

Plugs, socket-outlets and couplers for industrial purposes —

Part 2: Dimensional interchangeability requirements for pin and contact-tube accessories of harmonized configurations

The European Standard EN 60309-2:1992 has the status of a
British Standard

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Cooperating organizations

The European Committee for Electrotechnical Standardization (CENELEC), under whose supervision this European Standard was prepared, comprises the national committees of the following countries.

Austria	Italy
Belgium	Luxembourg
Denmark	Netherlands
Finland	Norway
France	Portugal
Germany	Spain
Greece	Sweden
Iceland	Switzerland
Ireland	United Kingdom

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National foreword

This British Standard has been prepared under the direction of the Power Electrical Engineering Standards Policy Committee, PEL/- and is the English language version of EN 60309-2:1992 *Plugs, socket-outlets and couplers for industrial purposes. Part 2: Dimensional interchangeability requirements for pin and contact-tube accessories of harmonized configurations*, published by the European Committee for Electrotechnical Standardization (CENELEC). It was derived from IEC 309-2:1989 published by the International Electrotechnical Commission (IEC).

The CENELEC common modifications have been implemented at the appropriate places in the text and are indicated by a side line in the margin. Parts of the original IEC text that have been modified by CENELEC have been quoted in National annex NA.

The following print types are used in this standard:

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

BS 4343:1968 will be withdrawn on 1-02-98.

NOTE Upon publication of this standard BSI sales department will respond to purchase orders for BS 4343 by supplying copies of this 1992 edition. Copies of the 1968 version of BS 4343 may be obtained by quoting the number BS 4343:1968.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

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

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 68, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Descriptors: Low-voltage equipment, industrial use, plug and socket-outlet, appliance coupler, pin and contact tube accessory, rating, dimension, interchangeability, construction, test

English version

Plugs, socket-outlets and couplers for industrial purposes Part 2: Dimensional interchangeability requirements for pin and contact-tube accessories of harmonized configurations

(IEC 309-2:1989 + Corrigendum 1992, modified)

Prises de courant pour usages industriels
Partie 2: Règles d'interchangeabilité
dimensionnelle pour les appareils à broches et
alvéoles ayant des configurations harmonisées
(CEI 309-2:1989 + corrigendum 1992,
modifiée)

Stecker, Steckdosen und Kupplungen für
industrielle Anwendung
Teil 2: Stift- und Buchsensteckvorrichtungen
mit genormten Anordnungen, Anforderungen
und Hauptmaße für die Verwechselbarkeit
(IEC 309-2:1989 + Corrigendum 1992,
modifiziert)

This European Standard was approved by CENELEC on 1991-09-23. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

The CENELEC questionnaire procedure, performed for finding out whether or not the International Standard IEC 309-2:1989 could be accepted without textual changes, has shown that some common modifications were necessary for the acceptance as European Standard.

The reference document, as corrected by the corrigendum originally, issued as IEC 23H(SEC)35 and published officially in April 1992, together with the common modifications prepared by the CENELEC Reporting Secretariat SR 23H, was submitted to the CENELEC members for formal vote.

The text of the draft was approved by CENELEC as EN 60309-2 on 23 September 1991.

This European Standard supersedes HD 196 S1:1978.

The following dates were fixed:

- latest date of publication
of an identical national
standard (dop) 1993-02-01
- latest date of withdrawal
of conflicting national
standards (dow) 1998-02-01

For products which have complied with HD 196 S1:1978 before 1998-02-01, as shown by the manufacturer or by a certification body, this previous standard may continue to apply for production until 2003-02-01.

Annexes designated “normative” are part of the body of the standard. In this standard, Annex ZA is normative.

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1 Scope

Replacement:

This standard applies to plugs and socket-outlets, cable couplers and appliance couplers with a rated operating voltage not exceeding 690 V, 500 Hz and a rated current not exceeding 125 A, primarily intended for industrial use, either indoors or outdoors.

All references for accessories with a rated current of more than 125 A in Part 1 are not applicable for this Part 2.

This standard applies to plugs and socket-outlets, cable couplers and appliance couplers with pins and contact tubes of standardized configurations.

