BS EN 1254-6:2012

BSI Standards Publication

Copper and copper alloys — Plumbing fittings

Part 6: Fittings with push-fit ends

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National foreword

This British Standard is the UK implementation of EN 1254-6:2012.

The UK participation in its preparation was entrusted to Technical Committee NFE/34/3, Copper and copper alloy fittings for tube and pipe.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Compliance with a British Standard cannot confer immunity from legal obligations.

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Foreword

This document (EN 1254-6:2012) has been prepared by Technical Committee CEN/TC 133 “Copper and copper alloys”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2013, and conflicting national standards shall be withdrawn at the latest by April 2013.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

Within its programme of work, Technical Committee CEN/TC 133 requested CEN/TC 133/WG 8 "Fittings" to prepare the following standard:

EN 1254-6*, Copper and copper alloys — Plumbing fittings — Part 6: Fittings with push-fit ends.*

EN 1254 comprises the following parts under the general title "*Copper and copper alloys — Plumbing fittings*":

— *Part 1: Fittings with ends for capillary soldering or capillary brazing to copper tubes*

— *Part 2: Fittings with compression ends for use with copper tubes*

— *Part 3: Fittings with compression ends for use with plastics pipes*

— *Part 4: Fittings with threaded end connections*

— *Part 5: Fittings with short ends for capillary brazing to copper tubes*

— *Part 6: Fittings with push-fit ends*

— *Part 7: Fittings with press ends for metallic tubes*

— *Part 8: Fittings with press ends for use with plastics and multilayer pipes*

Part 7 will be the subject of future work.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

Products complying with this document may be used for the transport of water for human consumption if they comply with the relevant national, regional or local regulatory provisions applicable in the place of use.

This European Standard provides the basis for the assessment of a manufacturer's production process for products manufactured in accordance with this European Standard.

1 Scope

This European Standard specifies materials and test requirements for fittings of copper and copper alloys.

This part of EN 1254 specifies push-fit end connections with or without plating or coating in the size range 6 mm to 54 mm for the purpose of joining tubes of copper, plated copper, multilayer pipes and plastics pipes, intended for use in hot and cold water systems according to EN 806, which are designed for service lifetime up to fifty years, as well as heating and cooling systems.

Permissible operating temperatures and maximum operating pressures are also established.

Fittings may comprise a combination of end types, specified in this European Standard, EN 1254, or other standards, providing they are suitable for the fluid being conveyed.

The standard establishes a designation system for the fittings.

This European Standard is applicable to push-fit fittings for joining one or more of the following tubes or pipes:

— Copper tubes to EN 1057;

— PE-X pipes to EN ISO 15875-2;

— PB pipes to EN ISO 15876-2;

— PP pipes to EN ISO 15874-2;

— PE-RT pipes to EN ISO 22391-2;

— Multilayer pipes to EN ISO 21003-2.

Fittings may be suitable for joining other tubes and pipes provided the push-fit joint with the specified tube or pipe meets the requirements of this standard.

Operating temperatures and pressures

For joints with copper tubes

It is essential that operating temperatures and maximum operating pressures for assembled joints do not exceed the values in Table 1.

Table 1 — Operating temperatures and pressures for fittings assembled to tubes

Operating temperature °C	**Maximum operating pressure (MOP) for nominal diameters from 6 mm up to and including 54 mm** bar
30	16
95	6
Intermediate pressure ratings are determined by linear interpolation. Certain designs of push-fit fittings are suitable for use at temperature/pressure ratings outside those given in this table. For such applications, the advice of the manufacturer should be sought. To allow for system malfunctions, it is essential that fittings be capable of temporary excursions up to a temperature of 110 °C at a pressure of 6 bar.	

For joints with multilayer and plastics pipes

The operating temperatures and maximum operating pressures for the assembled joints should be determined in accordance with multilayer or plastics pipe material properties, details of which are specified in the relevant multilayer and plastics piping system standards.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 681-1:1996, *Elastomeric seals — Materials requirements for pipe joint seals used in water and drainage applications — Part 1: Vulcanised rubber*

EN 712, *Thermoplastics piping systems — End-load bearing mechanical joints between pressure pipes and fittings — Test method for resistance to pull-out under constant longitudinal force*

EN 713, *Plastics piping systems — Mechanical joints between fittings and polyolefin pressure pipes — Test method for leaktightness under internal pressure of assemblies subjected to bending*

EN 1057, *Copper and copper alloys — Seamless, round copper tubes for water and gas in sanitary and heating applications*

EN 1254-4, *Copper and copper alloys — Plumbing fittings — Part 4: Fittings combining other end connections with capillary or compression ends*

EN 1655, *Copper and copper alloys — Declarations of conformity*

EN 1982, *Copper and copper alloys — Ingots and castings*

EN 12164, *Copper and copper alloys — Rod for free machining purposes*

EN 12165, *Copper and copper alloys – Wrought and unwrought forging stock*

EN 12293, *Plastics piping systems — Thermoplastics pipes and fittings for hot and cold water — Test method for the resistance of mounted assemblies to temperature cycling*

EN 12294, *Plastics piping systems — Systems for hot and cold water — Test method for leaktightness under vacuum*

EN 12295, *Plastics piping systems — Thermoplastics pipes and associated fittings for hot and cold water — Test method for resistance of joints to pressure cycling*

EN 12449, *Copper and copper alloys — Seamless, round tubes for general purposes*

EN ISO 6509:1995, *Corrosion of metals and alloys — Determination of dezincification resistance of brass (ISO 6509:1981)*

EN ISO 15874-2[1)], *Plastic piping systems for hot and cold water installations — Polypropylene (PP) — Part 2: Pipes (ISO 15874-2)*

EN ISO 15874-5 [1)], *Plastic piping systems for hot and cold water installations — Polypropylene (PP) — Part 5: Fitness for purpose of the system (ISO 15874-5)*

[1)] Currently under revision.

EN ISO 15875-2, *Plastics piping systems for hot and cold water installations — Crosslinked polyethylene (PE-X) — Part 2: Pipes (ISO 15875-2)*

EN ISO 15875-5, *Plastics piping systems for hot and cold water installations — Crosslinked polyethylene (PE-X) — Part 5: Fitness for purpose of the system (ISO 15875-5)*

EN ISO 15876-2, *Plastics piping systems for hot and cold water installations — Polybutylene (PB) — Part 2: Pipes (ISO 15876-2)*

EN ISO 15876-5, *Plastics piping systems for hot and cold water installations — Polybutylene (PB) —Part 5: Fitness for purpose of the system (ISO 15876-5)*

EN ISO 21003-2, *Multilayer piping systems for hot and cold water installations inside buildings – Part 2: Pipes (ISO 21003-2)*

EN ISO 21003-5, *Multilayer piping systems for hot and cold water installations inside buildings – Part 5: Fitness for purpose of the system (ISO 21003-5)*

EN ISO 22391-2, *Plastics piping systems for hot and cold water installations — Polyethylene of raised temperature resistance (PE-RT) — Part 2: Pipes (ISO 22391-2)*

ISO 815-1, *Rubber, vulcanized or thermoplastic — Determination of compression set — Part 1: At ambient or elevated temperatures*

ISO 6957:1988, *Copper alloys — Ammonia test for stress corrosion resistance*

ISO 9924-1*, Rubber and rubber products — Determination of the composition of vulcanizates and uncured compounds by thermogravimetry — Part 1: Butadiene, ethylene-propylene copolymer and terpolymer, isobutene-isoprene, isoprene and styrene-butadiene rubbers*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
plumbing fitting
device used in a tube system for the purpose of connecting the tubes either to each other or to a component part of the system

3.2
push-fit end
end which incorporates a sealing element and a gripping device. The joint is made by pushing the tube into the fitting and a seal is achieved without the use of heat or tools

Note 1 to entry: In some designs, this type of joint can be disconnected and re-connected or disconnected and the fitting re-used elsewhere.

