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Second edition
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Thermoplastics piping systems for non-pressure underground drainage and sewerage — Thermoplastics shafts or risers for inspection chambers and manholes — Determination of ring stiffness

Systèmes de canalisations thermoplastiques pour branchements et collecteurs d'assainissement enterrés sans pression — Éléments de réhausse thermoplastiques pour chambres d'inspection et de branchement ou regards — Détermination de la rigidité annulaire

Reference number
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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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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 1, *Plastics pipes and fittings for soil, waste and drainage (including land drainage)*.

This second edition cancels and replaces the first edition (ISO 13268:2010), which has been technically revised.

The main changes are as follows:

— normative references have been updated;

— definitions have been revised;

— in 8.2, the calculation of the shape factor, $S_{F,}$ has been changed for irregular sections;

— this document has been editorially revised.

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.

Thermoplastics piping systems for non-pressure underground drainage and sewerage — Thermoplastics shafts or risers for inspection chambers and manholes — Determination of ring stiffness

1 Scope

This document specifies a test method for assessing the initial (short-term) tangential ring stiffness of riser shafts for thermoplastics inspection chambers or manholes.

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 48-2, *Rubber, vulcanized or thermoplastic — Determination of hardness — Part 2: Hardness between 10 IRHD and 100 IRHD*

ISO 9969, *Thermoplastics pipes — Determination of ring stiffness*

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
regular cross-section shaft
circular riser shaft with a regular symmetrical design on their external surface

Note 1 to entry: These products can be either fabricated from plain pipe or from structured wall pipe or fittings.

3.2
irregular cross-section shaft
circular riser shaft with an irregular asymmetrical design on its external surface

Note 1 to entry: These products can include additional reinforcing rings or structures intended to strengthen the riser in specific areas.

4 Principle

4.1 General

The ring stiffness of a shaft with a regular cross-section is determined using the ISO 9969 test method.

Where a shaft has an irregular, square or rectangular cross-section, the ISO 9969 test shall be modified as described in this document to determine the ring stiffness (see Table 1).

Table 1 — Relevant International Standards for determination of ring stiffness

External shaft design	Type of cross-section	Relevant International Standard for determination of ring stiffness
Plain surface	Regular cross-section	ISO 9969
	Irregular, square or rectangular cross-section	This document
Structured wall surface	Regular cross-section	ISO 9969
	Irregular, square or rectangular cross-section	This document

4.2 Principle for shafts with regular cross-section

The ring stiffness shall be determined by measuring the force and the deflection while deflecting the shaft at a constant rate.

A length of shaft supported horizontally shall be compressed vertically between two parallel flat plates moved at a constant speed, which is dependent upon the diameter of the shaft.

A plot of force versus deflection shall be generated. The ring stiffness shall be calculated as a function of the force necessary to produce a deflection of 0,03d_i diametrically across the shaft.

4.3 Principle for shafts with irregular, square or rectangular cross-section

The ring stiffness shall be determined by measuring the force and deflection while deflecting the shaft at a constant rate or constant load, until sufficient force is applied to obtain a resulting deflection in the range of 2 % to 6 %.

A riser shaft or segment of shaft shall be placed symmetrically between two rigid parallel plates or beams or, alternatively, between one rigid beam and a V-shaped support. A compressive force shall be applied to the shaft or segment using a bearer shaped to the external surface of the test piece.

The ring stiffness shall be calculated as a function of the force required to produce the deflection.

5 Apparatus

5.1 Regular cross-section shaft

The apparatus shall conform to that described in ISO 9969.

A typical shaft with regular cross-section is shown in Figure 1.

