

QUICK SELECTION GUIDE

Furse electronic systems protection

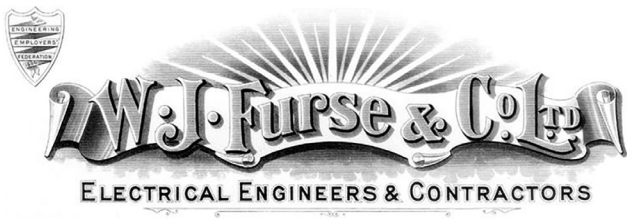
Surge protection devices (SPDs)



Furse® earthing & lightning protection

Brand history & values

Furse® Earthing & Lightning Protection is part of ABB's Installation Products division. With a heritage of over 130 years, the Furse® brand is synonymous with earthing and lightning protection, and is recognised worldwide for its Total Solution.



Brand history

It started in 1893 when William Joseph Furse acquired the premises and steeplejacking business of Joshua Till in Nottingham, UK. Starting with one employee, Mr. Furse improved and expanded the business. Recognising at an early stage the growing importance of electricity, he diversified into electrical installation, and opened a workshop for the manufacture of switchgear and components.

A new era for the Furse brand

In 1998, Furse became a part of the Thomas & Betts corporation and in 2012, Thomas & Betts was acquired by ABB, a leading global engineering company, that energises the transformation of society and industry to achieve a more productive, sustainable future.

With a history of excellence of its own, stretching back more than 130 years, ABB's success is driven by 144,000 talented employees in over 100 countries.

Today, the Furse name remains as a tribute to its founder, continuing to be synonymous with innovative electrical engineering and management success.

The Furse Total Solution incorporates customer needs for earthing and lightning protection, including structural lightning protection systems, earthing for lightning protection, power and telecommunications systems, transient overvoltage protection and customer project consultations, technical guidance and system design.

Furse delivers the most complete and effective protection against lightning and earth fault current risk, both safeguarding life and ensuring continuous, normal operation of electrical and electronic systems.

Furse continues to reinforce their commitment to both quality and service, providing solutions which deliver safety and protection of people, structures and electrical services within the built environment.

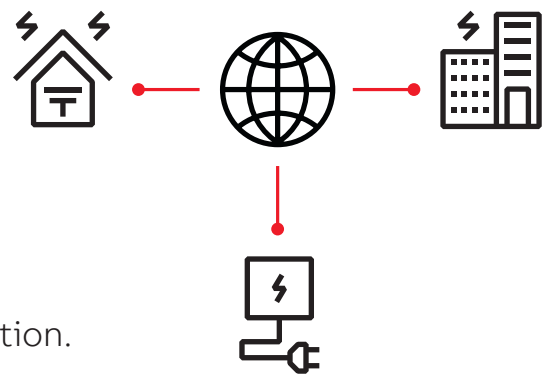




A total solution

Our reach & expertise

Furse® provides critical solutions for Earthing, Lightning Protection and Electronic Systems Protection.



The **Furse Total Solution** incorporates all customer needs for earthing & lightning protection, including:

- Structural lightning protection systems
- Earthing for lightning protection, power and telecommunications systems
- Transient overvoltage protection
- Customer project consultations, technical guidance and system design

The Total Solution delivers the most complete and effective protection against lightning and earth fault current risk, both safeguarding life and ensuring continuous, normal operation of electrical and electronic systems.

Acquired by the ABB Group in 2012, and benefitting from ABB's wider network, the Furse brand has now become an established world leader in earthing and lightning protection, with products specified and installed in many prestigious projects globally.

Why choose Furse products and services?

Being an integral part of ABB reinforces our commitment to quality, service and to providing solutions which deliver safety and protection of people, structures and electrical services within the built environment.

Furse products and services aim to deliver customer value in key areas:

• Reliability & ease of installation

Furse products are manufactured from high quality materials within an ISO 9001 environment, to ensure long lasting performance, and are designed for easiest possible installation

• Convenience & support

Furse products are readily available through our distributors worldwide, and our sales are supported both locally and globally by technical guidance and support

• Expertise & experience

Our time served technical engineers provide specific advice on customers' earthing and lightning protection concerns, and can provide drawings and system designs to any recognised standard.

Surge Protection

The use of electronics is increasingly prevalent in our everyday lives – even within todays home. We rely on electrical products to wash our clothes and dishes, entertain us, cook our food and keep us warm and secure within our homes.

