EUROPEAN ASSESSMENT DOCUMENT

EAD 040065-00-1201

July 2016

THERMAL INSULATION AND/OR SOUND ABSORBING BOARDS BASED ON EXPANDED POLYSTYRENE AND CEMENT

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This European Assessment Document (EAD) has been developed taking into account up-to-date technical and scientific knowledge at the time of issue and is published in accordance with the relevant provisions of Regulation (EU) No 305/2011 as a basis for the preparation and issuing of European Technical Assessments (ETA).

Contents

1 SCOPE OF THE EAD

1.1 Description of the construction product

This EAD is established for the assessment of product: a thermal insulation and/or a sound absorbing board based on expanded polystyrene and cement.

The thermal insulation and/or sound absorbing boards based on expanded polystyrene and cement ("insulation boards") are factory made products of homogenous mixture of the granulates of expanded polystyrene (EPS) and Portland cement (according to EN 197-1) and do not contain any other natural or artificial aggregate. The granulates of expanded polystyrene (EPS) are made only from new polystyrene granulates. If recycled material is used, only material originally manufactured according to EN 13163 is used and its content (in percentage % of mass of total EPS content) shall be defined by the manufacturer.

The product is not covered by a harmonised European standard (hEN).

Concerning product packaging, transport, storage, maintenance, replacement and repair it is the responsibility of the manufacturer to undertake the appropriate measures and to advise his clients on the transport, storage, maintenance, replacement and repair of the product as he considers necessary.

It is assumed that the product will be installed according to the manufacturer's instructions or (in absence of such instructions) according to the usual practice of the building professionals.

Relevant manufacturer's stipulations having influence on the performance of the product covered by this European Assessment Document shall be considered for the determination of the performance and detailed in the ETA.

1.2 Information on the intended use(s) of the construction product

1.2.1 Intended use(s)

The insulation board is used for thermal protection and/or sound absorbing of building constructions as follows:

– external thermal protection of walls (e.g. ETICS)

– thermal insulation layer of floors, ceilings and roofs

– sound absorbing.

The insulation board is used in structures only where it is protected from wetting, weathering and moisture.

1.2.2 Working life/Durability

The assessment methods included or referred to in this EAD have been written based on the manufacturer's request to take into account a working life of the thermal insulation and/or a sound absorbing insulation boards of based on expanded polystyrene and cement for the intended use of 50 years when installed in the works. These provisions are based upon the current state of the art and the available knowledge and experience.

When assessing the product the intended use as foreseen by the manufacturer shall be taken into account. The real working life may be, in normal use conditions, considerably longer without major degradation affecting the basic requirements for works[1].

[1] The real working life of a product incorporated in a specific works depends on the environmental conditions to which that works is subject, as well as on the particular conditions of the design, execution, use and maintenance of that works.

The indications given as to the working life of the construction product cannot be interpreted as a guarantee neither given by the product manufacturer or his representative nor by EOTA when drafting this EAD nor by the Technical Assessment Body issuing an ETA based on this EAD, but are regarded only as a means for expressing the expected economically reasonable working life of the product.

2 ESSENTIAL CHARACTERISTICS AND RELEVANT ASSESSMENT METHODS AND CRITERIA

2.1 Essential characteristics of the product

Tables 1 to 3 show how the performance of insulation boards is assessed in relation to the essential characteristics.

Table 1 Essential characteristics of the product and methods and criteria for assessing the performance of the product in relation to those essential characteristics - related to application as external thermal protection of walls (see point 1.2.1)

No	Essential characteristic	Assessment method	Type of expression of product performance *(level, class, description)*
Basic Works Requirement 2: Safety in case of fire			
1	Reaction to fire	see clause 2.2.1	Reaction to fire class according to Commission Delegated Regulation (EU) 2016/364)
Basic Works Requirement 3: Hygiene, health and the environment			
2	Water vapour permeability	see clause 2.2.2	Level *μ [-]*
3	Water absorption - short-term water absorption	see clause 2.2.3	Level W_p *[kg/m²]*
Basic Works Requirement 4: Safety and accessibility in use			
4	Tensile strength perpendicular to the faces	see clause 2.2.4	Level σ_{mt} *[kPa]*
5	Shear strength and shear modulus of elasticity	see clause 2.2.5	Level *T [kPa]* *G [kPa]*

Therefore, it cannot be excluded that in certain cases the real working life of the product may also be shorter than referred to above.