This standard applies to plugs and socket-outlets, cable couplers and appliance couplers, hereinafter referred to as accessories, for use when the ambient temperature does not normally exceed 40 °C.

The use of these accessories on building sites and for agricultural, commercial and domestic applications is not precluded.

Socket-outlets or appliance inlets incorporated in or fixed to electrical equipment are within the scope of this standard. This standard also applies to accessories intended to be used in extra-low voltage installations.

This standard does not apply to accessories primarily intended for domestic and similar general purposes.

In locations where special conditions prevail, for example on board ship or where explosions are liable to occur, additional requirements may be necessary.

2 Definitions

This clause of Part 1 is applicable.

3 General requirements

This clause of Part 1 is applicable.

4 General notes on tests

This clause of Part 1 is applicable except as follows:

Additional sub-clause:

4.101 If gauges are used, they shall be of hardened steel, all corners shall be slightly rounded-off with a maximum radius of 0.1 mm and the surface-finish for all measurement-surfaces shall be $\nabla 8$ min, if not otherwise specified.

5 Standard ratings

This clause of Part 1 is applicable except as follows:

5.2 *Replacement:*

Standard rated currents are given in Table 101.

Table 101

Series I A	Series II A
16	20
32	30
63	60
125	100

NOTE Series I is preferred.

6 Classification

This clause of Part 1 is applicable except as follows:

6.1.2 Replacement:

According to degrees of protection in accordance with HD 365 S3: IPX0, IPX4, IPX7, or according to degree of protection against moisture.

- ordinary accessories;
- splash-proof accessories;
- watertight accessories.

For new designs, degrees of protection according to HD 365 S3 shall be used.

IPX0/ordinary accessories have no special protection against moisture, and they need not have hinged lids.

In some countries, IPX0/ordinary accessories are not allowed.

7 Marking

This clause of Part 1 is applicable except as follows:

7.1 Addition:

The symbol indicating the position of the earthing contact or of the minor key or keyway shall be placed before or above the figure for the rated operating voltage, and separated from it by a line.

These markings shall be placed after that for rated current, separated from it by a dash if an oblique line separates the symbol indicating the position of the earthing contact or of the minor key or keyway from the figure for the rated operating voltage.

If a symbol for nature of supply is used, it shall be placed next to or below the marking for rated operating voltage.

For three-phase accessories it is not necessary to mark the voltage phase to neutral, if any.

The marking for rated current(s), position of the earthing contact or the minor key, keyway, rated operating voltage(s) and nature of supply may accordingly be as follows:

$$\begin{aligned}
 &16 \text{ A} - 7\text{h}/500 \text{ V} \sim \text{ or } 16 - 7\text{h}/500 \sim \text{ or } 16 \frac{7\text{h}}{500 \sim} \text{ or } \\
 &16/20 \text{ A} - 7\text{h}/500 \text{ V} \sim \text{ or } 16/20 - 7\text{h}/500 \sim \text{ or } 16/20 \frac{7\text{h}}{500 \sim} \\
 &32/30 \text{ A} - 6\text{h}/220/380 \text{ V} \sim \text{ or } 32/30 - 6\text{h} \frac{220/380 \sim}{240/415 \sim} \text{ or } 32/30 \frac{6\text{h}}{220/380 \sim} \text{ or } 32/30 \frac{6\text{h}}{380 \sim} \\
 &\hspace{15em} 240/415 \sim \hspace{1em} 480 \sim
 \end{aligned}$$

It is allowed to put the symbols for a.c. ($\sim$) and d.c. ($\equiv$ or —) after the values (IEC Publication 617-2).

The drawings of Standard Sheets 2-I, 2-II, 2-III and 2-IV show accessories with the symbol 6 h and those of Standard Sheets 2-VIII and 2-IX accessories with the symbol 12 h.

For accessories having rated operating voltages exceeding 50 V, the symbol indicating the position of the earthing contact shall be a numeral followed by the letter h.

The numeral is derived from the position of the earth contact tube, when compared with the face of a clock, the socket-outlet or connector being viewed from the front with the keyway at the sixth hour.

