EMP Protection Devices

Atmospheric disturbances may cause problems in antenna and cable systems and can present a severe danger to high-frequency equipment. The two most effective types of EMP protection are the spark gap and the quarter wavelength shorting stub. RFS offers devices using coaxial technology for N and 7-16 connector systems. During normal operation these devices will not influence the RF behavior of the antenna and cable system.

Selection Criteria

To find selection criteria for the right choice of protection devices the following should be considered:

The spark gap protector can be used for broadband applications up to 2.5 GHz. The gas capsules are replaceable and can be ordered separately.

The device provides a DC-path for tower mounted amplifiers or other applications with remote bias supply. The protection level can be selected by choice of the appropriate breakdown voltage. The RF-voltage must not exceed the breakdown voltage, otherwise disturbances of the RF-signal can occur due to unwanted ignition of the spark gap.

The quarter wave stub protector is especially suited for transmit applications, since power handling is limited by the connecting system only. The new inline version no longer has the protruding stub and is therefore easier to fit to tight spaces. Due to its resonant behavior, it provides minimum VSWR in the design frequency range. Standard types are available for 800 to 2200 MHz frequency bands, other frequency ranges are available on request. No maintenance is necessary, a DC-path is not available with standard types.

The hybrid type combines the advantages of both types, also offering a DC port in an optional version. The DC port can be used to feed a DC supply voltage for TMAs or other tower to equipment. For the use with separate AISG devices, a version that caries the 2.176MHz signal undisturbed is also available.

Product Spectrum

Different housing options are available to meet specific user requirements.

Adapter types feature male/female connector combinations and can be easily inserted into any feeder system. They may even be installed at later stages to upgrade the protection level of existing systems.

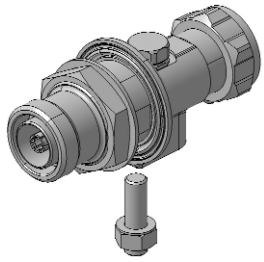
Fixed adapters with square flange can be installed in system cabinets, container walls or any other panel with a thickness not exceeding 4mm.

Fixed adapters with bulkhead version can be installed in system cabinets, container walls or any other panel with a thickness not exceeding 5mm. Only a single hole is required.

Gas type protectors are available with the gas capsule installed. Additional gas capsules are available separately to select the protection level at installation time or for replacement.

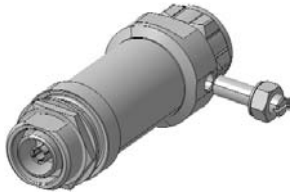
No tuning is necessary for any protection device offered by RFS.

Spark Gap Protector



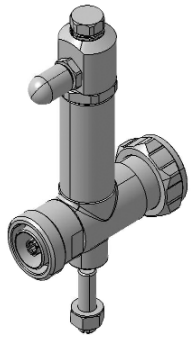
The spark gap protector is based on the gas discharge principle. Within an extremely short time the resistance drops from MOhm to mOhm in case of an atmospheric disturbance. This is caused by the ionization of the gas. A pulse traveling along the line will be diverted to ground.

Inline Quarter Wavelength Protector



The inline quarter wavelength protector consists of short-circuited branch lines connected to the main line, providing a direct ground path for the low frequency spectrum of the disturbances. The lines perform a 90° bend to run parallel to the main line, which removes the protruding stub and enables easier installation. The electrical length of the branch line equals a quarter wavelength at the designated frequency, transforming the short into an open circuit at the connecting point. There is a trade-off between the transformation bandwidth and the residual voltage, thus the standard types are optimized for the telecommunication frequency bands.

Hybrid Quarter Wave Shorting Stub



The hybrid quarter wavelength stub is a special design used in applications where high RF power, DC-fed components or trunked-/multi-channel transmitters are used on coaxial transmission lines. These devices have a specially designed gas capsule circuit, which is de-coupled from the RF path. This allows higher RF power or DC-fed components to reside on a single transmission line while improving the VSWR performance above ordinary spark gap protectors. Only a special 90V gas capsule protects the RF system where much higher voltage level gas capsules were previously required. Systems requiring tower-top amplifiers benefit from these types of EMP protection devices.

