PRODUCT CATALOGUE

Furse® Surge Protection Devices (SPDs)

Electronic systems protection

Furse® Surge Protection Devices (SPDs) are designed to provide simple system integration whilst achieving the highest levels of protection against transients. Whether for mains power, data and telecom or more specified applications, Furse Surge Protection ensures the continuous operation of critical electronic systems, helping to form a crucial part of a complete lightning protection solution to IEC/BS EN 62305.

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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.

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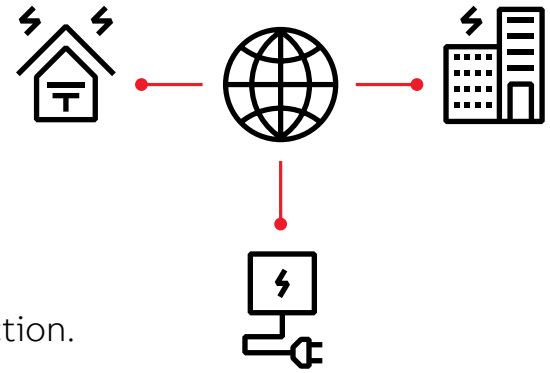
Furse continues to reinforce their commitment to both quality and service, providing solutions which deliver safety and protection of people, structures and electrical services within the built environment.

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.

The value of earthing & lightning protection

Lightning is one of nature's most powerful and destructive phenomena. Lightning strikes present a real and significant threat to life, to the structures in which we live and work, and to the electronic systems which support us in our daily lives.

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01 Data centres.
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02 Trackside substations.
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03 Wind farms.
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04 Oil & Gas.
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05 Water treatment.
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06 Telecommunications.
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07 Healthcare.
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08 Substations.

Lightning contains awesome amounts of electrical energy. Lightning discharges have been measured from several thousand to over 200,000 Amps (enough to light half a million 100 Watt bulbs) and even though of a very short duration, can cause tremendous damage and destruction.

Lightning can have devastating consequences:

- **Direct lightning strikes** damage structures, and create fire, explosion and electric shock hazards
- **Indirect lightning** (up to a kilometre away) creates transient overvoltages which degrade electronic systems and disrupt essential services

The effects of a direct strike are obvious and immediately apparent - buildings damaged, trees blown apart, personal injuries and even loss of life.

However, the secondary effects of lightning – the short duration, high voltage spikes called transient overvoltages - can, and do, cause equally catastrophic, if less visually obvious, damage to electronic systems within structures.

The need for a Total Solution
National and International lightning protection standards now stress the need for a comprehensive solution encompassing both structural lightning and electronic systems protection using Surge Protection Devices (SPDs).

Simply put, a structural lightning protection system cannot and will not protect electronic systems from lightning currents and transient overvoltages.

Earthing standards demand critical safety of the electrical installation and the personnel at site. Both quality of design and product material are paramount.

This is why we advocate our Total Solution to earthing and lightning protection - an approach which delivers effective life safety, together with long lasting, reliable protection of a structure and the electronic systems within.


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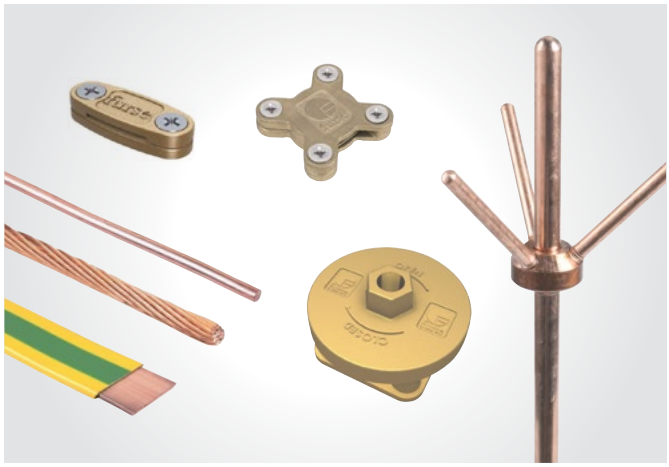
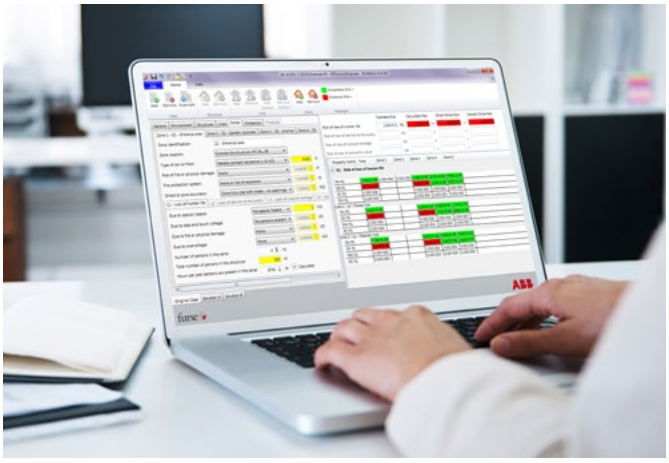


Structural lightning protection
From Furse air termination systems including air rods and strike plates to capture lightning strikes, through to our comprehensive range of down conductors and lightning protection components which channel lightning energy safely to an earth termination network.

This includes:
- Air termination systems
- Lightning protection conductors
- Conductor clips, clamps and holdfasts
- Bimetallic connection components

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

This includes:
- Lightning equipotential bonding SPDs
- Mains power transient overvoltage SPDs
- Data, signal & telecommunication lines SPDs
- DC power & photovoltaic systems SPDs



Earthing
The combination of Furse earth electrodes, clamps, conductors and equipotential bonding bars which provides lightning with an effective, low resistance route from the lightning protection system to earth.

This includes:
- Earth rods and conductor systems
- Mechanical earth clamps and bonds
- FurseWELD exothermic welding
- Earth bars and equipotenetial bonding

Technical support
Furse technical design teams ensure all designs for lightning protection, earthing and transient overvoltage protection meet relevant national and international standards, whilst our sales engineers provide key updates on lightning protection matters.

Services include:
- Lightning protection system design
- Site surveys & earthing analysis
- Lightning protection seminars & training
- Technical guides & StrikeRisk software

Surge Protection Devices (SPDs)
Introduction

IEC/BS EN 62305 makes clear the need for a combined lightning protection solution that safeguards both structural integrity and any electronic systems.

Electronic systems have become central to virtually every aspect of our lives from PCs and building management systems in the office to automated petrol pumps and barcode scanners at the supermarket.

The ever-changing pace of technological development, and especially the headlong quest for miniaturisation, has created the scenario where increasingly lightning sensitive systems are placed at the core of our society.

Both the threat of damage to vital electronic systems, and the seriousness of the consequences of that damage, are more real than ever. Most modern electronic systems are at risk.

Transient overvoltages
The main risk to electronic systems is through transient overvoltages - large, very brief and potentially destructive increases in voltage within the electrical system. These can reach magnitudes of up to 6,000 Volts in a well-insulated power distribution system, over eight times the level tolerated by many electronic systems.

Although lasting only thousandths or millionths of a second, without protection they can devastate these modern electronic systems:
- Disrupting system operations, through data loss, data corruption, and unexplained crashes
- Degrading equipment components and circuitry, shortening equipment lifetimes and increasing failures
- Causing costly and unnecessary system downtime

Transient overvoltages are caused by:
- The secondary effects of lightning strikes (either between clouds or to ground), from lightning energy induced on to above or below ground power, data and signal lines
- The electrical switching of large inductive loads (such as motors, transformers and electrical drives), or capacitive loads (such as power factor correction)

Protection benefits
Effective transient overvoltage or surge protection can prevent:
- Lost or destroyed data
- Equipment damage
- Costly repair work - especially at remote/ unmanned installations
- The high cost of extended stoppages - lost sales, lost production, spoilage of work in progress
- Loss of essential services - fire alarm, security systems, building management systems
- Health and safety hazards caused by plant instability
- Fire risks and electric shock hazards

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01 Transient overvoltages damage and degrade electronic components
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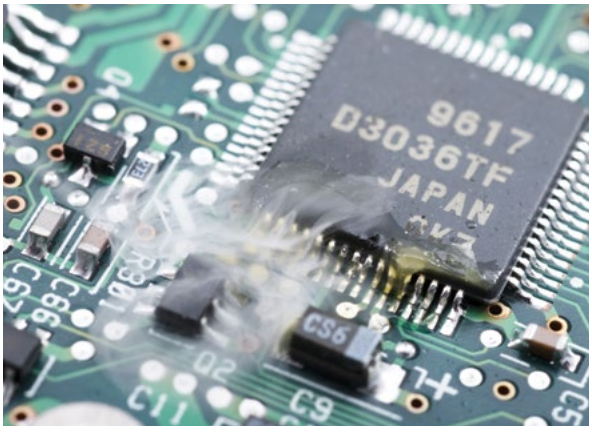
02 Complete destruction of components is a clear risk where no surge protection is applied



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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.

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

02 **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).

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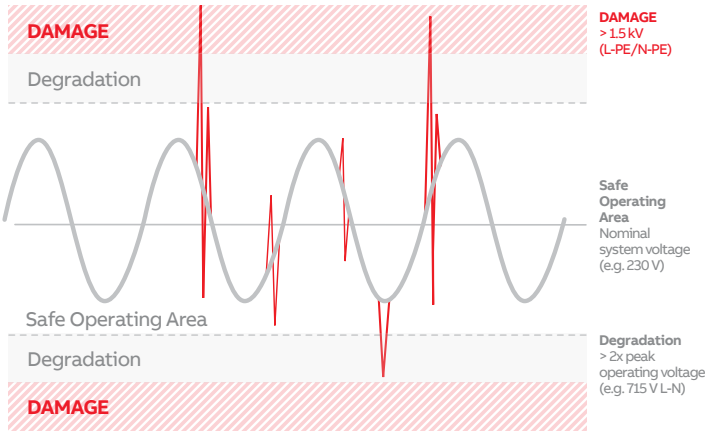

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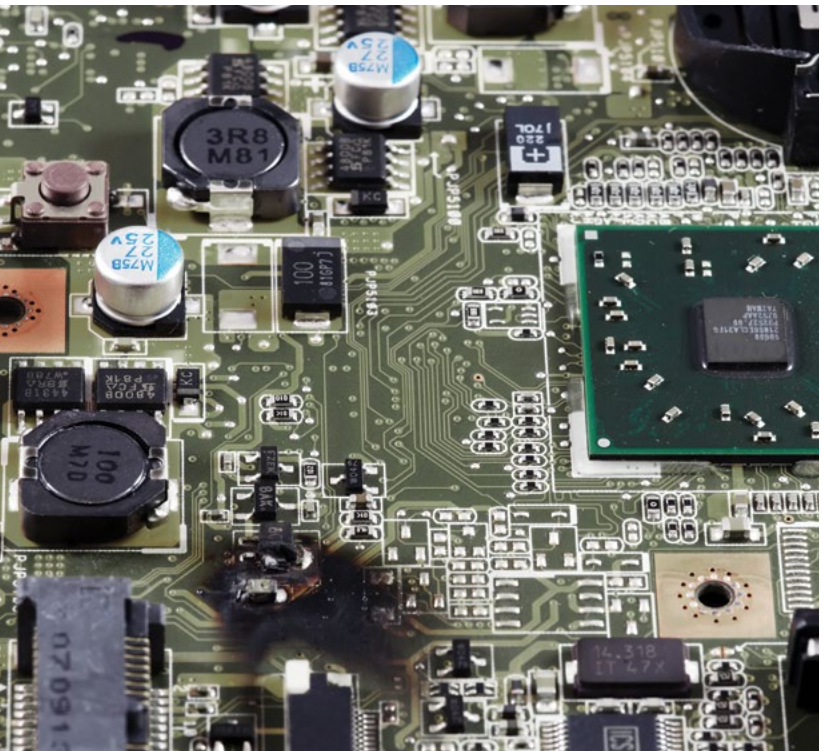


Transient overvoltages are short duration surges in voltage between two or more conductors, e.g. Live conductor to Protective Earth (L-PE), Live to Neutral (L-N) or Neutral to Protective Earth (N-PE) on a power line as illustrated in Figure 1a. These surges can reach up to 6000 V on a 230Vac supply,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

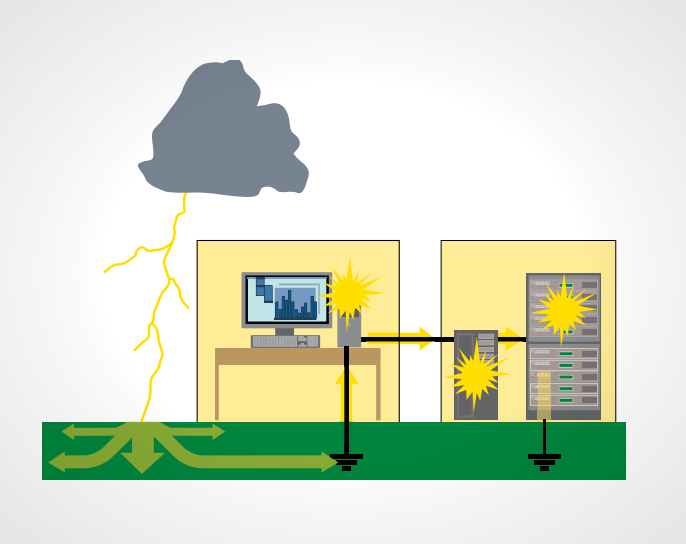
Similarly, surges can also occur between the conductors on data and telecommunication lines, causing damage to connected equipment. As such Surge Protective Devices (SPDs) are required to both power and data lines (see Figure 2b) to safeguard equipment to limit the transient overvoltages within its safe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



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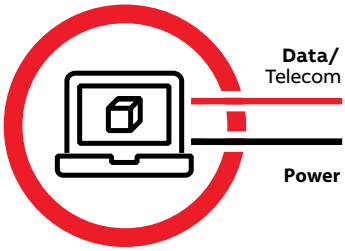

WARNING:
Equipment is ONLY protected against transient overvoltages if all incoming / outgoing mains and data lines have protection fitted.

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

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

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

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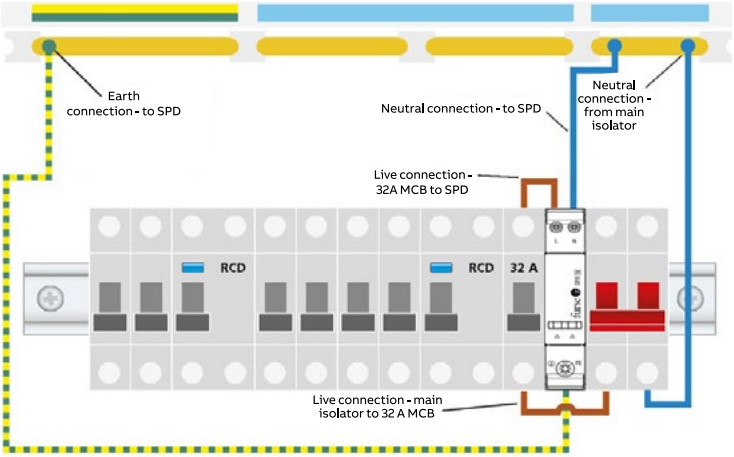

Electronic systems protection
Introduction

Lightning currents as a result of direct lightning strikes are represented by the simulated 10/350 µs waveform with a fast rise time and long decay that replicates the high energy content of direct lightning.

Direct lightning can inject partial lightning currents of the 10/350 µs waveform into a system where a structure with a structural Lightning Protection System (LPS) receives a direct strike (Source S1) or where lightning directly strikes an overhead service line (Source S3).

Remote or indirect lightning flashes near the structure (Source S2) or near a connected service to the structure (Source S4) of up to 1 km radius away (and hence far more common) are represented by the 8/20 µs waveform. Induced surges from direct lightning flashes and switching sources are also represented by this waveform.

With a much shorter decay or fall time relative to the 10/350 µs waveform, the 8/20 µs waveform presents significantly less energy (for an equivalent peak current) but is still devastating enough to damage electrical and electronic equipment.

IEC/BS EN 62305-1 recognizes that failure of internal systems (Damage Type D3) due to Lightning Electromagnetic Impulse (LEMP) is possible from all points of strike to the structure or service - direct or indirect (all Sources: S1, S2, S3 and S4).

To ensure continuous operation of critical systems even in the event of a direct strike, SPDs are essential and are suitably deployed, based on the source of surge and its intensity using the Lightning Protection Zones (LPZ) concept within IEC/BS EN 62305-4.

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01 Illustration of lightning current flow from a direct strike to a structure (Source S1)
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02 Illustration of lightning current flow from a direct strike to a nearby service (Source S3)
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03 Illustration of lightning current flow from a direct strike near the structure (Source S2)
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04 Illustration of lightning current flow from lightning flashes near connected services (Source S4)

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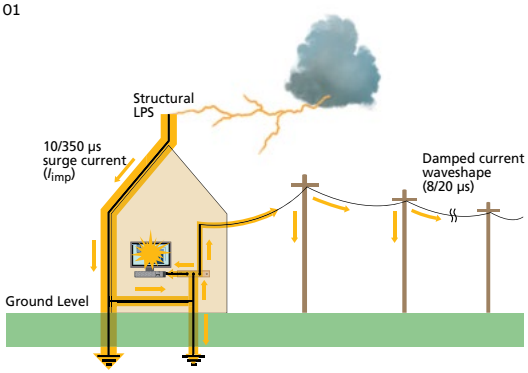

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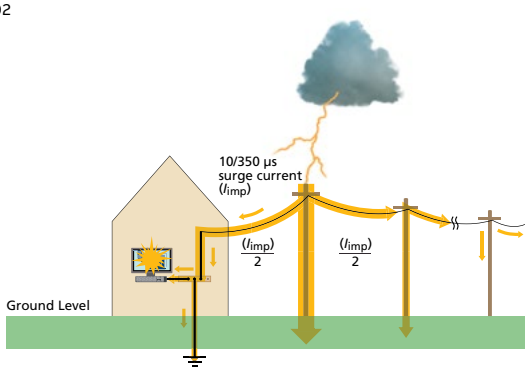

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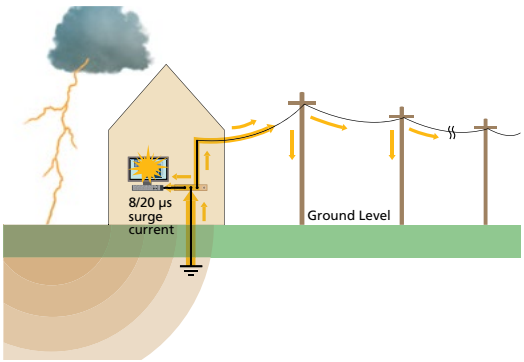

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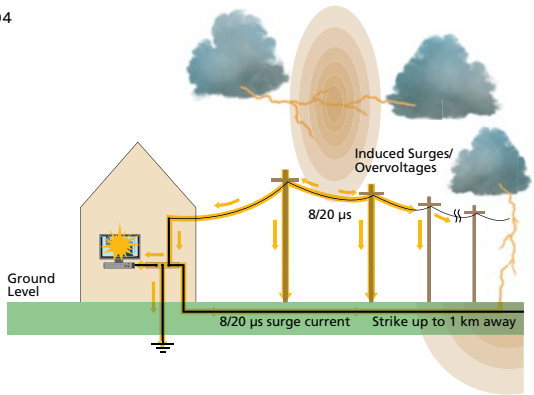


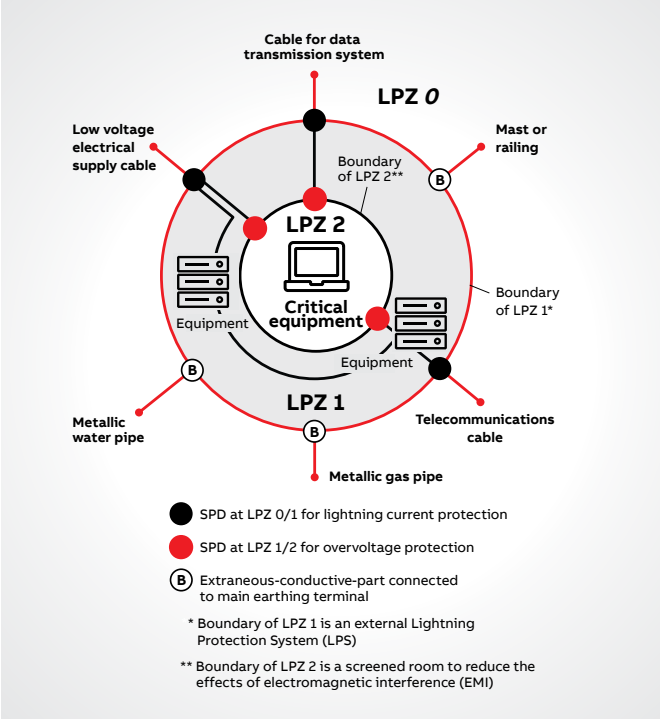
A series of zones is created within the structure according to the level of threat posed by the LEMP with each zone to have successively less exposure to the effects of lightning - for example LPZ 0 (outside the structure) where the threat of lightning currents and fields is most severe being more onerous than LPZ 3 (within the structure) where the threat of lightning is considerably reduced such that electronics can be safely located within this zone.

Figure 1. illustrates the basic LPZ concept defined by protection measures against LEMP as detailed in IEC/ BS EN 62305-4. Equipment is protected against both direct and indirect lightning strikes to the structure and connected services, through the use of Surge Protection Measures (SPM), formerly referred to as a LEMP Protection Measures System (LPMS).

To achieve this reduction in LEMP severity, from conducted surge currents and transient overvoltages, as well as radiated magnetic field effects, successive zones use a combination of shielding measures, bonding of incoming metallic services such as water and gas and the use of coordinated SPDs (further details can be found in the Furse Guide to BS EN 62305 Protection Against Lightning).

Given that the live cores of metallic electrical services such as mains power, data and telecom cables cannot be bonded directly to earth wherever a line penetrates each LPZ, a suitable SPD is therefore needed.

Figure 1 – Basic LPZ concept - IEC/ BS EN 62305-4



The SPDs characteristics at the boundary of each given zone or installation location need to take account of the surge energy they are to be subject to as well as ensure the transient overvoltages are limited to safe levels for equipment within the respective zone.

Table 1, below, details the standardized test waveforms with peak currents used to test SPDs typically located at each zone boundary.

Table 1 – Standardized test waveforms with peak currents used to test SPDs at each LPZ boundary

SPD location/LPZ boundary	LPZ 0/1	LPZ 1/2	LPZ 2/3
Typical SPD installation point	Service Entrance (e.g. Main distribution board or telecom NTP)	Sub-distribution board or telecom PBX frame	Terminal Equipment (e.g. socket outlet)
Mains Test Class/SPD Type[1]	I/1	II/2	III/3
Surge test waveform	10/350 current	8/20 current	Combination 8/20 current and 1.2/50 voltage
Typical peak test current (per mode)	25 kA[2]	40 kA	3 kA (with 6 kV)
Signal/Telecom Test Category[1]	D1[3]	C2[3]	C1
Surge test waveform	10/350 current	Combination 8/20 current and 1.2/50 voltage	Combination 8/20 current and 1.2/50 voltage
Typical peak test current (per mode)	2.5 kA	2 kA (with 4 kV)	0.5 kA (with 1 kV)

[1] Tests to BS EN 61643 series
[2] Peak current (per mode) for a 3 phase SPD to protect a TN-S mains system
[3] Test category B2 10/700 voltage waveform (also within ITU-T standards) up to 4 kV peak also permissible

Electronic systems protection Introduction

Types of SPD
IEC/BS EN 62305 deals with the provision of SPDs to protect against both the effects of indirect lightning strikes and high-energy direct lightning strikes.

- Direct lightning strikes are protected by lightning current or equipotential bonding SPDs (Mains Type 1 SPDs & Signal/Telecom SPDs to Test Category D)
- Indirect lightning strikes and switching transients are protected by transient overvoltage SPDs (Mains Type 2 and Type 3 SPDs and Signal/Telecom SPDs to Test Category C)

Lightning current or equipotential bonding SPDs
Lightning current/equipotential bonding SPDs are designed to prevent dangerous sparking caused by flashover.

Flashover is caused when the extremely high voltages associated with a direct lightning strike breaks down cable insulation. This can occur between the structural LPS and electrical services and presents a potential fire hazard and risk from electric shock.

Transient overvoltage SPDs
Transient overvoltage SPDs are designed to protect electrical/electronic equipment from the secondary effects of indirect lightning and against switching transients. SPDs should be installed at sub-distribution boards and at equipment level for critical equipment.

IEC/BS EN 62305 refers to the correct application of lightning current and transient overvoltage SPDs as a coordinated set where the service entrance lightning current SPD handles the majority of surge energy and prevents flashover whilst the downstream transient overvoltage SPDs ensure equipment protection by sufficiently limiting the overvoltages.

For further information, please refer to the Furse Guide to BS EN 62305 Protection Against Lightning. IEC/BS EN 62305-2 Risk Management is used to evaluate the required level of lightning protection measures necessary to lower the risk of damage to a particular structure, its contents and occupants to a defined tolerable level.

If the risk evaluation demands that a structural LPS is required, then lightning current or equipotential bonding SPDs are always required for any metallic electrical services entering the structure.

These SPDs are necessary to divert the partial lightning currents safely to earth and limit the transient overvoltage to prevent possible flashover. They are therefore an integral part of the structural LPS and typically form the first part of a coordinated SPD set for effective protection of electronic equipment.

If the risk evaluation shows that a structural LPS is not required but there is an indirect risk, any electrical services feeding the structure via an overhead line will require lightning current SPDs typically installed at the service entrance, with coordinated transient overvoltage SPDs downstream to protect electronic equipment.

In order to provide effective protection, a transient overvoltage protector/SPD must:

- Be compatible with the system it is protecting
- Survive repeated transients
- Have a low ‘let-through’ voltage, for all combinations of conductors (enhanced SPDs to IEC/BS EN 62305)
- Not leave the user unprotected, at the end of its life
- Be properly installed

Important
The primary purpose of lightning current or equipotential bonding SPDs is to prevent dangerous sparking caused by flashover to protect against the loss of human life.

In order to protect electronic equipment and ensure the continual operation of systems, transient overvoltage SPDs are required.
IEC/ BS EN 62305-4 specifically states that ‘a lightning protection system which only employs equipotential bonding SPDs provides no effective protection against failure of sensitive electrical or electronic systems.’

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Table 2 – General indication of system impairments, of which manufacturers of transient overvoltage protectors should provide details

	Protectors for mains supplies		Protectors for data lines		
	Parallel protectors	In-line protectors	Low frequency protectors	Network protectors	Radio frequency
Nominal operating voltage	•	•	•	•	•
Maximum operating voltage	•	•	•	•	•
Leakage current	•	•	•	•	•
Nominal current rating	–	•	•	•	•
Max continuous current rating	–	•	•	•	•
In-line impedance	–	•	•	•	•
Shunt capacitance	–	–	–	•	•
Bandwidth	–	–	•	•	•
Voltage standing wave ratio	–	–	–	•	•

Compatibility
The protector must not interfere with the system's normal operation:
- Mains power supply SPDs should not disrupt the normal power supply such as creating follow current that could blow supply fuses, or cause high leakage currents to earth
- SPDs for data communication, signal and telephone lines should not impair or restrict the systems data or signal transmission

Survival
It is vital that the protector is capable of surviving the worst case transients expected at its installation point/LPZ boundary. More importantly, since lightning is a multiple event, the protector must be able to withstand repeated transients.

The highest surge currents occur at the service entrance (boundary LPZ 0 to LPZ 1). For buildings with a structural LPS, the lightning current SPD could be subject to as high as 25 kA 10/350 µs surge currents per mode on a 3-phase TN-S/ TN-C-S mains system (up to 2.5 kA 10/350 µs per mode on a signal or telecom line) for a worst-case lightning strike of 200,000 A.

However, this 200 kA level of lightning current itself is extremely rare (approx. 1% probability of occurring) and the peak current the SPD would be subject to further assumes that a structure is only fed with one metallic service.

Almost all structures have several metallic services connected to them such as gas, water, mains, data and telecoms.

Each service shares a portion of the lightning current when the protected building receives a strike, greatly reducing the overall current seen by any single service, and as such any SPD fitted to the electric service lines.

Transient overvoltages caused by the secondary effects of lightning are considerably more common (lightning flash near a connected service up to 1 km away from the structure) and therefore are unlikely to have currents exceeding 10 kA 8/20 µs.

Let-through voltage
The larger the transient overvoltage, the greater the risk of flashover, equipment interference, physical damage and hence system downtime.

Therefore, the transient overvoltage let through the protector (also known as the voltage protection level Up of the SPD) should be as low as possible and certainly lower than the level at which flashover, interference or component degradation may occur.

Transient overvoltages can exist between any pair of conductors:
- Phase to neutral, phase to earth and neutral to earth on mains power supplies
- Line to line and line(s) to earth on data communication, signal and telephone lines

Thus, a good protector (enhanced SPDs to IEC/BS EN 62305) must have a low let-through voltage between every pair of conductors.

Electronic systems protection Introduction

Enhanced performance SPDs - SPD*
IEC/BS EN 62305-2 details the application of improved performance SPDs to further lower the risk from damage. The lower the sparkover voltage, the lower the chance of flashover causing insulation breakdown, electric shock and fire.

SPDs that offer lower let-through voltages further reduce the risks of injury to living beings, physical damage as well as failure and malfunction of internal systems. All Furse ESP protectors offer such superior protection and are termed as enhanced performance SPDs (SPD*) in line with IEC/BS EN 62305.

Enhanced SPDs can also satisfy more than one test class/category by handling both high-energy partial lightning currents of 10/350 µs waveshape whilst offering very low let-through voltages. Such enhanced SPDs may be suitable for changing a lightning protection zone from LPZ 0 right through to LPZ 3 at a single boundary or installation point. As such they provide both technical and economic advantages over standard SPDs.

End of life
When an SPD comes to the end of its working life it should not leave equipment unprotected. Thus in-line protectors should take the line out of commission, preventing subsequent transients from damaging equipment.

SPDs for data communication, signal and telephone lines and protectors for low current mains power supplies are usually in-line devices. Where SPDs are installed at mains power distribution boards it is usually unacceptable for these to suddenly fail, cutting the power supply.

Consequently, to prevent equipment being left unprotected, the SPD should have a clear pre-end-of-life warning, which allows plenty of time for it to be replaced.

Installation
The performance of SPDs is heavily dependent upon their correct installation. Thus, it is vital that SPDs are supplied with clear installation instructions.

The following is intended to supplement the detailed guidance given with each product in order to give a general overview of installation. This should not be viewed as a substitute for the Installation Instructions supplied with the SPD. Copies of these are available separately on request.

Installing parallel connected SPDs for mains power supplies:
- SPDs should be installed very close to the power supply to be protected, either within the distribution panel or directly alongside of it (in an enclosure to the required IP rating)
- Connections between the SPD and phase(s), neutral and earth of the supply should be kept very short (ideally 25 cm or less, but no more than 50 cm)
- SPD performance is further enhanced by tightly binding connecting leads together (simply using cable ties or similar), over their entire length
- For safety and convenient means of isolation, the phase/live connecting leads should be suitably fused using HRC fuses or switchfuse, MCB or MCCB

Installing in-line SPDs for data, signal, telephone or power:
- SPDs are usually installed between where cabling enters or leaves buildings and the equipment being protected (or actually within its control panel)
- The installation position should be close to the system's earth star point (usually the mains power earth) to enable a short and direct connection to earth
- In-line, or series, connected SPDs generally have connections marked line and clean. The line end of the SPD should be connected to the incoming or "dirty" line (from where the transient is expected). The clean end of the SPD should be connected to the line or cable feeding the equipment
- Cables connected to the SPDs clean end should never be routed next to dirty line cables or the SPDs earth bond
- Unless ready-boxed, SPDs should be installed within an existing cabinet/cubicle or in an enclosure to the required IP rating

How to apply protection
Transient overvoltages are conducted into the sensitive circuitry of electronic equipment on power and data communication, signal and telephone lines. Protection is recommended for:
- All cables which enter or leave the building (except fibre optic)
- The power supply local to important equipment
- Electronic equipment outside the main building(s)

Protecting incoming and outgoing electrical services
Lightning strikes between clouds or to ground (and objects upon it) can cause transient overvoltages to be coupled on to electrical cables, and hence into the sensitive electronic equipment connected to them.

To protect the electronic equipment inside a building, all cables that enter or leave the building must be protected. Cables leaving the building can also provide a route back into the building for transients.

For each building protect incoming/outgoing:
- Mains power supplies (including UPS supplies)
- Data communication and local area network cables
- Signal, control, instrumentation and alarm lines
- CCTV, satellite, TV and antenna cables
- Telephone and telemetry lines

Protect the power supply locally to important equipment
In addition to installing protection on the mains power supply as it enters/leaves the building, protection should also be installed locally to important equipment. Protection at the main LV (low voltage) incomer(s) is necessary to prevent large transients from entering the building's power distribution system, where they could have far reaching effects.

However, where the cable run to equipment exceeds 10 metres (to BS 7671 Clause 534.2.3.1.1), transient overvoltages may appear on the mains after the protector at the main LV incomer. These transients can result from:
- The electrical switching of large inductive loads within the building
- A lightning strike to the building - as lightning currents flow through down conductors transient overvoltages can be induced on to nearby power cables
- The natural inductance and capacitance of long cable runs, 'amplifying' the voltage 'let-through' the protector at the main LV incomer

Additionally, local protection guards against the possibility of a supply which enters/leaves the building being overlooked and left unprotected.

Protect data lines locally
Generally, the biggest risk to data, signal, telecom and network wiring is associated with cables that enter and leave the building.

These should always be protected. However, data cables within a building can additionally have transients induced on to them when loops between data and power cables 'pick up' voltages from the magnetic field caused by a lightning strike.

As part of the overall SPM, IEC/BS EN 62305 advocates the use of metal in the structure, and a Faraday cage lightning protection system to help exclude magnetic fields.

Cable management practices eliminate loops by routeing data and power cables along the same general path. In these cases, the need for local data line protection is minimal. However, where these steps are not possible, data line protection, local to the equipment requiring protection, should be considered.

Protect electronic equipment outside the building
On site or field based electronic equipment with mains power, data communication, video, signal or telephone line inputs will need to be protected against transient overvoltages. It may be helpful to think of each equipment cabinet or cubicle as a separate building with incoming/outgoing cables to be protected.

Complementary techniques
As well as the use of transient overvoltage protectors, IEC/BS EN 62305 outlines additional protection techniques (e.g. shielding measures), which can be used to help reduce the transient threat as part of the overall SPM.

These are described further in the Furse Guide to BS EN 62305 Protection Against Lightning. Where these can be used, principally on new build or refurbishment projects, they need to be supported by the use of SPDs.

Special product development
Whilst this catalogue focuses on our standard product range which meets a wide variety of applications, on occasion a customer will have a special requirement which needs transient overvoltage protection.

In these circumstances we have the technical capability in-house to design and propose a specific solution to meet the customer's special requirement.

Following our proposal, technical and performance parameters of the SPD can be finalized, and the special product manufactured to order. Special products completed to date include:
- Low-current supply protection to industrial microwave ovens
- Media distribution protection (TV/Radio/DAB on 19" rack)
- Integrated photovoltaic inverter protection
- Overvoltage disconnect for battery-charger installations within substations

For more information about special product development, or to discuss a particular project, please contact us.

Common terminology and definitions
The following common terminologies, as recognized by IEC/BS EN 61643, are used throughout SPD specifications in order to aid correct selection and are defined as follows:

Nominal Voltage U_o is the phase to neutral AC RMS voltage of the mains system (derived from the nominal system voltage for which the SPD is designed. U_o is the voltage by which the power system is designated e.g. 230 V.

Maximum Continuous Operating Voltage U_c is the maximum RMS voltage that may be continuously applied to the SPDs mode of protection, e.g. phase to neutral mode. This is equivalent to the SPDs rated peak voltage.

Temporary Overvoltage U_T is the stated test value of momentary voltage increase or overvoltage that the power SPD must withstand safely for a defined time.

Temporary overvoltages, typically lasting up to several seconds, usually originate from switching operations or wiring faults (for example, sudden load rejection, single-phase faults) as well as mains abnormalities such as ferro-resonance effects and harmonics.

Impulse Current I_{imp} is defined by three parameters, a current peak with a charge and a specific energy typically simulated with the 10/350 µs waveform to represent partial lightning currents. This waveform is used, with peak I_{imp} current value stated, for the mains Type 1 SPD Class I test and typically for data/telecom SPD Test Category D.

Nominal Discharge Current I_n is a defined nominal peak current value through the SPD, with an 8/20 µs current waveshape. This is used for classification of mains SPDs (Class II test) and also for preconditioning of SPDs in Class I and Class II tests. (Note: within BS 7671, I_n is referred to as I_{nspd}).

Maximum Discharge Current I_{max} is the peak current value through the SPD, with an 8/20 µs waveshape. I_{max} is declared for mains Type 2 SPDs in accordance to the test sequence of the Class II operating duty test. In general, I_{max} is greater than I_n.

Combined Impulse Test with Open Circuit Voltage U_{OC} is a hybrid 1.2/50 µs voltage test combined with an 8/20 µs current.

The test is performed using a combination wave generator where its open circuit voltage is defined as U_{OC}, typically 6 kV 1.2/50 µs for the mains Class III test and up to 4 kV 1.2/50 µs for signal/telecom Test Category C.

With an impedance of 2 Ω, the generator also produces a peak short circuit current (sometimes referred to as I_{SC}) at half the value of U_{OC} (3 kA 8/20 µs for the mains Class III test and up to 2 kA 8/20 µs for signal/telecom Test Category C). With both voltage and current test waveforms, the combined impulse test is designed to stress all technologies used within SPDs.

Voltage Protection Level U_p is the key parameter that characterizes the performance of the SPD in limiting the transient overvoltage across its terminals. A low protection level value (also known as let-through voltage) is therefore particularly critical for the effective protection and continued operation of electronic equipment.

The peak voltage protection level U_p is declared when the SPD is tested with its stated nominal discharge current I_n (or the peak current (I_{peak}) of I_{imp}) and is also declared when the SPD is subject to combined impulse test (mains Class III test for Type 3 SPDs) as well as data/telecom Test Categories C and B.

Electronic systems protection
Simplified SPD product selection

All Furse ESP products are designed to provide simple system integration whilst achieving highest levels of effective protection against transients.

Tested in line with the IEC/BS EN standards series, ESP protection can be selected and applied to IEC/BS EN 62305 and BS 7671 easily using the SPD product application tables and data sheets. Key product and application features are represented using the following symbols:

Lightning Protection Zone (LPZ) details the boundary (to IEC/BS EN 62305-4) or installation point of the SPD. For example, LPZ 0 - 3 signifies that the SPD can be installed at the service entrance boundary and create an immediate LPZ 3 suitable for protecting electronic equipment close to the SPD installation.

Equipment further downstream of this location may require additional protection, against switching transients for example.

Mains Test Type defines the Type of mains SPD (BS EN 61643 Type 1, 2, 3 or I, II, III to IEC 61643) tested with the respective test Class I (high energy 10/350 µs current waveform), II (8/20 µs current waveform) or III (combined 8/20 µs current and 1.2/50 µs voltage waveform) from theIEC/ BS EN 61643 series.

Where more than one Type is stated (for combined, enhanced Type SPDs), the SPD has been tested to each respective test Class, with the results detailed on its transient performance specification.

Signal/Telecom Test Category indicates the Test Categories (as defined in IEC/BS EN 61643 series) that SPDs for signal and telecom systems have been subject to, with the results detailed on the transient performance specification.

Test Category D is a high-energy test typically using the 10/350 µs current waveform. Test Category C is a fast rate of rise test using the 1.2/50 µs voltage waveform combined with 8/20 µs current waveform. Test Category B is a slow rate of rise test using the 10/700 µs waveform, also used within ITU standards. Enhanced SPDs tested with categories D, C and B can offer up to LPZ 0 →3 protection.

Common Mode signifies that the SPD specifically offers protection on conductors with respect to earth. For a mains system, this would be between phases and earth or neutral and earth. For a data/telecom line this would be between signal line(s) to earth.

Common mode surges can result in flashover if the insulation withstand voltage of connected wiring or equipment is exceeded. Flashover could lead to dangerous sparking potentially causing fire or electric shock risks. Equipotentially bonding Type 1 mains SPDs or Test Cat D tested signal/telecom SPDs reduce the risk of flashover by limiting common mode surges.

Full Mode means that the SPD protects in all possible modes; common mode (live conductors with respect to earth) and differential mode (between live conductors). For example, Full Modemains SPDs offer protection between phase(s) to earth, phase(s) to neutral and neutral to earth.

Whilst common mode protection ensures flashover is prevented, differential mode protection is critical to ensure sensitive electronics are protected as well as operational during surge activity.

Enhanced SPDs (SPD* within IEC/BS EN series) have lower (better) let-through voltage or protection levels (UP) and therefore further reduce the risk of injury to living beings, physical damage and failure of internal electronic systems. Enhanced Type 1 mains SPDs (for a 230/400 V system) should have a protection level UP of no more than 1600 V whilst Type 2 and Type 3 mains SPDs should have a protection level UP of no more than 600 V in all modes when tested in accordance with IEC/BS EN series. Enhanced signal/telecom SPDs should typically have a protection level UP no more than twice the peak operating voltage of the protected system.

Electronic systems protection
Simplified product selection

Status Indication for mains wire-in power distribution SPDs is essential as they are installed in parallel or shunt with the supply and as such could potentially leave the system unprotected should the SPD fail. 3-way status indication of the SPDs condition provides simple and clear visual inspection and further provides advanced pre-failure warning such that the system is never unprotected. Furthermore warning of potentially fatal neutral to earth faults due to incorrect earthing and wiring faults for example is provided with additional flashing indication.

Remote Indication is an innovative feature that further optimizes mains wire-in SPD protection. A parallel or shunt installed SPD has additive let-through voltage because of its connecting leads that need to be kept as short as possible - ideally no more than 25 cm. Often an SPD cannot be mounted in its optimum position without compromising the visibility of its status indication.

Innovative remote status indication displays overcome this by allowing the SPD to be mounted with short connecting leads with the separate status display being conveniently mounted in a visible position such as the front of a power distribution cabinet providing convenient and effective equipment protection.

Active Volt-free Contact is an essential addition to the visual 3-way status indication.

The changeover volt-free contact is simply connected or linked to an existing building management system, buzzer or light and should the SPD have a pre-failure condition, this would be remotely indicated - particularly important for remote installations where the building management system would be connected to a telecom modem.

Active contacts further enable the SPD to also conveniently warn of phase loss from a power failure or blown fuse.

Intelligent Display iD is an innovation from Furse that encompasses existing features of 3-way SPD status indication with Neutral to Earth voltage warning but through clear easy to read text on an illuminated LCD display.

Often SPDs should be mounted on their side in order to facilitate short connecting leads for better protection levels but as this compromises the position and appearance of the status indication, it is not widely practiced.

Also available in a remote display option, the iD feature enhances mains wire-in SPD installation as the status indication text can easily be rotated (in 90° steps, clockwise) at the push of a button to aid good installation practice.

Current Rating indicates the maximum continuous current rating of in-line SPDs for data communication, signal and telephone lines.

The SPDs quoted maximum continuous current rating should always exceed the peak running current of the protected system to ensure normal system operation is not impaired.

Damage, through overheating, would result if its quoted current rating were exceeded.

Low In-line Resistance states the resistance value in Ohms (Ω) per line of SPDs for data communication, signal and telephone lines.

A low in-line resistance is desirable; particularly for systems with high running currents in order to reduce any voltage drops across the SPD and ensure normal system operation is not impaired.

Consideration should be made for additional SPDs installed on the same line to protect connected equipment at each end of the line (e.g. CCTV camera and connected monitoring equipment) as the in-line resistance of each SPD is introduced into the system.

UL Listed applies to some signalling products, see specific datasheets for details of the approval. Approval covers use in the United States.

Replaceable Protection Module indicates that the SPD component providing protection can be easily removed and replaced following end-of-life with an appropriate replacement module, saving on reinstallation time and protector cost.

The replaceable module includes a quick release mechanism allowing partial removal, which facilitates line commissioning and maintenance.

LED Optional Indication is an additional feature where an SPD can be supplied with an integral LED which indicates performance or fault when installed in low current DC power applications.

This enables rapid assessment and replacement of SPDs in situations where a considerable number of SPDs are installed.

High Bandwidth SPDs ensure the full system frequency range of transmission signals, for protected data communication, signal and telephone lines, is not impaired.

Signal frequencies outside the stated SPD bandwidth may potentially be distorted causing information loss or corruption.

As the SPD should accommodate the characteristics of the protected system, the stated SPD bandwidth (typically quoted for a 50 Ω system) should always exceed the protected system's bandwidth.

IDC terminals are Insulation Displacement Connection, where a tool is used to push an insulated wire onto a contact, in such a way as to cut (displace) the insulation and make an electrical contact. Typically used for telephone connections, it is a fast process with high reliability.

SIL 3 is the 'hardware safety integrity' level achieved from an assessment to standard IEC 61508, allowing for a hardware fault tolerance of one (HFT=1). For an HFT=0, SIL 2 applies.

Push Terminal (PT) technology uses sprung terminations for reliable connections and fast-fitting. Solid cable or stranded cable with crimped ferrules can be directly pushed into the terminal without a tool. To remove the cable simply press the orange button and retract.

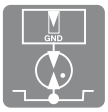
LED Indication is offered on some product lines. The operation of the LED only occurs if the line is active and the SPD is in a healthy state. Note that even with a healthy SPD, if no transmissions are being made the LED will not be lit.

BX IP is an International Protection (IP) rating (to IEC/BS EN 60529) for ready-boxed (BX) SPDs typically used in dusty and damp environments.

The IP rating system (also interpreted as "Ingress Protection") classifies the degrees of protection provided against the intrusion of solid objects (including body parts like hands and fingers), dust, accidental contact and water in electrical enclosures. For example, an IP66 rated enclosure provides no ingress of dust and therefore complete protection against contact as well as against water projected in powerful jets against the enclosure from any direction with no harmful effects.

Unboxed SPDs should be installed within distribution panels/cabinets or within external enclosures to the required IP rating (such as the Furse weatherproof WBX enclosure range).

Ultra Slim 7 mm Width highlights the Slim Line feature of our ESP SL range which permits installation in tight spaces, or multiple installation where a high number of lines require protection.



Isolated screens are offered on some products as optional or standard, and allow for systems where direct connection of the cable screen to earth can cause signalling problems. Examples might be fire alarm panels, or long cable runs for RS485 applications.

Non-isolated screens are offered on standard products, and are suitable for most applications where bonding to earth causes no signalling issues. If there is uncertainty, then use a product with an isolated screen to avoid any issues.

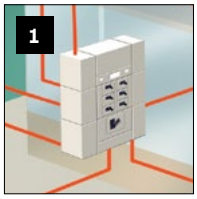
Electronic systems protection
Product selection guide

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

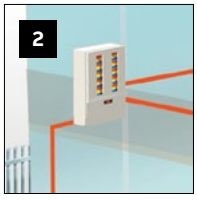
Protection should be installed on all cables which enter or leave the building (except fibre optic), the power supply local to important equipment and electronic equipment outside the main building(s). With the aid of the illustration we can see how this might be applied in practice.

Protect incoming and outgoing services

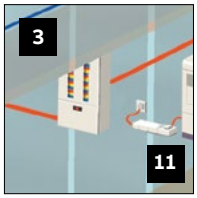
We'll start by considering the main (office) building in isolation.



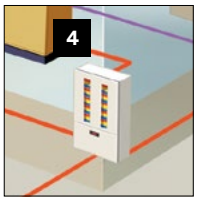
Incoming mains power supplies
Install protection on the incoming mains power supply at the incoming distribution board(s).



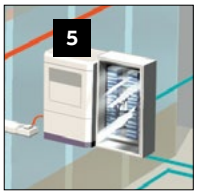
If, as in this example, there are any other power supplies entering the building install protection on these near where they enter the building.



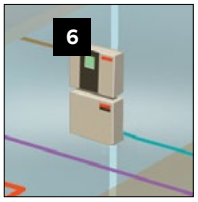
Incoming mains power supplies
Outgoing supplies can provide transient overvoltages with a route back into the building's power distribution system. Install protection on supplies to other buildings. (Note how, if correctly positioned, the protector at the incoming distribution board (1), also protects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



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.

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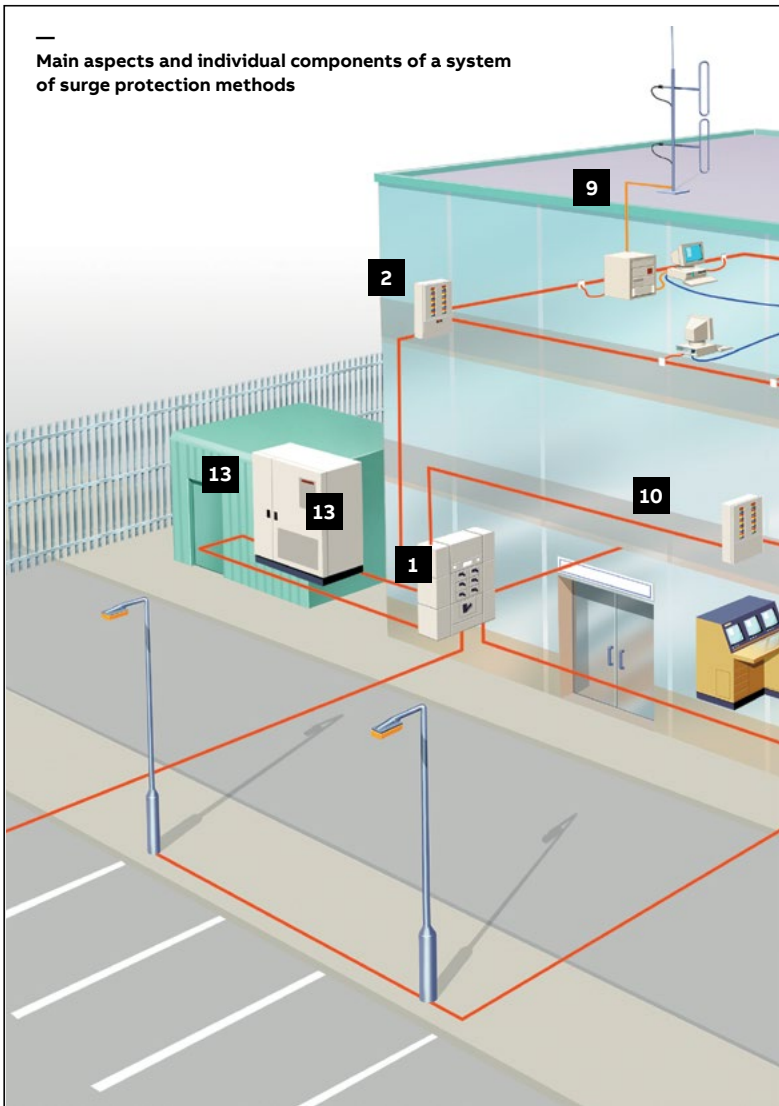
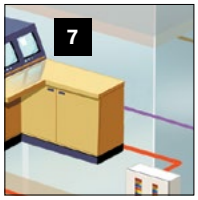
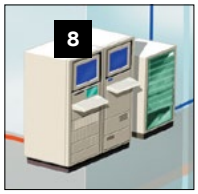
Main aspects and individual components of a system of surge protection methods

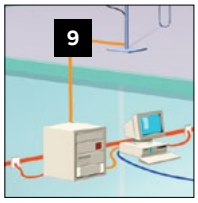




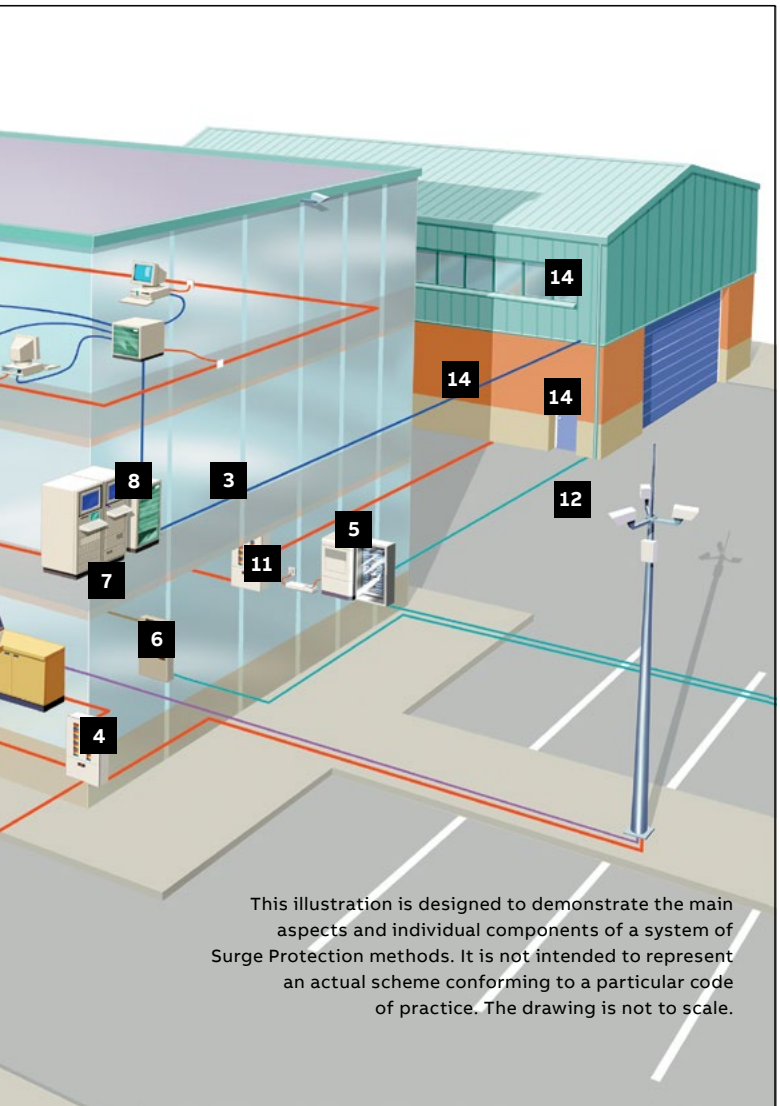
Data & signal lines
Protectors are installed on CCTV video cables from outdoor cameras to prevent damage to the control desk.



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

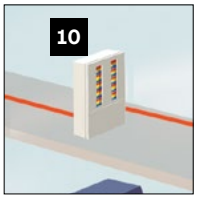


Equipment such as our RF receiver, with antenna (or satellite) links will also need protecting.

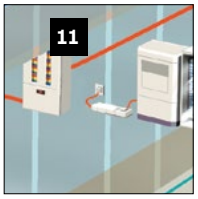


This illustration is designed to demonstrate the main aspects and individual components of a system of Surge Protection methods. It is not intended to represent an actual scheme conforming to a particular code of practice. The drawing is not to scale.

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.

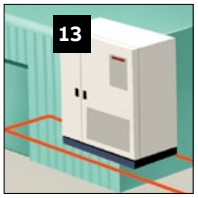


CCTV cameras
Protect outdoor CCTV cameras with protectors on the power supply, and video cable (and, if relevant, telemetry control line). The telephone PBX is protected locally by a plug-in protector.

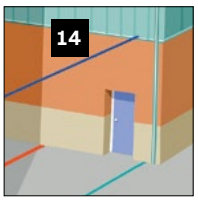
Protect electronic equipment
outside the building

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 acomputer-controlled warehouse or automated manufacturing operation with PLCs, drives and computer controls).

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.

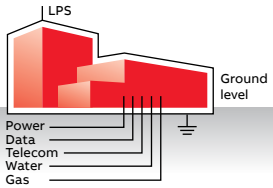
Product selection guide - Mains power protection

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



Type 1+2+3

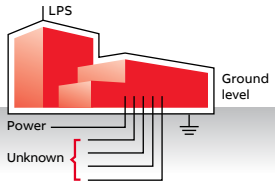
ESP 415 D1 Series **OR**

ESP 415 M1 Series

Example 4

External lightning protection system fitted

No. of services unknown



Type 1+2 OR Type 1+2+3

For LPL I & II:
ESP415T1/25/TNS
LPL III or IV:
ESP415T1/12.5/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

Mains power protection

ESP 415T1 Surge Protection Series

*NOTE: product label design may vary.

Combined Type 1 and 2 tested Surge Protective Device SPD (to BS EN 61643) for use on the main distribution board, particularly where a structural Lightning Protection System (LPS) is employed, for equipotential bonding. For use at boundaries up to LPZ 0 to protect against flashover (typically the main distribution board location) through to LPZ 2 to protect electrical equipment from damage.

Features & benefits

- Enhanced protection (to IEC/BS EN 62305) offering low let-through voltage further minimizing the risk of flashover creating dangerous sparking or electric shock
- Repeated protection in lightning intense environments
- Pluggable module design (with anti-vibration locking clip) allows for simple replacement at end-of-life
- Compact, space saving design
- Indicator shows when the SPD protection modules requires replacement
- Remote signal contact can indicate the protector's status through interfacing with a building management system

Application

- Use on three phase mains supplies and power distribution systems for protection against partial direct or indirect lightning strikes
- ESP 415T1/25/XXX versions for use with Class I or II LPS
- ESP 415T1/12.5/XXX versions for use with Class III or IV LPS; or exposed overhead three phase power lines where no LPS is fitted
- ESP 415T1/X/TNS versions also cover TN-C-S earthing systems

Installation

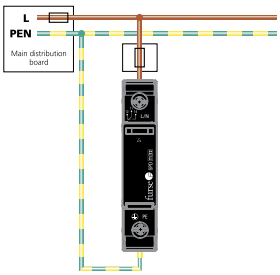
The SPD is to be installed in the main distribution board with connecting leads of minimal length. The protector should be fused and is suitable for attachment to a 35 mm top hat DIN rail. The diagrams below illustrate how to wire the appropriate ESP protector according to your chosen electrical system.

Weatherproof enclosure:
WBX D4
ABB order code:
7TCA085410R0032

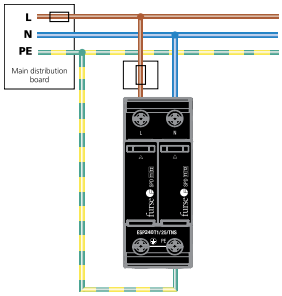
Metallic enclosure:
MBX D4
ABB order code:
7TCA085400R0649

SPD replacement modules:
ESP 240T1/25/M (25 kA L-N)
7TCA085460R0374
ESP 240T1/12.5/M (12.5 kA L-N)
7TCA085460R0373
ESP N-PE/T1/100/M (100 kA N-E)
7TCA085460R0375
ESP N-PE/T1/50/M (50 kA N-E)
7TCA085460R0376

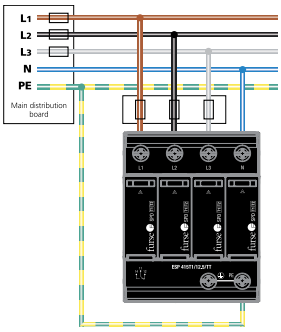
TN-C earthing system



TN-S earthing system



TT earthing system



NOTE: Remote contact connections not shown, for clarity.

IMPORTANT: The primary purpose of lightning current or equipotential bonding mains Type 1 Surge Protective Devices (SPDs) is to prevent dangerous sparking caused by flashover to protect against the loss of human life. In order to protect electronic equipment and ensure the continual operation of systems, transient overvoltage mains Type 2 and 3 SPDs such as the ESP M1 Series or ESP D1 Series are further required, typically installed at downstream subdistribution boards feeding sensitive equipment. IEC/BS EN 62305 refers to the correct application of mains Type 1, 2 and 3 SPDs as a coordinated set. For further information, please refer to the Furse Guide to BS EN 62305 Protection against lightning.

