



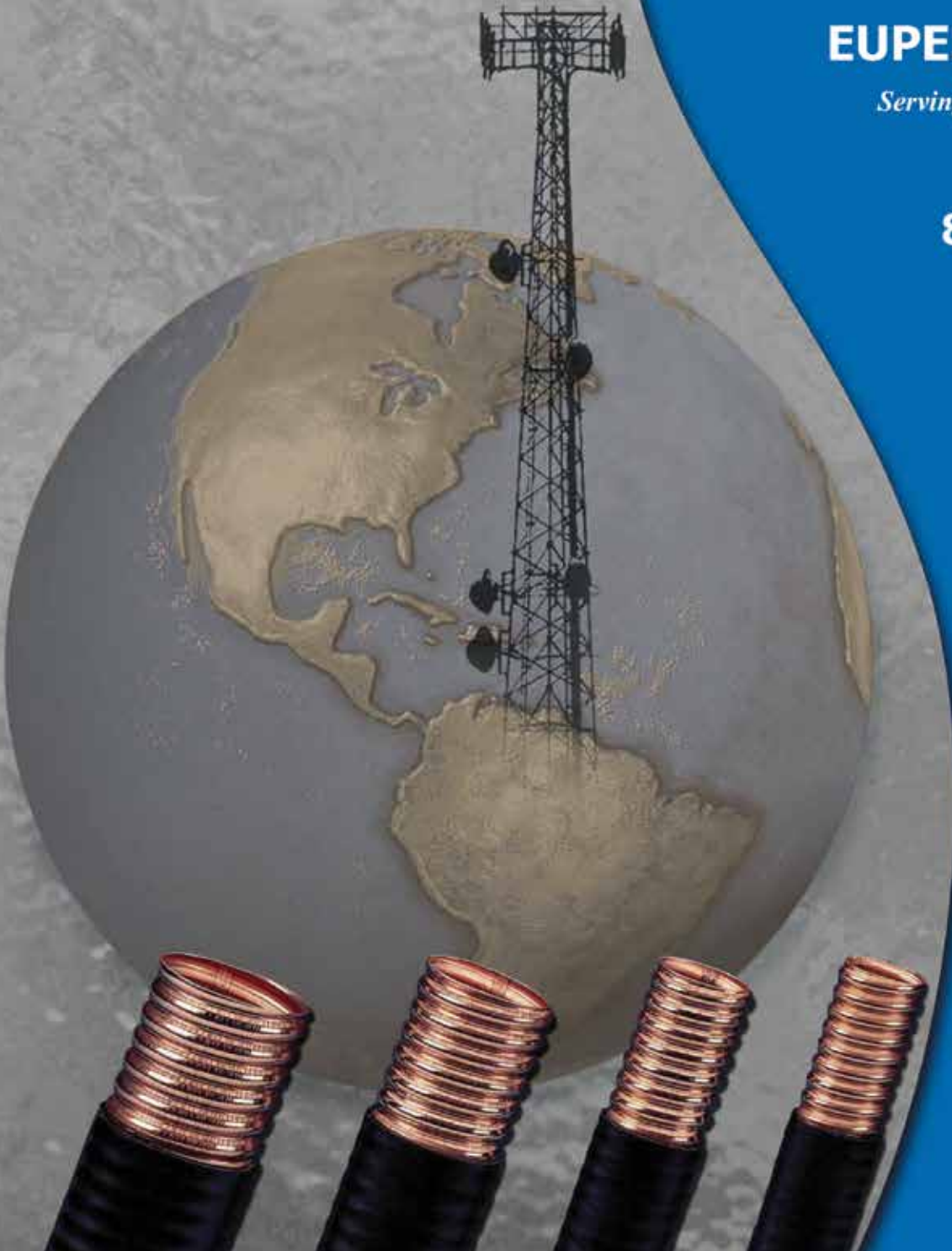
Elliptical Waveguides & Accessories

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Elliptical Waveguide and Connectors

EU52

Elliptical Waveguide Frequency range 4.6 - 6.425 GHz



CHARACTERISTICS

CONSTRUCTION

- Conductor
 - Material copper
 - Elliptical in (mm) 2.20 x 1.28 (56 x 32.4)
- Jacket
 - Material UV resistant, black polyethylene
 - Thickness in (mm) 0.07 (1.8)
- Volume ft³/100 ft (L/100 ft) 0.92 (26.1)

MECHANICAL

- Minimum bending radius
 - a) single bend
 - E plane in (mm) 7.9 (200)
 - H plane in (mm) 19.7 (500)
 - b) repeated bends
 - E plane in (mm) 11.8 (300)
 - H plane in (mm) 31.5 (800)
- Maximum twist °/feet (°/m) 1 (3)
- Maximum pulling length per hoisting grip ft (m) 197 (60)
- Recommended temperature range
 - Installation °F (°C) -4 to +140 (-20 to +60)
 - Operation °F (°C) -40 to +176 (-40 to +80)
- Weight approx. lb/ft (kg/m) 0.70 (1.05)
- Minimum drum core diameter in (mm) 47 (1200)
- Maximum operating pressure psi (bar) 7.3 (0.5)
- Recommended clamp spacing ft (m) 3 (1)

ELECTRICAL

- Frequency range GHz 4.6 - 6.425
- Principal mode cut-off frequency HE_{C11} GHz 3.7
- Attenuation, propagation velocity, power

