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# INTERNATIONAL STANDARD



# 3478

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INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

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## Polypropylene (PP) pipes – Determination of longitudinal reversion

*Tubes en polypropylène (PP) – Détermination du retrait à chaud longitudinal*

First edition – 1975-12-15

**ITeH STANDARD PREVIEW**  
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UDC 621.643.29 : 678.742.3 : 620.172.23

Ref. No. ISO 3478-1975 (E)

**Descriptors** : plastic pipes, polypropylene, tests, high temperature tests, dimensional stability.

## FOREWORD

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Draft International Standards adopted by the Technical Committees are circulated to the Member Bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 3478 was drawn up by Technical Committee ISO/TC 138, *Plastics pipes, fittings and valves for the transport of fluids*, and circulated to the Member Bodies in June 1974.

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It has been approved by the Member Bodies of the following countries :

Australia	Ireland	Sweden
Austria	Israel	Switzerland
Belgium	Italy	Thailand
Chile	Japan	Turkey
Czechoslovakia	Mexico	United Kingdom
Denmark	Netherlands	U.S.A.
Finland	Norway	U.S.S.R.
France	Poland	Yugoslavia
Germany	Portugal	
India	Romania	

No Member Body expressed disapproval of the document.

# Polypropylene (PP) pipes – Determination of longitudinal reversion

## 1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies two methods for the determination of the longitudinal reversion of polypropylene (PP) pipes.

The determination of the longitudinal reversion can be carried out according to method A, using a liquid bath, or method B, in air.

## 2 TEST PIECES

Cut three test pieces with a minimum length of 200 mm from the pipe to be tested.

NOTE – For the test in a liquid bath this length of 200 mm is generally short. Therefore, the exact length of the test piece shall be fixed so that it satisfies the prescriptions given in 3.3.

Trace on each test piece two circumferential marks 100 mm apart, so that one of them is approximately 10 mm from one of the ends.

## 3 METHOD A – TEST IN LIQUID BATH

### 3.1 Principle

Immersion of a test piece of specified length in an inert liquid maintained at a temperature of 150 °C for 30 min.

Measurement, under the same conditions, of a marked length of this portion of pipe, before and after immersion.

Calculation of the reversion as a percentage of the variation in length in relation to the initial length.

### 3.2 Apparatus

**3.2.1 Heating bath**, capable of being thermostatically controlled at 150 ± 2 °C.

The volume of the bath shall be such that there is no significant temperature change when the test pieces are introduced.

The heating medium chosen shall be stable at 150 °C and have no effect on polypropylene. Glycerine, glycol, mineral oil free from aromatic hydrocarbons, or a solution of calcium chloride are suitable but other liquids meeting the requirements may be used.

Provision shall be made for effective agitation to ensure that the temperature tolerance is maintained throughout the heating medium.

**3.2.2 Device** for holding the test pieces in the bath.

**3.2.3 Thermometer**, graduated in 0,5 °C.

### 3.3 Procedure

Condition the test pieces for at least 2 h at 23 ± 2 °C.

Measure at 23 ± 2 °C the distance between the two marks to within 0,25 mm.

Regulate the temperature of the heating medium at 150 ± 2 °C.

Place the test pieces in the heating medium in such a manner that the immersed part is at least 200 mm long and that they do not touch the sides or the bottom of the bath.

If the test specimens are suspended, the point of suspension shall be at the end farthest from the marks.

Leave the test pieces immersed for 30 min, irrespective of the wall thickness of the pipe.

Remove the test pieces from the bath and cool them completely in air to 23 ± 2 °C.

Measure at 23 ± 2 °C the distance between the marks along the maximum and minimum generating lines (diametrically opposed), to the nearest 0,25 mm.

## 4 METHOD B – TEST IN AIR

### 4.1 Principle

Exposure of a test piece in an air oven, maintained at a temperature of 150 °C, for 120 min.

Measurement, under the same conditions, of a marked length of this portion of pipe, before and after exposure.

Calculation of the reversion as a percentage of the variation in length in relation to the initial length.

### 4.2 Apparatus

**4.2.1 Air oven**, capable of being thermostatically controlled at 150 ± 2 °C.

The oven must be designed and constructed so as to satisfy the following conditions :

- the heating power must be such that the test temperature of 150 °C can be maintained and that this temperature is re-established within 15 min or less after the introduction of the test pieces;
- the oven must be fitted with equipment which will maintain the temperature at 150 ± 2 °C at all points in the working space of the oven.

**4.2.2 Device** for holding the test pieces in the oven.

**4.2.3 Thermometer**, graduated in 0,5 °C.

#### 4.3 Procedure

Condition the test pieces for at least 2 h at 23 ± 2 °C.

Measure at 23 ± 2 °C the distance between the two marks to within 0,25 mm.

Regulate the temperature of the oven at 150 ± 2 °C.

Place the test pieces in the oven in such a manner that they do not touch the side or the bottom of the oven.

If the test pieces are suspended, the point of suspension shall be at the end farthest from the marks.

If the test pieces are placed horizontally, it is recommended that they should be laid on a layer of talc.

Leave the test pieces in the oven for 120 min, after the temperature has reached 150 ± 2 °C, irrespective of the wall thickness of the pipe.

Remove the test pieces from the oven and cool them completely in air to 23 ± 2 °C.

Measure at 23 ± 2 °C the distance between the marks along the maximum and minimum generating lines (diametrically opposed), to the nearest 0,25 mm.

## 5 EXPRESSION OF RESULTS

**5.1** For each test piece, calculate the longitudinal reversion,  $T$ , as a percentage, by means of the formula

$$T = \frac{\Delta L}{L_0} \times 100$$

where  $\Delta L = L_0 - L$

$L_0$  being the distance, in millimetres, between the marks before the test;

$L$  being the distance, in millimetres, between the marks after the test, measured along the generatrices, which are usually no longer rectilinear after the test.

Choose those measurements of  $L$  which give the greatest value of  $\Delta L$  where  $\Delta L$  could be positive or negative.

**5.2** Give, as the value for the longitudinal reversion of the pipe, the arithmetic mean of the values obtained for each of the three test pieces.

## 6 TEST REPORT

The test report shall include the following information :

- reference to this International Standard;
- full identification of the pipe;
- the nature of the heating medium used;
- the length variation of each test piece,  $\Delta L$ , together with its sign (+ or -);
- any changes in the appearance of the test pieces during the test, or immediately afterwards;
- the longitudinal reversion of the pipe, calculated as shown in clause 5;
- all operating details not specified in this International Standard, as well as any incidents likely to have influenced the results.