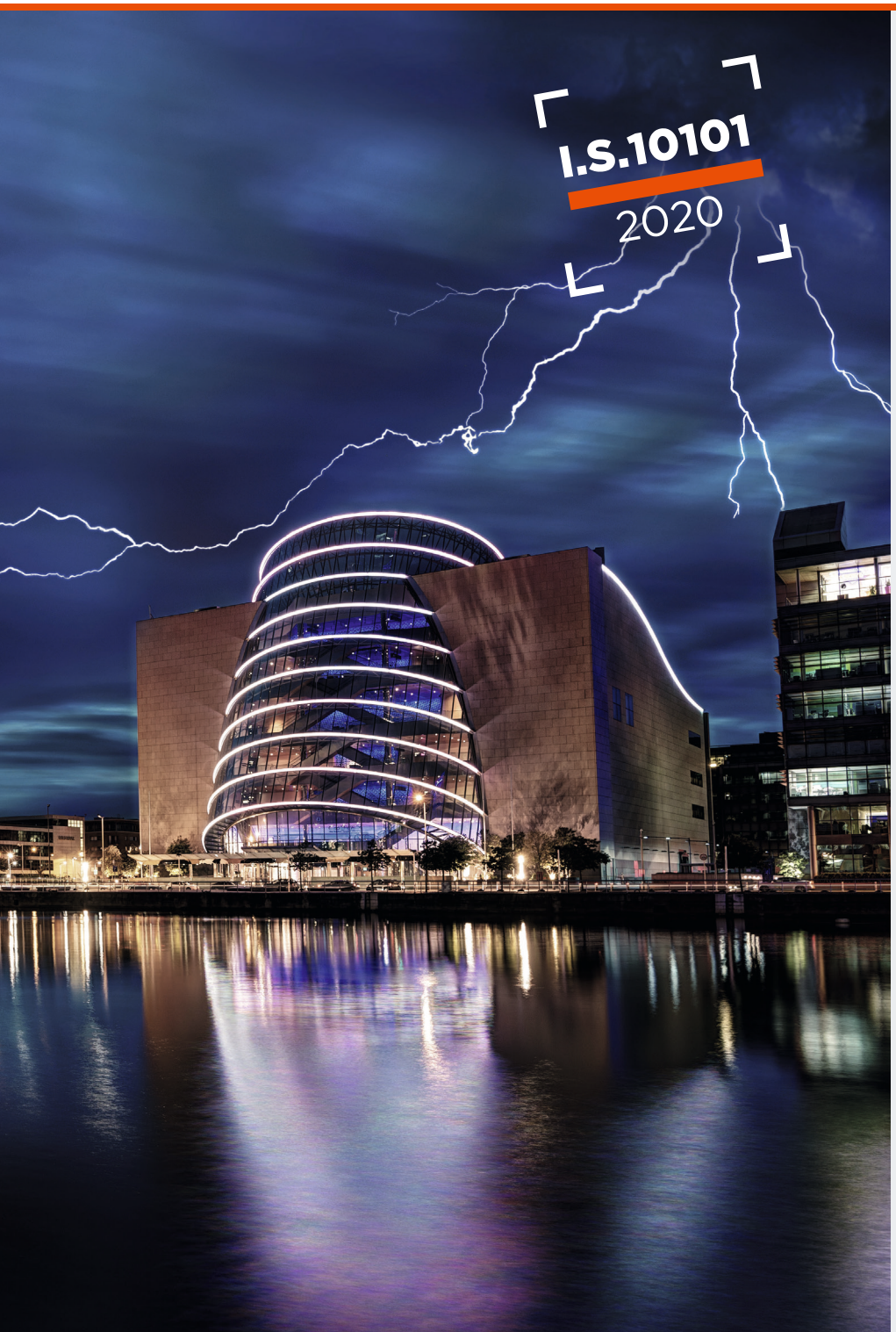
Expertise, our source of energy

SURGE PROTECTION SOLUTIONS

SURGE-TRAP® IEC TYPE 1, 1+2, 2, 2+3 LIGHTNING AND SURGE PROTECTION



INDEX

Expertise in power quality

Your global electrical power partner

Mersen is a leading market player with innovative solutions in the field of lightning and surge protection.

We design, manufacture, test and certify our products and your systems.

Safety & reliability for surge protection

- **Bringing together the experience** of the principal international **manufacturing and test standards** for SPDs (IEC and UL)
- **Unique expertise in the combination of SPD and fuse technology,** one of the hot topics in the SPD industry
- **Innovative ranges combining surge protection and ground monitoring** to provide full safety and continuity of service
- **World-class surge test platform,** with laboratories holding accreditations for both IEC/EN 61643-11 (Terrassa) and UL 1449 3rd ed (Newburyport)
- **Global manufacturing footprint** of a comprehensive range of solutions covering both IEC and UL markets
- **Leadership in POP (TOV)** (Power-frequency Overvoltage Protection) and combined **SPD+POP** devices. EN 50550.
- Wide range of solutions targeting **industrial, commercial and residential applications**

World-class surge test platform

Mersen is committed to **innovation.** The proof of that quest for continual improvement: a total of more than a million tests in 25 years!

In the field of lightning and surge protection Mersen has a highly specialised team, test laboratories, high investment in R&D, international patents and presence on standards committees.

Mersen has two surge test labs: one in Newburyport, Massachusetts, and one state of the art Lightning and Surge protection test lab in Terrassa, Spain, namely the Global Center of Excellence for IEC Surge Protection. The two are complementary, in terms of the available resources, to be able to offer the **widest possible range of tests to IEC, UL and NFC standards.**

Lightning and surge protection

Mersen offers a wide range of solutions along with advice and consulting services as well as after sale service

SPD – Surge-Trap®
Surge protective devices to IEC and NEMA/UL.
Also for telecom and signalling networks.

GND – Grounding system monitors.

POP (TOV) – Power-frequency Overvoltage Protection.
EN 50550. (Temporary Overvoltages TOV)

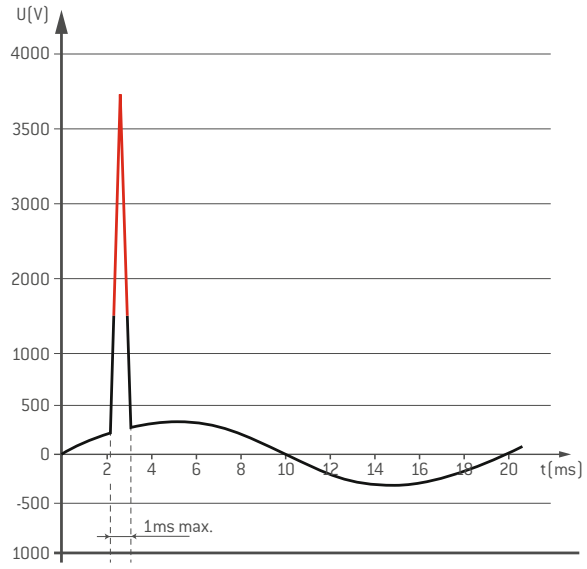
ESE – Electronic Early Streamer Emission lightning air terminals.

Mersen welcomes customers at both locations to run test campaigns focussed on critical points in their own bills of requirements

INTRODUCTION TO SURGE PROTECTION

What are surges?

Surges are transient over voltages that can reach tens of kilovolts with durations in the order of microseconds. Despite their short duration, the high energy content can cause serious problems to equipment connected to the line like premature ageing of electronic components, equipment failure or disruptions to service and financial loss.



When the peak voltage reaches a value higher than the equipment can withstand, it causes its destruction.

Origin of surges

- **Lightning:** The most destructive source of surge. Based on the IEC 61643-12 standard, energy from lightning can reach up to **200 kA**. However for reference, estimates indicate 65% are less than 20kA and 85% are less than 35kA.

- **Induction:** Sources include cloud to cloud lightning or nearby lightning impacts where the current flow induces an overvoltage on supply lines or other metallic conductors.

There is no way of really knowing when, where, the size, or the duration/waveform of a surge. Therefore, within the Standards, some assumptions have been made and 2 main waveforms have been chosen to simulate different surge events.

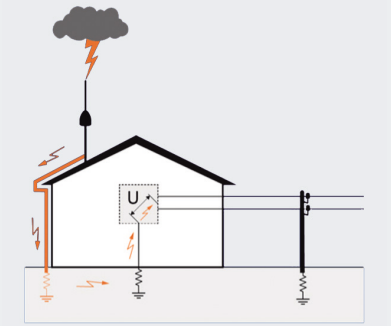
Types of Surges

Conduction
Conduction or 10/350 *µs* simulates energy from lightning direct impact

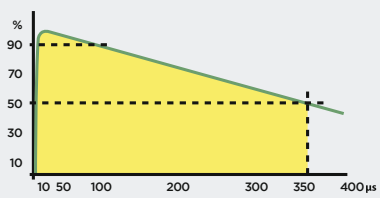
Induction
Induction or 8/20 *µs* simulates energy from indirect lightning impact

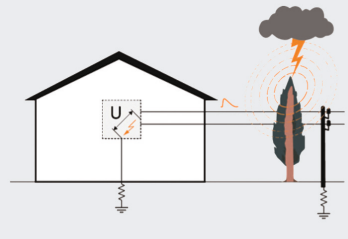
Do not confuse this kA rating with the fault levels of the installation.

