

Electronic Systems Protection

Equipotential bonding and transient overvoltage surge protection



Company overview

Our reach and expertise

With over 120 years of experience Furse provides world leading Earthing, Lightning and Electronic Systems Protection solutions. From our own designed and manufactured products, through to risk assessment and systems design advice. Furse provide its renowned total solution for earthing & lightning protection. By bringing together complimentary Furse products, ABB now offer a wider range of electronic systems protection solutions.

Our exhaustive range of equipotential bonding and transient overvoltage SPDs provide fully coordinated protection against transient overvoltages on all incoming and outgoing metallic service lines including power, data, signal & telecoms.

- Lightning Equipotential Bonding SPDs
- Mains power transient overvoltage SPDs
- Data, signal & telecommunication line SPDs
- DC power & photovoltaic SPDs

Expertise

Specialist advice from our fully qualified technical engineers - focusing on your lightning and surge protection issues and concerns.

Experience

Experience to provide the optimum design - one that doesn't use more material than is necessary, saving you money.

Knowledge

Our knowledge of the latest standards and systems ensures a tailored design that can be installed using the most appropriate and up-to-date products.



1 Datacentres | 2 Trackside substations | 3 Wind farms | 4 Oil & Gas | 5 Water treatment
6 Telecommunications | 7 Healthcare | 8 Substations

Electronic Systems Protection

Surge Protection now included in BS 7671

The latest amendment to the IET Wiring Regulations 17th Edition (BS 7671) brings into sharp focus the need to protect sensitive and critical electronic systems against transient overvoltages (surges).

Amendment 1 of BS 7671, effective from 1st January 2012, requires all electrical system designs and installations to be assessed against risk of transient overvoltages of atmospheric origin, or from switching events, in line with its Sections 443 & 534. Section 443 defines the criteria for risk assessment, whereas Section 534 describes the selection and installation of suitable Surge Protective Devices (SPDs), where required, for effective transient overvoltage protection.

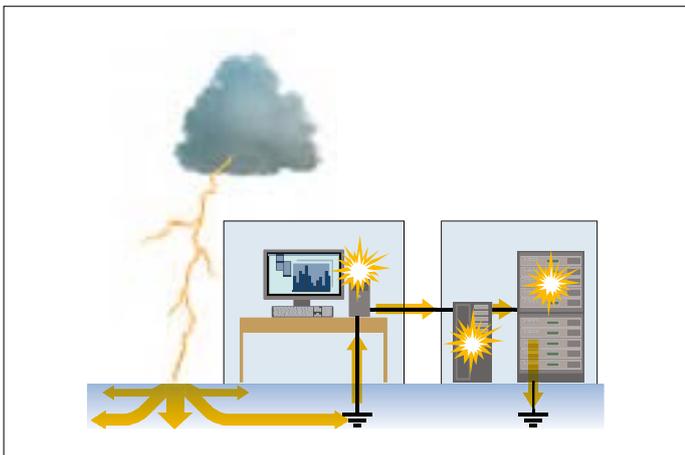
Why is transient overvoltage protection so important?

Transient overvoltages are short duration surges in voltage between two or more conductors (L-PE, L-N or N-PE), which can reach up to 6 kV on 230 Vac power lines, and generally result from:

Atmospheric origin (lightning activity) through resistive (see Figure 1) or inductive coupling and/or Electrical switching of inductive loads.

Transient overvoltages significantly damage and degrade electronic systems.

