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EN 60 400 : 1989

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British Standard Specification for

Lampholders for tubular fluorescent lamps and starterholders

Douilles pour lampes tubulaires à fluorescence et douilles pour starters — Spécifications

Lampenfassungen für röhrenförmige Leuchtstofflampen und Starterfassungen

This European Standard EN 60 400 has the status of a British Standard

British Standards Institution

BS 6702 : 1991
EN 60 400

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National foreword

This British Standard has been prepared under the direction of the Electrical Illumination Standards Policy Committee and supersedes BS 6702 : 1986 which is withdrawn. It is the English language version of EN 60 400 which is identical with IEC Publication 400 : 1987 'Lampholders for tubular fluorescent lamps and starterholders', published by the International Electrotechnical Commission (IEC) as modified by a CENELEC common modification to clause 5. For the sake of clarity this common modification has been incorporated at the appropriate place in the text of IEC 400 (1987); it is marked by a vertical line at the left-hand margin. The relevant part of the original IEC text has been quoted as 'INFORMATION' directly after the text of the common modification.

Cross-references. Details of other international publications quoted in this standard are given in annex ZA. Where there are British Standards corresponding to these international standards the relationship is given in national appendix X.

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

EUROPEAN STANDARD
NORME EUROPÉENNE
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English version

Lampholders for tubular fluorescent lamps and starterholders

(IEC 400 (1987) 3rd edition, modified)

Douilles pour lampes tubulaires à fluorescence
et douilles pour starters
(CEI 400 (1987) 3ème edition, modifiée)

Lampenfassungen für röhrenförmige
Leuchtstofflampen und Starterfassungen
(IEC 400 (1987) 3. Ausgabe, modifiziert)

This European Standard was ratified by CENELEC on 1 March 1989. CENELEC members are bound to comply with the requirements of the 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 CENELEC Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French and German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to CENELEC 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, Luxemburg, 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 Bréderode 2, B-1000 Brussels

Brief history

The CENELEC Questionnaire Procedure performed for finding out whether or not IEC 400 (3rd edition - 1987) could be accepted without textual changes, has shown that a common modification was necessary for the acceptance as European Standard (EN). The Reference Document was submitted to the CENELEC members for formal vote and acceptance by CENELEC.

Technical text

The text of the International Standard IEC 400 (3rd edition - 1987) modified by a CENELEC common modification of technical nature was approved by CENELEC on 1 March 1989 as European Standard.

Annexes designated "normative" are part of the body of the standard. Annexes designated "informative" are given only for information.

In this standard, Annex ZA is normative.

The following dates were fixed:

- date of announcement (doa) : 1989-09-01
- date of latest publication (dop) : 1990-03-01
- date of withdrawal of conflicting national standard (dow) : 1990-03-01

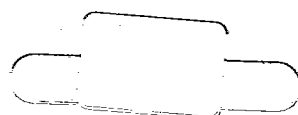
This European Standard supersedes EN 60 400, October 1985 and Amendment 1 to EN 60 400, April 1988.

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INFORMATION as to original IEC text

The Foreword of IEC 400 (1987) is not part of this European Standard. Annex ZA (normative) is not included in IEC 400 (1987).



LAMP HOLDERS FOR TUBULAR FLUORESCENT LAMPS AND STARTER HOLDERS

FOREWORD

- 1) The formal decisions or agreements of the IEC on technical matters, prepared by Technical Committees on which all the National Committees having a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.
- 2) They have the form of recommendations for international use and they are accepted by the National Committees in that sense.
- 3) In order to promote international unification, the IEC expresses the wish that all National Committees should adopt the text of the IEC recommendation for their national rules in so far as national conditions will permit. Any divergence between the IEC recommendation and the corresponding national rules should, as far as possible, be clearly indicated in the latter.

PREFACE

This standard has been prepared by Sub-Committee 34B: Lamp caps and holders, of IEC Technical Committee No. 34: Lamps and related equipment.

