

Live working — Earthing or earthing and short-circuiting equipment using lances as a short-circuiting device — Lance earthing

The European Standard EN 61219 : 1993 has the status of a
British Standard

Travaux sous tension — Appareil de mise à la
terre ou de mise à la terre et en court-circuit
utilisant des cannes comme dispositif de mise
en court-circuit — Mise à la terre au moyen de
cannes

Arbeiten unter Spannung
Erdungs- oder Erdungs- und
Kurzschlievorrichtung mit Stben als
kurzschlieendes Gert Stberdung

UDC 621.316.98-182:621.3.064.1

Cooperating organizations

The European Committee for Electrotechnical Standardization (CENELEC), under whose supervision this European Standard was prepared, comprises the national committees of the following countries:

Austria	Italy
Belgium	Luxembourg
Denmark	Netherlands
Finland	Norway
France	Portugal
Germany	Spain
Greece	Sweden
Iceland	Switzerland
Ireland	United Kingdom

This British Standard, having been prepared under the direction of the Power Electrical Engineering Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 15 July 1994

© BSI 1994

The following BSI references relate to the work on this standard:
Committee reference PEL/88
Draft for comment 92/20132 DC

ISBN 0 580 23147 X

Amendments issued since publication

Amd. No.	Date	Text affected

Contents

	Page
Cooperating organizations	Inside front cover
National foreword	i
EN foreword	2
Text of EN 61219 : 1994	3
National annex NA (informative) Original IEC text amended by CENELEC common modifications	38
National annex NB (informative) Committees responsible	Inside back cover
National annex NC (informative) Cross-references	Inside back cover

National foreword

This British Standard has been prepared under the direction of the Power Electrical Engineering Standards Policy Committee and is the English language version of EN 61219 *Live working — Earthing or earthing and short-circuiting equipment using lances as a short-circuiting device — Lance earthing*, published by the European Committee for Electrotechnical Standardization (CENELEC). It was derived by CENELEC from IEC 1219 : 1993, published by the International Electrotechnical Commission (IEC) and prepared by IEC Technical Committee No. 78 'Tools for live working'.

The CENELEC common modifications have been implemented at the appropriate places in the text and are indicated by a side line in the margin. Parts of the original IEC text that have been modified by CENELEC have been quoted in the national annex NA.

The graphic signs, symbols and letters used in this standard may be found in the following British Standard:

BS 3939 *Graphical symbols for electrical power, telecommunications and electronics diagrams*

Part 1 : 1986 *General information, general index*

Part 2 : 1985 *Symbol elements, qualifying symbols and other symbols having general application*

Compliance with a British Standard does not of itself confer immunity from legal obligations.

UDC 621.316.98-182:621.3.064.1

Descriptors: Live working, characteristics, tests, earthing device, short-circuiting device, lance

English version

Live working — Earthing or earthing and short-circuiting equipment using lances as a short-circuiting device — Lance earthing

(IEC 1219 : 1993)

Travaux sous tension — Appareil de mise à la terre ou de mise à la terre et en court-circuit utilisant des cannes comme dispositif de mise en court-circuit — Mise à la terre au moyen de cannes
(CEI 1219 : 1993)

Arbeiten unter Spannung
Erdungs- oder Erdungs- und KurzschlieÙvorrichtung mit Stäben als kurzschlieÙendes Gerät Stäberdung
(IEC 1219 : 1993)

This European Standard was approved by CENELEC on 1993-09-22. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B-1050 Brussels

© 1993 Copyright reserved to CENELEC members

Ref. No. EN 61219 : 1993 E

 **Documents**
Document Sharing Hub

Foreword

The text of document 78 (CO) 74, as prepared by IEC Technical Committee 78: Tools for live working, was submitted to the IEC-CENELEC parallel vote in December 1992.

The reference document was approved by CENELEC as EN 61219 on 22 September 1993.