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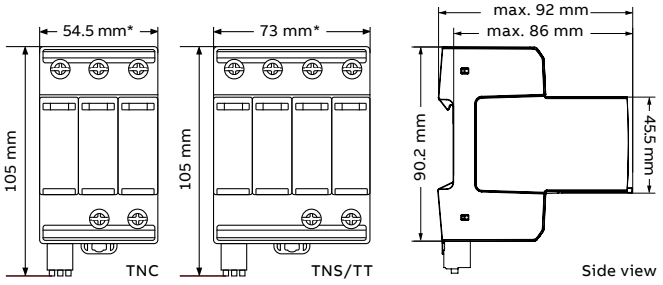
ESP 415T1 Surge Protection Series - Technical specification

Electrical specification	ESP 415T1/ 25/TNS	ESP 415T1/ 12.5/TNS	ESP 415T1/ 25/TNC	ESP 415T1/ 12.5/TNC	ESP 415T1/ 25/TT	ESP 415T1/ 12.5/TT
ABB order code	7TCA085460R0369	7TCA085400R0496	7TCA085400R0497	7TCA085460R0371	7TCA085400R0498	7TCA085460R0372
Nominal voltage - Phase-Neutral U_o (RMS)	240 V					
Maximum voltage - Phase-Neutral U_c (RMS)	275 V	300 V	275 V	300 V	275 V	300 V
Temporary Overvoltage TOV U_T[1] (5s/120m)	337 V / 442 V					
Short circuit withstand capability I_{SCCR}	50 kA_{RMS} / 50 Hz					
Frequency range	47-63 Hz					
Max. back-up fuse (see installation instructions)	≤ 315 A	≤ 250 A	≤ 315 A	≤ 250 A	≤ 315 A	≤ 250 A
Leakage current (to earth)	≤ 5 µA	≤ 600 µA	≤ 5 µA	≤ 600 µA	≤ 5 µA	≤ 5 µA
Follow current interrupt rating I_{fi}	50 kA_{RMS}	0	50 kA_{RMS}	0	50 kA_{RMS} (L-N) 100 A_{RMS} (N-E)	0 (L-N) 100 A_{RMS} (N-E)
Volt free contact:[2]	Push terminal					
– Current rating	1 A					
– Nominal voltage (RMS)	250 V					

Transient specification	ESP 415T1/ 25/TNS	ESP 415T1/ 12.5/TNS	ESP 415T1/ 25/TNC	ESP 415T1/ 12.5/TNC	ESP 415T1/ 25/TT	ESP 415T1/ 12.5/TT
Type 1 (BS EN/EN), Class I (IEC)						
Nominal discharge current 8/20 µs (per mode) I_n	25 kA	20 kA	25 kA	20 kA	25 kA (L-N) 100 kA (N-E)	20 kA (L-N) 50 kA (N-E)
Let-through voltage U_p at I_n[2]	≤ 1.5 kV	≤ 1.5 kV	≤ 1.5 kV	≤ 1.5 kV	≤ 1.5 kV (L-E) ≤ 1.7 kV (L-N)	≤ 1.5 kV
Impulse discharge current 10/350 µs I_{imp} (to earth)[3]	25 kA	12.5 kA	25 kA	12.5 kA	25 kA (L-N) 100 kA (N-E)	12.5 kA (L-N) 50 kA (N-E)
Total discharge current 10/350 µs I_{total} (total to earth)[4,5]	100 kA	50 kA	75 kA	37.5 kA	100 kA	50 kA
Let-through voltage U_p at 1.2/50 µs (N-E, TT system)	–	–	–	–	< 1.2 kV	< 1.2 kV
Type 2 (BS EN/EN), Class II (IEC)						
Nominal discharge current 8/20 µs (per mode) I_n	25 kA	20 kA	25 kA	20 kA	25 kA (L-N) 100 kA (N-E)	20 kA (L-N) 50 kA (N-E)
Let-through voltage U_p at I_n[2]	≤ 1.5 kV	≤ 1.5 kV	≤ 1.5 kV	≤ 1.5 kV	≤ 1.5 kV (L-E) ≤ 1.7 kV (L-N)	≤ 1.5 kV
Maximum discharge current I_{max} (per mode)[3]	65 kA	50 kA	65 kA	50 kA	65 kA (L-N) 150 kA (N-E)	50 kA (L-N) 100 kA (N-E)

Mechanical specification	ESP 415T1/ 25/TNS	ESP 415T1/ 12.5/TNS	ESP 415T1/ 25/TNC	ESP 415T1/ 12.5/TNC	ESP 415T1/ 25/TT	ESP 415T1/ 12.5/TT
Temperature range	-40 to +80 °C					
Connection type	Screw terminal - maximum torque 4.5 Nm					
Conductor size (solid/stranded)[5]	35 mm²					
Earth connection	Screw terminal - maximum torque 4.5 Nm					
Degree of protection (IEC 60529)	IP20					
Volt free contact	Push-fit connection for conductor up to 1.5 mm², rated AC 250 V, 1 A					
Case material	Thermoplastic UL-94 V-0					
Mounting	Indoor, 35 mm top hat DIN rail					
Weight	0.69 kg	0.65 kg	0.51 kg	0.51 kg	0.69 kg	0.68 kg
Dimensions to DIN 43880 - HxDxW[4]	90.2 mm x 92 mm x 73 mm* (4TE)	90.2 mm x 92 mm x 73 mm* (4TE)	90.2 mm x 92 mm x 54.5 mm* (3TE)	90.2 mm x 92 mm x 54.5 mm* (3TE)	90.2 mm x 92 mm x 73 mm* (4TE)	90.2 mm x 92 mm x 73 mm* (4TE)

[1] Temporary Overvoltage TOV rating is for durations of 5 seconds (withstand) and 120 minutes (safe fail) tested to BS EN/IEC 61643. TT versions have 1200V withstand for 200ms (N-E).
[2] The maximum transient voltage let-through of the protector throughout the test, phase to neutral and neutral to earth.
[3] The electrical system, external to the unit, may constrain the actual current rating achieved in a particular installation.
[4] The remote signal contact (removable) adds 15 mm to height.
[5] Conductor size (flexible) is 25 mm².
*Maximum dimension (this applies to all dimensions).



Mains power protection

ESP 240T1 Surge Protection Series

*NOTE: product label design may vary.

Combined Type 1 and 2 tested Surge Protective Device SPD (to BS EN 61643) for use on the main distribution board, particularly where a structural Lightning Protection System (LPS) is employed, for equipotential bonding. For use at boundaries up to LPZ 0 to protect against flashover (typically the main distribution board location) through to LPZ 2 to protect electrical equipment from damage.

Features & benefits

- Enhanced protection (to IEC/BS EN 62305) offering low let-through voltage further minimizing the risk of flashover creating dangerous sparking or electric shock
- Repeated protection in lightning intense environments
- Pluggable module design (with anti-vibration locking clip) allows for simple replacement at end-of-life
- Compact, space saving design
- Indicator shows when the SPD protection modules requires replacement
- Remote signal contact can indicate the protector's status through interfacing with a building management system

Application

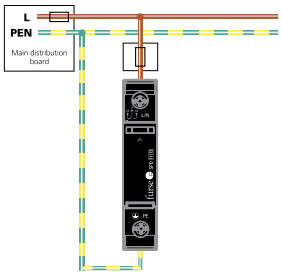
- Use on single phase mains supplies and power distribution systems for protection against partial direct or indirect lightning strikes
- ESP 240T1/25/XXX versions for use with Class I or II Lightning Protection Systems LPS where there are multiple metallic services to the building or on exposed overhead single phase power lines where no LPS is fitted

Installation

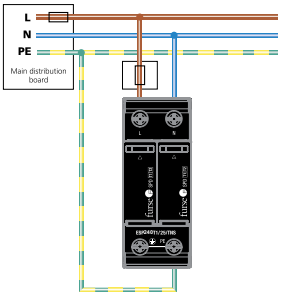
- ESP 240T1/12.5/XXX versions for use with Class III or IV LPS or where the LPS and service line information is unknown and so SPD impulse current I_{imp} cannot be calculated (minimum 12.5kA I_{imp} required)
- ESP 240T1/X/TNS versions also cover TN-C-S earthing systems

Weatherproof enclosure:
WBX D4
ABB order code: 7TCA085410R0032
SPD replacement modules:
ESP 240T1/25/M (25 kA L-N) 7TCA085460R0374
ESP 240T1/12.5/M (12.5 kA L-N) 7TCA085460R0373
ESP N-PE/T1/100/M (100 kA N-E) 7TCA085460R0375
ESP N-PE/T1/50/M (50 kA N-E) 7TCA085460R0376
Metallic enclosure:
MBX D4
ABB order code: 7TCA085400R0649

TN-C earthing system



TN-S/TT earthing system



NOTE: Remote contact connections not shown, for clarity.

IMPORTANT: The primary purpose of lightning current or equipotential bonding mains Type 1 Surge Protective Devices (SPDs) is to prevent dangerous sparking caused by flashover to protect against the loss of human life. In order to protect electronic equipment and ensure the continual operation of systems, transient overvoltage mains Type 2 and 3 SPDs such as the ESP M1 Series or ESP D1 Series are further required, typically installed at downstream subdistribution boards feeding sensitive equipment. IEC/BS EN 62305 refers to the correct application of mains Type 1, 2 and 3 SPDs as a coordinated set. For further information, please refer to the Furse Guide to BS EN 62305 Protection against lightning.

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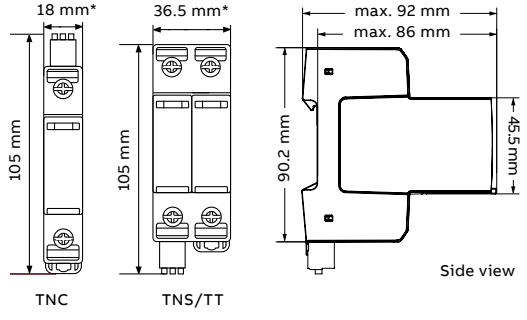
ESP 240T1 Surge Protection Series - Technical specification

Electrical specification	ESP 240T1/ 25/TNS	ESP 240T1/ 12.5/TNS	ESP 240T1/ 25/TNC	ESP 240T1/ 12.5/TNC	ESP 240T1/ 25/TT	ESP 240T1/ 12.5/TT
ABB order code	7TCA085400R0499	7TCA085460R0379	7TCA085400R0500	7TCA085460R0381	7TCA085460R0370	7TCA085460R0392
Nominal voltage - Phase-Neutral U_o (RMS)	240 V					
Maximum voltage - Phase-Neutral U_c (RMS)	275 V	300 V	275 V	300 V	275 V	300 V
Temporary Overvoltage TOV U_T[1] (5s/120m)	337 V / 442 V					
Short circuit withstand capability I_{SCCR}	50 kA_{RMS} / 50 Hz					
Frequency range	47-63 Hz					
Max. back-up fuse (see installation instructions)	≤ 315 A	≤ 250 A	≤ 315 A	≤ 250 A	≤ 315 A	≤ 250 A
Leakage current (to earth)	≤ 5 µA	< 2.5 mA	≤ 5 µA	< 2.5 mA	≤ 5 µA	< 2.5 mA
Follow current interrupt rating I_{fi}	50 kA_{RMS}	0	50 kA_{RMS}	0	50 kA_{RMS} (L-N) 100 A_{RMS} (N-E)	0 (L-N) 100 A_{RMS} (N-E)
Volt free contact:[2]	Push terminal					
– Current rating	1 A					
– Nominal voltage (RMS)	250 V					

Transient specification	ESP 240T1/ 25/TNS	ESP 240T1/ 12.5/TNS	ESP 240T1/ 25/TNC	ESP 240T1/ 12.5/TNC	ESP 240T1/ 25/TT	ESP 240T1/ 12.5/TT
Type 1 (BS EN/EN), Class I (IEC)						
Nominal discharge current 8/20 µs (per mode) I_n	25 kA	20 kA	25 kA	20 kA	25 kA (L-N) 100 kA (N-E)	20 kA (L-N) 50 kA (N-E)
Let-through voltage U_p at I_n[2]	≤ 1.5 kV	≤ 1.5 kV	≤ 1.5 kV	≤ 1.5 kV	≤ 1.5 kV	≤ 1.5 kV (L-N) ≤ 1.5 kV (N-E)
Impulse discharge current 10/350 µs I_{imp} (to earth)[3]	25 kA	12.5 kA	25 kA	12.5 kA	25 kA (L-N) 100 kA (N-E)	12.5 kA (L-N) 50 kA (N-E)
Total discharge current 10/350 µs I_{total} (total to earth)[4,5]	50 kA	25 kA	25 kA	12.5 kA	50 kA	25 kA
Let-through voltage U_p at 1.2/50 µs (N-E, TT system)	–	–	–	–	< 1.2 kV	< 1.2 kV
Type 2 (BS EN/EN), Class II (IEC)						
Nominal discharge current 8/20 µs (per mode) I_n	25 kA	20 kA	25 kA	20 kA	25 kA (L-N) 100 kA (N-E)	20 kA (L-N) 50 kA (N-E)
Let-through voltage U_p at I_n[2]	≤ 1.5 kV	≤ 1.5 kV	≤ 1.5 kV	≤ 1.5 kV	≤ 1.5 kV	≤ 1.5 kV (L-N) ≤ 1.5 kV (N-E)
Maximum discharge current I_{max} (per mode)[3]	65 kA	50 kA	65 kA	50 kA	65 kA (L-N) 150 kA (N-E)	50 kA (L-N) 100 kA (N-E)

Mechanical specification	ESP 240T1/ 25/TNS	ESP 240T1/ 12.5/TNS	ESP 240T1/ 25/TNC	ESP 240T1/ 12.5/TNC	ESP 240T1/ 25/TT	ESP 240T1/ 12.5/TT
Temperature range	-40 to +80 °C					
Connection type	Screw terminal - maximum torque 4.5 Nm					
Conductor size (solid/stranded)[5]	35 mm²					
Earth connection	Screw terminal - maximum torque 4.5 Nm					
Degree of protection (IEC 60529)	IP20					
Volt free contact	Push-fit connection with conductor up to 1.5 mm² (solid), rated AC 250 V, 1 A					
Case material	Thermoplastic UL-94 V-0					
Mounting	Indoor, 35 mm top hat DIN rail					
Weight	0.34 kg	0.34 kg	0.18 kg	0.18 kg	0.35 kg	0.35 kg
Dimensions to DIN 43880 - HxDxW[4]	90.2 mm x 92 mm x 36.5 mm* (2TE)	90.2 mm x 92 mm x 36.5 mm* (2TE)	90.2 mm x 92 mm x 18 mm* (1TE)	90.2 mm x 92 mm x 18 mm* (1TE)	90.2 mm x 92 mm x 36.5 mm* (2TE)	90.2 mm x 92 mm x 36.5 mm* (2TE)

[1] Temporary Overvoltage TOV rating is for durations of 5 seconds (withstand) and 120 minutes (safe fail) tested to BS EN/IEC 61643. TT versions have 1200V withstand for 200ms (N-E).
[2] The maximum transient voltage let-through of the protector throughout the test, phase to neutral and neutral to earth.
[3] The electrical system, external to the unit, may constrain the actual current rating achieved in a particular installation.
[4] The remote signal contact (removable) adds 15 mm to height.
[5] Conductor size (flexible) is 25 mm².
* Maximum dimensions (this applies to all dimensions).



Mains power protection

ESP 415DT1/12.5 Series (Three phase)

*NOTE: product label design may vary.

Combined Type 1, 2 and 3 tested protector (to BS EN 61643) for use on three phase mains power distribution systems primarily to protect connected electronic equipment from transient overvoltages on the mains supply, e.g. computer, communications or control equipment. For use at boundaries up to LPZ 0 to protect against flashover (typically the main distribution board location, with multiple metallic services entering) through to LPZ 3 to protect sensitive electronic equipment.

LPZ 0→3 | FULL MODE Bonding + Equipment Protection | MAINS TEST TYPE 1 + 2 + 3 | 3-WAY + N-E FAULT STATUS INDICATION | ENHANCED Low let-through voltage | ACTIVE VOLT-FREE CONTACT | EARTHING TN TT

Features & benefits

- Very low let-through voltage (enhanced protection to IEC/BS EN 62305) between phase and neutral conductors, where sensitive equipment is connected
- Full Mode design capable of handling partial lightning currents as well as allowing continual operation of protected equipment
- Repeated protection in lightning intense environments
- Innovative multiple thermal disconnect technology for safe disconnection from faulty or abnormal supplies (without compromising protective performance)
- Three way visual indication of protection status and advanced pre-failure warning so you need never be unprotected

Application

- ESP 415DT1/12.5 for use with Class I or II Lightning Protection Systems LPS where there are multiple metallic services to the building or on exposed overhead three phase power lines where no LPS is fitted
- ESP 415DT1/12.5 for use with Class III or IV LPS or where the LPS and service line information is unknown and so SPD impulse current I_{imp} cannot be calculated (minimum 12.5kA I_{imp} required)
- Remote indication facility allows pre-failure warning to be linked to a building management system, buzzer or light
- Changeover active volt-free contact enables the protector to be used to warn of phase loss (i.e. power failure, blown fuses, etc.)
- Flashing warning of potentially fatal neutral to earth supply faults (due to incorrect earthing, wiring errors or unbalanced conditions)
- Through terminal facility allows series connection on low current supplies to eliminate high additive voltage associated with connecting leads on units installed in parallel
- Compact space saving DIN housing

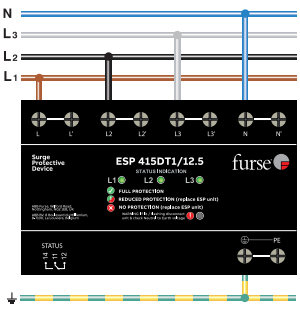
Installation

Install in parallel, within the power distribution board or directly (via fuses) on to the supply feeding equipment. Can be installed in series for low current supplies - see installation instructions. At distribution boards, the protector can be installed either on the load side of the incoming isolator, or on the closest outgoing way to the incoming supply. Connect, with very short connecting leads, to phases, neutral and earth.

Accessories

Weatherproof enclosure:
WBX D8
ABB Order code:
7TCA085410R0033

Parallel connection of ESP 415DT1/12.5 series to three phase star (4 wire and earth) supplies (fuses not shown for clarity).



NOTE: If you desire a protector with an extra high maximum surge current use the ESP M2 or ESP M4 series. If your supply is fused at 32 Amps, or less, the in-line protectors (and their ready-boxed derivatives) may be more suitable.

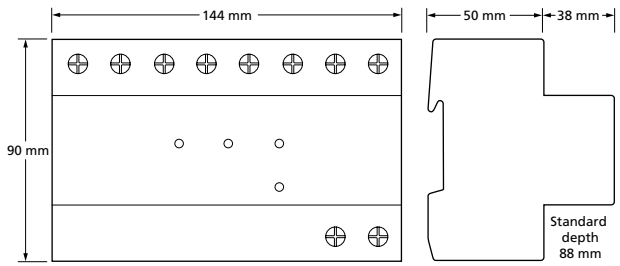
ESP 415DT1/12.5 Series (Three phase) - Technical specification

Electrical specification	ESP 415DT1/12.5
ABB order code	TBD
Nominal voltage - Phase-Neutral U_o (RMS)	240 V
Maximum voltage - Phase-Neutral U_c (RMS)	280 V
Temporary Overvoltage TOV U_T[1,2]	337 / 442 V (L-N), 1200 V (N-E)
Short circuit withstand capability	25 kA/50 Hz
Working voltage (RMS)	346-484 V
Frequency range	47-63 Hz
Max. back-up fuse (see installation instructions)	≤ 200 A
Leakage current (to earth)	< 5 µA
Indicator circuit current	< 10 mA
Volt free contact:[3]	Screw terminal
– Current rating	1 A
– Nominal voltage (RMS)	250 V

Transient specification	ESP 415DT1/12.5
Type 1 (BS EN/EN), Class I (IEC)	
Nominal discharge current 8/20 µs (per mode) I_n	20 kA
Let-through voltage U_p at I_n	< 1.3 kV (L-N), < 1.5 kV (N-E)
Impulse discharge current 10/350 µs I_{imp} (to earth)[5]	12.5 kA (L-N), 50 kA (N-E)
Total discharge current 10/350 µs I_{total} (total to earth)[5,6]	50 kA
Let-through voltage U_p at 1.2/50 µs (N-E, TT system)	< 1.2 kV
Type 2 (BS EN/EN), Class II (IEC)	
Nominal discharge current 8/20 µs (per mode) I_n	20 kA
Let-through voltage U_p at I_n	< 1.3 kV (L-N), < 1.5 kV (N-E)
Maximum discharge current I_{max} (L/N-E, L-N)[5]	80 kA (L-N), 100 kA (N-E)
Type 3 (BS EN/EN), Class III (IEC)	
Let-through voltage at U_{OC} of 6 kV 1.2/50 µs and I_{SC} of 3 kA 8/20 µs (per mode)[4,7]	600 V (L-N), 1200 V (N-E)

Mechanical specification	ESP 415DT1/12.5
Temperature range	-40 to +80 °C
Connection type	Screw terminal - maximum torque 4.5Nm
Conductor size (stranded)	25 mm²
Earth connection	Screw terminal - maximum torque 4.5Nm
Volt free contact	Connect via screw terminal with conductor up to 1.5 mm² (stranded) - maximum torque 0.25 Nm
Degree of protection (IEC 60529)	IP20
Case material	FR Polymer UL-94 V-0
Weight	0.85 kg
Dimensions to DIN 43880 - HxDxW[8]	90 mm x 88 mm x 144 mm (8TE)

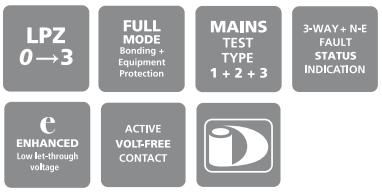
(1) Temporary Overvoltage rating is for a duration of 200 ms (N-E), tested to BS EN/IEC 61643.
(2) Temporary Overvoltage TOV rating is for durations of 5 seconds / 120 minutes (L-N), tested to BS EN/IEC 61643.
(3) Min. permissable load is 5 V DC, 10 mA to ensure reliable operation.
(4) The maximum transient voltage let-through of the protector throughout the test (±10%), phase to neutral and neutral to earth.
(5) The electrical system, external to the unit, may constrain the actual current rating achieved in a particular installation.
(6) Rating is considered as the current capability of the protector for equipotential bonding near the service entrance.
(7) Combination wave test within IEC/BS EN 61643, IEEE C62.41-2002 Location Cats C1 & B3, SS 555:2010, AS/NZS 1768-2007, UL 1449 mains wire-in
(8) The remote signal contact (removable) adds 10 mm to height.



Mains power protection

ESP D1 Series (Three phase)

*NOTE: product label design may vary.



Combined Type 1, 2 and 3 tested protector (to BS EN 61643) for use on three phase mains power distribution systems primarily to protect connected electronic equipment from transient overvoltages on the mains supply, e.g. computer, communications or control equipment. Innovative remote display options allow both protector and display to be mounted in their optimum position. For use at boundaries up to LPZ 0 to protect against flashover (typically the main distribution board location, with multiple metallic services entering) through to LPZ 3 to protect sensitive electronic equipment.

Features & benefits

- Very low let-through voltage (enhanced protection to IEC/BS EN 62305) between all sets of conductors (phase to neutral, phase to earth, neutral to earth - Full Mode protection)
- Full Mode design capable of handling partial lightning currents as well as allowing continual operation of protected equipment
- Repeated protection in lightning intense environments
- Innovative multiple thermal disconnect technology for safe disconnection from faulty or abnormal supplies (without compromising protective performance)
- Three way visual indication of protection status and advanced pre-failure warning so you need never be unprotected
- ESP XXX D1R or ESP XXX D1R/LCD units (where XXX = 208, or 415, or 480) have a remote display that allows the protector to be mounted close to the incoming feed or distribution board with the display being mounted in a visible
- ESP XXX D1/LCD or ESP XXX D1R/LCD units have backlit LCD intelligent display offering clear status information that can be rotated for side mounting to facilitate short connecting leads
- Remote indication facility allows pre-failure warning to be linked to a building management system, buzzer or light
- Changeover active volt-free contact enables the protector to be used to warn of phase loss (i.e. power failure, blown fuses, etc.)
- Flashing warning of potentially fatal neutral to earth supply faults (due to incorrect earthing, wiring errors or unbalanced conditions)
- Through terminal facility allows series connection on low current supplies to eliminate high additive voltage associated with connecting leads on units installed in parallel
- Compact space saving DIN housing

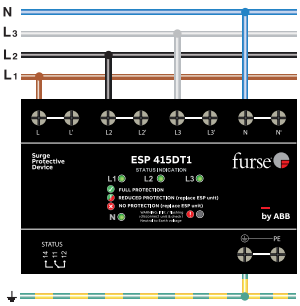
Installation

Install in parallel, within the power distribution board or directly (via fuses) on to the supply feeding equipment. Can be installed in series for low current supplies - see installation instructions. For ESP D1R or D1R/LCD units, position remote display, making sure that the cable is long enough, is unimpeded within the cabinet, and allows a minimum of 60 mm behind the panel front (for the interconnection cable). At distribution boards, the protector can be installed either on the load side of the incoming isolator, or on the closest outgoing way to the incoming supply. Connect, with very short connecting leads, to phases, neutral and earth. For TT installations, contact Furse.

Accessories

Weatherproof enclosure:
WBX D8
ABB Order code: 7TCA085410R0033
ESP RLA HD-1
ABB Order code: 7TCA085460R0304
Spare 1 m cable assembly for ESP XXX D1R or ESP XXX D1R/LCD
ESP RLA HD-2
ABB Order code: 7TCA085460R0305
Spare 2 m cable assembly for ESP XXX D1R or ESP XXX D1R/LCD
ESP RLA HD-4
ABB Order code: 7TCA085460R0156
Spare 4 m cable assembly for ESP XXX D1R or ESP XXX D1R/LCD
Metallic enclosure:
MBX D8
ABB Order code: 7TCA085400R0650

Parallel connection of ESP 415 D1, ESP 208 D1 and ESP 480 D1 series to three phase star (4 wire and earth) supplies (fuses not shown for clarity).



NOTE: If you desire a protector with an extra high maximum surge current use the ESP M2 or ESP M4 series. If your supply is fused at 32 Amps, or less, the in-line protectors (and their ready-boxed derivatives) may be more suitable.

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ESP D1 Series (Three phase) - Technical specification

Electrical specification	ESP 208 D1[1]	ESP 415 D1[1]	ESP 480 D1[1]
ABB order code	7TCA085460R0077	7TCA085460R0105	7TCA085460R0133
Nominal voltage - Phase-Neutral U_o (RMS)	120 V	240 V	277 V
Maximum voltage - Phase-Neutral U_c (RMS)	150 V	280 V	305 V
Temporary Overvoltage TOV U_T[2]	175 V / 229 V	337 V / 442 V	403 V / 529 V
Short circuit withstand capability	25 kA/50 Hz		
Working voltage (RMS)	156-260 V	346-484 V	402-600 V
Frequency range	47-63 Hz		
Max. back-up fuse (see installation instructions)	≤ 125 A		
Leakage current (to earth)	< 250 µA		
Indicator circuit current	< 10 mA		
Volt free contact:[3]	Screw terminal		
– Current rating	1 A		
– Nominal voltage (RMS)	250 V		

Transient specification	ESP 208 D1	ESP 415 D1	ESP 480 D1
Type 1 (BS EN/EN), Class I (IEC)			
Nominal discharge current 8/20 µs (per mode) I_n	20 kA		
Let-through voltage U_p at I_n	< 1 kV	< 1.3 kV	< 1.4 kV
Impulse discharge current 10/350 µs I_{imp} (to earth)[5]	6.25 kA		
Total discharge current 10/350 µs I_{total} (total to earth)[5,6]	25 kA		
Type 2 (BS EN/EN), Class II (IEC)			
Nominal discharge current 8/20 µs (per mode) I_n	20 kA		
Let-through voltage U_p at I_n	< 1 kV	< 1.3 kV	< 1.4 kV
Maximum discharge current I_{max} (L/N-E, L-N)[5]	40 kA, 40 kA		
Type 3 (BS EN/EN), Class III (IEC)			
Let-through voltage at U_{OC} of 6 kV 1.2/50 µs and I_{SC} of 3 kA 8/20 µs (per mode)[4,7]	400 V	600 V	680 V

Mechanical specification	ESP 120 D1	ESP 240 D1	ESP 277 D1
Temperature range[8]	-40 to +80 °C		
Connection type	Screw terminal - maximum torque 4.5Nm		
Conductor size (stranded)	25 mm²		
Earth connection	Screw terminal - maximum torque 4.5Nm		
Volt free contact	Connect via screw terminal with conductor up to 1.5 mm² (stranded) - maximum torque 0.25 Nm		
Display connection (D1R & D1R/LCD versions)	HD-D Type 1 metre interconnection cable / 2 metre cable (ESP RLA HD-2) or 4 metre cable (ESP RLA HD-4) optional		
Degree of protection (IEC 60529)	IP20		
Case material	FR Polymer UL-94 V-0		
Weight	0.85 kg		
Dimensions to DIN 43880 - HxDxW[9]	90 mm x 88 mm x 144 mm (8TE)		

[1] Three phase series (208 V, 415 V or 480 V) include fixed (D1) or remote (D1R) LED or LCD options, e.g. ESP 415 D1, ESP 415 D1/LCD, ESP 415 D1R, ESP 415 D1R/LCD.
[2] Temporary Overvoltage TOV rating is for durations of 5 seconds (withstand) and 120 minutes (safe fail) tested to BS EN/IEC 61643.
[3] Min. permissable load is 5 V DC, 10 mA to ensure reliable operation.
[4] The maximum transient voltage let-through of the protector throughout the test (±10%), phase to neutral, phase to earth and neutral to earth.
[5] The electrical system, external to the unit, may constrain the actual current rating achieved in a particular installation.
[6] Rating is considered as the current capability of the protector for equipotential bonding near the service entrance.
[7] Combination wave test within IEC/BS EN 61643, IEEE C62.41-2002 Location Cats C1 & B3, SS 555:2010, AS/NZS 1768-2007, UL 1449 mains wire-in.
[8] Temperature range of SPD within a 20°C ambient temperature. An increase in ambient temperature will de-rate the SPD upper temperature limit accordingly.
[9] The remote signal contact (removable) adds 10 mm to height.

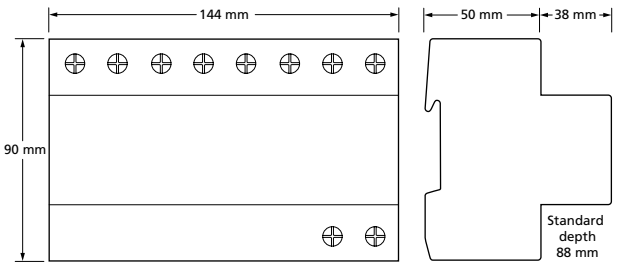

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ABB order codes

Part	ABB order code	Part	ABB order code	Part	ABB order code
ESP 208 D1	7TCA085460R0077	**ESP 415 D1**	7TCA085460R0105	**ESP 480 D1**	7TCA085460R0133
ESP 208 D1R	7TCA085460R0337	**ESP 415 D1R**	7TCA085460R0107	**ESP 480 D1R**	7TCA085460R0339
ESP 208 D1/LCD	7TCA085460R0338	**ESP 415 D1/LCD**	7TCA085460R0106	**ESP 480 D1/LCD**	7TCA085460R0134
ESP 208 D1R/LCD	7TCA085460R0336	**ESP 415 D1R/LCD**	7TCA085460R0108	**ESP 480 D1R/LCD**	7TCA085460R0135

Mains power protection

ESP D1 Series (Single phase)

*NOTE: product label design may vary.

Combined Type 1, 2 and 3 tested protector (to BS EN 61643) for use on single phase mains power distribution systems primarily to protect connected electronic equipment from transient overvoltages on the mains supply, e.g. computer, communications or control equipment. For use at boundaries up to LPZ 0 to protect against flashover (typically the main distribution board location, with multiple metallic services entering) through to LPZ 3 to protect sensitive electronic equipment.

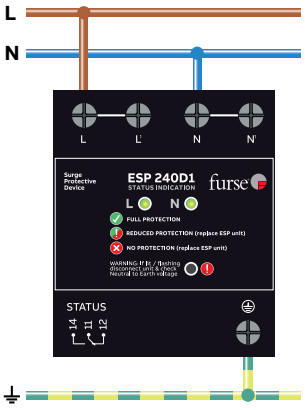
Features & benefits

- Very low let-through voltage (enhanced protection to IEC/BS EN 62305) between all sets of conductors (phase to neutral, phase to earth, neutral to earth - Full Mode protection)
- Full Mode design capable of handling partial lightning currents as well as allowing continual operation of protected equipment
- Repeated protection in lightning intense environments
- Innovative multiple thermal disconnect technology for safe disconnection from faulty or abnormal supplies (without compromising protective performance)
- Three way visual indication of protection status and advanced pre-failure warning so you need never be unprotected
- Remote indication facility allows pre-failure warning to be linked to a building management system, buzzer or light
- Changeover active volt-free contact enables the protector to be used to warn of phase loss (i.e. power failure, blown fuses, etc.)
- Flashing warning of potentially fatal neutral to earth supply faults (due to incorrect earthing, wiring errors or unbalanced conditions)
- Through terminal facility allows series connection on low current supplies to eliminate high additive voltage associated with connecting leads on units installed in parallel
- Compact space saving DIN housing

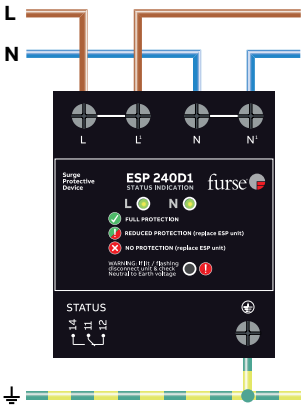
Installation

Install in parallel, within the power distribution board or directly (via fuses) on to the supply feeding equipment. Can be installed in series for low current supplies - see installation instructions. At distribution boards, the protector can be installed either on the load side of the incoming isolator, or on the closest outgoing way to the incoming supply. Connect, with very short connecting leads, to live, neutral and earth.

Parallel connection of ESP 120 D1, ESP 240 D1 and ESP 277 D1 series to single phase supplies (fuses not shown for clarity).



Series connection of ESP 120 D1, ESP 240 D1 and ESP 277 D1 to single phase supplies up to 125 A (fuses not shown for clarity).



Accessories

Weatherproof enclosure:
WBX D4
ABB Order code: 7TCA085410R0032
Metallic enclosure:
MBX D4
ABB Order code: 7TCA085400R0649

NOTE: If you desire a protector with an extra high maximum surge current use the ESP M2 or ESP M4 series. If your supply is fused at 16 Amps, or less, the in-line protectors (and their ready-boxed derivatives) may be more suitable.

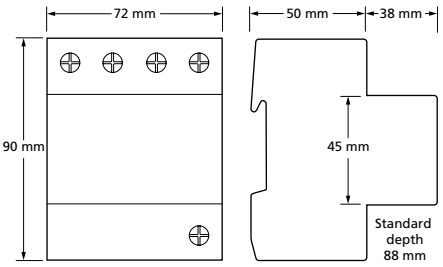
ESP D1 Series (Single phase) - Technical specification

Electrical specification	ESP 120 D1	ESP 240 D1	ESP 277 D1
ABB order code	7TCA085460R0069	7TCA085460R0086	7TCA085460R0096
Nominal voltage - Phase-Neutral U_o (RMS)	120 V	240 V	277 V
Maximum voltage - Phase-Neutral U_c (RMS)	150 V	280 V	350 V
Temporary Overvoltage TOV U_T[1]	175 V / 229 V	337 V / 442 V	403 V / 529 V
Short circuit withstand capability	25 kA/50 Hz		
Working voltage (RMS)	90-150 V	200-280 V	232-350 V
Frequency range	47-63 Hz		
Max. back-up fuse (see installation instructions)	≤ 125 A		
Leakage current (to earth)	< 250 µA		
Indicator circuit current	< 10 mA		
Volt free contact:[2]	Screw terminal		
– Current rating	1 A		
– Nominal voltage (RMS)	250 V		

Transient specification	ESP 120 D1	ESP 240 D1	ESP 277 D1
Type 1 (BS EN/EN), Class I (IEC)			
Nominal discharge current 8/20 µs (per mode) I_n	20 kA		
Let-through voltage U_p at I_n	< 1 kV	< 1.3 kV	< 1.4 kV
Impulse discharge current 10/350 µs I_{imp} (to earth)[5]	6.25 kA		
Total discharge current 10/350 µs I_{total} (total to earth)[4,5]	12.5 kA		
Type 2 (BS EN/EN), Class II (IEC)			
Nominal discharge current 8/20 µs (per mode) I_n	20 kA		
Let-through voltage U_p at I_n	< 1 kV	< 1.3 kV	< 1.4 kV
Maximum discharge current I_{max} (L/N-E, L-N)[4]	40 kA, 40 kA		
Type 3 (BS EN/EN), Class III (IEC)			
Let-through voltage at U_{oc} of 6 kV 1.2/50 µs and I_{sc} of 3 kA 8/20 µs (per mode)[3,6]	400 V	600 V	680 V

Mechanical specification	ESP 120 D1	ESP 240 D1	ESP 277 D1
Temperature range[7]	-40 to +80 °C		
Connection type	Screw terminal - maximum torque 4.5Nm		
Conductor size (stranded)	25 mm²		
Earth connection	Screw terminal - maximum torque 4.5Nm		
Volt free contact	Connect via screw terminal with conductor up to 1.5 mm² (stranded) - maximum torque 0.25 Nm		
Degree of protection (IEC 60529)	IP20		
Case material	FR Polymer UL-94 V-0		
Weight	0.4 kg		
Dimensions to DIN 43880 - HxDxW[8]	90 mm x 88 mm x 72 mm (4TE)		

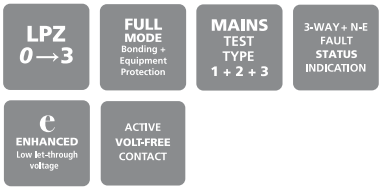
[1] Temporary Overvoltage TOV rating is for durations of 5 seconds (withstand) and 120 minutes (safe fail) tested to BS EN/IEC 61643.
[2] Minimum permissable load is 5 V DC, 10 mA to ensure reliable operation.
[3] The maximum transient voltage let-through of the protector throughout the test (±10%), phase to neutral, phase to earth and neutral to earth.
[4] Rating is considered as the current capability of the protector for equipotential bonding near the service entrance.
[5] The electrical system, external to the unit, may constrain the actual current rating achieved in a particular installation.
[6] Combination wave test within IEC/BS EN 61643, IEEE C62.41-2002 Location Cats C1 & B3, SS 555:2010, AS/NZS 1768-2007, UL 1449 mains wire-in.
[7] Temperature range of SPD within a 20°C ambient temperature. An increase in ambient temperature will de-rate the SPD upper temperature limit accordingly.
[8] The remote signal contact (removable) adds 10 mm to height.



Mains power protection

ESP M2/M4 Series

*NOTE: product label design may vary.



Combined Type 1, 2 and 3 tested protector (to BS EN 61643) for use on the main distribution board directly feeding electronic equipment such as computers, communication and control equipment, particularly where a structural Lightning Protection System (LPS) is employed. For use at boundaries up to LPZ 0 to protect against flashover (typically the main distribution board location) through to LPZ 3 to protect sensitive electronic equipment.

Features & benefits

- Very low let-through voltage (enhanced protection to IEC/BS EN 62305) between all sets of conductors (phase to neutral, phase to earth and neutral to earth - Full Mode protection)
- Full Mode design capable of handling high energy partial lightning currents as well as allowing continual operation of protected equipment
- Innovative multiple thermal disconnect technology, for safe disconnection from faulty or abnormal supplies (without compromising protective performance)
- Three way visual indication of protection status
- Advanced pre-failure warning so you need never be unprotected
- Remote indication facility allows pre-failure warning to be linked to a building management system, buzzer or light
- Changeover active volt-free contact enables the protector to be used to warn of phase loss (i.e. power failure, blown fuses, etc.)
- Unique flashing warning of potentially fatal neutral to earth supply faults (caused by incorrect earthing, wiring errors or unbalanced conditions)
- Robust steel housing
- Protector base provides ultra low inductance earth bond to metal panels
- Convenient holes for flat mounting

Application

Use ESP M2 versions on main distribution board for buildings with a Class III or IV structural LPS fitted or exposed 3 phase power lines where no LPS is fitted. Use ESP M4 versions on main distribution board for buildings with a Class I or II LPS fitted.

Installation

Install in parallel, within the power distribution board, either on the load side of the incoming isolator, or on the closest outgoing way to the incoming supply. Connect, with very short connecting leads, to phase(s), neutral and earth. Phase/live connecting leads should be fused with HRC fuses, a switchfuse, MCCB or type 'C' MCB. For TT installations, contact Furse.

Accessories

Weatherproof enclosures:

WBX M2

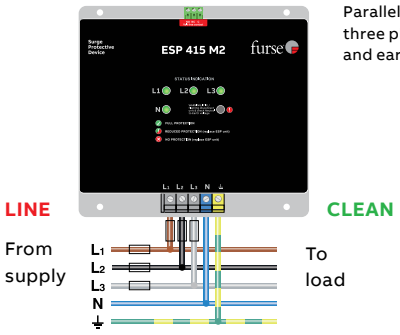
ABB Order code: 7TCA085410R0034

For use with the ESP XXX M2

WBX M4

ABB Order code: 7TCA085410R0035

For use with the ESP XXX M4



Parallel connection to three phase star (4 wire and earth) supplies.

NOTE: For main distribution boards with multiple metallic services (gas, water, telecom/data lines) entering and for sub-distribution boards, the ESP M1 Series are more suited. If your supply is fused at 16 Amps, or less, the in-line protection (ESP 240 or 120-5A (or -16A) and ready-boxed derivatives) may be suitable. If you need to mount the display panel separately from the main protector unit, use the ESP XXX M2R or ESP XXX M4R.

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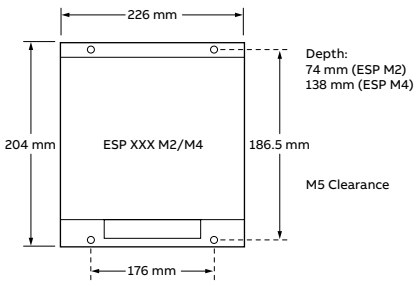
ESP M2/M4 Series - Technical specification

Electrical specification	ESP 415 M2	ESP 415 M4	ESP 480 M2	ESP 480 M4
ABB order code	7TCA085460R0119	7TCA085460R0124	7TCA085460R0138	7TCA085460R0140
Nominal voltage - Phase-Neutral U_o (RMS)	240 V	240 V	277 V	277 V
Maximum voltage - Phase-Neutral U_c (RMS)	280 V	280 V	305 V	305 V
Temporary Overvoltage TOV U_T[1]	337 V / 442 V	337 V / 442 V	403 V / 529 V	403 V / 529 V
Short circuit withstand capability	25 kA/50 Hz			
Working voltage (RMS)	346-484 V	346-484 V	402-600 V	402-600 V
Frequency range	47-63 Hz			
Max. back-up fuse (see installation instructions)	≤ 200 A	≤ 315 A	≤ 200 A	≤ 315 A
Leakage current (to earth)[7]	< 250 µA			
Indicator circuit current[7]	< 5 mA	< 10 mA	< 5 mA	< 10 mA
Volt free contact:[2]	Screw terminal			
– Current rating	1 A			
– Nominal voltage (RMS)	250 V			

Transient specification	ESP 415 M2	ESP 415 M4	ESP 480 M2	ESP 480 M4
Type 1 (BS EN/EN), Class I (IEC)				
Nominal discharge current 8/20 µs (per mode) I_n	20 kA	25 kA	20 kA	25 kA
Let-through voltage U_p at I_n[3]	< 1.3 kV	< 1.3 kV	< 1.4 kV	< 1.4 kV
Impulse discharge current 10/350 µs I_{imp} (to earth)[4]	12.5 kA	25 kA	12.5 kA	25 kA
Total discharge current 10/350 µs I_{total} (total to earth)[4,5]	50 kA	100 kA	50 kA	100 kA
Type 2 (BS EN/EN), Class II (IEC)				
Nominal discharge current 8/20 µs (per mode) I_n	20 kA	25 kA	20 kA	25 kA
Let-through voltage U_p at I_n[3]	< 1.3 kV	< 1.3 kV	< 1.4 kV	< 1.4 kV
Maximum discharge current I_{max} (L/N-PE, L-N)[4]	80 kA, 40 kA	150 kA, 40 kA	80 kA, 40 kA	150 kA, 40 kA
Type 3 (BS EN/EN), Class III (IEC)				
Let-through voltage at U_{oc} of 6 kV 1.2/50 µs and I_{sc} of 3 kA 8/20 µs (per mode)[3,6]	< 600 V	< 600 V	< 680 V	< 680 V

Mechanical specification	ESP 415 M2	ESP 415 M4	ESP 480 M2	ESP 480 M4
Temperature range[8]	-40 to +80 °C			
Connection type	Screw terminal - maximum torque 2.65 Nm			
Conductor size (stranded)	25 mm²			
Earth connection	Screw terminal - maximum torque 2.65 Nm			
Volt free contact	Connect via screw terminal with conductor up to 2.5 mm² (stranded) - maximum torque 0.25 Nm			
Degree of protection (IEC 60529)	IP20			
Case material	Steel			
Weight	2.35 kg	3.9 kg	2.35 kg	3.9 kg
Dimensions	226 mm x 204 mm x 74 mm	226 mm x 204 mm x 138 mm	226 mm x 204 mm x 74 mm	226 mm x 204 mm x 138 mm

[1] Temporary Overvoltage TOV rating is for durations of 5 seconds (withstand) and 120 minutes (safe fail) tested to BS EN/IEC 61643.
[2] Minimum permissible load is 5 V DC, 10 mA to ensure reliable operation.
[3] The maximum transient voltage let-through of the protector throughout the test (±10%), phase to neutral, phase to earth and neutral to earth.
[4] The electrical system, external to the unit, may constrain the actual current rating achieved in a particular installation.
[5] Rating is considered as the current capability of the protector for equipotential bonding near the service entrance.
[6] Combination wave test within IEC/BS EN 61643, IEEE C62.41-2002 Location Cats C1 & B3, SS 555:2010, AS/NZS 1768-2007, UL 1449 mains wire-in.
[7] Measured at Nominal Voltage *Uo*.
[8] Temperature range of SPD within a 20°C ambient temperature. An increase in ambient temperature will de-rate the SPD upper temperature limit accordingly.



Mains power protection

ESP 415MT1/12.5 Series (Three phase)

*NOTE: product label design may vary.

Combined Type 1, 2 and 3 tested Surge Protective Device (SPD) (to BS EN 61643) for use on the main distribution board directly feeding electronic equipment such as computers, communication and control equipment, particularly where a structural Lightning Protection System (LPS) is employed. For use at boundaries up to LPZ 0 to protect against flashover (typically the main distribution board location) through to LPZ 3 to protect sensitive electronic equipment.

LPZ 0→3 | ALL MODE Bonding + Equipment Protection | MAINS TEST TYPE 1 + 2 + 3 | 3-WAY + N-E FAULT STATUS INDICATION | ENHANCED Low let-through voltage | ACTIVE VOLT-FREE CONTACT | EARTHING TN TT

Features & benefits

- Very low let-through voltage (enhanced protection to IEC/BS EN 62305) between phase and neutral conductors, where sensitive equipment is connected
- All mode design capable of handling partial lightning currents as well as allowing continual operation of protected equipment
- Repeated protection in lightning intense environments
- Innovative multiple thermal disconnect technology for safe disconnection from faulty or abnormal supplies (without compromising protective performance)
- Three way visual indication of protection status and advanced pre-failure warning so you need never be unprotected
- Remote indication facility allows pre-failure warning to be linked to a building management system, buzzer or light
- Changeover active volt-free contact enables the protector to be used to warn of phase loss (i.e. power failure, blown fuses, etc)
- Unique flashing warning of potentially fatal neutral to earth supply faults (caused by incorrect earthing, wiring errors or unbalanced conditions)
- Robust steel housing
- SPD base provides ultra low inductance earth bond to metal panels
- Convenient holes for flat mounting

Application

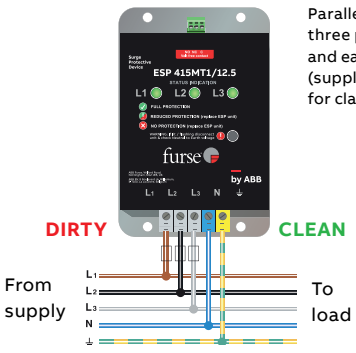
- ESP 415MT1/12.5 for use with Class I or II Lightning Protection Systems LPS where there are multiple metallic services to the building or on exposed overhead three phase power lines where no LPS is fitted
- ESP 415MT1/12.5 for use with Class III or IV LPS or where the LPS and service line information is unknown and so SPD impulse current I_{imp} cannot be calculated (minimum 12.5kA I_{imp} required)

Accessories

Weatherproof enclosure:
WBX 4
ABB Order code:
7TCA085410R0027

Installation

Install in parallel, within the power distribution board, either on the load side of the incoming isolator, or on the closest outgoing way to the incoming supply. Connect, with very short connecting leads, to phase(s), neutral and earth. Phase/live connecting leads should be fused with HRC fuses, a switchfuse, MCCB or type 'C' MCB.



Parallel connection to three phase star (4 wire and earth) supplies (supply fuses not shown for clarity).

NOTE: For main distribution boards with multiple metallic services (gas, water, telecom/data lines) entering and for sub-distribution boards, the ESP M1 Series are more suited. If your supply is fused at 16 Amps, or less, the in-line protection (ESP 240 or 120-5A (or -16A) and ready-boxed derivatives) may be suitable. If you need to mount the display panel separately from the main protector unit, use the ESP XXX M2R or ESP XXX M4R.

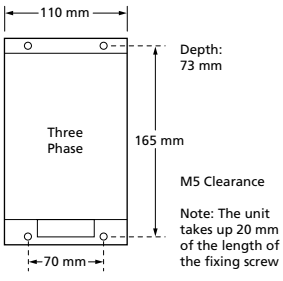
ESP 415MT1/12.5 Series - Technical specification

Electrical specification	ESP 415MT1/12.5
ABB order code	7TCA085465R0003
Nominal voltage - Phase-Neutral U_o (RMS)	240 V
Maximum voltage - Phase-Neutral U_c (RMS)	280 V
Temporary Overvoltage TOV U_T[1]	442 (120 mins) L-N: safe fail, 1200 V (200ms) N-E: withstand
Short circuit withstand capability I_{SCCR}	50 kA/50 Hz
Working voltage (RMS)	346-484 V
Frequency range	47-63 Hz
Max. back-up fuse (see installation instructions)	≤ 200 A
Leakage current (to earth)	< 5 µA
Indicator circuit current	< 5 mA
Volt free contact:[2]	Screw terminal
– Current rating	1 A
– Nominal voltage (RMS)	250 V

Transient specification	ESP 415MT1/12.5
Type 1 (BS EN/EN), Class I (IEC)	
Nominal discharge current 8/20 µs (per mode) I_n	20 kA
Impulse discharge current 10/350 µs I_{imp} (to earth)[5]	12.5 kA (L-N), 50 kA (N-E)
Total discharge current 10/350 µs I_{total} (total to earth)[4,5]	50 kA
Let-through voltage U_p at 1.2/50 µs (N-E, TT system)	< 1.2 kV
Type 2 (BS EN/EN), Class II (IEC)	
Nominal discharge current 8/20 µs (per mode) I_n	20 kA
Let-through voltage U_p at I_n[3]	< 1.3 kV (L-N), < 1.5 kV (N-E)
Maximum discharge current I_{max} (L/N-E, L-N)[4]	40 kA (L-N), 100 kA (N-E)
Type 3 (BS EN/EN), Class III (IEC)	
Let-through voltage at U_{oc} of 6 kV 1.2/50 µs and I_{sc} of 3 kA 8/20 µs (per mode)[3,6]	600 V (L-N), 1200 V (N-E)

Mechanical specification	ESP 415MT1/12.5
Temperature range[7]	-40 to +80 °C
Connection type	Screw terminal - maximum torque 2.65Nm
Conductor size (stranded)	25 mm²
Earth connection	Screw terminal - maximum torque 2.65Nm
Volt free contact	Connect via screw terminal with conductor up to 1.5 mm² (stranded) - maximum torque 0.25 Nm
Degree of protection (IEC 60529)	IP20
Case material	Steel
Weight	1 kg
Dimensions	See diagram below

[1] Temporary Overvoltage rating is for a duration of 5 seconds /120 minutes (L-N), and for 200 ms (N-E), tested to BS EN/IEC 61643.
[2] Minimum permissible load is 5 V DC, 10 mA to ensure reliable operation.
[3] The maximum transient voltage let-through voltage (voltage protection level U_p) of the SPD throughout the test (±10%), phase to neutral and neutral to earth.
[4] The electrical system, external to the SPD, may constrain the actual current rating achieved in a particular installation.
[5] Rating is considered as the current capability of the SPD for equipotential bonding near the service entrance.
[6] Combination wave test within IEC/BS EN 61643, IEEE C62.41-2002 Location Cats C1 & B3, SS 555:2010, AS/NZS 1768-2007, UL 1449 mains wire-in.
[7] Temperature range of SPD within a 20°C ambient temperature. An increase in ambient temperature will de-rate the SPD upper temperature limit accordingly.



Mains power protection

ESP M1 Series

*NOTE: product label design may vary.

Combined Type 1, 2 and 3 tested protector (to BS EN 61643) for use on mains power distribution systems primarily to protect connected electronic equipment from transient overvoltages on the mains supply, e.g. computer, communications or control equipment. For use at boundaries up to LPZ 0 to protect against flashover (typically the main distribution board location, with multiple metallic services entering) through to LPZ 3 to protect sensitive electronic equipment.

LPZ 0→3 | FULL MODE Bonding + Equipment Protection | MAINS TEST TYPE 1 + 2 + 3 | ENHANCED Low let-through voltage | ACTIVE VOLT-FREE CONTACT | 3-WAY + N-E FAULT STATUS INDICATION

Features & benefits

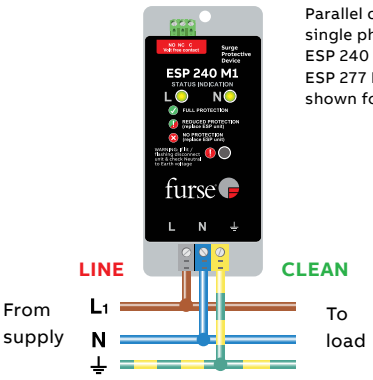
- Very low let-through voltage (enhanced protection to IEC/BS EN 62305) between all sets of conductors (phase to neutral, phase to earth, neutral to earth - Full Mode protection)
- Full mode design capable of handling partial lightning currents as well as allowing continual operation of protected equipment
- Repeated protection in lightning intense environments
- Innovative multiple thermal disconnect technology for safe disconnection from faulty or abnormal supplies (without compromising protective performance)
- Three way visual indication of protection status and advanced pre-failure warning so you need never be unprotected
- Remote indication facility allows pre-failure warning to be linked to a building management system, buzzer or light
- Changeover active volt-free contact enables the protector to be used to warn of phase loss (i.e. power failure, blown fuses, etc.)
- Flashing warning of potentially fatal neutral to earth supply faults (due to incorrect earthing, wiring errors or unbalanced conditions)
- Robust steel housing
- Base provides ultra-low inductance earth bond to metal panels
- Compact size for installation in the power distribution board
- ESP 120 M1 and ESP 240 M1 have Network Rail Approval PA05/02700 and PA05/01832 respectively. NRS PADS reference 086/000556 (ESP 120 M1) and 086/047149 (ESP 240 M1)

Installation

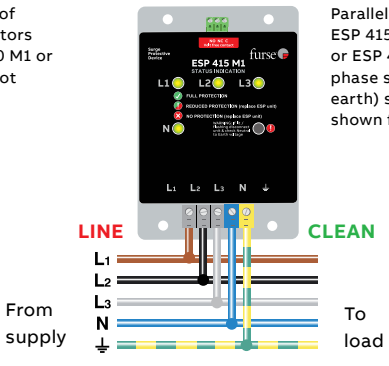
Install in parallel, within the power distribution board or directly (via fuses) on to the supply feeding equipment. At distribution boards, the protector can be installed either on the load side of the incoming isolator, or on the closest outgoing way to the incoming supply. Connect, with very short connecting leads, to phase(s), neutral and earth. For TT installations, contact Furse.

Accessories

Weatherproof enclosures:
WBX 3
ABB Order code:
7TCA085410R0023 Use with single phase protectors
WBX 4
ABB Order code:
7TCA085410R0027 Use with three phase protectors



Parallel connection of single phase protectors ESP 240 M1, ESP 120 M1 or ESP 277 M1 (fuses not shown for clarity).



Parallel connection of ESP 415 M1, ESP 208 M1 or ESP 480 M1 to three phase star (4 wire and earth) supplies (fuses not shown for clarity).

NOTE: If you desire a protector with an extra high maximum surge current use the ESP M2 or ESP M4 series. If your supply is fused at 16 amps, or less, the in-line protectors (ESP 240 or 120-5A (or -16A) and their ready-boxed derivatives) may be more suitable. If you need to mount the display panel separately from the main protector unit, use the ESP M1R series.

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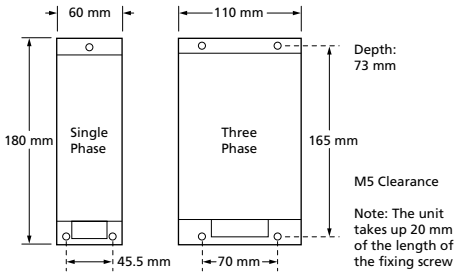
ESP M1 Series - Technical specification

Electrical specification	ESP 120 M1	ESP 208 M1	ESP 240 M1	ESP 415 M1	ESP 277 M1	ESP 480 M1
ABB order code	7TCA085460R0070	7TCA085460R0078	7TCA085460R0089	7TCA085460R0112	7TCA085460R0097	7TCA085460R0136
Nominal voltage - Phase-Neutral U_o (RMS)	120 V	120 V	240 V	240 V	277 V	277 V
Maximum voltage - Phase-Neutral U_c (RMS)	150 V	150 V	280 V	280 V	305 V	305 V
Temporary Overvoltage TOV U_T[1]	175 V / 229 V	175 V / 229 V	337 V / 442 V	337 V / 442 V	403 V / 529 V	403 V / 529 V
Short circuit withstand capability	25 kA/50 Hz	25 kA/50 Hz	25 kA/50 Hz	25 kA/50 Hz	25 kA/50 Hz	25 kA/50 Hz
Working voltage (RMS)	90-150 V	156-260 V	200-280 V	346-484 V	232-350 V	402-600 V
Frequency range	47-63 Hz					
Max. back-up fuse (see installation instructions)	≤ 125 A					
Leakage current (to earth)	< 250 µA					
Indicator circuit current	< 10 mA					
Volt free contact:[2]	Screw terminal					
– Current rating	1 A					
– Nominal voltage (RMS)	250 V					

Transient specification	ESP 120 M1	ESP 208 M1	ESP 240 M1	ESP 415 M1	ESP 277 M1	ESP 480 M1
Type 1 (BS EN/EN), Class I (IEC)						
Nominal discharge current 8/20 µs (per mode) I_n	20 kA					
Let-through voltage U_p at I_n	< 1 kV	< 1 kV	< 1.3 kV	< 1.3 kV	< 1.4 kV	< 1.4 kV
Impulse discharge current 10/350 µs I_{imp} (to earth)[4,7]	6.25 kA					
Total discharge current 10/350 µs I_{total} (total to earth)[4,5]	12.5 kA	25 kA	12.5 kA	25 kA	12.5 kA	25 kA
Type 2 (BS EN/EN), Class II (IEC)						
Nominal discharge current 8/20 µs (per mode) I_n	20 kA					
Let-through voltage U_p at I_n	< 1 kV	< 1 kV	< 1.3 kV	< 1.3 kV	< 1.4 kV	< 1.4 kV
Maximum discharge current I_{max} (L/N-PE, L-N)[4]	40 kA, 40 kA					
Type 3 (BS EN/EN), Class III (IEC)						
Let-through voltage at U_{oc} of 6 kV 1.2/50 µs and I_{sc} of 3 kA 8/20 µs (per mode)[3,6]	390 V	390 V	600 V	600 V	680 V	680 V

Mechanical specification	ESP 120 M1	ESP 208 M1	ESP 240 M1	ESP 415 M1	ESP 277 M1	ESP 480 M1
Temperature range[8]	-40 to +80 °C					
Connection type	Screw terminal - maximum torque 2.65 Nm					
Conductor size (stranded)	35 mm²					
Earth connection	Screw terminal - maximum torque 2.65 Nm					
Volt free contact	Connect via screw terminal with conductor up to 2.5 mm² (stranded) - maximum torque 0.25 Nm					
Degree of protection (IEC 60529)	IP20					
Case material	Steel					
Weight	0.6 kg	1.0 kg	0.6 kg	1.0 kg	0.6 kg	1.0 kg
Dimensions	See diagrams below					

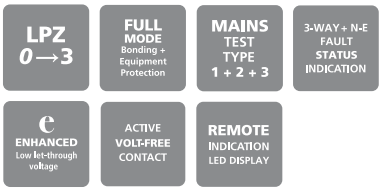
[1] Temporary Overvoltage TOV rating is for durations of 5 seconds (withstand) and 120 minutes (safe fail) tested to BS EN/IEC 61643.
[2] Minimum permissable load is 5 V DC, 10 mA to ensure reliable operation.
[3] The maximum transient voltage let-through of the protector throughout the test (±10%), phase to neutral, phase to earth and neutral to earth.
[4] The electrical system, external to the unit, may constrain the actual current rating achieved in a particular installation.
[5] Rating is considered as the current capability of the protector for equipotential bonding near the service entrance.
[6] Combination wave test within IEC/BS EN 61643, IEEE C62.41-2002 Location Cats C1 & B3, SS 555:2010, AS/NZS 1768-2007, UL 1449 mains wire-in.
[7] Total Discharge Current I_{imp} 10/350 µs is 4 kA L-N.
[8] Temperature range of SPD within a 20°C ambient temperature. An increase in ambient temperature will de-rate the SPD upper temperature limit accordingly.



Mains power protection

ESP M1R, M2R & M4R Series

*NOTE: product label design may vary.



Combined Type 1, 2 and 3 tested protector (to BS EN 61643) for use on mains power distribution systems primarily to protect connected electronic equipment from transient overvoltages on the mains supply, e.g. computer, communications or control equipment. Remote display allows both display and protector unit to be mounted in their optimum positions. For use at boundaries up to LPZ 0 to protect against flashover (typically the main distribution board location, with multiple metallic services entering) through to LPZ 3 to protect sensitive electronic equipment.

