MICROWAVE COMPONENTS

Lightning protectors

ISO 9001 APPROVED

RADIALL®

RADIALL COMPANY PROFILE

Head Office - Rosny sous Bois

Since 1952, RADIALL has specialized in the field of coaxial connectors and cables assemblies. RADIALL's experience and high technology focus, combined with our large worldwide production capability have made the company a major supplier of RF coaxial connectors in the world and the number one in Europe.

RESEARCH & DEVELOPMENT

The ever increasing sophistication of microwave communication systems is continually requiring components to meet a higher level of performance. RADIALL's research and development groups understand these needs and are committed to searching for product solutions that will be needed in the future. They also are providing continued improvements to our already extensive lines of high performance products. All our engineer teams are equipped with state of the art equipment and facilities, in an effort to provide the best solutions to our customers.

CAD workstation

Screw-machining shop

MANUFACTURING

RADIALL knows that the quality of the connectors components is directly related to the mechanical precision of the machining process, along with good quality procedures. In an effort to continually meet the highest quality standards, all our production plants are equipped with the latest state of the art production equipment. RADIALL's manufacturing process maintains strict control of all procedures and incorporates all tooling, machining, surface treatment and assembly operations into the manufacturing process of each production group.

Base station of cellular network

HIGH RELIABILITY

Reliability of inter-connection systems is of the utmost importance in telecommunications applications. This industry need has led RADIALL to link high performance design, manufacturing and quality control. This has given the company the capability to produce connectors that will operate in the most stringent environments. The wide range of our product offering allows us to propose the best complete solution for your exact need.

Microwave test device

QUALITY ASSURANCE

RADIALL, as a TQM company, continually searches for improvements to the quality process. We operate a Quality Assurance Program that has been developed in accordance with the national and CECC agencies (equivalent to MIL-I-45208 and MIL-C-45662 standards). This program has enabled us to achieve QPL approval on several of our connector series. RADIALL's Quality Assurance Program operates at all levels of manufacturing from the initial raw incoming material to the final testing procedures just prior to shipping. All test equipment is part of the quality process and is continually inspected on a regular scheduled basis. All production plants in Europe are AQA P4-NATO certified.

BVQI

Certificate of Approval

Awarded to

RADIALL

DIVISION CONNECTEURS COAXIAUX
ROSNY-SOUS-BOIS - VOREPPE - VOIRON
FRANCE

Bureau Veritas Quality International certify that the Quality Management System of the above supplier has been assessed and found to be in accordance with the requirements of the quality standards detailed below

QUALITY STANDARDS

BS EN ISO 9001 : 1994

SCOPE OF SUPPLY

DESIGN, DEVELOPMENT, PRODUCTION AND SALE OF RADIO FREQUENCY COAXIAL CONNECTORS AND LEADS. MANUFACTURING AND PLATING OF CONNECTION COMPONENTS.

CONCEPTION, DEVELOPPEMENT, PRODUCTION ET COMMERCIALISATION DE CONNECTEURS ET CORDONS COAXIAUX HAUTES FREQUENCES. FABRICATION ET TRAITEMENT DE SURFACE DE COMPOSANTS POUR CONNECTIQUE..

FORSCHUNG, ENTWICKLUNG, PRODUKTION UND VERTRIEB VON HF-STECKVERBINDERN UND-KABELN. HERSTELLUNG UND OBERFLACHENBEHANDLUNG VON KOMPONENTEN FUR STECKBVERBINDER.

Original approval date: **6 March, 1994**

Subject to the continued satisfactory operation of the supplier's Quality Management System, this Certificate is valid for a period of three years from:

27 April, 1997

Date **29 May, 1997**

Jacques ROY

For Bureau Veritas Quality International

Certificate No: **41206**

SF06/B

The use of the Accreditation Mark indicates accreditation in respect of those activities covered by the accreditation certificate number 008

ISO 9001 ACCREDITATION

This certificate is witness to RADIALL's achievement and commitment to the Total Quality Process. RADIALL has always been, since its inception, a company committed to being a Total Quality supplier. Quality is our way of life at RADIALL.

LIGHTNING PROTECTORS

INTRODUCTION

Lightnings can generate high power surges to electronic equipment, and extensively damage communications networks.
Therefore lightning protectors are needed to protect sensitive equipment from these harmful impulses.
Protecting devices should be physically located close to the equipment to be protected : the closer, the better.

Common locations in wireless infrastructures are at the top of the mast where the transmission line exits the antenna and at the entrance or inside the cabinet where the transmission line enters the Base Station electronics.
Applications that utilize. Tower mount electronics require additional lightning protectors.

RADIALL can offer different solutions to prevent communication systems from direct and indirect Lightning ElectroMagnetic Pulses (LEMP) : either a Quarter Wave Stub protection or a Gas Discharge Tube protection.
RADIALL lightning protectors are coaxial devices using N or 7/16 interfaces. They can operate at today and future's wireless communication bands (2G, 3G...). Maximum VSWR is less than 1.20 in the working frequency band.
They are silver plated. A strike of non-magnetic BBR* is plated over to provide protection against tarnishment.
RADIALL lightning protectors can be used either for indoor applications or for outdoor applications since they are IP67 rated. They are reversible and can be used in both directions.
They have been successfully tested under vibrations, salt spray, thermal shocks. They are all labeled with their part number and their operating frequency band.
Regarding environmental matters, packaging is a foam-free unit cardboard box in which the device is captured and protected by a neutral plastic film.

QUARTER WAVE STUB (QWS) PROTECTION

Some **RADIALL** lightning protectors utilize a quarter wave stub design. This technology is based on a 3 port coaxial device. One of these ports is a metallic short-circuit between the inner and the outer conductors, whose length is one quarter of λ wavelength at the centered frequency.
Quarter wave protectors work like band pass filters. They operate within a specified frequency band.

In normal use (i.e within the working frequency band), the RF signal flows through the quarter wave lightning protector to the protected equipment.
Whenever lightning hits the infrastructure (ex : Antenna mast), current will flow through the cable (feeder cable) to the lightning protector installed at the entrance to the critical equipment to be protected (Base Transceiver Station).
As lightning strikes operate at low frequencies i.e outside of the protector working frequency band, current will be instantaneously diverted through the short-circuit to the ground.

