

INTERNATIONAL STANDARD

IEC
60884-1

2002

AMENDMENT 1
2006-05

Amendment 1

Plugs and socket-outlets for household and similar purposes –

Part 1: General requirements

*This **English-language** version is derived from the original **bilingual** publication by leaving out all French-language pages. Missing page numbers correspond to the French-language pages.*

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PRICE CODE

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FOREWORD

This amendment has been prepared by subcommittee 23B: Plugs, socket-outlets and switches, of IEC technical committee 23: Electrical accessories.

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

FDIS	Report on voting
23B/816/FDIS	23B/821/RVD

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

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

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 - withdrawn,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

Page 17

3 Definitions

On page 19, replace definitions 3.11 and 3.12 by the following new definitions:

3.11

cord set

assembly consisting of one flexible cable fitted with one plug and one single connector, intended for the connection of an electrical appliance to the electrical supply

3.12

cord extension set

assembly consisting of one flexible cable fitted with one plug and one single or multiple portable socket-outlet

On page 23, add the following new definitions:

3.32

cable anchorage

that part of an accessory which has the ability to limit the displacement of a fitted flexible cable against pull, push and turning forces

3.33

main part

part carrying the socket contacts

Page 23

Replace the title of Clause 5 with the following new title:

5 General remarks on tests

Page 25

5.4 *Add, after the fourth paragraph, the following new paragraph:*

For the tests of Clauses 20 and 21 additional specimens may be necessary (see Clauses 20 and 21, and Figure 43).

Page 31

8 Marking

8.2 *On page 33, add the following text before NOTE 1:*

For screwless terminals: suitability to accept rigid conductors onlyr

8.3 *Delete NOTE 3.*

Page 37

9 Checking of dimensions

9.1 *Replace the first paragraph by the following new paragraph:*

Accessories and surface-type mounting boxes shall comply with the appropriate standard sheets and corresponding gauges for plug and socket-outlets systems, if any.

Page 87

14 Construction of plugs and portable socket-outlets

14.5 *On page 89, replace the first paragraph by the following new paragraph:*

Socket-contact assemblies shall have sufficient resilience to ensure adequate contact pressure on plug pins.

Delete the second paragraph.

Add the following new paragraphs:

Parts of socket-contact assemblies, which will be in contact with the portion of the pin intended to make electrical contact when the plug is fully inserted in the socket-outlet,

- shall not be of insulating material except ceramic, or other material with no less suitable characteristics, and

– shall ensure metallic contacts at least on two opposing sides of each pin.

The contact pressure of the contact tube shall not depend on soldered connection only.

Page 97

The correction applies to the French text only.

Page 99

14.24 *Replace this subclause by the following new subclause:*

Plugs shall be shaped in such a way and/or made of such material that they can easily be withdrawn by hand from the relevant socket-outlets.

In addition, the gripping surfaces shall be so designed that the plug can be withdrawn without having to pull the flexible cable.

Compliance is checked by inspection and in case of doubt by test.

NOTE Examples of possible tests are given in Annex C.

16 Resistance to ageing, protection provided by enclosures, and resistance to humidity

16.1 *Add, after the fifth paragraph, the following new text:*

For portable socket-outlets, a test plug as specified in Clause 20 shall be inserted into the socket-outlet during the test.

For accessories having lids, the test plug shall be so designed that when it is inserted the lid can be closed.

On page 101, add the following new paragraph before the note:

For portable socket-outlets, after having withdrawn the test plug from the socket-outlet the contact pressure of the contact assembly is checked as specified in subclause 22.2 with the single-pin gauge. The gauge shall not fall from the contact assembly within 30 s.

Page 109

19 Temperature rise

Add, at the end of the eleventh paragraph, the following new paragraph:

For this test, the temperature rise is measured on the terminals.

Replace the twelfth and thirteenth paragraphs by the following new paragraphs:

The plug shall be tested in a draught-free environment at the centre of a plane wooden sheet which shall be at least 20 mm thick, 500 mm wide and 500 mm high.

Plugs are tested as follows.

Clamping units having the dimensions specified in Figure 44 are fitted on each live pin and earthing pin, if any, of the plug together with the thermocouple. The screw is then placed approximately in the middle of the bare part of the pin and tightened with a torque of 0,8 Nm.

An alternating current as specified in Table 20 is then passed for 1 h.

Plugs having lateral earthing contacts and resilient earthing contacts are tested using a fixed socket-outlet complying with this standard and having as near to-average characteristics as can be selected, but with minimum size of the earthing pin, if any.

