
**Glass-reinforced thermosetting
plastics (GRP) pipes — Determination
of the apparent axial long-term
modulus of pipes subject to beam
bending**

*Tubes en plastiques thermodurcissables renforcés de verre (PRV) —
Détermination du module axial apparent à long terme de tubes
soumis à la flexion de poutre*

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Published in Switzerland

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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 documents 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*.

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.

Introduction

The apparent axial long-term modulus of pipes subject to beam bending of pipes manufactured according to ISO 23856 is required for designing pipe systems installed aboveground in accordance with ISO/TS 10986.

The modulus is used to calculate deflections and rotations of pipes installed on two or more supports.

Glass-reinforced thermosetting plastics (GRP) pipes — Determination of the apparent axial long-term modulus of pipes subject to beam bending

1 Scope

This document specifies a method for determining the apparent axial long-term modulus of pipes subject to beam bending deflection between vertically supported end-couplers, which allow rotation of the pipe relative to the couplers.

In conjunction with ISO 10928, this document expresses the results of the test as an apparent axial long-term modulus for use in the calculation of mid-span beam deflection and end rotation of GRP pipes as specified in ISO/TS 10986.

Test conditions and requirements are specified in the referring standard.

For practical reasons, the test method is not suited for diameters greater than DN 600.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 10928:2016, *Plastics piping systems — Glass-reinforced thermosetting plastics (GRP) pipes and fittings — Methods for regression analysis and their use*

3 Terms and definitions

No terms and definitions are listed in this document.

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

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

4 Principle

A pipe sample is mounted on supports at the ends and filled with water. The deflection is measured both at mid-span and at the supports. The deflections measured at the supports is subtracted from the deflection measured at the centre to obtain a flexural deflection to be used to compute the modulus. The displacements are measured at pipe springlines to minimize errors caused by pipe cross-section deformation.

The deflection is monitored over time, and the apparent axial long-term modulus computed. The 50-year modulus is computed from the extrapolated deflection after 10 000 h of testing.

5 Apparatus

5.1 Supporting frame, comprising two parallel steel beams, four floor supports, and two circular end closures (see [Figure 1](#) for typical test set-up). The beams shall be sufficiently stiff such that no visible