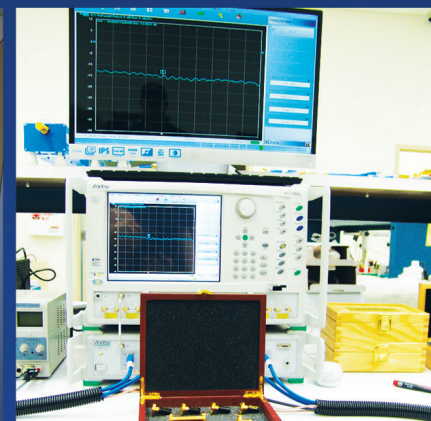
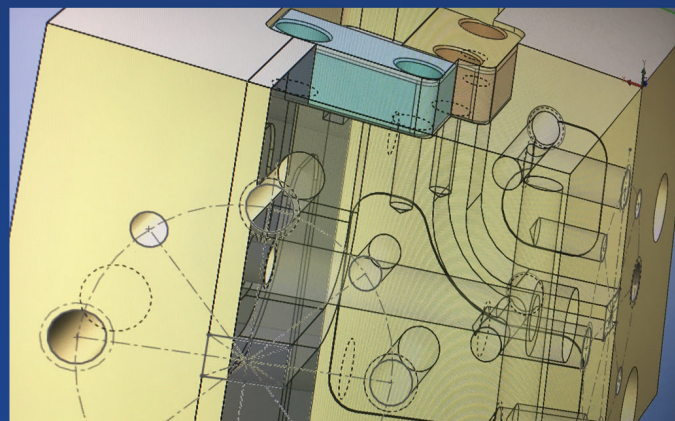


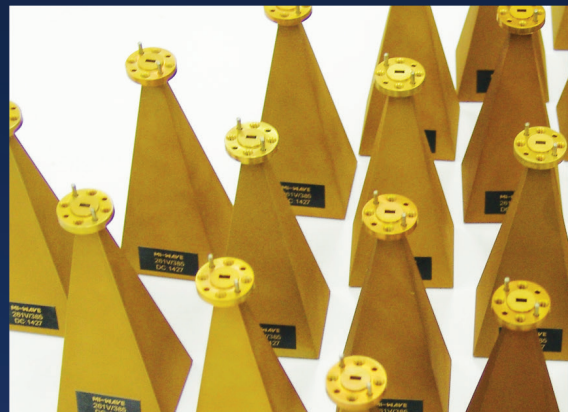
MI-WAVE®

Millimeter Wave Products Inc.

Millimeter Wave Products Inc. is a world wide leader in microwave and millimeter wave products for commercial and military applications.

Millimeter Wave Products Inc. 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.





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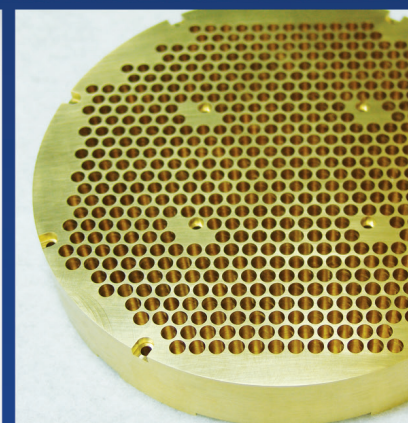
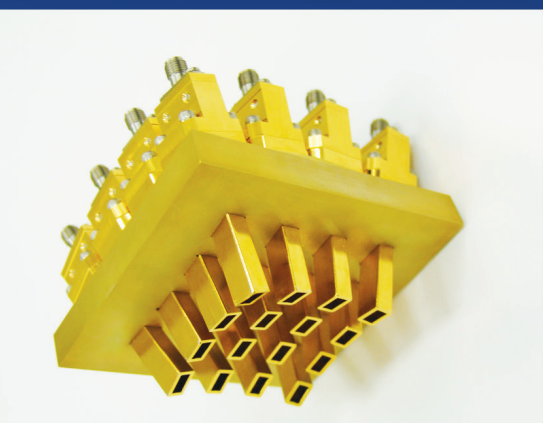
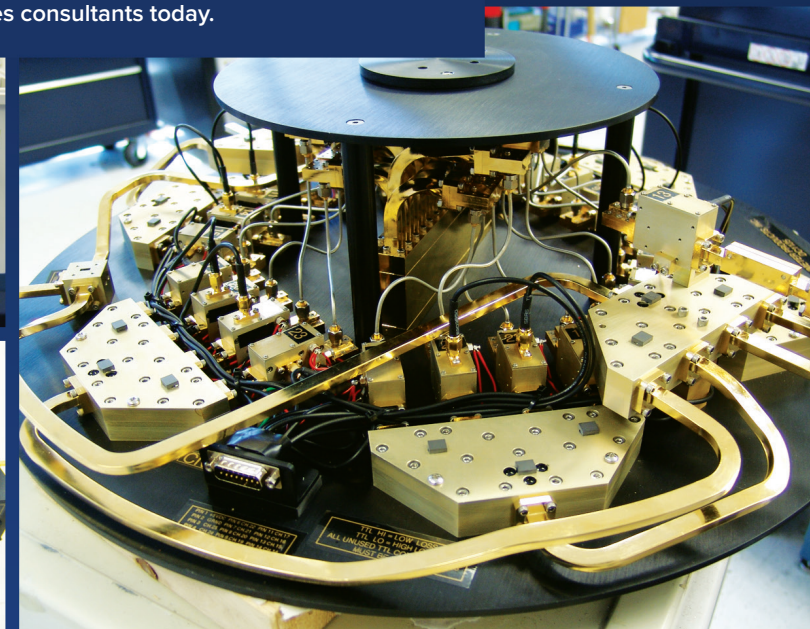


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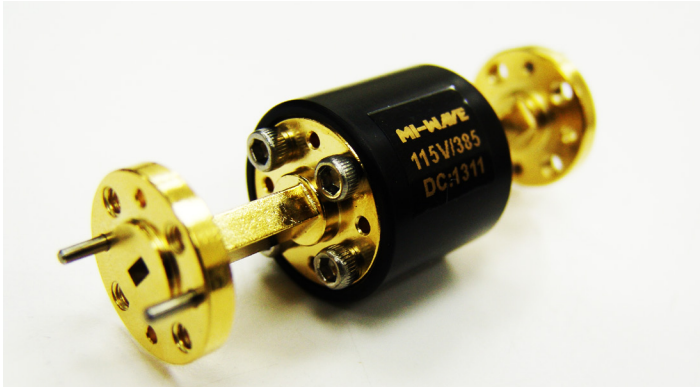
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All dimensions and technical specifications are subject to change without notice. Mi-Wave is not responsible for errors and changes.

Consult Mi-Wave at time of order for current production specifications.



Description

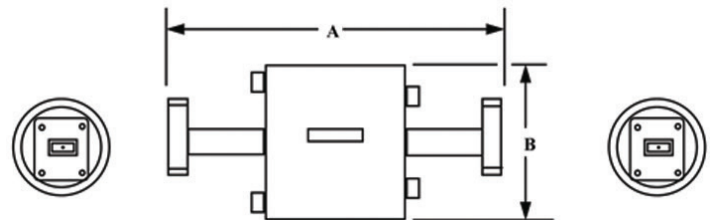
Mi-Wave's 115 series isolators use the Faraday principle of rotation in a broadband dielectric waveguide design to achieve high isolation across full waveguide bands. These isolators are available in standard waveguide sizes from 18.0 to 170 GHz. High-quality ferrite material is used in these isolators, and the magnetic field is produced by an integral permanent magnet. To ensure maximum reproducibility and performance, a combination of precise machining operations and refined assembly techniques are used.

- Low insertion loss
- Full waveguide band
- Excellent isolation across the band
- Faraday rotation principle of operation

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 automotive radar.

Dimensional Specifications				
Model No.	A		B	
	in.	mm	in.	mm
115K	4.34	110.2	1.25	31.8
115 WR-34	4.34	110.2	1.25	31.8
115A	3.43	85.9	1.25	31.8
115B	2.79	68.3	1.25	31.8
115U	2.57	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
115F	2.33	59.2	0.88	22.2
115D	2.31	59.7	0.88	22.2
115G	2.29	58.2	0.88	22.2



WARNING

Sensitive ferromagnetic devices are susceptible to 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.

TECHNICAL SPECIFICATIONS (TYPICAL)											
Model No.	115K	115	115A	115B	115U	115V	115E	115W	115F	115D	115G
Frequency	18–26.5	22–33.0	26.5–40	33–50	40–60	50–70	60–90	75–110	90–140	110–170	140–220
Isolation	25	25	25	25	25	25	25	25	22	20	20
Insertion loss (dB) Typ.	1.0	1.0	1.0	1.3	1.5	1.7	2.0	2.2	2.7*	3.1*	3.5*
VSWR (Typ.)	1.30	1.30	1.30	1.30	1.30	1.35	1.35	1.40	1.50	1.50*	1.50*
Power Handling (Watts Max)	2.0	2.0	2.0	1.5	1.5	1.0	1.0	1.0	0.4	0.2	0.2
Waveguide size	WR-42	WR-34	WR-28	WR-22	WR-19	WR-15	WR-12	WR-10	WR-08	WR-06	WR-05
Waveguide Flange ¹	UG-595/U (54-4-001)	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)	UG-387/U (67-2-010)	UG-387/U (67-2-010)	UG-387/U (67-2-010)	UG-387/U (67-2-010)

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

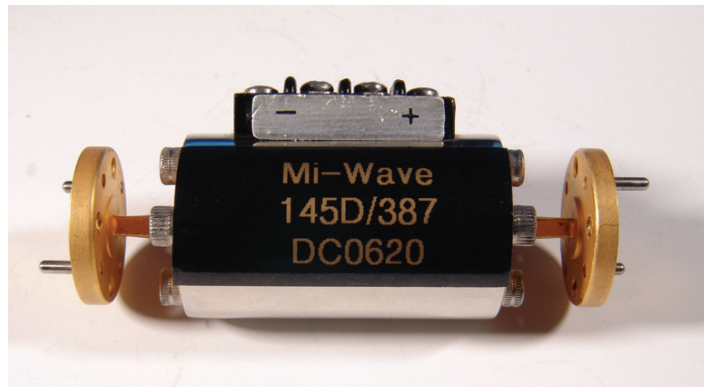
* Nominal Values

Description

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 $\pm 90^\circ$ 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.

- **Low VSWR**
- **Low Insertion Loss**
- **Faraday Rotation Devices**
- **Low Cross-polarization components**



Applications

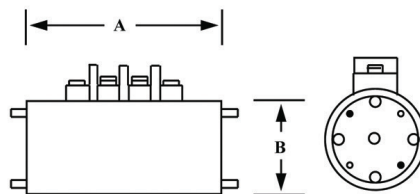
Used primarily in conjunction with the antenna product line, the 145 series polarization switch provides a means of remote controlled polarization change. These switches can be used to align polarization between satellite and ground station communication when the satellite polarization is unknown. They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

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. Appendix J

Ordering Information

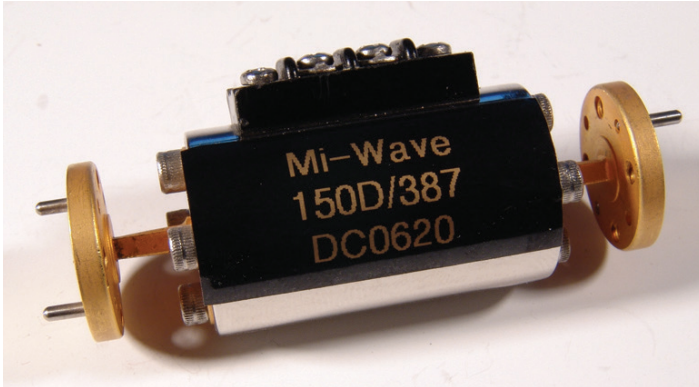
145



TECHNICAL SPECIFICATIONS							
Model No.	145A	145B	145U	145V	145E	145W	145F
Frequency Band (GHz)	26.5–40	33–50	40–60	50–70	60–90	75–110	90–140
Insertion Loss (dB) ¹	0.5	0.5	0.5	0.5	0.5	0.5	0.5
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
Band Width (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						

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 Upon Request....			
145-165	1.69	42.9	0.88	22.4
145-141 Upon Request....			
145-125	1.69	42.9	0.88	22.4
145-110	1.69	42.9	0.88	22.4
145-094	1.69	42.9	0.88	22.4
145-082 Upon Request....			
145-075	Upon Request			
145-067	1.50	38.1	0.88	22.4
145-059	Upon Request			

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.



Description

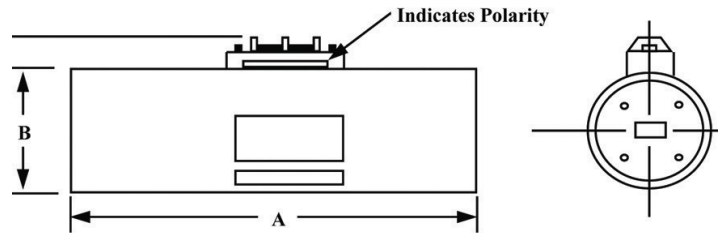
Mi-Wave's 150 Series is a suppressed rotation reciprocal ferrite phase shifter, built completely in rectangular waveguide to suppress Faraday rotational tendencies in the ferrite at the frequency of operation. This construction allows a low variation in loss as phase is changed. Rise time can be optimized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

- *Fast Rise-time*
- *180° Phase Shift*
- *Remote Controlled*

Applications

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

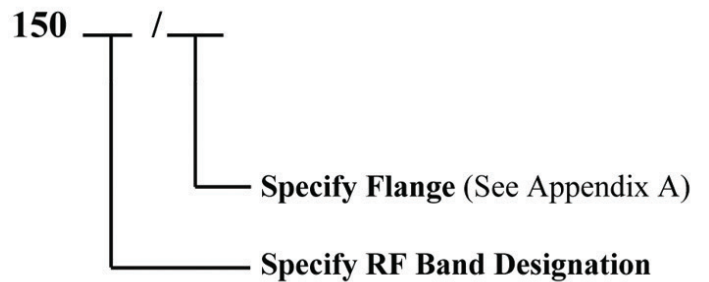
Dimensional Specifications						
Model No.	A		B		C	
	in.	mm	in.	mm	in.	mm
150A	6.00	152.4	1.25	31.8	1.53	38.9
150B	3.30	83.8	1.25	31.8	1.53	38.9
150U	3.30	83.8	1.25	31.8	1.53	38.9
150V	3.00	76.2	0.88	22.4	1.13	28.7
150E	2.50	63.5	0.88	22.4	1.13	28.7
150W	2.50	63.5	0.88	22.4	1.13	28.7



TECHNICAL SPECIFICATIONS (TYPICAL)						
Model No.	150A	150B	150U	150V	150E	150W
Frequency Band (GHz)	26.5-40	33-50	40-60	50-70	60-90	75-110
Insertion Loss (dB) max	2.5	2.7	2.8	3.0	3.0	3.0
VSWR (Typ)	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.

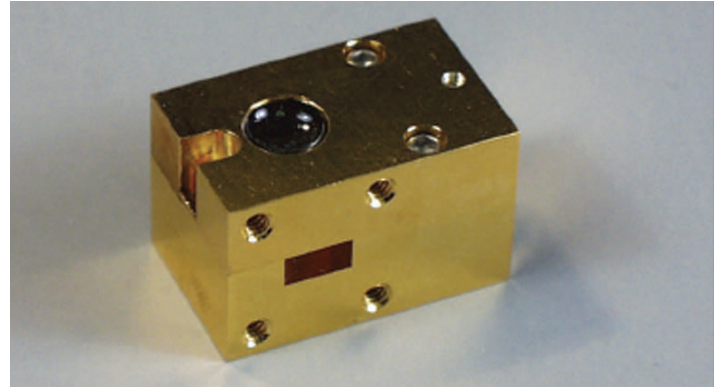
Ordering Information



Description

Mi-Wave's 172 Series is an H-plan, 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.

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



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.

PLEASE NOTE:

- Low-cost production versions available for telecommunications applications.
- Smaller versions of certain model numbers are available.
- Consult Mi-Wave for current dimensions.
- Wide bandwidth available

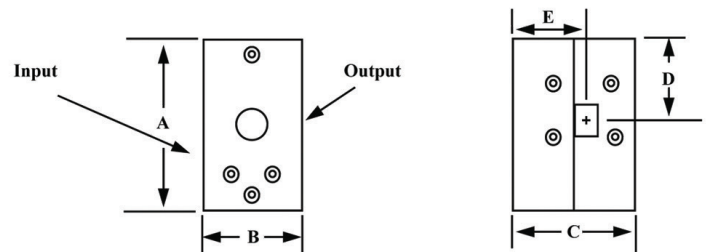
Dimensional Specifications

Model No.	A		B		C		D		E	
	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
172K	1.50	38.1	0.88	22.4	1.25	31.8	0.63	16.0	0.63	16.0
172A	1.20	30.5	0.75	19.1	0.75	19.1	0.38	9.7	0.38	9.7
172B	1.20	30.5	0.75	19.1	0.75	19.1	0.38	9.7	0.38	9.7

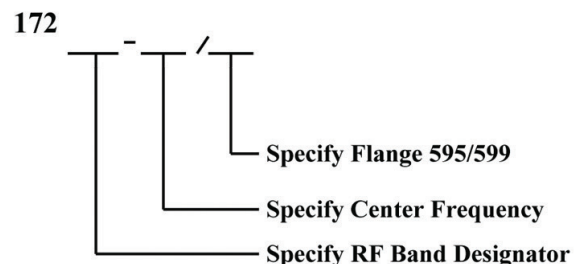
TECHNICAL SPECIFICATIONS

(TYPICAL)

Model No.	172K	172WR-34	172A	172B
Frequency Band (GHz)	18–26.5	22–33	26.5–40	33–50
Bandwidth¹	2.0 GHz	2.0 GHz	1.5 GHz	1.3 GHz
Isolation² (dB)	20.0	20.0	20.0	20.0
Insertion Loss (dB)¹	0.3	0.3	0.4	0.5
VSWR² Max	1.30	1.30	1.30	1.30
Temperature Range	-15° to +65°C			
Peak Power (kW)	1.0	1.0	1.0	1.0
Average Power (Watts)	—			
Forward	30	30	30	25
Backward	1.5	1.5	1.0	0.8
Weight (oz)	2.0	2.0	2.0	2.0
Flange Type	UG-595/U	UG-595/U	UG-599/U	UG-599/U

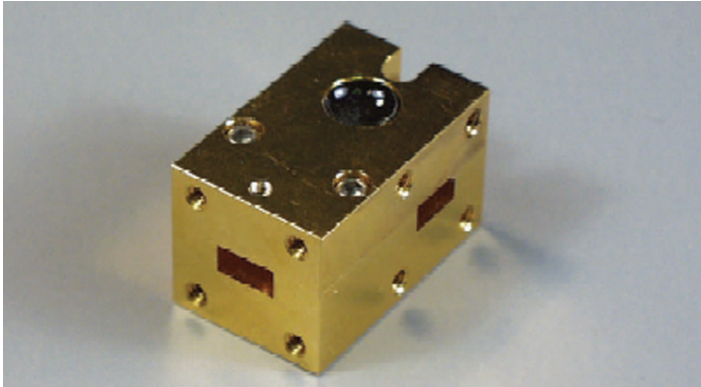


Ordering Information



1. Specify center frequency.
2. Wider bandwidths are available.

I Full Band Version available for WR-42 + WR-28



Description

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.

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

Applications

The 173 Series Y-Junction circulators are useful in transceivers, radars, and operational systems.

PLEASE NOTE:

- Smaller versions of certain model numbers are available.
- Consult Mi-Wave for current dimensions.

* Wider Bandwidths Available

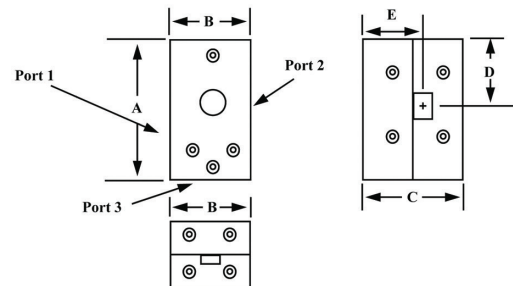
Dimensional Specifications

Model No.	A		B		C		D		E	
	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
173K	1.50	38.1	0.88	22.4	1.25	31.8	0.63	16.0	0.63	16.0
173A	1.20	30.5	0.75	19.1	0.75	19.1	0.38	9.7	0.38	9.7
173B	1.20	30.5	0.75	19.1	0.75	19.1	0.38	9.7	0.38	9.7

TECHNICAL SPECIFICATIONS

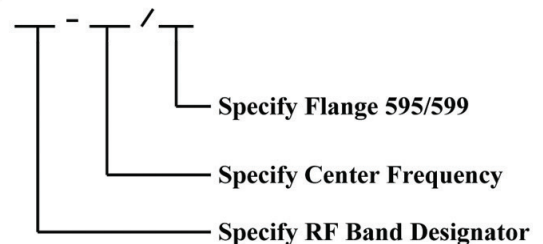
(TYPICAL)

Model No.	173K	173WR-34	173A	173B
Frequency Band (GHz)	18–26.5	22–33	26.5–40	33–50
Bandwidth¹	1.8 GHz	1.8 GHz	1.5 GHz	1.3 GHz
Isolation² (dB)	18.0	18.0	18.0	18.0
Insertion Loss (dB)¹	0.3	0.3	0.4	0.5
VSWR² (Typ)	1.30	1.30	1.30	1.30
Temperature Range	-15° to +65°C			
Peak Power (kW)	1.0	1.0	1.0	1.0
Average Power (Watts)	30	30	30	25
Weight (oz)	2.0	2.0	20	2.0
Flange Type	UG-595/U	UG-599/U	UG-599/U	UG-599/U



Ordering Information

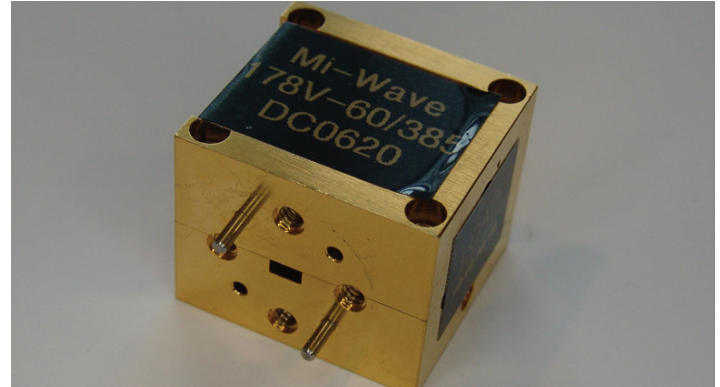
173



Description

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 179 Series isolators are available in standard waveguide sizes from 18.0 to 110 GHz, in round style flanges only.

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



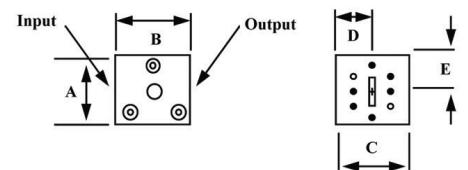
Applications

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.

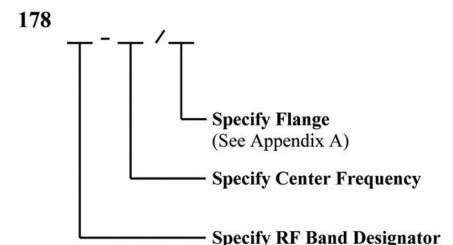
*Wider Bandwidths Available

Dimensional Specifications										
Model No.	A		B		C		D		E	
	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
178K	1.50	38.1	1.25	31.8	1.18	29.97	0.59	14.9	0.59	14.9
178A	1.50	38.1	1.25	31.8	1.18	29.97	0.59	14.9	0.59	14.9
178B	1.50	38.1	1.25	31.8	1.18	29.97	0.59	14.9	0.59	14.9
178U	1.50	38.1	1.25	31.8	1.18	29.97	0.59	14.9	0.59	14.9
178V	1.10	27.9	1.00	25.4	0.90	22.9	0.50	12.7	0.50	11.4
178E	1.10	27.9	1.00	25.4	0.90	22.9	0.50	12.7	0.50	11.4
178W	1.10	27.9	1.00	25.4	0.90	22.9	0.50	12.7	0.50	11.4
178F	1.10	27.9	1.00	25.4	0.90	22.9	0.50	12.7	0.50	11.4

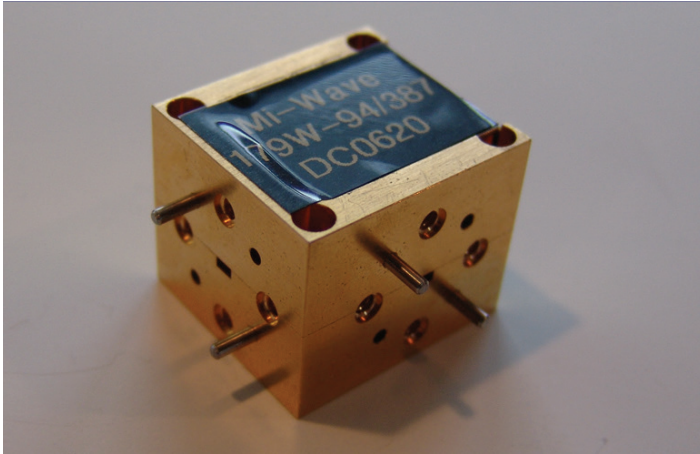
TECHNICAL SPECIFICATIONS								
(TYPICAL)								
Model No.	178K	178A	178B	178U	178V	178E	178W	178F
Frequency Band (GHz)	18–26.5	26.5–40	33–50	40–60	50–75	60–90	75–110	90–140
Bandwidth¹	1.8 GHz	1.5 GHz	1.3 GHz	1.3 GHz	1.5 GHz	1.5 GHz	1.5 GHz	1.5 GHz
Isolation² (dB) (typ)	20.0	20.0	20.0	18.0	18.0	15.0	15.0	15.0
Insertion Loss (dB)¹ (typ)	0.4	0.4	0.5	0.7	0.8	0.9	1.0	1.3
VSWR Max (typ)	1.30	1.30	1.30	1.35	1.40	1.4	1.4	1.4
Temperature Range	-15° to +65°C							
Peak Power (kW)	1.0	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	2
Backward	1.5	1.0	0.8	0.4	0.3	0.2	0.2	0.2
Weight (oz)	2.0	2.0	2.0	2.0	3.0	3.0	3.0	3.0
Flange Type	UG-425/U	UG-381/U	UG-383/U	UG-383/U	UG-385/U	UG-387/U	UG-387/U	UG-387/U



Ordering Information



1. Specify center frequency.



Description

Mi-Wave's 179 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.

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

Applications

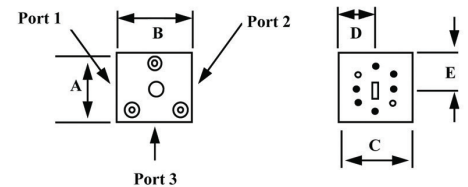
179 Series Y-junction circulators are useful in test setup and operational systems

* Wider Bandwidths Available

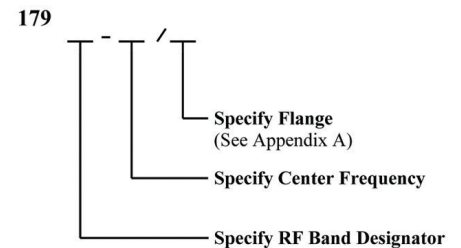
Dimensional Specifications										
Model No.	A		B		C		D		E	
	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
179K	1.50	38.1	1.25	31.8	1.18	29.97	0.59	14.9	0.59	14.9
179A	1.50	38.1	1.25	31.8	1.18	29.97	0.59	14.9	0.59	14.9
179B	1.50	38.1	1.25	31.8	1.18	29.97	0.59	14.9	0.59	14.9
179U	1.50	38.1	1.25	31.8	1.18	29.97	0.59	14.9	0.59	14.9
179V	1.10	27.9	1.00	25.4	0.90	22.9	0.50	12.7	0.50	11.4
179E	1.10	27.9	1.00	25.4	0.90	22.9	0.50	12.7	0.50	11.4

TECHNICAL SPECIFICATIONS							
(TYPICAL)							
Model No.	179K	179A	179B	179U	179V	179E	179W
Frequency Band (GHz)	18–26.5	26.5–40	33–50	40–60	50–75	60–90	75–110
Bandwidth ¹	1.8 GHz	1.3 GHz	1.2 GHz	1.2 GHz	1.3 GHz	1.3 GHz	1.3 GHz
Isolation ² (dB) (typ)	18.0	18.0	18.0	15.0	15.0	15.0	15.0
Insertion Loss (dB) ¹ (typ)	0.4	0.4	0.5	0.7	1.0	1.0	1.0
VSWR Max (typ)	1.30	1.30	1.30	1.35	1.40	1.4	1.4
Temperature Range	-15° to +65°C				0° 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)	2.0	2.0	2.0	2.0	3.0	3.0	3.0
Flange Type	UG-425/U	UG-381/U	UG-383/U	UG-383/U	UG-385/U	UG-387/U	UG-387/U

1. Specify center frequency.



Ordering Information



Description

Mi-Wave's 180 series is an H-plane, three-junction, 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.

- *Low Loss*
- *Low VSWR*
- *High Isolation (30 db typ.)*

The 180 Series circulators are available in standard wave-guide sizes from 18.00 to 110 GHz.

Applications

The 180 Series Y-junction circulators are useful in radar, sensing and communication systems.



Dimensional Specifications

Model No.	A		B		C		D		E	
	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
180K	K-W Band please consult MI-Wave for current outline									
180A										
180B										
180U										
180V										
180E										
180W										

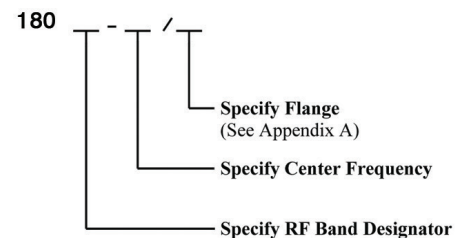
TECHNICAL SPECIFICATIONS

(TYPICAL)

Model No.	180K	180A	180B	180U	180V	180E	180W
Frequency Band (GHz)	18–26.5	26.5–40	33–50	40–60	50–75	60–90	75–110
Bandwidth ¹	1.2 GHz	1.2 GHz	1.0 GHz	1.0 GHz	1.0 GHz	1.0 GHz	1.0 GHz
Isolation ² (dB) (typ)	>30	>30	>30	>30	>30	>30	>30
Insertion Loss (dB) ¹ (typ)	0.7	0.8	0.9	1.0	1.2	1.4	1.5
VSWR (typ)	1.30	1.30	1.30	1.35	1.40	1.4	1.4
Temperature Range	-0° to +40°C				0° to +40°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	UG-595/U	UG-599/U	UG-383/U	UG-383/U	UG-385/U	UG-387/U	UG-387/U

1. Specify center frequency.

Ordering Information



Description

Mi-Wave's 180 series is an H-plane, three-junction, 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.

- **Low Loss**
- **Low VSWR**
- **High Isolation (30 db typ.)**

The 180 Series circulators are available in standard wave-guide sizes from 18.00 to 110 GHz.

Applications

The 180 Series Y-junction circulators are useful in radar, sensing and communication systems.



Dimensional Specifications

Model No.	A		B		C		D		E	
	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
180K	K-W Band please consult MI-Wave for current outline									
180A										
180B										
180U										
180V										
180E										
180W										

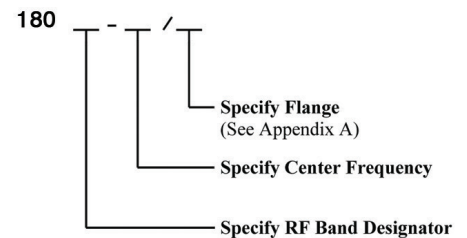
TECHNICAL SPECIFICATIONS

(TYPICAL)

Model No.	180K	180A	180B	180U	180V	180E	180W
Frequency Band (GHz)	18–26.5	26.5–40	33–50	40–60	50–75	60–90	75–110
Bandwidth ¹	1.2 GHz	1.2 GHz	1.0 GHz	1.0 GHz	1.0 GHz	1.0 GHz	1.0 GHz
Isolation ² (dB) (typ)	>30	>30	>30	>30	>30	>30	>30
Insertion Loss (dB) (typ)	0.7	0.8	0.9	1.0	1.2	1.4	1.5
VSWR (typ)	1.30	1.30	1.30	1.35	1.40	1.4	1.4
Temperature Range	-0° to +40°C				0° to +40°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	UG-595/U	UG-599/U	UG-383/U	UG-383/U	UG-385/U	UG-387/U	UG-387/U

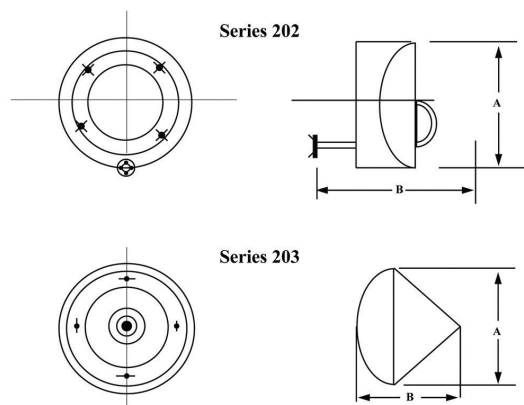
1. Specify center frequency.

Ordering Information



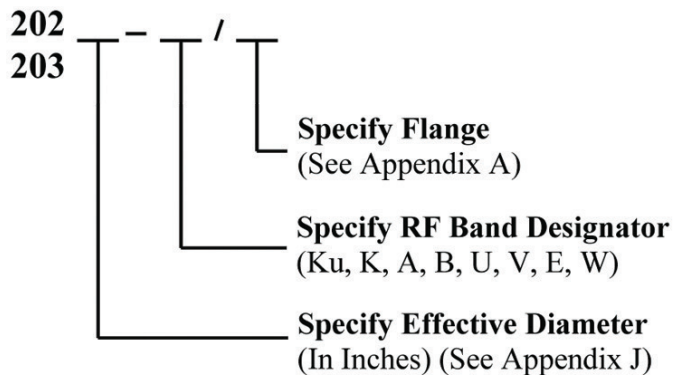
202 & 203 Series

Prime Focus Parabolic Antenna



(Consult Factory for Current Outline Details)

Ordering Information



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

Description

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 reflector in order to position the feed accurately. Tapped holes are provided on each antenna for mounting.

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

The 202 Series antennas feature a precision aluminum reflector which provides excellent performance at millimeter wave frequencies between 18 to 140 GHz and 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 makes them well-suited for applications where high performance is necessary.

For applications that require larger diameters, the 203 Series antennas feature metalized fiberglass reflectors and cover a frequency range from 12.4 to 140 GHz. They are available in diameters from 18 to 72 inches with low surface tolerances (typically 0.0023 inch RMS).

Applications

- Radar and Telemetry Systems
- Point to Point Communication Links

Dimensional Specifications

Model No.	Effective Diameter	A		B	
		in.	mm	in.	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	22.0	558	11.8	300
203	24	27.4	696	15.0	381
203	36	39.2	996	20.3	515
203	48	54.0	1372	23.5	597

PLEASE NOTE:

- Antenna feeds may vary due to reflector diameter performance requirements.
- Please consult Mi-Wave for further information and current dimensions.

Description

Mi-Wave's 222 Series Cassegrain Antenna consists of a parabolic reflector, a primary feed, sub-reflector, and a feed support assembly of four low profile aluminum spars that are attached to the rim of the reflector to position the feed.

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

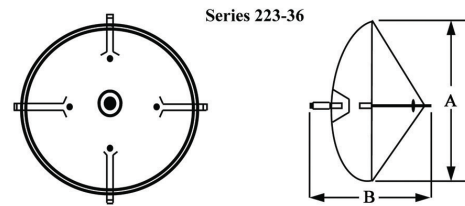
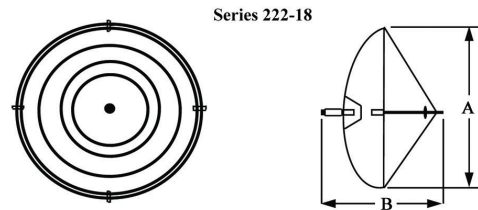
The 223 Series antennas feature metalized fiberglass reflectors and are available from 5.0 to 220 GHz. They offer very high performance in a lightweight antenna structure. These antennas are available in effective diameters of 10 to 84 inches. Because of the low surface tolerance (typically 0.0025 inch RMS) they provide excellent high frequency radiation characteristics.



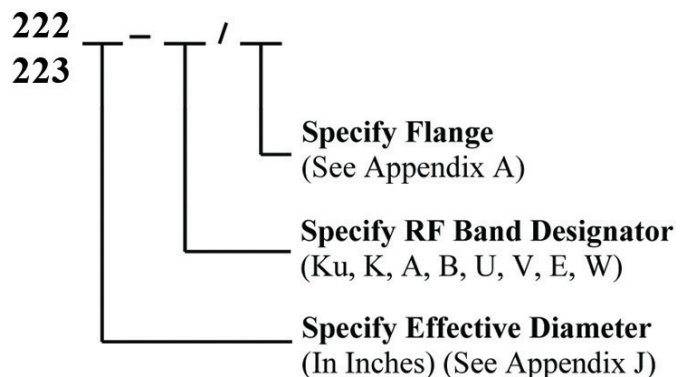
Applications

- Radars
- Satellite Tracking
- Communication Systems

Dimensional Specifications					
Model No.	Effective Diameter	A		B	
		in.	mm	in.	mm
222	12	14	376	12	257
222	18	16	564	18	338
222	24	20	716	28	394
223	18	22.2	564	13.3	338
223	24	28.2	706	15.5	394
223	36	39.1	993	20.9	531
223	48	54.0	1372	23.0	594



Ordering Information

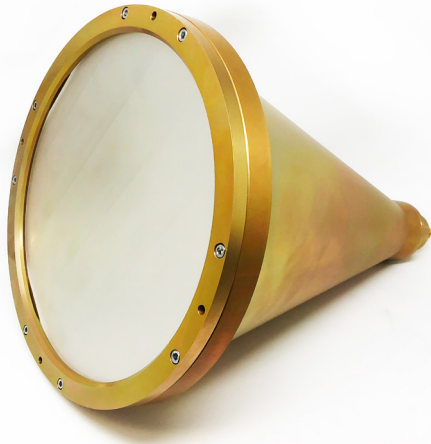


The center frequency should be specified when ordering these antennas.

PLEASE NOTE:

- Larger Diameters Available 60, 72, 84

Please consult Miwave for current dimensions



Description

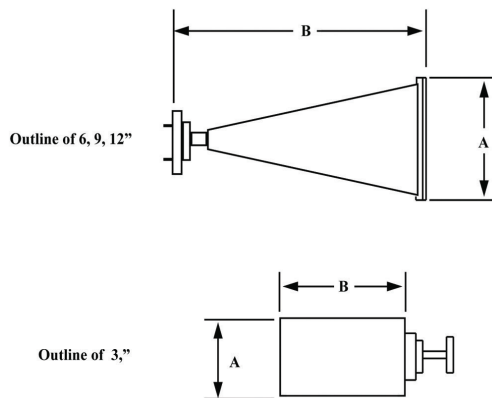
Mi-Wave's 258 Series horn lens antenna consists of a circular scalar feed horn illuminating a plano-convex lens. Housed in either aluminum or plastic, these horn lens antennas provide a high efficiency beam with equal E and H plane amplitude patterns.

- 8.4 to 260Ghz Available
- Simple Mechanical Performance
- Wide Range of Available Beamwidths and Reflector Sizes

The 258 Series antennas are available from 8 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.

Applications

Radars, Radioastronomy, Surveillance Equipment, and Communication Systems



PLEASE NOTE:

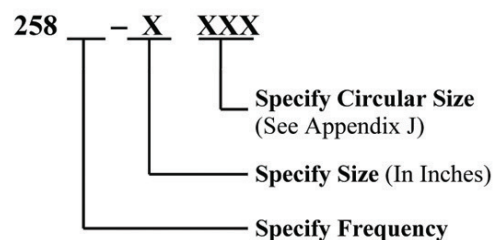
- Final dimensions are subject to variations from the tabulated data due to tuning, focusing, and mechanical tolerances.

