cunova

FORMERLY KME
SPECIAL PRODUCTS
& SOLUTIONS

OSNA®-10 Offshore

MARITIME
APPLICATIONS

CONTENT

The Company

cunova offers innovative product solutions tailored to the respective individual requirements of our customers from the most various industrial sectors. cunova is divided into four business units – Melting & Casting Technologies, Melting & Casting Services, Industrial Applications und Maritime Applications. This enables customised solutions to be developed and exemplary engineering and services to be provided.

Maritime Applications

The cunova business unit Maritime Applications is specialized in the production of coppernickel alloys for piping systems in ship-building, offshore installations and other maritime applications. Since decades, these alloys are successfully used in:

- Merchant and military shipbuilding
- Offshore oil and gas installations
- Coastal petroleum and petrochemical processing plants
- Seawater desalination plants
- Coastal electricity generation plants

Copper-nickel alloys are widely applied in:

- Seawater cooling systems
- Fire water systems
- Sanitary systems
- Deck steam pipes
- Deluge systems
- Hydraulic and pneumatic systems
- Seawater feed lines to desalination and processing units
- Splash zone sheathing

OSNA®-10 OFFSHORE

The Material

cunova OSNA®-10-Alloy

The chemical composition of the cunova's Osna®-10-alloy is modified to ensure the compliance with all international specifications. Controlled content of alloying elements and minimised concentration of impurities ensure reliable service and fabrication properties of the alloy.

Main Advantages of OSNA®-10-Alloy

Despite the rough conditions in marine service and the highly corrosive nature of seawater, the product range provides a well balanced combination of technical and economical benefits:

- Straight forward alloying system with good weldability
- Excellent ductility and toughness
- Good erosion / corrosion performance
- Resistant to uniform and localised corrosion
- No effect of ambient seawater temperatures
- No effect of seawater chlorination
- Resistant to biofouling
- Resistant to stress-corrosion cracking
- Low maintenance costs

Comparison of Standard Specifications for OSNA®-10 (CuNi 90/10)

	cunova Alloy OSNA®-10 (CuNi 90/10)	EN 1652 / 12420 / 12449 [1] CW352H	DIN 86019 WL 2.1972	EEMUA 2016, 234/1-2 UNS 7060 X	MIL-T- 16420K ASTM B 466/467 C 70620 [2]
Ni %	10.0 – 11.0	9.0 – 11.0	9.0 – 11.0	10.0 – 11.0	9.0 – 11.0
Fe %	1.5 – 1.8	1.0 – 2.0	1.5 – 1.8	1.5 – 2.0*	1.0 – 1.8
Mn %	0.6 – 1.0	0.5 – 1.0	0.5 – 1.0	0.5 – 1.0	max. 1.0
C %	max. 0.02	max. 0.05	max. 0.05	max. 0.05	max. 0.05
Pb %	max. 0.01	max. 0.02	max. 0.01	max. 0.01	max. 0.02
S %	max. 0.005	max. 0.05	max. 0.005	max. 0.02	max. 0.02
P %	max. 0.02	max. 0.02	max. 0.02	max. 0.02	max. 0.02
Zn %	max. 0.05	max. 0.50	max. 0.05	max. 0.20	max. 0.50
Sn %	max. 0.03	max. 0.03	-	-	-
other imp.	max. 0.20	max. 0.20	max. 0.20	max. 0.30	-
Cu %	rem.	rem.	rem.	rem.	min. 86.5

[1] formerly BS 2871 Part 2 (now withdrawn)

[2] equal to C 70600 for subsequent welding

* The iron content has been specified to improve corrosion resistance

OSNA®-10 OFFSHORE

Offshore Product Range

The Osna®-10 offshore product range is based on:

- EEMUA 234/1-2, 2016: Tubes[1] Seamless and Welded
- EEMUA 234/3-6, 2016: Flanges Composite and Solid
- EEMUA 234/7-13, 2016: Fittings

The unique dimensional range from ½ inch to 36 inch ensures the supply of the entire piping systems from one source. Although the pipe dimensions of 38 and 40 inch are not included in the EEMUA 234-2016 they are available here as they are commonly specified in offshore projects.

Furthermore, we are also offering sheets and plates in different sizes.

[1] The reference „pipe“ rather than „tube“ is used in this document.

Pipes

Seamless Pipes

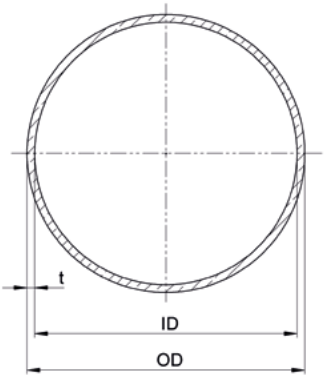
Seamless pipes are in accordance with EEMUA 234 / chapter 1. They are manufactured from hot extruded shells followed by cold work and annealing.

Welded Pipes

Longitudinally welded pipes are in accordance with EEMUA 234 / chapter 2. They are manufactured from hot rolled or cold rolled and annealed sheet or plates in accordance with BS 2870, BS 2875, ASTM B171 or ASTM B402. Mechanical testing is carried out in accordance with the standards above. The pipes are supplied in “as welded” condition.

Dimensions

Dimensions are based on EEMUA 234, Tables 3 / 4 and Tables 8 / 9. However, the pipe diameters range from ½ in. / 16 mm to 36 in. / 914 mm. Although the pipe dimensions of 38 in. / 965 mm and 40 in. / 1016 mm are not included in the EEMUA 234-2016 they are available on request as they are commonly specified. The corresponding wall thicknesses of the pipes comply with the pressure containment requirements of B31.3 as well as the requirements of the International Association of Classification Societies. Pipes with other wall thicknesses are available on request.



Tolerances

See notes 1 – 4 for seamless and notes 2 – 4 for welded pipes.

Weld Preparation

For wall thickness less than 3 mm, the pipes are supplied with plain weld ends. Larger thicknesses are supplied with the weld bevel of 37.5° ± 2.5°.

Pipes

Seamless Pipe

Size		Specified Wall Thickness (mm) t		Theoretical Weight/Metre (kg)	
Nominal inch	Specified mm	16 bar	20 bar	16 bar	20 bar
½	16.0	2.0	2.0	0.78	0.78
¾	25.0	2.0	2.0	1.29	1.29
1	30.0	2.5	2.5	1.93	1.93
1 ¼	38.0	2.5	2.5	2.49	2.49
1 ½	44.5	2.5	2.5	2.94	2.94
2	57.0	2.5	2.5	3.82	3.82
2 ½	76.1	2.5	2.5	5.15	5.15
3	88.9	2.5	2.5	6.05	6.05
4	108.0	3.0	3.0	8.82	8.82
6	159.0	3.0	3.5	13.10	15.24
8	219.1	4.0	4.5	24.10	27.04
10	267.0	4.5	5.5	33.10	40.27
12	323.9	5.5	7.0	49.05	62.10
14	368.0	6.5	8.0	65.80	80.64
16	419.0	7.0	9.0	80.75	103.32

Dimensions (mm)

Seam-Welded Pipe

Size		Specified Wall Thickness (mm) t		Theoretical Weight/Metre (kg)	
Nominal inch	Specified mm	16 bar	20 bar	16 bar	20 bar
16	419.0		9.0		103.32
18	457.2	8.0	9.5	100.62	119.10
20	508.0	8.5	11.0	118.90	153.10
24	610.0	10.5	13.0	176.30	217.30
28	711.0	12.0	15.0	234.90	292.21
32	813.0	13.5	17.0	302.20	378.76
36	914.0	15.5	19.0	390.00	475.97

Dimensions (mm)

Note 1
The pipe sizes up to including 4 in. / 108 mm are based on BS 2871 (now withdrawn): Part 2: Table 3 for outside diameters and their tolerances to allow for the use of capillary and compression fittings and brazed (and welded) slip-on flanges. The wall thickness of the 16 bar range have been increased to match the 20 bar range for mechanical strength.

Note 2
The pipe size 6 in. / 159 mm up to 16 in. / 419 mm are also based on BS 2871 (now withdrawn): Part 2: Table 3 for specified diameters but the tolerance have been applied to the inside diameters for facilitate alignment of matching weld preparations.

Note 3
The ovality of the finished pipe doesn't exceed 2 % of the difference of the maximum and minimum diameter measured on the same cross section.

Note 4
Up to including 4 in. / 108 mm, the wall thickness doesn't vary by more than 10 % specified therein. For diameters from 6in. / 159 mm and larger, the wall thickness is not less than 12.5 % of the specified value. The pipes with other dimensions than mentioned herein are available on request. Please contact us for more information.

Stock Dimensions
All seamless pipes are available from stock.

BUTT WELDING FITTINGS

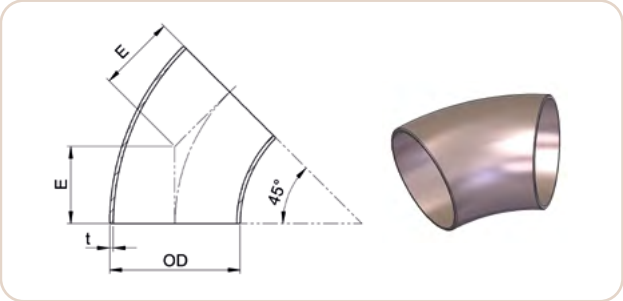
Elbows

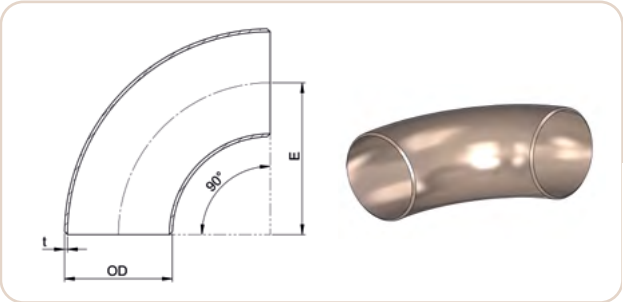
Type and Construction:
Elbows are in accordance with EEMUA 234 / 7. Seamless elbows are typically available up to 18 inch / 457 mm. Larger dimensions are manufactured from longitudinally welded half shells. 45° and 90° elbows are available in all sizes.

Dimensions
Dimensions are based on EEMUA 234 / 7, Figure 4, Tables 35 – 36 and 38 – 39. Standard elbows are supplied with long radius, i.e. 1.5 x O.D. Elbows with other dimensions are available on request.

Tolerances
See Appendix C

Weld Preparation
For wall thickness less than 3 mm, the elbows are supplied with plain weld ends. Larger thicknesses are supplied with the weld bevel of 37.5 °± 2.5 °.





Nominal Size	Specified Size	Specified Pipe Wall Thickness t		E		Theoretical Weight (kg)			
inch	mm	16 bar	20 bar	45°	90°	45° 16 bar	45° 20 bar	90° 16 bar	90° 20 bar
1	30	Use 20 bar	2.5	22	38	Use 20 bar	0.06	Use 20 bar	0.12
1 ¼	38		2.5	25	48		0.09		0.13
1 ½	44.5		2.5	29	57		0.15		0.30
2	57		2.5	35	76		0.25		0.52
2 ½	76.1		2.5	44	95		0.45		0.90
3	88.9		2.5	51	114		0.65		1.25
4	108		3.0	64	152		1.00		2.10
6	159	3.0	3.5	95	229	2.30	2.70	4.70	5.50

Nominal Size	Specified Size	Specified Pipe Wall Thickness t		E		Theoretical Weight (kg)			
inch	mm			45°	90°	45°	45°	90°	90°
		16 bar	20 bar			16 bar	20 bar	16 bar	20 bar
8	219.1	4.0	4.5	127	305	6.00	6.50	12	13
10	267	4.5	5.5	159	381	10	12	20	24
12	323.9	5.5	7.0	190	457	17	23	35	45
14	368	6.5	8.0	222	533	27	34	55	67
16	419	7.0	9.0	254	610	38	50	77	99
18	457.2	8.0	9.5	286	686	54	64	109	128
20	508	8.5	11.0	318	762	71	92	142	184
24	610	10.5	13.0	381	914	126	156	252	312
28	711	12.0	15.0	438	1067	197	245	394	490
32	813	13.5	17.0	502	1219	289	362	579	725
36	914	15.5	19.0	565	1372	420	513	841	1026

Dimensions (mm)

BUTT WELDING FITTINGS

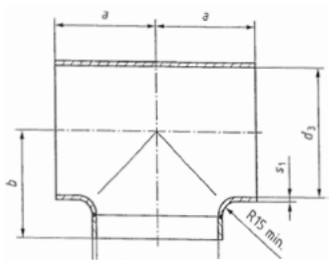
Equal Tees

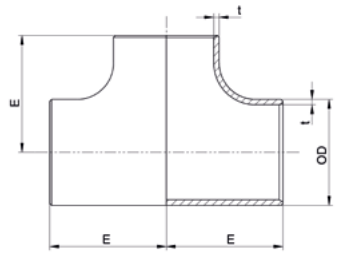
Type and Construction:
Tee pieces are in accordance with EEMUA 234/7. Seamless tee pieces are typically available up to 8 in./ 219.1 mm; bigger dimensions are welded.

Dimensions
Dimensions are based on EEMUA 234/7, Figures 4–5, Tables 35 – 36 and 40. Tee pieces with other dimensions are available on request.

Tolerances
See Appendix C

Weld Preparation
For wall thickness less than 3 mm, the tee pieces are supplied with plain weld ends. Larger thicknesses are supplied with the weld bevel of 37.5° ± 2.5°.





Diameter: 219.1 mm

Nominal Size	Specified Size (OD)	Specified Pipe Wall Thickness t		E	Theoretical Weight (kg)	
inch	mm	16 bar	20 bar		16 bar	20 bar
1	30	Use 20 bar	2.5	38	Use 20 bar	0.30
1 ¼	38		2.5	48		0.50
1 ½	44.5		2.5	57		0.75
2	57		2.5	64		1.00
2 ½	76.1		2.5	76		1.60
3	88.9		2.5	86		2.00
4	108		3.0	105		3.25
6	159	3.0	3.5	143	6.00	7.20
8	219.1	4.0	4.5	178	11.25	12.70
10	267	4.5	5.5	216	22.50	27.50

Nominal Size	Specified Size (OD)	Specified Pipe Wall Thickness t		E	Theoretical Weight (kg)	
inch	mm	16 bar	20 bar		16 bar	20 bar
12	323.9	5.5	7.0	254	39.50	50.30
14	368	6.5	8.0	279	62.00	76.00
16	419	7.0	9.0	305	88.00	119.00
18	457.2	8.0	9.5	343	128.00	152.00
20	508	8.5	11.0	381	165.00	214.00
24	610	10.5	13.0	432	266.00	330.00
28	711	12.0	15.0	521	388.00	458.00
32	813	13.5	17.0	597	508.00	606.00
36	914	15.4	19.0	673	650.00	794.00

Dimensions (mm)

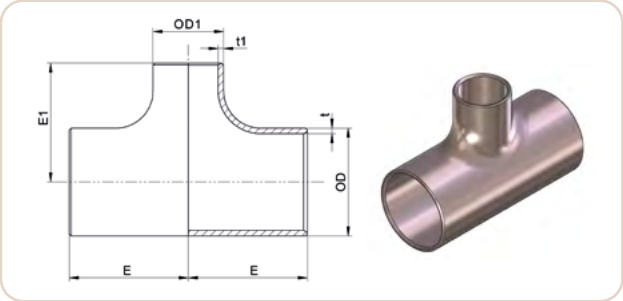
Reducing Tees (16 bar systems)

Type and Construction
Pieces are in accordance with EEMUA 234 / 7. Seamless tee pieces are typically available up to 8 inch / 219.1 mm; bigger dimensions are welded.

Dimensions
Dimensions are based on EEMUA 234 / 7, Figures 4 – 5, Tables 35 – 36 and 41 – 43. Tee pieces with other dimensions are available on request.

