



Selecting Copper Tube and Fittings

This note is an updated version of FF7 which provides guidance on selecting copper tube and fittings following revisions to BS EN14276-1:2020, BS EN14276-2:2020 and BS EN12735-1:2020. The pressure ratings have been updated to include copper tube sizes now in current use. This document only refers to the use of refrigeration copper tube with brazed connections supplied in straight lengths in the half hard or fully hard condition. There is a small increase in the pressure ratings from the previous version of FF7 due to the change from the formulae previously used.

Copper tube

BS EN14276-1 now includes Tensile Stress (Rm) values for fully annealed copper tube for temperatures up to 100°C and at 150°C, which is the condition of the material immediately adjacent to the brazed joint. These values are the same as used previously and there is no change in the safety factor of 3.5. There is however a slight change in the calculated pressure due to a change in the formulae in BS EN 14276-2:2020.

The pressure ratings also apply to bending of tube supplied in the half hard condition provided that no heat treatment is used in the bending zone (paragraph 6.9.2.2 – BS EN 14276-2:2020).

Copper fittings

The fittings commonly used are manufactured to the dimensions of ASME B16.22. Maximum allowable pressure information should be obtained from the appropriate supplier.

Basis of calculations

The formulae from BS EN 14276-2:2020 paragraph 6.9.2.1 straight piping has been rearranged to

calculate PS in Bar. $PS = 20 \times f \times z / (De - e)$

e = Minimum wall thickness, mm

PS = Allowable pressure, bar

De = Maximum outside diameter of straight tube, mm

f = Nominal design stress, (Rm/3.5) N/mm²

z = Joint coefficient (1.0 for seamless tube)

The following values have been used to calculate the information in the following table.

Tolerances on outside diameter to EN12735-1:2020 Table 5

Tolerances on wall thickness to EN12735-1:2020 Table 6

Tensile stress (Rm) at 100°C from EN14276-1:2020 200N/mm² Table F.3 Annex F

Tensile stress (Rm) at 150°C from of EN14276-1:2020 175N/mm² Table F.3 Annex F

Maximum Allowable Pressure (PS) of copper tube for the commonly available diameters and wall thickness at temperatures of up to 100°C and 150°C

Outside Diameter (in)	Wall Thickness (swg)	Wall Thickness (in)	*Nominal Wall Thickness (mm)	Maximum Operating Pressure (bar)	
				Fully annealed	
				Up to 100°C	150°C
3/8	21	0.032	0.81	94.64	82.81
1/2	21	0.032	0.81	69.62	60.92
1/2	20	0.036	0.91	78.92	69.06
1/2	18	0.048	1.22	103.79	90.82
5/8	20	0.036	0.91	62.32	54.53
5/8	19	0.040	1.02	67.20	58.81
5/8	18	0.048	1.22	81.60	71.41
3/4	20	0.036	0.91	51.46	45.03
3/4	19	0.040	1.02	54.12	47.36
3/4	18	0.048	1.22	65.56	57.37
3/4	16	0.064	1.63	89.12	77.99
7/8	19	0.040	1.02	46.09	40.33
7/8	18	0.048	1.22	55.76	48.79
7/8	16	0.064	1.63	75.54	66.10
7/8	12	0.104	2.64	127.98	111.99
1.1/8	18	0.048	1.22	42.91	37.55
1.1/8	16	0.064	1.63	57.94	50.70
1.1/8	14	0.080	2.03	73.36	64.19
1.3/8	18	0.048	1.22	34.89	30.53
1.3/8	16	0.064	1.63	46.99	41.12
1.3/8	14	0.080	2.03	59.35	51.93
1.3/8	12	0.104	2.64	78.35	68.56
1.5/8	18	0.048	1.22	29.39	25.72
1.5/8	16	0.064	1.63	39.52	34.58
1.5/8	14	0.080	2.03	49.83	43.61
1.5/8	12	0.104	2.64	65.63	57.43
1.5/8	11	0.116	2.95	73.69	64.48
2.1/8	18	0.048	1.22	22.34	19.55
2.1/8	16	0.064	1.63	29.98	26.24
2.1/8	14	0.080	2.03	37.73	33.01
2.1/8	12	0.104	2.64	49.54	43.35
2.5/8	18	0.048	1.22	18.02	15.77
2.5/8	16	0.064	1.63	24.16	21.14
2.5/8	14	0.080	2.03	30.36	26.57
2.5/8	12	0.104	2.64	39.78	34.81
3.1/8	16	0.064	1.63	20.23	17.70
3.1/8	14	0.080	2.03	25.40	22.22
3.1/8	12	0.104	2.64	33.24	29.09
3.5/8	16	0.064	1.63	17.40	15.22
3.5/8	14	0.080	2.03	21.83	19.10
3.5/8	12	0.104	2.64	28.54	24.98

4.1/8	16	0.064	1.63	15.26	13.36
4.1/8	14	0.080	2.03	19.14	16.75
4.1/8	12	0.104	2.64	25.01	21.88

References and sources of further information

- Safety Standards are available for purchase from BSI <http://shop.bsigroup.com/>

Prepared in conjunction with the Institute of Refrigeration (IOR). This content also exists as IOR Guidance Note 25.

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