

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Live working – Portable equipment for earthing or earthing and short-circuiting

Travaux sous tension – Equipements portables de mise à la terre ou de mise à la terre et en court-circuit

IEC 61230:2008

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**LIVE WORKING –
PORTABLE EQUIPMENT FOR EARTHING OR
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International Standard IEC 61230 has been prepared by IEC technical committee 78: Live working.

This second edition cancels and replaces the first edition published in 1993. It constitutes a technical revision.

The major changes are:

- extension of the scope to cover the use of equipment on d.c. installations;
- extension of the use of aluminium to all conductive parts of the device;
- extension of the application to silicone rubber cables made by the revision of TC 20 document IEC 61138;
- possibility of using this standard for separate components of the equipment;
- general revision of requirements and tests;
- deletion of the marking requirement of the double triangle to clarify that the products covered by the standard are not appropriate for performing live working;

- clarification and modification to the procedure for short-circuit test:
 - change of the number of devices submitted to test,
 - change of the pre-conditioning time to 48 h,
 - clarification of the test procedure for separate components,
- application of conformity assessment for products having completed the production phase, according to IEC 61318 Ed.3;
- revision of existing annexes;
- change of normative Annexes A and C into informative Annexes C and B with a reviewed wording;
- deletion of Annex B, not applicable according to IEC 61318 Ed.3;
- deletion of Annex D, its requirements and tests being now included in the body of the standard;
- introduction of a new informative Annex A on railway application;
- introduction of a new informative Annex D giving guidelines for determination of the equivalent r.m.s. value of a short-circuit current;
- revision of the list of type tests, which now appears in normative Annex E;
- introduction of a new normative Annex F on classification of defects.

The text of this standard is based on the following documents:

FDIS	Report on voting
78/741/FDIS	78/748/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

INTRODUCTION

This International Standard has been prepared in accordance with the requirements of IEC 61477.

An agreement may be made between manufacturer and customer for additional requirements, and tests. These additional requirements are prescribed in the customer's specification on the basis of an acceptance procedure.

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LIVE WORKING – PORTABLE EQUIPMENT FOR EARTHING OR EARTHING AND SHORT-CIRCUITING

1 Scope

This International Standard is applicable to portable equipment, with or without matching connection points, for temporary earthing or earthing and short-circuiting of electrically isolated or de-energized a.c. and d.c. installations, distribution and transmission networks, whether they are overhead or underground or of low or high voltage.

NOTE Annex A provides guidance for application to railway systems.

This standard covers equipment comprising an earthing or a short-circuiting or an earthing and short-circuiting device and insulating component. An example is given in Figure 1a and Figure 1b.

It also covers:

- earthing or short-circuiting or earthing and short-circuiting devices intended to be installed with insulating means. An example of an earthing device is given in Figure 1c;
- separate components, such as conductive extension (see Figure 1b) or clamp or cable with end fittings.

The performance of equipment, devices and components covered by this standard is based on electro-dynamic and electro-thermal effects acting during short-circuit. The withstand capability of the devices and equipment is expressed by their rated values of current, time and peak factor. No rated voltage is given, but the geometrical dimensions of the equipment are also linked to the voltage of the installation.

Examples of connection diagrams of earthing and short-circuiting devices are given in Figures 2 and 3. Associated usual lengths of cables are given in Table 1.

Not covered in this standard are:

- insulating means, such as insulating sticks, telescopic sticks, insulating handles, insulating gloves, aerial devices with insulating booms, insulating ropes to be used to install the earthing and short-circuiting device;
 - insulating components, except for basic safety requirements for the insulating element;
- NOTE Basic safety recommendations for earthing sticks are given in Annex B.
- devices meant only for the draining of induced currents;
 - relevant working procedures for using portable equipment for earthing or earthing and short-circuiting.

NOTE The equipment complying with this standard should be used according to safe working procedures and according to local or national regulation, such as live working or dead working procedures.