Features & benefits

- The remote display means the protector can be mounted close to the incoming feed or first way on the distribution board and the display in an easily visible position, e.g. on front of cabinet
- Very low let-through voltage (enhanced protection to IEC/BS EN 62305) between all sets of conductors (phase to neutral, phase to earth, neutral to earth - Full Mode protection)
- Full Mode design capable of handling partial lightning currents as well as allowing continual operation of protected equipment
- Repeated protection in lightning intense environments
- Innovative multiple thermal disconnect technology for safe disconnection from abnormal or faulty supplies
- Remote display gives three way visual indication of protection status
- Plug-in cable connections between protector and display enable easy connection (1 m cable supplied as standard)
- Advanced pre-failure warning so you need never be unprotected
- Remote indication facility allows pre-failure warning to be linked to a building management system, buzzer or light
- Changeover active volt-free contact enables the protector to be used to warn of phase loss (i.e. power failure, blown fuses, etc.)
- Unique flashing warning of potentially fatal neutral to earth supply faults (caused by incorrect earthing, wiring errors or unbalanced conditions)
- Robust steel housing (protector), and sturdy ABS housing (display)
- Base provides ultra-low inductance earth bond to metal panels
- Remote display comes with integral fixings and a panel drilling template

Application

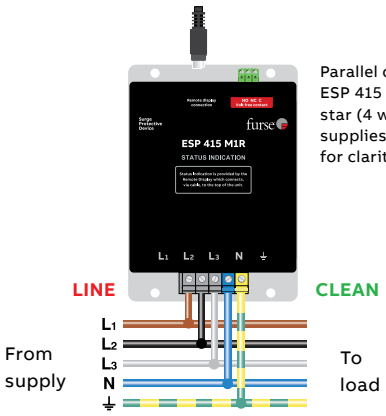
ESP M1R: main distribution board for buildings with multiple metallic services (e.g. gas, water, telecoms) and sub-distribution boards feeding sensitive equipment. ESP M2R: main distribution board for buildings with Class III or IV LPS fitted or exposed 3-ph power lines where no LPS is fitted. ESP M4R: main distribution board for buildings with a Class I or II LPS.

Installation

Installation of the protector unit is identical to the ESP M1, M2 or M4. Position remote display, making sure that the cable is long enough, is unimpeded within the cabinet, and allows a minimum of 60 mm behind the panel front (for the interconnection cable). For TT installations, contact Furse.

Accessories

ESP RLA-1
ABB Order code: 7TCA085460R0153
Spare 1 metre cable assembly
ESP RLA-2
ABB Order code: 7TCA085460R0154
Spare 2 metre cable assembly
ESP RLA-4
ABB Order code: 7TCA085460R0155
Spare 4 metre cable assembly



Parallel connection of ESP 415 M1R to three phase star (4 wire and earth) supplies (fuses not shown for clarity).

Simple plug and socket connection between the protector unit and the remote display

NOTE: For three phase applications where a remote display is unnecessary, use the respective ESP M1, M2 or M4 Series.

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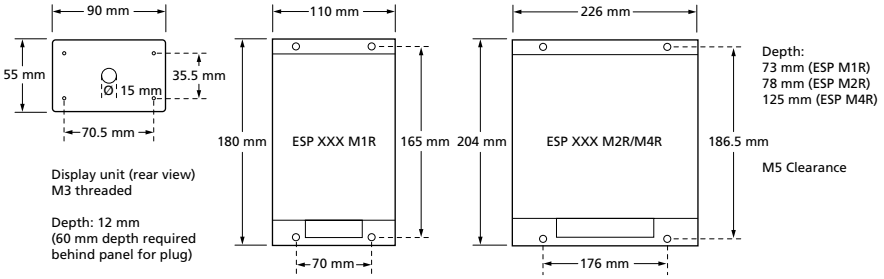
ESP M1R, M2R & M4R Series - Technical specification

Electrical specification	ESP 415 M1R	ESP 480 M1R	ESP 415 M2R	ESP 480 M2R	ESP 415 M4R	ESP 480 M4R
ABB order code	7TCA085460R0115	7TCA085460R0137	7TCA085460R0123	7TCA085460R0078	7TCA085460R0126	7TCA085460R0340
Nominal voltage - Phase-Neutral U_o (RMS)	240 V	277 V	240 V	277 V	240 V	277 V
Maximum voltage - Phase-Neutral U_c (RMS)	280 V	305 V	280 V	305 V	280 V	305 V
Temporary Overvoltage TOV U_T[1]	337 V / 442 V	403 V / 529 V	337 V / 442 V	403 V / 529 V	337 V / 442 V	403 V / 529 V
Short circuit withstand capability	25 kA/50 Hz					
Working voltage (RMS)	346-484 V	402-600 V	346-484 V	402-600 V	346-484 V	402-600 V
Frequency range	47-63 Hz					
Max. back-up fuse (see installation instructions)	≤ 125 A	≤ 125 A	≤ 200 A	≤ 200 A	≤ 315 A	≤ 315 A
Leakage current (to earth)	< 250 µA					
Indicator circuit current	< 5 mA	< 10 mA	< 5 mA	< 10 mA	< 5 mA	< 10 mA
Volt free contact:[2]	Screw terminal					
– Current rating	1 A					
– Nominal voltage (RMS)	250 V					

Transient specification	ESP 415 M1R	ESP 480 M1R	ESP 415 M2R	ESP 480 M2R	ESP 415 M4R	ESP 480 M4R
Type 1 (BS EN/EN), Class I (IEC)						
Nominal discharge current 8/20 µs (per mode) I_n	20 kA	20 kA	20 kA	20 kA	25 kA	25 kA
Let-through voltage U_p at I_n	< 1.3 kV	< 1.4 kV	< 1.3 kV	< 1.4 kV	< 1.3 kV	< 1.4 kV
Impulse discharge current 10/350 µs I_{imp} (to earth)[4]	6.25 kA	6.25 kA	12.5 kA	12.5 kA	25 kA	25 kA
Total discharge current 10/350 µs I_{total} (total to earth)[4,5]	25 kA	25 kA	50 kA	50 kA	100 kA	100 kA
Type 2 (BS EN/EN), Class II (IEC)						
Nominal discharge current 8/20 µs (per mode) I_n	20 kA	20 kA	20 kA	20 kA	25 kA	25 kA
Let-through voltage *U*p at I_n[3]	< 1.3 kV	< 1.4 kV	< 1.3 kV	< 1.4 kV	< 1.3 kV	< 1.4 kV
Maximum discharge current I_{max} (L/N-PE, L-N)[4]	40 kA, 40 kA	40 kA, 40 kA	80 kA, 40 kA	80 kA, 40 kA	150 kA, 40 kA	150 kA, 40 kA
Type 3 (BS EN/EN), Class III (IEC)						
Let-through voltage at U_{oc} of 6 kV 1.2/50 µs and I_{sc} of 3 kA 8/20 µs (per mode)[3,6]	< 600 V	< 680 V	< 600 V	< 680 V	< 600 V	< 680 V

Mechanical specification	ESP 415 M1R	ESP 480 M1R	ESP 415 M2R	ESP 480 M2R	ESP 415 M4R	ESP 480 M4R
Temperature range[7]	-40 to +80 °C					
Connection type	Screw terminal - maximum torque 2.65 Nm					
Conductor size (stranded)	25 mm²					
Earth connection	Screw terminal - maximum torque 2.65 Nm					
Volt free contact	Connect via screw terminal with conductor up to 2.5 mm² (stranded) - maximum torque 0.25 Nm					
Degree of protection (IEC 60529)	IP20					
Display connection	6 way 1 metre interconnection cable - 2 or 4 metre cable optional					
Case material	Unit - Steel, Display - FR Polymer UL-94 V0					
Weight	1.0 kg	1.0 kg	2.35 kg	2.35 kg	3.9 kg	3.9 kg
Dimensions	See diagrams below					

[1] Temporary Overvoltage TOV rating is for durations of 5 seconds (withstand) and 120 minutes (safe fail) tested to BS EN/IEC 61643.
[2] Minimum permissable load is 5 V DC, 10 mA to ensure reliable operation. Under fault conditions, the remote display will go blank if the L1 phase loses power or becomes faulty. This is due to the isolation requirements needed for circuitry mounted externally to the main protector unit.
[3] The maximum transient voltage let-through of the protector throughout the test (±10%), phase to neutral, phase to earth and neutral to earth.
[4] The electrical system, external to the unit, may constrain the actual current rating achieved in a particular installation.
[5] Rating is considered as the current capability of the protector for equipotential bonding near the service entrance.
[6] Combination wave test within IEC/BS EN 61643, IEEE C62.41-2002 Location Cats C1 & B3, SS 555:2010, AS/NZS 1768-2007, UL 1449 mains wire-in.
[7] Temperature range of SPD within a 20°C ambient temperature. An increase in ambient temperature will de-rate the SPD upper temperature limit accordingly.



Mains power protection

ESP 415T2 Surge Protection Series

*NOTE: product label design may vary.

Type 2 /Class II tested Surge Protective Device SPD (to BS EN/IEC 61643) for use on the sub-distribution board. For use at boundaries up to LPZ 1 through to LPZ 2 to protect electrical equipment from damage.

LPZ 1→2 | COMMON MODE Equipotential Bonding | MAINS TYPE 2 | REPLACEABLE PROTECTION MODULE | STATUS INDICATION + VOLT-FREE CONTACT

Features & benefits

- Repeated protection in lightning intense environments
- Pluggable module design (with anti-vibration locking clip) allows for simple replacement at end-of-life
- Compact, space saving design
- Indicator shows when the SPD protection modules requires replacement
- Remote signal contact can indicate the protector's status through interfacing with a building management system

Application

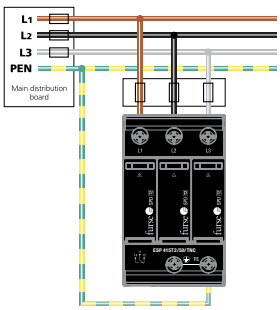
- Use on three phase mains supplies and power distribution systems for protection against indirect lightning strikes
- ESP 415T2/X/TNS versions also cover TN-C-S earthing systems

Installation

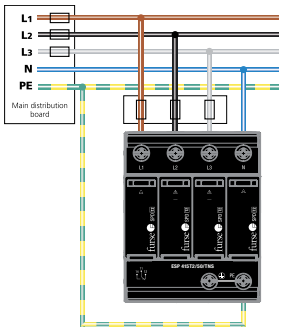
The SPD is to be installed in the sub-distribution board with connecting leads of minimal length. The protector should be fused and is suitable for attachment to a 35 mm top hat DIN rail. The diagrams below illustrate how to wire the appropriate ESP protector according to your chosen electrical system.

Weatherproof enclosure:
WBX D4
ABB order code:
7TCA085410R0032
SPD replacement modules:
ESP 240T2/50/M
7TCA085460R0387
ESP N-PE/T2/65/M
7TCA085460R0403
Metallic enclosure:
MBX D4
ABB order code:
7TCA085400R0649

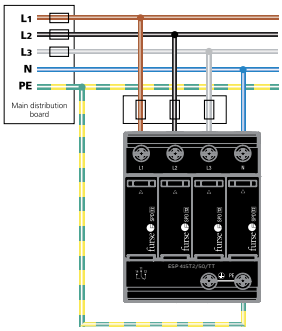
TN-C earthing system



TN-S earthing system



TT earthing system



NOTE: Remote contact connections not shown, for clarity.

IMPORTANT: In order to protect sensitive electronic equipment, particularly from electrical switching transients, plus ensure the continual operation of systems, full mode SPDs, with both common and differential mode protection, are required. ESP M1 Series or ESP D1 Series SPDs should be installed at sub-distribution boards feeding sensitive equipment. For further information, please refer to the Furse Guide to BS EN 62305 Protection against lightning.

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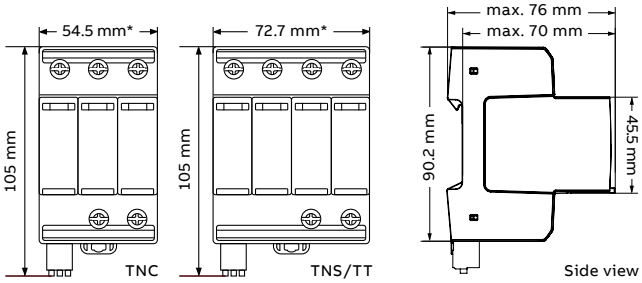
ESP 415T2 Surge Protection Series - Technical specification

Electrical specification	ESP 415T2/50/TNS	ESP 415T2/50/TNC	ESP 415T2/50/TT
ABB order code	7TCA085460R0391	7TCA085460R0390	7TCA085460R0380
Nominal voltage - Phase-Neutral U_o (RMS)	240 V		
Maximum voltage - Phase-Neutral U_c (RMS)	300 V		
Temporary Overvoltage TOV U_T[1] (5s/120m)	337 V / 442 V		
Short circuit withstand capability I_{SCCR}	50 kA_{RMS} / 50 Hz		
Frequency range	47-63 Hz		
Max. back-up fuse (see installation instructions)	≤ 250 A		
Leakage current (to earth)	≤ 400 µA	≤ 400 µA	≤ 5 µA
Volt free contact:[2]	Push terminal		
– Current rating	1 A		
– Nominal voltage (RMS)	250 V		

Transient specification	ESP 415T2/50/TNS	ESP 415T2/50/TNC	ESP 415T2/50/TT
Type 2 (BS EN/EN), Class II (IEC)			
Nominal discharge current 8/20 µs (per mode) I_n	20 kA	20 kA	20 kA (L-N) 40 kA (N-E)
Let-through voltage U_p at I_n[2]	≤ 1.5 kV	≤ 1.5 kV	≤ 1.5 kV (L-N) ≤ 1.5 kV (N-E)
Maximum discharge current I_{max} (per mode)[3]	50 kA	50 kA	50 kA (L-N) 65 kA (N-E)

Mechanical specification	ESP 415T2/50/TNS	ESP 415T2/50/TNC	ESP 415T2/50/TT
Temperature range	-40 to +80 °C		
Connection type	Screw terminal - maximum torque 4.5 Nm		
Conductor size (solid/stranded)[5]	35 mm²		
Earth connection	Screw terminal - maximum torque 4.5 Nm		
Degree of protection (IEC 60529)	IP20		
Volt free contact	Push-fit connection for conductor up to 1.5mm² rated AC 250 V, 1A		
Case material	Thermoplastic UL-94 V-0		
Mounting	Indoor, 35 mm top hat DIN rail		
Weight	0.47 kg	0.37 kg	0.46 kg
Dimensions to DIN 43880 - HxDxW[4]	90.2 mm x 70 mm x 72.7 mm* (4TE)	90.2 mm x 70 mm x 54.5 mm* (3TE)	90.2 mm x 70 mm x 72.7 mm* (4TE)

[1] Temporary Overvoltage TOV rating is for durations of 5 seconds (withstand) and 120 minutes (safe fail) tested to BS EN/IEC 61643. TT versions have 1200V withstand for 200ms (N-E).
[2] The maximum transient voltage let-through of the protector throughout the test, phase to neutral and neutral to earth.
[3] The electrical system, external to the unit, may constrain the actual current rating achieved in a particular installation.
[4] The remote signal contact (removable) adds 15 mm to height.
[5] Conductor size (flexible) is 25 mm².
* Maximum dimensions (this applies to all dimensions).



Mains power protection

ESP 240T2 Surge Protection Series

*NOTE: product label design may vary.

Type 2 /Class II tested Surge Protective Device SPD (to BS EN/IEC 61643) for use on the sub-distribution board. For use at boundaries up to LPZ 1 through to LPZ 2 to protect electrical equipment from damage.

LPZ 1→2 | COMMON MODE Equipotential Bonding | MAINS TYPE 2 | REPLACEABLE PROTECTION MODULE | STATUS INDICATION + VOLT-FREE CONTACT

Features & benefits

- Repeated protection in lightning intense environments
- Pluggable module design (with anti-vibration locking clip) allows for simple replacement at end-of-life
- Compact, space saving design
- Indicator shows when the SPD protection modules requires replacement
- Remote signal contact can indicate the protector's status through interfacing with a building management system

Application

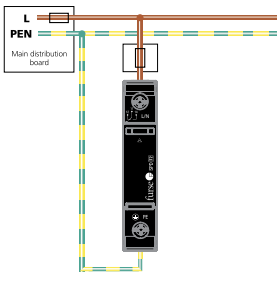
- Use on three phase mains supplies and power distribution systems for protection against indirect lightning strikes
- ESP 240T2/X/TNS versions also cover TN-C-S earthing systems

Installation

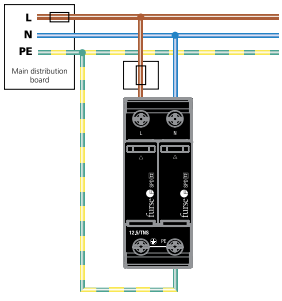
The SPD is to be installed in the sub-distribution board with connecting leads of minimal length. The protector should be fused and is suitable for attachment to a 35 mm top hat DIN rail. The diagrams below illustrate how to wire the appropriate ESP protector according to your chosen electrical system.

Weatherproof enclosure:
WBX D4
ABB order code:
7TCA085410R0032
SPD replacement modules:
ESP 240T2/50/M
7TCA085460R0387
ESP N-PE/T2/65/M
7TCA085460R0403
Metallic enclosure:
MBX D4
ABB order code:
7TCA085400R0649

TN-C earthing system



TN-S/TT earthing system



NOTE: Remote contact connections not shown, for clarity.

IMPORTANT: In order to protect sensitive electronic equipment, particularly from electrical switching transients, plus ensure the continual operation of systems, full mode SPDs, with both common and differential mode protection, are required. ESP M1 Series or ESP D1 Series SPDs should be installed at sub-distribution boards feeding sensitive equipment. For further information, please refer to the Furse Guide to BS EN 62305 Protection against lightning.

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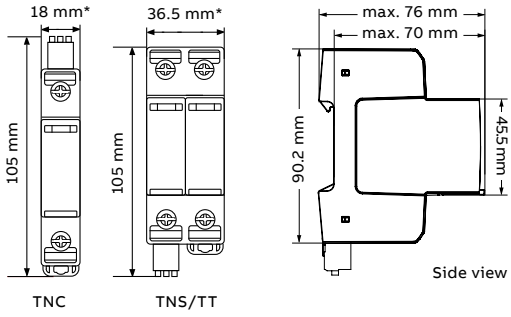
ESP 240T2 Surge Protection Series - Technical specification

Electrical specification	ESP 240T2/50/TNS	ESP 240T2/50/TNC	ESP 240T2/50/TT
ABB order code	7TCA085460R0388	7TCA085460R0383	7TCA085460R0404
Nominal voltage - Phase-Neutral U_o (RMS)	240 V		
Maximum voltage - Phase-Neutral U_c (RMS)	300 V		
Temporary Overvoltage TOV U_T[1] (5s/120m)	337 V / 442 V		
Short circuit withstand capability I_{SCCR}	50 kA_{RMS} / 50 Hz		
Frequency range	47-63 Hz		
Max. back-up fuse (see installation instructions)	≤ 250 A		
Leakage current (to earth)	≤ 400 µA	≤ 400 µA	≤ 5 µA
Volt free contact:[2]	Push terminal		
– Current rating	1 A		
– Nominal voltage (RMS)	250 V		

Transient specification	ESP 240T2/50/TNS	ESP 240T2/50/TNC	ESP 240T2/50/TT
Type 2 (BS EN/EN), Class II (IEC)			
Nominal discharge current 8/20 µs (per mode) I_n	20 kA	20 kA	20 kA (L-N) 40 kA (N-E)
Let-through voltage U_p at I_n[2]	≤ 1.5 kV	≤ 1.5 kV	≤ 1.5 kV (L-N) ≤ 1.5 kV (N-E)
Maximum discharge current I_{max} (per mode)[3]	50 kA	50 kA	50 kA (L-N) 65 kA (N-E)

Mechanical specification	ESP 240T2/50/TNS	ESP 240T2/50/TNC	ESP 240T2/50/TT
Temperature range	-40 to +80 °C		
Connection type	Screw terminal - maximum torque 4.5 Nm		
Conductor size (solid/stranded)[5]	35 mm²		
Earth connection	Screw terminal - maximum torque 4.5 Nm		
Degree of protection (IEC 60529)	IP20		
Volt free contact	Push-fit connection for conductor up to 1.5 mm², rated AC 250 V, 1 A		
Case material	Thermoplastic UL-94 V-0		
Mounting	Indoor, 35 mm top hat DIN rail		
Weight	0.26 kg	0.14 kg	0.25 kg
Dimensions to DIN 43880 - HxDxW[4]	90.2 mm x 70 mm x 36.5 mm* (4TE)	90.2 mm x 70 mm x 18 mm* (3TE)	90.2 mm x 70 mm x 36.5 mm* (4TE)

[1] Temporary Overvoltage TOV rating is for durations of 5 seconds (withstand) and 120 minutes (safe fail) tested to BS EN/IEC 61643. TT versions have 1200V withstand for 200ms (N-E).
[2] The maximum transient voltage let-through of the protector throughout the test, phase to neutral and neutral to earth.
[3] The electrical system, external to the unit, may constrain the actual current rating achieved in a particular installation.
[4] The remote signal contact (removable) adds 15 mm to height.
[5] Conductor size (flexible) is 25 mm².
* Maximum dimensions (this applies to all dimensions).



Mains power protection

ESP 415CDT2 Surge Protection Series

*NOTE: product label design may vary.

Type 2 /Class II tested compact Surge Protective Device SPD (to BS EN/IEC 61643) for use on the sub-distribution board. For use at boundaries up to LPZ 1 through to LPZ 2 to protect electrical equipment from damage.

LPZ 1→2 | COMMON MODE Equipotential Bonding | MAINS TYPE 2 | REPLACEABLE PROTECTION MODULE | STATUS INDICATION + VOLT-FREE CONTACT

Features & benefits

- Repeated protection in lightning intense environments
- Pluggable module design allows for simple replacement at end-of-life
- Ultra compact, space saving design to fit within distribution panel boards and Electric Vehicle EV charging stations
- Indicator shows when the SPD protection modules requires replacement
- Remote signal contact can indicate the protector's status through interfacing with a building management system
- Innovative locking DIN rail clip allows easy SPD positioning then securing

Application

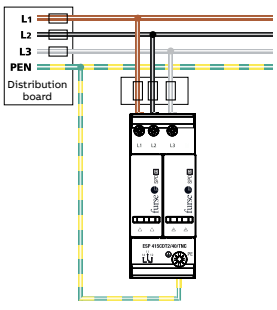
- Use on three phase mains supplies and power distribution systems for protection against indirect lightning strikes
- ESP 415CDT2/40/TNS and ESP 415CDT2/40/TT versions also cover TN-C-S earthing systems

Installation

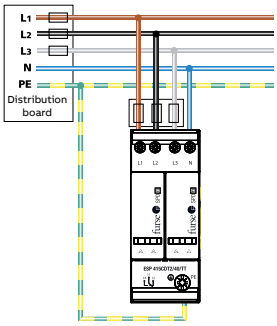
The SPD is to be installed in the sub-distribution board with connecting leads of minimal length. The protector should be fused and is suitable for attachment to a 35 mm top hat DIN rail. The diagrams below illustrate how to wire the appropriate ESP protector according to your chosen electrical system.

Weatherproof enclosure:
WBX D4
ABB order code:
7TCA085410R0032
Metallic enclosure:
MBX D4
7TCA085400R0649
SPD replacement modules:
ESP 240CDT2/40/M
7TCA085460R0425
ESP 240CDT2/40/TT/M
7TCA085460R0426
ESP 240CDT2/40/TNC/M
7TCA085460R0427

TN-C earthing system



TN-S/TT earthing system



NOTE: Remote contact connections not shown, for clarity.

IMPORTANT: In order to protect sensitive electronic equipment, particularly from electrical switching transients, plus ensure the continual operation of systems, full mode SPDs, with both common and differential mode protection, are required. ESP M1 Series or ESP D1 Series SPDs should be installed at sub-distribution boards feeding sensitive equipment. For further information, please refer to the Furse Guide to BS EN 62305 Protection against lightning.

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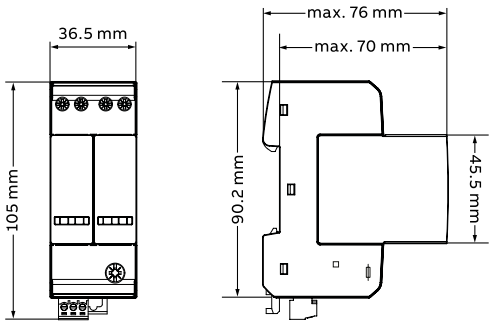
ESP 415CDT2 Surge Protection Series - Technical specification

Electrical specification	**ESP 415CDT2/40/TNS**	**ESP 415CDT2/40/TNC**	**ESP 415CDT2/40/TT**
ABB order code	7TCA085460R0421	7TCA085460R0422	7TCA085460R0420
Nominal voltage - Phase-Neutral U_o (RMS)	240 V		
Maximum voltage - Phase-Neutral U_c (RMS)	275 V		
Temporary Overvoltage TOV U_T[1] (5s/120m)	335 V / 440 V		
Short circuit withstand capability I_{SCCR}	25 kA_{RMS} / 50 Hz		
Frequency range	47-63 Hz		
Max. back-up fuse (see installation instructions)	≤ 100 A		
Leakage current (to earth)	≤ 300 µA	≤ 300 µA	≤ 5 µA
Volt free contact:[2]	Screw terminal		
– Current rating	0.5 A		
– Nominal voltage (RMS)	250 V		

Transient specification	**ESP 415CDT2/40/TNS**	**ESP 415CDT2/40/TNC**	**ESP 415CDT2/40/TT**
Type 2 (BS EN/EN), Class II (IEC)			
Nominal discharge current 8/20 µs (per mode) I_n	20 kA		
Let-through voltage U_p at I_n[2]	≤ 1.5 kV		
Maximum discharge current I_{max} (per mode)[3]	40 kA		

Mechanical specification	**ESP 415CDT2/40/TNS**	**ESP 415CDT2/40/TNC**	**ESP 415CDT2/40/TT**
Temperature range	-40 to +80 °C		
Connection type Screw terminal - maximum torque	1.2 Nm		
Conductor size (solid)[5]	10 mm² (L/N), 35 mm² (PE)		
Earth connection	Screw terminal - maximum torque 2.0 Nm		
Degree of protection (IEC 60529)	IP20		
Volt free contact	Screw connection for conductor up to 1.5 mm², rated AC 250 V, 0.5 A, 0.4 Nm Screw Torque		
Case material	Polybutylene terephthalate (PBT)		
Mounting	Indoor, 35 mm top hat DIN rail		
Weight	0.63 kg	0.55 kg	0.59 kg
Dimensions to DIN 43880 - HxDxW[4]	90.2 mm x 70 mm x 36 mm* (2TE)		

[1] Temporary Overvoltage TOV rating is for durations of 5 seconds (withstand) and 120 minutes (safe fail) tested to BS EN/IEC 61643. TT versions have 1200V withstand for 200ms (N-E).
[2] The maximum transient voltage let-through of the protector throughout the test, phase to neutral and neutral to earth.
[3] The electrical system, external to the unit, may constrain the actual current rating achieved in a particular installation.
[4] The remote signal contact (removable) adds 15 mm to height.
[5] Conductor size (flexible) is 6 mm² L/N, 25 mm² PE.
* Maximum dimensions (this applies to all dimensions).



Side view

Mains power protection

ESP 240CDT2 Surge Protection Series

*NOTE: product label design may vary.

Type 2 /Class II tested compact Surge Protective Device SPD (to BS EN/IEC 61643) for use on the sub-distribution board. For use at boundaries up to LPZ 1 through to LPZ 2 to protect electrical equipment from damage.

LPZ 1→2 | COMMON MODE Equipotential Bonding | MAINS TYPE 2 | REPLACEABLE PROTECTION MODULE | STATUS INDICATION + VOLT-FREE CONTACT

Features & benefits

- Repeated protection in lightning intense environments
- Pluggable module design allows for simple replacement at end-of-life
- Ultra compact, space saving design to fit within distribution panel boards and Electric Vehicle EV charging stations
- Indicator shows when the SPD protection modules requires replacement
- Remote signal contact can indicate the protector's status through interfacing with a building management system
- Innovative locking DIN rail clip allows easy SPD positioning then securing

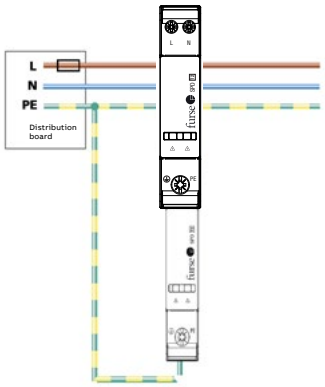
Application

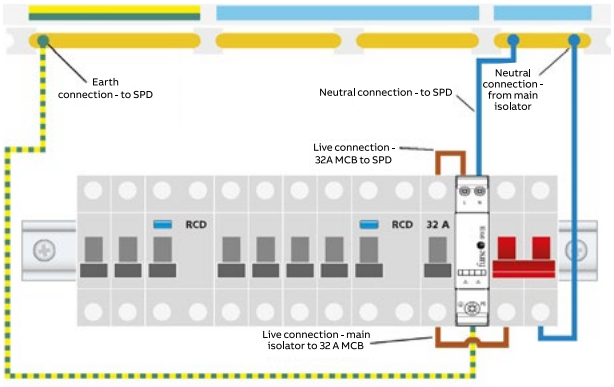
- Use on single phase mains supplies and power distribution systems for protection against indirect lightning strikes
- ESP 240CDT2/40/TNS and ESP 240CDT2/40/TT versions also cover TN-C-S earthing systems

Installation

The SPD is to be installed in the sub-distribution board with connecting leads of minimal length. The protector should be fused and is suitable for attachment to a 35 mm top hat DIN rail. The diagrams below illustrate how to wire the appropriate ESP protector according to your chosen electrical system.

Weatherproof enclosure:
WBX D4
ABB order code:
7TCA085410R0032
Metallic enclosure:
MBX D4
7TCA085400R0649
SPD replacement module:
ESP 240CDT2/40/TT/M
7TCA085460R0426





NOTE: Remote contact connections not shown, for clarity.

IMPORTANT: In order to protect sensitive electronic equipment, particularly from electrical switching transients, plus ensure the continual operation of systems, full mode SPDs, with both common and differential mode protection, are required. ESP M1 Series or ESP D1 Series SPDs should be installed at sub-distribution boards feeding sensitive equipment. For further information, please refer to the Furse Guide to BS EN 62305 Protection against lightning.

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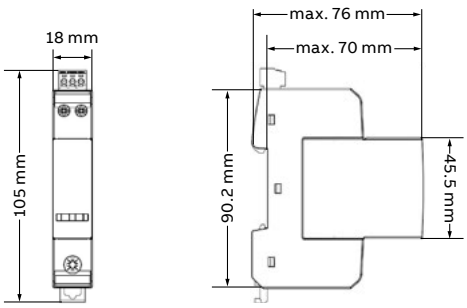
ESP 240CDT2 Surge Protection Series - Technical specification

Electrical specification	ESP 240CDT2/40/TNS	ESP 240CDT2/40/TT
ABB order code	7TCA085460R0424	7TCA085460R0423
Nominal voltage - Phase-Neutral U_o (RMS)	240 V	
Maximum voltage - Phase-Neutral U_c (RMS)	275 V	
Temporary Overvoltage TOV U_T[1] (5s/120m)	335 V / 440 V	
Short circuit withstand capability I_{SCCR}	25 kA_{RMS} / 50 Hz	
Frequency range	47-63 Hz	
Max. back-up fuse (see installation instructions)	≤ 100 A	
Leakage current (to earth)	≤ 300 µA	≤ 5 µA
Volt free contact:[2]	Screw terminal	
– Current rating	0.5 A	
– Nominal voltage (RMS)	250 V	

Transient specification	ESP 240CDT2/40/TNS	ESP 240CDT2/40/TT
Type 2 (BS EN/EN), Class II (IEC)		
Nominal discharge current 8/20 µs (per mode) I_n	20 kA	
Let-through voltage U_p at I_n[2]	≤ 1.5 kV	
Maximum discharge current I_{max} (per mode)[3]	40 kA	

Mechanical specification	ESP 240CDT2/40/TNS	ESP 240CDT2/40/TT
Temperature range	-40 to +80 °C	
Connection type Screw terminal - maximum torque	1.2 Nm	
Conductor size (solid)[5]	10 mm² (L/N), 35 mm² (PE)	
Earth connection	Screw terminal - maximum torque 2.0 Nm	
Degree of protection (IEC 60529)	IP20	
Volt free contact	Screw connection for conductor up to 1.5 mm², rated AC 250 V, 0.5 A, 0.4 Nm Screw Torque	
Case material	Polybutylene terephthalate (PBT)	
Mounting	Indoor, 35 mm top hat DIN rail	
Weight	0.35 kg	0.31 kg
Dimensions to DIN 43880 - HxDxW[4]	90.2 mm x 70 mm x 18 mm* (1TE)	

[1] Temporary Overvoltage TOV rating is for durations of 5 seconds (withstand) and 120 minutes (safe fail) tested to BS EN/IEC 61643. TT versions have 1200V withstand for 200ms (N-E).
[2] The maximum transient voltage let-through of the protector throughout the test, phase to neutral and neutral to earth.
[3] The electrical system, external to the unit, may constrain the actual current rating achieved in a particular installation.
[4] The remote signal contact (removable) adds 15 mm to height.
[5] Conductor size (flexible) is 6 mm² L/N, 25 mm² PE.
* Maximum dimensions (this applies to all dimensions).



Side view

Mains power protection

ESP DC Series

*NOTE: product label design may vary.

Combined Type 2 and 3 tested protector (to BS EN 61643) for use on DC systems to protect connected electronic equipment from transient overvoltages on the mains supply, e.g. control equipment. Available for 12, 24, 36 and 48 V DC systems. For use at boundaries LPZ 1 through to LPZ 3 to protect sensitive electronic equipment.

FULL MODE Bonding + Equipment Protection

MAINS TEST TYPE 2 + 3

ENHANCED Low let-through voltage

LPZ 1⟶3

STATUS INDICATION + VOLT-FREE CONTACT

Features & benefits

- Low let-through voltage (enhanced protection to IEC/BS EN 62305) between all sets of conductors (positive to negative, positive to earth and negative to earth - Full Mode protection) allowing continuous operation of equipment
- Repeated protection in lightning intense environments
- Visual indication of protector status
- Advanced pre-failure warning so you need never be unprotected
- Remote indication facility allows pre-failure warning to be linked to a building management system, buzzer or light
- Robust steel housing
- Simple parallel connection
- Base provides ultra-low inductance earth bond to metal panels
- Compact size for installation in the power distribution board
- Maintenance free

Installation

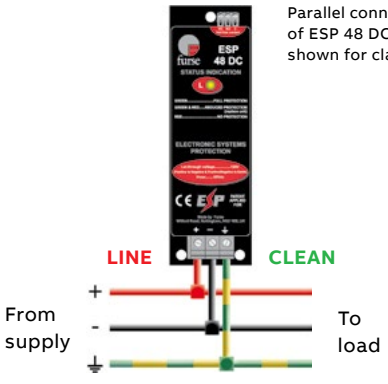
Install in parallel, within the power distribution board or directly on the supply feeding the equipment. At distribution boards, the protector can be installed either on the load side of the incoming isolator, or on the closest outgoing way to the incoming supply. Connect, with very short connecting leads, to positive, negative and earth.

Application

Use on DC power distribution systems to protect connected electronic equipment from transient overvoltages on the DC supply, e.g. DC fed communications or control equipment.

Accessories

Weatherproof enclosure:
WBX 3
ABB Order code: 7TCA085410R0023



Parallel connection of ESP 48 DC (fuse not shown for clarity).

NOTE: For low current applications, the ESP H Series (16 A), ESP E Series (1.25 A) or ESP D Series (300 mA) protectors may be suitable. For protection of photovoltaic (PV) systems up to 1500 Vdc, see our ESP DC PV DIN rail series.

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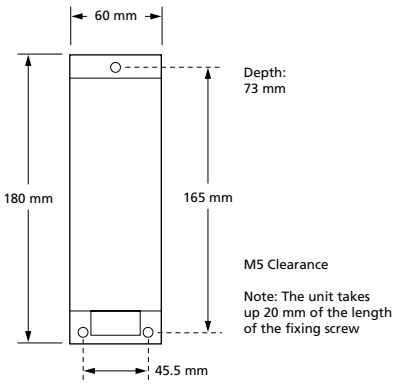
ESP DC Series - Technical specification

Electrical specification	ESP 12 DC	ESP 24 DC	ESP 36 DC	ESP 48 DC
ABB order code	7TCA085460R0073	7TCA085460R0091	7TCA085460R0100	7TCA085460R0142
Nominal voltage (DC)	12 V	24 V	36 V	48 V
Maximum voltage (DC)	15 V	30 V	45 V	60 V
Working voltage (DC)	9-15 V	18-30 V	27-45 V	36-60 V
Max. back-up fuse (see installation instructions)	≤ 63 A			
Leakage current (to earth)	< 250 µA			
Indicator circuit current	< 10 mA			
Volt free contact:[1]	Screw terminal			
– Current rating	1 A			
– Nominal voltage (RMS)	250 V			

Transient specification	ESP 12 DC	ESP 24 DC	ESP 36 DC	ESP 48 DC
Type 2 (BS EN/EN), Class II (IEC)				
Nominal discharge current 8/20 µs (per mode) I_n	5 kA			
Let-through voltage U_p at I_n[2]	250 V			
Maximum discharge current I_{max} (per mode)[3]	20 kA			
Type 3 (BS EN/EN), Class III (IEC)				
Let-through voltage at U_{OC} of 6 kV 1.2/50 µs and I_{SC} of 3 kA 8/20 µs (per mode)[2,4]	190 V			

Mechanical specification	ESP 12 DC	ESP 24 DC	ESP 36 DC	ESP 48 DC
Temperature range[5]	-40 to +80 °C			
Connection type	Screw terminal - maximum torque 1.5 Nm			
Conductor size (stranded)	16 mm²			
Earth connection	Screw terminal - maximum torque 1.5 Nm			
Volt free contact	Connect via screw terminal with conductor up to 2.5 mm² (stranded) - maximum			
Degree of protection (IEC 60529)	IP20			
Case material	Steel			
Weight	0.6 kg			
Dimensions	180 mm x 60mm x 73 mm			

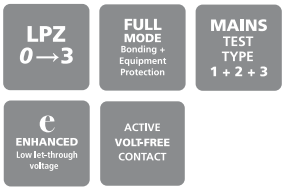
[1] Minimum permissable load is 5 V DC, 10 mA to ensure reliable operation.
[2] The maximum transient voltage let-through of the protector throughout the test (±10%) per mode.
[3] The electrical system, external to the unit, may constrain the actual current rating achieved in a particular installation.
[4] Combination wave test within IEC/BS EN 61643, IEEE C62.41-2002 Location Cats C1 & B3, SS 555:2010, AS/NZS 1768-2007, UL 1449 mains wire-in.
[5] Temperature range of SPD within a 20°C ambient temperature. An increase in ambient temperature will de-rate the SPD upper temperature limit accordingly.



Mains power protection

ESP D/DS 10A & 32A Series (Single phase)

*NOTE: product label design may vary.



Combined Type 1, 2 and 3 tested protector (to BS EN 61643) for use on low current (up to 10 or 32 A) single phase systems to protect connected electronic equipment from transient overvoltages on the mains supply, e.g. fire/intruder alarm panels. Available for 90-150 Volts, 200-280 Volts and 232-350 Volts supplies. For use at boundary LPZ 0 through to LPZ 3 boundaries to protect sensitive electronic equipment.

Features & benefits

- Very low let-through voltage (enhanced protection to IEC/BS EN 62305) between all sets of conductors (phase to neutral, phase to earth, neutral to earth - Full Mode protection)
- Repeated protection in lightning intense environments
- Compact space saving DIN housing for easy incorporation in the protected system
- Innovative multiple thermal disconnect technology for safe disconnection from faulty or abnormal supplies (without compromising protective performance)
- Three way visual indication of protection status and advanced pre-failure warning so you need never be unprotected
- Advanced status (DS) version has remote indication facility to a BMS via an active changeover volt-free contact to show pre-failure warnings and potential phase loss (i.e. power failure, blown fuses, etc.), and a flashing warning of potentially fatal neutral to earth supply volts

Installation

Connect in-line with the power supply usually either within the equipment panel (or for CCTV cameras, in an enclosure close by), or on the fused connection that supplies equipment.

To protect equipment inside a building from transients entering on an outgoing feed (e.g. to CCTV cameras or to site lighting) the protector should be installed as close to where the cable leaves the building as possible.

Protectors should be installed either within an existing cabinet/cubicle or in a separate enclosure.

Accessories

Weatherproof enclosure:
WBX D4
ABB Order code: 7TCA085410R0032

Application

Use these protectors on low current mains power supplies, e.g. CCTV cameras, alarm panels, industrial battery chargers and telemetry equipment.

Connect in-line on supplies fused up to 10 A (ESP 120D-10A, ESP 120DS-10A, ESP 240D-10A, ESP 240DS-10A, ESP 277D-10A or ESP 277DS-10A) or 32 A (ESP 120D-32A, ESP 120DS-32A, ESP 240D-32A, ESP 240DS-32A, ESP 277D-32A or ESP 277DS-32A).

NOTE: If your supply is fused at more than 32 Amps the ESP 120 M1, ESP 240 M1 or ESP 277 M1 are suitable.

ESP D/DS 10A & 32A Series (Single phase) - Technical specification

Electrical specification	ESP 120D-10A ESP 120DS-10A	ESP 120D-32A ESP 120DS-32A	ESP 240D-10A ESP 240DS-10A	ESP 240D-32A ESP 240DS-32A	ESP 277D-10A ESP 277DS-10A	ESP 277D-32A ESP 277DS-32A
ABB order code	7TCA085460R0328 7TCA085460R0326	7TCA085460R0327 7TCA085460R0325	7TCA085460R0323 7TCA085460R0317	7TCA085460R0322 7TCA085460R0318	7TCA085460R0319 7TCA085460R0321	7TCA085460R0320 7TCA085460R0324
Nominal voltage - Phase-Neutral U_o (RMS)	120 V		240 V		277 V	
Maximum voltage - Phase-Neutral U_c (RMS)	150 V		280 V		305 V	
Temporary Overvoltage TOV U_T[1]	175 V / 229 V		337 V / 442 V		403 V / 529 V	
Short circuit withstand capability	10 kA/50 Hz					
Working voltage (RMS)	90-150 V		200-280 V		232-350 V	
Frequency range	47-63 Hz					
Current rating (supply)	10 A or less	32 A or less	10 A or less	32 A or less	10 A or less	32 A or less
Max. back-up fuse (see installation instructions)	10 A	32 A	10 A	32 A	10 A	32 A
Leakage current (to earth)	Zero					
Indicator circuit current	< 10 mA					
Volt free contact (DS versions only):[2]	Screw terminal					
– Current rating	1 A					
– Nominal voltage (RMS)	250 V					

Transient specification	ESP 120D-10A ESP 120DS-10A	ESP 120D-32A ESP 120DS-32A	ESP 240D-10A ESP 240DS-10A	ESP 240D-32A ESP 240DS-32A	ESP 277D-10A ESP 277DS-10A	ESP 277D-32A ESP 277DS-32A
Type 1 (BS EN/EN), Class I (IEC)						
Nominal discharge current 8/20 µs (per mode) I_n	20 kA					
Let-through voltage U_p at I_n	< 1 kV		< 1.3 kV		< 1.4 kV	
Impulse discharge current 10/350 µs I_{imp} (L-N/E, N-E)[4]	4 kA, 12.5 kA					
Total discharge current (total to earth) I_{total}[4,5]	6.25 kA					
Type 2 (BS EN/EN), Class II (IEC)						
Nominal discharge current 8/20 µs (per mode) I_n	20 kA					
Let-through voltage U_p at I_n	< 1 kV		< 1.3 kV		< 1.4 kV	
Maximum discharge current I_{max} (L-N/E, N-E)[4]	40 kA, 40 kA					
Type 3 (BS EN/EN), Class III (IEC)						
Let-through voltage at U_{oc} of 6 kV 1.2/50 µs and I_{sc} of 3 kA 8/20 µs (per mode)[3,6]	400 V		600 V		680 V	

Mechanical specification	ESP 120D-10A ESP 120DS-10A	ESP 120D-32A ESP 120DS-32A	ESP 240D-10A ESP 240DS-10A	ESP 240D-32A ESP 240DS-32A	ESP 277D-10A ESP 277DS-10A	ESP 277D-32A ESP 277DS-32A
Temperature range[8]	-40 to +80 °C					
Connection type	Screw terminal - maximum torque 0.8 Nm[7]					
Conductor size (stranded)	6 mm²					
Earth connection	Screw terminal - maximum torque 0.8 Nm[7]					
Volt free contact (DS versions only)	Connect via screw terminal with conductor up to 1.5 mm² (stranded) - maximum torque 0.25 Nm[7]					
Degree of protection (IEC 60529)	IP20					
Case material	FR Polymer UL-94 V-0					
Weight	0.23 kg					
Dimensions to DIN 43880 - HxDxW[9]	90 mm x 75 mm x 36 mm (2TE)					

* To enclose the products to IP65, fit within a WDX D4, available from Furse.

[1] Temporary Overvoltage TOV rating is for durations of 5 seconds (withstand) and 120 minutes (safe fail) tested to BS EN/IEC 61643.

[2] Minimum permissable load is 5 V DC, 10 mA to ensure reliable operation.

[3] The maximum transient voltage let-through of the protector throughout the test (±10%).

[4] The electrical system, external to the unit, may constrain the actual current rating achieved in a particular installation.

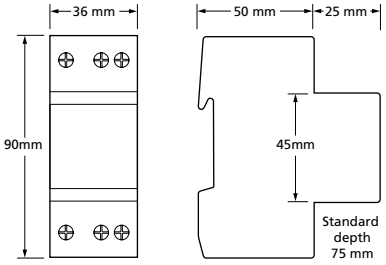
[5] Rating is considered as the current capability of the protector for equipotential bonding near the service entrance.

[6] Combination wave test within IEC/BS EN 61643, IEEE C62.41-2002 Location Cats C1 & B3, SS 555:2010, AS/NZS 1768-2007, UL 1449 mains wire-in.

[7] Torque should typically be 50% to 75% of the maximum value.

[8] Temperature range of SPD within a 20°C ambient temperature. An increase in ambient temperature will de-rate the SPD upper temperature limit accordingly.

[9] The remote signal contact (removable) adds 10 mm to height.



Mains power protection

ESP CD40 Series

*NOTE: product label design may vary.

Compact combined Type 2 and 3 tested (to IEC/BS EN 61643) Surge Protective Device (SPD) for use on single and three phase mains power distribution systems primarily to protect connected electronic equipment from transient overvoltages on the mains supply, e.g. computer, communications or control equipment. For use at boundaries up to LPZ 1 through to LPZ 3 to protect sensitive electronic equipment.

Features & benefits

- Very low let-through voltage (enhanced protection to IEC/BS EN 62305) between all sets of conductors (phase to neutral, phase to earth, neutral to earth - Full Mode protection)
- All mode design for continual operation of protected equipment
- Repeated protection in lightning intense environments
- SPD includes hybrid combination of MOVs and GDTs
- Innovative multiple thermal disconnect technology for safe disconnection from faulty or abnormal supplies (without compromising protective performance)
- Three way visual indication of protection status and advanced pre-failure warning so you need never be unprotected
- Changeover active volt-free contact enables the SPD to be used to warn of phase loss (i.e. power failure, blown fuses etc.)
- Flashing warning of supply faults leading to increased neutral to earth voltage (supply faults due to incorrect earthing, wiring errors or unbalanced conditions) - prevents potentially unsafe installations
- Compact space saving DIN housing with DIN release and locking feature for easy positioning onto DIN rail
- Large, robust terminals for straightforward connection of conductors
- Innovative design delivers zero leakage current to earth, so is suitable for TT and TN earthing systems

Installation

Install in parallel, within the power distribution board or directly (via fuses) on to the supply feeding equipment.

At distribution boards, the SPD can be installed either on the load side of the incoming isolator, or on the closest outgoing way to the incoming supply.

Connect, with very short connecting leads, to phase, neutral and earth (see installation instructions).

Accessories

Weatherproof enclosure:
WBX D4
ABB Order code: 7TCA085410R0032

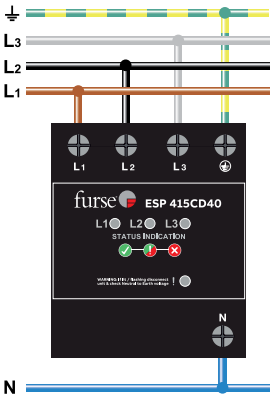
Metallic enclosure:
MBX D4
Order code: 7TCA085400R0649

Application

Install on single and three phase supplies at final distribution board level to protect electronic equipment against transient overvoltages.

Parallel connection of ESP 240CD40 to single phase supplies (fuses not shown for clarity).

Parallel connection of ESP 415CD40 to three phase supplies (fuses not shown for clarity).



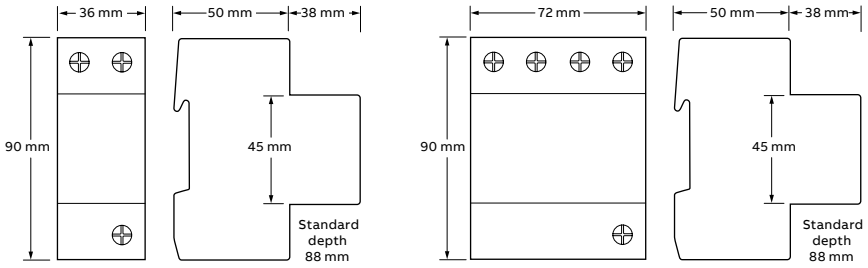
ESP CD40 Series - Technical specification

Electrical specification	ESP 240CD40	ESP 415CD40
ABB order code	7TCA085460R0378	7TCA085460R0303
Nominal voltage - Phase-Neutral U_o (RMS)	240 V	240 V
Maximum voltage - Phase-Neutral U_c (RMS)	280 V	280 V
Temporary Overvoltage TOV U_T[1] (5s/120m/200ms)	337 V / 442 V / 1200 V	337 V / 442 V / 1200 V
Short circuit withstand capability	25 kA/50 Hz	25 kA/50 Hz
Working voltage (RMS)	200-280 V	346-484 V
Frequency range	47-63 Hz	47-63 Hz
Max. back-up fuse (see installation instructions)	125 A, parallel connection via series fuses to supply - see installation guide	125 A, parallel connection via series fuses to supply - see installation guide
Leakage current (to earth)	Zero	Zero
Indicator circuit current	< 10 mA (per phase, to neutral)	< 10 mA (per phase, to neutral)
Volt free contact:[2]	Screw terminal	Screw terminal
– Current rating	1 A	1 A
– Nominal voltage (RMS)	250 V	250 V

Transient specification	ESP 240CD40	ESP 415CD40
Type 2 (BS EN/EN), Class II (IEC)		
Nominal discharge current 8/20 µs (per mode) I_n[3]	20 kA	20 kA
Let-through voltage U_p at I_n	< 1.1 kV	< 1.2 kV / <1.5 kV (L-N, N-E)
Impulse sparkover voltage	–	<1.2 kV (N-E)
Maximum discharge current (per mode) I_{max}[3]	40 kA (P-N, P-E)	40 kA (P-N, P-E)
Type 3 (BS EN/EN), Class II (IEC)		
Nominal voltage - Phase-Neutral U_{oc}[5]	6 kV	6 kV
Let-through voltage U_p at U_{oc}[4]	600 V	600 V / 1200 V (L-N, N-E)

Mechanical specification	ESP 240CD40	ESP 415CD40
Temperature range[6]	-40 to +80 °C	-40 to +80 °C
Connection type	Screw terminal	Screw terminal
Conductor size (stranded)	35 mm²	35 mm²
Earth connection	Screw terminal - maximum torque 4.5 Nm	Screw terminal - maximum torque 4.5 Nm
Degree of protection (IEC 60529)	IP20	IP20
Volt free contact	Connect via screw terminal with conductor up to 1.5 mm² (stranded) - maximum torque 0.25 Nm	Connect via screw terminal with conductor up to 1.5 mm² (stranded) - maximum torque 0.25 Nm
Case material	FR Polymer UL-94 V-0	FR Polymer UL-94 V-0
Weight	0.25 kg	0.4 kg
Dimensions to DIN 43880 - HxDxW[7]	90 mm x 88 mm x 36 mm (2TE)	90 mm x 88 mm x 72 mm (4TE)

[1] Temporary Overvoltage (in the absence of surges) to UL 1449 table 37.1 and BS EN/IEC 61643-1, rated for 5 seconds and 120 minutes phase to neutral/ earth, 1200V TOV withstand for 200ms (N-E).
[2] Minimum permissible load is 5 V DC, 10 mA to ensure reliable operation.
[3] Tested with 8/20 µs waveshape to BS EN/IEC 61643-1 Class II test. The electrical system, external to the unit, may constrain the actual current rating achieved in a particular installation.
[4] The maximum transient let-through voltage throughout the test (±10%).
[5] 6 kV 1.2/50 µs open circuit voltage, 3 kA 8/20 µs short circuit current test to BS EN/IEC 61643-11 Class III test, and UL 1449, IEEE C62.41:2002 (Parts 1&2).
[6] Temperature range of SPD within a 20°C ambient temperature. An increase in ambient temperature will de-rate the SPD upper temperature limit accordingly.
[7] The remote signal contact (removable) adds 10 mm to height.



Mains power protection

ESP 5A/BX & 16A/BX Series

*NOTE: product label design may vary.

Combined Type 2 and 3 tested protector (to BS EN 61643) for use on low current (up to 5 or 16 A) single phase systems to protect connected electronic equipment from transient overvoltages on the mains supply, e.g. fire/intruder alarm panels. Protectors with /BX suffix come ready-boxed, to IP66, for use in dirty or damp environments. Available for 90-150 Volts, 200-280 Volts and 232-350 Volts supplies. For use at boundaries LPZ 1 through to LPZ 3 to protect sensitive electronic equipment.

FULL MODE Bonding + Equipment Protection

MAINS TEST TYPE 2 + 3

ENHANCED Low let-through voltage

LPZ 1→3

BX IP66

Features & benefits

- Very low let-through voltage (enhanced protection to IEC/BS EN 62305) between all sets of conductors (phase to neutral, phase to earth, neutral to earth - Full Mode protection) allowing continuous operation of equipment
- Repeated protection in lightning intense environments
- Compact size for easy incorporation in the protected system
- Removable DIN rail foot for simple clip-on mounting to top hat DIN rails (unboxed versions)
- Maintenance free
- Colour coded terminals give a quick and easy installation check - grey for the dirty (line) end and green for the clean end
- Available ready-boxed to IP66 for use in dirty or damp environments (protectors with /BX suffix)
- Robust housing and substantial earth stud fixing holes ready for flat mounting
- ESP 240-5A/BX has Network Rail Approval PA05/02896. NRS PADS reference 087/037285

Installation

Connect in-line with the power supply usually either within the equipment panel (or for CCTV cameras, in an enclosure close by), or on the fused connection that supplies equipment.

To protect equipment inside a building from transients entering on an outgoing feed (e.g. to CCTV cameras or to site lighting) the protector should be installed as close to where the cable leaves the building as possible.
Unless ready boxed, protectors should be installed either within an existing cabinet/cubicle or in a separate enclosure.

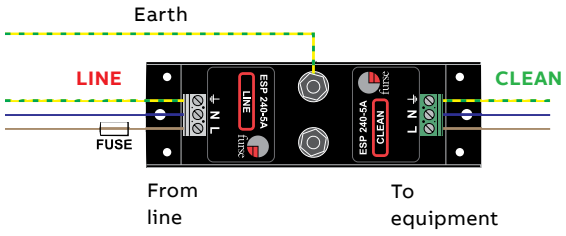
Accessories

If several **ESP 120-5A** or **16A**, **ESP 240-5A** or **16A** or **ESP 277-5A** or **16A** protectors are to be installed together, or if one is in use alongside Lightning Barriers for video or signal lines, these can be simultaneously mounted and earthed on a CME kit and housed in a suitable WBX enclosure.

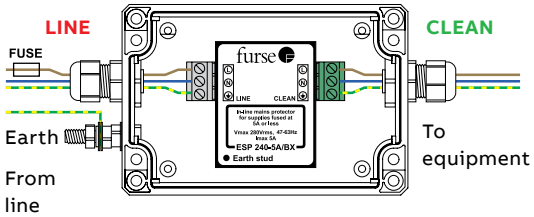
Application

Use these protectors on low current mains power supplies, e.g. CCTV cameras, alarm panels and telemetry equipment.

Connect in-line on supplies fused up to 5 A (ESP 120-5A/BX, ESP 240-5A/BX or ESP 277-5A/BX) or 16 A (ESP 120-16A/BX, ESP 240-16A/BX or ESP 277-16A/BX). Note how the protector can also be earthed from its earth stud.



Connect in-line on supplies fused up to 5 A (ESP 120-5A, ESP 240-5A or ESP 277-5A) or 16 A (ESP 120-16A, ESP 240-16A or ESP 277-16A). Note how the protector can also be earthed from its earth stud.



NOTE: If your supply is fused at more than 16 Amps the ESP 120 M1, ESP 240 M1 or ESP 277 M1 are suitable.

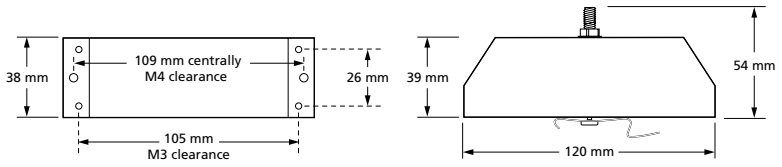
ESP 5A/BX & 16A/BX Series - Technical specification

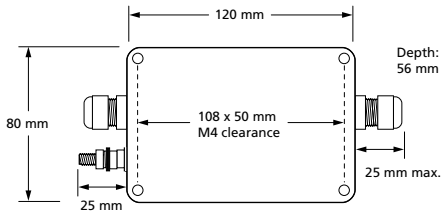
Electrical specification	ESP 120-5A ESP 120-5A/BX	ESP 120-16A ESP 120-16A/BX	ESP 240-5A ESP 240-5A/BX	ESP 240-16A ESP 240-16A/BX	ESP 277-5A ESP 277-5A/BX	ESP 277-16A ESP 277-16A/BX
ABB order code	7TCA085460R0066 7TCA085460R0067	7TCA085460R0064 7TCA085460R0065	7TCA085460R0083 7TCA085460R0084	7TCA085460R0080 7TCA085460R0081	7TCA085460R0095 7TCA085460R0348	7TCA085460R0093 7TCA085460R0094
Nominal voltage - Phase-Neutral U_o (RMS)	120 V	120 V	240 V	240 V	277 V	277 V
Maximum voltage - Phase-Neutral U_c (RMS)	150 V	150 V	280 V	280 V	350 V	350 V
Short circuit withstand capability	3 kA/50 Hz					
Temporary Overvoltage TOV U_T[1]	175 V / 229 V	175 V / 229 V	337 V / 442 V	337 V / 442 V	403 V / 529 V	403 V / 529 V
Working voltage (RMS)	90-150 V	90-150 V	200-280 V	200-280 V	232-350 V	232-350 V
Frequency range	47-63 Hz					
Current rating (supply)	5 A or less	16 A or less	5 A or less	16 A or less	5 A or less	16 A or less
Max. back-up fuse (see installation instructions)	≤ 5 A	≤ 16 A	≤ 5 A	≤ 16 A	≤ 5 A	≤ 16 A
Leakage current (to earth)	< 0.5 mA					

Transient specification	120 Volt protectors	240 Volt protectors	277 Volt protectors
Type 2 (BS EN/EN), Class II (IEC)			
Nominal discharge current 8/20 µs (per mode) I_n	5 kA		
Let-through voltage U_p at I_n[2]	450 V	750 V	790 V
Maximum discharge current I_{max} (per mode)[3]	10 kA		
Type 3 (BS EN/EN), Class III (IEC)			
Let-through voltage at U_{OC} of 6 kV 1.2/50 µs and I_{SC} of 3 kA 8/20 µs (per mode)[2,4]	400 V	600 V	680 V

Electrical specification	ESP 120-5A ESP 120-5A/BX	ESP 120-16A ESP 120-16A/BX	ESP 240-5A ESP 240-5A/BX	ESP 240-16A ESP 240-16A/BX	ESP 277-5A ESP 277-5A/BX	ESP 277-16A ESP 277-16A/BX
Temperature range	-40 to +80 °C					
Connection type	Screw terminal - maximum torque 0.5 Nm					
Conductor size (stranded)	4 mm²					
Earth connection	Via M6 stud or earth terminal - maximum torque 0.5 Nm					
Cable glands	–			5A/BX 4.8-8 mm cable (PG9) 16A/BX 8-12 mm cable (PG13.5)		
Degree of protection (IEC 60529)	IP20			IP66		
Case material	Steel			PVC		
Weight	0.23 kg			0.26 kg		
Dimensions	See diagrams below					

[1] Temporary Overvoltage TOV rating is for durations of 5 seconds (withstand) and 120 minutes (safe fail) tested to BS EN/IEC 61643.
[2] The maximum transient voltage let-through of the protector throughout the test (±10%), phase to neutral, phase to earth and neutral to earth.
[3] The electrical system, external to the unit, may constrain the actual current rating achieved in a particular installation.
[4] Combination wave test within IEC/BS EN 61643, IEEE C62.41-2002 Location Cats C1 & B3, SS 555:2010, AS/NZS 1768-2007, UL 1449 mains wire-in.





