इंटरनेट मानक

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Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

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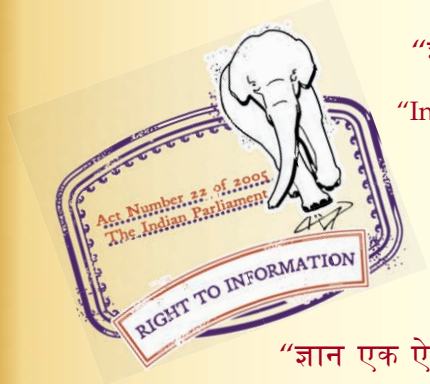
"पुराने को छोड नये के तरफ"
Jawaharlal Nehru
"Step Out From the Old to the New"

IS/IEC 60320-2-2 (1998): Appliance Couplers for Household and Similar General Purposes, Part 2-2:Interconnection Couplers for Household and Similar Equipment [ETD 14: Electrical Wiring Accessories]



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"ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है"
Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

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भारतीय मानक

घरेलू और ऐसे ही सामान्य प्रयोजनों के लिए साधित्र युग्मक

भाग 2-2 घरेलू और समान उपस्करों के लिए अंत: संयोजन युग्मक

Indian Standard

APPLIANCE COUPLERS FOR HOUSEHOLD AND SIMILAR GENERAL PURPOSES

PART 2-2 INTERCONNECTION COUPLERS FOR HOUSEHOLD AND SIMILAR EQUIPMENT

ICS 29.120.30

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

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Price Group 11

NATIONAL FOREWORD

This Indian Standard (Part 2-2) which is identical with IEC 60320-2-2 : 1998 'Appliance couplers for household and similar general purposes — Part 2-2: Interconnection couplers for household and similar equipment' issued by the International Electrotechnical Commission (IEC) was adopted by the Bureau of Indian Standards on the recommendation of the Electrical Wiring Accessories Sectional Committee and approval of the Electrotechnical Division Council.

The text of IEC Standard has been approved as suitable for publication as an Indian Standard without deviations. Certain conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

a) Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'.

b) Comma (,) has been used as a decimal marker, while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

In this adopted standard, reference appears to certain International Standards for which Indian Standards also exist. The corresponding Indian Standards, which are to be substituted in their respective places, are listed below along with their degree of equivalence for the editions indicated:

International Standard	*Corresponding Indian Standard*	*Degree of Equivalence*
IEC 60320-1 : 1994 Appliance couplers for household and similar general purposes — Part 1: General requirements	IS/IEC 60320-1 : 2001 Appliance couplers for household and similar general purposes: Part 1 General requirements	Identical
IEC 60536 : 1976 Classification of electrical and electronic equipment with regard to protection against electric shock	IS 9409 : 1980 Classification of electrical and electronic equipment with regard to protection against electronic shock	Technically Equivalent
ISO 1101 : 1983 Geometrical Product Specifications (GPS) — Geometrical tolerancing — Generalities, definitions, symbols, indication on drawings	IS 8000 (Part 1) : 1985 Geometrical tolerancing on technical drawing: Part 1 Tolerances of form orientation, location and run-out and appropriate geometrical definitions (*first revision*)	Identical

The technical committee responsible for the preparation of this standard has reviewed the provisions of the following International Standards referred in this adopted standard and has decided that they are acceptable for use in conjunction with this standard:

International Standard	*Title*
IEC 60083 : 1997	Plugs and socket-outlets for domestic and similar general use standardized in member countries of IEC
IEC 60906 (all parts)	IEC system of plugs and socket-outlets for household and similar purposes

This standard is intended to be used in conjunction with IEC 60320-1 (1994) 'Appliance couplers for household and similar general purposes — Part 1: General requirements'.

(*Continued on third cover*)

Indian Standard

APPLIANCE COUPLERS FOR HOUSEHOLD AND SIMILAR GENERAL PURPOSES

PART 2-2 INTERCONNECTION COUPLERS FOR HOUSEHOLD AND SIMILAR EQUIPMENT

1 Scope

This clause of IEC 60320-1 is replaced as follows:

This standard is applicable to two-pole interconnection couplers for a.c. only, with and without earthing contact, with a rated voltage not exceeding 250 V and a rated current not exceeding 16 A, for household and similar appliances and equipment and intended for the interconnection of the electrical supply to electrical appliances or equipment for 50 Hz or 60 Hz supply.

Appliance outlets integrated in or incorporated in appliances or other equipment are within the scope of this standard. The dimensional and general requirements of this standard apply to such outlets, but certain tests may not be relevant.

The requirements for plug connectors are based on the assumption that the temperature of the socket contacts of the corresponding appliance outlets does not exceed 65 °C (cold conditions).

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

Interconnection couplers complying with the standard sheets in this standard are intended for the interconnection of appliances or equipment having no special protection against moisture; for the interconnection of other appliances or equipment and of an appliance or equipment which is subject to spillage of liquid in normal use, additional requirements are necessary.

Special constructions may be required

- in locations where special conditions prevail as, for example, in ships, vehicles and the like;
- in hazardous locations, for example, where explosions are liable to occur.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 60320. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this part of IEC 60320 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 60083:1997, *Plugs and socket-outlets for domestic and similar general use standardized in member countries of IEC*

IEC 60320-1:1994, *Appliance couplers for household and similar general purposes – Part 1: General requirements*

IEC 60536:1976, *Classification of electrical and electronic equipment with regard to protection against electric shock*

IEC 60906 (all parts), *IEC system of plugs and socket-outlets for household and similar purposes*

ISO 1101,— *Geometrical Product Specifications (GPS) – Geometrical tolerancing – Generalities, definitions, symbols, indication on drawings* 1)

3 Definitions

This clause of IEC 60320-1 applies with the following additions:

Additional definitions:

3.101 An **interconnection coupler** is a means enabling the connection and disconnection at will of an appliance or equipment to a cord leading to another appliance or equipment.

It consists of two parts:

- a **plug connector**, which is the part integral with, or intended to be attached to, the cord;
- an **appliance outlet**, which is the part integrated or incorporated in the appliance or equipment or intended to be fixed to it, and from which the supply is obtained.

NOTE – An appliance outlet integrated in an appliance or equipment is an appliance outlet (the shroud and bottom of) which is formed by the housing of the appliance or equipment. An appliance outlet incorporated in an appliance or equipment is a separate appliance outlet built in or fixed to an appliance or equipment.

3.3 *Replacement:*

The term "accessory" is used as a general term covering plug connectors and/or appliance outlets.

4 General requirements

This clause of IEC 60320-1 is replaced as follows.

Interconnection couplers shall be so designed and constructed that in normal use their performance is reliable and without danger to the user or surroundings.

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

5 General notes on tests

This clause of IEC 60320-1 applies amended as follows:

5.4 *Replacement:*

Unless otherwise specified, plug connectors and appliance outlets are tested in conjunction with an appropriate appliance outlet or plug connector complying with this standard.

5.5 *Replacement:*

For appliance outlets, six specimens are required, three of which are subjected to the tests specified with the exception of those of clauses 14, 15, 16, 19, 20 and 21; the other three specimens are subjected to the tests of clauses 14, 15, 16, 19, 20 and 21 (including the repetition of the test of 16.2).

For plug connectors, nine specimens are required, three of which are subjected to the tests specified with the exception of those of clauses 14, 15 and 17 and subclauses 22.4 and 24.2; three other specimens are subjected to the tests of clauses 14, 15 and 17; the other three specimens are subjected to the test of 22.4.

For plug connectors of rubber or similar material, two additional specimens are required which are subjected to the test of 24.2.1.

For plug connectors of polyvinyl chloride (PVC) or similar material, two additional specimens are subjected to the test of 24.2.3.

Accordingly, for plug connectors the total number of specimens is:

Plug connector made of	Number of specimens
Rigid insulating material	9
PVC, rubber or similar material	11

6 Standard ratings

This clause of IEC 60320-1 applies amended as follows:

6.2 *Replacement:*

Standard rated currents are 2,5 A, 10 A and 16 A as specified in 9.1 of this standard.

7 Classification

This clause of IEC 60320-1 applies amended as follows:

Replacement:

7.1 Interconnection couplers are classified according to the type of appliance or equipment to be connected:

- interconnection couplers for class I equipment;
- interconnection couplers for class II equipment.

NOTE – For a description of the classes, see IEC 60536.

7.2 Plug connectors are, moreover, classified according to the method of connecting the cord:

- rewirable plug connectors;
- non-rewirable plug connectors.

8 Marking

This clause of IEC 60320-1 applies amended as follows:

8.1 *Replacement:*

Plug connectors shall be marked with:

- rated current in amperes;
- rated voltage in volts;
- symbol for nature of supply;
- name, trade mark or identification mark of the manufacturer or of the responsible vendor;
- type reference.

NOTE – The type reference may be a catalogue number.

8.2 *Replacement:*

Appliance outlets other than those integrated in an appliance or equipment shall be marked with

- the name, trade mark or identification mark of the manufacturer or of the responsible vendor, and
- a type reference, the latter being not visible after the appliance outlet is correctly mounted or when a plug connector is in engagement.

NOTE – The type reference may be a catalogue number.

8.3 *Replacement:*

Plug connectors and appliance outlets for class II equipment shall not be marked with the symbol for class II construction.

8.5 *Replacement:*

The marking specified in 8.1 shall be easily discernible when the plug connector is wired ready for use.

NOTE – The term "ready for use" does not imply that the plug connector is in engagement with an appliance outlet.

8.6 *Replacement:*

In non-reversible plug connectors, the contact positions shall be established by looking at the engagement face of the plug connectors and their disposition shall be as follows:

earthing contact:	upper central position;
line contact:	lower left-hand position;
neutral contact:	lower right-hand position.

In rewirable, non-reversible plug connectors, terminals shall be indicated as follows:

earthing terminal: the symbol 

neutral terminal: the letter N.

In non-rewirable, non-reversible plug connectors, no marking of contacts is necessary, but cores shall be connected as specified in 22.1.

Appliance outlets other than those integrated or incorporated in an appliance or equipment, for use with plug connectors according to this subclause, shall have terminal markings to correspond with this subclause.

The marking symbol or letters shall not be placed on screws, removable washers or other removable parts.

NOTE – The requirement concerning the marking of terminals and the connection of conductors has been introduced to align with the corresponding requirement for appliance couplers, which was introduced to take account of those countries which require a polarized supply system and the introduction of the IEC plug and socket-outlet system (see IEC 60906).

9 Dimensions and compatibility

This clause of IEC 60320-1 applies amended as follows:

Replacement:

9.1 Interconnection couplers shall comply with the appropriate standard sheets as specified below, except as permitted by 9.6:

2,5 A 250 V interconnection coupler for class I equipment:

- plug connector ..... Sheet A
- appliance outlet ..... Sheet B

2,5 A 250 V interconnection coupler for class II equipment:

- plug connector ..... Sheet C
- appliance outlet ..... Sheet D

10 A 250 V interconnection coupler for class I equipment:

- plug connector ..... Sheet E
- appliance outlet ..... Sheet F

10 A 250 V interconnection coupler for class II equipment:

- plug connector ..... Sheet G
- appliance outlet ..... Sheet H

16 A 250 V interconnection coupler for class I equipment

- plug connector ..... Sheet I
- appliance outlet ..... Sheet J

16 A 250 V interconnection coupler for class II equipment:

- plug connector ..... Sheet K
- appliance outlet ..... Sheet L

Compliance is checked by measurement or by means of gauges at an ambient temperature of 25 °C ± 5 °C.

The accessories shall be tested with the gauges according to the following table:

Accessory to be tested	*Gauge*
10 A plug connectors of standard sheets E and G	*Figure 9H*
16 A plug connectors of standard sheets I and K	*Figure 9M*
10 A appliance outlet of standard sheet F	*Figure 101*
10 A appliance outlet of standard sheet H	*Figure 102*
16 A appliance outlet of standard sheet J	*Figure 103*
16 A appliance outlet of standard sheet L	*Figure 104*

9.2 Provision, if any, for retaining the plug connector in the appliance outlet shall comply with standard sheet... (under consideration).