Tolerances
See Appendix C

Weld Preparation
For wall thickness less than 3 mm, the tees are supplied with plain weld ends. Larger thicknesses are supplied with the weld bevel of 37.5° ± 2.5°.



Specified Size			Pipe Wall Thickness			Centre-to-End (mm)		Theo-retical Weight
OD mm	OD mm	OD_1 mm	t mm	t mm	t_1 mm	E nom	E_1 nom	kg
		108.0			3.0		130	4.19
159	159	88.9	3.0	3.0	2.5	143	124	4.01
		76.1			2.5		121	3.96
		159.0			3.0		168	9.33
219.1	219.1	108.0	4.0	4.0	3.0	178	156	8.97
		88.9			2.5		152	8.82
		219.1			4.0		203	15.94
267	267	159.0	4.5	4.5	3.0	216	194	15.06
		108.0			3.0		184	14.71

Specified Size			Pipe Wall Thickness			Centre-to-End (mm)		Theo-retical Weight
OD mm	OD mm	OD_1 mm	t mm	t mm	t_1 mm	E nom	E_1 nom	kg
323.9	323.9	267.0 219.1 159.0	5.5	5.5	4.5 4.0 3.0	254	241 229 219	27.48 26.49 25.62
368	368	323.9 267.0 219.1	6.5	6.5	5.5 4.5 4.0	279	270 257 248	40.87 39.07 38.20
419	419	368.0 323.9 267.0	7.0	7.0	6.5 5.5 4.5	305	305 295 283	55.46 53.38 51.62
457.2	457.2	419.0 368.0 323.9	8.0	8.0	7.0 6.5 5.5	343	330 330 321	77.10 75.59 73.45

Dimensions for 16 bar systems

Reducing Tees (16 bar systems)

Specified Size			Pipe Wall Thickness			Centre-to-End (mm)		Theo-retical Weight
OD mm	OD mm	OD_1 mm	t mm	t mm	t_1 mm	E nom	E_1 nom	kg
		457.2			8.0		368	101.91
508	508	419.0	8.5	8.5	7.0	381	356	98.68
		368.0			6.5		356	97.16
		508.0			8.5		432	167.14
610	610	457.2	10.5	10.5	8.0	432	419	163.52
		419.0			7.0		406	160.21
		610.0			10.5		508	271.22
711	711	508.0	12.0	12.0	8.5	521	483	259.52
		457.2			8.0		470	255.88
		711.0			12.0		572	399.14
813	813	610.0	13.5	13.5	10.5	597	559	387.17
		508.0			8.5		533	375.34
		813.0			13.5		648	581.77
914	914	711.0	15.5	15.5	12.0	673	622	562.82
		610.0			10.5		610	551.05

For sizes from 30 mm up to 108 mm use 20 bar
Dimensions for 16 bar systems

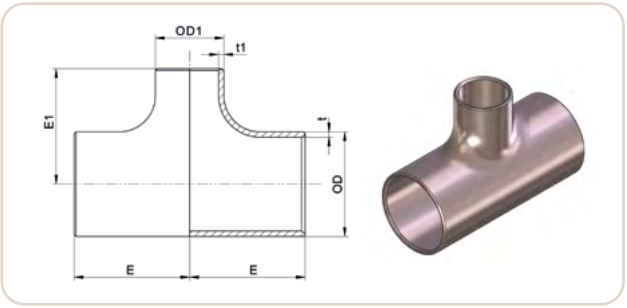
Reducing Tees (20 bar systems)

Type and Construction
Pieces are in accordance with EEMUA 234 / 7. Seamless tee pieces are typically available up to 8 inch / 219.1 mm; bigger dimensions are welded.

Dimensions
Dimensions are based on EEMUA 234 / 7, Figures 4 – 5, Tables 35 – 36 and 41 – 43. Tee pieces with other dimensions are available on request.

Tolerances
See Appendix C

Weld Preparation
For wall thickness less than 3 mm, the tees are supplied with plain weld ends. Larger thicknesses are supplied with the weld bevel of 37.5° ± 2.5°.



Specified Size			Pipe Wall Thickness			Centre-to-End (mm)		Theo-retical Weight
OD mm	OD mm	OD_1 mm	t mm	t mm	t_1 mm	E nom	E_1 nom	kg
30	30	25.0	2.5	2.5	2.0	38	38	0.18
38	38	30.0	2.5	2.5	2.5	48	48	0.29
		25.0	2.5	2.5	2.0			0.28
		38.0	2.5	2.5	2.5			0.42
44.5	44.5	30.0	2.5	2.5	2.5	57	57	0.40
		25 .0	2.5	2.5	2.0			0.38
		44.5					60	0.58
57	57	38.0	2.5	2.5	2.5	64	57	0.56
		30.0					51	0.53

Specified Size			Pipe Wall Thickness			Centre-to-End (mm)		Theo-retical Weight
OD mm	OD mm	OD_1 mm	t mm	t mm	t_1 mm	E nom	E_1 nom	kg
76.1	76.1	57.0 44.5 38.0	2.5	2.5	2.5	76	70 67 64	0.90 0.87 0.85
88.9	88.9	76.1 57.0 44.5	2.5	2.5	2.5	86	83 76 73	1.24 1.16 1.12
108	108	88.9 76.1 57.0	3.0	3.0	2.5	105	98 95 89	2.12 2.06 1.98
159	159	108.0 88.9 76.1	3.5	3.5	3.0 2.5 2.5	143	130 124 121	4.80 4.62 4.57
219.1	219.1	159.0 108.0 88.9	4.5	4.5	3.5 3.0 2.5	178	168 156 152	10.50 10.02 9.87
267	267	219.1 159.0 108.0	5.5	5.5	4.5 3.5 3.0	216	203 194 184	19.25 18.29 17.82

Dimensions for 20 bar systems

Reducing Tees (20 bar systems)

Specified Size			Pipe Wall Thickness			Centre-to-End (mm)		Theo-retical Weight
OD mm	OD mm	OD_1 mm	t mm	t mm	t_1 mm	E nom	E_1 nom	kg
		267.0			5.5		241	34.69
323.9	323.9	219.1	7.0	7.0	4.5	254	229	33.32
		159.0			3.5		219	32.38
		323.9			7.0		270	50.27
368.0	368.0	267.0	8.0	8.0	5.5	279	257	47.87
		219.1			4.5		248	46.66
		368.0			8.0		305	70.63
419.0	419.0	323.9	9.0	9.0	7.0	305	295	68.24
		267.0			5.5		283	65.89
		419.0			9.0		330	92.04
457.2	457.2	368.0	9.5	9.5	8.0	343	330	89.74
		323.9			7.0		321	87.31
		457.2			9.5		368	130.03
508.0	508.0	419.0	11.0	11.0	9.0	381	356	127.00
		368.0			8.0		356	124.69

Specified Size			Pipe Wall Thickness			Centre-to-End (mm)		Theo-retical Weight
OD mm	OD mm	OD_1 mm	t mm	t mm	t_1 mm	E nom	E_1 nom	kg
610	610	508.0 457.2 419.0	13.0	13.0	11.0 9.5 9.0	432	432 419 406	206.90 201.04 197.91
711	711	610.0 508.0 457.2	15.0	15.0	13.0 11.0 9.5	521	508 483 470	337.26 323.65 317.78
813	813	711.0 610.0 508.0	17.0	17.0	15.0 13.0 11.0	597	572 559 533	500.07 484.85 471.09
914	914	813.0 711.0 610.0	19.0	19.0	17.0 15.0 13.0	673	648 622 610	712.24 688.14 673.17

Dimensions for 16 bar systems

BUTT WELDING FITTINGS

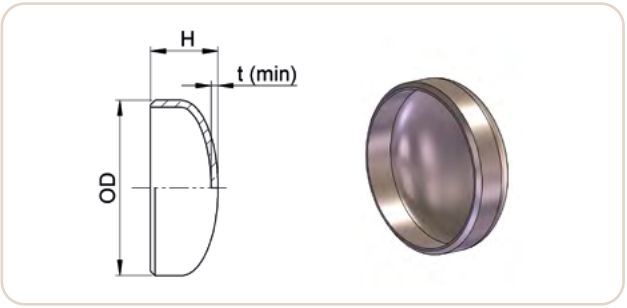
End Caps

Type and Construction
End caps are in accordance with EEMUA 234/7, and seamless.

Dimensions
Dimensions are based on EEMUA 234/7, Figure 4, Tables 35 – 36 and 44. The additional wall compensatory thicknesses over and above the minimum pipe wall thicknesses are included. End caps with other dimensions are available on request.

Tolerances
See Appendix C

Weld Preparation
For wall thickness less than 3 mm, the the end caps are supplied with plain weld ends. Larger thicknesses are supplied with the weld bevel of 37.5° ± 2.5°.



	16 bar		20 bar		Theoretical Weight	
Specified Size OD	t min mm	H mm	t min mm	H mm	16 bar kg	20 bar kg
44.5	Use 20 bar		2.25	19.6	Use 20 bar	0.08
57.0			2.25	22.0		0.11
76.1			2.25	25.7		0.18
88.9			2.25	28.2		0.24
108.0			2.70	31.7		0.40
159.0	2.63	41	3.12	44	0.8	0.97
219.1	3.54	55	4.29	60	2.0	2.40
267.0	4.29	69	5.23	69	3.4	4.10
323.9	5.24	80	6.34	85	5.9	7.70

	16 bar		20 bar		Theoretical Weight	
Specified Size OD	t min mm	H mm	t min mm	H mm	16 bar kg	20 bar kg
368.0	5.90	93	7.21	103	9.1	11.90
419.0	6.73	102	8.21	112	12.4	16.90
457.2	7.33	119	8.97	119	17.6	20.90
508.0	8.15	129	9.96	139	22.7	30.80
610.0	9.81	148	11.96	163	39.2	51.60
711.0	11.50	176	13.97	191	61.8	81.40
813.0	13.17	200	15.97	210	90.5	117.40
914.0	14.81	221	17.96	231	132.2	166.20

BUTT WELDING FITTINGS

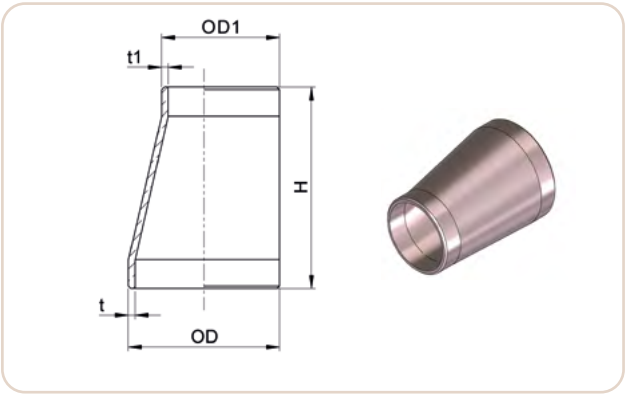
Reducers

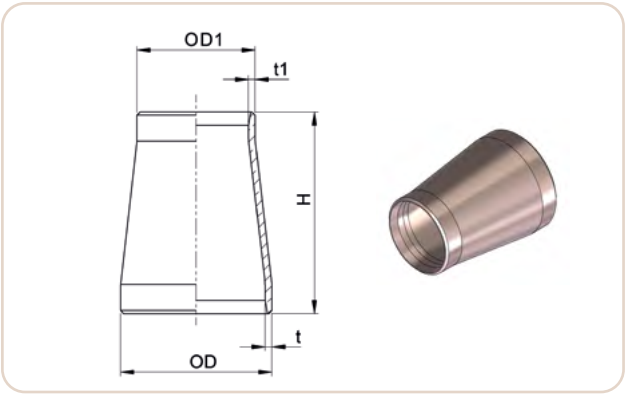
Type and Construction
Eccentric and concentric reducers are in accordance with EEMUA 234 / 7. The concentric reducers are typically supplied up to incl. 12 in. / 323.9 mm in seamless condition; bigger dimensions are seamwelded. The eccentric reducers are supplied up to incl. 8 inch / 219.1 mm in seamless condition; bigger dimensions are seamwelded.

Dimensions
Dimensions are based on EEMUA 234 / 7, Figures 4, Tables 35 – 36 and 45 – 47. Reducers with other dimensions are available on request.

Tolerances
See Appendix C

Weld Preparation
For wall thickness less than 3 mm, the reducers are supplied with plain weld ends. Larger thicknesses are supplied with the weld bevel of 37.5° ± 2.5°.





Specified Size OD_1 x OD_2	Length H	Specified Wall Thickness t x t1		Theoretical Weight	
mm	mm	16 bar mm	20 bar mm	16 bar kg	20 bar kg
30.0 x 25.0	51	2.5 x 2.0	2.5 x 2.0	0.07	0.07
38.0 x 25.0	51	2.5 x 2.0	2.5 x 2.0	0.09	0.09
38.0 x 30.0	51	2.5 x 2.5	2.5 x 2.5	0.11	0.11
44.5 x 25.0	64	2.5 x 2.0	2.5 x 2.0	0.18	0.18
44.5 x 30.0	64	2.5 x 2.5	2.5 x 2.5	0.20	0.20
44.5 x 38.0	64	2.5 x 2.5	2.5 x 2.5	0.22	0.22
57.0 x 30.0	76	2.5 x 2.5	2.5 x 2.5	0.29	0.29

Specified Size $OD_1 \times OD_2$	Length H	Specified Wall Thickness t x t1		Theoretical Weight	
mm	mm	16 bar mm	20 bar mm	16 bar kg	20 bar kg
57.0 x 38.0	76	2.5 x 2.5	2.5 x 2.5	0.29	0.29
57.0 x 44.5	76	2.5 x 2.5	2.5 x 2.5	0.29	0.29
76.1 x 57.0	89	2.5 x 2.5	2.5 x 2.5	0.40	0.40
88.9 x 57.0	89	2.5 x 2.5	2.5 x 2.5	0.44	0.44
88.9 x 76.1	89	2.5 x 2.5	2.5 x 2.5	0.50	0.50
108.0 x 57.0	102	3.0 x 2.5	3.0 x 2.5	0.67	0.67
108.0 x 76.1	102	3.0 x 2.5	3.0 x 2.5	0.75	0.75
108.0 x 88.9	102	3.0 x 2.5	3.0 x 2.5	0.80	0.80
159.0 x 57.0	140	3.0 x 2.5	3.5 x 2.5	1.32	1.54
159.0 x 76.1	140	3.0 x 2.5	3.5 x 2.5	1.44	1.68
159.0 x 88.9	140	3.0 x 2.5	3.5 x 2.5	1.52	1.77
159.0 x 108.0	140	3.0 x 3.0	3.5 x 3.0	1.64	1.91
219.1 x 76.1	152	4.0 x 2.5	4.5 x 2.5	2.49	2.79
219.1 x 88.9	152	4.0 x 2.5	4.5 x 2.5	2.60	2.92
219.1 x 108.0	152	4.0 x 3.0	4.5 x 3.0	2.77	3.11
219.1 x 159.0	152	4.0 x 3.0	4.5 x 3.5	3.21	3.60
267.0 x 108.0	178	4.5 x 3.0	5.5 x 3.0	4.84	5.89
267.0 x 159.0	178	4.5 x 3.0	5.5 x 3.5	5.52	6.71
267.0 x 219.1	178	4.5 x 4.0	5.5 x 4.5	6.31	7.68
323.9 x 159.0	203	5.5 x 3.0	7.0 x 3.5	7.63	9.65
323.9 x 219.1	203	5.5 x 4.0	7.0 x 4.5	8.60	10.89
323.9 x 267.0	203	5.5 x 4.5	7.0 x 5.5	9.38	11.87