02 **Figure 1a** Transient overvoltage on a mains power line.

01 **Figure 1b** Transient overvoltage damage to circuit board.

Such modern electrical appliances such as TV's, washing machines, heating systems, computers, telephones and security alarms contain electronic components that enable them to be innovative, compact and energy compliant. However, this equipment is susceptible to the effects of transient overvoltages or surges – namely reduced equipment lifespan through degradation and damage to its electronic circuitry (See Figure 1b).

Transient overvoltages are short duration surges in voltage between two or more conductors, e.g. Live conductor to Protective Earth (L-PE), Live to Neutral (L-N) or Neutral to Protective Earth (N-PE) on a power line as illustrated in Figure 1b. These surges can reach up to 6000 V on a 230Vac supply, and generally result from lightning activity (see Figure 2) and electrical switching of electrical equipment.

Similarly, surges can also occur between the conductors on data and telecommunication lines, causing damage to connected equipment. As such Surge Protective Devices (SPDs) are required to both power and data lines (see Figure 2b) to safeguard equipment to limit the transient overvoltages within its safe operating levels (see Figure 1).

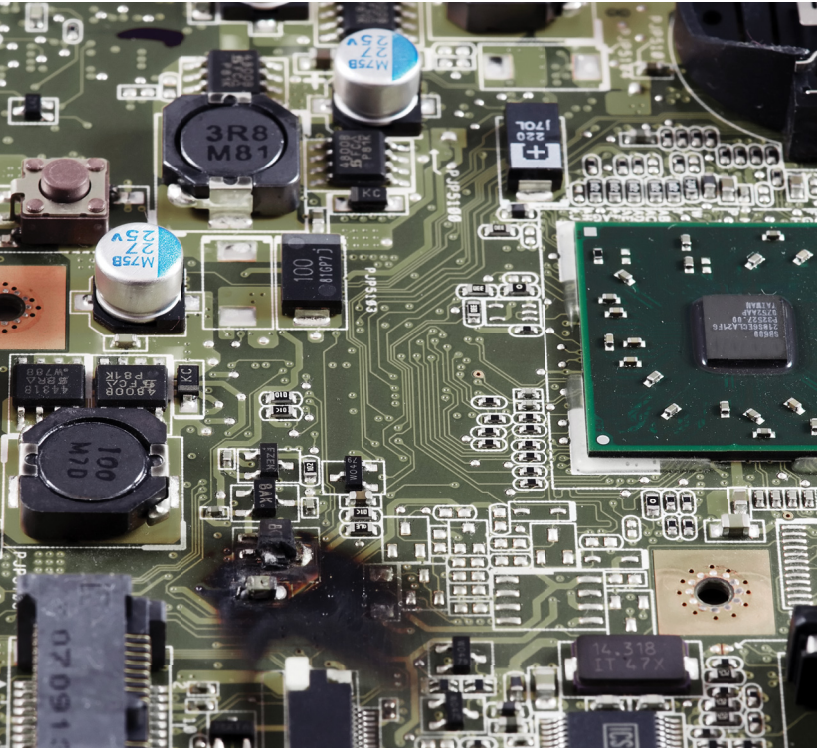
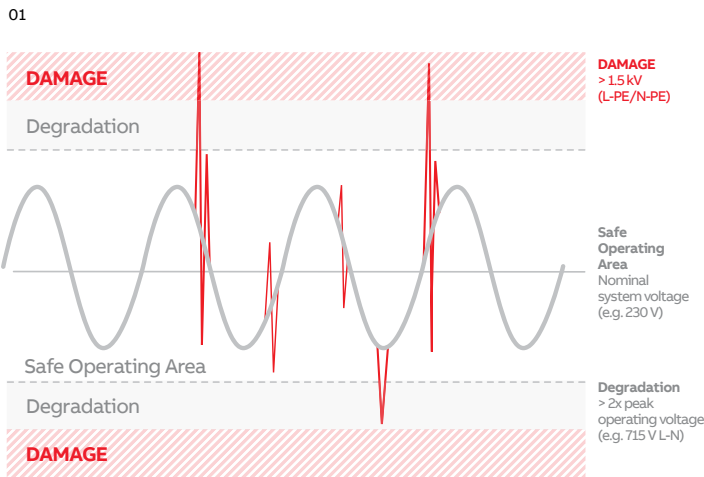
Figure 2a – Indirect lightning strike to ground from up to 1 km away can damage equipment.