Frequency GHz	Attenuation ⁽¹⁾ dB/100 ft (dB/100m)	Group velocity (%)	Av. Power ⁽²⁾ (kW)
4.6	1.49 (4.88)	59.4	4.56
4.7	1.43 (4.70)	61.7	4.73
4.9	1.35 (4.42)	63.7	4.89
5.0	1.31 (4.31)	65.6	5.16
5.1	1.28 (4.21)	67.3	5.28
5.2	1.26 (4.13)	70.3	5.39
5.3	1.23 (4.05)	71.6	5.49
5.5	1.19 (3.92)	74.0	5.68
5.7	1.16 (3.81)	76.1	5.83
5.9	1.13 (3.72)	77.9	5.97
6.0	1.12 (3.68)	78.7	6.04
6.2	1.10 (3.61)	80.2	6.15
6.4	1.08 (3.55)	81.8	6.27

(1) Attenuation at 68°F (20°C)

(2) Average power ratings based on VSWR 1.0, 180°F (82°C) inner temperature, 140°F (40°C) ambient temperature

VSWR characteristics

• VSWR ^[3]_{max} 4.600 - 6.425GHz < 1.15



Frequency range 4.6 - 6.425 GHz



EU52PCPR137G

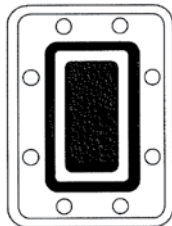


Flaring tool and Saw guide

FEATURES

- Low VSWR across entire frequency range
- No tuning required

FLANGE TYPE



CPR137G

TECHNICAL CHARACTERISTICS

Frequency Range (GHz)	4.6 – 6.425
VSWR	< 1.03
Connector Material	Brass
Pressure psi (bar)	3.6 (0.25)
Gas Port / Degree of protection	P1/8 / IP68

TOOLS

PART NUMBER	DESCRIPTION
EU-SG52	Saw guide
EU-FT52	Flaring tool with saw guide

ACCESSORIES

PART NUMBER	DESCRIPTION
HK-CPR137	Flange hardware kit
HGK137	Half-thickness gasket
FGK137	Full-thickness gasket
PW52FF137	Pressure window
87000-06-02	Gas port fitting for 3/8 tubing

EU63

Elliptical Waveguide
Frequency range 5.85 - 7.125 GHz



CHARACTERISTICS

CONSTRUCTION

- Conductor
 - Material copper
 - Elliptical in (mm) 1.89 x 1.06 (47.9 x 26.8)
- Jacket
 - Material UV resistant, black polyethylene
 - Thickness in (mm) 0.07 (1.8)
- Volume ft³/100 ft (L/100 ft) 0.92 (26.1)

MECHANICAL

- Minimum bending radius
 - a) single bend
 - E plane in (mm) 7.9 (200)
 - H plane in (mm) 19.7 (500)
 - b) repeated bends
 - E plane in (mm) 11.8 (300)
 - H plane in (mm) 27.6 (700)
- Maximum twist °/feet (°/m) 1 (3)
- Maximum pulling length per hoisting grip ft (m) 197 (60)
- Recommended temperature range
 - Installation °F (°C) -4 to +140 (-20 to +60)
 - Operation °F (°C) -40 to +176 (-40 to +80)
- Weight approx. lb/ft (kg/m) 0.56 (0.84)
- Minimum drum core diameter in (mm) 47 (1200)
- Maximum operating pressure psi (bar) 7.3 (0.5)
- Recommended clamp spacing ft (m) 3 (1)

ELECTRICAL

- Frequency range GHz 5.85-7.125
- Principal mode cut-off frequency HE_{C11} GHz 4.1
- Attenuation, propagation velocity, power

Frequency GHz	Attenuation ⁽¹⁾ dB/100 ft (dB/100m)	Group velocity (%)	Av. Power ⁽²⁾ (kW)
5.9	1.40 (4.58)	70.2	4.61
6.0	1.37 (4.51)	71.4	4.69
6.1	1.35 (4.44)	72.5	4.76
6.2	1.33 (4.38)	73.6	4.83
6.3	1.32 (4.32)	74.5	4.90
6.4	1.30 (4.27)	75.5	4.96
6.5	1.29 (4.22)	76.3	5.01
6.6	1.27 (4.17)	77.1	5.07
6.7	1.26 (4.13)	77.9	5.12
6.8	1.25 (4.09)	78.6	5.17
6.9	1.24 (4.06)	79.3	5.21
7.0	1.23 (4.03)	80.0	5.25
7.1	1.22 (3.99)	80.6	5.30

(1) Attenuation at 68°F (20°C)

(2) Average power ratings based on VSWR 1.0, 180°F (82°C) inner temperature, 140°F (40°C) ambient temperature

VSWR characteristics

• VSWR ⁽³⁾_{max} 5.850 - 7.125GHz < 1.15

Frequency range 5.85 - 7.125 GHz



EU63PCPR137G

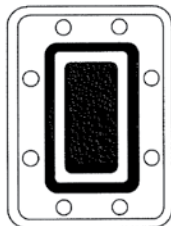


Flaring tool and Saw guide

FEATURES

- Low VSWR across entire frequency range
- No tuning required

FLANGE TYPE



CPR137G

TOOLS

PART NUMBER	DESCRIPTION
EU-SG63	Saw guide
EU-FT63	Flaring tool with saw guide

ACCESSORIES

PART NUMBER	DESCRIPTION
HK-CPR137	Flange hardware kit
HGK137	Half-thickness gasket
FGK137	Full-thickness gasket
PW63FF137	Pressure window
87000-06-02	Gas port fitting for 3/8" tubing

