



## Introduction

### COAXIAL COUPLERS

3dB hybrid couplers and directional couplers are passive devices used in microwave field. Directional coupler is a reciprocal 4 port device. When a signal is applied to its input port, it provides 2 amplitude ports, coupling is the ratio in dB of the incident power fed into the input port of the main line of the directional coupler to the coupled port of the secondary line when all ports are terminated on matched load. A 3db Hybrid coupler is a special class of directional couplers in which signals at the two outputs are equal to split RF signal in 2 equal parts or to combine 2 RF signals on one port

Directional couplers and power dividers have many applications, these include; providing a signal sample for measurement or monitoring, feedback, combining feeds to and from antennae, antenna beam forming .

### SPECIAL DEVICES

#### Feed through terminations

These components are used to properly terminate a transmission line while testing with a high impedance measuring system such as an oscilloscope input.

#### Detectors

A detector is a 2 port device capable of supplying a low frequency signal on its output port (video), of a level proportional of the RF power applied to its input port. This proportionality is achieved by means of non linearity property of the diodes used which at low level supply a detected voltage proportional to the RF voltage.

#### Rotary joints

These components provide the transition between two coaxial transmission lines rotating with respect to each other while retaining acceptable RF characteristics.

#### DC blocks

DC blocks are composed of a capacitor inserted to the the central conductor of the coaxial line. They block any DC or low frequency current present on the line.

#### Signal samplers

These devices are used to sample part of an RF signal from a coaxial line, They are not directive, and sample incident and reflected energy.

#### Phase shifters

These components create a mechanically adjustable phase shift by variation in the physical length of the transmission line



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Couplers

3 dB 90° Hybrid couplers

Frequency (GHz)	Amplitude Balance (dB)	Phase Balance	Input Power (W)		Max Insertion Loss (dB) Attenuation (dB)	Min Isolation (dB)	VSWR max.	Connectors main / coupled	Part Number
			Ave. <sup>(1)</sup>	Peak <sup>(2)</sup>					
0.15 - 0.3	± 0.5	90° ± 0.5°	500	5,000	0.3	30	1.15	N f / N f	R432 171 000
0,25 - 0.5	± 0.5	90° ± 5°	500	5,000	0.3	30	1.15	N f / N f	R432 271 000
0.5 - 1	± 0.5	90° ± 5°	300	5,000	0.3	25	1.15	N f / N f	R432 371 000
1 - 2	± 0.5	90° ± 5°	100	3,000	0.3	25	1.2	SMA f / SMA f	R432 431 000
1 - 2	± 0.5	90° ± 5°	200	5,000	0.3	25	1.2	N f / N f	R432 471 000
2 - 4	± 0.5	90° ± 5°	80	3,000	0.3	23	1.2	SMA f / SMA f	R432 531 000
2 - 4	± 0.5	90° ± 5°	80	3,000	0.3	20	1.2	N f / N f	R432 571 000
4 - 8	± 0.5	90° ± 5°	50	3,000	0.3	19	1.25	SMA f / SMA f	R432 631 000
7 - 12,4	± 0.5	90° ± 6°	30	3,000	0.4	18	1.35	SMA f / SMA f	R433 721 700
6 - 18	± 0.6	90° ± 6°	30	3,000	0.6	15	1.5	SMA f / SMA f	R433 611 700
12,4 - 18	± 0.7	90° ± 6°	30	3,000	0.6	16	1.4	SMA f / SMA f	R433 831 700

<sup>(1)</sup> at 25°C

<sup>(2)</sup> at 25°C [1us - duty cycle 1%]

Directional couplers (all directional couplers are loaded with SMA 50 Ohms termination)

