SPINNER
Mobile Communication

Site and In-Building Portfolio

LOW PIM

HIGH FREQUENCY PERFORMANCE WORLDWIDE
www.spinner-group.com

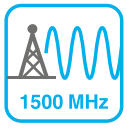
SPINNER

Designation of Mobile Communication Products

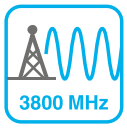
Most of our products such as connectors, adaptors and jumpers can be used for all common mobile communication frequencies. Other products support dedicated bands only.
To help you make the right choices we have decided to introduce icons for specific bands:

This product is suitable for PMR/TETRA
(Private Mobile Radio/Terrestrial Trunked Radio).

This product is suitable for
GSM-R.



This product is suitable for
the L-Band.



This product can be used for
up to 3800 MHz.

Some of our products will be customized before being dispatched.
The products for which this service is available are designated in our catalogue by the logo shown below:

Used for products that are specially
customized before being supplied.

For more information on products, please use our Product Finder at products.spinner-group.com

You can get the latest new edition of our mobile communications catalogue in the download section of our website. Please follow this link: www.spinner-group.com/downloads

The specifications given here as well as the illustrations are for information. They shall only be confirmed by SPINNER's written offer and are subject to technical amendments.

Contents

SPINNER Sets Standards in RF Technology

The SPINNER Group is a globally leading producer of high-quality RF components. Our technical competence and more than 70 years of experience make us a sought-after partner where RF technology is concerned. Based in Munich with production facilities in Germany, Hungary and China, today the SPINNER Group employs more than 1000 highly trained employees.

Committed to reduce cost

We are committed to minimizing our customers' operating costs by providing first-rate products and solutions that are planned, designed and manufactured with meticulous attention to every detail. Our success is based on professional development, superior quality, carefully selected materials, and competent personnel. SPINNER supplies a wide range of discrete passive components.

Above and beyond this, we also plan and develop customer-specific solutions based on our Mobile Network Combining Systems (MNCS®) to enable multiple uses of antenna systems. These customized passive solutions are highly integrated and extremely reliable while also being very flexible.

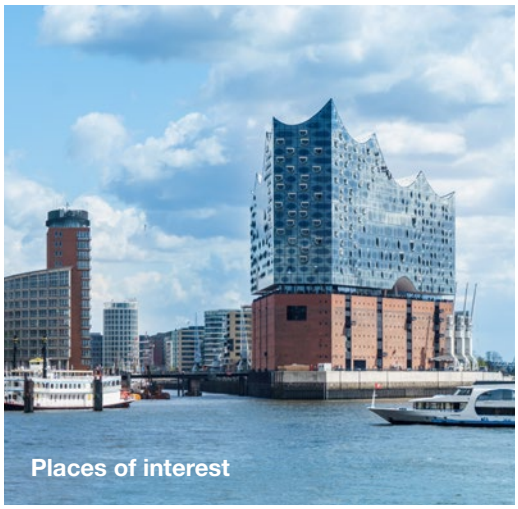
After our MNCS® systems are installed, there are no additional costs for electric power, spare parts or maintenance. Interruptions in service as a result of system failures or the need to replace discontinued components are a thing of the past. Being modular in structure, they are extremely versatile and can be easily scaled up at any time. This is good to know, since one thing is certain: there will always be yet another generation in mobile communications.

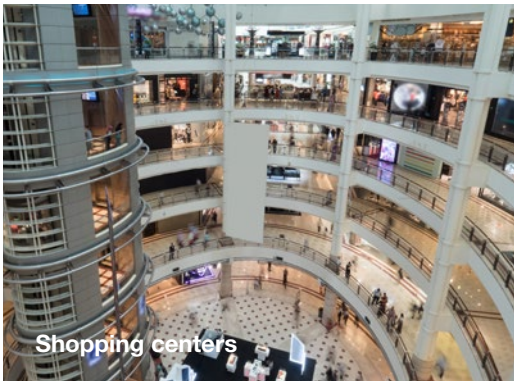
We invented soldered and molded jumpers

SPINNER is co-inventor of the 4.3-10 connector system

We invented the 7-16 connector system

Areas of Application for SPINNER Products and Solutions





Passive Intermodulation – PIM

In the mobile communication market, there is a lot of talk about the need for low passive intermodulation, also referred to as "low PIM". This is a very important topic and one that is often underestimated and occasionally even abused for marketing purposes.

PIM is still underestimated

Today's mobile communication networks already use three to five different bands simultaneously. And most new growth is achieved by adding even more frequency bands. Transmitting such a large number of different frequencies through the same medium greatly increases the risk of PIM. Consequently, today it is becoming more important than ever to use PIM-resistant products.

SPINNER was one of the first manufacturers to recognize the risks of PIM, back in the early days of mobile communications. And as a result, we have now spent more than 20 years intentionally developing our mobile communication products to keep passive intermodulation as low as possible.

There are widely diverging views in the market on how to define a product as "low PIM". Astonishingly, it has even become common to describe products afflicted by intermodulation of -140 dBc (IM3 @ 2 x 20 W) as having low PIM. At SPINNER, we don't refer to a product as "low PIM" unless final tests show levels below the -160 dBc threshold. In many of our data sheets, we also list not only the guaranteed value but also a typical value, e.g. -165 dBc. And even this excellent typical level is surpassed by about 80% of our products.

PIM must be considered end-to-end

It's important to note that a product's IM grade doesn't only depend on the product itself. It also depends on the environment in which it is tested. According to IEC recommendation 62037-1, a test system's own intermodulation must be 10 dB better than the value of a tested object. This requirement extends to all components involved in testing, including cables, switches and terminating resistors. If it isn't met, the measurement tolerance becomes much larger, greatly increasing the probability of errors.

As a leading producer of low intermodulation test equipment, we take this recommendation very seriously and consistently apply it to our test environments and for testing our own products.

In the future as well, we will remain committed to taking the topic of intermodulation very seriously. We guarantee you the best possible mobile communication products and test equipment and components, and we want to continue being your reliable partner. This lets you save quite a bit of money in the long run. Lower costs for maintenance and servicing may not always be an obvious consequence of excellent RF components. But we feel obliged to help you achieve them. Thank you for placing your confidence in us!

Back in 1997: SPINNER's first PIM test bench

Connectors

SPINNER has a long tradition of producing high-quality connectors. The first "carrier-grade" 6-16 (60 Ω) connector was invented by Dr. Georg Spinner back in 1949. It served as the basis for developing the 7-16 (50 Ω) version, which is the most widely used connector system in the mobile communication market today.

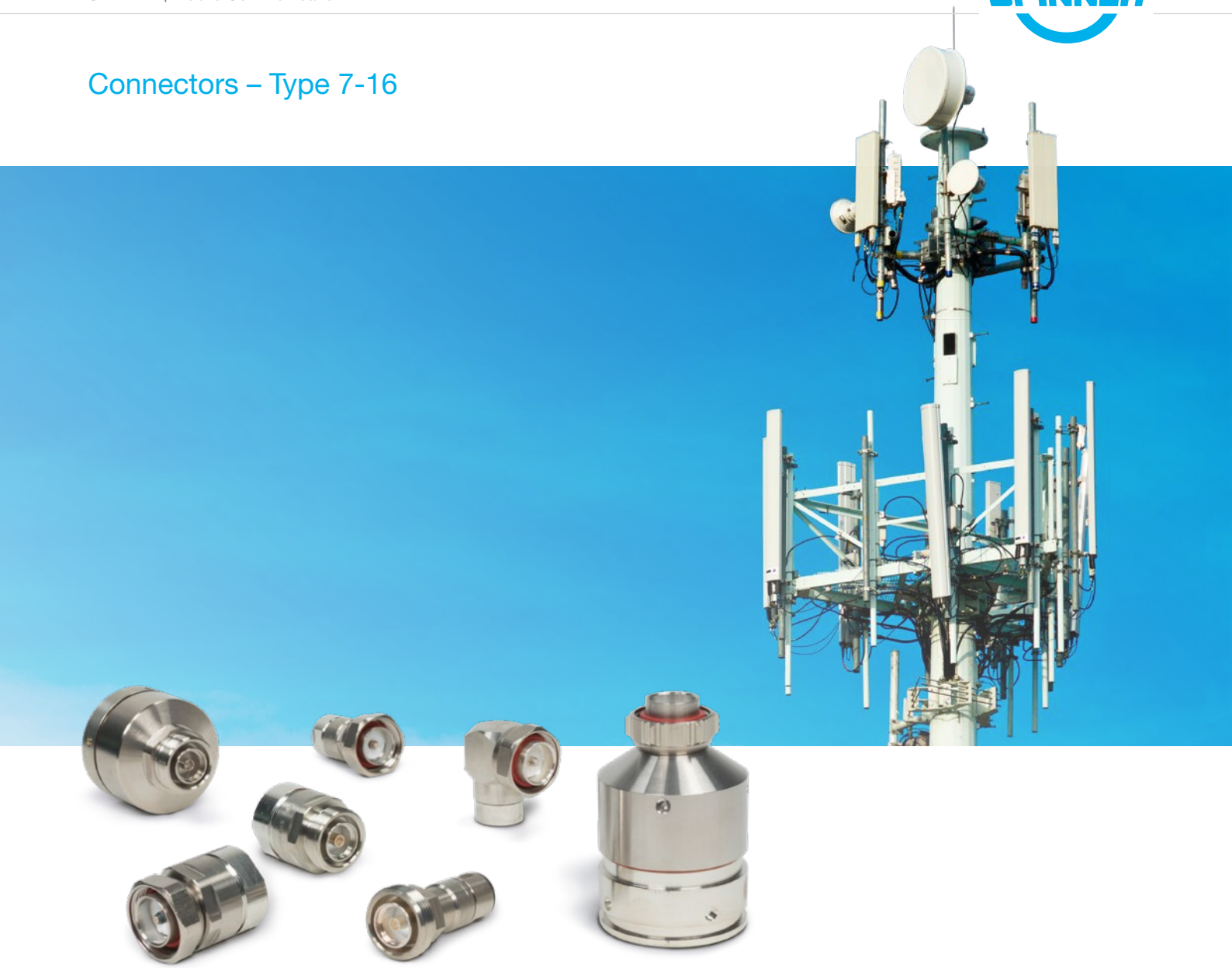
All SPINNER connectors possess excellent electrical and mechanical properties. The details of the individual connector systems are covered in the following chapters. On this page, we briefly acquaint you with the Cut And Fit (CAF®) and MultiFit cable clamp systems used by SPINNER.

Cable Clamp Systems (called "Version" on the next pages)	Benefits
SPINNER Cut and Fit (CAF®) Plast2000 	■ Ultra-safe IP68-rated protection based on Plast2000 sealing ■ For SpinnerFlex® and RFS cables
SPINNER Cut and Fit (CAF®)  SPINNER CAF® profile gasket; SPINNER CAF® O-ring; SPINNER CAF® heat shrink sleeve	■ Quick and safe single-step installation in less than two minutes ■ Sealing by profile gasket, O-ring or heat shrink sleeve ■ For SpinnerFlex® and RFS cables
SPINNER MultiFit®  SPINNER MultiFit® profile gasket; SPINNER MultiFit® O-ring	■ Quick and safe two-step installation in about two minutes ■ Sealing by profile gasket or O-ring ■ For all commercially available cables

Installation

We show you how to install our connectors for different cable sizes and cable clamp systems in videos on our YouTube channel. You can find more information in our installation guides: https://www.youtube.com/user/spinnergmbh

Connectors – Type 7-16



The 7-16 connector has become the most widely used coaxial connection system for mobile communication systems, due to its excellent mechanical and electrical properties.

In order to achieve the industry leading inter-modulation performance (typically -165 dBc), SPINNER applies silver-plating on all inner and outer conductor parts of the connector. As a supporting measure we use exclusively non-magnetic materials, and we have minimized the number of RF contact points.

The connection is especially suited for transmitting medium or high power signals, up to a frequency of 8.3 GHz. Most of our connectors are suited with a special SPINNER coupling nut.

The 50 Ω connector 7-16 is a variant of the connector system 6-16 (60 Ω) developed 1949 by Dr. Georg Spinner. The designation is derived from the metric dimensions of the inner and outer conductor.

Connectors – Type 7-16

Electrical	IEC 61169-4	Remark
Nominal impedance	50 Ω	
Frequency range	0 - 7.5 GHz	SPINNER: 0 - 8.3 GHz
Passive intermodulation (IM3) @ 2 x 20 W	≤ -155 dBc	SPINNER: ≤ -165 dBc
VSWR	≤ 1.22	Straight connector, up to 6 GHz
Center contact resistance	≤ 0.4 mΩ	Initial
Outer contact continuity	≤ 1.50 mΩ	Initial
Insulation resistance	≥ 10 GΩ	Initial
Proof voltage at sea level	3 kV	50 - 60 Hz
Screening effectiveness	≥ 110 dB	Straight cable connectors, up to 1 GHz

Mechanical	IEC 61169-4	Remark
Coupling torque	30 Nm	
Proof torque		SPINNER: 55 Nm
Tensile strength of coupling mechanism	445 N	SPINNER: 1000 N
Mechanical lifetime	500	Operations
Center contact captivation		Yes

Environmental	IEC 61169-4	Remark
Climatic category	55/155/56	
Degree of protection (mated)		SPINNER: IP 68

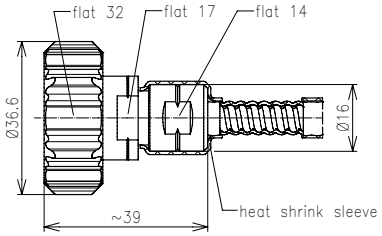
Materials and Surface Finish	
Resilient contact parts	High strength copper alloy, silver plated
Insulation	PTFE/FEP
Center and outer conductor parts	Copper alloy, silver plated and/or CuSnZn plated
Other metal parts	Copper alloy, bright nickel plated and/or tin plated
Gaskets	Silicone rubber

Connectors – Type 7-16

Cable Connector for SF 1/4"-50 Cables

Style	Version	Part Number
Male	CAF®	**BN 741460**

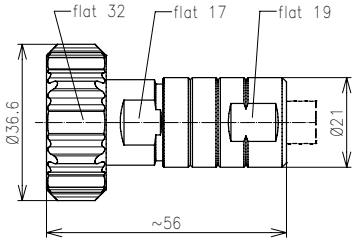
BN 741460



Cable Connectors for SF 3/8"-50 Cables

Style	Version	Part Number
Male	CAF®	**BN 847339**
Male right angle	CAF®	**BN 847373**
Female	CAF®	**BN 710339**

BN 847339



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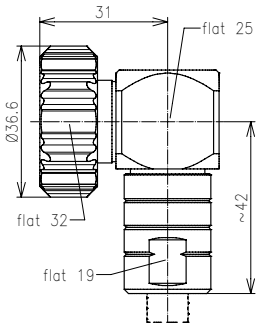
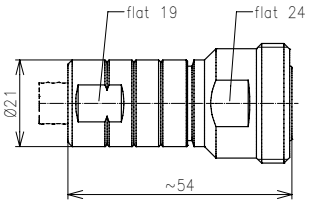


BN 710339

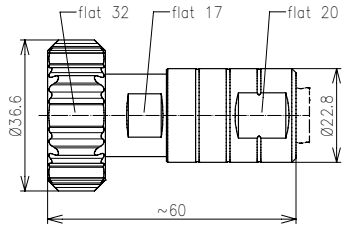


Connectors – Type 7-16

Cable Connectors for SF 1/2"-50 Cables

Style	Version	Part Number
Male	CAF®	**BN 847359**
Male	MultiFit	**BN 847371**
Male right angle	CAF®	**BN 847357**
Male right angle	MultiFit	**BN 847374**
Female	CAF®	**BN 710359**
Female	MultiFit	**BN 710371**

BN 847359



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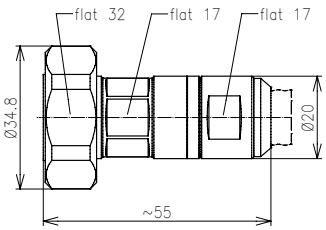

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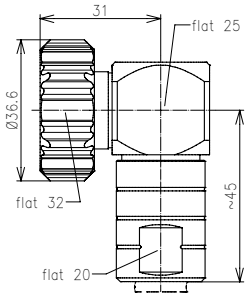

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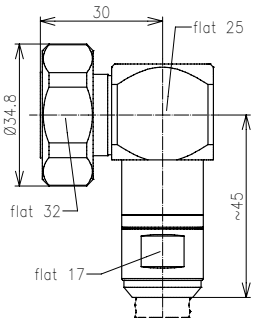

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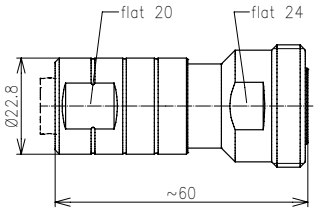

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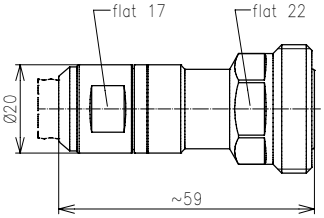
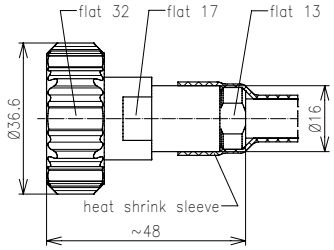


Connectors – Type 7-16

Cable Connector for LF 1/4"-50 Cables

Style	Version	Part Number
Male	CAF®	**BN 741445**

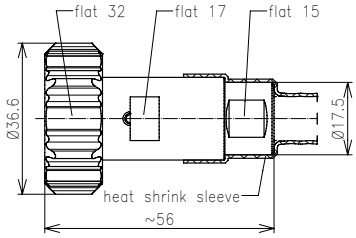
BN 741445



Cable Connector for LF 3/8"-50 Cables

Style	Version	Part Number
Male	CAF®	**BN 847369**

BN 847369

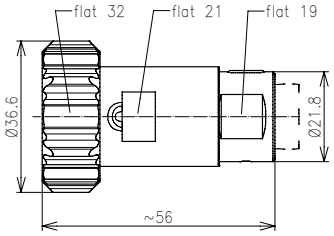


Connectors – Type 7-16

Cable Connectors for LF 1/2"-50 Cables

Style	Version	Part Number
Male	CAF® Plast2000	**BN 847368**
Male	CAF® O-ring	**BN 847389**
Male	MultiFit	**BN 854317**
Male right angle	CAF® Plast2000	**BN 847356**
Male right angle	CAF® O-ring	**BN 847391**
Male right angle	MultiFit	**BN 854316**
Female	CAF® Plast2000	**BN 710368**
Female	CAF® O-ring	**BN 710389**
Female	MultiFit	**BN 654317**

BN 847368



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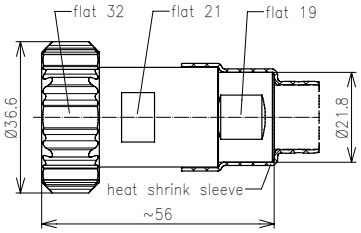

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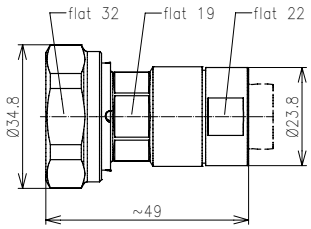

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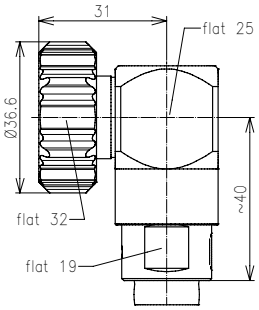

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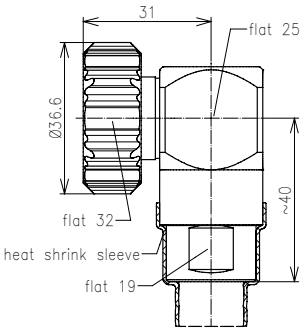

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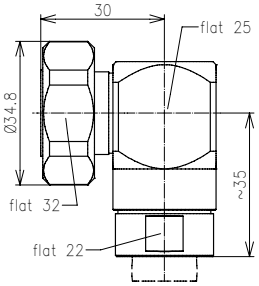

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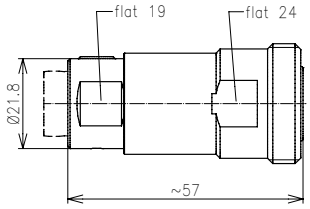

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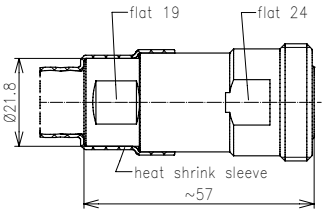

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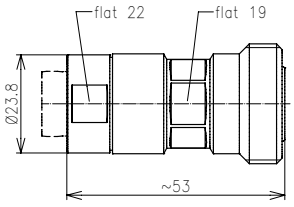
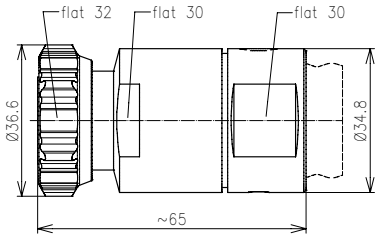


Connectors – Type 7-16

Cable Connectors for LF 7/8"-50 Cables

Style	Version	Part Number
Male	CAF® Plast2000	**BN 844840**
Male	CAF® O-ring	**BN 844841**
Male	MultiFit	**BN 854302**
Male right angle	CAF® Plast2000	**BN 844850**
Male right angle	CAF® O-ring	**BN 844851**
Male right angle	MultiFit	**BN 854309**
Female	CAF® Plast2000	**BN 655640**
Female	CAF® O-ring	**BN 655641**
Female	MultiFit	**BN 654302**

BN 844840



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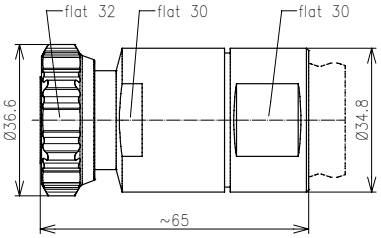

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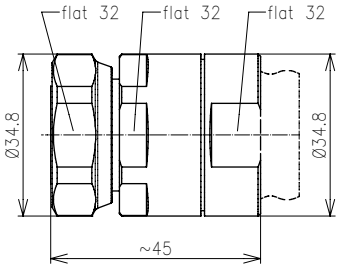

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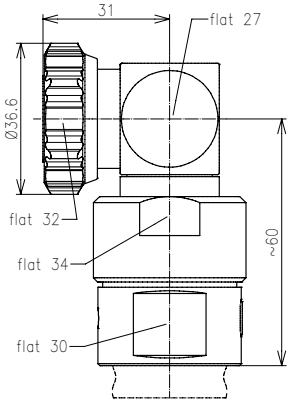

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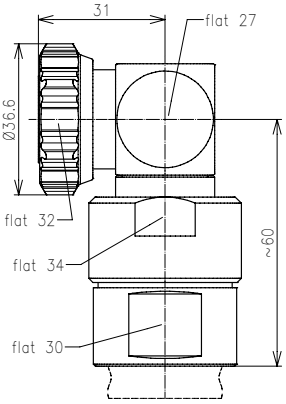

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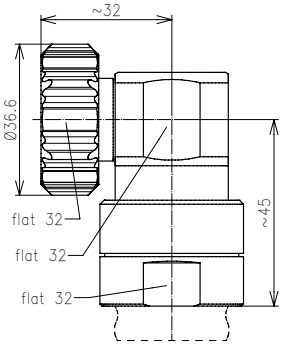

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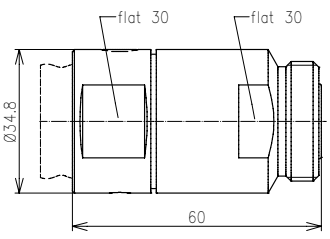

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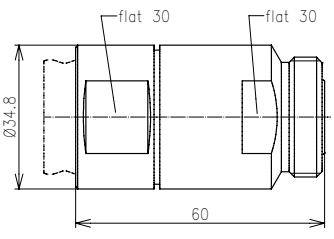
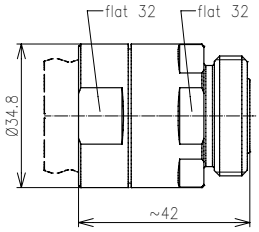


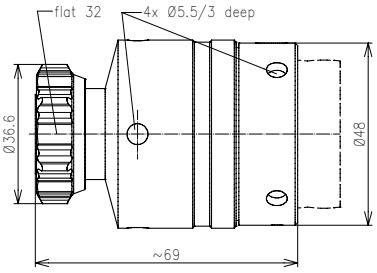
Connectors – Type 7-16



BN 654302

Cable Connectors for LF 1 1/4"-50 Cables

Style	Version	Part Number
Male	CAF® Plast2000	**BN 844842**
Male	MultiFit	**BN 854320**
Female	CAF® Plast2000	**BN 655642**
Female	MultiFit	**BN 654320**



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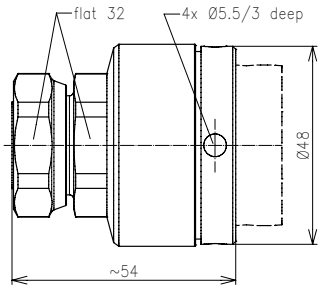

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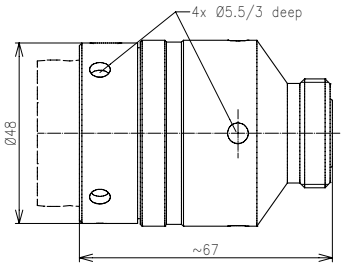

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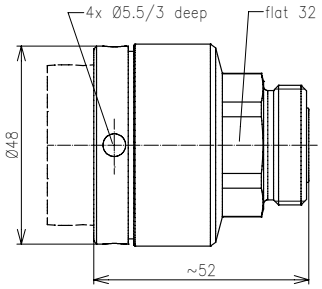


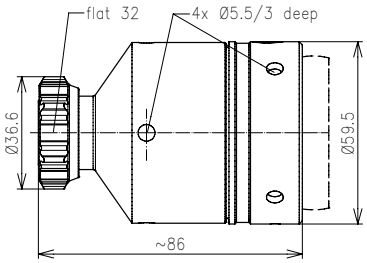
BN 654320

Connectors – Type 7-16

Cable Connectors for LF 1 5/8"-50 Cables

Style	Version	Part Number
Male	CAF® Plast2000	**BN 844844**
Male	MultiFit	**BN 854322**
Female	CAF® Plast2000	**BN 655644**
Female	MultiFit	**BN 654322**

BN 844844



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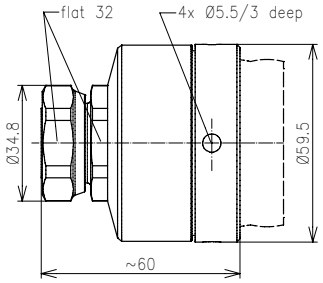

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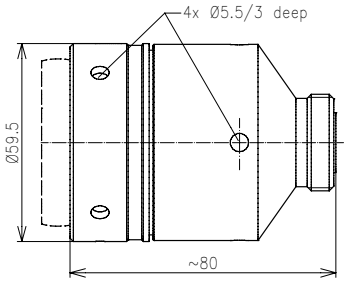

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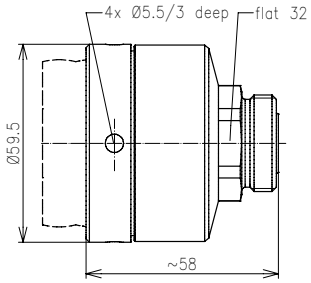
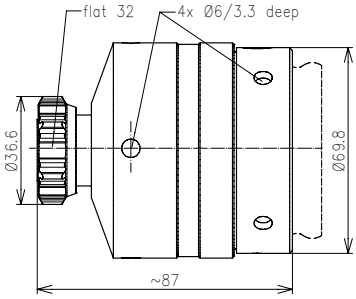


Connectors – Type 7-16

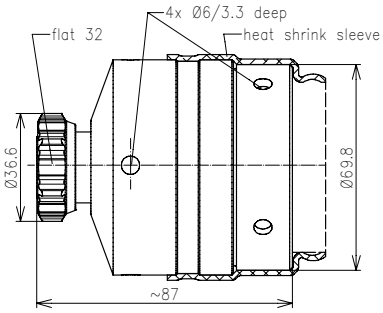
Cable Connectors for LF 2 1/4"-50 Cables

Style	Version	Part Number
Male	CAF® Plast2000	**BN 844873**
Male	CAF® O-ring	**BN 844863**
Female	CAF® Plast2000	**BN 655673**
Female	CAF® O-ring	**BN 655663**

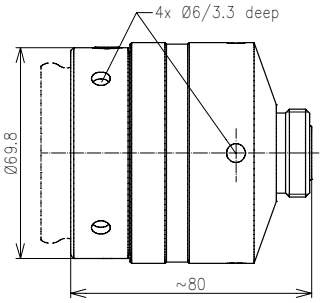
BN 844873



BN 844863



BN 655673



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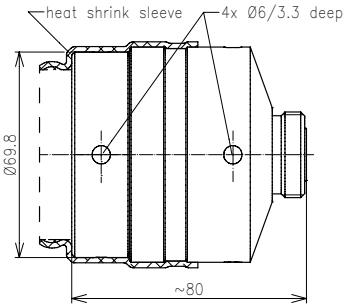
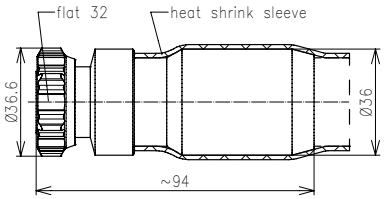


Connectors – Type 7-16

Cable Connectors for Radiating Cables

Cable Type	Style	Version	Part Number
RADIAFLEX® 78-50	Male	Heat shrink sleeve	**BN 557152**
RADIAFLEX® 78-50	Female	Heat shrink sleeve	**BN 557153**
RADIAFLEX® 114-50A	Female	Heat shrink sleeve	**BN 557163**
RADIAFLEX® 158-50A	Female	Heat shrink sleeve	**BN 557173**

BN 557152



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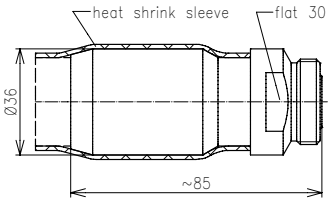
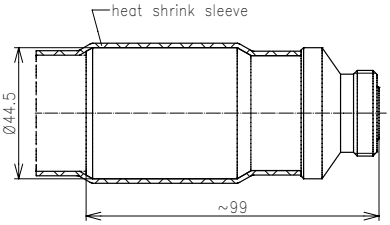
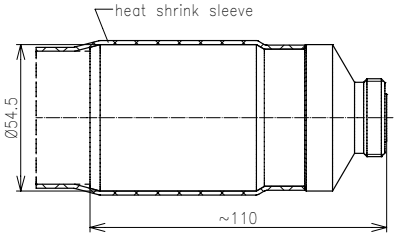


BN 557163



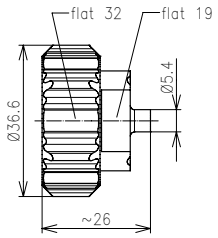
BN 557173



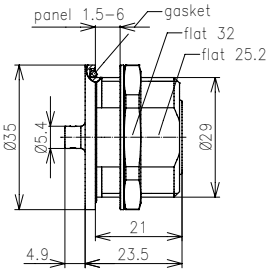
Cable Connectors for RG Cables

Cable Type	Style	Version	Part Number
Seriflex 141-50; RG 402/U	Male	Soldered	**BN 807625**
Seriflex 141-50; RG 402/U	Female bulkhead	Soldered; panel sealed	**BN 807788**
Seriflex 141-50; RG 402/U	Female four-hole flange	Soldered	**BN 807706**
Seriflex 141-50; RG 402/U	Female four-hole flange	Soldered; panel sealed	**BN 807750**
Seriflex 250-50; RG 401/U	Male	Soldered	**BN 807621**
Seriflex 250-50; RG 401/U	Female bulkhead	Soldered; panel sealed	**BN 807733**
Seriflex 250-50; RG 401/U	Female four-hole flange	Soldered	**BN 807752**
RG 214/U; RG 393/U	Male	Clamped	**BN 951820**
RG 214/U; RG 393/U	Male, straight and right angle mounting	Clamped	**BN 807680**
RG 214/U; RG 393/U	Female	Clamped	**BN 951920**

BN 807625

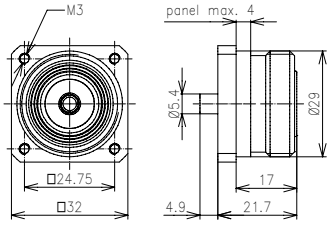


BN 807788



Connectors – Type 7-16

Cable Connectors for RG Cables



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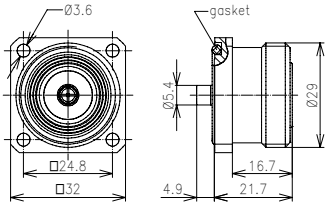
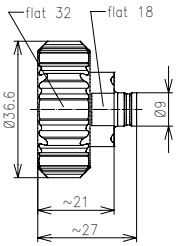
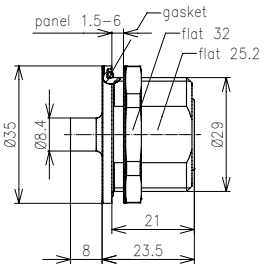


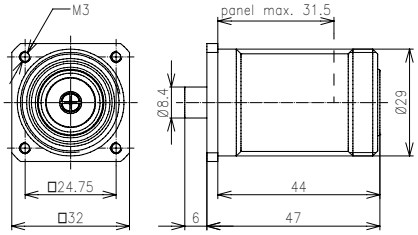
BN 807750



BN 807621



BN 807733



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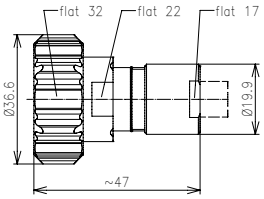
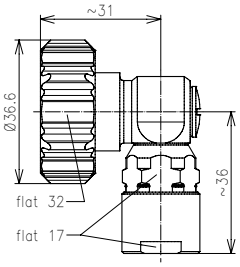


BN 951820



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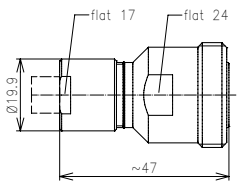

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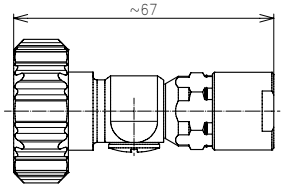
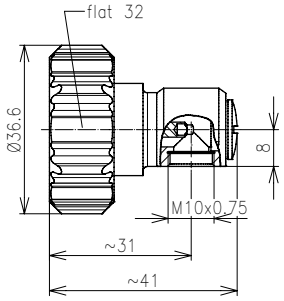


Connectors – Type 7-16

Connector Head

Style	Part Number
Male, straight and right angle mounting	**BN 450995**

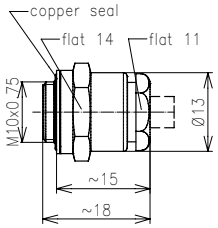
BN 450995



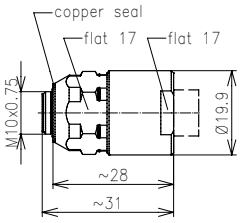
Cable Entries

Cable Type	Version	Part Number
RG 55 B/U RG 58 C/U RG 142 B/U RG 223/U RG 400/U	Clamped	**BN 419400**
RG 213/U	Clamped	**BN 420100**
RG 214/U RG 216/U RG 393/U	Clamped	**BN 982900**
RG 214/U RG 393/U	Crimped	**BN 982911**

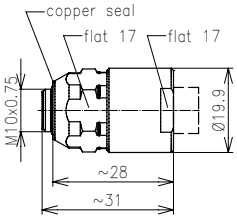
BN 419400



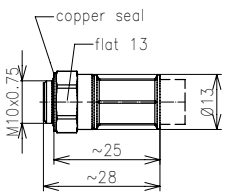
BN 420100



BN 982900



BN 982911

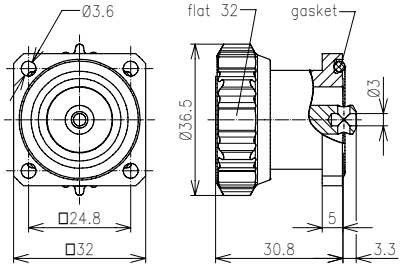


Connectors – Type 7-16

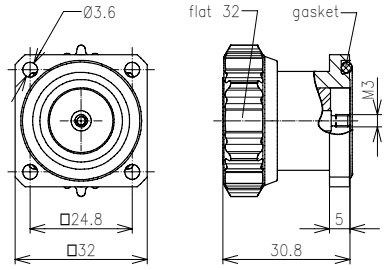
Fixed Connectors

Style	Version	Part Number
Male four-hole flange	Inner conductor solder cup; panel sealed	**BN 954716**
Male four-hole flange	Inner conductor M3; panel sealed	**BN 954765**
Female four-hole flange	Inner conductor solder cup	**BN 954510**
Female four-hole flange	Inner conductor M3; panel sealed	**BN 954684**

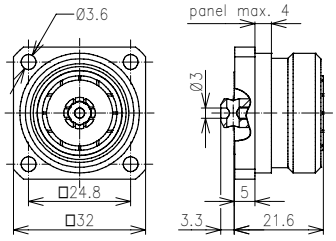
BN 954716



BN 954765



BN 954510



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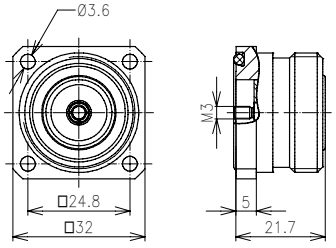


Connectors – Type 4.3-10

4.3-10 is the most advanced coaxial connector system. It was developed specifically to meet the requirements of today's mobile communication market. It boasts outstanding electrical and mechanical properties, and best of all it is characterized by extremely low passive intermodulation.

Best connector system in the market

Its compactness compared to conventional connector systems and its low coupling torque contribute to making it excellently suited for mobile communication systems.
In older connector systems for mobile communication applications, the electrical and mechanical reference planes are identical. The 4.3-10 standard separates them, thus significantly reducing the required coupling torque and ensuring more reliable contact. This separation also makes the system less susceptible to faults. Besides the screw version (installed using a tool), hand-screw and push-pull versions are also available.

Three different coupling mechanisms: screw - hand screw - push-pull

In 2014, SPINNER and other leading connector suppliers jointly developed the 4.3-10 connector system for the mobile communication market. By separating the electrical and mechanical reference planes best intermodulation values at low coupling torque can be achieved.

