INTERNATIONAL STANDARD

ISO 2505

Second edition
2005-05-15

Thermoplastics pipes — Longitudinal reversion — Test method and parameters

Tubes en matières thermoplastiques — Retrait longitudinal à chaud — Méthode d'essai et paramètres

Reference number
ISO 2505:2005(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

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

ISO 2505 was prepared by Technical Committee ISO/TC 138, *Plastics pipes, fittings and valves for the transport of fluids*, Subcommittee SC 5, *General properties of pipes, fittings and valves of plastic materials and their accessories — Test methods and basic specifications*.

This second edition cancels and replaces ISO 2505-1:1994 and ISO 2505-2:1994, of which it constitutes a technical revision.

Thermoplastics pipes — Longitudinal reversion — Test method and parameters

1 Scope

This International Standard specifies a method for determining the longitudinal reversion of thermoplastics pipes, to be carried out in either a liquid or in air. In case of dispute, heated liquid is used as the reference.

This International Standard is applicable to all thermoplastics pipes with smooth internal and external walls of constant cross-section. It is not applicable to non-smooth structured-wall thermoplastics pipes.

The parameters appropriate to the pipe material and recommendations for the maximum levels of reversion as a function of the pipe material are given in Annex A.

NOTE Measurement of longitudinal reversion is not considered relevant for pipe wall thickness greater than 16 mm.

2 Normative references

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

ISO 1043-1, *Plastics — Symbols and abbreviated terms — Part 1: Basic polymers and their special characteristics*

3 Abbreviations

The abbreviations used for the plastic materials are as specified in ISO 1043-1. The following abbreviations are used in this International Standard.

ABS	acrylonitrile/butadiene/styrene
PA	polyamide (nylon)
ASA	acrylonitrile/styrene/acrylate
PB	polybutene
PE 32/40	polyethylene MRS 3,2/4
PE 50/63	polyethylene MRS 5/6,3
PE 80/100	polyethylene MRS 8/10
PE-X	cross-linked polyethylene
PVC-C	chlorinated poly(vinyl chloride)
PVC-U	unplasticized poly(vinyl chloride)
PVC-HI	high-impact poly(vinyl chloride)
SAN + PVC	styrene/acrylonitrile plus poly(vinyl chloride)

PP-H	polypropylene homopolymer
PP-B	polypropylene block copolymer
PP-R	polypropylene random copolymer

4 Principle

A pipe of specified length is placed in a liquid bath or air oven at a specified temperature for a specified time . A marked length of this portion of pipe is measured, under identical conditions, before and after heating. The reversion is calculated as a percentage of the change in length in relation to the initial length. The surface appearance of the test piece shall not be changed after heating.

5 Apparatus

5.1 Heated liquid bath, thermostatically controlled at the temperature, T_R, as specified in Table 1, unless otherwise specified by a referring standard.

The volume and agitation of the bath shall be such that the temperature remains within the specified temperature range when the test piece is immersed.

The liquid chosen should be stable at the specified temperature and should not otherwise affect the plastics material.

NOTE Glycerine, glycol, mineral oil free from aromatic hydrocarbons, or a solution of calcium chloride are suitable, but any other liquid in line with these recommendations can be used.

5.2 Air oven, thermostatically controlled such that it operates at the temperature, T_R, as specified in Table 1, unless otherwise specified, and capable of re-establishing this temperature within 15 min of the introduction of the test pieces. The oven shall be equipped with a thermostat capable of maintaining T_R to a permissible deviation of ± 2 °C.

5.3 Ancillary equipment

5.3.1 Device to hold the test piece(s) within the heating bath or oven in accordance with Clause 7.

5.3.2 Thermometer, with an accuracy to within ± 0,5 °C.

6 Preparation

6.1 Test piece

Immediately after extrusion, the sample of pipe to be tested shall be stored at (23 ± 2) °C, or conditioning in accordance with 6.2 shall commence.

If the test is carried out immediately after production of the pipe, a pessimistic result may be obtained. In case of dispute, carry out the test at least 24 h after production and storage at (23 ± 2) °C.

Take as a test piece a pipe (200 ± 20) mm long.

Using, for example, a scriber, trace on this test piece two circumferential marks 100 mm apart, corresponding to the test area, at equal distances from the two ends.

Prepare a total of three similar test pieces per pipe sample.

Pipes of diameter 250 mm or larger may be cut into four even segments for production of test pieces.

