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Karakterizacija enokomponentnih pen - 4. del: Mehanska trdnost

Characterization of One Component Foam - Part 4: Mechanical strength

Charakterisierung von Einkomponentenschäumen - Teil 4: Mechanische Festigkeit

Caractérisation des mousses monocomposants - Partie 4 : Résistance mécanique

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Characterisation of one component foam - Part 4: Mechanical strength

Caractérisation des mousses monocomposants - Partie 4 : Résistance mécanique

Charakterisierung von Einkomponentenschäumen - Teil 4: Mechanische Festigkeit

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (EN 17333-4:2020) has been prepared by Technical Committee CEN/TC 193 “Adhesives”, the secretariat of which is held by UNE.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2020, and conflicting national standards shall be withdrawn at the latest by September 2020.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document is one of the product European Standards within the framework series of EN 17333 on Characterization of one component foam, as follows:

— *Part 1: Foam yield characteristics*;

— *Part 2: Expansion characteristics*;

— *Part 3: Application*;

— *Part 4: Mechanical strength* (this document);

— *Part 5: Insulation*.

This document is one of a series of standards which specify test methods for determining the properties of one component foams (OCFs).

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This document specifies test methods for the evaluation of the mechanical properties for moisture curing, self-curing activatable or water drying foams dispensed from single pressurized foam containers.

This document does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this document to establish appropriate safety and health practices and determine the applicability of regulatory requirements prior to use.

The following test methods are described:

— Method 1 – Compression strength: This test method describes how to determine the compressive strength of a cured foam. It gives an indication of the foams resistance against area distributed pressure. The maximum endurable stress is determined.

— Method 2 – Movement capability: This test method describes how to determine the movement capability of cured foam. The result gives an indication of the degree of flexibility of the cured foam.

— Method 3 – Bonding strength: The method displays the measurement of the bonding power of a One Component (Foam) Adhesive, dispensed from a pressurized foam container, between two substrates with direct contact.

— Method 4 – Tensile strength: This test method describes how to determine the maximum stress a cured foam can withstand while being stretched before breaking. The result gives an indication of the elasticity of the cured foam.

— Method 5 – Shear strength: This method displays the behaviour of a foam system towards shear forces. It shows the strength and the bonding power of the foam as the sandwich element between wooden plates. The test is conducted according to EN 12090.

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.

EN 205:2016, *Adhesives - Wood adhesives for non-structural applications - Determination of tensile shear strength of lap joints*

EN 312, *Particleboards - Specifications*

EN 923, *Adhesives - Terms and definitions*

EN 15006, *Metal aerosol containers - Aluminium containers - Dimensions of the 25,4 mm aperture*

EN 14847, *Aerosol containers - Tinplate containers - Dimensions of the 25,4 mm aperture*

EN ISO 844, *Rigid cellular plastics - Determination of compression properties (ISO 844)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 923 and the following apply.

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/ui

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

3.1
one component foam
(OCF)
moisture curing or water drying foam as well as self-curing activatable foam dispensed from a single pressurised foam container

3.2
pressurised foam container
pressurised can according to EN 14847 and EN 15006

3.3
test container
pressurised can according to EN 14847 and EN 15006 used for testing purposes

3.4
straw foam
one component or two component foams for the extrusion with an adapter tube

3.5
gun foam
one component foams for the extrusion with a foam application gun

3.6
fully cured or dried foam
cross-linked foam which reaches its mechanical properties as claimed by the manufacturer

4 Test methods

4.1 Method 1 – Compression strength

4.1.1 Principle

The test piece is prepared by foaming between two particle boards. When foam is fully cured the test piece is compressed by at least 10 % by a tensile testing machine (e.g. 3 mm compression for the given foam thickness of 30 mm). The compressive strength is obtained at 10 % compression.

4.1.2 Equipment

For each test piece (in total six test pieces required):

4.1.2.1 Two P3 or P5 particle boards (compliant with EN 312) with dimensions of 50 mm × 90 mm × 10 mm (length × width × thickness).

4.1.2.2 2 spacers, not water absorbing, not adherent, (e.g. polyethylene (PE), polytetrafluoroethylene (PTFE), on which polyurethane (PU) does not adhere), dimensions 30 mm × 20 mm × 50 mm.