Mains power protection

ESP MC Series

*NOTE: product label design may vary.

Combined Type 2 and 3 tested protector (to BS EN 61643) with telecom or network protection options. Suitable for use on 220/230/240 Volts supplies. Available with British style (three square pin) plugs and sockets with double-pole action. For use at boundaries LPZ 1 through to LPZ 3 to protect sensitive electronic equipment.

FULL MODE Bonding + Equipment Protection | SIGNAL/ TELECOM TEST CAT D + C + B | MAINS TEST TYPE 2 + 3

ENHANCED Low let-through voltage | LPZ 1→3

Features & benefits

- Low let-through voltage between all sets of conductors
- Three way visual indication of protection status
- Protects against radio frequency interference
- TN and Cat-5e versions can conveniently protect both mains and telecom/data lines in one unit
- Rugged, heavy duty construction
- Bracket kit ESP MC/19BK available for rear or 19” rack mounting
- Maintenance free

Installation

Simply plug the ESP MC series into the mains and your equipment into the ESP MC.

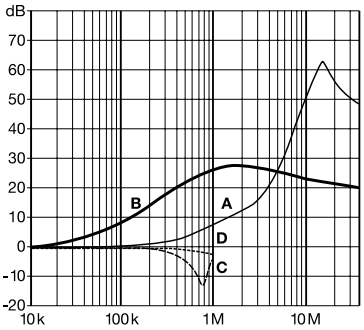
Application

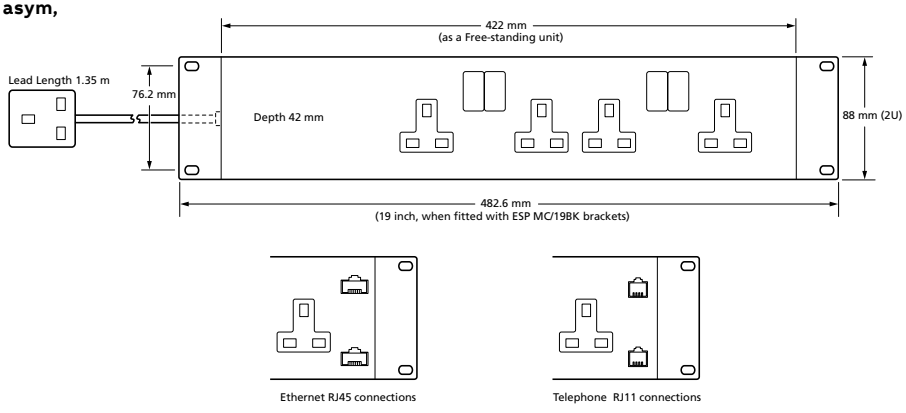
ESP MC series can be used to protect all sorts of plug-in equipment, including hospital laboratory equipment, modems, fax machines and PCs.

Accessories

ESP MC/19BK bracket kit can be used for rear mounting, or reversed for use in 19” cabinets. All fixings supplied.
ABB Order code:
7TCA085460R0034

RFI performance
Per CISPR 17: A = 50 Ω/50 Ω sym, B = 50 Ω/50 Ω asym, C = 0.1 Ω/100 Ω sym, D = 100 Ω/0.1 Ω sym





NOTE: For wire-in applications up to 16 amps, the ESP 16A/BX Series may be more suitable. For all other supplies, consider the ESP M1 Series.

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ESP MC Series - Technical specification

Electrical specification - mains	ESP MC	ESP MC/TN/RJ11	ESP MC/Cat-5e
ABB order code	7TCA085430R0003	7TCA085430R0005	7TCA085430R0004
Nominal voltage - Phase-Neutral U_o (RMS)	220/230/240 V		
Maximum voltage - Phase-Neutral U_c (RMS)	280 V		
Frequency range	47-63 Hz		
Current rating (supply)	13 A		
Leakage current (to earth)	< 0.5 mA		

Electrical specification - telecom/data	ESP MC	ESP MC/TN/RJ11	ESP MC/Cat-5e
Nominal voltage	–	296 V	5 V
Maximum working voltage U_c[1]	–	296 V	5 V[2]
Current rating (signal)	–	300 mA	300 mA
In-line resistance (per line ±10%)	–	4.4 Ω	1 Ω
Bandwidth (-3 dB 50 Ω system)	–	20 MHz	–
Maximum data rate	–	–	100 Mbps

Transient specification - mains	ESP MC	ESP MC/TN/RJ11	ESP MC/Cat-5e
Type 2 (BS EN/EN), Class II (IEC)			
Nominal discharge current 8/20 µs (per mode) I_n	5 kA		
Let-through voltage U_p at I_n[3]	850 V		
Maximum discharge current I_{max} (per mode)[4]	10 kA		
Type 3 (BS EN/EN), Class III (IEC)			
Let-through voltage at U_{oc} of 6 kV 1.2/50 µs and I_{sc} of 3 kA 8/20 µs (per mode)[3,5]	680 V		
Let-through voltage at U_{oc} of 6 kV 1.2/50 µs and I_{sc} of 500 A 8/20 (per mode)[3,5]	555 V		

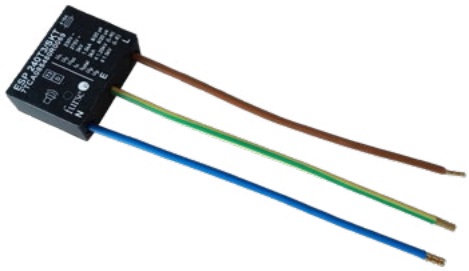
Transient specification - telecom/data	ESP MC	ESP MC/TN/RJ11	ESP MC/Cat-5e
Let-through voltage (all conductors)[6] U_p			
C2 test 4 kV 1.2/50 µs, 2 kA 8/20 µs to BS EN/EN/IEC 61643-21 - line to line / line to earth	–	390 V/390 V	120 V/700 V[8]
C1 test 1 kV, 1.2/50 µs, 0.5 kA 8/20 µs to BS EN/EN/IEC 61643-21 - line to line / line to earth	–	395 V/395 V	74 V/600 V[8]
B2 test 4 kV 10/700 µs to BS EN/EN/IEC 61643-21 - line to line / line to earth	–	295 V/295 V	21 V/550 V[8]
5 kV, 10/700 µs[7] - line to line / line to earth	–	300 V/300 V	25 V/600 V[8]
Maximum surge current[9]			
D1 test 10/350 µs to BS EN/EN/IEC 61643-21	–	1 kA	1 kA
8/20 µs to ITU (formerly CCITT), BS 6651:1999 Appendix C	–	10 kA	10 kA

Mechnical specification	ESP MC	ESP MC/TN/RJ11	ESP MC/Cat-5e
Temperature range[10]	-40 °C to +80 °C		
Connection type	Via British style three square pin plug and socket to BS 1363		
Conductor size (solid)	–	RJ11	RJ45
Earth connection	Via plug and socket		
Case material	Steel		
Weight	1.70 kg	1.75 kg	1.75 kg

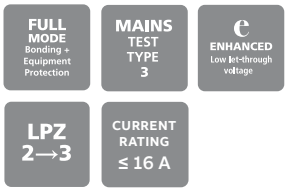
[1] Maximum working voltage (DC or AC peak) of telecom/data protection measured at <10 µA leakage for ESP MC/TN/RJ11 and 1 mA for ESP MC/Cat-5e.
[2] Maximum working voltage is 5 V for data pairs 1/2 & 3/6.
[3] The maximum transient voltage let-through of the protector throughout the test (±10%), phase to neutral, phase to earth and neutral to earth.
[4] The electrical system, external to the unit, may constrain the actual current rating achieved in a particular installation.
[5] Combination wave test within IEC/BS EN 61643, IEEE C62.41-2002 Location Cats C1 & B3, SS 555:2010, AS/NZS 1768-2007, UL 1449 mains wire-in.
[6] The maximum transient voltage let-through the protector throughout the test (±10%), line to line & line to earth. Response time < 10 ns.
[7] Test to IEC/BS EN 61643, IEC 61000-4-5:2006, ITU-T (formerly CCITT) K.20, K.21 and K.45, Telcordia GR-1089-CORE, Issue 2:2002, ANSI TIA/EIA/IS-968-A:2002 (formerly FCC Part 68).
[8] The interfaces used in Cat-5/5e systems incorporate an isolation transformer that inherently provides an inbuilt immunity to transients between line and earth of 1,500 Volts or more.
[9] The installation and connectors external to the protector may limit the capability of the protector.
[10] Temperature range of SPD within a 20°C ambient temperature. An increase in ambient temperature will de-rate the SPD upper temperature limit accordingly.

Mains power protection

ESP 240T3/SKT



*NOTE: product label design may vary.



Type 3 tested protector (to BS EN 61643) for use on low current (up to 16 A) single phase systems to protect connected electronic equipment from transient overvoltages on the mains supply, e.g. fire/intruder alarm panels. Available for supplies up to 275V. For use at boundaries LPZ 2 through to LPZ 3 to protect sensitive electronic equipment.

Features & benefits

- Low let-through voltage (enhanced protection to IEC/BS EN 62305) between all sets of conductors (phase to neutral, phase to earth, neutral to earth - Full Mode protection) allowing continuous operation of equipment
- Repeated protection in lightning intense environments
- Compact size for easy incorporation in the protected system
- Adhesive double-sided pad supplied, to secure in position within the application
- Colour coded wires make for simple connection
- Thermal protection technology, for safe disconnection under fault conditions
- Audible buzzer warns of loss of protection due to fault
- Maintenance free

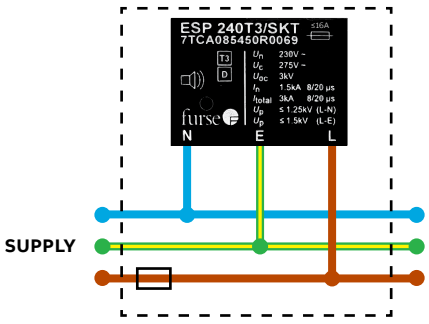
Installation

Connect in parallel (spur) with the power supply usually either within the equipment panel, or behind the socket-outlet.

To protect localized equipment inside the building from transients that could disrupt operation the protector should be installed directly at the socket-outlet.

Application

Use these protectors on low current mains power supplies, e.g. CCTV cameras, alarm panels and telemetry equipment.



NOTE: If your supply is fused at more than 16 Amps the ESP 240D-32A or ESP 240DS-32A units are suitable, or above 32A then consider the parallel-connected ESP 240D1.

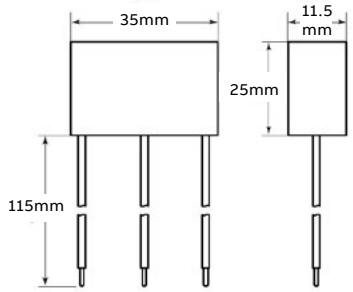
ESP 240T3/SKT - Technical specification

Electrical specification	ESP 240T3/SKT
ABB order code	7TCA085450R0069
Nominal voltage - Phase-Neutral U_o (RMS)	230 V
Maximum voltage - Phase-Neutral U_c (RMS)	275 V
Temporary overvoltage (TOV) withstand 5s	335 V
Working voltage (RMS)	200-275 V
Frequency range	47-63 Hz
Current rating (supply)	16 A or less
Max. back-up fuse (see installation instructions)	≤ 16 A
Leakage current (to earth)	Zero

Transient specification	ESP 240T3/SKT
Type 3 (BS EN/EN), Class III (IEC)	
Let-through voltage U_p at U_{oc} of 3 kV 1.2/50 µs and I_{sc} of 1.5 kA 8/20 µs (per mode)[1,3]	<1.25, 1.5 kV
Total discharge current 8/20 µs I_{total} (L+N-PE)[2]	3 kA

Mechanical specification	ESP 240T3/SKT
Temperature range	-40 to +80 °C
Connection type	Via 115 mm long cables, coloured brown, blue and green/yellow
Conductor size (stranded)	1 mm² / 17 AWG
Earth connection	Via 115 mm long cable coloured green/yellow
Degree of protection (IEC 60529)	IP20
Fault indication	Acoustic (buzzer)
Case material	FR Polymer UL-94 V-0
Weight	0.20 kg
Dimensions	See diagrams below

[1] The maximum transient voltage let-through of the protector throughout the test, L-N , L/N-PE.
[2] The electrical system, external to the unit, may constrain the actual current rating achieved in a particular installation.
[3] Combination wave test within IEC/BS EN 61643, IEEE C62.41-2002 Location Cats C1 & B3, SS 555:2010, AS/NZS 1768-2007, UL 1449 mains wire-in.



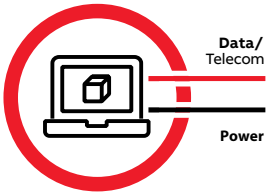
Data & signal protection

The Furse ESP data/telecom range of SPDs are designed to protect equipment connected to data & telephone lines to complement the ESP power SPD products and offer a complete system protection solution (power & data) against surges. The comprehensive range includes protection for twisted pair data lines (including hazardous environments), computer networks, telecom systems including PBX and ISDN, CCTV, TV and RF systems.

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	 **ESP RS485 or ESP SRS485/PT** Multiple Lines 7TCA085400R0191 7TCA085400R0647	Screw/Spring terminals:	 **ESP RS485Q or ESP RS485Q/PT** 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	 **ESP SL TNL** Slim Mount with LED 7TCA085400R0226	 **ESP STN or ESP STN/PT** Slim Mount 7TCA085400R0652 7TCA085400R0653	Screw/Spring terminals:	 **ESP TNQ or ESP TNQ/PT** Multiple Lines 7TCA085400R0183 7TCA085400R0472 (spring "Push Terminal" PT version)
2 wire systems (30 V)	Screw terminals:	 **ESP 30E** Flat Mount 7TCA085400R0104	 **ESP SL30** Slim Mount 7TCA085400R0067	 **ESP 30SD or ESP 30SE** Slim Mount 7TCA085400R0099 7TCA085400R0104	Screw/Spring terminals:	 **ESP 30Q or ESP 30Q/PT** Multiple Lines 7TCA085400R0107 7TCA085400R0476 (spring "Push Terminal" PT version)	Protection for different voltages are available
Resistance Temperature Detectors (RTD) 3 wire systems	Screw terminals:	 **ESP RTD** Flat/DIN Mount 7TCA085460R0157	 **ESP SL RTD** Slim (DIN Mount) 7TCA085400R0232	Screw/Spring terminals:	 **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:	 **ESP 30Q or ESP 30Q/PT** 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.

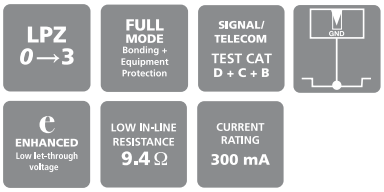
Furse data and signal SPD products are Class D+C+B tested (to IEC/BS EN 61643-21), making them suitable for installation at the service entrance, whilst giving superior voltage protection levels (enhanced to BS EN 62305) between all conductors or modes.
Furse data and signal SPDs come in a variety of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

Data and signal protection

ESP D & TN Series

*NOTE: product label design may vary.

Combined Category D, C, B tested protector (to BS EN 61643) suitable for most twisted pair signalling applications. Available for working voltages of up to 6, 15, 30, 50 and 110 Volts. ESP TN suitable for Broadband, POTS, dial-up, T1/E1, lease line and *DSL telephone applications. For use at boundaries up to LPZ 0 to protect against flashover (typically the service entrance location) through to LPZ 3 to protect sensitive electronic equipment.



Features & benefits

- Very low let-through voltage (enhanced protection to IEC/BS EN 62305) between all lines - Full Mode protection
- Full Mode design capable of handling partial lightning currents as well as allowing continual operation of protected equipment
- Repeated protection in lightning intense environments
- Low in-line resistance minimises unnecessary reductions in signal strength
- Strong, flame retardant, ABS housing
- Supplied ready for flat mounting on base or side
- Built-in DIN rail foot for simple clip-on mounting to top hat DIN rails
- Colour coded terminals give a quick and easy installation check - grey for the dirty (line) end and green for the clean end
- Screen terminal enables easy connection of cable screen to earth
- Substantial earth stud to enable effective earthing
- Integral earthing plate for enhanced connection to earth via a CME kit
- ESP 06D and ESP 50D have PADS reference 086/000551 (ESP 06D) and 086/000553 (ESP 50D)
- ESP TN is suitable for telecommunication applications in accordance with Telcordia and ANSI Standards (see Application Note AN005)

Installation

Connect in series with the data communication or signal line either near where it enters or leaves the building or close to the equipment being protected (e.g. within its control panel). Either way, it must be very close to the system's earth star point. Install protectors either within an existing cabinet/ cubicle or in a separate enclosure.

Application

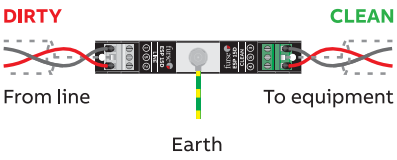
Use on twisted pair lines, e.g. those found in process control equipment, modems and computer communications interfaces.

Accessories

Combined Mounting/Earthing kits:
CME 4 Mount & earth up to 4 protectors
CME 8 Mount & earth up to 8 protectors
CME 16 Mount & earth up to 16 protectors
CME 32 Mount & earth up to 32 protectors

Weatherproof enclosures:
WBX 2/G
For use with up to 2 protectors
WBX 3, WBX 3/G
For use with up to 3 protectors
WBX 4, WBX 4/GS
For use with a CME 4 and up to 4 protectors
WBX 8, WBX 8/GS
For use with a CME 8 and up to 8 protectors
WBX 16/2/G
For use with one or two CME 16 and up to 32 protectors

Install in series (in-line)



NOTE: Derivatives of these protectors are available ready-boxed to IP66, for use in damp or dirty environments. Slim Line (ESP SL) and PCB mount (ESP PCB) versions are also available. If your system requires a protector with a very low resistance or higher current, see the ESP E & H Series. Also use the ESP E Series for systems needing a higher bandwidth. Protectors for 3-wire (ESP SL/3W) and RTD (ESP RTD, ESP SL RTD) are available, as are the space saving protectors (ESP Q, ESP SL Series). The ESP KT and TN Series are additional protectors specifically for telephone lines. The ESP KS Series are protectors for data and signal lines on an LSA-PLUS module.

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ESP D & TN Series - Technical specification

Electrical specification	ESP 06D	ESP 15D	ESP 30D	ESP 50D	ESP 110D	ESP TN
ABB order code	7TCA085400R0079	7TCA085400R0089	7TCA085400R0099	7TCA085400R0109	7TCA085400R0005	7TCA085400R0171
Nominal voltage[1]	6 V	15 V	30 V	50 V	110 V	–
Maximum working voltage U_c (DC)[2]	7.79 V	19 V	37.1 V	58 V	132 V	296 V
Maximum working voltage U_c (AC RMS)	5 V	13 V	26 V	41 V	93 V	–
Current rating (signal)	300 mA					
In-line resistance (per line ±10%)	10 Ω	10 Ω	10 Ω	10 Ω	10 Ω	4.4 Ω
Bandwidth (-3 dB 100 Ω system)	500 kHz	1.4 MHz	3 MHz	5.5 MHz	13 MHz	20 MHz

Transient specification	ESP 06D	ESP 15D	ESP 30D	ESP 50D	ESP 110D	ESP TN
Let-through voltage (all conductors) U_p[3]						
C2 test 4 kV 1.2/50 µs, 2 kA 8/20 µs to BS EN/EN/IEC 61643-21	12.0 V	25.0 V	44.0 V	78.0 V	155 V	395 V
C1 test 1 kV, 1.2/50 µs, 0.5 kA 8/20 µs to BS EN/EN/IEC 61643-21	11.5 V	24.5 V	43.5 V	76.0 V	150 V	390 V
B2 test 4 kV 10/700 µs to BS EN/EN/IEC 61643-21	10.0 V	23.0 V	42.5 V	73.0 V	145 V	298 V
5 kV, 10/700 µs[4]	10.5 V	23.8 V	43.4 V	74.9 V	150 V	300 V
Maximum surge current						
D1 test 10/350 µs to BS EN/EN/IEC 61643-21: – Per signal wire	2.5 kA					
– Per pair	5 kA					
8/20 µs to ITU-T K.45:2003, IEEE C62.41.2:2002: – Per signal wire	10 kA					
– Per pair	20 kA					

Mechanical specification	ESP 06D	ESP 15D	ESP 30D	ESP 50D	ESP 110D	ESP TN
Temperature range	-40 to +80 °C					
Connection type	Screw terminal - maximum torque 0.5 Nm					
Conductor size (stranded)	2.5 mm²					
Earth connection	M6 stud					
Case material	FR Polymer UL-94 V-0					
Weight	0.08 kg					
Dimensions	See diagram below					

[1] Nominal voltage (DC or AC peak) measured at < 5 µA (ESP 15D, ESP 30D, ESP 50D, ESP 110D) and <200 µA (ESP 06D).
[2] Maximum working voltage (DC or AC peak) measured at < 1 mA leakage (ESP 15D, ESP 30D, ESP 50D, ESP 110D), < 10 mA (ESP 06D) and < 10 µA (ESP TN).
[3] The maximum transient voltage let-through of the protector throughout the test (±10%), line to line & line to earth, both polarities. Response time < 10 ns.
[4] Test to IEC 61000-4-5:2006, ITU-T (formerly CCITT) K.20, K.21 and K.45,Telcordia GR-1089-CORE, Issue 2:2002, ANSI TIA/EIA/IS-968-A:2002 (formerly FCC Part 68).

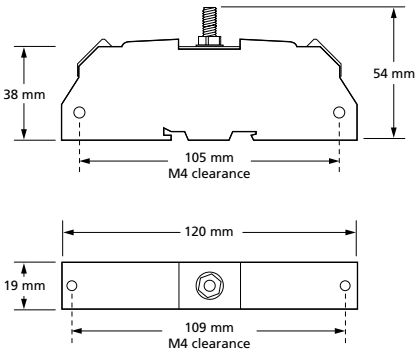

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ABB order codes

Part	ABB order code	Part	ABB order code	Part	ABB order code
CME4	7TCA085400R0001	**CME8**	7TCA085400R0002	**CME16**	7TCA085410R0002
CME32	7TCA085410R0003	**WBX 2/G**	7TCA085410R0022	**WBX 3**	7TCA085410R0023
WBX 3/G	7TCA085410R0024	**WBX 4**	7TCA085410R0027	**WBX 4/GS**	7TCA085410R0028
WBX 8	7TCA085410R0030	**WBX 8/GS**	7TCA085410R0031	**WBX 16/2/G**	7TCA085410R0020

Data and signal protection

ESP E Series

*NOTE: product label design may vary.

Combined Category D, C, B tested protector (to BS EN 61643) suitable for twisted pair signalling applications which require either a lower in-line resistance, an increased current or a higher bandwidth than the ESP D Series. Also suitable for DC power applications less than 1.25 Amps. Available for working voltages of up to 6, 15, 30, 50, 110 and 180 Volts. For use at boundaries up to LPZ 0 to protect against flashover (typically the service entrance location) through to LPZ 3 to protect sensitive electronic equipment.

Features & benefits

- Very low let-through voltage (enhanced protection to IEC/BS EN 62305) between all lines - Full Mode protection
- Full Mode design capable of handling partial lightning currents as well as allowing continual operation of protected equipment
- Repeated protection in lightning intense environments
- Very low (1 Ω) in-line resistance allows resistance critical applications (e.g. alarm loops) to be protected
- High (1.25 A) maximum running current
- High bandwidth enables higher frequency (high traffic or bit rate) data communications
- Screen terminal enables easy connection of cable screen to earth
- Strong, flame retardant, ABS housing
- Built-in DIN rail foot for simple clip-on mounting to top hat DIN rails
- Colour coded terminals give a quick and easy installation check - grey for the dirty (line) end and green for clean
- Substantial earth stud to enable effective earthing
- Supplied ready for flat mounting on base or side
- Integral earthing plate for enhanced connection to earth via CME kit
- ESP 06E and ESP 15E have Network Rail Approval PA05/02047. NRS PADS reference 086/000201 (ESP 06E) and 086/000200 (ESP 15E)

Installation

Connect in series with the data communication or signal line either near where it enters or leaves the building or close to the equipment being protected (e.g. within its control panel). Either way, it must be very close to the system's earth star point. Install protectors either within an existing cabinet/ cubicle or in a separate enclosure.

Application

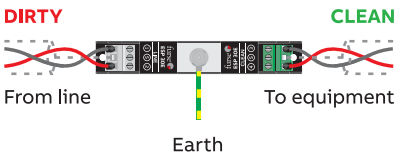
Use these units to protect resistance sensitive, higher frequency or running current systems, e.g. high speed digital communications equipment or systems with long signal lines.

Accessories

Combined Mounting/Earthing kits:
CME 4 Mount & earth up to 4 protectors
CME 8 Mount & earth up to 8 protectors
CME 16 Mount & earth up to 16 protectors
CME 32 Mount & earth up to 32 protectors

Weatherproof enclosures:
WBX 2/G
For use with up to 2 protectors
WBX 3, WBX 3/G
For use with up to 3 protectors
WBX 4, WBX 4/GS
For use with a CME 4 and up to 4 protectors
WBX 8, WBX 8/GS
For use with a CME 8 and up to 8 protectors
WBX 16/2/G
For use with one or two CME 16 and up to 32 protectors

Install in series (in-line)



NOTE: Slim Line (ESP SL) and PCB mount (ESP PCB) are available. For many twisted pair data and signal applications, the lower cost ESP D Series may be suitable. For applications requiring higher current (1.25 A to 16 A) or ultra-low in-line resistance, the ESP H Series protectors may be more suitable. For data and signal lines on LSA-PLUS modules, use the ESP KS Series.

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ESP E Series - Technical specification

Electrical specification	ESP 06E	ESP 15E	ESP 30E	ESP 50E	ESP 110E	ESP 180E
ABB order code	7TCA085400R0084	7TCA085400R0095	7TCA085400R0104	7TCA085400R0116	7TCA085400R0007	7TCA085400R0491
Nominal voltage[1]	6 V	15 V	30 V	50 V	110 V	180 V
Maximum working voltage U_c (DC)[2]	7.79 V	16.7 V	36.7 V	56.7 V	132 V	194 V
Maximum working voltage U_c (AC RMS)	5 V	11 V	25 V	40 V	93 V	137 V
Current rating (signal, at 25°C)	1.25 A				0.7 A	0.5 A
In-line resistance (per line ±10%)	1.0 Ω				3.3 Ω	6.8 Ω
Bandwidth (-3 dB 50 Ω system)	45 MHz					

Transient specification		ESP 06E	ESP 15E	ESP 30E	ESP 50E	ESP 110E	ESP 180E
Let-through voltage (all conductors) U_p[3]							
C2 test 4 kV 1.2/50 µs, 2 kA 8/20 µs to BS EN/EN/IEC 61643-21		36.0 V	39.0 V	60.0 V	86.0 V	180 V	217 V
C1 test 1 kV, 1.2/50 µs, 0.5 kA 8/20 µs to BS EN/EN/IEC 61643-21		26.2 V	28.0 V	49.0 V	73.5 V	170 V	216 V
B2 test 4 kV 10/700 µs to BS EN/EN/IEC 61643-21		16.0 V	25.5 V	43.5 V	65.0 V	160 V	216 V
5 kV, 10/700 µs[4]		17.0 V	26.2 V	44.3 V	65.8 V	165 V	217 V
Maximum surge current							
D1 test 10/350 µs to BS EN/EN/IEC 61643-21:	– Per signal wire	2.5 kA					
	– Per pair	5 kA					
8/20 µs to ITU-T K.45:2003, IEEE C62.41.2:2002:	– Per signal wire	10 kA					
	– Per pair	20 kA					

Mechanical specification	ESP 06E	ESP 15E	ESP 30E	ESP 50E	ESP 110E	ESP 180E
Temperature range	-40 to +80 °C					
Connection type	Screw terminal - maximum torque 0.5 Nm					
Conductor size (stranded)	2.5 mm²					
Earth connection	M6 stud					
Case material	FR Polymer UL-94 V-0					
Weight	0.08 kg					
Dimensions	See diagram below					

[1] Nominal voltage (DC or AC peak) measured at < 10 µA (ESP 15E, ESP 30E, ESP 50E, ESP 110E) and < 200 µA (ESP 06E).
[2] Maximum working voltage (DC or AC peak) measured at < 5 mA leakage (ESP 15E, ESP 30E, ESP 50E, ESP 110E) and < 10 mA (ESP 06E).
[3] The maximum transient voltage let-through of the protector throughout the test (±10%), line to line & line to earth, both polarities. Response time < 10 ns.
[4] Test to IEC 61000-4-5:2006, ITU-T (formerly CCITT) K.20, K.21 and K.45,Telcordia GR-1089-CORE, Issue 2:2002, ANSI TIA/EIA/IS-968-A:2002 (formerly FCC Part 68).

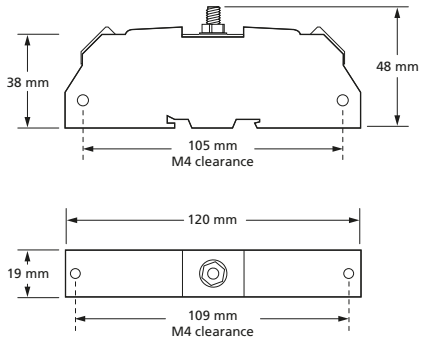

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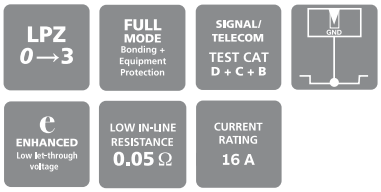
ABB order codes

Part	ABB order code	Part	ABB order code	Part	ABB order code
CME4	7TCA085400R0001	**CME8**	7TCA085400R0002	**CME16**	7TCA085410R0002
CME32	7TCA085410R0003	**WBX 2/G**	7TCA085410R0022	**WBX 3**	7TCA085410R0023
WBX 3/G	7TCA085410R0024	**WBX 4**	7TCA085410R0027	**WBX 4/GS**	7TCA085410R0028
WBX 8	7TCA085410R0030	**WBX 8/GS**	7TCA085410R0031	**WBX 16/2/G**	7TCA085410R0020

Data and signal protection

ESP H Series

*NOTE: product label design may vary.



Combined Category D, C, B tested protector (to BS EN 61643) suitable for twisted pair signalling applications which require either a lower in-line resistance, an increased current than the ESP D or E Series. Also suitable for DC power applications less than 16 Amps. Available for working voltages of up to 6, 15, 30, 50, 110 and 180 Volts. For use at boundaries up to LPZ 0 to protect against flashover (typically the service entrance location) through to LPZ 3 to protect sensitive electronic equipment.

Features & benefits

- Very low let-through voltage (enhanced protection to IEC/BS EN 62305) between all lines - Full Mode protection
- Full Mode design capable of handling partial lightning currents as well as allowing continual operation of protected equipment
- Repeated protection in lightning intense environments
- Ultra-low (< 0.05 Ω) in-line resistance allows resistance critical applications (e.g. alarm loops) to be protected
- Very high (16 A) maximum running current
- Strong, flame retardant ABS housing
- Supplied ready for flat mounting on base or side
- Built-in DIN rail foot for simple clip-on mounting to top hat DIN rails
- Colour coded terminals give a quick and easy installation check - grey for the dirty (line) end and green for clean
- Screen terminal enables easy connection of cable screen to earth
- Substantial earth stud to enable effective earthing
- Integral earth plate enables enhanced connection to earth via CME kit

Installation

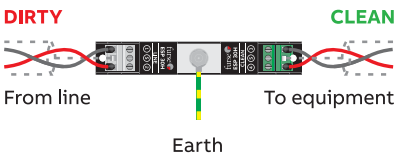
Connect in series with the data communication or signal line either near where it enters or leaves the building or close to the equipment being protected (e.g. within its control panel). Either way, it must be very close to the system's earth star point. Install protectors either within an existing cabinet/ cubicle or in a separate enclosure.

Accessories

Combined Mounting/Earthing kits:
CME 4 Mount & earth up to 4 protectors
CME 8 Mount & earth up to 8 protectors
CME 16 Mount & earth up to 16 protectors
CME 32 Mount & earth up to 32 protectors

Weatherproof enclosures:
WBX 2/G
For use with up to 2 protectors
WBX 3, WBX 3/G
For use with up to 3 protectors
WBX 4, WBX 4/GS
For use with a CME 4 and up to 4 protectors
WBX 8, WBX 8/GS
For use with a CME 8 and up to 8 protectors
WBX 16/2/G
For use with one or two CME 16 and up to 32 protectors

Install in series (in-line)



NOTE: For some data and signal applications with lower current, higher in-line resistance or higher bandwidth requirements, the ESP D or E Series protectors or the Slim Line ESP SL Series may be more suitable. If the protector is to be mounted directly onto a PCB, use the ESP PCB/**D or ESP PCB/**E protectors.

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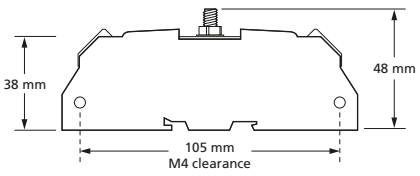
ESP H Series - Technical specification

Electrical specification	ESP 06H	ESP 15H	ESP 30H	ESP 50H	ESP 110H	ESP 180H
ABB order code	7TCA085400R0003	7TCA085400R0009	7TCA085400R0011	7TCA085400R0012	7TCA085400R0008	7TCA085400R0492
Nominal voltage[1]	6 V	15 V	30 V	50 V	110 V	180 V
Maximum working voltage U_c (DC)[2]	7.79 V	16.7 V	36.7 V	56.7 V	132 V	190 V
Maximum working voltage U_c (AC RMS)	5 V	11 V	25 V	40 V	93 V	130 V
Current rating (signal)[4]	16A (25 °C)					
In-line resistance (per line ±10%)	0.05 Ω					
Bandwidth (-3 dB 100 Ω system)	640 KHz	1.75 MHz	4 MHz	1.35 MHz	2.5 MHz	8.8 MHz

Transient specification		ESP 06H	ESP 15H	ESP 30H	ESP 50H	ESP 110H	ESP 180H
Let-through voltage (all conductors) U_p[3]							
C2 test 4 kV, 1.2/50 µs, 2 kA 8/20 µs, line to earth		750 V	750 V	750 V	750 V	850 V	850 V
C1 test 500 V, 1.2/50 µs, 250 A 8/20 µs, line to line		18.0 V	26.0 V	44.0 V	74.0 V	156 V	218 V
B2 test 4 kV 10/700 µs, 100 A 5/310 µs, line to earth		600 V	600 V	600 V	600 V	700 V	700 V
B1 test 1 kV 10/700 µs, 25 A 5/310 µs, line to line		16.0 V	23.0 V	43.0 V	68.0 V	145 V	210 V
C3 test 1 kV/µs, 100 A 10/1000 µs, line to line		10.0 V	22.0 V	46.0 V	79.0 V	160 V	220 V
Maximum surge current							
D1 test 10/350µs	– Per signal wire – I_{total} (total to earth)	2.5 kA 5 kA					
I_n test 8/20µs	– Line to Line – Per line-to-earth – I_{total} (total to earth)	700 A 10 kA 20 kA	500 A	250 A	500 A	350 A	250 A

Mechanical specification	ESP 06H	ESP 15H	ESP 30H	ESP 50H	ESP 110H	ESP 180H
Temperature range	-40 to +80 °C					
Connection type	Screw terminal - maximum torque 0.5 Nm					
Conductor size (stranded)	2.5 mm²					
Earth connection	M6 stud - maximum torque 0.5 Nm					
Case material	FR Polymer UL-94 V-0					
Weight	0.08 kg					
Dimensions	See diagram below					

[1] Nominal voltage (DC or AC peak) measured at < 10 µA (ESP 15H, ESP 30H, ESP 50H, ESP 110H, ESP 180H) and < 200 µA (ESP 06H).
[2] Maximum working voltage (DC or AC peak) measured at < 5 mA leakage (ESP 15H, ESP 30H, ESP 50H, ESP 180H) and < 10 mA (ESP 06H).
[3] The maximum transient voltage let-through of the protector throughout the test (±10%), both polarities. Response time < 10 ns.
[4] Current derates to zero at 85°C.



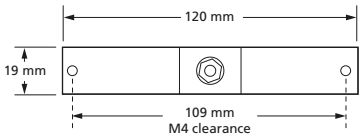


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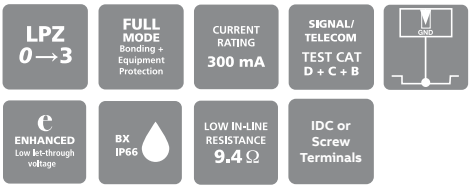
ABB order codes

Part	ABB order code	Part	ABB order code	Part	ABB order code
CME4	7TCA085400R0001	**CME8**	7TCA085400R0002	**CME16**	7TCA085410R0002
CME32	7TCA085410R0003	**WBX 2/G**	7TCA085410R0022	**WBX 3**	7TCA085410R0023
WBX 3/G	7TCA085410R0024	**WBX 4**	7TCA085410R0027	**WBX 4/GS**	7TCA085410R0028
WBX 8	7TCA085410R0030	**WBX 8/GS**	7TCA085410R0031	**WBX 16/2/G**	7TCA085410R0020

Data and signal protection

ESP D/BX Series

*NOTE: product label design may vary.



Combined Category D, C, B tested protector (to BS EN 61643) based on the ESP D Series and ESP TN but ready-boxed to IP66 for use in damp or dirty environments. Suitable for most twisted pair signalling applications. Available for working voltages of up to 6, 15, 30, 50 and 110 Volts. ESP TN suitable for Broadband, POTS, dial-up, T1/E1, lease line and *DSL telephone applications. For use at boundaries up to LPZ 0 to protect against flashover (typically the service entrance location) through to LPZ 3 to protect sensitive electronic equipment.

Features & benefits

- Very low let-through voltage (enhanced protection to IEC/BS EN 62305) between all lines - Full Mode protection
- Full Mode design capable of handling partial lightning currents as well as allowing continual operation of protected equipment
- Repeated protection in lightning intense environments
- Low in-line resistance minimises unnecessary reductions in signal strength
- Ready-boxed to IP66 and supplied ready for flat mounting
- Available with screw terminals or with IDC terminals (by adding /I suffix to part number)
- Colour coded terminals for quick and easy installation check - grey for the dirty (line) end and green for clean
- Screen terminal enables easy connection of cable screen to earth
- Substantial earth stud to enable effective earthing
- ESP TN/BX and ESP TN/2BX are suitable for telecommunication applications in accordance with Telcordia and ANSI Standards (see Application Note AN005)
- Supplied as standard with screw terminals - for IDC terminals order part code plus /I (e.g. ESP TN/BX/I)
- ESP TN/BX has Network Rail Approval PA05/02877. NRS PADS reference 087/037286

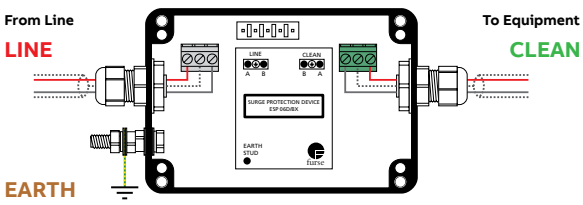
Installation

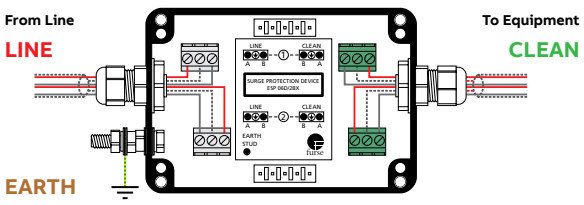
Connect in series with the data communication, signal or telephone line either near where it enters/leaves the building or close to the equipment being protected. Either way, it must be very close to the system's earth star point.

Application

Use these ready-boxed protectors on twisted pair lines in dirty or damp environments. For two wire lines, use /BX versions. For four wire lines, use /2BX versions.

Install in series (in-line)





NOTE: For installation in the equipment panel, protectors which are not boxed may be more suitable. If your system requires a protector with a very low resistance, higher current or higher bandwidth use the ESP E or H Series. Unboxed protectors for 3-wire RTD systems are available - as are plug-in protectors for telephone lines and compact Slim Line protectors.

ESP D/BX Series - Technical specification

Electrical specification	ESP 06D/BX ESP 06D/2BX	ESP 15D/BX ESP 15D/2BX	ESP 30D/BX ESP 30D/2BX	ESP 50D/BX ESP 50D/2BX	ESP 110D/BX ESP 110D/2BX	ESP TN/BX ESP TN/2BX
Nominal voltage[1]	6 V	15 V	30 V	50 V	110 V	–
Maximum working voltage U_c (DC)[2]	7.79 V	19 V	37.1 V	58 V	132 V	296 V
Maximum working voltage U_c (AC RMS)	5 V	13 V	26 V	41 V	93 V	–
Current rating (signal)	300 mA					
In-line resistance (per line ±10%)	9.4 Ω	9.4 Ω	9.4 Ω	9.4 Ω	9.4 Ω	4.4 Ω
Bandwidth (-3 dB 50 Ω system)	800 kHz	2.5 MHz	4 MHz	6 MHz	9 MHz	20 MHz
Transient specification	**ESP 06D/BX ESP 06D/2BX**	**ESP 15D/BX ESP 15D/2BX**	**ESP 30D/BX ESP 30D/2BX**	**ESP 50D/BX ESP 50D/2BX**	**ESP 110D/BX ESP 110D/2BX**	**ESP TN/BX ESP TN/2BX**
Let-through voltage (all conductors) U_p[3]						
C2 test 4 kV 1.2/50 µs, 2 kA 8/20 µs to BS EN/EN/IEC 61643-21	12.0 V	25.0 V	44.0 V	78.0 V	155 V	395 V
C1 test 1 kV, 1.2/50 µs, 0.5 kA 8/20 µs to BS EN/EN/IEC 61643-21	11.5 V	24.5 V	43.5 V	76.0 V	150 V	390 V
B2 test 4 kV 10/700 µs to BS EN/EN/IEC 61643-21	10.0 V	23.0 V	42.5 V	73.0 V	145 V	298 V
5 kV, 10/700 µs[4]	10.5 V	23.8 V	43.4 V	74.9 V	150 V	300 V
Maximum surge current						
D1 test 10/350 µs to BS EN/EN/IEC 61643-21: – Per signal wire	2.5 kA					
D1 test 10/350 µs to BS EN/EN/IEC 61643-21: – Per pair	5 kA					
8/20 µs to ITU-T K.45:2003, IEEE C62.41.2:2002: – Per signal wire	10 kA					
8/20 µs to ITU-T K.45:2003, IEEE C62.41.2:2002: – Per pair	20 kA					
Mechanical specification	**ESP 06D/BX ESP 06D/2BX**	**ESP 15D/BX ESP 15D/2BX**	**ESP 30D/BX ESP 30D/2BX**	**ESP 50D/BX ESP 50D/2BX**	**ESP 110D/BX ESP 110D/2BX**	**ESP TN/BX ESP TN/2BX**
Temperature range	-40 to +80 °C					
Connection type	Screw terminal - maximum torque 0.5 Nm (for IDC terminal use part number with added suffix /I)					
Conductor size (stranded)	1.5 mm²					
Earth connection	M6 stud - maximum torque 0.5 Nm					
Cable glands	Accommodate 2.3-6.7 mm diameter cable (PG7)					
Degree of protection (IEC 60529)	M6 stud					
Case material	PVC					
Weight	0.3 kg					
Dimensions	See diagram below					

[1] Nominal voltage (DC or AC peak) measured at < 10 µA (ESP 15D/BX, ESP 15D/2BX, ESP 30D/BX, ESP 30D/2BX, ESP 50D/BX, ESP 50D/2BX, ESP 110D/BX, ESP 110D/2BX) and < 200 µA (ESP 06D/BX & ESP 06D/2BX), and /I variants.

[2] Maximum working voltage (DC or AC peak) measured at < 1 mA leakage (ESP 15D/BX, ESP 15D/2BX, ESP 30D/BX, ESP 30D/2BX, ESP 50D/BX, ESP 50D/2BX, ESP 110D/BX, ESP 110D/2BX), < 10 mA (ESP 06D/BX, ESP 06D/2BX) and < 10 µA (ESP TN/BX, ESP TN/2BX), and /I variants.

[3] The maximum transient voltage let-through of the protector throughout the test (±10%), line to line & line to earth, both polarities. Response time < 10 ns.

[4] Test to IEC 61000-4-5:2006, ITU-T (formerly CCITT) K.20, K.21 and K.45, Telcordia GR-1089-CORE, Issue 2:2002, ANSI TIA/EIA/IS-968-A:2002 (formerly FCC Part 68).

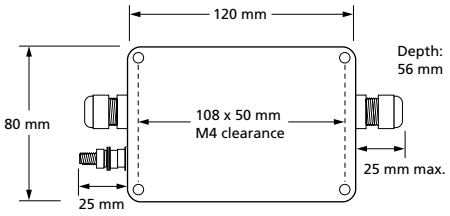


ABB order codes (screw terminal)

Part	ABB order code	Part	ABB order code	Part	ABB order code
ESP 06D/BX	7TCA085400R0081	**ESP 15D/BX**	7TCA085400R0091	**ESP 30D/BX**	7TCA085400R0101
ESP 06D/2BX	7TCA085400R0080	**ESP 15D/2BX**	7TCA085400R0090	**ESP 30D/2BX**	7TCA085400R0100
ESP 50D/BX	7TCA085400R0113	**ESP 110D/BX**	7TCA085400R0006	**ESP TN/BX**	7TCA085400R0175
ESP 50D/2BX	7TCA085400R0111	**ESP 110D/2BX**	7TCA085460R0343	**ESP TN/2BX**	7TCA085400R0172

ABB order codes (IDC connection)

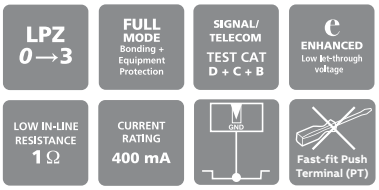
Part	ABB order code	Part	ABB order code	Part	ABB order code
ESP 06D/BX/I	7TCA085400R0275	**ESP 15D/BX/I**	7TCA085400R0277	**ESP 30D/BX/I**	7TCA085400R0274
ESP 06D/2BX/I	7TCA085400R0276	**ESP 15D/2BX/I**	7TCA085400R0278	**ESP 30D/2BX/I**	7TCA085400R0273
ESP 50D/BX/I	7TCA085400R0272	**ESP 110D/BX/I**	7TCA085460R0342	**ESP TN/BX/I**	7TCA085400R0176
ESP 50D/2BX/I	7TCA085400R0112	**ESP 110D/2BX/I**	7TCA085460R0344	**ESP TN/2BX/I**	7TCA085400R0173

Data and signal protection

ESP Standard Slimline (SD) Series

*NOTE: product label design may vary.

Combined Category D, C, B tested SPD (Surge Protective Device, to BS EN 61643) suitable for twisted pair signalling applications up to 400mA. Available for working voltages of up to 6, 15, 30, 50, 110 and 180 Volts plus telephone networks. For use at boundaries up to LPZ 0 to protect against flashover (typically the service entrance location) through to LPZ 3 to protect sensitive electronic equipment.



Features & benefits

- Very low let-through voltage (enhanced protection to IEC/BS EN 62305) between all lines - Full Mode protection
- Full Mode design capable of handling partial lightning currents as well as allowing continual operation of protected equipment
- Repeated protection in lightning intense environments
- Very low (10 Ω) in-line resistance allows resistance critical applications (e.g. alarm loops) to be protected
- 400mA maximum running current
- Strong, flame retardant housing
- Built-in DIN rail foot for simple clip-on mounting to top hat DIN rails
- Colour coded terminals give a quick and easy installation check - grey for the dirty (line) end and green for clean
- ESP STN is suitable for telecommunication applications in accordance with Telcordia and ANSI Standards (see Application Note AN005)

Installation

Connect in series with the data communication or signal line either near where it enters or leaves the building or close to the equipment being protected (e.g. within its control panel). Either way, it must be very close to the system's earth star point. Install protectors either within an existing cabinet/ cubicle or in a separate enclosure.

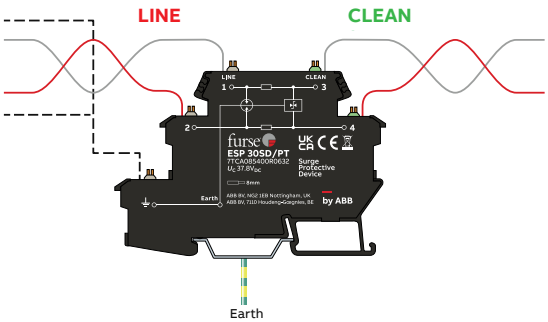
Application

Use on twisted pair lines, e.g. those found in process control equipment, modems and computer communications interfaces.

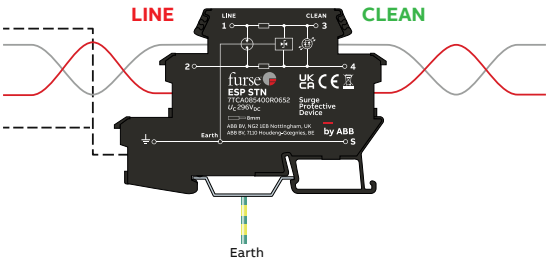
Accessories

Weatherproof enclosures:
WBX SLQ, WBX SLQ/G
For use with up to
16 protectors

ESP 30SD/PT installation in series (spring terminal, top cable entry)



ESP STN installation in series (screw terminal, side cable entry)



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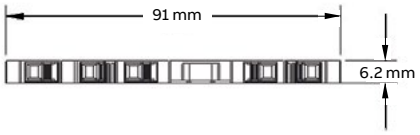
ESP Standard Slimline (SD) Series - Technical specification

Electrical specification	ESP 06SD ESP 06SD/PT	ESP 15SD ESP 15SD/PT	ESP 30SD ESP 30SD/PT	ESP 50SD ESP 50SD/PT	ESP 110SD ESP 110SD/PT	ESP 180SD ESP 180SD/PT	ESP STN ESP STN/PT
Nominal voltage (DC)[1]	6 V	15 V	30 V	50 V	110 V	180 V	–
Maximum working voltage U_c (DC)[2]	7.9 V	18.9 V	37.8 V	57.8 V	134 V	189 V	296 V
Maximum working voltage U_c (AC RMS)[2]	5.6 V	13.4 V	26.7 V	41 V	95 V	134 V	296 V
Current rating (signal, at 25°C)	400 mA						
In-line resistance (per line ±10%)	1Ω						4.3 Ω
Bandwidth (-3 dB 100Ω Balanced system)	0.9 MHz	1.7 MHz	3 MHz	5 MHz	8 MHz	9.5 MHz	20 MHz
Transient specification	**ESP 06SD ESP 06SD/PT**	**ESP 15SD ESP 15SD/PT**	**ESP 30SD ESP 30SD/PT**	**ESP 50SD ESP 50SD/PT**	**ESP 110SD ESP 110SD/PT**	**ESP 180SD ESP 180SD/PT**	**ESP STN ESP STN/PT**
Let-through voltage (all conductors) U_p[3]							
C2 test 4 kV 1.2/50 µs, 2 kA 8/20 µs to BS EN/EN/IEC 61643-21	15.8 V	25.8 V	44.2 V	69.0 V	163.5 V	217 V	395 V
C1 test 1 kV, 1.2/50 µs, 0.5 kA 8/20 µs to BS EN/EN/IEC 61643-21	12.6 V	27.5 V	47.9 V	73.6 V	154.5 V	210 V	390 V
B2 test 4 kV 10/700 µs to BS EN/EN/IEC 61643-21	10.7 V	24.0 V	43.8 V	68.0 V	152.5 V	214 V	298 V
5 kV, 10/700 µs[4]	11 V	24.5 V	44.0 V	69.5 V	154.0 V	215 V	300 V
Maximum surge current							
D1 test 10/350 µs to BS EN/EN/IEC 61643-21: – Per signal wire	2.5 kA						
D1 test 10/350 µs to BS EN/EN/IEC 61643-21: – Per pair	5 kA						
8/20 µs to ITU-T K.45:2003, IEEE C62.41.2:2002: – Per signal wire	10 kA						
8/20 µs to ITU-T K.45:2003, IEEE C62.41.2:2002: – Per pair	20 kA						
Mechanical specification	**ESP 06SD ESP 06SD/PT**	**ESP 15SD ESP 15SD/PT**	**ESP 30SD ESP 30SD/PT**	**ESP 50SD ESP 50SD/PT**	**ESP 110SD ESP 110SD/PT**	**ESP 180SD ESP 180SD/PT**	**ESP STN ESP STN/PT**
Temperature range	-40 to +80 °C						
Connection type	Screw terminal - maximum torque (0.4Nm/3.47lb-in) Spring terminal (/PT)						
Conductor size (stranded) / (solid)	0.2 to 2.5 mm² (24 to 14 AWG), stranded cable must be ferruled for /PT						
Earth connection	Din Rail Earth & Earth Terminal						
Case material	Flame retardant Polymer UL 94-V0						
Weight	0.08 kg						
Dimensions	See diagram below						

[1] Nominal voltage (DC) measured at < 10 µA leakage.
[2] Maximum working voltage (AC RMS or DC) measured at < 1 mA leakage.
[3] The maximum transient voltage let-through of the protector throughout the test (±10%), line to line & line to earth, both polarities. Response time < 10 ns.
[4] Test to IEC 61000-4-5:2006, ITU-T (formerly CCITT) K.20, K.21 and K.45,Telcordia GR-1089-CORE, Issue 2:2002, ANSI TIA/EIA/IS-968-A:2002 (formerly FCC Part 68).



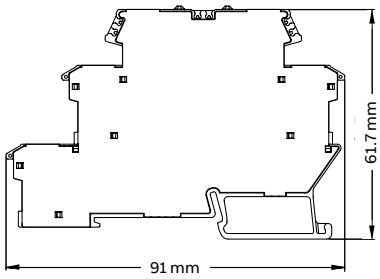


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ABB order codes

Part no.	ABB order code	Part no.	ABB order code	Part no.	ABB order code
ESP 06SD	7TCA085400R0613	**ESP 50SD**	7TCA085400R0616	**ESP STN**	7TCA085400R0652
ESP 06SD/PT	7TCA085400R0630	**ESP 50SD/PT**	7TCA085400R0633	**ESP STN/PT**	7TCA085400R0653
ESP 15SD	7TCA085400R0614	**ESP 110SD**	7TCA085400R0617	**WBX SLQ**	7TCA085410R0037
ESP 15SD/PT	7TCA085400R0631	**ESP 110SD/PT**	7TCA085400R0634	**WBX SLQ/G**	7TCA085410R0036
ESP 30SD	7TCA085400R0615	**ESP 180SD**	7TCA085400R0618		
ESP 30SD/PT	7TCA085400R0632	**ESP 180SD/PT**	7TCA085400R0635		

Data and signal protection

ESP Slimline Enhanced (SE) Series

*NOTE: product label design may vary.

Combined Category D, C, B tested SPD (Surge Protective Device, to BS EN 61643) suitable for twisted pair signalling applications which require either a lower in-line resistance, an increased current or a higher bandwidth than the ESP SD Series. Also suitable for DC power applications less than 1.25 Amps. Available for working voltages of up to 6, 15, 30, 50, 110 and 180 Volts. For use at boundaries up to LPZ 0 to protect against flashover (typically the service entrance location) through to LPZ 3 to protect sensitive electronic equipment.

Features & benefits

- Very low let-through voltage (enhanced protection to IEC/BS EN 62305) between all lines - Full Mode protection
- Full Mode design capable of handling partial lightning currents as well as allowing continual operation of protected equipment
- Repeated protection in lightning intense environments
- Very low (1 Ω) in-line resistance allows resistance critical applications (e.g. alarm loops) to be protected
- High (1.25 A) maximum running current
- High bandwidth enables higher frequency (high traffic or bit rate) data communications
- Screen terminal enables easy connection of cable screen
- Strong, flame retardant housing
- Built-in DIN rail foot for simple clip-on mounting to top hat DIN rails
- Colour coded terminals give a quick and easy installation check - grey for the dirty (line) end and green for clean
- Cable screen is galvanically isolated from earth, which are temporarily bonded together during lightning activity and then automatically resets afterwards
- Isolated screen allows alarm panels to function without the SPD unintentionally activating the sensor detection

Installation

Connect in series with the data communication or signal line either near where it enters or leaves the building or close to the equipment being protected (e.g. within its control panel). Either way, it must be very close to the system's earth star point. Install protectors either within an existing cabinet/ cubicle or in a separate enclosure.

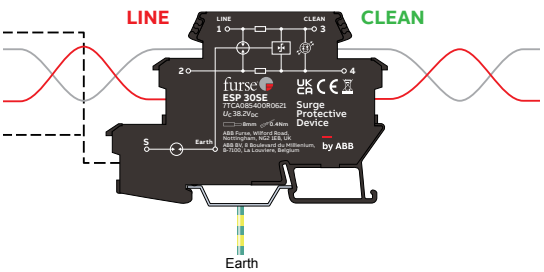
Application

Use these units to protect resistance sensitive, higher frequency or running current systems, e.g. high speed digital communications equipment or systems with long signal lines.

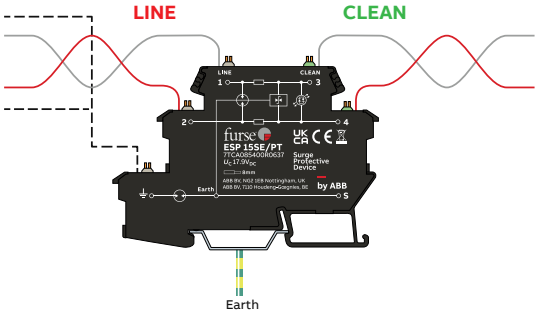
Accessories

Weatherproof enclosures:
WBX SLQ, WBX SLQ/G
For use with up to 16 protectors

ESP 30SE installation in series



ESP 15SE/PT installation in series



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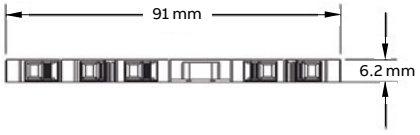
ESP Slimline Enhanced (SE) Series - Technical specification

Electrical specification		ESP 06SE ESP 06SE/PT	ESP 15SE ESP 15SE/PT	ESP 30SE ESP 30SE/PT	ESP 50SE ESP 50SE/PT	ESP 110SE ESP 110SE/PT	ESP 180SE ESP 180SE/PT
Nominal voltage (DC)[1]		6 V	15 V	30 V	50 V	110 V	180 V
Maximum voltage U_c (DC)[2]		7.9 V	17.9 V	38.2 V	58 V	134 V	194 V
Maximum voltage U_c (AC RMS)[2]		5.6 V	12.6 V	27 V	41 V	95 V	137 V
Current rating (signal, at 25°C)		1.25 A				0.7 A	0.5 A
In-line resistance (per line ±10%)		1Ω				3.3 Ω	6.8 Ω
Bandwidth (-3 dB 100Ω Balanced system)		30 MHz	30 MHz	30 MHz	30 MHz	30 MHz	30 MHz
Transient specification		**ESP 06SE ESP 06SE/PT**	**ESP 15SE ESP 15SE/PT**	**ESP 30SE ESP 30SE/PT**	**ESP 50SE ESP 50SE/PT**	**ESP 110SE ESP 110SE/PT**	**ESP 180SE ESP 180SE/PT**
Let-through voltage (all conductors) U_p[3]							
C2 test 4 kV 1.2/50 µs, 2 kA 8/20 µs to BS EN/EN/IEC 61643-21		33.3 V	39 V	72 V	86.6 V	173.5 V	224 V
C1 test 1 kV, 1.2/50 µs, 0.5 kA 8/20 µs to BS EN/EN/IEC 61643-21		21.1 V	27 V	57.2 V	81.8 V	170.0 V	216.5 V
B2 test 4 kV 10/700 µs to BS EN/EN/IEC 61643-21		15.8 V	25.4 V	48.9 V	71 V	166.5 V	215.5 V
5 kV, 10/700 µs[4]		16.5 V	26.5 V	50.1 V	72 V	169.5 V	217.5 V
Maximum surge current							
D1 test 10/350 µs to BS EN/EN/IEC 61643-21:	– Per signal wire	2.5 kA					
	– Per pair	5 kA					
8/20 µs to ITU-T K.45:2003, IEEE C62.41.2:2002:	– Per signal wire	10 kA					
	– Per pair	20 kA					
Mechanical specification		**ESP 06SE ESP 06SE/PT**	**ESP 15SE ESP 15SE/PT**	**ESP 30SE ESP 30SE/PT**	**ESP 50SE ESP 50SE/PT**	**ESP 110SE ESP 110SE/PT**	**ESP 180SE ESP 180SE/PT**
Temperature range		-40 to +80 °C					
Connection type		Screw terminal - maximum torque (0.4Nm/3.47lb-in) Spring terminal (/PT)					
Conductor size (solid/stranded)[5]		2.5mm² (24-14 AWG)/ 2.5mm² (24-14 AWG)					
Earth connection		Din Rail Earth & Earth Terminal					
Case material		Flame retardant Polymer UL 94-V0					
Weight		0.08 kg					
Dimensions		See diagram below					

[1] Nominal voltage (DC) measured at < 10 µA leakage.
[2] Maximum working voltage (AC RMS or DC) measured at < 5 mA leakage.
[3] The maximum transient voltage let-through of the protector throughout the test (±10%), line to line & line to earth, both polarities. Response time < 10 ns.
[4] Test to IEC 61000-4-5:2006, ITU-T (formerly CCITT) K.20, K.21 and K.45,Telcordia GR-1089-CORE, Issue 2:2002, ANSI TIA/EIA/IS-968-A:2002 (formerly FCC Part 68).



