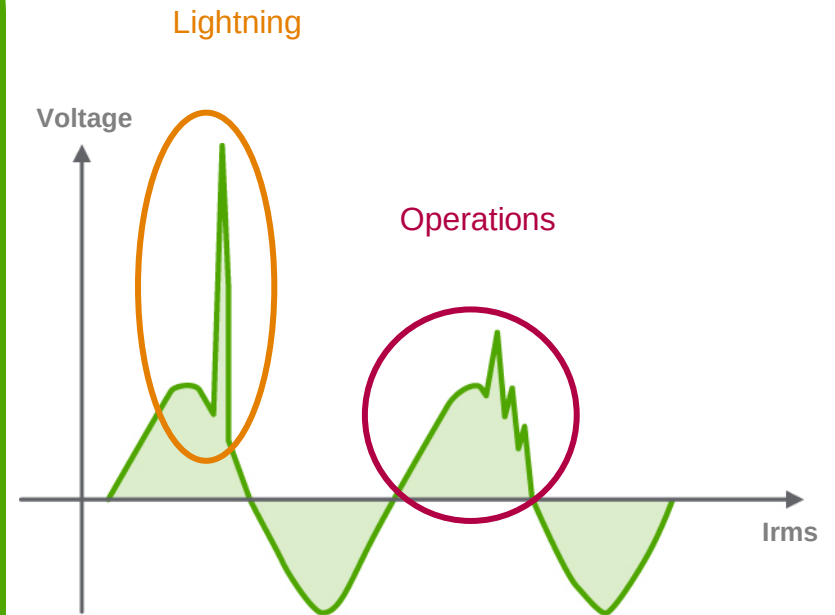


Overvoltage protection (surge arrester)

- Choose the best surge protection.
- Install overvoltage protection.
- Choose the best upstream protection for a surge arrester.
- Installation rules.

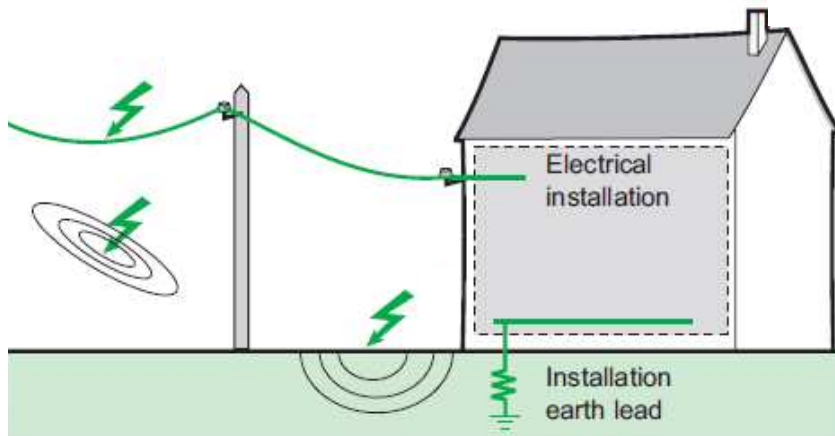
Electrical overvoltage, unique characteristics

Sources	Characteristics
● Lightning	● Ultra-rapid transient phenomenon. Unit of measurement = $\text{kV} / \mu\text{s}$ ● Highly destructive energy.
● Overvoltage generated by operations or incidents on the network.	● Repetitive phenomenon leading to premature aging. ● Malfunction which may even result in permanent damage.



Lightning and its consequences

- The main effect of lightning is **electrical overvoltage** which exposes the electrical installations to **a serious risk** of:

