MD EQUIPOS TECNOLÓGICOS

ELECTRICAL PROTECTION SYSTEMS

AIDITEC SYSTEMS

INDEX

WHO WE ARE?

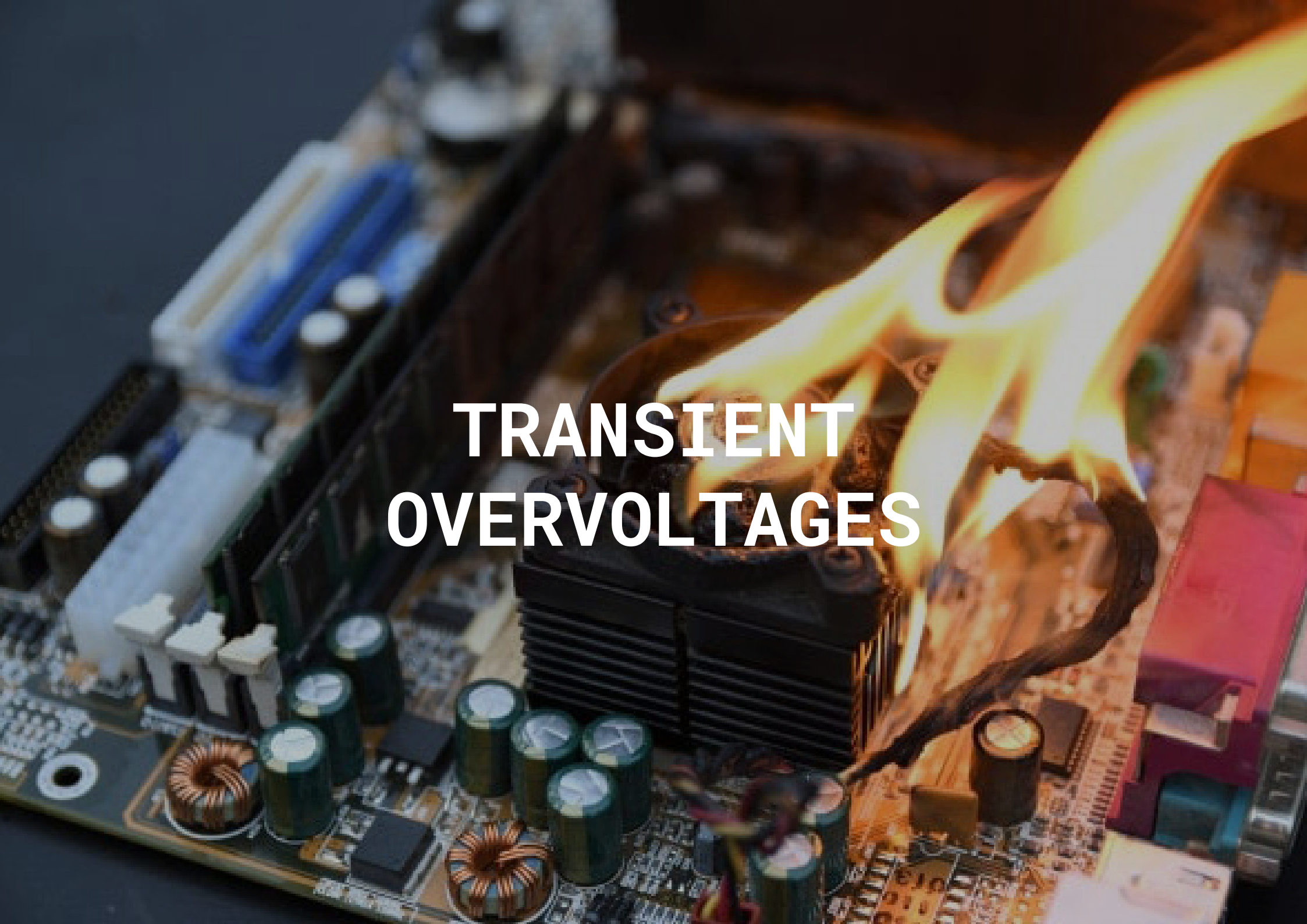
SPECIALISTS IN THE PROTECTION OF ELECTRICAL, COMPUTER AND COMMUNICATION INSTALLATIONS.

MD Equipos Tecnológicos is a company located in Valencia with more than 20 years of experience.

At present we are a group of companies formed by MD Equipos Tecnológicos, MD Asenerval and Aiditec Systems.

We are dedicated to the manufacture of electrical protection equipment against overvoltages, both internal and external:

- Surge protectors: SPD
- MF / AF surge and harmonic protectors: SPU
- Lightning rod: ESE
- Railway



TRANSIENT OVERVOLTAGES

2.1.DEFINITION

Transient overvoltages it’s when a very high voltage increases, of the order of kV, and of very short duration (of the order of microseconds), caused mainly by the impact of a lightning, but can also be caused by faulty network switches.

They are phenomena that are transmitted in high frequency, of the order of kHz.

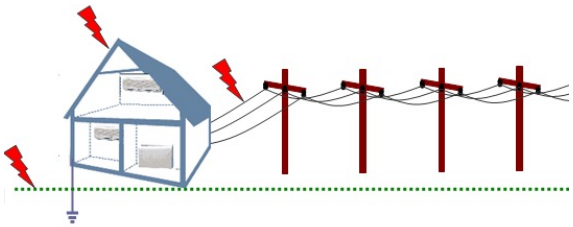
2.2.TYPES OF OVERVOLTAGES ACCORDING TO THEIR ORIGIN

Overvoltages of **atmospheric origin**

- direct overvoltages
- distant surges

Overvoltages of **industrial origin** / **network maneuvers**

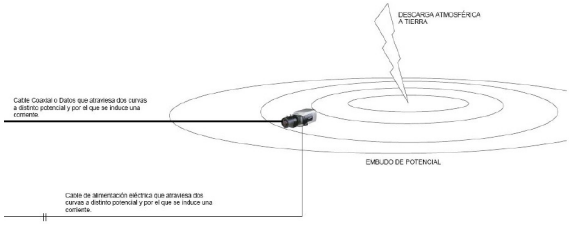
- surges generated by electrical loads
- overvoltages generated in the electrical distribution network



Direct atmospheric surges

They are those in which the lightning strikes at some point from which it can impact, in a conducted way, on the loads of the installation.

- A lightning strike on the high voltage lines that feeds the installation.
- Lightning strike on telephone lines.
- Lightning strike on the lightning rod.
-

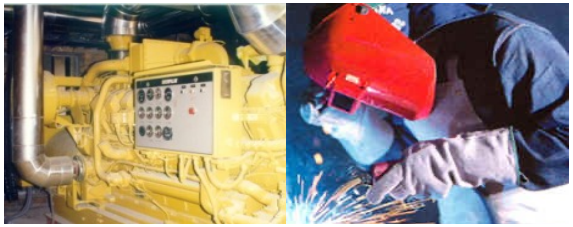


Overvoltages of distant atmospheric origin

They are those in which the lightning strikes a point on the ground more or less remote and independent of the industrial facility being analyzed.

When a lightning strike falls to the ground, a potential funnel is generated that gives rise to potential differences, the worse the resistivity value of the ground, the higher the voltages that appear.

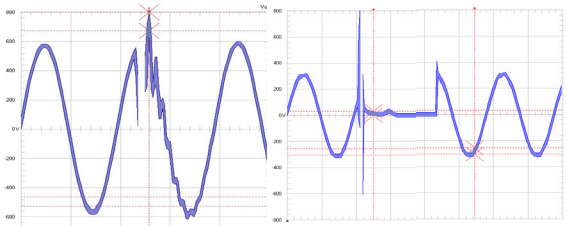
Surge of industrial origin



They are those that are generated by the installation's own loads:

- Starts and stops of high power engines.
- Welding machines.
- Poor timing of cogeneration and generator sets
- Emergency or maintenance stops.
- Sudden disconnections of power loads. FCEM of the connected loads.
- Connection and disconnection of capacitors.
- Machines with brushes.