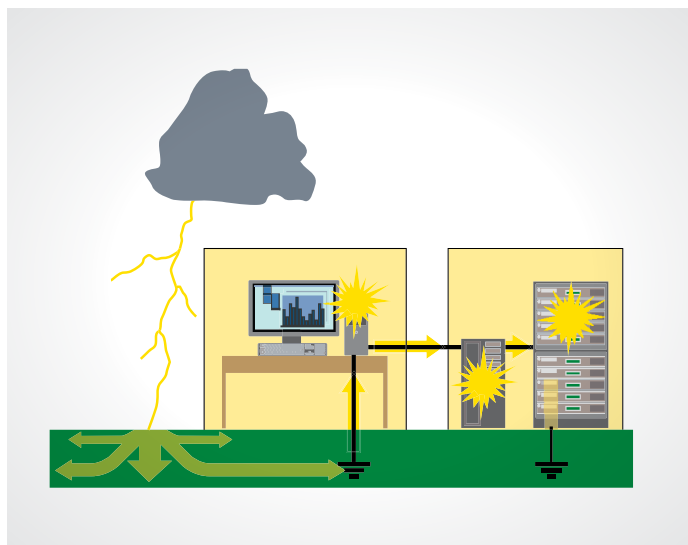
Figure 2b – Protect all incoming metallic lines to equipment to protect against surges.

The latest 18th edition of BS 7671 IET Wiring Regulations identifies the associated risk presented by transient overvoltages through Section 443. In summary, given the level of electronic equipment in the modern home, the total value of the installation and equipment therein would justify the use of SPDs, typically located at the service entrance to the building (e.g. the consumer unit for the power line).

Section 534 of BS 7671 provides further guidance to the selection and installation of SPDs. An SPD is a device that is intended to limit transient over voltages and divert damaging surge current away from sensitive equipment. In general, selecting SPDs with lower (i.e. better) voltage protection levels (U_p) is a critical factor, especially where continuous usage of electronic equipment is essential.

SPDs must have the necessary capability to deal with the current levels and durations involved in the surges to be expected at their point of installation.





03

03 **Figure 2a** Indirect lightning strike to ground from up to 1 km away can damage equipment.

04 **Figure 2b** Protect all incoming metallic lines to equipment to protect against surges.

Type 1 SPDs

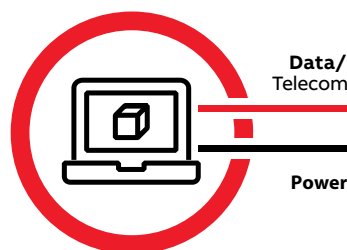
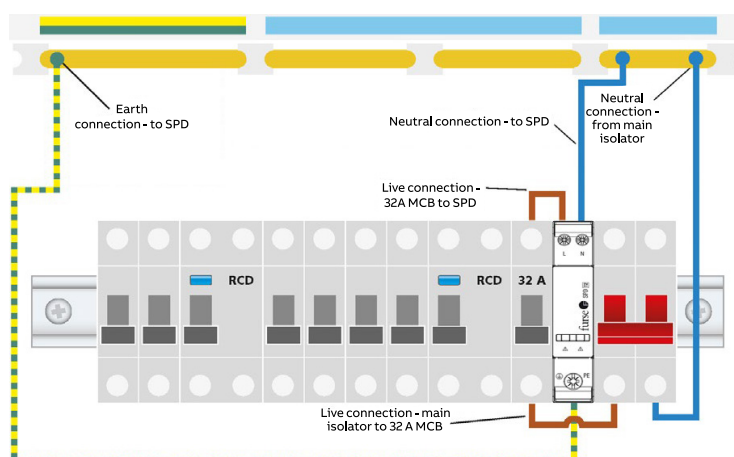
In general, if there is a risk of direct lightning to the building itself or to an overhead supply line to the building, a high energy Type 1 power SPD should be utilised at the service entrance to the building. The Type 1 SPD diverts the high surge currents associated with direct lightning strikes (denoted by the 10/350 long duration direct surge current waveform) safely to earth whilst limiting the transient overvoltage to prevent damage to the installation wiring and connected equipment.

Type 2 SPDs

For homes in built up urban areas where there is unlikely to be a risk from direct lightning strikes, a Type 2 power SPD located at the service entrance is suitable to handle the risk of indirect lightning strike (denoted by the 8/20 short duration indirect surge current waveform) whilst limiting the transient overvoltage to safe levels for connected equipment.

