

Indicator light units for household and similar fixed-electrical installations —

Part 1: General requirements

The European Standard EN 62094-1:2003, with the incorporation of amendment A11:2003, has the status of a British Standard

ICS 29.120.99; 29.140.99

National foreword

This British Standard is the official English language version of EN 62094-1:2003, including amendment A11:2003. It is identical with IEC 62094-1:2002.

The UK participation in its preparation was entrusted to Technical Committee PEL/23, Installed electrical accessories, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

Cross-references

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English version

**Indicator light units for household
and similar fixed-electrical installations**
Part 1: General requirements
(includes amendment A11:2003)
(IEC 62094-1:2002)

Voyants lumineux pour installations
électriques fixes domestiques
et analogues
Partie 1: Prescriptions générales
(inclut l'amendement A11:2003)
(CEI 62094-1:2002)

Anzeigeleuchten für Haushalt
und ähnliche ortsfeste elektrische
Installationen
Teil 1: Allgemeine Anforderungen
(enthält Änderung A11:2003)
(IEC 62094-1:2002)

This European Standard was approved by CENELEC on 2002-12-01; amendment A11 was approved by CENELEC on 2003-07-01. 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.

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CENELEC

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Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

The text of document 23B/679/FDIS, future edition 1 of IEC 62094-1, prepared by SC 23B, Plugs, socket-outlets and switches, of IEC TC 23, Electrical accessories, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 62094-1 on 2002-12-01.

The following dates were fixed:

- latest date by which the EN has to be implemented
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national standard or by endorsement (dop) 2003-09-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2005-12-01

Annexes designated "normative" are part of the body of the standard.
In this standard, annex ZA is normative.
Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 62094-1:2002 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60417-1	NOTE	Harmonized as EN 60417-1:1999 (not modified).
IEC 60598	NOTE	Harmonized in EN 60598 series (modified).
IEC 60999-1	NOTE	Harmonized as EN 60999-1:2000 (not modified).

Foreword to amendment A11

This amendment to the European Standard EN 62094-1 was prepared by the Technical Committee CENELEC TC 23B, Switches for household and similar fixed electrical installations.

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as amendment A11 to EN 62094-1:2003 on 2003-07-01.

The following dates were fixed:

- latest date by which the amendment has to be implemented
at national level by publication of an identical
national standard or by endorsement (dop) 2004-07-01
- latest date by which the national standards conflicting
with the amendment have to be withdrawn (dow) 2006-07-01

Annexes designated "normative" are part of the body of the standard.
In this standard, Annex ZB is normative.
Annex ZB has been added by CENELEC.

Notes which are additional to those in IEC 62094-1 are prefixed "Z".

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INDICATOR LIGHT UNITS FOR HOUSEHOLD AND SIMILAR FIXED-ELECTRICAL INSTALLATIONS –

Part 1: General requirements

1 Scope

This International Standard applies to stand-alone indicator light units intended to give a visible signal. They are designed for a.c. only with a rated voltage not exceeding 440 V and a rated power not exceeding 10 W, for household and similar fixed-electrical installations, either indoors or outdoors.

NOTE 1 Indicator light units are not intended for lighting as a luminaire (see IEC 60598).

This standard does not apply to pilot lights incorporated in products complying with their own standards which are tested as part of that product.

The standard also applies to boxes for indicator light units, with the exception of flush-mounting boxes (according to IEC 60670) for flush-type indicator light units.

Indicator light units complying with this standard are suitable for use at ambient temperatures not normally exceeding 25 °C, but occasionally reaching 35 °C.

In locations where special conditions prevail, as in ships, vehicles and the like and in hazardous locations, for example where explosions are liable to occur, special constructions may be required.

NOTE 2 LEDs and lamps are not considered as indicator light units, but as components.

