SLOVENSKI STANDARD
oSIST ISO 4065:2012

01-marec-2012

Plastomerne cevi - Preglednica univerzalne debeline stene

Thermoplastics pipes -- Universal wall thickness table

Tubes en matières thermoplastiques -- Tableau universel des épaisseurs de paroi

Ta slovenski standard je istoveten z: ISO 4065:1996

ICS:

23.040.20 Cevi iz polimernih materialov Plastics pipes

oSIST ISO 4065:2012 en

INTERNATIONAL STANDARD

ISO 4065

Second edition
1996-12-15

Thermoplastics pipes — Universal wall thickness table

Tubes en matières thermoplastiques — Tableau universel des épaisseurs de paroi

Reference number
ISO 4065:1996(E)

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 4065 was prepared by Technical Committee ISO/TC 138, *Plastics pipes, fittings and valves for the transport of fluids.*

This second edition cancels and replaces the first edition (ISO 4065:1978), which has been technically revised.

The aim of the first edition was to identify a series of standard wall thicknesses for thermoplastics pipes as a means of controlling the wide variety of wall thicknesses which might otherwise be produced. The revision of this document has resulted in a number of basic changes. The standard now provides a basis for establishing a series of wall thicknesses for use in the preparation of product standards. However, it is not regarded as providing an exclusive list of wall thicknesses, as there may be occasions when specific applications require other wall thicknesses to take into account additional factors such as stiffness or temperature conditions.

Annex A of this International Standard is for information only.

International Organization for Standardization
Case Postale 56 • CH-1211 Genève 20 • Switzerland

Printed in Switzerland

Thermoplastics pipes — Universal wall thickness table

1 Scope

This International Standard specifies the relationship between the nominal wall thickness e_n and the nominal outside diameter d_n of thermoplastics pipes.

It is applicable to smooth thermoplastics pipes of constant circular cross-section along the whole length of the pipe, whatever their method of manufacture, their composition or their intended application.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 3:1973, *Preferred numbers — Series of preferred numbers*.

3 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1 nominal outside diameter, d_n**:** A numerical designation of size which is common to all components in a thermoplastics piping system other than flanges and components designated by thread size. It is a convenient round number for reference purposes.

NOTE 1 For metric pipe series conforming to ISO 161-1[1] (see annex A), the nominal outside diameters, expressed in millimetres, are the minimum mean outside diameters $d_{em,min}$ in the applicable standard for pipe.

3.2 mean outside diameter, d_{em}**:** The measured length of the outer circumference of the pipe divided by π 1), rounded to the next higher 0,1 mm.

3.3 wall thickness at any point, e_y**:** The measured wall thickness at any point around the circumference of the pipe, rounded to the next higher 0,1 mm.

3.4 nominal wall thickness, e_n**:** A wall thickness tabulated in this International Standard, and identical to the minimum permissible wall thickness at any point, $e_{y,min}$.

3.5 standard dimension ratio, SDR: The ratio of the nominal outside diameter d_n of a pipe to its nominal wall thickness e_n.

NOTE 2 This value may also be derived from the equation given in 3.6.

3.6 pipe series, S: A dimensionless number related to the nominal outside diameter d_n and nominal wall thickness e_n, the value of which is as specified in the tables in this International Standard.

The pipe series number S is given by the following equation:

$$S = \frac{SDR - 1}{2}$$

1) The value of π is taken to be 3,142.

and for pressure pipes this can be expressed as:

$$S = \frac{\sigma}{p}$$

where

p is the internal pressure;

σ is the induced stress;

p and σ being expressed in the same units.

For the selection of p and σ, the reader is referred to ISO 161-1[1].

S-values equal to or less than 10 are selected from the R 10 series of preferred numbers given in ISO 3, whilst those greater than 10 are selected from the R 20 series.

4 Calculation of wall-thickness values

According to ISO 161-1, wall thicknesses for pressure pipes are calculated from either of the following equations:

$$e_n = \frac{1}{2\frac{\sigma}{p}+1} \times d_n$$

and

$$e_n = \frac{1}{2S+1} \times d_n$$

where

e_n is the nominal wall thickness;

d_n is the nominal outside diameter;

e_n and d_n being expressed in the same units;

σ is the induced stress;

p is the internal pressure;

σ and p being expressed in the same units;

S is the series number.

The general equations are also applicable to the relationship between the maximum allowable operating pressure p_{PMS} and the design stress σ_s, as follows:

$$e_n = \frac{1}{2\frac{\sigma_s}{p_{PMS}}+1} \times d_n$$

Values for p_{PMS} are selected from the R 10 series of preferred numbers given in ISO 3.

Values for σ_s equal to or less than 10 MPa are selected from the R 10 series of preferred numbers given in ISO 3, whilst those greater than 10 MPa are selected from the R 20 series.

S may therefore be defined as the quotient of the design stress and the maximum allowable operating pressure as follows:

$$S = \frac{\sigma_s}{p_{PMS}}$$

For maximum allowable operating pressures between 2,5 bar and 25 bar and design stresses between 2,5 MPa and 16 MPa, the corresponding S values are given in table 1. This table also incorporates an additional pipe series based on a nominal pressure of 6 bar which is not a preferred number of the R 10 series. This maximum allowable operating pressure has been included in table 1 because it is used in many countries in preference to the value of 6,3 bar.

Table 2 gives the calculated values of S taken from ISO 497[2], and table 3 gives calculated values of S for a p_{PMS} of 6 bar.

