

KS

KOREAN INDUSTRIAL STANDARD

Plastics piping systems for hot and cold water
installations
— Chlorinated poly(vinyl chloride) (PVC-C) Fittings
KS M 3415 : 2003

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Foreword

This standard is written on the basis of **ISO/FDIS 15877-3** *Plastics piping systems for hot and cold water installation - Chlorinated polyvinylchloride (PVC-C) - Part 3 : Fittings* with a little change of standard structure and technical modifications. The technical differences and the contents which are not originated from international standard are underlined.

1. Scope

1.1 This standard specifies the characteristics of fittings made from chlorinated poly(vinyl chloride) (PVC-C) for piping systems intended to be used for hot and cold water installations within buildings for the conveyance of water, whether or not intended for human consumption (domestic systems), and for heating systems, under design pressures and temperatures appropriate to the class of application (see **Table 1** of **KS M ISO 15877-1**).

This standard covers a range of service conditions (application classes), design pressure classes.

NOTE It is the responsibility of the purchaser or specifier to make the appropriate selections from these aspects, taking into account their particular requirements and any relevant national regulations and installation practices or codes.

It also specifies the test parameters for the test methods referred to in this standard.

In conjunction with the other Parts of **KS M ISO 15877** it is applicable to PVC-C fittings, their joints and to joints with components of PVC-C, other plastics and non-plastics materials intended to be used for hot and cold water installations.

This standard is applicable to fittings of the following types:

- fittings for solvent cement joints;
- mechanical fittings
- fitting with incorporated inserts

NOTE Fittings made from PVC-C are manufactured by injection-moulding.

1.2 Annex A(Normative) shall be effective with the Body of this standard until Dec 28, 2006, but it shall be deleted after that

2. Normative references

This standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to, or revisions of any of these publications apply to this standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

- KS M 3414** : 2003, *Plastics piping systems for hot and cold water installations - Chlorinated poly(vinyl chloride) (PVC-C) — Part 2: Pipes (MOD ISO/FDIS 15877-2:2002)*
- KS M ISO 1167** : 2003, *Thermoplastics pipes for the conveyance of fluids - Resistance to internal pressure - Test method*
- KS M ISO 2505-1** : 2003, *Thermoplastics pipes - Longitudinal reversion - Part 1 : Determination method*
- KS M ISO 2505-2** : 2003, *Thermoplastics pipes - Longitudinal reversion - Part 1 : Determination parameters*
- KS M ISO 3126** : 2003, *Plastics piping systems - Plastics piping component - Measurement and determination of dimensions*
- KS M ISO 4065** : 2003, *Thermoplastics pipes - Universal wall thickness table*
- KS M ISO 7686** : 2003, *Plastics pipes and fittings - Opacity - Test method*
- KS M ISO TR 9080** : 2003, *Plastics piping and ducting system - Determination of the long-term hydrostatic strength of thermoplastics materials in pipe form by extrapolation*
- ISO 15877-1** : 2002, *Plastics piping system for hot and cold water installations — Chlorinated poly(vinyl chloride) (PVC-C) — Part 1: General (ISO/FDIS 15877-1:2002)*
- ISO 15877-5** : *Plastics piping systems for hot and cold water installations — Chlorinated poly(vinyl chloride) (PVC-C) — Part 5: Fitness for purpose of the system (ISO/FDIS 15877-5:2002)*
- ISO 228-1** : *Pipe threads where pressure-tight joints are not made on the threads — Part 1: Designation, dimensions and tolerances*
- ISO 580** : *Plastics piping and ducting systems - Injection-moulded thermoplastics fittings Methods for visually assessing the effects of heating*
- ISO 2507-2** : 1995, *Thermoplastics pipes and fittings - Vicat softening temperature - part 2 : Test conditions for unplasticized poly(vinyl chloride) (PVC-U) or chlorinated poly(vinyl chloride) (PVC-C) pipes and fittings and for high impact resistance poly(vinyl chloride) (PVC-HI) pipes*
- ISO 2536** : 1974, *Unplasticized poly vinyl chloride (PVC) pressure pipes and fittings, metric series - Dimensions of flanges*
- ISO 12092** : 2000, *Fittings, valves and other piping system components made of unplasticized poly(vinyl chloride) (PVC-U), chlorinated poly(vinyl chloride) (PVC-C), acrylonitrile-butadiene-styrene (ABS) and acrylonitrile-styrene-acrylester (ASA) for pipes under pressure — Resistance to internal pressure — Test method*
- ISO 23711** : 2003, *Elastomeric seals - Requirements for pipe joint seals used in water and drainage application - part 1 : Vulcanized rubber*
- EN 681-1** : *Elastomeric seals — Materials requirements for pipe joint seals used in water and drainage applications — Part 1: Vulcanized rubber*
- EN 1254-3** : *Copper and copper alloys — Plumbing fittings — Part 3: Fittings with compression ends for use with plastics pipes*
- EN 10088-1** : *Stainless steels*
- EN 10226-1** : *Pipe threads where pressure-tight joints are made on the threads — Part 1:*