Distribution network source surges



They are those that are generated in the electrical distribution network itself:

- Micro cuts caused by maneuvering in the network.
- Entry of capacitors into substations.
- Current variations in distribution lines: For example after the disconnection of a large load (Factory)
- Drop of a phase to ground.
- Poor quality of electricity supply.

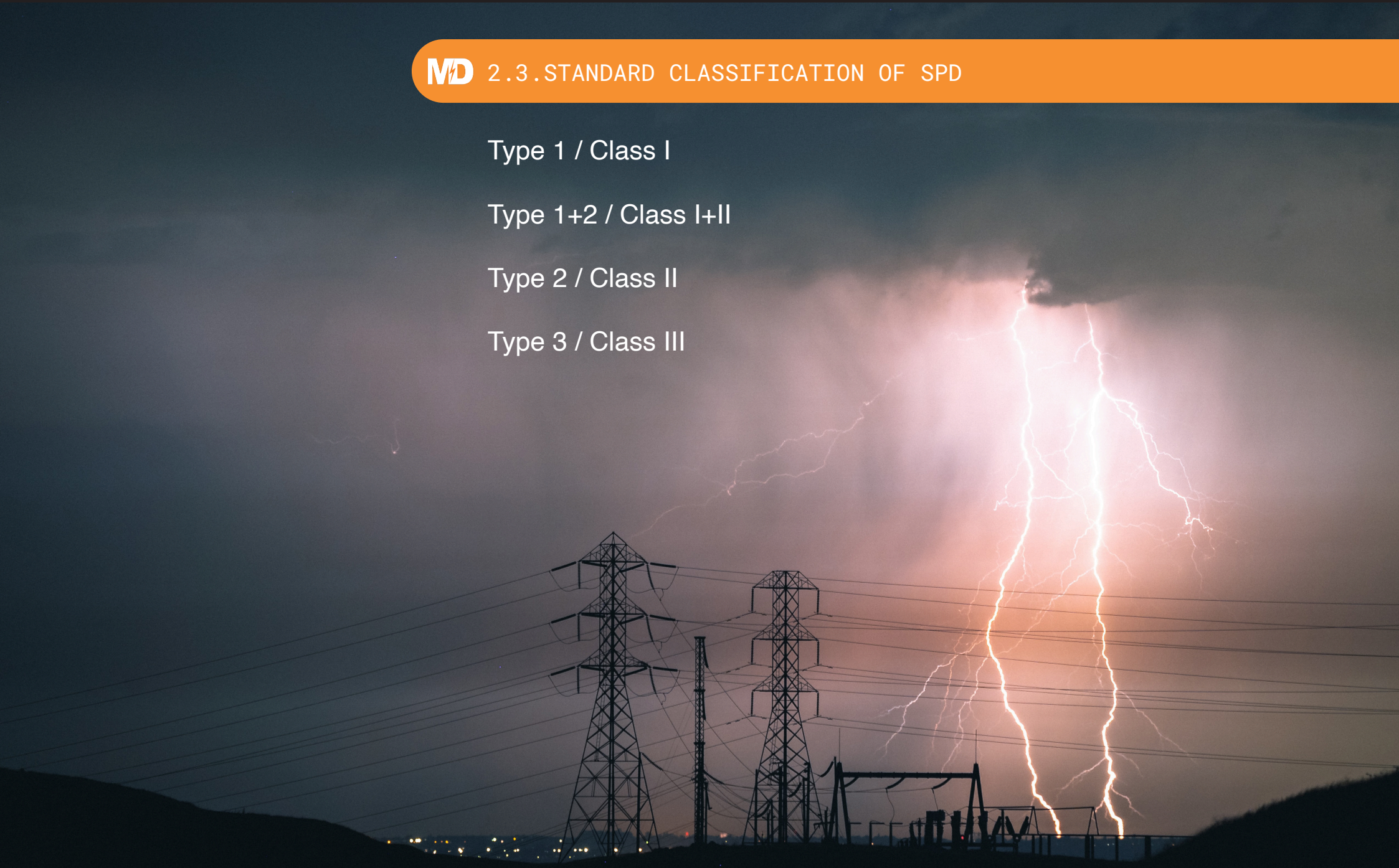
2.3.STANDARD CLASSIFICATION OF SPD

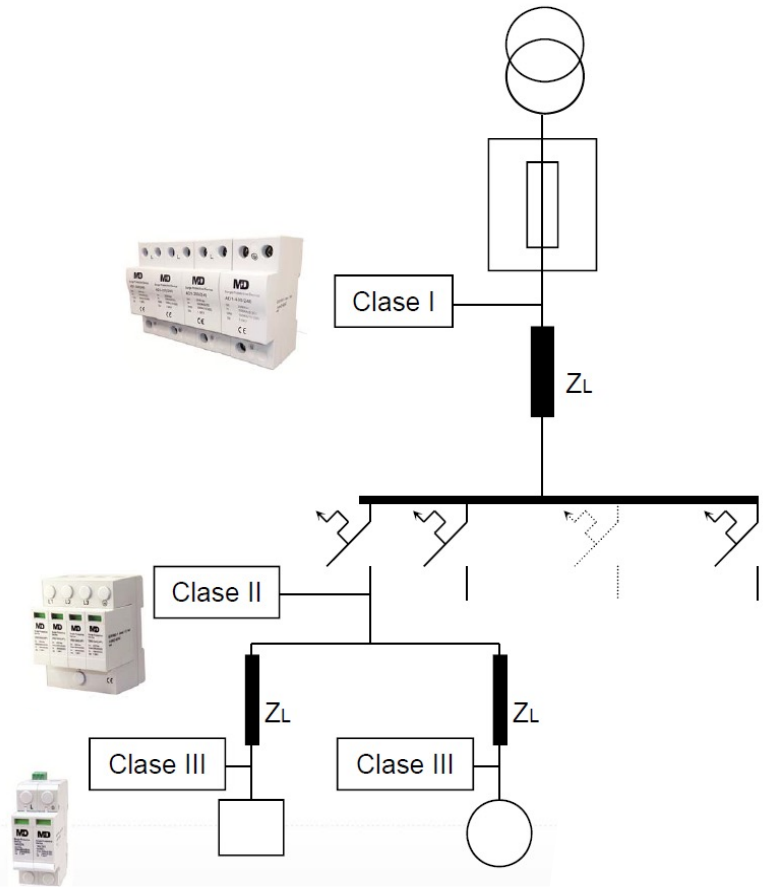
Type 1 / Class I

Type 1+2 / Class I+II

Type 2 / Class II

Type 3 / Class III



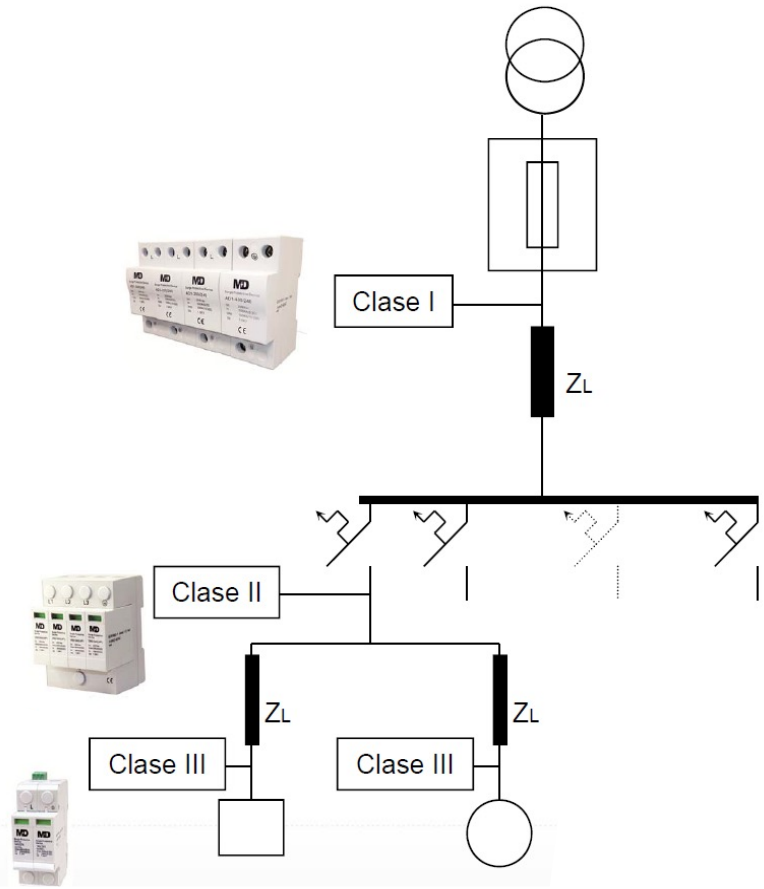


Type 1 / Class I

They are installed downstream of the general breaker.
Advisable in those facilities where there is a high probability of atmospheric discharges. They must be coordinated with Type 2 protectors to ensure the protection of the receivers.
Slower response than Type 2.
10/350 μs tests

