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Self-protected surge protective devices (SPDs)

Cat. Nos :
F10AZC2/4 - F10HZC2/4

1. GENERAL CHARACTERISTICS

1.1 Brief description

Type 2 (T2) self-protected surge protective devices (SPDs) with capacities I_{max} 20 kA and 40 kA for installations supplied with 230/400 V~ (50-60 Hz). This series is equipped with short-circuit protection that can occur at the end of the surge protector's life.

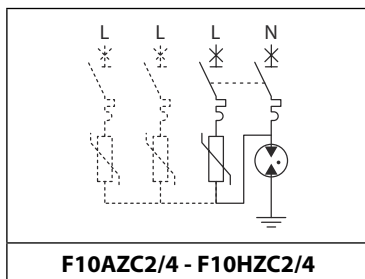
SPDs with spark gap technology on neutral branch, suitable for all network with neutral (TT and TNS), especially in case of a RCD present upstream of the SPD (no leakage current towards earth).

However, this products can be installed upstream the main RCD, thanks to the withstabd to industrial overvoltage (temporary overvoltage = TOV).

1.2 Protection modes

SPDs 1P+N/3P+N

TT, TNS systems



Surge protective devices with L/N-PE and L-N protection modes (common and differential protection modes)

The N-PE branch is built by a special encapsulated spark gaps with high capacity protection and the internal configuration of the SPD is called mode "1+1" or "connection type 2" (CT2) according to standards HD/IEC 60364 clause 534.

SPDs not suitable for two-phase or bi-phase network : use SPD 1Px2 or 2P.

SPDs not suitable for IT earthing systems : use SPD 1P/3P/4P with U_c 440V~.

1.3 Applications

1.3.1 Installation standards

1.3.1.1 CEI 64-8

According to part 443, SPDs are mandatory in many cases and applications. For other cases, in order not to be implemented, a risk analysis based on 443-5 or EN/IEC62305-2 (CEI 81-10/2) has to be carried out to prove it is not usefull.

1.3.1.2 European (HD) ans International standard (IEC)

SPDs are dealt with by standards HD/IEC 60364-4-443 (selection of SPDs ans mandatory aspects) ans HD/IEC 60364-5-534 (installation).

According to the latest version of 2015 and 2016, SPDs are now mandatory in building :

- where people are at risk (installations providing a security service, medical services, hospitals, etc...)
- offering a public or cultural service (public service, communication exchanges, museums, religious buildings, etc...)
- in the service sector and industry (hotels, banks, industries, shops, farms,

etc...)

- equipped with a lightning Protection System (LPS, lightning conductor) or designed in accordance with EN/IEC 62305

- likely to hold a large number of people in Europe (apartment buildings, office buildings, schools, etc...)

In the case of smaller installations (small shops, private houses, etc...), a risk analysis should be conducted (article 443-5).

Failing this, SPDs must be installed.

However, SPDs are not mandatory in private homes if the cost of installing it is more than a fifth of the cost of installation (exception not include in CEI 64-8 for italian market).

1.3.2 BTicino recommendations

To ensure correct protection, an SPD is recommended:

- at the origin of each installation
- at secondary distribution board feeding sensitive equipment
- on all outdoor electrical circuit outgoing lines (power supply for secondary buildings, outdoor lighting or outdoor distribution boards, etc).

Although not compulsory according to the installation standards, an SPD should always be installed for communication networks to protect the communication equipment when there is an SPD on the low voltage power network.

1.3.3 CEI 81-10/2, EN 62305, IEC 62305

An external lightning protection system (LPS) protects buildings against direct lightning strikes. It is generally based on the use of lightning conductors (single rods, with ESE, meshed cage, etc.) and/or the metal structure of the building.

If there is an LPS or a lightning risk assessment has been carried out in accordance with standards EN/IEC 62305 or CEI 81-10/2, SPDs are generally required in the main distribution board (T1 SPDs) and distribution boards (T2 SPDs).