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 60061 (all parts), *Lamp caps and holders together with gauges for the control of interchangeability and safety*

IEC 60112, *Method for determining the comparative and the proof tracking indices of solid insulating materials under moist conditions*

IEC 60212, *Standard conditions for use prior to and during the testing of solid electrical insulating materials*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 60695-2-10:2000, *Fire hazard testing – Part 2-10: Glowing/hot wire based test methods – Glow wire apparatus and common test procedure*

IEC 60695-2-11:2000, *Fire hazard testing – Part 2-11: Glowing/hot wire based test methods – Glow wire flammability test method for end-products*

IEC 60998 (all parts), *Connecting devices for low-voltage circuits for household and similar purposes*

IEC 61032:1997, *Protection of persons and equipment by enclosures – Probes for verification*

3 Definitions

For the purposes of this standard the following definitions apply.

NOTE Where the terms “voltage” and “current” are used, they imply r.m.s. values unless otherwise specified.

3.1

indicator light unit

device equipped with terminals or terminations (such as connecting leads), designed to give a visible signal by light emission, not designed for lighting as a luminaire

3.2

terminal with screw clamping

terminal intended for the connection, by clamping only, of external rigid or flexible conductors

3.3

pillar terminal

terminal with screw clamping in which the conductor is inserted into the hole or cavity, where it is clamped under the end of the screw or screws. The clamping pressure may be applied directly by the end of the screw or through an intermediate clamping member to which pressure is applied by the end of the screw

NOTE Examples of pillar terminals are shown in Figure 1.

3.4

screw terminal

terminal with screw clamping in which the conductor is clamped under the head of the screw. The clamping pressure may be applied directly to the head of the screw or through an intermediate part, such as a washer, clamping plate or anti-spread device

NOTE Examples of screw terminals are shown in Figure 2.

3.5

stud terminal

terminal with screw clamping in which the conductor is clamped under a nut. The clamping pressure may be applied directly by a suitably shaped nut or through an intermediate part, such as a washer, clamping plate or anti-spread device

NOTE Examples of stud terminals are shown in Figure 2.

3.6

mantle terminal

terminal with screw clamping in which the conductor is clamped against the base of a slot in a threaded stud by means of a nut. The conductor is clamped against the base of the slot by a suitably shaped washer under the nut, by a central peg if the nut is a cap nut, or by equally effective means for transmitting the pressure from the nut to the conductor within the slot

NOTE Examples of mantle terminals are shown in Figure 3.

3.7

screwless terminal

connecting device for the connection and subsequent disconnection of a rigid (solid or stranded) or flexible conductor or the interconnection of two conductors capable of being dismantled, the connection being made, directly or indirectly, by means of springs, parts of angled, eccentric or conical form, etc, without special preparation of the conductor concerned, other than removal of insulation

3.8

thread-forming screw

tapping screw having an uninterrupted thread which, by screwing in, forms a thread by displacing material

NOTE An example of a thread-forming screw is shown in Figure 4.

3.9

thread-cutting screw

tapping screw having an interrupted thread which, by screwing in, forms a thread by removing material

NOTE An example of a thread-cutting screw is shown in Figure 5.

3.10

base

part of the indicator light unit retaining current-carrying parts and the mechanism if any, in position

3.11

rated voltage

voltage assigned to the indicator light unit by the manufacturer

3.12

rated power

power of the indicator light unit equipped with the lamp(s) assigned by the manufacturer

4 General requirements

Indicator light units and boxes shall be so designed and constructed that, in normal use, their performance is reliable and without danger to the user or the surroundings.

Compliance is checked by meeting all the relevant requirements and tests specified.

5 General notes on tests

5.1 *Tests according to this standard are type tests.*

5.2 *Unless otherwise specified, the specimens are tested as delivered and under normal conditions of use.*

Indicator light units intended to be installed in dedicated boxes are tested with their corresponding boxes.

5.3 *Unless otherwise specified, the tests are carried out in the order of the clauses, at an ambient temperature between 15 °C and 35 °C.*

In case of doubt, the tests are made at an ambient temperature of (20 ± 5) °C.