The plug is inserted into the socket-outlet, and an alternating current as specified in Table 20 is passed for 1 h.

NOTE 4 Adequate measures should be taken to avoid electric shocks during the test.

Replace the sixteenth and seventeenth paragraphs by the following new paragraphs:

The temperature is determined by means of thermocouples.

The temperature rises indicated by the thermocouples shall not exceed 45 K.

Renumber NOTE 4 and NOTE 5 as NOTE 5 and NOTE 6.

Page 115

21 Normal operation

Replace NOTE 2 by the following new text:

The procedure specified in Figure 43 shall be followed.

The manufacturer shall be permitted to indicate at which point 1, 2 or 3 of Figure 43 the test program shall begin. If the manufacturer indicates to start at point 2 or point 3, the test shall be performed on new specimens that have previously been subjected to the test of Clause 20 in the conditions required to the relevant starting points 2 or 3.

Renumber NOTES 3, 4, 5, 6 and 7 as NOTES 2, 3, 4, 5 and 6.

Page 119

Replace Clause 22 by the following new Clause 22:

22 Force necessary to withdraw the plug

The construction of accessories shall allow the easy insertion and withdrawal of the plug, and prevent the plug from working out of the socket-outlet in normal use.

For the purpose of this test, resilient earthing contacts, irrespective of the number, are considered as one pole, and non-resilient earthing contacts, irrespective of the number, are considered not to be a pole.

NOTE 1 A solid pin used for earthing is a non-resilient earthing contact.

Interlocked accessories are tested in the unlocked position.

Compliance is checked as follows.

For socket-outlets, by

- *a test to ascertain that the maximum force necessary to withdraw the test plug from the socket-outlet is not higher than the force specified in Table 16, and*
- *a test to ascertain that the minimum force necessary to withdraw a single pin gauge from the individual contact assembly is not lower than the force specified in Table 16.*

For plugs with resilient earthing contact assemblies, by

- *a test to ascertain that the maximum force necessary to withdraw a single pin gauge from the individual resilient earthing contact assembly of the plug is not higher than the force specified in Table 16, and*
- *a test to ascertain that the minimum force necessary to withdraw a single pin gauge from the individual earthing contact assembly is not lower than the force specified in Table 16.*

22.1 Verification of the maximum withdrawal force

22.1.1 Test for socket-outlets

The socket-outlet is fixed to the mounting plate A of an apparatus as shown in Figure 18, so that the axes of the socket-contacts are vertical and the entry holes for the pins of the plug face downwards.

The test plugs have finely ground pins of hardened steel, having a surface roughness between $0,6 \mu\text{m}$ ($\sqrt{0,6}$) and $0,8 \mu\text{m}$ ($\sqrt{0,8}$) over their active length and spaced at the nominal distance, with a tolerance of $\pm 0,05 \text{ mm}$.

The diameter, for round pins, and the distance between contact surfaces, for other types of pins, shall have respectively the maximum specified dimensions, with a tolerance of $\begin{smallmatrix} 0 \\ -0,01 \end{smallmatrix} \text{ mm}$.

NOTE 1 The maximum specified dimension is the nominal plus the maximum tolerance.

The pins are wiped free from grease, before each test, using a cold chemical degreaser.

NOTE 2 When using the liquid specified for the test, adequate precautions should be taken to prevent inhalation of vapour.

The test plug with the maximum size pins is inserted into and withdrawn from the socket-outlet ten times. It is then inserted again, a carrier E for a principal mass F and a supplementary mass G being attached to it by means of a suitable clamp D. The supplementary mass is such that it exerts a force equal to one-tenth of the maximum withdrawal force shown in Table 16.

The principal mass, together with the supplementary mass, the clamp, the carrier and the plug exert a force equal to the maximum withdrawal force shown in Table 16.

The principal mass is hung on the plug without jolting and the supplementary mass is, if necessary, allowed to fall from a height of 50 mm onto the principal mass.

The plug shall not remain in the socket-outlet.

22.1.2 Test for plugs with resilient earthing contact assemblies

The test pin gauge, illustrated in Figure 19, is applied to the resilient earthing contact assembly, while the plug is held vertically and the gauge is hanging downwards.

The test pin gauge is made of hardened steel, having a surface roughness between $0,6 \mu\text{m}$ ($\sqrt{0,6}$) and $0,8 \mu\text{m}$ ($\sqrt{0,8}$) over its active length.

The diameter, for round pins, and the distance between contact surfaces, for other types of pins, shall have respectively the maximum specified dimensions, with a tolerance of $0_{-0,01}$ mm. The mass of the gauge shall be such that it exerts a force equal to that specified in Table 16.