Dimensional Specifications					
Model No.	Effective Diameter	A		B	
		in.	mm	in.	mm
258KU	12	14.0	356	21.0	533
258K	9	11.0	276	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	276	14.0	356
258A	12	14.0	356	18.2	462
258B, U	3	4.1	104	8.3	210
258B, U	6	7.6	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

Consult for current outline dimensions

Typical Electrical Specifications	
Frequency	12.4 to 140 GHz
Sizes	3, 6, 9, 12
Sidelobes	25dB (typical)
VSWR	1.2:1 (typical)
Cross Polarization	25dB (typical)

Ordering Information





Description

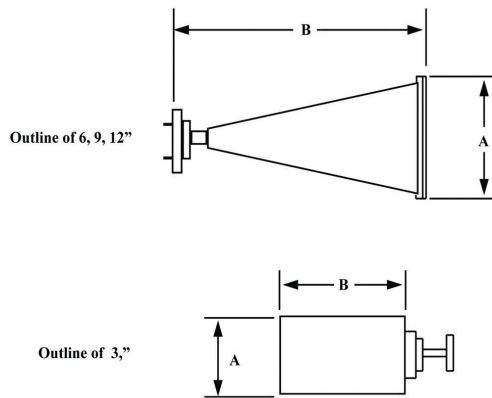
Mi-Wave's 258 Series horn lens antenna consists of a circular scalar feed horn illuminating a plano-convex lens. Housed in either aluminum or plastic, these horn lens antennas provide a high efficiency beam with equal E and H plane amplitude patterns.

- 8.4 to 260Ghz Available
- Low Cost
- High Directivity and Gain
- Simple Mechanical Performance
- Wide Range of Available Beamwidths and Reflector Sizes

The 258 Series antennas are available from 8 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.

Applications

Radars, Radioastronomy, Surveillance Equipment, and Communication Systems



PLEASE NOTE:

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

Production Capabilities



From small orders to high volume projects, we can accommodate all your volume production needs. Call us for more information.

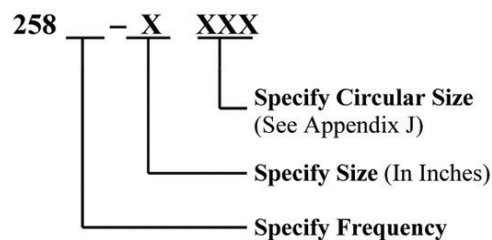
Picture left:
77 GHz Telecommunications volume order example.

Dimensional Specifications					
Model No.	Effective Diameter	A		B	
		in.	mm	in.	mm
258KU	12	14.0	356	21.0	533
258K	9	11.0	276	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	276	14.0	356
258A	12	14.0	356	18.2	462
258B, U	3	4.1	104	8.3	210
258B, U	6	7.6	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

Consult for current outline dimensions

Typical Electrical Specifications	
Frequency	12.4 to 140 GHz
Sizes	3, 6, 9, 12
Sidelobes	25dB (typical)
VSWR	1.2:1 (typical)
Cross Polarization	25dB (typical)

Ordering Information



Description

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.

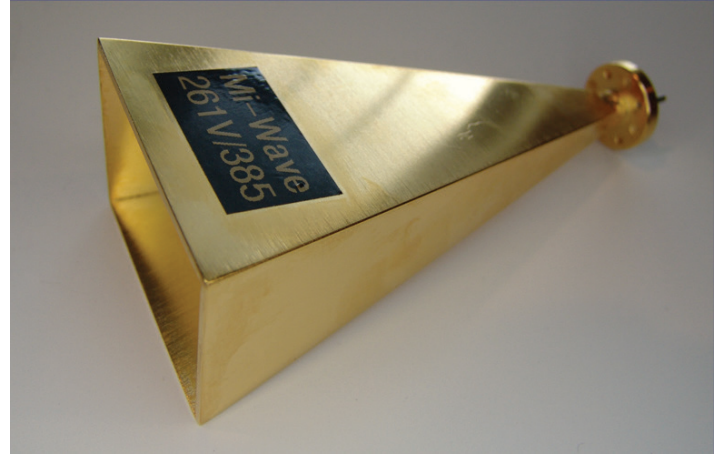
Standard gain horns can be used to experimentally determine the gain of other antennas by using the substitution method. The standard gain horn and the antenna under test are alternately connected to a well-matched detector system in order to compare their relative power levels. The power level difference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

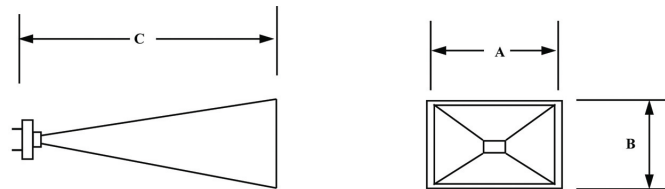
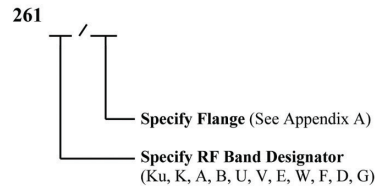
Additional Information

- Other common gains 10, 15, 20dB.
- Custom Gain horns (27 dB, etc.) and sectorial horns available from 7 to 27dB can be manufactured per customer request.

- *Nominal Gain of 25 dB*
- *Available from 12.4 to 500 GHz*
- *Made with precise dimensional tolerance control*
- *Gain calibration is accurate to 0.5 dB over full waveguide bandwidth*
- *Other gain values available upon request (ex: 10, 15, 20, etc.)*



Ordering Information



* Ku & K band 20dB gain

NOTE:

Due to wide variety of circular waveguide sizes and gain options, Consult Mi-Wave for A & B dimensions.

Custom Gain Horns Available



Horns in WR-4, WR-3, WR-2.2 also available



Description

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 supplied with a short section of circular waveguide and terminated in a standard round flange.

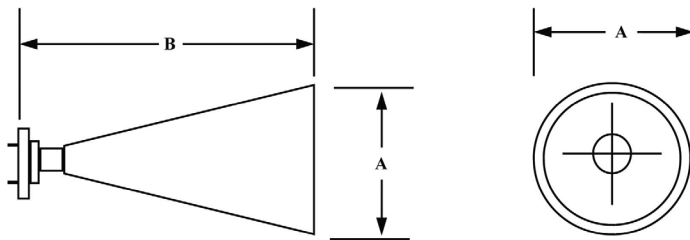
- Available from 12.4 to 325 GHz
- Nominal Gain of 10, 15, 20, and 25 dBi
- Made with Precise Dimensional Tolerance Control
- Gain Calibration is accurate to 0.5 dB over operating bandwidth.

Conical horns can be used to experimentally determine 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 to determine the absolute gain of the antenna under test.

Conical horns are also useful as power monitors in radars transmitter test, known-gain radiators in field propagation studies, and transmitting or receiving antennas in test bench applications.

PLEASE NOTE:

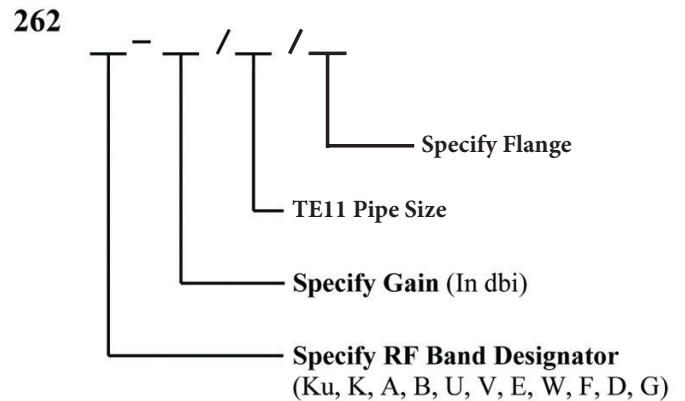
- 10, 15, 20 and 25dB models are available in all bands. Custom sizes also available.
- Gain calibration is an optional feature.



NOTE:

Due to wide variety of circular waveguide sizes and gain options, Consult Mi-Wave for A & B dimensions.

Ordering Information



ORDER EXAMPLE:

Model number 262W-25/.094/387 is a conical horn operating in W-band with a 25dB gain and 0.094 circular waveguide.

263 Series

Wide Angle Scalar Feed Horns

Description

Mi-Wave's 263 Series wide angle scalar feed horn, 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 0.5 and 0.4 in parabolic reflectors and offset feed applications.

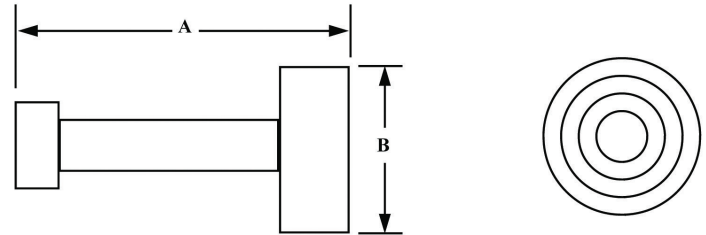
- *Low VSWR*
- *Wide Beamwidths*
- *Polarization Insensitive*
- *Partial Waveguide Bandwidths*

Applications

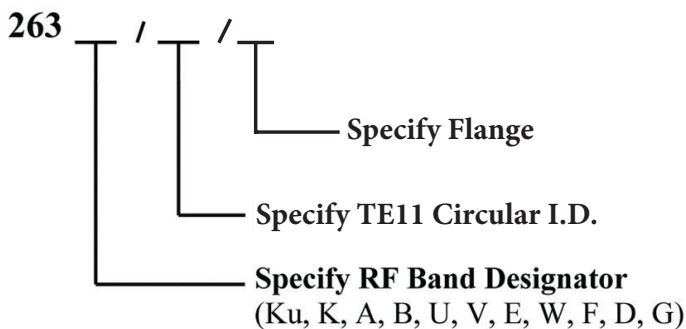
Low F/D Antennas
Surveillance Systems
Offset Feed Antennas



Typical Electrical Specifications	
Beamwidth (3 dB)	E-Plane 55 Deg. H-Plane 56 Deg.
SideLobes	E-Plane -25dB H-Plane -25dB
Bandwidth	50%



Ordering Information



ORDER EXAMPLE:

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

Dimensional Specifications						
Model No.	Frequency Band (GHz)	EIA-WG Designation	A		B	
			in.	mm	in.	mm
263	12.4–18.0	WR62	5.00	127.0	3.12	79.3
263	18.0–26.5	WR42	3.50	88.9	2.15	54.6
263	26.5–40.0	WR21	2.75	69.9	1.52	38.6
263	33.0–55.0	WR22	2.50	63.5	1.25	31.8
263	40.0–60.0	WR19	2.25	57.2	1.12	28.5
263	50.0–75.0	WR15	1.75	44.5	0.88	22.4
263	60.0–90.0	WR12	1.62	41.2	0.75	19.0
263	75.0–100.0	WR10	1.50	38.1	0.62	15.8
263	90.0–140.0	WR8				
263	110.0–170.0	WR-6				

Check with Miwave for current dimensions



Description

Mi-Wave's 267 Series Omni-directional Antennas have been designed to be used in wide angle applications.

Please consult Mi-Wave for other available beamwidths.

Applications

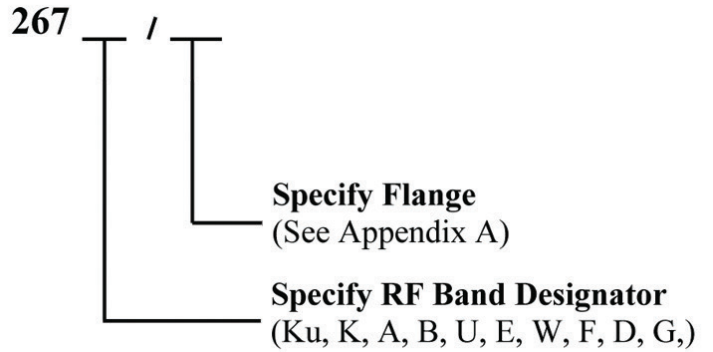
- Surveillance
- Network Broadcast and Receiving Systems
- RF Probes

- *12.4 to 140GHz Available*
- *Low VWSR*
- *Wide Bandwidths*
- *360 degree Azimuth Beamwidths*
- *Variable Elevation Beamwidths*
- *45 Degree Typical*
- *Gain 2-3 dB Typical*

170 GHz Omni-Directional



Ordering Information



ORDER EXAMPLE:

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

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

Description

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 available gain and beamwidths.

- 8.4 to 220Ghz Available
- Low VWSR
- Wide Bandwidths
- Narrow Beamwidths
- Polarization Insensitive

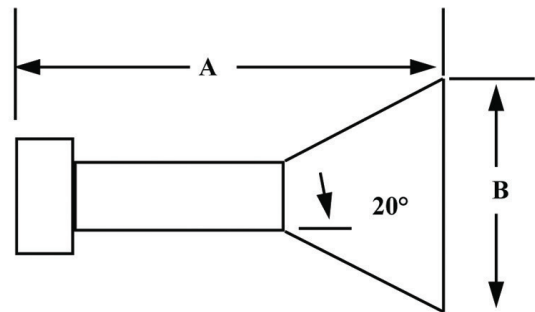
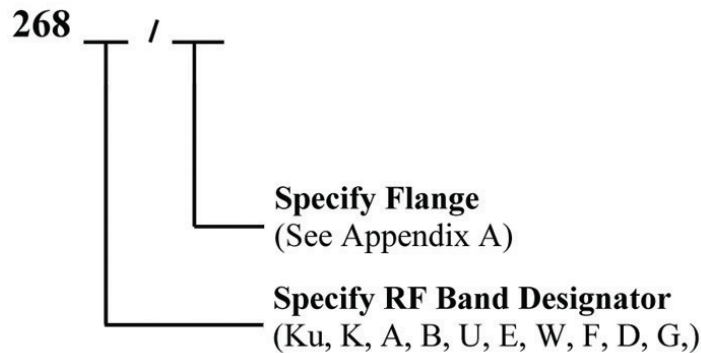
Applications

Feeds for Scalar Lens and Cassegrain Antennas



Typical Electrical Specifications	
Beamwidth (3 dB)	E-Plane 22 Deg. H-Plane 26 Deg.
SideLobes	E-Plane -25dB H-Plane -25dB
Bandwidth	35%

Ordering Information

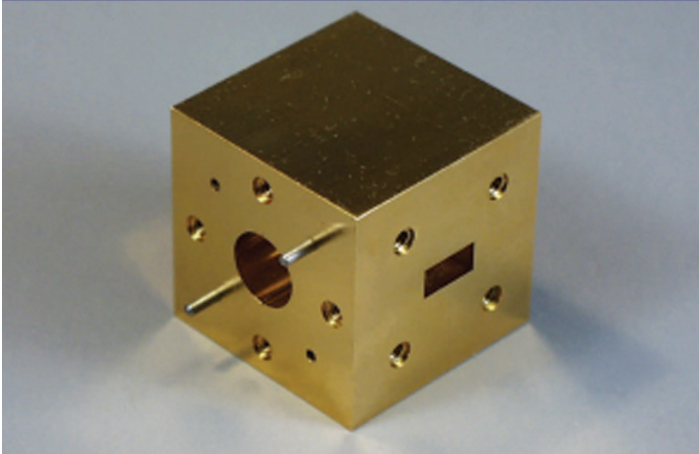


NOTE:

- 263 Series Feed Horns are normally supplied with a standard circular waveguide. Rectangular waveguide is also available.
- Consult factory for current outline drawing and custom antennas with different beamwidths.

ORDER EXAMPLE:

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



Description

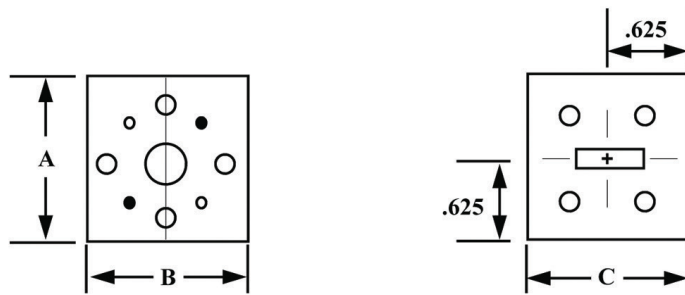
Mi-Wave's 281 Series Orthomode Transducer couples two orthogonal linearly polarized signals simultaneously while providing polarization isolation between transmit and receive.

Features

- *VSWR 1.2:1 typical*
- *Isolation > 30 dB typical*
- *Full Bandwidth Available*
- *Higher Frequency Units will be Quoted on Request*
- *Available from 12.4 to 220 GHz w3% or Greater Bandwidth*

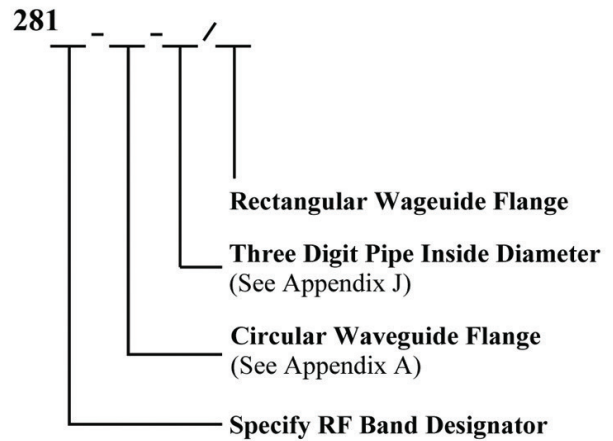
Applications

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 orthogonal/dual circular orthogonal polarization.



Consult for current dimensions

Ordering Information



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.
3. Wider bandwidths are available.

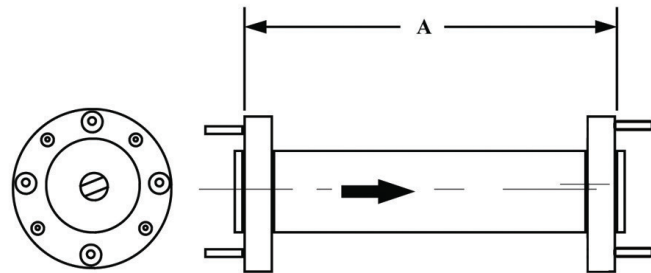
Description

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 order. This polarizer will yield a maximum VSWR of 1.2 an axial ratio of 1.0 dB maximum over the indicated bandwidth.

- **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 12.4 to 220 GHz with 3% or Greater Bandwidth.**

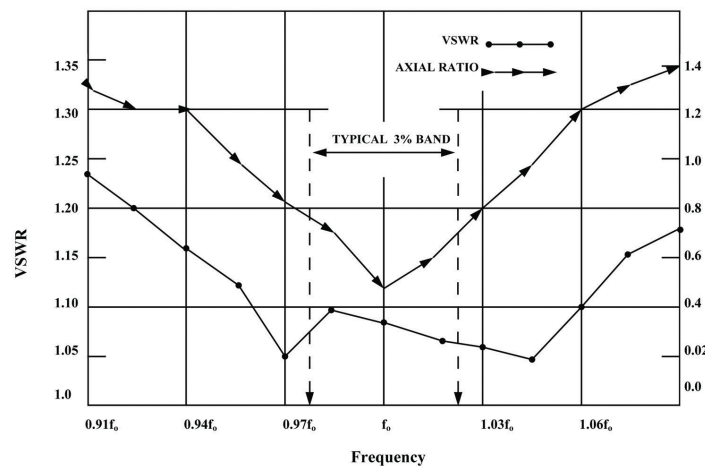
Applications

- Satellite Links
- Radio Astronomy
- Communications Systems



Dimensional Specifications

Model No.	Frequency Band (GHz)	A	
		in.	mm
282K	18.0–26.5	1.25	31.8
282A	26.5–40.0	1.25	31.8
282B	33.0–55.0	1.25	31.8
282U	40.0–60.0	1.25	31.8
282V	50.0–75.0	1.25	31.8
282E	60.0–90.0	1.25	31.8
282W	75.0–100.0	1.25	31.8
282F	90.0–140.0	1.25	31.8
282F	90.0–140.0	90.0–140.0	90.0–140.0
282F	90.0–140.0	90.0–140.0	90.0–140.0



Ordering Information

282



Specify Flange
(See Appendix A)

Three Digit Pipe Inside Diameter
(See Appendix J)

Specify RF Band Designator



Description

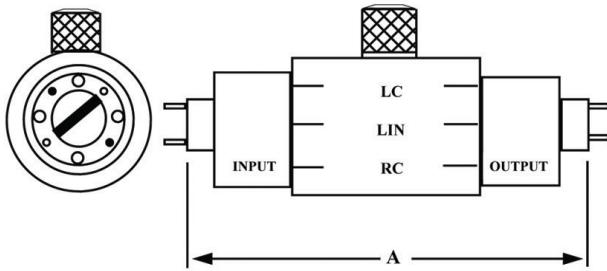
Mi-Wave's 283 Series Polarizer, similar to the 282 Series, will convert linear input signals to circular output signals with selectable output features. A manual switch on the unit allows for selection of the output signal's polarization sense or conversion back to a linear polarization. Therefore, for 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.

Applications

- Radio Astronomy
- Communication Links
- Communication Systems

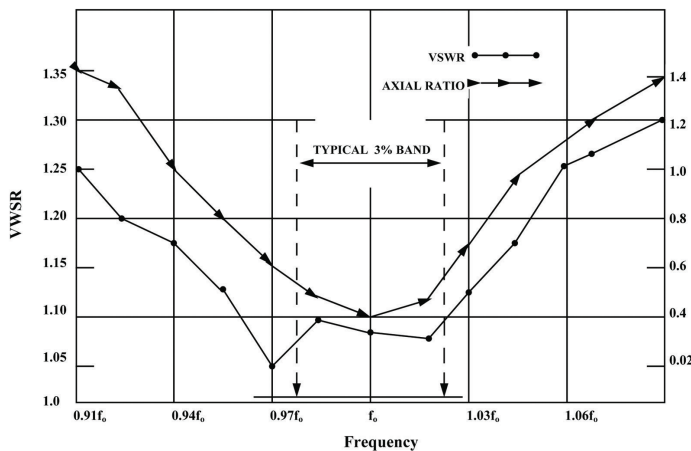
Features

- *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 12.4 to 220 GHz with 3% or Greater Bandwidth*
- *Output Signal Options: Right-Hand circular / Left-hand Circular / Linear*



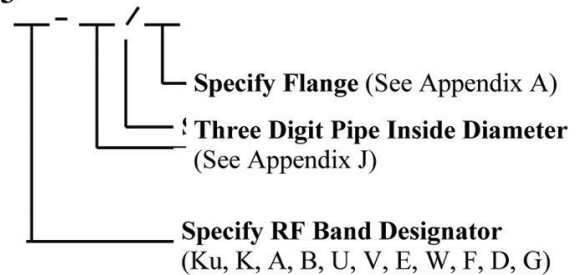
Dimensional Specifications		
Model No.	A	
	in.	mm
283K	2.3	58.4
283A	1.5	38.1
283B	1.5	38.1
283U	1.5	38.1
283V	1.1	27.9
283E	1.1	27.9
283W	1.0	25.4

Technical Specifications (typical)		
Model No.	Frequency Band (GHz)	Bandwidth % (typical)
283K	18.0–26.5	4%
283A	26.5–40.0	5%
283B	33.0–50.0	5%
283U	40.0–60.0	7%
283V	50.0–75.0	7%
283E	60.0–90.0	7%
283W	75.0–110.0	7%



Ordering Information

283



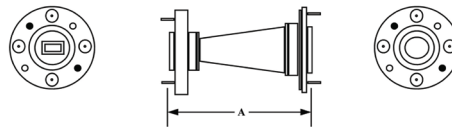
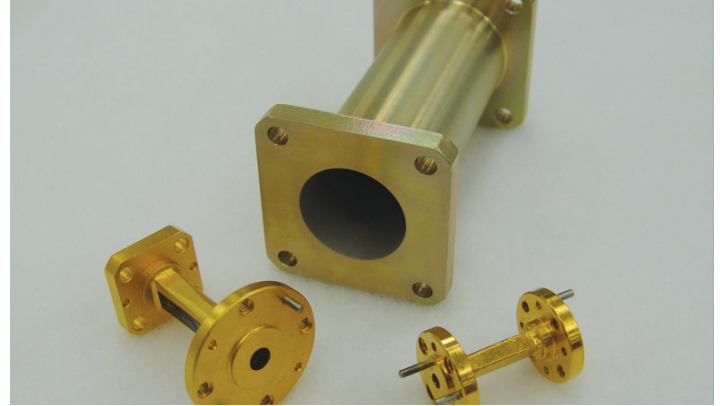
Description

Mi-Wave's 284 Series tapered mode transitions is a precision formed adapter used to transform rectangular TE10 mode waveguide to a circular TE11 mode waveguide. Mainly used in antenna systems and associated components to adapt to conventional waveguide.

- *Low Insertion Loss*
- *Precision-fabricated*
- *VSWR < 1.15 over a 10% Bandwidth*
- *Converts from rectangular TE10 Mode to Circular TE11 Mode*
- *Available from 5.4 to 325 GHz with 10% or greater bandwidth*

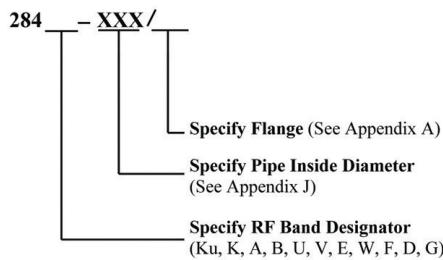
Applications

Antenna Systems
 Orthomode Transducers
 Polarization for Antennas



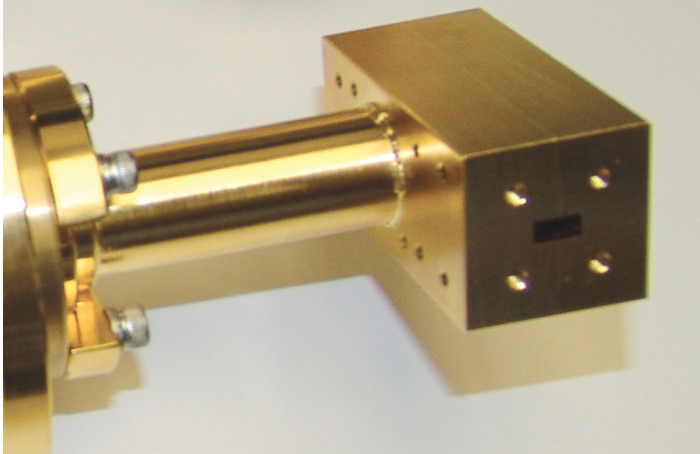
Dimensional Specifications		
Model No.	A	
	in.	mm
284Ku	2.5	63.5
284K	2.0	50.8
284A	1.5	38.1
284B	1.5	38.1
284U	1.5	38.1
284V	1.1	27.9
284E	1.1	27.9
284W	1.1	27.9
284F	1.1	27.9
284D	1.1	27.9
284G	1.1	27.9

Ordering Information



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
B1	.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	T68–77
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

TECHNICAL SPECIFICATIONS											
(TYPICAL)											
Model No.	284Ku	284K	284A	284B	284U	284V	284E	284W	284F	284D	284G
Frequency Band (GHz)	26.5–40	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
Waveguide Type	WR-62	WR-42	WR-28	WR-22	WR-19	WR-15	WR-12	WR-10	WR-8	WR-6	WR-5
VSWR Max.	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15



Description

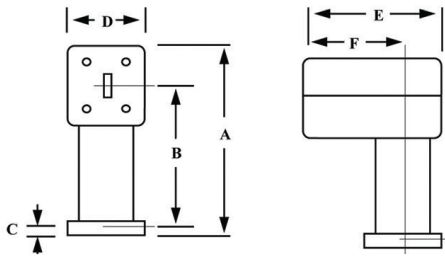
Mi-Wave's 330 Series TE01 mode transitions are available for operation from 18.0 to 140.0 GHz. These reciprocal devices have a standard rectangular TE10 mode waveguide input and a circular TE01 mode output. Due to the different frequency ranges of circular TE01 mode waveguide, it is possible for a standard sized rectangular waveguide input to have one of several different circular waveguide size outputs.

- *Minimum VSWR*
- *Minimum Insertion Loss*
- *Optional Pressurized Models Available*
- *Efficient Conversion from TE10 Mode Rectangular Waveguide to TE01 Mode Circular Waveguide*

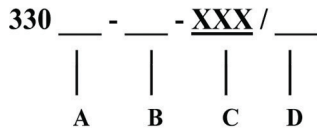
The 330 Series circular mode waveguide features low VSWR and insertion loss. The flanges used for circular waveguide output are Mi-Wave's standard male/female type. For maximum mode purity, filtering is recommended for all TE01 propagation (please refer to Appendix L).

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 TE10 rectangular waveguide mode to the TE01 circular waveguide mode for high-power, low-loss transmission.



Ordering Information



- 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)

EXAMPLE ORDER: 330A-M-688/599 is a mode transition in A-band with a UG/599/U Flange and a 0.688 inside diameter circular waveguide with 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.

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	2.57	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	1.30	35.31	.211	5.36	.75	19.05	1.16	29.46	.59	14.99

- * Varies per frequency range
- * Dimension varies

Consult Miwave for current dimensions

Technical Specifications (typical)

Model No.	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	90.0–140
Insertion TE Loss (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.



Description

Mi-Wave's 355 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 a ball bearings.

- *Negligible Variation During Rotation*
- *Minimum Effects on Transferred Signals*

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.

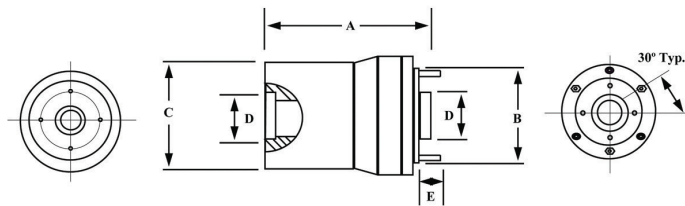
Applications

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, 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 TE01 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 usual design at frequencies that are too high for conventional rotary joints. For use in rectangular waveguide systems, they must be adapted with Mi-Wave's Series 330 mode transitions.

Technical Specifications (typical)

Frequency Band (GHz)	11.6–48.0	48.0–96.0	96.0–150
Insertion TE Loss (dB) max ¹	0.3	0.4	0.5
VSWR Min.	1.10	1.10	1.15
Weight (oz)	30	24	15



Consult Miwave for current dimensions

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	.264	6.71
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

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.

370–371 Series

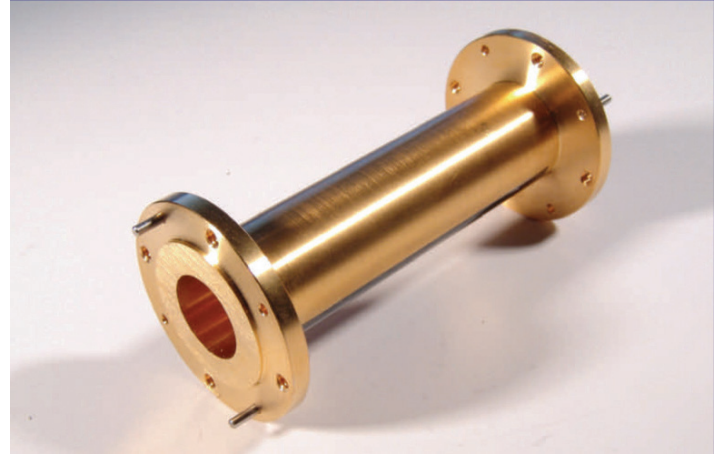
Flanged/Un-flanged Circular Waveguides

Description

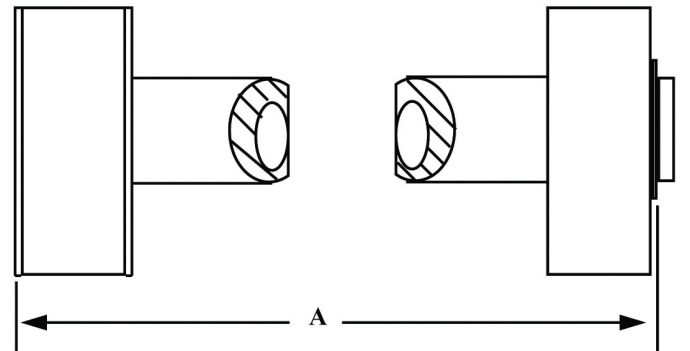
Mi-Wave's 370 Series flanged waveguide and 371 Series un-flanged waveguides are available in standard sizes from 12.6 to 320 GHz. The 370 Series waveguide sections are fitted with Mi-Wave's standard male/female flanges. Both waveguide types are manufactured primarily in copper.

- *Low VSWR*
- *Precision Size*
- *TE01 and TE11 modes available*

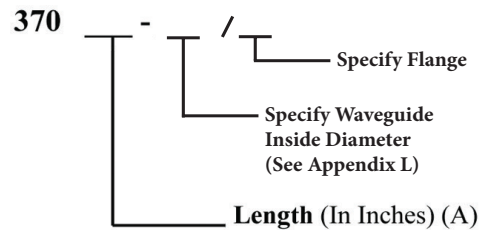
Please note: Due to the non-standardization of this product line, we recommend that you contact Mi-Wave for more specific information about your requirements.



TE01 Specifications					
Circular 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	27.3–38.8		0.594 X 0.674	29.3–40.4	WRC134C14
0.545 X 0.625	32.4–44.0		—	—	N/A
0.495 X 0.625	34.8–48.0		0.500 X 0.580	34.8–48.0	WRC159C14
—	—		0.438 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 0.341	61.9–85.0	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



Ordering Information



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.

410 Series

Waveguide to Coax Transitions



Description

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 110 GHz.

Low insertion losses and VSWR's are typical for these adapters. Low cost production versions are available for equipment used and OEM's. Laboratory grades are also offered on some models.

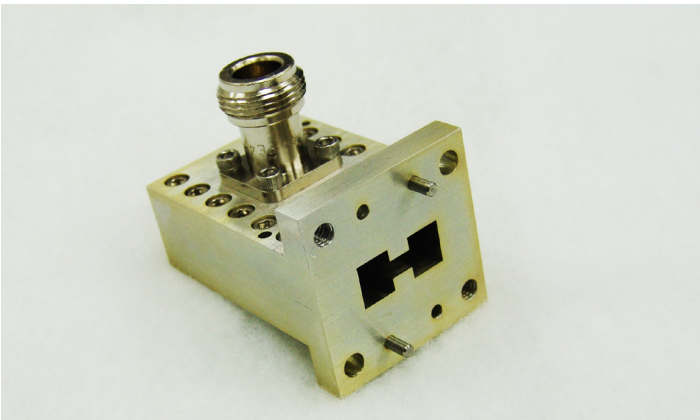
- *Low Cost Versions Available*
- *Frequency Ranges 12.4 to 110 GHz*
- *Wide Variety of Coax Connectors Available*
- *High Performance Versions for Laboratory Use.*

Applications

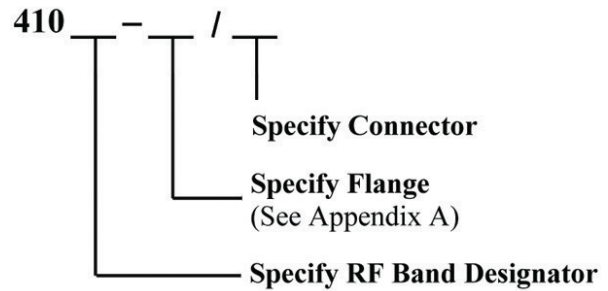
Test Equipment
Power Measurement
Broadband Systems



Double-ridged Adapters Available



Ordering Information



PLEASE NOTE:

Lower frequency versions are available from 6.0 GHz and up.

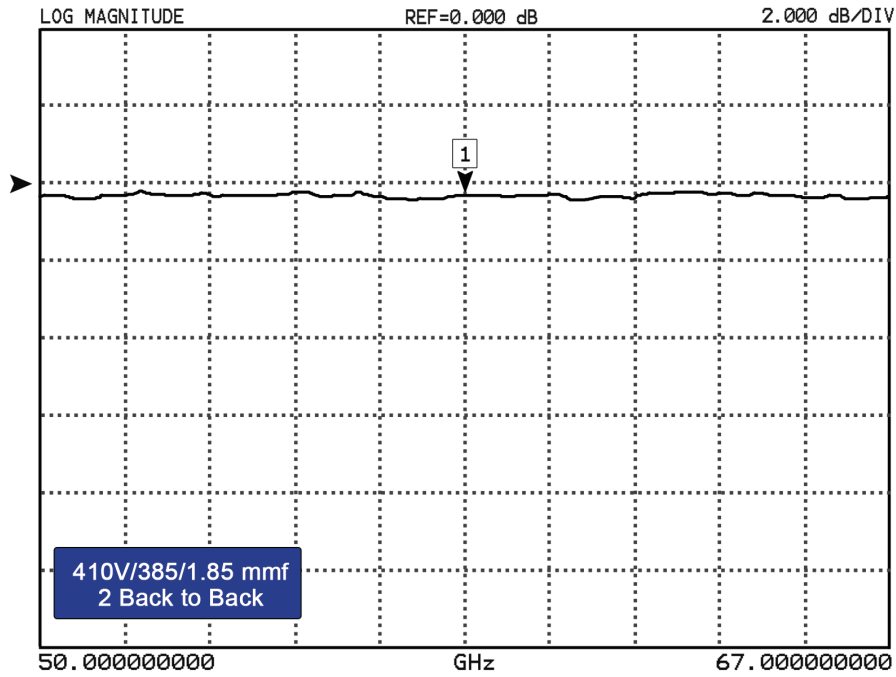
Technical Specifications (typical)

Model No.	410KU	410K	410(WR-34)	410A	410B	410U	410V	410E	410W
Frequency Band (GHz)	12.4–18.0	18.0–26.5	22.0–33.0	26.5–40.0	33.0–50.0	40.0–60.0	50.0–75.0	60.0–90.0	75–110.0
Waveguide	WR-62	WR-42	WR-34	WR-28	WR-22	WR-19	WR-15	WR-12	WR-10
Flange	UG-419/U	UG-595/U	UG-595/UM	UG-599/U	UG-599/UM	UG-383/UM	UG-385/U	UG-387/U	UG-387/U
Standard Connectors	N, SMA	2.92–2.4	2.92–2.4	2.92, 2.4	2.92, 2.4	2.92, 2.4	1.85, 1.0	1.0	1.0
Available	2.92, 2.4				1.85	1.85, 1.0			
Insertion (Loss) (dB) (typ)	.3	.3	.3	.4	.5	.5	.5	1.0	1.0
VSWR (typical)	1.3:1	1.3:1	1.3:1	1.3:1	1.3:1	1.3:1	1.3:1	<1.7:1	<1.7:1

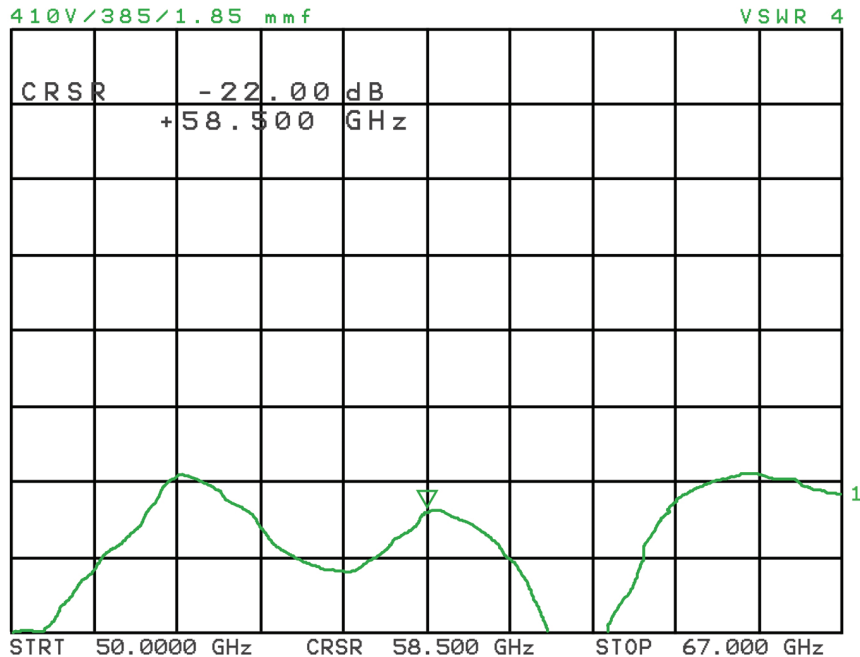
Anritsu

MARKER 1: 58.5000 GHz
INSERTION LOSS: -0.300 dB

PARAMETER: -S21-
NORMALIZATION: DATA / MEMORY
REFERENCE PLANE: 0.000 mm
SMOOTHING: 1.0 PERCENT
DELAY APERTURE: -



CH1: A -MS -22.00 dB
5.0 dB / REF 0.00 dB





Description

Mi-Wave's 411 Series Waveguide to Coax Transitions allow an efficient method of adapting from rectangular waveguide to a in-line coaxial connector. Full waveguide bands available from 12.4 to 110 GHz.