9.3 It shall not be possible to make single-pole connections between plug connectors and appliance outlets.

Appliance outlets shall not allow improper connections with plugs complying with IEC 60083.

Plug connectors shall not allow improper connections with portable socket-outlets complying with the same IEC 60083 nor with connectors complying with IEC 60320-1.

Compliance is checked by manual test.

NOTE 1 – Improper connections include single-pole connections and other connections which do not comply with the requirements concerning protection against electric shock.

NOTE 2 – Conformity to the standard sheets ensures compliance with these requirements.

9.4 It shall not be possible to engage

- plug connectors for class I equipment with appliance outlets for class II equipment;
- plug connectors with appliance outlets having a lower rated current than the plug connector.

Compliance is checked by inspection, by manual test and by means of gauges at an ambient temperature of 35 °C ± 2 °C.

NOTE 1 – Conformity to the standard sheets ensures compliance with the requirements, other than those verified by means of the gauges.

NOTE 2 – Gauges are under consideration.

9.5 Not applicable.

10 Protection against electric shock

This clause of IEC 60320-1 applies amended as follows:

10.1 *Replacement:*

Interconnection couplers shall be so designed that live parts are not accessible when the plug connector is in partial or complete engagement.

Appliance outlets shall be so designed that live parts are not accessible when the appliance outlet is properly mounted as in normal use.

Compliance is checked by inspection and, if necessary, by a test with the standard test finger shown in figure 10.

This finger is applied in every possible position, an electrical indicator being used to show contact with the relevant parts. For plug connectors and appliance outlets with shrouds, enclosures or bodies of rubber or thermoplastic material, the standard test finger is applied for 30 s with a force of 20 N at all points where yielding of the insulating material could impair the safety of the plug connector; this test is made at an ambient temperature of 35 °C ± 2 °C.

NOTE 1 – The standard test finger must be so designed that each of the jointed sections can be turned through an angle of 90° with respect to the axis of the finger in the same direction only.

NOTE 2 – An electrical indicator with a voltage between 40 V and 50 V is used to show contact with the relevant part.

NOTE 3 – Conformity to the standard sheets ensures compliance with the requirements so far as the inaccessibility of contact members during insertion of a plug connector into an appliance outlet is concerned.

10.2 *Replacement:*

It shall not be possible to make connection between a pin of a plug connector and a contact of an appliance outlet as long as any live part of the pins is accessible.

Compliance is checked by manual test and by the test of 10.1.

NOTE – Conformity to the standard sheets ensures compliance with the requirements.

10.4 *Replacement:*

External parts of plug connectors and of appliance outlets, with the exception of assembly screws and the like, shall be of insulating material.

Compliance is checked by inspection.

NOTE 1 – The suitability of the insulating material is checked during the insulation tests of clause 15.

NOTE 2 – Lacquer or enamel is not considered to be insulating material for the purposes of 10.1 to 10.4.

11 Provision for earthing

This clause of IEC 60320-1 applies amended as follows:

11.2 *Replacement:*

Interconnection couplers with earthing contact shall be so constructed that, when inserting the plug connector, the earth connection is made before the current-carrying contacts of the plug connector are energized.

When withdrawing a plug connector, the current-carrying contacts shall separate before the earth connection is broken.

For interconnection couplers not complying with the standard sheets, compliance is checked by inspection of drawings, taking into account the effect of tolerances, and by checking the specimens against these drawings.

NOTE – Conformity to the standard sheets ensures compliance with the requirement.

12 Terminals and terminations

This clause of IEC 60320-1 applies.

13 Construction

This clause of IEC 60320-1 applies amended as follows:

13.1 *Replacement:*

Interconnection couplers shall be so designed that there is no risk of accidental contact between the earthing contact of the plug connector and the current-carrying contacts of the appliance outlet.

Compliance is checked by inspection.

NOTE – Conformity to the standard sheets ensures compliance with this requirement.

13.3 *Replacement:*

Pins of plug connectors and contacts of appliance outlets shall be locked against rotation.

Compliance is checked by inspection and by manual test.

NOTE – Clamping screws may serve to prevent contacts from rotating.

13.4 *Replacement:*

Pins of plug connectors shall be securely retained and shall have adequate mechanical strength. They shall be surrounded by a shroud and it shall not be possible to remove them without the aid of a tool.

The security of the pin retention is checked by inspection and, in case of doubt, by the following test.

The specimen is heated to a temperature of 70 °C ± 2 °C for 1 h and maintained at this temperature for the duration of the test, including the 5 min period after removal of the test load.

The plug connector is held firmly in such a manner that there will be no undue squeezing or distortion of the body, and the means of holding shall not assist in maintaining the pins in their original position.

Each pin is subjected to a force of 60 N ± 0,6 N, applied without jerks, in a direction along the axis of the pin and maintained at this value for a period of 60 s.

For all pins the force is applied, first in the direction away from the base of the plug connector and then in the direction towards the base of the plug connector.

The attachment of the pins is deemed to be satisfactory if there is no movement exceeding 2,5 mm during the test on any pin, and provided that, within 5 min after removal of the pushing-in test force or within 5 min after removal of the pulling-out test force, all pins remain within the tolerances specified in the relevant standard sheet.

NOTE 1 – This requirement does not exclude pins which are to some extent floating.

NOTE 2 – The extent of permissible floating is not checked by measurement, but by using a gauge.

13.5 *Replacement:*

Contacts of appliance outlets shall be self-adjusting so as to provide adequate contact pressure.

Self-adjustment of the contacts shall not depend upon the resiliency of insulating material.

Compliance is checked by inspection and by the tests of clauses 16 to 21 inclusive.

13.7 Not applicable.

13.8 The third paragraph of the requirement is not applicable.

13.9 *Replacement:*

For plug connectors, the earthing pin shall be fixed to the body. If the earthing terminal and the earthing pin of a plug connector or the earthing terminal and the earthing contact of an appliance outlet are not in one piece, the various parts shall be fixed together by riveting, welding or in a similar reliable manner.

The connection between the earthing pin or contact and the earthing terminal shall be of metal which is resistant to corrosion.

Compliance is checked by inspection and, if necessary, by special tests.

NOTE 1 – This requirement does not exclude earthing pins which are to some extent floating.

NOTE 2 – The extent of permissible floating is not checked by measurement, but by using the gauge as shown in figure.... (under consideration) for the 2,5 A plug connectors, and in figure 9H of IEC 60320-1 for the 10 A plug connectors.

13.13 Not applicable.

14 Moisture resistance

This clause of IEC 60320-1 applies.

15 Insulation resistance and electric strength

This clause of IEC 60320-1 applies amended as follows:

15.2 *Replacement:*

The insulation resistance is measured with a d.c. voltage of approximately 500 V, each measurement being made 1 min after application of the voltage.

The insulation resistance is measured:

1) *for appliance outlets with and without a plug connector in engagement, between the current-carrying socket contacts connected together and the body;*
2) *for appliance outlets with a plug connector in engagement, between each socket contact in turn and the others, the latter being connected together;*
3) *for plug connectors, between the current-carrying pins connected together and the body;*
4) *for plug connectors, between each pin in turn and the others, the latter being connected together;*
5) *for rewirable plug connectors, between any metal part of the cord anchorage, including clamping screws, and the earthing pin or earthing terminal;*
6) *for rewirable plug connectors, between any metal part of the cord anchorage, excluding clamping screws, and a metal rod of the maximum diameter of the cord inserted in its place.*

The maximum diameters of the flexible cord are:

Type of cord	**Number of cores and nominal cross-sectional area** mm^2	**Maximum diameter** mm
60227 IEC 53	3 × 0,75	8,0
	3 × 1	8,4
	3 × 1,5	9,8
60245 IEC 53	3 × 0,75	8,8
	3 × 1	9,2
	3 × 1,5	11,0

The insulation resistance shall not be less than 5 MΩ.

NOTE 1 – The term "body" used in items 1 and 3 includes all metal parts, fixing screws, external assembly screws or the like, if any, and metal foil in contact with the outer surface of external parts of insulating material, but excluding the engagement face of plug connectors (item 3).

NOTE 2 – The metal foil is wrapped round the outer surface of the external parts of insulating material; however, it is not pressed into openings.

16 Forces necessary to insert and to withdraw the connector

This clause of IEC 60320-1 is replaced as follows:

16 Forces necessary to insert and to withdraw the plug connector

16.1 The construction of interconnection couplers shall be such that the plug connector can be easily inserted and withdrawn, but will not work out of the appliance outlet in normal use. This property shall not alter unduly in normal use.

Compliance is checked by the test of 16.2, which is made on appliance outlets and is repeated after the test of clause 21.

NOTE – Additional tests are under consideration for checking the force necessary to insert a plug connector into an appliance outlet. For these insertion forces a value of 1,5 times the withdrawal forces is also under consideration.

16.2 *The maximum and minimum forces necessary to withdraw a test plug connector from an appliance outlet are determined by means of an apparatus as shown in figure 12. This apparatus comprises a mounting plate A and the appliance outlet to be tested B, mounted so that the axes of the contacts are vertical and the open ends of the contacts are downwards.*

The test plug connector is of a type corresponding with the appliance outlet to be tested and has hardened steel pins having a surface roughness not exceeding 0,8 µm. The length of the pins and the distance between pin centres have the values specified in the relevant standard sheet, the tolerance on the distance between the pin centres being ±0,02 mm.

For measuring the maximum withdrawal force, the pin dimensions have the maximum values, with a tolerance of $^{0}_{-0,01}$ *mm and the inner dimensions of the shroud have the minimum values, with a tolerance of* $^{+0,01}_{0}$ *mm specified in the relevant standard sheet.*

For measuring the minimum withdrawal force the pin dimensions have the minimum values, with a tolerance of $^{+0,01}_{0}$ *mm, and the inner dimensions of the shroud have the maximum values, with a tolerance of* $^{0}_{-0,01}$ *mm specified in the relevant standard sheet.*

The test plug connector is inserted into and withdrawn from the appliance outlet 10 times. The test plug connector is then again inserted, a carrier E for a principal weight F and a supplementary weight G being attached to it by means of a suitable clamp. The supplementary weight is such that it exerts a force of 5 N.

The principal weight, with the supplementary weight, the clamp, the carrier and the test plug connector exert a force of 50 N for accessories with a rated current not exceeding 10 A and 60 N for accessories with a rated current of 16 A. The principal weight is hung on without jolting the plug connector and the supplementary weight is allowed to fall from a height of 5 cm onto the principal weight.

The test plug connector shall not remain in the appliance outlet.

Following this, the test is repeated using the other test plug connector, the principal weight and the supplementary weight being replaced by another weight such that the total weight of the test plug connector, the clamp, the carrier and the new weight exert a force of 10 N for accessories with a rated current not exceeding 10 A and 15 N for accessories with a rated current of 16 A.

The plug connector shall not come out.

17 Operation of contacts

This clause of IEC 60320-1 applies amended as follows:

17.1 *Replacement:*

Contacts and pins of interconnection couplers shall make connection with a sliding action. The contacts of appliance outlets shall provide adequate contact pressure and shall not deteriorate in normal use.

17.2 *Replacement:*

The resistance of circuits through interconnection couplers, especially that of the earthing circuit, shall be sufficiently low.

The pressure between earthing contacts and earthing pins shall not depend upon the resiliency of the insulating material on which they are mounted.

Compliance with the requirements of subclauses 17.1 and 17.2 is checked by inspection.

18 Resistance to heating of appliance couplers for hot conditions or very hot conditions

This clause of IEC 60320-1 does not apply.

19 Breaking capacity

This clause of IEC 60320-1 is replaced as follows:

Interconnection couplers shall have adequate breaking capacity.