Connectors – Type 4.3-10

Electrical	IEC 61169-54	Remark
Nominal impedance	50 Ω	
Frequency range	0 - 6 GHz	Grade 2: 0 – 6 GHz Grade 0 and 1: 0 – 12 GHz
Passive intermodulation (IM3) @ 2 x 20 W	≤ -166 dBc	
VSWR	≤ 1.05	Straight connector, up to 6 GHz
Center contact resistance	≤ 1.0 mΩ	Initial
Outer contact continuity	≤ 1.0 mΩ	Initial
Insulation resistance	≥ 5 GΩ	Initial
Proof voltage at sea level	2.5 kV	50 - 60 Hz
Screening effectiveness	≥ 110 dB	Screw type, up to 6 GHz

Mechanical	IEC 61169-54	Remark
Coupling torque	5 Nm	Screw type only
Proof torque	7 Nm	Screw type only
Tensile strength of coupling mechanism	445 N	
Mechanical lifetime	100 Cycles/Operations	SPINNER: 500 operations
Center contact captivation		Yes

Environmental	IEC 61169-54	Remark
Climatic category	55/125/56	
Degree of protection (mated)		SPINNER: IP 68

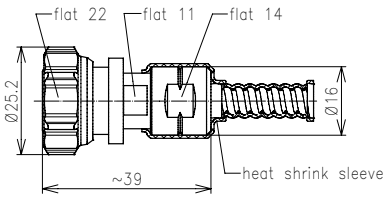
Materials and Surface Finish	
Resilient contact parts	High strength copper alloy, silver plated
Insulation	PTFE/FEP
Center and outer conductor parts	Copper alloy, silver plated and/or CuSnZn plated
Other metal parts	Copper alloy, bright nickel plated and/or tin plated
Gaskets	Silicone rubber

Connectors – Type 4.3-10

Cable Connectors for SF 1/4"-50 Cables

Style	Version	Part Number
Male, screw type	CAF®	**BN 431100**
Male, hand screw type	CAF®	**BN 431103**
Male, push-pull type	CAF®	**BN 431104**

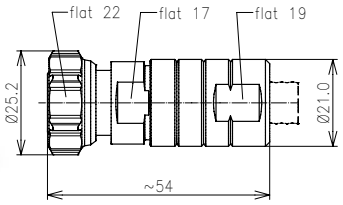
BN 431100



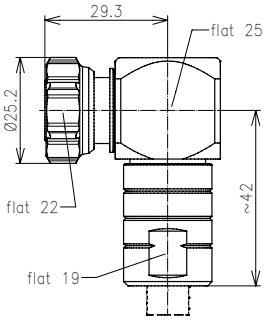
Cable Connectors for SF 3/8"-50 Cables

Style	Version	Part Number
Male, screw type	CAF®	**BN 431101**
Male, hand screw type	CAF®	**BN 431105**
Male, push-pull type	CAF®	**BN 431106**
Male right angle, screw type	CAF®	**BN 431107**
Male right angle, hand screw type	CAF®	**BN 431108**
Male right angle, push-pull type	CAF®	**BN 431109**

BN 431101



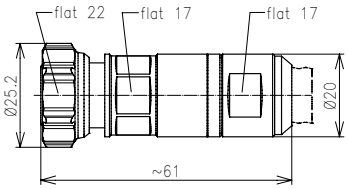
BN 431107



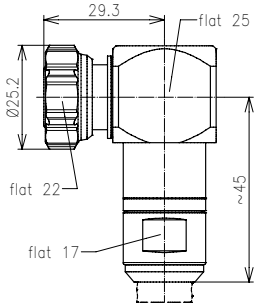
Cable Connectors for SF 1/2"-50 Cables

Style	Version	Part Number
Male, screw type	MultiFit	**BN 431171**
Male, hand screw type	MultiFit	**BN 431110**
Male, push-pull type	MultiFit	**BN 431111**
Male right angle, screw type	MultiFit	**BN 431174**
Male right angle, hand screw type	MultiFit	**BN 431113**
Male right angle, push-pull type	MultiFit	**BN 431114**
Female	MultiFit	**BN 431112**

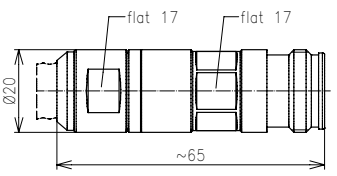
BN 431171



BN 431174



BN 431112

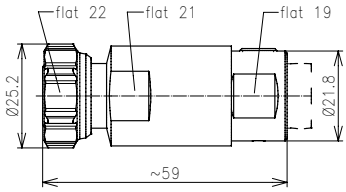


Connectors – Type 4.3-10

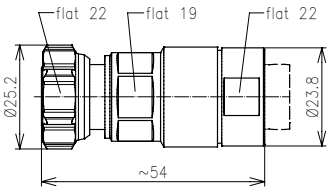
Cable Connectors for LF 1/2"-50 Cables

Style	Version	Part Number
Male, screw type	CAF® Plast2000	**BN 431168**
Male, screw type	MultiFit	**BN 431117**
Male, hand screw type	MultiFit	**BN 431115**
Male, push-pull type	MultiFit	**BN 431118**
Male right angle, screw type	MultiFit	**BN 431116**
Male right angle, hand screw type	MultiFit	**BN 431119**
Male right angle, push-pull type	MultiFit	**BN 431121**
Female	CAF® Plast2000	**BN 431068**
Female	MultiFit	**BN 431017**

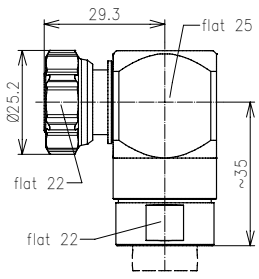
BN 431168



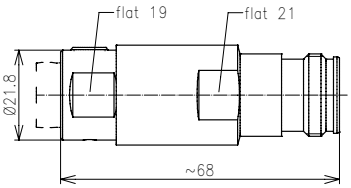
BN 431117



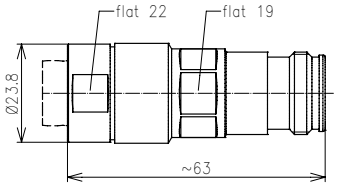
BN 431116



BN 431068



BN 431017

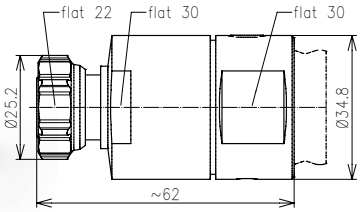


Connectors – Type 4.3-10

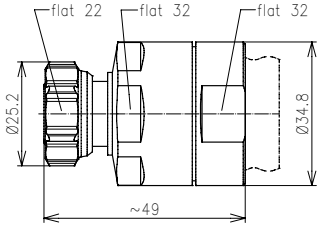
Cable Connectors for LF 7/8"-50 Cables

Style	Version	Part Number
Male, screw type	CAF® Plast2000	**BN 431140**
Male, screw type	MultiFit	**BN 431102**
Male, hand screw type	MultiFit	**BN 431123**
Male, push-pull type	MultiFit	**BN 431124**
Male right angle, screw type	MultiFit	**BN 431133**
Female	CAF® Plast2000	**BN 431040**
Female	MultiFit	**BN 431002**

BN 431140



BN 431102



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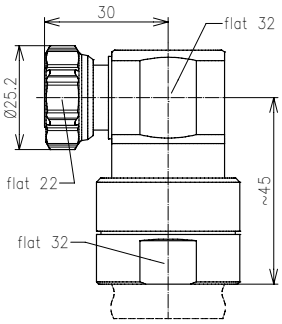

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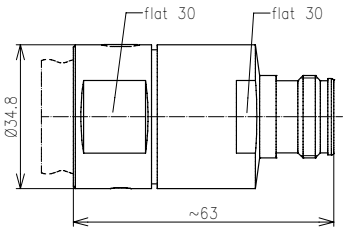
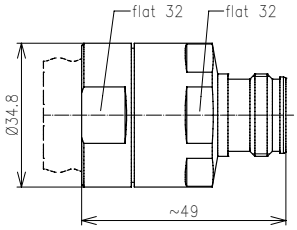


BN 431002

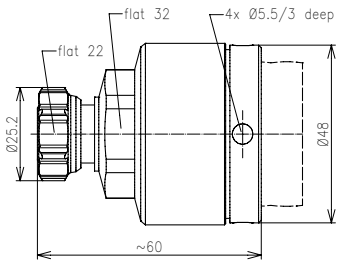


Connectors – Type 4.3-10

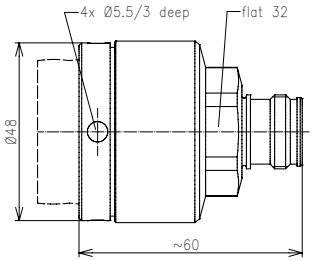
Cable Connectors for LF 1 1/4"-50 Cables

Style	Version	Part Number
Male, screw type	MultiFit	**BN 431120**
Male, hand screw type	MultiFit	**BN 431125**
Male, push-pull type	MultiFit	**BN 431126**
Female	MultiFit	**BN 431020**

BN 431120



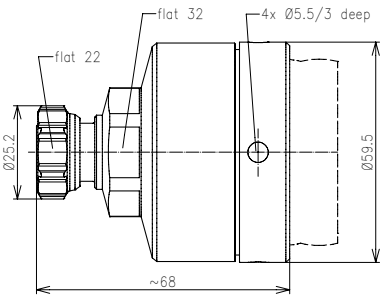
BN 431020



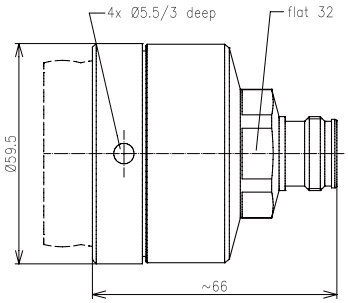
Cable Connectors for LF 1 5/8"-50 Cables

Style	Version	Part Number
Male, screw type	MultiFit	**BN 431122**
Male, hand screw type	MultiFit	**BN 431127**
Male, push-pull type	MultiFit	**BN 431128**
Female	MultiFit	**BN 431022**

BN 431122



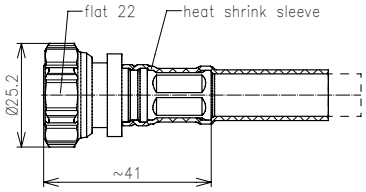
BN 431022



Connectors – Type 4.3-10

Cable Connectors for LMR-400 (RG8) Cables

Style	Version	Part Number
Male, screw type	Crimped	**BN 431130**
Male, hand screw type	Crimped	**BN 431131**
Male, push-pull type	Crimped	**BN 431129**



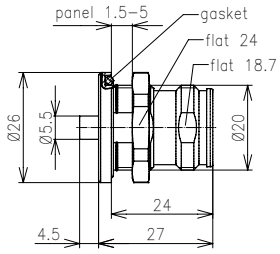
BN 431130

Connectors – Type 4.3-10

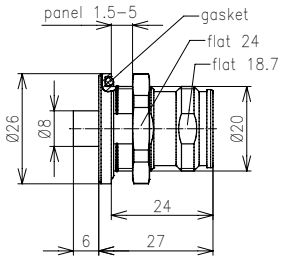
Fixed Connectors

Cable Type	Style	Version	Part Number
Seriflex 141-50; RG 402/U	Female bulkhead	Soldered; panel sealed	**BN 431500**
Seriflex 250-50; RG 401/U	Female bulkhead	Soldered; panel sealed	**BN 431501**
	Female bulkhead	Inner conductor M3; panel sealed	**BN 431502**
	Female bulkhead	Inner conductor solder cup; panel sealed	**BN 431503**
Seriflex 141-50; RG 402/U	Female four-hole flange	Soldered	**BN 431404**
Seriflex 250-50; RG 401/U	Female four-hole flange	Soldered	**BN 431403**
	Female four-hole flange	Inner conductor M3	**BN 431405**
	Female four-hole flange	Inner conductor solder cup	**BN 431406**

BN 431500



BN 431501



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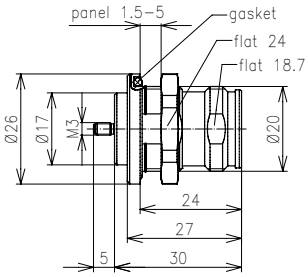

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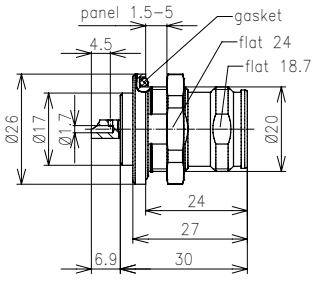
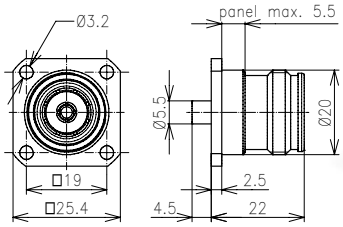
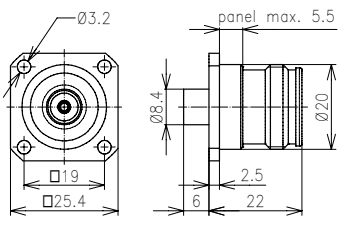


BN 431404



BN 431403



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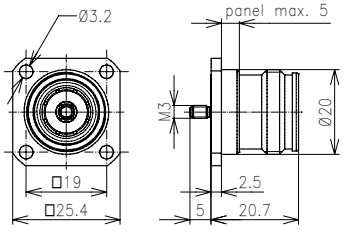

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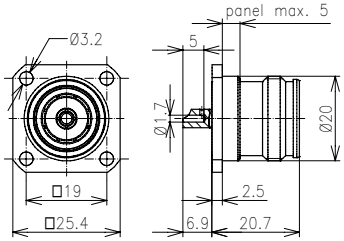


Connectors – Type N

Type N connectors can be used at frequencies up to 11 GHz, high-precision types up to 18 GHz.
It is typically used in mobile communication applications with demanding mechanical and electrical requirements.

That is why SPINNER exclusively manufactures N connectors with non-slotted outer conductor contacts and a special sealing profile in the connector head instead of the flat seal disk, specified by IEC or CECC. This ensures the most reliable sealing function.

The N connectors have been named after their inventor, Paul Neill, who developed this standard in 1942. But frequently the name is also related to Navy Connector.

Connectors – Type N

Electrical	IEC 61169-16	Remark
Nominal impedance	50 Ω	
Frequency range	0 - 11 GHz 0 - 18 GHz	Grade 2 Grade 0 and 1
Passive intermodulation (IM3) @ 2 x 20 W	Not specified	
VSWR	≤ 1.30 ≤ 1.50	Straight connector, up to 11 GHz Right angle connector, up to 11 GHz
Center contact resistance	≤ 1.50 mΩ	Initial
Outer contact continuity	≤ 1.00 mΩ	Initial
Insulation resistance	≥ 5 GΩ	Initial
Proof voltage at sea level	2.5 kV	50 - 60 Hz
Screening effectiveness	≥ 90 dB	Straight cable connectors, up to 1 GHz SPINNER: ≥ 100 dB

Mechanical	IEC 61169-16	Remark
Coupling torque	0.7 - 1.1 Nm	SPINNER: 3.0 Nm
Proof torque	1.7 Nm	SPINNER: 4.0 Nm
Tensile strength of coupling mechanism	450 N	
Mechanical lifetime	500	Operations
Center contact captivation		Yes

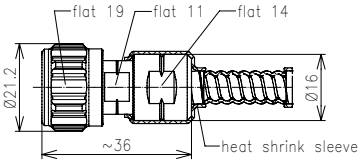
Environmental	IEC 61169-16	Remark
Climatic category	55/155/21	
Degree of protection (mated)		SPINNER: IP 68

Materials and Surface Finish	
Resilient contact parts	High strength copper alloy, silver plated
Insulation	PTFE/FEP
Center and outer conductor parts	Copper alloy, silver plated and/or CuSnZn plated
Other metal parts	Copper alloy, bright nickel plated and/or tin plated
Gaskets	Silicone rubber

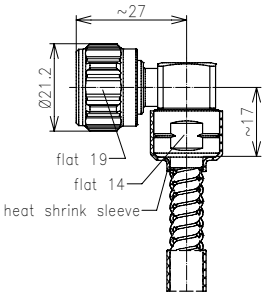
Connectors – Type N

Cable Connectors for SF 1/4"-50 Cables

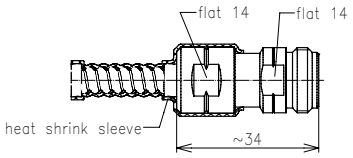
Style	Version	Part Number
Male	CAF®	**BN 844760**
Male right angle	CAF®	**BN 757860**
Female	CAF®	**BN 845560**



BN 844760



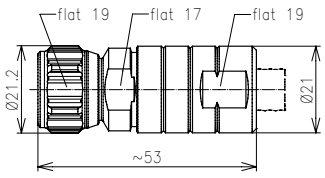
BN 757860



BN 845560

Cable Connectors for SF 3/8"-50 Cables

Style	Version	Part Number
Male	CAF®	**BN 870163**
Male, inner conductor gold plated	CAF®	**BN 870165**
Male right angle, inner conductor gold plated	CAF®	**BN 870173**
Female	CAF®	**BN 846063**



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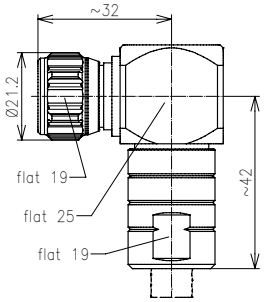
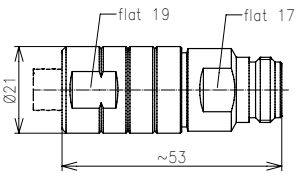


BN 870173

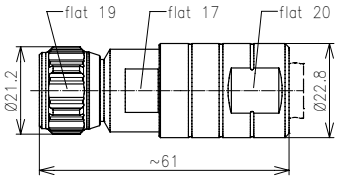


BN 846063

Connectors – Type N

Cable Connectors for SF 1/2"-50 Cables

Style	Version	Part Number
Male	CAF®	**BN 870157**
Male	MultiFit	**BN 870171**
Male right angle, inner conductor gold plated	CAF®	**BN 870156**
Male right angle	MultiFit	**BN 870174**
Female	CAF®	**BN 846057**
Female	MultiFit	**BN 846071**



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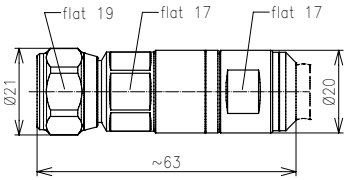
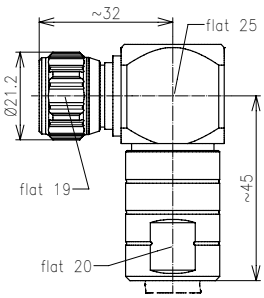


BN 870171



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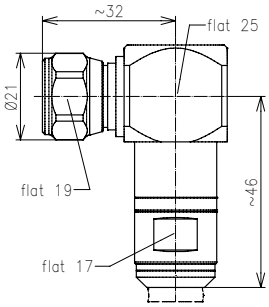

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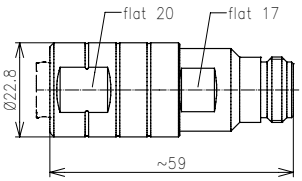

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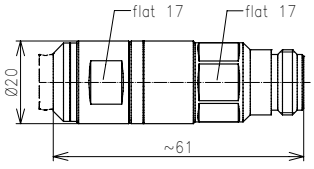
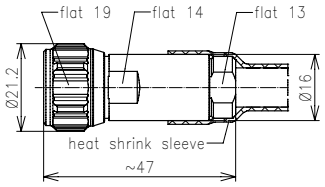


BN 846071

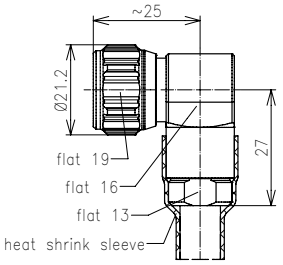
Connectors – Type N

Cable Connectors for LF 1/4"-50 Cables

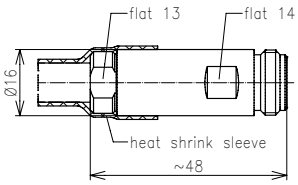
Style	Version	Part Number
Male	CAF®	**BN 844755**
Male right angle	CAF®	**BN 757855**
Female	CAF®	**BN 845555**
Female panel mount	CAF®	**BN 747645**



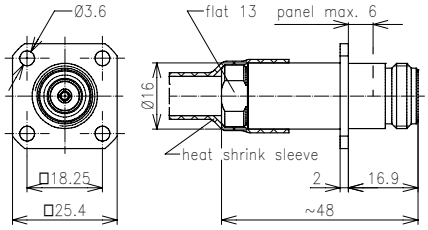
BN 844755



BN 757855



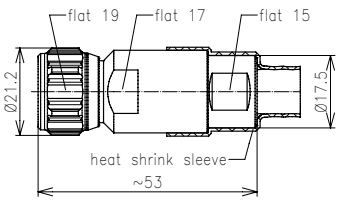
BN 845555



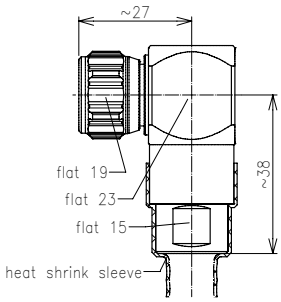
BN 747645

Cable Connectors for LF 3/8"-50 Cables

Style	Version	Part Number
Male	CAF®	**BN 870169**
Male right angle	CAF®	**BN 870170**
Female	CAF®	**BN 846069**



BN 870169



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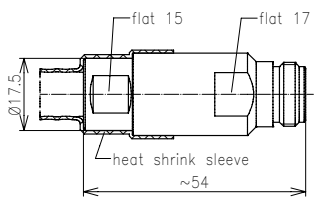


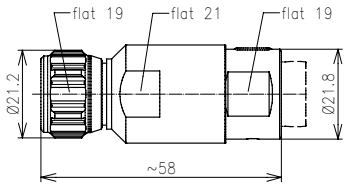
BN 846069

Connectors – Type N

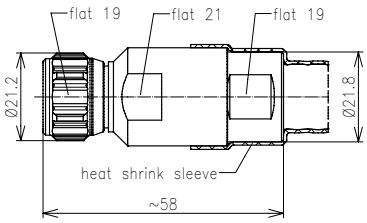
Cable Connectors for LF 1/2"-50 Cables

Style	Version	Part Number
Male	CAF® Plast2000	**BN 870168**
Male	CAF® O-ring	**BN 870189**
Male	MultiFit	**BN 706417**
Male right angle	CAF® Plast2000	**BN 870167**
Male right angle	CAF® O-ring	**BN 870187**
Male right angle	MultiFit	**BN 706416**
Female	CAF® Plast2000	**BN 846068**
Female	CAF® O-ring	**BN 846089**
Female	MultiFit	**BN 846417**
Female four-hole flange	CAF® Plast2000	**BN 747544**

BN 870168



BN 870189



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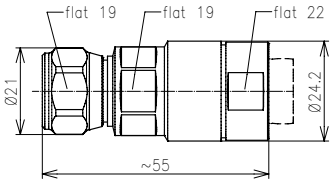

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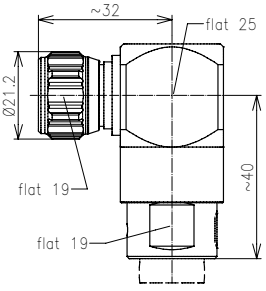

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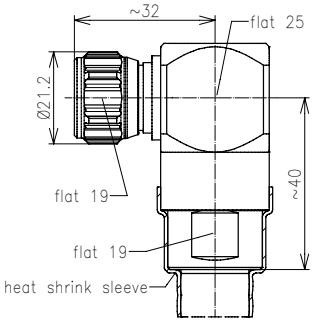
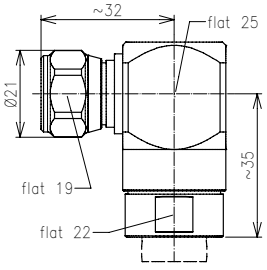
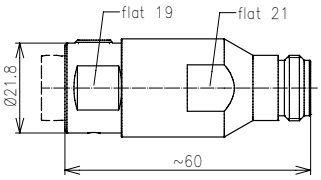


BN 706416

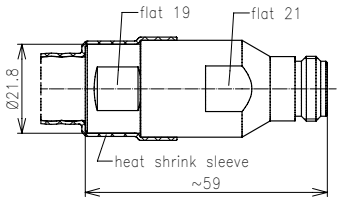


Connectors – Type N

Cable Connectors for LF 1/2"-50 Cables



BN 846068



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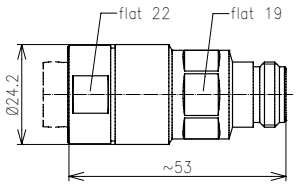
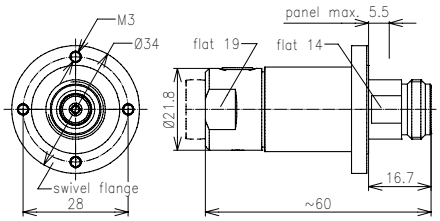


BN 846417

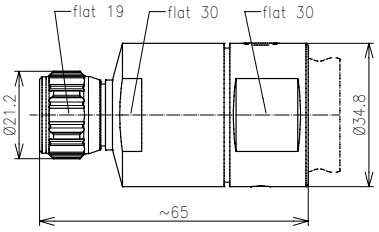


BN 747544

Connectors – Type N

Cable Connectors for LF 7/8"-50 Cables

Style	Version	Part Number
Male	CAF® Plast2000	**BN 706740**
Male	CAF® O-ring	**BN 706741**
Male	MultiFit	**BN 706402**
Female	CAF® Plast2000	**BN 846340**
Female	CAF® O-ring	**BN 846341**
Female	MultiFit	**BN 846402**



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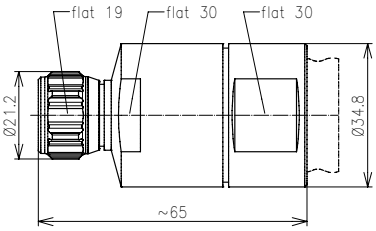

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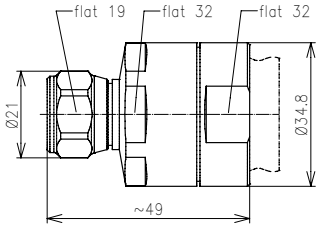

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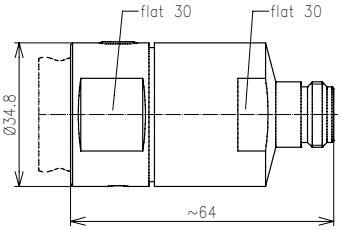

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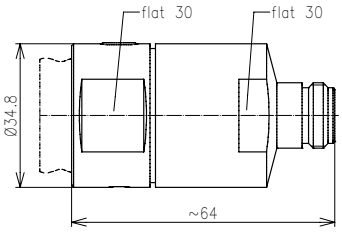

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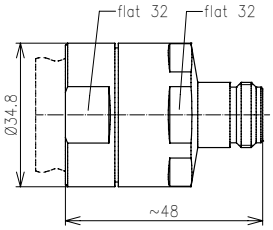
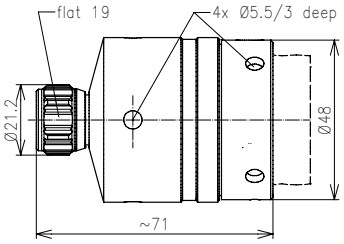


BN 846402

Connectors – Type N

Cable Connectors for LF 1 1/4"-50 Cables

Style	Version	Part Number
Male	CAF® Plast2000	**BN 706742**
Male	MultiFit	**BN 706420**
Female	CAF® Plast2000	**BN 846342**
Female	MultiFit	**BN 846420**



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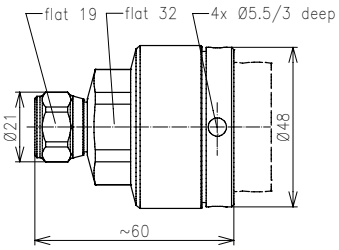

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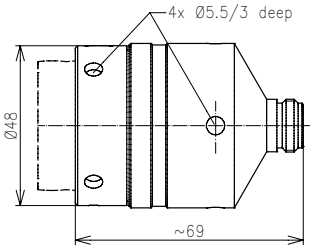

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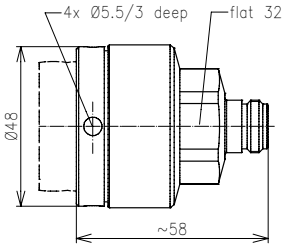


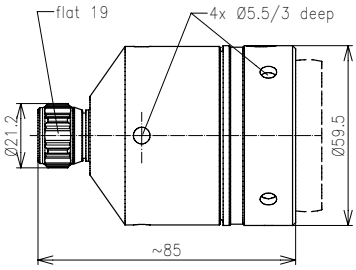
BN 846420

Connectors – Type N

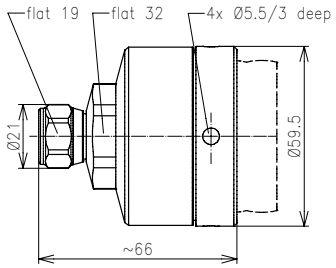
Cable Connectors for LF 1 5/8"-50 Cables

Style	Version	Part Number
Male	CAF® Plast2000	**BN 706744**
Male	MultiFit	**BN 706422**
Female	CAF® Plast2000	**BN 846344**
Female	MultiFit	**BN 846422**

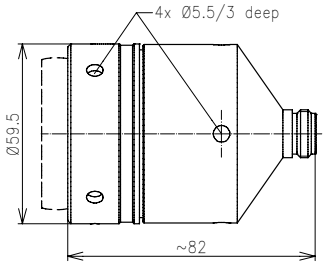
BN 706744



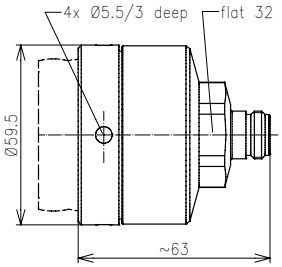
BN 706422



BN 846344



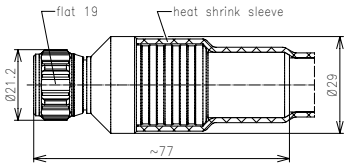
BN 846422



Connectors – Type N

Cable Connectors for Radiating Cables

Cable Type	Style	Version	Part Number
RADIAFLEX® 12-50	Male	Heat shrink sleeve	**BN 557110**
RADIAFLEX® 12-50	Female	Heat shrink sleeve	**BN 557111**
RADIAFLEX® 78-50	Male	Heat shrink sleeve	**BN 557150**
RADIAFLEX® 78-50	Female	Heat shrink sleeve	**BN 557151**
RADIAFLEX® 114-50 A	Female	Heat shrink sleeve	**BN 557161**
RADIAFLEX® 158-50 A	Female	Heat shrink sleeve	**BN 557171**



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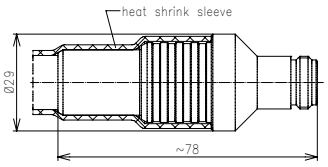
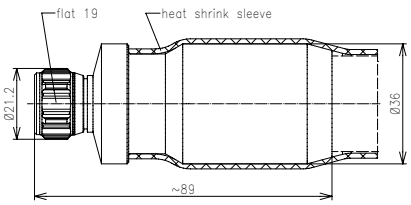


BN 557111



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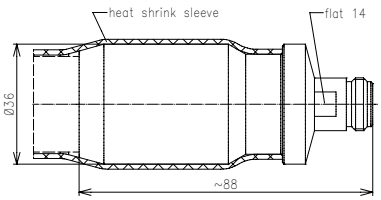

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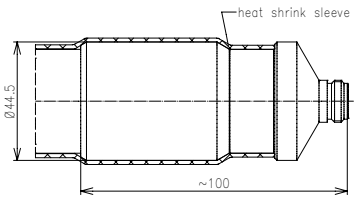

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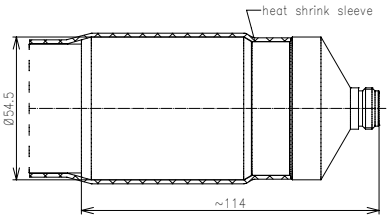
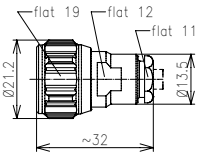


BN 557171

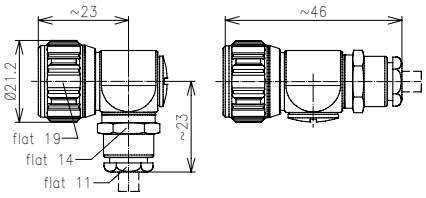
Connectors – Type N

Cable Connectors for RG Cables

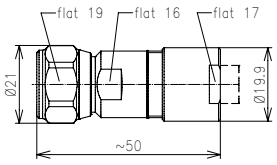
Cable Type	Style	Version	Part Number
RG 58 C/U; RG 142 B/U RG 223/U; RG 400/U	Male	Clamped	**BN 296650**
RG 58 C/U; RG 142 B/U RG 223/U; RG 400/U	Male, straight and right angle mounting	Clamped	**BN 721280**
RG 8 related	Male	Clamped	**BN 945060**
RG 8 related	Male right angle	Clamped	**BN 945061**
RG 213/U; RG 214/U	Male	Clamped	**BN 922450**
RG 213/U; RG 214/U	Female	Clamped	**BN 922550**
RG 214/U; RG 393/U	Male	Crimped	**BN 922475**
RG 214/U; RG 393/U	Male, straight and right angle mounting	Clamped	**BN 721283**



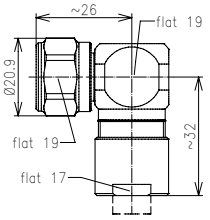
BN 296650



BN 721280



BN 945060



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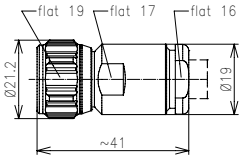
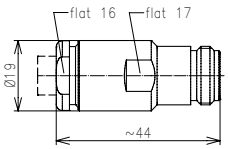
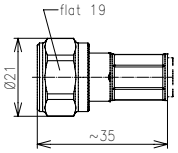


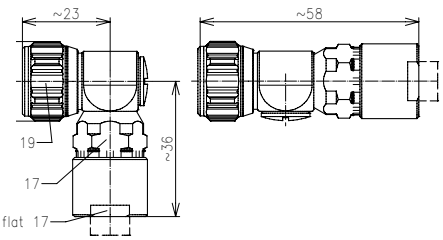
BN 922450



BN 922550



BN 922475

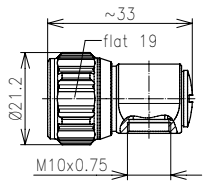


BN 721283

Connectors – Type N

Connector Head

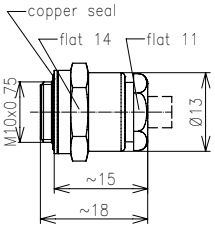
Style	Part Number
Male, straight and right angle mounting	**BN 450940**



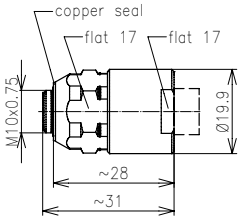
BN 450940

Cable Entries

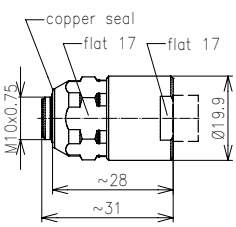
Cable Type	Version	Part Number
RG 55 B/U RG 58 C/U RG 142 B/U RG 223/U RG 400/U	Clamped	**BN 419400**
RG 213/U	Clamped	**BN 420100**
RG 214/U RG 216/U RG 393/U	Clamped	**BN 982900**
RG 214/U RG 393/U	Crimped	**BN 982911**



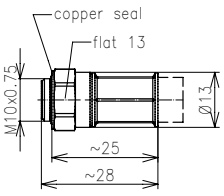
BN 419400



BN 420100



BN 982900



BN 982911

Connectors – Type 2.2-5

2.2-5 is the newest connector system and derived from 4.3-10. When 4.3-10 was launched a few years ago, it was the first connector system to be specifically developed for the mobile communication market. It combines excellent electrical and mechanical properties with relatively compact dimensions. Its developers also focused on ensuring low PIM, and this is one of the main ways in which 4.3-10 excels. With 5G and Small Cells, the miniaturization of mobile communication is ongoing. And it was only a matter of time until an even smaller connector system appeared.

New But Already Proven

2.2-5 is only half as large as 4.3-10. It is based on the tried-and-true design principles underlying 4.3-10 and ultimately only differs from it in terms of size. Even the available closure versions – screw, hand screw and push-pull – have been adopted from that model. Its IM is an excellent -166 dBc, independently of the tightening torque. Thanks to its smaller dimensions, the 2.2-5 connector system is suitable for frequencies up to 20 GHz while still being able to transfer more than 200 watts of power. The width of its flange has been reduced from 25.4 to 17.5 mm, which slashes its area by 53%. This connector's compact design makes it ideal for use in leading-edge antennas, remote radio units, MIMO, small cells and other applications that call for superb electrical properties in a minimum of space.

Connectors – Type 2.2-5

Electrical	IEC 61169-66	Remark
Nominal impedance	50 Ω	
Frequency range	0 - 6 GHz	
Passive intermodulation (IM3) @ 2 x 20 W	≤ -166 dBc	0.4 GHz to 4 GHz
VSWR	≤ 1.05	Straight connector
Center contact resistance	≤ 2.0 mΩ	Initial
Outer contact continuity	1.0 mΩ	Initial
Insulation resistance	3000 MΩ	Initial
Proof voltage at sea level	1.5 kV	50 - 60 Hz
Screening effectiveness	≥ 100 dB	Screw type

Mechanical	IEC 61169-66	Remark
Coupling torque	3 Nm	
Tensile strength of coupling mechanism	> 200 N	
Mechanical lifetime	100 Cycles	SPINNER: 500 Cycles

Environmental	IEC 61169-66	Remark
Climatic category	40/85/21	
Degree of protection (mated)		SPINNER: IP 68

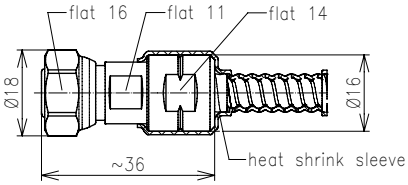
Materials and Surface Finish	
Resilient contact parts	High strength copper alloy, silver plated
Insulation	PTFE/FEP
Center and outer conductor parts	Copper alloy, silver plated and/or CuSnZn plated
Other metal parts	Copper alloy, nickel plated and/or tin plated
Gaskets	Silicone rubber

Connectors – Type 2.2-5

Cable Connectors for SF 1/4"-50 Cables

Style	Version	Part Number
Male, screw type	CAF®	**BN 225040**

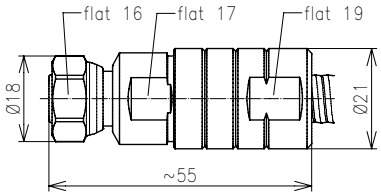
BN 225040



Cable Connectors for SF 3/8"-50 Cables

Style	Version	Part Number
Male, screw type	CAF®	**BN 225038**
Male right angle, screw type	CAF®	**BN 225039**

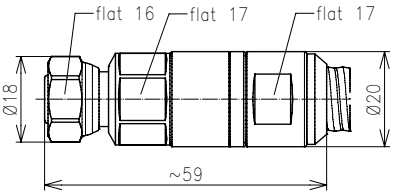
BN 225038



Cable Connectors for SF 1/2"-50 Cables

Style	Version	Part Number
Male, screw type	MultiFit	**BN 225035**
Male right angle, screw type	MultiFit	**BN 225036**

BN 225035

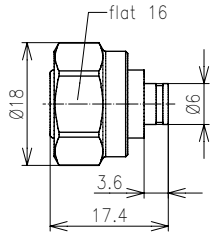


Connectors – Type 2.2-5

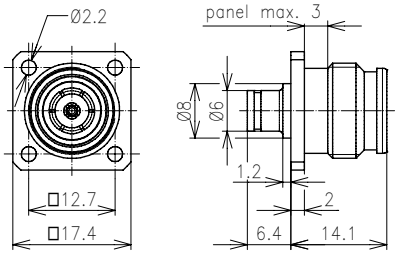
Fixed Connectors

Cable Type	Style	Version	Part Number
Seriflex 141-50; RG 402/U	Male screw type	Soldered	**BN 225027**
Seriflex 141-50; RG 402/U	Female bulkhead	Soldered	**BN 225046**
Seriflex 141-50; RG 402/U	Female four-hole flange	Soldered	**BN 225047**
Seriflex 250-50; RG 401/U	Male screw type	Soldered	**BN 225026**
Seriflex 250-50; RG 401/U	Female bulkhead	Soldered	**BN 225044**
Seriflex 250-50; RG 401/U	Female four-hole flange	Soldered	**BN 225045**

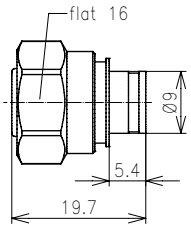
BN 225027



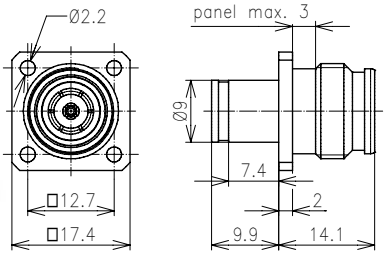
BN 225047



BN 225026



BN 225045



Adaptors

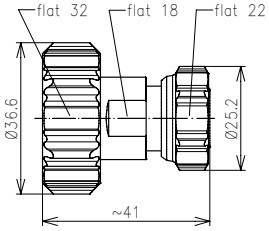
Adaptors are used to link up one connector type to another. The part numbers listed in this catalogue include the most common and important combinations for mobile communication systems. Further combinations are available upon request.

We specify the items as either male or female in order to describe the connector style. Our adaptors are designed for the lowest possible reflection factors.
Precision adaptors with RF quality grade 0 are available upon request.

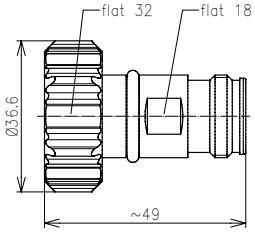
Inter-Type Adaptors

Inter-Type Adaptors 7-16 / 4.3-10

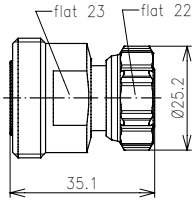
Connector 1	Connector 2	Part Number
7-16 male	4.3-10 male screw type	**BN 432005**
7-16 male	4.3-10 male hand screw type	**BN 432007**
7-16 male	4.3-10 male push-pull type	**BN 432008**
7-16 male	4.3-10 female	**BN 432001**
7-16 female	4.3-10 male screw type	**BN 432002**
7-16 female	4.3-10 male hand screw type	**BN 432015**
7-16 female	4.3-10 male push-pull type	**BN 432016**
7-16 female	4.3-10 female	**BN 432011**



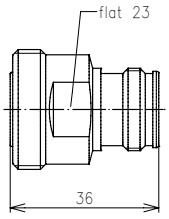
BN 432005



BN 432001



BN 432002



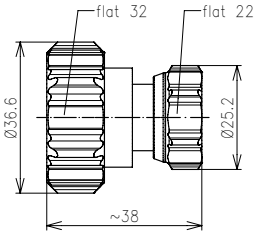
BN 432011

Inter-Type Adaptors

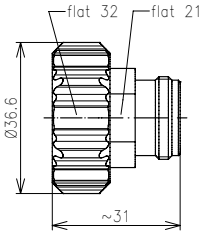
Inter-Type Adaptors 7-16 / 4.1-9.5

Connector 1	Connector 2	Part Number
7-16 male	4.1-9.5 male	**BN 941510**
7-16 male	4.1-9.5 female	**BN 941610**
7-16 female	4.1-9.5 male	**BN 941710**
7-16 female	4.1-9.5 female	**BN 941810**

BN 941510



BN 941610



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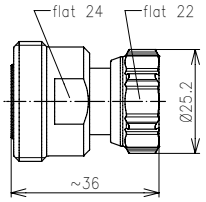

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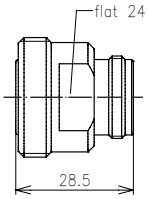
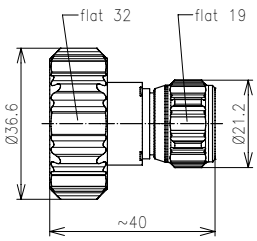


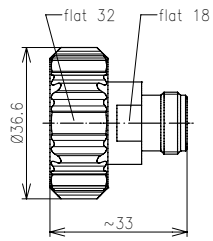
Inter-Type Adaptors 7-16 / N

Connector 1	Connector 2	Part Number
7-16 male	N male	**BN 293800**
7-16 male	N female	**BN 194400**
7-16 female	N male	**BN 293900**
7-16 female	N female	**BN 294000**

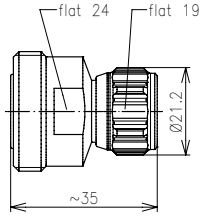
BN 293800



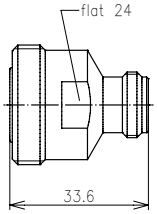
BN 194400



BN 293900



BN 294000

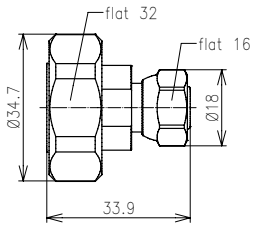


Inter-Type Adaptors

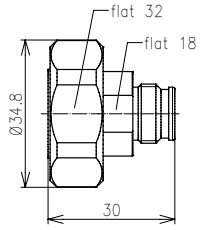
Inter-Type Adaptors 7-16 / 2.2-5

Connector 1	Connector 2	Part Number
7-16 male	2.2-5 male screw type	**BN 225002**
7-16 male	2.2-5 female	**BN 225003**
7-16 female	2.2-5 male screw type	**BN 225006**
7-16 female	2.2-5 female	**BN 225008**

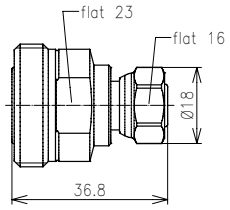
BN 225002



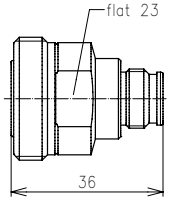
BN 225003



BN 225006



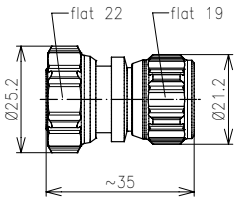
BN 225008



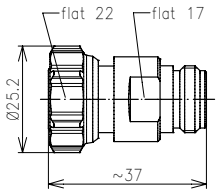
Inter-Type Adaptors

Inter-Type Adaptors 4.3-10 / N

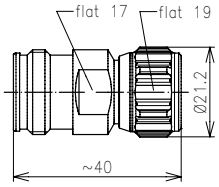
Connector 1	Connector 2	Part Number
4.3-10 male screw type	N male	**BN 432024**
4.3-10 male hand screw type	N male	**BN 432009**
4.3-10 male push-pull type	N male	**BN 432030**
4.3-10 male screw type	N female	**BN 432025**
4.3-10 male hand screw type	N female	**BN 432003**
4.3-10 male push-pull type	N female	**BN 432031**
4.3-10 female	N male	**BN 432004**
4.3-10 female	N female	**BN 432010**



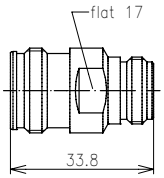
BN 432024



BN 432025



BN 432004

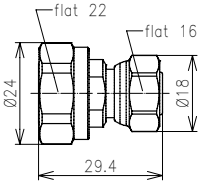


BN 432010

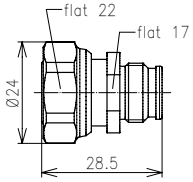
Inter-Type Adaptors

Inter-Type Adaptors 4.3-10 / 2.2-5

Connector 1	Connector 2	Part Number
4.3-10 male screw type	2.2-5 male screw type	**BN 225009**
4.3-10 male screw type	2.2-5 female	**BN 225010**
4.3-10 female	2.2-5 male screw type	**BN 225012**
4.3-10 female	2.2-5 female	**BN 225013**



BN 225009



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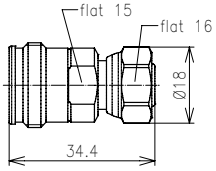
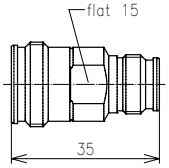


BN 225012

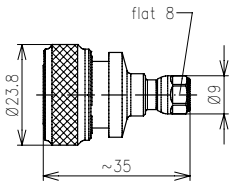


BN 225013

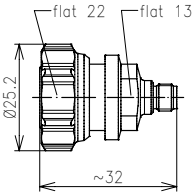
Inter-Type Adaptors

Inter-Type Adaptors 4.3-10 / 3.5 mm

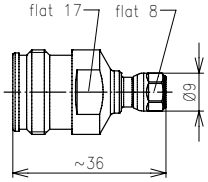
Connector 1	Connector 2	Part Number
4.3-10 male screw type	3.5 mm male	**BN 432026**
4.3-10 male hand screw type	3.5 mm male	**BN 432020**
4.3-10 male push-pull type	3.5 mm male	**BN 432032**
4.3-10 male screw type	3.5 mm female	**BN 432027**
4.3-10 male hand screw type	3.5 mm female	**BN 432021**
4.3-10 male push-pull type	3.5 mm female	**BN 432033**
4.3-10 female	3.5 mm male	**BN 432022**
4.3-10 female	3.5 mm female	**BN 432023**



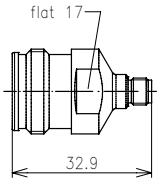
BN 432020



BN 432027



BN 432022

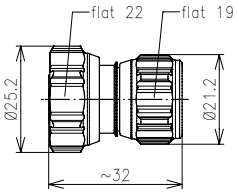


BN 432023

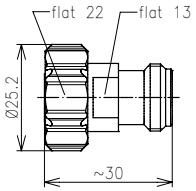
Inter-Type Adaptors

Inter-Type Adaptors 4.1-9.5 / N

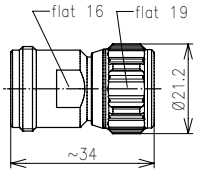
Connector 1	Connector 2	Part Number
4.1-9.5 male	N male	**BN 955450**
4.1-9.5 male	N female	**BN 955250**
4.1-9.5 female	N male	**BN 955550**
4.1-9.5 female	N female	**BN 955350**



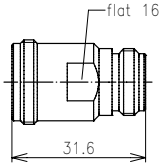
BN 955450



BN 955250



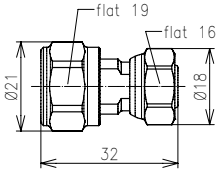
BN 955550



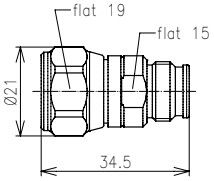
BN 955350

Inter-Type Adaptors N / 2.2-5

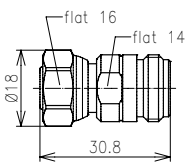
Connector 1	Connector 2	Part Number
N male	2.2-5 male screw type	**BN 225014**
N male	2.2-5 female	**BN 225015**
N female	2.2-5 male screw type	**BN 225016**
N female	2.2-5 female	**BN 225017**



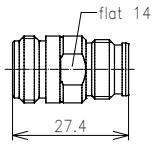
BN 225014



BN 225015



BN 225016

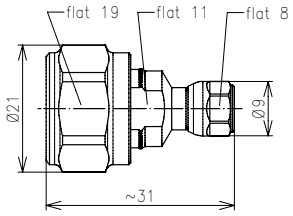


BN 225017

Inter-Type Adaptors

Inter-Type Adaptors N / 3.5 mm

Connector 1	Connector 2	Part Number
N male	3.5 mm male	**BN 640681**
N male	3.5 mm female	**BN 640683**
N female	3.5 mm male	**BN 640682**
N female	3.5 mm female	**BN 640680**