3.3
adaptor fitting
fitting combining more than one type of end

Note 1 to entry: For details of other ends, see the relevant parts of this European Standard or other standards.

3.4
nominal diameter
nominal diameter of the fitting end expressed as the nominal outside diameter of the connecting tube

3.5
supporting sleeve
insert stiffener
device permanently inserted in the tube end to provide internal support for low strength tube or pipe materials

3.6
durably marked
marked in such a way that the marking will remain readable at least up to the time of commissioning of the installation

Note 1 to entry: e.g. by ink marking.

3.7
permanently marked
marked in such a way that the marking will remain readable up to the end of the life of the installation

Note 1 to entry: e.g. by stamping, etching or engraving.

3.8
type test
test or series of tests aimed at approving a product to determine that the element designed is able to fulfil the requirements of the product specification

4 Requirements

4.1 General

Fittings shall conform to the requirements of 4.2 to 4.4 and shall be capable of meeting the type testing requirements of 5.1 as relevant to the application.

4.2 Materials

4.2.1 General

Fittings bodies shall be made from copper or copper alloys selected from materials specified in European Standards for copper and copper alloy products, provided that the fittings manufactured from them meet the functional requirements of this European Standard.

NOTE Some of the standardised coppers and copper alloys commonly used for the manufacture of fittings are shown in Table 2.

Table 2 — Examples of commonly used materials

Material designation		Standard
Symbol	Number	
Cu-DHP	CW024A	EN 12449
CuSn5Zn5Pb5-C	CC491K	EN 1982
CuZn36Pb2As	CW602N	EN 12164
CuZn39Pb3	CW614N	EN 12164
CuZn40Pb2	CW617N	EN 12165
CuZn33Pb2-C	CC750S	EN 1982
CuZn15As-C	CC760S	EN 1982
NOTE These examples do not constitute an exhaustive list.		

Other components can be made from metallic or non-metallic materials, provided that they do not prevent the fitting meeting the functional requirements of this standard and do not cause degradation of the connected tube or pipes.

Sealing elements shall conform to the requirements for elastomeric materials in EN 681-1 and Table 3 of this European Standard.

Table 3 — Requirements and tests for non-metallic sealing elements

Test procedures
Tear strength for butyl rubbers in accordance with EN 681-1:1996, Table 3. Minimum tear strength: ≥ 20 N.
Thermogravimetric analysis (TGA) for identity testing of elastomeric materials. The TGA is carried out in accordance with ISO 9924-1. Frequency of test — the TGA shall be carried out at the initial type testing stage to produce the master graph. Further analysis will be made to compare the production to the master graph at a frequency of once per year thereafter.

In order to demonstrate durability for long-term applications in water, elastomeric sealing elements shall be tested in accordance with the parameters shown in Table 4.

Table 4 — Durability test for elastomeric sealing elements for fittings for water applications

Test procedures	
Compression set test in water, in accordance with EN 681-1:1996, Annex B, and ISO 815-1.	
Test duration:	3 000 h
Test temperature:	110 °C
Test medium:	Distilled water
Compression set after 3 000 h:	≤ 30 %
Compression set increase between 1 000 h and 3 000 h	≤ 5 % / 1 000 h
Change in volume/Swelling (varying to EN 681-1 for IIR only).	
Test duration:	7 d
Test temperature:	95 °C
Test medium:	Distilled water
Change in volume	≤ 15 %

4.2.2 Reaction to fire

Copper and copper alloys are products/materials that do not require to be tested for reaction to fire (i.e. products/materials of class A.1 according to Commission Decision 96/603/EC, as amended 2000/605/EC).

4.2.3 Resistance to high temperature (for heating networks)

The mechanical properties of products which consist of copper or copper alloys at temperatures encountered in heating networks are not reduced significantly; for example, it is not necessary to include the maximum admissible stress in pressure calculations from ambient up to 120 °C.

4.3 Dimensions and tolerances

4.3.1 Minimum bore area

The minimum cross-sectional area of the bore through each fitting, excluding any internal pipe support, shall be not less than the theoretical minimum area of the bore given by reference to Table 5, except that for unequal-ended or adaptor fittings with ends specified in other parts of this standard or other standards, the smallest diameter shall apply provided that this diameter does not restrict other outlets.

Table 5 — Minimum bore diameter

Dimensions in millimetres

Nominal diameter *D*	**Minimum bore diameter**
6	4,0
8	6,0
10	7,0
12	9,0
14	10,0
14,7	11,0
15	11,0
16	12,0
17	13,0
18	14,0
20	16,0
21	18,0
22	18,0
25	21,0
27,4	23,0
28	23,0
32	26,0
34	29,0
35	29,0
40	35,0
40,5	36,0
42	36,0
50	40,0
53,6	47,0
54	47,0

4.3.2 Minimum bore area through fittings with an integral or separate internal support

When an internal support is provided, either as an integral part of the fitting or loose, the minimum cross-sectional area of the bore through the support shall be in accordance with Table 6.

Table 6 — Minimum cross-sectional area of bores

Nominal diameter *D* mm	**Relationship of bore area to the theoretical minimum area of the bore of the pipe**	
	for internal support with sealing element %	for fitting and internal support without sealing element %
6	18	35
8		
10		
12		
14	30	45
14,7		50
15		
16		
17		
18		
20		
21	35	55
22		
25		
27,4	45	60
28		
32		
34	55	65
40		
40,5	60	70
50		
53,6		
54		

EXAMPLE

For 16 mm nominal diameter push-fit end for plastics pipe with 2,0 mm wall thickness, area of bore = 113,1 mm^2.

Permissible area of bore through an internal support with sealing element (from table) = 30 % $\times$ 113,1 mm^2 = 33,9 mm^2.

Therefore the minimum internal diameter of the internal support = 6,57 mm.

Permissible area of bore through an internal support without sealing element (from table) = 50 % $\times$ 113,1 mm^2 = 56,6 mm^2.

Therefore minimum internal diameter of the internal support = 8,49 mm.

4.3.3 Tolerance for the alignment of the fitting ends

The alignment of the ends of the fitting shall be within 2° of the specified axis.

4.4 Design and manufacture

4.4.1 Tube and pipe abutment

Fitting ends are usually manufactured with an abutment to limit tube or pipe insertion and to retain a loose supporting sleeve, if used. Fittings may be produced for special purposes, particularly useful for repairs, where the fitting ends do not incorporate abutments, allowing for the fitting to slide along the tube or pipe.

4.4.2 Surface condition

Fittings shall be clean and with the exception of the gripping device, shall be free from sharp edges.

4.4.3 Plated or coated surfaces

Requirements for plated or coated surfaces shall be the subject of agreement between the purchaser and the manufacturer.

5 Testing, assessment and sampling methods

5.1 Type testing

5.1.1 General

Type testing shall be performed once to prove the product design by conformity with the type test requirements in this standard.

Further type testing shall be performed when a change has been made to the design, material or process, which may affect the performance characteristics, the type tests shall be repeated for those characteristics.

All sizes of fitting and each tube or pipe material, unless otherwise specified, shall be type tested but combinations within a test rig are permissible.

New fittings are required for each test.

Details of type tests on joints applicable to fittings intended for joining metallic tubes, multilayer pipes or plastics pipes are given in Table 7.