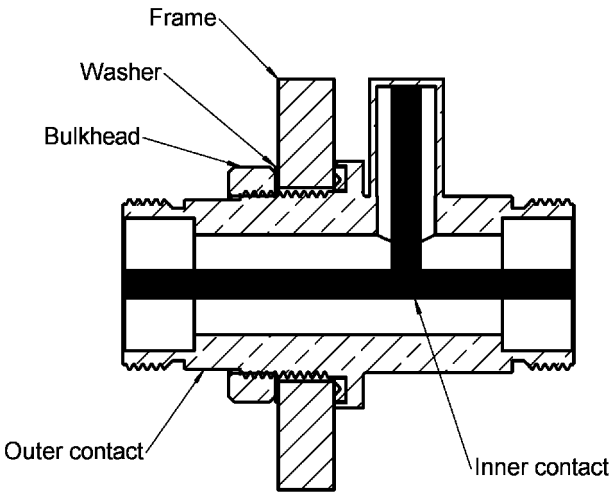
Since it is a mechanical system, it can handle repeated surges. Any impulse at any time will always be shunted to the ground. Only a low residual voltage, less than 15V, can pass through the equipment.

Single band devices for common wireless bands like CDMA, GSM, PCS, DCS are available as standard products. Quarter wave protectors working at other frequency bands or using other coaxial interfaces can be developed upon request.
Cable assemblies made with single band quarter wave protectors on SHF type cables are available as well.

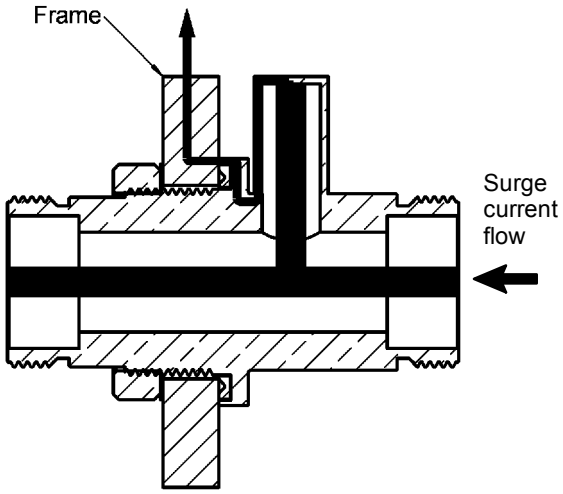
RADIALL has already designed the next generation of quarter wave protectors : Multiband protectors. The same protector can work within several frequency bands. Our standard multiband protectors can provide the same excellent protection, whether to CDMA, GSM, PCS, DCS or UMTS communication networks.

Main features :

Quarter wave protectors do not require any maintenance, they achieve high passive intermodulation performance (-110dBm/-153dBc) and they only pass the lowest residual voltage.
But, disadvantages are that they can not pass DC signals and must incorporate a fairly long stub element.



Under normal conditions



When lightning strikes

GAS DISCHARGE TUBE (GDT) PROTECTION

RADIALL GDT surge protectors look like in-line coaxial adapters using interfaces like N or 7/16, and that contain a field replaceable gas capsule placed between their inner and outer conductors. Unlike single band quarter wave protectors, gas tube surge arresters can be used for broadband applications. Their operating frequency band is DC to 2.5GHz.

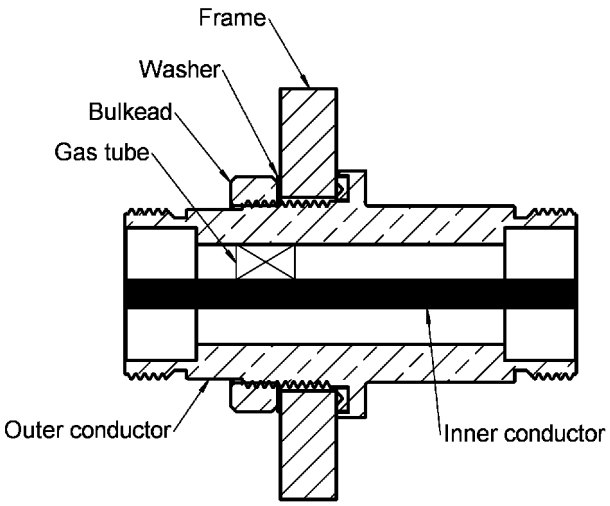
Gas discharge protectors work as voltage filters.

During normal operation, the gas inside the tube is and remains inert. Signal can pass through the surge arrester to the equipment.

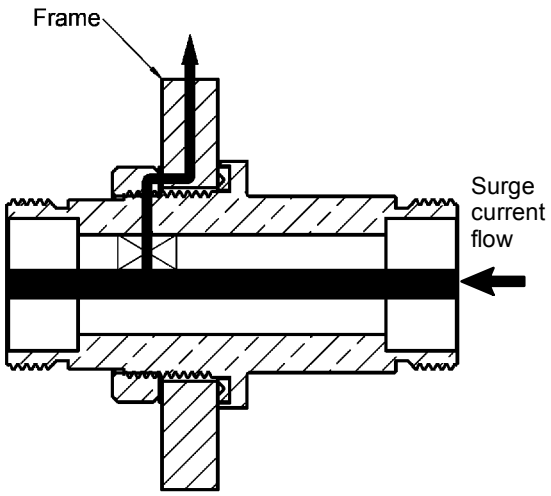
When a lightning strikes the infrastructure, current will flow through the cable to the surge protector. The voltage, appearing across the gas capsule, increases. When it reaches the DC sparkover voltage, the gas ionizes and becomes conductive. Current is then diverted through the gas capsule to the ground, outside of the equipment. A residual voltage will nevertheless reach the equipment. Once the pulse has been discharged to the ground i.e when the voltage is less than the holdover voltage, the gas capsule comes back to its initial state.

Life of the gas capsule depends on the number of strikes and of their intensity. The same capsule can divert to the ground either few impulses of 20KA or only one of 40KA. Regular control and maintenance are therefore highly recommended. However it is preferable to replace any suspicious gas tube.

Gas discharge protectors are delivered without gas capsule. A choice of gas capsules is available offering different static sparkover voltages. Selection should be made according to the maximum transmission power.



Under normal conditions



When lightning strikes

Main features :

Gas discharge capsule protectors are the only solution when DC injection is required, for example when a Tower Mount Amplifier is utilized. Moreover, they offer a wide band performance and benefit from their reduced dimensions. But disadvantages are the need of maintenance and non negligible residual voltage.

