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**Single Phase Plugs and Socket-outlets for Household and
Similar Purposes - Types, Basic Parameters and Dimensions**

家用和类似用途单相插头插座 型式、基本参数和尺寸

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Single Phase Plugs and Socket-outlets for Household and Similar Purposes - Types, Basic Parameters and Dimensions

1 Scope

This document specifies the types, basic parameters and dimensions of single-phase plugs and socket-outlets for household and similar purposes, and describes the corresponding test methods.

This document is applicable to single phase plugs and socket-outlets for household and similar purposes, with an AC frequency of 50 Hz, a rated voltage of 250 V and a rated current not exceeding 32 A.

NOTE: examples of products, to which, the types and dimensions of this document are applicable include:

- socket-outlets used in household scenarios;
- plugs provided with electrical equipment;
- plugs of direct plug-in equipment;
- fixed integrated AC-powered socket-outlets with a rated voltage of 220 V and for conductive charging of electric vehicles;
- charging socket-outlets in centralized charging facilities for electric bicycles and electric motorcycles.

2 Normative References

The contents of the following documents constitute indispensable clauses of this document through the normative references in the text. In terms of references with a specified date, only versions with a specified date are applicable to this document. In terms of references without a specified date, the latest version (including all the modifications) is applicable to this document.

GB/T 1184-1996 Geometrical Tolerancing - Geometrical Tolerance for Features without Individual Tolerance Indications

GB/T 2099.1-2021 Plugs and Socket-outlets for Household and Similar Purposes - Part 1: General Requirements

GB/T 2099.3 Plugs and Socket-outlets for Household and Similar Purposes - Part 2-5: Particular Requirements for Adaptors

GB/T 2900.70-2008 Electrotechnical Terminology - Electrical Accessories

3 Terms and Definitions

The terms and definitions defined in GB/T 2900.70-2008 and GB/T 2099.1-2021, and the following are applicable to this document.

3.1 direct plug-in equipment

An equipment, in which, the power plug and the equipment shell constitute an integral part.

NOTE: examples of direct plug-in equipment include shavers with rechargeable batteries, night lights mounted on electrical socket-outlets, plug-in transformers and power adapters, etc.

[source: GB 4943.1-2022, 3.3.3.1, modified]

4 Technical Requirements

4.1 General Requirements

4.1.1 Single phase plugs and socket-outlets for household and similar purposes are divided into two basic types: two-pole ungrounded and two-pole grounded.

4.1.2 The types, basic parameters and dimensions of the single-phase plugs and socket-outlets for household and similar purposes shall comply with the provisions of Figure 1 ~ Figure 6.

4.1.3 In addition to fixed socket-outlets, for mobile (portable) socket-outlets, converters and appliance socket-outlets, arrangement and combination of the socket jack in Figure 2 and the socket jack in Figure 4 are allowed, but the socket jack in Figure 2 and the socket jack in Figure 4 shall not overlap or be shared with each other. Figure 7 provides a schematic diagram.

NOTE 1: the arrangement and combination of socket jack here cannot be comprehended as adding corresponding plug types.

NOTE 2: the schematic diagram in Figure 7 does not exclude other forms of combinations.

NOTE 3: examples of fixed socket-outlets include wall-mounted socket-outlets.

4.1.4 The position of the plug bush of two-pole grounded socket-outlets shall be such that when facing the socket-outlets, the ground wire (E pole) is at the top, the neutral wire (N pole) is on the left, and the phase wire (L pole) is on the right. The position of the pin of two-pole grounded plugs shall correspond to that of the socket-outlets.

4.1.5 The single pin of a plug shall not undergo axial rotation that changes the type and position.

NOTE: axial rotation, for example, by twisting the pin, changes the two parallel-arranged pins of the plug in Figure 1 to the position of the phase pole and neutral pole arrangement shown

in Figure 3.

4.1.6 The strength of the inner frame of the fixed pin of non-rewireable plug shall be able to ensure the stability of the pin size, and the type and dimensions shall comply with the requirements of the corresponding dimensional drawings.

4.2 Plugs

4.2.1 Plug shape

The shape of the plugs is not specified, but the distance between the root of the live pin of the plugs and the edge of the plugs shall not be less than 6.5 mm.

NOTE 1: if there is an insulating sheath, then, take the metal pin after the insulating sheath is peeled off as the root.

NOTE 2: if the mating surface of the plug is not a plane, then, from a plane that passes through the highest point of the mating surface and is perpendicular to the axis of the plug, the line that is offset 1 mm towards the direction of the plug body and intersects the surface of the body is regarded as the edge of the plug. An example is the B value in Figure 8.

The protruding part of the plug mating surface shall not exceed 0.5 mm. The length of the plug pin shall be measured from the vertical plane of the pin at the highest point of the plug mating surface, till the top of the pin.

NOTE 3: examples of “protrusions” include the electrical parameters and trademarks, etc. formed by the injection molding of the plug mating surface, or other appearance structures that may affect the plug mating.

NOTE 4: for plugs with functional parts on the mating surface, when inserted into the socket-outlet, the gap between the plug mating surface and the socket-outlet surface does not exceed 1 mm.

NOTE 5: the length of the plug pin is considered to be the effective length of the metal pin part inserted into the socket-outlet.

4.2.2 Insulating sheath of pin

4.2.2.1 The live pin of the plug shall have an insulating sheath.

NOTE: the insulating sheath can adopt processes, such as: insert injection molding and adhesive backing, etc.

4.2.2.2 For the plug in Figure 1, the height of the insulating sheath shall be $7.0^{+0.5}_0$ mm; for the plug in Figure 3 and Figure 5, the height of the insulating sheath shall be $9.0^{+0.5}_0$ mm; see diagram G in Figure 9.

