Mi-Wave

Millimeter Wave Products Inc.

Mi-Wave is a world wide leader in microwave and millimeter wave products for commercial and military applications. **Mi-Waves** history incorporates the fundamental millimeter wave engineering and product lines of Alpha Industries inc. / TRG Division, Northeast Microwave Systems inc. and Millimeter Products inc. / Center Technologies Div. along with new designs in both passive and active components and systems engineering.

Telecommunication,

Industrial and Military,

Radar, Automotive Collision Avoidance,

Test and Instrumentation, Electronic Warfare,

Research and Development Projects

Millimeter Wave Products, Inc.
2200 Tall Pines Drive, Suite 100
Largo, Florida 33771
Tel. (727) 536-0033
Fax (727) 536-0012
Webb Site www.miwv.com
E-mail sales@miwv.com

June 2007 Edition

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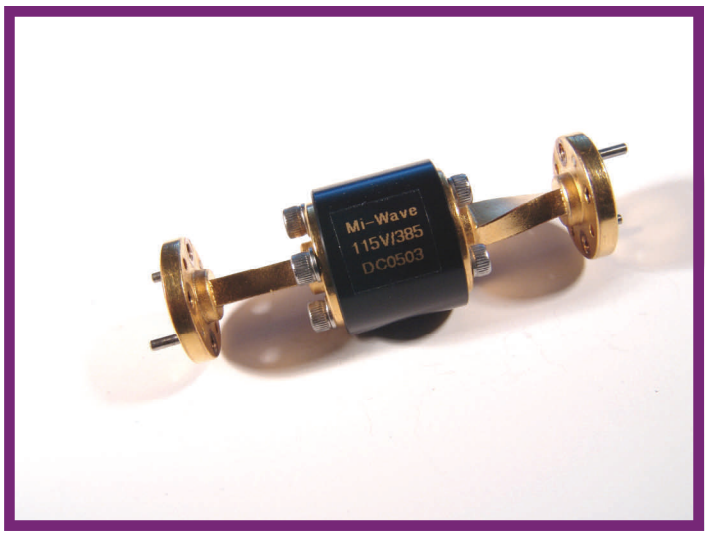

Features

- Low Insertion Loss
- Full Waveguide Band
- Lightweight and Compact Design
- Excellent Isolation Across the Band
- Faraday Rotation Principle of Operation

Description 115 Series Isolators

Mi-Wave's **115 series isolators use the Faraday principle of rotation in a broadband dielectric waveguide design to achieve high isolation across full waveguide bands. These isolators are available in standard waveguide sizes from 18.0 to 110 GHz.**

High-quality ferrite material is used in these isolators, and the magnetic field is produced by an integral Alnico V permanent magnet. To ensure maximum reproducibility and performance, a combination of precise machining operations and refined assembly techniques is used.

Applications

Designed for full waveguide band operation, the 115 series isolator is used in swept frequency applications. These components provide a high degree of isolation between signal sources and mismatched loads by attenuating the reflected signals. The insertion loss in the forward direction is minimized to allow for the full available power from the signal source-isolator combination. Typical applications for these broadband isolators include laboratory setups as well as millimeter wave test sets and EW / ELINT hardware.

Ordering Information

115 / ___

Specify Flange (See Appendix A)

Specify RF Band Designator

WARNING

Sensitive ferromagnetic devices are susceptible to the effects of stray magnetic fields and the presence of other ferrous components. These isolators should be kept at least two inches from all possible sources of interference.

Mi-Wave
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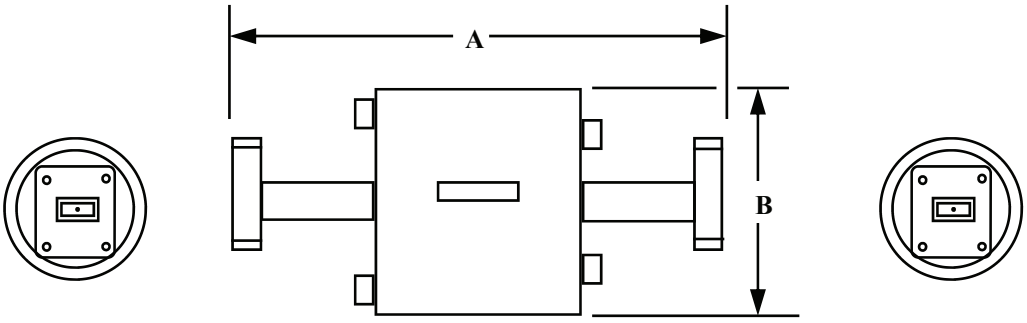
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

115 Series Full Waveguide Band Isolators

Technical Specifications

Model Number	115K	115A	115B	115U	115V	115E	115W
Frequency Band (GHz)	18.0-26.5	26.5-40.0	33.0-50.0	40.0-60.0	50.0-75.0	60.0-90.0	75.0-110.0
Isolation (dB) Typ.	25	25	25	25	25	25	25
Insertion Loss (dB) Typ.	1.0	1.0	1.3	1.5	1.6	1.9	2.2
VSWR Max.	1.30	1.30	1.30	1.30	1.35	1.35	1.40
Power Handling (Watts Max.)	2.0	2.0	1.5	1.5	1.0	1.0	1.0
Waveguide Size	WR-42	WR-28	WR-22	WR-19	WR-15	WR-12	WR-10
Waveguide Flange[1]	UG-595/U (54-4-001)	UG-599/U (54-4-003)	UG-383/U (67-2-006)	UG-383/U (67-2-008)	UG-385/U (67-2-008)	UG-387/U (67-2-009)	UG387/U-M (67-2-010)

1. Optional flanges are available: UG-381/U (67B-005), ***Mi-Wave*** 719, and ***Mi-Wave*** 720. Please consult ***Mi-Wave*** for further information.



Dimensional Specifications

Model No.	A		B	
	in	mm	in	mm
115K	**4.34**	**110.2**	**1.25**	**31.8**
115A	**3.38**	**85.9**	**1.25**	**31.8**
115B	**2.69**	**68.3**	**1.25**	**31.8**
115U	**2.56**	**65.2**	**1.25**	**31.8**
115V	**2.56**	**65.2**	**0.88**	**22.2**
115E	**2.56**	**64.9**	**0.88**	**22.2**
115W	**2.44**	**61.9**	**0.88**	**22.2**

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www.miwv.com
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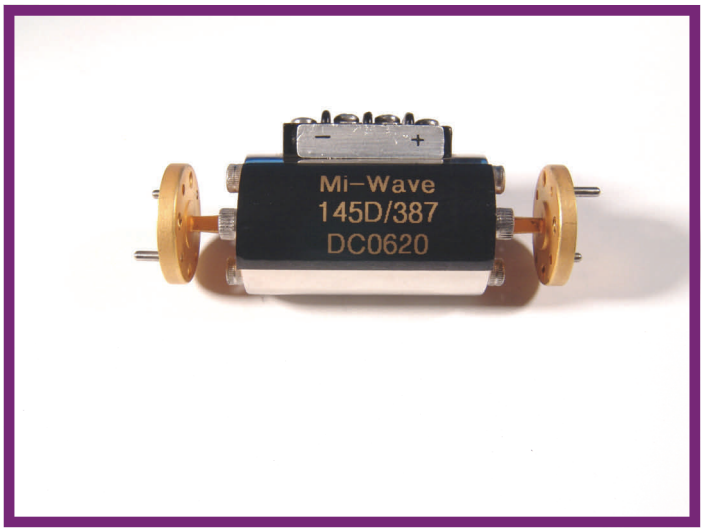
E: sales@miwv.com

145 Series Polarization Switches



Features

- Low VSWR
- Low Insertion Loss
- Faraday Rotation Devices
- Low Cross-Polarized Components

Description 145 Series Polarization Switches

Mi-Wave's **145 series polarization switch is a TE_{11} mode device with both the input and output in circular waveguide. It is equipped with a standard pin-aligned circular flange similar to most of *Mi-Wave's* standard 200 series antenna components.**

Typical units are continuously adjustable over ±90º of rotation. Please note that the rotation in Faraday rotators is frequency sensitive. The instantaneous bandwidth of these devices is limited to approximately 1% of the center frequency for a fixed drive current value.

Ordering Information

145

Specify RF Band Designator

Applications

Used primarily in conjunction with the antenna product line, the 145 series polarization switch provides a means of remote controlled polarization change. These switches can be used to align polarization between satellite and ground station communication when the satellite polarization is unknown. They are also useful in the test and measurement of circular TE_{11} mode components where axial ratio and elipticity must be calculated.

Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

145 Series Polarization Switches

Technical Specifications

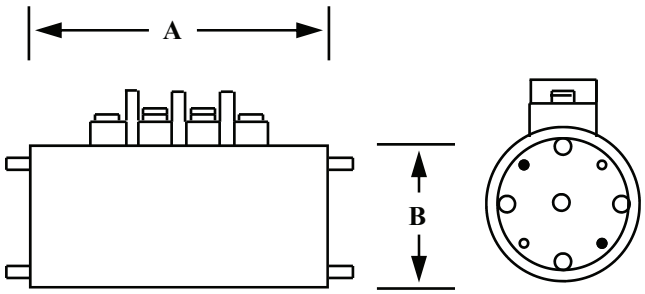
Circular waveguide components usually have different frequency bands than the rectangular waveguide components. Therefore, it is usually incorrect to refer to the common rectangular waveguide letter designations when specifying circular waveguide. For the ease of describing electrical specifications, it is convenient to group components in the standard rectangular waveguide frequency bands. Please refer to the circular waveguide chart for actual waveguide sizes.

Model Number	145A	145B	145U	145V	145E	145W	145F
Frequency Band (GHz)	26.5-40.0	33.0-50.0	40.0-60.0	50.0-70.0	60.0-90.0	75.0-110.0	90.0-140.0
Insertion Loss (dB) [1]	0.5	0.5	0.6	0.6	0.7	0.7	1.0
Cross Polarization (dB)	20	20	20	20	20	20	20
VSWR Max. [2]	1.25	1.25	1.25	1.25	1.30	1.30	1.30
Average Power (Watts)	12.0	8.0	3.0	3.0	2.0	1.5	1.0
Peak Power (kW)	4.0	2.5	1.0	1.0	0.7	0.5	0.3
Bandwidth (GHz)[1]	2	2	2	3	3	3	3
Coil Resistance (Ohms)	12	12	12	5	5	5	3
Coil Inductance (mH)	4	4	4	2	2	2	1.5
Switching Speed (usec)	5-10	5-10	5-10	2-5	2-5	2-5	2-5
Current Drive (mA)	0-250						

1. Insertion Loss and cross-polarization figures are shown for instantaneous bandwidths of approximately 1%. Drive current must be adjusted over the full RF bandwidth.
2. VSWR was measured using two ***Mi-Wave*** series 284 transitions.

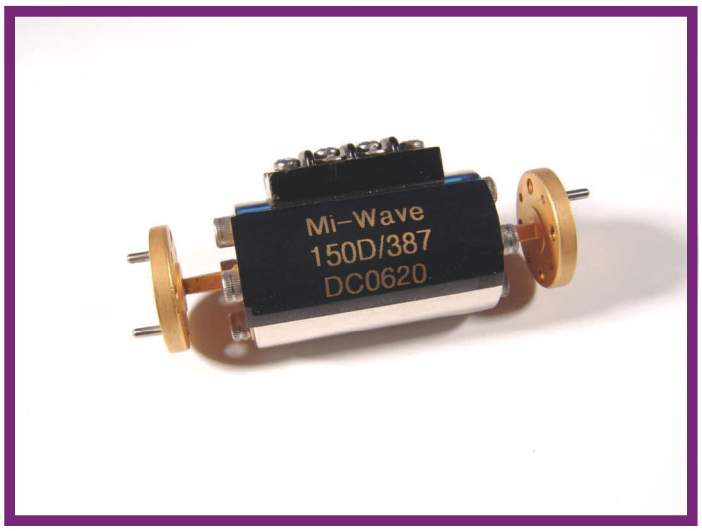
Dimensional Specifications

Model No.	A		B	
	in	mm	in	mm
145-550	3.25	82.6	1.75	44.5
145-396	3.00	76.2	1.25	31.8
145-328	2.50	63.5	1.25	31.8
145-281	2.50	63.5	1.25	31.8
145-250	2.50	63.5	1.25	31.8
145-219	2.50	63.5	1.25	31.8
145-188	2.50	63.5	1.25	31.8
145-172	On Request			
145-165	1.69	42.9	.88	22.4
145-141	On Request			
145-125	1.69	42.9	.88	22.4
145-110	1.69	42.9	.88	22.4
145-094	1.69	42.9	.88	22.4
145-082	On Request			
145-075	On Request			
145-067	1.50	38.1	.88	22.4
145-059	On Request			



Mi-Wave
Millimeter Wave Products, Inc.
www.miwv.com
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

150 Series Ferrite Phase Shifters



Features

- Fast Rise Time
- 360º Phase Shift
- Remote Controlled

Description 150 Series Phase Shifters

Mi-Wave's **150 series is a suppressed rotation reciprocal ferrite phase shifter, built completely in rectangular waveguide to suppress Faraday rotational tendencies in the ferrite at the frequency of operation. This construction allows a low variation in loss as phase is changed. Rise time is optimized through the use of stainless steel waveguide.**

Ordering Information

150 — **/** —

Specify Flange (See Appendix A)

Specify RF Band Designation

Applications

The 150 series phase shifters are designed for applications that require high speed phase modulation or remote controlled operation.

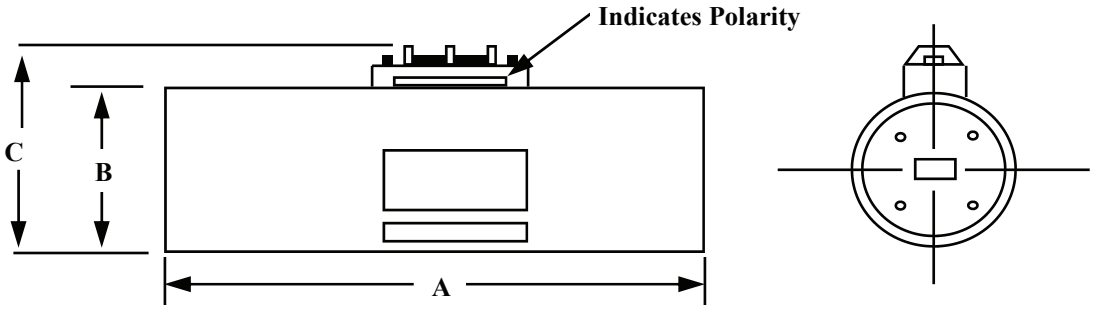
Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

150 Series Ferrite Phase Shifters

Technical Specifications

Model Number	150A	150B	150U	150V	150E	150W
Frequency Band (GHz)	26.5-40.0	33.0-50.0	40.0-60.0	50.0-75.0	60.0-90.0	75.0-110.0
Insertion Loss (db) Max.	2.5	2.7	2.7	3.0	3.0	3.0
VSWR Max.	1.30	1.30	1.30	1.30	1.35	1.35
Phase Shift [1]						
Bandwidth [2]	2%	2%	2%	2%	2%	1%
Switching Speed (usec)	20	20	20	15	15	15
Average Power (Watts)	5.0	4.0	2.0	1.0	1.0	0.5
Power, Peak (kW)	2.0	1.5	1.0	0.7	0.5	0.3
Weight (oz)	9.0	8.0	6.0	4.0	3.0	3.0

1. Consult factory for amount of phase shift.
2. Specify center frequency.



Dimensional Specifications

Model	A		B		C	
	B					
No.	in	mm	in	mm	in	mm
150A	6.00	152.4	1.25	31.8	1.53	38.9
150B	3.30	83.8	1.25	31.8	1.53	38.9
150U	3.30	83.8	1.25	31.8	1.53	38.9
150V	3.00	76.2	0.88	22.4	1.13	28.7
150E	2.50	63.5	0.88	22.4	1.13	28.7
150W	2.50	63.5	0.88	22.4	1.13	28.7

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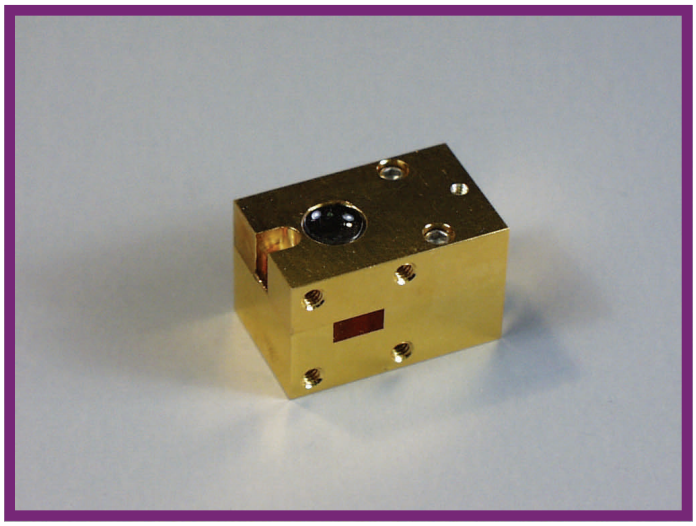
Millimeter Wave Products, Inc. **2200 Tall Pines Drive, Suite 100 Largo, FL 33771**
Tel. (727) 536-0033 Fax. (727) 536-0012 E: sales@miwv.com

172 Series Y-Junction Isolators



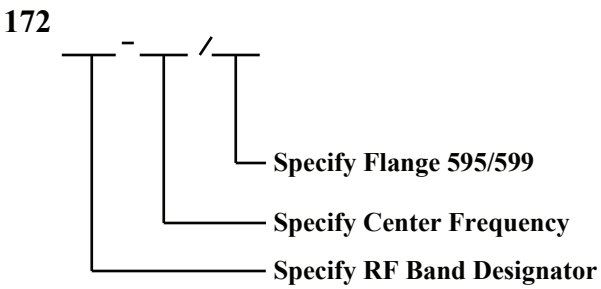
Features

- Low Loss
- Low VSWR
- High Isolation
- Broad Bandwidth
- Compact & Rugged
- Optimal Temperature Response

Description 172 Series Isolators

Mi-Wave's **172 series is an H-plane, three port Y-junction ferrite device with one arm internally terminated in a matched load. Reflected energy is circulated into this load to isolate the input. All external mating surfaces are machined to extreme flatness to provide connection to standard waveguide flanges for minimum discontinuity. The 172 series isolators are available in standard waveguide sizes from 12.4 to 50 GHz, using square UG-419, UG-595 and 599 style flanges only.**

Ordering Information



Applications

The 172 series Y-junction isolators are useful in test setup and operational systems. These devices provide a high degree of isolation between signal sources and system loads by sharply attenuating reflected signals with very low loss in the forward direction.

Mi-Wave

Millimeter Wave Products Inc.

www.miwv.com

2200 Tall Pines Drive, Suite 100

Largo, FL 33771

Tel. (727) 536-0033 Fax. (727) 536-0012

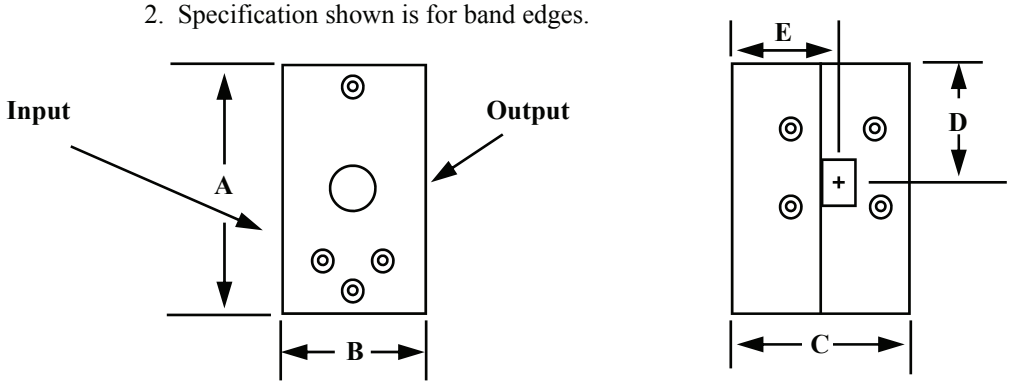
E: sales@miwv.com

172 Series Y-Junction Isolators

Technical Specifications

Model Number	172K	172A	172B
Frequency Band (GHz)	18.0-26.5	26.5-40.0	33.0-50.0
Bandwidth [1]	2.0GHz	1.5GHz	1.3GHz
Isolation [2] **(dB)**	20.0	20.0	20.0
Insertion Loss (dB)	0.3	0.4	0.5
VSWR [2] **Max.**	1.30	1.30	1.30
Temperature Range	-15° C to +65° C		
Peak Power (kW)	1.0	1.0	1.0
Average Power (Watts)			
Forward	30	30	25
Backward	1.5	1.0	0.8
Weight (oz)	4.0	4.0	4.0
Flange Type	UG-595/U	UG-599/U	UG-599/U

1. Specify center frequency.
2. Specification shown is for band edges.



Please Note: Smaller versions of certain model numbers are available. Please consult *Mi-Wave* for dimensions.

Dimensional Specifications

Model	A		B		C		D		E	
No.	**in**	**mm**	**in**	**mm**	**in**	**mm**	**in**	**mm**	**in**	**mm**
172K	**1.50**	**38.1**	**.88**	**22.4**	**1.25**	**31.8**	**.63**	**16.0**	**.63**	**16.0**
172A	**1.20**	**30.5**	**.75**	**19.1**	**.75**	**19.1**	**.38**	**9.7**	**.38**	**9.7**
172B	**1.20**	**30.5**	**.75**	**19.1**	**.75**	**19.1**	**.38**	**9.7**	**.38**	**9.7**

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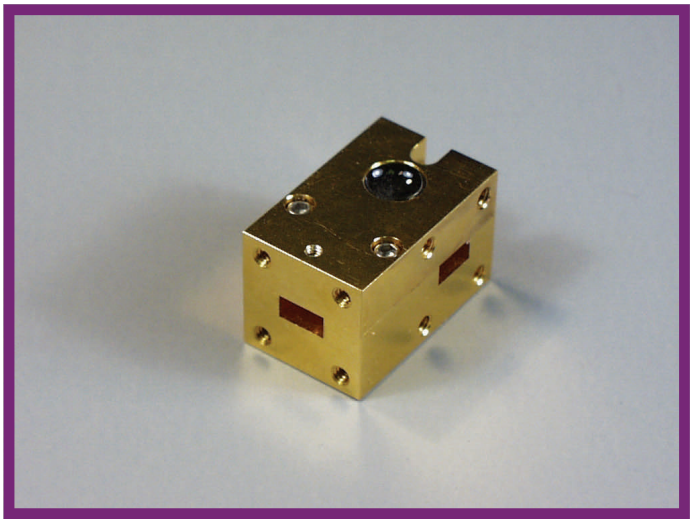
Millimeter Wave Products, Inc.
www.miwv.com Tel. (727) 536-0033 Fax. (727) 536-0012 E: sales@miwv.com

173 Series Y-Junction Circulators



Features

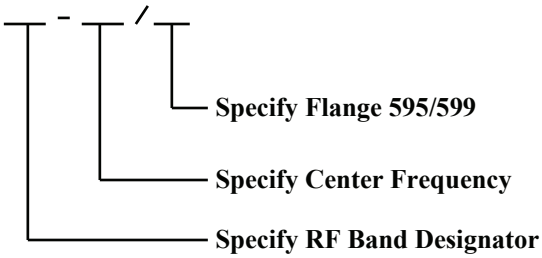
- Low Loss
- Low VSWR
- High Isolation
- Broad Bandwidth
- Compact & Rugged
- Optimal Temperature Response

Description 173 Series Circulators

Mi-Wave's **173 series is an H-plane, three port Y-junction ferrite device. Reflected energy is circulated to isolate the input. All external mating surfaces are machined to extreme flatness to provide connection to standard waveguide flanges for minimum discontinuity. The 173 series circulators are available in standard waveguide sizes from 12.4 to 50 GHz, using square UG-419, UG-595 and 599 style flanges only.**

Ordering Information

173



Applications

The 173 series Y-junction circulators are useful in test setup and operational systems.

Mi-Wave

Millimeter Wave Products Inc.

www.miwv.com

2200 Tall Pines Drive, Suite 100

Largo, FL 33771

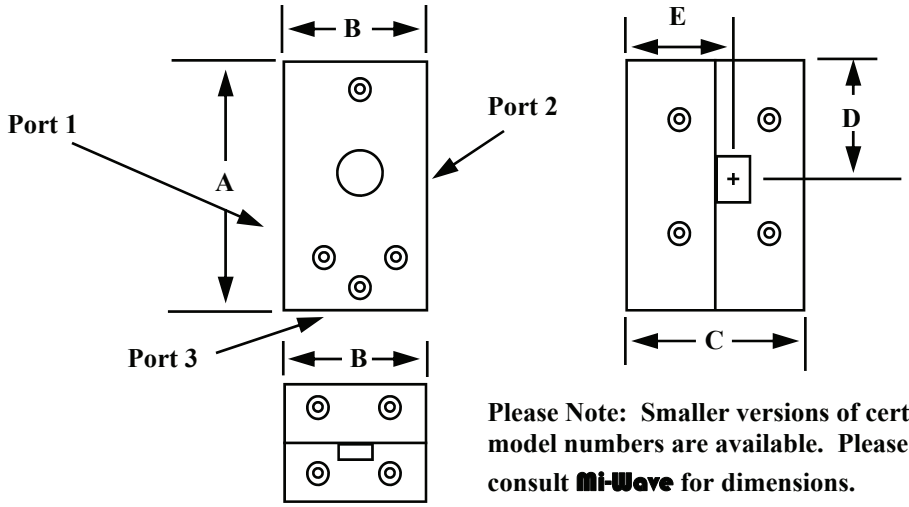
Tel. (727) 536-0033 Fax. (727) 536-0012

E: sales@miwv.com

173 Series Y-Junction Circulators

Technical Specifications

Model Number	173K	173A	173B
Frequency Band (GHz)	18.0-26.5	26.5-40.0	33.0-50.0
Bandwidth [1]	1.8GHz	1.5GHz	1.3GHz
Isolation [2] (dB)	18.0	18.0	18.0
Insertion Loss (dB)	0.3	0.4	0.5
VSWR [2] Max.	1.30	1.30	1.30
Temperature Range	_____	-15° C to +65° C	_____
Peak Power (kW)	1.0	1.0	1.0
Average Power (Watts)	30	30	25
Weight (oz)	4.0	4.0	4.0
Flange Type	UG-595/U	UG-599/U	UG-599/U



Please Note: Smaller versions of certain model numbers are available. Please consult Mi-Wave for dimensions.

Dimensional Specifications

Model No.	A		B		C		D		E	
	in	mm	in	mm	in	mm	in	mm	in	mm
173K	1.50	38.1	.88	22.4	1.25	31.8	.63	16.0	.63	16.0
173A	1.20	30.5	.75	19.1	19.1	19.1	.38	19.7	.38	19.7
173B	1.20	30.5	.75	19.1	19.1	19.1	.38	19.7	.38	19.7

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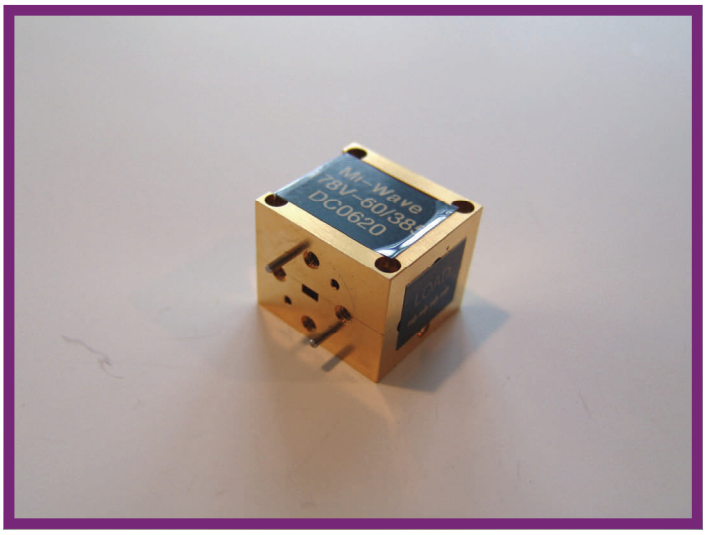
Millimeter Wave Products, Inc.
www.miwv.com Tel. (727) 536-0033 Fax. (727) 536-0012 E: sales@miwv.com

178 Series Y-Junction Isolators



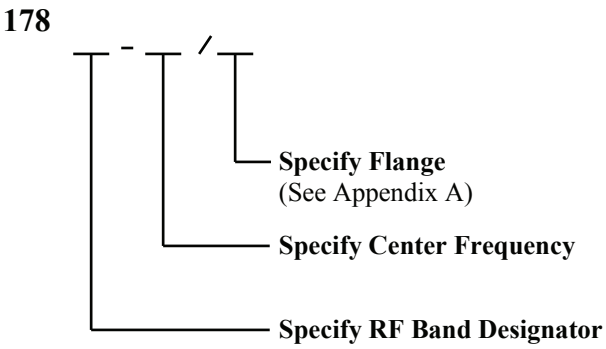
Features

- Low Loss
- Low VSWR
- High Isolation
- Broad Bandwidth
- Compact & Rugged
- Optimal Temperature Response

Description 178 Series Isolators

Mi-Wave's **178 series is an H-plane, three port Y-junction ferrite device with one arm internally terminated in a matched load. Reflected energy is circulated into this load to isolate the input. All external mating surfaces are machined to extreme flatness to provide connection to standard waveguide flanges for minimum discontinuity. The 178 series isolators are available in standard waveguide sizes from 18.0 to 110 GHz, in round style flanges only.**

Ordering Information



Applications

The 178 series Y-junction isolators are useful in test setup and operational systems. These devices provide a high degree of isolation between signal sources and system loads by sharply attenuating reflected signals with very low loss in the forward direction.

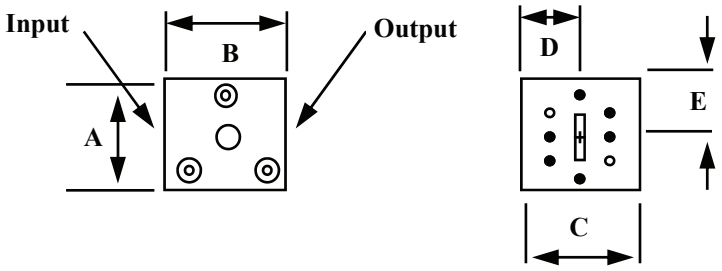
Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

178 Series Y-Junction Isolators

Technical Specifications

Model Number	178K	178A	178B	178U	178V	178E	178W
Frequency Band (GHz)	18.0-26.5	26.5-40.0	33.0- 50.0	40.0-60.0	50.0-75.0	60.0-90.0	75.0-110.0
Bandwidth [1]	2.0GHz	1.5GHz	1.3GHz	1.3GHz	1.5GHz	1.5GHz	1.5GHz
Isolation [2] (dB)	20.0	20.0	20.0	15.0	15.0	15.0	15.0
Insertion Loss (dB)	0.4	0.4	0.5	0.7	1.0	1.0	1.0
VSWR [2] Max.	1.30	1.30	1.30	1.35	1.40	1.4	1.4
Temperature Range	15º to + 65ºC					0º - 50º	
Peak Power (kW)	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Average Power (Watts)							
Forward	30	30	25	15	10	5	5
Backward	1.5	1.0	0.8	0.4	0.3	0.2	0.2
Weight (oz)	3.0	3.0	3.0	3.0	5.0	5.0	5.0
Flange Type	UG425/U	UG381/U	UG383/U	UG383/U	UG385/U	UG387/U	UG387/U

1. Specify center frequency.
2. Specification shown is for band edges.



Dimensional Specifications

Model	A		B		C		D		E	
No.	**in**	**mm**	**in**	**mm**	**in**	**mm**	**in**	**mm**	**in**	**mm**
178K	**1.50**	**38.1**	**1.25**	**31.8**	**1.18**	**29.97**	**.59**	**14.9**	**.59**	**14.9**
178A	**1.50**	**38.1**	**1.25**	**31.8**	**1.18**	**29.97**	**.59**	**14.9**	**.59**	**14.9**
178B	**1.50**	**38.1**	**1.25**	**31.8**	**1.18**	**29.97**	**.59**	**14.9**	**.59**	**14.9**
178U	**1.50**	**38.1**	**1.25**	**31.8**	**1.18**	**29.97**	**.59**	**14.9**	**.59**	**14.9**
178V	**1.10**	**27.9**	**1.00**	**25.4**	**.90**	**22.9**	**.50**	**12.7**	**.45**	**11.4**
178E	**1.10**	**27.9**	**1.00**	**25.4**	**.90**	**22.9**	**.50**	**12.7**	**.45**	**11.4**
178W	**1.10**	**27.9**	**1.00**	**25.4**	**.90**	**22.9**	**.49**	**12.7**	**.50**	**11.4**

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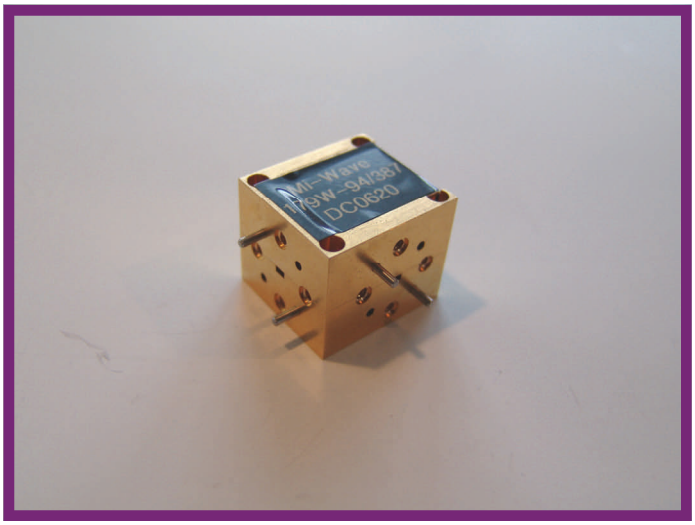
179 Series Y-Junction Circulators



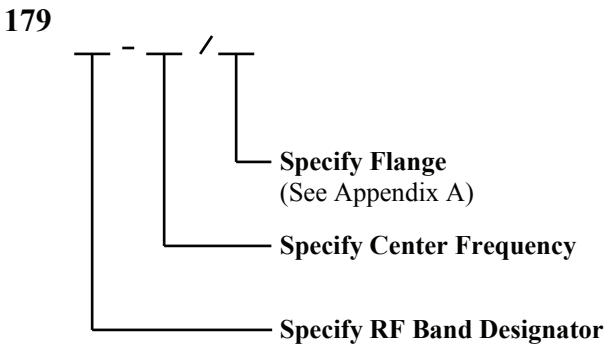
Features

- Low Loss
- Low VSWR
- High Isolation
- Broad Bandwidth
- Compact & Rugged
- Optimal Temperature Response

Description 179 Series Circulators

Mi-Wave's **179 series is an H-plane, three port Y-junction ferrite device. All external mating surfaces are machined to extreme flatness to provide connection to standard waveguide flanges for minimum discontinuity. The 179 series circulators are available in standard waveguide sizes from 18.0 to 110 GHz, in round style flanges only.**

Ordering Information



Applications

The 179 series Y-junction circulators are useful in test setup and operational systems.

Mi-Wave

Millimeter Wave Products Inc.

www.miwv.com

2200 Tall Pines Drive, Suite 100

Largo, FL 33771

Tel. (727) 536-0033 Fax. (727) 536-0012

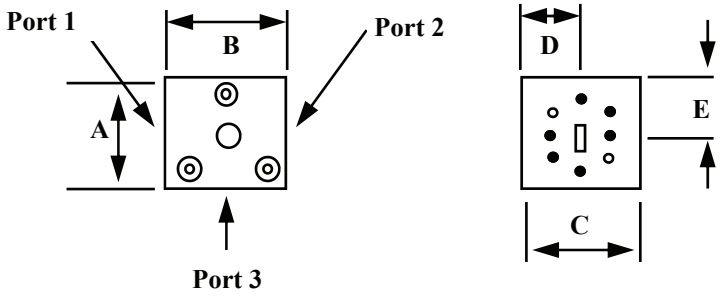
E: sales@miwv.com

179 Series Y-Junction Circulators

Technical Specifications

Model Number	179K	179A	179B	179U	179V	179E	179W
Frequency Band (GHz)	18.0-26.5	26.5-40.0	33.0-50.0	40.0-60.0	50.0-75.0	60.0-90.0	75.0-110.0
Bandwidth [1]	1.8GHz	1.3GHz	1.2GHz	1.2GHz	1.3GHz	1.3GHz	1.3GHz
Isolation [2] (dB)	18	18	18	15	15	15	15
Insertion Loss (dB)	0.4	0.4	0.5	0.7	1.0	1.0	1.0
VSWR [2] Max.	1.30	1.30	1.30	1.35	1.40	1.40	1.40
Temperature Range	-15° C to + 65° C					0° C to + 50° C	
Peak Power (kW)	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Average Power (Watts)	30	30	25	15	10	5	5
Weight (oz.)	3.0	3.0	3.0	3.0	5.0	5.0	5.0
Flange Type	UG425/U	UG381/U	UG383/U	UG383/U	UG385/U	UG387/U	UG387/U

1. Specify center frequency.
2. Specification shown is for band edges.



Dimensional Specifications

Model	A		B		C		D		E	
No.	**in**	**mm**	**in**	**mm**	**in**	**mm**	**in**	**mm**	**in**	**mm**
179K	**1.50**	**38.1**	**1.25**	**31.8**	**1.18**	**29.97**	**.59**	**14.9**	**.59**	**14.9**
179A	**1.50**	**38.1**	**1.25**	**31.8**	**1.18**	**29.97**	**.59**	**14.9**	**.59**	**14.9**
179B	**1.50**	**38.1**	**1.25**	**31.8**	**1.18**	**29.97**	**.59**	**14.9**	**.59**	**14.9**
179U	**1.50**	**38.1**	**1.25**	**31.8**	**1.18**	**29.97**	**.59**	**14.9**	**.59**	**14.9**
179V	**1.10**	**27.9**	**1.00**	**25.4**	**.90**	**22.9**	**.50**	**12.7**	**.45**	**11.4**
179E	**1.10**	**27.9**	**1.00**	**25.4**	**.90**	**22.9**	**.50**	**12.7**	**.45**	**11.4**
179W	**1.10**	**27.9**	**1.00**	**25.4**	**.90**	**22.9**	**.50**	**12.7**	**.45**	**11.4**

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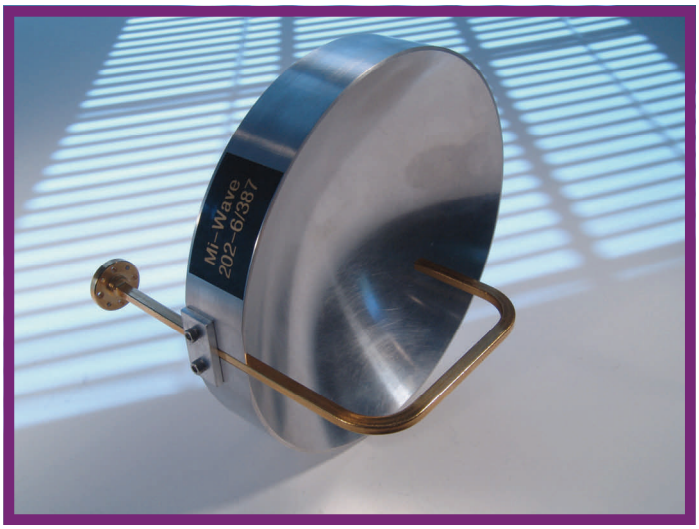
Millimeter Wave Products, Inc.
www.miwv.com Tel. (727) 536-0033 Fax. (727) 536-0012 E: sales@miwv.com

202 & 203 Series Prime Focus Parabolic Antennas



Features

- Low Cost
- High Directivity and Gain
- Simple Mechanical Design
- Moderate Sidelobe Performance
- Wide Range of Available Beamwidths and Reflector Sizes

Description 202 Series Parabolic Antennas

Mi-Wave's **202 series antenna consist of a parabolic reflector, a linearly-polarized primary feed, and a feed support assembly, that is attached to the rim of the reflector in order to position the feed accurately. Tapped holes are provided on each antenna for mounting.**

The 202 series antennas feature a precision aluminum reflector which provides excellent performance at millimeter wave frequencies between 18 to 140 GHz diameters from 3 to 24 inches are available. This design is recommended for frequencies where low surface tolerances (typically 0.001 inch RMS) are critical for electrical performance. The characteristics of the 202 series antennas makes them well-suited for applications where high performance is necessary.

For applications that require larger diameters, the 203 series antennas feature metallized fiberglass reflectors and cover a frequency range form 12.4 to 140 GHz. They are available in diameters from 18 to 120 inches with low surface tolerances (typically 0.0023 inch RMS).

Applications

Radar and Telemitry Systems
Point to Point Communication Links

Ordering Information

202
203 **– / **

- **Specify Flange** (See Appendix A)
- **Specify RF Band Designator** (Ku, K, A, B, U, V, E, W)
- **Specify Effective Diameter** (In Inches) (See Appendix J)

The center frequency should be specified when ordering these antennas. Beamwidths are typically ± 5%. Sidelobes are nominally -20dB. Boresight telescopes and boresighting are recommended and are availiable on request.

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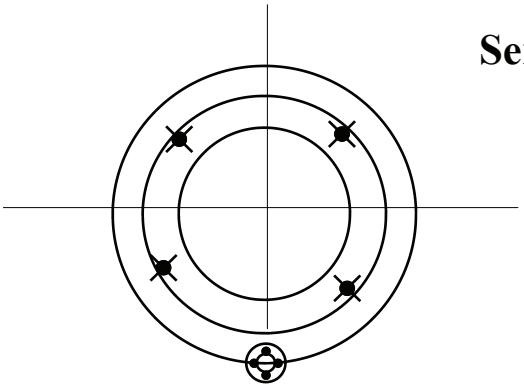
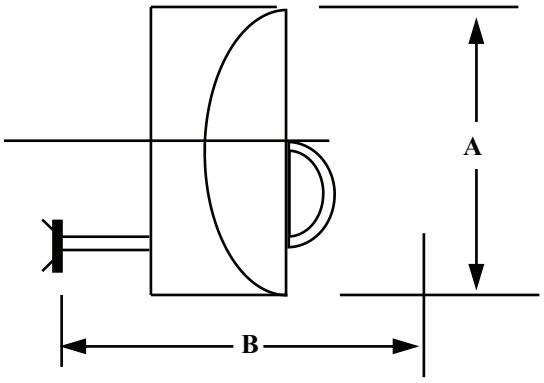
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

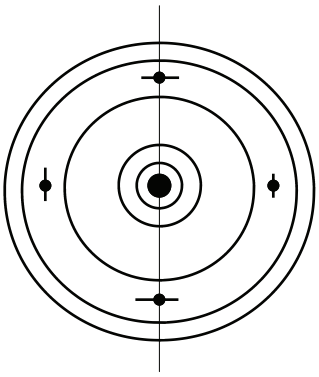
202 & 203 Series Prime Focus Parabolic Antennas

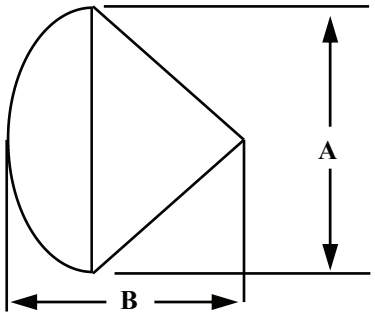
Series 202





Series 203





Dimensional Specifications

Model No.	Effective Diameter (Inches)	A in	A mm	B in	B mm
202	3	3.4	86	3.7	94
202	6	7.3	185	5.1	129
202	12	15.0	381	10.5	266
202	18	22.0	558	11.0	279
202	24	28.2	716	15.7	399
202	36				
202	48				
203	3				
203	6				
203	12				
203	18	11.8	300	22.0	558
203	24	15.0	381	27.4	696
203	36	20.3	515	39.2	996
203	48	23.5	597	54.0	1372

Please Note: Antenna feeds amy vary due to reflector diameter and performance requirements. Please consult *Mi-Wave* for further information.

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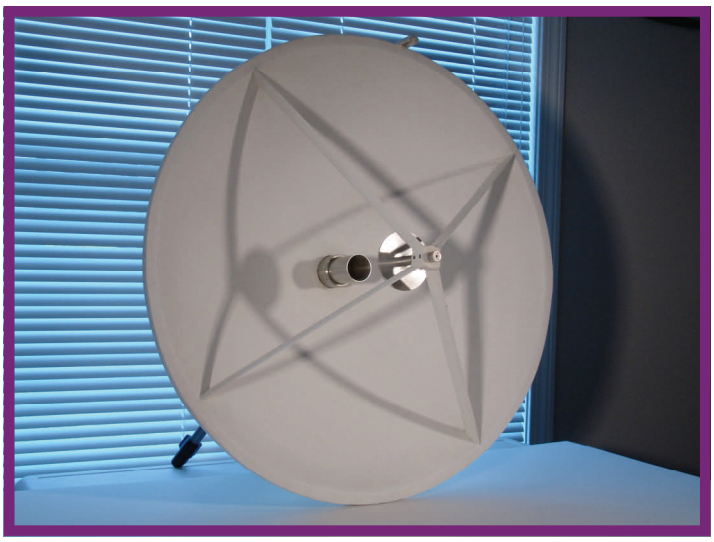
www.miwv.com
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

222 & 223 Series Cassegrain Antennas



Features

- Low VWSR
- Aluminum or Fiberglass Construction
- Low Loss Performance at Millimeter Wave Frequencies

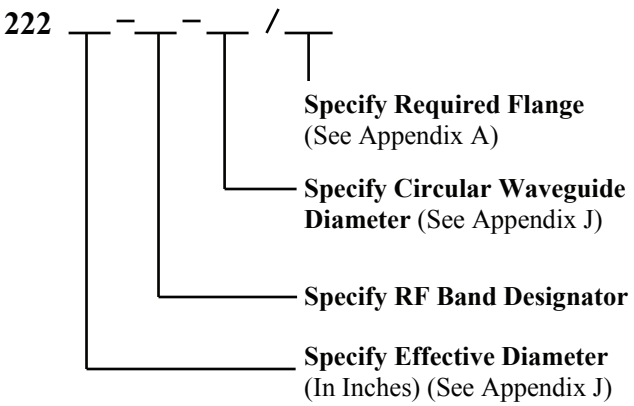
Description 222 Series Cassegrain Antennas

Mi-Wave's **222 series cassegrain antenna consists of a parabolic reflector, a primary feed, subreflector, and a feed support assembly of four low profile aluminum spars that are attached to the rim if the reflector to position the feed.**

The 222 series antennas feature a precision aluminum main reflector which provides excellent performance at millimeter wave frequencies between 18 to 140 GHz.

The 223 series antennas feature metallized fiberglass reflectors and are available from 12.4 to 140 GHz. They offer very high performance in a lightweight antenna structure. These antennas are available in effective diameters of 10 to 120 inches. Because of the low surface tolerance (typically 0.0025 inch RMS) they provide excellent high frequency radiation characteristics.

Ordering Information



The center frequency should be specified when ordering these antennas.

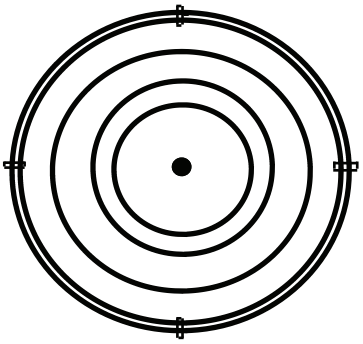
Applications

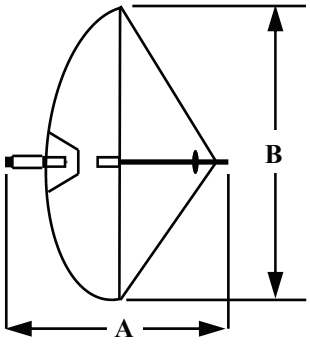
Radars
Satellite Tracking
Communication Systems

Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

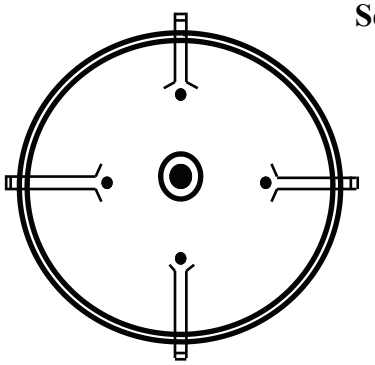
222 & 223 Series Cassegrain Antennas

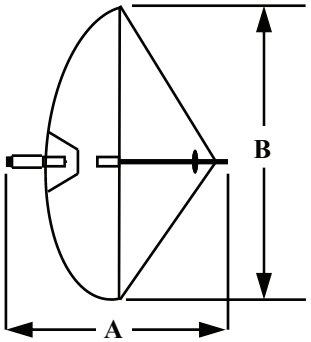
Series 222-18





Series 223-36





Dimensional Specifications

Model No.	Effective Diameter (Inches)	A in	A mm	B in	B mm
822	12	14	376	12	257
822	18	16	564	18	338
822	24	20	716	28	394
822	36				
822	48				
823	12				
823	18	13.3	338	22.2	564
823	24	15.5	394	28.2	706
823	36	20.9	531	39.1	993
823	48	23.0	594	54.0	1372

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Millimeter Wave Products, Inc.
www.miwv.com
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

258 Series Horn Lens Antennas

Features

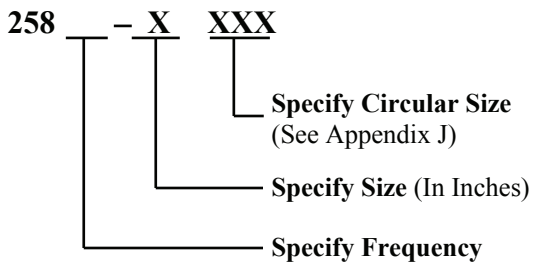
- Low Sidelobes
- Wide Bandwidths
- No Aperture Blockage
- Symetrical E and H Plane Beamwidths

Description 258 Series Horn Lens Antennas

Mi-Wave's **258 series horn lens antenna consists of a circular scalar feel horn illuminating a plano-convex lens. Housed in either aluminum or plastic, these horn lens antennas provide a high efficiency beam with equal E and H plane amplitude patterns.**

The 258 series antenna are available from 12.4 to 170 GHz in standard sizes of 3, 6, 9, and 12 inch lens apertures. Other custom sizes and configurations are available, please consult *Mi-Wave* for further information.

Ordering Information



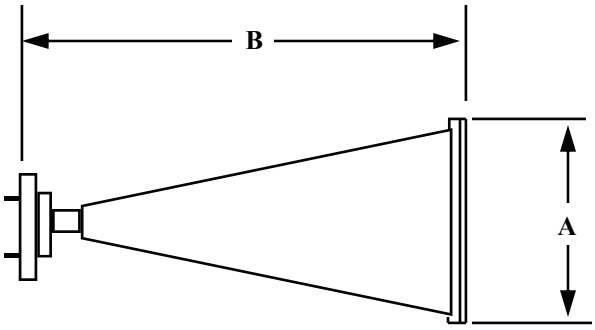
Applications

Radioastronomy
Surveillance Equipment
Communication Systems

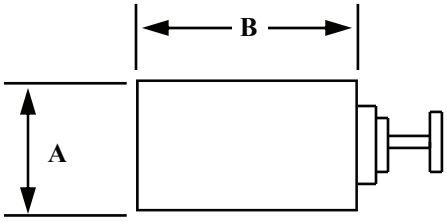
Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

258 Series Horn Lens Antennas

Outline of 6, 9, 12”



Outline of 3,”



Please Note: Final dimensions are subject to variations from the tabulated data due to tuning, focusing, and mechanical tolerances.

Dimensional Specifications

Model No.	Effective Diameter (Inches)	A		B	
		in	mm	in	mm
258KU	-12	14.0	356	21.0	533
258K	-9	11.0	279	15.7	399
258K	-12	14.0	356	19.5	495
258A	-3	4.1	104	8.30	210
258A	-6	7.6	193	11.1	282
258A	-9	11.0	279	14.0	356
258A	-12	14.0	356	18.2	462
258B, U	-3	4.1	104	8.3	210
258B, U	-6	7.60	193	10.6	269
258B, U	-9	11.0	279	14.0	356
258B, U	-12	14.0	356	17.7	450
258V, E, W	-3	4.2	107	6.0	152
258V, E, W	-6	7.6	193	9.6	244
258V, E, W	-9	11.0	279	13.0	330
258V, E, W	-12	14.0	356	16.7	424

Typical Electrical Specifications

Frequency	12.4 to 140 GHz
Sizes	3, 6, 19, 12
Sidelobes	25dB (typical)
VSWR	1.2:1 (typical)
Cross Polarization	25dB (typical)

Mi-Wave
Millimeter Wave Products, Inc.
www.miwv.com
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

261 Series Standard Gain Horns

Features

- Nominal Gain of 25 dBi
- Available from 12.4 to 220 GHz
- Made with Precise Dimensional Tolerance Control
- Gain Calibration is Accurate to 0.5 dB Over Full Waveguide Bandwidth
- Other Gain Values Availible upon Request, ex: 10, 15, 20, etc.

Description 261 Series Gain Horns

Mi-Wave's **261 series standard gain horns are fabricated with very close tolerances to ensure the precision of every horn manufactured by *Mi-Wave*. Each unit is joined to a short section of rectangular wave-guide and terminated in a standard flange.**

Standard gain horns can be used to determine experimentally the gain of other antennas by using the substitution method. The standard gain horn and the antenna under test are alternately connected to a well-matched detector system in order to compare their relative power levels. The power level difference is then added to the appropriate level of the calibration curve the determine the absolute gain of the antenna under test.

Standard gain horns are also useful as power monitors in radar transmitter tests, known-gain radiators in field propagation studies, and transmitting or receiving antennas in test bench applications. The completed units are gold-plated to protect from corrosion and for minimum RF losses.

Please Note: 15 dB models available in all bands.

Ordering Information

261 /

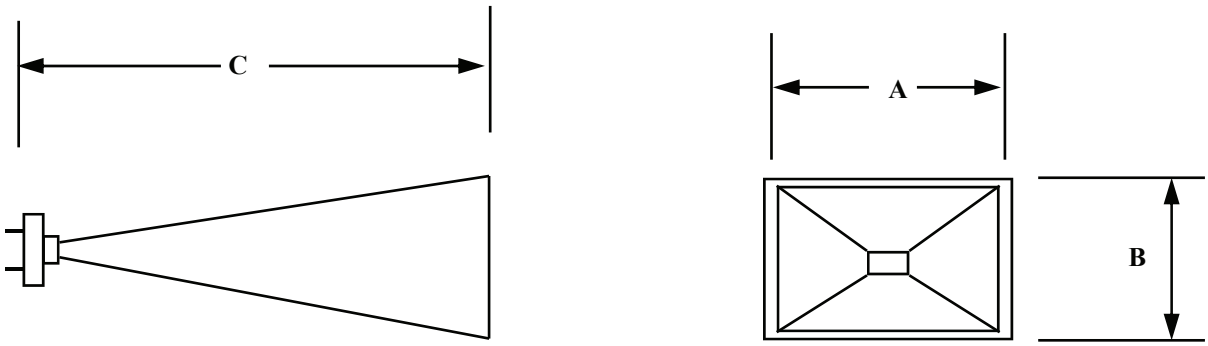
Specify Flange (See Appendix A)

Specify RF Band Designator
(Ku, K, A, B, U, V, E, W, F, D, G)

For Example: Model number 261 W/387 is a standard gain horn operating in W-band with a 387 type flange.

Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

261 Series Standard Gain Horns



Specifications

Model Number	Frequency Band (GHz)	Waveguide Dimension	Waveguide WR-	Flange Types	A		B		C	
					in	mm	in	mm	in	mm
261Ku	12.4-18.0	.622 x .311	62	425	5.62	142.8	4.18	106.2	12.50	317.5
261K	18.0-26.5	.420 x.170	42	595	4.12	104.7	3.40	86.4	9.20	233.7
261A	26.5-40.0	.280 x .140	28	599	2.84	72.1	2.35	59.7	6.60	167.6
261B	30.0-50.0	.224 x .112	22	383	2.30	58.4	1.91	48.5	5.10	129.5
261U	40.0-60.0	.188 x .094	19	385	1.81	46.0	1.38	35.1	4.05	102.9
261V	50.0-75.0	.148 x .074	15	387	1.72	43.7	1.43	36.3	3.90	99.1
261E	60.0-90.0	.122 x .061	12	387	1.46	37.1	1.21	30.8	3.20	81.3
261W	75.0-110.0	.100 x .050	10	387	1.21	30.7	1.02	25.9	2.80	71.1
261F	90.0-140.0	.080 x .040	8	387	1.00	25.4	0.84	21.3	2.10	53.3
261D	110.0-170.0	.065 x .0325	6	387	0.83	21.1	0.70	17.8	1.73	43.9
261G	140.0-220.0	.051 x .0255	5	387	0.54	13.7	0.64	16.3	1.25	31.8

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Millimeter Wave Products, Inc.
www.miwv.com
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

262 Series Conical Horn Antennas

Features

- Available from 12.4 to 220 GHz
- Nominal Gain of 15, 20 and 25 dbi
- Made with Precise Dimensional Tolerance Control
- Gain Calibration is Accurate to 0.5 dB Over Full Waveguide Bandwidth

Description 262 Series Horn Antennas

Mi-Wave's **262 series conical horns are fabricated with very close tolerances to ensure the precision of every horn manufactured by *Mi-Wave*. Each unit is supplied with a short section of circular waveguide and terminated in a standard round flange.**

Conical horns can be used to determine experimentally the gain of other antennas by using the substitution method. The conical horn and the antenna under test are alternately connected to a well-matched detector system in order to compare their relative power levels. The power level difference is then added to the appropriate level of the calibration curve the determine the absolute gain of the antenna under test.