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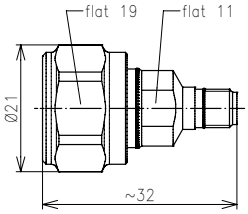
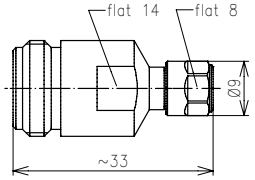
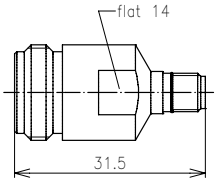


BN 640683



BN 640682



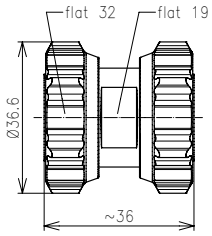
BN 640680

Within-Type Adaptors

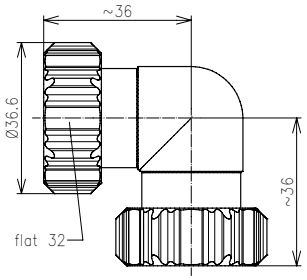
7-16 Within-Type Adaptors

Connector 1	Connector 2	Part Number
7-16 male	7-16 male	**BN 393370**
7-16 male right angle	7-16 male	**BN 944702**
7-16 male	7-16 female	**BN 756404**
7-16 male right angle	7-16 female	**BN 296400**
7-16 female	7-16 female	**BN 196400**
7-16 female four-hole flange	7-16 female	**BN 808450**

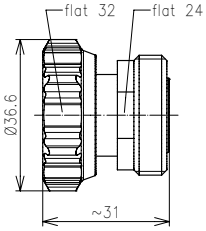
BN 393370



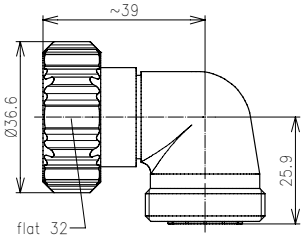
BN 944702



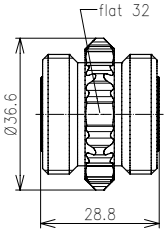
BN 756404



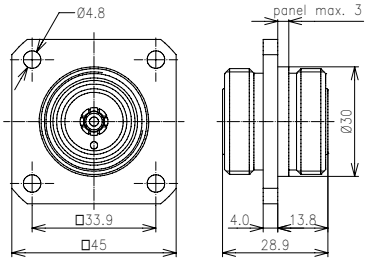
BN 296400



BN 196400



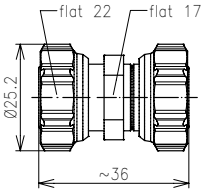
BN 808450



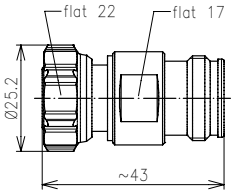
Within-Type Adaptors

4.3-10 Within-Type Adaptors

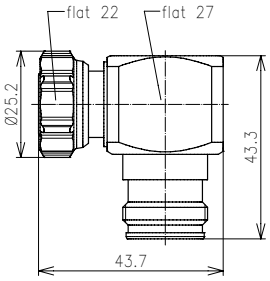
Connector 1	Connector 2	Part Number
4.3-10 male screw type	4.3-10 male screw type	**BN 432029**
4.3-10 male hand screw type	4.3-10 male hand screw type	**BN 432018**
4.3-10 male push-pull type	4.3-10 male push-pull type	**BN 432035**
4.3-10 male screw type	4.3-10 female	**BN 432017**
4.3-10 male hand screw type	4.3-10 female	**BN 432028**
4.3-10 male push-pull type	4.3-10 female	**BN 432034**
4.3-10 male right angle screw type	4.3-10 female	**BN 432055**
4.3-10 female	4.3-10 female	**BN 432049**
4.3-10 female four-hole flange	4.3-10 female	**BN 432050**
4.3-10 female bulkhead	4.3-10 female	**BN 432019**



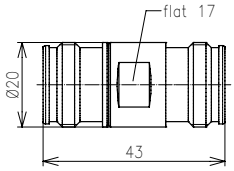
BN 432029



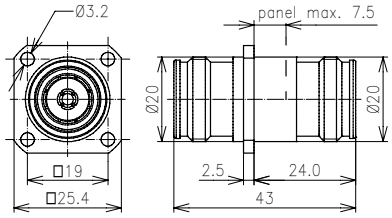
BN 432017



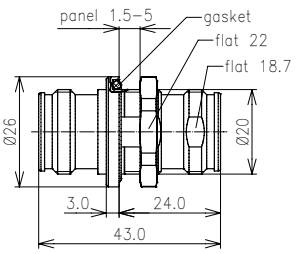
BN 432055



BN 432049



BN 432050

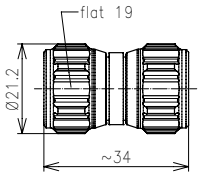


BN 432019

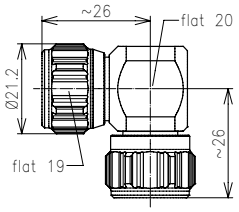
Within-Type Adaptors

N Within-Type Adaptors

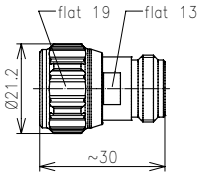
Connector 1	Connector 2	Part Number
N male	N male	**BN 293650**
N male right angle	N male	**BN 708250**
N male	N female	**BN 950890**
N male right angle	N female	**BN 299750**
N female	N female	**BN 293750**
N female four-hole flange	N female	**BN 944951**
N female bulkhead	N female	**BN 944950**



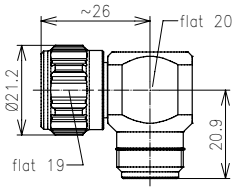
BN 293650



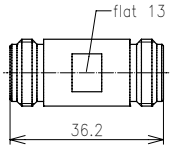
BN 708250



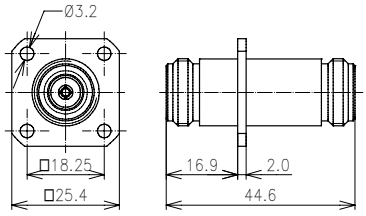
BN 950890



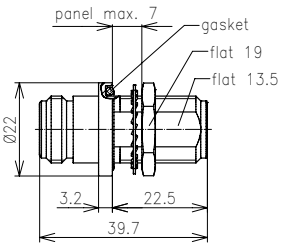
BN 299750



BN 293750



BN 944951



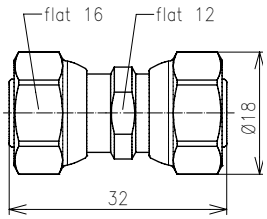
BN 944950

Within-Type Adaptors

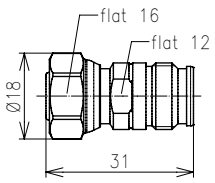
Within-Type Adaptors 2.2-5 / 2.2-5

Connector 1	Connector 2	Part Number
2.2-5 male screw type	2.2-5 male screw type	**BN 225018**
2.2-5 male screw type	2.2-5 female	**BN 225019**
2.2-5 female bulkhead	2.2-5 female	**BN 225020**
2.2-5 male right angle screw type	2.2-5 female	**BN 225021**

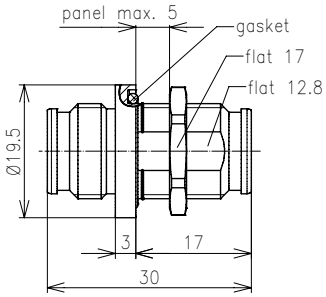
BN 225018



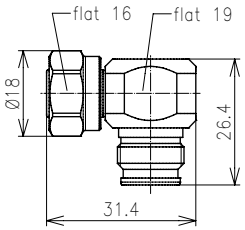
BN 225019



BN 225020



BN 225021



Jumper Cable Assemblies

SPINNER has long standing experience in manufacturing top-notch jumper cable assemblies for mobile communication. Our fully automated and permanently optimized manufacturing processes ensure excellent quality, competitive prices and short lead times.

Our high quality standards with regards to design, material and manufacturing ensure best possible connectivity between base stations and antennas, optimized installation and failure-free operation, even under toughest conditions.

We guarantee superior IM properties and low VSWR values over the entire lifetime of the cables. **The benefits are obvious: lower total cost of ownership.**

Jumpers can be manufactured based on your individual requirements for length and connector types. We also fulfill special requirements such as measurement or phase adjusted cables, jumpers with grey jacket or specified to meet fire retardant requirements.

Portfolio Overview

SpinnerFlex® TopFit jumpers

The classic jumpers

SpinnerFlex® MultiFit jumpers

SF1/2"-50 jumpers with integrated MultiFit 7/8" feeder cable clamp

SpinnerFlex® Hybrid jumpers

Factory assembled jumper-feeder-jumper combination

SPINNER Seriflex

Tailored cable for further processing

Jumper Cables – SpinnerFlex® TopFit

SpinnerFlex® TopFit – SF 1/2"-50

SpinnerFlex® TopFit jumpers based on SF 1/2" cable are available with 7-16, 4.3-10, 4.1-9.5, N and 2.2-5 connectors.

For ordering please use article codes on 67.

Electrical Specification					
Passive intermodulation (IM3) @ 2 x 20 W	≤ -160 dBc; typ. ≤ -165 dBc Jumpers with improved IM3 values on request				
Frequency ranges	≤ 960 MHz	≤ 2200 MHz	≤ 2700 MHz	≤ 3800 MHz	≤ 5825 MHz
Typ. VSWR for lengths ≤ 6 m					
2 straight connectors	≤ 1.03	≤ 1.05	≤ 1.06	≤ 1.10	≤ 1.14
1 straight, 1 right angle connector	≤ 1.04	≤ 1.06	≤ 1.07	≤ 1.11	≤ 1.16
2 right angle connectors	≤ 1.05	≤ 1.07	≤ 1.08	≤ 1.12	≤ 1.18
Typ. VSWR for lengths > 6 m					
2 straight connectors	≤ 1.04	≤ 1.06	≤ 1.07	≤ 1.11	≤ 1.15
1 straight, 1 right angle connector	≤ 1.05	≤ 1.07	≤ 1.08	≤ 1.12	≤ 1.17
2 right angle connectors	≤ 1.06	≤ 1.08	≤ 1.09	≤ 1.13	≤ 1.19
Insertion loss / 100 m	≤ 11.56 dB	≤ 18.64 dB	≤ 21.06 dB	≤ 25.90 dB	≤ 33.79 dB
Power rating @ 40 °C	≤ 0.91 kW	≤ 0.56 kW	≤ 0.49 kW	≤ 0.42 kW	≤ 0.31 kW

Jumper Cables – SpinnerFlex® TopFit

SpinnerFlex® TopFit – SF 3/8"-50

SpinnerFlex® TopFit jumpers based on SF 3/8" cable are available with 7-16, 4.3-10, 4.1-9.5, N and 2.2-5 connectors.

For ordering please use article codes on 67.

Electrical Specification					
Passive intermodulation (IM3) @ 2 x 20 W	≤ -160 dBc; typ. ≤ -165 dBc Jumpers with improved IM3 values on request				
Frequency ranges	≤ 960 MHz	≤ 2200 MHz	≤ 2700 MHz	≤ 3800 MHz	≤ 5825 MHz
Typ. VSWR for lengths ≤ 6 m					
2 straight connectors	≤ 1.03	≤ 1.05	≤ 1.06	≤ 1.10	≤ 1.14
1 straight, 1 right angle connector	≤ 1.04	≤ 1.06	≤ 1.07	≤ 1.11	≤ 1.16
2 right angle connectors	≤ 1.05	≤ 1.07	≤ 1.08	≤ 1.12	≤ 1.18
Typ. VSWR for lengths > 6 m					
2 straight connectors	≤ 1.04	≤ 1.06	≤ 1.07	≤ 1.11	≤ 1.15
1 straight, 1 right angle connector	≤ 1.05	≤ 1.07	≤ 1.08	≤ 1.12	≤ 1.17
2 right angle connectors	≤ 1.06	≤ 1.08	≤ 1.09	≤ 1.13	≤ 1.19
Insertion loss / 100 m	≤ 13.8 dB	≤ 21.7 dB	≤ 25.8 dB	≤ 30.4 dB	≤ 38.4 dB
Power rating @ 40 °C	≤ 0.57 kW	≤ 0.36 kW	≤ 0.31 kW	≤ 0.26 kW	≤ 0.20 kW

Jumper Cables – SpinnerFlex® TopFit

SpinnerFlex® TopFit – SF 1/4"-50

SpinnerFlex® TopFit jumpers based on SF 1/4" cable are available with 7-16, 4.3-10, 4.1-9.5, N and 2.2-5 connectors.

For ordering please use article codes on 67.

Electrical Specification					
Passive intermodulation (IM3) @ 2 x 20 W	≤ -156 dBc; typ. ≤ -160 dBc Jumpers with improved IM3 values on request				
Frequency ranges	≤ 960 MHz	≤ 2200 MHz	≤ 2700 MHz	≤ 3800 MHz	≤ 5825 MHz
Typ. VSWR for lengths ≤ 6 m					
2 straight connectors	≤ 1.03	≤ 1.05	≤ 1.06	≤ 1.10	≤ 1.14
1 straight, 1 right angle connector	≤ 1.04	≤ 1.06	≤ 1.07	≤ 1.11	≤ 1.16
2 right angle connectors	≤ 1.05	≤ 1.07	≤ 1.08	≤ 1.12	≤ 1.18
Typ. VSWR for lengths > 6 m					
2 straight connectors	≤ 1.04	≤ 1.06	≤ 1.07	≤ 1.11	≤ 1.15
1 straight, 1 right angle connector	≤ 1.05	≤ 1.07	≤ 1.08	≤ 1.12	≤ 1.17
2 right angle connectors	≤ 1.06	≤ 1.08	≤ 1.09	≤ 1.13	≤ 1.19
Insertion loss / 100 m	≤ 19.1 dB	≤ 30.1 dB	≤ 33.7 dB	≤ 40.4 dB	≤ 53.4 dB
Power rating @ 40 °C	≤ 0.35 kW	≤ 0.22 kW	≤ 0.19 kW	≤ 0.16 kW	≤ 0.12 kW

Jumper Cables – SpinnerFlex® TopFit

SpinnerFlex® TopFit – LF 1/2"-50

SpinnerFlex® TopFit jumpers based on LF 1/2" cable are available with 7-16, 4.3-10, 4.1-9.5, N and 2.2-5 connectors.

For ordering please use article codes on 67.

Electrical Specification					
Passive intermodulation (IM3) @ 2 x 20 W	≤ -156 dBc; typ. ≤ -165 dBc Jumpers with improved IM3 values on request				
Frequency ranges	≤ 960 MHz	≤ 2200 MHz	≤ 2700 MHz	≤ 3800 MHz	≤ 5825 MHz
Typ. VSWR for lengths ≤ 6 m					
2 straight connectors	≤ 1.03	≤ 1.05	≤ 1.06	≤ 1.10	≤ 1.14
1 straight, 1 right angle connector	≤ 1.04	≤ 1.06	≤ 1.07	≤ 1.11	≤ 1.16
2 right angle connectors	≤ 1.05	≤ 1.07	≤ 1.08	≤ 1.12	≤ 1.18
Typ. VSWR for lengths > 6 m					
2 straight connectors	≤ 1.04	≤ 1.06	≤ 1.07	≤ 1.11	≤ 1.15
1 straight, 1 right angle connector	≤ 1.05	≤ 1.07	≤ 1.08	≤ 1.12	≤ 1.17
2 right angle connectors	≤ 1.06	≤ 1.08	≤ 1.09	≤ 1.13	≤ 1.19
Insertion loss / 100 m	≤ 7.12 dB	≤ 11.25 dB	≤ 12.63 dB	≤ 15.36 dB	≤ 19.71 dB
Power rating @ 40 °C	≤ 1.06 kW	≤ 0.67 kW	≤ 0.59 kW	≤ 0.50 kW	≤ 0.38 kW

Jumper Cables – SpinnerFlex® TopFit Article Codes

Please use article codes for inquiries and orders.
These are self explaining and enable you to specify a product without knowing its part number.

Jumper	Cable Type	Cable Size	Cable Jacket		Connector 1	Connector 2		Length	Unit	Length	Extra Features
J	Z	X	Z	-	XZ	XZ	-	X	Z	X	-Z
			Blank for PE		Any combination of connectors below is possible. Please specify an XZ combination for connectors 1 and 2. In case of pigtail leave blank for connector 2						Leave blank if not applicable
LF	L										
SF	S										
1/4"		14									
3/8"		38									
1/2"		12									
Fire retardant			F								
Construction Products Regulation (CPR)			C								
Gray			G								

X = Connector System	Z = Connector Style	X	Z
7-16	Male	7	M
4.1-9.5	Male right angle	41	R
N	Female (right angle)	N	F(R)
	Female bulkhead (right angle)		B(R)
	Female four-hole panel (right angle)		P(R)
4.3-10	Male; screw	43	MS
2.2-5	Male; hand screw	22	MH
NEX10®	Male; push-pull	X	MP
	Male right angle; screw		RS
	Male right angle; hand screw		RH
	Male right angle; push-pull		RP
	Female (right angle)		F(R)
	Female bulkhead (right angle)		B(R)
	Female four-hole panel (right angle)		P(R)

Length in meters/feet (depending on unit specified)		
Meters as unit	M	
Feet as unit	F	
Length in decimeters/inches (depending on unit specified)		

Low PIM Measurement Cable (only available with PE jacket)	
- Passive intermodulation (IM3) @ 2 x 20 W ≤ -160 dBc[1], inspection certificate 3.1[2], per jumper	I0
- Passive intermodulation (IM3) @ 2 x 20 W ≤ -160 dBc[1], inspection certificate 3.1[2], per order	I1
- Passive intermodulation (IM3) @ 2 x 20 W ≤ -165 dBc[1], inspection certificate 3.1[2], per jumper	I2
- Passive intermodulation (IM3) @ 2 x 20 W ≤ -165 dBc[1], inspection certificate 3.1[2], per order	I3
- Passive intermodulation (IM3) @ 2 x 20 W ≤ -170 dBc[1], inspection certificate 3.1[2], per jumper	I4
- Passive intermodulation (IM3) @ 2 x 20 W ≤ -170 dBc[1], inspection certificate 3.1[2], per order	I5
Defined phase length	P
Extended frequency range (> 3800 MHz)	E
Connector specified on side B kitted to the jumper	K
Jumper set	S

[1] According to IEC 62037-2 and WN 20 000 [2] According to EN 10204

Examples of article codes:
JS12-7M43RS-2M5: 2.5-meter-long SF 1/2" jumper with 7-16 male and 4.3-10 male right-angle screw type connectors.
JS38C-43MS43MS-6M: 6-meter-long CPR-compliant SF 3/8" jumper with 4.3-10 male screw type connectors.

Jumper Cables – SpinnerFlex® MultiFit

SpinnerFlex® MultiFit – SF 1/2"-50

SpinnerFlex® MultiFit jumpers are based on SF 1/2" jumper cable. On one end fits a LF 7/8" feeder connector/cable clamp, the other end can be fitted with 7-16, 4.3-10, 4.1-9.5, N or 2.2-5 connectors.

For ordering please use article codes on page 69.

Electrical Specification				
Passive intermodulation (IM3) @ 2 x 20 W	≤ -156 dBc; typ. ≤ -165 dBc Jumpers with improved IM3 values on request			
Frequency ranges	≤ 960 MHz	≤ 2200 MHz	≤ 2700 MHz	≤ 3800 MHz
Typ. VSWR for lengths ≤ 6 m				
Straight connector	≤ 1.03	≤ 1.05	≤ 1.06	≤ 1.10
Right angle connector	≤ 1.04	≤ 1.06	≤ 1.07	≤ 1.11
Typ. VSWR for lengths > 6 m				
Straight connector	≤ 1.04	≤ 1.06	≤ 1.07	≤ 1.11
Right angle connector	≤ 1.05	≤ 1.07	≤ 1.08	≤ 1.12
Insertion loss / 100 m	≤ 11.56 dB	≤ 18.64 dB	≤ 21.06 dB	≤ 25.90 dB
Power rating @ 40 °C	≤ 0.91 kW	≤ 0.56 kW	≤ 0.49 kW	≤ 0.42 kW

Jumper Cables – SpinnerFlex® MultiFit Article Codes

Please use article codes for inquiries and orders.
These are self explaining and enable you to specify a product without knowing its part number.

Jumper MultiFit	Cable Type	Cable Size	Cable Jacket		Connector	Feeder Connection		Length	Unit	Length
JM	S	12	Z	-	XZ	L78	-	X	Z	X
	Currently only SF 1/2" available		Blank for PE		Please specify XZ combination for connector	Currently only LF 7/8" available				
			Fire retardant: F							
			Construction Products Regulation (CPR): C							
			Gray: G							

X = Connector system	Z = Connector style	X	Z
7-16	Male	7	M
4.1-9.5	Male right angle	41	R
N	Female (right angle)	N	F(R)
	Female bulkhead (right angle)		B(R)
	Female four-hole flange (right angle)		P(R)
4.3-10	Male; screw	43	MS
2.2-5	Male; hand screw	22	MH
	Male; push-pull		MP
	Male right angle; screw		RS
	Male right angle; hand screw		RH
	Male right angle; push-pull		RP
	Female (right angle)		F(R)
	Female bulkhead (right angle)		B(R)
	Female four-hole flange (right angle)		P(R)

Length in meters/feet (max. length from 0.5 m - 3 m/3 ft. - 10 ft., depending on unit specified)	
Meters	M
Feet	F
Length in decimeters/inch (depending on unit specified)	

Examples of article codes:
JMS12-43MSL78-1M5: 1.5-meter-long SF 1/2" jumper with 4.3-10 male screw type and assemble to feeder LF 7/8".

Jumper Cables – SpinnerFlex® Hybrid

SpinnerFlex® TopFit – LF 1/2"-50

The SpinnerFlex® Hybrid jumpers are based on SF 1/2" and LF 7/8" cable and available with 7-16, 4.3-10, 4.1-9.5, N or 2.2-5 connectors. Total length is between 6 and 20 meters, the SF 1/2" jumper part is one meter on each side. Other versions can be made available on request.

For ordering please use article codes on page 71.

Electrical Specification					
Passive intermodulation (IM3) @ 2 x 20 W		≤ -160 dBc; typ. ≤ -165 dBc Jumpers with improved IM3 values on request			
Frequency ranges		≤ 960 MHz	≤ 2200 MHz	≤ 2700 MHz	≤ 3800 MHz
Typ. VSWR		≤ 1.06	≤ 1.08	≤ 1.09	≤ 1.16
Insertion loss	Jumper SF 1/2" Feeder LF 7/8"	≤ 11.56 dB/100m ≤ 4.02 dB/100m	≤ 18.64 dB/100m ≤ 6.46 dB/100m	≤ 21.06 dB/100m ≤ 7.29 dB/100m	≤ 25.90 dB/100m ≤ 8.90 dB/100m
Power rating @ 40 °C		≤ 0.91 kW	≤ 0.56 kW	≤ 0.49 kW	≤ 0.35 kW

Jumper Cables – SpinnerFlex® Hybrid Jumper Article Codes

Please use article codes for inquiries and orders.
These are self explaining and enable you to specify a product without knowing its part number.

Jumper	Hybrid	Cable Jacket		Connector 1	Connector 2		Length	Unit	Length
J	H	Z	-	XZ	XZ	-	X	Z	X
		Blank for PE		Any combination of connectors below is possible. Please specify an XZ combination for connectors 1 and 2.					
SF 1/2"+LF 7/8"+SF 1/2"									
Fire retardant		F							
Construction Products Regulation (CPR)		C							

X = Connector system		Z = Connector style	
7-16	7	Male	M
4.1-9.5	41	Male right angle	R
N	N	Female (right angle)	F(R)
		Female bulkhead (right angle)	B(R)
		Female four-hole flange (right angle)	P(R)
4.3-10	43	Male; screw	MS
2.2-5	22	Male; hand screw	MH
		Male; push-pull	MP
		Male right angle; screw	RS
		Male right angle; hand screw	RH
		Male right angle; push-pull	RP
		Female (right angle)	F(R)
		Female bulkhead (right angle)	B(R)
		Female four-hole flange (right angle)	P(R)

Total length in meters/feet (depending on unit specified; please consider fix length for each SF1/2" end is 1 m by default and included in total length)	
Meters	M
Feet	F
Length in decimeters/inch (depending on unit specified)	

Example of article codes:

JH-7M43RS-6M: Hybrid jumper with 7-16 male and 4.3-10 male right angle screw type; length of 6 meters; 2x jumper SF 1/2" 1 meter each and feeder LF 7/8" with 4 meters.

SpinnerFlex® Cable

In-Building and other installation projects often call for cables that are cut to length and terminated on site. SPINNER lets you order the most popular cable types on reels and have them sent straight to where they will be used.

All SPINNER CAF® and SPINNER MultiFit® connectors can of course be attached to our cables to ensure the best possible connections for your applications.

Cable Type	Jacket (Fire Class)	Diameter over Jacket	Min. Bending Radius Repeated Bends	Attenuation @ 960 MHz / 100 m	Power Rating @ 960 MHz	Part Number
SF 1/2"-50-PE	PE (F_{ca})	13.5 mm	30 mm	≤ 11.56 dB	≤ 0.91 kW	**A73151 ***
SF 1/2"-50-CPR	CPR ($B2_{ca}$)	13.5 mm	30 mm	≤ 11.56 dB	≤ 0.91 kW	**A73030 ***
LF 1/2"-50-PE	PE (F_{ca})	15.8 mm	125 mm	≤ 7.12 dB	≤ 1.06 kW	**A73088 ***
LF 1/2"-50-CPR	CPR ($B2_{ca}$)	15.8 mm	125 mm	≤ 7.12 dB	≤ 1.06 kW	**A73028 ***
LF 7/8"-50-PE	PE (F_{ca})	27.3 mm	250 mm	≤ 4.02 dB	≤ 2.25 kW	**A73089 ***
LF 7/8"-50-CPR	CPR ($B2_{ca}$)	27.3 mm	250 mm	≤ 4.02 dB	≤ 2.25 kW	**A73029 ***
LF 1 1/4"-50-PE	PE (F_{ca})	38.8 mm	380 mm	≤ 2.87 dB	≤ 3.42 kW	**A73090 ****
LF 1 1/4"-50-FR	CPR (E_{ca})	38.8 mm	380 mm	≤ 2.87 dB	≤ 3.42 kW	**A73037 ****
LF 1 5/8"-50-PE	PE (F_{ca})	49.5 mm	510 mm	≤ 2.38 dB	≤ 4.61 kW	**A73091 ****
LF 1 5/8"-50-CPR	CPR (D_{ca})	49.5 mm	510 mm	≤ 2.38 dB	≤ 4.61 kW	**A73038 ****

* Ships on reels with a length of 500m ± 50m
** Ships on reels with a length of 350m ± 30m

A73151

A73088

A73089

A73090

A73091

SpinnerFlex® Cable

SpinnerFlex Cables Certified acc. to the EU Construction Products Regulation

Sadly, building fires still take a considerable toll in terms of human lives. Yet in many cases, it isn't the fire itself that makes it hard to rescue people but the toxic gases that are present in dense smoke. Smoke also makes it difficult to see escape routes and locate injured persons. With the aims of reducing emissions of smoke and toxic gases, delaying their spread and extending the available time for leaving burning buildings, in 2013 the European Union issued the Construction Products Regulation (CPR), to establish harmonized rules for the marketing and use of construction products.

This regulation also affects the mobile communication market, because permanently installed cables in buildings and facilities can pose risks in connection with In-Building/DAS projects. The EU therefore decided that cabling for fixed installations may no longer be used unless it is tested and certified under the rules of the CPR.

Cables are assigned to different classes depending on their reaction to fire behavior. These range from readily flammable (Class F) to non-combustible (Class A). Other criteria such as smoke emissions, burning droplets and acidity are also taken into account. All of these properties are determined by independent testing institutions, which certify each product while assigning it to a harmonized euroclass with defined smoke emissions, burning droplets and acidity.

For stricter classes (the requirements increase from A to F), the tests that must be performed by a "notified body" (a third-party institute designated by the EU country concerned) are also more extensive. Classes A to D require not only testing of samples, but also regular factory audits and regular sample taking from ongoing production.

The CPR cables supplied under the SpinnerFlex brand name undergo these tests and are also certified as complying with EU Regulation no. EN 50575:2014. In addition to the fire classes, smoke generation (s), flaming droplets (d) and acidity (a) are also determined and presented.

SpinnerFlex CPR cables are available in SF 1/2"-50-CPR, LF 1/2"-50-CPR, LF 7/8"-50-CPR, LF 1 1/4"-50-FR and LF 1 5/8"-50-CPR versions. For part numbers, please refer to the previous page.

Jumper Cables – Seriflex

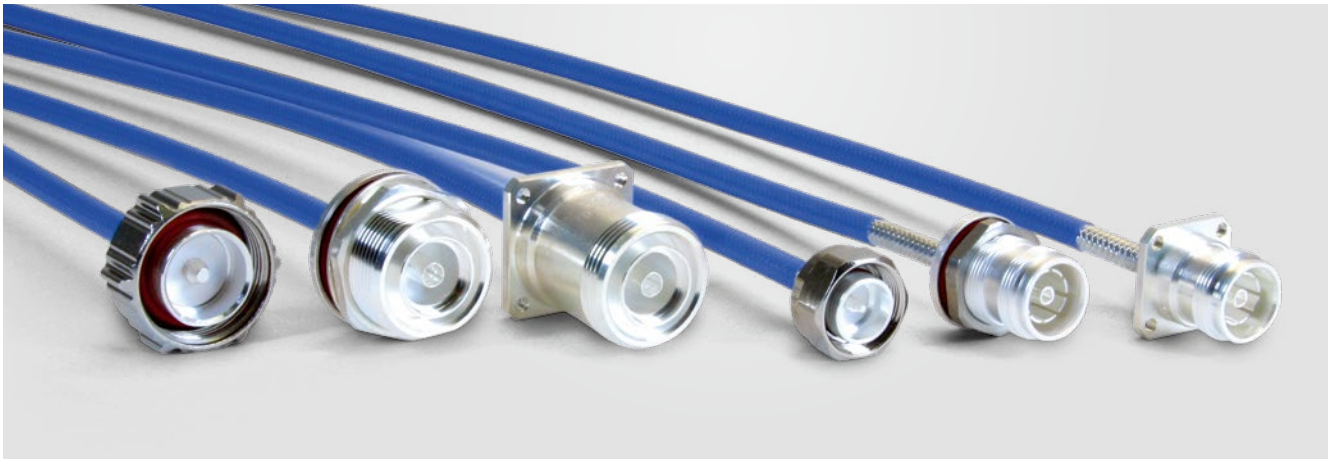
Seriflex cables are designed for housing installations. They also meet the RoHS 2002/95 guideline.
Upon request SPINNER delivers any cable length and connector combination.

Seriflex 141-50-FEP (RG 402/U)

Seriflex 141-50-FEP can be customized using connector types 7-16, 4.3-10, N, 2.2-5 and SMA.

Electrical Specification				
Frequency ranges	≤ 960 MHz	≤ 2200 MHz	≤ 2700 MHz	≤ 3800 MHz
Insertion loss	≤ 0.401 dB/m	≤ 0.642 dB/m	≤ 0.722 dB/m	≤ 0.876 dB/m
Power rating @ 40 °C	≤ 425 W	≤ 275 W	≤ 245 W	≤ 200 W

Seriflex 250-50-FEP (RG 401/U)



Seriflex 250-50-FEP can be customized using connector types 7-16, 4.3-10, N and 2.2-5.

Electrical Specification				
Frequency ranges	≤ 960 MHz	≤ 2200 MHz	≤ 2700 MHz	≤ 3800 MHz
Insertion loss	≤ 0.244 dB/m	≤ 0.403 dB/m	≤ 0.457 dB/m	≤ 0.562 dB/m
Power rating @ 40 °C	≤ 1080 W	≤ 680 W	≤ 610 W	≤ 500 W

Jumper Cables – Seriflex Article Codes

Please use article codes for inquiries and orders.
These are self explaining and enable you to specify a product without knowing its part number.

Jumper	Cable Type	Cable Size	Cable Jacket		Connector 1	Connector 2		Length	Unit	Length	Extra Features
J	X	z	x	-	xz	xz	-	x	z	x	-z
			Blank for FEP		Any combination of connectors below is possible. Please specify an XZ combination for connectors 1 and 2. In case of pigtail leave blank for connector 2						Leave blank if not applicable
Seriflex	X										
250-50		250									
141-50		141									
086-50		086									
No Jacket			N								
Halogen Free			H								

X = Connector System	Z = Connector Style	X	Z
7-16	Male	7	M
4.1-9.5	Male right angle	41	R
N	Female (right angle)	N	F(R)
TNC	Female bulkhead (r. a.)	T	B(R)
SMA	Female four-hole panel (r. a.)	SA	P(R)
4.3-10	Male; screw	43	MS
2.2-5	Male; hand screw	22	MH
NEX10®	Male; push-pull	X	MP
	Male right angle; screw		RS
	Male right angle; hand screw		RH
	Male right angle; push-pull		RP
	Female (right angle)		F(R)
	Female bulkhead (right angle)		B(R)
	Female four-hole panel (right angle)		P(R)

Length in meters/feet (depending on unit specified)	
Meters as unit Feet as unit	M F
Length in decimeters/inches (depending on unit specified)	

Customized Label	L
Jumper set	S

Example of article codes:
JX250-7M43RS-2M5: 2.5-meter-long SX250-50 FEP jumper with 7-16 male and 4.3-10 male right angle screw type connectors.

Filters

Since the demand for frequency bands in telecommunication keeps growing continuously the transmission and reception frequencies are getting closer all the time, causing more and more undesirable mutual interference and noise. This reduces the system power and finally results in lower throughput. It is most critical when bands which are close together are transmitted and received by the same transmission line.

Maximize bandwidth usage

The filters have been designed for the lowest possible attenuation in the pass-band. This helps to minimise the inevitable loss of useful power (0.5 dB of attenuation are already equivalent to more than a 10% power loss). In addition our filters stand out for high stop-band attenuation and steep filter edges.

We customize most of our filters before dispatching them. The products for which this service is available are designated in our catalogue by the logo shown on the right. The technical data given for the VSWR, frequency range, isolation and loss of these products depend on the individual tuning. Before you place your order, we send you a binding quotation indicating the specified technical data and measurement curves. To request a quotation for customized filters for your applications, please contact us at **info@spinner-group.com**.

Customized

SPINNER delivers a broad variety of band-pass, band-stop and low-pass filters to ensure suitable solutions.

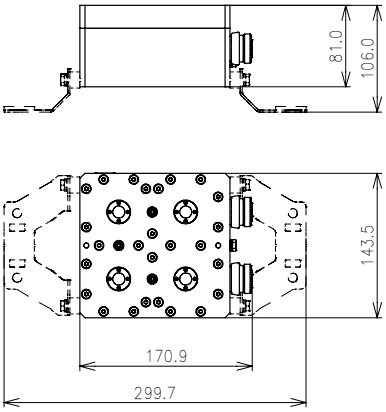
Band-Pass Filters

PMR

TETRA

Part Number	BN 616431	BN 616430
Pass-band	380 – 385 MHz	390 – 395 MHz
Pass-band loss	≤ 0.5 dB	
Stop-band	390 - 395 MHz 890 - 960 MHz	380 - 385 MHz 890 - 960 MHz
Stop-band loss	≥ 30 dB @ 390 – 395 MHz ≥ 50 dB @ 890 – 960 MHz	≥ 30 dB @ 380 – 385 MHz ≥ 50 dB @ 890 – 960 MHz
Passive intermodulation (IM3) @ 2 x 20 W	≤ -150 dBc; typ. ≤ -160 dBc	
VSWR	≤ 1.25	
Power rating	≤ 200 W	
Connectors	7-16 female	
Temperature range	-5 °C ... +60 °C	
Degree of protection (mated)	IP 54	
Weight	~ 1.7 kg	
Mounting brackets	**BN B07787**	

BN 616431 / BN 616430



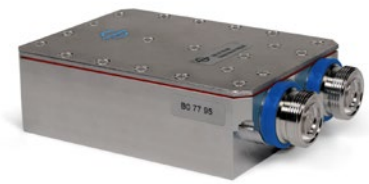
Band-Pass Filters

Customized

LTE800 | GSM1800 | UMTS

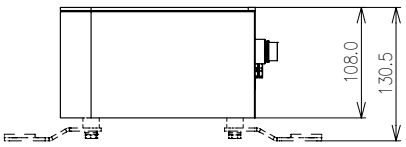
Part Number	BN 616499	BN 616396	BN 616398
Pass-band	Tunable within 790 - 857 MHz	Tunable within 1710 - 1880 MHz	Tunable within 1920 - 2170 MHz
Pass-band loss	Dependent on tuning		
Stop-band	Tunable and dependent on pass-band		
Stop-band loss	Dependent on tuning		
Passive intermodulation (IM3) @ 2 x 20 W	≤ -150 dBc; typ. ≤ -160 dBc		
VSWR	Dependent on tuning		
Power rating	≤ 100 W		
Connectors	7-16 female		
Temperature range	-40 °C ... +65 °C		
Degree of protection (mated)	IP 65		
Weight	~ 3.5 kg	~ 1.2 kg	~ 1.7 kg
Mounting brackets	BN B16603	BN B17365	

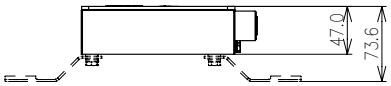
BN 616499

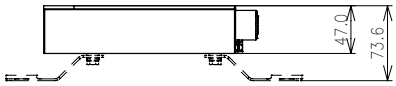


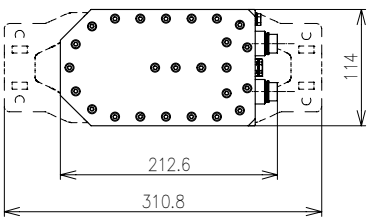
BN 616396

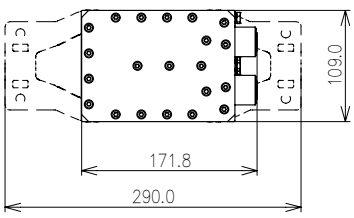
BN 616398

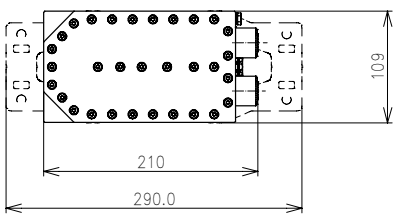










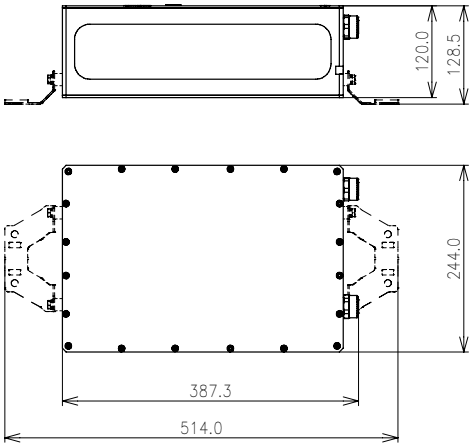


Band-Stop Filters

GSM-R

Part Number	BN 610007	BN 610015	BN 610017
Stop-band	873.1 – 880.1 MHz 918.1 – 925.1 MHz		
Stop-band loss	≥ 44 dB		
Pass-band	0.3 - 862.0 MHz 880.9 - 915.0 MHz 925.9 - 960.0 MHz 1710 - 1880 MHz 1920 - 2170 MHz 2500 - 2700 MHz		
Pass-band loss	≤ 1.0 dB @ 0.3 - 862.0 MHz ≤ 8.0 dB @ 880.9 - 883.5 MHz ≤ 1.0 dB @ 883.5 - 914.0 MHz ≤ 1.8 dB @ 914.0 - 915.0 MHz ≤ 8.0 dB @ 925.9 - 928.5 MHz ≤ 1.0 dB @ 928.5 - 960.0 MHz ≤ 1.0 dB @ 1710 - 1880 MHz ≤ 1.0 dB @ 1920 - 2170 MHz ≤ 1.0 dB @ 2500 - 2700 MHz		
Passive intermodulation (IM3) @ 2 x 20 W	≤ -150 dBc; typ. ≤ -160 dBc		
VSWR	≤ 1.29		
Power rating	≤ 200 W		
Connectors	7-16 female	4.3-10 female	N female
Temperature range	-25 °C ... +85 °C		
Degree of protection (mated)	IP 65		
Weight	~ 15 kg		
Mounting brackets	**BN B07787**		

BN 610007

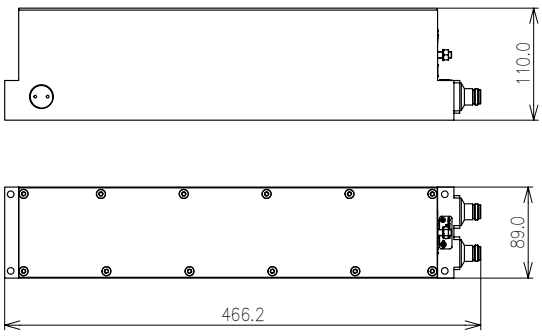


Band-Stop Filters

GSM-R

Part Number	BN 616314	BN 616313
Stop-band	876 -880 MHz 921 -925 MHz	
Stop-band loss	≥ 50 dB	
Pass-band	890 – 915 MHz 935 – 960 MHz 1710 – 1880 MHz 1920 – 2170 MHz	
Pass-band loss	≤ 0.7 dB @ 890 – 915 MHz ≤ 0.4 dB @ 935 – 960 MHz ≤ 0.2 dB @ 1710 – 1880 MHz ≤ 0.2 dB @ 1920 – 2170 MHz	
Passive intermodulation (IM3) @ 2 x 20 W	≤ -150 dBc; typ. ≤ -160 dBc	
VSWR	≤ 1.29	
Power rating	≤ 200 W	
Connectors	7-16 female	N female
Temperature range	-40 °C ... +85 °C	
Degree of protection (mated)	IP 65	
Weight	~ 6.5 kg	
Mounting brackets	N/A	

BN 616313



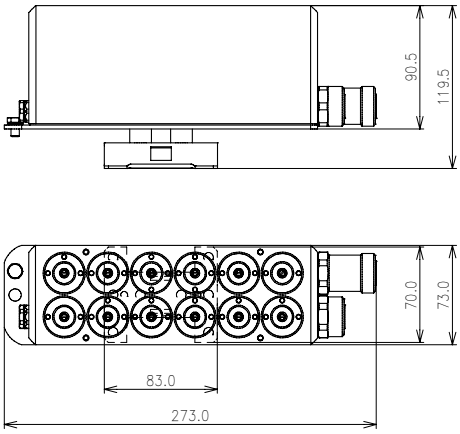
Band-Stop Filters

Customized

GSM900 | UMTS

Part Number	BN 610003	BN 570552	BN 570554
Stop-band	Tunable within 900 MHz band		Tunable within 1800 MHz band
Stop-band loss	Dependent on tuning		
Pass-band	Tunable and dependent on stop-band		
Pass-band loss	Dependent on tuning		
Passive intermodulation (IM3) @ 2 x 2 W (BN 610003) @ 2 x 20 W (BN 570552 / BN 570554)	≤ -130 dBc	≤ -150 dBc; typ. ≤ -155 dBc	
VSWR	Dependent on tuning		
Power rating	≤ 10 W	≤ 150 W	≤ 500 W
Connectors	7-16 female		
Temperature range	-25 °C ... +55 °C	-10 °C ... +60 °C	
Degree of protection (mated)	IP 65		
Weight	~ 3.6 kg	~ 5 kg	
Mounting brackets	Included	**BN B16603**	

BN 610003

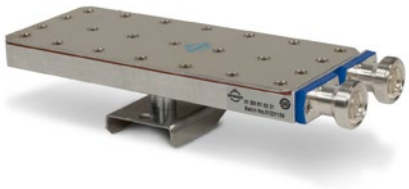


Low-Pass Filters

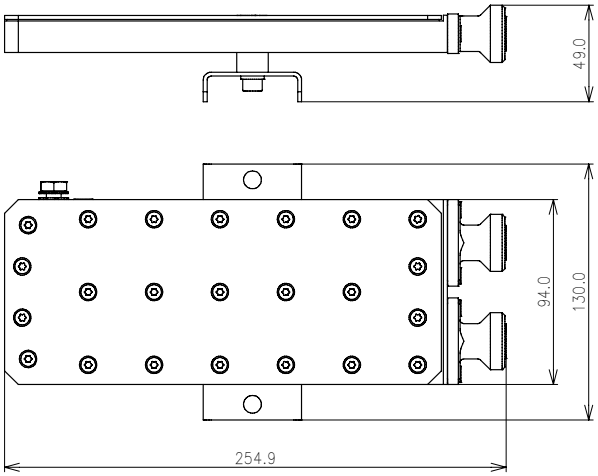
PMR

≤ 500 MHz | ≤ 614 MHz

Part Number	BN 616331	BN 616439
Pass-band	0 - 500 MHz	0 - 614 MHz
Pass-band loss	≤ 0.20 dB	≤ 0.20 dB
Stop-band	800 - 2200 MHz	800 - 2170 MHz
Stop-band loss	≥ 45 dB @ 800 - 876 MHz ≥ 55 dB @ 876 - 2200 MHz	≥ 30 dB @ 800 - 860 MHz ≥ 40 dB @ 860 - 960 MHz ≥ 70 dB @ 1710 - 2170 MHz
Passive intermodulation (IM3) @ 2 x 20 W	≤ -150 dBc; typ. ≤ -160 dBc	
VSWR	≤ 1.25 @ 0 - 380 MHz ≤ 1.14 @ 380 - 500 MHz	≤ 1.40 @ 0 - 380 MHz ≤ 1.15 @ 380 - 614 MHz
Power rating	≤ 150 W	
Connectors	7-16 female	
Temperature range	-40 °C ... +65 °C	
Degree of protection (mated)	IP 65	
Weight	~ 1.4 kg	
Mounting brackets	Included	



BN 616331 / 616439



Uplink / Downlink Filters

SPINNER offers uplink/downlink (UL/DL) filters, which consist of a parallel circuit each with one band-pass filter for the receiption and transmission signal. In comparison to a single band-pass filter, UL/DL filter offer the advantage of also eliminating signals which are between the transmitted and received band. Furthermore, the lower bandwidth means that a significantly larger edge steepness is possible which in turn leads to higher isolation values.