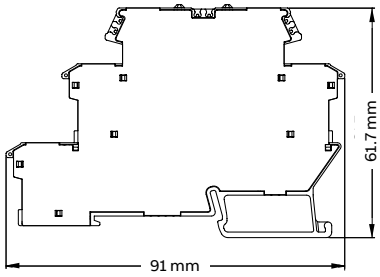


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ABB order codes

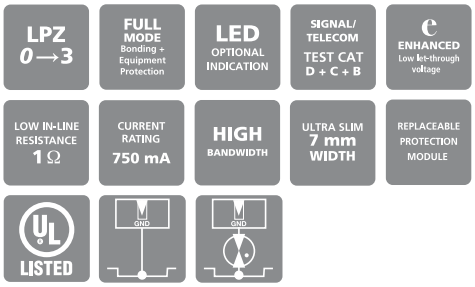
Part no.	ABB order code	Part no.	ABB order code	Part no.	ABB order code
ESP 06SE	7TCA085400R0619	**ESP 30SE/PT**	7TCA085400R0638	**ESP 180SE**	7TCA085400R0624
ESP 06SE/PT	7TCA085400R0636	**ESP 50SE**	7TCA085400R0622	**ESP 180SE/PT**	7TCA085400R0641
ESP 15SE	7TCA085400R0620	**ESP 50SE/PT**	7TCA085400R0639	**WBX SLQ**	7TCA085410R0037
ESP 15SE/PT	7TCA085400R0637	**ESP 110SE**	7TCA085400R0623	**WBX SLQ/G**	7TCA085410R0036
ESP 30SE	7TCA085400R0621	**ESP 110SE/PT**	7TCA085400R0640		

Data & signal protection

ESP Slimline (SL) Series

*NOTE: product label design may vary.

Combined Category D, C, B tested (to IEC/BS EN 61643) Surge Protection Device (SPD) suitable for twisted pair signalling applications which require either a lower in-line resistance, an increased current and/or higher bandwidth. Also suitable for DC power applications less than 0.75 Amps. Available for working voltages of up to 6, 15, 30, 50, 110 and 180 Volts, and also for global telephone applications up to 296 Volts. For use at boundaries up to LPZ 0 to protect against flashover (typically the service entrance location) through to LPZ 3 to protect sensitive electronic equipment.



Features & benefits

- Very low let-through voltage (enhanced protection to IEC/BS EN 62305) between all lines - Full Mode protection
- Full Mode design capable of handling partial lightning currents as well as allowing continual operation of protected equipment
- Repeated protection in lightning intense environments
- Ultra slim 7 mm width ideal for compact protection of large numbers of lines (e.g. process control installations)
- Optional LED status indication versions available for low current DC power applications - add L suffix to part number - e.g. ESP SL30L
- Two stage removable protection module with simple quick release mechanism allowing partial removal for easy line commissioning and maintenance as well as full removal for protection replacement
- Strong, flame retardant, polycarbonate housing
- High maximum running current
- High bandwidth enables higher frequency (high traffic or bit rate) data communications
- Screen terminal enables easy connection of cable screen to earth
- Suitable for earthed or isolated screen systems - add /I suffix to part number for versions that require isolated screens - e.g. ESP SL30/I
- Built-in innovative DIN rail foot with locking feature for simple positioning and clip-on mounting to top hat DIN rails
- 4 mm² terminals allow for larger cross section wiring, stranded wires terminated with ferrules or fitting two wires into a single terminal
- Convenient earthing through DIN foot and/or earth terminal
- Very low (1 Ω) in-line resistance (for products from 6V to 110V) allows resistance critical applications (e.g. alarm loops) to be protected
- ESP SL06-SL180 have UL497b approval under file E240341 (ESP SLTN not included)

Application

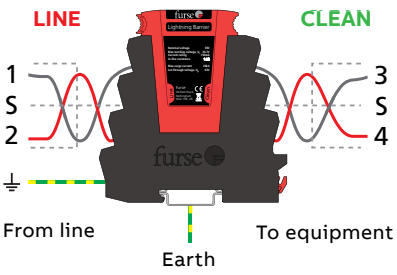
Use these protectors where installation space is at a premium and large numbers of lines require protection (e.g. process control, high speed digital communication equipment or systems with long signal lines).

Installation

Connect in series with the data communication or signal line either near where it enters or leaves the building or close to the equipment being protected (e.g. within its control panel). Either way, it must be very close to the system's earth star point. Install protectors either within an existing cabinet/ cubicle or in a separate enclosure.

Accessories

For replacement SPD modules (/M), spare base units (/B) and weatherproof enclosures (WBX) see ABB order code table overleaf.



NOTE: The ESP SL 'Slim Line' Series is also available for protection of 3-wire, RS 485 and RTD applications (ESP SL/3W, ESP SL RS485 & ESP SL RTD). The ESP SL X Series has approvals for use in hazardous areas.

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ESP Slimline (SL) Series - Technical specification

Electrical specification	ESP SL06	ESP SL15	ESP SL30	ESP SL50	ESP SL110	ESP SL180	ESP SL TN
Nominal voltage[1]	6 V	15 V	30 V	50 V	110 V	180 V	–
Maximum working voltage U_c (DC)[2]	7.79 V	16.7 V	36.7 V	56.7 V	132 V	190 V	296 V
Maximum working voltage U_c (AC RMS)	5 V	11 V	25 V	40 V	93 V	130 V	–
Current rating (signal)	750 mA				500 mA	250 mA	300 mA
In-line resistance (per line ±10%)	1.0 Ω				3.3 Ω	6.8 Ω	4.5 Ω
Bandwidth (-3 dB 50 Ω system)	45 MHz	45 MHz	45 MHz	45 MHz	45 MHz	45 MHz	20 MHz

Transient specification	ESP SL06	ESP SL15	ESP SL30	ESP SL50	ESP SL110	ESP SL180	ESP SL TN
Let-through voltage (all conductors) U_p[3]							
C2 test 4 kV 1.2/50 µs, 2 kA 8/20 µs to BS EN/EN/IEC 61643-21	36.0 V	38.4 V	63.0 V	90.3 V	185 V	215 V	395 V
C1 test 1 kV, 1.2/50 µs, 0.5 kA 8/20 µs to BS EN/EN/IEC 61643-21	26.2 V	29.4 V	51.3 V	77.2 V	175 V	205 V	390 V
B2 test 4 kV 10/700 µs to BS EN/EN/IEC 61643-21	16.0 V	26.8 V	45.4 V	68.3 V	165 V	203 V	298 V
5 kV, 10/700 µs[4]	17.0 V	27.5 V	46.3 V	69.1 V	170 V	200 V	300 V
Maximum surge current							
D1 test 10/350 µs to BS EN/EN/IEC 61643-21: – Per signal wire	1.25 kA						
D1 test 10/350 µs to BS EN/EN/IEC 61643-21: – Per pair	2.5 kA						
8/20 µs to ITU-T K.45:2003, IEEE C62.41.2:2002: – Per signal wire	5 kA						
8/20 µs to ITU-T K.45:2003, IEEE C62.41.2:2002: – Per pair	10 kA						

Mechanical specification	ESP SL06	ESP SL15	ESP SL30	ESP SL50	ESP SL110	ESP SL180	ESP SL TN
Temperature range	–40 to +80 °C						
Connection type	Screw terminal - maximum torque 0.8 Nm						
Conductor size (stranded)	4 mm²						
Earth connection	Via DIN rail or 4 mm² earth terminal - maximum torque 0.8 Nm						
Case material	FR Polymer UL-94 V-0						
Weight	0.08 kg						
Dimensions	See diagram below						

[1] Nominal voltage (DC or AC peak) measured at < 10 µA (ESP SL15, ESP SL30, ESP SL50, ESP SL110, ESP SL180 and LED variants) and < 200 µA (ESP SL06 and ESP SL06L).
[2] Maximum working voltage (DC or AC peak) measured at < 1 mA leakage.
[3] The maximum transient voltage let-through of the protector throughout the test (±10%), line to line & line to earth, both polarities. Response time < 10 ns.
[4] Test to IEC 61000-4-5:2006, ITU-T (formerly CCITT) K.20, K.21 and K.45, Telcordia GR-1089-CORE, Issue 2:2002, ANSI TIA/EIA/IS-968-A:2002 (formerly FCC Part 68).

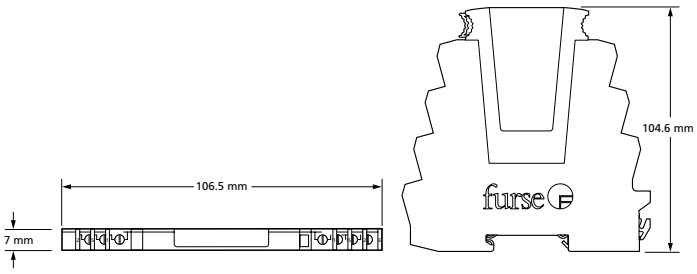

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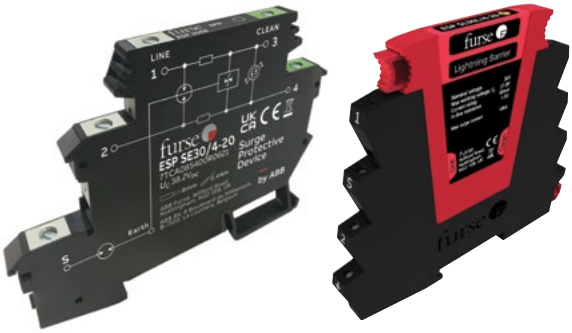
ABB order codes

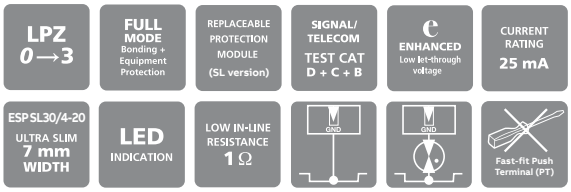
Part no.	ABB order code	Part no.	ABB order code	Part no.	ABB order code	Part no.	ABB order code
ESP SL06	7TCA085400R0058	**ESP SL15/M**	7TCA085400R0198	**ESP SL50(UL)**	7TCA085400R0513	**ESP SL180L**	7TCA085400R0419
ESP SL06/I	7TCA085400R0265	**ESP SL15L/M**	7TCA085400R0249	**ESP SL50/I(UL)**	7TCA085400R0514	**ESP SL180**	7TCA085400R0420
ESP SL06L	7TCA085400R0060	**ESP SL15/M(UL)**	7TCA085400R0583	**ESP SL50L(UL)**	7TCA085400R0515	**ESP SL180L/I**	7TCA085400R0421
ESP SL06L/I	7TCA085400R0280	**ESP SL15L/M(UL)**	7TCA085400R0584	**ESP SL50L/I(UL)**	7TCA085400R0516	**ESP SL180/I**	7TCA085400R0422
ESP SL06(UL)	7TCA085400R0501	**ESP SL30**	7TCA085400R0067	**ESP SL50/M**	7TCA085400R0254	**ESP SL180(UL)**	7TCA085400R0521
ESP SL06/I(UL)	7TCA085400R0502	**ESP SL30/I**	7TCA085400R0068	**ESP SL50L/M**	7TCA085400R0256	**ESP SL180/I(UL)**	7TCA085400R0522
ESP SL06L(UL)	7TCA085400R0503	**ESP SL30L**	7TCA085400R0069	**ESP SL50/M(UL)**	7TCA085400R0589	**ESP SL180L(UL)**	7TCA085400R0523
ESP SL06L/I(UL)	7TCA085400R0504	**ESP SL30L/I**	7TCA085400R0234	**ESP SL50L/M(UL)**	7TCA085400R0590	**ESP SL180L/I(UL)**	7TCA085400R0524
ESP SL06/M	7TCA085400R0243	**ESP SL30(UL)**	7TCA085400R0509	**ESP SL110**	7TCA085400R0061	**ESP SL180/M**	7TCA085400R0428
ESP SL06L/M	7TCA085400R0240	**ESP SL30/I(UL)**	7TCA085400R0510	**ESP SL110/I**	7TCA085400R0279	**ESP SL180L/M**	7TCA085400R0427
ESP SL06/M(UL)	7TCA085400R0581	**ESP SL30L(UL)**	7TCA085400R0511	**ESP SL110L**	7TCA085400R0062	**ESP SL180/M(UL)**	7TCA085400R0593
ESP SL06L/M(UL)	7TCA085400R0582	**ESP SL30L/I(UL)**	7TCA085400R0512	**ESP SL110L/I**	7TCA085400R0284	**ESP SL180L/M(UL)**	7TCA085400R0594
ESP SL15	7TCA085460R0058	**ESP SL30/M**	7TCA085400R0197	**ESP SL110(UL)**	7TCA085400R0517	**ESP SL/B**	7TCA085400R0194
ESP SL15/I	7TCA085400R0264	**ESP SL30L/M**	7TCA085400R0199	**ESP SL110/I(UL)**	7TCA085400R0518	**ESP SL/I/B**	7TCA085400R0261
ESP SL15L	7TCA085460R0058	**ESP SL30/M(UL)**	7TCA085400R0587	**ESP SL110L(UL)**	7TCA085400R0519	**ESP SLTN**	7TCA085400R0195
ESP SL15L/I	7TCA085400R0064	**ESP SL30L/M(UL)**	7TCA085400R0588	**ESP SL110L/I(UL)**	7TCA085400R0520	**ESP SLTNL**	7TCA085400R0226
ESP SL15(UL)	7TCA085400R0505	**ESP SL50**	7TCA085400R0074	**ESP SL110/M**	7TCA085400R0245	**WBX SLQ**	7TCA085410R0037
ESP SL15/I(UL)	7TCA085400R0506	**ESP SL50/I**	7TCA085400R0075	**ESP SL110L/M**	7TCA085400R0248	**WBX SLQ/G**	7TCA085410R0036
ESP SL15L(UL)	7TCA085400R0507	**ESP SL50L**	7TCA085400R0076	**ESP SL110/M(UL)**	7TCA085400R0591		
ESP SL15L/I(UL)	7TCA085400R0508	**ESP SL50L/I**	7TCA085400R0201	**ESP SL110L/M(UL)**	7TCA085400R0592		

Data & signal protection

ESP SL30L/4-20 & ESP SE30/4-20 Series



*NOTE: product label design may vary.



Combined Category D, C, B tested protector (to BS EN 61643) suitable for twisted pair 4-20 mA loop systems with innovative LED protector status indication. For use at boundaries up to LPZ 0 to protect against flashover (typically the service entrance location) through to LPZ 3 to protect sensitive electronic equipment (e.g. transmitters, monitors, controllers).

Features & benefits

- Very low let-through voltage (enhanced protection to IEC/BS EN 62305) between all lines - Full Mode protection
- Full Mode design capable of handling partial lightning currents as well as allowing continual operation of protected equipment
- Repeated protection in lightning intense environments
- Innovative LED indication of protection status provides easy visual checking and quick maintenance
- ESP 30SE/4-20 (6.2 mm) and ESP SL30L/4-20 (7 mm) are ultra slim units, ideal for compact protection of large numbers of lines (e.g. process control installations)
- ESP SL30L/4-20 includes two stage removable protection module with simple quick release mechanism allowing partial removal for easy line commissioning and maintenance as well as full removal for protection replacement
- Very low (1 Ω) in-line resistance for minimal system interference
- Screen terminal enables easy connection of cable screen to earth. Note: ESP SL30L/4-20/I is suitable for earthed and isolated screen systems
- Strong, flame retardant, polycarbonate housing
- Built-in innovative DIN rail foot with locking feature for simple positioning and clip-on mounting to top hat DIN rails
- Convenient earthing through DIN foot and/or earth terminal
- ESP 30SE/4-20 (and /PT variant) have colour coded terminals for quick and easy installation check
- ESP 30SE/4-20 available with Push Terminals (ESP 30SE/4-20/PT) for simple 'spring' connections, to provide fast and reliable cable termination
- Innovative self resetting design protects SPD against abnormal 4-20mA loop overcurrent faults

Application

Use these protectors on 4-20 mA loop systems - ideal where installation space is at a premium and large numbers of lines require protection, or for systems with long signal lines.

Installation

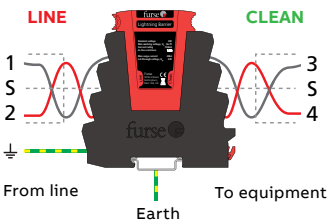
Connect in series with the 4-20 mA current loop either near where it enters or leaves the building or close to the equipment being protected (e.g. within its control panel). Either way, it must be very close to the system's earth star point. Install protectors either within an existing cabinet/cubicle or in a separate enclosure.

Accessories

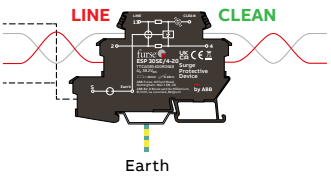
ESP SL30L/4-20/M
Module replacement
ESP SL/B
Base replacement

Weatherproof enclosures:
WBX SLQ, WBX SLQ/G
For use with up to 16 protectors

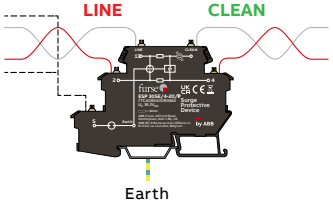
ESP SL30L/4-20 installation



ESP SE30/4-20 installation



ESP SE30/4-20/PT installation



TECHNICAL NOTE: 4-20 mA current loops can serve multiple devices over a long distance. The devices and wiring produce a voltage drop (also known as "loop drops") but these do not reduce the 4-20 mA current as long as the power supply voltage is greater than the sum of the voltage drops around the loop at the maximum signalling current of 20 mA. For design considerations, each SPD installed within the loop introduces a 2.2 V (SL) or 3.8V (SE) loop drop.

NOTE: The ESP SL 'Slim Line' Series is also available for protection of systems up to 110 V as well as 3-wire, RS 485, RTD & telecommunication applications (ESP SL/3W, ESP SL RS485, ESP SL RTD & ESP SL TN).

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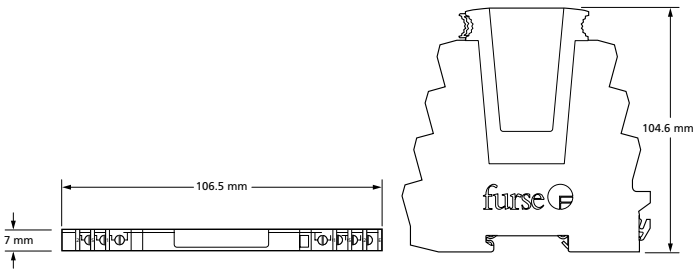
ESP SL30L/4-20 & ESP SE30/4-20 Series - Technical specification

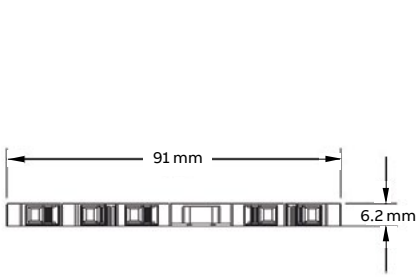
Electrical specification	ESP SL30L/4-20	ESP 30SE/4-20
ABB order code	7TCA085400R0070	7TCA085400R0648
Nominal voltage[1]	30 V	
Maximum working voltage U_c (DC)[2]	36.7 V	
Maximum working voltage U_c (AC RMS)	25 V	
Current rating (signal)[3]	25 mA	
In-line resistance (per line ±10%)	1.0 Ω	
Series voltage drop[4]	4.3 V	
Bandwidth (-3 dB 50 Ω systems)	45 MHz	

Transient specification		ESP SL30L/4-20	ESP 30SE/4-20
Let-through voltage (all conductors) U_p[5]			
C2 test 4 kV 1.2/50 µs, 2 kA 8/20 µs to BS EN/EN/IEC 61643-21		63.0 V	
C1 test 1 kV, 1.2/50 µs, 0.5 kA 8/20 µs to BS EN/EN/IEC 61643-21		51.3 V	
B2 test 4 kV 10/700 µs to BS EN/EN/IEC 61643-21		45.4 V	
5 kV, 10/700 µs[6]		46.3 V	
Maximum surge current			
D1 test 10/350 µs to	– Per signal wire	1.25 kA	2.5 kA
BS EN/EN/IEC 61643-21:	– Per pair	2.5 kA	5 kA
8/20 µs to ITU-T K.45:2003,	– Per signal wire	5 kA	10 kA
IEEE C62.41.2:2002:	– Per pair	10 kA	20 kA

Mechanical specification	ESP SL30L/4-20	ESP 30SE/4-20
Temperature range	–40 to +80 °C	
Connection type	Screw terminal - maximum torque 0.8 Nm	Screw terminal - max torque 0.4 Nm/PT version: Pluggable screwless Push Terminal
Conductor size (stranded)	4 mm²	2.5 mm²
Earth connection	Via DIN rail or 4 mm² earth terminal - maximum torque 0.8 Nm	Via DIN rail earth or earth terminal
Case material	FR Polymer UL-94 V-0	
Weight	0.08 kg	
Dimensions	See diagram below	

[1] Nominal voltage (DC or AC peak) measured at < 10 µA.
[2] Maximum working voltage (DC or AC peak) measured at < 1 mA leakage.
[3] The minimum current for LED indicator operation is 2 mA.
[4] At 20 mA.
[5] The maximum transient voltage let-through of the protector throughout the test (±10%), line to line & line to earth, both polarities. Response time < 10 ns.
[6] Test to IEC 61000-4-5:2006, ITU-T (formerly CCITT) K.20, K.21 and K.45, Telcordia GR-1089-CORE, Issue 2:2002, ANSI TIA/EIA/IS-968-A:2002 (formerly FCC Part 68).





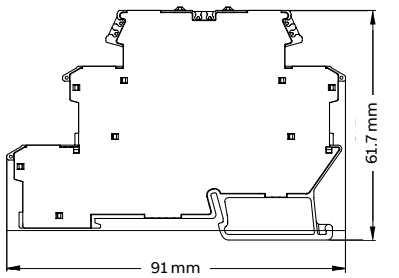


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ABB order codes

Part	ABB order code	Part	ABB order code
ESP SL30L/4-20	7TCA085400R0070	**ESP SL/I/B**	7TCA085400R0261
ESP SL30L/4-20/M	7TCA085400R0164	**ESP 30SE/4-20**	7TCA085400R0648
ESP SL/B	7TCA085400R0194	**ESP 30SE/4-20/PT**	7TCA085400R0646
ESP SL30L/4-20/I	7TCA085400R0237		

Data & signal protection

ESP SL 3-Wire Series

*NOTE: product label design may vary.

Combined Category D, C, B tested protector (to BS EN 61643) suitable for 3-wire signalling applications which require either a lower in-line resistance, an increased current and/or higher bandwidth. Also suitable for DC power applications less than 0.5 Amps. Available for working voltages of up to 6, 15, 30, 50 and 110 Volts. For use at boundaries up to LPZ 0 to protect against flashover (typically the service entrance location) through to LPZ 3 to protect sensitive electronic equipment.

Features & benefits

- Very low let-through voltage (enhanced protection to IEC/BS EN 62305) between all lines - Full Mode protection
- Full Mode design capable of handling partial lightning currents as well as allowing continual operation of protected equipment
- Repeated protection in lightning intense environments
- Ultra slim 7 mm width ideal for compact protection of large numbers of lines (e.g. process control installations)
- Two stage removable protection module with simple quick release mechanism allowing partial removal for easy line commissioning and maintenance as well as full removal for protection replacement
- Very low (1 Ω) in-line resistance allows resistance critical applications (e.g. alarm loops) to be protected
- High (500 mA) maximum running current
- High bandwidth enables higher frequency (high traffic or bit rate) data communications
- Strong, flame retardant, polycarbonate housing
- Built-in innovative DIN rail foot with locking feature for simple positioning and clip-on mounting to top hat DIN rails
- 4 mm² terminals allow for larger cross section wiring, stranded wires terminated with ferrules or fitting two wires into a single terminal
- Convenient earthing through DIN foot and/or earth terminal

Application

Use these protectors for 3-wire systems where installation space is at a premium and large numbers of lines require protection (e.g. process control, high speed digital communication equipment or systems with long signal lines).

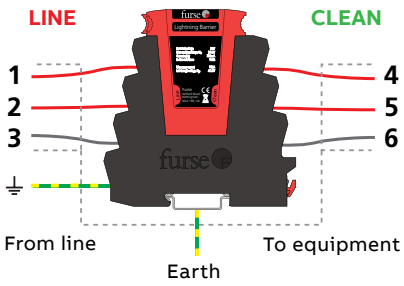
Installation

Connect in series with the data communication or signal line either near where it enters or leaves the building or close to the equipment being protected (e.g. within its control panel). Either way, it must be very close to the system's earth star point. Install protectors either within an existing cabinet/cubicle or in a separate enclosure.

Accessories

Replacement modules:
ESP SLXX/3W/M
Standard module replacement where XX is voltage rating (06, 15, 30, 50 or 110)
ESP SL/3W/B
Base replacement

Enclosures:
WBX SLQ (with clear lid)
WBX SLQ/G (with grey lid)



NOTE: The ESP SL 'Slim Line' Series is also available for protection of 2-wire systems up to 110 V, RS 485, RTD and telecommunication applications (ESP SL Series, ESP SL RS485, ESP SL RTD and ESP SL TN). The ESP SL X Series has approvals for use in hazardous areas.

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ESP SL 3-Wire Series - Technical specification

Electrical specification	ESP SL06/3W	ESP SL15/3W	ESP SL30/3W	ESP SL50/3W	ESP SL110/3W
ABB order code	7TCA085400R0238	7TCA085400R0269	7TCA085400R0268	7TCA085400R0267	7TCA085400R0266
Nominal voltage[1]	6 V	15 V	30 V	50 V	110 V
Maximum working voltage U_c (DC)[2]	7.79 V	16.7 V	36.7 V	56.7 V	132 V
Maximum working voltage U_c (AC RMS)	5 V	11 V	25 V	40 V	93 V
Current rating (signal)	500 mA				
In-line resistance (per line ±10%)	1.0 Ω				3.3 Ω
Bandwidth (-3 dB 50 Ω system)	45 MHz				

Transient specification		ESP SL06/3W	ESP SL15/3W	ESP SL30/3W	ESP SL50/3W	ESP SL110/3W
Let-through voltage (all conductors) U_p[3]						
C2 test 4 kV 1.2/50 µs, 2 kA 8/20 µs to BS EN/EN/IEC 61643-21		36.0 V	38.4 V	63.0 V	90.3 V	185 V
C1 test 1 kV, 1.2/50 µs, 0.5 kA 8/20 µs to BS EN/EN/IEC 61643-21		26.2 V	29.4 V	51.3 V	77.2 V	175 V
B2 test 4 kV 10/700 µs to BS EN/EN/IEC 61643-21		16.0 V	26.8 V	45.4 V	68.3 V	165 V
5 kV, 10/700 µs[4]		17.0 V	27.5 V	46.3 V	69.1 V	170 V
Maximum surge current						
D1 test 10/350 µs to BS EN/EN/IEC 61643-21:	– Per signal wire	1.25 kA				
	– Per pair	2.5 kA				
8/20 µs to ITU-T K.45:2003, IEEE C62.41.2:2002:	– Per signal wire	5 kA				
	– Per pair	10 kA				

Mechanical specification	ESP SL06/3W	ESP SL15/3W	ESP SL30/3W	ESP SL50/3W	ESP SL110/3W
Temperature range	–40 to +80 °C				
Connection type	Screw terminal - maximum torque 0.8 Nm				
Conductor size (stranded)	4 mm²				
Earth connection	Via DIN rail or 4 mm² earth terminal - maximum torque 0.8 Nm				
Case material	FR Polymer UL-94 V-0				
Weight	0.08 kg				
Dimensions	See diagram below				

[1] Nominal voltage (DC or AC peak) measured at < 10 µA (ESP SL15/3W, ESP SL30/3W, ESP SL50/3W, ESP SL110/3W) and < 200 µA (ESP SL06/3W).
[2] Maximum working voltage (DC or AC peak) measured at < 1 mA leakage.
[3] The maximum transient voltage let-through of the protector throughout the test (±10%), line to line & line to earth, both polarities. Response time < 10 ns
[4] Test to IEC 61000-4-5:2006, ITU-T (formerly CCITT) K.20, K.21 and K.45, Telcordia GR-1089-CORE, Issue 2:2002, ANSI TIA/EIA/IS-968-A:2002 (formerly FCC Part 68).

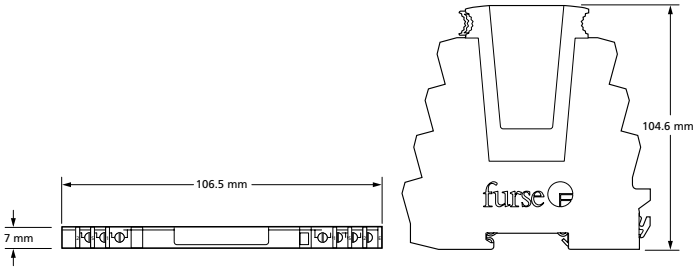

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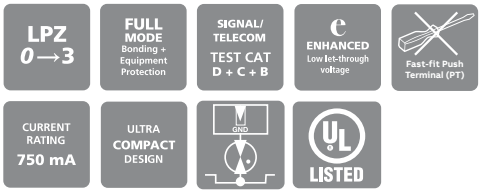
ABB order codes

Part no.	ABB order code	Part no.	ABB order code
ESP SL06/3W	7TCA085400R0238	**ESP SL50/3W/M**	7TCA085400R0255
ESP SL06/3W/M	7TCA085400R0244	**ESP SL110/3W**	7TCA085400R0266
ESP SL15/3W	7TCA085400R0269	**ESP SL110/3W/M**	7TCA085400R0246
ESP SL15/3W/M	7TCA085400R0247	**ESP SL/B**	7TCA085400R0194
ESP SL30/3W	7TCA085400R0268	**ESP SL/I/B**	7TCA085400R0261
ESP SL30/3W/M	7TCA085400R0251	**WBX SLQ**	7TCA085410R0037
ESP SL50/3W	7TCA085400R0267	**WBX SLQ/G**	7TCA085410R0036

Data & signal protection

ESP Q Series

*NOTE: product label design may vary.



Combined Category D, C, B (to IEC/BS EN 61643) Surge Protective Device (SPD) suitable for 4 twisted pair lines. Available for working voltages of up to 6, 15, 30, 50, 110 and 180 Volts. ESP TNQ suitable for Broadband, POTS, dial-up, T1/E1, lease line and *DSL telephone applications. For use at boundaries up to LPZ 0 to protect against flashover (typically the service entrance location) through to LPZ 3 to protect sensitive electronic equipment.

Features & benefits

- Very low let-through voltage (enhanced protection to IEC/BS EN 62305) between all lines - Full Mode protection
- Full Mode design capable of handling partial lightning currents as well as allowing continual operation of protected equipment
- Repeated protection in lightning intense environments
- Almost twice as space efficient as smallest competitor
- Standard DIN module (18 mm) depth
- Removable (plug-in) terminals allow pre-wiring of cable looms, for easier installation
- Suitable for earthed or isolated screen systems
- Built-in DIN rail foot for clip-on mounting to top hat or G DIN rails
- Optional flat mounting on side
- 2.5 mm² terminals allow for larger cross section wiring, stranded wires terminated with ferrules or fitting two wires into a single terminal
- Fast fit screwless Push Terminal versions (ESP X/PT) allow quick tool-less cable connection saving installation time
- Very low resistance to minimises unwanted signal strength reductions
- Strong, flame retardant, ABS housing
- Colour coded terminals (grey for line, green for clean) give a quick and easy installation check
- Screen terminal enables easy connection of cable screen to earth
- Simple, yet substantial, connection to earth via DIN rail
- ESP TNQ is suitable for telecommunication applications in accordance with Telcordia and ANSI Standards (see Application Note AN005)
- Available with Push Terminal options (/PT) for simple 'spring' connections, to provide fast and reliable cable termination
- ESP 06Q-180Q (and /PT variants) have UL497b approval under file E240341

Application

Use these SPDs where installation space is at a premium and large numbers of lines require protection.

Installation

Connect in series with the signal or data line either near where it enters or leaves the building or close to the equipment being protected. Install in a cabinet/cubicle close to the system's earth star point.

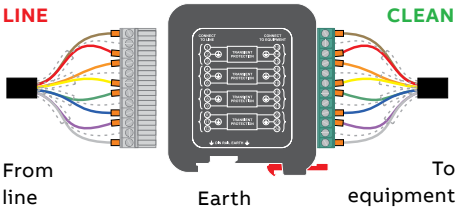
Accessories

Weatherproof enclosures:

ESP WBX SLQ (with transparent lid)
ABB order code
7TCA085410R0037

ESP WBX SLQ/G (with opaque grey lid)
ABB order code
7TCA085410R0036

ESP 06Q, ESP 15Q, ESP 30Q, ESP 50Q, ESP 110Q, ESP 180Q and ESP TNQ installed in series (in-line)



NOTE: The ESP Q Series is also available for protection of RS 485 and RTD applications (ESP RS485Q, ESP RTDQ). Protectors for individual data and signal lines are available (ESP D Series and Slim Line ESP SL Series), or ready-boxed to IP66 (ESP **D/BX etc). Alternatively, for individual protectors with higher current or bandwidth use the ESP E and ESP H Series.

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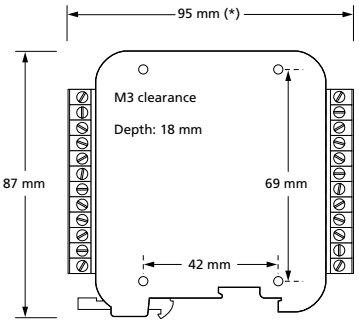
ESP Q Series - Technical specification

Electrical specification	ESP 06Q	ESP 15Q	ESP 30Q	ESP 50Q available for	ESP 110Q	ESP 180Q	ESP TNQ
Nominal voltage[1]	6 V	15 V	30 V	50 V	110 V	180 V	–
Maximum working voltage U_c (DC)[2]	7.79 V	18.8 V	37.8 V	57.8 V	132 V	190 V	296 V
Maximum working voltage U_c (AC RMS)	5 V	13 V	26 V	41 V	93 V	130 V	–
Current rating (signal)	750 mA	750 mA	750 mA	750 mA	500 mA	250 mA	300 mA
In-line resistance (per line ±10%)	1.0 Ω	1.0 Ω	1.0 Ω	1.0 Ω	3.3 Ω	6.8 Ω	4.3 Ω
Bandwidth (-3 dB 50 Ω system)	45 MHz	55 MHz	45 MHz	45 MHz	45 MHz	45 MHz	20 MHz

Transient specification	ESP 06Q	ESP 15Q	ESP 30Q	ESP 50Q	ESP 50Q	ESP 110Q	ESP 180Q
Let-through voltage (all conductors) U_p[3]							
C2 test 4 kV 1.2/50 µs, 2 kA 8/20 µs to BS EN/EN/IEC 61643-21	15.0 V	28.0 V	53.0 V	84.0 V	188 V	215 V	395 V
C1 test 1 kV, 1.2/50 µs, 0.5 kA 8/20 µs to BS EN/EN/IEC 61643-21	12.5 V	26.5 V	48.0 V	76.0 V	175 V	205 V	390 V
B2 test 4 kV 10/700 µs to BS EN/EN/IEC 61643-21	10.0 V	23.0 V	43.5 V	64.5 V	145 V	203 V	298 V
5 kV, 10/700 µs[4]	10.8 V	26.2 V	44.3 V	65.8 V	150 V	200 V	300 V
Maximum surge current							
D1 test 10/350 µs to wire – Per signal	2.5 kA					1.25 kA	2.5 kA
BS EN/EN/IEC 61643-21: – Per pair	5 kA					2.5 kA	5 kA
8/20 µs to ITU-T K.45:2003, – Per signal wire	10 kA						
IEEE C62.41.2:2002: – Per pair	20 kA						

Mechanical specification	ESP 06Q	ESP 15Q	ESP 30Q	ESP 50Q	ESP 50Q	ESP 110Q	ESP 180Q
Temperature range	-40 to +80 °C						
Connection type	Pluggable 12 way screw terminal - maximum torque 0.6 Nm /PT version: Pluggable 12 way screwless Push Terminal						
Conductor size (stranded)	2.5 mm²						
Earth connection	Via DIN rail or M5 threaded hole in base of unit						
Case material	FR Polymer UL-94 V-0						
Weight	0.1 kg						
Dimensions	See diagram below						

[1] Nominal voltage (DC or AC peak) measured at < 5 µA (ESP 15Q, ESP 30Q, ESP 50Q, ESP 110Q, ESP 180Q) and < 200 µA (ESP 06Q).
[2] Maximum working voltage (DC or AC peak) measured at < 5 mA leakage (ESP 15Q, ESP 30Q, ESP 50Q, ESP 110Q, ESP 180Q) and < 10 µA (ESP TNQ).
[3] The maximum transient voltage let-through of the protector throughout the test (±10%), line to line & line to earth, both polarities. Response time < 10 ns.
[4] Test to IEC 61000-4-5:2006, ITU-T (formerly CCITT) K.20, K.21 and K.45, Telcordia GR-1089-CORE, Issue 2:2002, ANSI TIA/EIA/IS-968-A:2002 (formerly FCC Part 68).



* Q/PT width is 106 mm

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ABB order codes

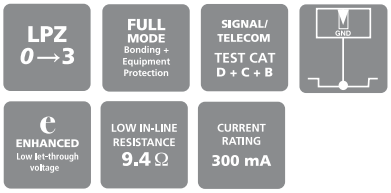
Part no.	ABB order code	Part no.	ABB order code	Part no.	ABB order code
ESP 06Q	7TCA085400R0087	**ESP 30Q(UL)**	7TCA085400R0108	**ESP 180Q**	7TCA085400R0462
ESP 06Q/PT	7TCA085400R0473	**ESP 30Q/PT(UL)**	7TCA085400R0561	**ESP 180Q/PT**	7TCA085400R0479
ESP 06Q(UL)	7TCA085400R0553	**ESP 50Q**	7TCA085400R0118	**ESP 180Q(UL)**	7TCA085400R0557
ESP 06Q/PT(UL)	7TCA085400R0559	**ESP 50Q/PT**	7TCA085400R0477	**ESP 180Q/PT(UL)**	7TCA085400R0564
ESP 15Q	7TCA085400R0098	**ESP 50Q(UL)**	7TCA085400R0555	**ESP TNQ**	7TCA085400R0183
ESP 15Q/PT	7TCA085400R0474	**ESP 50Q/PT(UL)**	7TCA085400R0562	**ESP TNQ/PT**	7TCA085400R0472
ESP 15Q(UL)	7TCA085400R0554	**ESP 110Q**	7TCA085400R0088	**WBXSLQ**	7TCA085410R0037
ESP 15Q/PT(UL)	7TCA085400R0560	**ESP 110Q/PT**	7TCA085400R0478	**WBXSLQ/G**	7TCA085410R0036
ESP 30Q	7TCA085400R0107	**ESP 110Q(UL)**	7TCA085400R0556		
ESP 30Q/PT	7TCA085400R0476	**ESP 110Q/PT(UL)**	7TCA085400R0563		

Data and signal protection

ESP PCB/D & PCB/TN Series

*NOTE: product label design may vary.

Combined Category D, C, B tested protector (to BS EN 61643) for 'through hole' mounting directly onto the PCB of data communication, signal or telephone equipment. Available for working voltages of up to 110 Volts. ESP PCB/TN suitable for Broadband, POTS, dial-up, T1/E1, lease line and *DSL telephone applications. For use at boundaries up to LPZ 0 to protect against flashover (typically the service entrance location) through to LPZ 3 to protect sensitive electronic equipment.



Features & benefits

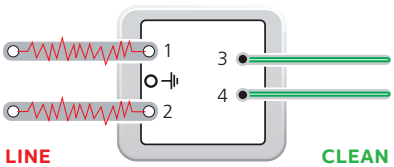
- Suitable for wave soldering
- Very low let-through voltage (enhanced protection to IEC/BS EN 62305) between all lines - Full Mode protection
- Full Mode design capable of handling partial lightning currents as well as allowing continual operation of protected equipment
- Repeated protection in lightning intense environments
- Low in-line resistance minimises unnecessary reductions in signal strength
- 2 pin clean end and 3 pin line end to ensure correct insertion
- ESP PCB/TN is suitable for telecommunication applications in accordance with Telcordia and ANSI Standards (see Application Note AN005)

Installation

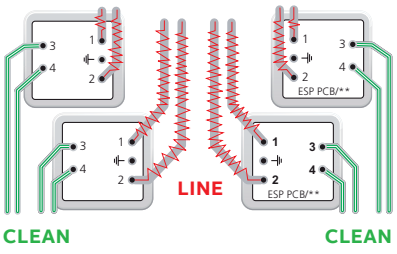
Connect in series, soldering pins direct onto PCB. Tracks to line and earth pins should be as wide as practical (see Furse Application Note AN003). Dirty (line) tracks should be routed parallel and as close together as possible. This should also be implemented on clean tracks, however clean tracks should never be routed close and parallel to line tracks or dirty barrier earth connections as transients can be re-introduced after the protector due to electromagnetic coupling.

The use of an earth layer or plane is highly recommended as this reduces the electromagnetic field produced by a transient discharging to earth considerably, and hence the chance of the transient being picked up on clean tracks.

Maximum line to clean separation. Large input tracks and pads (using top and bottom copper layers). Earth pin is bonded to an earth layer/plane.



All dirty (line) incoming tracks are separated from the clean output tracks, individual line and clean tracks are routed close together. Earth pins are bonded to an earth layer/plane.



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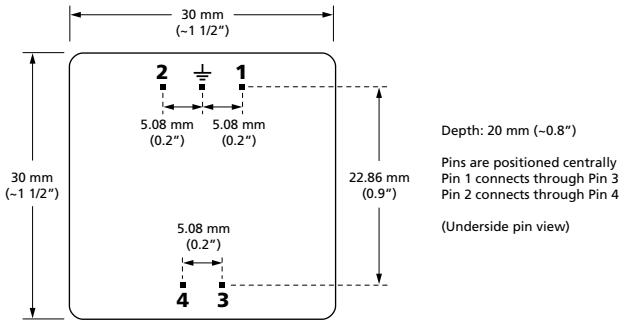
ESP PCB/D & PCB/TN Series - Technical specification

Electrical specification	ESP PCB/06D	ESP PCB/15D	ESP PCB/30D	ESP PCB/50D	ESP PCB/110D	ESP PCB/TN
ABB order code	7TCA085400R0038	7TCA085400R0042	7TCA085400R0154	7TCA085400R0155	7TCA085400R0040	7TCA085400R0157
Nominal voltage[1]	6 V	15 V	30 V	50 V	110 V	–
Maximum working voltage U_c (DC)[2]	7.79 V	19 V	37.1 V	58 V	132 V	296 V
Maximum working voltage U_c (AC RMS)	5 V	13 V	26 V	41 V	93 V	–
Current rating (signal)	300 mA					
In-line resistance (per line ±10%)	9.4 Ω	9.4 Ω	9.4 Ω	9.4 Ω	9.4 Ω	4.4 Ω
Bandwidth (-3 dB 50 Ω system)	800 kHz	2.5 MHz	4 MHz	6 MHz	9 MHz	20 MHz

Transient specification	ESP PCB/06D	ESP PCB/15D	ESP PCB/30D	ESP PCB/50D	ESP PCB/110D	ESP PCB/TN
Let-through voltage (all conductors) U_p[3]						
C2 test 4 kV 1.2/50 µs, 2 kA 8/20 µs to BS EN/EN/IEC 61643-21	12.0 V	25.0 V	44.0 V	78.0 V	155 V	395 V
C1 test 1 kV, 1.2/50 µs, 0.5 kA 8/20 µs to BS EN/EN/IEC 61643-21	11.5 V	24.5 V	43.5 V	76.0 V	150 V	390 V
B2 test 4 kV 10/700 µs to BS EN/EN/IEC 61643-21	10.0 V	23.0 V	42.5 V	73.0 V	145 V	298 V
5 kV, 10/700 µs[4]	10.5 V	23.8 V	43.4 V	74.9 V	150 V	300 V
Maximum surge current[5]						
D1 test 10/350 µs to BS EN/EN/IEC 61643-21: – Per signal wire	2.5 kA					
– Per pair	5 kA					
8/20 µs to ITU-T K.45:2003, IEEE C62.41.2:2002: – Per signal wire	10 kA					
– Per pair	20 kA					

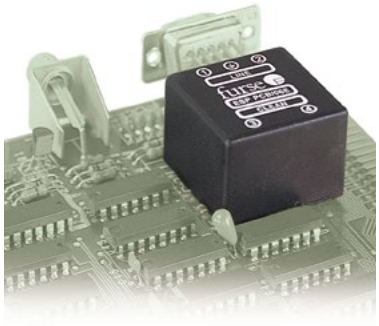
Mechanical specification	ESP PCB/D & PCB/TN Series
Temperature range	-40 to +80 °C
Connection type	0.64 mm (0.025”) square PCB pins, 1.2 mm diameter PCB holes recommended
Case Material	FR Polymer UL-94 V-0
Weight	0.035 kg
Dimensions	See diagram below

[1] Nominal voltage (DC or AC peak) measured at < 5 µA (ESP PCB/15D, ESP PCB/30D, ESP PCB/50D, ESP PCB/110D) and <200 µA (ESP PCB/06D).
[2] Maximum working voltage (DC or AC peak) measured at < 1 mA leakage (ESP PCB/15D, ESP PCB/30D, ESP PCB/50D, ESP PCB/110D), < 10 mA (ESP PCB/06D) and < 10 µA (ESP PCB/TN).
[3] The maximum transient voltage let-through of the protector throughout the test (±10%), line to line & line to earth, both polarities. Response time < 10 ns.
[4] Test to IEC 61000-4-5:2006, ITU-T (formerly CCITT) K.20, K.21 and K.45,Telcordia GR-1089-CORE, Issue 2:2002, ANSI TIA/EIA/IS-968-A:2002 (formerly FCC Part 68).
[5] The installation and connections external to the protector may limit the capability of the protector.



Data and signal protection

ESP PCB/E Series



*NOTE: product label design may vary.

Combined Category D, C, B tested protector (to BS EN 61643) for 'through hole' mounting directly onto the PCB of data communication, signal or telephone equipment which require a lower in-line resistance, an increased current or a higher bandwidth than the PCB/D Series. Available for working voltages of up to 110 Volts for AC & DC power applications up to 1.25 Amps. For use at boundaries up to LPZ 0 to protect against flashover (typically the service entrance location) through to LPZ 3 to protect sensitive electronic equipment.**

Features & benefits

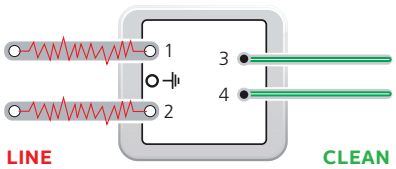
- Suitable for wave soldering
- Very low let-through voltage (enhanced protection to IEC/BS EN 62305) between all lines - Full Mode protection
- Full Mode design capable of handling partial lightning currents as well as allowing continual operation of protected equipment
- Repeated protection in lightning intense environments
- Very low (1 Ω) in-line resistance for resistance critical applications
- High (1.25 A) maximum running current
- Higher bandwidth enables higher frequency data communications
- 2 pin clean end and 3 pin line end to ensure correct insertion

Installation

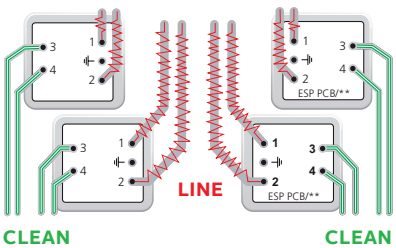
Connect in series, soldering pins direct onto PCB. Tracks to line and earth pins should be as wide as practical (see Furse Application Note AN003). Dirty (line) tracks should be routed parallel and as close together as possible. This should also be implemented on clean tracks, however clean tracks should never be routed close and parallel to line tracks or dirty barrier earth connections as earth connections as transients can be re-introduced after the protector due to electromagnetic coupling.

The use of an earth layer or plane is highly recommended as this reduces the electromagnetic field produced by a transient discharging to earth considerably, and hence the chance of the transient being picked up on clean tracks.

Maximum line to clean separation. Large input tracks and pads (using top and bottom copper layers). Earth pin is bonded to an earth layer/plane.



All dirty (line) incoming tracks are separated from the clean output tracks, individual line and clean tracks are routed close together. Earth pins are bonded to an earth layer/plane.



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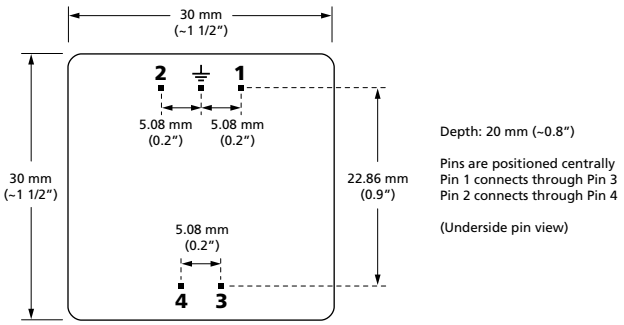
ESP PCB/E Series - Technical specification

Electrical specification	ESP PCB/06E	ESP PCB/15E	ESP PCB/30E	ESP PCB/50E	ESP PCB/110E
ABB order code	7TCA085400R0039	7TCA085400R0153	7TCA085400R0043	7TCA085400R0156	7TCA085400R0041
Nominal voltage[1]	6 V	15 V	30 V	50 V	110 V
Maximum working voltage U_c (DC)[2]	7.79 V	16.7 V	36.7 V	56.7 V	132 V
Maximum working voltage U_c (AC RMS)	5 V	11 V	25 V	40 V	93 V
Current rating (signal)	1.25 A				
In-line resistance (per line ±10%)	1.0 Ω				
Bandwidth (-3 dB 50 Ω system)	45 MHz				

Transient specification		ESP PCB/06E	ESP PCB/15E	ESP PCB/30E	ESP PCB/50E	ESP PCB/110E
Let-through voltage (all conductors) U_p[3]						
C2 test 4 kV 1.2/50 µs, 2 kA 8/20 µs to BS EN/EN/IEC 61643-21		36.0 V	39.0 V	60.0 V	86.0 V	180 V
C1 test 1 kV, 1.2/50 µs, 0.5 kA 8/20 µs to BS EN/EN/IEC 61643-21		26.2 V	28.0 V	49.0 V	73.5 V	170 V
B2 test 4 kV 10/700 µs to BS EN/EN/IEC 61643-21		16.0 V	25.5 V	43.5 V	65.0 V	160 V
5 kV, 10/700 µs[4]		17.0 V	26.2 V	44.3 V	65.8 V	165 V
Maximum surge current[5]						
D1 test 10/350 µs to BS EN/EN/IEC 61643-21:	– Per signal wire	2.5 kA				
	– Per pair	5 kA				
8/20 µs to ITU-T K.45:2003, IEEE C62.41.2:2002:	– Per signal wire	10 kA				
	– Per pair	20 kA				

Mechanical specification	ESP PCB/E Series
Temperature range	-40 to +80 °C
Connection type	0.64 mm (0.025”) square PCB pins, 1.2 mm diameter PCB holes recommended
Case Material	FR Polymer UL-94 V-0
Weight	0.035 kg
Dimensions	See diagram below

[1] Nominal voltage (DC or AC peak) measured at < 10 µA (ESP PCB/15E, ESP PCB/30E, ESP PCB/50E, ESP PCB/110E) and < 200 µA (ESP PCB/06E).
[2] Maximum working voltage (DC or AC peak) measured at < 5 mA leakage (ESP PCB/15E, ESP PCB/30E, ESP PCB/50E, ESP PCB/110E), < 10 mA (ESP PCB/06E).
[3] The maximum transient voltage let-through of the protector throughout the test (±10%), line to line & line to earth, both polarities. Response time < 10 ns.
[4] Test to IEC 61000-4-5:2006, ITU-T (formerly CCITT) K.20, K.21 and K.45,Telcordia GR-1089-CORE, Issue 2:2002, ANSI TIA/EIA/IS-968-A:2002 (formerly FCC Part 68).
[5] The installation and connections external to the protector may limit the capability of the protector.



Data & signal protection

ESP RTD, RTDQ & SL RTD Series

*NOTE: product label design may vary.

Combined Category D, C, B tested protector (to BS EN 61643) suitable for 3-wire RTD systems to protect monitoring equipment. For use at boundaries up to LPZ 0 (ESP RTD & ESP RTDQ) or LPZ 0 (ESP SL RTD) to protect against flashover (typically the service entrance location) through to LPZ 3. Available as standard ESP RTD format, or compact ESP RTDQ and Slim Line ESP SL RTD versions for installations where a high number of lines require protection.

Features & benefits

- Protects all three wires on a 3-wire RTD system with a single protector
- Very low let-through voltage (enhanced protection to IEC/BS EN 62305) between all lines - Full Mode protection
- Full Mode design capable of handling partial lightning currents as well as allowing continual operation of protected equipment
- Repeated protection in lightning intense environments
- Low in-line resistance minimises reductions in signal strength
- Built-in DIN rail foot for simple mounting to top hat DIN rails
- Convenient earthing through DIN foot and/or earth terminal
- ESP RTD can be flat mounted on base or side
- ESP RTD and ESP RTDQ have colour coded terminals for quick and easy installation check
- ESP SL RTD has ultra slim 7 mm width ideal for compact protection of large numbers of lines (e.g. process control installations)
- ESP SL RTD includes two stage removable protection module with simple quick release mechanism allowing partial removal for easy line commissioning and maintenance as well as full removal for protection replacement

For further information on RTD applications, see separate Application Note AN001 (contact us for a copy).

Installation

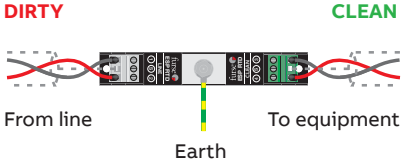
Connect in series with the signal line either near where it enters or leaves the building or close to the equipment being protected ensuring it is very close to the system's earth star point. Install protectors either within an existing cabinet/ cubicle or in a separate enclosure.

Accessories

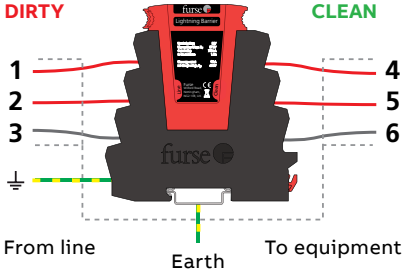
Replacement module for ESP SL RTD:
ESP SLRTD/M Standard module replacement
ESP SLRTD/B Base replacement

Combined Mounting/Earthing kits for ESP RTD:
CME 4 For up to 4 x ESP RTD
CME 8 For up to 8 x ESP RTD
CME 16 For up to 16 x ESP RTD
CME 32 For up to 32 x ESP RTD

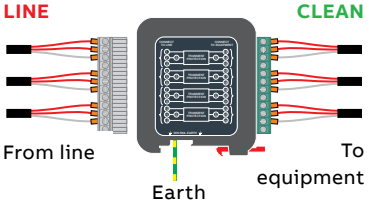
ESP RTD installed in series



ESP SL RTD installed in series



ESP RTDQ installed in series (in-line)



NOTE: For 2-wire or 4-wire RTD applications, use one or two ESP 06D or ESP SL06 protectors respectively.

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ESP RTD, RTDQ & SL RTD Series - Technical specification

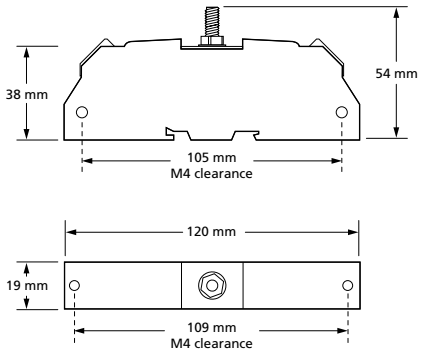
Electrical specification	ESP RTD	ESP SL RTD	ESP RTDQ
ABB order code	7TCA085460R0157	7TCA085400R0232	7TCA085400R0158
Nominal voltage[1]	6 V		
Maximum working voltage U_c (DC)[2]	7.79 V		
Maximum working voltage U_c (AC RMS)	5 V		
Current rating (signal)	200 mA	500 mA	700 mA
In-line resistance (per line ±10%)	10 Ω	1.0 Ω	1.0 Ω
Bandwidth (-3 dB 100 Ω system)	800 kHz	1.5 MHz	800 kHz

Transient specification		ESP RTD	ESP SL RTD	ESP RTDQ
Let-through voltage (all conductors) U_p[3]				
C2 test 4 kV 1.2/50 µs, 2 kA 8/20 µs to BS EN/EN/IEC 61643-21		12.0 V	17.9 V	15.0 V
C1 test 1 kV, 1.2/50 µs, 0.5 kA 8/20 µs to BS EN/EN/IEC 61643-21		11.5 V	12.1 V	12.5 V
B2 test 4 kV 10/700 µs to BS EN/EN/IEC 61643-21		10.0 V	11.0 V	10.0 V
5 kV, 10/700 µs[4]		10.5 V	11.3 V	10.5 V
Maximum surge current				
D1 test 10/350 µs to BS EN/EN/IEC 61643-21:	– Per signal wire 2.5 kA – Per pair	2.5 kA 5 kA	1.25 kA 2.5 kA	2.5 kA 5 kA
8/20 µs to ITU-T K.45:2003, IEEE C62.41.2:2002:	– Per signal wire – Per pair	10 kA 20 kA	5 kA 10 kA	10 kA 20 kA

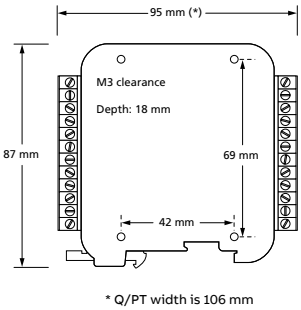
Mechanical specification	ESP RTD	ESP SL RTD	ESP RTDQ
Temperature range	-40 to +80 °C		
Connection type	Screw terminal - max. torque 0.5 Nm	Screw terminal - max. torque 0.8 Nm	Pluggable 12 way screw terminal
Conductor size (stranded)	2.5 mm²	4 mm²	2.5 mm²
Earth connection	M6 stud - max. torque 0.5 Nm	Via DIN rail or 4 mm² earth terminal - max. torque 0.8 Nm	Via DIN rail or M5 threaded hole in base of unit - max. torque 0.6 Nm
Case Material	FR Polymer UL-94 V-0		
Weight	0.08 kg	0.08 kg	0.1 kg
Dimensions	See diagram below		

[1] Nominal voltage (DC or AC peak) measured at < 200 µA.
[2] Maximum working voltage (DC or AC peak) measured at < 10 mA.
[3] The maximum transient voltage let-through of the protector throughout the test (±10%), line to line & line to earth, both polarities. Response time < 10 ns.
[4] Test to IEC 61000-4-5:2006, ITU-T (formerly CCITT) K.20, K.21 and K.45,Telcordia GR-1089-CORE, Issue 2:2002, ANSI TIA/EIA/IS-968-A:2002 (formerly FCC Part 68).

ESP RTD



ESP RTDQ



* Q/PT width is 106 mm

ESP SL RTD

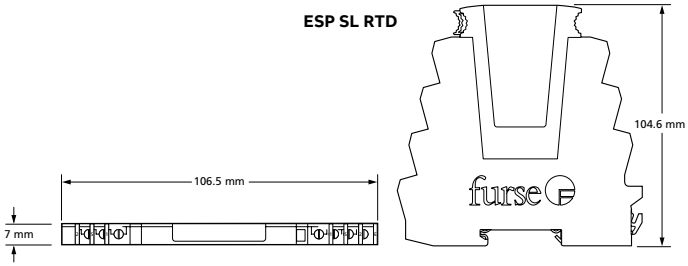


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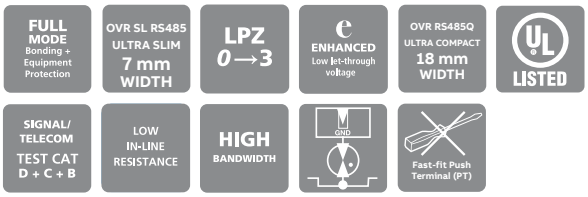
ABB order codes

Part	ABB order code	Part	ABB order code	Part	ABB order code
ESPSLRTD/M	7TCA085400R0258	**CME16**	7TCA085410R0002	**WBXSLQ**	7TCA085410R0037
ESP SLRTD/B	7TCA085400R0263	**CME8**	7TCA085400R0002	**WBXSLQ/G**	7TCA085410R0036
CME4	7TCA085400R0001	**CME32**	7TCA085410R0003		

Data & signal protection

ESP RS485, RS485Q & SL RS485 Series

*NOTE: product label design may vary.



Combined Category D, C, B tested (to IEC/BS EN 61643) Surge Protection Device (SPD) specifically designed for RS 485 and Fieldbus applications, such as Profibus DP. For use at boundaries up to LPZ 0 protect against flashover (typically the service entrance location) through to LPZ 3. Available as standard ESP RS485 format, or compact ESP RS485Q and Slim Line ESP SL RS485 versions for installations where a high number of lines require protection.