NOTE 1 The maximum specified dimension is the nominal plus the maximum tolerance.

The pin is wiped free from grease, before the test, using a cold chemical degreaser.

NOTE 2 When using the liquid specified for the test, adequate precautions should be taken to prevent inhalation of vapour.

The test pin with the maximum dimension(s) is inserted into and withdrawn from the earthing contact ten times. It is then inserted again and shall not remain in the contact assembly.

22.2 Verification of the minimum withdrawal force

The test pin gauge, illustrated in Figure 19, is applied to each individual contact with the socket-outlet or the plug held in such way that the gauge is hanging downwards.

Shutters, if any, are rendered inoperative so as not to affect the test.

The test pin gauge is made of hardened steel, having a surface roughness between $0,6 \mu\text{m}$ ($\sqrt{0,6}$) and $0,8 \mu\text{m}$ ($\sqrt{0,8}$) over its active length.

The diameter, for round pins, and the distance between contact surfaces, for other types of pins, shall have respectively the minimum specified dimensions, with a tolerance of $0_{-0,01}$ mm and a length sufficient to make adequate contact with the contact assembly. The force of the gauge shall be equal to that specified in Table 16.

If the socket-outlet is intended to accept plugs having pins with different nominal dimensions the smallest appropriate one shall be used.

In this case, the rating of the accessory in Table 16 is the rating of the plug with the smallest dimensions for the pins.

NOTE 1 The minimum specified dimension is the nominal minus the maximum tolerance.

The pin is wiped free from grease, before each test, using a cold chemical degreaser.

NOTE 2 When using the liquid specified for the test, adequate precautions should be taken to prevent inhalation of vapour.

The test pin gauge is inserted into the contact assembly.

The test pin gauge is applied gently, and care is taken not to knock the assembly when checking the minimum withdrawal force. The gauge shall not fall from the contact assembly within 30 s.

Table 16 – Maximum and minimum withdrawal force for plugs and socket-outlets

Ratings of the accessory	Number of the poles of the accessory	Withdrawal force		
		N		
		Multi-pin gauge maximum	Single-pin gauge minimum	Single-pin gauge maximum ^a
Up to and including 10 A	2	40	1,5	17
	3	50		
Above 10 A up to and including 16 A	2	50	2,0	18
	3	54		
	More than 3	70		
Above 16 A up to and including 32 A	2	80	3,0	27
	3	80		
	More than 3	100		

^a These withdrawal forces are only for testing the resilient earthing contact assembly of a plug.

Page 123

23 Flexible cables and their connections

23.1 *Replace the existing Subclause 23.1 by the following new Subclause 23.1:*

23.1 Rewirable plugs and rewirable portable socket-outlets shall be provided with a cord anchorage such that the conductors are relieved from strain, including twisting, where they are connected to the terminals and that their covering is protected from abrasion.

The sheath, if any, of the flexible cable shall be clamped within the cord anchorage.

Compliance is checked by inspection and by the test of 23.2.

Non rewirable plugs and non rewirable portable socket-outlets shall be designed in such a way that the cable is maintained in position and the terminations are relieved from strain and twisting.

The sheath, if any, of the flexible cable shall be maintained inside the accessory.

Compliance is checked by the test of 23.2 and 23.4.

Page 131

Table 20 *Replace the fifth line of Table 20 by the following new line:*

16A	22	16	20	16	1 ^a	16	16	Tinsel	1	1
130/250 V					1,5	16	16	0,5	2,5	2,5
								0,75	10	10
								1	12	12
								1 ^a	16	16
								1,5	16	16

^a Flexible cables having a cross-sectional area of 1 mm² are allowed with a length up to 2 m only.

23.4 *Delete the last but one paragraph.*

Page 135

24 Mechanical strength

Replace the first paragraph by the following new paragraph:

Accessories, surface mounting boxes, screwed glands and shrouds shall have adequate mechanical strength so as to withstand the stresses imposed during installation and use.

Add at the end of the list the following dashed text:

– *for shroud of portable socket-outlets* 24.19.

Page 137

24.1 *Replace, in the second paragraph, the words “of HR100” by “HR between 85 and 100”.*

On page 155, add the following new Subclause 24.19:

24.19 *The shrouds of portable socket-outlets are subjected to a compression test at an ambient temperature of (25 ± 5) °C in an apparatus similar to that shown in Figure 38.*

The apparatus comprises two steel jaws, having a cylindrical face of 25 mm radius, a width of 15 mm and a length of 50 mm. The length of 50 mm can be increased, depending on the size of the accessory to be tested.

