



The Waveguide Solution
a global **invacom** company

Waveguide Rigid Components

Straights / PS SERIES

Bends / PB SERIES

Twists / PT SERIES



The Waveguide Solution range of standard Rigid Waveguide components have been designed to offer electrical and mechanical specifications suitable for most microwave system designs.

The Rigid waveguide components include Precision Straight Waveguide, Precision and Compact Bends (E and H plane) and Precision Twists. Alternative designs for Twists, Bends and Straights to individual customer requirements are available on request. The PS, PB and PT series of rigid components are manufactured to the highest quality standards. All Rigid Waveguide Components manufactured with the full range of International Flange Styles, as shown in the Flange Catalogue, and can be offered with alternative plated finishes on request. All TWS Rigid Components are offered with an attractive, hardwearing, epoxy paint finish.

Precision Straights

A range of standard length waveguide straights is detailed in a variety of materials. The high performance is based on the use of selected, sized, tube, careful assembly and selective tuning where necessary.

Precision Bends

The precision bends have been designed to offer the optimum performance based on an average length and bend radius. All bends are precisely assembled to ensure the highest performance. Some of the larger bends are fabricated rather than formed due to the capacity of the larger forming machines and tooling.

Compact Bends

A set of specifications has been provided to offer the minimum radius bend available for both "E" and "H" plane bends in the respective frequency range. All compact bends are manufactured by forming to ensure optimum size and performance.

Precision Twists.

The precision twists have been designed and precisely assembled to offer the optimum performance based on an average length and twist angle.

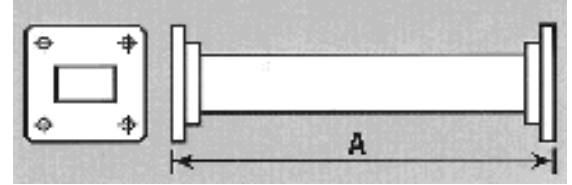
The Waveguide Solution facility is approved to ISO 9001: 2000.

PRECISION STRAIGHT

Standard Rectangular

Specification:

VSWR: Values through flanges only
 Power: Values at $f = 1.5f_c$
 Material: Aluminium, Brass & Copper
 Finish: Blue Paint, Unplated, Iridited or Chromated Flanges



Operating Frequency Band (GHz)	Waveguide Designation			TWS PART NUMBER	Max V.S.W.R.	Insertion Loss dB's per metre	Max Power K Watts
	UK WG	IEC R	E.I.A. WR				
1.70 – 2.60.	8	22	430	PS 08 –SQZ- (***)-(**)-B-M(**)	1.03	0.010	5900
2.20– 3.30	9A	26	340	PS 9A –SQZ- (***)-(**)-B-M(**)	1.03	0.015	3800
2.60 – 3.95	10	32	284	PS 10 –SQZ- (***)-(**)-B-M(**)	1.03	0.019	2430
3.30 – 4.90	11A	40	229	PS 11A –SQZ- (***)-(**)-B-M(**)	1.03	0.025	1600
3.95 – 5.85	12	48	187	PS 12 –SQZ- (***)-(**)-B-M(**)	1.03	0.036	1040
4.90 - 7.05	13	58	159	PS 13 –SQZ- (***)-(**)-B-M(**)	1.03	0.043	806
5.85 – 8.20	14	70	137	PS 14 –SQZ- (***)-(**)-B-M(**)	1.03	0.058	544
7.05 – 10.0	15	84	112	PS 15 –SQZ- (***)-(**)-B-M(**)	1.03	0.079	355
8.20 – 12.40	16	100	90	PS 16 –SQZ- (***)-(**)-B-M(**)	1.03	0.11	229
10.0 – 15.0	17	120	75	PS 17 –SQZ- (***)-(**)-B-M(**)	1.05	0.13	178
12.4 – 18.0	18	140	62	PS 18 –SQZ- (***)-(**)-C-M(**)	1.05	0.18	123
15.0 – 22.0	19	180	51	PS 19 –SQZ- (***)-(**)-C-M(**)	1.08	0.24	83
18.0 – 26.5	20	220	42	PS 20 –SQZ- (***)-(**)-C-M(**)	1.08	0.37	48
22.0 – 33.0	21	260	34	PS 21 –SQZ- (***)-(**)-C-M(**)	1.08	0.37	48
26.5 – 40.0	22	320	28	PS 22 –SQZ- (***)-(**)-C-M(**)	1.08	0.58	25

** Length in millimetres. Lengths up to 3 metres available as standard.

*** For 3 Digit Rectangular Flange part number, refer to the TWS Flange Catalogue, or consult the factory.

Double Ridge

Specification:

VSWR: Values through flanges only
 Power: Values at $f = 1.5f_c$
 Material: Aluminium
 Finish: Blue Paint, Iridited or Chromated
 Aluminium Flanges

Operating Frequency Band (GHz)	Waveguide Designation	TWS PART NUMBER	Max V.S.W.R.	Insertion Loss dB's per metre	Max Power K Watts
4.75 – 11.0	WRD475 D24	PS 475 - SQH- (***)-(**)-A –M(**)	1.06	0.161	83
5.8 – 16.0	WRD580 D28	PS 580 - SQH- (***)-(**)-A –M(**)	1.08	0.305	32
6.5 – 18.0	WRD650 D28	PS 650 - SQH- (***)-(**)-A –M(**)	1.08	0.348	23
7.5 – 18.0	WRD 750 D24	PS 750 - SQH- (***)-(**)-A –M(**)	1.08	0.315	33
18.0 – 40.0	WRD180 C24	PS 180- SQH- (***)-(**)-A –M(**)	1.11	1.18	5.3

** Length in millimetres. Lengths up to 3 metres available as standard.

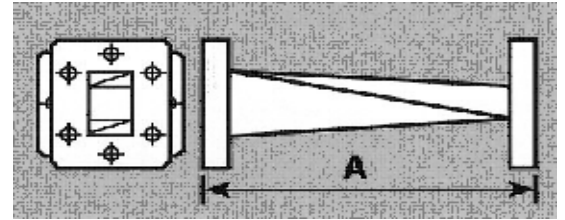
*** For 3 Digit Rectangular Flange part number, refer to the TWS Flange Catalogue, or consult the factory.

PRECISION TWISTS

Standard Rectangular

Specification:

VSWR: Values for through flanges and up to 90° Twists
 Power: Values at $f = 1.5f_c$ for 90° Twist only
 Material: Aluminium
 Finish: Blue Paint, Iridited or Chromated Aluminium Flanges



Operating Frequency Band (GHz)	Waveguide Designation			TWS PART NUMBER	Max V.S.W.R.	Max Power Watts C.W.	Length "A" (mm)
	UK WG	IEC R	E.I.A. WR				
2.60 – 3.95	10	32	284	PT 10 -(*)QZ- (**-**-*)-B-(**)	1.05	2230	458
3.30 – 4.90	11A	40	229	PT 11A -(*)QZ- (**-**-*)-B-(**)	1.05	1500	356
3.95 – 5.85	12	48	187	PT 12 -(*)QZ- (**-**-*)-B-(**)	1.05	990	305
4.90 – 7.05	13	58	159	PT 13 -(*)QZ- (**-**-*)-B-(**)	1.05	775	248
5.85 – 8.20	14	70	137	PT 14 -(*)QZ- (**-**-*)-B-(**)	1.05	520	217
7.05 – 10.0	15	84	112	PT 15 -(*)QZ- (**-**-*)-B-(**)	1.05	345	179
8.20 – 12.40	16	100	90	PT 16 -(*)QZ- (**-**-*)-B-(**)	1.05	225	140
10.0 – 15.0	17	120	75	PT 17 -(*)QZ- (**-**-*)-B-(**)	1.07	175	115
12.4 – 18.0	18	140	62	PT 18 -(*)QZ- (**-**-*)-C-(**)	1.07	120	100
15.0 – 22.0	19	180	51	PT 19 -(*)QZ- (**-**-*)-C-(**)	1.11	80	51
18.0 – 26.5	20	220	42	PT 20 -(*)QZ- (**-**-*)-C-(**)	1.11	46	71
22.0 – 33.0	21	260	34	PT 21 -(*)QZ- (**-**-*)-C-(**)	1.11	46	71
26.5 – 40.0	22	320	28	PT 22 -(*)QZ- (**-**-*)-C-(**)	1.11	24	39

* S = clockwise, A = anticlockwise (as viewed through the waveguide)

** Twist in degrees. Standard Twist 30, 45 and 90 degrees.

*** For 3 Digit Rectangular Flange part number, refer to the TWS Quasar Flange Catalogue, or consult the factory.

Double Ridge

Specification:

VSWR: Values for through flanges and up to 90° Twists
 Power: Values at $f = 1.5f_c$ for 90° Twist only
 Material: Aluminium
 Finish: Blue Paint, Iridited or Chromated Aluminium Flanges

