SLOVENSKI STANDARD
SIST EN 1228:1997

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Cevni sistemi iz polimernih materialov - Cevi iz duromernih materialov, ojačenih s steklenimi vlakni (GRP) - Določanje začetne specifične obodne togosti

Plastics piping systems - Glass-reinforced thermosetting plastics (GRP) pipes - Determination of initial specific ring stiffness

Kunststoff- Rohrleitungssysteme - Rohre aus glasfaserverstärkten duroplastischen Kunststoffen (GFK) - Ermittlung der spezifischen Anfangs-Ringsteifigkeit

Systemes de canalisations en plastique - Tubes en plastique thermodurcissable renforcé de verre (PRV) - Détermination de la rigidité annulaire spécifique initiale

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English version

Plastics piping systems - Glass-reinforced thermosetting plastics (GRP) pipes - Determination of initial specific ring stiffness

Systèmes de canalisations en plastique - Tubes en plastique thermodurcissable renforcé de verre (PRV) - Détermination de la rigidité annulaire spécifique initiale

Kunststoff-Rohrleitungssysteme - Rohre aus glasfaserverstärkten duroplastischen Kunststoffen (GFK) - Ermittlung der spezifischen Anfangs-Ringsteifigkeit

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 155 "Plastics piping systems and ducting systems", the secretariat of which is held by NNI.

This standard is based on the Draft International Standard ISO/DIS 7685 "Pipes and fittings of glass-fibre reinforced plastics (GRP) - Determination of specific ring stiffness of pipes - Test methods" prepared by the International Organization for Standardization (ISO). It is a modification of ISO/DIS 7685.2 for reasons of possible applicability to test conditions and alignment with texts of other standards on test methods.

The modifications are:

- test parameters (pressure, time, temperature) are not specified;
- material-dependend or performance requirements are not given;
- editorial changes have been introduced.

The material-dependent test parameters and/or performance requirements are incorporated in the referring standard.

This standard is one of a series of standards on test methods which support System Standards for plastics piping systems and ducting systems.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by december 1996, and conflicting national standards shall be withdrawn at the latest by december 1996.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This standard specifies methods for determining the initial specific ring stiffness of glass-reinforced thermosetting plastics (GRP) pipes. Two methods are given and within the specified deflection limits each is equally valid and may be used for any diameter.

2 Definitions

For the purposes of this standard, the following definitions apply:

2.1 compressive load (F): The load applied to a pipe to cause a diametric deflection.

It is expressed in newtons.

2.2 deflection (y): The change in diameter of a pipe in response to a diametric compressive load (see 2.1).

It is expressed in metres.

2.3 relative deflection (y/d_m): The ratio of the deflection, y, (see 2.2), to the mean diameter of the pipe, d_m, (see 2.4).

2.4 mean diameter (d_m): The diameter of the circle corresponding with the middle of the pipe wall cross section.

It is given, in metres, by either of the following equations:

$$d_m = d_i + e$$

$$d_m = d_e - e$$

where:

d_i is the average of the measured internal diameters (see 5.3.3), in metres;

d_e is the average of the measured external diameters (see 5.3.3), in metres;

e is the average of the measured wall thicknesses of the pipe (see 5.3.2), in metres.

2.5 specific ring stiffness (S): A physical characteristic of the pipe which is a measure of the resistance to ring deflection under external load.

This characteristic is determined by testing and is defined, in newtons per square metre, by the equation:

$$S = \frac{E \times I}{d_m^3}$$

where:

E is the apparent modulus of elasticity as determined in the ring stiffness test, in newtons per square metre;

I is the moment of inertia (the second moment of area) in the longitudinal direction per metre length, expressed in metres to the fourth power per metre, i.e.:

$$I = \frac{e^3}{12}$$

where:

e is the wall thickness of the pipe, in metres;

d_m is the mean diameter (see 2.4) of the pipe, in metres.

2.6 initial specific ring stiffness (S_0): The initial value of S obtained by testing in accordance with this standard.

It is expressed in newtons per square metre.

3 Principle

A cut length of pipe is loaded throughout its length to compress it diametrically and the resulting deflection or load achieved are determined. There are two methods, either of which can be used, designated A or B as follows:

method A: After applying the load to achieve a relative deflection of (3 ± 0,5) %, the load is kept constant for a period of time and the final deflection is determined at the end of this period;

method B: After applying the load to achieve the initial deflection specified in the referring standard, the deflection is kept constant for a period of time and the final load being applied at the end of this period is determined.

NOTE: It is assumed that the following test parameters are set by the standard making reference to this standard:

a) the method for determining the initial specific ring stiffness (see 2.6);

b) the length of the test piece (see 5.1);

c) the number of test pieces (see 5.2);

d) if applicable, conditioning of the test piece (see clause 6);

e) for method B, the relative deflection to be applied (see 7.3.3).