Compliance is checked, for appliance outlets, by the following test:

The appliance outlet is mounted in an apparatus similar to that shown in figure 14 which incorporates a plug connector having polished hardened steel pins and dimensions as specified in the relevant standard sheet.

The appliance outlet is positioned so that the plane through the axes of the socket contacts is horizontal and the earthing contact, if any, is uppermost.

The plug connector and the appliance outlet are connected and disconnected 50 times (100 strokes), at a rate of 30 strokes per min.

The connections are as shown in figure 15. The test voltage is 275 V. The test current is 1,25 times the rated current and the power factor is at least 0,95 for 10 A and 16 A appliance outlets and 0,6 ± 0,05 for 2,5 A appliance outlets.

No current is passed through the earthing circuit, if any.

The selector switch C, connecting the earthing circuit and accessible metal parts to one of the poles of the supply, is operated after half the number of strokes.

If an air-core inductor is used, a resistor taking approximately 1 % of the current through the inductor is connected in parallel with it. Iron-core inductors may be used, provided the current is of substantially sine-wave form.

During the test, there shall be no flashover between live parts of different polarity or between such parts and parts of the earthing circuit, if any, nor shall there be any sustained arcing.

After the test, the specimen shall show no damage impairing its further use and the entry holes for the pins shall not show any serious damage.

NOTE 1 – In case of doubt, the test is repeated with new pins, having a surface roughness not exceeding 0,8 µm over their active length, fitted in the plug connector of the test apparatus. If the set of new specimens withstands the repeated test with new pins, the appliance outlet is considered to comply with the requirement.

NOTE 2 – A stroke is an insertion or a withdrawal of the plug connector.

NOTE 3 – Plug connectors are not tested for breaking capacity.

20 Normal operation

This clause of IEC 60320-1 is replaced as follows:

Interconnection couplers shall withstand, without excessive wear or other harmful effect, the mechanical, electrical and thermal stresses occurring in normal use.

Compliance is checked by testing appliance outlets in the apparatus described in clause 19.

The plug connector and the appliance outlet are connected and disconnected 1 000 times (2 000 strokes) at rated current and 3 000 times (6 000 strokes) without current flowing.

The connections and the other test conditions are as specified in clause 19, except that the test voltage is 250 V.

The selector switch C, connecting the earthing circuit and accessible metal parts to one of the poles of the supply, is operated after half the number of strokes at rated current.

After the test, the specimens shall withstand an electric strength test as specified in 15.3, the test voltage being, however, reduced to 1 500 V.

The specimen shall show

- *no wear impairing its further use;*
- *no deterioration of enclosures or barriers;*
- *no damage to the entry holes for the pins that might impair proper working;*
- *no loosening of electrical or mechanical connections;*
- *no seepage of sealing compound.*

NOTE 1 – The humidity treatment is not repeated before the electric strength test of this clause.

NOTE 2 – Plug connectors are not tested for normal operation.

21 Temperature rise

This clause of IEC 60320-1 is replaced as follows:

Contacts and other current-carrying parts shall be so designed as to prevent excessive temperature rise due to the passage of current.

Compliance is checked, for appliance outlets, by the following test:

Appliance outlets are tested using a plug connector having brass pins with the minimum dimensions specified in the relevant standard sheet, a tolerance of $^{+0,02}_{0}$ mm being allowed and the distance between pin centres having the value specified in the standard sheet.

The plug connector is inserted into the appliance outlet and an alternating current of 1,25 times rated current is passed through the current-carrying contacts for 1 h.

For interconnection couplers with earthing contact, the current is then passed through one current-carrying contact and the earthing contact for 1 h.

The temperature is determined by means of melting particles, colour changing indicators or thermocouplers, which are so chosen and positioned that they have negligible effect on the temperature being determined.

The temperature rise of terminals or terminations and contacts shall not exceed 45 K.

After this test, the second set of three specimens specified in 5.5 shall withstand the test of clause 16.

NOTE 1 – Plug connectors are not tested for temperature rise.

NOTE 2 – During the test, the accessories are not exposed to an external source of heat.

22 Cords and their connection

This clause of IEC 60320-1 applies amended as follows:

22.3 *Replacement of the table:*

Type of plug connector rated current A	Type of cord	Nominal cross-sectional area mm²
10	60245 IEC 53	0,75 1
16	60245 IEC 53	1 1,5

22.4 *Replacement of the table:*

Type of plug connector rated current A	Type of cord	Nominal cross-sectional area mm²
10	60245 IEC 53	1
16	60245 IEC 53	1,5

23 Mechanical strength

This clause of IEC 60320-1 applies amended as follows:

23.1 *Replacement:*

Interconnection couplers shall have adequate mechanical strength.

Compliance is checked:

- *for plug connectors, by the tests of 23.2, 23.3, 23.5, 23.7 and 23.8;*
- *for appliance outlets, by the test of 23.5.*

23.3 *Replacement:*

After the test of 23.2, the plug connector is inserted into the appliance outlet of an apparatus similar to that shown in figure 19.

Plug connectors are tested using an appliance outlet complying with this standard and having as nearly to average characteristics as can be selected. The pins of the plug connector shall be pointing downwards.

A lateral pull, as specified in the following table, is applied to the cord in a direction perpendicular to the plane containing the axes of the current-carrying contacts and is immediately released.

This sequence of operation is made 100 times in one direction and then 100 times in the opposite direction.

Rated current of plug connector A	*Pull N*
2,5	*6*
10	*35*
16	*50*

If necessary, the plug connector is kept in place so as to prevent it from coming out of the appliance outlet.

During the test, the guard, if any, shall not separate from the body.

After the test, the plug connector shall show no damage within the meaning of this standard.

NOTE – The apparatus shown in figure 19 is intended for plug connectors where the axis of the plug connector and the axis of the cord coincide ("straight" plug connectors); for other plug connectors, the apparatus must be adapted, so that the pulls will be applied in the most unfavourable position.

23.4 Not applicable.

23.5 *Modification:*

Instead of the first paragraph the following applies:

The shrouds of plug connectors and appliance outlets are tested by means of the spring-operated impact-test apparatus shown in figure 21.

23.6 Not applicable.

23.8 The shroud of the plug connector is subjected to a pressure test at an ambient temperature of 25 °C ± 5 °C in an apparatus similar to that shown in figure 24 of IEC 60320-1.

The specimen is clamped between steel jaws having a cylindrical face of 25 mm radius, a width of 15 mm and an effective length between the guides of 50 mm minimum. The corners are rounded with a radius of 2,5 mm.

The specimen is clamped in such a way that the front face of the jaws is coinciding with the front face of the shroud.

The force applied through the jaws is 20 N ± 2 N.

After 1 min and while the shround is still under pressure, the corresponding go-gauges shall enter the plug connector. In case of doubt and where no gauges exist, the inner dimensions of the shroud are measured. The dimensions shall comply with the appropriate standard sheet.

The test is repeated with the specimen turned 90°.

24 Resistance to heat and ageing

This clause of IEC 60320-1 applies.

25 Screws, current-carrying parts and connections

This clause of IEC 60320-1 applies.

26 Creepage distances, clearances and distances through insulation

This clause of IEC 60320-1 applies amended as follows:

Modification:

Instead of the first paragraph of the explanatory matter below the table the following applies:

The term "accessible metal parts" includes:

- metal foil in contact with external surfaces of insulation material of appliance outlets;
- metal foil in contact with the external surfaces of insulating material of plug connectors which are accessible when the pins are in electrical connection with the contacts of the corresponding appliance outlet.

Delete the last paragraph of the test specification.

27 Resistance of insulating material to heat, fire and tracking

This clause of IEC 60320-1 applies amended as follows:

27.2 Not applicable.

28 Resistance to rusting

This clause of IEC 60320-1 applies.

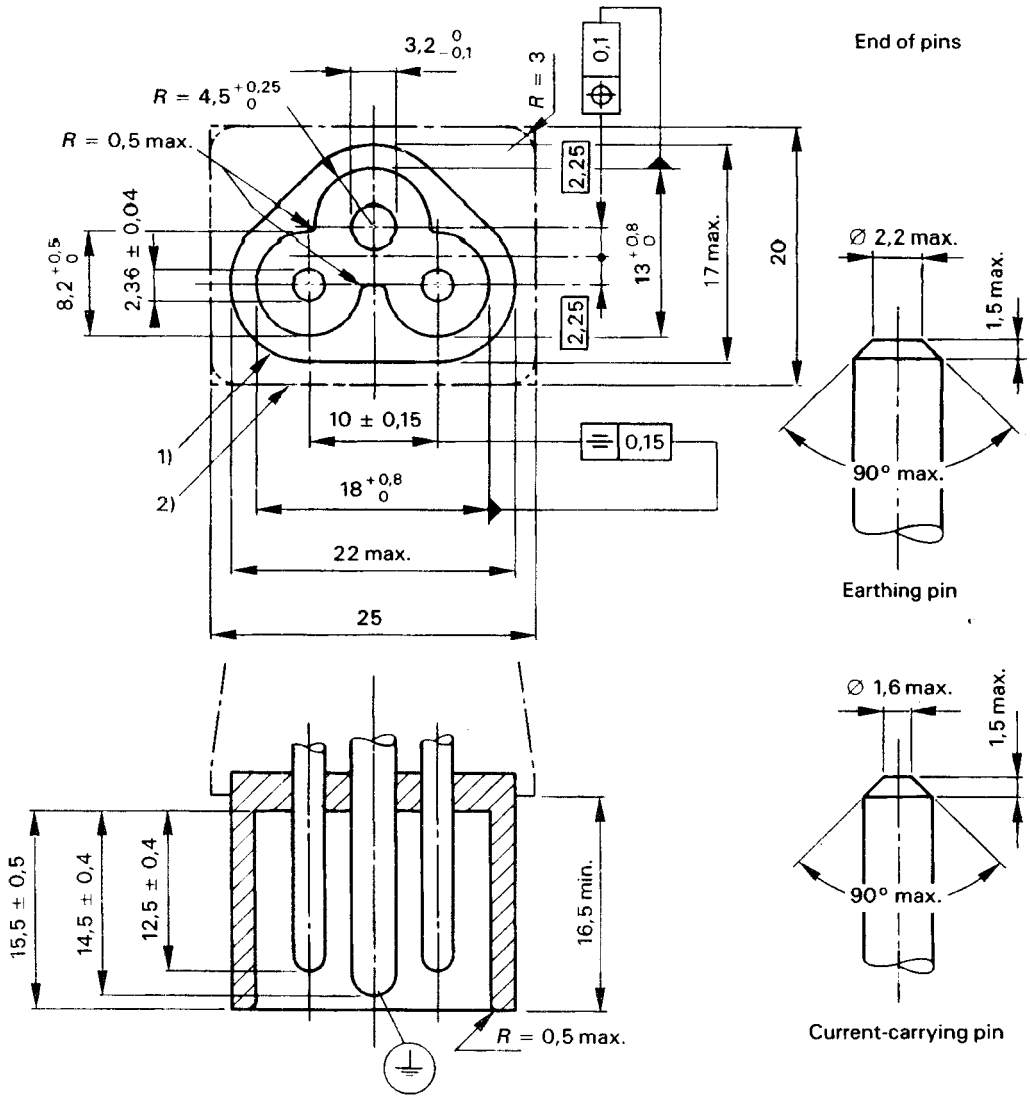
29 Electromagnetic compatibility (EMC) requirements

This clause of IEC 60320-1 applies.

STANDARD SHEET A

2,5 A PLUG CONNECTOR FOR CLASS I EQUIPMENT (non-rewirable only)

Dimensions in millimetres



The outline 1) of the front part shall not be exceeded or decreased, at any point, within a distance of 16,5 mm from the engagement face.