TECHNICAL CHARACTERISTICS

Frequency Range (GHz)	5.85 – 7.125
VSWR	< 1.04
Connector Material	Brass
Pressure psi (bar)	3.6 (0.25)
Gas Port / Degree of protection	P1/8 / IP68

EU90

Elliptical Waveguide
Frequency range 8.5 - 11.7 GHz



CHARACTERISTICS

CONSTRUCTION

- Conductor
 - Material copper
 - Elliptical in (mm) 1.19 x 0.67 (30.2 x 17.1)
- Jacket
 - Material UV resistant, black polyethylene
 - Thickness in (mm) 0.05 (1.3)
- Volume ft³/100 ft (L/100 ft) 0.36 (10.2)

MECHANICAL

- Minimum bending radius
 - a) single bend
 - E plane in (mm) 5.9 (150)
 - H plane in (mm) 11.8 (300)
 - b) repeated bends
 - E plane in (mm) 7.9 (200)
 - H plane in (mm) 19.7 (500)
- Maximum twist °/feet (°/m) 1 (3)
- Maximum pulling length per hoisting grip
 - ft (m) 197 (60)
- Recommended temperature range
 - Installation °F (°C) -4 to +140 (-20 to +60)
 - Operation °F (°C) -40 to +176 (-40 to +80)
- Weight approx. lb/ft (kg/m) 0.34 (0.5)
- Minimum drum core diameter in (mm) 47 (1200)
- Maximum operating pressure psi (bar) 7.3 (0.5)
- Recommended clamp spacing ft (m) 3 (1)

ELECTRICAL

- Frequency range GHz 8.5 - 11.7
- Principal mode cut-off frequency HE_{C11} GHz 6.75
- Attenuation, propagation velocity, power

Frequency GHz	Attenuation ⁽¹⁾ dB/100 ft (dB/100m)	Group velocity (%)	Av. Power ⁽²⁾ (kW)
10.2	3.07 (10.08)	75.0	1.58
10.3	3.05 (10.01)	75.5	1.59
10.4	3.03 (9.94)	76.1	1.60
10.5	3.01 (9.87)	76.6	1.61
10.6	2.99 (9.81)	77.1	1.62
10.7	2.97 (9.74)	77.6	1.63
10.8	2.95 (9.68)	78.1	1.64
10.9	2.93 (9.63)	78.5	1.65
11.0	2.92 (9.57)	79.0	1.66
11.1	2.90 (9.52)	79.4	1.67
11.2	2.89 (9.47)	79.8	1.68
11.3	2.87 (9.43)	80.2	1.69
11.4	2.86 (9.38)	80.6	1.70
11.5	2.85 (9.34)	81.0	1.70
11.6	2.83 (9.30)	81.3	1.71
11.7	2.82 (9.26)	81.7	1.72

(1) Attenuation at 68°F (20°C)

(2) Average power ratings based on VSWR 1.0, 180°F (82°C) inner temperature, 140°F (40°C) ambient temperature

VSWR characteristics

- VSWR^[3]_{max} 8.500 - 11.70GHz < 1.15

Frequency range 8.5 -11.7 GHz



EU90PCPR90G

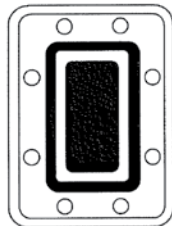


Flaring tool and Saw guide

FEATURES

- Low VSWR across entire frequency range
- No tuning required

FLANGE TYPE



CPR90G

TECHNICAL CHARACTERISTICS

Frequency range (GHz)	8.5 - 11.7
VSWR	< 1.03
Connector Material	brass
Pressure psi (bar)	3.6 (0.25)
Gas Port / Degree of protection	P1/8 / IP68

TOOLS

PART NUMBER	DESCRIPTION
EU-SG90	Saw guide
EU-FT90	Flaring tool

ACCESSORIES

PART NUMBER	DESCRIPTION
HK-CPR90	Flange hardware kit
HGK90	Half-thickness gasket
FGK90	Full-thickness gasket
PW90FF90	Pressure window
87000-06-02	Gas port fitting for 3/8" tubing

