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Thermal insulation products for building applications — Determination of the resistance to impact of external thermal insulation composite systems (ETICS)

National foreword

This British Standard is the UK implementation of EN 13497:2018+A1:2021. It supersedes BS EN 13497:2018, which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to CEN text carry the number of the CEN amendment. For example, text altered by CEN amendment A1 is indicated by A1.

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EUROPEAN STANDARD

EN 13497:2018+A1

NORME EUROPÉENNE

EUROPÄISCHE NORM

January 2021

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Supersedes EN 13497:2018

English Version

Thermal insulation products for building applications -
 Determination of the resistance to impact of external
 thermal insulation composite systems (ETICS)

Produits isolants thermiques pour le bâtiment -
 Détermination de la résistance au choc des systèmes
 composites d'isolation thermique par l'extérieur
 (ETICS)

Wärmedämmstoffe für das Bauwesen - Bestimmung
 der Schlagfestigkeit von außenseitigen Wärmedämm-
 Verbundsystemen (WDVS)

This European Standard was approved by CEN on 23 April 2018 and includes Amendment 1 approved by CEN on 29 September 2020.

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European foreword

This document (EN 13497:2018+A1:2021) has been prepared by Technical Committee CEN/TC 88 “Thermal insulating materials and products”, the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by July 2021, and conflicting national standards shall be withdrawn at the latest by July 2021.

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 supersedes A1 EN 13497:2018 A1.

The following table includes the most significant technical changes between both editions.

2002 Version	2018 Version
Two impact energy levels 2 J and 10 J with two different balls possible. ETAG 004 only partly matched	Thirteen impact energy levels with five different balls possible. Matches ETAG 004 levels. No 2 J impact energy level anymore
Only size and weight of steel balls defined	Definition of steel ball material added
No definition of measuring device	Definition of Crack measuring gauge included
No definition of specimen support	Definition of specimen support included
Weak definition of optional tube	Precise definition of optional tube
Minimum dimensions of test specimen given	Minimum distances between impacts defined instead.
-	More precise description of conditioning of the test specimens
-	Second procedure for conditioning added
-	Figure for second procedure for conditioning added
-	Detailed description of test procedure
-	Detailed description of the examination and expression of results
-	Introduction of hard facts for evaluation, which is the measurement of crack widths.
-	Evaluation of cracks well defined
-	Amended test report
Alternative ISO 7892 test possible	No alternative test possible

This document includes Amendment 1, approved by CEN on 2020-09-29.

The start and finish of text introduced or altered by amendment is indicated in the text by tags A1 A1.

This European Standard has been drafted for applications in buildings, but can also be used in other areas where it is relevant.

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1 Scope

This European Standard specifies the equipment and procedure for determining the resistance to impact of design ETICS kits with renders.

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 1602, *Thermal insulating products for building applications — Determination of the apparent density*

EN 1607, *Thermal insulating products for building applications — Determination of tensile strength perpendicular to faces*

EN 16383, *Thermal insulation products for building applications — Determination of the hygrothermal behaviour of external thermal insulation composite systems with renders (ETICS)*

EN 17237, *Thermal insulation products for buildings — External thermal insulation composite systems with renders (ETICS) — Specification*¹

EN ISO 9229, *Thermal insulation — Vocabulary (ISO 9229)*

ISO 3290-1, *Rolling bearings — Balls — Part 1: Steel balls*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 9229 and EN 17237 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 impact resistance of a design ETICS kit is the hard body impact resistance, determined by means of a steel ball falling onto the surface of the kit. The energy level and corresponding dropping height is selected from Table 1. Any damages occurring are visibly assessed (e.g. the reinforcement has become visible from the external surface, the finishing coat or the rendering system has visibly delaminated or been perforated) and cracks widths are measured.

¹ To be published. Stage at the time of publication: prEN 17237:2018.

5 Test apparatus

5.1 General

For the test a steel ball is dropped from a specified height onto the surface of the test specimen (see Table 1). A second impact (rebound) by the ball shall be avoided.

