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AMENDMENT 2

2021-09

Plastics piping systems for hot and cold water installations — Chlorinated poly(vinyl chloride) (PVC-C) —

Part 3: **Fittings**

AMENDMENT 2

Systèmes de canalisations en plastique pour les installations d'eau chaude et froide — Poly(chlorure de vinyle) chloré (PVC-C) —

Partie 3: Raccords

AMENDEMENT 2

Reference number
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This document was prepared by Technical Committee ISO/TC 138, *Plastics pipes, fittings and valves for the transport of fluids*, Subcommittee SC 2, *Plastics pipes and fittings for water supplies,* in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 155, *Plastics piping systems and ducting systems,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

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Plastics piping systems for hot and cold water installations — Chlorinated poly(vinyl chloride) (PVC-C) —

Part 3: Fittings

AMENDMENT 2

Normative references

Add the following normative references:

ISO 2768-1, *General tolerances — Part 1: Tolerances for linear and angular dimensions without individual tolerance indications*

ISO 6506-1, *Metallic materials — Brinell hardness test — Part 1: Test method*

ISO 6509-1, *Corrosion of metals and alloys — Determination of dezincification resistance of copper alloys with zinc — Part 1: Test method*

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

ISO 22081, *Geometrical product specifications (GPS) — Geometrical tolerancing — General geometrical specifications and general size specifications*

Delete the following normative reference:

EN 1254-3, *Copper and copper alloys — Plumbing fittings — Part 3: Fittings with compression ends for use with plastics pipes*

3.1.2.1

Replace the existing definition 3.1.2.1 with the following:

3.1.2.1
compression fitting
fitting with internal support in which the joint is made by screwing a union nut along a thread to compress a ring on the outside wall of the pipe and finally to cause a clamping of the pipe between the ring and the inner support of the fitting

Note 1 to entry: The fitting may be with or without sealing element.

4.2

Replace the existing title of subclause 4.2 with the following:

4.2 Plastics fitting material

4.4, Table 1

Insert the following table footnote [d] to Vicat softening temperature (VST):

[d] Test samples may be annealed prior to testing at conditions recommended by the manufacturer.

4.4, Table 2

Insert the following table footnote [d] to Vicat softening temperature (VST):

[d] Test samples may be annealed prior to testing at conditions recommended by the manufacturer.

4.5

Replace the existing subclause 4.5 with the following:

4.5 Metallic fitting material

Metallic materials for fittings intended to be used with components conforming to ISO 15877 shall be either copper alloys or stainless steel alloys. The alloys shall be defined according to a standard or regulatory document.

NOTE Examples for such standards and regulatory documents are listed in the Bibliography.

For copper alloys, the fittings made thereof shall conform with the corrosion resistance requirements according to 7.4.

5.1

Replace the existing subclause 5.1 with the following:

5.1 Appearance

5.1.1 Appearance of plastic fittings

When viewed without magnification, the internal and external surfaces of fittings shall be smooth, clean and free from scoring, cavities and other surface defects to an extent that would prevent conformance with this document. The material shall not contain visible impurities. Slight variations in appearance of the colour shall be permitted. Each end of a fitting shall be perpendicular to its longitudinal axis.

5.1.2 Appearance of metal fittings

When viewed without magnification, the internal and external surfaces of fittings shall be clean, free from any residues from the production (e.g. free from cast sand, grease or release agent) and shall have no sharp edges or cracks.

5.2

Replace the existing title of subclause 5.2 with the following:

5.2 Opacity of plastic fittings

6.1, first sentence

Replace the existing first sentence of subclause 6.1 with the following two sentences:

Dimensions of plastic fittings shall be measured in accordance with ISO 3126.

Dimensions of metal fittings shall be measured in accordance with ISO 2768-1 and/or ISO 22081.

6.2

Replace the existing title of subclause 6.2 with the following:

6.2 Dimensions of plastic fittings

6.2.2, Table 3

Replace the existing Table 3 with the following new Table 3. Larger dimensions (180 mm to 250 mm) have been added. The dimensions of 12 mm to 160 mm remain unchanged from the ISO 15877-3:2009 version.

