International Standard 2506

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Polyethylene pipes (PE) — Longitudinal reversion — Test methods and specification

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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 2506 was developed by Technical Committee ISO/TC 138, *Plastics pipes, fittings and valves for the transport of fluids*.

This second edition was submitted directly to the ISO Council, in accordance with clause 5.10.1 of part 1 of the Directives for the technical work of ISO. It results from the combination into one single document of International Standard ISO 2506-1974 and of draft International Standards ISO/DIS 4453 and ISO/DIS 4454, which were circulated to the member bodies in March 1976 and January 1978 respectively.

It cancels and replaces the first edition of ISO 2506, which had been approved by the member bodies of the following countries :

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Polyethylene pipes (PE) — Longitudinal reversion — Test methods and specification

1 Scope and field of application

This International Standard specifies the methods to be used for the determination of longitudinal reversion of low-density (LDPE), medium density (MDPE) and high-density (HDPE) polyethylene pipes. It also lays down the maximum permissible value of this reversion.

This International Standard applies to all polyethylene (PE) pipes whatever their purpose.

2 Test methods

2.1 Method A — Liquid bath test

2.1.1 Principle

Immersion of a test portion of pipe of given length in an inert liquid maintained at a temperature consistent with the type of PE, 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.

2.1.2 Apparatus

2.1.2.1 Heating bath, thermostatically controlled at 100 ± 2 °C or 110 ± 2 °C.

The volume of the bath shall be such that there is practically no temperature variation while the test pieces are immersed.

Water for the low density PE, and ethylene-glycol for the high density PE, may constitute the most appropriate heating media.

It shall be ensured in all cases that the liquid chosen is stable at the temperatures required and that it does not affect the product being examined.

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

2.1.2.2 Device to hold the test pieces at the centre of the heating medium.

2.1.2.3 Thermometer, graduated in 0,5 °C.

2.1.3 Test pieces

2.1.3.1 Take as a test piece a length of pipe of 150 ± 20 mm.

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

2.1.3.3 Prepare three similar test pieces per pipe.

2.1.4 Conditioning

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

2.1.5 Procedure

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

2.1.5.2 Regulate the temperature of the heating medium to :

- 100 ± 2 °C for low density PE;
- 110 ± 2 °C for medium density PE;
- 110 ± 2 °C for high density PE.

2.1.5.3 Place the test pieces in the heating medium. The test pieces shall be placed so that they touch neither the walls nor the base of the bath.

2.1.5.4 Leave the test pieces immersed for 30 min.

2.1.5.5 Remove the test pieces from the bath, and after complete cooling to 23 ± 2 °C, measure, under the same conditions as in 2.1.5.1, the distance between marks along the maximum and minimum generating lines (diametrically opposed).

2.1.6 Expression of results

2.1.6.1 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 is the distance, in millimetres, between the marks before the test;

L is 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 ΔL could be positive or negative.

2.1.6.2 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.

2.1.7 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 medium used;

d) test temperature;

e) the variation in length of each test piece, ΔL, together with its sign (+ or −);

f) any changes in the appearance of the test pieces during the test, or immediately afterwards;

g) the value of the longitudinal reversion of the pipe, calculated as shown in 2.1.6.2;

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

2.2 Method B — Oven test

2.2.1 Principle

Maintenance of a piece of pipe of given length in an oven at a temperature consistent with the type of PE, for a specified time.

Measurement, under the same conditions, of a marked length of this piece of pipe, before and after heating in the oven.

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

2.2.2 Apparatus

2.2.2.1 Air oven, thermostatically controlled, of a heating power such that it operates at 110 °C, and is capable of re-establishing this temperature within 15 min after the introduction of the test pieces.

The oven shall be equipped with a thermostat capable of maintaining the temperature at 100 ± 2 °C or 110 ± 2 °C.

2.2.2.2 Thermometer, graduated in 0,5 °C.

2.2.3 Test pieces

2.2.3.1 Take as a test piece a minimum length of 200 mm of pipe.

2.2.3.2 Using, for example, a scriber, trace on this test piece, two circumference marks 100 mm apart, so that one of them is approximately 10 mm from one end of the test piece.

2.2.3.3 Prepare three similar test pieces per pipe.

2.2.4 Conditioning

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

2.2.5 Procedure

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

2.2.5.2 Set the oven temperature at :

— 100 ± 2 °C in the case of low density PE;

— 110 ± 2 °C in the case of medium density PE;

— 110 ± 2 °C in the case of high density PE.

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

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

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

2.2.5.4 Maintain the test pieces in the oven for :

— 60 min for pipes having a wall thickness less than or equal to 8 mm;

— 120 min for pipes having a wall thickness greater than 8 mm and less than or equal to 16 mm;

— 240 min for pipes having a wall thickness greater than 16 mm.

Those periods shall be measured from the time when the temperature of the oven has returned to 100 ± 2 °C or 110 ± 2 °C.

2.2.5.5 Remove the test pieces from the oven and after complete cooling, by exposure to the air, to 23 ± 2 °C, measure, under the same conditions as in 2.2.5 the distance between the marks along the maximum and minimum generating lines (diametrically opposite).

2.2.6 Expression of results

2.2.6.1 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 is the distance, in millimetres, between the marks before the test;

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

Choose the measurement of L which gives the greatest value $|\Delta L|$, where ΔL could be positive or negative.

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

2.2.7 Test report

The test report shall include the following information :

a) *reference to this International Standard;*

b) full identification of the pipe;

c) the test temperature;

d) *the length variation* of each test piece, ΔL, together with its sign (+ or −);

e) any changes in the appearance of the test pieces during the test, or immediately afterwards;

f) the value for the longitudinal reversion of the pipe, calculated as in 2.2.6;

g) all operating details not specified in this International Standard, as well as any incidents likely to have influenced the results.

3 Specification

Using the test conditions in accordance with method A or method B, the value of the longitudinal reversion shall be no greater than 3 %.

For special applications requiring more stringent specifications, a value different from that defined above may be adopted, provided that it is lower than the above value.