

Capillary and compression tube fittings of copper and copper alloy —

Part 2: Specification for capillary and compression fittings for copper tubes

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Cooperating organizations

Associated Offices Technical Committee	Department of the Environment (PSA)
Association of Consulting Engineers	Department of Trade (Marine Division)
Association of Hydraulic Equipment Manufacturers	Department of Transport
Association of Mining Electrical and Mechanical Engineers	Electricity Supply Industry in England and Wales
British Compressed Air Society	Energy Industries Council
British Constructional Steelwork Association	Engineering Equipment and Materials Users' Association
British Electrical and Allied Manufacturers' Association (BEAMA)	Federation of Manufacturers of Construction Equipment and Cranes
British Gas Corporation*	Health and Safety Executive
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Department of Industry (National Engineering Laboratory)	Process Plant Association
	Society of Motor Manufacturers and Traders Limited
	Telecommunication Engineering and Manufacturing Association (TEMA)
	Water-tube Boilermakers' Association

The organizations marked with an asterisk in the above list, together with the following, were directly represented on the Technical Committee entrusted with the preparation of this British Standard:

British Non-ferrous Metals Federation	National Brassfoundry Association
Copper Development Association	National Water Council
Copper Tube Fittings Manufacturers' Association	Thames Water Authority (Metropolitan Water Division)
Hevac Association	Coopted member

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Foreword

This Part of this British Standard has been prepared under the direction of the Mechanical Engineering Standards Committee and is a revision of BS 864-2:1971, which is withdrawn.

The size of fittings is in accordance with those sizes agreed internationally, and that are given in ISO 2016-1981 “Capillary solder fittings for copper tubes — Assembly dimensions and tests” published by the International Organization for Standardization (ISO). However, the tolerances on the socket diameters in ISO 2016 are greater than those acceptable to the UK and therefore they have not been included in this standard. This was because it was felt by the UK Technical Committee that the clearances that would occur when using the ISO tolerances would not enable a satisfactory joint to be achieved by capillary action.

This standard relates to the following three types of tube fittings of copper and copper alloy for use in conjunction with copper tubes complying with BS 2871-1:1971 and it should be noted that as BS 2871-1 is being revised the relevant tables have been included as Table 1 to Table 4 of this standard.

- a) Capillary fittings, in which the joint is made by the flow of solder by capillary action along the annular space between the outside of the tube and the inside of the socket of the fitting, the size of this annular space being dimensionally controlled within close limits.
- b) Compression fittings, type A, in which the joint is made by the compression of a loose ring or sleeve, on to the outside wall of the tube.
- c) Compression fittings, type B, in which the joint is made by the compression of a manipulated portion of the tube at or near its end against the face of the body of the fitting or against a loose ring or sleeve within the fitting.

Where type A compression fittings are to be used with tubes in soft temper, reference should be made to the manufacturer to ensure that the design of fitting is suitable for this application. Regard should be paid to the provisions of appendix C in all cases where the joint is to be buried underground.

This standard does not attempt the complete dimensional standardization of any of the types of fittings, since the variety of the designs and methods of production already established by the various manufacturers makes any such attempt impracticable, and to do so would also restrict further development. It does however specify such dimensions and requirements as are essential to ensure satisfactory installation and performance.

NOTE All the figures in this standard are diagrammatic only. They do not purport to indicate standard forms or shapes, and are only for the purpose of indicating where the specified dimensions are to be measured.

Other British Standards dealing with copper and copper alloy pipe fittings are BS 66 & BS 99, BS 143 & BS 1256 and BS 2051.

Steel compression pipe couplings (metric dimensions) are covered in BS 4368-1 and for flange type fittings reference is made to BS 4504-2.

The major changes between this revision and the amended 1971 publication are as follows:

- a) the maximum service temperature for compression fittings has been increased;
- b) the thread requirements for the screwed ends of fittings have been clarified;
- c) reference material specifications have been included;
- d) minimum bore diameters are specified;
- e) marking is now required on all fittings of 12 mm and larger;

- f) minimum wall thicknesses of compression fittings and union ends are specified;
- g) a clause on gauging of external threads and diameters of capillary sockets has been included.

NOTE It is unlikely that capillary and compression fittings complying with this standard will be available immediately because of the need for manufacturers to change marking procedures and obtain plug gauges.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 16, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This Part of this British Standard specifies requirements for capillary fittings and compression fittings for use with copper tubes complying with Table 1 to Table 4. It applies to the most commonly used types of fittings of nominal sizes ranging from 6 mm to 67 mm inclusive, including combined fitting and draining taps. Lightweight fittings for waste pipe systems are not covered by this standard, however, this does not preclude the use of fittings to this standard for waste pipe purposes where considered desirable.

The fittings when assembled with tubing complying with Table 1 to Table 4 and in accordance with the manufacturers' instructions, are suitable for the working service pressures and temperatures specified in Table 5.

Capillary fittings are only intended for use with solder not inferior to grades C and G of BS 219.

NOTE The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this Part of this standard the following definitions apply.

