PRODUCT BROCHURE

Mains power protection

Type 1 & Type 2
Surge Protection Series

Surge Protection

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

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

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

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

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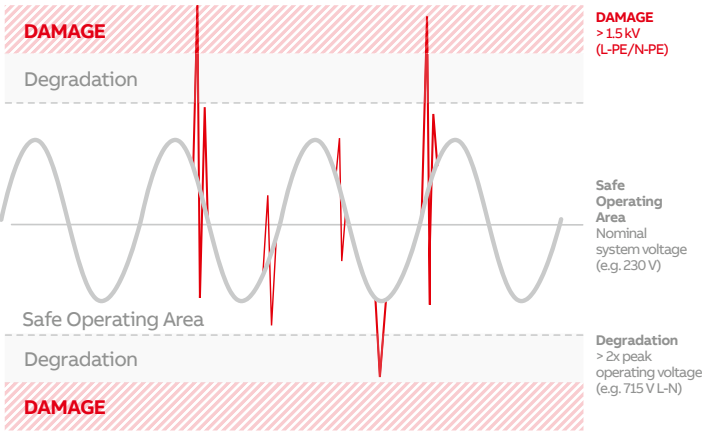

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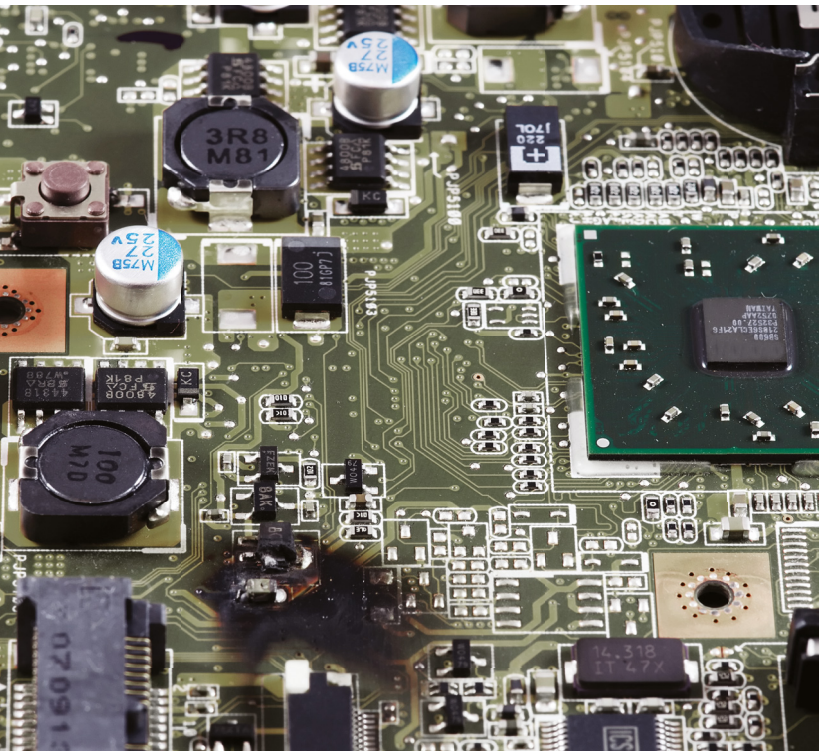


Transient overvoltages are short duration surges in voltage between two or more conductors, e.g. Live conductor to Protective Earth (L-PE), Live to Neutral (L-N) or Neutral to Protective Earth (N-PE) on a power line as illustrated in Figure 1b. These surges can reach up to 6000 V on a 230Vac supply,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

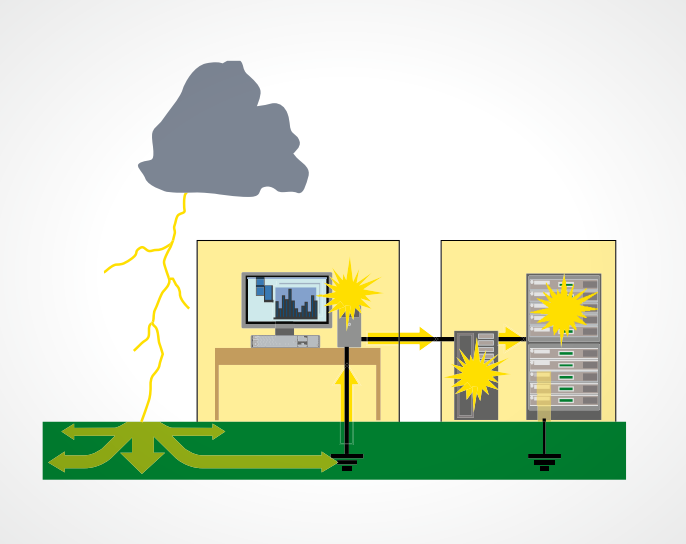
Similarly, surges can also occur between the conductors on data and telecommunication lines, causing damage to connected equipment. As such Surge Protective Devices (SPDs) are required to both power and data lines (see Figure 2b) to safeguard equipment to limit the transient overvoltages within its safe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

Figure 2a – Indirect lightning strike to ground from up to 1 km away can damage equipment.
Figure 2b – Protect all incoming metallic lines to equipment to protect against surges.

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

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

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



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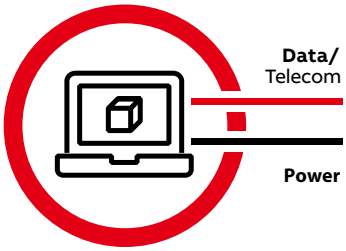

WARNING:
Equipment is ONLY protected against transient overvoltages if all incoming / outgoing mains and data lines have protection fitted.

