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JIS C 0920 : 2003
(IEC 60529 : 2001)

**Degrees of protection provided
by enclosures (IP Code)**

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee in accordance with the Industrial Standardization Law. Consequently **JIS C 0920 : 1993** is replaced with this Standard.

This revision has been made based on **IEC 60529 : 2001** *Degrees of protection provided by enclosures (IP Code)* for the purposes of making it easier to compare this Standard with International Standard; to prepare Japanese Industrial Standard conforming with International Standard; and to propose a draft of an International Standard which is based on Japanese Industrial Standard.

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Degrees of protection provided by enclosures (IP Code)

Introduction This Japanese Industrial Standard has been prepared based on the 2.1 edition of **IEC 60529** *Degrees of protection provided by enclosures (IP Code)* published in 2001 without any modification in technical contents.

The portions shown by sidelines or dotted underlines mean the matters not stated in the original International Standard.

This Standard describes a system for classifying the degrees of protection provided by the enclosures of electrical machinery and apparatus (hereafter referred to as “electrical equipment”). Whilst this system is suitable for use with most types of electrical equipment, it should not be assumed that all the listed degrees of protection are applicable to a particular type of equipment. The manufacturer of the equipment should be consulted to determine the degrees of protection available and the parts of equipment to which the stated degree of protection applies.

The adoption of this classification system, wherever possible, will promote uniformity in methods of describing the protection provided by the enclosure and in the tests to prove the various degrees of protection. It should also reduce the number of types of test devices necessary to test a wide range of products.

The 2.1 edition of **IEC 60529** takes account of experiences with the first edition, and clarifies the requirements. It provides for an optional extension of the IP Code by an additional letter A, B, C, or D if the actual protection of persons against access to hazardous parts is higher than that indicated by the first characteristic numeral.

In general, enclosures with an IP coding to the first edition would be eligible for the same code according to the 2.1 edition.

1 Scope This Standard applies to the classification of degrees of protection provided by enclosures for electrical equipment with a rated voltage not exceeding 72.5 kV. The object of this Standard is to give:

- a) Definitions for degrees of protection provided by enclosures of electrical equipment as regards:
 - 1) protection of persons against access to hazardous parts inside the enclosure;
 - 2) protection of the equipment inside the enclosure against ingress of solid foreign objects;
 - 3) protection of the equipment inside the enclosure against harmful effects due to the ingress of water.
- b) Designations for these degrees of protection.
- c) Requirements for each designation.
- d) Tests to be performed to verify that the enclosure meets the requirements of this Standard.

It will remain the responsibility of individual technical committees to decide on the extent and manner in which, the classification is used in their standards and to define “enclosure” as it applies to their equipment. However, it is recommended that for a given classification the tests do not differ from those specified in this Standard. If necessary, complementary requirements may be included in the relevant product standard. A guide for the details to be specified in relevant product standards is given in annex B (informative).

For a particular type of equipment, a technical committee may specify different requirements provided that at least the same level of safety is ensured.

This Standard deals only with enclosures that are in all other respects suitable for their intended use as specified in the relevant product standard and which from the point of view of materials and workmanship ensure that the claimed degrees of protection are maintained under the normal conditions of use.

This Standard is also applicable to empty enclosures provided that the general test requirements are met and that the selected degree of protection is suitable for the type of equipment to be protected.

Measures to protect both the enclosure and the equipment inside the enclosure against external influences or conditions such as

- mechanical impacts
- corrosion
- corrosive solvents (for example, cutting liquids)
- fungus
- vermin
- solar radiation
- icing
- moisture (for example, produced by condensation)
- explosive atmospheres

and the protection against contact with hazardous moving parts external to the enclosure (such as fans), are matters for the relevant product standard to be protected.

Barriers external to the enclosure and not attached to it and obstacles which have been provided solely for the safety of personnel are not considered as a part of the enclosure and are not dealt with in this Standard.

NOTE The International Standard corresponding to this Standard is as follows.

In addition, symbols which denote the degree of correspondence in the contents between the relevant International Standard and **JIS** are **IDT** (identical), **MOD** (modified), and **NEQ** (not equivalent) according to **ISO/IEC Guide 21**.

IEC 60529 : 2001 *Degrees of protection provided by enclosures (IP Code)*
(IDT)

2 Normative references The following normative documents contain provisions which, through reference in this text, constitute provisions of this Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. For undated references, the latest edition of the normative document (including amendments) referred to applies.

