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JAPANESE INDUSTRIAL STANDARD J I S

Tests to prove protection against ingress of water and degrees of protection against ingress of solid objects for electrical equipment

C 0920-1993

1. Scope This Japanese Industrial Standard specifies tests to prove protection against ingress of water and degrees of protection against ingress of solid matters for electric machinery and apparatus (hereafter referred to as "electric equipment").

If there is provisions, the Annex shall be followed.

Remarks 1. The International standard corresponding to this Standard is given below:

IEC 529 (1989) Degrees of protection provided by enclosures (IP code)

2. In this Standard, the units and numerical values given in { } are based on traditional unit system and given for informative reference.

2. Classification and meaning of protection against ingress of water The classification and meaning of protection against ingress of water are as given in Table 1.

Table 1. Classification and meaning of protection against ingress of water

Protection grade	Class	Meaning
0	–	Without protection
1	Drip-proof Type I	Having no harmful influence by drip of water falling perpendicularly.
2	Drip-proof Type II	Having no harmful influence by drip of water falling from the range covering 15° from perpendicular.
3	Spray-proof type	Having no harmful influence by rainfall covering the range of 60° from perpendicular.
4	Splash-proof type	Having no harmful influence by receiving splash of water from any direction.
5	Jet-proof type	Having no harmful influence by receiving direct jet of water from any direction.
6	Watertight type	Having no ingress of water into inside by receiving direct jet of water from any direction.
7	Immersion-proof type	Having no ingress of water into inside when immersed in water under specified conditions.
8	Submersible type	Always usable when submerged in water of specified pressure.
–	Moisture-proof type	Usable in moisture of 90 % or more relative humidity.

3. Performance The performance of electrical equipments shall be as given in Table 2.

Table 2. Performance

Protection grade	Class	Performance
0	–	–
1	Drip-proof Type I	There shall be no ingress of water inside the electrical equipment likely to hinder normal operation when tested in accordance with the method specified in 4.3.
2	Drip-proof Type II	There shall be no ingress of water inside the electrical equipment likely to hinder normal operation when tested in accordance with the method specified in 4.4.
3	Spray-proof type	There shall be no ingress of water inside the electrical equipment likely to hinder normal operation when tested in accordance with the method specified in 4.5.
4	Splash-proof type	There shall be no ingress of water inside the electrical equipment likely to hinder normal operation when tested in accordance with the method specified in 4.6.
5	Jet-proof type	There shall be no ingress of water inside the electrical equipment likely to hinder normal operation when tested in accordance with the method specified in 4.7.
6	Watertight type	There shall be no trace caused by ingress of water inside the electrical equipment when tested in accordance with the method specified in 4.8.
7	Immersion-proof type	There shall be no trace caused by ingress of water inside the electrical equipment when tested in accordance with the method specified in 4.9 (1). Or there shall be no generation of bubbles, when tested in accordance with the method specified in (2).
8	Submersible type	There shall be no trace caused by ingress of water inside the electrical equipment when tested in accordance with the method specified in 4.10.
–	Moisture-proof type	There shall be no ingress of moisture inside the electrical equipment likely to hinder normal operation when tested in accordance with the method specified in 4.11.

4. Test

4.1 Test condition Unless otherwise specified, the test shall be carried out in a place at ordinary temperature using fresh water.

4.2 Test for protection grade 0 (without protection) The test is not carried out.

4.3 Test for protection grade 1 (drip-proof type I) The electrical equipment is mounted as in normal service state, and water shall be dripped from the upper part at least 200 mm in height, at a precipitation of $1^{+0.5}_{0}$ mm per min, for 10 min.

4.4 Test for protection grade 2 (drip-proof type II) The electrical equipment is mounted as in normal service state, and water shall be dripped from the upper part at least 200 mm in height while the equipment is tilted by 15° from perpendicular in each of 4 directions (back and forth, right and left) at a precipitation of $3^{+0.5}_{0}$ mm per min. The duration of test shall be 2.5 min for each direction, i.e. 10 min in total.

4.5 Test for protection grade 3 (spray-proof type) The electrical equipment is mounted as in normal service state, and water shall be sprayed from the upper part of 300 mm to 500 mm in height, covering the whole range through 60° form the perpendicular, using a spray nozzle. The amount of spray water shall be 10 ± 0.5 *l* per min, the pressure of water shall be 50 kPa to 150 kPa {0.51 kgf/cm² to 1.53 kgf/cm²} and the duration of test shall be 1 min per 1 m² of enclosure surface area (excluding area of mounting part) but at least 5 min.