4.1.2.3 2 screw clamps.

4.1.2.4 Sharp and clean knife blade.

4.1.2.5 Tensile testing machine.

4.1.2.6 Conditioning chamber or lab facilities, capable of being controlled at (23 ± 2) °C and (50 ± 5) % relative humidity (RH).

4.1.3 Sampling

4.1.3.1 Conditioning

Bring the test container and the particle boards to the test temperature (23 ± 2) °C and (50 ± 5) % RH for at least 24 h.

4.1.3.2 Test pieces preparation

a) Attach the spacers between the particle boards and fix them with screw clamps. The cavity in the assembled joint shall measure 50 mm × 50 mm × 30 mm (see Figure 1).

b) Prepare 3 test pieces per test condition.

c) Self curing and water drying foams shall be tested in not moistured conditions. Moisture curing foams can be additionally pre-moistened. In the latter case, the clamped boards are immersed in water for 20 s, taken out and stored with the particle boards vertical and the spacers on the side for two minutes, until excess water has dripped off. The foaming shall have started within the next 30 s.

d) Shake the unused test container vigorously 20 times.

e) Discard the first (40 ± 10) g of foam.

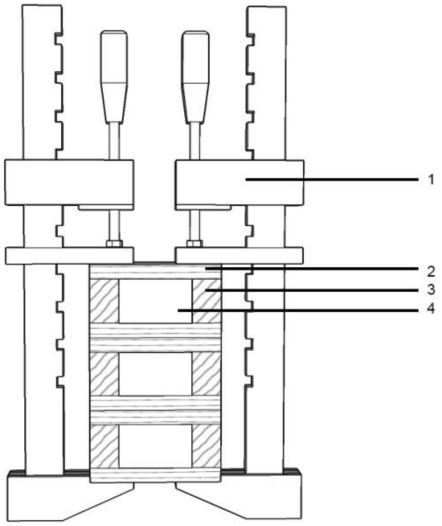
f) Fill the joint[1)] in horizontal direction to allow foam expand freely on both sides (see Figure 2).

g) Allow the foam to cure for 24 h at (23 ± 2) °C and (50 ± 5) % RH.

h) Cut the excess foam after 24 h (see Figure 3).

i) The sample is to be stored at (23 ± 2) °C and (50 ± 5) % RH for 6 more days.

1) Typically, filling volume of a gun foam is (80 ± 10) %, and for a straw foam (60 ± 10) %.