5.4 *For indicator light units which are marked with one rated voltage and one rated power, nine specimens are necessary. Three specimens are subjected to all the relevant tests except the tests of Clause 21, where another three specimens are used. For the test of 21.2, three additional specimens may be required.*

For the tests of 12.3.2, three additional specimens are necessary.

For the tests of 12.3.11, additional specimens having in total at least five screwless terminals are required.

For the tests of 12.3.12, three additional specimens are necessary; in each specimen, one clamping unit is tested.

5.5 *The specimens are submitted to all the relevant tests and the requirements are satisfied if all the tests are met.*

If one specimen does not satisfy a test due to an assembly or a manufacturing fault, that test and any preceding one which may have influenced the results of the test shall be repeated and also the tests which follow shall be made in the required sequence on another full set of specimens, all of which shall comply with the requirements.

NOTE The applicant may submit, together with the number of specimens specified in 5.4 an additional set of specimens which may be required, should one specimen fail. The testing station will then, without further request, test additional specimens and will reject only if a further failure occurs. If the additional set of specimens is not submitted at the same time, the failure of one specimen will entail rejection.

6 Ratings

6.1 Indicator light units shall preferably have rated voltages of 6 V, 12 V, 24 V, 48 V, 130 V, 230 V, 250 V, 277 V, 380 V, 400 V, 415 V and 440 V.

6.2 Indicator light units shall have rated power not exceeding 10 W.

Compliance with the requirements of 6.1 and 6.2 is checked by inspection of the marking.

6.3 Indicator light units shall preferably have a degree of protection IP20, IP40, IP44, IP54 or IP55.

7 Classification

Indicator light units are classified as follows.

7.1 According to the degree of protection against access to hazardous parts and against harmful effects due to the ingress of solid foreign objects:

- IP2X: indicator light units protected against access to hazardous parts with a finger and against harmful effects due to ingress of solid foreign objects of 12,5 mm diameter and greater;
- IP4X: indicator light units protected against access to hazardous parts with a wire and against harmful effects due to ingress of solid foreign objects of 1,0 mm diameter and greater;
- IP5X: indicator light units protected against access to hazardous parts with a wire and protected against dust.

7.2 According to the degree of protection against harmful effects due to the ingress of water:

- IPX0: indicator light units not protected against ingress of water;
- IPX4: indicator light units protected against splashing water;
- IPX5: indicator light units protected against water jets.

NOTE For an explanation of IP codes see IEC 60529.

7.3 According to the method of mounting the indicator light units:

- surface-type;
- flush-type;
- semi flush-type;
- panel-type;
- architrave-type.

7.4 According to the method of installation, as a consequence of the design of the indicator light units:

- indicator light units where the cover or cover plate can be removed without displacement of the conductors (design A);
- indicator light units where the cover or cover plate cannot be removed without displacement of the conductors (design B).

NOTE If an indicator light unit has a base (main part) which cannot be separated from the cover or cover plate, and requires a supplementary plate to meet the standard, which can be removed for redecorating the mounting surface (e.g. wall, ceiling, etc.) without displacement of the conductors, it is considered to be of design A, provided the supplementary plate meets the requirements specified for covers and cover plates.

7.5 According to the type of terminals or terminations:

- indicator light units with screw-type terminals;
- indicator light units with screwless terminals for rigid conductors only;
- indicator light units with screwless terminals for rigid and flexible conductors;
- indicator light units without terminals equipped with connecting leads.

7.6 According to the possibility of changing the light source:

- with a tool;
- without a tool;
- not possible.