The following dates were fixed:

- latest date of publication
of an identical national
standard (dop) 1994-10-01
- latest date of withdrawal
of conflicting national
standards (dow) 1994-10-01

For products which have complied with the relevant national standard before 1994-10-01, as shown by the manufacturer or by a certification body, this previous standard may continue to apply for production until 1999-10-01.

Annexes designated 'normative' are part of the body of the standard. Annexes designated 'informative' are given only for information. In this standard, annexes A, B, C and ZA are normative.

CONTENTS

Clause		Page
1	Scope	5
2	Normative references	5
3	Definitions	6
3.1	Tests	6
3.2	Special terms	7
4	Electrical characteristics	9
5	Requirements	9
5.1	General	9
5.2	Earthing cables	10
5.3	Lances, lance contacts and guiding components	11
5.4	Insulation co-ordination with assemblies	13
5.5	Co-ordination with assembly enclosure	13
5.6	Marking	13
5.7	Manufacturer's instructions for use	14
6	Tests	15
6.1	General	15
6.2	Lance insertion and removal test	18
6.3	Test on reliability of stops and ability of lances, couplings, handles and stops to withstand connecting forces	19
6.4	Short-circuit current tests	19
6.5	Dielectric tests	24
6.6	Testing durability of marking	24

Figures

1	Illustrations of multi-phase earthing and short-circuiting with one single lance	25
2	Illustration of multiple lance	25
3	Illustrations of multi-phase lance earthings with a set of single lances	26
4	Illustrations of single-phase lance earthings	27
5	Typical test set-up for multi-phase lance earthings with one single lance (used for voltages ≤ 36 kV)	28
6	Insulating handle and its preparation for voltage test	28
7	Typical test set-up for lance earthings with voltages > 36 kV	29

Tables

1	Special temperature categories	10
2	List of tests referred to subclauses and test categories	16
3	Peak current factor	21

Annexes

A	Sampling procedure	30
B	Short-circuit testing in a standardized test set-up of multi-phase devices using a set of single lances	31
C	Selection, use and maintenance of lance earthings	32
ZA (normative)	Other international publications quoted in this standard with the references of the relevant European publications.....	34

LIVE WORKING – EARTHING OR EARTHING AND SHORT-CIRCUITING EQUIPMENT USING LANCES AS A SHORT-CIRCUITING DEVICE – LANCE EARTHING

1 Scope

International Standard IEC 1219 applies to equipment for temporary earthing or earthing and short-circuiting of electrically isolated parts of a.c. installations, the disconnection of which has been verified including the absence of voltage, for the protection of workers while work is in progress using lance(s) (see 3.2.2) as the earthing or earthing and short-circuiting device. The standard specifies the performance and safety requirements and tests for lance devices with matching fixed contacts, guiding arrangements, enclosure, insulating elements and earthing cables, if any.

The characteristics of the earthing equipment covered by this standard should be defined on the basis of the intensity and duration of the current, and an voltage when needed for insulation purposes. IEC 855 provides the electrical requirements for separate insulating elements of the equipment.

Component types or configurations are not specified but should comply with the electrical and mechanical requirements of this standard.

This standard is restricted to equipment using copper bars, aluminium bars or iron bars as short-circuiting medium.

NOTE - This standard is not applicable to devices containing short-circuiting cables, which follow the requirements given in IEC 1230.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 50(151): 1978, *International Electrotechnical Vocabulary (IEV) – Chapter 151: Electrical and magnetic devices*

IEC 60-1: 1989, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 298: 1990, *A.C. metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV*

IEC 410: 1973, *Sampling plans and procedures for inspection by attributes*

IEC 439-1: 1992, *Low-voltage switchgear and controlgear assemblies – Part 1: Type-tested and partially type-tested assemblies*

IEC 479-1: 1984, *Effects of current passing through the human body – Part 1: General aspects – Chapter 1: Electrical impedance of the human body – Chapter 2: Effects of alternating current in the range of 15 Hz to 100 Hz – Chapter 3: Effects of direct current*