The corners are rounded with a radius of 2,5 mm.

The specimens are clamped in such a way that the front face of the jaws coincides with the front face of the shroud.

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

After 1 min, and while the shrouds are still under pressure, the dimensions shall comply with the appropriate standard sheet.

The test is repeated with the specimen rotated 90°.

25 Resistance to heat

Replace the second and third paragraphs by the following new text and table:

Compliance is checked as shown in Table 24.

Table 24 – Resistance to heat of different types or parts of accessories

Specimen		Test according to 25.1	Test according to 25.2	Test according to 25.3	Test according to 25.4
A	Surface-mounting boxes, separable covers, separable cover-plates and separable frames with the exception of parts of the front surface zone of thermoplastic material of 2 mm width surrounding the phase and neutral pin entry holes	-	-	X	-
B	Portable accessories with the exception of the parts covered by A	X	X	X	X
C	Portable accessories made of natural or synthetic rubber or a mixture of both or PVC	X	X	-	X
D	Fixed socket-outlets with the exception of the parts covered by A	X	X	X	-
E	Fixed socket-outlets made of natural or synthetic rubber or a mixture of both	X	X	-	-
X : test applicable					
- : test not applicable					

Parts intended for decorative purposes, such as certain lids, are not submitted to any of these tests.

27 Creepage distances, clearances and distances through sealing compound

Page 165

Table 23

In item 8, replace the third dashed item by the following new item:

- accessible unearthed or functional earthed metal parts^b of socket-outlets and plugs

30 Additional tests on pins provided with insulating sleeves

Page 175

30.1 Pressure test at high temperature

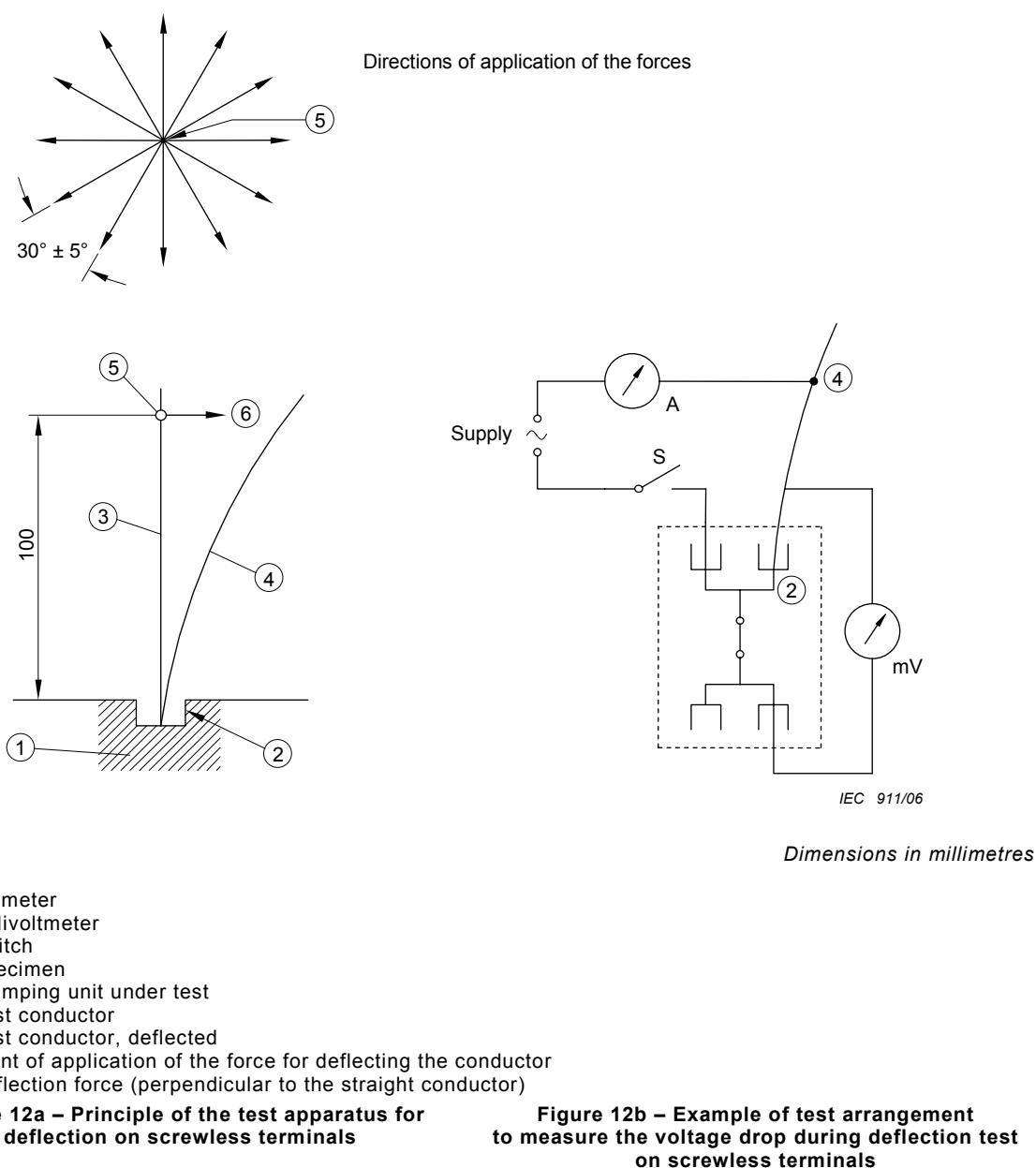
Replace the last two paragraphs by the following new paragraph:

The thickness of the insulation remaining at the point of impression is measured and shall not have been reduced by more than 50 % of its original value measured at the start of the test.

Page 195

Figure 12

Replace the existing Figure 12 by the following new Figure 12:



On page 239, add the following new Figures 43 and 44:

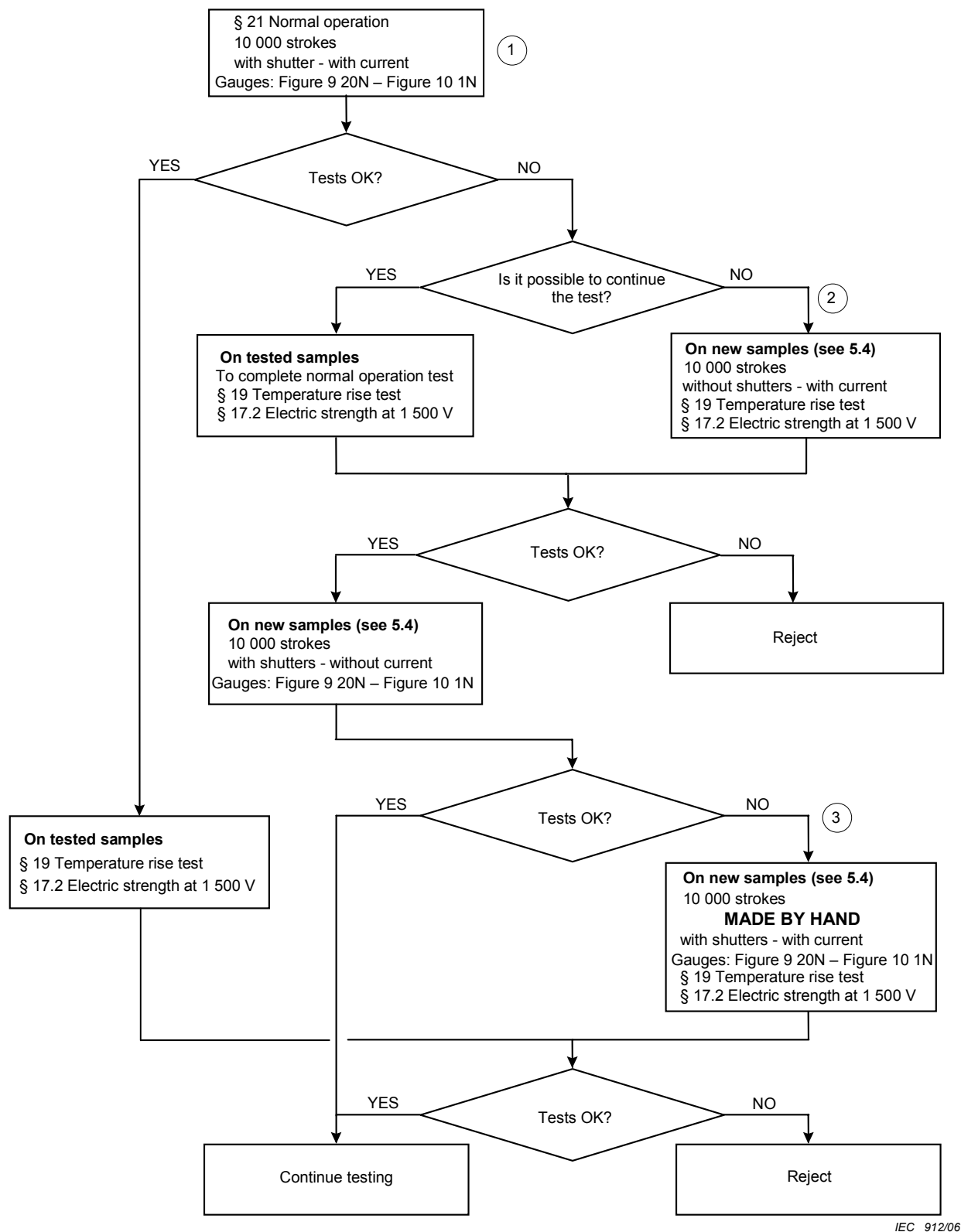
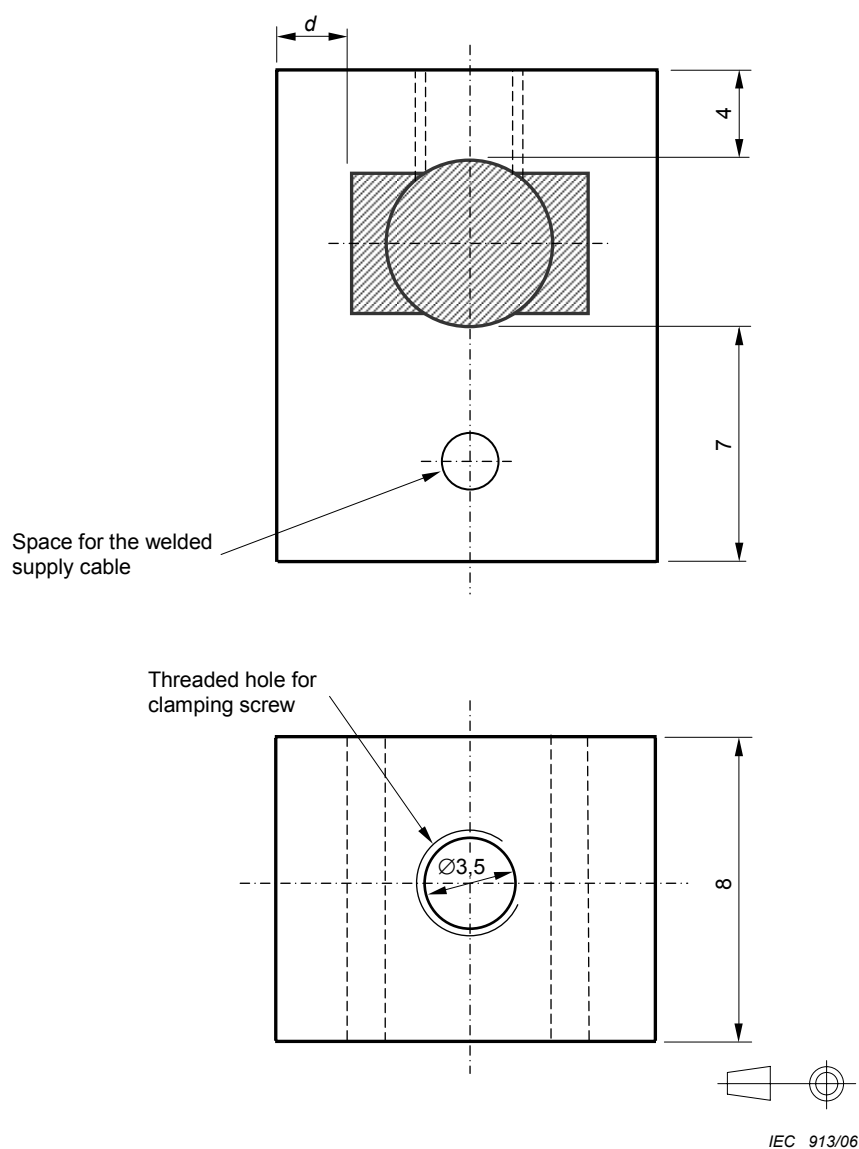


Figure 43 – Test procedures for normal operation (see Clause 21)



Dimensions in millimetres

Material : brass with at least 52 % of copper

Tolerance: $\pm 0,2$ mm unless otherwise stated

NOTE 1 The dimension(s) for the shaded area is(are) the maximum plug pin dimension(s) + 0,8 mm.

NOTE 2 $1,5 \leq d \leq 3$

NOTE 3 The thermocouple should be placed within the shaded area but not directly under the clamping screw.