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

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03 **Figure 2a** Indirect lightning strike to ground from up to 1 km away can damage equipment.
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04 **Figure 2b** Protect all incoming metallic lines to equipment to protect against surges.

Type 1 SPDs

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

Type 2 SPDs

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

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

Type 3 SPDs

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

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

Connection of SPDs

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

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

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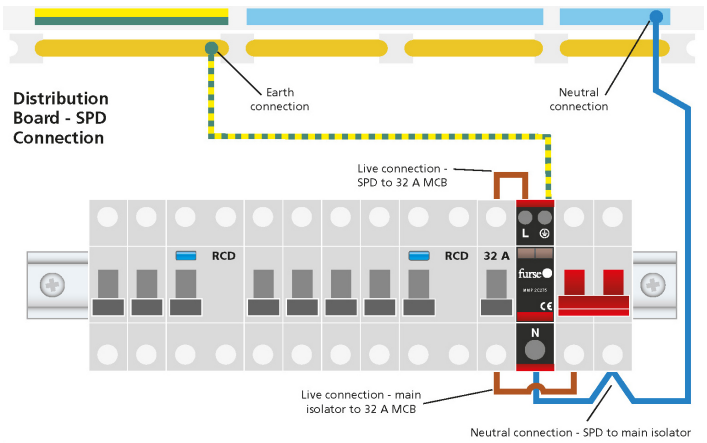
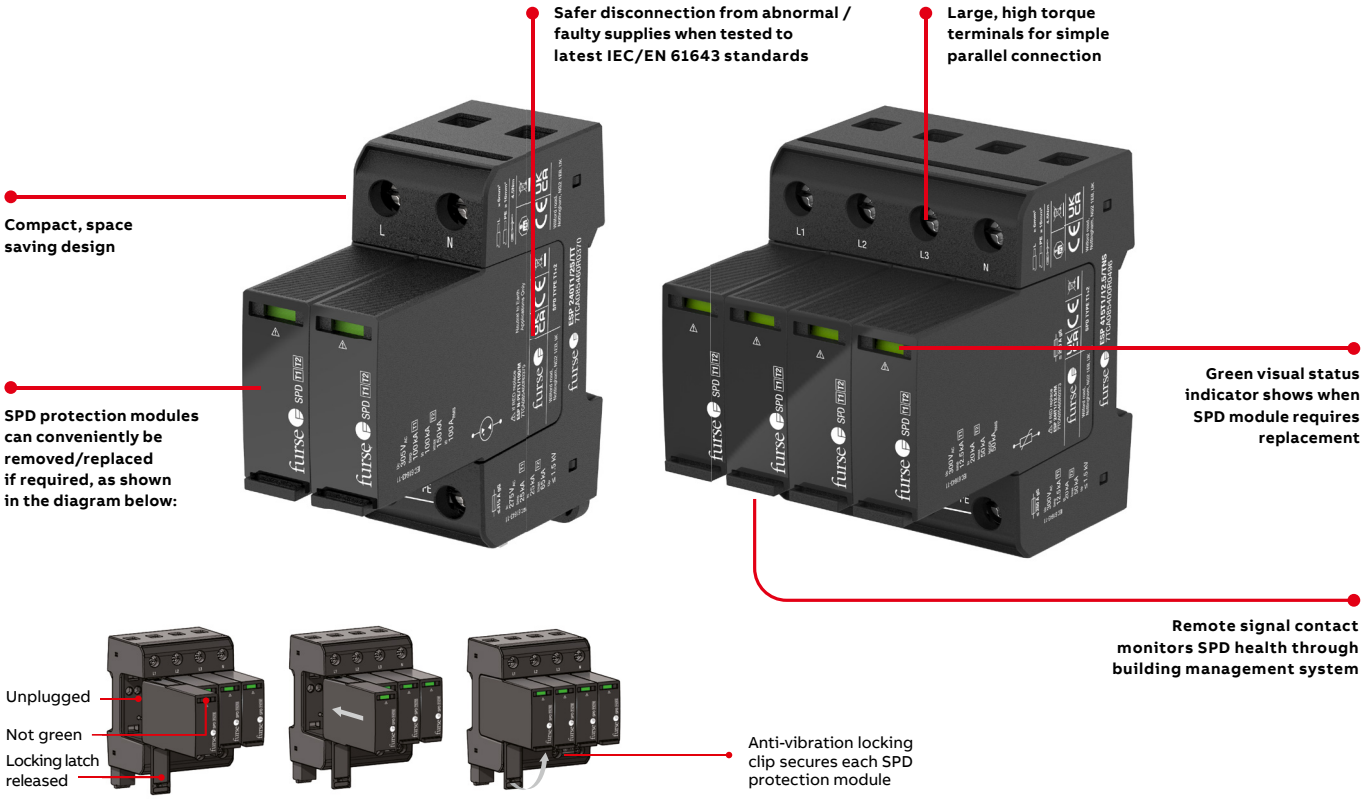


Mains power protection
Advanced Surge Protection Devices

For well over a decade the market leading ESP 240 and 415 Type 1+2 Surge Protective Devices (SPDs) for mains power supplies have been specified and used by engineers all over the world. In that time others have tried and failed to match the capabilities packaged with a compact unit.



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01 Key features of the ESP 240T1/ 415T1 Series.