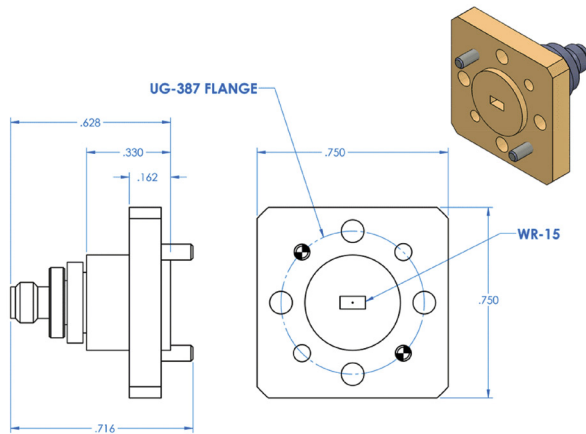
Our new design and manufacturing process allows for Low insertion losses and VSWR's for these adapters. Low cost production versions are available for equipment used and OEM's. Laboratory grades are also offered on some models.

- *Low Cost Versions Available*
- *Frequency Ranges 12.4 to 110 GHz*
- *1mm Connector*
- *Full Band Units*
- *Compact Size*
- *High Performance Lab Versions*

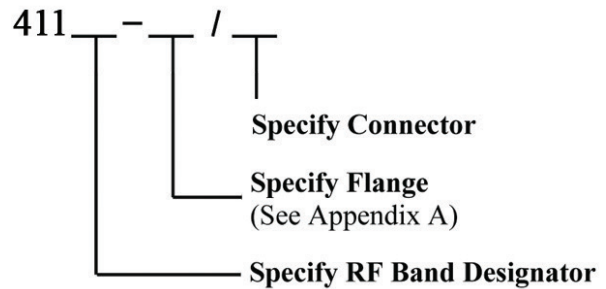
Applications

Test Equipment
Power Measurement

1mm Connectors for WR-15, WR-12, WR-10



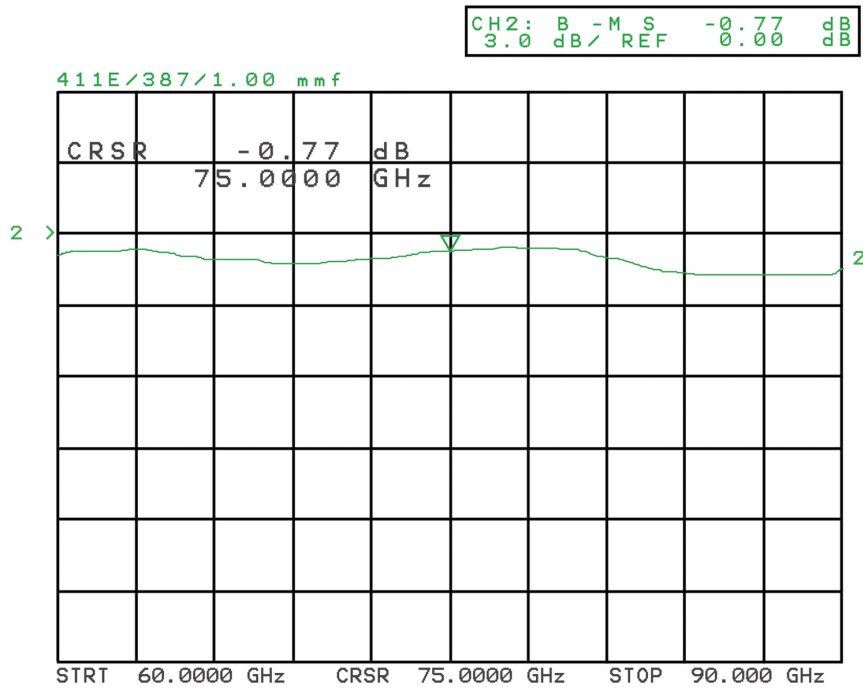
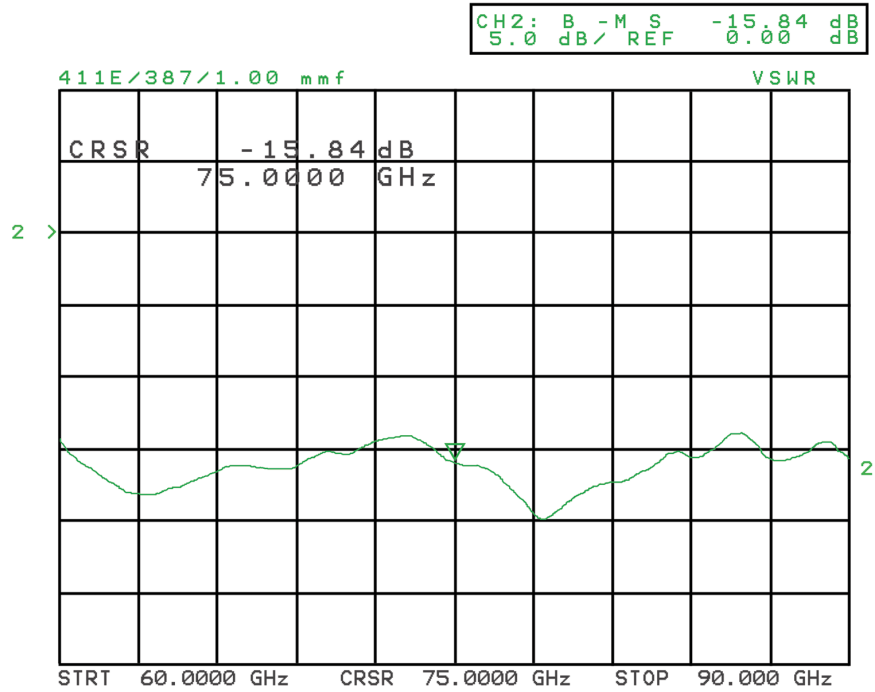
Ordering Information

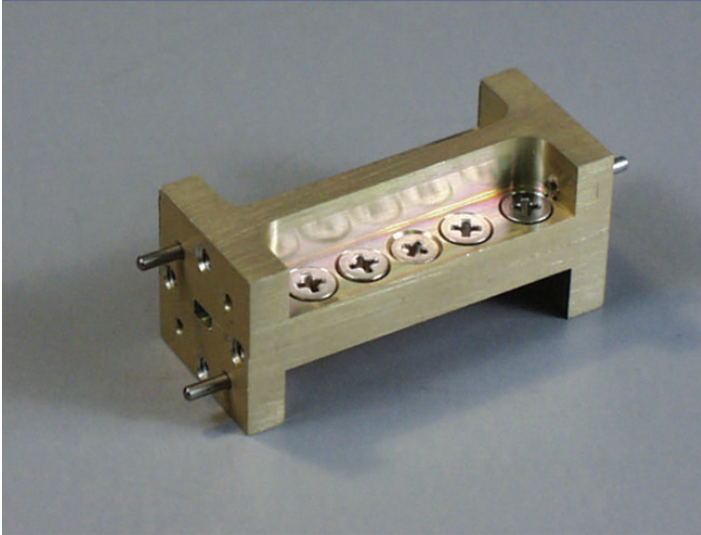


Technical Specifications (typical)

Model No.	411KU	411K	411(WR-34)	411A	411B	411U	411V	411E	411W
Frequency Band (GHz)	12.4–18.0	18.0–26.5	22.0–33.0	26.5–40.0	33.0–50.0	40.0–60.0	50.0–75.0	60.0–90.0	75–110.0
Waveguide	WR-62	WR-42	WR-34	WR-28	WR-22	WR-19	WR-15	WR-12	WR-10
Flange	UG-419/U	UG-595/U	UG-595/UM	UG-599/U	UG-599/UM	UG-383/UM	UG-385/U	UG-387/U	UG-387/U
Standard Connectors	N, SMA	2.92–2.4	2.92–2.4	2.92, 2.4	2.92, 2.4	2.92, 2.4	1.85, 1.0	1.0	1.0
Available	2.92, 2.4	2.0	1.85, 1.0	2.0	1.85, 1.0	1.85, 1.0	1.0	1.0	1.0
Insertion (Loss) (dB) (typ)	.3	.3	.3	.4	.7	.7	.7	1.0	1.0
VSWR (typical)	1.5:1	1.5:1	1.5:1	1.5:1	1.5:1	1.5:1	1.5:1	<1.5:1	<1.5:1

411 Test Data





Description

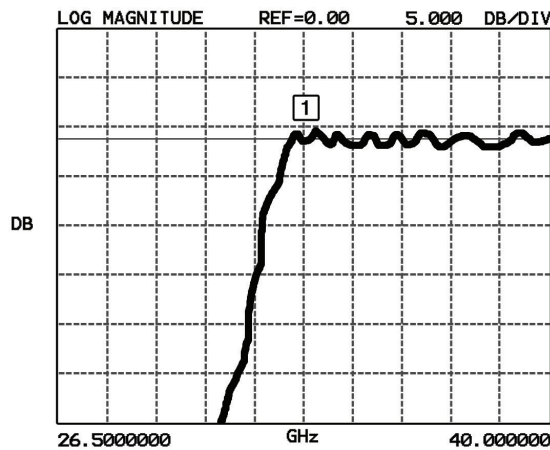
Mi-Wave's 450 Series High Pass Filters use a simple yet effective waveguide cut-off filter technique. This design is useful for eliminating unwanted side bands in up-converters and out-of-band frequencies in communication systems. These filters

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

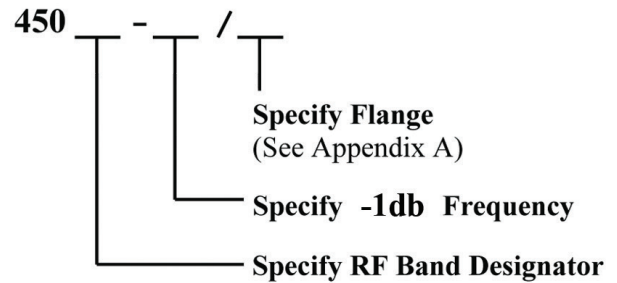
are small in size and compact by design. The 450 Series can be designed for any frequency range from 12.4 to 220 GHz. Low insertion losses from 0.15 dB and cut off rejections of up to 80 dB are possible. Consult Mi-Wave for dimensions due to the wide ranged of waveguide sizes and frequency ranges.

Applications

Side Band Filters
 Frequency Diplexers
 Telecommunications Systems



Ordering Information



Technical Specifications (typical)

Min Passband Frequency	Passband Insertion Loss	Min Rejection Frequency	Max Rejection Frequency	Rejection	Waveguide Port
130GHz	2.5 dB	DC	126Ghz	80dB	WR-06 Waveguide
104GHz	2.5 dB	DC	100Ghz	40dB	WR-08 Waveguide
92GHz	1.0 dB	DC	86Ghz	40dB	WR-10 Waveguide
90GHz	1.0 dB	DC	84Ghz	40dB	WR-10 Waveguide
84GHz	0.9 dB	DC	80Ghz	40dB	WR-10 Waveguide
82GHz	1.0 dB	DC	80Ghz	40dB	WR-10 Waveguide
81GHz	1.0 dB	DC	77Ghz	40dB	WR-12 Waveguide
86GHz	1.0 dB	DC	82Ghz	40dB	WR-10 Waveguide
75GHz	1.0 dB	DC	70Ghz	40dB	WR-10 Waveguide
71GHz	0.8 dB	DC	67Ghz	40dB	WR-12 Waveguide
70GHz	0.5 dB	DC	66Ghz	40dB	WR-12 Waveguide
67GHz	1.0 dB	DC	65Ghz	40dB	WR-12 Waveguide
57GHz	0.8 dB	DC	53Ghz	40dB	WR-12 Waveguide
60GHz	1.0 dB	DC	55Ghz	40dB	WR-12 Waveguide
63GHz	0.8 dB	DC	59Ghz	40dB	WR-12 Waveguide
75GHz	1.0 dB	DC	71Ghz	40dB	WR-15 Waveguide
63GHz	1.0 dB	DC	57Ghz	40dB	WR-15 Waveguide
57GHz	0.8 dB	DC	53Ghz	40dB	WR-15 Waveguide
57GHz	1.0 dB	DC	56Ghz	20dB	WR-15 Waveguide
50GHz	1.0 dB	DC	46Ghz	40dB	WR-15 Waveguide
35.5GHz	1.0 dB	DC	30.5Ghz	30dB	WR-22 Waveguide
34GHz	2.0 dB	DC	31Ghz	40dB	WR-22 Waveguide
30GHz	.5 dB	DC	26Ghz	40dB	WR-28 Waveguide
29GHz	.5 dB	DC	25Ghz	40dB	WR-28 Waveguide
26.5GHz	.5 dB	DC	22.5Ghz	40dB	WR-28 Waveguide

Description

Mi-Wave's 460 Series Band Pass Filters are used for narrow and wide band applications. Pass bands are typically from 1% to 10%. This design is well suited for frequency diplexers used in communication systems or any application where narrow bandwidths are required.

- *Low Cost*
- *Low VSWR*
- *Narrow Bandwidths*
- *High Rejection Levels*
- *Low In-band Insertion*

Insertion losses are typically in the 0.8 dB to 2.0 dB area depending upon rejection levels. The 460 Series Band pass filter can be designed from 8 to 140GHz.

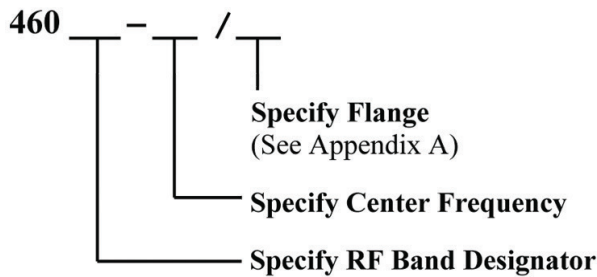
Please consult Mi-Wave for further dimensions and specific technical data.

Applications

Side Band Filters
Frequency Diplexers
Telecommunications Systems



Ordering Information



Technical Specifications (typical)

Min Passband Frequency	Max Passband Frequency	Min Rejection Frequency (Low Side)	Max Rejection Frequency (Low Side)	Min Rejection Frequency (High Side)	Max Rejection Frequency (High Side)	Rejection	Waveguide Port
125GHz	150Ghz	DC	100Ghz	163Ghz	250Ghz	40dB	WR-06 Waveguide
105GHz	140Ghz	DC	94Ghz	145Ghz	180Ghz	40dB	WR-08 Waveguide
109GHz	140Ghz	DC	94Ghz	145Ghz	160Ghz	40dB	WR-08 Waveguide
119.5GHz	120.5Ghz	DC	17Ghz	123Ghz	130Ghz	40dB	WR-08 Waveguide
98GHz	102Ghz	DC	95Ghz	105Ghz	110Ghz	40dB	WR-10 Waveguide
92GHz	100Ghz	DC	88Ghz	104Ghz	110Ghz	50dB	WR-10 Waveguide
90GHz	98Ghz	DC	88Ghz	102Ghz	110Ghz	25dB	WR-10 Waveguide
92GHz	96Ghz	DC	90Ghz	98Ghz	130Ghz	40dB	WR-10 Waveguide
92.5GHz	95.5Ghz	DC	91.5Ghz	97Ghz	97.5Ghz	20dB	WR-10 Waveguide
93.2GHz	95.2Ghz	DC	91Ghz	98.5Ghz	105Ghz	40dB	WR-10 Waveguide
70GHz	90Ghz	DC	60Ghz	93.3Ghz	130Ghz	40dB	WR-12 Waveguide
81GHz	87Ghz	DC	78Ghz	90Ghz	120Ghz	30dB	WR-12 Waveguide
82.5GHz	87Ghz	DC	80Ghz	90Ghz	120Ghz	40dB	WR-12 Waveguide
81GHz	86Ghz	DC	78Ghz	88Ghz	120Ghz	50dB	WR-10 Waveguide
81GHz	86Ghz	DC	78Ghz	90Ghz	120Ghz	50dB	WR-12 Waveguide
82.5GHz	85.5Ghz	DC	79Ghz	93.5Ghz	110Ghz	40dB	WR-10 Waveguide
76GHz	81Ghz	DC	73Ghz	84Ghz	105Ghz	40dB	WR-12 Waveguide
75GHz	78Ghz	DC	71Ghz	82Ghz	100Ghz	50dB	WR-12 Waveguide
76GHz	77Ghz	DC	74.5Ghz	78.5Ghz	90Ghz	50dB	WR-10 Waveguide
71GHz	76Ghz	DC	67Ghz	81Ghz	105Ghz	50dB	WR-10 Waveguide
71GHz	76Ghz	DC	67Ghz	81Ghz	105Ghz	50dB	WR-12 Waveguide
73GHz	76Ghz	DC	67Ghz	82Ghz	100Ghz	40dB	WR-12 Waveguide
74GHz	76Ghz	DC	70Ghz	80Ghz	100Ghz	40dB	WR-12 Waveguide
50GHz	75Ghz	DC	44Ghz	80Ghz	110Ghz	40dB	WR-15 Waveguide
73GHz	74Ghz	DC	70Ghz	76.6Ghz	95Ghz	30dB	WR-12 Waveguide
50GHz	67Ghz	DC	46Ghz	73Ghz	110Ghz	40dB	WR-15 Waveguide
55GHz	67Ghz	DC	51Ghz	71Ghz	95Ghz	40dB	WR-15 Waveguide
63GHz	67Ghz	DC	57Ghz	73Ghz	95Ghz	40dB	WR-12 Waveguide
61GHz	66Ghz	DC	59.5Ghz	69.5Ghz	80Ghz	40dB	WR-15 Waveguide
63.8GHz	65.8Ghz	DC	58.8Ghz	70.8Ghz	74.8Ghz	50dB	WR-15 Waveguide
59GHz	65Ghz	DC	57.5Ghz	67.5Ghz	75Ghz	40dB	WR-15 Waveguide
61GHz	64Ghz	DC	57.5Ghz	67.5Ghz	75Ghz	40dB	WR-15 Waveguide
61.64GHz	63.64Ghz	DC	56.64Ghz	67.64Ghz	71.64Ghz	50dB	WR-15 Waveguide
58.6GHz	63.4Ghz	DC	56Ghz	68Ghz	80Ghz	50dB	WR-15 Waveguide
61.7GHz	62.7Ghz	DC	60Ghz	65Ghz	80Ghz	40dB	WR-15 Waveguide
57.5GHz	62.5Ghz	DC	55Ghz	67Ghz	78Ghz	25dB	WR-15 Waveguide
60GHz	62Ghz	DC	59Ghz	63Ghz	80Ghz	30dB	WR-15 Waveguide
59.48GHz	61.48Ghz	DC	54.48Ghz	66.48Ghz	69.48Ghz	50dB	WR-15 Waveguide
59GHz	61Ghz	DC	57Ghz	62Ghz	78Ghz	25dB	WR-15 Waveguide

Description

Mi-Wave's 470 Series Low Pass Filters use a simple yet effective waveguide cut-off filter technique. This design is useful for eliminating unwanted side bands in up-converters and out-of-band frequencies in communication systems.

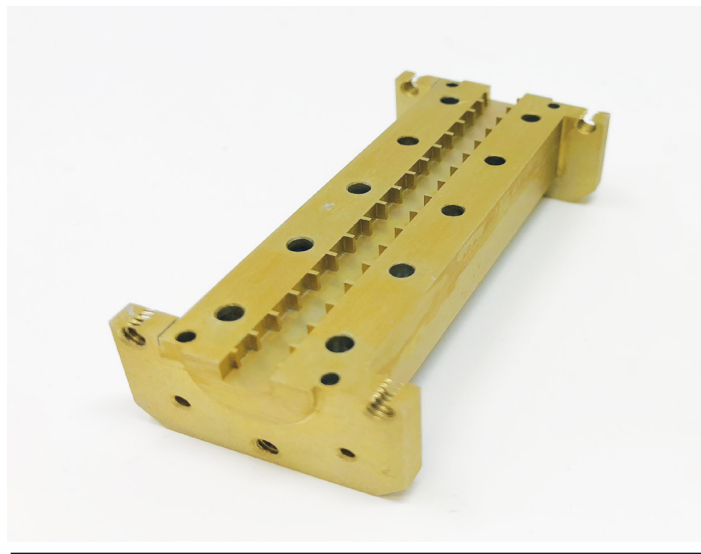
- *Low Cost*
- *Low VSWR*
- *Narrow Bandwidths*
- *High Rejection Levels*

These filters are small in size and compact by design. The 470 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 80 dB are possible.

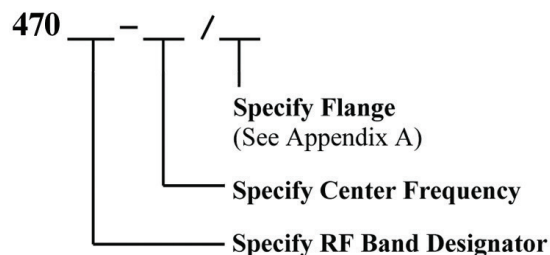
Consult Mi-Wave for dimensions due to the wide ranged of waveguide sizes and frequency ranges.

Applications

- Side Band Filters
- Frequency Diplexers
- Telecommunications Systems
- Alien Civilization Discoveries



Ordering Information



Technical Specifications (typical)

Min Passband Frequency	Max Passband Frequency	Min Rejection Frequency (Low Side)	Max Rejection Frequency (Low Side)	Min Rejection Frequency (High Side)	Max Rejection Frequency (High Side)	Rejection	Waveguide Port
62GHz	110Ghz	DC	56Ghz	120Ghz	160Ghz	50dB	WR-10 Waveguide
50GHz	90Ghz	DC	45Ghz	95Ghz	140Ghz	40dB	WR-12 Waveguide
62GHz	90Ghz	DC	59Ghz	92Ghz	140Ghz	80dB	WR-10 Waveguide
50GHz	84Ghz	DC	48Ghz	87Ghz	110Ghz	40dB	WR-12 Waveguide
50GHz	75Ghz	DC	48Ghz	79Ghz	110Ghz	40dB	WR-12 Waveguide
50GHz	75Ghz	DC	40Ghz	79Ghz	120Ghz	40dB	WR-15 Waveguide
26GHz	60Ghz	DC	20Ghz	90Ghz	140Ghz	50dB	WR-28 Waveguide
30GHz	50Ghz	DC	25Ghz	56Ghz	100Ghz	40dB	WR-22 Waveguide
26.5GHz	40Ghz	DC	21Ghz	48Ghz	90Ghz	60dB	WR-28 Waveguide
22GHz	35Ghz	DC	20Ghz	40Ghz	72Ghz	40dB	WR-28 Waveguide
22GHz	34Ghz	DC	21Ghz	37Ghz	67Ghz	40dB	WR-28 Waveguide
22GHz	34Ghz	DC	20Ghz	37Ghz	70Ghz	40dB	WR-28 Waveguide
22GHz	32Ghz	DC	17Ghz	37Ghz	75Ghz	40dB	WR-28 Waveguide
15GHz	22Ghz	DC	12Ghz	25Ghz	40Ghz	40dB	WR-51 Waveguide
10GHz	15Ghz	DC	8Ghz	18Ghz	25Ghz	40dB	WR-75 Waveguide



New Models Available

From WR-137 to WR-62 Waveguide Bands

Description	Specifications
Attenuation Range	0 dB to 60 dB (typical)
Accuracy	0.1 dB or 2% of reading*
Scale Increments	0.0 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 – 0.20 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

***NOTE:**

Lower frequency versions are available from 8.4 GHz and up.

Accuracy is based on attenuation settings. Consult Miwave for specifications.

OTHER BANDS AVAILABLE:

- WR-137
- WR-112
- WR-90
- WR-75
- WR-62
- WR-51
- WR-34

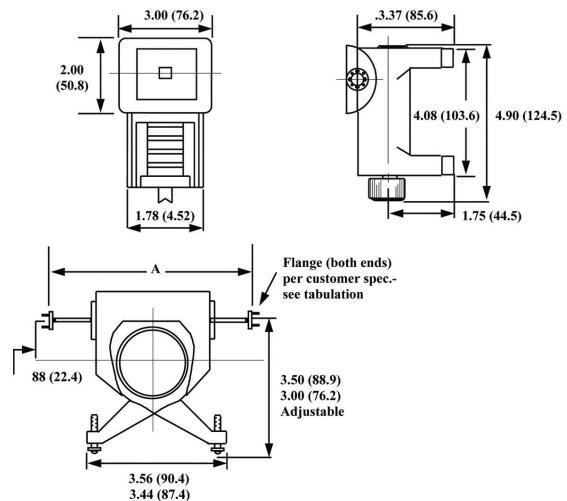
Description

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.

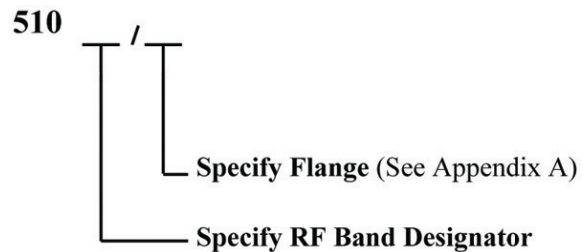
Applications

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.

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



Ordering Information



Technical Specifications (typical)

Model No.	510K	510A	510B	510U	510V	510E	510W	510F	510D	510G	510H	510J
Frequency Band (GHz)	18–26.5	26.5–40	33–50	40–60	50–75	60–90	75–110	90–140	110–170	140–220	170–260	220-325
Insertion (Loss) (dB)	0.5	0.5	0.6	0.7	0.9	1.0	1.2	1.5	3.0	4.0	5	5.5
VSWR (typical)	1.30	1.15	1.15	1.15	1.20	1.20	1.20	1.25	1.3	1.3	1.3	1.35
Weight (oz)	52	38	38	36	29	28	28	26	24	24	22	1
Average (Low) Power Handling (Watts)	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
High Power Handling (Watts)	n/a	n/a	n/a	n/a	3	3	3	n/a	n/a	n/a	n/a	n/a



Description

Mi-Wave's 515 Series Direct-reading electronic 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.

- High Accuracy to 60dB
- Low VSWR
- Direct Reading
- Low Insertion Loss
- Anti-backlash Drive
- Negligible Phase Shift
- Precision Construction
- Absolute Attenuation Reading

Applications

The 515 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.

Description	Specifications
Attenuation Range	0 dB to 60 dB (typical)
Accuracy	0.1 db or < 1% of the setting
Resolution	0 to 20 db in 0.01 db steps 20 to 60 db its 0.1 db steps Max Setting 60 dB

NOTE:

Lower frequency versions are available from 8.4 GHz and up.

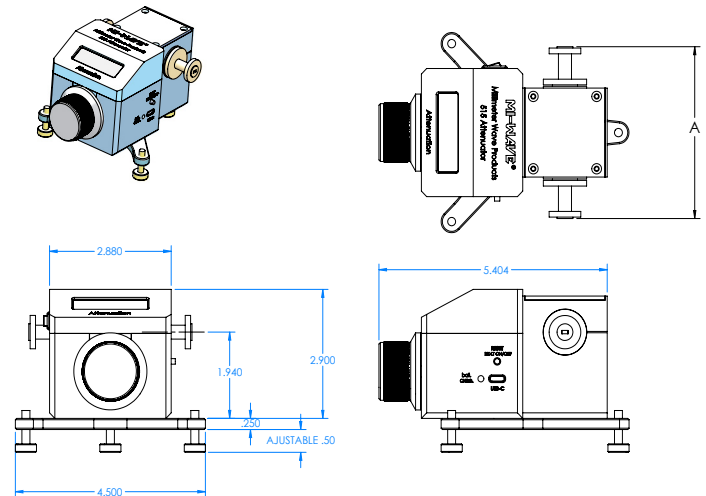
Accuracy is based on calibration of test equipment.

Rechargeable internal battery that will operate the attenuator up to 40 hours with the back light off or 10 hours with the back light on. Operates off a standard USB C cable that will charge the battery and operate the attenuator.

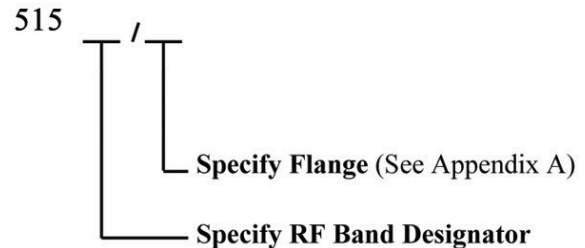
Dimensional Specifications		
Model No.	A	
	in.	mm
515K	8.48	215.0
515A	6.87	174.0
515B	6.25	159.0
515U	5.76	146.0
515V	4.50	114.3
515E	4.50	114.3
515W	4.50	114.3
515F	3.53	89.7
515D	3.44	87.4
515G	3.20	81.3

OTHER BANDS AVAILABLE:

- WR-137
- WR-112
- WR-90
- WR-75
- WR-62
- WR-51
- WR-34



Ordering Information



Technical Specifications (typical)

Model No.	515K	515A	515B	515U	515V	515E	515W	515F	515D	515G	515H	515J
Frequency Band (GHz)	18–26.5	26.5–40	33–50	40–60	50–75	60–90	75–110	90–140	110–170	140–220	170–260	220–325
Insertion (Loss) (dB)	0.5	0.5	0.6	0.7	0.9	1.0	1.2	1.5	3.0	4.0	5	5.5
VSWR (typical)	1.30	1.15	1.15	1.15	1.20	1.20	1.20	1.25	1.3	1.3	1.3	1.35
Weight (oz)	52	38	38	36	29	28	28	26	24	24	22	22
High Power (watts)	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Low Power (watts)	n/a	n/a	n/a	n/a	3	3	3	n/a	n/a	n/a	n/a	n/a

Description

Mi-Wave's 511 Series Precision Programmable Rotary Vane Attenuators are available in full waveguide bands from 7.0 to 220GHz. Attenuation control is performed manually via a front panel or remote controlled using a standard IEEE-488 or USB interface. The attenuators small compact size incorporates both the electronic controller and the microwave components. The unit operates from a single +24 Volt DC source or with an optional adapter.

- *Low Cost*
- *Compact Size*
- *7.0 to 220 GHz*
- *High Accuracy*
- *Highly Reliable*
- *Digital Readout*
- *Low Insertion Loss*
- *IEEE-488 & USB Interface*
- *Full Waveguide Bands*
- *Manual Operation Mode*

Attenuation range is from 0 to 70 dB in .01 dB steps from 0 to 70 dB. A digital readout is provided on the front panel to display attenuation settings. USB & GPIB interface available. Tested to over 1 million cycles

New company proprietary internal absorbing material that will handle high power levels and yield low insertion loss and mode free operation to 70 db attenuation levels.

Applications

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

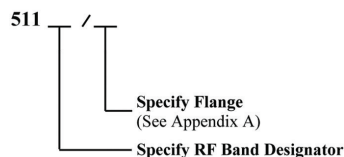
Technical Specifications (typical)						
Model No.	Frequency Band	Waveguide	Insertion Loss	VSWR	Avg Low Power Handling	High Power Handling
	GHz	WR	Max.	Max.	Max. n/a	n/a
511K	18.0–26.5	42	0.5 dB	1.15:1	0.3 watt	n/a
511A	26.5–40.0	28	0.5 dB	1.15:1	0.3 watt	n/a
511B	33.0–50.0	22	0.6 dB	1.15:1	0.3 watt	n/a
511U	40.0–60.0	19	0.7 dB	1.15:1	0.2 watt	n/a
511V	50.0–75.0	15	0.9 dB	1.20:1	0.2 watt	3
511E	60.0–90.0	12	1.0 dB	1.2:1	0.1 watt	3
511W	75.0–110.0	10	1.3 dB	1.2:1	0.1 watt	3
511F	90.0–140.0	8	1.5 dB	1.3:1	0.1 watt	n/a
511D	110.0–170.0	7	3.0 dB	1.3:1	0.1 watt	n/a
511G	140.0–220.0	5	3.0 dB	1.3:1	0.1 watt	n/a
511H	170-260	4	3.0 dB	1.3:1	0.1 watt	n/a
511J	220-325	3	3.0 dB	1.3:1	0.1 watt	n/a



511 v2 Upgrades Include:

- *Attenuation from 0 to 70 dB*
- *USB & IEEE-488 Interface*
- *Higher Speed*
- *Less than 2sec. to change attenuation level from 0 to 70 dB*
- *Significantly Quiet Operation*
- *Programmable GPIB address (now goes up to 30),*
- *“xx.xx dB Command Complete,” message sent via USB or GPIB after attenuation level is reached*
- *Rocker switch replaced by LED buttons for changing*
- *Attenuation levels efficiently and quickly*
- *Interactive User Menu*
- *Improved resolution with 0.01 steps from 0 to 70 dB*
- *Backlit Display*
- *Integrated shutdown safety feature in the event of*
- *Hall effect sensor failure*
- *Mode free*
- *Higher Power Handling capability*

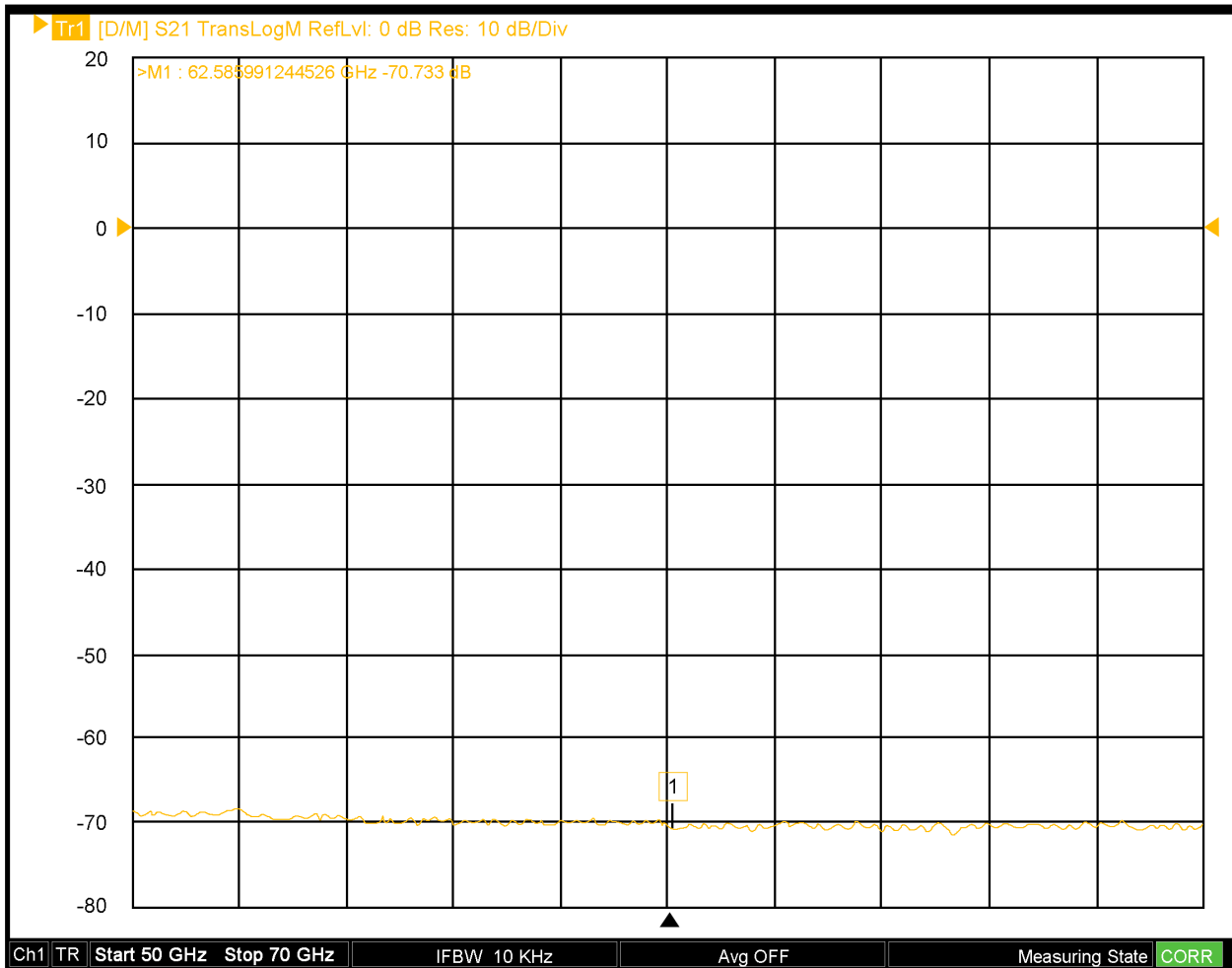
Ordering Information



EXAMPLE:

511A/599
 Frequency range 26.5 to 40 GHz
 UG-599/U Flange

Test Data for 511 Version 2





Description

Mi-Wave's 520 Series Uncalibrated Variable Attenuators and 522 Calibrated Attenuators are available in standard waveguide sizes from 8 to 220 GHz. The attenuating element in each unit provides a 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.

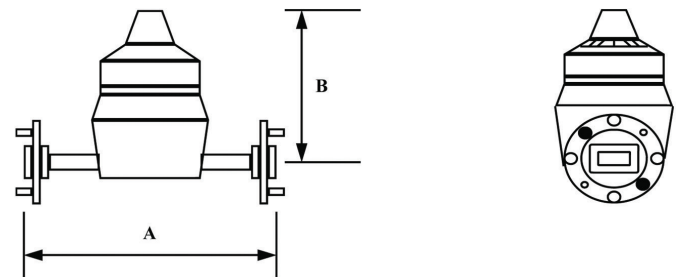
- *Dial Driven*
- *Compact, Mechanically Stable Design*
- *Wide Range of Attenuation Values*
- *Smooth, Spring-loaded Setting Control*

Applications

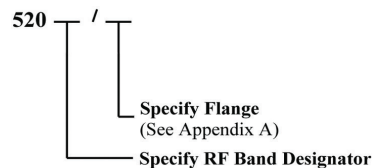
The 520/522 Series Variable Attenuators are useful in applications that require a reliable level setting or isolating pad. They provide maximum accuracy in establishing initial power levels in substitution-method attenuation measurements. Designed to maintain reliable performance for accurate test measurements, the stable setting control of these devices maintains constant attenuation under all normal conditions of vibration and orientation.

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

**CUSTOM
HIGH
POWER
VERSIONS
AVAILABLE**



Ordering Information



OTHER BANDS AVAILABLE:

- WR-90
- WR-62
- WR-75
- WR-34

522 Calibrated attenuators are calibrated at center frequency normally.

Technical Specifications (typical)										
Model No.	520K	520A	520B	520U	520V	520E	520W	520F	520D	520G
Frequency Band (GHz)	18-26.5	26.5-40	33-50	40-60	50-75	60-90	75-110	90-140	110-170	140-220
VSWR Max.	1.15	1.15	1.15	1.15	1.15	1.15	1.20	1.25	1.25	1.30
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 (Low) Power Handling (Watts)	.3	.3	.3	.2	.2	.1	.1	.1	.1	.1
Medium Power Handling (Watts)	5	5	4	3	2	1	.5	.25	.2	0.2

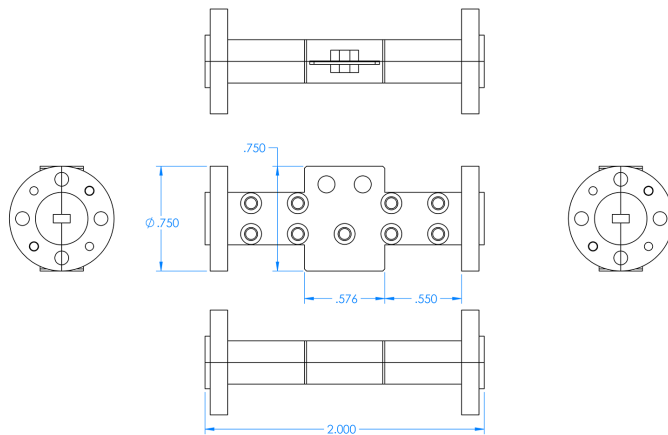
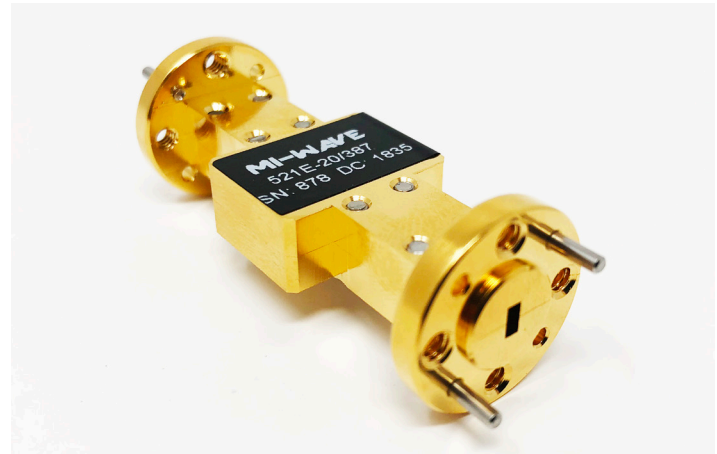
Description

Mi-Wave's 521 Series Fixed Attenuators are available in attenuation values up to 30 dB for each waveguide band from 8 to 220 GHz. Each fixed attenuator is calibrated at the exact frequency specified and is accurate within 0.1 dB or 1%.

