

# Electronic systems protection

## Introduction

### 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  $\mu$ s 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  $\mu$ s 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  $\mu$ s 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  $\mu$ s voltage test combined with an 8/20  $\mu$ s 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  $\mu$ s for the mains Class III test and up to 4 kV 1.2/50  $\mu$ s for signal/telecom Test Category C.

With an impedance of 2  $\Omega$ , 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  $\mu$ s for the mains Class III test and up to 2 kA 8/20  $\mu$ s 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 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:

**LPZ**  
**0 → 3**

**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**  
**1 + 2 + 3**

**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  $\mu$ s current waveform), II (8/20  $\mu$ s current waveform) or III (combined 8/20  $\mu$ s current and 1.2/50  $\mu$ s voltage waveform) from the IEC/ 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 CAT**  
**D + C + B**

**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  $\mu$ s current waveform. Test Category C is a fast rate of rise test using the 1.2/50  $\mu$ s voltage waveform combined with 8/20  $\mu$ s current waveform. Test Category B is a slow rate of rise test using the 10/700  $\mu$ s 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**  
Equipotential  
Bonding

**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**  
Bonding +  
Equipment  
Protection

**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 Mode mains 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.

**e**  
**ENHANCED**  
Low let-through  
voltage

**Enhanced SPDs** (SPD\* within IEC/BS EN series) have lower (better) let-through voltage or protection levels ( $U_p$ ) 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  $U_p$  of no more than 1600 V whilst Type 2 and Type 3 mains SPDs should have a protection level  $U_p$  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  $U_p$  no more than twice the peak operating voltage of the protected system.

# Electronic systems protection

## Simplified product selection

### 3-WAY + N-E FAULT STATUS INDICATION

**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 LED DISPLAY

**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

**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 4 A

**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 1 Ω

**Low In-line Resistance** states the resistance value in Ohms ( $\Omega$ ) 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.

REPLACEABLE  
PROTECTION  
MODULE

**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

**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

**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  $\Omega$  system) should always exceed the protected system's bandwidth.

BX  
IP66

**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.

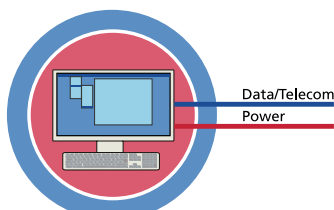
Unboxed SPDs should be installed within distribution panels/cabinets or within external enclosures to the required IP rating (such as the Furse weatherproof WBX enclosure range).

ULTRA SLIM  
7 mm  
WIDTH

**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.

ATEX/IEC  
APPROVED

**ATEX/IECex Approved** indicates that this SPD has undergone the relevant testing and approval process defined by ATEX/IECex, and has proven suitable for use in the hazardous environment as defined on the SPD datasheet.



**WARNING** Equipment is **ONLY** protected if all incoming lines have protection fitted





# Electronic systems protection

## Product selection guide

### Product selection guide - Electronic systems protection

No.	Type	Section / Page No.
1.	Mains wire-in protectors	11/4
2.	Mains wire-in protectors	11/8, 11/16
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5.	PBX telephone/ISDN line protection	13/1
6.	Plug-in telephone line protection, or Wire-in telephone line protection	13/14 12/4, 12/10
7.	CCTV video protectors	14/14
8.	Computer network protector	13/8
9.	RF signal protector	14/16
10.	Mains wire-in protector	11/8, 11/16
11.	Plug-in mains protector	11/24
12.	Protectors for low current mains power supplies	11/22
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13.	Mains wire-in protectors	11/14
14.	Mains wire-in protectors	11/14
	Computer network protector	13/8
	PBX telephone/ISDN line protection	13/6

We've described in the ESP introduction how 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.

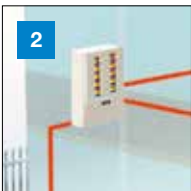
### Protect incoming and outgoing electrical services

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

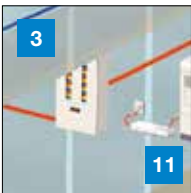


#### Incoming mains power supplies

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

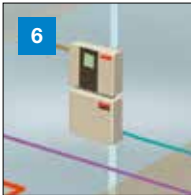
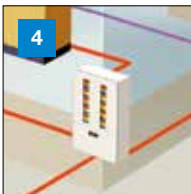


If, as in this example, there are any other power supplies entering the building install protection on these near where they enter the building.



#### 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).



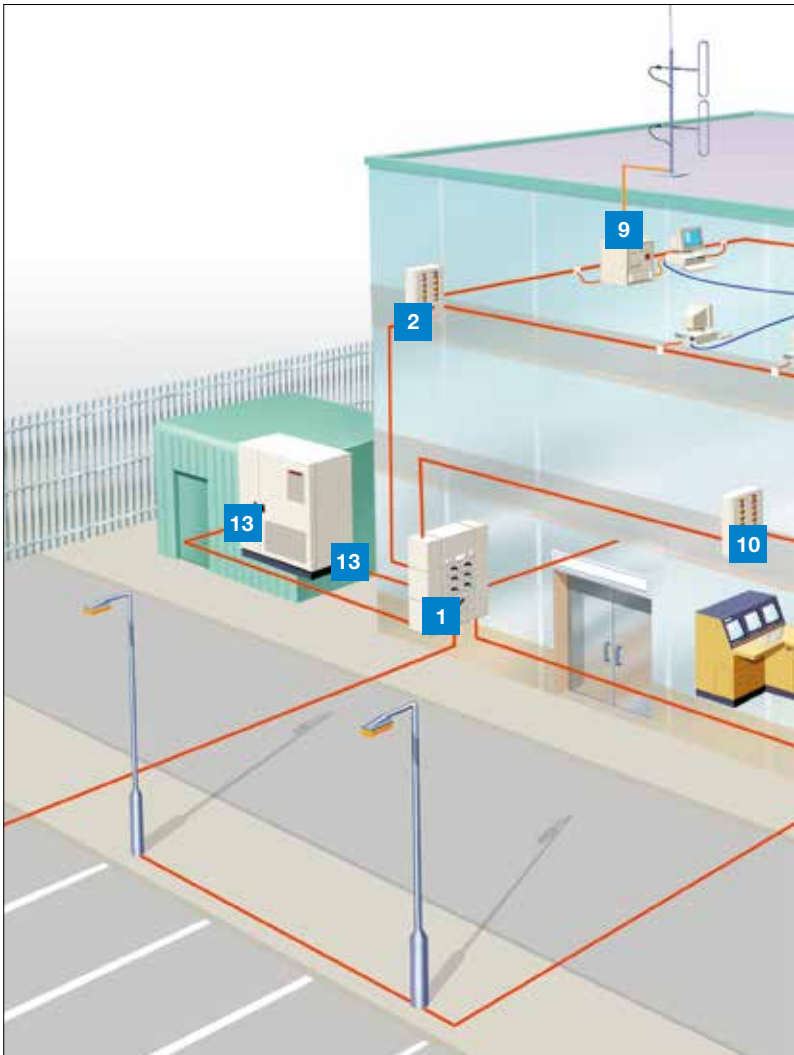
Install protection on outgoing supplies to site services, such as CCTV systems and site lighting. Protect all incoming/outgoing data communication, signal and telephone lines (unless fibre optic).

#### 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.

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



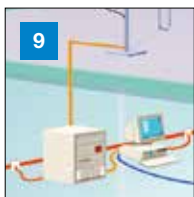


### Data & signal lines

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

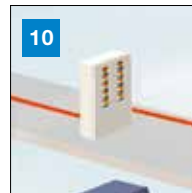


A protector is installed at the network hub to protect it from transients on the between building data link.

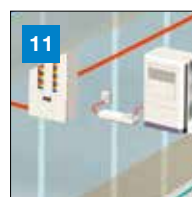


Equipment such as our RF receiver, with antenna (or satellite) links will also need protecting.

## Protect the power supply locally to important equipment



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



### CCTV cameras

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

## Protect electronic equipment outside the building

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



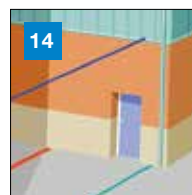
### CCTV cameras

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



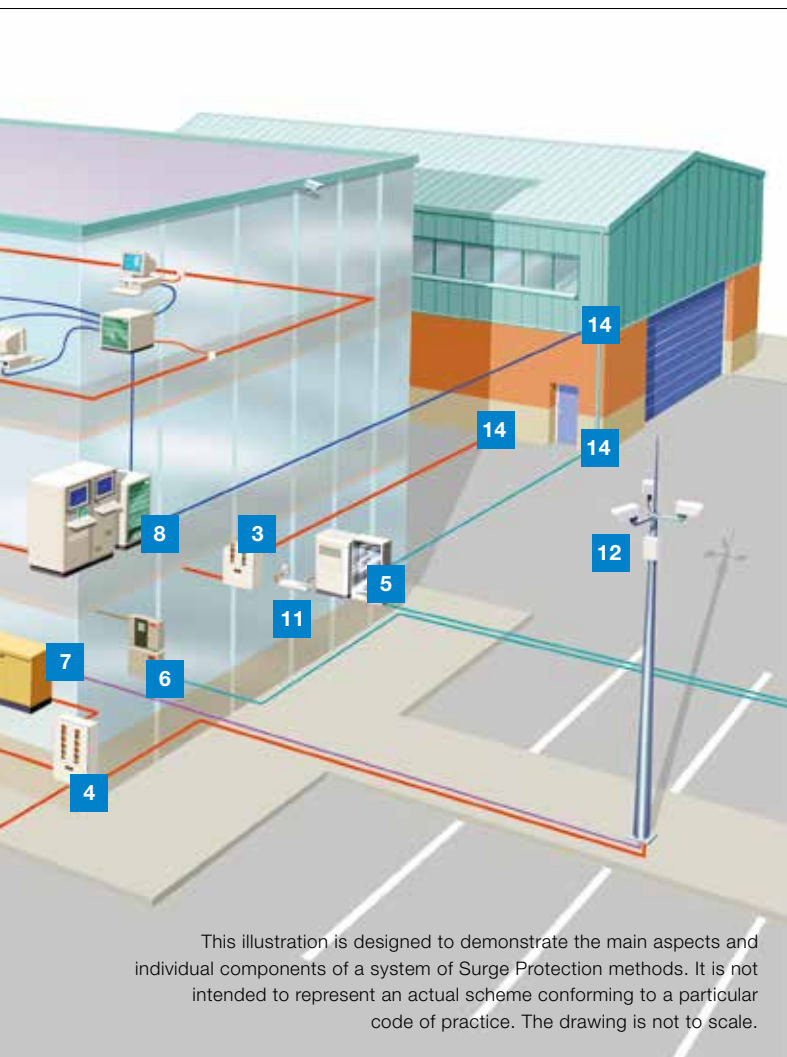
### External buildings

If the UPS is housed in a separate building with a separate earth, incoming and outgoing supplies will need to be protected. This is because most modern UPS systems contain electronics that make them vulnerable to being disabled by transient overvoltages. To prevent transient overvoltage damage to the UPS it must have a protector installed on both its input and output (outgoing the building). A protector will also need to be installed on the power supply into the main building (2).

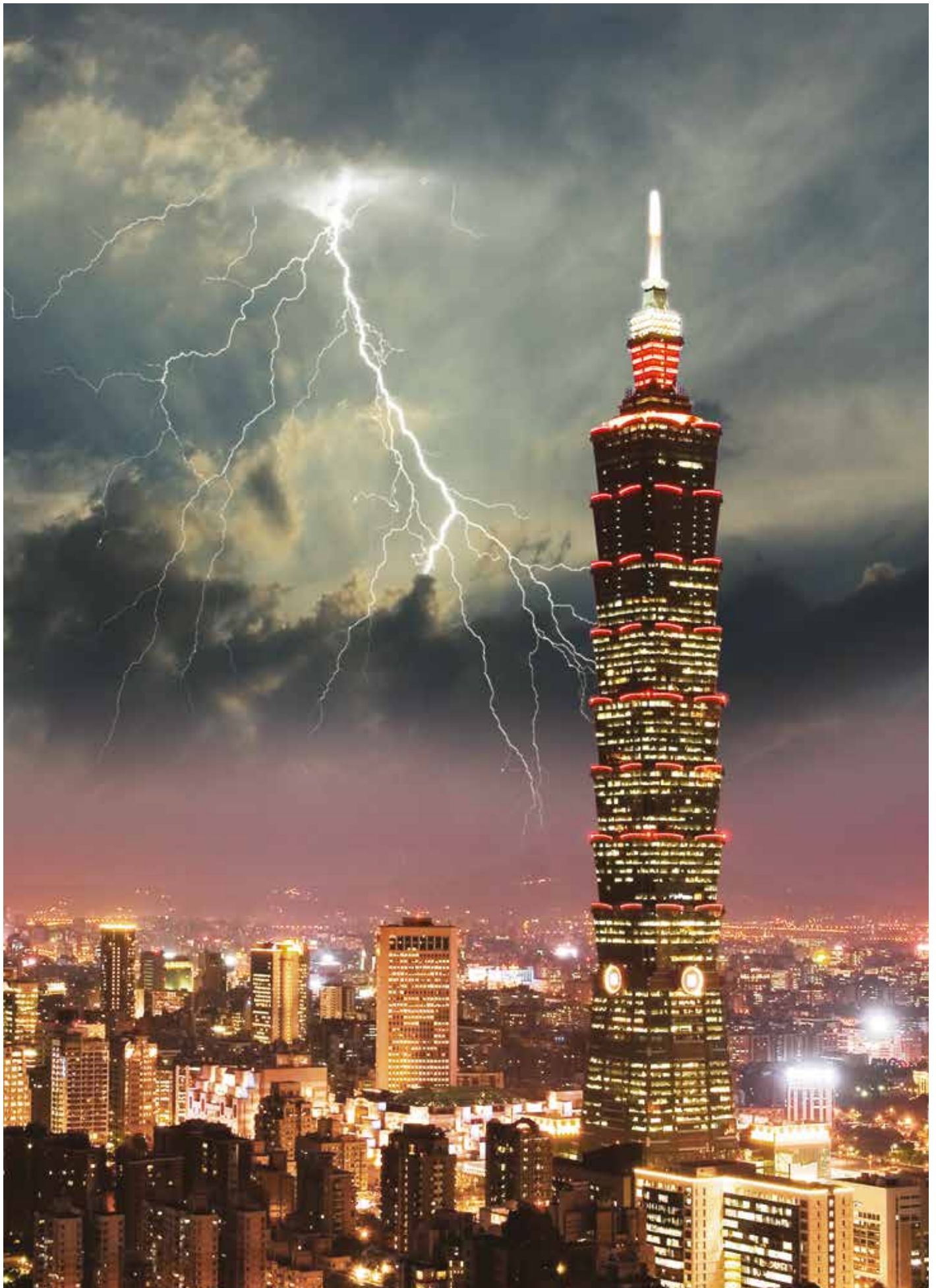


### Data communication/telephone lines

Protection is also installed on mains power, data communication and telephone lines entering the neighbouring building. Additional protection (not shown) may be required within this building (whether it's a computer-controlled warehouse or automated manufacturing operation with PLCs, drives and computer controls).







# Electronic systems protection

## Mains power protection

Mains power protection	
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ESP D1 Series (Single phase)	11/8
ESP D1 Series (Three phase)	11/10
ESP M2/M4 Series	11/12
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ESP M1R, M2R & M4R Series	11/16
ESP DC Series	11/18
ESP D/DS 10A & 32A Series (Single phase)	11/20
ESP 5A/BX & 16A/BX Series	11/22
ESP MC Series	11/24





# Mains power protection

## Product selector - Service entrance to terminal equipment

		Installation Locations		
Sturcture configuration - typical		Service entrance - after meter Main Distribution Board (MDB)	Sub Distribution Board (SDB) - located > 10m from MDB	Critical terminal equipment - located > 10 m from SDB
No external lightning protection system LPS fitted, 3 Phase 415V TN-S or TN-C-S mains supply - underground supply feed 		 <p><b>ESP 415 D1 Series</b> or <b>ESP 415 M1 Series</b>            For 3 Phase 415V supplies            See pages 11/10 and 11/14</p>	 <p><b>ESP 415 D1 Series</b>            For 3 Phase 415V supplies.            See page 11/10.</p>	 <p><b>ESP MC Series</b>            Hospital/Laboratory/Server            equipment. See page 11/26.</p>
No external lightning protection system LPS fitted, 3 Phase 415V TN-S or TN-C-S mains supply - exposed overhead supply feed 		 <p><b>ESP 415/III/TNS Series</b> or where electronics            are located near MDB before SDB use  <b>ESP 415 M2 Series</b>            See pages 11/6 and 11/12</p>	 <p><b>ESP 415 M1 Series</b>            For 3 Phase 415V supplies.            See page 11/14.</p>	 <p><b>ESP MC/TN/RJ11 Series</b>            Fax machines/Modems            See page 11/26.</p>
External lightning protection system LPS fitted, multiple connected metallic services (gas/water/ data/telecom) 3 Phase 415V TN-S or TN-C-S mains supply 		 <p><b>ESP 415 D1 Series</b> or For 3 Phase 415V            supplies <b>ESP 415 M1 Series</b>            See pages 11/10 and 11/14</p>	 <p><b>ESP 240 D1 Series</b>            For single phase 240V            supplies. See page 11/14.</p>	 <p><b>ESP MC/Cat-5e Series</b>            Computer network hubs            See page 11/26.</p>
External lightning protection system LPS fitted, metallic gas/water/ data/telecom services -unknown 3 Phase 415V TN-S or TN-C-S mains supply 		 <p><b>ESP 415/I/TNS Series</b>            for LPS to LPL level I and II  <b>ESP 415/III/TNS Series</b>            for LPS to LPL level III            and IV or where electronics            are located near MDB            before SDB use  <b>ESP 415 M2 Series</b> for            LPS to LPL level III &amp; IV            are located near MDB            before SDB  <b>ESP 415 M4 Series</b> for            LPS to LPL level I &amp; II are            located near MDB            See pages 11/4 and 11/12</p>	 <p><b>ESP 240 M1 Series</b>            For single phase 240V            supplies. See page 11/14.</p>	
Mains protectors for specific sytems				
Fire/intruder alarm panels and CCTV systems		Photovoltaic (solar) panels		
 <p><b>ESP In line mains</b> up to 32 Amps.            See pages 11/22 &amp; 11/24            Fire/Intruder alarm panels            See page 11/20</p>		 <p><b>ESP PV Series</b>            Photovoltaic            (solar) panels            See page 14/8.</p>		
		 <p><b>WARNING</b> Equipment is <b>ONLY</b>            protected if all incoming lines            have protection fitted</p>		



# Mains power protection

## ESP 240/XXX Series



Combined Type 1 and 2 tested protector (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
- Compact, space saving design
- The varistor based design eliminates the high follow current ( $I_f$ ) 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 single phase mains supplies and power distribution systems for protection against partial direct or indirect lightning strikes
- ESP 240/I/XXX versions for use with Class I or II LPS
- ESP 240/III/XXX versions for use with Class III or IV LPS; or exposed overhead single phase power lines where no LPS is fitted
- ESP 240/X/TNS versions also cover TN-C-S earthing systems

### Installation

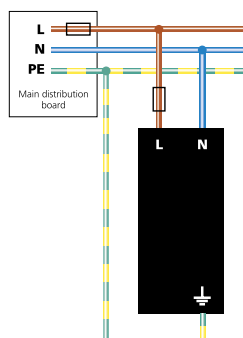
Protector to be installed in the main distribution board with connecting leads of minimal length. The protector should be fused and is suitable for attachment to a 35 mm top hat DIN rail. The diagrams below illustrate how to wire the appropriate ESP protector according to your chosen electrical system.

### Accessories

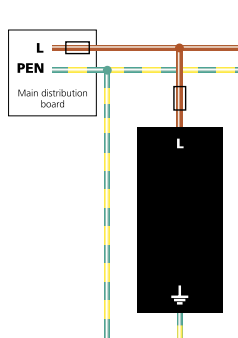
Weatherproof enclosure:  
**WBX D4**

Full product range order codes can be found on pages 17/8-17/9

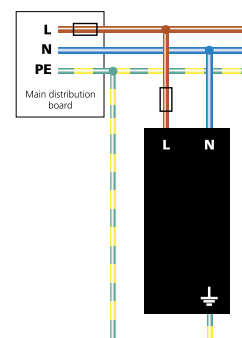
TN-S earthing system



TN-C earthing system



TT earthing system



**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.

# Mains power protection

## ESP 240/XXX Series

### ESP 240/XXX Series - Technical specification

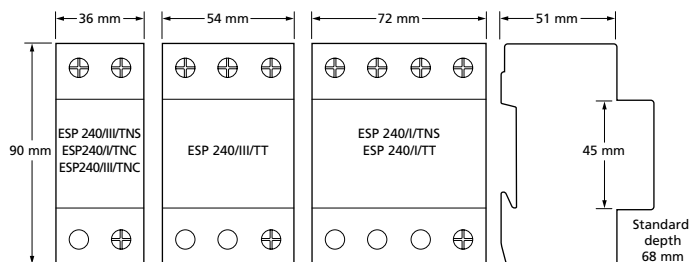
Electrical specification	ESP 240/I/TNS	ESP 240/III/TNS	ESP 240/I/TNC	ESP 240/III/TNC	ESP 240/I/TT	ESP 240/III/TT
<b>ABB order code</b>	7TCA085460R0019	7TCA085460R0022	7TCA085460R0018	7TCA085460R0021	7TCA085460R0020	7TCA085460R0023
Nominal voltage - Phase-Neutral $U_0$ (RMS)	240 V					
Maximum voltage - Phase-Neutral $U_c$ (RMS/DC)	320 V/420 V					
Temporary Overvoltage TOV $U_T^{(1)}$	350 V					
Short circuit withstand capability	25 kA/50 Hz					
Frequency range	47-63 Hz					
Max. back-up fuse (see installation instructions)	250 A					
Leakage current (to earth)	≤ 250 A	< 2.5 mA	< 2.5 mA	< 2.5 mA	0	0
Volt free contact:	Screw terminal					
– Current rating	0.5 A					
– Nominal voltage (RMS)	250 V					
Transient specification	ESP 240/I/TNS	ESP 240/III/TNS	ESP 240/I/TNC	ESP 240/III/TNC	ESP 240/I/TT	ESP 240/III/TT
<b>Type 1 (BS EN/EN), Class I (IEC)</b>						
Nominal discharge current 8/20 μs (per mode) $I_n$	25 kA	25 kA	25 kA	25 kA	25 kA/100 kA (N-E)	25 kA/50 kA (N-E)
Let-through voltage $U_p$ at $I_n^{(2)}$	< 1.4 kV	< 1.4 kV	< 1.4 kV	< 1.4 kV	< 1.4 kV	< 1.4 kV
Impulse discharge current 10/350 μs $I_{imp}$ (per mode) <sup>(2)</sup>	50 kA	25 kA	50 kA	25 kA	50 kA/100 kA (N-E)	25 kA/50 kA (N-E)
Let-through voltage $U_p$ at $I_{imp}^{(2)}$	< 1.2 kV	< 1.2 kV	< 1.2 kV	< 1.2 kV	< 1.2 kV	< 1.2 kV
Let-through voltage $U_p$ at 1.2/50 μs (N-E, TT system)	–	–	–	–	< 1.2 kV	< 1.2 kV
<b>Type 2 (BS EN/EN), Class II (IEC)</b>						
Nominal discharge current 8/20 μs (per mode) $I_n$	25 kA	25 kA	25 kA	25 kA	25 kA/100 kA (N-E)	25 kA/50 kA (N-E)
Let-through voltage $U_p$ at $I_n^{(2)}$	< 1.4 kV	< 1.4 kV	< 1.4 kV	< 1.4 kV	< 1.4 kV	< 1.4 kV
Maximum discharge current $I_{max}$ (per mode) <sup>(3)</sup>	100 kA	100 kA	100 kA	100 kA	100 kA/160 kA (N-E)	100 kA/100 kA (N-E)
Mechanical specification	ESP 240/I/TNS	ESP 240/III/TNS	ESP 240/I/TNC	ESP 240/III/TNC	ESP 240/I/TT	ESP 240/III/TT
Temperature range	-40 to +80 °C					
Connection type	Screw terminal - maximum torque 4.5 Nm					
Conductor size (stranded)	25 mm <sup>2</sup>					
Earth connection	Screw terminal - maximum torque 4.5 Nm					
Degree of protection (IEC 60529)	IP20					
Volt free contact	Connect via screw terminal with conductor up to 1.5 mm <sup>2</sup> (stranded) - maximum torque 0.25 Nm					
Case material	FR Polymer UL-94 V-0					
Mounting	Indoor, 35 mm top hat DIN rail					
Weight: – Unit	0.84 kg	0.44 kg	0.44 kg	0.29 kg	0.68 kg	0.44 kg
– Packaged	0.94 kg	0.54 kg	0.54 kg	0.39 kg	0.78 kg	0.54 kg
Dimensions to DIN 43880 - HxDxW <sup>(4)</sup>	90 mm x 68 mm x 72 mm (4TE)	90 mm x 68 mm x 36 mm (2TE)	90 mm x 68 mm x 36 mm (2TE)	90 mm x 68 mm x 36 mm (2TE)	90 mm x 68 mm x 72 mm (4TE)	90 mm x 68 mm x 54 mm (3TE)

<sup>(1)</sup> Temporary Overvoltage rating is for a maximum duration of 5 seconds tested to BS EN/EN/IEC 61643

<sup>(2)</sup> The maximum transient voltage let-through of the protector throughout the test, phase to earth and neutral to earth

<sup>(3)</sup> The electrical system, external to the unit, may constrain the actual current rating achieved in a particular installation

<sup>(4)</sup> The remote signal contact (removable) adds 10 mm to height



# Mains power protection

## ESP 415/XXX Series



**LPZ**  
0→2

**COMMON**  
MODE  
Equipotential  
Bonding

**MAINS**  
TEST  
TYPE  
1 + 2

**E**  
**ENHANCED**  
Low let-through  
voltage

**STATUS**  
INDICATION +  
VOLT-FREE  
CONTACT

Combined Type 1 and 2 tested protector (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
- The varistor based design eliminates the high follow current (if) associated with spark gap based surge protection
- Compact, space saving design
- 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 three phase mains supplies and power distribution systems for protection against partial direct or indirect lightning strikes
- ESP 415/I/XXX versions for use with Class I or II LPS
- ESP 415/III/XXX versions for use with Class III or IV LPS; or exposed overhead three phase power lines where no LPS is fitted
- ESP 415/X/TNS versions also cover TN-C-S earthing systems

### Installation

Protector 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.

