INTERNATIONAL STANDARD

ISO 8394-2

Second edition
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Buildings and civil engineering works — Determination of extrudability for sealant —

Part 2: Using standardized apparatus

Bâtiments et ouvrages de génie civil — Détermination de l'extrudabilité des mastics —
Partie 2: À l'aide d'un appareil normalisé

Reference number
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Contents

Page

Foreword

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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 on 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 the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 59, *Buildings and civil engineering works*, Subcommittee SC 8, *Sealants*.

This second edition cancels and replaces the first edition (ISO 8394-2:2010), which has been technically revised.

The main change compared to the previous edition is as follows:

— figures in this document have been modified.

A list of all parts in the ISO 8394 series can be found on the ISO website.

Buildings and civil engineering works — Determination of extrudability for sealant —

Part 2: Using standardized apparatus

1 Scope

This document specifies a method for determining the extrudability of sealants independently of the package in which they are supplied.

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 6927, *Buildings and civil engineering works — Sealants — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 6927 apply.

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

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

4 Principle

The tested sealant is filled in a standardized apparatus.

The sealant is extruded under defined conditions. The mass of the extruded sealant is determined.

This document specifies reference test conditions, such as temperature, pressure, extrusion time and geometry of cylinder. Deviation from these conditions is possible. Deviation modifies the final result; therefore, any deviation shall be described in the test report. The comparison of results is possible, only if all the test conditions are the same.

5 Apparatus

5.1 Regulated enclosure, regulated to (5 ± 2) °C, (23 ± 2) °C, (35 ± 2) °C or a temperature agreed on by the parties concerned.

5.2 Pneumatic standardized apparatus, with a test volume of 250 ml or 400 ml and with an orifice diameter from 2 mm to 10 mm, as agreed on by the parties concerned (see Figure 1 and Figure 2).

5.3 Compressed air, up to 700 kPa.

5.4 Stopwatch, accurate to 0,1 s.

5.5 Balance, accurate to 0,1 g.

6 General

Perform all the measurements under the same conditions (same batch number, temperature, volume of cylinder and orifice diameter, same pressure, etc.) for the following cases.

a) Single-component sealants:

   1) for each single-component sealant, perform three extrusion tests;

   2) for each extrusion test, use one standardized apparatus.

b) Multi-component sealants:

   1) for each multi-component sealant, determine an extrusion test at three different times (see 8.3);

   2) at each time, perform an extrusion test from three different standardized apparatus;

   3) carry out nine extrusion tests (with three standardized apparatus for each of the three different times).

7 Preparation of the standardized apparatus

Select the volume of the cylinder and the diameter of the orifice, according to the viscosity of the tested sealant, or as agreed on by the parties concerned.

Fit the plunger and ring of the standardized apparatus and insert in the cylinder, with the ring towards the orifice.

8 Conditioning of the sealant

8.1 General

Condition the single- or multi-component sealant and the cylinder at the testing temperature in the regulated enclosure (5.1) for a minimum of 12 h before testing.

The default conditioning temperature is (23 ± 2) °C.

This test temperature may be at (5 ± 2) °C, (23 ± 2) °C or (35 ± 2) °C, or a temperature agreed on by the parties concerned.

8.2 Single-component sealants

Fill the cylinder of the standardized apparatus with the sealant, avoiding the formation of air bubbles.

8.3 Multi-component sealants

Follow the instructions of the sealant manufacturer concerning the mixing procedure of the sealant.

Using the instructions of the sealant manufacturer, calculate the extrusion times corresponding to:

— the quarter of pot life at the corresponding testing temperature;

— the middle of pot life at the corresponding testing temperature;

— the third quarter of pot life at the corresponding testing temperature.

Fill the cylinder of the standardized apparatus with the multi-component sealant, avoiding the formation of air bubbles.

9 Test procedure

9.1 General

The measurements may be carried out at usual laboratory room temperature. All the following operations shall be carried out within 5 min.

Put the cylinder in the standardized apparatus.

Set the air pressure of the compressor to (300 ± 10) kPa or at any pressure as agreed on by the parties concerned.

Extrude a sufficient quantity of sealant to remove the air from the orifice.

9.2 Single-component sealants

Immediately, extrude the sealant out of the cylinder for 30 s. This time shall be measured using the stopwatch (5.4). Do not take into account the quantity of sealant coming out of the orifice after the end of test time.

The cylinder shall not be empty after testing.

If necessary, due to the rheological behaviour of the sealant, the test may be performed after a suitable recovery time of the sealant, as agreed on by the parties concerned. Condition the cylinder in the regulated enclosure, during the recovery time.

NOTE In the case of a low viscosity sealant, the extrusion time can be lower. In the case of a high viscosity sealant, the extrusion time can be higher.

After the pneumatic extrusion, weigh the quantity of extruded sealant, with the balance (5.5).