Features & benefits

- Very low let-through voltage (enhanced protection to IEC/BS EN 62305) between all lines - Full Mode protection
- Full Mode design capable of handling partial lightning currents as well as allowing continual operation of protected equipment
- Repeated protection in lightning intense environments
- 45 MHz bandwidth greatly exceeds 12 Mbps maximum speeds
- Low in-line resistance minimises reductions in signal strength
- Suitable for earthed or isolated screen systems
- Built-in DIN rail foot for simple mounting to top hat DIN rails
- Convenient earthing through DIN foot and/or earth terminal
- Connect screen connection 'S' as the 0V ground on RS485 systems
- ESP RS485 can be flat mounted on base or side
- ESP RS485 and ESP RS485Q have colour coded terminals for quick and easy installation check
- ESP SL RS485 has ultra slim 7 mm width ideal for compact protection of large numbers of lines (e.g. process control installations)
- ESP SL RS485 includes two stage removable protection module with simple quick release mechanism allowing partial removal for easy line commissioning and maintenance as well as full removal for protection replacement
- ESP SL RS485 includes optional LED status indication. Add L suffix to part number - i.e. ESP SL RS485L
- ESP RS485Q available with Push Terminals (ESP RTDQ/PT) for simple 'spring' connections, to provide fast and reliable cable termination
- ESP RS485Q and ESP RS485Q/PT have UL497B approval under file E240341

Installation

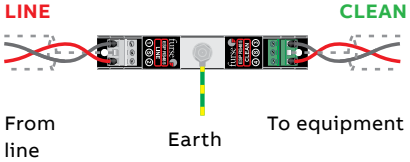
Connect in series with the signal line either near where it enters or leaves the building or close to the equipment being protected ensuring it is very close to the system's earth star point. Install SPDs either within an existing cabinet/ cubicle or in a separate enclosure.

Accessories

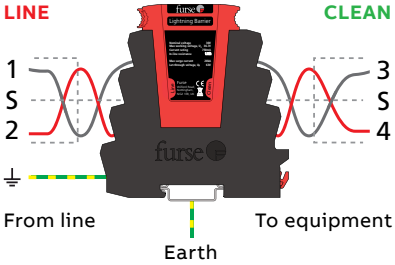
For replacement SPD modules (/M), spare base units (/B), weatherproof enclosures (WBX) and combined mounting and earthing kits (CME) see ABB order code table.

Combined Mounting/Earthing kits for ESP RS485:
CME 4 For up to 4 x ESP RS485
CME 8 For up to 8 x ESP RS485
CME 16 For up to 16 x ESP RS485
CME 32 For up to 32 x ESP RS485

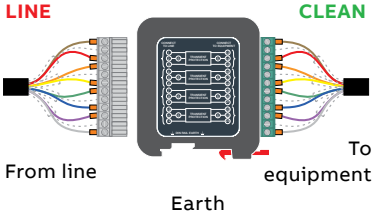
ESP RS485 installed in series



ESP SL RS485 installed in series



ESP RS485Q installed in series (in-line)



NOTE: The ESP SL 'Slim Line' Series is also available for protection of 3-wire and RTD applications (ESP SL/3W & ESP SL RTD). The ESP SL X Series has approvals for use in hazardous areas.

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ESP RS485, RS485Q & SL RS485 Series - Technical specification

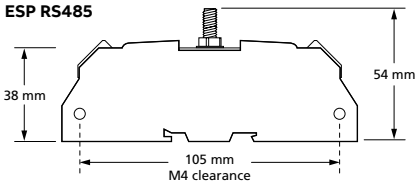
Electrical specification	ESP RS485	ESP SL RS485	ESP RS485Q
Nominal voltage[1]	15 V		
Maximum working voltage U_c (DC)[2]	16.7 V		
Maximum working voltage U_c (AC RMS)	11 V		
Current rating (signal)	300 mA		
In-line resistance (per line ±10%)	1 Ω		
Bandwidth (-3 dB 50 Ω system)	45 MHz		

Transient specification		ESP RS485	ESP SL RS485	ESP RS485Q
Let-through voltage (all conductors) U_p[3]				
C2 test 4 kV 1.2/50 µs, 2 kA 8/20 µs to BS EN/EN/IEC 61643-21		55.0 V		
C1 test 1 kV, 1.2/50 µs, 0.5 kA 8/20 µs to BS EN/EN/IEC 61643-21		42.0 V		
B2 test 4 kV 10/700 µs to BS EN/EN/IEC 61643-21		27.2 V		
5 kV, 10/700 µs[4]		28.2 V		
Maximum surge current				
D1 test 10/350 µs to BS EN/EN/IEC 61643-21:	– Per signal wire 2.5 kA – Per pair	2.5 kA 5 kA	1.25 kA 2.5 kA	2.5 kA 5 kA
8/20 µs to ITU-T K.45:2003, IEEE C62.41.2:2002:	– Per signal wire – Per pair	10 kA 20 kA	5 kA 10 kA	10 kA 20 kA

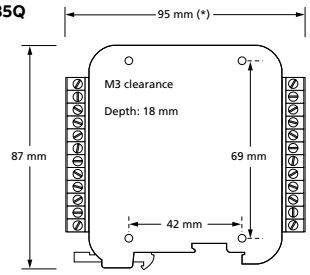
Mechanical specification	ESP RS485	ESP SL RS485	ESP RS485Q
Temperature range	-40 to +80 °C		
Connection type	Screw terminal - max. torque 0.5 Nm	Screw terminal - max. torque 0.8 N	Pluggable 12 way screw terminal
Conductor size (stranded)	2.5 mm²	4 mm²	2.5 mm²
Earth connection	M6 stud	Via DIN rail or 4 mm² earth terminal - max. torque 0.8 Nm	Via DIN rail or M5 threaded hole in base of unit
Case Material	FR Polymer UL-94 V-0		
Weight	0.08 kg		
Dimensions	See diagrams below		

[1] Nominal voltage (DC or AC peak) measured at < 10 µA.
[2] Maximum working voltage (DC or AC peak) measured at < 5 mA.
[3] The maximum transient voltage let-through of the protectorthroughout the test (±10%), line to line & line to earth, both polarities. Response time < 10 ns.
[4] Test to IEC 61000-4-5:2006, ITU-T (formerly CCITT) K.20, K.21 and K.45,Telcordia GR-1089-CORE, Issue 2:2002, ANSI TIA/EIA/IS-968-A:2002 (formerly FCC Part 68).

ESP RS485



ESP RS485Q



* Q/PT width is 106 mm

ESP SL RS485

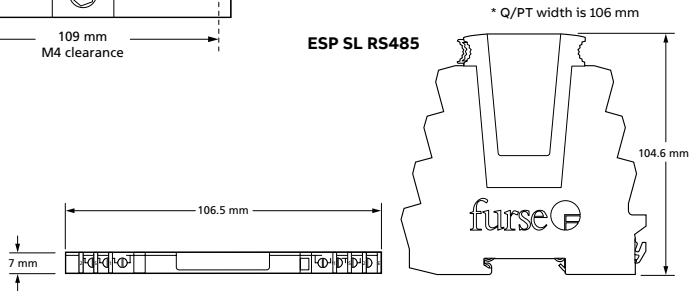


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ABB order codes

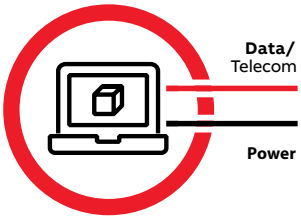
Part no.	ABB order code	Part no.	ABB order code	Part no.	ABB order code
ESP RS485	7TCA085400R0191	**ESP RS485Q(UL)**	7TCA085400R0558	**CME32**	7TCA085410R0003
ESP SLRS485/B	7TCA085400R0262	**ESP RS485Q/PT(UL)**	7TCA085400R0565	**WBXSLQ**	7TCA085410R0037
ESP SLRS485	7TCA085400R0193	**ESP SLRS485/M**	7TCA085400R0259	**WBXSLQ/G**	7TCA085410R0036
ESP SLRS485L	7TCA085400R0230	**ESP SLRS485L/M**	7TCA085400R0471	**WBX 4**	7TCA085410R0027
ESP SLRS485(UL)	7TCA085400R0525	**CME4**	7TCA085400R0001	**WBX 8**	7TCA085410R0030
ESP SLRS485L(UL)	7TCA085400R0526	**CME16**	7TCA085410R0002	**WBX 16/2/G**	7TCA085410R0020
ESP RS485Q	7TCA085400R0192	**CME8**	7TCA085400R0002		

Telecoms & computer line protection

The Furse ESP range of SPDs (telecoms & computer line protection) 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.

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	 **ESP TN Series** 7TCA085400R0171 **ESP TN/BX Series** 7TCA085400R0175 **ESP TN/2BX Series** 7TCA085400R0172	**ESP MC/TN/RJ11 Series** e.g. Fax machines / Modems 7TCA085430R0005 
Compact, ideal where space is a premium	 **ESP SL TN Series** 7TCA085400R0195	
Multiple line protection in a single unit	 **ESP TNQ Series** 7TCA085400R0183	
For BT type socket systems	 **ESP TN/JP Series** 7TCA085400R0177	**IMPORTANT:** Equipment is ONLY protected against transient overvoltages if all incoming / outgoing mains and data lines have protection fitted.
For PBX systems terminating of LSA-Plus disconnection modules	 **ESP K10T1** 7TCA085400R0130 **ESP KT1** 7TCA085400R0135 **ESP KE10** 7TCA085400R0134	

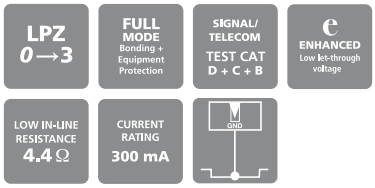
System	Computer system protector	
Computer networks with RJ45 connection	 **ESP Cat-6 Series** 7TCA085400R0023	 **ESP MC/Cat-5 Series** 7TCA085430R0004

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.

Telecoms & computer line protection

ESP TN/JP, TN/RJ11 & ISDN/RJ45 Series

*NOTE: product label design may vary.



Combined Category D, C, B tested protector (to BS EN 61643) suitable to protect telephony equipment plugged into a BT telephone (BS 6312), Modem (RJ11) or ISDN (RJ45) socket. For use at boundaries up to LPZ 0 to protect against flashover (typically the service entrance location) through to LPZ 3 to protect sensitive electronic equipment.

Features & benefits

- Very low let-through voltage (enhanced protection to IEC/BS EN 62305) between all lines - Full Mode protection
- Full Mode design capable of handling partial lightning currents as well as allowing continual operation of protected equipment
- Repeated protection in lightning intense environments
- Substantial earth connection to enable effective earthing
- Supplied in a sturdy ABS housing ready for flat mounting, or vertically via TS35 'Top Hat' DIN rail
- ESP TN/JP, ESP TN/RJ11-2/6, ESP TN/RJ11-4/6 and ESP TN/RJ11-6/6 are suitable for telecommunication applications in accordance with Telcordia and ANSI Standards (see Application Note AN005)

Application

- For PSTN (e.g. POTS, dial-up, lease line, T1/E1, *DSL and Broadband) use ESP TN/JP or TN/RJ11
- ESP TN/JP and ESP TN/RJ11... are suitable for use on telephone lines with a maximum (or ringing) voltage of up to 296 Volts
- For telephone lines with a British style, jack plug and socket connection, use ESP TN/JP
- For telephone lines with RJ11 connections protect the middle 2 (of 6) conductors with ESP TN/RJ11-2/6, the middle 4 (of 6) with ESP TN/RJ11-4/6 or all 6 with ESP TN/RJ11-6/6
- For S/T interface ISDN lines, use ESP ISDN/RJ45-4/8 and ESP ISDN/RJ45-8/8
- For S/T interface ISDN lines with RJ45 connections protect the middle 4 (of 8) conductors (paired 3&6, 4&5) with ESP ISDN/RJ45-4/8, or all 8 (outside pairs 1&2, 7&8) with ESP ISDN/RJ45-8/8

For further information on RJ45 ISDN applications, see separate Application Note AN002 and for global telephony applications, see separate Application Note AN005 (contact us for a copy).

Installation

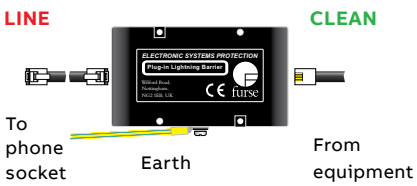
Connect in series with the telephone or ISDN line. These units are usually installed close to the equipment being protected and within a short distance of a good electrical earth.

Accessories

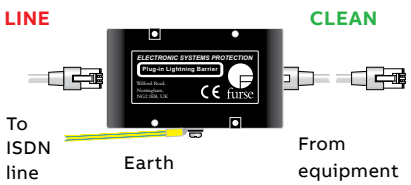
ESP CAT5e/UTP-1
ABB order code: 7TCA085400R0294
1 metre cable with RJ45 connections

Plug-in series connection for ESP TN/JP

Plug-in series connection for ESP TN/RJ11-2/6, 4/6 & 6/6



Plug-in series connection for ESP ISDN/RJ45-4/8 & 8/8



NOTE: For non-ISDN wire-in applications the high performance ESP TN or readyboxed derivative ESP TN/BX or ESP TN/2BX can be used. Protect PBX telephone exchanges and other equipment with LSA-PLUS connections.

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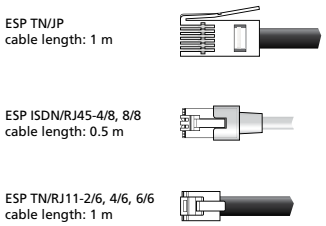
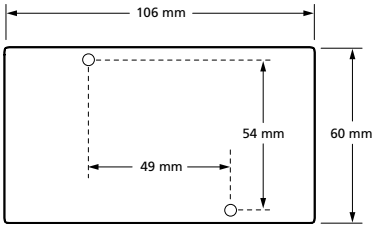
ESP TN/JP, TN/RJ11 & ISDN/RJ45 Series - Technical specification

Electrical specification		**ESP TN/JP**	**ESP TN/ RJ11-2/6**	**ESP TN/ RJ11-4/6**	**ESP TN/ RJ11-6/6**	**ESP ISDN/ RJ45-4/8**	**ESP ISDN/ RJ45-8/8**
ABB order code		7TCA085400R0177	7TCA085400R0178	7TCA085400R0179	7TCA085400R0180	7TCA085460R0170	7TCA085460R0171
Nominal voltage		296 V	296 V	296 V	296 V	5 V	5 V/58 V[2]
Maximum working voltage U_c[1]		296 V	296 V	296 V	296 V	58 V	58 V
Current rating (signal)		300 mA					
In-line resistance (per line ±10%)		4.4 Ω					
Bandwidth (-3 dB 50 Ω system)		20 MHz	20 MHz	20 MHz	20 MHz	19 MHz	19 MHz
Transient specification		**ESP TN/JP**	**ESP TN/ RJ11-2/6**	**ESP TN/ RJ11-4/6**	**ESP TN/ RJ11-6/6**	**ESP ISDN/ RJ45-4/8**	**ESP ISDN/ RJ45-8/8**
Let-through voltage (all conductors)[3] U_p							
C2 test 4 kV 1.2/50 µs,	– line to line	395 V	395 V	395 V	395 V	28 V	28 V/88 V[5]
2 kA 8/20 µs to	– line to earth	395 V	395 V	395 V	395 V	88 V	88 V
BS EN/EN/IEC 61643-21							
C1 test 1 kV, 1.2/50 µs,	– line to line	390 V	390 V	390 V	390 V	23 V	23 V/63 V[5]
0.5 kA 8/20 µs to BS EN/EN/IEC 61643-21	– line to earth	390 V	390 V	390 V	390 V	63 V	63 V
B2 test 4 kV 10/700 µs to	– line to line	298 V	298 V	298 V	298 V	26 V	26 V/65 V[5]
BS EN/EN/IEC 61643-21	– line to earth	298 V	298 V	298 V	298 V	65 V	65 V
5 kV, 10/700 µs4	– line to line	300 V	300 V	300 V	300 V	27 V	27 V/80 V[5]
	– line to earth	300 V	300 V	300 V	300 V	80 V	80 V
Maximum surge current[6]							
D1 test 10/350 µs to BS EN/EN/IEC 61643-21		1 kA					
8/20 µs to ITU-T K.45:2003, IEEE C62.41.2:2002:		10 kA					
Mechanical specification		**ESP TN/JP**	**ESP TN/ RJ11-2/6**	**ESP TN/ RJ11-4/6**	**ESP TN/ RJ11-6/6**	**ESP ISDN/ RJ45-4/8**	**ESP ISDN/ RJ45-8/8**
Temperature range		-40 to +80 °C					
Connection type		BT603A plug and socket	RJ11 plug and socket	RJ11 plug and socket	RJ11 plug and socket	RJ45 plug and socket	RJ45 plug and socket
Earth connection		M4/DIN rail					
Case Material		FR Polymer UL-94 V-0					
Weight		0.15 kg					
Dimensions		See diagram below					

[1] Maximum working voltage (DC or AC peak) measured at < 10 µA leakage for ESP TN/JP and ESP TN/RJ11 products and µA for ESP ISDN/RJ45 products.
[2] Maximum working voltage is 5 V for pairs 3/6 & 4/5, and 58 V for pairs 1/2 & 7/8.
[3] The maximum transient voltage let-through of the protector throughout the test (±10%), line to line & line to earth, both polarities. Response time < 10 ns.
[4] Test to IEC 61000-4-5:2006, ITU-T (formerly CCITT) K.20, K.21 and K.45,Telcordia GR-1089-CORE, Issue 2:2002, ANSI TIA/EIA/IS-968-A:2002 (formerly FCC Part 68).
[5] The first let-through voltage value is for pairs 3/4 & 5/6, and the second value is for pairs 1/2 & 7/8.
[6] The installation and connectors external to the protector may limit the capability of the protector.



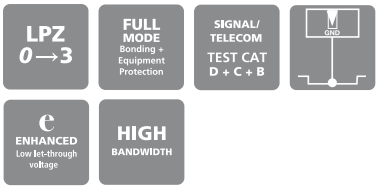


Depth: 24 mm
Fixing centres 49 x 54 mm, M3 clearance

Telecom & computer line protection

ESP K10T1 Series

*NOTE: product label design may vary.



Combined Category D, C, B tested protector (to BS EN 61643) suitable for use on ten line LSA-PLUS disconnection modules to PBX telephone exchanges, ISDN and other telecoms equipment with LSA-PLUS disconnection modules. For use at boundaries up to LPZ 0 to protect against flashover (typically the service entrance location) through to LPZ 3 to protect sensitive electronic equipment.

Features & benefits

- Low cost protection for large numbers of data and signal lines
- Very low let-through voltage (enhanced protection to IEC/BS EN 62305) between all lines - Full Mode protection
- Full Mode design capable of handling partial lightning currents as well as allowing continual operation of protected equipment
- Repeated protection in lightning intense environments
- Quick and easy plug-in installation, with ‘bump’ location feedback
- At larger installations ESP K10T1 provide all in one protection for all ten lines on LSA-PLUS disconnection modules
- ESP K10T1 has an integral earth connection, and an external M4 earth bush for use with non-metallic LSA-Plus frames
- Suitable for telecoms applications in accordance with Telcordia and ANSI Standards

Application

- For PSTN (e.g POTS, dial-up, lease line, T1/E1, *DSL and Broadband) and U interface ISDN lines
- Protect all ten lines on a disconnection module with ESP K10T1
- Suitable for speeds up to VDSL2 Profile 35b (35 MHz)

Installation

Install SPDs on all lines that enter or leave each building (including extensions to other buildings). Identify the lines requiring protection and plug-in the SPD (ensuring the correct orientation) for a series connection.
Plug ESP K10T1 directly into each disconnection module requiring protection.

This SPD fits inside Krone enclosure 250/5 (90mm total depth)

For further information on global telephony applications, see separate Application Note AN005 (contact us for a copy).

NOTE: For individual telephone lines and lines at unmanned sites the high performance ESP TN, ready-boxed derivative ESP TN/BX or ESP TN/2BX, or plug-in ESP TN/JP or ESP TN/RJ11 Series should be used. For plug-in S/T interface ISDN protection, use the ESP TN or ISDN Series SPDs.

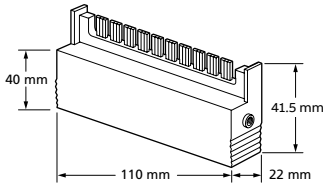
ESP K10T1 Series - Technical specification

Electrical specification		ESP K10T1
ABB order code		7TCA085400R0135
Maximum working voltage U_c [1]	– line to line	275 V
	– line to earth	275 V
Current rating (signal)		300 mA
In-line resistance (per line ±10%)		0 Ω
Bandwidth (-3 dB 50 Ω balanced system)		35 MHz

Electrical specification		ESP K10T1
Let-through voltage (all conductors)[2] U_p		
C2 test 4 kV 1.2/50 µs, 2 kA 8/20 µs to BS EN/EN/IEC 61643-21	– line to line	1000 V
C1 test 500V, 1.2/50µs, 250A 8/20µs to BS EN/EN/IEC 61643-21	– line to line	330 V
B2 test 4 kV 10/700 µs to BS EN/EN/IEC 61643-21	– line to line	340 V
	– line to earth	900 V
5 kV, 10/700 µs[3]	– line to line	345 V
	– line to earth	950 V
Maximum surge current[4]		
D1 test 10/350 µs to BS EN/EN/IEC 61643-21:	– line to line	2.5 kA
	– total to earth	5 kA
8/20 µs to ITU-T K.45:2003, IEEE C62.41.2:2002:	– line to line	5 kA
	– line to earth	10 kA
	– total to earth	10 kA

Mechanical specification	ESP K10T1
Temperature range	-40 to +80 °C
Connection type	To LSA-PLUS disconnection modules (BT part number 237A)
Earth connection	Via integral earth clip/external M4 bush
Material	FR Polymer UL-94 V-0
Weight	0.01 kg
Dimensions	See diagram below

[1] Maximum working voltage (DC or AC peak) at 5 µA.
[2] The maximum transient voltage let-through of the protector throughout the test (±10%), line to line & line to earth, both polarities. Response time < 10 ns.
[3] Test to IEC 61000-4-5:2006, ITU-T (formerly CCITT) K.20, K.21 and K.45, Telcordia GR-1089-CORE, Issue 2:2002, ANSI TIA/EIA/IS-968-A:2002 (formerly FCC Part 68).
[4] The installation and connections external to the protector may limit the capability of the protector.



Telecom & computer line protection

ESP KT & KE Series

*NOTE: product label design may vary.

Combined Category D, C, B tested protector (to BS EN 61643) suitable for use on ten line LSA-PLUS disconnection modules to PBX telephone exchanges, ISDN and other telecoms equipment with LSA-PLUS disconnection modules. For use at boundaries up to LPZ 0 to protect against flashover (typically the service entrance location) through to LPZ 3 to protect sensitive electronic equipment.

Features & benefits

- Low cost protection for large numbers of data and signal lines
- Very low let-through voltage (enhanced protection to IEC/BS EN 62305) between all lines - Full Mode protection
- All Mode design capable of handling partial lightning currents as well as allowing continual operation of protected equipment
- Repeated protection in lightning intense environments
- Quick and easy plug-in installation, with 'bump' location feedback
- Under power line cross conditions /PTC versions offer safe disconnection during fault duration. Unit auto-resets once fault corrected
- Use the ESP KE10 to provide trouble free earthing for up to ten ESP KT1 and ESP KT1/PTC (per disconnection module)
- ESP KT1/PTC have resettable overcurrent protection and are rated for power cross faults
- ESP KT1 and ESP KT1/PTC are suitable for telecoms applications in accordance with Telcordia and ANSI Standards

Application

- For PSTN (e.g POTS, dial-up, lease line, T1/E1, *DSL and Broadband) and U interface ISDN lines

Installation

Install protectors on all lines that enter or leave each building (including extensions to other buildings). Identify the lines requiring protection and plug-in the protector (ensuring the correct orientation) for a series connection.

ESP KT1 and ESP KT1/PTC must be installed via the ESP KE10 earth bar. Clip an ESP KE10 on to the disconnection module and plug an ESP KT1 or ESP KT1/PTC in to each line on the module that needs protecting. In the unlikely situation that the protector is damaged, it will sacrifice itself and fail short circuit, taking the line out of commission, indicating it needs replacing and preventing subsequent transients from damaging equipment.

For further information on global telephony applications, see separate Application Note AN005 (contact us for a copy).

NOTE: For individual telephone lines and lines at unmanned sites the high performance ESP TN, ready-boxed derivative ESP TN/BX or ESP TN/2BX, or plug-in ESP TN/JP or ESP TN/RJ11 Series should be used. For plug-in S/T interface ISDN protection, use the ESP TN or ISDN Series SPDs.

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ESP KT & KE Series - Technical specification

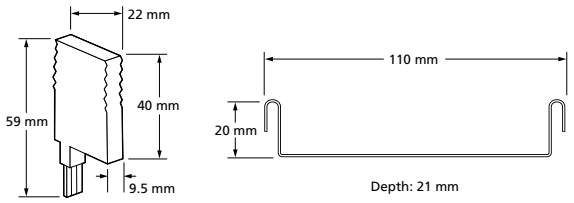
Electrical specification		ESP KT1	ESP KT1/PTC
ABB order code		7TCA085400R0135	7TCA085400R0034
Maximum working voltage U_c [1]	– line to line	296 V	296 V
	– line to earth	296 V	296 V
Current rating (signal)		300 mA	145 mA
In-line resistance (per line ±10%)		4.4 Ω	4.4 Ω
Bandwidth (-3 dB 50 Ω system)		20 MHz	20 MHz

Electrical specification		ESP KT1	ESP KT1/PTC
Let-through voltage (all conductors)[2] U_p			
C2 test 4 kV 1.2/50 µs, 2 kA 8/20 µs to BS EN/EN/IEC 61643-21	– line to line	395 V	395 V
	– line to earth	395 V	395 V
C1 test 1 kV, 1.2/50 µs, 0.5 kA 8/20µs to BS EN/EN/IEC 61643-21	– line to line	390 V	390 V
	– line to earth	390 V	390 V
B2 test 4 kV 10/700 µs to BS EN/EN/IEC 61643-21	– line to line	298 V	298 V
	– line to earth	298 V	298 V
5 kV, 10/700 µs[3]	– line to line	300 V	300 V
	– line to earth	300 V	300 V
Maximum surge current[4]			
D1 test 10/350 µs to BS EN/EN/IEC 61643-21:	– line to line	1 kA	1 kA
	– total to earth	2 kA	2 kA
8/20 µs to ITU-T K.45:2003, IEEE C62.41.2:2002:	– line to line	5 kA	5 kA
	– line to earth	10 kA	10 kA

Power faults specification	ESP KT1	ESP KT1/PTC
Power/Line Cross and Power Induction - tests to: ITU-T (formerly CCITT) K.20, K.21 and K.45, Telcordia GR-1089-CORE, Issue 2:2002, UL 60950/IEC 950		
Power/line cross	–	110/230 Vac (15 min)
Power induction	–	600 V, 1 A (0.2 sec)

Mechanical specification	ESP KT1	ESP KT1/PTC
Temperature range	-40 to +80 °C	
Connection type	To LSA-PLUS disconnection modules (BT part number 237A)	
Earth connection	Via ESP KE10 earth bar	
Material	FR Polymer UL-94 V-0	
Weight	0.01 kg	
Dimensions	See diagram below	

[1] Maximum working voltage (DC or AC peak) at 10 µA for ESP KT1, ESP KT1/PTC.
[2] The maximum transient voltage let-through of the protector throughout the test (±10%), line to line & line to earth, both polarities. Response time < 10 ns.
[3] Test to IEC 61000-4-5:2006, ITU-T (formerly CCITT) K.20, K.21 and K.45, Telcordia GR-1089-CORE, Issue 2:2002, ANSI TIA/EIA/IS-968-A:2002 (formerly FCC Part 68).
[4] The installation and connections external to the protector may limit the capability of the protector.

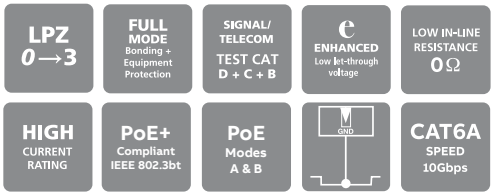


Telecom & computer line protection

ESP Cat-6 Series

*NOTE: product label design may vary.

Combined Category D, C, B tested protector (to BS EN 61643) suitable to protect twisted pair Ethernet networks, including Power over Ethernet (PoE++), with RJ45 connections. For use at boundaries up to LPZ 0 to protect against flashover (typically the service entrance location) through to LPZ 3 to protect sensitive electronic equipment.



Features & benefits

- Suitable for systems signalling on up to eight wires of either shielded or unshielded twisted pair cable
- Very low let-through voltage (enhanced protection to IEC/BS EN 62305) between all lines - Full Mode design capable of handling partial lightning currents as well as allowing continual operation of protected equipment
- Repeated protection in lightning intense environments
- Unlike some competing devices, the ethernet SPDs provide effective protection without impairing the system's normal operation
- Low capacitance circuitry prevents the start-up signal degradation associated with other types of network protector
- Low in-line resistance minimises unnecessary reductions in signal strength to maximize signalling distance
- Sturdy ABS housing with convenient holes for flat mounting, or vertically via TS35 'Top Hat' DIN rail
- Substantial earth connection to enable effective earthing
- Will protect all PoE powering modes A and B
- ESP Cat-6/PoE has additional components fitted to protect PoE power sourcing equipment (PSE) and powered devices (PD)

Application

Use these protectors on network cables that travel between buildings to prevent damage to equipment, e.g. computers, servers, repeaters and hubs. Suitable for computer networks up to Cat-6A cabling.

- To protect up to 1000baseT/ 10GbaseT networks with Cat-6/Cat-6A cabling use ESP Cat-6
- To protect up to 1000baseT/ 10GbaseT Power over Ethernet (PoE) networks with Cat-6/Cat-6A cabling use ESP Cat-6/PoE

For further application information, see separate Application Note ESP AN004 (contact us for a copy).

Installation

Connect in series with the network cable, either:

- Near to where it enters or leaves the building, or
- As it enters the network hub, or
- Close to the equipment being protected

This should be close to the system's earth star point (to enable a good connection to earth).

Accessories

ESP CAT6/STP-2
ABB Order code:
7TCA085400R0231
2 metre screened cable with shielded RJ45 connections

Plug-in series connection

TECHNICAL NOTE:
The interfaces used in Ethernet networks incorporate an isolation transformer which gives these systems an inbuilt immunity to transients between line and earth of 1,500 Volts or more.

NOTE: Please use 'ESP Cat-5e' for a 100BASE-T system, and to protect datacomms systems based on twisted pairs, use the ESP D, E or H Series.

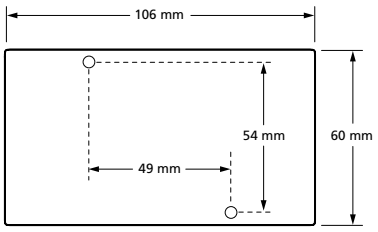
ESP Cat-6 Series - Technical specification

Electrical Specification		ESP Cat-6	ESP Cat-6/PoE
ABB order code		7TCA085400R0023	7TCA085400R0024
Maximum working voltage U_c[1]	– data	3.3 V	3.3 V
	– PoE[3]	–	58 V
Current rating		1.5 A	1.5 A[4]
In-line resistance[2]		~ 0 Ω	~ 0 Ω
Capacitance	– line to line	12 pF	12 pF
	– line to earth	6 pF	6 pF
Maximum data rate		10 Gbps	10 Gbps
Frequency		500 MHz	500 MHz
Networking standards:		10/100/1000/ 10GbaseT	10/100/1000/ 10GbaseT
		TIA Cat-6	TIA Cat-6
		IEEE 802.3i (10 BASE-T)	IEEE 802.3i (10 BASE-T)
		IEEE 802.3u (100 BASE-T)	IEEE 802.3u (100 BASE-T)
		IEEE 802.3ab (1000 BASE-T)	IEEE 802.3ab (1000 BASE-T)
		IEEE 802.3an (10G BASE-T)	IEEE 802.3an (10G BASE-T)
		–	IEEE 802.3at (PoE 30W)
		–	IEEE 802.3bt (PoE 100W)

Transient specification		ESP Cat-6	ESP Cat-6/PoE
Let-through voltage (all conductors)[5] U_p			
C3 test 1kV/µs, 100A 10/1000µs to BS EN/EN/IEC 61643-21	– line to line	15 V	15 V
	– pair to pair (PoE)	–	90 V
C2 test 4kV 1.2/50µs, 2kA 8/20µs to BS EN/EN/IEC 61643-21	– line to line	900 V	900 V
B2 test 1kV 10/700µs, 25A 5/320µs to BS EN/EN/IEC 61643-21	– line to line	9 V	9 V
	– pair to pair (PoE)	–	85 V
B2 test 4kV 10/700µs, 100A 5/320µs to BS EN/EN/IEC 61643-21	– line to earth[6]	700 V	700 V
Maximum surge current[7]			
D1 test 10/350 µs to BS EN/EN/IEC 61643-21	– line to line	1 kA	1 kA
8/20 µs to ITU-T K.45:2018, IEEE C62.41.2:2002	– line to line	100 A	100 A
	– line to earth	10 kA	10 kA

Mechanical specification	ESP Cat-6, ESP Cat-6/PoE
Temperature range	-40 to +80 °C
Connection type	RJ45 sockets
Cable (supplied)	0.5 m Cat-6 shielded patch lead[8]
Earth connection	M4/DIN rail
Case Material	FR Polymer UL-94 V-0
Weight	0.15 kg
Dimensions	See diagram below

[1] Maximum working voltage (DC or AC peak) measured at 1 mA leakage.
[2] Although no components are fitted in-line, internal connectors and tracking will contribute a resistance <0.5 Ω per line.
[3] PoE protectors transmit power Mode A and Mode B power.
[4] Based on 100W of transmitted PSE power, to IEEE 802.3bt.
[5] The maximum transient voltage let-through of the protector throughout the test (±10%). Response time <10 ns (on all protected pairs).
[6] The interfaces used in network systems incorporate an isolation transformer that inherently provides an inbuilt immunity to transients between line and earth of 1,500 Volts or more.
[7] The installation and connectors may limit the capability of the protector.
[8] There are many types of shielded cable available, minimum specification will be F/1U0T6 P or better.



Depth: 24 mm Fixing centres 49 x 54 mm, M3 clearance

Specific systems protection

The Furse ESP range of SPDs (specific systems protection) are widely specified in all applications to ensure the continuous operation of critical electronic systems. This includes many specific systems such as those used within sectors such as renewal energy, infrastructure, security surveillance and communications. These SPDs form part of a complete lightning protection solution to BS EN 62305.

Specific systems protection

Product selector - Specific protectors

For wind turbine systems		**ESP WT Series** 7TCA085460R0028
For photo-voltaic (solar) panel systems		**ESP PV Series** 7TCA085460R0147
For use on sub-distribution boards		**ESP 690T1 Surge Protection Series** 7TCA085460R0439
for use on the sub-distribution board		**ESP 690T2 Surge Protection Series** 7TCA085460R0402
For rail signalling systems		**ESP SSI Series** 7TCA085400R0168
For terrestrial, cable and satellite TV systems		**ESP TV Series** 7TCA085400R0122
For Closed Circuit TV systems		**ESP CCTV Series** 7TCA085400R0123
For coaxial Radio Frequency systems		**ESP RF Series** 7TCA085450R0002

Specific systems protection
Wind turbines

Wind turbines contain a vast array of electronic systems, including power, control and telecoms, which require transient overvoltage protection.

Protection follows the Lightning Protection Zones (LPZ) concept established in IEC/BS EN 62305 and IEC 61400, with equipment sited in internal zones up to LPZ 2 (see Figure 8 & Table 3 for specific locations).

Power line protection
Lightning current/equipotential bonding SPDs (minimum Type 1) are required at LPZ boundary LPZ 0 to LPZ 1 to counter partial lightning currents resulting from a direct lightning strike. Transient overvoltage SPDs (minimum Type 2) are required at LPZ boundary LPZ 1 to LPZ 2 to protect critical electronic systems.

The SPD selected should be suitable for the voltage of the line. Furse ESP WT Series protectors apply at 690 V with Furse ESP D1 Series or Furse ESP M1 Series protectors covering 230 V/400 V lines (see Table 3).

These power line protectors offer low let-through voltage protection creating a safe area downstream of minimum LPZ 2, meeting the requirements for wind turbines.

SPDs should be installed on the line side, as close as possible to the equipment being protected. Where connected downstream equipment is > 10 m away, a second SPD should be installed at the subsequent equipment (in line with guidance in DD CLC/TS 50539-22:2010).

If the main HV transformer is housed separately from the wind turbine, incoming/outgoing lines from the turbine and the HV transformer should be protected (minimum LPZ 0 to LPZ 1, or where control system electronics are installed LPZ 0 to LPZ 2).

Data/signal/telecoms line protection SPDs should be installed to protect data, signal and telecoms lines in the wind turbine and where appropriate, the HV transformer. A wide range of Furse SPDs are available for this purpose, including the the ESP SL Series and ESP D, E, H Series protectors (see Table 3 for specific application).

The SPD selected should be compatible with the system to be protected, and offer sufficient protection to reduce overvoltages below the immunity threshold of the protected equipment. The SPD must not impede system performance and must be able to survive repeated transients.

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Table 3 : SPD requirement according to component to be protected

Location	LPZ	SPD required
Generator (690 V)	LPZ 0 to LPZ 1	ESP 690/12.5/WT or ESP 690/25/WT
Frequency converter (690 V)	LPZ 0 to LPZ 2	ESP 690/12.5/WT or ESP 690/25/WT
Transformer (690 V)	LPZ 0 to LPZ 1*	ESP 690/12.5/WT or ESP 690/25/WT
Control system (230 V)	LPZ 0 to LPZ 1	ESP 240 D1 or ESP 240 M1
Aviation warning light (230 V)	LPZ 0 to LPZ 1	ESP 240 D1 or ESP 240 M1
Hub control (230 V)	LPZ 0 to LPZ 1	ESP 240 D1 or ESP 240 M1
(4-20 mA loop)	LPZ 0 to LPZ 1	ESP SL30L/4-20
(RS 485)	LPZ 0 to LPZ 1	ESP SL06
Anemometer (24 V)	LPZ 0 to LPZ 1	ESP SL30
Modem	LPZ 0 to LPZ 1	ESP TN

*Where the transformer includes process control/data lines, protect to LPZ 2

The SPD should be installed as close as possible to the point of entry/exit of the incoming/outgoing line. Where connected equipment is > 10 m from the incoming/outgoing line, a second SPD should be installed at any subsequent connected equipment.

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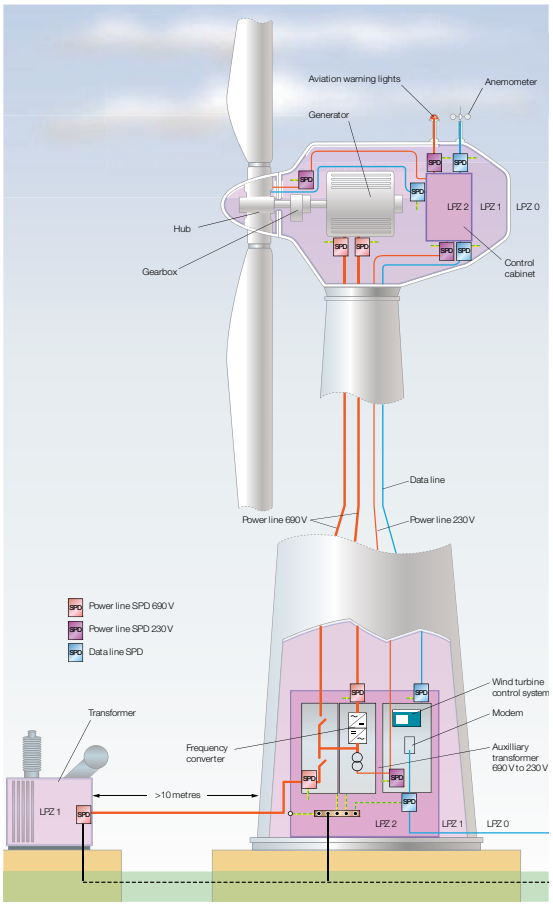
01 Application of SPDs within a typical wind turbine environment



Specific systems protection
Photovoltaic (PV) systems

Table 4: SPD requirement according to structural LPS configuration

Status of Structural LPS	DC side, distance PV array to inverter		AC side of inverter
	< 10 m	> 10 m	
No structural LPS	ESP DC PV Series protector (min. Type 2 performance)	ESP DC PV Series protector (min. Type 2 performance)	ESP AC mains power protector (min. Type 2 performance)
Structural LPS (separation distance kept)	ESP DC PV Series protector (min. Type 2 performance)	ESP DC PV Series protector (min. Type 2 performance)	ESP AC mains power protector (min. Type 2 performance - inverter) (min. Type 1 performance - MDB)
Structural LPS (separation distance not kept)	ESP DC PV Series protector (min. Type 1 performance)	ESP DC Series protector (min. Type 1 performance)	ESP AC mains power protector (min. Type 1 performance)

Photovoltaic (PV) systems are at risk from transient overvoltages which may enter the system following a direct lightning strike to a structural LPS, or via the wider electrical network.

Protection against transient overvoltages is achieved through installation of appropriate SPDs on the DC and AC side of the DC-AC inverter in the PV system. Installation should follow the guidance provided in Technical Specification DD CLC/TS 50539-12.

Installation on the DC side of the DC-AC inverter
An SPD specifically designed for use on the DC side of a PV system should be installed. Where the distance between the PV array and the inverter is < 10 m, a single SPD suffices, mounted as close as possible to the inverter. Where the distance > 10 m, two SPDs should be installed, one close to the inverter and the other close to the PV array. The minimum Type of SPD is dependent on presence of structural LPS/separation distance (see Table 4).

Installation on the AC side of the DC-AC inverter
The presence (or lack) of a structural LPS, plus whether sufficient separation distance has been kept between the LPS and the PV array, defines the SPD requirement on the AC side of the inverter (see Table 4). Where the distance between service entrance (Main Distribution Board (MDB)) and inverter is < 10 m, a single SPD should be installed at the service entrance (MDB). Where > 10 m, two SPDs should be installed, one at the MDB and the other close to the inverter.

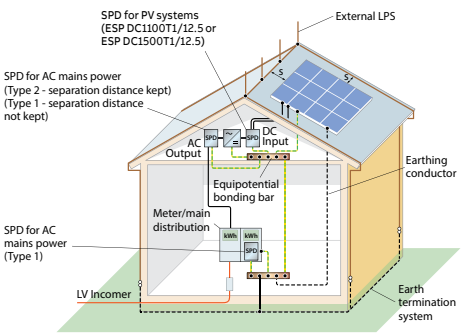
Furse Combined Type SPDs for AC mains power circuits are applicable here. The SPD to be installed will be dependent on the Class of LPS around the structure, and the location of the metallic services connected to it (i.e. underground/exposed overhead supply).

IMPORTANT: This page refers to protection of PV power circuits only. Ensure any data/signal/telecoms lines connected to the PV system are also appropriately protected.
NOTE: Furse ESP DC PV Series SPDs offer combined Type 1+2 protection, and therefore apply across all scenarios.

01 Roof mounted PV array, with external LPS.

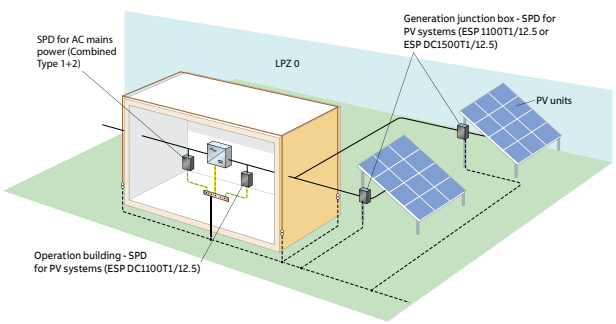
02 Protection of solar park/PV array.

01



s = separation distance. This installation shows the separation distance is kept. Where the separation distance is not kept, the PV array should be bonded directly to the external LPS.

02



Specific systems protection
Railways applications

Transient overvoltage protection for rail networks

Location	Requirement	Protection measure (SPD)
Main terminals & stations	Protect 3-phase & 1-phase power supplies	ESP M1 Series ESP D1 Series ESP M2/M4 Series ESP T1 and T2 Series
	Protect critical systems (e.g. fire fighting equipment)	ESP 5A/BX & ESP 16A/BX Series
	Protect telecoms systems	ESP D, E, H Series ESP SL Series
Trackside location Cabinets (LOCS)	Protect trackside signalling equipment (SSI systems) & radio network	ESP SSI/M & ESP SSI/B ESP RF Series
	Protect power supplies	SSI/120AC & ESP SSI/140AC ESP M1 Series ESP D1 Series
	Maintain TFMs/SSI datalinks	ESP PTE002 Tester
Level crossings	Protect CCTV systems	ESP 5A/BX & ESP 16A/BX Series ESP CCTV Series ESP D Series
	Signalling equipment & radio network	ESP SSI Series ESP RF Series

Safety, reliability and availability of service are essential prerequisites for a rail network.

For all types of network, from mass transit systems and mainline services to metros, airport links and light rail, this has clear implications for the sensitive and critical electronic systems installed throughout.

These systems manage network performance, and ensure its continuous safe and practical operation. Yet they can easily be damaged or degraded by transient overvoltages, caused by:

- Partial lightning currents entering an electrical system following a direct lightning strike to a network location
- Indirect lightning (nearby lightning strikes) to the rail network, leading to transient overvoltages entering an electrical system via a local earthing arrangement (resistive coupling), or via overhead metallic service lines (inductive coupling)

Outright damage to electronic systems causes service interruptions and network downtime leading to customer dissatisfaction and maintenance costs.

Degradation leads to reduced equipment reliability and lower equipment lifetimes, risking sudden, unpredictable or intermittent failures.

Installing protection against transient overvoltages throughout the network is therefore critical. Transient overvoltage protection should be applied on (but not limited to):

- Power supplies throughout the network, including trackside cabinets, level crossings and at stations and terminals
- Signalling networks including trackside Solid State Interlocking (SSI) systems
- Telecommunications equipment and trackside telephones
- CCTV monitoring systems
- Passenger information systems, ticketing and gating operations
- Security systems and critical safety equipment such as fire detection and fire alarm systems

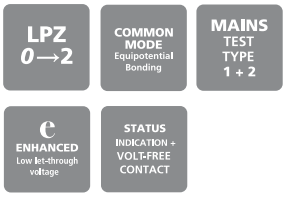
Effective, repeat protection against transient overvoltages can be achieved through installation of Furse Surge Protective Devices as part of an overall Lightning Protection System to IEC/BS EN 62305.

Key protection locations together with the appropriate Furse SPD are shown in the table above. Many of these SPDs have Network Rail approval (see individual product pages for further reference) and are listed on PADs database.

Specific systems protection

ESP WT Series

*NOTE: product label design may vary.



Combined Type 1 and 2 tested protector (to BS EN 61643) for use on the main distribution board within wind turbines, for equipotential bonding. For use at boundaries up to LPZ 0 to protect against flashover (typically the main distribution board location) through to LPZ 2 to protect electrical equipment from damage.

Features & benefits

- Enhanced protection (to IEC/BS EN 62305) offering low let-through voltage further minimizing the risk of flashover creating dangerous sparking or electric shock
- Repeated protection in lightning intense environments
- The varistor based design eliminates the high follow current (If) associated with spark gap based surge protection
- Indicator shows when the protector requires replacement
- Remote signal contact can indicate the protector's status through interfacing with a building management system

Application

Use on 690 V three phase mains power supplies and power distribution boards for protection against partial direct and indirect lightning strikes. The services (typically 3 phase 400 V mains, UPS, data, signal and telecom lines) to the cabinet within the wind turbine nacelle will require additional protection.

- For a 3 phase TN-S supply, install 4 ESP WT units together with ESP CE10 or ESP CE13 connecting and earthing bar (see installation)
- For a 3 phase TN-C supply, install 3 ESP WT units together with ESP CE7 or ESP CE9 connecting and earthing bar (see installation)

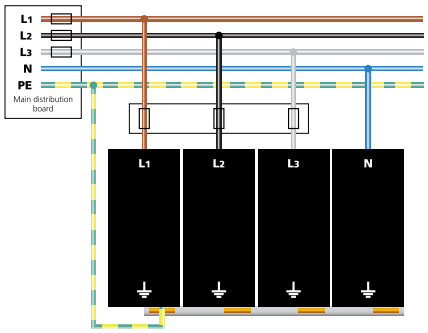
Installation

Protector should be installed in the main distribution board with connecting leads of minimal length. The protector should be fused and is suitable for attachment to a 35 mm top hat DIN rail. The diagrams below illustrate how to wire the appropriate ESP protector according to your chosen electrical system.

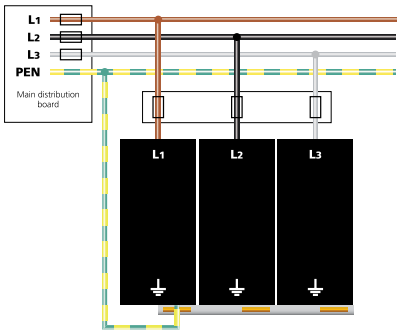
Accessories

Connecting and earthing bars:
ESP CE7 ABB Order code: 7TCA085460R0032
Use with 3 of ESP 690/12.5/WT for TN-C supplies
ESP CE9 ABB Order code: 7TCA085460R0033
Use with 3 of ESP 690/25/WT for TN-C supplies
ESP CE10 ABB Order code: 7TCA085460R0030
Use with 4 of ESP 690/12.5/WT for TN-S supplies
ESP CE13 ABB Order code: 7TCA085460R0031
Use with 4 of ESP 690/25/WT for TN-S supplies
For suitable enclosures for the ESP WT series, please contact us.

TN-S earthing system (ESP WT x 4) with ESP CE10 or ESP CE13 earthing bars.



TN-C earthing system (ESP WT x 3) with ESP CE7 or ESP CE9 earthing bars.



IMPORTANT: The primary purpose of lightning current or equipotential bonding mains Type 1 Surge Protective Devices (SPDs) is to prevent dangerous sparking caused by flashover to protect against the loss of human life. In order to protect electronic equipment and ensure the continual operation of systems, transient overvoltage mains Type 2 and 3 SPDs such as the ESP M1 Series or ESP D1 Series are further required, typically installed at downstream subdistribution boards feeding sensitive equipment. IEC/BS EN 62305 refers to the correct application of mains Type 1, 2 and 3 SPDs as a coordinated set. For further information, please refer to the Furse Guide to BS EN 62305 Protection against Lightning.

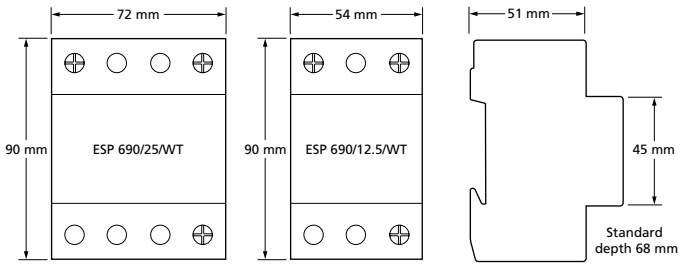
—
ESP WT Series - Technical specification

Electrical specification	**ESP 690/25/WT**	**ESP 690/12.5/WT**
ABB order code	7TCA085460R0028	7TCA085460R0027
Nominal voltage - Phase-Neutral U_o (RMS)	690 V	
Maximum working voltage U_c (RMS)	750 V	
Maximum working voltage U_c (DC)	1000 V	
Short circuit withstand capability	25 kA/50 Hz	
Max. back-up fuse (see installation instructions)	≤ 250 A	
Leakage current (to earth)	< 3.5 mA	< 2.5 mA
Volt free contact:	Screw terminal	
– current rating	0.5 A	
– nominal voltage (RMS)	250 V	

Transient specification	**ESP 690/25/WT**	**ESP 690/12.5/WT**
Type 1 (BS EN/EN), Class I (IEC)		
Nominal discharge current 8/20 µs (per mode) I_n	40 kA	20 kA
Let-through voltage U_p at I_n (1)	< 2.5 kV	
Impulse discharge current 10/350 µs I_{imp} (per mode) (2)	25 kA	12.5 kA
Let-through voltage U_p at I_{imp} (1)	< 2.0 kV	
Type 2 (BS EN/EN), Class II (IEC)		
Nominal discharge current 8/20 µs (per mode) I_n	40 kA	20 kA
Let-through voltage Up at I_n (1)	< 2.5 kV	
Maximum discharge current I_{max} (per mode) (2)	80 kA	40 kA

Mechanical specification		**ESP 690/25/WT**	**ESP 690/12.5/WT**
Temperature range		–40 to +80 °C	
Connection type		Screw terminal (Maximum torque 4.5 Nm, stripping length 11mm)	
Conductor size (stranded)		25 mm²	
Earth connection		Screw terminal (Maximum torque 4.5 Nm, stripping length 11mm)	
Volt free contact		Connect via screw terminal with conductor up to 1.5 mm² (stranded) (Maximum torque 0.25 Nm, stripping length 7mm)	
Degree of protection (IEC 60529)		IP20	
Case Material		FR Polymer UL-94 V-0	
Mounting		Indoor, 35 mm top hat DIN rail	
Weight		0.5 kg	0.33 kg
Dimensions to DIN 43880 - HxDxW: (3)	– Per module	90 mm x 68 mm x 72 mm (4TE)	90 mm x 68 mm x 54 mm (3TE)
	– for 3ph TN-C supplies	90 mm x 68 mm x 216 mm (total: 3 x ESP 690/25/WT)	90 mm x 68 mm x 162 mm (total: 3 x ESP 690/12.5/WT)
	– for 3ph TN-S supplies	90 mm x 68 mm x 288 mm (total: 4 x ESP 690/25/WT)	90 mm x 68 mm x 216 mm (total: 4 x ESP 690/12.5/WT)

(1) The maximum transient voltage let-through of the protector throughout the test, per mode.
(2) The electrical system, external to the unit, may constrain the actual current rating achieved in a particular installation.
(3) The remote signal contact (removable) adds 10 mm to height.

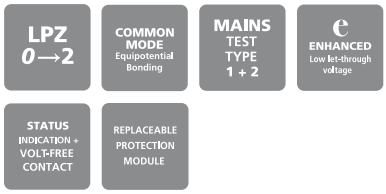


Specific systems protection

ESP DC Photovoltaic (PV) T1+2 Series

*NOTE: product label design may vary.

Combined Type 1 and 2 tested protector (BS EN 61643-31 and BS EN 50539-11) for a Photovoltaic PV solar panel system that is on a building where a structural Lightning Protection System (LPS) is employed, for equipotential bonding. For use at boundaries up to LPZ 0 to protect against flashover (on the DC side of the DC-AC inverter) through to LPZ 2 to protect the PV system from damage.



Features & benefits

- Enhanced protection (to IEC/BS EN 62305) offering low let-through voltage further minimizing the risk of flashover creating dangerous sparking or electric shock
- Repeated protection in lightning intense environments
- The varistor based design eliminates the high follow current (I_f) associated with spark gap based surge protection
- Pluggable module design (with anti-vibration locking clip) allows for simple replacement at end-of-life
- Compact, space saving design
- Indicator shows when the protector requires replacement
- Remote signal contact, with fast fit screw-less push terminals, can indicate the SPDs status through interfacing with a building management system

Application

Use on the DC side of the DC-AC inverter for protection against partial direct or indirect lightning strikes. ESP Type 1 AC mains protectors (e.g. ESP 415T1/12.5/TNS) are further required at the AC side of the DC-AC inverter.

Installation

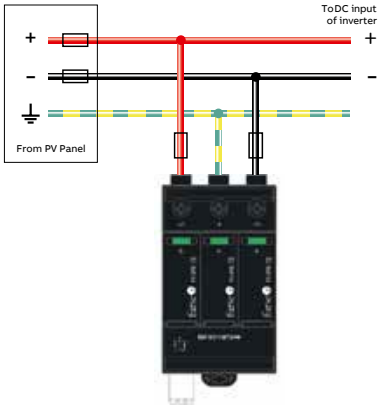
The SPD should be installed in the main distribution board with connecting leads of minimal length. The SPD should be installed in parallel to the DC supply of the DC-AC inverter via a suitable overcurrent protection device (e.g. gPV fuse) and is suitable for attachment to a 35 mm top hat DIN rail.

Accessories

Metallic enclosure:
MBX D4
ABB order code:
7TCA085400R0649

Weatherproof enclosure:
WBX D4
ABB order code:
7TCA085410R0032

SPD replacement modules:
ESP DC550T2/40/M
(end modules for 1100V SPD)
7TCA085460R0416
ESP DC550T1/6.25E/M
(central module for 1100V SPD)
7TCA085460R0417
ESP DC750T1/6.25/M
(end modules for 1500V SPD)
7TCA085460R0418
ESP DC750T1/6.25E/M
(central module for 1500V SPD)
7TCA085460R0419



IMPORTANT: The primary purpose of lightning current or equipotential bonding mains Type 1 Surge Protective Devices (SPDs) is to prevent dangerous sparking caused by flashover to protect against the loss of human life. In order to protect electronic equipment and ensure the continual operation of systems, transient overvoltage mains Type 2 and 3 SPDs such as the ESP M1 or ESP D1 Series are furtherrequired, typically installed at downstream sub-distribution boards feeding sensitive equipment. IEC/BS EN 62305 refers to the correct application of mains Type 1, 2 and 3 SPDs as a coordinated set. For further information, please refer to the Furse Guide to BS EN 62305 Protection against Lightning.

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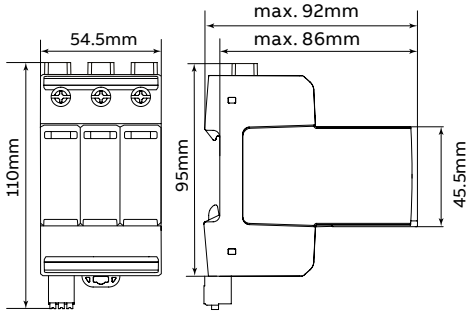
ESP DC Photovoltaic (PV) T1+2 Series - Technical specification

Electrical specification	**ESP DC1100T1/12.5**	**ESP DC1500T1/12.5**
ABB order code	7TCA085460R0406	7TCA085460R0413
Maximum DC voltage (RMS/DC), U_{CPV}	1100 V	1500 V
Short circuit current rating, I_{SCPV}	11 kA	30 kA
Leakage current (to earth)	< 1 mA	
Volt free contact:(3)	Push terminal	
– current rating	1 A	
– nominal voltage (RMS)	250 V	
Back up fuse	If the I_{SCMAX} rating delivered by the PV array is greater than I_{SCPV} rating of the SPD then external fusing must be fitted. ABB Furse always recommends the use of external PV fusing in all installations as it is good electrical practice. The following fuse guidance from IEC 60364-7-712 applies: – Use gPV fuses in accordance with IEC 60269-6 – The rated operating voltage Ue shall be greater or equal to $U_{OC\ MAX}$ of the PV array. To determine a suitable value for the gPV fuse, the following guidance is offered: – Determine I_{SCMAX} that can be delivered by the PV array at that point in the installation – Divide this value by 10 (equivalent to low irradiation value), divide this by 1.25 – Install gPV fuse value closest to this calculated value. – Example: if I_{SCMAX} = 3000A, then a suitable fuse would be 240A gPV	

Transient specification	**ESP DC1100T1/12.5**	**ESP DC1500T1/12.5**
Type 1 (BS EN/EN), Class I (IEC)		
Nominal discharge current 8/20 µs (per mode) I_n	20 kA	
Let-through voltage U_p at I_n(1)	< 3.8 kV	< 4.5 kV
Impulse discharge current 10/350 µs I_{imp} (per mode)(2)	6.25 kA	
Total discharge current 10/350 µs I_{total} (total to earth)(2)	12.5 kA	
Type 2 (BS EN/EN), Class II (IEC)		
Nominal discharge current 8/20 µs (per mode) I_n	20 kA	
Let-through voltage U_p at I_n(1)	< 3.8 kV	< 4.5 kV
Maximum discharge current I_{max} (per mode)(2)	40 kA	60 kA

Mechanical specification	**ESP DC1100T1/12.5**	**ESP DC1500T1/12.5**
Temperature range	-40 to +80 °C	
Connection type	Screw terminal - maximum torque 4.5 Nm	
Conductor size (stranded)	35 mm²	
Earth connection	Screw terminal	
Volt free contact	Push-fit connection with conductor up to 1.5 mm² (solid)	
Degree of protection (IEC 60529)	IP20	
Case Material	Thermoplastic UL-94 V-0	
Mounting	Indoor, 35 mm top hat DIN rail	
Weight	0.41 kg	0.47 kg
Dimensions to DIN 43880 - HxDxW:(3)	95 mm x 92 mm x 54.5 mm (3TE)	

(1) The maximum transient voltage let-through of the protector throughout the test, per mode.
(2) The electrical system, external to the unit, may constrain the actual current rating achieved in a particular installation.
(3) The remote signal contact (removable) adds 15 mm to height.

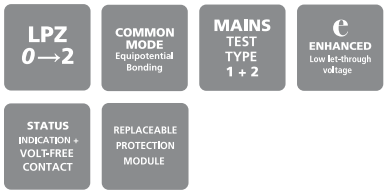


Specific systems protection

ESP DC Photovoltaic (PV) T2 Series

*NOTE: product label design may vary.