As with all SPINNER filters, the uplink/downlink filters are designed for minimum insertion loss and highest edge steepness. Furthermore, the filters are adjustable in the complete frequency band (LTE700/LTE800, CDMA850/GSM900, GSM1800/UMTS and LTE2600) with a bandwidth of ~ 5 MHz to 20 MHz and can therefore be individually tuned to your requirements.

Depending on requirements, there is a selection of 4 and 6 cavity filter types available. All UL/DL filters are suitable for outdoor installation. Their compact design means that they have a low weight and wind load which are key advantages when being used e.g. on a mobile site.

Please let us know your requirements so we can suggest the best possible solution.

Customized

LTE700 | LTE800 | GSM850 | GSM900

Part Number	**BN 570569**	**BN 610011**	**BN 570568**	**BN 570668**
Version	Single	Double	Single	Double
Cavities	4	4	6	6
Frequency range	694 - 960 MHz			
Insertion loss	Dependent on tuning			
Isolation	Dependent on tuning			
Passive intermodulation (IM3) @ 2 x 20 W	≤ -150 dBc; typ. ≤ -160 dBc			
VSWR	Dependent on tuning			
Power rating	≤ 100 W			
Connectors	7-16 female			
Temperature range	-25 °C ... +65 °C			
Degree of protection (mated)	IP 65			
Weight	~ 4.3 kg	~ 8.7 kg	~ 6.7 kg	~ 12.0 kg
Mounting brackets	**BN B16603**	Included	**BN B16603**	Included

Uplink / Downlink Filters

GSM1800 | UMTS2100

Customized

Part Number	BN 570571	BN 610013	BN 570572	BN 570672
Version	Single	Double	Single	Double
Cavities	4	4	6	6
Frequency range	1710 - 2170 MHz			
Insertion loss	Dependent on tuning			
Isolation	Dependent on tuning			
Passive intermodulation (IM3) @ 2 x 20 W	≤ -150 dBc; typ. ≤ -160 dBc			
VSWR	Dependent on tuning			
Power rating	≤ 100 W			
Connection	7-16 female			
Temperature range	-25 °C ... +65 °C			
Degree of protection (mated)	IP 65			
Weight	~ 3.0 kg	~ 6.4 kg	~ 5.0 kg	~ 10.4 kg
Mast or wall mounting brackets	**BN B16603**	Included	**BN B16603**	Included

LTE2600

Customized

Part Number	BN 570573	BN 610014	BN 570574	BN 570674
Version	Single	Double	Single	Double
Cavities	4	4	6	6
Frequency range	2500 - 2690 MHz			
Insertion loss	Dependent on tuning			
Isolation	Dependent on tuning			
Passive intermodulation (IM3) @ 2 x 20 W	≤ -150 dBc; typ. ≤ -160 dBc			
VSWR	Dependent on tuning			
Power rating	≤ 100 W			
Connection	7-16 female			
Temperature range	-25 °C ... +65 °C			
Degree of protection (mated)	IP 65			
Weight	~ 2.9 kg	~ 6.4 kg	~ 5.0 kg	~ 10.0 kg
Mast or wall mounting brackets	**BN B16603**	Included	**BN B16603**	Included

Combining Products and Systems

SPINNER develops and manufactures innovative combining products for all mobile communication bands. They are excellently suited as single- and multi-carrier solutions for shared use of antenna installations.

Their outstanding properties include minimal insertion loss, excellent isolation, and extremely low intermodulation. This ensures maximum bandwidth use while minimizing the chance of problems.

Multiband Combiners

Combining multiple different bands

- Diplexer
- Triplexer
- Quadruplexer
- Pentaplexer
- Hexaplexer

Multiband Combining Systems

Combining multiple different bands and multiple carriers

Input ports : output ports
- 2 : 1
- 3 : 3 6 : 3 9 : 3 12 : 3
- 4 : 4 8 : 4 12 : 4 16 : 4 20 : 4

Sameband Combiners

Combining multiple carriers within the same band

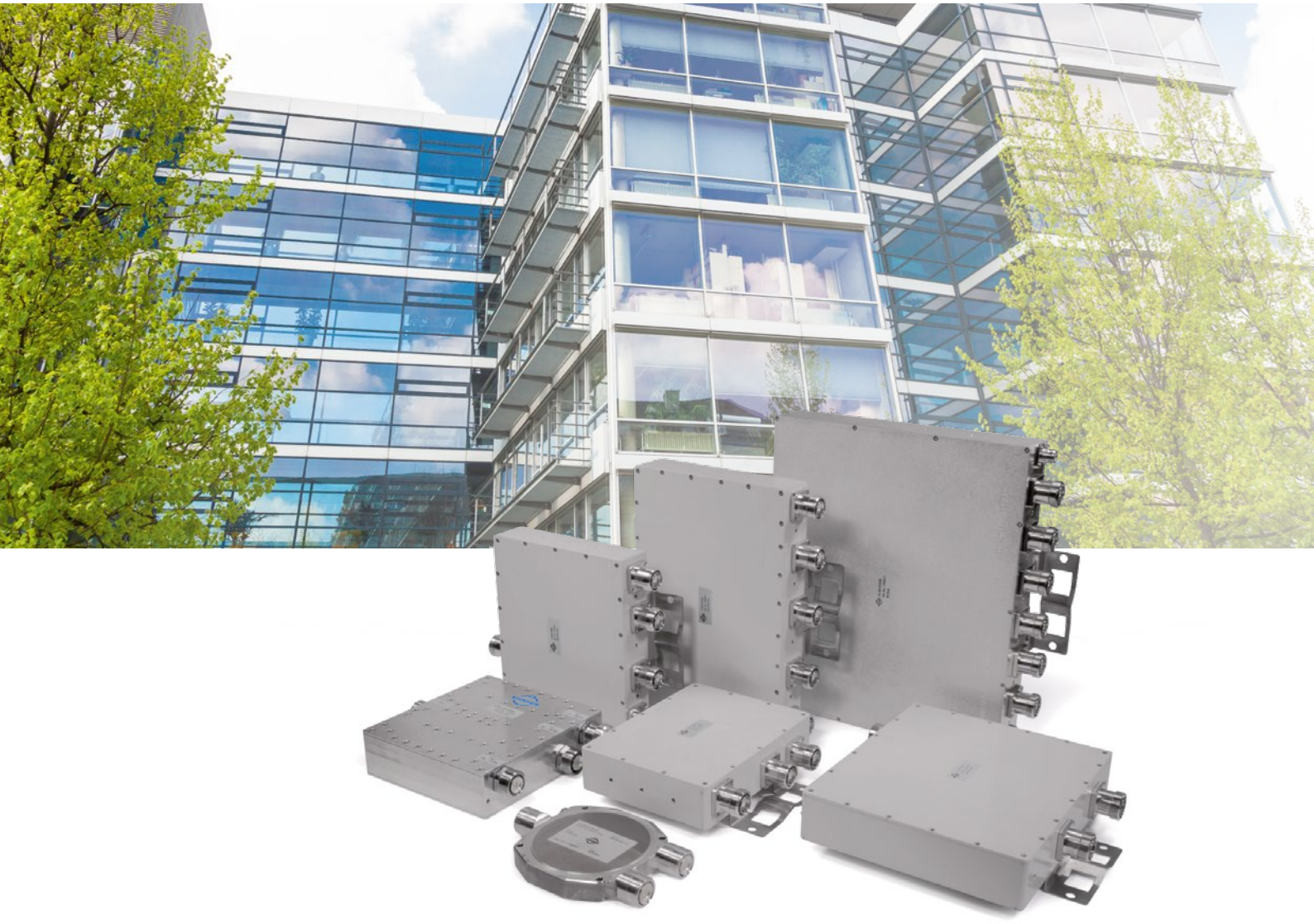
Available for different frequency bands as 4 and 6 cavity sameband combiner.

Mobile Network Combining System (MNCS®)

Combining multiple bands and multiple carriers

A fully customizable In-Building solution for feeding a distributed antenna system. The components are tuned to individual frequency plans and designed to ensure the greatest possible bandwidth. Modular rack architecture for easy extension at any time.

Multiband Combiners
Diplexers, Triplexers, Quadruplexers, Pentaplexers, Hexaplexer



Frequency combiners are used to isolate two or more channels on different frequencies, thus allowing the common use of one antenna feeder cable or one antenna by several transmitters or receivers.

Our combiners are available for frequency bands in the range from 0 to 3800 MHz, making our multiband combiner families ideal for the common utilization of antenna equipment by several mobile communication systems.

Besides solutions for GSM900, GSM1800, PCS1900, UMTS and LTE, SPINNER also offers diplexers for analogue radio, TETRA, DVB-H, DMB, WLAN and WiMAX.

All combiners work in bi-directional mode and can therefore be used to combine and split the transmitted and received signals.

Very low insertion loss, excellent signal isolation and superior intermodulation properties prevent mutual interference between adjacent systems. AISG/3GPP-compatible DC connections allow the transfer of control signals to the antenna as well as the power supply for antenna pre-amplifiers.

All combining products are suited for indoor and outdoor installation.

Multiband Combiners
Diplexers, Triplexers, Quadruplexers, Pentaplexers, Hexaplexer

Frequency Range in MHz													
	350 - 475	694 - 788	791 - 862	876 - 960	1427 - 1518	1710 - 1880	1850 - 1990	1920 - 2170	2300 - 2400	2400 - 2500	2496 - 2690	3300 - 3800	
Examples													
	TETRA PMR	LTE700	LTE800	LTE900 GSM900 GSM-R	LTE1500 L-Band	GSM1800 LTE1800 AWS RX	PCS1900	UMTS AWS TX	LTE2300	WLAN	LTE2500 LTE2600	5G	

Type													Page
Diplexer	Port 1 DC - 2170 MHz										Port 2 2496 - 2690 MHz		88
	Port 1 DC - 2700 MHz											Port 2 3300 - 3800 MHz	89
	Port 2 68 - 490 MHz	Port 1 698 - 960 MHz				Port 1 1710 - 2690 MHz							90
	Port 1 350 - 960 MHz					Port 2 1710 - 3800 MHz							92
	Port 1 440 - 475 MHz			Port 2 870 - 960 MHz									93
		Port 1 694 - 960 MHz				Port 2 1710 - 2170 MHz							94
		Port 1 694 - 960 MHz								Port 2 2400 - 2690 MHz			96
			Port 1 790 - 862 MHz	Port 2 880 - 960 MHz									97
			Port 1 790 - 960 MHz			Port 2 1710 - 2170 MHz							98
						Port 1 1710 - 1880 MHz		Port 2 1920 - 2170 MHz					99
						Port 1 1710 - 1880 MHz		Port 2 1920 - 2690 MHz					100
						Port 1 1710 - 2170 MHz					Port 2 2496 - 2690 MHz		101
Triplexer		Port 1 694 - 960 MHz				Port 2 1710 - 1880 MHz		Port 3 1920 - 2170 MHz					103
		Port 1 690 - 960 MHz				Port 2 1710 - 2170 MHz			Port 3 2300 - 2700 MHz				105
						Port 1 1710 - 1880 MHz		Port 2 1920 - 2170 MHz			Port 3 2500 - 2690 MHz		106
Quadru-plexer		Port 1 694 - 960 MHz				Port 2 1710 - 1880 MHz		Port 3 1920 - 2170 MHz			Port 4 2500 - 2690 MHz		107
Penta-plexer		Port 1 694 - 862 MHz		Port 2 880 - 960 MHz		Port 3 1710 - 1880 MHz		Port 4 1920 - 2170 MHz			Port 5 2500 - 2690 MHz		109
Hexa-plexer		Port 1 694 - 870 MHz		Port 2 880 - 960 MHz		Port 3 1710 - 1880 MHz		Port 4 1920 - 2170 MHz	Port 5 2300 - 2400 MHz		Port 6 2500 - 2700 MHz		110

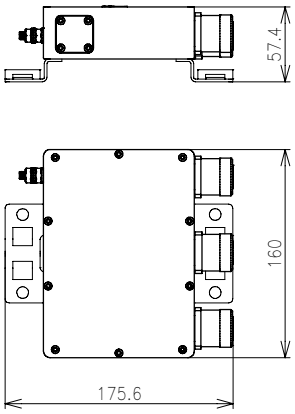
Multiband Combiners

PMR GSM-R 1500 MHz

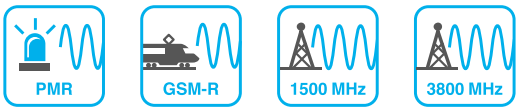
Diplexers

Part Number	BN 572674	BN 572677	BN 572668	BN 572669
Version	Single	Double	Single	Double
Frequency range Port 1 Port 2 Port 3	DC - 2170 MHz 2496 - 2690 MHz Common			
Insertion loss Port 1 -> port 3	≤ 0.30 dB			
Isolation	≥ 50 dB			
Passive intermodulation (IM3) @ 2 x 20 W	≤ -160 dBc			
VSWR	≤ 1.25			
Power rating Port 1 Port 2	≤ 600 W ≤ 100 W		≤ 500 W ≤ 100 W	
DC and AISG	1 A (port 1 -> port 3)			
Connectors	7-16 female		4.3-10 female	
Temperature range	-40 °C … +55 °C			
Degree of protection (mated)	IP 67			
Weight	~ 2.5 kg	~ 5.5 kg	~ 2.5 kg	~ 5.5 kg
Mounting bracket	Included			

BN 572674



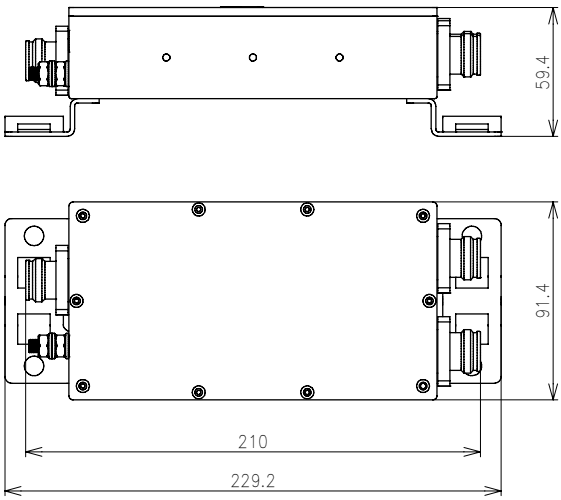
Multiband Combiners



Diplexer

Part Number	BN 570732	BN 570756
Version	Single	Double
Frequency range Port 1 Port 2 Port 3	DC - 2700 MHz 3300 - 3800 MHz Common	
Insertion Loss Port 1 -> port 3	≤ 0.50 dB	
Isolation	≥ 50 dB	
Passive intermodulation (IM3) @ 2 x 20 W	≤ -155 dBc	
VSWR	≤ 1.25	
Power rating Port 1 Port 2	≤ 300 W ≤ 60 W	
DC and AISG	1 A (port 1 -> port 3)	
Connectors	4.3-10 female	
Temperature range	-40 °C ... +60 °C	
Degree of protection (mated)	IP 65	
Weight	~ 6 kg	~ 12 kg
Mounting bracket	Included	

BN 570732



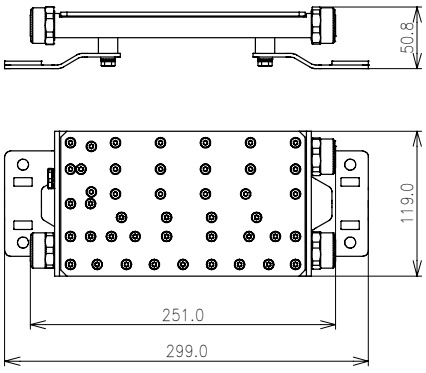
Multiband Combiners

PMR GSM-R

Diplexers

Part Number			BN 573189	BN 573191	BN 570637	BN 570638
Version			Single	Double	Single	Double
Frequency range						
	Port 1	range 1	698 - 800 MHz			
		range 2	800 - 960 MHz			
		range 3	1710 - 2500 MHz			
		range 4	2500 - 2690 MHz			
	Port 2	range 5	68 - 200 MHz			
		range 6	200 - 380 MHz			
		range 7	380 - 470 MHz			
		range 8	470 - 490 MHz			
	Port 3		Common			
Insertion loss						
	Port 1 -> port 3	range 1	≤ 0.3 dB			
		range 2, 3, 4	≤ 0.2 dB			
	Port 2 -> port 3	range 5, 6, 7	≤ 0.2 dB			
		range 8	≤ 0.3 dB			
Isolation						
	Port 1 -> port 2	range 1	≥ 30 dB			
		range 2, 3	≥ 50 dB			
		range 4	≥ 40 dB			
	Port 2 -> port 1	range 5, 6, 7	≥ 30 dB			
		range 8	≥ 25 dB			
Passive intermodulation (IM3) @ 2 x 20 W			≤ -155 dBc; typ. ≤ -160 dBc			
VSWR						
	Port 1	range 1	≤ 1.35			
		range 2, 3, 4	≤ 1.2			
	Port 2	range 5, 6, 8	≤ 1.2			
		range 7	≤ 1.35			
Power rating						
	Port 1		≤ 500 W			
	Port 2		≤ 300 W			
DC and AISG			N/A		1 A (port 2 -> port 3)	
Connectors			7-16 female			
Temperature range			-25 °C … +65 °C			
Degree of protection (mated)			IP 68			
Weight			~ 1.5 kg	~ 3.6 kg	~ 1.5 kg	~ 3.6 kg
Mounting brackets			Included			

BN 573189

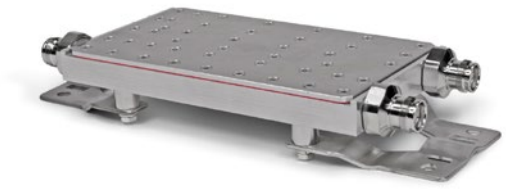


Multiband Combiners

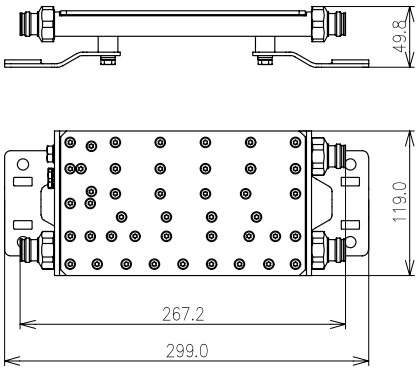
PMR GSM-R

Diplexers

Part Number			BN 572670	BN 572671	BN 572672	BN 572673
Version			Single	Double	Single	Double
Frequency range						
	Port 1	range 1	698 - 800 MHz			
		range 2	800 - 960 MHz			
		range 3	1710 - 2500 MHz			
		range 4	2500 - 2690 MHz			
	Port 2	range 5	68 - 200 MHz			
		range 6	200 - 380 MHz			
		range 7	380 - 470 MHz			
		range 8	470 - 490 MHz			
	Port 3		Common			
Insertion loss						
	Port 1 -> port 3	range 1	≤ 0.3 dB			
		range 2, 3, 4	≤ 0.2 dB			
	Port 2 -> port 3	range 5, 6, 7	≤ 0.2 dB			
		range 8	≤ 0.3 dB			
Isolation						
	Port 1 -> port 2	range 1	≥ 30 dB			
		range 2, 3	≥ 50 dB			
		range 4	≥ 40 dB			
	Port 2 -> port 1	range 5, 6, 7	≥ 30 dB			
		range 8	≥ 25 dB			
Passive intermodulation (IM3) @ 2 x 20 W			≤ -155 dBc; typ. ≤ -160 dBc			
VSWR						
	Port 1	range 1	≤ 1.35			
		range 2, 3, 4	≤ 1.2			
	Port 2	range 5, 6, 8	≤ 1.2			
		range 7	≤ 1.35			
Power rating						
	Port 1		≤ 500 W			
	Port 2		≤ 300 W			
DC and AISG			N/A		1 A (port 2 -> port 3)	
Connectors			4.3 - 10 female			
Temperature range			-25 °C … +65 °C			
Degree of protection (mated)			IP 68			
Weight			~ 1.5 kg	~ 3.6 kg	~ 1.5 kg	~ 3.6 kg
Mounting brackets			Included			



BN 572670



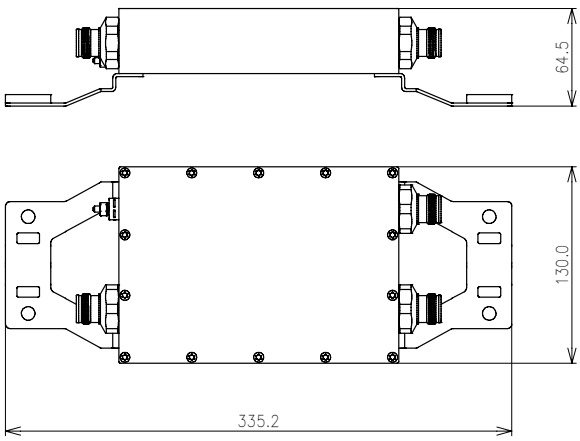
Multiband Combiners

PMR GSM-R 3800 MHz

Diplexer

Part Number	BN 570744
Version	Single
Frequency range Port 1 Port 2 Port 3	 350 - 960 MHz 1710 - 3800 MHz Common
Insertion loss	≤ 0.50 dB; typ. ≤ 0.30 dB
Isolation	≥ 50 dB; typ. ≥ 60 dB
Passive intermodulation (IM3) @ 2 x 20 W	≤ -155 dBc; typ. ≤ -160 dBc
VSWR	≤ 1.25; typ. ≤ 1.20
Power rating	≤ 250 W
DC and AISG	1 A (port 1 -> port 3)
Connectors	4.3-10 female
Temperature range	-20 °C … +60 °C
Degree of protection (mated)	IP 67
Weight	~ 2.0 kg
Mounting brackets	Included

BN 570744



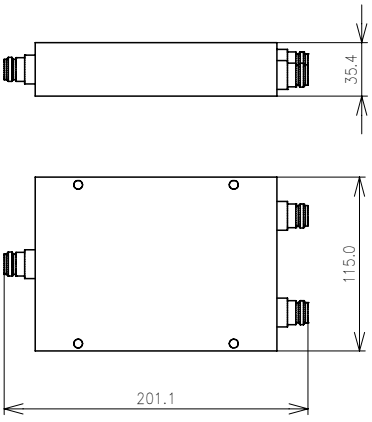
Multiband Combiners

GSM-R

Diplexer

Part Number	**BN 572924**
Version	Single
Frequency range Port 1 Port 2 Port 3	 440 - 475 MHz 870 - 960 MHz Common
Insertion loss	≤ 0.20 dB
Isolation	≥ 60 dB
Passive intermodulation (IM3) @ 2 x 20 W	≤ -150 dBc; typ. ≤ -160 dBc
VSWR	≤ 1.15
Power rating	≤ 50 W
DC and AISG	N/A
Connectors	N female
Temperature range	-40 °C … +70 °C
Degree of protection (mated)	IP 60
Weight	~ 1.3 kg
Mounting brackets	N/A

BN 572924



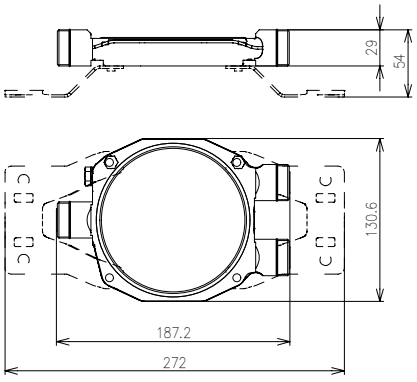
Multiband Combiners

GSM-R

Diplexers

Part Number	BN 570511	BN 570513	BN 570510	BN 570512
Version	Single	Double	Single	Double
Frequency range Port 1 Port 2 Port 3	694 - 960 MHz 1710 - 2170 MHz Common			
Insertion loss Port 1 -> port 3 Port 2 -> port 3	≤ 0.12 dB ≤ 0.15 dB			
Isolation	≥ 50 dB			
Passive intermodulation (IM3) @ 2 x 20 W	≤ -165 dBc; typ. ≤ -170 dBc			
VSWR	≤ 1.2			
Power rating Port 1 Port 2	≤ 570 W ≤ 380 W			
DC and AISG	5 A (port 2 -> port 3)		5 A (all ports)	
Connectors	7-16 female			
Temperature range	-40 °C … +85 °C			
Degree of protection (mated)	IP 68			
Weight	~ 0.8 kg	~ 1.9 kg	~ 0.8 kg	~ 1.9 kg
Mounting brackets	**BN B08962**	Included	**BN B08962**	Included

BN 570510



Multiband Combiners

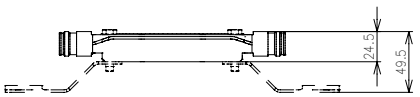
GSM-R

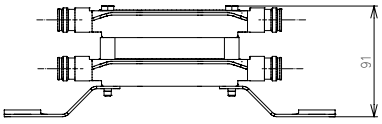
Diplexers

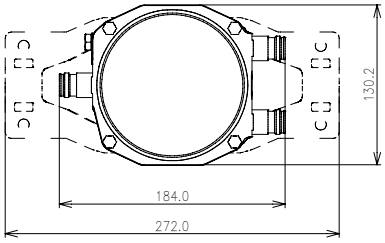
Part Number	BN 572639	BN 572641	BN 572638	BN 572640
Version	Single	Double	Single	Double
Frequency range Port 1 Port 2 Port 3	694 - 960 MHz 1710 - 2170 MHz Common			
Insertion loss Port 1 -> port 3 Port 2 -> port 3	≤ 0.12 dB ≤ 0.15 dB			
Isolation	≥ 50 dB			
Passive intermodulation (IM3) @ 2 x 20 W	≤ -165 dBc; typ. ≤ -170 dBc			
VSWR	≤ 1.2			
Power rating Port 1 Port 2	≤ 350 W ≤ 250 W			
DC and AISG	5 A (port 2 -> port 3)		5 A (all ports)	
Connectors	4.3-10 female			
Temperature range	-40 °C … +85 °C			
Degree of protection (mated)	IP 68			
Weight	~ 0.7 kg	~ 1.7 kg	~ 0.7 kg	~ 1.7 kg
Mounting brackets	**BN B08962**	Included	**BN B08962**	Included

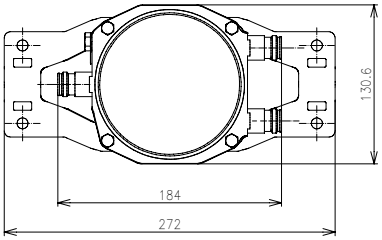
BN 572638

BN 572640









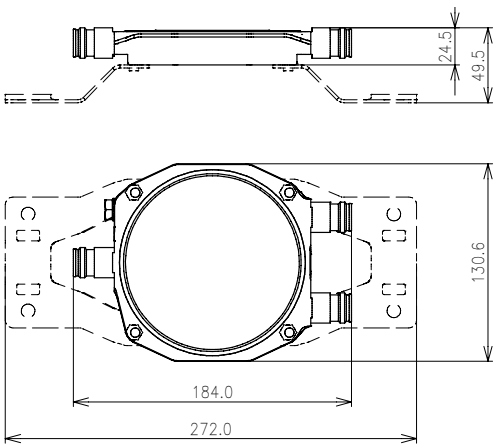
Multiband Combiners

GSM-R

Diplexers

Part Number	BN 572648	BN 572650	BN 572649	BN 572651
Version	Single	Double	Single	Double
Frequency range Port 1 Port 2 Port 3	694 - 960 MHz 2400 - 2690 MHz Common			
Insertion loss Port 1 -> port 3 Port 2 -> port 3	≤ 0.12 dB ≤ 0.15 dB			
Isolation	≥ 50 dB			
Passive intermodulation (IM3) @ 2 x 20 W	≤ -165 dBc; typ. ≤ -170 dBc			
VSWR	≤ 1.2			
Power rating Port 1 Port 2	≤ 400 W ≤ 200 W			
DC and AISG	5 A (port 2 -> port 3)		5 A (all ports)	
Connectors	4.3-10 female			
Temperature range	-40 °C … +85 °C			
Degree of protection (mated)	IP 68			
Weight	~ 0.7 kg	~ 1.7 kg	~ 0.7 kg	~ 1.7 kg
Mounting brackets	**BN B08962**	Included	**BN B08962**	Included

BN 572649



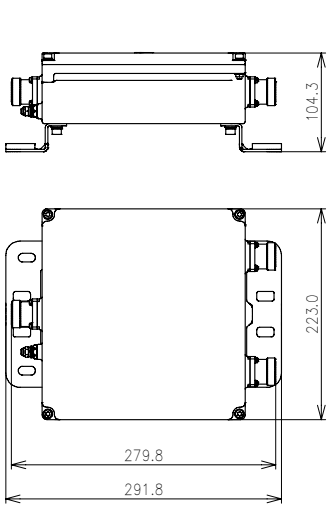
Multiband Combiners

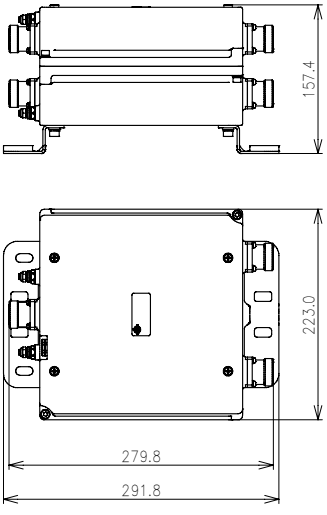
Diplexers

Part Number	BN 576115	BN 576116	BN 576117	BN 576118
Version	Single	Double	Single	Double
Frequency range Port 1 Port 2 Port 3	790 - 862 MHz 880 - 960 MHz Common			
Insertion loss	≤ 0.4 dB; typ. ≤ 0.25 dB			
Isolation	≥ 55 dB; typ. ≥ 60 dB		≥ 50 dB; typ. ≥ 55 dB	
Passive intermodulation (IM3) @ 2 x 20 W	≤ -155 dBc; typ. ≤ -160 dBc		≤ -160 dBc; typ. ≤ -165 dBc	
VSWR	≤ 1.25; typ. ≤ 1.2			
Power rating	≤ 300 W			
DC and AISG	1 A (all ports)			
Connectors	7-16 female		4.3-10 female	
Temperature range	-40 °C … +65 °C			
Degree of protection (mated)	IP 68			
Weight	~ 4 kg	~ 8 kg	~ 4 kg	~ 8 kg
Mounting brackets	Included			

BN 576115

BN 576116





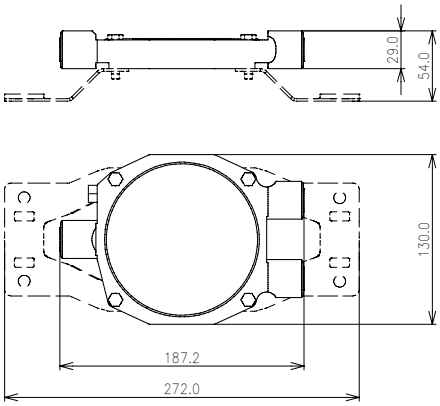
Multiband Combiners

GSM-R

Diplexers

Part Number	BN 573641	BN 573643	BN 573640	BN 573642
Version	Single	Double	Single	Double
Frequency range Port 1 Port 2 Port 3	790 - 960 MHz 1710 - 2170 MHz Common			
Insertion loss Port 1 -> port 3 Port 2 -> port 3	≤ 0.12 dB ≤ 0.15 dB			
Isolation	≥ 45 dB			
Passive intermodulation (IM3) @ 2 x 20 W	≤ -165 dBc; typ. ≤ -170 dBc			
VSWR	≤ 1.2; typ. ≤ 1.1			
Power rating Port 1 Port 2	≤ 570 W ≤ 380 W			
DC and AISG	5 A (port 2 -> port 3)		5 A (all ports)	
Connectors	7-16 female			
Temperature range	-40 °C … +85 °C			
Degree of protection (mated)	IP 68			
Weight	~ 0.8 kg	~ 1.8 kg	~ 0.8 kg	~ 1.8 kg
Mounting brackets	**BN B08962**	Included	**BN B08962**	Included

BN 573640

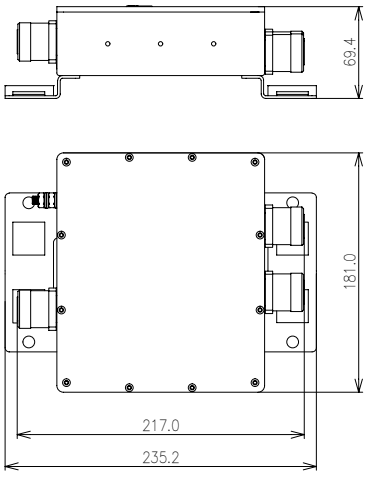


Multiband Combiners

Diplexers

Part Number	BN 572664	BN 572667	BN 572665	BN 572666
Version	Single	Double	Single	Double
Frequency range Port 1 Port 2 Port 3	1710 - 1880 MHz 1920 - 2170 MHz Common			
Insertion loss Port 1 -> port 3 Port 2 -> port 3	≤ 0.35 dB ≤ 0.45 dB			
Isolation	≥ 50 dB			
Passive intermodulation (IM3) @ 2 x 20 W	≤ -155 dBc; typ. ≤ -160 dBc			
VSWR	≤ 1.22			
Power rating	≤ 250 W			
DC and AISG	3 A (port 2 -> port 3)		3 A (all ports)	
Connectors	7-16 female			
Temperature range	-40 °C … +60 °C			
Degree of protection (mated)	IP 65			
Weight	~ 3 kg	~ 6 kg	~ 3 kg	~ 6 kg
Mounting brackets	Included			

BN 572665

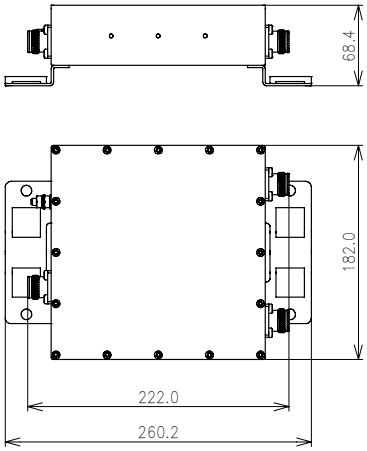


Multiband Combiners

Diplexers

Part Number	BN 572612	BN 572613	BN 572610	BN 572611
Version	Single	Double	Single	Double
Frequency range Port 1 Port 2 range 1 range 2 Port 3	1710 - 1880 MHz 1920 - 2170 MHz 2300 - 2690 MHz Common			
Insertion loss Port 1 -> port 3 Port 2 -> port 3	≤ 0.35 dB ≤ 0.45 dB			
Isolation	≥ 50 dB			
Passive intermodulation (IM3) @ 2 x 20 W	≤ -155 dBc; typ. ≤ -160 dBc			
VSWR	≤ 1.25			
Power rating	≤ 250 W			
DC and AISG	3 A (port 2 -> port 3)		3 A (all ports)	
Connectors	4.3-10 female			
Temperature range	-20 °C … +55 °C			
Degree of protection (mated)	IP 65			
Weight	~ 3 kg	~ 6 kg	~ 3 kg	~ 6 kg
Mounting brackets	Included			

BN 572612

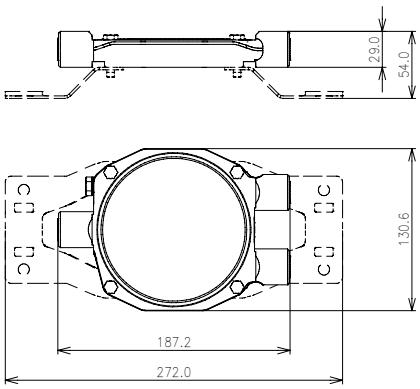


Multiband Combiners

Diplexers

Part Number	BN 570528	BN 572620	BN 573621	BN 572621	BN 573622	BN 572622
Version	Single	Double	Single	Double	Single	Double
Frequency range Port 1 Port 2 Port 3	1710 - 2170 MHz 2496 - 2690 MHz Common					
Insertion loss Port 1 -> port 3 Port 2 -> port 3	≤ 0.20 dB; typ. ≤ 0.12 dB ≤ 0.20 dB; typ. ≤ 0.15 dB					
Isolation	≥ 50 dB					
Passive intermodulation (IM3) @ 2 x 20 W	≤ -165 dBc; typ. ≤ -170 dBc					
VSWR	≤ 1.2					
Power rating Port 1 Port 2	≤ 400 W ≤ 200 W					
DC and AISG	5 A (port 1 -> port 3)		5 A (port 2 -> port 3)		5 A (all ports)	
Connectors	7-16 female					
Temperature range	-40 °C … +85 °C					
Degree of protection (mated)	IP 68					
Weight	~ 0.9 kg	~ 2 kg	~ 0.9 kg	~ 2 kg	~ 0.9 kg	~ 2 kg
Mounting brackets	**BN B08962**	Included	**BN B08962**	Included	**BN B08962**	Included

BN 570528

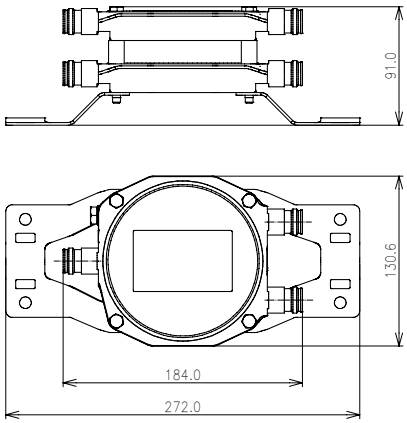


Multiband Combiners

Diplexers

Part Number	BN 572654	BN 572657	BN 572655	BN 572658	BN 572656	BN 572659
Version	Single	Double	Single	Double	Single	Double
Frequency range Port 1 Port 2 Port 3	1710 - 2170 MHz 2496 - 2690 MHz Common					
Insertion loss Port 1 -> port 3 Port 2 -> port 3	≤ 0.20 dB; typ. ≤ 0.12 dB ≤ 0.20 dB; typ. ≤ 0.15 dB					
Isolation	≥ 50 dB					
Passive intermodulation (IM3) @ 2 x 20 W	≤ -165 dBc; typ. ≤ -170 dBc					
VSWR	≤ 1.2					
Power rating Port 1 Port 2	≤ 300 W ≤ 150 W					
DC and AISG	5 A (port 1 -> port 3)		5 A (port 2 -> port 3)		5 A (all ports)	
Connectors	4.3-10 female					
Temperature range	-40 °C – +85 °C					
Degree of protection (mated)	IP 68					
Weight	~ 0.7 kg	~ 1.7 kg	~ 0.7 kg	~ 1.7 kg	~ 0.7 kg	~ 1.7 kg
Mounting brackets	**BN B08962**	Included	**BN B08962**	Included	**BN B08962**	Included

BN 572659



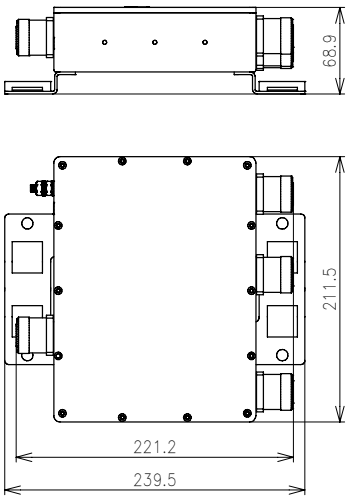
Multiband Combiners

GSM-R

Triplexers

Part Number	BN 570703	BN 570705	BN 570702	BN 570704
Version	Single	Double	Single	Double
Frequency range Port 1 Port 2 Port 3 Port 4	694 - 960 MHz 1710 - 1880 MHz 1920 - 2170 MHz Common			
Insertion loss Port 1 -> port 4 Port 2 -> port 4 Port 3 -> port 4	≤ 0.20 dB ≤ 0.35 dB ≤ 0.45 dB			
Isolation	≥ 50 dB			
Passive intermodulation (IM3) @ 2 x 20 W	≤ -155 dBc; typ. ≤ -160 dBc			
VSWR	≤ 1.22			
Power rating	≤ 250 W			
DC and AISG	1 A (port 3 -> port 4)		1 A (all ports)	
Connectors	7-16 female			
Temperature range	-40 °C … +60 °C			
Degree of protection (mated)	IP 65			
Weight	~ 3.3 kg	~ 6.6 kg	~ 3.3 kg	~ 6.6 kg
Mounting brackets	Included			

BN 570702



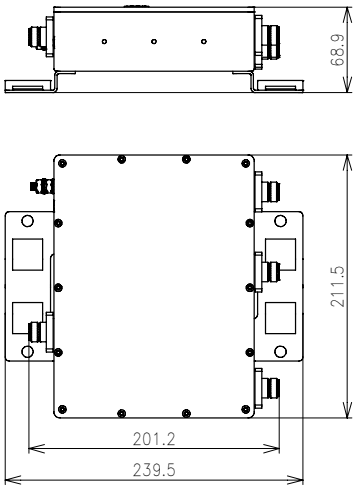
Multiband Combiners

GSM-R

Triplexers

Part Number	BN 570721	BN 570723	BN 570720	BN 570722
Version	Single	Double	Single	Double
Frequency range Port 1 Port 2 Port 3 Port 4	694 - 960 MHz 1710 - 1880 MHz 1920 - 2170 MHz Common			
Insertion loss Port 1 -> port 4 Port 2 -> port 4 Port 3 -> port 4	≤ 0.20 dB ≤ 0.35 dB ≤ 0.45 dB			
Isolation	≥ 50 dB			
Passive intermodulation (IM3) @ 2 x 20 W	≤ -155 dBc; typ. ≤ -160 dBc			
VSWR	≤ 1.22			
Power rating	≤ 250 W			
DC and AISG	1 A (port 3 -> port 4)		1 A (all ports)	
Connectors	4.3-10 female			
Temperature range	-40 °C … +60 °C			
Degree of protection (mated)	IP 65			
Weight	~ 3.3 kg	~ 6.6 kg	~ 3.3 kg	~ 6.6 kg
Mounting brackets	Included			

BN 570720

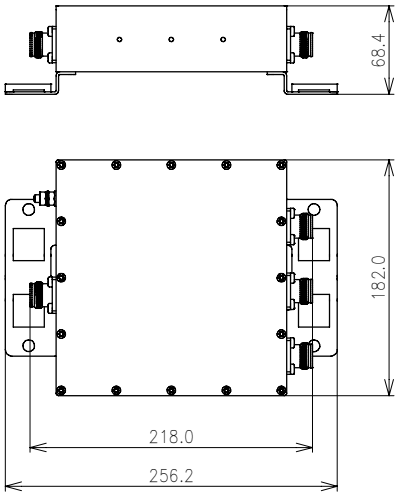


Multiband Combiners

Triplexers

Part Number	BN 570747	BN 570748	BN 570749	BN 570750
Version	Single	Double	Single	Double
Frequency range Port 1 Port 2 Port 3 Port 4	690 - 960 MHz 1710 - 2170 MHz 2300 - 2700 MHz Common			
Insertion loss	≤ 0.3 dB			
Isolation	≥ 60 dB			
Passive intermodulation (IM3) @ 2 x 20 W	≤ -155 dBc; typ. ≤ -160 dBc			
VSWR	≤ 1.25; typ. ≤ 1.2			
Power rating	≤ 300 W			
DC and AISG	1 A (all ports)			
Connectors	7-16 female		4.3-10 female	
Temperature range	-40 °C … +60 °C			
Degree of protection (mated)	IP 67			
Weight	~ 3 kg	~ 6 kg	~ 3 kg	~ 6 kg
Mounting brackets	Included			