IEC 855: 1985, *Insulating foam-filled tubes and solid rods for live working*

IEC 1138: 1992, *Live working – Cables for portable earthing and short-circuiting equipment*

IEC 1230: 1993, *Live working – Portable equipment for earthing or earthing and short-circuiting*

IEC 1235: 1993, *Live working – Insulating follow tubes for electrical purposes*

3 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1 Tests

3.1.1 Type test

A test of one or more devices made to a certain design to show that the design meets certain specifications. [IEV 151-04-15]

3.1.2 Sampling test

A test on a number of devices taken at random from a batch. [IEV 151-04-17]

3.1.3 Routine test

A test to which each individual device is subjected during or after manufacture to ascertain whether it complies with certain criteria. [IEV 151-04-16]

3.1.4 Acceptance test

A contractual test to prove to the customer that the device meets certain conditions of its specification. [IEV 151-04-20]

3.2 *Special terms*

3.2.1 Lance earthing

Earthing equipment using lance(s) as devices for earthing or earthing and short-circuiting (see figures 1 to 4). Comprises lance(s), lance contacts on the conductors to be earthed or earthed and short-circuited, earth connection, guiding components and insulating handle(s) or earthing pole(s).

3.2.2 Lance

Lance-shaped conductive rod used for earthing or earthing and short-circuiting by pushing it longitudinally and guiding it into lance contacts. Comprises a conductive part and an insulating handle with hand guard, an earthing pole or a coupling for a separate insulating element (see figures 1 to 4).

3.2.2.1 Single lance

Single- or multi-phase device with one lance only (see figures 1, 3 and 4).

3.2.2.2 Multiple lance

Multi-phase device with a number of lances electrically and mechanically connected together into a rigid multi-pole structure by a short-circuiting and mechanically uniting frame (see figure 2).

3.2.3 Multi-phase lance device

The general ways to assemble a multi-phase lance device are:

- a) A single lance used as the device for earthing and short-circuiting is:
 - connected to an earthing cable, pushed sequentially and guided into the line lance contacts of the conductors to be earthed and short-circuited (see figure 1a);
- or
- pushed sequentially and guided through an earthing lance contact into the line lance contacts of the conductors to be earthed and short-circuited (see figure 1b).
- b) With a set of single lances used as a device for earthing and short-circuiting by pushing and guiding each lance sequentially through an earthing lance contact into the line lance contact of one of the conductors to be earthed and short-circuited (see figure 3).
- c) With a multiple lance used as a device for earthing and short-circuiting. It is connected to an earthing cable and pushed simultaneously and guided into the lance contacts of the conductors to be earthed and short-circuited (see figure 2).

NOTES

- 1 A set of single lances can form a multi-phase lance device only when using earthing lance contacts (see notes in clause 1 and 3.2.7).
- 2 A multiple lance using earthing lance contacts has no advantages over a set of single lances.

3.2.4 Single-phase lance device

Single lance used for earthing and short-circuiting a single-phase system by being pushed sequentially and guided through an earthing lance contact into the line lance contact of the conductor to be earthed and short-circuited (see figure 4).

3.2.5 Earth connection

Connection between a lance and the earthing system. Comprises earth clamps, earthing lance contact or earthing cable and sometimes parts of supporting structures (see figures 1 to 4 and 7).

3.2.6 Lance contact

Fixed installation contact, specially arranged for the guiding, connection and securing of a lance.

3.2.6.1 Line lance contact

Lance contact connected to the conductor to be earthed or earthed and short-circuited (see figures 1 to 4).

3.2.6.2 Earthing lance contact

Lance contact connected to the earthing system (see figures 1b, 3 and 4).

3.2.7 Earthing cable

Cable used for earth connection (see figures 1a and 2).

NOTE - A cable forming part of a short-circuiting device is defined as a short-circuiting cable and cannot be referenced to this standard.

3.2.8 Insulating element

Hand-held insulating component for bringing and connecting a lance to parts of electrical installations for earthing or earthing and short-circuiting purposes.