### Accessories

Weatherproof enclosures:

#### WBX D4

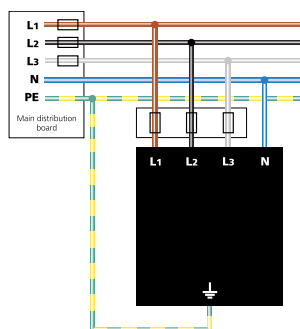
Use with TN-S, TN-C versions and ESP 415/III/TT

#### WBX D8

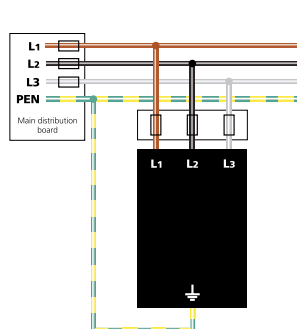
Use with ESP 415/I/TT

**Full product range order codes can be found on pages 17/8-17/9**

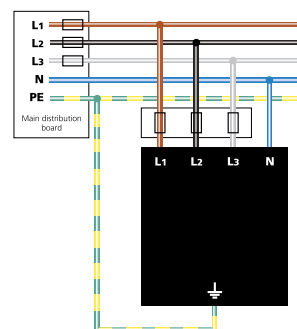
TN-S earthing system



TN-C earthing system



TT earthing system



**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.

# Mains power protection

## ESP 415/XXX Series

### ESP 415/XXX Series - Technical specification

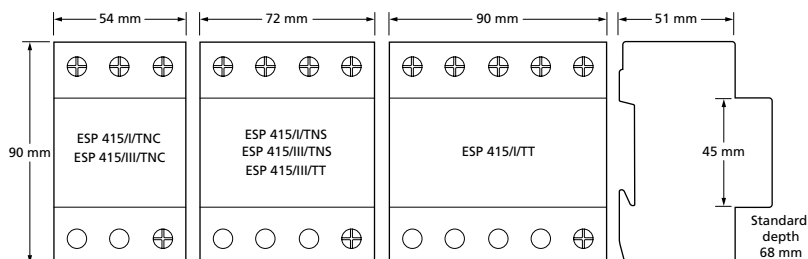
Electrical specification	ESP 415/I/TNS	ESP 415/III/TNS	ESP 415/I/TNC	ESP 415/III/TNC	ESP 415/I/TT	ESP 415/III/TT
<b>ABB order code</b>	7TCA085460R0101	7TCA085460R0103	7TCA085460R0024	7TCA085460R0025	7TCA085460R0102	7TCA085460R0026
Nominal voltage - Phase-Neutral $U_0$ (RMS)	240 V					
Maximum voltage - Phase-Neutral $U_c$ (RMS/DC)	320 V/420 V					
Temporary Overvoltage TOV $U_T^{(1)}$	350 V					
Short circuit withstand capability	25 kA/50 Hz					
Frequency range	47-63 Hz					
Max. back-up fuse (see installation instructions)	250 A					
Leakage current (to earth)	≤ 250 A	< 2.5 mA	< 2.5 mA	< 2.5 mA	0	0
Volt free contact: <sup>(2)</sup>	Screw terminal					
– Current rating	0.5 A					
– Nominal voltage (RMS)	250 V					
Transient specification	ESP 415/I/TNS	ESP 415/III/TNS	ESP 415/I/TNC	ESP 415/III/TNC	ESP 415/I/TT	ESP 415/III/TT
<b>Type 1 (BS EN/EN), Class I (IEC)</b>						
Nominal discharge current 8/20 μs (per mode) $I_n$	25 kA	20 kA	25 kA	20 kA	25 kA/100 kA (N-E)	20 kA/50 kA (N-E)
Let-through voltage $U_p$ at $I_n^{(2)}$	< 1.4 kV	< 1.5 kV	< 1.4 kV	< 1.5 kV	< 1.4 kV	< 1.5 kV
Impulse discharge current 10/350 μs $I_{imp}$ (per mode) <sup>(3)</sup>	25 kA	12.5 kA	25 kA	12.5 kA	25 kA/100 kA (N-E)	12.5 kA/50 kA (N-E)
Let-through voltage $U_p$ at $I_{imp}^{(2)}$	< 1.3 kV	< 1.2 kV	< 1.3 kV	< 1.2 kV	< 1.3 kV	< 1.2 kV
Let-through voltage $U_p$ at 1.2/50 μs (N-E, TT system)	–	–	–	–	< 1.2 kV	< 1.2 kV
<b>Type 2 (BS EN/EN), Class II (IEC)</b>						
Nominal discharge current 8/20 μs (per mode) $I_n$	25 kA	20 kA	25 kA	20 kA	25 kA/100 kA (N-E)	20 kA/50 kA (N-E)
Let-through voltage $U_p$ at $I_n^{(2)}$	< 1.4 kV	< 1.5 kV	< 1.4 kV	< 1.5 kV	< 1.4 kV	< 1.5 kV
Maximum discharge current $I_{max}$ (per mode) <sup>(3)</sup>	100 kA	50 kA	100 kA	50 kA	100 kA/160 kA (N-E)	50 kA/200 kA (N-E)
Mechanical specification	ESP 415/I/TNS	ESP 415/III/TNS	ESP 415/I/TNC	ESP 415/III/TNC	ESP 415/I/TT	ESP 415/III/TT
Temperature range	-40 to +80 °C					
Connection type	Screw terminal					
Conductor size (stranded)	25 mm <sup>2</sup>					
Earth connection	Screw terminal					
Volt free contact	Connect via screw terminal with conductor up to 1.5 mm <sup>2</sup> (stranded)					
Degree of protection (IEC 60529)	IP20					
Case material	FR Polymer UL-94 V-0					
Mounting	Indoor, 35 mm top hat DIN rail					
Weight: – Unit	0.84 kg	0.59 kg	0.64 kg	0.44 kg	0.9 kg	0.67 kg
– Packaged	0.94 kg	0.69 kg	0.74 kg	0.54 kg	1.0 kg	0.77 kg
Dimensions to DIN 43880 - HxDxW <sup>(4)</sup>	90 mm x 68 mm x 72 mm (4TE)	90 mm x 68 mm x 72 mm (4TE)	90 mm x 68 mm x 54 mm (3TE)	90 mm x 68 mm x 54 mm (3TE)	90 mm x 68 mm x 90 mm (5TE)	90 mm x 68 mm x 72 mm (4TE)

<sup>(1)</sup> Temporary Overvoltage rating is for a maximum duration of 5 seconds tested to BS EN/EN/IEC 61643

<sup>(2)</sup> The maximum transient voltage let-through of the protector throughout the test, phase to earth and neutral to earth

<sup>(3)</sup> The electrical system, external to the unit, may constrain the actual current rating achieved in a particular installation

<sup>(4)</sup> The remote signal contact (removable) adds 10 mm to height



# Mains power protection

## ESP D1 Series (Single phase)



**LPZ**  
**0→3**

**FULL**  
**MODE**  
Bonding +  
Equipment  
Protection

**MAINS**  
**TEST**  
**TYPE**  
**1 + 2 + 3**

**e**  
**ENHANCED**  
Low let-through  
voltage

**ACTIVE**  
**VOLT-FREE**  
**CONTACT**

**3-WAY + N-E**  
**FAULT**  
**STATUS**  
**INDICATION**

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

### 11 Installation

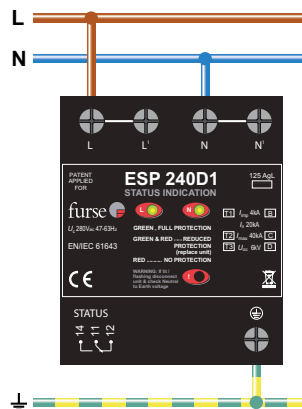
Install in parallel, within the power distribution board or directly (via fuses) on to the supply feeding equipment. Can be installed in series for low current supplies - see installation instructions. At distribution boards, the protector can be installed either on the load side of the incoming isolator,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

### Accessories

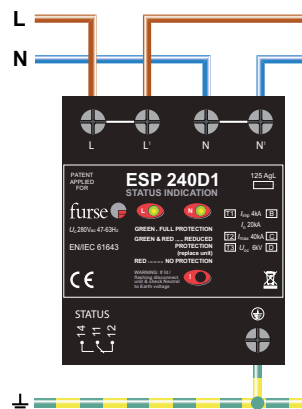
Weatherproof enclosure:  
**WBX D4**

Full product range order codes can be found on pages 17/8-17/9

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)



**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.

# Mains power protection

## ESP D1 Series (Single phase)

### ESP D1 Series (Single phase) - Technical specification

Electrical specification	ESP 120 D1	ESP 240 D1	ESP 277 D1
<b>ABB order code</b>	7TCA085460R0069	7TCA085460R0086	7TCA085460R0096
Nominal voltage - Phase-Neutral $U_0$ (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	350 V	402 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: <sup>(2)</sup>	Screw terminal		
– Current rating	1 A		
– Nominal voltage (RMS)	250 V		
Transient specification	ESP 120 D1	ESP 240 D1	ESP 277 D1
<b>Type 1 (BS EN/EN), Class I (IEC)</b>			
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) <sup>(6)</sup>	4 kA		
Let-through voltage $U_p$ at $i_{imp}$	< 1 kV	< 1.2 kV	< 1.3 kV
Total discharge current 10/350 µs $I_{total}$ (total to earth) <sup>(4,5)</sup>	8 kA		
<b>Type 2 (BS EN/EN), Class II (IEC)</b>			
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) <sup>(4)</sup>	40 kA, 40 kA		
<b>Type 3 (BS EN/EN), Class III (IEC)</b>			
Let-through voltage at $U_{oc}$ of 6 kV 1.2/50 µs and $I_{sc}$ of 3 kA 8/20 µs (per mode) <sup>(3,6)</sup>	400 V	600 V	680 V
Mechanical specification	ESP 120 D1	ESP 240 D1	ESP 277 D1
Temperature range	-40 to +80 °C		
Connection type	Screw terminal - maximum torque 4.5Nm		
Conductor size (stranded)	25 mm <sup>2</sup>		
Earth connection	Screw terminal - maximum torque 4.5Nm		
Volt free contact	Connect via screw terminal with conductor up to 1.5 mm <sup>2</sup> (stranded) - maximum torque 0.25 Nm		
Degree of protection (IEC 60529)	IP20		
Case material	FR Polymer UL-94 V-0		
Weight: – Unit	0.4 kg		
– Packaged	0.5 kg		
Dimensions to DIN 43880 - HxDxW <sup>(7)</sup>	90 mm x 88 mm x 72 mm (4TE)		

<sup>(1)</sup> Temporary Overvoltage rating is for a maximum duration of 5 seconds tested to BS EN/EN/IEC 61643

<sup>(2)</sup> Minimum permissible load is 5 V DC, 10 mA to ensure reliable operation

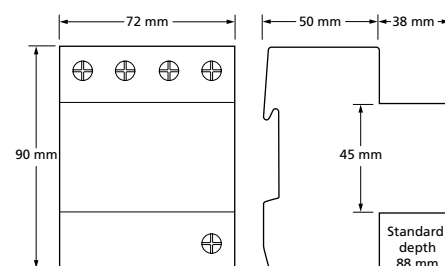
<sup>(3)</sup> The maximum transient voltage let-through of the protector throughout the test (±10%), phase to neutral, phase to earth and neutral to earth

<sup>(4)</sup> Rating is considered as the current capability of the protector for equipotential bonding near the service entrance

<sup>(5)</sup> The electrical system, external to the unit, may constrain the actual current rating achieved in a particular installation

<sup>(6)</sup> 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

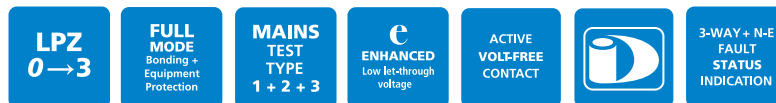
<sup>(7)</sup> The remote signal contact (removable) adds 10 mm to height





# Mains power protection

## ESP D1 Series (Three phase)



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

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### 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 Furze.

### Accessories

Weatherproof enclosure:  
**WBX D4**

#### ESP RLA HD-1

Spare 1 m cable assembly for ESP XXX D1R or ESP XXX D1R/LCD

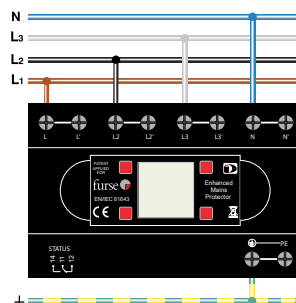
#### ESP RLA HD-2

Spare 2 m cable assembly for ESP XXX D1R or ESP XXX D1R/LCD

#### ESP RLA HD-4

Spare 4 m cable assembly for ESP XXX D1R or ESP XXX D1R/LCD

Full product range order codes can be found on pages 17/8-17/9



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.

# Mains power protection

## ESP D1 Series (Three phase)

### ESP D1 Series (Three phase) - Technical specification

Electrical specification	ESP 208 D1 <sup>(1)</sup>	ESP 415 D1 <sup>(1)</sup>	ESP 480 D1 <sup>(1)</sup>
<b>ABB order code</b>	7TCA085460R0077	7TCA085460R0105	7TCA085460R0133
Nominal voltage - Phase-Neutral $U_0$ (RMS)	120 V	240 V	277 V
Maximum voltage - Phase-Neutral $U_c$ (RMS)	150 V	280 V	350 V
Temporary Overvoltage TOV $U_T$ <sup>(2)</sup>	175 V	350 V	402 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: <sup>(3)</sup>	Screw terminal		
– Current rating	1 A		
– Nominal voltage (RMS)	250 V		
<b>Transient specification</b>	<b>ESP 208 D1</b>	<b>ESP 415 D1</b>	<b>ESP 480 D1</b>
<b>Type 1 (BS EN/EN), Class I (IEC)</b>			
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) <sup>(5)</sup>	4 kA		
Let-through voltage $U_p$ at $I_{imp}$	< 1 kV	< 1.2 kV	< 1.3 kV
Total discharge current 10/350 µs $I_{total}$ (total to earth) <sup>(5,6)</sup>	16 kA	16 kA	16 kA
<b>Type 2 (BS EN/EN), Class II (IEC)</b>			
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) <sup>(5)</sup>	40 kA, 40 kA		
<b>Type 3 (BS EN/EN), Class III (IEC)</b>			
Let-through voltage at $U_{oc}$ of 6 kV 1.2/50 µs and $I_{sc}$ of 3 kA 8/20 µs (per mode) <sup>(4,7)</sup>	400 V	600 V	680 V
<b>Mechanical specification</b>	<b>ESP 120 D1</b>	<b>ESP 240 D1</b>	<b>ESP 277 D1</b>
Temperature range	-40 to +80 °C		
Connection type	Screw terminal - maximum torque 4.5Nm		
Conductor size (stranded)	25 mm <sup>2</sup>		
Earth connection	Screw terminal - maximum torque 4.5Nm		
Volt free contact	Connect via screw terminal with conductor up to 1.5 mm <sup>2</sup> (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: – Unit	0.85 kg		
– Packaged	0.95 kg		
Dimensions to DIN 43880 - HxDxW <sup>(8)</sup>	90 mm x 88 mm x 144 mm (8TE)		

<sup>(1)</sup> 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

<sup>(2)</sup> Temporary Overvoltage rating is for a maximum duration of 5 seconds tested to IEC/BS EN 61463

<sup>(3)</sup> Min. permissible load is 5 V DC, 10 mA to ensure reliable operation

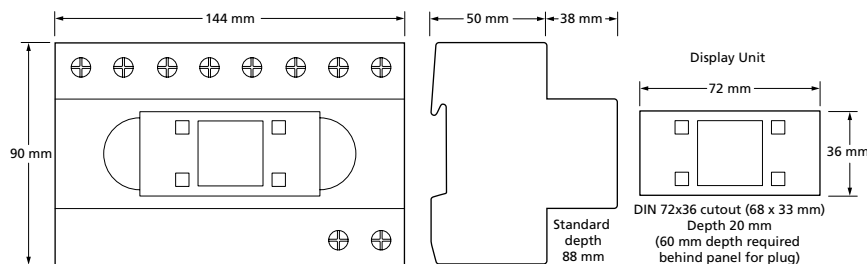
<sup>(4)</sup> The maximum transient voltage let-through of the protector throughout the test ( $\pm 10\%$ ), phase to neutral, phase to earth and neutral to earth

<sup>(5)</sup> The electrical system, external to the unit, may constrain the actual current rating achieved in a particular installation

<sup>(6)</sup> Rating is considered as the current capability of the protector for equipotential bonding near the service entrance

<sup>(7)</sup> 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

<sup>(8)</sup> The remote signal contact (removable) adds 10 mm to height



# Mains power protection

## ESP M2/M4 Series



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**

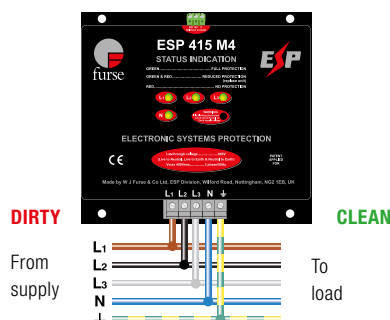
For use with the ESP XXX M2

**WBX M4**

For use with the ESP XXX M4

Full product range order codes can be found on pages 17/8-17/9

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

# Mains power protection

## ESP M2/M4 Series

### ESP M2/M4 Series - Technical specification

Electrical specification	ESP 415 M2	ESP 415 M4	ESP 480 M2	ESP 480 M4
<b>ABB order code</b>	7TCA085460R0119	7TCA085460R0124	7TCA085460R0138	7TCA085460R0140
Nominal voltage - Phase-Neutral $U_0$ (RMS)	240 V	240 V	277 V	277 V
Maximum voltage - Phase-Neutral $U_c$ (RMS)	280 V	280 V	350 V	350 V
Temporary Overvoltage TOV $U_T^{(1)}$	350 V	350 V	402 V	402 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)	< 500 $\mu$ A	< 1000 $\mu$ A	< 500 $\mu$ A	< 1000 $\mu$ A
Indicator circuit current	< 20 mA	< 40 mA	< 20 mA	< 40 mA
Volt free contact: <sup>(2)</sup>	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
<b>Type 1 (BS EN/EN), Class I (IEC)</b>				
Nominal discharge current 8/20 $\mu$ s (per mode) $I_n$	20 kA	25 kA	20 kA	25 kA
Let-through voltage $U_p$ at $I_n^{(3)}$	< 1.3 kV	< 1.4 kV	< 1.4 kV	< 1.5 kV
Impulse discharge current 10/350 $\mu$ s $I_{imp}$ (to earth) <sup>(4)</sup>	12.5 kA	25 kA	12.5 kA	25 kA
Let-through voltage $U_p$ at $I_{imp}^{(2)}$	< 1.2 kV	< 1.3 kV	< 1.4 kV	< 1.5 kV
Total discharge current 10/350 $\mu$ s $I_{total}$ (total to earth) <sup>(4,5)</sup>	50 kA	100 kA	50 kA	100 kA
<b>Type 2 (BS EN/EN), Class II (IEC)</b>				
Nominal discharge current 8/20 $\mu$ s (per mode) $I_n$	20 kA	25 kA	20 kA	25 kA
Let-through voltage $U_p$ at $I_n^{(3)}$	< 1.3 kV	< 1.4 kV	< 1.4 kV	< 1.5 kV
Maximum discharge current $I_{max}$ (L/N-PE, L-N) <sup>(4)</sup>	80 kA, 40 kA	150 kA, 40 kA	80 kA, 40 kA	150 kA, 40 kA
<b>Type 3 (BS EN/EN), Class III (IEC)</b>				
Let-through voltage at $U_{oc}$ of 6 kV 1.2/50 $\mu$ s and $I_{sc}$ of 3 kA 8/20 $\mu$ s (per mode) <sup>(3,6)</sup>	600 V	600 V	680 V	680 V
Mechanical specification	ESP 415 M2	ESP 415 M4	ESP 480 M2	ESP 480 M4
Temperature range	-40 to +80 °C			
Connection type	Screw terminal - maximum torque 2.5 Nm (ESP M2), 5.6 Nm (ESP M4)			
Conductor size (stranded)	25 mm <sup>2</sup>	50 mm <sup>2</sup>	25 mm <sup>2</sup>	50 mm <sup>2</sup>
Earth connection	Screw terminal - maximum torque 2.5 Nm (ESP M2), 5.6 Nm (ESP M4)			
Volt free contact	Connect via screw terminal with conductor up to 2.5 mm <sup>2</sup> (stranded) - maximum torque 0.25 Nm			
Degree of protection (IEC 60529)	IP20			
Case material	Steel			
Weight: – Unit	2.35 kg	3.9 kg	2.35 kg	3.9 kg
– Packaged	2.5 kg	4.2 kg	2.5 kg	4.2 kg
Dimensions	226 mm x 204 mm x 78 mm	226 mm x 204 mm x 125 mm	226 mm x 204 mm x 78 mm	226 mm x 204 mm x 125 mm

<sup>(1)</sup> Temporary Overvoltage rating is for a maximum duration of 5 seconds tested to BS EN/IEC 61643

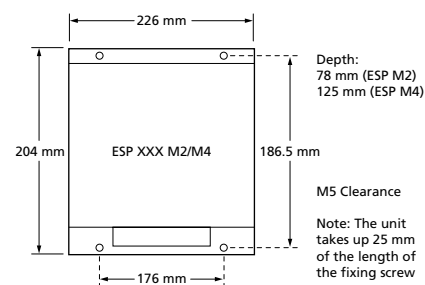
<sup>(2)</sup> Minimum permissible load is 5 V DC, 10 mA to ensure reliable operation

<sup>(3)</sup> The maximum transient voltage let-through of the protector throughout the test ( $\pm 10\%$ ), phase to neutral, phase to earth and neutral to earth

<sup>(4)</sup> The electrical system, external to the unit, may constrain the actual current rating achieved in a particular installation

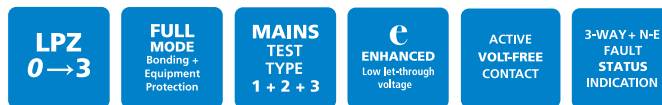
<sup>(5)</sup> Rating is considered as the current capability of the protector for equipotential bonding near the service entrance

<sup>(6)</sup> 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 M1 Series



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.

### 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:

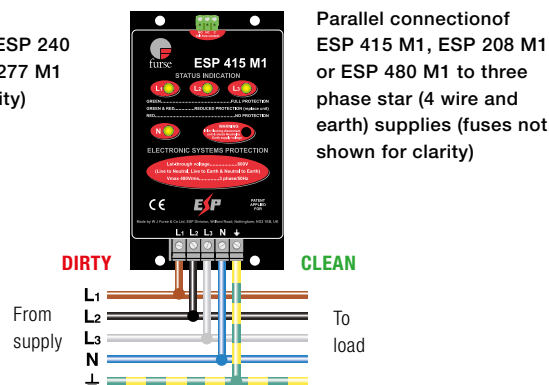
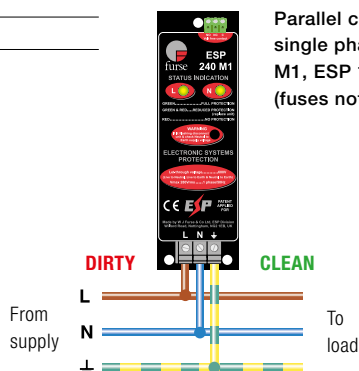
**WBX 3**

Use with single phase protectors

**WBX 4**

Use with three phase protectors

**Full product range order codes can be found on pages 17/8-17/9**



**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.

# Mains power protection

## ESP M1 Series

### 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
<b>ABB order code</b>	7TCA085460R0070	7TCA085460R0089	7TCA085460R0097	7TCA085460R0078	7TCA085460R0112	7TCA085460R0136
Nominal voltage - Phase-Neutral $U_0$ (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
Temporary Overvoltage TOV $U_T^{(1)}$	175 V	175 V	350 V	350 V	402 V	402 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: <sup>(2)</sup>	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
<b>Type 1 (BS EN/EN), Class I (IEC)</b>						
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) <sup>(4)</sup>	4 kA					
Let-through voltage $U_p$ at $I_{imp}$	< 1 kV	< 1 kV	< 1.3 kV	< 1.3 kV	< 1.4 kV	< 1.4 kV
Total discharge current 10/350 µs $I_{total}$ (total to earth) <sup>(4,5)</sup>	8 kA	16 kA	8 kA	16 kA	8 kA	16 kA
<b>Type 2 (BS EN/EN), Class II (IEC)</b>						
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) <sup>(4)</sup>	40 kA, 40 kA					
<b>Type 3 (BS EN/EN), Class III (IEC)</b>						
Let-through voltage at $U_{oc}$ of 6 kV 1.2/50 µs and $I_{sc}$ of 3 kA 8/20 µs (per mode) <sup>(3,6)</sup>	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	-40 to +80 °C					
Connection type	Screw terminal - maximum torque 1.5 Nm					
Conductor size (stranded)	16 mm <sup>2</sup>					
Earth connection	Screw terminal - maximum torque 1.5 Nm					
Volt free contact	Connect via screw terminal with conductor up to 2.5 mm <sup>2</sup> (stranded) - maximum torque 0.25 Nm					
Degree of protection (IEC 60529)	IP20					
Case material	Steel					
Weight: – Unit	0.6 kg	1.0 kg	0.6 kg	1.0 kg	0.6 kg	1.0 kg
– Packaged	0.7 kg	1.1 kg	0.7 kg	1.1 kg	0.7 kg	1.1 kg
Dimensions	See diagrams below					

<sup>(1)</sup> Temporary Overvoltage rating is for a maximum duration of 5 seconds tested to BS EN/IEC 61643

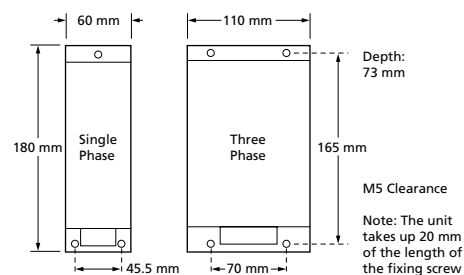
<sup>(2)</sup> Minimum permissible load is 5 V DC, 10 mA to ensure reliable operation

<sup>(3)</sup> The maximum transient voltage let-through of the protector throughout the test ( $\pm 10\%$ ), phase to neutral, phase to earth and neutral to earth

<sup>(4)</sup> The electrical system, external to the unit, may constrain the actual current rating achieved in a particular installation

<sup>(5)</sup> Rating is considered as the current capability of the protector for equipotential bonding near the service entrance

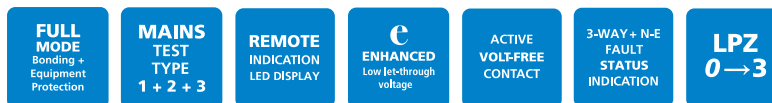
<sup>(6)</sup> Combination wave test within IEC/BS EN 61643, IEEE C62.41-2002 Location Cats C1 & B3, SS 555:2010, AS/NZS 1768-2007, UL 1449 mains wire-in





# Mains power protection

## ESP M1R, M2R & M4R Series



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

### Accessories

#### ESP RLA-1

Spare 1 metre cable assembly

#### ESP RLA-2

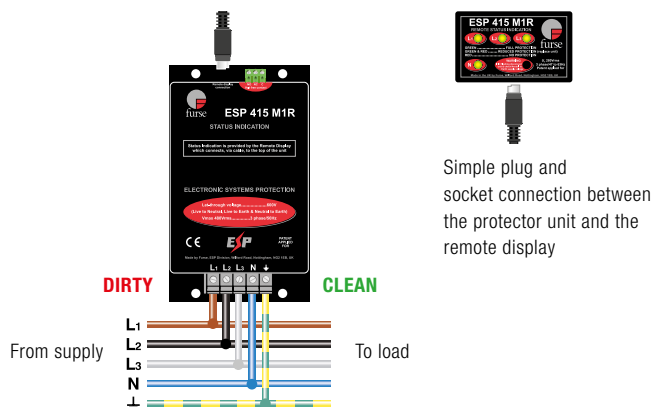
Spare 2 metre cable assembly

#### ESP RLA-4

Spare 4 metre cable assembly

Full product range order codes can be found on pages 17/8-17/9

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



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

# Mains power protection

## ESP M1R, M2R & M4R Series

### 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
<b>ABB order code</b>	7TCA085460R0115	7TCA085460R0137	7TCA085460R0123	7TCA085460R0078	7TCA085460R0126	7TCA085460R0340
Nominal voltage - Phase-Neutral $U_0$ (RMS)	240 V	277 V	240 V	277 V	240 V	277 V
Maximum voltage - Phase-Neutral $U_c$ (RMS)	280 V	350 V	280 V	350 V	280 V	350 V
Temporary Overvoltage TOV $U_T^{(1)}$	350 V	402 V	350 V	402 V	350 V	402 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 $\mu$ A	< 250 $\mu$ A	< 500 $\mu$ A	< 500 $\mu$ A	< 1000 $\mu$ A	< 1000 $\mu$ A
Indicator circuit current	< 10 mA	< 10 mA	< 20 mA	< 20 mA	< 40 mA	< 40 mA
Volt free contact: <sup>(2)</sup>	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
<b>Type 1 (BS EN/EN), Class I (IEC)</b>						
Nominal discharge current 8/20 $\mu$ s (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	< 1.4 kV	< 1.5 kV
Impulse discharge current 10/350 $\mu$ s $I_{imp}$ (to earth) <sup>(4)</sup>	4 kA	4 kA	12.5 kA	12.5 kA	25 kA	25 kA
Let-through voltage $U_p$ at $I_{imp}$ <sup>(3)</sup>	750 V	850 V	< 1.2 kV	< 1.4 kV	< 1.3 kV	< 1.5 kV
Total discharge current 10/350 $\mu$ s $I_{total}$ (total to earth) <sup>(4,5)</sup>	16 kA	16 kA	50 kA	50 kA	100 kA	100 kA
<b>Type 2 (BS EN/EN), Class II (IEC)</b>						
Nominal discharge current 8/20 $\mu$ s (per mode) $I_n$	20 kA	20 kA	20 kA	20 kA	25 kA	25 kA
Let-through voltage $U_p$ at $I_n$ <sup>(3)</sup>	< 1.3 kV	< 1.4 kV	< 1.3 kV	< 1.4 kV	< 1.4 kV	< 1.5 kV
Maximum discharge current $I_{max}$ (L/N-PE, L-N) <sup>(4)</sup>	40 kA, 40 kA	40 kA, 40 kA	80 kA, 40 kA	80 kA, 40 kA	150 kA, 40 kA	150 kA, 40 kA
<b>Type 3 (BS EN/EN), Class III (IEC)</b>						
Let-through voltage at $U_{oc}$ of 6 kV 1.2/50 $\mu$ s and $I_{sc}$ of 3 kA 8/20 $\mu$ s (per mode) <sup>(3,6)</sup>	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	-40 to +80 °C					
Connection type	Screw terminal - maximum torque 1.5 Nm (ESP M1R), 2.5 Nm (ESP M2R), 5.6 Nm (ESP M4R)					
Conductor size (stranded)	16 mm <sup>2</sup>	16 mm <sup>2</sup>	25 mm <sup>2</sup>	25 mm <sup>2</sup>	50 mm <sup>2</sup>	50 mm <sup>2</sup>
Earth connection	Screw terminal - maximum torque 1.5 Nm (ESP M1R), 2.5 Nm (ESP M2R), 5.6 Nm (ESP M4R)					
Volt free contact	Connect via screw terminal with conductor up to 2.5 mm <sup>2</sup> (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: – Unit	1.0 kg	1.0 kg	2.35 kg	2.35 kg	3.9 kg	3.9 kg
– Packaged	1.1 kg	1.1 kg	2.5 kg	2.5 kg	4.2 kg	4.2 kg
Dimensions	See diagrams below					

<sup>(1)</sup> Temporary Overvoltage rating is for a maximum duration of 5 seconds tested to BS EN/EN/IEC 61643

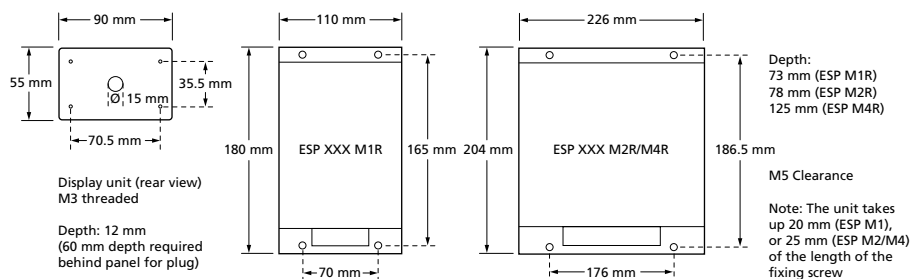
<sup>(2)</sup> Minimum permissible load is 5 V DC, 10 mA to ensure reliable operation. Under fault conditions, the remote display will go blank if the L1 phase loses power or becomes faulty. This is due to the isolation requirements needed for circuitry mounted externally to the main protector unit

<sup>(3)</sup> The maximum transient voltage let-through of the protector throughout the test ( $\pm 10\%$ ), phase to neutral, phase to earth and neutral to earth

<sup>(4)</sup> The electrical system, external to the unit, may constrain the actual current rating achieved in a particular installation

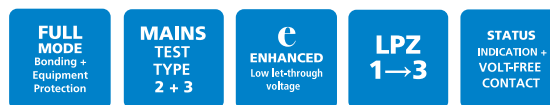
<sup>(5)</sup> Rating is considered as the current capability of the protector for equipotential bonding near the service entrance

<sup>(6)</sup> 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 DC Series



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.

### 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

### Application

Use on DC power distribution systems to protect connected electronic equipment from transient overvoltages on the DC

### 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.

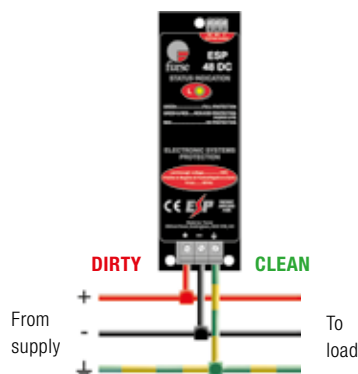
### Accessories

Weatherproof enclosure:

**WBX 3**

Full product range order codes can be found on pages 17/8-17/9

Parallel connection of ESP 48 DC



**NOTE:** For low current applications, the ESP H Series (4 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 1000 Vdc, see our ESP PV Series.