Figure 44 – Clamping unit for the temperature rise test of Clause 19

On page 245, add the following new Annex C:

Annex C **(informative)**

Alternative gripping tests

Gripping test C1

Prior to testing, the reference plug shown in Figure C.1 shall be cleaned with a metal cleaner.

The reference plug, the plug to be tested, and the hands of each person conducting the test shall be washed with soap and water, rinsed, and then dried.

The test apparatus consists of a measuring device equipped with a means to securely attach both the reference plug and the plug to be tested, in a manner that reduces the likelihood of rotational movement during the pulls. An engagement face simulating the use of a plug in a socket-outlet of the same system, having an opening for the plug pins, shall be secured to the movable member.

NOTE Other methods for measuring force may be used.

The mounting arrangements for the plug being tested shall be such that the face of the plug is flush with the faceplate.

A typical apparatus is shown in Figure C.2.

The plug to be tested with the flexible cable cut off close to the plug shall be securely attached to the test apparatus.

The person performing the test shall grip the plug to be tested, with either hand in a manner intended to apply the maximum pull force.

A steady straight pull shall be applied until the plug pulls free from the person's hand.

The person applying the force shall not view the force indicator during the pull.

The maximum pull force applied during the pull shall be recorded.

Immediately following the pull test, the reference plug shall be attached to the test apparatus and a comparison pull made using the same hand.

The maximum pull force shall be recorded.

The ratio of the force for the plug under test, to that for the reference plug shall be calculated and recorded.

The comparison pull procedure described above shall be repeated on the same plug an additional two times by the same person.

The ratio for each pair of pulls (test plug/reference plug) shall be calculated and recorded.

One person shall test three plugs (total nine comparison pulls) as described above with the ratio for each pair of pulls being calculated and recorded for all three plugs. If the ratio of the pull force (plug under test/reference plug) for each pair of pulls resulting from the tests carried out by this person is 0,8 or greater, the test shall be stopped and the results considered acceptable.

If the ratio is lower than 0,8, two additional people shall test three plugs each (for a total of nine comparison pulls per person), as described above.

The ratio for each pair of pulls (plug under test/reference plug) shall be calculated and recorded.

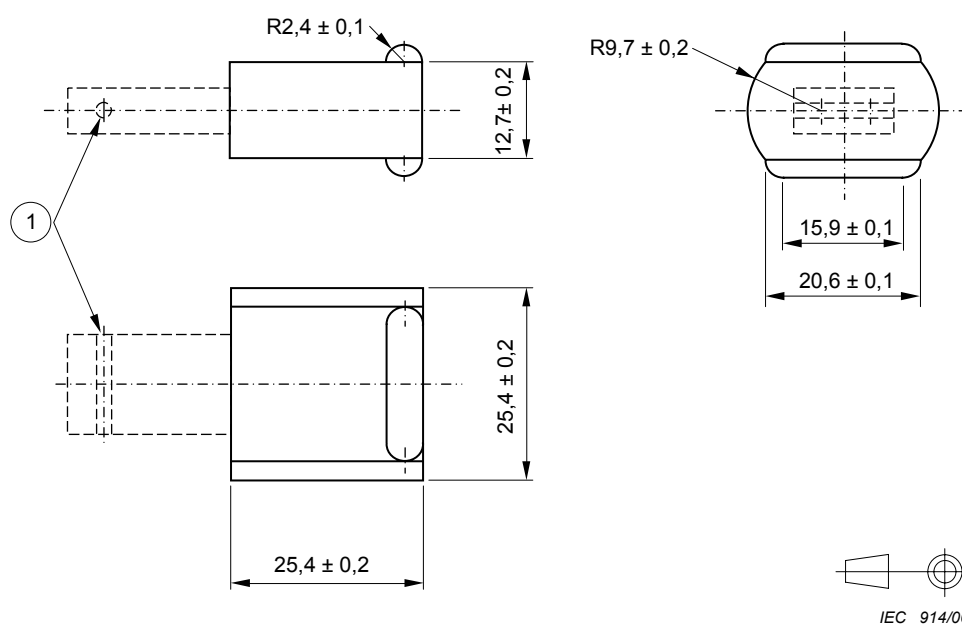
The results are considered acceptable if all of the following conditions are met:

- a) the ratio for each pair of pulls (test/reference plug) is 0,55 or greater for at least two pulls (of the three pulls performed) on each plug,*
- b) at least two (of the three) plugs tested by each person comply with item a), and*
- c) at least two persons' test results comply with item b).*

If only one person obtains results that comply with item b) then at the manufacturer's request, two persons not previously involved in the testing may test three plugs each as previously described.