Determination of SPDs in the main distribution board according to EN/IEC 62305 and TS/IEC 61643-12 :

Buildings with an external LPS

LPL ⁽¹⁾ : Lightning protection level	LPS total lightning current	Min. value of the SPD limp current (T1)	Usage practices
I	200 kA	25 kA/pole (IT: 35 kA min.)	Power installations
II	150 kA	18.5 kA/pole	Rarely used
III/IV	100 kA	12.5 kA/pole	Small installations

(1): LPL (Lightning Protection Level)

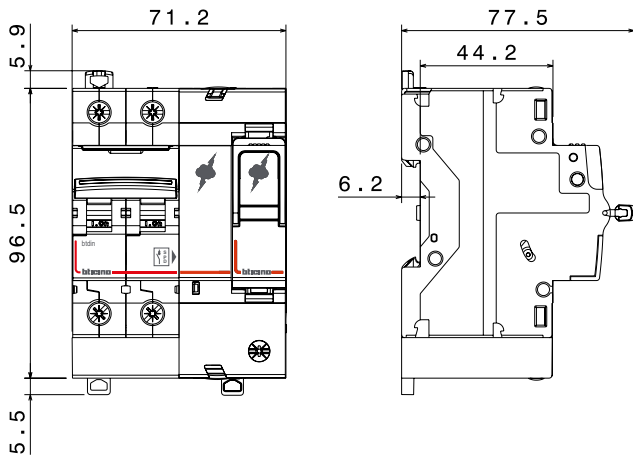
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2. OVERALL DIMENSIONS

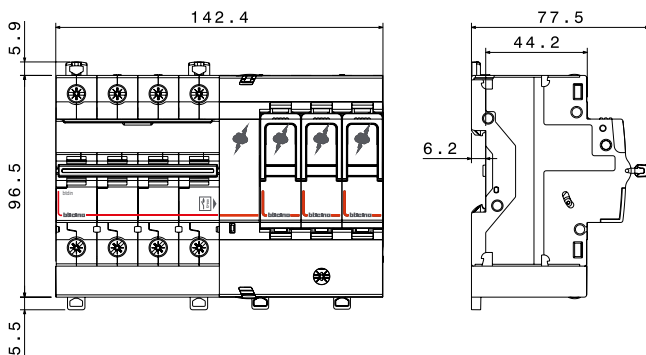
2.1 Self-protected SPDs for single phase power lines

Cat. Nos F10AZC2/HZC2



2.2 Self-protected SPDs for three phase + neutral power lines

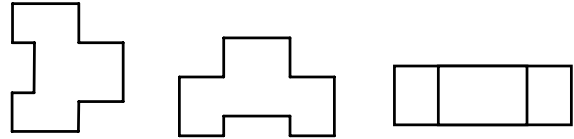
Cat. Nos F10AZC4/HZC4



3. TECHNICAL CHARACTERISTICS

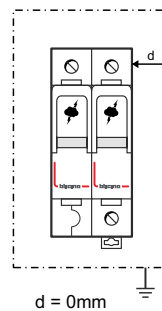
3.1 Operating positions

Vertical, horizontal, on the side



Fixed on EN 60715 or DIN 35 rail

3.2 Minimum distance from any earthed conductive surface



3.3 Enclosure materials

Base:

- Fibreglass reinforced (10%) polycarbonate (PC)
- Self-extinguishing: 850°/30 s
- Colour: RAL 7035 light grey

Plug-in module:

- Fibreglass reinforced (30%) polybutylene terephthalate (PBT)
- Self-extinguishing: 960°/30 s
- Colour: RAL 7035 light grey

3.4 Metal component materials

- Cage terminals, with detachable and captive screws, Base terminals : zinc-plated steel
- Terminal screws: zinc-plated steel
- Base contacts : tinned copper, tinned bronze.
- Plug-in module contacts: tinned bronze, nickel-plated bronze

3.5 Resistance to shock and vibrations

Sinusoidal vibrations

- In accordance with IEC 60721-3-3
- Frequency range: 1 to 150 Hz
- Duration: 10 cycles
- Displacement : 3.5 mm
- Acceleration: 1 g where $g = 9.81 \text{ m/s}^2$

Shock

- In accordance with IEC 60721-3-3
- Acceleration: 15 g where $g = 9.81 \text{ m/s}^2$