Fault ratings given by the transformer are kA for 1 second. Surge kA rates are for microseconds. Protection in front of surge will be based on this statement.

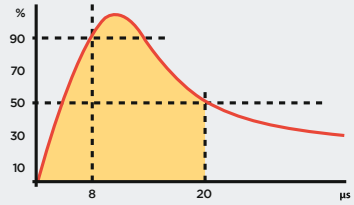


Current wave 10/350 *µs*





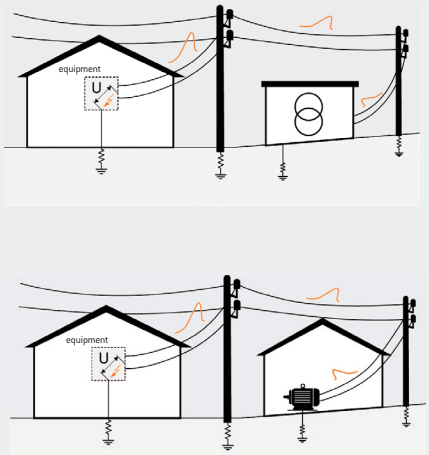
Current wave 8/20 *µs*



Internal sources:
These are the main sources of surge in real life

They come from utility grid switching, disconnection of motors or other inductive loads. Energy from these sources is also analysed with the 8/20 *µs* wave form.

Transient overvoltages do not occur solely in power distribution lines, they are also common in any line formed by metal conductors, such as telephony, communications, measurement and data.



Protector in front of surges: SPD (Surge Protection Device)

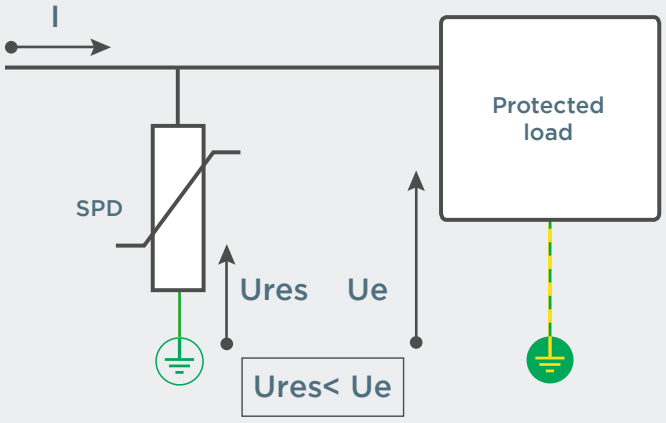
A transient overvoltage protection device acts as a voltage controlled switch and is installed between the active conductors and ground in parallel with the equipment to be protected. When the supply voltage is lower than its activation voltage, the protector acts as a high-impedance element so that no current flows through it. When the supply voltage is higher than the activation voltage, the protector acts as an element with impedance close to zero, diverting the over voltage to earth and preventing it from affecting equipment downstream.

Nevertheless, in the terminals of the SPD there will always be a residual voltage (Ures) which it is not a fixed rate. Because of the surge current, there will be a residual voltage across the SPD, that means higher surge current and higher residual voltage. To protect your electrical equipment the residual voltage across the SPD, including the wires and connections, needs to be less than the over voltage withstand of the equipment.

I: peak current

Ures: voltage protection level.
Residual voltage at In.

Ue: impulse voltage the equipment can withstand



SPD FEATURES BASED ON THE IEC 61643 STANDARD

Protector parameters

Up
Voltage protection level
Maximum residual voltage between the terminals of the protection device during the application of a peak current.

In
Nominal current
Peak current in 8/20 *µs* waveform the protection device can withstand 20 times without reaching end of life.

Imax
Maximum discharge current
Peak current with 8/20 *µs* waveform which the protection device can withstand.

Uc
Maximum continuous operating Voltage
Maximum effective voltage that can be applied permanently to the terminals of the protection device.

Iimp
Impulse current
Peak current with 10/350 *µs* waveform which the protection device can withstand without reaching end of life.

Classification of protectors

Protection devices are classified into types according to discharge capacity:

- **Type 1:**
  Tested with a 10/350 *µs* waveform (Class I test), which simulates the current produced by a direct lightning strike.

  Ability to discharge very high currents to earth, providing a high Up - voltage protection level.

  Must be accompanied by downstream Type 2 protectors. Designed for use in incoming power supply panels where the risk of lightning strike is high, for example in buildings with an external protection system.

- **Type 2:**
  Tested with a 8/20 *µs* waveform (Class II test), which simulates the current produced in the event of a switching or lightning strike on the distribution line or its vicinity.

  Ability to discharge high currents to earth, providing a medium Up - voltage protection level. Designed for use in distribution panels located downstream of Type 1 protectors or in incoming power supply panels in areas with low exposure to lightning strikes.

- **Type 3:**
  Tested with a combined 1.2/50 *µs* - 8/20 *µs* waveform (Class III test), which simulates the current and voltage that can reach the equipment to be protected.

  Ability to discharge medium currents to earth, providing a low Up - voltage protection level. Always installed downstream of a Type 2 protection, it is designed to protect sensitive equipment or equipment located more than 20m downstream of the Type 2 device.

  The technology can provide protection solutions that combine different types of protection: Type 1+2 and Type 2+3.

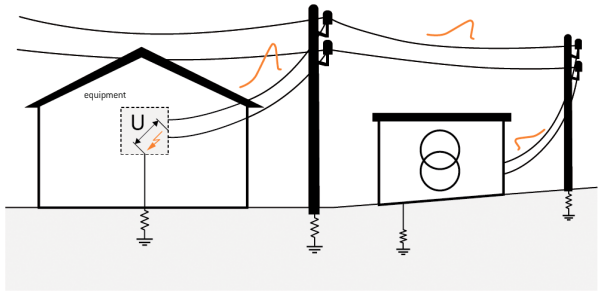
Typical current (Ityp); SPD performance that guarantees the surge protection in the real life

Iimp, Imax and In show the one off maximum robustness of the SPDs in heavy conditions. However, most surge currents are in practice lower and repetitive because of network switching or because of lightning inductions onto the power grid.

The Typical Surge Current (Ityp) is the value that statistically the SPD faces in real life. The value depends on the level of exposure:

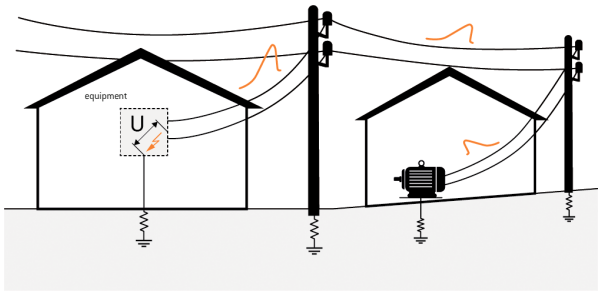
High exposed locations

Ityp=20kA 8/20 µs



Low exposed locations or internal surges

Ityp=5kA 8/20 µs



The lifetime is described by the number of hits that **the SPD is able to withstand at Typical Surge Current (Ityp).**

Lifetime of the SPDs: To estimate the lifetime of the SPD is a must in order to guarantee the protection. The **SPD must be designed in order to pass the test of the standards, but furthermore to guarantee a great performance in real life.**

The minimum lifetime values that we can expect are:

- **HIGH EXPOSED LOCATIONS: 100-200 peaks. Type 1+2 SPD** requirement; usually installed in the highest exposed locations.
- **LOW EXPOSED LOCATIONS OR INTERNAL SURGES: 500 peaks Type 2 SPD** requirement; usually installed in medium or lower exposed locations.

I.S.10101:2020

A step ahead for surge protection

Posted 6th March 2020 and effective from 1st April 2020, I.S.10101: 2020 introduces a big change in the surge protection requirements in the Republic of Ireland.

Firstly, the new Irish National Rules for Electrical Installations **opens the need for installing surge protection devices (SPD) in a very broad spectrum from public, commercial or industrial activities too, even consumer unit applications** depending on the circumstances. Secondly, the I.S. 10101: 2020 (based on the EN 62305-4 and EN 61643-12) describes the selection and the application of the surge protection devices too.

Where is surge protection required?