Table 3 — Wall thicknesses of fitting bodies

Nominal diameter	Pipe series		
	S 6,3	S 5	S 4
	Minimum wall thickness [a]		
d_n	e_{min}		
12	1,9	1,9	1,9
14	1,9	1,9	2,2
16	1,9	2,1	2,5
20	2,1	2,6	3,2
25	2,6	3,2	3,8
32	3,3	4,0	4,9
40	4,1	5,0	6,1
50	5,0	6,3	7,6
63	6,4	7,9	9,6
75	7,6	9,2	11,4
90	9,1	11,1	13,7
110	11,0	13,5	16,7
125	12,5	15,4	18,9
140	14,0	17,2	21,2
160	16,0	19,8	24,2
180	18,0	22,2	27,2
200	19,9	24,6	30,3
225	22,5	27,7	34,1
250	24,9	30,7	37,7

[a] The values are rounded up to the first place of the decimals (i.e. the nearest higher 0,1 mm).

6.2.5, Table 4

Replace the existing Table 4 with the following new Table 4. Larger dimensions (180 mm to 250 mm) have been added. The dimensions of 12 mm to 160 mm remain unchanged from the ISO 15877-3:2009 version.

Table 4 — Calculated laying lengths (*Z*-lengths) and related tolerances of elbows, tees and couplers (double-sockets)

Dimensions in millimetres

Nominal diameter	Type of fitting					
	90° elbow	45° elbow	90° tee	45° tee		Double-socket
	Calculated *Z*-length and recommended deviations					
d_n	Z	Z	Z	Z	Z_1	Z
12	7 ± 1	$3{,}5 \pm 1$	7 ± 1	--	--	3 ± 1
14	8 ± 1	4 ± 1	8 ± 1	--	--	3 ± 1
16	9 ± 1	$4{,}5 \pm 1$	9 ± 1	--	--	3 ± 1
20	11 ± 1	5 ± 1	11 ± 1	27 ± 3	6^{+2}_{-1}	3 ± 1
25	$13{,}5^{+1,2}_{-1}$	$6^{+1,2}_{-1}$	$13{,}5^{+1,2}_{-1}$	33 ± 3	7^{+2}_{-1}	$3^{+1,2}_{-1}$
32	$17^{+1,6}_{-1}$	$7{,}5^{+1,6}_{-1}$	$17^{+1,6}_{-1}$	42^{+4}_{-3}	8^{+2}_{-1}	$3^{+1,6}_{-1}$
40	21^{+2}_{-1}	$9{,}5^{+2}_{-1}$	21^{+2}_{-1}	51^{+5}_{-3}	10^{+2}_{-1}	3^{+2}_{-1}
50	$26^{+2,5}_{-1}$	$11{,}5^{+2,5}_{-1}$	$26^{+2,5}_{-1}$	63^{+6}_{-3}	12^{+2}_{-1}	3^{+2}_{-1}
63	$32{,}5^{+3,2}_{-1}$	$14^{+3,2}_{-1}$	$32{,}5^{+3,2}_{-1}$	79^{+7}_{-3}	14^{+2}_{-1}	3^{+2}_{-1}
75	$38{,}5^{+4}_{-1}$	$16{,}5^{+4}_{-1}$	$38{,}5^{+4}_{-1}$	94^{+9}_{-3}	17^{+2}_{-1}	4^{+2}_{-1}
90	46^{+5}_{-1}	$19{,}5^{+5}_{-1}$	46^{+5}_{-1}	112^{+11}_{-3}	20^{+3}_{-1}	5^{+2}_{-1}
110	56^{+6}_{-1}	24^{+6}_{-1}	56^{+6}_{-1}	137^{+13}_{-4}	24^{+3}_{-1}	6^{+3}_{-1}
125	$63{,}5^{+6}_{-1}$	27^{+6}_{-1}	$63{,}5^{+6}_{-1}$	157^{+15}_{-4}	27^{+3}_{-1}	6^{+3}_{-1}
140	71^{+7}_{-1}	30^{+7}_{-1}	71^{+7}_{-1}	175^{+17}_{-5}	30^{+4}_{-1}	8^{+3}_{-1}
160	81^{+8}_{-1}	34^{+8}_{-1}	81^{+8}_{-1}	200^{+20}_{-6}	35^{+4}_{-1}	8^{+4}_{-1}
180	91^{+8}_{-1}	39^{+8}_{-1}	91^{+8}_{-1}	224^{+24}_{-8}	39^{+8}_{-1}	8^{+4}_{-1}
200	101^{+9}_{-1}	43^{+9}_{-1}	101^{+9}_{-1}	249^{+25}_{-8}	43^{+9}_{-1}	8^{+5}_{-1}
225	114^{+10}_{-1}	48^{+10}_{-1}	114^{+10}_{-1}	280^{+28}_{-9}	48^{+10}_{-1}	10^{+5}_{-1}
250	126^{+10}_{-1}	53^{+10}_{-1}	126^{+10}_{-1}	310^{+31}_{-10}	53^{+10}_{-1}	12^{+5}_{-2}

6.2.5, Table 7

Replace the existing Table 7 with the following new Table 7. Larger dimensions (180 mm to 250 mm) have been added. The dimensions of 14 mm to 160 mm remain unchanged from the ISO 15877-3:2009 version.