Operating Frequency Band (GHz)	Waveguide Designation	TWS PART NUMBER	Max V.S.W.R.	Max Power Watts C.W.	Length "A" (mm)
4.75 – 11.0	WRD475 D24	PT 475 -(*)QH- (**-**-*)-A-(**)	1.10	80	229
5.8 – 16.0	WRD580 D28	PT 580 -(*)QH- (**-**-*)-A-(**)	1.12	30	114
6.5 – 18.0	WRD650 D28	PT 650 -(*)QH- (**-**-*)-A-(**)	1.12	20	114
7.5 – 18.0	WRD750 D24	PT 750 -(*)QH- (**-**-*)-A-(**)	1.12	30	114
18.0 – 40.0	WRD180 C24	PT 180 -(*)QH- (**-**-*)-A-(**)	1.15	5	51

* S = clockwise, A = anticlockwise (as viewed through the waveguide)

** Twist in degrees. Standard Twist 30, 45 and 90 degrees.

*** For 3 Digit Rectangular Flange part number, refer to the TWS Flange Catalogue, or consult the factory.

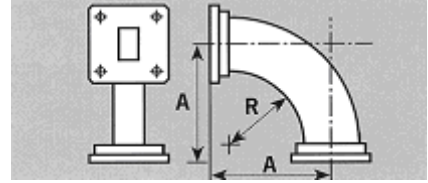
Alternative lengths or alternative angles of twist (anti-clockwise) available on request.

PRECISION BEND

Standard Rectangular

Specification:

VSWR: Values for through flanges and up to 90° Bends
 Power: Values at $f = 1.5f_c$ and for the 90° bends
 Material: Aluminium, Brass, Copper
 Finish: Blue Paint, Unplated Flanges



Operating Frequency Band (GHz)	Waveguide Designation			TWS PART NUMBER	V.S.W. R. Max	Max Power K Watts	Dim A (mm)	Bend Radius (mm) approx
	UK WG	IEC R	E.I.A. WR					
2.60 – 3.95	10	32	284	PB 10 –SQZ- (**-**-**-*)-B-(**)-(*)	1.05	2230	153	90
3.30 – 4.90	11A	40	229	PB 11A –SQZ- (**-**-**-*)-B-(**)-(*)	1.05	1500	153	85
3.95 – 5.85	12	48	187	PB 12 –SQZ- (**-**-**-*)-B-(**)-(*)	1.05	1005	150	75
4.90 – 7.05	13	58	159	PB 13 –SQZ- (**-**-**-*)-B-(**)-(*)	1.05	775	140	80
5.85 – 8.20	14	70	137	PB 14 –SQZ- (**-**-**-*)-B-(**)-(*)	1.05	520	125	60
7.05 – 10.0	15	84	112	PB 15 –SQZ- (**-**-**-*)-B-(**)-(*)	1.05	345	100	45
8.20 – 12.40	16	100	90	PB 16 –SQZ- (**-**-**-*)-B-(**)-(*)	1.05	225	75	40
10.0 – 15.0	17	120	75	PB 17 –SQZ- (**-**-**-*)-B-(**)-(*)	1.07	175	65	22
12.40 – 18.0	18	140	62	PB 18 –SQZ- (**-**-**-*)-C-(**)-(*)	1.07	120	50	22
15.0 – 22.0	19	180	51	PB 19 –SQZ- (**-**-**-*)-C-(**)-(*)	1.11	80	50	20
18.0 – 26.5	20	220	42	PB 20 –SQZ- (**-**-**-*)-C-(**)-(*)	1.11	46	50	20
22.0 – 33.0	21	260	34	PB 21 –SQZ- (**-**-**-*)-C-(**)-(*)	1.11	46	50	20
26.5 – 40.0	22	320	28	PB 22 –SQZ- (**-**-**-*)-C-(**)-(*)	1.11	24	40	15

* E or H Plane bend (add "E" or "H"), when included in the above table, the dimensions refer specifically to either E or H Plane bends.

** Angle of bend in degrees. Standard Bends 30, 45, 60 and 90 degrees, alternative angles available on request.

*** For 3 Digit Rectangular Flange part number, refer to the TWS Flange Catalogue, or consult the factory.

Cast Bends may be offered as an alternative.

Double Ridge

Specification:

VSWR: Values for through flanges and up to 90° Twists
 Power: Values at $f = 1.5f_c$ for 90° bends
 Material: Aluminium
 Finish: Blue Paint, Iridited or Chromated Aluminium Flanges

Operating Frequency Band (GHz)	Waveguide Designation	TWS PART NUMBER	Max V.S.W.R.	Max Power Watts C.W.	Dim A (mm)	Bend Radius (mm) approx
4.75 – 11.0	WRD475 D24	PB 475 –SQH- (**-**-**-*)-A-(**)-(*)	1.10	80	110	50
5.8 – 16.0	WRD580 D28	PB 580 –SQH- (**-**-**-*)-A-(**)-(*)	1.12	30	110	35
6.5 – 18.0	WRD650 D28	PB 650 –SQH- (**-**-**-*)-A-(**)-(*)	1.12	20	70	28
7.5 – 18.0	WRD750 D24	PB 750 –SQH- (**-**-**-*)-A-(**)-(*)	1.12	30	70	28
18.0 – 40.0	WRD180 C24	PB 180 –SQH- (**-**-**-*)-A-(**)-(*)	1.15	5	60	20

* E or H Plane bend (add "E" or "H"), when included in the above table, the dimensions refer specifically to either E or H Plane bends.

