

CPT
SURGE PROTECTION

PRODUCT CATALOGUE



KAMIC

CPT cirprotec

Surge protection

Parameters and selection of an SPD according to IEC 61643

PROTECTION PARAMETERS ACCORDING TO IEC 61643-11

I_{imp}

Impulse current

Peak current in 10/350 μ s waveform which the protection device can withstand.

I_{max}

Maximum discharge current

Peak current in 8/20 μ s waveform which the protection device can withstand.

I_n

Nominal current

Peak current in 8/20 μ s waveform the protection device can withstand at least 20 times.

U_p

Voltage protection level

Maximum residual voltage between the terminals of the protection device during the application of a peak current equal to the nominal current (I_n).

U_c

Maximum continuous operating voltage

Maximum effective voltage that can be applied permanently to the terminals of the protection device.

U_{oc}

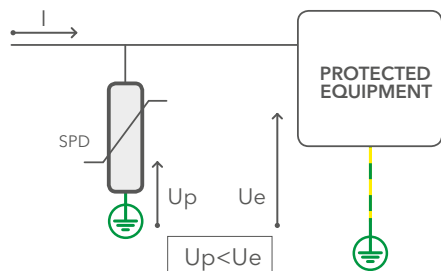
Open circuit voltage (combined voltage pulse)

This parameter is used only for the Class III test and is applicable to a Type 3 SPD. It consists of the injection of a combination wave (1.2/50 μ s in open circuit - 8/20 μ s in short circuit).

I_{fi}

Follow current extinction capability

This parameter is only devoted to surge protectors using "spark gap" technology. Once they have "switched", these surge protectors conduct part of the network current (follow current) and need to interrupt it.

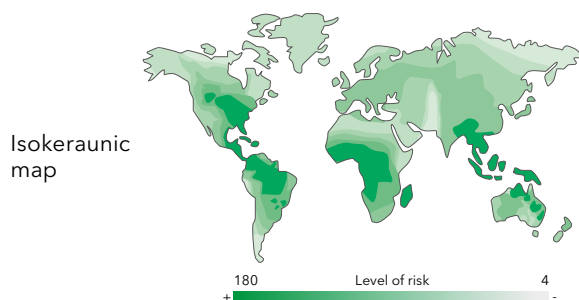


SELECTION OF SPDs

When selecting an SPD, several points must be considered:

- 1- Network typology:** TNS, TNC, TT, IT, PV and No. of conductors (see page 10).
- 2- Nominal voltage rating (U_n)** of the supply. Both features will condition **the maximum continuous operating voltage (U_c)** IEC/HD standard 60364-5-534 sets the minimum allowed value of U_c depending on the system configuration, taking into account a safety margin of the device above the nominal voltage.
- 3- Voltage withstand rating (U_e)** of the equipment in the installation. The protection device should be selected so that **the voltage protection level (U_p)** is compatible with the value of U_e (U_p < U_e). IEC/HD standard 60364-4-443 classifies equipment into four categories, based on the impulse voltage they are capable of withstanding. Items of electronic equipment to be protected are typically part of surge Category 1, withstanding up to 1.5 kV, which means they require a dedicated Type 3 or the very least a Type 2 protection device no more than 10 m away.
- 4- Exposure of the installation** to atmospheric and non-weather phenomena.
The actual exposure of an installation depends on the combination of 3 basic criteria: **1 electrical service system**, **2 external (and internal) switching of loads** and **3 lightning strike density** (isokeraunic level).
Factors **1** and **2** generate three possible situations:
 - Direct impact** exposure of an installation fitted with external lightning protection system or close to a tower or element susceptible to receive a strike.
 - High** exposure of an installation fed by long overhead service lines or situated in large industrial or commercial premises.
 - Medium** exposure of installations with an underground service and not subject to switchings of industrial loads in the vicinity.Factor **3** **the isokeraunic level** of a certain country.

Density of lightning strikes on the ground N_g (strikes/year²km²)



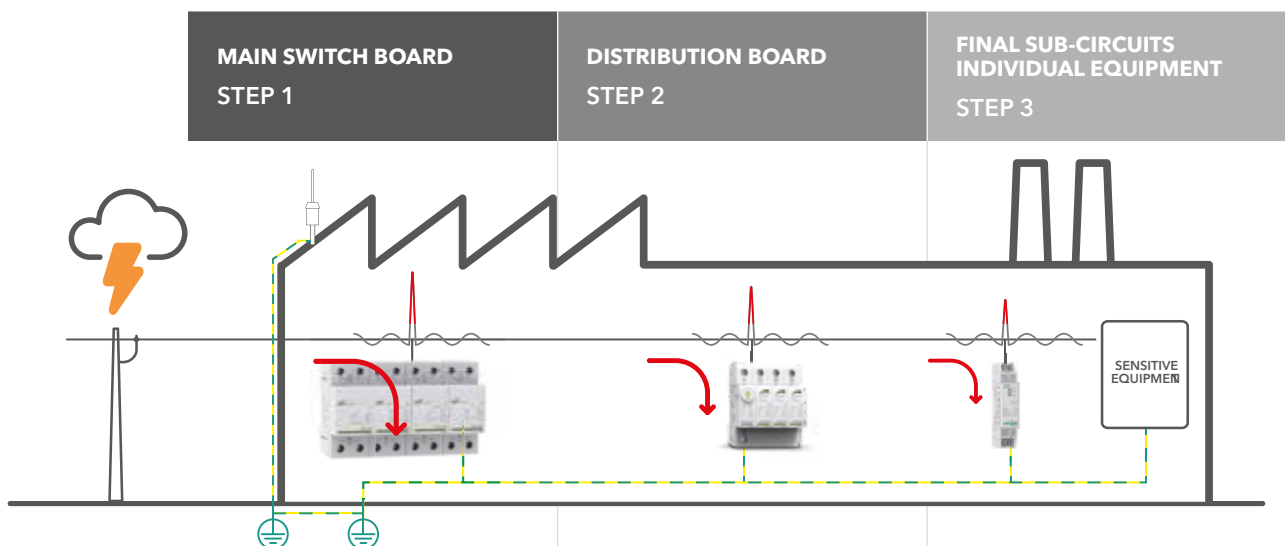
Protection system of coordinated stages: Type 1, 2 and 3 SPDs

The SPDs of a surge protection system must be able to withstand the discharged current and provide a U_{res} level (residual voltage) lower than the U_e peak voltage that the equipment can withstand.

Most of the times it is not possible to achieve this with just one SPD, especially because the intensity of the surge is not known, and because of the induction of overvoltages when conductors

exceed 10 m. The optimal system of protection is the **3-STEP approach, in which successive stages are combined in the performance of high discharge capacity devices and devices with an optimal voltage protection level (low)**

This is addressed by the definition of "Types" or "Classes" of SPDs according to the type of transient pulses to which each protected zone in the installation is subject to.



	MAIN SWITCH BOARD STEP 1	DISTRIBUTION BOARD STEP 2	FINAL SUB-CIRCUITS INDIVIDUAL EQUIPMENT STEP 3
Overtoltage category IEC/HD 60364-4-443	IV, III, II	IV, III, II, I if <10 m	I
Overtoltage withstand (U_e) values for equipment at 230/400V	6 kV / 4 kV / 2,5 kV	6 kV / 4kV / 2,5 kV / 1,5 kV si <10 m	1,5 kV
IEC/EN 61643-11	Type 1/Class I	Type 2/Class II	Type 3/Class III
Definition	Designed for use in incoming power supply panels where the risk of lightning strike is high, in particular in buildings with an external lightning protection system. Must be accompanied by downstream Class II protectors.	Designed for use in distribution panels located downstream of class I protectors or in incoming power supply panels in areas with low exposure to lightning strikes, where the building is not fitted with an external LPS.	Always installed downstream of a Class II protection designed to protect sensitive equipment or equipment located more than 10m downstream of the Class II SPD.
LPZ IEC 62305-4 protection zone	LPZ 1	LPZ 2	LPZ 3
Class test to IEC/EN 61643-11	10/350 μ s waveform, Class I test.	8/20 μ s waveform, Class II test.	Combined 1.2/50 μ s-8/20 μ s waveform Class III test.
Surge	Direct impact of a lightning strike (current).	Indirect impact of a lightning strike on the distribution line (overhead lines) or its vicinity (rise of ground potential or induction by coupling of electromagnetic radiation of the strike) or in the event of a switching.	Indirect impact simulated by the current and voltage that can reach the long-distance circuits and individual equipment to be protected.
Discharge capacity (I_{imp} , I_{max})	High	Medium	Low
Voltage protection level (U_p)	\surd (Coarse)	\surd (Fine)	\surd (Very Fine)

MAIN SPDs SERIES	CSH		
	PSC; PSC PV		
		PSM; PSM PV	
	PSM; PSL; CSF; NS; DM2		

Grounding systems

All national codes on the generation, transmission and distribution of electricity require **grounding of all the elements of the installation**. This ground connection ensures a sufficiently low impedance path for **protection devices to protect people and equipment**,

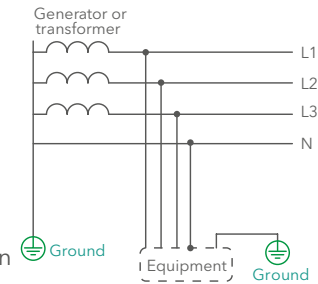
and to prevent hazardous step and touch voltages. As we will see, **there are several systems** for making this ground connection, depending on the interconnection between the installation components.

TT ARRANGEMENT

- Individual ground connection at the consumer level, separated from the transformer. Without distributed ground conductor (PE).
- The protective ground is the physical ground connection itself.

ADVANTAGES: Less interference. More reliable.

DISADVANTAGES: High impedance L-PE fault loop, hence it requires a differential protection device.

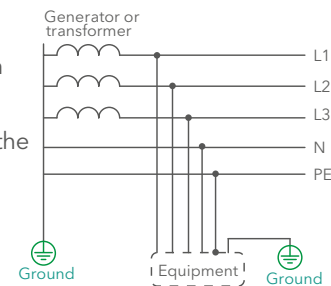


TN-S (OR TNC-S) ARRANGEMENT

- Neutral and ground wires distributed from the installation origin (one cable performs both functions in TNC-S distribution).
- The protective ground connection is through the protection conductor itself, generally to the transformer ground.

ADVANTAGES: Maximum safety against cable breaks and L-PE faults.

DISADVANTAGES: The most expensive system, both for cable and for installation and maintenance.

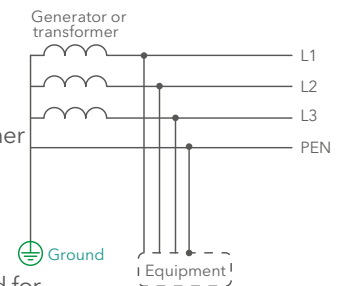


TN-C ARRANGEMENT

- The PEN conductor performs the functions of neutral and ground wire from transformer to the consumer.
- The protective ground connection is through the PEN conductor, generally to the transformer ground.

ADVANTAGES: Minimum costs for both wiring and installation.

DISADVANTAGES: Cable breaks are safety critical. High electromagnetic interference. Need for oversizing cable.

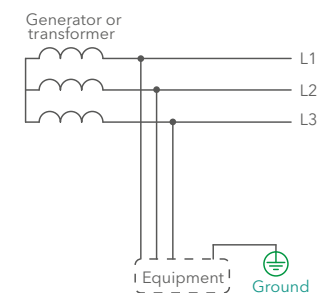


IT ARRANGEMENT

- The transformer neutral is isolated from ground. Optional distributed neutral conductor. Local ground connection at the consumer level.
- The protective ground is made via the local ground connection. There is no risk at the first L-PE fault due to the high loop impedance.

ADVANTAGES: No neutral breakage risk. Continuity of service in case of L-PE incidents.

DISADVANTAGES: Requires connected devices to be able to work at line voltages. Needs insulation monitoring to act at the first fault.