This standard forms the third edition of IEC Publication 400 and replaces the second edition (1982) and Amendment No. 1 (1986)

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

Six Months' Rule	Reports on Voting
34B(CO)484	34B(CO)519
34B(CO)485	34B(CO)520
34B(CO)486	34B(CO)521
34B(CO)487	34B(CO)522
34B(CO)501	34B(CO)537
34B(CO)523	34B(CO)549

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

In this standard, the following print types are used:

- requirements proper: in roman type;
- *test specifications: in italic type;*
- explanatory matter: in smaller roman type.

The following IEC publications are quoted in this standard:

- Publications Nos. 61: Lamp caps and holders together with gauges for the control of interchangeability and safety.
- 61-1: Part 1: Lamp caps.
61-2: Part 2: Lampholders.
61-3: Part 3: Gauges.
- 68-2-20 (1979): Basic environmental testing procedures, Part 2: Tests – Test T: Soldering.
- 81 (1984): Tubular fluorescent lamps for general lighting service.
155 (1983): Starters for fluorescent lamps.
352-1 (1983): Solderless connections, Part 1: Solderless wrapped connections – General requirements, test methods and practical guidance.
529 (1976): Classification of degrees of protection provided by enclosures.
598-1 (1986): Luminaires, Part 1: General requirements and tests.
695-2-1 (1980): Fire hazard testing, Part 2: Test methods; Glow-wire test and guidance.
695-2-2 (1980): Fire hazard testing, Part 2: Test methods; Needle-flame test.

LAMPHOLDERS FOR TUBULAR FLUORESCENT LAMPS AND STARTERHOLDERS

1. Scope

This standard states the technical and dimensional requirements for lampholders for tubular fluorescent lamps and for starterholders, and the methods of test to be used in determining the safety and the fit of the lamps in the lampholders and the starters in the starterholders.

This standard covers independent lampholders and lampholders for building-in used with tubular fluorescent lamps provided with caps such as G5, G13, 2G13, G20, G23, G10q, Fa6, Fa8 and R17d and independent starterholders and starterholders for building-in used with starters in accordance with IEC Publication 155, intended for use in a.c. circuits where the working voltage does not exceed 1000 V r.m.s.

As far as it applies, this standard also covers combinations of lampholders and starterholders as well as lampholders or combinations which are wholly or partly integral with the luminaire. It also applies, as far as is reasonable, to lampholders and starterholders other than the types explicitly mentioned above and to lamp connectors.

Where the term "holders" is used in the standard, both lampholders and starterholders are intended.

2. Definitions

For the purposes of this standard the following definitions apply.

2.1 *Rated voltage*

A voltage declared by the manufacturer to indicate the highest working voltage for which the holder is intended.

2.2 *Working voltage*

The highest r.m.s. voltage which may occur across any insulation, transients being disregarded, both when the lamp or starter is operating under normal conditions and when the lamp or starter is removed.

2.3 *Flexible lampholders for linear double-capped fluorescent lamps*

A pair of lampholders in which the base of each holder is rigidly mounted in the luminaire but which has one or both of the lampholders so designed as to allow axial movement of the contacts to provide compensation for variations in lamp lengths and, where necessary, to permit insertion and removal of the lamp.

In case of doubt whether a lampholder G5 or G13 provides the required axial movement of the contact a test with the device shown in Figure 3 may be carried out.

2.4 *Inflexible lampholders for linear double-capped fluorescent lamps*

A pair of lampholders intended for rigid mounting and in which no axial movement of the contacts is provided or is needed, either for the insertion and removal of the lamp or as compensation for variation in lamp lengths.

2.5 *Flexibly mounted lampholders for linear double-capped fluorescent lamps*

A pair of lampholders which do not in themselves provide for any axial movement of the contact-system but which are intended to be mounted in a luminaire in a specified manner so that the combination provides the necessary axial movement of the contact system.

Lampholders of this type may or may not be suitable for rigid mounting also.

2.6 *Lamp connectors*

A set of contacts mounted on flexible conductors which provide for electrical contact but do not support the lamp.

2.7 *Holder for building-in*

A lampholder designed to be built into a luminaire, an additional enclosure or the like.

2.7.1 *Unenclosed holder*

A holder for building-in so designed that it requires additional means, for example an enclosure, to meet the requirements of this standard with regard to protection against electric shock.