# Mains power protection

## ESP DC Series

### ESP DC Series - Technical specification

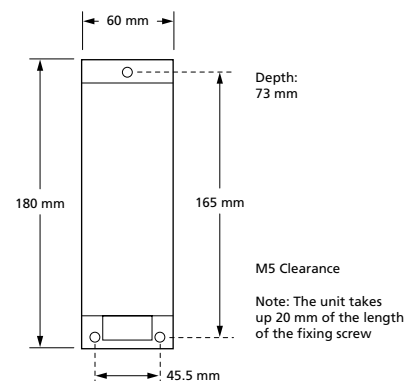
Electrical specification	ESP 12 DC	ESP 24 DC	ESP 36 DC	ESP 48 DC
ABB order code	7TCA085460R0073	7TCA085460R0091	7TCA085460R0100	7TCA085460R0142
Nominal voltage (DC)	12 V	24 V	36 V	48 V
Maximum voltage (DC)	15 V	30 V	45 V	60 V
Working voltage (DC)	9-15 V	18-30 V	27-45 V	36-60 V
Max. back-up fuse (see installation instructions)	≤ 63 A			
Leakage current (to earth)	< 250 µA			
Indicator circuit current	< 10 mA			
Volt free contact: <sup>(1)</sup>	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>I</i> <sub>n</sub>	5 kA			
Let-through voltage <i>U</i> <sub>p</sub> at <i>I</i> <sub>n</sub> <sup>(2)</sup>	250 V			
Maximum discharge current <i>I</i> <sub>max</sub> (per mode) <sup>(3)</sup>	20 kA			
Type 3 (BS EN/EN), Class III (IEC)				
Let-through voltage at <i>U</i> <sub>oc</sub> of 6 kV 1.2/50 µs and <i>I</i> <sub>sc</sub> of 3 kA 8/20 µs (per mode) <sup>(2,4)</sup>	190 V			
Mechanical specification	ESP 12 DC	ESP 24 DC	ESP 36 DC	ESP 48 DC
Temperature range	-40 to +80 °C			
Connection type	Screw terminal - maximum torque 1.5 Nm			
Conductor size (stranded)	16 mm <sup>2</sup>			
Earth connection	Screw terminal - maximum torque 1.5 Nm			
Volt free contact	Connect via screw terminal with conductor up to 2.5 mm <sup>2</sup> (stranded) - maximum torque 0.25 Nm			
Degree of protection (IEC 60529)	IP20			
Case material	Steel			
Weight: – Unit	0.6 kg			
– Packaged	0.7 kg			
Dimensions	180 mm x 60mm x 73 mm			

<sup>(1)</sup> Minimum permissible load is 5 V DC, 10 mA to ensure reliable operation

<sup>(2)</sup> The maximum transient voltage let-through of the protector throughout the test (±10%) per mode

<sup>(3)</sup> The electrical system, external to the unit, may constrain the actual current rating achieved in a particular installation

<sup>(4)</sup> 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 D/DS 10A & 32A Series (Single phase)



**LPZ**  
0→3

**FULL MODE**  
Bonding +  
Equipment  
Protection

**MAINS TEST TYPE**  
1 + 2 + 3

**e**  
**ENHANCED**  
Low let-through  
voltage

**ACTIVE VOLT-FREE CONTACT**

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**

Full product range order codes can be found on pages 17/8-17/9

### 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.

# Mains power protection

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

### ESP D/DS 10A & 32A Series (Single phase) - Technical 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
Electrical specification						
ABB order code	7TCA085460R0328 7TCA085460R0326	7TCA085460R0327 7TCA085460R0325	7TCA085460R0323 7TCA085460R0317	7TCA085460R0322 7TCA085460R0318	7TCA085460R0319 7TCA085460R0321	7TCA085460R0320 7TCA085460R0324
Nominal voltage - Phase-Neutral U <sub>0</sub> (RMS)	120 V		240 V		277 V	
Maximum voltage - Phase-Neutral U <sub>c</sub> (RMS)	150 V		280 V		350 V	
Temporary Overvoltage TOV U <sub>T</sub> <sup>(1)</sup>	175 V		350 V		402 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): <sup>(2)</sup>	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 <sub>n</sub>	20 kA					
Let-through voltage U <sub>p</sub> at I <sub>n</sub>	< 1 kV		< 1.3 kV		< 1.4 kV	
Impulse discharge current 10/350 μs I <sub>imp</sub> (L-N/E, N-E) <sup>(4)</sup>	4 kA, 12.5 kA					
Let-through voltage U <sub>p</sub> at I <sub>imp</sub> <sup>(3)</sup>	< 1 kV		< 1.2 kV		< 1.3 kV	
Total discharge current (total to earth) I <sub>total</sub> <sup>(4,5)</sup>	6.25 kA					
Type 2 (BS EN/EN), Class II (IEC)						
Nominal discharge current 8/20 μs (per mode) I <sub>n</sub>	20 kA					
Let-through voltage U <sub>p</sub> at I <sub>n</sub>	< 1 kV		< 1.3 kV		< 1.4 kV	
Maximum discharge current I <sub>max</sub> (L-N/E, N-E) <sup>(4)</sup>	40 kA, 40 kA					
Type 3 (BS EN/EN), Class III (IEC)						
Let-through voltage at U <sub>oc</sub> of 6 kV 1.2/50 μs and I <sub>sc</sub> of 3 kA 8/20 μs (per mode) <sup>(3,6)</sup>	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	-40 to +80 °C					
Connection type	Screw terminal - maximum torque 0.8 Nm <sup>(7)</sup>					
Conductor size (stranded)	6 mm <sup>2</sup>					
Earth connection	Screw terminal - maximum torque 0.8 Nm <sup>(7)</sup>					
Volt free contact (DS versions only)	Connect via screw terminal with conductor up to 1.5 mm <sup>2</sup> (stranded) - maximum torque 0.25 Nm <sup>(7)</sup>					
Degree of protection (IEC 60529)	IP20					
Case material	FR Polymer UL-94 V-0					
Weight: – Unit	0.23 kg					
– Packaged	0.25 kg					
Dimensions to DIN 43880 - HxDxW <sup>(8)</sup>	90 mm x 75 mm x 36 mm (2TE)					

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

<sup>(1)</sup> Temporary Overvoltage rating is for a maximum duration of 5 seconds tested to BS EN/EN/IEC 61643

<sup>(2)</sup> Minimum permissible load is 5 V DC, 10 mA to ensure reliable operation

<sup>(3)</sup> The maximum transient voltage let-through of the protector throughout the test ( $\pm 10\%$ )

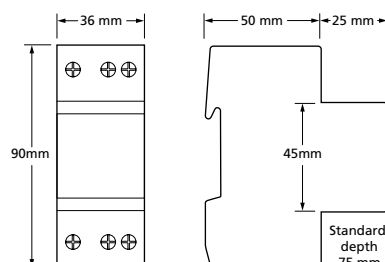
<sup>(4)</sup> The electrical system, external to the unit, may constrain the actual current rating achieved in a particular installation

<sup>(5)</sup> Rating is considered as the current capability of the protector for equipotential bonding near the service entrance

<sup>(6)</sup> 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

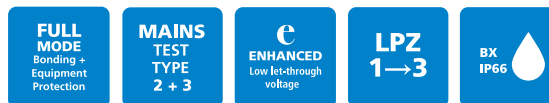
<sup>(7)</sup> Torque should typically be 50% to 75% of the maximum value

<sup>(8)</sup> The remote signal contact (removable) adds 10 mm to height



# Mains power protection

## ESP 5A/BX & 16A/BX Series



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.

### 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)
- 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
- Maintenance free
- ESP 240-5A/BX has Network Rail Approval PA05/02896. NRS PADS reference 087/037285

### Application

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

### Installation

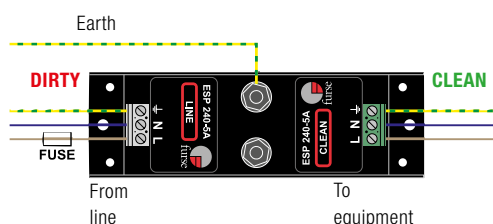
Connect in-line with the power supply usually either within the equipment panel (or for CCTV cameras, in an enclosure close by), or on the fused connection that supplies equipment. To protect equipment inside a building from transients entering on an outgoing feed (e.g. to CCTV cameras or to site lighting) 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

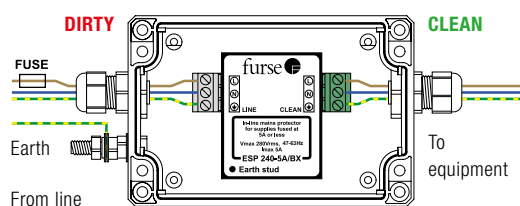
If several **ESP 120-5A** or **16A**, **ESP 240-5A** or **16A** or **ESP 277-5A** or **16A** protectors are to be installed together, or if one is in use alongside Lightning Barriers for video or signal lines, these can be simultaneously mounted and earthed on a CME kit and housed in a suitable WBX enclosure.

**Full product range order codes can be found on pages 17/8-17/9**

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.

# Mains power protection

## ESP 5A/BX & 16A/BX Series

### ESP 5A/BX & 16A/BX Series - Technical 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
<b>Electrical specification</b>						
<b>ABB order code</b>	7TCA085460R0066 7TCA085460R0067	7TCA085460R0064 7TCA085460R0065	7TCA085460R0083 7TCA085460R0084	7TCA085460R0080 7TCA085460R0081	7TCA085460R0095 7TCA085460R0348	7TCA085460R0093 7TCA085460R0094
Nominal voltage - Phase-Neutral $U_0$ (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
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					
<b>Transient specification</b>	<b>120 Volt protectors : 240 Volt protectors : 277 Volt protectors</b>					

#### Type 2 (BS EN/EN), Class II (IEC)

Nominal discharge current 8/20 $\mu$ s (per mode) $I_n$	5 kA
Let-through voltage $U_p$ at $I_n^{(1)}$	450 V : 750 V : 790 V
Maximum discharge current $I_{max}$ (per mode) <sup>(2)</sup>	10 kA

#### Type 3 (BS EN/EN), Class III (IEC)

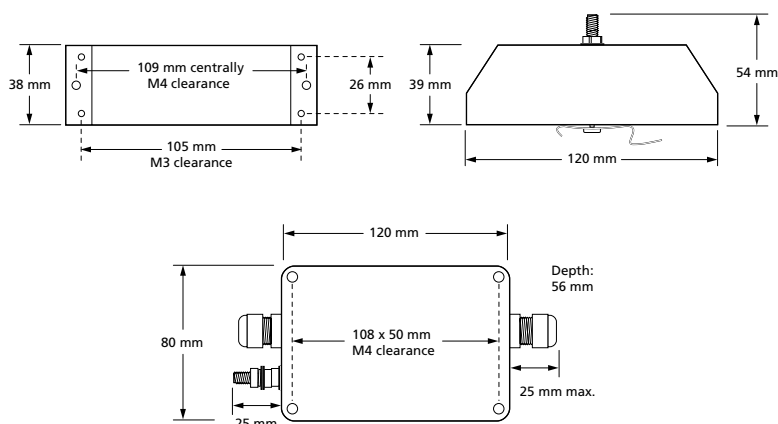
Let-through voltage at $U_{oc}$ of 6 kV 1.2/50 $\mu$ s and $I_{sc}$ of 3 kA 8/20 $\mu$ s (per mode) <sup>(1,3)</sup>	400 V : 600 V : 680 V
--	-----------------------

	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
Electrical specification						
Temperature range	-40 to +80 °C			-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: – Unit	0.23 kg			0.26 kg		
– Packaged	0.25 kg			0.31 kg		
Dimensions	See diagrams below					

<sup>(1)</sup> The maximum transient voltage let-through of the protector throughout the test ( $\pm 10\%$ ), phase to neutral, phase to earth and neutral to earth

<sup>(2)</sup> The electrical system, external to the unit, may constrain the actual current rating achieved in a particular installation

<sup>(3)</sup> 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



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.

### 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

### Application

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

### Installation

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

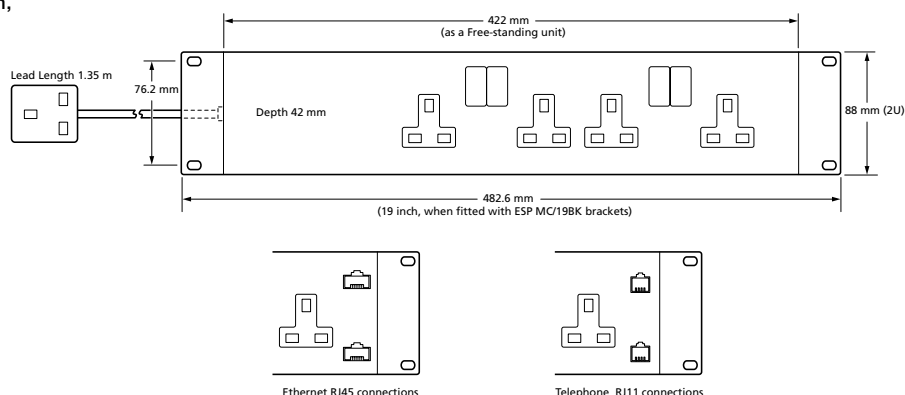
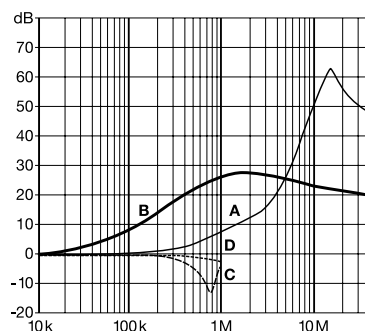
### Accessories

ESP MC/19BK bracket kit can be used for rear mounting, or reversed for use in 19" cabinets. All fixings supplied.

Full product range order codes can be found on pages 17/8-17/9

### RFI performance

Per CISPR 17: A = 50  $\Omega$ /50  $\Omega$  sym, B = 50  $\Omega$ /50  $\Omega$  asym, C = 0.1  $\Omega$ /100  $\Omega$  sym, D = 100  $\Omega$ /0.1  $\Omega$  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.



# Mains power protection

## ESP MC Series

### 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 $U_0$ (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 <sup>(2)</sup>
Current rating (signal)	–	300 mA	300 mA
In-line resistance (per line $\pm 10\%$ )	–	4.4 $\Omega$	1 $\Omega$
Bandwidth (-3 dB 50 $\Omega$ system)	–	20 MHz	–
Maximum data rate	–	–	100 Mbps
Transient specification - mains	ESP MC	ESP MC/TN/RJ11	ESP MC/Cat-5e
<b>Type 2 (BS EN/EN), Class II (IEC)</b>			
Nominal discharge current 8/20 $\mu$ s (per mode) $I_n$	5 kA		
Let-through voltage $U_p$ at $I_n^{(3)}$	850 V		
Maximum discharge current $I_{max}$ (per mode) <sup>(4)</sup>	10 kA		
<b>Type 3 (BS EN/EN), Class III (IEC)</b>			
Let-through voltage at $U_{oc}$ of 6 kV 1.2/50 $\mu$ s and $I_{sc}$ of 3 kA 8/20 $\mu$ s (per mode) <sup>(3,5)</sup>	680 V		
Let-through voltage at $U_{oc}$ of 6 kV 1.2/50 $\mu$ s and $I_{sc}$ of 500 A 8/20 (per mode) <sup>(3,5)</sup>	555 V		
Transient specification - telecom/data	ESP MC	ESP MC/TN/RJ11	ESP MC/Cat-5e
<b>Let-through voltage (all conductors)<sup>(6)</sup> <math>U_p</math></b>			
C2 test 4 kV 1.2/50 $\mu$ s, 2 kA 8/20 $\mu$ s to BS EN/EN/IEC 61643-21 - line to line / line to earth	–	390 V/390 V	120 V/700 V <sup>(8)</sup>
C1 test 1 kV, 1.2/50 $\mu$ s, 0.5 kA 8/20 $\mu$ s to BS EN/EN/IEC 61643-21 - line to line / line to earth	–	395 V/395 V	74 V/600 V <sup>(8)</sup>
B2 test 4 kV 10/700 $\mu$ s to BS EN/EN/IEC 61643-21 - line to line / line to earth	–	295 V/295 V	21 V/550 V <sup>(8)</sup>
5 kV, 10/700 $\mu$ s <sup>(7)</sup> - line to line / line to earth	–	300 V/300 V	25 V/600 V <sup>(8)</sup>
<b>Maximum surge current<sup>(9)</sup></b>			
D1 test 10/350 $\mu$ s to BS EN/EN/IEC 61643-21	–	1 kA	1 kA
8/20 $\mu$ s to ITU (formerly CCITT), BS 6651:1999 Appendix C	–	10 kA	10 kA
Mechanical specification	ESP MC	ESP MC/TN/RJ11	ESP MC/Cat-5e
Temperature range	-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: – Unit	1.70 kg	1.75 kg	1.75 kg
– Packaged	1.75 kg	1.8 kg	1.8 kg

<sup>(1)</sup> Maximum working voltage (DC or AC peak) of telecom/data protection measured at <10  $\mu$ A leakage for ESP MC/TN/RJ11 and 1 mA for ESP MC/Cat-5e

<sup>(2)</sup> Maximum working voltage is 5 V for data pairs 1/2 & 3/6

<sup>(3)</sup> The maximum transient voltage let-through of the protector throughout the test ( $\pm 10\%$ ), phase to neutral, phase to earth and neutral to earth

<sup>(4)</sup> The electrical system, external to the unit, may constrain the actual current rating achieved in a particular installation

<sup>(5)</sup> 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

<sup>(6)</sup> The maximum transient voltage let-through the protector throughout the test ( $\pm 10\%$ ), line to line & line to earth. Response time < 10 ns

<sup>(7)</sup> 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)

<sup>(8)</sup> 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

<sup>(9)</sup> The installation and connectors external to the protector may limit the capability of the protector



# Electronic systems protection

## Data & signal protection

### Data & signal protection










Product selector - Data / Signal line protection	12/2
ESP D & TN Series	12/4
ESP E Series	12/6
ESP H Series	12/8
ESP D/BX Series	12/10
ESP SL Series	12/12
ESP SLX Series	12/14
ESP SL LED 4-20 mA Series	12/16
ESP SL 3-Wire Series	12/18
ESP Q & TNQ Series	12/20
ESP KS & KE Series	12/22
ESP PCB/D & PCB/TN Series	12/24
ESP PCB/E Series	12/26
ESP RTD, RTDQ & SL RTD Series	12/28
ESP RS485, RS485Q & SL RS485 Series	12/30










# Data & signal protection

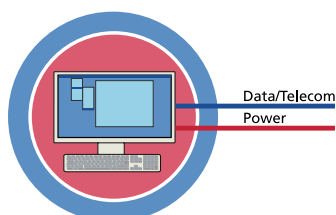
## Product selector - Data / Signal line protection

Selection guide - data/signal systems		Installation locations
Common applications	Service entrance	Critical terminal equipment - located >20 m from service entrance
RS 232 Data interfaces - Twisted pair data protection  Compact for limited space  Multiple line protection	 <p><b>ESP 15D Series</b> <b>ESP 15D/BX Series</b> See pages 12/4 and 12/10</p> <p><b>ESP SL15 Series</b> See page 12/12</p> <p><b>ESP 15Q Series</b> See page 12/20</p>	 <p><b>ESP LA Series</b> See page 13/10</p>
RS 422 & RS 423 Data interfaces	 <p><b>ESP 06E Series</b> <b>ESP SL06 Series</b> See pages 12/6 and 12/12</p>	 <p><b>ESP LB Series</b> See page 13/10</p>
RS 485 Data interfaces	 <p><b>ESP RS485 Series</b> <b>ESP SL RS485 Series</b> <b>ESP RS485Q Series</b> See pages 12/30</p>	 <p><b>ESP LB Series</b> See page 13/10</p>
PBX systems terminating on LSA-Plus disconnection modules	 <p><b>ESP KS Series</b> <b>KE Series</b> See pages 12/22</p>	
Computer networks, including Power over Ethernet (PoE) (see Furse Application Note AN004)	 <p><b>ESP Cat-5 Series</b> <b>ESP Cat-6 Series</b> See pages 13/8</p>	 <p><b>ESP LN Series</b> See page 13/12</p>

### Protectors for specific systems

System	Protector
4-20 mA loops and low current telemetry systems - Compact, for limited space	 <p><b>ESP SL Series</b> <b>ESP SL LED 4-20mA Series</b> See pages 12/12 and 12/16</p>
Multiple line and PBX protection	 <p><b>ESP D &amp; Q Series</b> <b>ESP KS Series</b> See pages 12/4, 12/20 and 12/22</p>
Hazardous area (process control, fire & gas detectors, 4-20 mA loops, shut down systems)	 <p><b>ESP SL X Series</b> See pages 12/14</p>

System	Protector
DC systems up to 110V, 4A	 <p><b>ESP H Series</b> See pages 12/8</p>
DC systems up to 110V, 0.75 A - Compact, for limited space	 <p><b>ESP SL LED Series</b> See pages 12/12</p>
3-wire systems - Compact for limited space	 <p><b>ESP SL/3W Series</b> See pages 12/18</p>
RTD systems (see Furse Application Note AN001)	 <p><b>ESP RTD Series</b> <b>ESP SL RTD Series</b> <b>ESP RTDQ Series</b> See pages 12/28</p>
Data interfaces at PCB level (see Furse Application Note AN003)	 <p><b>ESP PCB Series</b> See pages 12/24</p>
RF radio and antenna communication systems	 <p><b>ESP RF Series</b> See pages 14/16 &amp; 14/18</p>



**WARNING** Equipment is **ONLY** protected if all incoming lines have protection fitted



# Data & signal protection

## ESP D & TN Series



**LPZ**  
0→3

**FULL MODE**  
Bonding +  
Equipment  
Protection

**SIGNAL/  
TELECOM**  
TEST CAT  
D + C + B

**e**  
**ENHANCED**  
Low let-through  
voltage

**LOW IN-LINE  
RESISTANCE**  
9.4 Ω

**CURRENT  
RATING**  
300 mA

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 minimizes 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)

### Application

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

### 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.

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### Accessories

Combined Mounting/Earthing kits:

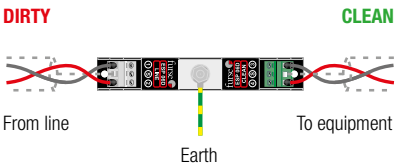
- CME 4** Mount & earth up to 4 protectors
- CME 8** Mount & earth up to 8 protectors
- CME 16** Mount & earth up to 16 protectors
- CME 32** Mount & earth up to 32 protectors

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
- Full product range order codes can be found on pages 17/8-17/9**

### 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), ATEX (ESP SLX) 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.

# Data & signal protection

## ESP D & TN Series

### ESP D & TN Series - Technical specification

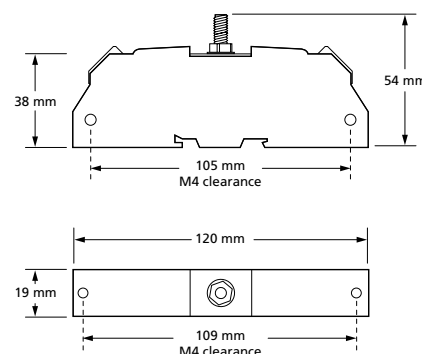
Electrical specification	ESP 06D	ESP 15D	ESP 30D	ESP 50D	ESP 110D	ESP TN
ABB order code	7TCA085400R0079	7TCA085400R0089	7TCA085400R0099	7TCA085400R0109	7TCA085400R0005	7TCA085400R0171
Nominal voltage <sup>(1)</sup>	6 V	15 V	30 V	50 V	110 V	–
Maximum working voltage $U_c$ (RMS/DC) <sup>(2)</sup>	5 V / 7.79 V	13 V / 19 V	26 V / 37.1 V	41 V / 58 V	93 V / 132 V	– / 296 V
Current rating (signal)	300 mA					
In-line resistance (per line $\pm 10\%$ )	9.4 $\Omega$	9.4 $\Omega$	9.4 $\Omega$	9.4 $\Omega$	9.4 $\Omega$	4.4 $\Omega$
Bandwidth (-3 dB 50 $\Omega$ system)	800 kHz	2.5 MHz	4 MHz	6 MHz	9 MHz	20 MHz
Transient specification	ESP 06D	ESP 15D	ESP 30D	ESP 50D	ESP 110D	ESP TN
<b>Let-through voltage (all conductors)<sup>(3)</sup> Up</b>						
C2 test 4 kV 1.2/50 $\mu$ s, 2 kA 8/20 $\mu$ s 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 $\mu$ s, 0.5 kA 8/20 $\mu$ s 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 $\mu$ s 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 $\mu$ s <sup>(4)</sup>	10.5 V	23.8 V	43.4 V	74.9 V	150 V	300 V
<b>Maximum surge current</b>						
D1 test 10/350 $\mu$ s to BS EN/EN/IEC 61643-21: – Per signal wire	2.5 kA					
8/20 $\mu$ s to ITU-T K.45:2003, – Per pair	5 kA					
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 mm <sup>2</sup>					
Earth connection	M6 stud					
Case material	FR Polymer UL-94 V-0					
Weight: – Unit	0.08 kg					
– Packaged (per 10)	0.85 kg					
Dimensions	See diagram below					

<sup>(1)</sup> Nominal voltage (RMS/DC or AC peak) measured at < 5  $\mu$ A (ESP 15D, ESP 30D, ESP 50D, ESP 110D) and < 200  $\mu$ A (ESP 06D)

<sup>(2)</sup> Maximum working voltage (RMS/DC or AC peak) measured at < 1 mA leakage (ESP 15D, ESP 30D, ESP 50D, ESP 110D), < 10 mA (ESP 06D) and < 10  $\mu$ A (ESP TN)

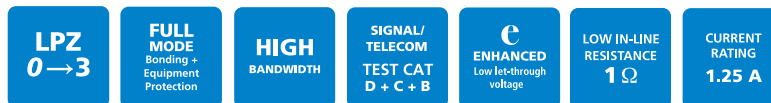
<sup>(3)</sup> The maximum transient voltage let-through of the protector throughout the test ( $\pm 10\%$ ), line to line & line to earth, both polarities. Response time < 10 ns

<sup>(4)</sup> 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)



# Data & signal protection

## ESP E Series



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 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
- 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)

### 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.

### 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

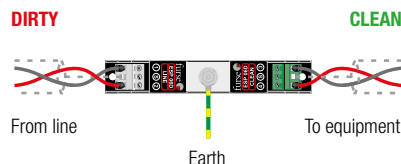
For use with a CME 8 and up to 8 protectors

#### WBX 16/2/G

For use with one or two CME 16 and up to 32 protectors

**Full product range order codes can be found on pages 17/8-17/9**

#### Install in series (in-line)



**NOTE:** Slim Line (ESP SL), ATEX (ESP SLX) 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 4 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.

# Data & signal protection

## ESP E Series

### ESP E Series - Technical specification

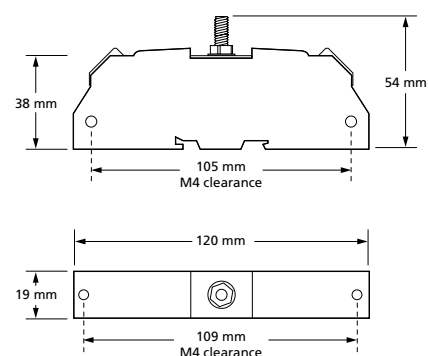
Electrical specification	ESP 06E	ESP 15E	ESP 30E	ESP 50E	ESP 110E
<b>ABB order code</b>	7TCA085400R0084	7TCA085400R0095	7TCA085400R0104	7TCA085400R0116	7TCA085400R0007
Nominal voltage <sup>(1)</sup>	6 V	15 V	30 V	50 V	110 V
Maximum working voltage $U_c$ (RMS/DC) <sup>(2)</sup>	5 V / 7.79 V	11 V / 16.7 V	25 V / 36.7 V	40 V / 56.7 V	93 V / 132 V
Current rating (signal)	1.25 A				
In-line resistance (per line $\pm 10\%$ )	1.0 $\Omega$				
Bandwidth (-3 dB 50 $\Omega$ system)	45 MHz				
Transient specification	ESP 06E	ESP 15E	ESP 30E	ESP 50E	ESP 110E
<b>Let-through voltage (all conductors)<sup>(3)</sup> Up</b>					
C2 test 4 kV 1.2/50 $\mu$ s, 2 kA 8/20 $\mu$ s 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 $\mu$ s, 0.5 kA 8/20 $\mu$ s 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 $\mu$ s 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 $\mu$ s <sup>(4)</sup>	17.0 V	26.2 V	44.3 V	65.8 V	165 V
<b>Maximum surge current</b>					
D1 test 10/350 $\mu$ s to BS EN/EN/IEC 61643-21: – Per signal wire	2.5 kA				
8/20 $\mu$ s to ITU-T K.45:2003, – Per pair	5 kA				
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
Temperature range	-40 to +80 °C				
Connection type	Screw terminal - maximum torque 0.5 Nm				
Conductor size (stranded)	2.5 mm <sup>2</sup>				
Earth connection	M6 stud				
Case material	FR Polymer UL-94 V-0				
Weight: – Unit	0.08 kg				
– Packaged (per 10)	0.85 kg				
Dimensions	See diagram below				

<sup>(1)</sup> Nominal voltage (RMS/DC or AC peak) measured at < 10  $\mu$ A (ESP 15E, ESP 30E, ESP 50E, ESP 110E) and < 200  $\mu$ A (ESP 06E)

<sup>(2)</sup> Maximum working voltage (RMS/DC or AC peak) measured at < 5 mA leakage (ESP 15E, ESP 30E, ESP 50E, ESP 110E) and < 10 mA (ESP 06E)

<sup>(3)</sup> The maximum transient voltage let-through of the protector throughout the test ( $\pm 10\%$ ), line to line & line to earth, both polarities. Response time < 10 ns

<sup>(4)</sup> 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)



# Data & signal protection

## ESP H Series



**LPZ**  
0→3

**FULL MODE**  
Bonding +  
Equipment  
Protection

**SIGNAL/  
TELECOM**  
TEST CAT  
D + C + B

**e**  
**ENHANCED**  
Low let-through  
voltage

**LOW IN-LINE  
RESISTANCE**  
**0.05 Ω**

**CURRENT  
RATING**  
**4 A**

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 or an increased current than the ESP D or E Series. Also suitable for DC power applications less than 4 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-low (< 0.05 Ω) in-line resistance allows resistance critical applications (e.g. alarm loops) to be protected
- Very high (4 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

### Application

Use these applications to protect resistance sensitive or higher running current systems, e.g. systems with long signal lines, or DC power applications.