Comprehensive range of solutions in protection



FIRST STEP OF PROTECTION 50 kA

CSH



COMBINED TYPE 1+2

PSC



PVEN 50539-11

PSC PV



PV EN 50539-11 UL 1449

PSM PV



WIDE RANGE UL 1449

PSM-40

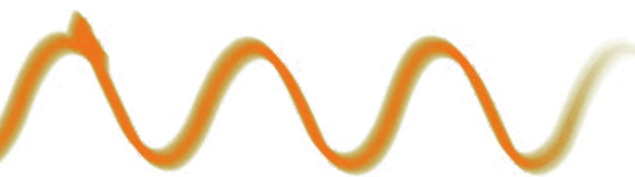
Location	First step of protection	First step of protection	First step of protection for DC PV applications	Second step of protection for DC PV applications	Second step of protection
SPD Type	Type 1 lightning current arrester to IEC/EN 61643-11	Type 1+2 SPD to IEC/EN 61643-11	Type 1+2 DC to EN 50539-11	Type 2 DC to EN 50539-11 UL 1449 4 th Ed. Certified	Type 2 SPD to IEC/EN 61643-11 UL 1449 4 th Ed. Certified (available)
Iimp (10/350µs)	50kA (phase) / 100kA (N-PE)	12,5 kA, 25 kA	5 kA		
I _{max} (8/20µs)		65 kA, 100 kA	40 kA	40 kA	40 kA
I _n (8/20µs)	50kA (phase) / 100kA (N-PE)	20 kA, 25 kA	20 kA	20 kA	20 kA
U _{oc} (1,2/50µs)					
Special features	I _{fi} = 50kA follow current interrupt rating. Multi-spark gap technology. Leakage current free.	ELV: Extra Low Voltage models available. Reversible & coded cartridges.	I _{scpv} = 10 kA (no back-up fuse needed). Reversible & coded cartridges	I _{scpv} = 10 kA (no back-up fuse needed),SCCR 50 kA to 100 kA Reversible & coded cartridges.	ELV: Extra Low Voltage models available. PLC: Friendly versions Power Line Communication Reversible & coded cartridges
Supply voltage U _n (L-N/L-L)	120/208V, 230/400V, 277/480V	60 V (ELV) 120/208 V, 230/400 V, 277/480 V 400/690 V	1060 Vdc	65 Vdc, 80 Vdc 660 Vdc, 1060 Vdc, 1500 Vdc	48 V, 60 V (ELV) 120/208 V, 230/400 V, 277/480 V 400/690 V + above
Network configuration	TNS, TNC, TT, IT	TNS, TNC, TT, IT	PV (DC side)	PV (DC side)	TNS, TNC, TT, IT
Format	DIN-rail mountable. Monobloc format.	DIN-rail mountable. Pluggable format.	DIN-rail mountable. Pluggable format.	DIN-rail mountable. Pluggable format.	DIN-rail mountable. Pluggable format.
Type according to EN 61643-11	TYPE 1	TYPE 1+2		TYPE 2	



A solution for each STEP of protection



Second step of protection (most demanding installations)	Final stage of protection (very fine)	Final stage of protection (very fine)	Final stage of protection (very fine)	For installation in the pole or OEM in the luminary of outdoor LED lighting systems
Type 2 SPD to IEC/EN 61643-11 with ground connection monitoring	Type 2+3 SPD to IEC/EN 61643-11	Type 2+3 SPD to IEC/EN 61643 -11	Type 2+3 SPD to IEC/EN 61643 -11	Type 2+3 SPD to IEC/EN 61643-11, with CB scheme. Luminary "surge tested" and certified (optional)
40 kA	20 kA	20 kA	6 kA, 10 kA, 20 kA	10 kA, 20 kA
20 kA	10 kA	10 kA	3 kA, 5 kA, 10 kA	5 kA, 10 kA
		6 kV	6 kV, 10 kV	10 kV, 20 kV
SAFEGROUND® technology for loop impedance monitoring.	PLC: Friendly versions Power Line Communication Reversible & coded cartridges.	Filter attenuation up to 82dB (common mode) vs electromagnetic disturbances. Rated current load up to 20A.	Ideal for limited spaces (1 module). Special model for fuse boxes.	Class 1 and Class 2 luminaires. Miniature size and easy to install. IP66 Models.
230 V	120/208 V, 230/400 V, 227/480 V + above	120 V, 230 V	12 V, 24 V, 48 V, 60 V, 120 V, 230 V Also for use in CC voltage applications	230 V
TT, TNS	TNS, TNC, TT, IT	Single Phase TT, TNS	Single phase TT, TNS	Solutions for all types of electrical grids (configurations and voltages)
DIN-rail mountable. Pluggable format.	DIN-rail mountable. Pluggable format.	DIN-rail mountable. Monobloc format.	DIN-rail mountable. Monobloc format.	Series and parallel connection. Terminal/wires.
TYPE 2	TYPE 2+3			



Certifications/Standards



Type 1 SPDs

CSH

CSH is the range of single pole Type 1/Class I lightning current arresters, able to shunt energy (current) from a direct lightning strike (10/350 μ s) on an external lightning protection system (LPS) or overhead supplies, in accordance with the IEC/EN 61643-11 standard.

Suitable for the first step of protection at the service entrance (meters center or main switch board) and in areas of high atmospheric exposure where installations are usually provided with an external protection system against direct lightning strikes.

RATINGS AND FEATURES

- Lightning impulse current (10/350 μ s): 50 kA
- Follow current quenching capacity (Ifi): 50kA
- Leakage current free (LCF)
- Multidischarge technology
- Single pole devices for TNS, TNC, TT and IT systems.
- Un (L-N/L-L): 120/208 V, 230/400 V, 277/480 V, 400/690 V
- Monobloc DIN rail format

limp

50kA

TECH
INFO

cirprotec.com/CSH

Standards

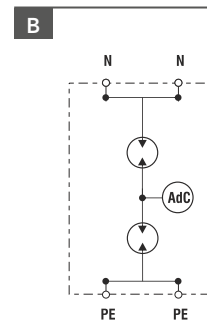
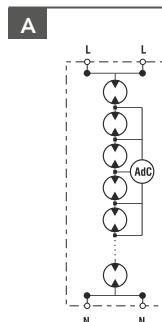
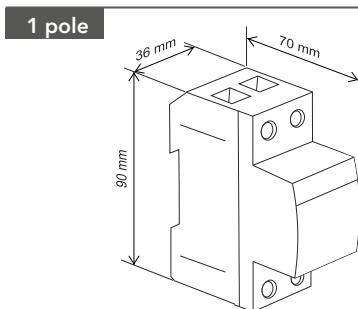
- IEC/EN 61643-11
- CE

PART NUMBERS

ORDERING CODE	PART NUMBER	Network			Un [V]	Uc [V]	limp (10/350) [kA]	In (8/20) [kA]	Up@In(8/20) [kV]
		SYSTEM TYPE	Electrical diagram						
77738010	CSH1-50-120	L-N (1Ph)	A	120	150	50	50	≤2	
77738012	CSH1-50-230	L-N (1Ph)	A	230	275	50	50	≤2	
77738016	CSH1-50-277	L-N (1Ph)	A	277	320	50	50	≤2	
77738014	CSH1-50-400	L-N (1Ph)	A	400	440	50	50	≤2,5	
77738030	CSH1-100N	N-PE (N)	B	Neutral	255	100	100	≤2	
77739710**	PCL-BP	-	-	-	-	-	-	-	

* Consult Cirprotec for dimensions and diagrams.

** Feed-through terminal for busbar wiring.



Type 1+2 SPDs

PSC 12,5

PSC 12,5 is the range of combined Type 1+2/Class I+II devices intended for discharging lightning currents (10/350 μ s) and protecting against induced voltage surges (8/20 μ s), in accordance with the IEC/EN 61643-11 standard.

Suitable for the first step of protection in the main switchboard and in areas of high atmospheric exposure, where installations are often provided with external protection against direct lightning strikes.

RATINGS AND FEATURES

- Lightning impulse current (10/350 μ s): 12.5 kA per phase
- Maximum discharge current (8/20 μ s): 65 kA per phase
- Nominal discharge current (8/20 μ s): 20 kA per phase
- TNS, TNC, TT and IT networks
- U_n (L-N/L-L): 60 V, 120/208 V, 230/400 V, 277/480 V and 400/690 V
- Plug-in DIN rail format
- Visual and remote end of life indication
- Reversible chassis to allow cable entry from above or below
- Mechanically coded cartridges to avoid replacement errors

limp

12,5kA

TECH
INFO

cirprotec.com/PSC

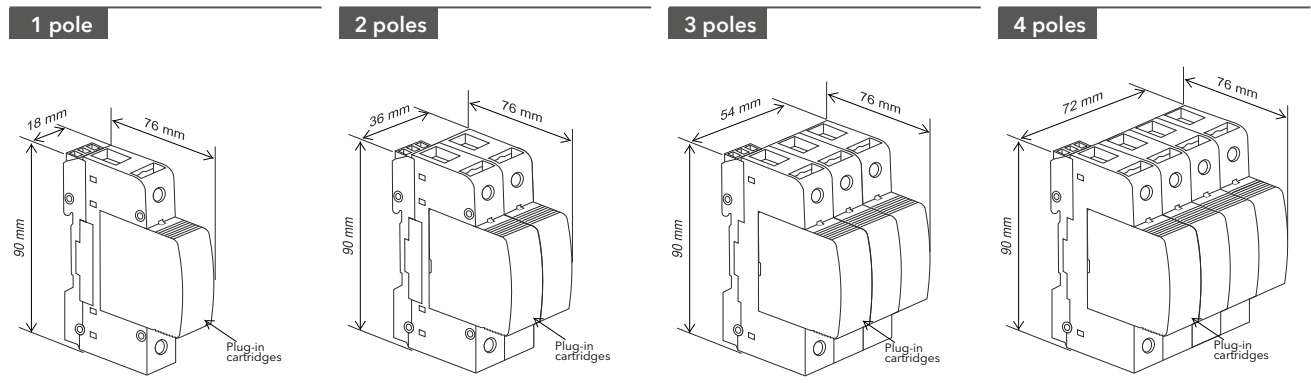


Standards

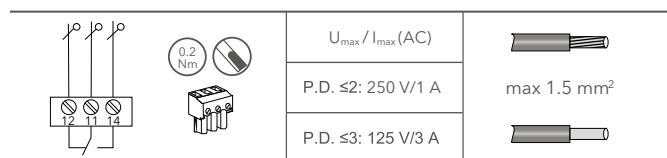
- IEC/EN 61643-11
- CE



DIMENSIONS



MICROSWITCH DIAGRAM (IR)



Type 1+2 SPDs | PSC 12,5

PART NUMBERS

1 pole

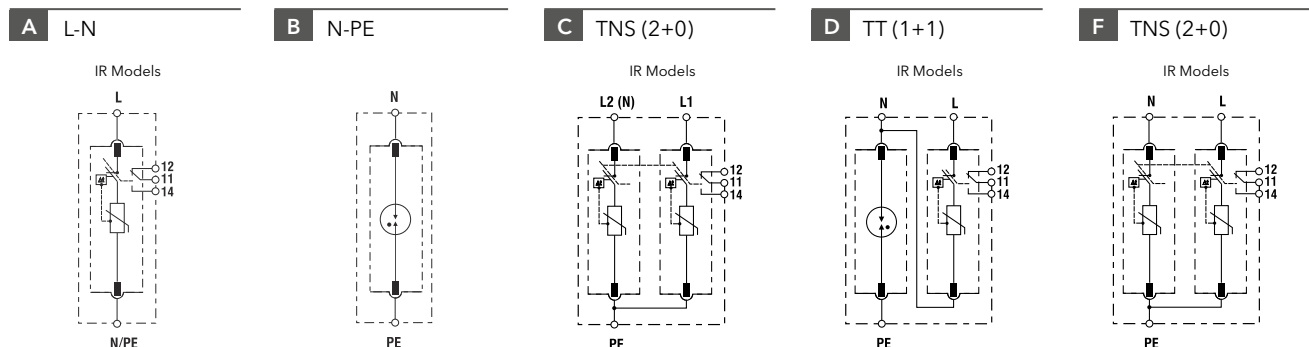
ORDERING CODE	PART NUMBER	Network								Cartridges		
		SYSTEM TYPE	Electrical diagram	Un [V]	Uc [V]	limp (10/350) [kA]	I _{max} (8/20) [kA]	I _n (8/20) [kA]	U _{p@I_n} (8/20) [kV]	IR	L	N
77738100	PSC1-12,5-120	L-N (1Ph)	A	120	150	12,5	65	20	≤1		C02	-
77738101	PSC1-12,5-120-IR	L-N (1Ph)	A	120	150	12,5	65	20	≤1	√	C02	-
77738105	PSC1-12,5-230	L-N (1Ph)	A	230	275	12,5	65	20	≤1,3		C03	-
77738106	PSC1-12,5-230-IR	L-N (1Ph)	A	230	275	12,5	65	20	≤1,3	√	C03	-
77738112	PSC1-12,5-277	L-N (1Ph)	A	277	320	12,5	65	20	≤1,4		C04	-
77738113	PSC1-12,5-277-IR	L-N (1Ph)	A	277	320	12,5	65	20	≤1,4	√	C04	-
77738110	PSC1-12,5-400	L-N (1Ph)	A	400	440	12,5	65	20	≤1,8		C05	-
77738111	PSC1-12,5-400-IR	L-N (1Ph)	A	400	440	12,5	65	20	≤1,8	√	C05	-
77738180	PSC1-25N	N-PE (N)	B	Neutral	255	25	65	25	≤1,5		-	C06
77738182	PSC1-50N	N-PE (N)	B	Neutral	255	50	65	50	≤1,5		-	C07