** Angle of bend in degrees. Standard Bends 30, 45, 60 and 90 degrees, alternative angles available on request.

*** For 3 Digit Rectangular Flange part number, refer to the TWS Flange Catalogue, or consult the factory.

COMPACT BEND

Standard Rectangular

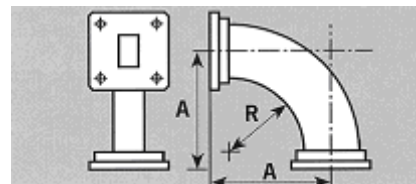
Specification:

VSWR: Values for through flanges and up to 90° Bends

Power: Values at $f = 1.5f_c$ and for the 90° bends

Material: Aluminium, Brass, Copper

Finish: Blue Paint, Unplated Flanges



Operating Frequency Band (GHz)	Waveguide Designation			TWS PART NUMBER	V.S.W. R. Max	Max Power K Watts	Dim A (mm)	Bend Radius (mm) approx
	UK WG	IEC R	E.I.A. WR					
2.60 – 3.95	10	32	284	PB 10 –CQZ- (**-**-**)-B(**)-E	1.15	2200	74	45
2.60 – 3.95	10	32	284	PB 10 –CQZ- (**-**-**)-B(**)-H	1.15	2200	93	45
3.30 – 4.90	11A	40	229	PB 11A –CQZ- (**-**-**)-B(**)-E	1.15	1490	84	58
3.30 – 4.90	11A	40	229	PB 11A –CQZ- (**-**-**)-B(**)-H	1.15	1490	91	50
3.95 – 5.85	12	48	187	PB 12 –CQZ- (**-**-**)-B(**)-E	1.15	995	81	58
3.95 – 5.85	12	48	187	PB 12 –CQZ- (**-**-**)-B(**)-H	1.15	995	90	55
4.90 – 7.05	13	58	159	PB 13 –CQZ- (**-**-**)-B(**)-E	1.15	770	72	50
4.90 – 7.05	13	58	159	PB 13 –CQZ- (**-**-**)-B(**)-H	1.15	770	77	45
5.85 – 8.20	14	70	137	PB 14 –CQZ- (**-**-**)-B(**)-E	1.15	518	69	40
5.85 – 8.20	14	70	137	PB 14 –CQZ- (**-**-**)-B(**)-H	1.15	518	73	34
7.05 – 10.00	15	84	112	PB 15 –CQZ- (**-**-**)-B(**)-E	1.15	343	50	22
7.05 – 10.00	15	84	112	PB 15 –CQZ- (**-**-**)-B(**)-H	1.15	343	61	25
8.20 – 12.40	16	100	90	PB 16 –CQZ- (**-**-**)-B(**)-E	1.15	222	42	16
8.20 – 12.40	16	100	90	PB 16 –CQZ- (**-**-**)-B(**)-H	1.15	222	55	22
10.0 – 15.00	17	120	75	PB 17 –CQZ- (**-**-**)-B(**)-E	1.18	172	39	13
10.0 – 15.00	17	120	75	PB 17 –CQZ- (**-**-**)-B(**)-H	1.18	172	47	16
12.40 – 18.00	18	140	62	PB 18 –CQZ- (**-**-**)-C(**)-E	1.18	119	37	13
12.40 – 18.00	18	140	62	PB 18 –CQZ- (**-**-**)-C(**)-H	1.18	119	44	15
15.0 – 22.00	19	180	51	PB 19 –CQZ- (**-**-**)-C(**)-E	1.20	77	26	12
15.0 – 22.00	19	180	51	PB 19 –CQZ- (**-**-**)-C(**)-H	1.20	77	29	12
18.0 – 26.50	20	220	42	PB 20 –CQZ- (**-**-**)-C(**)-E	1.25	44	25	12
18.0 – 26.50	20	220	42	PB 20 –CQZ- (**-**-**)-C(**)-H	1.25	44	28	12
22.0 – 33.00	21	260	34	PB 21 –CQZ- (**-**-**)-C(**)-E	1.25	44	25	12
22.0 – 33.00	21	260	34	PB 21 –CQZ- (**-**-**)-C(**)-H	1.25	44	28	12
26.5 – 40.00	22	320	28	PB 22 –CQZ- (**-**-**)-C(**)-E	1.25	22	25	12
26.5 – 40.00	22	320	28	PB 22 –CQZ- (**-**-**)-C(**)-H	1.25	22	27	12

** Angle of bend in degrees. Standard Bends 30, 45, 60 and 90 degrees, alternative angles available on request.

*** For 3 Digit Rectangular Flange part number, refer to the TWS Flange Catalogue, or consult the factory.

Cast Bends may be offered as an alternative option.