8 Marking

8.1 Indicator light units shall be marked with:

- rated voltages in volts;
- symbol for nature of supply;
- manufacturer's or responsible vendor's name, trade mark or identification mark;
- type reference, which may be a catalogue number;
- first characteristic numeral for the degree of protection against access to hazardous parts and against harmful effects due to ingress of solid foreign objects, if declared higher than 2, in which case the second characteristic numeral shall also be marked;

- second characteristic numeral for the degree of protection against harmful effects due to the ingress of water, if declared higher than 0, in which case the first characteristic numeral shall also be marked;
- the rated power of each lamp in watts (or the rated current in amperes) for replaceable lamp(s) only. For indicator light units with more than one lamp holder, this marking shall be placed near each individual lamp holder unless the lamp holders are identical, in which case the marking may only appear once.

In addition, indicator light units with screwless terminals shall be marked with:

- an indication of the suitability to accept rigid conductors only, for those indicator light units having this restriction;
- the minimum and maximum cross-section area of connectable conductors;
- the length of conductor insulation to be removed (12.3.8).

This additional information may be put on the indicator light unit or the smallest packaging unit.

8.2 When symbols or abbreviations are used, they shall be as follows:

Watts	W
Amperes	A
Volts	V
Alternating current	~
Neutral	N
Line	L
Protective earth	
Degree of protection, when relevant.....	IPXX
Screwless terminals which are able to accept rigid conductors only	r

NOTE 1 Details of construction of symbols are given in IEC 60417-1.

NOTE 2 In the IP code the letter "X" is replaced by the relevant number.

NOTE 3 Lines formed by the construction of the tool are not considered as part of the marking.

The marking for the nature of supply shall be placed next to the marking of the rated voltage.

8.3 The following markings shall be placed on the main part of the indicator light unit:

- the rated power, rated voltage, nature of supply,
- either the name, trade mark, or identification mark of the manufacturer or of the responsible vendor,
- type reference.

NOTE 1 The type reference may be the series reference only.

Parts such as cover plates, which are necessary for safety purposes and are intended to be sold separately, shall be marked with the manufacturer's or responsible vendor's name, trade mark or identification mark and type reference.

The IP code, when applicable, shall be marked so as to be easily discernible when the indicator light unit is mounted and wired as in normal use.

The marking shall be clearly visible with normal or corrected vision, without additional magnification, marked either on the front of the indicator light unit or on the inner part of its associated enclosure, or on the main part of the indicator light unit so that it is easily legible on removal of any cover or cover plate which may be present when the indicator light unit is mounted and wired as in normal use. These markings shall not be placed on parts which can be removed without the use of a tool.

The marking of the maximum power shall be clearly visible when changing the lamp(s).

NOTE 2 Additional type references may be marked on the main part, or on the outside or the inside of the associated enclosure.

NOTE 3 The term 'main part' means that part carrying the contacts and any part integral with it; it does not include knobs, handles and the like or parts intended to be sold separately.

8.4 Terminals intended for the connection of phase conductors shall be identified unless this is of no importance, is self-evident or is indicated on a wiring diagram.

NOTE 1 Such identification may take the form of a letter L.

When placed on the product these markings shall not be on screws or any other easily removable parts.

NOTE 2 The wiring diagram may be an instruction sheet which accompanies the indicator light units.

NOTE 3 "Easily removable parts" are those parts which can be removed during the normal installation of the indicator light units.

8.5 Terminals intended exclusively for the neutral conductor shall be indicated by the letter N.

Earthing terminals shall be indicated by the symbol .

These markings shall not be placed on screws or any other easily removable part.

8.6 If it is necessary to take special precautions when installing the indicator light units, details of these shall be given in an instruction sheet which accompanies the indicator light unit.

If it is necessary to take precaution against touching live parts when changing a lamp, details shall be given in an instruction sheet which accompanies the indicator unit.

Instruction sheets shall be written in the official language(s) of the country in which the indicator light units are intended to be sold.

Compliance with the requirements of 8.1 to 8.6 is checked by inspection.

NOTE 1 Special precautions may, for example, be necessary for unenclosed indicator light units and for indicator light units for panel mounting.