- *Wide Range of Accurately Calibrated Values*
- *Available in Every Waveguide Size from 8 to 325 GHz*

Applications

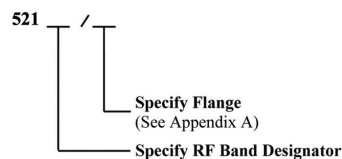
The 521 Series Fixed Attenuators are used in millimeter wave applications that require accurate fixed attenuation levels in waveguide transmission lines. All units are H-plane fixed attenuators. The attenuators are useful for isolating generators from mismatched load effects. They are also used for extending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



**CUSTOM
HIGH
POWER
VERSIONS
AVAILABLE**

Dimensional Specifications		
Model No.	A	
	in.	mm
521K	3.00	76.2
521A	2.00	50.8
521B	2.00	50.8
521U	2.00	50.8
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

Ordering Information



NOTE:
Please specify center frequency at time of order.

Technical Specifications (typical)												
Model No.	521K	521A	521B	521U	521V	521E	521W	521F	521D	521G	521H	521J
Frequency Band (GHz)	18–26.5	26.5–40	33–50	40–60	50–75	60–90	75–110	90–140	110–170	140–220	170–260	220–325
VSWR Max.	1.15	1.15	1.15	1.15	1.15	1.15	1.20	1.20	1.20	1.30	1.35	1.35
Average (Low) Power Handling (Watts)	.3	.3	.3	.2	.2	.1	.1	.1	.1	.1	.05	.05
Medium Power Handling (Watts)	5	5	4	3	2	1	1	2	1	0.5	0.1	0.1
High Power Handling (Watts)	**	**	**	**	**	**	**	**	**	**	**	**
Weight (oz)	1.15	10	1.0	1.0	0.5	0.4	0.3	0.2	0.15	0.1	0.1	0.1

** Please Consult For High Power Attenuators

Description

Mi-Wave's 523 Series Micrometer-driven Calibrated Attenuators are compact precision attenuating devices available in standard waveguide sizes from 18.0 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.

- *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*

Applications

The 523 Series Micrometer-driven Calibrated Attenuators are designed for laboratory applications in standard waveguide bands from 18.0 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.

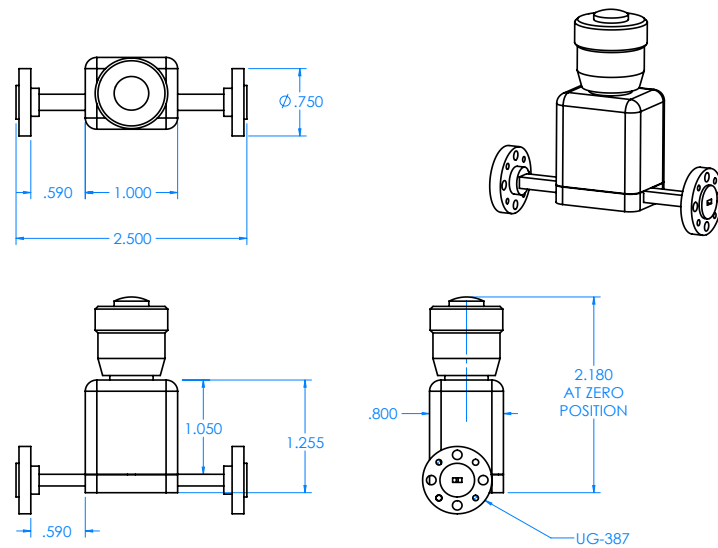


Dimensional Specifications				
Model No.	A		B'	
	in	mm	in	mm
523F	2.0	50.8	3.65	92.9
523D	2.0	50.8	3.65	92.7
523G	2.0	50.8	3.65	92.7

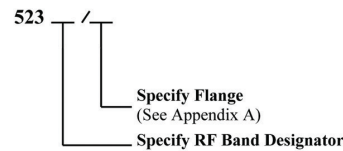
1. 1.415 in. (105.4 mm) maximum dimensions with micrometer fully extended.

OTHER BANDS AVAILABLE:

- WR-42, 34, 28, 22, 19, 15, 12, and 10.



Ordering Information



Technical Specifications (typical)										
Model No.	523K	523A	523B	523U	523V	523E	523W	523F	523D	523G
Frequency Band (GHz)	18–26.5	26.5–40	33–50	40–60	50–75	60–90	75–110	90–140	110–170	140–220
VSWR Max.	1.15	1.15	1.15	1.15	1.15	1.15	1.20	1.25	1.25	1.30
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 (Low) Power Handling (Watts)	.3	.3	.3	.2	.2	.1	.1	.1	.1	.1

NOTE:

Please specify center frequency at time of order.

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



Description

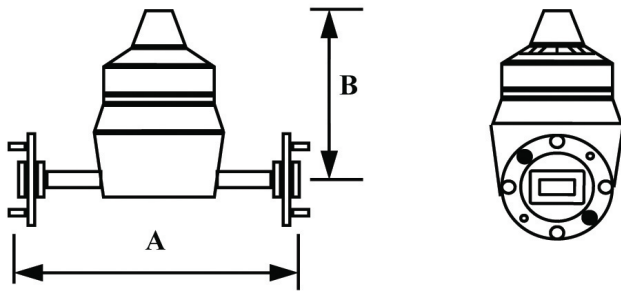
Mi-Wave's 525 Uncalibrated and 526 Calibrated Phase Shifters provide phase shifts from 0° to 180° at any frequency within the waveguide band.

- *Dial Driven*
- *Smooth Phase Shift Control*
- *Compact and Mechanically-stable Design*
- *Settings Maintained in all Orientations*

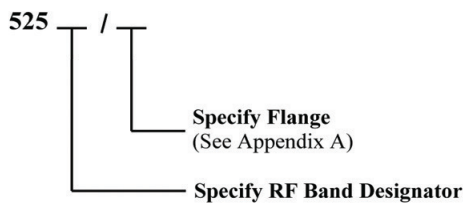
Designed to maintain reliable performance for accurate test measurements, the firm setting control of these devices maintains stable performance under all normal conditions of unit orientation and test bench vibration.

Applications

Mi-Wave's 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



Ordering Information



OTHER BANDS AVAILABLE:

- WR-90, 75, 51, 34

526 Calibrated at 1 frequency

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

Technical Specifications (typical)										
Model No.	525K	525A	525B	525U	525V	525E	525W	525F	525D	525G
Frequency Band (GHz)	18–26.5	26.5–40	33–50	40–60	50–75	60–90	75–110	90–140	110–170	140–220
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

527 Series

Micrometer-driven Calibrated Phase Shifters

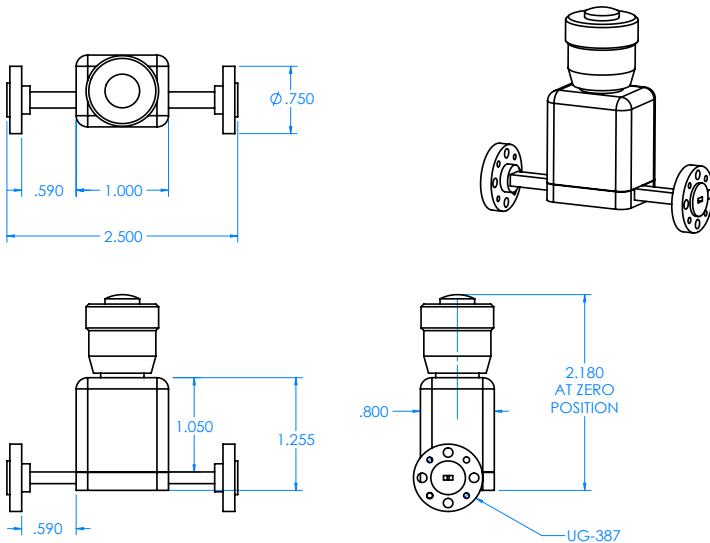


Description

Mi-Wave's 527 Series Phase Shifters are designed for operation in waveguide sizes from 18 to 220 GHz. This resolution is advantageous since the total travel of the phase shift vane is quite short at high frequencies.

- *Low VSWR*
- *Micrometer Readout*
- *Smooth Anti-Backlash Operation*

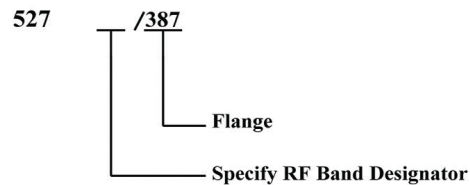
The precise micrometer readout enhances setting and repeatability of these devices tested. Each phase shifter is at the specified frequency. Calibrations are supplied at an additional cost.



Dimensional Specifications				
Model No.	A		B	
	in.	mm	in.	mm
527F	2.0	50.8	4.0	101.6
527D	2.0	50.8	4.0	101.6
527G	2.0	50.8	4.0	101.6

Technical Specifications (typical)			
Model No.	527F	527D	527G
Frequency Band (GHz)	90–140	110–170	140–220
VSWR Max.	1.15	1.15	1.15
Phase Shift (degrees) Min.	180	180	180
Accuracy (°)	+3.0	+3.0	+3.0
Weight (oz)	5.5	5.5	5.5

Ordering Information



OTHER BANDS AVAILABLE:

From 18 to 110 GHz

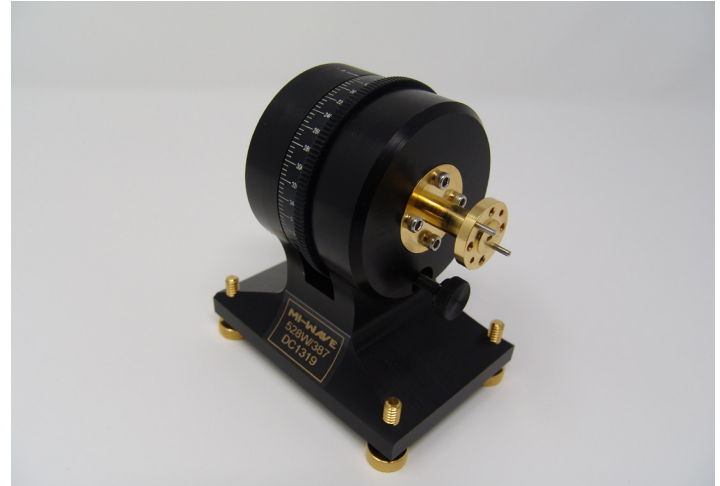
Description

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 170.0 GHz. They feature low VSWR, low insertion-loss, and low insertion-loss variation due to the rotation of the phasing section.

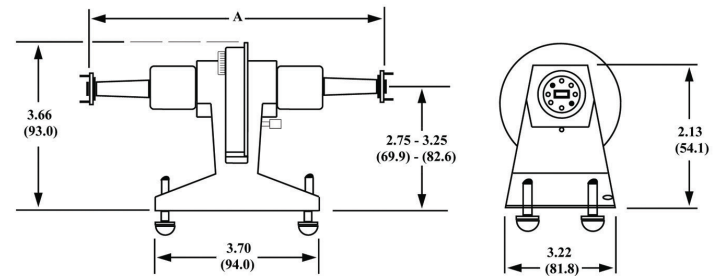
- *Compact & Mechanically-Stable Design*
- *Smooth Anti-backlash Phase Shift Control*
- *High Resolution Over a Wide Phase-shifting Range*

Applications

The 528 Series Direct-reading 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.

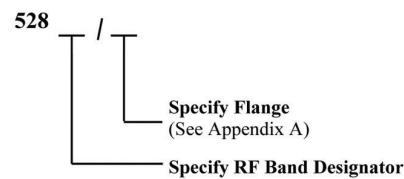


Dimensional Specifications		
Model No.	A	
	in	mm
528A	8.53	217.0
528B	6.85	174.0
528U	5.83	148.0
528V	4.75	121.0
528E	4.16	106.0
528W	3.38	85.8
XXXXXX	XXXXX	XXXXX
XXXXXX	XXXXX	XXXXX



Operation Specifications	
Phase Shift Range	0° to 360° Direct-reading
Read-out	0° to 360° in 5° Divisions with 0.5s vernier
Loss Variation	1.0 dB (Max.)

Ordering Information



OTHER BANDS AVAILABLE

Technical Specifications (typical)								
Model No.	528A	528B	528U	528V	528E	528W	528F	528D
Frequency Band (GHz)	26.5-40	33-50	40-60	50-75	60-90	75-110	90-140	110-170
Accuracy (degrees) (typ)	± 3	± 3	± 3	± 4	± 5	± 5	± 5	—
Insertion Loss (dB)	1.0	1.2	1.3	1.5	1.8	2.0	3.0	4.0
VSWR (typ)	1.30	1.30	1.30	1.30	1.30	1.35	1.5	1.5
Average Power (watts)	1.0	1.0	1.0	0.8	0.7	0.6	0.5	0.3
Weight (oz)	30	29	28	27	26	24	24	23



Description

Mi-Wave has developed a new motorized rotary vane phase shifter which is available in W/G bands from 18.0 to 170 GHz. The 529 Series is a computer controlled version of Mi-Waves' standard direct reading phase shifter and features a 0° to 360° range with 0.5 degree resolution. IEEE-488 & USB available.

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

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 accurate 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.

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	4.0	101.6	5.50	139.7	3.50	88.9

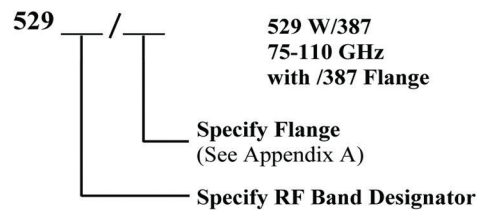
Electrical Specifications

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
529F	0.5	± 0.5	4 deg.	5 sec
529D	0.5	± 0.5	4 deg.	5 sec

Technical Specifications

Model No.	Frequency (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 Watts	30 oz
529F	90.0-140.0	2.0 dB	1.30	0.2 Watts	30 oz
529D	110.0-170.0	3.0 dB	1.50	0.1 Watts	30 oz

Ordering Information



When the unit is connected to 24 VDC with no connection to the IEEE interface. The 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.

Description

Mi-Wave's 530 Series Manual Switches are designed for use in standard millimeter wave frequency bands from 8.4 to 325 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.

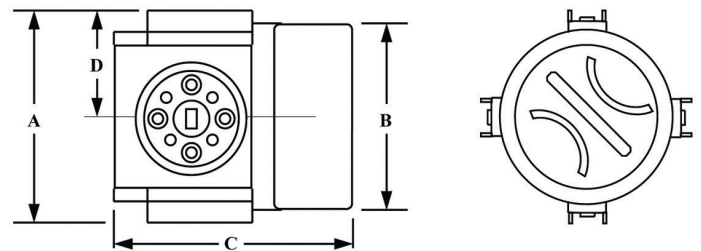
- *Positive Indexing*
- *Optimum Isolation*
- *Non-contacting Choke Coupling*
- *Versatile Switching Combinations*

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.



Dimensional Specifications								
Model No.	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



Ordering Information

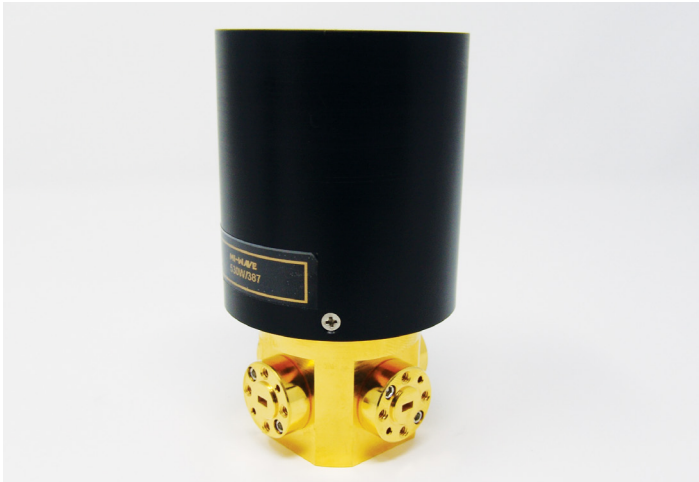


OTHER FREQUENCY BANDS AND CUSTOM CONFIGURATIONS AVAILABLE.

-WR-42 and lower will be E-Plane Types

-Switches available in WR-4 & WR-3 Bands

Technical Specifications (typical)									
Model No.	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) (typical)	60	60	60	60	60	60	50	50	45
Insertion Loss (dB) (typical)	0.3	0.3	0.3	0.4	0.5	0.6	0.7	0.9	1.0
VSWR (typical)	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.20	1.25



Description

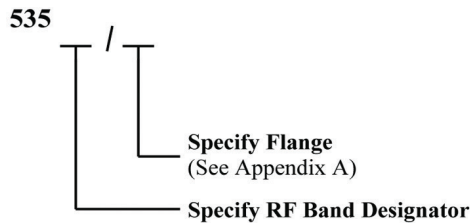
Each of Mi-Wave's 535 Series Waveguide Switches consists of a waveguide switch selection similar to the 530 Series switch and a rotary motor encased in a machined housing.

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

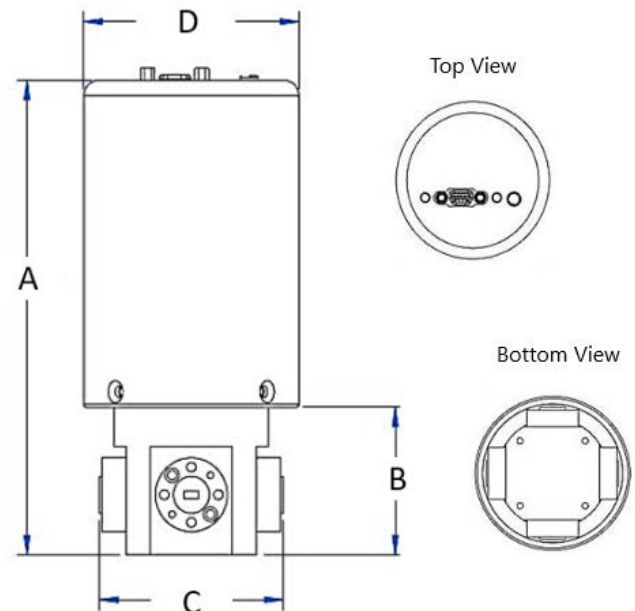
Applications

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.

Ordering Information



Controls: TTL and GPIB options available.



Dimensional Specifications								
Model No.	A		B		C		D	
	in.	mm	in.	mm	in.	mm	in.	mm
535A	4.83	122.6	1.50	38.1	1.96	49.9	2.24	56.8
535B	4.83	122.6	1.50	38.1	1.96	49.9	2.24	56.8
535U	4.83	122.6	1.50	38.1	1.96	49.9	2.24	56.8
535V	4.83	122.6	1.50	38.1	1.92	48.8	2.24	56.8
535E	4.83	122.6	1.50	38.1	1.92	48.8	2.24	56.8

-Switches available in WR-4 & WR-3 Bands

Technical Specifications (typical)									
Model No.	535A	535B	535U	535V	535E	535W	535F	535D	535G
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) (typical)	60	60	60	60	60	60	50	50	45
Insertion Loss (dB) (typical)	0.3	0.3	0.3	0.4	0.5	0.7	0.9	0.9	1.0
VSWR (typical)	1.15	1.15	1.15	1.15	1.15	1.15	1.2	1.3	1.3
Average Switching Speed (Seconds)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	1.2

Other frequencies available from 8.2–220 GHz

Description

Mi-Wave's 550 Series Frequency Meters are available in three standard waveguide sizes for operation from 50 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 the plotted on a curve to allow extrapolation for all frequencies.

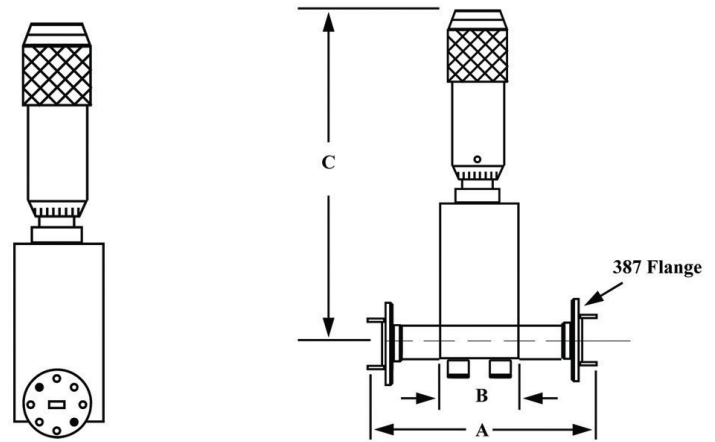
- *High Frequency Operation from 50.0 to 220 GHz*
- *Circular Waveguide Cavity for High-Q Resonances*
- *Micrometer Readout for Accurate Frequency Determination*

Applications

The 550 Series Frequency Meters are reaction-type cavity wavemeters designed for the accurate determination of millimeter wave signal frequencies.

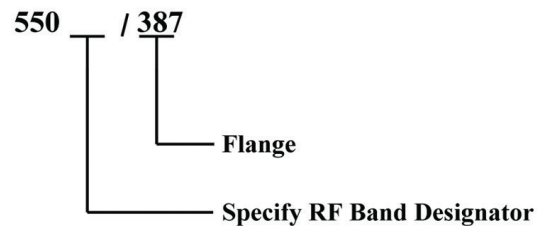


Dimensional Specifications						
Model No.	A		B		C	
	in.	mm	in.	mm	in.	mm
550F	1.20	30.5	.50	12.7	2.50	63.5
550D	1.20	30.5	.50	12.7	2.50	63.5
550G	1.20	30.5	.50	12.7	2.50	63.5



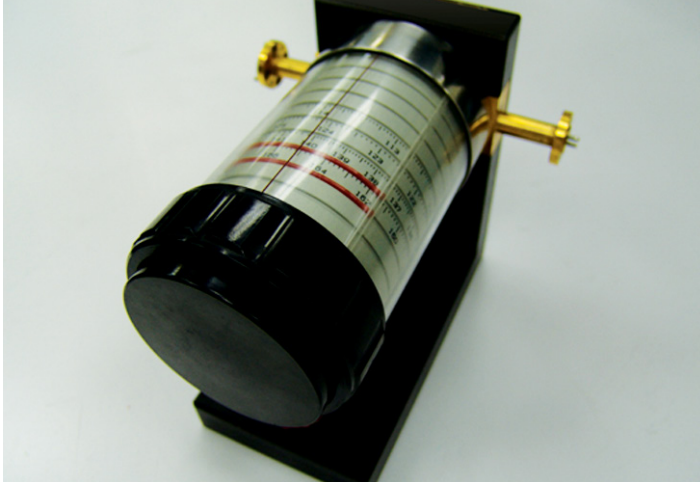
Technical Specifications (typical)			
Model No.	550F	550D	550G
Frequency Band (GHz)	90.0–140.0	110.0–170.0	140.0–220.0
Absolute Accuracy (%)	0.5	0.5	0.7
VSWR MAX. ¹	1.20	1.20	1.20
Insertion Loss (dB) Typical	0.5	0.6	0.8
Dip at Resonance (dB)	0.3–1.0	0.3–1.0	0.3–1.0
Weight (oz)	3.0	2.5	2.5

Ordering Information



OTHER FREQUENCY BANDS AND CUSTOM CONFIGURATIONS AVAILABLE.

WR-28, 22, 15, 12 and 10



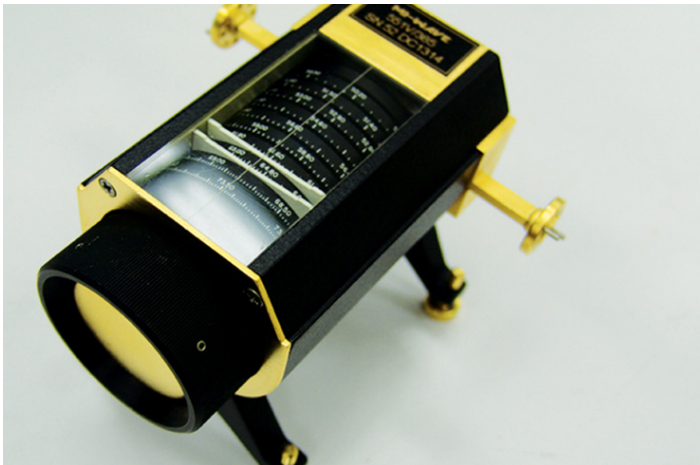
Description

Each of Mi-Wave's 551 Series Direct-reading Frequency Meters are available in standard waveguide sizes from 18.0 to 170.0 GHz and are designed to provide easy direct readout of frequency with a high degree of resolution and accuracy.

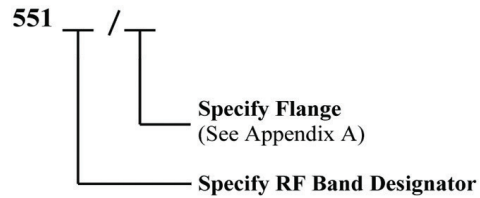
- Full Band
- Direct Reading
- High Resolution
- Anti-backlash Drive

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.



Ordering Information



Technical Specifications (typical)									
Model No.	551K	551A	551B	551U	551V	551E	551W	551F	551D
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	110.0-160.0
Absolute Accuracy (%)	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.4	0.5
Resonance Dip (dB)	0.5-1.0	0.5-1.0	0.5-1.0	0.5-1.0	0.5-1.0	0.5-1.0	0.5-1.0	0.3-1.0	0.3-1.0
VSWR ¹ Max.	1.10	1.15	1.15	1.15	1.20	1.20	1.20	1.20	1.20
Insertion Loss (dB) Max.	.30	.30	.50	.70	.90	1.0	1.1	1.5	2.0
Scale Divisions (MHz) Min.	10	10	10	20	20	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		

Description

Mi-Wave's 555 Series Bi-directional couplers are broadband, broadwall waveguide type. The 556 are split block type components with a multi-hold directivity. The 555 Series couplers are available in 3, 6, 10, 20, 30, and 40 dB coupling values for standard waveguide bands from 18 to 220 GHz.

- High Directivity
- Accurate Coupling
- Full Waveguide Bandwidth

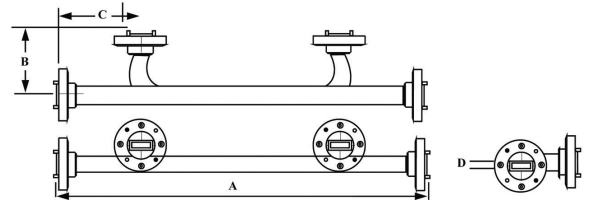
Applications

The 555 Series Bi-directional 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 bi-directional couplers can provide full bandwidth power division.



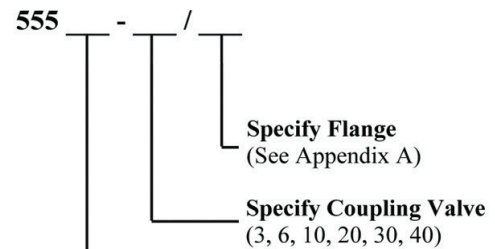
Dimensional Specifications								
Model No.	A		B		C		D	
	in.	mm	in.	mm	in.	mm	in.	mm
555A/10, 20, 30, 40	9.62	244.0	1.75	44.5	1.38	35.1	.16	4.06
555A/3, 6 dB	12.0	304.8	1.75	44.5	1.38	35.1	.16	4.06
555B/10, 20, 30, 40	8.40	213.0	1.64	41.7	1.30	33.0	.13	3.30
555B/3, 6 dB	10.25	259.1	1.64	41.7	1.30	33.0	.13	3.30
555U/10, 30, 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	0.6	1.52
555W/3, 6 dB	5.50	139.7	1.00	25.4	0.81	20.6	.06	1.52

556 up to J Band



Technical Specifications (typical)						
Model No.	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

Ordering Information



OTHER WAVEGUIDE BANDS AVAILABLE:

- WR-90
- WR-75
- WR-62
- WR-51
- WR-34



Description

Each of Mi-Wave's 559 Series Broadband Directional Couplers are broadwall multi-hole energy-coupling devices. The 559 Series couplers are designed in 7 couplings of 3, 6, 10, 20, 30, 40 and 50 dB are offered to complement specific test set requirements. Other custom configurations are available upon request.

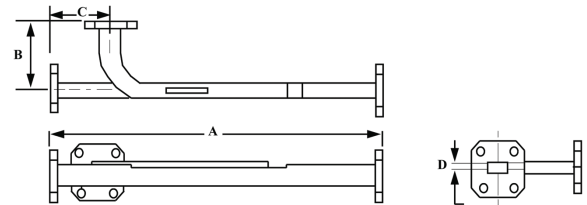
- Broadband
- Low VSWR
- High Directivity
- Rugged Construction
- High Coupling Accuracy
- Calibrated Coupling Values
- Minimum Coupling Variation with Frequency

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.

Dimensional Specifications

Model No.	A		B		C		D	
	in.	mm	in.	mm	in.	mm	in.	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, 30, 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	8.6	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



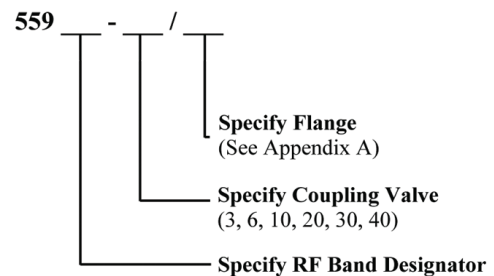
OTHER BANDS AVAILABLE:

- WR-90
- WR-75
- WR-51
- WR-34

Technical Specifications (typical)

Model No.	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)	±1.0	±1.0	±1.0	±1.0	±1.0	±1.0	±1.0
Coupling Accuracy (dB) (at center freq.)	±1.0	±1.0	±1.0	±1.0	±1.0	±1.0	±1.0
Directivity (dB) Typical	40	40	40	40	40	40	40
Main Line VSWR (typ)	1.05	1.05	1.05	1.10	1.10	1.10	1.10
Auxiliary Line VSWR (typ)	1.12	1.12	1.12	1.15	1.15	1.15	1.17

Ordering Information



*Coupling fluctuates +/- 1dB or +/- 5% whichever is greater

Description

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, 6, 10, 20, 30, 40 and 50 dB are offered to complement specific test set requirements.

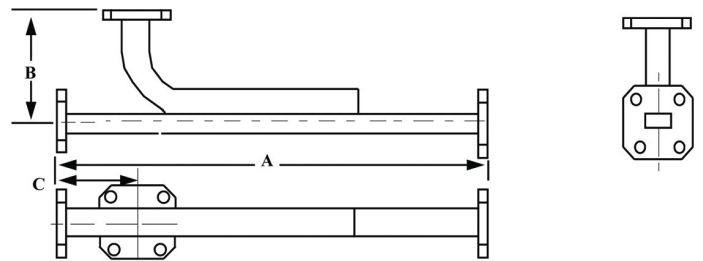
Applications

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.

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



Dimensional Specifications						
Model No.	A		B		C	
	in.	mm	in.	mm	in.	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, 30, 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

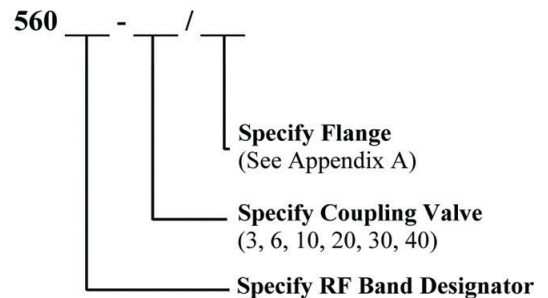


OTHER WAVEGUIDE BANDS AVAILABLE:

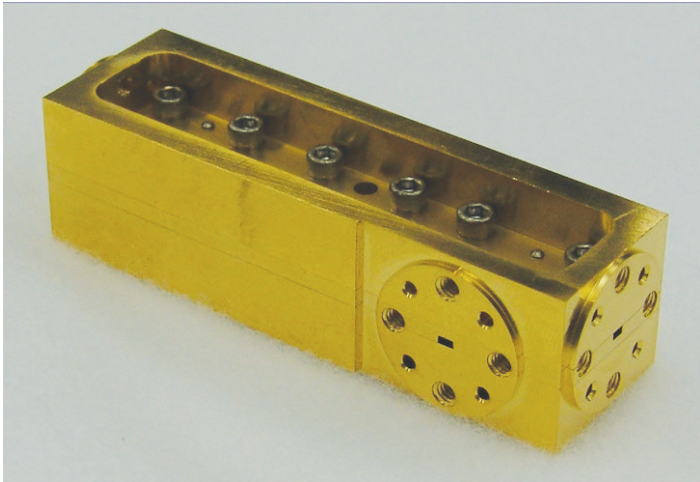
- WR-90
- WR-75
- WR-62
- WR-51
- WR-34

Technical Specifications (typical)							
Model No.	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)	± 1.0	± 1.0	± 1.0	± 1.0	± 1.0	± 1.0	± 1.0
Coupling Accuracy (dB) (at center freq)	± 1.0	± 1.0	± 1.0	± 1.0	± 1.0	± 1.0	± 1.0
Directivity (dB) Typical	40	40	40	40	40	40	40
Main Line VSWR (typ)	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

Ordering Information



*Coupling fluctuates +/- 1dB or +/- 5% whichever is greater



Description

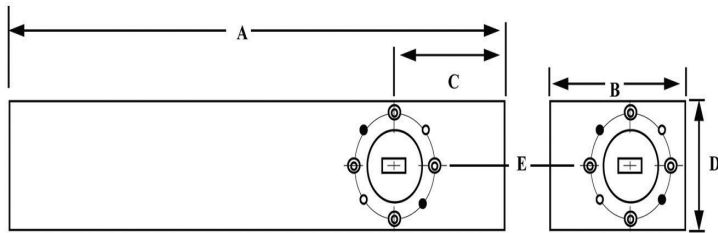
Mi-Wave's 561 Series Broadband Directional Couplers are broadband multi-hole energy-coupling devices. The 561 Series devices are available in various waveguide sizes ranging in frequency from 18.0 to 500 GHz.

Nominal couplings of 3, 6, 10, 20, 30, 40 and 50 dB are offered to complement specific test set requirements.

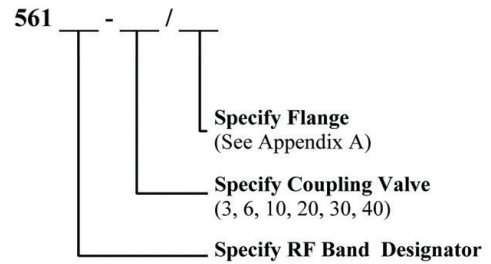
- *Broadband*
- *Low VSWR*
- *High Directivity*
- *Rugged Construction*
- *High Coupling Accuracy*
- *Calibrated Coupling Values*
- *Minimum Coupling Variation with Frequency*

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.



Ordering Information



* Coupler available in WR-4 & WR-3 Bands

Technical Specifications (typical)									
Model No.	561A	561B	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)	± 1.0	± 1.0	± 1.0	± 1.0	± 1.0	± 1.0	± 1.5	± 1.5	± 1.5
Coupling Accuracy (dB) (at center frequency)	± 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

*Coupling fluctuates +/- 1dB or +/- 5% whichever is greater

Description

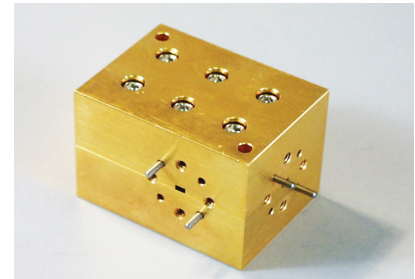
Mi-Wave's 564 Series Cross Guide Coupler consists of two waveguides at right angles to each other, joined by small coupling slots whose size, location, and orientation determine the coupling and directivity of the unit. All ports are available for sampling or injecting energy and are clearly marked to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

- *Low VSWR*
- *Four-port Device*
- *Rugged Construction*
- *Broadband Operation*

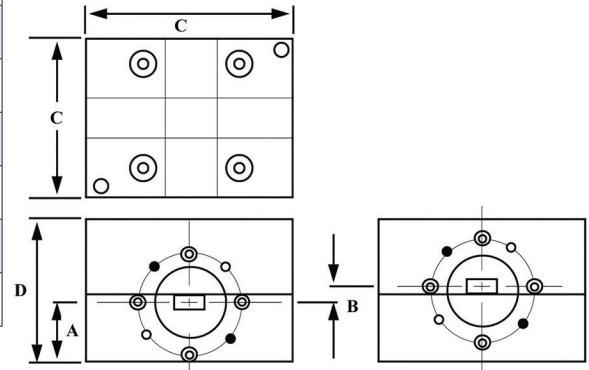
Applications

The 564 Series Cross Guide Directional Couplers provide an efficient means for sampling power or injecting a signal into a waveguide transmission line.

565 has 4th port terminated
Check with Miwave for dimensions

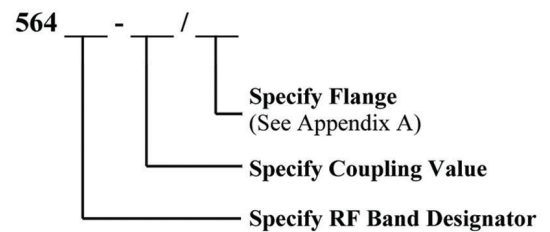


Dimensional Specifications								
Model No.	A		B		C		D	
	in.	mm	in.	mm	in.	mm	in.	mm
564K	.568	14.4	0.18	4.6	1.62	41.1	1.31	33.3
564A	.580	14.7	0.15	3.8	1.62	41.1	1.31	33.3
564B	.594	15.1	0.12	3.0	1.62	41.1	1.31	33.3
564U	.603	15.3	0.10	2.5	1.62	41.1	1.31	33.3
564V	.588	14.9	0.08	2.01	1.25	31.8	1.25	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



Technical Specifications (typical)									
Model No.	564K	564A	564B	564U	564V	564E	564W	564F	564D
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
Standard Coupling Values (dB) Nom.	16, 20, 30, 40, 50								
Directivity (dB) Typical	15	15	15	15	15	15	15	15	14
VSWR (typica)	1.15	1.15	1.15	1.15	1.20	1.20	1.20	1.20	1.5
Weight (oz)	2	2	2	2	3	3	3	3	3

Ordering Information



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

Description

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.

- *Low Cost*
- *Low VSWR*
- *Four-port Device*
- *Rugged Construction*
- *Broadband Operation*

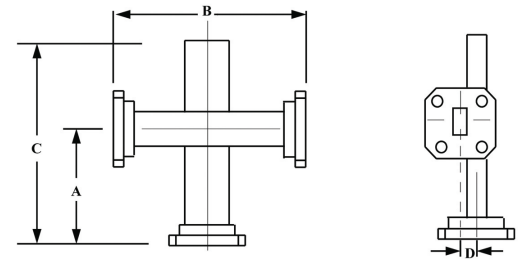
Applications

The 566 Series Cross Guide Directional Couplers provide an efficient means for sampling power or injecting a signal into a waveguide transmission line.



Dimensional Specifications

Model No.	A		B		C		D	
	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



OTHER WAVEGUIDE BANDS AVAILABLE:

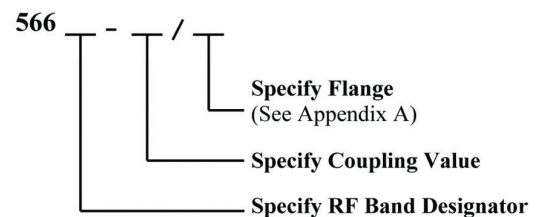
WR-90 WR-51
WR-75 WR-34
WR-62

Technical Specifications (typical)

Model No.	566K	566A	566B	566U	566V
Frequency Band (GHz)	18.0–26.5	26.5–40.0	33.0–50.0	40.0–60.0	50.0–75.0
Standard Coupling Values (dB) Nom.	20, 30, 40, 50				
Directivity (dB) Typical	15	15	15	15	15
VSWR Max.	1.15	1.15	1.15	1.15	1.20
Weight (oz)	3.0	3.0	3.0	3.0	2.0

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

Ordering Information





Description

Mi-Wave's 567 Series Dual-directional Couplers are broadband, broadwall components with a multi-hole directivity. The 567 Series Couplers are available in 3, 6, 10, 20, 30, 40 and 50 dB coupling values for standard waveguide bands from 18 to 170.0 GHz.

