

Introduction to enclosures and thermostats with enclosures of types Y0 to Y5

The housings are designed to protect electrical equipment located inside. This protection must be considered in the electrical and environmental angles.)

Sets Y0 to Y5 describe products with protection classes which are different and intended for different applications. This introduction allows to understand and define the specifications for an application.

For further information on the specific protection explosive atmospheres, see catalogs No. 4 and No. 2 for the resistance of plastics and elastomers to temperature and UV

Electrical protection classes

There are two main types of electrical protection, protection against the risk of **direct contact** (functional isolation) and protection against **indirect contact** hazards.

The functional isolation is not sufficient in case of electrical failure and it is necessary to add protection against the risks of indirect contacts, which can be achieved by the following means:

- The earthing of all metal parts
- Double or reinforced insulation
- A low voltage supply via a transformer

The combination of these protections determines the class of electrical protection of the device.

The 4 electrical safety levels of electrical devices

Class	Symbol	Description
0		Equipment with only functional insulation but not binding to the metal masses. Banned in Europe.
1		Material with a functional isolation and earthing of metal masses. These devices must be connected to earth
2		Equipment with dual insulation of live parts (functional isolation and physical). No earthing of metal parts. This ensures that no double insulation accessible part may be subject to dangerous voltages even after a first insulation fault. The advantage of this class of appliances is a higher protection to the user regardless of the electrical sockets used (With or without earth terminal). These devices must not be connected to earth
3		Equipment class 2 transformer with a SELV (Safety Extra Low Voltage). This solution ensures that no accessible part may be subject to dangerous voltages even after a first and a second insulation fault. The electrical insulation of a device by a transformer located apart eliminates the risks of electrical ground return on a user by accidental contact with an electric leakage. On the other hand, the low voltage SELV severely limits the current that can pass through the human body in contact with two elements of the device under different potentials. The advantage of this class of appliances is a higher protection to the user regardless of the electrical sockets used (With or without earth terminal). These devices must not be connected to earth

IP protection (Ingress protection)

The IP rating defined by the IEC 60529 specifies the degree of protection against ingress of solid bodies (first digit) and against the ingress of water (second digit). The third and fourth characters are optional and provide information on the level of protection. The classification is done by increasing efficiency. There are 7 levels against solid (0: no protection, 6 fully protected) and 9 levels against water (0: no protection, 8: protected against immersion under pressure). For example, "IP21" means protected against solid objects greater than 12.5 mm (eg a finger) and resistant to condensation.

« X » use in the IP Coding

The letter X is used anywhere in the code when the protection it represents is meant to be avoided. There may be various reasons for choosing this coding variant, such as marketing considerations. Thus, e.g. an IPX7 rating for a consumer device specifies that the device has water protection up to limited immersion, but gives deliberately no information as to whether the device has any protection against mechanical ingress or dust. Among other common IP ratings using the letter X, is IPX4. IP2X is frequently used on electrical items to specify the item must prevent from finger access to live terminals i.e plug sockets are IP2X.

First digit (Solid particle protection)

The first digit indicates the level of protection that the enclosure provides against access to hazardous parts (e.g., electrical conductors, moving parts) and the ingress of solid foreign objects

The first digit of the IP marking is not required by EN 60335-1

IP1X	IP2X	IP3X	IP4X	IP5X	IP6X
Ø50mm	Ø12.5mm	Ø2.5mm	Ø1mm		

First digit	Protection type	Effective
0	No protection	No protection against contact and ingress of objects
1	Protected against solid particles >50 mm	Protected against any large surface of the body, such as the back of a hand, but no protection against deliberate contact with a smaller body part
2	Protected against solid particles >12.5 mm	Protected against fingers or similar objects
3	Protected against solid particles >2.5 mm	Protected against tools, thick wires, etc.
4	Protected against solid particles >1 mm	Protected against most wires, screws, etc.
5	Dust protected	Ingress of dust is not entirely prevented, but it must not enter in sufficient quantity to interfere with the satisfactory operation of the equipment. Completely protected against contact.
6	Dust tight	Completely protected against ingress of dust. Completely protected against contact.