The new T1 Surge Protection series from Furse brings you all the benefits of the original ESP 240 and 415 Type 1+2 SPDs for mains power supplies BUT with additional innovation for best in class performance, convenient installation and maintenance.

Features & benefits

- Enhanced protection (to IEC/BS EN 62305) offering low (superior) let-through voltage (voltage protection level U_P) further minimising the risk of flashover creating dangerous sparking or electric shock
- Safer disconnection from abnormal/faulty supplies when tested to latest IEC/BS EN 61643 safety standards
- Pluggable SPD module design (with anti-vibration locking clip and health indicator) allows for simple maintenance and replacement at end-of-life
- Remote status indication facility (with fast-fit tool-less push terminal) allows pre-failure warning to be connected to Building Management System BMS, buzzer or lighting
- Compact size for space saving convenient DIN rail installation in power distribution board
- Large, high torque terminals for simple parallel connection to mains power supplies of any load current
- Repeated protection in lightning intense environments
- Improved, straightforward installation instructions
- Maintenance free
- 5 year warranty

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02 Parallel installation of an ESP 240T1 SPD on a single phase TN-S, TN-C-S or TT supply.

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03 Parallel installation of an ESP 415T1 on a three phase TN-S, TN-C-S or TT supply.

Key points of installation
Lightning and electrical switching events can cause transient overvoltages on main power supplies, exposing computers and other electronic equipment to:
- Data loss and disruption
- Component degradation and damage
- Costly system

With a simple parallel connection to phase(s), neutral and earth at the distribution board feeding equipment, the SPD can be installed on either:
a) The load side of the incoming isolator, or
b) The closest outgoing way to the incoming supply

Phase connecting leads should be suitably fused (as per installation guidance provided) taking care to ensure discrimination with the upstream device.

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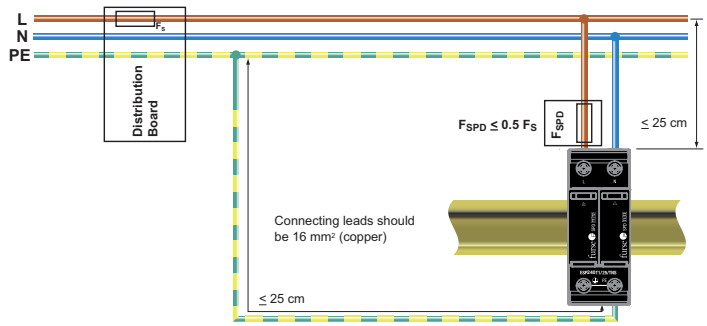

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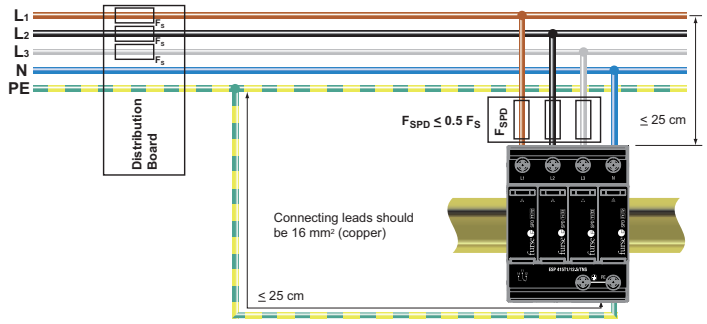


Selection
As ESP Type 1+2 SPDs are installed with parallel connection to the supply, the installation's supply current doesn't go through the SPD - hence they are suitable for installations of any supply current.

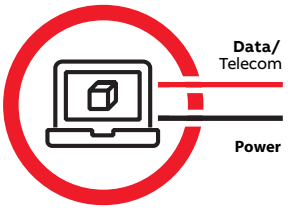
The ESP T1 Type 1+2 series are "Enhanced SPDs" to IEC/BS EN 62305 offering low (superior) voltage protection level U_p that further minimize the risk of flashover creating dangerous sparking or electric shock on mains power distribution systems.

Application
The ESP Type 1+2 SPDs are used at the service entrance (e.g. main distribution board) for buildings at risk from a direct lightning strike (where Lightning Protection Systems (LPS) are fitted and/or anexposed overhead line is present).

For downstream sub-distribution panel boards, Furse have also introduced a **new Type 2 SPD range** which fully shares the innovation, features and benefits of the new T1 series.

Metallic data and telecom lines will also require suitable SPDs for complete protection in accordance to relevant industry safety standards - contact ABB Furse for support.

Typical uses include the protection of:
- Computer equipment
- Transmitter/receiver systems
- Uninterruptible power supplies (UPSs)
- Drives and inverters
- Programmable logic controllers (PLCs)
- Medical equipment
- Critical equipment



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

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

Mains power protection

ESP Type 1+2 and Type 2 Surge Protection Series

ESP T1 Surge Protection Series

T1 part no.	T1 GID code	Comment
415T1 Series		
ESP 415T1/25/TNS	7TCA085460R0369	25kA 10/350, 4 modes
ESP 415T1/25/TNC	7TCA085400R0497	25kA 10/350, 3 modes
ESP 415T1/25/TT	7TCA085400R0498	25kA (L-N) + 100kA (N-E) 10/350, 3+1 modes
ESP 415T1/12.5/TNS	7TCA085400R0496	12.5kA 10/350, 4 modes
ESP 415T1/12.5/TNC	7TCA085460R0371	12.5kA 10/350, 3 modes
ESP 415T1/12.5/TT	7TCA085460R0372	12.5kA (L-N) + 50kA (N-E) 10/350, 3+1 modes