Table 7 — List of type tests required

Description of test	Tests on fitting end tube or pipe	
	metallic	multilayer/plastics
Leaktightness under internal hydrostatic pressure	Yes	Yes
Resistance to pull-out	Yes	Yes
Temperature cycling	Yes	Yes
Pressure cycling	Yes	Yes
Vacuum	Yes	Yes
Vibration	Yes	No
Leaktightness under internal hydrostatic pressure while subjected to bending	Yes	No
Static bending	No	Yes
Disconnection and re use (if applicable)	Yes	Yes
Fitting rotation	Yes	Yes
Stress corrosion	Yes	Yes

5.1.2 Preparation of fittings for testing

The fittings to be tested in accordance with 5.1.4 to 5.1.14 shall be assembled with the relevant tube or pipe, in accordance with the manufacturer's instructions.

5.1.3 Test temperature

Tests shall be conducted at a temperature of (23 ± 5) °C unless otherwise stated.

5.1.4 Leaktightness under internal hydrostatic pressure

When tested in accordance with the parameters shown in Table 8 the fittings shall show no signs of leakage.

Table 8 — Hydrostatic pressure test parameters

Tube or pipe material	Minimum free length of the tube or pipe in the test assembly mm	Test pressure	Test duration min	Number of test pieces per size	Test method
Copper EN 1057	100	(24 ± 1) bar	15	1	Annex A
PE-X EN ISO 15875-2		1,5 PN of pipe		3	
PB EN ISO 15876-2					
PP EN ISO 15874-2					
Multilayer EN ISO 21003-2					

5.1.5 Resistance to pull-out

When tested in accordance with the parameters shown in Table 9 the joint assemblies shall withstand the pull-out force without being separated and shall not leak when subjected to the subsequent hydrostatic pressure test.

Table 9 — Pull-out test parameters

Tube or pipe material	Pull-out force	Number of test pieces per size	Test method
Copper EN 1057	see Annex B	1	Annex B followed by Annex A
PE-X EN ISO 15875-2	see EN ISO 15875-5	3	EN 712 followed by Annex A
PB EN ISO 15876-2	see EN SO 15876-5		
PP EN ISO 15874-2	see EN ISO 15874-5		
Multilayer EN ISO 21003-2	see EN ISO 21003-5		

5.1.6 Temperature cycling

When tested in accordance with the parameters shown in Table 10 the fittings under test shall show no signs of leakage.

Table 10 — Temperature cycling test parameters

Tube or pipe material	Hot water inlet temperature °C	Cold water inlet temperature °C	Test pressure bar	Flow rate m/s	Test duration min	Test cycles	Test method
Copper EN 1057	93 ± 2	20 ± 5	10 ± 1	≥ 0,5	(15 ± 1) hot (15 ± 1) cold	5 000	Annex C
PE-X EN ISO 15875-2	see EN ISO 15875-5						EN 12293
PB EN ISO 15876-2	see EN ISO 15876-5						
PP EN ISO 15874-2	see EN ISO 15874-5						
Multilayer EN ISO 21003-2	see EN ISO 21003-5						

5.1.7 Pressure cycling test

When tested in accordance with the parameters shown in Table 11 the fittings under test shall show no signs of leakage.

Table 11 — Pressure cycling test parameters

Tube or pipe material	Low pressure limit	High pressure limit	Number of cycles	Frequency of cycles	Number of test pieces per size	Test method
Copper EN 1057	(1 ± 0,5) bar	(25 ± 0,5) bar	10 000	(30 ± 5) per min	3	Annex D
PE-X EN ISO 15875-2	see EN ISO 15875-5					EN 12295
PB EN ISO 15876-2	see EN ISO 15876-5					
PP EN ISO 15874-2	see EN ISO 15874-5					
Multilayer EN ISO 21003-2	see EN ISO 21003-5					

5.1.8 Vacuum test

When tested in accordance with the parameters shown in Table 12 the change in pressure shall not be greater than 0,05 bar at the conclusion of the test.

Table 12 — Vacuum test parameters

Tube or pipe material	Test pressure	Test duration	Number of test pieces per size	Test method
Copper EN 1057	(– 0,8 ± 0,05) bar	1 h	3	Annex E
PE-X EN ISO 15875-2	see EN ISO 15875-5			EN 12294
PB EN ISO 15876-2	see EN ISO 15876-5			
PP EN ISO 15874-2	see EN ISO 15874-5			
Multilayer EN ISO 21003-2	see EN ISO 21003-5			

5.1.9 Vibration test (metallic tube only)

When tested in accordance with the parameters shown in Table 13 the fitting shall show no signs of leakage.

Table 13 — Vibration test parameters

Tube material	Test pressure bar	Deflection mm	Number of cycles	Frequency of cycles Hz	Number of test pieces per size	Test method
Copper EN 1057	15 ± 0,5	± 1	1 000 000	20	4	Annex F

5.1.10 Leaktightness under internal hydrostatic pressure while subjected to bending (metallic tube only)

When tested in accordance with the test parameters shown in Table 14 the fittings shall show no signs of leakage.

Table 14 — Test parameters for leaktightness under internal hydrostatic pressure while subjected to bending

Tube material	Nominal diameter mm	Test pressure bar	Deflection mm	Time after the required deflection is reached min	Distance between test support centres mm	Number of test pieces per size	Test method
Copper EN 1057	6 to 10	10 ± 0,5	20 ± 1	5	900 ± 10	1	Annex G
	12 to 18				1 200 ± 10		
	21 to 35				1 800 ± 10		
	40 to 42				2 400 ± 10		
	53,6 to 54				2 700 ± 10		

5.1.11 Static bending test (plastics pipe only)

When tested in accordance with the parameters shown in Table 15 the fitting shall show no signs of leakage.

Table 15 — Static bending test parameters

Pipe material	Bending radius	Test pressure	Test duration	Number of test pieces per size	Test method
PE-X EN ISO 15875-2	see EN ISO 15875-5			3	EN 713
PB EN ISO 15876-2	see EN ISO 15876-5				
PP EN ISO 15874-2	see EN ISO 15874-5				
Multilayer EN ISO 21003-2	see EN ISO 21003-5				

5.1.12 Disconnection and re-use (for fittings capable of being disconnected)

When tested in accordance with the parameters shown in Table 16 the fitting shall no signs of leakage.

Table 16 — Disconnection and re-use test parameters

Tube or pipe material	Number of connections/disconnections	Number of test pieces per size	Test method
Copper EN 1057	20 or as specified by the manufacturer	1	Annex H followed by Annex A
PE-X EN ISO 15875-2			
PB EN ISO 15876-2			
PP EN ISO 15874-2			
Multilayer EN ISO 21003-2			

5.1.13 Rotation test

When tested in accordance with the parameters shown in Table 17 the fitting shall show no signs of leakage.

Table 17 — Rotation test parameters

Tube or pipe material	Test pressure bar	Number of cycles	Number of test pieces per size	Test method
Copper EN 1057	10 ± 0,5	10	1	Annex I
PE-X EN ISO 15875-2	maximum working pressure of pipe			Annex I followed by Annex A
PB EN ISO 15876 –2				
PP EN ISO 15874-2				
Multilayer EN ISO 21003-2				

5.1.14 Resistance to stress corrosion

Fittings manufactured from copper-zinc alloys containing more than 10 % zinc shall be resistant to stress corrosion. When tested in accordance with the parameters shown in Table 18, components manufactured from these alloys shall show no evidence of cracking.

Table 18 — Stress corrosion resistance test parameters

Fitting material	Test solution	Number of test pieces per size	Test method
Copper alloy	pH 9,5	1	ISO 6957: 1988, Annex J

5.2 Factory production control system

5.2.1 General

In order to assure every production batch will meet the requirements of this standard, the manufacturer shall operate a quality system that checks at the minimum, on a regular basis, the aspects shown in Table 19 that can vary during production.