Section 443. Protection against transient overvoltages of atmospheric origin or due to switching states that protection against transient overvoltages shall be provided where the consequence caused by overvoltage affects:

- **Human life, e.g. safety services, medical care facilities**
- **Public services and cultural heritage, e.g. loss of public services, IT centres, museums, commercial or industrial activity, e.g. hotels, banks, industries, commercial markets, farms, a large number of individuals, e.g. large buildings, offices, schools**

For all other cases, a risk assessment according to 443.5 shall be performed in order to determine if protection against transient overvoltages is required. If the risk assessment is not performed, the electrical installation shall be provided with protection against transient overvoltages.

However, the transient overvoltage protection is not required for single dwelling units where the total value of the electrical installation to be protected is less than 5 times the economic value of the SPD located at the origin of the installation.

Protection against switching overvoltages should be considered in the case of equipment likely to produce switching overvoltages or disturbances exceeding the values according to the overvoltage category of the installation, e.g. where an LV generator supplies the installation or where inductive or capacitive loads (e.g. motors, transformers, capacitor banks), storage units or high-current loads are installed.

SPD PLACEMENT IN YOUR DESIGN
(I.S.10101 SECTION 534.4 "SELECTION AND INSTALLATION OF SPDs")

Which SPD should be selected?

Section 534 describes the selection and installation of SPD

Where to start the protection design and what is the SPD that should be installed?

As stated in section 534.4.1 SPDs shall at least be installed as close as possible to the origin of the installation. Thus **main switchboard** is the place to start the design of SPDs on the network. This section also states SPDs at the origin of installation shall be Type 1 or Type 2.

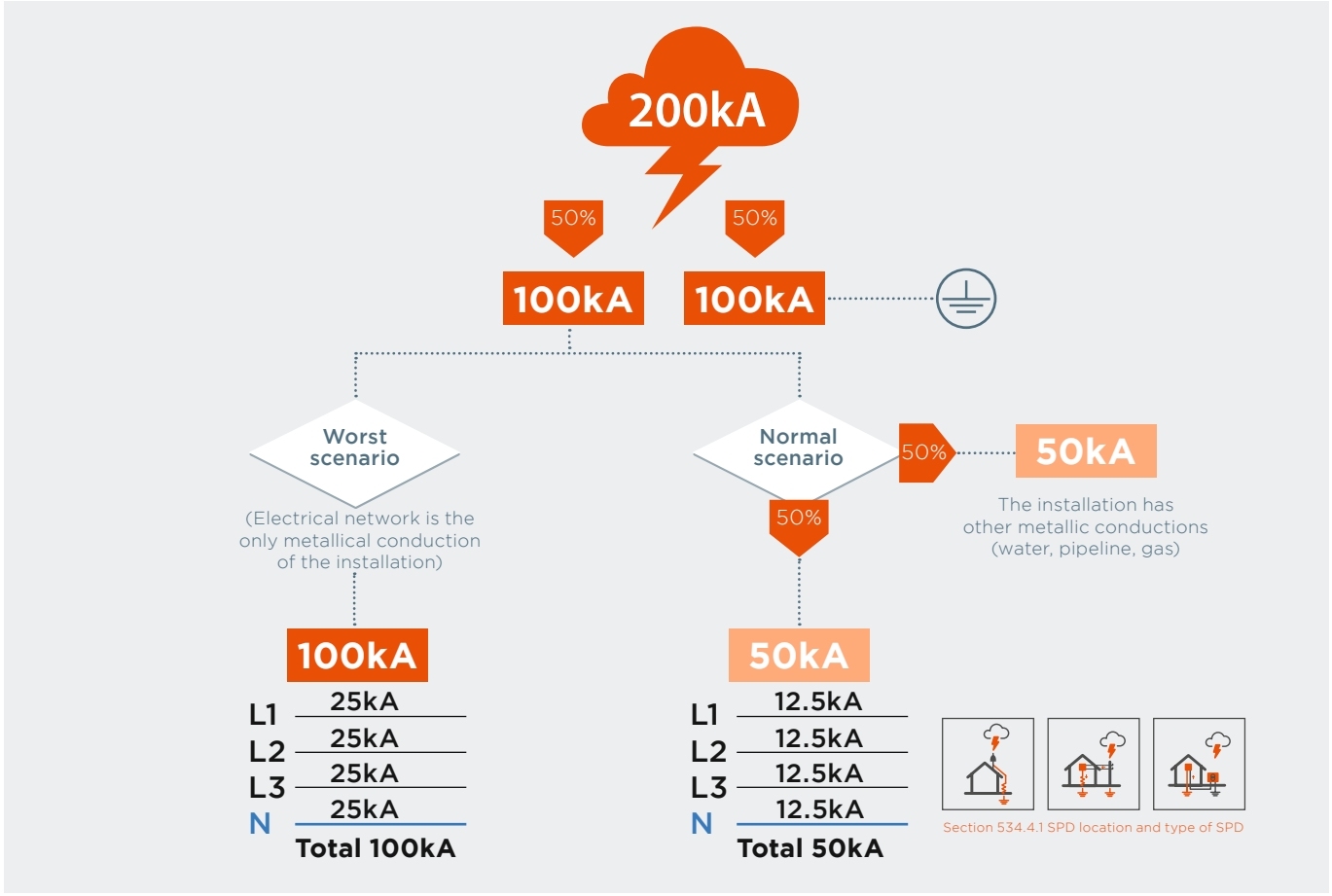
Type 1, Type 2 which SPD should be selected? Does a specific surge capacity rate should be considered?

As previously stated, the SPD protection design does not depend on the fault ratings given by the transformer, it only depends on the level of exposure in front of a surge. So, which SPD do we have to install in the main switchboard?

See the diagram below from IEC 61643-12 standard which displays the dispersion of the highest lightning considered: 200kA @ 10/350 µs

In the worst case scenario, 50% of this energy is conducted away to earth leaving 100kA potential across the networks 3 phase and neutral. Here a 25kA @ 10/350 µs (limp) Type 1 SPD is recommended for insulated installations in extreme exposed locations to lightning.

In the "Normal Scenario" it is assumed any direct lightning strike to the network will be at such a distance from the installation that another 50% of the energy is dispersed to earth via other conductors before entering your point of connection. In this scenario, a device with **12.5kA @ 10/350 µs (limp) Type 1** is recommended. **Furthermore, based also on the IEC 61643-12 standard and even stated in section 534.4, 12.5kA is the minimum kA rate when a Type 1 is needed (section 534.4.1: structure equipped with an external lightning protection system or protection against effects of direct lightning or where the occurrence of direct lightning strikes to the overhead lines is to be taken into considerations)**. If the level of exposure of the installation is lower than above described scenarios (switching overvolatges) Type 2 SPD (Imax) may be considered along with risk and cost of equipment and downtime.



Should other considerations be taken into account?

Common mode installation:

As stated in section 534.4.2 we can conclude **SPDs have to be installed in common mode configuration (CT1) by default.** This is compulsory for all SPDs installed in the main panel".

What is common mode?
This mode of protection (CT1 configuration) involves the installation of SPDs between each live conductors and PE (including neutral to PE if there is a neutral conductor).

Common mode SPD configuration has the capability to discharge bigger surges, because the total discharge potential is the combined capacity of all of the phases of the SPD.

Why does I.S.10101 set common mode installation in Ireland?
Some areas in Ireland are highly exposed to lightning. The main priority is the discharge of the highest level of surges in order to protect the installations.

Additionally...
I.S.10101 sets also the possibility for installing differential mode SPDs (CT2) to ensure the equipment protection but always under the consideration of a common mode SPD in the mains. Those SPDs are usually installed in the distribution boards or as close as possible to the equipment.

What is differential mode?

SPD assembly providing a mode of protection between each line conductor and the neutral conductor, and between the neutral conductor and PE. With this configuration, the level of protection between Lines and Neutral is finest. (figure 2).

Conclusion:
MERSEN have adapted their product range to the IRISH standard requirements. This is the reason because even though MERSEN have in their general portfolio Type 1, and Type 1+2 CT2 configurations (usually installed in the mains) these solutions have not been included in the MERSEN's Irish portfolio because they are outside of the I.S. 10101 scope.