The outline 2) of the rear part shall not be exceeded in any section perpendicular to the axis of the plug connector, except that, for plug connectors with lateral cord entry and for those combined with other accessories, this limitation does not apply in the direction of the axis of the cord or of the actuating member.

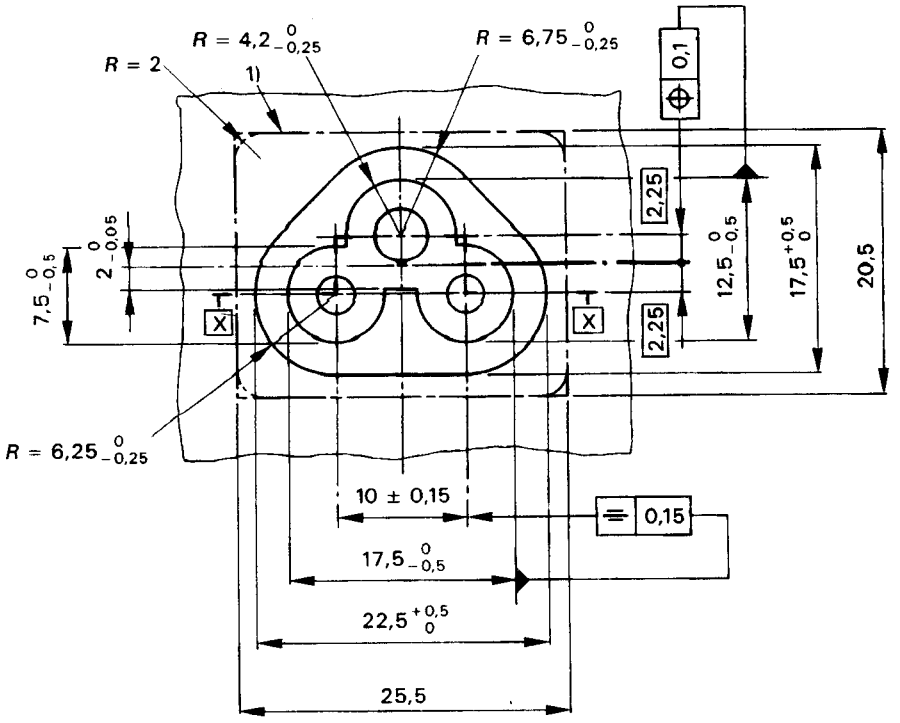
The sketches are not intended to govern design except as regards the dimensions shown.

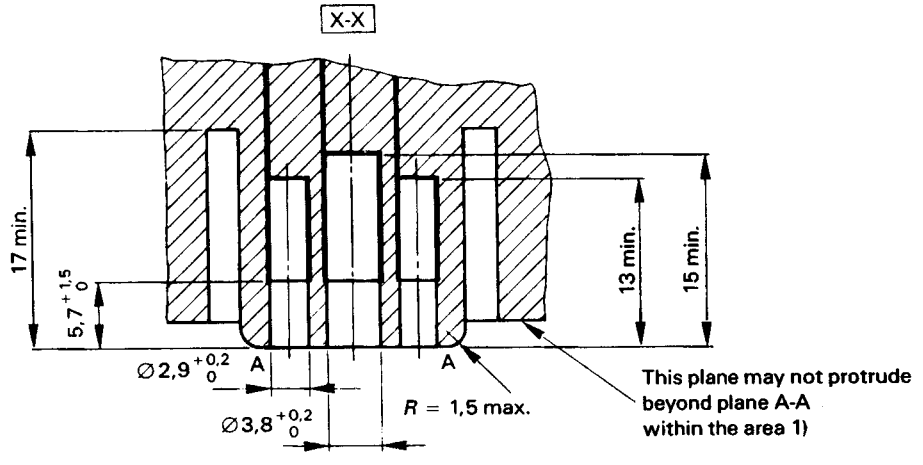
For the symbols indicating the tolerance of form and of position, see ISO 1101.

STANDARD SHEET B

2,5 A APPLIANCE OUTLET FOR CLASS I EQUIPMENT

Dimensions in millimetres





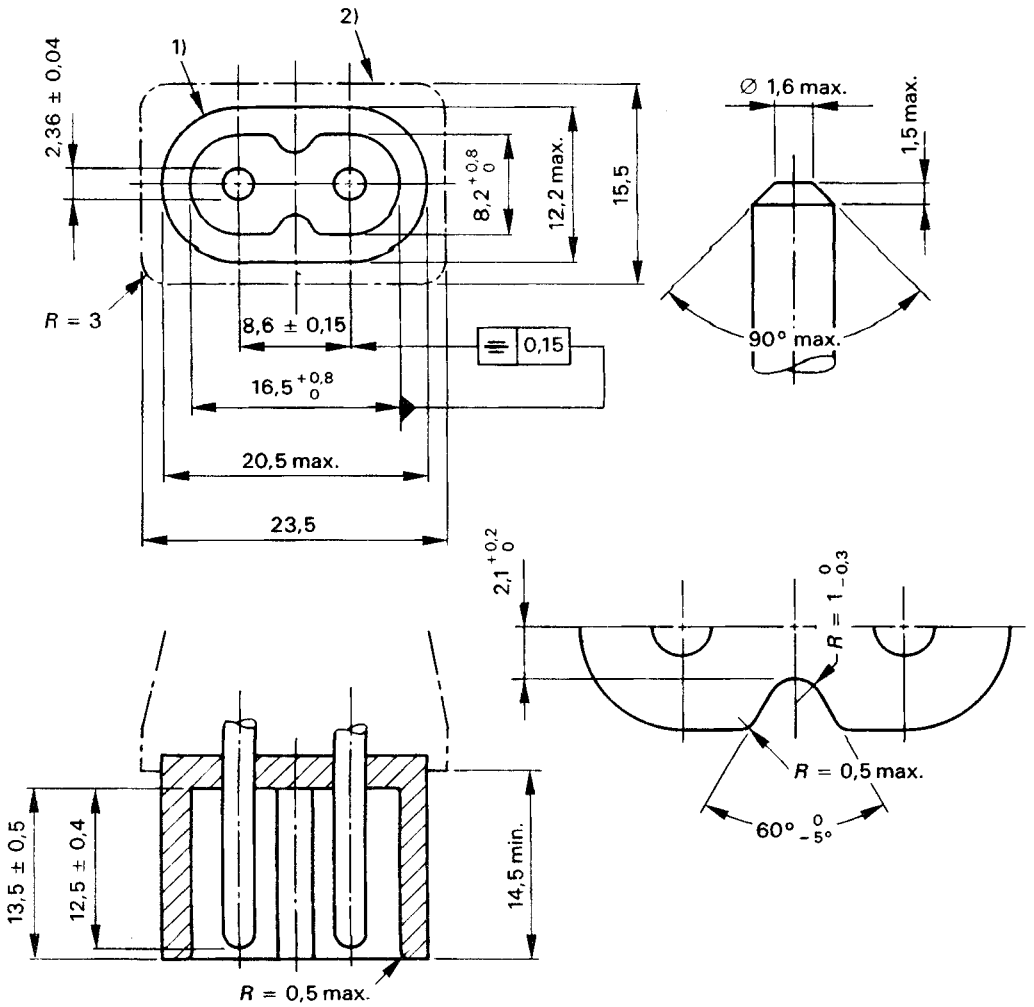
The sketches are not intended to govern design except as regards the dimensions shown.

For the symbols indicating the tolerance of form and of position, see ISO 1101.

STANDARD SHEET C

2,5 A PLUG CONNECTOR FOR CLASS II EQUIPMENT (non-rewirable only)

Dimensions in millimetres



The outline 1) of the front part shall not be exceeded or decreased, at any point, within a distance of 14,5 mm from the engagement face.

The outline 2) of the rear part shall not be exceeded in any section perpendicular to the axis of the plug connector, except that, for plug connectors with lateral cord entry and for those combined with other accessories, this limitation does not apply in the direction of the axis of the cord or of the actuating member.

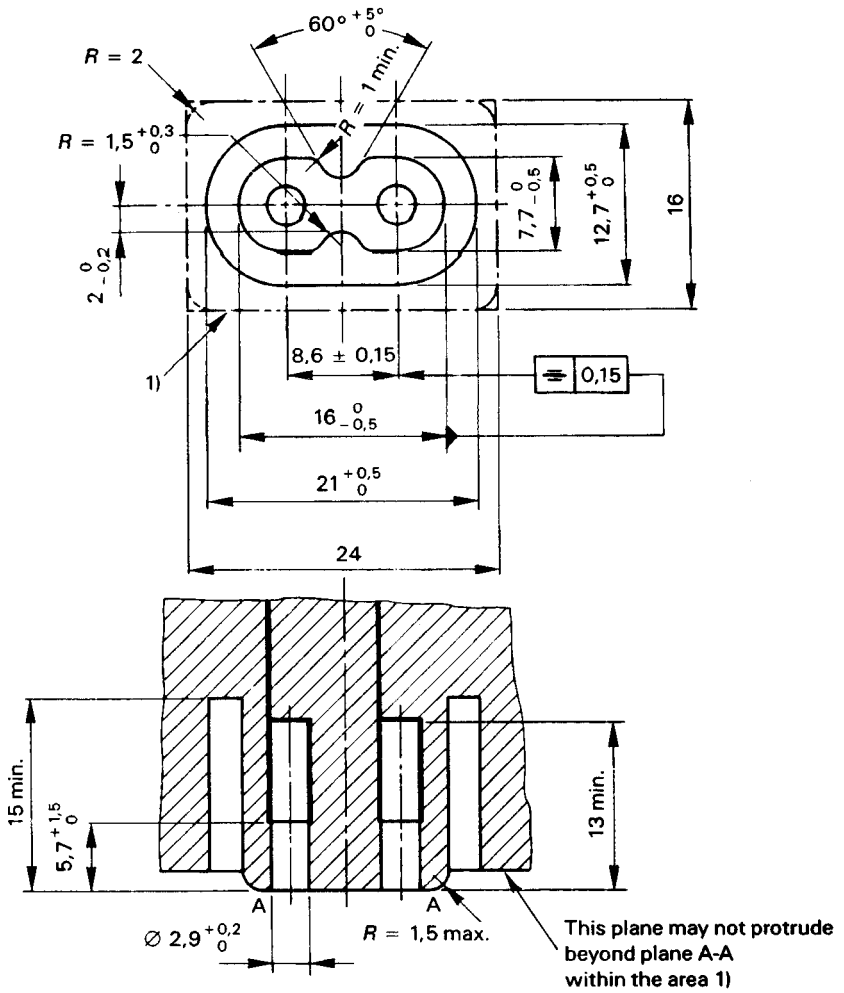
The sketches are not intended to govern design except as regards the dimensions shown.

For the symbols indicating the tolerance of form and of position, see ISO 1101.