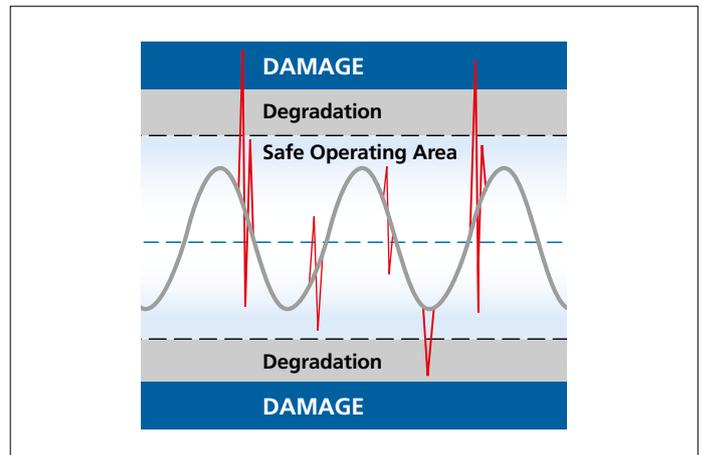
Figure 1: Resistive coupling



Outright damage to sensitive electronic systems, such as computers etc, occurs when transient overvoltages between L-PE or N-PE exceed the withstand voltage of the electrical equipment (i.e. above 1.5 kV for Category I equipment to BS 7671 Tables 44.3 & 44.4).

Equipment damage leads to unexpected failures and expensive downtime, or risk of fire/electric shock due to flashover, if insulation breaks down.

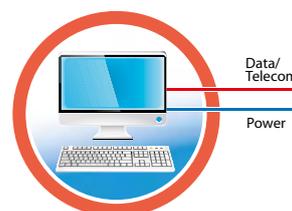
Figure 2: Equipment risk



Protect additional metallic services

For protection measures against direct lightning strikes, and against transient overvoltages on additional metallic service lines (e.g. data, signal & telecoms), BS 7671 refers to BS EN 62305 (534.1 NOTE 2).

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



IMPORTANT:

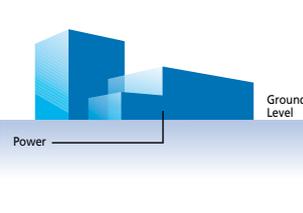
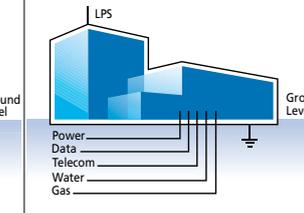
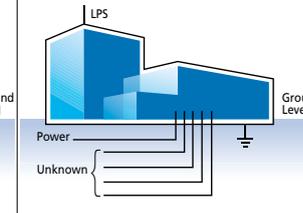
Equipment is ONLY protected against transient overvoltages if all incoming / outgoing mains and data lines have protection fitted.

Furse Electronic Systems Protection

Enhanced Solutions to BS EN 62305 / BS 7671

Furse Surge Protective Devices are widely specified and offer industry-leading voltage protection levels to ensure the continuous operation of critical electronic systems, such as those found in data centres, hospitals and automated process control. Used with Furse data / telecom SPDs, they form part of a complete lightning protection solution.

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

	<ul style="list-style-type: none"> No external lightning protection system fitted Underground mains supply feed 	<ul style="list-style-type: none"> No external lightning protection system fitted Exposed overhead mains supply feed 	<ul style="list-style-type: none"> External lightning protection system fitted Multiple connected metallic services 	<ul style="list-style-type: none"> External lightning protection system fitted No. of services unknown
				
3 Phase 400 V Service entrance, after electricity meter (Main distribution board (MDB))	  ESP 415 D1 Series OR ESP 415 M1 Series	  ESP 415/III/TNS OR ESP 415 M2 Series (for electronics located near MDB before SDB)	  ESP 415 D1 Series OR ESP 415 M1 Series	  For LPL I & II ESP 415/III/TNS or ESP 415 M4 (for electronics located near MDB before SDB) OR For LPL III & IV ESP 415/III/TNS or ESP 415 M2 (for electronics located near MDB before SDB)
3 Phase 400 V 1 Phase 230 V Sub-distribution board (SDB) located > 10 m from MDB feeding electronic equipment	 OR  For 3 Phase 400 V: ESP 415 D1 Series, or ESP 415 M1 Series	 OR  For 1 Phase 230 V: ESP 240 D1 Series, or ESP 240 M1 Series		
Critical terminal equipment located > 10 m from SDB	 ESP MC ESP MC/TN/RJ11 (e.g. for fax machines) ESP MC/Cat-5e (e.g. for servers)			

