

# Section 4

## Short Slot Hybrids

### Theory

These couplers have a plane of symmetry running the full length of the unit, and are comprised of two waveguides side by side with a portion of the common wall removed to permit coupling between the two sections. Since these units are symmetrical, any of the four arms may be used as an input without impairing its performance.

In MDL short-slot 3 dB (hybrid) couplers the incoming power divides equally between the two output terminals. With the remaining arm isolated, this structure then becomes an ideal hybrid junction. If the output terminals (B&C) are short-circuited, the energy is reflected without relative phase shift. Voltages in the input arm (A) arising from reflections at short-circuit (C) experience an additional 90° phase shift, and thus cancel those which are reflected from short-circuit (B). The reflections arriving in arm (D) arising from the reflections at short-circuit (B) experience a 90° phase shift and thus reinforce those reflected from short-circuit (C).

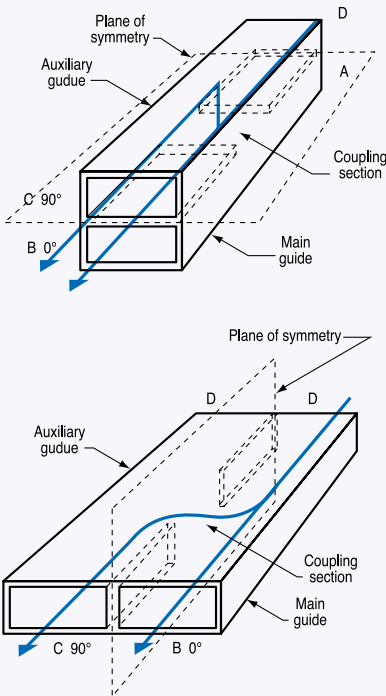


FIGURE 1 – COUPLER TERMINOLOGY

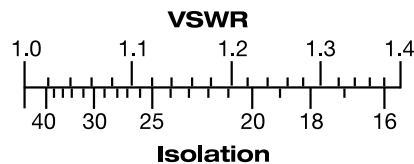
- Coupling = Ratio A to C
- Balance = Ratio B to C
- Directivity = Ratio C to D
- Isolation = Ratio A to D
- Isolation = Coupling + Directivity

#### PHASE DIFFERENCE AT OUTPUTS

- Sidewall C lags B by 90°
- Topwall C leads B by 90°
- Note: In a sidewall hybrid, add 1/4 wave length to B arm for equal phase at output.

### Engineering Information

Most standard MDL 3 dB short slot (hybrid) couplers have a normal output power unbalance of 0.25 dB max., (a coupling of 3dB ± 0.125 dB) and an isolation exceeding 30 dB in applications up to and including 15% band width. The terminated VSWR is a function of isolation, and can be determined from the chart below. Generally, the VSWR is less than 1.07.



Each hybrid is designed for optimum isolation and flat balance response over as broad a band as possible. In a sidewall hybrid, the power out of the auxiliary arm lags the power out of the main arm, while in a topwall hybrid the power of the auxiliary arm leads the main arm (See Fig. 1). The parameters that cause phase error are:

1. Non-symmetry (seldom exceeds 2°)
2. A function of isolation, approximately equal to  $2 \tan^{-1} \sqrt{I}^2$ , where  $\sqrt{I}$  is isolation in voltage ratio. This can account for slightly over 0.1° error with 30 dB isolation.

# Section 4

## Short Slot Hybrids

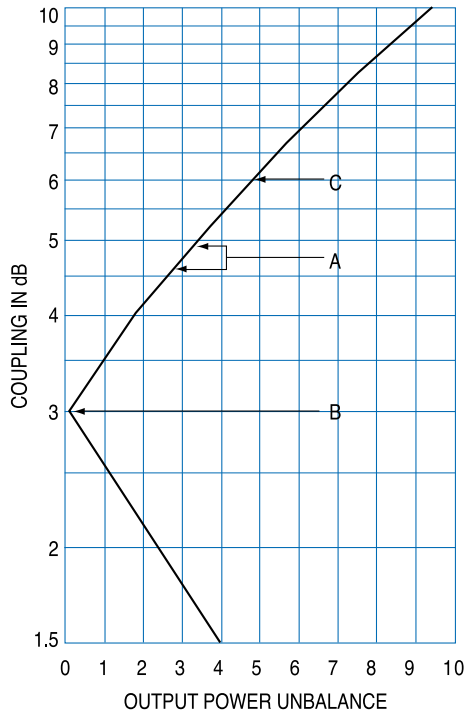
### Terminology

The terms “Coupling,” “Balance,” “Directivity” and “Isolation” are occasionally misused. Coupling is the ratio of input power to the auxiliary guide output power while Balance is the ratio of the main guide output power to the auxiliary guide output power.

Directivity is the ratio of forward to reverse power in the auxiliary guide while isolation is the ratio of the main guide input power to reverse power in the auxiliary guide. Isolation is equal to coupling + directivity.

These and other common terms are illustrated and defined in Fig. 1. All Terms in Fig. 1 are expressed in decibels.

The graph illustrates the relationship between coupling and balance.

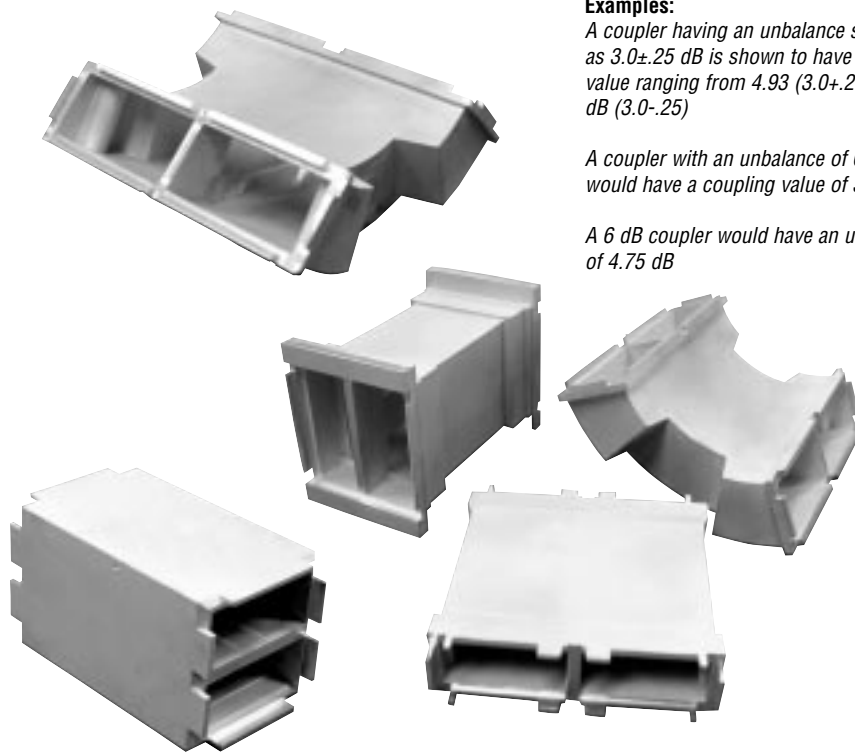


### Examples:

A coupler having an unbalance specified as  $3.0 \pm .25$  dB is shown to have a coupling value ranging from 4.93 ( $3.0 + .25$ ) to 4.6 dB ( $3.0 - .25$ )