2 poles

ORDERING CODE	PART NUMBER	Network								Cartridges		
		SYSTEM TYPE	Electrical diagram	Un [V]	Uc [V]	limp (10/350) [kA]	I _{max} (8/20) [kA]	I _n (8/20) [kA]	U _{p@I_n} (8/20) [kV]	IR	L	N
77738094	PSC2-12,5-60-ELV	TNS (1Ph+N); PV	C	60/-	75; 80 U _{cpv}	12,5	65	20	≤0,65			C01
77738095	PSC2-12,5-60-ELV-IR	TNS (1Ph+N); PV	C	60/-	75; 80 U _{cpv}	12,5	65	20	≤0,65	√		C01
77738200	PSC2-12,5-120-TT	TT (1Ph+N)	D	120/-	150	12,5 (L-N) 25 (N-PE)	65	20	≤1 (L-N) ≤1,5 (N-PE)		C02	C06
77738201	PSC2-12,5-120-TT-IR	TT (1Ph+N)	D	120/-	150	12,5 (L-N) 25 (N-PE)	65	20	≤1 (L-N) ≤1,5 (N-PE)	√	C02	C06
77738205	PSC2-12,5-230-TT	TT (1Ph+N)	D	230/-	275	12,5 (L-N) 25 (N-PE)	65	20	≤1,3 (L-N) ≤1,5 (N-PE)		C03	C06
77738206	PSC2-12,5-230-TT-IR	TT (1Ph+N)	D	230/-	275	12,5 (L-N) 25 (N-PE)	65	20	≤1,3 (L-N) ≤1,5 (N-PE)	√	C03	C06
77738250	PSC2-12,5-120-TNS	TNS (1Ph+N)	F	120/-	150	12,5	65	20	≤1		C02	-
77738251	PSC2-12,5-120-TNS-IR	TNS (1Ph+N)	F	120/-	150	12,5	65	20	≤1	√	C02	-
77738255	PSC2-12,5-230-TNS	TNS (1Ph+N)	F	230/-	275	12,5	65	20	≤1,3		C03	-
77738256	PSC2-12,5-230-TNS-IR	TNS (1Ph+N)	F	230/-	275	12,5	65	20	≤1,3	√	C03	-
77738257	PSC2-12,5-277-TNS	TNS (1Ph+N)	F	277/-	320	12,5	65	20	≤1,4		C04	-
77738258	PSC2-12,5-277-TNS-IR	TNS (1Ph+N)	F	277/-	320	12,5	65	20	≤1,4	√	C04	-

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

ELECTRICAL DIAGRAMS



Type 1+2 SPDs | PSC 12,5

3 poles

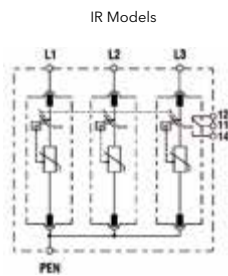
ORDERING CODE	PART NUMBER	Network									Cartridges	
		SYSTEM TYPE	Electrical diagram	Un [V]	Uc [V]	Iimp (10/350) [kA]	Imax (8/20) [kA]	In (8/20) [kA]	Up@In (8/20) [kV]	IR	L	N
77738320	PSC3-12,5-230-TNC	TNC (3Ph)	H	-/208	150	12,5	65	20	≤1		C02	-
77738321	PSC3-12,5-230-TNC-IR	TNC (3Ph)	H	-/208	150	12,5	65	20	≤1	√	C02	-
77738325	PSC3-12,5-400-TNC	TNC (3Ph)	H	-/400	275	12,5	65	20	≤1,3		C03	-
77738326	PSC3-12,5-400-TNC-IR	TNC (3Ph)	H	-/400	275	12,5	65	20	≤1,3	√	C03	-
77738329	PSC3-12,5-480-TNC	TNC (3Ph)	H	-/480	320	12,5	65	20	≤1,4		C04	-
77738330	PSC3-12,5-480-TNC-IR	TNC (3Ph)	H	-/480	320	12,5	65	20	≤1,4	√	C04	-

4 poles

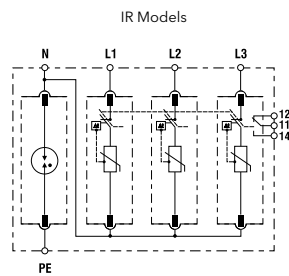
ORDERING CODE	PART NUMBER	Network									Cartridges	
		SYSTEM TYPE	Electrical diagram	Un [V]	Uc [V]	Iimp (10/350) [kA]	Imax (8/20) [kA]	In (8/20) [kA]	Up@In (8/20) [kV]	IR	L	N
77738400	PSC4-12,5-230-TT	TT (3Ph+N)	J	120/208	150	12,5 (L-N) 50 (N-PE)	65	20	≤1 (L-N) ≤1,5 (N-PE)		C02	C07
77738401	PSC4-12,5-230-TT-IR	TT (3Ph+N)	J	120/208	150	12,5 (L-N) 50 (N-PE)	65	20	≤1 (L-N) ≤1,5 (N-PE)	√	C02	C07
77738405	PSC4-12,5-400-TT	TT (3Ph+N)	J	230/400	275	12,5 (L-N) 50 (N-PE)	65	20	≤1,3 (L-N) ≤1,5 (N-PE)		C03	C07
77738406	PSC4-12,5-400-TT-IR	TT (3Ph+N)	J	230/400	275	12,5 (L-N) 50 (N-PE)	65	20	≤1,3 (L-N) ≤1,5 (N-PE)	√	C03	C07
77738450	PSC4-12,5-230-TNS	TNS (3Ph+N)	L	120/208	150	12,5	65	20	≤1		C02	-
77738451	PSC4-12,5-230-TNS-IR	TNS (3Ph+N)	L	120/208	150	12,5	65	20	≤1	√	C02	-
77738455	PSC4-12,5-400-TNS	TNS (3Ph+N)	L	230/400	275	12,5	65	20	≤1,3		C03	-
77738456	PSC4-12,5-400-TNS-IR	TNS (3Ph+N)	L	230/400	275	12,5	65	20	≤1,3	√	C03	-
77738457	PSC4-12,5-480-TNS	TNS (3Ph+N)	L	277/480	320	12,5	65	20	≤1,4		C04	-
77738458	PSC4-12,5-480-TNS-IR	TNS (3Ph+N)	L	277/480	320	12,5	65	20	≤1,4	√	C04	-

ELECTRICAL DIAGRAMS

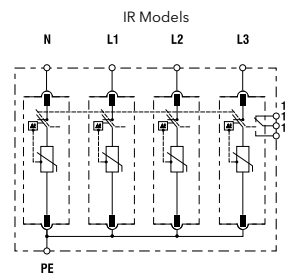
H TNC (3+0)



J TT (3+1)



L TNS (4+0)



Consult Cirprotect for specific models for IT isolated networks.

Replacement cartridges

ORDERING CODE	PART NUMBER	SYSTEM TYPE	Un [V]	Uc [V]	Iimp (10/350) [kA]	Imax (8/20) [kA]	In (8/20) [kA]	Up@In (8/20) [kV]	Cartridges
77738606	PSC-12,5-60	L-N (1Ph)	60	75	12,5	65	20	≤0,65	C01
77738600	PSC-12,5-120	L-N (1Ph)	120	150	12,5	65	20	≤1	C02
77738601	PSC-12,5-230	L-N (1Ph)	230	275	12,5	65	20	≤1,3	C03
77738603	PSC-12,5-277	L-N (1Ph)	277	320	12,5	65	20	≤1,4	C04
77738602	PSC-12,5-400	L-N (1Ph)	400	440	12,5	65	20	≤1,8	C05
77738613	PSC-25N	N-PE (N)	Neutral	255	25	65	25	≤1,5	C06
77738614	PSC-50N	N-PE (N)	Neutral	255	50	65	50	≤1,5	C07

Type 1+2 SPDs

PSC 25

PSC 25 is the range of combined Type 1+2/Class I+II devices intended for discharging lightning currents (10/350 μ s) and protecting against induced voltage surges (8/20 μ s), in accordance with the IEC/EN 61643-11 standard.

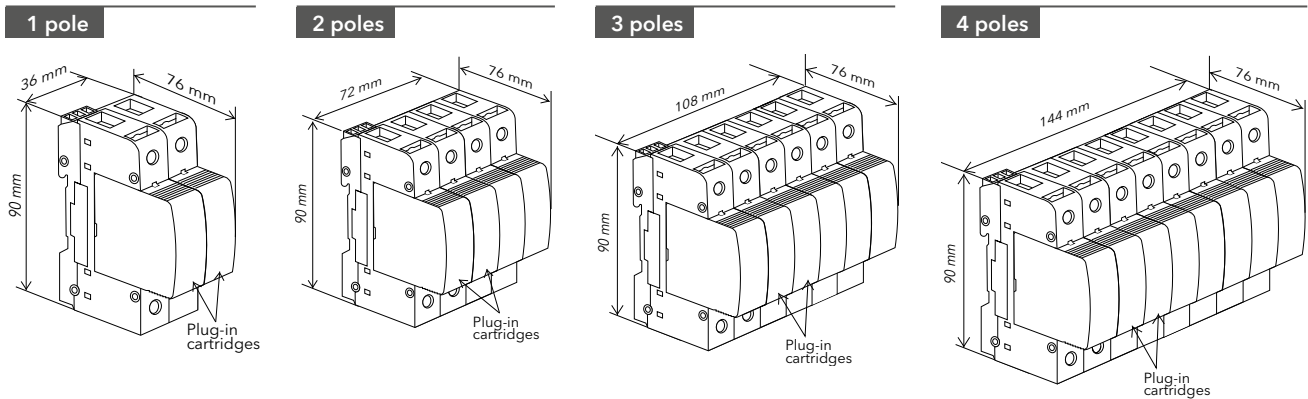
Suitable for the first step of protection in the main switchboard and in areas of high atmospheric exposure, where installations are often provided with external protection against direct lightning strikes.

RATINGS AND FEATURES

- Lightning impulse current (10/350 μ s): 25 kA per phase
- Maximum discharge current (8/20 μ s): 100 kA per phase
- Nominal discharge current (8/20 μ s): 25 kA per phase
- TNS, TNC, TT and IT networks
- Un (L-N/L-L): 120/208 V, 230/400 V, 400/690 V
- Plug-in DIN rail format
- Visual and remote end of life indication
- Reversible chassis to allow cable entry from above or below
- Mechanically coded cartridges to avoid replacement errors



DIMENSIONS



PART NUMBERS

1 pole

ORDERING CODE	PART NUMBER	Network								Cartridges		
		SYSTEM TYPE	Electrical diagram	Un [V]	Uc [V]	limp (10/350) [kA]	Imax (8/20) [kA]	In (8/20) [kA]	Up [kV]	IR	L	N
77738121	PSC1-25-120	L-N (1Ph)	A	120	150	25	100	25	<1		C70	-
77738121	PSC1-25-120-IR	L-N (1Ph)	A	120	150	25	100	25	<1	√	C70	-
77738125	PSC1-25-230	L-N (1Ph)	A	230	275	25	100	25	≤ 1,5		C66	-
77738126	PSC1-25-230-IR	L-N (1Ph)	A	230	275	25	100	25	≤ 1,5	√	C66	-
77738131	PSC1-25-400	L-N (1Ph)	A	400	440	25	100	25	<2		C71	-
77738131	PSC1-25-400-IR	L-N (1Ph)	A	400	440	25	100	25	<2	√	C71	-
77738183	PSC1-100N	N-PE (N)	B	Neutral	255	100	100	50	≤ 1,5		-	C67

Type 1+2 SPDs | PSC 25

2 poles

ORDERING CODE	PART NUMBER	Network									Cartridges	
		SYSTEM TYPE	Electrical diagram	Un [V]	Uc [V]	Iimp (10/350) [kA]	I _{max} (8/20) [kA]	I _n (8/20) [kA]	U _p [kV]	IR	L	N
77738225	PSC2-25-230-TT	TT (1Ph+N)	D	230/-	275	25	100	25	≤ 1,5		C66	C68
77738226	PSC2-25-230-TT-IR	TT (1Ph+N)	D	230/-	275	25	100	25	≤ 1,5	√	C66	C68