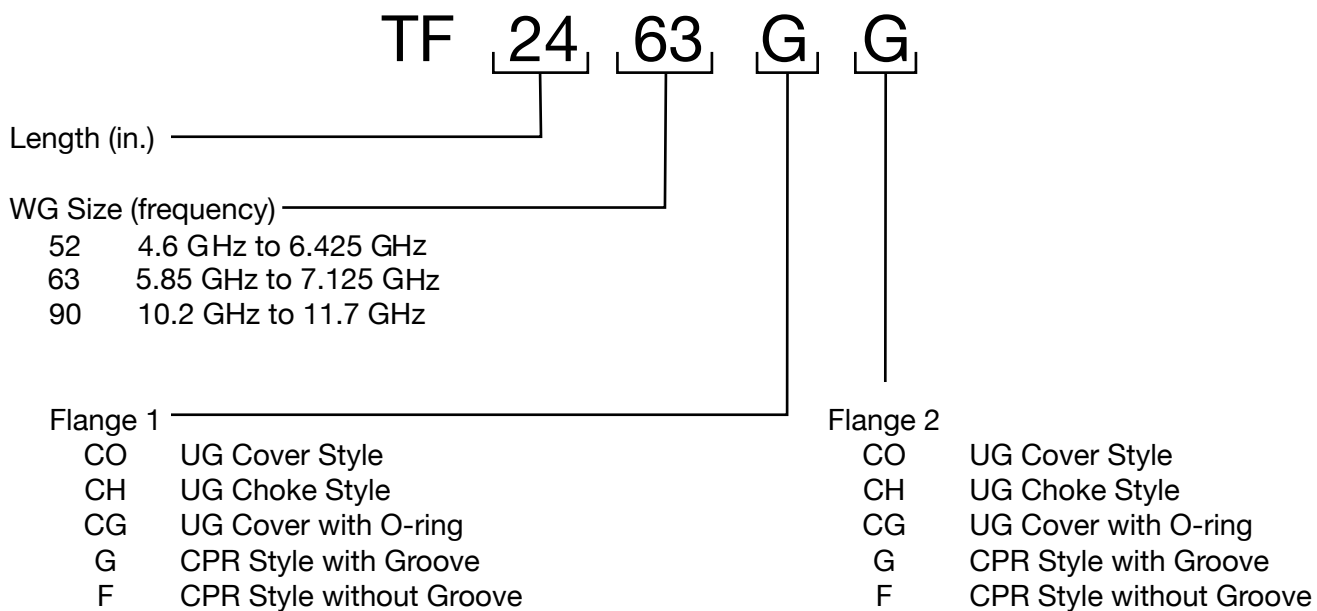


Elliptical Waveguide Components

Twist Flex



Twist Flex is available for frequencies ranging from 5.85 GHz to 11.7 GHz with multiple flange variations. Please refer to the code below for part numbers.

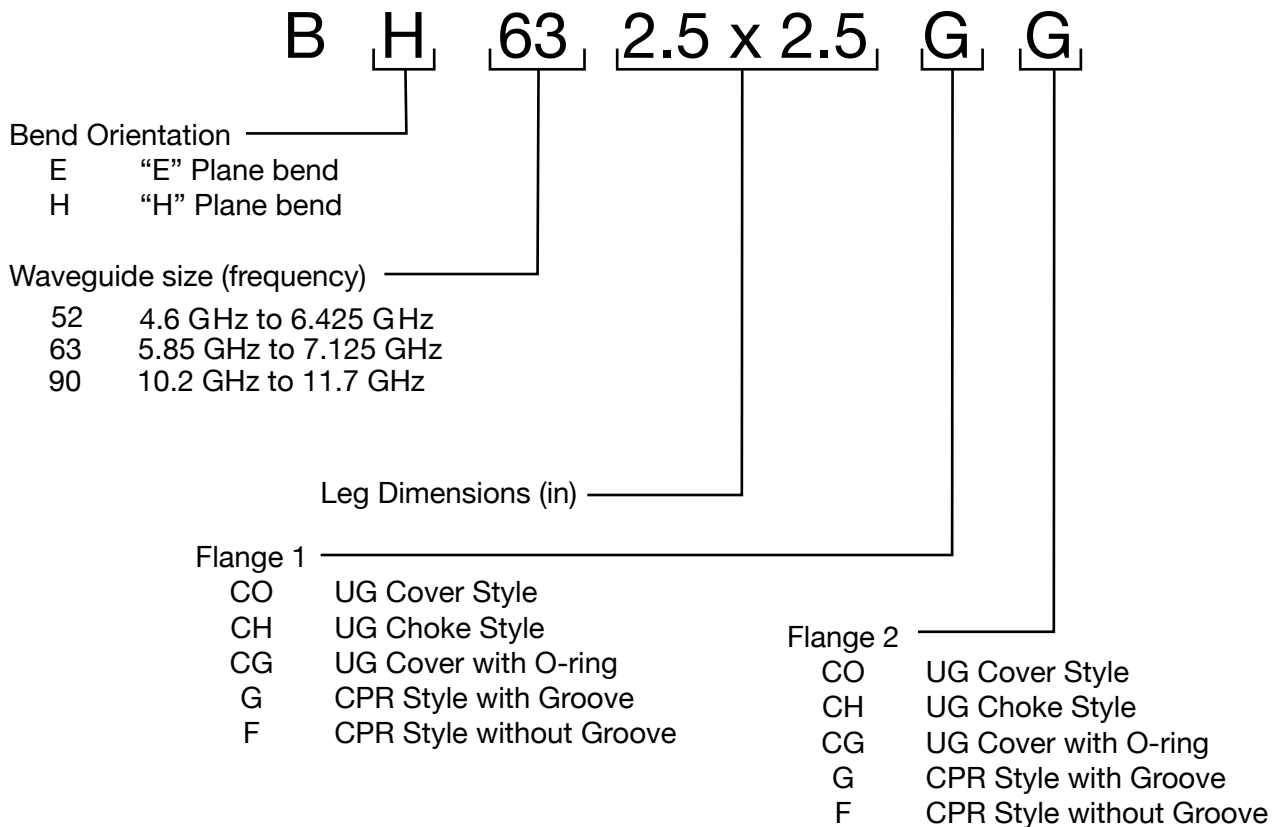


EXAMPLE: TF2463GG – 24" Twist Flex for EU63 (5.85 to 7.125) GHz with a CPR137G on first end and a CPR137G on the second end

90° Waveguide Bend



90° mitered bends are available for the “E” and “H” plane with a variety of lengths and flange combinations. Please refer to the code below for part numbers.