A coupler with an unbalance of 0.0 dB would have a coupling value of 3 dB

A 6 dB coupler would have an unbalance of 4.75 dB



### Introduction

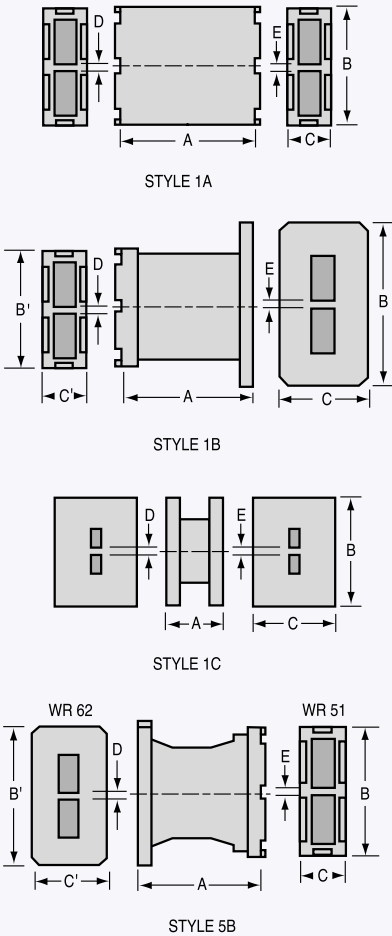
MDL has prepared this section as an up to date guide in the selection of short-slot couplers. This section is divided into four major groups: sidewall 3 dB couplers, topwall 3 dB couplers, sidewall couplers other than 3 dB and topwall couplers other than 3dB. These major groups are sub-divided into EIA waveguide size (WR10 thru 284).

MDL short-slot couplers, because of their uniplanar construction, simplify packaging, particularly where space is limited. Models are also available in 90° and 180° bends, narrow height waveguide and tapers from one guide to another.

The short-slot 3 dB (hybrid) couplers are ideal for compact power dividers, bridge circuits, duplexers, diplexers, monopulse comparators, balanced mixers, etc. MDL, the pioneer and largest manufacturer of short-slot couplers can produce a unit to meet your requirements. Quotations and inquiries are invited.

# Sidewall Couplers – 3dB

## SIDEWALL COUPLERS



W/G Size	Frequency GHz	Style	Model Number	Dimensions (inches)				
				A	B	C	D	E
WR10	91.75-95.75 <sup>X</sup>	1C <sup>2</sup>	10HS12B <sup>3</sup>	.440	1.00	.75	.040	.040
WR22	43.5-45.5	1A	22HS12	.440	.648	.280	.040	.040
WR28	26.5-29.5	1A	28HS42	.550	.77	.30	.040	.040
	26.0-30.0 <sup>▲</sup>							
	27.5-31.2	1A	28HSA22	.550	.77	.30	.040	.040
	30.0-34.0	1A	28HS52	.550	.76	.30	.040	.040
	34.0-36.0	1A	28HS32	.550	.77	.30	.040	.040
	33.5-37.0 <sup>▲</sup>							
	36.0-40.0	1A	28HS62*	.550	.77	.30	.040	.040
WR42	17.6-20.0	1A	42HS42	.900	1.11	.31	.090	.090
	17.6-20.0	1B <sup>1</sup>	42HS14	.900	1.39B 11.1B	.87C .32C	.090	.090
	17.6-20.0	1C <sup>1</sup>	42HS24	.900	1.39	.87	.090	.090
	19.3-22.0	1A	42HS32	.900	1.11	.29	.090	.090
	23.0-25.5	1A	42HS12	.900	1.09	.33	.040	.090
	22.5-26.0 <sup>▲</sup>							
	23.0-25.0	2A	42HS22	.500(R)	1.07	.31	.040	.090
WR51	15.5-17.5	1A	51HS62	1.375	1.33	.47	.090	.090
	16.0-17.0 <sup>■</sup>	1A	51HS22	1.375	1.33	.47	.090	.090
	17.35-19.65	1A	51HS12	1.125	1.22	.42	.040	.040
	17.35-19.65	1A	51HS32	1.125	1.27	.42	.090	.090
WR51 Tapered to	15.5-16.5	5B <sup>5</sup>	51HS42	1.250	1.27B 1.75B'	.42C 1.31C'	.040	.090
WR62	15.5-16.5	5B <sup>7</sup>	51HS52	1.250	1.27B 1.75B'	.42C 1.31C'	.040	.090
	12.4-14.0	1A	62HS22	1.110	1.45	.48	.040	.040
WR62	12.4-14.0	1A	62HS132	1.110	1.50	.48	.090	.090

Except as Noted Output power Unbalance (dBmax.) ±0.25 Isolation (db min.) 30

Notes: <sup>X</sup> Unbalance ±.50 dB max. Isolation 25 dB min. <sup>\*</sup> Isolation 28 dB min.

<sup>■</sup> Unbalance ±.15 dB max.

<sup>▲</sup> These models have been tested and exhibit reasonable electrical characteristics over extended frequency range. Specific data available on request.

<sup>1</sup> Dual flat flange with four .116 dia. cleared holes 42FS32

<sup>2</sup> Dual flat flange with six .120 dia. cleared holes 10FS22

<sup>3</sup> Material BECU only

<sup>5</sup> Dual sidewall flat flange four 0.144 dia. holes 62FS52

<sup>7</sup> Dual choke pressure flange 62FS12 four 0.144 dia. holes

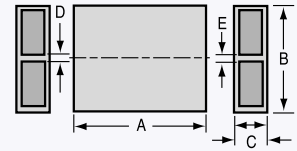
NOTE: All hybrids corrals mate with standard W/G (WR size noted in the table on Page 51) having a common wall of the thickness shown by dimensions D and E.