NOTE 2 In order to ensure that, after installation, the conditions necessary to meet the requirements of this standard are achieved, the instruction sheet should where necessary include clear information with regard to the following:

- dimensions of the space to be provided for each indicator light unit;
- dimensions and position of the means for supporting and fixing the indicator light unit within this space;
- minimum clearance between the various parts of the indicator light unit and the surrounding parts where fitted;
- minimum dimensions of ventilating openings, if needed, and their correct arrangement;
- instructions for the correct connection of the connecting leads to other accessories.

8.7 Marking shall be durable and easily legible.

Compliance is checked by inspection and by the following test.

The marking is rubbed by hand for 15 s with a piece of cloth soaked with water and again for 15 s with a piece of cloth soaked with petroleum spirit.

Marking made by impression, moulding, pressing or engraving is not subjected to this test.

NOTE It is recommended that the petroleum spirit used consist of a solvent hexane with an aromatic content of maximum 0,1 % in volume percentage, a kauributanol value of approximately 29, an initial boiling point of approximately 65 °C, a dry point of approximately 69 °C and a density of approximately 0,68 g/cm³.

9 Checking of dimensions

Indicator light units and boxes shall comply with the appropriate standard sheets (if any).

Compliance is checked by measurement.

If lampholders are used, they shall comply with IEC 60061.

10 Protection against electric shock

10.1 Indicator light units shall be so designed that when they are mounted and wired as in normal use and equipped with lamp(s), live parts are not accessible even after removal of parts which can be removed without the use of a tool.

Compliance is checked by inspection and, if necessary, by the following test.

The specimen is mounted as in normal use and fitted with conductors of the smallest cross-sectional area specified in Clause 12; the test is repeated using conductors of the largest cross-sectional area specified in Clause 12.

The standard test finger (test probe B of IEC 61032) is applied in every possible position, an electrical indicator, with a voltage not less than 40 V and not more than 50 V, being used to show contact with the relevant part.

Indicator light units, having enclosures or covers in thermoplastic or elastomeric material, are subjected to the following additional test, which is carried out at an ambient temperature of (35 ± 2) °C, the indicator light units being at this temperature.

During the additional test, the indicator light units are subjected for 1 min to a force of 75 N applied through the tip of a straight unjointed test finger (test probe 11 of IEC 61032).

This finger, with an electrical indicator as described above, is applied to all places where yielding of insulating material could impair the safety of the indicator light units, but is not applied to membranes or the like and is applied to thin-walled knock-outs with a force of only 10 N. During this test, indicator light units with their associated mounting means shall not deform to such an extent that live parts can be touched with the unjointed test finger.

NOTE Membranes or the like are tested according to 13.13.1 only.

10.2 Accessible parts of indicator light units classified IXP0 shall be made of insulating material with the exception of the following:

- a) small screws and the like which are insulated from live parts and which are used for fixing bases and covers or cover plates;
- b) covers and cover plates of metal which comply with the requirements of 10.2.1 or 10.2.2.

10.2.1 Covers or cover plates of metal shall be protected by additional insulation made by insulating linings or insulating barriers. The insulating linings or insulating barriers shall:

- either be fixed to covers or cover plates or the body of the indicator light units in such a way that they cannot be removed without being permanently damaged,
- or be so designed that
 - they cannot be replaced in an incorrect position;
 - if they are omitted, the indicator light units are rendered inoperable or manifestly incomplete;
 - there is no risk of accidental contact between live parts and metal covers or cover plates, for example through their fixing screws, even if a conductor should come away from its terminal;
 - precautions are taken in order to prevent creepage distances or clearances becoming less than the values specified in Clause 20.

Compliance is checked by inspection.

The above linings or barriers shall comply with the tests of Clauses 15 and 20.

NOTE Insulating coating sprayed on the inside or on the outside of the metal cover or cover plate is not deemed to be an insulating lining or barrier for the purpose of this subclause.

