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Capillary solder fittings for copper tubes — Assembly dimensions and tests

Raccords à braser par capillarité pour tubes en cuivre — Dimensions d'assemblage et essais

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Descriptors : pipes (tubes), copper tubes, pipe fittings, dimensions, dimensional tolerances, designation, tests.

Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 2016 was developed by Technical Committee ISO/TC 5, *Ferrous metal pipes and metallic fittings*, and was circulated to the member bodies in April 1980.

It has been approved by the member bodies of the following countries :

Austria	Germany, F.R.	South Africa, Rep. of
Belgium	India	Spain
Brazil	Israel	Sweden
Czechoslovakia	Korea, Rep. of	Switzerland
Denmark	Netherlands	USSR
Egypt, Arab Rep. of	Poland	
Finland	Romania	

The member bodies of the following countries expressed disapproval of the document on technical grounds :

Australia	Japan
Canada	United Kingdom
France	USA

This International Standard cancels and replaces ISO Recommendation R 2016-1971, of which it constitutes a technical revision.

Capillary solder fittings for copper tubes — Assembly dimensions and tests

1 Scope and field of application

This International Standard specifies the field of application, the assembly dimensions and their tolerances, the materials and tests for capillary solder fittings for copper tubes.

Capillary soldered joints having socket and male end dimensions and tolerances as given in this International Standard are suitable for the service conditions shown in table 1.

2 References

ISO 7, *Pipe threads where pressure-tight joints are made on the threads* —

*Part 1 : Designation, dimensions and tolerances.*¹⁾

*Part 2 : Verification by means of limit gauges.*²⁾

ISO 228, *Pipe threads where pressure-tight joints are not made on the threads* —

*Part 1 : Designation, dimensions and tolerances.*³⁾

Part 2 : Verification by means of limit gauges.

Table 1 — Service conditions

Soldering/ brazing	Typical examples of soldering/ brazing alloys ¹⁾²⁾	Service temperature ²⁾ °C max.	Service pressure in bars for assembly diameters ²⁾³⁾		
			6 to 28 mm	35 to 54 mm	76,1 to 108 mm
Soldering	I lead/tin 50/50 % or 60/40 %	30	16	16	10
		65	10	10	6
		110	6	6	4
	II tin/silver or tin/copper 95/5 % or 97/3 %	30	40	25	16
		65	25	16	16
		110	16	10	10
Brazing	III silver cadmium free 55 % silver	30	40	25	16
		65	25	16	16
	V copper/phosphorous 94/6 % or with 2 % silver	110	16	10	10

1) The choice depends upon the field of application and the rules in force.

2) For use in applications involving higher working pressures and higher working temperatures, solder/brazing alloys with suitable fluxes as recommended by the solder or fitting manufacturer shall be used.

3) A factor of safety of 2,5 will be achieved with 50/50 % tin/lead solder when a solder bond of 60 % of the specified assembly surface is attained.

1) At present at the stage of draft. (Revision of ISO 7/1-1978.)

2) At present at the stage of draft.

3) At present at the stage of draft. (Revision of ISO 228/1-1978.)

ISO 272, *Fasteners — Hexagon products — Widths across flats.*

ISO 274, *Copper tubes of circular section — Dimensions.*

ISO 426, *Wrought copper-zinc alloys — Chemical composition and forms of wrought products —*

Part 1 : Non-leaded and special alloys.¹⁾

Part 2 : Leaded alloys.²⁾

ISO 1085, *Combinations of double-ended wrench gaps.*

ISO 1336, *Wrought coppers (having minimum copper contents of 97,5 %) — Chemical composition and forms of wrought products.*

ISO 1337, *Wrought coppers (having minimum copper contents of 99,85 %) — Chemical composition and forms of wrought products.*

ISO 1338, *Cast copper alloys — Composition and mechanical properties.*

ISO/R 1938, *ISO system of limits and fits — Part 2 : Inspection of plain workpieces.*

3 Materials, design and manufacture

3.1 Materials

3.1.1 Fittings of copper

The fittings shall be made from copper tubes or bars etc. having characteristics and properties similar to

Cu-DHP specified in ISO 1337.

Appropriate copper alloys containing tellurium or sulphur according to ISO 1336 are also allowed.