Table 19 — List of factory production checks required

Description of check or test	Check required
Dimensions as determined by the manufacturer	Measure or gauge to manufacturing drawing
Pressure test for fittings bodies with as-cast microstructure or fabricated by welding or brazing	see 5.2.2
Resistance to dezincification	see 5.2.3

The frequency and number of test pieces is dependent on the manufacturer's quality system.

5.2.2 Integrity of fittings bodies with as-cast microstructure or fabricated by welding or brazing

When tested in accordance with the parameters shown in Table 20, fittings bodies after machining shall give no visual indication of leakage within the pressure zone of the assembled fitting.

Table 20 — Pressure test parameters

Fitting material	Test pressure		Frequency and number of test pieces per size	Test method
	pneumatic bar	hydrostatic bar		
Cast or fabricated bodies	5 ± 0,5	24 ± 1	The frequency and number of test pieces is dependent on the manufacturer's quality system	Annex K (see NOTE)
NOTE At the option of the manufacturer, other pressure test methods of equivalent performance may also be used.				

5.2.3 Resistance to dezincification

Components which are manufactured from alloys containing more than 10 % zinc and which are declared to be resistant to dezincification, shall be capable of meeting the acceptance criteria for resistance to dezincification. When tested in accordance with EN ISO 6509: 1995, Annex L, the depth of dezincification, in any direction, shall be:

— for grade A: max. 200 µm;

— for grade B: mean not to exceed 200 µm and max. 400 µm.

If any of the test pieces fail the dezincification resistance test, further test samples from the same batch shall be selected for re-testing.

If all the further test pieces pass the test, the batch represented shall be deemed to conform to the requirements of this standard for dezincification resistance. If any of the further test pieces fail, then the batch represented shall be deemed not to conform to this standard.

NOTE The frequency and number of test pieces are dependent on the manufacturer's quality system.

6 Evaluation of conformity

6.1 General

The conformity of plumbing fittings to the requirements of this standard and with the stated values shall be demonstrated by:

— type testing;

— factory production control by the manufacturer, including product assessment.

For the purposes of testing, plumbing fittings may be grouped into families, where it is considered that the selected property/properties is/are common to all the fittings within that family.

6.2 Type testing

6.2.1 General

A type test is the complete set of tests, determining the performance of samples of products representative of the product type.

Type testing shall be performed to show conformity with this standard.

6.2.2 Requirements and characteristics

All requirements in Clause 4 and in 5.1 shall be subject to type testing. The metallic material characteristics in in 4.2.2 and 4.2.3 do not need testing because:

— reaction to fire – copper and copper alloys are class A.1 according to Commission Decision;

— resistance to high temperature – mechanical properties are not reduced significantly at temperatures concerned;

6.2.3 Use of historical data

Tests previously performed on fittings of the same design and dimension in accordance with the provisions of this European Standard (same characteristic(s), test method, sampling procedure, system of attestation of conformity, etc.) may be taken into account.

6.2.4 Further type testing

Whenever a change occurs in the fitting design, the raw material or supplier of the components, or the production process (subject to the definition of a family), which would change significantly one or more of the characteristics, the type tests shall be repeated for the appropriate characteristic(s).

6.3 Sampling, testing and conformity criteria

6.3.1 Sampling

Type testing shall be performed on representative samples of plumbing fittings production.

6.3.2 Testing and conformity criteria

Plumbing fittings shall be tested for conformity to the requirements and characteristics listed in Clauses 4 and 5 in accordance with the relevant methods indicated in Annex A to Annex L.

The results of all type tests shall be recorded and held by the manufacturer for at least five years.

6.4 Factory production control (FPC)

6.4.1 General

The manufacturer of the fitting shall establish, document and maintain an FPC system to ensure that the products placed on the market conform to the declared performance characteristics. The FPC system shall consist of written procedures (works' manual), regular inspections and tests and/or assessments and the use of the results to control raw and other incoming materials, equipment, the production process and the product.

All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures. This production control system documentation shall ensure a common understanding of conformity evaluation and enable the achievement of the required component characteristics and checking the effective operation of the production control system.

Factory production control therefore brings together operational techniques and all measures allowing maintenance and control of the conformity of the component with its technical specifications. Its implementation may be achieved by controls and tests on measuring equipment, raw materials and constituents, processes, machines and manufacturing equipment and finished components, including material properties in components, and by making use of the results thus obtained.

The FPC system may be part of a Quality Management system, e.g. in accordance with EN ISO 9001:2008.

The manufacturer shall establish procedures to ensure that the production tolerances allow for the plumbing fittings' performances to be in conformity with the declared values derived from type testing.

The requirements and characteristics, and the means of verification, are given or indicated in Clause 4, 5.1 and Annexes K and L, and the minimum frequency of testing is given by the manufacturer's quality system.

The manufacturer shall record the results of the tests specified above. These records shall at least include the following information:

— identification of the plumbing fittings tested;

— the date of testing;

— the test results.

The results of inspections, tests or assessments requiring action shall be recorded, as shall any action taken. The action to be taken when control values or criteria are not met shall be recorded and retained for the period specified in the manufacturer's FPC procedures.

6.4.2 Personnel

The responsibility, authority and the relationship between personnel that manages, performs or verifies work affecting product conformity, shall be defined. This applies in particular to personnel that need to initiate actions preventing product non-conformities from occurring, actions in case of non-conformities and to identify and register product conformity problems.

6.4.3 Equipment

All weighing, measuring and testing equipment necessary to achieve, or produce evidence of, conformity shall be calibrated or verified and regularly inspected according to documented procedures, frequencies and criteria.

All equipment used in the manufacturing process shall be regularly inspected and maintained to ensure use, wear or failure does not cause inconsistency in the manufacturing process.

Inspections and maintenance shall be carried out and recorded in accordance with the manufacturer's written procedures and the records retained for the period defined in the manufacturer's FPC procedures.

6.4.4 Raw materials and components

The specifications of all incoming raw materials and components shall be documented, as shall the inspection scheme for ensuring their conformity.

6.4.5 In-process control

The manufacturer shall plan and carry out production under controlled conditions.

6.4.6 Traceability and marking

Batches or packages of plumbing fittings shall be identifiable and traceable with regards to their production origin. The manufacturer shall have written procedures ensuring that processes related to affixing traceability codes and/or markings (see Clause 8) are inspected regularly.

6.4.7 Non-conforming products

The manufacturer shall have written procedures, which specify how non-conforming products shall be dealt with. Any such events shall be recorded as they occur and these records shall be kept for the period defined in the manufacturer's written procedures.

6.4.8 Corrective action

The manufacturer shall have documented procedures that instigate action to eliminate the cause of non-conformities in order to prevent recurrence. Compliance with EN ISO 9001:2008, 8.5.2 is deemed to satisfy the requirements of this clause.

6.4.9 Handling, storage, packaging

The manufacturer shall have written procedures providing methods of product handling and shall provide suitable storage areas preventing damage or deterioration.

7 Classification and designation

Fittings shall be designated by quoting:

a) common term or manufacturer's catalogue number (see note below);

b) number and part of this standard (EN 1254-6);

c) size of the connecting ends by the nominal outside diameter of the connecting tube or, in the case of fittings incorporating threaded connections, in accordance with EN 1254-4 or other standards, by the thread designation (see paragraph below for sequence of specifying ends);

d) without abutment, if applicable;

e) if required, the grade of dezincification resistance acceptance criteria;

f) if required, the type of plating or coating.

NOTE Fittings are normally designated either by a manufacturer's catalogue number or by the common terms, straight coupling, bend, elbow, tee, etc.