Common mode installation

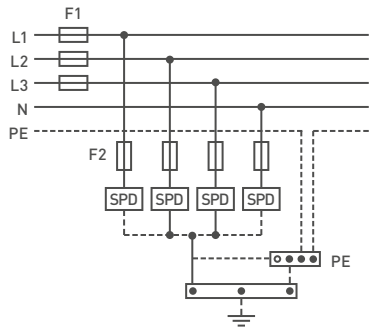
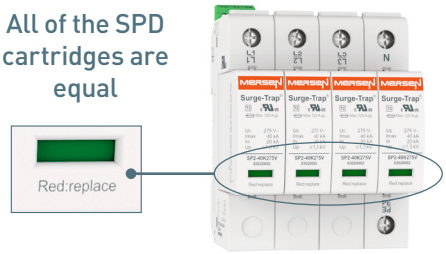


Figure 1
Connection scheme CT1. IEC 61643-12

All of the SPD cartridges are equal



Differential mode installation:

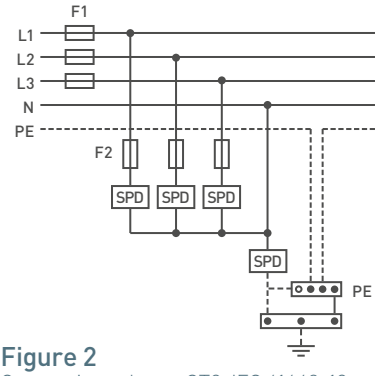
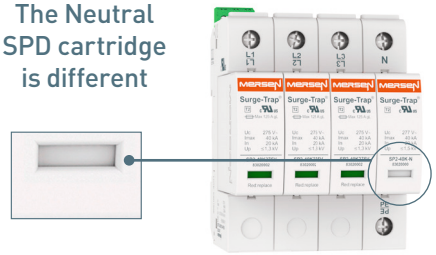


Figure 2
Connection scheme CT2. IEC 61643-12

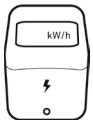
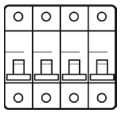
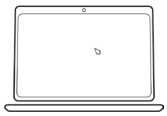
The Neutral SPD cartridge is different



Do we have to consider more SPDs in the distribution boards?

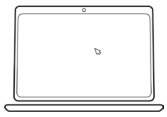
Table 534.1 (taken from IEC 60634-4-443 standard) classifies electrical devices in categories, depending on how sensitive they are to the surge over voltage (Ue). Category 1 devices (electronic receivers) are the most sensitive, Ue has to be at least 1.5 kV.

Whereas category 4 devices can withstand 6kV or more. Generally, components in main switchboards are category 4 devices ie ACB, MCCB etc.

Category	IV	III	II	I
230/400 lines	Counters / MCCB / ACB	MCBs and RCCDs	Electrical devices	Electronic receivers
Example				
Impulse voltage withstand	6kV	4kV	2.5kV	1.5kV

The table below shows an example where a Type 1+2 SPD is installed at the mains board of the installation.

It shows the status of the SPD and the final catagory 1 load (the most sensitive Ue: 1.5kV) in three different surge scenarios

		Surge example		
		≤ 25kA (In)	100kA (Imax)	>100kA
Iimp = 25kA Imax = 100kA In = 25kA Up ≤ 1.5kV In accordance with the IEC 61643-11				
Ue = 1.5kV Robustness classification for electric and electronic devices according to IEC 60634-4-443				

According to the IEC 61643-1 declared Up rate is related to In. Although the SPD is able to withstand Imax probably Up level will be higher than Ue.

Statements:

1 - For discharges over the maximum capacity **(Imax)** of the SPD, the loads and the SPD itself will be damaged.
2 - Iimp and Imax describe the maximum surge level the SPD itself can withstand but does not describe the protection
3 - Only **In** describes the level of protection as at **In** the residual voltage seen but the equipment being protection is Ue.
4 - As surges may be induced in cable between the main switchboard and distribution board, or by the final loads themselves, the switchboard may not be close enough to direct a surge in time to protect other final loads.

Conclusions:

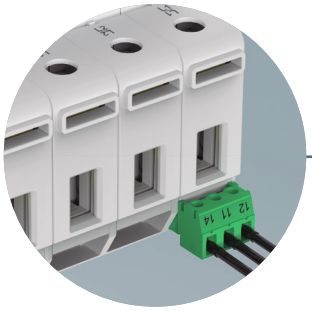
1 - With just one stage of protection only equipment close to the SPD is protected and only up to a surge of In.
2 - To improve the protection, at least a second stage of protection installed at the distribution board is required. This SPD design is called cascading protection.
3.- Further SPDs (Type 2 and Type 3) are required to protect sensitive and critical equipment downstream of the origin of the installation when a Type 1 is fitted at the origin of installation (534.4.1.1)

Do we need to install a third stage of surge protection devices ?

A third stage of surge protection installed at the final load may be considered depending on what the load it is, how critical, expensive, cost of downtime and sensitive it is. If the cost of the equipment and/or downtime is high then installing a third stage Type 3 (1.5/50 µs) device will further reduce the risk of any remaining surge energy getting to your equipment.

SURGE-TRAP® HIGHLIGHTS

STP Surge-Trap® Pluggable



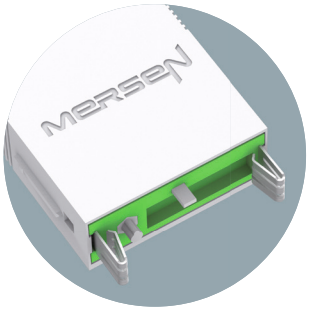
12 11 14

Remote indication

Dry contacts, optional in all ranges, for remote indication of protector end of life.

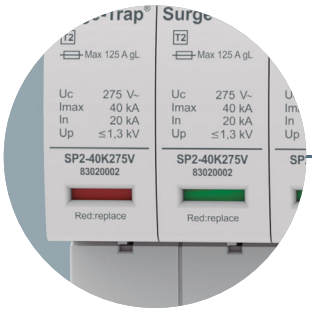
Biconnect connection

Two types of terminal: for rigid or flexible cable and for fork type comb busbar.



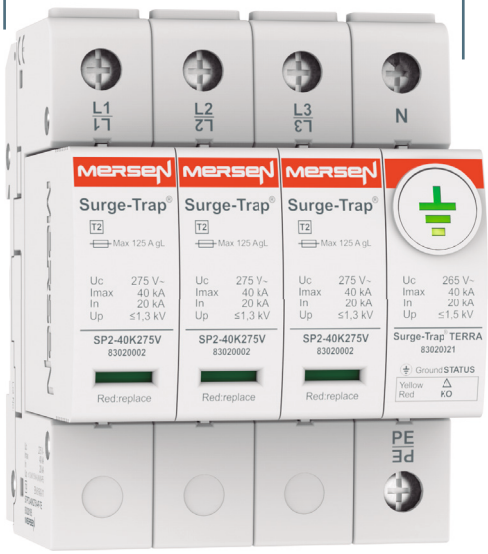
Mersen quality

Product range produced entirely by Mersen, with a thermal disconnection system. Use of the best materials and components. UL 1449 4th Ed.



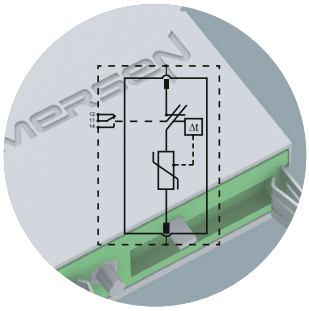
Protector lifetime status indication

Clear display of protection end of life.



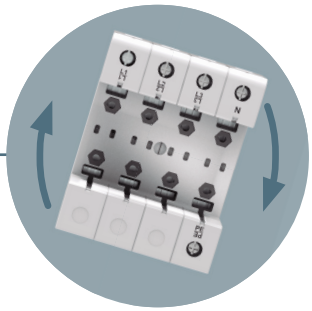
Cartridge security system

Vibration proof according to the maximum levels specified in IEC 60721 (2M3 transport & 3M8 operation).



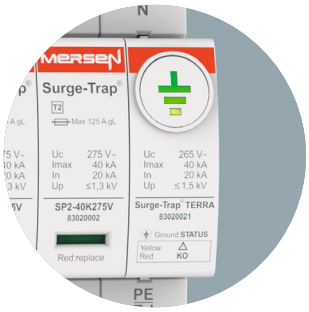
New, optimised disconnection system

Mersen has developed an optimised disconnection system for end of life. Complies with the disconnection tests of the standards for protectors for photovoltaic applications.



Reversible installation

Reversible chassis to allow cable entry from above or below.



Surge-Trap® TERRA

Monitoring the grounding system in the surge protection device itself.

THE BEST PERFORMANCE IN THE MARKET

STP T12 12.5

Combined Type 1+2 lightning current arrester and voltage surge protector

Ability to discharge lightning currents (10/350 *µs*) and induced voltage surges (8/20 *µs*)

Suitable as the first step of protection

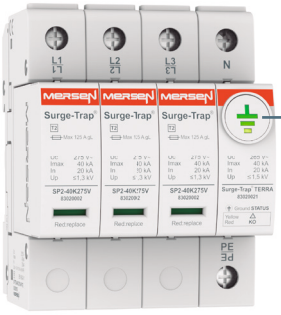
Power supply panels.

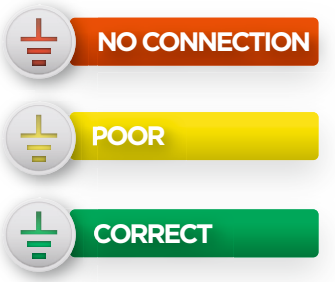
Areas with exposure to the atmosphere

Where installations are usually provided with an external lightning protection

STP T2 40 TERRA

TERRA® is the first protection device on the market that, in addition to indicating that it is properly wired, guarantees that there is an adequate path to earth, which is essential if the protection device is to shunt the energy peaks to earth effectively.