BN 570749

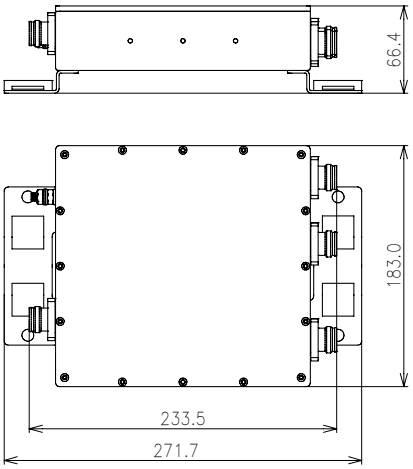


Multiband Combiners

Triplexers

Part Number	BN 570735	BN 570738	BN 570736	BN 570739	BN 570734	BN 570737
Version	Single	Double	Single	Double	Single	Double
Frequency range Port 1 Port 2 Port 3 Port 4	1710 - 1880 MHz 1920 - 2170 MHz 2500 - 2690 MHz Common					
Insertion loss Port 1 -> port 4 Port 2 -> port 4 Port 3 -> port 4	≤ 0.4 dB ≤ 0.45 dB ≤ 0.5 dB					
Isolation	≥ 50 dB					
Passive intermodulation (IM3) @ 2 x 20 W	≤ -155 dBc					
VSWR	≤ 1.25					
Power rating	≤ 240 W					
DC and AISG	1 A (port 1 -> port 4)		1 A (port 2 -> port 4)		1A (all ports)	
Connectors	4.3-10 female					
Temperature range	-25 °C … +65 °C					
Degree of protection (mated)	IP 65					
Weight	~ 3.3 kg	~ 6.6 kg	~ 3.3 kg	~ 6.6 kg	~ 3.3 kg	~ 6.6 kg
Mounting brackets	Included					

BN 570734



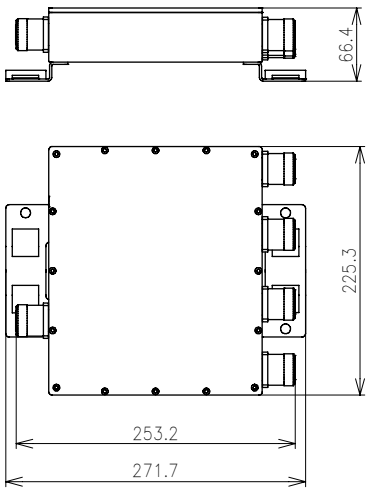
Multiband Combiners

GSM-R

Quadruplexers

Part Number	BN 570698	BN 570699	BN 570691	BN 570692
Version	Single	Double	Single	Double
Frequency range Port 1 Port 2 Port 3 Port 4 Port 5	694 - 960 MHz 1710 - 1880 MHz 1920 - 2170 MHz 2500 - 2690 MHz Common			
Insertion loss Port 1 -> port 5 Port 2 -> port 5 Port 3 -> port 5 Port 4 -> port 5	≤ 0.2 dB ≤ 0.4 dB ≤ 0.5 dB ≤ 0.3 dB			
Isolation	≥ 50 dB			
Passive intermodulation (IM3) @ 2 x 20 W	≤ -155 dBc			
VSWR	≤ 1.25			
Power rating	≤ 250 W			
DC and AISG	3 A (port 4 -> port 5)		3 A (all ports)	
Connectors	7-16 female			
Temperature range	-40 °C … +65 °C			
Degree of protection (mated)	IP 65			
Weight	~ 4.0 kg	~ 9.0 kg	~ 4.0 kg	~ 9.0 kg
Mounting brackets	Included			

BN 570691



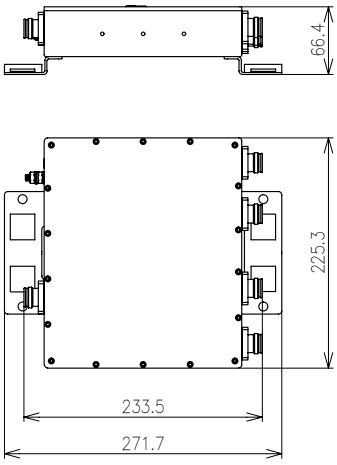
Multiband Combiners

GSM-R

Quadruplexers

Part Number	BN 572646	BN 572647	BN 572642	BN 572643
Version	Single	Double	Single	Double
Frequency range Port 1 Port 2 Port 3 Port 4 Port 5	694 - 960 MHz 1710 - 1880 MHz 1920 - 2170 MHz 2500 - 2690 MHz Common			
Insertion loss Port 1 -> Port 5 Port 2 -> Port 5 Port 3 -> Port 5 Port 4 -> Port 5	≤ 0.2 dB ≤ 0.4 dB ≤ 0.5 dB ≤ 0.3 dB			
Isolation	≥ 50 dB			
Passive intermodulation (IM3) @ 2 x 20 W	≤ -155 dBc			
VSWR	≤ 1.25			
Power rating	≤ 250 W			
DC and AISG	3 A (port 4 -> port 5)		3 A (all ports)	
Connectors	4.3-10 female			
Temperature range	-40 °C … +65 °C			
Degree of protection (mated)	IP 65			
Weight	~ 4.0 kg	~ 9.0 kg	~ 4.0 kg	~ 9.0 kg
Mounting brackets	Included			

BN 572642



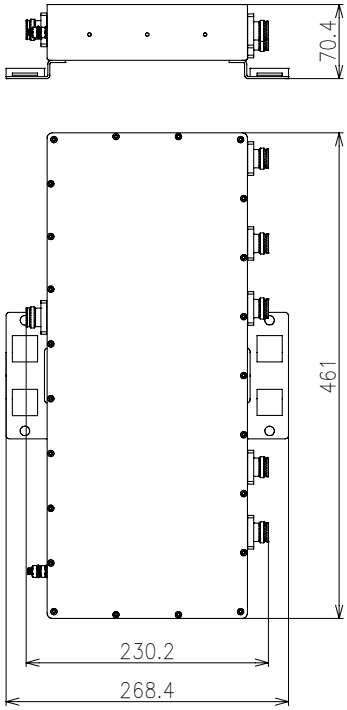
Multiband Combiners

GSM-R

Pentaplexers

Part Number	**BN 572680**
Version	Single
Frequency range Port 1 Port 2 Port 3 Port 4 Port 5 Port 6	 694 - 862 MHz 880 - 960 MHz 1710 - 1880 MHz 1920 - 2170 MHz 2500 - 2690 MHz Common
Insertion loss	≤ 0.5 dB
Isolation	≥ 50 dB
Passive intermodulation (IM3) @ 2 x 20 W	≤ -155 dBc
VSWR	≤ 1.25
Power rating	≤ 250 W
DC and AISG	3 A (all ports)
Connectors	4.3-10 female
Temperature range	-40 °C … +65 °C
Degree of protection (mated)	IP 65
Weight	~ 8.0 kg
Mounting brackets	Included

BN 572680

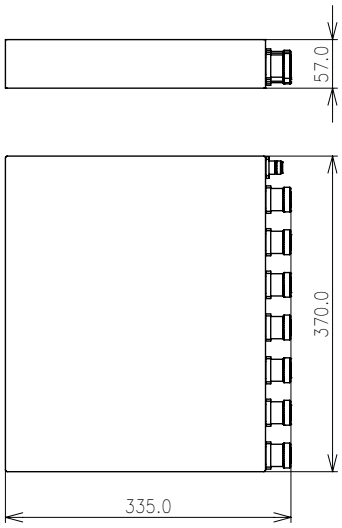


Multiband Combiners

Hexaplexer

Part Number	BN 572691	BN 572692
Version	Single	
Frequency range Port 1 Port 2 Port 3 Port 4 Port 5 Port 6 Port 7 Port 8	 694 - 870 MHz 880 - 960 MHz 1710 - 1880 MHz 1920 - 2170 MHz 2300 - 2400 MHz 2500 - 2700 MHz Common Common monitoring port: -30 dB	
Insertion loss Port 1,2 -> port 7 Port 3,4,5,6 -> port 7	 ≤ 0.60 dB ≤ 0.40 dB	
Isolation	≥ 50 dB	
Passive intermodulation (IM3) @ 2 x 20 W	≤ -155 dBc	
VSWR	≤ 1.25; typ. ≤ 1.2	
Power rating	≤ 250 W	
DC and AISG	N/A	1 A (all ports)
Connectors	7-16 female	
Temperature range	-25 °C … +65 °C	
Degree of protection (mated)	IP 65	
Weight	~ 12.0 kg	
Mounting brackets	Included	

BN 572691



Multiband Combining Systems

SPINNER multiband combining systems are excellently suited for merging multiple operators with a number of different bands and/or carrier frequencies.

The appropriate solution for every requirement

SPINNER multiband combining systems have a wide variety of uses. Different types are available for small to midsized projects and for quickly and easily equipping business buildings, underground stations and shopping malls, to name just a few examples.

A large selection of systems with different numbers of inputs and outputs is available: 2:1, 3:3, 4:4, 6:3, 9:3, 12:3, 8:4, 12:4 and 16:4. These can be mounted in a 19" rack or on a wall. On request, we are also happy to supply a system to you in a sturdy box for outdoor installation.

No operating cost

The principal advantages of these systems are: no operating cost, high flexibility, simple installation, and excellent technical properties.

All SPINNER multiband combining systems are completely passive and require no power supply, maintenance or network management. They also eliminate costs when services are discontinued. Once installed, a system runs reliably and fault-free. The broadband inputs also make it extremely flexible; for example, operator frequencies can be easily changed without tinkering with the system itself.

Multiband Combining Systems

Frequency Range in MHz	350 - 475	694 - 788	791 - 862	876 - 960	1427 - 1518	1710 - 1880	1850 - 1990	1920 - 2170	2300 - 2400	2400 - 2500	2496 - 2690	3300 - 3800	
Examples	TETRA PMR	LTE700	LTE800	LTE900 GSM900 GSM-R	LTE1500 L-Band	GSM1800 LTE1800 AWS RX	PCS1900	UMTS AWS TX	LTE2300	WLAN	LTE2500 LTE2600	5G	
Type (input ports : output ports) – Style													**Page**
Broadband versions													
2 : 1 - compact	2 inputs 350 - 2700 MHz												115
2 : 1 - compact		2 inputs 694 - 2700 MHz											114 115
2 : 1 - compact		2 inputs 694 - 3800 MHz											115
3 : 3 - compact	3 inputs 380 - 3800 MHz												116
3 : 3 - compact		3 inputs 694 - 2700 MHz											117 118
4 : 4 - compact	4 inputs 350 - 2700 MHz												119
4 : 4 - compact	4 inputs 380 - 3800 MHz												119
4 : 4 - compact		4 inputs 694 - 3800 MHz											120
4 : 4 - compact		4 inputs 694 - 2700 MHz											121
Optimized for combining 3 carriers with 2 bands each													
6 : 3 - shelf		3 inputs 694 - 960 MHz				3 inputs 1710 - 2170 MHz							122
6 : 3 - shelf		3 inputs 694 - 2170 MHz									3 inputs 2496 - 2690 MHz		122
6 : 3 - shelf						3 inputs 1710 - 1880 MHz		3 inputs 1920 - 2170 MHz					122
Optimized for combining 3 carriers with 3 bands each													
9 : 3 - shelf		3 inputs 694 - 960 MHz				3 inputs 1710 - 1880 MHz		3 inputs 1920 - 2170 MHz					123
Optimized for combining 3 carriers with 4 bands each													
12 : 3 - shelf		3 inputs 694 - 960 MHz				3 inputs 1710 - 1880 MHz		3 inputs 1920 - 2170 MHz			3 inputs 2500 - 2690 MHz		124
12 : 3 - box		3 inputs 694 - 960 MHz				3 inputs 1710 - 1880 MHz		3 inputs 1920 - 2170 MHz			3 inputs 2500 - 2690 MHz		125
Optimized for combining 4 carriers with 2 bands each													
8 : 4 - shelf		4 inputs 694 - 960 MHz				4 inputs 1710 - 2170 MHz							126
8 : 4 - shelf		4 inputs 694 - 2170 MHz									4 inputs 2496 - 2690 MHz		126
8 : 4 - shelf						4 inputs 1710 - 1880 MHz		4 inputs 1920 - 2170 MHz					126
8 : 4 - box		4 inputs 694 - 960 MHz				4 inputs 1710 - 2170 MHz							127
Optimized for combining 4 carriers with 3 bands each													
12 : 4 - shelf		4 inputs 694 - 960 MHz				4 inputs 1710 - 1880 MHz		4 inputs 1920 - 2170 MHz					128
12 : 4 - shelf						4 inputs 1710 - 1880 MHz		4 inputs 1920 - 2170 MHz			4 inputs 2500 - 2690 MHz		128
Optimized for combining 4 carriers with 4 bands each													
16 : 4 - shelf		4 inputs 694 - 960 MHz				4 inputs 1710 - 1880 MHz		4 inputs 1920 - 2170 MHz			4 inputs 2500 - 2690 MHz		129
16 : 4 - box		4 inputs 694 - 960 MHz				4 inputs 1710 - 1880 MHz		4 inputs 1920 - 2170 MHz			4 inputs 2500 - 2690 MHz		130
Optimized for combining 4 carriers with 5 bands each													
20 : 4 - shelf		4 inputs 694 - 960 MHz				4 inputs 1710 - 1880 MHz		4 inputs 1920 - 2170 MHz			4 inputs 2500 - 2690 MHz	4 inputs 3300 - 3800 MHz	131

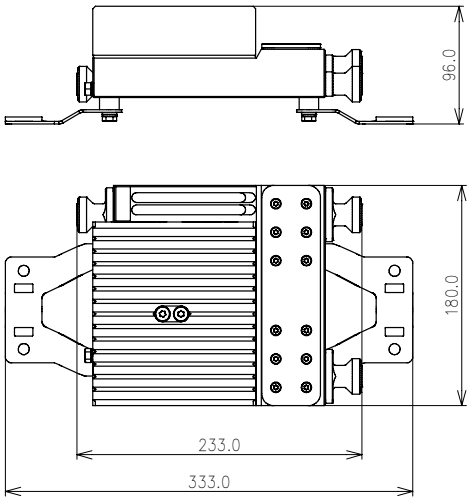
Multiband Combining Systems

2 : 1 (Hybrid) Combiners
Compact Version

GSM-R 1500 MHz

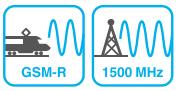
Part Number	BN 573645	BN 753367
Version (input : output)	2 : 1	
Frequency range	694 - 2700 MHz	
Insertion loss	3.0 dB ± 0.5 dB	
Isolation	≥ 30 dB	
Passive intermodulation (IM3) @ 2 x 20 W	≤ -155 dBc; typ. ≤ -160 dBc	
VSWR	≤ 1.15	
Power rating	≤ 100 W	
Connectors	7-16 female	4.3-10 female
Temperature range	-40 °C … +55 °C	
Degree of protection (mated)	IP 68	
Weight	~ 4.0 kg	
Mounting brackets	Included	

BN 573645



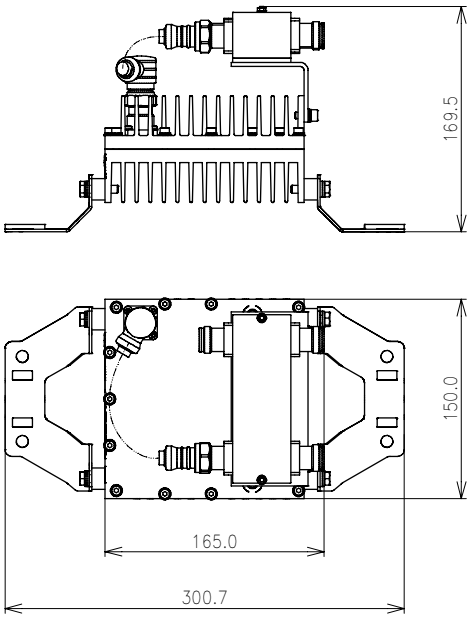
Multiband Combining Systems

2 : 1 (Hybrid) Combiners
Compact Version



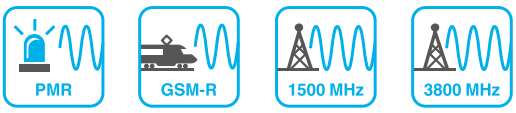
Part Number	BN 753388	BN 753373	BN 753374
Version (input : output)	2 : 1		
Frequency range	350 - 2700 MHz	694 - 2700 MHz	694 - 3800 MHz
Insertion loss	3.0 dB ± 0.9 dB	3.0 dB ± 0.6 dB	
Isolation	≥ 23 dB		≥ 23 dB @ 694 - 2700 MHz ≥ 20 dB @ 2700 - 3800 MHz
Passive intermodulation (IM3) @ 2 x 20 W	≤ 140 dBc @ 350 - 694 MHz ≤ 150 dBc @ 694 - 2700 MHz	≤ 150 dBc @ 694 - 800 MHz ≤ 155 dBc @ 800 - 3000 MHz	
VSWR	≤ 1.25		
Power rating	≤ 80 W		
Connectors	4.3-10 female		
Temperature range	-40 °C … +50 °C		
Degree of protection (mated)	IP 65		
Weight	~ 3.7 kg	~ 3.5 kg	
Mounting brackets	Included		

BN 753373



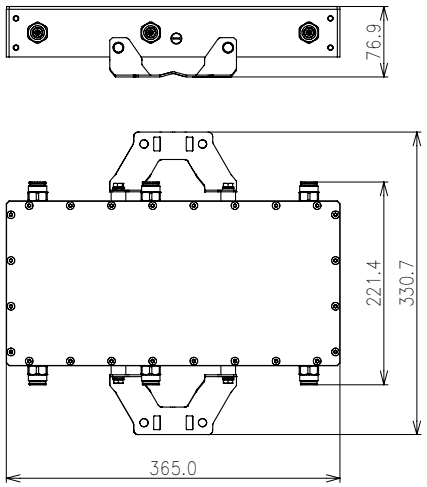
Multiband Combining Systems

3 : 3 Combiners
Compact Version



Part Number	BN 570754
Version (input : output)	3 : 3
Frequency range	380 - 3800 MHz
Insertion loss	5.0 dB ± 1.2 dB
Isolation	≥ 28 dB; typ. ≥ 30 dB
Passive intermodulation (IM3) @ 2 x 20 W	≤ -160 dBc; typ. ≤ -165 dBc
VSWR	≤ 1.25
Power rating	≤ 500 W
Connectors	4.3-10 female
Temperature range	-40 °C … +55 °C
Degree of protection (mated)	IP 65
Weight	~ 6.6 kg
Mounting brackets	Included

BN 570754



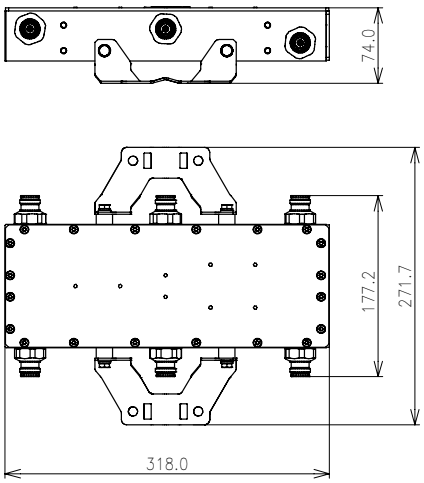
Multiband Combining Systems

3 : 3 Combiners
Compact Version

GSM-R 1500 MHz

Part Number	BN 570633	BN 570635
Version (input : output)	3 : 3	
Frequency range	694 - 2700 MHz	
Insertion loss Port 1,2,3 -> port 4,5 Port 1,2,3 -> port 6	 5.0 dB ± 0.8 dB 5.0 dB ± 1.2 dB	
Isolation	≥ 30 dB	
Passive intermodulation (IM3) @ 2 x 20 W	≤ -160 dBc; typ. ≤ -165 dBc	
VSWR	≤ 1.20	
Power rating	≤ 500 W	
Connectors	7-16 female	4.3-10 female
Temperature range	-40 °C … +70 °C	
Degree of protection (mated)	IP 65	
Weight	~ 5.0 kg	
Mounting brackets	Included	

BN 570635



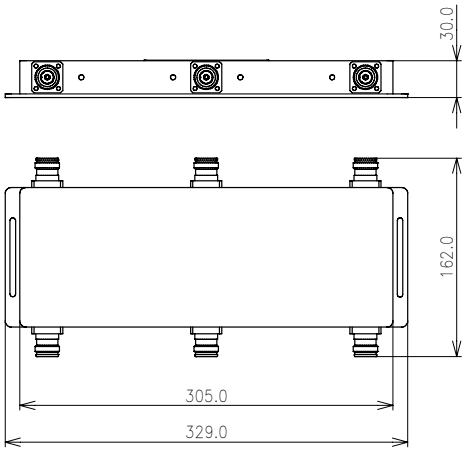
Multiband Combining Systems

3 : 3 Combiners
Compact Version

GSM-R 1500 MHz

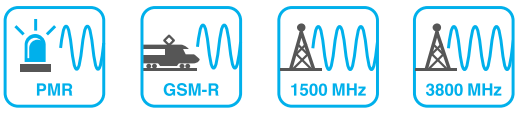
Part Number	BN 570684	BN 570685	BN 570733
Version (input : output)	3 : 3		
Frequency range	694 - 2700 MHz		
Insertion loss	5.0 dB ± 1.3 dB		
Isolation	≥ 23 dB		
Passive intermodulation (IM3) @ 2 x 20 W	≤ -155 dBc; typ. ≤ -160 dBc		
VSWR	≤ 1.25		
Power rating	≤ 200 W		
Connectors	7-16 female	4.3-10 female	N female
Temperature range	-30 °C … +65 °C		
Degree of protection (mated)	IP 65		
Weight	~ 2.6 kg	~ 2.0 kg	~ 1.6 kg
Mounting brackets	Included		

BN 570685



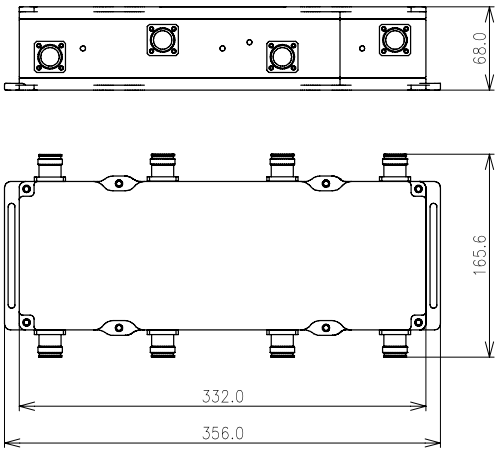
Multiband Combining Systems

4 : 4 Combiners
Compact Version



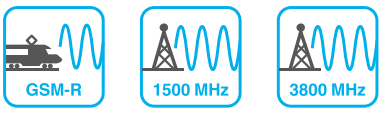
Part Number	BN 570680	BN 570680F001	BN 570755
Version (input : output)	4 : 4		
Frequency range	350 - 2700 MHz		380 - 3800 MHz
Insertion loss	6.0 dB ± 1.5 dB		6.1 dB ± 1.2 dB
Isolation	≥ 23 dB		≥ 28 dB; typ. ≥ 30 dB
Passive intermodulation (IM3) @ 2 x 20 W	≤ -155 dBc	≤ -160 dBc; typ. ≤ -165 dBc	
VSWR	≤ 1.25; typ. ≤ 1.2		≤ 1.25
Power rating	≤ 400 W		≤ 500 W
Connectors	4.3-10 female		
Temperature range	-25 °C … +65 °C		-40 °C … +55 °C
Degree of protection (mated)	IP 65		
Weight	~ 3.6 kg		~ 6.2 kg
Mounting brackets	Included		

BN 570680



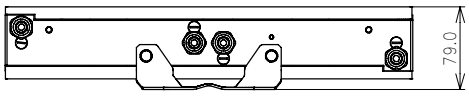
Multiband Combining Systems

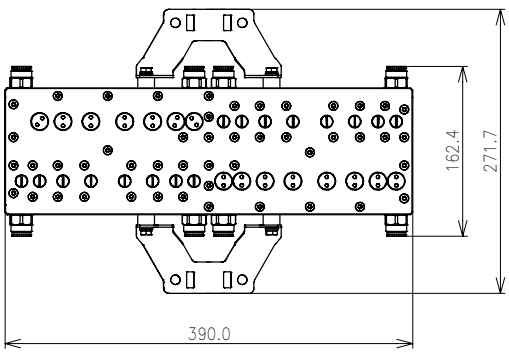
4 : 4 Combiners
Compact Version



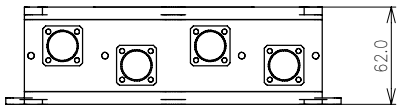
Part Number	BN 570682	BN 570741	BN 570681	BN 570683
Version (input : output)	4 : 4			
Frequency range	694 - 3800 MHz			
Insertion loss	6.1 dB ± 1.4 dB			
Isolation	≥ 23 dB	≥ 30 dB	≥ 23 dB	
Passive intermodulation (IM3) @ 2 x 20 W	≤ -155 dBc	≤ -160 dBc; typ. ≤ -165 dBc	≤ -155 dBc	
VSWR	≤ 1.3	≤ 1.2	≤ 1.3	
Power rating		≤ 500 W	≤ 400 W	≤ 200 W
Connectors	7-16 female	4.3-10 female		N female
Temperature range	-40 °C … +65 °C			
Degree of protection (mated)	IP 65			
Weight	~ 2.4 kg	~ 10,0 kg	~ 2.1 kg	~ 1.9 kg
Mounting brackets	Included			

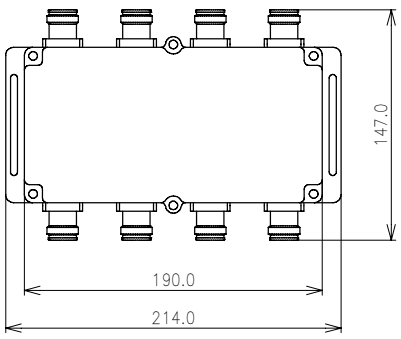
BN 570741





BN 570681





Multiband Combining Systems

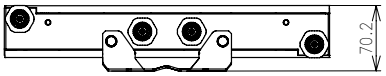
4 : 4 Combiners
Compact Version

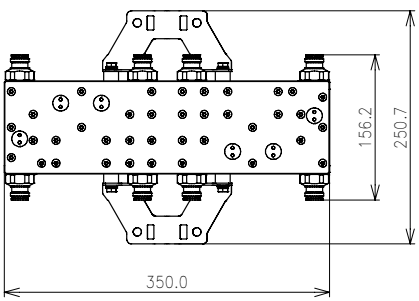
GSM-R 1500 MHz

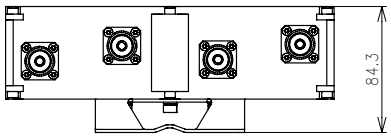
Part Number	BN 570538	BN 570634	BN 570742	BN 570657	BN 570656
Version (input : output)	4 : 4				
Frequency range	694 - 2700 MHz				
Insertion loss	6.1 dB ± 0.9 dB		6.1 dB ± 1.0 dB	6.1 dB ± 0.9 dB	6.1 dB ± 1.2 dB
Isolation	≥ 30 dB; typ. ≥ 32 dB		≥ 25 dB; typ. ≥ 30 dB	≥ 30 dB; typ. ≥ 32 dB	≥ 25 dB
Passive intermodulation (IM3) @ 2 x 20 W	≤ -160 dBc; typ. ≤ -165 dBc			≤ -155 dBc; typ. ≤ -160 dBc	≤ -150 dBc
VSWR	≤ 1.12		≤ 1.25; typ. 1.15	≤ 1.12	≤ 1.25
Power rating	≤ 500 W		≤ 200 W	≤ 250 W	≤ 200 W
Connectors	7-16 female	4.3-10 female		N female	
Temperature range	-40 °C … +70 °C		-30 °C … +65 °C	-40 °C … +70 °C	-30 °C … +55 °C
Degree of protection (mated)	IP 65				
Weight	~ 5.5 kg				~ 3.0 kg
Mounting brackets	Included				

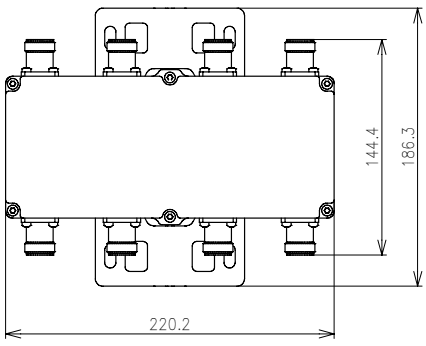
BN 570634

BN 570742







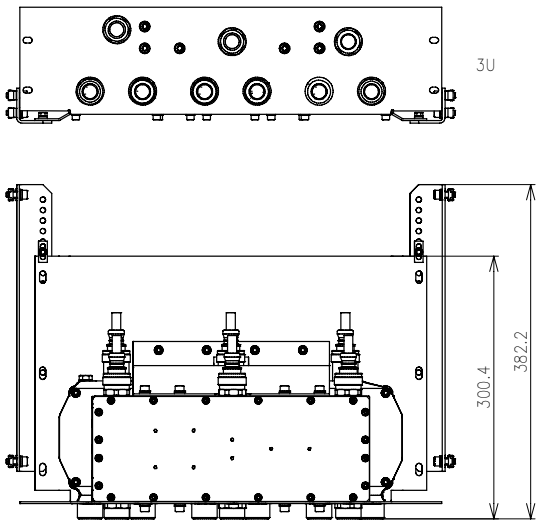


Multiband Combining Systems

6 : 3 Combiners
Indoor Shelf for 19" Rack or Wall Mounting

Part Number	BN 610633	BN 572681	BN 610632	BN 572682	BN 610634	BN 572683
Version (input : output)	6 : 3 (3 inputs per band)					
Frequency range Band 1 Band 2	694 - 960 MHz 1710 - 2170 MHz		694 - 2170 MHz 2496 - 2690 MHz		1710 - 1880 MHz 1920 - 2170 MHz	
Insertion loss	5.35 dB ± 0.8 dB		5.55 dB ± 0.8 dB		5.65 dB ± 0.8 dB	
Isolation interband	≥ 50 dB					
Isolation intraband	≥ 30 dB					
Passive intermodulation (IM3) @ 2 x 20 W	≤ -155 dBc; typ. ≤ -160 dBc					
VSWR	≤ 1.40; typ. ≤ 1.25					
Power rating	≤ 200 W					
Connectors	7-16 female	4.3-10 female	7-16 female	4.3-10 female	7-16 female	4.3-10 female
Temperature range	-40 °C … +65 °C					
Degree of protection (mated)	IP 65					
Weight	~ 10 kg		~ 17 kg			
Mounting brackets	Included					

BN 610633



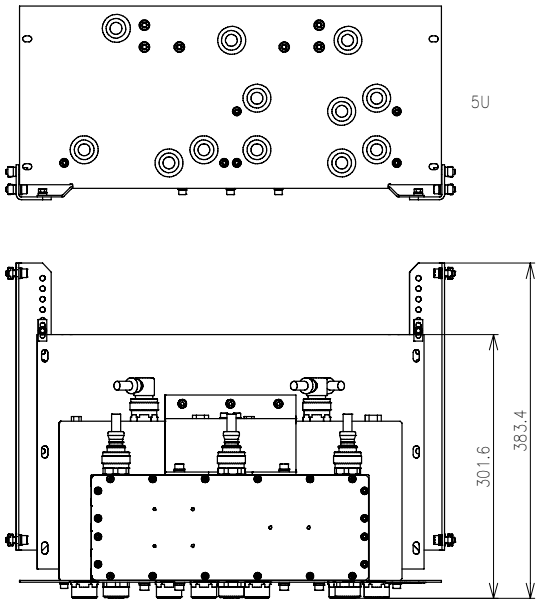
Multiband Combining Systems

GSM-R

9 : 3 Combiners
Indoor Shelf for 19" Rack or Wall Mounting

Part Number	BN 610635	BN 572684
Version (input : output)	9 : 3 (3 inputs per band)	
Frequency range Band 1 Band 2 Band 3	 694 - 960 MHz 1710 - 1880 MHz 1920 - 2170 MHz	
Insertion loss	5.65 dB ± 0.8 dB	
Isolation interband	≥ 50 dB	
Isolation intraband	≥ 30 dB	
Passive intermodulation (IM3) @ 2 x 20 W	≤ -155 dBc; typ. ≤ -160 dBc	
VSWR	≤ 1.40; typ. ≤ 1.25	
Power rating	≤ 130 W	
Connectors	7-16 female	4.3-10 female
Temperature range	-40 °C … +65 °C	
Degree of protection (mated)	IP 65	
Weight	~ 19 kg	
Mounting brackets	Included	

BN 610635



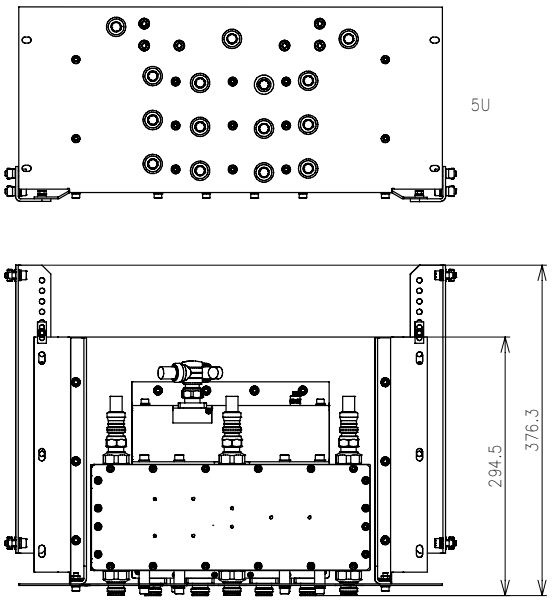
Multiband Combining Systems

GSM-R

12 : 3 Combiners
Indoor Shelf for 19" Rack or Wall Mounting

Part Number	BN 610631	BN 572661
Version (input : output)	12 : 3 (3 inputs per band)	
Frequency range Band 1 Band 2 Band 3 Band 4	 694 - 960 MHz 1710 - 1880 MHz 1920 - 2170 MHz 2500 - 2690 MHz	
Insertion loss	5.75 dB ± 0.8 dB	
Isolation interband	≥ 50 dB	
Isolation intraband	≥ 30 dB	
Passive intermodulation (IM3) @ 2 x 20 W	≤ -155 dBc; typ. ≤ -160 dBc	
VSWR	≤ 1.40; typ. ≤ 1.25	
Power rating	≤ 125 W	
Connectors	7-16 female	4.3-10 female
Temperature range	-40 °C … +60 °C	
Degree of protection (mated)	IP 65	
Weight	~ 21 kg	
Mounting brackets	Included	

BN 572661



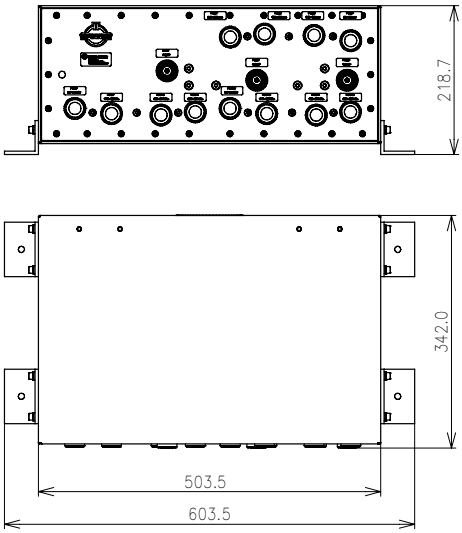
Multiband Combining Systems

GSM-R

12 : 3 Combiners
Outdoor Box

Part Number	BN 610630	BN 572660
Version (input : output)	12 : 3 (3 inputs per band)	
Frequency range Band 1 Band 2 Band 3 Band 4	 694 - 960 MHz 1710 - 1880 MHz 1920 - 2170 MHz 2500 - 2690 MHz	
Insertion loss	5.70 dB ± 1.2 dB	
Isolation interband	≥ 50 dB	
Isolation intraband	≥ 30 dB	
Passive intermodulation (IM3) @ 2 x 20 W	≤ -155 dBc; typ. ≤ -160 dBc	
VSWR	≤ 1.40; typ. ≤ 1.25	
Power rating	≤ 125 W	
Connectors	7-16 female	4.3-10 female
Temperature range	-40 °C … +60 °C	
Degree of protection (mated)	IP 65	
Weight	~ 25 kg	
Mounting brackets	Included	

BN 610630

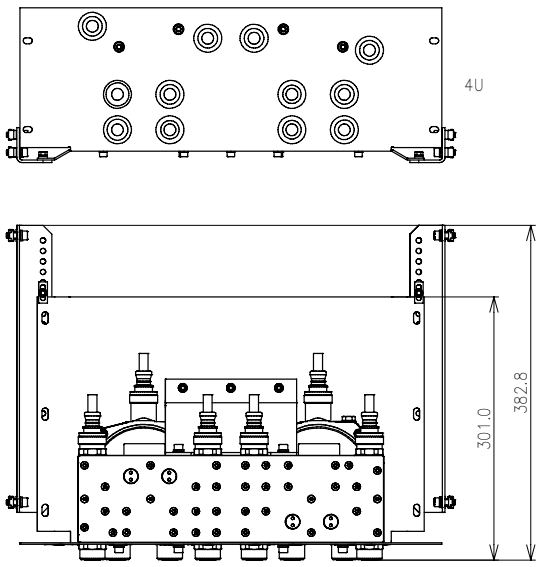


Multiband Combining Systems

8 : 4 Combiners
Indoor Shelf for 19" Rack or Wall Mounting

Part Number	BN 610649	BN 572685	BN 610652	BN 572687	BN 610650	BN 572688
Version (input : output)	8 : 4 (4 inputs per band)					
Frequency range Band 1 Band 2	694 - 960 MHz 1710 - 2170 MHz		694 - 2170 MHz 2496 - 2690 MHz		1710 - 1880 MHz 1920 - 2170 MHz	
Insertion loss	6.45 dB ± 0.9 dB		6.65 dB ± 0.9 dB		6.75 dB ± 0.9 dB	
Isolation interband	≥ 50 dB					
Isolation intraband	≥ 30 dB					
Passive intermodulation (IM3) @ 2 x 20 W	≤ -155 dBc; typ. ≤ -160 dBc					
VSWR	≤ 1.40; typ. ≤ 1.25					
Power rating	≤ 200 W					
Connectors	7-16 female	4.3-10 female	7-16 female	4.3-10 female	7-16 female	4.3-10 female
Temperature range	-40 °C … +65 °C					
Degree of protection (mated)	IP 65					
Weight	~ 12 kg		~ 21 kg			
Mounting brackets	Included					

BN 610649



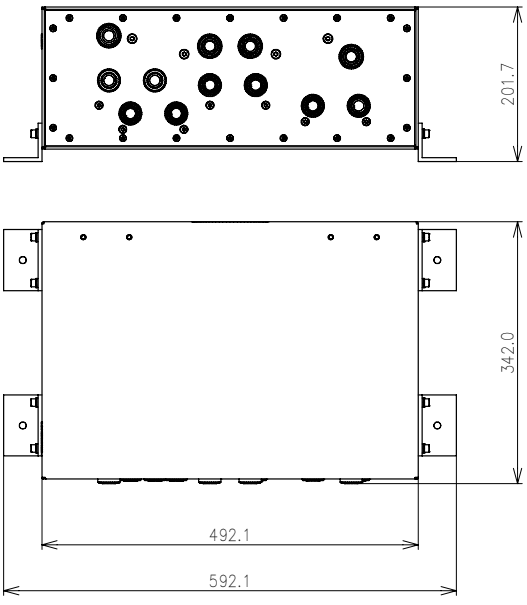
Multiband Combining Systems

GSM-R

8 : 4 Combiners
Outdoor Box

Part Number	BN 570690	BN 572686
Version (input : output)	8 : 4 (4 inputs per band)	
Frequency range Band 1 Band 2	694 - 960 MHz 1710 - 2170 MHz	
Insertion loss	6.45 dB ± 0.9 dB	
Isolation interband	≥ 50 dB	
Isolation intraband	≥ 30 dB	
Passive intermodulation (IM3) @ 2 x 20 W	≤ -155 dBc; typ. ≤ -160 dBc	
VSWR	≤ 1.40; typ. ≤ 1.25	
Power rating	≤ 250 W	
Connectors	7-16 female	4.3-10 female
Temperature range	-40 °C … +65 °C	
Degree of protection (mated)	IP 65	
Weight	~ 17 kg	
Mounting brackets	Included	

BN 570690



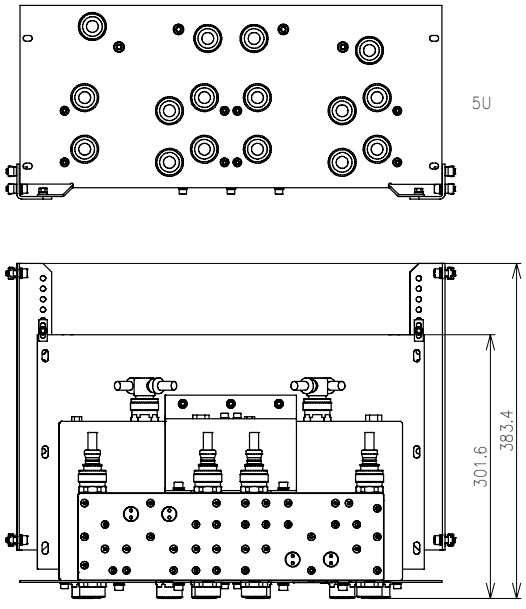
Multiband Combining Systems

GSM-R

12 : 4 Combiners
Indoor Shelf for 19" Rack or Wall Mounting

Part Number	BN 610651	BN 572689	BN 572679
Version (input : output)	12 : 4 (4 inputs per band)		
Frequency range Band 1 Band 2 Band 3	694 - 960 MHz 1710 - 1880 MHz 1920 - 2170 MHz		1710 - 1880 MHz 1920 - 2170 MHz 2500 - 2690 MHz
Insertion loss	6.75 dB ± 0.9 dB		6.70 dB ± 0.6 dB
Isolation interband	≥ 50 dB		
Isolation intraband	≥ 30 dB		
Passive intermodulation (IM3) @ 2 x 20 W	≤ -155 dBc; typ. ≤ -160 dBc		
VSWR	≤ 1.40; typ. ≤ 1.25		
Power rating	≤ 130 W		≤ 100 W
Connectors	7-16 female	4.3-10 female	
Temperature range	-40 °C … +65 °C		
Degree of protection (mated)	IP 65		
Weight	~ 24 kg		~ 25 kg
Mounting brackets	Included		

BN 610651



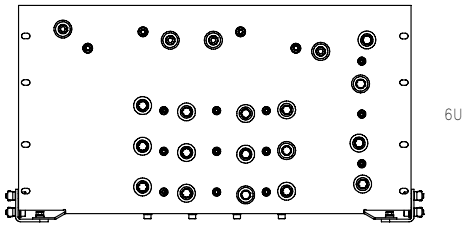
Multiband Combining Systems

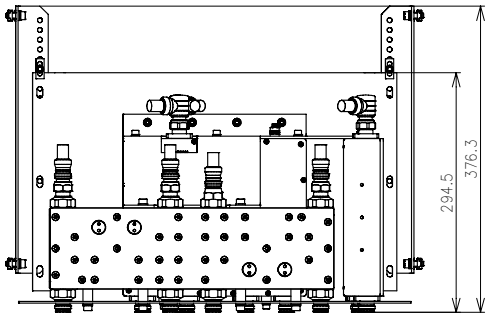
GSM-R

16 : 4 Combiners
Indoor Shelf for 19" Rack or Wall Mounting

Part Number	BN 610648	BN 572663
Version (input : output)	16 : 4 (4 inputs per band)	
Frequency range Band 1 Band 2 Band 3 Band 4	 694 - 960 MHz 1710 - 1880 MHz 1920 - 2170 MHz 2500 - 2690 MHz	
Insertion loss	6.85 dB ± 0.9 dB	
Isolation interband	≥ 50 dB	
Isolation intraband	≥ 30 dB	
Passive intermodulation (IM3) @ 2 x 20 W	≤ -155 dBc; typ. ≤ -160 dBc	
VSWR	≤ 1.40; typ. ≤ 1.25	
Power rating	≤ 125 W	
Connectors	7-16 female	4.3-10 female
Temperature range	-40 °C … +60 °C	
Degree of protection (mated)	IP 65	
Weight	~ 26 kg	
Mounting material	Included	

BN 572663





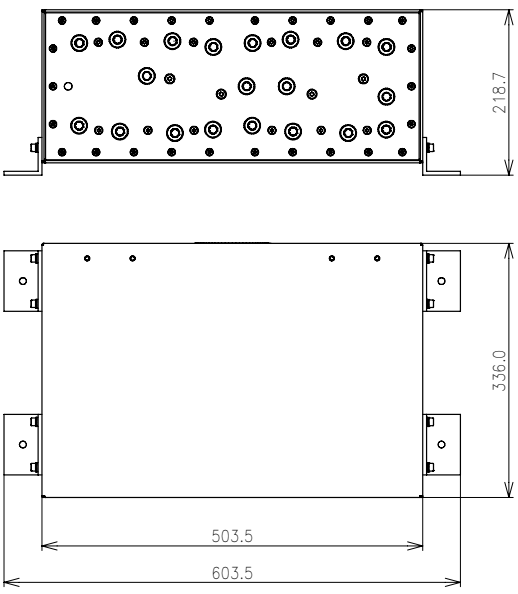
Multiband Combining Systems

GSM-R

16 : 4 Combiners
Outdoor Box

Part Number	BN 610647	BN 572662
Version (input : output)	16 : 4 (4 inputs per band)	
Frequency range Band 1 Band 2 Band 3 Band 4	 694 - 960 MHz 1710 - 1880 MHz 1920 - 2170 MHz 2500 - 2690 MHz	
Insertion loss Band 1 Band 2 Band 3 Band 4	 6.5 dB ± 0.90 dB 6.7 dB ± 0.60 dB 6.8 dB ± 0.60 dB 6.6 dB ± 0.60 dB	
Isolation interband	≥ 50 dB	
Isolation intraband	≥ 30 dB	
Passive intermodulation (IM3) @ 2 x 20 W	≤ -155 dBc; typ. ≤ -160 dBc	
VSWR	≤ 1.40; typ. ≤ 1.25	
Power rating	≤ 125 W	
Connectors	7-16 female	4.3-10 female
Temperature range	-40 °C … +65 °C	
Degree of protection (mated)	IP 65	
Weight	~ 32 kg	
Mounting brackets	Included	

BN 572662



Multiband Combining Systems

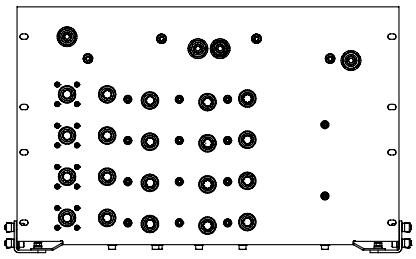
20 : 4 Combiners
Indoor Shelf for 19" Rack or Wall Mounting

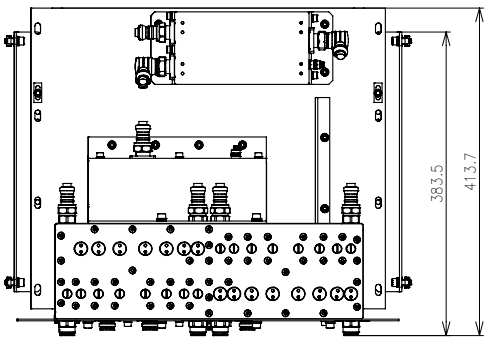
GSM-R

3800 MHz

Part Number	BN 572690
Version (input : output)	20 : 4 (5 inputs per band)
Frequency range Band 1 Band 2 Band 3 Band 4 Band 5	 694 - 960 MHz 1710 - 1880 MHz 1920 - 2170 MHz 2500 - 2690 MHz 3300 - 3800 MHz
Insertion loss	7.20 dB ± 1.0 dB
Isolation interband	≥ 50 dB
Isolation intraband	≥ 30 dB
Passive intermodulation (IM3) @ 2 x 20 W	≤ -155 dBc; typ. ≤ -160 dBc
VSWR	≤ 1.40; typ. ≤ 1.25
Power rating	Band 1 – 4 ≤ 75 W Band 5 ≤ 60 W
Connectors	4.3-10 female
Temperature range	-40 °C … +60 °C
Degree of protection (mated)	IP 65
Weight	~ 60 kg
Mounting material	Included

BN 572690





Sameband Combiners

Sameband combiners enable antenna and feeder sharing for two or more base stations in the same frequency band. For this purpose, the transmitted and received signals of base stations are separated and the corresponding signals are combined via band-pass filter and star points. SPINNER sameband combiners stand out for low insertion loss, high isolation between frequency blocks and extremely low intermodulation.