For accessories having rated operating voltages not exceeding 50 V, the symbol indicating the position of the minor key shall be a numeral followed by the letter h.

The numeral is derived from the position of the minor key, when compared with the face of a clock, the socket-outlet or connector being viewed from the front with the major key at the sixth hour.

For plugs and appliance inlets, the symbol indicating the position of the earthing contact or the minor keyway shall be the same as that for the corresponding socket-outlet or connector.

Contact tubes of socket-outlets and connectors with a rated operating voltage exceeding 50 V shall be positioned in the clockwise order when viewed from the front:

- for three-phase, L1, L2, L3, N and $\oplus$ or $\perp$, alternatively 1, 2, 3, N and $\oplus$ or $\perp$;

— for single-phase L/+, unmarked, $\oplus$ or $\perp$.

Contact tubes of socket-outlets and connectors with rated operating voltage not exceeding 50 V shall be positioned as shown in Standard Sheet 2-VIII.

Pins of plugs and appliance inlets shall be positioned in the opposite order viewed from the front.

NOTE The marking of the insulation voltage, is mandatory.

7.2 Modification:

Delete the following:

IPXX other constructions.

8 Dimensions

This clause of Part 1 is applicable except as follows:

8.1 Replacement:

Accessories shall comply with the relevant standard sheets as specified below:

- accessories having rated operating voltages exceeding 50 V:
 - 16/20 A and 32/30 A: Sheets 2-I and 2-II;
 - 63/60 A and 125/100 A: without pilot contact: Sheets 2-III and 2-IV;
 - 63/60 A and 125/100 A: with pilot contact: Sheets 2-IIIa and 2-IVa;
 - mechanical interlock for 16 A to 125 A accessories: Sheet 2-V.
- accessories having rated operating voltage not exceeding 50 V:
 - 16/20 A and 32/30 A: Sheets 2-VIII and 2-IX.

Deviations from the dimensions specified in the standard sheets may be made, but only if they provide a technical advantage and do not adversely affect the purpose and safety of the accessories complying with the standard sheets, especially with regard to interchangeability and non-interchangeability.

Compliance is checked by means of gauges or by measurement for those dimensions not covered by gauges,

- *for accessories having rated operating voltages exceeding 50 V according to:*
 - *Figure 101 and Figure 102 for socket-outlets and connectors;*
 - *Figure 107 and Figure 108 for plugs and appliance inlets;*
- *for accessories having rated operating voltages not exceeding 50 V according to:*
 - *Figure 110 and Figure 112 for 16/20 A and 32/30 A accessories.*

The gauges shall be moved axially to the centre line of the accessory with a force as shown in the following table and applied for 1 min.

Table 102

Rated operating voltage V	Rated current A		Force (max) for “GO” gauge N	Force for “NOT GO” gauge N ($\begin{smallmatrix} 0 \\ -1 \end{smallmatrix}$)
	Series I	Series II		
Not exceeding 50 V	16	20	150	30
	32	30	150	30
Exceeding 50 V	16	20	60	20
	32	30	90	30
	63	60	165	55
	125	100	240	80

Before the test, the test specimen of insulating material shall be stored at a temperature of 20 ± 5 °C and a relative humidity between 45 % and 75 % for four weeks.

For accessories having rated operating voltages not exceeding 50 V, the position of the minor key or keyway shall be as shown in Table 103.

For accessories having rated operating voltages exceeding 50 V, the position of the earthing contact shall be as shown in Table 104.

Compliance is checked by inspection.

Table 103

Rated operating voltage V	Frequency Hz	Minor key or keyway position ^a
20 to 25	50 and 60	no minor key or keyway
40 to 50	50 and 60	12
20 to 25 and 40 to 50	100 up to and including 200	4
	300	2
	400	3
	over 400 up to and including 500	11
	Direct current	10
^a The minor key or keyway position is indicated by the relevant number (see Sub-clause 7.1).		

Positions 1, 8 and 9 are reserved for future standardization. For constructional reasons, positions 5, 6 and 7 cannot be used.

