

PAKISTAN STANDARD

PLUGS AND SOCKET-OUTLETS FOR HOUSEHOLD AND SIMILAR PURPOSES –

PART 2-4: PARTICULAR REQUIREMENTS FOR PLUGS AND SOCKET-OUTLETS FOR SELV



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**PLUGS AND SOCKET-OUTLETS FOR HOUSEHOLD AND SIMILAR
PURPOSES - PART 2-4: PARTICULAR REQUIREMENTS FOR PLUGS AND
SOCKET-OUTLETS FOR SELV**

0. **FOREWORD**

- 0.1 This Pakistan Standard was adopted by the authority of the Board of Directors for Pakistan Standards and Quality Control Authority after approval by the Technical Committee for “Plugs and socket-outlets for household and similar purposes - Part 2-4: Particular requirements for plugs and socket-outlets for SELV” had been approved and endorsed by the Electrotechnical National Standards Committee on _____.
- 0.2 This Pakistan Standard was adopted on the basis of IEC: 60884-2-4 since IEC Standard have been established in 2007, hence it is deemed necessary to adopt the International standard to keep abreast with the latest technology and as per with IEC standard.
- 0.3 This Pakistan Standard is an adoption of IEC: 60884-2-4 “ Plugs and socket-outlets for household and similar purposes Part 2-4: Particular requirements for plugs and socket-outlets for SELV” and its use hereby acknowledged with thanks.
- 0.4 This standard is subject to periodical review in order to keep pace with the development in industry. Any suggestions for improvement shall be recorded and placed before the revising committee in due course.
- 0.5 This standard is intended chiefly to cover the technical provisions relating to this standard and it does not include all the necessary provisions of a Contract.

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IEC 60906-3:1994, *IEC system of plugs and socket-outlets for household and similar purposes – Part 3: SELV plugs and socket-outlets, 16 A 6 V, 12 V, 24 V, 48 V, a.c. and d.c.*

ISO 1302:2002, *Geometrical Product Specifications (GPS) – Indication of surface texture in technical product documentation*

3 Definitions

This clause of Part 1 is applicable, except as follows:

Addition:

3.101 SELV

voltage which does not exceed 50 V a.c. r.m.s. or 120 V d.c. (ripple free) between conductors, or between any conductor and earth, in a circuit which is isolated from the supply mains by means such as a safety isolating transformer or converter with separate windings

NOTE The rated voltages of the systems considered by this standard do not exceed 48 V a.c. and 48 V d.c.

4 General requirements

This clause of Part 1 is applicable.

5 General remarks on tests

This clause of Part 1 is applicable, except as follows:

5.4 *Addition after the first paragraph:*

When a manufacturer's design is used for d.c., as well as for a.c., three additional specimens are required for the tests of Clauses 19, 20 and 21.

When a manufacturer's design is used for two or more voltages, three additional specimens are required for each additional voltage.

All relevant tests are carried out with the specimens having the highest rated voltage(s).

In addition, compliance with the dimensions of standard sheets 1 to 6 of IEC 60906-3 is checked on one specimen of each type.

NOTE A table showing the specimens required for the tests is given in Annex B.

6 Ratings

This clause of Part 1 is applicable, except as follows:

6.1 *Replacement:*

Accessories shall be of the type and have voltage and current rating as shown in Table 1.

Table 1 – Ratings

Type	Rated voltage		Rated current
		V	A
2P (rewirable or non-rewirable)	AC	6 ^a , 12, 24, 48	16
	DC	6 ^a , 12, 24, 48	
^a Non-preferred values.			

6.2 This subclause of Part 1 is not applicable.

7 Classification

This clause of Part 1 is applicable, except as follows:

7.1.3 This subclause is not applicable.

7.2.1 This subclause is not applicable.

7.2.2 This subclause is not applicable.

7.2.5 This subclause is not applicable.

7.3 Replacement:

Plugs are classified according to the class of equipment to which they are intended to be connected:

- plugs for equipment of class III.

NOTE For the description of the classes of equipment, see IEC 61140.

8 Marking

This clause of Part 1 is applicable except as follows:

8.1 Addition:

In addition, the terminals of d.c. accessories shall be marked with symbols.