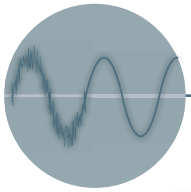
Earth status indicator

Continuous LED display of earth status

STE T23 EMI

EMI / RFI Filter

All models include an electromagnetic filter for network noise.



Combined SPD (Type 2+3)

Combined devices for discharging induced transient overvoltages, while providing a very fine protection level for sensitive equipment.

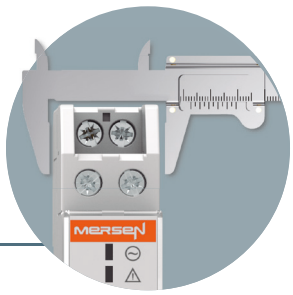
STM T23 SLIM

Status indication

Remote and visual indication of life status of the protection device.

Type 2+3, 2 poles in 1 module

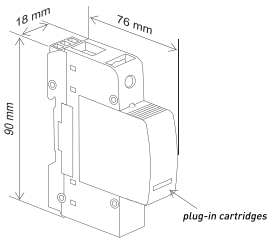
Compact combined device (Type 2+3) for fine protection. Ideal for limited spaces.



STP T12 12.5

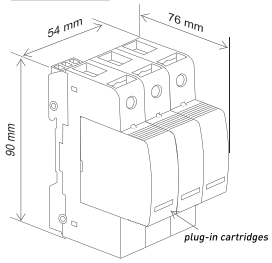
Dimensions

1 pole

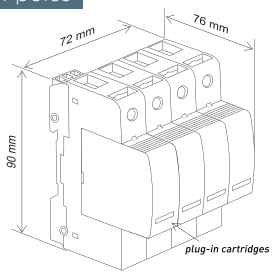


2 poles

3 poles



4 poles



Catalogue numbers / Reference numbers

1 pole

REFERENCE NUMBER	CATALOGUE NUMBER	SYSTEM TYPE	Un [Vac]	Uc [V]	Iimp (10/350) [kA]	Imax (8/20) [kA]	In (8/20) [kA]	Up@In (8/20) [kV]	REMOTE (M)	Cartridge Id. L	Cartridge Id. N
83120102	**STPT12-12K275V-1P**	L-N (1Ph)	230	275	12.5	50	20	≤1.3		C03	-
83120103	**STPT12-12K275V-1PM**	L-N (1Ph)	230	275	12.5	50	20	≤1.3	√	C03	-

2 poles

REFERENCE NUMBER	CATALOGUE NUMBER	SYSTEM TYPE	Un [Vac]	Uc [V]	Iimp (10/350) [kA]	Imax (8/20) [kA]	In (8/20) [kA]	Up@In (8/20) [kV]	REMOTE (M)	Cartridge Id. L	Cartridge Id. N
83120120	**STPT12-12K275V-2P**	TNS (1Ph+N)	230/-	275	12.5	50	20	≤1.3		C03	
83120121	**STPT12-12K275V-2PM**	TNS (1Ph+N)	230/-	275	12.5	50	20	≤1.3	√	C03	

ELV Extra Low Voltage, also for use in DC Photovoltaic self-consumption / off-grid applications.

3 poles

REFERENCE NUMBER	CATALOGUE NUMBER	SYSTEM TYPE	Un [Vac]	Uc [V]	Iimp (10/350) [kA]	Imax (8/20) [kA]	In (8/20) [kA]	Up@In (8/20) [kV]	REMOTE (M)	Cartridge Id. L	Cartridge Id. N
83120130	**STPT12-12K275V-3P**	TNC (3Ph)	-/400	275	12.5	50	20	≤1.3		C03	-
83120131	**STPT12-12K275V-3PM**	TNC (3Ph)	-/400	275	12.5	50	20	≤1.3	√	C03	-

4 poles

REFERENCE NUMBER	CATALOGUE NUMBER	SYSTEM TYPE	Un [Vac]	Uc [V]	Iimp (10/350) [kA]	Imax (8/20) [kA]	In (8/20) [kA]	Up@In (8/20) [kV]	REMOTE (M)	Cartridge Id. L	Cartridge Id. N
83120144	**STPT12-12K275V-4P**	TNS (3Ph+N)	230/400	275	12.5	50	20	≤1.3		C03	
83120145	**STPT12-12K275V-4PM**	TNS (3Ph+N)	230/400	275	12.5	50	20	≤1.3	√	C03	

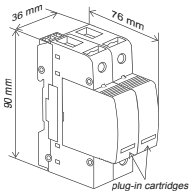
Replacement cartridges

REFERENCE NUMBER	CATALOGUE NUMBER	NETWORK	Un [Vac]	Uc [V]	Iimp (10/350) [kA]	Imax (8/20) [kA]	In (8/20) [kA]	Up@In (8/20) [kV]	CARTRIDGE ID.
83120002	**SP12-12K275V**	L-N (1Ph)	230	275	12.5	50	20	≤1.3	C03

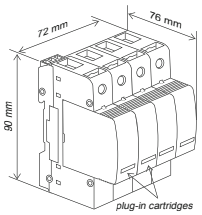
STP T12 25

Dimensions

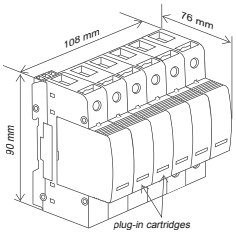
1 pole



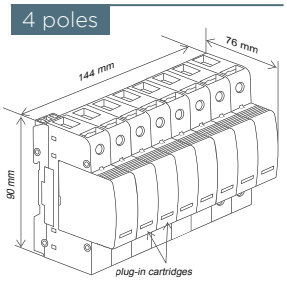
2 poles



3 poles



4 poles



Catalogue numbers / Reference numbers

1 pole

REFERENCE NUMBER	CATALOGUE NUMBER	SYSTEM TYPE	Un [Vac]	Uc [V]	Iimp (10/350) [kA]	Imax (8/20) [kA]	In (8/20) [kA]	Up [kV]	REMOTE (M)	Cartridge Id. L	Cartridge Id. N
83120152	**STPT12-25K275V-1P**	L-N (1Ph)	230	275	25	100	25	≤ 1,5		C65	
83120153	**STPT12-25K275V-1PM**	L-N (1Ph)	230	275	25	100	25	≤ 1,5	√	C65	

2 poles

REFERENCE NUMBER	CATALOGUE NUMBER	SYSTEM TYPE	Un [Vac]	Uc [V]	Iimp (10/350) [kA]	Imax (8/20) [kA]	In (8/20) [kA]	Up [kV]	REMOTE (M)	Cartridge Id. L	Cartridge Id. N
83120156	**STPT12-25K275V-2P**	TNS (1Ph+N)	230 / -	275	25	100	25	≤ 1,5		C65	
83120157	**STPT12-25K275V-2PM**	TNS (1Ph+N)	230 / -	275	25	100	25	≤ 1,5	√	C65	

3 poles

REFERENCE NUMBER	CATALOGUE NUMBER	SYSTEM TYPE	Un [Vac]	Uc [V]	Iimp (10/350) [kA]	Imax (8/20) [kA]	In (8/20) [kA]	Up [kV]	REMOTE (M)	Cartridge Id. L	Cartridge Id. N
83120158	**STPT12-25K275V-3P**	TNC (3Ph)	- / 400	275	25	100	25	≤ 1,5		C65	
83120159	**STPT12-25K275V-3PM**	TNC (3Ph)	- / 400	275	25	100	25	≤ 1,5	√	C65	

4 poles

REFERENCE NUMBER	CATALOGUE NUMBER	SYSTEM TYPE	Un [Vac]	Uc [V]	Iimp (10/350) [kA]	Imax (8/20) [kA]	In (8/20) [kA]	Up [kV]	REMOTE (M)	Cartridge Id. L	Cartridge Id. N
83120160	**STPT12-25K275V-4P**	TNS (3Ph+N)	230 / 400	275	25	100	25	≤ 1,5		C65	
83120161	**STPT12-25K275V-4PM**	TNS (3Ph+N)	230 / 400	275	25	100	25	≤ 1,5	√	C65	

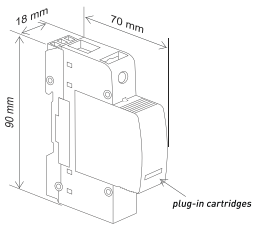
Replacement cartridges

REFERENCE NUMBER	CATALOGUE NUMBER	NETWORK	Un [Vac]	Uc [V]	Iimp (10/350) [kA]	Imax (8/20) [kA]	In (8/20) [kA]	Up [kV]	CARTRIDGE ID.
83120007	**SP12-25K275V**	L-N (1Ph)	230	275	25	100	25	≤ 1,5	C65