240T1 Series		
ESP 240T1/25/TNS	7TCA085400R0499	25kA 10/350, 2 modes
ESP 240T1/25/TNC	7TCA085400R0500	25kA 10/350, 1 mode
ESP 240T1/25/TT	7TCA085460R0370	25kA (L-N) + 100kA (N-E) 10/350, 1+1 modes

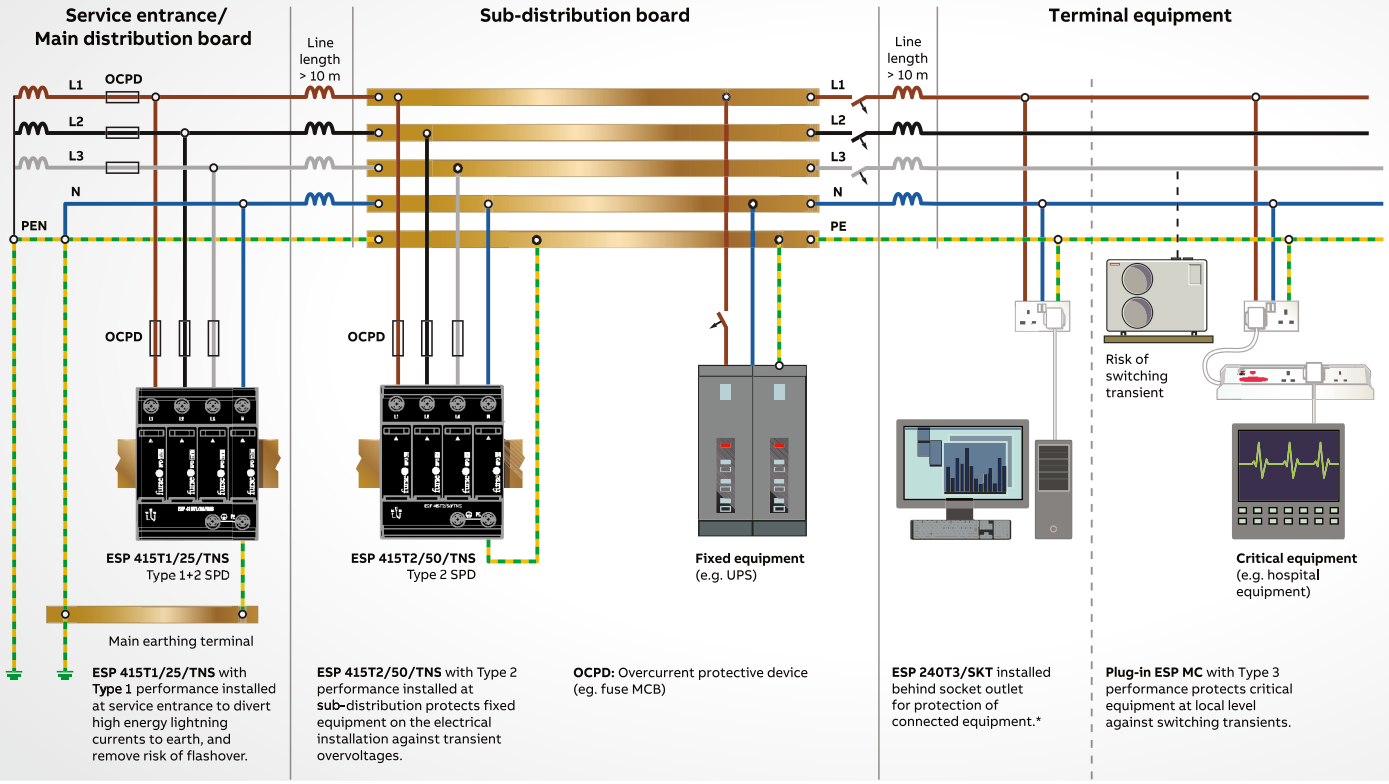
ESP T2 Surge Protection Series

T2 part no.	T2 GID code	Comment
415T2 Series		
ESP 415T2/50/TNS	7TCA085460R0391	50kA 8/20, 4 modes
ESP 415T2/50/TNC	7TCA085460R0390	50kA 8/20, 3 modes
ESP 415T2/50/TT	7TCA085400R0380	50kA (L-N) + 65kA (N-E) 8/20, 3+1 modes

240T2 Series		
ESP 240T2/50/TNS	7TCA085400R0388	50kA 8/20, 2 modes
ESP 240T2/50/TNC	7TCA085400R0383	50kA 8/20, 1 mode
ESP 240T2/50/TT	7TCA085460R0404	50kA (L-N) + 65kA (N-E) 8/20, 1+1 modes

T1 / T2 Replacement modules

Part no.	T1 GID code	Comment
ESP N-PE/T1/100/M	7TCA085460R0375	Replacement N-E 100kA 10/350 module
ESP N-PE/T1/50/M	7TCA085460R0376	Replacement N-E 50kA 10/350 TT module
ESP 240T1/25/M	7TCA085460R0374	Replacement L-N 25kA 10/350 module
ESP 240T1/12.5/M	7TCA085460R0373	Replacement L-N 12.5kA 10/350 module
ESP N-PE/T2/65/M	7TCA085460R0403	Replacement N-E 65kA 8/20 TT module
ESP 240T2/50/M	7TCA085460R0387	Replacement L-N 50kA 8/20 module



***ESP 240T3/SKT not needed** if Type 2+3 SPD (ESP 415D1) installed at sub-distribution as it protects downstream sensitive equipment against transient overvoltages.

