachable connections (bolts) of the earthing and short-circuiting device tight, as far as detectable?		X
Are the moving parts of the clamps (spindles, etc.) easy-moving and movable in full range?		X
Are the contact areas of the clamps metallic bright and free of unevenness, heat penetration, burnings?		X
Are other clamp parts free of fissures or deformation which may limit stability?		X



Of all these examination criteria, probably most difficult is the examination for possible corrosion of copper strands. A lead for earthing and short-circuiting devices consists of a few thousand stranded wires which are covered with synthetic material. Caused by damage or ageing of the synthetic material, moisture can enter and cause corrosion of strands. This corrosion which is accompanied with discolouring, reduces the effective lead cross-section of the earthing and short-circuiting device, and thus its safety.

A problem is the correct interpretation of the discolouring between green and black. A green discolouring can indicate copper oxide (copper rust) caused by corrosion. Yet it could also be a discolouring of the PVC-insulation conditional of production (for instance by passivators) which has no influence on the copper strands. But in case of black discolouring one has to expect corrosion.

The present state of the art does not know a reliable and economic method to prove the faultless condition of earthing and short-circuiting cables by means of a non-destructive examination. Neither visual inspection nor evaluation of measurements will give a definite statement regarding possible corrosion of earthing and short-circuiting cables, or whether they still offer their full short circuit carrying capacity.



Reliability of devices serving primarily as security for persons must not be subjected to any compromise. For this reason those devices which are not clearly free of corrosion have to be withdrawn from further use.

In order to determine whether visible discolouring was really caused by corrosion, one presently has to cut the cables of earthing and short-circuiting devices and remove a short length of insulation. Only afterwards one can clearly see if indeed corrosion is the case or if the discolouring is negligible. With an insignificant discolouring one could crimp new cable lugs to the cable ends and return the earthing and short-circuiting cables for service.



Standard DIN VDE 61230: 2009-07 (IEC 61230: 2008-07) in Annex C.3.2.2, Example 2, recommends to inspect earthing and short-circuiting cables for corrosion at least every five years (ten years for indoor use). The failure rate should be compiled and used to determine the frequency of inspection, related to usage and storage conditions.

We would be pleased to assist you in evaluating cut or damaged earthing and short-circuiting cables or devices, and in repairing them, in order to permanently maintain the safety level of your earthing and short-circuiting devices.

One final note: The most effective prevention of corrosion or other damages of the earthing and short-circuiting device is careful and appropriate handling of the device during storage, transport, and usage. For this reason, where possible avoid anything that could damage the earthing and short-circuiting device or limit its usability.

**Only then you will reach a maximum in safety for yourself, your colleagues and assistants.**

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