BRITISH STANDARD

BS EN 1638 : 1997
BS 2782 : Part 12 : Method 1223D : 1997

Plastics piping systems — Glass-reinforced thermosetting plastics (GRP) pipes — Test method for the effects of cyclic internal pressure

The European Standard EN 1638 : 1997 has the status of a British Standard

ICS 23.040.20

National foreword

This British Standard is the English language version of EN 1638 : 1997 published by the European Committee for Standardization (CEN).

The UK participation in its preparation was entrusted to Technical Committee PRI/61, Plastics piping systems and components, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

This European Standard is also incorporated into BS 2782 *Methods of testing plastics*: Part 12 *Reinforced plastics pipes, fittings and valves*, as Method 1223D : 1997, for association with related test methods for plastics materials and plastics piping systems.

It is also for use for the revision or amendment of other national standards as practicable, but it should not be presumed to apply to any existing standard or specification which contains or makes reference to a different test method until that standard/specification has been amended or revised to make reference to this method and any requirements adjusted as appropriate.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled 'International Standards Correspondence Index', or by using the 'Find' facility of the BSI Standards Electronic Catalogue.

NOTE 1. In **8.6** of this standard, reference is made to 'method A of EN 1394', and hence that reference and the corresponding reference in clause **2** should be regarded as dated references to the 1996 edition of EN 1394.

NOTE 2. A concurrent draft for a similar purpose to EN 1394 was ISO/DIS 8521, which is not technically equivalent.

Warning note. This British Standard, which is identical with EN 1638 : 1997, does not necessarily detail all the precautions necessary to meet the requirements of the Health and Safety at Work etc. Act 1974. Attention should be paid to any appropriate safety precautions and the method should be operated only by trained personnel.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 6, an inside back cover and a back cover.

This British Standard, having been prepared under the direction of the Sector Board for Materials and Chemicals, was published under the authority of the Standards Board and comes into effect on 15 December 1997

ISBN 0 580 28705 X

Amendments issued since publication

Amd. No.	Date	Text affected

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 1638

April 1997

ICS 23.040.20

Descriptors: Plastic tubes, reinforced plastics, glass reinforced plastics, thermosetting resins, pressure tests, pressure resistance, test specimen

English version

Plastics piping systems — Glass-reinforced thermosetting plastics (GRP) pipes — Test method for the effects of cyclic internal pressure

Systèmes de canalisations en plastiques — Tubes en plastiques thermodurcissables renforcés de verre (PRV) — Méthode d'essai relative aux effets de la pression cyclique interne

Kunststoff-Rohrleitungssysteme — Rohre aus glasfaserverstärkten duroplastischen Kunststoffen (GFK) — Prüfverfahren für die Aus-wirkungen von zyklischem Innendruck

This European Standard was approved by CEN on 1997-01-27. 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.

This European Standard exists 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

Ref. No. EN 1638 : 1997 E

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.

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 October 1997, and conflicting national standards shall be withdrawn at the latest by October 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.

Contents

1 Scope

This standard specifies a method for the effects of cyclic internal pressure on glass-reinforced thermosetting plastics (GRP) pipes. This standard is applicable to pipes of nominal size up to and including DN 600.

NOTE. Whilst this standard refers to pipes the procedures described can be applied to fittings.

2 Normative reference

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 1394 *Plastics piping systems — Glass-reinforced thermosetting plastics (GRP) pipes — Determination of the apparent initial circumferential tensile strength*

3 Definitions

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

3.1 cyclic pressure

The pressure which fluctuates about a mean value at a given frequency and amplitude.

It is expressed in bars[1)] (or in megapascals).

3.2 mean pressure

The arithmetic average of the lower and upper limits of the pressure cycle.

It is expressed in bars (or in megapascals).

3.3 peak-to-peak pressure amplitude

The difference between the lower and upper pressure limits.

It is expressed in bars (or in megapascals).

3.4 cycle frequency

The number of cycles per unit time.

It is expressed in cycles per minute.

3.5 cycle

The change of pressure from the lower limit to the upper limit and then return to the lower limit.