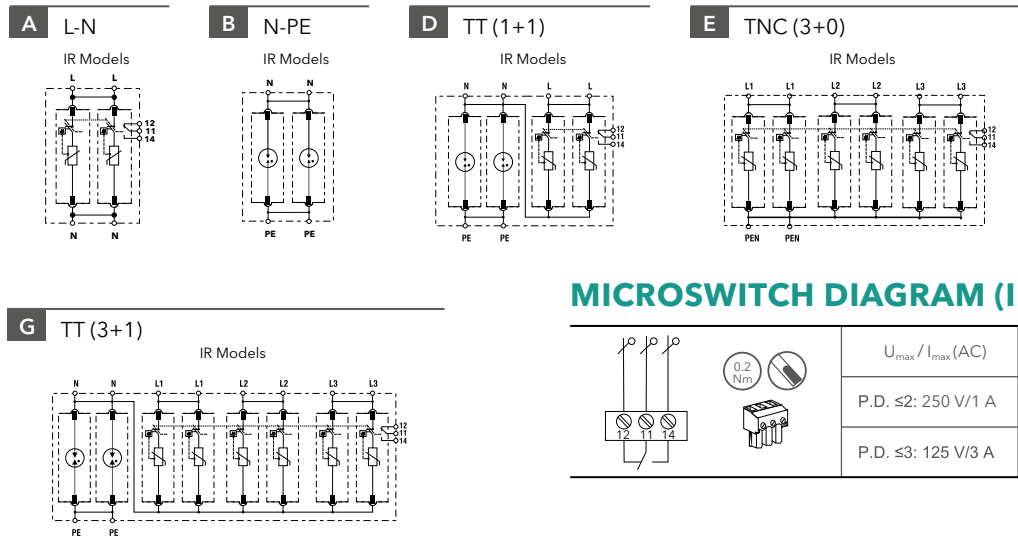
3 poles

ORDERING CODE	PART NUMBER	Network									Cartridges	
		SYSTEM TYPE	Electrical diagram	Un [V]	Uc [V]	Iimp (10/350) [kA]	I _{max} (8/20) [kA]	I _n (8/20) [kA]	U _p [kV]	IR	L	N
77738345	PSC3-25-400-TNC	TNC (3Ph)	E	-/400	275	25	100	25	≤ 1,5		C66	-
77738346	PSC3-25-400-TNC-IR	TNC (3Ph)	E	-/400	275	25	100	25	≤ 1,5	√	C66	-

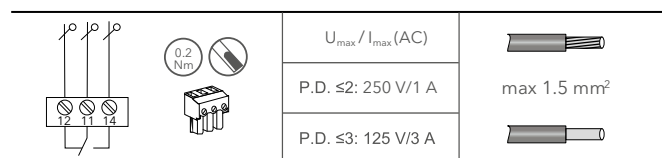
4 poles

ORDERING CODE	PART NUMBER	Network									Cartridges	
		SYSTEM TYPE	Electrical diagram	Un [V]	Uc [V]	Iimp (10/350) [kA]	I _{max} (8/20) [kA]	I _n (8/20) [kA]	U _p [kV]	IR	L	N
77738425	PSC4-25-400-TT	TT (3Ph+N)	G	230/400	275	25	100	25	≤ 1,5		C66	C68
77738426	PSC4-25-400-TT-IR	TT (3Ph+N)	G	230/400	275	25	100	25	≤ 1,5	√	C66	C68

ELECTRICAL DIAGRAMS



MICROSWITCH DIAGRAM (IR)



Consult Cirprotec for other configurations (TNS) and voltages (120/208 V, 400/690 V)

Replacement cartridges

ORDERING CODE	PART NUMBER	SYSTEM TYPE	Un [V]	Iimp (10/350) [kA]	I _{max} (8/20) [kA]	I _n (8/20) [kA]	U _p [kV]	Cartridges
77738610	PSC-25-120	L-N (1Ph)	120	25	100	25	<1	C70
77738611	PSC-25-230	L-N (1Ph)	230	25	100	25	≤ 1,5	C66
77738612	PSC-25-400	L-N (1Ph)	400	25	100	25	<2	C71
77738616	PSC-50N2	N-PE (N)	Neutral	50	100	25	≤ 1,5	C67
77738619	PSC-100N	N-PE (N)	Neutral	100	100	50	≤ 1,5	C68

Type 1+2 Photovoltaic SPD

PSC 5 PV

PSC 5 PV is the PHOTOVOLTAIC range of combined Type 1+2/ Class I+II devices intended for discharging lightning currents (10/350 μ s) and protecting against induced voltage surges (8/20 μ s), in accordance with EN 50539-11 and IEC 61643-31 standards.

Cirprotec uses its dynamic thermal disconnection system with high breaking capacity, optimised for DC voltages. This means there is no need to install a backup fuse to interrupt the typical short-circuit currents of any photovoltaic installation.

These lightning current and surge protection devices are suitable for all photovoltaic applications: large-scale, rooftop and self-consumption (off-grid) DC installations; especially in facilities provided with external LPS.

RATINGS AND FEATURES

- Lightning impulse current (10/350 μ s): 5 kA
- Maximum discharge current (8/20 μ s): 40 kA
- Nominal discharge current (8/20 μ s): 20 kA
- U_{cpv} : 1060 Vdc
- I_{scpv} : 10 kA (EN 50539-11), no back-up fuse required
- Plug-in DIN rail format
- Visual and remote end of life indication
- Reversible chassis to allow cable entry from above or below
- Mechanically coded cartridges to avoid replacement errors

limp

5 kA

TECH INFO
↓
cirprotec.com/PSC-PV



No back-up fuse required



Standards

- IEC 61643-31
- EN 50539-11
- CE



Watch the video on www.youtube.com/cptcirprotec

PART NUMBERS

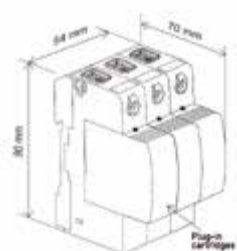
ORDERING CODE	PART NUMBER	Network									Cartridges	
		SYSTEM TYPE	Electrical diagram	U_{cpv} [Vdc]	limp (10/350) [kA]	I_{scpv} [kA]	I_{max} (8/20) [kA]	I_n (8/20) [kA]	$U_p@I_n$ (8/20) [kV]	IR	L	
77738377	PSC3-5-1000-PV	"Y" PV	A	1060	5	10	40	20	≤4		C69	
77738378	PSC3-5-1000-PV-IR	"Y" PV	A	1060	5	10	40	20	≤4	√	C69	

Replacement cartridges

ORDERING CODE	PART NUMBER	SYSTEM TYPE	U_{cpv} (Vdc)	limp (10/350) [kA]	I_{max} (8/20) [kA]	I_n (8/20) [kA]	$U_p@I_n$ (8/20) [kV]	Cartridges
77738643	PSC-5-1000-PV	PV	1060	5	40	20	≤2	C69

DIMENSIONS

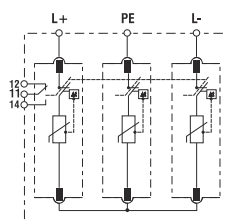
3 modules




ELECTRICAL DIAGRAM/MICROSWITCH DIAGRAM (IR)

A Y PV

IR Models



U_{max} / I_{max} (AC)	 max 1.5 mm ²
P.D. ≤2: 250 V/1 A	
P.D. ≤3: 125 V/3 A	

Type 2 Photovoltaic SPD

PSM 40 PV

PSM 40 PV is the PHOTOVOLTAIC range of Type 2/Class II devices intended for protecting against induced voltage surges (8/20 μ s), in accordance with EN 50539-11 and IEC 61643-31 standards.

Cirprotec uses its dynamic thermal disconnection system with high breaking capacity, optimised for DC voltages. This means there is no need to install a backup fuse to interrupt the typical short-circuit currents of any photovoltaic installation.

These surge protection devices are suitable for all photovoltaic applications: large-scale, rooftop and self-consumption (off-grid) DC installations.

RATINGS AND FEATURES

- Maximum discharge current (8/20 μ s): 40 kA
- Nominal discharge current (8/20 μ s): 20 kA
- U_{cpv} : 65, 80, 660, 1060 Vdc and 1500 Vdc
- I_{scpv} : 10 kA (EN 50539-11), no back-up fuse required
- SCCR: 50 kA, 100 kA (UL 1449 4th Ed)
- Plug-in DIN rail format
- Visual and remote end of life indication
- Reversible chassis to allow cable entry from above or below
- Mechanically coded cartridges to avoid replacement errors

Imax

40 kA

TECH INFO
↓
cirprotec.com/PSM-PV

No back-up fuse required

Standards

- IEC 61643-31
- EN 50539-11
- UL 1449 4th Ed., File No. E468946
- CE

IEC **UL** **CE**

Watch the video on www.youtube.com/cptcirprotec



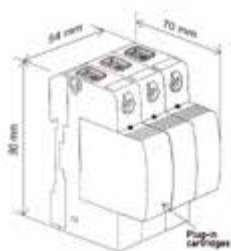
PART NUMBERS

ORDERING CODE	PART NUMBER	Network								Cartridges
		SYSTEM TYPE	Electrical diagram	U_{cpv} [Vdc]	I_{scpv} [kA]	I_{max} (8/20) [kA]	I_n (8/20) [kA]	$U_p@I_n$ (8/20) [kV]	IR	L
77707850	PSM3-40-600-PV	"Y" PV	A	660	10	40	20	≤2,6		C40
77707851	PSM3-40-600-PV-IR	"Y" PV	A	660	10	40	20	≤2,6	✓	C40
77707852	PSM3-40-1000-PV	"Y" PV	A	1060	10	40	20	≤4		C41
77707853	PSM3-40-1000-PV-IR	"Y" PV	A	1060	10	40	20	≤4	✓	C41
77707840	PSM3-40-1500-PV	"Y" PV	A	1500	10	40	15	≤5		C42
77707841	PSM3-40-1500-PV-IR	"Y" PV	A	1500	10	40	15	≤5	✓	C42

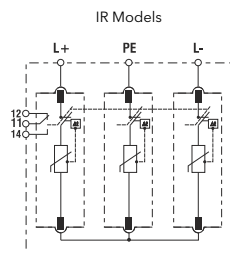
Remark: see also page 27 "2 poles" for DC self-consumption "off-grid" applications (extra low voltage). Consult us for other voltages.

DIMENSIONS ELECTRICAL DIAGRAMS

3 modules



A Y PV



MICROSWITCH DIAGRAM (IR)

U_{max} / I_{max} (AC)	
P.D. ≤2: 250 V/1 A	max 1.5 mm ²
P.D. ≤3: 125 V/3 A	

Replacement cartridges

ORDERING CODE	PART NUMBER	SYSTEM TYPE	U_{cpv} [Vdc]	I_{max} (8/20) [kA]	I_n (8/20)	$U_p@I_n$ (8/20) [kV]	Cartridges
77707656	PSM-40-600-PV	PV	330	40	20	≤1,3	C40
77707657	PSM-40-1000-PV	PV	530	40	20	≤2	C41
77707683	PSM-40-1500-PV	PV	750	40	15	≤2,5	C42

Type 2 SPDs

PSM 40

PSM 40 is the range of Type 2/Class II devices intended for protecting against induced voltage surges (8/20 μ s), in accordance with the IEC/EN 61643-11 standard.

Suitable for the second step of protection in distribution boards in which Type 1 protectors are installed upstream or for the first step of protection in commercial installations, homes or other applications not exposed to direct strikes and with no external lightning protection system.