Table 104

Type	Frequency Hz	Rated operating voltage V	Accessories earthing-contact position ^a	
			16/20 A 32/30 A	63/60 A 125/100 A
2P + $\perp$	50 and 60	100 to 130	4	4
		200 to 250	6	6
	60	277	5	5
	50 and 60	380 to 415	9	9
		480 to 500	7	7
		supply from an isolating transformer	12	12
	100 up to and including 300	over 50	—	—
	over 300 up to and including 500	over 50	2	—
	direct current	over 50 up to and including 250	3	3
		over 250	8	8
3P + $\perp$	50 and 60	100 to 130	4	4
		200 to 250	9	9
		380 to 415	6	6
	60	440 to 460 ^b	11	11
	50 and 60	480 to 500	7	7
		600 to 690	5	5
		supply from an isolating transformer	12	12
	50 60	380 440 ^c	3	—
	100 up to and including 300	over 50	10	—
	over 300 up to and including 500	over 50	2	—
3P + N + $\perp$	50 and 60	57/100 to 75/130	4	4
		120/208 to 144/250	9	9
		200/346 to 240/415	6	6
		277/480 to 288/500	7	7
		347/600 to 400/690	5	5
	60	250/440 to 265/460 ^b	11	11
	50 60	220/380 250/440 ^c	3	—
	100 up to and including 300	over 50	—	—
	over 300 up to and including 500	over 50	2	—
All types	All rated operating voltages and/or frequencies not covered by other configurations.		1	1

^a The earthing-contact position is indicated by the relevant numeral (see Sub-clause 7.1).

^b Mainly for marine installations.

^c Only for refrigerated containers (standardized by ISO).

The positions shown by a dash (—) are not standardized.

8.2 Replacement:

For accessories having rated operating voltages exceeding 50 V, it shall not be possible to engage plugs or connectors with socket-outlets or appliance inlets having different ratings, or having different contact combinations.

In addition, for all accessories the design shall be such that improper connections shall not be possible between:

- the earth and/or pilot plug-contact and a live socket-contact, or a live plug-contact and the earth and/or pilot socket-contact;
- the phase plug-contacts and the neutral socket-contact, if any;
- a neutral plug-contact and phase socket-contact.

Compliance is checked by inspection.

It shall not be possible to engage plugs with socket-outlets or connectors having different earthing-contact positions or minor key positions.

Compliance is checked by inspection and tests using the methods indicated below. These tests are made after storage of test specimens of insulating material at a temperature of $20 \pm 5^\circ\text{C}$ and with relative humidity between 45 % and 75 % for four weeks.

For accessories having thermoplastic housing, this test is made at a temperature of $35 \pm 2^\circ\text{C}$, both the accessories and the gauges being at this temperature.

a) Checking plugs and appliance inlets

For plugs and appliance inlets with rated operating voltage exceeding 50 V, gauges according to Figure 109 are used.

For plugs and appliance inlets with rated operating voltage not exceeding 50 V, gauges according to Figure 113 are used.

First test (key)

The socket-gauge shown in Figure 109 is placed before the plug in such a way that during the test the key shall hit the lower part of the shroud of the gauge approximately in the middle.

The force F is slowly increased in such a way that the total force given in Table 105 is exerted after 15 s. After that the full force is applied for 1 min.

The forces used are given in Table 105.

Table 105

Rated current Series I/II	A	16/20	32/30	63/60	125/100
Force F	N	175	210	385	560

When the force is applied, the gauge is not permitted to move more than 4 mm in relation to the shroud of the plug or appliance inlet.

After the test, the plug and appliance inlet shall not be damaged in such a way that impairs the further use of the accessory.

These forces are equal to 1.4 times the corresponding withdrawal forces.

Second test (earth-pin)

The force F shall be applied to the earth-pin in the same manner and for the same duration as in the previous test.

After that test, the plug and appliance inlet shall comply with the relevant standard sheet.

b) Checking socket-outlets and connectors

For socket-outlets and connectors having rated operating voltages exceeding 50 V, gauges according to Figure 104 are used.

For socket-outlets and connectors having rated operating, voltages not exceeding 50 V, gauges according to Figure 111 are used.

