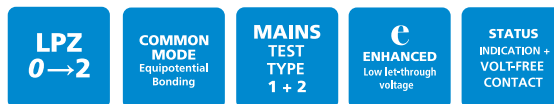


Specific systems protection

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 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

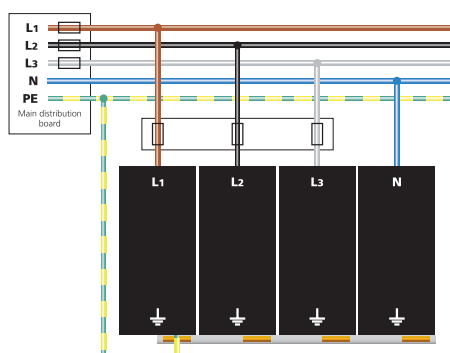
Use with 4 of ESP 690/12.5/WT for TN-S supplies

ESP CE13

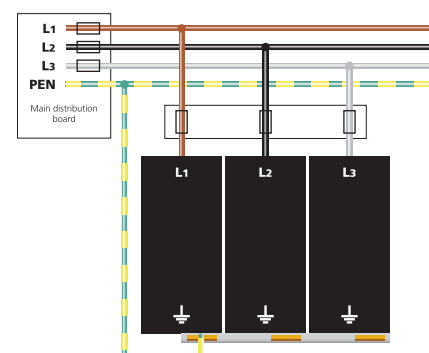
Use with 4 of ESP 690/25/WT for TN-S supplies

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

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. BS EN/IEC 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 Fursee Guide to BS EN 62305 Protection against Lightning.

Specific systems protection

ESP WT Series

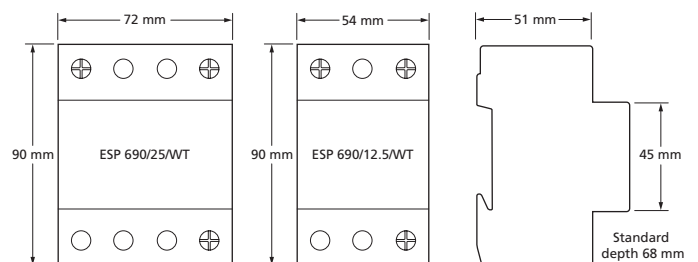
ESP WT Series - Technical specification

Electrical Specification	ESP 690/25/WT	ESP 690/12.5/WT
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
Type 1 (BS EN/EN), Class I (IEC)		
Nominal discharge current 8/20 μ 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 μ s I_{imp} (per mode) ⁽²⁾	25 kA	12.5 kA
Let-through voltage U_p at $I_{imp}^{(1)}$	< 2.0 kV	
Type 2 (BS EN/EN), Class II (IEC)		
Nominal discharge current 8/20 μ 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) ⁽²⁾	80 kA	40 kA
Mechanical Specification	ESP 690/25/WT	ESP 690/12.5/WT
Temperature range	-40 to +80 °C	
Connection type	Screw terminal	
Conductor size (stranded)	25 mm ²	
Earth connection	Screw terminal	
Volt free contact	Connect via screw terminal with conductor up to 1.5 mm ² (stranded)	
Degree of protection (IEC 60529)	IP20	
Case Material	Thermoplastic, UL94 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 ESP690/25/WT)
- HxDxW: ⁽³⁾	- for 3ph TN-C supplies 90 mm x 68 mm x 216 mm (total: 3 x ESP690/25/WT)	90 mm x 68 mm x 162 mm (total: 3 x ESP690/12.5/WT)
	- for 3ph TN-S supplies 90 mm x 68 mm x 288 mm (total: 4 x ESP 690/25/WT)	90 mm x 68 mm x 216 mm (total: 4 x ESP 690/12.5/WT)

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

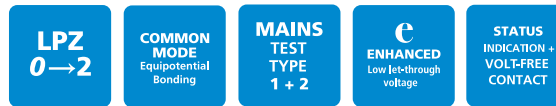
⁽²⁾ The electrical system, external to the unit, may constrain the actual current rating achieved in a particular installation

⁽³⁾ The remote signal contact (removable) adds 10 mm to height



Specific systems protection

ESP 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 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.