Conical horns are also useful as power monitors in radar transmitter tests, known-gain radiators in field propagation studies, and transmitting or receiving antennas in test bench applications. The completed units are gold-plated.

Please Note: 10, 15, and 20 dB models are available in all bands.

Ordering Information

262 _ _ /

- **Specify Flange** (See Appendix A)
- **Specify Gain** (In dbi)
- **Specify RF Band Designator** (Ku, K, A, B, U, V, E, W, F, D, G)

For Example: Model number 262 W/387 is a conical horn operating in W-band with a 387 type flange.

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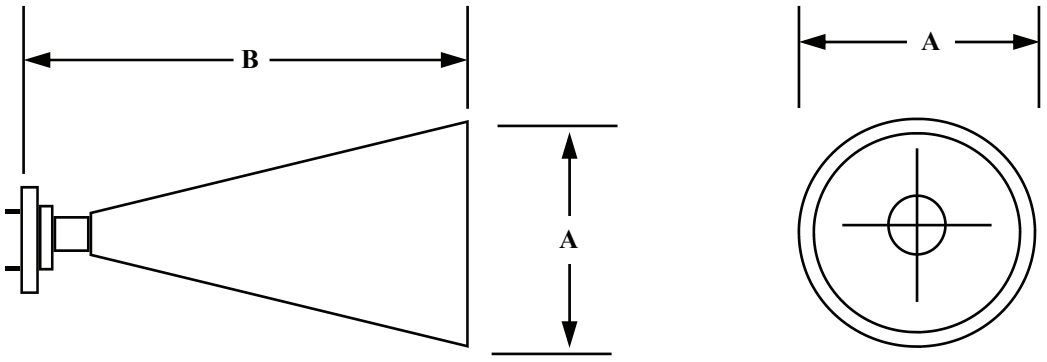
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

262 Series Conical Horn Antennas



Specifications

Model Number	Frequency Band (GHz)	Pipe Diameter	A in	A mm	B in	B mm
262Ku	12.4-18.0	(see note)				
262K	18.0-26.5	(see note)				
262A	26.5-40.0	(see note)				
262B	30.0-50.0	(see note)				
262U	40.0-60.0	(see note)	Consult Mi-Wave for Dimensions Due to Wide Variety of Circular Waveguide Sizes and Gain Options.			
262V	50.0-75.0	(see note)				
262E	60.0-90.0	(see note)				
262W	75.0-110.0	(see note)				
262F	90.0-140.0	(see note)				
262D	110.0-170.0	(see note)				
262G	140.0-220.0	(see note)				

Please Note: Please refer to chart for correct pipe size based on center frequency and bandwidth.

Mi-Wave
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www.miwv.com
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

263 Series Wide Angle Scalar Feed Horns

Features

- Low VSWR
- Wide Beamwidths
- Polarization Insensitive
- Partial Waveguide Bandwidths

Description 263 Series Scalar Feed Horns

Mi-Wave's **263 series wide angle scalar feed horn or also called a choke horn, has been designed to be used in applications where wide beamwidth (55 Deg.) is required such as low F/D ratios of .5 and .4 in parabolic reflectors and offset feed applications.**

Ordering Information

263 ___ **/** ___

Specify Flange (See Appendix A)

Specify RF Band Designator
(Ku, K, A, B, U, V, E, W, F, D, G)

For Example: Model number 263W/387 is a wide beam scalar feed horn operating in W-Band with a UG-387 flange.

Applications

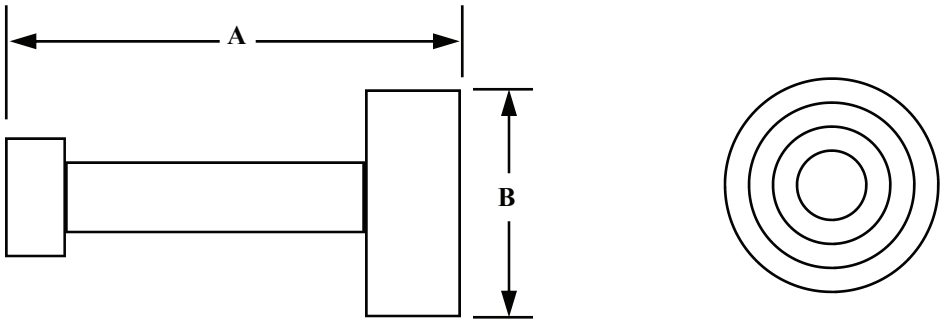
Low F/D Antennas
Surveillance Systems
Offset Feed Antennas

Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

263 Series Wide Angle Scalar Feed Horns

Typical Electrical Specifications

Beamwidth (3dB)	E-Plane 55 Deg. H- Plane 56 Deg.
Sidelobes	E-Plane -25dB H-Plane -25dB
Bandwidth	50 %



Please Note: 263 series Feed Horns are normally supplied with a standard rectangular waveguide, circular is also available.

Dimensional Specifications

Model No.	Frequency Band (GHz)		EIA-WG Designation	A		B	
				in	mm	in	mm
263	12.4	18.0	WR62	1.8	45.7	2.72	69.1
263	18.0	26.5	WR42	1.5	38.1	1.86	47.2
263	26.5	40.0	WR28	1.5	38.1	1.17	29.7
263	33.0	50.0	WR22	1.2	30.5	1.00	25.4
263	40.0	60.0	WR19	1.0	25.4	0.83	21.1
263	50.0	75.0	WR15	.08	20.3	0.66	16.8
263	60.0	90.0	WR12	0.80	20.3	0.55	14.0
263	75.0	110.0	WR10	0.60	15.2	0.45	11.4
263	90.0	140.0	WR8	0.60	15.2	0.36	9.10

Mi-Wave
Millimeter Wave Products, Inc.
www.miwv.com
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

267 Series Omni-Directional Antennas

Features

- Low VWSR
- Wide Bandwidths
- 360 degree Beamwidths
- Variable Elevation Beamwidths

Description 267 Series Omni-Directional

Mi-Wave's **267 series Omni-Directional Antennas has been designed to be used in wide angle applications.**

Please consult *Mi-Wave* for other availiable beamwidths.

Applications

Surveillance , Network Broadcast and Receiving Systems, RF Probes.

Ordering Information

267 ___ / ___

Specify Flange
(See Appendix A)

Specify RF Band Designator
(Ku, K, A, B, U, E, W, F, D, G,)

For Example: Model number 267A-35/599 is an Omni Antenna operating in A-band at 35Ghz with a circular polarization capability.

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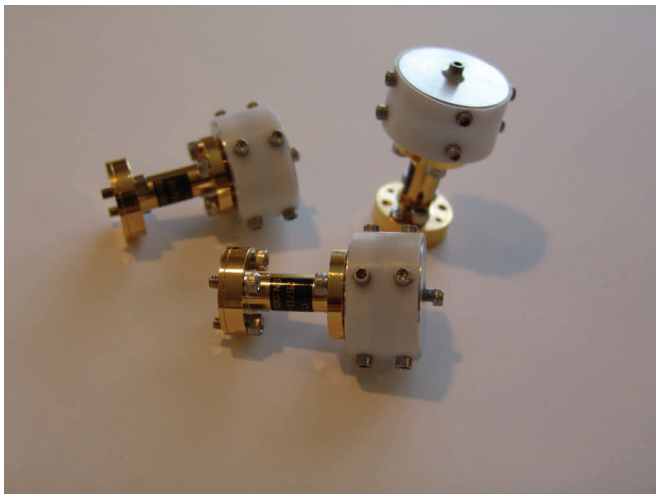
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

267 Series Omni-Directional Antennas

Technical Specifications

170 GHz Omni-Directional



Consult MI-Wave for complete dimensional outline for the application and specifications required.

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E: sales@miwv.com

268 Series Scalar Feed Horns

Features

- Low VWSR
- Wide Bandwidths
- Narrow Beamwidths
- Polarization Insensitive

Description 268 Series Scalar Feed Horns

Mi-Wave's **268 series scalar feed horn has been designed to be used in lens illumination such as scalar lens antennas and cassegrain antennas. Low sidelobes are inherent in this type of feed.**

Please consult *Mi-Wave* for other availiable beamwidths.

Ordering Information

268 __ / __

Specify Flange
(See Appendix A)

Specify RF Band Designator
(Ku, K, A, B, U, E, W, F, D, G,)

Applications

Feeds for Scalar Lens and Cassegrain Antennas

For Example: Model number 268A is a scalar feed horn operating in A-band at 35Ghz with a circular polarization capability.

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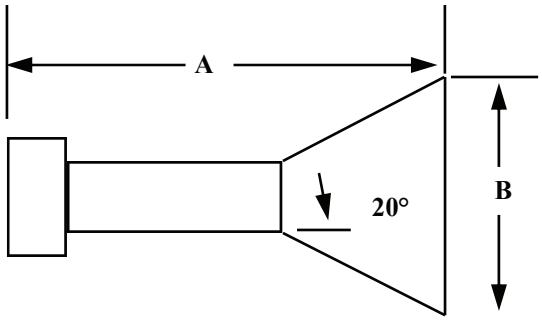
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

268 Series Scalar Feed Horns

Typical Electrical Specifications

Beamwidth (3dB)	**E-Plane 22 Deg.** **H-Plane 26 Deg.**
Sidelobes	**E-Plane -25dB** **H-Plane -25dB**
Bandwidth	**35 %**



Specifications

Model Number	Frequency Band (GHz)	EIA-WG Designation	A in	A mm	B in	B mm
268	12.4 - 18.0	WR62	5.00	127.0	3.12	79.3
268	18.0 - 26.5	WR42	3.50	88.9	2.15	54.6
268	26.5 - 40.0	WR28	2.75	69.9	1.52	38.6
268	33.0 - 50.0	WR22	2.50	63.5	1.25	31.8
268	40.0 - 60.0	WR19	2.25	57.2	1.12	28.5
268	50.0 - 75.0	WR15	1.75	44.5	0.88	22.4
268	60.0 - 90.0	WR12	1.62	41.2	0.75	19.0
268	75.0 -100.0	WR10	1.50	38.1	0.62	15.8
268	90.0 -140.0	WR8				

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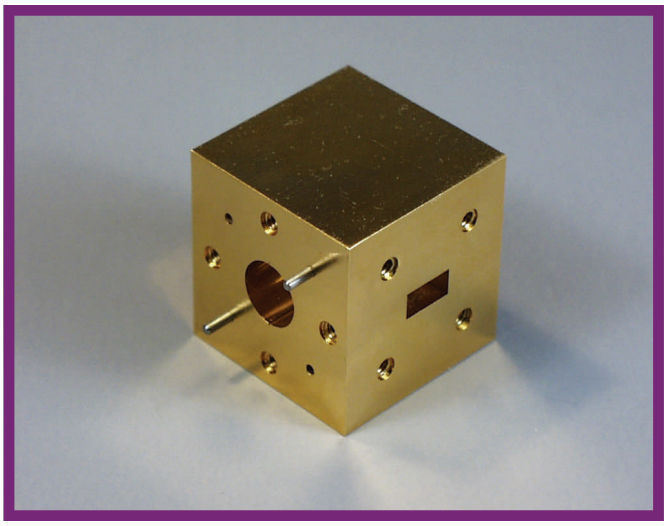
E: sales@miwv.com

281 Series Orthomode Transducers



Features

- **VSWR < 1.2**
- **Isolation > 30 dB in Linear Mode**
- **Higher Frequency Units will be Quoted on Request**
- **Available from 18.0 to 110 GHz with 3% or Greater Bandwidth**

Description 281 Series Transducers

Mi-Wave's **281 series orthomode transducer couples two orthogonal linearly polarized signals simultaneously while providing polarization isolation between transmit and receive.**

Applications

The 281 series used primarily in conjunction with the antenna product line, which can be combined with cassegrain, horn lens, or circular horn antennas to provide dual linear orthognal/dual circular othogonal polarization.

Ordering Information

281 _ _ _ / _

- **Rectangular Wageuide Flange**
- **Three Digit Pipe Inside Diameter** (See Appendix J)
- **Circular Waveguide Flange** (See Appendix A)
- **Specify RF Band Designator**

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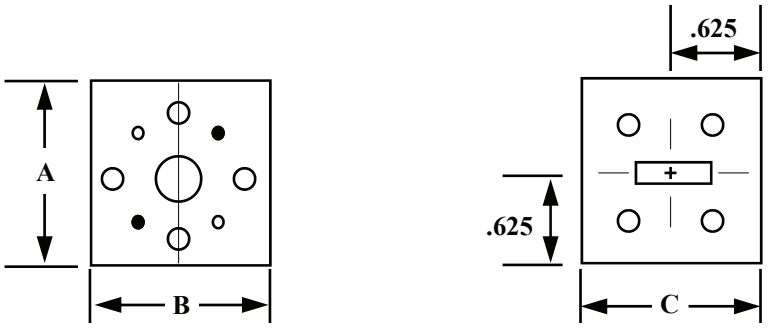
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

281 Series Orthomode Transducers



Specifications

Model Number	Frequency Band (GHz)	% Bandwidth	A		B		C	
			in	mm	in	mm	in	mm
281K	18.0-26.5	4 %	1.25	31.8	1.25	31.8	1.25	31.8
281A	26.5-40.0	4 %	1.25	31.8	1.25	31.8	1.25	31.8
281B	30.0-50.0	4 %	1.25	31.8	1.25	31.8	1.25	31.8
281U	40.0-60.0	3 %	1.25	31.8	1.25	31.8	1.25	31.8
281V	50.0-75.0	3 %	1.25	31.8	1.25	31.8	1.25	31.8
281E	60.0-90.0	3 %	1.25	31.8	1.25	31.8	1.25	31.8
281W	75.0-110.0	3 %	1.25	31.8	1.25	31.8	1.25	31.8
281F	90.0-140.0	3 %	1.25	31.8	1.25	31.8	1.25	31.8

1. Please specify circular waveguide size per appendix, include both ends.
2. For rectangular straight through, please add a Model No. 284-XXX at time of order.

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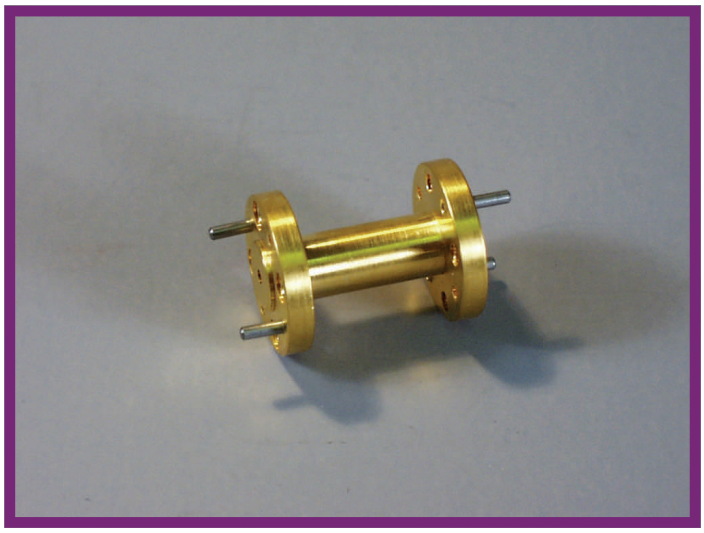
Millimeter Wave Products, Inc.
www.miwv.com
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

282 Series Circular Polarizers



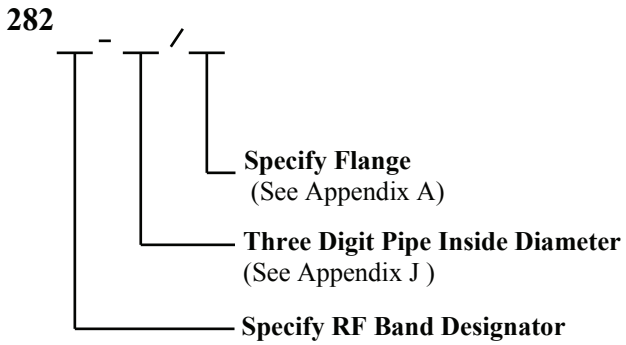
Features

- VSWR < 1.2
- Higher Frequency Units will be Quoted on Request
- Axial Ratio < 1.0 dB Over the Indicated Bandwidth
- Converts Linear Input Signals to Circular Out
- Specify Sense of Circular Polarization (RHCP or LHCP)
- Available from 18.0 to 110 GHz with 3% or Greater Bandwidth

Description 282 Series Polarizers

Mi-Wave's **282 series circular polarizer converts input linear signals to circularly polarized output signals. The circular polarization sense (RHCP or LHCP) and center frequency should be specified at the time of the order. This polarizer will yield a maximum VSWR of 1.2 an an axial ratio of 1.0 dB maximum over the indicated bandwidth.**

Ordering Information



Applications

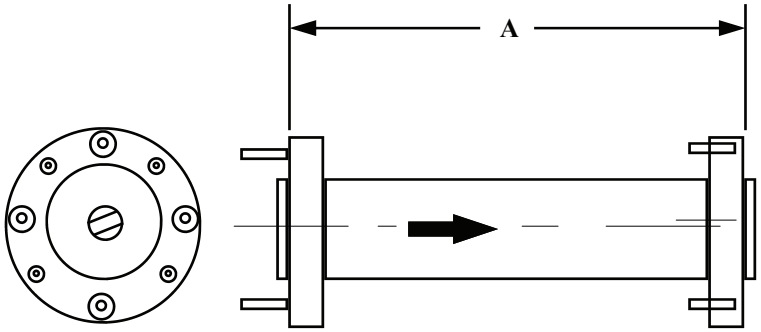
Satellite Links
Radio Astronomy
Communication Systems

Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

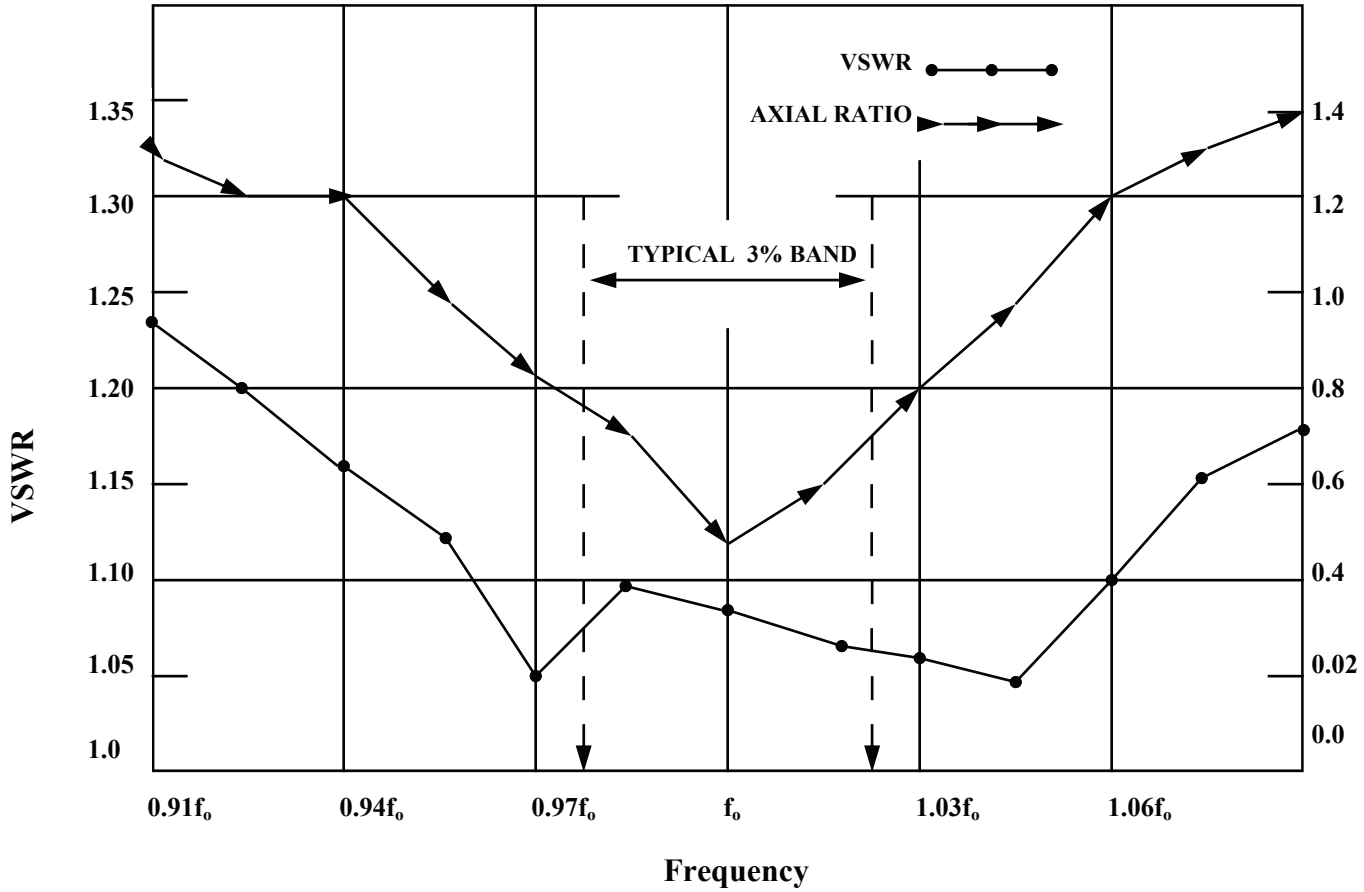
282 Series Circular Polarizers

Specifications

Model No.	Frequency Band (GHz)	A in	A mm
282K	18.0-26.5	2.3	58.4
282A	26.5-40.0	1.5	38.1
282B	33.0-50.0	1.5	38.1
282U	40.0-60.0	1.5	38.1
282V	50.0-75.0	1.1	28.0
282E	60.0-90.0	1.1	28.0
282W	75.0-110.0	1.0	25.4



Performance Curve



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Millimeter Wave Products, Inc.
www.miwv.com
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

283 Series Linear-Circular Switchable Polarizers

Features

- **VSWR < 1.2**
- **Extremely Compact**
- **Manual Switch for Polarization Selection**
- **Higher Frequency Units will be Quoted on Request**
- **Axial Ratio < 1.0 dB Over the Indicated Bandwidth**
- **Converts Linear Input Signals to Selectable Output Signals**
- **Available from 18.0 to 110 GHz with 3% or Greater Bandwidth**
- **Output Signal Options: Right-Hand Circular / Left-Hand Circular / Linear**

Description 283 Series Polarizers

Mi-Wave's **283 series polarizer, similar to the 282 series, will convert linear input signals to circular output signals with selectable output features. A manual switch on the unit allows for selection of the output signal's polarization sense or conversion back to a linear polarization. Therefore, for any linearly polarized input signal, the output may be selected to be right circular, left circular or linear polarization. The characteristics of the circularly polarized signal are similar to the 282 models.**

Ordering Information

283 - - /

- **Specify Flange** (See Appendix A)
- **Three Digit Pipe Inside Diameter** (See Appendix J)
- **Specify RF Band Designator** (Ku, K, A, B, U, V, E, W, F, D, G)

Applications

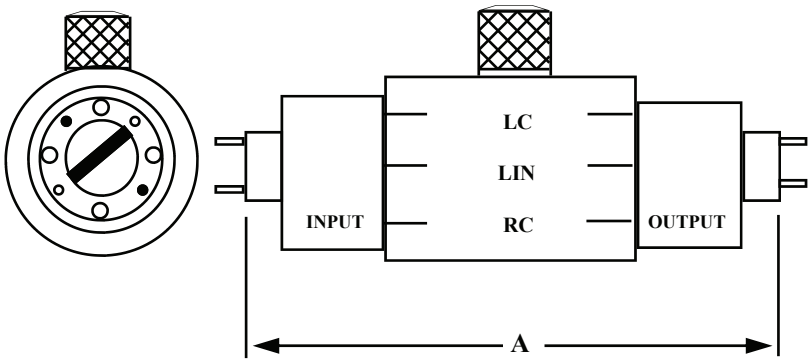
Radio Astronomy
Communication Links
Communication Systems

Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

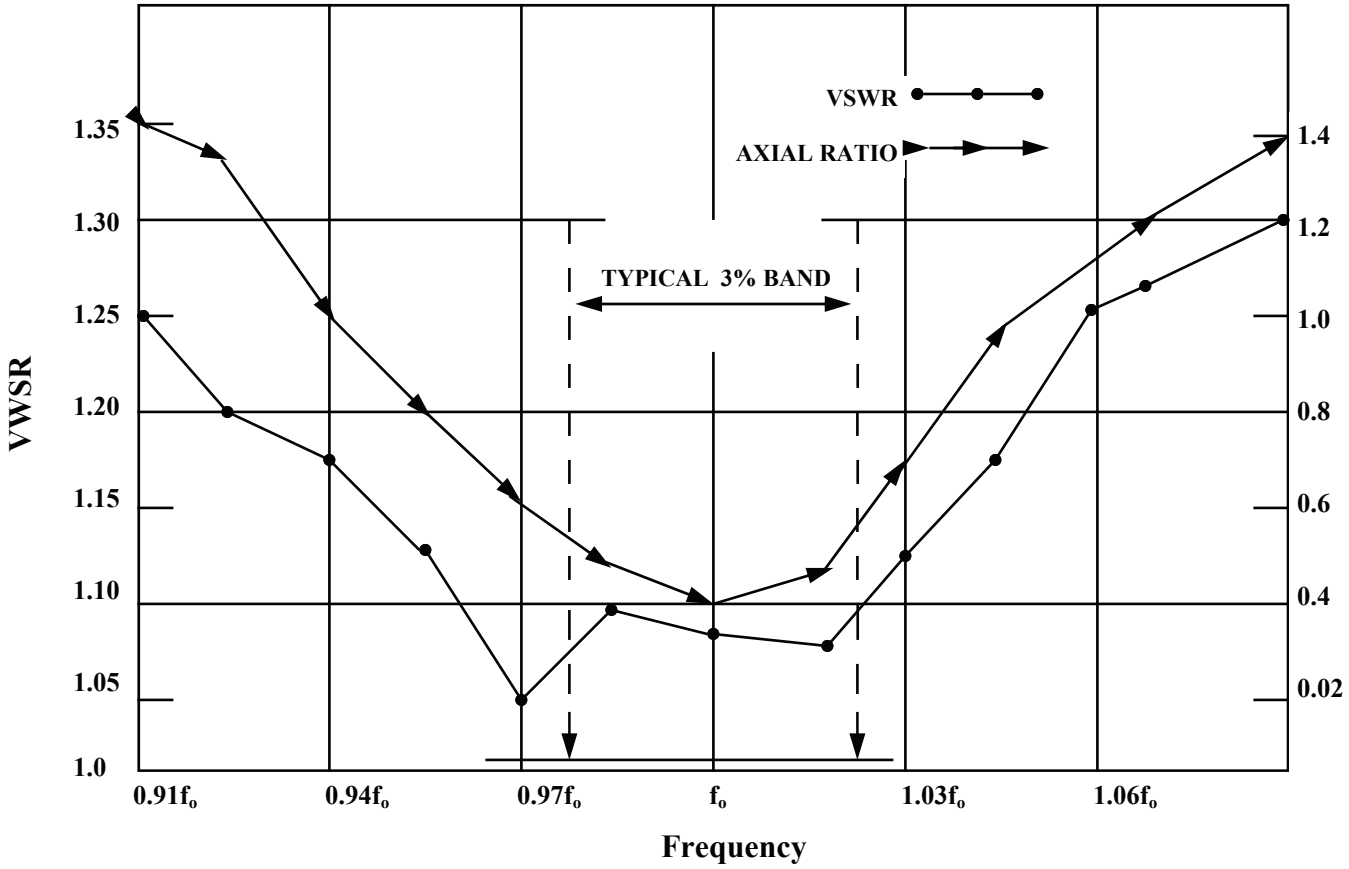
283 Series Linear-Circular Switchable Polarizers

Specifications

Model No.	Frequency Band (GHz)	A in	mm
283K	18.0-26.5	2.3	58.4
283A	26.5-40.0	1.5	38.1
283B	33.0-50.0	1.5	38.1
283U	40.0-60.0	1.5	38.1
283V	50.0-75.0	1.1	27.9
283E	60.0-90.0	1.1	27.9
283W	75.0-110.0	1.0	25.4



Performance Curve



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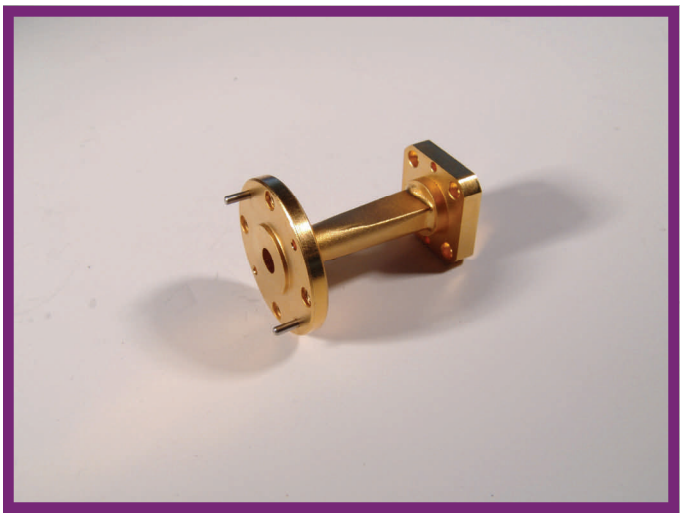
www.miwv.com
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

284 Series Tapered Mode Transitions



Features

- **Low Insertion Loss**
- **Precision-Fabricated**
- **VSWR < 1.15 Over a 10% Bandwidth**
- **Converts from Rectangular TE_{10} Mode to Circular TE_{11} Mode**
- **Available from 18.0 to 110 GHz with 10% or Greater Bandwidth**

Description 284 Series Mode Transitions

Mi-Wave's **284 series tapered mode transitions is a precision formed adapter used to transform rectangular TE_{10} mode waveguide to a circular TE_{11} mode waveguide. Mainly used in antenna systems and associated components to adapt to conventional waveguide.**

Ordering Information

284 ___ – XXX / ___

Specify Flange (See Appendix A)

Specify Pipe Inside Diameter (See Appendix J)

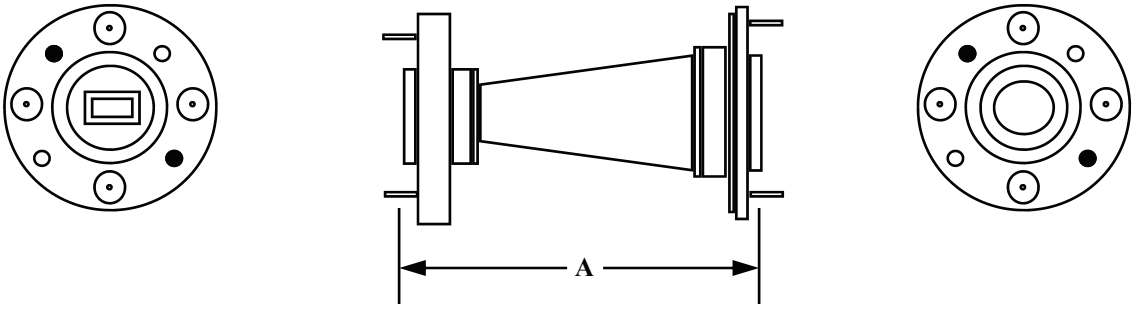
Specify RF Band Designator (Ku, K, A, B, U, V, E, W, F, D, G)

Applications

Antenna Systems
Orthomode Transducers
Polarization for Antennas

Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

284 Series Tapered Mode Transitions



Specifications

Model Number	Frequency Band (GHz)	Waveguide I.D. (Inches)	Waveguide Type	Maximum VSWR	A in	A mm
284Ku	12.4-18.0	0.622 x 0.311	WR-62	1.15	2.5	63.5
284K	18.0-26.5	0.420 x 0.170	WR-42	1.15	2.0	50.8
284A	26.5-40.0	0.280 x 0.140	WR-28	1.15	1.5	38.1
284B	33.0-50.0	0.224 x 0.122	WR-22	1.15	1.5	38.1
284U	40.0-60.0	0.188 x .094	WR-19	1.15	1.5	38.1
284V	50.0-75.0	0.148 x 0.074	WR-15	1.15	1.1	27.9
284E	60.0-90.0	0.122 x 0.061	WR-12	1.15	1.1	27.9
284W	75.0-110.0	0.100 x 0.050	WR-10	1.15	1.1	27.9
284F	90.0-140.0	0.080 x 0.040	WR- 8	1.15	1.1	27.9
284D	110.0-170.0	0.065 x 0.0325	WR- 7	1.15	1.1	27.9
284G	140.0-220.0	0.051 x 0.0255	WR- 5	1.15	1.1	27.9

1. Dimensions, specifications, and configurations are subject to change without notice.
2. Other flanges available on request at additional cost.

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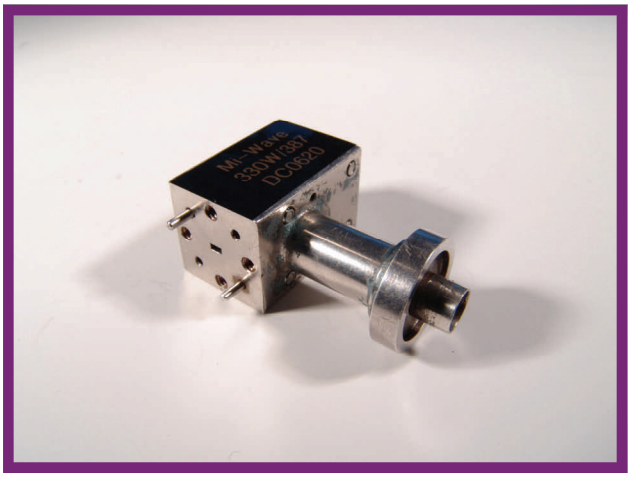
E: sales@miwv.com

330 Series Mode Transitions



Features

- **Minimum VSWR**
- **Minimum Insertion Loss**
- **Optional Pressurized Models Available**
- **Efficient Conversion from TE_{10} Mode Rectangular Waveguide to TE_{01} Mode Circular Waveguide**

Ordering Information

330 ___ - ___ - XXX / ___

A B C D

A) RF Band Designator
B) Three Digit Pipe Inside Diameter
(See Appendix L)
C) Circular Waveguide Flange:
Male (M) or Female (F)
D) Rectangular Waveguide Flange
(See Appendix A)

Please specify center frequency at time of order.

For Example: 330A-M-688/599 is a mode transition in A-band with a UG/599/U flange and an 0.688 inside diameter circular waveguide with a male circular flange.

Please Note: Due to the non-standardization of this product line, we recommend that you contact *Mi-Wave* for more specific information about your requirements.

Description 330 Series Mode Transitions

Mi-Wave's **330 Series TE_{01} mode transitions are available for operation from 18.0 to 140.0 GHz. These reciprocal devices have a standard rectangular TE_{10} mode waveguide input and a circular TE_{01} mode output. Because of the different frequency ranges of circular TE_{01} mode waveguide, it is possible for a standard sized rectangular waveguide input to have one of several different circular waveguide size outputs.**

The 330 series circular mode waveguide features low VSWR and insertion loss. The flanges used for circular wave-guide output are *Mi-Wave's* standard male/female type. For maximum mode purity, filtering is recommended for all TE_{01} propagation (please refer to Appendix L).

Applications

The 330 series rectangular-to-circular waveguide transitions are useful in millimeter wave radar systems or laboratory setups where long transmission lines are required. These transitions will provide efficient conversion from the TE_{10} rectangular waveguide mode to the TE_{01} circular waveguide mode for high-power, low-loss transmission.

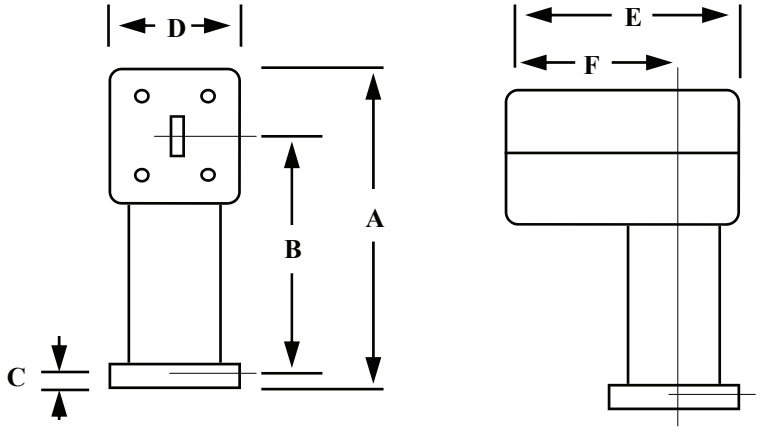
Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

330 Series Mode Transitions

Technical Specifications

Model Number	330KU	330K	330A	330B	330U	330V	330E	330W	330F
Frequency Band (GHz)	12.4-18.0	18.0-26.5	26.5-40.0	33.0-50.0	40.0-60.0	50.0-75.0	60.0-90.0	75.0-110.0	90.0-140.0
Insertion Loss TE_{01} (dB) Max. [1]	0.3	0.3	0.3	0.4	0.4	0.5	0.5	0.6	0.8
VSWR Max.	1.40	1.40	1.40	1.40	1.40	1.40	1.40	1.50	1.60
Bandwidth	6%	6%	6%	6%	5%	5%	4%	4%	3%
Average Power (Watts)[2]	4000	2000	1000	1000	600	400	200	100	50
Peak Power (kW)[2]	20	10	5	4	3	2	1	0.5	0.2
Weight (oz)[3]	40	30	25	25	25	10	5	5	4

1. Loss measured using two 330 series and 340 series mode filters.
2. Estimated
3. Average: Weight varies with circular waveguide size and flange configuration



Dimensional Specifications

Model No.	A		B		C		D		E		F	
	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
330KU	5.17	131.3	4.46	113.3	.267	6.78	2.00	50.80	5.14	130.6	2.75	130.6
330K	3.50	88.9	2.56	65.02	.267	6.78	1.25	31.75	*		*	
330A,B,U	3.62	91.95	2.79	70.87	.267	6.78	1.12	28.45	2.25	57.15	1.30	33.02
330V	2.00	50.80	1.41	35.81	.211	5.36	.75	19.05	1.16	29.46	.59	14.99
330E, W	1.98	50.29	1.39	35.31	.211	5.36	.75	19.05	1.16	29.46	.59	14.99
330F	1.98	50.29	1.39	35.31	.211	5.36	.75	19.05	1.16	29.46	.59	14.99

*** Varies Per Frequency Range**

*** Dimension Varies**

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Millimeter Wave Products, Inc.
Tel.(727) 536-0033 Fax.(727) 536-0012 Email. sales@miwv.com

340 Series Mode Filters

Features

- Low Loss
- High Spurious Mode Attenuation

Ordering Information

340 - XXX

Three Digit of Waveguide Inside Diameter (See Appendix L)

For Example: *Mi-Wave's* model number 340-688 is a mode filter for a frequency range of 25.3 to 34.9 GHz with an 0.688" inside

Please Note: Due to the non-standardization of this product line, we recommend that you contact *Mi-Wave* for more specific information

Description 340 Series Mode Filters

Mi-Waves' **340 series a critical consideration when using TE_{01} mode circular waveguide is the preservation of mode purity. Due to the similarities between the TE_{01} and TM_{11} modes, even the slightest irregularities in the circular waveguide will cause mode conversion from TE_{01} to TM_{11}. And the large waveguide diameters will readily propagate TE_{M1} modes which degrade the purity of the TE_{01} signal. Extraneous TE_{M1} and TE_{MN} modes cannot be reconverted to the TE_{10} rectangular mode - they show up as large spurious losses.**

Each 340 series mode filter consists of a section of lossy wall waveguide. Because the higher order modes (TM_{M1}, TE_{MN}) have wall currents, they are sharply attenuated and do not propagate. Although the energy transferred to these modes is minimal, mode filters must be placed periodically along the transmission line. The TE_{01} mode, which does not have wall currents, passes through this section unaffected. The 340 series mode filters are available in circular waveguide sizes from 12.4 to 140 GHz. They are fitted with one male and one female type of *Mi-Waves'* standard circular flanges.

Applications

The 340 series mode filters are used to prevent TE_{01} conversion to higher order modes. By attenuating unwanted TE_{M1} modes, the 340 series filters allow for the low loss transmission of $TE_{01,02}$ modes in circular waveguide and eliminate unwanted resonances, it is recommended that the 340 series filters be placed at least every 10 feet in long

Mi-Wave

Millimeter Wave Products Inc.

www.miwv.com

2200 Tall Pines Drive, Suite 100

Largo, FL 33771

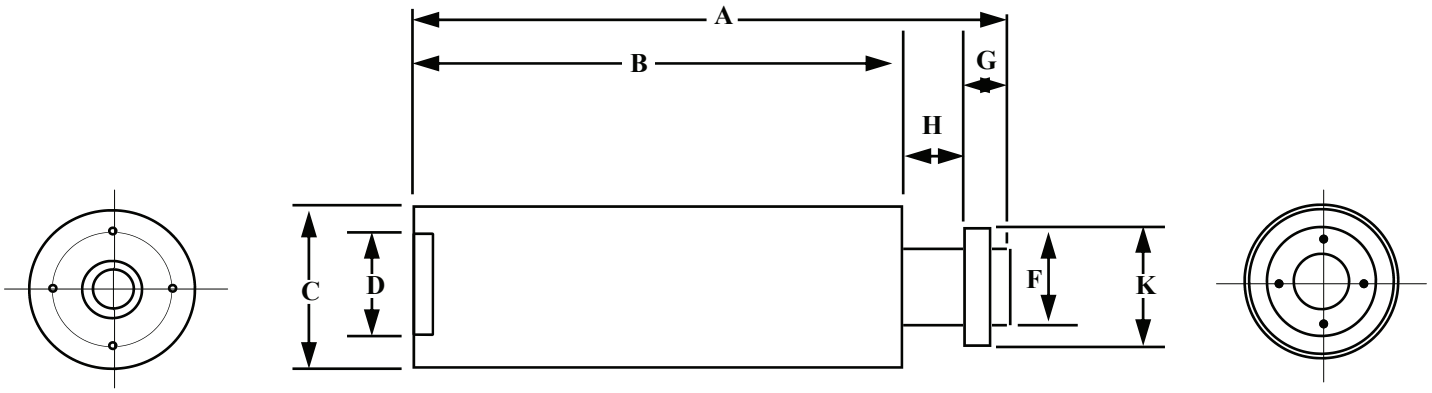
Tel. (727) 536-0033 Fax. (727) 536-0012

E: sales@miwv.com

340 Series Mode Filters

Technical Specifications

Frequency Band (GHz)	11.6-48.0	48.0-96.0	96.0-150.0
Insertion Loss TE_{01} (dB) Max.	0.2	0.3	0.4
Insertion Loss TE_{11} (dB) Min.	10.0	10.0	10.0
VSWR Min.	1.20	1.20	1.25



Dimensional Specifications

Model No.	A		B		C		D		F		G		H		K	
	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
340-201	4.28	108.71	3.18	80.77	1.38	35.05	.292	7.42	.201	5.11	.48	12.19	.28	7.11	1.20	30.48
340-250	4.28	108.71	3.18	80.77	1.38	35.05	.292	7.42	.250	6.35	.48	12.19	.28	7.11	1.20	30.48
340-291	4.28	108.71	3.18	80.77	1.38	35.05	.376	9.55	.291	7.39	.48	12.19	.28	7.11	1.20	30.48
340-353	4.28	108.71	3.18	80.77	1.38	35.05	.437	11.1	.353	8.97	.48	12.19	.28	7.11	1.20	30.48
340-495	6.85	173.99	4.70	119.38	2.12	53.85	.626	15.9	.495	12.6	.42	10.67	.30	7.62	1.95	49.53
340-545	7.56	192.02	5.45	138.43	2.12	53.85	.626	15.9	.545	13.8	.42	10.67	.30	7.62	1.95	49.53
340-634	7.56	192.02	5.45	138.43	2.12	53.85	.789	20.0	.688	17.5	.42	10.67	.30	7.62	1.95	49.53

Mi-Wave
Millimeter Wave Products, Inc.
www.miwv.com
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

355 Series Rotary Joints

Features

- Negligible Variation During Rotation
- Minimum Effects on Transferred Signals

Description 355 Series Rotary Joints

Mi-Waves' **355 series rotary joints are available in standard circular waveguide sizes from 11.6 to 150 GHz. Each rotary joint consists of two circular waveguide sections mounted on ball bearings. Connections to the guides are made at standard male and female circular flanges. Precise alignment of the waveguide sections prevents spurious mode generation, and the very small gap between abutting surfaces contributes a negligible loss in the TE_{01} circular mode. In all models, amplitude variation with rotation is less than 0.2 dB and phase variation is less than 2 degrees.**

Applications

The 355 series rotary joints provide efficient energy transfer in radar antenna systems or in other applications requiring relative rotation between two sections of waveguide. Designed for low phase variation, low insertion loss, and low wow, they are also useful in special laboratory test set-ups for the measurement of millimeter wave parameters including phase variation in radiated fields. Operating in the low-loss TE_{01} circular mode, these rotary joints are designed for use in circular waveguide transmission lines.

The 355 series rotary joint can also be fitted with two series 330 mode transitions and a 340 series mode filter to provide a rotary joint assembly for rectangular waveguide applications. Despite the assembly's size, it is a useful design at frequencies that are too high for conventional rotary joints. For use in rectangular waveguide systems, they must be adapted with ***Mi-Waves'*** **Series 330 mode transitions.**

Ordering Information

355 - XXX

Three Digit of Waveguide Inside Diameter (See Appendix L)

For Example: ***Mi-Wave's*** **model number 355-250 is a rotary joint for a frequency range of 69.7 to 95.9 GHz with an inside pipe diameter of 0.250**

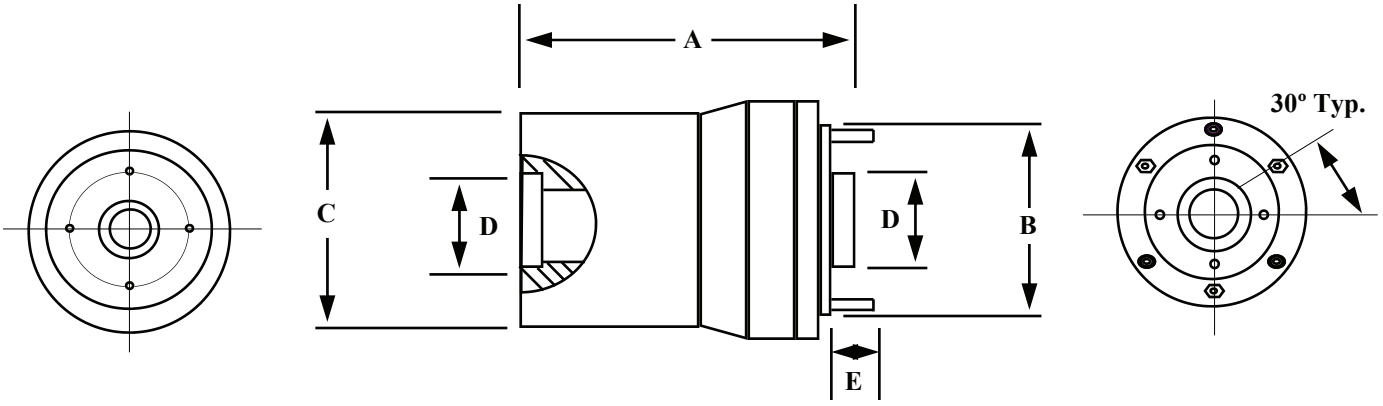
Please Note: Due to non-standardization of this product line, we recommend that you contact ***Mi-Wave*** **for more specific information about your requirements.**

Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

355 Series Rotary Joints

Technical Specifications

Frequency Band (GHz)	11.6-48.0	48.0-96.0	96.0-150.0
Insertion Loss TE_{01} (dB) Max.	0.3	0.4	0.5
VSWR Min.	1.10	1.10	1.15
Weight (oz)	30	24	15

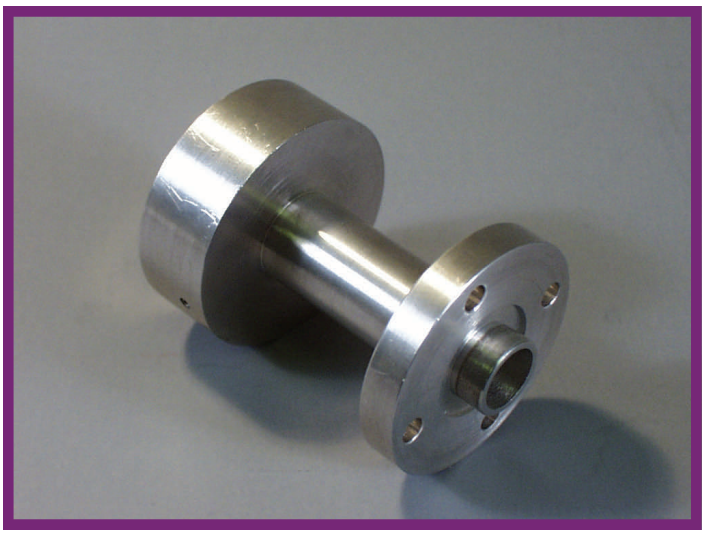


Dimensional Specifications

Model No.	A		B		C		D		E	
	in	mm	in	mm	in	mm	in	mm	in	mm
355-180	2.35	59.69	1.82	46.23	1.38	35.05	.180	4.57	.211	5.36
355-250	2.35	59.69	1.82	46.23	1.38	35.05	.291	7.39	.211	5.36
355-291	2.35	59.69	1.82	46.23	1.38	35.05	.375	9.53	.211	5.36
355-353	2.35	59.69	1.82	46.23	1.38	35.05	.437	11.10	.211	5.36
355-495	3.35	85.09	3.01	76.45	2.50	63.5	.625	15.88	.264	6.71
355-545	3.35	85.09	3.01	76.45	2.50	63.5	.625	15.88	.264	6.71
355-634	3.35	85.09	3.01	76.45	2.50	63.5	.750	19.05	.264	6.71

Mi-Wave
Millimeter Wave Products, Inc.
www.miwv.com
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

365 Series TE_{01} Circular Waveguide Terminations



Features

- Low VSWR
- Full Waveguide Bandwidth

Ordering Information

365 - XXX

- Three Digit of Waveguide Inside Diameter (See Appendix L)
- Specify Flange M: Male F: Female

Description 365 Series Terminations

Mi-Wave's **365 series termination is a section of circular waveguide with an integral conical load made from a dielectric absorber material. The long precise taper allows optimum absorption of the microwave energy with minimum reflection. Each termination is fitted with a standard male or female circular flange, specified at the time of order.**

For Example: *Mi-Wave's* model number 365 F-495 is a circular load for a frequency range of 34.8 to 48.0 GHz with an inside waveguide diameter of 0.500" inches.

Please Note: Due to the non-standardization of this product line, we recommend that you contact *Mi-Wave* for more specific information about your requirements.

Applications

The 365 series terminations are used in experimental and developmental test set-ups where a low VSWR waveguide load is essential for measurement validity. When measuring the VSWR that results from insertion of various waveguide components in a system, these terminations ensure precise determination of the individual effects.

Mi-Wave

Millimeter Wave Products Inc.

www.miwv.com

2200 Tall Pines Drive, Suite 100

Largo, FL 33771

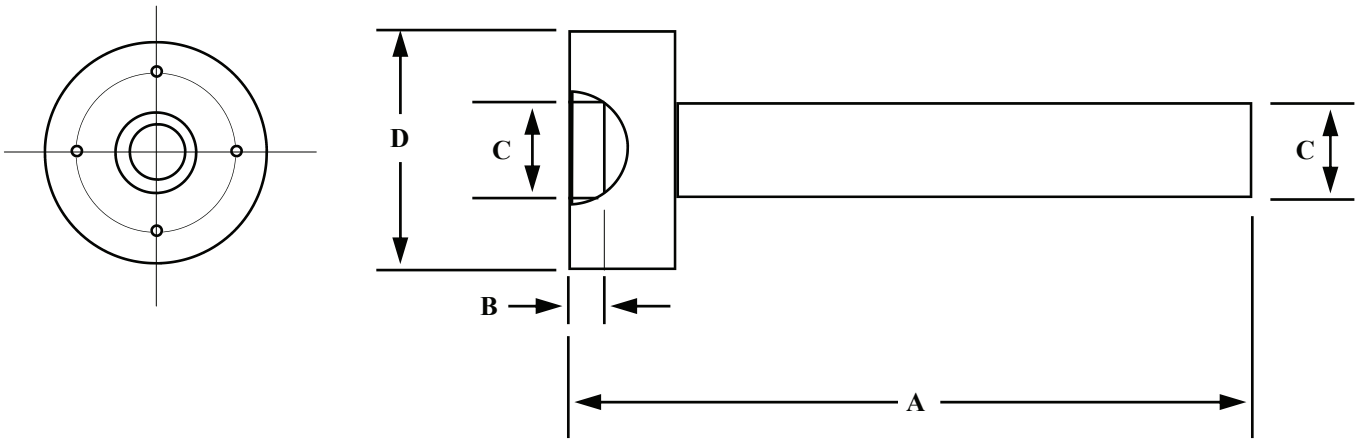
Tel. (727) 536-0033 Fax. (727) 536-0012

E: sales@miwv.com

365 Series TE_{01} Circular Waveguide

Technical Specifications

Frequency Band (GHz)	11.6-48.0	48.0-96.0	96.0-150.0
VSWR	1.05	1.08	1.10



Dimensional Specifications

Model No.	A		B		C		D	
	in	mm	in	mm	in	mm	in	mm
365-201	2.22	56.39	.211	5.36	.250	6.35	1.20	30.48
365-250	2.22	56.39	.211	5.36	.291	7.39	1.20	30.48
365-291	2.22	56.39	.211	5.36	.375	9.53	1.20	30.48
365-353	2.22	56.39	.211	5.36	.437	11.10	1.20	30.48
365-495	4.26	108.2	.264	6.71	.625	15.88	1.95	49.53
365-545	3.76	95.5	.264	6.71	.625	15.88	1.95	49.53
365-634	3.76	95.5	.264	6.71	.750	19.05	1.95	49.53
365-688	4.76	120.9	.264	6.71	.788	20.02	1.95	49.53

Mi-Wave
Millimeter Wave Products, Inc.
www.miwv.com
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

370-371 Series Flanged/Unflanged Circular Waveguides

Features

- **Low VSWR**
- **Precision Size**

Ordering Information

370 -

Specify Waveguide Inside Diameter (See Appendix L)

Length (In Inches) (A)

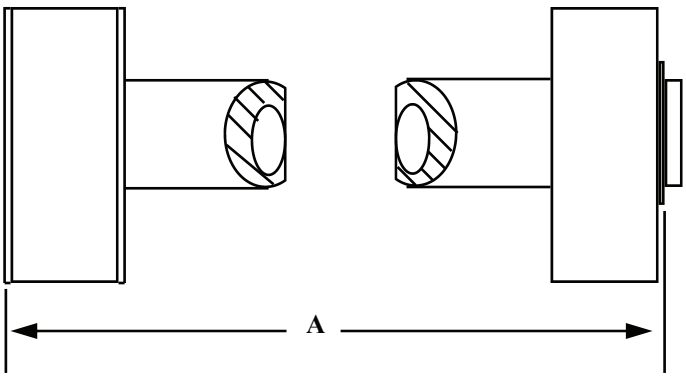
Description

370 Series Flanged Circular Waveguides
371 Series Unflanged Circular Waveguides

Mi-Wave's **370 series flanged waveguide and 371 series unflanged waveguide is available in standard sizes from 12.6 to 320 GHz. The 370 series waveguide sections are fitted with *Mi-Wave's* standard male/female flanges. Both waveguide types are manufactured primarily in copper. *Mi-Wave* recommends using the 340 series mode filters in any circular waveguide system to maintain mode purity.**

Please Note: Due to the non-standardization of this product line, we recommend that you contact *Mi-Wave* for more specific information about your requirements.

For Example: *Mi-Wave's* model number 370-12.7-688 is a 12.7" section of circular waveguide for a frequency range of 25.3 to 34.9 GHz with an inside pipe diameter of 0.688 inches.