Socket dimensions & overall tolerances shown on Page 44.

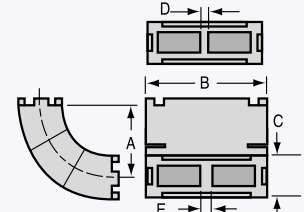
# Sidewall Couplers – 3dB

W/G Size	Frequency GHz	Style	Model Number	Dimensions (inches)				
				A	B	C	D	E
WR62 (cont.)	12.4-14.0	1B <sup>6</sup>	62HS54	1.250	1.75B 1.46B'	1.31C .48C'	.040	.040
	13.0-15.0*	1A	62HS162	1.250	1.50	.48	.090	.090
	13.5-15.6	1A	62HS122	1.250	1.50	.48	.090	.090
	13.5-15.6	1A	62HS12	1.250	1.45	.48	.040	.040
	13.5-15.8	1B <sup>6</sup>	62HS64	1.250	1.75B 1.46B'	1.31C .48C'	.040	.040
	15.0-17.0	1A	62HS32	1.110	1.45	.48	.040	.040
	15.0-17.0	1A	62HS152	1.110	1.50	.48	.090	.090
	15.5-17.5	1A	62HS112	1.110	1.53	.51	.090	.090
	15.5-17.5	1B <sup>8</sup>	62HS142	1.110	1.80B 1.50B'	1.31C .48C'	.090	.090
	15.5-17.5	1B <sup>9</sup>	62HS84	1.110	1.80B 1.50B'	1.31C .48C'	.090	.090
	15.5-17.5	1A	62HSA52	1.312	1.53	.50	.090	.040
	15.5-17.5	1B <sup>7,11</sup>	62HSA14	1.360 <sup>10</sup>	1.75B 1.53B'	1.31C .50C'	.090	.040
	15.5-17.5	1B <sup>5</sup>	62HSA44	1.360	1.75B 1.53B'	1.31C .50C'	.090	.040
	15.5-17.5	1A	62HSA42	1.110	1.45	.47	.040	.040
	15.5-18.0 <sup>▲</sup>							
WR62 90°	15.5-17.0	2A	62HSA92	.750 (R)	1.61	.58	.040	.090
WR62.138 HGT	12.6-14.2	1A	B62HS12	1.110	1.43	.28	.040	.040
	12.6-14.2	1D	B62HS22	1.110	1.36	.22	.040	.040
WR75	10.1-11.6	1A	75HS32	1.375	1.75	.58	.050	.050
	10.5-12.0	1A	75HS12	1.375	1.75	.58	.050	.050
	11.6-13.4	1A	75HS22	1.500	1.75	.58	.050	.050
	11.7-14.3*+	1A	75HS42	1.500	1.75	.58	.050	.050
	13.0-15.0	1A	75HS52	1.375	1.75	.58	.050	.050
WR75 .200 HGT	10.0-10.5	1A	A75HS12	1.375	1.75	.40	.050	.050
WR90	8.10-9.30	1A	90HS342	1.735	2.13	.61	.120	.120
	8.10-9.30	1B <sup>3</sup>	90HS94	1.735	2.58B 2.13B'	1.62C .61C'	.120	.120

SIDEWALL COUPLERS



STYLE 1D



STYLE 2A

Except as Noted Output power Unbalance (dBmax.) ±0.25 Isolation (db min.) 30

Notes: \* Isolation 28 dB min. + Unbalance ±.50 dB.

<sup>5</sup> Dual sidewall flat flange four 0.144 dia. holes 62FS52

<sup>6</sup> Dual S/W blank flange (no holes)

<sup>7</sup> Dual choke pressure flange 62FS12 four 0.144 dia. holes

<sup>8</sup> Dual S/W flat flange four 0.144 dia. holes 62FS92

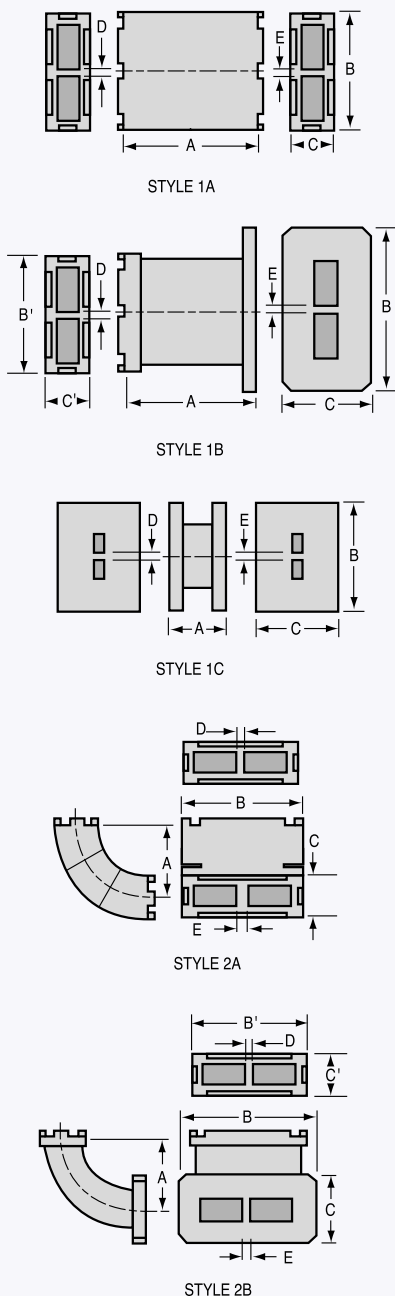
<sup>9</sup> Dual S/W pressure flange six 0.144 dia. holes

NOTE: All hybrids corrals mate with standard W/G (WR size noted in the table on Page 51) having a common wall of the thickness shown by dimensions D and E.

Socket dimensions & overall tolerances shown on Page 44.