EN 12107 : *Plastics piping systems — Injection-moulded thermoplastics fittings, valves and ancillary equipment — Determination of long-term hydrostatic strength of thermoplastics materials used for injection-moulded piping components*

3. Terms and definitions, symbols and abbreviated terms

For the purposes of this standard the terms and definitions, symbols and abbreviated terms given in **KS M ISO 15877-1** apply together with the following terms and definitions:

3.1 Terms and definitions

3.1.1 Fitting for solvent cement joints Fitting in which the joint with the pipe or another component is made by means of an adhesive

3.1.2 Mechanical fittings

3.1.2.1 Compression fitting

Fitting in which the joint is made by the compression of a ring or sleeve on the outside wall of the pipe with or without additional sealing elements and with internal support

3.1.2.2 Flanged fitting

Fitting in which the pipe connection consists of two mating flanges which are mechanically pressed together and sealed by the compression of an elastomeric sealing element between them

3.1.2.3 Flat seat union fitting

Fitting in which the pipe connection consists primarily of two components, at least one of which normally incorporates a flat sealing surface, which are mechanically pressed together by means of a screwed nut or similar and sealed by the compression of an elastomeric sealing element between them

3.1.2.4 Fitting with incorporated inserts

Fitting in which the joint is made by means of connecting threads or other outlets, inserted in the injection-moulded fitting body, combined with at least one solvent cement socket injection-moulded fitting body, combined with at least one solvent cement socket

3.2 Symbols

d_{s1}	inside diameter of the socket at entry
d_{s2}	inside diameter of the socket at shoulder
d_1	nominal diameter of the socket
d_2	nominal diameter of the spigot
L	socket length
l_0	free length
r	bending radius
Z	laying length (Z-length)
α_n	nominal angle of fitting

4. Material characteristics

4.1 General

The PVC-C material from which the fittings are made shall conform to this standard and to the relevant requirements of **KS M ISO 15877-1**.

4.2 Fitting material

The material from which the fittings are made shall be chlorinated poly(vinyl chloride) (PVC-C) resin to which are added those additives that are needed to facilitate the manufacture of fittings conforming to this standard.

4.3 Evaluation of σ_{LCL} -values

The fitting material shall be evaluated in accordance with **KS M ISO TR 9080** or equivalent, where an internal pressure test is made in accordance with **KS M ISO 1167** to find the σ_{LCL} -values. The σ_{LCL} -values thus determined shall be at least as high as the corresponding values of the reference curves given in **Figure 1** over the complete range of times.

NOTE 1 One equivalent way of evaluation is to calculate the σ_{LCL} -values for each temperature (e.g. for 20°C, 60°C and 90°C) individually.

Equation (1) shall be used to determine the design stress, σ_{DF} , in the fitting material (see **Annex A** of **KS M 3414**), as well as the values of the hydrostatic stress, σ_F , of the fitting material corresponding to the temperature and time control points given in **Table 14**.

$$\log t = -121.699 - \frac{25985}{T} \log \sigma + \frac{47143.18}{T} + 63.03511 \times \log \sigma \quad (1)$$

where, t : Time(h)

T : temperature (K)

σ : hoop stress (MPa)

NOTE 2 The reference curves in **Figure 1** in the temperature range of 10 °C to 90 °C are derived from equation (1).