Mi-Wave

Millimeter Wave Products Inc.

www.miwv.com

2200 Tall Pines Drive, Suite 100

Largo, FL 33771

Tel. (727) 536-0033 Fax. (727) 536-0012

E: sales@miwv.com

370-371 Series Flanged/Unflanged Circular Waveguides

TE 01 Circular Waveguides

Standard Waveguide		MIL-W-23068 Circular Waveguide		
I.D. O.D. (inches)	Frequency (GHz)	I.D. O.D. (inches)	Frequency (GHz)	Type
1.500 X 1.750	11.6-16.0	1.500 X 1.700	11.6-16.0	WRC530D14
1.265 X 1.375	13.2-18.9	1.281 X 1.441	13.6-18.7	WRC621D14
1.106 X 1.250	15.9-21.9	1.094 X 1.224	15.9-21.9	WRC727D14
0.951 X 1.125	18.6-25.6	0.938 X 1.068	18.6-25.6	WRC849D14
0.686 X 0.750	25.3-34.9	0.797 X 0.897	21.9-30.1	WRC997D14
0.688 X 0.888	25.3-34.9	0.688 X 0.788	25.3-34.9	WRC116C14
0.634 X 0.750	27.3-38.0	0.594 X 0.674	29.3-40.4	WRC134C14
0.545 X 0.625	32.0-44.0	———	———	N/A
0.495 X 0.625	34.8-48.0	0.500 X 0.580	34.8-48.0	WRC159C14
———	———	04.38 X 0.518	39.8-54.8	WRC182C14
0.370 X 0.500	46.4-63.9	0.375 X 0.435	46.4-63.9	WRC212C14
0.353 X 0.438	50.0-68.0	0.328 X 0.388	53.1-73.1	WRC243C14
0.291 X 0.375	62.0-84.0	0.281 X .0341	61.9-85.2	WRC283C14
0.249 X 0.313	69.7-95.9	0.250 X 0.290	69.7-95.9	WRC318C14
0.201 X 0.290	86.0-115.0	0.219 X 0.259	79.6-110.0	WRC364C14
0.186 X 0.250	93.0-128.0	0.188 X 0.228	92.9-128.0	WRC424C14
———	———	0.172 X 0.212	101.0-139.0	WRC463C14
———	———	0.141 X 0.181	124.0-171.0	WRC566C14

Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

380 Series Circular Waveguide Flange Set

Features

- **Self-Aligning Connectors**
- **Supplied in Male and Female Pairs**

Description 380 Series Flange Set

Mi-Wave's **380 series circular waveguide flanges have been designed specifically for the TE_{01} low loss mode circular waveguide components. These flanges are precision-machined to facilitate low loss, low reflection waveguide connections at millimeter wave frequencies. O-ring gaskets are included to make these flanges appropriate for use in pressurized waveguide systems. The 380 series flanges are self-aligning male/female connectors and are available in both standard and custom size waveguide.**

Ordering Information

380

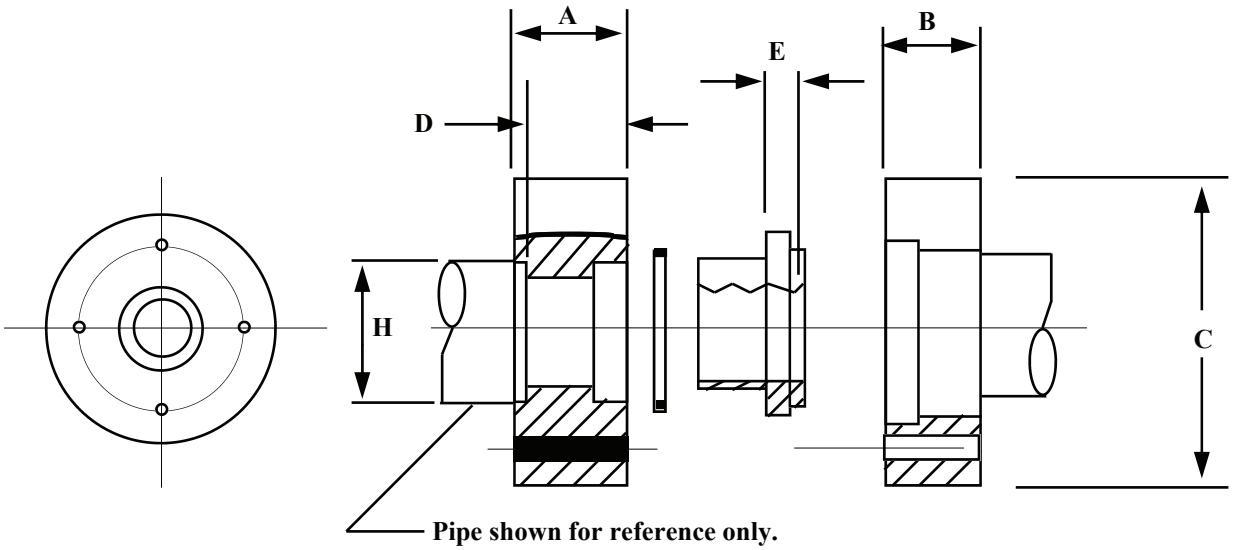
Specify Waveguide Inside Diameter
(See Appendix L)

Example: *Mi-Wave's* model number 380-688 is a circular waveguide flange with an inside waveguide diameter of 0.688 inches.

Please Note: Due to the non-standardization of this product line, we recommend that you contact *Mi-Wave* for more specific information about your requirements.

Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

380 Series Circular Waveguide Flange Set



Dimensional Specifications

Model No.	A		B		C		D		E		H	
	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
380-688	0.55	13.97	0.30	7.62	1.95	49.53	.450	11.43	.185	4.70	.788	20.02
380-635	0.55	13.97	0.30	7.62	1.95	49.53	.450	11.43	.185	4.70	.750	19.05
380-545	0.55	13.97	0.30	7.62	1.95	49.53	.450	11.43	.185	4.70	.625	15.88
380-495	0.55	13.97	0.30	7.62	1.95	49.53	.450	11.43	.185	4.70	.625	15.88
380-353	0.40	10.16	0.27	6.86	1.20	30.48	.300	7.62	.141	3.58	.437	11.10
380-291	0.40	10.16	0.27	6.86	1.20	30.48	.300	7.62	.141	3.58	.375	9.53
380-250	0.40	10.16	0.27	6.86	1.20	30.48	.300	7.62	.141	3.58	.291	7.39

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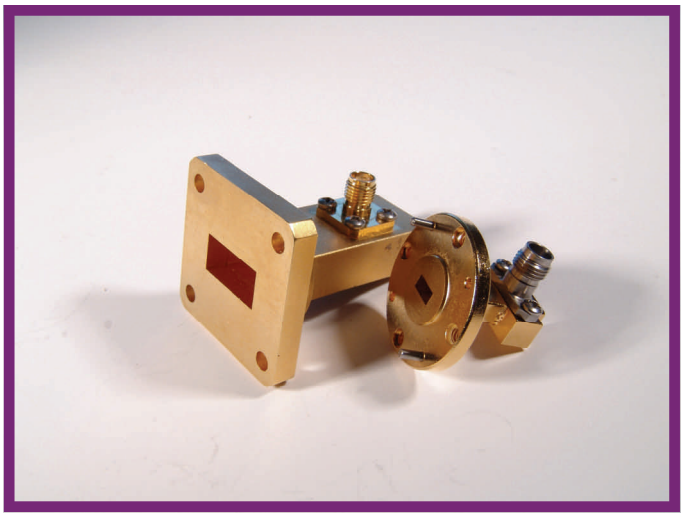
Millimeter Wave Products, Inc.
www.miwv.com
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

410 Series Waveguide to Coax Transitions



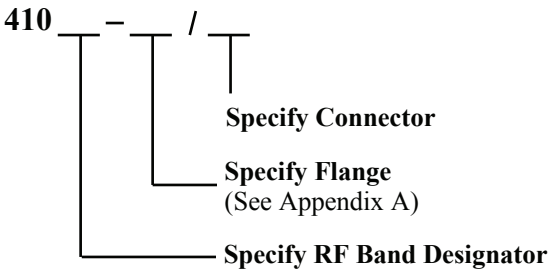
Features

- Low Cost Versions Available
- Frequency Ranges 12.4 to 75 GHz
- Wide Variety of Coax Connectors Available
- High Performance Versions for Laboratory Use

Description 410 Series Coax Transitions

Mi-Wave's **410 series waveguide to coax transitions allow an efficient method of adapting from rectangular waveguide to a coaxial connector. Full waveguide bands available from 12.4 to 75 GHz. Low insertion losses and VSWR's are typical for these adapters. Low cost production versions available for equipment use and OEM's. Laboratory grades are also offered on some models.**

Ordering Information



Applications

Test Equipment
Power Measurment
Broadband Systems

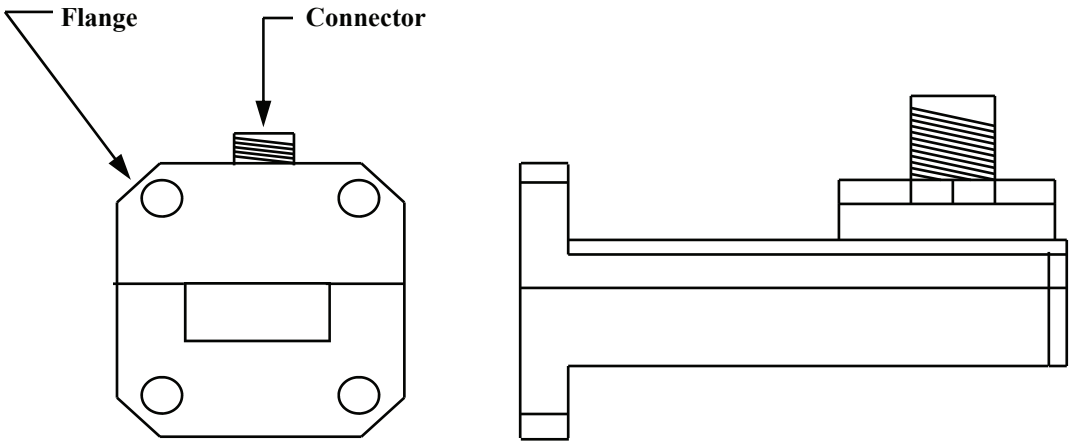
Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

410 Series Waveguide to Coax Transitions

Technical Specifications

Model Number	Frequency Band (GHz)	Waveguide	Flange	Standard Connection Available	Insertion (Loss) (dB)	VWSR
410KU	12.4 - 18.0	WR-62	UG-419/U	N, SMA	0.30	1.20:1
410K	18.0 - 26.5	WR-42	UG-595/U	K, 2.4 mm	0.30	1.20:1
410(WR-34)	22.0 - 33.0	WR-34	UG-595/UM	K, 2.4 mm	0.35	1.25:1
410A	26.5 - 40.0	WR-28	UG-599/U	K, 2.4 mm	0.40	1.30:1
410B	33.0 - 50.0	WR-22	UG-599/UM	K, 2.4 mm	0.60	1.40:1
410U	40.0 - 60.0	WR-19	UG-383/UM	2.4 mm	0.80	1.50:1
410V	50.0-75.0	WR-15	UG-385/U	2.4mm,V	1.2	1.65:1

Please Note: Lower frequency versions are available from 6.0 GHz and up.



Please consult *Mi-Wave* for outline drawings for desired

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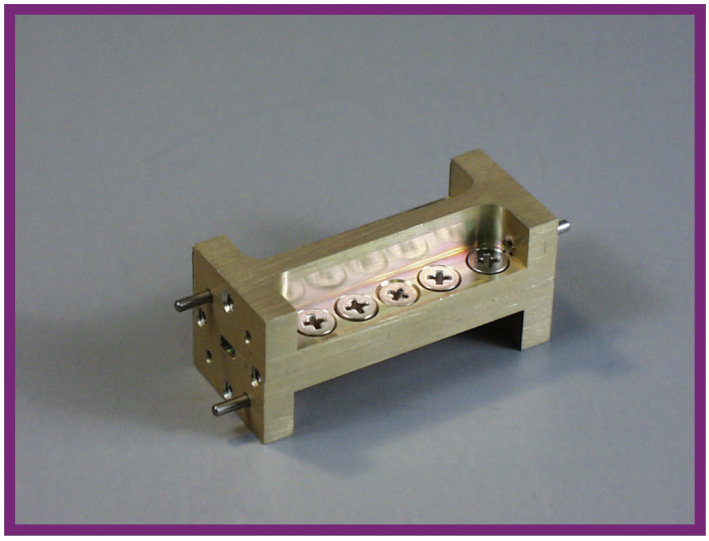
Millimeter Wave Products, Inc.
www.miwv.com
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

450 Series High Pass Filters



Features

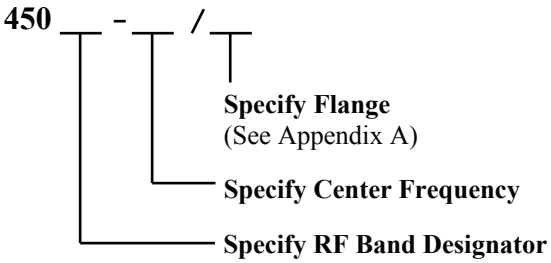
- Low Cost
- Wide Bandwidths
- Low Insertion Loss
- Low VSWR in Band

Description 450 Series High Pass Filters

Mi-Wave's **450 series high pass filters use a simple yet effective waveguide cut-off filter technique. This design is useful for eliminating unwanted side bands in upconverters and out-of band frequencies in communication systems. These filters are small in size and compact by design. The 450 series can be designed for any frequency range from 12.4 to 220 GHz. Low insertion losses from 0.15 dB and cut off rejections of up to 80dB are possible.**

Consult *Mi-Wave* for dimensions due to the wide range of waveguide sizes and frequency ranges.

Ordering Information



Applications

Side Band Filters
Frequency Diplexers
Telecommunications Systems

Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

460 Series Band Pass Filters

Features

- Low Cost
- Low VSWR
- Narrow Bandwidths
- High Rejection Levels
- Low in-Band Insertion

Description 460 Series Band Pass Filters

Mi-Wave's **460 series band pass filter is primarily used for narrow band applications. Pass bands are typically from 1% to 4%. This design is well suited for frequency diplexers used in communication systems or any application where narrow bandwidths are required. Insertion losses are typically in the 0.8 dB to 2.0dB area depending upon rejection levels. The 460 series band pass filter can be designed from 12.4 to 60 GHz.**

Please consult *Mi-Wave* for further dimensions and specific technical data.

Ordering Information

460 ___ – ___ / ___

- Specify Flange (See Appendix A)
- Specify Center Frequency
- Specify RF Band Designator

Applications

Side Band Filters
Frequency Diplexers
Telecommunications Systems

Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

510 Series Direct-Reading Precision Attenuators

Features

- **Low VSWR**
- **Direct Reading**
- **Low Insertion Loss**
- **Anti-Backlash Drive**
- **Negligible Phase Shift**
- **Precision Construction**
- **Frequency Independent**

Description 510 Series Attenuators

Mi-Wave's **510 series direct-reading precision attenuators provide 0 to 60 dB of calibrated attenuation by rotation of a resistive vane mounted in a circular waveguide section. These units are often referred to as "precision rotary vane attenuators".**

Applications

The 510 series direct reading precision attenuators are used in all RF measurement systems. They are most frequently used in RF substitution-type set-ups for precise measurement of characteristics such as isolation, coupling, insertion loss, and gain.

Ordering Information

510 /

Specify Flange (See Appendix A)

Specify RF Band Designator

The following specifications are common to all bands.

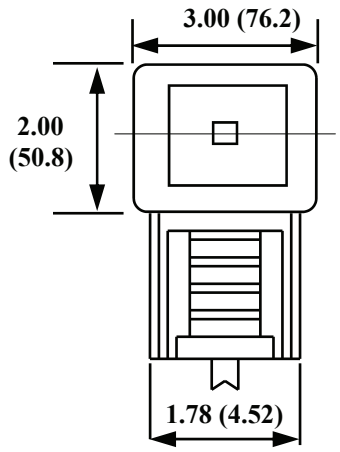
Description	Specification
Attenuation Range	0 dB to 60 dB (Above Residual Attenuation) Over entire waveguide band
Accuracy (The greater of the two)	0.1 dB or 2% of reading
Scale Length	21 inches
Scale Increments	0 dB to 0.1 dB - 0.01 dB 0.1 dB to 1.0 dB - 0.05 dB 1.0 dB to 10.0 dB - 0.10 dB 10.0 dB to 20.0 dB - 0.20 dB 20.0 dB to 30.0 dB - 0.5 dB 30.0 dB to 50.0 dB - 1.0 dB Max Setting 60 dB Typical
Phase Shift vs. Attenuation	Negligible

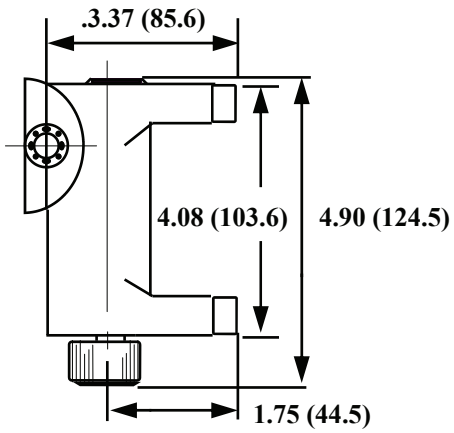
Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100 Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

510 Series Direct-Reading Precision Attenuators

Technical Specifications

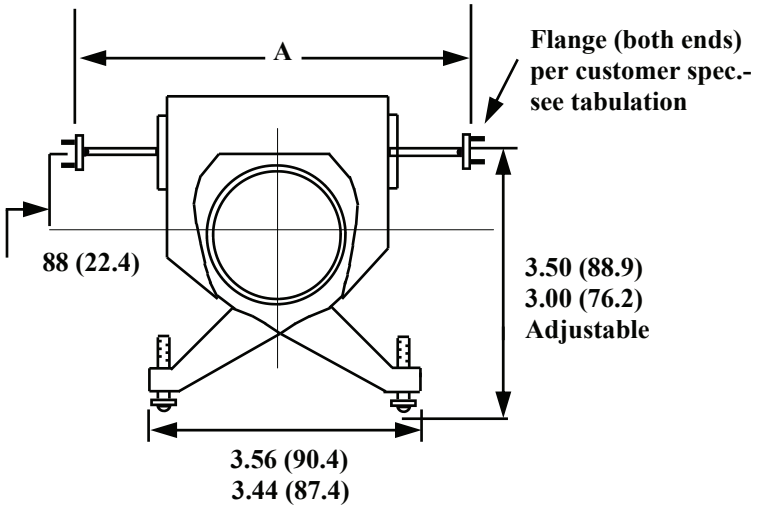
Model Number	510K	510A	510B	510U	510V	510E	510W	510F	510D	510G
Frequency Band (GHz)	18.0-26.5	26.5-40.0	33.0-50.0	40.0-50.0	50.0-75.0	60.0-90.0	75.0-110.0	90.0-140.0	110.0-170.0	140.0 220.0
Insertion Loss (dB) Max.	0.5	0.5	0.6	0.7	0.8	0.9	1.0	1.2	1.5	1.8
VSWR [1] Max.	1.30	1.15	1.15	1.15	1.20	1.20	1.20	1.25	1.25	1.25
Average Power (Watts)	1.0	0.5	0.5	0.4	0.3	0.2	0.2	0.1	0.1	0.1
Weight (oz)	52	38	38	36	29	28	28	.26	.24	24





Dimensional Specifications

Model No.	A	
510K	8.48	215.0
510A	6.87	174.0
510B	6.25	159.0
510U	5.76	146.0
510V	4.50	114.3
510E	4.50	114.3
510W	4.50	114.3
510F	3.53	89.7
510D	3.44	87.4
510G	3.20	81.3



Mi-Wave
Millimeter Wave Products, Inc.
Tel. (727) 536-0033 Fax. (727) 536-0012 Email. sales@miwv.com

511 Series Programmable Rotary Vane Attenuators

Features

- Low Cost
- Compact Size
- 7.0 to 170 GHz
- High Accuracy
- Highly Reliable
- Digital Readout
- Low Insertion Loss
- IEEE-488 Interface
- Full Waveguide Bands
- Manual Operation Mode

Description 511 Series Attenuators

Mi-Wave's **511 series precision programmable rotary vane attenuators are available in full waveguide bands from 7.0 to 220.0 GHz. Attenuation control is either manually via a front panel or remote controlled using a standard IEEE-488 interface. The attenuators' small compact size incorporates both the electronic controller and microwave components. The unit operates from a single +24 volt DC source or with an optional AC adapter.**

Attenuation range is from 0 to 60 dB in 0.1 dB steps with 0.05 dB steps from 0 to 20 dB. A digital readout is provided on the front panel to display attenuation settings. The attenuators are highly reliable and designed to be used in ATE and remote power control applications.

RS-232 Control Also Available

Applications

Instrumentation
Remote Control of RF Power Levels
Fade Margin Testing of Microwave Radios
Fade Margin Testing of Microwave Radio Equipment

Ordering Information

511 ___ / ___

Specify Flange
(See Appendix A)
Specify RF Band Designator

Example :

511A/599

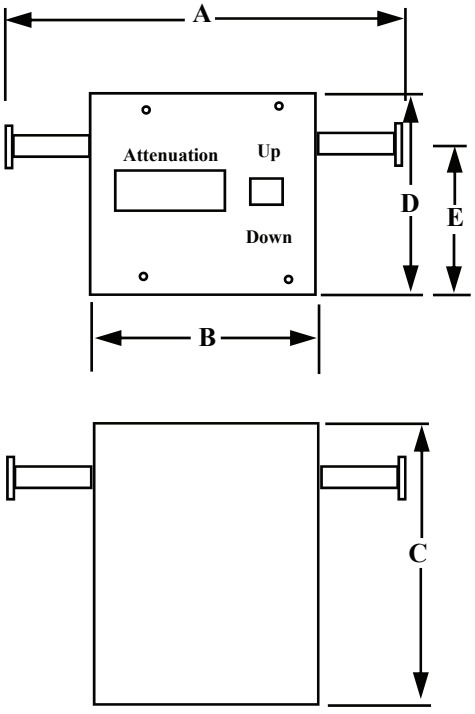
Frequency Range 26.5 to 40 GHz
UG-599/U Flange

Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

511 Series Programmable Rotary Vane Attenuators

Technical Specifications

Model Number	Frequency Band (GHz)	Waveguide (WR)	Insertion Loss (Max.)	VSWR (Max.)	Power (Max.)
511XL	7.0 - 10.0	112	0.5 dB	1.2:1	5 watts
511X	8.2 - 12.4	90	0.5 dB	1.2:1	2 watts
511XS	10.0 - 15.0	75	0.5 dB	1.25:1	2 watts
511KU	12.4 - 18.0	62	0.5 dB	1.25:1	2 watts
511K	18.0 - 26.5	42	0.5 dB	1.15:1	1 watt
511A	26.5 - 40.0	28	0.5 dB	1.15:1	0.5 watt
511B	33.0 - 50.0	22	0.6 dB	1.15:1	0.5 watt
511U	40.0 - 60.0	19	0.7 dB	1.15:1	0.4 watt
511V	50.0 - 75.0	15	0.8 dB	1.20:1	0.3 watt
511E	60.0 - 90.0	12	1.0 dB	1.2:1	0.25 watt
511W	75.0 - 110.0	10	1.0 dB	1.2:1	0.25 watt
511F	90.0 - 140.0	8	1.2 dB	1.3:1	0.2 watt
511G	110.0 - 170.0	5	1.4 dB	1.3:1	0.2 watt



Dimensional Specifications

Model No.	A		B		C		D		E	
	in	mm	in	mm	in	mm	in	mm	in	mm
511XL	11.69	296.9	4.66	118.3	6.32	160.5	4.04	102.6	2.29	58.2
511X	11.69	296.9	4.66	118.3	6.32	160.5	4.04	102.6	2.29	58.2
511XS	11.19	284.2	4.66	118.3	6.32	160.5	4.04	102.6	2.29	58.2
511KU	10.94	277.8	4.00	101.6	5.50	139.7	3.50	88.9	2.29	58.2
511K	8.48	215.4	4.00	101.6	5.50	139.7	3.50	88.9	2.29	58.2
511A	6.87	174.5	4.00	101.6	5.50	139.7	3.50	88.9	2.29	58.2
511B	6.24	158.4	4.00	101.6	5.50	139.7	3.50	88.9	2.29	58.2
511U	5.74	145.7	4.00	101.6	5.50	139.7	3.50	88.9	2.29	58.2
511V	4.50	114.3	4.00	101.6	5.50	139.7	3.50	88.9	2.29	58.2
511E	4.50	114.3	4.00	101.6	5.50	139.7	3.50	88.9	2.29	58.2
511W	4.50	114.3	4.00	101.6	5.50	139.7	3.50	88.9	2.29	58.2
511F	4.50	114.3	4.00	101.6	5.50	139.7	3.50	88.9	2.29	58.2
511G	4.50	114.3	4.00	101.6	5.50	139.7	3.50	88.9	2.29	58.2

Mi-Wave
Millimeter Wave Products, inc.
Tel. (727) 536-0033 Fax. (727) 536-0012 Email. sales@miwv.com

520 Series Uncalibrated Variable Attenuators

Features

- Dial Driven
- Compact, Mechanically Stable Design
- Wide Range of Attenuation Values
- Smooth, Spring-Loaded Setting Control

Description 520 Series Attenuators

Mi-Wave's 520 series uncalibrated variable attenuators are available in standard waveguide sizes from 26.5 to 220 GHz. The attenuating element in each unit provides variable attenuation, from 0 dB to 25 dB minimum. Precision-designed internal controls are accurately contoured to provide a low bilateral VSWR and minimum variation of attenuation with frequency.

Ordering Information

520 — / —
- Specify Flange (See Appendix A)
- Specify RF Band Designator

Applications

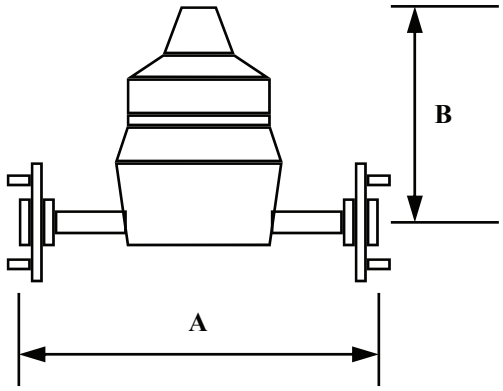
The 520 series uncalibrated variable attenuators are useful in applications that require a reliable level-setting or isolating pad. They provide maximum accuracy in establishing initial power levels in substitution-method attenuation measurements. Designed to maintain reliable performance for accurate test measurements, the stable setting control of these devices maintains constant attenuation under all normal conditions of vibration and orientation.

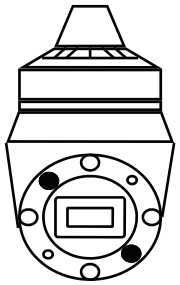
Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

520 Series Uncalibrated Variable Attenuators

Technical Specifications

Model Number	520K	520A	520B	520U	520V	520E	520W	520F	520D	520G
Frequency Band (GHz)	18.0-26.5	26.5-40.0	33.0-50.0	40.0-60.0	50.0-75.0	60.0-90.0	75.0-110.0	90.0-140.0	110.0-170.0	140-220
VSWR Max.	1.15	1.15	1.15	1.15	1.15	1.15	1.20	1.25	1.25	1.30
Attenuation Range (dB) Min.	0-30	0-30	0-30	0-30	0-30	0-25	0-25	0-25	0-25	0-25
Insertion Loss @ 0 Setting (dB)	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.5	0.6	0.7
Weight (oz.)	8.0	6.0	6.0	6.0	3.0	3.0	3.0	2.5	2.5	2.5
Average Power (Watts)	1.5	1.0	1.0	1.0	0.6	0.6	0.5	0.3	0.2	0.1





Dimensional Specifications

Model No.	A		B	
	in	mm	in	mm
520K	3.00	76.2	2.35	59.7
520A	2.75	69.9	2.16	54.9
520B	2.75	69.9	2.16	54.9
520U	2.75	69.9	2.16	54.9
520V	2.50	63.5	1.94	49.3
520E	2.50	63.5	1.94	49.3
520W	2.50	63.5	1.94	49.3
520F	2.00	50.8	1.94	49.3
520D	2.00	50.8	1.94	49.3
520G	2.00	50.8	1.94	49.3

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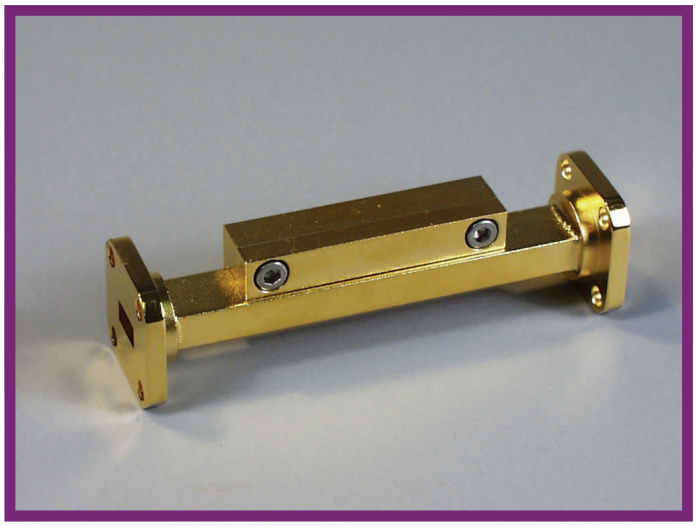
Millimeter Wave Products, Inc.
www.miwv.com
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

521 Series Fixed Attenuators



Features

- **Wide Range of Accurately Calibrated Values**
- **Available in Every Waveguide Size from 18.0 to 220 GHz**

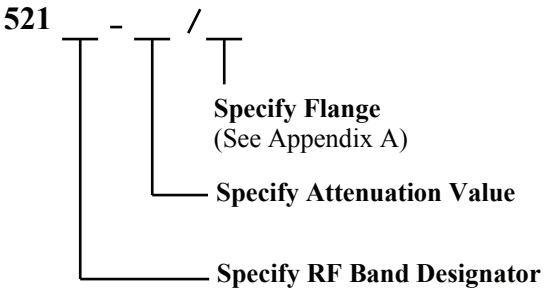
Description 521 Series Attenuators

Mi-Wave's **521 series fixed attenuators are available in attenuation values up to 30 dB for each waveguide band from 18.0 to 220 GHz. Each fixed attenuator is calibrated at the exact frequency specified and is accurate within 0.1 dB or 1%.**

Applications

The 521 series fixed attenuators are used in millimeter wave applications that require accurate fixed attenuation levels in waveguide transmission lines. All units are H-plane fixed attenuators. The attenuators are useful for isolating generators from mismatched load effects. They are also used for extending the frequency ranges of power measuring equipment and for accurately reducing signal source output levels.

Ordering Information



Please specify center frequency at time of order.

Mi-Wave

Millimeter Wave Products Inc.

www.miwv.com

2200 Tall Pines Drive, Suite 100

Largo, FL 33771

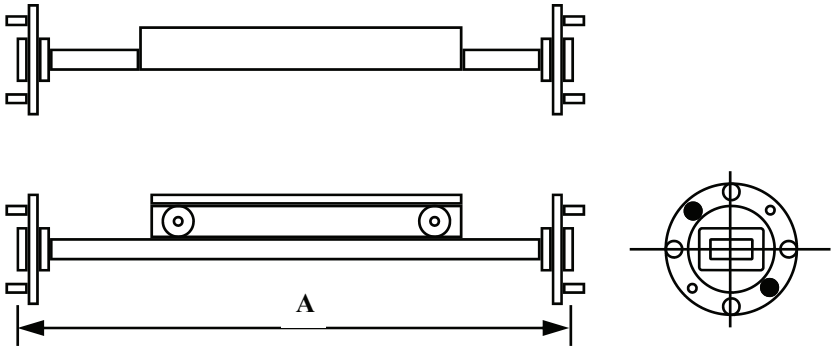
Tel. (727) 536-0033 Fax. (727) 536-0012

E: sales@miwv.com

521 Series Fixed Attenuators

Technical Specifications

Model Number	521K	521A	521B	521U	521V	521E	521W	521F	521D	521G
Frequency Band (GHz)	18.0-26.5	26.5-40.0	33.0-50.0	40.0-60.0	50.0-75.0	60.0-90.0	75.0-110.0	90.0-140.0	110.0-170.0	140-220
VSWR Max.	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.20	1.20	1.30
Attenuation Range (dB) Min.	0-30	0-30	0-30	0-30	0-30	0-30	0-30	0-30	0-30	0-30
Average Power (Watts) Max.	1.5	1.0	1.0	1.0	0.6	0.6	0.5	0.3	0.2	0.1
Weight (oz)	2.0	2.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0



Dimensional Specifications

Model No.	A	B
	in	mm
521K	3.00	76.2
521A	2.75	69.9
521B	2.75	69.9
521U	2.75	69.9
521V	2.00	50.8
521E	2.00	50.8
521W	2.00	50.8
521F	2.00	50.8
521D	2.00	50.8
521G	2.00	50.8

Mi-Wave
Millimeter Wave Products, Inc.
www.miwv.com
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

522 Series Dial-Driven Calibrated Attenuators

Features

- Compact & Mechanically-Stable Design
- Smooth Anti-Backlash Attenuation Control
- High Resolution Over Wide Attenuation Range
- Microdial Knob with Calibration Curve for Repeatable Measurements

Description 522 Series Attenuators

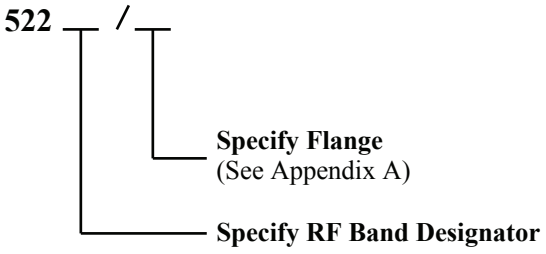
Mi-Wave's **522 series dial-driven calibrated attenuators are compact precision attenuating devices available in standard waveguide sizes from 18.0 to 110 GHz. Designed to maintain reliable performance for accurate test measurements, the stable setting control of these devices maintains constant attenuation under all normal conditions of vibration and orientation.**

Each attenuator is calibrated at the frequency specified at the time of order, and a table of attenuation vs. dial-reading is included with every unit. Calibration data at other frequencies are also available.

Applications

The 522 series dial-driven calibrated attenuators are designed for use in laboratory experimental and developmental applications which require high accuracy, resolution, and repeatability in attenuation measurements. These devices are frequently used as standard test equipment for antenna gain and radiation pattern measurements, directional coupler evaluation procedures, and waveguide component insertion loss tests.

Ordering Information



Please specify center frequency at time of order.

Mi-Wave

Millimeter Wave Products Inc.

www.miwv.com

2200 Tall Pines Drive, Suite 100

Largo, FL 33771

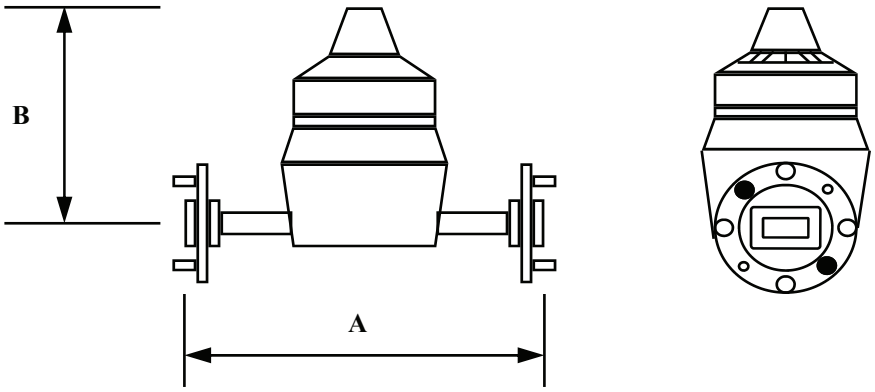
Tel. (727) 536-0033 Fax. (727) 536-0012

E: sales@miwv.com

522 Series Dial-Driven Calibrated Attenuators

Technical Specifications

Model Number	522K	522A	522B	522U	522V	522E	522W
Frequency Band (GHz)	18.0-26.5	26.5-40.0	33.0-50.0	40.0-60.0	50.0-75.0	60.0-90.0	75.0-110.0
Insertion Loss @ 0 Setting (dB)	0.3	0.3	0.3	0.3	0.4	0.4	0.4
Average Power (Watts)	1.5	1.0	1.0	1.0	0.6	0.6	0.5
Weight (oz.)	8.0	6.0	6.0	6.0	3.0	3.0	3.0



Operating Specifications

Attenuation Range . . . . . 0 dB to 25 dB Minimum
Calibration Accuracy . . . . . 0.1 dB to 1%
VSWR (Max.) 1.15
Calibration Curve . . . . . .Supplied for calibraion frequency specified at time of order.

Dimensional Specifications

Model No.	A		B	
	B			
	in	mm	in	mm
522K	**3.00**	**76.2**	**2.35**	**59.7**
522A	**2.75**	**69.9**	**2.16**	**54.9**
522B	**2.75**	**69.9**	**2.16** **2.16**	**54.9**
522U	**2.75**	**69.9**	**2.16**	**54.9**
522V	**2.50**	**63.5**	**1.94**	**49.3**
522E	**2.50**	**63.5**	**1.94**	**49.3**
522W	**2.50**	**63.5**	**1.94**	**49.3**

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Millimeter Wave Products, Inc.
www.miwv.com
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

523 Series Micrometer-Driven Calibrated Attenuators

Features

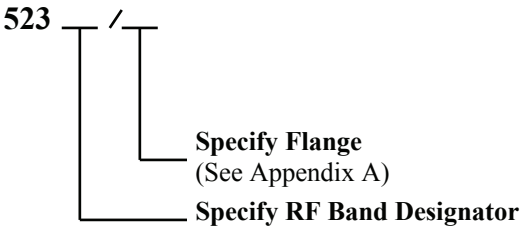
- High Resolution
- Micrometer Readout
- Differential Screw Drive
- Anti-Backlash Operation
- Excellent Mechanical Stability
- Calibration Accuracy: 0.2 dB or 2%
- Calibration Curve Provided at Specified Frequency

Description 523 Series Attenuators

Mi-Wave's **523 series micrometer-driven calibrated attenuators are compact precision attenuating devices available in standard waveguide sizes from 90.0 to 220 GHz.**

Each attenuator is calibrated at the frequency specified at the time of order, and a curve of attenuation vs. dial-reading is included with every unit. Calibration curves at other frequencies are also available.

Ordering Information



Please specify center frequency at time of order.

Applications

The 523 series micrometer-driven calibrated attenuators are designed for laboratory applications in standard waveguide bands from 90.0 to 220.0 GHz. The drive mechanism is designed for the high resolution of vane insertion vs. attenuation characteristics that is required for the small waveguide dimensions associated with the higher millimeter wave frequencies. These attenuators are very useful for insertion loss measurements, and a wide variety of other attenuation and power level determinations.

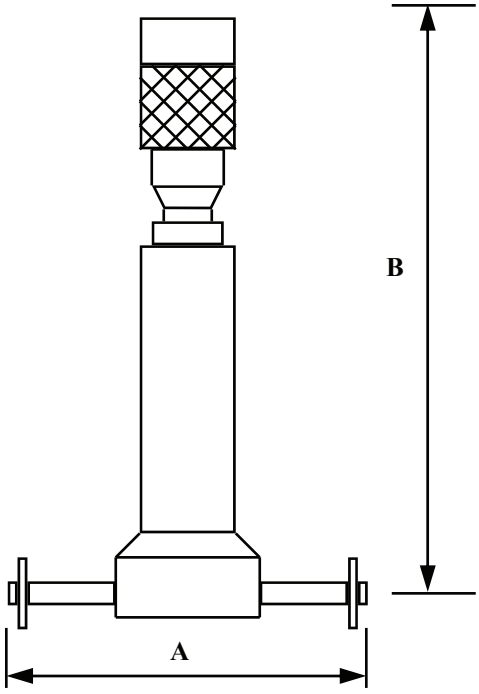
Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

523 Series Micrometer-Driven Calibrated Attenuators

Technical Specifications

Model Number	523F	523D	523G [1]
Frequency Band (GHz)	90.0-140.0	110.0-170.0	140.0-220.0
Calibration Accuracy	0.2 dB - 2%	0.2 dB - 2%	0.2 dB - 2%
Attenuation Range	0 dB - 25 dB	0 dB - 25 dB	0 dB - 25 dB
VSWR	1.25	1.25	1.25
Insertion Loss	0.5 dB	0.6 dB	0.7 dB
Average (W) Avg.	0.3	0.2	0.1
Weight (oz)	5.5	5.5	5.5

1. Full attenuation range may not be available for all G-band frequencies.



Dimensional Specifications

Model No.	A		B[1]	
	in	mm	in	mm
523F	**2.00**	**50.8**	**3.65**	**92.7**
523D	**2.00**	**50.8**	**3.65**	**92.7**
523G	**2.00**	**50.8**	**3.65**	**92.7**

1. 4.15 in (105.4 mm) maximum dimension with micrometer fully extended.

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Millimeter Wave Products, Inc.
www.miwv.com
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

525 Series Uncalibrated Phase Shifters

Features

- Dial Driven
- Smooth Phase Shift Control
- Compact & Mechanically-Stable Design
- Settings Maintained in all Orientations

Description 525 Series Phase Shifters

Mi-Wave's **525 series uncalibrated phase shifters provide phase shifts from 0º to 180º at any frequency within the waveguide band. All units are H-plane units with the exception of the K-band unit which is an E-plane device.**

Designed to maintain reliable performance for accurate test measurements, the firm setting control of these devices maintains stable performance under all normal conditions of unit orientation and test bench vibration.

Ordering Information

525 / Specify Flange (See Appendix A)

Specify RF Band Designator

Applications

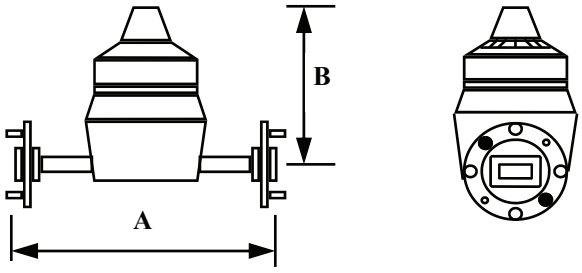
The 525 series uncalibrated phase shifters are designed for applications that require variation in the electrical length of a transmission line section with minimum energy loss and reflections. These devices are used in test bench bridge circuits and balanced mixers to provide control of the phase relationship between RF signals. They may also be used to control similar phase relations in array-type antenna systems.

Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

525 Series Uncalibrated Phase Shifters

Technical Specifications

Model Number	525K	525A	525B	525U	525V	525E	525W	525F	525D	525G
Frequency Band (GHz)	18.0-26.5	26.5-40.0	33.0-50.0	40.0-60.0	50.0-75.0	60.0-90.0	75.0-110.0	90.0-140.0	110-170.0	140.0-220.0
VSWR Max.	1.15	1.15	1.15	1.20	1.20	1.20	1.20	1.25	1.25	1.25
Phase Shift (degrees) Min.	180	180	180	180	180	180	180	180	180	180
Insertion Loss (dB)	0.3	0.3	0.3	0.3	0.4	0.5	0.5	0.6	0.8	1.0
Average Power (Watts)	1.5	1.0	1.0	1.0	0.8	0.7	0.6	0.4	0.3	0.2
Weight (oz.)	8.0	6.0	6.0	6.0	3.0	3.0	3.0	2.5	2.5	2.5



Dimensional Specifications

Model No.	A		B	
	in	mm	in	mm
525K	3.00	76.2	2.35	59.7
525A	2.75	69.9	2.16	54.9
525B	2.75	69.9	2.16	54.9
525U	2.75	69.9	2.16	54.9
525V	2.50	63.5	1.94	49.9
525E	2.50	63.5	1.94	49.9
525W	2.50	63.5	1.94	49.9
525F	2.00	50.8	1.94	49.9
525D	2.00	50.8	1.94	49.9
525G	2.00	50.8	1.94	49.9

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www.miwv.com
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

526 Series Dial-Driven Calibrated Phase Shifters

Features

- Compact & Mechanically-Stable Design
- Smooth Anti-Backlash Phase Shift Control
- High Resolution Over A Wide Phase-Shifting Range

Description 526 Series Phase Shifters

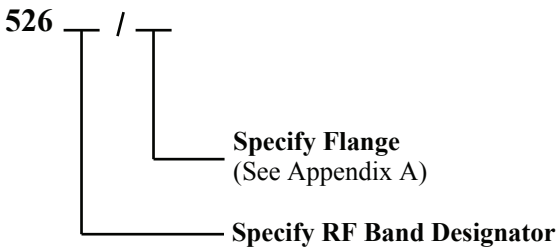
Mi-Wave's **526 series dial-driven calibrated phase shifters are precision phase-shifting devices, designed for operation from 18.0 to 110 GHz to provide phase shifts from 0º to 180º at any frequency within the waveguide band. All units are H-plane units with the exception of the K-band unit which is an E-plane device.**

Designed to maintain reliable performance for accurate test measurements, the firm setting control of these devices maintains stable performance under all normal conditions of unit orientation and test bench vibration.
Each phase shifter is calibrated at the frequency specified at the time of order, and a curve of attenuation vs. dial-reading is included with every unit. Calibration curves at other frequencies are also available.

Applications

The 526 series dial-driven calibrated phase shifters are designed to provide accurate variations in the electrical length of transmission line sections with minimum energy loss and reflections. The accuracy, resolution, and repeatability of these devices permit the measurement of standard test equipment applications. They can also provide accurate field phase data in the determination of antenna primary

Ordering Information



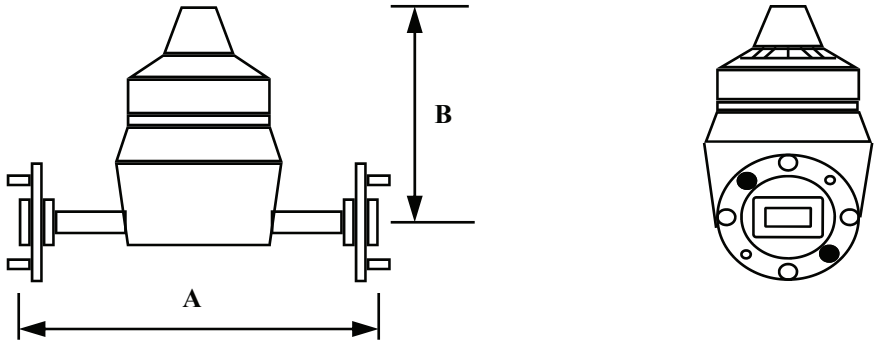
Please specify center frequency at time of order.

Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

526 Series Dial-Driven Calibrated Phase Shifters

Technical Specifications

Model Number	526K	526A	526B	526U	526V	526E	526W
Frequency Band (GHz)	18.0-26.5	26.5-40.0	33.0-50.0	40.0-60.0	50.0-75.0	60.0-90.0	75.0-110.0
VSWR	1.15	1.15	1.15	1.2	1.2	1.2	1.2
Insertion Loss (dB)	0.3	0.3	0.3	0.3	0.4	0.5	0.5
Average Power (Watts)	1.5	1.0	1.0	1.0	0.8	0.7	0.6
Weight (oz.)	8.0	6.0	6.0	6.0	3.0	3.0	3.0



Operating Specifications

Phase Shift ..... 0º to 180º Minimum
Accuracy..... ± 3.0º
Calibration Curve ..... Supplied at the frequency specified at time of order.

Dimensional Specifications

Model No.	A		B	
	B			
	in	mm	in	mm
526K	**3.00**	**76.2**	**2.35**	**59.7**
526A	**2.75**	**69.9**	**2.16**	**54.9**
526B	**2.75**	**69.9**	**2.16** **2.16**	**54.9**
526U	**2.75**	**69.9**	**2.16**	**54.9**
526V	**2.50**	**63.5**	**1.94**	**49.3**
526E	**2.50**	**63.5**	**1.94**	**49.3**
526W	**2.50**	**63.5**	**1.94**	**49.3**

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Millimeter Wave Products, Inc.
www.miwv.com
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

527 Series Micrometer-Driven Calibrated Phase Shifters

Features

- Low VSWR
- Micrometer Readout
- Smooth Anti-Backlash Operation
- Differential Screw Drive for Increased Phase Shift Resolution

Description 527 Series Phase Shifters

Mi-Wave's **527 series calibrated phase shifters are designed for operation in three waveguide sizes from 90 to 220 GHz. The differential screw drive provides and increased resolution when compared with single screw drives. This resolution is advantageous since the total travel of the phase shift vane is quite short at high frequencies. The precise micrometer readout enhances the settability and repeatability of these devices.**

Each phase shifter is calibrated at the specified frequency and a curve of phase shift vs. micrometer readout is supplied. Additional calibrations are supplied at an additional cost.

Ordering Information

527 /387

/387 — Flange

Specify RF Band Designator

Please specify center frequency at time of order.

Mi-Wave

Millimeter Wave Products Inc.

www.miwv.com

2200 Tall Pines Drive, Suite 100

Largo, FL 33771

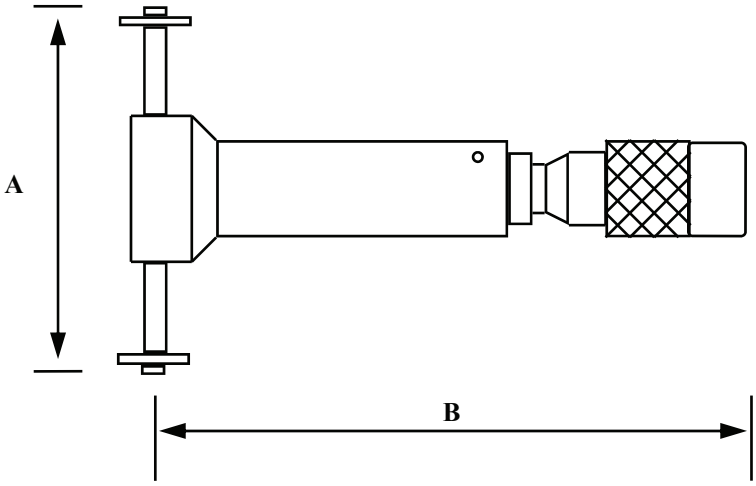
Tel. (727) 536-0033 Fax. (727) 536-0012

E: sales@miwv.com

527 Series Micrometer-Driven Calibrated Phase Shifters

Technical Specifications

Model Number	527F	527D	527G
Frequency Band (GHz)	90.0-140.0	110.0-170.0	140.0-220.0
VSWR Max.	1.15	1.15	1.15
Phase Shift (degree) Min.	180	180	180
Accuracy (°)	±3.0	±3.0	±3.0
Weight (oz)	5.5	5.5	5.5



Dimensional Specifications

Model No.	A		B	
	in	mm	in	mm
527F	2.00	50.8	4.00	101.6
527D	2.00	50.8	4.00	101.6
527G	2.00	50.8	4.00	101.6

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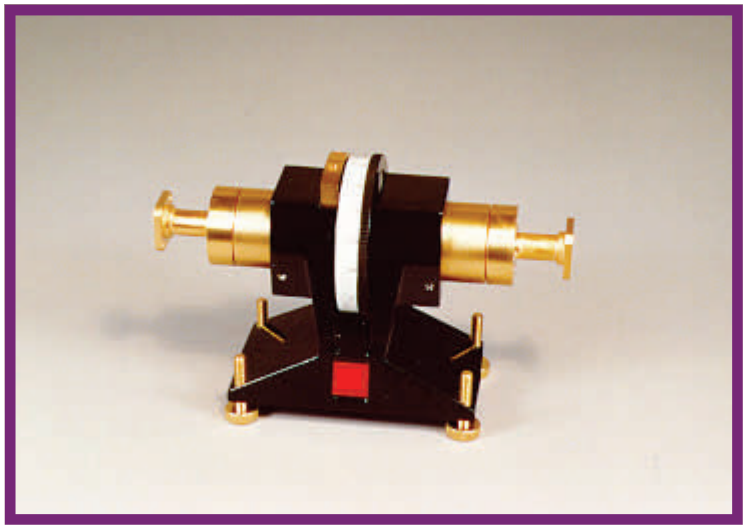
www.miwv.com
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

528 Series Direct-Reading Phase Shifters



Features

- High Accuracy
- Direct Reading Dial
- Frequency Independent
- Direct Drive With No Gears
- Covers Full Waveguide Band
- Continuously Adjustable Phase
- Low VSWR & Low Insertion Loss

Description 528 Series Phase Shifters

Mi-Wave's **528 series direct reading phase shifters provide highly accurate measurement of phase shift over each full waveguide band from 26.5 to 110.0 GHz. They feature low VSWR, low insertion loss, and low insertion loss variation due to the rotation of the phasing section.**

Ordering Information

528 — / —

Specify Flange
(See Appendix A)

Specify RF Band Designator

Applications

The 528 series direct-reading precision phase shifters offer a convenient, frequency insensitive method of measuring phase shift. These devices are useful in waveguide systems where the phase and amplitude must be measured or adjusted independently. Typical applications include bridge circuits, phased arrays, and interferometers.

Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

528 Series Direct-Reading Phase Shifters

Technical Specifications

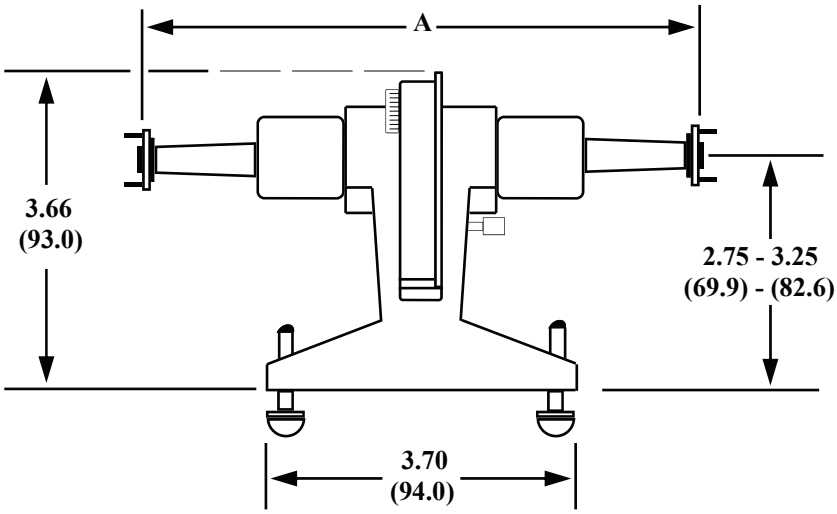
Model Number	528A	528B	528U	528V	528E	528W
Frequency Band (GHz)	26.5-40.0	33.0-50.0	40.0-60.0	50.0-75.0	60.0-90.0	75.0-110.0
Accuracy (degrees)	3	3	3	4	4	4
Insertion Loss (dB)	1.0	1.2	1.3	1.5	1.8	2.0
VSWR Max.	1.30	1.30	1.30	1.30	1.30	1.35
Average Power (Watts)	1.0	1.0	1.0	0.8	0.7	0.6
Weight (oz.)	30	29	28	27	26	24

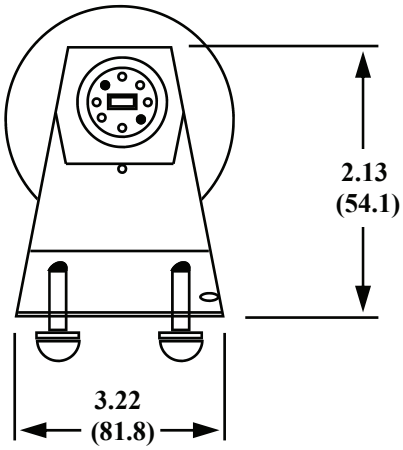
Dimensional Specifications

Model No.	A in	A mm
528A	8.53	217.0
528B	6.85	174.0
528U	5.83	148.0
528V	4.75	121.0
528E	4.16	106.0
528W	3.38	85.8

Operating Specifications

Phase Shift Range	0º to 360º Direct Reading
Read-Out	0º to 360º in 5º divisions, with 0.5º vernier
Loss Variation.	1.0 dB (Max.)





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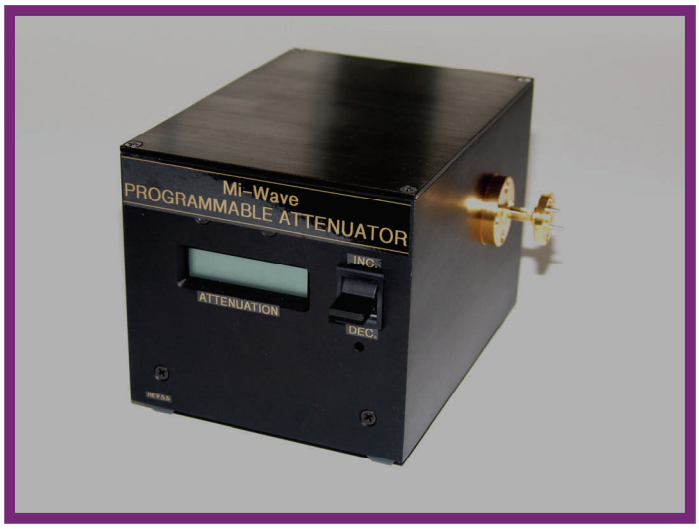
Millimeter Wave Products, Inc.
www.miwv.com
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

529 Series Motorized Rotary Vane Phase Shifters



Features

- High Accuracy
- Digital Readout
- Low Insertion Loss
- Computer Controlled
- Precision Construction
- Full Waveguide Bands

Ordering Information

Example :

529 ___ / ___

529 W/387
75-110 GHz
with /387 Flange

Specify Flange
(See Appendix A)

Specify RF Band Designator

Description 529 Series Phase Shifters

Mi-Wave **has developed a new motorized rotary vane phase shifter which is available in W/G bands from 18.0 to 110 GHz. The 529 series is a computer controlled version of Mi-Waves' standard direct reading phase shifter and features a 0 to 360º range with 0.5 degree resolution.**

The phase shifter is controlled by a precision stepping motor and all electronics required to drive the motor are contained within the phase shifter housing. Custom microprocessor based electronics translate the desired phase shifter setting into the required motor position and provide the proper drive signals for the motor. Motor speed is ramped up and down ensuring accurated positioning and smooth operation. The unit can be controlled remotely through an IEEE-488 interface or manually with a front panel switch. A three digit readout on the front panel displays the setting. All that is required is a 24 volt, 500 mA supply, which is included.

Applications

The 529 series motorized direct reading phase shifters are used in all RF automated measurement systems. They are most frequently used in RF substitution type set-ups for precise measurement of characteristics including bridge circuits and phased arrays.

Principles of Operation

Remote
Local

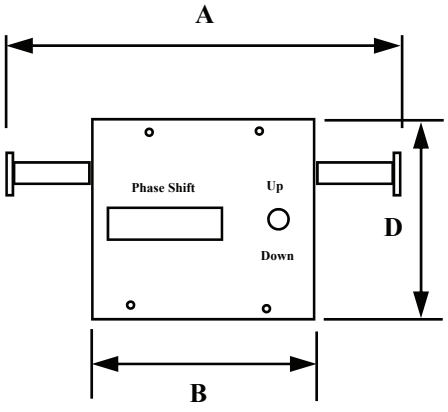
When the unit is connected to 24 VDC with no connection to the IEEE interface, phase shifter is controlled by a front panel toggle switch. If the toggle is held up or down from 5 counts or more, the phase shifter changes at a rapid rate to facilitate larger changes.

Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

529 Series Motorized Rotary Vane Phase Shifters

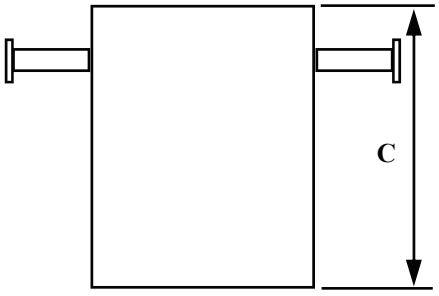
Technical Specifications

Model No.	Frequency Band (GHz)	Insertion Loss	VSWR	Average Power	Weight
529K	18.0 - 26.5	1.0 dB	1.30	1.0 Watts	63 oz
529A	26.5 - 40.0	1.0 dB	1.15	0.5 Watts	60 oz
529B	33.0 - 50.0	1.0 dB	1.15	0.5 watts	60 oz
529U	40.0 - 60.0	1.1 dB	1.15	0.4 watts	59 oz
529V	50.0 - 75.0	1.2 dB	1.20	0.3 watts	50 oz
529E	50.0 - 90.0	1.4 dB	1.20	0.2 watts	30 oz
529W	75.0 - 110.0	1.5 dB	1.20	0.2 watt	30 oz



Electrical Specifications

Model No.	Resolution (degree)	Repeatability	Accuracy	Speed (Sec) 0-360
529K	0.5	0.5	4 deg.	5 sec
529A	0.5	0.5	4 deg.	5 sec
529B	0.5	0.5	4 deg.	5 sec
529U	0.5	0.5	4 deg.	5 sec
529V	0.5	0.5	4 deg.	5 sec
529E	0.5	0.5	4 deg.	5 sec
529W	0.5	0.5	4 deg.	5 sec



Dimensional Specifications

Model No.	A		B		C		D	
	in	mm	in	mm	in	mm	in	mm
529K	8.48	215.4	4.00	101.6	5.50	139.7	3.50	88.9
529A	6.87	174.5	4.00	101.6	5.50	139.7	3.50	88.9
529B	6.24	158.4	4.00	101.6	5.50	139.7	3.50	88.9
529U	5.74	145.7	4.00	101.6	5.50	139.7	3.50	88.9
529V	4.50	114.3	4.00	101.6	5.50	139.7	3.50	88.9
529E	4.50	114.3	4.00	101.6	5.50	139.7	3.50	88.9
529W	4.50	114.3	4.00	101.6	5.50	139.7	3.50	88.9

Mi-Wave
Millimeter Wave Products, Inc.
www.miwv.com Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

530 Series Manual Waveguide Switches

Features

- Positive Indexing
- Optimum Isolation
- Non-Contacting Choke Coupling
- Versatile Switching Combinations

Description 530 Series Switches

Mi-Wave's **530 series manual switches are designed for use in standard millimeter wave frequency bands from 12.4 to 220 GHz. Each unit will operate over the full waveguide bandwidth with minimum insertion loss, minimum VSWR, and maximum isolation between coupled and uncoupled waveguide sections.**

Ordering Information

530 /

Specify Flange
(See Appendix A)

Specify RF Band Designator

Applications

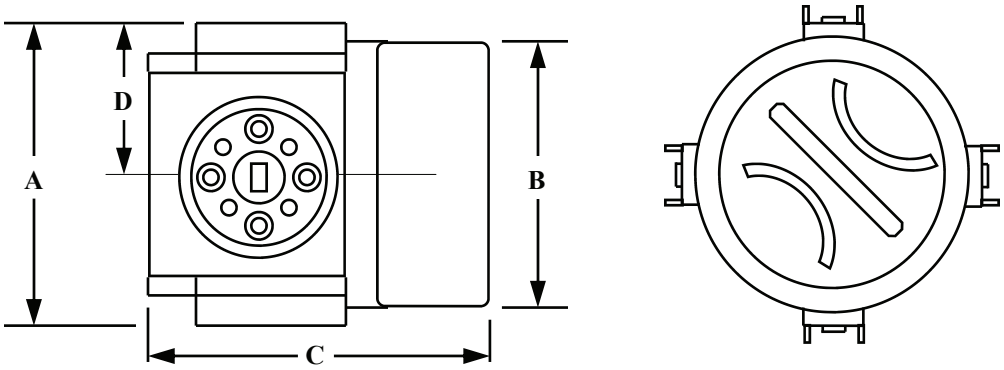
The 530 series manual waveguide switches are used for transmission switching applications in millimeter wave systems. These versatile devices provide a variety of switching combinations using three waveguide channels and three positions. In a typical radar application, a three-position switch can be used manually to switch one of two transmitters to a common antenna, while simultaneously connecting the other transmitter to a suitable termination. A manual switch will also provide a convenient means for alternately connecting a test antenna and standard horn to gain-measuring test equipment.

Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

530 Series Manual Waveguide Switches

Technical Specifications

Model Number	530A	530B	530U	530V	530E	530W	530F	530D	530G
Frequency Band (GHz)	26.5-40.0	33.0-50.0	40.0-60.0	50.0-75.0	60.0-90.0	75.0-110.0	90.0-140.0	110.0-170.0	140.0-220.0
Isolation (dB) Min.	50	50	50	50	45	40	40	35	30
Inmsertion Loss (dB) Max.	0.3	0.3	0.3	0.3	0.4	0.5	0.7	0.9	1.0
VSWR Max.	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.20	1.25



Dimensional Specifications

Model Number	A		B		C		D	
	in	mm	in	mm	in	mm	in	mm
530A/599	1.97	50.0	1.85	47.0	2.10	53.3	.985	25.0
530B/383	1.97	50.0	1.85	47.0	2.10	53.3	.985	25.0
530U/383	1.97	50.0	1.85	47.0	2.10	53.3	.985	25.0
530V/385	1.97	50.0	1.85	47.0	2.10	53.3	.985	25.0
530E/387	1.97	50.0	1.85	47.0	2.10	53.3	.985	25.0
530W/387	1.97	50.0	1.85	47.0	2.10	53.3	.985	25.0
530D/387	1.76	44.7	1.85	47.0	2.10	53.3	.880	22.4
530G/387	1.76	44.7	1.85	47.0	2.10	53.3	.880	22.4

Mi-Wave
Millimeter Wave Products, Inc.
www.miwv.com
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

535 Series Two-Position Solenoid Switches

Features

- Low Loss
- Low VSWR
- Accurate Positioning
- High Isolation Between Ports
- GPIB IEEE-488 Control Available

Description 535 Series Solenoid Switches

Each of *Mi-Wave's* 535 series waveguide switches consists of a waveguide switch selection similar to the 530 series switch and a rotary solenoid stepping motor encased in a machined housing.

Ordering Information

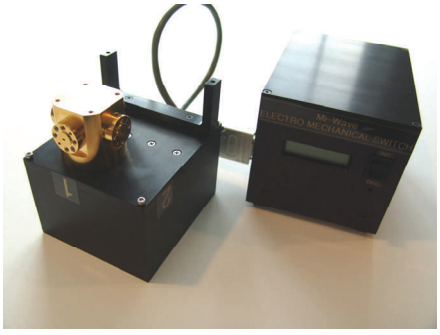
535 /

Specify Flange
(See Appendix A)

Specify RF Band Designator

Applications

The 535 series solenoid switches are used in applications that require remote-controlled or timed transmission line switching. They are particularly useful in operational systems and test setups where they supply a variety of switching combinations.



GPIB Controlled Switch 4 port 4 position

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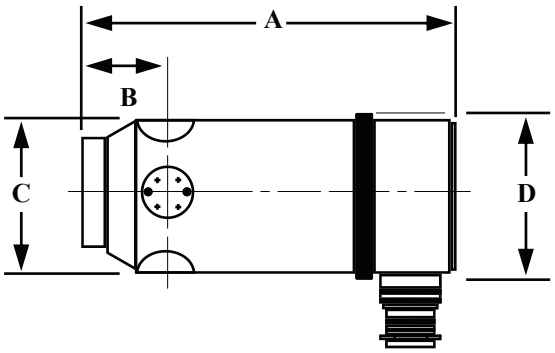
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

535 Series Two Position Solenoid Switches

Technical Specifications

Model Number	535A	535B	535U	535V	535E	535W
Frequency Band (GHz)	26.5-40.0	33.0-50.0	40.0-60.0	50.0-75.0	60.0-90.0	75.0-110.0
Isolation (dB) Min.	50	50	50	40	40	40
Insertion Loss (dB) Max.	0.3	0.3	0.3	0.3	0.4	0.5
VSWR Max.	1.15	1.15	1.15	1.15	1.15	1.15
Average Switching Speed (Seconds)	0.5	0.5	0.5	0.5	0.5	0.5

Please Check with MI-Wave for current outline drawings.



Dimensional Specifications

Model	A		B		C		D	
No.	in	mm	in	mm	in	mm	in	mm
535A	5.21	132.0	1.28	32.5	2.61	66.3	2.73	69.3
535B	5.21	132.0	1.28	32.5	2.61	66.3	2.73	69.3
535U	5.21	132.0	1.28	32.5	2.61	66.3	2.73	69.3
535V	5.41	137.0	1.14	28.9	1.92	48.8	2.50	63.5
535E	5.41	137.0	1.14	28.9	1.92	48.8	2.50	63.5
535W	5.41	137.0	1.14	28.9	1.92	48.8	2.50	63.5

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Millimeter Wave Products, Inc.
www.miwv.com
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

550 Series Frequency Meters

Features

- High Frequency Operation from 90.0 to 220 GHz
- Circular Waveguide Cavity for High-Q Resonances
- Micrometer Readout for Accurate Frequency Determination

Description 550 Series Frequency Meters

Mi-Wave's **550 series frequency meters are available in three standard waveguide sizes for operation over 90 to 220 GHz frequency range.**

Each unit is supplied with a calibration table and curve. The calibration is performed by using the micrometer-driven plunger to measure the distance between electrical resonances for a known frequency. These distances are recorded for several frequencies and then plotted on a curve to allow extrapolation for all frequencies.

Ordering Information

550 / 387

Flange

Specify RF Band Designator

Applications

The 550 series frequency meters are reaction-type cavity wavemeters designed for the accurate determination of millimeter wave signal frequencies.

Mi-Wave

Millimeter Wave Products Inc.

www.miwv.com

2200 Tall Pines Drive, Suite 100

Largo, FL 33771

Tel. (727) 536-0033 Fax. (727) 536-0012

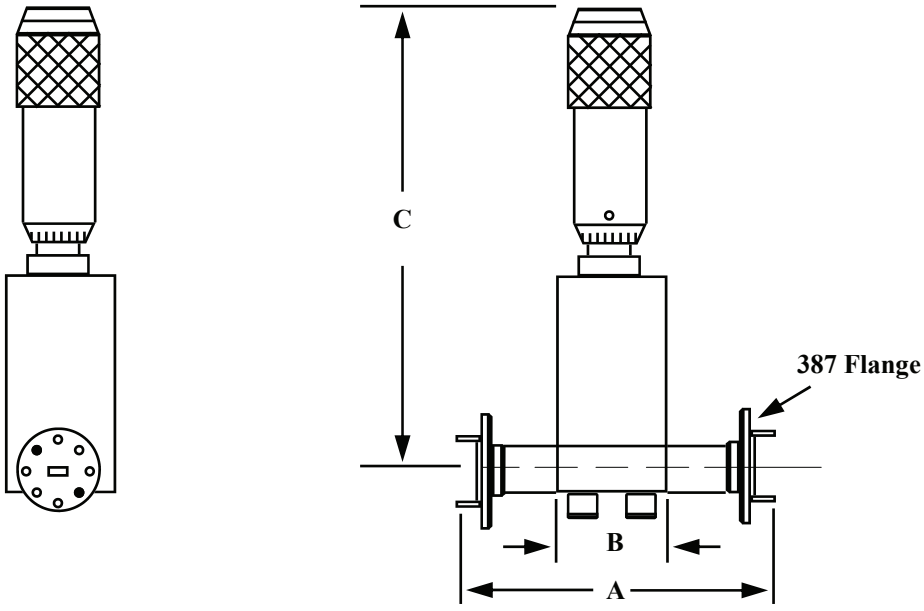
E: sales@miwv.com

550 Series Frequency Meters

Technical Specifications

Model Number	550F	550D	550G
Frequency Band (GHz)	90.0-140.0	110.0-170.0	140.0-220.0
Absolute Accuracy (%)	0.5	0.5	0.7
VSWR Max. [1]	1.20	1.20	1.20
Insertion Loss (dB) Typical	0.5	0.6	0.8
Dip at Resonance (dB)	0.3-1.0	0.3-1.0	0.3-1.0
Weight (oz)	3.0	2.5	2.5

1. Off Resonance.



Dimensional Specifications

Model Number	A		B		C	
	in	mm	in	mm	in	mm
550F	1.20	30.5	.50	12.7	2.50	63.5
550D	1.20	30.5	.50	12.7	2.50	63.5
550G	1.20	30.5	.50	12.7	2.50	63.5

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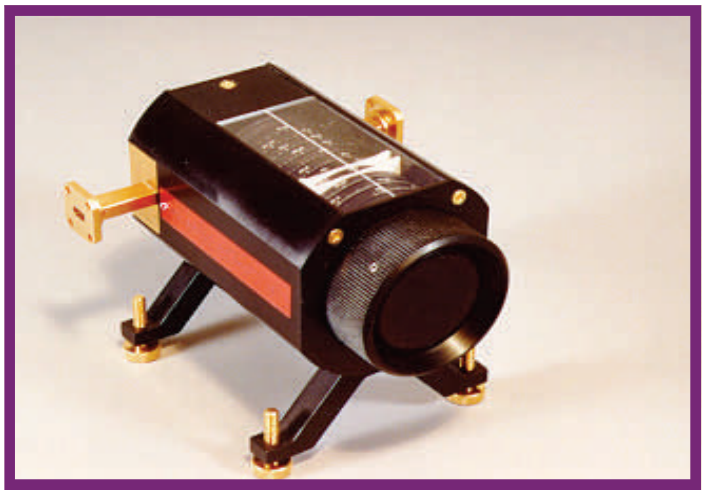
www.miwv.com
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

551 Series Direct-Reading Frequency Meters



Features

- **Full Band**
- **Direct Reading**
- **High Resolution**
- **Anti-Backlash Drive**

Description 551 Series Frequency Meters

Mi-Wave's **551 series direct-reading frequency meters are available in standard waveguide sizes from 18.0 to 110.0 GHz and are designed to provide easy direct readout of frequency with a high degree of resolution and accuracy.**

Ordering Information

551 /

Specify Flange
(See Appendix A)

Specify RF Band Designator

Applications

The 551 series direct-reading frequency meters provide a quick and accurate method of determining frequency over the complete waveguide band to facilitate measurements in any research, development, or production applications.

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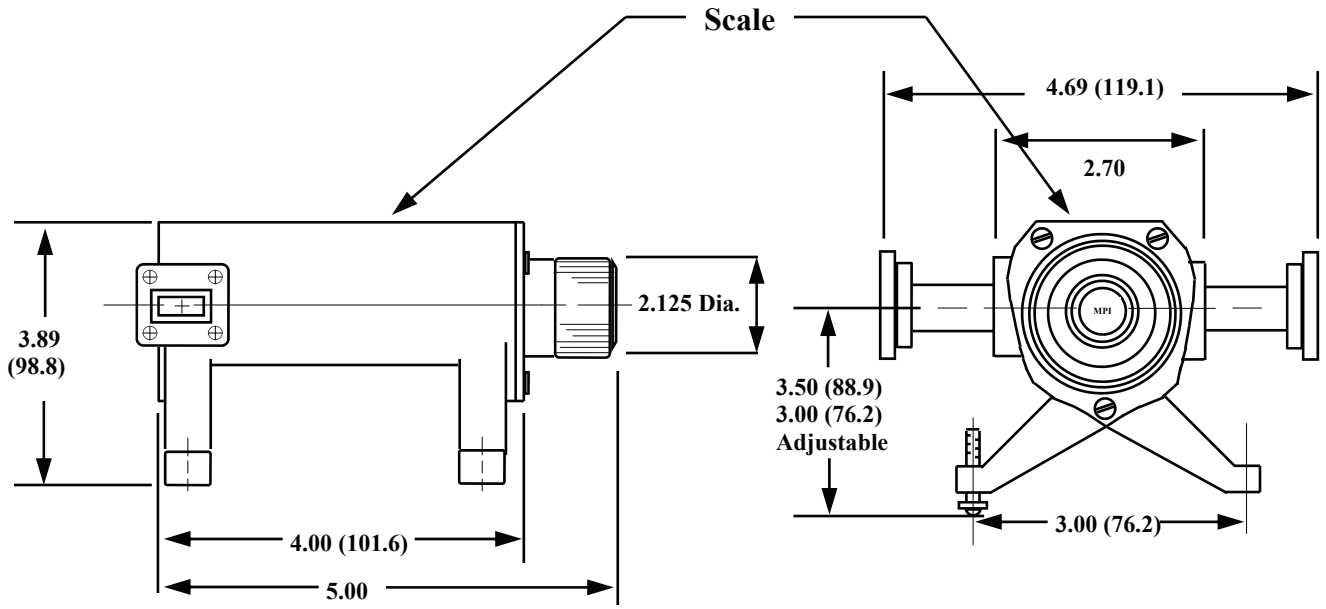
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

551 Series Direct-Reading Frequency Meters

Technical Specifications

Model Number	551K	551A	551B	551U	551V	551E	551W
Frequency Band (GHz)	18.0-26.5	26.5-40.0	33.0-50.0	40.0-60.0	50.0-75.0	60.0-90.0	75.0-110.0
Absolute Accuracy (%)	0.11	0.12	0.12	0.20	0.20	0.20	0.20
Resonance Dip (dB)	0.5-1.0	0.5-1.0	0.5-1.0	0.5-1.0	1.0-3.0	0.5-1.0	1.5-3.5
VSWR [1] Max.	1.10	1.15	1.15	1.15	1.20	1.20	1.20
Insertion Loss (dB) Max.	.25	.30	.40	.50	.60	.70	.70
Scale Divisions (MHz) Min.	10	10	10	20	20	20	20
Scale Length (in)	74.0	76.0	78.0	78.5	77.0	75.0	58.0
Weight (oz)	55	54	54	54	53	53	53

1. Off Resonance.



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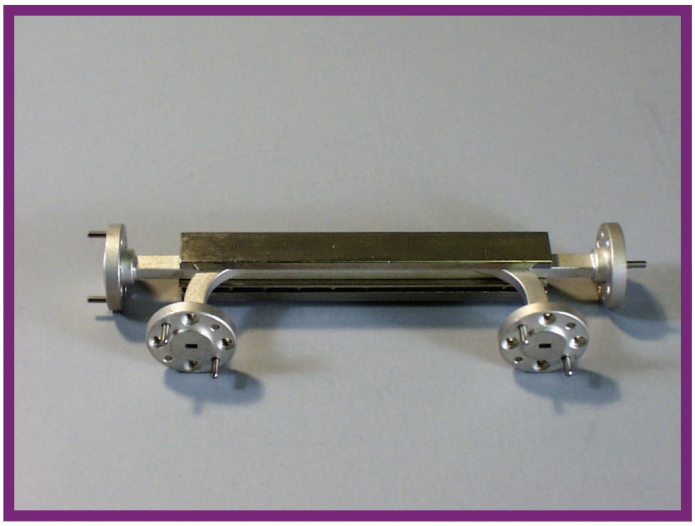
Millimeter Wave Products, Inc.
www.miwv.com
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

555 Series Bidirectional Couplers



Features

- High Directivity
- Accurate Coupling
- Full Waveguide Bandwidth

Description 555 Series Couplers

Mi-Wave's **555 series bidirectional couplers are broadband, broadwall components with a multi-hole pattern that features an inherently high directivity. The 555 series couplers are available in 3 dB, 6 dB, 10 dB, 20 dB, 30 dB, and 40 dB coupling values for standard waveguide bands from 26.5 to 110.0 GHz.**

Ordering Information

555 ___ - ___ / ___

- **Specify Flange** (See Appendix A)
- **Specify Coupling Valve** (3, 6, 10, 20, 30, 40)
- **Specify RF Band Designator**

Applications

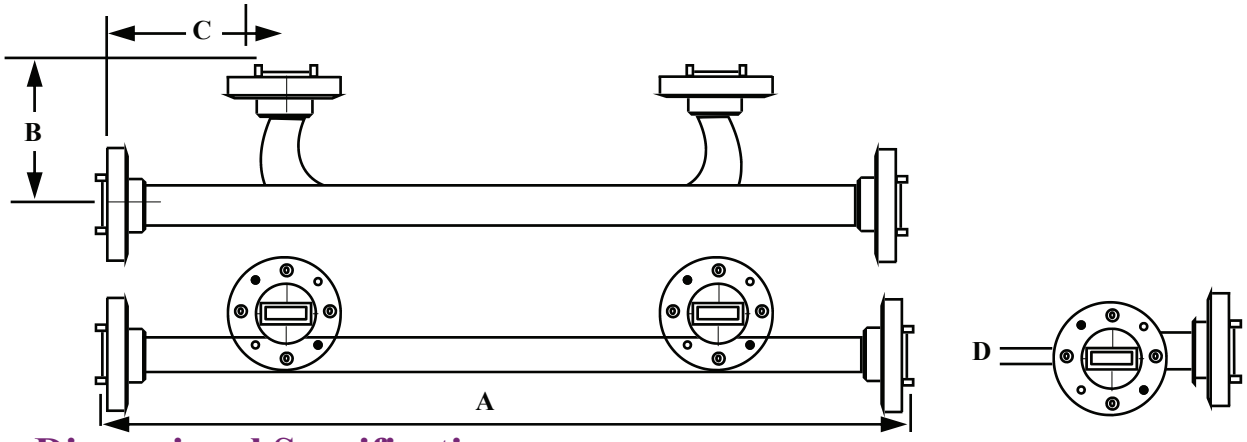
The 555 series bidirectional couplers are used in applications that require precise sampling of both incident and reflected energy. The 3 dB couplers are especially useful in balanced mixer work where broadband power division of RF and LO signals is required to supply both sides of a balanced mixer unit. The 3 dB bidirectional couplers can provide full bandwidth power division.

Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

555 Series Bidirectional Couplers

Technical Specifications

Model Number	555A	555B	555U	555V	555E	555W
Frequency Band (GHz)	26.5-40.0	33.0-50.0	40.0-60.0	50.0-75.0	60.0-90.0	75.0-110.0
Coupling (dB)	3, 6, 10, 20, 30, 40					
Coupling Variation (dB)	± 0.7	± 0.7	± 0.8	± 1.0	± 1.0	± 1.0
Coupling Accuracy (dB)	± 1.0	± 1.0	± 1.2	± 1.5	± 1.5	± 1.5
Directivity (dB) Typical	30	30	30	30	30	30
Main Line VSWR	1.05	1.05	1.10	1.10	1.10	1.10
Auxiliary Line VSWR	1.15	1.15	1.20	1.20	1.20	1.20
Weight (oz)	6.0	5.0	4.0	3.0	2.5	2.0



Dimensional Specifications

Model Number	A		B		C		D	
	in	mm	in	mm	in	mm	in	mm
555A/10, 20, 30, 40	9.62	244.0	1.75	445	1.38	35.1	.16	4.06
555A/3, 6 dB	12.0	304.8	1.75	445	1.38	35.1	.16	4.06
555B/10, 20, 30, 40	8.40	213.0	1.64	41.7	1.30	33.0	.13	3.30
555B/3, 6 dB	10.25	259.1	1.64	41.7	1.30	33.0	.13	3.30
555U/10, 20, 30, 40	7.38	187.4	1.38	35.1	1.12	28.5	.11	2.80
555U/3, 6 dB	9.12	231.6	1.38	35.1	1.12	28.5	.11	2.80
555V/10, 20, 30, 40	6.25	159.0	1.13	28.6	0.88	22.4	.08	2.03
555V/3, 6 dB	7.25	184.1	1.13	28.7	0.88	22.4	.08	2.03
555E/10, 20, 30, 40	5.50	140.0	1.13	28.5	0.88	22.4	.07	1.78
555E/3, 6 dB	6.62	168.1	1.13	28.7	0.88	22.4	.07	1.78
555W/10, 20, 30, 40	4.50	114.0	1.00	25.4	0.81	20.6	.06	1.52
555W/3, 6 dB	5.50	139.7	1.00	25.4	0.81	20.6	.06	1.52

559 Series Broadband Directional Couplers

Features

- Broadband
- Low VSWR
- High Directivity
- Rugged Construction
- High Coupling Accuracy
- Calibrated Coupling Values
- Minimum Coupling Variation with Frequency

Description 559 Series Couplers

Mi-Wave's 559 series broadband directional couplers are broadwall multi-hole energy-coupling devices. The 559 series couplers are designed in 7 waveguide sizes from 18.0 to 110 GHz. Nominal couplings of 3 dB, 6 dB, 10 dB, 20 dB, 30 dB, and 40 dB are offered to complement specific test set requirements. Other custom configurations are available upon request.

Ordering Information

559 ___ - ___ / ___

- Specify Flange (See Appendix A)
- Specify Coupling Valve (3, 6, 10, 20, 30, 40)
- Specify RF Band Designator

Applications

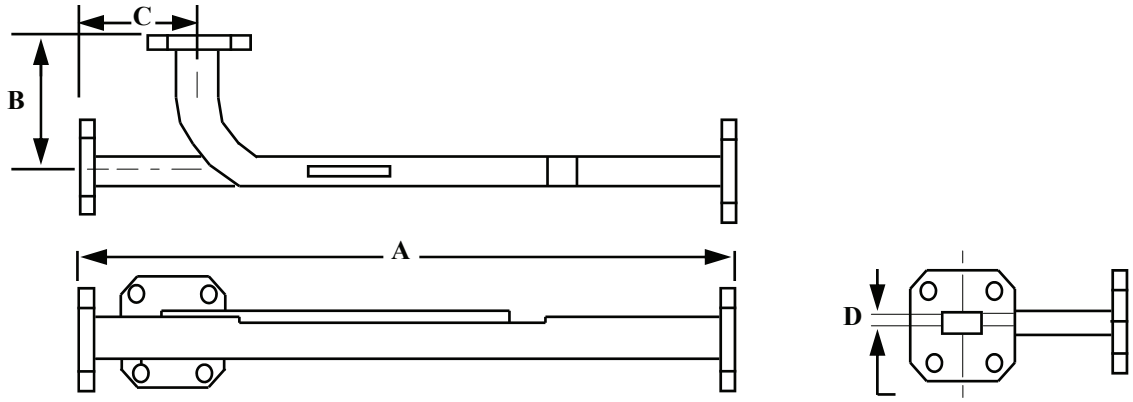
The 559 series directional couplers provide an efficient and convenient means for sampling a finite quantity of power flowing in a transmission line or for injecting a desired signal into the line.

Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

559 Series Broadband Directional Couplers

Technical Specifications

Model Number	559K	559A	559B	559U	559V	559E	559W
Frequency Band (GHz)	18.0-26.5	26.5-40.0	33.0-50.0	40.0-60.0	50.0-75.0	60.0-90.0	75.0-110.0
Coupling (dB)	3, 6, 10, 20, 30, 40						
Coupling Variation (dB)	± 0.6	± 0.6	± 0.6	± 0.8	± 1.0	± 1.0	± 1.0
Coupling Accuracy (dB)	± 1.0	± 1.0	± 1.0	± 1.2	± 1.5	± 1.5	± 1.5
Directivity (dB) Typical	40	40	40	40	40	40	40
Main Line VSWR	1.05	1.05	1.05	1.10	1.10	1.10	1.10
Auxiliary Line VSWR	1.12	1.12	1.12	1.15	1.15	1.15	1.17



Dimensional Specifications

Model Number	A in	A mm	B in	B mm	C in	C mm	D in	D mm
559K/10, 20, 30, 40	11.50	292.0	2.00	50.8	1.50	38.1	.25	6.35
559K/3, 6 dB	12.75	323.9	2.00	50.8	1.50	38.1	.25	6.35
559A/10, 20, 30, 40	9.62	244.0	1.75	44.5	1.38	35.1	.16	4.06
559A/3, 6 dB	12.0	304.8	1.75	44.5	1.38	35.1	.16	4.06
559B/10, 20, 30, 40	8.40	213.0	1.64	41.7	1.30	33.0	.13	3.30
559B/3, 6 dB	10.25	259.1	1.64	41.7	1.30	33.0	.13	3.30
559U/10, 20, 30, 40	7.38	187.4	1.38	35.1	1.12	28.5	.11	2.80
559U/3, 6 dB	9.12	231.6	1.38	35.1	1.12	28.5	.11	2.80
559V/10, 20, 30, 40	6.25	159.0	1.13	28.6	0.88	22.4	.08	2.03
559V/3, 6 dB	7.25	184.1	1.13	28.7	0.88	22.4	.08	2.03
559E/10, 20, 30, 40	5.50	140.0	1.13	28.5	0.88	22.4	.07	1.78
559E/3, 6 dB	6.62	168.1	1.13	28.7	0.88	22.4	.07	1.78
559W/10, 20, 30, 40	4.50	114.0	1.00	25.4	0.81	20.6	.06	1.52
559W/3, 6 dB	5.50	139.7	1.00	25.4	0.81	20.6	.06	1.52

560 Series Broadband Directional Couplers

Features

- **Broadband**
- **Low VSWR**
- **E-plane design**
- **High Directivity**
- **Rugged Construction**
- **High Coupling Accuracy**
- **Calibrated Coupling Values**
- **Minimum Coupling Variation with Frequency**

Description 560 Series Couplers

Mi-Wave's **560 series broadband directional couplers are broadwall E-plane multi-hole energy-coupling devices. The 560 series couplers are designed in 8 waveguide sizes from 12.4 to 110 GHz. Nominal couplings of 3 dB, 6 dB, 10 dB, 20 dB, 30 dB, and 40 dB re offered to complement specific test set requirements.**

Ordering Information

560 ___ - ___ / ___

Specify Flange
(See Appendix A)

Specify Coupling Valve
(3, 6, 10, 20, 30, 40)

Specify RF Band Designator

Applications

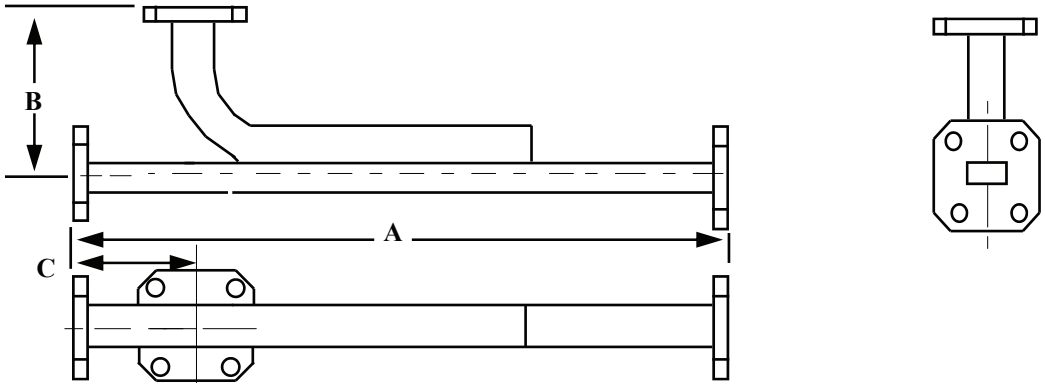
The 560 series directional couplers provide an efficient and convenient means for sampling a finite quantity of power flowing in a transmission line or for injecting a desired signal into the line.

Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

560 Series Broadband Directional Couplers

Technical Specifications

Model Number	560K	560A	560B	560U	560V	560E	560W
Frequency Band (GHz)	18.0-26.5	26.5-40.0	33.0-50.0	40.0-60.0	50.0-75.0	60.0-90.0	75.0-110.0
Coupling (dB)	3, 6, 10, 20, 30, 40						
Coupling Variation (dB)	± 0.6	± 0.6	± 0.6	± 0.8	± 1.0	± 1.0	± 1.0
Coupling Accuracy (dB)	± 1.0	± 1.0	± 1.0	± 1.2	± 1.5	± 1.5	± 1.5
Directivity (dB) Typical	40	40	40	40	40	40	40
Main Line VSWR	1.05	1.05	1.05	1.10	1.10	1.10	1.10
Auxiliary Line VSWR	1.12	1.12	1.12	1.15	1.15	1.15	1.17



Dimensional Specifications

Model Number	A in	A mm	B in	B mm	C in	C mm
560K/10, 20, 30, 40	11.50	292.0	2.00	50.8	1.50	38.1
560K/3, 6 dB	12.75	323.9	2.00	50.8	1.50	38.1
560A/10, 20, 30, 40	9.62	244.0	1.75	44.5	1.38	35.1
560A/3, 6 dB	12.0	304.8	1.75	44.5	1.38	35.1
560B/10, 20, 30, 40	8.40	213.0	1.64	41.7	1.30	33.0
560B/3, 6 dB	10.25	259.1	1.64	41.7	1.30	33.0
560U/10, 20, 30, 40	7.38	187.4	1.38	35.1	1.12	28.5
560U/3, 6 dB	9.12	231.6	1.38	35.1	1.12	28.5
560V/10, 20, 30, 40	6.25	159.0	1.13	28.6	0.88	22.4
560V/3, 6 dB	7.25	184.1	1.13	28.7	0.88	22.4
560E/10, 20, 30, 40	5.50	140.0	1.13	28.5	0.88	22.4
560E/3, 6 dB	6.62	168.1	1.13	28.7	0.88	22.4
560W/10, 20, 30, 40	4.50	114.0	1.00	25.4	0.81	20.6
560W/3, 6 dB	5.50	139.7	1.00	25.4	0.81	20.6

561 Series Broadband Directional Couplers

Features

- **Broadband**
- **Low VSWR**
- **High Directivity**
- **Rugged Construction**
- **High Coupling Accuracy**
- **Calibrated Coupling Values**
- **Minimum Coupling Variation with Frequency**

Description 561 Series Couplers

Mi-Wave's **561 series broadband directional couplers are broadwall multi-hole energy-coupling devices. The 561 series devices are available in various waveguide sizes ranging in frequency from 18.0 to 220 GHz. Nominal couplings of 3 dB, 6 dB, 10 dB, 20 dB, 30 dB, and 40 dB are offered to complement specific test set requirements.**

Ordering Information

561 ___ **-** ___ **/** ___

Specify Flange
(See Appendix A)

Specify Coupling Valve
(3, 6, 10, 20, 30, 40)

Specify RF Band Designator

Applications

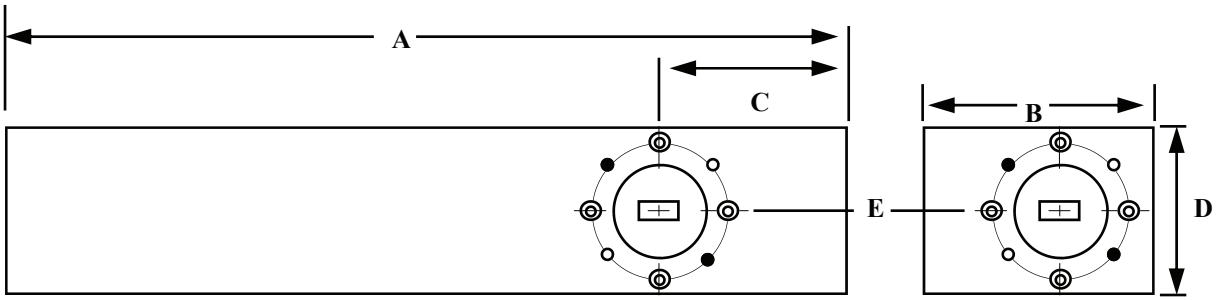
The 561 series directional couplers provide an efficient and convenient means for sampling a finite quantity of power flowing in a transmission line or for injecting a desired signal into the line.

Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

561 Series Broadband Directional Couplers

Technical Specifications

Model Number	561 A	561 B	561U	561V	561E	561W	561F	561D	561G
Frequency Band (GHz)	26.5-40.0	33.0-50.0	40.0-60.0	50.0-75.0	60.0-90.0	75.0-110.0	90.0-140.0	110.0-170.0	140.0-220.0
Coupling (dB)	3, 6, 10, 20, 30, 40								
Coupling Variation (dB)	± .06	± .06	± .08	± 1.0	± 1.0	± 1.0	± 1.5	± 1.5	± 1.5
Coupling Accuracy (dB)	± 1.0	± 1.0	± 1.0	± 1.5	± 1.5	±1.5	± 2.0	± 2.0	± 2.0
Directivity (dB) Typical	35	35	35	35	35	35	25	25	25
Main Line VSWR	1.05	1.05	1.05	1.10	1.10	1.10	1.15	1.15	1.15
Auxiliary Line VSWR	1.12	1.12	1.12	1.15	1.15	1.17	1.20	1.20	1.20

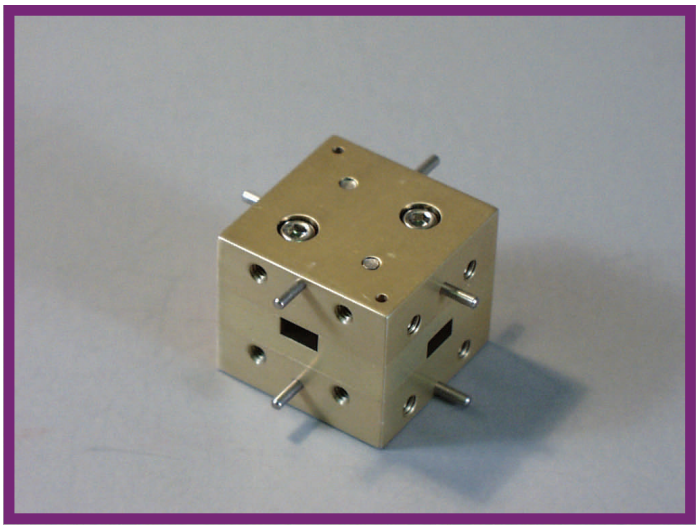


Dimensional Specifications

Model Number	A		B		C		D		E	
	in	mm	in	mm	in	mm	in	mm	in	mm
561A	9.5	241.3	1.50	38.1	1.50	38.1	1.30	33.0	0.65	16.5
561B	8.0	203.2	1.30	33.0	1.50	38.1	1.30	33.0	0.65	16.5
561U	7.0	177.8	1.30	33.0	1.30	33.0	1.30	33.0	0.65	16.5
561 V	6.0	152.4	1.30	33.0	1.25	31.8	1.00	25.4	0.50	12.7
561E	5.0	127.0	1.10	27.9	1.00	25.4	1.00	25.4	0.50	12.7
561W	4.0	101.6	1.10	27.9	0.80	20.32	1.00	25.4	0.50	12.7
561F	2.88	73.15	1.10	27.9	0.80	20.32	1.00	25.4	0.50	12.7
561D	2.88	73.15	1.10	27.9	0.80	20.32	1.00	25.4	0.50	12.7
561 G	2.88	73.15	1.10	27.9	0.80	20.32	1.00	25.4	0.50	12.7

Mi-Wave
Millimeter Wave Products, Inc.
www.miwv.com
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

564 Series Cross Guide Directional Couplers



Features

- Low VSWR
- Four-Port Device
- Rugged Construction
- Broadband Operation

Description 564 Series Couplers

Mi-Wave's **564 series cross guide coupler consists of two waveguides at right angles to each other, joined by small coupling slots whose size, location, and orientation determine the coupling and directivity of the unit. All ports are available for sampling or injecting energy and are clearly marked to indicate the coupling direction.**

Ordering Information

564 ___ - ___ / ___

- **Specify Flange** (See Appendix A)
- **Specify Coupling Value**
- **Specify RF Band Designator**

Applications

The 564 series cross guide directional couplers provide an efficient means for sampling power or injecting a signal into a waveguide transmission line.

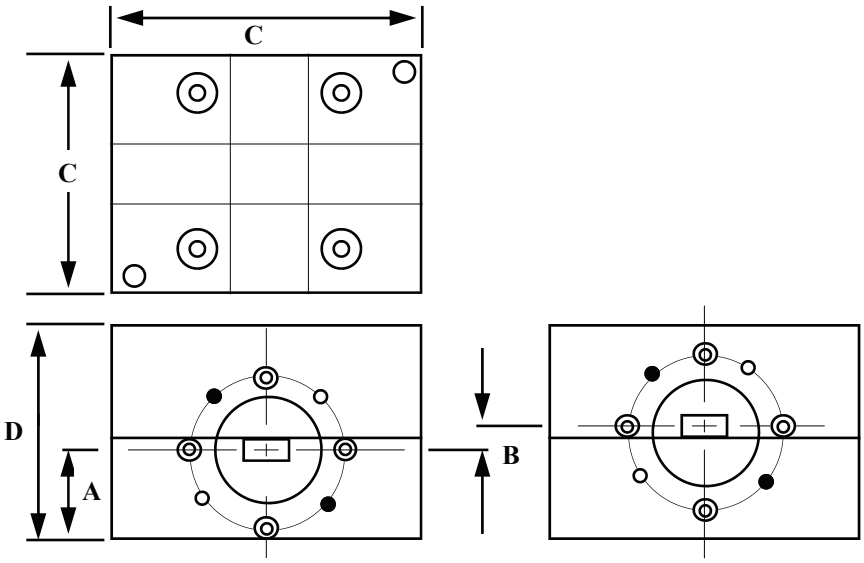
Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

564 Series Cross Guide Directional Couplers

Technical Specifications

Model Number	564K	564A	564B	564U	564V	564E	564W	564F
Frequency Band (GHz)	18.0-26.5	26.5-40.0	33.0-50.0	40.0-60.0	50.0-75.0	60.0-90.0	75.0-110.0	90.0-140.0
Standard Coupling [1, 2] Values (dB) Nom.	16, 20, 30, 40, 50							
Directivity (dB) Typical	15	15	15	15	10	10	10	10
VSWR Max.	1.15	1.15	1.15	1.15	1.20	1.20	1.20	1.20
Weight (oz)	3.0	3.0	3.0	3.0	9.0	8.0	8.0	7.0

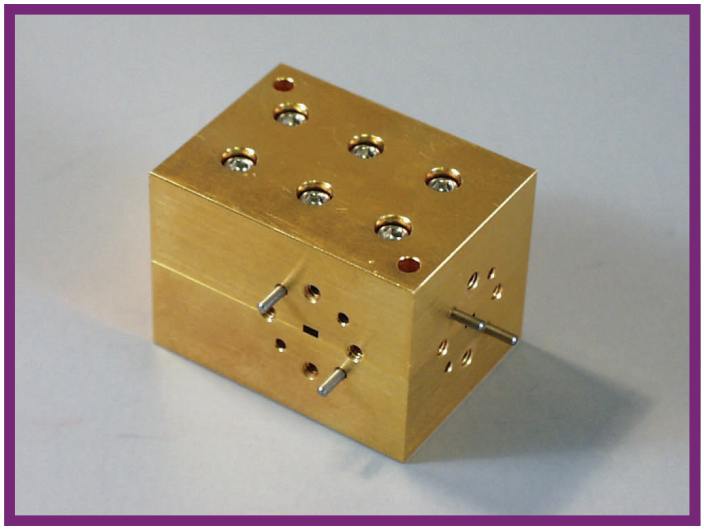
1. Any coupling values are available upon request.
2. Nominal ± 2.0dB coupling variation over the waveguide band when set for coupling value at the band center.



Dimensional Specifications

Model	A		B		C		D	
Number	in	mm	in	mm	in	mm	in	mm
564K	.568	14.4	0.18	4.6	1.62	41.1	1.31	33.3
564A	.580	14.7	0.15	3.8	1.62	41.1	1.31	33.3
564B	.594	15.1	0.12	3.0	1.62	41.1	1.31	33.3
564U	.603	15.3	0.10	2.5	1.62	41.1	1.31	33.3
564V	.588 8.595	14.9	0.08	2.01	1.25	31.8	1.25	31.8
564E	.595	15.1	0.07	1.8	1.25	31.8	1.25	31.8
564W	.600	15.2	0.05	1.3	1.25	31.8	1.25	31.8
564F	.600	15.2	0.05	1.3	1.25	31.8	1.25	31.8

565 Series Cross Guide Directional Couplers



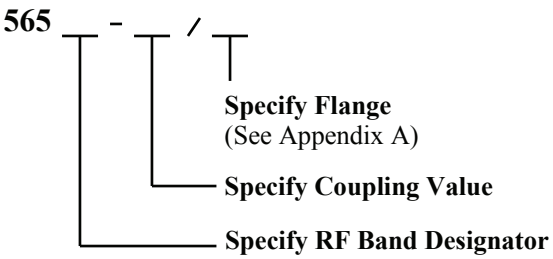
Features

- Low VSWR
- High Isolation
- High Directivity
- Rugged Construction
- Broadband Operation

Description 565 Series Couplers

Mi-Wave's **565 series cross guide couplers are similar in construction to the 564 series cross guide couplers. The units consist of two waveguides at right angles to each other, joined by small coupling slots whose size, location, and orientation determine the coupling and directivity of the unit. The 565 series couplers are unidirectional because one arm is internally terminated with a matched load.**

Ordering Information



Applications

The 565 series cross guide directional couplers provide an efficient means for sampling power or injecting a signal into a waveguide transmission line.

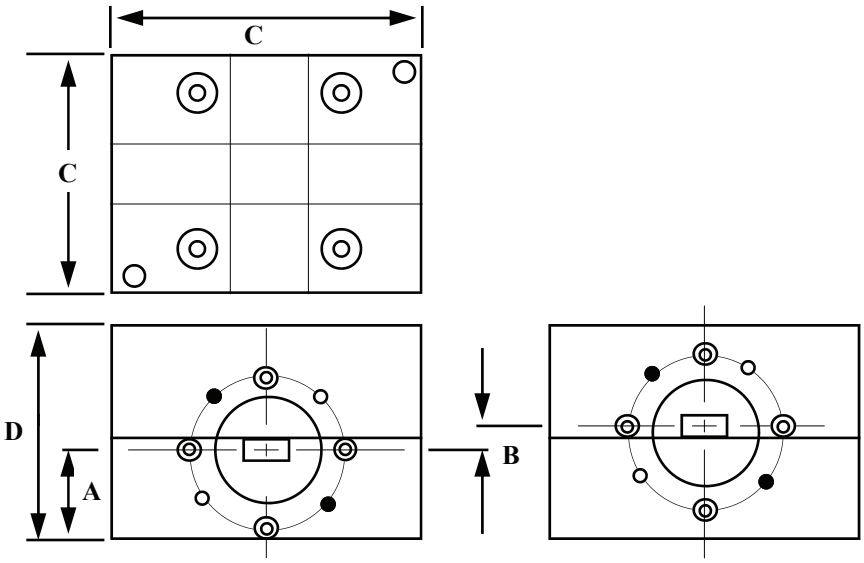
Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

564 Series Cross Guide Directional Couplers

Technical Specifications

Model Number	564K	564A	564B	564U	564V	564E	564W	564F
Frequency Band (GHz)	18.0-26.5	26.5-40.0	33.0-50.0	40.0-60.0	50.0-75.0	60.0-90.0	75.0-110.0	90.0-140.0
Standard Coupling [1, 2] Values (dB) Nom.	16, 20, 30, 40, 50							
Directivity (dB) Typical	15	15	15	15	10	10	10	10
VSWR Max.	1.15	1.15	1.15	1.15	1.20	1.20	1.20	1.20
Weight (oz)	3.0	3.0	3.0	3.0	9.0	8.0	8.0	7.0

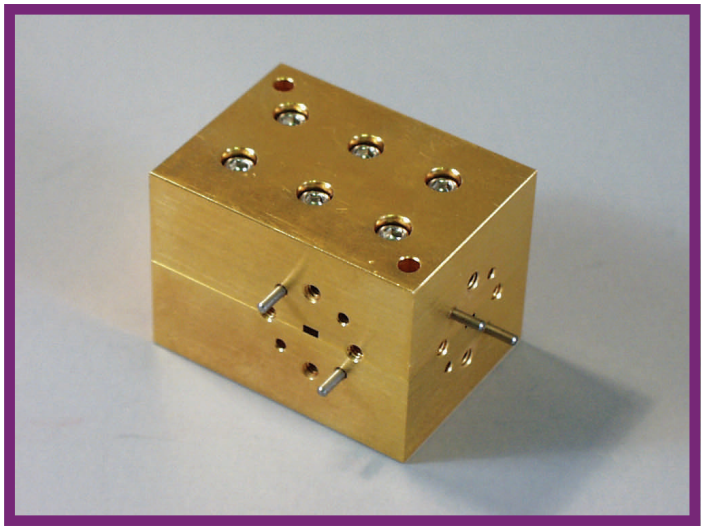
1. Any coupling values are available upon request.
2. Nominal ± 2.0dB coupling variation over the waveguide band when set for coupling value at the band center.



Dimensional Specifications

Model	A		B		C		D	
Number	in	mm	in	mm	in	mm	in	mm
564K	.568	14.4	0.18	4.6	1.62	41.1	1.31	33.3
564A	.580	14.7	0.15	3.8	1.62	41.1	1.31	33.3
564B	.594	15.1	0.12	3.0	1.62	41.1	1.31	33.3
564U	.603	15.3	0.10	2.5	1.62	41.1	1.31	33.3
564V	.588	14.9	0.08	2.01	1.25	31.8	1.25	31.8
564E	.595	15.1	0.07	1.8	1.25	31.8	1.25	31.8
564W	.600	15.2	0.05	1.3	1.25	31.8	1.25	31.8
564F	.600	15.2	0.05	1.3	1.25	31.8	1.25	31.8

565 Series Cross Guide Directional Couplers



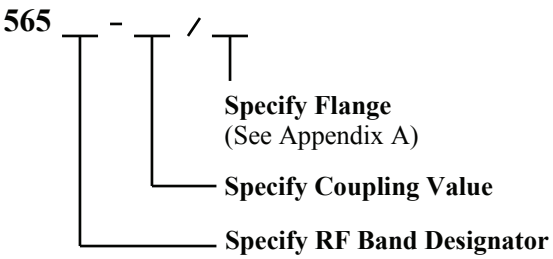
Features

- Low VSWR
- High Isolation
- High Directivity
- Rugged Construction
- Broadband Operation

Description 565 Series Couplers

Mi-Wave's **565 series cross guide couplers are similar in construction to the 564 series cross guide couplers. The units consist of two waveguides at right angles to each other, joined by small coupling slots whose size, location, and orientation determine the coupling and directivity of the unit. The 565 series couplers are unidirectional because one arm is internally terminated with a matched load.**

Ordering Information



Applications

The 565 series cross guide directional couplers provide an efficient means for sampling power or injecting a signal into a waveguide transmission line.

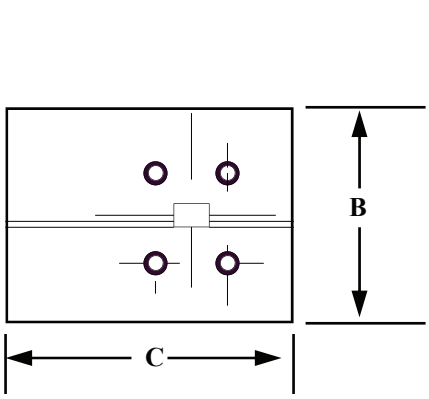
Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

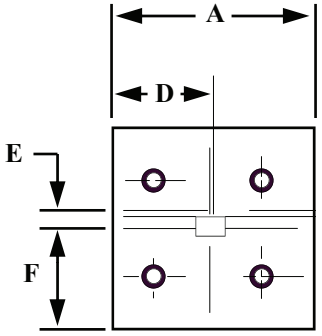
565 Series Cross Guide Directional Couplers

Technical Specifications

Model Number	565K	565A	565B	565U	565V	565E	565W	565F
Frequency Band (GHz)	18.0-26.5	26.5-40.0	33.0-50.0	40.0-60.0	50.0-75.0	60.0-90.0	75.0-110.0	90.0-140.0
Standard Coupling [1, 2] Values (dB) Nom.	16, 20, 30, 40, 50							
Directivity (dB) Typical	15	15	15	15	10	10	10	10
VSWR Max.	1.15	1.15	1.15	1.15	1.20	1.20	1.20	1.20

1. Any coupling values are available upon request. **2. Nominal ± 2.0dB coupling variation over the waveguide band when set for coupling value at the band center.**





Dimensional Specifications

Model	A		B		C		D		E		F	
Number	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
565K	1.50	38.1	1.31	33.3	4.75	120.7	0.75	19.0	0.187	4.74	0.58	14.7
565A	1.50	38.1	1.31	33.3	2.60	66.0	0.75	19.0	0.151	3.84	0.58	14.7
565B	1.50	38.1	1.31	33.3	2.60	66.0	0.75	19.0	0.121	3.07	0.59	15.0
565U	1.50	38.1	1.31	33.3	2.60	66.0	0.75	19.0	0.102	2.59	0.60	15.2
565V	1.25	31.8	1.25	31.8	1.70	43.2	0.62	15.7	0.080	2.03	0.58	14.7
565E	1.25	31.8	1.25	31.8	1.70	43.2	0.62	15.7	0.066	1.68	0.59	15.0
565W	1.25	31.8	1.25	31.8	1.70	43.2	0.62	15.7	0.054	1.37	0.59	15.0
565F	1.25	31.8	1.25	31.8	1.70	43.2	0.62	15.7	0.045	1.14	0.60	15.3

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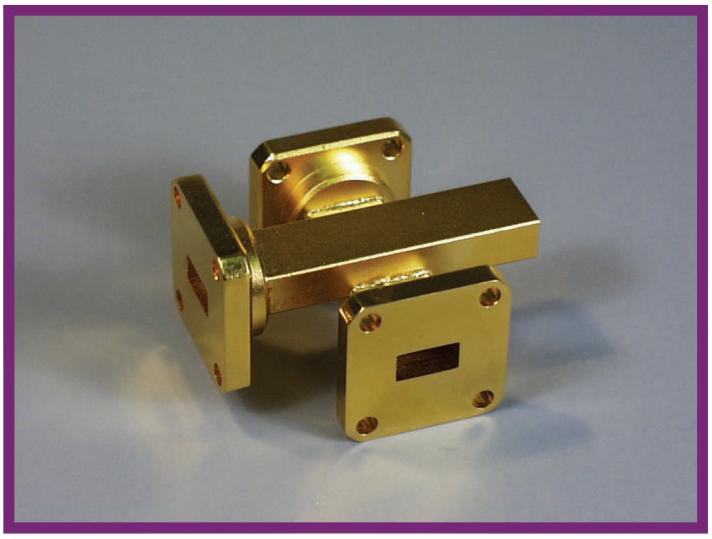
566 Series Cross Guide Directional Couplers



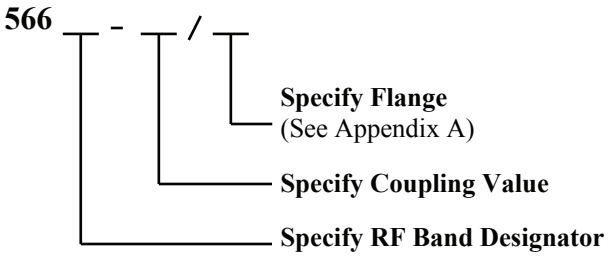
Features

- Low Cost
- Low VSWR
- Four-Port Device
- Rugged Construction
- Broadband Operation

Description 566 Series Couplers

Mi-Wave's **566 series cross guide coupler consists of two waveguides at right angles to each other, joined by small coupling slots whose size, location, and orientation determine the coupling and directivity of the unit. All ports are available for sampling or injecting energy and are clearly marked to indicate the coupling direction.**

Ordering Information



Applications

The 566 series cross guide directional couplers provide an efficient means for sampling power or injecting a signal into a waveguide transmission line.

Mi-Wave

Millimeter Wave Products Inc.

www.miwv.com

2200 Tall Pines Drive, Suite 100

Largo, FL 33771

Tel. (727) 536-0033 Fax. (727) 536-0012

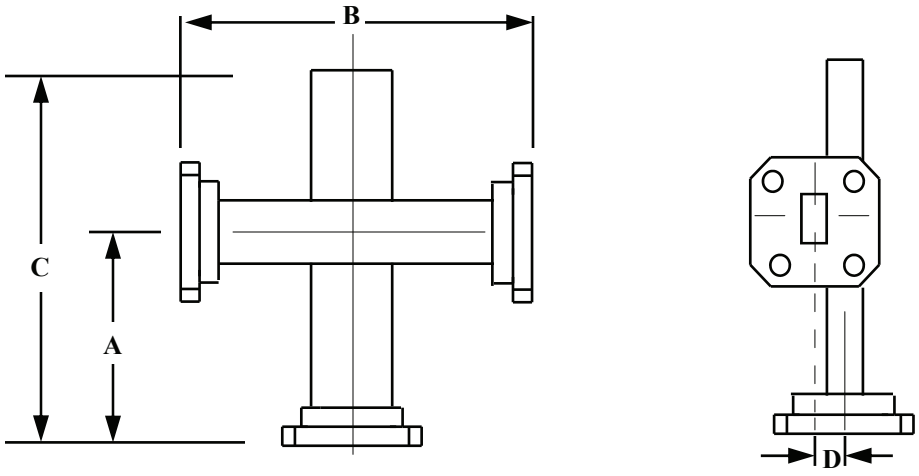
E: sales@miwv.com

566 Series Cross Guide Directional Couplers

Technical Specifications

Model Number	566K	566A	566B	566U	566V	566E	566W
Frequency Band (GHz)	18.0-26.5	26.5-40.0	33.0-50.0	40.0-60.0	50.0-75.0	60.0-90.0	75.0-110
Standard Coupling [1, 2] Values (dB) Nom.	16, 20, 30, 40, 50						
Directivity (dB) Typical	15	15	15	15	10	10	10
VSWR Max.	1.15	1.15	1.15	1.15	1.20	1.20	1.20
Weight (oz)	3.0	3.0	3.0	3.0	2.0	2.0	2.0

1. Any coupling values are available upon request.
2. Nominal ± 2.0dB coupling variation over the waveguide band when set for coupling value at the band center.