Table 7 — Calculated laying lengths (*Z*-lengths) and related tolerances of reducing bushes, long type, with cylindrical sockets

Dimensions in millimetres

Nominal diameter of the socket d_1	Nominal diameter of the spigot, d_2															
	20	25	32	40	50	63	75	90	110	125	140	160	180	200	225	250
	Calculated laying length, *Z*, and related tolerances															
	±1			±1,5				±2								
14	21	25	30	–	–	–	–	–	–	–	–	–	–	–	–	–
16	21	25	30	36	–	–	–	–	–	–	–	–	–	–	–	–
20	–	25	30	36	44	–	–	–	–	–	–	–	–	–	–	–
25	–	–	30	36	44	54	–	–	–	–	–	–	–	–	–	–
32	–	–	–	36	44	54	62	–	–	–	–	–	–	–	–	–
40	–	–	–	–	44	54	62	74	–	–	–	–	–	–	–	–
50	–	–	–	–	–	54	62	74	88	–	–	–	–	–	–	–
63	–	–	–	–	–	–	62	74	88	100	–	–	–	–	–	–
75	–	–	–	–	–	–	–	74	88	100	111	–	–	–	–	–
90	–	–	–	–	–	–	–	–	88	100	111	126	–	–	–	–
110	–	–	–	–	–	–	–	–	–	100	111	126	141	–	–	–
125	–	–	–	–	–	–	–	–	–	–	111	126	141	156	–	–
140	–	–	–	–	–	–	–	–	–	–	–	126	141	156	175	–
160	–	–	–	–	–	–	–	–	–	–	–	–	141	156	175	194
180	–	–	–	–	–	–	–	–	–	–	–	–	–	156	175	194
200	–	–	–	–	–	–	–	–	–	–	–	–	–	–	175	194
225	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	194

6.2.5, Table 9

Replace the existing Table 9 with the following new Table 9. Larger dimensions (180 mm to 250 mm) have been added. The dimensions of 14 mm to 160 mm have been unchanged from the ISO 15877-3:2009 version.

Table 9 — Calculated laying lengths (*Z*-lengths) and related tolerances of reducing bushes, short type, with cylindrical sockets

Dimensions in millimetres

Nominal diameter of the socket d_1	**Nominal diameter of the spigot,** d_2																
	16	20	25	32	40	50	63	75	90	110	125	140	160	180	200	225	250
	Calculated laying length, *Z*, and related tolerances ±1																
14	1	3	5,5	9	–	–	–	–	–	–	–	–	–	–	–	–	–
16	–	2	4,5	8	12	–	–	–	–	–	–	–	–	–	–	–	–
20	–	–	2,5	6	10	15	–	–	–	–	–	–	–	–	–	–	–
25	–	–	–	3,5	7,5	12,5	19	–	–	–	–	–	–	–	–	–	–
32	–	–	–	–	4	9	15,5	21,5	–	–	–	–	–	–	–	–	–
40	–	–	–	–	–	5	11,5	17,5	25	–	–	–	–	–	–	–	–
50	–	–	–	–	–	–	6,5	12,5	20	30	–	–	–	–	–	–	–
63	–	–	–	–	–	–	–	6	13,5	23,5	31	–	–	–	–	–	–
75	–	–	–	–	–	–	–	–	7,5	17,5	25	32,5	–	–	–	–	–
90	–	–	–	–	–	–	–	–	–	10	17,5	25	35	–	–	–	–
110	–	–	–	–	–	–	–	–	–	–	7,5	15	25	35	–	–	–
125	–	–	–	–	–	–	–	–	–	–	–	7,5	17,5	27,5	37,5	–	–
140	–	–	–	–	–	–	–	–	–	–	–	–	10	20	30	42,5	–
160	–	–	–	–	–	–	–	–	–	–	–	–	–	10	20	32,5	45
180	–	–	–	–	–	–	–	–	–	–	–	–	–	–	10	22,5	35
200	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	12,5	25
225	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	12,5

6.3.1, Table 10

Replace the existing Table 10 with the following new Table 10. Larger dimensions (180 mm to 250 mm) have been added. The dimensions of 12 mm to 160 mm remain unchanged from the ISO 15877-3:2009 version.