# Sidewall Couplers – 3dB

## SIDEWALL COUPLERS



W/G Size	Frequency GHz	Style	Model Number	Dimensions (inches)					
				A	B	C	D	E	
<b>WR90 (cont.)</b>	8.5-9.7	1B <sup>3</sup>	90HS84	1.735	2.58B 2.13B'	1.62C .61C'	.120	.120	
	8.5-9.6	1A <sup>1</sup>	90HS52	1.235	2.00	.56	.050	.050	
	8.4-9.6	1A	90HS272	1.735	2.06	.59	.050	.050	
	8.5-9.7	1A	90HSA232	1.735	2.13	.61	.120	.120	
	8.5-9.6	1A	90HS322	1.735	2.12B 2.05B'	.60	.050	.120	
	8.5-9.7	1B <sup>4B</sup>	90HS54	1.875	2.58B 2.14B'	1.63C .61C'	.120	.050	
	8.5-9.7	1B <sup>4A</sup>	90HS24	1.875	2.58B 2.14B'	1.63C .61C'	.120	.050	
	8.6-10.0	1A	90HS92	2.000	2.14	.61	.120	.120	
	8.8-10.0	1A	90HSA242	1.485	2.06	.60	.050	.050	
	9.10-10.20	1A	90HS152	1.735	2.13	.61	.120	.120	
	9.10-10.20	1B <sup>3</sup>	90HS74	1.735	2.58B 2.13B'	1.62C .61C'	.120	.120	
	9.0-10.0	1A	90HS112	1.875	2.14	.61	.050	.120	
	9.0-10.0	1B <sup>4A</sup>	90HS144	1.875	2.58B 2.14B'	1.63C .61C'	.120	.050	
	9.4-10.8	1A	90HS82	2.000	2.13	.61	.120	.120	
	9.6-10.25	1A	90HSA252	1.485	2.03	.59	.050	.050	
10.5-11.9	1A	90HS42	1.735	2.13	.61	.120	.120		
10.5-11.9	1C <sup>2</sup>	90HS44	1.735	2.80	1.27	.120	.120		
<b>WR90 60°</b>	8.4-9.7	4B <sup>2</sup>	90HS114	1.680(R)	2.84B 2.03B'	1.38C .58C'	.050	.050	
	<b>WR90 90°</b>	8.5-9.6	2A	90HS12	1.125(R)	2.04	.60	.050	.050
		8.5-9.6	2A	90HS292	1.125(R)	2.12	.61	.120	.120
8.8-10.0		2A	90HS332	1.125(R)	2.10	.60	.050	.050	
9.6-10.7		2A	90HS22	1.125(R)	2.13	.61	.120	.120	
<b>WR90 180°</b>	8.5-9.6	3A	90HS102	1.100(D)	2.15	.70	.050	.050	
	8.4-9.6	3A	90HS142	1.095(D)	2.22	.70	.120	.120	
<b>WR90 Tapered to WR112</b>	8.5-9.6	5A	90HS62	2.187	2.11B 2.62B'	.60C .72C'	.120	.120	
	8.5-9.6	6A	90HS132	1.312(R)	2.13B 2.60B'	.62C .71C'	.120	.150	
<b>WR90 .200 HGT</b>	8.2-9.3	1A	A90HS12	1.735	2.12	.40	.120	.120	
	8.5-9.6	1A	A90HS22	1.735	2.12	.40	.120	.120	
	9.4-10.8	1A	A90HS32	1.735	2.12	.40	.120	.120	
<b>WR90 Tapered to .300 HGT</b>	8.5-9.6	1A	B90HS22	1.735	2.14B 2.14B'	.63C .53C'	.120	.120	

Except as Noted Output power Unbalance (dBmax.) ±.25 Isolation (db min.) 30

Notes: • Isolation 27 dB min.

<sup>1</sup> No physical center wall .050 commonwall required by both mating components to function electrically

<sup>2</sup> Flange blank

<sup>3</sup> Dual S/W flat flanges six .169 dia. holes 90FS112

<sup>4A</sup> Dual S/W pressure flange 90FS152 six .169 dia.

<sup>4B</sup> Dual S/W pressure flange 90FS162 six 8/32 threaded

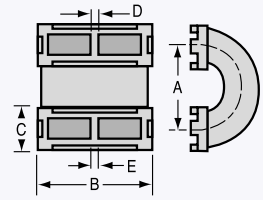
NOTE: All hybrids corrals mate with standard W/G (WR size noted in the table on Page 51) having a common wall of the thickness shown by dimensions D and E.

Socket dimensions & overall tolerances shown on Page 44.

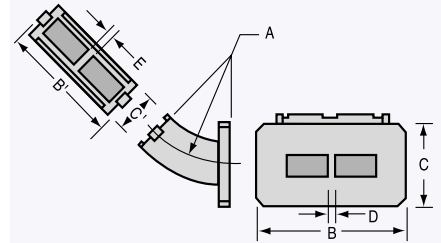
# Sidewall Couplers – 3dB

W/G Size	Frequency GHz	Style	Model Number	Dimensions (inches)				
				A	B	C	D	E
WR90 Tapered to .300 HGT 90°	8.5-9.6	6A	B90HS12	1.125(R)	2.10B 2.10B'	.50C .60C'	.120	.120
	9.5-10.5	6A	B90HS42	1.124(R)	2.10B 2.10B'	.50C .60C'	.120	.120
WR90 .150 HGT	8.5-9.6	1A	C90HS12	1.580	2.07	.35	.070	.070
WR102	9.4-10.6	1A	102HS12	2.250	2.450	.77	.150	.150
	9.4-10.6	1B	102HS22	2.250	3.48B 2.45B'	1.78C .77C'	.150	.150
WR112	6.9-8.0	1A	112HS12	2.187	2.64	.73	.150	.150
	7.1-8.5**	1A	112HS32	2.187	2.64	.73	.150	.150
	7.1-8.5**	1B <sup>7</sup>	112HS44	2.187	3.218 2.64	1.375 .73	.150	.150
	7.5-8.5	1A	112HS62	2.187	2.64	.73	.150	.150
	7.9-9.0	1A	112HS142	2.187	2.64	.74	.150	.150
	8.4-9.6	1B	112HS34	2.000	3.21B 2.52B'	1.37C .72C'	.064	.064
	8.4-9.8	1A	112HS72	2.000	2.53	.73	.064	.064
	8.5-9.7	1A	112HS112	2.187	2.61B 2.53B'	.72	.064	.150
	8.5-9.6	1B <sup>5</sup>	112HS14	2.437	3.06B 2.53B'	1.87C .73C'	.064	.064
	8.5-9.7	1B <sup>6</sup>	112HS24	2.187	3.22B 2.61B'	1.38C .72C'	.150	.064
WR 112 90°	8.5-9.6	1A	112HS92	2.000	2.53	.73	.064	.064
	8.5-9.6	2A	112HS122	1.312(R)	2.64	.83	.064	.064
WR 112 180°	8.5-9.6	2A	112HS102	1.312(R)	2.66	.77	.064	.150
	8.5-9.6	3A	112HS22	1.375(D)	2.62	.72	.150	.150
WR137	5.4-6.0	1A <sup>*</sup>	137HS12	2.750	3.15	.88	.150	.150
	5.4-6.0	1B <sup>1</sup>	137HS14	2.750	3.80B 3.14B'	1.61C .88C'	.150	.150
	5.8-6.5	1A	137HS72	2.625	3.11	.83	.150	.150
	6.0-7.0	1A	137HS52	2.625	3.09	.83	.150	.150
	6.85-7.80	1A	137HS32	2.625	3.13	.88	.150	.150
	7.15-8.20	1A	137HS22	2.625	3.13	.88	.150	.150
WR137 .247 HGT	5.4-6.0	1A	A137HS12	2.625	3.13	.48	.150	.150
WR137 .487 HGT	6.0-7.0	1B <sup>2</sup>	B137HS14	2.625	3.80B 3.09B'	1.40C 0.69C'	.150	.150
WR159	5.4-5.9	1A	159HS22	3.250	3.56	1.02	.150	.150
	5.9-6.5	1A	159HS12	3.250	3.56	1.02	.150	.150
	5.925-6.425 <sup>■</sup>	1A	159HSA12	3.250	3.56	1.02	.150	.150
	5.9-6.5	1B <sup>3</sup>	159HS14	3.250	4.20B 3.56B'	1.67C 1.02C'	.150	.150
	5.9-6.5	1C <sup>3</sup>	159HS24	3.250	4.20	1.67	.150	.150