Type 1 + 2 / Class I + II

They are installed downstream of the general breaker.
At the head of electrical installations.
They combine characteristics of Type 1 and 2.



Type 2 / Class II

They are installed in secondary panels.
At the head of electrical installations. They protect electrical and electronic equipment against transient overvoltages of atmospheric origin and maneuvering.
8/20 μs test

Type 3 / Class III

They are installed next to the load to be protected.
Coordinated with Type 2. They are installed in the feeding of the final receivers.
Test at 1.2/50 μs

2.4.SPD INSTALLATION MODE

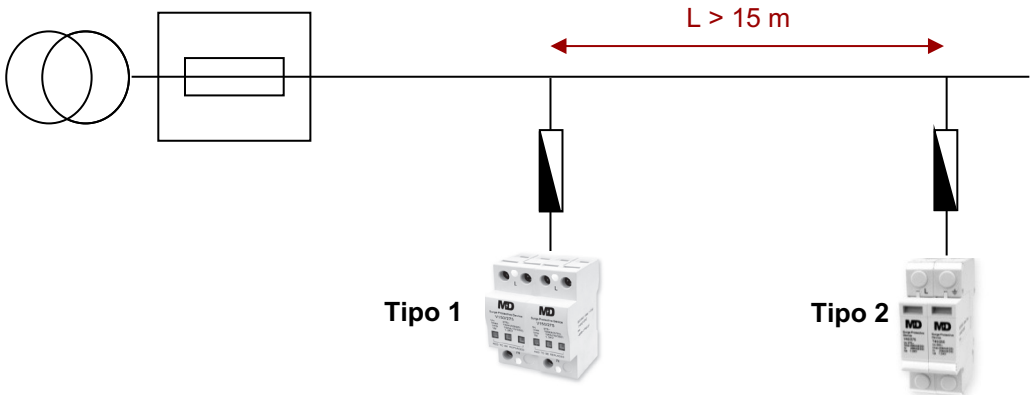
SPD equipment is installed in bypass with the electrical installation.

They have to be installed by means of fuses or circuit breakers.

The fuse or circuit breaker installed must have a breaking capacity suitable for the installation and its amperage must be lower than the immediate upper cutting element.

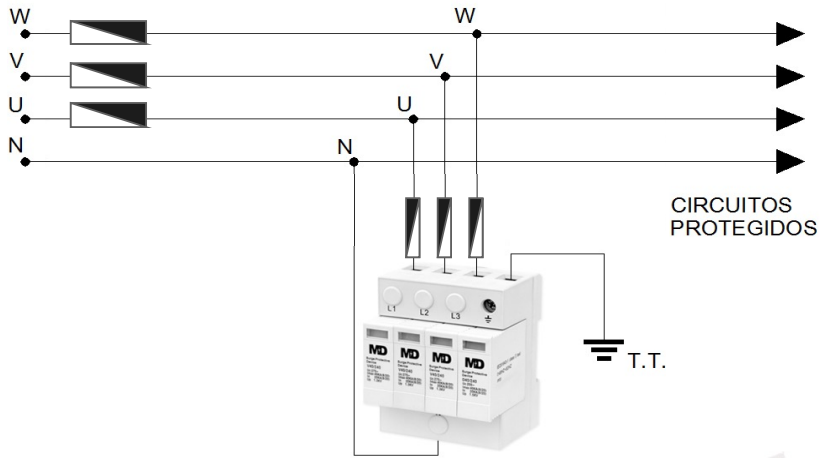
The different classes of arresters must be installed respecting a minimum electrical distance (Principle of energy coordination) that ensure their coordinated operation, in such a way that that provide the protection that the installation requires. Likewise, it is recommended to install an exclusive cut-off element for the surge protector.

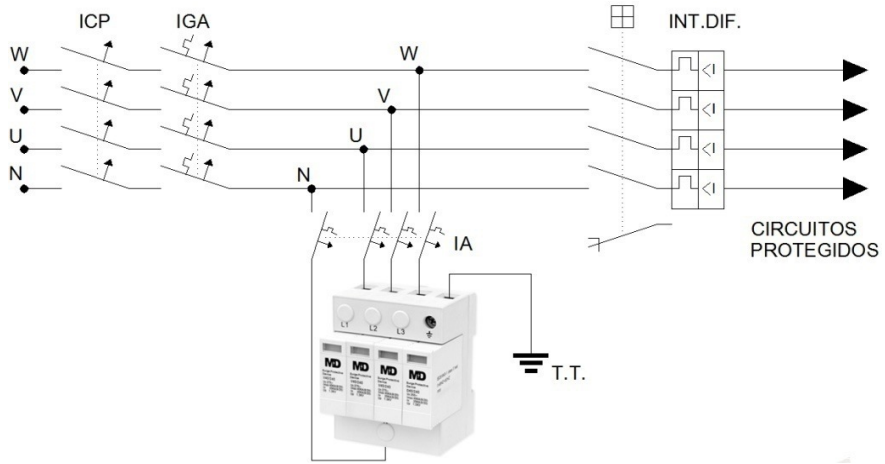
TYPE 1: Response speed = 100 μs
TYPE 2: Response speed = 25μs



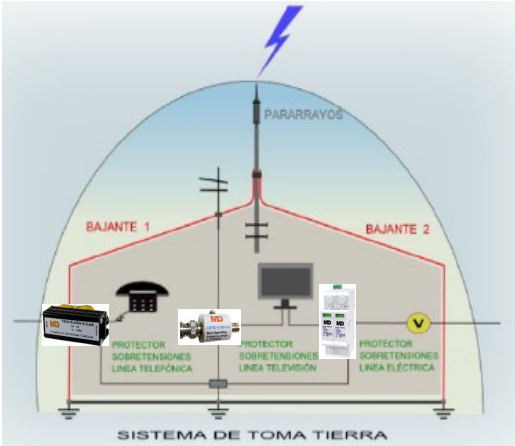
UNCOUPLING COILS: Installing decoupling coils achieves the correct operation of the equipment, despite this it makes installation more expensive, space problems increase and it is very limited to low power installations since it requires the installation of elements in series.

TYPE 1 + 2 EQUIPMENT: effective, simple, economical and safe solution in those cases in which the provision of at least the first two levels of protection is necessary, the characteristics of the installation do not allow the provision of the different classes of arresters required in a staggered and coordinated way.





2.5.PROBLEMS AND SOLUTIONS IN INSTALLATIONS



INSTALLATIONS WITH LIGHTNING RODS

Electromagnetic fields: The sudden currents generated by the lightning will give rise to a magnetic field that will induce currents in any conductor close to the downconductor of the lightning rod.

