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Protective measures acc. IEC/EN standards



IEC 61439-1

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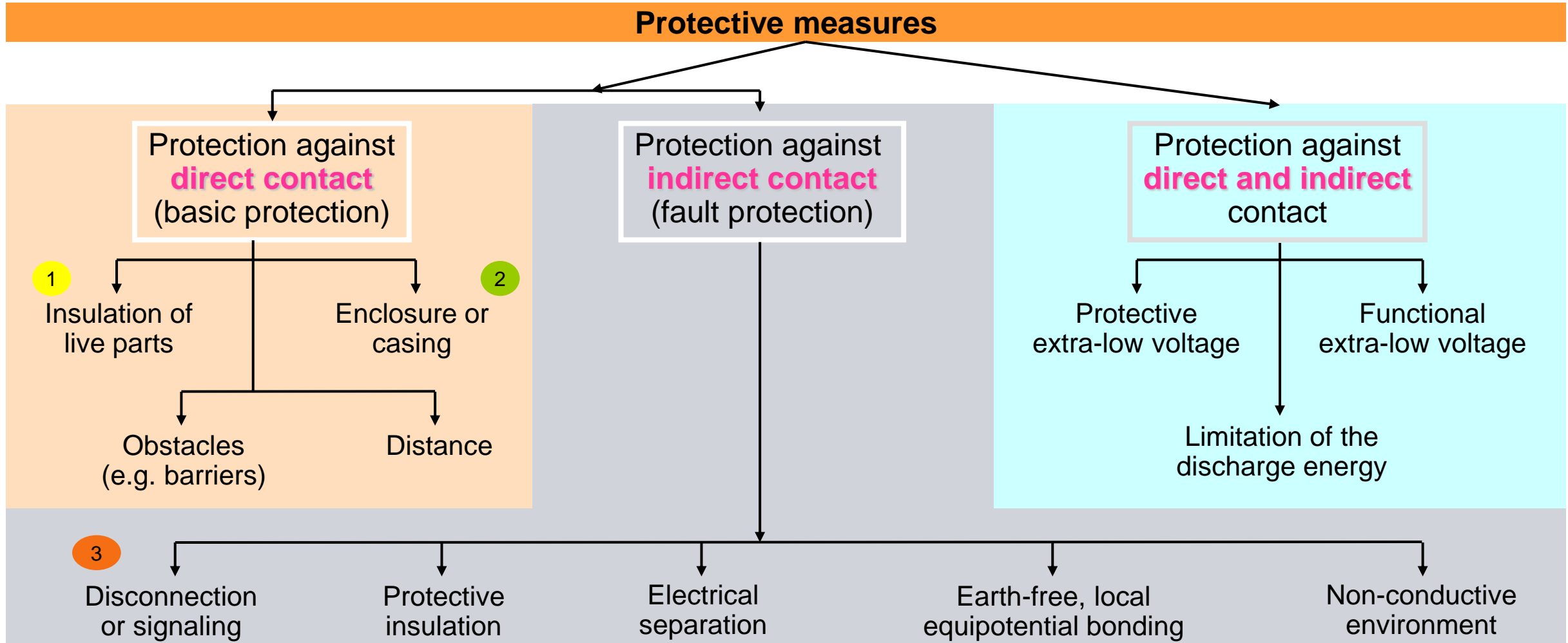
INTERNATIONAL
STANDARD

NORME
INTERNATIONALE



Low-voltage switchgear and controlgear assemblies –
Part 1: General rules

Ensembles d'appareillage à basse tension –
Partie 1: Règles générales



Protective Measures – IEC/EN 60204-1

§ 6.2.3 Protection by Insulation of Live Parts



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- Live parts have to be completely encased with insulation.
- Such insulation must only be removable by way of destruction.
- The insulation must be capable of withstanding the mechanical, chemical, electrical and thermal stresses to which it can be subjected under normal operating conditions.

Note: Coats of paint, varnish, lacquer, enamel and similar products alone are generally considered to be inadequate for protection against electric shock.

Examples include cables/lines and electrical components which are completely encased with insulating material.

This basic insulation:

- must correspond to the respective overvoltage categories (compliance with clearances and creepage distances).
- must be sufficiently ageing-resistant for the respective service life of the insulated part.

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§ 6.2.2 Protection by Enclosures (Casings)



- Live parts must be installed inside **enclosures** which offer protection against direct contact of **at least IP2X or IPXXB**.
- If the top surfaces of the enclosures are easily accessible, the top surfaces must at least offer degree of protection IP4X or IPXXD.
- **IP2x or IPxxB**: Also referred to as finger-proof
IP4x or IPxxD: Also referred to as wire-proof (poke-proof)
- **Opening of the enclosure** (i.e. opening of doors, lids, covers and the like) must only be possible **under certain conditions**.
→ see next slide



a) With keys or tools

→ Access only for electrically instructed persons, electrically skilled persons.