Frequency (GHz)	Amplitude Balance (dB)	Phase Balance	Input Power (W)		Max Insertion Loss <sup>(3)</sup> (dB) Attenuation (dB)	Directivity (dB)	VSWR max. <sup>(4)</sup>	Connectors main / coupled	Part Number
			Ave. <sup>(1)</sup>	Peak <sup>(2)</sup>					
0.15 - 0.3	6 ± 0.3	± 0.8	500	5,000	2	30	1.10 / 1.10	N f / N f	R432 172 000
0.15 - 0.3	10 ± 0.3	± 0.8	500	5,000	1	30	1.10 / 1.10	N f / N f	R432 173 000
0.15 - 0.3	20 ± 0.3	± 0.8	500	5,000	0.4	30	1.10 / 1.10	N f / N f	R432 174 000
0.15 - 0.3	30 ± 0.3	± 0.8	500	5,000	0.4	30	1.10 / 1.10	N f / N f	R432 175 000
0.25 - 0.5	10 ± 0.3	± 0.8	500	5,000	1	30	1.12 / 1.12	N f / N f	R432 273 000
0.25 - 0.5	20 ± 0.3	± 0.8	500	5,000	0.4	30	1.12 / 1.12	N f / N f	R432 274 000
0.25 - 0.5	30 ± 0.3	± 0.8	500	5,000	0.4	30	1.12 / 1.12	N f / N f	R432 275 000
0.5 - 1	6 ± 0.3	± 0.8	300	5,000	2	25	1.15 / 1.15	N f / N f	R432 372 000
0.5 - 1	10 ± 0.3	± 0.8	300	5,000	1	27	1.15 / 1.15	N f / N f	R432 373 000
0.5 - 1	20 ± 0.3	± 0.8	300	5,000	0.4	27	1.15 / 1.15	N f / N f	R432 374 000
0.5 - 1	30 ± 0.3	± 0.8	300	5,000	0.4	27	1.15 / 1.15	N f / N f	R432 375 000
1 - 2	6 ± 1.1	± 0.8	100	3,000	1.8	23	1.20 / 1.20	SMA f / SMA f	R432 432 000
1 - 2	10 ± 0.3	± 0.8	100	3,000	1	23	1.15 / 1.15	SMA f / SMA f	R432 433 000
1 - 2	20 ± 0.3	± 0.8	100	3,000	0.4	23	1.15 / 1.15	SMA f / SMA f	R432 434 000
1 - 2	30 ± 0.3	± 0.8	100	3,000	0.4	23	1.15 / 1.15	SMA f / SMA f	R432 435 000
1 - 2	6 ± 0.3	± 0.6	200	5,000	2.25	23	1.15 / 1.15	N f / N f	R432 472 000
1 - 2	10 ± 0.3	± 0.8	200	5,000	1	23	1.15 / 1.15	N f / N f	R432 473 000
1 - 2	20 ± 0.3	± 0.8	200	5,000	0.4	23	1.15 / 1.15	N f / N f	R432 474 000
1 - 2	30 ± 1.1	± 0.8	200	5,000	0.4	23	1.15 / 1.15	N f / N f	R432 475 000
2 - 4	10 ± 0.3	± 0.8	80	3,000	1	20	1.15 / 1.15	SMA f / SMA f	R432 533 000



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## Couplers

2 - 4	10 ± 0.3	± 0.8	100	3,000	0.4	20	1.15 / 1.15	N f / N f	R432 573 000
2 - 4	20 ± 0.3	± 0.8	80	3,000	0.4	20	1.15 / 1.15	SMA f / SMA f	R432 534 000
2 - 4	20 ± 0.3	± 0.8	100	3,000	0.4	20	1.15 / 1.15	N f / N f	R432 574 000
2 - 4	30 ± 1.1	± 0.8	80	3,000	0.4	20	1.15 / 1.15	SMA f / SMA f	R432 535 000
4 - 8	10 ± 0.3	± 0.8	50	3,000	1	17	1.20 / 1.20	SMA f / SMA f	R432 633 000
4 - 8	20 ± 0.3	± 0.8	50	3,000	0.4	17	1.20 / 1.20	SMA f / SMA f	R432 634 000
4 - 8	30 ± 0.3	± 0.8	50	3,000	0.4	17	1.20 / 1.20	SMA f / SMA f	R432 635 000

<sup>(1)</sup> at 25°C

<sup>(2)</sup> at 25°C (1us - duty cycle 1%)