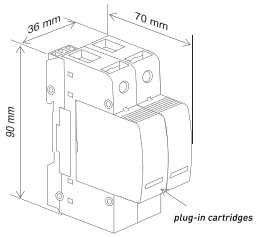
STP T2 40

Dimensions

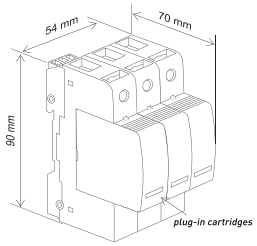
1 pole



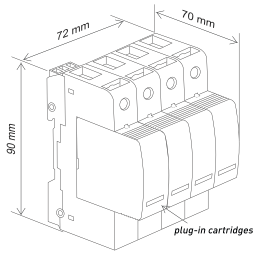
2 poles



3 poles



4 poles



Catalogue numbers / Reference numbers

1 pole

REFERENCE NUMBER	CATALOGUE NUMBER	SYSTEM TYPE	Un [VAC]	Uc [V]	Imax (8/20) [kA]	In (8/20) [kA]	Up@In (8/20) [kV]	REMOTE (M)	Cartridge Id. L	Cartridge Id. N
83020106	**STPT2-40K275V-1P**	L-N (1Ph)	230	275	40	20	≤1.3		C23	-
83020107	**STPT2-40K275V-1PM**	L-N (1Ph)	230	275	40	20	≤1.3	√	C23	-
83020112	**STPT2-40K-N**	N-PE (N)	Neutral	265	40	20	≤1.5		-	C27

2 poles

REFERENCE NUMBER	CATALOGUE NUMBER	SYSTEM TYPE	Un [VAC]	Uc [V]	Imax (8/20) [kA]	In (8/20) [kA]	Up@In (8/20) [kV]	REMOTE (M)	Cartridge Id. L	Cartridge Id. N
83020116	**STPT2-40K275V-2PG**	TT (1Ph+N)	230/-	275	40	20	≤1.3 (L-N) ≤1.5 (N-PE)		C23	C27
83020117	**STPT2-40K275V-2PGM**	TT (1Ph+N)	230/-	275	40	20	≤1.3 (L-N) ≤1.5 (N-PE)	√	C23	C27
83020122	**STPT2-40K275V-2P**	TNS (1Ph+N)	230/-	275	40	20	≤1.3		C23	
83020123	**STPT2-40K275V-2PM**	TNS (1Ph+N)	230/-	275	40	20	≤1.3	√	C23	

ELV Extra Low Voltage, also for use in DC Photovoltaic self-consumption / off-grid applications.

3 poles

REFERENCE NUMBER	CATALOGUE NUMBER	SYSTEM TYPE	Un [VAC]	Uc [V]	Imax (8/20) [kA]	In (8/20) [kA]	Up@In (8/20) [KV]	REMOTE (M)	Cartridge Id. L	Cartridge Id. N
83020134	**STPT2-40K275V-3P**	TNC (3Ph)	-/400	275	40	20	≤1.3		C23	-
83020135	**STPT2-40K275V-3PM**	TNC (3Ph)	-/400	275	40	20	≤1.3	√	C23	-

4 poles

REFERENCE NUMBER	CATALOGUE NUMBER	SYSTEM TYPE	Un [VAC]	Uc [V]	Imax (8/20) [kA]	In (8/20) [kA]	Up@In (8/20) [KV]	REMOTE (M)	Cartridge Id. L	Cartridge Id. N
83020146	**STPT2-40K275V-4PG**	TT (3Ph+N)	230/400	275	40	20	≤1.3 (L-N) ≤1.5 (N-PE)		C23	C27
83020147	**STPT2-40K275V-4PGM**	TT (3Ph+N)	230/400	275	40	20	≤1.3 (L-N) ≤1.5 (N-PE)	√	C23	C27
83020152	**STPT2-40K275V-4P**	TNS (3Ph+N)	230/400	275	40	20	≤1.3		C23	
83020153	**STPT2-40K275V-4PM**	TNS (3Ph+N)	230/400	275	40	20	≤1.3	√	C23	

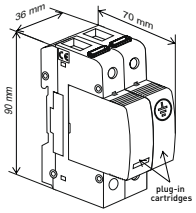
Replacement cartridges

REFERENCE NUMBER	CATALOGUE NUMBER	NETWORK	Un [VAC]	Uc [V]	Imax (8/20) [kA]	In (8/20) [kA]	Up@In (8/20) [kV]	CARTRIDGE ID.
83020002	**SP2-40K275V**	L-N (1Ph)	230	275	40	20	≤1.3	C23
83020000	**SP2-40K-N**	N-PE (N)	Neutral	265	40	20	≤1.5	C27

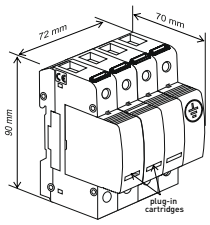
STP T2 40 - TERRA

Dimensions

2 poles



4 poles



Catalogue numbers / Reference numbers

2 poles

Cartridge Id.

REFERENCE NUMBER	CATALOGUE NUMBER	SYSTEM TYPE	Un [Vac]	Uc [V]	Imax (8/20) [kA]	In (8/20) [kA]	Up@In (8/20) [kV]	L
83020183	**STPT2-40K275V-2P-TE**	TT (1Ph+N)	230	275	40	20	≤1.3	C23

4 poles

Cartridge Id.

REFERENCE NUMBER	CATALOGUE NUMBER	SYSTEM TYPE	Un [Vac]	Uc [V]	Imax (8/20) [kA]	In (8/20) [kA]	Up@In (8/20) [kV]	L
83020185	**STPT2-40K275V-4P-TE**	TT (3Ph+N)	230/400	275	40	20	≤1.3 (L-N) ≤1.5 (N-PE	C23

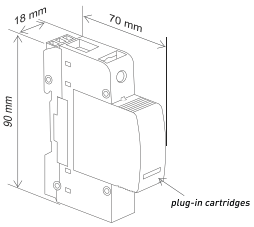
Replacement cartridges

REFERENCE NUMBER	CATALOGUE NUMBER	NETWORK	Un [VAC]	Uc [V]	Imax (8/20) [kA]	In (8/20) [kA]	Up@In (8/20) [kV]	CARTRIDGE ID.
83020002	**SP2-40K275V**	L-N (1Ph)	230	275	40	20	≤1.3	C23

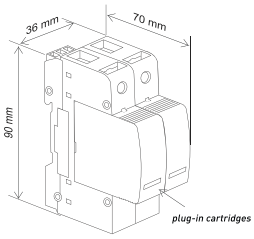
STP T23 20

Dimensions

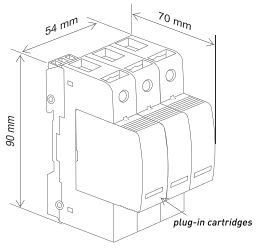
1 pole



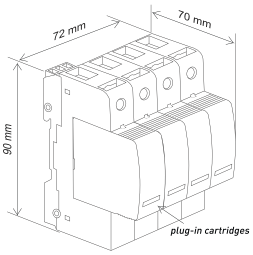
2 poles



3 poles



4 poles



Catalogue numbers / Reference numbers

1 pole

REFERENCE NUMBER	CATALOGUE NUMBER	SYSTEM TYPE	Un [Vac]	Uc [V]	Imax (8/20) [kA]	In (8/20) [kA]	Uoc [kV]	Up@In (8/20) [KV]	REMOTE (M)	Cartridge Id. L	Cartridge Id. N
83230102	**STPT23-20K320V-1P**	L-N (1Ph)	230; 277	320	20	10	10	≤1.4		C62	-
83230103	**STPT23-20K320V-1PM**	L-N (1Ph)	230; 277	320	20	10	10	≤1.4	√	C62	-

2 poles

REFERENCE NUMBER	CATALOGUE NUMBER	SYSTEM TYPE	Un [Vac]	Uc [V]	Imax (8/20) [kA]	In (8/20) [kA]	Uoc [kV]	Up@In (8/20) [kV]	REMOTE (M)	Cartridge Id. L	Cartridge Id. N
83230112	**STPT23-20K320V-2PG**	TT (1Ph+N)	230/-; 277/-	320	20	10	10	≤1.4 (L-N) ≤1.5 (N-PE)		C62	C64
83230113	**STPT23-20K320V-2PGM**	TT (1Ph+N)	230/-; 277/-	320	20	10	10	≤1.4 (L-N) ≤1.5 (N-PE)	√	C62	C64
83230116	**STPT23-20K320V-2P**	TNS (1Ph+N)	230/-; 277/-	320	20	10	10	≤1.4		C62	
83230117	**STPT23-20K320V-2PM**	TNS (1Ph+N)	230/-; 277/-	320	20	10	10	≤1.4	√	C62	