Protection for data signal and telecoms applications

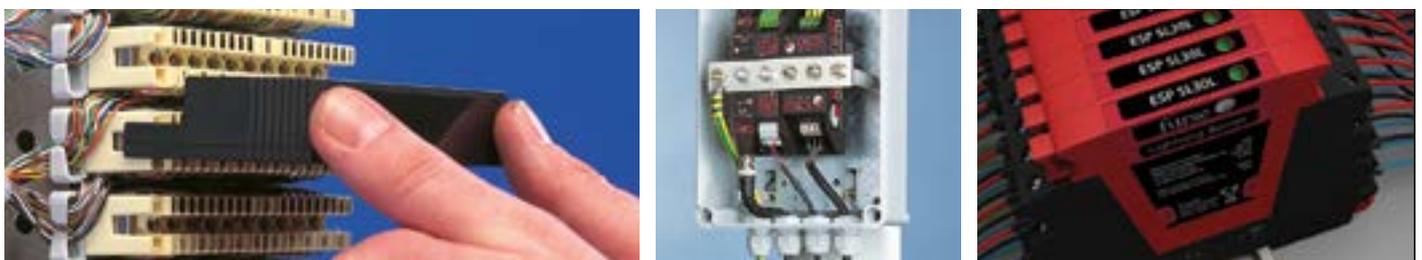


ABB LV Panel SPDs

Commercial, Industrial & Domestic Installations

ABB's wide range of mains SPDs compliment the power DIN-rail product range, providing protection to the electrical installation at any point in the mains distribution system.



Main section board

OVR T1+2 3N 15-255-7 surge protective device – TNS/TT 230/400V 3Ph+N networks

Type 1+2 ABB surge protective devices have a high impulse current (10/350 waveform) withstand capacity whilst ensuring a low (better) voltage protection level (U_p).

- Multi-mode protection
- End of life SPD visual indicator
- DIN rail mounting for quick installation
- Compact design

Characteristics



Sub-distribution board

OVR T2 3N 40 275s P TS surge protective device - TNS/TT 230/400V 3Ph+N networks

Type 2 surge protective devices are designed to protect electrical installations and sensitive equipment against indirect surge currents

- Multi-mode protection
- End of life SPD visual indicator
- Plug-in cartridge
- DIN rail mounting for quick installation
- Auxiliary contact TS for remote status indication

Characteristics



OVR Plus N3 40 self-protected surge protective device - TNS/TT 230V/400V 3Ph+N networks

Self-protected with integral backup miniature circuit breaker offering dedicated over current protection device (OCPD) fully coordinated with the surge protective device.

- Multi-mode protection
- DIN rail mounting for quick installation
- High reliability
- Innovative, weld-free safe thermal disconnection sensor
- Fully compatible with the complete ABB pro M modular range

Characteristics



Consumer units – Domestic/Residential

OVR Plus N1 20 self-protected surge protective device - TNS/TT 230 V 1Ph+N networks

Self-protected with integral backup miniature circuit breaker offering dedicated over current protection device (OCPD) fully coordinated with

- Multi-mode protection
- DIN rail mounting for quick installation
- Fully coordinated unit for optimised installation and simplified wiring
- High reliability
- Innovative, weld-free safe thermal disconnection sensor
- Compact design

Characteristics



Enhanced Total Solution

Compliance to BS EN 62305 / BS 7671

BS 7671 Section 534 focuses guidance on selection and installation of SPDs to limit transient overvoltages on the AC power supply.

BS 7671 Section 443 states that, transient overvoltages transmitted by the supply distribution system are not significantly attenuated downstream in most installations (443.1.1 NOTE 3).

BS 7671 Section 534 therefore recommends that SPDs are installed at key locations in the electrical system:

- As close as practicable to the origin of the installation (usually in the main distribution board after the meter) (534.2.1)
- As close as practicable to sensitive equipment (sub-distribution level), and local to critical equipment (534.2.1)

Figure 3 shows a typical installation on a 230/400 V TN-C-S/ TN-S system using Furuse SPDs, to meet the requirements of BS 7671.