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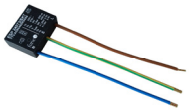
Protection for 230/400 V TN-S or TN-C-S supplies

Supply type	**Example 1**	**Example 2**	**Example 3**	**Example 4**
	No external lightning protection system fitted	No external lightning protection system fitted	External lightning protection system fitted	External lightning protection system fitted
	Underground mains supply feed	Exposed overhead mains supply feed	Multiple connected metallic services	No. of services unknown
				
Main distribution board (MDB)	**Type 1+2+3**	**Type 1+2 OR Type 1+2+3**	**Type 1+2+3**	**Type 1+2 OR Type 1+2+3**
3 Phase 400 V Service entrance, after electricity meter (Main distribution board (MDB)). Type 1+2+3 SPDs such as the ESP M and D series are used where the MDB directly feeds critical electronics	 ESP 415 D1 Series **OR** ESP 415 M1 Series	 ESP415T1/ 12.5/TNS **OR** to protect critical electronics fed from MDB ESP 415M2 Series	 ESP 415 D1 Series **OR** ESP 415 M1 Series	 For LPL I & II: ESP 415T1/ 25/TNS LPL III or IV: ESP 415T1/ 12.5/TNS **OR** For LPL I & II: ESP 415 M4 Series LPL III or IV: ESP 415 M2 Series
Sub-distribution board (SDB)	**Type 1+2+3 - 3 Phase**		**Type 1+2+3 - 1 Phase**	
Located >10 m from MDB feeding electronic equipment	 ESP 415 D1 Series **OR** ESP 415 M1 Series **OR** ESP 415 CD40 (Type 2+3) Compact Series		ESP 240 D1 Series, or ESP 240 M1 Series, or ESP 240 CD40 (Type 2+3) Compact Series **OR** **For 1 Phase 230 V** ESP 240T2/50/TNS **For 3 Phase 400 V** ESP 415T2/50/TNS	 **OR** SDB located >10 m from MDB not directly feeding electronic equipment
Final circuit equipment	**For 13 A sockets** (e.g. servers)	**Equipment up to 32 A**		**Fused spurs or single phase sockets**
Located >10 m from SDB	ESP MC ESP MC/TN/RJ11 ESP MC/Cat-5e 	 ESP 240D-10A ESP 240D-32A		For single phase spurs/socket outlets up to 16 A ESP 240T3/SKT 

Mains power protection
ESP 240T1 Surge Protection Series

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

LPZ 0→2 | COMMON MODE Equipotential Bonding | MAINS TEST TYPE 1 + 2 | REPLACEABLE PROTECTION MODULE | ENHANCED Low let-through voltage | STATUS INDICATION + VOLT-FREE CONTACT

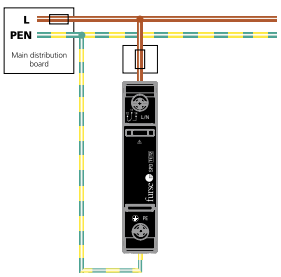
Features & benefits
- Enhanced protection (to IEC/BS EN 62305) offering low let-through voltage further minimizing the risk of
- flashover creating dangerous sparking or electric shock
- Repeated protection in lightning intense environments
- Pluggable module design (with anti-vibration locking clip)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

Application
- Use on single phase mains supplies and power distribution systems for protection against partial direct or indirect lightning strikes
- ESP 240T1/25/XXX versions for use with Class III LPS or IV LPS; or exposed overhead single phase power lines where no LPS is fitted
- ESP 240T1/25/TNS versions also cover TN-C-S earthing systems
- ESP 240T1/25/XXX can also be used for Class I LPS or Class II LPS where there are multiple metallic services to the building

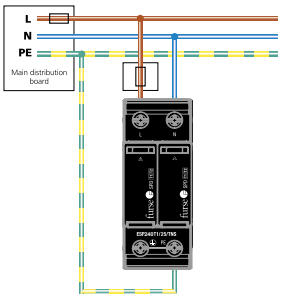
Installation
The SPD is to be installed in the main distribution board with connecting leads of minimal length. The protector should be fused and is suitable for attachment to a 35 mm top hat DIN rail. The diagrams below illustrate how to wire the appropriate ESP protector according to your chosen electrical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

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

TN-C earthing system



TN-S/TT earthing system



NOTE: Remote contact connections not shown, for clarity.