9.3 Multi-component sealants

Extrude the sealant out of the cylinder for a total of three extrusions, each corresponding to one of the three pot life times (see 8.3). Do not take into account the quantity of sealant coming out of the orifice after the end of test time. The cylinder shall not be empty after these three extrusions.

Place the cylinder back into the regulated enclosure between the three measurements.

After each pneumatic extrusion, weigh the quantity of extruded sealant, with the balance (5.5).

10 Expression of results

10.1 Extrusion rate, expressed as mass per minute

The result of each measurement, expressed in grams of extruded sealant per minute, is rounded to the nearest gram, using Formula (1):

$$E_{\mathrm{m}} = \frac{m \times 60}{t} \tag{1}$$

where

E_{m} is the extrusion rate of the sealant, expressed in grams per minute;

m is the mass of the extruded sealant, expressed in grams;

t is the time of extrusion, expressed in seconds.

Calculate the mean value of the three measurements, rounded to the nearest gram per minute.

10.2 Extrusion rate, expressed as volume per minute

If needed, the result may be expressed in millilitres of extruded sealant per minute, rounded to the nearest millilitre, using Formula (2):

$$E_{\mathrm{v}} = \frac{E_{\mathrm{m}}}{D} \tag{2}$$

where

E_{v} is the extrusion rate of the sealant, expressed in millilitres per minute;

E_{m} is the extrusion rate of the sealant, expressed in grams per minute;

D is the density of the sealant, at the test temperature of the sealant.

10.3 Multi-component sealants

Plot the graph mean value of $E_{\mathrm{m}} = f$ (time elapsed after mixing), allowing for the determination of the increase of viscosity of the multi-component sealant during its working time.

11 Test report

The test report shall contain the following information:

a) a reference to this document, i.e. ISO 8394-2;

b) the test laboratory's name and date of test;

c) the name, type (chemical family) and colour of sealant;

d) the batch number of sealant;

e) the conditioning temperature;

f) the volume of the cylinder and the diameter of the orifice;

g) the pressure of extrusion;

h) the time of extrusion;

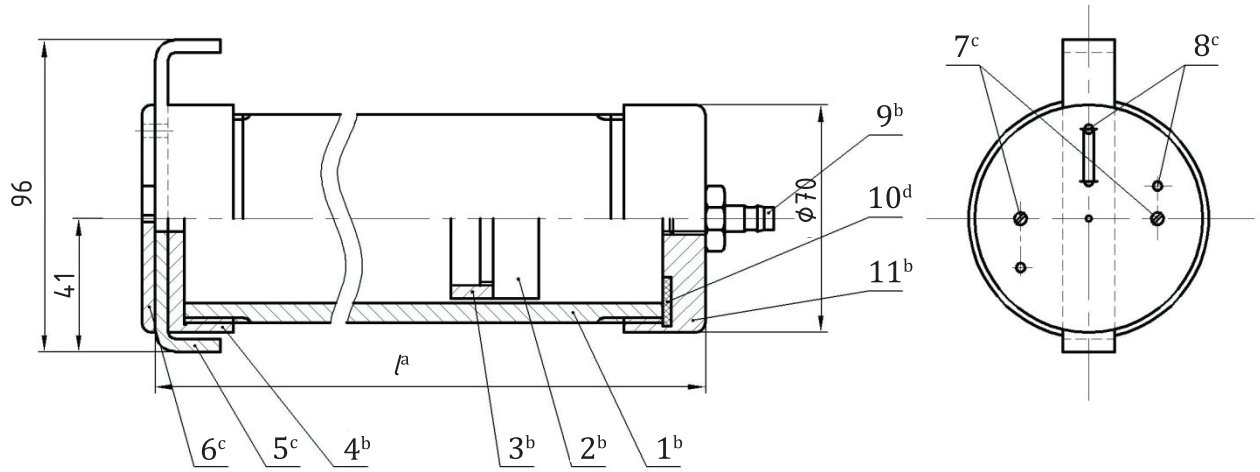
i) the result of each extrusion, in grams per minute, and the mean value;

j) the result of each extrusion, in millilitres per minute, the mean value and the density, if necessary;

k) the graph of $E_m = f$ (time elapsed from mixing), for the multi-component sealants;

l) any deviation from this document.

Dimensions in millimetres



Key

1 cylinder
2 piston
3 ring
4 orifice cap
5 slide bar
6 orifice plate, d = 2 mm, or d = 4 mm, or d = 6 mm, or d = 10 mm
7 countersunk head screw: ISO 2009 - M3 × 6 - 4,8
8 parallel pin: ISO 2338 - 3 × 8
9 coupling with pipe thread: ISO 228-1 - G 3/8
10 gasket, outer diameter 60 mm, material 35 mm × 2 mm
11 bottom cap
a l = 182 mm for 250 ml test volume; l = 262 mm for 400 ml test volume.
b Copper-zinc alloy.
c Stainless steel.
d Neoprene.

Figure 1 — Extrusion device