

Electrical specification	ESP RF 111A11	ESP RF AA1A11	ESP RF 441A11
Maximum working voltage U_c (RMS)		86V	
Maximum transmitted power (RMS)		150W	
Characteristic impedance		50Ω	
Bandwidth		50 – 2700MHz	
Voltage standing wave ratio		≤1.2	
Insertion loss over bandwidth – 50-500MHz		≤0.4dB	
– 500-1,600MHz		≤0.2dB	
– 1.6-2.7GHz		≤0.4dB	
Maximum power		150W	

Transient specification	ESP RF 111A11	ESP RF AA1A11	ESP RF 441A11
Let-through voltage (all conductors) ¹ U_p			
C2 test 4kV 1.2/50μs, 2kA 8/20μs to BS/EN/IEC 61643-21		24V	
C1 test 1kV, 1.2/50μs, 0.5kA 8/20μs to BS/EN/IEC 61643-21		15V	
B2 test 4kV 10/700μs to BS/EN/IEC 61643-21		15V	
5kV, 10/700μs ²		20V	
Maximum surge current ³			
D1 test 10/350μs to BS/EN/IEC 61643-21		1kA	
8/20μs to ITU (formerly CCITT), BS 6651:1999 Appendix C		10kA	

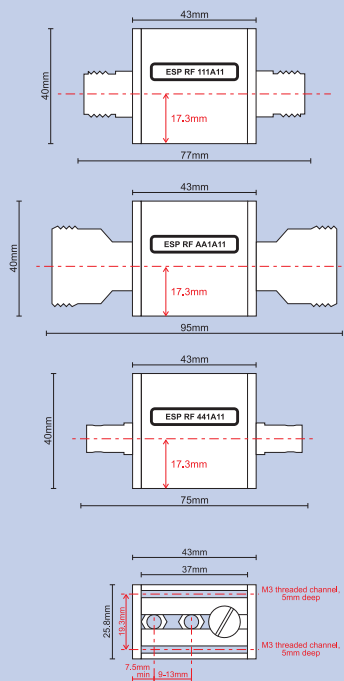
¹ The maximum transient voltage let-through the protector throughout the test (±10%). Response time <10ns. This let-through voltage represents a deviation from the applied signal voltage, present at the time of the test.

² Test to BS 6651:1999 Appendix C, Cat C-High, IEC 61000-4-5:1995, 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.

Mechanical specification	ESP RF 111A11	ESP RF AA1A11	ESP RF 441A11
Temperature range		-25°C to +70°C	
Connection type	N female	7/16 DIN female	BNC female
Earth connection		Via mounting fixtures	
Case material, finish		Aluminium, Silver plated	
Weight – unit	150g	220g	120g
– packaged	170g	240g	160g

Dimensions



ESP RF BK1

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

ESP RF BK2

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

(Mounting brackets supplied with screws for fixing to protector)

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.



LPZ $0_A \rightarrow 3$	FULL MODE Bonding + Equipment Protection
SIGNAL/ TELECOM TEST CAT D + C + B	ENHANCED Low let-through voltage
LOW INLINE 1Ω RESISTANCE	CURRENT 300mA RATING
HIGH BANDWIDTH	

Combined Category D, C, B tested protector (to BS EN 61643-21) 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_A to protect against flashover (typically the service entrance location) through to LPZ 3 to protect sensitive electronic equipment.

Features and 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
- ✓ 100MHz 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 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



Protectors for the video (ESP CCTV/B, left), camera telemetry (ESP 06E, centre) and the low current mains power (ESP 240-5A, right) inputs to a camera, installed together on a CME 4 mounting and earthing kit. Note that the protectors have been cross bonded to the metal work of the pole (out of shot)

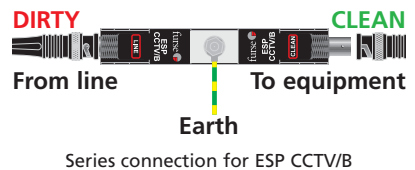
Application

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 simultaneously mounted and earthed 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.