BUTT WELDING FITTINGS

Reducers

Specified Size $OD_1 \times OD_2$	Length H	Specified Wall Thickness $t \times t_1$		Theoretical Weight	
mm	mm	16 bar mm	20 bar mm	16 bar mm	20 bar mm
368 x 219.1	330	6.5 x 4.0	8.0 x 4.5	17.24	21.50
368 x 267	330	6.5 x 4.5	8.0 x 5.5	18.68	23.00
368 x 323.9	330	6.5 x 5.5	8.0 x 7.0	20.39	25.00
419 x 267	356	7.0 x 4.5	9.0 x 5.5	23.44	30.00
419 x 323.9	356	7.0 x 5.5	9.0 x 7.0	25.43	32.50
419 x 368	356	7.0 x 6.5	9.0 x 8.0	26.97	34.50
457.2 x 323.9	381	8.0 x 5.5	9.5 x 7.0	30.70	37.03
457.2 x 368	381	8.0 x 6.5	9.5 x 8.0	34.06	41.50
457.2 x 419	381	8.0 x 7.0	9.5 x 9.0	37.90	46.50
508 x 368	508	8.5 x 6.5	11.0 x 8.0	50.80	64.10
508 x 419	508	8.5 x 7.0	11.0 x 9.0	55.40	71.10
508 x 457.2	508	8.5 x 8.0	11.0 x 9.5	61.20	75.70

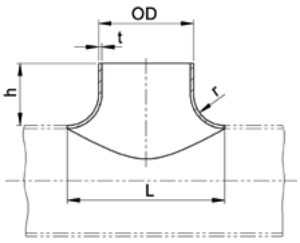
Specified Size $OD_1 \times OD_2$	Length H	Specified Wall Thickness $t \times t_1$		Theoretical Weight	
mm	mm	16 bar mm	20 bar mm	16 bar mm	20 bar mm
610 x 419	508	10.5 x 7.0	13 x 9	70.00	87.50
610 x 457.2	508	10.5 x 8.0	13 x 9.5	76.30	92.50
610 x 508	508	10.5 x 8.5	13 x 11	81.80	102.80
711 x 457.2	610	12.0 x 8.0	15 x 9.5	109.30	133.60
711 x 508	610	12.0 x 8.5	15 x 11	116.30	146.70
711 x 610	610	12.0 x 10.5	15 x 13	137.30	170.10
813 x 508	610	13.5 x 8.5	17 x 11	136.40	172.60
813 x 610	610	13.5 x 10.5	17 x 13	158.40	197.30
813 x 711	610	13.5 x 12.0	17 x 15	179.50	224.20
914 x 610	610	15.5 x 10.5	19 x 13	185.00	226.70
914 x 711	610	15.5 x 12	19 x 15	207.10	255.00
914 x 813	610	15.5 x 13.5	19 x 17	231.30	285.80

Saddle Pieces

Type and Construction
Saddle pieces are in accordance with EEMUA 234 / 13. Saddle pieces up to including 12 inch / 323.9 mm are supplied in seamless. Larger dimensions are manufactured from seamless or welded pipes as well as plates.

Dimensions
Dimensions are based on EEMUA 234 / 13, Figures 7 – 9 and Tables 60 – 65. Saddle pieces with other dimensions are available on request.

Tolerances
The tolerances are based on EEMUA 234 / 13, Tables 62 – 63.



seamless

Weld Preparation
Welding ends of butt weld ends for wall thickness less than 3 mm, the saddle pieces are supplied with plain weld ends. Larger thicknesses are supplied with the weld bevel of 37.5° ± 2.5°.

Seamless Saddle Pieces

Header Specified OD	Branch Size Range	t	t	Dimension	Tolerance on	Dimension	Tolerance on	Theo-retical Weight
mm	mm	16 bar mm	20 bar mm	L mm	L mm	h mm	h mm	r mm
All header sizes equal to or larger than branch up to and in-cluding 914 x 15.5 (16 bar) 610 x 13 (20 bar)	323.9	5.5	7.0	560	± 6	185	± 2.5	100
	267.0	4.5	5.5	447	± 6	155	± 2.5	90
	219.1	4.0	4.5	379	± 5	125	± 2.5	80
	159.0	3.0	3.5	279	± 4	95	± 1.6	60
	108.0	3.0	3.0	188	± 4	75	± 1.6	40
	88.9	2.5	2.5	149	± 3	55	± 1.6	30
	76.1	2.5	2.5	126	± 3	50	± 1.6	25
	57.0	2.5	2.5	97	± 3	40	± 1.6	20
	44.5	2.5	2.5	74	± 3	35	± 1.6	15
	38.0	2.5	2.5	64	± 3	35	± 1.6	13

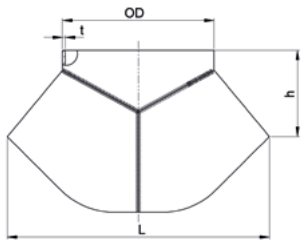
Note: Other sizes and reducing saddles are available on request.

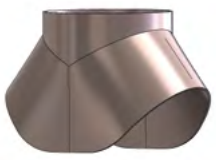
Saddle Pieces (16 bar rating)

Type and Construction
Saddle pieces are in accordance with EEMUA 234 / 13. Saddle pieces up to including 12 inch / 323.9 mm are supplied in seamless. Larger dimensions are manufactured from seamless or welded pipes as well as plates.

Dimensions
Dimensions are based on EEMUA 234/13, Figures 7 – 9 and Tables 60 – 65. Saddle pieces with other dimensions are available on request.

Tolerances
The tolerances are based on EEMUA 234/13, Tables 62 – 63.





seamwelded

Weld Preparation
Welding ends of butt weld ends for wall thickness less than 3 mm, the saddle pieces are supplied with plain weld ends. Larger thicknesses are supplied with the weld bevel of 37.5° ± 2.5°.

Seamwelded Saddle Pieces (16 bar rating)

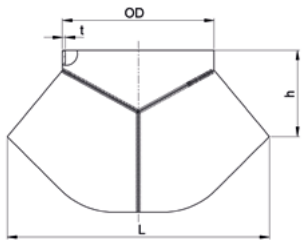
Header Specified OD	Branch Size Range	Dimension	Tolerance on	Dimension	Tolerance on
mm	mm	L mm	L mm	h mm	h mm
All header sizes equal to or larger than branch in the range 323.9 x 5.5 up to and including 914 x 15.5	914 x 15.5	1550	± 7	460	± 3.5
	813 x 13.5	1400	± 7	410	± 3.5
	711 x 12.0	1225	± 7	360	± 3.5
	610 x 10.5	1020	± 7	300	± 3.0
	508 x 8.5	880	± 6	275	± 3.0
	457.2 x 8.0	800	± 6	250	± 3.0
	419 x 7.0	680	± 6	225	± 3.0
	368 x 6.5	613	± 6	200	± 3.0
	323.9 x 5.5	560	± 6	185	± 2.5
	267 x 4.5	447	± 5	155	± 2.5
	219.1 x 4.0	379	± 5	125	± 1.6

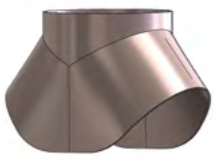
Saddle Pieces (20 bar rating)

Type and Construction
Saddle pieces are in accordance with EEMUA 234 / 13. Saddle pieces up to including 12 inch / 323.9 mm are supplied in seamless. Larger dimensions are manufactured from seamless or welded pipes as well as plates.

Dimensions
Dimensions are based on EEMUA 234 / 13, Figures 7 – 9 and Tables 60 – 65. Saddle pieces with other dimensions are available on request.

Tolerances
The tolerances are based on EEMUA 234 / 13, Tables 62 – 63.





Seamwelded

Weld Preparation
Welding ends of butt weld ends for wall thickness less than 3 mm, the saddle pieces are supplied with plain weld ends. Larger thicknesses are supplied with the weld bevel of 37.5° ± 2.5°.

Seamwelded Saddle Pieces (20 bar rating)

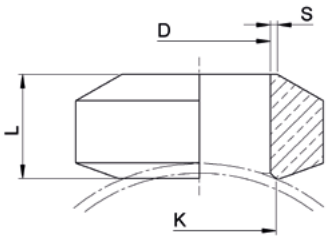
Header Specified OD	Branch Size Range	Dimension	Tolerance on	Dimension	Tolerance on
mm	mm	L mm	L mm	h mm	h mm
All header sizes equal to or larger than branch in the range 323.9 x 7.0 up to and including 610 x 13.0	610 x 13	1020	± 7	300	± 3.0
	508 x 11	880	± 7	275	± 3.0
	457.2 x 9.5	800	± 6	250	± 3.0
	419 x 9.0	680	± 6	225	± 3.0
	368 x 8.0	613	± 6	200	± 3.0
	323.9 x 7.0	560	± 6	185	± 2.5
	267 x 5.5	447	± 5	155	± 2.5
	219.1 x 4.5	379	± 5	125	± 1.6

Welding Outlets

Self Reinforced Branch Connector - Butt Welding Type

Type and Construction
Welding outlets are in accordance with EEMUA 234 / 12. The components are manufactured by hot forging and machining from extruded bars (solid or hollow).

Dimensions
The dimensions and tolerances are suitable for welding to seamless and seam-welded pipes to EEMUA 234 / 1–2. The branch size covered is from ½ in. / 16 mm to 16 in. / 419 mm. Other branch sizes are available on request. The welding outlets covered are suitable for application to header sizes from ½ in. / 16 mm to 38 in. / 965 mm. The sizes of the header pipes for a given branch size are consolidated in accordance with MSS SP-97, Section 3.3 and Figure 1, whereas the gap distance between the header pipe radius and the fitting inlet radius doesn't exceed 1 / 16 in. / 1.6 mm. The design of the self reinforced connection is in accordance with B31.3 Section 304.3 suitable for both 16 and 20 bar pressure ratings. The additional design feature is the smooth entry into the connection to reduce the turbulences. The overall dimensions are based on EEMUA 234 / 12, Table 57.



section view

Branch Specified OD	Branch Size Range	L	D	K	S
mm	mm	Nom mm	mm	Nom mm	min/max mm
16	16 - 965	18	11.57 - 12.45	12.8 - 17.0	1.8 - 2.0
25	25 - 965	23	20.58 - 21.45	26.0 - 26.0	1.8 - 2.0
30	30 - 965	26	24.48 - 25.56	31.0 - 31.0	2.25 - 2.5
38	38 - 965	29	32.49 - 33.57	34.8 - 40.0	2.25 - 2.5
44.5	44.5 - 965	32	38.99 - 40.07	41.3 - 45.0	2.25 - 2.5
57	57 - 965	36	51.62 - 52.70	53.8 - 58.0	2.25 - 2.5
76.1	76.1 - 965	43	70.65 - 71.80	72.9 - 75.0	2.25 - 2.5
88.9	88.9 - 965	44 - 53	83.50 - 84.65	85.7 - 88.0	2.25 - 2.5

Welding Outlets

Self Reinforced Branch Connector - Butt Welding Type

Branch Specified OD	Branch Size Range	L	D	K	S
mm	mm	Nom mm	mm	Nom mm	min/max mm
108.0	108 - 965	53	101.40 - 102.85	104.8 - 108.0	0.8 - 2.4
159.0	159 - 965	60	151.50 - 153.00	155.8 - 170.0	0.8 - 2.4
219.1	219.1 - 965	70	209.40 - 210.90	215.9 - 219.0	0.8 - 2.4
267.0	267 - 965	78	255.20 - 256.70	263.8 - 267.0	0.8 - 2.4
323.9	323.9 - 965	86	309.00 - 310.50	320.7 - 324.0	0.8 - 2.4
368.0	368 - 965	89	350.00 - 352.00	364.8 - 368.0	0.8 - 2.4
419.0	419 - 965	94	399.00 - 401.00	415.0 - 419.0	0.8 - 2.4

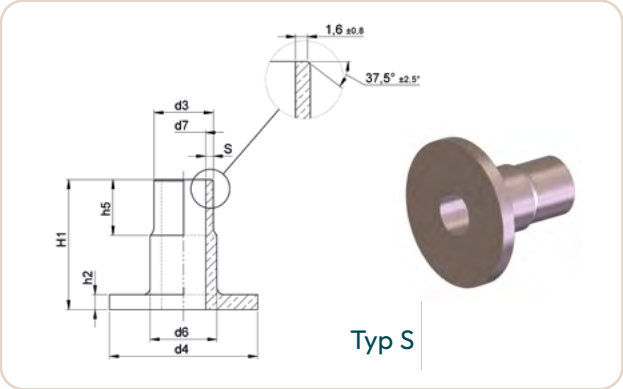
Composite Weld Neck Flanges
Weld Neck Stub Ends and Backing Flanges

Type and Construction
The weld neck stub ends are in accordance with EEMUA 234 / 3 for 16 and 20 bar systems. The range of sizes covered is ½ inch / 16 mm to 36 inch / 914 mm. Other sizes are available on request. The stub ends are subdivided in two types short (Type S) based on DIN 86037 and long (Type L) based on MSS SP – 43 suit the appropriate pipe dimension. The Type L stub ends are included to facilitate the attachments of this type of flange to butt weld welding fittings in accordance with EEMUA 234 / 7.

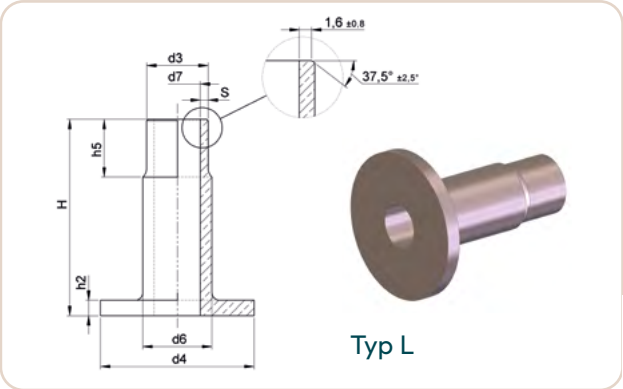
Dimensions
Dimensions are based on EEMUA 234 / 3, Tables 12 – 13.

Tolerances
The tolerances are based on EEMUA 234 / 3, Table 15.

Weld Preparation
The stub ends with S1 < 3 mm are supplied with plain weld ends. Larger dimension are supplied with the weld bevel of 37.5° ± 2.5°.