NOTE 3 Resistance to T_{mal} of PVC-C material is verified by testing in accordance with **Annex A** of **KS M ISO 15877-1**

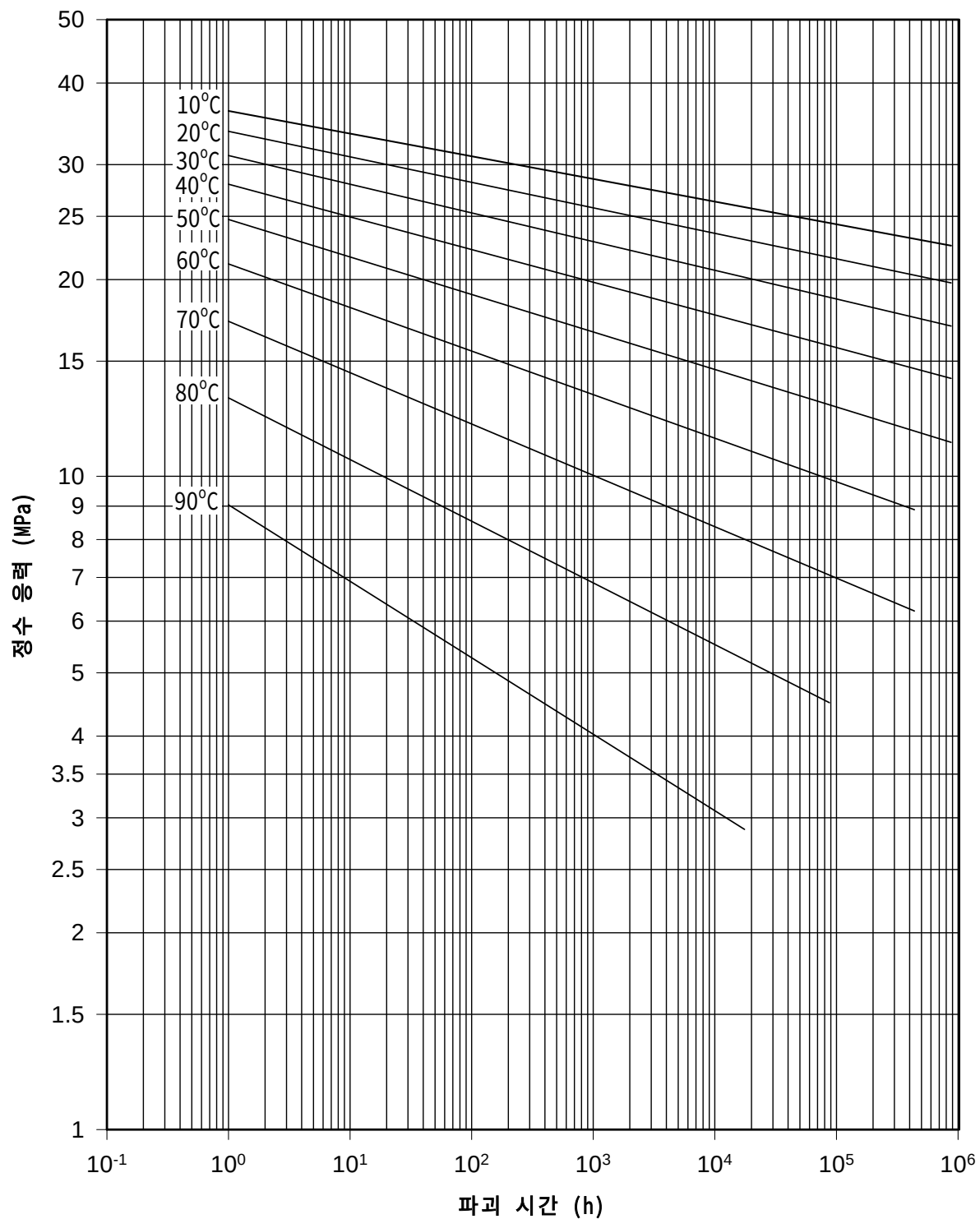


Figure 1 — Reference curves for the expected hydrostatic strength of PVC-C fitting material

4.4 Metallic material

Metallic material for fittings, intended to be used with components conforming to **KS M ISO 15877**, shall conform to the requirements given in **EN 1254-3** or **prEN 1088-1**, as applicable.

4.5 Influence on water intended for human consumption

The material from which the fittings are made shall conform to **KS M ISO 15877-1**.

5. General characteristics

5.1 Appearance

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 standard. The material shall not contain visible impurities. Each end of the fitting shall be square to its axis.

5.2 Opacity

PVC-C fittings that are declared to be opaque shall not transmit more than 0,2% of visible light, when tested in accordance with **KS M ISO 7686**.

6. Geometrical characteristics

6.1 General

Dimensions shall be measured in accordance with **KS M ISO 3126**.

NOTE **Figure 2** to **Figure 9** cover schematic sketches only, to indicate the relevant dimensions. It does not necessarily represent the manufactured components.

6.2 Dimensions of fittings

6.2.1 Nominal diameter

The nominal diameter(s), d_n , of a fitting shall correspond to and be designated by the nominal outside diameter(s) of the pipe(s) conforming to **KS M 3414** for which they are designed.