The illustration demonstrates how effective protection comprises a service entrance SPD to divert high energy lightning currents to earth, followed by downstream SPDs at appropriate points to protect sensitive and critical equipment.

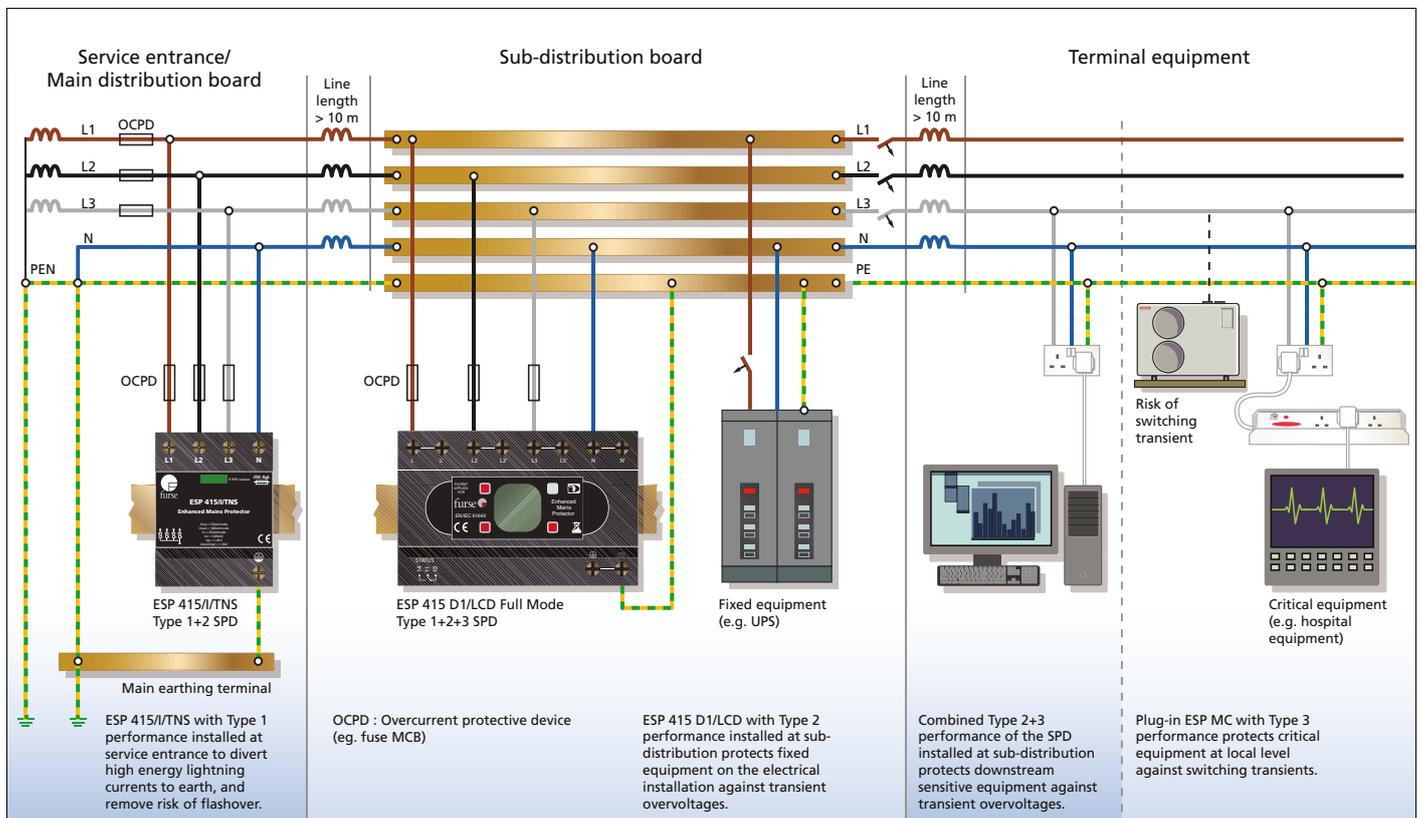
Selecting appropriate SPDs

SPDs are classified by Type within BS 7671 (534.2.1), following the criteria established in BS EN/IEC 62305.

