INTERNATIONAL STANDARD

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Adhesives — Determination of shear strength of anaerobic adhesives using pin-and-collar specimens

Adhésifs — Détermination de la résistance au cisaillement des adhésifs anaérobies sur assemblage type axe-bague

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 on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 61, *Plastics*, Subcommittee SC 11, *Products*.

This second edition cancels and replaces the first edition (ISO 10123:1990), of which it constitutes a minor revision.

Adhesives — Determination of shear strength of anaerobic adhesives using pin-and-collar specimens

SAFETY STATEMENT — Persons using this International Standard should be familiar with normal laboratory practice, if applicable. This International Standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user to establish appropriate safety and health practices and to ensure compliance with any regulatory requirements.

1 Scope

This International Standard specifies a method for the determination of the shear strength of anaerobic-curing liquid adhesives used for retaining cylindrical assemblies, pin-and-collar type, or for locking and sealing threaded fasteners.

This test method can also be used for other adhesives.

The test is for ranking and quality control of adhesives. The result does not necessarily reflect the performance of the materials in service and the test is not suitable for providing numerical data for design purposes.

NOTE Numerical design data can be obtained from tests using the materials and configurations used in the actual structure.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 683-9, *Heat-treatable steels, alloy steels and free-cutting steels — Part 9: Wrought free-cutting steels*

ISO 7500-1, *Metallic materials — Verification of static uniaxial testing machines — Part 1: Tension/compression testing machines — Verification and calibration of the force-measuring system*

3 Principle

The force required to shear the adhesive joint formed between a metal pin and a metal collar is determined. The static shear strength is calculated from this force.

4 Apparatus

4.1 **Universal testing machine**, complying with ISO 7500-1, class 1.

The machine shall be able to apply a compressive force directly or indirectly. An example of a jig for compression testing, which can be used to adapt a tensile testing machine, is shown in Annex A.

4.2 Test specimen support, made of hardened steel, as shown in Figure 1, for positioning the test specimen on the universal testing machine.

4.3 Non-adhering material sheet, e.g. polyethylene sheet.

5 Preparation of test specimens

Assemble not less than five specimens for each test as described below.

5.1 Each specimen shall be comprised of a pin of diameter ($20^{-0,020}_{-0,041}$) mm and a slip collar ($20^{+0,025}_{0}$) mm in inside diameter and (18,00 ± 0,05) mm in width, both components being finished to 0,8 µm to 1,6 µm (see Figure 2). The material used for the collar and pin shall be stated in the test report.

NOTE Unless there is a specific requirement to test the adhesive with a specific material, low-grade carbon steel (complying with grade 2 of ISO 683-9) is generally used and has been found to be satisfactory.

The cutting oil used in the manufacture of the specimens shall be soluble in the degreasing solvents at room temperature and shall contain no lanolin. The corrosion protection materials shall also be soluble in the degreasing solvents at room temperature.

5.2 Clean all pins and collars with a suitable cleaning agent to degrease them and allow them to dry. The cleaning agents used shall not leave any visually detectable residue on the surface. The pins and collars shall be stored at (23 ± 2) °C for at least 30 min before assembly, or store them in a desiccator at (23 ± 2) °C. After cleaning, use the degreased specimens within 4 d or discard them (oxidation affects the test results after this period of time). Take precautions to avoid contamination during subsequent handling. Do not prime or activate the surface unless specified for the material under test. If the specimen is primed or activated, state this in the test report.

5.3 Pre-assemble pins and collars before application of the adhesive to ensure a smooth and sliding fit.

Disassemble the parts. Apply sufficient adhesive to the surface of each pin, beginning at one end, to completely cover a length corresponding to the width of the collar in its final position. Also apply sufficient adhesive to completely cover the interior of the collar. Before application of the adhesive, an activator can be applied as recommended by the manufacturer.

Slip the collar over the pin completely, with a helicoidal back-and-forth movement (this operation shall not take longer than 6 s).

5.4 Place the assembly vertically, with the fillet upwards, on a sheet of non-adhering material (e.g. polyethylene) as shown in Figure 3. Ensure that the assembly is at the required temperature and do not place it on a hot or cold surface.

5.5 Cure the adhesive in accordance with the manufacturer's instructions. After curing, wipe the excess of the surfaces of the pin-and-collar assemblies to remove any uncured adhesive.

6 Procedure

After allowing for cure and any predetermined environmental conditioning, determine the static shear strength as follows.

Place the pin-and-collar assembly in the steel specimen support and place the support on the test device (see Figure 4). Load the specimen smoothly using a constant crosshead speed between 1 mm/min and 2 mm/min.

Record the maximum load in Newtons. Calculate the static shear strength τ, expressed in megapascals, using Formula (1):

$$\tau = \frac{F}{S} \tag{1}$$

where

F is the maximum load, in Newtons;

S is the bond area, in square millimetres.

The bond area shall be calculated from the dimensions of the pin-and-collar assembly given in Figure 3. The effective bond length is calculated as 16 mm, from the nominal collar width, subtracting the length of both chamfers.