Electrical specification

	ESP CCTV/B	ESP CCTV/T
Nominal voltage¹ (peak – peak)	1V	2V
Maximum working voltage U_c^2 (peak)	6.45V	
Current rating (signal)	300mA	
In-line resistance ($\pm 10\%$)	1 Ω inserted in coax inner	1 Ω per line
Bandwidth (-3dB 75W system) ³	>100MHz	
Voltage standing wave ratio	<1.2	

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

² Maximum working voltage (DC or AC peak) measured at 10mA leakage. Other voltages available – contact Furse for details.

³ Capacitance <30pF.

Transient specification

	ESP CCTV/B	ESP CCTV/T
Let-through voltage (all conductors) ¹ U_p		
C2 test 4kV 1.2/50 μ s, 2kA 8/20 μ s to BS/EN/IEC 61643-21	39.5V	
C1 test 1kV, 1.2/50 μ s, 0.5kA 8/20 μ s to BS/EN/IEC 61643-21	26.0V	
B2 test 4kV 10/700 μ s to BS/EN/IEC 61643-21	16.0V	
5kV, 10/700 μ s ²	17V	
Maximum surge current³		
D1 test 10/350 μ s to BS/EN/IEC 61643-21		
– per signal wire	2.5kA	2.5kA
– per pair	–	5kA
8/20 μ s to ITU (formerly CCITT), BS 6651:1999 Appendix C		
– per signal wire	10kA	10kA
– per pair	–	20kA

¹ The maximum transient voltage let-through the protector throughout the test ($\pm 10\%$), line to line & line to earth. Screen to earth let-through voltage will be up to 600V (with 5kV 10/700 test), when protector is configured for use with non-earthed or isolated screen systems. Response time <10ns.

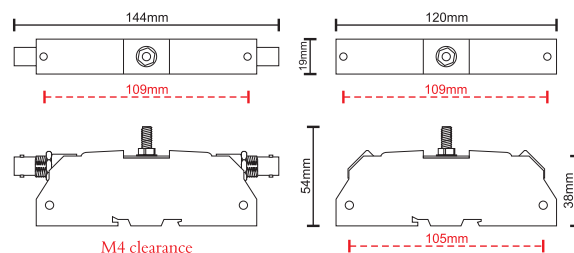
² Test to BS 6651:1999 Appendix C, Cat C-High, IEC 61000-4-5:1995, ITU-T (formerly CCITT) K.20, K.21 and K.45, Telcordia GR-1089-CORE, Issue 2:2002, ANSI TIA/EIA/IS-968-A:2002 (formerly FCC Part 68).

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

Mechanical specification

	ESP CCTV/B	ESP CCTV/T
Temperature range	-25°C to +70°C	
Connection type	Coaxial BNC female	Screw terminal
Conductor size (stranded)	Not applicable	2.5mm ²
Earth connection	M6 stud	
Casing material	Conductive ABS UL94 V-0	
Weight – unit	0.08kg	
– packaged (per 10)	0.9kg	

Dimensions



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



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

Combined Category C, B tested data link protector (to BS EN 61643-21) and Combined Type 2 and Type 3 tested mains protector (to BS EN 61643-11) 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 to through to LPZ 3 to protect sensitive electronic equipment.

Features and 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 modified base unit 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 incorporates a 100Ω terminating resistance that can be connected if required
- ✓ ESP SSI/B can be flat mounted, or a built-in DIN rail foot allows simple clip-on mounting to top-hat or G DIN rails
- ✓ 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 base unit with the ESP SSI/M protection module

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

Network Rail Certification

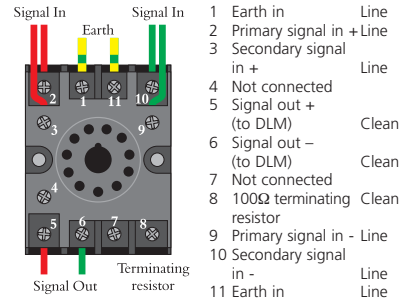
All the products on this page have Network Rail Certificates of Acceptance, allowing them to be used on Network Rail infrastructure.