JIS C 0010 *Environmental testing Part 1 : General and guidance*

NOTE IEC 60068-1 : 1988 *Environmental testing—Part 1 : General and guidance* is identical with the above standard.

IEC 60050-195 : 1998 *International Electrotechnical Vocabulary—Part 195 : Earthing and protection against electric shock*

IEC 60050-826 : 1982 *International Electrotechnical Vocabulary. Electrical installations of buildings*

IEC 60068-2-68 : 1994 *Environmental testing—Part 2 : Tests—Test L : Dust and sand*

IEC 60071-2 : 1996 *Insulation co-ordination—Part 2 : Application guide*

3 Definitions For the purpose of this Standard, the following definitions apply:

3.1 enclosure a part providing protection of equipment against certain external influences and, in any direction, protection against direct contact [IEC 60050-826 IEV 826-03-12]

NOTE This definition taken from the existing International Electrotechnical Vocabulary (IEV) needs the following explanations under the scope of this Standard:

- 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.

3.2 direct contact contact of persons or livestock with live parts [IEV 826-03-05]

NOTE This IEV definition is given for information. In this Standard “direct contact” is replaced by “access to hazardous parts”.

3.3 degree of protection the extent of protection provided by an enclosure against access to hazardous parts, against ingress of solid foreign objects and/or against ingress of water and verified by standardized test methods

3.4 IP Code a coding system to indicate the degrees of protection provided by an enclosure against access to hazardous parts, ingress of solid foreign objects, ingress of water and to give additional information in connection with such protection

3.5 hazardous part a part that is hazardous to approach or touch

3.5.1 hazardous live part a live part which, under certain conditions of external influences, can give an electric shock (see **IEC 60050-195, IEV 195-06-05**)

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

3.6 protection provided by an enclosure against access to hazardous parts the protection of persons against

- contact with hazardous low-voltage live parts
- contact with hazardous mechanical parts
- approach to hazardous high-voltage live parts below adequate clearance inside an enclosure

NOTE This protection may be provided

- by means of the enclosure itself,
- by means of barriers as part of the enclosure or distances inside the enclosure.

Information : The “high voltage” includes “extra-high voltage” in Japan.

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

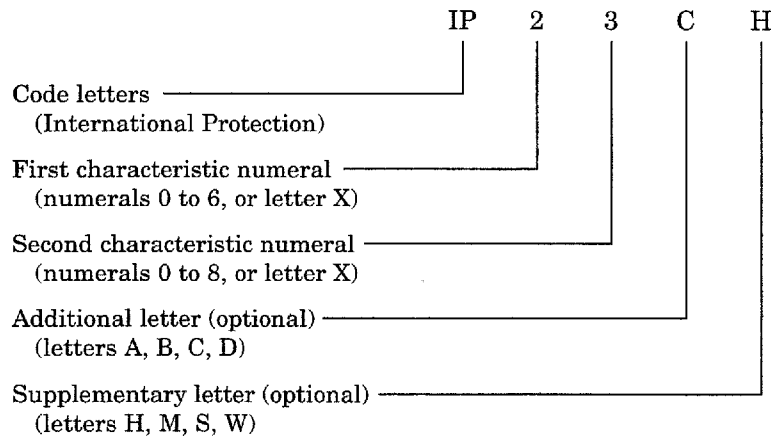
3.8 access probe a test probe simulating in a conventional manner a part of a person or a tool, or the like, held by a person to verify adequate clearance from hazardous parts

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

3.10 opening a gap or aperture in an enclosure which exists or may be formed by the application of a test probe at the specified force

4 Designations The degree of protection provided by an enclosure is indicated by the IP Code in the following way:

4.1 Arrangement of the IP Code



Where a characteristic numeral is not required to be specified, it shall be replaced by the letter “X” (“XX” if both numerals are omitted).

Additional letters and/or supplementary letters may be omitted without replacement.

Where more than one supplementary letter is used, the alphabetic sequence shall apply.

If an enclosure provides different degrees of protection for different intended mounting arrangements, the relevant degrees of protection shall be indicated by the manufacturer in the instructions related to the respective mounting arrangements.

Details for the marking of an enclosure are given in clause 10.

Information : When the degrees of protection against oil of control equipment are prepared in this IP Code, Annex 1 (informative) should be followed. When the degrees of protection against elevated temperature and humidity of luminaries are prepared, Annex 2 (informative) should be followed.

4.2 Elements of the IP Code and their meanings

A brief description of the IP Code elements is given in the following chart.

Full details are specified in the clauses indicated in the last column.