Table 10 — Dimensions of cylindrical sockets

Dimensions in millimetres

Nominal diameter	Mean inside diameter of the socket [a]		Maximum out-of-roundness (ovality)	Minimum socket length
d_n	$d_{sm,min}$	$d_{sm,max}$		L_{min}
12	12,1	12,3	0,25	12
14	14,1	14,3	0,25	13
16	16,1	16,3	0,25	14
20	20,1	20,3	0,25	16
25	25,1	25,3	0,25	18,5
32	32,1	32,3	0,25	22
40	40,1	40,3	0,25	26
50	50,1	50,3	0,3	31
63	63,1	63,3	0,4	37,5
75	75,1	75,3	0,5	43,5
90	90,1	90,3	0,6	51
110	110,1	110,4	0,7	61
125	125,1	125,4	0,8	68,5
140	140,2	140,5	0,9	76
160	160,2	160,5	1,0	86
180	180,2	180,6	1,1	96
200	200,2	200,6	1,2	106
225	225,3	225,7	1,4	118,5
250	250,3	250,8	1,5	131

[a] The mean inside diameter of the socket, d_{sm}, shall be measured at the midpoint of the socket. The maximum internal angle of the socketed portion shall not exceed 0°30' (see ISO 727-1 and ISO 727-2).

6.4.1, Table 12

Replace the existing Table 12 with the following new Table 12. Larger dimensions (180 mm to 250 mm) have been added. The dimensions of 16 mm to 160 mm remain unchanged from the ISO 15877-3:2009 version.

Table 12 — Dimensions of flange adaptors

Dimensions in millimetres

Flange adaptor					Nominal size of the flange [a]
Nominal outside diameter of the corresponding	Outside diameter of chamfer	Radius of chamfer on shoulder	Jointing face		
			for flat gasket	with O-ring groove	
d_n	d_1	r_1	Z	Z_1	DN
16	22 ± 0,1	1	3	6	10
20	27 ± 0,15	1	3	6	15
25	33 ± 0,15	1,5	3	6	20
32	41 ± 0,2	1,5	3	6	25
40	50 ± 0,2	2	3	8	32
50	61 ± 0,2	2	3	8	40
63	76 ± 0,3	2,5	3	8	50
75	90 ± 0,3	2,5	3	8	65
90	108 ± 0,3	3	5	10	80
110	131 ± 0,3	3	5	11	100
125	148 ± 0,4	3	5	11	125
140	165 ± 0,4	4	5	11	125
160	188 ± 0,4	4	5	11	150
180	201 ± 0,5	4	6	12	150
200	224 ± 0,5	4	6	12	200
225	248 ± 0,6	4	6	12	200
250	275 ± 0,6	4	6	12	250

[a] In accordance with ISO 2536.

6.4.2, Table 13

Replace the existing Table 13 with the following new Table 13. Larger dimensions (180 mm to 250 mm) have been added. The dimensions of 16 mm to 160 mm remain unchanged from the ISO 15877-3:2009 version.

Table 13 — Dimensions of flanges

Dimensions in millimetres

Nominal outside diameter of the corresponding pipe d_n	Nominal size of the flange DN	Outside diameter of the flange D	Inside diameter of the flange d [a]	Pitch circle diameter of bolt holes d_1	Diameter of bolt holes d_2	Radius r	Number of bolt holes n	Thread size
16	10	90	23	60	14	1	4	M12
20	15	95	28	65	14	1	4	M12
25	20	105	34	75	14	1,5	4	M12
32	25	115	42	85	14	1,5	4	M12
40	32	140	52	100	18	2	4	M16
50	40	150	63	110	18	2	4	M16
63	50	165	78	125	18	2,5	4	M16
75	65	185	92	145	18	2,5	4	M16
90	80	200	110	160	18	3	8	M16
110	100	220	133	180	18	3	8	M16
125	125	250	150	210	18	4	8	M16
140	125	250	167	210	18	4	8	M16
160	150	285	190	240	22	4	8	M20
180	150	285	190	240	22	4	8	M20
200	200	340	226	295	22	4	8	M20
225	200	340	226	295	22	4	8	M20
250	250	395	277	350	22	4	12	M20

NOTE All joining dimensions conform to ISO 2536.

[a] The tolerance for d: -0,5 for $d \leq 63$ mm;
-1 for $d > 63$ mm,
whereby d shall be compatible with the outside diameter, d_1, of the flange adaptor (see Table 12).

6.5

Replace the existing subclause 6.5 with the following:

6.5 Dimensions of metallic fittings

6.5.1 General

The dimensions and related tolerances of metallic fittings shall correspond to the dimensions of the pipe(s) conforming to ISO 15877-2 for which they are intended to be used.