Where a building includes a structural LPS, or connected overhead metallic services at risk from a direct lightning strike, equipotential bonding SPDs (Type 1 or Combined Type 1+2) must be installed at the service entrance, to remove risk of flashover (534.2.3.4.2).

Installation of Type 1 SPDs alone however does not provide protection to electronic systems (534.2.1 NOTE 3).

Figure 3: Typical installation on a 230/400 V TN-C-S/TN-S system, using Furuse SPDs, to meet the requirements of BS 7671.



Enhanced Total Solution

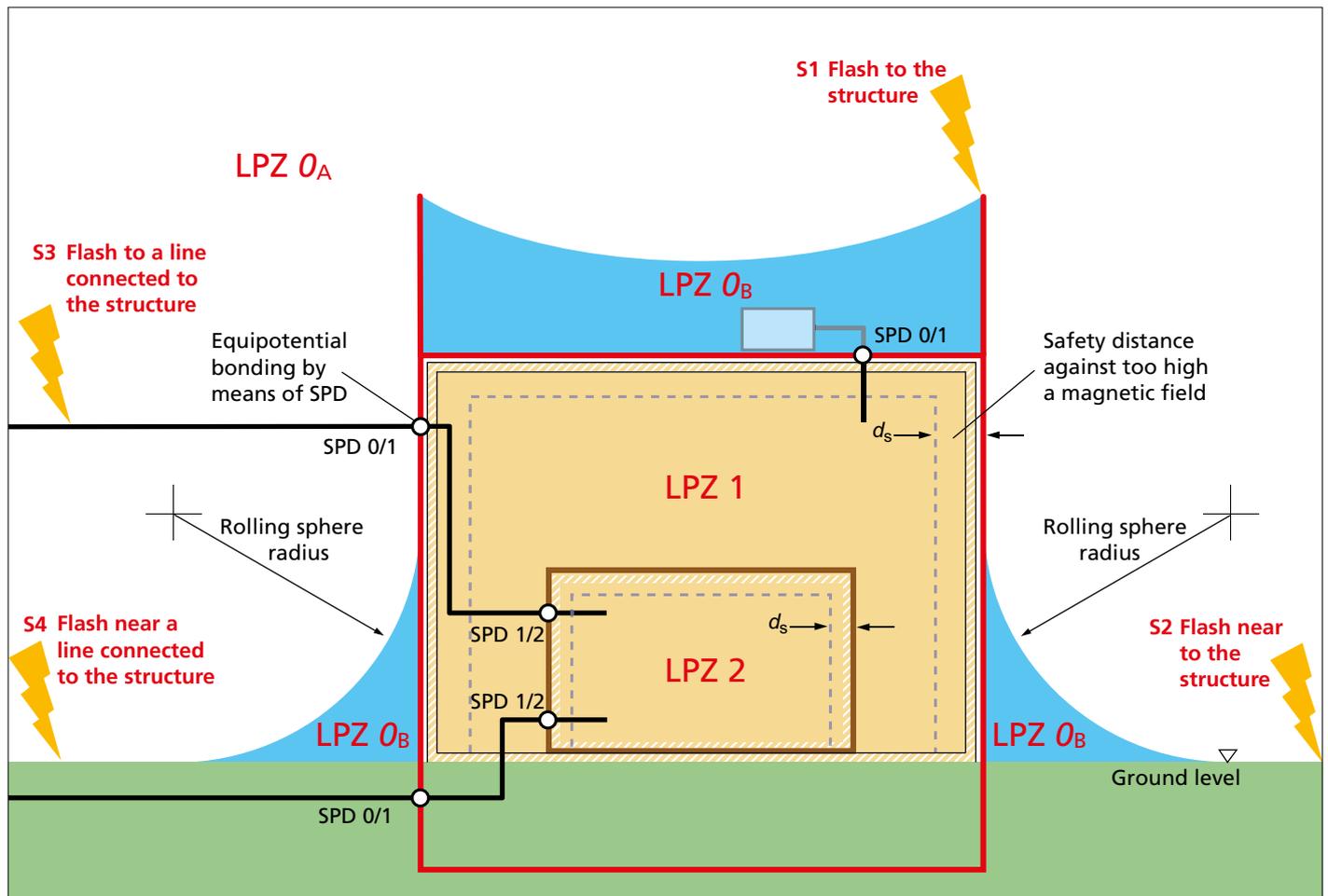
Lightning Protection Zone (LPZ) Concept

The Lightning Protection Zone (LPZ) concept was introduced in BS EN 62305, particularly to assist in determining the Surge Protection Measures (SPM) required within a structure.

The general principle is that the equipment requiring protection should be located in an LPZ whose electromagnetic characteristics are compatible with the equipment stress withstand or immunity capability.

In general, the higher the number of the zone (LPZ 2; LPZ 3 etc) the lower the electromagnetic effects expected. Typically, any sensitive electronic equipment should be located in higher numbered LPZs and be protected by its relevant SPM.

Figure 4: LPZ defined by protection measures



Fusing and Installation of SPDs

Transient overvoltage protection to BS 7671

Critical length of connecting conductors

An installed SPD will always present a higher let through voltage to equipment compared with the voltage protection level (U_p) stated on a manufacturer's data sheet, due to additive inductive voltage drops across the conductors on the SPD's connecting leads.

Therefore, for maximum transient overvoltage protection the SPDs connecting conductors must be kept as short as possible.

BS 7671 Clause 534.2.9 defines that for SPDs installed in parallel (shunt), the total lead length between line conductors, protective conductor and SPD preferably should not exceed 0.5 m and never exceed 1 m. Current loops should be avoided.

For SPDs installed in-line (series), the lead length between the protective conductor and SPD preferably should not exceed 0.5 m and never exceed 1 m.