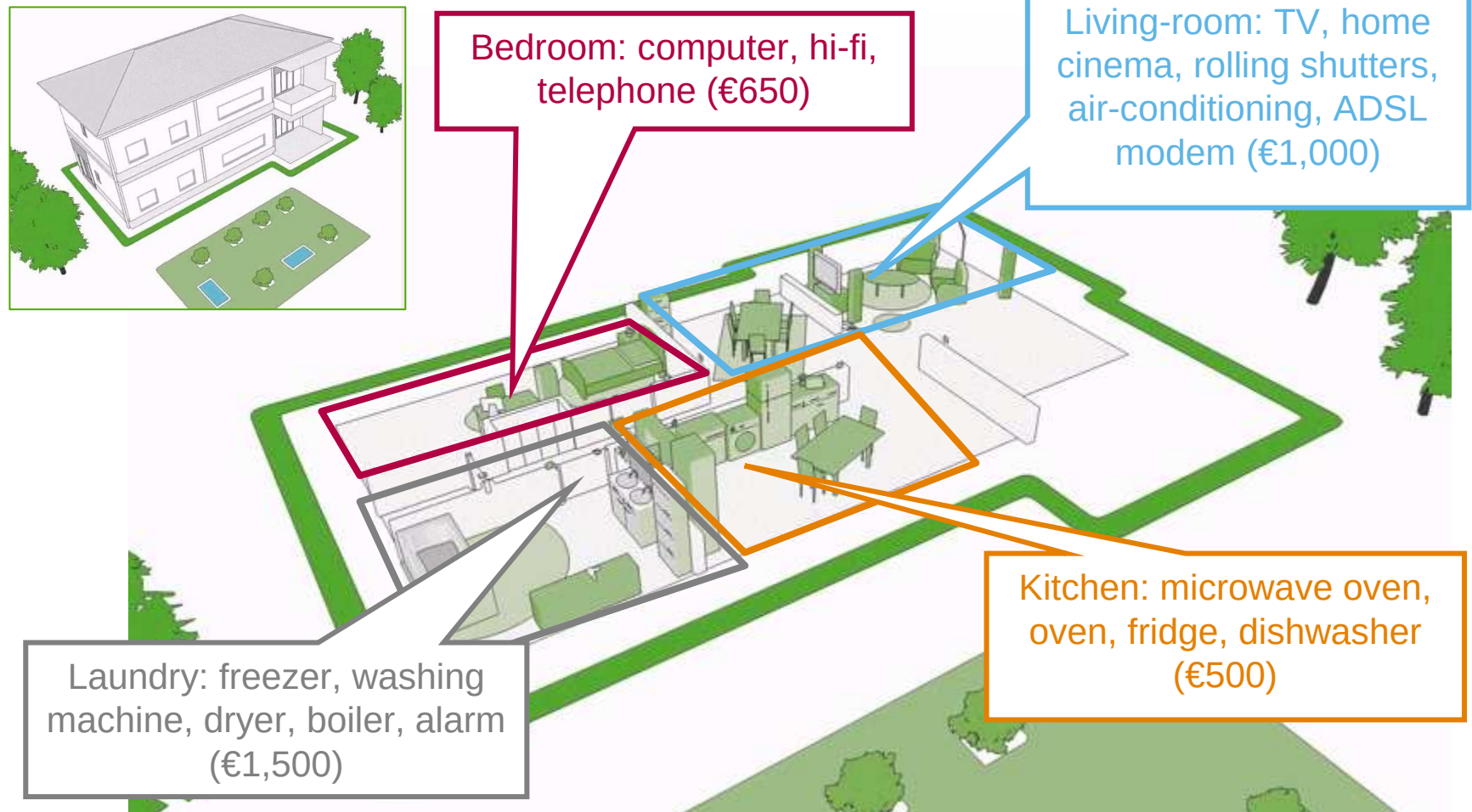


- malfunction,
- destruction of equipment,
- unavailability of production tools,
- etc.

➔ The overvoltages come either from the **electricity network** or from **the earth**.

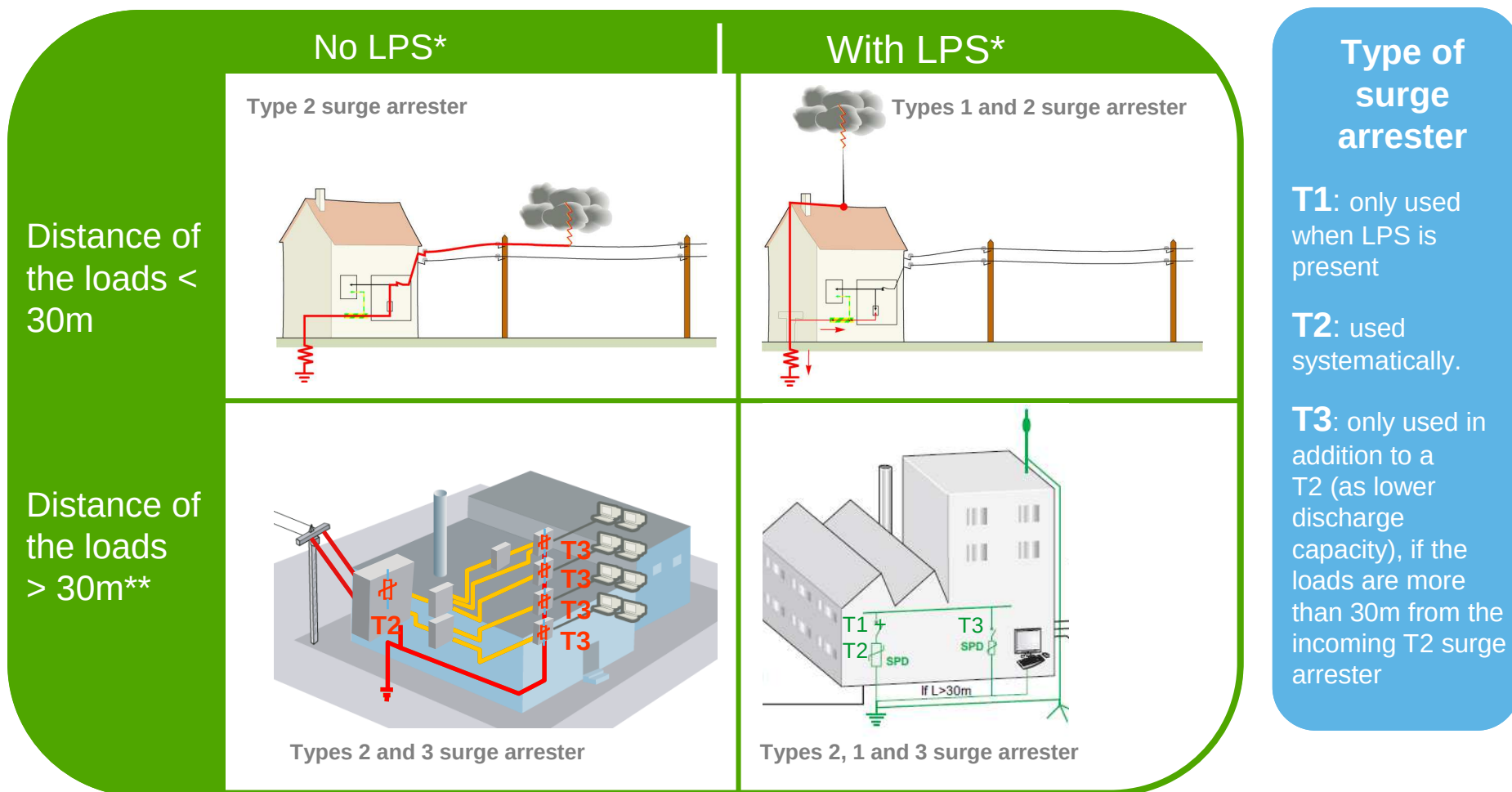
The damage caused by lightning

- **90%** of sockets power sensitive equipment and an overvoltage can damage them (Total values estimated amount = €3,650).



Choose the best
surge protection

A means of protection for every situation

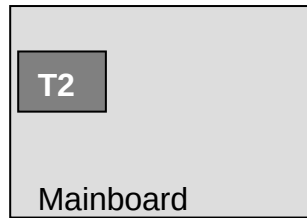


* LPS (Lightning Protection System) = lightning rod, meshed cage on buildings)

** After 30m (between the surge arrester and the loads) lightning wave reflection phenomena appear in the cables.

In practice: distance of equipments >30 metres

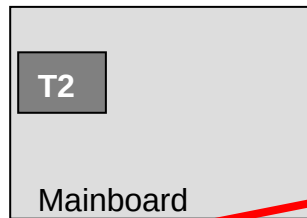
Case No.1 (the most common)



Distance under than 30 metres

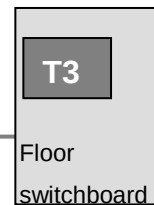
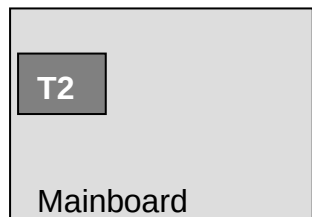
T2 = type 2 surge arrester