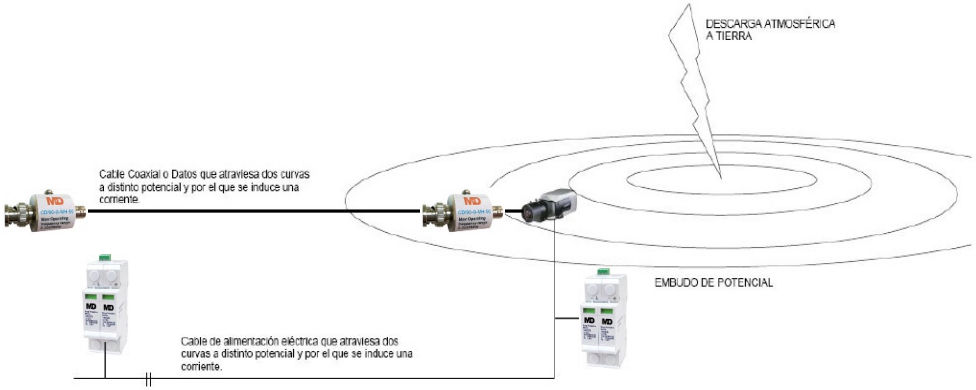
Insulation faults: Lightning discharges can enter installations if at the moment that the lightning rod channels the lightning to ground, a lack of insulation appears, causing the lightning to enter our installation.

SOLUTION: Install surge suppressors on boards electrical cables and in any conductive cable (electricity, data, coaxial, ethernet, etc) that passes next to the lightning rod downcomer.

LARGE INSTALLATIONS

In large installations, such as army barracks, mining operations, solar parks, logistics centers, etc., where there are cables that run long distances, currents can be induced when lightning strikes the ground.

When a lightning strike falls to the ground, a potential funnel is generated that gives rise to potential differences, the worse the resistivity value of the ground, the higher the voltages that appear. Thus, if an electrical, coaxial, data cable, etc., runs between two curves of different potential, a current will be induced on the conducting cable, causing the loads connected to said cable to fail.



SOLUCIÓN: Install surge suppressors at both ends of the conductor cables to prevent the induced current from affecting both the load and from entering the installation through the conductor cable.

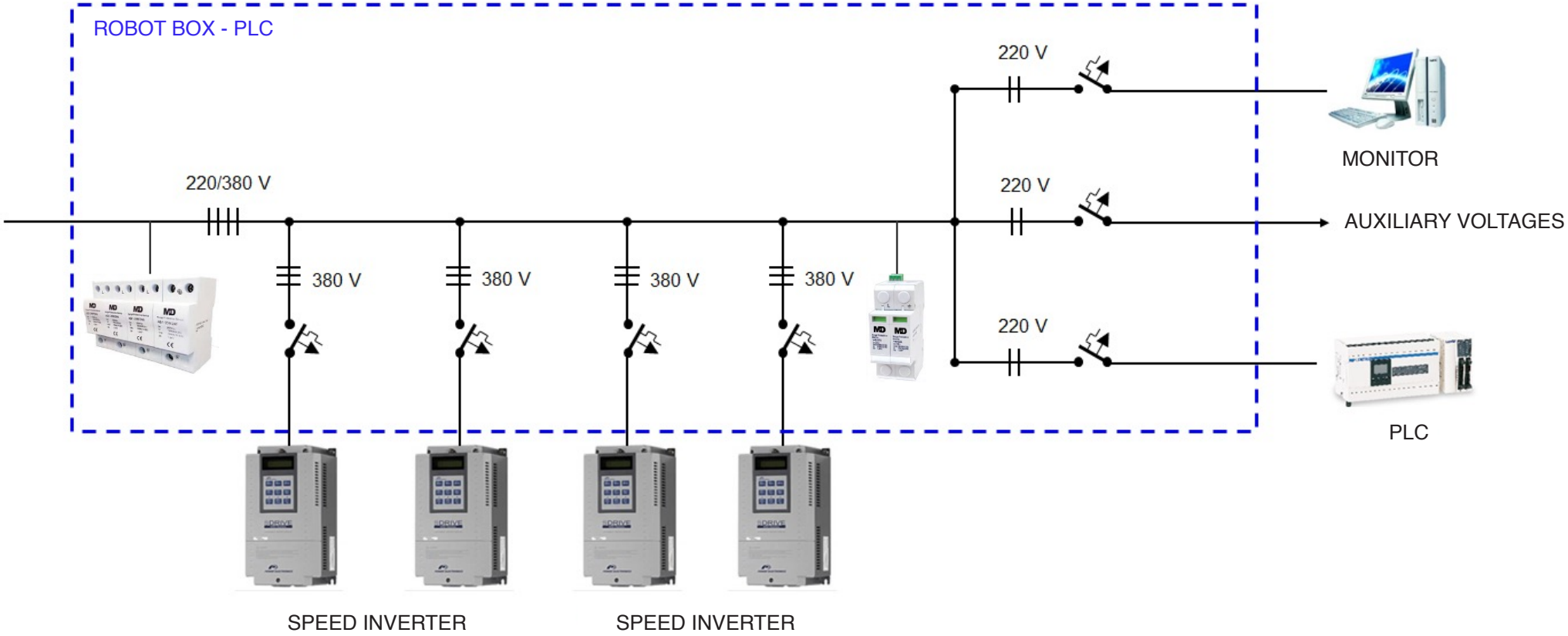
INDUSTRIES / COMPANIES

It is common for companies and industries with a lot of electronics to cause breakdowns in electronic boards, power supplies and electronic equipment in general: PLC's, switchboards, computers, variable speed drives, servers, cash registers, etc.

The main reason for these faults are transient overvoltages that affect the most sensitive loads. As we have seen previously, these transient peaks have their origin in:

- Atmospheric discharges on the electrical network that are transmitted to all your subscribers
- Overvoltages generated in the distribution network: Maneuvers, micro-cuts, voltage variations.
- Overvoltages generated by the industry itself: The equipment of welding, variable speed drives, power motors, shocks electrostatics, etc., generate transient peaks that deteriorate little by little the most sensitive equipment.

SOLUTION: Install surge filters in the electrical supplies of the most sensitive loads.


ROBOT BOX - PLC
220/380 V
380 V
380 V
380 V
380 V
220 V
220 V
220 V
MONITOR
AUXILIARY VOLTAGES
PLC
SPEED INVERTER
SPEED INVERTER

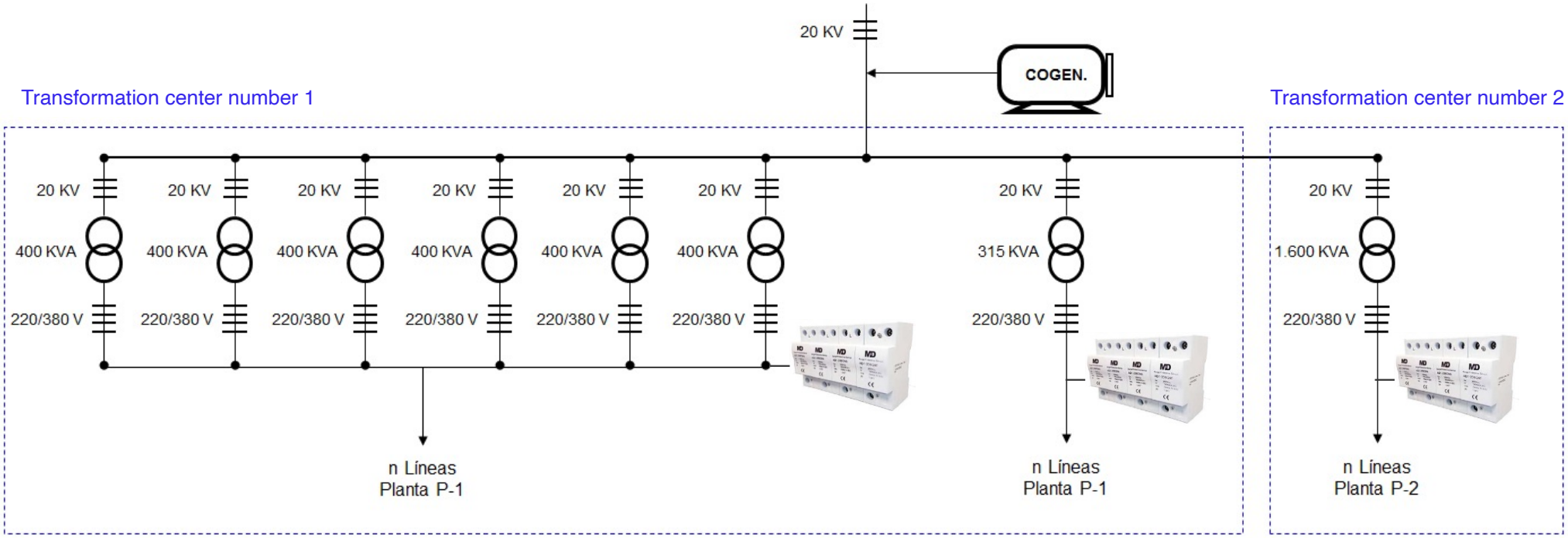
FACILITIES AFFECTED BY POOR SUPPLY QUALITY