STANDARD SHEET D

2,5 A APPLIANCE OUTLET FOR CLASS II EQUIPMENT

Dimensions in millimetres



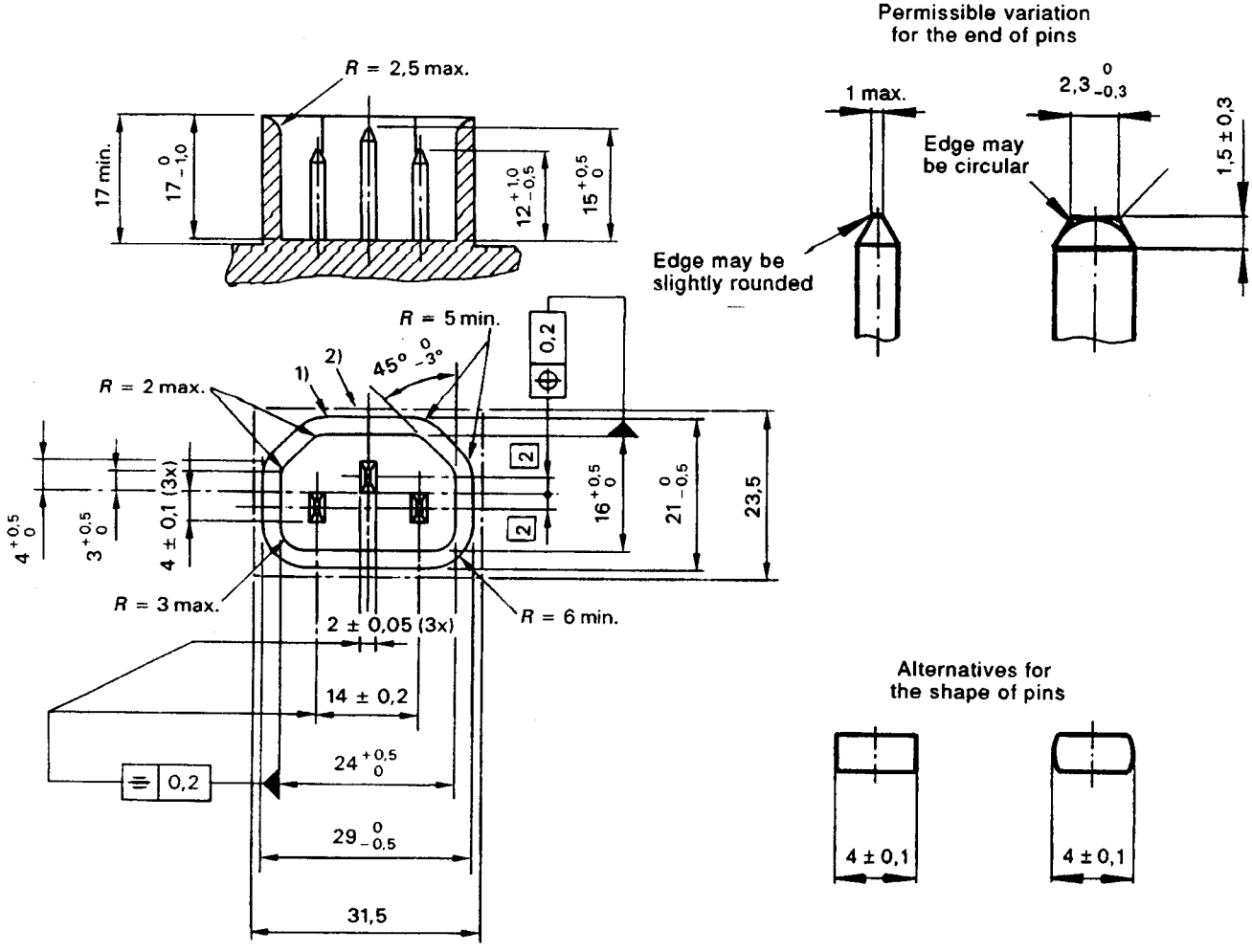
The sketches are not intended to govern design except as regards the dimensions shown.

For the symbols indicating the tolerance of form and of position, see ISO 1101.

STANDARD SHEET E

10 A PLUG CONNECTOR FOR CLASS I EQUIPMENT

Dimensions in millimetres



The outline 1) of the front part shall not be exceeded or decreased, at any point, within a distance of 17 mm from the engagement face.

The outline 2) of the rear part shall not be exceeded in any section perpendicular to the axis of the plug connector, except that, for plug connectors with lateral cord entry and for those combined with other accessories, this limitation does not apply in the direction of the axis of the cord or of the actuating member.

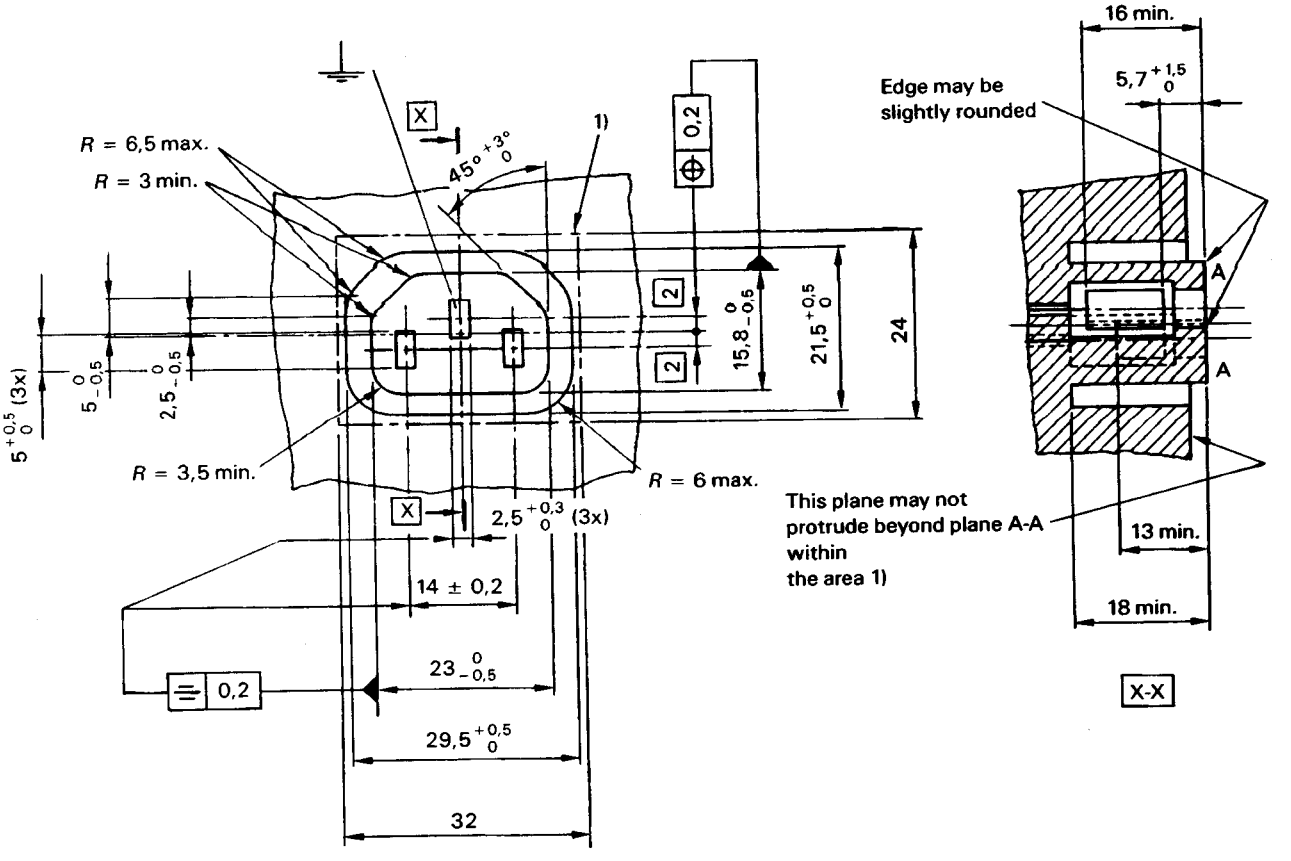
The sketches are not intended to govern design except as regards the dimensions shown.

For the symbols indicating the tolerance of form and of position, see ISO 1101.

STANDARD SHEET F

10 A APPLIANCE OUTLET FOR CLASS I EQUIPMENT

Dimensions in millimetres



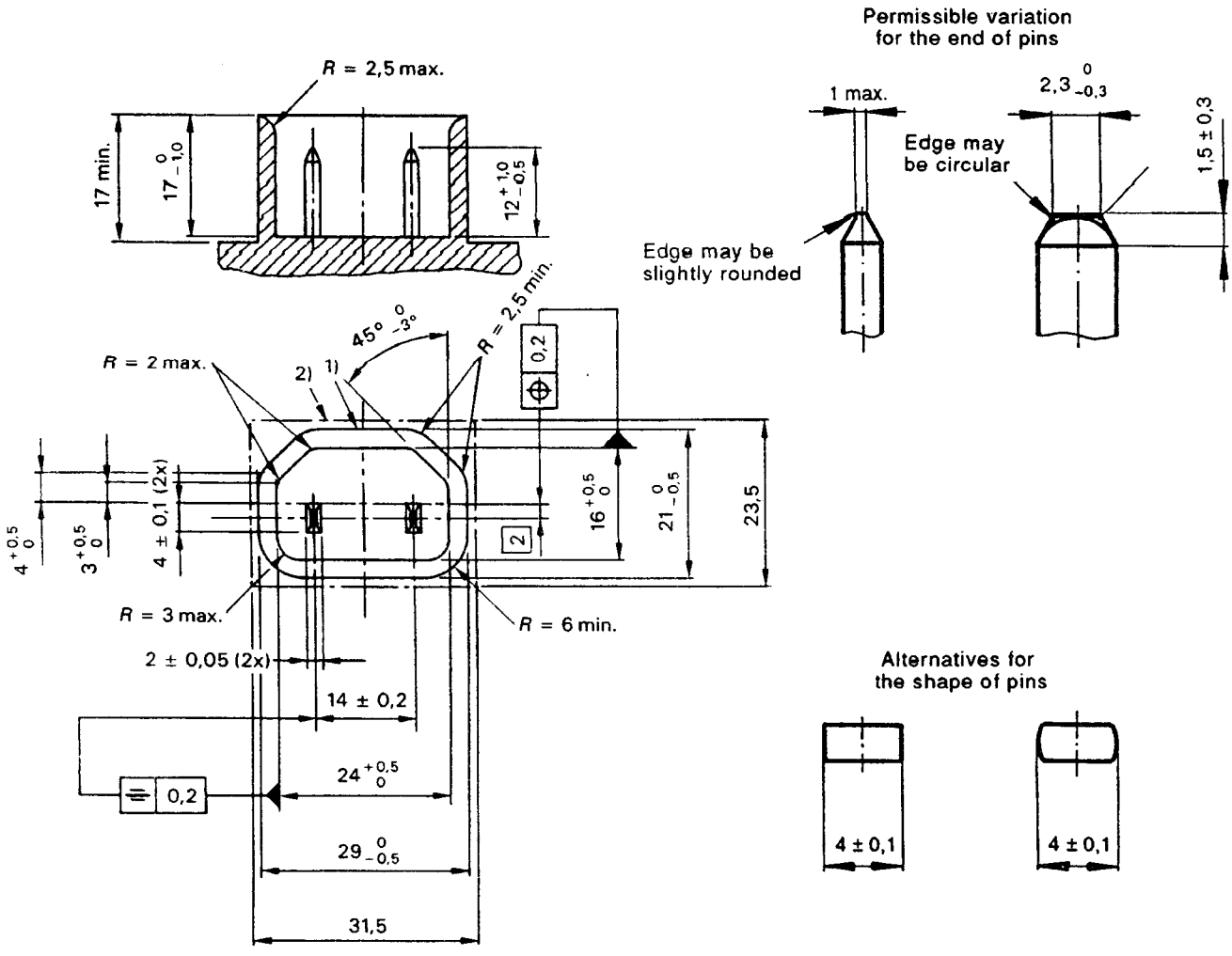
The sketches are not intended to govern design except as regards the dimensions shown.

For the symbols indicating the tolerance of form and of position, see ISO 1101.

STANDARD SHEET G

10 A PLUG CONNECTOR FOR CLASS II EQUIPMENT (non-rewirable only)

Dimensions in millimetres



The outline 1) of the front part shall not be exceeded or decreased, at any point, within a distance of 17 mm from the engagement face.

The outline 2) of the rear part shall not be exceeded in any section perpendicular to the axis of the plug connector, except that, for plug connectors with lateral cord entry and for those combined with other accessories, this limitation does not apply in the direction of the axis of the cord or of the actuating member.