First test (shroud)

The first test is carried out on all different clock positions, except for the one corresponding to the socket-outlet or connector to be used.

The test specimen shall be fixed and supported in such a way that the rigidity of the socket-outlet or connector is not influenced.

Arrangement for test shall be according to Figure 103.

The gauge shown in Figure 104 shall hit two opposite points of the accessory at the same time. The axis of the gauge and of the accessory shall be approximately parallel and the chamfer shall be equally divided on both sides.

The force F is slowly increased in such a way that the total force given in Table 105 is exerted after 15 s. After that the full force is applied for 1 min.

When the force is applied, the gauge is not permitted to move more than 4 mm in relation to the shroud of the socket-outlet or connector.

After the test, the socket-outlet or connector shall not be so damaged as to impair the further use of the accessory.

Second test (holes)

For the second test, the gauge shown in Figure 105 is inserted in each phase hole.

The gauge shall not enter the phase hole by a greater distance than that shown in Table 106 measured from the front of the internal part (see Figure 106).

The same forces and duration and the same method of application are used as for the previous test.

Table 106

Rated current Series I/II	A	16/20	32/30	63/60	125/100
Distance X	mm	11	12.5	15	20

8.3 Addition:

Compliance is checked by manual test and, for accessories with enclosures of resilient or thermoplastic material, by means of the gauge shown in Figure 114.

The gauge is applied with a force of 200 N for 1 min. For accessories with enclosures of thermoplastic material, the gauge is applied at a temperature of $35 \pm 2^\circ\text{C}$, both the accessories and the gauge being at this temperature.

For accessories of rigid material, such as metal, thermosetting resins, ceramic material and the like, conformity to the relevant standard sheets ensures compliance with this requirement.

9 Protection against electric shock

This clause of Part 1 is applicable except as follows:

9.1 Addition:

Conformity with the relevant standard sheets ensures compliance with the requirement as far as inaccessibility of contacts during insertion of a plug or connector into the complementary accessories is concerned.

9.2 Addition:

Conformity with the relevant standard sheets ensures compliance with these requirements.

10 Provision for earthing

This clause of Part 1 is applicable.

11 Terminals

This clause of Part 1 is applicable except as follows:

11.4 Replacement:

Terminals shall allow the connection of conductors having nominal cross-sectional areas specified in Table 107 and are identified by the terminal sizes given in the table.

Terminals shall comply with Standard Sheets as specified in Sub-clause 11.8 of this standard and are not subject to be tested as in Sub-clauses 11.8 and 11.9 of Part 1.

11.8 Replacement:

First test:

Terminals shall comply with the Standard Sheets as specified below, except that for Standard Sheets 2-X, 2-XI and 2-XII the length of thread in the fixed part or nut and the length of thread on the screw or stud may be reduced, if the mechanical strength of the terminal is adequate and at least two full threads of every clamping screw are in engagement when a conductor of the most unfavourable cross-sectional area is clamped.

Standard Sheet 2-X applies to pillar terminals.

Standard Sheet 2-XI applies to screw terminals and stud terminals.

Standard Sheet 2-XII applies to saddle terminals.

Standard Sheet 2-XIII applies to lug terminals.

Mantle terminals shall comply with Standard Sheet 2-X with regard to the dimensions D and e . Terminals which are essentially of the pillar type, but with the part with the hole for the conductor slotted to enable the conductor to be moved laterally into position, shall comply with Standard Sheet 2-X, except that the maximum gap between the conductor restraining parts on the side where the slot is located shall comply with Standard Sheet 2-XI.

If the required length of thread in a terminal screw hole is obtained by plunging, the edge of the extrusion shall be reasonably smooth and the length of thread shall exceed the specified minimum value by at least 0.5 mm.

Compliance is checked by inspection, by measurement and, for terminals with a reduced length of thread, by the tests of Sub-clause 11.9.