Element	Numerals or letters	Meaning for the protection of equipment	Meaning for the protection of persons	Ref.
Code letters	IP	—	—	—
First characteristic numeral	0 1 2 3 4 5 6	Against ingress of solid foreign objects (non-protected) ≥ 50 mm diameter ≥ 12.5 mm diameter ≥ 2.5 mm diameter ≥ 1.0 mm diameter dust-protected dust-tight	Against access to hazardous parts with (non-protected) back of hand finger tool wire wire wire	Cl. 5
Second characteristic numeral	0 1 2 3 4 5 6 7 8	Against ingress of water with harmful effects (non-protected) vertically dripping dripping (15° tilted) spraying splashing jetting powerful jetting temporary immersion continuous immersion	—	Cl. 6
Additional letter (optional)	A B C D	—	Against access to hazardous parts with: back of hand finger tool wire	Cl. 7
Supplementary letter (optional)	H M S W	Supplementary information specific to: High voltage apparatus Motion during water test Stationary during water test Weather conditions	—	Cl. 8

4.3 Examples for the use of letters in the IP Code The following examples are to explain the use and arrangement of letters in the IP Code.

For more comprehensive examples see clause 9.

- IP44 — no letters, no options;
- IPX5 — omitting first characteristic numeral;
- IP2X — omitting second characteristic numeral;
- IP20C — using additional letter;
- IPXXC — omitting both characteristic numerals, using additional letter;
- IPX1C — omitting first characteristic numeral, using additional letter;
- IP3XD — omitting second characteristic numeral, using additional letter;
- IP23S — using supplementary letter;
- IP21CM — using additional letter and supplementary letter;
- IPX5/IPX7 — giving two different degrees of protection by an enclosure against both water jets and temporary immersion for “versatile” application.

5 Degrees of protection against access to hazardous parts and against solid foreign objects indicated by the first characteristic numeral The designation with a first characteristic numeral implies that conditions stated in both 5.1 and 5.2 are met.

The first characteristic numeral indicates that:

- the enclosure provides protection of persons against access to hazardous parts by preventing or limiting the ingress of a part of the human body or an object held by a person;

and simultaneously

- the enclosure provides protection of equipment against the ingress of solid foreign objects.

An enclosure shall only be designated with a stated degree of protection indicated by the first characteristic numeral if it also complies with all lower degrees of protection.

However, the tests establishing compliance with any one of the lower degrees of protection need not necessarily be carried out provided that these tests would obviously be met if applied.

5.1 Protection against access to hazardous parts Table 1 gives brief descriptions and definitions for the degrees of protection against access to hazardous parts.

Degrees of protection listed in this table shall be specified only by the first characteristic numeral and not by reference to the brief description or definition.

To comply with the conditions of the first characteristic numeral, adequate clearance shall be kept between the access probe and hazardous parts.

The tests are specified in clause 12.

Table 1 Degrees of protection against access to hazardous parts indicated by the first characteristic numeral

First characteristic numeral	Degree of protection		Test conditions, see
	Brief description	Definition	
0	Non-protected	—	—
1	Protected against access to hazardous parts with the back of a hand	The access probe, sphere of 50 mm ϕ , shall have adequate clearance from hazardous parts	12.2
2	Protected against access to hazardous parts with a finger	The jointed test finger of 12 mm ϕ , 80 mm length, shall have adequate clearance from hazardous parts	12.2
3	Protected against access to hazardous parts with a tool	The access probe of 2.5 mm ϕ shall not penetrate	12.2
4	Protected against access to hazardous parts with a wire	The access probe of 1.0 mm ϕ shall not penetrate	12.2
5	Protected against access to hazardous parts with a wire	The access probe of 1.0 mm ϕ shall not penetrate	12.2
6	Protected against access to hazardous parts with a wire	The access probe of 1.0 mm ϕ shall not penetrate	12.2

NOTE In the case of the first characteristic numerals 3, 4, 5 and 6, protection against access to hazardous parts is satisfied if adequate clearance is kept. The adequate clearance should be specified by the relevant product standard in accordance with 12.3.

Due to the simultaneous requirement specified in table 2, the definition “shall not penetrate” is given in table 1.

5.2 Protection against solid foreign objects Table 2 gives brief descriptions and the definitions for the degrees of protection against the penetration of solid foreign objects including dust.

Degrees of protection listed in this table shall only be specified by the first characteristic numeral and not by reference to the brief description or definition.