### 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:

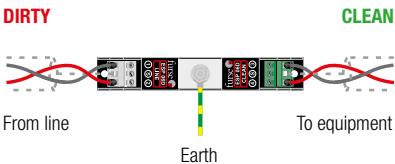
- CME 4** Mount & earth up to 4 protectors
- CME 8** Mount & earth up to 8 protectors
- CME 16** Mount & earth up to 16 protectors
- CME 32** Mount & earth up to 32 protectors

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
- Full product range order codes can be found on pages 17/8-17/9**

### 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.



# Data & signal protection

## ESP H Series

### ESP H Series - Technical specification

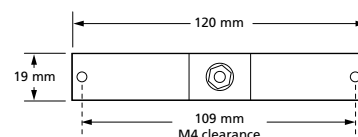
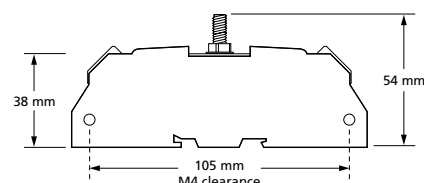
Electrical specification	ESP 06H	ESP 15H	ESP 30H	ESP 50H	ESP 110H
<b>ABB order code</b>	7TCA085400R0003	7TCA085400R0009	7TCA085400R0011	7TCA085400R0012	7TCA085400R0008
Nominal voltage <sup>(1)</sup>	6 V	15 V	30 V	50 V	110 V
Maximum working voltage $U_c$ (RMS/DC) <sup>(2)</sup>	5 V / 7.79 V	11 V / 16.7 V	25 V / 36.7 V	40 V / 56.7 V	93 V / 132 V
Current rating (signal)	4 A				
In-line resistance (per line $\pm 10\%$ )	0.05 $\Omega$				
Bandwidth (-3 dB 50 $\Omega$ system)	160 KHz	140 KHz	130 KHz	120 KHz	120 KHz
Transient specification	ESP 06H	ESP 15H	ESP 30H	ESP 50H	ESP 110H
<b>Let-through voltage (all conductors)<sup>(3)</sup> Up</b>					
C2 test 4 kV 1.2/50 $\mu$ s, 2 kA 8/20 $\mu$ s to BS EN/EN/IEC 61643-21	12.0 V	27.5 V	46.0 V	67.0 V	150 V
C1 test 1 kV, 1.2/50 $\mu$ s, 0.5 kA 8/20 $\mu$ s to BS EN/EN/IEC 61643-21	11.0 V	26.5 V	45.0 V	66.5 V	145 V
B2 test 4 kV 10/700 $\mu$ s to BS EN/EN/IEC 61643-21	10.5 V	25.5 V	43.5 V	65.0 V	140 V
5 kV, 10/700 $\mu$ s <sup>(4)</sup>	10.8 V	26.2 V	44.3 V	65.8 V	145 V
<b>Maximum surge current</b>					
D1 test 10/350 $\mu$ s to BS EN/EN/IEC 61643-21: – Per signal wire	2.5 kA				
8/20 $\mu$ s to ITU-T K.45:2003, – Per pair	5 kA				
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
Temperature range	-40 to +80 °C				
Connection type	Screw terminal - maximum torque 0.5 Nm				
Conductor size (stranded)	2.5 mm <sup>2</sup>				
Earth connection	M6 stud - maximum torque 0.5 Nm				
Case material	FR Polymer UL-94 V-0				
Weight: – Unit	0.08 kg				
– Packaged (per 10)	0.85 kg				
Dimensions	See diagram below				

<sup>(1)</sup> Nominal voltage (RMS/DC or AC peak) measured at < 10  $\mu$ A (ESP 15H, ESP 30H, ESP 50H, ESP 110H) and < 200  $\mu$ A (ESP 06H)

<sup>(2)</sup> Maximum working voltage (RMS/DC or AC peak) measured at < 5 mA leakage (ESP 15H, ESP 30H, ESP 50H, ESP 110H) and < 10 mA (ESP 06H)

<sup>(3)</sup> The maximum transient voltage let-through of the protector throughout the test ( $\pm 10\%$ ), line to line & line to earth, both polarities. Response time < 10 ns

<sup>(4)</sup> 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)



# Data & signal protection

## ESP D/BX Series



**LPZ**  
0→3

**FULL MODE**  
Bonding +  
Equipment  
Protection

**CURRENT RATING**  
300 mA

**SIGNAL/ TELECOM**  
TEST CAT  
D + C + B

**e ENHANCED**  
Low let-through  
voltage

**BX IP66**

**LOW IN-LINE RESISTANCE**  
9.4 Ω

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 minimizes 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

### Application

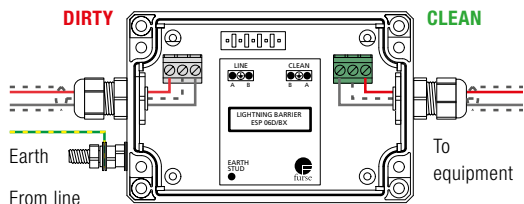
Use these ready-boxed protectors on twisted pair lines in dirty or damp environments. For two wire lines, use /BX versions. For four wire lines, use /2BX versions.

Full product range order codes can be found on pages 17/8-17/9

### 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.

### 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.

# Data & signal protection

## ESP D/BX Series

### ESP D/BX Series - Technical specification

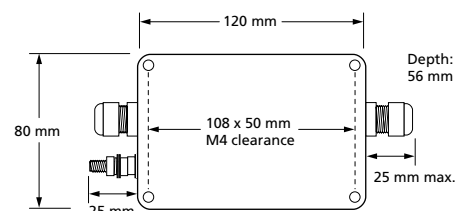
	ESP 06D/BX ESP 06D/2BX	ESP 15D/BX ESP 15D/2BX	ESP 30D/BX ESP 30D/2BX	ESP 50D/BX ESP 50D/2BX	ESP 110D/BX ESP 110D/2BX	ESP TN/BX ESP TN/2BX
<b>Electrical specification</b>						
<b>ABB order code</b>	7TCA085400R0081 7TCA085400R0080	7TCA085400R0091 7TCA085400R0090	7TCA085400R0101 7TCA085400R0100	7TCA085400R0113 7TCA085400R0111	7TCA085400R0006 7TCA085460R0343	7TCA085400R0175 7TCA085400R0172
Nominal voltage <sup>(1)</sup>	6 V	15 V	30 V	50 V	110 V	–
Maximum working voltage $U_c$ (RMS/DC) <sup>(2)</sup>	5 V / 7.79 V	13 V / 19 V	26 V / 37.1 V	41 V / 58 V	93 V / 132 V	– / 296 V
Current rating (signal)	300 mA					
In-line resistance (per line $\pm 10\%$ )	9.4 $\Omega$	9.4 $\Omega$	9.4 $\Omega$	9.4 $\Omega$	9.4 $\Omega$	4.4 $\Omega$
Bandwidth (-3 dB 50 $\Omega$ system)	800 kHz	2.5 MHz	4 MHz	6 MHz	9 MHz	20 MHz
<b>Transient specification</b>	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
<b>Let-through voltage (all conductors)<sup>(3)</sup> Up</b>						
C2 test 4 kV 1.2/50 $\mu$ s, 2 kA 8/20 $\mu$ s 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 $\mu$ s, 0.5 kA 8/20 $\mu$ s 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 $\mu$ s 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 $\mu$ s <sup>(4)</sup>	10.5 V	23.8 V	43.4 V	74.9 V	150 V	300 V
<b>Maximum surge current</b>						
D1 test 10/350 $\mu$ s to – Per signal wire	2.5 kA					
BS EN/EN/IEC 61643-21: – Per pair	5 kA					
8/20 $\mu$ s to ITU-T K.45:2003, – Per signal wire	10 kA					
IEEE C62.41.2:2002: – Per pair	20 kA					
<b>Mechanical specification</b>	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 - for IDC terminal use part number with /I - maximum torque 0.5 Nm					
Conductor size (stranded)	1.5 mm <sup>2</sup>					
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: – Unit	0.3 kg					
– Packaged (per 10)	0.35 kg					
Dimensions	See diagram below					

<sup>(1)</sup> Nominal voltage (RMS/DC or AC peak) measured at < 10  $\mu$ A (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  $\mu$ A (ESP 06D/BX & ESP 06D/2BX)

<sup>(2)</sup> Maximum working voltage (RMS/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  $\mu$ A (ESP TN/BX, ESP TN/2BX)

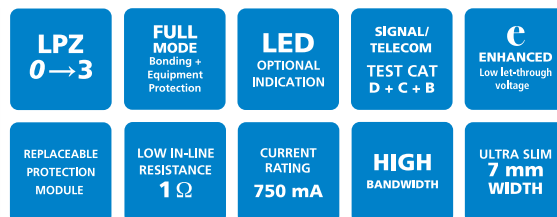
<sup>(3)</sup> The maximum transient voltage let-through of the protector throughout the test ( $\pm 10\%$ ), line to line & line to earth, both polarities. Response time < 10 ns

<sup>(4)</sup> 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)



# Data & signal protection

## ESP SL Series



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 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 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)
- 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 (750 mA) 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 mm<sup>2</sup> 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 allows resistance critical applications (e.g. alarm loops) to be protected

### 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

Replacement modules:

#### ESP SLXX/M

Standard module replacement where XX is voltage rating (06, 15, 30, 50 or 110)

#### ESP SLXL/M

LED module replacement where XX is voltage rating, as above

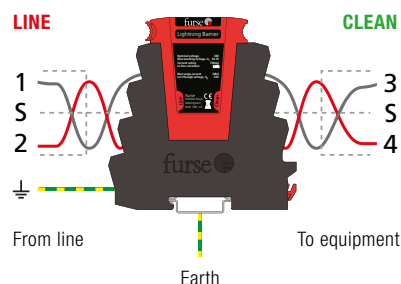
#### ESP SL/B

Base replacement (common for standard and LED modules)

#### ESP SL/I/B

Base replacement with isolated screen from earth

Full product range order codes can be found on pages 17/8-17/9



**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.

# Data & signal protection

## ESP SL Series

### ESP SL Series - Technical specification

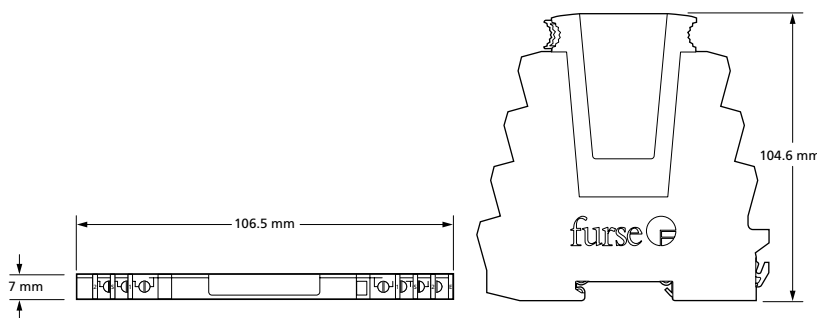
Electrical specification	ESP SL06	ESP SL15	ESP SL30	ESP SL50	ESP SL110	ESP SL TN
<b>ABB order code</b>	7TCA085400R0058	7TCA085400R0063	7TCA085400R0067	7TCA085400R0074	7TCA085400R0061	7TCA085400R0195
Nominal voltage <sup>(1)</sup>	6 V	15 V	30 V	50 V	110 V	–
Maximum working voltage $U_c$ (RMS/DC) <sup>(2)</sup>	5 V / 7.79 V	11 V / 16.7 V	25 V / 36.7 V	40 V / 56.7 V	93 V / 132 V	– / 296 V
Current rating (signal)	750 mA					
In-line resistance (per line $\pm 10\%$ )	1.0 $\Omega$					
Bandwidth (-3 dB 50 $\Omega$ system)	45 MHz	45 MHz	45 MHz	45 MHz	45 MHz	20 MHz
<b>Transient specification</b>	<b>ESP SL06</b>	<b>ESP SL15</b>	<b>ESP SL30</b>	<b>ESP SL50</b>	<b>ESP SL110 E</b>	<b>SP SL TN</b>
<b>Let-through voltage (all conductors)<sup>(3)</sup> Up</b>						
C2 test 4 kV 1.2/50 $\mu$ s, 2 kA 8/20 $\mu$ s to BS EN/EN/IEC 61643-21	36.0 V	38.4 V	63.0 V	90.3 V	185 V	395 V
C1 test 1 kV, 1.2/50 $\mu$ s, 0.5 kA 8/20 $\mu$ s to BS EN/EN/IEC 61643-21	26.2 V	29.4 V	51.3 V	77.2 V	175 V	390 V
B2 test 4 kV 10/700 $\mu$ s to BS EN/EN/IEC 61643-21	16.0 V	26.8 V	45.4 V	68.3 V	165 V	298 V
5 kV, 10/700 $\mu$ s <sup>(4)</sup>	17.0 V	27.5 V	46.3 V	69.1 V	170 V	300 V
<b>Maximum surge current</b>						
D1 test 10/350 $\mu$ s to – Per signal wire	1.25 kA					
BS EN/EN/IEC 61643-21: – Per pair	2.5 kA					
8/20 $\mu$ s to ITU-T K.45:2003, – Per signal wire	10 kA					
IEEE C62.41.2:2002: – Per pair	20 kA					
<b>Mechanical specification</b>	<b>ESP SL06</b>	<b>ESP SL15</b>	<b>ESP SL30</b>	<b>ESP SL50</b>	<b>ESP SL110</b>	<b>ESP SL TN</b>
Temperature range	-40 to +80 °C					
Connection type	Screw terminal - maximum torque 0.8 Nm					
Conductor size (stranded)	4 mm <sup>2</sup>					
Earth connection	Via DIN rail or 4 mm <sup>2</sup> earth terminal - maximum torque 0.8 Nm					
Case material	FR Polymer UL-94 V-0					
Weight: – Unit	0.08 kg					
– Packaged (per 10)	0.85 kg					
Dimensions	See diagram below					

<sup>(1)</sup> Nominal voltage (RMS/DC or AC peak) measured at < 10  $\mu$ A (ESP SL15, ESP SL30, ESP SL50, ESP SL110 and LED variants) and < 200  $\mu$ A (ESP SL06 and ESP SL06L)

<sup>(2)</sup> Maximum working voltage (RMS/DC or AC peak) measured at < 1 mA leakage

<sup>(3)</sup> The maximum transient voltage let-through of the protector throughout the test ( $\pm 10\%$ ), line to line & line to earth, both polarities. Response time < 10 ns

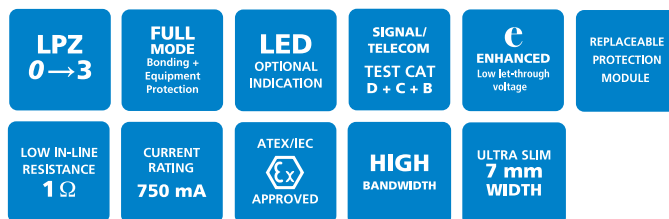
<sup>(4)</sup> Test to IEC 61000-4-5:2006, ITU-T (formerly CCITT) K.20, K.21 and K.45, Telcordia GR-1089-CORE, Issue 2:2002, ANSI TIA/EIA/IS-968-A:2002 (formerly FCC Part 68)





# Data & signal protection

## ESP SL X Series



Combined Category D, C, B tested protector (to BS EN 61643) suitable for twisted pair signalling applications within hazardous environments (ATEX/IECEx approved). Available for working voltages of up to 15 and 30 Volts. For use at boundaries up to LPZ 0 to protect against flashover through to LPZ 3 to protect sensitive electronic equipment.

### Features & benefits

- Approved for use in hazardous environments for the protection of Intrinsically Safe circuits (Classification: II 2(1) G, Ex ia (ia Ga) IIC T4 Gb)
- 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
- Negligible self-capacitance and self-inductance offering minimal interference when protecting Intrinsically Safe circuits
- Very low (1  $\Omega$ ) in-line resistance allows resistance critical applications (e.g. alarm loops) to be protected
- High (750 mA) 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
- Built-in innovative DIN rail foot with locking feature for simple positioning and clip-on mounting to top hat DIN rails
- 4 mm<sup>2</sup> terminals allow for larger cross section wiring, stranded wires terminated with ferrules or fitting two wires into a single terminal
- Approval references for ESP SL X Series: IECEx SIR 10.0030X, Sira 10ATEX2063X

### Application

Use these protectors in hazardous environments where installation space is at a premium and large numbers of lines require protection (e.g. process control, 4-20 mA loops, fire and gas detectors and shut-down systems). Suitable for high speed digital communication equipment or systems with long signal lines. See Furse Application Note AN013.

### Accessories

Replacement modules:

**ESP SL15X/M, ESP30X/M**

Standard module replacement for 15 and 30 V protectors respectively

**ESP SL15XL/M, ESP30XL/M**

LED module replacement for 15 and 30 V protectors respectively

**ESP SLX/B**

Base replacement (common for standard and LED modules)

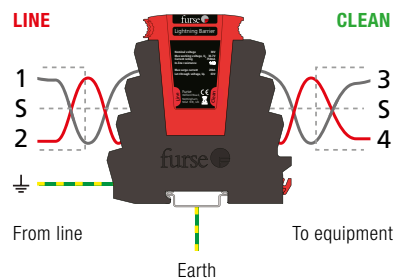
**ESP SLX/I/B**

Base replacement with isolated screen from earth

Full product range order codes can be found on pages 17/8-17/9

### 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.



**NOTE:** Use the standard ESP SL 'Slim Line' Series for non-hazardous areas. The ESP SL Series is also available for protection of 3-wire, RS 485, RTD & telecommunication applications (ESP SL/3W, ESP SL RS485, ESP SL RTD & ESP SL TN).

# Data & signal protection

## ESP SL X Series

### ESP SL X Series - Technical specification

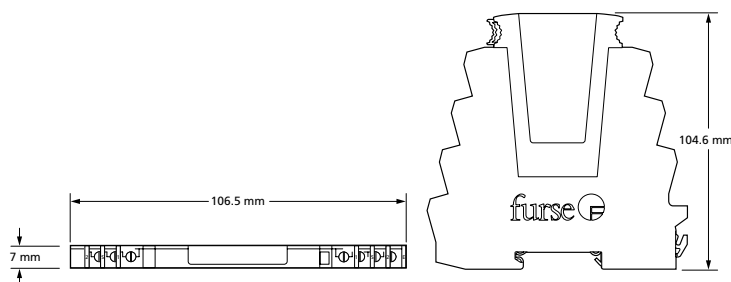
Electrical specification	ESP SL15X	ESP SL30X
ABB order code	7TCA085400R0065	7TCA085400R0071
Nominal voltage <sup>(1)</sup>	15 V	30 V
Maximum working voltage $U_c$ (RMS/DC) <sup>(2)</sup>	11 V / 16.7 V	25 V / 36.7 V
Current rating (signal)	750 mA	
In-line resistance (per line $\pm 10\%$ )	1.0 $\Omega$	
Bandwidth (-3 dB 50 $\Omega$ system)	45 MHz	
Intrinsically safe specification	ESP SL15X	ESP SL30X
Maximum voltage $U_i$	30 V	
Maximum power $P_i$ :		
– Per $-40\text{ }^\circ\text{C} < T_a < 40\text{ }^\circ\text{C}$	1.3 W	
– Per $-40\text{ }^\circ\text{C} < T_a < 60\text{ }^\circ\text{C}$	1.2 W	
– Per $-40\text{ }^\circ\text{C} < T_a < 80\text{ }^\circ\text{C}$	1.0 W	
Capacitance $C_i$	0 $\mu\text{F}$	
Inductance $L_i$	0 $\mu\text{H}$	
Certificate number	IECEX SIR 10.0030X, Sira 10ATEX2063X	
Classification	Ex II 2 (1) G, Ex ia (ia Ga) IIC T4 Gb	
Transient specification	ESP SL15X	ESP SL30X
<b>Let-through voltage (all conductors)<sup>(3)</sup> <math>U_p</math></b>		
C2 test 4 kV 1.2/50 $\mu\text{s}$ , 2 kA 8/20 $\mu\text{s}$ to BS EN/EN/IEC 61643-21	38.4 V	63.0 V
C1 test 1 kV, 1.2/50 $\mu\text{s}$ , 0.5 kA 8/20 $\mu\text{s}$ to BS EN/EN/IEC 61643-21	29.4 V	51.3 V
B2 test 4 kV 10/700 $\mu\text{s}$ to BS EN/EN/IEC 61643-21	26.8 V	45.4 V
5 kV, 10/700 $\mu\text{s}$ <sup>(4)</sup>	27.5 V	46.3 V
<b>Maximum surge current</b>		
D1 test 10/350 $\mu\text{s}$ to BS EN/EN/IEC 61643-21:		
– Per signal wire	1.25 kA	
– Per pair	2.5 kA	
8/20 $\mu\text{s}$ to ITU-T K.45:2003, IEEE C62.41.2:2002:		
– Per signal wire	10 kA	
– Per pair	20 kA	
Mechanical specification	ESP SL15X	ESP SL30X
Temperature range	$-40$ to $+80\text{ }^\circ\text{C}$	
Connection type	Screw terminal - maximum torque 0.8 Nm	
Conductor size (stranded)	4 mm <sup>2</sup>	
Earth connection	Via DIN rail or 4 mm <sup>2</sup> earth terminal - maximum torque 0.8 Nm	
Case material	FR Polymer UL-94 V-0	
Weight:		
– Unit	0.08 kg	
– Packaged (per 10)	0.85 kg	
Dimensions	See diagram below	

<sup>(1)</sup> Nominal voltage (RMS/DC or AC peak) measured at  $< 10\text{ }\mu\text{A}$

<sup>(2)</sup> Maximum working voltage (RMS/DC or AC peak) measured at  $< 1\text{ mA}$  leakage

<sup>(3)</sup> The maximum transient voltage let-through of the protector throughout the test ( $\pm 10\%$ ), line to line & line to earth, both polarities. Response time  $< 10\text{ ns}$

<sup>(4)</sup> 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)



# Data & signal protection

## ESP SL LED 4-20 mA Series



**LPZ**  
**0→3**

**FULL**  
**MODE**  
Bonding + Equipment Protection

REPLACEABLE PROTECTION MODULE

SIGNAL/ TELECOM TEST CAT D + C + B

**C** ENHANCED Low let-through voltage

LOW IN-LINE RESISTANCE **1 Ω**

CURRENT RATING **75 mA**

ULTRA SLIM **7 mm** WIDTH

**LED** INDICATION

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
  - 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 for minimal system interference
  - High (75 mA) maximum running current - can also be used on 10-50 mA systems (e.g. process control)
  - Screen terminal enables easy connection of cable screen to earth
  - 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 mm<sup>2</sup> 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 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.

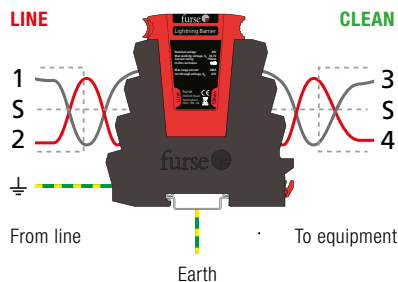
### Accessories

**ESP SL30L/4-20/M**  
Module replacement

**ESP SL/B**  
Base replacement

Full product range order codes can be found on pages 17/8-17/9

**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 ESP SL30L/4-20 device installed within the loop introduces a 1.7 V 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). The ESP SL X Series has approvals for use in hazardous areas.

# Data & signal protection

## ESP SL LED 4-20 mA Series

### ESP NEW SL LED 4-20 mA Series - Technical specification

Electrical specification	ESP SL30L/4-20
ABB order code	7TCA085400R0070
Nominal voltage <sup>(1)</sup>	30 V
Maximum working voltage U <sub>c</sub> (RMS/DC) <sup>(2)</sup>	25 V / 36.7 V
Current rating (signal) <sup>(3)</sup>	75 mA
In-line resistance (per line ±10%)	1.0 Ω
Series voltage drop <sup>(4)</sup>	1.7 V
Transient specification	ESP SL30L/4-20
Let-through voltage (all conductors) <sup>(5)</sup> Up	
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 <sup>(6)</sup>	46.3 V
Maximum surge current	
D1 test 10/350 μs to BS EN/EN/IEC 61643-21:	– Per signal wire 1.25 kA
8/20 μs to ITU-T K.45:2003, IEEE C62.41.2:2002:	– Per pair 2.5 kA
	– Per signal wire 10 kA
	– Per pair 20 kA
Mechanical specification	ESP SL30L/4-20
Temperature range	-40 to +80 °C
Connection type	Screw terminal - maximum torque 0.8 Nm
Conductor size (stranded)	4 mm <sup>2</sup>
Earth connection	Via DIN rail or 4 mm <sup>2</sup> earth terminal - maximum torque 0.8 Nm
Case material	FR Polymer UL-94 V-0
Weight: – Unit	0.08 kg
– Packaged (per 10)	0.85 kg
Dimensions	See diagram below

<sup>(1)</sup> Nominal voltage (RMS/DC or AC peak) measured at < 10 µA

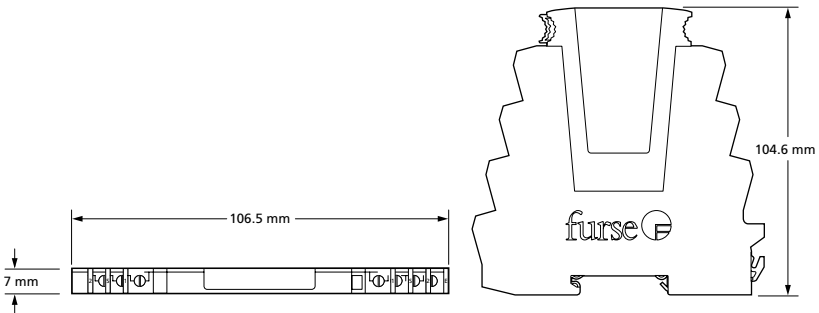
<sup>(2)</sup> Maximum working voltage (RMS/DC or AC peak) measured at < 1 mA leakage

<sup>(3)</sup> The minimum current for LED indicator operation is 2 mA

<sup>(4)</sup> At 20 mA

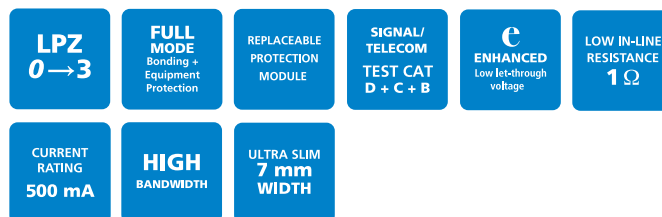
<sup>(5)</sup> The maximum transient voltage let-through of the protector throughout the test (±10%), line to line & line to earth, both polarities. Response time < 10 ns

<sup>(6)</sup> 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)



# Data & signal protection

## ESP SL 3-Wire Series



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 mm<sup>2</sup> 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:

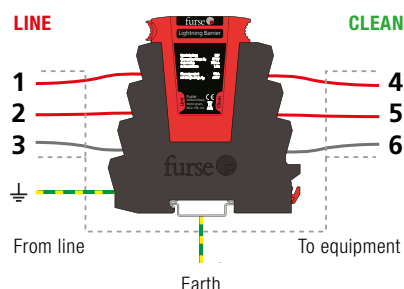
**ESP SLXX/3W/M**

Standard module replacement where XX is voltage rating (06, 15, 30, 50 or 110)

**ESP SL/3W/B**

Base replacement

Full product range order codes can be found on pages 17/8-17/9



**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.



# Data & signal protection

## ESP SL 3-Wire Series

### ESP SL 3-Wire Series - Technical specification

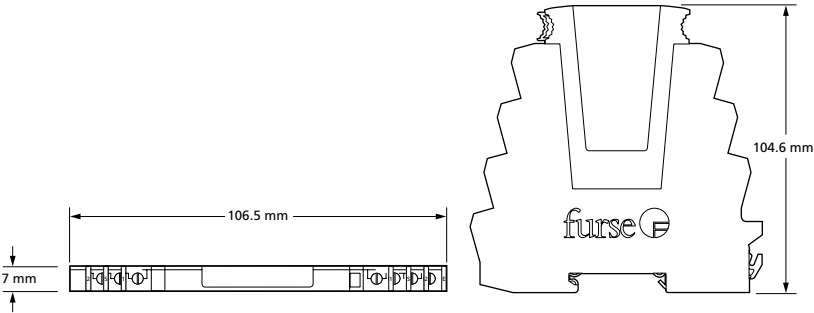
Electrical specification	ESP SL06/3W	ESP SL15/3W	ESP SL30/3W	ESP SL50/3W	ESP SL110/3W
ABB order code	7TCA085400R0238	7TCA085400R0269	7TCA085400R0268	7TCA085400R0267	7TCA085400R0266
Nominal voltage <sup>(1)</sup>	6 V	15 V	30 V	50 V	110 V
Maximum working voltage U <sub>c</sub> (RMS/DC) <sup>(2)</sup>	5 V / 7.79 V	11 V / 16.7 V	25 V / 36.7 V	40 V / 56.7 V	93 V / 132 V
Current rating (signal)	500 mA				
In-line resistance (per line ±10%)	1.0 Ω				
Series voltage drop	45 MHz				
Transient specification	ESP SL06/3W	ESP SL15/3W	ESP SL30/3W	ESP SL50/3W	ESP SL110/3W
<b>Let-through voltage (all conductors)<sup>(3)</sup> Up</b>					
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 <sup>(4)</sup>	17.0 V	27.5 V	46.3 V	69.1 V	170 V
<b>Maximum surge current</b>					
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,	– Per signal wire	10 kA			
IEEE C62.41.2:2002:	– Per pair	20 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 mm <sup>2</sup>				
Earth connection	Via DIN rail or 4 mm <sup>2</sup> earth terminal - maximum torque 0.8 Nm				
Case material	FR Polymer UL-94 V-0				
Weight: – Unit	0.08 kg				
– Packaged (per 10)	0.85 kg				
Dimensions	See diagram below				

<sup>(1)</sup> Nominal voltage (RMS/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)

<sup>(2)</sup> Maximum working voltage (RMS/DC or AC peak) measured at < 1 mA leakage

<sup>(3)</sup> 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

<sup>(4)</sup> 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)



# Data & signal protection

## ESP Q & TNQ Series



**LPZ**  
**0→3**

**FULL MODE**  
 Bonding +  
 Equipment  
 Protection

**SIGNAL/  
TELECOM**  
**TEST CAT**  
**D + C + B**

**ENHANCED**  
 Low let-through  
 voltage

**CURRENT  
RATING**  
**750 mA**

**ULTRA  
COMPACT  
DESIGN**

Combined Category D, C, B tested protector (to BS EN 61643) suitable for 4 twisted pair lines. Available for working voltages of up to 6, 15, 30, 50 and 110 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

### 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 mm<sup>2</sup> terminals allow for larger cross section wiring, stranded wires terminated with ferrules or fitting two wires into a single terminal
- Very low resistance to minimizes 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 as a ‘UL Listed’ version, add /UL to part code (ESP 06Q, ESP 15Q, ESP 30Q and ESP 50Q only)

### Application

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

### Installation

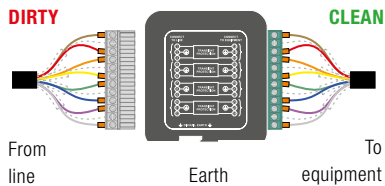
Connect in series with the signal or data line either near where it enters or leaves the building or close to the equipment being protected. Install in a cabinet/cubicle close to the system’s earth star point.