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

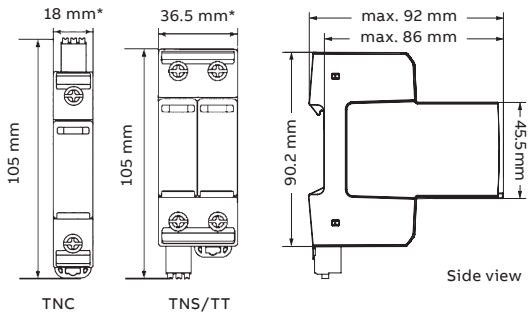
Mains power protection

ESP 240T1 Surge Protection Series

ESP 240T1 Surge Protection Series - Technical specification

Electrical specification	ESP 240T1/ 25/TNS	ESP 240T1/ 25/TNC	ESP 240T1/ 25/TT
ABB order code	7TCA085400R0499	7TCA085400R0500	7TCA085460R0370
Nominal voltage - Phase-Neutral U_o (RMS)	240 V		
Maximum voltage - Phase-Neutral U_c (RMS)	275 V		
Temporary Overvoltage TOV U_T[1] (5s/120m)	337 V / 442 V		
Short circuit withstand capability I_{SCCR}	50 kA_{RMS} / 50 Hz		
Frequency range	47-63 Hz		
Max. back-up fuse (see installation instructions)	≤ 315 A		
Leakage current (to earth)	≤ 5 µA	≤ 5 µA	≤ 5 µA
Follow current interrupt rating I_{fi}	50 kA_{RMS}	50 kA_{RMS}	50 kA_{RMS} (L-N) 100 A_{RMS} (N-E)
Volt free contact:[2]	Push terminal		
– Current rating	1 A		
– Nominal voltage (RMS)	250 V		
Transient specification	**ESP 240T1/ 25/TNS**	**ESP 240T1/ 25/TNC**	**ESP 240T1/ 25/TT**
Type 1 (BS EN/EN), Class I (IEC)			
Nominal discharge current 8/20 µs (per mode) I_n	25 kA	25 kA	25 kA (L-N) 100 kA (N-E)
Let-through voltage U_p at I_n[2]	≤ 1.5 kV	≤ 1.5 kV	≤ 1.5 kV
Impulse discharge current 10/350 µs I_{imp} (to earth)[3]	25 kA	25 kA	25 kA (L-N) 100 kA (N-E)
Total discharge current 10/350 µs I_{total} (total to earth)[4,5]	50 kA	25 kA	50 kA
Let-through voltage U_p at 1.2/50 µs (N-E, TT system)	–	–	< 1.2 kV
Type 2 (BS EN/EN), Class II (IEC)			
Nominal discharge current 8/20 µs (per mode) I_n	25 kA	25 kA	25 kA (L-N) 100 kA (N-E)
Let-through voltage U_p at I_n[2]	≤ 1.5 kV	≤ 1.5 kV	≤ 1.5 kV
Maximum discharge current I_{max} (per mode)[3]	65 kA	65 kA	65 kA (L-N) 150 kA (N-E)
Mechanical specification	**ESP 240T1/ 25/TNS**	**ESP 240T1/ 25/TNC**	**ESP 240T1/ 25/TT**
Temperature range	-40 to +80 °C		
Connection type	Screw terminal - maximum torque 4.5 Nm		
Conductor size (solid/stranded)[5]	35 mm^2		
Earth connection	Screw terminal - maximum torque 4.5 Nm		
Degree of protection (IEC 60529)	IP20		
Volt free contact	Push-fit connection with conductor up to 1.5 mm^2 (solid), rated AC 250 V, 1 A		
Case material	Thermoplastic UL-94 V-0		
Mounting	Indoor, 35 mm top hat DIN rail		
Weight	0.34 kg	0.18 kg	0.35 kg
Dimensions to DIN 43880 - HxDxW[4]	90.2 mm x 92 mm x 36.5 mm* (2TE)	90.2 mm x 92 mm x 18 mm* (1TE)	90.2 mm x 92 mm x 36.5 mm* (2TE)

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



Mains power protection
ESP 415T1 Surge Protection Series

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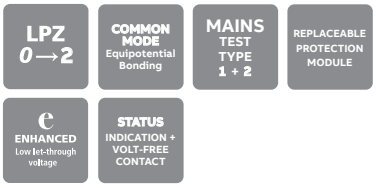


Features & benefits

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

Application

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

Installation

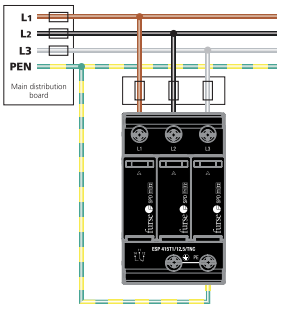
The SPD is to be installed in the main distribution board with connecting leads of minimal length. The protector should be fused and is suitable for attachment to a 35 mm top hat DIN rail. The diagrams below illustrate how to wire the appropriate ESP protector according to your chosen electrical system.

Weatherproof enclosure:
WBX D4
ABB order code:
7TCA085410R0032

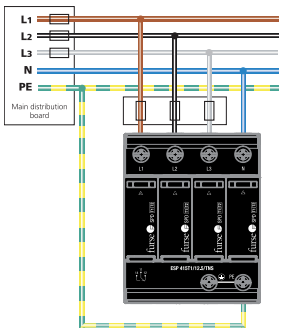
Metallic enclosure:
MBX D4
ABB order code:
7TCA085400R0649

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

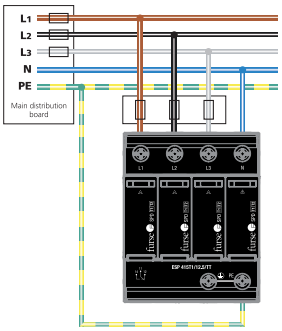
TN-C earthing system



TN-S earthing system



TT earthing system



NOTE: Remote contact connections not shown, for clarity.