8.2 Replacement:

When symbols are used, they shall be as follows:

Amperes	A
Volts	V
Alternating current.....	~
Direct current.....	==
Positive pole	+
Negative pole.....	-

Degree of protection, when relevant IPXX

NOTE 1 Details of construction of symbols are given in IEC 60417 (IEC 60417, *Graphical symbols for use on equipment*).

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

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

For the marking of rated current and rated voltage, the figures may be used alone. These figures may be placed on one line separated by an oblique line or the figure for rated current may be placed above the figure for rated voltage, separated by a horizontal line.

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

NOTE 4 The marking for current, voltage and nature of supply may be, for instance, as follows:

$$16 \text{ A } 48 \text{ V } \sim \text{ or } 16/48 \sim \text{ or } \frac{16}{48} \sim$$

$$16 \text{ A } 12 \text{ V } \text{ --- } \text{ or } 16/12 \text{ --- } \text{ or } \frac{16}{12} \text{ ---}$$

8.4 *Deletion of the second paragraph.*

8.5 *Replacement:*

Terminals for d.c. accessories shall be indicated by the symbols + and –.

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

NOTE 1 "Easily removable parts" are those parts which can be removed during the normal installation of the socket-outlet or the assembly of the plug.

NOTE 2 Terminations in non-rewirable accessories need not be marked.

9 Checking of dimensions

This clause of Part 1 is applicable, except as follows:

9.1 *Replacement:*

Accessories shall comply with the relevant standard sheets 1 to 6 of IEC 60906-3, as applicable.

Compliance is checked by inspection.

9.2 *Replacement of all the paragraphs before the compliance by:*

It shall not be possible for

- d.c. plugs to enter a.c. socket-outlets, nor a.c. plugs to enter d.c. socket-outlets;
- plugs to enter socket-outlets of any other plug and socket-outlet system;
- plugs to be able to enter socket-outlets of other voltage ratings.

10 Protection against electric shock

This clause of Part 1 is applicable, except as follows:

10.2 Replacement of words "given in 10.2.1 or 10.2.2 are fulfilled" by "given in 10.2.1 are fulfilled."

10.2.2 This subclause is not applicable.

10.3 This subclause is not applicable.

10.4 This subclause is not applicable.

10.5 This subclause is not applicable.

10.6 This subclause is not applicable.

10.7 This subclause is not applicable.

11 Provision for earthing

This clause of Part 1 is not applicable.

12 Terminals and terminations

This clause of Part 1 is applicable, except as follows:

12.2.1 Replacement of Table 3 by the following new table:

Table 3 – Relationship between rated current and connectable nominal cross-sectional areas of copper conductors

Current and type of the accessory	Rigid (solid or stranded) copper conductors		Flexible copper conductors	
	Nominal cross-sectional area mm ²	Diameter of the largest conductor mm	Nominal cross-sectional area mm ²	Diameter of the largest conductor mm
16 A 2P (fixed accessory)	From 1,5 up to 2 × 2,5 inclusive	2,13	From 1,5 up to 2 × 2,5 inclusive	2,21
16 A 2P (portable accessory)	–	–	From 0,75 up to 1,5 inclusive	1,73

12.2.10 This subclause is not applicable.

12.3.12 Replacement of Table 11 by the following new table:

Table 11 – Nominal cross-sectional areas of rigid copper conductors for the deflection test of screwless terminals

Rated current of the socket-outlet A	Nominal cross-sectional area of the test conductor mm ²	
	First test sequence	Second test sequence
16	1,5	2,5

13 Construction of fixed socket-outlets

This clause of Part 1 is applicable, except as follows:

13.7.2 *Replacement of the last item of the third dashed text by:*

- live parts of SELV circuits not greater than 25 V a.c. or 60 V d.c.

13.8 This subclause is not applicable.

13.17 This subclause is not applicable.

13.18 This subclause is not applicable.

13.19 This subclause is not applicable.

Addition:

13.101 Multiple socket-outlets shall consist only of SELV socket-outlets.

Compliance is checked by inspection.