5.2 Steel ball requirements

Balls made of cutlery grade steel, AISI/SE Type 440 C and grade G100 according to ISO 3290-1 with the weights and nominal diameters given in Table 1.

5.3 Crack measuring gauge

For measurement of the width of any cracks formed as a result of the impact of the steel ball onto the surface of the test specimen. The gauge shall be capable measuring from 0,1 mm and be graduated in steps of 0,05 mm.

5.4 Specimen support

The support itself shall be flat, not bend, deform or absorb impact energy during the test, e.g. concrete support, in order not to influence the test result. ^{A1} The test specimen shall be firmly held to prevent movement during the test. ^{A1}

NOTE 1 Larger specimen tends to show less movement than smaller specimen.

NOTE 2 The specimen might be fixed, clamped or glued to the support so that contact between them is maintained during the test.

5.5 Optional tube to control descent of steel ball

A vertical tube manufactured from a metal or rigid plastic can be used for this purpose with an inner diameter at least 2 mm larger than the steel ball diameter. The walls of the tube should preferably include regular perforated holes to prevent air within the tube becoming compressed due to the velocity of the ball during its descent and thereby acting as a "resistance cushion" to the impact of the ball with the specimen surface.

^{A1}

Table 1 — Impact energy levels and specified height from the specimen surface

Impact energy J	Steel ball nominal diameter mm	Steel ball weight (±1,5 %) kg	Specified height from the surface mm
3	50,0	0,51	610
10	63,5	1,04	990
15	63,5	1,04	1 480
20	63,5	1,04	1 970
30	80,0	2,07	1 480
40	80,0	2,07	1 970
60	100,0	4,05	1 520
80	100,0	4,05	2 020
100	100,0	4,05	2 520
125	125,0	7,91	1 620
150	125,0	7,91	1 940
175	125,0	7,91	2 260
200	125,0	7,91	2 580

A1

6 Test specimens

6.1 Preparation of a test specimen

The test specimen shall have the size/dimension to allow minimum 5 impacts taking into account the minimum distances according to 7.2. It consists of the thermal insulation product with the rendering system. It shall be prepared according to the system holders instructions.

6.2 Sealing and conditioning of test specimens

Sealing and conditioning of test specimen shall be according to procedure 1 or procedure 2 as follows:

Procedure 1:

The reverse side and the edges of the test specimen shall be sealed, if exposure to water occurs. Condition the test specimens after preparation as follows:

- (23 ± 2) °C and (50 ± 5) % r. H. for at least 28 days;

A1

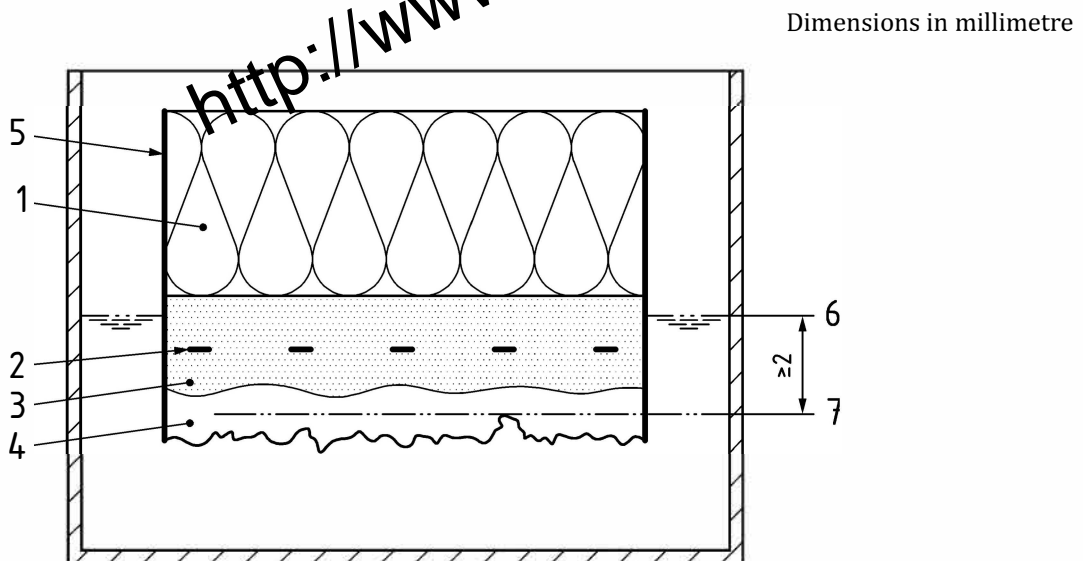
- Conditioning according to EN 16383 test cycles, either
 - heating and wetting (hw), or
 - heating and wetting plus heating and cooling (hwc), or
 - heating and wetting plus heating and cooling plus wetting, freezing and thawing (hwcft); A1