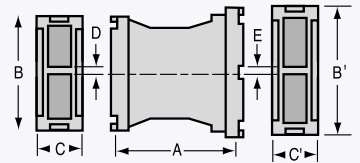
SIDEWALL COUPLERS



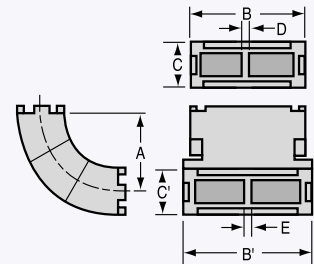
STYLE 3A



STYLE 4B



STYLE 5A



STYLE 6A

Except as Noted Output power Unbalance (dBmax.) ±.25 Isolation (db min.) 30

Notes: \* Coralls same as Style 1B      \*\* Isolation 28 unbalance, .35 dB min.

■ Unbalance ±.15 dB max. Isolation 35 dB min.

<sup>1</sup> Dual S/W flat flange 137FS32

<sup>2</sup> Dual S/W flat flange B 137FS12

<sup>5</sup> Dual S/W pressurized choke flange six 0.169 dia. holes 112FS22

<sup>6</sup> Dual S/W pressure flat flange ten 0.167 dia. holes 112FS102

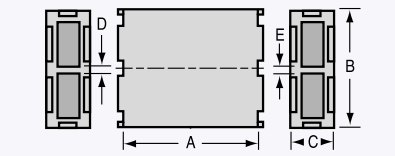
<sup>7</sup> Dual S/W flat flange ten 0.169 dia. holes 112FS82

NOTE: All hybrids coralls mate with standard W/G (WR size noted in the table on Page 51)

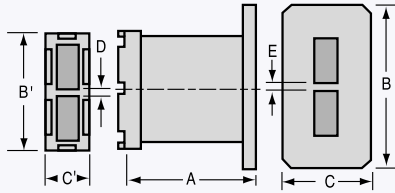
having a common wall of the thickness shown by dimensions D and E.

Socket dimensions & overall tolerances shown on Page 44.

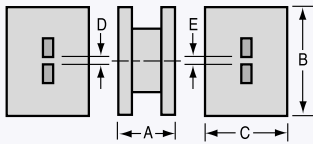
# Sidewall Couplers – 3dB



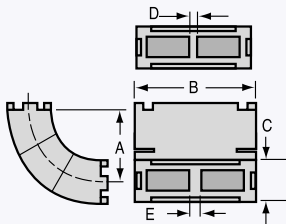
STYLE 1A



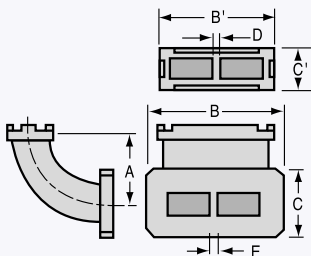
STYLE 1B



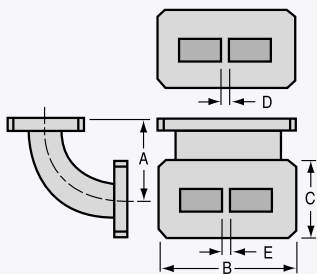
STYLE 1C



STYLE 2A



STYLE 2B



STYLE 2C

W/G Size	Frequency GHz	Style	Model Number	Dimensions (inches)				
				A	B	C	D	E
WR187	3.95-4.50	1A	187HSA92	3.625	4.17	1.17	.150	.150
	3.95-4.50	1B <sup>4</sup>	187HSA84	3.625	4.76B 4.17B'	1.77C 1.17C'	.150	.150
	3.95-4.50	1C <sup>4</sup>	187HS74	3.625	4.76	1.77	.150	.150
	4.34-5.06	1A	187HSA32	3.625	4.17	1.17	.150	.150
	4.34-5.06	1C <sup>4</sup>	187HS44	3.625	4.76	1.77	.150	.150
	4.34-5.06	1B <sup>4</sup>	187HS94	3.625	4.76B 4.17B'	1.77C 1.17C'	.150	.150
	4.50-5.20	1A	187HSA52	3.625	4.17	1.17	.150	.150
	4.50-5.20	1B <sup>4</sup>	187HSA64	3.625	4.76B 4.17B'	1.77C 1.17C'	.150	.150
	4.50-5.20	1C <sup>4</sup>	187HS54	3.625	4.76	1.77	.150	.150
	4.70-5.25	1A	187HS62	3.625	4.14	1.13	.128	.128
	4.90-5.75	1A	187HS72	3.625	4.14	1.13	.150	.150
	5.2-5.9	1A	187HSA42	3.250	4.14	1.14	.128	.128
	5.2-5.9	1B <sup>5A</sup>	187HSA24	3.250	5.02B 4.14B'	2.01C 1.14C'	.128	.128
	5.2-5.9	1B <sup>5B</sup>	187HSA14	3.250	5.02B 4.14B'	2.01C 1.14C'	.128	.128
	WR187 90°	3.8-4.3	2C <sup>3</sup>	187HS13	2.250(R)	4.75	1.78	.150
3.8-4.3		2A	187HS112	2.250(R)	4.15	1.13	.150	.150
4.4-5.0		2A	187HS22	2.375(R)	4.14	1.12	.150	.150
5.2-5.9		2A	187HS82	2.250(R)	4.19	1.20	.128	.128
5.2-5.9		2B <sup>5A</sup>	187HS34	2.250(R)	5.02B 4.19B'	2.01C 1.20C'	.128	.128
WR229	3.7-4.2	1A	229HS12	5.25	4.96	1.40	.128	.128
WR284	2.66-2.99	1A	284HS32	5.50	6.14	1.62	.160	.160
	2.7-2.9	1A	284HS22	5.50	6.14	1.62	.160	.160
	2.7-2.9	1C <sup>6</sup>	284HS14	5.50	7.22	2.72	.160	.160
	2.7-2.9	1A	284HS92	5.50	6.18	1.67	.160	.160
	2.8-3.2	1A	284HS12	5.50	6.14	1.62	.160	.160
	2.99-3.44	1A	284HS52	5.50	6.14	1.62	.160	.160
	3.1-3.5	1A	284HS102	5.50	6.18	1.67	.160	.160
	3.44-3.95	1A	284HS42	5.50	6.11	1.62	.160	.160
	3.1-3.5	1A <sup>8</sup>	A284HS22	5.50	6.16	.72	.160	.160
	3.1-3.5	1A <sup>7</sup>	A284HS32	5.50	6.16	.99	.160	.160
WR284 90°	2.85-3.15	1A	284HS62	3.50(R)	6.20	1.60	.160	.160