- High Directivity
- Accurate Coupling
- Full Waveguide Bandwidth

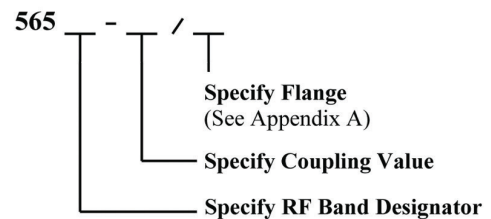
Applications

The 567 Series Dual-directional 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 bi-directional couplers can provide full bandwidth power division.

Dimensional Specifications

Model No.	A		B		C		D	
	in.	mm	in.	mm	in.	mm	in.	mm
567A/10, 20, 30, 40	9.62	244.0	1.75	44.5	1.38	35.1	.16	4.06
567A/3, 6 dB	12.0	304.8	1.75	44.5	1.38	35.1	.16	4.06
567B/10, 30, 30, 40	8.40	213.0	1.64	41.7	1.30	33.0	.13	3.30
567B/3, 6 dB	10.25	259.1	1.64	41.7	1.30	33.0	.13	3.30
567U/10, 20, 30, 40	7.38	187.4	1.38	35.1	1.12	28.5	.11	2.80
567U/3, 6 dB	9.12	231.6	1.38	35.1	1.12	28.5	.11	2.80
567V/10, 20, 30, 40	6.25	159.0	1.13	8.6	0.88	22.4	.08	2.03
567V/3, 6 dB	7.25	184.1	1.13	28.7	0.88	22.4	.08	2.03
567E/10, 20, 30, 40	5.50	140.0	1.13	28.5	0.88	22.4	.07	1.78
567E/3, 6 dB	6.62	168.1	1.13	28.7	0.88	22.4	.07	1.78
567W/10, 20, 30, 40	4.50	114.0	1.00	25.4	0.81	20.6	.06	1.52
567W/3, 6 dB	5.50	139.7	1.00	25.4	0.81	20.6	.06	1.52

Ordering Information



OTHER BANDS AVAILABLE:

- WR-90
- WR-75
- WR-62
- WR-51
- WR-34

Technical Specifications (typical)

Model No.	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)	± 1.0	± 1.0	± 1.0	± 1.0	± 1.0	± 1.0	± 1.0
Coupling Accuracy (dB) **	± 1.0	± 1.0	± 1.0	± 1.0	± 1.0	± 1.0	± 1.0
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

** at center frequency

*Coupling fluctuates +/- 1dB or +/- 5% whichever is greater

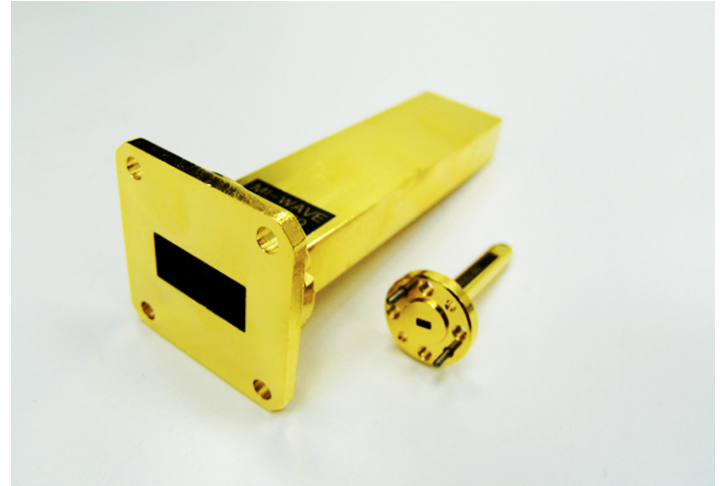
Description

Mi-Wave's 580 Series Terminations are designed with standard waveguide flanges for use from 5 to 320 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.

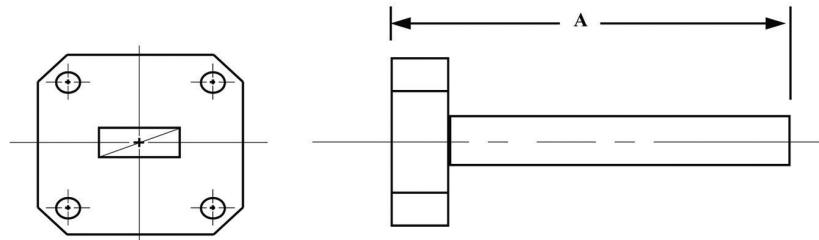
- *Low VSWR*
- *Compact Sizes*
- *Full Waveguide Bandwidths*
- *Available for Low Power and Medium Power Applications*

Applications

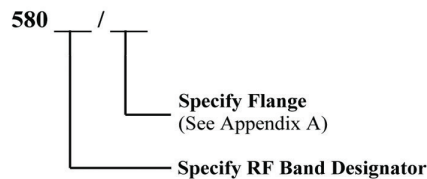
The 580 Series Terminations are used in experimental and developmental test sets where a low VSWR wave-guide load is essential for valid and accurate measurements. These terminations will ensure precise measurement of the VSWR resulting from insertion of various waveguide components into a system.



Dimensional Specifications		
Model No.	A	
	in.	mm
580Ku	3.31	84.1
580K	3.00	76.2
6655	3.00	3.00
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



Ordering Information



OTHER WAVEGUIDE BANDS AVAILABLE:

WR-137	WR-75
WR-112	WR-51
WR-90	WR-34

Technical Specifications (typical)											
Model No.	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 (typical)	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

* Available in WR-4, WR-3 & WR-2 Bands



Description

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.

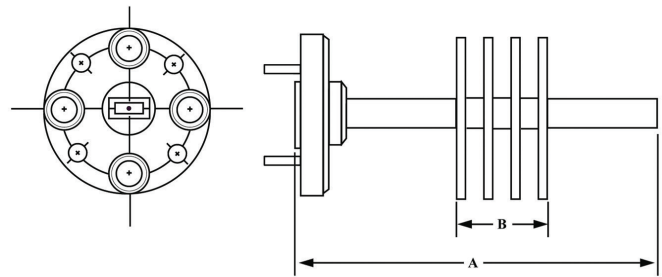
- Low VSWR
- Compact Size
- Full Waveguide Bandwidths
- Available for Low Power and Medium Power Applications

PLEASE NOTE:

Please note: for higher power requirements 582 Series and up to 100 watts CW, please consult Mi-Wave for technical specifications.

Applications

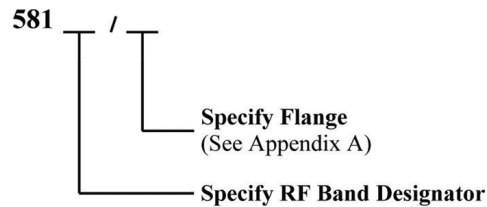
The 581 Series Terminations are used in experimental and developmental test sets where a low VSWR wave-guide load is essential for valid and accurate measurements. These terminations will ensure precise measurement of the VSWR resulting from insertion of various waveguide components into a system.



* Consult Mi-wave for current dimensions

Dimensional Specifications				
Model No.	A		B	
	in.	mm	in.	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

Ordering Information



OTHER BANDS AVAILABLE:

- WR-137
- WR-90
- WR-51
- WR-112
- WR-75
- WR-34

Technical Specifications (typical)											
Model No.	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	140–220
VSWR (typical)	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

Description

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.

- *Low VSWR*
- *Compact Sizes*
- *Full Waveguide Bandwidths*
- *Available for High Power up to 250 Watts CW Applications*

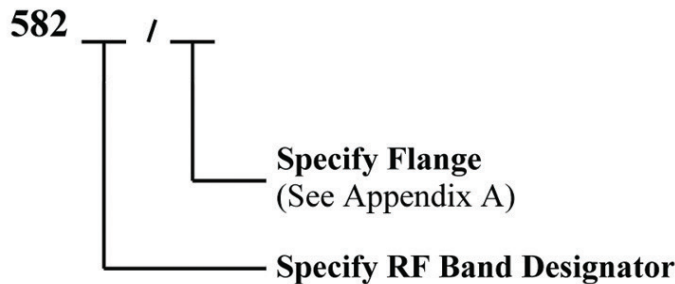
Power requirements for the 482 Series is up to 250 Watts CW, please consult Mi-Wave for other power availabilities and further technical information.

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.



Ordering Information



* Consult Mi-wave for current dimensions

Dimensional Specifications

(Subject to Change)

Model No.	A		B	
	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

Technical Specifications (typical)

Model No.	582Ku	582K	582A	582B	582U	582V	582E	582W	582F	582D	582G
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 (typical)	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	200	100	75	30	20	10	5	2	1



Description

Mi-Wave's 585 Series Sliding Matched load consists micrometer drive. The load is machined to precise tolerances to permit the close fit necessary for sliding without binding.

- Low VSWR
- Precision Adjustment

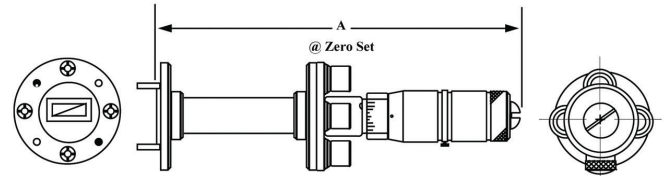
Applications

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.

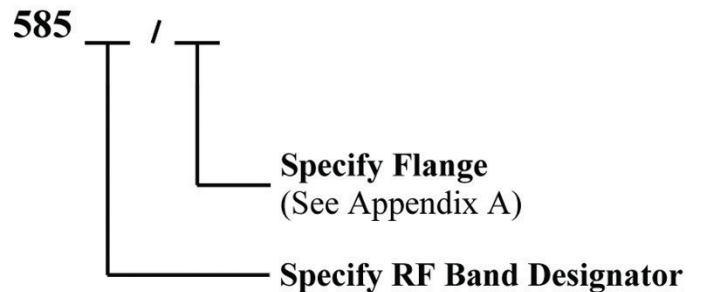
This min/max VSWR is used to determine the true VSWR of the unit under test. The 585 Series loads are also used to measure coupler directivity and residual VSWR in slotted line or other reflection measuring devices.

Dimensional Specifications

Model No.	A	
	in.	mm
585Ku	3.88	98.6
585K	2.88	73.2
585A	2.43	61.7
585B	2.43	61.7
585U	2.43	61.7
585V	2.00	50.8
585E	2.00	50.8
585W	2.00	50.8
585F	1.38	35.1
585D	1.38	35.1
585G	1.38	35.1



Ordering Information



* Consult Mi-wave for current dimensions

Technical Specifications (typical)

Model No.	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	140–220
VSWR	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	5.0	0.7	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

590/595 Series

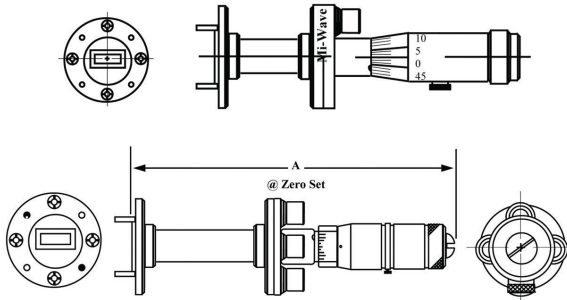
Adjustable & Fixed Waveguide Short Circuits

Description

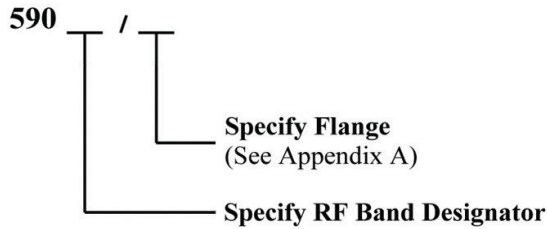
Mi-Wave's 590 Series Waveguide Short Circuits are available in standard waveguide sizes from 12.4 to 325 GHz. The non-contacting choke type short circuit is designed to operate with high electrical stability over a broad range of frequencies. The micrometer drive provides smooth, accurate positional tuning over the entire distance traveled and a positive locking device ensures continued setting reliability.

The 595 Series is a fixed short circuit

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



Ordering Information

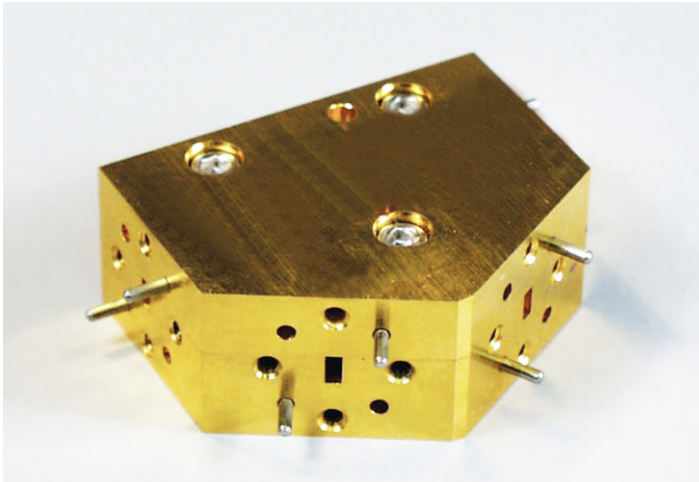


Dimensional Specifications

Model No.	A	
	in.	mm
590Ku	5.02	127.5
590K	4.59	116.6
590A	3.43	87.1
590B	3.43	87.1
590U	3.03	100.0
590V	3.03	76.9
76.9	3.03	76.9
590W	3.03	76.9
590F	3.03	76.9
590D	2.42	61.5
590G	2.42	61.5

Technical Specifications (typical)

Model No.	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	140–220



Description

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.

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

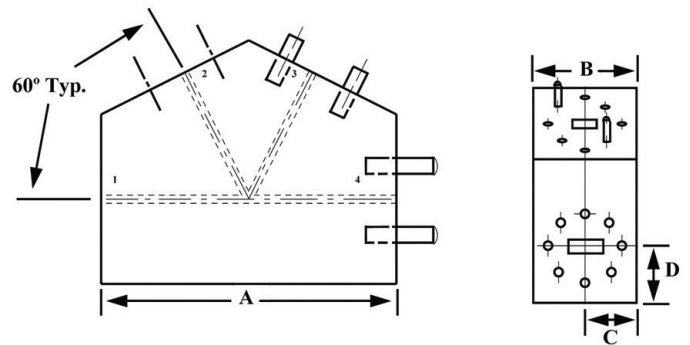
Mi-Wave's 610 Series Triple Hybrid Rings consist of three single hybrid rings

integrated into one compact component. This device provides four 6 dB outputs for use in dual balanced mixers and power divider/combiner circuits.

Applications

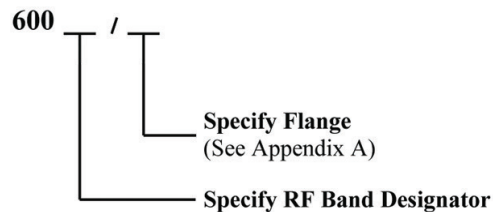
The 600 Series Hybrid Rings are used in balanced mixers and power divider/combiner circuits where precise power splitting, high isolation, and accurate phase inversion are necessary.

Dimensional Specifications								
Model No.	A		B		C		D	
	in.	mm	in.	mm	in.	mm	in.	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	0.62	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							



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

Ordering Information



Technical Specifications (typical)										
Model No.	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) (typical)	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)	5.5	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

Description

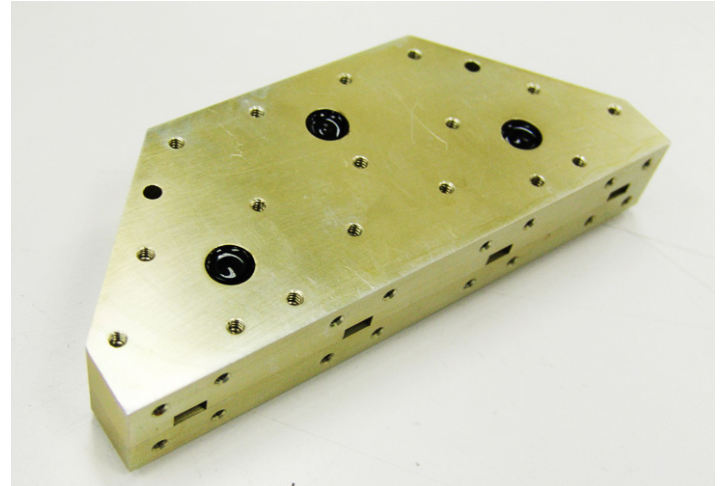
Mi-Wave's 604 Series Four-way Power Divider, inherently-matched 3 dB power splitting devices. Available in standard waveguide sizes from 8.0 to 140.0 GHz, these units are capable of in-phase splitting.

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

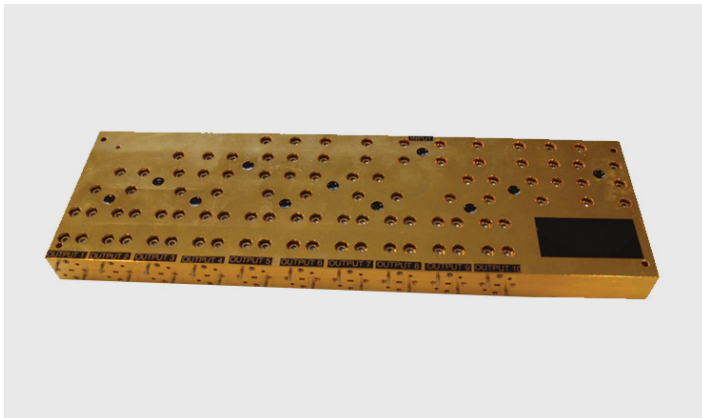
Applications

The 604 Series Four-way Power Divider are used in:

- Power Splitting
- Power Combining

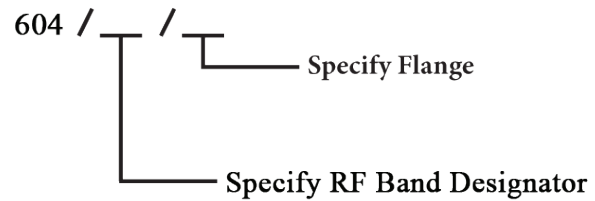


Custom 10-Way & 8 Way Power Divider Available



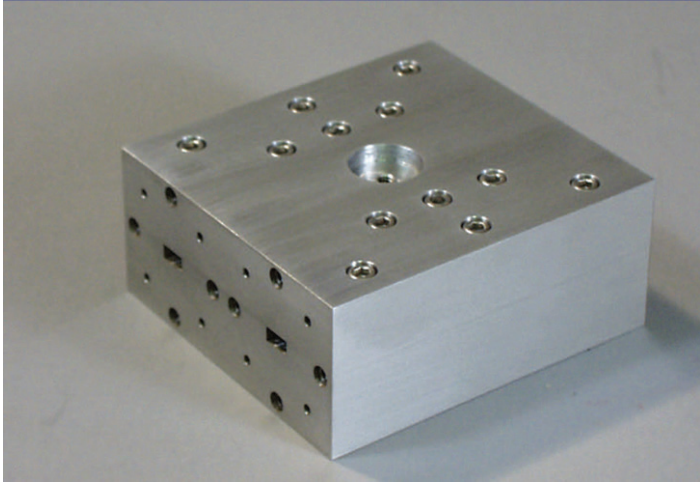
Custom configurations available: 4, 8, 12, 16, 24, 32

Ordering Information



Technical Specifications (typical) (for 4 way)

Model No.	604K	604A	604B	604U	604V	604E	604W	604F
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
Isolation (dB) (typical)	20	20	20	20	20	20	20	20
Insertion Loss (dB) Max.	1.5	1.5	1.8	2.0	2.1	2.2	2.3	2.8
Power Imbalance Max. (dB)	0.5	0.5	0.5	0.7	0.8	0.8	0.9	1.2
VSWR (typical)	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
Bandwidth (%)	80	80	80	80	80	80	80	80



Description

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 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.

- *Small*
- *Compact*
- *Negligible Coupling Variation*

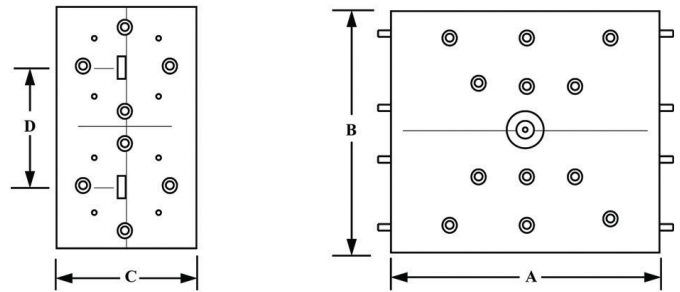
Access to the input and output ports of these hybrids is achieved with a special dual-waveguide, single flange arrangement.

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.

Dimensional Specifications

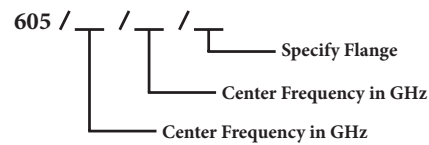
Model No.	A		B		C		D	
	in.	mm	in.	mm	in.	mm	in.	mm
605K	3.75	95.3	2.47	62.7	1.12	28.5	1.38	35.1
605A	3.50	88.9	2.47	62.7	1.12	28.5	1.38	35.1
605B	2.60	66.0	2.37	60.2	1.14	29.0	1.18	30.2
605U	2.60	66.0	2.37	60.2	1.14	29.0	1.18	30.2
605V	1.75	44.5	1.75	44.5	1.0	25.4	0.90	22.86
605E	1.75	44.5	1.75	44.5	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



Series 605

Input	Power Split	Phase Relation
1	2, 3	90 degrees out
2	1, 4	90
3	1, 4	90
4	2, 3	90

Ordering Information



Consult with MI-wave for current outline dimensions

Technical Specifications (typical)

Model No.	605Ku	605K	605A	605B	605U	605V	605E	605W
Coupling (dB)	3	3	3	3	3	3	3	3
VSWR (typical)	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15
Isolation (dB) (typical)	20	20	20	20	20	20	20	18
Bandwidth (%) (typical)	6	6	6	6	6	6	6	6



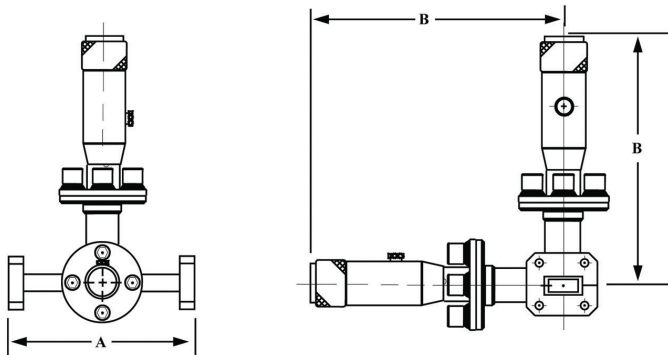
Description

Mi-Wave's 620 Series E/H Plane Tuners are hybrid tee sections available in standard waveguide sizes for operation from 12.4 to 325 GHz. The devices feature micrometer-driven tunable shorts in both the E-plane and H-plane arms for accurate tuning and reproducing 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.

- *Micrometer Driven*
- *Non-contacting Choke-type Short Circuits*

Applications

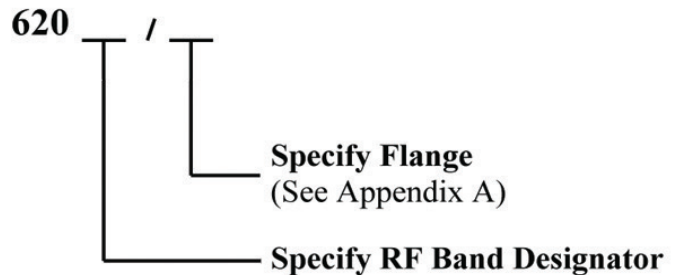
The 620 Series Tuners are excellent millimeter wave impedance matching networks designed to provide the reliable mismatch control required in most experimental and developmental test applications. These tuners introduce discontinuities into the waveguide transmission line for simultaneous control of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



Consult with MI-wave for current outline dimensions

Dimensional Specifications					
Model No.	A		B		Weight (oz)
	in.	mm	in.	mm	
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

Ordering Information



Description

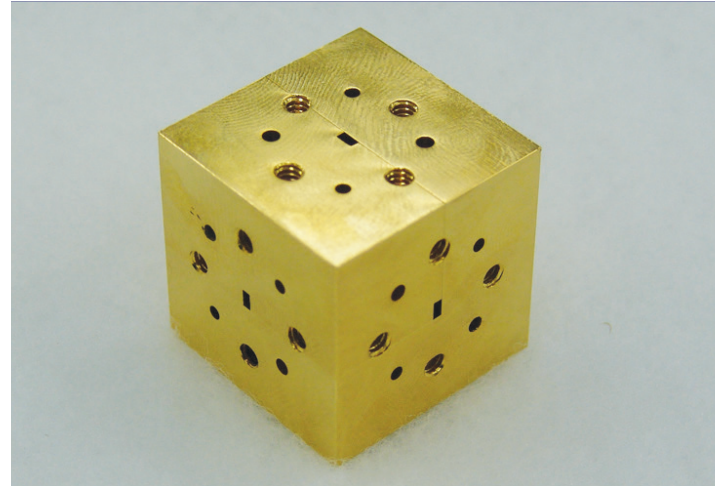
Mi-Wave's 630/635 Series E/H Hybrid and Magic Tees consist of three mutually perpendicular flanged sections of a standard waveguide. Two of these sections are symmetrically located on the broad and narrow walls of the main tee section to provide E-plane and H-plane connections.

- *Equal Power Division*
- *Available from 12.4 to 325GHz*
- *High Isolation Provided by Symmetrical Construction*

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 two 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 630/635 Series Hybrid Tees are available in standard wave-guide sizes from 12.4 to 325 GHz.

Applications

The 630/635 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. In the 630 series (E) and shunt (H) arms are not matched, these units are not suited for low VSWR applications. For matched applications, Mi-Wave recommends 635 Series Magic Tee.



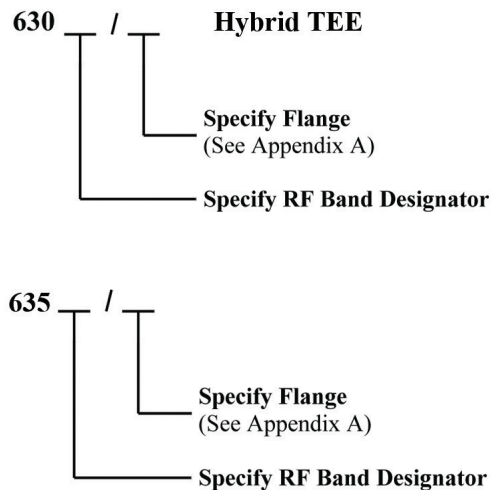
* Available in WR-4 & WR-3 Bands

Dimensional Specifications							
Model No.	A		B		C		Weight (oz)
	in.	mm	in.	mm	in.	mm	
635Ku	2.50	63.5	1.25	31.7	2.25	57.2	5.5
635K	2.50	63.5	1.25	31.7	1.63	41.4	5.5
635A	2.50	63.5	1.25	31.7	1.20	30.5	5.0
635B	2.50	63.5	1.25	31.7	1.17	29.7	4.8
635U	2.50	63.5	1.25	31.7	1.15	29.2	4.4
635V	2.00	50.8	1.00	25.4	0.85	21.6	3.4
635E	2.00	50.8	1.00	25.4	0.83	21.1	3.2
635W	2.00	50.8	1.00	25.4	0.82	20.8	3.0
635F	1.50	38.1	0.75	19.1	0.56	14.2	2.2
635D	1.50	38.1	0.75	19.1	0.55	14.0	1.6
635G	1.50	38.1	0.75	19.1	0.54	13.7	1.5

Please inquire with Mi-Wave for 630 specifications.

Consult with MI-wave for current outline dimensions

Ordering Information



640 & 650 Series

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

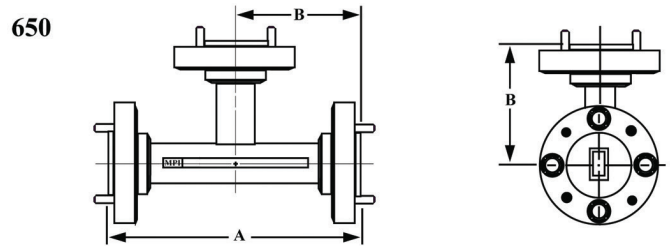
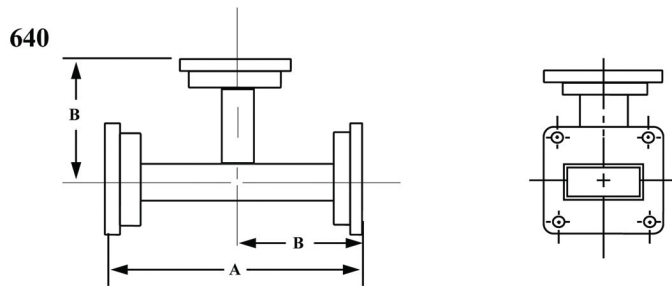


Description

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.

- *Unmatched ports*
- *Geometrical Symmetry*
- *Available from 12.4 to 110 GHz*
- *Equal Power Division Between the Two Outputs*

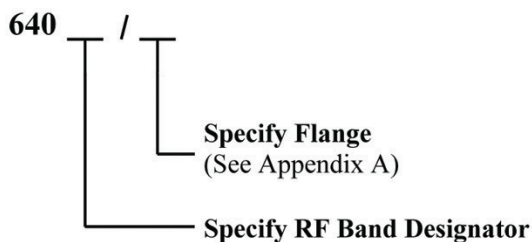
Similarly, the 650 Series H-plane Tees feature an H-plane coupling arm located on the narrow waveguide wall. Power at the coupling arm input is divided into equal signals in phase at the main outputs. These devices are available in standard waveguide sizes from 12.4 to 110 GHz. Neither the 640 Series or the 650 Series Tees have matched junctions and therefore are not recommended for low VSWR applications.



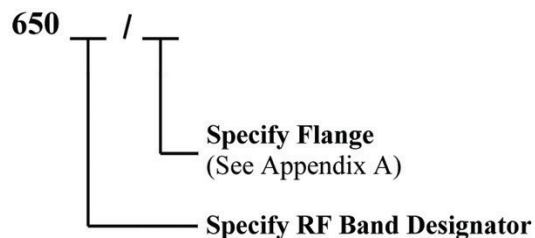
640 E-plane Dimensional Specifications					
Model No.	A		B		Weight (oz)
	in.	mm	in.	mm	
640Ku	2.50	63.50	1.25	31.75	3.7
640K	2.40	60.96	1.20	30.48	3.7
640A	2.40	60.96	1.20	30.48	3.7
640B	2.40	60.96	1.20	30.48	3.4
640U	2.40	60.96	1.20	30.48	3.2

650 H-plane Dimensional Specifications					
Model No.	A		B		Weight (oz)
	in.	mm	in.	mm	
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

Ordering Information



Ordering Information



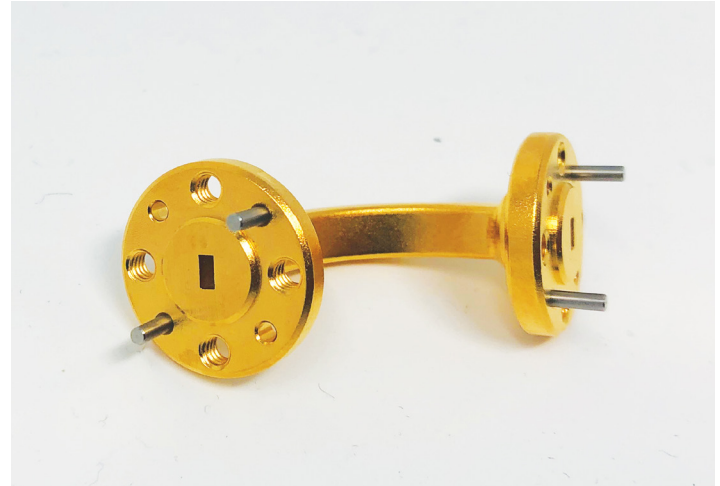
Description

Mi-Wave's 660, 661, 662 Series E-plane Bends are sections of high-precision waveguide accuratetaped to either 30° (661), 45° (665), 60° (662), or 90° (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.

- Available from 12.4 to 320 GHz
- Additional Radius and Angle Bends by Special Order
- Smooth Precision Bends Minimize Energy Reflections

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.

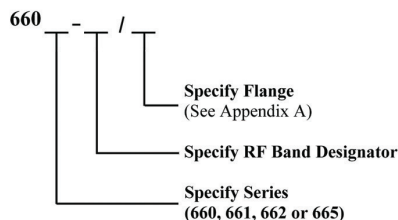


Dimensional Specifications			
Model No.	A		Weight (oz)
	in.	mm	
660Ku, 661Ku, 662Ku	2.00	50.0	2.7
660K, 661K, 662K	1.50	38.1	2.7
660A, 661A, 662A	1.50	38.1	2.5
660B, 661B, 662B	1.50	38.1	2.3
660U, 661U, 662U	1.50	38.1	2.2
660V, 661V, 662V	1.00	25.4	1.7
660E, 661E, 662E	1.00	25.4	1.6
660W, 661W, 662W	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

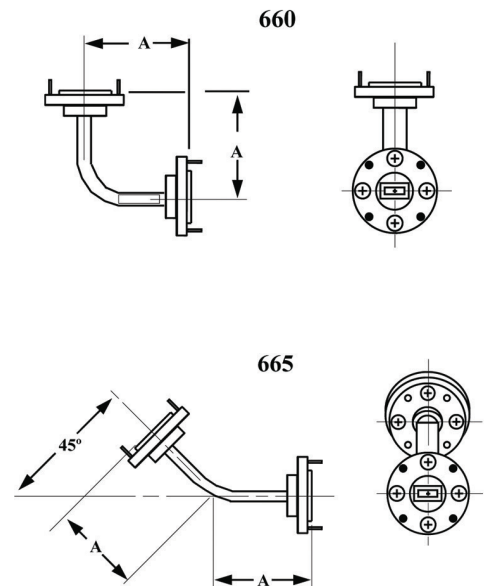
Technical Specifications (typical)		
Model No.	Frequency Band B Band (GHz)	VSWR
660Ku, 661Ku, 662Ku, 665Ku, 665Ku	12.4–18.0	1.10
660K, 661K, 662K, 665K	18.0–26.5	1.10
660A, 661A, 662A, 665A	26.5–40.0	1.10
660B, 661B, 662B, 665B	33.0–50.0	1.10
660U, 661U, 662U, 665U	40.0–60.0	1.12
660V, 661V, 662V, 665V	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

* Available in WR-4, WR-3 and WR-2.2 Bands

Ordering Information



Custom Bends Available	
660	90°
661	30°
662	60°
665	45°



670, 671, 672, & 675 Series

H-plane Bends

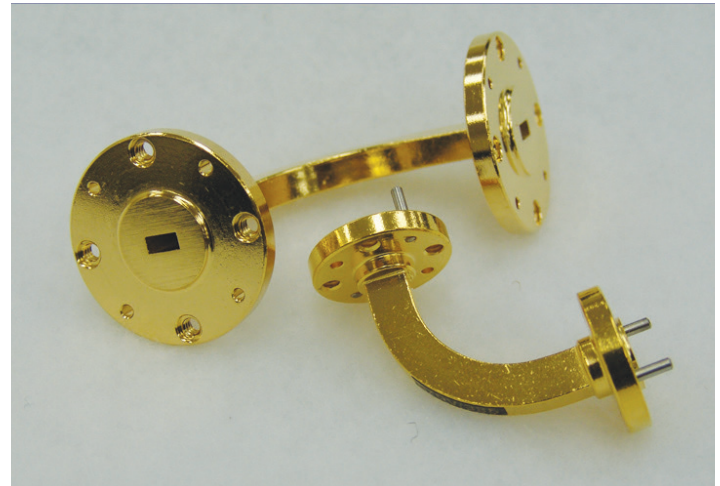
Description

Mi-Wave's 670, 671, 672, and 675 Series H-e Bends are sections of high-precision waveguide accurately shaped to either 30° (671), 45° (675), 60° (672), or 90° (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.

- Available from 12.4 to 320 GHz
- Additional Radius and Angle Bends by Special Order
- Smooth Precision Bends Minimize Energy Reflections

Applications

The H-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.

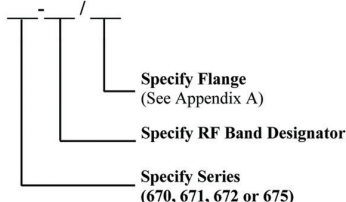


Dimensional Specifications			
Model No.	A		Weight (oz)
	in.	mm	
670Ku, 671Ku, 672Ku	1.80	45.7	2.7
670K, 671K, 672K	1.50	38.1	2.7
670A, 671A, 672A	1.50	38.1	2.5
670B, 671B, 672B	1.50	38.1	2.3
670U, 671U, 672U	1.50	38.1	2.2
670V, 671V, 672V	1.00	25.4	1.7
670E, 671E, 672E	1.00	25.4	1.6
670W, 671W, 672W	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

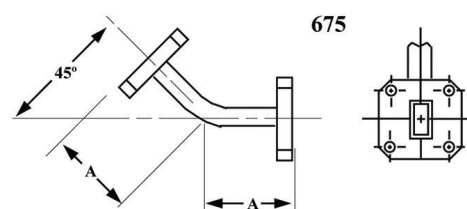
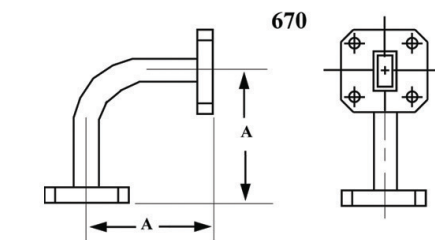
Technical Specifications (typical)		
Model No.	Frequency Band BBand (GHz)	VSWR
670Ku, 671Ku, 672Ku, 675Ku, 675Ku	12.4–18.0	1.10
670K, 671K, 672K, 675K	18.0–26.5	1.10
670A, 671A, 672A, 675A	26.5–40.0	1.10
670B, 671B, 672B, 675B	33.0–50.0	1.10
670U, 671U, 672U, 675U	40.0–60.0	1.12
670V, 671V, 672V, 675V	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

* Available in WR-4, WR-3 and WR-2.2 Bands

Ordering Information



Custom Bends Available	
670	90°
671	30°
672	60°
675	45°



680 & 681 Series

45° and 90° Twists



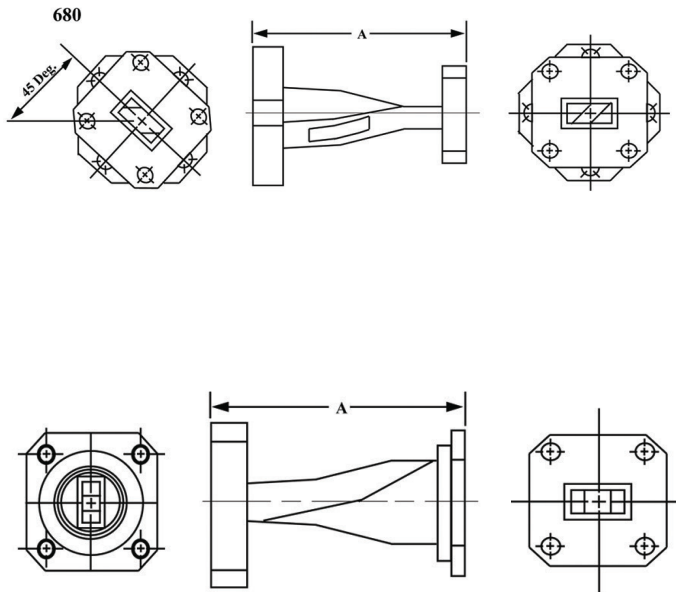
Description

Mi-Wave's 680 Series Twists are short sections of standard flanged waveguide with left-hand or right-hand 45° twist configurations while the 681 Series Twists provide 90° twist configurations. The units are available in standard waveguide sizes from 12.4 to 325 GHz. Please be sure to specify the left-hand or right-hand configuration when ordering.

- *Smooth 45°/90° Polarization Changes for Minimum Energy Reflection.*

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.