Key

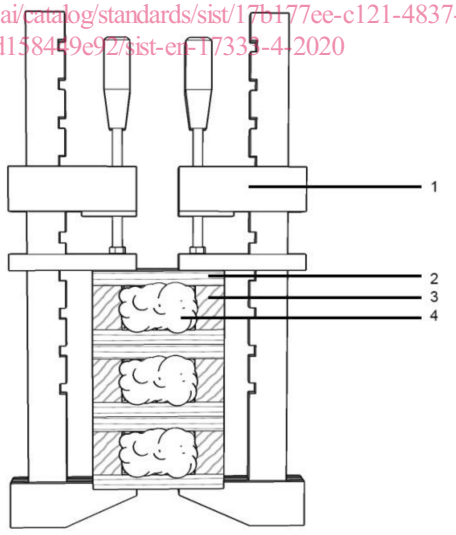
1 screw clamp

2 particle board 90 mm × 50 mm × 10 mm

3 spacer 30 mm × 20 mm × 50 mm

4 cavity 50 mm × 50 mm × 30 mm

Figure 1 — Test piece preparation



Key

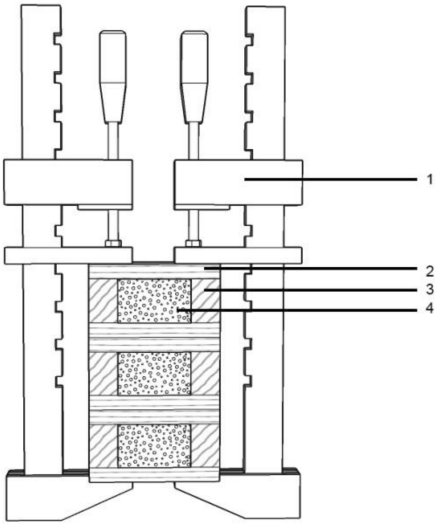
1 screw clamp

2 particle board 90 mm × 50 mm × 10 mm

3 spacer 30 mm × 20 mm × 50 mm

4 extruded PU-foam

Figure 2 — Application of PU-foam



Key

1 screw clamp

2 particle board 90 mm × 50 mm × 10 mm

3 spacer 30 mm × 20 mm × 50 mm

4 cut PU-foam

Figure 3 — Sample after cutting off the excessive foam

4.1.4 Test procedure

Remove screw clamps and spacers. Insert the test piece into the tensile testing machine like shown in Figure 4. Start the measurement within 5 min after removing the clamps and spacers.

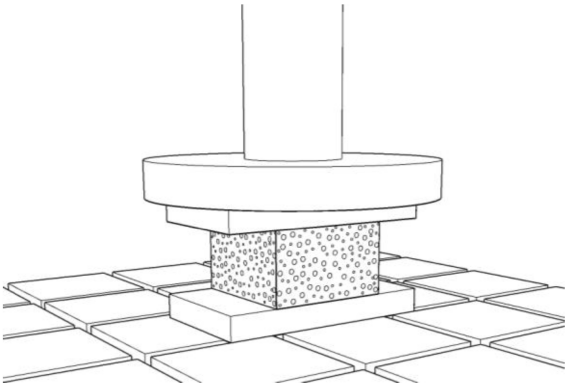


Figure 4 — Test piece in the tensile testing machine

Testing is performed according to EN ISO 844. The force is applied through a moving compressive plate perpendicular to the particle board. The cross head velocity of the tensile machine is 3 mm/min. The compression strength is taken as stress at 10 % compression, in relation to the foam thickness (i.e. strain).

The point where measurement of compression starts is when the force reaches 2 N (Do not zero at this point).

4.1.5 Expression of results

Take the mean value of the measurements, report whether the test piece was moistened or not. The compression force, usually obtained in Newton (N), is divided by the foam area in square centimetres to express the compressive strength in kilopascals.

Report the compression length in per cent (preferably 10 %, corresponds to 3 mm compression for the given foam thickness of 30 mm).

4.1.6 Test report

The test report shall include the following information:

a) reference to this document;

b) the name and address of the testing laboratory;

c) the number and date of the test report;

d) the name and signature of the person responsible or signatory of the report;

e) product identification:

   1) product name, manufacturer or supplier,

   2) batch number or identification code,

   3) origin of the sample(s),

   4) way of dispensing, e.g. dispensing gun and type or adapter tube,

   5) packaging: volume,

   6) expiry date and/or production date;

f) test procedure for test performed according to 4.1:

   1) date of test,

   2) performer,

   3) any deviation from procedure in 4.1;

g) results of test:

   1) test results (individual, mean values and chart of results),

   2) observations (if any).

4.2 Method 2 – Tensile strength

4.2.1 Principle

All test pieces are prepared by foaming between two plates. When foam is fully cured, these plates are sheared perpendicularly by a tensile testing machine until the sample fractures or breaks. The tensile strength is the maximum force withstood by the test piece.

4.2.2 Equipment

For each test piece (in total six test pieces are required):

4.2.2.1 Two P3 or P5 particle boards (compliant with EN 312) with dimensions of 50 mm × 200 mm × 10 mm (length × width × thickness).

4.2.2.2 Two P3 or P5 particle boards (compliant with EN 312) with dimensions of 80 mm × 200 mm × 10 mm (length × width × thickness).

4.2.2.3 2 spacers, not water absorbing, not adherent, (e.g. polyethylene (PE), polytetrafluoroethylene (PTFE), on which polyurethane (PU) does not adhere), dimensions: 50 mm × 20 mm × 20 mm.

4.2.2.4 2 screw clamps.

Other equipment:

4.2.2.5 PU adhesive.

4.2.2.6 Sharp and clean knife blade.

4.2.2.7 Tensile testing machine, with a capacity up to 2 kN fitted with suitable metallic pressure sensor plates to measure the force exerted by the foam during the test

4.2.2.8 2 test piece grips for fixing the test piece to the tensile testing machine (see Figure 5).