10.2.2 The earthing of metal covers or cover plates is made while fixing the covers or cover plates and may be made without requiring the use of means other than the fixing means; the resulting connection shall be of low resistance.

NOTE Fixing screws or other means are allowed.

Compliance is checked by inspection and by the tests of 11.4.

NOTE Z1 See Annex ZB for special national conditions.

10.3 Replacement of a lamp

When equipped with lamp(s), indicator light units shall be so constructed that their live parts are not accessible when they are opened for replacing lamp(s), unless for the replacement of the lamp a tool is necessary (see 8.6).

Compliance is checked by inspection.

11 Provision for earthing

11.1 Accessible metal parts which can become live in the event of an insulation fault shall be provided with, or permanently and reliably connected to, an earthing terminal.

NOTE 1 This requirement does not apply to the metal cover plates mentioned in 10.2.1.

NOTE 2 For the purpose of this requirement, small screws and the like, isolated from live parts, for fixing bases, covers or cover plates, are not considered as accessible parts which can become live in the event of an insulation fault.

11.2 Earthing terminals shall be terminals with screw clamping or screwless terminals and shall comply with the appropriate requirements of Clause 12.

They shall be of the same size as the corresponding terminals of the supply conductors except that any additional external earthing terminal shall be of a size suitable for conductors of at least 6 mm².

11.3 Surface-type indicator units with an enclosure of insulating material, having an IP code higher than IPX0 and more than one cable inlet, shall be provided with either an internal fixed earthing terminal or adequate space for a floating terminal allowing the connection of an incoming and outgoing conductor for the continuity of the earthing circuit.

Clause 12 does not apply to floating terminals.

Compliance with 11.1 to 11.3 is checked by inspection and by tests of Clause 12.

Compliance for adequate space for floating terminals is checked by performing a test connection using the type of terminal specified by the manufacturer.

11.4 The connection between the earthing terminal and accessible metal parts to be connected thereto shall be of low resistance.

Compliance is checked by the following test.

A current of 25 A derived from an a.c. source having a no-load voltage not exceeding 12 V, is passed between the earthing terminal and each of the accessible metal parts in turn.

The voltage drop between the earthing terminal and the accessible metal part is measured, and the resistance calculated from the current and this voltage drop.

In no case shall the resistance exceed 0,05 Ω .

NOTE Care should be taken that the contact resistance between the tip of the measuring probe and the metal part under test does not influence the test results.

12 Terminals

12.1 General

Terminals of indicator light units shall be provided with screw clamping or with screwless clamping.

The means for clamping the conductors in the terminals shall not serve to fix any other component, although they may hold the terminals in place or prevent them from turning.

All the tests on terminals, with the exception of 12.3.11, shall be carried out after the test of Clause 16.

Compliance is checked by inspection and by the tests of 12.2 or 12.3, as applicable.

12.2 Terminals with screw clamping for external copper conductors

12.2.1 Indicator light units provided with terminals with screw clamping shall allow the proper connection of rigid (solid or stranded) or flexible copper conductors having nominal cross-sectional areas from 1 mm² up to 2,5 mm² inclusive (the largest conductor having a diameter of 2,21 mm).

Each supply terminal shall allow the connection of two 2,5 mm² conductors.

The conductor space shall be at least that specified in Figures 1, 2 or 3.

Compliance is checked by inspection and by fitting conductors of the smallest and largest cross-sectional areas specified.

12.2.2 Terminals with screw clamping shall allow conductors to be connected without special preparation.

Compliance is checked by inspection.

NOTE The term "special preparation" covers soldering of the wires of the conductor, use of cable lugs, formation of eyelets, etc., but not the reshaping of the conductor before its introduction into the terminal or the twisting of a flexible conductor to consolidate the end.

12.2.3 Terminals with screw clamping shall have adequate mechanical strength.

Screws and nuts for clamping the conductors shall have a metric ISO thread or a thread comparable in pitch and mechanical strength.