We offer a wide range of sameband combiners for all mobile networks ranging from LTE700 to LTE2600. The bandwidths can be tuned between 4 and 20 MHz. Sameband combiners with a larger number of circuits (cavities) grant a greater isolation within the stopbands. In conjunction with this the passband attenuation increases. Please let us know your requirements so we can suggest the best possible solution.

All sameband combiners need to be customized to individual customer needs. The products for which this service is required are designated in our catalog by the logo shown below.

Customized

The technical data given for the insertion loss, isolation and VSWR depend on the individual tuning. Before you place your order, we send you a binding quotation indicating the specified technical data and measurement curves. To request a quotation for customized filters for your applications, please contact us at info@spinner-group.com.

Sameband Combiners

LTE700 | LTE800 | GSM900

Customized

Part Number	BN 570531	BN 570561	BN 570627	BN 570630	BN 570662	BN 570673	BN 570626	BN 570631	BN 570663	BN 570643
Version	Single	Double	Single	Double	Single	Double	Single	Double	Single	Double
Cavities	4				6		4		6	
Frequency range	LTE700		LTE800				GSM900			
Insertion loss	Depending on tuning									
Isolation	Depending on tuning									
Passive intermodulation (IM3) @ 2 x 20 W	≤ -150 dBc; typ. ≤ -160 dBc									
VSWR	Depending on tuning									
Power rating	≤ 100 W									
Connectors	7-16 female									
Temperature range	-5 °C … +65 °C									
Degree of protection (mated)	IP 65									
Weight	~ 6.7 kg	~ 13.0 kg	~ 6.7 kg	~ 13.0 kg	~ 9.2 kg	~ 20.0 kg	~ 6.7 kg	~ 13.0 kg	~ 9.2 kg	~ 20.0 kg
Mounting brackets	Included									

Further sameband combiners on request.

GSM1800 | UMTS | LTE2600

Customized

Part Number	BN 570611	BN 570614	BN 570665	BN 570644	BN 570612	BN 570615	BN 570613	BN 570616	BN 570752	BN 570753
Version	Single	Double	Single	Double	Single	Double	Single	Double	Single	Double
Cavities	4		6		4				6	
Frequency range	GSM1800				UMTS		LTE2600		LTE3800	
Insertion loss	Depending on tuning									
Isolation	Depending on tuning									
Passive intermodulation (IM3) @ 2 x 20 W	≤ -150 dBc; typ. ≤ -160 dBc									
VSWR	Depending on tuning									
Power rating	≤ 100 W									
Connectors	7-16 female									
Temperature range	-5 °C … +65 °C									
Degree of protection (mated)	IP 65									
Weight	~ 6.3 kg	~ 13.0 kg	~ 9.2 kg	~ 20.0 kg	~ 6.7 kg	~ 13.0 kg	~ 6.7 kg	~ 13.0 kg	~ 6.0 kg	~ 12.0 kg
Mounting brackets	Included									

Further sameband combiners on request.

Mobile Network Combining System (MNCS®)

The Mobile Network Combining System (MNCS®) from SPINNER is an In-Building solution for combining a large number of bands and carrier frequencies of one or more operators and distributing them via a Distributed Antenna System (DAS).

It is especially useful whenever it is not possible to achieve a satisfactory solution by linking together conventional multiband or sameband combiners. This applies especially if:

- The carrier frequencies within a band are very close together.
- The isolation requirement is very high (> 50 dB).
- It is necessary to maximize bandwidth use.
- Multiple operators will share the same In-Building solution.

If at least one of these statements holds true, MNCS® is ideal.

What Exactly Is MNCS®?

Every SPINNER MNCS® system is a custom-configured In-Building/DAS solution in which a large number of frequency bands and carrier frequencies are combined. It has an appropriate number of outputs for the sectors that are fed into it.

The MNCS® doesn't simply combine an array of individual components on a rack. Instead, it is a solution in which the components are specially selected, assembled and connected to meet the customer's particular needs. The components are planned and harmonized with utmost care to make sure that you benefit from the greatest possible bandwidth and isolation with minimal susceptibility to interference. The likelihood of interference increases greatly as the number of frequencies used in a system rises (see page 6). To manage this, we only use components with extremely low intermodulation and design the transitions and wiring to minimize PIM. This approach enables us to develop virtually interference-free systems with an intermodulation value below -160 dBc.

Who Uses MNCS®?

The uses for MNCS® systems are diverse, ranging from simple single-operator campus solutions all the way to complex multi-operator systems at airports, fairgrounds, subway and rapid transit stations with tunnels, governmental and office buildings, stadiums, hotels, shopping malls etc. Every facility in which many people use mobile services within a clearly bounded space is a potential candidate for a SPINNER MNCS® In-Building solution. It doesn't matter whether the system is planned by one or multiple operators. If there is more than one, SPINNER is happy to assume the role of coordinator during the planning phase in order to reconcile their needs.

Small indoor MNCS® rack

Mobile Network Combining System (MNCS®)

The Benefits of SPINNER's MNCS®

At SPINNER we are committed to supplying technical solutions with the best possible performance. This naturally also applies to the SPINNER MNCS® system. When planning and bidding for In-Building projects, many criteria and factors need to be taken into account to choose the most appropriate solution. The possibilities cover a wide range, from a simple multiband combining system all the way to extremely complex setups. Every project and implementation is different and has to be very thoughtfully considered on its own merits in order to weigh the pros and cons of the available alternatives. Based on experience gained from more than 1000 successfully completed In-Building projects, you can count on a SPINNER system to deliver the following benefits:

We would be very happy to have the opportunity to help you successfully implement an In-Building project. In order to make you a nonbinding offer with no further obligation on your part, we require information on all planned frequency bands and carriers and the structure of the antenna distribution system for all involved operators.

Benefits:

- Cost savings, since no expensive active components are used.
- No OPEX, because the solution is exclusively passive and can dispense with cooling systems.
- No follow-up CAPEX for operation, which can be the case with active systems when components fail or are discontinued.
- Low space requirements in equipment rooms.
- Unproblematic outdoor setup installation, even in the harshest climatic conditions, since all components are suitable for outside use.
- Flexible scalability, since the system is modular and easy to expand at any time. This also applies to adding new bands, carriers and operators.
- Low installation costs, since the system is supplied completely assembled and tested.

Small wall-mount MNCS® racks

Midsized indoor MNCS® system

Large outdoor MNCS® system on a building roof

Products for Distributed Antenna System (DAS)

It is becoming increasingly important to ensure good mobile connectivity inside complexes such as office buildings, shopping malls, stadiums, airports and so on. Multiple network operators and frequencies have to be combined, distributed, and broadcast by appropriate antennas in the buildings.

Covering all bands

A wide range of requirements have to be met for this. The communication standards and systems involved can extend from TETRA across GSM, UMTS, PCS/AWS and LTE to seamless Wi-Fi. Depending on local conditions, a variety of different components may have to be used for branching signals from the trunk line to the antennas.

Whenever many frequencies are carried by a shared cable, there is a risk of passive intermodulation (see page 6). The main drawbacks of this are, on the one hand, considerably greater installation and/or maintenance costs to cope with transmission problems and, on the other, reduced bandwidth use, which translates into a less than optimal return on the investment.

SPINNER avoids these problems by developing high-quality, low-intermodulation components. The following products, some of which boast a very large bandwidth, are available for distributing signals:

Symmetrical splitters (power splitters) divide an incoming signal into several equal parts.

Asymmetrical splitters (taps) divide an incoming signal into parts of different sizes based on fixed proportions.

Directional couplers make it possible to split an incoming signal into two equal or unequal parts with excellent isolation. A directional coupler can also be used in reverse to mix two incoming signals, even if they have different frequencies (it is then referred to as a hybrid coupler).

Distributing Products

Frequency Range in MHz													
	350 - 475	694 - 788	791 - 862	876 - 960	1427 - 1518	1710 - 1880	1850 - 1990	1920 - 2170	2300 - 2400	2400 - 2500	2496 - 2690	3300 - 3800	
Examples													
	TETRA PMR	LTE700	LTE800	LTE900 GSM900 GSM-R	LTE1500 L-Band	GSM1800 LTE1800 AWS RX	PCS1900	UMTS AWS TX	LTE2300	WLAN	LTE2500 LTE2600	5G	

Product Style – Connectors													Page
Symmetric Splitters													
Star - 7-16	330 - 2700 MHz												138
Star - 4.3-10	330 - 2700 MHz												139
Star - N	330 - 2700 MHz												140
Star - 4.3-10	350 - 3800 MHz												141
In line - 4.3-10		694 - 3800 MHz											142
In line - 4.3-10		694 - 2700 MHz											143
In line - N		694 - 2700 MHz											143
Star - 7-16		694 - 3800 MHz											144
Star - 4.3-10		694 - 3800 MHz											145
Star - N		694 - 3800 MHz											146
Star - 7-16				870 - 960 MHz									147
Asymmetric Splitters													
Tapper - 7-16	170 - 1500 MHz					1710 - 2700 MHz							148
Tapper - 4.3-10	170 - 1500 MHz					1710 - 2700 MHz							149
Tapper - N	170 - 1500 MHz					1710 - 2700 MHz							150
Tapper - 4.3-10	380 - 3800 MHz												151
Coupler - 7-16	350 - 3800 MHz												152
Coupler - 4.3-10	350 - 3800 MHz												153
Tapper - 4.3-10		690 - 2170 MHz							2300 - 3800 MHz				154
Coupler - 7-16		694 - 2700 MHz											155
Coupler - 4.3-10		694 - 2700 MHz											156
Coupler- N		694 - 2700 MHz											157
Directional Couplers													
H - 7-16	330 - 520 MHz												158
X - 7-16	350 - 2700 MHz												159
X - 4.3-10	350 - 2700 MHz												159
X - N	350 - 2700 MHz												159
X - 7-16		694 - 3800 MHz											160
X - 4.3-10		694 - 3800 MHz											160
H - 7-16		694 - 2700 MHz											161
H - 4.3-10		694 - 2700 MHz											162
H - N		694 - 2700 MHz											161
X - 7-16		694 - 2700 MHz											161 164
H - 4.3-10 (unidir.)		694 - 2700 MHz											163
X - 4.3-10		694 - 2700 MHz											162 164
X - N		694 - 2700 MHz											164

Symmetric Splitters

PMR GSM-R 1500 MHz

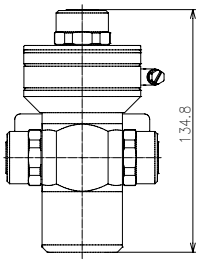
330 - 2700 MHz

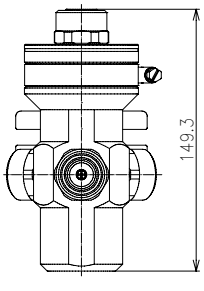
Part Number	BN 818289	BN 818290	BN 818291
Version (outputs)	2	3	4
Frequency range	330 - 2700 MHz		
Insertion loss	≤ 3.2 dB	≤ 5.0 dB	≤ 6.5 dB
Passive intermodulation (IM3) @ 2 x 20 W	≤ -160 dBc		
VSWR	≤ 1.2		
Power rating	≤ 450 W		
Connectors	7-16 female		
Temperature range	-40 °C ... +75 °C		
Degree of protection (mated)	IP68		
Weight	~ 1.1 kg	~ 1.1 kg	~ 1.2 kg
Mounting brackets	Included		

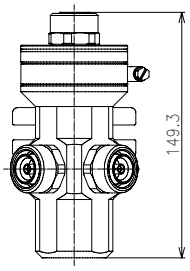
BN 818289

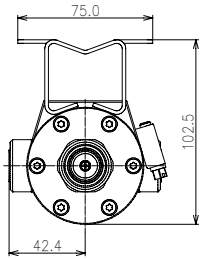
BN 818290

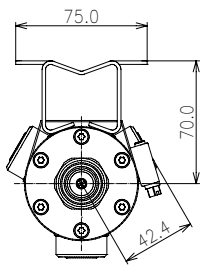
BN 818291

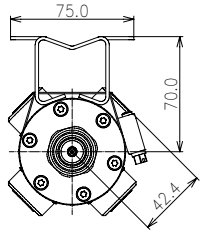












Symmetric Splitters

PMR GSM-R 1500 MHz

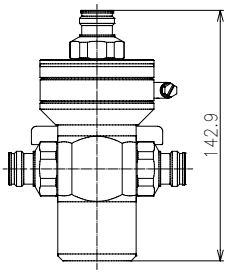
330 - 2700 MHz

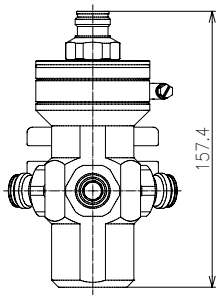
Part Number	BN 818292	BN 818293	BN 818294
Version (outputs)	2	3	4
Frequency range	330 - 2700 MHz		
Insertion loss	≤ 3.2 dB	≤ 5.0 dB	≤ 6.5 dB
Passive intermodulation (IM3) @ 2 x 20 W	≤ -160 dBc		
VSWR	≤ 1.2		
Power rating	≤ 450 W		
Connectors	4.3 - 10 female		
Temperature range	-40 °C ... +75 °C		
Degree of protection (mated)	IP68		
Weight	~ 1.1 kg	~ 1.1 kg	~ 1.2 kg
Mounting brackets	Included		

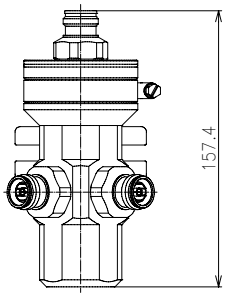
BN 818292

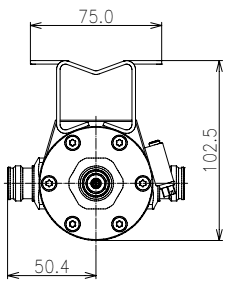
BN 818293

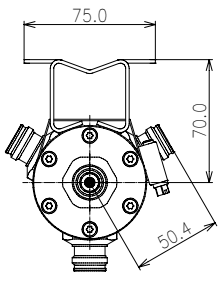
BN 818294

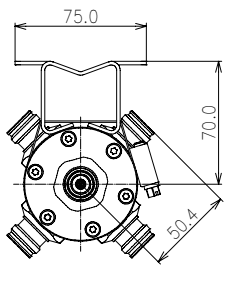












Symmetric Splitters

PMR GSM-R 1500 MHz

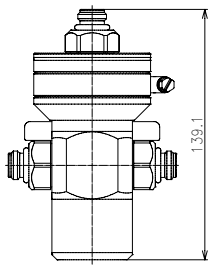
330 - 2700 MHz

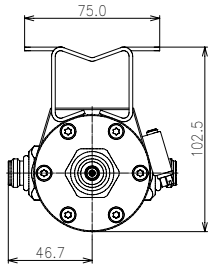
Part Number	BN 923089	BN 923090	BN 923091
Version (outputs)	2	3	4
Frequency range	330 - 2700 MHz		
Insertion loss	≤ 3.2 dB	≤ 5.0 dB	≤ 6.5 dB
Passive intermodulation (IM3) @ 2 x 20 W	≤ -160 dBc		
VSWR	≤ 1.2		
Power rating	≤ 250 W		
Connectors	N female		
Temperature range	-40 °C ... +75 °C		
Degree of protection (mated)	IP68		
Weight	~ 1.1 kg	~ 1.1 kg	~ 1.2 kg
Mounting brackets	Included		

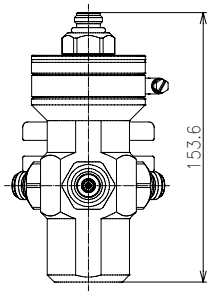
BN 923089

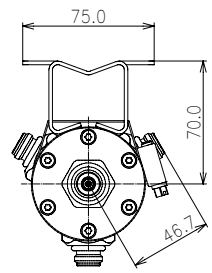
BN 923090

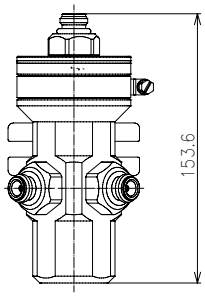
BN 923091

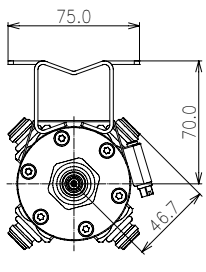












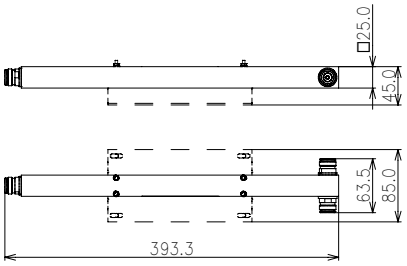
Symmetric Splitters

PMR GSM-R 1500 MHz 3800 MHz

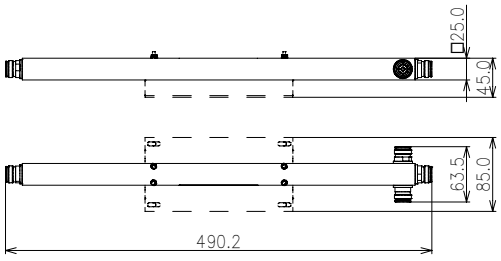
350 - 3800 MHz

Part Number	BN 818269	BN 818273	BN 818274
Version (outputs)	2	3	4
Frequency range	350 - 3800 MHz		
Insertion loss	≤ 3.3 dB	≤ 5.2 dB	≤ 6.6 dB
Passive intermodulation (IM3) @ 2 x 20 W	≤ -155 dBc; typ. ≤ -160 dBc		
VSWR	≤ 1.25		≤ 1.35
Power rating	≤ 300 W		
Connectors	4.3-10 female		
Temperature range	-30 °C ... +65 °C		
Degree of protection (mated)	IP 65		
Weight	~ 1.0 kg	~ 1.0 kg	~ 1.1 kg
Mounting brackets	**BN B30342**		

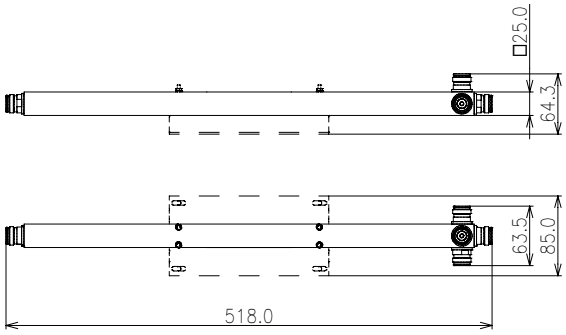
BN 818269



BN 818273



BN 818274



Symmetric Splitters

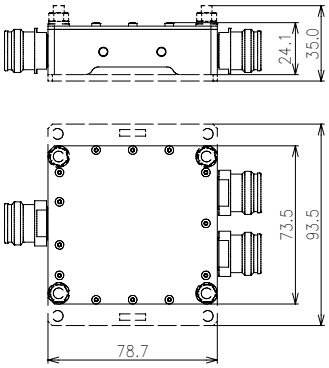
694 - 3800 MHz

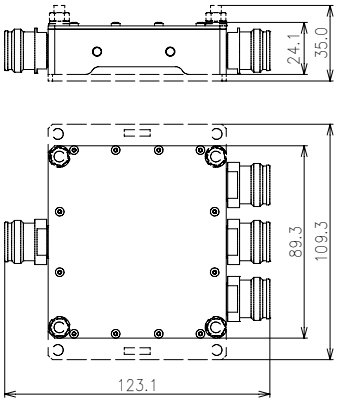
Part Number	BN 433003	BN 433004	BN 433005
Version (outputs)	2	3	4
Frequency range	694 - 3800 MHz		
Insertion loss	≤ 3.1 dB	≤ 4.8 dB	≤ 6.2 dB
Passive intermodulation (IM3) @ 2 x 20 W	≤ -155 dBc; typ. ≤ -160 dBc		
VSWR	≤ 1.3 @ 694 - 2700 MHz ≤ 1.4 @ 2700 - 3800 MHz		
Power rating	≤ 300 W		
Connectors	4.3-10 female		
Temperature range	-25 °C ... +55 °C		
Degree of protection (mated)	IP 65		
Weight	~ 0.4 kg	~ 0.5 kg	~ 0.7 kg
Mounting brackets	**BN B26441**	**BN B26443**	**BN B26444**

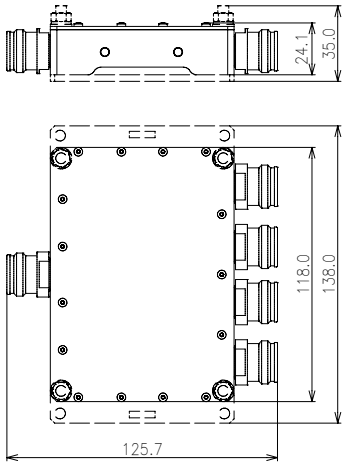
BN 433003

BN 433004

BN 433005







Symmetric Splitters

GSM-R 1500 MHz

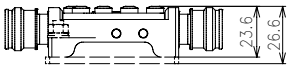
694 - 2700 MHz

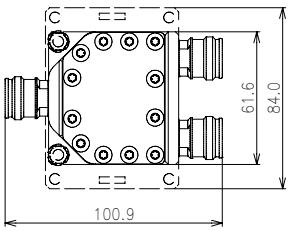
Part Number	BN 433000	BN 433001	BN 433002	BN 923067	BN 923068	BN 923069
Version (outputs)	2	3	4	2	3	4
Frequency range	694 - 2700 MHz					
Insertion loss	≤ 3.1 dB	≤ 4.8 dB	≤ 6.1 dB	≤ 3.1 dB	≤ 4.8 dB	≤ 6.1 dB
Passive intermodulation (IM3) @ 2 x 20 W	≤ -160 dBc; typ. ≤ -165 dBc					
VSWR	≤ 1.3					
Power rating	≤ 300 W					
Connectors	4.3-10 female			N female		
Temperature range	-25 °C ... +55 °C					
Degree of protection (mated)	IP 62					
Weight	~ 0.3 kg	~ 0.4 kg	~ 0.5 kg	~ 0.2 kg	~ 0.3 kg	~ 0.4 kg
Mounting brackets	BN B23655	BN B23656	BN B23657	BN B23655	BN B23656	BN B23657

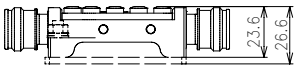
BN 433000

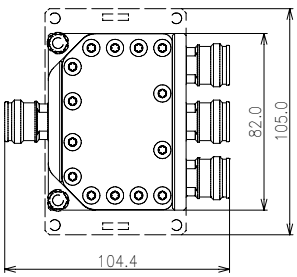
BN 433001

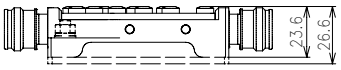
BN 433002

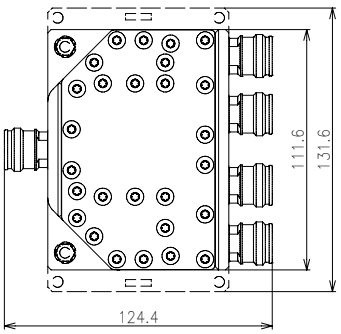




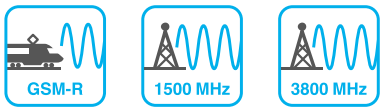








Symmetric Splitters



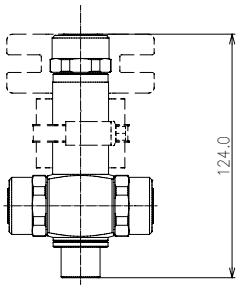
694 - 3800 MHz

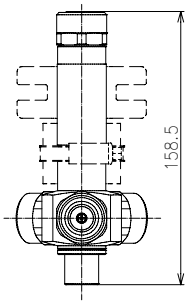
Part Number	BN 818263	BN 818264	BN 818265
Version (outputs)	2	3	4
Frequency range	694 - 3800 MHz		
Insertion loss	≤ 3.2 dB	≤ 5.0 dB	≤ 6.2 dB
Passive intermodulation (IM3) @ 2 x 20 W	≤ -160 dBc; typ. ≤ -165 dBc		
VSWR	≤ 1.2		
Power rating	≤ 500 W		
Connectors	7-16 female		
Temperature range	-40 °C ... +85 °C		
Degree of protection (mated)	IP 68		
Weight	~ 0.4 kg	~ 0.5 kg	~ 0.6 kg
Mounting brackets	**BN B07691**		**BN B15701**

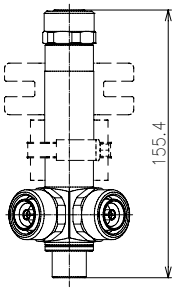
BN 818263

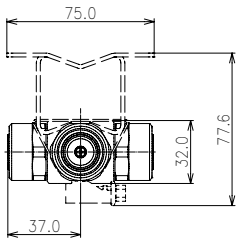
BN 818264

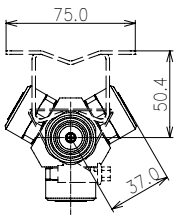
BN 818265

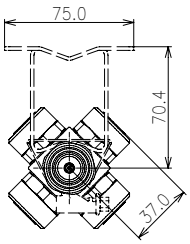












Symmetric Splitters

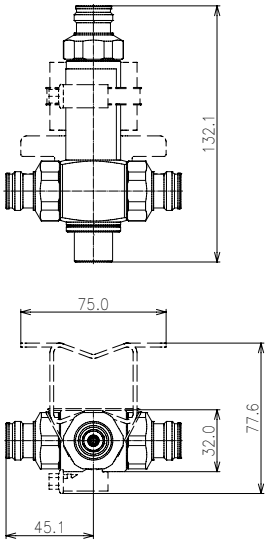
694 - 3800 MHz

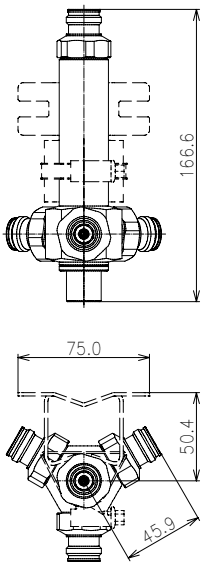
Part Number	BN 818266	BN 818267	BN 818268
Version (outputs)	2	3	4
Frequency range	694 - 3800 MHz		
Insertion loss	≤ 3.2 dB	≤ 5.0 dB	≤ 6.2 dB
Passive intermodulation (IM3) @ 2 x 20 W	≤ -160 dBc; typ. ≤ -165 dBc		
VSWR	≤ 1.2		
Power rating	≤ 500 W		
Connectors	4.3-10 female		
Temperature range	-40 °C ... +85 °C		
Degree of protection (mated)	IP 68		
Weight	~ 0.4 kg	~ 0.5 kg	~ 0.6 kg
Mounting brackets	**BN B07691**		**BN B15701**

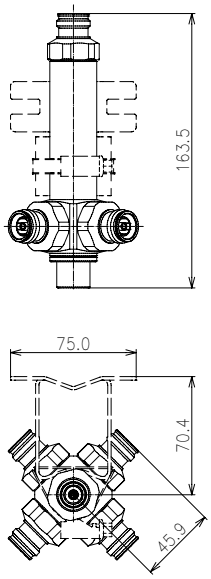
BN 818266

BN 818267

BN 818268







Symmetric Splitters

GSM-R 1500 MHz 3800 MHz

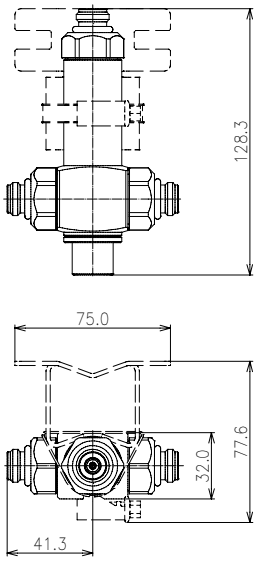
694 - 3800 MHz

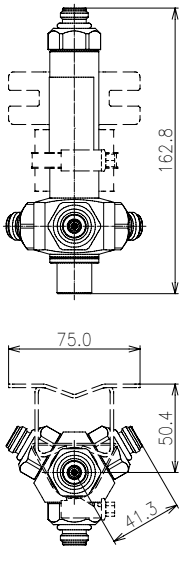
Part Number	BN 923063	BN 923064	BN 923065
Version (outputs)	2	3	4
Frequency range	694 - 3800 MHz		
Insertion loss	≤ 3.2 dB	≤ 5.0 dB	≤ 6.2 dB
Passive intermodulation (IM3) @ 2 x 20 W	≤ -160 dBc; typ. ≤ -165 dBc		
VSWR	≤ 1.2		
Power rating	≤ 250 W		
Connectors	N female		
Temperature range	-40 °C ... +85 °C		
Degree of protection (mated)	IP 68		
Weight	~ 0.4 kg	~ 0.5 kg	~ 0.6 kg
Mounting brackets	**BN B07691**		**BN B15701**

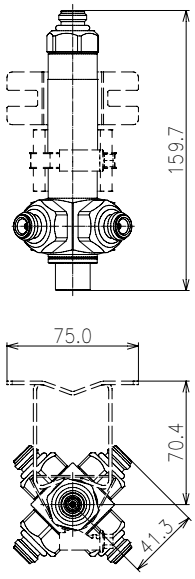
BN 923063

BN 923064

BN 923065







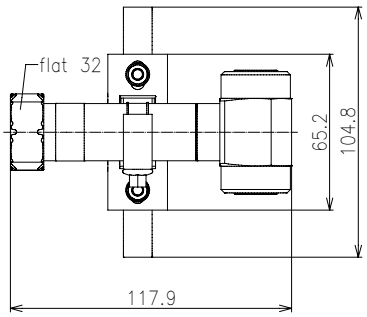
Symmetric Splitters

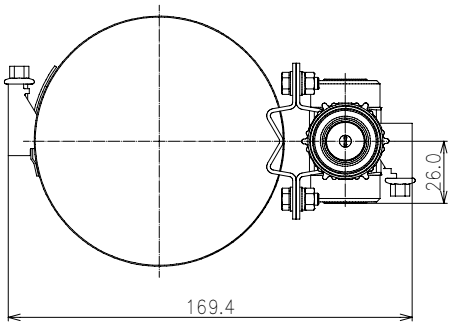
GSM-R

870 - 960 MHz

Part Number	BN 818257
Version (outputs)	2
Frequency range	870 - 960 MHz
Insertion loss	≤ 3.2 dB
Passive intermodulation (IM3) @ 2 x 20 W	≤ -150 dBc; typ. ≤ -160 dBc
VSWR	≤ 1.1
Power rating	≤ 800 W
Connectors	7-16 male / 7-16 female
Temperature range	-40 °C ... +55 °C
Degree of protection (mated)	IP 65
Weight	~ 0.6 kg
Mounting brackets	Included

BN 818257





Asymmetric Splitters

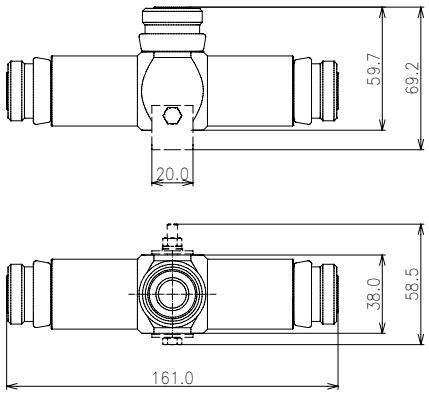
PMR GSM-R 1500 MHz

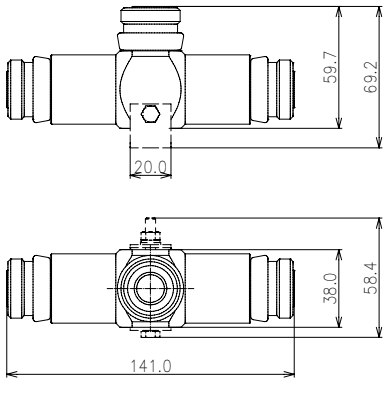
170 - 2700 MHz

Part Number	BN 818242	BN 818243	BN 818244	BN 818245	BN 818246	BN 818299	BN 818248	BN 818249
Version (splitting ratio) Secondary line Main line	1/4 3/4	1/5 4/5	1/6 5/6	1/10 9/10	1/20 19/20	1/30 29/30	1/100 99/100	1/1000 999/1000
Frequency range	170 – 1500 MHz 1710 – 2700 MHz							
Insertion loss Secondary line	6.0 dB	7.0 dB	8.0 dB	10.0 dB	13.0 dB	15.0 dB	20.0 dB	30.0 dB
Passive intermodulation (IM3) @ 2 x 20 W	≤ -155 dBc; typ. ≤ -160 dBc							
VSWR	≤ 1.45	≤ 1.35		≤ 1.2				
Power rating	≤ 500 W							
Connectors	7-16 female							
Temperature range	-40 °C ... +70 °C							
Degree of protection (mated)	IP 68							
Weight	~ 0.6 kg							
Mounting brackets	**BN B09499**							

BN 818242 / BN 818243 / BN 818244

BN 818245 / BN 818246 / BN 818248 / BN 818249 / BN 818299





Asymmetric Splitters

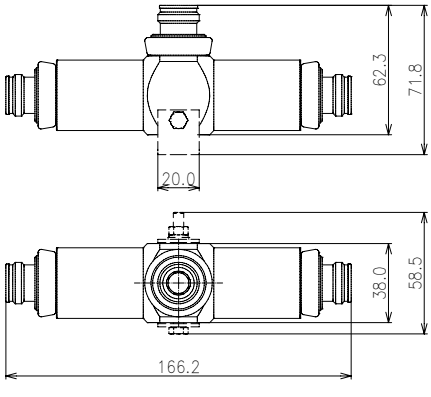
PMR GSM-R 1500 MHz

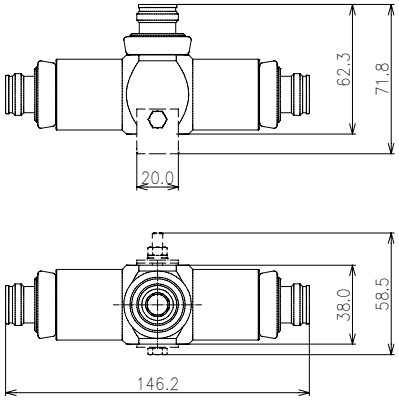
170 - 2700 MHz

Part Number	BN 818342	BN 818343	BN 818344	BN 818345	BN 818346	BN 818399	BN 818348	BN 818349
Version (splitting ratio) Secondary line Main line	1/4 3/4	1/5 4/5	1/6 5/6	1/10 9/10	1/20 19/20	1/30 29/30	1/100 99/100	1/1000 999/1000
Frequency range	170 – 1500 MHz 1710 – 2700 MHz							
Insertion loss Secondary line	6.0 dB	7.0 dB	8.0 dB	10.0 dB	13.0 dB	15.0 dB	20.0 dB	30.0 dB
Passive intermodulation (IM3) @ 2 x 20 W	≤ -160 dBc; typ. ≤ -165 dBc							
VSWR	≤ 1.45	≤ 1.35		≤ 1.2				
Power rating	≤ 500 W							
Connectors	4.3-10 female							
Temperature range	-40 °C ... +70 °C							
Degree of protection (mated)	IP 68							
Weight	~ 0.6 kg							
Mounting brackets	**BN B09499**							

BN 818342 / BN 818343 / BN 818344

BN 818345 / BN 818346 / BN 818348 / BN 818349 / BN 818399





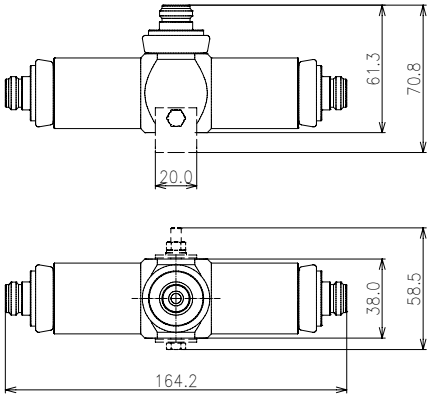
Asymmetric Splitters

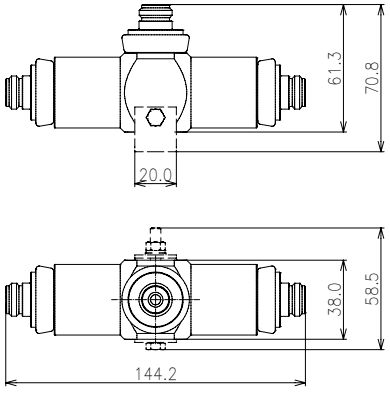
170 - 2700 MHz

Part Number	BN 923042	BN 923043	BN 923044	BN 923045	BN 923046	BN 923099	BN 923048	BN 923049
Version (splitting ratio) Secondary line Main line	1/4 3/4	1/5 4/5	1/6 5/6	1/10 9/10	1/20 19/20	1/30 29/30	1/100 99/100	1/1000 999/1000
Frequency range	170 – 1500 MHz 1710 – 2700 MHz							
Insertion loss Secondary line	6.0 dB	7.0 dB	8.0 dB	10.0 dB	13.0 dB	15.0 dB	20.0 dB	30.0 dB
Passive intermodulation (IM3) @ 2 x 20 W	≤ -150 dBc; typ. ≤ -155 dBc							
VSWR	≤ 1.45	≤ 1.35		≤ 1.2				
Power rating	≤ 250 W							
Connectors	N female							
Temperature range	-40 °C ... +70 °C							
Degree of protection (mated)	IP 68							
Weight	~ 0.6 kg							
Mounting brackets	**BN B09499**							

BN 923042 / BN 923043 / BN 923044

BN 923045 / BN 923046 / BN 923048 / BN 923049 / BN 923099



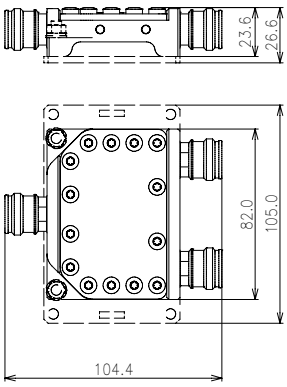


Asymmetric Splitters

380 - 3800 MHz

Part Number	BN 818458	BN 818459	BN 818460	BN 818461	BN 818462	BN 818463	BN 818464	BN 818465
Version (splitting ratio) Secondary line Main line	1/3 2/3	1/4 3/4	1/5 4/5	1/6 5/6	1/10 9/10	1/20 19/20	1/30 29/30	1/100 99/100
Frequency range	380 – 3800 MHz							
Insertion loss Secondary line	4.8 dB	6 dB	7 dB	8 dB	10 dB	13 dB	15 dB	20 dB
Passive intermodulation (IM3) @ 2 x 20 W	≤ -155 dBc; typ. ≤ -160 dBc							
VSWR	≤ 1.3							
Power rating	≤ 300 W							
Connectors	4.3 -10 female							
Temperature range	-40 °C … +55 °C							
Degree of protection (mated)	IP 65							
Weight	~ 300 g							
Mounting brackets	**BN B23656**							

BN 818459



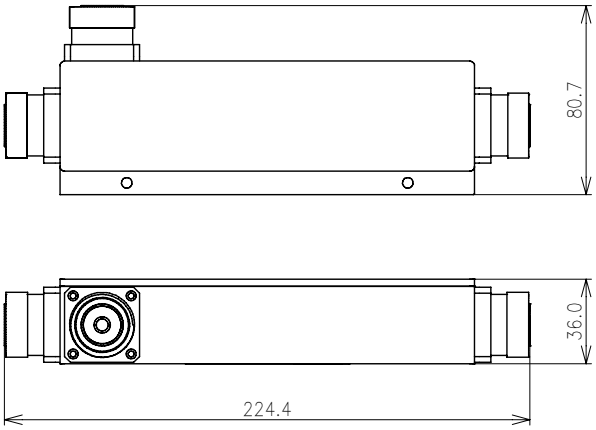
Asymmetric Splitters

PMR GSM-R 1500 MHz 3800 MHz

350 - 3800 MHz

Part Number	BN 818440	BN 818441	BN 818442	BN 818443	BN 818444	BN 818445	BN 818446	BN 818447	BN 818448
Version (splitting ratio) Secondary line Main line	1/3 2/3	1/4 3/4	1/5 4/5	1/6 5/6	1/10 9/10	1/20 19/20	1/30 29/30	1/100 99/100	1/1000 999/1000
Frequency range	350 – 3800 MHz								
Insertion loss Secondary line	4.8 dB	6 dB	7 dB	8 dB	10 dB	13 dB	15 dB	20 dB	30 dB
Isolation	≥ 23 dB	≥ 24 dB	≥ 25 dB	≥ 26 dB	≥ 28 dB	≥ 30 dB	≥ 32 dB	≥ 35 dB	≥ 45 dB
Passive intermodulation (IM3) @ 2 x 20 W	≤ -155 dBc; typ. ≤ -160 dBc								
VSWR	≤ 1.3								
Power rating	≤ 500 W								
Connectors	7-16 female								
Temperature range	-35 °C … +75 °C								
Degree of protection (mated)	IP 65								
Weight	~ 880 g								
Mounting brackets	Included								

BN 818443

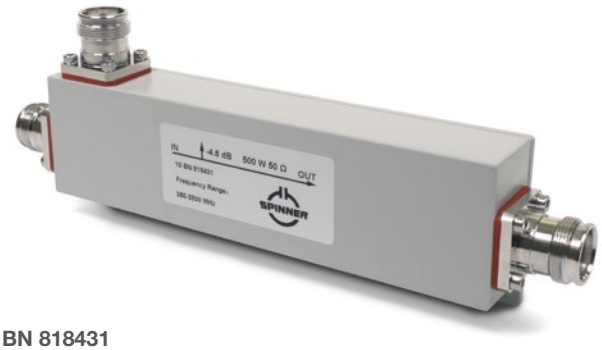


Asymmetric Splitters

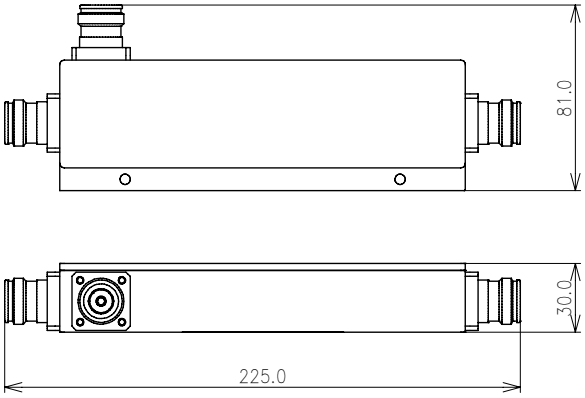
PMR GSM-R 1500 MHz 3800 MHz

350 - 3800 MHz

Part Number	BN 818431	BN 818432	BN 818433	BN 818434	BN 818435	BN 818436	BN 818437	BN 818438	BN 818439
Version (splitting ratio) Secondary line Main line	1/3 2/3	1/4 3/4	1/5 4/5	1/6 5/6	1/10 9/10	1/20 19/20	1/30 29/30	1/100 99/100	1/1000 999/1000
Frequency range	350 – 3800 MHz								
Insertion loss Secondary line	4.8 dB	6 dB	7 dB	8 dB	10 dB	13 dB	15 dB	20 dB	30 dB
Isolation	≥ 23 dB	≥ 24 dB	≥ 25 dB	≥ 26 dB	≥ 28 dB	≥ 30 dB	≥ 32 dB	≥ 35 dB	≥ 45 dB
Passive intermodulation (IM3) @ 2 x 20 W	≤ -155 dBc; typ. ≤ -160 dBc								
VSWR	≤ 1.3								
Power rating	≤ 400 W								
Connectors	4.3 -10 female								
Temperature range	-35 °C … +75 °C								
Degree of protection (mated)	IP 65								
Weight	~ 680 g								
Mounting brackets	Included								