### Accessories

For suitable enclosures for the ESP Q & TNQ Series, please contact us.

Full product range order codes can be found on pages 17/8-17/9

ESP 06Q, ESP 15Q, ESP 30Q, ESP 50Q, ESP 110Q 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.

# Data & signal protection

## ESP Q & TNQ Series

### ESP Q & TNQ Series - Technical specification

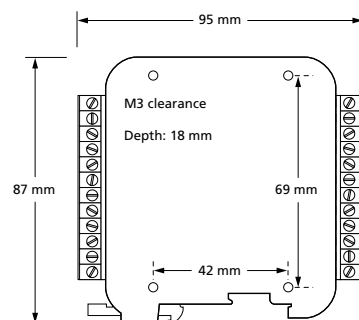
Electrical specification	ESP 06Q	ESP 15Q	ESP 30Q	ESP 50Q	ESP 110Q	ESP TNQ
<b>ABB order code</b>	7TCA085400R0087	7TCA085400R0098	7TCA085400R0107	7TCA085400R0118	7TCA085400R0088	7TCA085400R0183
Nominal voltage <sup>(1)</sup>	6 V	15 V	30 V	50 V	110 V	–
Maximum working voltage $U_c$ (RMS/DC) <sup>(2)</sup>	5 V / 7.79 V	13 V / 18.8 V	26 V / 37.8 V	41 V / 57.8 V	93 V / 132 V	– / 296 V
Current rating (signal)	750 mA	750 mA	750 mA	750 mA	750 mA	300 mA
In-line resistance (per line $\pm 10\%$ )	1.0 $\Omega$	1.0 $\Omega$	1.0 $\Omega$	1.0 $\Omega$	1.0 $\Omega$	4.3 $\Omega$
Bandwidth (-3 dB 50 $\Omega$ system)	1 MHz	2.5 MHz	6 MHz	5 MHz	15 MHz	20 MHz
<b>Transient specification</b>	<b>ESP 06Q</b>	<b>ESP 15Q</b>	<b>ESP 30Q</b>	<b>ESP 50Q</b>	<b>ESP 110Q</b>	<b>ESP TNQ</b>
<b>Let-through voltage (all conductors)<sup>(3)</sup> Up</b>						
C2 test 4 kV 1.2/50 $\mu$ s, 2 kA 8/20 $\mu$ s to BS EN/EN/IEC 61643-21	15.0 V	28.0 V	53.0 V	84.0 V	188 V	395 V
C1 test 1 kV, 1.2/50 $\mu$ s, 0.5 kA 8/20 $\mu$ s to BS EN/EN/IEC 61643-21	12.5 V	26.5 V	48.0 V	76.0 V	175 V	390 V
B2 test 4 kV 10/700 $\mu$ s to BS EN/EN/IEC 61643-21	10.0 V	23.0 V	43.5 V	64.5 V	145 V	298 V
5 kV, 10/700 $\mu$ s <sup>(4)</sup>	10.8 V	26.2 V	44.3 V	65.8 V	150 V	300 V
<b>Maximum surge current</b>						
D1 test 10/350 $\mu$ s to BS EN/EN/IEC 61643-21: – Per signal wire	2.5 kA					
8/20 $\mu$ s to ITU-T K.45:2003, – Per pair	5 kA					
IEEE C62.41.2:2002: – Per signal wire	10 kA					
– Per pair	20 kA					
<b>Mechanical specification</b>	<b>ESP 06Q</b>	<b>ESP 15Q</b>	<b>ESP 30Q</b>	<b>ESP 50Q</b>	<b>ESP 110Q</b>	<b>ESP TNQ</b>
Temperature range	-40 to +80 °C					
Connection type	Pluggable 12 way screw terminal - maximum torque 0.6 Nm					
Conductor size (stranded)	2.5 mm <sup>2</sup>					
Earth connection	Via DIN rail or M5 threaded hole in base of unit					
Case material	FR Polymer UL-94 V-0					
Weight: – Unit	0.1 kg					
– Packaged (each)	0.12 kg					
– Packaged (per 10)	1.3 kg					
Dimensions	See diagram below					

<sup>(1)</sup> Nominal voltage (RMS/DC or AC peak) measured at < 5  $\mu$ A (ESP 15Q, ESP 30Q, ESP 50Q, ESP 110Q) and < 200  $\mu$ A (ESP 06Q)

<sup>(2)</sup> Maximum working voltage (RMS/DC or AC peak) measured at < 5 mA leakage (ESP 15Q, ESP 30Q, ESP 50Q, ESP 110Q) and < 10  $\mu$ A (ESP TNQ)

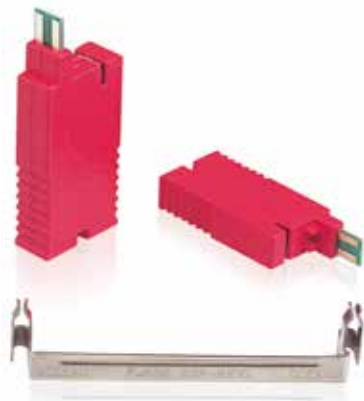
<sup>(3)</sup> The maximum transient voltage let-through of the protector throughout the test ( $\pm 10\%$ ), line to line & line to earth, both polarities. Response time < 10 ns

<sup>(4)</sup> 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)



# Data & signal protection

## ESP KS & KE Series



**LPZ**  
**0→3**

**FULL**  
**MODE**  
Bonding +  
Equipment  
Protection

**SIGNAL/  
TELECOM**  
TEST CAT  
**D + C + B**

**e**  
**ENHANCED**  
Low let-through  
voltage

**CURRENT**  
**RATING**  
**150 mA**

Combined Category D, C, B tested protector (to BS EN 61643) suitable for use on ten line LSA-PLUS disconnection modules to protect individual twisted pair data or signal lines. 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
- Colour of housing distinguishes electrically different protectors to help avoid confusion when installed with other protectors (e.g. the ESP KT1/2) on the same distribution frame
- Protect only the lines you need
- Ridged finger holds make it easy to obtain a firm grip for installation or removal
- Use the ESP KE10 to provide trouble free earthing for up to ten protectors (per disconnection module)

### Application

Use these units to protect signal, data, control and instrumentation systems with LSA-PLUS disconnection modules.

Full product range order codes can be found on pages 17/8-17/9

### Installation

Install protectors on all data communication and signal lines that enter or leave each building. All protectors must be installed via the ESP KE10 earth bar. Identify the lines requiring protection and clip the ESP KE10 on to the disconnection modules' earth points. Plug the protector directly into each disconnection module requiring protection (ensuring the correct orientation) for a series connection.

In the unlikely situation that the protector is damaged, it will sacrifice itself and fail short circuit, taking the line out of commission. In addition to indicating that the protector needs replacing, this will also prevent subsequent transients from damaging the equipment.

**NOTE:** For PSTN and U interface ISDN lines on LSA-PLUS modules, use the ESP KT1 or ESP K10T1. For S/T interface ISDN lines on LSA-PLUS modules, use the ESP KT2 or ESP K10T2. For individual twisted pair data or signal lines, use the ESP D, E or H Series Lightning Barriers. The ESP SL and ESP Q Series Lightning Barriers are suitable for high density data and signal lines.

# Data & signal protection

## ESP KS & KE Series

### ESP KS & KE Series - Technical specification

Electrical specification	ESP KS06	ESP KS15	ESP KS30	ESP KS50	
ABB order code	7TCA085400R0029	7TCA085400R0030	7TCA085400R0032	7TCA085400R0033	
Nominal voltage <sup>(1)</sup>	6 V	15 V	30 V	50 V	
Maximum working voltage U <sub>c</sub> (RMS/DC) <sup>(2)</sup>	5 V / 7.79 V	11 V / 16.7 V	24 V / 33.4 V	41 V / 58 V	
Current rating (signal)	150 mA				
In-line resistance (per line ±10%)	1 Ω	22 Ω	22 Ω	22 Ω	
Bandwidth (-3 dB 50 Ω system)	2 MHz	5 MHz	5 MHz	5 MHz	
Transient specification	ESP KS06	ESP KS15	ESP KS30	ESP KS50	
<b>Let-through voltage (all conductors)<sup>(3)</sup> Up</b>					
C2 test 4 kV 1.2/50 μs, 2 kA 8/20 μs to BS EN/EN/IEC 61643-21	16.0 V	26.5 V	48.0 V	98.0 V	
C1 test 1 kV, 1.2/50 μs, 0.5 kA 8/20 μs to BS EN/EN/IEC 61643-21	14.5 V	24.0 V	46.5 V	84.5 V	
B2 test 4 kV 10/700 μs to BS EN/EN/IEC 61643-21	11.5 V	23.0 V	45.0 V	75.0 V	
5 kV, 10/700 μs <sup>(4)</sup>	12.0 V	24.4 V	48.8 V	80.0 V	
<b>Maximum surge current<sup>(5)</sup></b>					
D1 test 10/350 μs to BS EN/EN/IEC 61643-21: – Per signal wire	1 kA				
8/20 μs to ITU-T K.45:2003, – Per pair	2 kA				
IEEE C62.41.2:2002: – Per signal wire	5 kA				
– Per pair	10 kA				
Mechanical specification	ESP KS06	ESP KS1	ESP KS30	ESP KS50	ESP KE10
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				Stainless Steel
Weight: – Unit	0.01 kg				0.01 kg
– Packaged	0.10 kg (per 10)				0.12 kg (per 10)
Dimensions	See diagram below				

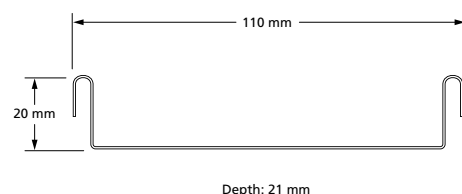
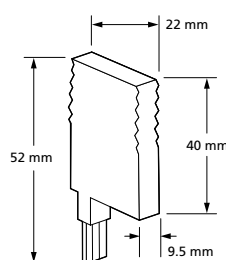
<sup>(1)</sup> Nominal voltage (RMS/DC or AC peak) at 200  $\mu$ A for ESP KS06 and at 5  $\mu$ A for ESP KS15, ESP KS30 and ESP KS50

<sup>(2)</sup> Maximum working voltage (RMS/DC or AC peak) at 10 mA for ESP KS06, at 1 mA for ESP KS15 and ESP KS30, and at 5  $\mu$ A for ESP KS50.

<sup>(3)</sup> The maximum transient voltage let-through of the protector throughout the test ( $\pm 10\%$ ), line to line & line to earth, both polarities. Response time < 10 ns

<sup>(4)</sup> 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)

<sup>(5)</sup> The installation and connections external to the protector may limit the capability of the protector





# Data & signal protection

## ESP PCB/D & PCB/TN Series



**LPZ**  
**0→3**

**FULL**  
**MODE**  
Bonding +  
Equipment  
Protection

**SIGNAL/**  
**TELECOM**  
TEST CAT  
D + C + B

**e**  
**ENHANCED**  
Low let-through  
voltage

**LOW IN-LINE**  
**RESISTANCE**  
**9.4 Ω**

**CURRENT**  
**RATING**  
**300 mA**

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 minimizes 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)

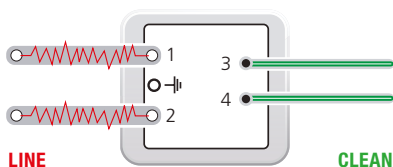
### Installation

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.

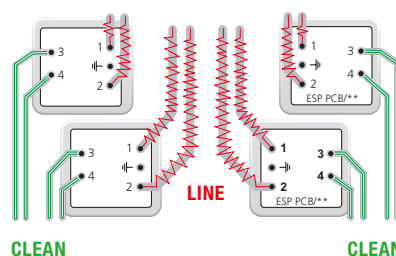
The use of an earth layer or plane is highly recommended as this reduces the electromagnetic field produced by a transient discharging to earth considerably, and hence the chance of the transient being picked up on clean tracks.

**Full product range order codes can be found on pages 17/8-17/9**

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.



# Data & signal protection

## ESP PCB/D & PCB/TN Series

### 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
<b>ABB order code</b>	7TCA085400R0038	7TCA085400R0042	7TCA085400R0154	7TCA085400R0155	7TCA085400R0040	7TCA085400R0157
Nominal voltage <sup>(1)</sup>	6 V	15 V	30 V	50 V	110 V	–
Maximum working voltage $U_c$ (RMS/DC) <sup>(2)</sup>	5 V / 7.79 V	13 V / 19 V	26 V / 37.1 V	41 V / 58 V	93 V / 132 V	– / 296 V
Current rating (signal)	300 mA					
In-line resistance (per line $\pm 10\%$ )	9.4 $\Omega$	9.4 $\Omega$	9.4 $\Omega$	9.4 $\Omega$	9.4 $\Omega$	4.4 $\Omega$
Bandwidth (-3 dB 50 $\Omega$ system)	800 kHz	2.5 MHz	4 MHz	6 MHz	9 MHz	20 MHz
<b>Transient specification</b>	<b>ESP PCB/06D</b>	<b>ESP PCB/15D</b>	<b>ESP PCB/30D</b>	<b>ESP PCB/50D</b>	<b>ESP PCB/110D</b>	<b>ESP PCB/TN</b>
<b>Let-through voltage (all conductors)<sup>(3)</sup> Up</b>						
C2 test 4 kV 1.2/50 $\mu$ s, 2 kA 8/20 $\mu$ s 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 $\mu$ s, 0.5 kA 8/20 $\mu$ s 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 $\mu$ s 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 $\mu$ s <sup>(4)</sup>	10.5 V	23.8 V	43.4 V	74.9 V	150 V	300 V
<b>Maximum surge current<sup>(5)</sup></b>						
D1 test 10/350 $\mu$ s to BS EN/EN/IEC 61643-21: – Per signal wire	2.5 kA					
8/20 $\mu$ s to ITU-T K.45:2003, – Per signal wire	10 kA					
IEEE C62.41.2:2002: – Per pair	20 kA					
<b>Mechanical specification</b>	<b>ESP PCB/D &amp; PCB/TN Series</b>					
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					
Dimensions	See diagram below					

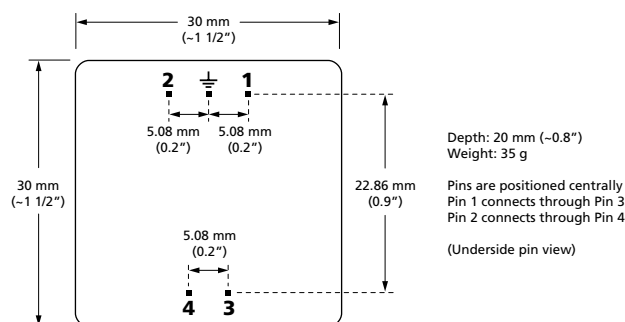
<sup>(1)</sup> Nominal voltage (RMS/DC or AC peak) measured at < 5  $\mu$ A (ESP PCB/15D, ESP PCB/30D, ESP PCB/50D, ESP PCB/110D) and < 200  $\mu$ A (ESP PCB/06D)

<sup>(2)</sup> Maximum working voltage (RMS/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  $\mu$ A (ESP PCB/TN)

<sup>(3)</sup> The maximum transient voltage let-through of the protector throughout the test ( $\pm 10\%$ ), line to line & line to earth, both polarities. Response time < 10 ns

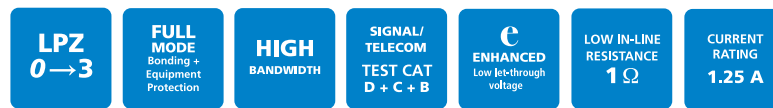
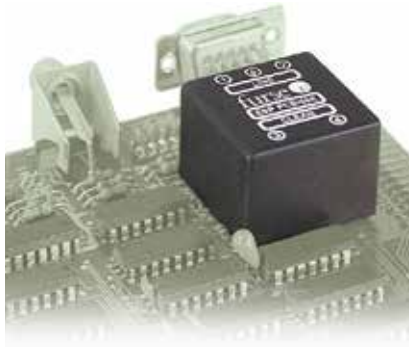
<sup>(4)</sup> Test to IEC 61000-4-5:2006, ITU-T (formerly CCITT) K.20, K.21 and K.45, Telcordia GR-1089-CORE, Issue 2:2002, ANSI TIA/EIA/IS-968-A:2002 (formerly FCC Part 68)

<sup>(5)</sup> The installation and connections external to the protector may limit the capability of the protector



# Data & signal protection

## ESP PCB/E Series



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 125 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

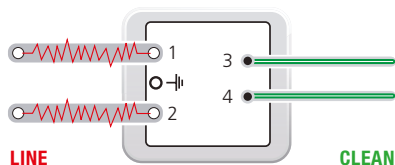
### Installation

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.

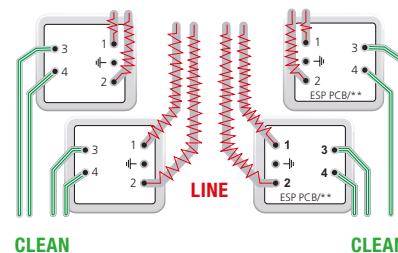
The use of an earth layer or plane is highly recommended as this reduces the electromagnetic field produced by a transient discharging to earth considerably, and hence the chance of the transient being picked up on clean tracks.

**Full product range order codes can be found on pages 17/8-17/9**

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.



# Data & signal protection

## ESP PCB/E Series

### 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 <sup>(1)</sup>	6 V	15 V	30 V	50 V	110 V
Maximum working voltage U <sub>c</sub> (RMS/DC) <sup>(2)</sup>	5 V / 7.79 V	11 V / 16.7 V	25 V / 36.7 V	40 V / 56.7 V	93 V / 132 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
<b>Let-through voltage (all conductors)<sup>(3)</sup> Up</b>					
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 <sup>(4)</sup>	17.0 V	26.2 V	44.3 V	65.8 V	165 V
<b>Maximum surge current<sup>(5)</sup></b>					
D1 test 10/350 μs to BS EN/EN/IEC 61643-21: – Per signal wire	2.5 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 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				
Dimensions	See diagram below				

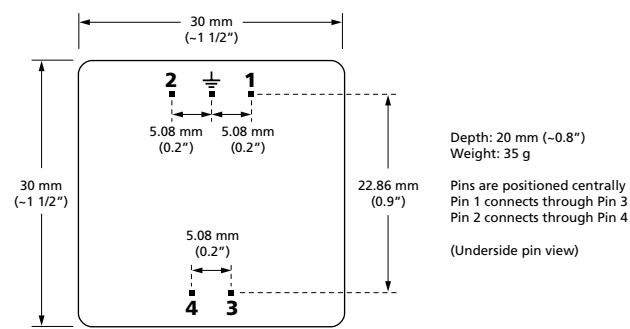
<sup>(1)</sup> Nominal voltage (RMS/DC or AC peak) measured at < 10 μA (ESP PCB/15E, ESP PCB/30E, ESP PCB/50E, ESP PCB/110E) and < 200 μA (ESP PCB/06E)

<sup>(2)</sup> Maximum working voltage (RMS/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)

<sup>(3)</sup> 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

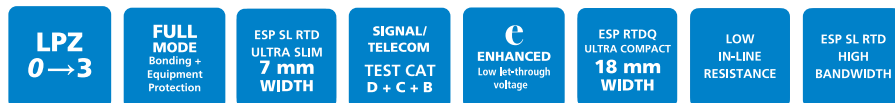
<sup>(4)</sup> Test to IEC 61000-4-5:2006, ITU-T (formerly CCITT) K.20, K.21 and K.45, Telcordia GR-1089-CORE, Issue 2:2002, ANSI TIA/EIA/IS-968-A:2002 (formerly FCC Part 68).

<sup>(5)</sup> The installation and connections external to the protector may limit the capability of the protector



# Data & signal protection

## ESP RTD, RTDQ & SL RTD Series



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 minimizes 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

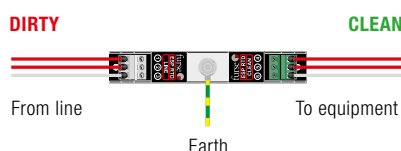
**CME 8** For up to 8 x ESP RTD

**CME 16** For up to 16 x ESP RTD

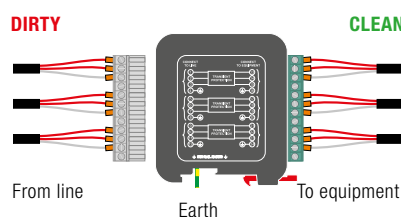
**CME 32** For up to 32 x ESP RTD

Full product range order codes can be found on pages 17/8-17/9

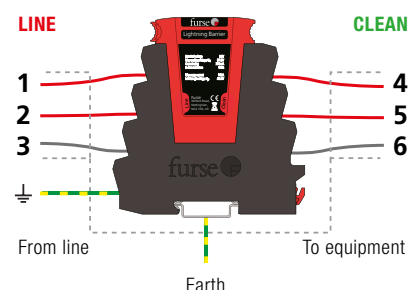
ESP RTD installed in series



ESP RTDQ installed in series (in-line)



ESP SL RTD installed in series



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



# Data & signal protection

## ESP RTD, RTDQ & SL RTD Series

### ESP RTD, RTDQ & SL RTD Series - Technical specification

Electrical specification	ESP RTD	ESP SL RTD	ESP RTDQ
<b>ABB order code</b>	7TCA085460R0157	7TCA085400R0232	7TCA085400R0158
Nominal voltage <sup>(1)</sup>	6 V		
Maximum working voltage $U_c$ (RMS/DC) <sup>(2)</sup>	5 V / 7.79 V		
Current rating (signal)	200 mA	500 mA	700 mA
In-line resistance (per line $\pm 10\%$ )	10 $\Omega$	1.0 $\Omega$	1.0 $\Omega$
Bandwidth (-3 dB 50 $\Omega$ system)	800 kHz	1.5 MHz	800 kHz
Transient specification	ESP RTD	ESP SL RTD	ESP RTDQ
<b>Let-through voltage (all conductors)<sup>(3)</sup> Up</b>			
C2 test 4 kV 1.2/50 $\mu$ s, 2 kA 8/20 $\mu$ s to BS EN/EN/IEC 61643-21	12.0 V	17.9 V	15.0 V
C1 test 1 kV, 1.2/50 $\mu$ s, 0.5 kA 8/20 $\mu$ s to BS EN/EN/IEC 61643-21	11.5 V	12.1 V	12.5 V
B2 test 4 kV 10/700 $\mu$ s to BS EN/EN/IEC 61643-21	10.0 V	11.0 V	10.0 V
5 kV, 10/700 $\mu$ s <sup>(4)</sup>	10.5 V	11.3 V	10.5 V
<b>Maximum surge current</b>			
D1 test 10/350 $\mu$ s to BS EN/EN/IEC 61643-21:	2.5 kA	1.25 kA	2.5 kA
– Per signal wire	5 kA	2.5 kA	5 kA
8/20 $\mu$ s to ITU-T K.45:2003,	10 kA		
– Per signal wire	20 kA		
IEEE C62.41.2:2002:			
– Per pair			
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 mm <sup>2</sup>	4 mm <sup>2</sup>	2.5 mm <sup>2</sup>
Earth connection	M6 stud - max. torque 0.5 Nm	Via DIN rail or 4 mm <sup>2</sup> 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: – Unit	0.08 kg	0.08 kg	0.1 kg
– Packaged (per 10)	0.85 kg	0.85 kg	1.3 kg
Dimensions	See diagram below		

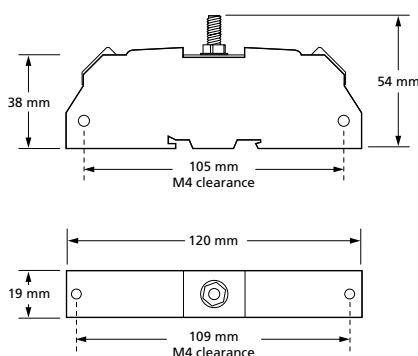
<sup>(1)</sup> Nominal voltage (RMS/DC or AC peak) measured at < 200  $\mu$ A

<sup>(2)</sup> Maximum working voltage (RMS/DC or AC peak) measured at < 10 mA

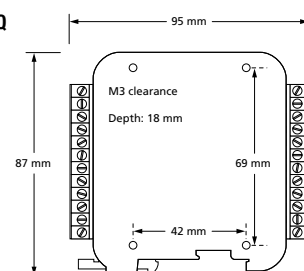
<sup>(3)</sup> The maximum transient voltage let-through of the protector throughout the test ( $\pm 10\%$ ), line to line & line to earth, both polarities. Response time < 10 ns

<sup>(4)</sup> 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)

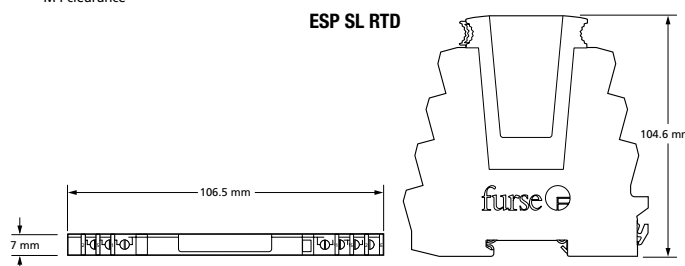
ESP RTD



ESP RTDQ



ESP SL RTD



# Data & signal protection

## ESP RS485, RS485Q & SL RS485 Series



Combined Category D, C, B tested protector (to BS EN 61643) specifically designed for RS 485 and Fieldbus applications, such as Profibus DP. For use at boundaries up to LPZ 0 (ESP RS485 & ESP RS485Q), or LPZ 0 (ESP SL RS485) 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 minimizes 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
- 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

### Application

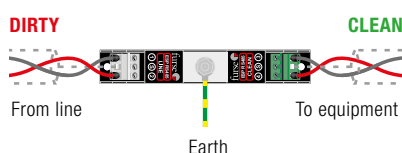
Connect in series with the signal line either near where it enters or leaves the building or close to the equipment being protected ensuring it is very close to the system's earth star point. Install protectors either within an existing cabinet/cubicle or in a separate enclosure.

### Accessories

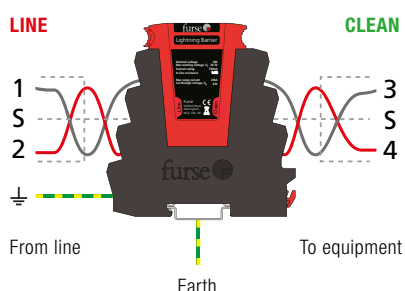
Replacement module for ESP SL RS485:	Combined Mounting/Earthing kits for ESP RS485:
<b>ESP SLRS485/M</b>	<b>CME 4</b> For up to 4 x ESP RS485
Standard module replacement	<b>CME 8</b> For up to 8 x ESP RS485
<b>ESP SLRS485/B</b>	<b>CME 16</b> For up to 16 x ESP RS485
Base replacement	<b>CME 32</b> For up to 32 x ESP RS485

Full product range order codes can be found on pages 17/8-17/9

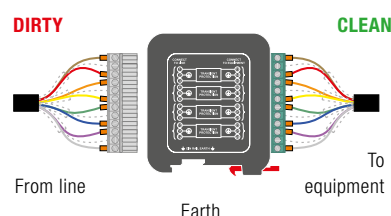
ESP RS485 installed in series



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.