Electronic Systems Protection | SSI mains power supplies and data links

Installation

ESP SSI/B

Connect in series with the data link either near where it enters the trackside location cabinet or the equipment room.

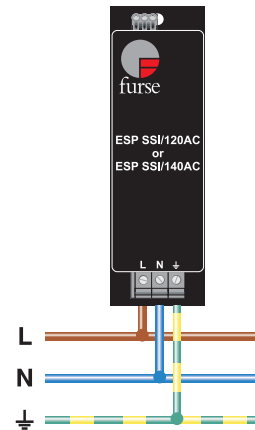


ESP SSI/120AC and ESP SSI/140AC

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)



Furse transient overvoltage protectors are maintenance free and have long lifetimes – essential criteria for trackside equipment

Electrical specification

	ESP SSI/M
Maximum signal voltage ¹	7V
Maximum common mode stand-off voltage	90Vrms
Current rating	100mA
In-line resistance (per line, ±10%)	4.5Ω
Leakage (Line to line impedance) (Line to earth impedance)	>1MΩ >10kΩ
Differential Bandwidth (50Ω system)	10MHz

¹ Maximum signal voltage (DC or AC peak) measured at 200μA.

ESP SSI/B

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

Transient specification

	ESP SSI/M
Transverse (Differential) 'let-through' voltage ¹ U_p	15V
Common mode 'let-through' voltage ² U_p	250V

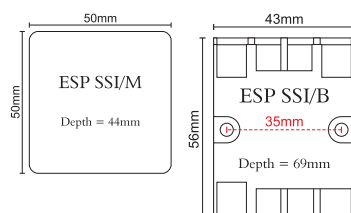
¹ 'Let-through' voltage is the maximum transient voltage 'let-through' to the equipment to be protected. C2 test (to BS/EN/IEC 61643-21) 2kV 1.2/50μs. 1kA 8/20μs. 'Let-through' voltage (±10%).

² 'Let-through' voltage is the maximum transient voltage 'let-through' to the equipment to be protected. C2 test (to BS/EN/IEC 61643-21) 4kV 1.2/50μs. 2kA 8/20μs. 'Let-through' voltage (±20%).

Mechanical specification

	ESP SSI/M	ESP SSI/B
Temperature range	-25 to +70°C	
Connection type	-	Screw terminal
Fixing connection (SSI/B) - Flat mount	-	Two M4 fixing holes with 35mm centres
- Top Hat Din rail mount	-	An integral clip
- G Din rail mount	-	Two mounting clips with screws
Max load	-	10A, 250V
Casing material	ABS UL94 V-0	
Weight – unit	0.065kg	0.075kg
- packaged (per 50)	3.25kg	3.9kg

Dimensions



ESP SSI/120AC ESP SSI/140AC

Nominal voltage - Phase - Neutral U_o (RMS)	120V	140V
Maximum working voltage - Phase - Neutral U_c (RMS)	150V	165V
Working voltage (RMS)	90-150V	90-165V
Frequency range	47 – 63Hz	
Current rating (supply) - see installation instructions	100A	
Leakage current (to earth)	<60μA	
Indicator circuit current	<10mA	
Volt free contact ¹	Screw terminal	
- current rating	200mA	
- nominal voltage (RMS)	250V	

¹ Minimum permissible load is 5V DC, 10mA to ensure reliable contact operation.

ESP SSI/120AC ESP SSI/140AC

Let-through voltage (all conductors) Type 2 (BS/EN), Class II (IEC)		
Nominal discharge current 8/20μs (per mode) I_n	5kA	
Let-through voltage U_p at I_n ¹	460V	540V
Maximum discharge current I_{max} (per mode) ²	20kA	
Type 3 (BS/EN), Class III (IEC)		
Let-through voltage at U_{oc} of 6kV 1.2/50μs and I_{sc} of 3kA 8/20μs (per mode) ³	400V	500V

¹ The maximum transient voltage let-through of the protector throughout the test (±5%), per mode.