6.2.2 Wall thicknesses

The wall thickness, e , of the fitting body shall conform to **Table 1** in relation to the pipe series S.

NOTE Compared with the wall thickness of the corresponding pipe conforming to **KS M 3414** the wall thickness, e , of the fitting body is increased by the factor 1,35.

6.2.3 Angles

The preferred nominal angle, α_n , of non-straight fittings is 45° and 90°.

6.2.4 Threads

Threads used for jointing shall conform to **prEN 10226-1**. Where a thread is used as a fastening thread for jointing an assembly (e.g. union nuts) it shall conform to **ISO 228-1** except that these requirements need not apply to the threads used by the manufacturer to join component parts of a fitting together.

6.2.5 Laying lengths (Z-lengths)

For the following types of injection-moulded fittings the Z-lengths shall be calculated using one of the following equations (2) to (10), as applicable, where α is the angle of the fitting and r is the bending radius:

$$\text{a) } 90^\circ \text{ elbow (see Figure 2 and Table 2)} : Z = \frac{dn}{2} + 1 \quad (2)$$

$$\text{b) } 45^\circ \text{ elbow (see Figure 2 and Table 2)} : Z = \left(\frac{dn}{2} \times \tan \frac{\alpha}{2} \right) + 1 \quad (3)$$

$$\text{c) } 90^\circ \text{ tee (see Figure 2 and Table 2)} : Z = \frac{dn}{2} + 1 \quad (2)$$

$$\text{d) } 45^\circ \text{ tee (see Figure 2 and Table 2)} : Z = \left(\frac{dn}{2} \times \cot \frac{\alpha}{2} \right) + t \quad (4)$$

where

d_n	t
≤ 90	3
110	4
125	6
140	6
160	7

$$Z \approx \left(\frac{dn}{2} \times \tan \frac{\alpha}{2} \right) + 1 \quad (5)$$

$$\text{e) bends (see Figure 3 and Table 3)} : Z \approx r = 2d_n \quad (6)$$

f) reducing bushes, long type (see Figure 4)

$$\text{- with conical sockets (see Table 4)} : Z_{\text{con.}} = 0.3 \times (d_2 - d_1) + L_{d2} \quad (7)$$

$$\text{- with cylindrical sockets (see Table 5)} : Z_{\text{cyl.}} = 0.75d_2 + 6 \quad (8)$$

g) reducing bushes, short type (see Figure 5)

$$\text{- with conical sockets (see Table 6)} : Z_{\text{con.}} = L_{d2} - L_{d1} \quad (9)$$

$$\text{- with cylindrical sockets (see Table 7)} : Z_{\text{cyl.}} = \left(\frac{d_2^2}{2} + 6 \right) - \left(\frac{d_1^2}{2} + 6 \right) \quad (10)$$

The calculated values of the Z-lengths are given in **Table 2** to **Table 7**, as applicable. These values may be adopted by the manufacturer. The manufacturer shall state the exact values for the Z-lengths in his documents (e.g. catalogues).

Table 1 Wall thicknesses of fitting bodies

Dimension : mm

Nominal diameter d_n	Pipe series		
	S 6.3	S 5	S 4
	Minimum wall thickness ¹⁾ 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

1) The values are rounded up to the first place of the decimals (i.e. the nearest 0.1mm).

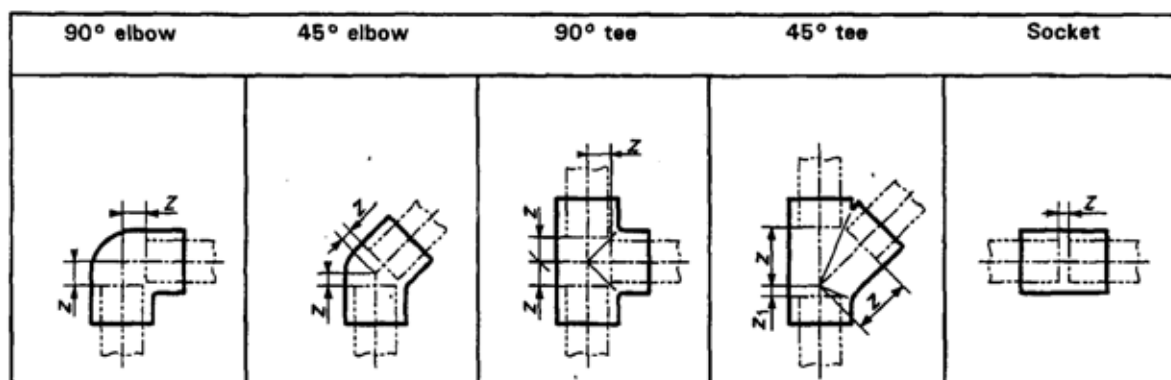


Figure 2 Z-lengths of elbows, tees and couplers (double-sockets)