4.2.2.3 After removing the insulating sheath, the thickness (t) of the plug body is shown in

4.3.1 The type and dimensions of plugs of the direct plug-in equipment shall comply with the requirements of this document.

4.3.2 The insulating sheath (if any) of the plugs of the direct plug-in equipment shall cover the root of the metal part of the exposed pin.

There shall be no gap between the insulating sheath and the equipment shell, causing the metal root of the live pin to be exposed. If in doubt, check through the test in 5.4. During the test, the probe shall not touch the live pin.

NOTE: this requirement only applies to the assessment of the plug part. The assessment of the electric shock prevention of the whole machine is determined by the standard of the whole machine.

4.3.3 When the plug of the direct plug-in equipment rotates as a whole, there should be locking measures in the normal use position and shall satisfy the requirements for the plugs in this document.

4.3.4 The plugs of the direct plug-in equipment shall be subject to the roller drop test of 5.5 in normal use conditions.

After the test, the specimen shall not be damaged within the meaning of this document. After calibration, it shall be normally plugged into a socket-outlet that complies with the requirements of relevant standards, and shall satisfy:

---the metal pin shall not break;

---no parts are loose.

If the protection against electric shock is not affected, then, even small fragments fell off, for example, the falling-off of the insulating sheath, it is still considered to be in compliance.

NOTE: damage to the surface layer and small dents that will not reduce the creepage distance or electrical clearance below the values specified in 27.1 of GB/T 2099.1-2021 can be ignored.

4.3.5 The plug part of the direct plug-in equipment shall also comply with the requirements of the applicable provisions on plugs in GB/T 2099.1-2021, including 14.23, 24.6, 24.8, 24.11, 28.1.3 and Chapter 30 in GB/T 2099.1-2021.

4.4 Socket-outlets

4.4.1 The distance K between the live plug bush of the socket-outlet and the mating surface is as shown in Figure 11, and the value should not be less than the value specified in Table 1; and shall pass the corresponding non-contact gauge tests in Figure 12, Figure 13 and Figure 14.

- a) After the finished plug sample is clamped by a rigid stationary fixture, apply a force to the pin to cause it to bend (as shown in Figure 26).
- b) Before starting the test, the pin shall be straight. If there is any doubt whether the pin is straight enough, the corresponding measuring gauges in Figure 16, Figure 17 and Figure 18 can be used to check it.
- c) The test force shall be applied at a distance of (14 ± 0.5) mm from the plug mating surface.
- d) The direction of application of the test force shall be parallel to the mating surface of the plug.
- e) For phase line pins and neutral line pins, the test force shall be applied toward the center point of the plug, then, return to the initial position.
- f) The displacement distance of the pin from the point of force application shall be (7.5 ± 0.3) mm, then, push the pin back to the starting point. Any “bounce” can be ignored.

NOTE 2: “bounce” means that when the force is removed, the pin returns to a position less than the travel distance.

- g) From the starting point of the displacement to the end point $(7.5 \text{ mm} \pm 0.3 \text{ mm})$, then, back to the starting point is one cycle (that is, one cycle is equal to two separate bending and normalizing movements).
- h) The deviation displacement speed shall be not greater than 50 mm/s, and there shall be no intentional delay between consecutive movements in each cycle.
- i) There shall be at least 10 s interval between each cycle.
- j) The action time of a single cycle shall be not greater than 60 s.
- k) The pin shall complete 20 complete cycles.
- l) After the test, check the pin with normal or corrected t normal vision.
- m) If in doubt, remove the pin from the plug and remove all insulation outside the pin, then, conduct an inspection.

NOTE 3: in some cases, the break may be below the mating surface of the plug, or the insulation may hold the broken pins together and maintain electrical contact.

5.4 After normally inserting the direct plug-in equipment into the socket-outlet, use the steel probe shown in Figure 10 of GB/T 2099.1-2021 to apply a force of 1 N to the root of the pin, and use an electrical indicator with a voltage between 40 V ~ 50 V to display the contact status of relevant components.

5.5 Use 3 new samples to carry out the roller drop test in 24.3 of GB/T 2099.1-2021 in accordance with the normal use conditions. If the direct plug-in equipment is equipped with a flexible cable, then, the free length of the flexible cable extending from the direct plug-in equipment is approximately 100 mm.

The number of drops is:

---100 times: if the weight of the specimen without the flexible cable does not exceed 100 g;

---50 times: if the weight of the specimen without the flexible cable exceeds 100 g, but does not exceed 200 g;

---25 times: if the weight of the specimen without the flexible cable exceeds 200 g.

For plugs with pins with an insulating sheath, every 5 drops, they need to be checked through the socket-outlet and manually corrected.

5.6 The methods of using the measuring gauges for the socket-outlet are as follows:

---the socket-outlet go gauge shall be able to be inserted into the jack on the socket-outlet panel;

---the socket-outlet no-go gauge shall not be able to be inserted into the jack on the socket-outlet panel;

---the socket-outlet contact gauge shall contact the live plug bush of the socket-outlet;

NOTE: as long as the contact gauge touches the live plug bush, it is deemed to satisfy the requirements.

---the socket-outlet non-contact gauge shall not come into contact with the live plug bush of the socket-outlet.

When using measuring gauges, if the socket-outlet has a protective door, it shall be disabled to avoid affecting the test.

The insertion force of the measuring gauges shall be not greater than the maximum withdrawal force in Table 16 of GB/T 2099.1-2021.

6 Implementation of Standard

6.1 For the types and dimensions of products that are produced or imported before the date of implementation of this document, and that implement or refer to this document, the implementation will start from the 13th month of the date of implementation of this document.

6.2 The requirement that the live pin of the plug shall have an insulating sheath (4.2.2) shall be

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