Dimensional Specifications

Model	A		B		C		D	
Number	in	mm	in	mm	in	mm	in	mm
566K	1.00	25.4	2.00	50.8	2.00	50.8	.187	4.74
566A	.75	.19	1.50	38.1	1.50	38.1	.161	4.09
566B	.75	.19	1.50	38.1	1.50	38.1	.127	3.22
566U	.75	.19	1.50	38.1	1.50	38.1	.11	2.80
566V	.75	.19	1.50	38.1	1.50	38.1	.090	2.29
566E	.75	.19	1.50	38.1	1.50	38.1	.075	1.90
566W	.75	.19	1.50	38.1	1.50	38.1	.065	1.65

580 Series Terminations

Features

- Low VSWR
- Compact Size
- Full Waveguide Bandwidths
- Available for Low Power and Medium Power Applications

Description 580 Series Terminations

Mi-Wave's **580 series terminations are designed with standard waveguide flanges for use from 12.4 to 220 GHz. Each unit consists of a short length of waveguide and an integral matched terminal load. Individual resistive dielectric loads are tapered to precise wedge configurations for maximum effective energy absorption. The gradual taper provides a low VSWR over the full waveguide bandwidth.**

Ordering Information

580 ___ / ___

Specify Flange
(See Appendix A)

Specify RF Band Designator

Applications

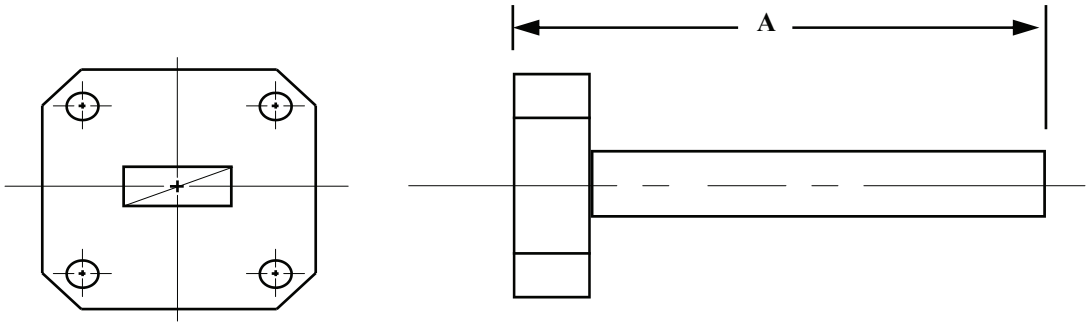
The 580 series terminations are used in experimental and developmental test sets where a low VSWR wave-guide load is essential for valid and accurate measurements. These terminations will ensure precise measurement of the VSWR resulting from insertion of various waveguide components into a system.

Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

580 Series Terminations

Technical Specifications

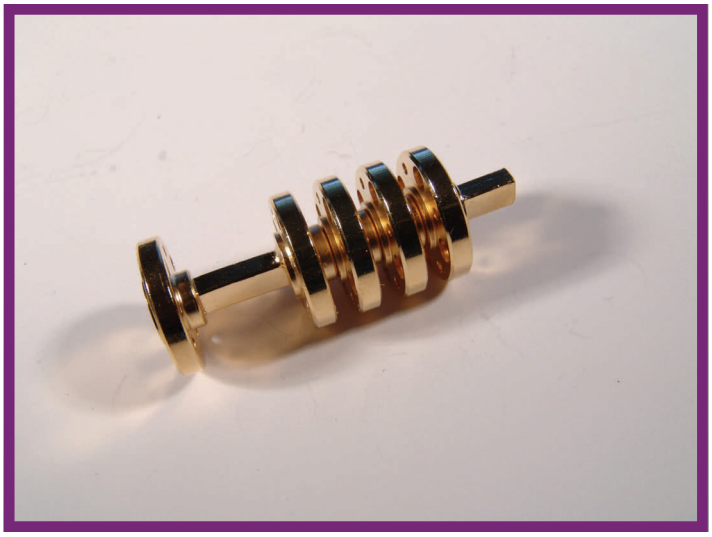
Model Number	580Ku	580K	580A	580B	580U	580V	580E	580W	580F	580D	580G
Frequency Band (GHz)	12.4-18.0	18.0-26.5	26.5-40.0	33.0-50.0	40.0-60.0	50.0-75.0	60.0-90.0	75.0-110.0	90.0-140.0	110.0-170.0	140-220
VSWR Max.	1.05	1.05	1.05	1.05	1.06	1.06	1.06	1.06	1.10	1.10	1.10
Average Power (Watts)	7.0	6.0	5.0	4.0	2.0	1.0	0.6	0.4	0.2	0.1	0.1



Dimensional Specifications

Model Number	A in	A mm
580Ku	3.31	84.1
580K	3.00	76.2
580A	2.38	60.5
580B	2.00	50.8
580U	1.75	44.5
580V	1.50	38.1
580E	1.50	38.1
580W	1.50	38.1
580F	0.88	22.4
580D	0.88	22.4
580G	0.88	22.4

581 Series Medium Power Load Terminations



Features

- Low VSWR
- Compact Size
- Full Waveguide Bandwidths
- Available for Low Power and Medium Power Applications

Description 581 Series Terminations

Mi-Wave's **581 series terminations are designed with standard waveguide flanges for use from 12.4 to 220 GHz. Each unit consists of a short length of waveguide and an integral matched terminal load. Individual resistive dielectric loads are tapered to precise wedge configurations for maximum effective energy absorption. The gradual taper provides a low VSWR over the full waveguide bandwidth.**

Please Note: For higher power requirements 582 series up to 100 watts CW, please consult *Mi-Wave* for technical specifications.

Ordering Information

581 / ___

Specify Flange
(See Appendix A)

Specify RF Band Designator

Applications

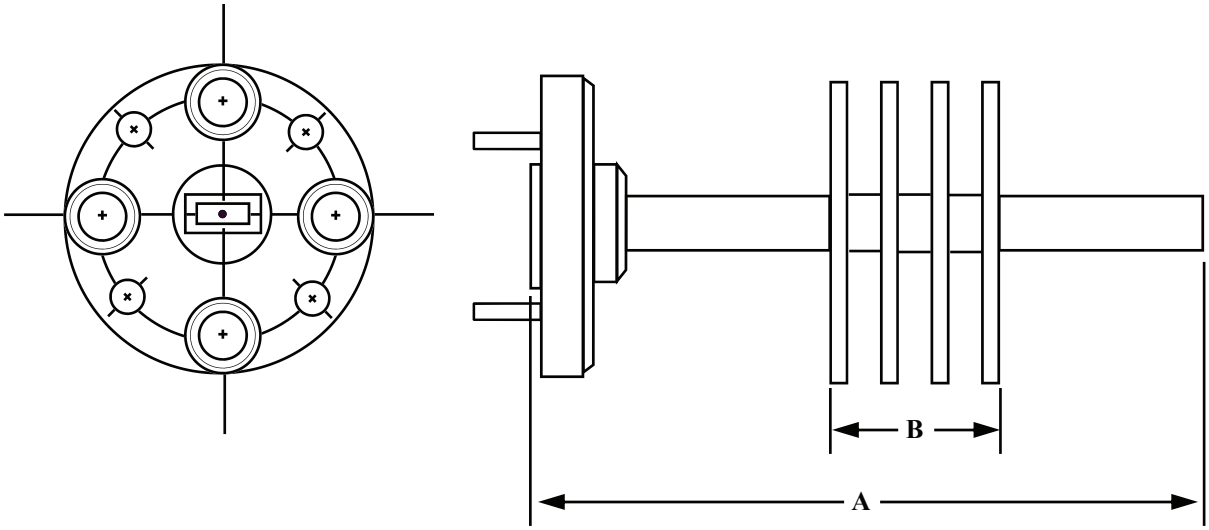
The 581 series terminations are used in experimental and developmental test sets where a low VSWR wave-guide load is essential for valid and accurate measurements. These terminations will ensure precise measurement of the VSWR resulting from insertion of various waveguide components into a system.

Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

581 Series Medium Power Load Terminations

Technical Specifications

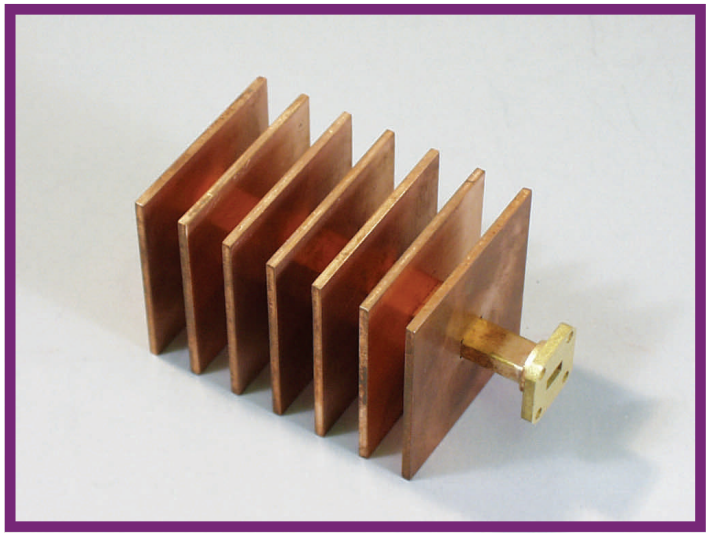
Model Number	581Ku	581K	581A	581B	581U	581V	581E	581W	581F	581D	581G
Frequency Band (GHz)	12.4-18.0	18.0-26.5	26.5-40.0	33.0-50.0	40.0-60.0	50.0-75.0	60.0-90.0	75.0-110.0	90.0-140.0	110.0-170.0	140.0-220.0
VSWR Max.	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.15	1.15	1.15
Average Power (Watts)	10.0	8.0	7.0	5.0	3.0	2.0	1.8	1.2	0.4	0.3	0.2



Dimensional Specifications

Model Number	A in	A mm	B in	B mm
581Ku	3.88	98.6	1.50	38.1
581K	2.88	73.2	1.00	25.4
581A	2.43	61.7	1.25	31.8
581B	2.43	61.7	1.12	28.4
581U	2.43	61.7	0.75	19.1
581V	2.00	50.8	0.75	19.1
581E	2.00	50.8	0.75	19.1
581W	2.00	50.8	0.75	19.1
581F	1.38	35.1	0.75	19.1
581D	1.38	35.1	0.75	19.1
581G	1.38	35.1	0.75	19.1

582 Series High Power Load Terminations



Features

- Low VSWR
- Compact Size
- Full Waveguide Bandwidths
- Available for High Power up to 250 watts CW Applications

Description 582 Series Terminations

Mi-Wave's **582 series terminations are designed with standard waveguide flanges for use from 12.4 to 220 GHz. Each unit consists of a short length of waveguide and an integral matched terminal load. Individual resistive dielectric loads are tapered to precise wedge configurations for maximum effective energy absorption. The gradual taper provides a low VSWR over the full waveguide bandwidth.**

Power requirements for the 582 series is up to 250 watts CW, please consult *Mi-Wave* for other power availabilities and further technical information.

Ordering Information

582 /

Specify Flange
(See Appendix A)

Specify RF Band Designator

Applications

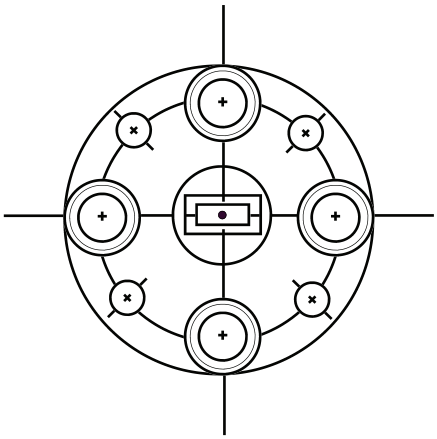
The 582 series terminations are used in experimental and developmental test sets where a low VSWR wave-guide load is essential for valid and accurate measurements. These terminations will ensure precise measurement of the VSWR resulting from insertion of various waveguide components into a system.

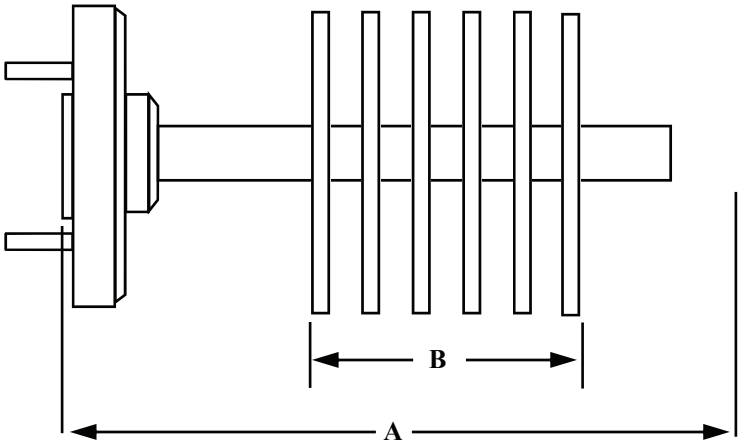
Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

582 Series High Power Load Terminations

Technical Specifications

Model Number	581Ku	581K	581A	581B	581U	581V	581E	581W	581F	581D	581G
Frequency Band (GHz)	12.4-18.0	18.0-26.5	26.5-40.0	33.0-50.0	40.0-60.0	50.0-75.0	60.0-90.0	75.0-110.0	90.0-140.0	110.0-170.0	140.0-220.0
VSWR Max.	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.15	1.15	1.15
Average Power (Watts)	300	250	250	200	150	100	100	75	50	50	50





Dimensional Specifications

Model	A		B	
Number	in	mm	in	mm
582Ku	5.00	127.0	4.00	101.6
582K	4.00	101.6	3.00	76.2
582A	4.00	101.6	3.00	76.2
582B	4.00	101.6	3.00	76.2
582U	4.00	101.6	3.00	76.2
582V	3.50	88.9	2.50	63.5
582E	3.50	88.9	2.50	63.5
582W	3.50	88.9	2.50	63.5
582F	3.00	76.2	2.00	50.8
582D	3.00	76.2	2.00	50.8
582G	3.00	76.2	2.00	50.8

.3.

585 Series Sliding Matched Terminations

Features

- Low VSWR
- Precision Adjustment

Description 585 Series Terminations

Mi-Wave's 585 series sliding matched load consists of a precision-tapered waveguide load coupled to a micrometer drive. The load is machined to precise tolerances to permit the close fit necessary for sliding without binding.

Ordering Information

585 /

Specify Flange
(See Appendix A)

Specify RF Band Designator

Applications

The 585 series sliding matched loads are designed for use in test and development sets where low VSWR is being measured. By changing the position of the sliding load, the test engineer can determine a minimum/maximum VSWR due to the phasing between the VSWR of the load and VSWR of the unit under test.

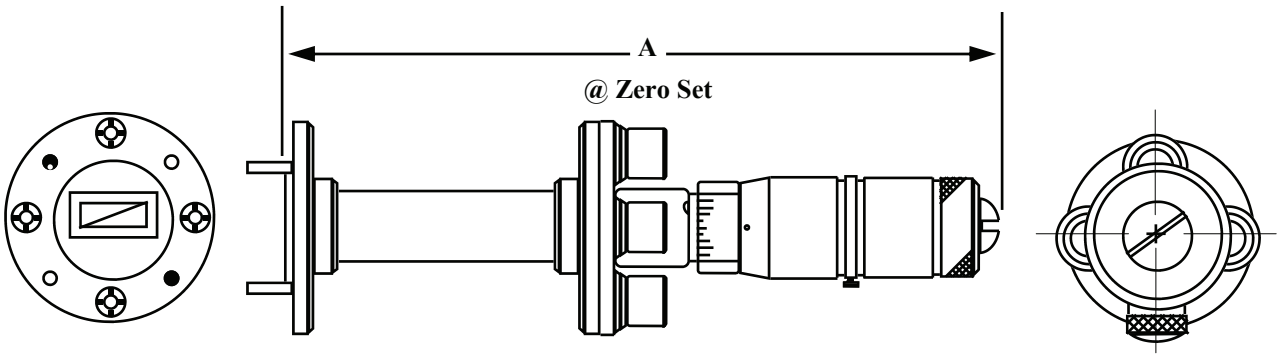
This min/max VSWR is used to determine the true VSWR of the unit under test. The 585 series loads are also used to measure coupler directivity and residual VSWR in slotted line or other reflection measuring devices.

Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

585 Series Sliding Matched Terminations

Technical Specifications

Model Number	585Ku	585K	585A	585B	585U	585V	585E	585W	585F	585D	585G
Frequency Band (GHz)	12.4-18.0	18.0-26.5	26.5-40.0	33.0-50.0	40.0-60.0	50.0-75.0	60.0-90.0	75.0-110.0	90.0-140.0	110.0-170.0	140.0-220.0
VSWR Max.	1.05	1.05	1.05	1.05	1.05	1.06	1.06	1.08	1.08	1.08	1.10
Average Power (Watts)	1.0	1.0	1.0	0.7	0.3	0.3	0.3	0.2	0.1	0.1	0.1
Weight (oz)	3.0	3.0	3.0	2.0	2.0	2.0	2.0	1.5	1.5	1.5	1.5



Dimensional Specifications

Model Number	A in	A mm
585Ku	6.93	176.0
585K	6.32	160.5
585A	4.94	125.5
585B	4.38	111.1
585U	3.94	100.0
585V	3.78	96.0
585E	3.78	96.0
585W	3.28	83.3
585F	3.03	76.9
585D	3.03	76.9
585G	3.03	76.9

590 Series Adjustable Waveguide Short Circuits

Features

- **Full Waveguide Coverage**
- **Non-Contacting Choke Type Short**
- **Precision Micrometer Tuning and Readout**
- **Minimum Travel of One-Half Wavelength at Lowest Operating Frequency**

Description 590 Series Short Circuits

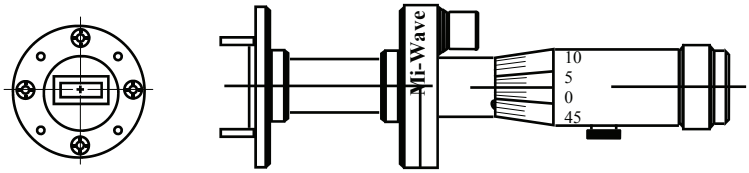
Mi-Wave's **590 series waveguide short circuits are available in standard waveguide sizes from 12.4 to 220 GHz. The non-contacting choke type short circuit is designed to operate with high electrical stability over a broad range of frequencies. The micrometer drive provides smooth, accurate positional tuning over the entire distance traveled and a positive locking device ensures continued setting reliability.**

Ordering Information

590 / ____

Specify Flange
(See Appendix A)

Specify RF Band Designator

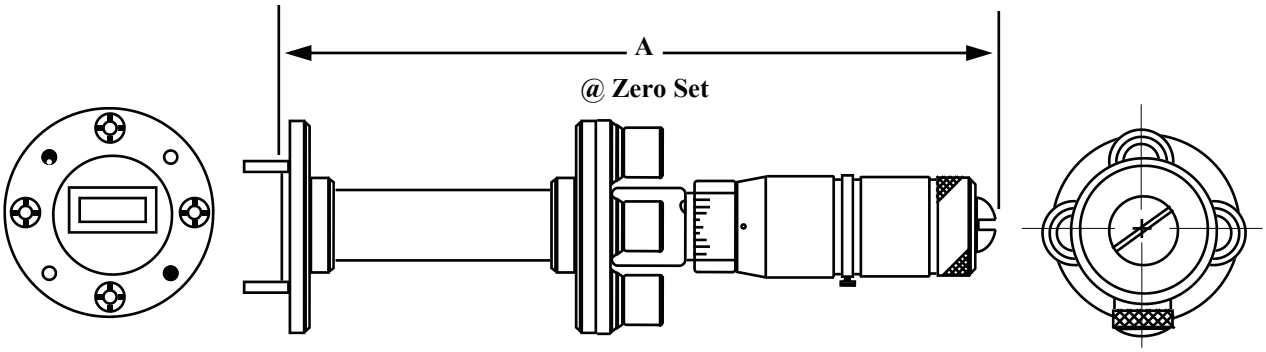


Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

590 Series Adjustable Waveguide Short Circuits

Technical Specifications

Model Number	590Ku	590K	590A	590B	590U	590V	590E	590W	590F	590D	590G
Frequency Band (GHz)	12.4-18.0	18.0-26.5	26.5-40.0	33.0-50.0	40.0-60.0	50.0-75.0	60.0-90.0	75.0-110.0	90.0-140.0	110.0-170.0	140.0-220.0
VSWR Max.											
Average Power (Watts)	1.0	1.0	1.0	0.7	0.3	0.3	0.3	0.2	0.1	0.1	0.1
Weight (oz)	5.0	4.0	3.0	3.0	3.0	2.0	2.0	2.5	1.5	1.5	1.5



Dimensional Specifications

Model Number	A in	A mm
585Ku	5.02	127.5
585K	4.59	116.6
585A	3.43	87.1
585B	3.43	87.1
585U	3.03	100.0
585V	3.03	76.9
585E	3.03	76.9
585W	3.03	76.9
585F	3.03	76.9
585D	2.42	61.5
585G	2.42	61.5

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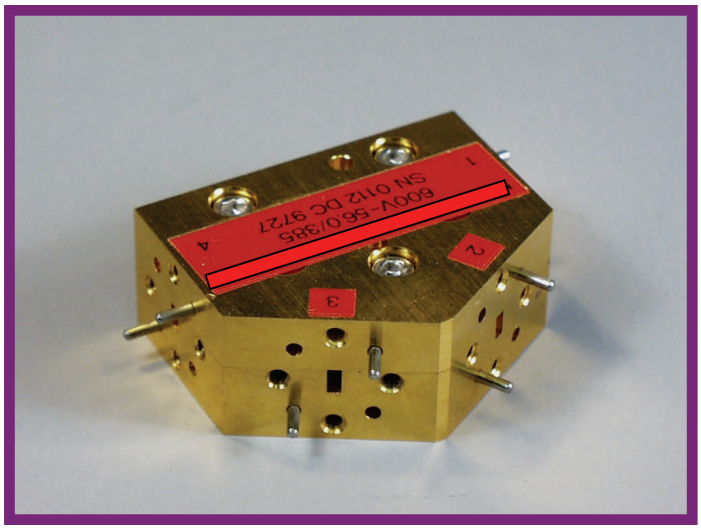
www.miwv.com Tel. (727) 536-0033 Fax. (727) 536-0012 E: sales@miwv.com

600 Series Single Hybrid Rings



Features

- Low VSWR
- High Isolation
- Minimum Size
- High Reliability
- Equal Power Split
- Low Insertion Loss
- Rugged Construction

Description 600 Series Single Hybrid Rings

Mi-Wave's **600 series hybrid rings are four-port, inherently-matched 3 dB power splitting devices. Available in standard waveguide sizes from 18.0 to 220.0 GHz, these units are capable of both in-phase and out-of-phase splitting.**

Ordering Information

600 / _____

Specify Flange
(See Appendix A)

Specify RF Band Designator

Applications

The 600 series hybrid rings are used in balanced mixers and power divider/combiner circuits where precise power splitting, high isolation, and accurate phase inversion are necessary.

Port Configurations

Series 600

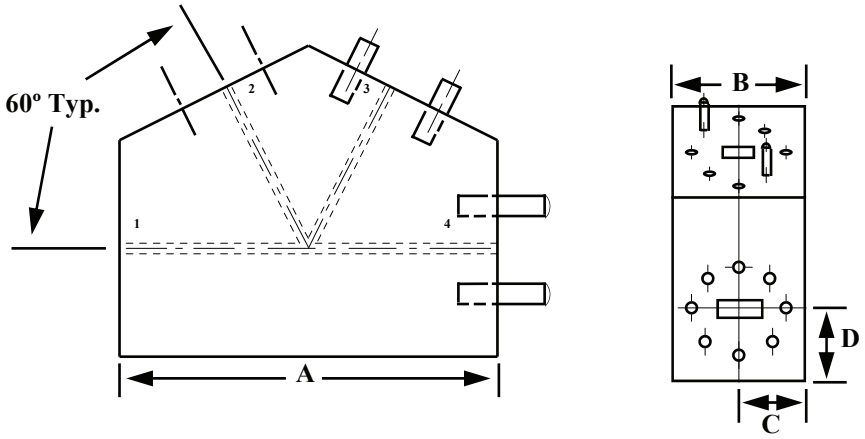
Input	Power Split	Phase Relation
1	2,4	180 degrees out
2	1,3	in-phase
3	2,4	in-phase
4	1,3	180 degrees out

Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

600 Series Single Hybrid Rings

Technical Specifications

Model Number	600K	600A	600B	600U	600V	600E	600W	600F	600D	600G
Frequency Band (GHz)	18.0-26.5	26.5-40.0	33.0-50.0	40.0-60.0	50.0-75.0	60.0-90.0	75.0-110.0	90.0-140.0	110.0-170.0	140.0-220.0
Isolation (dB) Max.	20	20	20	20	20	20	20	20	20	20
Insertion Loss (dB) Max.	0.5	0.5	0.5	0.5	0.5	0.5	0.7	0.7	0.8	0.8
Power Imbalance Max. (dB)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
VSWR Max.	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.30
Bandwidth (%)	5	5	5	5	5	5	5	5	5	4
Weight (oz)	22	22	22	22	9.0	9.0	9.0	2.5	2.5	2.5



Dimensional Specifications

Model Number	A in	A mm	B in	B mm	C in	C mm	D in	D mm
600K	2.50	63.5	1.14	28.9	0.57	14.5	0.63	16.0
600A	2.38	60.9	1.25	31.7	0.63	16.0	0.63	16.0
600B	2.38	60.9	1.25	31.7	0.65	16.5	0.63	16.0
600U	2.34	59.4	1.12	28.4	0.55	14.0	0.57	14.5
600V	1.90	48.3	0.76	19.3	0.38	9.6	0.46	11.7
600E	1.90	48.3	0.76	19.3	0.38	9.6	0.46	11.7
600W	1.90	48.3	0.76	19.3	0.38	9.6	0.46	11.7
600F, D, G	On Request							

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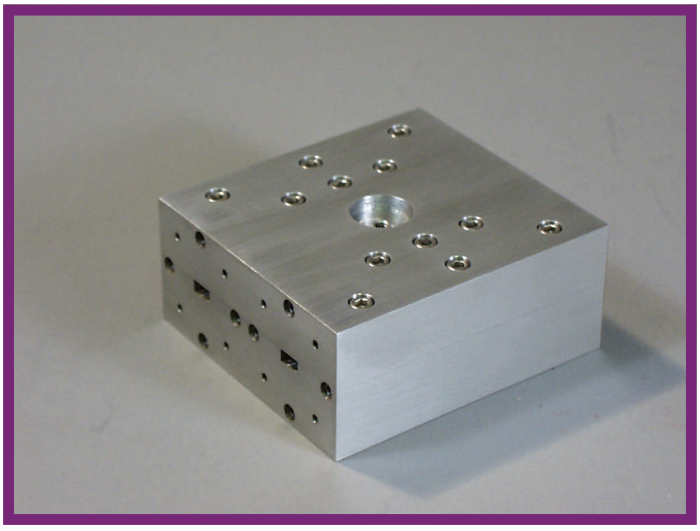
605 Series 3dB Short Slot Hybrids



Features

- Small
- Compact
- Negligible Coupling Variation

Description 605 Series Short Slot Hybrids

Mi-Wave's **605 series short slot hybrid is a narrow wall 3 dB coupler, available in standard wave-guide sizes from 18.0 to 110.0 GHz. This compact, four-port device is inherently matched and well-suited for balanced mixers and power splitting circuits. There is a 90 degree phase difference between the output signals, while the fourth port is isolated from the input.**

Access to the input and output ports of these hybrids is achieved with a special dual-waveguide, single-flange arrangement.

Ordering Information

605 — **Specify RF Band Designator**

Applications

The 605 series short slot hybrids are compact 3 dB couplers that can be used in waveguide bridge circuits, balanced mixers, phase shifters, and power splitters where space is limited.

Mi-Wave

Millimeter Wave Products Inc.

www.miwv.com

2200 Tall Pines Drive, Suite 100

Largo, FL 33771

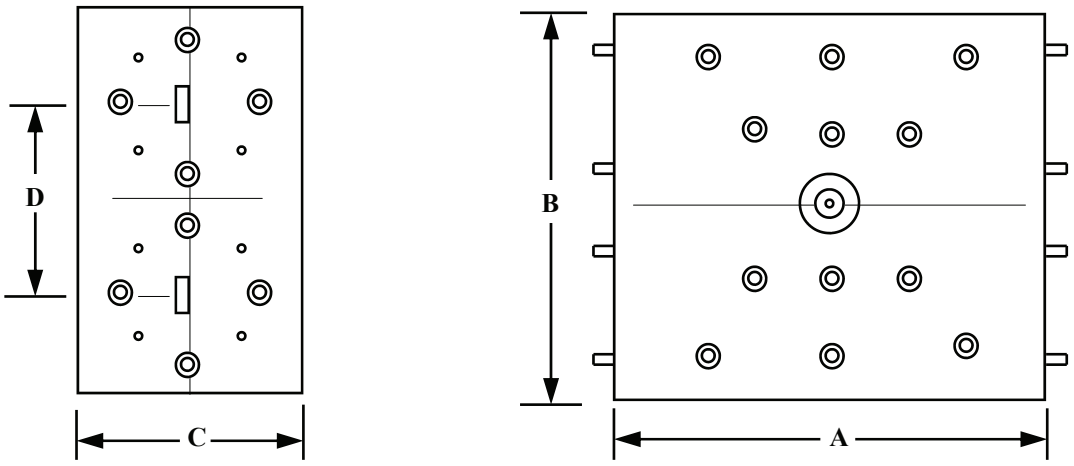
Tel. (727) 536-0033 Fax. (727) 536-0012

E: sales@miwv.com

605 Series 3dB Short Slot Hybrids

Technical Specifications

Model Number	605Ku	605K	605A	605B	605U	605V	605E	605W
Coupling (dB)	3	3	3	3	3	3	3	3
VSWR Max.	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15
Isolation (dB) Min.	20	20	20	20	20	20	20	18
Bandwidth (%)	6	6	6	6	6	6	6	6



Dimensional Specifications

Model Number	A		B		C		D	
	in	mm	in	mm	in	mm	in	mm
605K	3.75	95.3	2.47	62.7	1.12	28.5	1.38	35.1
605A	3.50	88.9	2.47	62.7	1.12	28.5	1.38	35.1
605B	2.60	66.0	2.37	60.2	1.14	29.0	1.18	30.2
605U	2.60	66.0	2.37	60.2	1.14	29.0	1.18	30.2
605V	1.75	44.5	1.75	44.5	1.0	25.4	0.90	22.86
605E	1.75	44.5	1.75	44.5	1.0	25.4	0.90	22.86
605W	1.75	44.5	1.75	44.5	1.0	25.4	0.90	22.86

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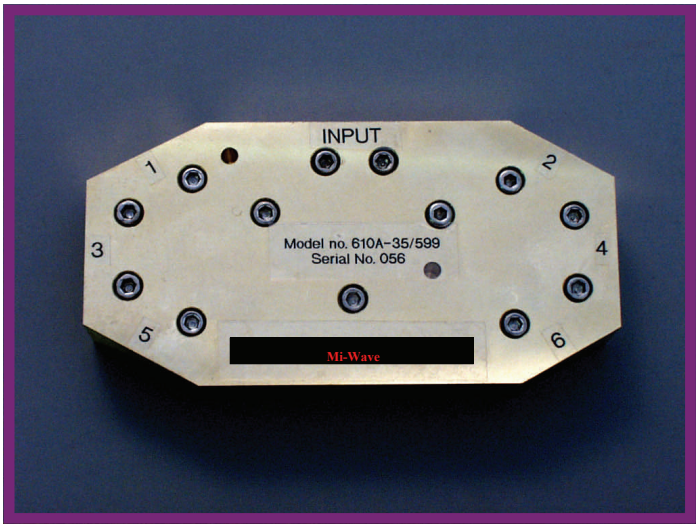
610 Series Triple Hybrid Rings



Features

- Low VSWR
- High Isolation
- Minimum Size
- High Reliability
- Equal Power Split
- Low Insertion Loss
- Rugged Construction

Description 610 Series Triple Hybrid Rings

Mi-Wave's **610 series triple hybrid rings consist of three single hybrid rings integrated into one compact component. This device provides four 6 dB outputs for use in dual balanced mixers and power divider/ combiner circuits.**

Applications

The 610 series hybrid rings are used in balanced mixers and power divider/combiner circuits where precise power splitting, high isolation, and accurate phase inversion are necessary.

Ordering Information

**610 / **

Specify Flange
(See Appendix A)

Specify RF Band Designator

Port Configurations

Series 610

Input	Output	Phase Relation
"input"	1,2	in-phase
	5,6	in-phase
	3,4	isolated

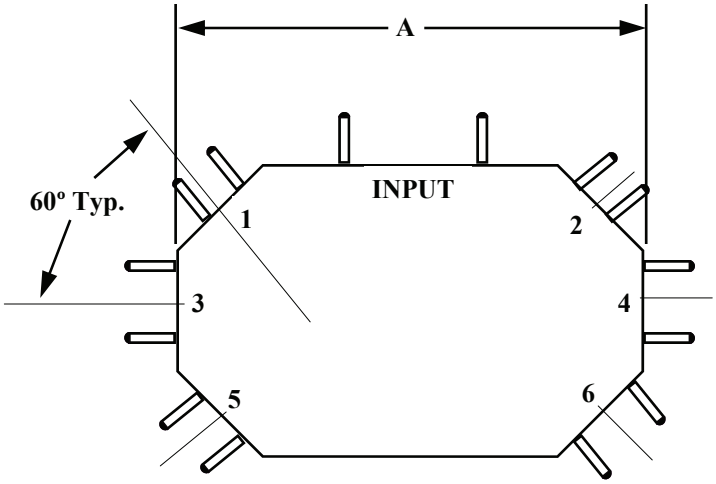
Please Note: **Outputs 1, 2 are 180 degrees out of phase with ouptuts 5, 6.**

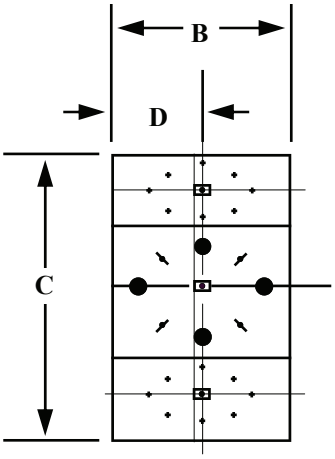
Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

610 Series Triple Hybrid Rings

Technical Specifications

Model Number	610K	610A	610B	610U	610V	610E	610W	610F	610D	610G
Isolation (dB) Max.	20	20	20	20	20	20	20	20	20	20
Insertion Loss (dB) Max.	0.5	0.5	0.5	0.5	0.5	0.5	0.7	0.7	0.8	0.8
Power Imbalance Max. (dB)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
VSWR Max.	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.30
Bandwidth (%)	5	5	5	5	5	5	5	5	5	4





Dimensional Specifications

Model	A		B		C		D	
Number	in	mm	in	mm	in	mm	in	mm
610K	Consult Factory							
610A	4.53	115.0	0.76	19.3	2.30	58.4	0.38	9.65
610B	4.98	126.0	1.12	28.6	2.59	65.9	0.56	14.22
610U	4.98	126.0	1.12	28.6	2.59	65.9	0.56	14.22
610V	3.48	88.4	0.76	19.3	1.91	48.5	0.38	9.65
610E	3.48	88.4	0.76	19.3	1.91	48.5	0.38	9.65
610W	3.48	88.4	0.76	19.3	1.91	48.5	0.38	9.65
610F, D, G	On Request							

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620 Series E/H Plane Tuners

Features

- **Micrometer Driven**
- **Non-Contacting Choke-Type Short Circuits**

Description 620 Series E/H Plane Tuners

Mi-Wave's **620 series E/H plane tuners are hybrid tee section available in standard waveguide sizes for operation from 12.4 to 220 GHz. The devices feature micrometer-driven tunable shorts in both the E-plane and H-plane arms for accurate tuning and reproducible settings. The internal short circuits are non-contacting, choke-type plungers that provide a highly stable electrical short. Locking devices ensure continued setting reliability under all normal conditions of test bench shock and vibration. The shorts travel a minimum of one-half wavelength at the lowest frequency.**

Ordering Information

620 / Specify Flange (See Appendix A)

Specify RF Band Designator

Applications

The 620 series tuners are excellent millimeter wave impedance matching networks designed to provide the reliable mismatch control required in most experimental and developmental test applications. These tuners introduce discontinuities into the waveguide transmission line for simultaneous control of both phase and amplitude of the RF reflection coefficient. They can be used as matching devices to cancel reflections in transmission lines or to match detectors, terminations, and similar components.

Mi-Wave

Millimeter Wave Products Inc.

www.miwv.com

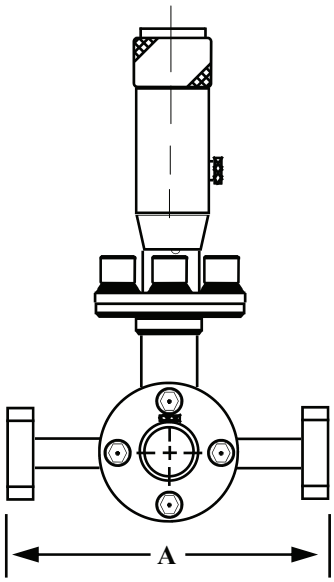
2200 Tall Pines Drive, Suite 100

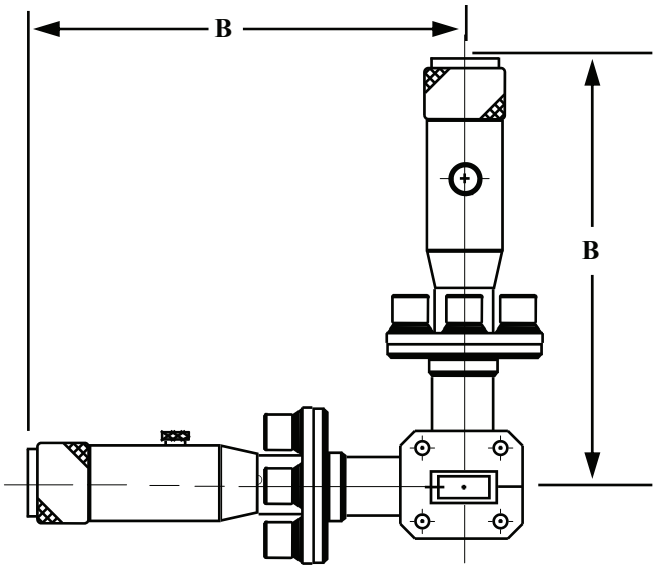
Largo, FL 33771

Tel. (727) 536-0033 Fax. (727) 536-0012

E: sales@miwv.com

620 Series E/H Plane Tuners





Dimensional Specifications

Model	A		B		Weight
Number	in	mm	in	mm	(oz)
620Ku	2.50	63.5	5.78	146.81	12
620K	2.50	63.5	4.86	123.44	10
620A	2.50	63.5	2.95	74.93	9.5
620B	2.50	63.5	2.92	74.17	9.0
620U	2.50	63.5	2.90	73.66	7.0
620V	2.00	50.8	2.28	57.91	3.5
620E	2.00	50.8	2.26	57.40	2.0
620W	2.00	50.8	2.25	57.15	2.0
620F	1.50	38.1	2.12	53.8	1.5
620D	1.50	38.1	2.12	53.8	1.5
620G	1.50	38.1	2.12	53.8	1.3

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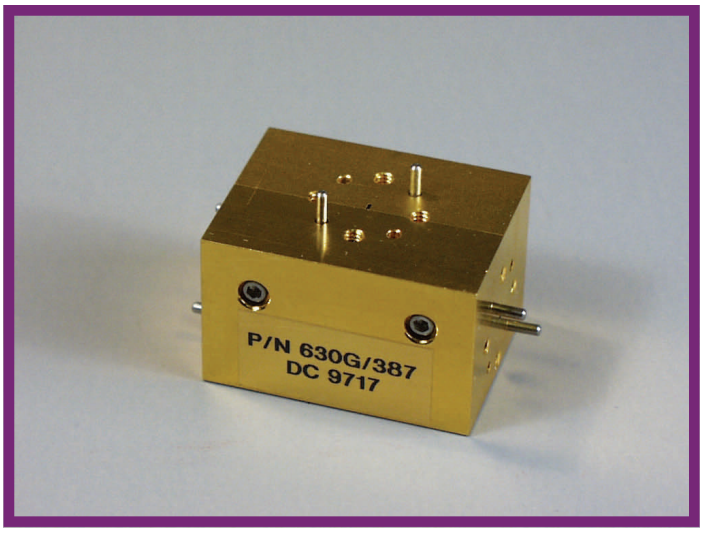
Millimeter Wave Products, Inc.
www.miwv.com Tel. (727) 536-0033 Fax. (727) 536-0012 E: sales@miwv.com

630 / 635 Series Magic & Hybrid Tees



Features

- Equal Power Division
- Available from 12.4 to 220 GHz
- High Isolation Provided by Symmetrical Construction

Description 630 Series Hybrid Tees

Mi-Wave's 630 series E/H hybrid tees consist of three mutually perpendicular flanged sections of a standard waveguide. Two of these sections are symmetrically located on the broad and narrow walls of the main tee section to provide E-plane and H-plane connections. The internal geometry of these hybrids provides a power-dividing and phase-inverting characteristic. Power applied to the shunt H-plane arm is divided between the tow in-line ports of the main tee section to result in equal power, in-phase output signals. Power applied to the series E-plane arm is also divided between these two ports, but with a phase reversal which provides equal-power, opposite-phase outputs. With symmetrical construction, good isolation is maintained between the E-plane and H-plane arms. The 630 series hybrid tees are available in standard wave-guide sizes from 12.4 to 220 GHz.

Applications

The 630 series hybrid tees are four-port transmission line components designed for basic power-splitting and mixing applications. These devices are useful as integral parts of RF bridge circuits for routine impedance comparisons and reflection coefficient measurements or as power dividers and isolators in radar balanced mixer circuits. Because the series (E) and shunt (H) arms are not matched, these units are not suited for low VSWR applications. For these applications, *Mi-Wave* recommends the 600 series and 605 hybrids. Also 635 Magic Tee.

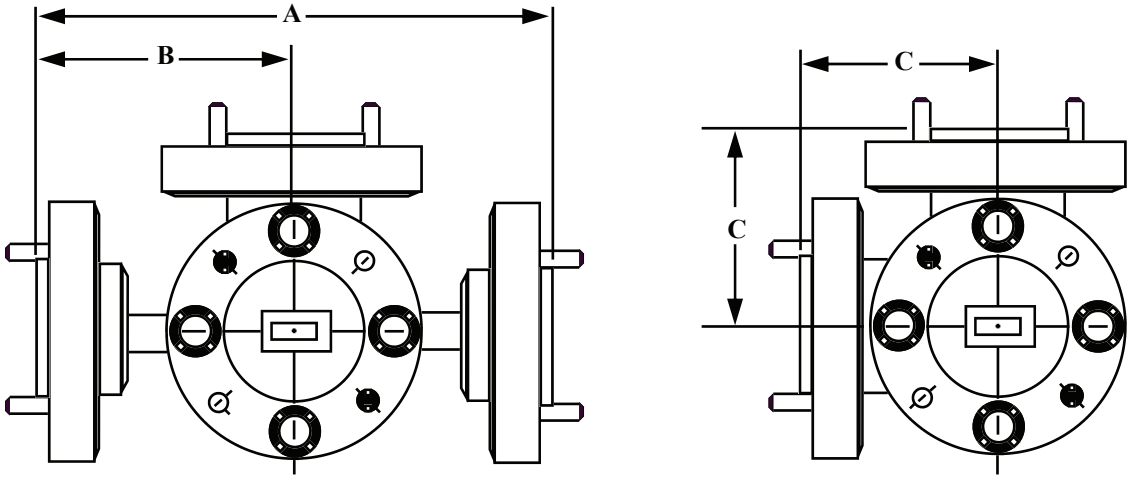
Ordering Information

630 /

- Specify Flange (See Appendix A)
- Specify RF Band Designator

Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

630 Series Hybrid Tees



Dimensional Specifications

Model	A		B		C		Weight
Number	in	mm	in	mm	in	mm	(oz)
630Ku	2.50	63.5	1.25	31.7	2.25	57.2	5.5
630K	2.50	63.5	1.25	31.7	1.63	41.4	5.5
630A	2.50	63.5	1.25	31.7	1.20	30.5	5.0
630B	2.50	63.5	1.25	31.7	1.17	29.7	4.8
630U	2.50	63.5	1.25	31.7	1.15	29.2	4.4
630V	2.00	50.8	1.00	25.4	0.85	21.6	3.4
630E	2.00	50.8	1.00	25.4	0.83	21.1	3.2
630W	2.00	50.8	1.00	25.4	0.82	20.8	3.0
630F	1.50	38.1	0.75	19.1	0.56	14.2	2.2
630D	1.50	38.1	0.75	19.1	0.55	14.0	1.6
630G	1.50	38.1	0.75	19.1	0.54	13.7	1.5

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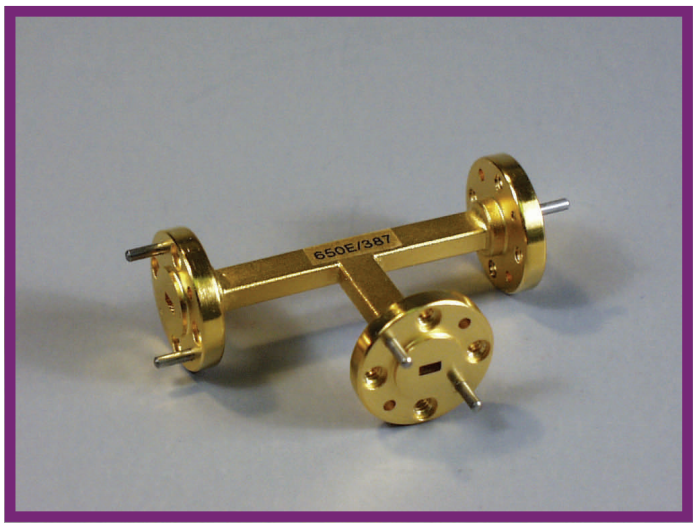
640 E-Plane Series & 650 H-Plane Series Tees



Features

- Unmatched Ports
- Geometrical Symmetry
- Available from 12.4 to 220 GHz
- Equal Power Division Between the Two Outputs

Description 640 and 650 Series Tees

Mi-Wave's **640 series E-plane tees consist of a length of standard flanged waveguide with a perpendicular E-plane coupling arm symmetrically located on the broad waveguide wall. Input power is divided equally and in opposite phase between the two outputs.**

Similarly, the 650 series H-plane tees feature an H-plane coupling arm located on the narrow waveguide wall. Power at the coupling arm input is divided into equal signals in phase at the main outputs. These devices are available in standard waveguide sizes from 12.4 to 220 GHz. Neither the 640 series or the 650 series tees have matched junctions and therefore are not recommended for low VSWR applications.

Ordering Information

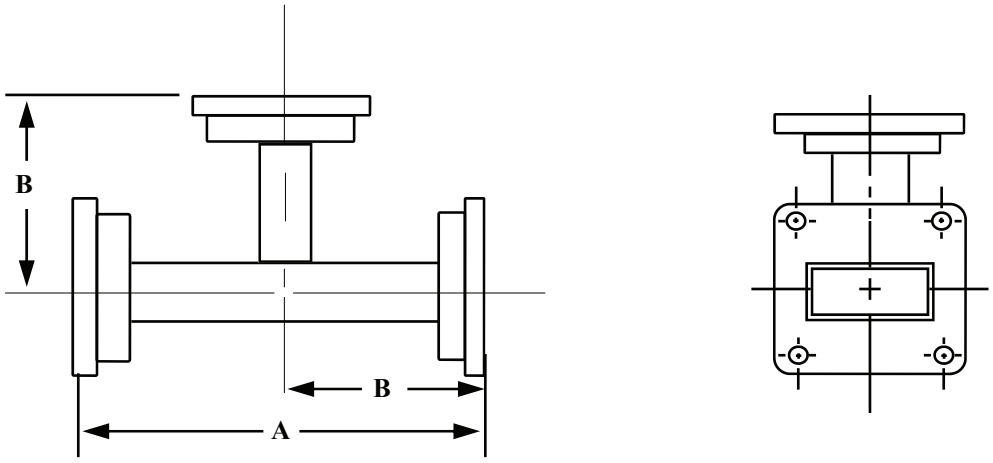
640 / Specify Flange (See Appendix A) **Specify RF Band Designator**

650 / Specify Flange (See Appendix A) **Specify RF Band Designator**

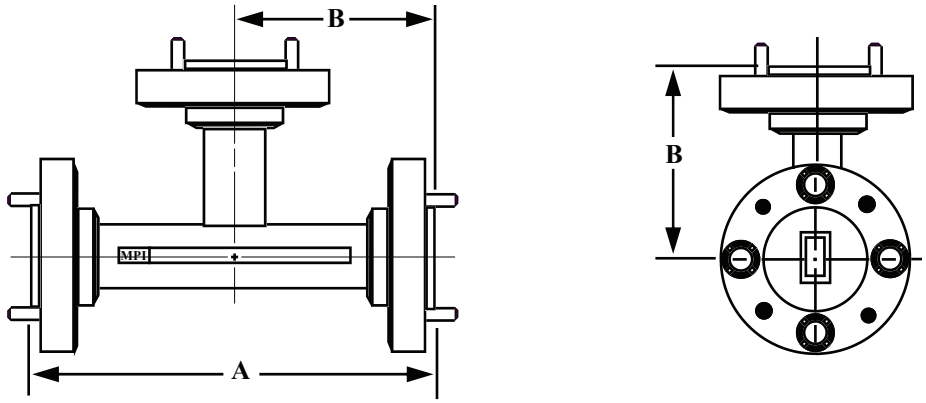
Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

640 E-Plane Series & 650 H-Plane Series Tees

640



650



Dimensional Specifications

640 E-Plane

Model	A		B		Weight
Number	in	mm	in	mm	(oz)
640Ku	2.50	63.50	1.25	31.75	3.7
640K	2.40	60.96	1.20	30.48	3.7
640A	2.40	60.96	1.20	30.48	3.7
640B	2.40	60.96	1.20	30.48	3.4
640U	2.40	60.96	1.20	30.48	3.2
640V	2.00	50.80	1.00	25.40	2.6
640E	2.00	50.80	1.00	25.40	2.4
640W	2.00	50.80	1.00	25.40	2.3
640F	1.50	38.10	0.75	19.05	1.7
640D	1.50	38.10	0.75	19.05	1.3
640G	1.50	38.10	0.75	19.05	1.3

650 H-Plane

Model	A		B		Weight
Number	in	mm	in	mm	(oz)
650Ku	2.50	63.50	1.25	31.75	3.7
650K	2.40	60.96	1.20	30.48	3.7
640A	2.40	60.96	1.20	30.48	3.7
650B	2.40	60.96	1.20	30.48	3.4
650U	2.40	60.96	1.20	30.48	3.2
650V	2.40	60.96	1.00	25.40	2.6
650E	2.00	50.80	1.00	25.40	2.4
650W	2.00	50.80	1.00	25.40	2.3
650F	1.50	38.10	0.75	19.05	1.7
640D	1.50	38.10	0.75	19.05	1.3
650G	1.50	38.10	0.75	19.05	1.3

660, 661, 662, & 665 Series E-Plane Bends

Features

- Available from 12.4 to 220 GHz
- Additional Radius and Angle Bends by Special Order
- Smooth Precision Bends Minimize Energy Reflections

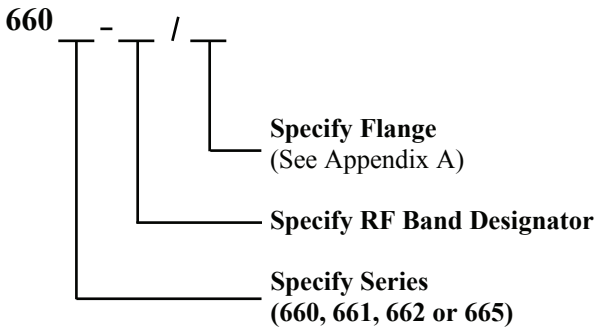
Description 660, 661, 662 & 665 Series Bends

Mi-Wave's **660, 661, 662 and 665 series E-plane bends are sections of high-precision waveguide accurately shaped to either 30º (661), 45º (665), 60º (662), or 90º (660) bends. Special angles, radii, and configurations for particular application can be developed on special order. All E-plane series bends are available from 12.4 to 320 GHz.**

Applications

The E-plane bends series provide accurate offsets and directional changes in waveguide transmission lines for test and developmental applications. Manufactured to rigid specifications, these transmission line components provide minimum detrimental effects on the overall system VSWR.

Ordering Information



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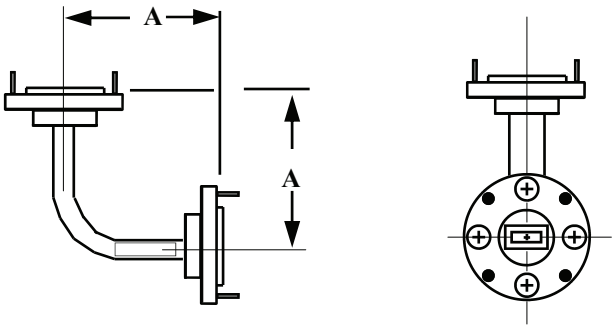
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

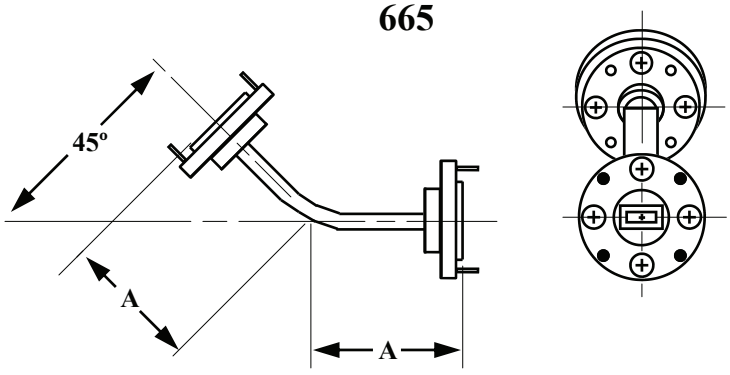
660, 661, 662, & 665 Series E-Plane Bends

660



660	90º
661	30º
662	60º
665	45º

665



Dimensional Specifications

Model Number	A in	A mm	Weight (oz)
660Ku, 661 Ku, 662Ku	2.00	50.0	2.7
660K, 661K, 662K	1.50	38.1	2.7
660A, 661A, 662A	1.50	38.1	2.5
660B, 661B, 662B	1.50	38.1	2.3
660U, 661U, 662U	1.50	38.1	2.2
660V, 661V, 662V	1.00	25.4	1.7
660E, 661E, 662E	1.00	25.4	1.6
660W, 661W, 662W	1.00	25.4	1.5
660F, 661F, 662F	1.00	25.4	1.1
660D, 661D, 662D	1.00	25.4	0.8
660G, 661G, 662G	1.00	25.4	0.8
665Ku	2.00	50.0	2.4
665K	1.50	38.1	2.4
665A	1.50	38.1	2.5
665B	1.50	38.1	2.3
665U	1.50	38.1	2.2
665V	1.00	25.4	1.7
665E	1.00	25.4	1.6
665W	1.00	25.4	1.5
665F	1.00	25.4	1.0
665D	1.00	25.4	0.8
665G	1.00	25.4	0.8

Technical Specifications

Model Number	Frequency Band Band (GHz)	VSWR
660Ku, 661Ku, 662Ku, 665KU 665Ku	12.4 - 18.0	1.10
660K, 661K, 662K, 665K	18.0 - 26.5	1.10
660A, 661A, 662A, 665A	26.5 - 40.0	1.10
660B, 661B, 662B, 665B	33.0 - 50.0	1.10
660U, 661U, 662U, 665U	40.0 - 60.0	1.12
660V, 661V, 662V, 665V	50.0 - 75.0	1.12
660E, 661E, 662E, 665E	60.0 - 90.0	1.12
660W, 661W, 662W, 665W	75.0 - 110.0	1.15
660F, 661F, 662F, 665F	90.0 - 140.0	1.15
660D, 661D, 662D, 665D	110.0 - 170.0	1.15
660G, 661G, 662G, 665G	140.0 - 220.0	1.15

670, 671, 672, & 675 Series H-Plane Bends

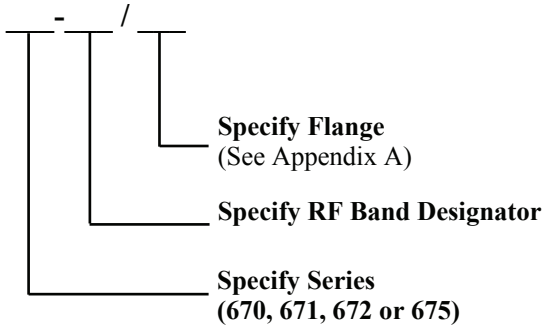
Features

- Available from 12.4 to 220 GHz
- Additional Radius and Angle Bends by Special Order
- Smooth Precision Bends Minimize Energy Reflections

Description 670, 671, 672 & 675 Series Bends

Mi-Wave's 670, 671, 672 and 675 series H-plane bends are sections of high-precision waveguide accurately shaped to either 30º (671), 45º (675), 60º (672), or 90º (670). Special angles, radii, and configurations for particular application can be developed on special order. All H-plane bends are available from 12.4 to 320 GHz.