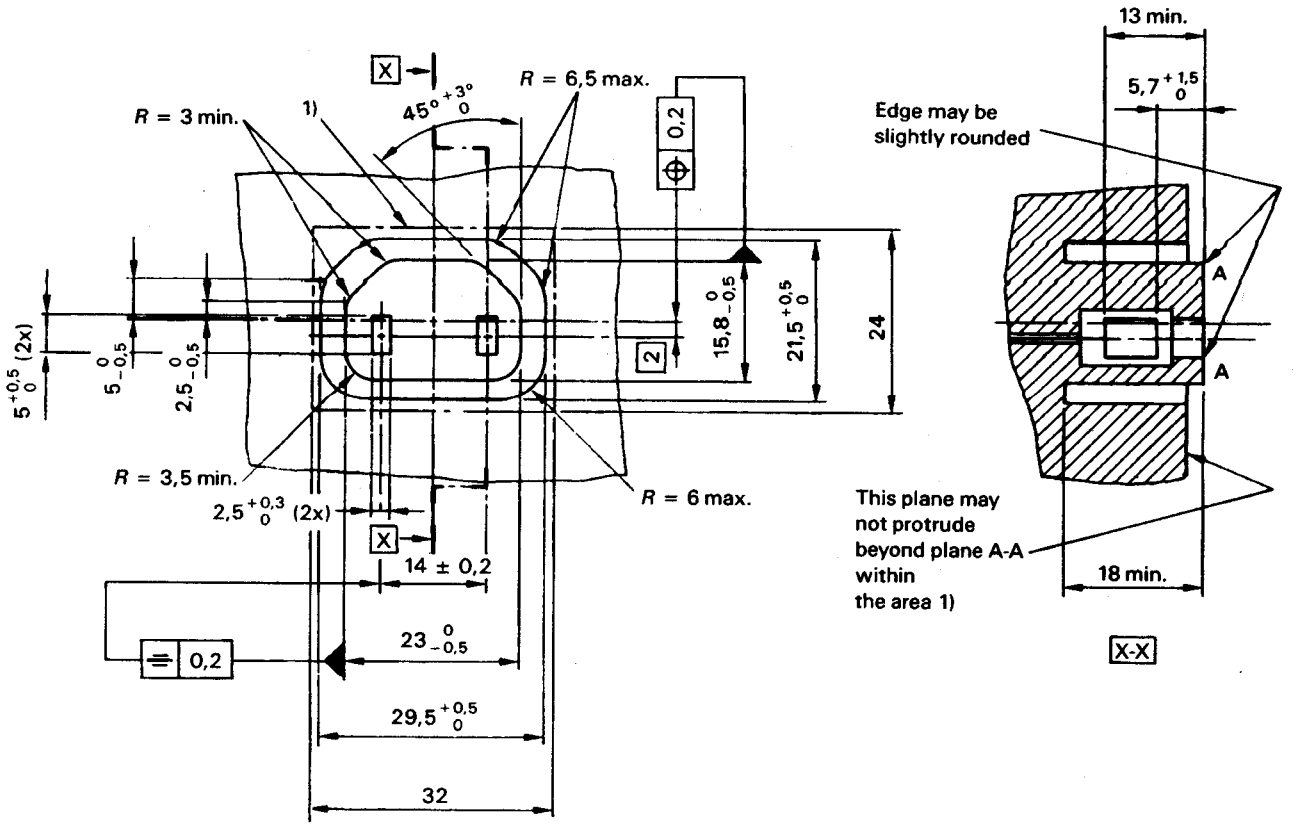
The sketches are not intended to govern design except as regards the dimensions shown.

For the symbols indicating the tolerance of form and of position, see ISO 1101.

STANDARD SHEET H

10 A APPLIANCE OUTLET FOR CLASS II EQUIPMENT

Dimensions in millimetres



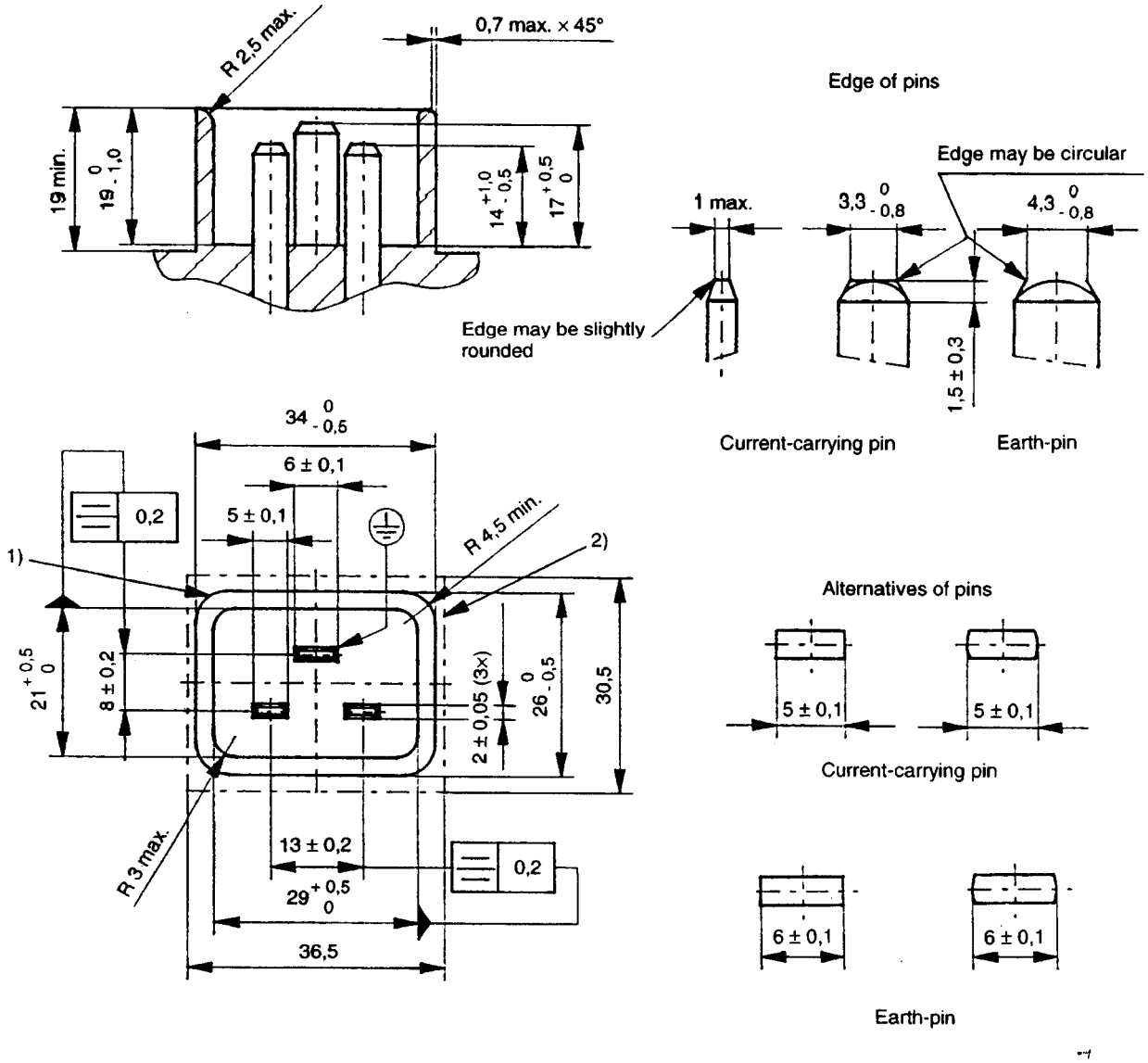
The sketches are not intended to govern design except as regards the dimensions shown.

For the symbols indicating the tolerance of form and of position, see ISO 1101.

STANDARD SHEET I

16 A PLUG CONNECTOR FOR CLASS I EQUIPMENT

Dimensions in millimetres



The outline 1) of the front part shall not be exceeded or decreased, at any point, within a distance of 19 mm from the engagement face.

The outline 2) of the rear part shall not be exceeded in any section perpendicular to the axis of the plug connector, except that, for plug connectors with lateral cord entry and for those combined with other accessories, this limitation does not apply in the direction of the axis of the cord or of the actuating member.

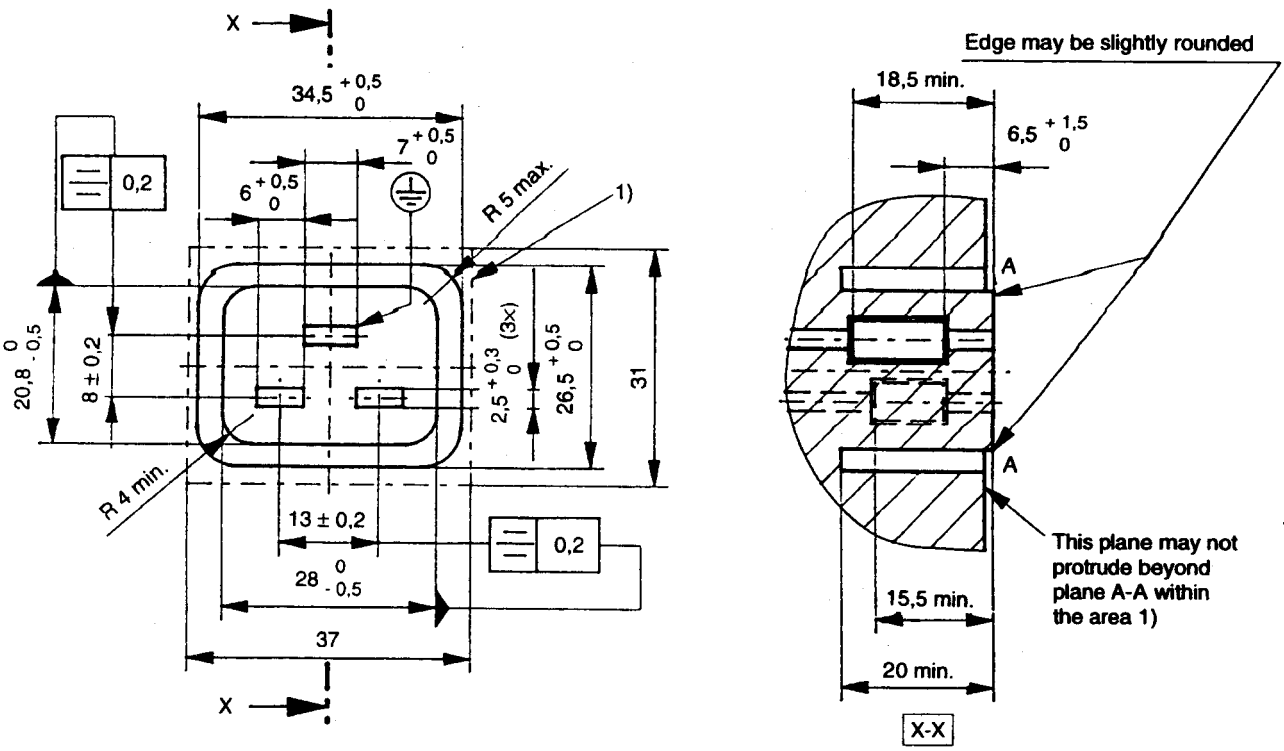
The sketches are not intended to govern design except as regards the dimensions shown.

For the symbols indicating the tolerance of form and position, see ISO 1101.