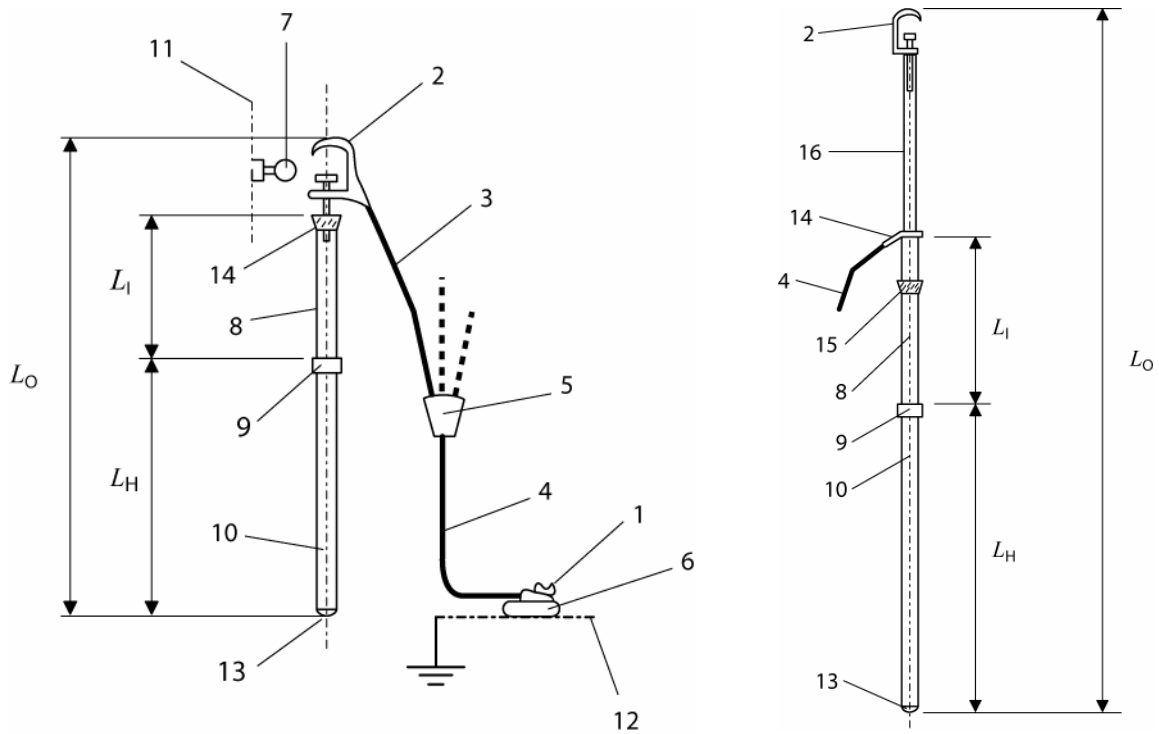
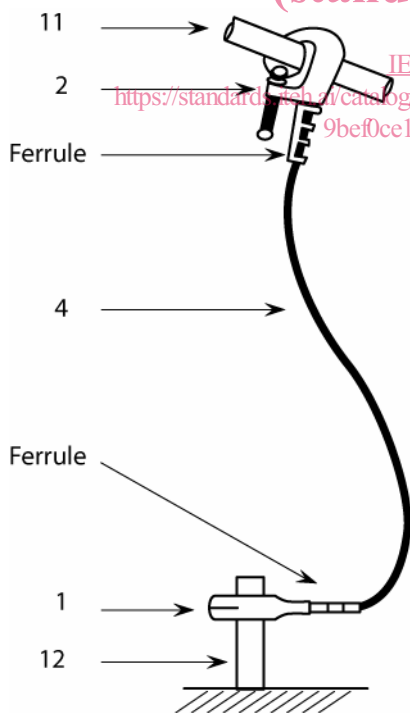


Figure 1a – Multi-phase equipment

Figure 1b – Single-phase equipment with extension



NOTE The same device can also be used for short-circuiting.

Figure 1c – Earthing device

Figure 1 – Examples of portable equipment and device for installations, network and railway systems application

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Key

- 1 Earth clamp or rail clamp
- 2 Line clamp or contact line clamp
- 3 Short-circuiting cable(s)
- 4 Earthing cable(s)
- 5 Connecting cluster
- 6 Earth permanent connection point or rail
- 7 Line permanent connection point or overhead contact line profile
- 8 Insulating element
- 9 Handle limit mark
- 10 Handle of earthing stick
- 11 Installation conductor or bar
- 12 Earthing system
- 13 End cap of stick
- 14 End fitting, permanent or detachable
- 15 Stick coupling, detachable for transport reasons
- 16 Conductive extension
- L_1 Length of insulating element
- L_H Length of handle
- L_O Overall length of earthing stick and conductive extension component

NOTE 1 The earthing and short-circuiting device comprises components 1, 2, 3, 4, 5 and 16.