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3.6 Detailed characteristics

References	F10AZC2	F10AZC4	F10HZC2	F10HZC4	
Number of poles	1P+N	3P+N	1P+N	3P+N	
Type of SPD	T2/20 kA	T2/20 kA	T2/40 kA	T2/40 kA	
Mains supply	230 V~ 240 V~	230/400 V~ 240/415 V~	230 V~ 240 V~	230/400 V~ 240/415 V~	
Maximum supply fluctuation	(230 V~ ; 230/400 V~) +10% (240 V~ ; 240/415 V~) +6%				
Frequency	50/60 Hz				
Earthing system	TT, TNS				
Protection modes	L-N/N-PE/L-PE				
Max. continuous operating voltage (Uc)	L-N	320 V~			
	N-PE	255 V~			
	L-PE	320 V~			
Nominal current In (8/20)	L-N	5 kA	5 kA	20 kA	20 kA
	N-PE	20 kA	20 kA	20 kA	20 kA
	L-PE	5 kA	5 kA	20 kA	20 kA
Current Imax (8/20)	L-N / N-PE / L-PE	20 kA	20 kA	40 kA	40 kA
Total discharge current (L+N)/PE (Itotal, 8/20)	40 kA		60 kA	40 kA	60 kA
Protection level (Up) at In	L-N	1,3 kV	1,4 kV	2,4 kV	2,5 kV
	N-PE	1,1 kV	1,2 kV	1,5 kV	1,5 kV
	L-PE	1,4 kV	1,3 kV	2,2 kV	2,2 kV
Protection level (Up) at 5 kA	L-N			1,3 kV	1,3 kV
	N-PE			1,5 kV	1,5 kV
	L-PE			1,14 kV	1,3 kV
Temporary overvoltages (LV supply faults)	L-N : 336 V / 5s (withstand mode) L-PE : 440 V / 5s (withstand mode) L-N : 440 V / 2h (failure mode)				
Temporary overvoltages (HV supply faults)	1200 V (withstand mode)				
Associated protection for potential short-circuit at the end of SPD's life	Integrated protection : circuit breaker curve C25, I _{sc} r, I _{sc} max 25 kA				
Follow current (Ifi)	N-PE = 100 A				
Residual current at U _c (I _{PE})	0 A				
Response time	L/N : 25ns ; N/PE : 100ns				
Terminal capacity : solid or flexible wire Terminal capacity : flexible wire with ferrule	6/35mm ² 6/25mm ²				
Auxiliary contact for remote monitoring of SPD status	250 V~ - 1A - 1.5 mm ² max				
Pollution level	2				
Location category	Indoors				
Number of ports	1				
Installation method	Fixed				
Width (number of modules)	4	8	4	8	
Protection index	IP 20 / IK04				
Operating temperature	-25°C à +70°C				
Storage temperature	-40°C à +70°C				
Hygrometric index	HR : 5 - 95 %				

4. CONFORMITY

Compliant to standards EN 61643-11:2012 and IEC 61643-11 edition 1: 2011.

These SPDs ensure compliance with the installation obligations and recommendations of standards HD/IEC 60364 and CEI 64-8 part 534, standards IEC/EN 62305 and guide TS/IEC 61643-12.

Compliant to LVD (Low Voltage Directives), 2014/35/EU and on electromagnetic compatibility (EMC) N°2014/30.

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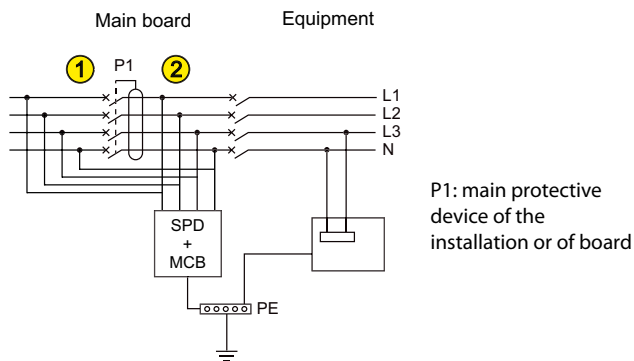
5. MOUNTING

5.1 General principle

Surge protective devices must not be installed in locations where there is a risk of fire or explosion without special provisions. They must be disconnected before checking the insulation resistance of the installation.