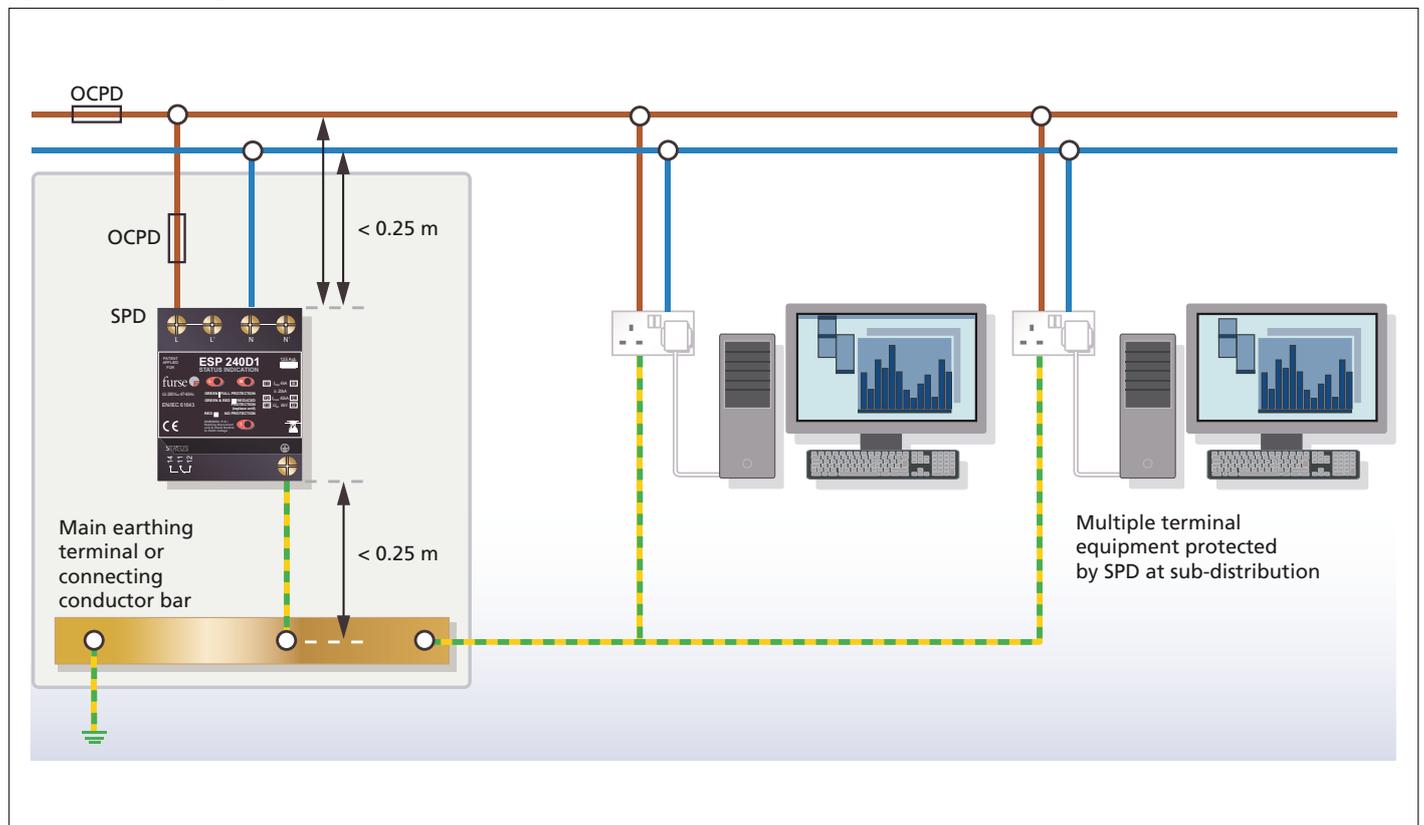
Best practice

Poor installation can significantly reduce effectiveness of SPDs. Therefore, keeping connecting leads as short as possible is vital to maximize performance, and minimize additive inductive voltages.

Best practice cabling techniques, such as binding together connecting leads over as much of their length as possible, using cable ties or spiral wrap, is highly effective in cancelling inductance.

The combination of an SPD with low voltage protection level (U_p), and short, tightly bound connecting leads will lead to an optimum controlled installation meeting the requirements of BS 7671.

Figure 5: Total lead length for SPDs installed in parallel



SPD connections should be kept as short as possible, ideally below 0.25 m between SPD, live conductors & earth, but in any case not more than 0.5 m, to reduce risk of additive inductive voltage drops across the conductors.

Cross-sectional area of connecting conductors

Following BS 7671, the cross-sectional area of the SPD's connecting conductors shall be:

- Not less than 4 mm² copper (or equivalent) if the cross-sectional area of the line conductors is greater than or equal to 4 mm², or
- Not less than that of the line conductors, where the line conductors have a cross-sectional area less than 4 mm²
- For Type 1 SPDs, a minimum of 16 mm² copper or equivalent, where a structural LPS is installed

These cross-sectional area values are based on the surge current that these SPD connecting leads need to handle, not the supply current.

However, in the event of a short circuit, for example due to the end of life condition of the SPD, the connecting leads to the SPD would need to be protected by a suitable Overcurrent Protective Device (OCPD).

BS 7671 defines requirements to ensure that fault protection shall remain effective in the protected installation even in the case of failure of SPDs.

Therefore an SPD needs to be protected against short circuits through the use of an appropriate OCPD capable of eliminating the short-circuit. In effect, the SPD should have a dedicated OCPD installed in-line on its connecting leads, ensuring that this OCPD to the SPD discriminates with the upstream OCPD of the main supply.

Selection of the appropriate OCPD in-line with the SPD must ensure sufficient discrimination with the upstream OCPD of the main supply load. Installers should refer to OCPD manufacturers' operating characteristics to ensure discrimination, particularly where an installation includes a mixture of types of OCPD.

However, as a general rule of thumb, the OCPD for the SPD should be rated at approximately half the value of the upstream supply OCPD.