Ordering Information



Applications

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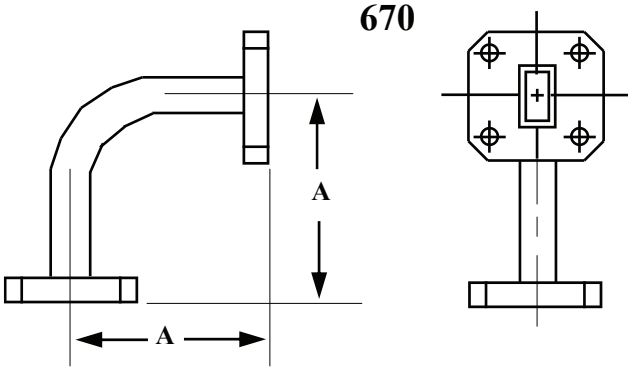
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

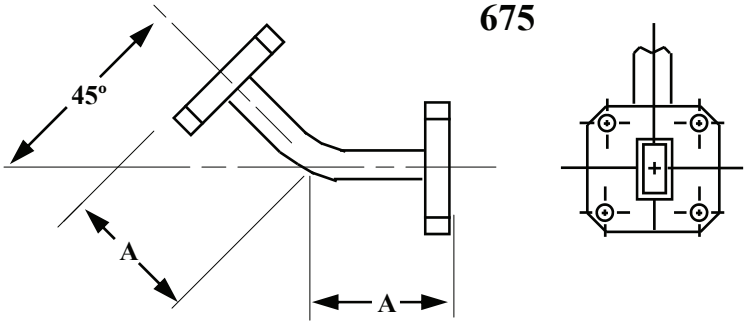
670, 671, 672, & 675 Series H-Plane Bends

670



660	90º
661	30º
662	60º
665	45º

675



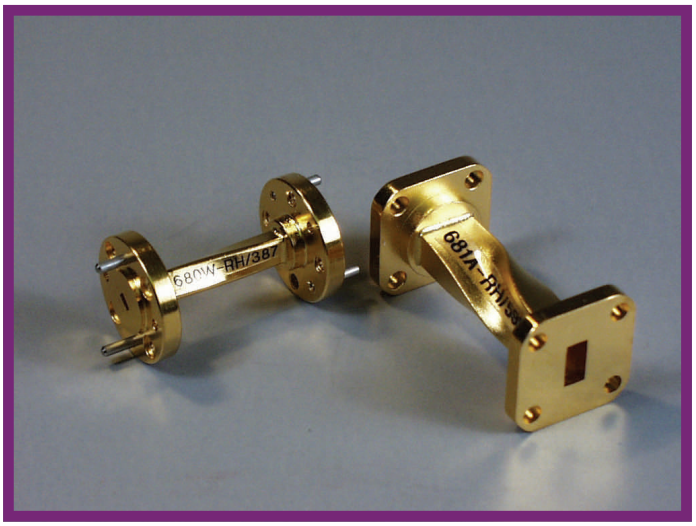
Dimensional Specifications

Model	A		Weight
Number	in	mm	(oz)
670Ku, 671Ku, 672Ku	1.80	45.7	2.7
670K, 671K, 672K	1.50	38.1	2.7
670A, 671A, 672A	1.50	38.1	2.5
670B, 671B, 672B	1.50	38.1	2.3
670U, 671U, 672U	1.50	38.1	2.2
670V, 671V, 672V	1.00	25.4	1.7
670E, 671E, 672E	1.00	25.4	1.6
670W, 671W, 672W	1.00	25.4	1.5
670F, 671F, 672F	1.00	25.4	1.1
670D, 671D, 672D	1.00	25.4	0.8
670G, 671G, 672G	1.00	25.4	0.8
675Ku	1.80	45.7	2.4
675K	1.50	38.1	2.4
675A	1.50	38.1	2.5
675B	1.50	38.1	2.3
675U	1.50	38.1	2.2
675V	1.00	25.4	1.7
675E	1.00	25.4	1.6
675W	1.00	25.4	1.5
675F	1.00	25.4	1.1
675D	1.00	25.4	0.8
675G	1.00	25.4	0.8

Technical Specifications

Model	Frequency Band BBand	
Number	(GHz)	VSWR
670Ku, 671Ku, 672Ku, 675Ku 665Ku	12.4 - 18.0	1.10
670K, 671K, 672K, 675K	18.0 - 26.5	1.10
670A, 671A, 672A, 675A	26.5 - 40.0	1.10
670B, 671B, 672B, 675B	33.0 - 50.0	1.10
670U, 671U, 672U, 675U	40.0 - 60.0	1.12
670V, 671V, 672V, 675V	50.0 - 75.0	1.12
670E, 671E, 672E, 675E	60.0 - 90.0	1.12
670W, 671W, 672W, 675W	75.0 - 110.0	1.15
670F, 671F, 672F, 675F	90.0 - 140.0	1.15
670D, 671D, 672D, 675D	110.0 - 170.0	1.15
670G, 671G, 672G, 675G	140.0 - 220.0	1.15

680 & 681 Series 45° and 90° Twists



Features

- **Smooth 45º / 90º Polarization Changes for Minimum Energy Reflections**

Ordering Information

680 ___-___ / ___

- **Specify Flange** (See Appendix A)
- **Specify Twist Orientation**
  RH: Right-Hand
  LH: Left-Hand
- **Specify RF Band Designator**

681 ___-___ / ___

- **Specify Flange** (See Appendix A)
- **Specify Twist Orientation**
  RH: Right-Hand
  LH: Left- Hand
- **Specify RF Band Designator**

Description 680 and 681 Series Twists

Mi-Wave's **680 series twists are short sections of standard flanged waveguide with left-hand or right-hand 45º twist configurations while the 681 series twists provide 90º twist configurations. The units are available in standard waveguide sizes from 12.4 to 320 GHz. Please be sure to specify the left-hand or right-hand configuration when ordering.**

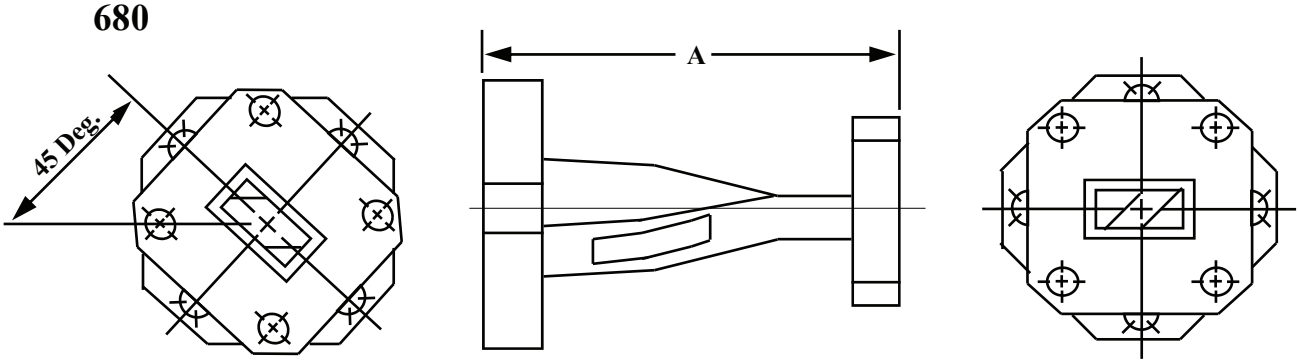
Applications

The 680 series and the 681 series waveguide twists are designed to provide changes in waveguide orientation with minimum energy loss and reflections. As integral parts in many of *Mi-Wave's* ferrite devices, these twists efficiently adapt polarization-rotated RF fields to the orientation of the remaining transmission line components.

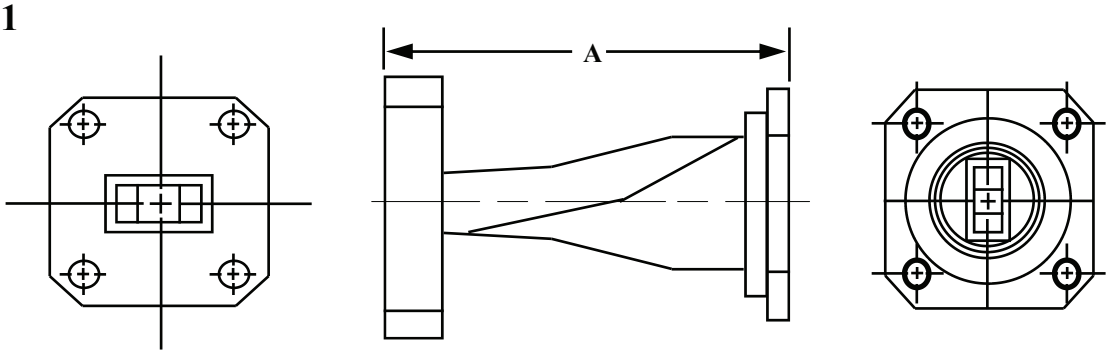
Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

680 & 681 Series 45° and 90° Twists

680



681



Dimensional Specifications

Model Number	A in	A mm	Weight (oz)
680Ku, 681Ku	3.20	81.28	3.2
680K, 681K	2.70	68.58	2.7
680A, 681A	1.50	38.1	1.9
680B, 681B	1.50	38.1	1.9
680U, 681U	1.50	38.1	1.8
680V, 681V	1.25	31.75	1.7
680E, 681E	1.25	31.75	1.6
680W, 681W	1.25	31.75	1.6
680F, 681F	1.25	31.75	1.3
680D, 681D	1.25	31.75	1.2
680G, 681G	1.25	31.75	1.2

Please Note: Any twist angle between 0 and 90 degrees are available. Please consult *Mi-Wave* for further information.

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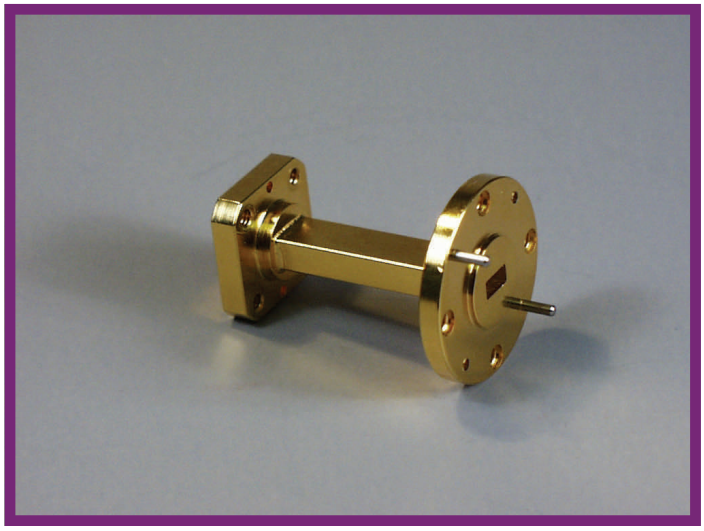
Millimeter Wave Products, Inc.
www.miwv.com
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

688 Series Flange Adapters



Features

- **Precision Built**
- **Available from 12.4 to 220 GHz**

Description 688 Flange Adapters

Mi-Wave's **688 series flange adapters are manufactured in standard waveguide sizes from 12.4 to 220 GHz. Each section is precision-machined and terminated in a variety of flange combinations. Please refer to Appendix A for a full list of available flanges.**

Precise control of the waveguide dimensions and elimination of surface discontinuities makes these sections useful in transmission line applications that require low waveguide loss and VSWR effects. In addition to the standard 688 series flanges, specialized flange adapters are available on request.

Ordering Information

688 ___-___ / ___

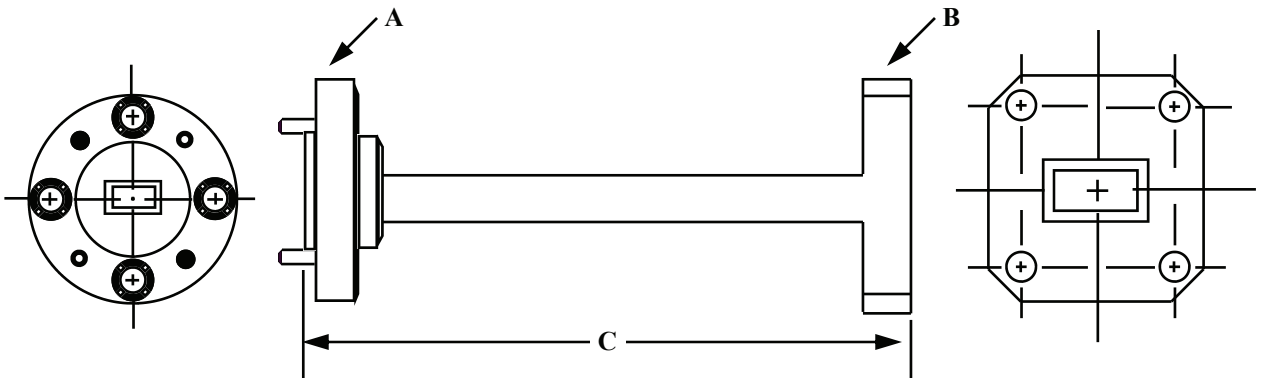
- **Specify First Flange** (See Appendix A)
- **Specify Second Flange** (See Appendix A)
- **Specify RF Band Designator**

Applications

The 688 series flange adapters are used in operational millimeter wave transmission systems that require a transition between components or systems with different flanges.

Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

688 Series Flange Adapters



Dimensional Specifications

Model	Flanges		C		Weight
Number	A	B	in	mm	(oz)
688Ku/419/541	UG-419/U	UG-541/U	1.00	25.40	3.0
688K/595/596	UG-595/U	UG-596/U	1.00	25.40	1.3
688K/595/425	UG-595/U	UG-425/U	1.00	25.40	1.4
688A/381/599	UG-381/U	UG-599/U	1.00	25.40	1.2
688A/381/600	UG-381/U	UG-600/U	1.00	25.40	1.1
688A/599/600	UG-599/U	UG-600/U	1.00	25.40	1.1
688B/383/719	UG-383/U	719	1.00	25.40	0.8
688B/383/385	UG-383/U	UG-385/U	1.00	25.40	0.8
688U/383/720	UG-383/U	720	1.00	25.40	0.8
688F/714/724	714	724	0.38	9.65	0.6
688F/714/387	714	UG-387/U-M	0.75	19.05	0.6
688F/724/387	724	UG-387/U-M	0.75	19.05	0.6
688D/716/726	716	726	0.38	9.65	0.6
688D/716/387	716	UG-387/U-M	0.75	19.05	0.6
688D/726/387	726	UG-387/U-M	0.75	19.05	0.6
688G/715/725	715	725	0.38	9.65	0.6
688G/715/385	715	UG-385/U-M	0.75	19.05	0.6

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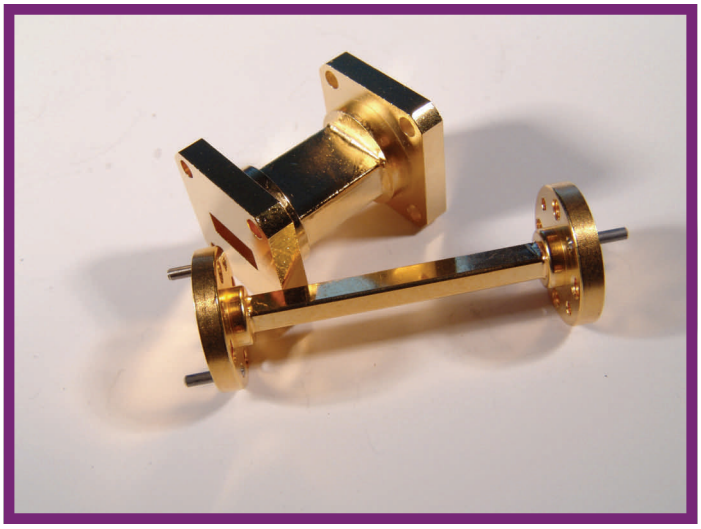
690 Series Flanged Waveguide Sections



Features

- Available from 12.4 to 220 GHz
- Precision Fabricated to Meet Electrical & Mechanical Specifications

Flexguide Available from 8.2 to 50 GHz
Consult Mi-Wave for Lengths, Materials and Jacketing.

Description 690 Waveguide Sections

Mi-Wave's **690 series flanged waveguide sections are available in standard waveguide sizes from 12.4 to 320 GHz. Each section is precisely fabricated using MIL-SPEC waveguide and flanges. Precise control of the fabrication processes eliminates waveguide discontinuities and distortion. The 690 series waveguide is available in a wide variety of materials. Available lengths are limited by raw waveguide which varies in length with each waveguide size. Check with an *Mi-Wave* sales engineer for available lengths. Longer sections, different wave-guide materials, and special flanges are all available upon request.**

Ordering Information

690 ___-___ / ___

- **Specify Flange** (See Appendix A)
- **Specify Length** (In Inches)
- **Specify RF Band Designator**

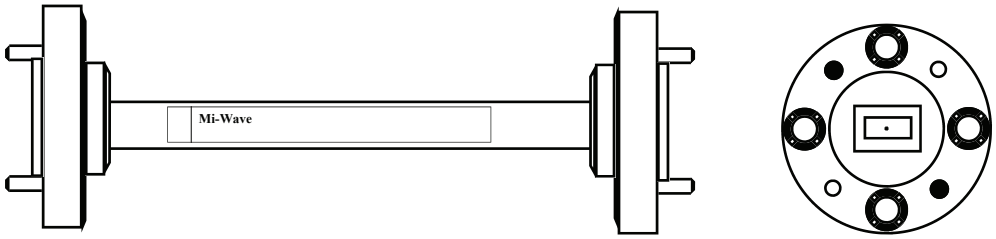
Applications

The 690 series straight waveguide sections with standard flanges are used in operational millimeter wave transmission systems and as basic transmission sections in test and laboratory sets.

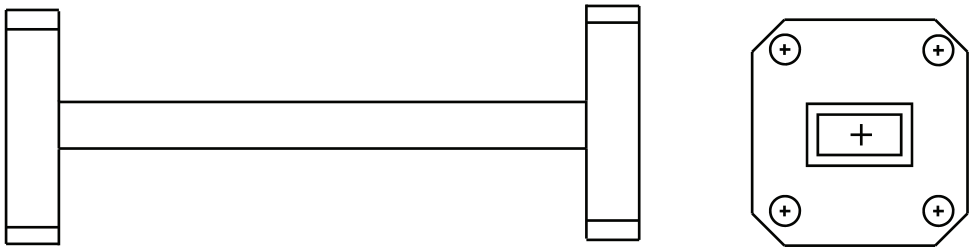
Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

690 Series Flanged Waveguide Sections

690B



690A



Dimensional Specifications

Model Number	Inside Dimensions in	Inside Dimensions mm
690Ku	0.622 x 0.311	15.80 x 7.90
690K	0.420 x 0.170	10.66 x 5.33
690A	0.280 x 0.140	7.12 x 3.56
690B	0.224 x 0.112	5.68 x 2.84
690U	0.188 x 0.094	4.78 x 2.39
690V	0.148 x 0.074	3.76 x 1.88
690E	0.122 x 0.061	3.10 x 1.55
690W	0.100 x 0.050	2.54 x 1.27
690F	0.080 x 0.040	2.04 x 1.02
690D	0.065 x 0.0325	1.65 x .8255
690G	0.051 x 0.0255	1.30 x 0.650

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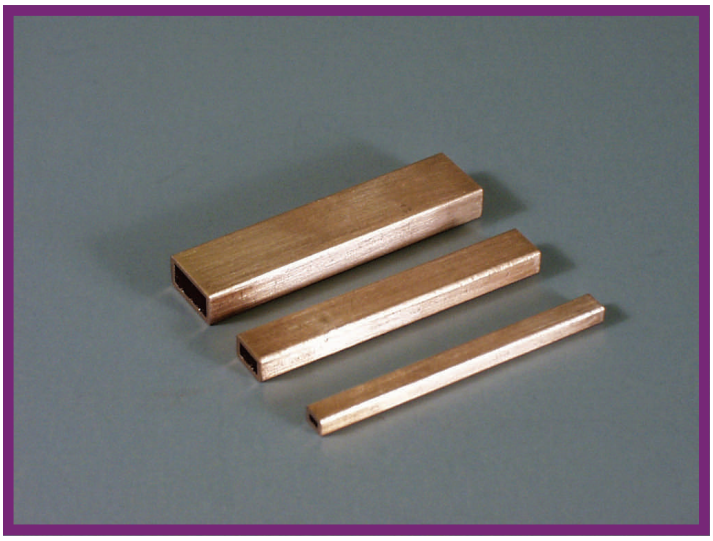
www.miwv.com Tel. (727) 536-0033 Fax. (727) 536-0012 E: sales@miwv.com

691 Series Unflanged Waveguides



Features

- **Precise Fabrication**

Description 691 Unflanged Waveguides

Mi-Wave's **691 series unflanged waveguide is manufactured to precise specifications in accordance with MIL-W-85. It is available in various maximum lengths and optional materials. Typically, larger waveguide sizes are manufactured in larger lengths than the smaller sizes. Please consult *Mi-Wave* for maximum available lengths.**

Ordering Information

691 ___-___ / ___

- Specify Length (In Inches)
- Specify Material Designator
- Specify RF Band Designator

Material Designation	Material
CS	Coin Silver
SS	Stainless Steel (0.010" wall thickness)
OFC	Oxygen Free Copper
BR	Bronze
AL	Aluminum

Please Note: Other Materials available upon request.

Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

Mi-Wave Band	Waveguide Designator(s) (JAN & WR)	Waveguide Inner Dimensions in Inches	Recommended Operating Range for TE_{10} Mode		Cut-Off for TE_{10} Mode		Theoretical Power CW Breakdown Lowest to Highest Frequency (KW)	Theoretical Attenuation Lowest to Highest Frequency (dB/ff)	Flange Type	Historic Designation	New MIL Part Number
			Frequency (GHz)	Wavelength (mm)	Frequency (GHz)	Wavelength (mm)					
KU	RG-91/U WR-62	0.622 x 0.311	12.4 - 18.0	24.2 - 16.6	9.486	31.60	400 - 600	.064 - .030	Cover[1] Choke	UG-419/U UG-541/U	M3922/53-4/005 M3922/59-2/001
K	RG-53/U WR-42	0.420 x 0.170	18.0 - 26.5	16.6 - 11.3	14.047	21.34	160 - 240	.17 - .11	Cover[1] Choke Cover	UG-595/U UG-596A/U UG-425/U	M3922/54-4/001 M3922/59-2/003 M3922/67-2/004
A	RG-96/U WR-28	0.280 x 0.140	26.5 - 40.0	11.3 - 7.5	21.081	14.22	95 - 145	0.22 - 0.15	Cover[1] Choke Cover	UG-599/U UG-600/U UG-381/U	M3922/54-4/003 M3922/59-2/005 M3922/67-2/005
B	RG-97/U WR-22	0.224 x 0.112	33.0 - 50.0	9.1 - 6.0	26.342	11.38	62 - 90	0.31 - 0.21	Cover[1] Cover Cover	UG-383/U 719 719T	M3922/67-2/006 N/A N/A
U	WR-19	0.188 x 0.094	40.0 - 60.0	7.5 - 5.0	31.357	9.56	47 - 64	0.39 - 0.27	Cover[12] Cover Cover	UG-383/U-M 710 720T	M3922/67-2/007 N/A N/A
V	RG-98/U WR-15	0.148 x 0.074	50.0 - 75.0	6.0 - 4.0	39.863	7.52	29 - 42	0.57 - 0.39	Cover[1]	UG-385/U	M3922/67-2/008
E	RG-99/U WR-12	0.122 x 0.061	60.0 - 90.0	5.0 - 3.3	48.350	6.20	20 - 29	0.78 - 0.53	Cover[1]	UG-387/U	M3922/67-2/009
W	WR-10	0.100 x 0.050	75.0 - 110.0	4.0 - 2.7	59.010	5.08	14 - 20	1.02 - 0.71	Cover[12]	UG-387/U-M	M3922/67-2/010
F	RG-138/U WR-8	0.080 x 0.040	90.0 - 140.0	3.3 - 2.1	73.764	4.06	8.5 - 13.5	1.52 - 0.98	Pin[1] Cover[2]	714 UG-387/U-M	M3922/74-001 N/A
D	RG-136/U WR-7	0.065 x 0.0325	110.0 - 170.0	2.7 - 1.8	90.786	3.30	5.8 - 9.0	2.12 - 1.35	Pin[1] Cover[2]	716 UG-387/U-M	M3922/74-002 N/A
G	RG-135/U WR-5	0.051 x 0.0255	140.0 - 220.0	2.1 - 1.4	115.71	2.59	3.7 - 6.1	3.05 - 1.93	Pin[1] Cover[2]	715 UG-387/U-M	M3922/74-003 N/A

1. Standard flange unless otherwise specified.
2. Modified (-M) means waveguide opening has been reduced appropriately. Screw and pin pattern are unchanged.

692 Series Tapered Transitions

Features

- Low Loss
- Minimum Reflections
- Precise Fabricated Tapers
- Shortest Possible Insertion Length Consistent with High Mode Purity

Description 692 Tapered Transitions

Mi-Wave's **692 series tapered transitions are precision tapers with standard flanges for two different waveguide sizes. In each transition, the fabrication process allows precise control of taper dimensions to provide a good impedance match. As a result, high mode purity is maintained in the transfer process with minimum VSWR effects and energy loss. These transitions are available in many waveguide size combinations from 12.4 to 220 GHz. In addition to the standard configurations listed in this section, many special transitions will be developed upon request.**

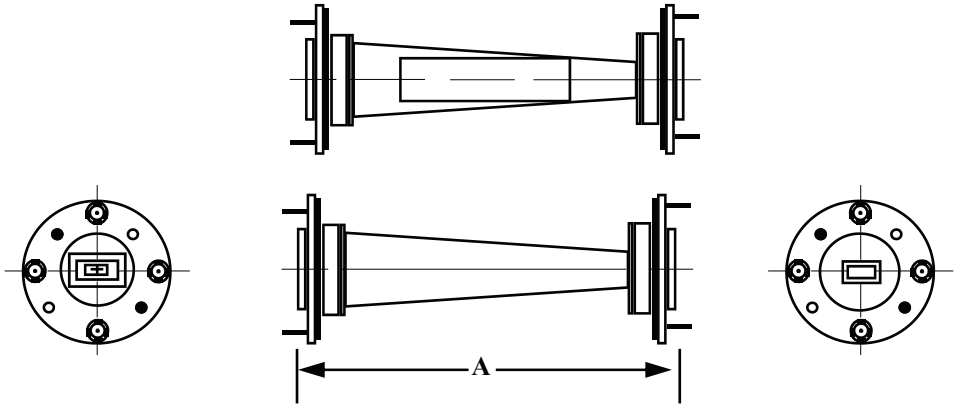
Ordering Information

692 ___-___/___/___

- Specify Output Flange (See Appendix A)
- Specify Input Flange (See Appendix A)
- Specify Output RF Band Designator
- Specify Input RF Band Designator

Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

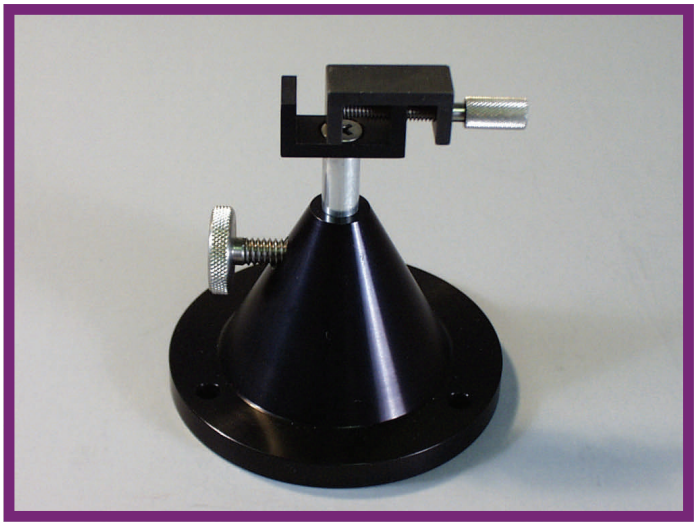
692 Series Tapered Transitions



Specifications

Model Number	Input Waveguide Dimension (in.)	Output Waveguide Dimension (in.)	VSWR Max.	A	
				in	mm
692K-A	0.422 X 0.170	0.2280 X 0.140	1.10	2.10	53.3
692A-B	0.280 X 0.140	0.224 X 0.112	1.10	2.00	50.8
692A-U	0.280 X 0.140	0.188 X 0.094	1.10	2.00	50.8
692A-V	0.280 X 0.140	0.148 X 0.074	1.10	2.00	50.8
692B-U	0.224 X 0.112	0.188 X 0.094	1.10	2.00	50.8
692B-V	0.224 X 0.112	0.148 X 0.074	1.10	2.00	50.8
692B-E	0.224 X 0.112	0.122 X 0.061	1.10	2.00	50.8
692B-W	0.224 X 0.112	0.100 X 0.050	1.10	2.00	50.8
692U-V	0.188 X 0.094	0.148 X 0.074	1.10	1.50	38.1
692U-E	0.188 X 0.094	0.122 X 0.061	1.10	1.50	38.1
692U-W	0.188 X 0.094	0.100 X 0.050	1.10	1.50	38.1
692V-E	0.148 X 0.074	0.122 X 0.061	1.10	1.50	38.1
692V-W	0.148 X 0.074	0.100 X 0.050	1.10	1.50	38.1
692V-F	0.148 X 0.074	0.080 X 0.040	1.10	1.50	38.1
692V-D	0.148 X 0.074	0.065 X 0.0325	1.15	1.50	38.1
692V-G	0.148 X 0.074	0.051 X 0.0255	1.15	1.50	38.1
692E-W	0.122 X 0.061	0.100 X 0.050	1.10	1.00	25.4
692E-F	0.122 X 0.061	0.080 X 0.040	1.10	1.00	25.4
692E-D	0.122 X 0.061	0.065 X 0.0325	1.15	1.00	25.4
692E-G	0.122 X 0.061	0.051 X 0.0255	1.15	1.00	25.4
692W-F	0.100 X 0.050	0.080 X 0.040	1.10	1.00	25.4
692W-D	0.100 X 0.050	0.065 X 0.0325	1.15	1.00	25.4
692W-G	0.100 X 0.050	0.051 X 0.0255	1.15	1.00	25.4
692F-D	0.080 X 0.040	0.065 X 0.0325	1.15	1.00	25.4
692F-G	0.080 X 0.040	0.051 X 0.0255	1.15	1.00	25.4
692D-G	0.065 X 0.0325	0.051 X 0.0255	1.15	1.00	25.4

695 Series Waveguide Stands

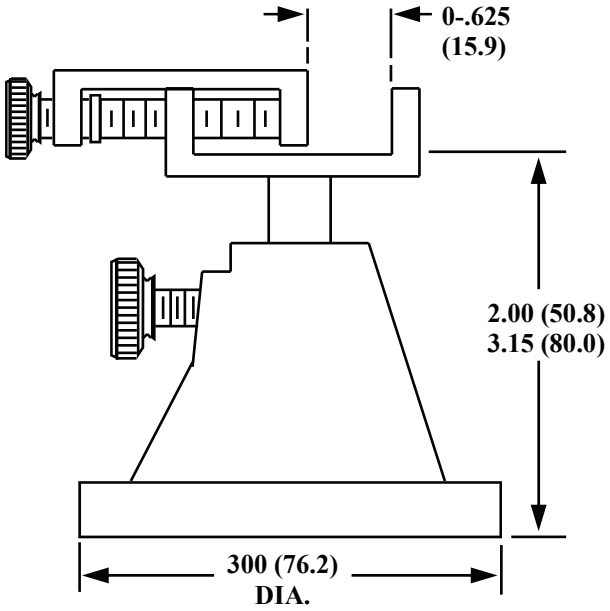


Features

- Clamp Rigidly Secures Waveguide with Single Thumbscrew
- Adjusts to Fit all Millimeter Waveguides Mounted in Either Polarization

Description 695 Waveguide Stands

Mi-Wave's **695 series waveguide stand consists of an adjustable clamp mounted on an "adjustable height" rugged base stand. The unique waveguide clamp may be readily adjusted to fit the clamping jaws to particular waveguide sizes or orientations. The cast stand has a large base area to prevent moving or tipping under normal test bench conditions. For further stability, the base may be secured to the bench with mounting bolts.**



Applications

The 695 series waveguide stand is used to support millimeter wave components in laboratory test bench setups. Designed to fit all standard waveguide sizes from 18.0 to 220 GHz, this versatile device may be easily adjusted for a wide variety of setup conditions.

Mi-Wave

Millimeter Wave Products Inc.

www.miwv.com

2200 Tall Pines Drive, Suite 100

Largo, FL 33771

Tel. (727) 536-0033 Fax. (727) 536-0012

E: sales@miwv.com

700 Series Precision Drill Jigs

Features

- Hardened Steel Provides Continued Accurate Drilling Alignment
- Tapered Locating Tab Uses Waveguide Surfaces as Location Reference to Ensure a Perfect Mate

Ordering Information

700 ___ / ___

Specify Flange
(See Appendix A)

Specify RF Band Designator

Description 700 Series Drill Jigs

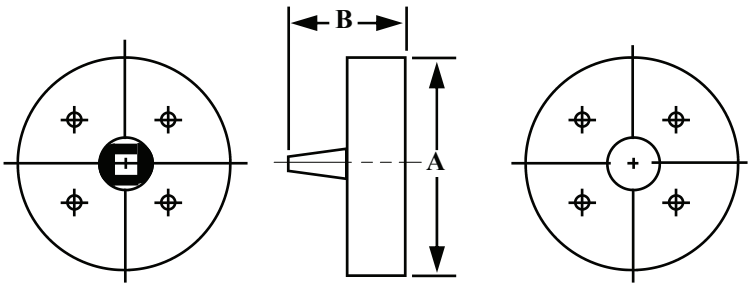
Each of *Mi-Wave's* 700 series drill jigs consists of a solid steel block with accurately positioned drill holes and a tapered locating tab that will locate the drill holes in precise relation to the internal waveguide surfaces. Hardened steel minimizes wear to ensure drilling accuracy.

Applications

The 700 series precision drill jigs are designed to facilitate accurate fabrication of flanged waveguide sections for standard waveguide sizes from 26.5 to 220 GHz. These jigs are used to locate alignment pins, mating pin holes, and connecting screw holes in the waveguide flanges. By using the interior waveguide surface as the primary location reference, they ensure accurate waveguide alignment at each flanged junction with low loss and

Dimensional Specifications

Model	A		B	
Number	in	mm	in	mm
700A	1.38	35.05	0.62	15.75
700B	1.38	35.05	0.62	15.75
700U	1.38	35.05	0.62	15.75
700V	1.00	25.4	0.62	15.75
700E	1.00	25.4	0.62	15.75
700W	1.00	25.4	0.62	15.75
700F	0.75	19.05	0.51	12.95
700D	0.75	19.05	0.51	12.95
700G	0.75	19.05	0.51	12.95



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Tel. (727) 536-0033 Fax. (727) 536-0012
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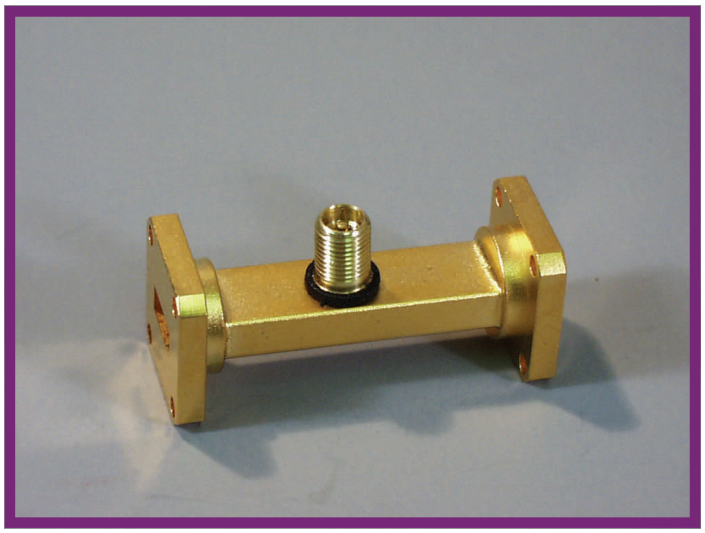
705 Series Pressurizing Units



Features

- System Pressure Continuously Monitored
- Convenient Means for Pressurizing Waveguide Transmission Lines

Ordering Information

705 ___ / ___

Specify Flange
(See Appendix A)

Specify RF Band Designator

Description 705 Series Pressurizing Units

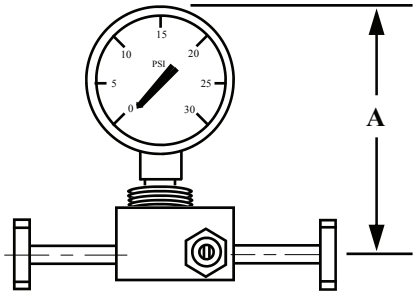
Each of ***Mi-Wave*** 705 series pressurizing units consists of a short length of flanged, rectangular waveguide fitted with a Schrader valve and optional pressure gauge. These units are available in all standard wave-guide sizes from 12.4 to 220 GHz. In A-band, the choke-to-cover flange combination makes allowances for the insertion of a standard O-ring gasket to ensure maintenance of pressurization over operation. Provision is made for gaskets in the case of the round flanges used for millimeter wave frequencies.

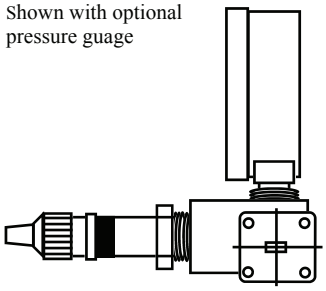
Applications

The 705 series pressurizing units are designed for applications such as high power radar systems that require a pressurized transmission line to prevent arcing during peak power operation. The pressurizing units can also be used to purge systems with dry gasses in order to prevent condensation. These devices provide a simple means for introducing the desired pressurizing gas into the system and for continuous monitoring of the internal pressure level.

Dimensional Specifications

Model Number	A in	A mm
705A	2.64	67.06
705B	2.62	66.55
705U	2.61	66.29
705V	2.60	66.04
705E	2.60	66.04
705W	2.59	65.79
705F	2.58	65.53
705D	2.58	66.53
705G	2.57	65.28





Shown with optional pressure guage

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712 Series Bulkhead Waveguide Adapters

Features

- Full Waveguide Bandwidths
- O-Ring, Provided for Moisture Resistance
- Waveguide Feedthru for Panel Mount Applications

Ordering Information

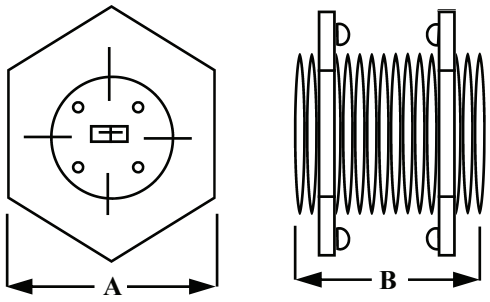
712 /

Specify Flange
(See Appendix A)

RF Band Designator
(K, A, B, U, V, E, W, F)

Description 712 Series Waveguide Adapters

Mi-Wave **712 series waveguide bulkhead adapter was developed for panel feedthru use in systems. These 712 adapters operate over the full waveguide bands from 18.0 to 140 GHz. O-rings are provided on the panel mount for moisture resistance and a wide variety of flange types and configurations. Units come with body, two nuts and two O-rings. Standard lengths are 1.50 inches with custom lengths available upon request. Consult *Mi-Wave* for further details.**



Dimensional Specifications

Model No.	A		B	
	in	mm	in	mm
712K	1.75	44.45	1.00	25.4
712A	1.75	44.45	1.00	25.4
712B	1.75	44.45	1.00	25.4
712U	1.75	44.45	1.00	25.4
712V	1.125	28.57	1.00	25.4
712E	1.125	28.57	1.00	25.4
712W	1.125	28.57	1.00	25.4

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750 Series Waveguide Flanges

Precision Machined
Materials Brass, Aluminum, Copper

- **WR-62, 42, 28, 22, 19**
- **Cover and Choke Style Available**
- **Standard UG Models**
- **Milistar Type Available**

(See Appendix H For Specifications)

- **WR-42, 28, 22, 19**
- **UG-381, 383 Style**

(See Appendix C For Specifications)

- **WR-15, 12, 10, 8, 7, 5**
- **UG-385 and 387 Style**

(See Appendix C For Specifications)

Flange Hardware

752 Series .062 Diameter Stainless Steel Pins - Per 100

754 Series 4-40 Captivated Flange Screws - Per 100

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2200 Tall Pines Drive, Suite 100
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Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

830 Series Mechanically Tuned Gunn Oscillators

Features

- Low Noise
- High Stability
- 12.4 to 110 GHz
- Broadband Tuning
- Excellent Reliability

Description 830 Oscillators

Mi-Wave **830 series mechanically tuned gunn oscillators have been designed to be used where a low noise stable frequency source is required. This source can be used for a mixer local oscillator or transmit source.**

The 830 series is a moderate stability gunn oscillator typically ± 750 KHz / ° C with power outputs up to 300 milliwatts. Higher power options and stabilities are available upon request. Please consult *Mi-Wave* for further information.

Ordering Information

830 – / / /

- **Specify Flange** (See Appendix A)
- **Specify Center Frequency**
- **Specify Output Power**
- **Specify RF Band Designator** (Ku, K, A, B, U, V, E, W)

Technical Specifications

Model Number	Frequency Band (GHz)	Power Output (up to) mw	Frequency Stability MHz/C°	Mech. Tuning Range MHz Min.
830Ku	12.4 - 18.0	300	.300	250
830K	18.0 - 26.5	275	.500	250
830A	26.5 - 40.0	250	.750	250
830B	33.0 - 50.0	250	.800	300
830U	40.0 - 60.0	200	1.00	350
830V	50.0 - 75.0	150	2.00	500
830E	60.0 - 90.0	100	2.50	500
830W	75.0 - 110.0	50	3.00	500

Applications

Radar
Radiometers
Local Oscillators
Telecommunications

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Largo, FL 33771
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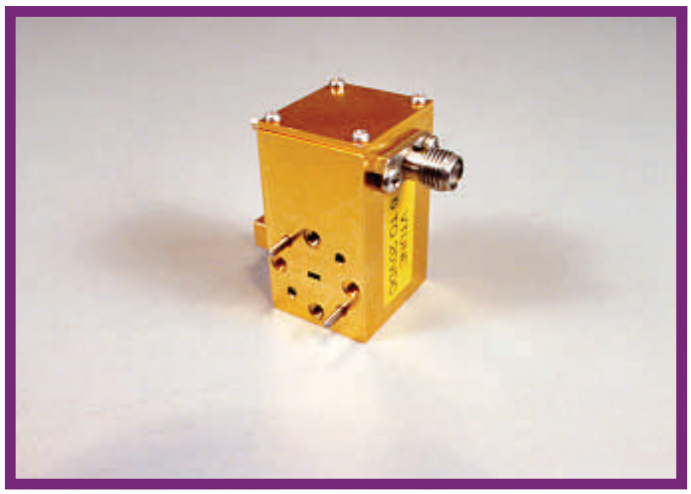
E: sales@miwv.com

840 Series Electronically Tuned Gunn Oscillators



Features

- Low Noise
- High Reliability
- 12.4 to 110 GHz
- Electronic Tuning

Ordering Information

840 _ - _ / _ / _

- Specify Flange (See Appendix A)
- Specify Center Frequency
- Specify Output Power
- Specify RF Band Designator (Ku, K, A, B, U, V, E, W)

Description 840 Series Oscillators

Mi-Wave's **840 series electronically tuned gunn oscillators have been designed to be used where a frequency agile millimeter source is required. This source can be used as a modulated transmitter or local oscillator. This 840 series gunn oscillator can provide up to 500 MHz of electronic tuning with power outputs of up to 250 milliwatts. Frequency stabilities of 100 KHz / ° C can be provided.**

Technical Specifications

Model No.	Frequency Band (GHz)	Power Output (up to mw)	Electronic Tuning (MHz)	Mech. Tuning	Freq. Stability MHz / ° C
840Ku	12.4 - 18.0	250	100	250	.30
840K	18.0 - 26.5	250	125	250	.50
840A	26.5 - 40.0	200	140	250	.70
840B	33.0 - 50.0	200	175	300	.90
840U	40.0 - 60.0	150	200	300	1.10
840V	50.0 - 75.0	100	200	400	2.2
840E	60.0 - 90.0	75	225	500	2.6
840W	75.0 - 110.0	50	250	500	3.5

Applications

Radar
Swept Sources
Telecommunication Systems

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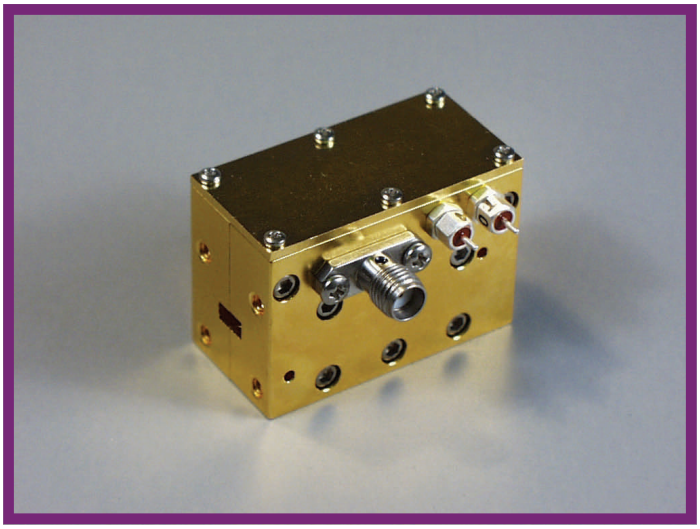
900 & 905 Series Pin Diode Attenuators



Features

- **Series 900 Attenuators 10 to 60 dB - 6% Bandwidth**
- **Series 905 Attenuator 10 to 40 dB Full Bandwidth (K, A, B, U)**

Ordering Information

900
905
/

Specify Attenuation
-10 dB
-20 dB
-30 dB
-40 dB
-50 dB
-60 dB

Specify RF Band Designator
(K, A, B, U, V, E, W) *

Please specify center frequency at time of order.

*** V, E, W are 50% bandwidth.**

Description 900 & 905 Series Attenuators

Mi-Wave **900 series PIN diode attenuator is a SPST reflective attenuator that combines low loss, high isolation performance in a compact package. Attenuation options are available for the 900 series attenuation with isolation versions up to 60 dB. These attenuators are supplied without drivers, control is typically 0 to +10 Vdc. For full band applications, the 905 series attenuation feature an excellent on/off ratio and a full bandwidth.**

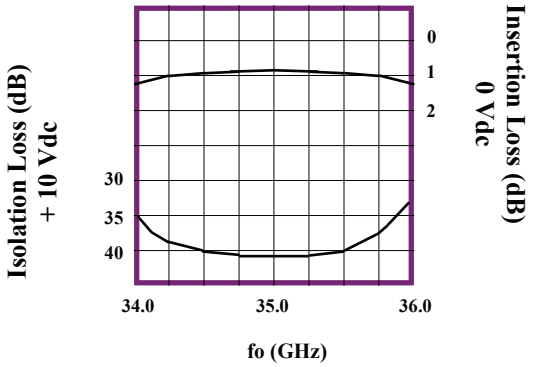
Operating Specifications

Control Input.....	0 to +10 Vdc
Operating Temperature...	0º C to +60º C
Storage Temperature.....	-55º C to +125º C
VSWR.....	1.5 Typical (Low Loss Condition)

Applications

Both series of PIN attenautors can be used for a variety of applications including wave shaping, amplitude modulation, signal switching, and receiver protection.

Technical Performance



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Millimeter Wave Products Inc.
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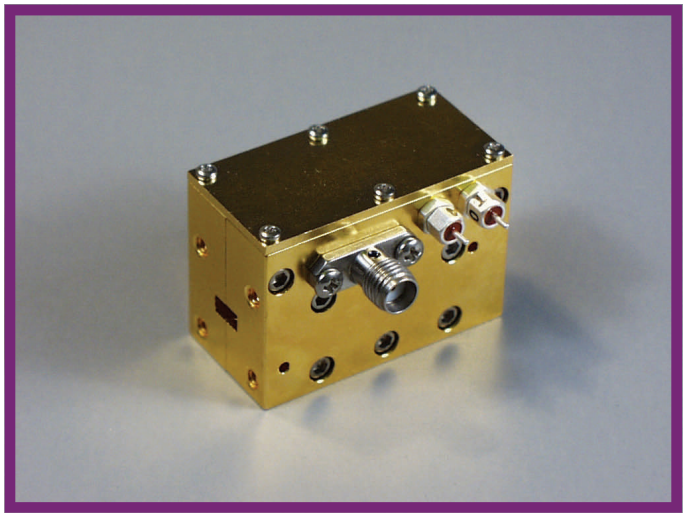
910 Series Pin Diode Switches



Features

- **Millimeter Wave Switches with Integral TTL drivers**
- **Series 910 Single Throw Switches (SPST) - 6% Bandwidth (100 ns)**

Ordering Information

910 / Specify Logic/Driver Option

Standard	High Isolation	Loss State for Logic "1"
-01	-03	Low Loss
-02	-04	Isolation

Specify RF Band Designator
(K, A, B)

Please specify center frequency at time of order.

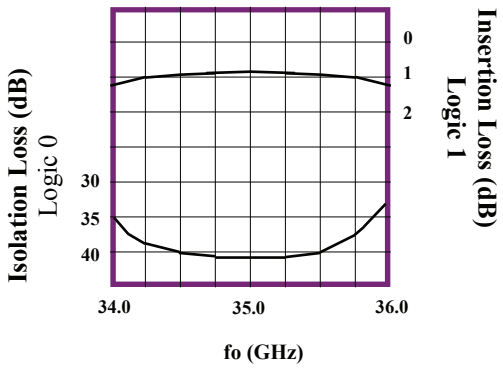
Description 910 Series Switches

Mi-Wave's **910 series PIN diode switch is a SPST reflective switch that combines low loss, high isolation performance with an integra TTL driver in a compact package. Various driver options are available and the 910 series switches are available in higher isolation versions up to 60 dB. These switches can also be supplied without drivers.**
For higher speed applications, the 911 series switches feature an excellent on/off ratio and a 6% bandwidth. Integral drivers are standard with various driver options available. Custom units will be quoted on request.

Applications

Both series of PIN switches can be used for a variety of applications including wave shaping, duplexing,

Technical Performance



Operating Specifications

Control Input.....	TTL
DC Power.....	+5/-12 Vdc
with Driver.....	+100/-10 mA
Operating Temperature..	0º C to +60º C
Storage Temperature.....	-55º C to +125º C
VSWR.....	1.5 Typical (Low Loss Condition)

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Largo, FL 33771
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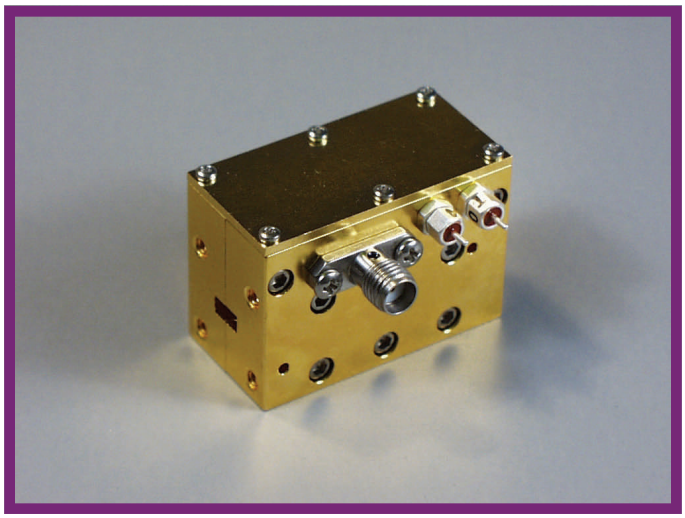
911 Series High Speed Pin Diode Switches



Features

- **Series 911 Single Throw Switches (SPST) - 6% Bandwidth**
- **Series 911 Single Throw Switches (SPST) - 6% Bandwidth (10 ns)**

Ordering Information

911 /

Specify Logic/Driver Option
(-01 Standard)

Standard	High Isolation	Loss State for Logic "1"
-01	-03	Low Loss
-02	-04	Isolation

Specify RF Band Designator
(K, A, B)

Please specify center frequency at time of order.

Description 911 Series Switches

Mi-wave's **911 series PIN diode switch is a SPST reflective switch that combines low loss, high isolation performance with an integra TTL driver in a compact package. Various driver options are available and the 911 series switches are available in higher isolation versions up to 60 dB. These switches can also be supplied without drivers. For higher speed applications, the 911 series switches feature an excellent on/off ratio and a 6% bandwidth. Integral drivers are standard with various driver options available.**

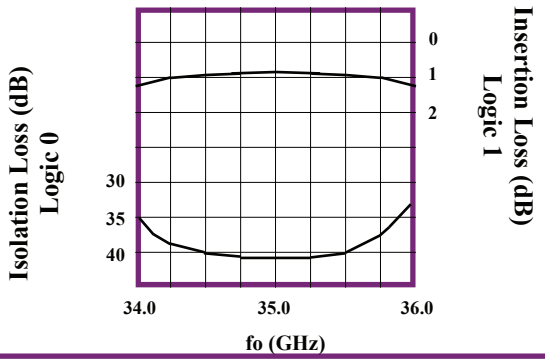
Applications

Both series of PIN switches can be used for a variety of applications including wave shaping, duplexing, pulse modulation, signal switching, and receiver protection.

Operating Specifications

Control Input.....	TTL
DC Power.....	+5/-12 Vdc
with Driver.....	+100/-10 mA
Operating Temperature...	0º C to +60º C
Storage Temperature.....	-55º C to +125º C
VSWR.....	1.5 Typical (Low Loss Condition)

Technical Performance



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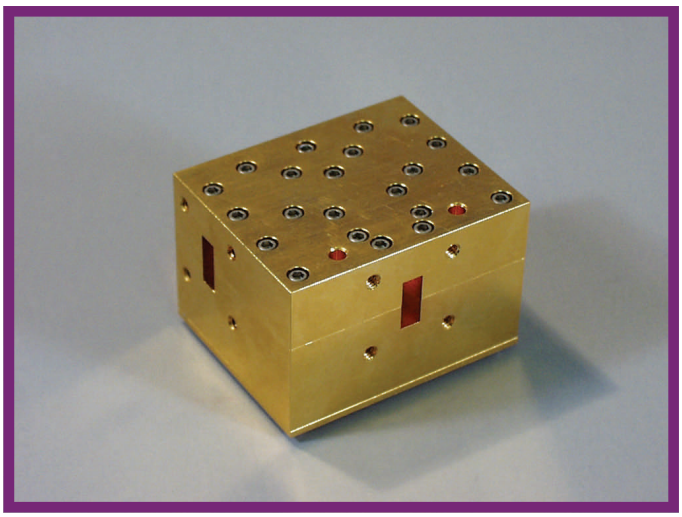
912 Series SPDT Pin Diode Switches



Features

- **Series 912 Double Throw Switches (SPDT) - 6% Bandwidth**

Ordering Information

912 /

Specify Logic/Driver Option
(-01 Standard)

Standard	High Isolation	Loss State for Logic "1"
-01	-03	Low Loss
-02	-04	Isolation

Specify RF Band Designator
(K, A, B)

Please specify center frequency at time of order.

Description 912 Series Switches

Mi-Wave's **912 series PIN diode switch is a SPDT reflective switch that combines low loss, high isolation performance with an integra TTL driver in a compact package. Various driver options are available and the 912 series switches are available in higher isolation versions up to 40 dB. These switches can also be supplied without drivers.**

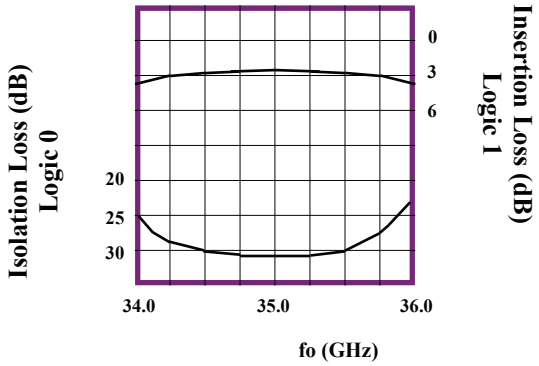
Applications

The 912 series of PIN switches can be used for a variety of applications including wave shaping, duplexing, pulse modulation, signal switching, and receiver protection.

Operating Specifications

Control Input.....	TTL
DC Power.....	+5/-12 Vdc
with Driver.....	+100/-10 mA
Operating Temperature...	0º C to +60º C
Storage Temperature.....	-55º C to +125º C
VSWR.....	1.5 Typical (Low Loss Condition)

Technical Performance



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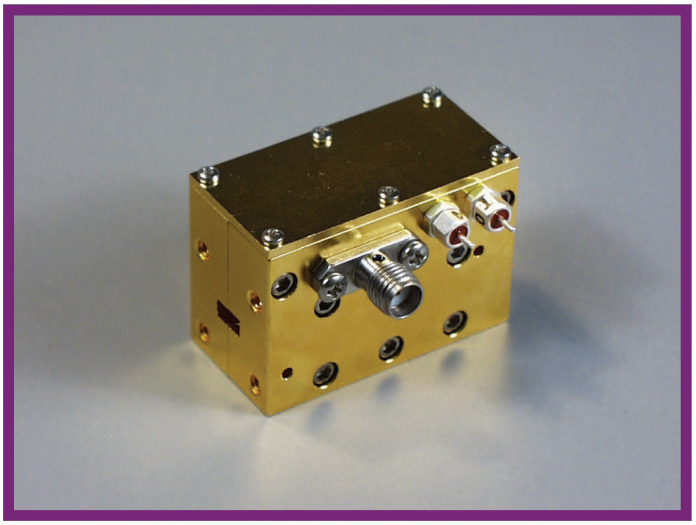
915 Series Full Bandwidth Pin Diode Switches



Features

- **18.0 to 110.0 GHz**
- **Various On/Off Ratios Available**
- **10 GHz Bandwidths from 75 to 110 GHz**
- **Full Waveguide Band Coverage up to 75 GHz**
- **Broadband SPST Diode Switches with Integral TTL Devices**

Description 915 Series Switches

Mi-Wave's **915 series SPST PIN diode switches are full waveguide band units with integral TTL drivers. Full band performance is available in K-band thru V-band and 10 GHz bandwidths are available in E-band and W-band. Fast switching and high isolation options are available and these assemblies can be tailored to customer specifications.**

Applications

These switches can be used in pulse shaping, amplitude modulation, and receiver protection applications.