Table 1 — Parameters for the determination using a liquid bath or air oven

Thermoplastics material [a]	Temperature of bath or air oven T_R °C	Duration of exposure min	Length of test piece mm
PVC-U	150 ± 2	For liquid bath: 15 for $e \leqslant 8$; 30 for $8 < e \leqslant 16$. For air oven: 60 for $e \leqslant 8$; 120 for $8 < e \leqslant 16$	200 ± 20
PVC-C	150 ± 2		
PVC-HI	150 ± 2		
SAN+PVC	150 ± 2		
PA	150 + 2 (air oven only)		
PE 32/40	100 ± 2		
PE 50/63	110 ± 2		
PE 80/100			
PE-X	120 ± 2		
PB	110 ± 2		
PP-H et PP-B	150 ± 2		
PP-R	135 ± 2		
ABS et ASA	150 ± 2		
e mean wall thickness, in millimetres.			
[a] Symbols in accordance with ISO 1043-1.			

6.2 Conditioning

Condition the test pieces at (23 ± 2) °C for a period of time according to the wall thickness of the pipe as follows:

$\geqslant$ 1 h, for $e < 3$ mm

$\geqslant$ 3 h, for 3 mm $\leqslant e < 8$ mm

$\geqslant$ 6 h, for 8 mm $\leqslant e \leqslant$ 16 mm

where e is the mean wall thickness in millimetres.

7 Procedure

At a temperature of (23 ± 2) °C, measure the distance L_0 between the marks to within 0,25 mm.

Set the temperature of the heating bath or air oven to the temperature T_R, as specified in Table 1, unless otherwise specified.

Suspend the test pieces allowing free movement in the heating bath or air oven so that they touch neither the walls nor the base of the bath or oven, and in the case of the bath so that there is a minimum distance of 30 mm between the upper boundary of the test area (see 6.1) and the fluid–air interface. Alternatively the test piece may be supported providing this does not inhibit reversion.

Leave the test pieces for the duration specified in Table 1, unless otherwise specified. Maintain the specified test temperature in the zone between the circumferential marks on the test piece.

Remove the test pieces from the bath or oven and allow them to hang freely in the same position. After they have cooled to (23 ± 2) °C, measure the maximum and minimum distance, L, between marks (diametrically opposed), following any curvature of the marked surfaces.

8 Expression of results

For each test piece, calculate the longitudinal reversion, $R_{L,i}$, as a percentage, using the following equation:

$$R_{L,i} = \frac{\Delta L}{L_0} \times 100$$

where

$\Delta L = L_0 - L$;

L_0 is the distance between the marks before the immersion, in millimetres;

L is the distance between the marks after the immersion, measured along the generatrices, in millimetres.

Choose those measurements of L which give the greatest value of ΔL, with ΔL being either positive or negative.

When the test piece has been cut into four even segments (see 6.1), the longitudinal reversion of the test piece, $R_{L,i}$, is calculated as the average of the three highest of the four results.

Calculate, as the value for the longitudinal reversion R_L of the pipe, the arithmetic mean of the values obtained for each of the three test pieces.

9 Test report

The test report shall include the following information:

a) reference to this International Standard;

b) full identification of the pipe;

c) the nature of the heating fluid used;

d) the duration of the test and the temperature T_R of the bath or oven;

e) the change in length of each test pipe ΔL, indicating whether it is positive or negative;

f) any change in the appearance of the test pieces during the immersion, or immediately afterwards, for example, bubbles or cracking;

g) the value of the longitudinal reversion R_L of the pipe, calculated in accordance with Clause 8;

h) all operating details not specified in this method, as well as any incidents likely to have influenced the results;

i) the date of the test.

Annex A
(informative)

Recommended basic specifications for longitudinal reversion

Using either a liquid bath or an air oven, the calculated value of the longitudinal reversion should conform to the recommended value given in Table A.1.

Table A.1 — Basic specifications of longitudinal reversion

Thermoplastics material	Reversion %	Thermoplastics material	Reversion %
PVC-U	$\leqslant 5$	PB	$\leqslant 2$
PVC-C	$\leqslant 5$	PP-H	$\leqslant 2$
PVC-HI	$\leqslant 5$	PP-B	$\leqslant 2$
SAN+PVC	$\leqslant 5$	PP-R	$\leqslant 2$
PE	$\leqslant 3$	PA	$\leqslant 2$
PE-X	$\leqslant 3$	ABS et ASA	$\leqslant 5$

For applications requiring more stringent specifications, a value smaller than the applicable limit given in Table A.1 may be adopted.

ICS 23.040.20

Price based on 5 pages