CONCLUSION

In order to be able to choose the best suited lightning protector to their application between a quarter wave lightning protector and a gas discharge protector, users should answer the following questions :

- ☞ Should DC signal pass ? Are there some tower mount electronics ?
- ☞ Is maintenance possible ?
- ☞ What is the desired operating frequency range ?
- ☞ What is the maximum voltage that can withstand the equipment to be protected?
- ☞ Is Intermodulation level critical?

	ADVANTAGES	DISADVANTAGES
 **QWS = Frequency filter**	Maintenance free Lower residual voltage Low intermodulation level	No DC capability Narrowband (except multiband ones)
 **GDT = Voltage filter**	DC capability Wide band DC-2.5GHz Reduce dimensions	Maintenance required Non negligible residual voltage

FINDER GUIDE

	CDMA	GSM	DCS	PCS	DECT	UMTS	WLL/WLAN
N female - N female	**R445 Q00 001** (p10)						
			R445 Q00 000 (p10)				
						R445 Q00 003 (p10)	
							R445 Q00 002 **R445 Q00 004** (p10)
	R445 M00 000 (p12)						
	R445 G00 000 (p14) **R445 G00 001** (p14)						
N male- N female	**R445 Q00 101** (p10)						
			R445 Q00 100 (p10)				
	R445 M00 100 (p12)						
	R445 G00 101 (p14) **R445 G00 100** (p14)						
7/16 female - 7/16 female	**R445 Q02 001** (p10)						
			R445 Q02 000 (p10)				
						R445 Q02 002 (p10)	
	R445 M02 000 (p12)						
	R445 G02 000 (p14) **R445 G02 001** (p14)						
7/16 male - 7/16 female	**R445 Q02 101** (p10)						
			R445 Q02 100 (p10)				
	R445 M02 100 (p12)						
	R445 G02 101 (p14) **R445 G02 100** (p14)						
7/16 female - N female	**R445 M01 000** (p12) **R445 G01 000** (p14)						
SHF 5MD cable - 7/16 female	**R446 Q01 002** (p11)						
						R446 Q01 004 (p11)	
			R446 Q01 000 (p11)				
				R446 Q01 001 (p11)			
			R446 Q01 003 (p11)				
	R446 M01 000 (p13)						
SHF 5MD cable - N female*	**R446 Q00 000** (p11)						
SHF 5LI cable - 7/16 female*	**R446 Q01 101** (p11)						
				R446 Q01 102 (p11)			
			R446 Q01 100 (p11)				
SHF 5LI cable - N female*	**R446 Q00 100** (p11)						

**Only sold as cable assembly.*

CHARACTERISTICS

	N	7/16
ELECTRICAL		
Impedance	50 Ω	
Frequency range	According to product specification	
VSWR	1.20 max	
Insertion loss (dB)	0.2dB	
RF leakage (dB)	100	
Surge current capability (kA) (8/20μs test pulse)	50	
Residual voltage : QWS and MBQWS GDT	15V max at 2.50 kA, 8/20 μs 350V max at 2.50 kA, 8/20 μs	
Intermodulation products (2x20W) 3rd order QWS and MBQWS	-110dBm (-153dBc)	
RF power (kW) for VSWR=1, sea level and 20°C QWS and MBQWS GDT	1.2 at 0.9 GHz, 0.8 at 1.9 GHz	2.2 at 0.9 GHz, 1.7 at 1.9 GHz according to selected gas capsule
DC current (A) GDT only	11.8	15.5
MECHANICAL		
Durability (matings)	500	
Recommended coupling nut torque (N.cm)	170	3500
Bulkhead mounting torque (N.cm)	500	3500
ENVIRONMENTAL		
Temperature range	- 40/+85°C	
Moisture resistance	IP67 (IP 65 for crimp type)	
Thermal shocks	CECC -40°C/+155°C/5 cycles	IEC -55°C/+155°C/5 cycles
High temperature test	CECC 1000h/120°C	CECC 1000h/155°C
Salt spray corrosion	CECC 48h	IEC 48h/Na Cl 5%/35°C
Vibration	CECC 98m/s^2 - 10 Hz at 500 Hz	
MATERIALS		
Body	Brass	
Nut	Brass	
Center contact male female	Brass CuBe2	
Insulator	PTFE	
Gasket	Silicon rubber	Silicon rubber or copper
FINISH		
Body	Silver (+ flash BBR*)	
Nut	BBR*	
Center contact male female	Silver (+ flash BBR*) Silver (+ flash BBR*)	