05 **Figure 3** SPD installation within a consumer unit.

05



WARNING:
Equipment is ONLY protected against transient overvoltages if all incoming / outgoing mains and data lines have protection fitted.

IMPORTANT: Full protection of electronic systems can only be achieved if all incoming/outgoing metallic services, including data, signal and telecoms lines are protected.

04

In larger industrial installations, Type 2 SPDs are installed on sub-distribution panel boards, downstream from Type 1 SPDs installed on the main distribution panel board located at the service entrance.

Type 3 SPDs

Very sensitive equipment within the installation may benefit from additional protection (downstream of Type 2 SPDs) located close to its vicinity – for example at the socket outlet. This also protects the equipment from any potential source of internal electrical switching transients. Section 534 recognises these SPDs as Type 3 where the voltage protection level (denoted by “ U_p ” on the SPDs labelling) is lower than the susceptibility threshold of sensitive equipment.

Combined Type SPDs (e.g. Type 1+2, Type 1+2+3) handle direct lightning currents whilst limiting overvoltages to protect sensitive equipment within a single enclosure, saving space, cost and installation time.

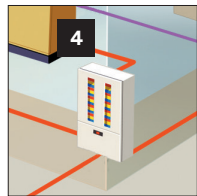
Connection of SPDs

In order to gain maximum protection (in accordance with Section 534), the supply conductors of the SPD shall be kept as short as possible, to minimise additive inductive voltage drops across the conductors. (Figure 3 illustrates an SPD installed upstream of RCDs, with short connecting conductors within a consumer unit).

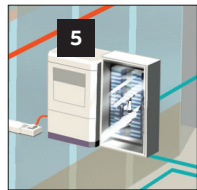
Electronic systems protection

Product selection guide

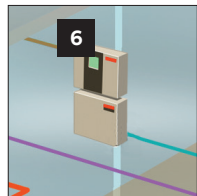
Product selection guide - Electronic systems protection	
No.	Type
1.	Mains wire-in protectors
2.	Mains wire-in protectors
3.	Mains wire-in protectors
4.	Mains wire-in protectors
5.	PBX telephone/ISDN line protection
6.	Wire-in telephone line protection
7.	CCTV video protectors
8.	Computer network protector
9.	RF signal protector
10.	Mains wire-in protector
11.	Plug-in mains protector
12.	Protectors for low current mains power supplies CCTV video and Telemetry lines
13.	Mains wire-in protectors
14.	Mains wire-in protectors Computer network protector PBX telephone/ISDN line protection



Install protection on outgoing supplies to site services, such as CCTV systems and site lighting. Protect all incoming/ outgoing data communication, signal and telephone lines (unless fibre optic).



Telephone lines
Incoming telephone lines and extensions that leave the building have protectors installed on them at the PBXs distribution frame.

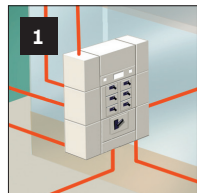


In our example, there is a direct (i.e. not via the PBX) telephone line to an alarm panel, which also needs protecting.

Protection should be installed on all cables which enter or leave the building (except fibre optic), the power supply local to important equipment and electronic equipment outside the main building(s). With the aid of the illustration we can see how this might be applied in practice.

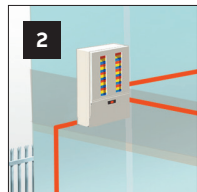
Protect incoming and outgoing services

We'll start by considering the main (office) building in isolation.