4.6 Test for protection grade 4 (splash-proof type) The electrical equipment is mounted as in normal service state, and water shall be sprayed from the upper part of 300 mm to 500 mm in height, covering the whole range through 180° from the perpendicular, using a spray nozzle. The amount of spray water shall be 10 ± 0.5 *l* per min, the pressure of water shall be 50 kPa to 150 kPa {0.51 kgf/cm² to 1.53 kgf/cm²}, and the duration of test shall be 1 min per 1m² of enclosure surface area but at least 5 min.

4.7 Test for protection grade 5 (jet-proof type) The electrical equipment is mounted as in normal service state, and water stream shall be projected from all directions by means of a nozzle with 6.3 mm bore as shown in Fig. 1. The distance between the nozzle and the equipment shall be 2.5 m to 3.0 m, the amount of jet water shall be 12.5 *l*/min ± 5 %, the size of water stream shall be approximately 40 mmϕ at a position 2.5 m from the end of nozzle and the duration of test shall be 1 min per 1 m² of equipment enclosure surface area but at least 3 min.

4.8 Test for protection grade 6 (watertight type) The electrical equipment is mounted as in normal service state, and water stream shall be projected from all directions by means of a nozzle with 12.5 mm bore as shown in Fig. 1. The distance between he nozzle and the equipment shall be 2.5 m to 3 m, the amount of jet water shall be 100 *l*/min ± 5 %, the size of water stream shall be approximately 120 mmϕ at a position 2.5 m from the end of nozzle and the duration of test shall be 1 min per 1 m² of equipment enclosure surface area but at least 3 min.

4.9 Test for protection grade 7 (immersion-proof type) The test shall be made in accordance with either one of the following methods:

(1) The equipment shall be immersed in water so as to locate the highest part will become deeper than 150 mm below the water surface and the lowest part will become deeper than 1 m below the water surface, and be exposed under water for 30 min. It is recommended to make the temperature difference between the water and the equipment 5°C or lower.

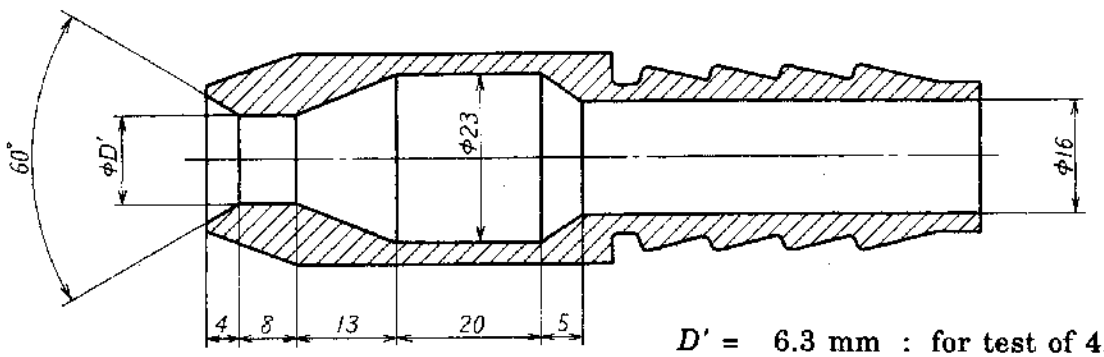
(2) The equipment is coated with soapy water on its outer surface of enclosure or immersed into water to its upper surface, then air pressure of 4.90 kPa {0.05 kgf/cm²} shall be applied inside of the electrical equipment for 1 min.

4.10 Test for protection grade 8 (submersible type) The test is subject to agreements between the parties concerned with delivery.

4.11 Moisture-proof test This test is applicable to lighting fixtures, and the fixture shall be placed in a bath at an ambient temperature of 35°C or higher, relative humidity of 90 % or more under lighting condition for 8 h, then allowed to stand under off condition in a room of ordinary temperature and humidity for 16 h. This operation shall be repeated 10 times.

Fig. 1. Standard nozzle

Unit: mm



D' = 6.3 mm : for test of 4.7

D' = 12.5 mm : for test of 4.8

5. Marking The class of protection against ingress of water shall be marked in accordance with following example:

Example: IPX3

└——Protection grade given in Table 1.

Remarks: IP is the symbol to indicate protection grade against the ingress of solid foreign matter and water, and shall be followed by 2 numerals. The first numeral indicates the protection grade against ingress of solid foreign matter and is marked as X when not specified, and the second numeral indicates the protection grade against ingress of water.