
**Building construction — Jointing
products —**

Part 2:

**Determination of extrudability of sealants
using standardized apparatus**

Construction immobilière — Produits pour joints —

*Partie 2: Détermination de l'extrudabilité des mastics au moyen d'un
appareil normalisé*

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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 8394-2 was prepared by Technical Committee ISO/TC 59, *Building construction*, Subcommittee SC 8, *Jointing products*.

ISO 8394 consists of the following parts, under the general title *Building construction — Jointing products*:

- *Part 1: Determination of extrudability of sealants*
- *Part 2: Determination of extrudability of sealants using standardized apparatus*

This first edition of ISO 8394-2, together with ISO 8394-1, cancels and replaces ISO 8394:1988, which has been technically revised.

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Building construction — Jointing products —

Part 2:

Determination of extrudability of sealants using standardized apparatus

1 Scope

This part of ISO 8394 specifies a method for determining the extrudability of sealants independently of the package in which they are supplied.

It is not applicable to the classification of sealants.

2 Normative references

The following referenced documents are indispensable for the application 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, *Building construction — Jointing products — Sealants — Vocabulary*

3 Terms and definitions

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

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 part of ISO 8394 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 Figures 1 and 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, and
- 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 Equation (1):

$$E_m = \frac{m \times 60}{t} \quad (1)$$

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 Equation (2):

$$E_v = \frac{E_m}{D} \quad (2)$$

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.

Calculate the mean value of the three values of E_v , rounded to the nearest millilitre per minute.

10.3 Multi-component sealants

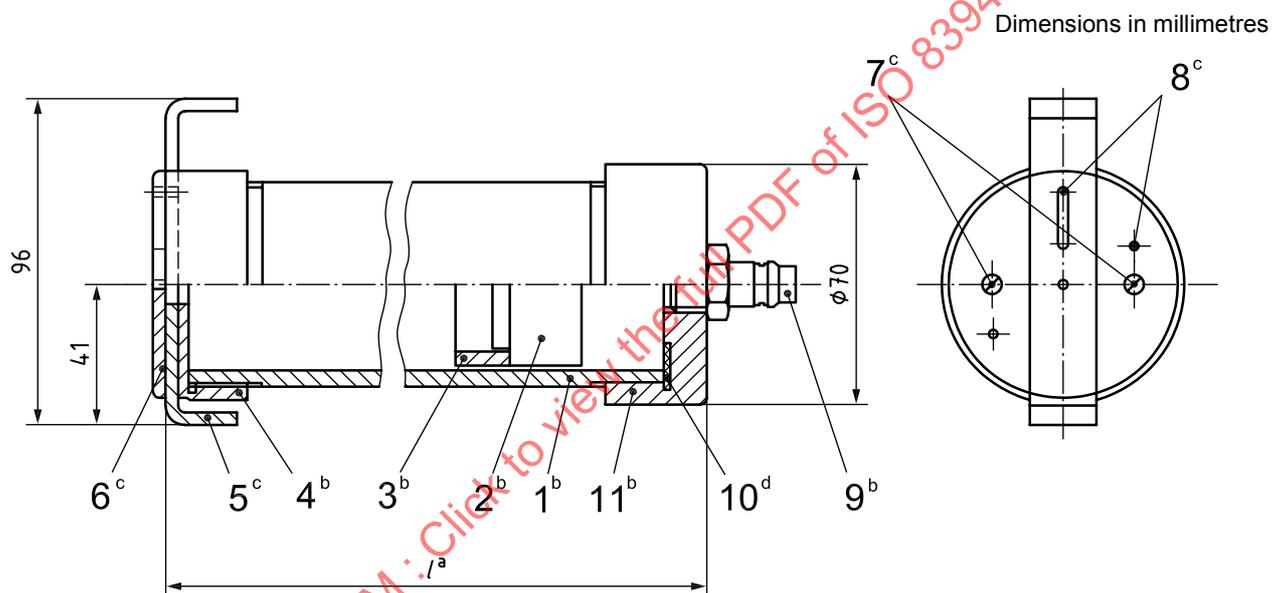
Plot the graph mean value of $E_m = f$ (time elapsed after mixing), allowing for the determination of the increase of viscosity of the multi-component sealant during its working time.

11 Test report

The test report shall contain the following information:

- a) a reference to this part of ISO 8394, i.e. ISO 8394-2:2010;
- 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 $E_m = f(\text{time elapsed from mixing})$, for the multi-component sealants;
- l) any deviation from this part of ISO 8394.

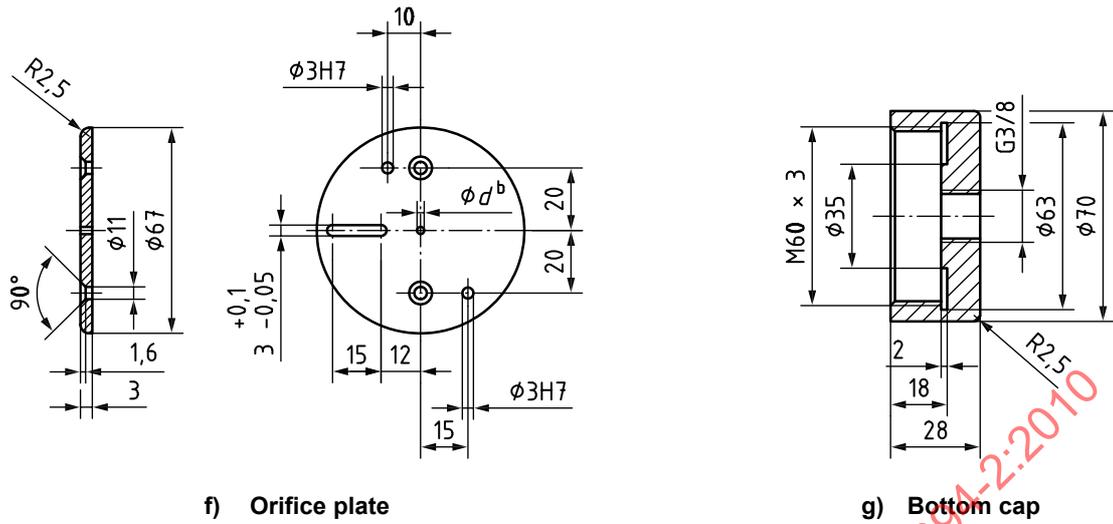


Key

- 1 cylinder
- 2 piston
- 3 ring
- 4 orifice cap
- 5 slide bar
- 6 orifice plate, $d = 2 \text{ mm}$, or $d = 4 \text{ mm}$, or $d = 6 \text{ mm}$, or $d = 10 \text{ mm}$
- 7 countersunk head screw: ISO 2009 - M3 \times 6 - 4,8
- 8 parallel pin: ISO 2338 - 6 \times 8
- 9 coupling with pipe thread: ISO 228-1 - G 3/8
- 10 gasket, outer diameter 60 mm, material 25 mm \times 2 mm
- 11 bottom cap

- a $l = 182 \text{ mm}$ for 250 ml test volume; $l = 262 \text{ mm}$ for 400 ml test volume.
- b Copper-zinc alloy.
- c Stainless steel.
- d Neoprene.

Figure 1 — Extrusion device



NOTE $Ra = 6,3 \mu\text{m}$ all over, except where otherwise stated

Specified tolerances

3 H7	10 H7	20 H8	20 e8	50 H7
+0,009 0	+0,015 0	+0,033 0	-0,04 -0,073	-0,025 0

Figure 2 — Parts of extrusion device