** BBR : Bright Bronze RADIALL **D1 030 DE***

ADAPTER STYLE

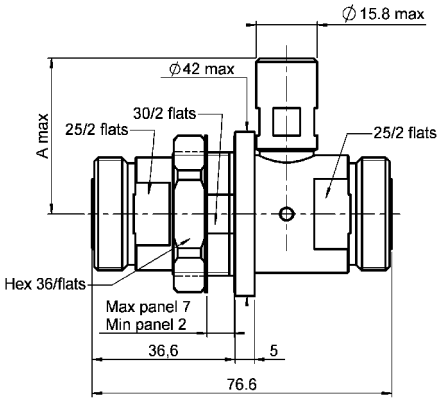


Fig. 1

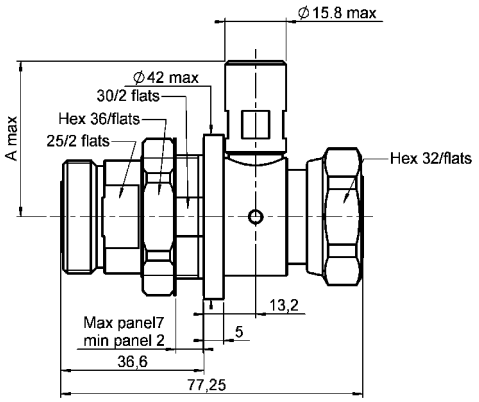


Fig. 2

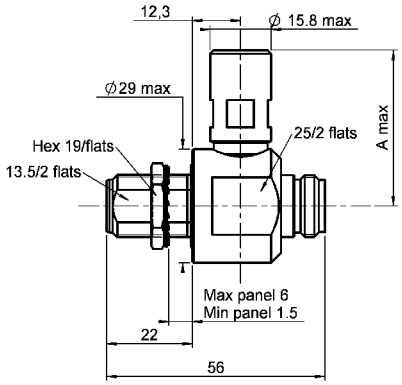


Fig. 3

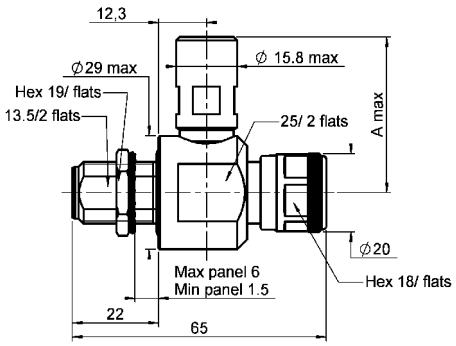
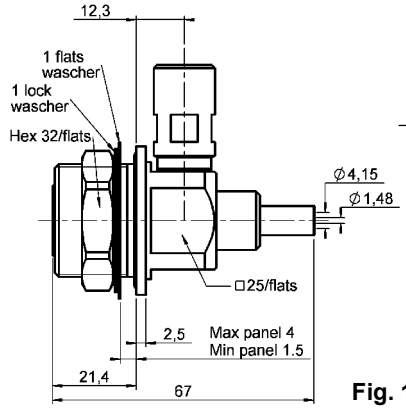


Fig. 4

Frequency range (MHz)	Part number	Panel side	Opposite side	fig	dimension A	cut out	finish
824/960	**R445 Q02 001**	7/16 female	7/16 female	1	71	P02	Silver + BBR*
	R445 Q02 101		7/16 male	2			
	R445 Q00 001	N female	N female	3		P03	
	R445 Q00 101		N male	4			
1700/2000	**R445 Q02 000**	7/16 female	7/16 female	1	40	P02	
	R445 Q02 100		7/16 male	2			
	R445 Q00 000	N female	N female	3		P03	
	R445 Q00 100		N male	4			
1885/2200	**R445 Q00 003**	N female	N female	3	36.5	P03	
	R445 Q02 002	7/16 female	7/16 female	1	36.5	P02	
2400/2500	**R445 Q00 004**	N female	N female	3	39	P03	
3410/3600	**R445 Q00 002**			3	28	P03	

LIGHTNING PROTECTORS FOR CABLE ASSEMBLIES (CANNOT BE SOLD UNCABLED)



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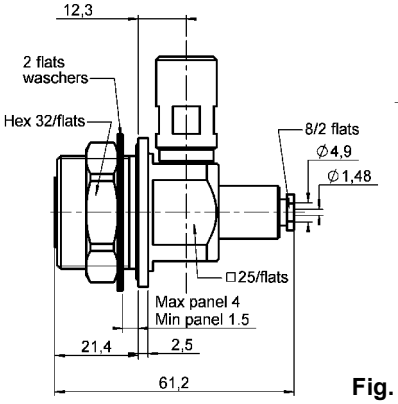

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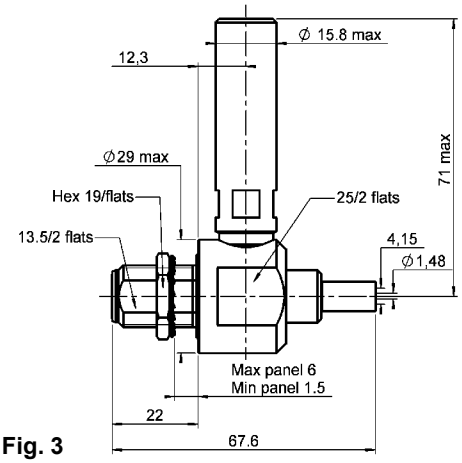

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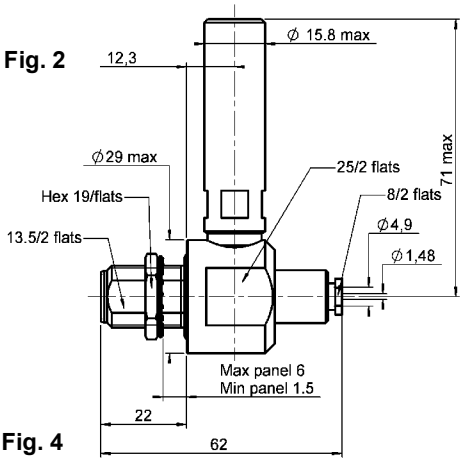
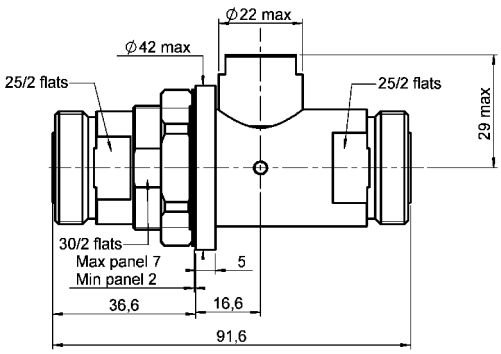


Fig. 4

Frequency range (MHz)	Part number	Panel side	Cable attachment	Cable	fig	dimension A	cut out	finish
824/960	**R446 Q01 002**	7/16 female	crimp type	SHF 5MD	1	71	P01	Silver + BBR*
	R446 Q01 101		solder type	SHF 5LI	2			
	R446 Q00 000	N female	crimp type	SHF 5MD	3		P03	
	R446 Q00 100		solder type	SHF 5LI	4			
1700/2000	**R446 Q01 000**	7/16 female	crimp type	SHF 5MD	1	40	P01	
	R446 Q01 100		solder type	SHF 5LI	2			
1710/1880	**R446 Q01 003**		crimp type	SHF 5MD	1	42		
1850/1990	**R446 Q01 001**							
	R446 Q01 102		solder	SHF 5LI	2	40	P01	
1920/2170	**R446 Q01 004**		crimp type	SHF 5MD	1	37	P01	

For information on cable, please refer to catalog **D1 287 CE.**

ADAPTER STYLE



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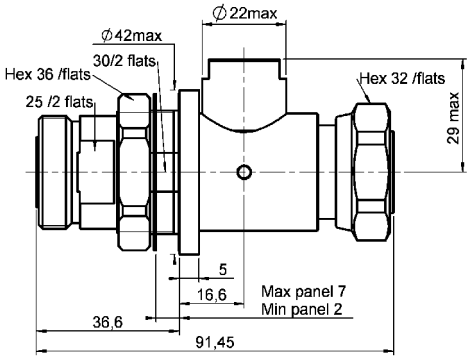