Operating Specifications

Control Input	TTL
DC Power (standard unit)	+5/-12 Vdc
	+10/-2 mA
DC Power (fast switching)	+5/-20 Vdc
	+10/-2 mA
CW Power (Max.)	0.2 Watt
Operating Temperature	0 to +60º C
Storage Temperature	-55º C to +125º C
VSWR	1.8 Typical (Low Loss)
	3.5 Typical (Isolation)

Ordering Information

915 /

Specify Logic/Driver Option
(-01 Standard)

Standard	High Isolation	Loss State for Logic "1"
-01	-03	Low Loss
-02	-04	Isolation
	-05	No Driver

Specify RF Band Designator
(K, A, B, U, V, E, W)

Please specify center frequency at time of order.

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2200 Tall Pines Drive, Suite 100
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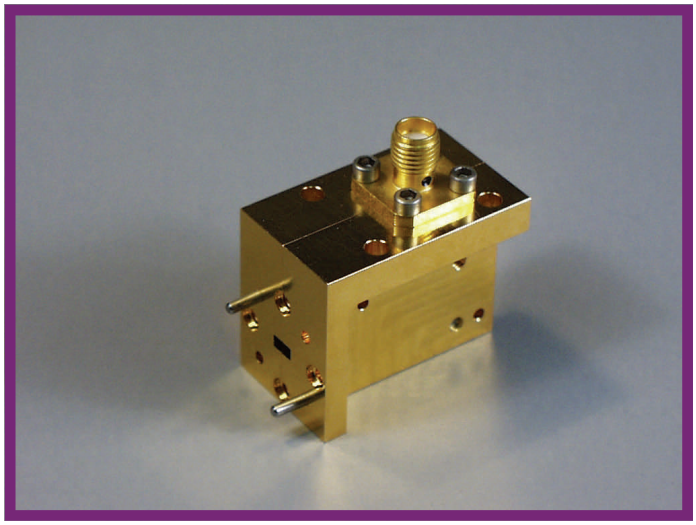
E: sales@miwv.com

920 Series Harmonic Mixers



Features

- **Full Waveguide Band Coverage**
- **Extends the Useful Frequency Range of Spectrum Analyzers**

Description 920 Series Harmonic Mixers

Mi-Wave's **920 series harmonic mixers are used to downconvert millimeter wave signals using a Schottky barrier mixer diode. Measurements can be made by mixing the harmonic of the LO with the desired RF signal and observing the resulting IF.**

The 920 series is designed for applications where a Diplexer is not required.

Ordering Information

920 __ / __ / __ (Without Diplexer)

IF Band Designator
02: 10-110 MHz
05: 100-600 MHz
09: 100-1000 MHz
10: 1000-2000 MHz

LO Band Designator
S: 2-4 GHz
C: 4-8 GHz
X: 8-12 GHz
Ku: 12-18 GHz

Specify RF Frequency Designator
(A, B, U, V, E, W, F)

Optional IF amplifiers are available. Please consult *Mi-Wave* for further information.

Operating Specifications

RF Input Power.....	+15 dBm, Max.
LO Input Power.....	+18 dBm, Max.
Storage Temperature.....	-55º C to +125º C
Operating Temperature.....	0º C to +60º C
Bias Requirements:	
Diode.....	-0.7 Vdc @ 5 mA

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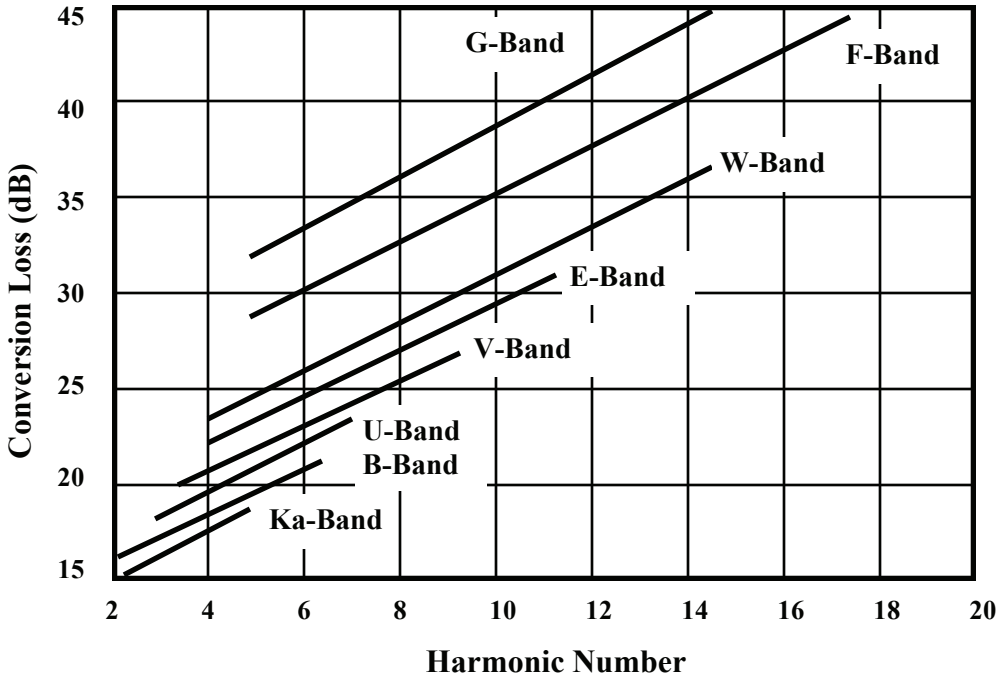
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

920 Series Harmonic Mixers

Technical Specifications

Standard Mixer	Frequency Band (GHz)	Waveguide	Flange	LO Band	SSB Conversion Loss (dB)
920K	26.5 - 40.0	WR - 28	UG - 599		18
920A	33.0 - 50.0	WR - 22	UG - 383		20
920B	40.0 - 60.0	WR - 19	UG - 383M		22
920U	50.0 - 75.0	WR - 15	UG - 385	8.0 - 12.0 GHz	24
920V	60.0 - 90.0	WR - 12	UG - 387		27
920E	75.0 - 110.0	WR - 10	UG - 387M		30
920W	90.0 - 140.0	WR - 8	UG - 387M		40

Nominal Conversion Loss vs. Harmonic Number and RF Band



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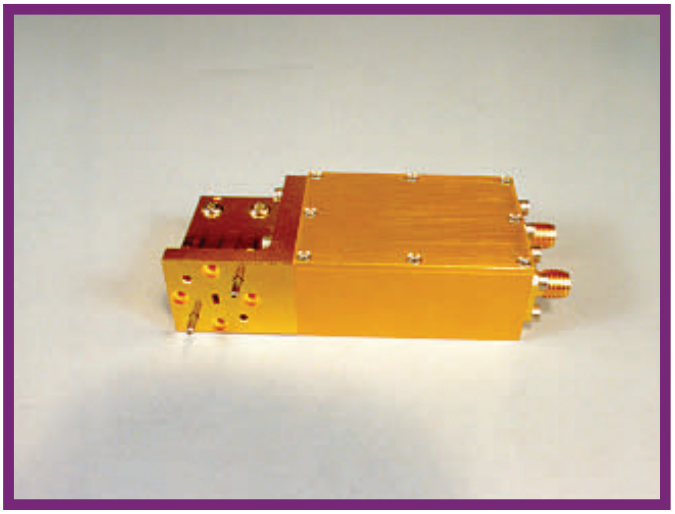
922 Series Harmonic Mixers



Features

- **Full Waveguide Band Coverage**
- **Available With or Without IF Amplifier**
- **Extends the Useful Frequency Range of Spectrum Analyzers**

Description 922 Series Harmonic Mixers

Mi-Wave's **922 series harmonic mixers are used to downconvert millimeter wave signals using a Schottky barrier mixer diode and a Diplexer circuit to separate the local oscillator, and IF paths. Measurements can be made by mixing the harmonic of the LO with the desired RF signal and observing the resulting IF.**

Designed for use with spectrum analyzers such as the HP 8566B and the HP 8569B, the 922 series harmonic mixers are used to extend the operating range of spectrum analyzers and other commercial test equipment. The mixers feature separate LO output and IF input ports with a standard triplexer circuit. The units can also be supplied with an optional 30 dB IF amplifier. For applications where a Diplexer is not required, please order 920 series harmonic mixers.

Ordering Information

922 ___ / ___ / ___ / ___ / ___

Bias Designator
N: Negative (STD)
P: Positive
(When Required)

Amplifier Option
A: 30 dB IF Amplifier
H: Without Amplifier

IF Band Designator
02: 10-110 MHz
05: 100-600 MHz
09: 100-1000 MHz
10: 1000-2000 MHz

LO Band Designator
S: 2-4 GHz
C: 4-8 GHz
X: 8-12 GHz
Ku: 12-18 GHz

Specify RF Frequency Designator
(A, B, U, V, E, W, F)

Optional IF amplifiers are available. Please consult *Mi-Wave* for further information.

Operating Specifications

RF Input Power.....	+15 dBm, Max.
LO Input Power.....	+18 dBm, Max.
Storage Temperature.....	-55° C to +125° C
Operating Temperature.....	° C to +60° C
Bias Requirements:	
Diode.....	-0.7 Vdc @ 5 mA
Amplifier.....	+15 Vdc @ 60 mA

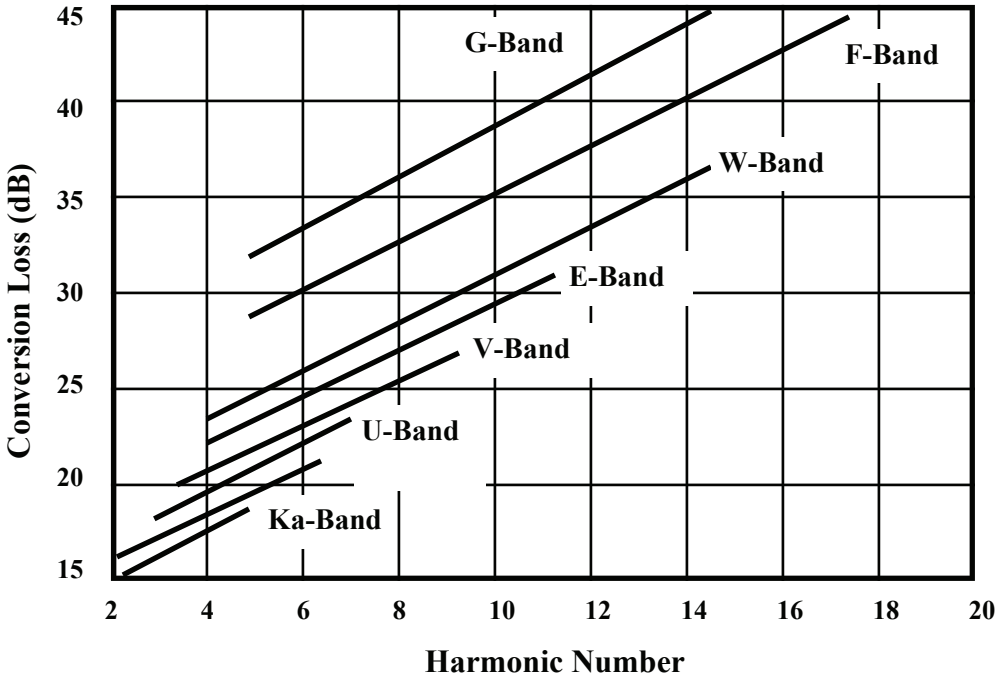
Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

922 Series Harmonic Mixers

Technical Specifications

Standard Mixer	Frequency Band (GHz)	Waveguide	Flange	LO Band	SSB Conversion Loss (dB)
922K	26.5 - 40.0	WR - 28	UG - 599		18
922A	33.0 - 50.0	WR - 22	UG - 383		20
922B	40.0 - 60.0	WR - 19	UG - 383M		22
922U	50.0 - 75.0	WR - 15	UG - 385	8.0 - 12.0 GHz	24
922V	60.0 - 90.0	WR - 12	UG - 387		27
922E	75.0 - 110.0	WR - 10	UG - 387M		30
922W	90.0 - 140.0	WR - 8	UG - 387M		40

Nominal Conversion Loss vs. Harmonic Number and RF Band



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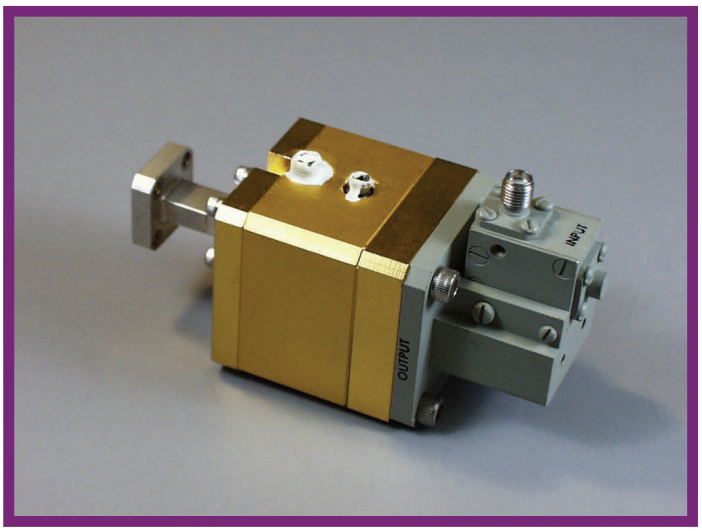
932, 933, 934, 936 Series High-Power Multipliers



Features

- Operation to 150 GHz
- High Efficiency (to 40 Percent)
- X2, X3, X4, X6, X9 Multiplication
- 1 Percent to 5 Percent Bandwidths

Description

932, 933, 934, 936 Series Multipliers

Mi-Wave's **932 series frequency multipliers offer high power, high efficiency designs that can be used to generate millimeter wave frequencies from lower frequency microwave sources. GaAs varactor diodes mounted in high-Q housings provide for minimal circuit losses and optimal harmonic generation. An SMA female input connector is available up to an input frequency of 40 GHz.**

X2, X3, and most X4 multipliers use only a single multiplier stage. In a two-stage X4, X6, or X9 multiplier, an interstage isolator is provided. The 932 series multipliers are designed for input power levels from 30 mW to 1 W. The multipliers are optimized for specific power levels in this range for an input dynamic range of 3 to 4 dB. These units are used for LO sources, frequency extension of synthesizers, and CW transmitters. Options such as isolators and filters can be supplied for many specialized applications. Please consult *Mi-Wave* for

Operating Specifications

Input VSWR (Typ.).....	2:1
Harmonic Rejection.....	-20 dBc
Operating Temperature.....	0 to +60º C
Storage Temperature.....	-55º C to +125º C

Ordering Information

932
933
934
936 /

Specify Output Band
(Ku, K, A, B, U, V, E, W, F, D, G)

Specify Input Band
(X, Ku, K, A, B, U, V, E, W)

Please be sure to specify:

- **Input Power**
- **Input Flange**
- **Output Power**
- **Output Flange**

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Millimeter Wave Products Inc.
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2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

932, 933, 934, 936 Series High-Power Multipliers

Technical Specifications (X2, X3)

Model Number	932X 933X	932Ku 933Ku	932K 933K	932A 933A	932B 933B
Frequency Input (GHz)	8.2 - 12.4	12.4 - 18.0	18.0 - 26.5	26.5 - 40.0	33.0 - 50.0
Input Flange	UG-39	UG-419	UG-595	UG-599	UG-599M
Bandwidth (3 dB)	2%	2%	1%	1%	1%
Power Input (mW)[1]	650	650	500	300	200
Power Output (mW)[1]					
X2	280	250	180	50	40
X3	230	200	125	20	10
Output Flange					
X2	UG-595	UG-599	UG-599M	UG-385	UG-387M
X3	UG-599	UG-599M	UG-385	UG-387M	714

1. Maximum levels, specify required input/output levels.

Technical Specifications (X4, X6, X9)

Model Number	934X 936X 939X	934Ku 936Ku 939Ku
Frequency Input (GHz)	8.2 - 12.4	12.4 - 18.0
Input Flange	UG-39 or SMA-F	UG-419 or SMA-F
Bandwidth (3 dB)	1%	1%
Power Input Max.	650 mW	650 mW
Power Output Max.		
X4:	15%	12%
X6:	10%	8%
X9:	5%	On Request
Output Flange		
X4:	UG-599	UG-383 or 599M
X6:	UG-385/387	UG-387M
X9:	UG-387	UG-387M

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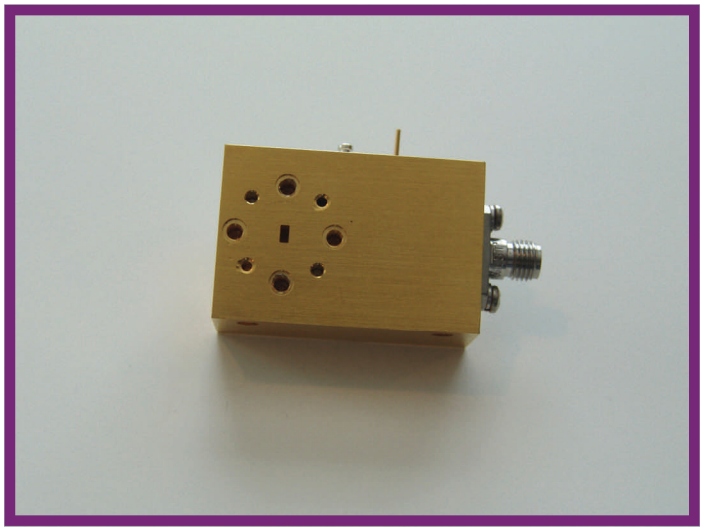
Millimeter Wave Products, Inc.
www.miwv.com
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

938 Series Active & Passive Broadband Multipliers



Features

- Operation thru 140 GHz
- X2, X3, X4, X6 Multiplication
- High Efficiency
- 10° Percent to 100 Percent Bandwidth's

Description 938 Series Multipliers

Mi-Wave's **938 series frequency multipliers offer broad-band, high efficiency designs that can be used to generate millimeter wave frequencies from lower frequency microwave sources. The Passive Designs use GaAs varactor diodes mounted on a fin line design provides for minimal circuit losses and optimal harmonic generation. An SMA female input connector is available up to an input frequency of 50 GHz.**

X2, X3, and most X4 multipliers use only a single multiplier stage. The 938 series multipliers are designed for input power levels from 30 mW to 100 mW. The multipliers are optimized for specific power levels in this range for an input dynamic range of 3 to 4 dB. These units are used for LO sources, frequency extension of synthesizers, and CW transmitters. Options such as isolators and filters can be supplied for many specialized applications. Please consult *Mi-Wave* for further

Operating Specifications

Input VSWR (Typ.).....	2:1
Harmonic Rejection.....	-20 dBc
Operating Temperature.....	0 to + 60° C
Storage Temperature.....	-55° C to + 125° C

Ordering Information

938 /

- Specify Output Band (Ku, K, A, B, U, V, E, W, F, D, G)
- Specify Input Band (X, Ku, K, A, B, U, V, E, W)

Please be sure to specify:

- Input Power
- Input Flange
- Output Power
- Output Flange

Mi-Wave

Millimeter Wave Products Inc.

www.miwv.com

2200 Tall Pines Drive, Suite 100

Largo, FL 33771

Tel. (727) 536-0033 Fax. (727) 536-0012

E: sales@miwv.com

938 Series Broadband Multipliers

Technical Specifications (X2, X3) Passive

Model Number	938X	938Ku	938K	938A	938B
Frequency Input (GHz)	8.2 - 12.4	12.4 - 18.0	18.0 - 26.5	26.5 - 40.0	33.0 - 50.0
Input Flange	SMA	SMA	K	UG-599	UG-599M
Bandwidth (3 dB)	15%	15%	10%	10%	10%
Power Input (mW)[1]	50	40	40	20	20
Power Output (mW)[1]					
X2	5	5	3	1	1
X3	2	1	1		
Output Flange					
X2	UG-595	UG-599	UG-599M	UG-385	UG-387M
X3	UG-599	UG-599M	UG-385	UG-387M	714

1. Maximum levels, specify required input/output levels.

Operating Specifications

Input VSWR (Typ.).....	2:1
Harmonic Rejection.....	-20 dBc
Operating Temperature.....	0 to + 60º C
Storage Temperature.....	-55º C to + 125º C

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Millimeter Wave Products Inc.
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2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
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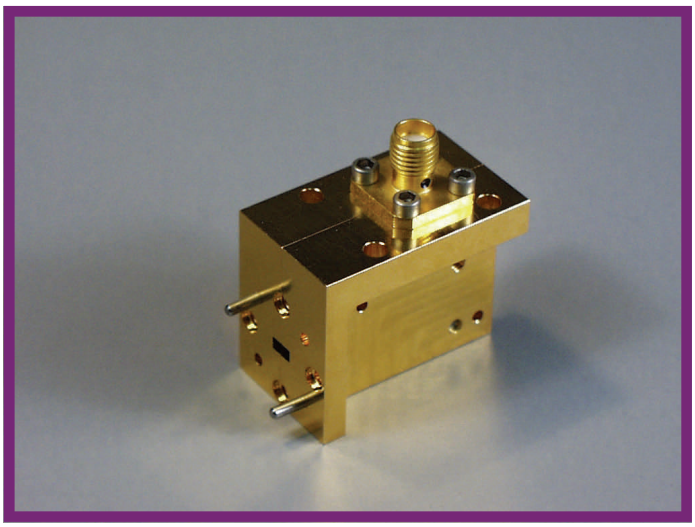
950 Series Finline Detectors



Features

- Full Waveguide Band
- High Video Sensitivity
- No Bias Voltage Required
- Planar Finline Construction
- Lightweight Compact Design

Description 950 Series Detectors

Mi-Wave's **950 series detectors convert incident RF energy into a DC voltage signal. The function of these detectors is similar to power sensors, with two exceptions. The 950 series detectors perform measurements more quickly and have a greater dynamic range than that obtainable from comparable power sensors. Ideally suited for rapid power measurements, these finline detectors are designed for a variety of instrumentation setups such as scalar analyzer applications. For low signal level measurement, the detectors provide significantly more sensitivity than that available from power sensors.**

Ordering Information

950 /

Specify Flange
(See Appendix A)

Specify RF Band Designator
(K, A, B, U, V, E, W)

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Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

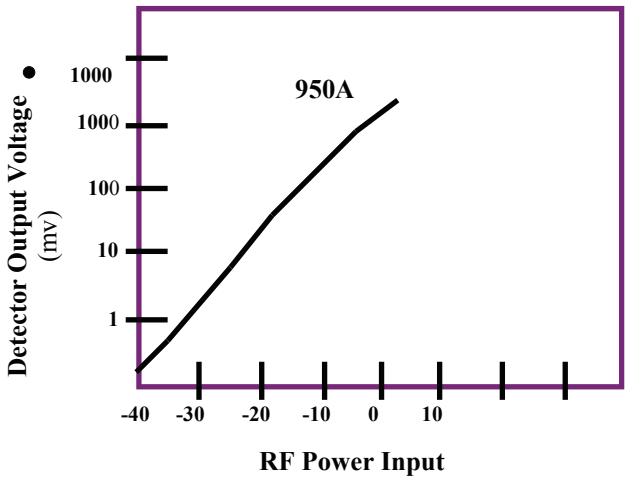
950 Series Finline Detectors

Technical Specifications at 25° C

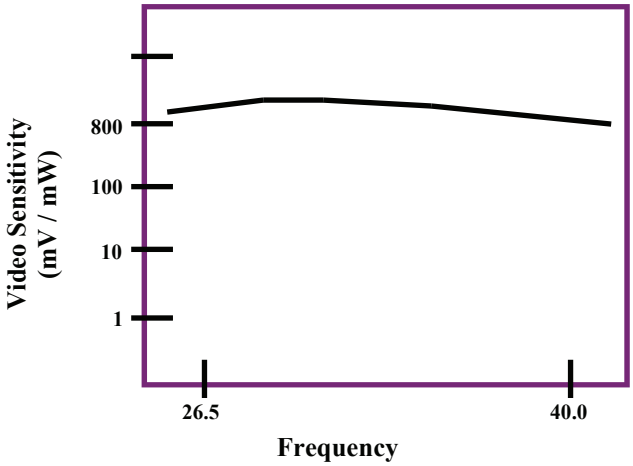
Model Number	950K	950A	950B	950U	950V	950E	950W
Frequency Band (GHz)	18.0-26.5	26.5-40.0	33.0-50.0	40.0-60.0	50.0-75.0	60.0-90.0	75.0-110.0
Video Sensitivity (mV/mW) Typ.	800	800	700	600	500	450	400
Tangential Sensitivity (dBm)	-55	-55	-50	-50	-50	-45	-45
Flatness (dB)	± 1.5	± 1.5	± 1.5	± 1.5	± 2.0	± 2.0	± 2.0

Detectors up to 320 GHz are now available. Consult Mi-Wave for technical specifications.

RF Power Input vs. Detector Output



Technical Video Sensitivity with Frequency



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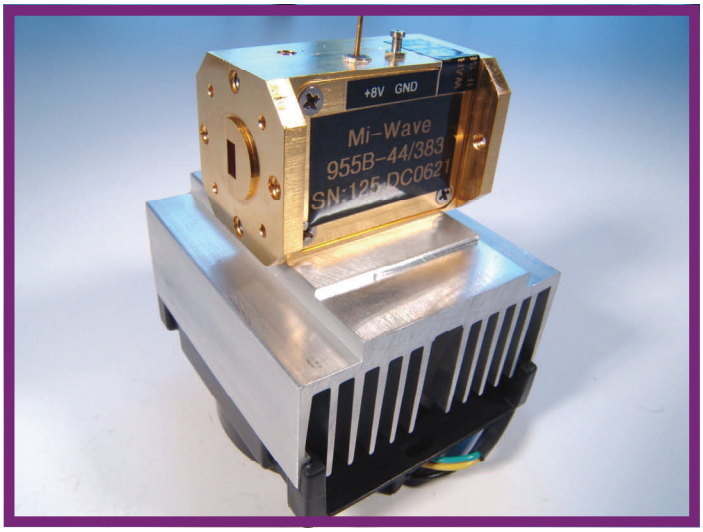
Millimeter Wave Products, Inc.
www.miwv.com
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

955 Series Amplifiers



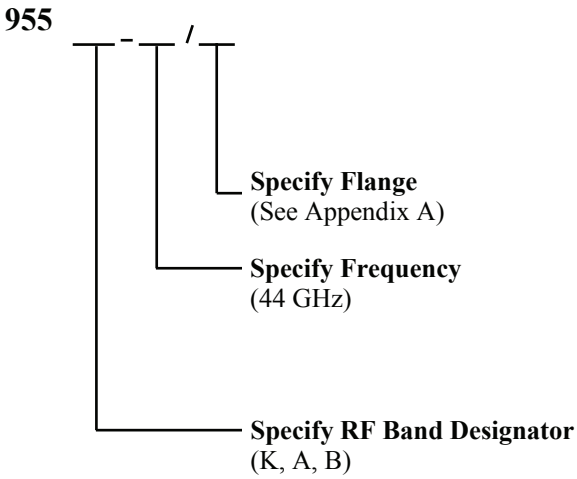
Features

- Low Noise
- High Gain
- Full Bandwidths
- High 1 db Comp. Points
- Wide Varity of Frequency Ranges
- 2 GHz to 140 GHz

Description 955 Series Amplifiers

Mi-Wave's **955 series microwave and millimeter wave amplifiers offer a wide variety of frequency ranges, bandwidths, gain and power outputs. Low Noise versions are now available. Frequencies from 2 GHz to 140 GHz. Low cost production designs to meet the demanding needs of communications are also now available. High Power Outputs in the Millimeter Wave Frequencies up to +43 dbm. Please consult Mi-Wave for technical specifications and outline drawings**

Ordering Information



Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

955 Series Amplifiers

Technical Specifications

Frequency Ranges 2 to 140 GHz

Gain 10 to 60 db

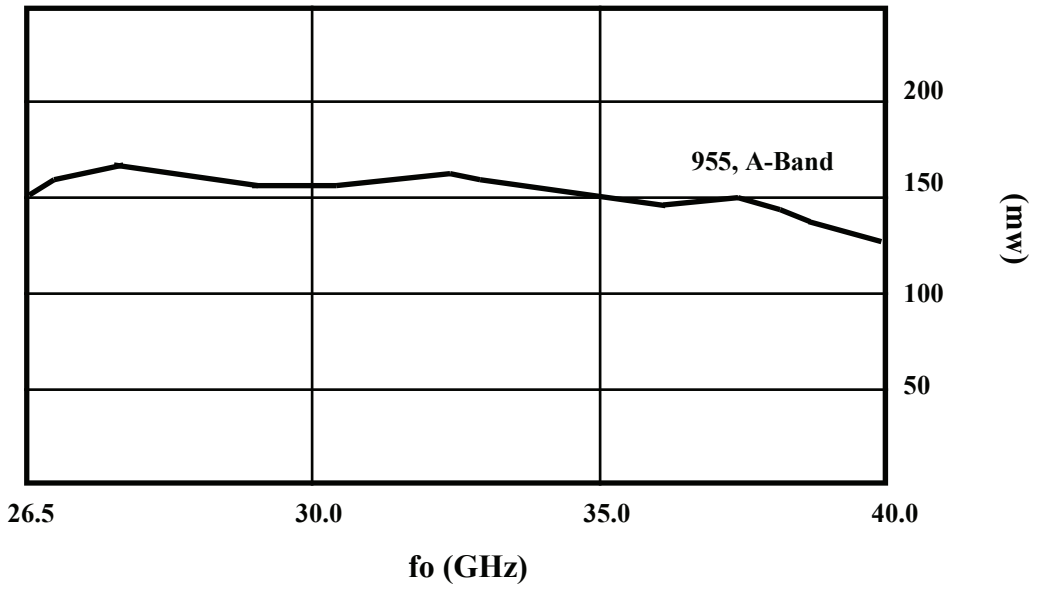
Noise Figures 0.6 db

+43 dbm power outputs

Coaxial and waveguide interfaces

1. Please Consult Mi-Wave with your technical requirements.

Typical Output Power
Ka Band Instrumentation Amplifier
RF input -20 dBm



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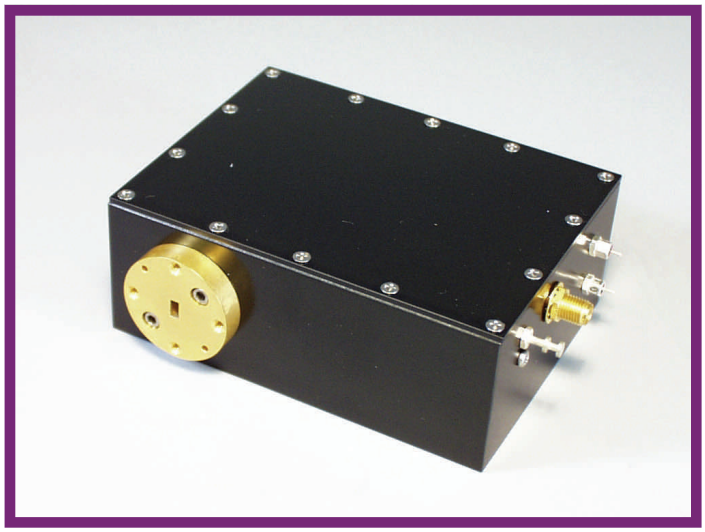
Millimeter Wave Products, Inc.
www.miwv.com
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

957 Series Phase-Locked Oscillators



Features

- Several Stability Options
- High Power Models Available
- Several Spectral Purity Options
- Available from 18.0 to 140.0 GHz
- Miniaturized Lightweight Assembly

Ordering Information

957 ___ / ___ / ___

Specify Power Output in mW
(005, 010, 025, 050, 100, 200)

Specify Crystal Reference Options
1: External
2: Standard Stability Internal Oscillator
3: High stability Internal Oscillator
4: Super Stability Internal Oscillator
5: Low Phase-Noise Internal Oscillator
6: 10 MHz External

Specify RF Band Designator
(K, A, B, U, V, E, W, F)

Please specify center frequency at time of order.

Description 957 Series Oscillators

Mi-Wave's **957 series miniature phase-locked source provides a high-stability, spectrally pure millimeter wave signal. To ensure high performance, a low noise, high-Q varactor-tuned oscillator is phase-locked to a precision crystal reference. Through the use of state-of-the-art millimeter wave component integration and beam-lead diode technology, the RF portion has been drastically reduced in size over conventional waveguide methods. The sophisticated millimeter wave components of the 957 series source, coupled with the advanced electronic design of the loop system, enable high performance to be achieved with miniaturized packaging. A variety of options are possible in the selection of the crystal reference. Crystals are available that offer low noise, superior aging, and improved temperature stability.** ***Mi-Wave*** **will assist in the selection of the appropriate crystal. When an output frequency in excess of approximately 50 GHz is required, an additional stage is used for the 957 series. This stage consists of a doubler or tripler for output frequencies in the 60 to 140 GHz range. In addition, the multiplier stage may have to be followed with an injection-locked Gunn oscillator depending on the power level required at these frequencies.** ***Mi-Wave*** **will provide any additional stages necessary to produce the specified output frequency and power level.**

Applications

The 957 series miniature phase-locked source is ideally suited for applications demanding low noise and high stability in a compact design. Typical applications for phase-locked oscillators include frequency synthesizers, frequency upconverters, monopulse transmit/receive systems, FM CW radar systems, and low noise local oscillators for millimeter wave mixers.

The 957 series PLO can also be used in applications requiring laboratory bench type millimeter wave source either as a single oscillator or in a multiple configuration to provide frequency selection.

Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

957 Series Phase-Locked Oscillators

Technical Specifications

Model Number	957K	957A	957B	957U	957V	957E	957W	957F
Frequency Band (GHz)	18.0-26.5	26.5-40.0	33.0-50.0	40.0-60.0	50.0-75.0	60.0-90.0	75.0-110.0	90.0-140.0
Waveguide	WR-42	WR-28	WR-22	WR-19	WR-15	WR-12	WR-10	WR-8
Power Output (mW)	10 50 100 200	10 50 100 200	10 50 100	10 50 100	10 25 50	10 25 50	10 25 40	5 10
Waveguide Flange (MIL-F3922/Equivalent)	UG-595/U (54-001)	UG-599/U (54-001)	719 (-)	720 (-)	UG-385/U (678-078)	UG-387/U (678-009)	UG-387/u-M (678-010)	UG-387/U-M (-)

Performance Specifications

		Aging/Year
Operating Temperature	0º C to +50º C	
Frequency Stability (internal reference)	0ºC to +50º C	
Standard Stability	± 3 x 10-6	± 5 x 10-6
High Stability	± 1 x 10-8	± 3 x 10-6
Super Stability	± 2 x 10-9	± 3 x 10-7
Low Phase Noise	± 1 x 10-8	± 3 x 10-6
Harmonic Suppression	-30 dBc (Min.)	
Non-Harmonic Spurious Response	-40 dBc (Min.)	
Power Stability	± 1.0 dB	
Load VSWR	2:1 (Max.)	
External Reference Signal		
Frequency (determined by required output frequency)	90-120 MHz	
Input Power	10 dBm (Min.)	
DC Power[1]	+ 15 V	
Weight (external reference)	8 ounces (Max.) 0.7 kg (Max.)	
Dimensions[1]		
External Reference (K-band)	4.0” L x 3.0” W x 1.57” H	
External Reference (other bands)	4.0” L x 3.0” W x 1.57” H	
Internal Reference (standard crystal)	Consult Mi-Wave	
Internal Reference (high stability)	Consult Mi-Wave	

1. For output frequencies greater than approximately 60 GHz, an external doubler or tripler must be used which alters the physical size requirements. For higher power levels at these frequencies, an injection-locked Gunn oscillator may be necessary, thus requiring an additional DC power supply. Gunn oscillator bias voltage may vary from 3 to 7 vdc depending on operating frequency.

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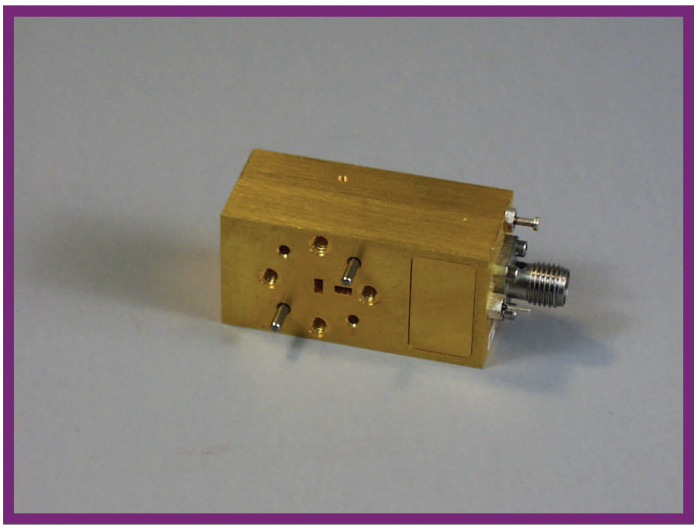
www.miwv.com
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

960 Series Balanced Mixers



Features

- Low Cost
- Low Noise Figures
- Moderate RF Bandwidths
- With or Without IF Amplifier

Description 960 Series Mixers

Mi-Wave's **960 series balanced mixers offers low conversion losses, 7dB nominal at 35 GHz with a 1Ghz IF. These units are available with or without IF amplifiers and have low DSB noise figures. Improved performance results from the use of GaAs beam-lead diodes and MIC construction. IF amplifier designs from 1 to 8 GHz use GaAs FETs to ensure low noise figure. Bipolar transistor amplifiers are used between 10 and 1000 MHz.**

This low cost 960 series design can be used in applications where critical conversion loss or noise figures are not essential. Possible applications include breadboard or feasibility models and in commercial test equipment.

Ordering Information

960 / /

Specify L. O. Options
P: Phase-Locked Oscillator
L: Gunn Oscillator
M: Multiplier

Specify Amplifier Requirement
A: With IF Amplifier

Specify RF Band Designator
(K, A, B, U, V, E, W, F)

Please be sure to specify center RF frequency, LO frequency, and IF output frequency. Optimized performance units are available.

Mi-Wave
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www.miwv.com
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Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

960 Series Balanced Mixers

Technical Specifications

Model Number	960K	960A	960B	960U	960V	960E	960W	960F
Frequency Band (GHz)	18.0-26.5	26.5-40.0	33.0-50.0	40.0-60.0	50.0-75.0	60.0-90.0	75.0-110.0	90.0-140.0
Waveguide	WR-42	WR-28	WR-22	WR-19	WR-15	WR-12	WR-10	WR-8
DSB Noise Figure (dB) Max.[1]	3.5	4.0	4.0	4.5	4.5	5.0	5.0	5.5
Conversion Loss (dB) Max.[2]	5.0	5.5	5.5	6.0	6.0	6.5	6.5	7.0

1. DSB noise figure assumes +7 dBm L. O., IF frequency 10-1000 MHz, and 1.5 dB IF amplifier noise figure. Please note that noise figure and conversion loss both increase with increasing IF bandwidth.
2. Conversion loss SSB (dB) assumes +7 dBm L. O. Please note that noise figure and conversion loss both increase with increasing IF bandwidth. Starved or high LO drive versions available upon request, e. g. O dBm > LO > +16 dBm.

Operating Specifications

LO Bandwidth.....	2 GHz
LO Drive.....	+9 dBm Type[1]
LO/RF Isolation.....	20 dB Typ
VSWR-RFPort.....	2:1Typ
CW RF Burnout Level.....	+20 dBm Max.
Pulsed RF Burnout.....	+23 dBm Max.
Level.....	200 ns -40 KHz PRF
Operating Temperature.....	-40º C to +70º C
IF Amplifier - Typical Performance for 10 - 1000 MHz	
Gain.....	23 + 1 dB Standard
Output Power.....	0 dBm (1 dB Compressed)
Output Impedance.....	50 Ohm Nom.
Output VSWR.....	1:5:1 Max.
DC Power.....	+15 Vdc @ 80 mA Max.

1. Starved or high LO drive versions available upon request, e. g. O dBm > LO > +16 dBm.

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Millimeter Wave Products, Inc.
www.miwv.com
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

970 Series Wide-Band Balanced Mixers

Features

- **Very Wide RF Bandwidth**
- **Available With or Without IF Amplifiers**

Ordering Information

**970 / / **

Specify L. O. Options
P: Phase-Locked Oscillator
L: Gunn Oscillator

Specify Amplifier Requirement
A: With IF Amplifier

Specify RF Band Designator

Please be sure to specify center frequency and IF output frequency.

Description 970 Series Mixers

Mi-Wave's **970 series balanced mixers have been designed to cover extremely wide RF bandwidths for EW/ELINT applications. These units offer excellent SSB conversion loss figures and are available up to 110 GHz. GaAs beam-lead diodes are used with a broadband circuit to provide excellent IF response. The 970 series mixers are available with low noise IF amplifiers that use premium GaAs FETs to ensure low noise figures.**

Technical Specifications

Model Number	Conversion Loss Max.[1]	Typ.[1]
970K	7.0	6.5
970A	8.0	7.5
970B	8.5	8.0
970U	9.0	8.5
970V	9.5	9.0
970E	9.5	9.0
970W	10.0	9.5

1. Conversion loss SSB (dB) assumes +12 dBm L. O. and 8 GHz IF. Please note that noise figure and conversion loss both increase with increasing IF.

Operating Specifications

Bandwidth	18 GHz
LO Drive	+12 dBm Typ.
LO/RF Isolation	20 dB, Typ.
VSWR-RF	2:5:1 Typ.
CW RF Burnout Level	+20 dBm Max.
Pulsed RF Burnout Level	+23 dBm Max. 200 ns 40 KHz PRF
Operating Temperature	-40° C to +70° C

Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

970 Series Wide-Band Balanced Mixers

Technical Specifications

Model Number	Conversion Loss Max.[1]	Typ.[1]
970K	7.0	6.5
970A	8.0	7.5
970B	8.5	8.0
970U	9.0	8.5
970V	9.5	9.0
970E	9.5	9.0
970W	10.0	9.5

1. Conversion loss SSB (dB) assumes +12 dBm L. O. and 8 GHz IF. Please note that noise figure and conversion loss both increase with increasing IF.

Operating Specifications

Bandwidth.....	18 GHz
LO Drive.....	+12 dBm Typ.
LO/RF Isolation.....	20 dB, Typ.
VSWR-RF.....	2:5:1 Typ.
CW RF Burnout Level.....	+20 dBm Max.
Pulsed RF Burnout Level.....	+23 dBm Max. 200 ns 40 KHz PRF
Operating Temperature.....	-40º C to +70º C

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2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
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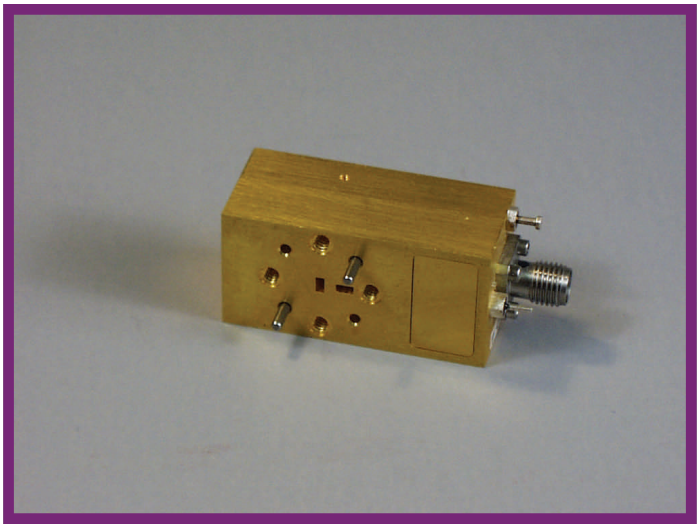
980 & 985 Series Upconverters



Features

- **Low Drive (Biased)**
- **Low Conversion Loss**
- **Wide Choice of IF Inputs**
- **With or Without RF Filter**
- **High Drive (Unbiased) Options**

Description 980/985 Series Upconverters

Mi-Wave's **980/985 series millimeter wave upconverters use MIC balanced mixers to provide optimum electrical performance throughout the standard product line.** ***Mi-Wave's*** **GaAs beam-lead diode technology means power levels as high as +5 dBm. Low conversion loss specifications ensure efficient upconversion.**

Ordering Information

980 /

Specify Bias Requirement
B: With Bias
U: Without Bias

Specify RF Band Designator
(K, A, B, U, V, E, W, F)

985 includes RF filter with -30 dbc lower sideband suppression at IF's greater than 3 GHz.

Please be sure to specify center RF frequency

Operating Specifications

RF Bandwidth.....	Up to Full Band
Conversion Flatness.....	±1 dB, Typ.
LO Input Power.....	+20 dBm, Max.
IF Input Power.....	+20 dBm, Max.
Combined Power.....	+23 dBm, Max.
RF Output Power.....	±0 dBm, Typ.
LO VSWR.....	2:1, Typ.
IF VSWR.....	2:1, Typ.
LO/RF Isolation.....	20 dB, Min.
Operating Temperature.....	-40º C to +70º C

Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

980 & 985 Series Upconverters

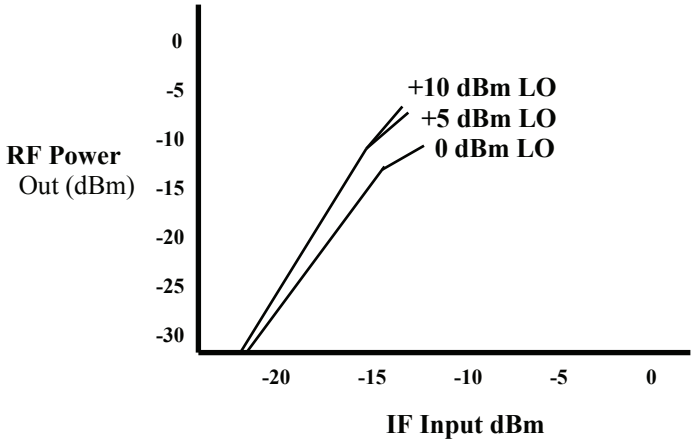
Technical Specifications

Model Number	980K	980A	980B	980U	980V	980E	980W
Frequency Band (GHz)	18.0-26.5	26.5-40.0	33.0-50.0	40.0-60.0	50.0-75.0	60.0-90.0	75.0-110.0
Waveguide	WR-42	WR-28	WR-22	WR-19	WR-15	WR-12	WR-10
IF Input Range	10 MHz-14 GHz	10 MHz-16 GHz	10 MHz-18 GHz	10 MHz-18 GHz	10 MHz-18 GHz	10 MHz-18 GHz	10 MHz-18 GHz
RF Output Power[1] (dbm)	2.0	2.0	2.0	1.5	1.0	0	0

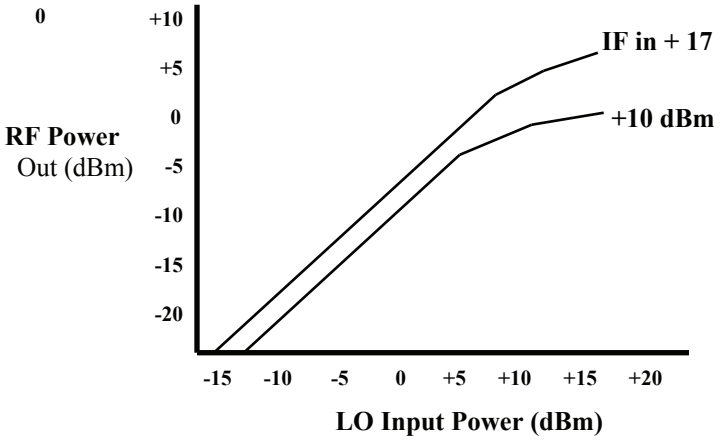
1. LO drive +14 dBm, IF drive +10 dBm @2

Typical Performance

IF Input vs. RF Power Output



LO Input vs. RF Power Output



Mi-Wave
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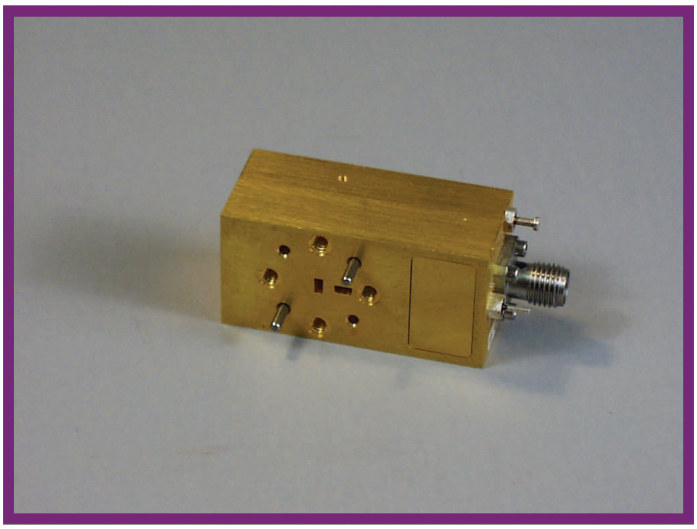
www.miwv.com
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

990 Series Balanced Phase Detectors



Features

- High Sensitivity
- Good RF Isolation
- High-Reliability Beam-Lead Diodes

Description 990 Series Detectors

Mi-Wave's **990 series balanced phase detectors feature a pair of Schottky diodes that that mix or beat two input signals at the same frequency to produce a DC output voltage proportional to the phase difference of the input signals. Matching the two Schottky diodes ensures low DC offset results as well as good port-to-port isolation.**

The 990 series phase detectors can be used in applications such as phased-lock loops, phase-encoded systems and phase bridges.

Ordering Information

990 – _ _

Specify Flange
(See Appendix A)

Specify RF Band Designator
(K, A, B, U, V, E, W)

Please specify center frequency at time of order.

Mi-Wave
Millimeter Wave Products Inc.
www.miwv.com
2200 Tall Pines Drive, Suite 100
Largo, FL 33771
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

990 Series Balanced Phase Detectors

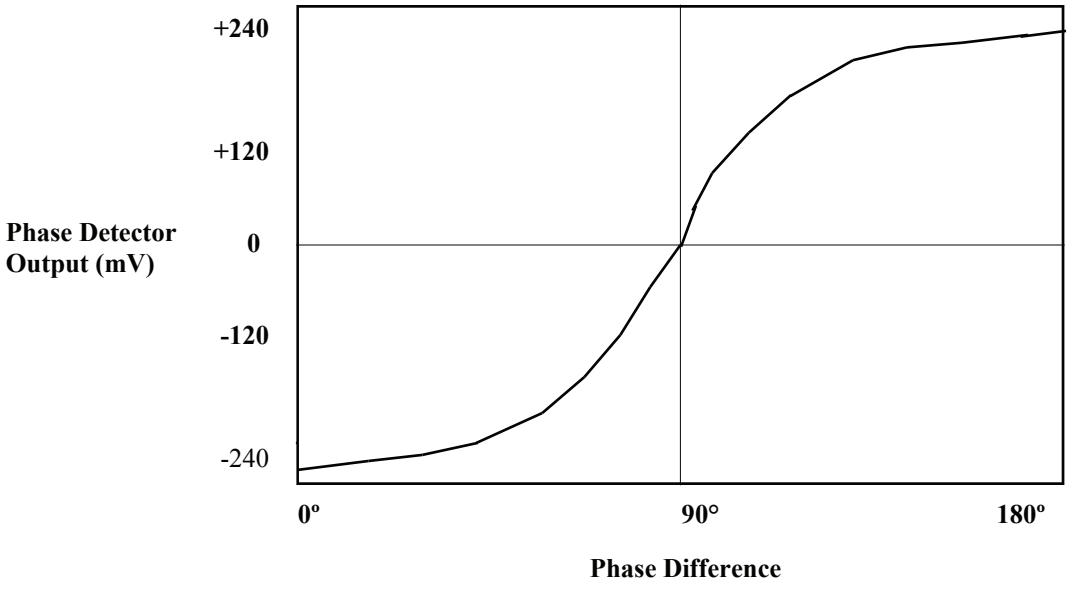
Technical Specifications

Model Number	990K	990A	990B	990U	990V	990E	990W
Frequency Band (GHz)	18.0-26.5	26.5-40.0	33.0-50.0	40.0-60.0	50.0-75.0	60.0-90.0	75.0-110.0
Waveguide	WR-42	WR-28	WR-22	WR-19	WR-15	WR-12	WR-10
Sensitivity[1] (mV/o), Typ.	4	4	4	3	3	2	2
Bandwidth (%), Typ.	4	4	4	4	4	4	4
RF Isolation (dB), Typ.	20	20	20	20	20	20	20
AM Suppression (dB), Typ.	20	20	20	20	20	20	20

1. The sensitivity given above was measured with 4 dBm incident onto each input port with a 1 megohm load on the output port.