Table 107
Size of connectable conductors

Rating of the accessory			Internal connection ^a				External earthing connection if any	
Voltage V	Current A		Flexible cables for plugs and connectors		Solid or stranded cables for socket-outlets ^b			
			Solid or stranded cables for appliance inlets ^b					
	Series I	Series II	mm ²	Terminal size	mm ²	Terminal size	mm ²	Terminal size
Not exceeding 50	16	20	4 to 10	6	4 to 10	5		
	32	30	4 to 10	6	4 to 10	5		
Exceeding 50	16	20	1 to 2.5	2	1.5 to 4	3 ^d	6	4
	32	30	2.5 to 6	5	2.5 to 10	5	10	5
	63	60	6 to 16	7	6 to 25	7	25	7
	125	100	16 to 50	9 ^e	25 to 70	9 ^e	25	7

^a Terminals for pilot conductors, if any, shall allow the connection of conductors having the same nominal cross-sectional areas as the internal terminals of 16 A accessories having rated operating voltages exceeding 50 V.

^b Classification of conductors: according to IEC Publication 228, Clause 2, solid (Class 1); stranded (Class 2); flexible (Class 5).

^c The nominal cross-sectional areas of conductors are given in square millimetres (mm²).

^d For pillar terminals, size 2.

^e Compliance with terminal size 9 is provisionally not required.

The maximum gap between the conductor restraining parts is checked by means of a steel gauge pin with a diameter equal to $e \pm 0.05$ mm.

For terminals without pressure plate or the like, complying with Standard Sheet 2-X, the clamping screw is screwed fully home without a conductor in position. It shall not then be possible to insert the gauge pin between the threaded part of the screw and the wall of the conductor space.

For terminals complying with Standard Sheet 2-XI, and for terminals with a pressure plate or the like complying with Standard Sheet 2-X, where it is not appropriate to insert the gauge pin in all positions, a conductor is clamped in the terminal.

For terminals complying with Standard Sheet 2-X, the conductor is in the form of a rod with a diameter equal to that corresponding to the middle cross-sectional area of the range specified for the particular terminal and having a flat end perpendicular to the axis.

For terminals complying with Standard Sheet 2-XI, the conductor is solid and has a diameter D as specified in the standard sheet for the particular terminal.

With this conductor in position, it shall not be possible to insert the gauge pin, applied in a direction parallel to the axis of the conductor, into any gap through which a wire of a stranded conductor might escape.

The minimum distance between the clamping screw and the end of the conductor when fully inserted, which is specified in Standard Sheet 2-X, is checked by means of the rod conductor specified above, which shall pass into the conductor space for a distance beyond the threaded hole at least equal to the minimum distance specified.

For terminals with pressure plate, complying with Standard Sheet 2-X, the gauge pin is applied to the gap between the pressure plate and the wall of the conductor space.

The following negative deviations from the specified values are allowed for the minimum nominal thread diameter of the screw:

- 0.15 mm for screws with a nominal diameter not exceeding 5 mm;
- 0.22 mm for screws with a nominal diameter over 5 mm but not exceeding 10 mm;
- 0.27 mm for screws with a nominal diameter over 10 mm.

This sub-clause does not exclude terminals of types other than those shown in the standard sheets. Such terminals shall, however, comply with the other requirements of this clause as far as is reasonable, and it may be necessary to formulate additional requirements.

If the thread in the fixed part or nut is recessed, the total length of the shank of headed screws shall be increased accordingly.

If one or more of the dimensions are larger than the minimum values specified in the standard sheets, the other dimensions need not be correspondingly increased, but departures from the specified values shall not impair the function of the terminal.

11.9 Replacement:

Second test:

Terminals complying with Standard Sheet 2-X, but with a reduced length of thread, are fitted with a conductor of the smallest cross-sectional area specified in Table 107, tightly clamped, or a conductor of the largest cross-sectional area specified in this table, lightly clamped, whichever is the more unfavourable.

Terminals complying with Standard Sheets 2-XI or 2-XII, but with a reduced length of thread, are fitted with a conductor of the largest cross-sectional area specified in Table 107, lightly clamped.

At least two threads shall be in full engagement.