3.6 leakage; weeping

Passage of liquid through the pipe wall.

3.7 bursting

Rupture of the pipe wall with immediate loss of test liquid.

4 Principle

A test piece is subjected to a specified cyclic pressure for a specified number of cycles. Following successful completion of the cyclic test the test piece is subjected to a circumferential tensile strength test.

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

a) type of end sealing device to be used (see **5.3**);

b) the number of test pieces (see **6.1**);

c) the length of the test piece (see **6.2**);

d) the test temperature and its tolerance (see clause **7**);

e) the mean pressure (see **8.2**);

f) the peak-to-peak pressure amplitude (see **8.2**);

g) the cycle frequency (see **8.5**);

h) the test liquid and external environment (see **8.3**);

i) the number of cycles (see **8.5**).

5 Apparatus

5.1 *Source of internal pressure*, capable of both of the following:

a) applying the required pressures gradually;

b) maintaining the consistency of the cycle for the duration of the test.

5.2 *Pressure measuring device*, capable of checking conformity to the required pressure limits (see **5.1** and **8.2**) under the applicable cycle conditions (see **8.5**).

5.3 *End sealing devices for the test pieces* (see figure 1), such that the specified state of stress [see item a) of the note to clause **4**, and **8.3**] will be induced with or without end thrust, as applicable.