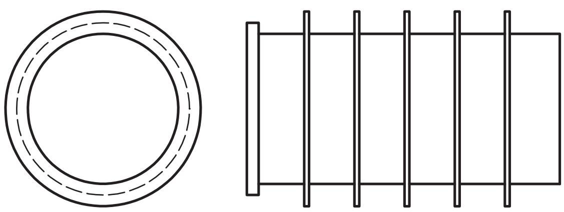


Figure 1 — Typical shaft with regular cross-section

5.2 Irregular, square or rectangular cross-section shaft

5.2.1 Irregular cross-section shaft

Typical shafts with irregular cross-section are shown in Figure 2.

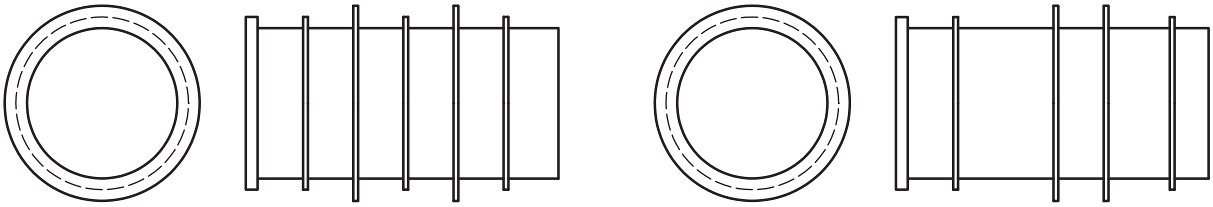


Figure 2 — Typical shafts with irregular cross-section

5.2.2 Square and rectangular cross-section shaft

Typical shafts with square and rectangular cross-section are shown in Figure 3.

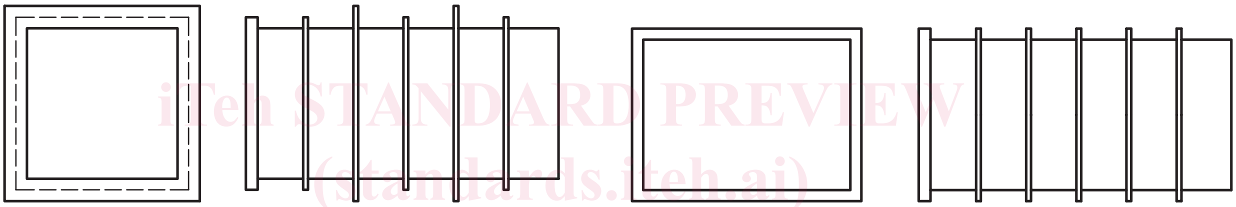


Figure 3 — Typical shafts with square and rectangular cross-section

5.3 Loading frame, with two rigid parallel plates or beams between which a compressive force, *F*, can be applied to the test piece such that the force and the resulting deflection of the test piece in the direction of the force can be measured to an accuracy of ±1 %.

Where a V-shaped support is used, the included angle shall be 170° or more.

For shafts with square or rectangular cross-sections, the bearers shall have a width, *W*, not greater than 25 mm.

For shafts with irregular cross-section, the maximum width of bearers shall be for:

— DN/ID ≤ 400: 50 mm;

— 400 < DN/ID ≤ 1 200: 0,12 × [DN/ID], expressed in millimetres (mm);

— DN/ID > 1 200: 150 mm.

