
Cevni sistemi iz polimernih materialov - Cevi iz duromernih materialov, ojačenih s steklenimi vlakni (GRP) - Določanje dolgoročne odpornosti proti notranjemu tlaku

Plastics piping systems - Glass-reinforced thermosetting plastics (GRP) pipes - Determination of long-term resistance to internal pressure

Kunststoff-Rohrleitungssysteme - Rohre aus glasfaserverstärkten duroplastischen Kunststoffen (GFK) - Bestimmung der Langzeit-Widerstandsfähigkeit gegen Innendruck

Systemes de canalisations en plastiques - Tubes en plastiques thermodurcissables renforcés de verre (PRV) - Détermination de la résistance a long terme a la pression interne

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Ta slovenski standard je istoveten z: EN 1447:1996

ICS:

23.040.20 Cevi iz polimernih materialov Plastics pipes

SIST EN 1447:1997

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EUROPEAN STANDARD

EN 1447

NORME EUROPÉENNE

EUROPÄISCHE NORM

September 1996

ICS 23.040.20

Descriptors: plastic tubes, reinforced plastics, glass reinforced plastics, thermosetting resins, tests, determination, pressure resistance, hydrostatic pressure

English version

**Plastics piping systems - Glass-reinforced
thermosetting plastics (GRP) pipes - Determination
of long-term resistance to internal pressure**

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Systèmes de canalisations en plastiques - Tubes en plastiques thermodurcissables renforcés de verre (PRV) - Détermination de la résistance à long terme à la pression interne

Kunststoff-Rohrleitungssysteme - Rohre aus glasfaserverstärkten duroplastischen Kunststoffen (GFK) - Bestimmung der Langzeit-Widerstandsfähigkeit gegen Innendruck

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This European Standard was approved by CEN on 1996-05-09. CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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.

The European Standards exist in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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CEN

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

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

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/DP 7509.2 "Glass-fibre reinforced thermosetting plastics (GRP) pipes and fittings - Determination of resistance to internal pressure". It is a modification of ISO/DP 7509.2 for reasons of possible applicability to other test conditions and alignment with texts of other standards on test methods.

The modifications are:

- the test method using increasing pressure is deleted and that using constant pressure retained;
- test parameters (pressure, time, temperature) are not specified;
- material-dependent or performance requirements are not given;
- editorial changes have been introduced.

The material-dependent 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 March 1997, and conflicting national standards shall be withdrawn at the latest by March 1997.

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.

Introduction

This standard describes a method for determining the long-term resistance to internal pressure of glass-reinforced thermosetting plastics (GRP) pipes.

It is a method which uses the following conditions:

- water as the reference liquid inside the test piece;
- water or air as the environment outside the test piece.

The method can be used for tests at different temperatures. It should be noted that, for a given temperature, the results obtained can differ depending on the end sealing device and whether the external environment is water or air.

The method described in this standard differs from some other similar standards, in the following details:

- the failure criteria and the detection of failure;
- the strain in the longitudinal and circumferential directions may be measured during the test;
- the test pressure is maintained constant.

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This method may be used to obtain data to establish internal pressure versus time-to-failure relationships at different temperatures. The procedures for establishing the relationships are not within the scope of this standard. For such purposes attention is drawn to EN 705.

1 Scope

This standard specifies a method for determining the long-term behaviour of glass-reinforced thermosetting plastics (GRP) pipes under internal hydrostatic pressure at a specified temperature in water or air.

NOTE: For other internal or external environments the referring standard should specify any additional requirement.

2 Normative references

This standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter.

For dated references, subsequent amendments to, or revisions of, any of these publications apply to this standard only when incorporated in it by amendment or revision.

For undated references the latest edition of the publication referred to applies.

EN 705

*SIST EN 1447:1997
Plastics piping systems - Glass-reinforced
thermosetting plastics (GRP) pipes and fittings -
Methods for regression analyses and their use*

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3 Definitions

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

- 3.1 failure:** Any continuous loss of pressure resulting from the passage of the test liquid through the wall of the test piece under test (see 9.1).
- 3.2 bursting:** Failure by rupture of the pipe wall with immediate loss of test liquid and drop of pressure (see 9.1 and 9.2.2).
- 3.3 leaking:** Failure by loss of the pressurizing liquid through the pipe wall to an extent detectable visually and/or by a continuous drop in pressure (see 9.1, 9.2.1 and 9.2.2).

3.4 weeping: Failure by passage of the pressurizing liquid through the pipe wall to an extent detectable visually or electronically (see 9.1 and 9.2.3).

4 Principle

A cut length of pipe at the required temperature is subjected to a specified internal hydrostatic pressure to cause a state of stress in the pipe wall which depends upon the loading conditions, i.e. with or without the effects of end thrust being carried by the pipe wall. Water or air are used as the environment outside of the test piece.