NOTE 2 The earthing stick comprises components 8, 9, 10, 13, 14 and 15.

NOTE 3 The earthing device comprises components 1, 2 and 4.

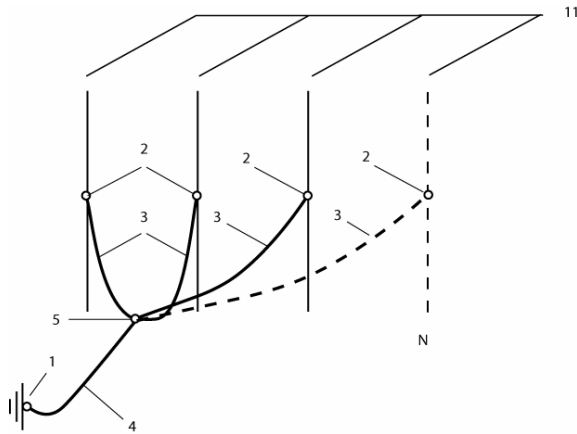


Figure 2a

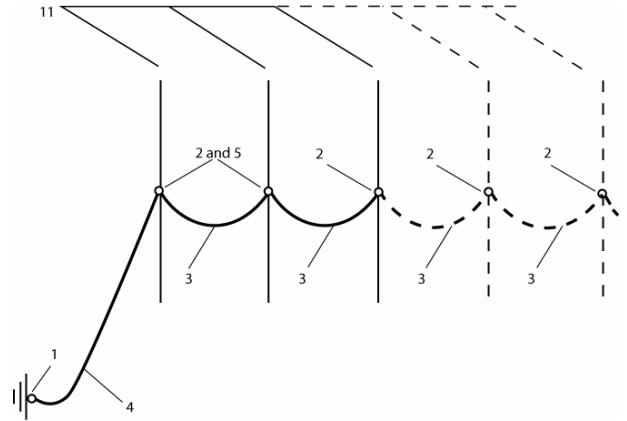


Figure 2b

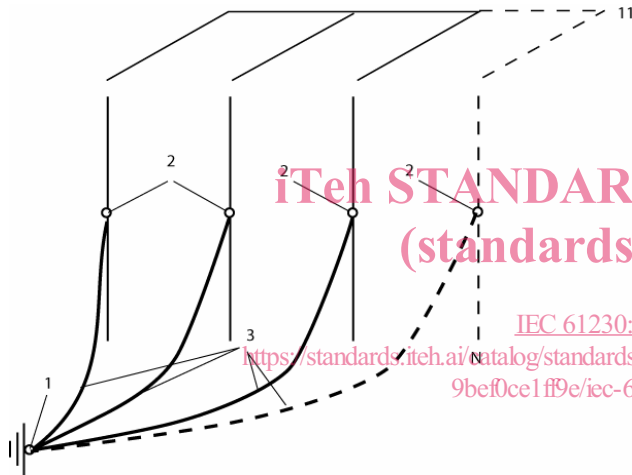


Figure 2c

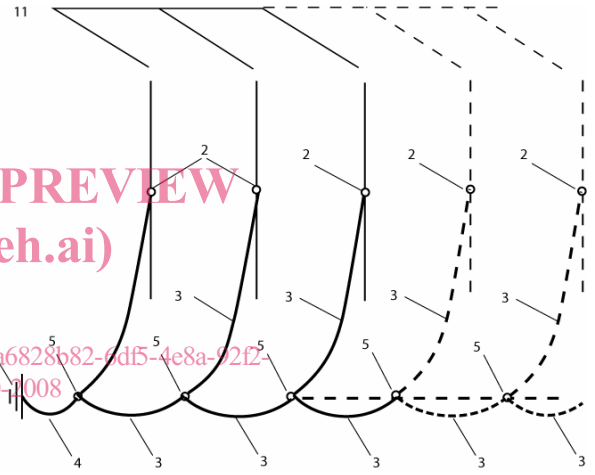
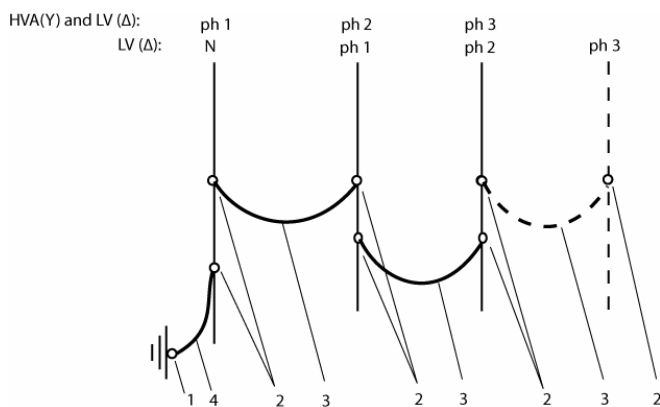


Figure 2d



Key

- 1 Earth clamp
- 2 Line clamp
- 3 Short-circuiting cable(s)
- 4 Earthing cable(s)
- 5 Connecting cluster
- 11 Installation conductor or bar
- 16 Conductive extension

HVA (Y) = High voltage distribution , Y Neutral system