COMPACT BEND

Double Ridge

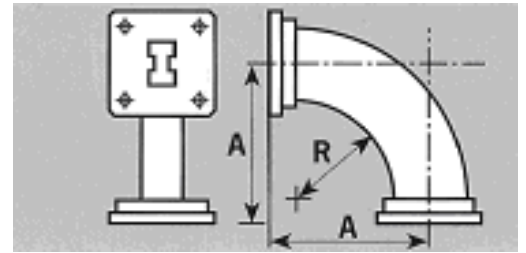
Specification:

VSWR: Values for through flanges and up to 90° Bends

Power: Values at $f = 1.5f_c$ and for the 90° bends

Material: Aluminium

Finish: Blue Paint, Iridited or Chromated Aluminium Flanges

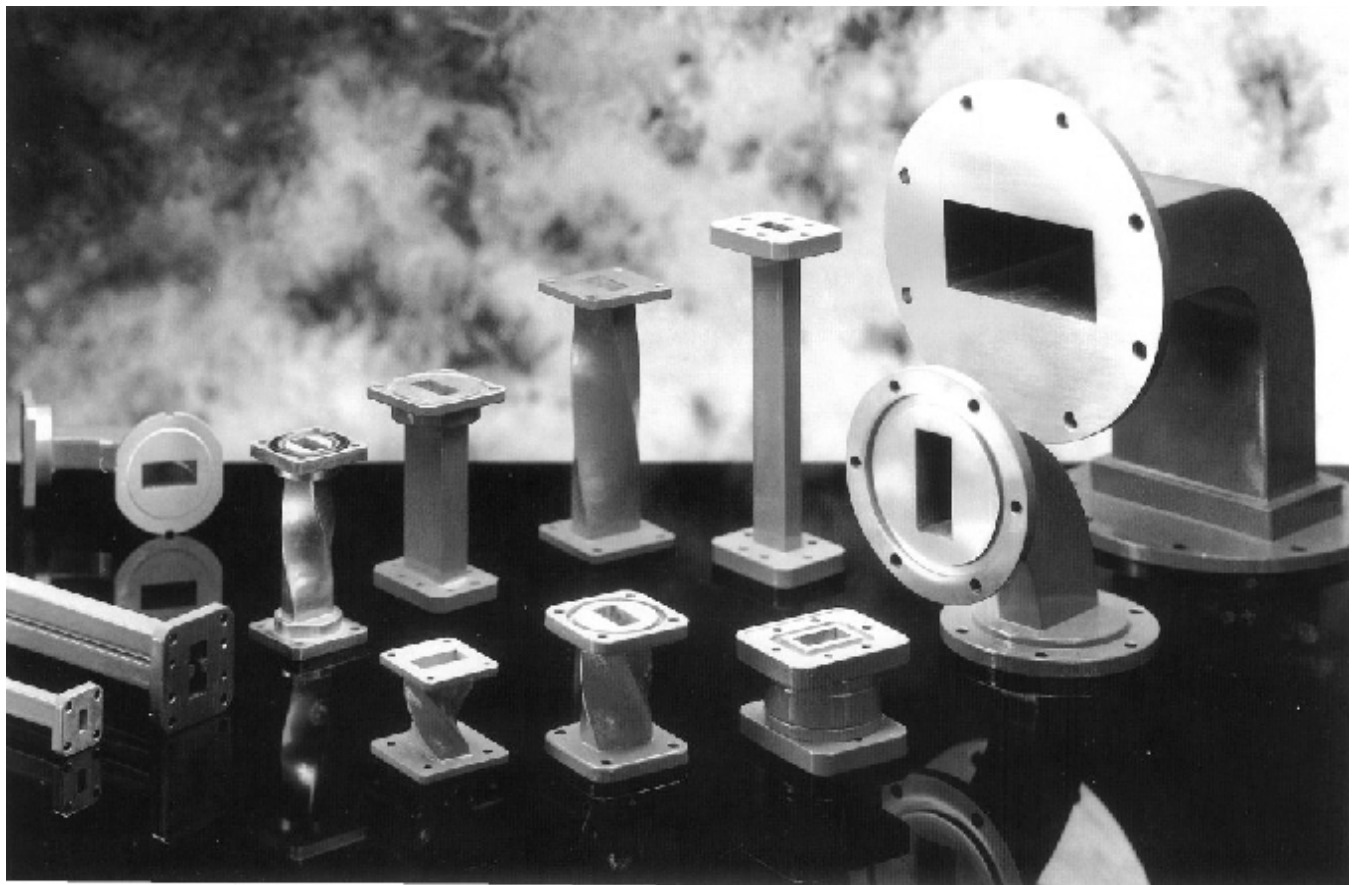


Operating Frequency Band (GHz)	Waveguide Designation	TWS PART NUMBER	Max V.S.W.R.	Max Power Watts C.W.	Dim A (mm)	*Bend Radius (mm) approx
4.75 – 11.0	WRD475 D24	PB 475 –CQH- (**-***)-A-(**)-E	1.15	78	48	30
4.75 – 11.0	WRD475 D24	PB 475 –CQH- (**-***)-A-(**)-H	1.15	78	55	30
5.80 – 16.0	WRD580 D28	PB 580 –CQH- (**-***)-A-(**)-E	1.15	28	41	25
5.80 – 16.0	WRD580 D28	PB 580 –CQH- (**-***)-A-(**)-H	1.15	28	46	25
