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**Protection of persons and equipment by enclosures - Probe
for verification**

外壳对人和设备的防护 检验用试具

(IEC 61032:1997, IDT)

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Protection of persons and equipment by enclosures - Probe for verification

1 General

1.1 Scope and purpose

This Standard specifies the dimensions and details of probes used to verify the enclosure protection. They are used to verify:

- a) Protection against human contact with hazardous parts inside the enclosure;
- b) Protection against solid foreign objects entering the equipment inside the enclosure.

Purpose of this Standard:

- a) Gather the object probes, access probes and required new probes currently specified in various standards into one publication.
- b) Guide each standardization technical committee in selecting probes.
- c) Relevant parties are encouraged to standardize the probes according to the requirements of this Standard instead of modifying the dimensions and details of the probes.
- d) Limit the further increase in the types of probes.

1.2 Recommended principles

When selecting probes, give priority to IP code probes.

The use of other probes, especially the probes not specified in this Standard, shall be limited to situations where the IP code probe is not applicable.

NOTE 1: The selection of a probe for a specific purpose is the responsibility of the relevant standardization technical committee.

NOTE 2: If each standardization technical committee wants to create a new probe or modify the current probe, it shall submit suggestions for modifying this Standard to the responsible authority of this Standard.

In order to prevent conflicts with test results, the application of probes, test conditions, result judgment and procedures are the responsibilities of the relevant standardization

technical committees.

Product certification based on probes that comply with the 1st edition of the standard can continue to be valid.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB 4208, *Degrees of protection provided by enclosure (IP code)* (GB 4208-2008, IEC 60529:2001, IDT)

IEC 60050(826):1982, *International Electrotechnical Vocabulary (IEV) - Chapter 826: Electrical installations of buildings*

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

ISO4287-1:1984, *Surface roughness - Terminology - Part 1: Surface and its parameters*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1 enclosure

a part providing protection of equipment against certain external influences and, in any direction, protection against direct contact

NOTE: This definition taken from the International Electrotechnical Vocabulary (IEV) needs the following additional explanations:

- 1) Enclosures provide protection of persons or livestock against access to hazardous parts.
- 2) Barriers, shapes of openings or any other means - whether attached to the enclosure or formed by the enclosed equipment - suitable to prevent or limit the penetration of the specified test probes are considered as a part of the enclosure, except when they can be removed without the use of a key or tool.

[IEC 826-03-12]

3.2 hazardous part

a part that is hazardous to approach or touch

[GB 4208, definition 3.5]

3.2.1 hazardous live part

a live-part which, under certain conditions of external influences, can give an electric shock

[GB 4208, definition 3.5.1]

3.2.2 hazardous mechanical part

a moving part, other than a smooth rotating shaft, that is hazardous to touch

[GB 4208, definition 3.5.2]

3.2.3 hazardous hot or glowing part

a hot or glowing part that is hazardous to touch

3.3 access probe

a test probe simulating in a conventional manner a part of a person or a tool, or the like, held by a person to verify adequate clearance from hazardous parts

[GB 4208, definition 3.8]

3.4 object probe

a test probe simulating a solid foreign object to verify the possibility of ingress into an enclosure

[GB 4208, definition 3.9]

3.5 IP code probe

a test probe to verify the degrees of protection specified in GB 4208

3.6 other probe

a test probe, different from IP code probes

3.7 adequate clearance for protection against access to hazardous parts

a distance to prevent contact or approach of an access probe to a hazardous part

[GB 4208, definition 3.7]

NOTE: The requirements to verify adequate clearance are specified in IEC 60529:2013.

Figure 17 -- Probe 43

7 Design requirements for probes

7.1 The means of measuring the applied force (e.g., spring) shall be specified.

7.2 According to the provisions of ISO 4287-1:1984, the arithmetic mean deviation R_a of the surface roughness profile of the metal parts of the probe shall not exceed $1.6\ \mu\text{m}$. The minimum hardness value of all parts of the probe in contact with the specimen shall reach 50 HCR (Rockwell hardness level C).

NOTE 1: If circuit inspection is required, terminals shall be provided to connect to an extra-low safety voltage.

Unless otherwise specified in product standards, it is recommended that the voltage of the indicator light circuit be no less than 40 V and no more than 50 V.

NOTE 2: Probes shall be anti-corrosion. If the probe is made of corrosive materials, protective measures shall be provided, especially when not in use. The use of oils and similar means of protection is recommended.

NOTE 3: The handle shall be designed for safe holding.

7.3 See Annex A for the impact of probe tolerances on equipment and test results. See Annex B for the tolerance marking criteria for new probes.

Annex A

(informative)

Influence of probe tolerances on equipment and test results

A.1 General

Select the probe correctly and test the protection of electrical equipment against access to hazardous parts in the prescribed manner.

Smaller tolerances ensure consistency and repeatability of test results. However, manufacturing cost economics require wider tolerances to allow for wear due to frequent use.

Designers of electrical equipment with hazardous parts and users of probes must be aware of these factors, as well as the limitations of probe applications.

In principle, the relevant dimensions of electrical components (such as apertures or gaps) shall be designed to provide a sufficient safety margin between hazardous parts and probes with maximum tolerances.

The following examples explain the above problem in detail.

A.2 Unlimited length probe

Example: Probes 17, 32, 43.

According to the test conditions specified in the relevant product standards, the purpose of this test is to verify the prevention of human contact with hazardous parts in the enclosure.

These probes are specifically shown to be inaccessible to the enclosure (see Figure A.1).

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