14 Construction of plugs and portable socket-outlets

This clause of Part 1 is applicable, except as follows:

14.3 *Deletion of the second paragraph.*

14.4 This subclause is not applicable.

14.7 *Deletion of the last dashed text.*

14.8 This subclause is not applicable.

14.9 This subclause is not applicable.

14.10.1 *Deletion of the fourth paragraph.*

14.10.2 *Deletion of the fourth paragraph.*

14.11 *Deletion of the last dashed text.*

14.15 *Deletion of the note.*

14.21 This subclause is not applicable.

14.23 *Deletion of the second paragraph.*

Replacement of the last paragraph by:

Compliance is checked by the tests of 14.23.1 and 14.23.2.

Deletion of Note 2.

Addition:

14.101 For cord extension sets, the minimum nominal cross-sectional area of cables is

- 1,0 mm² up to and including 2 m length;
- 1,5 mm² over 2 m length.

15 Interlocked socket-outlets

This clause of Part 1 is not applicable.

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

This clause of Part 1 is applicable.

17 Insulation resistance and electric strength

This clause of Part 1 is applicable, except as follows:

17.1.1 *Deletion of item d) and of the last five words of the second paragraph, i.e. “earthing terminals or earthing contacts”.*

17.1.2 *Deletion of item c), and in the last paragraph, the words “earthing terminals” and “earthing contacts”.*

17.2 *Replacement of the second paragraph by:*

The test voltage shall be 500 V.

18 Operation of earthing contacts

This clause of Part 1 is not applicable.

19 Temperature rise

This clause of Part 1 is applicable, except as follows:

Deletion of the fourth paragraph from the end of the testing specification (starting with “For accessories having three poles”).

20 Breaking capacity

This clause of Part 1 is applicable, except as follows:

Deletion of Notes 2 and 3.

Replacement of the text, from the sixth paragraph of the testing specification to the end inclusive, by the following:

The length of the stroke of the test apparatus is between 50 mm and 60 mm.

The plug is inserted and withdrawn from the socket-outlet 50 times (100 strokes) at a rate of – 30 strokes per minute.

NOTE A stroke is an insertion or withdrawal of the plug.

The test voltage is 53 V and the test current 20 A.

The periods during which the test current is passed from the insertion of the plug until the subsequent withdrawal is $(1,5^{+0,5}_0)$ s.

Accessories for a.c. are tested using an alternating current ($\cos \varphi = 0,6 \pm 0,05$).

Accessories for d.c. are tested in a substantially non-inductive circuit.

The test is made with the connections shown in Figure 17.

With regard to a.c., test resistors and inductors are not connected in parallel, except that, 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 has a substantially sine-wave form.

Accessible metal parts, metal supports, and any metal frame supporting the base of flush-type socket-outlets are connected through the selector switch C to one of the poles of the supply for half the number of strokes, and to the other pole for the remainder.

In the case of multiple socket-outlets, the test is carried out individually on each socket-outlet.

During the test, no sustained arcing shall occur.

After the test, the specimens shall show no damage impairing their further use and the entry holes for the pins shall not show any damage which may impair the safety within the meaning of this standard.

21 Normal operation

Replacement:

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

Compliance is checked by testing socket-outlets, and plugs with pins which are not solid, by means of an appropriate test apparatus, an example of which is shown in Figure 16.

The test pins shall be replaced after 2 500 strokes.

Socket-outlets are tested using a test plug with brass pins having the maximum specified dimensions, with a tolerance of $^0_{-0,06}$ mm, and spaced at the nominal distance with a tolerance of $^{+0,05}_0$ mm.

NOTE 1 Plugs are tested using a fixed socket-outlet complying with this standard, and having as near to average characteristics as possible.

NOTE 2 Care should be taken to see that the pins of the test plug are in good condition before the test is started.

NOTE 3 The material of the brass pins of the test plug should be as specified in ISO 1639, designation CuZn39Pb2-M. The microcomposition should be homogenous.

The plug is inserted into and withdrawn from the socket-outlet 5 000 times (10 000 strokes) at a rate of

- 30 strokes per minute.

NOTE 4 A stroke is an insertion or a withdrawal of the plug.

The test voltage is 48 V, and the test currents are taken from Table 20.

Accessories for a.c. are tested using an alternating current ($\cos \varphi = 0,8 \pm 0,05$).