5.2 Rules and location area in the electrical installation

TT neutral earthing system

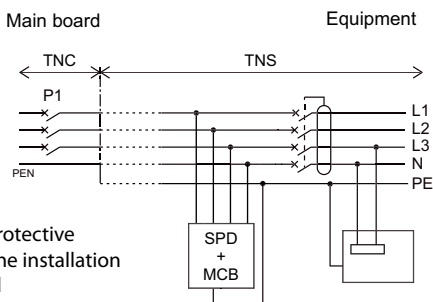


This SPDs can be implemented on upstream side of P1 ① or downstream side ②.

Integrated protection is similar to curve C-25A.

So, on downstream side ②, if $P1 \leq$ circuit breaker curve C-25A, choose SPD without short-circuit protection integrated (F10AS2/4 or F10HS2/4).

TNS and TNC-S neutral earthing systems



If $P1 \leq C25$ then choose a SPD without integrated I_{cc} protection (F10AS2/4 or F10HS2/4)

Residual current devices and continuity of service: if the main distribution board protective device P1 located upstream of the SPD includes a residual current device and if SPD is implemented on downstream side ②, this must be type S or delayed at the installation source (residual current device immunised against overvoltages up to 3 kA in accordance with CEI 64-8 and HD/IEC 60364. Also recommended for secondary distribution boards.

5.3 Connections

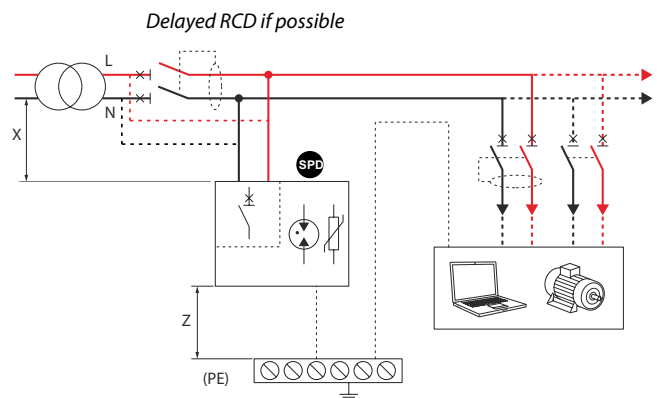
Check that the earth connection to which the exposed conductive parts of the installation are connected complies with standard CEI 64-8 HD/IEC 60364.

SPD connected to the mains supply and to the protective conductor (PE) using as short a connection as possible, $X+Z \leq 50$ cm.

Compulsory connection of the earth terminal on the surge protective device to the protective conductor (PE) on the distribution board.

Equipotentiality rules: interconnection of the exposed conductive parts of the equipment and the protective conductor (PE) on the distribution board, which is itself connected to the earth terminal of the surge protective device.

Electromagnetic compatibility rules: avoid loops, fix the cables firmly against the exposed metal conductive parts.



Recommended connection cross-sections and lengths to be stripped

	6 - 35 mm ²
	6 - 35 mm ² 6 - 25 mm ² (with ferrule)

Tools required and tightening torque

Flat blade screwdriver \varnothing 4 to 6.5 mm

Crosshead screwdriver \varnothing 4 to 6.5 mm, Pozidriv PZ2 recess

Min. torque: 2.5 Nm

Max. torque: 3 Nm

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5.5 Coordinating upstream/downstream SPDs

Consists of ensuring that any downstream SPD (in distribution enclosures or proximity SPDs) is correctly coordinated in energy terms with any SPD located upstream (TS 61643-12).