Except as Noted Output power Unbalance (dBmax.) ±.25 Isolation (db min.) 30

Notes: <sup>3</sup> Blank flange

<sup>4</sup> Dual s/w flat flange 187FS92

<sup>5A</sup> Dual sidewall flat pressure flange twelve 0.196 dia. holes (187FS52)

<sup>5B</sup> Dual sidewall flat pressure flange twelve 10.32 threaded holes (187FS62)

<sup>6</sup> Dual S/W flat flange 284FS12

<sup>7</sup> .670 height

<sup>8</sup> .400 height

NOTE: All hybrids corrals mate with standard W/G (WR size noted in the table on Page 51) having a common wall of the thickness shown by dimensions D and E.

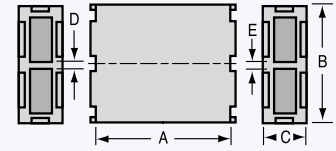
Socket dimensions & overall tolerances shown on Page 44.



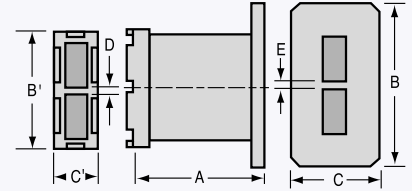
# Sidewall Couplers – Other than 3dB

SIDEWALL COUPLERS – OTHER THAN 3dB

W/G Size	Electrical Data						Mechanical Data (inches)				
	Frequency GHz	Style	Model Number	Coupling Reference (dB)	Output Power Unbalance (dB)	Directivity (dB min)	A	B	C	D	E
<b>WR28</b>	38.0-40.2	1A	28CH12	4.8	-3.0±.25	20	.550	.77	.30	.040	.040
<b>WR42</b>	19.5-22.5	1A	42CH12	4.8	-3.0±.25	18	.900	1.11	.29	.090	.090
<b>WR62</b>	12.0-14.0	1A	62CH12	4.8	-3.0±.25	15	1.110	1.44	.47	.040	.040
	12.6-14.0	1A	62CH102	4.8	-3.0±.25	20	1.110	1.44	.47	.040	.040
	12.6-14.4	1A	62CH32	5.6	-4.2±.25	20	1.110	1.45	.46	.040	.040
	12.6-14.6	1A	62CH42	5.4	-3.95±.25	20	1.110	1.45	.46	.040	.040
	13.0-14.5	1A	62CH52	6.0	-4.8±.25	20	1.110	1.45	.46	.040	.040
	13.1-14.3	1A	62CH72	6.2	-5.0±.25	20	1.110	1.45	.46	.040	.040
	13.5-15.5	1A	62CH62	4.8	-3.0±.25	18	1.250	1.50	.48	.090	.090
	15.0-17.0	1A	62CH22	4.8	-3.0±.25	20	1.110	1.44	.47	.040	.040
	15.4-17.4	1B <sup>1</sup>	62CH92	4.8	-3.0±.25	22	1.110	1.75B 1.45B'	1.30C .48C'	.040	.040
<b>WR75</b>	10.7-11.7	1A	75CH12	6.0	-4.8±.25	24	1.375	1.75	.58	.050	.050
<b>WR90</b>	8.2-9.2	1A	90CH52	7.0	-6.1±.25	20	1.735	2.14	.69	.120	.120
	8.5-9.6	1A	90CH12	4.8	-3.0±.25	22	1.735	2.13	.63	.120	.120
	8.5-9.6	1A	90CH62	3.5	-1.0±.25	25	1.735	2.06	.59	.050	.050
	8.7-9.6	1A	90CH72	5.8	-4.5±.25	15	1.735	2.06	.59	.050	.050
	8.8-9.6	1A	90CH82	2.5	+1.0±.25	25	1.735	2.06	.66	.050	.050
	8.8-9.8	1A	90CH92	5.5	-4.0±.25	15	1.735	2.06	.59	.050	.050
	9.1-9.6	1A	90CH102	6.0	-4.9±.25	22	1.735	2.06	.59	.050	.050
	9.1-9.65	1A	90CH112	4.0	-1.8±.25	20	1.735	2.06	.59	.050	.050
	9.3-11.0	1A	90CH122	5.2	-3.7±.25	15	2.000	2.13	.61	.120	.120
	9.5-10.3	1A	90CH132	5.2	-3.7±.25	20	2.000	2.13	.61	.120	.120
	9.5-11.0	1A	90CH32	4.8	-3.0±.25	20	2.000	2.13	.61	.120	.120
9.7-10.0	1A	90CH142	5.5	-4.0±.25	18	1.735	2.06	.59	.050	.050	
<b>WR90 200 HGT</b>	8.5-9.6	1A	A90CH12	-3.2	-4.0±.40	25	1.735	2.12	.40	.120	.120
	8.5-9.6	1A	A90CH22	-3.5	-1.00±.25	25	1.735	2.12	.40	.120	.120
	8.5-9.6	1A	A90CH32	-3.75	-1.40±.25	23	1.735	2.12	.40	.120	.120
	8.5-9.6	1A	A90CH42	-4.0	-1.80±.25	20	1.735	2.12	.40	.120	.120
	8.5-9.6	1A	A90CH52	-4.8	-3.00±.25	20	1.735	2.12	.40	.120	.120
	8.5-9.6	1A	A90CH62	-5.4	-3.90±.25	15	1.735	2.12	.40	.120	.120
	9.3-10.3	1A	A90CH72	-5.2	-3.64±.25	24	1.735	2.12	.42	.120	.120
	9.3-10.3	1A	A90CH82	6.96	-5.98±.25	20	1.735	2.12	.47	.120	.120
	9.3-10.3	1A	A90CH92	7.65	-6.83±.25	14	1.735	2.12	.49	.120	.120
<b>WR112</b>	7.25-7.75	1A	112CH32	4.8	-3.0±.25	20	2.187	2.64	.73	.150	.150
	7.25-8.75	1A	112CH12	4.8	-3.0±.25	20	2.187	2.64	.73	.150	.150
	8.5-9.6	1A	112CH22	4.8	-3.0±.25	20	2.000	2.53	.73	.064	.064
<b>WR137</b>	5.3-6.3	1A	137CH12	4.8	-3.0±.30	20	2.750	3.15	.88	.150	.150
	5.5-6.2	1A	137CH22	5.0	-3.3±.30	22	2.750	3.15	.88	.150	.150



