
Plastics piping systems — Glass-reinforced thermosetting plastics (GRP) pipes — Test methods for the determination of the initial longitudinal tensile strength

Systèmes de canalisations en plastiques — Tubes en plastiques thermodurcissables renforcés de verre (PRV) — Méthodes d'essai pour la détermination de la force en traction longitudinale





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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 138, *Plastics pipes, fittings and valves for the transport of fluids*, Subcommittee SC 6, *Reinforced plastics pipes and fittings for all applications*.

This fourth edition cancels and replaces the third edition (ISO 8513:2016), which has been technically revised.

The main changes are as follows:

- [subclause 6.2.3](#) has been modified to allow the manufacturer to choose to utilize built-up ends on the samples, independent of the grips holding the test piece (see [6.2.3](#)).

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Plastics piping systems — Glass-reinforced thermosetting plastics (GRP) pipes — Test methods for the determination of the initial longitudinal tensile strength

1 Scope

This document specifies two test methods (method A and method B) for determining the longitudinal tensile properties of glass-reinforced thermosetting plastics (GRP) pipes. The properties which can be determined are:

- the longitudinal tensile strength, and
- the percentage ultimate elongation.

Method A uses, for the test piece(s), a longitudinal strip cut from a pipe.

Method B uses a specified length of the full cross-section of the pipe.

Method A is applicable to pipes with a nominal size of DN 50 or greater with circumferentially-wound filaments, with or without chopped glass and/or woven rovings and/or fillers, and to centrifugally-cast pipes. It is applicable to pipes with helically wound filaments with a nominal size of DN 200 or greater.

Method B is applicable to all types of GRP pipe. It is usually used for pipes with a nominal size up to and including DN 150.

Results from one method are not necessarily equal to the results derived from any of the alternative methods. However, all methods have equal validity.

[Annex A](#) describes additional considerations for method B that have been found useful for the testing of thin-walled helically-wound pipes and can be used to supplement the basic text.

NOTE This document does not address the determination of longitudinal tensile modulus. Due to the multi-layer construction of many GRP pipes, the accurate measurement of strain, necessary for modulus determination, can be very difficult. If it is desired to determine longitudinal modulus, see ISO 527-4 and/or ISO 527-5.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

helically filament-wound

cross wound

filament-wound pipes made with a balanced winding angle

3.2 longitudinal tensile strength

σ_{LA}^*
 σ_{LB}^*

maximum tensile force in the longitudinal direction per unit mean circumference at failure

Note 1 to entry: It is expressed in newtons per millimetre of the circumference (N/mm).

Note 2 to entry: The subscripts A and B denote the method of test used.

3.3 mean circumference

circumference corresponding to the mean diameter multiplied by π

Note 1 to entry: $\pi \approx 3,141\ 6$.

Note 2 to entry: It is expressed in millimetres (mm).

3.4 mean diameter

d_m

diameter of the circle corresponding with the middle of the pipe wall cross-section

Note 1 to entry: It is given by any of the following:

- a) the average of the external diameter of the pipe minus the average of the wall thickness;
- b) the external circumference of the pipe divided by π ($\pi \approx 3,141\ 6$) minus the average of the wall thickness;
- c) the average of the internal diameter of the pipe plus the average of the wall thickness.

Note 2 to entry: It is expressed in millimetres (mm).

3.5 ultimate elongation

ε_L

elongation coincident with the ultimate longitudinal tensile strength.

Note 1 to entry: For the purposes of this document, the measurement of elongation is limited to measurement of the movement of the tensile testing machine cross-heads.

Note 2 to entry: It is expressed as a percentage of an initial gauge length or free length of a test piece.

4 Principle

Test pieces comprising of either strips cut longitudinally from a pipe wall segment (method A) or a specified length of pipe (method B) are subjected to extension in the longitudinal direction at a constant speed such that fracture occurs within a specified time.

The tensile properties are determined using the initial dimensions of the test piece, the tensile force, and the cross-head movement.

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

- a) the methods to be used, i.e. method A or method B;
- b) the number of test pieces (see [6.4](#));
- c) if applicable, the requirements for conditioning, e.g. temperature, humidity, time and associated tolerances (see [Clause 7](#));
- d) the test temperature and its tolerance (see [Clause 8](#));