Accessories for d.c. are tested in a substantially non-inductive circuit. The test current is passed during each engagement of the plug.

The periods during which the test current is passed from the insertion of the plug until the subsequent withdrawal is $(1,5^{+0,5}_0)$ s.

The test is made with the connections indicated in Clause 20, the selector switch C being operated as prescribed in that clause.

During the test, no sustained arcing shall occur.

After the test, the specimens shall not show

- wear impairing their further use,
- deterioration of enclosures, insulating linings, or barriers,
- damage to the entry holes for the pins that might impair proper working,
- loosening of electrical or mechanical connections,
- seepage of sealing compound.

The specimens shall then comply with the requirements of Clause 19, the test current being, however, equal to the test current required for the normal operation test and the temperature rise, at any point, not exceeding 45 K, and they shall withstand an electric strength test made according to 17.2.

The humidity treatment, as for 16.3, is not repeated before the electric strength test of this clause.

The tests of 13.2 and 14.2 are made after the tests of this clause.

22 Force necessary to withdraw the plug

This clause of Part 1 is applicable, except as follows:

Deletion of the second and third paragraphs.

22.1.1 *Replacement in the first paragraph of "Figure 18" by "Figure 101".*

22.1.1 *Replacement of the words "The test plug" by "The test plug as shown in Figure 101".*

22.1.2 *Replacement in the first paragraph of "Figure 19" by "Figure 102".*

22.2 Replacement in the first paragraph of "Figure 19" by "Figure 102".

Replacement of Table 16 by the following new table:

Table 16 – Maximum and minimum withdrawal forces

Rating A	Withdrawal forces	
	N	
	Multi-pin gauge (see Figure 101) maximum	Single-pin gauge (see Figure 102) minimum
16	50	2

23 Flexible cables and their connection

This clause of Part 1 is applicable, except as follows:

23.2 Deletion of the fourth paragraph.

Replacement of Table 17 by the following new table:

Table 17 – External dimensions of flexible cables to be accommodated by cord anchorages

Rating A	Number of poles	Type of flexible cable (cable reference)	Number of conductors and nominal cross- sectional area mm ²	Limits for external dimensions for flexible cables mm	
				minimum	maximum
16	2	60227 IEC 42 60227 IEC 53	2 × 0,75 2 × 1,5	2,7 × 5,4 7,4	3,2 × 6,4 9,0

Replacement of the fifth paragraph after the table by the following new paragraph:

The flexible cable is then subjected 100 times to a pull of 60 N.

Replacement of Table 18 by the following new table:

Table 18 – Torque test values for cord anchorages

Rating of plugs or portable socket-outlets A	Flexible cable (number of cores × nominal cross-sectional area) mm ²		
	16	2 × 0,5	2 × 0,75
0,1 Nm		0,15 Nm	0,25 Nm

Replacement of Table 19 by the following new table:

Table 19 – Maximum dimensions of flexible cables to be accommodated in rewirable accessories

Rating of accessory	Number of poles	Types of flexible cable (cable references)	Number of conductors and nominal cross-sectional area mm ²	Maximum dimension for flexible cables mm
A				
16	2	60245 IEC 53	2 × 1,5	10,5

23.3 Replacement of Table 20 and the rest of the subclause by the following:

Table 20 – Relationship between rating of accessories, nominal cross-sectional areas of test conductors and test currents for the tests of temperature rise (Clause 19) and normal operation (Clause 21)

Rating	Rewirable fixed accessories		Rewirable portable accessories		Non-rewirable portable socket-outlets			Non-rewirable plugs		
	Test current A		Test current A		Nominal cross-sectional area mm ²	Test current A		Nominal cross-sectional area mm ²	Test current A	
	Clause 19	Clause 21	Clause 19	Clause 21		Clause 19	Clause 21		Clause 19	Clause 21
16	22	16	20	16	1,5 ^b	16	16	Tinsel ^a 0,5 ^a 0,75 1 1,5 ^b	1 2,5 10 12 16	1 2,5 10 12 16
^a Tinsel cords and flexible cables having a cross-sectional area of 0,5 mm ² are allowed in lengths up to 2 m only. ^b This value may be reduced to 1 mm ² under the conditions of 14.101.										