2.7.2 *Enclosed holder*

A holder for building-in so designed that on its own it fulfills the requirements of this standard with regard to protection against electric shock and IP classification, if appropriate.

2.8 *Independent holder*

A holder so designed that it can be mounted separately from a luminaire and at the same time providing all the necessary protection according to its classification and marking.

2.9 *Rated operating temperature*

The highest operating temperature for which the holder is designed.

2.10 *Rated lampholder rearside temperature*

The rearside temperature for lampholders G13 with T-marking ascertained by test *b)* of Sub-clause 17.1.

2.11 *Type test*

A test or series of tests made on a type test sample, for the purpose of checking compliance of the design of a given product with the requirements of the relevant standard.

2.12 *Type test sample*

A sample consisting of one or more similar specimens submitted by the manufacturer or responsible vendor for the purpose of a type test.

2.13 *Live part*

A conductive part which may cause an electric shock.

3. General requirement

Holders shall be so designed and constructed that in normal use they function reliably and cause no danger to persons or surroundings.

In general, compliance is checked by carrying out all the tests specified.

In addition, independent holders shall comply with the appropriate requirements of IEC Publication 598-1.

4. General conditions for tests

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

4.2 *Unless otherwise specified, the tests are made at an ambient temperature of between 10 °C and 30 °C and with the holder in the most unfavourable position for normal use.*

4.3 *The tests and inspections are carried out in the order of the clauses.*

4.4 *Four units, representing two pairs of holders, are submitted to all the tests on holders for linear double-capped fluorescent lamps.*

Two units are submitted to all the tests on holders for single-capped fluorescent lamps and starter-holders.

In the case of flexible and inflexible lampholders G5 or G13 (see Sub-clauses 2.3 and 2.4 respectively) the units are mounted on two pairs of mounting sheets as specified in Figure 2.

One set of holders are mounted so as to represent the minimum mounting distance for this pair of holders according to the manufacturer's mounting instructions; the other set is mounted at the maximum distance. The matching mounting sheets are marked.

In special cases, it may be necessary to test more than the specified number of units.

Together with these units, the manufacturer's mounting instructions (see Sub-clause 7.3) shall be supplied.

4.5 *Holders are deemed to comply with this standard, if no specimen fails in the complete series of tests specified in Sub-clause 4.4.*

Holders are deemed not to comply with this standard if there are more failures than that of one specimen in one of the tests. If one specimen fails in one test, that test and the preceding ones which may have influenced the result of that test are repeated on another type test sample to the number required by Sub-clause 4.4, all of which shall then comply with the repeated tests and with the subsequent tests.

In general, it will only be necessary to repeat the relevant test, unless the specimen fails in the tests according to Clauses 13 or 14, in which case the tests shall be repeated from the test according to Clause 12 onwards.

A second type test sample which may be required should one specimen fail, may be submitted together with the first sample.

If the additional type test sample is not submitted at the same time, a failure of one specimen entails a rejection.

5. Electrical rating

The electrical rating shall be:

- not less than 125 V and not more than 250 V a.c. r.m.s. for lampholders G5;
- not less than 125 V and not more than 1000 V a.c. r.m.s. for all other holders;
- not less than 1 A for lampholders G5, G10q and G23;
- not less than 2 A for all other holders.

INFORMATION as to original IEC text

A note is included: It reads

In countries where marking of rated wattage is required in place of rated current, the rating of the G5 lampholder shall be not less than 75 W.

6. Classification

Holders are classified:

6.1 According to protection against electric shock:

- unenclosed holders;
- enclosed holders;
- independent holders.

6.2 According to degree of protection against ingress of dust or water in accordance with the "IP number" system of classification explained in IEC Publication 529.

Symbols for the degrees of protection are given in Sub-clause 7.4 (Independent and enclosed holders only.)

6.3 According to the resistance to heat:

- for operating temperatures up to and including 80 °C;
- for operating temperatures over 80 °C.

This requirement does not apply to lampholders G23.

The measuring point for the operating temperature is that area of the lampholder where it touches the lamp cap.

6.4 Moreover, starterholders are classified according to the possibility of accepting different types of starters:

- starterholders intended for starters according to IEC Publication 155;
- starterholders intended for starters according to IEC Publication 155, Appendix B only.