RATINGS AND FEATURES

- Maximum discharge current (8/20 μ s): 40 kA per phase
- Nominal discharge current (8/20 μ s): 20 kA per phase
- TNS, TNC, TT and IT networks
- U_n (L-N/L-L): 48 V, 60 V, 120/208 V, 230/400 V, 277/480 V, 400/690 V and higher
- Plug-in DIN rail format
- Visual and remote end of life indication
- Reversible chassis to allow cable entry from above or below
- Mechanically coded cartridges to avoid replacement errors
- UL 1449 4th Ed. certified models

Imax

40 kA

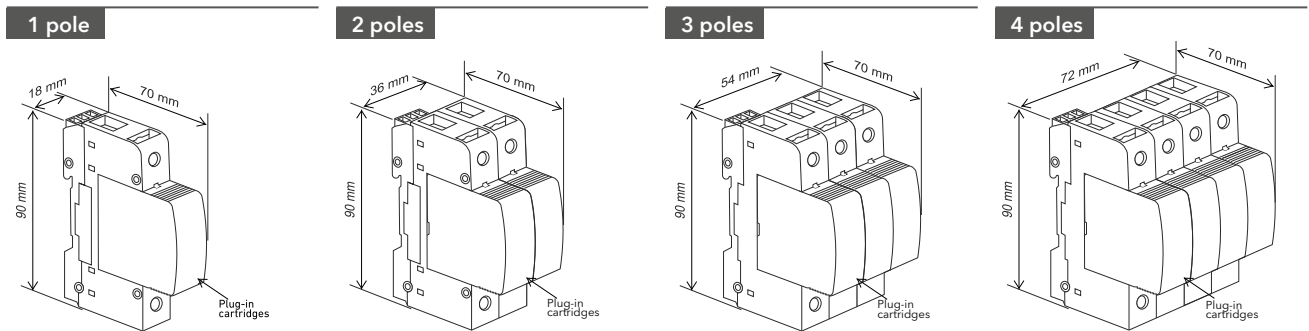
TECH
INFO

cirprotec.com/PSM

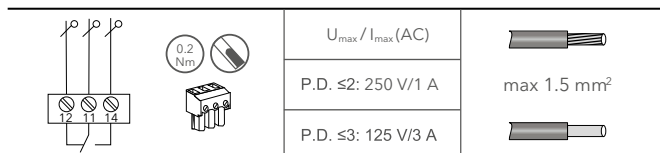
Standards

- IEC/EN 61643-11
- UL 1449 4th Ed., File No. E468946
- CE

DIMENSIONS



MICROSWITCH DIAGRAM (IR)



Type 2 SPDs | PSM 40

PART NUMBERS

1 pole

ORDERING CODE	PART NUMBER	Network								Cartridges	
		SYSTEM TYPE	Electrical diagram	Un [V]	Uc [V]	I _{max} (8/20) [kA]	I _n (8/20) [kA]	U _{p@I_n} (8/20) [kV]	IR	L	N
77707706	PSM1-40-120	L-N (1Ph)	A	120	150	40	20	≤1		C22	-
77707707	PSM1-40-120-IR	L-N (1Ph)	A	120	150	40	20	≤1	√	C22	-
77707708	PSM1-40-230	L-N (1Ph)	A	230	275	40	20	≤1,3		C23	-
77707709	PSM1-40-230-IR	L-N (1Ph)	A	230	275	40	20	≤1,3	√	C23	-
77707734	PSM1-40-277	L-N (1Ph)	A	277	320	40	20	≤1,5		C24	-
77707735	PSM1-40-277-IR	L-N (1Ph)	A	277	320	40	20	≤1,5	√	C24	-
77707710	PSM1-40-400	L-N (1Ph)	A	400	440	40	20	≤2		C25	-
77707711	PSM1-40-400-IR	L-N (1Ph)	A	400	440	40	20	≤2	√	C25	-
77707714	PSM1-30-750	L-N (1Ph)	A	690	750	30	15	≤3		C26	-
77707715	PSM1-30-750-IR	L-N (1Ph)	A	690	750	30	15	≤3	√	C26	-
77707746	PSM1-40N	N-PE (N)	B	Neutral	277	40	20	≤1,5		-	C27

2 poles

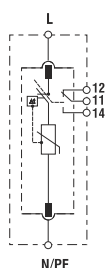
ORDERING CODE	PART NUMBER	Network								Cartridges	
		SYSTEM TYPE	Electrical diagram	Un [V]	Uc [V]	I _{max} (8/20) [kA]	I _n (8/20) [kA]	U _{p@I_n} (8/20) [kV]	IR	L	N
77707926	PSM2-40-48-ELV	TNS (1Ph+N); PV	C	48/-	60; 65 U _{cpv}	40	20	≤0,7		C20	-
77707927	PSM2-40-48-ELV-IR	TNS (1Ph+N); PV	C	48/-	60; 65 U _{cpv}	40	20	≤0,7	√	C20	-
77707928	PSM2-40-60-ELV	TNS (1Ph+N); PV	C	60/-	75; 80 U _{cpv}	40	20	≤0,8		C21	-
77707929	PSM2-40-60-ELV-IR	TNS (1Ph+N); PV	C	60/-	75; 80 U _{cpv}	40	20	≤0,8	√	C21	-
77707754	PSM2-40-120-TT	TT (1Ph+N)	D	120/-	150	40	20	≤1 (L-N) ≤1,5 (N-PE)		C22	C27
77707755	PSM2-40-120-TT-IR	TT (1Ph+N)	D	120/-	150	40	20	≤1 (L-N) ≤1,5 (N-PE)	√	C22	C27
77707756	PSM2-40-230-TT	TT (1Ph+N)	D	230/-	275	40	20	≤1,3 (L-N) ≤1,5 (N-PE)		C23	C27
77707757	PSM2-40-230-TT-IR	TT (1Ph+N)	D	230/-	275	40	20	≤1,3 (L-N) ≤1,5 (N-PE)	√	C23	C27
77707760	PSM2-40-277-TT	TT (1Ph+N)	D	277/-	320	40	20	≤1,5 (L-N) ≤1,5 (N-PE)		C24	C27
77707761	PSM2-40-277-TT-IR	TT (1Ph+N)	D	277/-	320	40	20	≤1,5 (L-N) ≤1,5 (N-PE)	√	C24	C27
77707904	PSM2-40-120-TNS	TNS (1Ph+N)	F	120/-	150	40	20	≤1		C22	-
77707905	PSM2-40-120-TNS-IR	TNS (1Ph+N)	F	120/-	150	40	20	≤1	√	C22	-
77707906	PSM2-40-230-TNS	TNS (1Ph+N)	F	230/-	275	40	20	≤1,3		C23	-
77707907	PSM2-40-230-TNS-IR	TNS (1Ph+N)	F	230/-	275	40	20	≤1,3	√	C23	-
77707914	PSM2-40-277-TNS	TNS (1Ph+N)	F	277/-	320	40	20	≤1,5		C24	-
77707915	PSM2-40-277-TNS-IR	TNS (1Ph+N)	F	277/-	320	40	20	≤1,5	√	C24	-

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

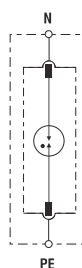
ELECTRICAL DIAGRAMS

A L-N

IR Models

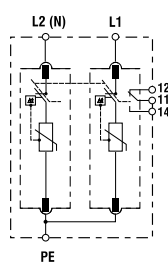


B N-PE



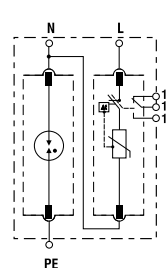
C TNS (2+0)

IR Models



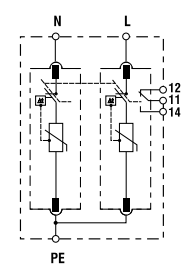
D TT (1+1)

IR Models



F TNS (2+0)

IR Models



Type 2 SPDs | PSM 40

3 poles

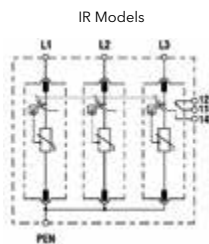
ORDERING CODE	PART NUMBER	Network							Cartridges		
		SYSTEM TYPE	Electrical diagram	Un [V]	Uc [V]	I _{max} (8/20) [kA]	I _n (8/20) [kA]	Up@In (8/20) [kV]	IR	L	N
77707864	PSM3-40-230-TNC	TNC (3Ph)	H	-/208	150	40	20	≤1		C22	-
77707865	PSM3-40-230-TNC-IR	TNC (3Ph)	H	-/208	150	40	20	≤1	√	C22	-
77707866	PSM3-40-400-TNC	TNC (3Ph)	H	-/400	275	40	20	≤1,3		C23	-
77707867	PSM3-40-400-TNC-IR	TNC (3Ph)	H	-/400	275	40	20	≤1,3	√	C23	-
77707882	PSM3-40-480-TNC	TNC (3Ph)	H	-/480	320	40	20	≤1,5		C24	-
77707883	PSM3-40-480-TNC-IR	TNC (3Ph)	H	-/480	320	40	20	≤1,5	√	C24	-
77707870	PSM3-30-750-TNC	TNC (3Ph)	H	-/690; -/1000	750	30	15	≤3		C26	-
77707871	PSM3-30-750-TNC-IR	TNC (3Ph)	H	-/690; -/1000	750	30	15	≤3	√	C26	-

4 poles

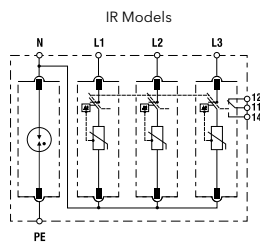
ORDERING CODE	PART NUMBER	Network							Cartridges		
		SYSTEM TYPE	Electrical diagram	Un [V]	Uc [V]	I _{max} (8/20) [kA]	I _n (8/20) [kA]	Up@In (8/20) [kV]	IR	L	N
77707804	PSM4-40-230-TT	TT (3Ph+N)	J	120/208	150	40	20	≤1 (L-N) ≤1,5 (N-PE)		C22	C27
77707805	PSM4-40-230-TT-IR	TT (3Ph+N)	J	120/208	150	40	20	≤1 (L-N) ≤1,5 (N-PE)	√	C22	C27
77707806	PSM4-40-400-TT	TT (3Ph+N)	J	230/400	275	40	20	≤1,3 (L-N) ≤1,5 (N-PE)		C23	C27
77707807	PSM4-40-400-TT-IR	TT (3Ph+N)	J	230/400	275	40	20	≤1,3 (L-N) ≤1,5 (N-PE)	√	C23	C27
77707810	PSM4-40-480-TT	TT (3Ph+N)	J	277/480	320	40	20	≤1,5 (L-N) ≤1,5 (N-PE)		C24	C27
77707811	PSM4-40-480-TT-IR	TT (3Ph+N)	J	277/480	320	40	20	≤1,5 (L-N) ≤1,5 (N-PE)	√	C24	C27
77707954	PSM4-40-230-TNS	TNS (3Ph+N)	L	120/208	150	40	20	≤1		C22	-
77707955	PSM4-40-230-TNS-IR	TNS (3Ph+N)	L	120/208	150	40	20	≤1	√	C22	-
77707956	PSM4-40-400-TNS	TNS (3Ph+N)	L	230/400	275	40	20	≤1,3		C23	-
77707957	PSM4-40-400-TNS-IR	TNS (3Ph+N)	L	230/400	275	40	20	≤1,3	√	C23	-
77707989	PSM4-40-480-TNS	TNS (3Ph+N)	L	277/480	320	40	20	≤1,5		C24	-
77707990	PSM4-40-480-TNS-IR	TNS (3Ph+N)	L	277/480	320	40	20	≤1,5	√	C24	-

ELECTRICAL DIAGRAMS

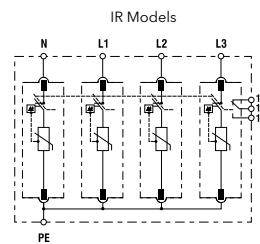
H TNC (3+0)



J TT (3+1)



L TNS (4+0)



Consult Cirprotec for specific models for IT isolated networks.

Replacement cartridges

ORDERING CODE	PART NUMBER	SYSTEM TYPE	Un [V]	Uc [V]	I _{max} (8/20) [kA]	I _n (8/20) [kA]	Up@In (8/20) [kV]	Cartridges
77707680	PSM-40-48	L-N (1Ph)	48	60	40	20	≤0,7	C20
77707681	PSM-40-60	L-N (1Ph)	60	75	40	20	≤0,8	C21
77707653	PSM-40-120	L-N (1Ph)	120	150	40	20	≤1	C22
77707654	PSM-40-230	L-N (1Ph)	230	275	40	20	≤1,3	C23
77707671	PSM-40-277	L-N (1Ph)	277	320	40	20	≤1,5	C24
77707655	PSM-40-400	L-N (1Ph)	400	440	40	20	≤2	C25
77707668	PSM-30-750	L-N (1Ph)	690	750	30	15	≤3	C26
77707664	PSM-40N	N-PE (N)	Neutral	277	40	20	≤1,5	C27

Type 2 SPD with grounding status monitoring

SAFEGROUND®

SAFEGROUND® is the first range of Type 2/Class II devices intended for protecting against induced voltage surges (8/20 μ s) according to IEC/EN 61643-11, which incorporate a special LED for indication of proper installation and monitoring of the earth loop, so providing information on the effectiveness of the protection offered.

SAFEGROUND® is Cirprotec's premium solution, especially suitable for the most demanding installations, which by their nature require continuous monitoring of the state of the grounding system. Installation should be as close possible to the equipment to be protected to allow for a complete loop impedance measurement.