5.4 A means of determining and recording the number of cycles completed.

[1)] 1 bar = 10^5 N/m^2 = 0,1 MPa

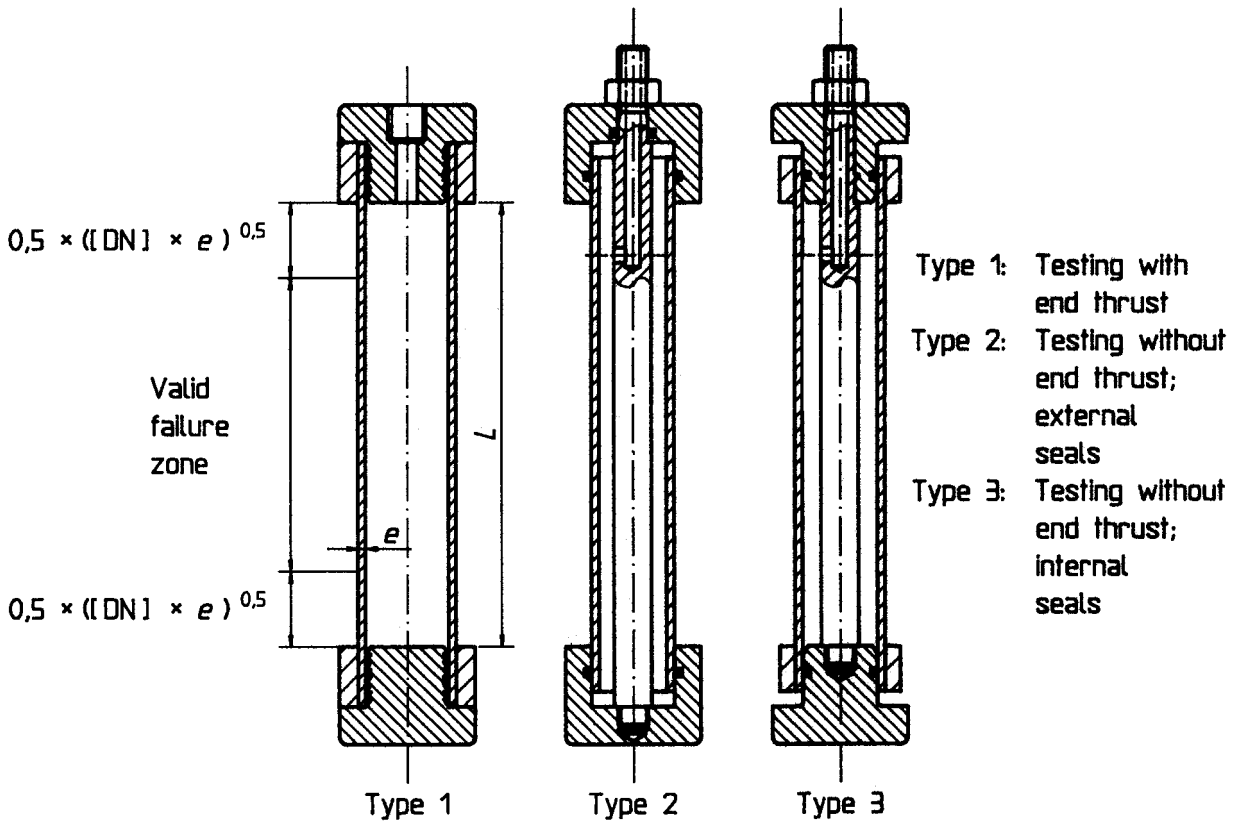

Figure 1. Typical arrangement for pressure testing of pipe

6 Test pieces

6.1 Number

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

6.2 Length

The length, *L*, of the test piece between the end sealing devices shall be as specified in the referring standard (see figure 1).

6.3 Conditioning

Unless otherwise specified in the referring standard conditioning is not required.

7 Test temperature

The test temperature and tolerance shall be as specified in the referring standard.

8 Procedure

8.1 Determine the following dimensions of the test piece:

a) external diameter;

b) wall thickness;

c) length.

8.2 Unless otherwise specified in the referring standard, determine the pressure settings as follows:

a) the mean pressure shall be equal to [PN], when expressed in bar;

b) the peak-to-peak pressure amplitude shall be 0,5 times [PN], when expressed in bar.

EXAMPLE: For a PN 10 pipe tested with a symmetrical peak-to-peak pressure amplitude of 5 bar, the lower test pressure limit is 7,5 bar and the upper limit 12,5 bar.

8.3 Fit the end sealing devices (see **5.3**) and fill the test piece with the test liquid specified in the referring standard. Ensure that all air is expelled.

The external environment shall, unless otherwise specified by the referring standard, be air.

8.4 Connect the arrangement to the pressure generating system.

Prior to commencing the test ensure that both the external environment and the test liquid are at the test temperature (see clause **7**).

8.5 Bring the internal pressure to the lower limit of the cycle.

Increase the internal pressure until the upper pressure limit is reached. Then reduce the pressure to the lower limit. Repeat this process using the applicable cycle frequency given in table 1 unless otherwise specified in the referring standard, until either the test piece fails (see clause **9**) or the minimum required number of cycles specified in the referring standard is reached.

Table 1. Cycle frequency

Nominal size DN	**Cycle frequency**
$DN \leq 150$	(16 ± 4) cycles/min
$150 < DN \leq 350$	(8 ± 2) cycles/min
$350 < DN \leq 600$	(4 ± 1) cycles/min

In the event of an apparatus breakdown, the test may be continued following its repair.

8.6 For test pieces that have undergone testing to the minimum required number of cycles, and for the test pieces that have not been subjected to pressure cycling, determine and record the circumferential tensile strength, using method A of EN 1394.

8.7 Record the number of cycles to failure (see clause **9**) for test pieces which fail before reaching the minimum required number of cycles.

In the event of an apparatus breakdown (see **8.5**), the number of cycles of the different stages may be added together to give the total number of cycles achieved.

9 Failure

Failure shall comprise any type of leakage or weeping (see **3.6**) or bursting (see **3.7**) that occurs inside the valid failure zone (see figure 1).

If leakage occurs where an end sealing device is fitted, the device may be resealed and the test continued. The resulting interruption to the test shall be recorded.

10 Test report

The test report shall include the following information:

a) a reference to this standard and to the referring standard;

b) the full identification of the pipe tested;

c) the number of test pieces;

d) the dimensions of each test piece;

e) the equipment details;

f) the mean test pressure and peak-to-peak pressure amplitude;

g) the number of cycles and the maximum and minimum cycle frequencies;

h) the residual circumferential tensile strength of each cycled test piece;

i) the type of failure;

j) the test temperature;

k) any factors which can have affected the results, such as any incidents or any operating details not specified in this standard;

l) the dates of commencement and completion of testing.

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