3 poles

REFERENCE NUMBER	CATALOGUE NUMBER	SYSTEM TYPE	Un [Vac]	Uc [V]	Imax (8/20) [kA]	In (8/20) [kA]	Uoc [kV]	Up@In (8/20) [kV]	REMOTE (M)	Cartridge Id. L	Cartridge Id. N
83230122	**STPT23-20K320V-3P**	TNC (3Ph)	-/400; -/480	320	20	10	10	≤1.4		C62	-
83230123	**STPT23-20K320V-3PM**	TNC (3Ph)	-/400; -/480	320	20	10	10	≤1.4	√	C62	-

4 poles

REFERENCE NUMBER	CATALOGUE NUMBER	SYSTEM TYPE	Un [Vac]	Uc [V]	Imax (8/20) [kA]	In (8/20) [kA]	Uoc [kV]	Up@In (8/20) [kV]	REMOTE (M)	Cartridge Id. L	Cartridge Id. N
83230128	**STPT23-20K320V-4PG**	TT (3Ph+N)	230/400; 277/480	320	20	10	10	≤1.4 (L-N) ≤1.5 (N-PE)		C62	C64
83230129	**STPT23-20K320V-4PGM**	TT (3Ph+N)	230/400; 277/480	320	20	10	10	≤1.4 (L-N) ≤1.5 (N-PE)	√	C62	C64
83230132	**STPT23-20K320V-4P**	TNS (3Ph+N)	230/400; 277/480	320	20	10	10	≤1.4		C62	
83230133	**STPT23-20K320V-4PM**	TNS (3Ph+N)	230/400; 277/480	320	20	10	10	≤1.4	√	C62	

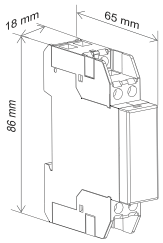
Replacement cartridges

REFERENCE NUMBER	CATALOGUE NUMBER	NETWORK	Un [Vac]	Uc [V]	Imax (8/20) [kA]	In (8/20) [kA]	Uoc [kV]	Up@In (8/20) [kV]	CARTRIDGE ID.
83230002	**SP23-20K320V**	L-N (1Ph)	230; 277	320	20	10	10	≤1.4	C62

STM T23 20 S

Dimensions

2 poles



Catalogue numbers / Reference numbers

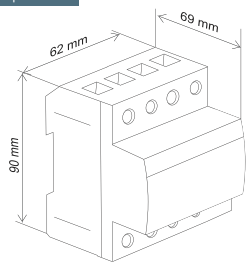
2 poles

REFERENCE NUMBER	CATALOGUE NUMBER	SYSTEM TYPE	Un [Vac]	Uc [V]	Imax (8/20) [kA]	In (8/20) [kA]	Uoc [kV]	Up@In (8/20) [kV]	REMOTE (M)
83230510	**STMT23-20K275V-SP-S**	TT/TNS (1Ph+N)	230	275	20	10	10	≤1.4 (L1-L2) 1.4 (L1/L2-PE)	
83230511	**STMT23-20K275V-SP-SM**	TT/TNS (1Ph+N)	230	275	20	10	10	≤1.4 (L1-L2) 1.4 (L1/L2-PE)	√

STE T23 20

Dimensions

2 poles



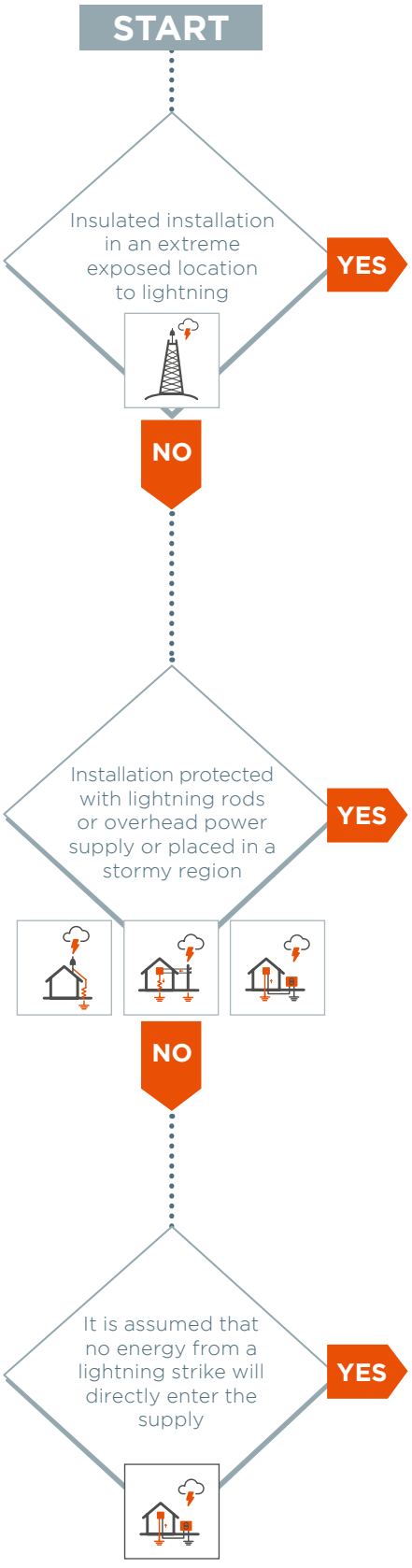
Catalogue numbers / Reference numbers

2 poles

REFERENCE NUMBER	CATALOGUE NUMBER	SYSTEM TYPE	Un [Vac]	Uc [V]	Imax (8/20) [kA]	In (8/20) [kA]	Uoc [kV]	Up@In [kV]	IL [A]	REMOTE (M)
83230403	**STET23-20K275V-SPM**	TT/TNS (1Ph+N)	230	275	20	10	6	≤1.2	20	√

SELECTION GUIDE
(ACCORDING TO SECTION 534.4 "SELECTION AND INSTALLATION OF SPDs")

First Stage of Surge Protection
Service Entrance - Generally in the main switchboard



MAIN SWITCHBOARD

STPT12 - 25kA

Conducted Lightning Energy

Worst case as per IEC 61643

USE limp 25kA
(10/350µs waveform)

NETWORK		TYPE 1+2 limp 25kA
		CATALOGUE NUMBER
SinglePhase	TNS (1 Ph+N)	STPT12-25K275V-2PM
Three Phase	TNS (3 Ph+N)	STPT12-25K275V-4PM

PARAMETERS PER RANGE	
limp	25kA
Ityp	200 x @ 20kA
Imax	100kA
In	20kA
Up	< 1.3 kV

STPT12 - 12.5kA

Conducted Lightning Energy

Normal case as per IEC 61643

USE limp 12.5kA
(10/350µs waveform)

NETWORK		TYPE 1+2 limp 12.5kA
		CATALOGUE NUMBER
Single Phase	TNS (1 Ph+N)	STPT12-12K275V-2PM
Three Phase	TNS (3 Ph+N)	STPT12-12K275V-4PM

PARAMETERS PER RANGE	
limp	12.5kA
Ityp	100 x @ 20kA
Imax	50kA
In	20kA
Up	< 1.3 kV

STPT2 - 40kA

Induced Surge Events
· Supply Network switching
· Inductive/Capacitive loads

USE Imax 40kA
(8/20µs waveform)

NETWORK		TYPE 2 Imax 40kA
		CATALOGUE NUMBER
Single Phase	TNS (1 Ph+N)	STPT2-40K275V-2PM
Three Phase	TNS (3 Ph+N)	STPT2-40K275V-4PM

* Replace IR with SG for inbuilt earth loop impedance monitoring

PARAMETERS PER RANGE	
Imax	40kA
Ityp	500 x @ 5kA
In	20kA
Up	< 1.3 kV

Second Stage of Surge Protection
Generally, in the distribution board

DISTRIBUTION SWITCHBOARD

STPT2 - 40kA

NETWORK		TYPE 2 Imax 40kA
		CATALOGUE NUMBER
Single Phase	TT (1 Ph+N)	STPT2-40K275V-2PGM
	TNS (1 Ph+N)	STPT2-40K275V-2PM
Three Phase	TT (3 Ph+N)	STPT2-40K275V-4PGM
	TNS (3 Ph+N)	STPT2-40K275V-4PM

* Replace IR with SG for inbuilt earth loop impedance monitoring

PARAMETERS PER RANGE	
Imax	40kA
In	20kA
Up	< 1.3 kV
Ityp	500 x @ 5kA

STPT23 - 20kA

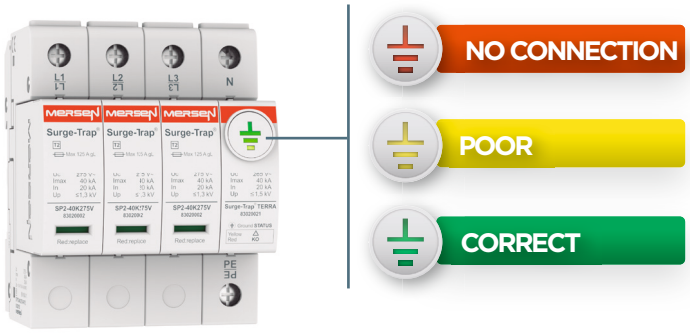
NETWORK		TYPE 2 Imax 20kA
		CATALOGUE NUMBER
Single Phase	TT (1 Ph+N)	STPT23-20K320V-2PGM
	TNS (1 Ph+N)	STPT23-20K320V-2PM
Three Phase	TT (3 Ph+N)	STPT23-20K320V-4PGM
	TNS (3 Ph+N)	STPT23-20K320V-4PM

* Replace IR with SG for inbuilt earth loop impedance monitoring

PARAMETERS PER RANGE	
Imax	20kA
In	10kA
Up	< 1.3 kV
Ityp	500 x @ 5kA

Upgrade the STPT2 range to STPT2 TERRA to monitor the earth connection critical to provide a path to direct surge energy.