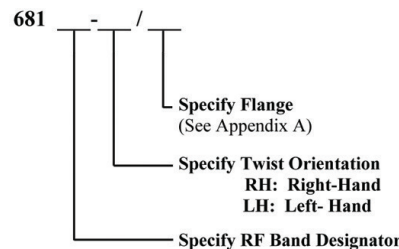
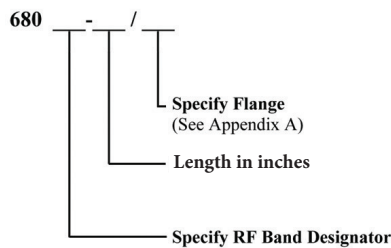
Dimensional Specifications

Model No.	A		Weight (oz)
	in.	mm	
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	31.75	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

* Available in WR-4 & WR-3 Bands

CUSTOM LENGTHS AVAILABLE

Ordering Information



Description

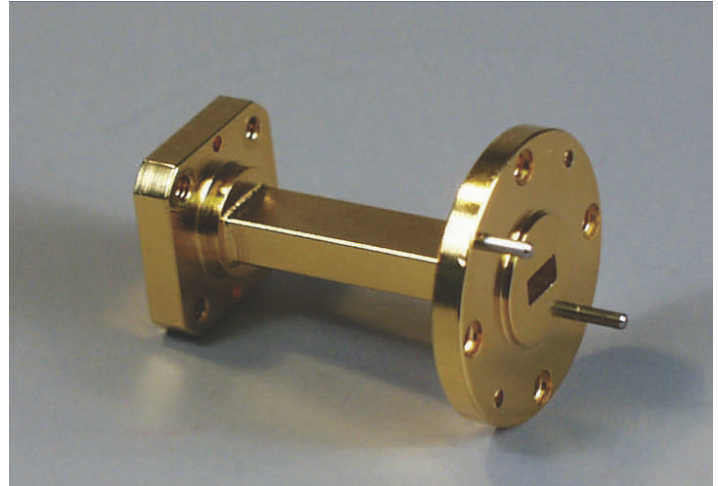
Mi-Wave's 688 Series Flange adapters are manufactured in standard waveguide sizes from 8 to 60 GHz. Each section is precision-machined and terminated in a variety of flange combinations. Please refer to Appendix A for a full list of available flanges.

- Precision Built
- Available from 8 to 60 GHz

Precise control of the waveguide dimensions and elimination of surface discontinuities make 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.

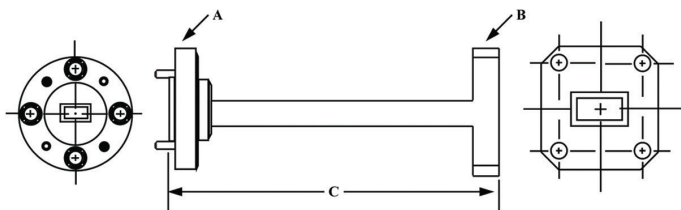
Applications

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

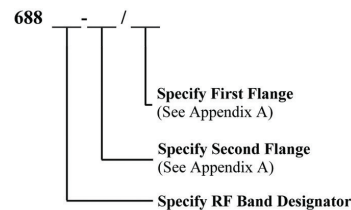


Custom flanges available

Dimensional Specifications					
Model No.	A	B	C		Weight (oz)
			in.	mm	
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



Ordering Information





Description

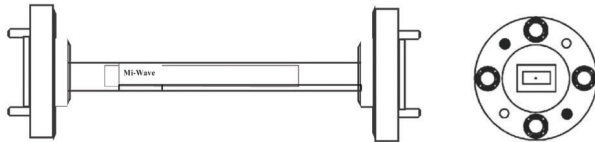
Mi-Wave's 690 Series flanged waveguide sections are available in standard waveguide sizes from 8 to 320 GHz. Each section is precisely fabricated using MIL-SPEC waveguide and flanges. Precise control of the fabrication processes eliminates waveguide discontinuities and distortion.

The 690 Series waveguide is available in a wide variety of materials. Available lengths are limited by raw waveguide which varies length with each waveguide size. Check with Mi-Wave's sales engineer for available lengths. Longer sections different wave-guide materials, and special flanges are all available upon request.

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.

690B



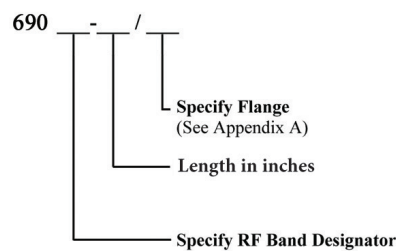
Dimensional Specifications		
Model No.	Inside Dimensions	
	in.	mm
690Ku	0.622 x 0.311	15.80 x 7.90
690K	0.420 x 0.170	10.66 x 5.33
690A	0.280 x 0.140	7.12 x 3.56
690B	0.224 x 0.112	5.68 x 2.84
690U	0.188 x 0.094	4.78 x 2.39
690V	0.148 x 0.074	3.76 x 1.88
690E	0.122x 0.061	3.0988 x 1.549
690W	0.100 x 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 0.8255
690G	0.051 x 0.0255	1.30 x 0.650

WR 4.3, WR-3.4, WR-2.2 WR-1.0 available

CUSTOM LENGTHS AVAILABLE

*Standard tolerances of +/- .020

Ordering Information



Description

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.

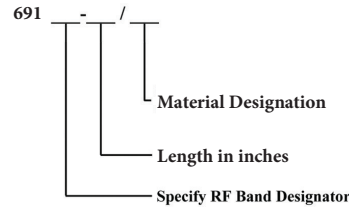
Please consult Mi-Wave for maximum available length.



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

WR-4.3 and 3.4 available

Ordering Information



Rectangular Waveguides											
			Recommended Operating Range for TE ₁₀ Mode		Cut-off for TE ₁₀ Mode						
Mi-Wave Band	Waveguide Designator(s) (JAN & WR)	Waveguide Inner Dimensions in Inches	Frequency (GHz)	Wavelength (mm)	Frequency (GHz)	Wavelength (mm)	Theoretical Power CW Breakdown Lowest to Highest Frequency (KW)	Theoretical Attenuation Lowest to Highest Frequency (dB/ft)	Flange Type	Historic Designation	New MIL Part Number
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 ^{1,2} Cover Cover	UG-385/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	0.78–0.53	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	4.0–2.7	59.010	5.08	14–20	1.02–0.71	Cover ^{1,2}	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.



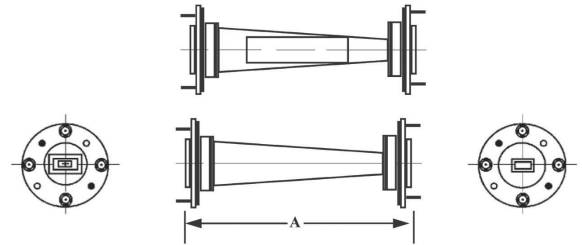
Description

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 8.4 to 320 GHz. In addition to the standard configurations listed in this section, many special transitions will be developed upon request.

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

Dimensional Specifications

Model No.	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	1.15	1.00	25.4
692E-F	0.122 x 0.061	0.080 x 0.040	1.15	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	1.15	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

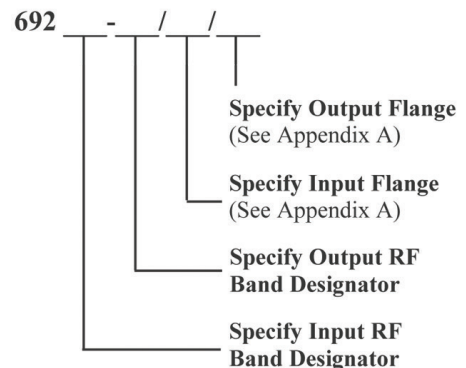


MULTIPLE BAND TRANSITIONS ARE AVAILABLE

Example: 692A-W/599/387 WR-28 TO WR-10 Transition.

*Consult Mi-wave for dimensions and availability.

Ordering Information



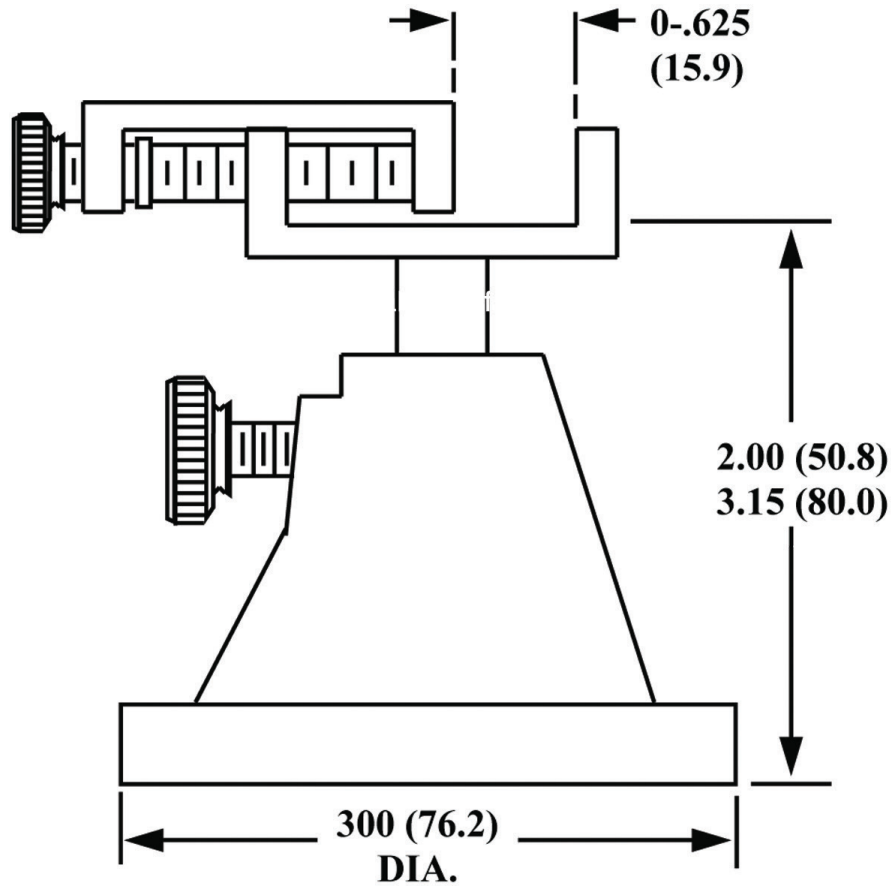
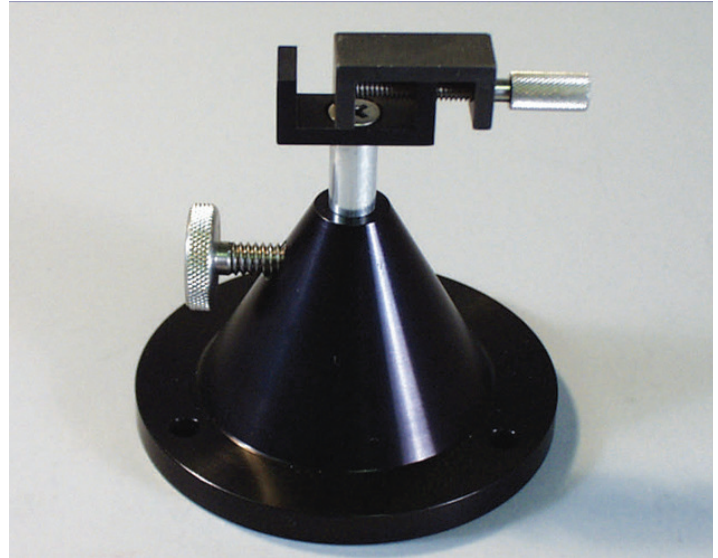
Description

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.

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

Applications

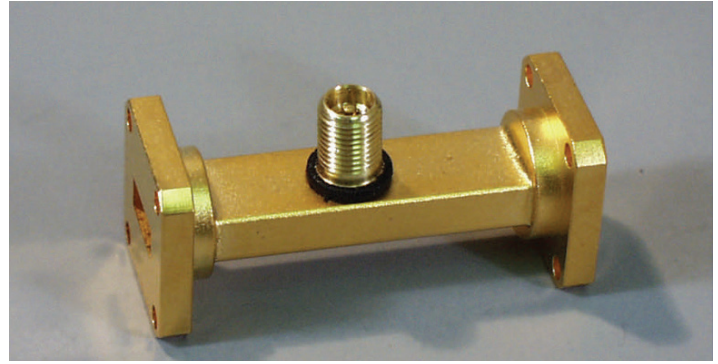
The 695 Series waveguide stand is used to support millimeter wave components in laboratory test bench setups. Designed to fit standard waveguide sizes from 18.0 to 220 GHz, this versatile device may be easily adjusted for a wide variety of setup conditions.



Description

Each of Mi-Wave's 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.

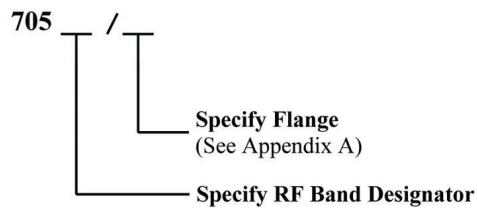
- *System Pressure Continuously Monitored*
- *Convenient Means for Pressurizing Waveguide Transmission Lines.*



Applications

The 700 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 gases 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 internal pressure level.

Ordering Information



712 Series

Bulkhead Adapter

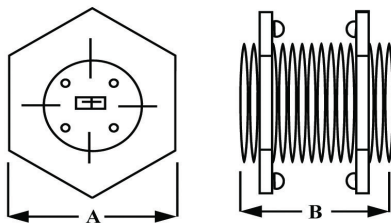
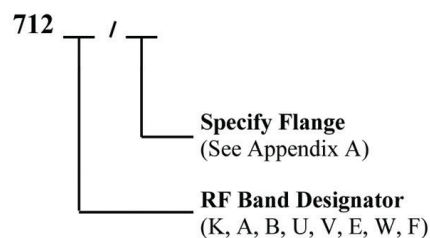


Description

Each of Mi-Wave's 712 Series Waveguide Bulkhead Adapter was developed for panel feed-thru 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 1.00 inches with custom lengths available upon request. Consult Mi-Wave for further details.

- *Full Waveguide Bandwidths*
- *O-ring, Provided for Moisture Resistance*
- *Waveguide Feed-thru for Panel Mount Applications*

Ordering Information



Description

Each of Mi-Wave's 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.

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

Applications

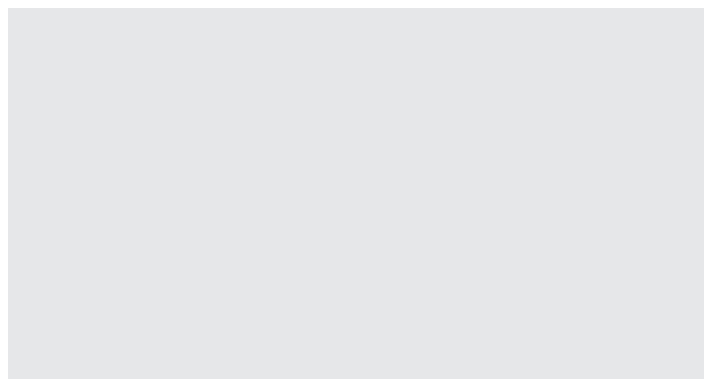
The 700 Series Pressurizing Units are designed for applications such as high power radar systems that require a pressurized transmission line to prevent arcing during peak power operation. The pressurizing units can also be used to purge systems with dry gases in order to prevent condensation. These devices provide a simple means for introducing the desired pressurizing gas into the system and for continuous monitoring of internal pressure level.

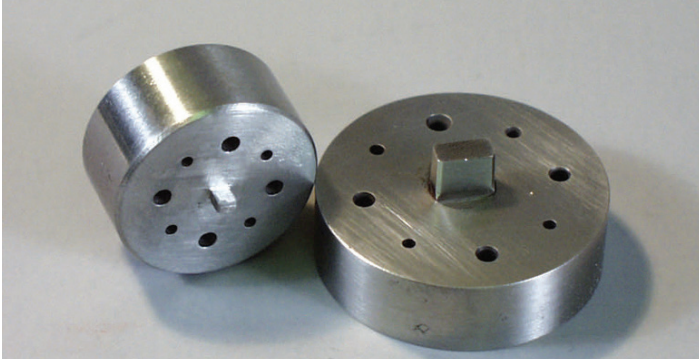


Ordering Information

Series

N/A





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



Precision Machined

Materials: Brass, Aluminum, Copper

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

Specifications

See Appendix H for Specifications



Precision Machined

Materials: Brass, Aluminum, Copper

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

Specifications

See Appendix C for Specifications



Precision Machined

Materials: Brass, Aluminum, Copper

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

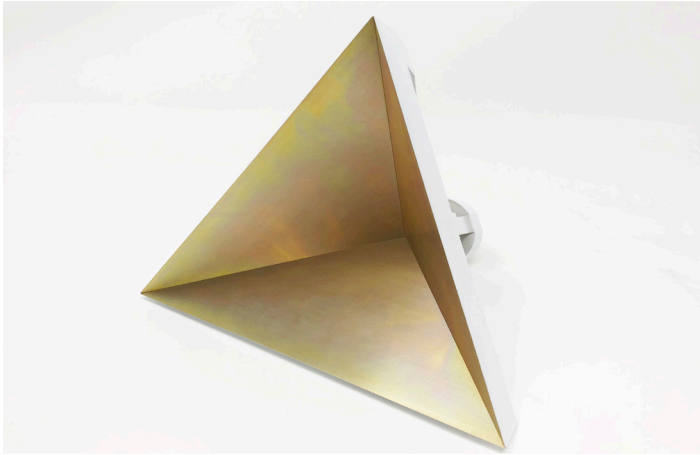
Specifications

See Appendix C for Specifications

752 Series .062 Diameter Stainless Steel Pins - Per 100

754 Series 4-40 Captivated Flange Screws - Per 100

Note: On standard round cover flanges UG-381, 383, 385 and 387. Holes for alignment pins are pre-drilled. Flanges can be ordered without alignment pin holes



Description

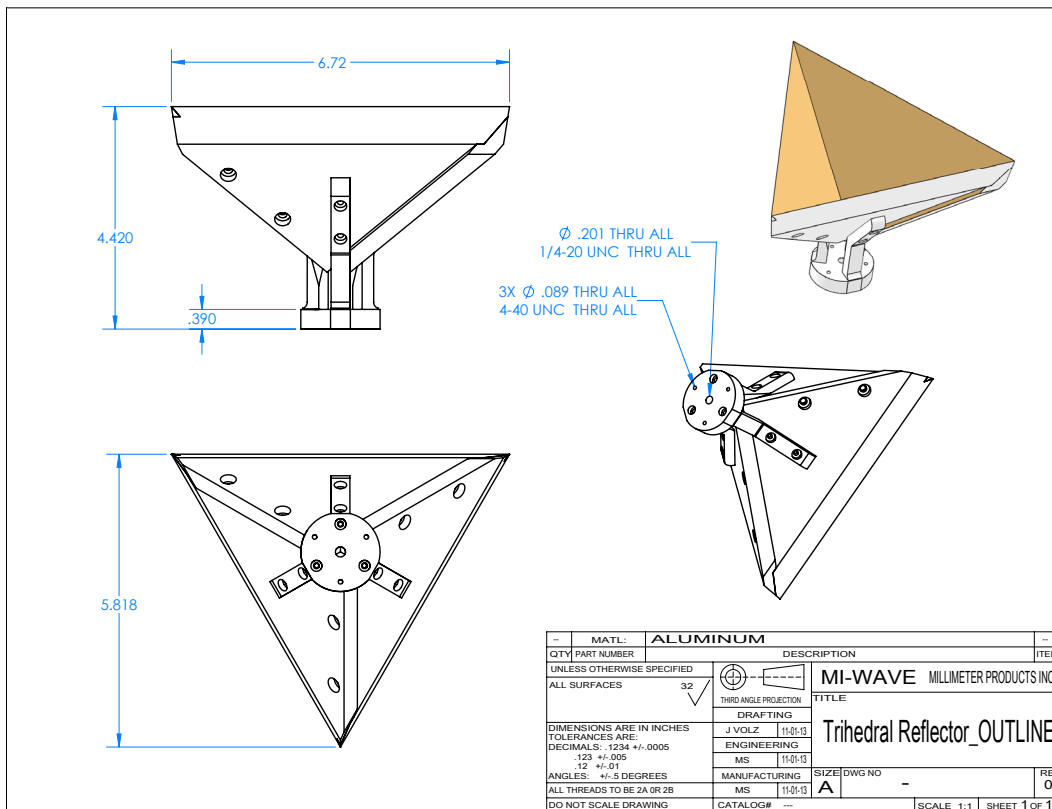
Mi-Wave's 770 Trihedral antennas consists of a circular scalar feed horn illuminating a piano-convex lens. The trihedral reflector simulates radar target precisely and is widely used for Radar system calibration.

The 770 Series antennas are available from 8 to 260 GHz in standard sizes 1 to 8 inch configurations. We can manufacture to any custom size or specification, please consult Mi-Wave for further information.

- 8.4 to 260Ghz Available
- Low Cost
- High Directivity and Gain
- Simple Mechanical Performance
- Wide Range of Available Beamwidths and Reflector Sizes

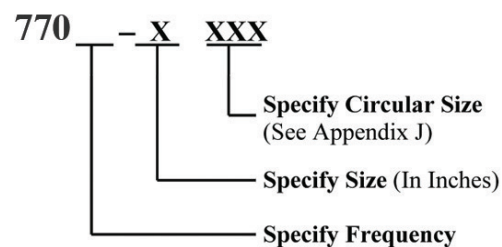
Applications

Radars, Test Chambers, Surveillance Equipment, and Communication Systems



Consult for current outline dimensions

Ordering Information

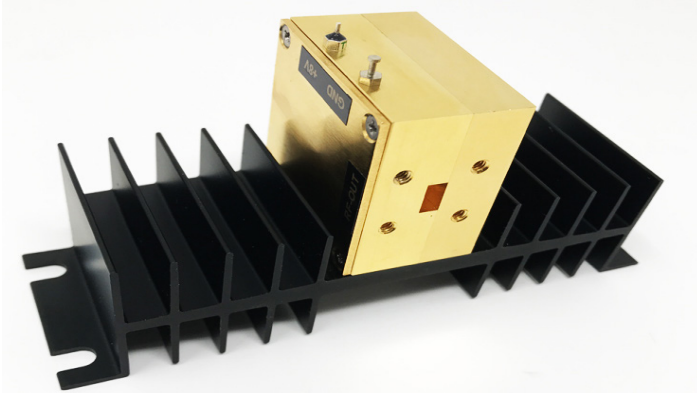


Typical Electrical Specifications

Frequency	8.4 to 260 GHz
Sizes	1.4 inch to 8 inch edge lengths
Finish	Gold, aluminum

PLEASE NOTE:

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



Description

Mi-Wave's 830 Series Fixed Frequency source are available in 18 to 110GHz frequency range.

This source can be used for a mixer local oscillator or transmit source. The 830 Series is a moderate stability source.

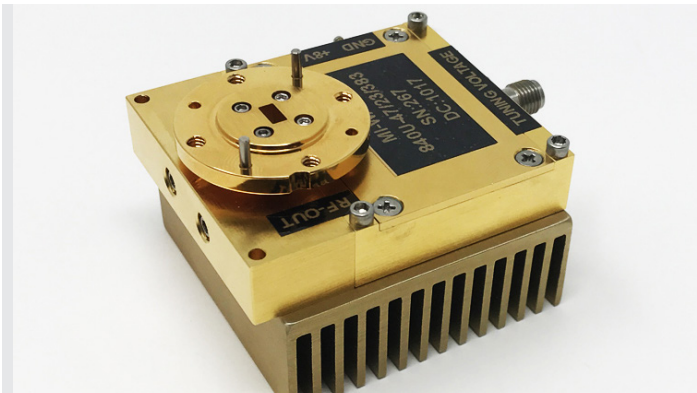
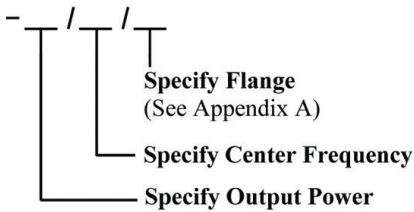
Very high power sources available.

- *Low Noise'*
- *High Stability*
- *18 to 110 GHz*
- *Broadband Tuning*
- *Excellent Reliability*
- *In-Built Regulator*
- *Heatsink Included for high power sources*

Applications

- Radar
- Radiometers
- Local Oscillators
- Telecommunications

Ordering Information



Description

Mi-Wave's 840 Voltage controlled sources are available in 18 to 110GHz.

This source can be used as a modulated transmitter or local oscillator.

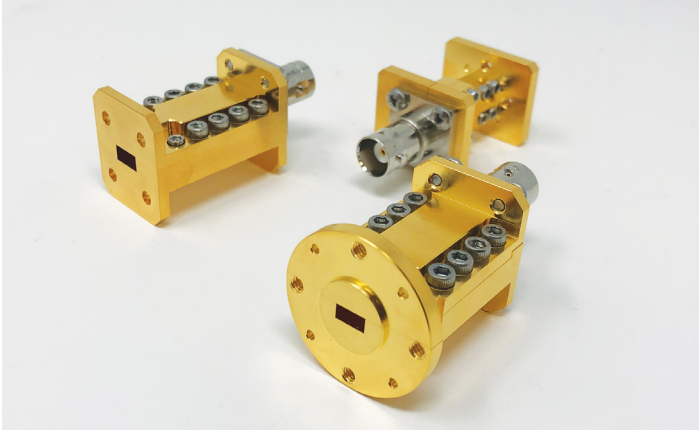
Applications

- Radar
- Swept Sources
- Telecommunications Systems

- *Low Noise'*
- *High Reliability*
- *18 to 110 GHz*
- *Voltage Tuning*
- *In-built Regulator*
- *Heatsink included for high power sources*

NOTE: High Power Available for narrow band sources

Technical Specifications (typical)							
Model No.	840K	840A	840B	840U	840V	840E	840W
Frequency (GHz)	18-26.5	26.5-40	33-50	40-60	50-75	60-90	75-110
Output Port	WR-42/SMA-F	WR-428/K-F	WR-22/2.4mF	WR-19/1.85mm	WR-15	WR-12	WR-10
Output Power	30dBm	30dBm	20dBm	20dBm	17dBm	17dBm	15dBm



Description

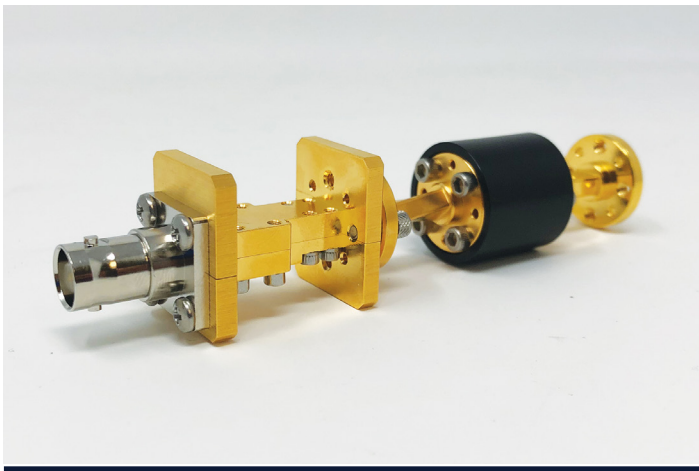
Mi-Wave's 870 Series Precision Calibrated Noise Sources are available in 18 to 110GHz frequency range offering the best stability, switching speed and ripple-free response over other brands.

- *Low Noise'*
- *High Stability*
- *18 to 110 GHz*
- *Ripple Free*
- *Excellent Reliability*

Mi-Wave's 870 Series have tailored the response so ripple is minimized through the frequency range specified.

Applications

- Noise Figure Measurement
- Radar Systems
- Radiometers
- Built In Test Equipment
- Telecommunications
- Military Applications
- 60GHz WiGig
- Small Cell Backhaul



*Noise Source attached with Series 115 Isolator

Technical Specifications (typical)							
Model No.	870K	870A	870B	870U	870V	870E	870W
Frequency (GHz)	18-26.5	26.5-40	33-50	40-60	50-75	60-90	75-110
Calibration Frequencies	1GHz Steps	1GHz Steps	1GHz Steps	1GHz Steps	1GHz Steps	1GHz Steps	1GHz Steps
Waveguide	WR-42	WR-28	WR-22	WR-19	WR-15	WR-12	WR-10
Noise Output ENR (dB)	25	15.5	15.5	15	15.5	15	13
Noise Output Flatness (dB)	± 1.0	± 1.5	± 1.5	± 2.0	± 3.0	± 4.0	± 5.0
Typical VSWR	1.3:1	1.3:1	1.3:1	1.3:1	1.6:1	1.6:1	1.6:1
Flange	UG595/U	UG599/U	UG383/U	UG383/U	UG385/U	UG387/U	UG387/U

Description

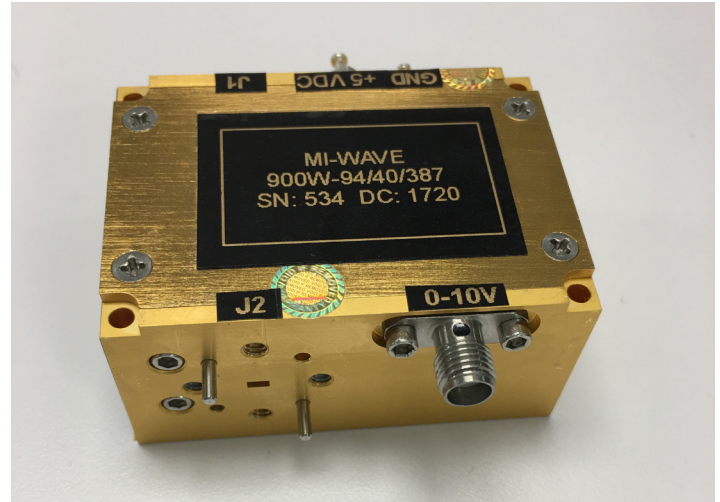
Mi-Wave's 900 Series Pin Diode or MMIC Attenuator is a SPST reflective attenuator that combines low loss, high isolation performance in a compact package. Attenuation options are available for the 900 Series attenuation with isolation versions up to 60 dB.

- *Series 900 Attenuators 10 to 50 dB narrow or full bandwidth available.*

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.

Applications

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



Operating Specifications

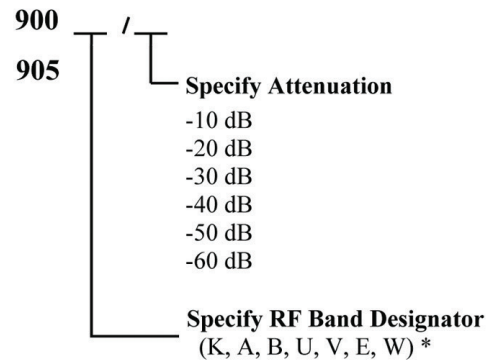
Control Input	0 to +10 Vdc
Operating Temperature	0° C to +50C
Storage Temperature	-10C to +60C
VSWR	1.5 Typical (Low Loss Condition)

NOTE:

Consult Mi-Wave for current outline drawings and insertion loss versus isolation specification.

Consult Mi-Wave for coaxial ports

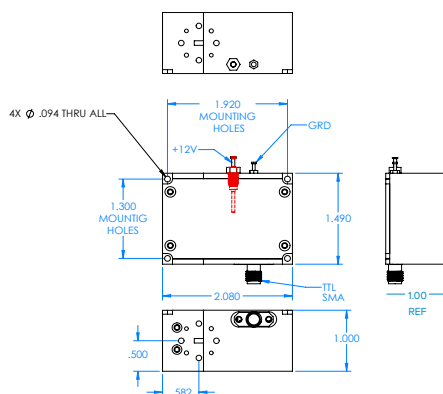
Ordering Information



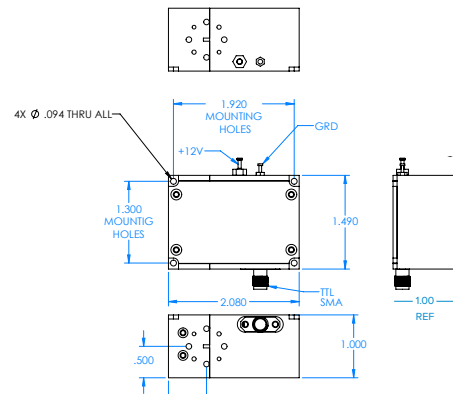
Please specify center frequency at time of order.

Consult Mi-Wave for A, B & U Band attenuator outline

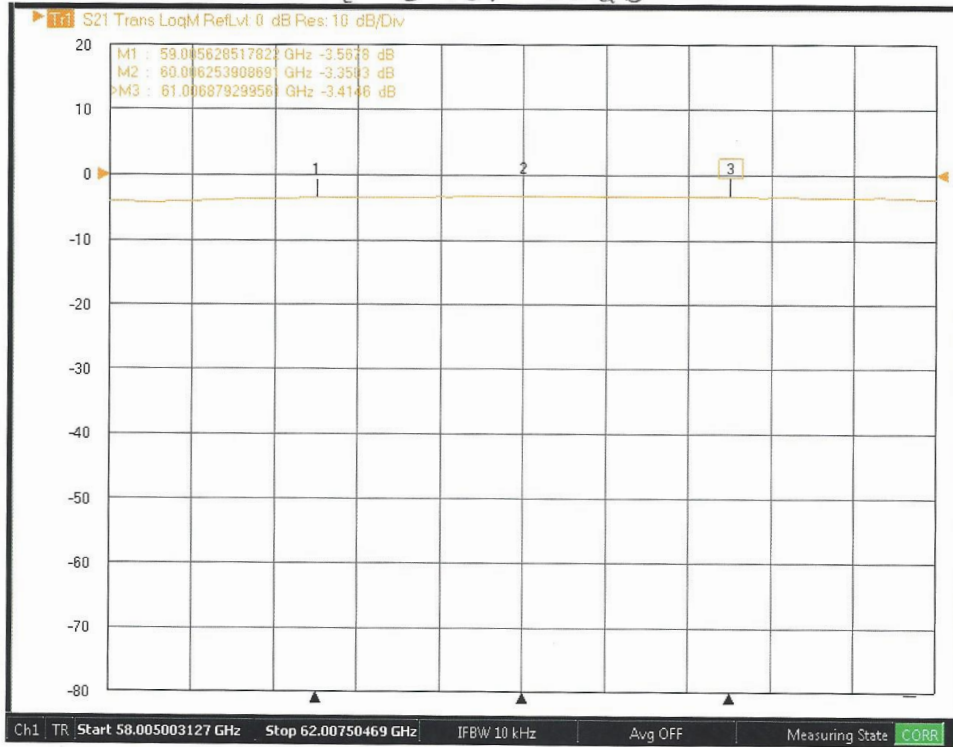
900V SPDT Outline Drawing



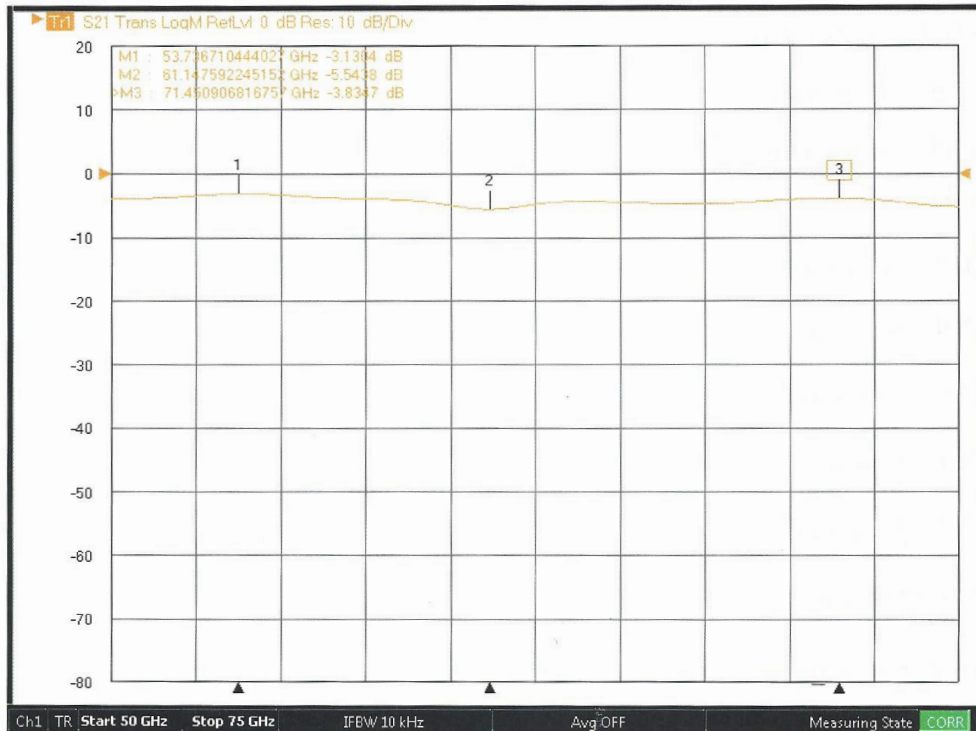
900W SPDT Outline Drawing



Insertion Loss Plot for 50dB Attenuator



Insertion Loss Plot for 30dB Attenuator





Description

Mi-Wave's 911 Series PIN Diode or MMIC switch is a SPST (912 Series is SPDT) reflective switch that combines low loss, high isolation performance with an trega TTL driver in a compact package. They are available in standard waveguide bands from 18 - 110GHz. Various driver options 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 10% bandwidth. Integral drivers are standard with various driver options available.

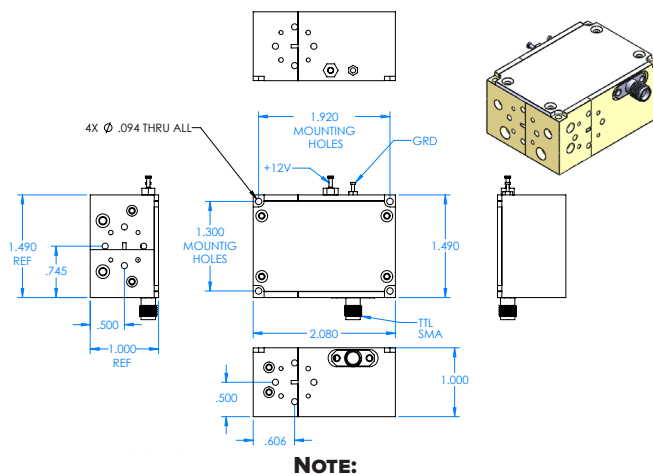
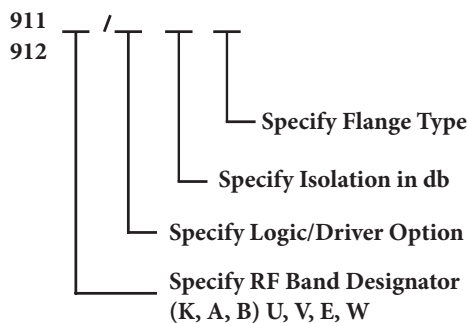
- *Series 911 Single Throw Switches (SPST) - 10% Bandwidth*

Applications

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

Ordering Information

Please specify center frequency at time of order.



Technical Specifications (typical)

Model No.	K	A	B	U	V	E	W
Frequency	18-26.5 GHz	26.5-40 GHz	33-50 GHz	40-60 GHz	50-75 GHz	60-90 GHz	75-110 GHz
Insertion Loss (dB) typical	1.5 2.5	1.8 2.8	2 3	2 3	3 4	3.5 X	4 X
Isolation (dB) typical	30 60	30 60	30 60	30 60	30 60	35 X	35 X
Rise/Fall Time (ns)	10	10	10	10	10	10	10
Bias (volts)	8	8	8	8	8	8	8
Power Handling (dBm) - nominal	17	17	17	17	17	17	17
Power Handling (dBm) - max	23	23	23	23	23	23	23
Input/Output	WR-42 Waveguide UG- 595 Flange OR SMA-F	WR-42 Waveguide UG- 595 Flange OR SMA-F	WR-42 Waveguide UG- 595 Flange OR SMA-F	WR-42 Waveguide UG- 595 Flange OR SMA-F	WR-42 Waveguide UG- 595 Flange OR SMA-F	WR-42 Waveguide UG- 595 Flange OR SMA-F	WR-42 Waveguide UG- 595 Flange OR SMA-F
Control	TTL	TTL	TTL	TTL	TTL	TTL	TTL
Control Port	SMA-F	SMA-F	SMA-F	SMA-F	SMA-F	SMA-F	SMA-F

Please consult Mi-Wave for current outline dimensions and insertion loss versus isolation specifications.

For A, B and U bands customer please consult Mi-wave.

For Coaxial Switches please consult Mi-wave.