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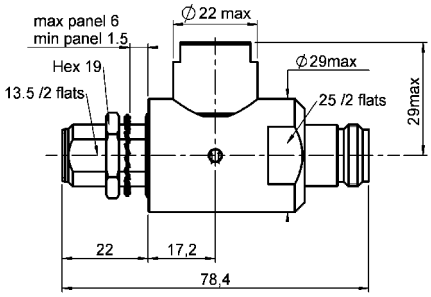

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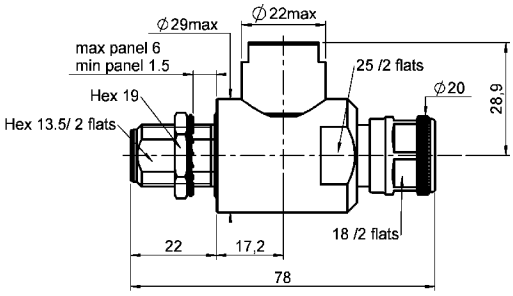

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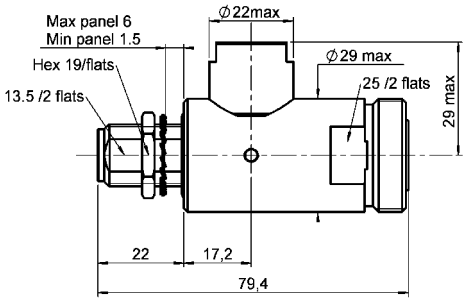
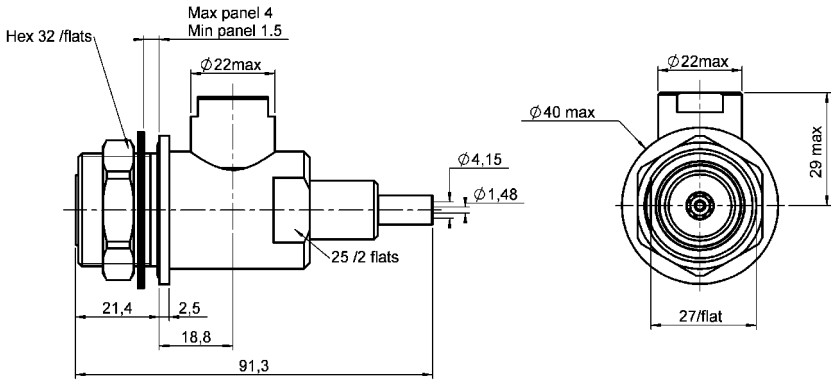


Fig. 5

Frequency range (MHz)	Part number	Panel side	Opposite side	fig	cut out	finish
824/960 - 1700/2200	**R445 M02 000**	7/16 female	7/16 female	1	P02	Silver + BBR*
	R445 M02 100		7/16 male	2		
	R445 M00 000	N female	N female	3	P03	
	R445 M00 100		N male	4		
	R445 M01 000		7/16 female	5		

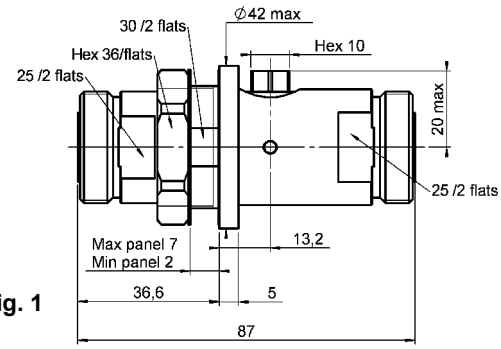
LIGHTNING PROTECTORS FOR CABLE ASSEMBLIES (CANNOT BE SOLD UNCABLED)



Frequency range (MHz)	Part number	Panel side	Cable attachment	cut out	finish
824/960 - 1700/2200	**R446 M01 000**	7/16 female	crimp type SHF 5MD	P01	Silver + BBR*

For information on cable, please ask catalog **D1 287 CE.**

ADAPTER STYLE



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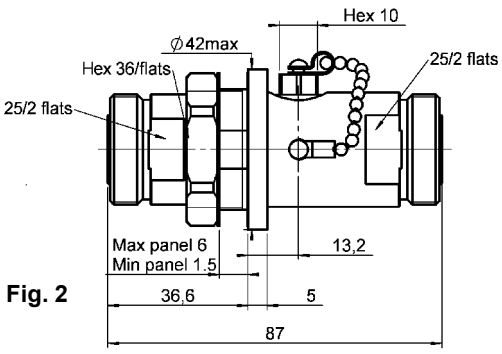

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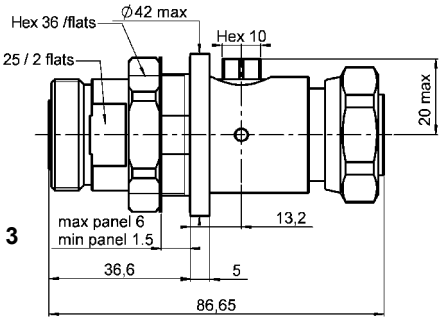

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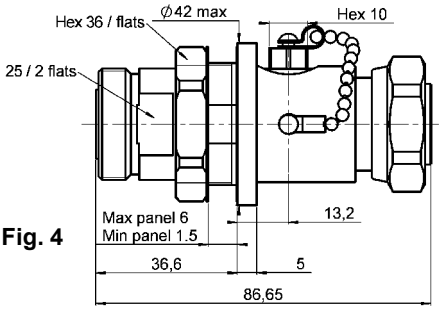

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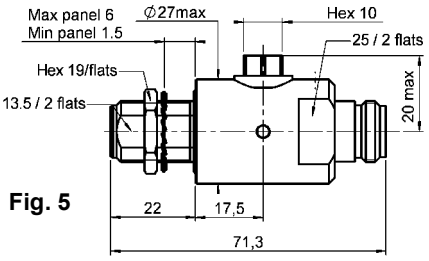
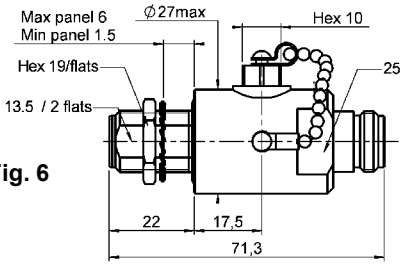