The terminals are then fitted with conductors of the smallest and largest cross-sectional areas specified in Table 107, rigid (solid or stranded) for socket-outlets and appliance inlets, and flexible for plugs and connectors, and the terminal screws are tightened, the maximum torque applied being equal to two-thirds of the torque specified in Table XIV of EN 60309-1. Each conductor is subjected to a pull of the value, in newtons, shown in Table 108; the pull is applied without jerks, for 1 min, in the direction of the axis of the conductor space.

Table 108

Terminal size	2	3	4	5	6	7	8	9	10
Pull force N	50	50	60	80	90	100	120	150	200

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

For terminals of sizes 8 to 10, the value of the pull is provisional.

12 Interlocks and retaining devices

This clause of Part 1 is applicable except as follows:

12.1 *Addition:*

If an accessory having a rated operating voltage exceeding 50 V, is provided with a mechanical interlock, this shall comply with Standard Sheet 2-V.

It shall not be possible to operate the mechanical switching device of a mechanically interlocked switched socket-outlet or switched connector, except after the insertion of an appropriate plug.

NOTE Tools are not considered as appropriate plugs.

It is accepted that tools may be used to override interlock for circuit testing purposes.

12.3 *Addition:*

Accessories shall be provided with a retaining device as indicated in Table 109.

13 Resistance to ageing of rubber and thermoplastic material

This clause of Part 1 is applicable.

Table 109

Rated current of the accessory A	Classification according to degree of protection against moisture	Socket-outlets and connectors			Plugs and appliance inlets		
		Retaining means	Standard Sheet		Retaining means	Standard Sheet	
			Rated operating voltage exceeding 50 V	Rated operating voltage not exceeding 50 V		Rated operating voltage exceeding 50 V	Rated operating voltage not exceeding 50 V
16/20 and 32/30	IPX0/ordinary	lever or lid	2-I (continuation 1)	2-VIII (continuation 1)	lug or cavity	2-II (continuation 1)	2-IX (continuation 1)
	IPX4/splash-proof	lid	2-I (continuation 1)	2-VIII (continuation 1)	lug or cavity	2-II (continuation 1)	2-IX (continuation 1)
	IPX7/watertight	two-ramp system	2-I (continuation 2)	2-VIII (continuation 2)	lug or cavity and bayonet ring	2-II (continuation 2)	2-IX (continuation 2)
63/60	IPX4/splash-proof	lid and two-ramp system	2-III (continuation 1)	—	lug or cavity	2-IV (continuation 1)	—
	IPX7/watertight	two-ramp system	2-III (continuation 2)	—	bayonet ring	2-IV (continuation 2)	—
125/100	IPX7/watertight ^a	two-ramp system	2-III (continuation 2)	—	bayonet ring	2-IV (continuation 2)	—

^a When 125/100 A socket-outlets are mounted on or integrated with enclosures, the whole unit can also be IPX4.

14 General construction

This clause of Part 1 is applicable except as follows:

Addition:

Accessories having a rated current of 63/60 A shall be IPX4/splashproof or IPX7/watertight.

Accessories having a rated current of 125/100 A shall be IPX7/watertight.

When 125/100 A socket-outlets are mounted on or integrated with enclosures, the whole unit can be IPX4.

15 Construction of socket-outlets

This clause of Part 1 is applicable except as follows:

15.1 Addition:

Contact tubes shall be self-adjusting and so designed as to ensure adequate contact continuity before and after a number of operations corresponding to their operational life.

Contact tubes other than the earth-contact shall be floating.

Earth contact tubes need not be floating, provided that they have the necessary resilience in all directions.

Compliance is checked by inspection and by the following test:

The sample is mounted so that the axes of the contact tubes are vertical with the contact openings downwards.

A gauge of hardened steel, with a finish of 0.002 mm and free from grease, having the dimensions shown in Table 110, is inserted into each contact tube also free from grease, and the force necessary to withdraw the gauge is measured.

The sum of the force and the weight of the gauge shall exceed the minimum total force shown in Table 110.

Table 110

Nominal pin diameter mm	Gauge	
	Diameter of gauge mm $\begin{smallmatrix} +0 \\ -0.01 \end{smallmatrix}$	Minimum total force N
5	4.80	2.5
6	5.80	5
7	6.80	5
8	7.80	10
10	9.80	15
12	11.80	20

This test shall be made after that of Sub-clause 15.2.