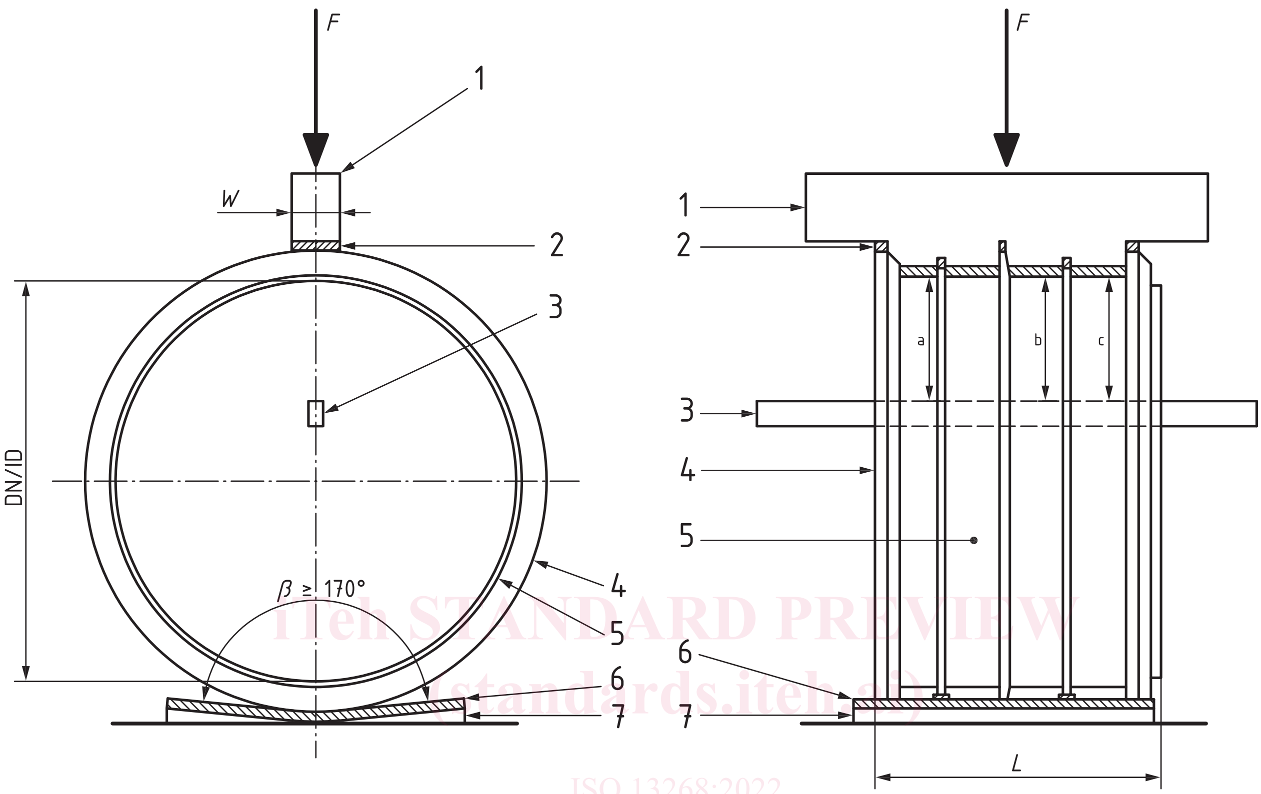
NOTE The above values have been taken from EN 476:1997, 9.2.1[1].

Where the outside of an irregular shaft has a change in cross-section incorporated within the test piece, the bearers shall be shaped to accommodate this (see Figure 4). Where square or rectangular shafts have a regular rib configuration, this shall not be considered to be a change in cross-section, and the load, *F*, imposed shall be applied just to the crests of the ribs.

The centre of loading shall be so arranged that the vertical deflection of the two ends of the test piece differs by not more than 0,5 % of the nominal size of the shaft.

Where the surface of the outside of the shaft does not provide a smooth bearing contact, the bearers shall be surfaced with a strip, not less than 3 mm thick, of elastomeric material of (50 ± 5) IRHD hardness in accordance with ISO 48-2.

The length of each bearer shall be not less than the length of the test piece.



Key

1 bearer, accommodated to shape of test piece

2 elastomeric strips

3 reference beam, datum, for measuring

4 joint element, assembled, comprising standard sealing system of the manufacturer (note that this is an example, the sealing system can also be placed on the spigot end)

5 test piece

6 elastomeric material

7 support

F load, applied to upper bearer

L length of test piece

W width of bearer

a Measuring point 1.

b Measuring point 2.

c Measuring point 3.

Figure 4 — Example of a loading arrangement

5.4 Measuring devices, capable of determining the length to an accuracy of ±0,5 mm and the force and deflection along the length of the test piece to an accuracy of ±1 % in the direction of the applied force.