Fig. 5



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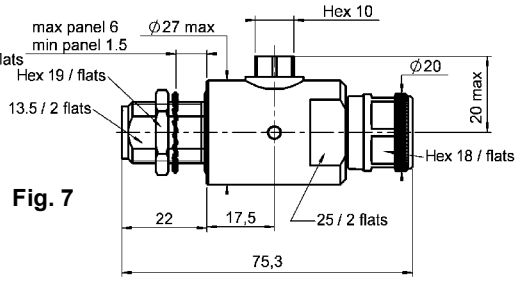

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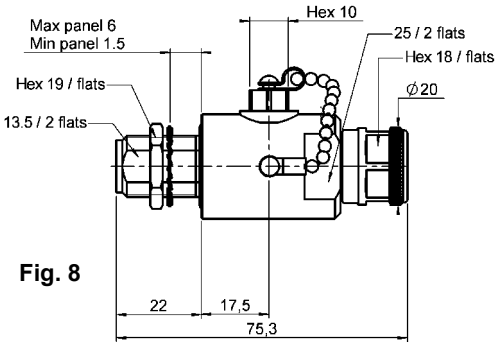


Fig. 8

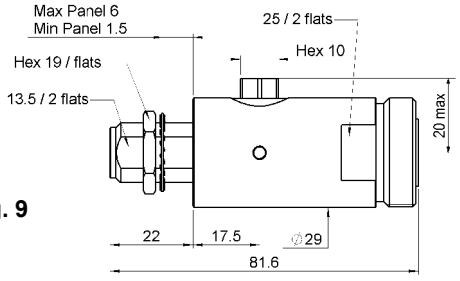


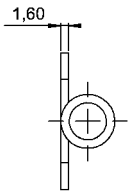
Fig. 9

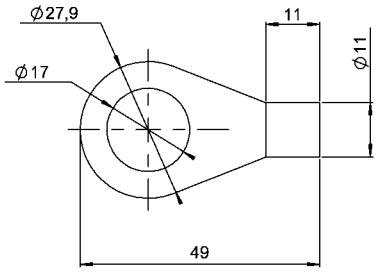
Frequence range (MHz)	Part number	Panel side	Opposite side	fig	cut out	note	finish
DC-2500	**R445 G02 000**	7/16 female	7/16 female	1	P02		Silver + BBR*
	R445 G02 001			2		with chain	
	R445 G02 100		7/16 male	3			
	R445 G02 101			4		with chain	
	R445 G00 000	N female	N female	5	P03		
	R445 G00 001			6		with chain	
	R445 G00 100		N male	7			
	R445 G00 101			8		with chain	
	R445 G01 000		7/16 female	9	P03		

FIELD REPLACEABLE GAS CAPSULES

Part number	DC sparkover voltage (V)	impulse sparkover voltage (V)	impulse discharge current (kA)	glow discharge voltage (V)	Arc voltage (V)
R445 999 100	230 +/- 20%	< 600	10 (red)	60	15
R445 999 101	350 +/- 20%	< 800			
R445 999 102	90 +/- 20%	< 550	20 (blue)		10
R445 999 103	230 +/- 20%				15
R445 999 105	350 +/- 20%	< 700			
R445 999 107	600 +/- 20%	< 1 100			10

GROUNDING RING (to be used on bulkhead type N interface)





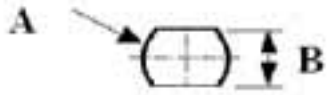
Part number	Finish and material
R445 999 001	tin lead brass