Description

Use MI-Wave's multithrow PIN Switches for a variety of applications that require multiple throws and/or custom switch configuration. These Switches offer low insertion loss and a wide bandwidth of operation for a isolation level. Waveguide and coaxial versions are available depending on the operating frequency. These switches are ideally suited for signal attenuation and switching for receiver protection, antenna switching, test and measurement sets and transreceivers. Switch drivers that accepts TTL signals may be incorporated in these switches as an optional feature.

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

Applications

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

Operating Specifications

Configurations	SP3T to SP8T
Insertion Loss	1 - 6dB depending on configuration & freq.*
Frequency Range	8 - 110GHz
Switching Speed	1 - 50ns
Isolation	20 db to 60db

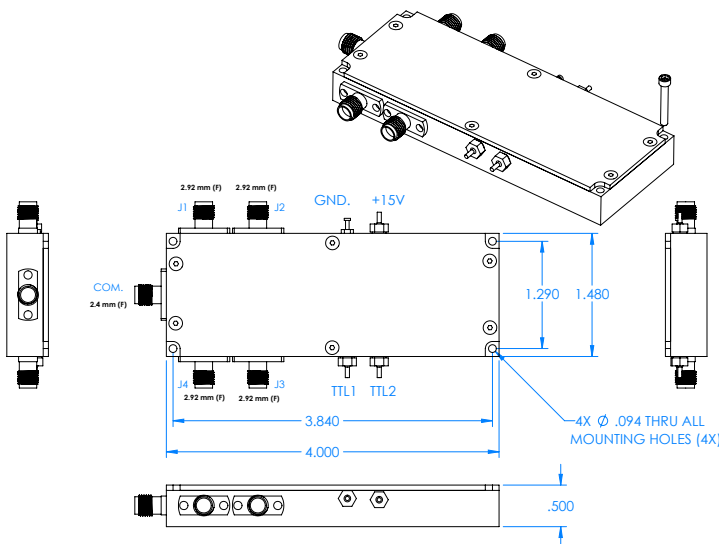
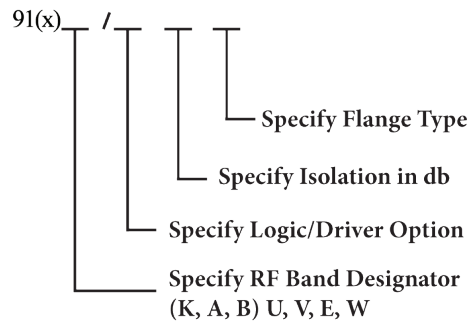
NOTE:

Please consult Mi-Wave for current outline dimensions and insertion loss versus isolation specifications.

For A, B and U bands customer please consult Mi-wave.

For Coaxial Switches please consult Mi-wave.

Ordering Information



9112A-28.75/60/KF

Description

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.

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

The 920 Series is designed for applications where a Diplexer is not required
922 Series include optional LO-IF frequency diplexer.



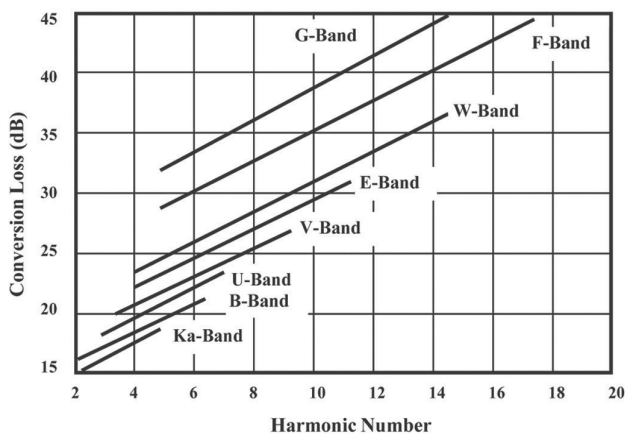
Operating Specifications	
RF Input Power	+15 dBm, Max.
LO Input Power	+15dBm, Max./ 6dBm typical
Storage Temperature	-10 C to +60 C
Operating Temperature	0 C to +50 C
Bias Requirements: (optional) Diode	-0.7 Vdc @ 5 mA

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

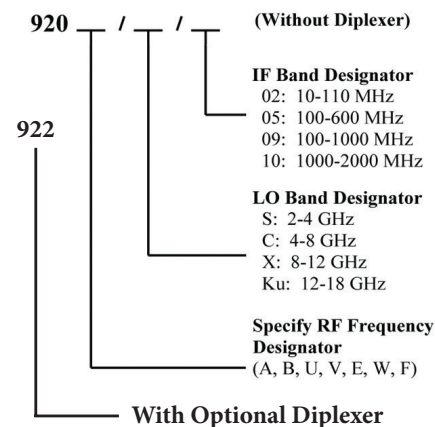
* IF range not to exceed +20dbm

920 D, G available

Nominal Conversion vs. Harmonic Number and RF Band



Ordering Information

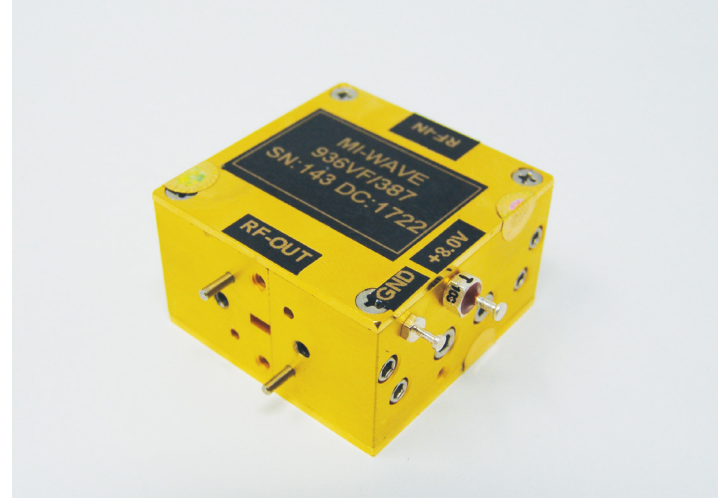


Optional IF amplifiers are available. Please consult miwave.

Description

Mi-Wave's 93(x) Series Active Multipliers utilize high performance MMIC chips for frequency multiplication and amplification. The multipliers offer moderate conversion gain with output frequency covering 18 to 140 GHz in six waveguide bands. The X2, X3, X4, and X6 are offered as standard multiplication factors. The input power requirement for these multipliers is +5 to +10 db. While SMA or K female coaxial connector is equipped for input and waveguide for output interface, waveguide input is available as an option for U, V, E, and W Band multipliers.

- High Output Power
- Up to Full Waveguide Operation
- Moderate Conversion Gain
- Frequency up to 140 GHz
- Single Power Supply



Applications

- Frequency Extenders
- Test Set
- Local Oscillators
- Sub-systems

Technical Specifications (typical)

Output Freq. (GHz)	Multiplying Factor	Input Freq. (GHz)	Output Power (dBm, Typ)	Bandwidth (GHz)	Output Waveguide	Input Connector
18.0–26.5	x2	9.0–13.25	10 to 30	±2 to Full	WR-42, K, F	SMA (F)
26.5–40.0	x2	13.25–20.0	10 to 27	±2 to Full	WR-28, K, F	SMA (F)
	x4	6.625–10.0	10 to 27	±2 to Full	WR-28	SMA (F)
33.0–50.0	x2	16.5–25.0	10 to 25	±2 to Full	WR-22	SMA (F)
	x4	8.25–12.5	7 to 25	±2 to Full	WR-22	SMA (F)
40.0–60.0	x4	10.0–15.0	7 to 20	±2 to Full	WR-19	SMA (F)
50.0–75.0	x4	12.5–18.75	7 to 20	±2 to Full	WR-15	K (F)
60.0–90.0	x6	10.0–15.0	7 to 25	±2 to Full	WR-12	K (F)
75.0–110.0	x6	12.5–18.33	5 to 20	±2 to Full	WR-10	SMA (F)

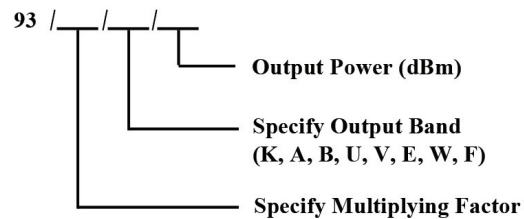
Please consult Mi-Wave for specifications above 110 GHz.

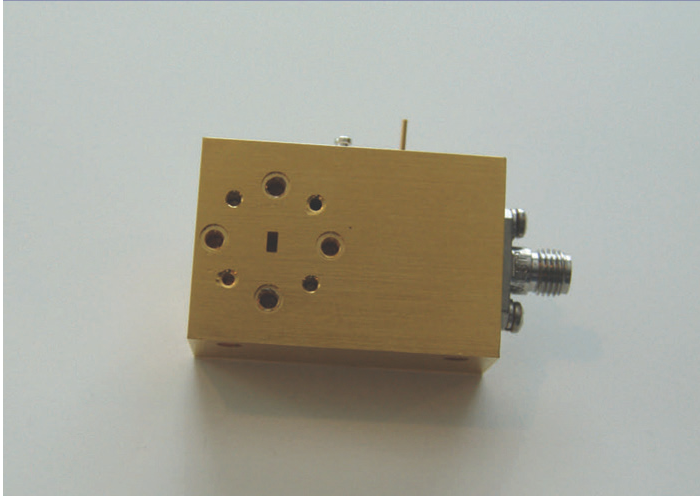
* High power outputs are available in narrow bandwidths. Please consult

Operating Specifications

RF Input Power	+15 dBm, Max.
Storage Temperature	-10 C to +60 C
Operating Temperature	0 C to +50 C
Bias Requirements: (optional) Diode	+8 to +12Vdc @ tbd MA

Ordering Information





Description

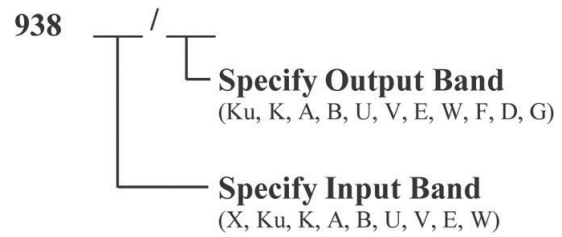
Mi-Wave's 938 Series Frequency Multipliers offer broad-band, high efficiency designs that can be used to generate millimeter wave frequencies from lower frequency microwave sources. The passive designs use GaAs varactor diodes mounted on a finline design provides for minimal circuit losses and optimal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

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

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.

Operating Specifications	
Input VSWR (Typ.)	2:1
Harmonic Rejection	-20 dBc
Operating Temperature	0 to +50 C
Storage Temperature	-10 C to +60 C

Ordering Information



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% to full	15% to full	10% to full	10% to full	10% to 80%
Power Input (mW) ¹	50	40	40	20	20
Power Input (mW) ¹					
X2	100	100	100	100	100
X3	100	100	100	100	100
Output Flange					
X2	UG-595	UG-599	UG-599M	UG-385	UG-387M
X3	UG-599	UG-599M	UG-385	UG-387M	UG-387

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

Check with Mi-Wave for current specifications

Description

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.

- *Full Waveguide Band*
- *High Video Sensitivity*
- *No Bias Voltage Required*
- *Lightweight Compact Design*

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.



Technical Specifications (typical)

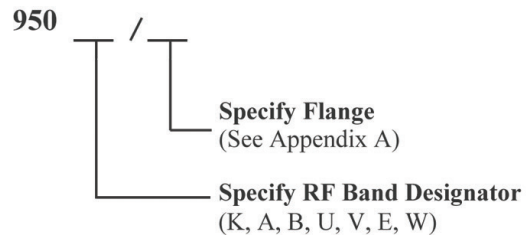
Model Number	950K	950A	950B	950U	950V	950E	950W	950F	950D	950G	950H	950J
Frequency Input (GHz)	18.0–26.5	26.5–40.0	33.0–50.0	40.0–60.0	50.0–75.0	60.0–90.0	75.0–110.0	90–140.0	110–170	140 - 220	170 - 260	220 - 375
Video Sensitivity (mV/mW) Typ.	2500	2300	2000	1800	1200	1100	1000	900	800	500	500	500
Tangential Sensitivity	-55	-55	-50	-50	-50	-45	-45	-45	-40	-40	-40	-35
Flatness (dB)	±1.5	±1.5	±1.5	±1.5	±2.0	±2.0	±2.0	±2.0	±2.5	±2.5	±2.5	±2.5

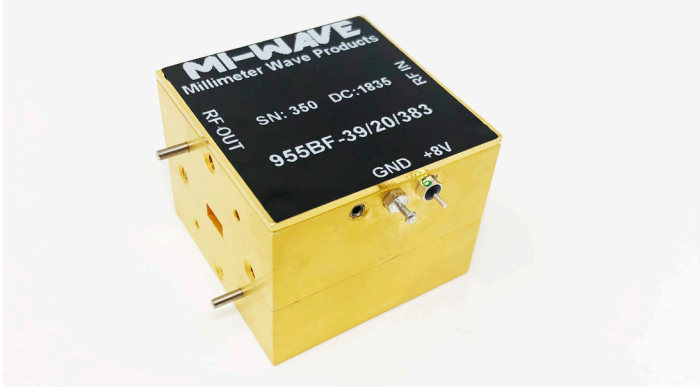
* Detectors are tested at -20dBm power level and extrapolated to 1mw power level

Detectors up to 220 GHz are now available.

Consult Mi-Wave for technical specifications.

Ordering Information





Description

Mi-Wave's 955 Series microwave and millimeter wave amplifiers offer a wide variety of frequency ranges, bandwidths, gain and power outputs.

Low cost production designs to meet the demanding needs of communications are also now available.

Please consult Mi-Wave for technical specifications and outline drawings.

- *High Gain*
- *Full Bandwidths*
- *High 1 db Comp. Points*
- *Wide Varsity of Frequency Ranges*
- *8 GHz to 140 GHz*

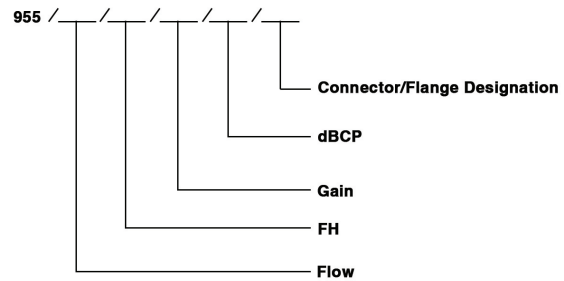
Technical Specifications (typical)					
Freq. Min. (GHz)	Freq. Max (GHz)	Gain	Psat (dBm)	Bias	I/O
18	40	20dB	+20 dBm	2:1	K (F)
26.5	40	20dB	+20 dBm	2:1	K (F)
33	50	30dB	+18 dBm	2:1	2.4mm (F)
33	50	30dB	+18 dBm	2:1	WR22 Waveguide
35	47	35dB	+20 dBm	2:1	2.4mm (F)
35	47	35dB	+20 dBm	2:1	WR22 Waveguide
50	70	28dB	+15 dBm	2:1	WR15 Waveguide
50	68	35dB	+18 dBm	2:1	V (F)
55	65	25dB	+18 dBm	1.5:1	WR15 Waveguide
63	90	10dB	+8.5 dBm	3:1	WR12 Waveguide
66	78	20dB	+16 dBm	3:1	WR12 Waveguide
70	90	30dB	+15 dBm	2:1	WR12 Waveguide
71	86	30dB	+15 dBm	2:1	WR12 Waveguide
75	110	25dB	+15 dBm	2:1	WR10 Waveguide
75	110	10dB	+15 dBm	2:1	WR10 Waveguide
76	81	16dB	+10 dBm	3:1	WR12 Waveguide
81	86	25dB	+20 dBm	2:1	WR12 Waveguide
90	100	30dB	+15 dBm	2:1	WR10 Waveguide
92	96	35dB	+16 dBm	3:1	WR10 Waveguide
92	96	30dB	+20dBm	3:1	WR10 Waveguide

Low Cost E-band Amplifiers Available

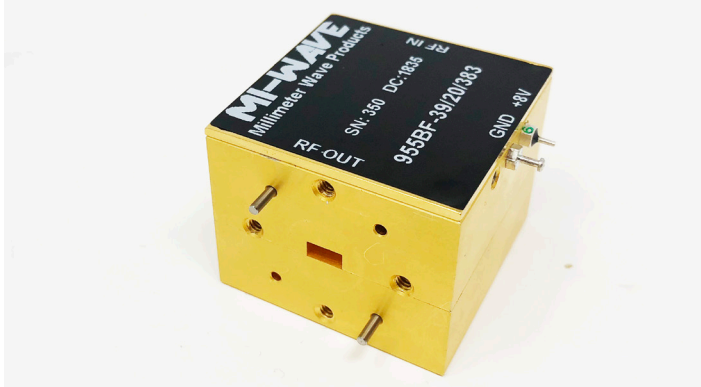
Other Bandwidths, Gain, and dBCEP available.

Consult Mi-Wave for more specification needs.

Ordering Information



Reference Outline Drawings on Page 100



Description

Mi-Wave's 955 Series microwave and millimeter wave amplifiers offer a wide variety of frequency ranges, bandwidths, gain and power outputs.

Low cost production designs to meet the demanding needs of communications are also now available.

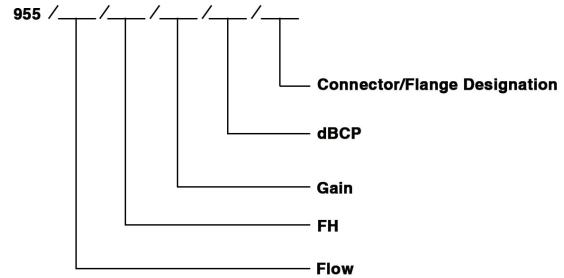
Please consult Mi-Wave for technical specifications and outline drawings.

- *Low Noise*
- *High Gain*
- *Full Bandwidths*
- *Wide Variety of Frequency Ranges*
- *8 GHz to 140 GHz*

Technical Specifications (typical)						
Freq. Min. (GHz)	Freq. Max (GHz)	Gain	Psat (dBm)	Noise Figure	Bias	I/O
01	18	26dB	3.0 dB	2.5:1	SMA (F)	SMA (F)
04	08	28dB	0.8 dB	1.5:1	SMA (F)	SMA (F)
08	12	33dB	2.0 dB	1.8:1	SMA (F)	SMA (F)
18	40	41dB	3.0 dB	2.4:1	K (F)	K (F)
18	26.5	48dB	2.5 dB	2:1	K (F)	K (F)
18	26.5	48dB	2.5 dB	2:1	WR42 Waveguide	WR42 Waveguide
18	26.5	30dB	2.5 dB	2:1	K (F)	K (F)
18	26.5	30dB	2.5 dB	2:1	WR42 Waveguide	WR42 Waveguide
18	26.5	20dB	2.5 dB	2:1	K (F)	K (F)
18	26.5	20dB	2.5 dB	2:1	WR42 Waveguide	WR42 Waveguide
26.5	40	30dB	3.0 dB	2:1	K (F)	K (F)
26.5	40	30dB	3.0 dB	2:1	WR28 Waveguide	WR28 Waveguide
26.5	40	20dB	3.0 dB	2:1	K (F)	K (F)
26.5	40	20dB	3.0 dB	2:1	WR28 Waveguide	WR28 Waveguide
27	35	35dB	3.0 dB	2:1	K (F)	K (F)
27	35	35dB	3.0 dB	2:1	WR28 Waveguide	WR28 Waveguide
33	50	25dB	6.5 dB	2.5:1	K (F)	K (F)
33	50	25dB	6.5 dB	2.5:1	WR22 Waveguide	WR22 Waveguide
33	37	30dB	3.0 dB	2:1	K (F)	K (F)
33	37	30dB	3.0 dB	2:1	WR22 Waveguide	WR22 Waveguide
36	45.5	25dB	3.5 dB	2:1	2.4mm (F)	2.4mm (F)
40	60	30dB	8.0 dB	3:1	WR19 Waveguide	WR19 Waveguide
40	45	35dB	4.0 dB	2.5:1	2.4mm (F)	2.4mm (F)
50	75	35dB	5.0 dB	2.5:1	WR15 Waveguide	WR15 Waveguide
50	70	35dB	5.0 dB	2.5:1	V (F)	V (F)
60	90	25dB	5.0 dB	3.5:1	WR12 Waveguide	WR12 Waveguide
71	86	30dB	6.0 dB	3:1	WR12 Waveguide	WR12 Waveguide
71	86	20dB	4.0 dB	3.5:1	WR12 Waveguide	WR12 Waveguide
75	90	25dB	4.0 dB	3.5:1	WR12 Waveguide	WR12 Waveguide
75	90	25dB	4.0 dB	3:1	WR10 Waveguide	WR10 Waveguide
75	90	25dB	4.0 dB	3.5:1	WR10 Waveguide	WR10 Waveguide
75	110	20dB	4.0 dB	3:1	WR10 Waveguide	WR10 Waveguide
80	100	25dB	4.0 dB	3:1	WR10 Waveguide	WR10 Waveguide
80	100	25dB	4.0 dB	3.5:1	WR10 Waveguide	WR10 Waveguide

ABOVE: STANDARD SPECIFICATIONS CHART

Ordering Information



Other Bandwidths, Gain, and dBCP available.

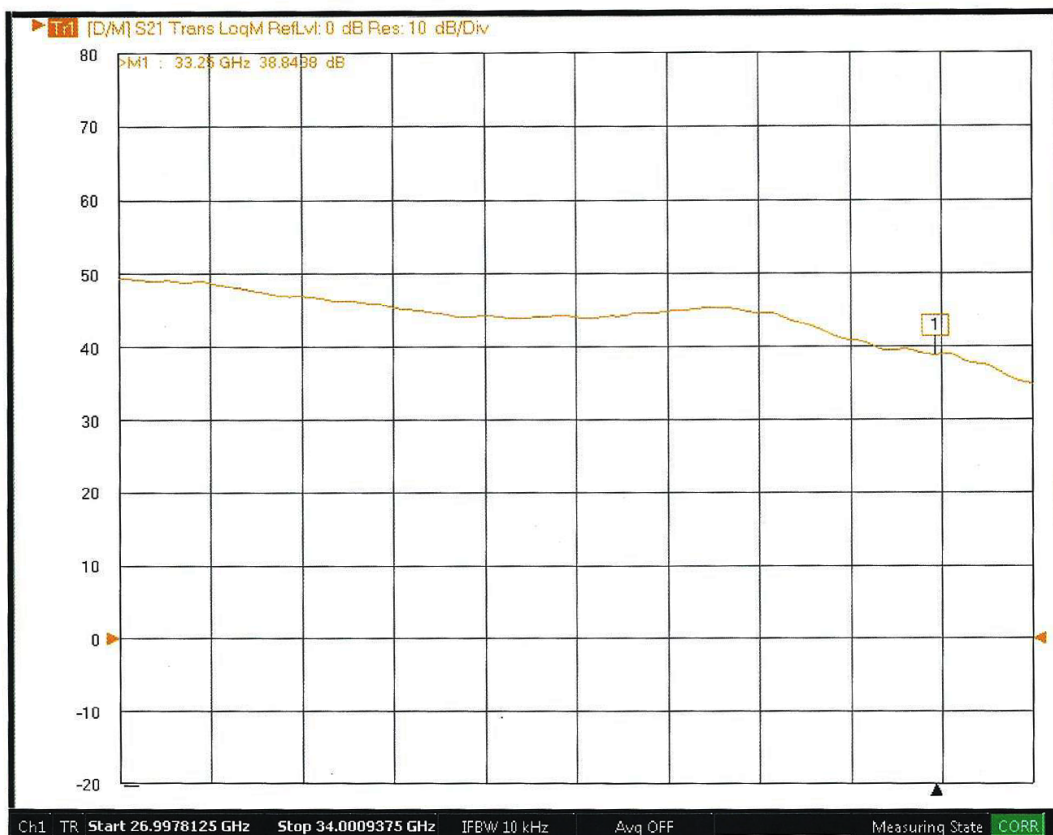
Consult Mi-Wave for more specification needs.

Reference Outline Drawings on Page 100

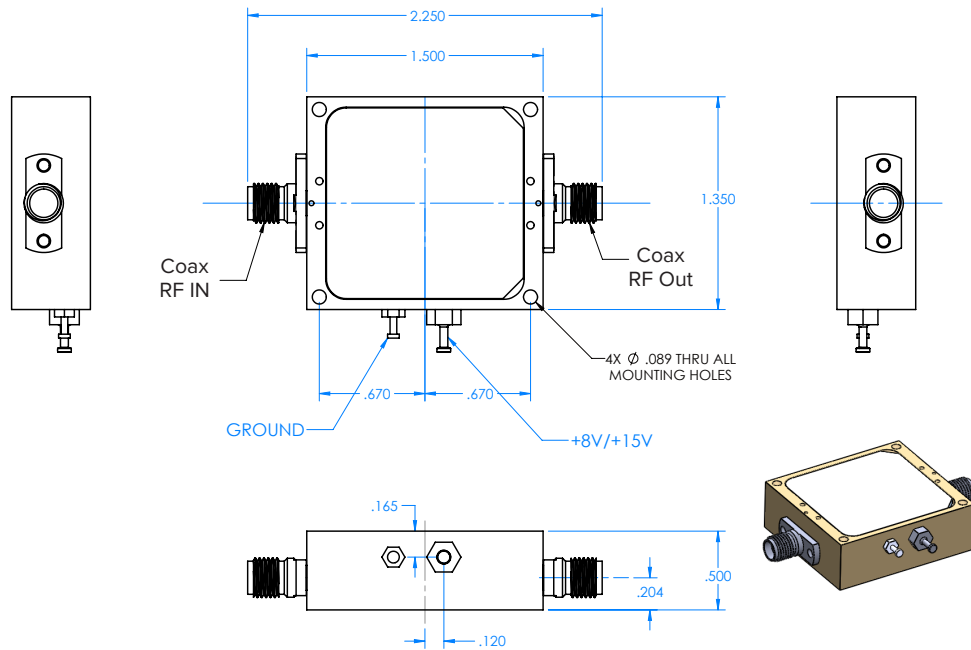
955A 27-33GHz, 10Watt Power Amplifier

Millimeter Wave Products Inc. has begun manufacturing its latest line of amplifiers for the 5G industry. We can push to higher levels of power also!

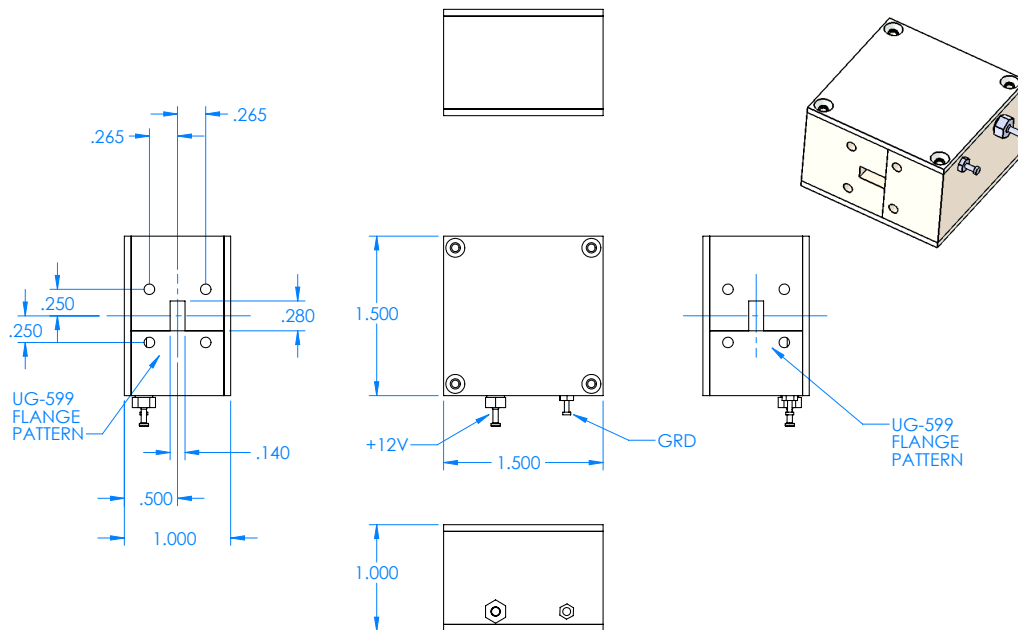
- Frequency 27-34GHz
- Small Signal Gain 40dB typ
- Output Power (Psat) +41.5dBm typ
- Input Drive Level +5dBm typ
- Input/Output Return Loss (dB) 2.0 :1
- Bias Voltage 100 to 230 VAC 50 to 60 Hz
- Maximum RF Input Power +15dBm max

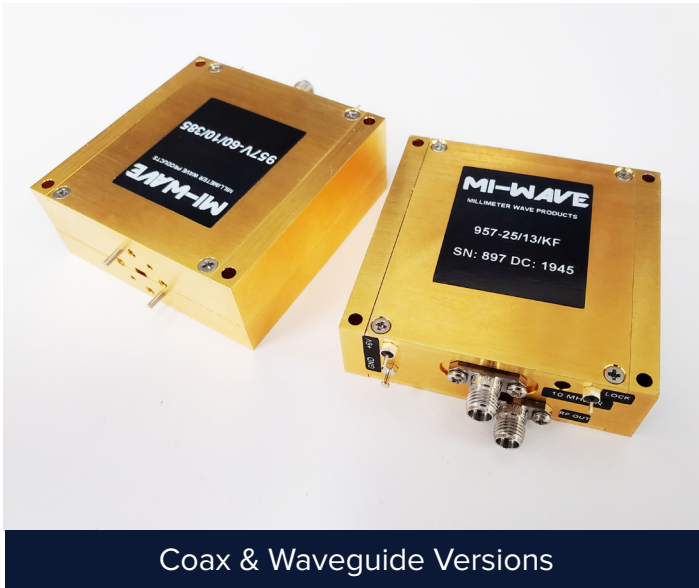


955ABU-coax-coax



955A_INLINE_OUTLINE





Description

Mi-Wave's 957 Series Phase Locked Oscillators uses fixed frequency low noise synthesizer technology. These oscillators use an external reference from 1MHz to 600MHz and frequency outputs from 100MHz to 110GHz.

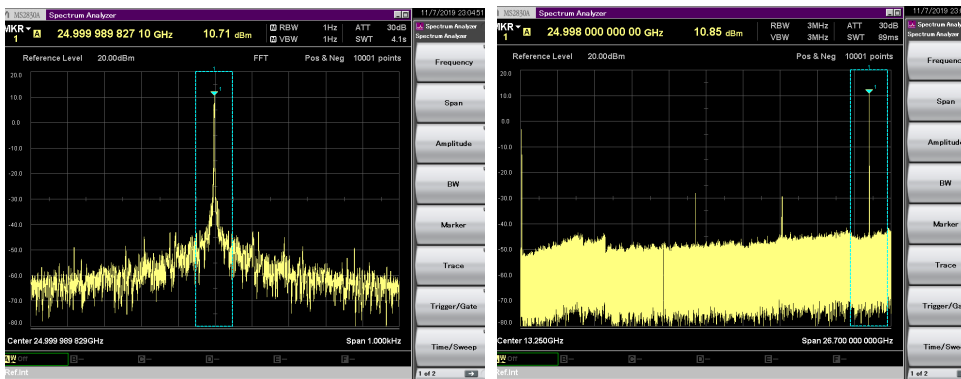
Both coaxial and waveguide versions available. Internal crystal references are available on request.

- Features
- TTL Phase Lock Indicator Alarm
- Phase Lock Indicator L.E.D.
- Low Phase Noise
- Compact Design
- High Power Versions

Open loop phase noise offset @ 16GHz

- 80 dBc @ 10Hz
- 100 dBc 100KHz
- 130 dBc @ 1Mhz
- 150 dBc @ 10MHz

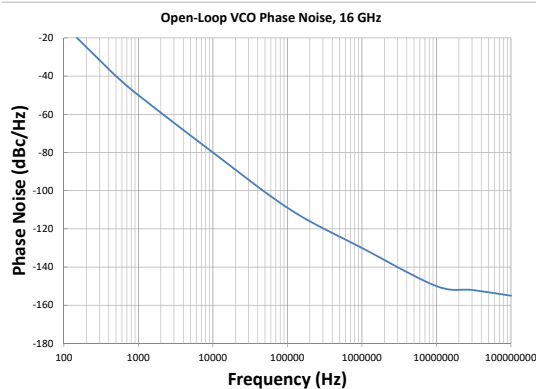
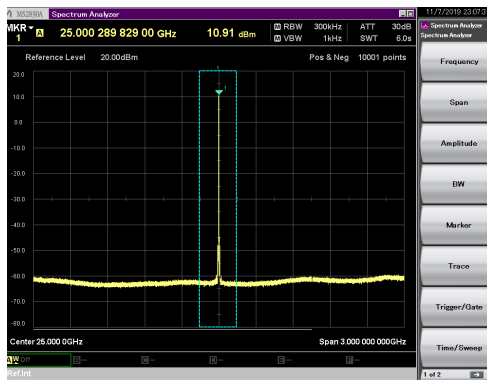
Coax & Waveguide Versions



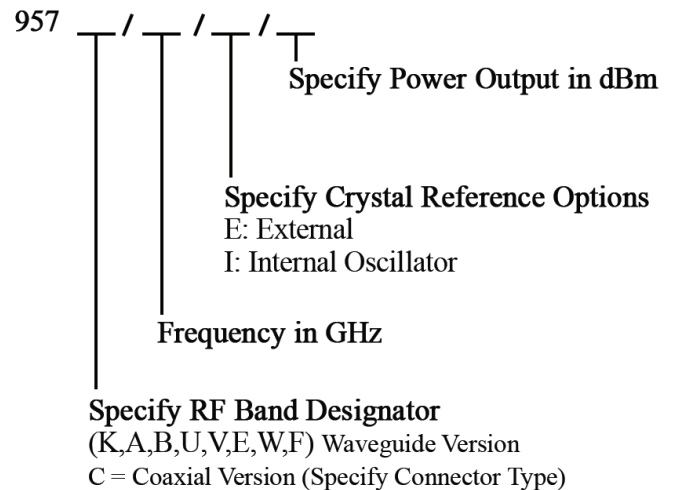
Specifications	
Reference Input	1 to 600 MHz **
Frequency Output	100 MHz to 110 GHz
Output Port	+13 dBm typical*
Harmonics	-30 dBc typical
Spurious	-60 dBc typical
Temperature Range	-20° to +50° C
Operating Voltage	+8 to +15 VDC
Lock Time	3ms

* Depending upon frequency
Higher output power available

** External Reference must be powered on before or at the same time as PLO. Consult Mi-Wave for output frequency vs reference frequency requirements.



Ordering Information



970 Series

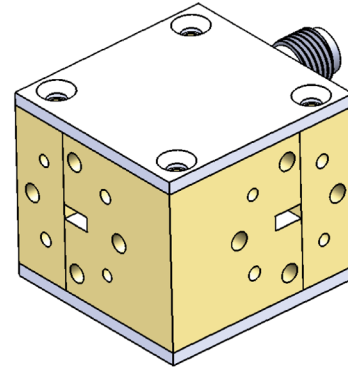
Wide-band Balanced Mixers

Description

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.

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

Mixers with lower LO drive available.

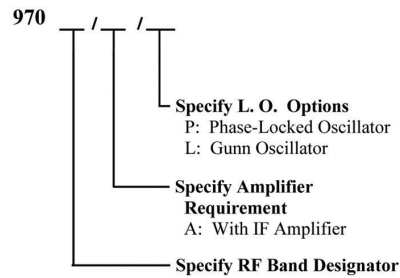


Technical Specifications		
Model Number	Conversion Loss	
	Max. ¹	Typ. ¹
970A	8.0	7.0
970B	8.5	7.5
970U	9.0	7.5
970V	9.5	7.0
970E	9.5	7.5
970W	10.0	7.5

1. Conversion loss SSB (dB) assumes +12 dBm L.O. and 4 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	-0 C to +50 C

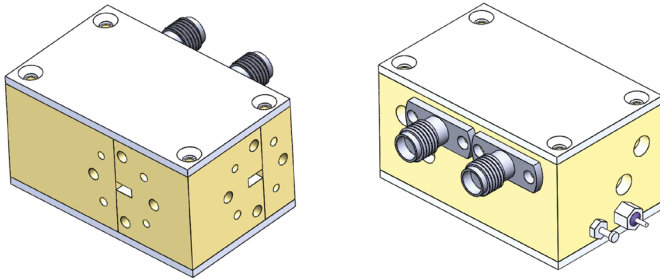
Ordering Information



NOTE:

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

Consult Mi-Wave for current specifications and outline drawings



Description

Mi-wave supplies 971 series mixer with I (in phase) and Q (quadrature phase) outputs. They are offered over the RF range of DC to 110 GHz. Good LO to RF isolation is achieved over a relatively broad RF and LO frequency ranges. Typical IF range is from DC to 5 GHz. Both waveguide and coaxial interfaces are offered as options for RF and LO ports. The mechanical design of these mixers is very compact and can be customized to suit any specific application and outline requirement. These IQ mixers find applications in communication equipment, radar sensors and instrumentation receivers.

- Low Conversion Loss
- Wide Choice of IF Inputs
- With or Without RF Filter



TEST DATA SHEET

Customer: _____

Model No: 971E-79/387

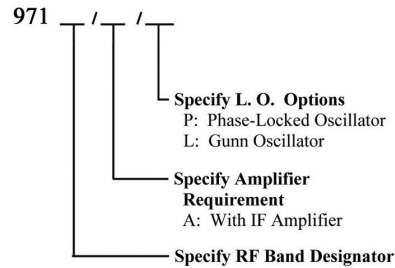
Serial No: 109

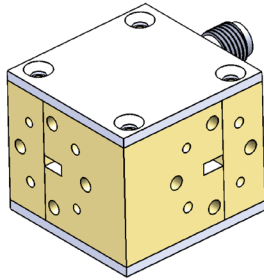
Item No.	Specification	Test Data								
1	RF Frequency	76.5GHz - 81.5GHz								
2	LO Frequency	76.5GHz - 81.5GHz								
3	IF Frequency	DC - 1GHz								
4	Conversion Loss (dB)	<table border="1"> <thead> <tr> <th>76.5GHz</th> <th>78 GHz</th> <th>80GHz</th> <th>81.5GHz</th> </tr> </thead> <tbody> <tr> <td>11.9</td> <td>12</td> <td>12.2</td> <td>12.2</td> </tr> </tbody> </table>	76.5GHz	78 GHz	80GHz	81.5GHz	11.9	12	12.2	12.2
76.5GHz	78 GHz	80GHz	81.5GHz							
11.9	12	12.2	12.2							
5	LO Power	<table border="1"> <tbody> <tr> <td>7dBm typ</td> <td>7dBm</td> </tr> <tr> <td>+12dBm max</td> <td>+12dBm max</td> </tr> </tbody> </table>	7dBm typ	7dBm	+12dBm max	+12dBm max				
7dBm typ	7dBm									
+12dBm max	+12dBm max									
6	RF - LO Isolation	30dB typ								
7	DC Bias	<table border="1"> <tbody> <tr> <td>+8V</td> <td>+8V</td> </tr> <tr> <td>+12V max</td> <td>+12V max</td> </tr> </tbody> </table>	+8V	+8V	+12V max	+12V max				
+8V	+8V									
+12V max	+12V max									

Notes:

- 1) Mixer Data taken at +25°C
- 2) Reverse Biasing will destroy Mixer (Warranty Void)
- 3) Warranty Void if VDC, LO and/or RF Input Power exceeds maximum rating specified above

Ordering Information





Description

Mi-wave supplies 972 series mixer with I (in phase) and Q (quadrature phase) outputs. They are offered over the RF range of DC to 110 GHz. Good LO to RF isolation is achieved over a relatively broad RF and LO frequency ranges. Typical IF range is from DC to 5 GHz. Both waveguide and coaxial interfaces are offered as options for RF and LO ports. The mechanical design of these mixers is very compact and can be customized to suit any specific application and outline requirement. These IQ mixers find applications in communication equipment, radar sensors and instrumentation receivers.

