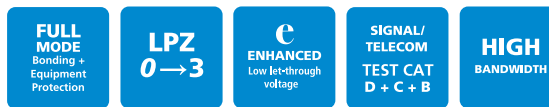


# Specific systems protection

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

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

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

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

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

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

**Protector rating - ESP RF xxxxDx** 5th digit specifies the protector rating: **1** - Higher specification, **2** - Standard specification  
**Case plating - ESP RF xxxxxE** 6th digit specifies the case plating: **1** - White bronze, **2** - Silver

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

# Specific systems protection

## ESP RF Series

### ESP RF Series - Technical specification

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

Transient Specification	ESP RF xx1x21					
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#### Let-through voltage (all conductors)<sup>(2)</sup> Up

C2 test 4 kV 1.2/50 $\mu$ s, 2 kA 8/20 $\mu$ s to BS EN/EN/IEC 61643-21	< 700 V	< 650 V	< 700 V	< 800 V	< 900 V	< 1050 V
C1 test 1 kV 1.2/50 $\mu$ s, 0.5 kA 8/20 $\mu$ s to BS EN/EN/IEC 61643-21	< 550 V	< 450 V	< 550 V	< 650 V	< 800 V	< 950 V
B2 test 4 kV 10/700 $\mu$ s to BS EN/EN/IEC 61643-21	< 400 V	< 350 V	< 450 V	< 550 V	< 730 V	< 800 V
5 kV, 10/700 $\mu$ s <sup>(3)</sup>	< 430 V	< 370 V	< 470 V	< 580 V	< 750 V	< 830 V

#### Maximum surge current<sup>(4)</sup>

D1 test 10/350 $\mu$ s to BS EN/EN/IEC 61643-21	2.5 kA
8/20 $\mu$ s to ITU-T K.45:2003, IEEE C62.41.2:2002	20 kA

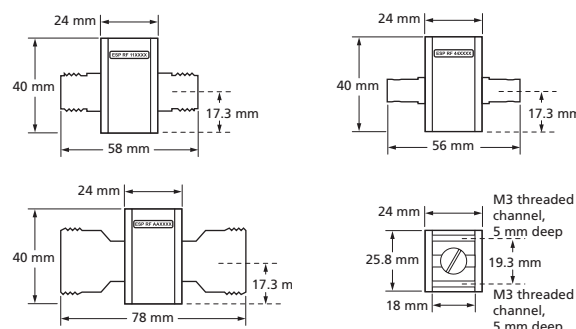
Mechanical Specification	ESP RF 111x21	ESP RF AA1x21	ESP RF 441x21
Temperature range	-40 to +80 °C		
Connection type	N female	7/16 DIN female	BNC female
Conductor size (stranded)	Via mounting fixtures		
Case Material	Aluminium, white bronze plated		
Weight: – Unit	120 g	190 g	90 g
– Packaged	140 g	210 g	110 g
Dimensions	See diagram below		

<sup>(1)</sup> The maximum RF working voltage and maximum power for the protectors is dependent on the GDT selected. See 'Gas Discharge Tube selection' below

<sup>(2)</sup> The maximum transient voltage let-through of the protector throughout the test ( $\pm 10\%$ ) ( $\pm 10\%$ ). Response time < 10 ns. This let-through voltage represents a deviation from the applied signal voltage, present at the time of the test

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

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



#### ESP RF BK1

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 $\Omega$ system ( $P_{RMS}$ ) with VSWR = 2:1	Code	Digit
72 V	40 W	90 V	1
120 V	120 W	150 V	2
185 V	280 W	230 V	3
280 V	650 W	350 V	4
375 V	1.15 kW	470 V	5
480 V	1.90 kW	600 V	6

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

# Specific systems protection

## ESP RF Series



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)

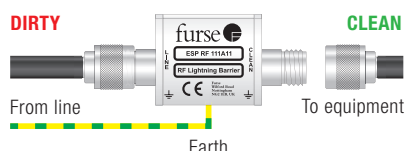
#### ESP RF BK4

Bulkhead through mounting plate (for 4 products)

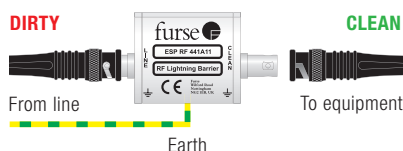
#### ESP RF GDT-A

Replacement gas discharge tube (for 4 products)

#### 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 $\Omega$		
Bandwidth	50-2700 MHz		
Voltage standing wave ratio	$\leq 1.2$		
Insertion loss over bandwidth:			
– 50-500 MHz	$\leq 0.4$ dB		
– 500-1,600 MHz	$\leq 0.2$ dB		
– 1.6-2.7 GHz	$\leq 0.4$ dB		
Maximum power	150 W		

Transient Specification	ESP RF 111A11	ESP RF AA1A11	ESP RF 441A11
<b>Let-through voltage (all conductors)<sup>(1)</sup> Up</b>			
C2 test 4 kV 1.2/50 $\mu$ s, 2 kA 8/20 $\mu$ s to BS EN/EN/IEC 61643-21	24 V		
C1 test 1 kV 1.2/50 $\mu$ s, 0.5 kA 8/20 $\mu$ s to BS EN/EN/IEC 61643-21	15 V		
B2 test 4 kV 10/700 $\mu$ s to BS EN/EN/IEC 61643-21	15 V		
5 kV, 10/700 $\mu$ s <sup>(2)</sup>	20 V		
<b>Maximum surge current<sup>(3)</sup></b>			
D1 test 10/350 $\mu$ s to BS EN/EN/IEC 61643-21	1 kA		
8/20 $\mu$ s to ITU-T K.45:2003, IEEE C62.41.2:2002	10 kA		

Mechanical Specification	ESP RF 111A11	ESP RF AA1A11	ESP RF 441A11
Temperature range	-40 to +80 °C		
Connection type	N female	7/16 DIN female	BNC female
Conductor size (stranded)	Via mounting fixtures		
Case Material	Aluminium, white bronze plated		
Weight: – Unit	150 g	220 g	120 g
– Packaged	170 g	240 g	160 g
Dimensions	See diagram below		

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

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

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

#### ESP RF BK1

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