Case No.2



Distance of more than 30 metres

T2 = type 2 surge arrester

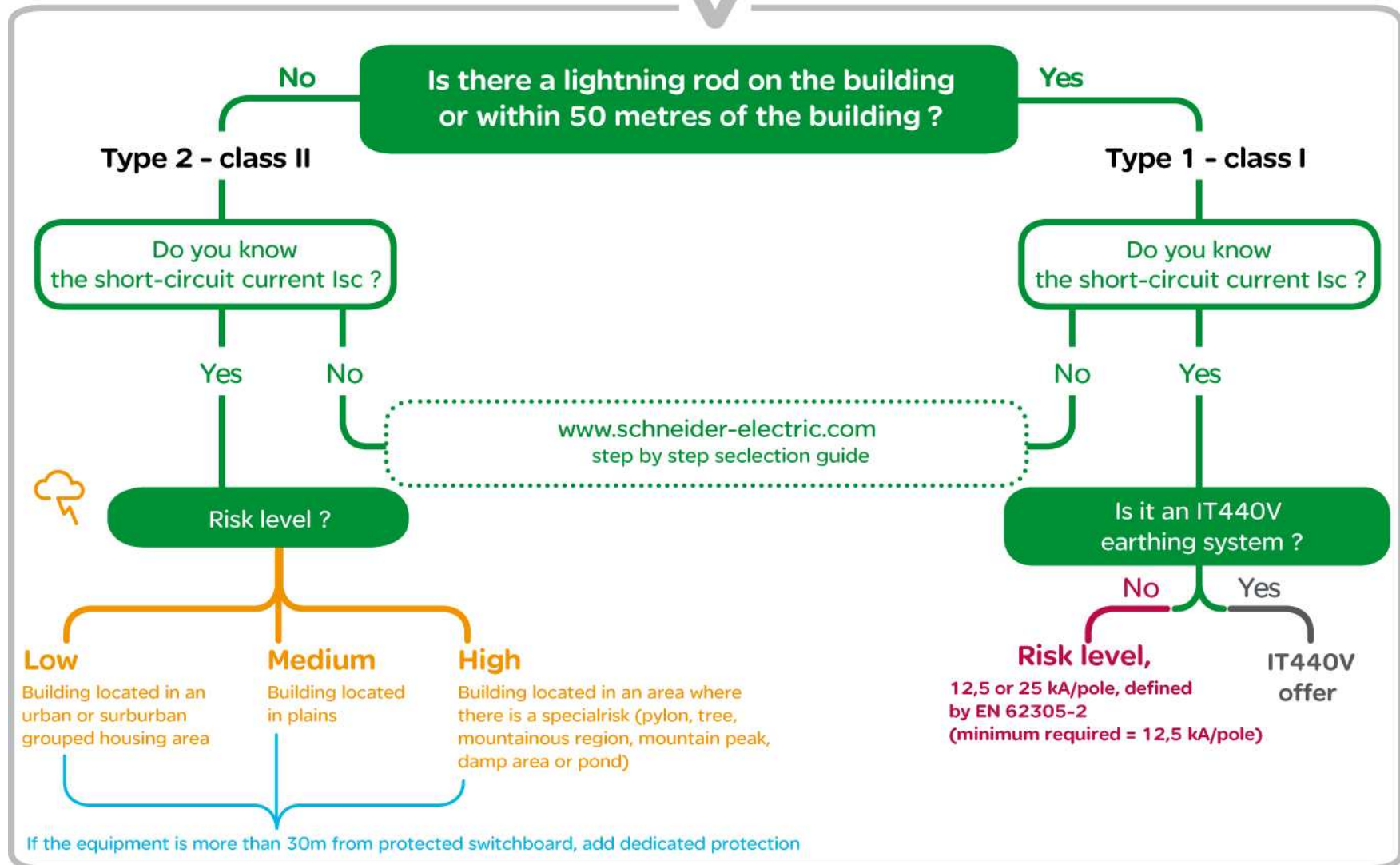


Install the surge arrester
as close as possible to the
sensitive equipment

* T2 = type 2 surge arrester, T3 = type 3 surge arrester.