Depending on the stress level, cracks may be initiated and propagate. These mechanisms are time-dependent, so that after a certain time failure may occur. The time-to-failure is longer at lower stress levels.

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

- a) whether or not the test piece is to be loaded by the hydrostatic end thrust while under pressure (see 5.2);
- b) the test pressure (see 5.5 and 8.4);
- c) the free length of the test piece (see 6.1);
- d) the number of test pieces (see 6.3);
- e) the test temperature and its tolerance (see 8.1);
- f) if and what strain measurements are required (see 8.2);
- g) the external environmental fluid, i.e. water or air (see 8.3) or other environment (see note to clause 1);
- h) the internal environmental fluid, if not water or a test liquid for the purposes of 5.7 and 9.2.3 (see note to clause 1);
- i) the limiting times to failure for the test (see 8.4).

5 Apparatus

5.1 Dimensional measurement devices, capable of determining the dimensions (length, diameters, wall thickness) to an accuracy of within $\pm 1,0$ %.

5.2 End sealing devices for the test piece, capable of inducing the specified state of stress (see figure 1).

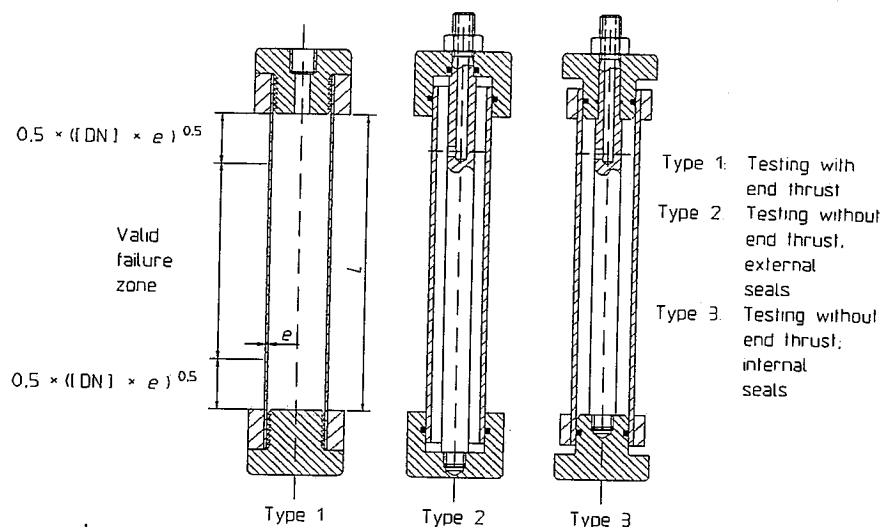


Figure 1: Typical arrangement for pressure testing of pipes

5.3 **Test piece support(s)**, as necessary to minimize deformation of the test piece due to its own weight. Such support(s) shall not constrain the test piece circumferentially or longitudinally.

5.4 **Container for water**, if required (see 8.3), equipped so that the specified temperature can be maintained uniformly throughout the liquid.

NOTE: This may require circulation.

5.5 **Pressurizing system**, capable of applying the pressure to the liquid in the test piece in such a way as to avoid entrapment of air.

The system shall be capable of maintaining the pressure at the level specified by the referring standard [see b) of the note to clause 4] and within the limits detailed in 8.4 for the duration of the test.

NOTE 1: The pressure should, preferably, be applied individually to each test piece. However, the use of equipment enabling the pressure to be applied simultaneously to several test pieces is also permitted if there is no danger of interference when failure occurs.

NOTE 2: If the tests are carried out at a specified stress, the dimensions of the various test pieces should be similar.

NOTE 3: It is recommended that an automatic system be used which adjusts the pressure to keep it within the specified limits.

5.6 Pressure measuring device, having an accuracy within $\pm 1,0 \%$ of the test pressure.

5.7 Electrical resistance meter and associated circuit (optional, see 9.1), capable of detecting a change in electrical resistance to a level of $3 \text{ M}\Omega$ or less (see 9.2.3) between a sufficiently conductive test liquid and a conductive layer.

5.8 Strain measuring device(s) (optional, see 8.2), capable of measuring the required strain to an accuracy of within $\pm 2 \%$.

6 Test pieces

6.1 Free length

Each test piece shall comprise a full section of the pipe, the free length of which, between the sealing devices, shall be as specified in the referring standard.

6.2 Cutting

The ends shall be smooth, perpendicular to the axis of the pipe and the surface sealed with resin.

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6.3 Number

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

7 Conditioning

Unless otherwise specified by the referring standard, store the test piece(s) at the test temperature (see 8.1) for 24 h prior to testing.

8 Procedure

8.1 Conduct the following procedures at the temperature and tolerance specified in the referring standard.

8.2 If strain measurements are required, use equipment conforming to 5.8.