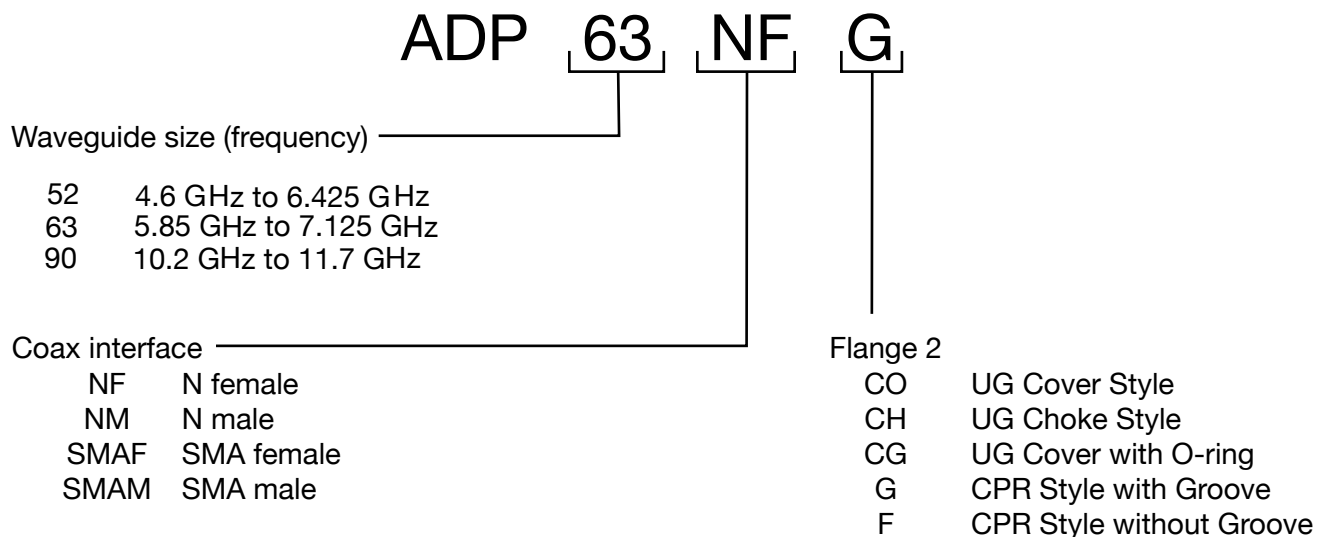


EXAMPLE: BH632.5X2.5GG – 90 DEGREE WAVEGUIDE BEND IN THE “H” PLANE FOR EU63, 2 1/2” X 2 1/2” WITH A CPR137G ON THE FIRST END AND A CPR137G ON THE SECOND END

Waveguide to Coax Adapter



Waveguide to coax adapters are available for multiple flange styles and male/female N-style connections. Please refer to the code below for part numbers.