Typ S



Typ L

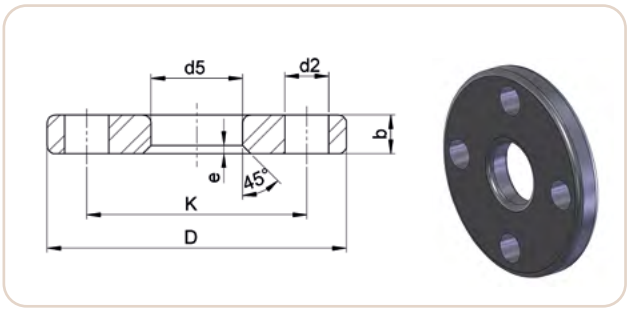
Nom. Size	Spec. Size	d_3	d_4	d_6	16 bar d_7	20 bar d_7	Type S H_1	Type L H	h_2	h_5	16 bar S min.	20 bar S min.
inch	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
½	16.0	16.0	40	18	Use 20 bar	12.00	35	51	4	15	Use 20 bar	2.0
¾	25.0	25.0	50	27		21.00	40	51	5	15		2.0
1	30.0	30.0	60	32		25.00	40	51	5	15		2.5
1 ¼	38.0	38.0	70	40		33.03	40	51	5	15		2.5
1 ½	44.5	44.5	80	46.5		39.53	45	51	6	15		2.5
2	57.0	57.0	99	59		52.16	45	64	6	15		2.5
2 ½	76.1	76.1	120	78		71.23	45	64	6	15		2.5

Nom. Size	Spec. Size	d_3	d_4	d_6	16 bar d_7	20 bar d_7	Type S H_1	Type L H	h_2	h_5	16 bar S min.	20 bar S min.
inch	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
3	88.9	88.9	130	91	Use	84.08	50	64	7	15	Use	2.5
4	108.0	108.0	158	110	20 bar	102.13	50	76	7	15	20 bar	3.0
6	159.0	159.0	212	161.5	153.75	152.38	50	89	9	15	3.0	3.5
8	219.1	219.1	270	222	211.10	210.10	50	102	9	15	4.0	4.5
10	267.0	267.0	320	270	257.97	255.93	50	127	9	15	4.5	5.5
12	323.9	323.9	370	327	312.83	309.74	50	152	11	16	5.5	7.0
14	368.0	368.0	430	371	354.22	351.00	50	152	11	16	6.5	8.0
16	419.0	419.0	482	422	404.17	399.84	50	152	12	16	7.0	9.0
18	457.2	457.2	530	460	441.50	438.50	50	152	12	16	8.0	9.5
20	508.0	508.0	585	511	490.50	486.50	50	152	12	20	8.5	11.0
24	610.0	610.0	685	613	589.50	584.50	60	152	14	20	10.5	13.0
28	711.0	711.0	800	719	687.50	681.50	60	190	19	24	12.0	15.0
32	813.0	813.0	905	821	786.50	779.50	60	190	20.5	24	13.5	17.0
36	914.0	914.0	1000	922	883.50	876.50	60	190	22	32	15.5	19.0

Composite Weld Neck Flanges
Weld Neck Stub Ends and Backing Flanges

Type and Construction
The weld neck backing flanges are in accordance with EEMUA 234/3 and are suitable for both 16 and 20 bar pressure rating. The range of sizes covered is ½ inch / 16 mm to 36 inch / 914 mm Class 150. Other sizes are available on request. Drilling and outside diameter dimensions of flange sizes ½ inch / 16 mm-24 inch / 610 mm are in accordance with ANSI B16.5 and BS EN 1759-1:2004, whereas the larger sizes, 28 inch / 711 mm-36 inch / 914 mm are in accordance with MSS SP-44.

The backing flanges are manufactured from forged carbon steel in accordance with ASTM A105N. The chemical composition and mechanical properties of the components are in accordance with EEMUA 234/3, Table 18. The recommended bolting is in accordance with ASTM A193-B7. Unless otherwise specified the flanges are protected by hot dipped galvanising.



Dimensions
Dimensions are based on EEMUA 234/3, Table 14.

Tolerances
The tolerances are based on EEMUA 234/3, Table 16.

Nom. Size	Spec. Size	D	b min.	d_2		d_5	K	No. of	e	Theoretical Total Weight incl. Stub End – kg			
inch	mm	mm	mm	inch	mm	mm	mm	Bolts	mm	S	16 bar L	S	20 bar L
½	16.0	89	14	⅝	15.9	19	60.3	4	2			0.64	0.66
¾	25.0	98	14	⅝	15.9	28	69.8	4	3			0.8	0.9
1	30.0	108	14	⅝	15.9	33	79.4	4	3	As for 20 bar		1.0	1.0
1 ¼	38.0	117	14	⅝	15.9	41	88.9	4	3			1.2	1.3
1 ½	44.5	127	14	⅝	15.9	48	98.4	4	3			1.5	1.6

Nom. Size	Spec. Size	D	b min.	d_2		d_5	K	No. of	e	Theoretical Total Weight incl. Stub End – kg			
inch	mm	mm	mm	inch	mm	mm	mm	Bolts	mm	S	16 bar L	S	20 bar L
2	57.0	152	18	¾	19.0	62	120.6	4	3	As for 20 bar		2.5	2.6
2 ½	76.1	178	18	¾	19.0	81	139.7	4	3			3.3	3.4
3	88.9	190	19	¾	19.0	94	152.4	4	3			3.8	3.9
4	108.0	229	24	¾	19.0	113	190.5	8	3			6.6	6.9
6	159.0	279	27	⅞	22.2	164	241.3	8	4	9.7	10.4	9.9	10.7
8	219.1	343	31	⅞	22.2	225	298.4	8	5	15.0	16.7	15.1	17.0
10	267.0	406	38	1	25.4	273	362.0	12	5	23.1	26.6	23.5	27.5
12	323.9	483	41	1	25.4	330	431.8	12	7	34.6	41.0	35.2	43.1
14	368.0	533	45	1 ⅛	28.6	374	476.2	12	7	44.7	53.4	45.5	55.8
16	419.0	597	51	1 ⅛	28.6	426	539.8	16	7	60.0	70.5	60.6	72.5
18	457.2	635	52	1 ¼	31.8	465	577.8	16	7	66.0	78.0	68.0	84.3
20	508.0	698	58	1 ¼	31.8	517	635.0	20	7	84.4	98.7	86.0	103.5
24	610.0	813	71	1 ⅜	34.9	618	749.3	20	9	131.4	149.8	134.0	156.5
28	711.0	927	81	1 ⅜	34.9	727	864.0	28	9	180.3	202.9	183.6	212.1
32	813.0	1060	95	1 ⅝	41.1	829	978.0	28	9	269.0	296.8	275.5	311.2
36	914.0	1168	105	1 ⅝	41.1	931	1086.0	32	9	335.8	369.8	341.0	385.8

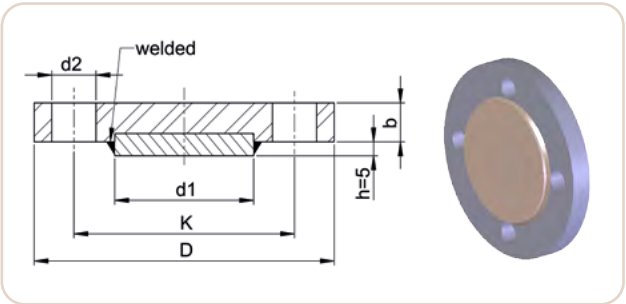
FLANGES

Composite Blind Flanges

Type and Construction
The composite blind flanges are in accordance with manufacturer's specification. The range of sizes covered is ½ in. / 16 mm to 36 inch / 914 mm Class 150. Drilling and outside diameter dimensions of flange sizes ½ in. / 16 mm – 24 inch / 610 mm are in accordance with ANSI Class 150, whereas the larger sizes, 28 inch / 711 mm – 36 inch / 914 mm are in accordance with MSS SP-44. The blind flanges are suitable for use both 16 and 20 bar systems. The composite blind flanges are manufactured from forged carbon steel in accordance with ASTM A105N with a welded C70620 copper nickel disc. The recommended bolting is in accordance with ASTM A193-B7 and ASTM A194-2H and should be suitably protected from corrosion. Unless otherwise specified the flanges are protected by hot dipped galvanising.

The recommended bolting is in accordance with ASTM A193-B7 and ASTM A194-2H and should be suitably protected from corrosion. Unless otherwise specified the flanges are protected by hot dipped galvanising.

Tolerances
Dimension and Tolerances acc. ASME B 16.5 except flange thickness acc. to EEMUA 234.



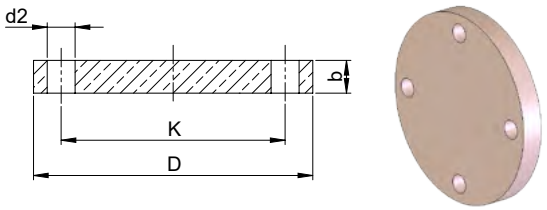
Size	Size	Flange Diameter D	K	Diameter of Bolt Holes d_2		Flange Thickness b	Diameter of Disc d_1	No. of Bolt	Theoretical Total Weight
inch	mm	mm	mm	inch	mm	S	16 mm	Holes	kg
½	16.0	89	60.3	⅝	15.9	14	40	4	0.82
¾	25.0	98	69.8	⅝	15.9	14	50	4	1.04
1	30.0	108	79.4	⅝	15.9	14	50	4	1.31
1 ¼	38.0	117	88.9	⅝	15.9	14	70	4	1.58
1 ½	44.5	127	98.4	⅝	15.9	14	80	4	1.90

Size	Size	Flange Diameter D	K	Diameter of Bolt Holes d_2		Flange Thickness b	Diameter of Disc d_1	No. of Bolt	Theoretical Total Weight
inch	mm	mm	mm	inch	mm	S	16 mm	Holes	kg
2	57.0	152	120.6	¾	19.0	18	99	4	3.01
2 ½	76.1	178	139.7	¾	19.0	18	120	4	4.68
3	88.9	190	152.4	¾	19.0	19	130	4	5.70
4	108.0	229	190.5	¾	19.0	24	158	8	8.67
6	159.0	279	241.3	⅞	22.2	27	212	8	15.46
8	219.1	343	298.4	⅞	22.2	31	270	8	24.90
10	267.0	406	362.0	1	25.4	38	320	12	41.23
12	323.9	483	431.8	1	25.4	41	370	12	70.55
14	368.0	533	476.2	1 ⅛	28.6	45	430	12	93.16
16	419.0	597	539.8	1 ⅛	28.6	51	482	16	123.99
18	457.2	635	577.8	1 ¼	31.8	52	530	16	147.55
20	508.0	698	635.0	1 ¼	31.8	58	585	20	191.00
24	610.0	813	749.3	1 ⅜	34.9	71	685	20	285.74
28	711.0	927	864.0	1 ⅜	34.9	81	800	28	434.66
32	813.0	1060	978.0	1 ⅝	41.1	95	905	28	665.63
36	914.0	1168	1086.0	1 ⅝	41.1	105	1000	32	886.43

Solid Blind Flanges

Type and Construction
The basic metric dimensions for drilling and flange outside diameters are those given in ANSI B16.5-2017, BS EN 1759-1:2004 and MSS SP-44-2006 for Class 150 rating with inch size bolting. The range of sizes covered is ½ inch to 24 inch. One side of the flange is produced with a serrated finish.

The blind flanges are suitable for use in 16 and 20 bar systems. All items are made of Osna10 to cover material grade UNS C 70620 and C 7060X as well. Flanges in Raised face, Class 300 and ANSI B16.47 are available upon request.



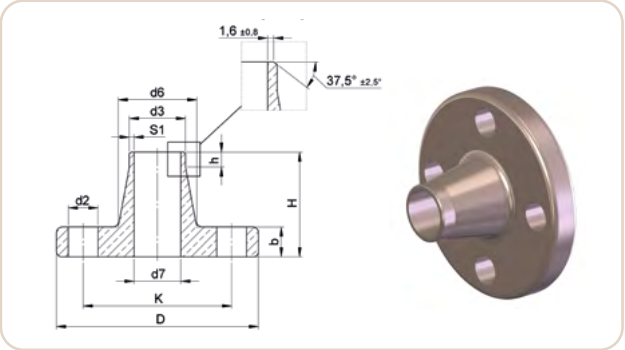
Tolerances
Tolerances are in accordance with ANSI B 16.5-2017.

Nom. Size	Spec. Size	Flange Diameter D	K	Diameter of Bolt Holes d_2		Flange Thickness b	No. of Bolt	Theoretical Total Weight
inch	mm	mm	mm	inch	mm	min mm	Holes	kg
½	16/213	90	60.3	⅝	15.9	9.6	4	0.54
¾	25/26.7	100	69.8	⅝	15.9	11.2	4	0.72
1	30/33.4	110	79.4	⅝	15.9	12.7	4	1.08
1¼	38/42.2	115	88.9	⅝	15.9	14.3	4	1.41
1½	44.5/48.3	125	98.4	⅝	15.9	15.9	4	1.86
2	57/60.3	150	120.7	¾	19.0	17.5	4	3.04
2½	76.1/73	180	139.7	¾	19.0	20.7	4	4.67
3	88.9	190	152.4	¾	19.0	22.3	4	5.64
4	108/114.3	230	190.5	¾	19.0	22.3	8	8.52
6	159/168.3	280	241.3	⅞	22.2	23.9	8	13.01

Nom. Size	Spec. Size	Flange Diameter D	K	Diameter of Bolt Holes d_2		Flange Thickness b	No. of Bolt	Theoretical Total Weight
inch	mm	mm	mm	inch	mm	min mm	Holes	kg
8	219.1	345	298.5	⅞	22.2	27.0	8	22.91
10	267 / 273	405	362.0	1	25.4	28.6	12	33.80
12	323.9	485	431.8	1	25.4	30.2	12	50.26
14	368 / 355.6	535	476.3	1⅛	28.6	33.4	12	68.33
16	419 / 406.4	595	539.8	1⅛	28.6	35.0	16	88.68
18	457	635	577.9	1¼	31.8	38.1	16	109.00
20	508	700	635.0	1¼	31.8	41.3	20	141.90
24	610	815	749.3	1⅜	34.9	46.1	20	216.50

Solid Weld Neck Flanges

Type and Construction
The solid weld neck flanges are in accordance with EEMUA 234/5 for 16 and 20 bar systems. The range of sizes covered is ½ inch/16 mm to 36 inch / 914 mm Class 150. Other sizes are available on request. Drilling and outside diameter dimensions of flange sizes ½ inch/16 mm - 24 inch / 610 mm are in accordance with ANSI B16.5 and BS EN 1759-1:2004, whereas the larger sizes, 28 inch / 711 mm - 36 inch / 914 mm are in accordance with MSS SP - 44. The recommended bolting is in accordance with ASTM B150 alloy UNS C63000.



Dimensions
Dimensions are based on EEMUA 234 / 5, Table 27 - 28.

Tolerances
The tolerances are based on EEMUA 234 / 5, Table 29.

		Outside Diameter of Flange	Thickn. of Flange	Diameter of Hub	Hub Dia at weld	Length Through Hub	16 bar Bore of Flange	20 bar Bore of Flange
Nom. Size inch	Spec. Size mm	D mm	b mm	d_6 mm	d_3 mm	H mm	d_7 mm	d_7 mm
½	16.0	89	14	23	16.0	48		12.00
¾	25.0	98	16	32	25.0	52		21.00
1	30.0	108	16	42	30.0	56		25.00
1 ¼	38.0	117	17	51	38.0	57		33.03
1 ½	44.5	127	20	61	44.5	62	Use 20 bar	39.53
2	57.0	152	25	73	57.0	64		52.16
2 ½	76.1	178	27	91	76.1	70		71.23
3	88.9	190	27	105	88.9	70		84.08
4	108.0	229	27	135	108.0	76		102.13

		Outside Diameter of Flange	Thickn. of Flange	Diameter of Hub	Hub Dia at weld	Length Through Hub	16 bar Bore of Flange	20 bar Bore of Flange
Nom. Size inch	Spec. Size mm	D mm	b mm	d_6 mm	d_3 mm	H mm	d_7 mm	d_7 mm
6	159.0	279	27	192	159.0	89	153.75	152.38
8	219.1	343	31	246	219.1	98	211.10	210.10
10	267.0	406	31	305	267.0	98	257.97	255.93
12	323.9	483	35	365	323.9	98	312.83	309.74
14	368.0	533	41	400	368.0	99	354.22	351.00
16	419.0	597	43	457	419.0	106	404.17	399.84
18	457.2	635	45	505	457.2	113	441.50	438.50
20	508.0	698	45	559	508.0	118	490.50	486.50
24	610.0	813	49	664	610.0	137	589.50	584.50
28	711.0	927	72	748	711.0	145	687.50	681.40
32	813.0	1060	72	876	813.0	160	786.50	779.50
36	914.0	1168	72	984	914.0	175	883.50	876.50

It should be noted that although these flanges are flat faced, inside bolt circle gaskets shall be used and special care should be taken to avoid overtightening the bolting.