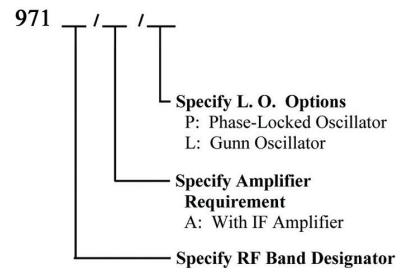
- *Low Conversion Loss*
- *Wide Choice of IF Inputs*
- *With or Without RF Filter*

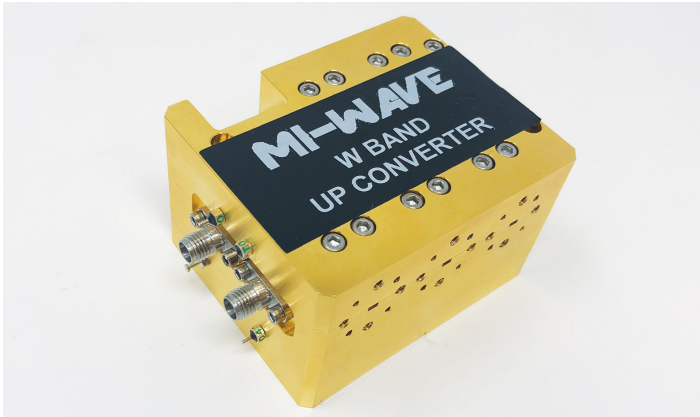


TEST DATA SHEET

Customer: _____				
Model No: <u>971E-79/387</u>				
Serial No: <u>109</u>				
Item No:	Specification		Test Data	
1	RF Frequency	76.5GHz - 81.5GHz	76.5GHz - 81.5GHz	
2	LO Frequency	76.5GHz - 81.5GHz	76.5GHz - 81.5GHz	
3	IF Frequency	DC - 1GHz	DC - 1GHz	
4	Conversion Loss (dB)	12dB typ	76.5GHz	78 GHz
			80GHz	81.5GHz
			11.9	12
			12.2	12.2
5	LO Power	7dBm typ	7dBm	
		+12dBm max	+12dBm max	
6	RF - LO Isolation	30dB typ	30dB	
7	DC Bias	+8V	+8V	
		+12V max	+12V max	
Notes:				
1) Mixer Data taken at +25°C				
2) Reverse Biasing will destroy Mixer (Warranty Void)				
3) Warranty Void if VDC, LO and/or RF Input Power exceeds maximum rating specified above				

Ordering Information





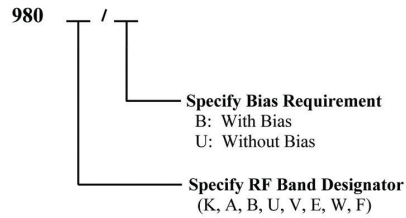
Description

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 +2 dBm. Low conversion loss specifications ensure efficient upconversion.

- Low Conversion Loss
- Wide Choice of IF Inputs
- With or Without RF Filter

Operating Specifications	
RF Bandwidth	Up to Full Band
Conversion Flatness	±1 dB, Typ.
LO Input Power	+17 dBm
IF Input Power	+17 dBm.
Combined Power	±20 dBm,
RF Output Power	±0 dBm, Typ.
LO VSWR	2:1, Typ.
IF VSWR	2:1, Typ.
LO/RF Isolation	20 dB, Min.
Operating Temperature	-0 C to +50 C

Ordering Information



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.



Description

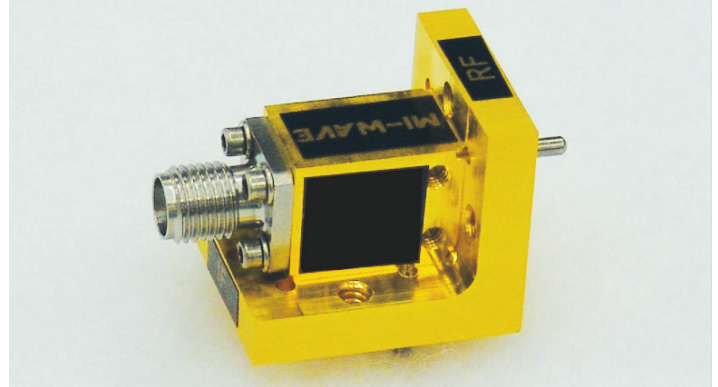
Mi-Wave's 990 Series Balanced Phase Detectors feature a pair of Schottky diodes that mix or beat two input signals at the same frequency to produce a DC output voltage proportional to the phase difference of the input signals. Matching the two Schottky diodes ensures low DC offset results as well as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

- High Sensitivity
- Good RF Isolation
- High-reliability Beam-lead Diodes or MMIC's

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

Mi-Wave 991 Series Quadrature phase detector is available in specific bands.

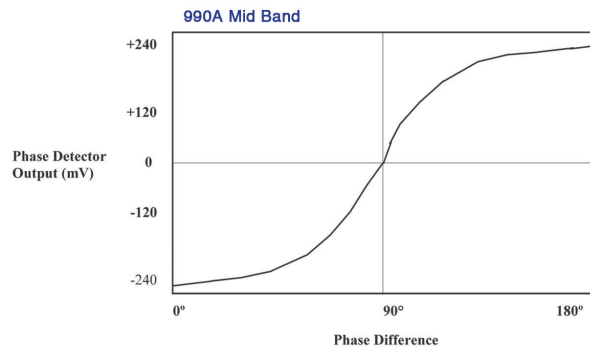
Please consult for specifications.



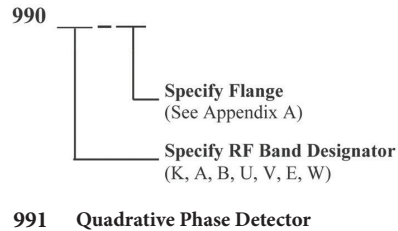
Technical Specifications

Model Number	990K	990A	990B	990U	990V	990E	990W
Frequency Input (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

Typical Transfer Characteristics



Ordering Information



NOTE:

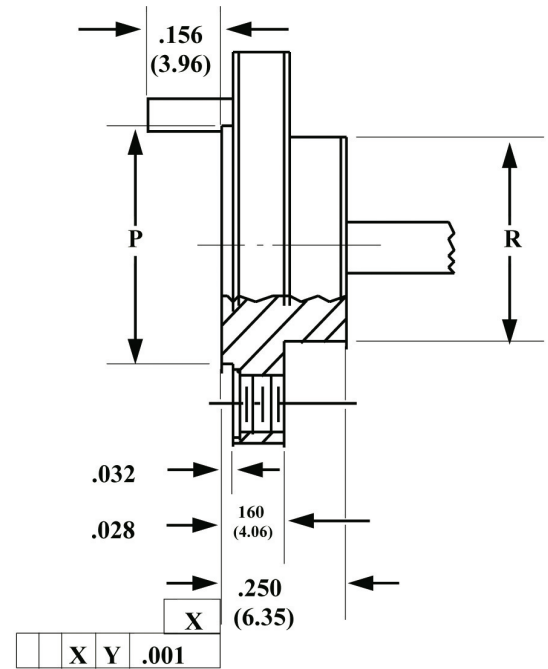
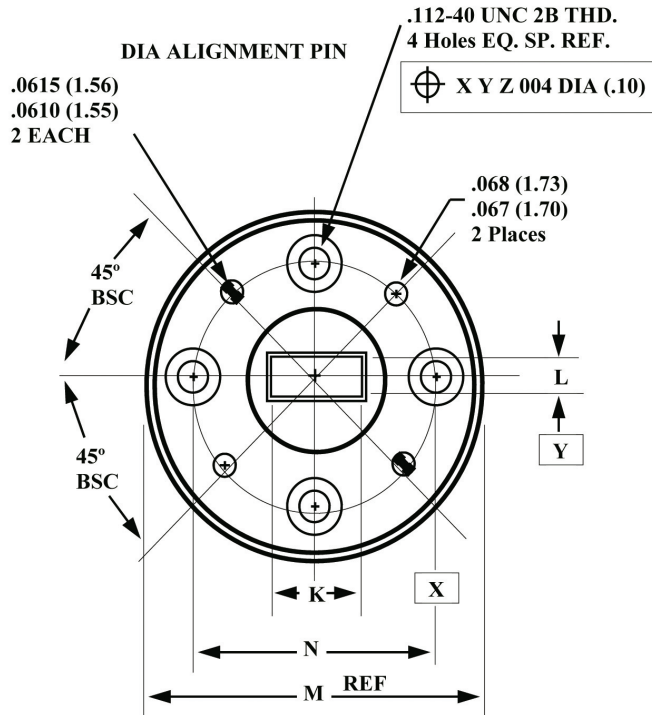
Please be sure to specify frequency at time of order.

Rectangular Waveguides											
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/ft)	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-385/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	0.78–0.53	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	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

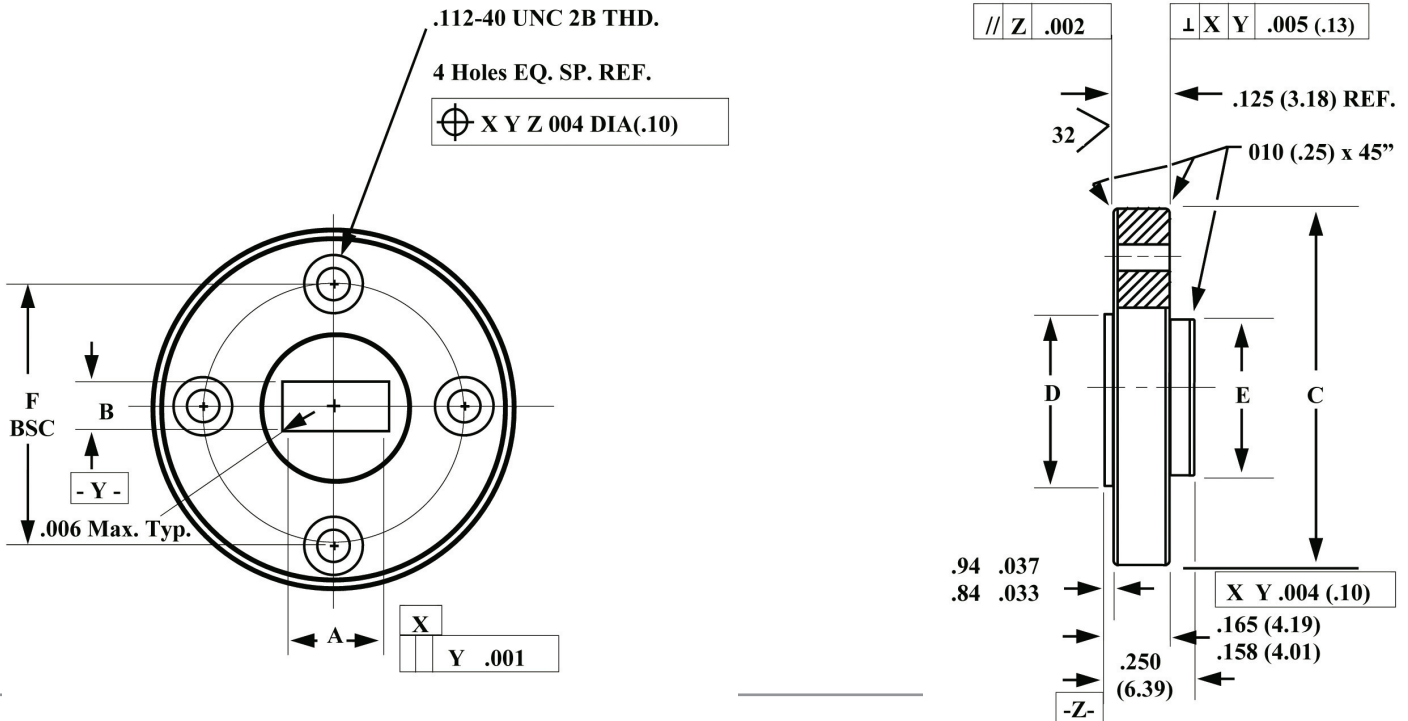
1. Standard flange unless otherwise specified.

2. Modified (-M) means waveguide opening has been reduced appropriately. Screw and pin pattern are unchanged.

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 Designation	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	.1180 (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

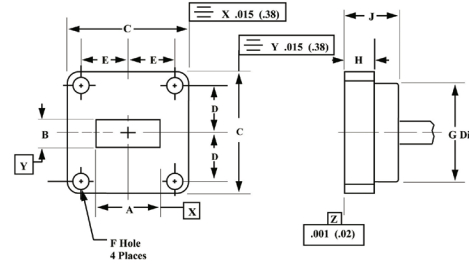
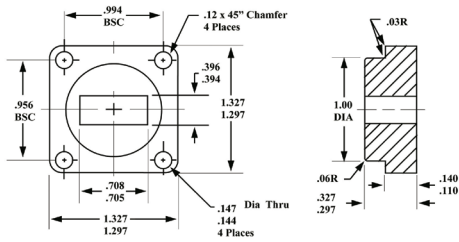


Note: Flange can be ordered with or without holes for pins

MIWV Band	Frequency Band (GHz)	MIL Part Number M3922/67	A +.002/-0.000 (.05)	B +.002/-0.000 (.05)	C +.000/-0.002 (.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)	56.25 (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)	56.25 (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)	56.25 (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)	56.25 (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)	56.25 (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)	56.25 (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

UG-419/U (WR-62)

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

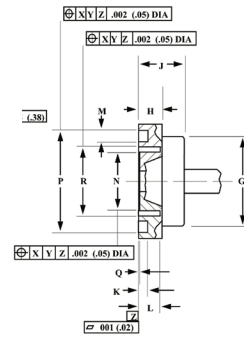
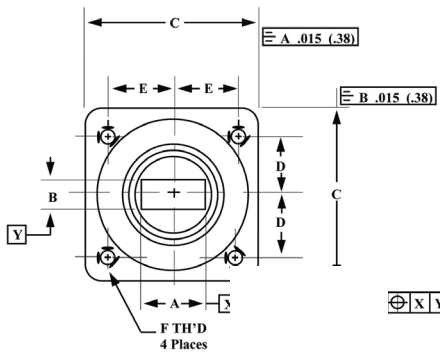


MIWV Band	Frequency Band (GHz)	MIL Part Number M3922/53	A	B	C .015 (.38)	D BSC	E BSC	F ±.003 (.08)	G ±.015 (.38)	H ±0.15 (.38)	J ±.015 (.38)	MIWV Flange Bank
Ku	12.4 18.0	-4/005	.622 ± .002 (15.8) (.05)	.311 ± .002 (.79) (.05)	1.312 33.32	4.78 (12.14)	.497 (12.62)	.144 (3.66)	1.000 (25.40)	.125 (3.18)	.313 (7.95)	UG-419/U

Appendix G

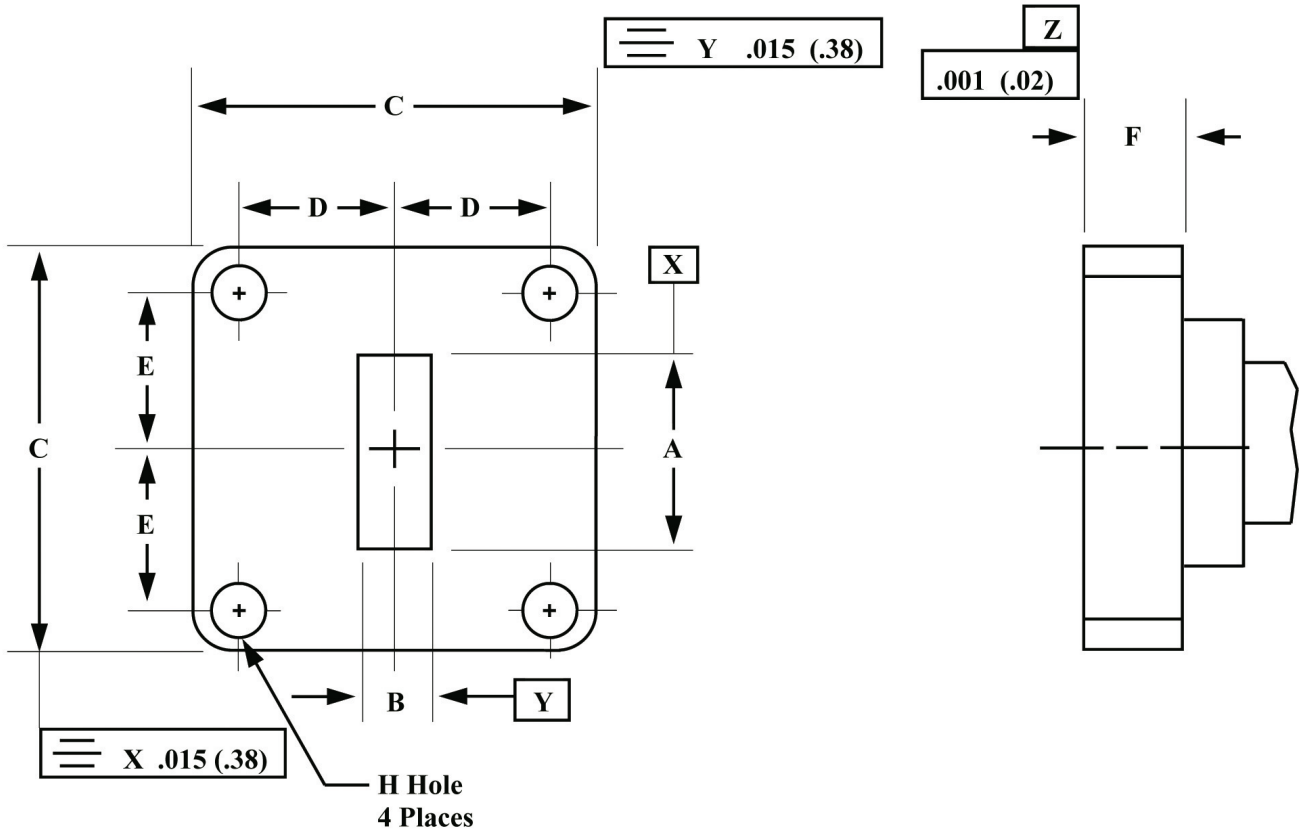
Choke Flanges

Finished Flange and Waveguide



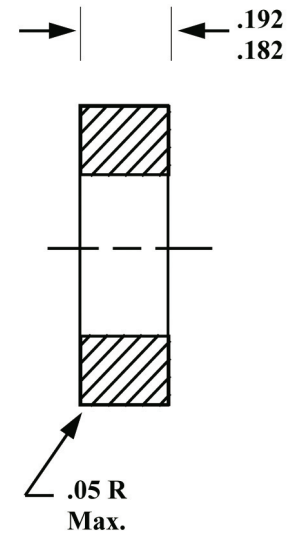
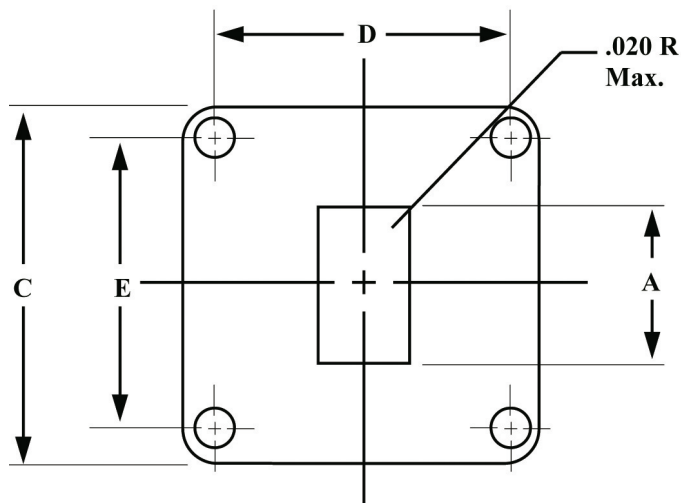
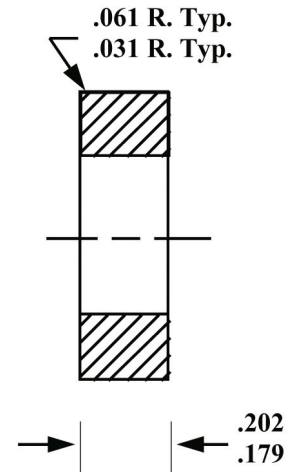
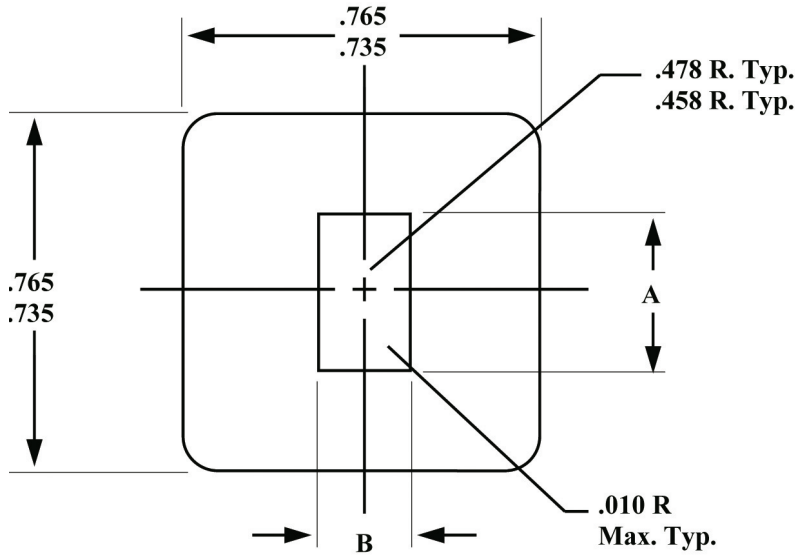
MIWV Band	Frequency Band (GHz)	MIL Part Number M3922/59	MIWV FLG. ESIG.	A	B	C .015 (.38)	D BSC	E BSC	F	G ±.015 (.38)	H ±.015 (.38)	J ±.015 (.38)	K ±.002 (.05)	L ±.002 (.05)	M ±.002 (.05)	N ±.002 (.05)	P ±.002 (.05)	Q ±.001 (.03)	R ±.002 (.05)
Ku	12.4 18.0	-2/001	UG541	.622±.002 (15.8)(.05)	.311±.002 (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)

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

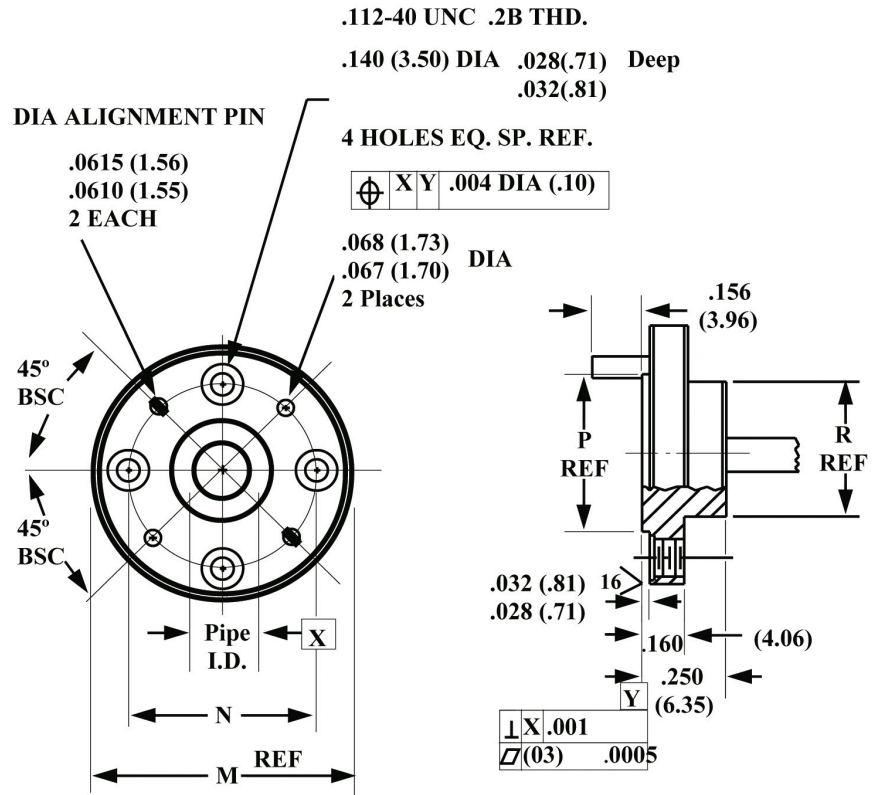
Flange Blank



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

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

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
B1	.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



MIWV Band	M +.000/.002 (.05)	N BSC	P +.005 (.13)	R +.005 (.13)	MIWV Flange Designation	MIWV Flange Blank
Ku	1.44 (36.68)	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 (23.8)	.500 (12.70)	.468 (11.89)	UG-381/U	107729-1
B	1.125 (28.58)	.9375 (23.8)	.500 (12.70)	.468 (11.89)	UG-383/U	107729-2
U	1.125 (28.58)	.9375 (23.8)	.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-385/U	107729-4
E	.750 (19.05)	.5625 (14.29)	.375 (9.53)	.312 (7.92)	UG-387/U-M	107729-5
W	.750 (19.05)	.5625 (14.29)	.375 (9.53)	.312 (7.92)	UG-387/U-M	107729-6
F	.750 (19.05)	.5625 (14.29)	.375 (9.53)	.312 (7.92)	UG-387/U-M	107729-8
D	.750 (19.05)	.5625 (14.29)	.375 (9.53)	.312 (7.92)	UG-387/U-M	107729-9
G	.750 (19.05)	.5625 (14.29)	.375 (9.53)	.312 (7.92)	UG-387/U-M	107729-10

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

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
1.01	46.06	0.09	0.00	.0001	100.	0.00
1.011	45.00	0.10	0.01	.0001	100.	0.00
1.02	40.09	0.17	0.01	.0004	99.99	0.01
1.020	40.00	0.17	0.01	.0004	99.99	0.01
1.03	36.61	0.26	0.01	.0009	99.98	0.02
1.036	35.00	0.31	0.02	.0014	99.97	0.03
1.04	34.15	0.34	0.02	.0017	99.96	0.04
1.045	33.15	0.38	0.02	.0021	99.95	0.05
1.05	32.26	0.42	0.02	.0026	99.94	0.06
1.06	30.71	0.51	0.03	.0037	99.92	0.08
1.065	30.00	0.55	0.03	.0043	99.90	0.10
1.07	29.42	0.59	0.03	.0050	99.89	0.11
1.08	28.30	0.67	0.04	.0064	99.85	0.15
1.09	27.32	0.75	0.04	.0081	99.81	0.19
1.10	26.44	0.83	0.05	.0099	99.77	0.23
1.11	25.66	0.91	0.05	.0118	99.73	0.27
1.119	25.00	0.98	0.06	.0138	99.68	0.32
1.12	24.94	0.98	0.06	.0139	99.68	0.32
1.13	24.29	1.06	0.06	.0162	99.63	0.37
1.135	24.00	1.10	0.06	.0173	99.60	0.40
1.14	23.69	1.14	0.07	.0186	99.57	0.43
1.15	23.13	1.21	0.07	.0212	99.51	0.49
1.152	23.00	1.23	0.07	.0212	99.50	0.50
1.16	22.61	1.29	0.07	.0239	99.45	0.55
1.17	22.12	1.36	0.08	.0267	99.39	0.61
1.173	22.00	1.38	0.08	.0275	99.37	0.63
1.18	21.66	1.44	0.08	.0297	99.32	0.68
1.19	21.23	1.51	0.09	.0328	99.25	0.75
1.196	21.00	1.55	0.09	.0346	99.21	0.79
1.20	20.83	1.58	0.09	.0360	99.17	0.83
1.21	20.44	1.66	0.10	.0394	99.10	0.90
1.22	21.08	1.73	0.10	.0429	99.02	0.98
1.222	20.00	1.74	0.10	.0436	99.00	1.00
1.23	19.73	1.80	0.10	.0464	98.94	1.06
1.24	19.40	1.87	0.11	.0501	98.85	1.15
1.25	19.08	1.94	0.11	.0540	98.77	1.23
1.253	19.00	1.96	0.11	.0550	98.74	1.26
1.26	18.78	2.01	0.12	.0579	98.68	1.32
1.27	18.49	2.08	0.12	.0619	98.59	1.41
1.28	18.22	2.14	0.12	.0660	98.49	1.51
1.288	18.00	2.20	0.13	.0694	98.42	1.58
1.29	17.95	2.21	0.13	.0702	98.40	1.60
1.30	17.89	2.28	0.13	.0745	98.30	1.70

VSWR	Return Loss (dB)	VSWR (dB)	Volt REFL COEFF	XMSN Loss (dB)	Power XMIT (%)	Power REFL (%)
1.31	17.45	2.35	0.13	0.08	98.20	1.80
1.32	17.21	2.41	0.14	0.08	98.10	1.90
1.329	17.00	2.47	0.14	0.09	98.00	2.00
1.33	16.98	2.48	0.14	0.09	97.99	2.01
1.34	16.75	2.54	0.15	0.09	97.89	2.11
1.35	18.54	2.61	0.15	0.10	97.78	2.22
1.36	16.33	2.61	0.15	0.10	97.67	2.33
1.37	16.13	2.73	0.16	0.11	97.56	2.44
1.377	16.00	2.78	0.16	0.11	97.49	2.51
1.38	15.94	2.80	0.16	0.11	97.45	2.55
1.39	15.75	2.86	0.16	0.11	97.49	2.51
1.40	15.56	2.92	0.17	0.12	97.22	2.78
1.41	15.38	2.98	0.17	0.13	97.11	2.89
1.42	15.21	3.05	0.17	0.13	96.99	3.01
1.43	15.04	3.11	0.18	0.14	96.87	3.13
1.433	15.00	3.12	0.18	0.14	96.84	3.16
1.44	14.88	3.17	0.18	0.14	96.75	3.25
1.45	14.72	3.23	0.18	0.15	96.63	3.37
1.46	14.56	3.29	0.19	0.15	96.50	3.50
1.464	14.50	3.31	0.19	0.16	96.45	3.55
1.47	14.41	3.35	0.19	0.16	96.38	3.62
1.48	14.26	3.41	0.19	0.17	96.25	3.75
1.49	14.12	3.46	0.20	0.17	96.13	3.87
1.499	14.00	3.51	0.20	0.18	96.02	3.98
1.50	13.96	3.52	0.20	0.18	96.00	4.00
1.536	13.50	3.73	0.21	0.20	95.53	4.47
1.55	13.32	3.81	0.22	0.21	95.35	4.65
1.577	13.00	3.96	0.22	0.22	94.99	5.01
1.60	12.74	4.08	0.23	0.24	94.67	5.33
1.622	12.50	4.20	0.24	0.25	94.38	5.62
1.65	12.21	4.35	0.25	0.27	93.98	6.02
1.671	12.00	4.46	0.25	0.28	93.69	6.31
1.70	11.73	4.61	0.26	0.30	93.28	6.72
1.725	11.50	4.74	0.27	0.32	92.92	7.08
1.75	11.29	4.86	0.27	0.34	92.56	7.44
1.785	11.00	5.03	0.28	0.36	92.06	7.94
1.80	10.88	5.11	0.29	0.37	91.84	8.16
1.851	10.50	5.35	0.30	0.41	91.09	8.16
1.90	10.16	5.58	0.31	0.44	90.37	9.63
1.925	10.00	5.69	0.32	0.46	90.00	10.00
2.00	9.54	6.02	0.33	0.51	88.89	11.11
2.50	7.36	7.96	0.43	0.88	81.63	18.37
3.00	6.02	9.54	0.50	1.25	75.00	25.00
3.50	5.11	10.88	0.56	1.60	69.14	30.86

TE ₀₁ Specifications					
Circular 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	27.3–38.8		0.594 X 0.674	29.3–40.4	WRC134C14
0.545 X 0.625	32.4–44.0		—	—	N/A
0.495 X 0.625	34.8–48.0		0.500 X 0.580	34.8–48.0	WRC159C14
—	—		0.438 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 0.341	61.9–85.0	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

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 acknowledgment by Mi-Wave, and only such acknowledgment, 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.

The term payment is net thirty (30) days FOB the Mi-Wave facility where commitment to shipping carrier is made. Firms not on open account will be required to prepay or accept material COD.

Cancellation of an order by the Buyer will be subject to payment of all costs incurred up to the date of notification of termination. Buyer will accept all finished goods, work in progress, and direct material. Costs will be calculated using standard accounting procedures including profit and G & A. If said termination is a result of reduction or cancellation of a Government contract to the Buyer, the provisions of the current applicable Defense Acquisition Regulations shall apply.

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 warranted. 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 warranty 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 effective quote date. ▶

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.

Mi-Wave agrees to indemnify Buyer against actions brought against the Buyer for infringement of valid patents. Mi-Wave will not be a party to an action resulting from the use of its components in a collection or assembly of components that are alleged to violate a patented circuit, system, equipment, assembly or any combination of components so described. Immediate notification of Mi-Wave regarding any action relating to patents or infringement of same is required but in no case shall such notice be delayed in excess of five (5) working days.

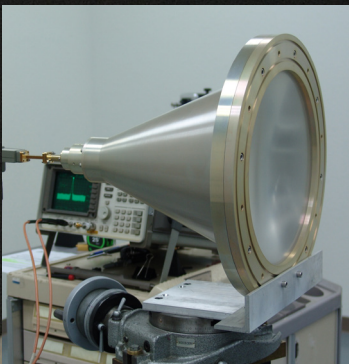
Further, delivery of components to the Buyer does in no way imply any license agreement regarding patents or disclosures held or in process by Mi-Wave. All rights under such patents remain with Mi-Wave.

Source inspection of material or components by the Buyer or any designate of his will be quoted as a separate line item.

Failure to include this line item will not relieve the Buyer from the obligation of payment for said service. Source inspection that requires witnessing of electrical tests must be preceded by mutual acceptance of a test procedure. Such test procedure, if generated by Mi-Wave, will be at the expense of the Buyer.

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.

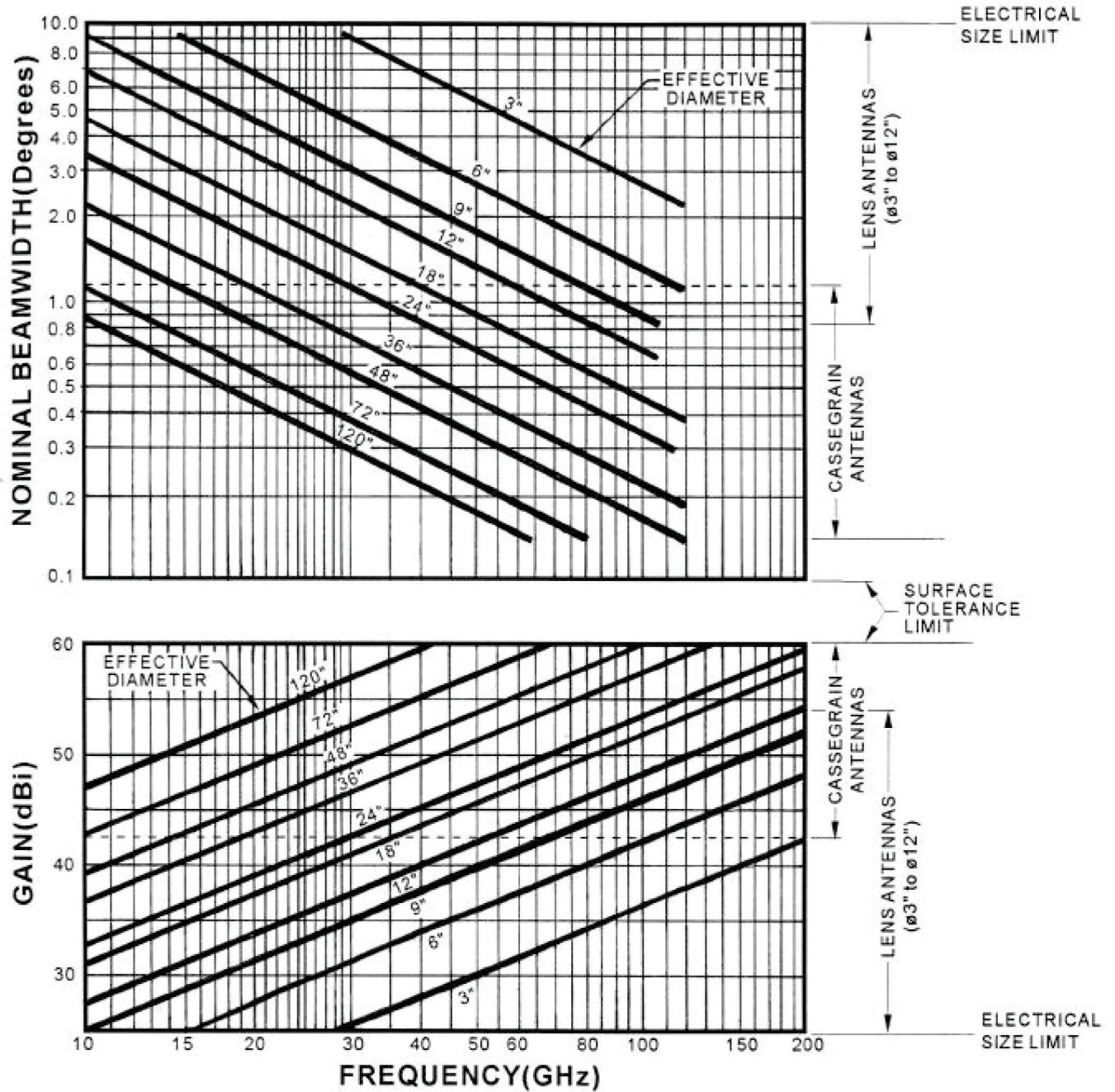




Mi-Wave's indoor facility is equipped with a 60 foot antenna test range. Here we test all our outgoing antennas.

We can also lease range time to outside companies looking to test equipment.

Consult with Mi-Wave for more information.



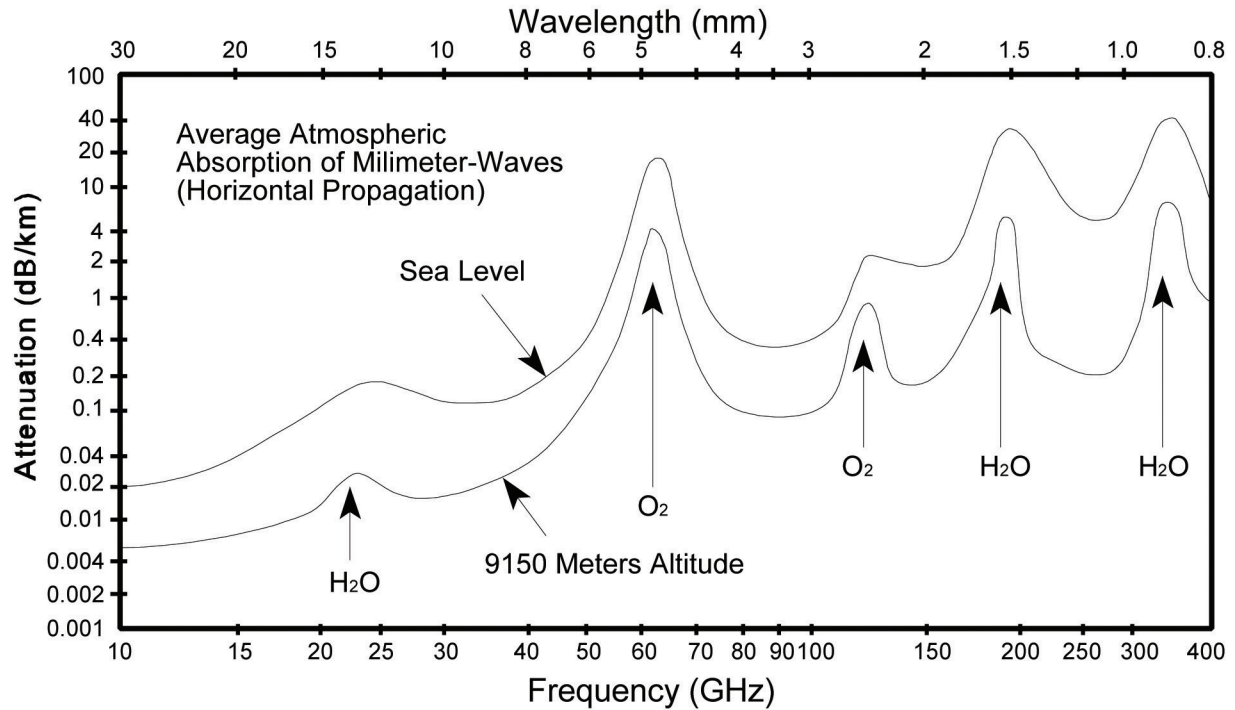


Figure 1. Atmospheric Absorption of Millimeter Waves

Signal losses are associated with each stage of signal processing in both the transmitting and receiving portions of the system. The transmitting losses include power transmission efficiency, waveguide, and antenna losses, and duplexer losses. In the receiver, losses include antenna, waveguide, RF amplifier, mixer, and IF amplifier.

In addition to these losses, energy traveling through the atmosphere suffers from atmospheric attenuation caused primarily by absorption by the gasses. For lower frequencies (below 10 GHz), the attenuation is reasonably predictable.

For high frequencies in the millimeter wave range, the attenuation not only increases, but becomes more dependent upon particular absorbing characteristics of H₂O, O₂, and the like.





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