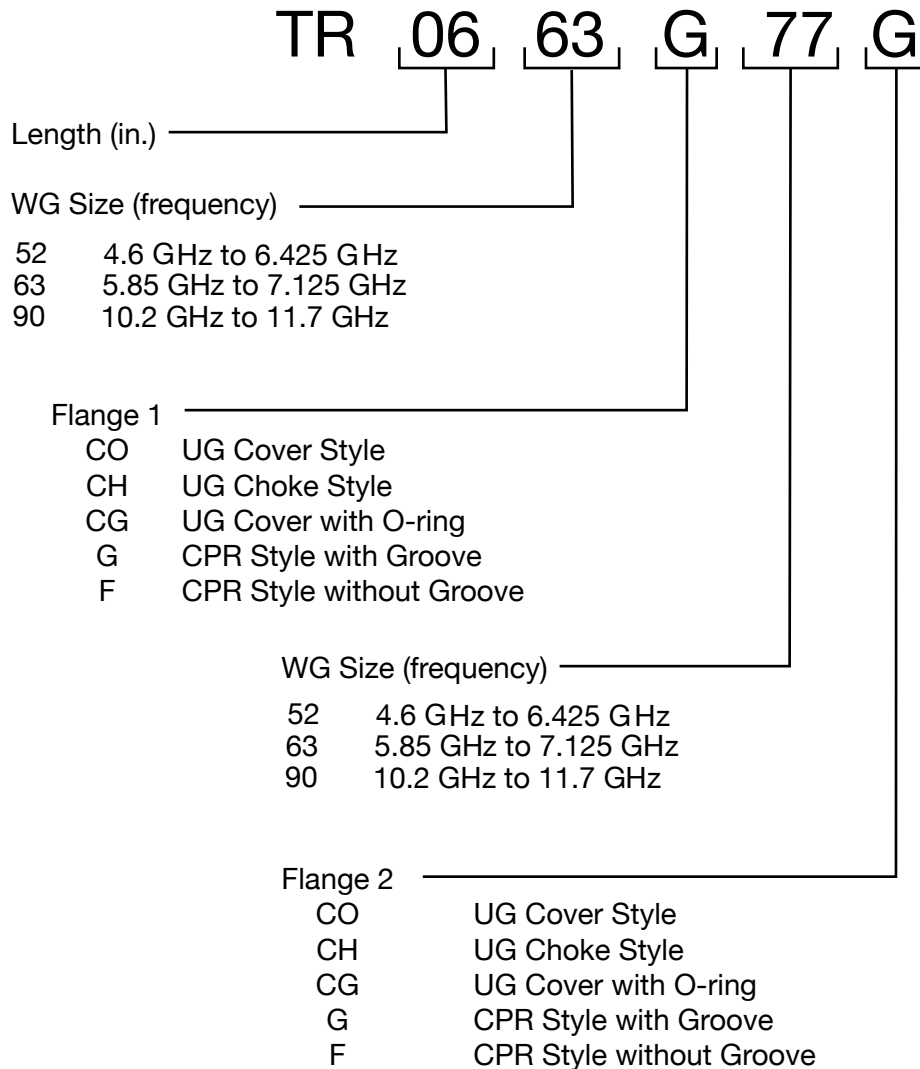


EXAMPLE: ADP63NFG – Waveguide to coax adapter, N female to CPR137G

Transitions



Waveguide Transitions are available for a variety of lengths and flange combinations.
Please refer to the code below for part numbers.



EXAMPLE: TR0663G77G – Waveguide Transition, 6” long with a CPR137G TO CPR112G



Elliptical Waveguide Accessories

Butterfly Hangers



PART #	DESCRIPTION	KIT QTY.
BH-52	Butterfly hanger kit for EU52 elliptical waveguide	10
BH-63	Butterfly hanger kit for EU63 elliptical waveguide	10
BH-90	Butterfly hanger kit for EU90 elliptical waveguide	10

Cushion Hangers



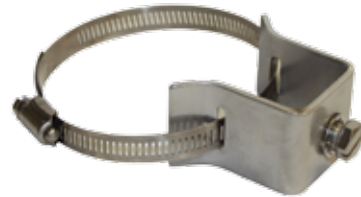
PART #	DESCRIPTION	KIT QTY.
CH-A52-1	Cushion hanger for EU52 elliptical waveguide	5
CH-A63-1	Cushion hanger for EU63 elliptical waveguide	5
CH-A90-1	Cushion hanger for EU90 elliptical waveguide	5

Angle Adapters



PART #	DESCRIPTION	KIT QTY.
AA-U	Universal angle adapter	10
AA-SL	Angle adapter with 3/8" tapped holes	10

Standoff Adapters



PART #	DESCRIPTION	KIT QTY.
SA-38S	Stand-off adapter with 3/8" tapped holes	10
SA-38S100	Stand-off adapter for 1"-2" OD round members with 3/8" tapped holes	10
SA-38S200	Stand-off adapter for 2"-3" OD round members with 3/8" tapped holes	10
SA-38S300	Stand-off adapter for 3"-4" OD round members with 3/8" tapped holes	10
SA-38S400	Stand-off adapter for 4"-5" OD round members with 3/8" tapped holes	10
SA-38S500	Stand-off adapter for 5"-6" OD round members with 3/8" tapped holes	10

Lace-up Hoisting Grip



PART #	DESCRIPTION	KIT QTY.
HG-52	Lace-up hoisting grip for EU52 elliptical waveguide	1
HG-63	Lace-up hoisting grip for EU63 elliptical waveguide	1
HG-90	Lace-up hoisting grip for EU90 elliptical waveguide	1

Standard Ground Kit



PART #	DESCRIPTION	KIT QTY.
GK-S52	Standard ground kit for EU52 elliptical waveguide includes 5' lead with unattached 3/8" two-hole lug	1
GK-S63	Standard ground kit for EU63 elliptical waveguide includes 5' lead with unattached 3/8" two-hole lug	1
GK-S90	Standard ground kit for EU90 elliptical waveguide includes 5' lead with unattached 3/8" two-hole lug	1

4" Boot Assembly Kits



PART #	DESCRIPTION	KIT QTY.
BA-52-1A	Boot assembly kit for EU52, 4" with (1) hole	1
BA-63-1A	Boot assembly kit for EU63, 4" with (1) hole	1
BA-90-1A	Boot assembly kit for EU90, 4" with (1) hole	1



Dehydrators

Etsiline Dehydrator

Etsiline 32 ■ Etsiline 52 ■ Etsiline 102



Dehydrators are an integral part in maintaining optimal performance in a waveguide system. Fluctuations in temperature and wind speed can cause a difference between the pressure inside the system and the environment. When the pressure is lower in the waveguide, moist air can be pulled into the waveguide causing undesirable conditions such as corrosion and arcing. These conditions will result in increased VSWR or failure of the system to operate. A dehydrator will pump dry air into the waveguide system ensuring that the system will be held at a higher pressure than the environment.

The Etsiline Series of dehydrators was designed specifically for use in terrestrial microwave systems with volumes up to 625 liters. The Etsiline Dehydrators operate using a system involving two separate desiccant chambers resulting in a completely automatic, maintenance-free and highly reliable unit. The design of the dehydrator also allows it to operate with a very low noise level, under 43 dB, with no vibration. The Etsiline Dehydrators consume little power when compared to other models on the market, drawing as little as 5 watts in the stand-by mode. These features make the Etsiline Series the ideal choice for both remote sites and in-office use. Please contact Eupen customer service for more information.