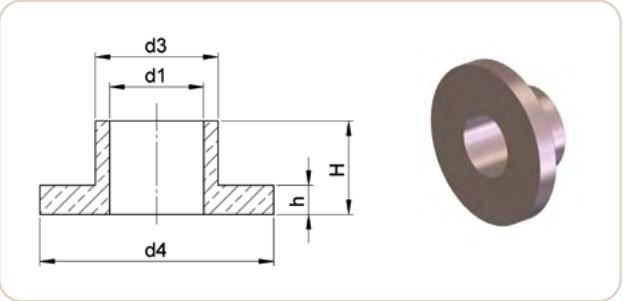
FLANGES

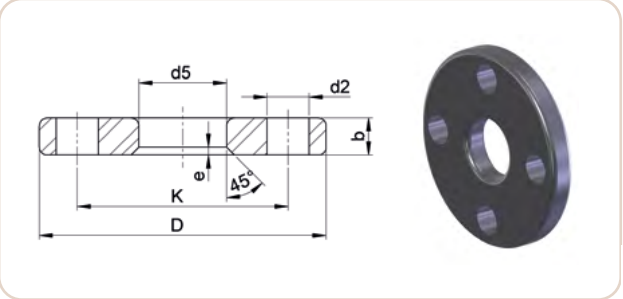
Solid Weld Neck Flanges

Nom. Size inch	Spec. Size mm	16 bar Thickn. of Hub at Welding End S_1 min mm	20 bar Thickn. of Hub at Welding End S_1 min mm	16 bar Theo-retical Weight kg	20 bar Theo-retical Weight kg	Parallel Length of Hub h mm	Diameter of Bolt Circle K mm	Drilling No. of Bolts	Diameter of Bolt Holes d_2 mm
½	16.0	Use 20 bar	2.0	Use 20 bar	0.7	8	60.3	4	15.9
¾	25.0		2.0		1.0	7	69.8	4	15.9
1	30.0		2.5		1.3	8	79.4	4	15.9
1 ¼	38.0		2.5		1.6	8	88.9	4	15.9
1 ½	44.5		2.5		2.2	7	98.4	4	15.9
2	57.0		2.5		3.6	9	120.6	4	19.0
2 ½	76.1		2.5		5.3	8	139.7	4	19.0
3	88.9		2.5		5.8	8	152.4	4	19.0
4	108.0		3.0		8.7	8	190.5	8	19.0
6	159.0	3.0	3.5	12.3	12.6	8	241.3	8	22.2
8	219.1	4.0	4.5	19.1	19.4	8	298.4	8	22.2
10	267.0	4.5	5.5	26.2	26.9	8	362.0	12	25.4
12	323.9	5.5	7.0	39.7	41.0	8	431.8	12	25.4
14	368.0	6.5	8.0	50.9	52.5	8	476.2	12	28.6
16	419.0	7.0	9.0	65.8	68.4	8	539.8	16	28.6
18	457.2	8.0	9.5	76.6	78.7	8	577.8	16	31.8
20	508.0	8.5	11.0	92.3	95.5	8	635.0	20	31.8
24	610.0	10.5	13.0	133.1	138.7	8	749.3	20	34.9
28	711.0	12.0	15.0	206.4	214.7	8	864.0	28	34.9
32	813.0	13.5	17.0	285.8	297.5	8	978.0	28	41.1
36	914.0	15.5	19.0	349.6	364.7	8	1086.0	32	41.1

Composite Slip-On Flanges
Slip-On Stub Ends and Slip-On Backing Flanges

Type and Construction
The slip-on stub ends are in accordance with EEMUA 234 / 4 and are suitable for 16 and 20 pressure rating. The range of sizes covered is ½ inch / 16 mm to 4 inch / 108 mm Class 150. The slip-on backing flanges are in accordance with EEMUA 234 / 4. Drilling and outside diameter dimensions are in accordance with ANSI B16.5 and BS EN 1759 - 1:2004. The backing flanges are suitable for use in both 16 and 20 bar systems. The backing flanges are manufactured from forged carbon steel in accordance with ASTM A105N. The chemical composition and mechanical properties of the components are in accordance with EEMUA 234 / 4, Table 25. The recommended bolting is in accordance with ASTM A193 - B7. Unless otherwise specified the flanges are protected by hot dipped galvanising.





Dimensions
Dimensions are based on EEMUA 234 / 4, Tables 20 – 21.

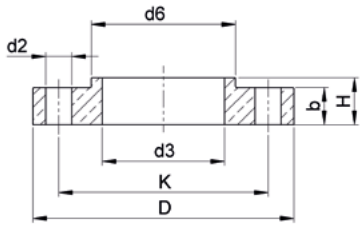
Tolerances
The tolerances are based on EEMUA 234 / 4, Tables 22 – 23.

		Inner Stub End Dimension					Outer Steel Flange – Dimension						Bolt Holes	Theo-retical Total Weight
Nom. Size inch	Spec. Size mm	d_1 mm	d_2 mm	d_4 mm	H mm	h mm	D mm	b mm	K mm	d_5 inch/ mm	d_2 inch/ mm	e mm		kg
½	**16.0**	16.07	21	40	16	5	89	14	60.3	23	⅝ / 15.9	3	4	0.61
¾	**25.0**	25.08	31	53	16	5	98	14	69.8	33	⅝ / 15.9	3	4	0.75
1	**30.0**	30.08	36	60	18	5	108	14	79.4	38	⅝ / 15.9	3	4	0.92
1 ¼	**38.0**	38.10	45	70	18	5	117	14	88.9	47	⅝ / 15.9	3	4	1.10
1 ½	**44.5**	44.60	51	80	19	5	127	14	98.4	53	⅝ / 15.9	3	4	1.30
2	**57.0**	57.23	67	99	19	6	152	18	120.6	69	¾ / 19	3	4	2.20
2 ½	**76.1**	76.33	87	120	19	6	178	18	139.7	89	¾ / 19	3	4	3.00
3	**88.9**	89.18	100	130	21	7	190	19	152.4	103	¾ / 19	3	4	3.50
4	**108.0**	108.38	120	158	23	7	229	24	190.5	123	¾ / 19	3	8	6.00

FLANGES

Solid Slip-On Flanges

Type and Construction
The solid slip-on flanges are in accordance with EEMUA 234 / 6 and are suitable for both 16 and 20 bar systems. The range of sizes covered is ½ inch / 16 mm to 4 inch / 108 mm Class 150. Drilling and outside diameter dimensions are in accordance with ANSI B16.5 and BS EN 1759-1:2004. The recommended bolting is in accordance with ASTM B150 alloy UNS C63000.



Dimensions
Dimensions are based on EEMUA 234 / 6, Table 32.

Tolerances
The tolerances are based on EEMUA 234 / 6, Table 33.

		Nom. Size	Spec. Size	Flange Dia-meter		Flange Thick-ness			Bolt Holes	Dia-meter of Bolt Holes		Theo-retical Total Weight
Nom. Size inch	Spec. Size mm	inch	mm	D mm	d_3 mm	b mm	H mm	d_6 mm		d_2 mm	K mm	kg
½	**16.0**	89	16.07	89	16.07	14	20	23	4	15.9	60.3	0.66
¾	**25.0**	98	25.08	98	25.08	16	24	32	4	15.9	69.8	0.91
1	**30.0**	108	30.08	108	30.08	16	24	47	4	15.9	79.4	1.16
1 ¼	**38.0**	117	38.10	117	38.10	17	26	51	4	15.9	88.9	1.40
1 ½	**44.5**	127	44.60	127	44.60	20	26	61	4	15.9	98.4	1.90
2	**57.0**	152	57.23	152	57.23	25	28	73	4	19.0	120.6	3.30
2 ½	**76.1**	178	76.33	178	76.33	27	32	91	4	19.0	139.7	4.70
3	**88.9**	190	89.18	190	89.18	27	34	105	4	19.0	152.4	5.20
4	**108.0**	229	108.38	229	108.38	27	40	135	8	19.0	190.5	7.70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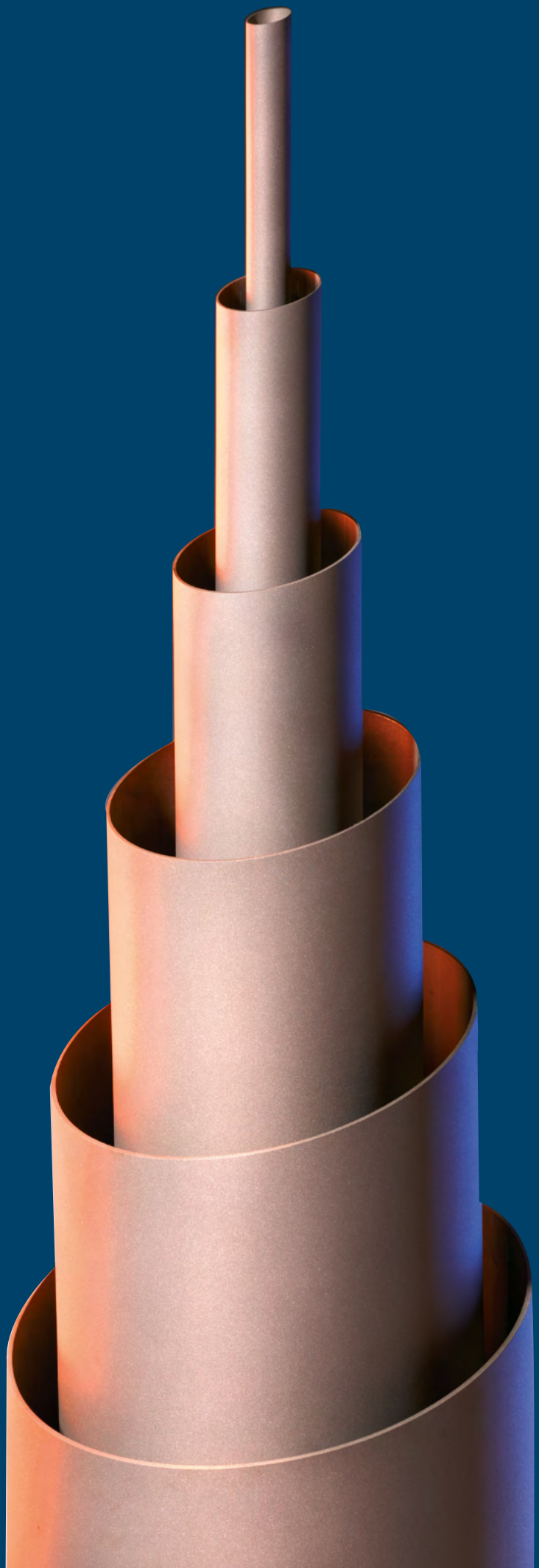
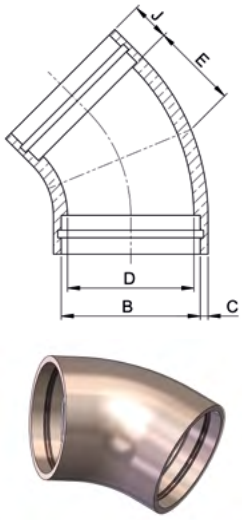


Welding Ends

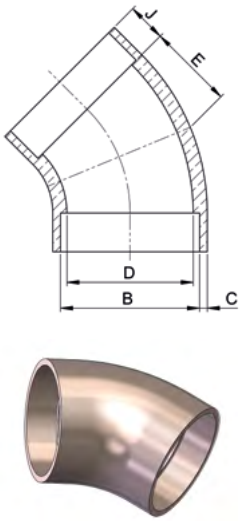
Capillary Brazing Elbow 45°
Socket Welding Elbow 45°

Elbows 45° | 16 mm – 57 mm

CB



SW



		J	B		C socket wall	D	E centre-to socket	Weight
Nom. inch	Spec. mm	min mm	min mm	max mm	min mm	min mm	(+/- 1m)	~kg
½	**16.0**	10	16.070	16.121	3.2	12.0	12.0	0.080
¾	**25.0**	13	25.080	25.131	3.2	21.0	15.5	0.139
1	**30.0**	13	30.080	30.131	3.2	25.0	18.6	0.201
1 ¼	**38.0**	13	38.095	38.146	3.2	33.0	23.6	0.289
1 ½	**44.5**	13	44.595	44.646	3.2	39.5	27.6	0.402
2	**57.0**	16	57.225	57.276	3.2	52.0	35.3	0.552

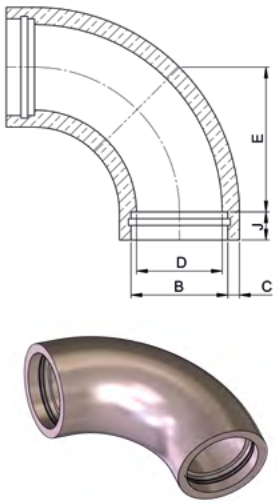
Dimensions Table 45°

CB = Capillary Brazing SW = Socket Welding

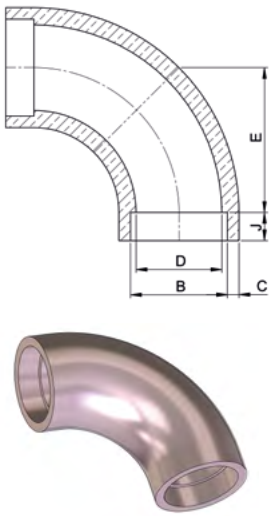
Capillary Brazing Elbow 90°
Socket Welding Elbow 90°

Elbows 90° | 16 mm – 57 mm

CB



SW



		J	B		C socket wall	D	E centre-to socket	Weight
Nom. inch	Spec. mm	min mm	min mm	max mm	min mm	min mm	(+/- 1m)	~kg
½	**16.0**	10	16.070	16.121	3.2	12.0	30.0	0.091
¾	**25.0**	13	25.080	25.131	3.2	21.0	37.5	0.170
1	**30.0**	13	30.080	30.131	3.2	25.0	45.0	0.248
1 ¼	**38.0**	13	38.095	38.146	3.2	33.0	57.0	0.406
1 ½	**44.5**	13	44.595	44.646	3.2	39.5	66.8	0.547
2	**57.0**	16	57.225	57.276	3.2	52.0	85.5	0.831

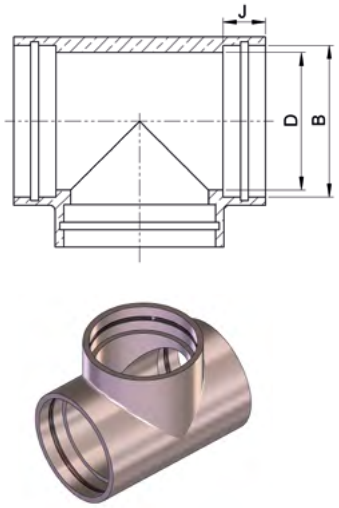
Dimensions Table 90°

CB = Capillary Brazing SW = Socket Welding

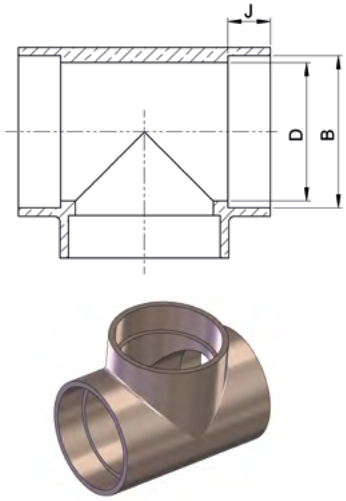
Capillary Brazing Equal Tees
Socket Welding Equal Tees

Equal Tees | 16 mm – 57 mm

CB



SW



		D	B		J	Weight
Nom. inch	Spec. mm	min mm	max mm	min mm	min mm	~kg
½	**16.0**	12.0	16.121	16.070	10	0.107
¾	**25.0**	21.0	25.131	25.080	13	0.193
1	**30.0**	25.0	30.131	30.080	13	0.261
1 ¼	**38.0**	33.0	38.146	38.095	13	0.428
1 ½	**44.5**	39.5	44.646	44.595	13	0.567
2	**57.0**	52.0	57.276	57.225	16	0.804