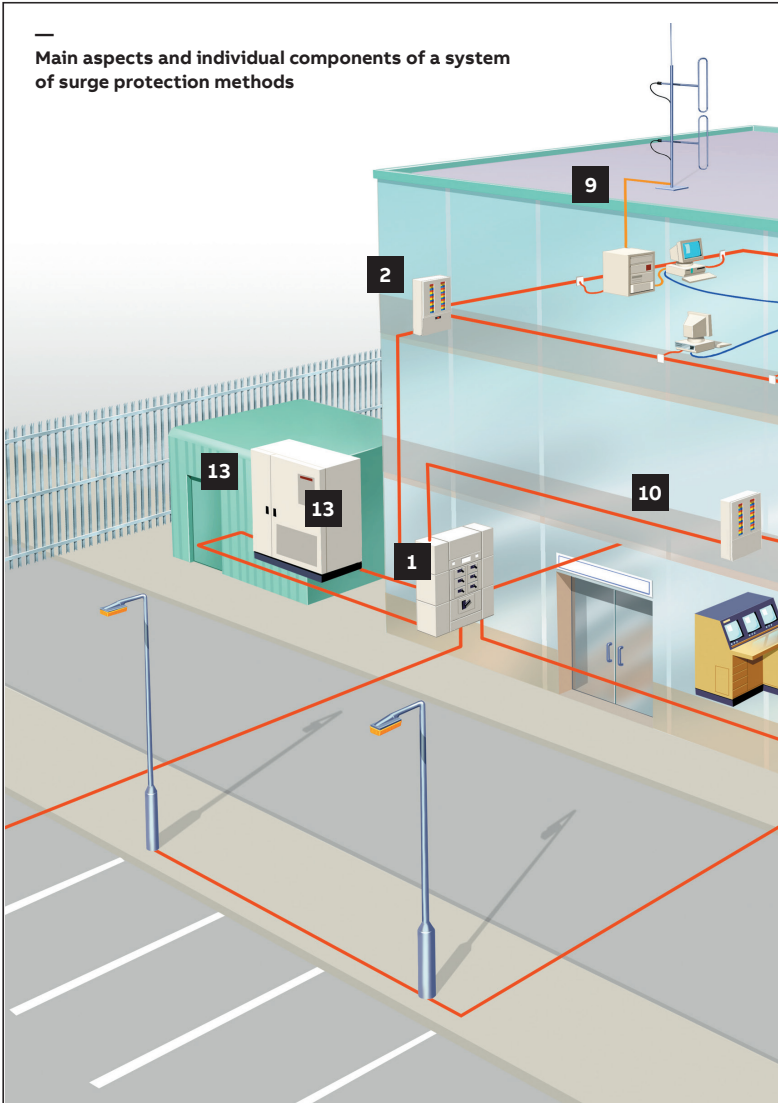
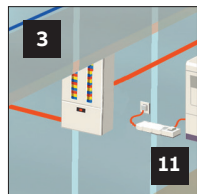


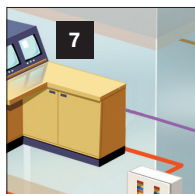
Incoming mains power supplies
Install protection on the incoming mains power supply at the incoming distribution board(s).

If, as in this example, there are any other power supplies entering the building install protection on these near where they enter the building.



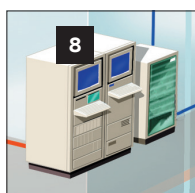
Incoming mains power supplies
Outgoing supplies can provide transient overvoltages with a route back into the building's power distribution system. Install protection on supplies to other buildings. (Note how, if correctly positioned, the protector at the incoming distribution board (1), also protects against transients from the outgoing supply to the UPS building).



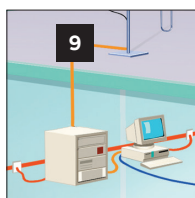


Data & signal lines

Protectors are installed on CCTV video cables from outdoor cameras to prevent damage to the control desk.



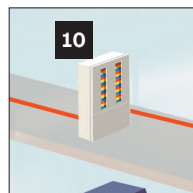
A protector is installed at the network hub to protect it from transients on the between building data link.



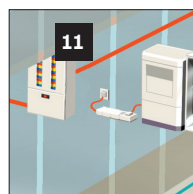
Equipment such as our RF receiver, with antenna (or satellite) links will also need protecting.

Protect the power supply

locally to important equipment



Within the building transient overvoltages can be injected on to the mains power supply (downstream of the protector at the incomer). Consequently, protectors should be installed close to important pieces of equipment.



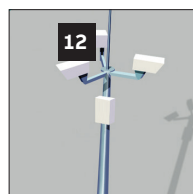
CCTV cameras

Protect outdoor CCTV cameras with protectors on the power supply, and video cable (and, if relevant, telemetry control line). The telephone PBX is protected locally by a plug-in protector.

Protect electronic equipment

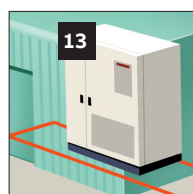
outside the building

Electronic equipment outside the main building in ancillary buildings, on site or in the field should also be protected.



CCTV cameras

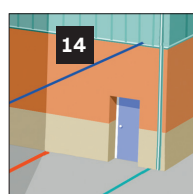
Protect outdoor CCTV cameras with protectors on the power supply, and video cable (and, if relevant, telemetry control line).