6.5 – 18.0	WRD650 D28	PB 650 –CQH- (**-***)-A-(**)-E	1.20	18	35	20
6.5 – 18.0	WRD650 D28	PB 650 –CQH- (**-***)-A-(**)-H	1.20	18	40	20
7.5 – 18.0	WRD750 D24	PB 750 –CQH- (**-***)-A-(**)-E	1.20	28	35	20
7.5 – 18.0	WRD750 D24	PB 750 –CQH- (**-***)-A-(**)-H	1.20	28	40	20
18.0 – 40.0	WRD180 C24	PB 180 –CQH- (**-***)-A-(**)-E	1.25	4.5	25	12
18.0 – 40.0	WRD180 C24	PB 180 –CQH- (**-***)-A-(**)-H	1.25	4.5	27	12

* The bend radius indicated are approximate please consult the factory for actual values for your application.

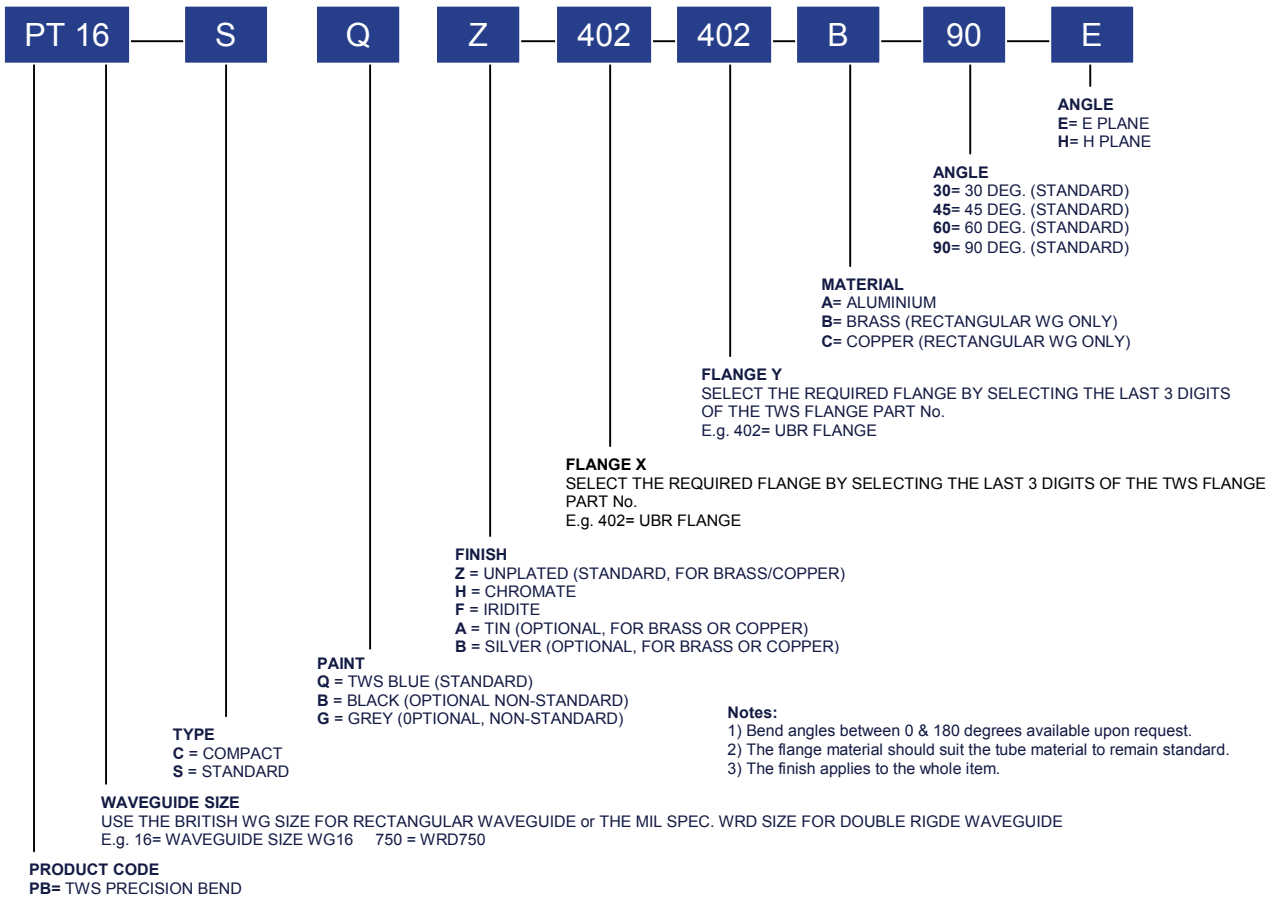
** Angle of bend in degrees. Standard Bends 30, 45, 60 and 90 degrees, alternative angles available on request.