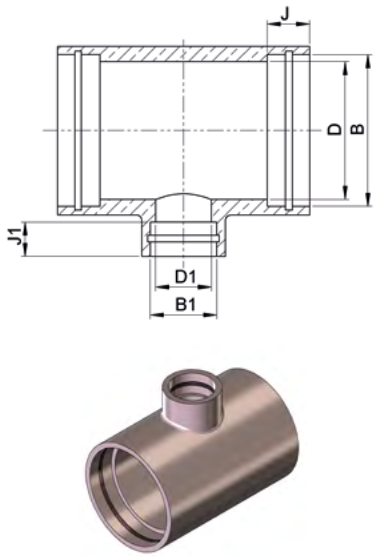
Dimensions Table Equal Tees

CB = Capillary Brazing SW = Socket Welding

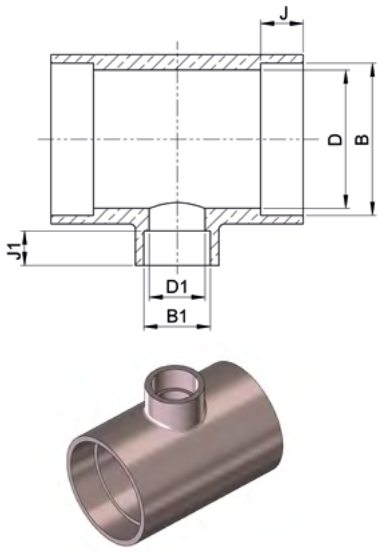
Capillary Brazing Reducing Tees
Socket Welding Reducing Tees

Reducing Tees | 16 mm – 57 mm

CB



SW



		D	B		J	D_1	B_1		J_1	Weight
Nom. inch	Spec. mm	min mm	max mm	min mm	min mm	min mm	min mm	max mm	min mm	~kg
¾ x ½	25 x 16	21.0	25.131	25.080	13	12	16.121	16.070	10	0.196
1 x ½	30 x 16	25.0	30.131	30.080	13	12	16.121	16.070	10	0.270
1 x ¾	30 x 25	25.0	30.131	30.080	13	21	25.131	25.080	13	0.269
1 ¼ x ½	38 x 16	33.0	38.146	38.095	13	12	16.121	16.070	10	0.481
1 ¼ x ¾	38 x 25	33.0	38.146	38.095	13	21	25.131	25.080	13	0.454
1 ¼ x 1	38 x 30	33.0	38.146	38.095	13	25	30.131	30.080	13	0.451

Capillary Brazing Reducing Tees
Socket Welding Reducing Tees

		D	B		J	D_1	B_1		J_1	Weight
Nom. inch	Spec. mm	min mm	max mm	min mm	min mm	min mm	min mm	max mm	min mm	~kg
1 ½ x ½	44.5 x 16	39.5	44.646	44.595	13	12	16.121	16.070	10	0.651
1 ½ x ¾	44.5 x 25	39.5	44.646	44.595	13	21	25.131	25.080	13	0.629
1 ½ x 1	44.5 x 30	39.5	44.646	44.595	13	25	30.131	30.080	13	0.623
1 ½ x 1 ¼	44.5 x 38	39.5	44.646	44.595	13	33	38.146	38.095	13	0.600
2 x ½	57 x 16	52.0	57.276	57.225	16	12	16.121	16.070	10	0.972
2 x ¾	57 x 25	52.0	57.276	57.225	16	21	25.131	25.080	13	0.966
2 x 1	57 x 30	52.0	57.276	57.225	16	25	30.131	30.080	13	0.961
2 x 1 ¼	57 x 38	52.0	57.276	57.225	16	33	38.146	38.095	13	0.939
2 x 1 ½	57 x 44.5	52.0	57.276	57.225	16	39.5	44.646	44.595	13	0.911

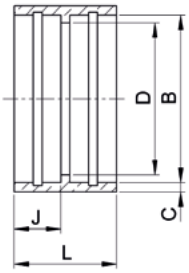
Dimensions Table Reducing Tees

CB = Capillary Brazing SW = Socket Welding

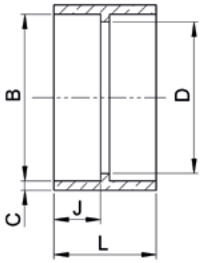
Capillary Brazing Equal Couplings
Socket Welding Equal Couplings

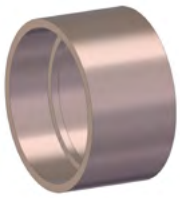
Equal Couplings | 16 mm – 57 mm

CB



SW





		D	B		C	J	Weight
Nom. inch	Spec. mm	min mm	max mm	min mm	min mm	min mm	~kg
½	**16.0**	12.0	16.121	16.070	3.2	10	0.039
¾	**25.0**	21.0	25.131	25.080	3.2	13	0.073
1	**30.0**	25.0	30.131	30.080	3.2	13	0.087
1 ¼	**38.0**	33.0	38.146	38.095	3.2	13	0.108
1 ½	**44.5**	39.5	44.646	44.595	3.2	13	0.132
2	**57.0**	52.0	57.276	57.225	3.2	16	0.201

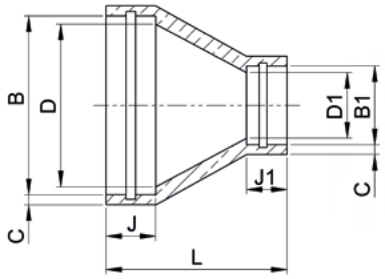
Dimensions Table Equal Couplings

CB = Capillary Brazing SW = Socket Welding

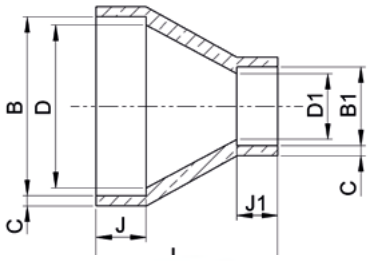
Capillary Brazing Reducing Couplings
Socket Welding Reducing Couplings

Reducing Couplings | 16 mm – 57 mm

CB



SW



CB = Capillary Brazing SW = Socket Welding

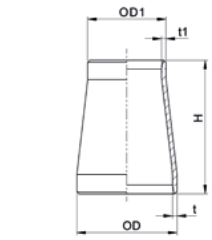
		D	B		J	C	D_1	B_1		J_1	L	Weight
Nom. inch	**Spec. mm**	min mm	max mm	min mm	min mm	min mm	min mm	min mm	max mm	min mm	min mm	~kg
¾ x ½	**25 x 16**	21.0	25.131	25.080	13	3.2	12	16.121	16.070	10	36	0.092
1 x ½	**30 x 16**	25.0	30.131	30.080	13	3.2	12	16.121	16.070	10	37	0.108
1 x ¾	**30 x 25**	25.0	30.131	30.080	13	3.2	21	25.131	25.080	13	33	0.102
1¼ x ½	**38 x 16**	33.0	38.146	38.095	13	3.2	12	16.121	16.070	10	43	0.152
1¼ x ¾	**38 x 25**	33.0	38.146	38.095	13	3.2	21	25.131	25.080	13	37	0.136
1¼ x 1	**38 x 30**	33.0	38.146	38.095	13	3.2	25	30.131	30.080	13	33	0.126
1½ x ½	**44.5 x 16**	39.5	44.646	44.595	13	3.2	12	16.121	16.070	10	49	0.199
1½ x ¾	**44.5 x 25**	39.5	44.646	44.595	13	3.2	21	25.131	25.080	13	43	0.182
1½ x 1	**44.5 x 30**	39.5	44.646	44.595	13	3.2	25	30.131	30.080	13	39	0.174
1½ x 1¼	**44.5 x 38**	39.5	44.646	44.595	13	3.2	33	38.146	38.095	13	32	0.144
2 x ½	**57 x 16**	52.0	57.276	57.225	16	3.2	12	16.121	16.070	10	63	0.322
2 x ¾	**57 x 25**	52.0	57.276	57.225	16	3.2	21	25.131	25.080	13	58	0.310
2 x 1	**57 x 30**	52.0	57.276	57.225	16	3.2	25	30.131	30.080	13	53	0.298
2 x 1¼	**57 x 38**	52.0	57.276	57.225	16	3.2	33	38.146	38.095	13	46	0.268
2 x 1½	**57 x 44.5**	52.0	57.276	57.225	16	3.2	39.5	44.646	44.595	13	40	0.234

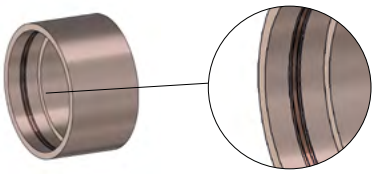
Dimensions Table Reducing Couplings

Capillary Brazing (Half)-Couplings
Socket Welding (Half)-Couplings

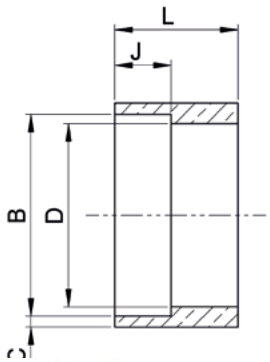
(Half)-Couplings | 16 mm – 57 mm

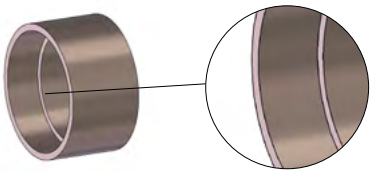
CB





SW





		D	B		C	J	L	Halfcoupling Weight	Coupling Weight
Nom. inch	Spec. mm	min mm	max mm	min mm	min mm	min mm	min mm	~kg	~kg
½	**16.0**	12.0	16.121	16.070	3.2	10	22	0.047	0.039
¾	**25.0**	21.0	25.131	25.080	3.2	13	28	0.090	0.073
1	**30.0**	25.0	30.131	30.080	3.2	13	28	0.112	0.087
1 ¼	**38.0**	33.0	38.146	38.095	3.2	13	28	0.141	0.108
1 ½	**44.5**	39.5	44.646	44.595	3.2	13	29	0.171	0.132
2	**57.0**	52.0	57.276	57.225	3.2	16	35	0.266	0.201

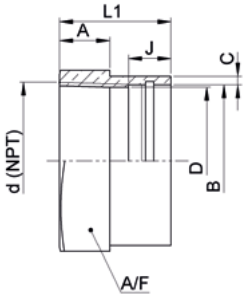
Dimensions Table Brazing (Half)-Couplings / Socket Welding (Half)-Couplings

CB = Capillary Brazing SW = Socket Welding

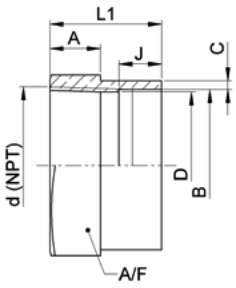
Straight Female Connector

Connector 30 | 16 mm – 57 mm

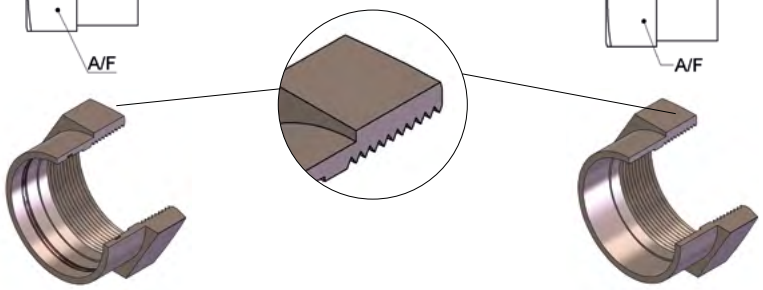
CB



SW



section view



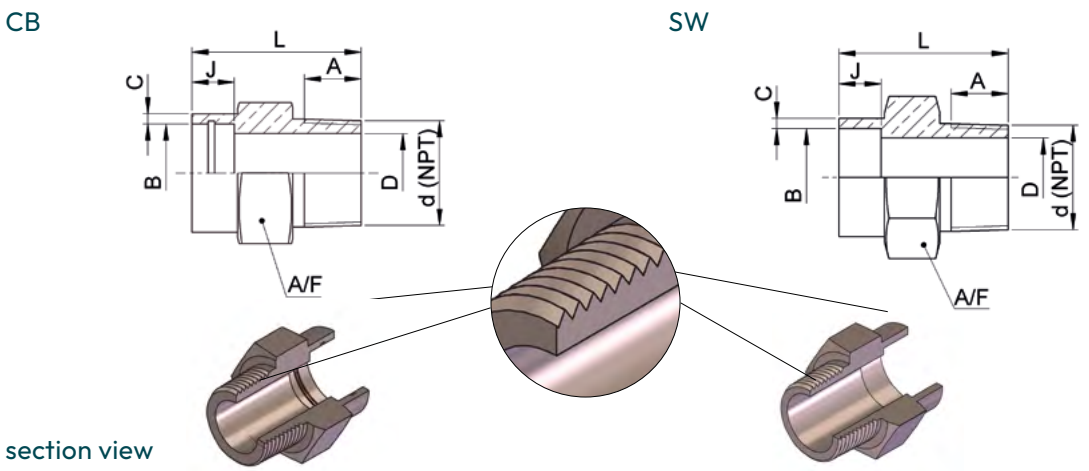
		d Thread NPT	B		C	L_1	J	A	A/F	Weight
Nom. inch	Spec. mm	min mm	max mm	min mm	min mm	mm	min mm	min mm	mm	~kg
½	16.0	½	16.121	16.070	3.2	32	10	13.5	27	0.070
¾	25.0	¾	25.131	25.080	3.2	33	13	14	32	0.110
1	30.0	1	30.131	30.080	3.2	37	13	17.5	41	0.180
1 ¼	38.0	1 ¼	38.146	38.095	3.2	38	13	18	50	0.240
1 ½	44.5	1½	44.646	44.595	3.2	38	13	18.5	55	0.280
2	57.0	2	57.276	57.225	3.2	42	16	19	70	0.470

Dimensions Table Female

CB = Capillary Brazing SW = Socket Welding

Straight Male Connector

Connector 30 | 16 mm – 57 mm



		A Thread NPT	B		C	D	L	J	A	A/F	Weight
Nom. inch	Spec. mm	min mm	max mm	min mm	min mm	mm	mm	min mm	min mm	mm	~kg
½	16.0	½	16.121	16.070	3.2	13.8	40	10	13.5	27	0.090
¾	25.0	¾	25.131	25.080	3.2	18.9	46	13	14	32	0.150
1	30.0	1	30.131	30.080	3.2	24.3	52	13	17.5	41	0.250
1 ¼	38.0	1 ¼	38.146	38.095	3.2	32.5	54	13	18	50	0.350
1 ½	44.5	1 ½	44.646	44.595	3.2	38.1	57	13	18.5	55	0.440
2	57.0	2	57.276	57.225	3.2	49.2	63	16	19	70	0.720

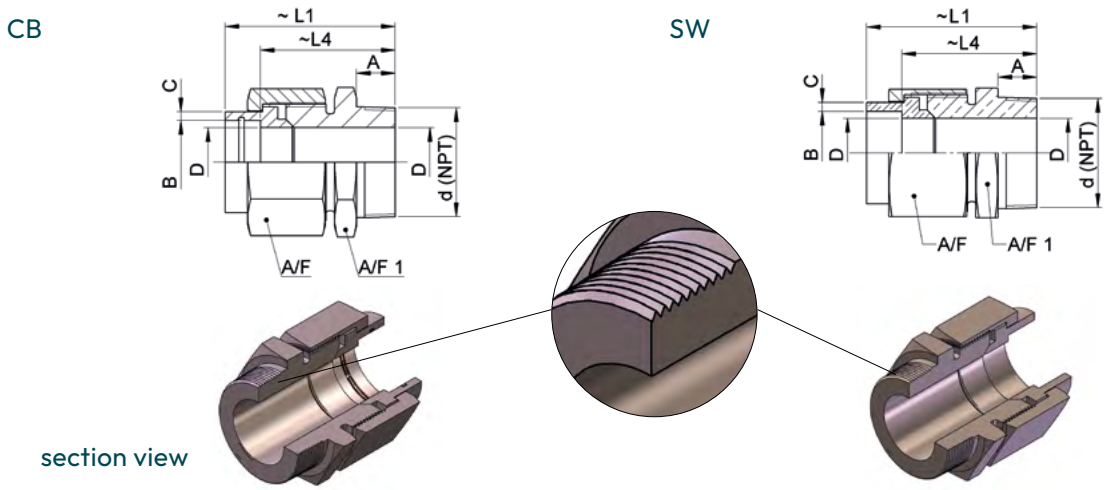
Dimensions Table Male Connector

CB = Capillary Brazing SW = Socket Welding

Male Unions

Socket Welding Unions, Capillary Brazing Unions, Male Unions, Socket Welding x Male Thread, Capillary Brazing x Male Thread