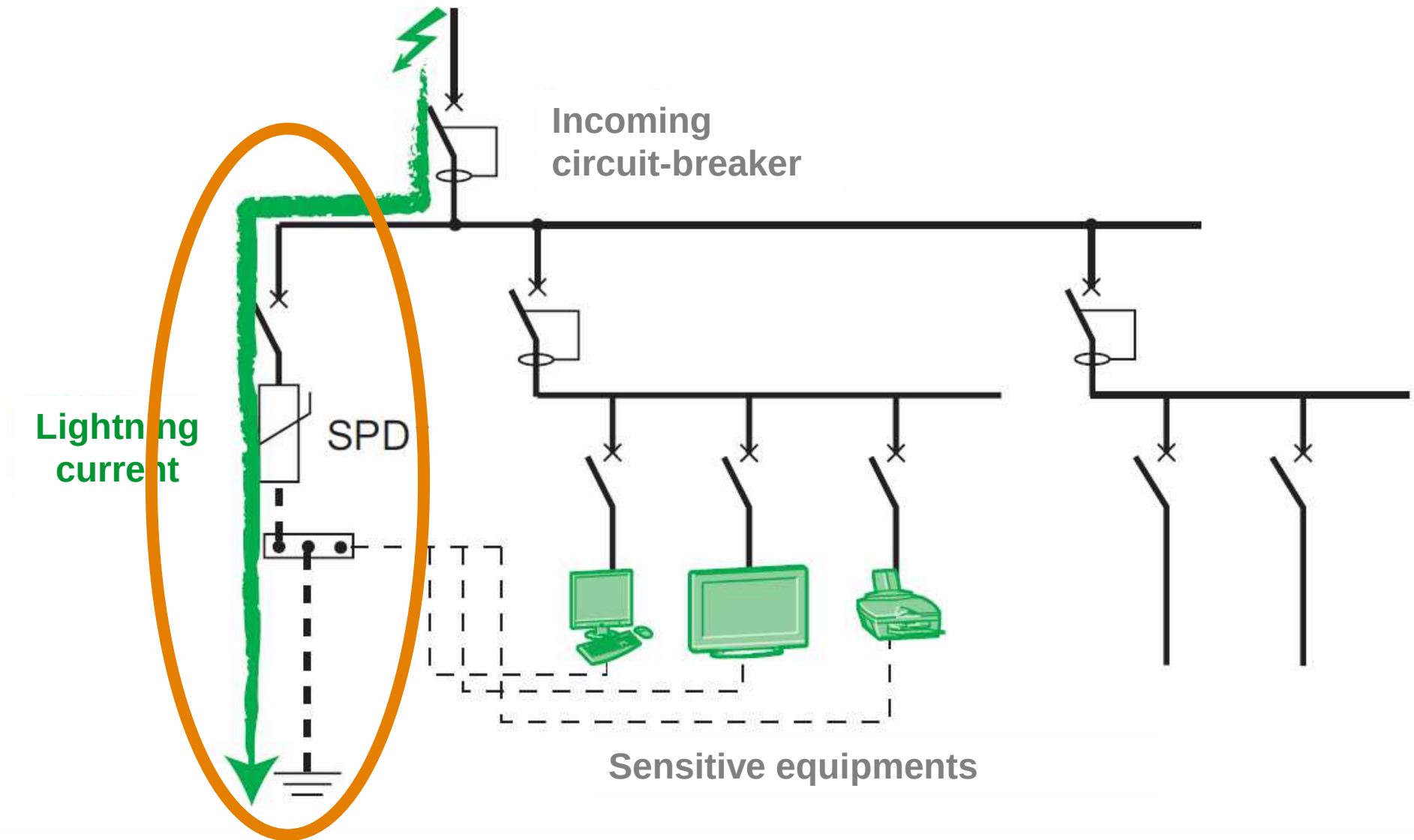
To summarise

You need to install a surge arrester in a switchboard



Install surge arrester

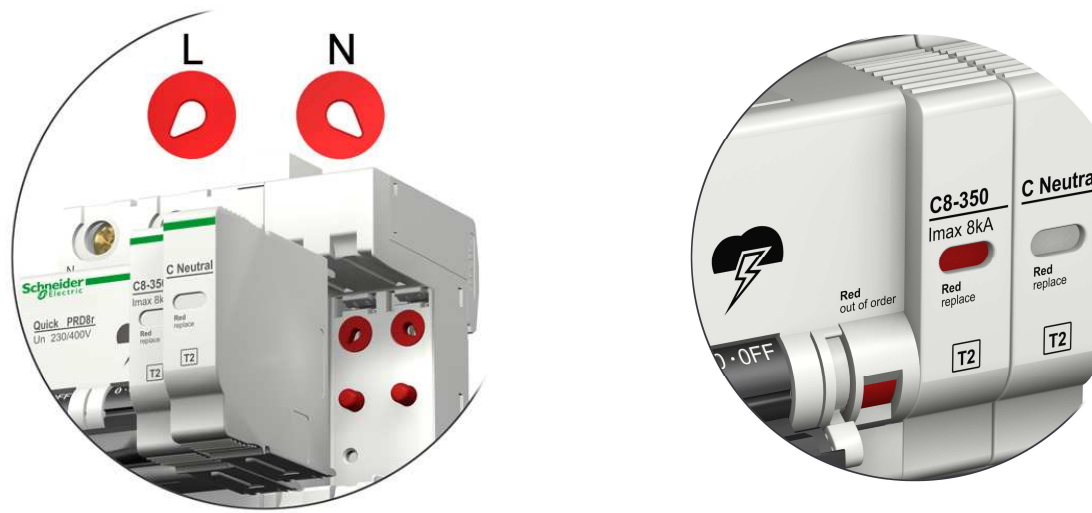
Location in the switchboard: in parallel



* SPD = Surge Protection Device.

Lifetime of the surge arrester

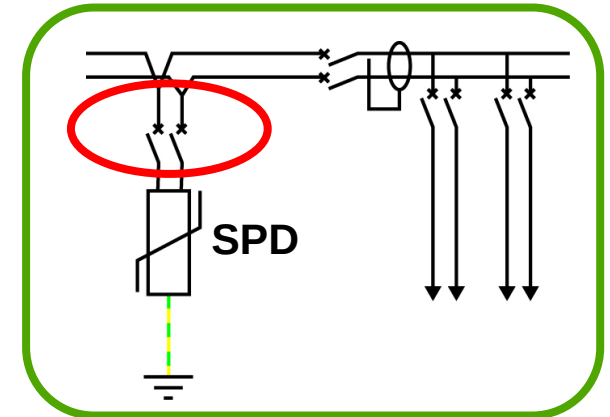
- The surge arrester has the same lifetime as the **switchboard**.
- At the end of its life, a thermal protector integrated into the surge arrester:
 - isolate the surge arrester from the rest of the installation.
 - activates the red end-of-life warning light, indicating that the surge arrester needs to be changed.



The upstream protection of the surge arrester

- The role of the surge arrester is to drive the lightning current to the earth in a **very short time** (< 350 microseconds).
- However, the surge arrester is not **intended to be exposed to a permanent overvoltage** (phase/neutral inversion, or neutral rupture). In this case, it would be short-circuited and may damage the switchboard.
- A device protecting the surge arrester against short circuits is therefore required to ensure the safety of the electrical installation.

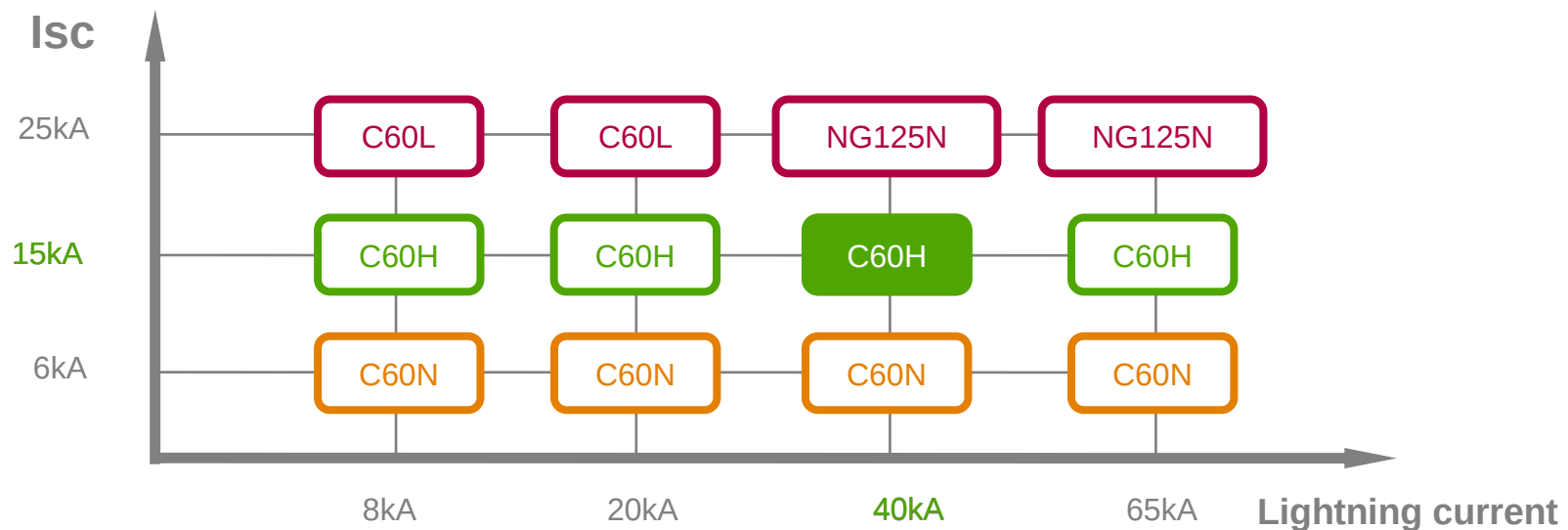
➔ The surge arrester must be **protected upstream** by a **disconnection circuit breaker**.



