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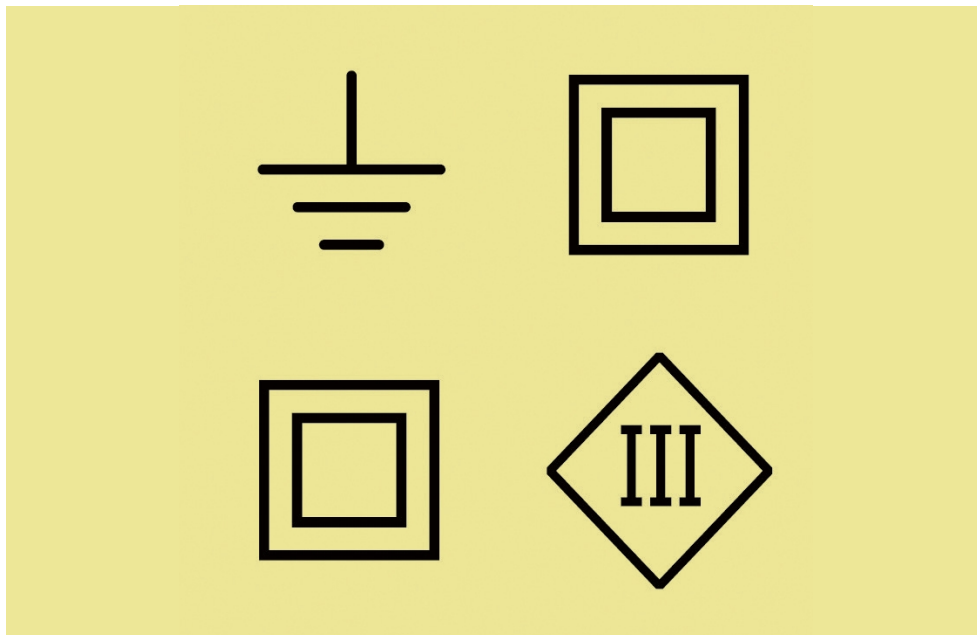


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Technology of components used in heating.

Chapter 9

Electrical protection of enclosures



Electrical protection of enclosures




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 device.

Class	Symbol	Description
0		Equipment with only functional insulation but not binding to the metal parts. Banned in Europe.
1		Material with a functional isolation and earthing of metal parts. These devices must be connected to earth.
2		Equipment with dual insulation of live parts (functional insulation and physical insulation). No earthing of metal parts. This double insulation ensures that no 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 do not need 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 isolation of a device by a transformer located in the gap eliminates the risks for electrical ground return of a user would be accidentally contacted by 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.

Earthing provisions of metal enclosures and fittings

The design of the grounding connections was made to meet all the points of the EN60335-1 standard, and to ensure a safe grounding, and specially the following requirements:

EN60335-1, § 27.1: Accessible metal parts of class I appliances that may become live in the event of an insulation fault, shall be permanently and reliably connected to an earthing terminal within the appliance.

To meet this normative obligation, our metal housings and our brass and stainless steel fittings are equipped with at least one grounded terminal. For stamped sheet metal housings, the grounding is performed by a welded terminal having at least two soldering points.

EN60335-1, § 27.2: The clamping means of earthing terminals shall be adequately secured against accidental loosening.

It shall not be possible to loosen the conductors without the aid of a tool.

To meet this normative obligation, earthing is made by screws needing a screwdriver to screw and unscrew, and have dented washers.

EN60335-1, § 27.4: All parts of the earthing terminal intended for the connection of external conductors shall be such that there is no risk of corrosion resulting from contact between these parts and the copper of the earthing conductor or any other metal in contact with these parts.

To meet this normative obligation, the choice of terminal materials and screws is made taking into account the galvanic voltage between materials, to avoid bimetallic corrosion, and favoring, whenever possible, the stainless steel screws and terminals.

EN60335-1, § 28.1: Earth connections which failures may provide a lack of earthing continuity shall withstand the mechanical stresses occurring in normal use. Screws used for connections providing earthing continuity shall screw into metal.

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To meet this normative obligation, earth terminals withstand more than one and a half times the nominal tightening torque required by the standards and are threaded in the mass of the metal of the housing or fitting.

EN60335-1, § 28.2 Connections providing earthing continuity shall be constructed so that contact pressure is not transmitted through insulating material that is liable to shrink or to distort.

- Thread-cutting (self-tapping) screws shall not be used if they are likely to be operated by the user or installer.

- At least two screws must be used for each connection providing earthing continuity unless the screw forms a thread having a length of at least half the diameter of the screw.

In order to meet this normative obligation, the earthing terminals of the connectors are designed so that, even when they are used with a plastic housing with an interposed gasket, the tightening of the conductor is done only on metallic parts.

EN60335-1, § 28.2: Self-tapping screws shall not be used if they can be used by the installer or the user. At least two screws shall be used for each earth connector unless the screw forms a thread having a length of at least half the diameter of the screw.

To meet this normative obligation, self-tapping screws are never used for grounding, and when the grounding is performed by a screw in a tapping, the length of it is always greater to the value given by the standard.

28.4 Screws and nuts that make a mechanical connection between different parts of the appliance shall be secured against loosening if they also make connections providing earthing continuity.

- Sealing compound that softens on heating provides satisfactory security only for screw connections not subject to torsion in normal use.

To meet this normative obligation, the screws of metal covers include a mechanical device avoiding accidental loosening. No sealing compound is used on the screws.