# Data & signal protection

## ESP RS485, RS485Q & SL RS485 Series

### ESP RS485, RS485Q & SL RS485 Series - Technical specification

Electrical specification	ESP RS485	ESP SL RS485	ESP RS485Q	
ABB order code	7TCA085400R0191	7TCA085400R0193	7TCA085400R0192	
Nominal voltage <sup>(1)</sup>	15 V			
Maximum working voltage <i>U</i> <sub>c</sub> (RMS/DC) <sup>(2)</sup>	11 V / 16.7 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) <sup>(3)</sup> Up				
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 <sup>(4)</sup>	28.2 V			
Maximum surge current				
D1 test 10/350 μs to BS EN/EN/IEC 61643-21:	– Per signal wire	2.5 kA	1.25 kA	2.5 kA
8/20 μs to ITU-T K.45:2003, IEEE C62.41.2:2002:	– Per pair	5 kA	2.5 kA	5 kA
	– Per signal wire	10 kA		
	– Per pair	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: – Unit	0.08 kg		0.1 kg	
– Packaged (per 10)	0.85 kg		1.3 kg	
Dimensions	See diagram below			

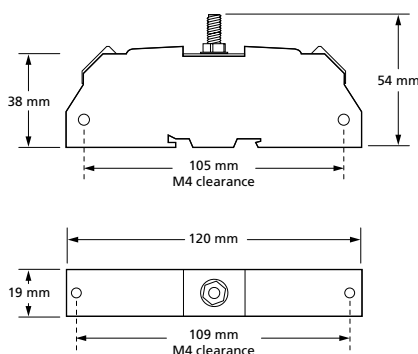
<sup>(1)</sup> Nominal voltage (RMS/DC or AC peak) measured at < 10  $\mu$ A

<sup>(2)</sup> Maximum working voltage (RMS/DC or AC peak) measured at < 5 mA

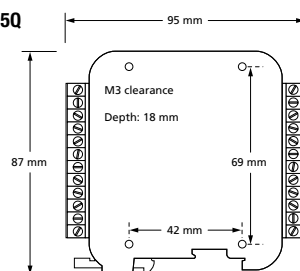
<sup>(3)</sup> The maximum transient voltage let-through of the protector throughout the test ( $\pm 10\%$ ), line to line & line to earth, both polarities. Response time < 10 ns

<sup>(4)</sup> 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)

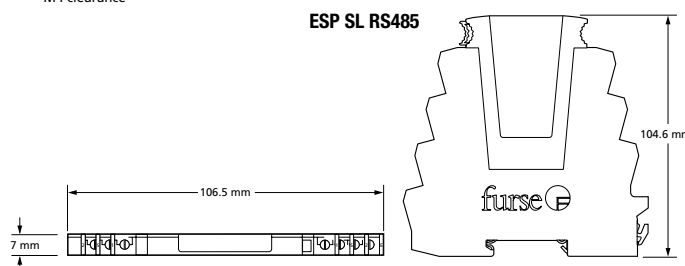
ESP RS485



ESP RS485Q



ESP SL RS485



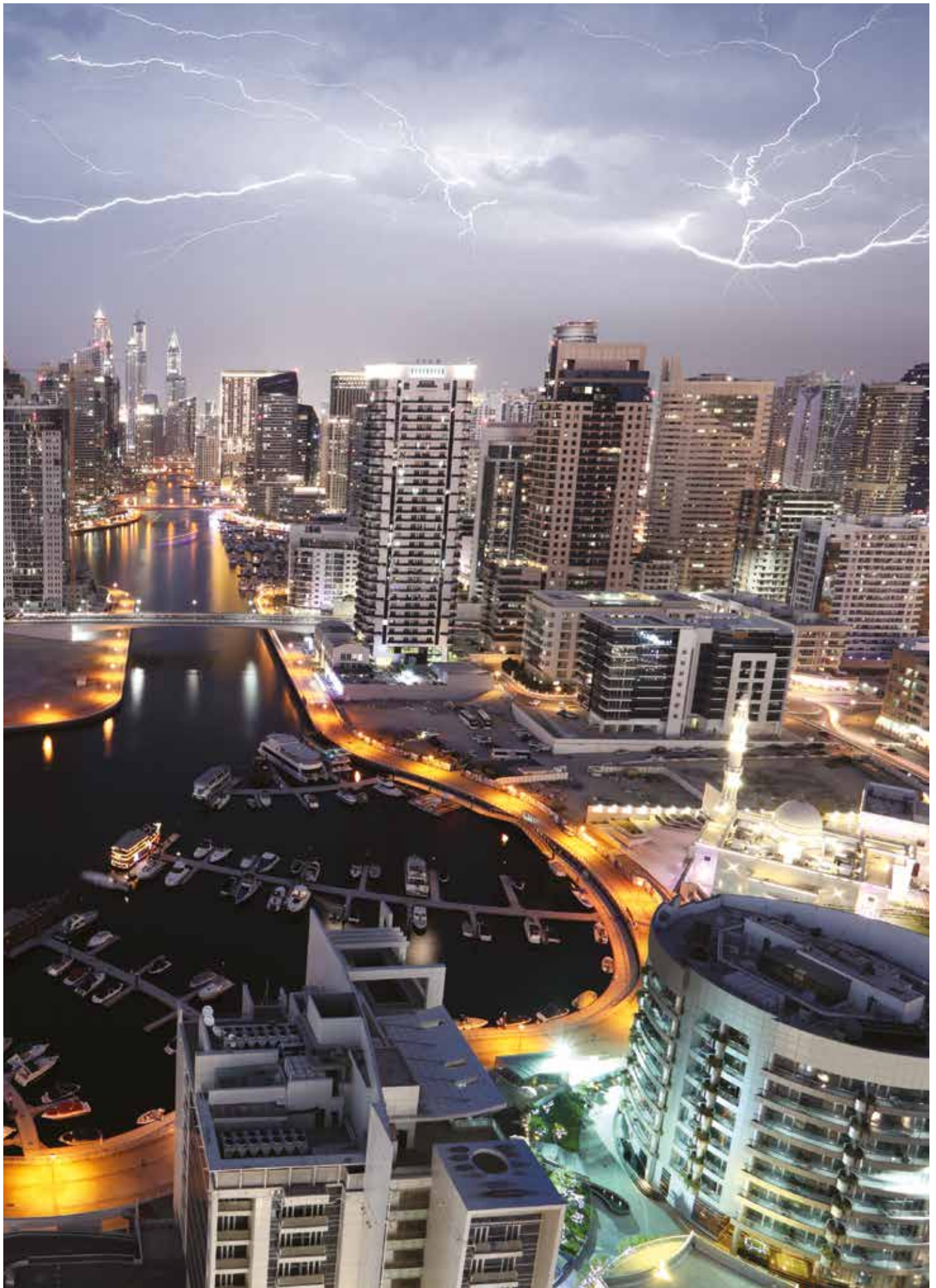


# Electronic systems protection

## Telecoms & computer line protection





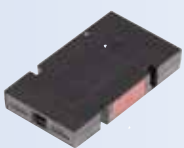

Telecoms & computer line protection	
Product selector - Telecommunication / Computer systems	13/2
ESP TN/JP, TN/RJ11 & ISDN/RJ45 Series	13/4
ESP KT & KE Series	13/6
ESP Cat-5 & Cat-6 Series	13/8
ESP LA & LB Series	13/10
ESP LN Series	13/12








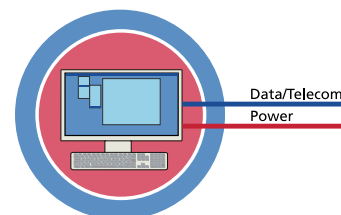
# Telecoms & computer line protection

## Product selector - Telecommunications / Computer systems

Selection guide - Telecommunications /Computer systems		Installation locations
Common applications	Service entrance	Critical terminal equipment - located >20 m from service entrance
<p>Analogue Telecom systems Twisted pair data protection see Furse Application Note AN005) Standard, for twisted pair lines</p>	 <p><b>ESP TN Series</b> <b>ESP TN/BX Series</b> <b>ESP TN/2BX Series</b> See pages 12/4 &amp; 12/10</p>	 <p><b>ESP MC/TN/RJ11 Series</b> e.g. Fax machines / Modems See page 12/24</p>
<p>Compact, ideal where space is a premium</p>	 <p><b>ESP SL TN Series</b> See page 12/12</p>	
<p>Multiple line protection in a single unit</p>	 <p><b>ESP TNQ Series</b> See page 12/20</p>	
<p>For BT type socket systems</p>	 <p><b>ESP TN/JP Series</b> See page 13/4</p>	
<p>For PBX systems terminating of LSA-Plus disconnection modules</p>	 <p><b>ESP KT Series</b> See page 13/6</p>	

### Protectors for specific systems

System	Protector
<p>ISDN telecom systems see Furse Application Note, Note AN002, AN005)</p>	  <p><b>ESP KT2 Series</b> <b>ESP ISDN Series</b> See pages 13/6 &amp; 13/4</p>
<p>Coaxial CCTV systems</p>	 <p><b>ESP CCTV/B Series</b> See pages 4/14</p>
<p>Cable TV systems (see Furse Application Note AN006)</p>	 <p><b>ESP TV Series</b> See pages 14/12</p>
<p>Telecom interfaces at PCB level (see Furse Application Note AN003)</p>	 <p><b>ESP PCB Series</b> See pages 12/24 &amp; 12/26</p>



**WARNING** Equipment is **ONLY** protected if all incoming lines have protection fitted

# Telecoms & computer line protection

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



**LPZ**  
0→3

**FULL MODE**  
Bonding +  
Equipment  
Protection

**SIGNAL/  
TELECOM**  
TEST CAT  
D + C + B

**ENHANCED**  
Low let-through  
voltage

**LOW IN-LINE  
RESISTANCE**  
4.4 Ω

**CURRENT  
RATING**  
300 mA

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

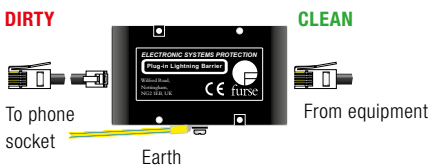
Connect in series with the telephone or ISDN line. These units are usually installed close to the equipment being protected and within a short distance of a good electrical earth.

### Accessories

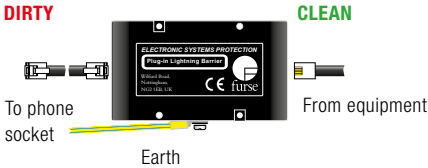
**ESP CAT5e/UTP-1**  
1 metre cable with RJ45 connections

Full product range order codes can be found on pages 17/8-17/9

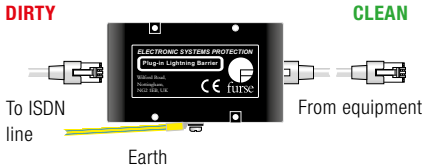
#### Plug-in series connection for ESP TN/JP



#### 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.



# Telecoms & computer line protection

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

### ESP TN/JP, TN/RJ11 & ISDN/RJ45 Series - Technical 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	
Electrical specification							
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 <sup>(2)</sup>	
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 $\pm 10\%$ )	4.4 $\Omega$						
Bandwidth (-3 dB 50 $\Omega$ 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) <sup>(3)</sup> Up							
C2 test 4 kV 1.2/50 $\mu$ s, 2 kA 8/20 $\mu$ s to BS EN/EN/IEC 61643-21	– line to line	395 V	395 V	395 V	395 V	28 V	28 V/88 V <sup>(5)</sup>
BS EN/EN/IEC 61643-21	– line to earth	395 V	395 V	395 V	395 V	88 V	88 V
C1 test 1 kV, 1.2/50 $\mu$ s, 0.5 kA 8/20 $\mu$ s to BS EN/EN/IEC 61643-21	– line to line	390 V	390 V	390 V	390 V	23 V	23 V/63 V <sup>(5)</sup>
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 $\mu$ s to BS EN/EN/IEC 61643-21	– line to line	298 V	298 V	298 V	298 V	26 V	26 V/65 V <sup>(5)</sup>
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 $\mu$ s <sup>4</sup>	– line to line	300 V	300 V	300 V	300 V	27 V	27 V/80 V <sup>(5)</sup>
	– line to earth	300 V	300 V	300 V	300 V	80 V	80 V
Maximum surge current <sup>(6)</sup>							
D1 test 10/350 $\mu$ s to BS EN/EN/IEC 61643-21	1 kA						
8/20 $\mu$ s 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	Standard BT jack plug and socket (to BS 6312)	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: – Unit	0.15 kg						
– Packaged	0.2 kg						
Dimensions	See diagram below						

<sup>(1)</sup> Maximum working voltage (DC or AC peak) measured at < 10  $\mu$ A leakage for ESP TN/JP and ESP TN/RJ11 products and  $\mu$ A for ESP ISDN/RJ45 products

<sup>(2)</sup> Maximum working voltage is 5 V for pairs 3/6 & 4/5, and 58 V for pairs 1/2 & 7/8

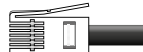
<sup>(3)</sup> The maximum transient voltage let-through of the protector throughout the test ( $\pm 10\%$ ), line to line & line to earth, both polarities. Response time < 10 ns

<sup>(4)</sup> 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)

<sup>(5)</sup> The first let-through voltage value is for pairs 3/4 & 5/6, and the second value is for pairs 1/2 & 7/8

<sup>(6)</sup> The installation and connectors external to the protector may limit the capability of the protector

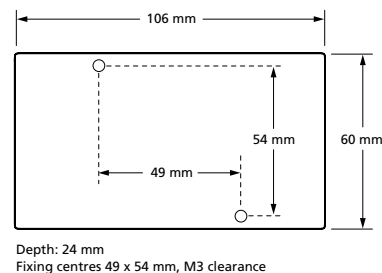
ESP TN/JP  
cable length: 1 m



ESP ISDN/RJ45-4/8, 8/8  
cable length: 0.5 m

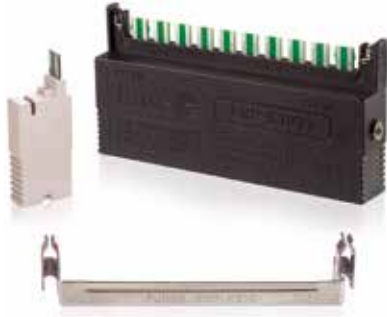


ESP TN/RJ11-2/6, 4/6, 6/6  
cable length: 1 m



# Telecoms & computer line protection

## ESP KT & KE Series



**LPZ**  
**0→3**

**FULL**  
**MODE**  
Bonding &  
Equipment  
Protection

**SIGNAL/**  
**TELECOM**  
**TEST CAT**  
**D + C + B**

**e**  
**ENHANCED**  
Low let-through  
voltage

**HIGH**  
**BANDWIDTH**

**LOW IN-LINE**  
**RESISTANCE**  
**4.4 Ω**

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
- Colour of housing distinguishes electrically different protectors - avoids confusion when installed together on the same distribution frame
- 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
- At larger installations ESP K10T1/2 and ESP K10T1/PTC provide all in one protection for all ten lines on LSA-PLUS disconnection modules
- Use the ESP KE10 to provide trouble free earthing for up to ten ESP KT1/2 and ESP KT1/PTC (per disconnection module)
- ESP K10T1/2 and ESP K10T1/PTC have an integral earth connection, and an external M4 earth bush for use with non-metallic LSA-Plus frames
- ESP KT1/PTC and ESP K10T1/PTC have resettable overcurrent protection and are rated for power cross faults
- ESP KT1, ESP KT1/PTC, ESP K10T1 and ESP K10T1/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, use ESP KT1 (or ESP KT1/PTC) and ESP K10T1 (or ESP K10T1/PTC)
- For S/T interface ISDN lines, use ESP KT2 and ESP K10T2
- Protect single lines with ESP KT1, ESP KT2 or ESP KT1/PTC
- Protect all ten lines on a disconnection module with ESP K10T1/2

Full product range order codes can be found on pages 17/8-17/9

### 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. Plug ESP K10T1/2 directly into each disconnection module requiring protection.

ESP KT1/2 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 KT1/2 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 protectors.



# Telecoms & computer line protection

## ESP KT & KE Series

### ESP KT & KE Series - Technical specification

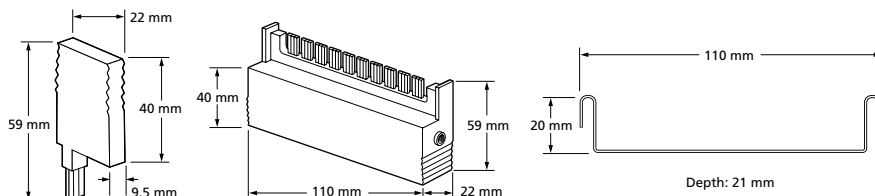
Electrical specification		ESP KT1	ESP KT1/PTC	ESP KT2	ESP K10T1	ESP K10T1/PTC	ESP K10T2
ABB order code		7TCA085400R0135	7TCA085400R0034	7TCA085400R0136	7TCA085400R0130	7TCA085400R0131	7TCA085400R0133
Maximum working voltage $U_c^{(1)}$	– line to line	296 V	296 V	5 V	296 V	296 V	5 V
	– line to earth	296 V	296 V	58 V	296 V	296 V	58 V
Current rating (signal)		300 mA	145 mA	300 mA	300 mA	145 mA	300 mA
In-line resistance (per line $\pm 10\%$ )		4.4 $\Omega$					
Bandwidth ( $\sim 3$ dB 50 $\Omega$ system)		20 MHz	20 MHz	20 MHz	20 MHz	19 MHz	19 MHz
Transient specification		ESP KT1	ESP KT1/PTC	ESP KT2	ESP K10T1	ESP K10T1/PTC	ESP K10T2
Let-through voltage (all conductors) <sup>(2)</sup> Up							
C2 test 4 kV 1.2/50 $\mu$ s, 2 kA 8/20 $\mu$ s to BS EN/EN/IEC 61643-21	– line to line	395 V	395 V	28 V	395 V	395 V	28 V
	– line to earth	395 V	395 V	88 V	395 V	395 V	88 V
C1 test 1 kV, 1.2/50 $\mu$ s, 0.5 kA 8/20 $\mu$ s to BS EN/EN/IEC 61643-21	– line to line	390 V	390 V	23 V	390 V	390 V	23 V
	– line to earth	390 V	390 V	63 V	390 V	390 V	63 V
B2 test 4 kV 10/700 $\mu$ s to BS EN/EN/IEC 61643-21	– line to line	298 V	298 V	26 V	298 V	298 V	26 V
	– line to earth	298 V	298 V	65 V	298 V	298 V	65 V
5 kV, 10/700 $\mu$ s <sup>(3)</sup>	– line to line	300 V	300 V	27 V	300 V	27 V	27 V
	– line to earth	300 V	300 V	80 V	300 V	80 V	80 V
Maximum surge current <sup>(4)</sup>							
D1 test 10/350 $\mu$ s to BS EN/EN/IEC 61643-21:	– line to line	1 kA					
	– line to earth	2 kA					
8/20 $\mu$ s to ITU-T K.45:2003, IEEE C62.41.2:2002:	– line to line	5 kA					
	– line to earth	10 kA					
Power Faults specification		ESP KT1	ESP KT1/PTC	ESP KT2	ESP K10T1	ESP K10T1/PTC	ESP K10T2
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)	–	–	110/230 Vac (15 min)	–
Power induction		–	600 V, 1 A (0.2 sec)	–	–	600 V, 1 A (0.2 sec)	–
Mechanical specification		ESP KT1, ESP KT2, ESP KT1/PTC		ESP K10T1, ESP K10T2, ESP K10T1/PTC		ESP KE10	
Temperature range		-40 to +80 °C				–	
Connection type		To LSA-PLUS disconnection modules (BT part number 237A)				–	
Earth connection		Via ESP KE10 earth bar		Via integral earth clip/external M4 bush		–	
Material		FR Polymer UL-94 V-0				Stainless Steel	
Weight:	– Unit	0.01 kg		0.10 kg		0.01 kg	
	– Packaged	0.12 kg (per 10)		0.12 kg		0.10 kg (per 10)	
Dimensions		See diagram below					

<sup>(1)</sup> Maximum working voltage (DC or AC peak) at 10  $\mu$ A for ESP KT1, ESP KT1/PTC, ESP K10T1, ESP K10T1/PTC and at 5  $\mu$ A for ESP KT2 and ESP K10T2

<sup>(2)</sup> The maximum transient voltage let-through of the protector throughout the test ( $\pm 10\%$ ), line to line & line to earth, both polarities. Response time < 10 ns

<sup>(3)</sup> 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)

<sup>(4)</sup> The installation and connections external to the protector may limit the capability of the protector



# Telecoms & computer line protection

## ESP Cat-5 & Cat-6 Series



LPZ  
0→3

FULL  
MODE  
Bonding +  
Equipment  
Protection

SIGNAL/  
TELECOM  
TEST CAT  
D + C + B

ENHANCED  
Low let-through  
voltage

LOW IN-LINE  
RESISTANCE  
1.5 Ω

HIGH  
CURRENT  
RATING

PoE+  
Compliant  
IEEE 802.3at

PoE  
Modes  
A & B

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 minimizes 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.

### 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 100baseT networks with Cat-5/Cat-5e cabling use ESP Cat-5e
- To protect up to 1000baseT/ 10GbaseT networks with Cat-6/Cat-6A cabling use ESP Cat-6

- To protect up to 100baseT Power over Ethernet (PoE) networks with Cat-5/Cat-5e use ESP Cat-5e/PoE
- 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 AN004 (contact us for a copy).

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### 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 CAT5e/UTP-1

1 metre cable with unshielded RJ45 connections

#### ESP CAT6/STP-2

2 metre screened cable with shielded RJ45 connections

Full product range order codes can be found on pages 17/8-17/9

### 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:** To protect datacomms systems based on twisted pairs, use the ESP D, E or H Series. Local protection for networked equipment is also available. For protection of legacy coaxial Ethernet networks, please contact us for details of our ESP ThinNet and ESP ThickNet protectors.

# Telecoms & computer line protection

## ESP Cat-5 & Cat-6 Series

### ESP Cat-5 & Cat-6 Series - Technical specification

Electrical Specification		ESP Cat-5e	ESP Cat-5e/PoE	ESP Cat-6	ESP Cat-6/PoE
ABB order code		7TCA085400R0017	7TCA085400R0021	7TCA085400R0023	7TCA085400R0024
Maximum working voltage $U_c^{(1)}$	– data <sup>(2)</sup>	5 V			
	– power <sup>(3)</sup>	–	58 V	–	58 V
Current rating		300 mA	600 mA <sup>(4)</sup>	300 mA	600 mA <sup>(4)</sup>
In-line resistance (per line $\pm 25\%$ )	– data <sup>(2)</sup>	1.5 $\Omega$			
	– power	–	1.5 $\Omega$	–	–
Maximum data rate		100 Mbps	100 Mbps	1000 Mbps	1000 Mbps
Networking standards:		10/100baseT	10/100baseT	10/100/1000/10GbaseT	10/100/1000/10GbaseT
		TIA Cat-5e	TIA Cat-5/PoE	TIA Cat-6	TIA Cat-6
		IEEE 802.3i	IEEE 802.3i	IEEE 802.3i	IEEE 802.3i
		IEEE 802.3u	IEEE 802.3u	IEEE 802.3u	IEEE 802.3u
		–	IEEE 802.3af	IEEE 802.3ab	IEEE 802.3ab
		–	IEEE 802.3at	IEEE 802.3an	IEEE 802.3an
		–	–	–	IEEE 802.3af
		–	–	–	IEEE 802.3at
Transient specification		ESP Cat-5e	ESP Cat-5e/PoE	ESP Cat-6	ESP Cat-6/PoE
Let-through voltage (all conductors) <sup>(6)</sup> Up					
C2 test 4 kV 1.2/50 $\mu$ s, 2 kA 8/20 $\mu$ s to BS EN/EN/IEC 61643-21	– line to line	120 V	120 V/116 V <sup>(8)</sup>	120 V	120 V/116 V <sup>(8)</sup>
	– line to earth <sup>(6)</sup>	700 V			
C1 test 1 kV, 1.2/50 $\mu$ s, 0.5 kA 8/20 $\mu$ s to BS EN/EN/IEC 61643-21	– line to line	74 V	74 V/95 V <sup>(8)</sup>	74 V	74 V/95 V <sup>(8)</sup>
	– line to earth <sup>(6)</sup>	600 V			
B2 test 4 kV 10/700 $\mu$ s to BS EN/EN/IEC 61643-21	– line to line	21 V	21 V/87 V <sup>(8)</sup>	21 V	21 V/87 V <sup>(8)</sup>
	– line to earth <sup>(6)</sup>	550 V			
5 kV, 10/700 $\mu$ s <sup>(7)</sup>	– line to line	25 V	25 V/90 V <sup>(8)</sup>	25 V	25 V/90 V <sup>(8)</sup>
	– line to earth <sup>(6)</sup>	600 V			
Maximum surge current <sup>(9)</sup>					
D1 test 10/350 $\mu$ s to BS EN/EN/IEC 61643-21		1 kA			
8/20 $\mu$ s to ITU-T K.45:2003, IEEE C62.41.2:2002		10 kA			
Mechanical specification		ESP Cat-5e, ESP Cat-5e/PoE		ESP Cat-6, ESP Cat-6/PoE	
Temperature range		-40 to +80 °C			
Connection type		RJ45 sockets			
Cable (supplied)		0.5 m Cat-5e UTP patch lead		0.5 m Cat-6 STP patch lead	
Earth connection		M4/DIN rail			
Case Material		FR Polymer UL-94 V-0			
Weight: – Unit		0.15 kg			
– Packaged		0.2 kg			
Dimensions		See diagram below			

<sup>(1)</sup> Maximum working voltage (DC or AC peak) measured at 1 mA leakage

<sup>(2)</sup> Data pairs 1/2 and 3/6 are protected as standard. Pairs 4/5 and 7/8 are also protected on Cat-6 barriers

<sup>(3)</sup> PoE protectors transmit power Mode A and Mode B power

<sup>(4)</sup> Based on 30W of transmitted PSE power, to IEEE 802.3at.

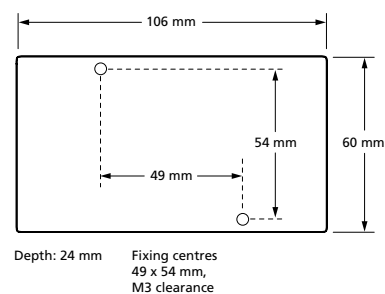
<sup>(5)</sup> The maximum transient voltage let-through of the protector throughout the test ( $\pm 10\%$ ), line to line & line to earth. Response time <10 ns (on all protected pairs)

<sup>(6)</sup> 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

<sup>(7)</sup> Test to IEC 61000-4-5:2014, ITU-T (formerly CCITT) K.20, K.21 and K.45, Telcordia GR-1089-CORE, Issue 6:2011, ANSI TIA/EIA/IS-968-A:2005 (formerly FCC Part 68).

<sup>(8)</sup> The first number is for the data pair, with the second number for the power pair

<sup>(9)</sup> The installation and connectors may limit the capability of the protector



# Telecoms & computer line protection

## ESP LA & LB Series



Combined Category C, B tested protector (to BS EN 61643) suitable to protect PCs and other computer equipment on systems using 9, 15 or 25 pins. For use on lines running within buildings at boundaries up to LPZ 2 through to LPZ 3 to protect sensitive electronic equipment.

### Features & benefits

- Let-through voltage below equipment susceptibility levels
- Negligible in-line resistance
- Suitable for equipment using “D” connectors - DB-9, DB-15 and DB-25
- ESP LA-5/25 protects pins 1, 2, 3, 7 & 20 to earth/shell. Note pin 1 is connected to earth
- ESP LA-25/25 and ESP LB-25/25 protects all pins. Note pin 1 is connected to earth/shell
- ESP LA-9/9, ESP LB-9/9, ESP LA-15/15 and ESP LB-15/15 protect all pins
- Sturdy plastic housing
- Male/female connectors allow easy plug-in installation without rewiring
- Earthed via shell and supplementary earth strap

### Application

Use on cables running within a building to protect equipment locally from transients induced on to data cables from the magnetic field caused by a lightning strike.

- For Asynchronous RS 232 systems, use ESP LA-5/25
- For RS 232 systems, use ESP LA-25/25, ESP LA-9/9 or ESP LA-15/15
- For RS 422, RS 423 and RS 485 systems, use ESP LB-9/9, ESP LB-15/15 or ESP LB-25/25

### Installation

Simple plug-in connection to the communication port, between the equipment to be protected and its incoming data cable. Make suitable attachment to earth.

**Full product range order codes can be found on pages 17/8-17/9**

**TECHNICAL NOTE:** ESP LA... and ESP LB... protectors are designed only for use on cables running within a building (typically LPZ 2) to offer local protection to equipment. They therefore will not be able to handle the higher level transients that occur when lines between buildings are protected. ESP LA... and ESP LB... protectors should not be used in such an application (up to LPZ 0) where high energy ESP lightning barriers (such as ESP E Series) should be employed. If they are used in lines between buildings, there is a high risk of the protector being overloaded and destroyed during transient activity. Connected equipment will, in most cases, still be protected, but there is a small risk that equipment will suffer damage in such circumstances.

**NOTE:** For cabling up to Cat-6 with RJ45 connections (running external to the building) and local protection for up to Cat-6 with RJ45 connections, (running within a building) products are also available. For protection of legacy coaxial Ethernet networks, please contact us for details of our ESP ThinNet and ESP ThickNet protectors.

# Telecoms & computer line protection

## ESP LA & LB Series

### ESP LA & LB Series - Technical specification

Electrical specification	ESP LA-5/25	ESP LA-25/25	ESP LA-9/9	ESP LB-9/9	ESP LA-15/15	ESP LB-15/15	ESP LB-25/25
<b>ABB order code</b>	7TCA085400R0139	7TCA085400R0138	7TCA085400R0140	7TCA085400R0143	7TCA085400R0137	7TCA085400R0141	7TCA085400R0142
Nominal voltage <sup>(1)</sup>	23.1 V	23.1 V	23.1 V	5.8 V	15.3 V	6.4 V	5.8 V
Maximum working voltage $U_c$ (RMS/DC) <sup>(2)</sup>	25.7 V	25.7 V	25.7 V	6.4 V	17.1 V	7.13 V	6.4 V
Capacitance	< 500 pF	< 500 pF	< 500 pF	< 2000 pF	< 50 pF	< 50 pF	< 2000 pF
Current rating	300 mA						
In-line resistance	~ 0 $\Omega$						
Transient specification	ESP LA-5/25	ESP LA-25/25	ESP LA-9/9	ESP LB-9/9	ESP LA-15/15	ESP LB-15/15	ESP LB-25/25
<b>Let-through voltage<sup>(3)</sup> Up</b>							
C2 test 4 kV 1.2/50 $\mu$ s, 2 kA 8/20 $\mu$ s to BS EN/EN/IEC 61643-21	–	–	–	12.5 V	31.5 V	16.0 V	12.5 V
B2 test 1 kV 10/700 $\mu$ s to BS EN/EN/IEC 61643-21	36.5 V	36.5 V	36.5 V	10.0 V	27.5 V	14.0 V	10.0 V
5 kV, 10/700 $\mu$ s <sup>(4)</sup>	37.5 V	37.5 V	37.5 V	10.5 V	28.5 V	14.6 V	10.5 V
Protection provided	Pins 1, 2, 3, 7 and 20 to earth/shell <sup>(5)</sup>	Pins 1-25 to earth/shell <sup>(5)</sup>	Pins 1-9 to earth/shell	Pins 1-9 to earth/shell	Pins 1-15 to earth and each other	Pins 1-15 to earth and each other	Pins 1-25 to earth/shell <sup>(5)</sup>
<b>Maximum surge current</b>							
8/20 $\mu$ s to ITU-T K.45:2003, IEEE C62.41.2:2002	200 A	200 A	200 A	300 A	350 A	700 A	300 A
Mechanical specification	ESP LA-5/25	ESP LA-25/25	ESP LA-9/9	ESP LB-9/9	ESP LA-15/15	ESP LB-15/15	ESP LB-25/25
Temperature range	-40 to +80 °C						
Connection type	DB-25 m-f	DB-25 m-f	DB-9 m-f	DB-9 m-f	DB-15 m-f	DB-15 m-f	DB-25 m-f
Earth connection	Shell or 150 mm earth lead (supplied)						
Case Material	FR Polymer UL-94 V-0						
Weight: – Unit	50 g	50 g	40 g	40 g	50 g	50 g	50 g
– Packaged	70 g	70 g	50 g	50 g	60 g	60 g	70 g
Dimensions	See diagram below						

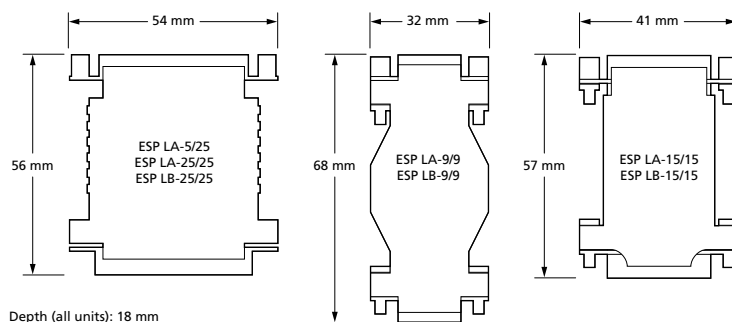
<sup>(1)</sup> Nominal voltage (RMS/DC or AC peak) measured at 5  $\mu$ A (ESP LA-5/25, ESP LA-9/9, ESP LA-25/25, ESP LA-15/15), 0.5 mA (ESP LB-15/15) and 1 mA (ESP LB-9/9, ESP LB-25/25)

<sup>(2)</sup> Maximum working voltage (RMS/DC or AC peak) measured at 1 mA leakage (ESP LA-5/25, ESP LA-9/9, ESP LA-25/25, ESP LA-15/15) and 10 mA (ESP LB-15/15, ESP LB-9/9 and ESP LB-25/25)

<sup>(3)</sup> The maximum transient voltage let-through of the protector throughout the test ( $\pm 10\%$ ). Response time < 10 ns.