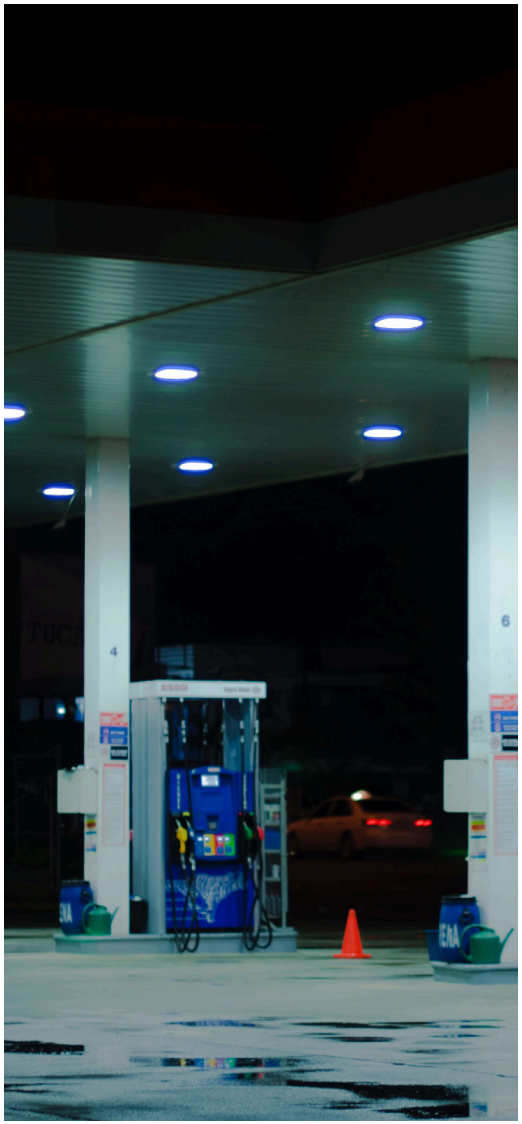
Micro-cuts: In the event of a micro-cut caused by the maneuvers carried out in the electrical network, mainly due to switching of the substations, transient voltage peaks will be generated (caused by the counter-electromotive force) that will be transmitted throughout the electrical network affecting the all users of it.

Voltage fluctuations in the electrical network:

- Current variations in distribution lines: For example after the disconnection of a large load (Factory)
- Drop of a phase to ground.
- Poor quality of electricity supply

SOLUTION: Install a surge filter on the main panel of the installation. Additionally, filters can be installed in the most sensitive lengths.


20 KV
COGEN.
Transformation center number 1
Transformation center number 2
20 KV
400 KVA
220/380 V
315 KVA
1.600 KVA
n Líneas
Planta P-1
n Líneas
Planta P-1
n Líneas
Planta P-2



INSTALLATIONS NEAR HIGH VOLTAGE LINES

The high voltage lines have a guard wire that runs in parallel with the phases and discharge to earth in the towers.

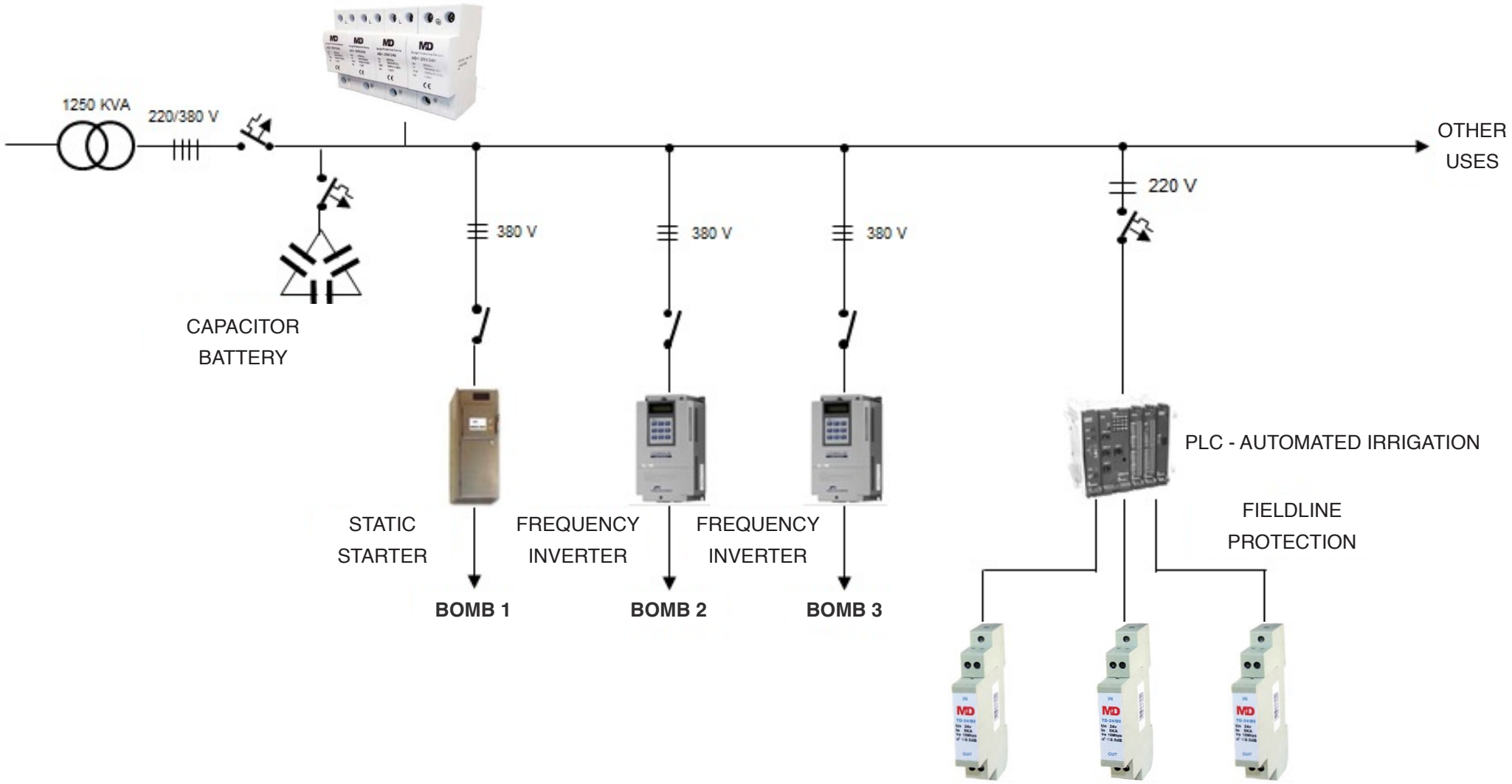
SOLUTION: Install surge suppressors on main board.

