# IEC 60529 Degrees of Protection Provided by Enclosures (IP Code)-Testing of IP6 Equipment

## Description

### 13.1 Test Means

Test means and the main test conditions are given in table 7.

**Table 7 – Test means for the tests for protection against solid foreign objects**

| First characteristic numeral | Test means (object probes and dust chamber) | Test force | Test conditions, see |
|---|---|---|---|
| 0 | No test required | – | – |
| 1 | Rigid sphere without handle or guard $50^{+0,05}_{0}$ mm diameter | 50 N ± 10 % | 13.2 |
| 2 | Rigid sphere without handle or guard $12,5^{+0,2}_{0}$ mm diameter | 30 N ± 10 % | 13.2 |
| 3 | Rigid steel rod $2,5^{+0,05}_{0}$ mm diameter with edges free from burrs | 3 N ± 10 % | 13.2 |
| 4 | Rigid steel rod $1,0^{+0,05}_{0}$ mm diameter with edges free from burrs | 1 N ± 10 % | 13.2 |
| 5 | Dust chamber figure 2, with or without underpressure | – | 13.4 + 13.5 |
| 6 | Dust chamber figure 2, with under-pressure | – | 13.4 + 13.6 |

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### 13.2 Test conditions for first characteristic numerals 1, 2, 3, 4

The object probe is pushed against any openings of the enclosure with the force specified in table 7.

### 13.3 Acceptance conditions for first characteristic numerals 1, 2, 3, 4

The protection is satisfactory if the full diameter of the probe specified in table 7 does not pass through any opening.

NOTE: For first characteristic numerals 3 and 4 the probes specified in table 7 are intended to simulate foreign objects which may be spherical. Where an enclosure has an indirect or tortuous entry path and there is any doubt about ingress of a spherical object capable of motion, it may be necessary to examine drawings or to provide special access for the object probe to be applied with the specified force to the opening(s) where ingress has to be checked.

### 13.4 Dust test for first characteristic numerals 5 and 6

The test is made using a dust chamber incorporating the basic principles shown in figure 2 whereby the powder circulation pump may be replaced by other means suitable to maintain the talcum powder in suspension in a closed test chamber. The talcum powder used shall be able to pass through a square-



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meshed sieve the nominal wire diameter of which is 50 micrometers and the nominal width of a gap between wires 75 micrometers. The amount of talcum powder to be used is 2 kg per cubic metre of the test chamber volume. It shall not have been used for more than 20 tests.
NOTE: Health and safety regulations should be observed in selecting the type of talcum powder and its use.

Enclosures are of necessity in one of two categories:
**Category 1:** Enclosures where the normal working cycle of the equipment causes reductions in air pressure within the enclosure below that of the surrounding air, for example, due to thermal cycling effects.
**Category 2:** Enclosures where no pressure difference relative to the surrounding air is present.

**Category 1 enclosures:**
The enclosure under test is supported inside the test chamber and the pressure inside the enclosure is maintained below the surrounding atmospheric pressure by a vacuum pump. The suction connection shall be made to a hole specially provided for this test. If not otherwise specified in the relevant product standard, this hole shall be in the vicinity of the vulnerable parts.
If it is impracticable to make a special hole, the suction connection shall be made to the cable inlet hole. If there are other holes (for example, more cable inlet holes or drain-holes) these shall be treated as intended for normal use on site.
The object of the test is to draw into the enclosure, by means of depression, a volume of air 80 times the volume of the sample enclosure tested without exceeding the extraction rate of 60 volumes per hour. In no event shall the depression exceed 2 kPa (20 mbar) on the manometer shown in figure 2.
If an extraction rate of 40 to 60 volumes per hour is obtained the duration of the test is 2 h.
If, with a maximum depression of 2 kPa (20 mbar), the extraction rate is less than 40 volumes per hour, the test is continued until 80 volumes have been drawn through, or a period of 8 h has elapsed.

**Category 2 enclosures:**
The enclosure under test is supported in its normal operating position inside the test chamber, but is not connected to a vacuum pump. Any drain-hole normally open shall be left open for the duration of the test. The test shall be continued for a period of 8 h. Category 1 and category 2 enclosures:
If it is impracticable to test the complete enclosure in the test chamber, one of the following procedures shall be applied:
â€“ testing of individually enclosed sections of the enclosure;
â€“ testing of representative parts of the enclosure, comprising components such as doors, ventilation openings, joints, shaft seals, etc., in position during test;
â€“ testing of a smaller enclosure having the same full-scale design details.

In the last two cases, the volume of air to be drawn through the enclosure under test shall be the same as for the whole enclosure in full scale.

13.5 Special conditions for first characteristic numeral 5
13.5.1 Test conditions for first characteristic numeral 5
The enclosure shall be deemed category 1 unless the relevant product standard for the equipment specifies that the enclosure is category 2.
13.5.2 Acceptance conditions for first characteristic numeral 5

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The protection is satisfactory if, on inspection, talcum powder has not accumulated in a quantity or location such that, as with any other kind of dust, it could interfere with the correct operation of the equipment or impair safety. Except for special cases to be clearly specified in the relevant product standard, no dust shall deposit where it could lead to tracking along the creepage distances.