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

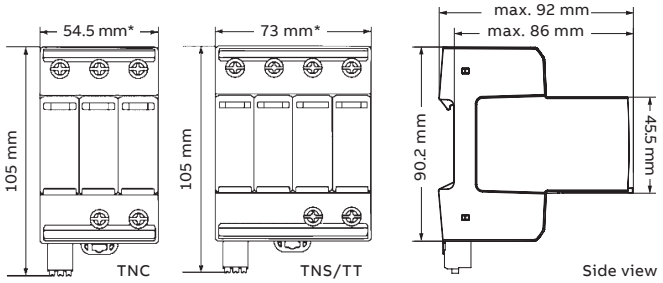
Mains power protection

ESP 415T1 Surge Protection Series

ESP 415T1 Surge Protection Series - Technical specification

Electrical specification	ESP 415T1/ 25/TNS	ESP 415T1/ 12.5/TNS	ESP 415T1/ 25/TNC	ESP 415T1/ 12.5/TNC	ESP 415T1/ 25/TT	ESP 415T1/ 12.5/TT
ABB order code	7TCA085460R0369	7TCA085400R0496	7TCA085400R0497	7TCA085460R0371	7TCA085400R0498	7TCA085460R0372
Nominal voltage - Phase-Neutral U_o (RMS)	240 V					
Maximum voltage - Phase-Neutral U_c (RMS)	275 V	300 V	275 V	300 V	275 V	300 V
Temporary Overvoltage TOV U_T[1] (5s/120m)	337 V / 442 V					
Short circuit withstand capability I_{SCCR}	50 kA_{RMS} / 50 Hz					
Frequency range	47-63 Hz					
Max. back-up fuse (see installation instructions)	≤ 315 A	≤ 250 A	≤ 315 A	≤ 250 A	≤ 315 A	≤ 250 A
Leakage current (to earth)	≤ 5 µA	≤ 600 µA	≤ 5 µA	≤ 600 µA	≤ 5 µA	≤ 5 µA
Follow current interrupt rating I_{fi}	50 kA_{RMS}	0	50 kA_{RMS}	0	50 kA_{RMS} (L-N) 100 A_{RMS} (N-E)	0 (L-N) 100 A_{RMS} (N-E)
Volt free contact:[2]	Push terminal					
– Current rating	1 A					
– Nominal voltage (RMS)	250 V					
Transient specification	**ESP 415T1/ 25/TNS**	**ESP 415T1/ 12.5/TNS**	**ESP 415T1/ 25/TNC**	**ESP 415T1/ 12.5/TNC**	**ESP 415T1/ 25/TT**	**ESP 415T1/ 12.5/TT**
Type 1 (BS EN/EN), Class I (IEC)						
Nominal discharge current 8/20 µs (per mode) I_n	25 kA	20 kA	25 kA	20 kA	25 kA (L-N) 100 kA (N-E)	20 kA (L-N) 50 kA (N-E)
Let-through voltage U_P at I_n[2]	≤ 1.5 kV	≤ 1.5 kV	≤ 1.5 kV	≤ 1.5 kV	≤ 1.5 kV (L-E) ≤ 1.7 kV (L-N)	≤ 1.5 kV
Impulse discharge current 10/350 µs I_{imp} (to earth)[3]	25 kA	12.5 kA	25 kA	12.5 kA	25 kA (L-N) 100 kA (N-E)	12.5 kA (L-N) 50 kA (N-E)
Total discharge current 10/350 µs I_{total} (total to earth)[4,5]	100 kA	50 kA	75 kA	37.5 kA	100 kA	50 kA
Let-through voltage U_P at 1.2/50 µs (N-E, TT system)	–	–	–	–	< 1.2 kV	< 1.2 kV
Type 2 (BS EN/EN), Class II (IEC)						
Nominal discharge current 8/20 µs (per mode) I_n	25 kA	20 kA	25 kA	20 kA	25 kA (L-N) 100 kA (N-E)	20 kA (L-N) 50 kA (N-E)
Let-through voltage U_P at I_n[2]	≤ 1.5 kV	≤ 1.5 kV	≤ 1.5 kV	≤ 1.5 kV	≤ 1.5 kV (L-E) ≤ 1.7 kV (L-N)	≤ 1.5 kV
Maximum discharge current I_{max} (per mode)[3]	65 kA	50 kA	65 kA	50 kA	65 kA (L-N) 150 kA (N-E)	50 kA (L-N) 100 kA (N-E)
Mechanical specification	**ESP 415T1/ 25/TNS**	**ESP 415T1/ 12.5/TNS**	**ESP 415T1/ 25/TNC**	**ESP 415T1/ 12.5/TNC**	**ESP 415T1/ 25/TT**	**ESP 415T1/ 12.5/TT**
Temperature range	-40 to +80 °C					
Connection type	Screw terminal - maximum torque 4.5 Nm					
Conductor size (solid/stranded)[5]	35 mm^2					
Earth connection	Screw terminal - maximum torque 4.5 Nm					
Degree of protection (IEC 60529)	IP20					
Volt free contact	Push-fit connection for conductor up to 1.5 mm^2, rated AC 250 V, 1 A					
Case material	Thermoplastic UL-94 V-0					
Mounting	Indoor, 35 mm top hat DIN rail					
Weight	0.69 kg	0.65 kg	0.51 kg	0.51 kg	0.69 kg	0.68 kg
Dimensions to DIN 43880 - HxDxW[4]	90.2 mm x 92 mm x 73 mm* (4TE)	90.2 mm x 92 mm x 73 mm* (4TE)	90.2 mm x 92 mm x 54.5 mm* (3TE)	90.2 mm x 92 mm x 54.5 mm* (3TE)	90.2 mm x 92 mm x 73 mm* (4TE)	90.2 mm x 92 mm x 73 mm* (4TE)