ST TERRA
TYPE 2 Imax 40kA SPD + EARTH MONITORING SYSTEM



Imax 40kA (type 2)

EFFECTIVE SURGE PROTECTION
When the ST TERRA® LED is green, it indicates that the ground path is good enough to shunt the energy peaks to ground effectively.

CONFIRMATION OF PROPPER INSTALLATION
When the ST TERRA® LED is green, it indicates that the protection device is properly wired and powered up.

SAFETY INFORMATION IN THE EVENT OF INDIRECT CONTACT
When the ST TERRA® cannot detect any ground connection, it is advisable to check the installation status.

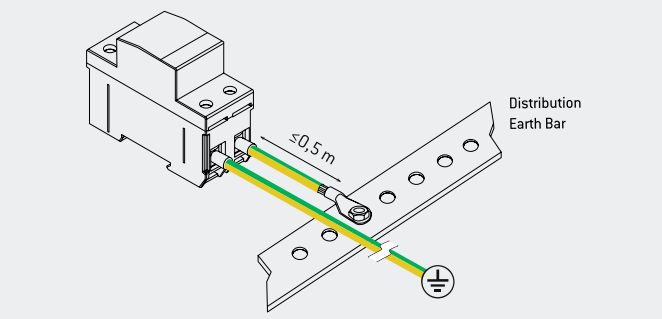
For other voltages, please contact MERSEN.

SPD GENERAL INSTALLATION FEATURES

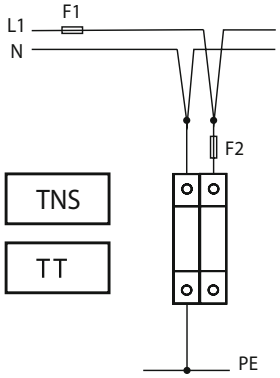
Recommended lengths and connection types according to 61643-12

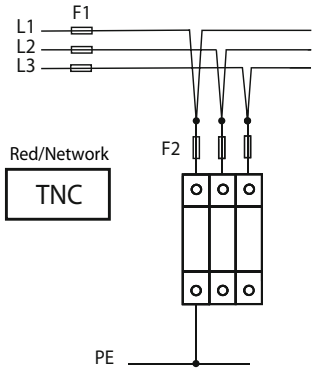
In order to achieve optimum overvoltage protection, connecting conductors of SPDs shall be as short as possible. Long lead lengths will degrade the protection offered by the SPD.

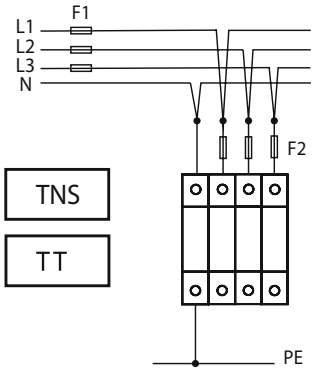
When connecting an SPD in parallel, the optimal connection is a “V-type” (see image below). Whenever this is not feasible, the maximum derivation cable length should be less than 0.5m.



Wiring, general considerations (lengths and sections)

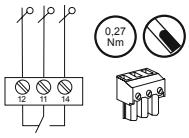






TYPE OF WIRE	STRANDED	RIGID
	10 mm	10 mm
Ø min. L,N	6 mm²	
Ø min. PE	6 mm²(T2)/16mm²(T1)	
Ø max. L,N,PE	25 mm²	35 mm²

Remote Indication

Umax/ Imax		
	AC:	50V/1A
	DC:	125V/0,2A

max 1,5 mm²
min 0,05 mm²

When do we have to install a back-up fuse or circuit breaker?*

RANGE		MAXIMUM BACK-UP RATING ACCORDING TO MANUFACTURER		BACK-UP FUSE RECOMMENDED IN IEC61643
STP T12 25	Iimp 25 kA	If F1 >315 A then ↓ F2≤ 315 A	If F1 ≤315 A then ↓ F2 not required	250 A gG
STP T12 12.5	Iimp 12.5 kA	F1 >200 A ↓ F2≤ 200 A	If F1 ≤200 A then ↓ F2 not required	160 A gG
STP T2 40	Imax 40 kA	F1 >125 A ↓ F2≤ 125 A	If F1 ≤125 A then ↓ F2 not required	100 A gG
STP T2 20	Imax 20 kA	F1 >80 A ↓ F2≤ 80 A	If F1 ≤80 A then ↓ F2 not required	63 A gG

* If the main circuit breaker has a rating less than the maximum required by the SPD, then additional protection is not required.

SPD back-up fuse/ fuse holder guide selection

SPD			FUSE					
SPD RANGE	TYPE	RATING KA	MIN BACK-UP FUSE RECOMMENDED IN IEC61643	TYPE	3P&N FUSE HOLDER REFERENCE	3P FUSE HOLDER REFERENCE	FUSE REFERENCE GG	NEUTRAL LINK
STP T12 25	1+2	Iimp 25kA	250A gG	Multibloc DIN NH 1	Y1023061	S229878	E219815	A219834
STP T12 12	1+2	Iimp 12.5kA	160A gG	Multibloc DIN NH 00	J1023002	P1023007	P211084	Z218269
STP T2 40	2	Imax 40kA	100A gG	Modulostar 22x58	A331108	E331135	E218205	N/A
STP T23 20	2+3	Imax 20kA	63A gG	Modulostar 22x58	A331108	E331135	Y215646	N/A

MULTIBLOC® bottom fitting

CATALOG NUMBER	ITEM NUMBER	RATED VOLTAGE AC (IEC)	SIZE	POLES	CABLE TERMINATION COMPONENTS	DESIGN	PACKAGE	WEIGHT
1.000.405	Y1023061	690 VAC	NH1 250 A	4	8 M10 terminal screws	-	1 piece	3.4 kg
1.000.141	J1023002	690 VAC	NH00 160 A	4	8 M8 terminal screws	pole 4 right side	1 piece	1.04 kg
1.000.299	S229878	690 VAC	NH1 250 A	3	6 M10 terminal screws	-	1 piece	2.42 kg
2.030.000	P1023007	690 VAC	NH00 160 A	3	6 M8 terminal screws	-	1 piece	0.75 kg

NH fuse-links gG 500VAC

CATALOG NUMBER	ITEM NUMBER	RATED VOLTAGE AC (IEC)	RATED CURRENT IN	POWER DISSIPATION AT IN	PACKAGE	WEIGHT
NH1GG50V250	E219815	500 V	250 A	20 W	3	0.3 kg
NH00GG50V160	P211084	500 V	160 A	11.3 W	3	0.2 kg

Solid links with live tags

CATALOG NUMBER	ITEM NUMBER	SIZE	RATED CURRENT IN	PACKAGE	WEIGHT
NH1NEUTRAL	A219834	1	250 A	9	0.15 kg
NH00NEUTRAL	Z218269	000/00	160 A	15	80 g

Modulostar® CMS22 fuse-holders, without indicator

CATALOG NUMBER	ITEM NUMBER	NUMBER OF POLES/ PHASES	DESIGN	PACKAGE	WEIGHT
CMS223N	A331108	3 + N	CMS22 triple pole + neutral conductor	1	0.93 kg
CMS223	E331135	3	CMS22 triple pole	2	0.66 kg

Ferrule fuse-links 22x58 gG 500 to 690VAC

CATALOG NUMBER	ITEM NUMBER	RATED VOLTAGE AC (IEC)	RATED CURRENT IN	RATED BREAKING CAPACITY AC	POWER DISSIPATION AT IN	WEIGHT
FR22GG50V100	E218205	500 V	100 A	120 kA	8.3 W	54 g
FR22GG69V63	Y215646	690 V	63 A	120 kA	6.3 W	54 g

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