*** For 3 Digit Rectangular Flange part number, refer to the TWS Flange Catalogue, or consult the factory.

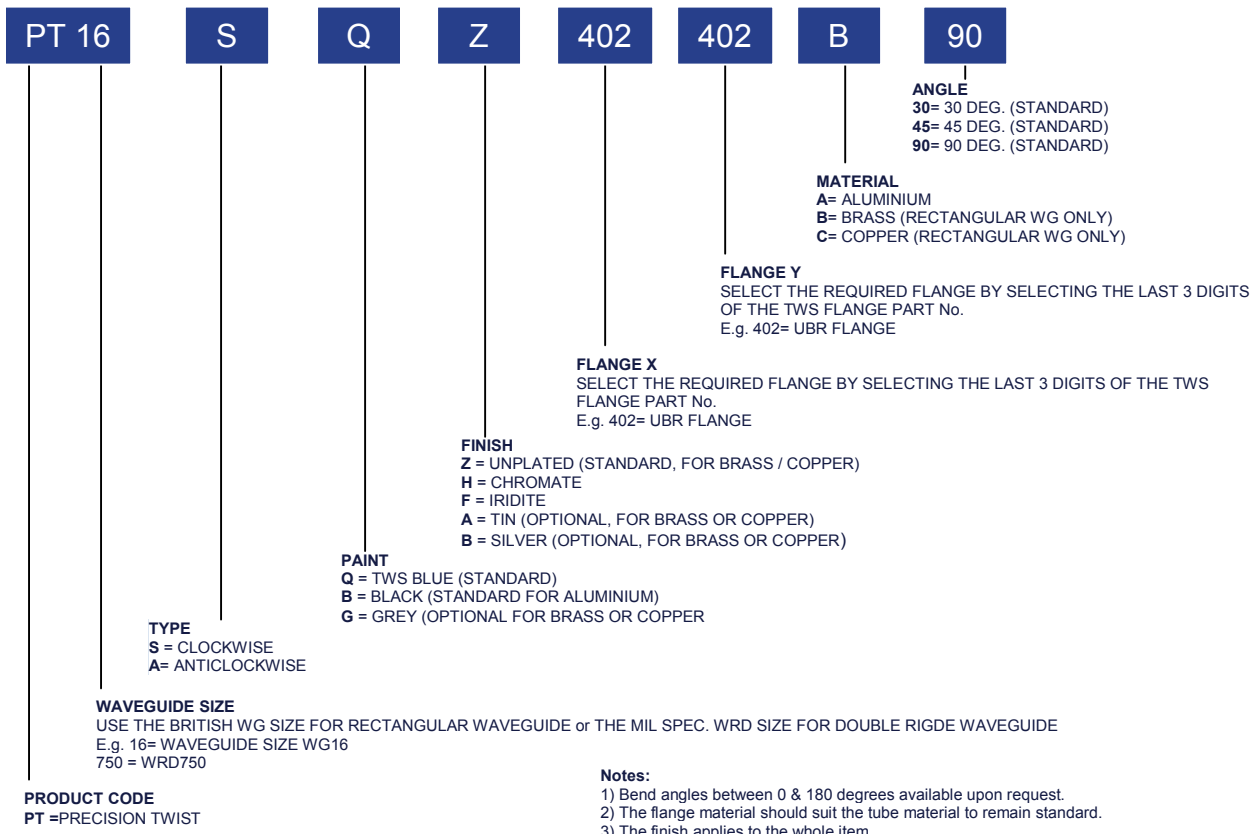


Ordering Information

TWS PRECISION BENDS

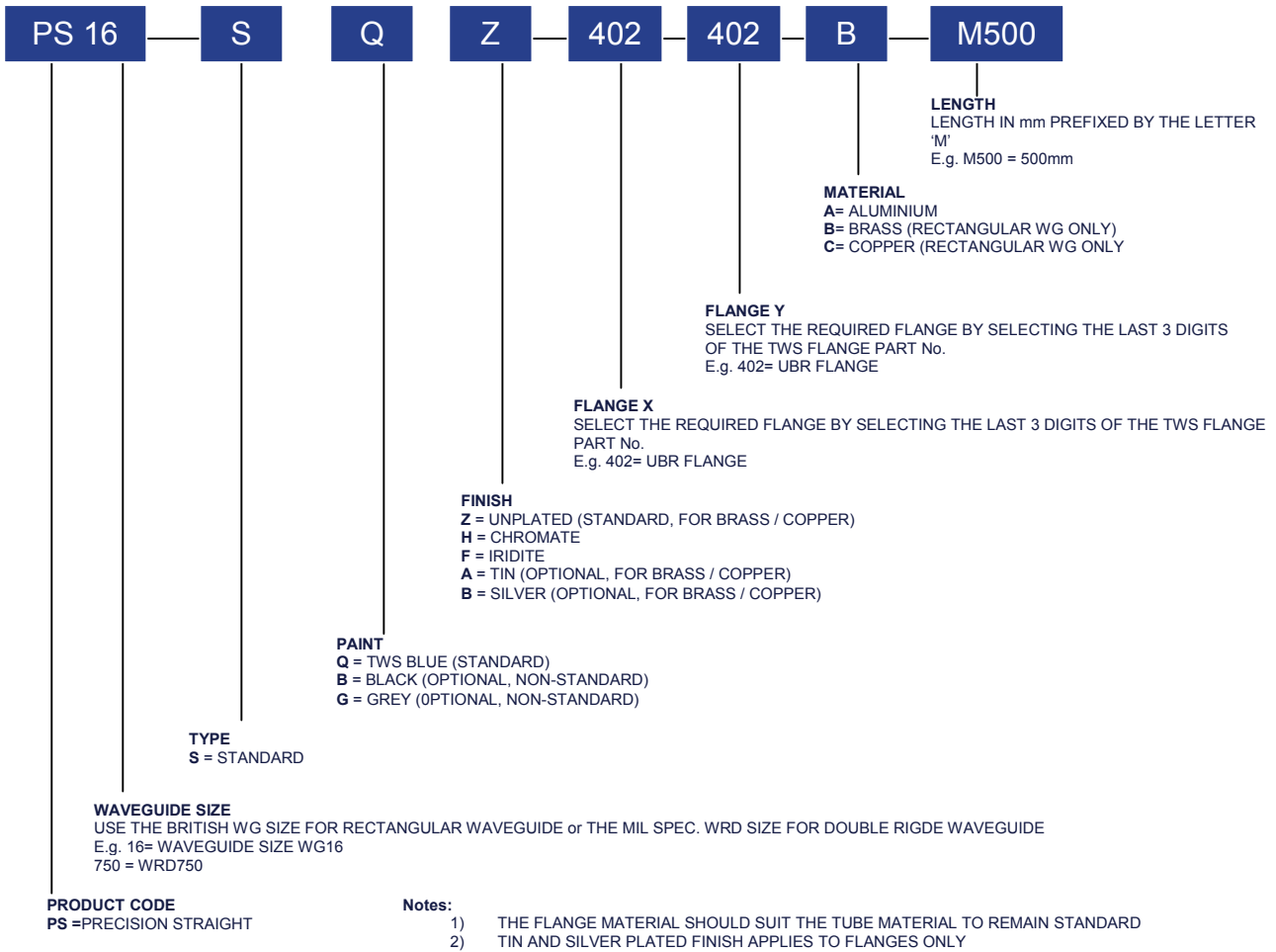


TWS PRECISION TWISTS



Ordering Information

TWS PRECISION STRAIGHTS



For assistance selecting RoHS compliant options please contact the factory



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Specifications shown on this document are offered as a guide only. Components may be modified to suit the mechanical or electrical parameters requested, or may be optimized to suit the operating frequency range. Frequency range of operation shall be advised when ordering.

Information provided in this brochure is for reference only. Dimensions or specifications are typical values. All designs, specifications and availabilities of products and services presented in this document may be subject to change without notice. For confirmation of details please consult your agent or manufacturer. Issue 1.0b