PANEL CUT OUT

P 01

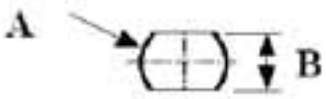
	mm	
	Maxi	mini
A	29.4	29.2
B	27.5	27.3

P 02



	mm	
	Maxi	mini
A	32.4	32.2
B	30.5	30.3

P 03



	mm	
	Maxi	mini
A	16.1	16
B	13.7	13.6

TORQUE WRENCH

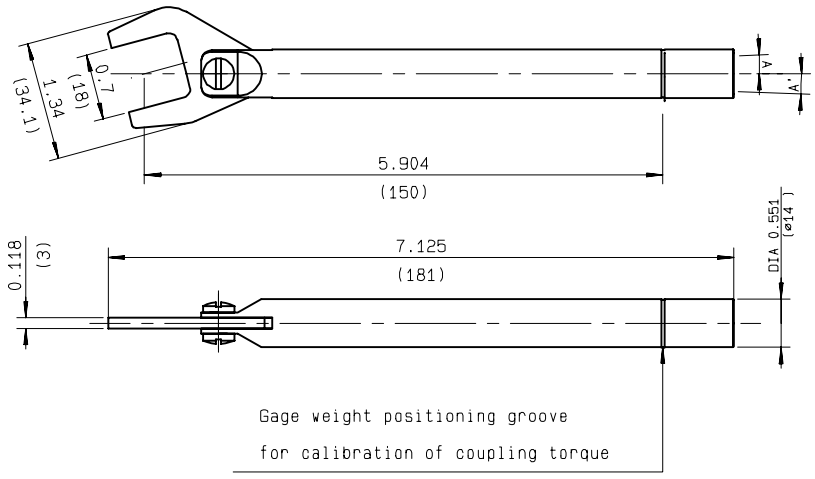


Fig 1

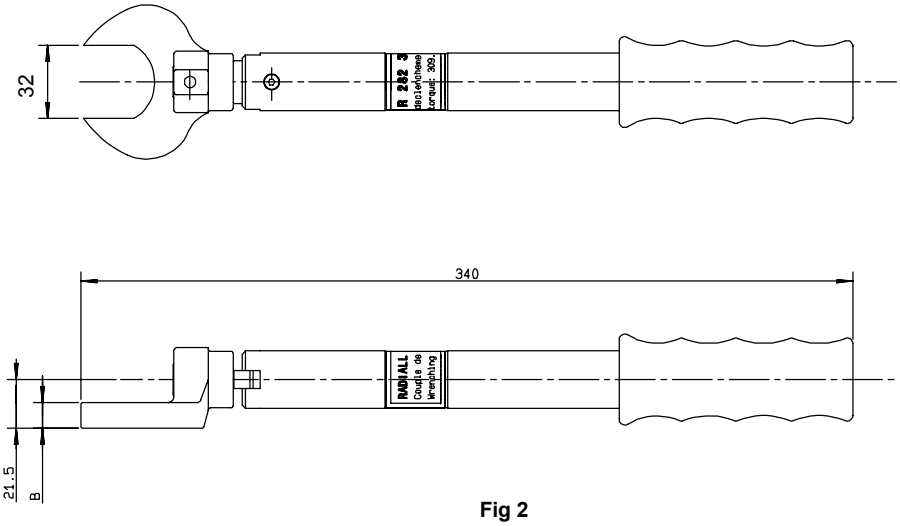


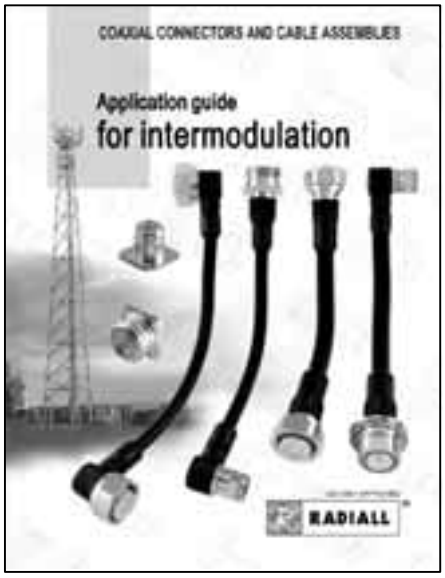
Fig 2

Part number	Fig.	Coupling torque (N cm)	Note
R282 303 020	1	170	Torque wrench for hex. 18mm coupling nut (N series)
R282 303 500	2	3500	Torque wrench for hex. 32 mm coupling nut (7/16 series)

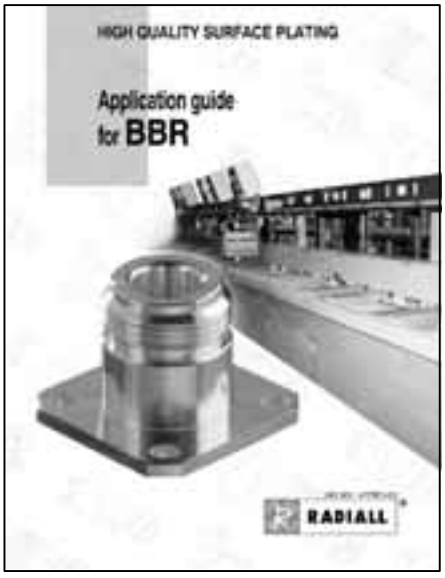
LIGHTNING PROTECTORS

P/N : D1 161 CE

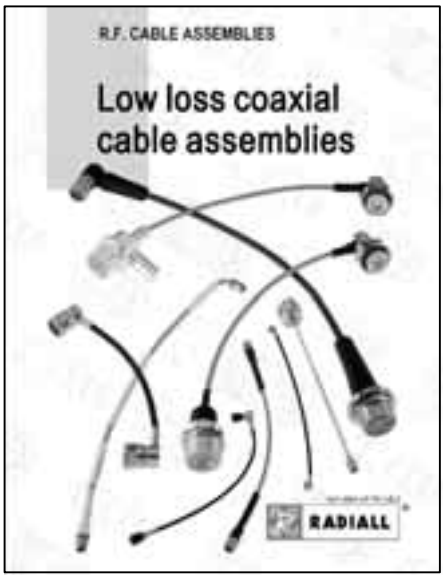
P/N : D1 185 CE



P/N : D1 032 DE



P/N : D1 030 DE



P/N : D1 287 DE

INNOVATIVE TECHNOLOGIES : *surface-mount / press-fit / low intermodulation / quick lock / pressure contact*

➤ **ULTRAMINIATURE**

IMP : 50 Ω ,SMT series, press-on electrical contact
UMP : 50 Ω ,SMT series, press-on electrical contact

➤ **MICROMINIATURE**

SBMO : 50 Ω ,snap-on blind mate series (DC-40GHz)
MMS/MC card/MMT : 50 Ω ,snap-on, SMT series
RF switch
COAXIPACK : metric system 2mm & DIN 41626
SSMA : 50 Ω, screw-on
SSMB : 50 Ω, snap-on
SBMA : 50 Ω, blind mate

Custom models *can be developed according to your specifications*

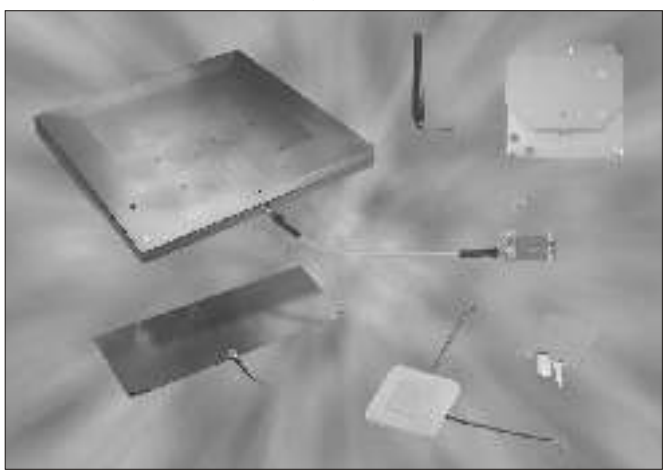
Custom packaging *can be adapted to the exact customer needs*

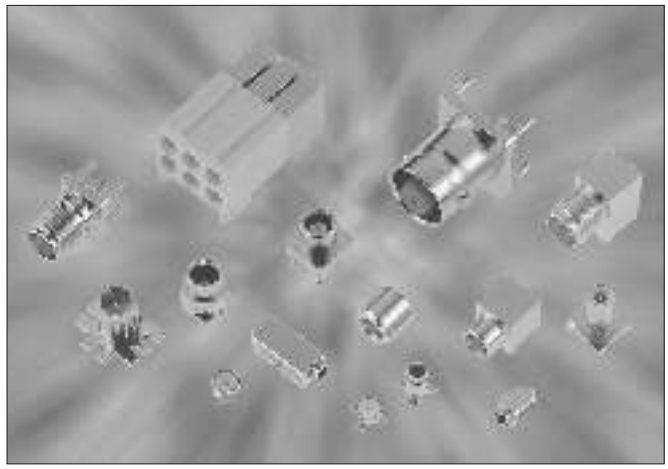
➤ **STANDARD**

DT-F : 75 Ω, screw-on
BNC : 50 & 75 Ω, bayonet system, standard & commercial
TNC/TNC 18 : 50 & 75 Ω, screw-on, standard & commercial
DIN 1.6/5.6 : 75 Ω, screw-on, snap-on & slide-on
N/N 18 : 50 & 75 Ω, screw-on, standard & commercial, low intermodulation models, slide-on models
DIN 7/16 : 50 Ω, screw-on, low intermodulation
Other series : HN - UHF - C - LC