Compliance is checked by inspection, by measurement, and by checking that the flexible cables are in accordance with IEC 60227 or IEC 60245, as applicable.

24 Mechanical strength

This clause of Part 1 is applicable, except as follows:

24.7 This subclause is not applicable.

24.8 This subclause is not applicable.

25 Resistance to heat

This clause of Part 1 is applicable, except as follows:

25.2 Replacement of the first paragraph by:

Parts of insulating material necessary to retain current-carrying parts in position, as well as parts of the front surface zone of thermoplastic material, 2 mm wide, surrounding the pin entry

holes of socket-outlets, shall be subjected to a ball-pressure test by means of the apparatus shown in Figure 37.

25.3 Replacement:

Parts of insulating material not necessary to retain current-carrying parts are subjected to a ball-pressure test in accordance with 25.2, but the test is made at a temperature of $(70 \pm 2) ^\circ\text{C}$, or $(40 \pm 2) ^\circ\text{C}$ plus the highest temperature rise determined for the relevant part during the test of Clause 19, whichever is the higher.

26 Screws, current-carrying parts and connections

This clause of Part 1 is applicable, except as follows:

26.5 Replacement of the first paragraph by:

Current-carrying parts, including those of terminals, shall be of metal having, under the conditions occurring in the accessory, mechanical strength, electrical conductivity and resistance to corrosion adequate for their intended use.

27 Creepage distances, clearances and distances through sealing compound

This clause of Part 1 is applicable, except as follows:

27.1 Replacement of Table 23 by the following new table:

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Table 23 – Creepage distances and clearances

Description	mm
Creepage distances:	
1 Between live parts of different polarity	2
2 Between live parts and <ul style="list-style-type: none"> – accessible insulating parts; – metal frames supporting the base of flush-type socket-outlets; – screws or devices for fixing bases, covers or cover-plates of fixed socket-outlets; – external assembly screws, other than screws which are on the engagement face of plugs 	2
3 Between pins of plugs and metal parts connected to them, when fully engaged, and a socket-outlet of the same system having accessible metal parts ^a , made according to the most unfavourable construction ^b	2
4 Between the accessible metal parts ^a of a socket-outlet and a fully engaged plug of the same systems having pins and metal parts connected to them, made according to the most unfavourable construction ^b	2
5 Between live parts of a socket-outlet (without a plug) and its accessible metal parts ^a	2
Clearance:	
6 Between live parts of different polarity	1,6
7 Between live parts and <ul style="list-style-type: none"> – accessible insulating parts not mentioned under item 9; – metal frames supporting the base of flush-type socket-outlets; – screws or devices for fixing bases, covers or cover-plates of fixed socket-outlets; – external assembly screws, other than screws which are on the engagement face of plugs 	1,6
8 Between live parts and <ul style="list-style-type: none"> – metal boxes, without insulating lining with the socket-outlet in the most unfavourable position 	2
9 Between live parts and the surfaces on which the base of a socket-outlet for surface mounting is mounted	2
10 Between live parts and the bottom of any conductor recess, if any, in the base of a socket-outlet for surface mounting	1,6
^a With exception of screws and the like.	
^b The most unfavourable construction may be checked by means of a gauge which is based on the standard sheets relevant to the system concerned.	

28 Resistance of insulating material to abnormal heat, to fire and to tracking

This clause of Part 1 is applicable, except as follows:

28.1.1 Glow-wire test

Replacement of the dashed texts by:

- *for parts made of insulating material, necessary to retain current-carrying parts and parts of fixed accessories in position, by the test made at 850 °C;*
- *for parts of insulating material, necessary to retain current-carrying parts of portable accessories in position, by the test made at a temperature of 750 °C;*

- *for parts of insulating material, not necessary to retain current-carrying parts, even though they are in contact with them, by the test made at a temperature of 650 °C.*