Choose the best upstream
protection for a surge arrester

2 aspects must be taken into account

- When making your choice, take into account:
 - lightning current withstand capacity (to avoid nuisance tripping),
 - short-circuit withstand capacity of the installation (Isc).

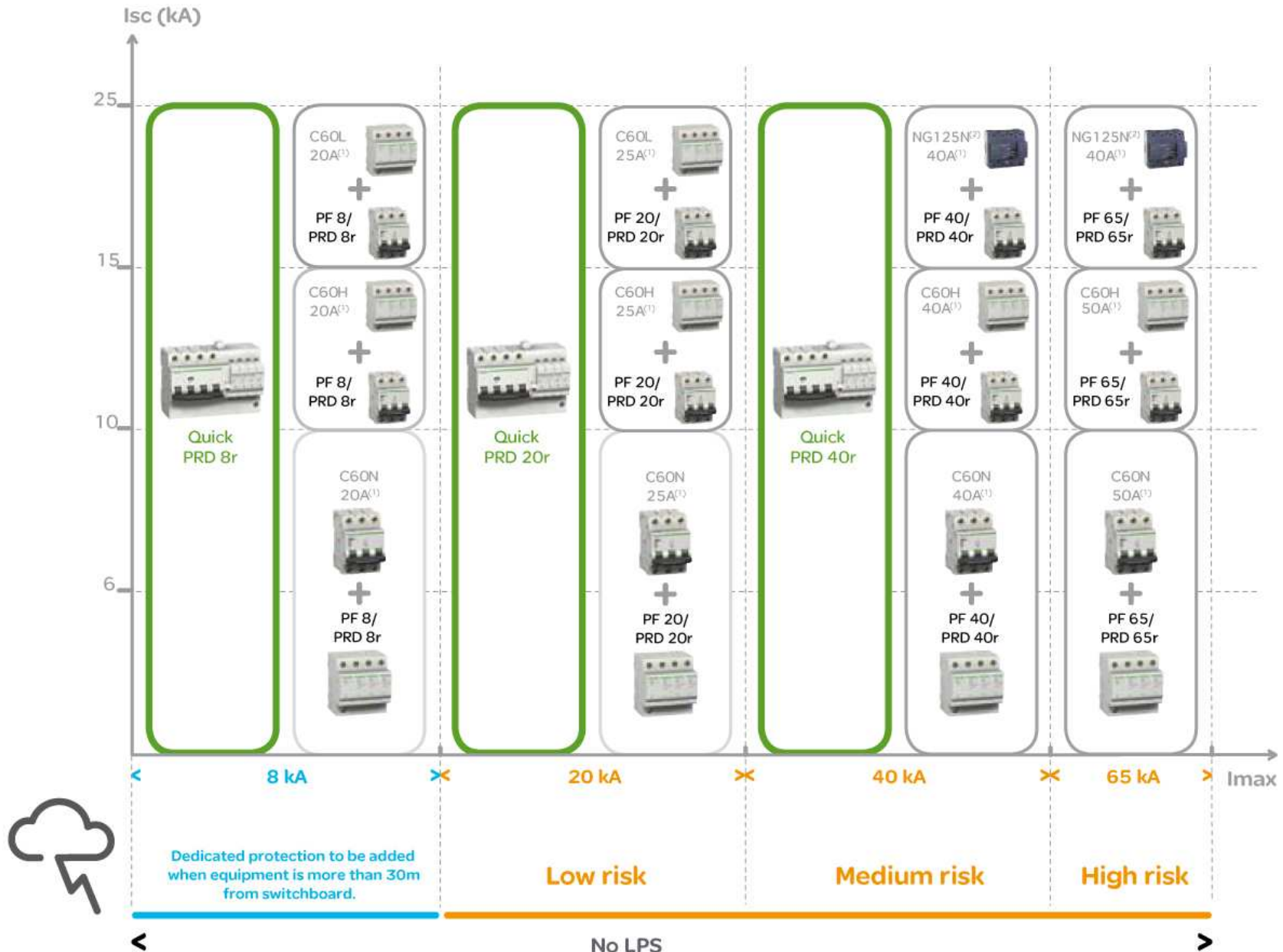


- E.g. the best disconnection circuit breaker for a breaking capacity of 15kA and I_{max} of 40kA is a C60H.



The surge arrester/protection device coordination table is supplied by **Schneider Electric**.

Example of Schneider Electric coordination table

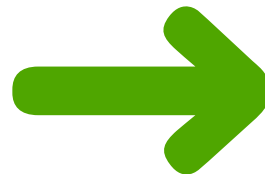


Schneider Electric innovates for safe coordination and easy installation

- **Quick PF** and **Quick PRD** include both an upstream circuit breaker and a surge arrester, thus ensuring:
 - no risk of coordination error,
 - continuity of service.