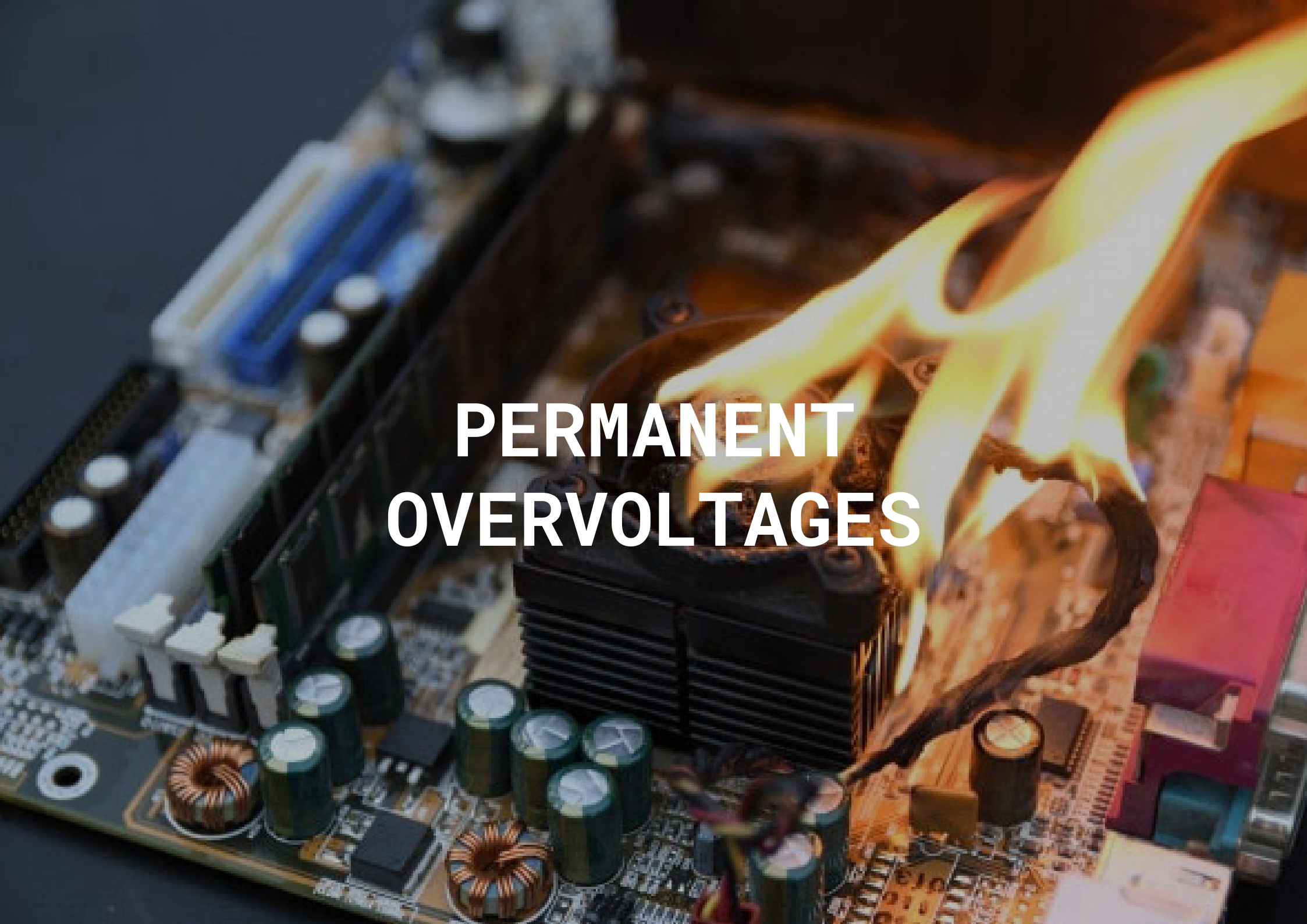
END OF LINE AND / OR ISOLATED INSTALLATIONS

These types of industries include: Pumps, pump heads, irrigation, gas stations, farms, emission centers, etc. End-of-line installations are exposed to 3 problems:

- The long distances covered by the high voltage lines collect all the effects of the line.
- High risk of lightning strikes on them, when traveling hundreds kilometers.
- They are also often affected by power dips and surges.

SOLUTION: Install surge filters on the main board.


1250 KVA
220/380 V
OTHER USES
220 V
380 V
380 V
380 V
CAPACITOR BATTERY
PLC - AUTOMATED IRRIGATION
STATIC STARTER
FREQUENCY INVERTER
FREQUENCY INVERTER
FIELDLINE PROTECTION
BOMB 1
BOMB 2
BOMB 3



PERMANENT OVERVOLTAGES

3.1.DEFINITION

A permanent overvoltage is a relatively long overvoltage in a given place, and which is usually due to network operations or faults in the installation itself.

The duration of these overvoltages is given by the time it takes for the medium voltage protections to act, and the automatic switch to clear the fault.

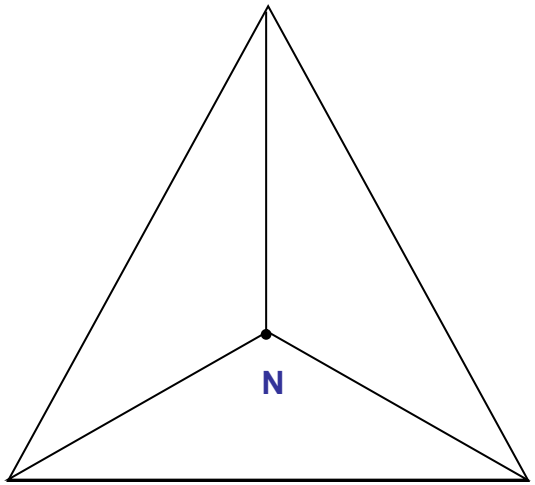
The only way to protect against these events is to disconnect the line.

At certain levels it can be protected by voltage stabilizers.

3.2.ORIGIN OF PERMANENT OVERVOLTAGES

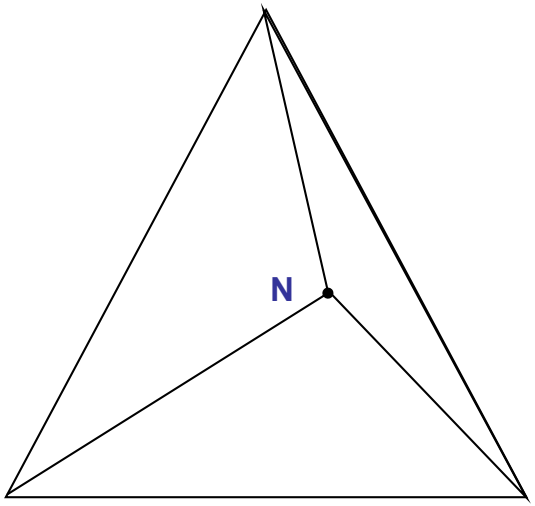
- Voltage variations in the electrical network itself.
- Voltage variations with connection and disconnection of loads from high consumption, both in the network and in the installation itself.
- High voltages near substations.
- Neutral fail.

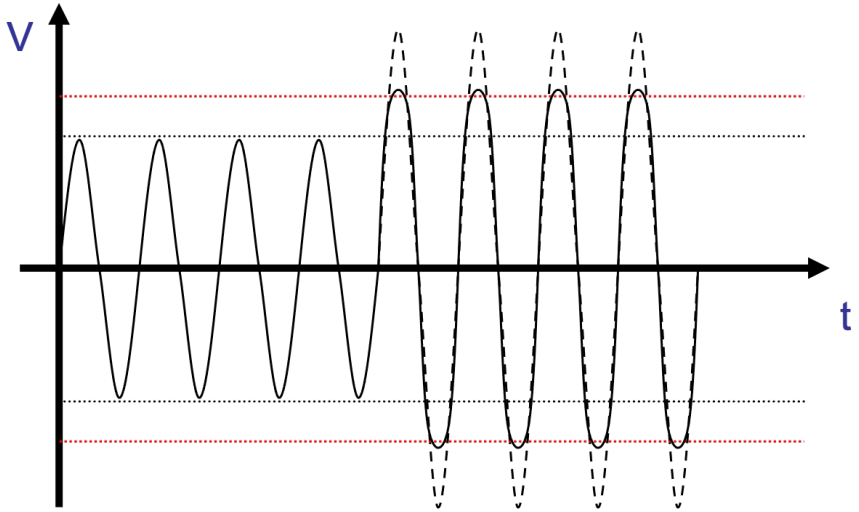
3.3.NEUTRAL CUT



If the neutral fails, load unbalances occur and it causes dangerous overvoltages in the receivers connected between phase and neutral, a very common case in low voltage distribution networks. The neutral cut will result in immediate failure of the receivers fed downconductor of the cut.