2.1 fitting

any device used in a tube system for the purpose of connecting the tubes either to each other or to a component part of a system

2.2 capillary fitting

a fitting in which the joint is made by the flow of solder by capillary action along the annular space between the outside of the tube and the inside of the socket of the fitting

2.3 compression fitting, type A

a fitting that requires no preparation of the ends of the tube other than that they are cut square and deburred, and in which the joint is made by the compression of a ring or sleeve on the outside wall of the tube

2.4 compression fitting, type B

a fitting that requires a manipulation of the tube at or near its end, and in which the joint is made by compressing the manipulated portion of the tube against the face of the body of the fitting or against a loose ring or sleeve within the fitting

2.5 combined fitting and draining tap

a fitting which incorporates a drain-off facility and in which the drain-off portion complies with the appropriate requirements of BS 2879

3 Designation of sizes and fittings

The size by which fittings are designated shall be the nominal outside diameter of the tube with which the fittings are to be used. The outside diameters of tubes shall be in accordance with Table 1 to Table 4.

NOTE The method of specifying the sizes of fittings is given in appendix A.

Table 1 — Annealed copper tubes for use in micro-bore or mini-bore heating systems

1	2	3	4	5
Size of tube	Outside diameter		Nominal thickness	Maximum working pressure
	Max.	Min.		
mm	mm	mm	mm	bar ^a
6	6.045	5.965	0.6	90
8	8.045	7.965	0.6	66
10	10.045	9.965		62

^a 1 bar = 10⁵ N/m² = 100 kPa.

Table 2 — Half-hard copper tubes

1	2	3	4	5
Size of tube	Outside diameter		Nominal thickness	Maximum working pressures ^a
	Max.	Min.		
mm	mm	mm	mm	bar
6	6.045	5.965	0.6	133
8	8.045	7.965	0.6	97
10	10.045	9.965	0.6	77
12	12.045	11.965	0.6	63
15	15.045	14.965	0.7	58
18	18.045	17.965	0.8	56
22	22.055	21.975	0.9	51
28	28.055	27.975	0.9	40
35	35.07	34.99	1.2	42
42	42.07	41.99	1.2	35
54	54.07	53.99	1.2	27
67	66.75	66.60	1.2	20

^a Based on material in ½ H (half-hard) condition.

Table 3 — Half-hard and annealed copper tubes

1	2	3	4	5	6
Size of tube	Outside diameter		Nominal thickness	Maximum working pressure $\frac{1}{2}$ H condition ^a	Maximum working pressure 0 condition ^b
	Max.	Min.			
mm	mm	mm	mm	bar	bar
6	6.045	5.965	0.8	188	144
8	8.045	7.965	0.8	136	105
10	10.045	9.965	0.8	106	82
12	12.045	11.965	0.8	87	67
15	15.045	14.965	1.0	87	67
18	18.045	17.965	1.0	72	55
22	22.055	21.975	1.2	69	55
28	28.055	27.975	1.2	55	42
35	35.07	34.99	1.5	54	41
42	42.07	41.99	1.5	47	36
54	54.07	53.99	2.0	45	34
67	66.75	66.60	2.0	37	28

^a Based on material in $\frac{1}{2}$ H (half-hard) condition.
^b Based on material in 0 (annealed) condition.

Table 4 — Hard drawn copper tubes

1	2	3	4	5
Size of tube	Outside diameter		Nominal thickness	Maximum working pressures ^a
	Max.	Min.		
mm	mm	mm	mm	bar
6	6.045	5.965	0.5	113
8	8.045	7.965	0.5	98
10	10.045	9.965	0.5	78
12	12.045	11.965	0.5	64
15	15.045	14.965	0.5	50
18	18.045	17.965	0.6	50
22	22.055	21.975	0.6	41
28	28.055	27.975	0.6	32
35	35.07	34.99	0.7	30
42	42.07	41.99	0.8	28
54	54.07	53.99	0.9	25
67	66.75	66.60	1.0	20

^a Based on material in H (as drawn) condition.

4 Threads for screwed ends of fittings (other than for copper connector ends)

The screwed ends of fittings shall be screwed with one of the appropriate forms of screw thread as follows.

- a) Parallel external threads as shown in Figure 1, in accordance with Table 3M, class B of BS 2779:1973 and Table 6 of this standard.
- b) Taper external threads, as shown in Figure 2, in accordance with BS 21 with the exception of thread length and gauge position (see 9.1). The thread lengths shall be in accordance with column 8 of Table 6.
- c) Parallel internal threads, as shown in Figures 3(a) and 3(b), screwed in accordance with Table 4M of BS 2779:1973 and Table 6.
- d) Screw threads in accordance with BS 21.
- e) Screw threads for copper tubes in accordance with BS 61.
- f) Special screw threads, provided that the minimum wall thickness is not less than that specified in columns 2 and 3 of Table 15.

Unless specifically ordered (see appendix B), screw threads shall be in accordance with a), b) or c) above.

In fittings with parallel threads the faces designated A and B in Figure 1 and Figure 3 respectively shall be smoothly machined at right angles to the axis of the threads.

Internal threads shall be chamfered at the face of the fitting to an included angle of approximately 90°, not more than one thread deep.

5 Material

5.1 General. Materials used in the manufacture of fittings shall comply with the British Standards listed in Table 7.

NOTE For flange type fittings, loose flanges and bolts may be of ferrous material unless otherwise specified. Ferrous flanges and bolts should be adequately protected against corrosion.

5.2 Solder

5.2.1 General applications. For general applications the solder used for making capillary joints shall be one of the tin-lead solders, grades A, AP, K, KP, F, R or G specified in BS 219 or one of the lead free grades specified in Table 17 of this standard (i.e. BS 864-2).

5.2.2 Potable water applications. For potable water applications the solder used for making capillary joints shall be one of the lead free grades of soft solder specified in Table 17.