BN 818431



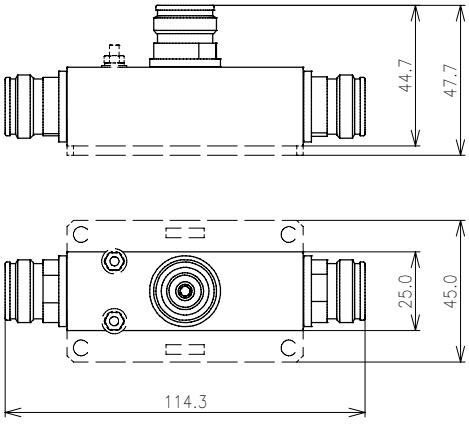
Asymmetric Splitters

GSM-R 1500 MHz 3800 MHz

690 - 3800 MHz

Part Number	BN 818449	BN 818450	BN 818451	BN 818452	BN 818453	BN 818454	BN 818455	BN 818456	BN 818457
Version (splitting ratio) Secondary line Main line	1/3 2/3	1/4 3/4	1/5 4/5	1/6 5/6	11/100 89/100	1/10 9/10	1/20 19/20	1/30 29/30	1/100 99/100
Frequency range	690 – 2170 MHz 2300 – 3800 MHz								
Insertion loss Secondary line	4.8 dB	6 dB	7 dB	8 dB	9 dB	10 dB	13 dB	15 dB	20 dB
Passive intermodulation (IM3) @ 2 x 20 W	≤ -153 dBc								
VSWR	≤ 1.3								
Power rating	≤ 300 W								
Connectors	4.3-10 female								
Temperature range	-30 °C … +75 °C								
Degree of protection (mated)	IP 65								
Weight	~ 220 g								
Mounting brackets	**BN B30578**								

BN 818449

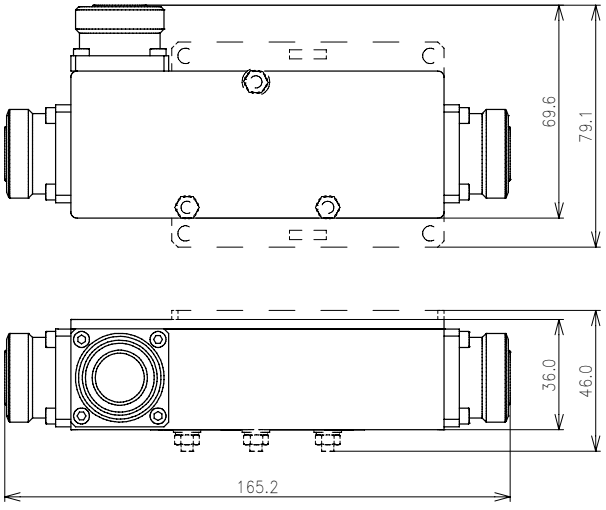


Asymmetric Splitters

694 - 2700 MHz

Part Number	BN 818355	BN 818356	BN 818357	BN 818362	BN 818358	BN 818366	BN 818359	BN 818360	BN 818361
Version (splitting ratio) Secondary line Main line	1/3 2/3	1/4 3/4	1/5 4/5	1/6 5/6	1/10 9/10	1/20 19/20	1/30 29/30	1/100 99/100	1/1000 999/1000
Frequency range	694 - 2700 MHz								
Insertion loss Secondary line	4.8 dB	6 dB	7 dB	8 dB	10 dB	13 dB	15 dB	20 dB	30 dB
Isolation	≥ 25 dB	≥ 26 dB	≥ 27 dB	≥ 28 dB	≥ 30 dB	≥ 33 dB	≥ 35 dB	≥ 40 dB	≥ 45 dB
Passive intermodulation (IM3) @ 2 x 20 W	≤ -155 dBc; typ. ≤ -160 dBc								
VSWR	≤ 1.25								
Power rating	≤ 300 W								
Connectors	7-16 female								
Temperature range	-40 °C ... +80 °C								
Degree of protection (mated)	IP 65								
Weight	~ 660 g								
Mounting brackets	**BN B26399**								

BN 818355

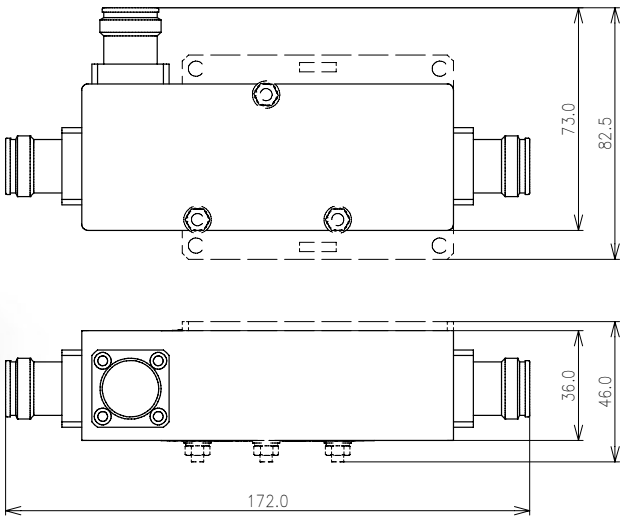


Asymmetric Splitters

694 - 2700 MHz

Part Number	BN 923014	BN 923001	BN 923003	BN 923006	BN 923007	BN 923008	BN 923009	BN 923012	BN 923013
Version (splitting ratio) Secondary line Main line	1/3 2/3	1/4 3/4	1/5 4/5	1/6 5/6	1/10 9/10	1/20 19/20	1/30 29/30	1/100 99/100	1/1000 999/1000
Frequency range	694 - 2700 MHz								
Insertion loss Secondary line	4.8 dB	6 dB	7 dB	8 dB	10 dB	13 dB	15 dB	20 dB	30 dB
Isolation	≥ 25 dB	≥ 26 dB	≥ 27 dB	≥ 28 dB	≥ 30 dB	≥ 33 dB	≥ 35 dB	≥ 40 dB	≥ 45 dB
Passive intermodulation (IM3) @ 2 x 20 W	≤ -155 dBc; typ. ≤ -160 dBc								
VSWR	≤ 1.25								
Power rating	≤ 300 W								
Connectors	4.3-10 female								
Temperature range	-40 °C ... +80 °C								
Degree of protection (mated)	IP 65								
Weight	~ 550 g								
Mounting brackets	**BN B26399**								

BN 923014

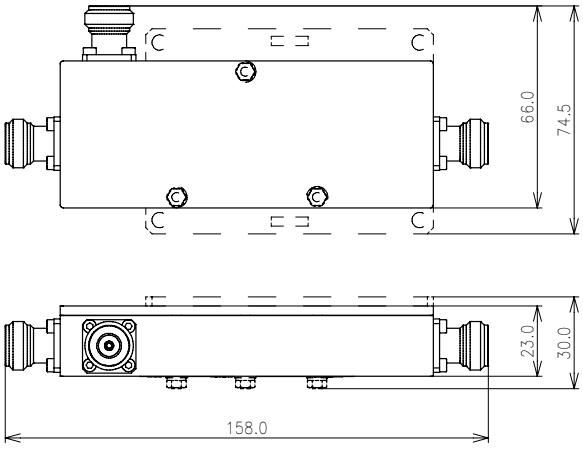


Asymmetric Splitters

694 - 2700 MHz

Part Number	BN 923071	BN 923056	BN 923057	BN 923062	BN 923058	BN 923066	BN 923059	BN 923060	BN 923061
Version (splitting ratio) Secondary line Main line	1/3 2/3	1/4 3/4	1/5 4/5	1/6 5/6	1/10 9/10	1/20 19/20	1/30 29/30	1/100 99/100	1/1000 999/1000
Frequency range	694 - 2700 MHz								
Insertion loss Secondary line	4.8 dB	6 dB	7 dB	8 dB	10 dB	13 dB	15 dB	20 dB	30 dB
Isolation	≥ 25 dB	≥ 26 dB	≥ 27 dB	≥ 28 dB	≥ 30 dB	≥ 33 dB	≥ 35 dB	≥ 40 dB	≥ 45 dB
Passive intermodulation (IM3) @ 2 x 20 W	≤ -155 dBc; typ. ≤ -160 dBc								
VSWR	≤ 1.25								
Power rating	≤ 300 W								
Connectors	N female								
Temperature range	-40 °C ... +80 °C								
Degree of protection (mated)	IP 65								
Weight	~ 350 g								
Mounting brackets	**BN B23654**								

BN 923058



Directional Couplers

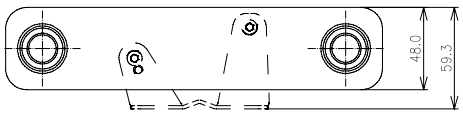
PMR

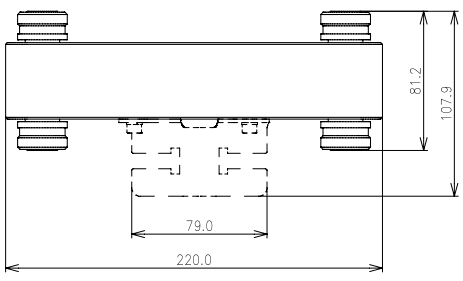
330 - 520 MHz

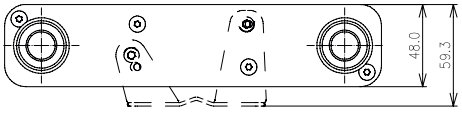
Part Number	BN 753381	BN 753382	BN 753383	BN 753386
Version	H-style			
Frequency range	330 - 520 MHz			
Coupling attenuation	3.0 dB	6.0 dB	10.0 dB	20.0 dB
Isolation	≥ 36 dB	≥ 36 dB	≥ 40 dB	≥ 50 dB
VSWR	≤ 1.06			
Power rating	≤ 1000 W			
Connectors	7-16 female			
Temperature range	-40 °C ... +70 °C			
Degree of protection (mated)	IP 68			
Weight	~ 1.4 kg			
Mounting brackets	**BN B13702**			

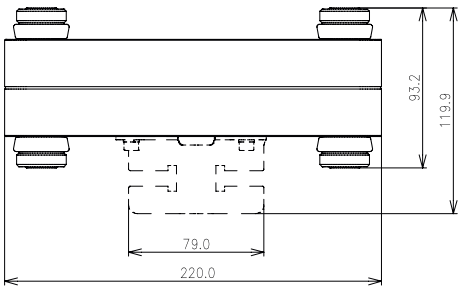
BN 753381 / BN 753382 / BN 753383

BN 753386









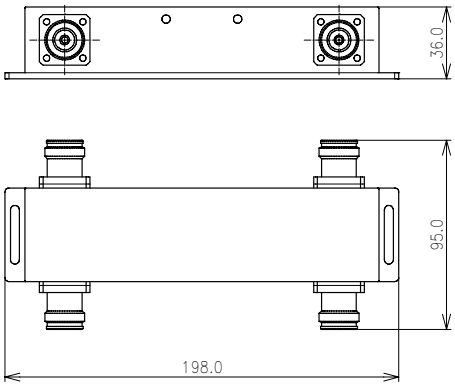
Directional Couplers

PMR GSM-R 1500 MHz

350 - 2700 MHz

Part Number	BN 753357	BN 753359	BN 753358
Version	X-style		
Frequency range	350 - 2700 MHz		
Coupling attenuation	3.0 dB		
Isolation	≥ 23 dB; typ. ≥ 25 dB		
Passive intermodulation (IM3) @ 2 x 20 W	≤ -155 dBc		
VSWR	≤ 1.25		
Power rating	≤ 300 W		
Connectors	7-16 female	4.3-10 female	N female
Temperature range	-40 °C ... +80°C		
Degree of protection (mated)	IP 65		
Weight	~ 0.9 kg	~ 0.8 kg	~ 0.7 kg
Mounting brackets	Included		

BN 753359

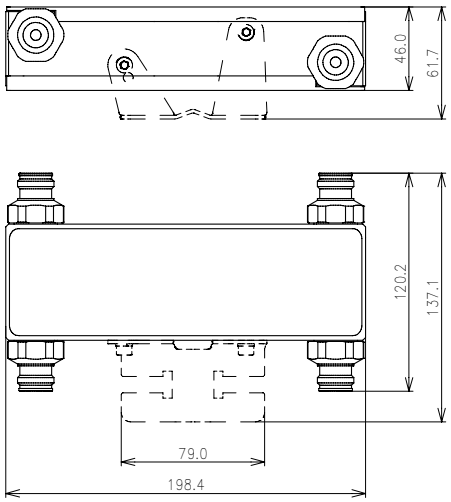


Directional Couplers

694 - 3800 MHz

Part Number	BN 753368	BN 753369	BN 923083
Version	X-style		
Frequency range	694 - 3800 MHz		
Coupling attenuation	3.0 dB		
Isolation	≥ 30 dB; typ. ≥ 35 dB		≥ 25 dB
Passive intermodulation (IM3) @ 2 x 20 W	≤ -160 dBc		≤ -155 dBc
VSWR	≤ 1.08 @ 694 - 2700 MHz ≤ 1.10 @ 2700 - 3800 MHz		≤ 1.25
Power rating	≤ 500 W @ 694 - 2000 MHz ≤ 300 W @ 2000 - 3800 MHz		≤ 300 W
Connectors	7-16 female	4.3-10 female	
Temperature range	-40 °C ... +70°C		-40 °C ... +65°C
Degree of protection (mated)	IP 68		IP 65
Weight	~ 1.8 kg		~ 0.8 kg
Mounting brackets	**BN B13702**		Included

BN 753369



Directional Couplers

GSM-R 1500 MHz

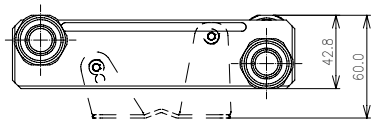
694 - 2700 MHz

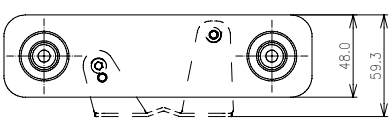
Part Number	BN 753355	BN 753360	BN 753352	BN 753356	BN 753348	BN 753349	BN 753353
Version	X-style	H-style					
Frequency range	694- 2700 MHz						
Coupling attenuation	3.0 dB	3.0 dB	3.0 dB	4.8 dB	6.0 dB	10.0 dB	30.0 dB
Isolation 694 - 2200 MHz 2200 - 2500 MHz 2500 - 2700 MHz	≥ 33 dB ≥ 31 dB ≥ 28 dB	≥ 33 dB ≥ 33 dB ≥ 28 dB	≥ 33 dB ≥ 33 dB ≥ 28 dB	≥ 35 dB ≥ 30 dB ≥ 27 dB	≥ 36 dB ≥ 30 dB ≥ 27 dB	≥ 39 dB ≥ 34 dB ≥ 31 dB	≥ 60 dB ≥ 60 dB ≥ 60 dB
Passive intermodulation (IM3) @ 2 x 20 W	≤ -160 dBc; typ. ≤ -165 dBc	≤ -155 dBc; typ. ≤ -160 dBc	≤ -160 dBc; typ. ≤ -165 dBc				
VSWR 694 - 2200 MHz 2200 - 2500 MHz 2500 - 2700 MHz	≤ 1.06 ≤ 1.08 ≤ 1.10	≤ 1.06 ≤ 1.06 ≤ 1.10	≤ 1.06 ≤ 1.06 ≤ 1.10	≤ 1.08 ≤ 1.12 ≤ 1.14	≤ 1.08 ≤ 1.15 ≤ 1.15	≤ 1.10 ≤ 1.20 ≤ 1.30	≤ 1.06 ≤ 1.06 ≤ 1.06
Power rating	≤ 1000 W	≤ 500 W	≤ 1000 W				
Connectors	7-16 female	N female	7-16 female				
Temperature range	-40 °C ... +70 °C						
Degree of protection (mated)	IP 68						
Weight	~ 0.9 kg	~ 1.2 kg					
Mounting brackets	**BN B13702**						

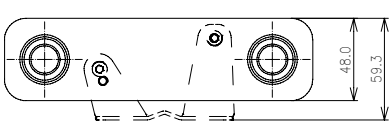
BN 753355

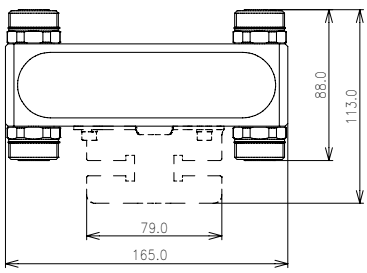
BN 753360

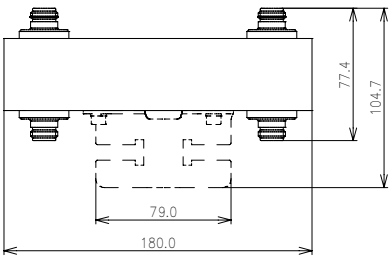
BN 753352 / BN 753356 / BN 753348 / BN 753349 / BN 753353

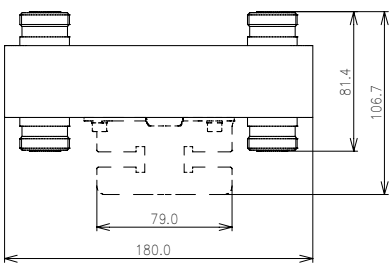












Directional Couplers

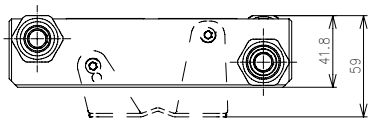
GSM-R 1500 MHz

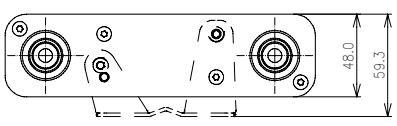
694 - 2700 MHz

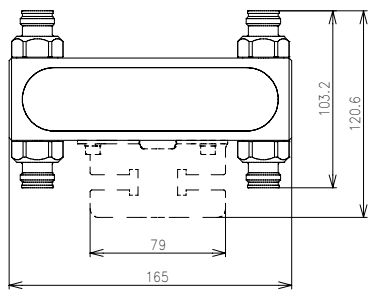
Part Number	BN 753366	BN 753361	BN 753362	BN 753363	BN 753364	BN 753365
Version	X-style	H-style				
Frequency range	694 - 2700 MHz					
Coupling attenuation	3.0 dB	3.0 dB	4.8 dB	6.0 dB	10.0 dB	30.0 dB
Isolation 694 - 2200 MHz 2200 - 2500 MHz 2500 - 2700 MHz	≥ 33 dB ≥ 31 dB ≥ 28 dB	≥ 33 dB ≥ 33 dB ≥ 28 dB	≥ 35 dB ≥ 30 dB ≥ 27 dB	≥ 36 dB ≥ 30 dB ≥ 27 dB	≥ 39 dB ≥ 34 dB ≥ 31 dB	≥ 60 dB ≥ 60 dB ≥ 60 dB
Passive intermodulation (IM3) @ 2 x 20 W	≤ -160 dBc; typ. ≤ -165 dBc					
VSWR 694 - 2200 MHz 2200 - 2500 MHz 2500 - 2700 MHz	≤ 1.06 ≤ 1.08 ≤ 1.10	≤ 1.06 ≤ 1.06 ≤ 1.10	≤ 1.08 ≤ 1.12 ≤ 1.14	≤ 1.08 ≤ 1.15 ≤ 1.15	≤ 1.10 ≤ 1.20 ≤ 1.30	≤ 1.06 ≤ 1.06 ≤ 1.06
Power rating	≤ 500 W					
Connectors	4.3-10 female					
Temperature range	-40 °C ... +70 °C					
Degree of protection (mated)	IP 68					
Weight	~ 0.9 kg	~ 1.2 kg				
Mounting brackets	**BN B13702**					

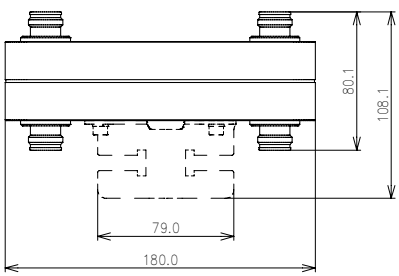
BN 753366

BN 753361 / BN 753362 / BN 753363 / BN 753364 / BN 753365







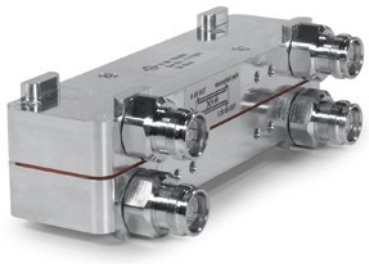


Directional Couplers

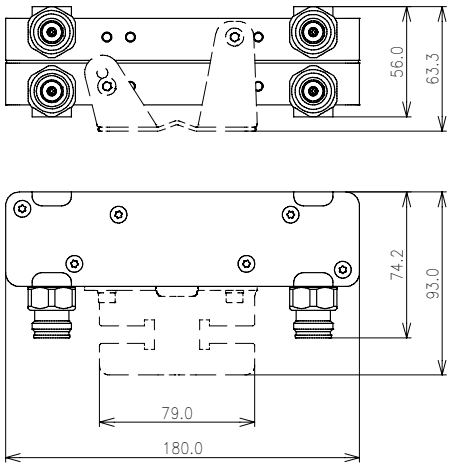
GSM-R 1500 MHz

694 - 2700 MHz

Part Number	BN 753391	BN 753390
Version	H-style unidirectional	
Frequency range	694 - 2700 MHz	
Coupling attenuation	3.0 dB	6.0 dB
Isolation	≥ 33 dB @ 694 - 2200 MHz ≥ 33 dB @ 2200 - 2500 MHz ≥ 28 dB @ 2500 - 2700 MHz	≥ 36 dB @ 694 - 2200 MHz ≥ 30 dB @ 2200 - 2500 MHz ≥ 27 dB @ 2500 - 2700 MHz
Passive intermodulation (IM3) @ 2 x 20 W	≤ -160 dBc; typ. ≤ -165 dBc	
VSWR	≤ 1.06 @ 694 - 2500 MHz ≤ 1.10 @ 2500 - 2700 MHz	≤ 1.08; typ. ≤ 1.06 @ 694 - 2200 MHz ≤ 1.15; typ. ≤ 1.10 @ 2200 - 2700 MHz
Power rating	≤ 500 W	
Connectors	4.3-10 female	
Temperature range	-40 °C ... +70°C	
Degree of protection (mated)	IP 68	
Weight	~ 1.2 kg	
Mounting brackets	**BN B13702**	



BN 753390

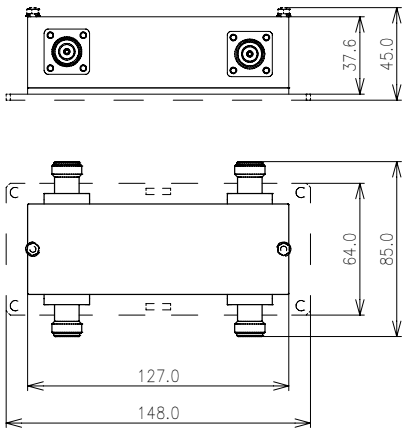


Directional Couplers

694 - 2700 MHz

Part Number	BN 923075	BN 923076	BN 923070
Version	X-style		
Frequency range	694 - 2700 MHz		
Coupling attenuation	3.0 dB		
Isolation	≥ 25 dB		
Passive intermodulation (IM3) @ 2 x 20 W	≤ -155 dBc; typ. ≤ -160 dBc		
VSWR	≤ 1.25		
Power rating	≤ 300 W		
Connectors	7-16 female	4.3-10 female	N female
Temperature range	-40 °C ... +80°C		
Degree of protection (mated)	IP 65		
Weight	~ 0.9 kg	~ 0.8 kg	~ 0.8 kg
Mounting brackets	**BN B23742**		

BN 923070



Antennas

For indoor coverage, SPINNER offers three different types of antennas:

Panel antennas for wall mount

Omni antennas for ceiling mount

Omni chip antennas for ceiling mount

The table below maps antenna types to frequencies. All antennas are shown on the next pages.

Frequency Range in MHz														
	380 - 470	694 - 788	791 - 862	876 - 960	1427 - 1518	1710 - 1880	1850 - 1990	1920 - 2170	2300 - 2400	2400 - 2500	2496 - 2690	3300 - 3800	4900 - 6000	
Examples														
	TETRA PMR	LTE700	LTE800	LTE900 GSM900 GSM-R	LTE1500 L-Band	GSM1800 LTE1800 AWS RX	PCS1900	UMTS AWS TX	LTE2300	WLAN	LTE2500 LTE2600	5G	5G WLAN	
Type														**Page**
A77137 SISO Omni-Chip-H	380 - 520	694 - 960				1690 - 2700								169
A77144 SISO Omni-V	380 - 520	694 - 960				1690 - 6000								168
A77149 SISO Panel-V	380 - 520	698 - 960				1710 - 2700						3400 - 4000		167
A77146 SISO Card-Omni-H		617 - 960			1350 - 1550	1690 - 2700						3300 - 3800	4900 - 6000	169
A77147 MIMO Chip-Omni-HH		694 - 960			1350 - 1550	1710 - 2700						3300 - 4000		169
A77140 SISO Panel-V		694 - 960			1350 - 2700							3400 - 4000		167
A77143 SISO Omni-H		694 - 960			1350 - 2700							3400 - 4000		169
A77141 SISO Omni-V		694 - 960			1427 - 2700									168
A77148 MIMO Omni-Chip-VH		694 - 960			1427 - 2700							3400 - 3800		169
A77145 SISO Omni-V		694 - 960			1427 - 2180				2305 - 6000					168
A77139 MIMO Panel-X		694 - 960				1690 - 2700						3300 - 4000		167
A77138 MIMO Panel-VH		694 - 960				1690 - 2700						3400 - 4000		167
A77136 MIMO Panel-X		698 - 960				1710 - 2700								167
A77142 MIMO Omni-VH		698 - 960				1710 - 2700						3400 - 4000		169

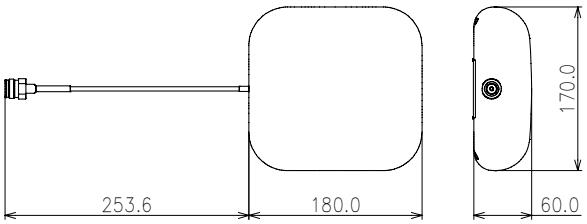
Antennas

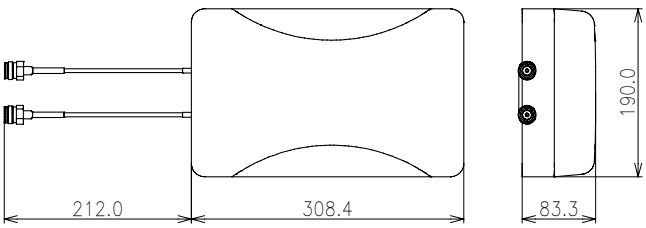
Panel Antennas for Wall Mount

Part Number	BN A77149	BN A77140	BN A77139	BN A77138	BN A77136
Polarization	Vertical	Vertical	±45°	Dual	±45°
Beamwidth	70°	75°	70°	75°	70°
Frequency range	380 - 4000 MHz		694 - 4000 MHz		698 - 2700 MHz
Ports	1	1	2		
Gain	≥ 4.0 dBi ... ≥ 7.5 dBi	≥ 5.0 dBi ... ≥ 8.5 dBi	≥ 6.0 dBi ... ≥ 7.5 dBi	≥ 5.0 dBi ... ≥ 8.5 dBi	≥ 6.4 dBi ... ≥ 8.1 dBi
Passive intermodulation (IM3) @ 2 x 20 W	≤ -140 dBc	≤ -153 dBc			≤ -150 dBc
VSWR	≤ 2.5 @ 380 - 520 MHz ≤ 2.0 @ 698 - 6000 MHz	≤ 2.0	≤ 1.8	≤ 2.0	≤ 1.5
Power rating	50 W				
Connector(s)	4.3-10 female				
Temperature range	-55 °C ... +60 °C				
Material and color	ABS, white, RAL9003				
Degree of protection	IP 54				
Weight	~ 0.6 kg	~ 0.4 kg	~ 1.0 kg	~ 1.5 kg	~ 0.9 kg
Mounting material	Included				

BN A77140

BN A77139





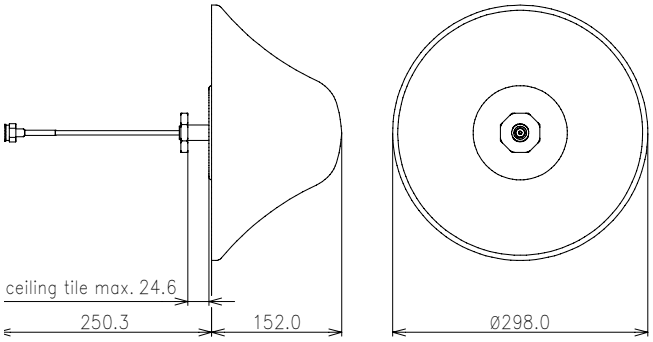
Antennas

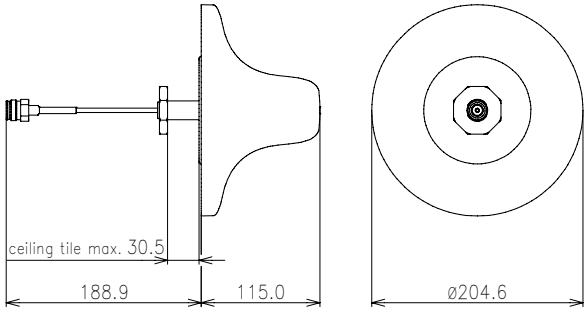
Omni Antennas for Ceiling Mount

Part Number	BN A77144	BN A77145	BN A77141
Polarization	Vertical		
Beamwidth	360°		
Frequency range	380 - 6000 MHz	694 - 6000 MHz	694 - 2700 MHz
Ports	1		
Gain	≥ 2.0 dBi ... ≥ 4.0 dBi	≥ 2.0 dBi ... ≥ 4.5 dBi	≥ 1.8 dBi ... ≥ 3.0 dBi
Passive intermodulation (IM3) @ 2 x 20 W	≤ -153 dBc		
VSWR	≤ 3.0 @ 380 - 520 MHz ≤ 2.0 @ 694 - 6000 MHz	≤ 1.8 @ 694 - 806 MHz ≤ 1.5 @ 860 - 2700 MHz ≤ 1.8 @ 2700 - 6000 MHz	≤ 1.8 @ 694 - 806 MHz ≤ 1.5 @ 806 - 960 MHz ≤ 1.8 @ 1427 - 1710 MHz ≤ 1.5 @ 1710 - 2700 MHz
Power rating	50 W		
Connector(s)	4.3-10 female		
Temperature range	-55 °C ... +60 °C		
Material and color	ABS, white, RAL9003		
Degree of protection	IP 54		
Weight	~ 0.9 kg	~ 0.5 kg	~ 0.4 kg
Mounting material	Included		

BN A77144

BN A77145





Antennas

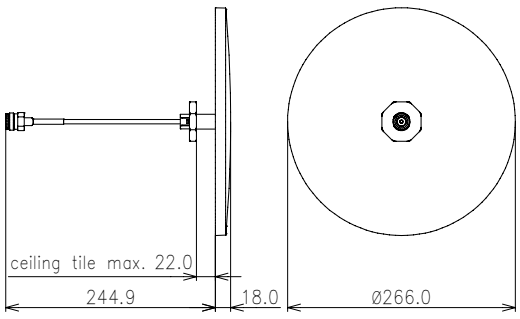
Omni Chip Antennas for Ceiling Mount

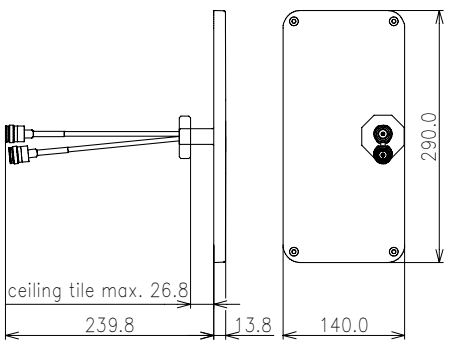
Part Number	BN A77137	BN A77146	BN A77148	BN A77147	BN A77143	BN A77142
Polarization	Horizontal		Dual	Dual Horizontal	Horizontal	Dual
Beamwidth	360°					
Frequency range	380 - 2700 MHz	617 - 6000 MHz	694 - 3800 MHz	694 - 4000 MHz		698 - 4000 MHz
Ports	1		2		1	2
Gain	≥ 2.0 dBi ... ≥ 4.5 dBi	≥ 1.5 dBi ... ≥ 6.0 dBi	≥ 2.5 dBi ... ≥ 5.0 dBi	≥ 1.5 dBi ... ≥ 6.0 dBi	≥ 2.2 dBi ... ≥ 6.0 dBi	≥ 3.0 dBi ... ≥ 5.0 dBi
Passive intermodulation (IM3) @ 2 x 20 W	≤ -140 dBc *)	≤ -153 dBc				≤ -150 dBc
VSWR	≤ 2.5 @ 380 - 520 MHz ≤ 2.0 @ 694 - 2700 MHz	≤ 1.8		≤ 1.8 ≤ 2.0 @ 1350 - 1550 MHz	≤ 1.5 ≤ 1.8 @ 1350 - 1710 MHz	≤ 2.0
Power rating	50 W					
Connector(s)	4.3-10 female					
Temperature range	-55 °C ... +60 °C					
Material and color	ABS, white, RAL9003					
Degree of protection	IP 54					
Weight	~ 0.4 kg	~ 0.3 kg	~ 0.4 kg	~ 0.5 kg	~ 0.3 kg	~ 0.5 kg
Mounting material	Included					

*) Variant with IM3 ≤ -150 dBc is available, please order BN 77137C0001

BN A77137

BN A77148

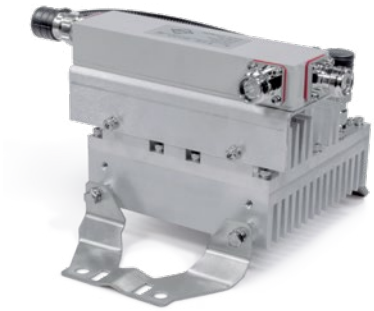




Absorbing Products

SPINNER loads and attenuators are often used in the installation and calibration of mobile radio communication stations, but also in measurement technology applications in which they excel thanks to their excellent IM properties.

Low PIM loads



Low PIM attenuators

Loads

Attenuators

Loads and Attenuators – Now Even More Flexible

Both for the loads and for the attenuators, SPINNER has developed a new modular system by means of which you are significantly more flexible in choosing your components. The requirements for performance and the connector system are diverse and the new system enables you to easily combine loads and attenuators with the performance and connector system specified by you. Thus, you are able to combine your components freely to meet your requirements and do not have to use oversized components or adapters without the support of which you could not even install the components. The advantages are obvious: cost savings and improved technical values.

The new modular system is available for the 25 W, 50 W, 100 W and 200 W performance versions as well as for 7-16, 4.3-10 and N connector system. Of course, you will be able to choose from connectors and couplers of the connector systems mentioned above. The standard version is available between 0 and 4 GHz. Extended versions are possible up to 6 GHz. Moreover, you can order your versions with an integrated DC block as well as with a measurement report.

Standard Loads

Standard Attenuators

Loads

PMR GSM-R 1500 MHz 3800 MHz

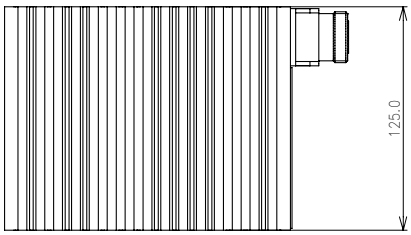
Low Intermodulation Loads

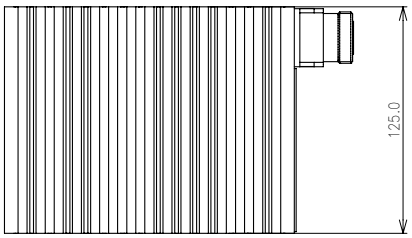
Part Number	BN 534279	BN 534280	BN 534277
Frequency range	350 – 3800 MHz		
Passive intermodulation (IM3) @ 2 x 20 W	≤ -140 dBc; typ. ≤ -145dBc @ 350 - 694 MHz ≤ -150 dBc; typ. ≤ -155dBc @ 694 - 870 MHz ≤ -160 dBc; typ. ≤ -165dBc @ 870 - 3000 MHz		
VSWR	≤ 1.15; typ. ≤1.08 @ 350 - 3000 MHz ≤ 1.20; typ. ≤1.15 @ 3000 - 3800 MHz		
Power dissipation	≤ 50 W	≤ 100 W	≤ 150 W
Connectors	7-16 female		
Temperature range	-40° C ... +50° C		
Degree of protection (mated)	IP 20		
Weight	~ 2.0 kg	~ 2.8 kg	~ 4.1 kg
Mounting brackets	**BN B20962** or **BN B20963** (see data sheet)		

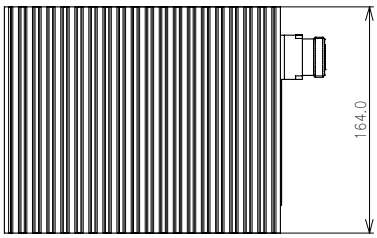
BN 534279

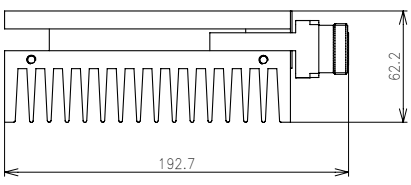
BN 534280

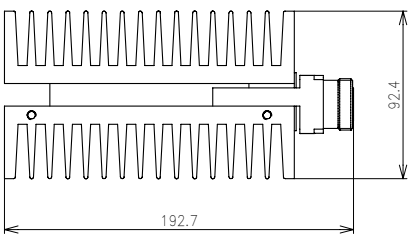
BN 534277

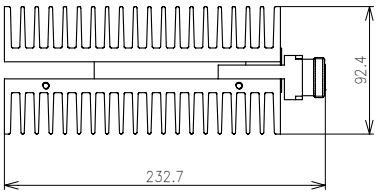










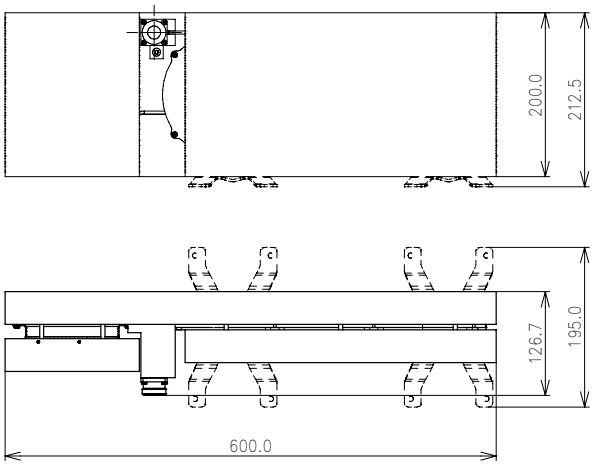


Loads

Low Intermodulation Loads

Part Number	**BN 534276**
Frequency range	380 –4000 MHz
Passive intermodulation (IM3) @ 2 x 20 W	≤ -160 dBc @ 380 - 2700 MHz
VSWR	≤ 1.25 @ 380 – 694 MHz ≤ 1.15 @ 694 – 4000 MHz
Power dissipation	≤ 250 W @ 380 - 694 MHz ≤ 400 W @ 694 - 2700 MHz ≤ 250 W @ 2700 - 4000 MHz
Connectors	7-16 female
Temperature range	-5° C … +55° C
Degree of protection (mated)	IP 20
Weight	~ 14.5 kg
Mounting brackets	**BN B20641**

BN 534276



Loads

PMR GSM-R 1500 MHz 3800 MHz

Low Intermodulation Loads

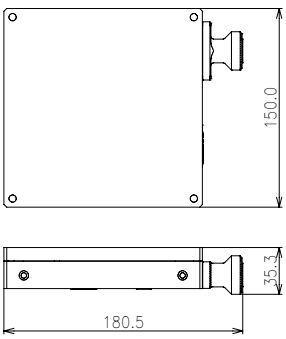
Part Number	BN 594272	BN 594273	BN 594274	BN 594275
Frequency range	350 – 3800 MHz			
Passive intermodulation (IM3) @ 2 x 20 W	≤ -140 dBc; typ. ≤ -145dBc @ 350 - 694 MHz ≤ -150 dBc; typ. ≤ -155dBc @ 694 - 800 MHz ≤ -160 dBc; typ. ≤ -165dBc @ 800 - 3000 MHz			
VSWR	≤ 1.15; typ. ≤ 1.08 @ 350 – 3000 MHz ≤ 1.20; typ. ≤ 1.15 @ 3000 – 3800 MHz			
Power dissipation	≤ 20 W	≤ 50 W	≤ 100 W	≤ 150 W
Connectors	7-16 female			
Temperature range	-40° C … +50° C			
Degree of protection (mated)	IP 68			
Weight	~ 1.2 kg	~ 2.5 kg	~ 3.5 kg	~ 5.3 kg
Mounting brackets	**BN B20962** or **BN B20963** (see data sheet)			

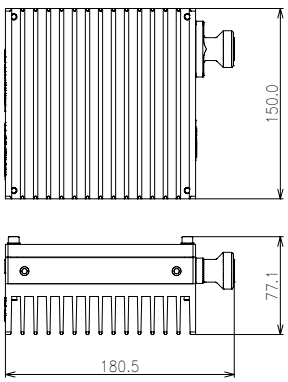
BN 594272

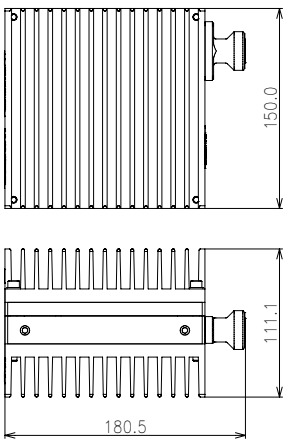
BN 594273

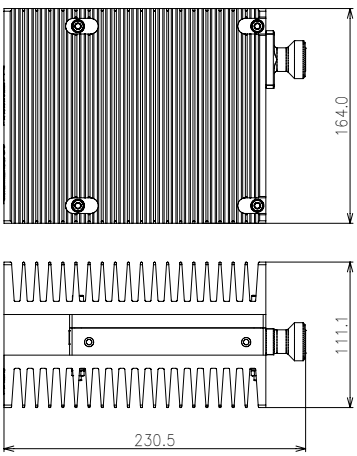
BN 594274

BN 594275









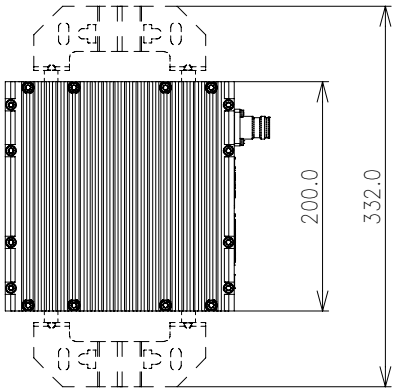
Loads

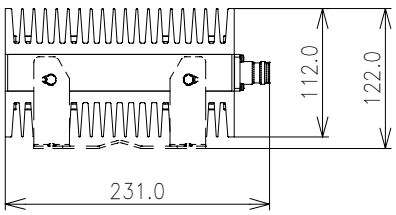
PMR GSM-R 1500 MHz 3800 MHz

Low Intermodulation Loads

Part Number	BN 594276	BN 594278
Frequency range	350 – 3800 MHz	
Passive intermodulation (IM3) @ 2 x 20 W	≤ -160 dBc; typ. ≤ -165dBc @ 350 - 3000 MHz	
VSWR	≤ 1.20; typ ≤ 1.15 @ 350 – 694 MHz ≤ 1.15; typ ≤ 1.10 @ 694 – 3800 MHz	
Power dissipation	≤ 200 W	
Connectors	7-16 female	4.3-10 female
Temperature range	-40° C … +40° C	
Degree of protection (mated)	IP 68	
Weight	~ 8.2 kg	
Mounting brackets	**BN B20962**	

BN 594278





Loads

PMR GSM-R 1500 MHz 3800 MHz

Low Intermodulation Loads

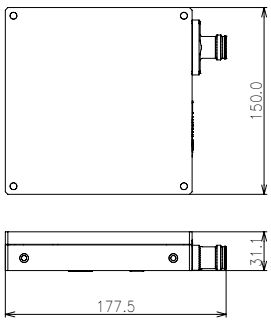
Part Number	BN 594282	BN 594283	BN 594284	BN 594285
Frequency range	350 – 3800 MHz			
Passive intermodulation (IM3) @ 2 x 20 W	≤ - 140 dBc; typ. ≤ -145dBc @ 350 - 694 MHz ≤ - 150 dBc; typ. ≤ -155dBc @ 694 - 800 MHz ≤ - 160 dBc; typ. ≤ -165dBc @ 800 - 3000 MHz			
VSWR	≤ 1.15; typ ≤ 1.08 @ 350 – 3000 MHz ≤ 1.20; typ ≤ 1.15 @ 3000 – 3800 MHz			
Power dissipation	≤ 20 W	≤ 50 W	≤ 100 W	≤ 150 W
Connectors	4.3-10 female			
Temperature range	-40° C … +50° C			
Degree of protection (mated)	IP 68			
Weight	~ 1.2 kg	~ 2.5 kg	~ 3.5 kg	~ 5.3 kg
Mounting brackets	**BN B20962** or **BN B20963**			

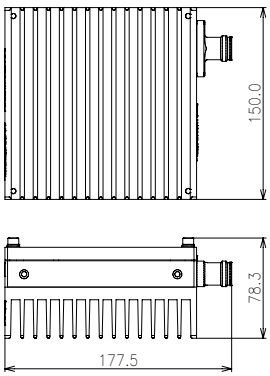
BN 594282

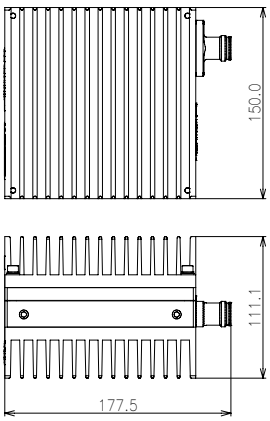
BN 594283

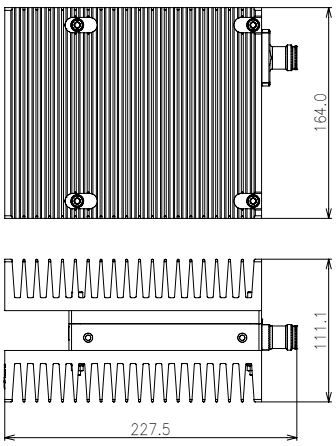
BN 594284

BN 594285







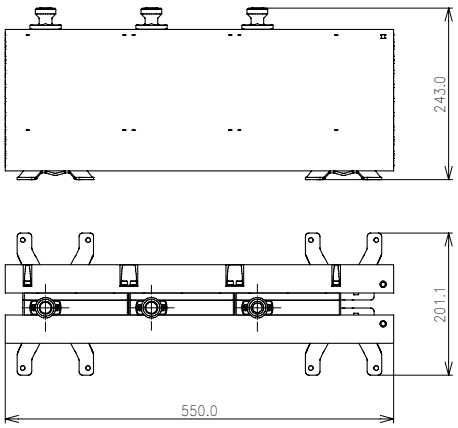


Loads

Low Intermodulation Loads

Part Number	BN 534268
Frequency range	350 – 3800 MHz
Passive intermodulation (IM3) @ 2 x 20 W	≤ -140 dBc; typ. ≤ -145 dBc @ 350 - 694 MHz ≤ -150 dBc; typ. ≤ -155 dBc @ 694 - 800 MHz ≤ -160 dBc; typ. ≤ -165 dBc @ 800 - 3000 MHz
VSWR	≤ 1.15 @ 350 – 3000 MHz ≤ 1.20 @ 3000 – 3800 MHz
Power dissipation	≤ 450 W (≤ 150 W per port)
Connectors	7-16 female
Temperature range	-40° C … +30° C
Degree of protection (mated)	IP 68
Weight	~ 18 kg
Mounting brackets	Included

BN 534268



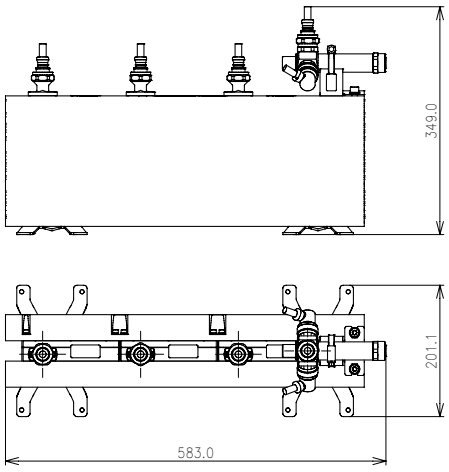
Loads

GSM-R 1500 MHz 3800 MHz

Low Intermodulation Loads

Part Number	BN 534267
Frequency range	694 – 3800 MHz
Passive intermodulation (IM3) @ 2 x 20 W	≤ -155 dBc; typ. ≤ -160 dBc @ 694 - 800 MHz ≤ -160 dBc; typ. ≤ -165 dBc @ 800 - 3000 MHz
VSWR	≤ 1.15 @ 694 – 2700 MHz ≤ 1.25 @ 2700 – 3800 MHz
Power dissipation	≤ 400 W
Connectors	7-16 female
Temperature range	-40° C … +30° C
Degree of protection (mated)	IP 67
Weight	~ 19 kg
Mounting brackets	Included

BN 534267



Loads

Standard Loads - Modular Construction System for 25 to 200 W Loads

The standard loads are foreseen for individual configuration. Four power levels from 25 W to 200 W are available. The connectors can be chosen from 7-16, 4.3-10 and N, either male or female. 4.3-10 male versions are available with screw, hand screw and push-pull version.