External buildings

If the UPS is housed in a separate building with a separate earth, incoming and outgoing supplies will need to be protected. This is because most modern UPS systems contain electronics that make them vulnerable to being disabled by transient overvoltages. To prevent

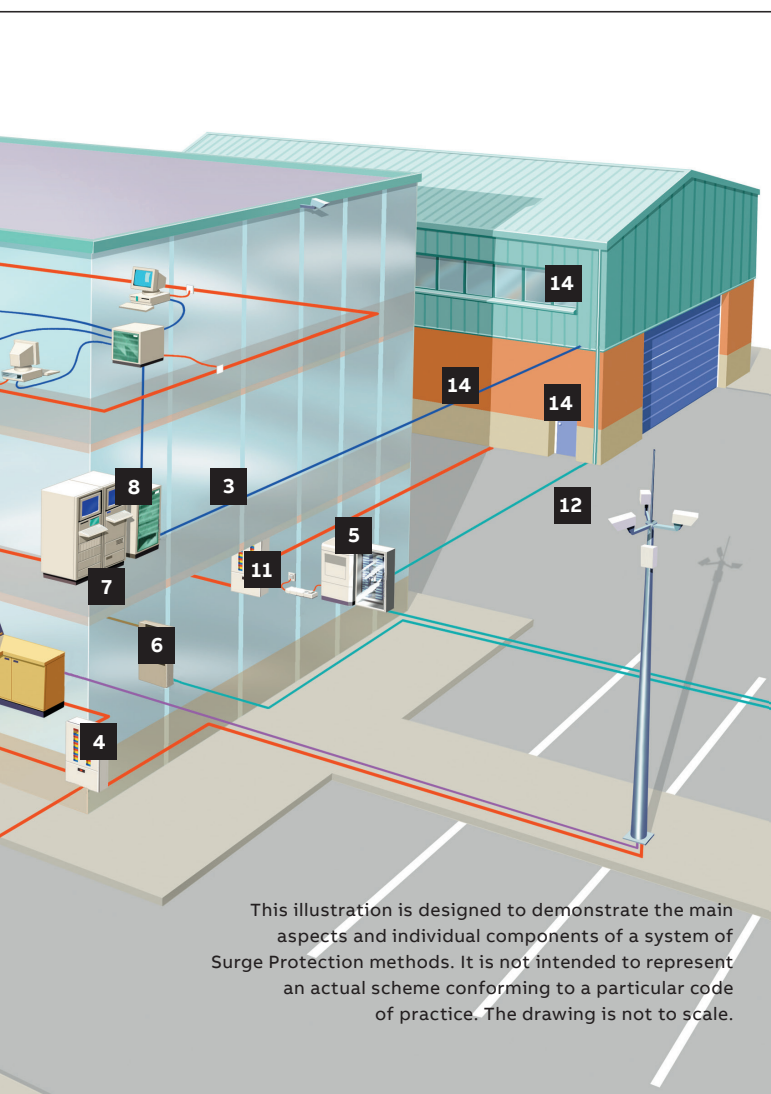
transient overvoltage damage to the UPS it must have a protector installed on both its input and output (outgoing the building). A protector will also need to be installed on the power supply into the main building (2).



Data communication/telephone lines

Protection is also installed on mains power, data communication and telephone lines entering the neighbouring building. Additional protection (not shown) may be required within this building

(whether it's a computer-controlled warehouse or automated manufacturing operation with PLCs, drives and computer controls).



This illustration is designed to demonstrate the main aspects and individual components of a system of Surge Protection methods. It is not intended to represent an actual scheme conforming to a particular code of practice. The drawing is not to scale.

Mains power protection

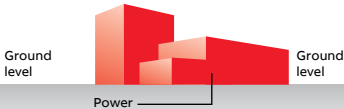













Product selector

The Furse ESP range of SPDs (power, data and telecom) are widely specified in all applications to ensure the continuous operation of critical electronic systems. They form part of a complete lightning protection solution to BS EN 62305.

Furse ESP M and ESP D power SPD products are Type 1+2+3 devices, making them suitable for installation at the service entrance, whilst giving superior voltage protection levels (enhanced to BS EN 62305) between all conductors or modes.