➤ **SPECIAL & HIGH VOLTAGE**

miniQUICK : 50 & 75 Ω, push-pull system, slide-on models
BNC TRX / N TRX : triax series
BNC HT/SHV : bayonet system, 10 KV-10 A
miniQUICK HT : push-pull system, 12 KV-10 A



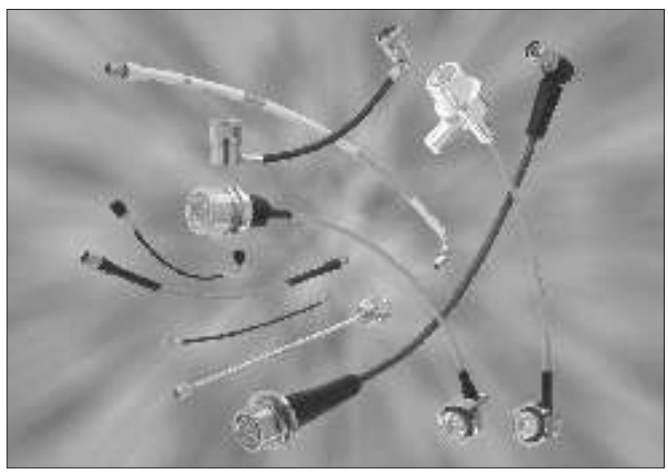


➤ **MINIATURE**

MCX : 50 & 75 Ω, snap-on
SMA : 50 Ω, screw-on, slide-on, standard & commercial
QMA : 50 Ω, snap-on, quick lock family
SMA 2.9 : 50 Ω, screw-on (DC-40GHz)
SMB, SMB LOCK, SMB CARLOCK : 50 Ω, snap-on
SMC : 50 Ω, screw-on
SMZ : 75 Ω, snap-on, lock-on, type BT43 series
BMA : 50 Ω, blind mate, standard & commercial
DIN 1.0/2.3 : 50 & 75 Ω , screw-on, snap-on & slide-on, lock-on models
FME : easy-connect cabling system

➤ **BETWEEN-SERIES ADAPTORS**

More than 95 combinations of different interfaces 50 & 75 Ω, push-on type



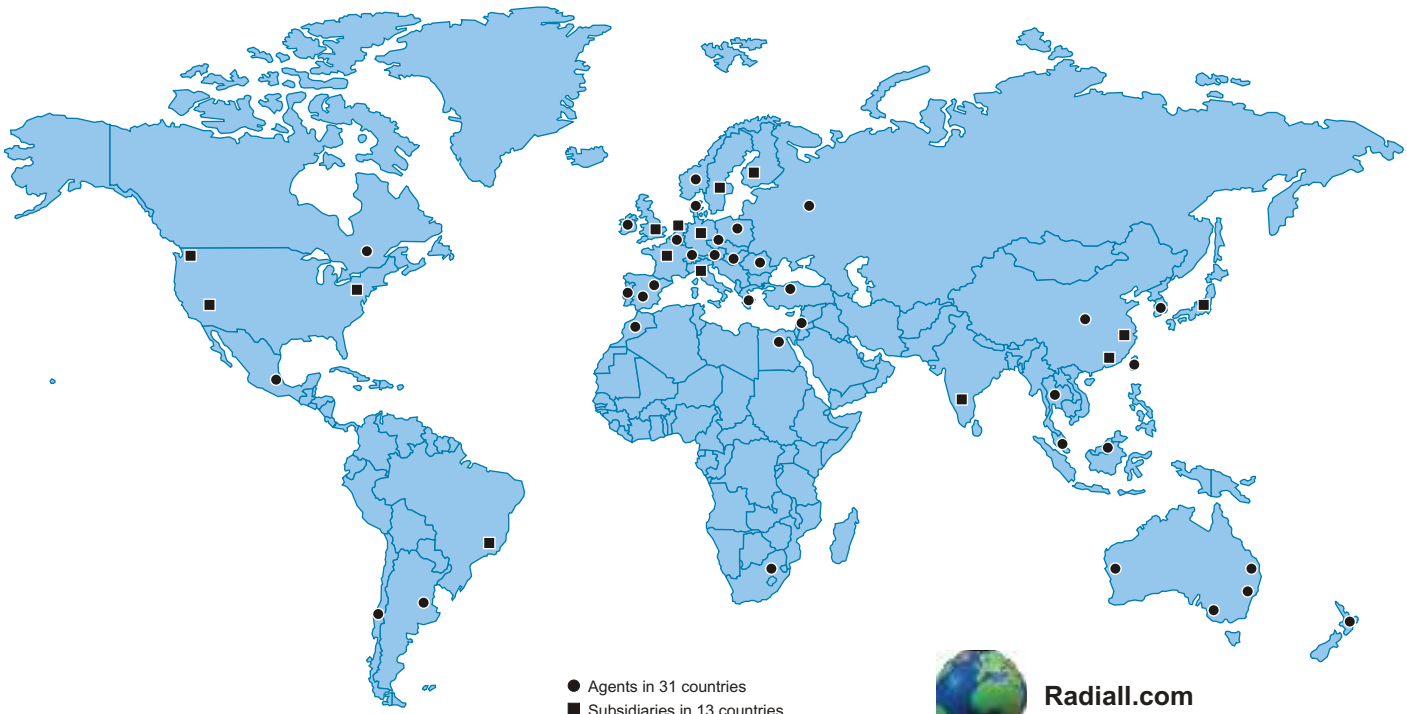
➤ **COAXIAL CABLE & CABLE ASSEMBLIES**

RG cable ass. : standard & special cables DC-18GHz
Option to RG cable ass. : halogen free, flame retardant
SHF cable ass. : ultra low loss flexible cables DC-40GHz
Corrugated cable assemblies : (IMP : -125 dBm)
Semi-rigid and conformable cables : DC-46GHz
Custom design products (harness)

➤ **ANTENNAS**

Omnidirectional wire pach antenna
Patch array antenna (new dielectric material)
Patch ceramic or metallic antenna
Printed or wire dipole antenna
Dual polarization antenna
Dual band antenna
Embedded or external antenna

➤ **ACCESSORIES & ASSEMBLY TOOLING**



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