Safe
Efficient
Easy selection

**Quick PF and
Quick PRD**



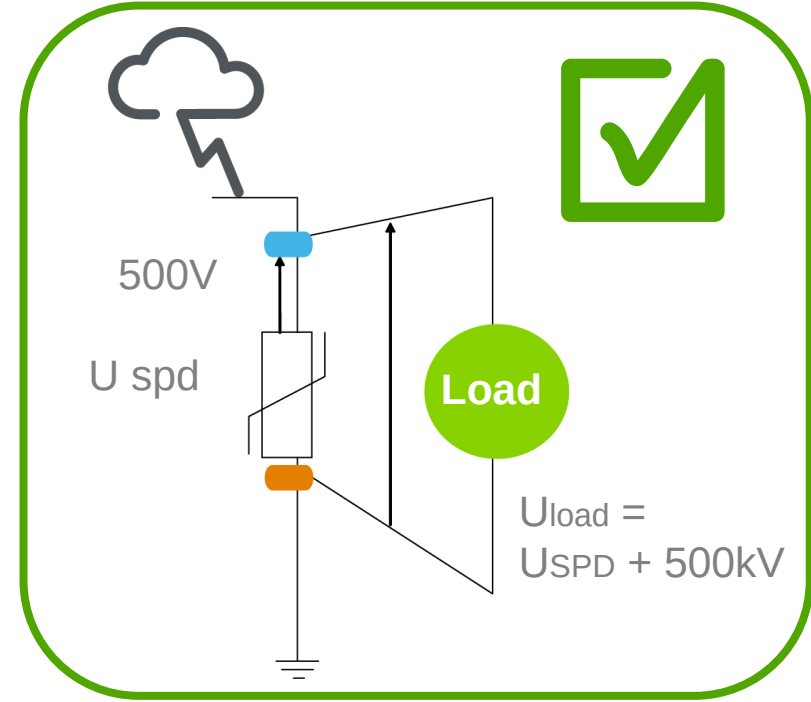
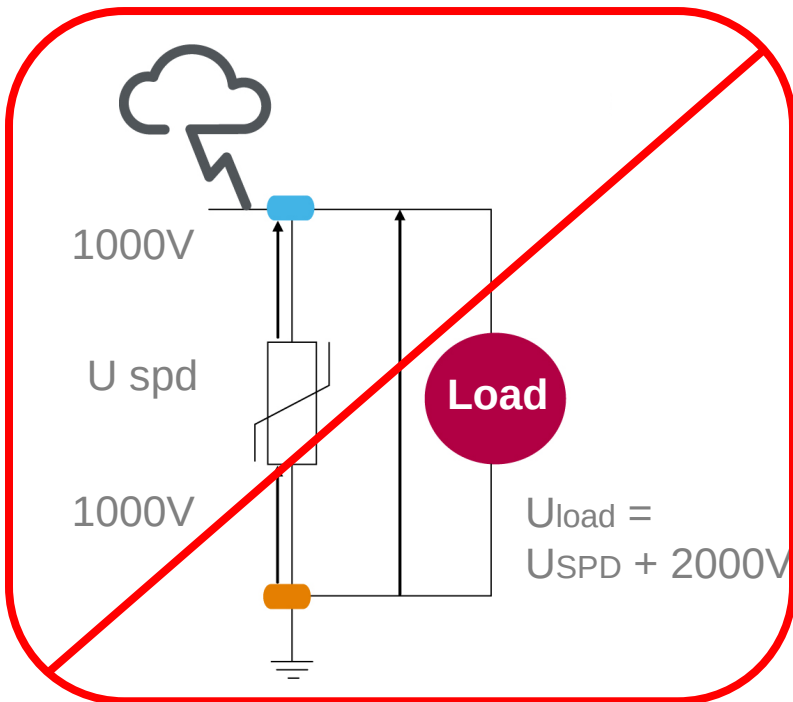
Installation rules



**The surge arrester is effective
only if it is properly installed!**

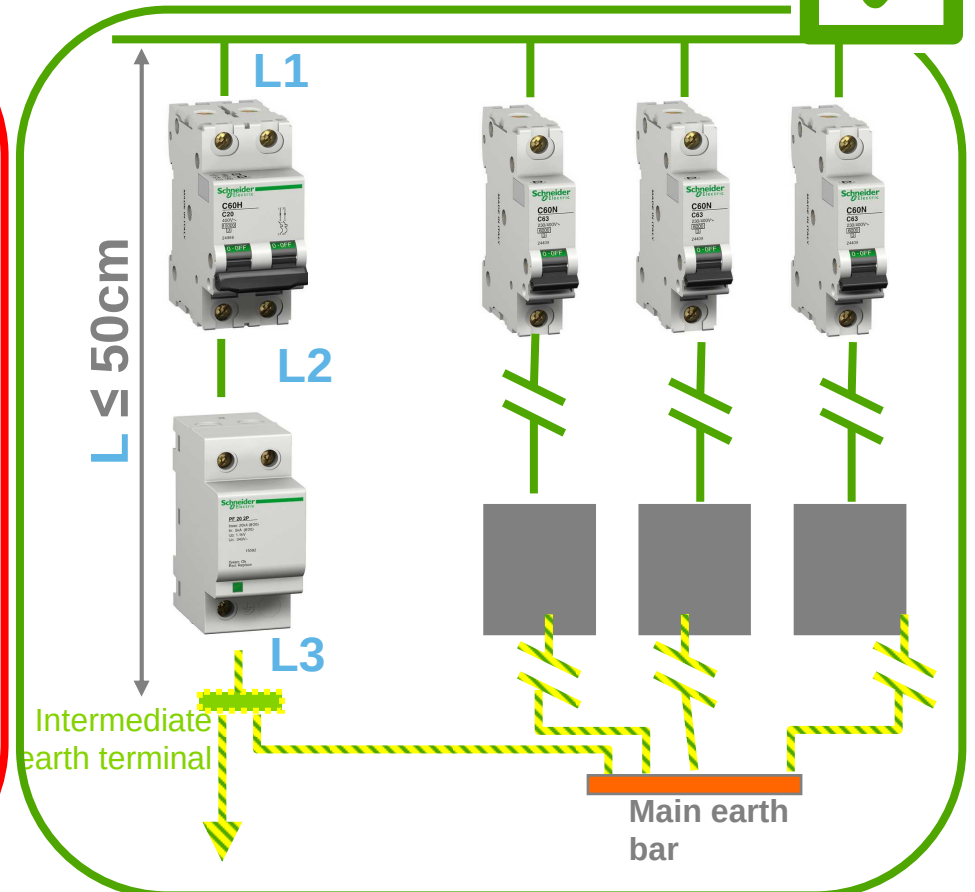
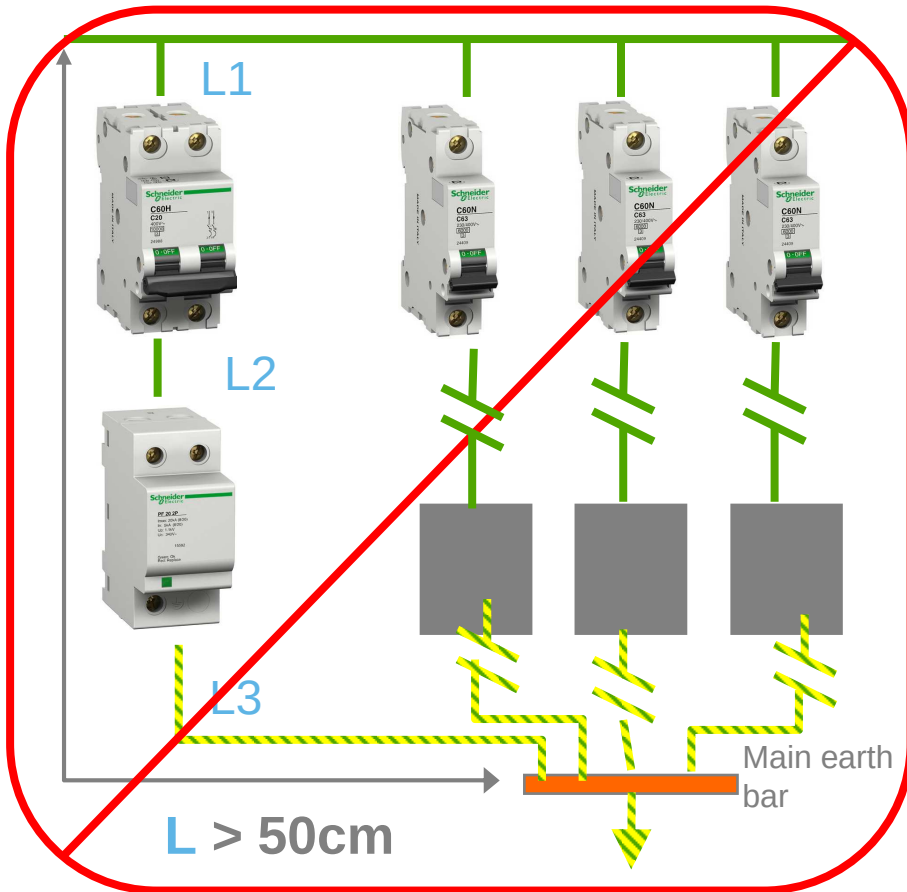
Installing a surge arrester