<sup>(3)</sup> coupling loss included

<sup>(4)</sup> main line / coupled line

### Flat frequency response directional couplers (all directional couplers are loaded with SMA 50 Ohms termination)

Frequency (GHz)	Coupling <sup>(4)</sup> (dB)	Frequency sensitivity <sup>(4)</sup> ± (dB)	Input Power(W)		Max Insertion Loss <sup>(5)</sup> (dB) Attenuation (dB)	Directivity (dB)	VSWR max. <sup>(3)</sup>	Connectors main / coupled	Part Number
			Ave. <sup>(1)</sup>	Peak <sup>(2)</sup>					
0.9 - 2.1	10 ± 0.8	± 0.3	50	3,000	1	22	1.15 / 1.15	SMA f / SMA f	R433 423 000
0.9 - 2.1	10 ± 0.5	± 0.3	50	3,000	1	22	1.20 / 1.20	N f / N f	R433 463 000
0.9 - 2.1	20 ± 0.8	± 0.3	50	3,000	0.4	22	1.15 / 1.15	SMA f / SMA f	R433 424 000
0.9 - 2.1	20 ± 0.5	± 0.3	50	3,000	0.4	22	1.20 / 1.20	N f / N f	R433 464 000
1.7 - 4.2	10 ± 0.8	± 0.3	50	3,000	1	20	1.20 / 1.20	SMA f / SMA f	R433 523 000
1.7 - 4.2	10 ± 0.5	± 0.3	50	3,000	1	20	1.25 / 1.25	N f / N f	R433 563 000
1.7 - 4.2	20 ± 0.8	± 0.3	50	3,000	0.4	20	1.20 / 1.20	SMA f / SMA f	R433 524 000
1.7 - 4.2	20 ± 0.8	± 0.4	50	3,000	0.4	20	1.25 / 1.25	N f / N f	R433 564 000
3.7 - 8.3	10 ± 0.5	± 0.3	50	3,000	1	18	1.25 / 1.25	SMA f / SMA f	R433 623 000
3.7 - 8.3	10 ± 0.5	± 0.3	50	3,000	1	18	1.30 / 1.30	N f / N f	R433 663 000
3.7 - 8.3	20 ± 0.5	± 0.3	50	3,000	0.4	18	1.25 / 1.25	SMA f / SMA f	R433 624 000
3.7 - 8.3	20 ± 0.5	± 0.3	50	3,000	0.4	18	1.30 / 1.30	N f / N f	R433 664 000
2 - 8	10 ± 1	± 0.4	50	3,000	1	20	1.25 / 1.25	SMA f / SMA f	R433 513 700
2 - 8	20 ± 1	± 0.4	50	3,000	0.4	20	1.25 / 1.25	SMA f / SMA f	R433 514 700
7 - 12.4	10 ± 1	± 0.5	50	3,000	1	16	1.30 / 1.30	SMA f / SMA f	R433 723 700
7 - 12.4	20 ± 1	± 0.5	50	3,000	0.4	16	1.30 / 1.30	SMA f / SMA f	R433 724 700
2 - 18	10 ± 1	± 0.6	20	3,000	1.4	12	1.35 / 1.50	SMA f / SMA f	R433 503 000
6 - 18	6 ± 1	± 0.5	50	3,000	2.2	15	1.40 / 1.40	SMA f / SMA f	R433 612 700
6 - 18	10 ± 1	± 0.5	50	3,000	1.1	16	1.40 / 1.40	SMA f / SMA f	R433 613 700
6 - 18	20 ± 1	± 0.5	50	3,000	0.6	15	1.40 / 1.40	SMA f / SMA f	R433 614 700
12.4 - 18	6 ± 1	± 0.5	50	3,000	2.2	15	1.40 / 1.40	SMA f / SMA f	R433 832 700
12.4 - 18	10 ± 1	± 0.5	50	3,000	1.1	15	1.35 / 1.35	SMA f / SMA f	R433 833 700
12.4 - 18	20 ± 1	± 0.5	50	3,000	0.55	15	1.35 / 1.35	SMA f / SMA f	R433 834 700

<sup>(1)</sup> at 25°C

<sup>(2)</sup> at 25°C (1us - duty cycle 1%)

<sup>(3)</sup> main line / coupled line

<sup>(4)</sup> frequency sensitivity is included in coupling

<sup>(5)</sup> coupling loss included



Special devices

**Feed through termination BNC - 50 and 75 Ohms**

Frequency DC to (GHz)	VSWR max.	Return loss min. (dB)	Power		VSWR max.	Connectors main / coupled	Part Number
			Ave.(W)	Peak(W)			
1	1.35	16.5	2	1,000	50±5%	m / f straight	R405 005 000
1	1.35	16.5	2	1,000	50±5%	m / f right angle	R405 035 000
1	1.35	16.5	2	1,000	75±5%	m / f straight	R405 006 000