The protection against the ingress of solid foreign objects implies that the object probes up to numeral 2 in table 2 shall not fully penetrate the enclosure. This means that the full diameter of the sphere shall not pass through an opening, in the enclosure. Object probes for numerals 3 and 4 shall not penetrate the enclosure at all.

Dust-protected enclosures to numeral 5 allow a limited quantity of dust to penetrate under certain conditions.

Dust-tight enclosures to numeral 6 do not allow any dust to penetrate.

NOTE Enclosures assigned a first characteristic numeral of 1 to 4 generally exclude both regularly and irregularly shaped solid foreign objects provided that three mutually perpendicular dimensions of the object exceed the appropriate figure in column 3 of table 2.

The tests are specified in clause 13.

Table 2 Degrees of protection against solid foreign objects indicated by the first characteristic numeral

First characteristic numeral	Degree of protection		Test conditions, see
	Brief description	Definition	
0	Non-protected	—	—
1	Protected against solid foreign objects of 50 mm ϕ and greater	The object probe, sphere of 50 mm ϕ , shall not fully penetrate ⁽¹⁾	13.2
2	Protected against solid foreign objects of 12.5 mm ϕ and greater	The object probe, sphere of 12.5 mm ϕ , shall not fully penetrate ⁽¹⁾	13.2
3	Protected against solid foreign objects of 2.5 mm ϕ and greater	The object probe, sphere of 2.5 mm ϕ , shall not penetrate at all ⁽¹⁾	13.2
4	Protected against solid foreign objects of 1.0 mm ϕ and greater	The object probe of 1.0 mm ϕ , shall not penetrate at all ⁽¹⁾	13.2
5	Dust-protected	Ingress of dust is not totally prevented, but dust shall not penetrate in a quantity to interfere with satisfactory operation of the apparatus or to impair safety.	13.4 13.5
6	Dust-tight	No ingress of dust	13.4 13.6

Note ⁽¹⁾ The full diameter of the object probe shall not pass through an opening of the enclosure.

6 Degrees of protection against ingress of water indicated by the second characteristic numeral The second characteristic numeral indicates the degree of protection provided by enclosures with respect to harmful effects on the equipment due to the ingress of water.

The tests for the second characteristic numeral are carried out with fresh water. The actual protection may not be satisfactory if cleaning operations with high pressure and/or solvents are used.

Table 3 gives brief descriptions and definitions of the protection for the degrees represented by the second characteristic numeral.

Degrees of protection listed in this table shall be specified only by the second characteristic numeral and not by reference to the brief description or definition.

The tests are specified in clause 14.

Up to and including second characteristic numeral 6, the designation implies compliance also with the requirements for all lower characteristic numerals. However, the tests establishing compliance with any one of the lower degrees of protection need not necessarily be carried out provided that these tests obviously would be met if applied.

An enclosure designated with second characteristic numeral 7 or 8 only is considered unsuitable for exposure to water jets (designated by second characteristic numeral 5 or 6) and need not comply with requirements for numerals 5 or 6 unless it is dual coded as follows:

Enclosure passes test for		Designation and marking	Range of application
water jets second characteristic numeral	temporary/continuous immersion second characteristic numeral		
5	7	IPX5/IPX7	Versatile
6	7	IPX6/IPX7	Versatile
5	8	IPX5/IPX8	Versatile
6	8	IPX6/IPX8	Versatile
—	7	IPX7	Restricted
—	8	IPX8	Restricted

Enclosures for “versatile” application indicated in the last column shall meet requirements for exposure to both water jets and temporary or continuous immersion.

Enclosures for “restricted” application indicated in the last column are considered suitable only for temporary or continuous immersion and unsuitable for exposure to water jets.

Table 3 Degrees of protection against water indicated by the second characteristic numeral

Second characteristic numeral	Degree of protection		Test conditions, see
	Brief description	Definition	
0	Non-protected	—	—
1	Protected against vertically falling water drops	Vertically falling drops shall have no harmful effects	14.2.1
2	Protected against vertically falling water drops when enclosure tilted up to 15°	Vertically falling drops shall have no harmful effects when the enclosure is tilted at any angle up to 15° on either side of the vertical	14.2.2
3	Protected against spraying water	Water sprayed at an angle up to 60° on either side of the vertical shall have no harmful effects	14.2.3
4	Protected against splashing water	Water splashed against the enclosure from any direction shall have no harmful effects	14.2.4
5	Protected against water jets	Water projected in jets against the enclosure from any direction shall have no harmful effects	14.2.5
6	Protected against powerful water jets	Water projected in powerful jets against the enclosure from any direction shall have no harmful effects	14.2.6