- Lightning is a phenomenon that generates a high frequency voltage:
 - The **length of the cables** must be taken into account in cases of high frequency
 - 1 metre of cable crossed by a lightning current generates an overvoltage of 1,000V.



For an effective surge protection, shorten the length of cables.

In practice: consider the intermediate earth terminal to shorten cables length

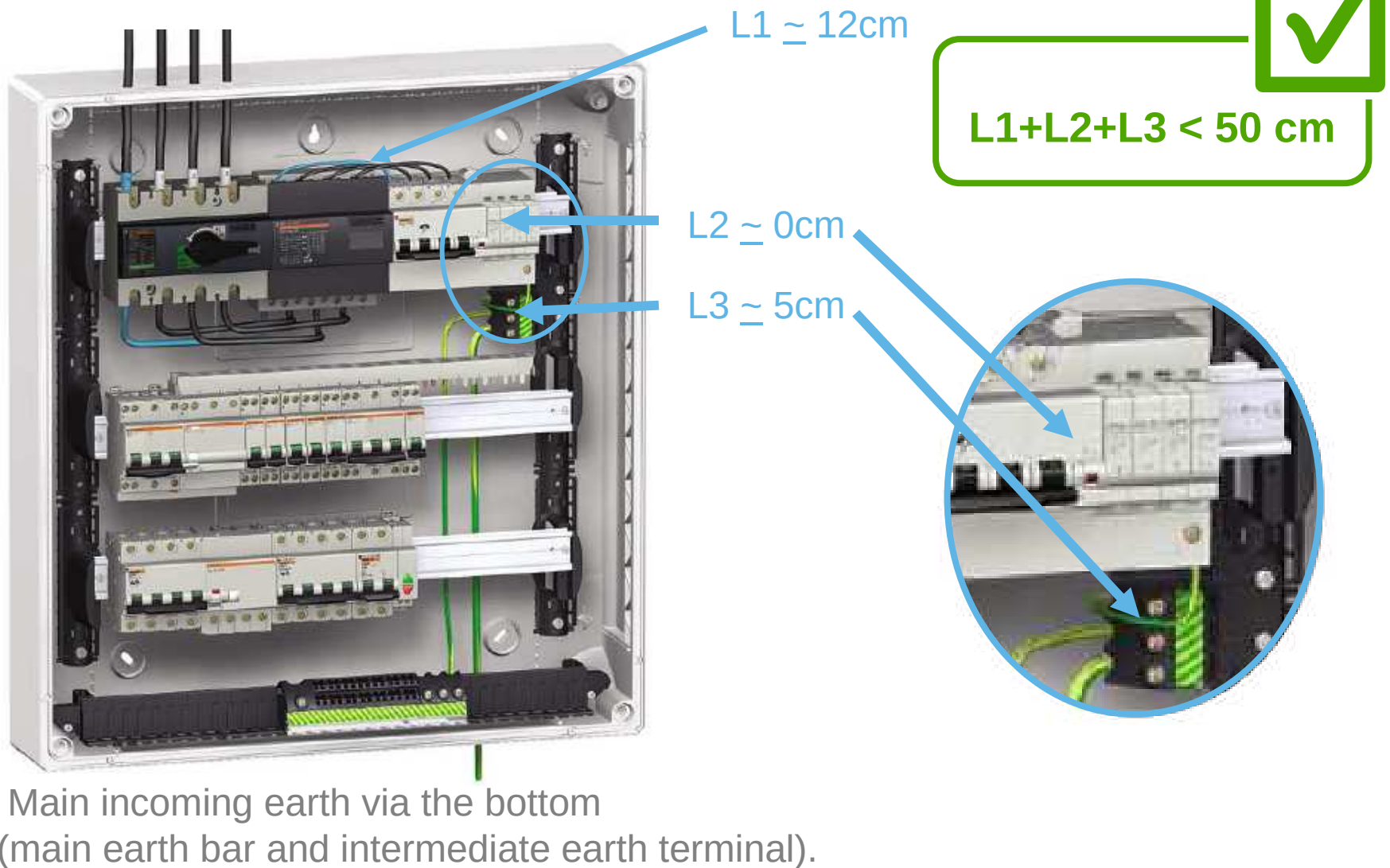


Mandatory in Standard IEC 60364-5-534:

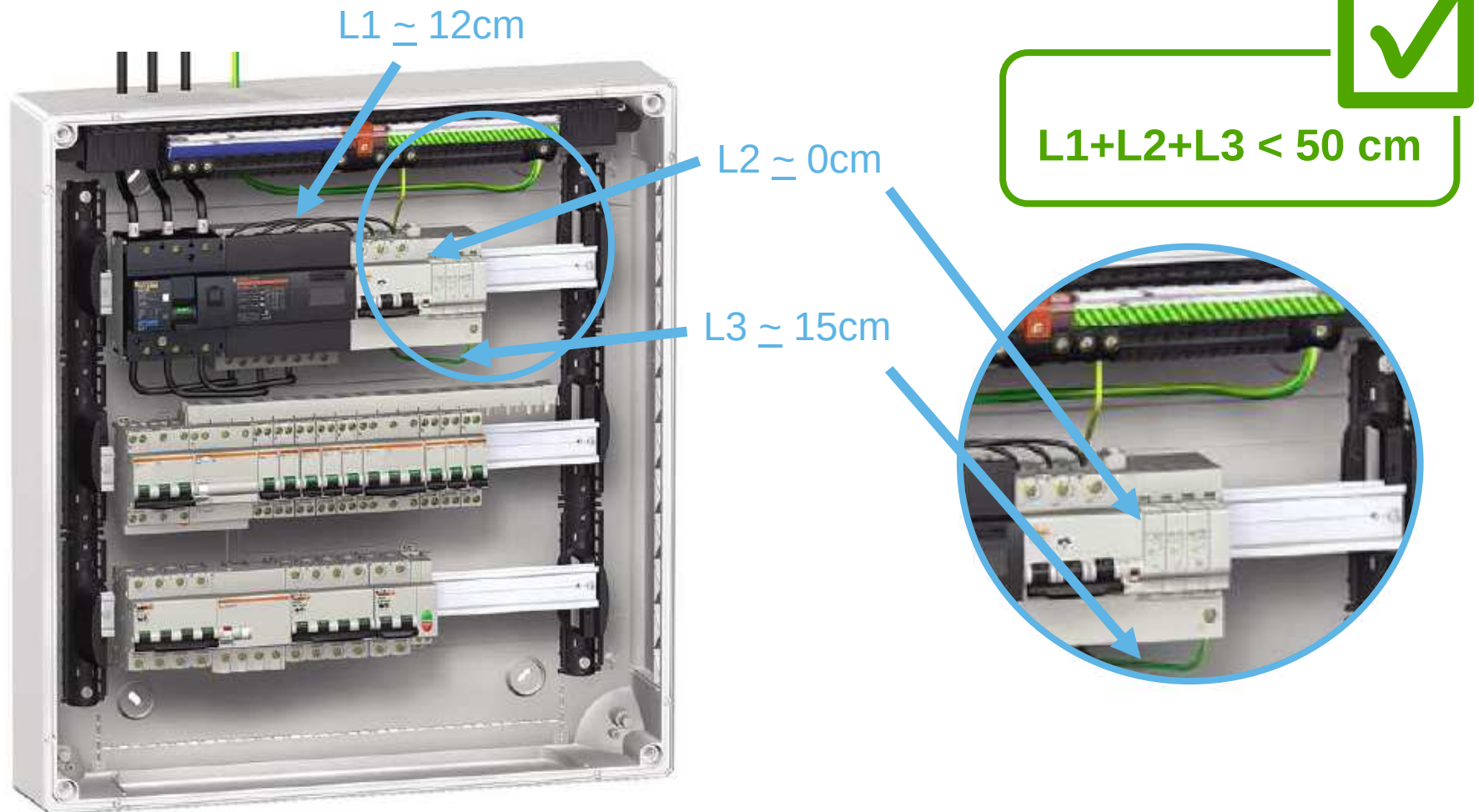
- L (length of cables) < 50cm,
- cable cross-section $S < 4\text{mm}^2$ (Type 2) and $S < 16\text{mm}^2$ (Type 1).

$$L = L1 + L2 + L3$$

Installation in a plastic enclosure (e.g. Pragma)



Installation in a plastic enclosure (e.g. Pragma)



Incoming earth cable via the top
(main earth bar and intermediate earth terminal).

Installation in a metal enclosure (e.g. Prisma Plus)

- Directly on "metal chassis".
- Use a lock washer to connect the cable to the chassis to give a good electrical contact.



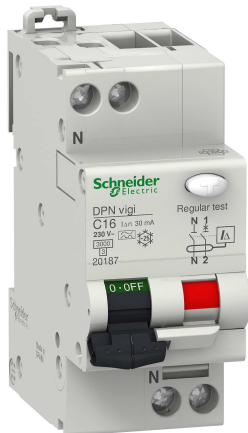
The installation is possible
only if the enclosure complies
**with standard
IEC 60439-1.**



ELECTRICAL DISTRIBUTION PROTECTION

Protection of people

Against permanent failure (due to overcurrent, overload, earth fault)

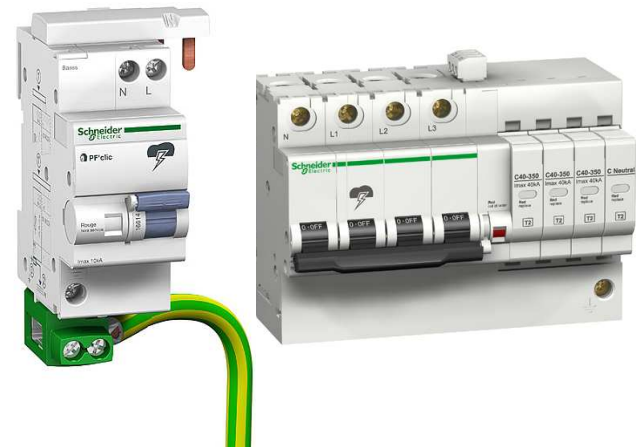


Circuit protection



Protection of sensitive equipment

Against temporary failure (overvoltage, lightning)



In the low-voltage system, the surge arrester is essential to **ensure complete protection.**