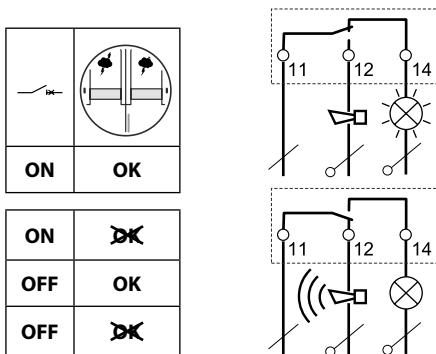
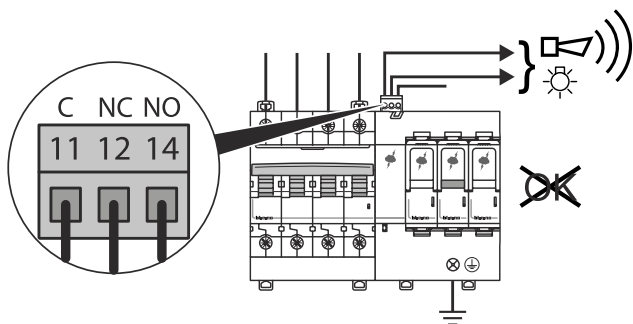
Minimum distances between SPDs

Upstream SPD	Downstream SPD	Minimum distance (m)	
		With LPS*	Without LPS*
T1+T2 limp 35 and T1+T2 limp 25	T2 I _{max} 40 (Uc 440V)	0	0
	T2 I _{max} 40 (Uc 320V)	1	0
T1+T2 limp 12.5 and T1+T2 limp 8	T2 I _{max} 40	5	0
	T2 I _{max} 20 or T2 I _{max} 12	8	0
T2 I _{max} 40	T2 I _{max} 20 or T2 I _{max} 12	-	1
T2 I _{max} 20	T2 I _{max} 12	-	0.5
T2 I _{max} 20 and T2 I _{max} 12	Proximity SPDs	-	2

6. ACCESSORIES

6.1 Signalling auxiliary

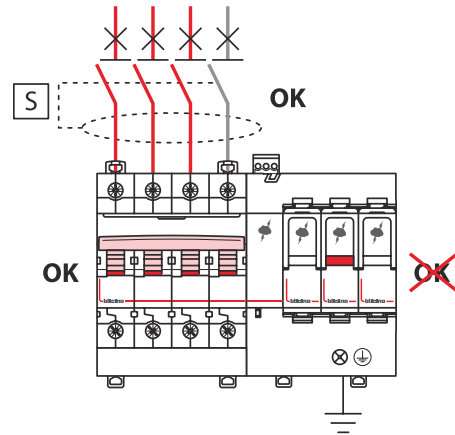
Cat. Nos F10AZC2/4, F10HZC2/4



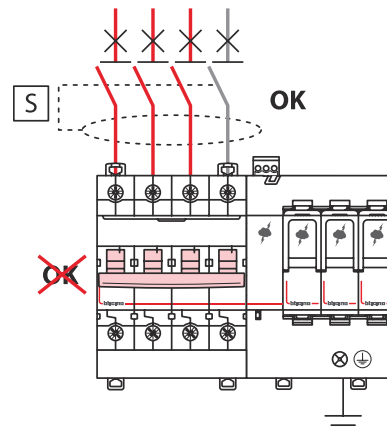
6.2 Replacement plug-in modules with status indicator

End of life situation involves the exchange of plug-in modules. Always replace all plug-in modules in followings situations :

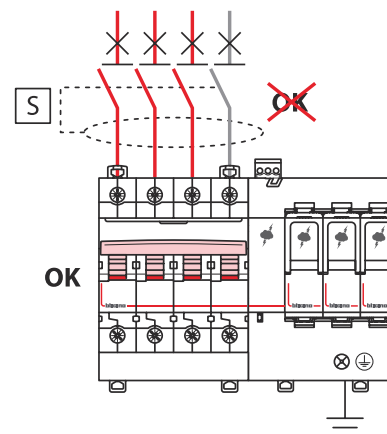
- The indicator on a replacement module has changed to orange.



- The integrated circuit breaker has worked and does not reset while plug-in module lights are green.



- The upstream differential protection triggers : perform a test by unplugging modules.



Module Cat. Nos.	Type	SPD Cat. Nos.
F10A	T2/20 kA	F10AZC2/4
F10H	T2/40 kA	F10HZC2/4