STANDARD FEATURES



6-port manifold with 3/8" compression fit outlets



Digital readout indicates the pressure in digital and analog forms as well as the operating time and process.



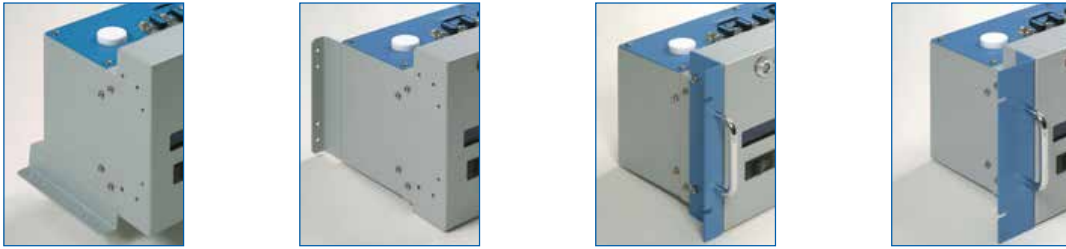
In the event the pressure in the system rises above 2.3 psi, the high pressure relief valve will open to prevent damage to pressure sensitive components.



Optical dew point indicator shows the relative humidity of the air being handled.



The Signalization plug is used to connect to a remote location such as a control room.



Unit comes standard with a universal mounting kit that will allow it to be mounted in an ETSI-rack, a 19" rack or to a wall, table or floor.

ALARMS AND OPTIONS

Low Pressure Alarm

The Estiline series dehydrator comes standard with a low pressure alarm. The low pressure alarm will show in the display as "LOW PR". It will activate when the pressure drops below 0.15 psig for at least 1 minute. The low pressure alarm will alert the user that the system is losing pressure faster than the dehydrator is able to replenish.

High Pressure Alarm

The high pressure alarm is available as an option for the Estiline series dehydrator. The high pressure alarm will show in the display as "HIGH PR". The high pressure alarm will activate when the pressure exceeds 14.5 psig. A high pressure relief valve is standard on all units and will activate when the pressure exceeds 2.3 psig.

Excess Run Alarm

The excess run alarm is available as an option for the Estiline series dehydrator. The excess run alarm will show in the display as "PUMP AL". The alarm is only activated during the "COOL.1" or "COOL.2" mode and will not function during the "HEATER.1" or "HEATER.2" regeneration period.

Humidity Alarm

The humidity alarm is available as an option for the Estiline series dehydrator. In the case that the relative humidity rises above 7%, the display will read "HIGH RH". The alarm will deactivate when the humidity lowers to 4%.

RS-232 Communication Port

The RS-232 communication port is an available option for the Estiline series dehydrator. The RS-232 will allow the dehydrator to be monitored remotely via Windows HyperTerminal.

DEHYDRATOR OPERATING MODES

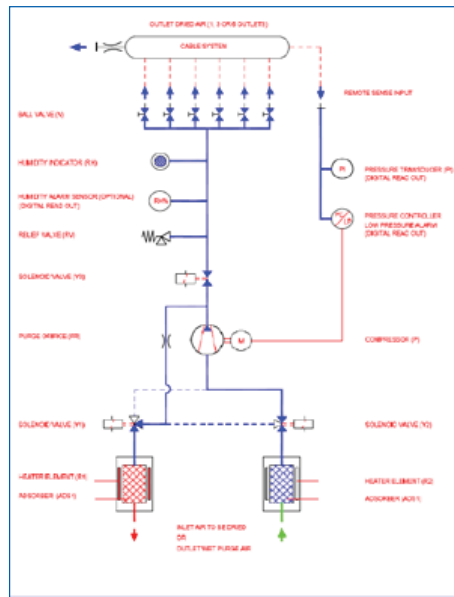
The Estiline Dehydrator operates in three distinct separate modes; drying, standby and regeneration. During the drying mode, the unit is providing pressure and dry air to the waveguide system. This mode will typically draw up to 9 Watts of power for the Estiline 32 and 52 and 13 Watts for the Estiline 102. When the required pressure is reached in the system, the unit will enter the stand by mode. The unit will stay in the stand by mode until the pressure in the system drops to the minimum level. This mode consumes 5 Watts of power. The drying mode and standby mode will both read "COOL.1" or "COOL.2" in the display. The regeneration mode occurs after the pump has run a total of 6 hours during the drying mode, time spent in the standby mode is not counted. This phase will draw approximately 53 Watts of power for the Estiline 32 and 52, and 59 Watts of power for the Estiline 102. During the regeneration mode the display will read "HEATER.1" or "HEATER.2".

OPERATION

The Etsiline Series Dehydrator operates on a 12-hour cycle subdivided into three components, drying, regenerating and cooling. During the drying phase, air is pulled through the absorber by the compressor. The water vapor is absorbed by the desiccant and the air flows through a solenoid, pump and through another solenoid to the waveguide system. When the pressure in the waveguide systems reaches the required level, the pressure controller will turn the pump off and the unit will go into standby mode. The unit will continue to monitor the pressure in the system. When the pressure drops below an acceptable level the low pressure alarm activates and the pump will run until the pressure is raised to the required level. The drying phase will continue for a total of 6 hours (time spent in the stand by mode is not counted).