SOLUCIÓN: Install a permanent overvoltage relay that disconnect the line if the simple voltage exceeds a certain value, for example 260V.

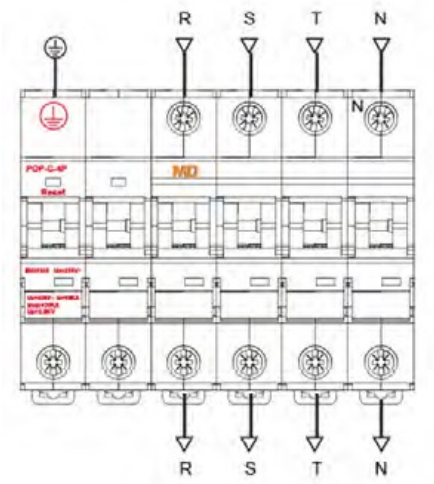




3.4.POP EN-50550 REGULATION

The equipment of the POP series (acronym in English for Power frequency Overvoltage Protector) conform to the European standard EN: 50550. This standard applies to permanent surge protectors for domestic use in 230 Vac installations (between phase and neutral) and 50Hz frequency.

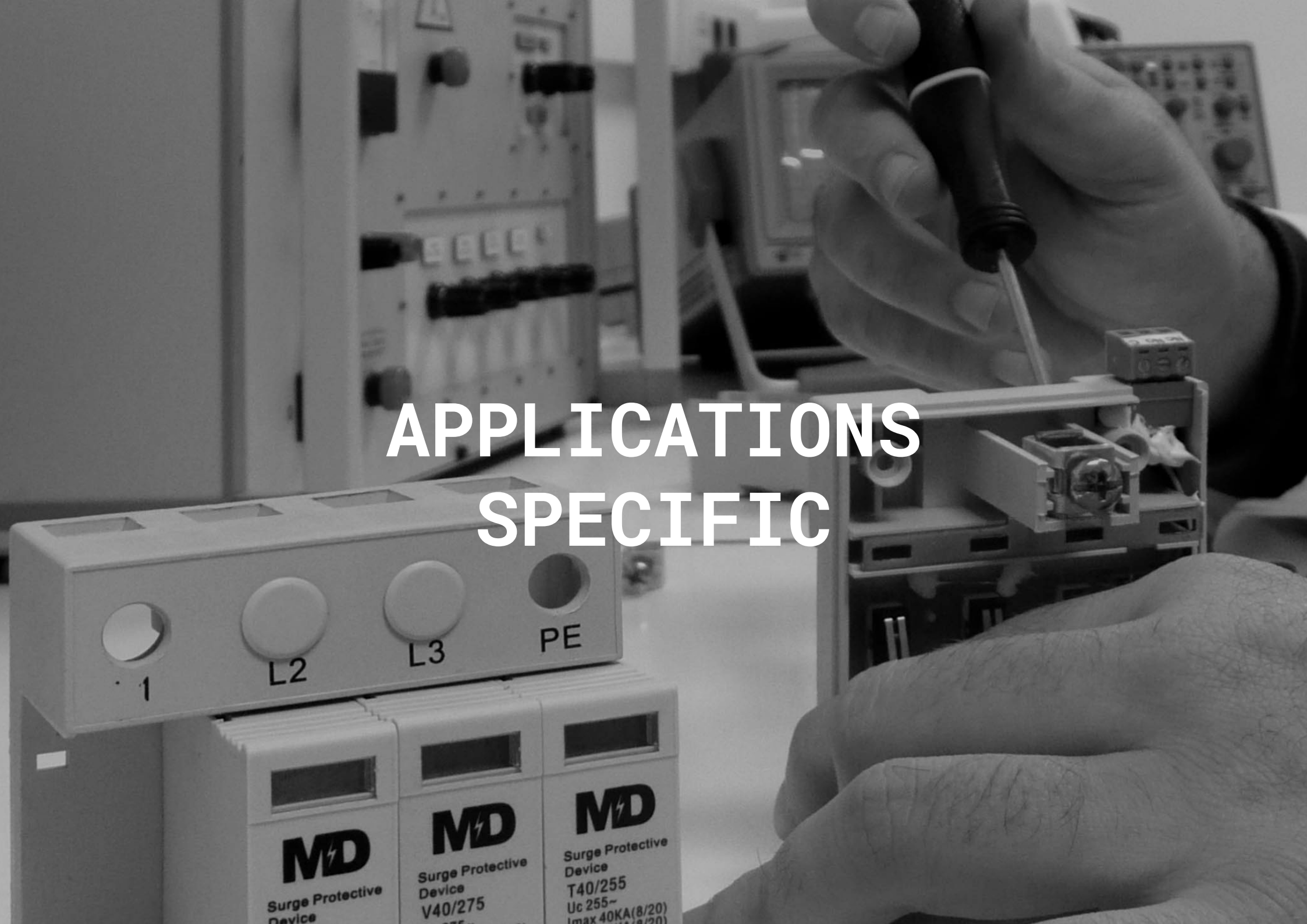
These equipments, when a permanent overvoltage occurs, will act on the cut-off element associated with the same equipment, disconnecting the installation from the electrical network to prevent the overvoltage from affecting the equipment downstream of the POP.



POP protectors must comply with the following trip curve:

	POP trip and non-response curves				
	225 V	275 V	300 V	350 V	400 V
Maximum shooting time	No disparo	15 s	5 s	0,75 s	0,20 s
Maximum no response time		3 s	1 s	0,25 s	0,07 s

Mandatory in residential and electric vehicle chargers (ENDESA)



APPLICATIONS SPECIFIC

CRITERION: TYPE OF NETWORK TO PROTECT

Alternating power supply

Continuous power supply

Photovoltaic

Telephony

Coaxial

Data buses: RS485, RS232

4-20mA signals

Ethernet, PoE

LED lighting

Self-consumption

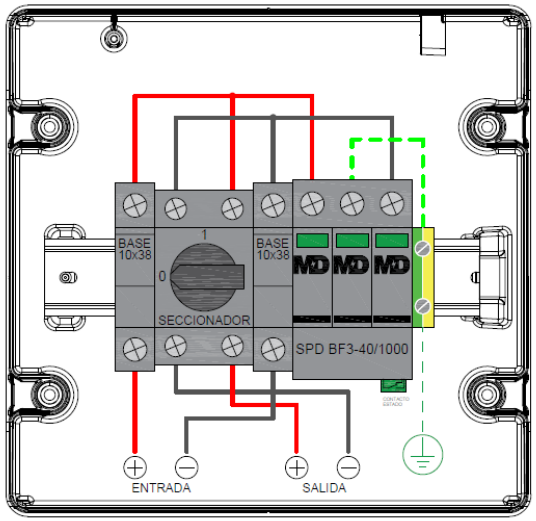
Electric vehicle chargers

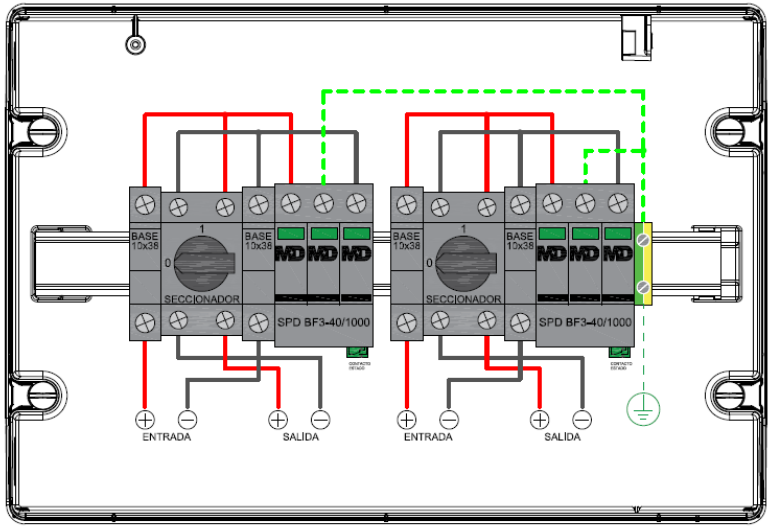
PROTECTION OF SELF-CONSUMPTION INSTALLATIONS (SPF)