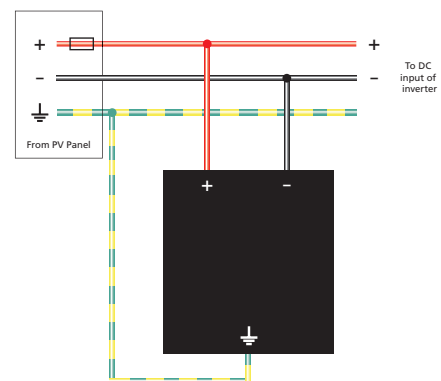
Installation

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



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. BS EN/IEC 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
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"> – 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. – 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. 	

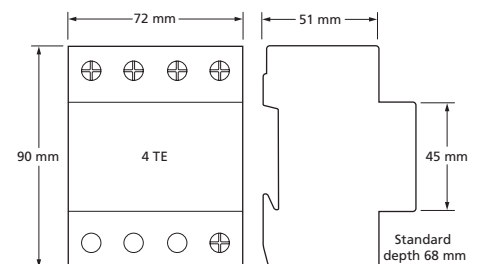
Transient Specification	ESP DC550/12.5/PV	ESP DC1000/12.5/PV
Type 1 (BS EN/EN), Class I (IEC)		
Nominal discharge current 8/20 μ s (per mode) I_n	20 kA	
Let-through voltage U_p at $I_n^{(1)}$	< 2.0 kV	< 2.6 kV
Impulse discharge current 10/350 μ s I_{imp} (per mode) ⁽²⁾	12.5 kA	
Let-through voltage U_p at $I_{imp}^{(1)}$	< 1.7 kV	< 2.4 kV
Type 2 (BS EN/EN), Class II (IEC)		
Nominal discharge current 8/20 μ 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) ⁽²⁾	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 ²	
Earth connection	Screw terminal	
Volt free contact	Connect via screw terminal with conductor up to 1.5 mm ² (stranded)	
Degree of protection (IEC 60529)	IP20	
Case Material	Thermoplastic, UL94 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: ⁽³⁾	90 mm x 68 mm x 72 mm (4TE)	

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

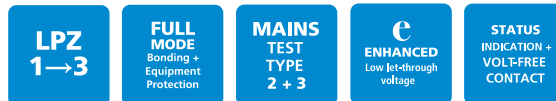
⁽²⁾ The electrical system, external to the unit, may constrain the actual current rating achieved in a particular installation

⁽³⁾ The remote signal contact (removable) adds 10 mm to height



Specific systems protection

ESP 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

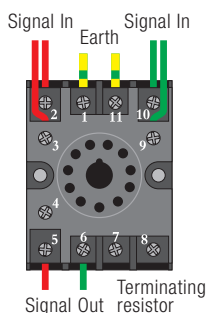
- Accepted for use on Network Rail infrastructure. NRS PADS references: ESP SSI/M - 086/047066; ESP SSI/B - 086/047067; ESP SSI/120AC - 086/047058 and ESP SSI/140AC - 086/047059 (Network Rail Approval PA05/00471)
- Very low let-through voltage (enhanced protection to BS EN 62305) between all sets of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

Application

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

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

Use ESP PTE002 SSI tester for line-side testing of SSI/M modules.

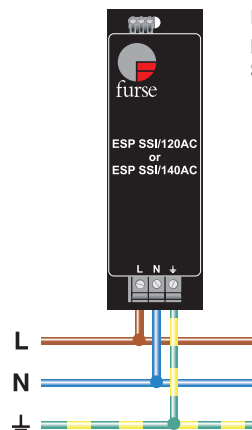


- 1 - Earth in Line
- 2 - Primary signal in + Line
- 3 - Secondary signal in + Line
- 4 - Not connected
- 5 - Signal out + (to DLM) Clean
- 6 - Signal out - (to DLM) Clean
- 7 - Not connected
- 8 - 100 Ω terminating Clean resistor
- 9 - Primary signal in - Line
- 10 - Secondary signal in - Line
- 11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