<sup>(4)</sup> 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)

<sup>(5)</sup> Pin 1 connected to earth/shell





# Telecoms & computer line protection

## ESP LN Series



LPZ  
2→3

FULL  
MODE  
Bonding +  
Equipment  
Protection

SIGNAL/  
TELECOM  
TEST CAT  
C + B

e  
ENHANCED  
Low let-through  
voltage

LOW IN-LINE  
RESISTANCE  
~0 Ω

CURRENT  
RATING  
300 mA

Combined Category C, B tested protector (to BS EN 61643) suitable to protect equipment on twisted pair applications using Cat-5 wiring with RJ45 connectors. For use on lines running within buildings at boundaries up to LPZ 2 through to LPZ 3 to protect sensitive electronic equipment.

### Features & benefits

- Suitable for systems signalling on up to 8 wires of unshielded twisted pair cable - protects all 8 pins in each line
- Use to protect 1, 4, 8 or 16 lines
- Suitable for RS 422/423, 10baseT, 100baseT, Token Ring and Fast Ethernet systems
- Available for individual connections or for multiport applications
- Free-standing or 19" rack mounted versions available for multiport applications
- Let-through voltage below equipment susceptibility levels
- Protects twisted pair lines operating at speeds up to 100 Mbps
- Available as 4 or 8 port free-standing versions (ESP LN-4 and ESP LN-8) and 8 or 16 port 19" rack mounted panels (ESP LN-8/16 and ESP LN-16/16)
- Negligible in-line resistance
- Sturdy housing and simple plug-in installation
- Simple earthing via single braided metal strap

### Application

Use on network cables running within a building to protect systems locally from transients induced on to data cables from the magnetic field caused by a lightning strike.

Suitable for internal cabling Cat-5.

- Protect the network connection to individual pieces of equipment with the ESP LN
- Protect multiport applications such as hubs, switches and patch panels with the ESP LN-4, ESP LN-8, ESP LN-8/16 or ESP LN-16/16

### Installation

Plug-in connection between incoming data cables and equipment to be protected. Make suitable attachment to earth.

Full product range order codes can be found on pages 17/8-17/9

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**TECHNICAL NOTE:** ESP LN... range of protectors are designed only for use on cables running within a building (typically LPZ 2) to offer local protection to equipment. They therefore will not be able to handle the higher level transients that occur when lines between buildings are protected. ESP LN... range of protectors should not be used in such an application (up to LPZ 0) where high energy ESP lightning barriers (such as ESP E and ESP Cat-5 & Cat-6 Series) should be employed. If they are used in lines between buildings, there is a high risk of the protector being overloaded and destroyed during transient activity. Connected equipment will, in most cases, still be protected, but there is a small risk that equipment will suffer damage in such circumstances.

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

# Telecoms & computer line protection

## ESP LN Series

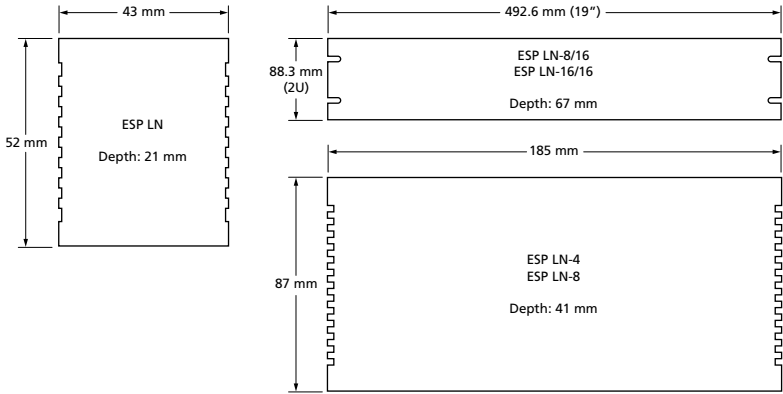
### ESP LN Series - Technical specification

Electrical specification	ESP LN	ESP LN-4	ESP LN-8	ESP LN-8/16	ESP LN-16/16
ABB order code	7TCA085400R0145	7TCA085400R0147	7TCA085400R0148	7TCA085400R0149	7TCA085400R0146
Maximum working voltage $U_c$ (RMS/DC) <sup>(1)</sup>	4 V				
Current rating	300 mA				
In-line resistance	~ 0 Ω				
Bandwidth (-3 dB 50 Ω system)	100 Mbps				
Transient specification	ESP LN	ESP LN-4	ESP LN-8	ESP LN-8/16	ESP LN-16/16
Let-through voltage <sup>(2)</sup> Up					
C2 test 4 kV 1.2/50 μs, 2 kA 8/20 μs to BS EN/EN/IEC 61643-21	13.5 V				
B2 test 4 kV 10/700 μs to BS EN/EN/IEC 61643-21	12.0 V				
1.5 kV, 10/700 μs <sup>(3)</sup>	12.5 V				
Maximum surge current					
8/20 μs to ITU-T K.45:2003, IEEE C62.41.2:2002	350 A				
Mechanical specification	ESP LN	ESP LN-4	ESP LN-8	ESP LN-8/16	ESP LN-16/16
Temperature range	-40 to +80 °C				
Connection type	RJ45 sockets				
Earth connection	External earth strap	External earth strap on front fascia panel	External earth strap on front fascia panel	External earth strap through mounting screws	External earth strap through mounting screws
Case Material	FR Polymer UL-94 V-0			Steel	Steel
Weight: – Unit	0.05 kg	0.29 kg	0.32 kg	0.75 kg	1 kg
– Packaged	0.09 kg	0.58 kg	0.61 kg	1.1 kg	1.35 kg
Dimensions	See diagram below				

<sup>(1)</sup> Maximum working voltage (RMS/DC or AC peak) measured at 1 mA leakage

<sup>(2)</sup> The maximum transient voltage let-through of the protector throughout the test (±10%). Response time < 10 ns

<sup>(3)</sup> 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)





# Electronic systems protection

## Specific systems protection

Specific systems protection	
Introduction	14/2
ESP WT Series	14/6
ESP PV Series	14/8
ESP SSI Series	14/10
ESP TV Series	14/12
ESP CCTV Series	14/14
ESP RF Series	14/16



# Specific systems protection

## Introduction



Protecting 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.

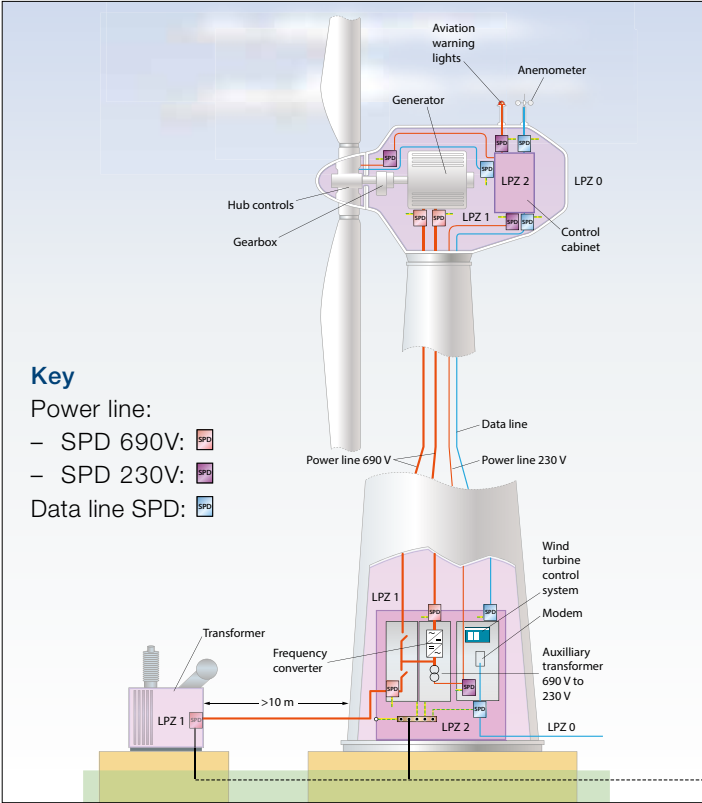
Table 3: SPD requirement according to component to be protected

Location	LPZ	SPD required
Generator (690 V)	LPZ 0 to LPZ 1	ESP WT Series protector
Frequency converter (690 V)	LPZ 0 to LPZ 2	ESP WT Series protector
Transformer (690 V)	LPZ 0 to LPZ 1*	ESP WT Series protector
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 SL RS485
– (RS 485 line)	LPZ 0 to LPZ 1	ESP SL RS485
Anemometer (24 V)	LPZ 0 to LPZ 1	ESP SL30
Modem	LPZ 0 to LPZ 1	ESP TN or ESP SL 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.

### Application of SPDs within a typical wind turbine environment



# Specific systems protection

## Introduction

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 PV Series protector (min. Type 2 performance)	ESP PV Series protector (min. Type 2 performance)	ESP AC mains power protector (min. Type 2 performance)
Structural LPS (separation distance kept)	ESP PV Series protector (min. Type 2 performance)	ESP WT 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 PV Series protector (min. Type 1 performance)	ESP PV 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).

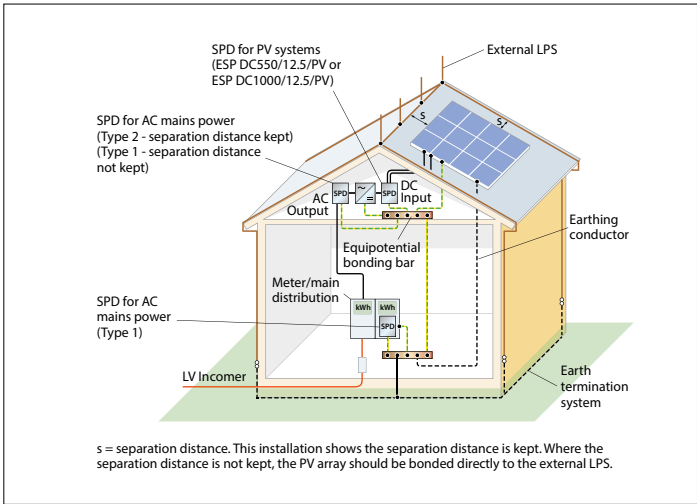
### Installation on the AC side of the DC-AC inverter

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.

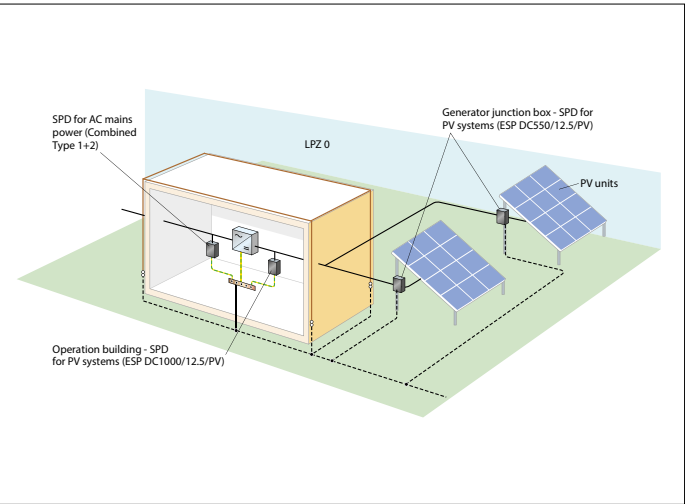
Furse Combined Type SPDs for AC mains power circuits are applicable here. The SPD to be installed will be dependent on the Class of LPS around the structure, and the location of the metallic services connected to it (i.e. underground/ exposed overhead supply).

**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 PV Series SPDs offer combined Type 1+2 protection, and therefore apply across all scenarios.

Roof mounted PV array, with external LPS



Protection of solar park/PV array



## 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 415/XXX 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

Note: list of Surge Protection Measures shown above is not exhaustive. Additional electronic systems may require transient overvoltage protection on a case-by-case basis. Please contact us to discuss particular project requirements.

## 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):

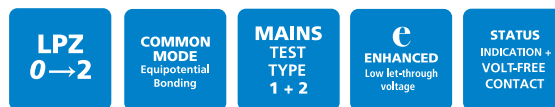
- Power supplies throughout the network, including trackside cabinets, level crossings and at stations and terminals
- Signalling networks including trackside Solid State Interlocking (SSI) systems
- Telecommunications equipment and trackside telephones
- CCTV monitoring systems
- Passenger information 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 Furze Surge Protective Devices as part of an overall Lightning Protection System to IEC/BS EN 62305.

Key protection locations together with the appropriate Furze SPD are shown in the table below. Many of these SPDs have Network Rail approval (see individual product pages for further reference).

# Specific systems protection

## ESP WT Series



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 ( $I_f$ ) 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

Use with 3 of ESP 690/12.5/WT for TN-C supplies

#### ESP CE9

Use with 3 of ESP 690/25/WT for TN-C supplies

#### ESP CE10

Use with 4 of ESP 690/12.5/WT for TN-S supplies

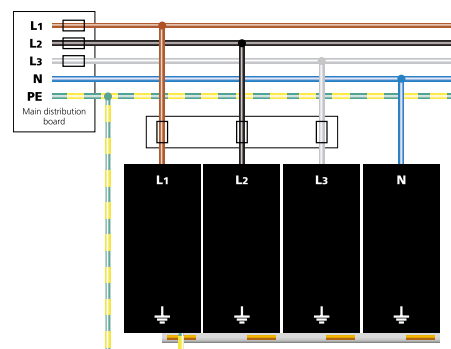
#### ESP CE13

Use with 4 of ESP 690/25/WT for TN-S supplies

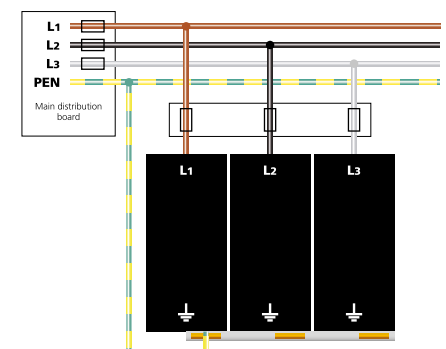
For suitable enclosures for the ESP WT series, please contact us.

Full product range order codes can be found on pages 17/8-17/9

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.

# Specific systems protection

## ESP WT Series

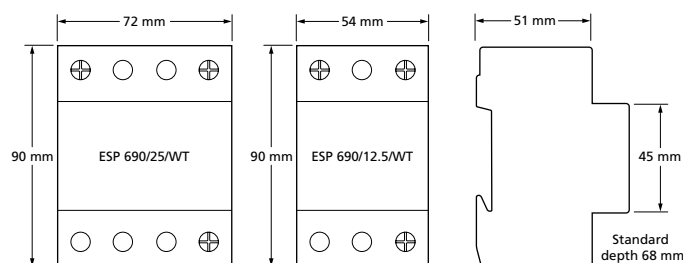
### ESP WT Series - Technical specification

Electrical specification	ESP 690/25/WT	ESP 690/12.5/WT
ABB order code	7TCA085460R0028	7TCA085460R0027
Nominal voltage - Phase-Neutral $U_0$ (RMS)	690 V	
Maximum voltage - Phase-Neutral $U_c$ (RMS/DC)	750 V/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
<b>Type 1 (BS EN/EN), Class I (IEC)</b>		
Nominal discharge current 8/20 $\mu$ s (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 $\mu$ s $I_{imp}$ (per mode) <sup>(2)</sup>	25 kA	12.5 kA
Let-through voltage $U_p$ at $I_{imp}^{(1)}$	< 2.0 kV	
<b>Type 2 (BS EN/EN), Class II (IEC)</b>		
Nominal discharge current 8/20 $\mu$ s (per mode) $I_n$	40 kA	20 kA
Let-through voltage $U_p$ at $I_n^{(1)}$	< 2.5 kV	
Maximum discharge current $I_{max}$ (per mode) <sup>(2)</sup>	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	
Conductor size (stranded)	25 mm <sup>2</sup>	
Earth connection	Screw terminal	
Volt free contact	Connect via screw terminal with conductor up to 1.5 mm <sup>2</sup> (stranded)	
Degree of protection (IEC 60529)	IP20	
Case Material	FR Polymer UL-94 V-0	
Mounting	Indoor, 35 mm top hat DIN rail	
Weight: – Unit	0.5 kg	0.33 kg
– Packaged	0.6 kg	0.43 kg
Dimensions to DIN 43880 – Per module	90 mm x 68 mm x 72 mm (4TE)	90 mm x 68 mm x 216 mm (total: 3 x ESP 690/25/WT)
– HxDxW: <sup>(3)</sup>	– 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)

<sup>(1)</sup> The maximum transient voltage let-through of the protector throughout the test, per mode

<sup>(2)</sup> The electrical system, external to the unit, may constrain the actual current rating achieved in a particular installation

<sup>(3)</sup> The remote signal contact (removable) adds 10 mm to height





# Specific systems protection

## ESP PV Series



Combined Type 1 and 2 tested protector (to BS EN 61643) 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 (If) associated with spark gap based surge protection
- Compact, space saving design
- 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 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 415/III/TNS) are further required at the AC side of the DC-AC inverter.

### Installation

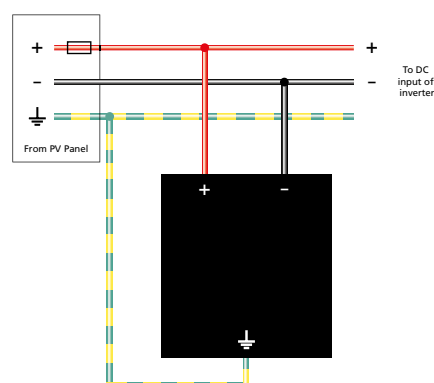
Protector should be installed in the main distribution board with connecting leads of minimal length. The protector should be fused and is suitable for attachment to a 35 mm top hat DIN rail. Install in parallel to the DC supply of the DC-AC inverter via fuses.

### Accessories

#### WBX D4

Weatherproof enclosure

Full product range order codes can be found on pages 17/8-17/9



**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 further required, 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.

# Specific systems protection

## ESP PV Series

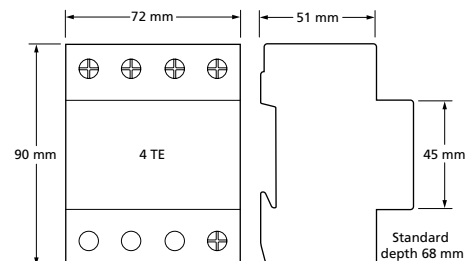
### ESP PV Series - Technical specification

Electrical specification	ESP DC550/12.5/PV	ESP DC1000/12.5/PV
ABB order code	7TCA085460R0147	7TCA085460R0146
Maximum DC voltage (RMS/DC)	550 V	1000 V
Short circuit withstand capability	25 kA/50 Hz	
Leakage current (to earth)	< 2.5 mA	
Volt free contact:	Screw terminal	
– current rating	0.5 A	
– nominal voltage (RMS)	250 V	
Back up fuse	Fuses specifically designed for use on PV systems are recommended. Determine the most appropriate back up fuse from assessment of the nominal current of the PV module, and the open circuit voltage of the PV array: <ul style="list-style-type: none"> <li>– Multiply the nominal current of the photovoltaic module by a factor of 1.4 and select the closest, higher value fuse to the calculated figure.</li> <li>– Multiply the open circuit voltage of the PV array by a factor of 1.2 and ensure that the selected fuse has a higher voltage withstand than the calculated figure.</li> </ul>	
Transient specification	ESP DC550/12.5/PV	ESP DC1000/12.5/PV
<b>Type 1 (BS EN/EN), Class I (IEC)</b>		
Nominal discharge current 8/20 $\mu$ s (per mode) $I_n$	20 kA	
Let-through voltage $U_p$ at $I_n^{(1)}$	< 2.0 kV	< 2.6 kV
Impulse discharge current 10/350 $\mu$ s $I_{imp}$ (per mode) <sup>(2)</sup>	12.5 kA	
Let-through voltage $U_p$ at $I_{imp}^{(1)}$	< 1.7 kV	< 2.4 kV
<b>Type 2 (BS EN/EN), Class II (IEC)</b>		
Nominal discharge current 8/20 $\mu$ s (per mode) $I_n$	20 kA	
Let-through voltage $U_p$ at $I_n^{(1)}$	< 2.0 kV	< 2.6 kV
Maximum discharge current $I_{max}$ (per mode) <sup>(2)</sup>	40 kA	
Mechanical specification	ESP DC550/12.5/PV	ESP DC1000/12.5/PV
Temperature range	-40 to +80 °C	
Connection type	Screw terminal	
Conductor size (stranded)	25 mm <sup>2</sup>	
Earth connection	Screw terminal	
Volt free contact	Connect via screw terminal with conductor up to 1.5 mm <sup>2</sup> (stranded)	
Degree of protection (IEC 60529)	IP20	
Case Material	FR Polymer UL-94 V-0	
Mounting	Indoor, 35 mm top hat DIN rail	
Weight: – Unit	0.38 kg	0.59 kg
– Packaged	0.48 kg	0.69 kg
Dimensions to DIN 43880 - HxDxW: <sup>(3)</sup>	90 mm x 68 mm x 72 mm (4TE)	

<sup>(1)</sup> The maximum transient voltage let-through of the protector throughout the test, per mode

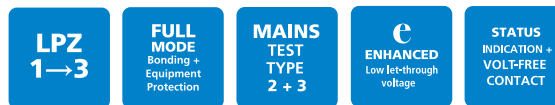
<sup>(2)</sup> The electrical system, external to the unit, may constrain the actual current rating achieved in a particular installation

<sup>(3)</sup> The remote signal contact (removable) adds 10 mm to height



# Specific systems protection

## ESP SSI Series



Combined Category C, B tested data link protector and Combined 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 running within buildings at boundaries up to LPZ 1 through to LPZ 3 to protect sensitive electronic equipment.

### Features & benefits

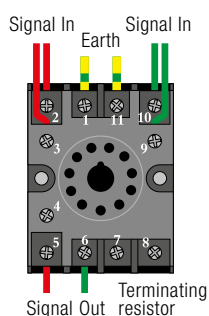
- Accepted for use on Network Rail infrastructure. NRS PADS references: ESP SSI/M - 086/047066; ESP SSI/B - 086/047067; ESP SSI/120AC - 086/047058 and ESP SSI/140AC - 086/047059 (Network Rail Approval PA05/00471)
- Very low let-through voltage (enhanced protection to IEC/BS EN 62305) between all sets 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  $\Omega$  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

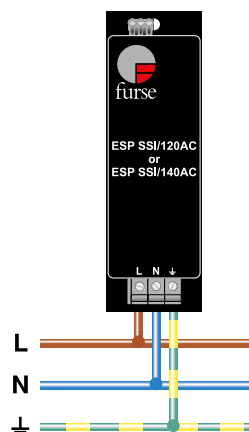
To prevent transient overvoltage damage to Solid State Interlocking (SSI) systems, protectors should be fitted in trackside cabinets and equipment rooms, on both the data link and the mains power lines.

- 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.



- 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  $\Omega$  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)



# Specific systems protection

## ESP SSI Series

### ESP SSI Series - Technical specification

Electrical specification	ESP SSI/M	ESP SSI/B	Electrical specification	ESP SSI/120AC	ESP SSI/140AC
ABB order code	7TCA085400R0168 7TCA085400R0166		ABB order code	7TCA085460R0059	7TCA085460R0060
Maximum signal voltage <sup>(1)</sup>	7 V		Nominal voltage - Phase - Neutral U <sub>o</sub> (RMS)	120 V	140 V
Maximum common mode stand-off voltage	90 Vrms		Maximum working voltage - Phase - Neutral U <sub>c</sub> (RMS)	150 V	165 V
Current rating	100 mA	10 A, 250 V	Working voltage (RMS)	90-150 V	90-165 V
In-line resistance (per line, ±10%)	4.5 Ω		Frequency range	47-63 Hz	
Leakage:   – (Line to line impedance)	> 1 MΩ		Current rating (supply) - see installation instructions	100 A	
– (Line to earth impedance)	> 10 kΩ		Leakage current (to earth)	< 60 µA	
Differential bandwidth (50 Ω system)	10 MHz		Indicator circuit current	< 10 mA	
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.			Volt free contact: <sup>(4)</sup>	Screw terminal	
			– Current rating	> 1 MΩ	
			– Nominal voltage (RMS)	> 10 kΩ	
Transient specification	ESP SSI/M	ESP SSI/B	Transient specification	ESP SSI/120AC	ESP SSI/140AC
Transverse (Differential) 'let-through' voltage <sup>(2)</sup> Up	15 V		Let-through voltage (all conductors) Type 2 (BS EN/EN), Class II (IEC)		
Common mode 'let-through' voltage <sup>(3)</sup> Up	250 V		Nominal discharge current 8/20 µs (per mode) I <sub>n</sub>	5 kA	
			Let-through voltage Up at I <sub>n</sub> <sup>(5)</sup>	460 V	540 V
			Maximum discharge current I <sub>max</sub> (per mode) <sup>(6)</sup>	20 kA	
			Type 3 (BS EN/EN), Class III (IEC)		
			Let-through voltage at U <sub>oc</sub> of 6 kV 1.2/50 µs and I <sub>sc</sub> of 3 kA 8/20 µs (per mode) <sup>(7)</sup>	400 V	500 V
Mechanical specification	ESP SSI/M	ESP SSI/B	Mechanical specification	ESP SSI/120AC	ESP SSI/140AC
Temperature range	-40 to +80 °C		Temperature range	-40 to +80 °C	
Connection type	–	Screw terminal	Connection type	Screw terminal	
Fixing connection:		2 x M4 fixing holes with 33 mm centres	Conductor size (stranded)	16 mm <sup>2</sup>	
– Flat mount	–		Earth connection	Screw terminal	
– Top Hat Din rail mount (ESP SSI/B)	–	An integral clip	Volt free contact	Connect via screw terminal with conductor up to 2.5 mm <sup>2</sup> (stranded)	
– G Din rail mount (ESP SSI/B/G)	–	2 x mounting clips with screws			
Case material	FR Polymer UL-94 V-0		Case material	Steel	
Weight:   – Unit	0.065 kg	0.075 kg	Weight:   – Unit	0.5 kg	
– Packaged (per 50)	3.25 kg	3.9 kg	– Packaged	0.6 kg	
Dimensions	See diagram below		Dimensions	See diagram below	

<sup>(1)</sup> Maximum signal voltage (DC or AC peak) measured at 200  $\mu$ A

<sup>(2)</sup> '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  $\mu$ s.

1 kA 8/20  $\mu$ s. 'Let-through' voltage ( $\pm 10\%$ )

<sup>(3)</sup> '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  $\mu$ s.

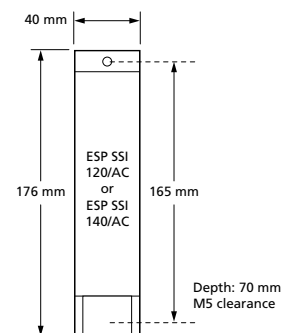
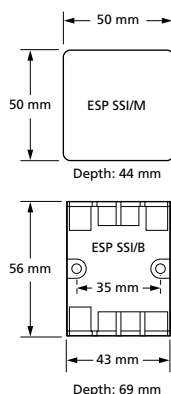
2 kA 8/20  $\mu$ s. 'Let-through' voltage ( $\pm 20\%$ )

<sup>(4)</sup> Minimum permissible load is 5 V DC, 10 mA to ensure reliable contact operation

<sup>(5)</sup> The maximum transient voltage let-through of the protector throughout the test ( $\pm 10\%$ ), per mode

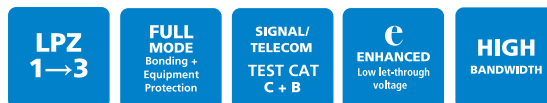
<sup>(6)</sup> The electrical system, external to the unit, may constrain the actual current rating achieved in a particular installation

<sup>(7)</sup> Combination wave test within IEEE C62.41-2002 Location Cats C1 & B3, SS CP 33:1996 App. F, AS 1768-1991 App. B, Cat B, UL1449 mains wire-in



# Specific systems protection

## ESP TV Series



Combined Category 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 1 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

### 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

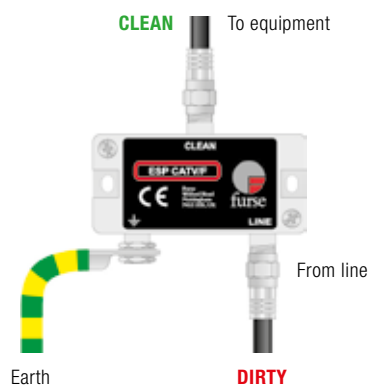
- For protecting distributed combined TV feeds use ESP MATV/F
- For protecting cable TV feeds use ESP CATV/F

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.