Type 2 tested surge protective device SPD (to BS EN 61643-31) for DC applications such as Photovoltaic PV solar panel systems. Typically for use at the DC side of the DC-AC inverter located within lightning protection zone 1 LPZ 1 to protect the PV system from surge damage due to lightning and electrical switching events.



Features & benefits

- Enhanced protection (to IEC/BS EN 62305) offering low let-through voltage further minimizing the risk of flashover creating dangerous sparking or electric shock
- Repeated protection in lightning intense environments
- The varistor based design eliminates the high follow current (I_f) associated with spark gap based surge protection
- Pluggable module design (with anti-vibration locking clip) allows for simple replacement at end-of-life
- Compact, space saving design
- Indicator shows when the protector requires replacement
- Remote signal contact, with fast fit screw-less push terminals, can indicate the SPDs status through interfacing with a building management system

Application

Use on the DC side of the DC-AC inverter for protection against partial direct or indirect lightning strikes. ESP Type 1 AC mains protectors (e.g. ESP 415T1/12.5/TNS) are further required at the AC side of the DC-AC inverter.

Installation

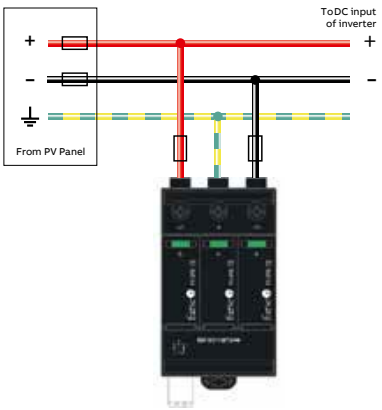
The SPD should be installed in the main distribution board with connecting leads of minimal length. The SPD should be installed in parallel to the DC supply of the DC-AC inverter via a suitable overcurrent protection device (e.g. gPV fuse) and is suitable for attachment to a 35 mm top hat DIN rail.

Accessories

Metallic enclosure:
MBX D4
ABB order code:
7TCA085400R0649

Weatherproof enclosure:
WBX D4
ABB order code:
7TCA085410R0032

SPD replacement modules:
ESP DC550T2/40/M
(module for 1100V SPD)
7TCA085460R0410
ESP DC750T2/30/M
(module for 1500V SPD)
7TCA085460R0412



IMPORTANT: In order to protect sensitive electronic equipment, particularly from electrical switching transients, plus ensure the continual operation of systems, full mode SPDs, with both common and differential mode protection, are required. ESP M1 Series or ESP D1 Series SPDs should be installed at AC sub-distribution boards feeding sensitive equipment. For further information, please refer to the Furse Guide to BS EN 62305 Protection against lightning.

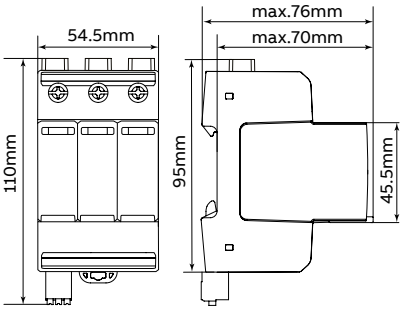
ESP DC Photovoltaic (PV) T2 Series - Technical specification

Electrical specification	ESP DC1100T2/40	ESP DC1500T2/30
ABB order code	7TCA085460R0415	7TCA085460R0411
Maximum DC voltage (RMS/DC), U_{CPV}	1100 V	1500 V
Short circuit current rating, I_{SCPV}	11 kA	
Leakage current (to earth)	< 1 mA	
Volt free contact:(3)	Push terminal	
– current rating	1 A	
– nominal voltage (RMS)	250 V	
Back up fuse	If the I_{SCMAX} rating delivered by the PV array is greater than I_{SCPV} rating of the SPD then external fusing must be fitted. ABB Furse always recommends the use of external PV fusing in all installations as it is good electrical practice. The following fuse guidance from IEC 60364-7-712 applies: – Use gPV fuses in accordance with IEC 60269-6 – The rated operating voltage Ue shall be greater or equal to $U_{OC\ MAX}$ of the PV array. To determine a suitable value for the gPV fuse, the following guidance is offered: – Determine I_{SCMAX} that can be delivered by the PV array at that point in the installation – Divide this value by 10 (equivalent to low irradiation value), divide this by 1.25 – Install gPV fuse value closest to this calculated value. – Example: if I_{SCMAX} = 3000A, then a suitable fuse would be 240A gPV	

Transient specification	ESP DC1100T2/40	ESP DC1500T2/30
Type 2 (BS EN/EN), Class II (IEC)		
Nominal discharge current 8/20 µs (per mode) I_n	20 kA	
Let-through voltage U_p at I_n(1)	< 2.0 kV	< 5.0 kV
Maximum discharge current I_{max} (per mode)(2)	40 kA	30 kA

Mechanical specification	ESP DC1100T2/40	ESP DC1500T2/30
Temperature range	-40 to +80 °C	
Connection type	Screw terminal - maximum torque 4.5 Nm	
Conductor size (stranded)	35 mm²	
Earth connection	Screw terminal	
Volt free contact	Push-fit connection with conductor up to 1.5 mm² (solid)	
Degree of protection (IEC 60529)	IP20	
Case Material	Thermoplastic UL-94 V-0	
Mounting	Indoor, 35 mm top hat DIN rail	
Weight	0.41 kg	0.46 kg
Dimensions to DIN 43880 - HxDxW:(3)	95 mm x 76 mm x 54.5 mm (3TE)	

(1) The maximum transient voltage let-through of the protector throughout the test, per mode.
(2) The electrical system, external to the unit, may constrain the actual current rating achieved in a particular installation.
(3) The remote signal contact (removable) adds 10 mm to height.



Mains power protection

ESP 690T1 Surge Protection Series

*NOTE: product label design may vary.

LPZ 0⟶2 | COMMON MODE Equipotential Bonding | MAINS TYPE 1+2 | REPLACEABLE PROTECTION MODULE | STATUS INDICATION + VOLT-FREE CONTACT

Combined Type 1 and 2 tested Surge Protective Device SPD (to BS EN 61643) for use on the main distribution board, particularly where a structural Lightning Protection System (LPS) is employed, for equipotential bonding. For use at boundaries up to LPZ 0 to protect against flashover (typically the main distribution board location) through to LPZ 2 to protect electrical equipment from damage.

Features & benefits

- Repeated protection in lightning intense environments
- Pluggable module design (with anti-vibration locking clip) allows for simple replacement at end-of-life
- Compact, space saving design
- Indicator shows when the SPD protection modules requires replacement
- Remote signal contact can indicate the SPD's status through interfacing with a building management system

Application

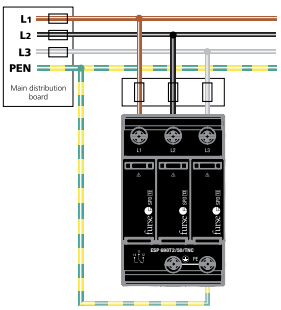
- Use on three phase mains supplies and power distribution systems for protection against partial direct or indirect lightning strikes
- ESP 690T1/25/TNS versions also cover TN-C-S earthing systems
- ESP 690T1/XXX can be installed on IT earthing systems where the earth on the distribution transformer is interconnected with the earth on the consumer side

Installation

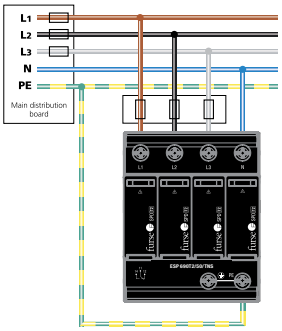
The SPD is to be installed in the sub-distribution board with connecting leads of minimal length. The protector should be fused and is suitable for attachment to a 35 mm top hat DIN rail. The diagrams below illustrate how to wire the appropriate ESP SPD according to your chosen electrical system.

Weatherproof enclosure:
WBX D4
ABB order code:
7TCA085410R0032
SPD replacement modules:
ESP 400T1/25/TNS
7TCA085460R0441
Metallic enclosure:
MBX D4
ABB order code:
7TCA085400R0649

TN-C earthing system



TN-S earthing system



NOTE: Remote contact connections not shown, for clarity.

IMPORTANT: The primary purpose of lightning current or equipotential bonding mains Type 1 Surge Protective Devices (SPDs) is to prevent dangerous sparking caused by flashover to protect against the loss of human life. In order to protect electronic equipment and ensure the continual operation of systems, transient overvoltage mains Type 2 and 3 SPDs such as the ESP M1 Series or ESP D1 Series are further required, typically installed at downstream subdistribution boards feeding sensitive equipment. IEC/BS EN 62305 refers to the correct application of mains Type 1, 2 and 3 SPDs as a coordinated set. For further information, please refer to the Furse Guide to BS EN 62305 Protection against lightning.

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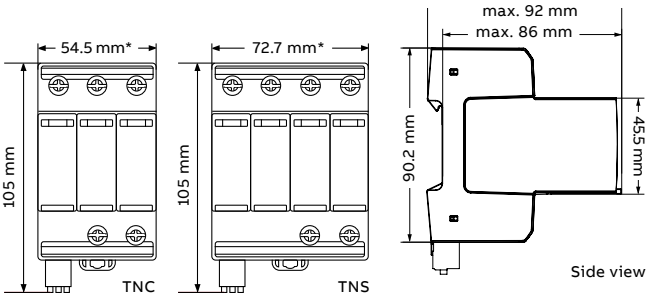
ESP 690T1 Surge Protection Series - Technical specification

Electrical specification	ESP 690T1/25/TNS	ESP 690T1/25/TNC
ABB order code	7TCA085460R0439	7TCA085460R0440
Nominal voltage - Phase-Neutral U_o (RMS)	400 V	
Maximum voltage - Phase-Neutral U_c (RMS)	480 V	
Temporary Overvoltage TOV U_T[1] (120m)	762 V	
Short circuit withstand capability I_{SCCR}	100 kA_{RMS} / 50 Hz	
Frequency range	47-63 Hz	
Max. back-up fuse (see installation instructions)	≤ 250 A	
Leakage current (to earth)	≤ 5 µA	
Follow current interrupt rating I_{fi}	100 kA_{RMS}	
Volt free contact:[2]	Push terminal	
– Current rating	1 A	
– Nominal voltage (RMS)	250 V	

Transient specification	ESP 690T1/25/TNS	ESP 690T1/25/TNC
Type 1 (BS EN/EN), Class I (IEC)		
Nominal discharge current 8/20 µs (per mode) I_n	25 kA	
Let-through voltage U_p at I_n[2]	≤ 2.5 kV	
Impulse discharge current 10/350 µs I_{imp} (to earth)[3]	25 kA	
Total discharge current 10/350 I_{total} (total to earth)[4,5]	100 kA	75 kA
Type 2 (BS EN/EN), Class II (IEC)		
Nominal discharge current 8/20 µs (per mode) I_n	25 kA	
Let-through voltage U_p at I_n[2]	≤ 2.5 kV	
Maximum discharge current I_{max} (per mode)[3]	50 kA	

Mechanical specification	ESP 690T1/25/TNS	ESP 690T1/25/TNC
Temperature range	-40 to +85 °C	
Connection type	Screw terminal - maximum torque 4.5 Nm	
Conductor size (solid/stranded)[5]	35 mm²	
Earth connection	Screw terminal - maximum torque 4.5 Nm	
Degree of protection (IEC 60529)	IP20	
Volt free contact	Push-fit connection for conductor up to 1.5mm² rated AC 250 V, 1A	
Case material	Thermoplastic UL-94 V-0	
Mounting	Indoor, 35 mm top hat DIN rail	
Weight	0.7 kg	0.53 kg
Dimensions to DIN 43880 - HxDxW[4]	90.2 mm x 92 mm x 72.7 mm* (4TE)	90.2 mm x 92 mm x 54.5 mm* (3TE)

[1] Temporary Overvoltage TOV rating is for durations of 120 minutes (safe fail) tested to BS EN/IEC 61643.
[2] The maximum transient voltage let-through of the protector throughout the test, phase to neutral and neutral to earth.
[3] The electrical system, external to the unit, may constrain the actual current rating achieved in a particular installation.
[4] The remote signal contact (removable) adds 15 mm to height.
[5] Conductor size (flexible) is 25 mm².
* Maximum dimensions (this applies to all dimensions).



Mains power protection

ESP 690T2 Surge Protection Series

*NOTE: product label design may vary.

Type 2 /Class II tested Surge Protective Device SPD (to BS EN/IEC 61643) for use on the sub-distribution board. For use at boundaries up to LPZ 1 through to LPZ 2 to protect electrical equipment from damage.

LPZ 1→2 | COMMON MODE Equipotential Bonding | MAINS TYPE 2 | REPLACEABLE PROTECTION MODULE | STATUS INDICATION + VOLT-FREE CONTACT

Features & benefits

- Repeated protection in lightning intense environments
- Pluggable module design (with anti-vibration locking clip) allows for simple replacement at end-of-life
- Compact, space saving design
- Indicator shows when the SPD protection modules requires replacement
- Remote signal contact can indicate the protector's status through interfacing with a building management system

Application

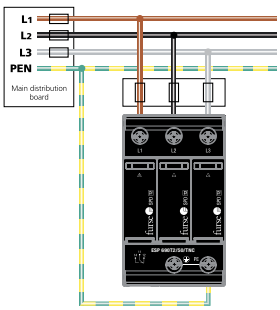
- Use on three phase mains supplies and power distribution systems for protection against indirect lightning strikes
- ESP ESP 690T2/50/TNS versions also cover TN-C-S earthing systems
- ESP 690T2/XXX can be installed on IT earthing systems IT supply where the earth on the distribution transformer is interconnected with the earth on the consumer side

Installation

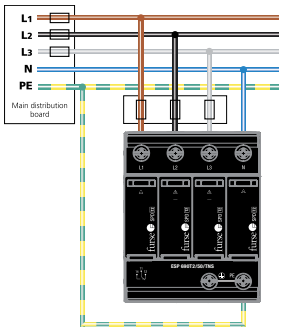
The SPD is to be installed in the sub-distribution board with connecting leads of minimal length. The protector should be fused and is suitable for attachment to a 35 mm top hat DIN rail. The diagrams below illustrate how to wire the appropriate ESP protector according to your chosen electrical system.

Weatherproof enclosure:
WBX D4
ABB order code:
7TCA085410R0032
SPD replacement modules:
ESP 400T2/50/M
7TCA085460R0398
Metallic enclosure:
MBX D4
ABB order code:
7TCA085400R0649

TN-C earthing system



TN-S earthing system



NOTE: Remote contact connections not shown, for clarity.

IMPORTANT: In order to protect sensitive electronic equipment, particularly from electrical switching transients, plus ensure the continual operation of systems, full mode SPDs, with both common and differential mode protection, are required. ESP M1 Series or ESP D1 Series SPDs should be installed at sub-distribution boards feeding sensitive equipment. For further information, please refer to the Furse Guide to BS EN 62305 Protection against lightning.

—

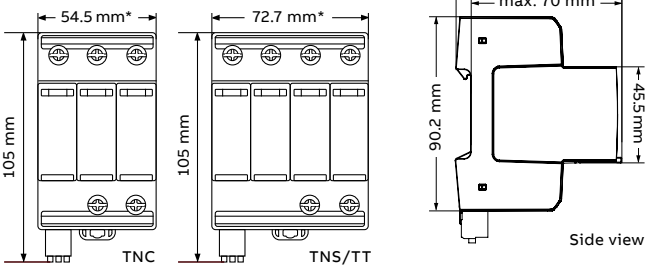
ESP 690T2 Surge Protection Series - Technical specification

Electrical specification	ESP 690T2/50/TNS	ESP 690T2/50/TNC
ABB order code	7TCA085460R0402	7TCA085460R0401
Nominal voltage - Phase-Neutral U_o (RMS)	400 V	
Maximum voltage - Phase-Neutral U_c (RMS)	480 V	
Temporary Overvoltage TOV U_T[1] (5s/120m)	581 V / 762 V	
Short circuit withstand capability I_{SCCR}	50 kA_{RMS} / 50 Hz	
Frequency range	47-63 Hz	
Max. back-up fuse (see installation instructions)	≤ 250 A	
Leakage current (to earth)	≤ 400 µA	≤ 400 µA
Volt free contact:[2]	Push terminal	
– Current rating	1 A	
– Nominal voltage (RMS)	250 V	

Transient specification	ESP 690T2/50/TNS	ESP 690T2/50/TNC
Type 2 (BS EN/EN), Class II (IEC)		
Nominal discharge current 8/20 µs (per mode) I_n	20 kA	
Let-through voltage U_p at I_n[2]	≤ 2.3 kV	
Maximum discharge current I_{max} (per mode)[3]	50 kA	

Mechanical specification	ESP 690T2/50/TNS	ESP 690T2/50/TNC
Temperature range	-40 to +85 °C	
Connection type	Screw terminal - maximum torque 4.5 Nm	
Conductor size (solid/stranded)[5]	35 mm²	
Earth connection	Screw terminal - maximum torque 4.5 Nm	
Degree of protection (IEC 60529)	IP20	
Volt free contact	Push-fit connection for conductor up to 1.5mm² rated AC 250 V, 1A	
Case material	Thermoplastic UL-94 V-0	
Mounting	Indoor, 35 mm top hat DIN rail	
Weight	0.52 kg	0.41 kg
Dimensions to DIN 43880 - HxDxW[4]	90.2 mm x 70 mm x 72.7 mm* (4TE)	90.2 mm x 70 mm x 54.5 mm* (3TE)

[1] Temporary Overvoltage TOV rating is for durations of 5 seconds (withstand) and 120 minutes (safe fail) tested to BS EN/IEC 61643.
[2] The maximum transient voltage let-through of the protector throughout the test, phase to neutral and neutral to earth.
[3] The electrical system, external to the unit, may constrain the actual current rating achieved in a particular installation.
[4] The remote signal contact (removable) adds 15 mm to height.
[5] Conductor size (flexible) is 25 mm².
* Maximum dimensions (this applies to all dimensions).



Specific systems protection

ESP SSI Series

*NOTE: product label design may vary.

LPZ 0→3 | FULL MODE Bonding + Equipment Protection | MAINS TEST TYPE 1 + 2 + 3 | ENHANCED Low let-through voltage | STATUS INDICATION + VOLT-FREE CONTACT

Combined Category D, C, B tested data link protector and Combined Type 1, Type 2 and Type 3 tested mains protector (to BS EN 61643) suitable for Solid State Interlocking (SSI) mains power and data links. Protectors are Network Rail approved. For use on lines at boundaries from LPZ 0 through to LPZ 3 to protect sensitive electronic equipment.

Features & benefits

- Accepted for use on Network Rail infrastructure. NRS PADS references: ESP SSI/M - 086/047066; ESP SSI/B - 086/047067; ESP SSI/120AC - 086/047058 and ESP SSI/140AC - 086/047059 (Network Rail Approval PA05/00471)
- Very low let-through voltage (enhanced protection to IEC/BS EN 62305) between all sets of conductors - Full Mode protection (ESP SSI/120AC and ESP SSI/140AC) and all signal lines (ESP SSI/M)
- ESP SSI/B (or ESP SSI/B/G) modified base can be permanently wired into the system
- ESP SSI/M plug-in protection module can be replaced without interfering with the operation of the system
- ESP SSI/B (or ESP SSI/B/G) incorporates a 100 Ω terminating resistance that can be connected if required
- ESP SSI/B (or ESP SSI/B/G) can be flat mounted, or a built-in DIN rail foot allows simple clip-on mounting to top-hat (ESP SSI/B) or G DIN rails (ESP SSI/B/G)
- ESP SSI/120AC and ESP SSI/140AC are a compact size for easy installation in trackside cabinets and control rooms
- ESP SSI/120AC and ESP SSI/140AC have three way visual indication of protector status and advanced pre-failure warning

Application

To prevent transient overvoltage damage to Solid State Interlocking (SSI) systems, protectors should be fitted in trackside cabinets and equipment rooms, on both the data link and the mains power lines.

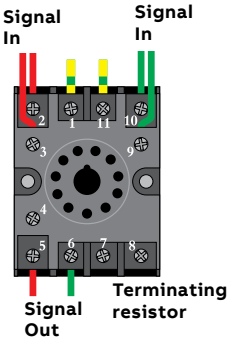
- For single phase mains power supplies of 90-150 Volts, use the ESP SSI/120AC (formerly ESP 120X)
- For single phase mains power supplies of 90-165 Volts, use the ESP SSI/140AC (formerly S065)
- For SSI data links, use the ESP SSI/B (or ESP SSI/B/G) base unit with the ESP SSI/M protection module

Use ESP PTE002 SSI tester for line-side testing of SSI/M modules. NRS PADS: 094/020033.

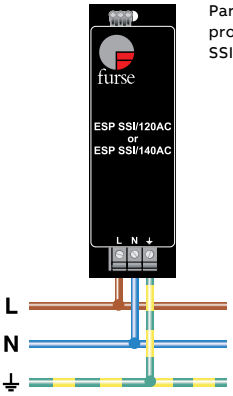
Installation

ESP SSI/B: Connect in series with the data link either near where it enters the trackside location cabinet or the equipment room.

ESP SSI/120AC and ESP SSI/140AC: Install in parallel, within the trackside cabinet or equipment room. The protector should be installed on the load side of the fuses, at the secondary side of the step-down transformer. Connect, with very short leads, to phase (BX), neutral (NX or CNX) and earth.



1 - Earth in Line
2 - Primary signal in + Line
3 - Secondary signal in + Line
4 - Not connected
5 - Signal out + (to DLM) Clean
6 - Signal out - (to DLM) Clean
7 - Not connected
8 - 100 Ω terminating Clean resistor
9 - Primary signal in - Line
10 - Secondary signal in - Line
11 - Earth in Line



Parallel connection of single phase protectors ESP SSI/120AC and ESP SSI/140AC (fuses not shown for clarity)

—

ESP SSI Series - Technical specification

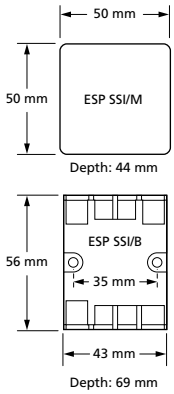
Electrical specification	ESP SSI/M	ESP SSI/B
ABB order code	7TCA085400R0168	7TCA085400R0166
Maximum signal voltage[1]	7 V	
Maximum common mode stand-off voltage:	90 Vrms	
	100 mA	10 A, 250 V
In-line resistance (per line, ±10%)	4.5 Ω	
Leakage: – (Line to line impedance)	> 1 MΩ	
– (Line to earth impedance)	> 10 kΩ	
Differential bandwidth (50 Ω system)	10 MHz	

ESP SSI/B:
This is a modified 11 pin 'relay type' socket containing a 100 Ω ±5% wire-wound 2.5 W resistor connected between terminals 8 and 9. Internal links between terminals 2 & 3, 9 & 10, and 1 & 11.

Transient specification	ESP SSI/M	ESP SSI/B
Let-through voltage U_p		
C2 test 2 kV 1.2/50 µs, 1 kA 8/20 µs to BS EN/EN/IEC 61643-21 (Line to Line)[6]	15 V[3]	
C2 test 4 kV 1.2/50 µs, 2 kA 8/20 µs to BS EN/EN/IEC 61643-21 (Line to Earth)[7]	250 V[3]	
B2 test 4 kV 10/700 µs, 100 A 5/310 µs to BS EN/EN/IEC 61643-21 (Line to Line)[6]	15 V[3]	
B2 test 4 kV 10/700 µs, 100 A 5/310 µs to BS EN/EN/IEC 61643-21 (Line to Earth)[7]	300 V[3]	
Maximum surge current		
D1 test 10/350 µs to BS EN/EN/ IEC 61643-21 (Line to Earth) – Per signal wire	2.5 kA	
– Per pair	5 kA	
Maximum discharge current test 8/20 µs to BS EN/EN/ IEC 61643-21 (Line to Earth) – Per signal wire	10 kA	
– Per pair	20 kA	

Mechanical specification	ESP SSI/M	ESP SSI/B
Temperature range	-40 to +80 °C	
Connection type	–	Screw terminal
Fixing connection: – Flat mount	–	2 x M4 fixing holes with 33 mm centres
– Top Hat Din rail mount (ESP SSI/B)	–	An integral clip
– G Din rail mount (ESP SSI/B/G)	–	2 x mounting clips with screws
Case material	FR Polymer UL-94 V-0	
Weight	0.065 kg	0.075 kg
Dimensions	See diagram below	

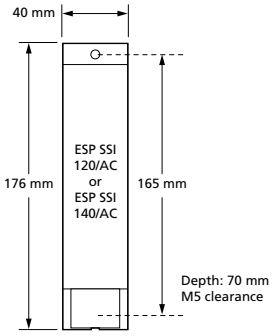
[1] Maximum signal voltage (DC or AC peak) measured at 200 µA.
[2] 'Let-through' voltage is the maximum transient voltage 'let-through' to the equipment to be protected. C2 test (to BS EN/EN/IEC 61643-21) 2 kV 1.2/50 µs. 1 kA 8/20 µs. 'Let-through' voltage (±10%).
[3] 'Let-through' voltage is the maximum transient voltage 'let-through' to the equipment to be protected. C2 test (to BS EN/EN/IEC 61643-21) 4 kV 1.2/50 µs. 2 kA 8/20 µs. 'Let-through' voltage (±20%).
[4] Minimum permissible load is 5 V DC, 10 mA to ensure reliable contact operation.
[5] The maximum transient voltage let-through of the protector throughout the test (±10%), per mode.
[6] Line to Line are differential/transverse modes.
[7] Line to Earth are common/longitudinal modes.



Electrical specification	ESP SSI/120AC	ESP SSI/140AC
ABB order code	7TCA085460R0059	7TCA085460R0060
Nominal voltage - Phase - Neutral U_o (RMS)	120 V	140 V
Maximum working voltage - Phase - Neutral U_c (RMS)	150 V	165 V
Working voltage (RMS)	90-150 V	90-165 V
Frequency range	47-63 Hz	
Current rating (supply) - see installation instructions	100 A	
Leakage current (to earth)	< 60 µA	
Indicator circuit current	< 10 mA	
Volt free contact:[4]	Screw terminal	
– Current rating	1 A	
– Nominal voltage (RMS)	250 V	

Transient specification	ESP SSI/120AC	ESP SSI/140AC
Type 1 (BS EN/EN), Class I (IEC)		
Nominal discharge current 8/20 µs (per mode) I_n	5 kA	
Impulse discharge current 10/350 µs (per mode) I_{imp}[4]	2.5 kA	
Total discharge current 10/350 µs (total to earth) I_{total}[4]	5 kA	
Type 2 (BS EN/EN), Class II (IEC)		
Nominal discharge current 8/20 µs (per mode) I_n	5 kA	
Let-through voltage Up at I_n[5]	460 V	540 V
Maximum discharge current I_{max} (per mode)[6]	20 kA	
Type 3 (BS EN/EN), Class III (IEC)		
Let-through voltage at U_{oc} of 6 kV 1.2/50 µs and I_{sc} of 3 kA 8/20 µs (per mode)[7]	400 V	500 V

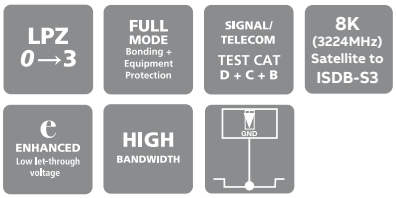
Mechanical specification	ESP SSI/120AC	ESP SSI/140AC
Temperature range	-40 to +80 °C	
Connection type	Screw terminal	
Conductor size (stranded)	16 mm²	
Earth connection	Screw terminal	
Volt free contact	Connect via screw terminal with conductor up to 2.5 mm² (stranded)	
Case material	Steel	
Weight	0.5 kg	
Dimensions	See diagram below	



Specific systems protection

ESP TV Series

*NOTE: product label design may vary.



Combined Category D, C, B tested protector (to BS EN 61643) suitable to protect Cable, Terrestrial and Satellite TV systems. For use on lines running within buildings at boundaries up to LPZ 0 to through to LPZ 3 to protect sensitive electronic equipment.

Features & benefits

- Very low let-through voltage (enhanced protection to IEC/BS EN 62305) between all lines - Full Mode protection
- Low attenuation and high return loss over a wide range of frequencies ensures the protectors do not impair system performance
- Substantial earth termination
- Supplied ready for flat mounting
- Strong metal housing
- 8K (3224 MHz) ready to ISDB-S3 satellite digital broadcast standard

Application

Use to protect analogue and digital Cable, Terrestrial and Satellite TV installations. ESP CATV/F, ESP MATV/F, ESP SMATV/F and ESP TV/F are suitable for systems using F connectors. ESP TV/EURO is suitable for systems using EURO-TV connectors.

- For protecting terrestrial antenna feeds use ESP TV/F or ESP TV/EURO
- For protecting satellite feeds use ESP SMATV/F
- For protecting distributed combined TV feeds use ESP MATV/F
- For protecting cable TV feeds use ESP CATV/F

For further information on TV applications, see separate Application Note AN006 (contact us for a copy).

Installation

Connect in series with the coaxial cable either near where it enters or leaves each building or close to equipment being protected.

NOTE: Protectors for coaxial (or twisted pair) CCTV Lines are available. For coaxial RF lines, use the ESP RF Series. Transients can also be conduced TV systems via the mains power supplies - use suitable ESP mains protection.

—

ESP TV Series - Technical specification

Electrical specification		ESP CATV/F	ESP MATV/F	ESP SMATV/F	ESP TV/F	ESP TV/EURO
ABB order code		7TCA085400R0122	7TCA085450R0000	7TCA085450R0026	7TCA085450R0028	7TCA085450R0027
Maximum working voltage[1]		140 V	18.9 V	18.9 V	6.4 V	6.4 V
Maximum operating current		4 A	800 mA	800 mA	300 mA	300 mA
Characteristic impedance		75 Ω				
Bandwidth		5-860 MHz	5-3224 MHz	860-3224 MHz	5-860 MHz	5-860 MHz
Insertion loss:	– 5-860 MHz	< 0.5 dB	< 0.3 dB	–	< 0.3 dB	< 0.3 dB
	– 860-2150 MHz	–	< 1.5 dB	< 1.5 dB	–	–
	– 2150-3224 MHz	–	< 2.2 dB	< 2.2 dB	–	–
Return loss (VSWR):	– 5-860 MHz	> 20 dB (< 1.2:1)	> 32 dB (< 1.05:1)	–	> 32 dB (< 1.05:1)	> 32 dB (< 1.05:1)
	– 860-2150 MHz	–	> 20 dB (< 1.2:1)	> 20 dB (< 1.2:1)	–	–
	– 2150-3224 MHz	–	< 2.2 dB	< 2.2 dB	–	–

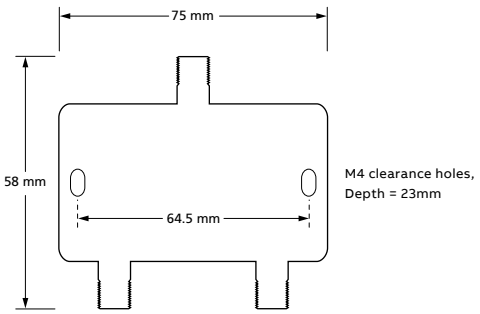
Transient specification	ESP CATV/F	ESP MATV/F	ESP SMATV/F	ESP TV/F	ESP TV/EURO
Let-through voltage (all conductors)[2] U_p					
C2 test 4 kV 1.2/50 µs, 2 kA 8/20 µs to BS EN/EN/IEC 61643-21	270 V	70 V	70 V	65 V	65 V
C1 test 1 kV 1.2/50 µs, 0.5 kA 8/20 µs to BS EN/EN/IEC 61643-21	265 V	60 V	60 V	50 V	50 V
B2 test 4 kV 10/700 µs to BS EN/EN/IEC 61643-21	245 V	45 V	45 V	30 V	30 V
5 kV, 10/700 µs[3]	250 V	50 V	50 V	35 V	35 V
Maximum surge current					
8/20 µs to ITU-T K.45:2003, IEEE C62.41.2:2002	3 kA				
D1 test 10/350 µs to BS EN/EN/IEC 61643-21	500 A	750 A	750 A	750 A	750 A

Mechanical specification	ESP CATV/F	ESP MATV/F	ESP SMATV/F	ESP TV/F	ESP TV/EURO
Temperature range	–40 to +80 °C				
Connection type	F female				Euro-TV
Earth connection	~ 9.5 mm (⅜") diameter earth stud				
Case Material	Diecast				
Weight	0.14 kg				
Dimensions	See diagram below				

[1] Maximum working voltage (DC or AC peak) measured at < 5 µA (ESP CATV/F) and < 50 mA (ESP MATV/F, ESP SMATV/F, ESP TV/EURO, ESP TV/F).

[2] The maximum transient voltage let-through of the protector throughout the test (±10%), line to line & line to earth. Response time < 10 ns.

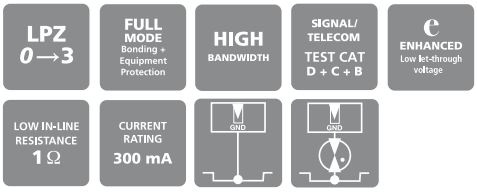
[3] Test to IEC 61000-4-5:2006, ITU-T (formerly CCITT) K.20, K.21 and K.45, Telcordia GR-1089-CORE, Issue 2:2002, ANSI TIA/EIA/IS-968-A:2002 (formerly FCC Part 68).



Specific systems protection

ESP CCTV Series

*NOTE: product label design may vary.



Combined Category D, C, B tested protector (to BS EN 61643) suitable for coaxial CCTV cables with BNC connectors (ESP CCTV/B) or twisted pair CCTV lines (ESP CCTV/T) on systems with either an earthed or an isolated screen. Not suitable for use on broadcast, satellite or cable TV systems. For use at boundaries up to LPZ 0 to protect against flashover (typically the service entrance location) through to LPZ 3 to protect sensitive electronic equipment.

Features & benefits

- Very low let-through voltage (enhanced protection to IEC/BS EN 62305) between all lines - Full Mode protection
- Full Mode design capable of handling partial lightning currents as well as allowing continual operation of protected equipment
- Repeated protection in lightning intense environments
- 100 MHz bandwidth prevents the degradation of high frequency signals
- Low in-line resistance to minimise unnecessary reductions in signal strength and maximizes signalling distance
- Very low reflection coefficient/VSWR ensure that the protector doesn't disrupt system operations
- Suitable for either earthed or isolated screen systems
- Sturdy, conductive ABS housing for 2 way shielding - preventing emissions & providing signals with immunity from external interference
- Convenient holes for flat mounting on base or side
- Built-in DIN rail foot for easy installation on a top hat DIN rail
- ESP CCTV/T has colour coded terminals for a quick and easy installation check - grey for the dirty (line) end and green for the clean end
- Substantial earth stud to enable effective earthing
- Integral earthing plate for enhanced connection to earth via CME kit
- ESP CCTV/B has Network Rail Approval PA05/02510. NRS PADS reference 086/023410

Application

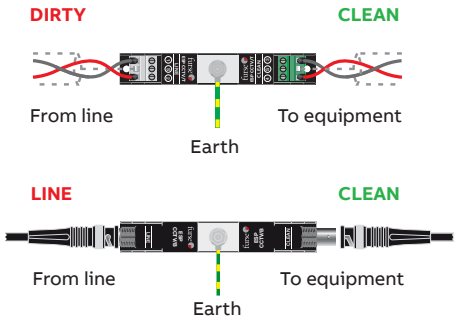
Use these protectors on the video cable to outdoor CCTV cameras and central control and monitoring equipment.

Installation

Connect in series with the CCTV cable in a convenient place close to the equipment being protected. For outdoor CCTV cameras, protectors should be mounted in the junction box, or in a separate enclosure, close to the camera. Protect central control and monitoring equipment inside the building by installing protectors on all incoming or outgoing lines, either:
a) near where they enter or leave the building, or
b) close to the equipment being protected (or actually within its control panel).

Accessories

When CCTV protectors are installed in groups, or alongside protectors for signal and mains power lines, these can be mounted and earthed simultaneously on a CME kit. A CME 4 will accommodate the video, telemetry and power protectors to a camera. If protectors cannot be incorporated within an existing panel or enclosure, WBX enclosures are available for up to 4, 8, 16 or 32 protectors and their associated CME kit.
The WBX 4/GS is a secure IP66 enclosure suitable for a CME 4 and associated protectors.



NOTE: Camera telemetry or control lines should be protected with a suitable Lightning Barrier from the ESP D or E Series. Protectors for the power supply to individual cameras (e.g. ESP 240-16A) and the mains supply to the control room (e.g. ESP 240 D1) are available. For coaxial RF (ESP RF Series) cable protectors and CATV systems (ESP CATV/F) are also available.

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ESP CCTV Series - Technical specification

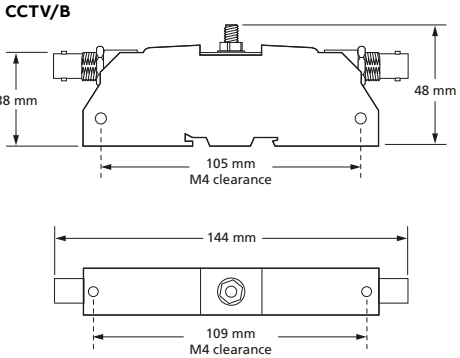
Electrical specification	ESP CCTV/B	ESP CCTV/ B-15V	ESP CCTV/ B-30V	ESP CCTV/ B-50V	ESP CCTV/T	ESP CCTV/ T-15V	ESP CCTV/ T-30V	ESP CCTV/ T-50V
ABB order code	7TCA085400R0123	7TCA085400R0124	7TCA085400R0125	7TCA085400R0126	7TCA085400R0129	7TCA085400R0270	7TCA085400R0271	7TCA085400R0027
Nominal voltage[1] (peak-peak)	1 V				2 V			
Maximum working voltage U_c[2] (peak)	7.79 V	16.7 V	36.7 V	56.7 V	7.79 V	16.7 V	36.7 V	56.7 V
Current rating (signal)	300 mA							
In-line resistance (±10%)	1 Ω inserted in coax inner				1 Ω per line			
Bandwidth (-3 dB 75 Ω system)[3]	> 100 MHz							
Voltage standing wave ratio	< 1.2:1							

Transient specification	ESP CCTV/B	ESP CCTV/ B-15V	ESP CCTV/ B-30V	ESP CCTV/ B-50V	ESP CCTV/T	ESP CCTV/ T-15V	ESP CCTV/ T-30V	ESP CCTV/ T-50V
Let-through voltage (all conductors)[4] U_p								
C2 test 4 kV 1.2/50 µs, 2 kA 8/20 µs to BS EN/EN/IEC 61643-21	39.5 V	55.0 V	78.0 V	105.0 V	39.5 V	55.0 V	78.0 V	105.0 V
C1 test 1 kV 1.2/50 µs, 0.5 kA 8/20 µs to BS EN/EN/IEC 61643-21	26.0 V	42.0 V	66.5 V	93.5 V	26.0 V	42.0 V	66.5 V	93.5 V
B2 test 4 kV 10/700 µs to BS EN/EN/IEC 61643-21	16.0 V	27.2 V	47.5 V	73.6 V	16.0 V	27.2 V	47.5 V	73.6 V
5 kV, 10/700 µs[5]	17.0 V	28.2 V	49.5 V	76.2 V	17.0 V	28.2 V	49.5 V	76.2 V
Maximum surge current[6]								
D1 test 10/350 µs to BS EN/EN/IEC 61643-21:	2.5 kA (per signal wire) –				2.5 kA (per signal wire) 5 kA (per pair)			
8/20 µs to ITU (formerly CCITT):	10 kA (per signal wire) –				10 kA (per signal wire) 20 kA (per pair)			

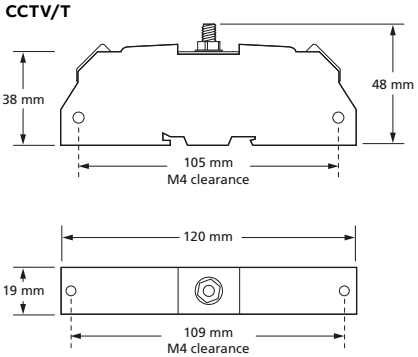
Mechanical specification	ESP CCTV/B variants	ESP CCTV/T variants
Temperature range	-40 to +80°C	
Connection type	Coaxial BNC female	Screw terminal
Conductor size (stranded)	Not applicable	2.5 mm²
Earth connection	M6 stud	
Case Material	Conductive ABS UL94 V-0	
Weight	0.08 kg	
Dimensions	See diagram below	

[1] Nominal voltage (DC or AC peak) measured at <10 µA leakage.
[2] Maximum working voltage (DC or AC peak) measured at 5 mA leakage.
[3] Capacitance < 30 pF.
[4] The maximum transient voltage let-through of the protector throughout the test (±10%), line to line & line to earth. Screen to earth let-through voltage will be up to 600 V (with 5 kV 10/700 test), when protector is configured for use with non-earthed or isolated screen systems. Response time < 10 ns.
[5] Test to IEC 61000-4-5:2006, ITU-T (formerly CCITT) K.20, K.21 and K.45,Telcordia GR-1089-CORE, Issue 2:2002, ANSI TIA/EIA/IS-968-A:2002 (formerly FCC Part 68).
[6] The installation and connectors external to the protector may limit the capability of the protector.

CCTV/B



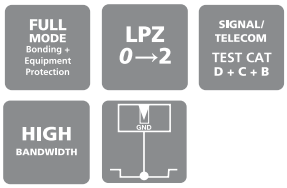
CCTV/T



Specific systems protection

ESP RF Series

*NOTE: product label design may vary.



Combined Category D, C, B tested surge protective device (SPD) (to BS EN 61643) suitable for RF systems using coaxial cables at frequencies between DC and up to 3.5 GHz and where DC power is present. Suitable for RF systems with power up to 780 W. For use at boundaries up to LPZ 0 to protect against flashover (typically the service entrance location) through to LPZ 2 to protect equipment.

Features & benefits

- Very low let-through voltage (enhanced protection to IEC/BS EN 62305) between all lines - Full Mode protection
- Full Mode design capable of handling partial lightning currents as well as allowing continual operation of protected equipment
- Repeated protection in lightning intense environments
- Wide bandwidth means a single product is suitable for a range of applications
- Very low attenuation and near unity VSWR over a wide range of frequencies ensure the protectors do not impair system performance
- Available with N, 7/16 DIN, SMA, TNC and BNC connectors
- Easily mounted and earthed via bulkhead mounting, or via mounting brackets
- Bulkhead-female to male connections for simple installation
- Indoor or outdoor use up to IP66

Application

Use on coaxial cables to protect RF transmitter and receiver systems, including electronics located at the antenna or dish. Typical examples include cell sites, military communications, satellite earth stations, pager systems and emergency services communications systems.

Installation

In a building, connect in series with the coaxial cable near where it enters or leaves the structure, or close to the equipment being protected. This should be as close as possible to the system's earth star point (to enable a good connection to earth). On a mast, connect in series with the coaxial cable near the antenna/dish being protected. Install in a radio communications room, an existing cabinet or a suitable enclosure.

Accessories

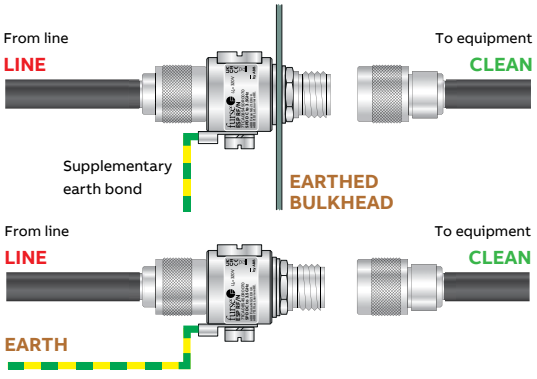
Angled brackets:

ESP RF/BK-N (7TCA085450R0078)
ESP RF/BK-DIN (7TCA08 5450R0077)
ESP RF/BK-SMA (7TCA085450R0080)
ESP RF/BK-BNC/TNC (7TCA085450R0079)

Replacement GDT capsules:

ESP RF/GDT-500V (7TCA085450R0081)

ESP RF/N with N bulkhead female/



NOTE: These protectors are based on a continuous transmission line with a GDT connected between this line and screen/earth, and are suited for applications where DC is required to pass to the equipment. ESP CCTV/B and ESP CCTV/T are suitable for use on coaxial (or twisted pair) CCTV lines. For coaxial CATV lines, use the ESP CATV/F.

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ESP RF Series - Technical specification

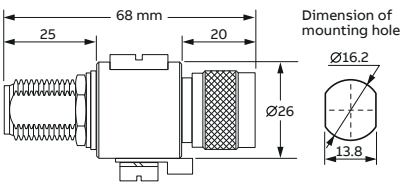
Electrical specification	ESP RF/N	ESP RF/DIN	ESP RF/BNC	ESP RF/TNC	ESP RF/SMA
ABB order code	7TCA085450R0070	7TCA085450R0071	7TCA085450R0072	7TCA085450R0073	7TCA085450R0068
Gas Discharge Tube voltage	500 V				
Maximum working voltage U_c (RMS)	320 V				
Characteristic impedance	50 Ω				
Capacitance (@ 1 MHz)	< 5 pF				
Bandwidth	DC-3.5 GHz				
Voltage standing wave ratio (VSWR)	≤ 1.2				
Insertion loss over bandwidth	≤ 0.2 dB				
Maximum power[1]	780 W				

Transient specification	ESP RF/N	ESP RF/DIN	ESP RF/BNC	ESP RF/TNC	ESP RF/SMA
Let-through voltage (all conductors)[2] U_p					
C2 test 4 kV 1.2/50 µs, 2 kA 8/20 µs to BS EN/EN/IEC 61643-21	< 1.5 kV				
C1 test 2 kV 1.2/50 µs, 1 kA 8/20 µs to BS EN/EN/IEC 61643-21	< 1.45 kV				
B2 test 4 kV 10/700 µs to BS EN/EN/IEC 61643-21	< 1.5 kV				
C3 test 1kV/µs, 100 A 10/1000 µs	< 1.2 kV				
Maximum surge current[3]					
D1 test 10/350 µs to BS EN/EN/IEC 61643-21	2.5 kA				
8/20 µs to ITU-T K.45:2003, IEEE C62.41.2:2002	20 kA				

Mechanical specification	ESP RF/N	ESP RF/DIN	ESP RF/BNC	ESP RF/TNC	ESP RF/SMA
Temperature range	-40 to +80 °C				
Connection type, input LINE side	N bulkhead female	7/16 DIN bulkhead female	BNC bulkhead female	TNC bulkhead female	SMA bulkhead female
Connection type, output CLEAN side	N male	7/16 DIN male	BNC male	TNC male	SMA male
Case Material	Brass body, alloy plated. Bronze connections, silver plated				
Weight	120 g	190 g	90 g	130 g	130 g
Degree of protection (IEC 60529)	IP66				
Dimensions	See diagram below				

[1] Power levels have been de-rated to allow for real life 'worst case' conditions, calculated with VSWR as 2:1.
[2] Response time < 10ns.
[3] The installation and connections external to the protector may limit the capability of the protector.

ESP RF/N



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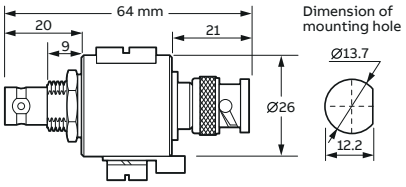
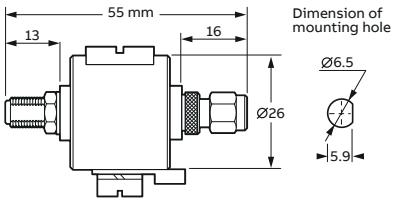
Mounting hole dimensions

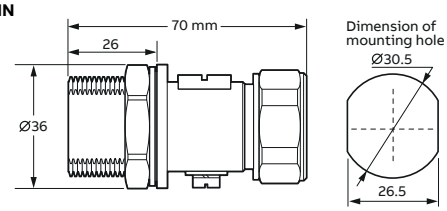
ESP RF/BNC



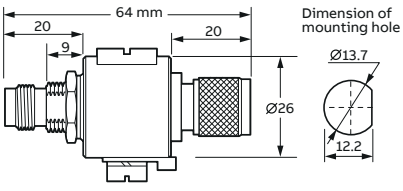
ESP RF/SMA



ESP RF/DIN



ESP RF/TNC



Protector accessories

WBX Series

*NOTE: product label design may vary.

A range of moisture and dirt resistant enclosures for the convenient installation of any ESP protector. For signalling applications they can be used with their associated CME with grey base and either a see-through or grey (part number /G or /GS) lid.

Features & benefits

- Tough polycarbonate enclosures (except ABS WBX 2/G)
- Weatherproof with IP resistance to dirt & water of IP56 or more
- Clear lid enables easy visual inspection of the protector's visual status indication (WBX 3, WBX 4, WBX D4, WBX 8, WBX D8, WBX M2, WBX M4)
- Grey lid for applications not needing regular protector inspection (WBX 2/G, WBX 3/G, WBX 4/GS, WBX 8/GS and WBX 16/2/G)
- For external CCTV and other installations requiring added security the WBX 4/GS and WBX 8/GS are supplied with an opaque lid and special secure head screws (plus tool)
- Supplied complete with metal base (mounting) plate with pre-prepared mounting positions and fixing hardware for easy installation (except WBX 2/G which has a plain metal base)

Application

Use WBX enclosures when your ESP protector(s) can't be installed within the existing equipment panel or enclosure and for added protection in damp and dirty environments.

Installation

The protector(s), or CME kit, are mounted on the metal base plate, which in turn mounts in the enclosure.

WBX Series - Technical specification

Part no.	For use with following protectors
WBX D4*	1 ESP 240 or 415/XXX/TNS or TNC protector, or single phase D1 series protector. ESP T1 series SPDs, such as the ESP 415T1/25/TNS (use low height DIN rail supplied to mount T1 series SPD within enclosures). ESP T2 series SPDs, such as the 2TE wide (36mm) ESP 240T2/50/TT (use supplied blanking plates to cover exposed 2TE opening in inspection window. Use tall height DIN rail supplied to mount T2 series SPD within enclosure)
WBX D8*	1 ESP 415/XXX/TT protector, or three phase D1 series protector ESP 415/I/TT (5TE wide - use supplied blanking plates to cover exposed 3TE in inspection window. Use tall height DIN rail to mount the unit within the enclosure)

* Metallic enclosures (MBX D4 and MBX D8) also available

Enclosure part no.	For use with following protectors
WBX 3	1 single phase M1 series protector, such as ESP240M1
WBX 4	1 three phase M1 series protector, such as ESP415M1
WBX M2	1 ESP M2 series protector, such as ESP415M2
WBX M4	1 ESP M4 series protector, such as ESP415M4
WBX 4 or the secure WBX 4/GS	1 CME 4 and associated protectors
WBX 8 or the secure WBX 8/GS	1 CME 8 and associated protectors
WBX 16/2/G	1 or 2 CME 16 and associated protectors
WBX 2/G	1 or 2 single earth stud protectors
WBX 3/G	Up to 3 single earth stud protectors
WBX 3/G	1 double earth stud protector
WBX SLQ or WBX SLQ/G	Up to 6 x ESP**Q, or up to 15 x ESP SL**

* Metallic enclosures (MBX D4 and MBX D8) also available

	WBX 2/G	WBX 3 WBX 3/G	WBX 4 WBX 4/GS	WBX D4	WBX 8 WBX 8/GS	WBX D8	WBX 16/ 2/G	WBX M2	WBX M4	WBX SLQ WBX SLQ/G
ABB Order Code	7TCA085410R0022	7TCA085410R0023 7TCA085410R0024	7TCA085410R0027 7TCA085410R0028	7TCA085410R0032	7TCA085410R0030 7TCA085410R0031	7TCA085410R0033	7TCA085410R0020	7TCA085410R0034	7TCA085410R0035	7TCA085410R0037 7TCA085410R0036
Weight: – Unit	0.45 kg	0.5 kg	0.9 kg	0.4 kg	1.3 kg	0.55 kg	6.4 kg	1.9 kg	2.2 kg	0.7 kg
– Packaged	0.5 kg	0.55 kg	0.95 kg	0.45 kg	1.35kg	0.6 kg	7.6 kg	2.3 kg	3.0 kg	1.0 kg
Dimensions:										
Length: – Internal	150 mm	222 mm	246 mm	–	225 mm	–	460 mm	254 mm	254 mm	230 mm
– External	160 mm	230 mm	255 mm	174 mm	235 mm	220 mm	474 mm	280 mm	280 mm	250 mm
Width: – Internal	110 mm	72 mm	171 mm	–	225 mm	–	380 mm	254 mm	254 mm	105 mm
– External	120 mm	80 mm	180 mm	104 mm	235 mm	205 mm	396 mm	280 mm	280 mm	125 mm
Depth: – Internal	71 mm	79 mm	119 mm	–	100 mm	–	120 mm	115 mm	165 mm	110 mm
– External	90 mm	85 mm	125 mm	112 mm	117 mm	140 mm	128 mm	130 mm	180 mm	125 mm
Fixing centres (mm)	148 x 90	210 x 60	240 x 165	110 centrally	215 x 215	90 x 94	380 x 310	254 x 254	254 x 254	235 x 110
IP rating	IP66	IP67	IP66	IP65	IP66	IP65	IP56	IP67	IP67	IP67
Temperature range	-40 to +80 °C	-40 to +80 °C	-15 to +75 °C	-25 to +60 °C	-15 to +75 °C	-25 to +60 °C	-25 to +60 °C	-40 to +80 °C	-40 to +80 °C	-40 to +80 °C
Flammability	UL 746C 5V	UL 746C 5V	UL 94 V2	UL 94 V0	UL 94 V2	UL 94 V0	UL 94 V0	UL 746C 5V	UL 746C 5V	UL 746C 5V

Protector accessories

MBX Series

Metallic enclosures for the convenient installation of Electronic Systems Protection (ESP) DIN rail mounted single and three phase power Surge Protection Devices (SPDs).

Features & benefits

- High quality steel enclosure, for safe and secure mounting of ESP DIN rail mounted SPDs.
- Spacious design with extra wiring space to aid SPD installation and maintenance
- Hinged inspection lid for easy inspection of ESP SPD status indication
- Supplied complete with two heights of DIN rail (to suit both tall and shorter depth SPDs), inspection window blanking plates and earth link wire (between base and lid)

Application

- Use MBX enclosures when your ESP SPD cannot be installed within the existing equipment panel or enclosure.

Metallic Enclosure Series - Technical specification

Part no.	MBX D4	MBX D8
ABB order code	7TCA085400R0649	7TCA085400R0650
Weight: – UnIt	1.47kg	1.99kg
– Packaged	1.6kg	2.16kg
Dimensions (mm)		
Length: – External	268	268
Width: – External	134	208
Depth: – External	104	104
Fixing centres (mm):	201 x 66.5 (3 holes)	201 x 137 (4 holes)
IP Rating:	IP20	IP20
Temperature range:	-40 to +80°C	-40 to +80°C
Product available width:	73.5mm (4TE)	146mm (8TE)

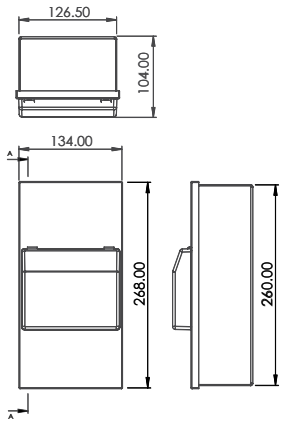
MBX D4	Use for SPDs up to 4TE wide (72mm):
–	ESP T1 series SPDs, such as the ESP 415T1/25/TNS (use low height DIN rail supplied to mount T1 series SPD within enclosure)
–	ESP T2 series SPDs, such as the 2TE wide (36mm) ESP 240T2/50/TT (use supplied blanking plates to cover exposed 2TE opening in inspection window. Use tall height DIN rail supplied to mount T2 series SPD within enclosure)
–	ESP 240/XXX/ single phase series or ESP 415/XXX/TNS or TNC three phase series (use supplied blanking plates to cover exposed opening inspection window, SPD is mounted on tall height DIN rail supplied)
–	A single phase D1 series SPD, such as the ESP 240D1 (use low height DIN rail supplied)
–	ESP CD40 series SPDs, such as the ESP 415CD40 (use low height DIN rail supplied to mount SPD within enclosure)
MBX D8	**Use for SPDs up to 8TE wide (144mm):**
–	ESP 415/I/TT (5TE wide - use supplied blanking plates to cover exposed 3TE in inspection window. Use tall height DIN rail to mount the unit within the enclosure)
–	A three phase D1 series SPD, such as the ESP 415D1 - use low height DIN rail supplied to mount SPD within enclosure

Installation

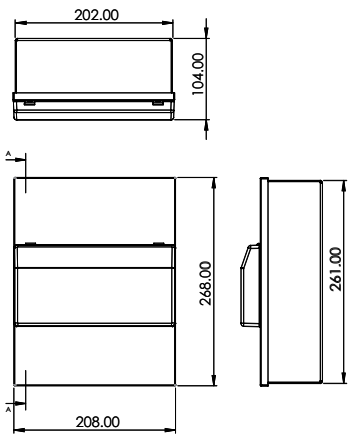
Once the enclosure has been prepared (conduit entries, etc.) and mounted securely to a flat surface, select the correct height DIN rail (2 are supplied) to suit the SPD to be installed within the enclosure (see application table below).

Mount the SPD onto the DIN rail (simply click onto the DIN rail to lock SPD into position). Make all necessary electrical connections to the SPD. Ensure an earth connection is made from the earth stud in the base of the enclosure to the earth stud of the enclosure lid using the earth wire supplied. Secure the lid to the base and ensure no live parts are exposed in the inspection window - use supplied blanking plates if necessary.

Dimensions (mm)
MBX D4



Dimensions (mm)
MBX D8



Protector accessories

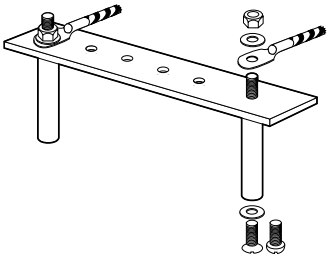
CME Series

CME Series

Enables groups of protectors to be simultaneously mounted and earthed via their earth stud. Suitable for installing protectors with one or two earth studs on their top face. Available with 4, 8, 16 and 32 mounting holes.

Features & benefits

- Enables quick and easy installation of protectors for added convenience
- Speedy installation of groups of protectors saves time and money
- Individual protectors can be changed without needing to remove others
- Sturdy construction
- Supplied with a choice of flat and round ended fixing screws to suit your application



Assembly of CME kit

Earth connection (not supplied)

Application

Use CME kits to simultaneously mount and earth groups of single and double earth stud protectors. Each single earth stud protector requires one CME mounting position and each double earth stud protector requires two CME mounting positions, this includes:

- High conductivity copper with electro-tin plating and nylon insulating pillars, for low impedance to earth Single earth stud protectors which are:
  - ESP 06D
  - ESP 06E
  - ESP 06H
  - ESP TN
  - ESP 15D
  - ESP 15E
  - ESP 15H
  - ESP RTD
  - ESP 30D
  - ESP 30E
  - ESP 30H
  - ESP CCTV/B
  - ESP 50D
  - ESP 50E
  - ESP 50H
  - ESP CCTV/T
  - ESP 110D
  - ESP 110E
  - ESP 110H
  - ESP RS485
- Double earth stud protectors which are:
  - ESP 120-5A
  - ESP 120-16A
  - ESP 240-16A
  - ESP 240-5A
  - ESP 277-5A
  - ESP 277-16A

Once you know how many CME mounting positions you require choose a CME kit to suit:

- CME 4 has 4 mounting positions
- CME 8 has 8 mounting positions
- CME 16 has 16 mounting positions
- CME 32 has 32 mounting positions

Accessories

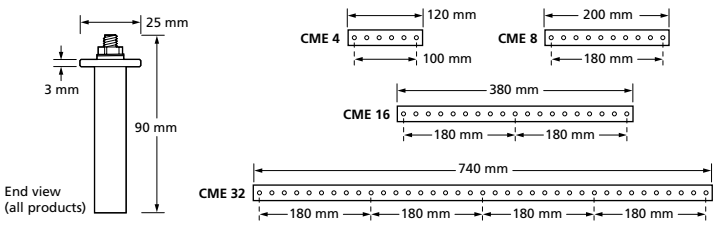
Enclosures suitable for a CME 4 and its associated protectors: **(WBX 4/GS), CME 8** and protectors **(WBX 8/GS)** or one or two **CME 16** and protectors **(WBX 16/2/G)**

Installation

The earth bar is supported by a series of mounting pillars (which are fixed to the cubicle or box base). Protectors are attached to the CME's earth bar via their earth stud(s) and earthed with shared connections to earth. We suggest one earth connection per mounting pillar.

CME Series - Technical specification

	CME 4	CME 8	CME 16	CME 32
ABB Order Code	7TCA085400R0001	7TCA085400R0002	7TCA085410R0002	7TCA085400R0003
Hole size	6.5 mm with 20 mm spacings			
Weight	0.1 kg	0.15 kg	0.3 kg	0.6 kg
Dimensions	See diagram above			



Protector accessories

Accessories

ESP M1R Remote display unit

Part no.	ABB Order Code	Description
ESP RDU/415M1R	7TCA085460R0151	Remote LED display for 3 phase 415 V M1R protector
ESP RDU/415M2R	7TCA085460R0152	Remote LED display for 3 phase 415 V M2R protector
ESP RDU/415M4R	7TCA085460R0334	Remote LED display for 3 phase 415 V M4R protector
ESP RDU/480M1R	7TCA085460R0296	Remote LED display for 3 phase 480 V M1R protector
ESP RDU/480M2R	7TCA085400R0281	Remote LED display for 3 phase 480 V M2R protector
ESP RDU/480M4R	7TCA085400R0239	Remote LED display for 3 phase 480 V M4R protector
ESP RDU-SEAL	7TCA085460R0150	IP64 rated seal for remote displays

*NOTE: product label design may vary.