3.1.2 Fittings of gunmetal

The fittings shall be made from castings or pressings having characteristics and properties similar to

CuPb 5 Sn 5 Zn 5 specified in ISO 1338.

3.1.3 Fittings of brass

The fittings shall be made from castings or bars having characteristics and properties similar to

CuZn 40 specified in ISO 1338 and ISO 426.

3.1.4 Fittings of other materials

Notwithstanding these requirements in clauses 3.1.1 to 3.1.3, any other materials which give results similar to those specified above will be admitted.

1) At present at the stage of draft. (Revision of ISO 426/1-1973.)

2) At present at the stage of draft. (Revision of ISO 426/2-1973.)

3.2 Design

Illustrations used in this International Standard are diagrammatic only and have been chosen without prejudice.

3.2.1 Assembly dimensions and tolerances

3.2.1.1 Assembly diameters *D*

The diameters and tolerances specified permit the assembly of fittings with tubes having the following outside diameters *D* :

6 — 8 — 10 — 12 — 15 — 18 — 22 — 28 — 35 — 42 — 54 —
76,1 — 88,9 — 108

3.2.1.2 Tolerances on the assembly diameters

In order to ensure the distribution of solder by capillary action and to allow for the alignment of the male end of a fitting or the free end of a tube in the socket, the tolerances shown in table 2 shall be maintained.

3.2.1.3 Lengths of engagement and their tolerances

An internal soldering end according to figure 1 is the socket end of a fitting intended for capillary soldering and is the end which is passed over the tube end.

An external soldering end according to figure 2 is the end of a tube or the male end of a fitting intended for capillary soldering which is pushed into a capillary solder fitting.

The values of the lengths of engagement and their tolerances are given in table 3.

Table 2 — Tolerances on the assembly diameter

Values in millimetres

Assembly diameter <i>D</i> ¹⁾	Tolerances of the mean diameter ²⁾ with respect to the assembly diameter <i>D</i>		Resulting diametrical difference	
	Outside diameter of male end	Inside diameter of socket	max.	min.
6 to 18	± 0,045 ³⁾	+ 0,155 + 0,065	0,20	0,02
22 and 28	± 0,055 ³⁾	+ 0,185 + 0,075	0,24	0,02
35 to 54	± 0,07 ³⁾	+ 0,230 + 0,090	0,30	0,02
76,1 to 108	± 0,07	+ 0,33 + 0,10	0,40 ⁴⁾	0,03

1) Outside diameter of copper tube.

2) Arithmetical mean of two diameters at right angles in a cross-section taken anywhere on the length of the socket or of the male end.

3) Equal to the reduced outside diameter tolerances as specified in ISO 274, table 2.

4) The jointing process under these conditions is not entirely controlled by capillary action. Skilled soldering techniques are required.

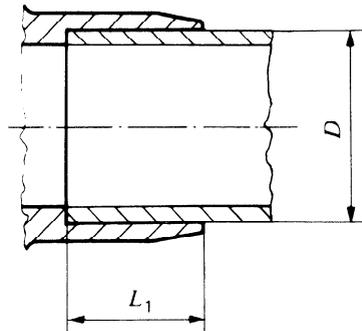


Figure 1 – Socket

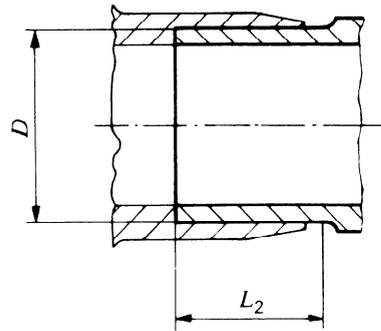


Figure 2 – Male end

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Table 3 – Lengths of engagement and their tolerances

Dimensions in millimetres

Assembly diameter $D^{1)}$	Socket length $L_1^{2)}$	Male end length $L_2^{2)}$	Tolerance on length valid for L_1 and L_2
6	7	9	$\pm 1,2$
8	8	10	
10	9	11	
12	10	12	$\pm 1,4$
15	12	14	
18	14	16	
22	17	19	$\pm 1,6$
28	20	22	
35	25	27	$\pm 2,0$
42	29	31	
54	34	36	
76,1	36	39	$\pm 2,5$
88,9	40	43	
108	50	53	

1) Outside diameter of copper tube.

2) The lengths L_1 and L_2 of integral solder ring fittings shall be increased by the width of the solder groove.