Table 2 Calculated laying lengths (Z-lengths) and related tolerances of elbows, tees and couplers (double-sockets)

Dimensions : mm

Nominal diameter <
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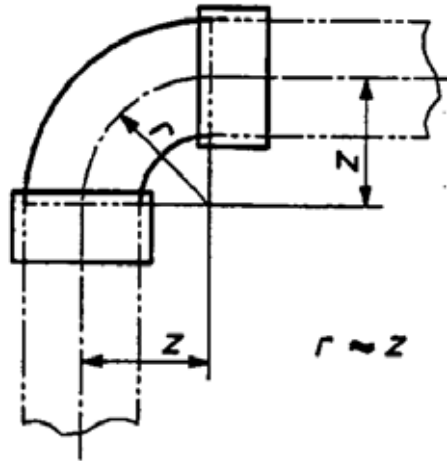


Figure 3 Dimensions of injection-moulded bends

Table 3 Calculated laying lengths (Z-lengths) and related tolerances of injection-moulded bends

Dimensions : mm

Nominal diameter d_n	Calculated laying length and related tolerances Z	Nominal diameter d_n	Calculated laying length and related tolerances Z
12	24 ± 1	63	126 $+3.2$ -1
14	28 ± 1	75	150 $+4$ -1
16	32 ± 1	90	180 $+5$ -1
20	40 ± 1	110	220 $+2.5$ -1
25	50 $+1.2$ -1	125	250 $+6$ -1
32	64 $+1.6$ -1	140	280 $+7$ -1
40	80 $+2$ -1	160	320 $+8$ -1
50	100 $+2.5$ -1	-	-

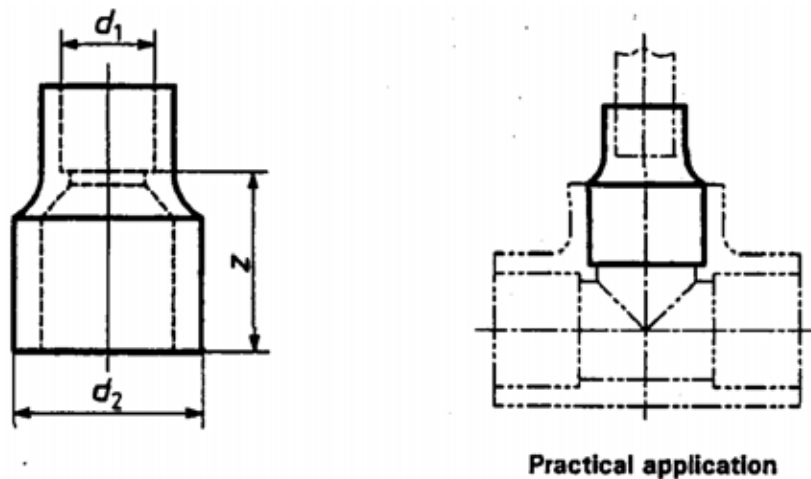


Figure 4 Dimensions of reducing bushes, long type, and example of application

Table 4 Calculated laying lengths (Z-lengths) and related tolerances of reducing bushed, long type, with conical sockets

Dimension : mm

Nominal diameter of the socket d_1	Nominal diameter of the spigot d_2								
	20	25	32	40	50	63	75	90	110
	Calculated laying length, Z, and related tolerances								
	± 1			± 1.5			± 2		
16	21	28	35	-	-	-	-	-	-
20	-	27	34	41	-	-	-	-	-
25	-	-	32	40	49	-	-	-	-
32	-	-	-	38	46	59	-	-	-
40	-	-	-	-	44	57	71	-	-
50	-	-	-	-	-	54	68	84	-
63	-	-	-	-	-	-	64	80	102
75	-	-	-	-	-	-	-	77	99
90	-	-	-	-	-	-	-	-	94

Table 5 Calculated laying lengths (Z-lengths) and related tolerances of reducing bushes, long type, with cylindrical sockets

Dimension : mm

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
	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
125	-	-	-	-	-	-	-	-	-	-	111	126
140	-	-	-	-	-	-	-	-	-	-	-	126