Screws shall not be of metal which is soft or liable to creep, such as zinc or aluminium.

Compliance is checked by inspection and by the tests of 12.2.6 and 12.2.8.

NOTE Provisionally SI, BA, and UN threads are considered to be comparable in pitch and mechanical strength to metric ISO threads.

12.2.4 Terminals with screw clamping shall comply with 19.5.

12.2.5 Screw-type terminals shall be so designed and constructed that they clamp the conductor(s) without unduly damaging them.

Compliance is checked by the following test.

The terminal is placed in the test apparatus according to Figure 6 and fitted with rigid (solid or stranded) and/or flexible conductor(s), according to Table 1 first with the smallest and then with the largest cross-sectional area, the clamping screw(s) or nut(s) being tightened with the torque according to Table 2.

Table 1 – Composition of conductors

Nominal cross-sectional area mm ²	Number of wires and nominal diameter of wires ^a mm	
	Solid conductor	Stranded conductor
1	1 × 1,13	7 × 0,42
2,5	1 × 1,78	7 × 0,67
^a The use of flexible conductors is permitted		

Table 2 – Tightening torque for the verification of the mechanical strength of screw-type terminals

Nominal diameter of thread mm	Torque Nm				
	1	2	3	4	5
Up to and including 2,8	0,2		0,4		0,4
Over 2,8 up to and including 3,0	0,25		0,5		0,5
Over 3,0 up to and including 3,2	0,3		0,6		0,6
Over 3,2 up to and including 3,6	0,4		0,8		0,8
Over 3,6 up to and including 4,1	0,7	1,2	1,2	1,2	1,2
Over 4,1 up to and including 4,7	0,8	1,2	1,8	1,8	1,8
NOTE Column 1 applies to screws without heads if the screw when tightened does not protrude from the hole, and to other screws which cannot be tightened by means of a screwdriver with a blade wider than the diameter of the screw. Column 2 applies to nuts of mantle terminals which are tightened by means of a screwdriver. Column 3 applies to other screws which are tightened by means of a screwdriver. Column 4 applies to nuts of mantle terminals in which the nut is tightened by means other than a screwdriver. Column 5 applies to screws or nuts, other than nuts of mantle terminals, which are tightened by means other than a screwdriver. Where a screw has a hexagonal head with a slot for tightening with a screwdriver, and the values of columns 3 and 5 are different, the test is made twice, first applying to the hexagonal head the torque specified in column 5 and then applying the torque specified in column 3 by means of a screwdriver. If the values of columns 3 and 5 are the same, only the test with the screwdriver is made.					

The length of the test conductor shall be 75 mm longer than the height (H) specified in Table 3.

Table 3 – Test values for flexing and pull tests for copper conductors

Nominal cross-sectional area of conductor mm ²	Diameter of bushing hole mm	Height ^a (H) mm	Mass for conductor kg
1,0	6,5	260	0,4
2,5	9,5	280	0,7
^a Tolerances for height H = ±15 mm			

The end of the conductor is passed through an appropriate bushing in a plate positioned at a height (H) as given in Table 3 below the equipment. The bushing is positioned in a horizontal plane such that its centre line describes a circle of 75 mm diameter, concentric with the centre of the clamping unit in the horizontal (plane); the platen is then rotated at a rate of (10 ± 2) rev/min.

The distance between the mouth of the clamping unit and the upper surface of the bushing shall be within ± 15 mm of the height (H) in Table 3. The bushing may be lubricated to prevent binding, twisting, or rotation of the insulated conductor.

A mass as specified in Table 3 is suspended from the end of the conductor. The duration of the test is approximately 15 min.

During the test, the conductor shall neither slip out of the clamping unit nor break near the clamping unit, nor shall the conductor be damaged in such a way as to render it unfit for further use.