The preferred sequence a) for specifying ends is run-branch-run-branch (omitting where necessary for tees). The non-preferred sequence b) is run-run-branch-branch (omitting where necessary for tees). Ordering details should state if the non-preferred sequence system was used.

For fittings with equal ends, the nominal size can be specified by the one diameter.

For fittings with unequal ends or adaptor fittings, the ends are specified in the same order, but the largest end of the run should be quoted first.

8 Marking

8.1 General

Each fitting shall be legibly and permanently marked, at the minimum, with the following:

— Manufacturer's identity symbol.

If it is practicable, each fitting should be legibly and durably marked with the nominal diameter, otherwise it should be on the label or packaging.

The manufacturer has the option to mark the number and part of this European Standard on either the packaging or the fitting.

8.2 Dezincification resistant copper-zinc alloys

When national regulatory requirements demand, components manufactured from dezincification resistant copper-zinc alloys and capable of meeting the requirements of 5.2.3 shall be legibly and permanently marked in accordance with either a) or b) as follows:

a) for grade A material, use symbol ŒRor characters DRA;

b) for grade B material, use characters DRB.

9 Documentation

9.1 Declaration of conformity

When national regulatory requirements demand, or when requested by the purchaser, the supplier shall give a written declaration in accordance with EN 1655 that the push fitting connections fulfil the requirements of this standard.

9.2 User instructions

User instructions shall be available from the manufacturer.

Annex A
(normative)

Method for testing leaktightness of joints under internal hydrostatic pressure

A.1 Introduction

This annex specifies the test method for determining the resistance of the joint assemblies to internal hydrostatic pressure.

A.2 Principle

The test pieces incorporating one or more fittings are subjected to a specified constant internal hydrostatic water pressure for a specified period of time.

A.3 Apparatus

A.3.1 Pressure measurement device, capable of checking the conformity to the specified test pressure. In the case of gauges or similar calibrated pressure measurement devices, the range of the gauge shall be such that the required pressure setting shall lie within the calibrated range of the device used.

NOTE The use of master gauges for calibration of the apparatus is recommended.

A.3.2 Pressurising pump, capable of applying and maintaining the required pressure in accordance with Table 7 for the duration of the test.

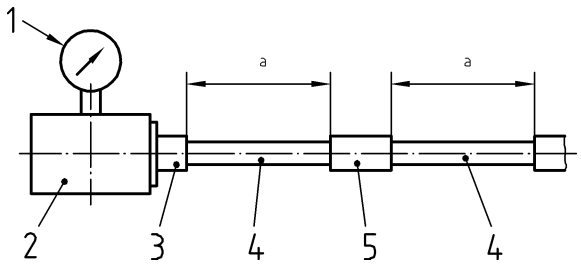
NOTE The pressure can be applied individually to each test piece or simultaneously to several test pieces, which may be of different sizes, in a test piece assembly.

A.3.3 Pump connection, capable of connecting the pressurizing device to the tube and test piece assembly and remaining leaktight for the duration of the test.

A.4 Test piece

The test piece shall consist of the fitting or fittings to be tested connected to the relevant tube or pipe to a minimum length as specified in Table 8. The free end of the tube shall be fitted with an end cap to seal off the assembly.

The test piece and apparatus shall be arranged as shown schematically in Figure A.1.



Key
1 pressure measurement device
2 pressurising pump
3 pump connection
4 tube
5 fitting under test
[a] for dimensions, see Table 8

Figure A.1 — Arrangement of apparatus for leaktightness test — Under internal hydrostatic pressure

A.5 Procedure

Connect the test pieces to the pressurising pump and bleed off the air. Progressively and smoothly apply the test pressure and maintain for the duration of the test, all as stated in Table 8.

Inspect the test joint assemblies for leaks.

Annex B
(normative)

Method for testing resistance to pull-out of joints with metallic tube

B.1 Introduction

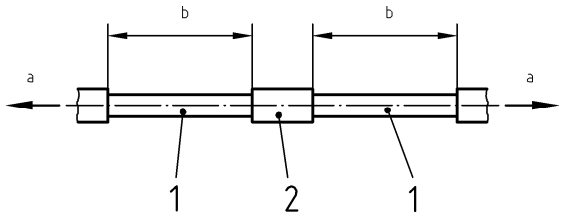
This annex specifies the test method for determining the resistance of the joint assemblies to axial tensile loading.

B.2 Principle

The test piece incorporates one fitting assembled with two pieces of tube and is subjected to an axial tensile loading and held under tension for a period of time, followed by a leaktightness test. Separate combinations shall be assembled for each type of tube for which the fittings are designed.

B.3 Apparatus

The apparatus shall consist of a means to apply the load gradually, and then maintain a constant longitudinal force for the period of testing. Accuracy of load application to be better than 5 %. A typical arrangement is shown in Figure B.1.



Key
1 tube
2 fitting under test
a for magnitude of test force, see Table 9
b for dimensions, see Table 9

Figure B.1 — Arrangement of apparatus for resistance to pull-out test

B.4 Test assembly

Separate assemblies shall be used for each size and type of fitting. Each piece of tube shall be not less than 100 mm.

B.5 Procedure

Secure the test assembly in the apparatus and apply gradually over a period not less than 30 s the force as shown in Table B.1 below. Hold the specimen in constant tension for 1 h.

Table B.1 — Tensile force

Nominal diameter	Force F N
6 to 17	600
18	611
20	754
21	831
22	913
25	1 179
27,4	1 415
28	1 478
32	1 931
34	2 179
35	2 310
40	3 016
40,5	3 092
42	3 326
50	4 713
53,6	5 416
54	5 497

For sizes up to and including 17 mm, the force, F, is based on a minimum practical requirement for the separation of joints.

For sizes above 17 mm, the force, F, is calculated from the following equation:

$$F = \frac{\pi \times {d_n}^2 \times p_D \times S_f}{4} \quad \text{(B.1)}$$

where

F is the force, expressed in Newtons (N);

d_n is the nominal diameter of the tube in millimetres (mm);

p_D is the maximum design pressure of 16 bar, expressed in megapascals (MPa);

S_f is a factor of safety of 1,5.

Annex C
(normative)

Test method for resistance of joints with metallic tube to temperature cycling

C.1 Introduction

This annex specifies the test method for determining the resistance of joint assemblies to temperature cycling.

C.2 Principle

An assembly of tube and fittings is subjected to temperature cycling by the passage of cold water followed by hot water at specified temperatures and pressure, followed by an internal hydrostatic pressure test. The joints are then inspected for leaks.

C.3 Apparatus

C.3.1 means of alternately circulating hot and cold water through the test assembly;

The alternation equipment shall be capable of effecting each change between hot and cold sources within a specified period.

C.3.2 means of regulating the water pressure in the test assembly;

C.3.3 means of measuring the water temperature at the inlet and outlet from the test assembly;

C.3.4 pump capable of providing the pressure specified in Table 10.