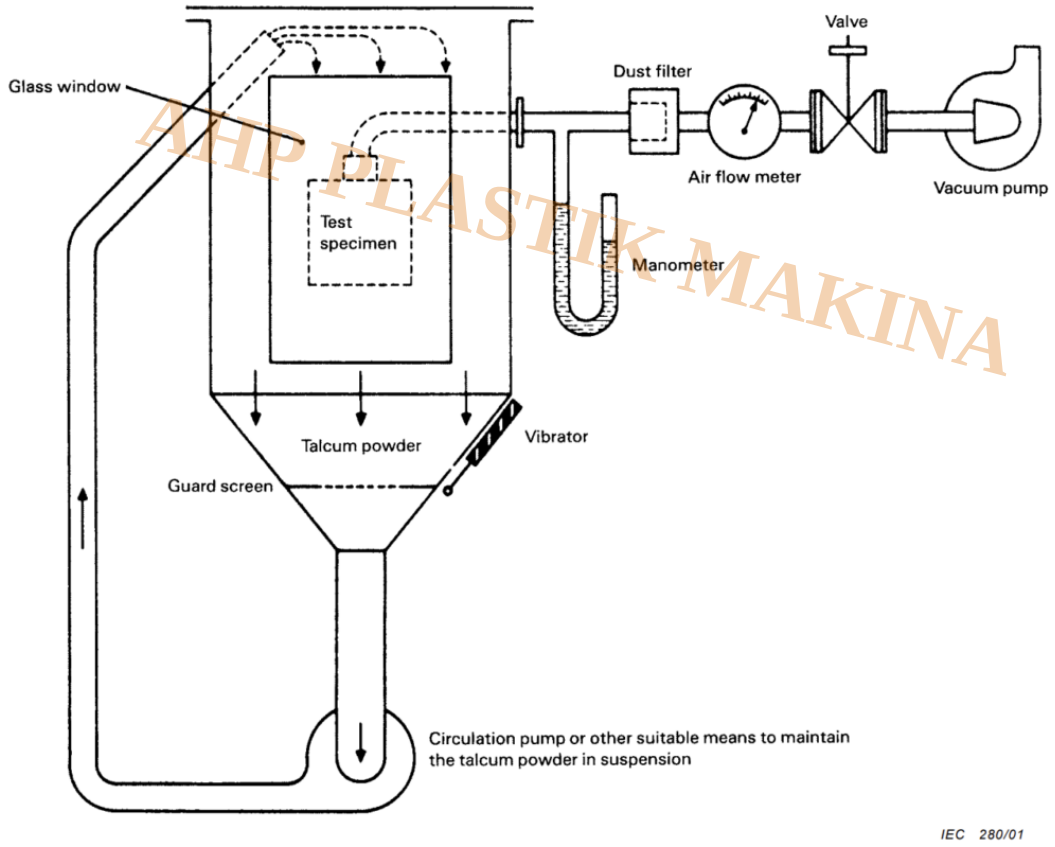
13.6 Special conditions for first characteristic numeral 6

13.6.1 Test conditions for first characteristic numeral 6

The enclosure shall be deemed category 1, whether reductions in pressure below the atmospheric pressure are present or not.

13.6.2 Acceptance conditions for first characteristic numeral 6

The protection is satisfactory if no deposit of dust is observable inside the enclosure at the end of the test.




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NOTE See IEC 60068-2-68, figure 2 valid for La2 only.

**Figure 2 – Test device to verify protection against dust (dust chamber)**



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**IEC 60529 IP5X IP6X Testing Dust Chamber**

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Dust-protected enclosures to numeral 5 (IP5X) allow a limited quantity of dust to penetrate under certain conditions. Dust-tight enclosures to numeral 6(IP6X) do not allow any dust to penetrate. The sand and dust testing chamber aims to evaluate the productâ€™s resistance to dust particles.

- For **both IP5X and IP6X** dustproof testing
- Steel outer body with electrostatic coated paint
- The inner box and the sample holder are made of **stainless steel plate**s to ensure **no rust** for long time use
- Large transparent **observation window** and **LED lighting inside** for easier observation
- **Dust-remove device** at the bottom of the device, which can easily replace the used dust 100%
- A special **device to prevent the dust from sticking** to the wall of the inner box
- There is an **air suction pipe** in the box, which can complete the **vacuuming** action on the sample
- **Heating system**: The circulating air duct is equipped with a heater to warm the dust to avoid dust condensation
- Digital PID temperature controller
- **Vacuum system**: equipped with vacuum pump
- Vacuum pressure, air filtration, flow meter, pressure regulating triple piece are included
- All specifications are fully in accordance with **IEC60529**.
- Inner size 50*50*50 cm
- Temperature range RT+10~60â„ƒ
- Standard line warp of metal screen 50um
- Standard spacing between lines 75um
- Test Dust is dry talc powder
- Powder spraying Method is free Dust Falling
- Digital timer included
- The door is with observation windows
- Vacuum degree -4kPa-0
- Pumping speed 0-2400L/Hour
- Power supply 1KW

## Category

1. Equipment for Standards
2. Standards

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