STYLE 1A

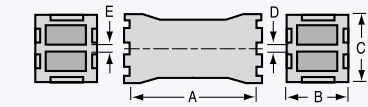


STYLE 1B

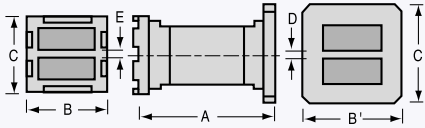


# Topwall Couplers – 3dB

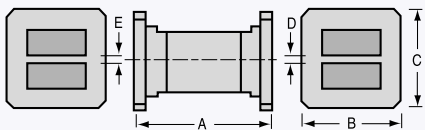
TOPWALL COUPLERS – 3dB



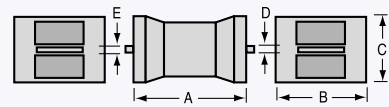
STYLE 7A



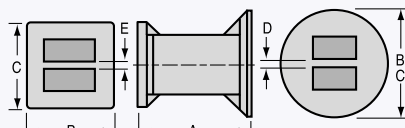
STYLE 7B



STYLE 7C



STYLE 7E



STYLE 7F

W/G Size	Electrical Data					Mechanical Data (inches)					
	Frequency GHz	Style	Model Number	Output Power Unbalance (dB)	Isolation (dB min)	A	B	C	D	E	
WR51	15.0-17.5	7A	51HT22	±.25	30	.975	.66	.70	.040	.040	
	17.1-20.0	7A	51HT12	±.25	30	1.125	.67	.72	.040	.040	
WR62	13.3-15.6	7A	62HT82	±.25	30	1.250	.78	.88	.090	.090	
	15.0-17.0	7A	62HT22	±.25	30	1.110	.78	.88	.090	.090	
	15.0-17.5	7A	62HT72	±.25	30	1.110	.78	.88	.090	.090	
	15.5-17.5	7A	62HT52	±.25	30	1.110	.78	.88	.090	.090	
	16.0-17.0	7A	62HT32	±.25	35	1.110	.78	.88	.090	.090	
WR90	8.5-9.6	7A	90HT22	±.25	30	1.735	1.13	1.14	.120	.120	
	9.0-9.2	7A	90HT112	±.40	25	1.735	1.14	1.16	.120	.120	
	9.2-11.0	7A	90HT112	±.40	28	1.735	1.14	1.16	.120	.120	
	9.4-10.8	7A	90HT92	±.25	30	1.735	1.14	1.16	.120	.120	
WR112	7.5-7.7	7A	112HT12	±.45	25	2.000	1.34	1.38	.150	.150	
	7.7-9.6	7A	112HT12	±.45	28	2.000	1.34	1.38	.150	.150	
	7.9-9.3	7A	112HT22	±.25	30	2.000	1.34	1.38	.150	.150	
WR137	5.2-6.0	7A	137HT82	±.25	30	2.625	1.63	1.64	.150	.150	
	5.2-6.7	7E	137HT42	±.60	28	2.750	2.13	1.53	.150	.150	
	5.4-5.9	7A	137HT72	±.15	35	2.625	1.63	1.64	.150	.150	
	6.7-8.2	7E	137HT52	±.45	26	2.750	2.13	1.53	.150	.150	
	WR187	4.0-5.2	7E	187HT32	±.60	28	3.750	2.59	2.09	.150	.150
4.3-5.0		7A	187HT62	±.25	30	3.535	2.61	2.12	.150	.150	
5.0-5.6		7A	187HT22	±.25	30	3.625	2.14	2.16	.150	.150	
5.1-5.9		7A	187HT42	±.25	30	3.625	2.13	2.14	.150	.150	
WR229		3.7-4.2	7A	229HT12	±.25	30	4.250	2.57	2.69	.128	.128
		WR284	2.5-3.0	7F	284HT64	±.25	30	4.660	4.09B 5.00B'	4.09C 5.00C'	.160
2.7-2.9	7A		284HT12	±.25	30	4.750	3.19	3.19	.160	.160	
2.7-2.9	7B <sup>1</sup>		284HT34	±.25	30	4.750	3.19B 4.70B'	3.19C 4.70C'	.160	.160	
2.7-2.9	7C <sup>1</sup>		284HT44	±.25	30	4.750	4.70	4.70	.160	.160	
2.75-3.25	7A		284HT22	±.25	30	4.750	3.19	3.19	.160	.160	
2.7-3.3	7A		284HT22	±.35	28	4.750	3.19	3.19	.160	.160	
2.7-3.25	7B <sup>1</sup>		284HT14	±.25	30	4.750	3.19B	3.19C	.160	.160	
2.7-3.3	7B <sup>1</sup>		284HT14	±.35	28	4.750	4.70B'	4.70C'	.160	.160	
2.75-3.25	7C <sup>1</sup>		284HT24	±.25	30	4.750	4.70	4.70	.160	.160	
2.7-3.3	7C <sup>1</sup>		284HT24	±.35	28	4.750	4.70	4.70	.160	.160	
2.7-3.7	7B <sup>1</sup>		284HT54	±1.0	20	5.500	3.19B 4.70B'	3.19C 4.70C'	.160	.160	
3.0-3.5	7A		284HT42	±.25	30	4.750	3.19	3.19	.160	.160	

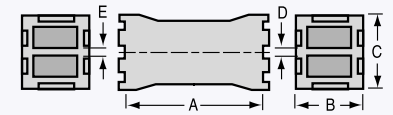
Notes: <sup>1</sup> 284FT12 flange  
Socket dimensions & overall tolerances shown on Page 44.