C.4 Test assembly

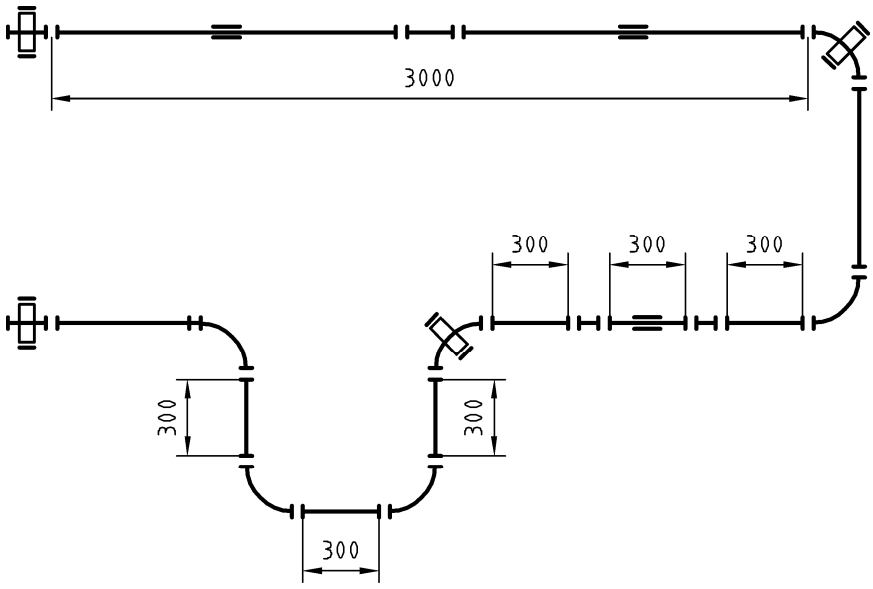
The test assembly shall comprise metallic tube and fittings jointed and clipped in accordance with the manufacturer's instructions as shown in Figure C.1 for sizes up to and including 54 mm.

The total number of fitting ends shall be not less than 20 and shall include straight connectors and 90° elbows.

For sizes up to and including 22 mm, a combination of size, material (tempers) and the minimum and maximum recommended wall thickness as specified in EN 1057 are allowed in one test line. A test line may include as many combinations as possible but no more than three sizes, providing all test conditions are fulfilled.

For sizes above 22 mm, each size shall be tested in one line, however combinations of material temper and the minimum and maximum recommended wall thickness may be tested in the same line, as specified by the manufacturer.

Dimensions in millimetres



Key

elbow

pipe with guide

free pipe

fixed straight connector

fixed elbow

Figure C.1 — Test assembly for systems based on metallic tubes

C.5 Procedure

Prepare the assembly for testing and prime it with water so that all air is excluded.

Subject the assembly to the number of cycles of hot and cold water at pressures, temperatures as specified in Table 10. Perform any required adjustment of the joints within the first five cycles. Control the flow of the circulating water such that the measured temperature drop on the hot and cold cycle from the inlet to the outlet of the test assembly does not exceed 5 °C.

The temperature cycle from cold to hot and vice-versa shall be completed within 1 min when measured at the inlet.

On completion of the cyclic test schedule, subject the assembly to a hydrostatic water pressure test at 16 bar at ambient temperature for not less than 15 min.

It is recommended that the hydrostatic pressure test be carried out without removal of the assembly from the test rig.

Annex D
(normative)

Method for testing the resistance of joints with metallic tube to pressure cycling

D.1 Introduction

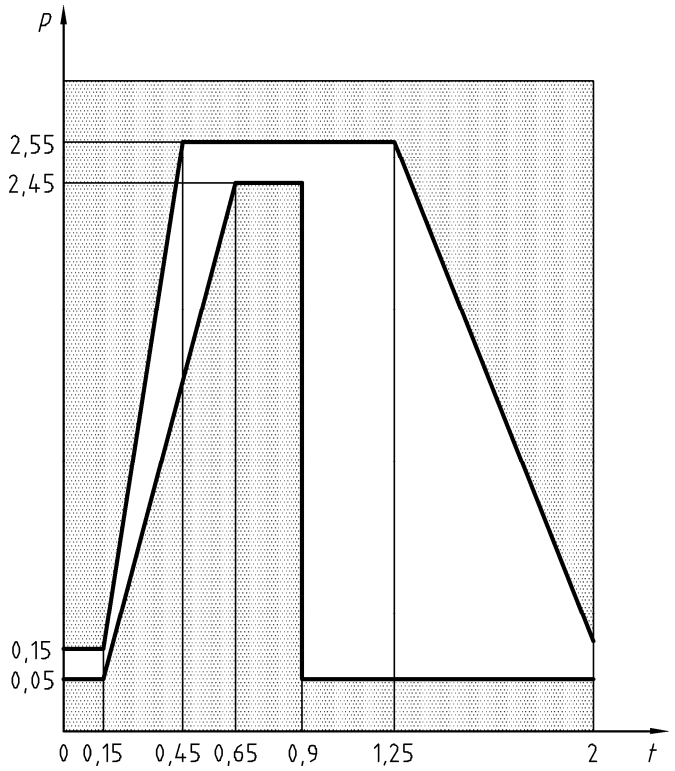
This annex specifies a method for testing the resistance of assemblies to pressure cycling.

D.2 Principle

An assembly of tubes and fittings in air or water is subjected to pressure cycling between two positive pressure limits using water maintained at the required temperature.

D.3 Apparatus

D.3.1 Pressurising device capable of applying and regulating the water pressure in the test piece to a pressure jump as shown in Figure D.1 with the pressure line staying within the white area.



Key
p pressure (MPa)
t time (s)

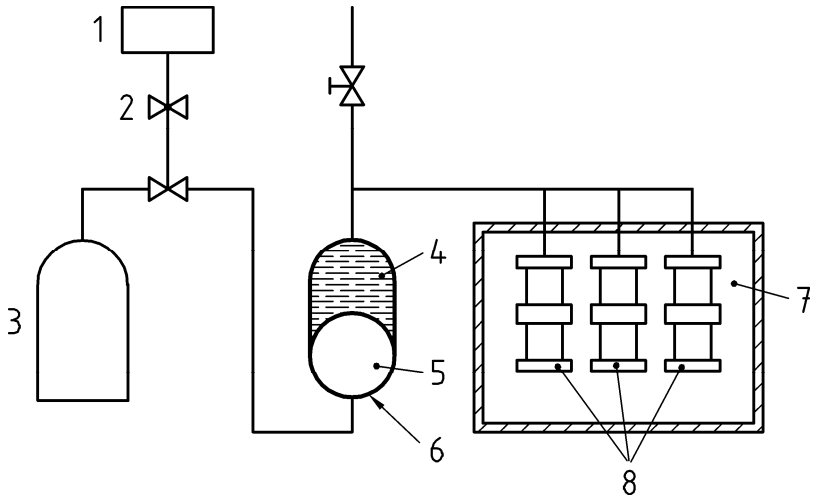
Figure D.1 — Pressure requirement

D.3.2 Pressure-measuring device capable of measuring water pressure in the test piece with an accuracy of ± 5 %.

D.3.3 Test chamber capable of maintaining the specified test temperature within ± 5 °C.

D.3.4 Temperature sensing device(s) capable of measuring the test temperature to the required accuracy.

A typical test arrangement is shown in Figure D.2.



Key

1 electrical control
2 valve
3 compressed air cylinder
4 water
5 air
6 pressure converter
7 temperature controlled test chamber containing air or water
8 test assemblies

Figure D.2 — Schematic test arrangement

D.4 Test pieces

Test pieces shall comprise an assembly of tubes and fittings, the number as specified in Table 11, joined in accordance with the manufacturer's instructions. The free length on each side of the fitting(s) under test shall be not less than 1,5 DN, or 300 mm whichever is the greater, where DN is the nominal size of the tube.

NOTE Several fittings of different sizes may be tested simultaneously.

D.5 Procedure

Each test assembly shall be filled with water, and all air expelled prior to the start of the test. The test assembly and water within the test chamber shall be allowed to attain the required test temperature before the test is started. The internal test pressures are then applied to the test assembly for the number of cycles and at the frequency specified in Table 11.

Annex E
(normative)

Test method for leaktightness of joints with metallic tube under vacuum

E.1 Introduction

This annex specifies the method for testing the leaktightness under vacuum of joint assemblies with metallic tube.

It is applicable to systems intended to be used in hot and cold water pressure applications.

E.2 Principle

Assembled metallic tubes and fittings are subjected to partial vacuum for a specific period during which the joints are inspected for air tightness.