Male Unions | 16 mm – 57 mm male thread 3/4" – 2"



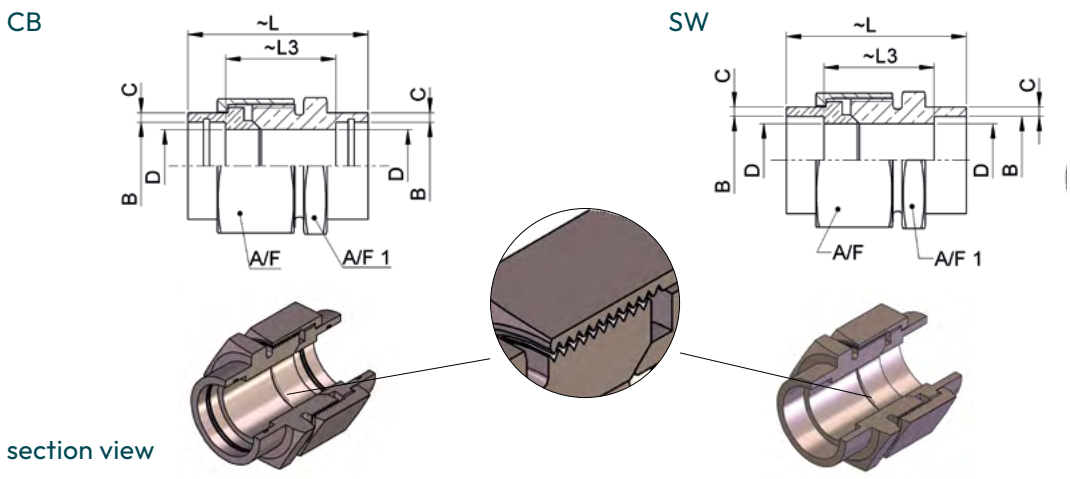
		d Thread	C	B		D	~L_1	~L_4	A	A / F	A / F_1	Weight
Nom. inch	Spec. mm	NPT	min mm	max mm	min mm	min mm	mm	mm	min mm	mm	mm	~kg
½	16.0	¾	3.2	16.121	16.070	12.0	66	56	14	36	32	0.39
¾	25.0	1	3.2	25.131	25.080	21.0	81	68	17.5	46	41	0.69
1	30.0	1¼	3.2	30.131	30.080	25.0	83.5	70.5	18	50	46	0.87
1¼	38.0	1½	3.2	38.146	38.095	33.0	86.5	73.5	18.5	60	55	1.17
1½	44.5	1½	3.2	44.646	44.595	39.5	91.5	78.5	18.5	70	60	1.46
2	57.0	2	3.2	57.276	57.225	52.0	100.5	84.5	19	85	75	2.18

Dimensions Table Male Unions

CB = Capillary Brazing SW = Socket Welding

Unions

Unions | 16 mm – 57 mm



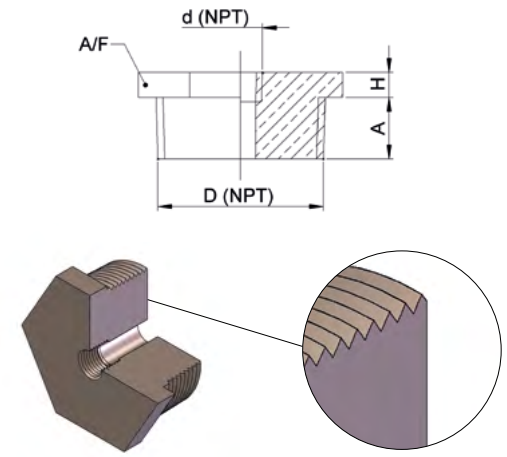
		C	B		D	~L	~L_3	A/F	A/F_1	Weight
Nom. inch	**Spec. mm**	min mm	max mm	min mm	min mm	mm	mm	mm	mm	~kg
½	**16.0**	3.2	16.121	16.070	12.0	58.0	38.0	36	32	0.34
¾	**25.0**	3.2	25.131	25.080	21.0	71.0	45.0	46	41	0.62
1	**30.0**	3.2	30.131	30.080	25.0	72.5	46.5	50	46	0.71
1 ¼	**38.0**	3.2	38.146	38.095	33.0	75.5	49.5	60	55	1.02
1 ½	**44.5**	3.2	44.646	44.595	39.5	80.5	54.5	70	60	1.39
2	**57.0**	3.2	57.276	57.225	52.0	91.5	59.5	85	75	2.12

Dimension Table Unions

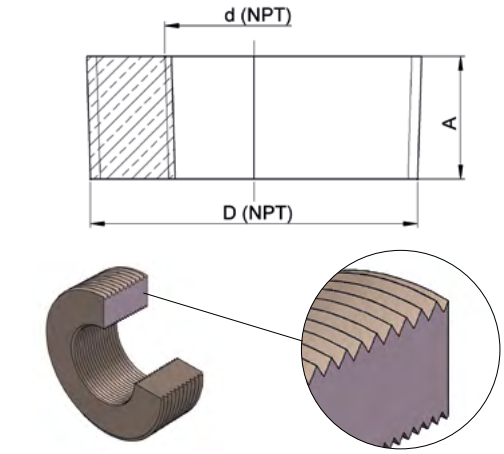
CB = Capillary Brazing SW = Socket Welding

Hexagon Head and Flush Bushings

Hex. Head and Flush Bushings



section view



section view

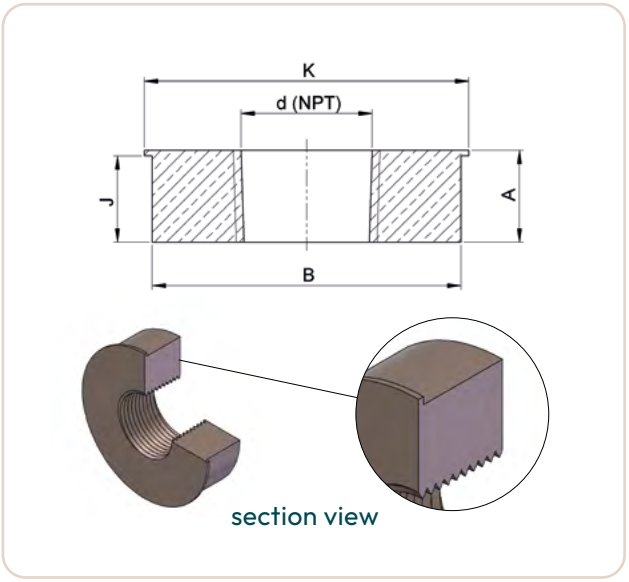
		d Thread	A	H	A/F	Hex. Head Weight	Flush Weight
Nom. Size inch	Thread D NPT	NPT	min mm	mm	mm	~kg	~kg
½	½	¼	14.5	5	22	0.048	0.033
¾	¾	¼	16.0	6	27	0.094	0.065
¾	¾	⅜	16.0	6	27	0.082	0.056
1	1	¼	19.0	6	35	0.181	0.129
1	1	⅜	19.0	6	35	0.167	0.118
1	1	½	19.0	6	35	0.150	0.105
1 ¼	1 ¼	¼	20.5	7	44.5	0.333	0.233
1 ¼	1 ¼	⅜	20.5	7	44.5	0.318	0.221

		d Thread	A	H	A/F	Hex. Head Weight	Flush Weight
Nom. Size inch	Thread D NPT	NPT	min mm	mm	mm	~kg	~kg
1¼	1¼	½	20.5	7	44.5	0.299	0.207
1¼	1¼	¾	20.5	7	44.5	0.260	0.177
1½	1½	¼	20.5	8	51	0.463	0.311
1½	1½	⅜	20.5	8	51	0.447	0.299
1½	1½	½	20.5	8	51	0.428	0.285
1½	1½	¾	20.5	8	51	0.387	0.255
1½	1½	1	20.5	8	51	0.331	0.214
2	2	¼	22.0	9	63.5	0.799	0.530
2	2	⅜	22.0	9	63.5	0.782	0.518
2	2	½	22.0	9	63.5	0.761	0.503
2	2	¾	22.0	9	63.5	0.716	0.471
2	2	1	22.0	9	63.5	0.655	0.427
2	2	1¼	22.0	9	63.5	0.534	0.341
2	2	1½	22.0	9	63.5	0.432	0.268

Dimensions Table

Sprinkler Bushing

Sprinkler Bushing | 25 mm – 57 mm x 1" - 11 / 2" NPT



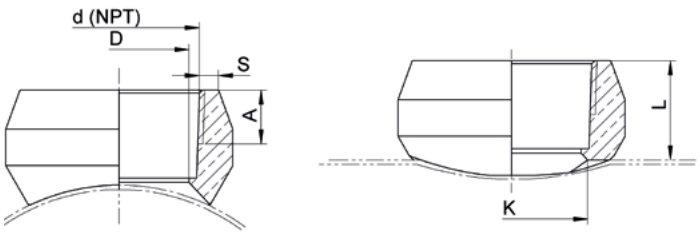
		B		A	J	K	d Thread	Weight
Nom. inch	Spec. mm	max mm	min mm	min mm	mm	mm	NPT	~kg
½	**25.0**	25.031	24.980	14	13	28	½	0.031
1	**30**	30.055	29.975	14	13	33	½	0.058
1 ¼	**38**	38.070	37.990	14	13	41	½	0.112
1 ½	**44.5**	44.570	44.490	14	13	47.5	½	0.165
2	**57**	57.200	57.120	17	16	60	½	0.350
1	**30**	30.055	29.975	14	13	33	¾	0.037
1 ¼	**38**	38.070	37.990	14	13	41	¾	0.091

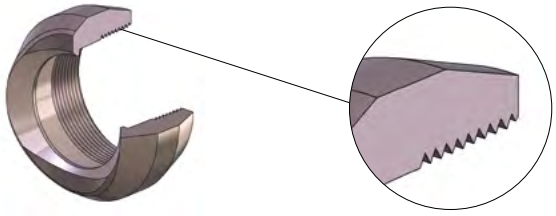
		B		A	J	K	d Thread	Weight
Nom. inch	Spec. mm	max mm	min mm	min mm	mm	mm	NPT	~kg
1 ½	44.5	44.570	44.490	14	13	47.5	¾	0.143
2	57	57.200	57.120	17	16	60	¾	0.324
1 ¼	38	38.070	37.990	14	13	41	1	0.061
1 ½	44.5	44.570	44.490	14	13	47.5	1	0.114
2	57	57.200	57.120	17	16	60	1	0.288
1 ½	44.5	44.570	44.490	14	13	47.5	1 ¼	0.057
2	57	57.200	57.120	17	16	60	1 ¼	0.219
2	57	57.200	57.120	17	16	60	1 ½	0.161

Dimensions Table

Threaded Outlets
Self Reinforced Branch Connector
Threaded Type

Threaded Outlets | 16 mm – 965mm x 1/2" - 2" NPT





section view

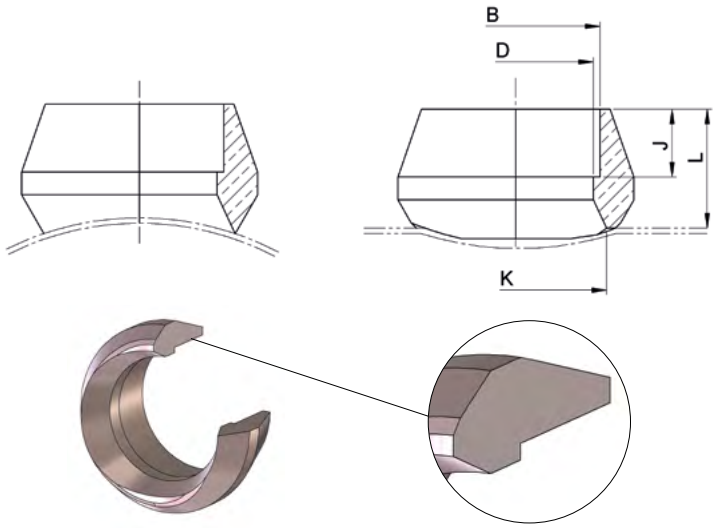
Dimensions Table 16 / ½" - 965 / 38" x 16 / ½" - 57 / 2" - 16 / 20 bar

		L	D	K	A	S
Nom. Branch Size d NPT inch	Header Size mm	Nom mm	Nom mm	Nom mm	min mm	mm
½	16 – 965	24	13.84	14.0 – 21.0	13.5	4.78
¾	25 – 965	24	18.88	21.0 – 26.0	14.0	5.56
1	30 – 965	28	24.30	26.8 – 33.0	17.5	6.35
1 ¼	38 – 965	30	32.50	34.8 – 42.0	18.0	6.35
1 ½	44.5 – 965	33 – 34	38.14	53.8 – 59.5	18.5	7.14
2	57 – 965	34 – 38	49.22	53.8 – 59.5	19.0	8.74

Threaded Outlets

Socket Outlets
Self Reinforced Branch Connector
Socket Welding Type

Socket Outlets | 16 mm – 57 mm x 16 mm - 965 mm



section view

Dimensions Table 16 / ½" - 965 / 38" x 16 / ½" - 57 / 2" - 16 / 20 bar

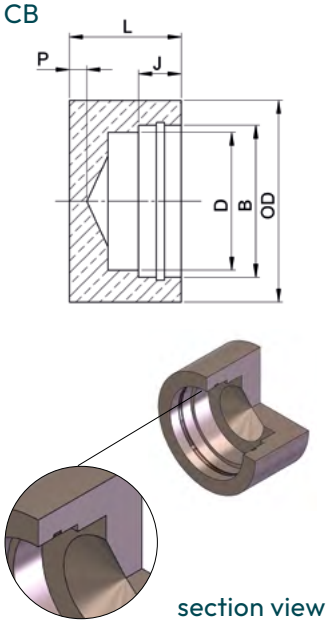
		L	D	K	J	B min/mm
Branch Specified OD mm	**Header Size mm**	**Nom mm**	**max/min mm**	**min mm**	**min mm**	**max/min mm**
16	**16 – 965**	18	11.565 – 12.445	12.8 – 17	10	16.070 – 16.121
25	**25 – 965**	23	20.575 – 21.445	26 – 26	13	25.080 – 25.131
30	**30 – 965**	26	24.475 – 25.555	31 – 31	13	30.080 – 30.131
38	**38 – 965**	29	32.490 – 33.570	34.8 – 40	13	32.490 – 33.570
44.5	**44.5 – 965**	32	38.990 – 40.070	41.3 – 45	13	38.990 – 40.070
57	**57 – 965**	36	51.620 – 52.700	53.8 – 58	16	57.225 – 57.276