LV (Δ) = Low voltage, Δ Neutral system

Figure 2e

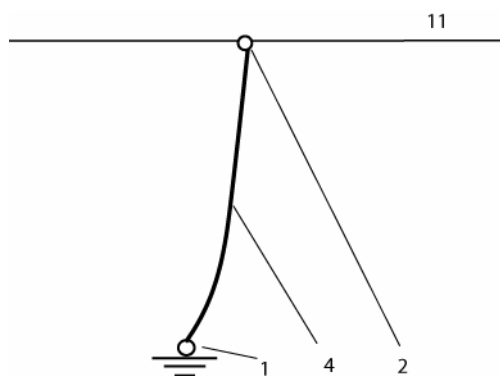


Figure 2f

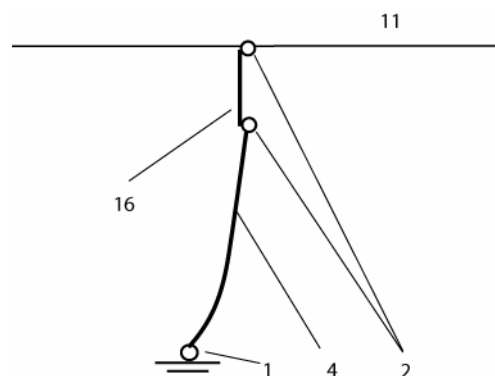


Figure 2g

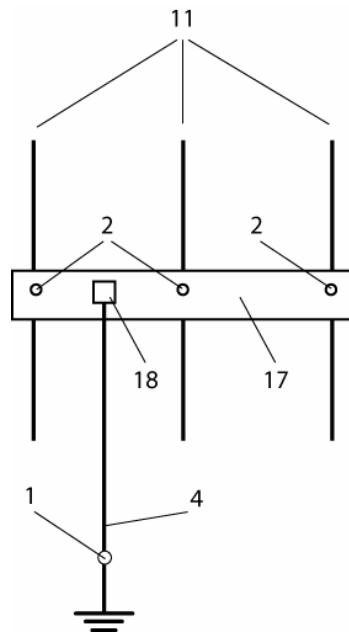
Figure 2 – Connection diagrams of single and multi-phase earthing and short-circuiting devices for network application

NOTE Figure 2 shows examples only of connection arrangements. Not all are suitable for all situations. It is the responsibility of the user to consider movement of connecting cables from magnetic forces. This has to be considered prior to a final connection.