**Wide band detectors(all detectors use Schottky zero bias diode.**

**They are 50 Ohms -12dBm. CW = 200 mw, peak power 2 W)**

Frequency (GHz)	Connectors		Part Number	
	Input HF	Output Video	Negative	Positive
0.01 - 18	SMA m	SMB m	R451 533 000	R451 533 500
0.01 - 18	SMA m	SMC m	R451 534 000	R451 534 500
0.01 - 18	SMA m	SMA f	R451 542 000	R451 542 500
0.01 - 18	SMA m	pin	R451 543 000	R451 543 500
0.01 - 18	SMA m	BNC f	R451 544 000	R451 544 500
0.01 - 12.4	N m	BNC f	R451 574 000	R451 574 500
0.01 - 18	N m	BNC f	R451 576 000	R451 576 500
2.45	N m	BNC f	R451 572 120	

**High sensibility detectors(all detectors use Schottky zero bias diode.**

**They are 50 Ohms -12dBm. CW = 200 mw, peak power 2 W)**

Frequency (GHz)	Connectors		Part Number	
	Input HF	Output Video	Negative	Positive
1 - 18	SMA m	SMB m	R451 030 000	R451 030 500
1 - 18	SMA m	SMC m	R451 031 000	R451 031 500
1 - 18	SMA m	SMA f	R451 032 000	R451 032 500
1 - 18	SMA m	Pin	R451 033 000	R451 033 500
1 - 18	SMA m	BNC f	R451 034 000	R451 034 500

**Diode holder detectors**

Frequency (GHz)	Connectors		Part Number	
	Input HF	Output Video	Negative	Positive
0.01 - 4	N m	BNC f	R451 570 000	R451 570 500
0.01 - 10	N m	BNC f	R451 075 000	

**Rotary joints**

Frequency DC to (GHz)	VSWR max.	Max V.S.W.R. variation per turn	Insertion Loss (dB) Max.	Power max	Part Number
18	1.5	1.02	0.60	50	R447 120 000
18	1.5	1.02	0.80	40	R447 171 000



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Special devices

**DC blocks : inner conductor block Type**

Frequency (GHz)	Capacitance (pF)	VSWR max.	Insertion Loss (dB) Max.	Connectors	Main line Max DC Voltage (Volts)	Part Number
0.01 - 6	4700	1.30	0.50	SMA m/f	63	R443 131 000
1 - 12.4	100	1.25	0.50	SMA m/f	300	R443 134 000
0.01 - 6	4700	1.30	0.50	BNC m/f	63	R443 141 000
0.01 - 6	4700	1.30	0.50	TNC m/f	63	R443 151 000
0.01 - 6	4700	1.30	0.50	N m/f	63	R443 171 000
0.01 - 6	4700	1.30	0.50	QMA m/f	63	R443 191 000
0.5 - 22	180	1.25	0.50	SMA m/f	100	R443 137 000
0.1 - 40	180	1.35	0.60	SMA2.9	100	R443 162 000

**Monitor tees**

Frequency (GHz)	Nominal capacity (pF)	VSWR max.	Insertion Loss (dB) Max.	Max average Power (W)	Connectors	Part Number
0.01 - 1.5	15000	1.30	0.25	50	SMA	R443 530 000
0.9 - 3	10	1.25	0.25	10	SMA	R443 533 480
1.5 - 6	10	1.20	0.40	40	SMA	R443 533 000
6 - 12.4	3.5	1.35	0.50	40	SMA	R443 536 000

**Signal samplers**

Frequency DC to (GHz)	Coupling Variation (W)	VSWR max.	Insertion Loss (dB) Max.	Connectors main line	Connector coupled line	Part Number
12.4	6 / Octave	1.50	0.20	N male/female	BNC	R435 270 000 <sup>(1)</sup>
12.4	6 / Octave	1.50	0.20	N male/female	BNC	R435 170 000 <sup>(2)</sup>
12	6 / Octave	1.50	0.20	N male/female	BNC	R435 470 000 <sup>(3)</sup>

<sup>(1)</sup> Loop probe, <sup>(2)</sup> Resistive loop probe, <sup>(3)</sup> Capacitive probe

**Phase shifters**

Frequency DC to (GHz)	Total phase variation	VSWR max.	Connectors	Part Number
18	180° (18GHz)	1.30	SMA male / female	R499103000
18	180° (18GHz)	1.30	SMA male to S.R. .141 cable	R499101000