7. Marking

7.1 Holders shall be marked with:

- a) mark of origin (this may take the form of a trade mark, manufacturer's identification mark or the name of the responsible vendor);
- b) type reference;
- c) rated voltage, in volts;
- d) rated current, in amperes (see explanation to Clause 5, electrical rating);
- e) rated maximum operating temperature "T" if greater than 80 °C, in steps of 10 °C.

This requirement does not apply to lampholders G23;

- f) degree of protection against ingress of dust and water, for drip-proof holders only (see Sub-clause 7.4).

Where X is used in an IP number in Sub-clause 7.4, it is intended to indicate a missing numeral in the symbol but both the appropriate numerals in accordance with IEC Publication 529 shall be marked on the holder.

Marking of "IP20" on ordinary holders is not required;

- g) for holders protected against dust and moisture, the holder manufacturer shall indicate in his instructions the nominal diameter of the lamp(s) or starter for which the holder is intended.

Compliance is checked by inspection.

- 7.2 In addition, the manufacturer shall provide in his catalogue information on the temperature T_m , measured for the rear side of the holder, for holders tested according to test b) of Sub-clause 17.1.

Compliance is checked by inspection.

- 7.3 The instructions supplied by the holder manufacturer or responsible vendor in order to ensure correct mounting and operation of a pair of holders for linear double-capped fluorescent lamps shall contain at least the following information:

- Method of mounting. For flexibly mounted holders it shall be stated clearly whether both or only one of the methods of mounting are intended.
- Mounting distance, with tolerance or reference to standard sheets.
- Which holders shall be used as a pair.
- Allowable angle of displacement of the pair of holders.
- Required mounting plate thickness, if the holder is designed for screwless mounting.

The above information may be part of the manufacturer's or responsible vendor's catalogue.

Compliance is checked by inspection.

- 7.4 If symbols are used these shall be as follows:

For electrical rating:

- volt V;
- ampere A;
- watt W.

Alternatively, for volt and ampere ratings, figures may be used alone, the figure for the rated current being marked before or above that for the rated voltage and separated from the latter by an oblique stroke or a line.

Therefore the marking for current and voltage may be as follows:

$$2 \text{ A } 250 \text{ V or } 2/250 \text{ or } \frac{2}{250}$$

For operating temperature T

followed by the operating temperature in °C, e.g. T 200

For degrees of protection against ingress of dust or water:

- ordinary IP20
- protected against dripping water (drip-proof) IPX1
- protected against dripping water when tilted up to 15° IPX2
- protected against spraying water (rain-proof) IPX3
- protected against splashing water (splash-proof) IPX4
- protected against water jets (jet-proof) IPX5
- protected against the effects of immersion (watertight) IPX7

- protected against submersion (pressure watertight) IPX8
- protected against ingress of solid objects greater than 1.0 mm IP4X
- dust-protected (dust-proof) IP5X
- dust-tight IP6X

Compliance is checked by inspection.

7.5 Marking shall be suitably placed.

The marking of Items *a)* to *e)* of Sub-clause 7.1 on holders, when installed as in normal use, shall be easily discernible, covers being removed if necessary. If Item *f)* is marked on holders for built-in, it shall not be visible when the holder is installed as in normal use, in order to avoid the mark being applied to the complete luminaire.

Compliance is checked by inspection.

7.6 Marking shall be durable and easily legible.

Compliance is checked by inspection and by trying to remove the marking by rubbing lightly for 15 s with a piece of cloth soaked with water and for a further 15 s with a piece of cloth soaked with petroleum spirit.

After the test, the marking shall still be legible.

The petroleum spirit used should consist of a solvent hexane with a content of aromatics of maximum 0.1 volume percentage, a kauri-butanol value of 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.

8. Protection against electric shock

8.1 Holders shall be so designed that their live parts are not accessible when the holder has been built-in or installed and wired as in normal use and is fitted with the appropriate lamp and/or starter.

For enclosed holders, compliance is checked by means of the standard test finger shown in Figure 26. This test finger is applied in every possible position with a force of 10 N, an electrical indicator being used to show contact with live parts. It is recommended that a voltage of not less than 40 V be used.