4 Apparatus

4.1 Compressive loading machine, comprising a system capable of applying a controlled rate of compression (suitable for methods A or B) or a dead weight loading system (suitable for method A only), without shock, through two parallel load application surfaces conforming to 4.2 so that a horizontally orientated test piece of pipe conforming to clause 5 can be compressed vertically. The accuracy of loading shall be ± 1 % of the maximum indicated load.

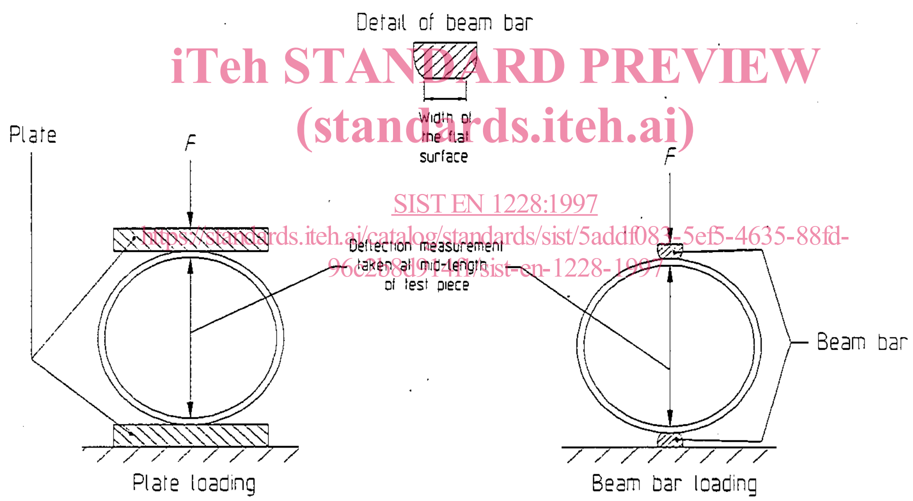

Figure 1: Schematic diagram of the test arrangement

4.2 Load application surfaces

4.2.1 General arrangement

The surfaces shall be provided by a pair of plates (see 4.2.2), or a pair of beam bars (see 4.2.3), or a combination of one such plate and one such bar, with their major axes perpendicular to and centred on the direction of application of load *F* by the compressive loading machine, as shown in figure 1. The surfaces to be in contact with the test piece shall be flat, smooth, clean and parallel.

Plates and beam bars shall have a length at least equal to the test piece (see clause 5) and have a thickness such that visible deformation does not occur during the test.

4.2.2 Plates

The plate(s) shall have a width of at least 100 mm.

4.2.3 Beam bars

Each beam bar shall have rounded edges, a flat face (see figure 1) without sharp edges and a width dependent upon the pipe as follows:

a) for pipes with a nominal size not greater than DN 300 the width shall be (20 ± 2) mm;

b) for pipes of nominal sizes greater than DN 300 the width shall be (50 ± 5) mm.

The beam bars shall be so constructed and supported that no other surface of the beam bar structure shall come into contact with the test piece during the test.

4.3 Dimensional measuring devices, capable of determining

- the necessary dimensions (length, diameter, wall thickness) to an accuracy of within ± 0,1 mm;
- the deflection of the test piece in the vertical direction to an accuracy of within ± 1,0 % of the maximum value.

5 Test piece

5.1 Preparation

The test piece shall be a complete ring cut from the pipe to be tested. The length of the test piece shall be as specified in the referring standard, with permissible deviations of ± 5 %.

The cut ends shall be smooth and perpendicular to the axis of the pipe.

Straight lines, to serve as reference lines, shall be drawn on the inside or the outside along the length of the test piece at 60° intervals around its circumference.

5.2 Number

The number of test pieces shall be as specified in the referring standard.

5.3 Determination of the dimensions

5.3.1 Length

Measure the length of the test piece along each reference line to an accuracy of 0,2 mm.

Calculate the average length, L, in metres, of the test piece from the six measured values.

5.3.2 Wall thickness

Measure to within ± 0,2 mm the wall thickness of the test piece at each end of each reference line.

Calculate the average wall thickness, e, as the average of the 12 measured values, in metres.

5.3.3 Mean diameter

Measure to an accuracy of within ± 0,5 mm either of the following:

a) the internal diameter, d_i, of the test piece between each diametrically opposed pair of reference lines at their mid-length, e.g. by means of a caliper;

b) the external diameter, d_e, of the test piece at the mid-points of the reference lines, e.g. by means of a circumferential wrap steel tape.