E.3 Apparatus

E.3.1 Vacuum source (pump), capable of producing in the test piece the partial vacuum specified in Table 12.

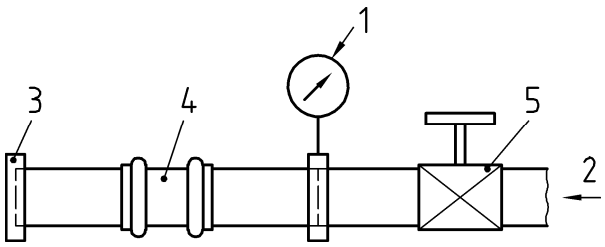
E.3.2 Vacuum pressure measurement device, capable of measuring the pressure in the test piece with an accuracy of ± 0,01 bar[2)].

E.3.3 Shut-off valve, to isolate the test piece from the vacuum source.

E.3.4 Thermometer(s), capable of checking conformity to the specified test temperature.

E.3.5 End-sealing device, of appropriate size and sealing method, for sealing the non-jointed end of the test piece.

2) 1 bar = 10^5 N/m^2 = 0,1 MPa



Key
1 gauge or manometer
2 to vacuum pump
3 end seal
4 joint under test
5 shut-off valve

Figure E.1 — Typical test arrangement

E.4 Test piece

The test piece shall comprise an assembly of tubes and fittings joined in accordance with the manufacturer's instructions.

The test piece shall be connected to the vacuum source (pump) via a line with shut-off valve.

E.5 Procedure

Maintain the test temperature in the range (23 ± 5) °C ensuring that variations in the test temperature do not exceed ± 2 °C. Evacuate the test piece to the test pressure specified in Table 12. Record the time when the test pressure is achieved and close the shut-off valve. Record the increase of pressure, until either the test period specified in Table 12 has elapsed or prior failure of the test piece as indicated by an increase of internal pressure.

Annex F
(normative)

Test method for the resistance of joints with metallic tube to vibration

F.1 Introduction

This annex specifies the test method for determining the resistance of joint assemblies to vibration.

F.2 Principle

An assembly of metallic tubes and fittings is subjected to vibration of a specified displacement, and duration whilst under internal hydrostatic pressure.

F.3 Apparatus

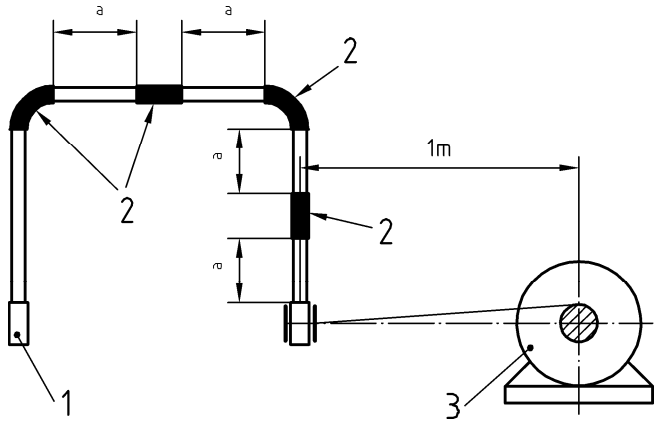
F.3.1 Drive, which incorporates an eccentric disc to produce a displacement of ± 1,0 mm at the free end of the assembly, and providing a vibration at a frequency of (20 ± 2) Hz.

F.3.2 Means of pressurising the test assembly to the pressure required by Table 13, and maintaining that pressure throughout the test period.

F.3.3 Means of counting the elapsed cycles.

F.4 Test assembly

The test assembly shall comprise copper tube as specified in Table 13, four fittings; two 90° elbows, and two straight couplers, arranged as shown in Figure F.1.



Key
1 fixed point and pressurised water connection point
2 test specimens
3 eccentric disk, see F.3.1
[a] free pipe segments of 200 mm

Figure F.1 — Example of a test set-up for a vibration test (diagram)

F.5 Procedure

The test assembly shall be fitted to the apparatus and filled with water, all air excluded and then pressurised to the requirement in Table 13. The test is then started to complete the number of cycles required as specified in Table 13.

On completion of the test, the fittings shall be inspected for leaks.

Annex G
(normative)

Test method for leaktightness of joints with metallic tube under internal hydrostatic pressure while subjected to bending

G.1 Introduction

This annex specifies the test method for the determination of the resistance of joints assembled with metallic tube to internal hydrostatic pressure while subjected to bending.

G.2 Principle

An assembly of metallic tubes and a fitting is subjected to a specified displacement while under internal hydrostatic pressure.

G.3 Apparatus

G.3.1 Pressure measurement device, capable of checking the conformity to the specified test pressure.

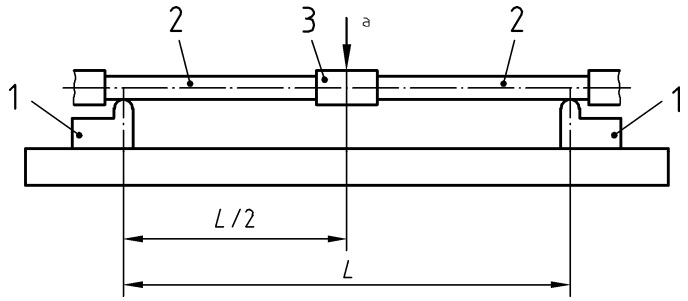
G.3.2 Pressurising device, capable of applying and maintaining the required pressure in accordance with Table 14 for the duration of the test.

G.3.3 Means of supporting the tubes at the distance specified in Table 14.

G.4 Test piece

The test piece shall consist of the fitting to be tested connected to the relevant tubes. One tube shall be connected to the pressurising device and the other shall be fitted with an end cap to seal off the assembly. The centreline of the fitting shall be equidistant from the support centres.

The test piece and apparatus shall be arranged as schematically shown in Figure G.1.



Key
1 support
2 tube
3 fitting under test
a for magnitude of deflection, see Table 14
L for dimensions see Table 14

Figure G.1 — Typical arrangement of apparatus for leaktightness test under internal hydrostatic pressure while subjected to bending

G.5 Procedure

Connect the test pieces to the pressurising device, fill with water, bleed off the air and pressurise to the requirement in Table 14. Gradually apply a bending force to cause a deflection specified in Table 14. Maintain the deflection for the time specified in Table 14.

Inspect the joints for leaks.

Annex H
(normative)

Test method for disconnection and re-use

H.1 Introduction

This annex specifies the test method for determining the ability of a joint to be disconnected and re-used.

H.2 Principle

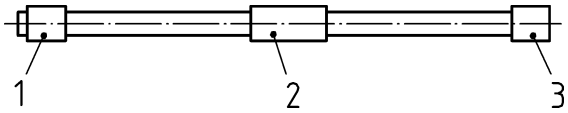
A fitting is connected to a tube or pipe, disconnected and reconnected a specified number of times and then subjected to an internal hydrostatic pressure test.

H.3 Apparatus

H.3.1 Disconnection tool as specified by the manufacturer.

H.4 Test assembly

The test assembly shall be comprised of a metallic tube or plastics pipe and one fitting arranged as shown in Figure H.1.



Key
1 pressure connection
2 test fitting
3 end stop

Figure H.1 — Typical test assembly

H.5 Procedure

The assembled fitting is disconnected from the tube or pipe and reconnected to the tube or pipe the number of times specified in Table 16. The assembly is then subjected to a hydrostatic pressure test as specified in Annex A and inspected for leaks.

Annex I
(normative)

Fitting rotation test

I.1 Introduction

This annex specifies the test method for determining the ability of joint assemblies to maintain performance after the joint is subjected to rotation.