ESP D1R Remote display unit

Part no.	ABB Order Code	Description
ESP RDU D1R/208	7TCA085400R0282	Remote LED display for 3 phase 208 V D1R protector
ESP RDU D1R/415	7TCA085460R0055	Remote LED display for 3 phase 415 V D1R protector
ESP RDU D1R/480	7TCA085400R0283	Remote LED display for 3 phase 480 V D1R protector
ESP RDU D1R/LCD/208	7TCA085400R0282	Remote LCD display for 3 phase 208 V D1R protector
ESP RDU D1R/LCD/415	7TCA085460R0055	Remote LCD display for 3 phase 415 V D1R protector
ESP RDU D1R/LCD/480	7TCA085400R0283	Remote LCD display for 3 phase 480 V D1R protector

*NOTE: product label design may vary.

Case assembly for connecting remote displays to suitable three phase connectors

Part no.	ABB Order Code	Description	Length
ESP RLA-1	7TCA085460R0153	Cable assembly for connecting ESP Remote Display Unit to ESP M1R, M2R and M4R series	1 m
ESP RLA-2	7TCA085460R0154	Cable assembly for connecting ESP Remote Display Unit to ESP M1R, M2R and M4R series	2 m
ESP RLA-4	7TCA085460R0155	Cable assembly for connecting ESP Remote Display Unit to ESP M1R, M2R and M4R series	4 m
ESP RLA HD-1	7TCA085460R0304	Cable assembly for connecting display unit to three phase ESP XXX D1R or ESP XXX D1R/LCD protectors	1 m
ESP RLA HD-2	7TCA085460R0305	Cable assembly for connecting display unit to three phase ESP XXX D1R or ESP XXX D1R/LCD protectors	2 m
ESP RLA HD-4	7TCA085460R0156	Cable assembly for connecting display unit to three phase ESP XXX D1R or ESP XXX D1R/LCD protectors	4 m

Case assembly for use with ESP ISDN/RJ45-*/8 or ESP Cat-5e or ESP Cat-6 protector range

Part no.	ABB Order Code	Description	Length
ESP CAT5e/UTP-1	7TCA085400R0026	Cable assembly for ESP Cat-5e with unshielded RJ45 connections	1 m
ESP CAT6/STP-2	7TCA085400R0231	Cable assembly for ESP Cat-6 with shielded RJ45 connections	2 m

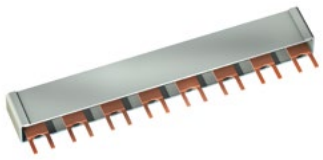
Cable assembly with RJ45 connections for the ESP ISDN/RJ45-4/8 or ESP ISDN/RJ45-8/8 plug-in ISDN protectors for use if the standard 0.5 m cable is insufficient.

Slim Line replacement base

Part no.	ABB Order Code	Description
Slim Line protector replacement base		
ESP SL/B	7TCA085400R0194	For use with standard and 4-20 mA Slim Line Series
ESP SL/I/B	7TCA085400R0261	Isolated screen version for use with standard and 4-20 mA Slim Line Series
ESP SL/3W/B	7TCA085400R0260	For use with Slim Line 3-wire Series
ESP SL RTD/B	7TCA085400R0263	For use with Slim Line RTD Series
ESP SL RS485/B	7TCA085400R0262	For use with Slim Line RS485 Series

Slim Line replacement module

Part no.	ABB Order Code	Description
Slim Line protector replacement module		
ESP SL06/M	7TCA085400R0243	For use with Slim Line Series - 6 V
ESP SL15/M	7TCA085400R0249	For use with Slim Line Series - 15 V
ESP SL30/M	7TCA085400R0197	For use with Slim Line Series - 30 V
ESP SL50/M	7TCA085400R0254	For use with Slim Line Series - 50 V
ESP SL110/M	7TCA085400R0245	For use with Slim Line Series - 110 V
ESP SL180/M	7TCA085400R0428	For use with Slim Line Series - 180 V
ESP SLTN/M	7TCA085400R0241	For use with Slim Line TN Series
ESP SLRTD/M	7TCA085400R0258	For use with Slim Line RTD Series
ESP SLRS485/M	7TCA085400R0259	For use with Slim Line RS485 Series
ESP SL06/3W/M	7TCA085400R0244	For use with Slim Line 3-wire LED Series - 6 V
ESP SL15/3W/M	7TCA085400R0247	For use with Slim Line 3-wire LED Series - 15 V
ESP SL30/3W/M	7TCA085400R0251	For use with Slim Line 3-wire LED Series - 30 V
ESP SL50/3W/M	7TCA085400R0255	For use with Slim Line 3-wire LED Series - 50 V
ESP SL110/3W/M	7TCA085400R0246	For use with Slim Line 3-wire LED Series - 110 V
Slim Line LED protector replacement module		
ESP SL06L/M	7TCA085400R0240	For use with Slim Line LED Series - 6 V
ESP SL15L/M	7TCA085400R0249	For use with Slim Line LED Series - 15 V
ESP SL30L/M	7TCA085400R0199	For use with Slim Line LED Series - 30 V
ESP SL50L/M	7TCA085400R0256	For use with Slim Line LED Series - 50 V
ESP SL110L/M	7TCA085400R0248	For use with Slim Line LED Series - 110 V
ESP SL180L/M	7TCA085400R0427	For use with Slim Line Series - 180 V
ESP SLTNL/M	7TCA085400R0469	For use with Slim Line LED Series, TN
ESP SL30L/4-20/M	7TCA085400R0164	For use with Slim Line LED Series, 4-20 mA
ESP SLRS485L/M	7TCA085400R0471	For use with Slim Line RS485 Series



Connecting and earthing bar

Part no.	ABB Order Code	Description
ESP CE7	7TCA085460R0032	For use with 3 x ESP 690/12.5/WT for TN-C supplies
ESP CE9	7TCA085460R0033	For use with 3 x ESP 690/25/WT for TN-C supplies
ESP CE10	7TCA085460R0030	For use with 4 x ESP 690/12.5/WT for TN-S supplies
ESP CE13	7TCA085460R0031	For use with 4 x ESP 690/25/WT for TN-S supplies

SSI Portable tester

Part no.	ABB Order Code	Description
ESP PTE002	7TCA085400R0055	SSI Portable Tester to to test the ESP SSI/M protector
ESP PTE002/CASE	7TCA085460R0054	Spare carry case with strap, for use with ESP PTE002
ESP PTE002/CAL	7TCA085410R0012	Annual calibration service

ESP PTE002 has Network Rail Approval PA05/02216. NRS PADS reference 094/020033.
Annual calibration is required, which is processed as ESP PTE002/CAL and managed by ABB Service in Stonehouse UK.

ESP RF Mounting plates

Part no.	ABB Order Code	Description
ESP RF/BK-N	7TCA085450R0078	Angled bracket for use with ESP RF/N
ESP RF/BK-DIN	7TCA08 5450R0077	Angled bracket for use with ESP RF/DIN
ESP RF/BK-SMA	7TCA085450R0080	Angled bracket for use with ESP RF/SMA
ESP RF/BK-BNC/TNC	7TCA085450R0079	Angled bracket for use with ESP RF/BNC and ESP RF/TNC

*NOTE: Image for illustration purposes only.

Gas discharge tubes

Part no.	ABB Order Code	Description	GDT Voltage
ESP RF/GDT-500V	7TCA085450R0081	Gas discharge tube*	600 V

*Replacement Gas Discharge Tube for use with the ESP RF 111A11, ESP RF AA1A11 and ESP RF 441A11 high performance RD protectors.
**NOTE: Image for illustration purposes only.

ESP LSC Lightning strike counter

Part no.	ABB Order Code	Description
ESP LSC	7TCA085410R0054	Detects and counts lightning strikes (to IEC/BS EN 62561-6) as part of a structure's Lightning Protection System (LPS)

*NOTE: product label design may vary.

Technical reference

Furse SPDs meet the performance parameters defined in two national & European standards:
BS EN 61643-11 Surge protective devices connected to low-voltage power systems - requirements and tests
BS EN 61643-21 Surge protective devices connected to telecommunications and signalling networks - performance requirements and testing methods

Technical reference
BS EN 61643 standard series

The **BS EN 61643** standard applies for all SPDs providing protection against lightning (direct and indirect) and transient overvoltages.

BS EN 61643-11 covers AC mains protection, for 50/60 Hz AC power circuits and equipment rated up to 1000 V_{RMS} AC and 1500 V DC.

BS EN 61643-21 covers telecommunications and signalling networks with nominal system voltages up to 1000 V_{RMS} AC and 1500 V DC.

Within these parts to the standard is defined:
- The electrical requirements for SPDs, including voltage protection and current limiting levels, status indication and minimum test performance
- The mechanical requirements for SPDs, to ensure an appropriate quality of connection, and mechanical stability when mounted
- The safety performance of the SPD, including its mechanical strength and its ability to withstand heat, overstress and insulation resistance

The standard establishes the importance of testing SPDs to determine their electrical, mechanical and safety performance.

Electrical tests include impulse durability, current limiting, and transmission tests. Mechanical and safety tests establish levels of protection against direct contact, water, impact, the SPD installed environment etc.

For voltage and current limiting performance, an SPD is tested according to its Type (which correlates to its test Class), which defines the level of lightning current or transient overvoltage it is expected to limit/divert away from sensitive equipment.

Tests include Class I impulse current, Class I & II nominal discharge current and Class III combination wave tests for SPDs installed on power lines, and Class D (high energy), C (fast rate of rise), and B (slow rate of rise) for those on data, signal and telecoms lines.

SPDs are tested with the connections or terminations following manufacturer's instructions, as per the expected SPD installation.

Measurements are taken at the connectors/terminals. Three samples of an SPD are tested and all must pass before approval is granted.

SPDs which have been tested to BS EN 61643 should be suitably labelled and marked, to include the relevant performance data for their application.

Technical specifications
Within BS EN 61643 there are two Technical Specifications which provide recommendations on the selection and installation of SPDs.

These are:
- **DD CLC/TS 61643-12** Surge protective devices connected to low-voltage power systems - selection and application principles
- **DD CLC/TS 61643-22** Surge protective devices connected to telecommunications and signalling networks - selection and application principles

These Technical Specifications should be used with BS EN 61643-11 and BS EN 61643-21 respectively.
Each Technical Specification provides information and guidance on:
- Risk assessment and evaluating the need for SPDs in low-voltage systems, with reference to IEC/BS EN 62305 Lightning Protection standard and IEC 60364 Electrical installations for buildings
- Important characteristics of an SPD (e.g. voltage protection level) in conjunction with the protection needs of equipment (i.e. its rated impulse voltage or impulse immunity voltage for sensitive equipment)
- Selection of SPDs considering the entire installation environment, including their classification, function and performance
- Coordination of SPDs throughout the installation (for power and data lines) and between SPDs and RCDs or overcurrent protective devices

Through following the guidance in these documents, appropriate specification of SPDs to meet the installation requirement can be achieved.

Technical reference
Overvoltage protection to BS 7671

Based on the IEC 60364 series, the 18th Edition of BS 7671 Wiring regulations covers the electrical installation of buildings including the use of surge protection.

The 18th Edition of BS 7671 applies to the design, erection and verification of electrical installations, and also to additions and alterations to existing installations. Existing installations that have been installed in accordance with earlier editions of BS 7671 may not comply with the 18th edition in every respect. This does not necessarily mean that they are unsafe for continued use or require upgrading.

A key update in the 18th Edition relates to Sections 443 and 534, which concern protection of electrical and electronic systems against transient overvoltages, either as a result of atmospheric origin (lightning) or electrical switching events.

Essentially the 18th Edition require all new electrical system designs and installations, as well as alterations and additions to existing installations, to be assessed against key consequences caused by transient overvoltages and, where necessary, protected using appropriate surge protection measures (in the form of Surge Protection Devices SPDs).

Within BS 7671:

- **Section 443** now requires protection against transient overvoltages to be provided where the consequence caused by the overvoltage could result in:
  (i) serious injury to, or loss of, human life
  (ii) significant financial or data loss
  For all other cases, protection against transient overvoltages shall be provided unless the owner of the installation declares it is not required due to any loss or damage being tolerable and they accept the risk of damage to equipment and any consequential loss.
  The benefits of SPDs and their relative small cost to implement far outweigh the potential hardware and consequential losses for even the modern home with its dependency on electronics (computers, white goods, audio video equipment, electric vehicle charging etc).

  It should be noted that as far as Section 443 is concerned, the BS EN 62305-2 risk assessment method must be used for high risk installations such as nuclear or chemical sites where the consequences of transient overvoltages could lead to explosions, harmful chemical or radioactive emissions thus affecting the environment.

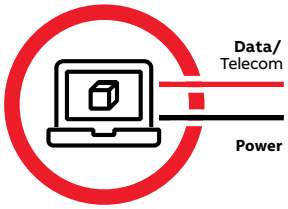
  Outside of such high risk installations, if there is a risk of a direct lightning strike to the structure itself or to overhead lines to the structure SPDs will be required in accordance with BS EN 62305.

- **Section 534** details the selection and installation of SPDs for effective transient overvoltage protection, including SPD Type, performance and co-ordination

Readers of this guide should be mindful of the need to protect all incoming metallic service lines against the risk of transient overvoltages. BS 7671 provides focussed guidance for the assessment and protection of electrical and electronic equipment intended to be installed on AC mains power supplies.

In order to observe the Ligntning Protection Zone LPZ concept within BS 7671 and BS EN 62305, all other incoming metallic service lines, such as data, signal and telecommunications lines, are also a potential route through which transient overvoltages to damage equipment. As such all such lines will require appropriate SPDs.

BS 7671 clearly points the reader back to BS EN 62305 and BS EN 61643 for specific guidance. This is covered extensively in the Furse guide to BS EN 62305 Protection Against Lightning.



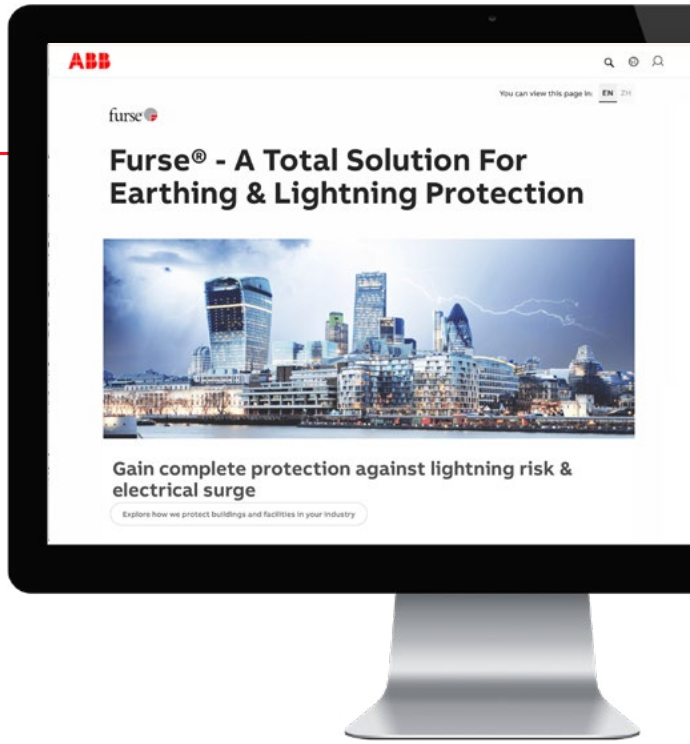
IMPORTANT:
Equipment is ONLY protected against transient overvoltages if all incoming / outgoing mains and data lines have protection fitted.

ESP Surge Protection
Application Notes

The following application notes (available from our website) ease the SPD product selection process for specific applications:

- **Choosing the correct Furse ESP surge protector for your data and signal line applications**
- **AN001** Protection for Resistance Temperature Detectors (RTDs)
- **AN003** Protection for OEM data communications, signal and telephone systems
- **AN004** Protection for Local Area Networks (LAN) with PoE
- **AN005** Protection for global telephony equipment
- **AN006** Protection for TV, satellite and radio systems
- **AN010** Analogue and digital telecommunications protection
- **AN013** Protection for data and signal lines in Intrinsically Safe circuits
- **AN014** Protection of photovoltaic (PV) systems
- **AN015** Protection of wind turbines

MORE INFO



Technical reference
Introduction

The IEC/BS EN 62305 standard reflects increased scientific understanding of lightning and its effects over the last twenty years, and takes stock of the growing impact of technology and electronic systems on our daily activities.

IEC/BS EN 62305 Lightning protection standard
The IEC/BS EN 62305 Standard for lightning protection was originally published in September 2006, to supercede the previous standard, BS 6651:1999.

For a period, IEC/BS EN 62305 and BS 6651 ran in parallel, but in August 2008, BS 6651 was withdrawn and now IEC/BS EN 63205 is the recognized standard for lightning protection.

More complex and exacting than its predecessor, IEC/BS EN 62305 includes four distinct parts - general principles, risk management, physical damage to structures and life hazard, and electronic systems protection.

Key to IEC/BS EN 62305 is that all considerations for lightning protection are driven by a complex and comprehensive risk assessment and that this assessment not only takes into account the structure to be protected, but also the services to which the structure is connected. In essence, structural lightning protection can no longer be considered in isolation, protection against transient overvoltages or electrical surges is integral to IEC/BS EN 62305.

Structure of IEC/BS EN 62305
The IEC/BS EN 62305 series consists of four parts, all of which need to be taken into consideration. These four parts are outlined here.

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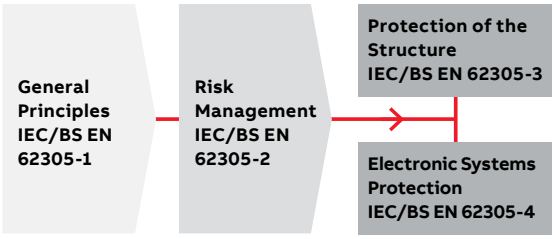
Structure of IEC/BS EN 62305



Part 1: General principles
IEC/BS EN 62305-1 (part 1) is an introduction to the other parts of the standard and essentially describes how to design a Lightning Protection System (LPS) in accordance with the accompanying parts of the standard.

Part 2: Risk management
IEC/BS EN 62305-2 (part 2) risk management approach, does not concentrate so much on the purely physical damage to a structure caused by a lightning discharge, but more on the risk of loss of human life (including permanent injury), loss of service to the public, loss of cultural heritage and economic loss.

Part 3: Physical damage to structures and life hazard
IEC/BS EN 62305-3 (part 3) relates directly to the major part of BS 6651. It differs from BS 6651 in as much that this new part has four Classes or protection levels of LPS, as opposed to the basic two (ordinary and high-risk) levels in BS 6651.

Part 4: Electrical and electronic systems within structures
IEC/BS EN 62305-4 (part 4) covers the protection of electrical and electronic systems housed within structures. It embodies what Annex C in BS 6651 conveyed, but with a new zonal approach referred to as Lightning Protection Zones (LPZs). It provides information for the design, installation, maintenance and testing of a Lightning Electromagnetic Impulse (LEMP) protection system (now referred to as Surge Protection Measures - SPM) for electrical/ electronic systems within a structure.

Technical reference
Key points

Key variances between the previous standard, BS 6651, and IEC/BS EN 62305 - Technical reference table

BS 6651 Standard (withdrawn August 2008)	IEC/BS EN 62305 Standard
Document structure	
118 page document, including 9 pages devoted to risk assessment	Over 470 pages in 4 parts, including over 150 pages devoted to risk assessment (IEC/BS EN 62305-2)
Focus on Protection of Structures against Lightning	Broader focus on Protection against Lightning including the structure and services connected to the structure
Specific tables relating to choice and dimension of LPS components and conductors	Specific tables relating to sizes and types of conductors and earth electrodes LPS components - specifically related to BS EN 50164/IEC 62561 testing regimes
Annex B - guidance on application of BS 6651	IEC/BS EN62305-3 Annex E - extensive guidance given on application of installation techniques complete with illustrations
Annex C - general advice (recommendation) for protection of electronic equipment with separate risk assessment	IEC/BS EN 62305-4 is devoted entirely to protection of electrical and electronic systems within the structure (integral part of standard) and is implemented through single separate risk assessment (IEC/BS EN 62305-2)
Definition of risk	
Risk (of death/injury) level set at 1 in 100,000 (1×10^{-5}) based on comparable exposures (smoking, traffic accidents, drowning etc)	3 primary risk levels defined (IEC/BS EN 62305): • R_1 Loss of human life (including permanent injury) 1 in 100,000 (1×10^{-5}) • R_2 Loss of service to the public 1 in 10,000 (1×10^{-4}) • R_3 Loss of cultural heritage 1 in 10,000 (1×10^{-4})
Protection measures	
Mesh arrangement is promoted as the commonly used means of air termination network	Mesh arrangement, protective angle method, catenary system, extensive use of air finials, all form part of or all of air termination network
2 levels of Lightning Protection mesh design: (20 m x 10 m; 10 m x 5 m)	4 sizes of mesh defined according to structural class of Lightning Protection System: • Class I 5 m x 5 m • Class II 10 m x 10 m • Class III 15 m x 15 m • Class IV 20 m x 20 m
2 levels of down conductor spacing: 20 m & 10 m	4 levels of down conductor spacing dependent on structural class of Lightning Protection System: • Class I 10 m • Class II 10 m • Class III 15 m • Class IV 20 m
Use of bonds promoted to minimise side flashing	Extensive sections/explanations provided on equipotential bonding
10 Ω overall earthing requirement, achieved by 10 x number of down conductors	10 Ω overall earthing requirement achieved either by Type A arrangement (rods) or Type B arrangement (ring conductor)
Requirement to bond all metallic services, (gas, water, electricity etc) to main earth terminal along with external down conductor	Requirement to bond all metallic services to main equipotential bonding bar. 'Live' electrical conductors (e.g. power, data, telecoms) bonded via Surge Protective Devices (SPDs)
Rolling sphere concept on structures over 20 m tall: 20 m sphere used on highly flammable contents/electronic equipment within building All other buildings: 60 m rolling sphere	4 sizes of rolling sphere concept defined according to structural class of Lightning Protection System: • Class I 20 m • Class II 30 m • Class III 45 m • Class IV 60 m

Technical reference
IEC/BS EN 62305-1 - General principles

This opening part of the IEC/BS EN 62305 suite of standards serves as an introduction to the further parts of the standard. It classifies the sources and types of damage to be evaluated and introduces the risks or types of loss to be anticipated as a result of lightning activity.

Furthermore, it defines the relationships between damage and loss that form the basis for the risk assessment calculations in part 2 of the standard.

Lightning current parameters are defined. These are used as the basis for the selection and implementation of the appropriate protection measures detailed in parts 3 and 4 of the standard.

Part 1 of the standard also introduces new concepts for consideration when preparing a lightning protection system, such as Lightning Protection Zones (LPZs) and separation distance.

Damage and loss
IEC/BS EN 62305 identifies four main sources of damage:
- **S1** Flashes to the structure
- **S2** Flashes near to the structure
- **S3** Flashes to the lines connected to the structure
- **S4** Flashes near the lines connected to the structure

Each source of damage may result in one or more of three types of damage:
- **D1** Injury of living beings by electric shock
- **D2** Physical damage (fire, explosion, mechanical destruction, chemical release) due to lightning current effects including sparking
- **D3** Failure of internal systems due to Lightning
- Electromagnetic Impulse (LEMP)

The following types of loss may result from damage due to lightning:
- **L1** Loss of human life (including permanent injury)
- **L2** Loss of service to the public
- **L3** Loss of cultural heritage
- **L4** Loss of economic value (structure, its content, and loss of activity)

The relationships of all of the above parameters are summarized in Table 1.

System design criteria
The ideal lightning protection for a structure and its connected services would be to enclose the structure within an earthed and perfectly conducting metallic shield (box), and in addition provide adequate bonding of any connected services at the entrance point into the shield.

This in essence would prevent the penetration of the lightning current and the induced electromagnetic field into the structure. However, in practice it is not possible or indeed cost effective to go to such lengths.

This standard thus sets out a defined set of lightning current parameters where protection measures, adopted in accordance with its recommendations, will reduce any damage and consequential loss as a result of a lightning strike. This reduction in damage and consequential loss is valid provided the lightning strike parameters fall within defined limits, established as Lightning Protection Levels (LPL).

Table 1: Damage and loss in a structure according to point of lightning strike (IEC/BS EN 62305-1 Table 2)

Point of strike	Source of damage	Type of damage	Type of loss
Structure	S1	D1	L1, L4**
		D2	L1, L2, L3, L4
		D3	L1*, L2, L4
Near a Structure	S2	D3	L1*, L2, L4
Lines connected to the structure	S3	D1	L1, L4**
		D2	L1, L2, L3, L4
		D3	L1*, L2, L4
Near a Line	S4	D3	L1*, L2, L4

*Only for structures with risk of explosion and for hospitals or other structures where failures of internal systems immediately endangers human life
**Only for properties where animals may be lost

Technical reference

IEC/BS EN 62305-1 - Lightning protection levels (LPL)

01 The types of damage and loss resulting from a lightning strike on or near a structure

Lightning Protection Levels (LPL)
Four protection levels have been determined based on parameters obtained from previously published technical papers. Each level has a fixed set of maximum and minimum lightning current parameters. These parameters are shown in Table 2.

The maximum values have been used in the design of products such as lightning protection components and Surge Protective Devices (SPDs).

The minimum values of lightning current have been used to derive the rolling sphere radius for each level.

Table 2: Lightning current for each LPL based on 10/350 µs waveform

LPL	I	II	III	IV
Maximum current (kA)	200	150	100	100
Minimum current (kA)	3	5	10	16

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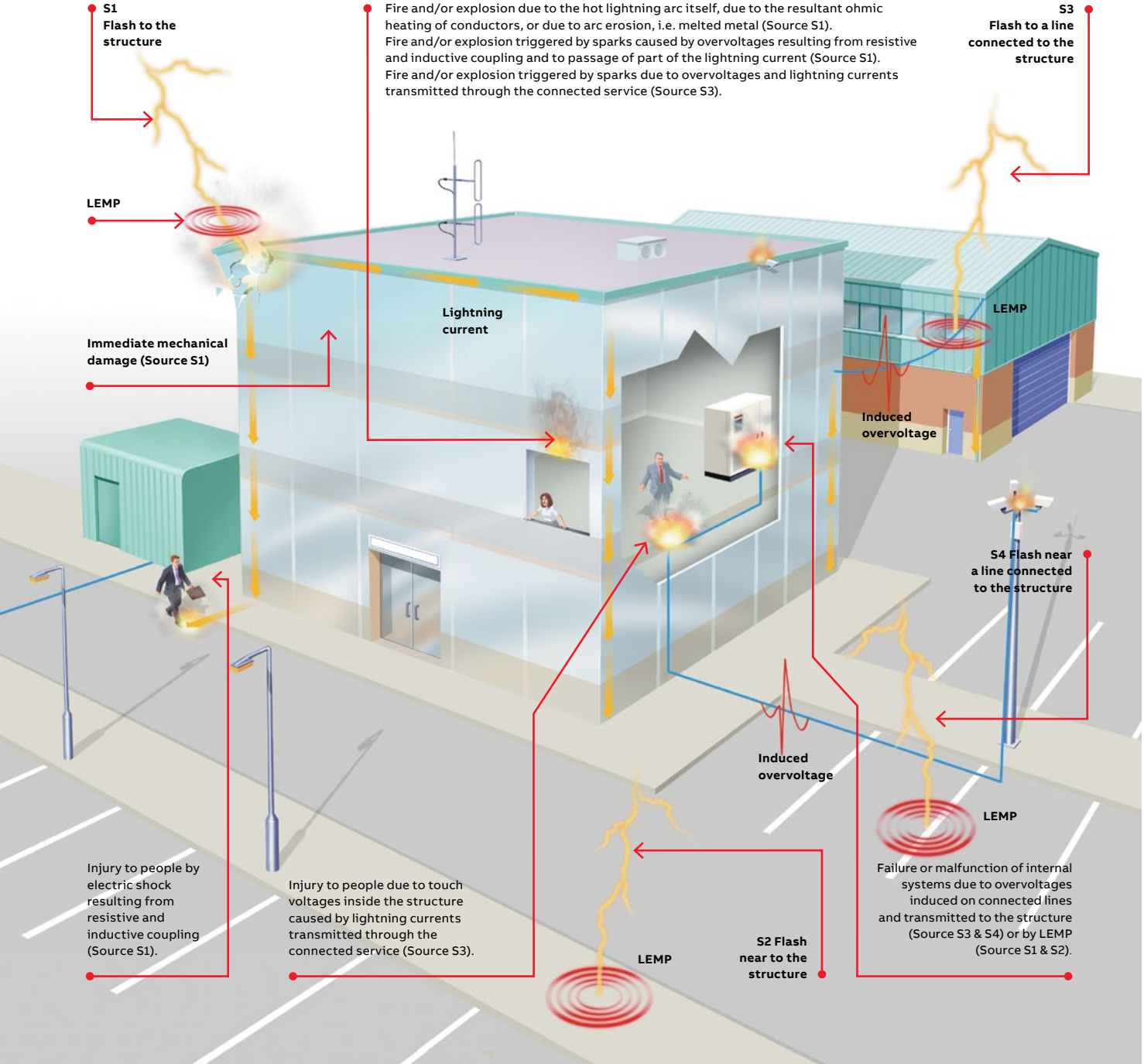

Technical reference
IEC/BS EN 62305-1 - Lightning protection zones (LPZ)

—
02 The LPZ concept

Lightning protection zones (LPZ)
The concept of the Lightning Protection Zone (LPZ) was introduced within IEC/BS EN 62305 particularly to assist in determining the protection measures required to establish protection measures to counter Lightning Electromagnetic Impulse (LEMP) 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.

The concept caters for external zones, with risk of direct lightning strike, or partial lightning current occurring (LPZ 0) and levels of protection within internal zones (LPZ 1 & LPZ 2).

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 against LEMP by relevant Surge Protection Measures (SPM as defined in IEC/BS EN 62305).

SPM were previously referred to as a LEMP Protection Measures System (LPMS) in IEC/BS EN 62305:2006.

Figure 4 highlights the LPZ concept as applied to the structure and to SPM. The concept is expanded upon in IEC/BS EN 62305-3 and IEC/BS EN 62305-4.

Selection of the most suitable SPM is made using the risk assessment in accordance with IEC/BS EN 62305-2.

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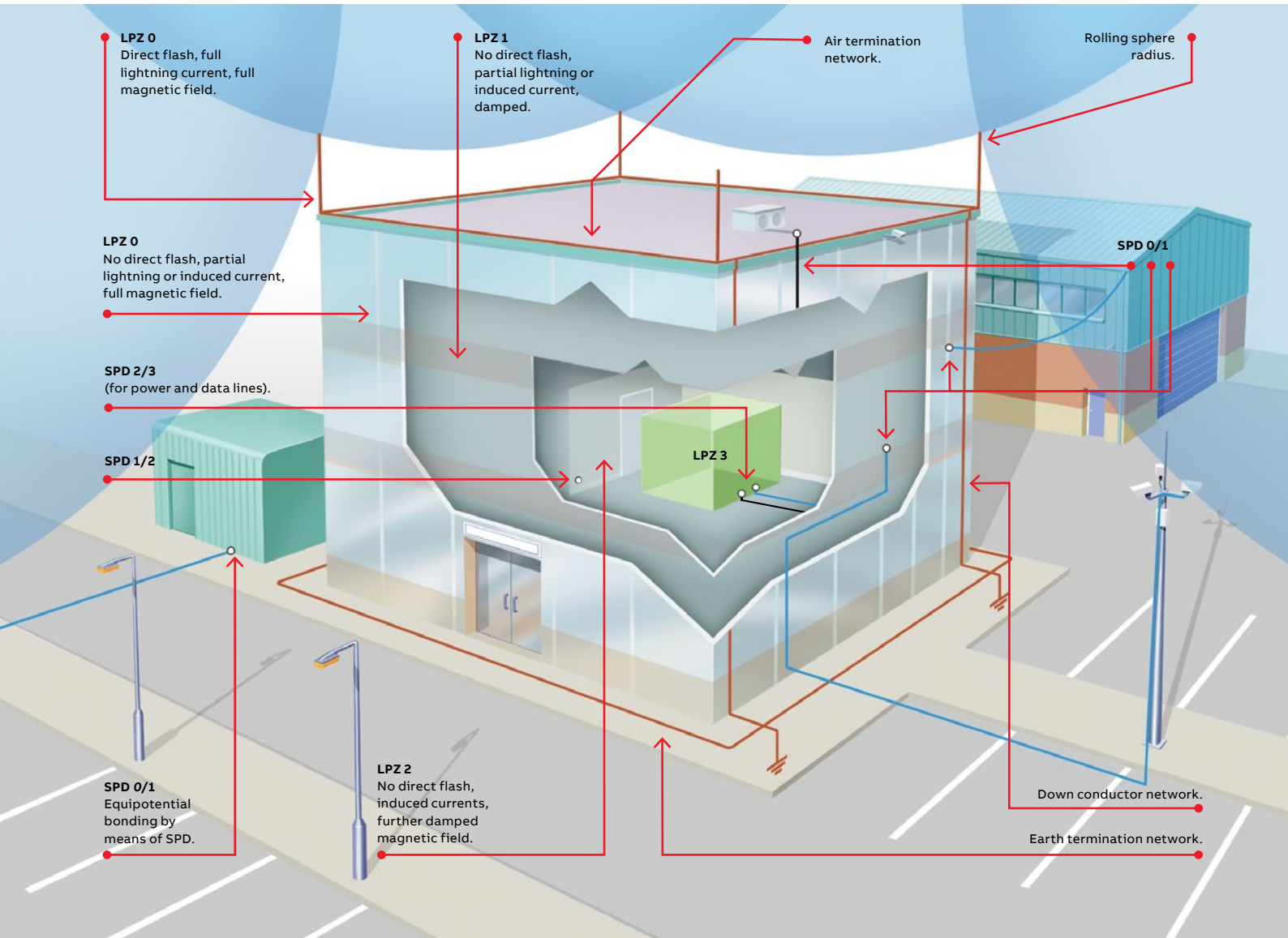

Technical reference
IEC/BS EN 62305-2 - Risk management

IEC/BS EN 62305-2 is key to the correct implementation of IEC/BS EN 62305-3 and IEC/BS EN 62305-4. The assessment and management of risk is now significantly more in depth and extensive than the approach of BS 6651.

—
01 Procedure for deciding the need for protection (IEC/BS EN 62305-1 Figure 1).

IEC/BS EN 62305-2 specifically deals with making a risk assessment, the results of which define the level of Lightning Protection System (LPS) required. While BS 6651 devoted 9 pages (including figures) to the subject of risk assessment, IEC/BS EN 62305-2 currently contains over 140 pages.

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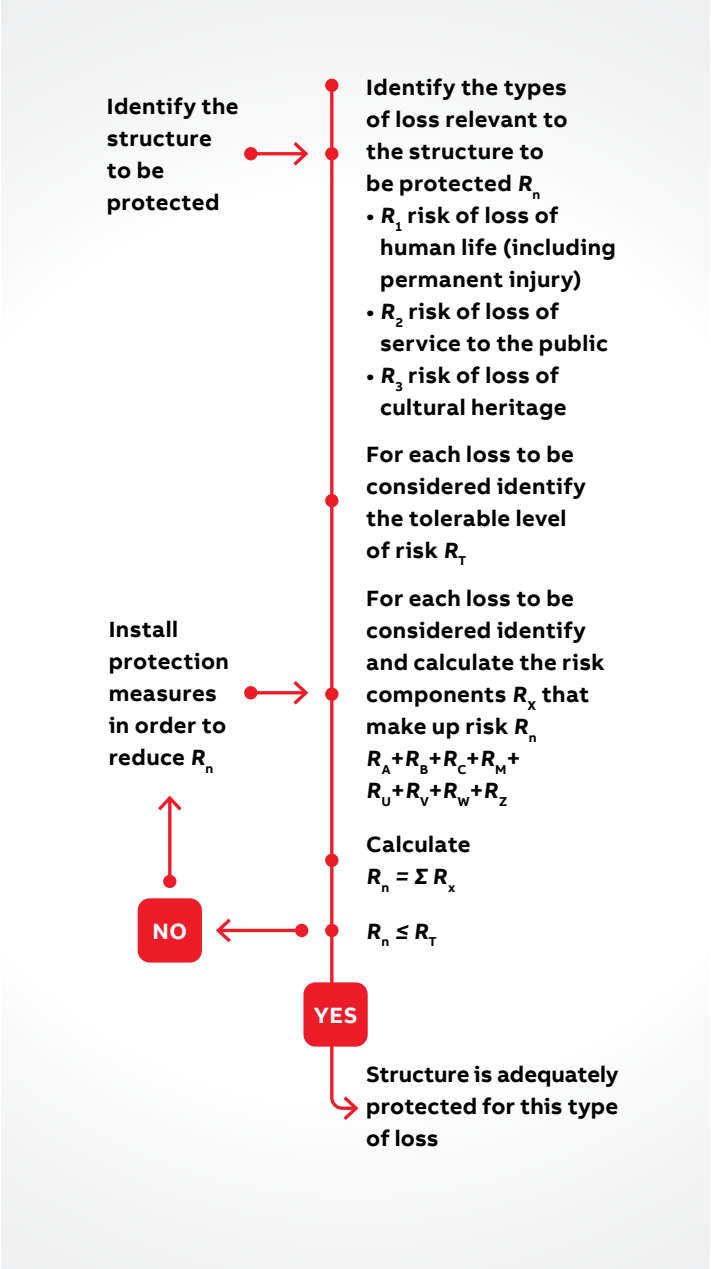


The first stage of the risk assessment is to identify which of the four types of loss (as identified in IEC/BS EN 62305-1) the structure and its contents can incur. The ultimate aim of the risk assessment is to quantify and if necessary reduce the relevant primary risks i.e.:

- R_1 risk of loss of human life (including permanent injury)
- R_2 risk of loss of service to the public
- R_3 risk of loss of cultural heritage
- R_4 risk of loss of economic value

For each of the first three primary risks, a tolerable risk (R_T) is set. This data can be sourced in Table 7 of IEC 62305-2 or Table NF.1 of the National Annex of BS EN 62305-2.

Each primary risk (R_n) is determined through a long series of calculations as defined within the standard. If the actual risk (R_n) is less than or equal to the tolerable risk (R_T), then no protection measures are needed. If the actual risk (R_n) is greater than its corresponding tolerable risk (R_T), then protection measures must be instigated. The above process is repeated (using new values that relate to the chosen protection measures) until R_n is less than or equal to its corresponding R_T.

It is this iterative process as shown in the Figure to the left that decides the choice or indeed Lightning Protection Level (LPL) of Lightning Protection System (LPS) and Surge Protective Measures (SPM) to counter Lightning Electromagnetic impulse (LEMP).

Technical reference
IEC/BS EN 62305-3 - Physical damage to structures & life hazard

IEC/BS EN 62305-3. This part of the suite of standards deals with protection measures in and around a structure.

The main body of this part of the standard gives guidance on the design of an external Lightning Protection System (LPS), internal LPS and maintenance and inspection programmes.

Lightning Protection System (LPS)
IEC/BS EN 62305-1 has defined four Lightning Protection Levels (LPLs) based on probable minimum and maximum lightning currents. These LPLs equate directly to classes of Lightning Protection System (LPS).

The correlation between the four levels of LPL and LPS is identified in Table 3. In essence, the greater the LPL, the higher class of LPS is required.

External LPS design considerations
The lightning protection designer must initially consider the thermal and explosive effects caused at the point of a lightning strike and the consequences to the structure under consideration. Depending upon the consequences the designer may choose either of the following types of external LPS:
- Isolated
- Non-isolated

External LPS design considerations
An Isolated LPS is typically chosen when the structure is constructed of combustible materials or presents a risk of explosion. Conversely a non-isolated system may be fitted where no such danger exists.

An external LPS consists of:
- Air termination system
- Down conductor system
- Earth termination system

These individual elements of an LPS should be connected together using appropriate lightning protection components (LPC) complying (in the case of BS EN 62305) with IEC/BS EN 62561 series. This will ensure that in the event of a lightning current discharge to the structure, the correct design and choice of components will minimise any potential damage.

Air termination system
The role of an air termination system is to capture the lightning discharge current and dissipate it harmlessly to earth via the down conductor and earth termination system. Therefore it is important to use a correctly designed air termination system.

IEC/BS EN 62305-3 advocates the following, in any combination, for the design of the air termination:
- Air rods (or finials) whether they are free-standing masts or linked with conductors to form a mesh on the roof
- Catenary (or suspended) conductors, whether they are supported by free-standing masts or linked with conductors to form a mesh on the roof
- Meshed conductor network that may lie in direct contact with the roof or be suspended above it (in the event that it is of paramount importance that the roof is not exposed to a direct lightning discharge)

The standard makes it quite clear that all types of air termination systems that are used shall meet the positioning requirements laid down in the body of the standard. It highlights that the air termination components should be installed on corners, exposed points and edges of the structure.

The three basic methods recommended for determining the position of the air termination systems are:
- The rolling sphere method
- The protective angle method
- The mesh method

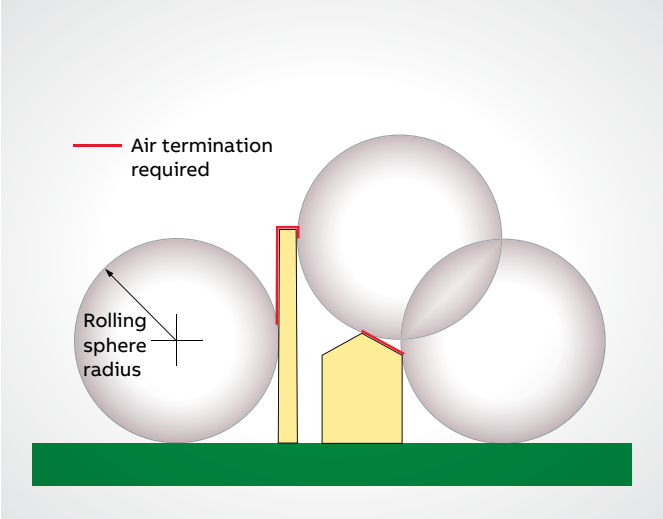
These methods are detailed over the following pages.

Table 3: Relation between Lightning Protection Level (LPL) and Class of LPS (IEC/BS EN 62305-3 Table 1)

LPL	Class of LPS
I	I
II	II
III	III
IV	IV

Technical reference

IEC/BS EN 62305-3 - Physical damage to structures & life hazard



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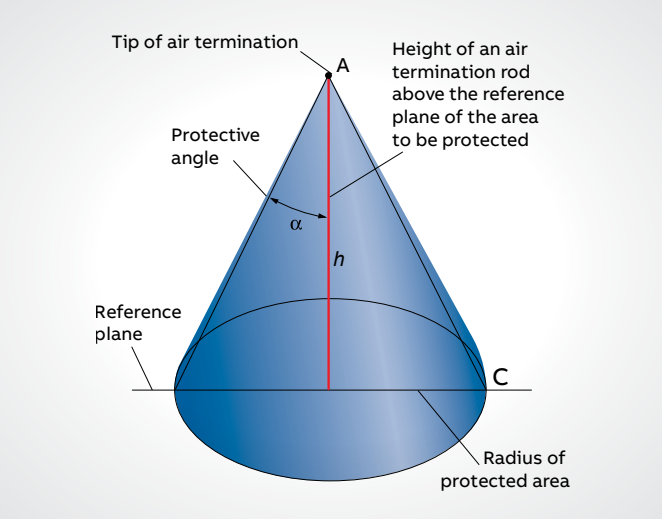

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01 Application of the rolling sphere method
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02 The protective angle method for a single air rod

The rolling sphere method
The rolling sphere method is a simple means of identifying areas of a structure that need protection, taking into account the possibility of side strikes to the structure. The basic concept of applying the rolling sphere to a structure is illustrated above.

The rolling sphere method was used in BS 6651, the only difference being that in IEC/BS EN 62305 there are different radii of the rolling sphere that correspond to the relevant class of LPS (see Table 4).This method is suitable for defining zones of protection for all types of structures, particularly those of complex geometry.

The protective angle method
The protective angle method is a mathematical simplification of the rolling sphere method. The protective angle (α) is the angle created between the tip (A) of the vertical rod and a line projected down to the surface on which the rod sits (see above).

The protective angle afforded by an air rod is clearly a three dimensional concept whereby the rod is assigned a cone of protection by sweeping the line AC at the angle of protection a full 360° around the air rod.

The protective angle differs with varying height of the air rod and class of LPS. The protective angle afforded by an air rod is determined from Table 2 of IEC/BS EN 62305-3.

Varying the protection angle is a change to the simple 45° zone of protection afforded in most cases in BS 6651. Furthermore the new standard uses the height of the air termination system above the reference plane, whether that be ground or roof level.

The protective angle method is better suited for simple shaped buildings. However this method is only valid up to a height equal to the rolling sphere radius of the appropriate LPL.

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Table 4: Max. values of rolling sphere radius corresponding to the Class of LPS

Class of LPS	Rolling sphere radius (m)
I	20
II	30
III	45
IV	60

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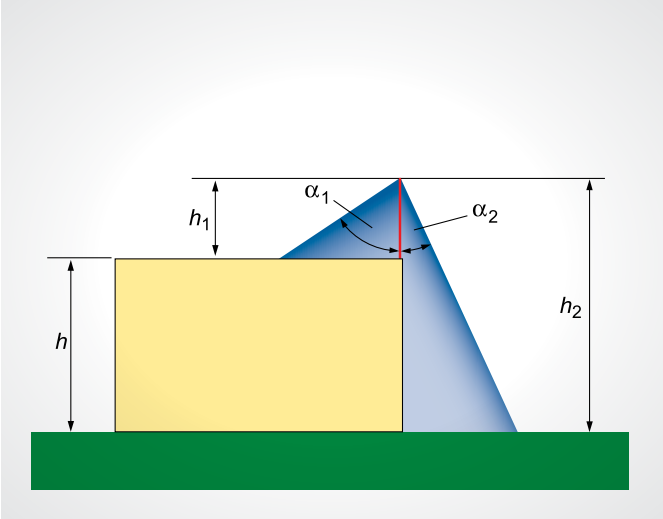
Table 5: Max. values of mesh size corresponding to the Class of LPS

Class of LPS	Mesh size (m)
I	5 x 5
II	10 x 10
III	15 x 15
IV	20 x 20



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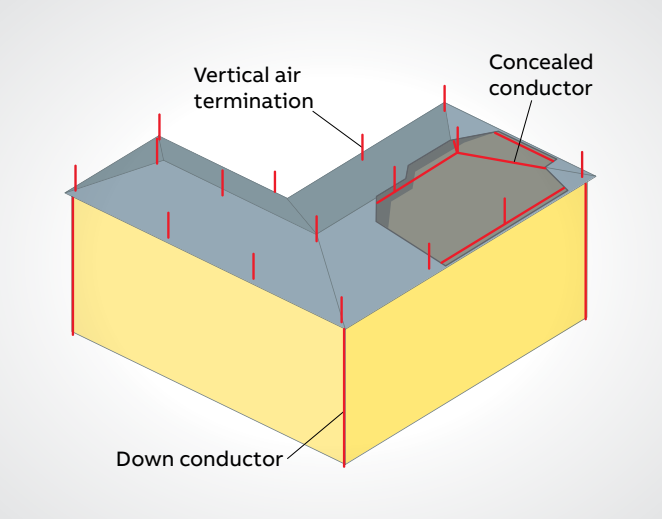

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03 Effect of the height of the reference plane on the protection angle
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04 Concealed air termination network
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05 Determination of the protective angle (IEC/BS EN 62305-3 Table 2)

The mesh method
IEC/BS EN 62305 lists four different air termination mesh sizes that are defined and correspond to the relevant class of LPS.

This method is suitable where plain surfaces require protection if the following conditions are met:

- Air termination conductors must be positioned at roof edges, on roof overhangs and on the ridges of roof with a pitch in excess of 1 in 10 (5.7°)
- No metal installation protrudes above the air termination system

Modern research on lightning inflicted damage has shown that the edges and corners of roofs are most susceptible to damage. So on all structures particularly with flat roofs, perimeter conductors should be installed as close to the outer edges of the roof as is practicable.

The IEC/BS EN 62305 Standard permits the use of conductors (whether they be fortuitous metalwork or dedicated LP conductors) under the roof. Vertical air rods (finials) or strike plates should be mounted above the roof and connected to the conductor system beneath.

The air rods should be spaced not more than 10 m apart and if strike plates are used as an alternative, these should be strategically placed over the roof area not more than 5 m apart.

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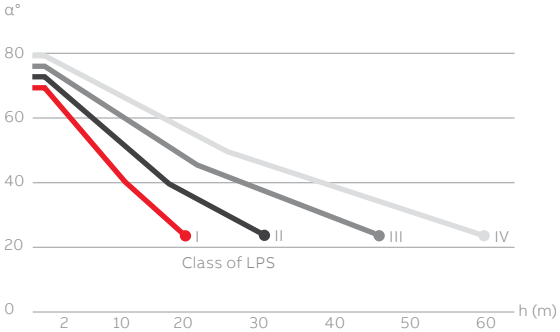

Note 1: Not applicable beyond the values marked with ●
Only rolling sphere and mesh methods apply in these cases
Note 2: *h* is the height of air-termination above the reference plane of the area to be protected
Note 3: The angle will not change for values of h below 2m

Technical reference
IEC/BS EN 62305-4 - Electrical & electronic systems within structures

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01 Motors create switching events

Electronic systems now pervade almost every aspect of our lives, from the work environment, through to filling the car with petrol and even shopping at the local supermarket. As a society, we are now heavily reliant on the continuous and efficient running of such systems.

The use of computers, electronic process controls and telecommunications has exploded during the last two decades. Not only are there more systems in existence, the physical size of the electronics involved has reduced considerably (smaller size means less energy required to damage circuits).

IEC/BS EN 62305 accepts that we now live in the electronic age, making LEMP (Lightning Electromagnetic Impulse) protection for electronic and electrical systems integral to the standard through part 4. LEMP is the term given to the overall electromagnetic effects of lightning, including conducted surges (transient overvoltages and currents) and radiated electromagnetic field effects.

LEMP damage is so prevalent such that it is identified as one of the specific types (D3) to be protected against and that LEMP damage can occur from ALL strike points to the structure or connected services - direct or indirect.

For further reference to the types of damage caused by lightning see Table 1 on page 145. This extended approach also takes into account the danger of fire or explosion associated with services connected to the structure, e.g. power, telecoms and other metallic lines.

Lightning is not the only threat
Transient overvoltages caused by electrical switching events are very common and can be a source of considerable interference. Current flowing through a conductor creates a magnetic field in which energy is stored. When the current is interrupted or switched off, the energy in the magnetic field is suddenly released. In an attempt to dissipate itself it becomes a high voltage transient.

The more stored energy, the larger the resulting transient. Higher currents and longer lengths of conductor both contribute to more energy stored and also released! This is why inductive loads such as motors, transformers and electrical drives are all common causes of switching transients.

Significance of IEC/BS EN 62305-4
Previously transient overvoltage or surge protection was included as an advisory annex in the BS 6651 standard, with a separate risk assessment.

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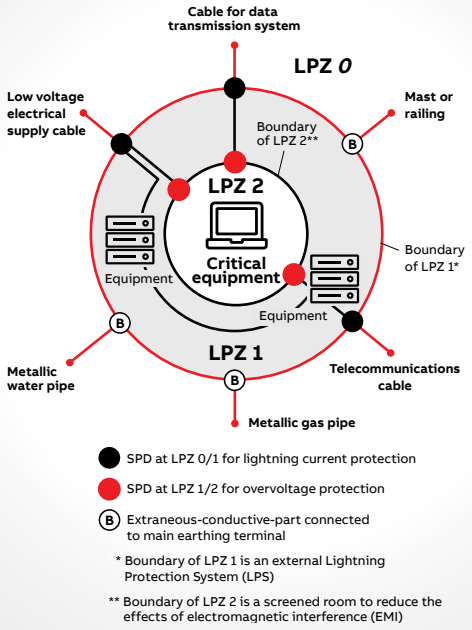

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02 Basic LPZ concept - IEC/BS EN 62305-4

As a result protection was often fitted after equipment damage was suffered, often through obligation to insurance companies. However, the single risk assessment in IEC/BS EN 62305 dictates whether structural and/or LEMP protection is required hence structural lightning protection cannot now be considered in isolation from transient overvoltage protection - known as Surge Protective Devices (SPDs) within this new standard. This in itself is a significant deviation from that of BS 6651.

Indeed, as per IEC/BS EN 62305-3, an LPS system can no longer be fitted without lightning current or equipotential bonding SPDs to incoming metallic services that have 'live cores' such as power and telecoms cables which cannot be directly bonded to earth. Such SPDs are required to protect against the risk of loss of human life (including permanent injury) by preventing dangerous sparking that could present fire or electric shock hazards.

Lightning current or equipotential bonding SPDs are also used on overhead service lines feeding the structure that are at risk from a direct strike. However, the use of these SPDs alone "provides no effective protection against failure of sensitive electrical or electronic systems", to quote IEC/BS EN 62305 part 4, which is specifically dedicated to the protection of electrical and electronic systems within structures.

Lightning current SPDs form one part of a coordinated set of SPDs that include overvoltage SPDs - which are needed in total to effectively protect sensitive electrical and electronic systems from both lightning and switching transients.

Lightning Protection Zones (LPZs)
Whilst BS 6651 recognized a concept of zoning in Annex C, IEC/BS EN 62305-4 defines the concept of Lightning Protection Zones (LPZs). The Figure above illustrates the basic LPZ concept defined by protection measures against LEMP as detailed within part 4.

Within a structure a series of LPZs are created to have, or identified as already having, successively less exposure to the effects of lightning.

Successive zones use a combination of bonding, shielding and coordinated SPDs to achieve a significant reduction in LEMP severity, from conducted surge currents and transient overvoltages, as well as radiated magnetic field effects. Designers coordinate these levels so that the more sensitive equipment is sited within the more protected zones.

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The LPZs can be split into two categories - 1 external zone (LPZ 0) and usually 2 internal zones (LPZ 1, 2) although further zones can be introduced for a further reduction of the electromagnetic field and lightning current if required.

External zones
LPZ 0 is the area subject to direct lightning strokes and therefore may have to carry up to the full lightning current. This is typically the roof area of a structure. The full electromagnetic field occurs here. It also covers the area not subject to direct lightning strokes and typically includes the sidewalls of a structure. However the full electromagnetic field still occurs here and conducted partial lightning currents and switching surges can occur here.

Internal zones
LPZ 1 is the internal area that is subject to partial lightning currents. The conducted lightning currents and/or switching surges are reduced compared with the external zones LPZ 0. This is typically the area where services enter the structure or where the main power switchboard is located.

LPZ 2 is an internal area that is further located inside the structure where the remnants of lightning impulse currents and/or switching surges are reduced compared with LPZ 1.
This is typically a screened room or, for mains power, at the sub-distribution board area.

Protection levels within a zone must be coordinated with the immunity characteristics of the equipment to be protected, i.e. the more sensitive the equipment, the more protected the zone required.

The existing fabric and layout of a building may make readily apparent zones, or LPZ techniques may have to be applied to create the required zones.

Technical reference

IEC/BS EN 62305-4 - Electrical & electronic systems within structures

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01 Furse ESP mains power SPDs

Surge Protection Measures (SPM)
Some areas of a structure, such as a screened room, are naturally better protected from lightning than others and it is possible to extend the more protected zones by careful design of the LPS, earth bonding of metallic services such as water and gas, and cabling techniques. However it is the correct installation of coordinated Surge Protective Devices (SPDs) that protect equipment from damage as well as ensuring continuity of its operation - critical for eliminating downtime. These measures in total are referred to as Surge Protection Measures (SPM) (formerly LEMP Protection Measures System (LPMS)).

When applying bonding, shielding and SPDs, technical excellence must be balanced with economic necessity. For new builds, bonding and screening measures can be integrally designed to form part of the complete SPM. However, for an existing structure, retrofitting a set of coordinated SPDs is likely to be the easiest and most cost-effective solution.

Coordinated SPDs
IEC/BS EN 62305-4 emphasizes the use of coordinated SPDs for the protection of equipment within its environment. This simply means a series of SPDs whose locations and LEMP handling attributes are coordinated in such a way as to protect the equipment, by reducing the LEMP effects to a safe level. So there may be a heavy duty lightning current SPD at the service entrance to handle the majority of the surge energy (partial lightning current from an LPS and/or overhead lines) with the respective transient overvoltage controlled to safe levels by coordinated plus downstream overvoltage SPDs to protect terminal equipment including potential damage by switching sources, e.g. large inductive motors. Appropriate SPDs should be fitted wherever services cross from one LPZ to another.

Coordinated SPDs have to effectively operate together as a cascaded system to protect equipment in their environment. For example the lightning current SPD at the service entrance should handle the majority of surge energy, sufficiently relieving the downstream overvoltage SPDs to control the overvoltage.

Poor coordination could mean that the overvoltage SPDs are subject to too much surge energy putting both itself and potentially equipment at risk from damage.

Furthermore, voltage protection levels or let-through voltages of installed SPDs must be coordinated with the insulating withstand voltage of the parts of the installation and the immunity withstand voltage of electronic equipment.

Enhanced SPDs

Whilst outright damage to equipment is not desirable, the need to minimise downtime as a result of loss of operation or malfunction of equipment can also be critical. This is particularly important for industries that serve the public, i.e. hospitals, financial institutions, manufacturing plants or commercial businesses, where the inability to provide a service due to the loss of operation of equipment would result in significant health and safety and/or financial consequences.

Standard SPDs may only protect against common mode surges (between live conductors and earth), providing effective protection against outright damage but not against downtime due to system disruption.

BS EN 62305 therefore considers the use of enhanced SPDs (SPD*) that further reduce the risk of damage and malfunction to critical equipment where continuous operation is required. Installers will therefore need to be much more aware of the application and installation requirements of SPDs than perhaps they may have been previously.

Superior or enhanced SPDs provide lower (better) let-through voltage protection against surges in both common mode and differential mode (between live conductors) and therefore also provide additional protection over bonding and shielding measures.

Such enhanced SPDs can even offer up to mains Type 1+2+3 or data/telecom Test Cat D+C+B protection within one unit. As terminal equipment, e.g. computers, tends to be more vulnerable to differential mode surges, this additional protection can be a vital consideration.

Furthermore, the capacity to protect against common and differential mode surges permits equipment to remain in continued operation during surge activity - offering considerable benefit to commercial, industrial and public service organisations alike.

All Furse SPDs offer enhanced SPD performance with industry leading low let-through voltages (voltage protection level, U_p), as this is the best choice to achieve cost-effective, maintenance-free repeated protection in addition to preventing costly system downtime. Low let-through voltage protection in all common and differential modes means fewer units are required to provide protection, which saves on unit and installation costs, as well as installation time.

Conclusion

Lightning poses a clear threat to a structure but a growing threat to the systems within the structure due to the increased use and reliance of electrical and electronic equipment. The IEC/BS EN 62305 series of standards clearly acknowledge this. Structural lightning protection can no longer be in isolation from transient overvoltage or surge protection of equipment. The use of enhanced SPDs provides a practical cost-effective means of protection allowing continuous operation of critical systems during LEMP activity.

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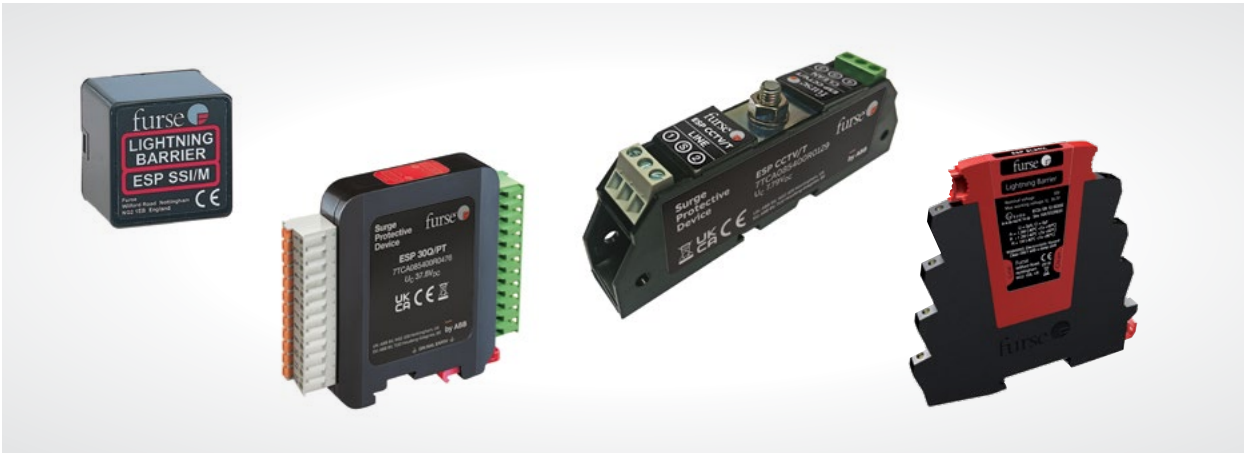

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02 Furse ESP SSI and data line SPDs

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