# Topwall Couplers – Other than 3dB

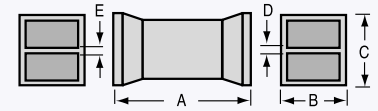
TOPWALL COUPLERS – OTHER THAN 3dB

W/G Size	Electrical Data						Mechanical Data (inches)				
	Frequency GHz	Style	Model Number	Coupling Reference (dB)	Output Power Unbalance (dB)	Directivity (dB min)	A	B	C	D	E
WR51	16.0-17.0	7A	51CE12	4.1	-2.0 ±.25	20	.975	.66	.70	.040	.040
	16.0-17.0	7D	51CE22	3.8	-1.5 ±.10	20	1.000	.59	.63	.040	.040
	16.0-17.0	7D	51CE32	5.3	-3.8 ±.10	19	1.000	.59	.63	.040	.040
	16.0-17.0	7D	51CE42	6.5	-5.5 ±.10	18	1.000	.59	.63	.040	.040
WR62	13.0-14.7	7A	62CE32	6.0	-4.8 ±.25	15	1.250	.78	.88	.090	.090
	13.2-14.7	7A	62CE42	10.0	-9.5 ±.20	12	1.250	.78	.88	.090	.090
	15.5-18.0	7A	62CE52	7.0	-6.0 ±.15	16	1.110	.78	.88	.090	.090
	16.0-17.0	7A	62CE62	7.0	-6.0 ±.10	24	1.110	.78	.88	.090	.090
	16.0-18.5	7A	62CE72	4.8	-3.0 ±.25	20	1.110	.78	.88	.090	.090
WR90	8.5-9.6	7A	90CE12	4.8	-3.0 ±.25	22	1.735	1.14	1.09	.050	.050
	8.5-9.8	7A	90CE22	6.0	-4.8 ±.25	18	1.735	1.14	1.09	.050	.050
	9.0-10.0	7D	90CE42	7.0	-6.0 ±.25	20	1.780	1.00	1.02	.120	.120
	9.09-9.66	7D	90CE52	5.3	-3.8 ±.30	20	1.830	1.000	.950	.050	.050
	9.09-9.66	7D	90CE62	3.8	-1.5 ±.25	27	2.070	1.000	.950	.050	.050
	9.09-9.66	7D	90CE72	6.5	-5.5 ±.25	20	2.600	1.000	.950	.050	.050

Notes: Socket dimensions & overall tolerances shown on Page 44.

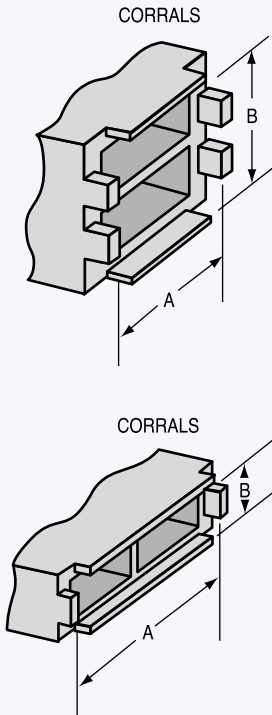


STYLE 7A



STYLE 7D

# Socket Dimensions & Tolerances



WR	ID	Common Wall Ref.	A	Tolerance -.000	B	Tolerance B
<b>Topwall</b>						
51	.510-.255	.040	.592	+.003	.632	+.003
62	.622-.311	.040	.704	+.003	.744	+.003
		.090	.704	+.003	.794	+.003
90	.900-.400	.050	1.002	+.003	.952	+.003
		.120	1.002	+.003	1.022	+.003
112	1.122-.497	.150	1.252	+.003	1.274	+.003
137	1.372-.622	.074	1.503	+.004	1.449	+.004
		.150	1.503	+.004	1.525	+.004
187	1.872-.872	.150	2.004	+.005	2.026	+.005
229	2.290-1.145	.128	2.453	+.005	2.551	+.005
284	2.840-1.340	.160	3.005	+.005	3.005	+.005

WR	ID	Common Wall Ref.	A	Tolerance -.000	B	Tolerance B
<b>Sidewall</b>						
15	.148-.074	.040	.417	+.004	.155	+.002
28	.280-.140	.040	.681	+.004	.221	+.002
42	.420-.170	.040	.961	+.006	.251	+.003
		.090	1.011	+.006	.251	+.003
51	.510-.255	.040	1.142	+.006	.337	+.003
		.090	1.192	+.006	.337	+.003
62	.622-.311	.040	1.366	+.006	.393	+.003
		.090	1.416	+.006	.393	+.003
MDL-B62	.622-.138	.040	1.366	+.006	.218	+.003
75	.750-.375	.050	1.652	+.006	.477	+.003
MDL-A75	.750-.200	.050	1.652	+.006	.302	+.003
90	.900-.400	.050	1.952	+.006	.502	+.003
		.120	2.022	+.006	.502	+.003
MDL-A90	.900-.200	.120	2.022	+.006	.302	+.003
MDL-B90	.900-.300	.120	2.022	+.006	.402	+.003
MDL-C90	.900-.150	.070	1.938	+.006	.213	+.003
WR102	1.020-.510	.150	2.318	+.006	.638	+.003
112	1.122-.497	.064	2.438	+.006	.627	+.003
		.150	2.524	+.006	.627	+.003
137	1.372-.622	.074	2.949	+.008	.753	+.004
		.150	3.025	+.008	.753	+.004
MDL-A137	1.372-.247	.150	3.025	+.008	.379	+.004
MDL-B137	1.372-.487	.150	3.025	+.008	.618	+.004
159	1.590-.795	.150	3.461	+.008	.926	+.004
187	1.872-.872	.128	4.005	+.010	1.005	+.005
		.150	4.026	+.010	1.005	+.005
MDL-A187	1.872-.370	.150	4.027	+.010	.503	+.005
229	2.290-1.145	.128	4.841	+.010	1.278	+.005
284	2.840-1.340	.160	6.005	+.010	1.505	+.005
MDL-A284	2.840-.400	.160	6.045	+.010	.605	+.005

## Tolerances

Tolerances on "A" Dimension (Length)  
 WR-10 to WR-51 = ±.005  
 WR-62 to WR-112 = ±.010  
 WR-137 to WR-187 = ±.015  
 WR-229 to WR-284 = ±.020

See MDL Flange Catalog for flange dimensions and tolerances  
 All dimensions and specifications are subject to change without  
 notice: Contact MDL for specific dimensions and tolerances.  
 All other dimensions unless otherwise specified  
 reference only.