RATINGS AND FEATURES

- Patented SAFEGROUND® technology for loop impedance monitoring
- Checking of correct device wiring at installation time
- Continuous indication of the effectiveness of the protection offered
- Additional safety information in the event of indirect contacts
- Maximum discharge current (8/20 μ s): 40 kA per phase
- Nominal discharge current (8/20 μ s): 20 kA per phase
- TT and TNS networks
- Un (L-N/L-L): 230/400 V
- Plug-in DIN rail format
- Further information on page 60 of this catalogue or at www.cirprotec.com/safeground



Watch the video on www.youtube.com/cptcirprotec



PART NUMBERS

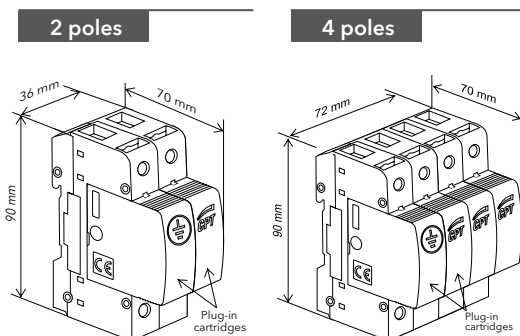
ORDERING CODE	PART NUMBER	Network							Cartridges
		SYSTEM TYPE	Electrical diagram	Un [V]	Uc [V]	Imax (8/20) [kA]	In (8/20) [kA]	Up@In (8/20) [kV]	L
77727756	PSM2-40-230-SG	1Ph+N	A	230	275	40	20	≤1,3	C23
77727806	PSM4-40-400-SG	3Ph+N	B	230/400	275	40	20	≤1,3 (L-N) ≤1,5 (N-PE)	C23

Consult Cirprotec for other models.

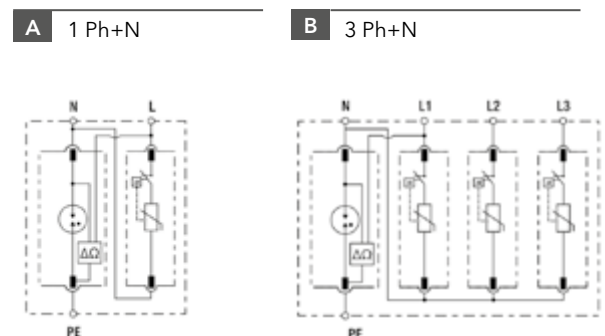
Replacement cartridges

ORDERING CODE	PART NUMBER	SYSTEM TYPE	Un [V]	Uc [V]	Imax (8/20) [kA]	In (8/20) [kA]	Up@In (8/20) [kV]	Cartridges
77707654	PSM-40-230	L-N (1Ph)	230	275	40	20	≤1,3	C23

DIMENSIONS



ELECTRICAL DIAGRAMS



Tel: +46 (0)54-570120 | info@kamic.se | www.kamic.se

KAMIC förbehåller sig rätten till konstruktionsändringar som kan påverka produktens prestanda. För övrig info se: www.kamic.se

Type 2+3 SPDs

PSM 20

PSM 20 is the range of Type 2+3/Class II+III devices intended for protecting against induced voltage surges (8/20 μ s), in accordance with the IEC/EN 61643-11 standard.

Suitable for the second and final steps of protection in panels with Type 2 protection devices installed upstream, such as PSM 40. These systems should be installed as close as possible to the equipment to be protected.

RATINGS AND FEATURES

- Maximum discharge current (8/20 μ s): 20 kA per phase
- Nominal discharge current (8/20 μ s): 10 kA per phase
- Combined voltage pulse U_{oc} (1.2/50 μ s): 10 kV
- TNS, TNC, TT and IT networks
- U_n (L-N/L-L): 120/208 V, 230/400 V, 277/480 V and 400/690 V
- Models compatible with PLC Power Line Communications
- Plug-in DIN rail format
- Visual and remote end of life indication
- Reversible chassis to allow cable entry from above or below
- Mechanically coded cartridges to avoid replacement errors

Imax

20 kA

TECH
INFO

cirprotec.com/PSM

Standards

- IEC/EN 61643-11
- CE

DIMENSIONS

1 pole

2 poles

3 poles

4 poles

MICROSWITCH DIAGRAM (IR)

	U_{max} / I_{max} (AC)	 max 1.5 mm ²
	P.D. \leq 2: 250 V/1 A	
	P.D. \leq 3: 125 V/3 A	

Type 2+3 SPDs | PSM 20

PART NUMBERS

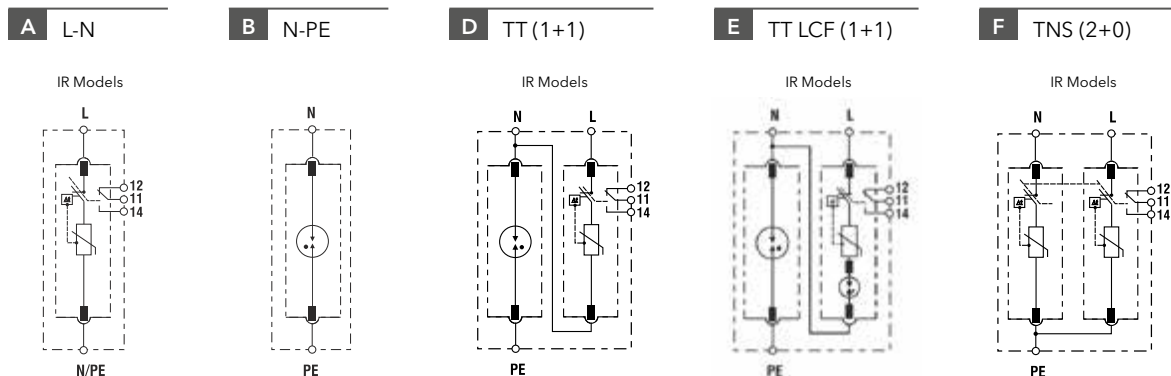
1 pole

ORDERING CODE	PART NUMBER	Network									Cartridges	
		SYSTEM TYPE	Electrical diagram	Un [V]	Uc [V]	I _{max} (8/20) [kA]	I _n (8/20) [kA]	U _{oc} [kV]	U _{p@I_n} (8/20) [kV]	IR	L	N
77707700	PSM1-20-120	L-N (1Ph)	A	120	150	20	10	10	≤0,8		C60	-
77707701	PSM1-20-120-IR	L-N (1Ph)	A	120	150	20	10	10	≤0,8	√	C60	-
77707702	PSM1-20-230	L-N (1Ph)	A	230	320	20	10	10	≤1,4		C62	-
77707703	PSM1-20-230-IR	L-N (1Ph)	A	230	320	20	10	10	≤1,4	√	C62	-
77707732	PSM1-20-277	L-N (1Ph)	A	277	320	20	10	10	≤1,4		C65	-
77707733	PSM1-20-277-IR	L-N (1Ph)	A	277	320	20	10	10	≤1,4	√	C65	-
77707704	PSM1-20-400	L-N (1Ph)	A	400	440	20	10	10	≤2		C63	-
77707705	PSM1-20-400-IR	L-N (1Ph)	A	400	440	20	10	10	≤2	√	C63	-
77707745	PSM1-20N	N-PE (N)	B	Neutral	255	20	10	10	≤1,5		-	C64

2 poles

ORDERING CODE	PART NUMBER	Network									Cartridges	
		SYSTEM TYPE	Electrical diagram	Un [V]	Uc [V]	I _{max} (8/20) [kA]	I _n (8/20) [kA]	U _{oc} [kV]	U _{p@I_n} (8/20) [kV]	IR	L	N
77707750	PSM2-20-120-TT	TT (1Ph+N)	D	120/-	150	20	10	10	≤0,8 (L-N) ≤1,5 (N-PE)		C60	C64
77707751	PSM2-20-120-TT-IR	TT (1Ph+N)	D	120/-	150	20	10	10	≤0,8 (L-N) ≤1,5 (N-PE)	√	C60	C64
77707752	PSM2-20-230-TT	TT (1Ph+N)	D	230/-	320	20	10	10	≤1,4 (L-N) ≤1,5 (N-PE)		C62	C64
77707753	PSM2-20-230-TT-IR	TT (1Ph+N)	D	230/-	320	20	10	10	≤1,4 (L-N) ≤1,5 (N-PE)	√	C62	C64
77707980	PSM2-20-230-PLC-TT	TT (1Ph+N)	E	230/-	275	20	10	10	≤1,5 (L-N) ≤1,5 (N-PE)		C61	C64
77707981	PSM2-20-230-PLC-TT-IR	TT (1Ph+N)	E	230/-	275	20	10	10	≤1,5 (L-N) ≤1,5 (N-PE)	√	C61	C64
77707758	PSM2-20-277-TT	TT (1Ph+N)	E	277/-	320	20	10	10	≤1,4 (L-N) ≤1,5 (N-PE)		C65	C64
77707759	PSM2-20-277-TT-IR	TT (1Ph+N)	E	277/-	320	20	10	10	≤1,4 (L-N) ≤1,5 (N-PE)	√	C65	C64
77707900	PSM2-20-120-TNS	TNS (1Ph+N)	F	120/-	150	20	10	10	≤0,8		C60	-
77707901	PSM2-20-120-TNS-IR	TNS (1Ph+N)	F	120/-	150	20	10	10	≤0,8	√	C60	-
77707902	PSM2-20-230-TNS	TNS (1Ph+N)	F	230/-	320	20	10	10	≤1,4		C62	-
77707903	PSM2-20-230-TNS-IR	TNS (1Ph+N)	F	230/-	320	20	10	10	≤1,4	√	C62	-
77707912	PSM2-20-277-TNS	TNS (1Ph+N)	F	277/-	320	20	10	10	≤1,4		C65	-
77707913	PSM2-20-277-TNS-IR	TNS (1Ph+N)	F	277/-	320	20	10	10	≤1,4	√	C65	-

ELECTRICAL DIAGRAMS



Type 2+3 SPDs | PSM 20

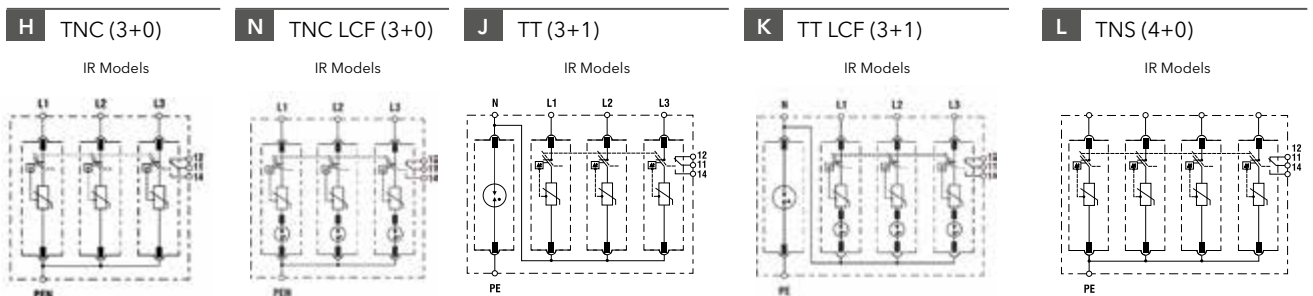
3 poles

ORDERING CODE	PART NUMBER	Network									Cartridges	
		SYSTEM TYPE	Electrical diagram	Un [V]	Uc [V]	Imax (8/20) [kA]	In (8/20) [kA]	Uoc [kV]	Up@In (8/20) [kV]	IR	L	N
77707860	PSM3-20-230-TNC	TNC (3Ph)	H	-/208	150	20	10	10	≤0,8		C60	-
77707861	PSM3-20-230-TNC-IR	TNC (3Ph)	H	-/208	150	20	10	10	≤0,8	√	C60	-
77707862	PSM3-20-400-TNC	TNC (3Ph)	H	-/400	320	20	10	10	≤1,4		C62	-
77707863	PSM3-20-400-TNC-IR	TNC (3Ph)	H	-/400	320	20	10	10	≤1,4	√	C62	-
77707880	PSM3-20-480-TNC	TNC (3Ph)	H	-/480	320	20	10	10	≤1,4		C65	-
77707881	PSM3-20-480-TNC-IR	TNC (3Ph)	H	-/480	320	20	10	10	≤1,4	√	C65	-
77707982	PSM3-20-400-PLC-TNC	TNC (3Ph)	N	-/400	275	20	10	10	≤1,5		C61	-
77707983	PSM3-20-400-PLC-TNC-IR	TNC (3Ph)	N	-/400	275	20	10	10	≤1,5	√	C61	-