Installation

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

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



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
Maximum signal voltage ⁽¹⁾	7 V		Nominal voltage - Phase - Neutral U_0 (RMS)	120 V	140 V
Maximum common mode stand-off voltage	90 Vrms		Maximum working voltage - Phase - Neutral U_c (RMS)	150 V	165 V
Current rating	100 mA		Working voltage (RMS)	90-150 V	90-165 V
In-line resistance (per line, $\pm 10\%$)	4.5 Ω		Frequency range	47-63 Hz	
Leakage: - (Line to line impedance)	> 1 M Ω		Current rating (supply) - see installation instructions	100 A	
- (Line to earth impedance)	> 10 k Ω		Leakage current (to earth)	< 60 μ A	
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 $\pm 5\%$ 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: ⁽⁴⁾	Screw terminal	
			- Current rating	> 1 M Ω	
			- Nominal voltage (RMS)	> 10 k Ω	

Transient Specification	ESP SSI/M	ESP SSI/B	Transient Specification	ESP SSI/120AC	ESP SSI/140AC
Transverse (Differential) 'let-through' voltage ⁽²⁾ U_p	15 V		Let-through voltage (all conductors) Type 2 (BS EN/EN), Class II (IEC)		
Common mode 'let-through' voltage ⁽³⁾ U_p	250 V		Nominal discharge current 8/20 μ s (per mode) I_n	5 kA	
			Let-through voltage U_p at I_n ⁽⁵⁾	460 V	540 V
			Maximum discharge current I_{max} (per mode) ⁽⁶⁾	20 kA	
			Type 3 (BS EN/EN), Class III (IEC)		
			Let-through voltage at U_{oc} of 6 kV 1.2/50 μ s and I_{sc} of 3 kA 8/20 μ s (per mode) ⁽⁷⁾	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 33mm centres	Conductor size (stranded)	16 mm ²	
- 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 ² (stranded)	
- G Din rail mount (ESP SSI/B/G)	-	2 x mounting clips with screws	Case material	Steel	
Max load	ABS UL94 V-0		Weight: - Unit	0.5 kg	
Weight: - Unit	0.065 kg	0.075 kg	- Packaged	0.6 kg	
- Packaged (per 50)	3.25 kg	3.9 kg	Dimensions	See diagram below	
Dimensions	See diagram below				

⁽¹⁾ Maximum signal voltage (DC or AC peak) measured at 200 μ A

⁽²⁾ 'Let-through' voltage is the maximum transient voltage 'let-through' to the equipment to be protected.

C2 test (to BS EN/EN/IEC 61643-21) 2 kV 1.2/50 μ s. 1 kA 8/20 μ s. 'Let-through' voltage ($\pm 10\%$)

⁽³⁾ 'Let-through' voltage is the maximum transient voltage 'let-through' to the equipment to be protected.

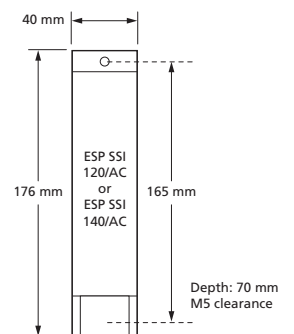
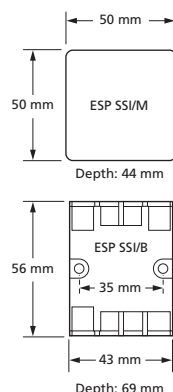
C2 test (to BS EN/EN/IEC 61643-21) 4 kV 1.2/50 μ s. 2 kA 8/20 μ s. 'Let-through' voltage ($\pm 20\%$)

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

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

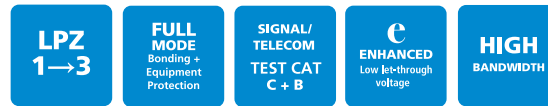
⁽⁶⁾ The electrical system, external to the unit, may constrain the actual current rating achieved in a particular installation

⁽⁷⁾ 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 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.