I.2 Principle

An assembly of tubes or pipes and a fitting is subjected to a specified angular displacement while under hydrostatic pressure.

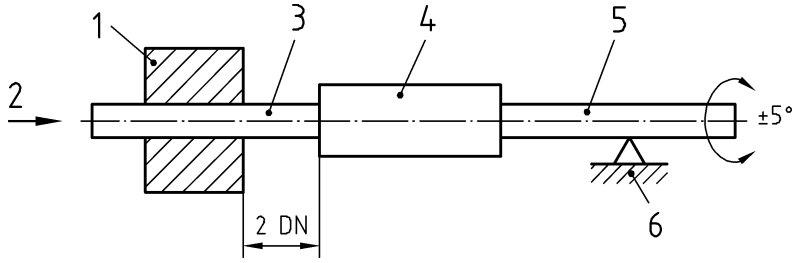
I.3 Apparatus

I.3.1 Drive which incorporates means to produce a displacement of ± 5° at the free end of the assembly.

I.3.2 Means of counting the elapsed cycles.

I.4 Test assembly

The test assembly shall be comprised of tubes or pipes and one fitting arranged as shown in Figure I.1.



Key
1 fixed support for pipe
2 test pressure
3 pipe
4 specimen
5 pipe 2
6 simple support for pipe

Figure I.1 — Typical test arrangement

I.5 Procedure

The test assembly shall be fitted to the apparatus. The test is then started to complete the number of cycles required as specified in Table 17.

One cycle equals the rotation of the free end of the tube 5°.

For metallic tube assemblies, inspect the test joint assemblies for leaks.

Subject plastics and multilayer pipe assemblies to a leaktightness under internal hydrostatic pressure test in accordance with Annex A.

Annex J
(normative)

Determination of resistance to stress corrosion

J.1 Introduction

ISO 6957 specifies a method for the determination of resistance to stress corrosion using ammonia.

The principle of the method, the reagents, materials and apparatus required and the procedure for the selection and preparation of the test pieces, are all in accordance with ISO 6957.

J.2 Test piece

Test pieces shall be complete fittings incorporating all components but shall not be assembled to the tube.

J.3 Procedure

Fittings shall be tested in accordance with the procedure stated in Clause 8 of ISO 6957:1988 using a test solution of pH 9,5 but without prior pickling.

J.4 Test report

The test report shall make reference to this standard, the test date, the pH value of the solution used, the exposure temperature, the number of replicated samples, and the test result — cracks or no cracks.

Annex K
(normative)

Pressure test for fittings bodies with as-cast microstructure or fabricated by welding or brazing

K.1 Introduction

This annex specifies the test method for determining the resistance of bodies with as-cast microstructure or fabricated by welding or brazing, to internal pressure.

K.2 Principle

The test pieces are subjected to a specified internal pressure for a specified period of time and inspected for leaks.

K.3 Apparatus

K.3.1 Pressure measurement device, capable of checking the conformity to the specified test pressure. In the case of gauges or similar calibrated pressure measurement devices, the range of the gauge shall be such that the required pressure setting shall lie within the calibrated range of the device used.

The use of master gauges for calibration of the apparatus is recommended.

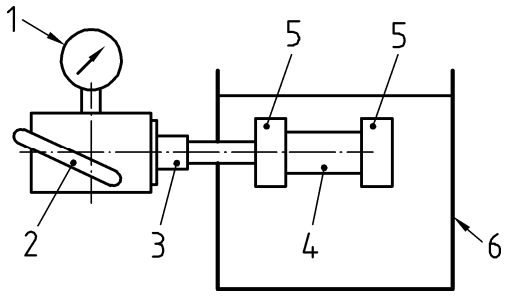
K.3.2 Pressurising device, capable of applying and maintaining the required pressure in accordance with Table 20 for the duration of the test.

K.3.3 Pressure connection, capable of connecting the pressurizing device to the test piece and remaining leaktight for the duration of the test.

K.4 Test piece

The test piece shall consist of the fitting to be tested, which has been machined and is not assembled to any other component.

The test piece and apparatus shall be arranged as shown schematically in Figure K.1.



Key
1 pressure measurement device
2 pressurizing device
3 connection device
4 fitting under test
5 end sealing device
6 tank for pneumatic test

Figure K.1 — Typical arrangement of apparatus for internal pressure test of fitting bodies with as-cast microstructure or fabricated

K.5 Procedure

Apply an internal pressure of either;

a) pneumatic pressure as specified in Table 20 for a duration of 5 s, or

b) hydrostatic pressure as specified in Table 20 for a duration of 5 min, or

c) any other pressure test of equivalent performance.

Inspect the fitting for leaks in the working pressure zone of the body, for the duration of the test.

Annex L
(normative)

Determination of mean depth of dezincification

L.1 Introduction

EN ISO 6509 specifies a method for the determination of the maximum depth of dezincification of a brass specimen. In accordance with the ruling given in EN ISO 6509:1995, 7.5.3, the following procedure extends the method to cover the determination of the mean depth of dezincification, in order to verify conformity to the dezincification resistance acceptance criteria for dezincification resistant alloy grade B products.

The principle of the method, the reagents, materials and apparatus required and the procedure for the selection and preparation of the test pieces, are all in accordance with EN ISO 6509.

L.2 Procedure

Having determined the maximum depth of dezincification in a longitudinal direction, in accordance with EN ISO 6509:1995, Clause 7 (see 6.2.3), carry out the following operations to determine the mean depth of dezincification.

Adjust the magnification of the microscope to suit the general depth of dezincification and use the same magnification for all measurements. Examine the entire length of the section for evaluation, in contiguous visual fields of the microscope.

To ensure the best accuracy of measurement, the largest number of contiguous fields at the greatest possible magnification should be measured.

Using the measuring scale incorporated in the microscope, measure and record the dezincification depth, i.e. the point of intersection of the scale and the dezincification front for each contiguous field. If the scale lies between two dezincified areas within the usual field, the dezincification depth shall be recorded as the point of intersection of the scale and an imaginary line joining the extremities of the two dezincification fronts adjacent to the scale.

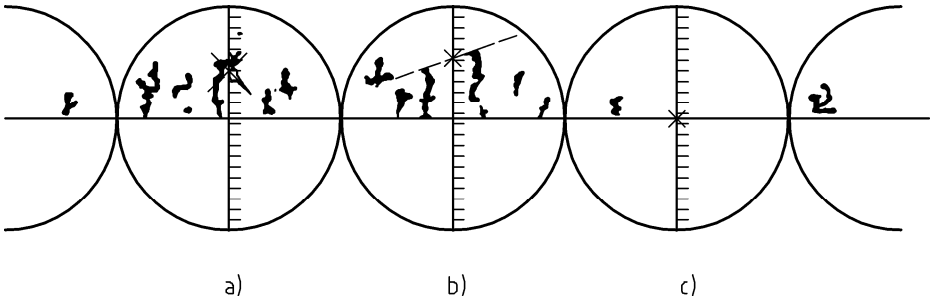
— for grade A: max. 200 µm;

— for grade B: mean not to exceed 200 µm and max. 400 µm.

If there is no evidence of dezincification in the field examined, or only one dezincified area which does not intersect the scale, then record the dezincification as zero.

L.3 Expression of results

After measurement of all the contiguous fields along the entire length of the section for evaluation, calculate and report the mean dezincification depth as the sum of the measured depths for every field, divided by the number of contiguous fields examined.



NOTE The locations for the measurement of dezincification depth, in three different cases, are marked X.

Figure L.1 — Example of contiguous fields

Bibliography

EN ISO 9001:2008, *Quality management systems — Requirements (ISO 9001:2008)*

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