Table 1 – Usual lengths of earthing and short-circuiting cables for different types of installations and different voltage levels

Classes of operating voltages	STANDARD PREVIEW (standards.iteh.ai)		
	Overhead line	Open air substation	Metal enclosed or indoor substation
Low voltage ^a	Multi-phase Figures 2a, 2b, 2c, 2d key 3 = 0,5 m key 4 = 12 m to 16 m	Multi-phase Figure 2c ; key 3 = 0,5 m Figure 2a ; key 3 = 0,5 m and key 4 = 1 m to 10 m	Specific
	Single-phase Figure 2f key 4 = 0,5 m to 10 m		
Distribution ^a	Multi-phase Figures 2a, 2b, 2c, 2d key 3 = 2 m to 2,5 m key 4 = 8 m to 10 m	Multi-phase Figures 2a, 2b, 2c key 3 = 7,5m to 10 m key 4 = 2,5 m to 3 m	Multi-phase Figure 2a key 3 = 0,7 m key 4 = 2 m
	Multi-phase + 5 m extension Figure 2g key 4 = 8 m to 10 m		
	Single-phase Figure 2f key 4 = 8 m to 10 m	Single-phase Figure 2f key 4 = 10 m to 12 m	
Transmission ^a	Single-phase Figure 2f key 4 = 8 m	Single-phase Figure 2f key 4 = 10 m to 12 m	Multi-phase Figure 2a key 3 = 3 m key 4 = 3 m
		Single-phase + 2 m to 5 m extension Figure 2g key 4 = 7 m to 8 m	Single-phase Figure 2f key 4 = 3 m to 4 m

^a The voltage limits for the different classes of operating voltage are conventional values and could be modified by national regulations or national practice.



Key

- 1 Earth clamp
- 2 Line clamp
- 4 Earthing cable(s)
- 11 Installation conductor
- 17 Short-circuiting bar
- 18 Earthing cable connection

Figure 3 – Illustration of a three-phase earthing and short-circuiting device with short-circuiting bar and earthing cable(s) for installation and network application

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60060-1:1989 *High voltage test techniques – Part 1: General definitions and test requirements* ¹⁾

IEC 60068-2-11:1981, *Environmental testing – Part 2: Tests – Test Ka: Salt mist*

IEC 60068-2-42:2003, *Environmental testing – Part 2-42: Tests – Test Kc: Sulphur dioxide test for contacts and connections*

IEC 60811-1-4:1985, *Common test methods for insulating and sheathing materials of electric cables – Part 1: Methods for general application – Section Four: Tests at low temperature*
 Amendment 1 (1993)
 Amendment 2 (2001)

¹⁾ Under revision.

IEC 60811-2-1:1998, *Insulating and sheathing materials of electric and optical cables Common test methods – Part 2-1: Methods specific to elastomeric compounds – Ozone resistance, hot test and mineral oil immersion tests*
Amendment 1 (2001)²⁾

IEC 60811-3-1:1985, *Common test methods for insulating and sheathing materials of electric cables – Part 3: Methods specific to PVC compounds – Section One – Pressure test at high temperature – Tests for resistance to cracking*
Amendment 1 (1994)
Amendment 2 (2001)

IEC 61138:2007, *Cables for portable earthing and short-circuiting equipment*

IEC 61318:2007, *Live working – Conformity assessment applicable to tools, devices and equipment*

IEC 61477:2001, *Live working – Minimum requirements for the utilization of tools, devices and equipment*
Amendment 1 (2002)
Amendment 2 (2004)³⁾

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61318 and the following apply.

NOTE Further information on terminology is illustrated in Figures 1, 2 and 3.

3.1

conductive extension

rigid conductor forming an extension of an earthing or short-circuiting or earthing and short-circuiting device

NOTE The conductive extension can be installed between the end fitting of an earthing stick and a line clamp, or between a line clamp and connecting point.

[IEC 60743, definition 15.9, modified; IEV 651-14-11, modified]

3.2

connecting cluster

component of an earthing and short-circuiting device for connecting short-circuiting cables either directly or through connecting links, such as cable lugs, to each other and to the earthing cable(s) and/or the earth clamp

[IEC 60743, definition 15.5, modified; IEV 651-14-06, modified]

3.3

connecting point

part of installation or part of test set-up to which a clamp is connected

²⁾ There exists a consolidated edition 2.1 (2001) that includes IEC 60811-2-1:1998 and its Amendment 1.

³⁾ There exists a consolidated edition 1.2 (2005) that includes IEC 61447:2001 and its Amendments 1 and 2.