Overview Table EMP Protection Devices

Protective Device	Connector Series	Connector Transition	Frequency Range	Return Loss (VSWR)[1]	Insertion Loss[2]	Surge Current	Model Number
Quarter Wave	7-16 DIN	7-16 DIN Male, 7-16 DIN Female, bulkhead	806-2200 MHz 824-960 MHz 1740-2200 MHz	20.8 dB (1.20:1) 26.0 dB (1.10:1) 26.0 dB (1.10:1)	0.1 dB	100 kA	716-STUB-10
Quarter Wave	N	N Male, N DIN Female, bulkhead	806-2200 MHz 824-960 MHz 1740-2200 MHz	20.8 dB (1.20:1) 26.0 dB (1.10:1) 26.0 dB (1.10:1)	0.1 dB	50 kA	N-STUB-10

Protective Device	Connector Series	Connector Transition	Frequency Range	Return Loss (VSWR)[3]	Insertion Loss	Nominal Breakdown Voltage	Model Number
Gas Tube	N	N Male N Female, bulkhead	DC-2500 MHz DC-1000 MHz	20 dB (1.22:1) 26.4 dB (1.10:1)	0.2 dB 0.15 dB	230 V	N-UC230-01
Gas Tube	7-16 DIN	7-16 DIN Male, 7-16 DIN Female, bulkhead	DC-2500 MHz DC-1000 MHz	20 dB (1.22:1) 26.4 dB (1.10:1)	0.2 dB 0.15 dB	230 V	716-UC230-05

Protective Device	Connector Series	Connector Transition	Frequency Range	Return Loss (VSWR)	Insertion Loss	Surge Current	Model Number
Quarter Wave Hybrid	7-16 DIN	7-16 DIN Male, 7-16 DIN Female, bulkhead	806-2500 MHz 806-960 MHz 1710-2500 MHz	20.8 dB (1.2:1) 26 dB (1.10:1) 26 dB (1.10:1)	0.10 dB	30kA	716-UC90-05
Quarter Wave Hybrid AISG Compliant @ 2.176 MHz	7-16 DIN	7-16 DIN Male, 7-16 DIN Female, bulkhead	806-2500 MHz 806-960 MHz 1710-2500 MHz 2.176 MHz	20.8 dB (1.2:1) 26 dB (1.10:1) 26 dB (1.10:1) 20 dB (1.22:1)	0.10 dB	30kA	716-UC90-10

Protective Device	Connector Series	Connector Transition	Frequency Range	Return Loss (VSWR)[3]	Insertion Loss	Surge Current	Model Number
Bias-T with Surge Protection[4]	7-16 DIN	7-16 DIN Female, (Protected) 7-16 DIN Male	800-2200 MHz	19 dB (1.25:1)	0.15	30kA	716-UC90-07
Bias-T with Surge Protection[4]	7-16 DIN	7-16 DIN Male, (Protected) 7-16 DIN Female	800-2200 MHz	19 dB (1.25:1)	0.15	30kA	716-UC90-09

Protective Device	Nominal Breakdown Voltage	Model Number
Spare Capsule	230 V	UC230
Spare Capsule for Quarter Wave Hybrid Only	90 V	UC90-HP

[1]For DC-1000MHz; Max. Return Loss (VSWR) for 1000-2500MHz = 20.0 dB (1.22:1)

[2]For 1000MHz; Max. Insertion Loss for 1000-2500MHz = 0.2 dB

[3]For 806-2500MHz; Max. Return Loss for 806-960 & 1710-2500MHz = 26 dB (1.1:1)

[4]TNC Female for DC injection, EF316D Jumper, single ended with TNC Male Connector, L=25ft included