As special features, the loads can be ordered with an extended frequency range up to 6 GHz and with measurement protocol included in the delivery. The individual configuration can be chosen by the article code shown on page 179.

25 W

50 W

100 W

200 W

PMR GSM-R 1500 MHz 3800 MHz

Power dissipation	**25 W**	**50 W**	**100 W**	**200 W**
Frequency range	0 - 4000 MHz (special feature up to 6000 MHz)			
VSWR	≤ 1.06 @ 0 - 1000 MHz ≤ 1.14 @ 1000 - 2000 MHz ≤ 1.20 @ 2000 - 3000 MHz ≤ 1.30 @ 3000 - 4000 MHz (≤ 1.40 @ 4000 - 6000 MHz)			
Temperature range	-40 °C ... +40 °C			
Degree of protection (mated)	IP 50			
Weight	~ 0.6 kg	~ 0.9 kg	~ 1.1 kg	~ 2.7 kg

Loads

Standard Loads - Article Codes

Please use article codes for inquiries and orders.
These are self explaining and enable you to specify a product without knowing its part number.

Load	Power Dissipation		Connector	Extra Feature
L	X	-	Z	-X
25 W	25			Leave blank if N/A
50 W	50			
100 W	100			
200 W	200			
			7-16 male	7M
			7-16 female	7F
			4.3-10 male; screw	43MS
			4.3-10 male; hand screw	43MH
			4.3-10 male; push-pull	43MP
			4.3-10 female	43F
			N male	NM
			N female	NF
				Measurement protocol: P
				Extended frequency range: E
				Upgrade from IP 50 to IP 68 (outdoor capable): O
				Extended frequency range + measurement protocol: EP
				Measurement protocol + IP 68: PO
				Extended frequency range + IP 68: EO
				Extended frequency range + measurement protocol + IP 68: EPO

Example of article codes:

L50-7M: Load with 50 W power dissipation and 7-16 male connector.

L200-43MP-P: Load with 200 W power dissipation and 4.3-10 male push-pull connector. Ships with extended frequency range from DC to 6 GHz.

Loads

PMR GSM-R 1500 MHz 3800 MHz

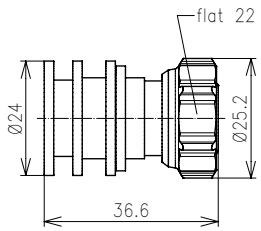
Loads

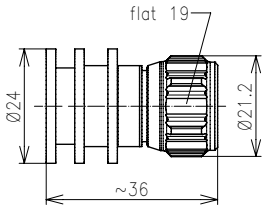
Part Number	BN 531702	BN 531712	BN 531726	BN 531727	BN 531225	BN 531227	BN 531221
Frequency range	0 - 4000 MHz	0 - 7000 MHz					
VSWR	≤ 1.06 @ 0 - 1000 MHz ≤ 1.11 @ 1000 - 2000 MHz ≤ 1.17 @ 2000 - 5000 MHz ≤ 1.22 @ 5000 - 7000 MHz						
Power dissipation	≤ 2 W	≤ 5 W			≤ 10 W		
Connectors	4.3-10 male screw type	7-16 male	4.3-10 male screw type	N male	7-16 male	4.3-10 male screw type	N male
Temperatur range	-40 °C ... +40 °C						
Degree of protection (mated)	IP 68	IP 64	IP 68	IP 64		IP 68	IP 64
Weight	~ 55 g	~ 100 g	~ 55 g	~ 40 g	~ 120 g	~ 85 g	~ 80 g

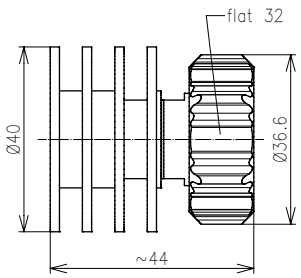
BN 531702

BN 531727

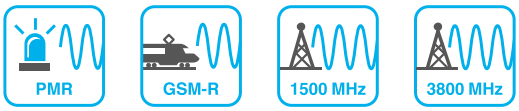
BN 531225







Loads



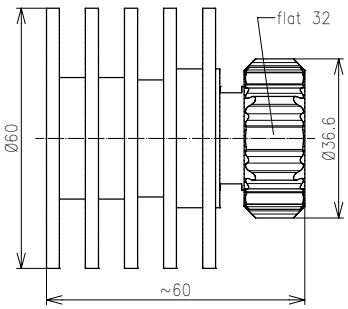
Loads

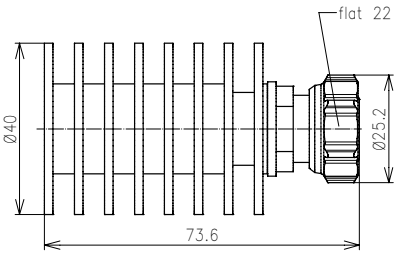
Part Number	BN 547720	BN 527757	BN 527755	BN 527751
Frequency range	0 – 4000 MHz	0 - 7000 MHz		
VSWR	≤ 1.07 @ 0 – 1000 MHz ≤ 1.10 @ 1000 – 2000 MHz ≤ 1.15 @ 2000 – 3000 MHz ≤ 1.20 @ 3000 – 4000 MHz	≤ 1.06 @ 0 – 1000 MHz ≤ 1.11 @ 1000 – 2000 MHz ≤ 1.17 @ 2000 – 5000 MHz ≤ 1.22 @ 5000 – 7000 MHz		
Power dissipation	≤ 25 W			
Connectors	7-16 male		4.3-10 male	N male
Temperature range	-40 °C ... +40 °C			
Degree of protection (mated)	IP 65	IP 40	IP 68	IP 40
Weight	~ 240 g	~ 200 g	~ 130 g	~ 120 g

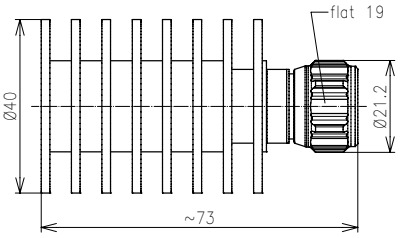
BN 547720

BN 527755

BN 527751





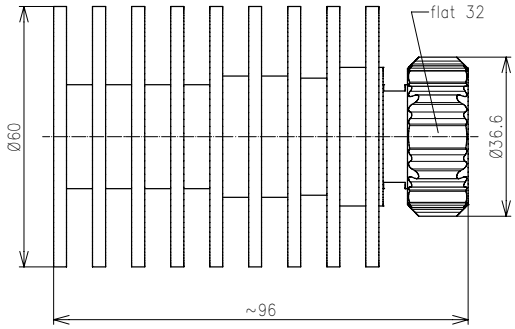


Loads

Loads

Part Number	BN 547700
Frequency range	0 – 4000 MHz
VSWR	≤ 1.07 @ 0 – 1000 MHz ≤ 1.10 @ 1000 – 2000 MHz ≤ 1.15 @ 2000 – 3000 MHz ≤ 1.20 @ 3000 – 4000 MHz
Power dissipation	≤ 50 W
Connectors	7-16 male
Temperature range	-40 °C ... +40 °C
Degree of protection (mated)	IP 65
Weight	~ 380 g

BN 547700



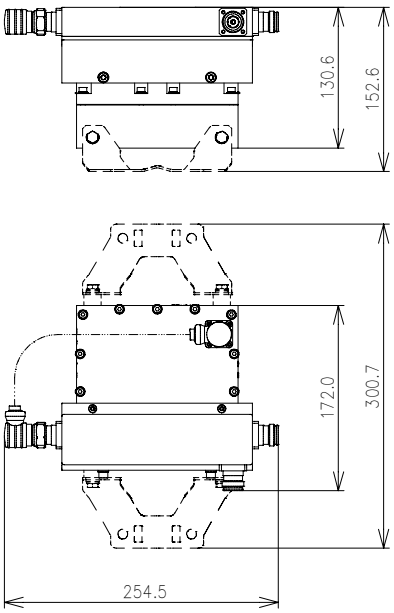
Attenuators

PMR GSM-R 1500 MHz 3800 MHz

Low Intermodulation Attenuators

Part Number	BN 745401	BN 745402	BN 745403	BN 745404	BN 745405	BN 745406	BN 745407	BN 745408	BN 745409
Frequency range	350 - 3800 MHz								
Attenuation	4.8 dB	6.0 dB	7.0 dB	8.0 dB	10 dB	13 dB	15 dB	20 dB	30 dB
Passive intermodulation (IM3) @ 2 x 20 W	≤ -140 dBc; typ. ≤ -145 dBc @ 350 - 694 MHz ≤ -150 dBc; typ. ≤ -155 dBc @ 694 - 800 MHz ≤ -155 dBc; typ. ≤ -160 dBc @ 800 - 3000 MHz								
VSWR	≤ 1.3								
Power rating	≤ 80 W								
Connectors	4.3-10 female								
Temperature range	-40 °C ... +50 °C								
Degree of protection (mated)	IP 65								
Weight	~ 3.0 kg								
Mounting brackets	**BN B07787**								

BN 745401



Attenuators

Standard Attenuators - Modular Construction System for 25 to 200 W Attenuators

The standard attennators are foreseen for individual configuration. Four power levels from 25 W to 200 W are available.The connectors can be chosen from 7-16, 4.3-10 and N, either male or female. 4.3-10 male versions are available with screw, hand screw and push-pull version.

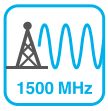
As special features, the attenuators can be ordered with an extended frequency range up to 6 GHz, with measurement protocol included in the delivery and integrated DC break. The individual configuration can be chosen by the sales article code on page 185.

Type 25

Type 50

Type 100

Type 200



Version	Type 25	Type 50	Type 100	Type 200
Frequency range	0 - 4000 MHz (special feature up to 6000 MHz)			
Frequency range for attenuator with integrated DC break	100 - 4000 MHz (special feature up to 6000 MHz)			
VSWR	≤ 1.06 @ 0 – 1000 MHz ≤ 1.14 @ 1000 – 2000 MHz ≤ 1.20 @ 2000 – 3000 MHz ≤ 1.30 @ 3000 – 4000 MHz (≤ 1.40 @ 4000 – 6000 MHz)			
VSWR for attenuators with integrated DC break	≤ 1.70 @ 100 – 330 MHz ≤ 1.25 @ 330 – 694 MHz ≤ 1.20 @ 694 – 2690 MHz ≤ 1.30 @ 2690 – 3800 MHz (≤ 1.40 @ 5000 – 6000 MHz)			
Temperature range	-40 °C ... +40 °C			
Degree of protection	IP 50			
Weight	~ 0.6 kg	~ 0.9 kg	~ 1.1 kg	~ 2.7 kg

Max. Input Power in Both Directions

Attenuation	3 dB	6 dB	10 dB	20 dB	30 dB	40 dB
Type 25	≤ 50 W	≤ 30 W	≤ 25 W	≤ 25 W	≤ 25 W	≤ 25 W
Type 50	≤ 100 W	≤ 65 W	≤ 50 W	≤ 50 W	≤ 50 W	≤ 50 W
Type 100	≤ 150 W	≤ 120 W	≤ 100 W	≤ 100 W	≤ 100 W	≤ 100 W
Type 200	≤ 300 W	≤ 200 W	≤ 200 W	≤ 200 W	≤ 200 W	≤ 200 W

Attenuators

Standard Attenuators - Article Codes

Please use article codes for inquiries and orders.
These are self explaining and enable you to specify a product without knowing its part number.

Attenuator	Power Dissipation		Connector 1	Connector 2		Attenuation	Extra Features
A	X	-	Z	X	-	Z	-X
			Any combination of connectors below is possible				Leave blank if N/A
25 W	25						
50 W	50						
100 W	100						
200 W	200						
			7-16 male	7M			
			7-16 female	7F			
			4.3-10 male; screw	43MS			
			4.3-10 male; hand screw	43MH			
			4.3-10 male; push-pull	43MP			
			4.3-10 female	43F			
			N male	NM			
			N female	NF			
						3	
						6	
						10	
						20	
						30	
						40	
							Measurement protocol: P
							Extended frequency range: E
							DC break: D
							Upgrade from IP 50 to IP 68 (outdoor capable): O
							Extended frequency range + measurement protocol: EP
							DC break + measurement protocol: DP
							Measurement protocol + IP 68: PO
							Extended frequency range + IP 68: EO
							DC break + IP 68: DO
							Extended frequency range + measurement protocol + IP 68: EPO
							DC break + measurement protocol + IP 68: DPO

Example of article codes:
A25-7M43MH-10: 10 dB attenuator with 25 W power dissipation and 7-16 male/4.3-10 male hand screw connectors.
A200-NMNF-20-EP: 20 dB attenuator with 200 W power dissipation and N male/N female connectors.
Ships with extended frequency range from DC to 6 GHz and measurement protocol.

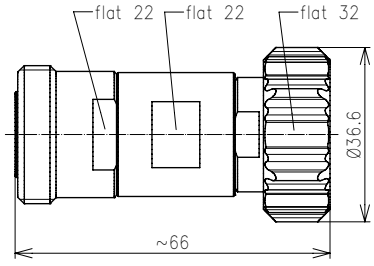
Attenuators

PMR GSM-R 1500 MHz

Attenuators

Part Number	BN 534361	BN 534362	BN 534363	BN 534364
Frequency range	0 - 3000 MHz			
Attenuation	3 dB ± 0.2 dB	6 dB ± 0.2 dB	10 dB ± 0.3 dB	20 dB ± 0.5 dB
VSWR	≤ 1.04 @ 0 - 1000 MHz ≤ 1.08 @ 1000 - 2200 MHz ≤ 1.10 @ 2200 - 3000 MHz			
Power rating	≤ 10 W	≤ 6.5 W	≤ 5 W	≤ 5 W
Connectors	7-16 male / 7-16 female			
Temperature range	-40 °C ... +25 °C			
Degree of protection (mated)	IP 65			
Weight	~ 0.2 kg			

BN 534361



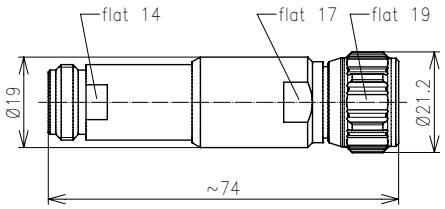
Attenuators

PMR GSM-R 1500 MHz 3800 MHz

Attenuators

Part Number	BN 528622	BN 528624	BN 528626	BN 528627
Frequency range	0 - 12400 MHz			
Attenuation	3 dB ± 0.3 dB	6 dB ± 0.4 dB	10 dB ± 0.5 dB	20 dB ± 1.0 dB
VSWR	≤ 1.15 @ 0 - 4000 MHz ≤ 1.27 @ 4000 - 8000 MHz ≤ 1.44 @ 8000 - 12400 MHz			
Power rating	≤ 10 W	≤ 6.5 W	≤ 5 W	≤ 5 W
Connectors	N male / N female			
Temperature range	-40 °C ... +25 °C			
Degree of protection (mated)	IP 40			
Weight	~ 0.1 kg			

BN 528622



Surge Protectors

Surges are mainly caused by electromagnetic fields generated by nearby lightning strikes.

SPINNER offers a premium choice of different protection elements for coaxial systems. It covers all relevant RF applications for which a surge protection is necessary e.g.:

- The protection of installations for analog and digital communication such as 4m radio, VHF ground radio in aviation, 2m radio, TETRA, GSM900/1800, UMTS, LTE
- The protection of communication lines in tunnels
- The protection related to radiating cables

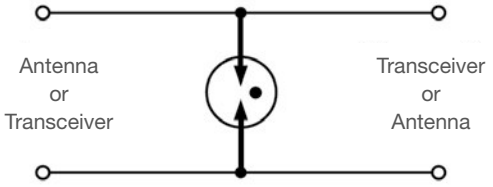
Version	Gas Discharge Arrestor (GDA)	Quarter Wavelength Stub (QWS)	Hybrid
Application	- Universal broadband - From 0 to 2500 MHz	- Up to 3 mobile bands - From 380 to 2200 MHz	- All mobile bands with active elements at the antenna
Advantages	- DC transmission possible	- No maintenance - High RF power rating - Very low intermodulation	- DC transmission possible - High RF power rating - Low intermodulation
Remark	- Maintenance required - Limited RF power - High intermodulation	- No DC transmission possible	- Maintenance required

Surge Protectors – Technical Preface

Gas discharge arrestor (GDA)

Construction:
A gas discharge arrestor consists of a cylindric insulator (mostly ceramics) with conductive caps at the ends. The inside is filled with noble gas under defined pressure.

circuit symbol

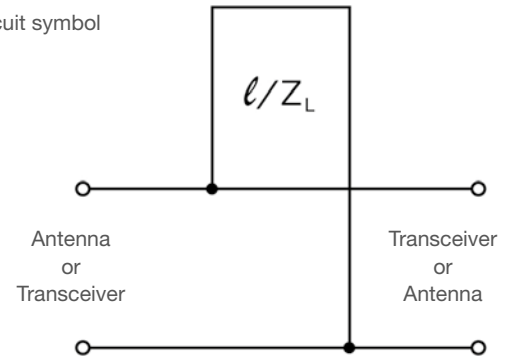


Function:
During normal operation the arrestor has a quasi-infinite resistance (> 1 GΩ). If the voltage between the electrodes rises above the sparkover voltage, a breakthrough and discharge in the form of an electrical arc occurs.
The sparkover voltage is dependent upon the rise time of the voltage and the type of arrestor. As the discharge is of low resistance the voltage between the electrodes is reduced to the arc (residual) voltage (typ. 20 V). The surge current can grow to very high values (≥ 25 kA) before the arrestor is destroyed. If the voltage between the electrodes falls below the arc voltage the arc extinguishes and the arrestor returns to normal operation.

Quarter Wavelength Stub (QWS)

Construction:
A coaxial line with a defined characteristic nominal impedance is short-circuited at one end. The other end of the line with a length similar to a quarter wavelength is connected parallel to the main line.

circuit symbol



Function:
The short at the end of the stub is transformed to an open at the bottom. Thus the RF on the main line is inessentially influenced, and the stub acts like a simple band-pass filter with the quarter-wave frequency as centre frequency.
The nature of the stub line (characteristic nominal impedance Z_L and length l) together with additional transforming elements in the main line is responsible for the operating bandwidth of the device.

Because of the galvanic connection of inner and outer conductor, a DC transmission is not possible.
The missing of any non-linear component (e.g. a gas discharge arrestor) secures very low intermodulation.
The stub can be orthogonal to or folded into the axis of the main line (in-line design).

Hybrid – with Quarter Wavelength Stub and Gas Discharge Arrestor

The Hybrid type combines both protection mechanisms. The short at the end of the λ/4 line is replaced by a capacity and a gas discharge arrestor. The inner and outer conductor of the main line are not connected galvanically, therefore DC and low frequency can be transmitted. The main line is decoupled from the effects of the arrestor and vice versa by the quarter wavelength line. Thus the arrestor is free of electrical stress in normal operation.

Surge Protectors – Gas Discharge Arrestors

Surge protectors with gas discharge arrestors can be used for all applications in the frequency range of 0 to 2.5 GHz. The RF power rating is limited by the sparkover voltage of the discharge arrestor.

- Symmetrical design (both sides protected)
- Suitable for outdoor installation
- DC transmission via inner conductor possible
- Gas discharge arrestor easily replaceable
- Replacement recommended every 3 to 4 years
- Arrestors free of radioactivity

Housings for Gas Discharge Arrestors

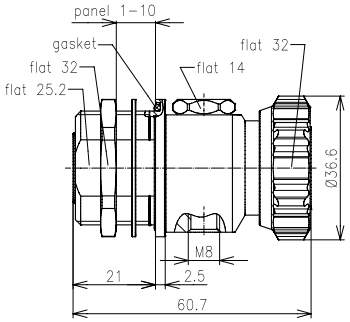
Part Number	BN 194284	BN 920480	BN 950880	BN 950888
Frequency range	0 - 2500 MHz			
Insertion loss	≤ 0.1 dB			
Passive intermodulation (IM3) @ 2 x 20 W	N/A			
VSWR	≤ 1.06 @ 0 - 1000 MHz ≤ 1.20 @ 1000 - 2500 MHz			
Connectors	7-16 male / 7-16 female bulkhead	7-16 female / 7-16 female bulkhead	N male / N female bulkhead	N female / N female bulkhead
Temperature range	-40 °C ... +85 °C			
Degree of protection (mated)	IP 67			
Weight	~ 270 g	~ 280 g	~ 160 g	~ 130 g
Grounding cable	**BN A71367**			

Gas Discharge Arrestors

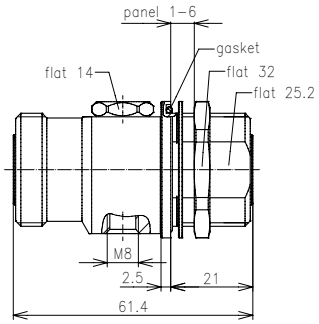
Part Number		BN A71307	BN A71308	BN A71311	BN A71313
Stat. sparkover voltage (100 V/s)		90 V ± 20 V	230 V ± 35 V	600 +120 V / -90 V	1000 V ± 200 V
Power rating		≤ 20 W	≤ 180 W	≤ 1200 W	≤ 3000 W
Dyn. sparkover voltage (1 kV/µs)		≤ 700 V	≤ 750 V	≤ 1200 V	≤ 1600 V
Surge current	Single (8/20 µs)	≤ 25 kA			
	multiple (8/20 µs) 5 pulses in 3 min.	≤ 20 kA	≤ 10 kA	≤ 10 kA	≤ 5 kA
Arc (residual) voltage		≤ 25 V			≤ 30 V

A reliable protection against surges is given only by a proper installation and regular maintenance depending on the protector type. The maintenance intervals depend mainly upon the number and the strength of the impulse current impacts.

Surge Protectors – Gas Discharge Arrestors



BN 194284



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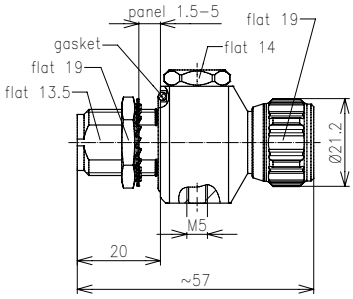
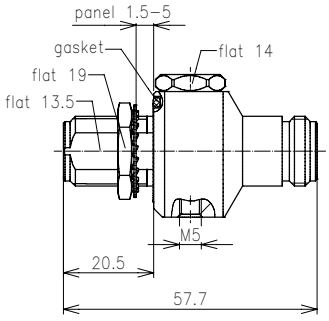
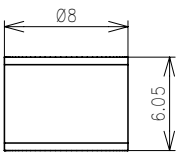


BN 950880



BN 950888



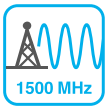
BN A71307

Surge Protectors – Quarter Wavelength Stubs

This kind of surge protector is suitable for applications with single or multiple combined mobile communication bands (e.g. GSM900, GSM1800 and UMTS). DC transmission via the coaxial ports is not possible with this type.

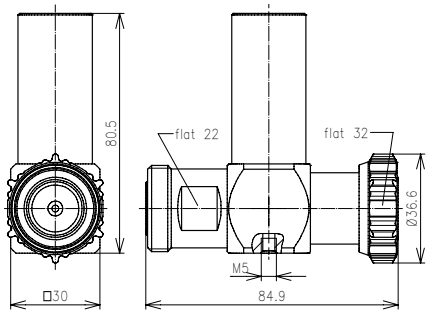
The stub can be orthogonal to or folded into the axis of the main line (in-line design).

- Symmetrical design, both sides protected
- High RF power rating
- Very low intermodulation
- Suitable for outdoor installation
- Maintenance free

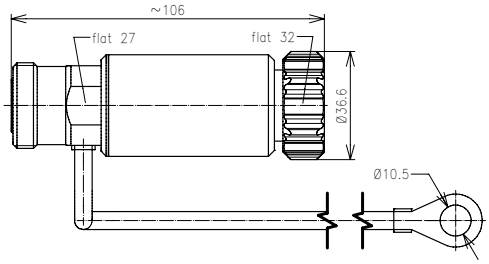


Part Number	**BN 766419**	**BN 756473**	**BN 756474**
Frequency range	380 - 512 MHz	800 - 2170 MHz	
Insertion loss	≤ 0.1 dB		
Surge current (8/20 µs)	≤ 50 kA	≤ 60 kA	
Test pulse	4 kV (1.2/50 µs) and 2 kA (8/20 µs)		
Residual energy at test pulse	≤ 20 µJ	≤ 7 µJ	
Passive intermodulation (IM3) @ 2 x 20 W	N/A	≤ -160 dBc	
VSWR	≤ 1.22	≤ 1.11	
Power rating	≤ 3 kW	≤ 0.95 kW @ 800 MHz ≤ 0.60 kW @ 2170 MHz	
Connectors	7-16 male / 7-16 female		7-16 female / 7-16 female
Temperature range	-40 °C … +75 °C	-40 °C … +85 °C	
Degree of protection (mated)	IP 67		
Weight	~ 430 g	~ 500 g	~ 450 g
Grounding cable	**BN A71367**	Included	

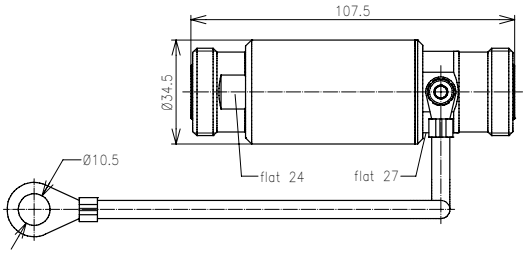
Surge Protectors – Quarter Wavelength Stubs



BN 766419

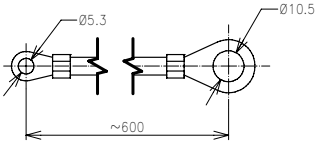


BN 756473



BN 756474

Accessory



Grounding cable length: 600 mm.
Ground lead Li2Y 1x6 mm^2 with crimped ground lugs for M5/M8 screws.

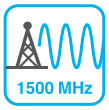
BN A71367

Surge Protectors – Hybrid Protectors
with Quarter Wavelength Line and Gas Discharge Arrestor

This surge protector design combines the advantages of both protection techniques (DC transmission and low intermodulation). Therefore, it is also called a hybrid design.

The bandwidth is 678 MHz to 2700 MHz and 0 to 10 MHz (for AISG). Suitable for DC and low frequency (LF) transmission these surge protectors can also be used to transmit control signals (according to AISG) of antenna amplifiers and/or remote controlled antennas.

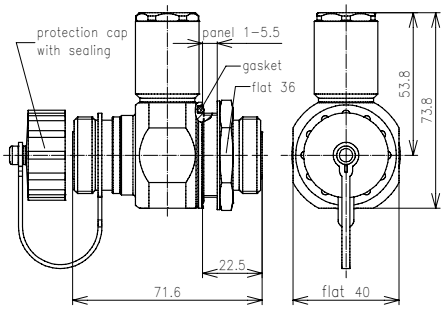
- Symetrical design (both sides protected)
- Broadband low VSWR
- High RF power rating
- High DC voltage and current rating
- Very low intermodulation
- Arrestor free of radioactivity
- Arrestor easy to replace
- Recommended replacement every 8 to 10 years
- Suitable for outdoor installation



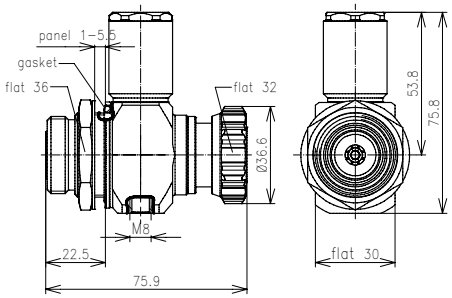
Part Number	BN 766471	BN 766475	BN 432900	BN 432901
Frequency range	678 - 2700 MHz			
Insertion loss	≤ 0.1 dB			
Surge current (8/20 µs)	≤ 30 kA (single) ≤ 20 kA (multiple)			
Test pulse	4 kV (1.2/50 µs) and 2 kA (8/20 µs)			
Residual energy at test pulse	≤ 350 µJ			
Stat. sparkover voltage of the gas discharge arrestor	90 V ± 20 V			
Passive intermodulation (IM3) @ 2 x 20 W	≤ -160 dBc			
VSWR	≤ 1.25 @ 678 - 694 MHz ≤ 1.20 @ 694 - 725 MHz ≤ 1.15 @ 725 - 2675 MHz ≤ 1.20 @ 2675 - 2700 MHz			
Power rating	≤ 2.7 kW @ 678 MHz ≤ 1.3 kW @ 2700 MHz		≤ 850 W @ 694 MHz ≤ 430 W @ 2700 MHz	
DC and AISG	≤ 60 V (≤ 10 A)			
Connectors	7-16 female / 7-16 female bulkhead	7-16 male / 7-16 female bulkhead	4.3-10 male screw type / 4.3-10 female bulkhead	4.3-10 female/ 4.3-10 female bulkhead
Temperatur range	-40 °C ... +85 °C			
Degree of protection (mated)	IP 67			
Weight	~ 400 g		~ 350 g	
Spare arrestor	**BN A72245**			

Surge Protectors – Hybrid Protectors
with Quarter Wavelength Line and Gas Discharge Arrestor

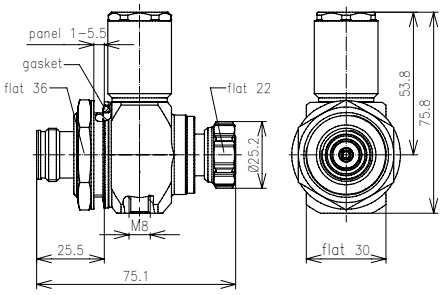
BN 766471



BN 766475



BN 432900



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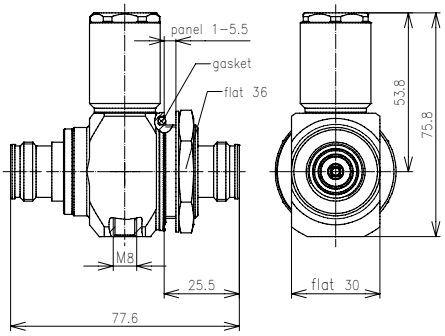
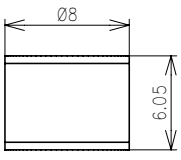




BN A72245

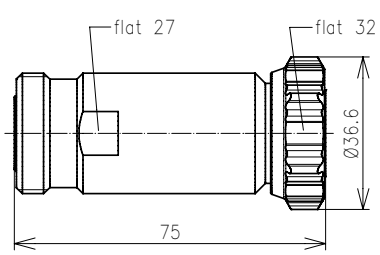
DC Breaks

DC breaks prevent the propagation of direct current or of signals with low transmission frequencies while allowing RF transmission to proceed smoothly at the same time.

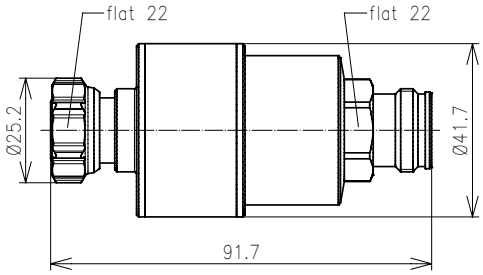
SPINNER delivers two types of DC breaks:

- Types with open inner conductor only: They are mainly used for shielding antennas or ground stations from low-frequency signals deliberately fed in for controlling mobile communication antennas or for the power supply of tower mounted amplifiers.
- Types with open inner and outer conductor: They are mainly used for preventing undesirable induced voltage, in communication equipment, e.g. radiating cables. Inducted voltages are generated by e.g. high power lines in underground train systems.

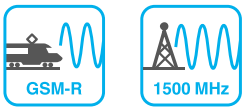
BN 756486



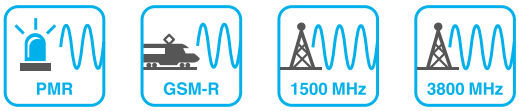
BN 432054



DC Breaks



Part Number	BN 756486	BN 432065
Version	Inner conductor separated	
Frequency range	670 - 2700 MHz	
Insertion loss	≤ 0.10 dB	
Passive intermodulation (IM3) @ 2 x 20 W	≤ -160 dBc; typ. ≤ -165 dBc	
VSWR	≤ 1.25 @ 670 - 800 MHz ≤ 1.16 @ 800 - 2500 MHz ≤ 1.25 @ 2500 - 2700 MHz	
Power rating	≤ 800 W @ 698 MHz ≤ 400 W @ 2700 MHz	
Temperature range	-40 °C ... +55 °C	
Degree of protection (mated)	IP 68	
Connectors	7-16 male / 7-16 female	4.3-10 male screw type / 4.3-10 female
Weight	~ 0.3 kg	
Blocking DC voltage	≤ 1000 V	



Part Number	BN 766436	BN 766438	BN 432054	BN 432067	BN 950720	BN 950721
Version	Inner and outer conductor separated	Inner conductor separated	Inner and outer conductor separated	Inner conductor separated	Inner and outer conductor separated	Inner conductor separated
Frequency range	80 - 3800 MHz *)					
Insertion loss	≤ 0.25 dB; typ. ≤ 0.10 dB					
Passive intermodulation (IM3) @ 2 x 20 W	≤ -160 dBc; typ. ≤ -165 dBc				≤ -155 dBc; typ. ≤ -160 dBc	
VSWR	≤ 1.40; typ. ≤ 1.28 @ 80 – 100 MHz ≤ 1.30; typ. ≤ 1.22 @ 100 – 300 MHz ≤ 1.10; typ. ≤ 1.06 @ 300 – 1880 MHz ≤ 1.20; typ. ≤ 1.11 @ 1880 – 2700 MHz ≤ 1.25; typ. ≤ 1.19 @ 2700 – 3800 MHz					
Power rating	1500 W @ 80 MHz 300 W @ 1880 MHz 250 W @ 2700 MHz 130 W @ 3800 MHz					
Temperature range	-40 °C ... +55 °C					
Degree of protection (mated)	IP 67					
Connectors	7-16 male / 7-16 female		4.3-10 male screw type / 4.3-10 female		N male / N female	
Weight	~ 0.3 kg					
Blocking DC voltage	3000 V					

*) All DC Breaks can be made available with extended frequency range from 33 - 4000 MHz + 5000 - 6000 MHz.
For ordering, please add suffix F001 to above shown part numbers (e.g. BN 766436F001).

Tools and Accessories

SPINNER Plast2000

SPINNER Plast2000 guarantees a perfect sealing function and corrosion protection between connector and cable.

Product	Part Number
20 cm³ tube, screws directly into the cable entries	**BN 151671**
70 cm³ tube, to be squeezed into injection gun **BN 070551**	**BN 150597**
150 ml injection gun, screws directly into the cable entries	**BN 070551**

BN 151671

BN 150597

BN 070551

Trimming Tools

- Assembly time cut by more than 60%
- Considerable reduction of assembly costs
- Constant assembly quality

Cable Type	Version	Part Number
SF 1/4"-50	CAF®	**BN 541328**
SF 3/8"-50	CAF®	**BN 541335**
SF 1/2"-50	CAF®	**BN 541334**
SF 1/2"-50	MultiFit	**BN 541354**
LF 1/4"-50	CAF®	**BN 541320**
LF 3/8"-50	CAF®	**BN 541338**
LF 1/2"-50	CAF®	**BN 541317**
LF 1/2"-50	MultiFit	**BN 541387**
LF 7/8"-50	CAF®	**BN 541318**
LF 7/8"-50	MultiFit	**BN 541301**
UCF114-50A LCF158-50A LCF214-50A	Economy type	**BN 541343**
1 1/4"* 1 5/8"*	Comfort type	**BN 541346**

* For all annularly corrugated foam and radiating cables

BN 541354

BN 541343

BN 541346

Tools and Accessories

Torque Wrenches

During connector installation, the back nut has to be tightened to the connector body. The best possible result can be achieved by using a torque wrench. SPINNER offers a choice of torque wrenches for SPINNER MultiFit® connectors.

Cable Type / Version	Wrench Size mm	Torque Nm	Part Number
SF 1/2" / MultiFit	17	25	**BN 238734**
LF 1/2" / MultiFit	22	25	**BN 238735**
LF 7/8" / MultiFit	32	30	**BN 238736**
LF 1 1/4" and LF 1 5/8" / MultiFit	32	60	**BN 238737**

BN 238736

SPINNER offers a choice of torque wrenches to support connector mating.

Connector Style	Wrench Size mm	Torque Nm	Part Number
7-16 male	32	30	**BN 238736**
4.3-10 male screw type	22	5	**BN 238739**
N male	19	3	**BN 238738**
2.2-5 male screw type	16	3	**BN 238742**

BN 238739

Poly Hook Spanner

For the assembly of connectors to LF 1 1/4", LF 1 5/8" and LF 2 1/4" coaxial cables, we recommend poly hook spanners with 5 mm pin for outer diameters of 48 to 90 mm.

Tool Type	Pin mm	Outer diameters mm	Part Number
Poly hook spanner	5	48-90	**BN 071551**

BN 071551

Tools and Accessories

Protective Caps

For Connector Type 7-16

BN 239002

For 7-16 male connectors
(brass – with chain)

BN 239004 *)

For 7-16 male connectors
(plastic)

BN 238950

For 7-16 female connectors
(brass – with chain)

BN 238904 *)

For 7-16 female connectors
(plastic)

*) Once stock with black caps is cleared, new versions will be blue.

For Connector Type 4.3-10

BN 239021

For 4.3-10 male connectors
(brass)

BN 239020

For 4.3-10 male connectors
(brass – with chain)

BN 239043

For 4.3-10 male connectors
(plastic)

BN 238921

For 4.3-10 female connectors
(brass)

BN 238920

For 4.3-10 female connectors
(brass – with chain)

BN 238943

For 4.3-10 female connectors
(plastic)

For Connector Type N

BN 998800
For N male connectors
(brass – with chain)

BN 296300
For N female connectors
(brass – with chain)

Tools and Accessories

Grounding Kits

SPINNER FlexGround is available for different cable types. For cable stripping tools, please see below.

Cable Type	Part Number
LF 1/2" - 50	BN A73258
LF 7/8" - 50	BN A73259
LF 1 1/4" - 50	BN A73260
LF 1 5/8" - 50	BN A73261

BN A73259

Jacket Stripping Tools

To connect a grounding kit, first use an appropriate stripping tool to remove a short section of the cable jacket.

Cable Type	Part Number
LF 1/2" - 50	BN A73233
LF 7/8" - 50	BN A73234
LF 1 1/4" - 50	BN A73235
LF 1 5/8" - 50	BN A73236

BN A73234

Cable Clamps

The SPINNER FlexFix cable clamps are suitable for C-rail.

Cable Type	Part Number for 1 Cable	Part Number for 2 Cables	Part Number for 3 Cables
LF 1/2" - 50	A73243C0001	A73244C0001	A73245C0001
LF 7/8" - 50	A73246C0001	A73242C0001	A73247C0001
LF 1 1/4" - 50	A73248C0001	A73249C0001	A73250C0001
LF 1 5/8" - 50	A73251C0001	A73252C0001	A73253C0001

A73246C0001

A73242C0001

A73247C0001

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HIGH FREQUENCY PERFORMANCE WORLDWIDE

SPINNER designs and builds cutting-edge radio frequency systems, setting performance and longevity standards for others to follow. The company's track record of innovation dates back to 1946, and many of today's mainstream products are rooted in SPINNER inventions.

Industry leaders continue to count on SPINNER's engineering excellence to drive down their costs of service and ownership with premium-quality, off-the-shelf products and custom solutions. Headquartered in Munich, Germany, the global frontrunner in RF components remains the first choice in simple-yet-smart RF solutions.

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