Sockets Outlets

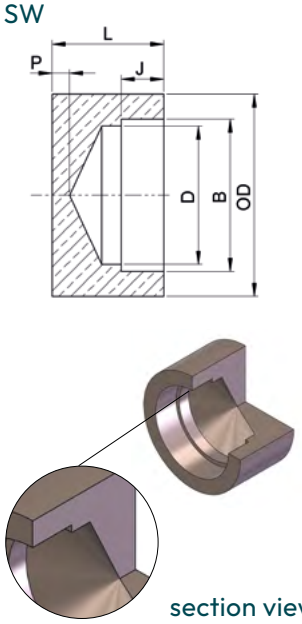
Capillary Brazing End Caps
Socket Welding End Caps / NPT End Caps

End Caps | 16 mm – 57 mm

CB

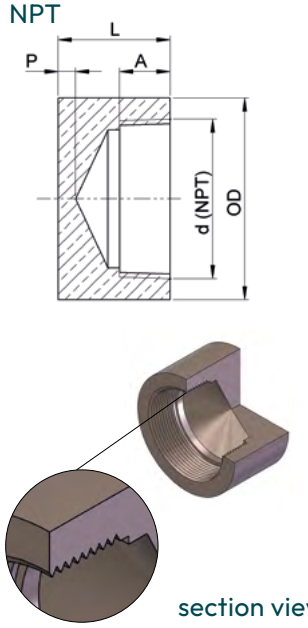


SW



NPT End Caps | 16 mm – 57 mm

NPT



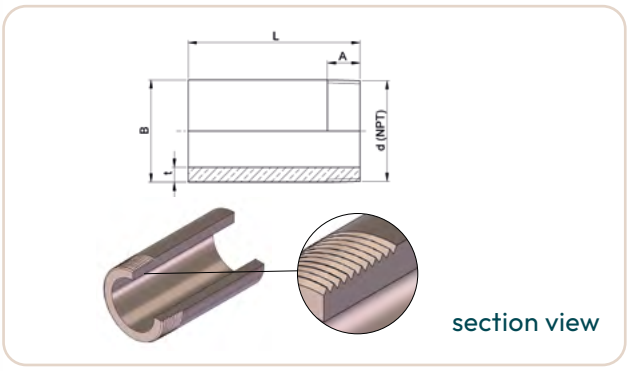
		OD	B		D	L	P	J	A	d	Weight
Nom. inch	Spec. mm	min mm	min mm	max mm	min mm	mm	mm	mm	mm	NPT	~kg
½	**16.0**	29	16.121	16.070	12	32	6.5	10	13.5	½	0.149
¾	**25.0**	35	25.131	25.080	21	37	6.5	13	14.0	¾	0.216
1	**30.0**	44	30.131	30.080	25	38	6.5	13	17.5	1	0.363
1 ¼	**38.0**	57	38.146	38.095	33	41	6.5	13	18.0	1¼	0.665
1 ½	**44.5**	64	44.646	44.595	39.5	41	6.5	13	18.5	1 ½	0.814
2	**57.0**	76	57.276	57.225	52	42	6.5	16	19.0	2	1.098

Dimensions Table

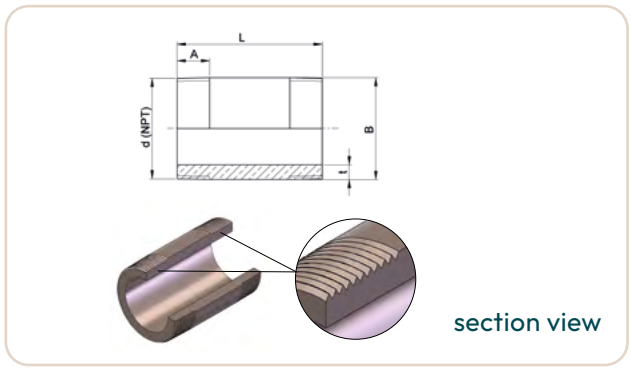
CB = Capillary Brazing SW = Socket Welding

Male Nipple one / Male Nipple both

Male Nipple one | ½" - 2" x 21.3 mm – 60.3 mm



Male Nipple both | 21,3 mm – 60.3 mm

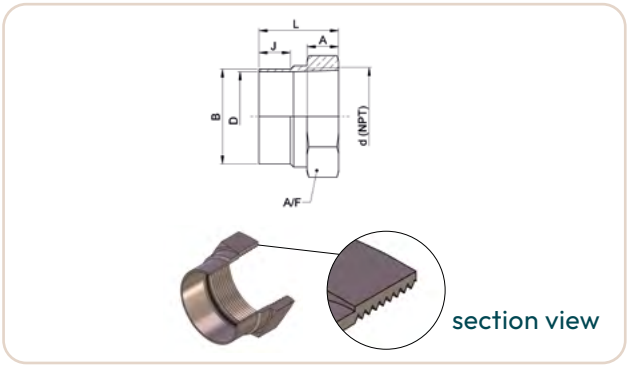


		d Thread	L	A	t	Weight
Nom. inch	B Spec. mm	NPT	min mm	min mm	mm	~kg
½	21.3	½	76.2	13.6	4.78	0.167
¾	26.7	¾	76.2	13.9	5.56	0.248
1	33.4	1	76.2	17.3	6.35	0.362
1 ¼	42.2	1 ¼	76.2	18.0	6.35	0.479
1 ½	48.3	1 ½	76.2	18.4	7.14	0.619
2	60.3	2	76.2	19.2	8.74	0.950
½	21.3	½	101.6	13.6	4.78	0.223
¾	26.7	¾	101.6	13.9	5.56	0.332
1	33.4	1	101.6	17.3	6.35	0.484
1 ¼	42.2	1 ¼	101.6	18.0	6.35	0.641
1 ½	48.3	1 ½	101.6	18.4	7.14	0.828
2	60.3	2	101.6	19.2	8.74	1.270

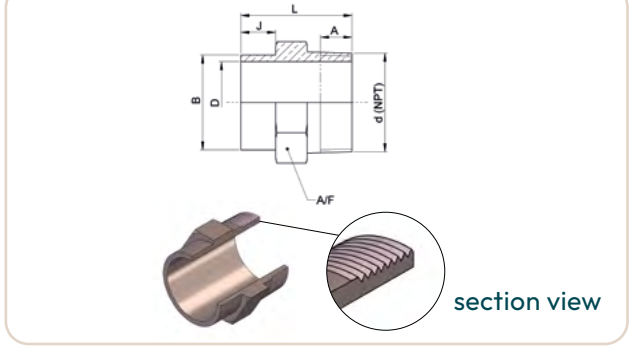
Dimensions Table Male Nipple one

Female Adapter / Male Adapter

Female End Adapter | 16 mm – 57 mm



Male End Adapter | 16 mm – 57 mm



		d Thread	B		D	L	J	A	A/F	Weight
Nom. inch	Spec. mm	NPT	max mm	min mm	min mm	min mm	min mm	min mm	mm	~kg
½	**16.0**	½	16.045	15.965	12	36	13	13.5	27	0.070
¾	**25.0**	¾	25.055	24.975	21	39	16	14	32	0.110
1	**30.0**	1	30.055	29.975	25	43	16	17.5	41	0.190
1 ¼	**38.0**	1 ¼	38.070	37.990	33	44	16	18	50	0.240
1 ½	**44.5**	1 ½	44.570	44.490	39.5	44	16	18.5	55	0.290
2	**57.0**	2	57.200	57.120	52	48	19	19	70	0.470

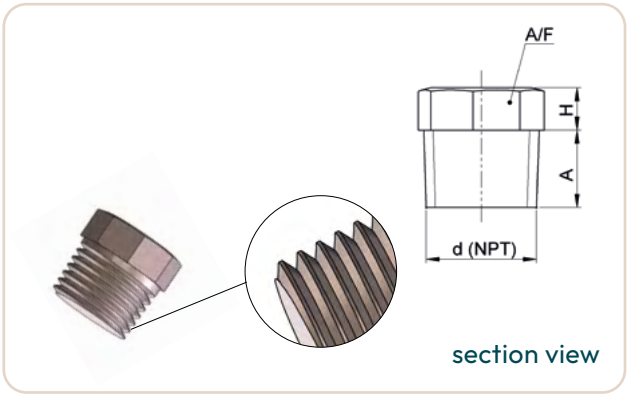
Dimensions Table Female Adaptor

		d Thread	B		D	L	J	A	A/F	Weight
Nom. inch	Spec. mm	NPT	max mm	min mm	min mm	min mm	min mm	min mm	mm	~kg
½	**16.0**	½	16.045	15.965	12.0	44	15	13.5	27	0.100
¾	**25.0**	¾	25.055	24.975	18.9	50	18	14	32	0.140
1	**30.0**	1	30.055	29.975	24.3	56	18	17.5	41	0.240
1 ¼	**38.0**	1 ¼	38.070	37.990	32.5	58	18	18	50	0.340
1 ½	**44.5**	1 ½	44.570	44.490	38.1	61	18	18.5	55	0.440
2	**57.0**	2	57.200	57.120	49.2	67	21	19	70	0.740

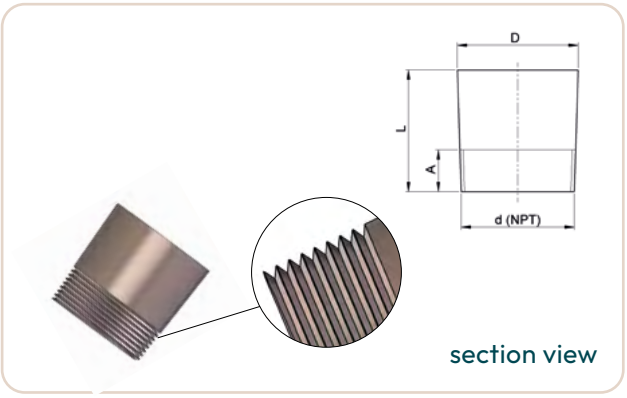
Dimensions Table Male Adaptor

Hexagon Plug / Round Plug

Hex. Plug | 21.3 mm – 60.3 mm ½" - 2"



Round Plug | ½" - 2"



		Width of flats A/F	Hex height H	Length L	Dia of Head D	Hex. Head weight	Round Head weight
Thread d NPT inch	A min mm	mm	min mm	min mm	min mm	~kg	~kg
½	14.5	22	8	44	21	0.074	0.135
¾	16.0	27	10	44	27	0.133	0.219
1	19.0	35	10	51	33	0.242	0.386
1 ¼	20.5	44.5	14	51	43	0.461	0.641
1 ½	20.5	51	16	51	48	0.645	0.616
2	22.0	63.5	17	64	60	1.073	1.603

nominal size = Length. Dimensions Table

Appendix A

Surface finish of the copper-nickel stub end and flangejoint faces

Method of Machining	Ra* µm		Rz* µm	
Nominal inch	min.	max.	min.	max.
turning	3.2	12.5	12.5	5.0

Note: The term "turning" includes any method of machining producing concentric or spiral grooves.

Mechanical Properties

	Tensile Strength N/mm²		0.2 % Proof Stress N/mm²	Elongation % min	Hardness HV5
	min.	max.		on $L = 5.65\sqrt{S_0}$	max.
Seamless Pipes	300	380	105	30	
Seam-welded pipes	280	-	105	30	120*
Weld neck and slip-on stub ends, solid weld neck and slip-on flanges	280	-	105	30	120*
Fittings	280	-	105	30	120*

* Determined on finished tube outside of heat affected zone

Appendix B

Temperature Range	SI Units	Imperial Units	20°C	68° F	100° F	212° F
Thermal Expansion Coefficient	10 – 16 / °K	10 – 16 / °K			16.4	9.1
Young's Modulus	kN / mm²	ksi	124	18.000	118	17.110
Modulus of Rigidity	kN / mm²	ksi	50	6.800		
Poisson's Ratio	–	–	0.35		0.36	
Density	g / cm³	pound / inch³	8.91	0.321		
Thermal Conductivity	W / m° K	Btu / pound °F	51.7	29.9	60.2	34.8
Specific Heat Capacitiy	kJ / kg° K	BTU / pound °F	0.377	0.09		
Electrical Conductivity	Mega Siemens / cm	%IACS	0.053	9		
Electrical Resistivity	microhm–cm	circular mil ohm / foot	19.12	115.0		

Temperature Range	200° F	392° F	300° F	572° F	400° F	752° F
Thermal Expansion Coefficient	16.8	9.3	17.1	9.5	17.5	9.7
Young's Modulus	112	16.240	106	15.370	100	14.500
Modulus of Rigidity						
Poisson's Ratio	0.36		0.36			
Density						
Thermal Conductivity	70	40,5	78.9	45.6	86.7	50.1
Specific Heat Capacitiy						
Electrical Conductivity						
Electrical Resistivity						

Appendix C

Adjust the description of dimensions to the images

	90 deg & 45 deg elbows & tees (see tables 1.4, 1.6 & 1.7)	reducer (see table 1.9)	end caps (see table 1.8)
Specified OD	centre-to-end dimension D, E, C&M	overall length H	overall length h1 + h2
up to and including 267	±2	±2	
323.9 up to and including 711	±3	±3	$+0.015\ D_0$ -0
813 up to and including 914	±5	±5	

Design Scope

Working pressures and temperatures of components included in this specification:

1. 16 bar / 232 psi: -29°C / -20° F to +75°C / +167° F
2. 20 bar / 290 psi: -29°C / -20° F to +38°C / +100° F

Pipes Seamless and Welded:

- Pipes are based on BS MA 60 (now withdrawn), DIN 86007, and ANSI B31.3
- The wall thicknesses comply with ANSI B31.3 and DIN 86007 as well as International Association of Classification Societies with additional allowances for robustness to withstand mecha nical damage, especially in the smaller sizes.
- The fit-for-purpose corrosion allowance of 0.5 mm sufficient for entire service life of the piping installation has been included. This corrosion allowance is in accordance with all major classification societies specified for alloys containing ≥10 wt. % Ni and ≥1.5 wt. % Fe. Mechanical properties of pipes are given in Appendix A.

Flanges Composite and Solid:

- Included series of composite (lap type) and solid flanges in metric dimensions based on ANSI B16.5, MSS SP-44 and BS EN 1759-1:2004
- The basic metric dimensions for drilling and flange outside diameters are those given in ANSI B16.5 and MSS SP 44 Class 150 rating with inch size bolting.
- The copper-nickel stub end and flange joint faces are machine finished and comply with the corresponding Sections of EEMUA 234/3-6 and are summarized in the Appendix A.
- Mechanical properties of flanges are given in Appendix A.

Fittings:

- The specification comprises a series for pipe fittings including butt weld, socket welding, capillary brazing, threaded, self-reinforced fittings as well as saddle pieces.
- The “assembly dimensions" of the butt welding fittings are based on ANSI B16.9 apart from the caps that are based on DIN 28011 (with suitable amendments).
- Mechanical properties of fittings are given in Appendix A.

Physical Properties of CuNi 90/10

The physical properties of the alloy are given by Appendix B. The basic allowable stresses in tension are in accordance with B31.3 Table A-1.

Welding

The welding consumables used for the manufacturing of welded components are in accordance with AWS-A5.7 Class ER CuNi. The welding procedure specification and welder qualification are in accordance with the requirements of EEMUA Publication 234 Edition 1 (section IX).

Testing of Welds

The weld seams are examined by the liquid dye penetrant testing in accordance with EEMUA Publication 234 Edition 1 (section VIII, division 1, appendix 8). The radiographic examination is performed for the complete length of each weld to meet the requirements of EEMUA Publication 234 Edition 1 (section VIII, UW51).

Gaskets

The gaskets normally used with flanges are those made from aramid fibre with nitrile binder. The gasket hardness shall not be less than 75 Shore. The gaskets shall not be graphited. In order to ensure adequate fit when solid weldneck and solid slip-on flanges are used, irrespective of gasket materials, the gaskets shall be located within the bolt circle. Note: Gaskets should not be used when mating with elastomer rubber faced flanges.

PDMS Data

The components mentioned in this catalogue are available in the PDMS-format. Please contact us for more information.

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- preventing errors and defects
- minimising the costs associated with errors and inefficiencies
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