28.1.2 This subclause is not applicable.

28.2 This subclause is not applicable.

29 Resistance to rusting

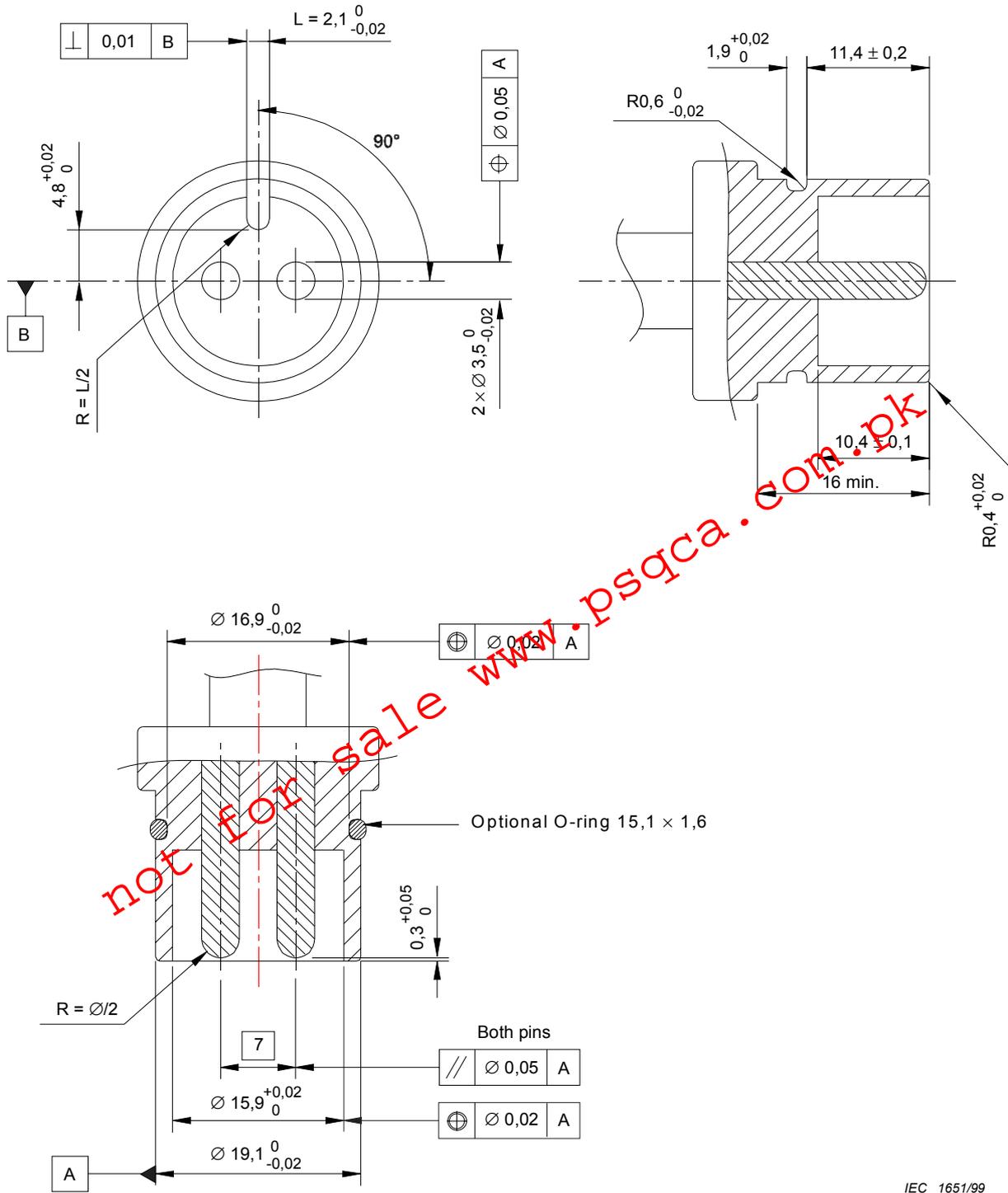
This clause of Part 1 is applicable.

30 Additional tests on pins provided with insulating sleeves

This clause of Part 1 is not applicable.