Protection for 230/400 V TN-S or TN-C-S supplies

Supply type	Example 1	Example 2
	No external lightning protection system fitted	No external lightning protection system fitted
	Underground mains supply feed	Exposed overhead mains supply feed
		
Main distribution board (MDB)	Type 1+2+3	Type 1+2 OR Type 1+2+3
3 Phase 400 V Service entrance, after electricity meter (Main distribution board (MDB)). Type 1+2+3 SPDs such as the ESP M and D series are used where the MDB directly feeds critical electronics	 ESP 415 D1 Series OR  ESP 415 M1 Series	 ESP 415T1/12.5/TNS OR  ESP 415MT1/12.5 OR  ESP 415DT1/12.5 OR to protect critical electronics fed from MDB ESP 415M2 Series
Sub-distribution board (SDB)	Type 1+2+3 - 3 Phase	
Located >10 m from MDB feeding electronic equipment	 ESP 415 D1 Series OR  ESP 415 M1 Series OR  ESP 415 CD40 (Type 2+3) Compact Series	
Final circuit equipment	For 13 A sockets (e.g. servers)	Equipment up to 32 A
Located >10 m from SDB	ESP MC ESP MC/TN/RJ11 ESP MC/Cat-5e 	ESP 240D-10A ESP 240D-32A 
Mains protectors for specific systems		
	ESP PV series For Photovoltaic (solar panels) up to 1500 VDC 	ESP WT series For 690V Wind Turbines 

The active status indication informs the user of:

- Loss of power
- Loss of phase
- Excessive N-E voltage
- Reduced protection

The SPD and supply status can also be monitored remotely via the volt-free contact.

Product selection guide - Mains power protection

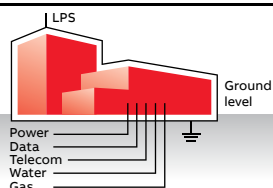
Product no.	GID code	Product no.	GID code
ESP 415 D1	7TCA085460R0105	ESP 415 CD40	7TCA085460R0303
ESP 415 M1	7TCA085460R0112	ESP 240 D1	7TCA085460R0086
ESP 415 M2	7TCA085460R0119	ESP 240 M1	7TCA085460R0089
ESP 415 M4	7TCA085460R0124	ESP MC	7TCA085430R0003
ESP 415T1/25/TNS	7TCA085460R0499	ESP MC/TN/RJ11	7TCA085430R0005
ESP 415T1/12.5/TNS	7TCA085460R0496	ESP MC/Cat-5e	7TCA085430R0004
ESP 415T2/50/TNS	7TCA085460R0388	ESP 240D-10A	7TCA085460R0328
ESP 240T1/25/TNS	7TCA085400R0499	ESP 240D-32A	7TCA085460R0322
ESP 240T2/50/TNS	7TCA085460R0388	ESP 240T3/SKT	7TCA085450R0069



Example 3

External lightning protection system fitted

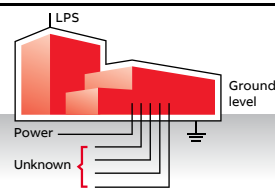
Multiple connected metallic services



Example 4

External lightning protection system fitted

No. of services unknown



Type 1+2+3



ESP 415 D1 Series

OR



ESP 415 M1 Series

Type 1+2 OR Type 1+2+3



For LPL I & II:
ESP 415T1/25/TNS
LPL III or IV:
ESP 415T1/12.5/TNS

OR to protect critical electronics fed from MDB



For LPL I & II:
ESP 415 M4 Series
LPL III or IV:
ESP 415 M2 Series

Type 1+2+3 - 1 Phase

ESP 240 D1 Series, or
ESP 240 M1 Series, or
ESP 240 CD40
(Type 2+3)
Compact Series