Enclosed holders are mounted as in normal use, i.e. on a supporting surface or the like, with the most unfavourable conductor size fitted for which it is intended, before being subjected to the above test.

Unenclosed holders are only tested after appropriate installation in a luminaire or other additional enclosure.

8.2 Protection against electric shock shall be provided when the holder is installed as in normal use, both without lamp or starter and during insertion or removal of the lamp and starter. The insertion of only one pin of the lamp (in case of caps with more than one pin) or starter to the first point of contact shall be prevented.

Lampholders incorporating a rotating part shall be tested with this part in the position of normal lamp insertion.

For lampholders G5, G13, 2G13, G10q and G23, the protection against electric shock shall be ensured when a lamp is inserted into a lampholder at an angle not greater than 5° from the axis of the normal inserted position of the lamp.

Compliance is checked:

- for starterholders, by means of the standard test finger, shown in Figure 26;
- for lampholders G5, by means of the gauge as per IEC Publication 61-3, Standard Sheet 7006-47A, and in conjunction with lamps by means of the standard test finger, shown in Figure 26;
- for lampholders G13, 2G13, G20, G10q, G23 and Fa6 by means of the standard test finger, shown in Figure 26;
- for lampholders Fa8 and R17d by means of a gauge having a cylindrical form with a hemispherical end radius of 5.2 mm.

- 8.3 Parts providing protection against electric shock shall have adequate mechanical strength and shall not work loose in normal use. It shall not be possible to remove these parts by hand.

Compliance is checked by inspection, by manual test and by the tests according to Clauses 13 and 14.

- 8.4 External parts of holders accessible after installation shall either be of insulating material, or if of conducting material they shall be adequately insulated from live parts of the holder.

Compliance is checked by inspection and by the relevant tests of this standard.

9. Terminals

- 9.1 Holders shall be provided with at least one of the following means of connection:

- terminals with screw clamping;
- screwless terminals of spring or wedge type;
- tabs or pins for push-on connections;
- posts for wire wrapping;
- soldering lugs;
- connecting leads (tails).

Compliance is checked by inspection.

- 9.2 Terminals shall comply with the following requirements with the restriction that the requirements referring to internal wiring relate to wiring inside independent holders and to wiring inside luminaires for holders for building-in.

All terminal tests shall be made on separate specimens which have not been subjected to any other test.

- terminals with screw clamping shall comply with Section Fourteen of IEC Publication 598-1;
- screwless terminals of spring or wedge type shall comply with Section Fifteen of IEC Publication 598-1;
- tabs or pins for push-on connections shall comply with Section Fifteen of IEC Publication 598-1;
- posts for wire wrapping shall comply with IEC Publication 352-1;

Wire wrapping applies only to single solid round wire for internal wiring.

- soldering lugs shall comply with the requirements for good solderability. Suitable requirements can be found in IEC Publication 68-2-20;
- connecting leads (tails) shall comply with the requirements prescribed in Sub-clause 9.5.

- 9.3 Unless otherwise specified in Sections Fourteen or Fifteen of IEC Publication 598-1, terminals shall permit the connection of conductors with a cross-sectional core area from 0.5 mm² to 1.0 mm² for holders for building-in and from 1.0 mm² to 1.5 mm² for independent holders.

For lampholders exclusively designed to be built into a luminaire or other additional enclosure, deviations from this conductor size range are permitted, but in this case the manufacturer shall state the conductor size(s) for which the terminal is designed.

It is recommended that lampholders employing spring or wedge type terminals shall be designed to accept connecting wires having stripped lengths ranging from a minimum of 8 mm to a maximum of 11.5 mm.

Compliance is checked by fitting wires of the smallest and largest required cross-sectional area.

- 9.4 Any terminal shall be so located that the conductors can be easily introduced and connected and the cover, if any, can be fitted without any risk of damage to the conductors.

Compliance is checked by inspection and by manual test.

- 9.5 Connecting leads (tails) shall be connected to the holders by soldering, welding, crimping or by any other, at least equivalent, method.

Leads shall be made of insulated conductors with a cross-sectional core area from 0.5 mm² to 1.0 mm².