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
Maximum working voltage ⁽¹⁾	140 V	18.9 V	18.9 V	6.4 V	6.4 V
Maximum operating current	4 A	800 mA	800 mA	300 mA	300 mA
Characteristic impedance	75 Ω				
Bandwidth	5-860 MHz	5-2450 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	–	–

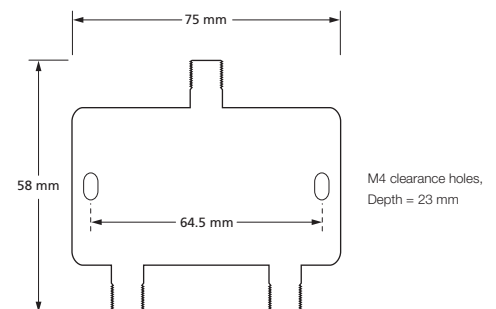
Transient Specification	ESP CATV/F	ESP MATV/F	ESP SMATV/F	ESP TV/F	ESP TV/EURO
Let-through voltage (all conductors)⁽²⁾ U_p					
C2 test 4 kV 1.2/50 μs, 2 kA 8/20 μs to BS EN/EN/IEC 61643-21	270 V	70 V	70 V	65 V	65 V
C1 test 1 kV 1.2/50 μs, 0.5 kA 8/20 μs to BS EN/EN/IEC 61643-21	265 V	60 V	60 V	50 V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

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				

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

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

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



Specific systems protection

ESP CCTV Series



LPZ 0→3	FULL MODE Bonding + Equipment Protection	HIGH BANDWIDTH	SIGNAL/ TELECOM TEST CAT D + C + B	ENHANCED Low let-through voltage	LOW IN-LINE RESISTANCE 1 Ω	CURRENT RATING 300 mA
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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 BS EN 62305) between all lines - Full Mode protection
- Full mode design capable of handling partial lightning currents as well as allowing continual operation of protected equipment
- Repeated protection in lightning intense environments
- 100 MHz bandwidth prevents the degradation of high frequency signals
- Low in-line resistance to minimise unnecessary reductions in signal strength and maximise 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.

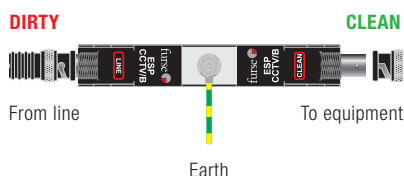
Installation

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).

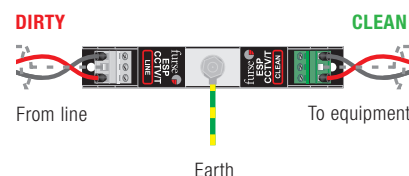
Accessories

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.

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
Nominal voltage ⁽¹⁾ (peak-peak)	1 V				2 V			
Maximum working voltage U_c ⁽²⁾ (peak)	7.79 V	16.7 V	36.7 V	56.7 V	7.79 V	16.7 V	36.7 V	56.7 V
Current rating (signal)	300 mA							
In-line resistance ($\pm 10\%$)	1 Ω inserted in coax inner				1 Ω per line			
Bandwidth (-3 dB 75 Ω system) ⁽³⁾	> 100 MHz							
Voltage standing wave ratio	< 1.2:1							

Transient Specification	ESP CCTV/B	ESP CCTV/B-15V	ESP CCTV/B-30V	ESP CCTV/B-50V	ESP CCTV/T	ESP CCTV/T-15V	ESP CCTV/T-30V	ESP CCTV/T-50V
Let-through voltage (all conductors)⁽⁴⁾ Up								
C2 test 4 kV 1.2/50 μ s, 2 kA 8/20 μ s 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 μ s, 0.5 kA 8/20 μ s 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 μ s 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 μ s ⁽⁵⁾	17.0 V	28.2 V	49.5 V	76.2 V	17.0 V	28.2 V	49.5 V	76.2 V
Maximum surge current⁽⁶⁾								
D1 test 10/350 μ s to BS EN/EN/IEC 61643-21: - Per signal wire	2.5 kA				2.5 kA			
- Per pair	-				5 kA			
8/20 μ s 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 ²
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	