STANDARD SHEET J

16 A APPLIANCE OUTLET FOR CLASS I EQUIPMENT

Dimensions in millimetres



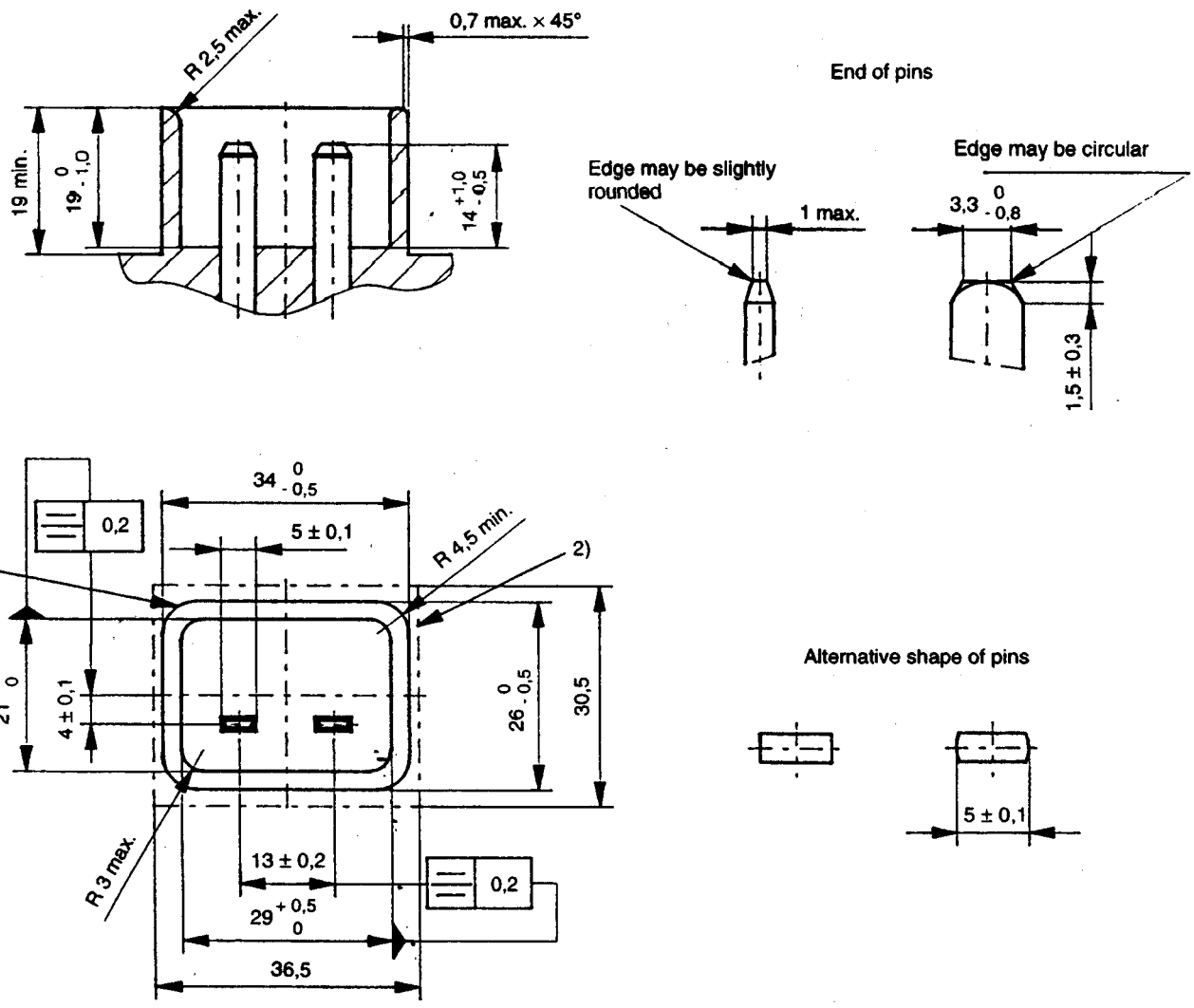
The sketches are not intended to govern design except as regards the dimensions shown.

For the symbols indicating the tolerance of form and of position, see ISO 1101.

STANDARD SHEET K

16 A PLUG CONNECTOR FOR CLASS II EQUIPMENT

Dimensions in millimetres



The outline 1) of the front part shall not be exceeded or decreased, at any point, within a distance of 19 mm from the engagement face.

The outline 2) of the rear part shall not be exceeded in any section perpendicular to the axis of the plug connector, except that, for plug connectors with lateral cord entry and for those combined with other accessories, this limitation does not apply in the direction of the axis of the cord or of the actuating member.

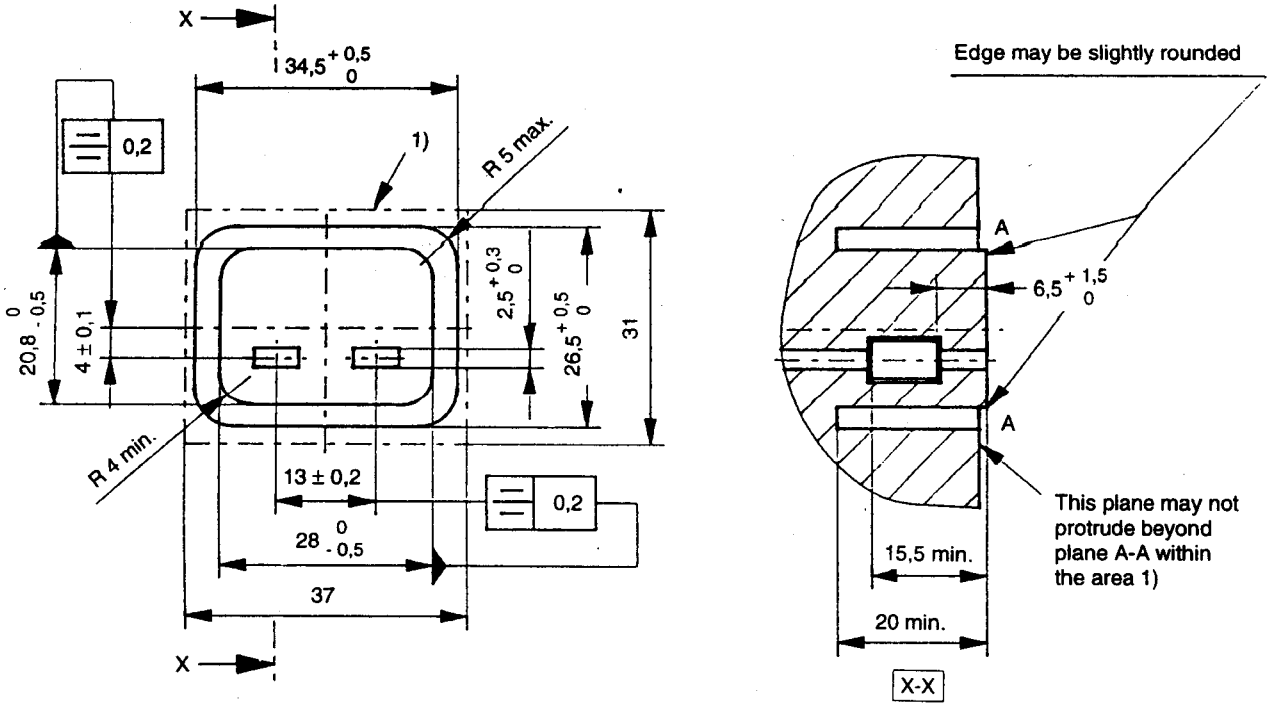
The sketches are not intended to govern design except as regards the dimensions shown.

For the symbols indicating the tolerance of form and position, see ISO 1101.

STANDARD SHEET L

16 A APPLIANCE OUTLET FOR CLASS II EQUIPMENT

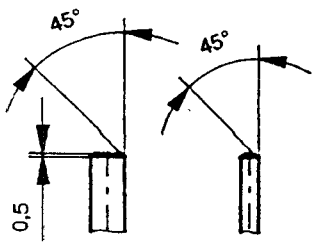
Dimensions in millimetres



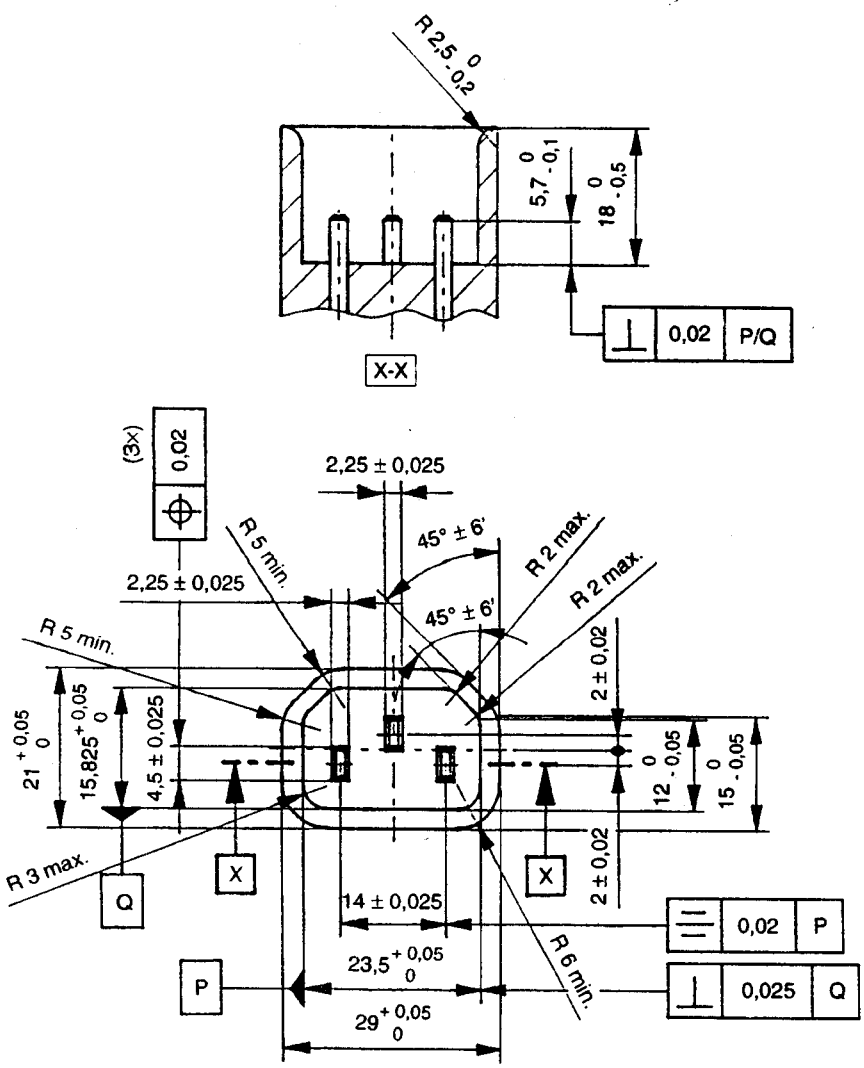
The sketches are not intended to govern design except as regards the dimensions shown.

For the symbols indicating the tolerance of form and of position, see ISO 1101.

Dimensions in millimetres



Detail of pin ends



Gauge and pins: hardened steel.

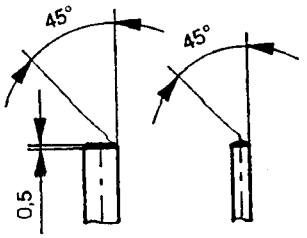
It shall be possible to insert the appliance outlet fully into the gauge with a force not exceeding 60 N.

For the purpose of verifying whether or not the connector is fully inserted, it is recommended to provide the gauge with an aperture.