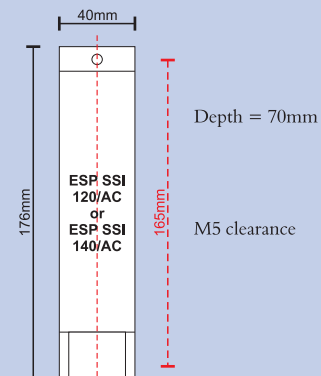
² The electrical system, external to the unit, may constrain the actual current rating achieved in a particular installation.

³ Combination wave test within BS 6651:1999 App. C, Cats C-Low & B-High, 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

ESP SSI/120AC ESP SSI/140AC

Temperature range	-40 to +70°C
Connection type	Screw terminal
Conductor size (stranded)	16mm ²
Earth connection	Screw terminal
Volt free contact	Connect via screw terminal with conductor up to 2.5mm ² (stranded)
Case material	Steel
Weight – unit	0.5kg
- packaged	0.6kg

Dimensions





FULL MODE Bonding + Equipment Protection	SIGNAL/ TELECOM TEST CAT C + B	e ENHANCED Low let-through voltage
LPZ 1→3	HIGH BANDWIDTH	

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 further information on TV applications, see separate Application Note AN006 (contact Furse 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.

Combined Category C, B tested protector (to BS EN 61643-21) 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 and 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



Electrical specification

	ESP CATV/F	ESP MATV/F	ESP SMATV/F	ESP TV/EURO	ESP TV/F
Maximum working voltage¹	140V	18.9V	18.9V	6.4V	6.4V
Maximum operating current	4A	800mA	800mA	300mA	300mA
Characteristic impedance			75Ω		
Bandwidth	5 – 860MHz	5 – 2450MHz	860 – 2450MHz	5 – 860MHz	5 – 860MHz
Insertion loss: 5 – 860MHz	<0.5dB	<0.3dB	–	<0.3dB	<0.3dB
860 – 2150MHz	–	<1.5dB	<1.5dB	–	–
2150 – 2450MHz	–	<2.2dB	<2.2dB	–	–
Return loss (VSWR): 5 – 860MHz	–	>32dB (<1.05:1)	–	>32dB (<1.05:1)	>32dB (<1.05:1)
860 – 2150MHz	–	>20dB (<1.2:1)	>20dB (<1.2:1)	–	–
2150 – 2450MHz	–	>20dB (<1.2:1)	>20dB (<1.2:1)	–	–

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

Transient specification

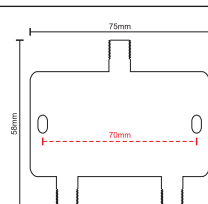
	ESP CATV/F	ESP MATV/F	ESP SMATV/F	ESP TV/EURO	ESP TV/F
Let-through voltage (all conductors) ¹ Up					
C2 test 4kV 1.2/50µs, 2kA 8/20µs to BS/EN/IEC 61643-21	270V	70V	70V	65V	65V
C1 test 1kV 1.2/50µs, 0.5kA 8/20µs to BS/EN/IEC 61643-22	265V	60V	60V	50V	50V
B2 test 4kV 10/700µs to BS/EN/IEC 61643-21	245V	45V	45V	30V	30V
5kV, 10/700µs ²	250V	50V	50V	35V	35V
Maximum surge current					
8/20µs to ITU (formerly CCITT), BS 6651:1999 Appendix C	3kA	3kA	3kA	3kA	3kA

¹ The maximum transient voltage let-through of the protector throughout the test (±10%), line to line & line to earth. Response time <10ns.

² Test to BS 6651:1999 Appendix C, Cat C-High, IEC 61000-4-5:1995, 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).

Mechanical specification

	ESP CATV/F, ESP MATV/F, ESP SMATV/F, ESP TV/EURO, ESP TV/F
Temperature range	–25°C to +70°C
Connection type	F female
Earth connection	~9.5mm (3/8") diameter earth stud
Case material	Diecast
Weight – unit	0.14kg
– packaged	0.15kg
Dimensions	M4 clearance holes, Depth=23mm



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. Contact Furse.