⁽¹⁾ Nominal voltage (DC or AC peak) measured at <10 μ A leakage

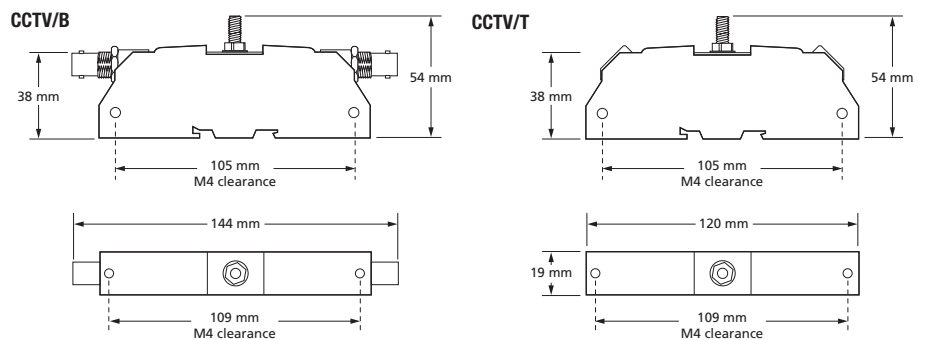
⁽²⁾ Maximum working voltage (DC or AC peak) measured at 5 mA leakage

⁽³⁾ Capacitance < 30 pF

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

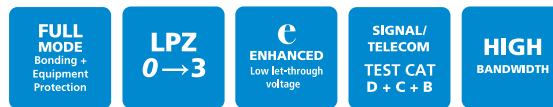
⁽⁵⁾ Test to IEC 61000-4-5:2006, ITU-T (formerly CCITT) K.20, K.21 and K.45, Telcordia GR-1089-CORE, Issue 2:2002, ANSI TIA/EIA/IS-968-A:2002 (formerly FCC Part 68)

⁽⁶⁾ The installation and connectors external to the protector may limit the capability of the protector



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 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).

ESP RF 111A21 with N female connectors installed in series



PART NUMBERING SYSTEM: Fursey 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 AABCDE**

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 Ω 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 xxxxE** 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

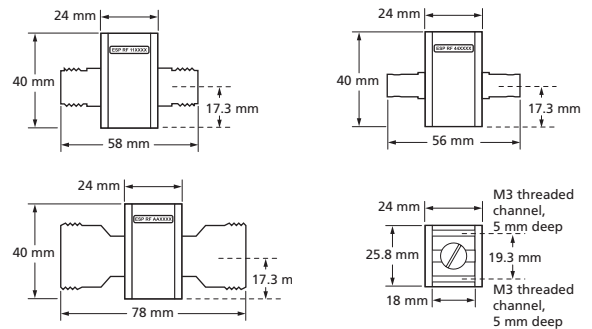
ESP RF Series - Technical specification

Electrical Specification	ESP RF xx1x21					
Gas Discharge Tube voltage	90 V	150 V	230 V	350 V	470 V	600 V
Maximum working voltage U_c (RMS) ⁽¹⁾	51 V	85 V	130 V	200 V	265 V	340 V
Characteristic impedance	50 Ω					
Bandwidth	DC-2.7 GHz					
Voltage standing wave ratio	≤ 1.1					
Insertion loss over bandwidth	≤ 0.1 dB					
Maximum power ⁽¹⁾	40 W	120 W	280 W	650 W	1.15 kW	1.90 kW

Transient Specification	ESP RF xx1x21					
Let-through voltage (all conductors)⁽²⁾ Up						
C2 test 4 kV 1.2/50 μ s, 2 kA 8/20 μ 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 μ s, 0.5 kA 8/20 μ 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 μ s to BS EN/EN/IEC 61643-21	< 400 V	< 350 V	< 450 V	< 550 V	< 730 V	< 800 V
5 kV, 10/700 μ s ⁽³⁾	< 430 V	< 370 V	< 470 V	< 580 V	< 750 V	< 830 V
Maximum surge current⁽⁴⁾						
D1 test 10/350 μ s to BS EN/EN/IEC 61643-21	2.5 kA					
8/20 μ 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		