NOTES

3 With the exception of the 6 bar series, S is the quotient of two R 10 numbers for design stresses of 10 MPa and below, and therefore it is itself a number of the R 10 series also. For values greater than 10 MPa, S is the quotient of an R 10 and an R 20 number, and therefore in this case the number is an R 20 value.

This is the key to the reduction in the many theoretical combinations of design stress and operating pressure to a practical selection of values of S. Since preferred numbers are themselves rounded off from the theoretical values, quotients of preferred numbers cannot basically be identical either with preferred numbers or with the theoretical values.

These theoretical values may, however, be considered as mean values for all corresponding quotients. Therefore, a universal wall thickness table which is mathematically based on the theoretical values of the R 10 and R 20 series of preferred numbers for S guarantees a minimum number of deviations from the numerous theoretical wall thicknesses.

4 All calculated values of wall thickness given in tables 4 and 5 have been rounded off to one significant figure using the following procedure:

Step 1: Express the calculated value to three significant figures, e.g. 0,XXX.

Step 2:

a) If the second significant figure is 1 or higher, then the first significant figure is rounded up.

b) If the second significant figure is 0 and the third significant figure is 5 or over, then the first significant figure is rounded up, but if the third significant figure is 4 or less, then the value is rounded down by expressing the value as the first significant figure.

5 Wall-thickness tables

Table 4 gives the relationship between the nominal wall thickness e_n and the nominal outside diameter d_n based on the S-values given in table 2.

The wall thicknesses of an additional pipe series based on a maximum permissible operating pressure of 6 bar are given in table 5, and are calculated from the S-values given in table 3.

6 Non-pressure pipes

Although the calculation of the wall thickness with the value of S derived from the quotient of the design stress σ_s and a maximum allowable operating pressure p_{PMS} which applies to pipes predominantly subject to internal hydrostatic pressure, the values given in tables 4 and 5 also apply to pipes not subject to internal pressure.

7 Deviations

Notwithstanding the generalities expressed in clause 6, it is appreciated that there may be some occasions when specific applications require other wall thicknesses in order to take into account additional factors such as stiffness or temperature conditions. It is strongly recommended that such exceptions are kept to a minimum, however.

Table 1 — Individual S-values calculated from selected values of design stress, σ_s, and maximum allowable operating pressure, p_{PMS}

Design stress σ_s MPa	p_{PMS} bar											
	25	**20**	**16**	**12,5**	**10**	**8**	**6,3**	**6**	**5**	**4**	**3,15**	**2,5**
	S-values											
16	6,400 0	8,000 0	10,000	12,800	16,000	20,000	25,397	26,667	32,000	40,000	50,794	64,000
14	5,600 0	7,000 0	8,750 0	11,200	14,000	17,000	22,222	23,333	28,000	35,000	44,444	56,000
12,5	5,000 0	6,250 0	7,812 5	10,000	12,500	15,625	19,841	20,833	25,000	31,250	39,683	50,000
11,2	4,480 0	5,600 0	7,000 0	8,960 0	11,200	14,000	17,778	18,667	22,400	28,000	35,556	44,800
10	4,000 0	5,000 0	6,250 0	8,000 0	10,000	12,500	15,873	16,667	20,000	25,000	31,746	40,000
8	3,200 0	4,000 0	5,000 0	6,400 0	8,000 0	10,000	12,698	13,333	16,000	20,000	25,397	32,000
6,3	2,520 0	3,150 0	3,937 5	5,040 0	6,300 0	7,875 0	10,000	10,500	12,600	15,750	20,000	25,200
5	2,000 0	2,500 0	3,125 0	4,000 0	5,000 0	6,250 0	7,936 5	8,333 3	10,000	12,500	15,873	20,000
4		2,000 0	2,500 0	3,200 0	4,000 0	5,000 0	6,439 2	6,666 7	8,000 0	10,000	12,698	16,000
3,15			1,968 8	2,150 0	3,150 0	3,937 5	5,000 0	5,250 0	6,300 0	7,875 0	10,000	12,600
2,5				2,000 0	2,000 0	3,125 0	3,968 3	4,166 7	5,000 0	6,250 0	7,936 5	10,000

NOTE — Individual S-values below 2,000 0 have been excluded from this table as the resulting pipe geometry is considered to be unacceptable for practical applications.

Table 2 — Nominal S-values and their calculated values, taken from ISO 497 for p_{PMS} values of 2; 2,5; 3,15; 4; 5; 6,3; 8; 10; 12,5; 16; 20 and 25 bar [1)]

Nominal S-values	Calculated values
2	1,995 3
2,5	2,511 9
3,2	3,162 3
4	3,981 1
5	5,011 9
6,3	6,309 6
8	7,943 3
10	10,000
11,2	11,220
12,5	12,589
14	14,125
16	15,849
20	19,953
25	25,119
32	31,623
40	39,811
50	50,119
63	63,096

1) Higher values shall be taken from the R 10 series of numbers given in ISO 3.

Table 3 — S-values and design stresses, taken from table 1 for the calculation of wall thicknesses for the p_{PMS} value of 6 bar

Design stress MPa	Calculated S-values	Nominal S-values
2,5	4,166 7	4,2
3,15	5,250 0	5,3
4	6,666 7	6,7
5	8,333 3	8,3
6,3	10,500	10,5
8	13,333	13,3
10	16,667	16,7
11,2	18,667	18,7
12,5	20,833	20,8
14	23,333	23,3
16	26,667	26,7