4 poles

ORDERING CODE	PART NUMBER	Network									Cartridges	
		SYSTEM TYPE	Electrical diagram	Un [V]	Uc [V]	Imax (8/20) [kA]	In (8/20) [kA]	Uoc [kV]	Up@In (8/20) [kV]	IR	L	N
77707800	PSM4-20-230-TT	TT (3Ph+N)	J	120/208	150	20	10	10	≤0,8 (L-N) ≤1,5 (N-PE)		C60	C64
77707801	PSM4-20-230-TT-IR	TT (3Ph+N)	J	120/208	150	20	10	10	≤0,8 (L-N) ≤1,5 (N-PE)	√	C60	C64
77707802	PSM4-20-400-TT	TT (3Ph+N)	J	230/400	320	20	10	10	≤1,4 (L-N) ≤1,5 (N-PE)		C62	C64
77707803	PSM4-20-400-TT-IR	TT (3Ph+N)	J	230/400	320	20	10	10	≤1,4 (L-N) ≤1,5 (N-PE)	√	C62	C64
77707985	PSM4-20-400-PLC-TT	TT (3Ph+N)	K	230/400	275	20	10	10	≤1,5 (L-N) ≤1,5 (N-PE)		C61	C64
77707986	PSM4-20-400-PLC-TT-IR	TT (3Ph+N)	K	230/400	275	20	10	10	≤1,5 (L-N) ≤1,5 (N-PE)	√	C61	C64
77707808	PSM4-20-480-TT	TT (3Ph+N)	K	277/480	320	20	10	10	≤1,4 (L-N) ≤1,5 (N-PE)		C65	C64
77707809	PSM4-20-480-TT-IR	TT (3Ph+N)	K	277/480	320	20	10	10	≤1,4 (L-N) ≤1,5 (N-PE)	√	C65	C64
77707950	PSM4-20-230-TNS	TNS (3Ph+N)	L	120/208	150	20	10	10	≤0,8		C60	-
77707951	PSM4-20-230-TNS-IR	TNS (3Ph+N)	L	120/208	150	20	10	10	≤0,8	√	C60	-
77707952	PSM4-20-400-TNS	TNS (3Ph+N)	L	230/400	320	20	10	10	≤1,4		C62	-
77707953	PSM4-20-400-TNS-IR	TNS (3Ph+N)	L	230/400	320	20	10	10	≤1,4	√	C62	-
77707987	PSM4-20-480-TNS	TNS (3Ph+N)	L	277/480	320	20	10	10	≤1,4		C65	-
77707988	PSM4-20-480-TNS-IR	TNS (3Ph+N)	L	277/480	320	20	10	10	≤1,4	√	C65	-

ELECTRICAL DIAGRAMS



Replacement cartridges

ORDERING CODE	PART NUMBER	SYSTEM TYPE	Un [V]	Uc [V]	Imax (8/20) [kA]	In (8/20) [kA]	Uoc [kV]	Up@In (8/20) [kV]	Cartridges
77707650	PSM-20-120	L-N (1Ph)	120	150	20	10	10	≤0,8	C60
77707670	PSM-20-230-PLC	L-N (1Ph)	230	275	20	10	10	≤1,5	C61
77707651	PSM-20-230	L-N (1Ph)	230	320	20	10	10	≤1,4	C62
77707669	PSM-20-277	L-N (1Ph)	277	320	20	10	10	≤1,4	C65
77707652	PSM-20-400	L-N (1Ph)	400	440	20	10	10	≤2	C63
77707663	PSM-20N	N-PE (N)	Neutral	255	20	10	10	≤1,5	C64

Type 3 SPDs

PSL

PSL is the range of Type 3/Class III devices which provide very fine protection (1,2/50 μ s) from induced voltage surges to sensitive equipment, in accordance with the IEC/EN 61643-11 standard

Suitable for the final step of protection in panels with Type 2 protection devices installed upstream as a second step, such as PSM 40 or PSM 20. These systems should be installed as close as possible to the equipment to be protected.

RATINGS AND FEATURES

- Maximum discharge current (8/20 μ s): 8 kA per phase
- Nominal discharge current (8/20 μ s): 3 kA per phase
- Combined voltage pulse U_{oc} (1.2/50 μ s): 6 kV
- TT and TNS networks
- Plug-in DIN rail format
- Visual and remote end of life indication
- Reversible chassis to allow cable entry from above or below
- Mechanically coded cartridges to avoid replacement errors

I_{max}

8 kA

TECH
INFO

cirprotec.com/PSL



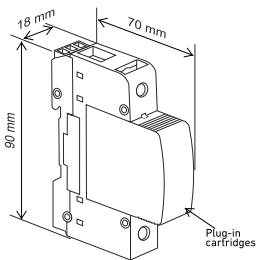
Standards

- IEC/EN 61643-11
- CE

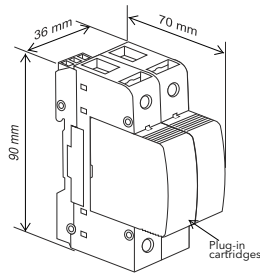


DIMENSIONS

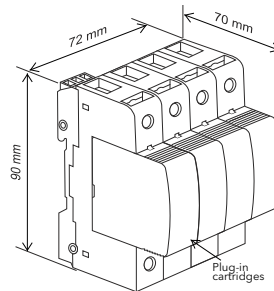
1 pole



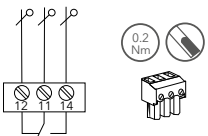


2 poles



4 poles



MICROSWITCH DIAGRAM (IR)

	$U_{max} / I_{max} (AC)$	
	P.D. ≤ 2 : 250 V/1 A	max 1.5 mm ²
	P.D. ≤ 3 : 125 V/3 A	

Type 3 SPDs | PSL

PART NUMBERS

1 pole

ORDERING CODE	PART NUMBER	Network								Cartridges		
		SYSTEM TYPE	Electrical diagram	Un [V]	Uc [V]	I _{max} (8/20) [kA]	I _n (8/20) [kA]	U _{oc} [kV]	U _{p@I_n} (8/20) [kV]	IR	L	N
77708110	PSL1-8-120	L-N (1Ph)	A	120	150	8	3	6	≤0,8		L03	-
77708111	PSL1-8-120-IR	L-N (1Ph)	A	120	150	8	3	6	≤0,8	√	L03	-
77708112	PSL1-8-230	L-N (1Ph)	A	230	320	8	3	6	≤1,1		L01	-
77708113	PSL1-8-230-IR	L-N (1Ph)	A	230	320	8	3	6	≤1,1	√	L01	-
77708130	PSL1-8N	N-PE (N)	B	Neutral	255	8	3	6	≤1,5		-	L02

2 poles

ORDERING CODE	PART NUMBER	Network								Cartridges		
		SYSTEM TYPE	Electrical diagram	Un [V]	Uc [V]	I _{max} (8/20) [kA]	I _n (8/20) [kA]	U _{oc} [kV]	U _{p@I_n} (8/20) [kV]	IR	L	N
77708155	PSL2-8-230-TT	TT (1Ph+N)	D	230/-	320	8	3	6	≤1,1 (L-N) ≤1,5 (N-PE)		L01	L02
77708156	PSL2-8-230-TT-IR	TT (1Ph+N)	D	230/-	320	8	3	6	≤1,1 (L-N) ≤1,5 (N-PE)	√	L01	L02
77708173	PSL2-8-120-TNS	TNS (1Ph+N)	F	120/-	150	8	3	6	≤0,8		L03	-
77708174	PSL2-8-120-TNS-IR	TNS (1Ph+N)	F	120/-	150	8	3	6	≤0,8	√	L03	-
77708175	PSL2-8-230-TNS	TNS (1Ph+N)	F	230/-	320	8	3	6	≤1,1		L01	-
77708176	PSL2-8-230-TNS-IR	TNS (1Ph+N)	F	230/-	320	8	3	6	≤1,1	√	L01	-

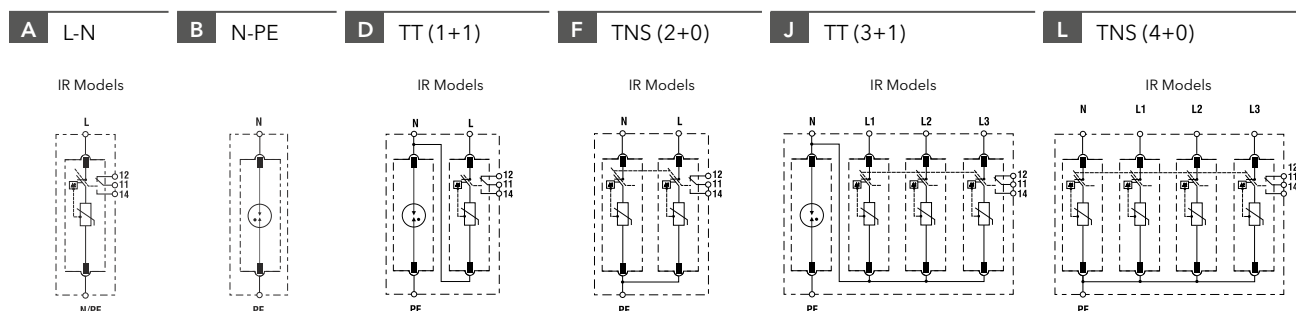
4 poles

ORDERING CODE	PART NUMBER	Network								Cartridges		
		SYSTEM TYPE	Electrical diagram	Un [V]	Uc [V]	I _{max} (8/20) [kA]	I _n (8/20) [kA]	U _{oc} [kV]	U _{p@I_n} (8/20) [kV]	IR	L	N
77708205	PSL4-8-400-TT	TT (3Ph+N)	J	230/400	320	8	3	6	≤1,1 (L-N) ≤1,5 (N-PE)		L01	L02
77708206	PSL4-8-400-TT-IR	TT (3Ph+N)	J	230/400	320	8	3	6	≤1,1 (L-N) ≤1,5 (N-PE)	√	L01	L02
77708223	PSL4-8-230-TNS	TNS (3Ph+N)	L	120/208	150	8	3	6	≤0,8		L03	-
77708224	PSL4-8-230-TNS-IR	TNS (3Ph+N)	L	120/208	150	8	3	6	≤0,8	√	L03	-
77708225	PSL4-8-400-TNS	TNS (3Ph+N)	L	230/400	320	8	3	6	≤1,1		L01	-
77708226	PSL4-8-400-TNS-IR	TNS (3Ph+N)	L	230/400	320	8	3	6	≤1,1	√	L01	-

Replacement cartridges

ORDERING CODE	PART NUMBER	SYSTEM TYPE	Un [V]	Uc [V]	I _{max} (8/20) [kA]	I _n (8/20) [kA]	U _{oc} [kV]	U _{p@I_n} (8/20) [kV]	Cartridges
77708102	PSL-8-120	L-N	120	150	8	3	6	≤0,8	L03
77708100	PSL-8-230	L-N	230	320	8	3	6	≤1,1	L01
77708105	PSL-8N	N-PE	Neutral	255	8	3	6	≤1,5	L02

ELECTRICAL DIAGRAMS



Type 2+3 SPDs

DM2

DM2 is the range of combined Type 2+3/Class II+III devices intended for protecting against induced voltage surges (8/20 μ s) while providing a very fine protection (1,2/50 μ s) to sensitive equipment, in accordance with the IEC/EN 61643-11 standard. Supplied with built-in high attenuation EMI filter.

Suitable for the final step of protection in installations with electromagnetic disturbances which could interrupt, degrade or limit system performance.

Series connection for applications up to 20 A rated current.