6.5.2 Minimum wall thickness of fittings made of copper alloys

The minimum wall thickness shall be measured with a calibrated micrometer or equivalent instrument. The wall thickness shall be measured at three or more discrete places and efforts shall be made to find the minimum.

The minimum wall thickness at points A, B and C of the fitting (see Annex A and Figure A.1) shall be in accordance with Table A.1 and Figure A.1.

The minimum wall thickness specified does not apply along the cone angle or to the thickness of the loose ring or sleeve where such a ring or sleeve has been or is intended to be deformed to form a seal. It also does not apply to internal pipe supports.

Clause 7

Replace the existing title of Clause 7 with the following.

7 Physical and chemical characteristics

7.1

Replace the existing title of subclause 7.1 with the following:

7.1 Plastics fittings — Resistance to internal pressure

7.2

Replace the existing title of subclause 7.2 with the following:

7.2 Plastics fittings — Determination of free length

7.3

Replace the existing title of subclause 7.3 with the following:

7.3 Plastics fittings — Derivation of the hydrostatic test pressure

7.4

Add the following new subclause after the end of subclause 7.3:

7.4 Physical and chemical characteristics of metallic fittings

7.4.1 Fittings made of copper alloys — resistance to stress corrosion

Fittings made of copper alloys shall be resistant to stress corrosion.

Fittings manufactured from copper-tin-zinc alloys (e.g. CuSnZnPb) and copper-zinc-silicon alloys containing ≥ 2 % Si are deemed to be resistant to stress corrosion.

Fittings manufactured from CuZn-alloys are deemed to be resistant to stress corrosion when the product has a hardness HBW 2,5/62,5 ≤ 110 measured according to ISO 6506-1 or a hardness HV_5 ≤ 134 measured according to ISO 6507-1.

Other fittings manufactured from copper alloys with a zinc content of 10 % or greater not mentioned in the previous paragraphs shall be tested according to ISO 6957 using a test solution of pH 9,5 without prior pickling. The fittings shall not show any evidence of cracking.

7.4.2 Fittings made of copper alloys — resistance to dezincification

This requirement only applies where a fitting made of copper alloy is declared to be resistant to dezincification.

The resistance to dezincification of alloy fittings can be obtained by the correct material selection and processing of that material.

Copper alloys containing 15 % or less zinc provide a good resistance to dezincification and may be declared accordingly without testing.

For casted and wrought fittings, representative fitting samples shall be used.

For machined fittings, either representative fitting samples or alternatively representative material samples, prior to machining, shall be tested.

The samples shall be tested according to ISO 6509-1. The following acceptance criteria shall be met:

— Maximum dezincification depth: ≤ 200 µm

— Average dezincification depth: ≤ 100 µm

NOTE The requirement in this subclause duplicates ISO 6509-2:2017, Table 1, line (a).

Clause 12

Add the following new Clause 12 after the end of Clause 11:

12 Fittings made from cast alloys — tightness test

In order to identify cavities or holes that may cause leakage, fittings manufactured from casting alloys shall be tested on leak tightness. The tightness test shall be conducted after machining of the casted fitting. The fittings shall not show any form of leakage.

The tightness shall be tested by the use of compressed air with a pressure of ≥ 0,5 MPa (5 bar), when the fitting is immersed in water. Air bubbles indicate a leakage.

NOTE Alternative test methods can be applied.

Annex A

Add the following new annex after Clause 12, before the Bibliography:

Annex A
(normative)

Dimensional requirements for metallic fittings — Minimal wall thickness of fittings made of copper alloys at points A, B and C

The minimum wall thickness at points A, B and C of the fitting shall be in accordance with Table A.1 and Figure A.1.

Table A.1 — Minimum wall thickness of fittings made of copper alloys

Dimensions in millimetres

Nominal diameter *D*	**Minimum wall thickness of fittings made of copper alloys at points A, B and C**	
	Machined and wrought fittings	Cast fittings
10	1,0	1,0
12	1,1	1,1
14		
14,7	1,2	1,2
15		
16		
17	1,4	1,4
18		
20		
21		
22		1,5
25		1,6
26		
27,4	1,5	
28		1,8
32	1,6	
34		
40	1,8	2,0
40,5		
50	1,9	2,3
53,6		
63	2,0	2,4
75	2,6	2,8
90	2,9	3,1
110	3,3	3,5
125	3,7	3,9
140	4,1	4,3
160	4,6	4,8