After the compressor runs a total of six hours the unit will enter the regeneration phase. During the regeneration phase, a small portion of dried air will be branched from the compressor outlet line and led to the regenerating absorber. This purge air flows through the regenerating absorber which is heated by a heater. During this phase the compressor will run continuously for three hours regardless of the pressure in the waveguide system. Upon completion of the regeneration phase the dehydrator will enter the cooling phase and the compressor will be controlled by the system pressure. After three hours in the cooling phase the absorber will be ready for drying.

The drying, regeneration and cooling process are monitored and stored in the dehydrators memory which is controlled by the compressor. The time for the dehydrator to complete one cycle can vary. If main power is lost or the unit is switched off, the unit will start in the same place it was when power is returned.



VOLUME CAPACITY

There are three Etsiline models available to choose from depending on the system requirements. For systems up to 225 liters the Etsiline 32 would be ideal. The Etsiline 52 and Etsiline 102 were designed for systems up to 375 liters and 625 liters respectively. The volume each dehydrator can support was based on two separate assumptions. The first is that the dehydrator would have to support the total system volume with the addition of an anticipated leak rate of 2% per hour. The unit would also have to maintain pressure during a temperature drop of 6 degrees in a 10 minute period.

To calculate the anticipated leakage of the system the following information is needed:

- (P_{AM}) Ambient Pressure
- (P_1) Pressure at Start
- (V_1) System Volume
- (P_2) Pressure after 30 Minutes

The equation is as follows:

$$\left[\frac{(P_1 - P_2) \times V_1}{P_{AM}} \right] \times 0.5 = \text{LPHL (Liters leaked per hour)}$$



To calculate the drop in pressure due to temperature change, the following information is needed:

- (T_1) Ambient Temperature
- (T_2) Temperature decrease of 6 degrees K in 10 minutes
- (V_1) System Volume
- (P_1) Pressure at start
- (P_{AM}) Ambient pressure

The equation is as follows:

$$\frac{(T_1, T_2) \times V_1}{T_1} \times \left(\frac{P_1}{P_{AM}} \right) = \text{LPHL (Liters per hour needed to maintain pressure during temperature drop)}$$

0.17

The total liters needed to maintain pressure to compensate for leaks in the system and pressure drops due to temperature changes would be the sum of the two values calculated above.

Liters per hour needed to maintain pressure = (LPHL) + (LPHT)

Taking these conditions into account and using an ambient pressure and temperature of 1000 mbars and 27 degrees Celsius respectively, the total lengths in feet each unit can support are summarized in the chart below.

Waveguide Size	Etsiline 102	Etsiline 52	Etsiline 32
EU63	2400 feet	1440 feet	870 feet
EU77	3470 feet	2080 feet	1250 feet
EU90	6250 feet	3750 feet	2250 feet
EU127	7810 feet	4690 feet	2810 feet

Technical Data

delair® Etsiline Pressurizers 32, 52 and 102

Each delair® Etsiline pressurizer is equipped with two heat-generated adsorbers, an air compressor, a pressure relief valve and a microprocessor controlled printed circuit board. The combination results in an attractive pressurizer which is suitable for fully continuous and automatic operation.

CHARACTERISTICS	
Microprocessor-controlled printed circuit board	•
Digital display:	
– Digital pressure indication	•
– Analogue pressure indication	•
– Operating time indication	•
– Process read out	•
Programmable pressure level	
– Standard pressure ranges (factory set)	20-30 mbar
– Other pressure ranges on request	40-80 mbar
Outlets, each equipped with shut-off valve	6
Tubing 6 mm OD, other connections on request	
Remote pressure sense input	•
Optical dew point indication	•
Safety relief valve	•
Electrical fuse	•
Humidity alarm	Optional
Low pressure alarm	•
Mounting:	
– ETSI-rack	•
– 19" rack	•
– Wall mounting	•
– Floor/table mounting	•



STANDARD SPECIFICATIONS

Medium	Ambient air
Operation	Fully automatic and continuous
Locaton	Indoors
Enclosure	IP 40
Ambient temperature	-10°C--45°C
Relative humidity	Max. 95%
Outlet dew point Full load, 23°C inlet, 83% R.H.	<-40°C
Power supply	110V, 230V, 50/60 Hz 24V, 48V, 60V DC
Drying time	6 hours
Regeneration time	3 hours
Stand-by time	depending on requirements

TECHNICAL DATA

delair® Etsiline Model	Configuration	Outlet capacity l/h	Power consumption			Sound level db(A)	Dimensions			Weight (kg)
			Dry- ing	Regeneration	Stand-by		Width	Depth	Height	
			W	W	W		mm	mm	mm	
32	ETSI-rack	30	9	53	5	<43	535	200	221.5	10
	19" rack						482.6	200	221.5	
	Wall mounting						420	234	221.5	
	Floor/table mount- ing						420	200	243.5	
52	ETSI-rack	50	9	53	5	<43	535	200	221.5	10
	19" rack						482.6	200	221.5	
	Wall mounting						420	234	221.5	
	Floor/table mount- ing						420	200	243.5	
102	ETSI-rack	100	13	59	5	<43	535	200	221.5	12
	19" rack						482.6	200	221.5	
	Wall mounting						420	234	221.5	
	Floor/table mount- ing						420	200	243.5	



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Lined area for notes, consisting of numerous horizontal lines for writing.



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