15.2 Replacement:

The pressure exerted by the contact tubes on the pins of a plug shall not be so great as to prevent easy insertion and withdrawal of the plug.

Compliance is checked by determining the force necessary to withdraw the test plug from the sample, this being mounted so that the axes of the contact tubes are vertical with the contact openings downwards, as shown in Figure 115.

A test plug provided with pins having the dimensions shown in Table 111 is inserted into the sample.

Table 111

Nominal pin diameter mm	Diameter of pins of the test plug mm +0.01 -0
5	5.00
6	6.00
7	7.00
8	8.00
10	10.00
12	12.00

The principal weight, together with the supplementary weight (the latter being such that it exerts a force equal to one-tenth of the force exerted by the principal weight) and the test plug, exert a force equal to the maximum withdrawal force shown in Table 112.

The principal weight is hung without jolting on the test plug and the supplementary weight is allowed to fall from a height of 5 cm onto the principal weight.

The plug shall not remain in the sample.

Table 112

Rated current A		Maximum withdrawal force N
Series I	Series II	
16	20	150
32	30	150
63	60	275
125	100	400

Details of the test plugs are under consideration.

15.7 Modification:

Instead of the third paragraph of the requirements the following applies:

Socket-outlets, splash-proof or up to and including IPX4 designed for only one mounting position, shall have provision for opening a drain hole at least 5 mm in diameter, or 20 mm² in area with a width of at least 3 mm, which is effective when the socket-outlet is in the mounting position.

16 Construction of plugs and connectors

This clause of Part 1 is applicable except as follows:

16.1 Replacement of the 3rd paragraph with the following:

Accessories shall be so designed that they can only be reassembled so as to ensure the correct angular relationship between key(s), keyway(s), the earthing pin and the earthing-contact tube, as originally assembled.

Tests to be carried out are those described in Sub-clauses 15.1 and 15.2.

16.101 Additional sub-clause:

Pins shall be solid.

Compliance is checked by inspection.

17 Construction of appliance inlets

This clause of Part 1 is applicable except as follows:

Additional sub-clause:

17.101 Pins shall be solid.

Compliance is checked by inspection.

18 Degrees of protection

This clause of Part 1 is applicable.

19 Insulation resistance and dielectric strength

This clause of Part 1 is applicable except as follows:

19.4 Replacement:

Immediately after the test of Sub-clause 19.3 it shall not be possible to engage accessories with enclosures of thermoplastic material with gauges having an earthing-contact position or a minor key or keyway position different from that of the sample.

For socket-outlets and connectors having rated operating voltages exceeding 50 V, the gauges shown in Figure 101 and Figure 102 are used. For plugs and appliance inlets having rated operating voltages exceeding 50 V, the gauges shown in Figure 107 and Figure 108 are used.

For 16/20 A and 32/30 A socket-outlets and connectors having rated operating voltages not exceeding 50 V, the gauges shown in Figure 111 are used. For plugs and appliance inlets having rated operating voltages not exceeding 50 V, the gauges shown in Figure 113 are used.

The gauges are applied with a force of 200 N applied for 1 min.

20 Breaking capacity

This clause of Part 1 is applicable except as follows:

Addition:

Plugs and appliance inlets complying with this standard are not to be tested.

21 Normal operation

This clause of Part 1 is applicable except as follows:

Addition:

Plugs and appliance inlets complying with this standard are not to be tested.

22 Temperature rise

This clause of Part 1 is applicable.

23 Flexible cables and their connection

This clause of Part 1 is applicable except as follows:

23.1 Addition:

Cable anchorages shall be of insulating material or be provided with an insulating lining fixed to the metal parts.

24 Mechanical strength

This clause of Part 1 is applicable.

25 Screws, current-carrying parts and connections

This clause of Part 1 is applicable.

26 Creepage distances, clearances and distances through sealing compound

This clause of Part 1 is applicable.

27 Resistance to heat, fire and tracking

This clause of Part 1 is applicable.

28 Resistance to rusting

This clause of Part 1 is applicable.