Replacement of Figures 18 and 19 by the following two figures:

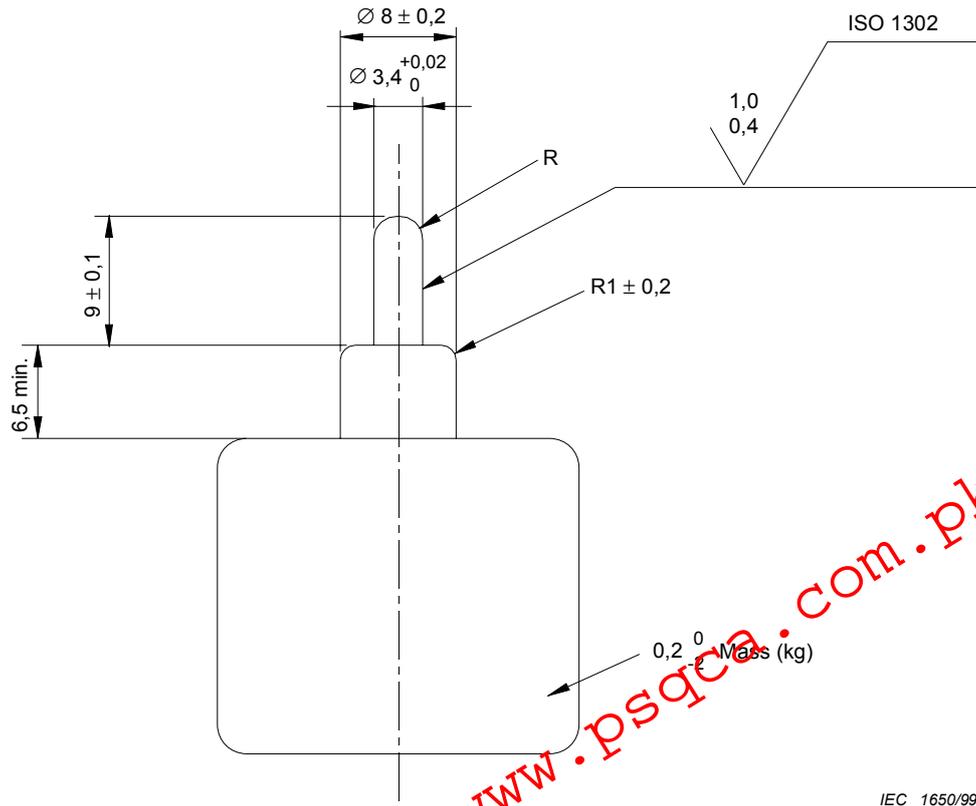
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IEC 1651/99

Dimensions in millimetres

Figure 101 – Gauge for the verification of the maximum withdrawal force



Dimensions in millimetres

Figure 102 – Gauge for the verification of the minimum withdrawal force

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IEC 1650/99

Annex A
(normative)

**Safety-related routine tests for factory-wired portable accessories
(protection against electric shock and correct polarity)**

This annex of Part 1 is applicable, except as follows:

A.1 *Deletion, in the first paragraph, of the following line of the text:*

"more than two-pole: clauses A.2, A.3, A.4"

A.3 This clause is not applicable.

A.4 This clause is not applicable.

Replacement of Table A.1 by the following new table:

**Table A.1 – Diagrammatic representation of routine tests to be applied
to factory-wired portable accessories**

Clause	Number of poles
	2
A.3	X

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Annex B (normative)

Survey of specimens needed for tests

Table shown in Part 1 is applicable, except as follows:

- Clause 11 is not applicable.
- Clause 15 is not applicable.
- Subclause 28.2 is not applicable.
- Clause 30 is not applicable.

Addition:

The number of specimens required for the tests according to 5.4 is specified in Table B.101. The specimens required for a certain (some) additional test(s) may be used for another additional test.

Table B.101 – Number of specimens required for the tests

Nature of supply	Number of specimens								
	For general tests ^a	For additional tests							
		12.3.11 ^b	12.3.12	13.22 13.23	23.2 ^c	23.4	24.10	28	Standard sheets ^d
AC	3	3	3	3	3	3	3	3	$3(n_a - 1)$
DC	3	3	3	3	3	3	3	3	$3(n_b - 1)$

^a General tests are those other than additional, and are carried out on the specimens having the highest rated voltage.

^b Only five screwless terminals are tested.

^c Three additional specimens of separate membranes (grommets) or accessories incorporating membranes.

^d Dimensional checking:

n_a number of different a.c. voltages covered by the specimens;

n_b number of different d.c. voltages covered by the specimens.