3.2.8.1 Insulating handle

Insulating element comprising a short grip, a handguard and a coupling, fixed or detachable, to a lance (see figure 6).

3.2.8.2 Earthing pole

Insulating element comprising an insulating rod, foam-filled tube or hollow tube with fixed or detachable coupling to a lance (see figure 3b).

3.2.9 Short-circuiting device

Device for interconnecting conductors for short-circuiting purposes.

NOTE - The interconnection may be made partly through the earthing system (see figures 3 and 7).

3.2.10 Rated current I_r and rated time t_r

Values assigned to a lance earthing or part of it, to define the highest r.m.s. value of current and the highest Joule-integral ($I_r^2 t_r$) that it can resist without unacceptable effects. The values apply only to those parts designed to withstand short-circuit current.

3.2.11 Rated conditional short-circuit current

Value of the prospective short-circuit current that a lance earthing, protected by a current-limiting switching device, can satisfactorily withstand for the operating time of this device under specified test conditions (see 4.6 of IEC 439-1).

3.2.12 Peak current I_m

Peak value of the highest current during the transient period following initial energizing of the circuit.

4 Electrical characteristics

Each component of a lance earthing that is exposed to short-circuit current is characterized by rated current I_r and rated time t_r .

Six values of rated time are standardized:

3; 2; 1; 0,5; 0,25 and 0,1 s

I_r shall be specified for one of these standard times or as a rated conditional short-circuit current for a specified combination with an effective current-limiting protection.

No part of a lance earthing shall be exposed to a current or Joule-integral higher than that defined by its rated values.

NOTE - The equipment may be used for a longer short-circuit time than its rated time if the Joule-integral $I_r^2 t_r$ is not exceeded.

5 Requirements

5.1 General

Equipment shall permit safe and simple earthing and short-circuiting of electrical installations (see annex C).

Devices, when installed according to instructions for use, shall be able to withstand all stresses from fault currents that they will be exposed to in practice without causing electrical, mechanical, chemical or thermal danger to persons. For indoor use, accepted temperatures and materials shall be co-ordinated so as to avoid any interference with the evacuation of personnel to avoid harmful concentrations of toxic vapours as well as serious, permanent damage to installations or buildings.

Reliable current-limiting fuses and circuit breakers are available for low voltage. If a low-voltage lance earthing designed for continued use is effectively protected by a current-limiting switching device, the requirements can be based on the rated conditional short-circuit current.

Equipment for continued use after short-circuit exposure shall, as an additional requirement, be in perfect condition after exposure to the severest short-circuit stresses for which it is designed.

The following clauses specify the requirements and tests necessary to verify that a device meets these requirements (see table 2). Agreement may be made between manufacturer and customer on additional requirements and tests prescribed in the customer's specification.

With respect to climatic conditions, equipment for stationary use in normal indoor atmosphere shall refer to a temperature range + 5 °C to + 55 °C. For mobile and outdoor equipment, normal use shall refer to a temperature range – 25 °C to + 55 °C. Two special categories for high (W) and low (C) temperature use are included (see table 1).

Table 1 – Special temperature categories

Category	Temperature range
Warm (W)	– 5 °C to + 70 °C
Cold (C)	– 40 °C to + 55 °C

5.2 Earthing cables

Earthing cables shall be sized for expected fault currents.

For mechanical reasons the conductor shall have as a minimum a 16 mm² copper equivalent cross-section.

The cable shall have an insulating cover for mechanical and chemical protection and shall be connected in such a way as to ensure reliable contacts and excellent fatigue resistance. This is achieved by selecting earthing cables according to IEC 1138 and end fittings according to 4.4 of IEC 1230.

NOTE - There are two common practices regarding the colour of the covering:

- a) a bright colour, such as orange or red, to increase the visibility of the device. Preferences differ among users;
- b) transparency to permit inspection of the conductor for signs of corrosion or surface strand damage, although such transparency is usually lost after repeated use.