- Drying for at least 7 days at $(23 \pm 2)^\circ\text{C}$ and $(50 \pm 5)\%$ r. H.

Procedure 2:

The edges of the test specimens shall be sealed. Condition the test specimens after preparation as follows:

- $(23 \pm 2)^\circ\text{C}$ and $(50 \pm 5)\%$ r. H. for at least 28 days;
- Immersion in tap water for at least 7 days at $(20 \pm 5)^\circ\text{C}$. The depth of submersion over the entire surface shall be at least 2 mm that is, the distance between levels 6 and 7 in Figure 1;



Key

- 1 insulation product
- 2 reinforcement
- 3 base coat
- 4 finishing layer
- 5 sealing of the test specimen
- 6 surface of the water
- 7 level at which the minimum point of external surface of the finishing layer occurs

Figure 1 — Minimum depth of submersion of the test specimen for water absorption

- Drying for at least 7 days at $(23 \pm 2)^\circ\text{C}$ and $(50 \pm 5)\%$ r. H.

7 Procedure

7.1 Test conditions

The test shall be carried out at $(20 \pm 5)^\circ\text{C}$.

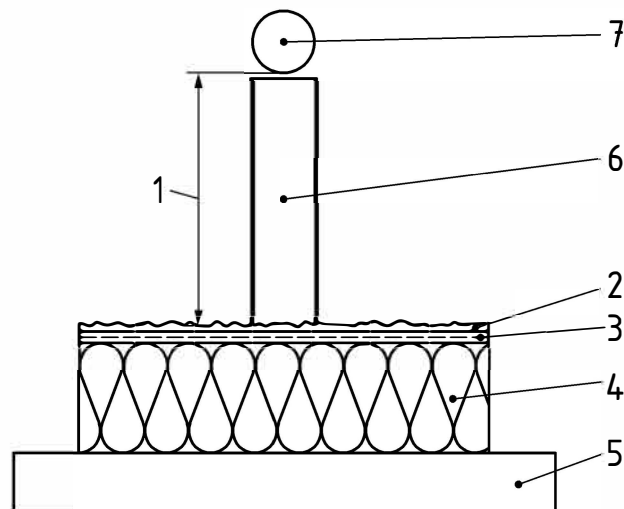
7.2 Test procedure

The test specimen shall be placed on a support according to 5.4.

The steel ball is dropped from the specified height onto the surface of the test specimen, as determined in Table 1, see Figure 2. For each energy level chosen, five separate impacts are performed at different positions of the test specimen. The minimum distance between any impact position and the specimen edges shall be at least 100 mm. The minimum distance between any impact position and the insulation board edges shall be at least 100 mm, i.e. no impact on a joint between insulation boards if more than one board is used to prepare the test specimen. The centre to centre distance between any two impacts shall be at least 100 mm.

In case of possible rebound, the steel ball shall be caught or diverted away to avoid a second impact.

If a perforated tube is used to control descent of the steel ball, it can be placed directly onto the test specimen surface. Alternatively, an unperforated tube can be used but this should be lifted above the specimen surface to allow the compressed air to be dissipated immediately before impact occurs. The verticality of the tube shall be checked before each individual test. The tube may be used for diverting the steel ball before a second impact.