Live parts which may be touched during resetting, adjustment, etc. must be at least IP2x (IPxxB). Inside of doors → at least IP1x or IPxxA.

b) Disconnection of live parts

before the enclosure can be opened, e.g.: Door-coupling operating devices

The door can only be opened when the disconnecting device is open

The disconnecting device can only be switched ON when door is closed

All parts which remain energized after disconnecting must be protected against direct contact (at least IP2x / IPxxB). Such parts must be marked with a warning sign (also see identification of conductors by color).

c) Without keys or tools or without disconnection

when all live parts at least correspond to IP2x (IP4x) or IPxxB (IPxxD).

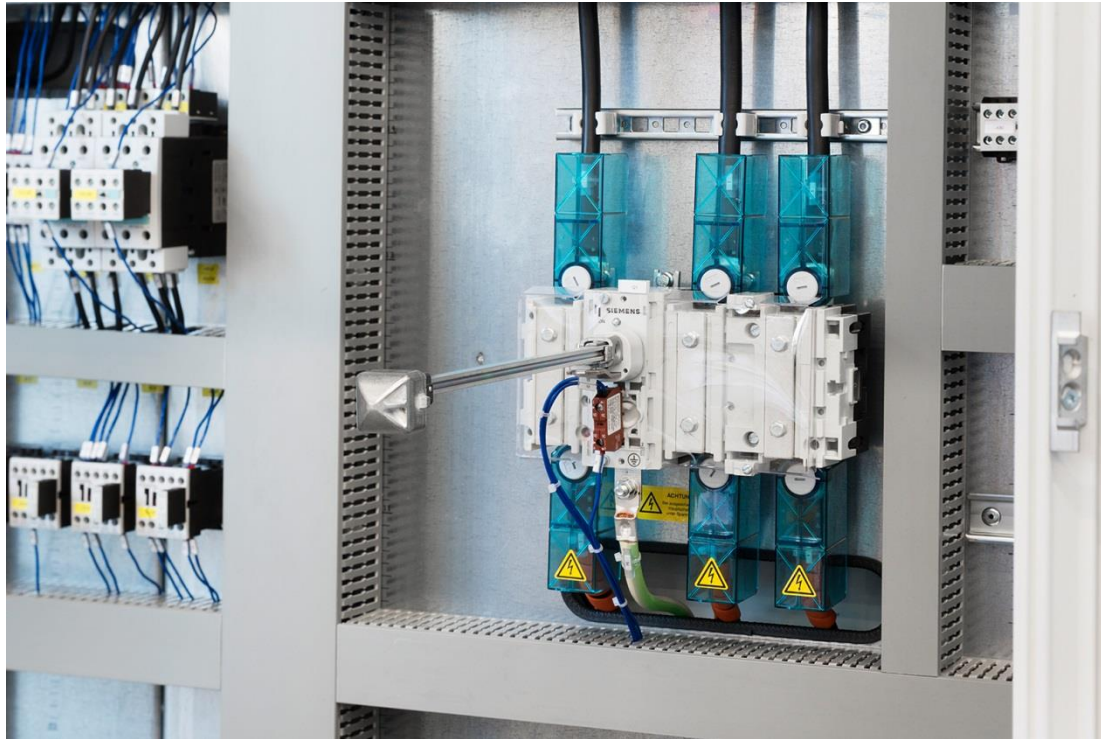
Barriers must only be removable **by means of tools**.

If barriers are removable without tools, the respective live parts have to be **disconnected automatically**.

Sample pictures of IEC panels



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§ 6.3.3 Protection by Automatic Disconnection



The protection device must disconnect the faulty circuit (all live conductors!) within the specified time (Annex A – see below).

Target: Avoidance of hazardous situations

This measure requires co-ordination between:

- The type of supply and the earthing system (network type)
- The impedance values of the protective conductor system’s different parts
- The characteristics of protection devices

a) TN → Overcurrent protection devices

If this is not possible within the specified time, additional equipotential bonding may have to be provided

b) TT → Residual current devices

c) IT → Earth-fault monitoring or residual current devices (RCDs); acoustic and/or optical signal

Table A.1 – Maximum disconnecting times for TN systems

$U_o^{a)}$ V	Disconnecting time s
120	0,8
230	0,4
277	0,4
400	0,2
>400	0,1

a) U_o is the nominal a.c. r.m.s. voltage to earth.

NOTE 1 For voltages which are within the tolerance band stated in IEC 60038, the disconnecting time appropriate to the nominal voltage applies.

NOTE 2 For intermediate values of voltage, the next higher value in the above table is to be used.

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§ 6.3 Protection Against Indirect Contact



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In general:

Serves the avoidance of hazardous situations in the event of an insulation fault between live parts and bodies.

At least one of the following measures has to be taken for every circuit or every part of the electrical equipment:

- **Automatic disconnection** of the supply before any contact may become hazardous (depending on voltage and duration of contact)
- Measures which **prevent** the occurrence of a **touch voltage**

Note:

The risk (for persons and livestock) of harmful effects as a result of a touch voltage **depends on the voltage level and the duration of exposure.**

For protection classes of the equipment and protective measures, see IEC/EN 61140.

Any questions?