OR

SDB located >10 m
from MDB not
directly feeding
electronic equipment

For 3 Phase 400 V
ESP 415T2/50/TNS
For 1 Phase 230 V
ESP 240T2/50/TNS



Fused spurs or single phase sockets

For single phase
spurs/socket outlets
up to 16 A
ESP 240T3/SKT



ESP DC series
For DC systems
up to 48V



ESP CDT2 series
for residential
consumer units
and space critical
panel boards

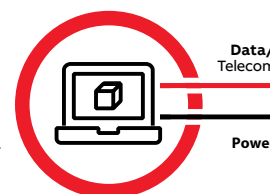


Data & signal protection

Product selector - Data line protection



Fieldbus/ PROFIBUS Systems					
HART Systems RS485	Screw terminals:	ESP RS485 Flat/DIN Mount 7TCA085400R0191	ESP SL RS485 Slim DIN Mount 7TCA085400R0193	Multiple Lines 7TCA085400R0191 7TCA085400R0647	Screw/Spring terminals: Multiple Lines (DIN Mount) 7TCA085400R0192 7TCA085400R0475 (spring "Push Terminal" PT version)
4 - 20 mA current loops	Screw terminals:				
		ESP SL30L/4-20 Slim mount 7TCA085400R0070	ESP SE30/4-20 Slim mount 7TCA085400R0648		
Telephone ISDN DSL G.FAST	Screw terminals:				
		ESP TN Flat Mount 7TCA085400R0171	ESP SL TN Slim Mount 7TCA085400R0195	Slim Mount with LED 7TCA085400R0226	Screw/Spring terminals: Slim Mount 7TCA085400R0652 7TCA085400R0653
2 wire systems (30 V)	Screw terminals:				
		ESP 30E Flat Mount 7TCA085400R0104	ESP SL30 Slim Mount 7TCA085400R0067	Slim Mount 7TCA085400R0099 7TCA085400R0104	Multiple Lines 7TCA085400R0107 7TCA085400R0476 (spring "Push Terminal" PT version)
Resistance Temperature Detectors (RTD) 3 wire systems	Screw terminals:				
		ESP RTD Flat/DIN Mount 7TCA085460R0157	ESP SL RTD Slim (DIN Mount) 7TCA085400R0232		ESP RTDQ or ESP RTDQ/PT Multiple Lines (DIN Mount) 7TCA085400R0158 7TCA085400R0480 (spring "Push Terminal" PT version)
3 wire systems (30 V)	Screw terminals:				
		ESP SL30/3W Slim Mount 7TCA085400R0268	Protection for different voltages are available		
US regions UL Approved	Screw terminals:				
		ESP SL30 Slim Mount 7TCA085400R0067	Screw/Spring terminals:	Multiple Lines 7TCA085400R0107 7TCA085400R0476 (spring "Push Terminal" PT version)	Protection for different voltages are available









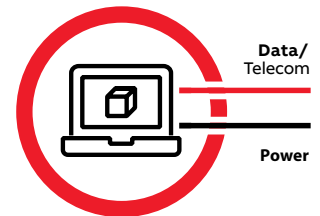
IMPORTANT:
Equipment is ONLY
protected against
transient overvoltages if
all incoming / outgoing
mains and data lines
have protection fitted.

Furse data and signal SPD products are Class D+C+B tested (to IEC/BS EN 61643-21), making them suitable for installation at the service entrance, whilst giving superior voltage protection levels (enhanced to BS EN 62305) between all conductors or modes. Furse data and signal SPDs come in a variety of formats to allow easy integration within any installation. Key variants offer active status indication, screw terminals and UL listing.



Telecoms & computer line protection

Product selector

Common applications	Service entrance protectors	Critical terminal equipment - located >20 m from service entrance
Analogue Telecom systems Twisted pair data protection see Furse Application Note AN005) Standard, for twisted pair lines	 <p>ESP TN Series 7TCA085400R0171 ESP TN/BX Series 7TCA085400R0175 ESP TN/2BX Series 7TCA085400R0172</p>	<p>ESP MC/TN/RJ11 Series e.g. Fax machines / Modems 7TCA085430R0005</p> 
Compact, ideal where space is a premium	 <p>ESP SL TN Series 7TCA085400R0195</p>	
Multiple line protection in a single unit	 <p>ESP TNQ Series 7TCA085400R0183</p>	
For BT type socket systems	 <p>ESP TN/JP Series 7TCA085400R0177</p>	
For PBX systems terminating of LSA-Plus disconnection modules	 <p>ESP K10T1 7TCA085400R0130 ESP KT1 7TCA085400R0135 ESP KE10 7TCA085400R0134</p>	



IMPORTANT:
Equipment is ONLY protected against transient overvoltages if all incoming / outgoing mains and data lines have protection fitted.

System	Computer system protector
Computer networks with RJ45 connection	 <p>ESP Cat-6 Series 7TCA085400R0023</p>  <p>ESP MC/Cat-5 Series 7TCA085430R0004</p>

Furse telecom and computer line SPD products are Class D+C+B tested (to IEC/BS EN 61643-21), making them suitable for installation at the service entrance, whilst giving superior voltage protection levels (enhanced to BS EN 62305) between all conductors or modes. Furse SPDs come in a variety of formats to allow easy integration within any installation.



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