RATINGS AND FEATURES

- Maximum discharge current (8/20 μ s): 20 kA
- Nominal discharge current (8/20 μ s): 10 kA
- Combined voltage pulse (1,2/50 μ s): 6 kV
- Attenuation filter up to 82 dB (common mode)
- Nominal phase current (IL): 20 A
- Single phase TT and TNS networks
- Un: 120 V, 230 V
- Monobloc DIN rail format
- Visual (LED) and remote (IR) end-of-life indicators
- External power indicator (LED)

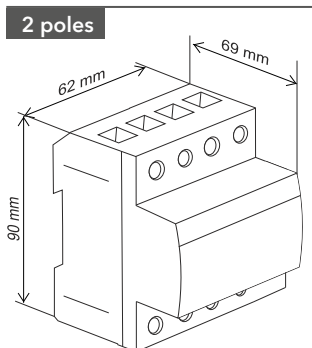


PART NUMBERS

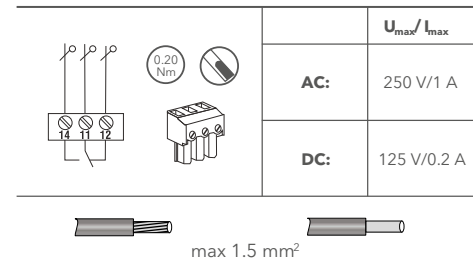
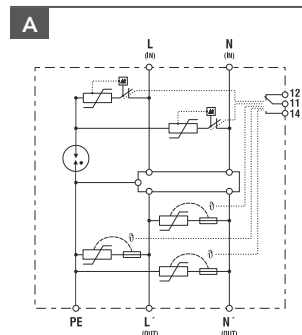
2 poles

ORDERING CODE	PART NUMBER	Network									
		SYSTEM TYPE	Electrical diagram	Un [V]	Uc [V]	Imax (8/20) [kA]	In (8/20) [kA]	Uoc [kV]	Up@In [kV]	IL [A]	IR
77702840	DM2-20A-120-IR	TT/TNS (1Ph+N)	A	120	150	20	10	6	≤0,8	20	✓
77702830	DM2-20A-230-IR	TT/TNS (1Ph+N)	A	230	275	20	10	6	≤1,2	20	✓

DIMENSIONS



ELECTRICAL DIAGRAMS MICROSWITCH DIAGRAM (IR)



Type 2+3 SPDs

CSF

CSF is the range of combined Type 2+3/Class II+III devices intended for protecting against induced voltage surges (8/20 μ s) while providing a very fine protection (1,2/50 μ s) to sensitive equipment, in accordance with the IEC/EN 61643-11 standard.

Suitable for the second and final steps of protection in panels with Type 2 protection devices installed upstream, such as PSM 40.

These systems should be installed as close as possible to the equipment to be protected. Ideal for small spaces. Wide range of rated voltages.

RATINGS AND FEATURES

- Maximum discharge current (8/20 μ s): 20 kA, 6 kA
- Nominal discharge current (8/20 μ s): 10 kA, 3 kA
- Combined voltage pulse (1.2/50 μ s): 10 kV, 6 kV
- Single phase TT and TNS networks
- Un: 12 V, 24 V, 48 V, 60 V, 120 V, 230 V
- Also applicable to DC installations
- Monobloc DIN rail format
- Visual (LED) and remote (IR) end-of-life indicators
- External power indicator (LED)
- Space-saving "slim" format
- UL 1449 4th Ed. certified models

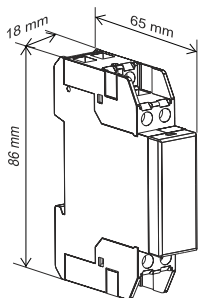
PART NUMBERS

2 poles

ORDERING CODE	PART NUMBER WITHOUT IR	PART NUMBER WITH IR	Network		Un [V]	Uc [V]	Imax (8/20) [kA]	In (8/20) [kA]	Uoc [kV]	Up@In (8/20) [kV]
			SYSTEM TYPE	Electrical diagram						
77704101 77704102	CSF21-12	CSF21-12-IR	TT/TNS (1Ph+N)	A	12	20	6	3	6	≤0,22 (L1-L2) 0,7 (L1/L2-PE)
77704103 77704104	CSF21-24	CSF21-24-IR	TT/TNS (1Ph+N)	A	24	30	6	3	6	≤0,22 (L1-L2) 0,7 (L1/L2-PE)
77704105 77704106	CSF21-48	CSF21-48-IR	TT/TNS (1Ph+N)	A	48	60	6	3	6	≤0,33 (L1-L2) 0,7 (L1/L2-PE)
77704107 77704108	CSF21-60	CSF21-60-IR	TT/TNS (1Ph+N)	A	60	75	6	3	6	≤0,5 (L1-L2) 0,9 (L1/L2-PE)
77704109 77704110	CSF21-120	CSF21-120-IR	TT/TNS (1Ph+N)	A	120	150	6	3	6	≤0,7 (L1-L2) 0,9 (L1/L2-PE)
77704115 77704116	CSF21-230	CSF21-230-IR	TT/TNS (1Ph+N)	A	230	275	20	10	10	≤1,4 (L1-L2) 1,4 (L1/L2-PE)

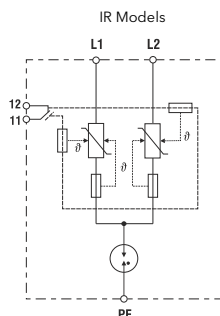
DIMENSIONS


2 poles



ELECTRICAL DIAGRAMS MICROSWITCH DIAGRAM (IR)

A



		U _{max} /I _{max}
	AC:	250 V/1 A
	DC:	125 V/0.2 A

Imax   

20 kA

TECH INFO


cirprotec.com/CSF



Standards

- IEC/EN 61643-11
- UL 1449 4th Ed., File No. E468946
- CE



LED lighting SPDs Type 2+3

CSF FB

CSF FB is the range of combined Type 2+3/Class II+III devices intended for protecting against induced voltage surges (8/20 μ s) while providing a very fine protection (1,2/50 μ s) to sensitive equipment, in accordance with the IEC/EN 61643-11 standard.

Suitable for the protection of outdoor LED luminaires (street lighting), due to exposure of the LED electronics which are extremely sensitive to surges induced by lightning. This range has been designed to be installed in the pole within the fuse box, where there are DIN rails.

RATINGS AND FEATURES

- Combined voltage pulse (1,2/50 μ s): 10 kV (U_{oc})
- Maximum discharge current (8/20 μ s): 10 kA
- Nominal discharge current (8/20 μ s): 5 kA
- Installation in series or parallel
- Compact size and easy to install
- Dual end-of-life indication: disconnection (wired in series) and local (status LED)
- No leakage current
- Nominal phase current (I_n 2,5 A (series))
- For fuse boxes with DIN rail (in the lamp pole)

Imax

10 kA

TECH
INFO

cirprotec.com/CSF

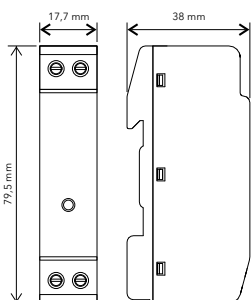
Standards

- IEC/EN 61643-11
- CE

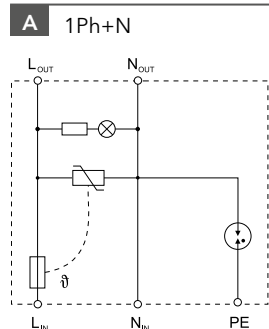
PART NUMBERS

ORDERING CODE	PART NUMBER	Network		Un [V]	Uc [V]	Imax (8/20) [kA]	In (8/20) @Up [kA]	Uoc [kV]	Up [kV]	IL [A]
		SYSTEM TYPE	Electrical diagram							
77704120	CSF21-10-230-FB	TT/TNS (1Ph+N)	A	230	320	10	5	10	$\leq 1,5$ (L-N) $\leq 1,8$ (N-PE)	2,5

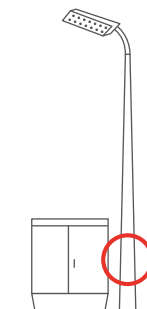
DIMENSIONS



ELECTRICAL DIAGRAMS



LOCATION



LED lighting SPDs Type 2+3

NS 10

The **NS 10** series consists of 2 ranges: NSS 10 and NSB 10. Both are combined Type 2+3/Class II+III devices of 10 kA (8/20 μ s) and 10 kV (1,2/50 μ s) intended for protecting outdoor LED luminaires from induced voltage surges, in accordance with IEC/EN 61643-11.

Suitable for protection of outdoor LED luminaires (street-lighting). Due to the exposure of LED electronics, which are extremely sensitive to surges induced by lightning, NSS-10/230 and NSB-10/230 are market standard solutions for manufacturers of LED lighting systems. See the features before choosing between NSS and NSB.

RATINGS AND FEATURES

- Combined voltage pulse (1.2/50 μ s): 10 kV (Uoc)
- Maximum discharge current (8/20 μ s): 10 kA
- Nominal discharge current (8/20 μ s): 5 kA
- Rated load current (IL): 2,5 A (series)
- Class 1 and Class 2 luminaires
- Wired in series and parallel
- Dual end-of-life indication: disconnection (wired in series) and local (status LED)
- No leakage current
- NSS: miniature size, "universal" models
- NSB: compact size, IP66 models
- Optional: luminaire with overvoltage protection (NSS-10 or NSB-10) tested and certified by accredited laboratory



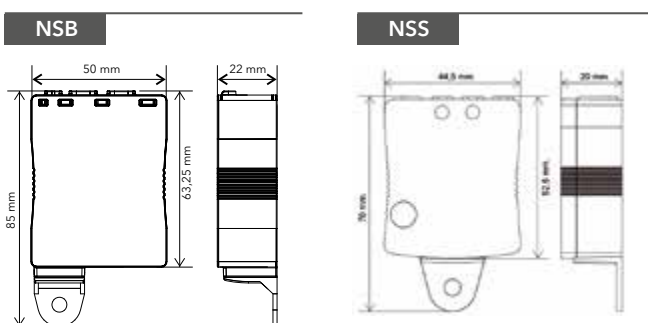
Watch the video on www.youtube.com/cptcirprotec

PART NUMBERS

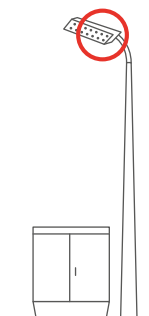
ORDERING CODE	PART NUMBER	Network		Un [V]	Uc [V]	Imax (8/20) [kA]	In (8/20) [kA]	Uoc [kV]	Up@In [kV]	IL [A]	IP
		SYSTEM TYPE	Luminaires Class								
77705868	NSS-10-230-C12-P	Universal*	1,2	230	320	10	5	10	$\leq 1,5$ (L1-L2) $\leq 1,8$ (L1/L2-GND)	10	IP20
77705646	NSB-10-230-C4-DD	TT, TN	1,2	230	320	10	5	10	$\leq 1,5$ (L-N) $\leq 1,8$ (L/N-GND)	2,5	IP20
77705754	NSB-10-230-C4-WD	TT, TN	1,2	230	320	10	5	10		2,5	IP20
77705644	NSB-10-230-C4-WW-IP	TT, TN	1,2	230	320	10	5	10		2,5	IP66

* Guarantees luminaire universality and safety:
 - Compatible with all TT, TN & IT network configurations
 - LN/NL reversible wiring safety
 - Universality L-N 230 V, L-L 230 V
 Consult Cirprotec for other models: electrostatic discharge, L-L-N, UL 1449, only L-N.

DIMENSIONS



LOCATION



LED lighting SPDs Type 2+3

NS 20

NS 20 is a combined Type 2+3/Class II+III device of 20 kA (8/20 μ s) and 20 kV (1,2/50 μ s) intended for protecting outdoor LED luminaires from induced voltage surges, in accordance with IEC/EN 61643-11.

Suitable for protection of special LED luminaire applications in sports stadiums, parks, green areas and other facilities where the voltage and discharge capacity needed are 20 kV and 20 kA, or rather, reinforced values.

RATINGS AND FEATURES

- Combined voltage pulse (1,2/50 μ s): 20 kV (Uoc)
- Maximum discharge current (8/20 μ s): 20 kA
- Nominal discharge current (8/20 μ s): 10 kA
- Rated load current (I): 2,5 A (series)
- Rated voltage: up to 230 V
- Luminaires Class 1 and 2
- Wired in series and parallel
- Double end-of-life indication: disconnection (connected in series) and local (status LED)
- No leakage current
- Optional: luminaire with overvoltage protection (NS-20) tested and certified by accredited laboratory

Uoc
20 kV

TECH INFO
cirprotec.com/NS

Standards

- IEC/EN 61643-11
- CE

IEC CE

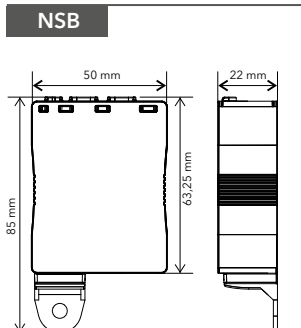
Watch the video on www.youtube.com/cptcirprotec

PART NUMBERS

ORDERING CODE	PART NUMBER	Network		Un [V]	Uc [V]	Imax (8/20) [kA]	In (8/20) [kA]	Uoc [kV]	Up@In [kV]	IL [A]	IP
		SYSTEM TYPE	Luminaires Class								
77705891	NSB-20-230-C4-DD	TT, TN	1,2	230	275	20	10	20	$\leq 1,5$ (L-N) $\leq 1,8$ (L/N-GND)	2,5	IP20

Check for availability and delivery terms.

DIMENSIONS



LOCATION