ABB surge solutions

Furse Electronic Systems Protection

Furse Part No.	ABB Order Code	ABB MCCB / MCB Part No.*	ABB Fuse Holder Part No.*
ESP 415/I/TNS	7TCA085460R0101	1SDA067398R1	E933N/125 ¹
ESP 415/III/TNS	7TCA085460R0103	1SDA067398R1	E933N/125 ¹
ESP 415 M4	7TCA085460R0124	1SDA067398R1	E933N/125 ¹
ESP 415 M2	7TCA085460R0119	1SDA067398R1	E933N/125 ¹
ESP 415 M1	7TCA085460R0112	S203MC50	E933N/125 ²
ESP 415 D1	7TCA085460R0105	S203MC50	E933N/125 ²

ABB Part No.	ABB Order Code	ABB MCCB / MCB Part No.*	ABB Fuse Holder Part No.*
OVR T1+2 3N 15-255-7	2CTB815101R9000	1SDA067398R1	E933N/125 ¹
OVR T2 3N 40 275s P TS	2CTB803395R0200	S203MC50	E933N/125 ²
OVR Plus N3 40	2CTB803701R0300	N/A	N/A
OVR Plus N1 20	2CTB803701R0700	N/A	N/A

* Maximum MCB/fuse ratings must be in accordance with the installation to follow coordination rules with main or upstream short circuit protection.

¹ Must be used with 125 A 22 mm x 58 mm cylindrical fuse, ordered separately

² Must be used with 50 A 22 mm x 58 mm cylindrical fuse, ordered separately

Other products to consider

ESP SL Series



For protection of twisted pair signalling applications

ESP Cat 6 Series



For protection of local area networks up to Cat 6 including Power over Ethernet (PoE)

ESP TN/JP Series



For protection of equipment connected to BT telephone (BS 6312) socket

The next MCB generation System pro M compact®

Uncompromising safety and comfort

For over 120 years ABB have been supplying advanced MCBs. Today ABB offer MCB solutions for all kinds of applications, developed in close touch with market requirements.

Worldwide approved S 200 / S 200 M meet all international standards

The next generation MCB S 200 / S 200 M product range provides highest safety solutions for the installer according to all relevant standards worldwide. Our products are tested acc to: IEC 60898-1, IEC 60947-2, UL 1077, CSA 22.2 No. 235.

Miniature circuit breakers (MCBs) applications

Our circuit breakers are available in various configurations to meet the requirements of different applications. So you don't have to mix up different systems and can rely on the proven System pro M compact® in every situation. They are selectively switchable, even under load, in case of a fault or for maintenance purposes. The MCB guarantees constant tripping-characteristics over its entire lifetime.

For domestic/residential installations in defined markets up to 6 kA breaking capacity 3 / 4,5 / 6 kA

Compact Home
SH 200 T, SH 200 L,
SH 200

For domestic or small commercial installations up to 10 kA breaking capacity

pro M compact S200,
S200S, S200 M

For industrial installations up to 25 kA breaking capacity

pro M compact S200,
S200M, S200P, S200U,
S200UP, S200UDC
S280UC, S290

For commercial and industrial applications with high breaking capacities and special features / accessories

S200P, S220, S290
S500, S800

Special selective MCB (SMCB) with dedicated upstream and downstream selectivity are available in the ranges

S700
S750



ABB Low voltage products division

Business units

ABB has a reputation for manufacturing and supplying quality low voltage components, the result of our on-going research and development programme.



Breakers & switches

- Circuit breakers
- Switches
- Fusegear & cable distribution cabinets



Wiring accessories

- Wiring accessories
- Industrial plugs & sockets
- Door entry systems
- Intelligent building control (KNX)



Control products

- Control & protection
- Electronic products & relays
- Connection
- Jokab safety products



LV Systems

- MNS conventional switchgear
- MNS intelligent switchgear
- MNS integrated switchgear



Enclosures & DIN-Rail

- Modular DIN-Rail products
- Enclosures & cable systems
- Furse Surge Protection



Cabling & wiring

- Power connectivity & control
- Wire & cable management
- Cable protection systems
- Safety technology

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