Full product range order codes can be found on pages 17/8-17/9



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



# Specific systems protection

## ESP TV Series

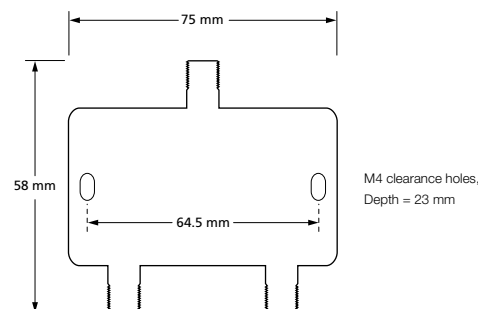
### ESP TV Series - Technical specification

Electrical specification	ESP CATV/F	ESP MATV/F	ESP SMATV/F	ESP TV/F	ESP TV/EURO
<b>ABB order code</b>	7TCA085400R0122	7TCA085450R0000	7TCA085450R0026	7TCA085450R0028	7TCA085450R0027
Maximum working voltage <sup>(1)</sup>	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	5-2450 MHz	860-2450 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	–	–
– 2150-2450 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)	–	–
– 2150-2450 MHz	–	< 2.2 dB	< 2.2 dB	–	–
Transient specification	ESP CATV/F	ESP MATV/F	ESP SMATV/F	ESP TV/F	ESP TV/EURO
<b>Let-through voltage (all conductors)<sup>(2)</sup> Up</b>					
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 <sup>(3)</sup>	250 V	50 V	50 V	35 V	35 V
<b>Maximum surge current</b>					
8/20 μs to ITU-T K.45:2003, IEEE C62.41.2:2002	3 kA				
Mechanical specification	ESP CATV/F	ESP MATV/F	ESP SMATV/F	ESP TV/F	ESP TV/EURO
Temperature range	-40 to +80 °C				-40 to +80 °C
Connection type	F female				Euro-TV
Earth connection	~ 9.5 mm (3/8") diameter earth stud				~ 9.5 mm (3/8") diameter earth stud
Case Material	Diecast				Diecast
Weight: – Unit	0.14 kg				0.14 kg
– Packaged	0.15 kg				0.15 kg
Dimensions	See diagram below				

<sup>(1)</sup> 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)

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

<sup>(3)</sup> 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



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 minimize 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:

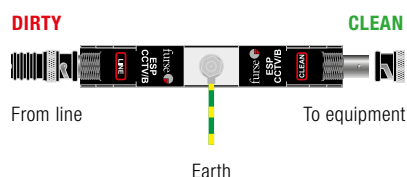
- a) near where they enter or leave the building, or
- b) close to the equipment being protected (or actually within its control panel).

### Accessories

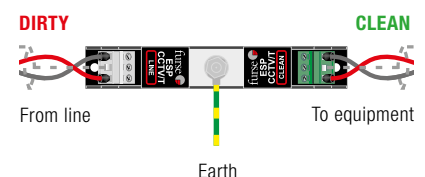
When CCTV protectors are installed in groups, or alongside protectors for signal and mains power lines, these can be mounted and earthed simultaneously on a CME kit. A CME 4 will accommodate the video, telemetry and power protectors to a camera. If protectors cannot be incorporated within an existing 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.

Full product range order codes can be found on pages 17/8-17/9

#### Series connection for ESP CCTV/B



#### Series connection for ESP CCTV/T



**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.

# Specific systems protection

## ESP CCTV Series

### 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 <sup>(1)</sup> (peak-peak)	1 V				2 V			
Maximum working voltage U <sub>c</sub> <sup>(2)</sup> (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) <sup>(3)</sup>	> 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) <sup>(4)</sup> Up								
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 <sup>(5)</sup>	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 <sup>(6)</sup>								
D1 test 10/350 μs to BS EN/EN/IEC 61643-21: – Per signal wire	2.5 kA				2.5 kA			
– Per pair	–				5 kA			
8/20 μs to ITU (formerly CCITT): – Per signal wire	10 kA				10 kA			
– Per pair	–				20 kA			
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 mm <sup>2</sup>			
Earth connection	M6 stud							
Case Material	Conductive ABS UL94 V-0				Conductive ABS UL94 V-0			
Weight: – Unit	0.08 kg							
– Packaged	0.9 kg							
Dimensions	See diagram below							

<sup>(1)</sup> Nominal voltage (DC or AC peak) measured at <10  $\mu$ A leakage

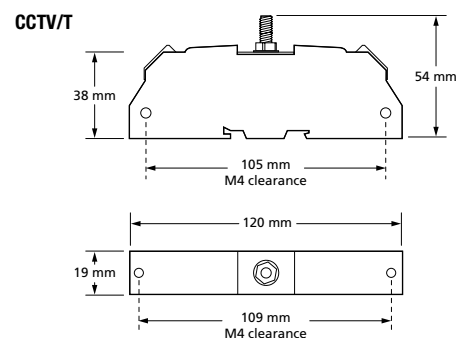
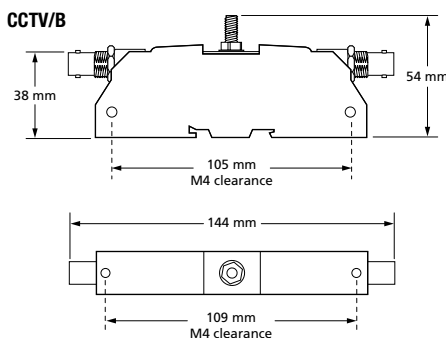
<sup>(2)</sup> Maximum working voltage (DC or AC peak) measured at 5 mA leakage

<sup>(3)</sup> Capacitance < 30 pF

<sup>(4)</sup> The maximum transient voltage let-through of the protector throughout the test ( $\pm 10\%$ ), 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

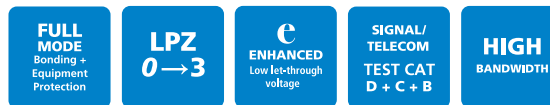
<sup>(5)</sup> Test to IEC 61000-4-5:2006, ITU-T (formerly CCITT) K.20, K.21 and K.45, Telcordia GR-1089-CORE, Issue 2:2002, ANSI TIA/EIA/IS-968-A:2002 (formerly FCC Part 68)

<sup>(6)</sup> The installation and connectors external to the protector may limit the capability of the protector



# Specific systems protection

## ESP RF Series



Combined Category D, C, B tested protector (to BS EN 61643) suitable for RF systems using coaxial cables at frequencies between DC and 2.7 GHz and where DC power is present. Suitable for RF systems with power up to 2.3 kW. 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
- Superior transient protection to both Gas Discharge Tube (GDT) and Quarter Wave Stub (QWS) based protectors
- 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 and BNC connectors
- Easily mounted and earthed via fixtures on the base of the unit that accept M3 and M5 screws or via mounting brackets
- Additional mounting plates give increased flexibility
- Robust white bronze plated aluminium housing (silver plate option)

### 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.

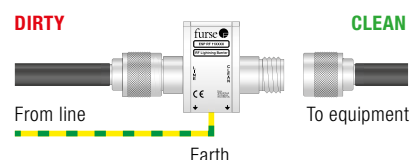
### Accessories

**ESP RF BK1** Straight mounting plates  
**ESP RF BK2** 90° angled mounting plates  
**ESP RF BK3** Bulkhead through mounting plate (single)

**ESP RF BK4** Bulkhead through mounting plate (for 4 products)  
**ESP RF GDT-x** Replacement gas discharge tubes (Where x is the correct GDT part code digit for your system).

Full product range order codes can be found on pages 17/8-17/9

**ESP RF 111A21 with N female connectors installed in series**



**PART NUMBERING SYSTEM:** Furse RF protectors have six digit part codes, prefixed with ESP RF. The selected digits define the exact specification of the required protector, e.g. **ESP RF AABCD E**

**Connector type - ESP RF AAxxxx** The first 2 digits refer to the connector type: **11** - N type female, **AA** - 7/16 DIN type female, **44** - BNC female

**Line impedance - ESP RF xxBxxx** 3rd digit refers to the line impedance. Currently only one option: **1** - 50  $\Omega$  transmission line.

**Gas Discharge Tube (GDT) selection - ESP RF xxxCxx** Select the 4th digit from the table at the bottom (opposite). Selection of the correct GDT is critical

in the effectiveness of using these protectors. For the correct GDT, take the maximum RF power or voltage of the system and select a GDT with a voltage/power handling greater than the system.

**IMPORTANT NOTE:** When using the peak RF voltage to select the GDT, if the system is a multi-carrier system the (in phase) peak RF voltage can be calculated as the total of all the single carrier peak voltages on the transmission line.

**Protector rating - ESP RF xxxxDx** 5th digit specifies the protector rating:

**1** - Higher specification, **2** - Standard specification **Case plating - ESP RF xxxxxE** 6th digit specifies the case plating: **1** - White bronze, **2** - Silver

**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. For RF applications where the connected equipment is very sensitive to transient overvoltages, use the higher specification RF protectors. ESP CCTV/B and ESP CCTV/T are suitable for use on coaxial (or twisted pair) CCTV lines. For coaxial CATV lines, use the CATV/F.

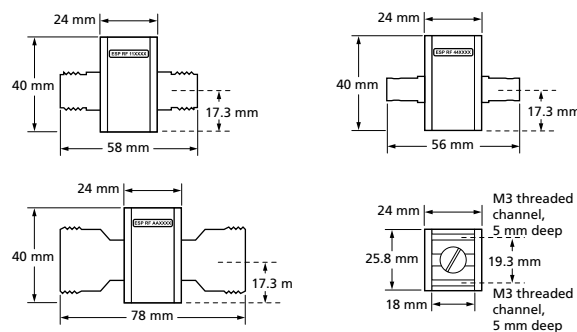
# Specific systems protection

## ESP RF Series

### ESP RF Series - Technical specification

Electrical specification	ESP RF xx1x21					
ABB order code	** See table at the bottom of the page for Part no./ABB order code **					
Gas Discharge Tube voltage	90 V	150 V	230 V	350 V	470 V	600 V
Maximum working voltage $U_c$ (RMS) <sup>(1)</sup>	51 V	85 V	130 V	200 V	265 V	340 V
Characteristic impedance	50 $\Omega$					
Bandwidth	DC-2.7 GHz					
Voltage standing wave ratio	$\leq 1.1$					
Insertion loss over bandwidth	$\leq 0.1$ dB					
Maximum power <sup>(1)</sup>	40 W	120 W	280 W	650 W	1.15 kW	1.90 kW
Transient specification	ESP RF xx1x21					
Let-through voltage (all conductors) <sup>(2)</sup> Up						
C2 test 4 kV 1.2/50 $\mu$ s, 2 kA 8/20 $\mu$ s to BS EN/EN/IEC 61643-21	< 700 V	< 650 V	< 700 V	< 800 V	< 900 V	< 1050 V
C1 test 1 kV 1.2/50 $\mu$ s, 0.5 kA 8/20 $\mu$ s to BS EN/EN/IEC 61643-21	< 550 V	< 450 V	< 550 V	< 650 V	< 800 V	< 950 V
B2 test 4 kV 10/700 $\mu$ s to BS EN/EN/IEC 61643-21	< 400 V	< 350 V	< 450 V	< 550 V	< 730 V	< 800 V
5 kV, 10/700 $\mu$ s <sup>(3)</sup>	< 430 V	< 370 V	< 470 V	< 580 V	< 750 V	< 830 V
Maximum surge current <sup>(4)</sup>						
D1 test 10/350 $\mu$ s to BS EN/EN/IEC 61643-21	2.5 kA					
8/20 $\mu$ s to ITU-T K.45:2003, IEEE C62.41.2:2002	20 kA					
Mechanical specification	ESP RF 111x21		ESP RF AA1x21		ESP RF 441x21	
Temperature range	-40 to +80 °C					
Connection type	N female		7/16 DIN female		BNC female	
Conductor size (stranded)	Via mounting fixtures					
Case Material	Aluminium, white bronze plated					
Weight: – Unit	120 g		190 g		90 g	
– Packaged	140 g		210 g		110 g	
Dimensions	See diagram below					

- <sup>(1)</sup> The maximum RF working voltage and maximum power for the protectors is dependent on the GDT selected, with the power levels derated based on real life 'worst case' conditions with VSWR=2:1. See 'Gas Discharge Tube selection' below
- <sup>(2)</sup> The maximum transient voltage let-through of the protector throughout the test ( $\pm 10\%$ ) ( $\pm 10\%$ ). Response time < 10 ns. This let-through voltage represents a deviation from the applied signal voltage, present at the time of the test
- <sup>(3)</sup> 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)
- <sup>(4)</sup> The installation and connections external to the protector may limit the capability of the protector



#### ESP RF BK1 (ABB order code: 7TCA085450R0017)

Straight mounting bracket, 53 x 26.3 x 3 mm  
2 x M4 clearance mounting holes, 16.3 mm apart

#### ESP RF BK2 (ABB order code: 7TCA085450R0018)

90° mounting bracket, 33 x 26.3 x 3 mm, 20 x 26.3 x 3 mm  
2 x M4 clearance mounting holes, 16.3 mm apart, 14 mm from fold line

#### ESP RF BK3 (ABB order code: 7TCA085450R0020)

90° mounting bracket, 50 x 24 x 1.5 mm, 60 x 24 x 1.5 mm  
2 x M5 clearance mounting holes, 40 mm apart

#### ESP RF BK4 (ABB order code: 7TCA085450R0046)

90° quad mounting bracket, 50 x 24 x 1.5 mm, 210 x 24 x 1.5 mm  
5 x M5 clearance mounting holes, various spacings

Mounting brackets supplied with screws for fixing to protector

### Gas Discharge Tube selection

Max RF voltage	Max RF power	GDT voltage	GDT part
$V_{Peak}$	50 $\Omega$ system ( $P_{RMS}$ ) with VSWR = 2:1	code	digit
72 V	40 W	90 V	1
120 V	120 W	150 V	2
185 V	280 W	230 V	3
280 V	650 W	350 V	4
375 V	1.15 kW	470 V	5
480 V	1.90 kW	600 V	6

Power levels have been de-rated to allow for real life 'worst case' conditions, calculated with VSWR as 2:1



# Specific systems protection

## ESP RF Series



LPZ  
0→3

FULL  
MODE  
Bonding +  
Equipment  
Protection

SIGNAL/  
TELECOM  
TEST CAT  
D + C + B

e  
ENHANCED  
Low let-through  
voltage

HIGH  
BANDWIDTH

Combined Category D, C, B tested protector (to BS EN 61643) suitable for RF systems (of power up to 150 W) using coaxial cables at frequencies between 50 MHz and 2.7 GHz to provide effective protection without impairing system performance. 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
- Superior transient protection to both Gas Discharge Tube (GDT) and Quarter Wave Stub (QWS) based protectors
- Very low attenuation and near unity VSWR over a wide range of frequencies ensure the protectors do not impair system performance
- Wide bandwidth means a single product is suitable for a range of applications
- Available with N, 7/16 DIN and BNC connectors
- Easily mounted and earthed via fixtures on the base of the unit that accept M3 and M5 screws or via mounting brackets
- Additional mounting plates give increased flexibility
- Robust white bronze plated aluminium housing (silver plate option)

### 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

#### ESP RF BK1

Straight mounting plates

#### ESP RF BK2

90° angled mounting plates

#### ESP RF BK3

Bulkhead through mounting plate (single)

#### ESP RF BK4

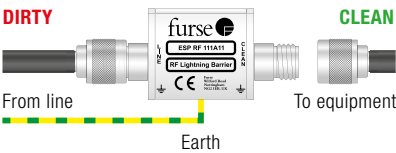
Bulkhead through mounting plate (for 4 products)

#### ESP RF GDT-A

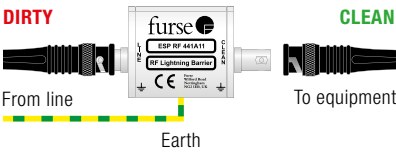
Replacement gas discharge tube

Full product range order codes can be found on pages 17/8-17/9

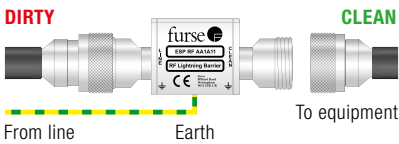
#### ESP RF 111A11 with N female connectors installed in series



#### ESP RF 441A11 with BNC female connectors installed in series



#### ESP RF AA1A11 with 7/16 DIN female connectors installed in series



**NOTE:** The high level of protection offered by these units comes from the addition of a high pass filter circuit which gives a very low letthrough voltage. It should be noted that due to this high pass filter circuit no DC power can pass along the transmission line. This is referred to as "DC blocked". Protectors with other connectors are available. For RF applications where DC power is present on the coaxial cable, use the alternative RF protectors. The 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.

# Specific systems protection

## ESP RF Series

### ESP RF Series - Technical specification

Electrical specification	ESP RF 111A11	ESP RF AA1A11	ESP RF 441A11
ABB order code	7TCA085450R0007	7TCA085450R0016	7TCA085450R0014
Maximum working voltage $U_c$ (RMS)	86 V		
Maximum transmitted power (RMS)	150 W		
Characteristic impedance	50 $\Omega$		
Bandwidth	50-2700 MHz		
Voltage standing wave ratio	$\leq 1.2$		
Insertion loss over bandwidth:			
– 50-500 MHz	$\leq 0.4$ dB		
– 500-1,600 MHz	$\leq 0.2$ dB		
– 1.6-2.7 GHz	$\leq 0.4$ dB		
Maximum power	150 W		
Transient specification	ESP RF 111A11	ESP RF AA1A11	ESP RF 441A11
<b>Let-through voltage (all conductors)<sup>(1)</sup> Up</b>			
C2 test 4 kV 1.2/50 $\mu$ s, 2 kA 8/20 $\mu$ s to BS EN/EN/IEC 61643-21	24 V		
C1 test 1 kV 1.2/50 $\mu$ s, 0.5 kA 8/20 $\mu$ s to BS EN/EN/IEC 61643-21	15 V		
B2 test 4 kV 10/700 $\mu$ s to BS EN/EN/IEC 61643-21	15 V		
5 kV, 10/700 $\mu$ s <sup>(2)</sup>	20 V		
<b>Maximum surge current<sup>(3)</sup></b>			
D1 test 10/350 $\mu$ s to BS EN/EN/IEC 61643-21	1 kA		
8/20 $\mu$ s to ITU-T K.45:2003, IEEE C62.41.2:2002	10 kA		
Mechanical specification	ESP RF 111A11	ESP RF AA1A11	ESP RF 441A11
Temperature range	-40 to +80 °C		
Connection type	N female	7/16 DIN female	BNC female
Conductor size (stranded)	Via mounting fixtures		
Case Material	Aluminium, white bronze plated		
Weight: – Unit	150 g	220 g	120 g
– Packaged	170 g	240 g	160 g
Dimensions	See diagram below		

<sup>(1)</sup> The maximum transient voltage let-through of the protector throughout the test ( $\pm 10\%$ ). Response time < 10 ns.

This let-through voltage represents a deviation from the applied signal voltage, present at the time of the test

<sup>(2)</sup> 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)

<sup>(3)</sup> The installation and connectors external to the protector may limit the capability of the protector

#### ESP RF BK1 (ABB order code: 7TCA085450R0017)

Straight mounting bracket, 53 x 26.3 x 3 mm

2 x M4 clearance mounting holes, 16.3 mm apart

#### ESP RF BK2 (ABB order code: 7TCA085450R0018)

90° mounting bracket, 33 x 26.3 x 3 mm, 20 x 26.3 x 3 mm

2 x M4 clearance mounting holes, 16.3 mm apart, 14 mm from fold line

#### ESP RF BK3 (ABB order code: 7TCA085450R0020)

90° mounting bracket, 50 x 24 x 1.5 mm, 60 x 24 x 1.5 mm

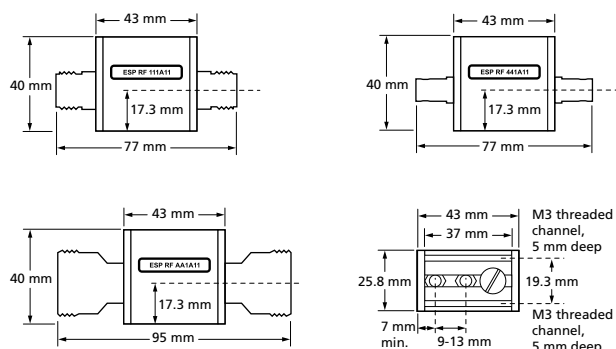
2 x M5 clearance mounting holes, 40 mm apart

#### ESP RF BK4 (ABB order code: 7TCA085450R0046)

90° quad mounting bracket, 50 x 24 x 1.5 mm, 210 x 24 x 1.5 mm

5 x M5 clearance mounting holes, various spacings

Mounting brackets supplied with screws for fixing to protector





# Electronic systems protection

## Protector accessories

Protector accessories	
WBX Series	15/2
CME Series	15/3
ESP Remote display unit	15/4
Cable assembly	15/4
Slim Line replacement base/module	15/5
Connecting and earthing bar	15/5
ESP PTE002	15/5
ESP RF mounting plates	15/5
ESP RF GDT-x	16/18

# Protector accessories

## WBX Series



### WBX Series

A range of moisture and dirt resistant enclosures for the convenient installation of ESP protectors and 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 and 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 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.

**Full product range order codes can be found on pages 17/8-17/9**

### Installation

#### WBX Series

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

### WBX Series - Technical specification

Enclosure part no.	For use with following protectors	Enclosure 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	WBX M4	1 ESP M4 series protector
WBX D8	1 ESP 415/XXX/TT protector, or three phase D1 series protector	WBX 4 or the secure WBX 4/GS	1 CME 4 and associated protectors
WBX 3	1 single phase M1 series protector	WBX 8 or the secure WBX 8/GS	1 CME 8 and associated protectors
WBX 4	1 three phase M1 series protector	WBX 16/2/G	1 or 2 CME 16 and associated protectors
WBX M2	1 ESP M2 series protector	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 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
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	246 mm	230 mm
– External	160 mm	230 mm	255 mm	200 mm	235 mm	200 mm	474 mm	280 mm	255 mm	250 mm
Width: – Internal	110 mm	72 mm	171 mm	–	225 mm	–	380 mm	254 mm	171 mm	105 mm
– External	120 mm	80 mm	180 mm	123 mm	235 mm	195 mm	396 mm	280 mm	180 mm	125 mm
Depth: – Internal	71 mm	79 mm	119 mm	–	100 mm	–	120 mm	115 mm	119 mm	110 mm
– External	90 mm	85 mm	125 mm	112 mm	117 mm	112 mm	128 mm	130 mm	125 mm	125 mm
Fixing centres (mm)	148 x 90	210 x 60	240 x 165	140 centrally	215 x 215	140 x 88	380 x 310	254 x 254	240 x 165	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	-5 to +40 °C	-15 to +75 °C	-5 to +40 °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 V2	UL 94 V2	UL 94 V2	UL 94 V0	UL 746C 5V	UL 746C 5V	UL 746C 5V

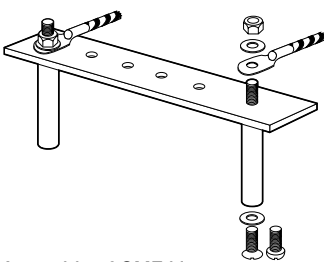


# Protector accessories

## CME Series



CME Series



Assembly of CME kit  
Earth connection (not supplied)

### 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

### 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

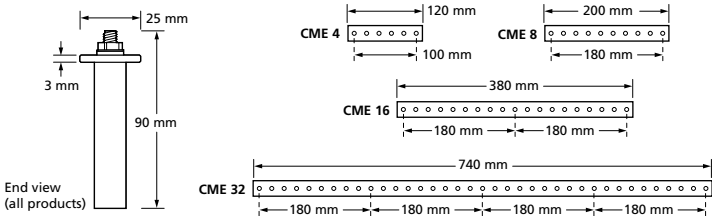
### Accessories

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)**

Full product range order codes can be found on pages 17/8-17/9

### 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
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 opposite			

# Protector accessories

## Accessories



### ESP Remote display unit

Use with: ESP M1R, M2R and M4R

Part no.	Description
ESP RDU/415M1R	Remote LED display for 3 phase 415 V M1R protector
ESP RDU/415M2R	Remote LED display for 3 phase 415 V M2R protector
ESP RDU/415M4R	Remote LED display for 3 phase 415 V M4R protector
ESP RDU/480M1R	Remote LED display for 3 phase 480 V M1R protector
ESP RDU/480M2R	Remote LED display for 3 phase 480 V M2R protector
ESP RDU/480M4R	Remote LED display for 3 phase 480 V M4R protector
ESP RDU-SEAL	IP64 rated seal for remote displays

Full product range order codes can be found on pages 17/8-17/9



### Cable assembly

Use to: Connect display units to suitable three phase protectors

Part no.	Description	Length
ESP RLA-1	Cable assembly for connecting ESP Remote Display Unit to ESP M1R, M2R and M4R series	1 m
ESP RLA-2	Cable assembly for connecting ESP Remote Display Unit to ESP M1R, M2R and M4R series	2 m
ESP RLA-4	Cable assembly for connecting ESP Remote Display Unit to ESP M1R, M2R and M4R series	4 m
ESP RLA HD-1	Cable assembly for connecting display unit to three phase ESP XXX D1R or ESP XXX D1R/LCD protectors	1 m
ESP RLA HD-2	Cable assembly for connecting display unit to three phase ESP XXX D1R or ESP XXX D1R/LCD protectors	2 m
ESP RLA HD-4	Cable assembly for connecting display unit to three phase ESP XXX D1R or ESP XXX D1R/LCD protectors	4 m

Full product range order codes can be found on pages 17/8-17/9



### ESP Remote display unit

Use with: ESP D1R variants

Part no.	Description
ESP RDU D1R/208	Remote LED display for 3 phase 208 V D1R protector
ESP RDU D1R/415	Remote LED display for 3 phase 415 V D1R protector
ESP RDU D1R/480	Remote LED display for 3 phase 480 V D1R protector
ESP RDU D1R/LCD/208	Remote LCD display for 3 phase 208 V D1R protector
ESP RDU D1R/LCD/415	Remote LCD display for 3 phase 415 V D1R protector
ESP RDU D1R/LCD/480	Remote LCD display for 3 phase 480 V D1R protector

Full product range order codes can be found on pages 17/8-17/9



### Cable assembly

Use with: ESP ISDN/RJ45-\*8 or ESP Cat-5e or ESP Cat-6 protector range

Part no.	Description	Length
ESP CAT5e/UTP-1	Cable assembly for ESP Cat-5e with unshielded RJ45 connections	1 m
ESP CAT6/STP-2	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

Full product range order codes can be found on pages 17/8-17/9

# Protector accessories

## Accessories



Slim Line replacement base/module

### Slim Line replacement base/module

**Replacement:** Base & module for the Slim Line Series of protectors

Part no.	Description
<b>Slim Line protector replacement base</b>	
ESP SL/B	For use with standard and 4-20 mA Slim Line Series
ESP SL/I/B	Isolated screen version for use with standard and 4-20 mA Slim Line Series
ESP SLX/B	For use with Slim Line Intrinsically Safe (ATEX) Series
ESP SLX/I/B	Isolated screen version for use with Slim Line Intrinsically Safe (ATEX) Series
ESP SL/3W/B	For use with Slim Line 3-wire Series
ESP SLRTD/B	For use with Slim Line RTD Series
ESP SL RS485/B	For use with Slim Line RS485 Series

### Slim Line protector replacement module

ESP SLXX/M	For use with Slim Line Series - replace 'XX' with relevant voltage, i.e. 06, 15, 30, 50, 110
ESP SLTN/M	For use with Slim Line TN Series
ESP SL15X/M	For use with Slim Line Intrinsically Safe (ATEX) Series, 15 V
ESP SL30X/M	For use with Slim Line Intrinsically Safe (ATEX) Series, 30 V
ESP SLRTD/M	For use with Slim Line RTD Series
ESP SLRS485/M	For use with Slim Line RS485 Series

### Slim Line LED protector replacement module

ESP SLXXL/M	For use with Slim Line LED Series - replace 'XX' with relevant voltage, i.e. 06, 15, 30, 50, 110
ESP SL30L/4-20/M	For use with Slim Line LED Series, 4-20 mA
ESP SL15XL/M	For use with Slim Line Intrinsically Safe (ATEX) LED Series, 15 V
ESP SL30XL/M	For use with Slim Line Intrinsically Safe (ATEX) LED Series, 30 V
ESP SLXX/3W/M	For use with Slim Line 3-wire LED Series – replace 'XX' with relevant voltage, i.e. 06, 15, 30, 50, 110

Full product range order codes can be found on pages 17/8-17/9



Connecting and earthing bar

### Connecting and earthing bar

**Use with:** ESP WT protectors

Part no.	Description
ESP CE7	For use with 3 x ESP 690/12.5/WT for TN-C supplies
ESP CE9	For use with 3 x ESP 690/25/WT for TN-C supplies
ESP CE10	For use with 4 x ESP 690/12.5/WT for TN-S supplies
ESP CE13	For use with 4 x ESP 690/25/WT for TN-S supplies

Full product range order codes can be found on pages 17/8-17/9



ESP PTE002

### ESP PTE002

**Use to:** Test the ESP SSI/M protector

Part no.	Description
ESP PTE002	SSI Portable Tester

ESP PTE002 has Network Rail Approval PA05/02216. NRS PADS reference 094/020033 Annual calibration is required, which is processed as ESP PTE002/CAL

Full product range order codes can be found on pages 17/8-17/9



ESP RF mounting plates

### ESP RF mounting plates

**Use with:** Any ESP RF protector to assist installation

Part no.	Description
ESP SL/B	Straight Mounting plate
ESP RF BK2	90° Mounting plate
ESP RF BK3	Bulkhead through mounting plate (single)
ESP RF BK4	Bulkhead through mounting plate (4 protectors)

Full product range order codes can be found on pages 17/8-17/9



ESP RF GDT-x

### ESP RF GDT-x

**Replacement:** Gas Discharge Tubes for use with standard RF protectors

Part no.	Description	Voltage
ESP SL/B	Gas Discharge Tube	90 V
ESP RF GDT-2	Gas Discharge Tube	150 V
ESP RF GDT-3	Gas Discharge Tube	230 V
ESP RF GDT-4	Gas Discharge Tube	350 V
ESP RF GDT-5	Gas Discharge Tube	470 V
ESP RF GDT-6	Gas Discharge Tube	600 V

Part no.	Description	GDT Voltage
ESP RF GDT-A	Gas Discharge Tube	600 V

Replacement Gas Discharge Tube for use with the ESP RF 111A11, ESP RF AA1A11 and ESP RF 441A11 protectors

Full product range order codes can be found on pages 17/8-17/9