Key

- 1 specified height of the steel ball from the specimen surface (see Table 1)
- 2 finishing layer
- 3 reinforced base coat
- 4 thermal insulation product
- 5 support
- 6 vertical tube (optional)
- 7 steel ball

Figure 2 — Example of a test apparatus and the test specimen for the impact resistance

8 Examination and expression of results

Test results will be visibly observed and described. The observations are made from the external surface and from the rear face of the rendering system. The insulation product shall be removed carefully.

Observations shall be taken at each impact zone. If one or more of the following defects are observed, no further evaluation is necessary:

- delamination between the finishing layer and the base coat;
- delamination between the base coat and the insulation product;
- delamination within the base coat;
- visibility of the reinforcement;
- perforation of the finishing layer and/or base coat.
- cracks in the impacted surface wider than 0,5 mm.

If none of these defects are observed, state it in the test report and examine the cracks on each impact zone. The impact zone shall be examined from several angles with a bright white light to measure the maximum width of the widest crack:

- cracks in the external surface of the render system. The maximum width of the widest crack is measured with the gauge specified in 5.3; record in increments of 0,05 mm or state no cracks observed
- cracks in the rear face of the render system. The maximum width of the widest crack is measured with the gauge specified in 5.3; record in increments of 0,05 mm or state no cracks observed;

NOTE Separation of the layers can be done mechanically with a suitable knife/hot wire. Alternatively, some thermal insulation products can be dissolved using solvents. If this process is used, it is advised to follow the safety procedures associated with the use and disposal of the particular solvent.

- spalling of grains at the point of impact;
- Report the maximum depth for each impact zone to the nearest mm or state no deformation observed.

9 Accuracy of measurement

NOTE It has not been possible to include a statement on the accuracy of measurement in this edition of the standard, but it is intended to include such a statement when the standard is next revised.

10 Test report

The test report shall include the following information:

- a) the name and address of the laboratory;
- b) the signature of the person in charge of the test;
- c) the number and date of the report;
- d) a reference to this European Standard;
- e) product identification given by the system holder;
 - 1) for the base coat, the finishing coat and, if used, the key coat and/or the decorative coat:

- i) type, product name and manufacturer;
 - ii) DOP/CE-label, if available;
 - iii) packaging when the product arrived at the laboratory;
 - iv) the form of the product (paste or powder);
 - v) preparation of the product (with adding cement, water or other components, time and procedure for mixing the components before application etc.);
 - vi) test results (indirect testing) according to the test plan for the product prescribed by the EN 17237 (Annex "Attestation of Performance and Assessment and verification of constancy of performance"). The particle size grading is not mandatory;
- 2) reinforcement:
- i) type, product name and manufacturer;
 - ii) DOP/CE-label, if available;
 - iii) mass per unit area of the reinforcement in gram per square metre;
 - iv) thread count in warp and weft per 100 mm or mesh dimensions of the reinforcement;
- 3) thermal insulating product:
- i) type, product name and manufacturer;
 - ii) DOP/CE-label, if available;
 - iii) measured apparent density according to EN 1602;
 - iv) measured tensile strength perpendicular to faces in dry conditions according to EN 1607;
- f) test procedure, sampling, conditioning and test conditions:
- 1) pre-test history and sampling, e.g. who sampled and where;
 - 2) dimension of the test specimen;
 - 3) conditioning of test specimen;
 - 4) fixing of test specimen, if any;
 - 5) deviation from Clauses 6 and 8;
 - 6) impact energy used for the test, according to Table 1;
 - 7) date of test;
 - 8) general information regarding to the test;
 - 9) events which may have affected the results;

10) number and type of test specimens which have been discarded and why;

Information about the apparatus and identity of the technician should be kept available in the laboratory, but it need not be recorded in the report.

g) results:

- 1) impact energy chosen;
- 2) observations according to Clause 8;
- 3) photo of every impact zone including a crack width measuring gauge or another sufficient scale, front and back, to an adequate magnification for clarity.
- 4) thickness of the thermal insulation product, used for the test specimen and measured according to the relevant thermal insulation product standard;
- 5) thickness of the reinforced base coat, rounded to the nearest 0,5 mm;
- 6) thickness of the finishing layer, rounded to the nearest 0,5 mm;
- 7) thickness of the rendering system, rounded to the nearest 0,5 mm.

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