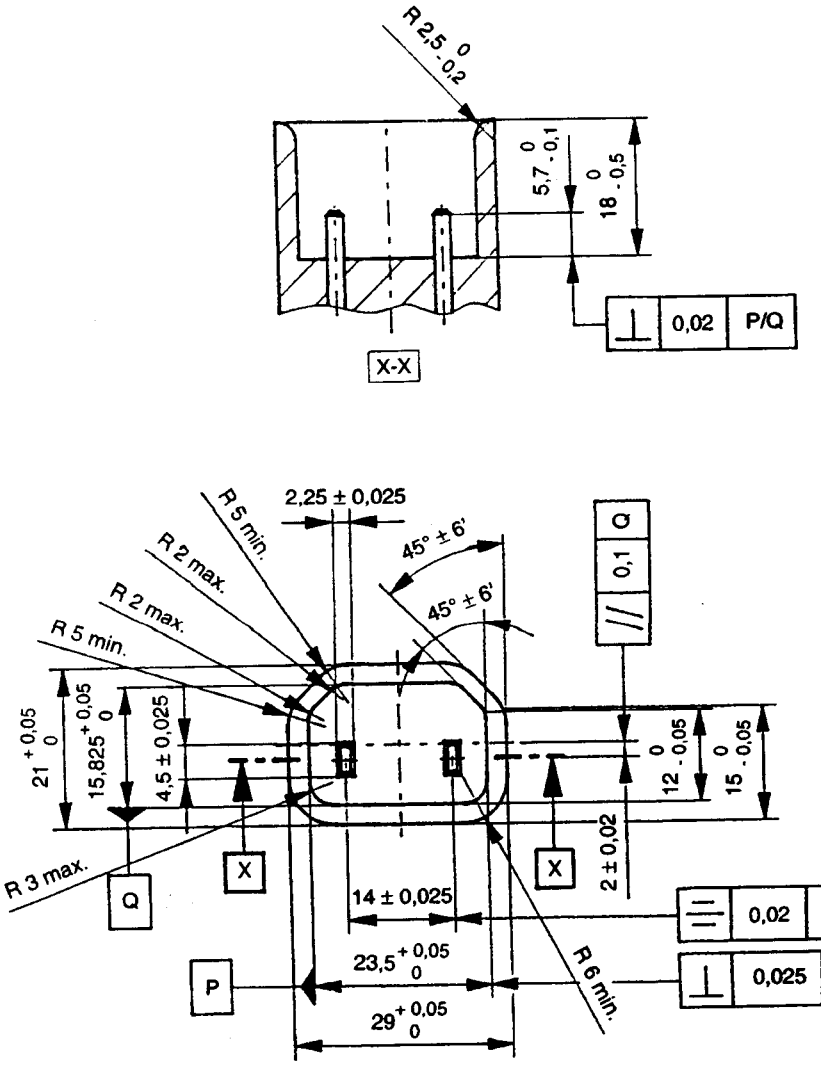
For the symbols indicating the tolerance of form or of position, see ISO 1101.

Figure 101 – "GO" gauge for appliance outlets to standard sheet F (see 8.1)

Dimensions in millimetres



Detail of pin ends



Gauge and pins: hardened steel.

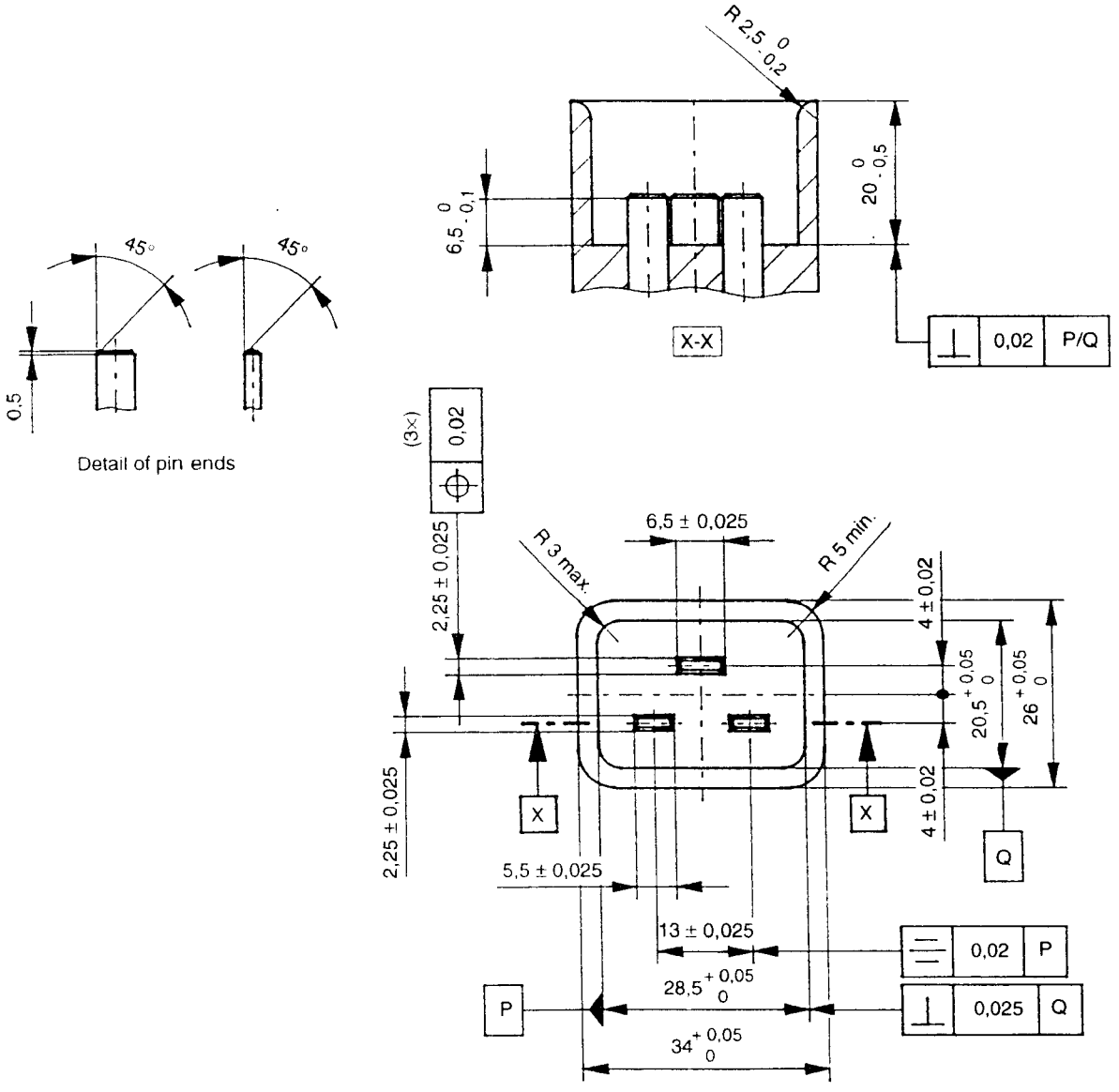
It shall be possible to insert the appliance outlet fully into the gauge with a force not exceeding 60 N.

For the purpose of verifying whether or not the connector is fully inserted, it is recommended to provide the gauge with an aperture.

For the symbols indicating the tolerance of form or of position, see ISO 1101.

Figure 102 – "GO" gauge for appliance outlets to standard sheet H (see 8.1)

Dimensions in millimetres



Gauge and pins: hardened steel.

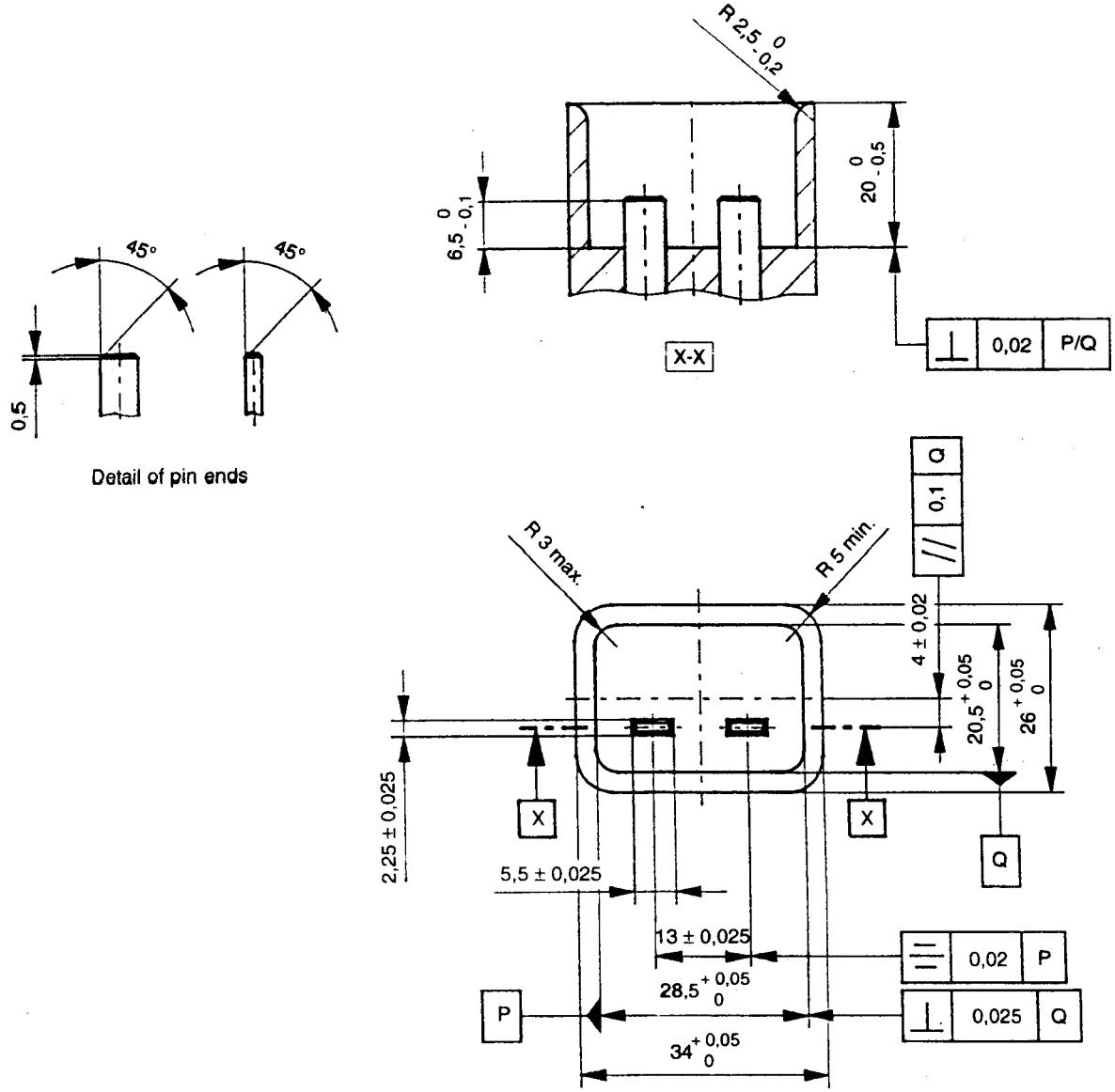
It shall be possible to insert the appliance outlet fully into the gauge with a force not exceeding 60 N.

For the purpose of verifying whether or not the connector is fully inserted, it is recommended to provide the gauge with an aperture.

For the symbols indicating the tolerance of form or of position, see ISO 1101.

Figure 103 – "GO" gauge for appliance outlets to standard sheet J (see 8.1)

Dimensions in millimetres



Gauge and pins: hardened steel.

It shall be possible to insert the appliance outlet fully into the gauge with a force not exceeding 60 N.

For the purpose of verifying whether or not the connector is fully inserted, it is recommended to provide the gauge with an aperture.

For the symbols indicating the tolerance of form or of position, see ISO 1101.

Figure 104 – "GO" gauge for appliance outlets to standard sheet L (see 8.1)

(*Continued from second cover*)

The clauses of this standard supplement or modify the corresponding clauses of IEC 60320-1. Where there is no corresponding subclause in this standard, the subclause of IEC 60320-1 applies without modification as far as is reasonable. Where this standard states "addition", "modification" or "replacement", the requirement, the specification or explanatory matter in IEC 60320-1 should be adapted accordingly.

In this particular standard, subclauses, figures or tables which are additional to those in Part 1 are numbered starting from 101.

Only the English text of the International Standard has been retained while adopting it as an Indian Standard, and as such the page numbers given here are not the same as in the IEC Publication.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be same as that of the specified value in this standard.

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This Indian Standard has been developed from Doc: No. ETD 14 (5771).

Amendments Issued Since Publication

Amendment No.	Date of Issue	Text Affected

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