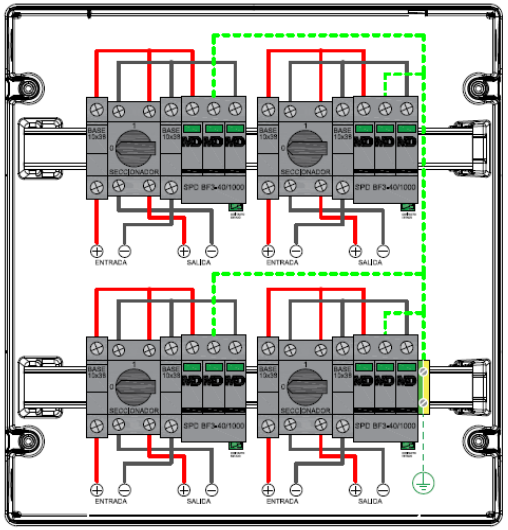
MODULAR PANELS FOR PHOTOVOLTAIC INSTALLATIONS

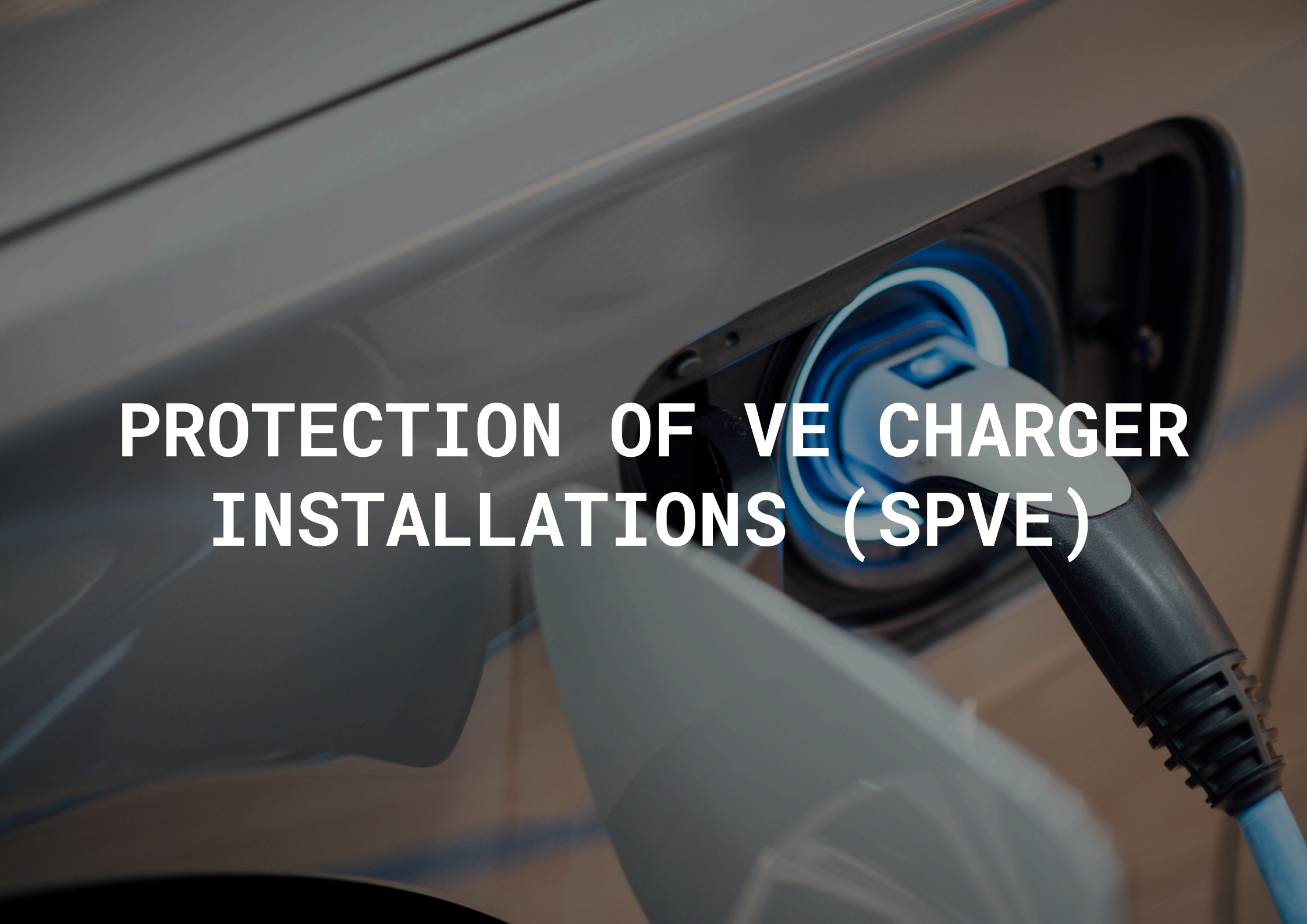
The SPF protection panels with a compact and easy-to-install solution for the protection of solar self-consumption installations.

Due to the location of this type of installation, the set of photovoltaic patents or strings of a photovoltaic installation are exposed to the effects of lightning, both by direct impact, and through inductions or potential funnels, causing overcurrents and overvoltages in the installation.









PROTECTION OF VE CHARGER INSTALLATIONS (SPVE)

MODULAR PANELS FOR ELECTRIC VEHICLE CHARGERS

SPVE panels are specially designed to protect vehicle charging stations as specified in ITC-BT-52.

These panels protect the vehicle charging station against short circuits, ground faults and overvoltages.

Protection against permanent overvoltages complies with the POP 50: 550 standard, protecting the installation against voltages higher than 275V.

The protection against transient overvoltages will protect the loads against voltage peaks of atmospheric origin, as well as transients associated with the operations carried out in the electrical network.

Options: They can also be supplied with lock, Schuko base, differentials with automatic reclosing, polycarbonate housing and energy meter.

SPU PROTECTORS: SURGE AND HARMONICS MF/AF (RFI)

SPU EQUIPMENT

Stepped protection systems against overvoltages and harmonics of medium and high frequency for power networks in low voltage alternating current.

Technical Features	SPU Series 4S, 2S	SPU Series 4D, 2D	SPD Series
Installation mode	Series	Parallel	Parallel
Protection sets coordinated with each other	4	3	1
Type protection (Class)	1+2	1+2	1 or 2 or 3
Discharge capacity Itotal kA 8/20us	180 - 3.800	180 - 4.500	10 - 400
Discharge capacity Itotal kA 10/350us	25 - 875	25 - 975	0 - 100
Residual values (V)	250/450	250/450	< 1.200
MF/AF harmonics filter	yes	yes	no
Exclusive protection L-N	yes	yes	yes
Exclusive protection L-L	yes	yes	no
Exclusive protection L-G	yes	yes	no
Exclusive protection N-G	yes	yes	yes

MARCOS MONTERO
Dpto. Ingeniería
MD Equipos Tecnológicos

tel.: +34 963 838 122
tel.2: +34 963 705 097
email: marcosmontero@mdelectro.es

ÁLEX CUENCA
International Sales Director
Aiditec Systems, S.L.

tel.: +34 963 842 957
mob.: +57 322 364 6336
email: acuenca@aiditecsystems.com