Typical Transfer Characteristics

990A Mid Band



Mi-Wave
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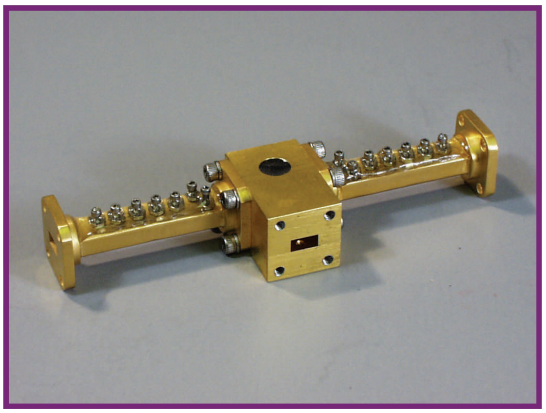
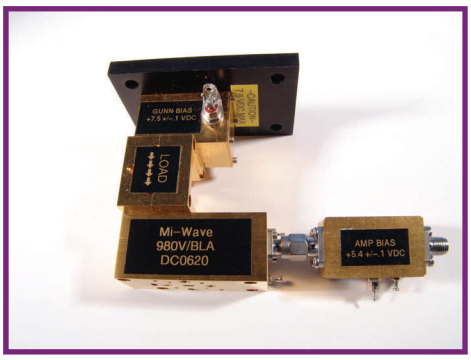
www.miwv.com
Tel. (727) 536-0033 Fax. (727) 536-0012
E: sales@miwv.com

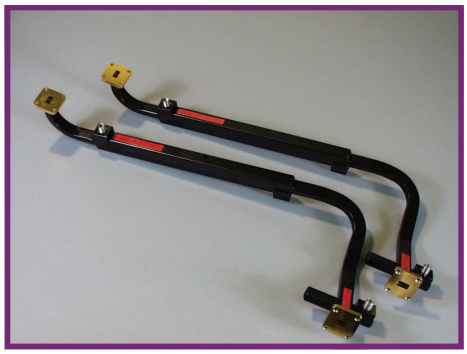
Custom Assemblies



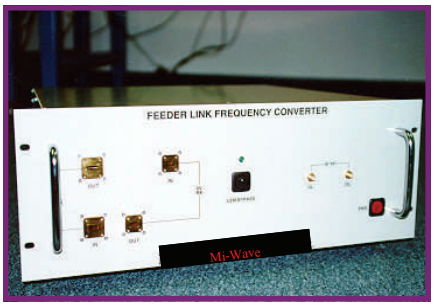
Filter / Diplexer



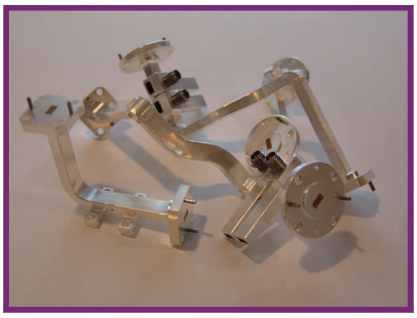
Down Converter Assembly



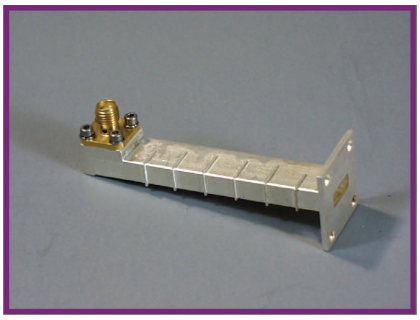
Multifunction Directional Coupler



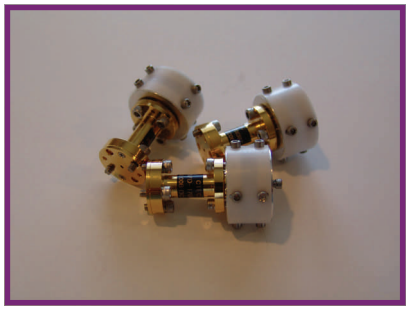
Satellite Ground Terminal Link



Custom Waveguide Assemblies



Filter with Coax Adapter



170 GHz Omni-directional Antenna

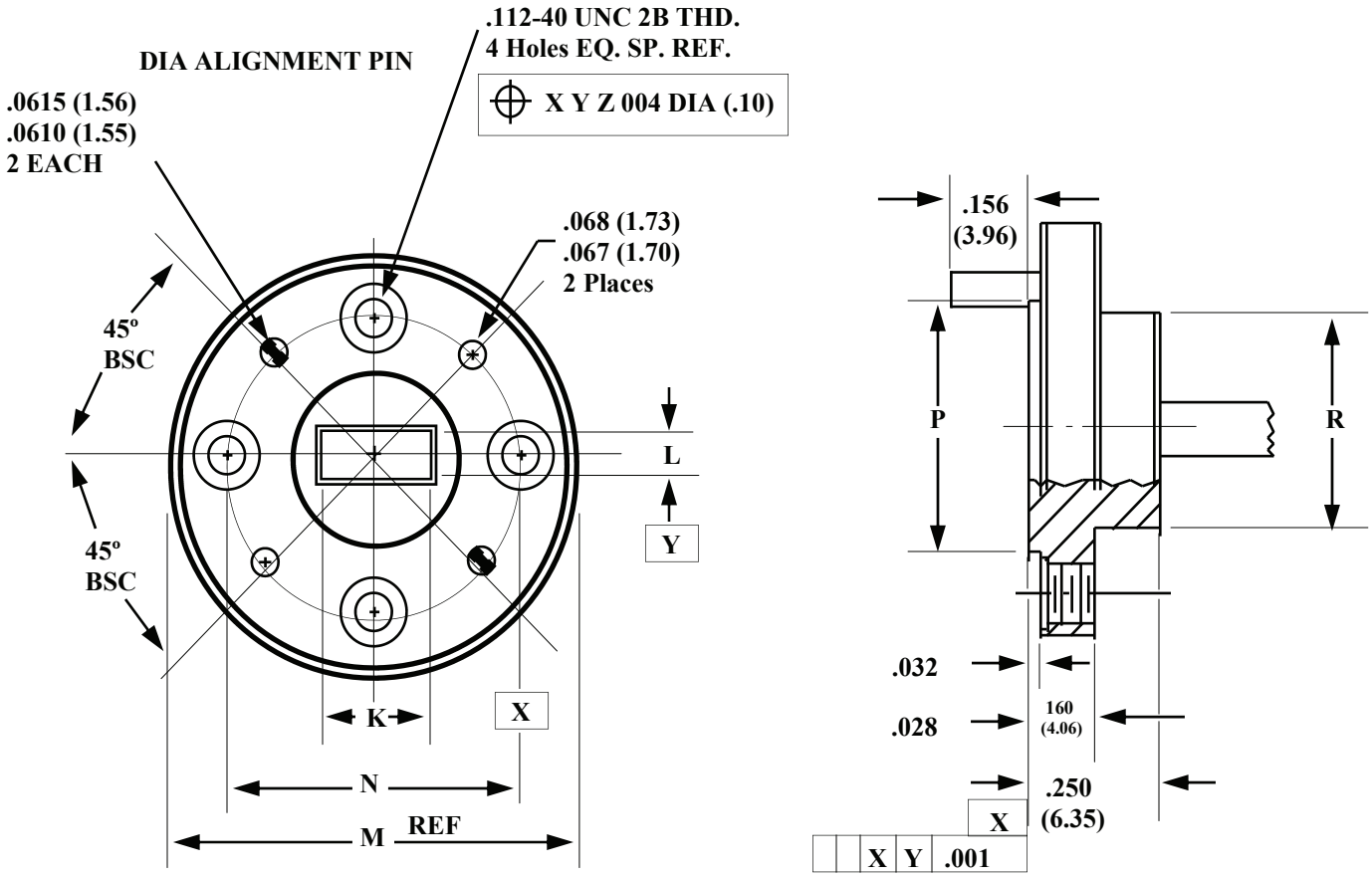
Circulator with Coax Adapter

Mi-Wave's Band	Waveguide Designator(s) (JAN & WR)	Waveguide Inner Dimensions in Inches	Recommended Operating Range for TE_{10} Mode		Cut-Off for TE_{10} Mode		Theoretical Power CW Breakdown Lowest to Highest Frequency (KW)	Theoretical Attenuation Lowest to Highest Frequency (dB/ff)	Flange Type	Historic Designation	New MIL Part Number
			Frequency (GHz)	Wavelength (mm)	Frequency (GHz)	Wavelength (mm)					
KU	RG-91/U WR-62	0.622 x 0.311	12.4 - 18.0	24.2 - 16.6	9.486	31.60	400 - 600	.064 - .030	Cover[1] Choke	UG-419/U UG-541/U	M3922/53-4/005 M3922/59-2/001
K	RG-53/U WR-42	0.420 x 0.170	18.0 - 26.5	16.6 - 11.3	14.047	21.34	160 - 240	.17 - .11	Cover[1] Choke Cover	UG-595/U UG-596A/U UG-425/U	M3922/54-4/001 M3922/59-2/003 M3922/67-2/004
A	RG-96/U WR-28	0.280 x 0.140	26.5 - 40.0	11.3 - 7.5	21.081	14.22	95 - 145	0.22 - 0.15	Cover[1] Choke Cover	UG-599/U UG-600/U UG-381/U	M3922/54-4/003 M3922/59-2/005 M3922/67-2/005
B	RG-97/U WR-22	0.224 x 0.112	33.0 - 50.0	9.1 - 6.0	26.342	11.38	62 - 90	0.31 - 0.21	Cover[1] Cover Cover	UG-383/U 719 719T	M3922/67-2/006 N/A N/A
U	WR-19	0.188 x 0.094	40.0 - 60.0	7.5 - 5.0	31.357	9.56	47 - 64	0.39 - 0.27	Cover[12] Cover Cover	UG-383/U-M 710 720T	M3922/67-2/007 N/A N/A
V	RG-98/U WR-15	0.148 x 0.074	50.0 - 75.0	6.0 - 4.0	39.863	7.52	29 - 42	0.57 - 0.39	Cover[1]	UG-385/U	M3922/67-2/008
E	RG-99/U WR-12	0.122 x 0.061	60.0 - 90.0	5.0 - 3.3	48.350	6.20	20 - 29	0.78 - 0.53	Cover[1]	UG-387/U	M3922/67-2/009
W	WR-10	0.100 x 0.050	75.0 - 110.0	4.0 - 2.7	59.010	5.08	14 - 20	1.02 - 0.71	Cover[12]	UG-387/U-M	M3922/67-2/010
F	RG-138/U WR-8	0.080 x 0.040	90.0 - 140.0	3.3 - 2.1	73.764	4.06	8.5 - 13.5	1.52 - 0.98	Pin[1] Cover[2]	714 UG-387/U-M	M3922/74-001 N/A
D	RG-136/U WR-7	0.065 x 0.0325	110.0 - 170.0	2.7 - 1.8	90.786	3.30	5.8 - 9.0	2.12 - 1.35	Pin[1] Cover[2]	716 UG-387/U-M	M3922/74-002 N/A
G	RG-135/U WR-5	0.051 x 0.0255	140.0 - 220.0	2.1 - 1.4	115.71	2.59	3.7 - 6.1	3.05 - 1.93	Pin[1] Cover[2]	715 UG-387/U-M	M3922/74-003 N/A

1. Standard flange unless otherwise specified.
2. Modified (-M) means waveguide opening has been reduced appropriately. Screw and pin pattern are unchanged.

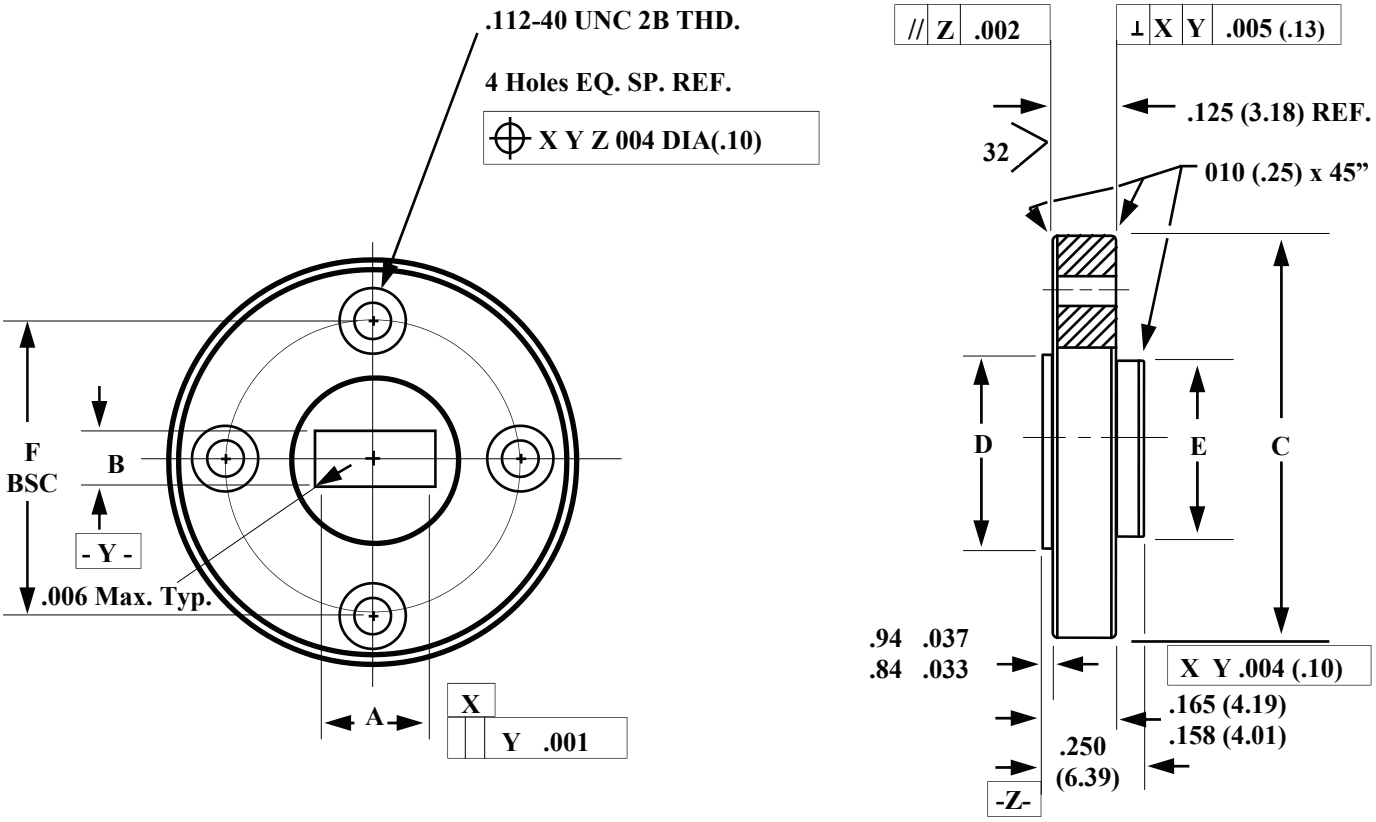
Appendix B Contact Flanges

Finished Flange and Waveguide



MIWV Band	Frequency Band (GHz)	MIL Part Number M3922/67	K ± .0015 (.04)	L ± .0015 (.04)	M ± .000/.002 (.05)	N BSC	P ± .005 (.13)	R ± .005 (.13)	EIA Waveguide Designatio	MIWV Flange Designation	MIWV Flange Bank
K	18.0 26.5	-004	.4200 (10.67)	.1700 (4.32)	1.125 (28.58)	.9375 (23.81)	.625 (15.88)	.625 (15.88)	WR-42	UG-425/U	101957-10
A	26.5 40.0	-005	.2800 (7.11)	.1400 (3.56)	1.125 (28.58)	.9375 (23.81)	.500 (12.70)	.468 (11.89)	WR-28	UG-381/U	101957-1
B	33.0 50.0	-006	.2240 (5.69)	.1120 (2.84)	1.125 (28.58)	.9375 (23.81)	.500 (12.70)	.468 (11.89)	WR-22	UG-383/U	101957-2
U	40.0 60.0	-007	.1880 (4.78)	.0940 (2.39)	1.125 (28.58)	.9375 (23.81)	.500 (12.70)	.468 (11.89)	WR-19	UG-383/U-M	101957-3
V	50.0 75.0	-008	.1480 (3.76)	.0740 (1.88)	.750 (19.05)	.5625 (14.29)	.375 (9.53)	.312 (7.92)	WR-15	UG-385/U	101957-4
E	60.0 90.0	-009	.1220 (3.10)	.0610 (1.55)	.750 (19.05)	.5625 (14.29)	.375 (9.53)	.312 (7.92)	WR-12	UG-387/U	101957-5
W	75.0 110.0	-010	.1000 (2.54)	.0500 (1.27)	.750 (19.05)	.5625 (14.29)	.375 (9.53)	.312 (7.92)	WR-10	UG-387/U-M	101957-6
F	90.0 140.0	N/A	.0800 (2.03)	.0400 (1.02)	.750 (19.05)	.5625 (14.29)	.375 (9.53)	.312 (7.92)	WR-8	UG-387/U-M	101957-7
D	110.0 170.0	N/A	.0650 (1.65)	.0325 (.83)	.750 (19.05)	.5625 (14.29)	.375 (9.53)	.312 (7.92)	WR-7	UG-387/U-M	101957-8
G	140.0 220.0	N/A	.0510 (1.30)	.0255 (.65)	.750 (19.05)	.5625 (14.29)	.375 (9.53)	.312 (7.92)	WR-5	UG-387/U-M	101957-9

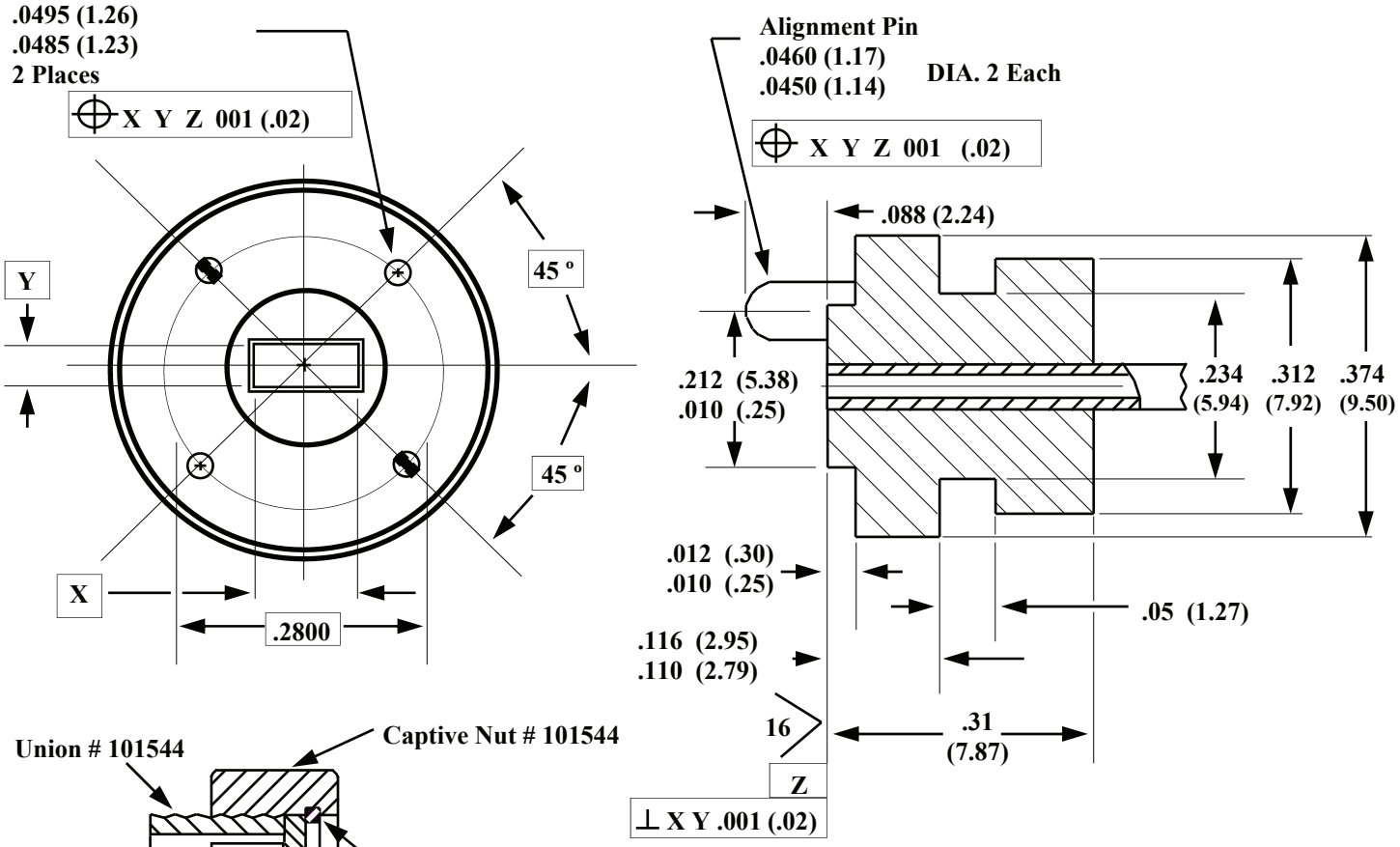
Appendix C Flange Blanks



MIWV Band	Frequency Band (GHz)	MIL Part Number M3922/67	A +.002/-.000 (.05)	B +.002/-.000 (.05)	C +.000/-.002 (.05)	D ± .005 (.13)	E ± .005 (.13)	F BSC	MIWV Flange Designation
K	180.0 260.5	-004	.502 (12.75)	.252 (6.40)	1.125 (28.58)	.625 (15.88)	.625 (15.88)	.312 (7.92)	UG-425/U
A	26.5 40.0	-005	.362 (9.19)	.222 (5.64)	1.125 (28.58)	.500 (12.70)	.468 (11.89)	.9375 (23.81)	UG-381/U
B	33.0 50.0	-006	.306 (7.77)	.194 (4.93)	1.125 (28.58)	.500 (12.70)	.468 (11.89)	.9375 (23.81)	UG-383/U
U	40.0 60.0	-007	.270 (6.86)	.167 (4.47)	1.125 (28.58)	.500 (12.70)	.468 (11.89)	.5625 (14.29)	UG-383/U-M
V	50.0 75.0	-008	.230 (5.84)	.156 (3.96)	.750 (19.05)	.375 (9.53)	.312 (7.92)	.5625 (14.29)	UG-385/U
E	60.0 90.0	-009	.204 (5.18)	.143 (3.63)	.750 (19.05)	.375 (9.53)	.312 (7.92)	.5625 (14.29)	UG-387/U
W	75.0 110.0	-010	.182 (4.62)	.132 (3.35)	.750 (19.05)	.375 (9.53)	.312 (7.92)	.5625 (14.29)	UG-387/U-M
F	90.0 140.0	N/A	.141 (3.58)	.101 (2.56)	.750 (19.05)	.375 (9.53)	.312 (7.92)	.5625 (14.29)	UG-387/U-M
D	110.0 170.0	N/A	.126 (3.20)	.094 (2.39)	.750 (19.05)	.375 (9.53)	.312 (7.92)	.5625 (14.29)	UG-387/U-M
G	140.0 220.0	N/A	.112 (2.84)	.089 (2.21)	.750 (19.05)	.375 (9.53)	.312 (7.92)	.9375 (23.81)	UG-387/U-M

Appendix D Pin Flanges

Finished Flange and Waveguide

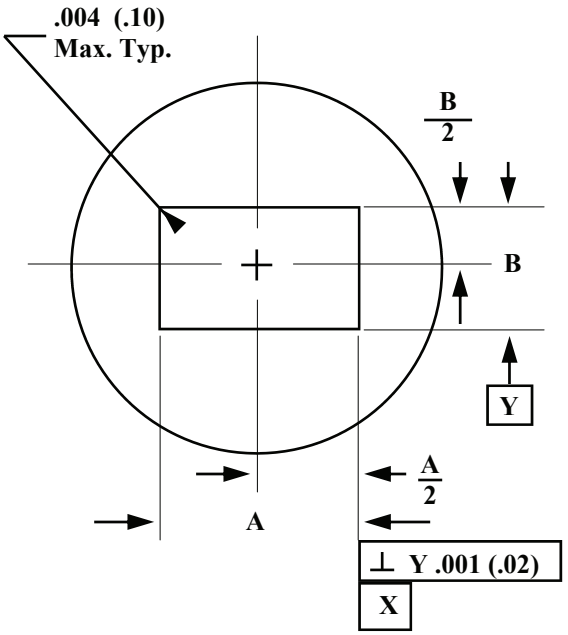


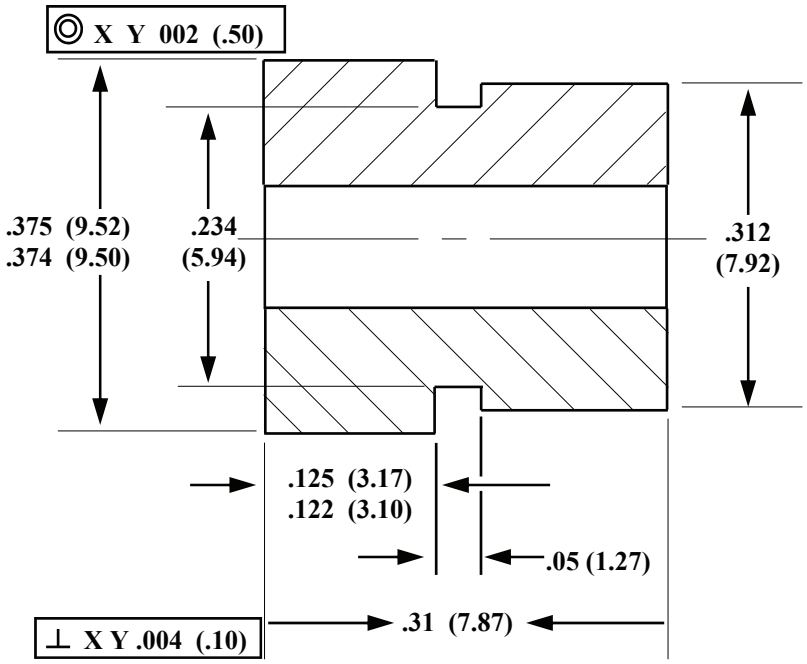
Flange Assembly

MIWV Band	MIWV Part	Frequency Band (GHz)	MIL Part Number M3922/74	C ± .0005 (.01)	D ± .0005 (.01)	EIA Waveguide Designation
F	714	90.0 140.0	-001	.0800 (2.03)	.0400 (1.02)	WR 8
D	716	110.0 170.0	-002	.0650 (1.63)	.0325 (.83)	WR 7
G	715	140.0 220.0	-003	.0510 (1.30)	.0255 (.65)	WR 5
H	717	180.0 260.5	-004	.430 (1.09)	.0215 (.55)	WR 4
J	718	220.0 325.0	-005	.0340 (.86)	.0170 (.43)	WR 3

Appendix E Flange Blanks

For Pin Type Flange

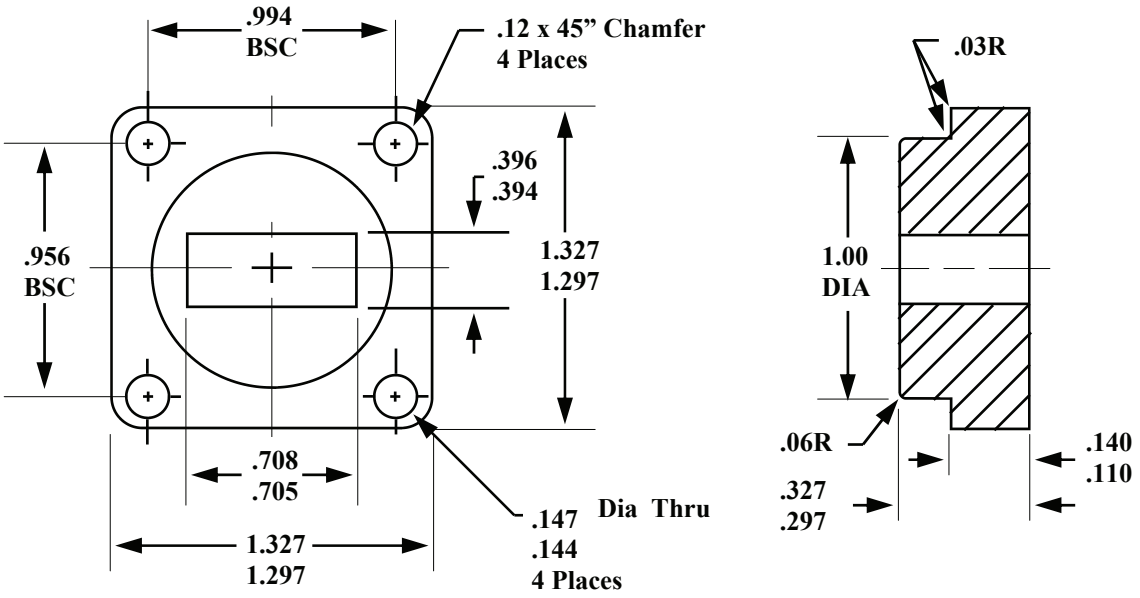




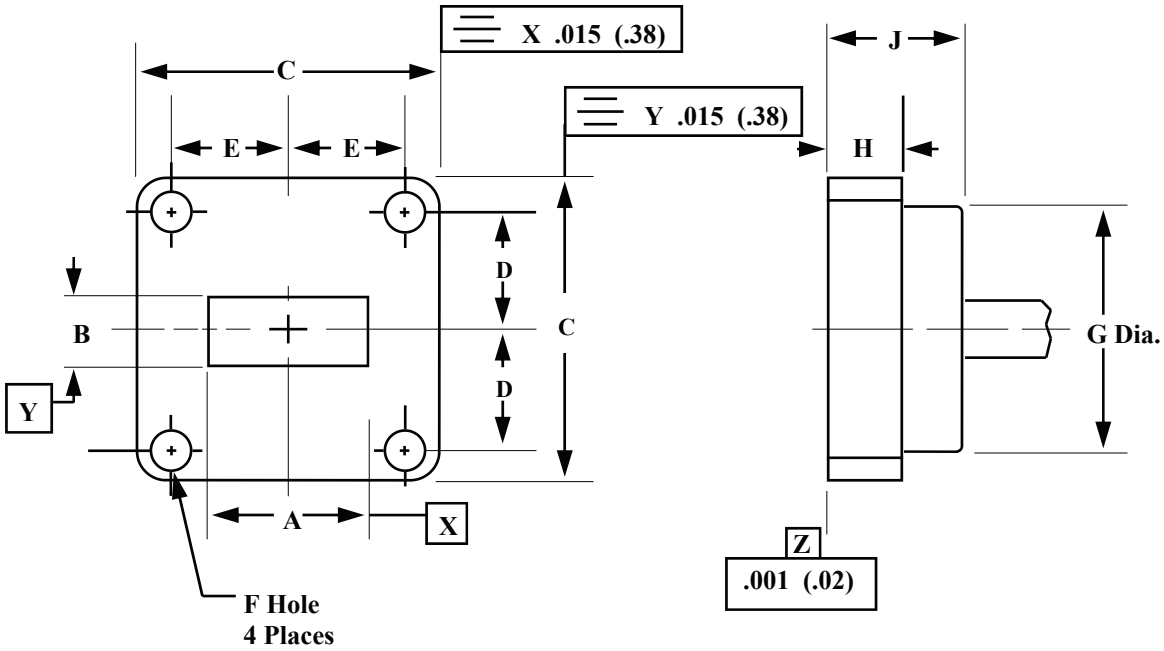
MIWV Band	TRG Part No.	Frequency Band (GHz)	A ±.001 (.02)	B ± .001 (.02)	EIA Waveguide Designation
F	714	90.0 140.0	.143 (3.63)	.103 (2.62)	WR 8
D	716	110.0 170.0	.128 (3.25)	.098 (2.49)	WR 7
G	715	140.0 220.0	.115 (2.92)	.089 (2.26)	WR 5
H	717	170.0 260.0	.430 (1.09)	.0845 (2.15)	WR 4
J	718	220.0 325.0	.106 (2.69)	.080 (2.03)	WR 3

Appendix F Cover Flanges-Flange Blanks

UG-419/U (WR-62)



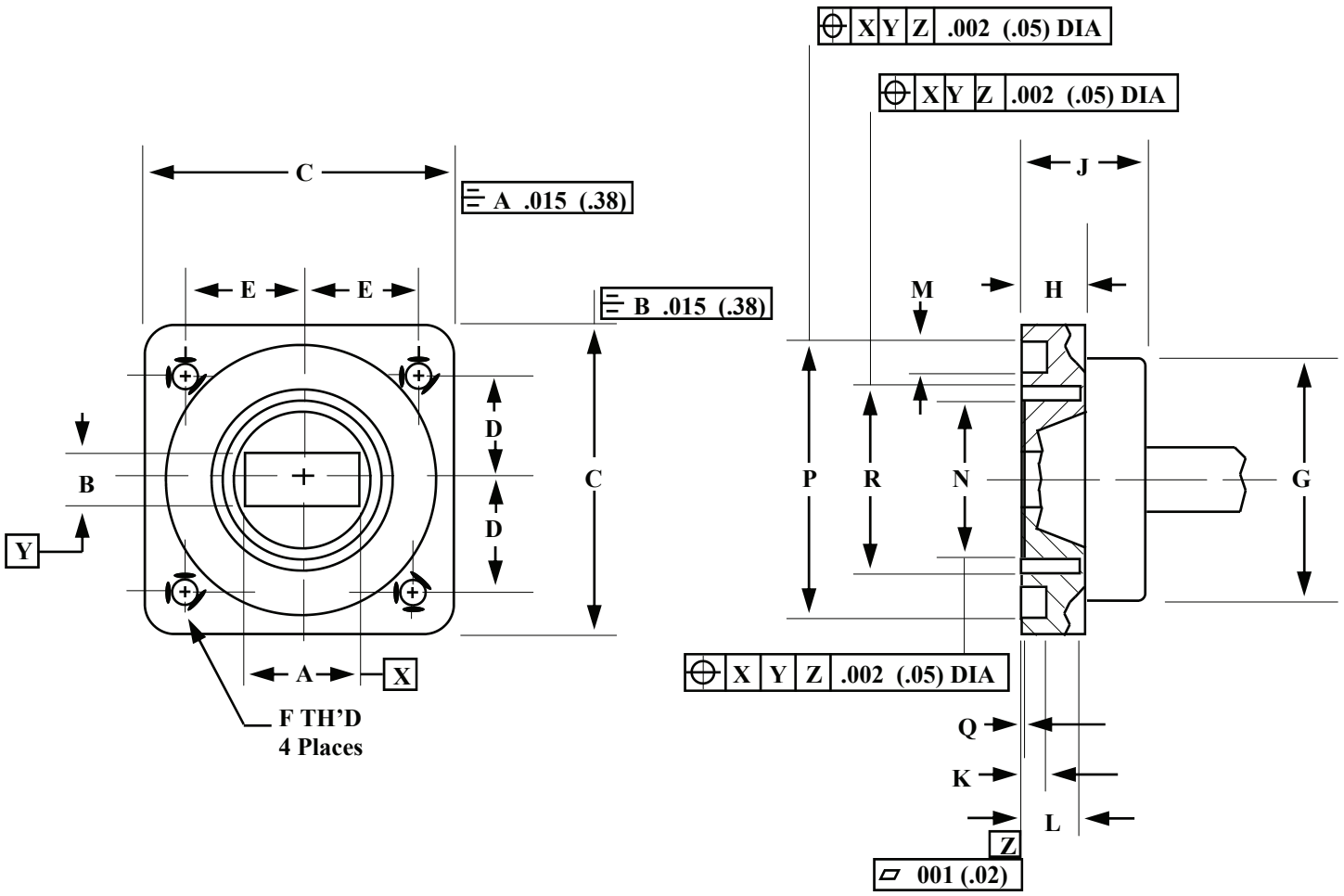
Cover Flanges - Finished Flange and Waveguide UG-419/U (WR-62)



MIWV Band	Frequency Band (GHz)	MIL Part Number M3922/53	A	B	C .015 (.38)	D BSC	E BSC	F ± .003 (.08)	G ± .015 (.38)	H ± .015 (.38)	J ± .015 (.38)	MIWV Flange Bank
Ku	12.4 18.0	-4/005	.622 ± .002 (15.8) (.05)	.311 ± .002 (.79) (.05)	1.312 33.32	4.78 (12.14)	.497 (12.62)	.144 (3.66)	1.000 (25.40)	.125 (3.18)	.313 (7.95)	UG-419/U

Appendix G Choke Flanges

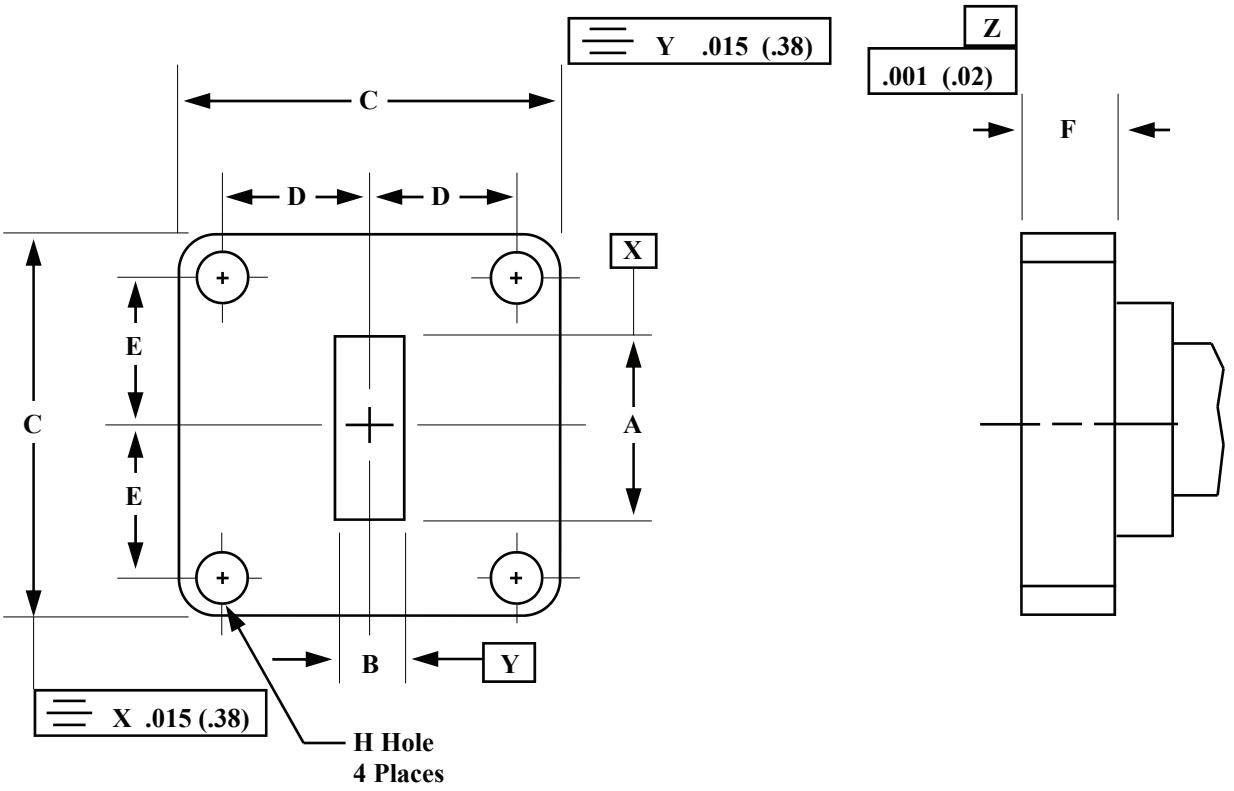
Finished Flange and Waveguide



MIWV Band	Freq. Band (GHz)	MIL Part Number M3922/59	MIWV FLG. DESIG.	A	B	C .015 (.38)	D BSC	E BSC	F	G ±.015 (.38)	H ±.015 (.38)	J ±.015 (.38)	K ±.002 (.05)	L ±.002 (.05)	M ±.002 (.05)	N ±.002 (.05)	P ±.002 (.05)	Q ±.001 (.03)	R ±.002 (.05)
KU	12.4 18.0	-2/001	UG541	.622±.002 (15.8)(.05)	.311±.002 (7.9)(.05)	1.312 (33.32)	.478 (12.14)	.497 (12.62)	.138-32 UNC-2B	1.000 (25.40)	.188 (4.78)	.375 (9.53)	.113 (2.87)	.190 (4.83)	1.58 (4.01)	.710 (18.03)	1.208 (30.68)	.0075 (.19)	.828 (21.03)
K	18.0 26.5	-2/003	UG596	.420±.002 (10.67)(.05)	.170±.002 (4.32)(.05)	.875 (22.23)	.335 (8.51)	.320 (8.13)	.112-40 UNC-2B	.625 (15.88)	.156 (3.96)	.285 (7.24)	0.42 (1.07)	.129 (3.28)	0.87 (2.21)	.472 (11.99)	.761 (19.33)	.005 (.13)	.536 (13.61)
A	26.5 40.0	-2/005	UG600	.280±.0014 (7.11)(.04)	.140±.0014 (3.56)(.04)	.750 (19.05)	.265 (6.73)	.250 (6.35)	.112-40 UNC-2B	.500 (12.70)	.109 (2.77)	.210 (5.33)	.050 (1.27)	.086 (2.18)	.096 (2.44)	.321 (8.15)	.596 (15.14)	.003 (.08)	.372 (9.45)

Appendix H Cover Flanges

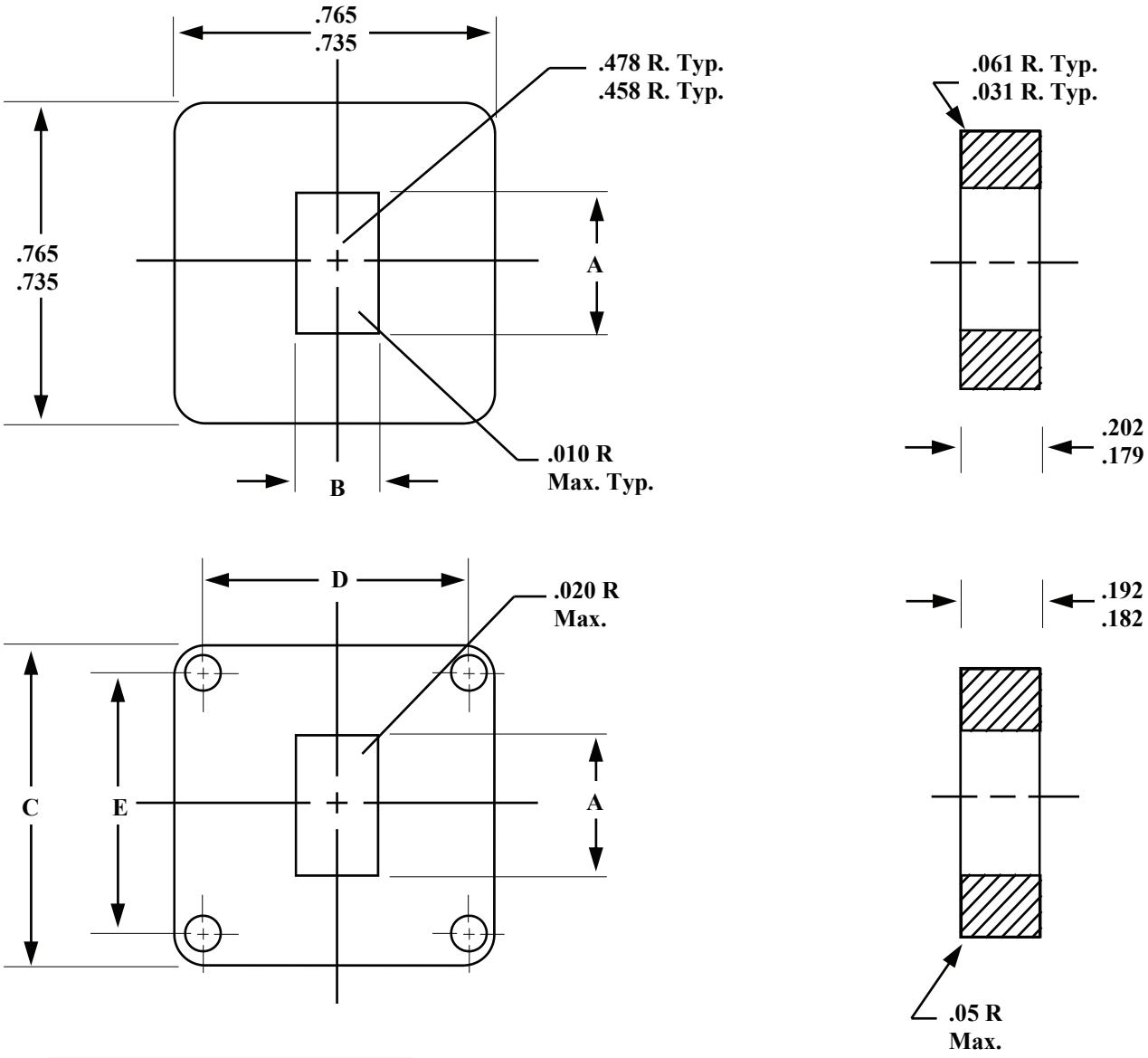
Finished Flange and Waveguide



MIWV Band	Frequency Band (GHz)	MIL Part Number M3922/54-4	A ± .0015 (.04)	B ± .0015 (.04)	C	D BSC	E BSC	F	H	MIWV Flange
K	18.0 26.5	-001	.4200 (10.67)	.1700 (4.32)	.875±.015 (22.22)(.38)	.335 (8.51)	.320 (8.13)	.156±.015 (3.96)(.38)	.116+.002 (2.95)(.05)	UG-595/U
A	26.5 40.0	-003	.2800 (7.11)	.1400 (3.56)	.750±.005 (19.05)(1.3)	.265 (6.75)	.250 (6.35)	.109±.005 (2.77)(.38)	.116+.002 (2.95)(.05)	UG-599/U
B	33.0 50.0	N/A	.2240 (5.69)	.1120 (2.84)	.750±.005 (19.05)(1.3)	.265 (6.75)	.250 (6.35)	.156±.005 (3.96)(.38)	.116+.002 (2.95)(.05)	719 (UG-599/UM)
B	33.0 50.0	N/A	.2240 (5.69)	.1120 (2.84)	.750±.005 (19.05)(1.3)	.265 (6.75)	.250 (6.35)	.156±.005 (3.96)(.38)	.112-40 UNC-2B	719T
U	40.0 60.0	N/A	.1880 (4.78)	.0940 (2.39)	.750±.005 (19.05)(1.3)	.265 (6.75)	.250 (6.35)	.187±.005 (4.75)(.38)	.116+.002 (2.95)(.05)	720 (UG-599/UM)
U	40.0 60.0	N/A	.1880 (4.78)	.0940 (2.39)	.750±.005 (19.05)(1.3)	.265 (6.75)	.250 (6.35)	.187±.005 (4.75)(.38)	.112-40 UNC-2B	720T

Appendix I Cover Flanges

Flange Blank



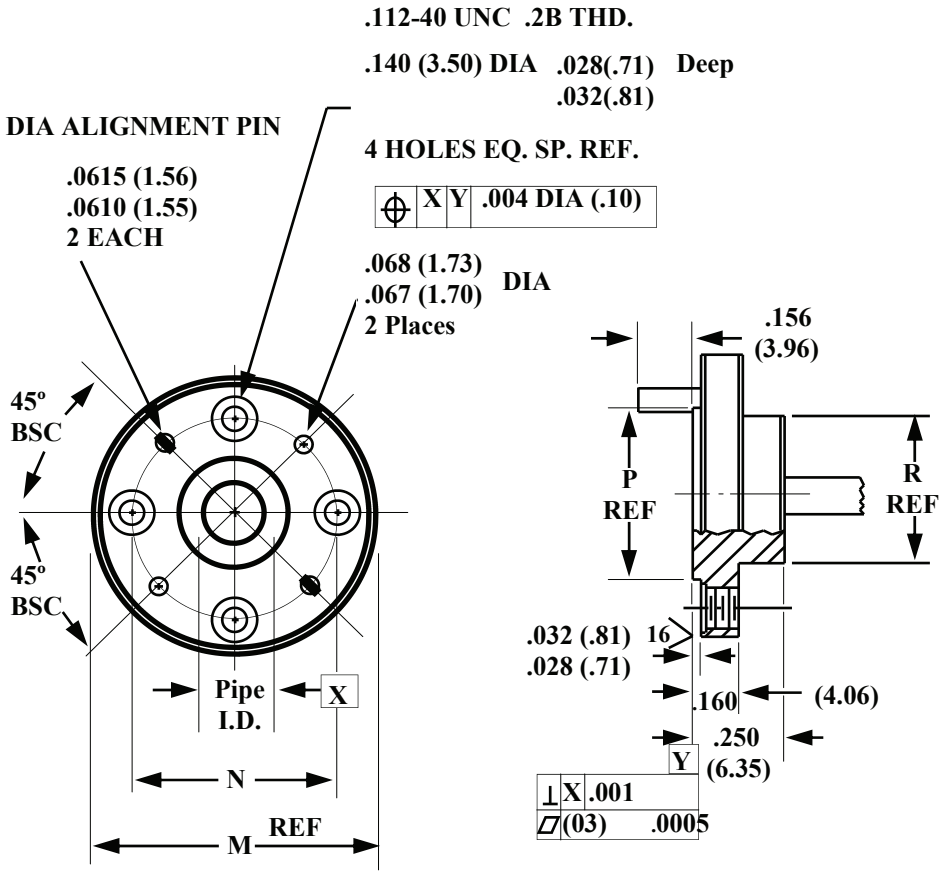
MIWV Part Number	A +.002 - .000	B +.002 - .000
719B	.306	.194
720U	.270	.176

MIWV Flange Designation	A	B	C	D BSC	E BSC
UG 599A	.364 .362	.224 .222	.755 .745	.530	.500
UG 595K	.505 .503	.255 .253	.890 .860	.670	.640

Appendix J Antenna TE $_{11}$ Circular Waveguides

Band	Pipe ID	Frequency Band
Ku-1	.660	12.4 - 14.6
Ku-2	.550	14.6 - 17.5
K-1	.470	17.5 - 20.5
K-2	.396	20.5 - 24.5
K-3	.328	24.5 - 26.5
A-0	.328	26 - 28.5
A-1	.281	28.5 - 33
A-2	.250	33 - 38.5
A-3	.219	38.5 - 43
B-0	.250	33 - 38.5
B-1	.219	38.5 - 43
B-2	.188	43 - 50
U-0	.219	38.5 - 43
U-1	.188	43 - 50
U-2	.165	50 - 58
V-0	.165	50 - 58
V-1	.141	58 - 68
V-2	.125	68 - 77
E-0	.141	58 - 68
E-1	.125	68 - 77
E-2	.110	77 - 87
E-3	.094	87 - 100
W-0	.110	77 - 87
W-1	.094	87 - 100
W-2	.082	100 - 112
F-0	.094	87 - 100
F-1	.082	100 - 112
F-2	.075	112 - 125
F-3	.067	125 - 140
D-0	.082	100 -112
D-1	.075	112 - 125
D-2	.067	125 - 140
D-3	.059	140 - 160
G-0	.067	125 - 140
G-1	.059	140 - 220

Where frequency has two pipe sizes take smaller pipe, except for 100 GHZ and higher, then take larger pipe.



MIWV Band	M +.000 / .002 (.05)	N BSC	P +.005 (.13)	R +.005 (.13)	MIWV Flange Designation	MIWV Flange Blank
Ku	1.44 (36.58)	1.250 (28.6)	.967 (24.6)	.967 (24.6)	731	108872
K	1.125 (28.58)	.9375 (23.8)	.625 (15.88)	.625 (15.88)	UG-425/U	107729-7
A	1.125 (28.58)	.9375 (23.81)	.500 (12.70)	.468 (11.89)	UG-381/U	107729-1
B	1.125 (28.58)	.9375 (23.81)	.500 (12.70)	.468 (11.89)	UG-383/U	107729-2
U	1.125 (28.58)	.9375 (23.81)	.500 (12.70)	.468 (11.89)	UG-385/U-M	107729-3
V	.750 (19.05)	.5625 (14.29)	.375 (9.53)	.312 (7.92)	UG-387/U	107729-4
E	.750 (19.50)	.5625 (14.29)	.375 (9.53)	.312 (7.92)	UG-387/U-M	107729-5
W	.750 (19.50)	.5625 (14.29)	.375 (9.53)	.312 (7.92)	UG-387/U-M	107729-6
F	.750 (19.50)	.5625 (14.29)	.375 (9.53)	.312 (7.92)	UG-387/U-M	107729-8
D	.750 (19.50)	.5625 (14.29)	.375 (9.53)	.312 (7.92)	UG-387/U-M	107729-9
G	.750 (19.50)	.5625 (14.29)	.375 (9.53)	.312 (7.92)	UG-387/U-M	107729-10

Appendix K The Effect of VSWR on Transmitted Power

VSWR	Return Loss (dB)	VSWR (dB)	Volt REFL COEFF	XMSN Loss (dB)	Power XMIT (%)	Power REFL (%)	VSWR	Return Loss (dB)	VSWR (dB)	Volt REFL COEFF	XMSN Loss (dB)	Power XMIT (%)	Power REFL (%)
1.006	50.00	0.05	0.00	.0000	100.	0.00	1.31	17.45	2.35	0.13	0.08	98.20	1.80
1.01	46.06	0.09	0.00	.0001	100.	0.00	1.32	17.21	2.41	0.14	0.08	98.10	1.90
1.011	45.00	0.10	0.01	.0001	100.	0.00	1.329	17.00	2.47	0.14	0.09	98.00	2.00
1.02	40.09	0.17	0.01	.0004	99.99	0.01	1.33	16.98	2.48	0.14	0.09	97.99	2.01
1.020	40.00	0.17	0.01	.0004	99.99	0.01	1.34	16.75	2.54	0.15	0.09	97.89	2.11
1.03	36.61	0.26	0.01	.0009	99.98	0.02	1.35	18.54	2.61	0.15	0.10	97.78	2.22
1.036	35.00	0.31	0.02	.0014	99.97	0.03	1.36	16.33	2.61	0.15	0.10	97.67	2.33
1.04	34.15	0.34	0.02	.0017	99.96	0.04	1.37	16.13	2.73	0.16	0.11	97.56	2.44
1.045	33.15	0.38	0.02	.0021	99.95	0.05	1.377	16.00	2.78	0.16	0.11	97.49	2.51
1.05	32.26	0.42	0.02	.0026	99.94	0.06	1.38	15.94	2.80	0.16	0.11	97.45	2.55
1.06	30.71	0.51	0.03	.0037	99.92	0.08	1.39	15.75	2.86	0.16	0.12	97.34	2.66
1.065	30.00	0.55	0.03	.0043	99.90	0.10	1.40	15.56	2.92	0.17	0.12	97.22	2.78
1.07	29.42	0.59	0.03	.0050	99.89	0.11	1.41	15.38	2.98	0.17	0.13	97.11	2.89
1.08	28.30	0.67	0.04	.0064	99.85	0.15	1.42	15.21	3.05	0.17	0.13	96.99	3.01
1.09	27.32	0.75	0.04	.0081	99.81	0.19	1.43	15.04	3.11	0.18	0.14	96.87	3.13
1.10	26.44	0.83	0.05	.0099	99.77	0.23	1.433	15.00	3.12	0.18	0.14	96.84	3.16
1.11	25.66	0.91	0.05	.0118	99.73	0.27	1.44	14.88	3.17	0.18	0.14	96.75	3.25
1.119	25.00	0.98	0.06	.0138	99.68	0.32	1.45	14.72	3.23	0.18	0.15	96.63	3.37
1.12	24.94	0.98	0.06	.0139	99.68	0.32	1.46	14.56	3.29	0.19	0.15	96.50	3.50
1.13	24.29	1.06	0.06	.0162	99.63	0.37	1.464	14.50	3.31	0.19	0.16	96.45	3.55
1.135	24.00	1.10	0.06	.0173	99.60	0.40	1.47	14.41	3.35	0.19	0.16	96.38	3.62
1.14	23.69	1.14	0.07	.0186	99.57	0.43	1.48	14.26	3.41	0.19	0.17	96.25	3.75
1.15	23.13	1.21	0.07	.0212	99.51	0.49	1.49	14.12	3.46	0.20	0.17	96.13	3.87
1.152	23.00	1.23	0.07	.0218	99.50	0.50	1.499	14.00	3.51	0.20	0.18	96.02	3.98
1.16	22.61	1.29	0.07	.0239	99.45	0.55	1.50	13.96	3.52	0.20	0.18	96.00	4.00
1.17	22.12	1.36	0.08	.0267	99.39	0.61	1.536	13.50	3.73	0.21	0.20	95.53	4.47
1.173	22.00	1.38	0.08	.0275	99.37	0.63	1.55	13.32	3.81	0.22	0.21	95.35	4.65
1.18	21.66	1.44	0.08	.0297	99.32	0.68	1.577	13.00	3.96	0.22	0.22	94.99	5.01
1.19	21.23	1.51	0.09	.0328	99.25	0.75	1.60	12.74	4.08	0.23	0.24	94.67	5.33
1.196	21.00	1.55	0.09	.0346	99.21	0.79	1.622	12.50	4.20	0.24	0.25	94.38	5.62
1.20	20.83	1.58	0.09	.0360	99.17	0.83	1.65	12.21	4.35	0.25	0.27	93.98	6.02
1.21	20.44	1.66	0.10	.0394	99.10	0.90	1.671	12.00	4.46	0.25	0.28	93.69	6.31
1.22	21.08	1.73	0.10	.0429	99.02	0.98	1.70	11.73	4.61	0.26	0.30	93.28	6.72
1.222	20.00	1.74	0.10	.0436	99.00	1.00	1.725	11.50	4.74	0.27	0.32	92.92	7.08
1.23	19.73	1.80	0.10	.0464	98.94	1.06	1.75	11.29	4.86	0.27	0.34	92.56	7.44
1.24	19.40	1.87	0.11	.0501	98.85	1.15	1.785	11.00	5.03	0.28	0.36	92.06	7.94
1.25	19.08	1.94	0.11	.0540	98.77	1.23	1.80	10.88	5.11	0.29	0.37	91.84	8.16
1.253	19.00	1.96	0.11	.0550	98.74	1.26	1.851	10.50	5.35	0.30	0.41	91.09	8.16
1.26	18.78	2.01	0.12	.0579	98.68	1.32	1.90	10.16	5.58	0.31	0.44	90.37	9.63
1.27	18.49	2.08	0.12	.0619	98.59	1.41	1.925	10.00	5.69	0.32	0.46	90.00	10.00
1.28	18.22	2.14	0.12	.0660	98.49	1.51	2.00	9.54	6.02	0.33	0.51	88.89	11.11
1.288	18.00	2.20	0.13	.0694	98.42	1.58	2.50	7.36	7.96	0.43	0.88	81.63	18.37
1.29	17.95	2.21	0.13	.0702	98.40	1.60	3.00	6.02	9.54	0.50	1.25	75.00	25.00
1.30	17.89	2.28	0.13	.0745	98.30	1.70	3.50	5.11	10.88	0.56	1.60	69.14	30.86

Appendix L Table 2-1 TE_{01} Circular Waveguides

Standard Waveguide		MIL-W-23068 Circular Waveguide		
I.D. O.D. (inches)	Frequency (GHz)	I.D. O.D. (inches)	Frequency (GHz)	Type
1.500 X 1.750	11.6-16.0	1.500 X 1.700	11.6-16.0	WRC530D14
1.265 X 1.375	13.2-18.9	1.281 X 1.441	13.6-18.7	WRC621D14
1.106 X 1.250	15.9-21.9	1.094 X 1.224	15.9-21.9	WRC727D14
0.951 X 1.125	18.6-25.6	0.938 X 1.068	18.6-25.6	WRC849D14
0.686 X 0.750	25.3-34.9	0.797 X 0.897	21.9-30.1	WRC997D14
0.688 X 0.888	25.3-34.9	0.688 X 0.788	25.3-34.9	WRC116C14
0.634 X 0.750	27.3-38.0	0.594 X 0.674	29.3-40.4	WRC134C14
0.545 X 0.625	32.0-44.0	———	———	N/A
0.495 X 0.625	34.8-48.0	0.500 X 0.580	34.8-48.0	WRC159C14
———	———	04.38 X 0.518	39.8-54.8	WRC182C14
0.370 X 0.500	46.4-63.9	0.375 X 0.435	46.4-63.9	WRC212C14
0.353 X 0.438	50.0-68.0	0.328 X 0.388	53.1-73.1	WRC243C14
0.291 X 0.375	62.0-84.0	0.281 X .0341	61.9-85.2	WRC283C14
0.249 X 0.313	69.7-95.9	0.250 X 0.290	69.7-95.9	WRC318C14
0.201 X 0.290	86.0-115.0	0.219 X 0.259	79.6-110.0	WRC364C14
0.186 X 0.250	93.0-128.0	0.188 X 0.228	92.9-128.0	WRC424C14
———	———	0.172 X 0.212	101.0-139.0	WRC463C14
———	———	0.141 X 0.181	124.0-171.0	WRC566C14

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The following terms and conditions apply to all purchase orders accepted and all quotations submitted by ***Mi-Wave***, hereinafter referred to as ***Mi-Wave.*** Orders accepted by ***Mi-Wave*** are based on Buyer's acceptance of these Terms and Conditions. Return of this acknowledgement by ***Mi-Wave***, and only such acknowledgement, constitutes acceptance of the Buyer's purchase order. Acceptance by the Buyer of merchandise shipped against any purchase order acknowledges acceptance of the Terms and Conditions set forth in this document. Failure of ***Mi-Wave*** to enforce any of these provisions does not relieve Buyer from all Terms and Conditions contained herein.

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Mi-Waves' warranty obligations shall be limited to, at ***Mi-Waves'*** option, repairing, replacing, or granting a credit at the purchase order price for items returned to ***Mi-Wave*** at the Buyer's expense within 90 days of delivery that are determined to be defective by analysis at ***Mi-Waves'*** facility. Material that has been misapplied, mechanically or electrically over stressed, repaired or altered in any way will not be warranteed. ***Mi-Wave*** warrants that its products conform to applicable specifications and are free from defects in material or workmanship. No other warranties exist or are implied. This warranty is not transferable.

Repairs at the Buyer's expense will only be accepted when accompanied by a purchase order issued to ***Mi-Wave*** for estimated cost to repair. RMA's are issued only for in warrenty repairs.

Quoted prices shall be valid and firm for thirty (30) days. All prices are subject to change without notice. Prices accepted by the Buyer and acknowledged by ***Mi-Wave*** shall remain in effect throughout the term of the

Mi-Wave will not be responsible for delays caused by events outside of its control. ***Mi-Wave*** assumes no liability of any kind resulting from failure to meet delivery schedules.

All applicable taxes will appear on invoices issued by ***Mi-Wave*** to be paid by the Buyer, unless a properly executed exemption certificate is received with the purchase order or shipment and invoicing.

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Mi-Wave may change, delete, or add additional conditions without notice. Such changes will be made a part of all quotes and acceptance of purchase orders.

Mi-Wave

Millimeter Wave Products Inc.

www.miwv.com

2200 Tall Pines Drive, Suite 100

Largo, FL 33771

Tel. (727) 536-0033 Fax. (727) 536-0012

E: sales@miwv.com