The results are considered acceptable if both of the additional persons' test results comply with items a) and b).

No result should be lower than the maximum withdrawal force for the relevant socket-outlet as specified in Table 16.



Dimensions in millimetres

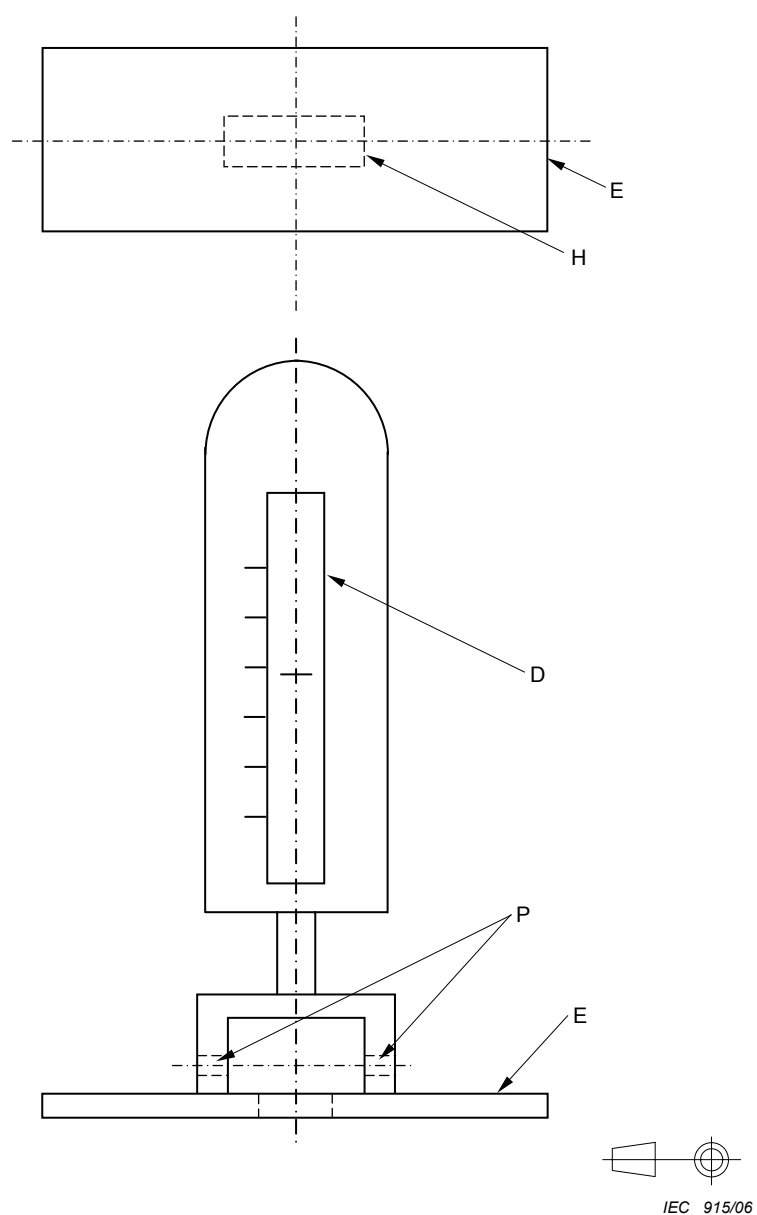
Material: for example heat-treated steel.

Surface roughness of the gripping surface: between $0,6 \mu\text{m}$ and $0,8 \mu\text{m}$.

1 Hole for retaining pins.

NOTE The dimensions are to suit the test specimen and those of Figure C.2.

Figure C.1 – Reference plug for gripping test



E Simulated engagement face

H Hole for introduction of fixing means

P Holes for pins for retention of fixing means

D Measuring device

NOTE The figure is for guidance only and is not intended to govern the design of the test apparatus.

Figure C.2 – Example of the test apparatus for plug gripping test

Gripping test C2

This test consists of a verification of one of the following characteristics of the plug under test:

- the plug has a usable length for gripping of at least 55 mm in axial direction; or*
- the plug has such indent(s) that a ball with a diameter of $(12 \pm 0,1)$ mm can penetrate radially into the body at least 2 mm from two opposite directions or at least 4 mm from one direction; or*
- the plug has special means for withdrawal (e.g. hooks, rings).*

The results are considered acceptable if at least one of the above conditions is fulfilled.

ISBN 2-8318-8651-1



9 782831 886510

ICS 29.120.30

Typeset and printed by the IEC Central Office
GENEVA, SWITZERLAND