Test no fewer than five specimens.

7 Precision

The precision of this test method is not known because interlaboratory data are not available.

8 Test report

The test report shall include the following information:

a) a reference to this International Standard, i.e. ISO 10123;

b) complete identification of the adhesive tested, including type, form, source, date manufactured and manufacturer's code number;

c) complete identification of the material used and the method of cleaning and surface preparation prior to bonding;

d) the adhesive-application and bonding conditions used in preparing the specimens;

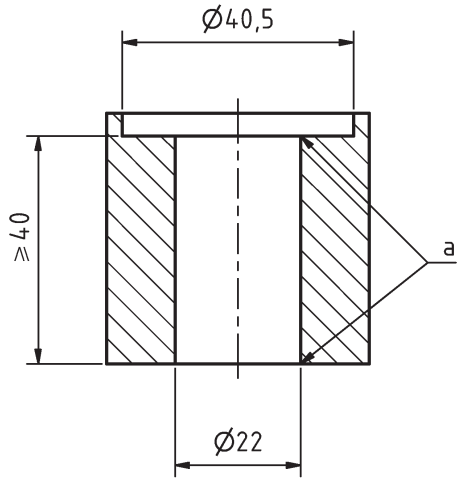
e) the conditioning procedure used for the specimens prior to testing;

f) the number of specimens tested;

g) the crosshead speed;

h) the average value of the maximum load and the standard deviation, as well as the average value and the standard deviation of the shear strength.

Dimensions in millimetres

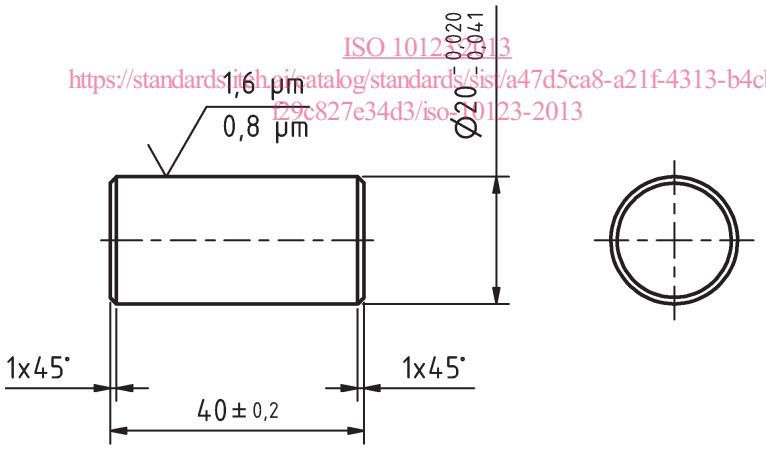


Key

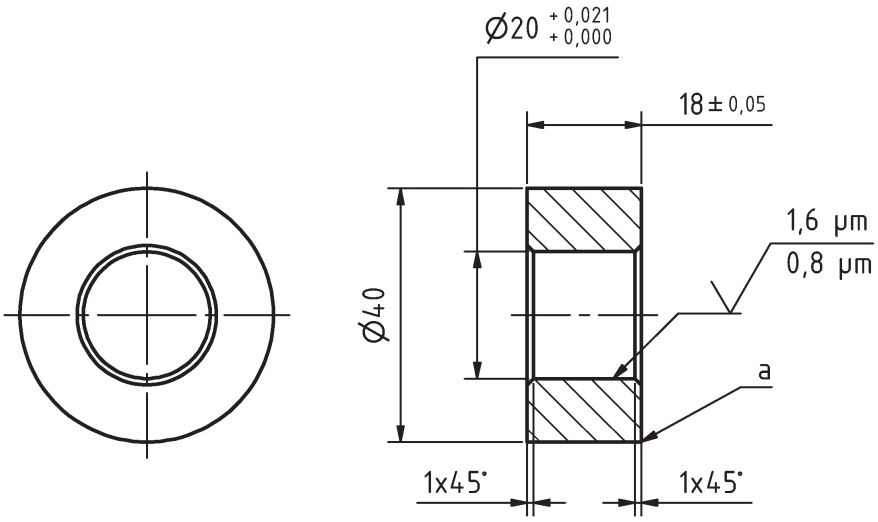
a Chamfers, 0,5 × 45°.

Figure 1 — Test specimen support

Dimensions in millimetres
(except where otherwise stated)



a) Pin

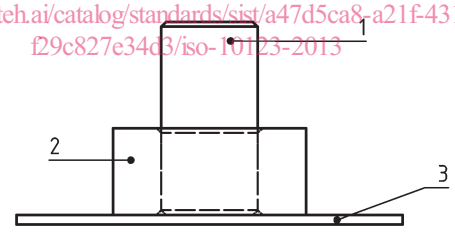


b) Collar

Key

a Break edge.

Figure 2 — Pin-and-collar assembly



Key

1 pin
2 collar
3 non-adhering sheet (e.g. polyethylene sheet)

Figure 3 — Test specimens positioned for curing