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



Mains power protection
ESP 240T2 Surge Protection Series

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

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

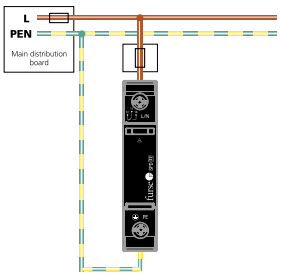
Features & benefits
- Repeated protection in lightning intense environments
- Pluggable module design (with anti-vibration locking clip) allows for simple replacement at end-of-life
- Compact, space saving design
- Indicator shows when the SPD protection modules requires replacement
- Remote signal contact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

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

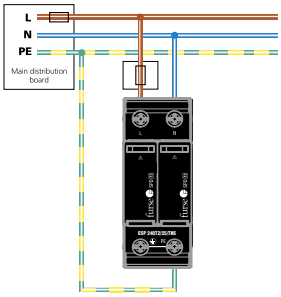
Installation
The SPD is to be installed in the sub-distribution board with connecting leads of minimal length. The protector should be fused and is suitable for attachment to a 35 mm top hat DIN rail. The diagrams below illustrate how to wire the appropriate ESP protector according to your chosen electrical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

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

TN-C earthing system



TN-S/TT earthing system



NOTE: Remote contact connections not shown, for clarity.

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

Mains power protection

ESP 240T2 Surge Protection Series

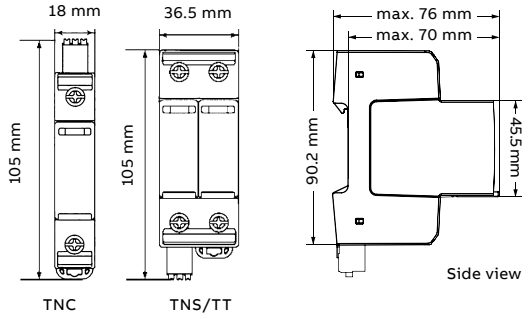
ESP 240T2 Surge Protection Series - Technical specification

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

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

Mechanical specification	ESP 240T2/50/TNS	ESP 240T2/50/TNC	ESP 240T2/50/TT
Temperature range	-40 to +80 °C		
Connection type	Screw terminal - maximum torque 4.5 Nm		
Conductor size (solid/stranded)[5]	35 mm²		
Earth connection	Screw terminal - maximum torque 4.5 Nm		
Degree of protection (IEC 60529)	IP20		
Volt free contact	Push-fit connection for conductor up to 1.5 mm², rated AC 250 V, 1 A		
Case material	Thermoplastic UL-94 V-0		
Mounting	Indoor, 35 mm top hat DIN rail		
Weight	0.26 kg	0.14 kg	0.25 kg
Dimensions to DIN 43880 - HxDxW[4]	90.2 mm x 70 mm x 36.5 mm* (2TE)	90.2 mm x 70 mm x 18 mm* (1TE)	90.2 mm x 70 mm x 36.5 mm* (2TE)

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



Mains power protection
ESP 415T2 Surge Protection Series

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

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

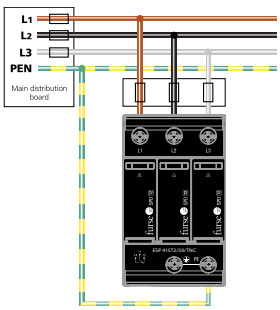
Features & benefits
- Repeated protection in lightning intense environments
- Pluggable module design (with anti-vibration locking clip) allows for simple replacement at end-of-life
- Compact, space saving design
- Indicator shows when the SPD protection modules requires replacement
- Remote signal contact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

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

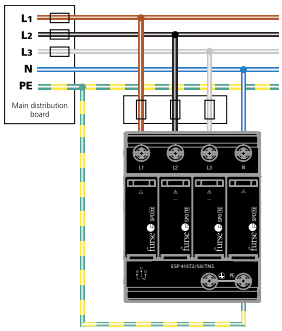
Installation
The SPD is to be installed in the sub-distribution board with connecting leads of minimal length. The protector should be fused and is suitable for attachment to a 35 mm top hat DIN rail. The diagrams below illustrate how to wire the appropriate ESP protector according to your chosen electrical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

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

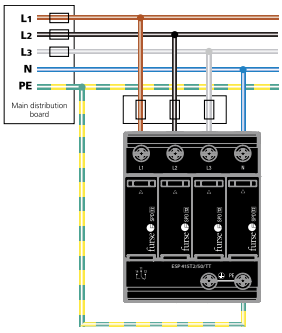
TN-C earthing system



TN-S earthing system



TT earthing system



NOTE: Remote contact connections not shown, for clarity.

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

Mains power protection

ESP 415T2 Surge Protection Series

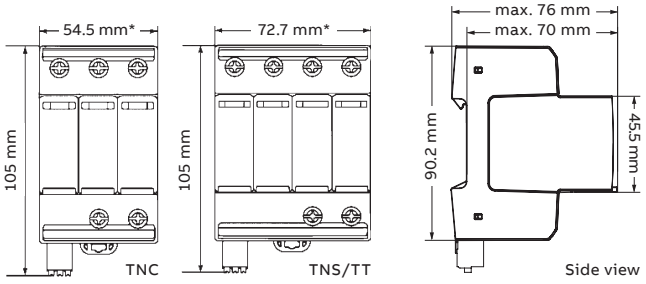
ESP 415T2 Surge Protection Series - Technical specification

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

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

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

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



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