- ⁽¹⁾ The maximum RF working voltage and maximum power for the protectors is dependent on the GDT selected. See 'Gas Discharge Tube selection' below
- ⁽²⁾ 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
- ⁽³⁾ Test to IEC 61000-4-5:2006, ITU-T (formerly CCITT) K.20, K.21 and K.45, Telcordia GR-1089-CORE, Issue 2:2002, ANSI TIA/EIA/IS-968-A:2002 (formerly FCC Part 68)
- ⁽⁴⁾ The installation and connections external to the protector may limit the capability of the protector



ESP RF BK1

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

ESP RF BK2

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

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

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 Ω 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

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 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)

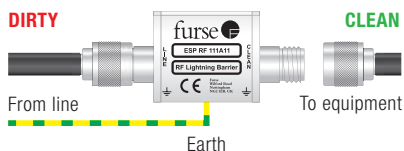
ESP RF BK4

Bulkhead through mounting plate (for 4 products)

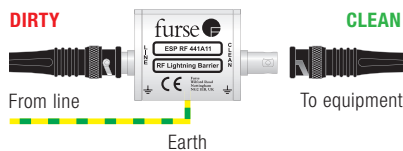
ESP RF GDT-A

Replacement gas discharge tube

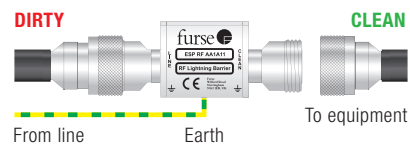
ESP RF 111A11 with N female connectors installed in series



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
Maximum working voltage U_c (RMS)	86 V		
Maximum transmitted power (RMS)	150 W		
Characteristic impedance	50 Ω		
Bandwidth	50-2700 MHz		
Voltage standing wave ratio	≤ 1.2		
Insertion loss over bandwidth:			
– 50-500 MHz	≤ 0.4 dB		
– 500-1,600 MHz	≤ 0.2 dB		
– 1.6-2.7 GHz	≤ 0.4 dB		
Maximum power	150 W		

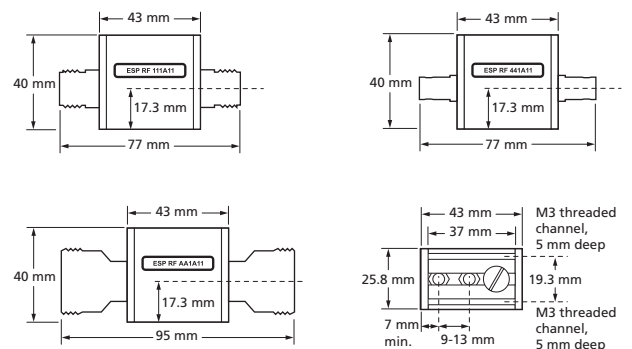
Transient Specification	ESP RF 111A11	ESP RF AA1A11	ESP RF 441A11
Let-through voltage (all conductors)⁽¹⁾ U_p			
C2 test 4 kV 1.2/50 μ s, 2 kA 8/20 μ s to BS EN/EN/IEC 61643-21	24 V		
C1 test 1 kV 1.2/50 μ s, 0.5 kA 8/20 μ s to BS EN/EN/IEC 61643-21	15 V		
B2 test 4 kV 10/700 μ s to BS EN/EN/IEC 61643-21	15 V		
5 kV, 10/700 μ s ⁽²⁾	20 V		
Maximum surge current⁽³⁾			
D1 test 10/350 μ s to BS EN/EN/IEC 61643-21	1 kA		
8/20 μ 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		

⁽¹⁾ 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

⁽²⁾ 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)

⁽³⁾ The installation and connectors external to the protector may limit the capability of the protector



ESP RF BK1

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

ESP RF BK2

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

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

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