The test shall be repeated with rigid solid conductors in the case they exist in the relevant IEC standard, if the first test has been made with rigid stranded conductors. Where rigid stranded conductors do not exist, the test may be made with rigid solid conductors only.

12.2.6 Terminals with screw clamping shall be so designed that they clamp the conductor reliably between metal surfaces.

Compliance is checked by inspection and by the following test.

The terminals are fitted with rigid stranded conductors of the smallest and largest cross-sectional area specified in 12.2.1, the terminal screws being tightened with a torque equal to two-thirds of the torque shown in the appropriate column of Table 2.

If the screw has a hexagonal head with a slot, the torque applied is equal to two-thirds of the torque shown in column 3 of Table 2.

Each conductor is then subjected to a pull as specified in Table 4, applied without jerks, for 1 min, in the direction of the axis of the conductor space.

Table 4 – Test values for pull test

Nominal cross-sectional area of conductors mm ²	Pull N
1	40
2,5	50

If the terminal is intended for the connection of two conductors, the appropriate pull is applied consecutively to each conductor.

During the test, the conductor shall not move noticeably in the terminal.

If the terminal is intended for connection of more than two conductors, reference is made for the testing to the requirements given in the appropriate part of IEC 60998.

The test is repeated with rigid solid conductors in the case where they exist in the relevant IEC standard, if the first test has been made with rigid stranded conductors. In the case where rigid stranded conductors do not exist, the test is made with rigid solid conductors only.

NOTE In the following countries terminals allowing connection of two conductors are additionally tested with one rigid solid conductor and one rigid stranded conductor with the same cross-sectional area connected at the same time: DK, FI, NO, SE.

12.2.7 Terminals with screw clamping shall be so designed or placed that neither a rigid solid conductor nor a wire of a stranded conductor can slip out while the clamping screws or nuts are tightened.

This requirement does not apply to lug terminals.

Compliance is checked by the following test.

The terminals are fitted with conductors having the largest cross-sectional area specified in 12.2.1.

The terminals are checked both with solid conductors and with stranded conductors.

Terminals intended for the looping-in of two or three conductors are checked, being fitted with the permissible number of conductors.

The terminals are fitted with conductors having the composition shown in Table 1.

Before insertion into the clamping means of the terminal, wires of rigid (solid or stranded) conductors are straightened and rigid stranded conductors may be, in addition, twisted to restore them approximately to their original shape.

The conductor is inserted into the clamping means of the terminal for the minimum distance prescribed or, where no distance is prescribed, until it just projects from the far side of the terminal and in the position most likely to allow the wire to escape. The clamping screw is then tightened with a torque equal to two-thirds of the torque shown in the appropriate column of Table 2.

After the test, no wire of the conductor shall have escaped outside the clamping unit thus reducing creepage distances and clearances to values lower than those indicated in Clause 20.

12.2.8 Terminals with screw clamping shall be so fixed or located within the indicator light unit that, when the clamping screws or nuts are tightened or loosened, the terminals shall not work loose from their fixing to the indicator light units.

NOTE 1 These requirements do not imply that the terminals are designed so that their rotation or displacement is prevented, but any movement is sufficiently limited so as to prevent non-compliance with this standard.

NOTE 2 The use of sealing compound or resin is considered to be sufficient for preventing a terminal from working loose, provided that:

- the sealing compound or resin is not subject to stress during normal use, and
- the effectiveness of the sealing compound or resin is not impaired by temperatures attained by the terminal under the most unfavourable conditions specified in this standard.

Compliance is checked by inspection, by measurement and by the following test.

A solid rigid copper conductor of the largest cross-sectional area specified in 12.2.1 is placed in the terminal.

Screws and nuts are tightened and loosened five times by means of a suitable test screwdriver or spanner, the torque applied when tightening being equal to the torque shown in the appropriate column of Table 2 or in the table of the appropriate Figure 1 or 2, whichever is the highest.

The conductor is moved each time the screw or nut is loosened.