Insulation of the free end of the leads may be stripped to expose the conductors.

Fixing of the leads to the holders shall withstand the mechanical efforts which may occur in normal use.

Compliance is checked by inspection and by the following test which shall be made after the test of Sub-clause 17.1 on the same three specimens.

Each connecting lead is subjected to a pull of 50 N. The pull is applied without jerks for 1 min in the most unfavourable direction.

During the test, leads shall not move from their fixing.

After the test the holders shall show no damage within the meaning of this standard.

- 9.6 Hinged lampholders shall be so constructed that wiring is not damaged.

For holders intended for wiring other than with stranded conductors compliance is checked by the following test:

The holder is fitted with solid copper wires of the appropriate required cross-sectional area and fixed on a mounting plate in its intended operating position.

On the same mounting plate a clamping device for the conductors is provided at a distance of 50 mm to the entrance opening of the terminals. The conductors are pulled taut and marked at the entrance opening of the clamping device.

An additional wire length measuring 30 mm is added to the length marked before clamping.

The holder is then moved over 45 cycles of operation. A cycle of operation is a movement from one extreme of the range to the other and back to the starting position. If no limitation is given, 90° is taken.

After the test, the holder shall comply with:

- *The voltage drop test in accordance with Clause 13; the measured voltage drop at each terminal shall not exceed 22.5 mV.*
- *The conductor shall show no deep or sharp indentations.*

10. Construction

- 10.1 Wood, cotton, silk, paper and similar hygroscopic materials are not allowed as insulation unless suitably impregnated.

Compliance is checked by inspection.

- 10.2 Holders shall be so designed that a lamp or starter as appropriate can be easily inserted and removed and cannot work loose due to vibration or temperature variation.

Provisions for fixing holders shall be such that the fixed part of the holder cannot be turned.

Inflexible holders could also be flexibly mounted on the luminaire so that the assembly as a whole then acts as a pair of flexible holders.

Compliance is checked by inspection and by manual test, using a commercial lamp or starter, as appropriate.

- 10.3 Holders shall be so designed that adequate contact force is provided.

Compliance is checked by inspection and by the tests of Sub-clauses 10.3.1 to 10.3.4, as appropriate.

- 10.3.1 *For bi-pin lampholders G5, G13 and G20, making contact mainly along one side of each pin of the cap, the contact force is measured with a single ended gauge having pin dimensions and pin distances according to the current edition of the following standard sheets of IEC Publication 61-3:*

- *for lampholders G5 : 7006-47B, gauges III and V;*
- *for lampholders G13: 7006-60B, gauges III and V;*
- *for lampholders G20: under consideration.*

The contact force is between:

- *2 N and 30 N for lampholders not providing support for the lamp pins;*
- *2 N and 35 N for lampholders G5, when the lamp pins are supported by the holder construction;*
- *2 N and 45 N for lampholders G13 and G20, when the lamp pins are supported by the holder construction.*

At first the maximum contact force is measured with a pin distance as shown for gauge V. This is followed by measurement of the minimum contact force with the pin distance of gauge III.

For other lampholder constructions, for example where the contact is made by a sleeve over the pins or at the pin ends, a test for checking the contact force is under consideration.

For bi-pin lampholders G5, G13 and G20, requiring a rotary motion for the insertion and removal of the lamp, the torque required shall be measured with single-ended gauges having pin dimensions and pin distances according to the current edition of the following standard sheets of IEC Publication 61-3:

- for lampholders G5 : 7006-47B, gauge V and a second gauge of the same dimensions but E and D changed to 2.44 mm and 4.4 mm respectively;
- for lampholders G13 : 7006-60B, gauge V and a second gauge of the same dimensions but E and D changed to 2.44 mm and 12.35 mm respectively;
- for lampholders G20: under consideration.

The torque required to insert the gauges until the position representing the operating position of the lamp is reached shall not exceed:

- 0.3 Nm for lampholders G5;
- 0.5 Nm for lampholders G13 and G20.

The torque required to clear the gauges from the seated position shall be between:

- 0.02 Nm and 0.3 Nm for lampholders G5;
- 0.1 Nm and 0.5 Nm for lampholders G13 and G20.