6 Test pieces

6.1 Number of test pieces

Three test pieces shall be taken, each consisting of a riser or an appropriate length of riser segment incorporating a joint element, if required. An additional jointing element can be placed on the socket or on the spigot end depending on where the standard sealing system is placed (see Figure 5).

6.2 Age of test pieces

Test pieces shall be (21 ± 2) days old and conditioned, in air, at ambient temperature for at least 24 h prior to testing.

6.3 Specification of test pieces

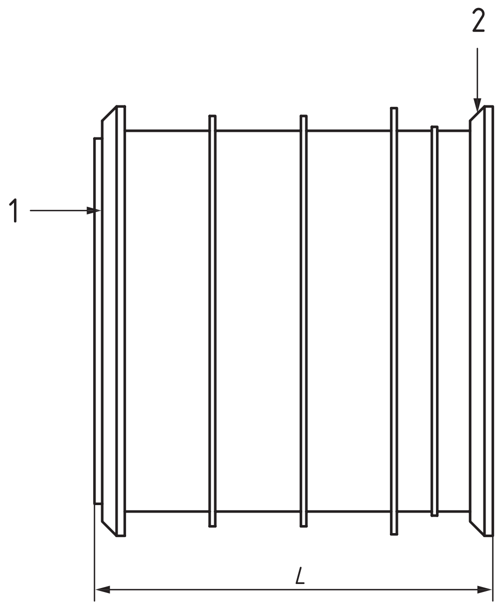
6.3.1 Shafts with regular cross-section

When the shaft has a regular cross-section, the test piece shall be in accordance with ISO 9969 and have a minimum length of 300 mm. In the case of a one-piece chamber or manhole, the shaft shall be cut off at a minimum of 300 mm from the top of the main channel. It shall be cut smoothly and perpendicular to the main axis.

6.3.2 Shafts with irregular, square or rectangular cross-section

When the chamber or manhole consists of a chamber base and a separate shaft, the whole shaft with an additional joint element shall be used as the test piece. The additional joint element shall be connected with the shaft by using the standard sealing or welding system of the manufacturer (see Figure 5).

In the case of a one-piece chamber or manhole, the test piece shall be cut off at a minimum of 300 mm from the top of the main channel. It shall be cut smoothly and perpendicular to the main axis of the chamber or manhole. The length of the piece shall be chosen to obtain maximum symmetry, but shall be not less than 300 mm and not exceed 1 000 mm.



Key

L length

1 example showing a standard jointing element of the manufacturer

2 example showing an additional jointing element with standard sealing system of the manufacturer connected (note that this is an example, the additional jointing element can be placed on the socket or spigot end)

Figure 5 — Example of a shaft with an irregular cross-section connected with an additional jointing element

7 Procedure

7.1 Test temperature

The test shall be conducted at a temperature of (23 ± 2) °C.

7.2 Shafts with regular cross-section

The test shall be carried out in accordance with ISO 9969.

7.3 Shafts with irregular, square or rectangular cross-section

7.3.1 Assemble the test piece symmetrically in the test apparatus. The line of loading and support for rectangular cross-sections shall be at the centre of the longest side.

7.3.2 Determine the datum for deflection at zero load without applied force at three points of measurement. One of the measuring points shall be in the middle of the test piece, the other two points being near either end.

7.3.3 Apply sufficient force to obtain a deflection of 2 % to 6 % of the shaft. The rate of loading shall be uniform such that the force required to generate the deflection is applied within a period of 3 min to 6 min. The centre of loading shall be so arranged that the vertical deflection of the test piece at the three points of measurement differs by not more than 0,5 % of the nominal dimension of the shaft (between the loading plates) along the line of deformation. If the test piece incorporates a change in cross-section on the inside of the shaft, the deflection shall be determined on the short side of the smallest cross-section for a square or rectangular section.