During complete removal of the gauges, the maximum values shall not be exceeded.

For bi-pin lampholders G5, G13 and G20, requiring a lateral push-in motion for the insertion and the removal of the lamp, the force required is measured with single-ended gauges having pin dimensions and pin distances according to the current edition of the following standard sheets of IEC Publication 61-3:

- for lampholders G5 : 7006-47B, gauges IV and V and a third gauge of the same dimensions but E and D changed to 2.44 mm and 4.4 mm respectively;
- for lampholders G13 : 7006-60B, gauges IV and V and a third gauge of the same dimensions but E and D changed to 2.44 mm and 12.35 mm respectively;
- for lampholders G20: under consideration.

The force required to insert and remove the gauges shall not exceed 50 N.

The force required to withdraw the gauges from the normal seated position shall be not less than 10 N.

During the torque and force testing care should be taken that the front face of the gauges is kept parallel with the holder face.

As a preconditioning cycle, there shall be one clockwise and one counterclockwise rotation or one insertion and withdrawal routine of each test device before the initial measurement is taken.

In case this might influence the test results, conductors of the smallest and largest cross-sectional area respectively for which the holder is designed are fitted to it.

Lampholders G23 shall comply with the following:

- a) The lampholder shall not exert excessive mechanical resistance against the insertion and withdrawal of lamp caps having the most unfavourable ("maximum") dimensions in these respects. Compliance is checked by means of the following gauges:
 - Plug Gauge "A" for checking maximum insertion force and maximum withdrawal force in lampholder G23 - standard sheet 7006-69A of IEC Publication 61-3.



- Plug Gauge "B" for checking maximum insertion force in lampholder G23 - standard sheet 7006-69B of IEC Publication 61-3.

b) The lampholder shall be provided with a means of retention which exerts sufficient resistance against withdrawal of lamp caps having the most unfavourable ("minimum") dimensions in this respect.

Compliance is checked by means of the following gauge:

- Plug Gauge "C" for checking minimum retention force in lampholder G23 - standard sheet 7006-69C of IEC Publication 61-3.

c) The individual contacts of the lampholder shall not exert excessive mechanical resistance against the withdrawal of cap pins having the most unfavourable ("maximum") dimensions in this respect.

In addition, the contacts shall exert sufficient retention force on cap pins having the most unfavourable ("minimum") dimensions in this respect.

Compliance is checked by means of the following gauges respectively:

- Single-pin Gauge "D" for checking maximum force for withdrawal of cap pins from lampholder G23 - standard sheet 7006-69D of IEC Publication 61-3.
- Single-pin Gauge "E" for checking minimum retention force of contacts in lampholder G23 - standard sheet 7006-69E of IEC Publication 61-3.

10.3.2 For lampholders Fa6, Fa8 and G10q, a test for checking the contact force is under consideration. In some cases, for lampholders Fa6, the means of producing the contact pressure may be external to the holder.

10.3.3 For lampholders R17d, contact with the lamp may be made either on the ends of the lamp contacts, or on the internal surfaces of the lamp contacts, or both. The electrical contacts shall be so designed that they make and maintain electrical contact with the minimum cap gauges and will not prevent the acceptance of the maximum cap gauges (see Sub-clause 10.5).

The resistance of the lampholder contacts and connections shall not exceed 0.2 Ω , when measured as follows:

- on lampholders equipped with leads, the resistance is measured between points 75 mm from where the leads come out of the holder;
- on holders without leads, it is necessary to attach leads of the minimum size for which the holder was designed (but not less than 0.75 mm² copper wire). The resistance is measured between points 75 mm from where the leads come out of the holder;
- the lamp cap used shall meet the dimensional requirements of standard sheet 7004-56 and shall have shorted contacts with overall resistance not in excess of 0.01 Ω ;
- the cap shall be fully seated in the holder, irrespective of the position of the plunger;
- resistance measurement is made by the bridge method.

The force required to fully compress the spring on the compressible end shall be not less than 35 N nor greater than 90 N.

10.3.4 For starterholders making contact mainly along one side of each pin on the starter, the contact force is measured with a device made according to the dimensions of gauge A shown in figure 12.