No	Essential characteristic	Assessment method	Type of expression of product performance *(level, class, description)*
6	Bending strength	see clause 2.2.6	Level σ_b *[kPa]*
7	Compressive stress at 10 % strain / Compressive strength	see clause 2.2.10	Level σ_{10} *[kPa]* or σ_m *[kPa]*
8	Dimensions (length and width, thickness, squareness, flatness)	see clause 2.2.8	Level *l [mm], b [mm], d [mm],* $S_{b/d}$ *[mm/m],* S_{max} *[mm],*
9	Dimensional stability at 23 °C/ 50 % RH; under specified conditions	see clause 2.2.9.1 see clause 2.2.9.2	Level $\Delta\varepsilon_l$ *[%],* $\Delta\varepsilon_b$ *[%];* $\Delta\varepsilon_l$ *[%],* $\Delta\varepsilon_b$ *[%],* $\Delta\varepsilon_d$ *[%]*
Basic Works Requirement 5: Protection against noise			
10	Mass per square meter	see clause 2.2.12	Level ρ *[kg/m²]*
11	Sound absorption - practical sound absorption coefficient - weighted sound absorption coefficient	see clause 2.2.15	Level α_{pi} *[-] for all standardized frequencies* α_w *[-]*
Basic Works Requirement 6: Energy economy and heat retention			
12	Thermal conductivity	see clause 2.2.13	Level λ_D *[W/(m.K)],* $f_{u,1}$ *[kg/kg]* $u_{23,50}$ *[kg/(kg]* and $u_{23,80}$ *[kg/(kg],* $f_{u,2}$ *[kg/kg],* F_{m1} *[-]* and F_{m2} *[-]*
13	Apparent density	see clause 2.2.9	Level γ *[kg/m³]*
14	Moisture sorption	see clause 2.2.16	Level *u [kg/kg]*

Table 2 Essential characteristics of the product and methods and criteria for assessing the performance of the product in relation to those essential characteristics - related to application as thermal insulation layer of floors, ceilings and roofs (see point 1.2.1)

No	Essential characteristic	Assessment method	Type of expression of product performance *(level, class, description)*
Basic Works Requirement 2: Safety in case of fire			
1	Reaction to fire	see clause 2.2.1	Reaction to fire class according to Commission Delegated Regulation (EU) 2016/364)
Basic Works Requirement 3: Hygiene, health and the environment			
2	Water vapour permeability	see clause 2.2.2	Level *μ [-]*
3	Water absorption - short-term water absorption - long-term water absorption (for application in floors only)	see clause 2.2.3	Level W_p *[kg/m²]* W_{lp} *[kg/m²]*
Basic Works Requirement 4: Safety and accessibility in use			
4	Tensile strength perpendicular to the faces	see clause 2.2.4	Level σ_{mt} *[kPa]*
5	Shear strength and shear modulus of elasticity	see clause 2.2.5	Level *T [kPa]* *G [kPa]*
6	Bending strength	see clause 2.2.6	Level σ_b *[kPa]*
7	Compressive stress at 10% strain and/or compressive strength (for applications in floors only)	see clause 2.2.10	Level σ_{10} *[kPa]* or σ_m *[kPa]*
8	Dimensions - length, width, thickness - squareness, flatness	see clause 2.2.8	Level *l [mm], b [mm], d [mm],* $S_{b/d}$ *[mm/m],* S_{max} *[mm],*
9	Dimensional stability at 23 °C/ 50 % RH; under specified conditions	see clause 2.2.9.1 see clause 2.2.9.2	Level $\Delta\varepsilon_l$ *[%],* $\Delta\varepsilon_b$ *[%];* $\Delta\varepsilon_l$ *[%],* $\Delta\varepsilon_b$ *[%],* $\Delta\varepsilon_d$ *[%]*

No	Essential characteristic	Assessment method	Type of expression of product performance *(level, class, description)*
10	Deformation under specified compressive load and temperature conditions (for applications in floors only)	see clause 2.2.11	Level ε, ε_2 *[%]*
Basic Works Requirement 6: Energy economy and heat retention			
11	Thermal conductivity	see clause 2.2.13	Level λ_D *[W/(m.K)]*, $f_{u,1}$ *[kg/kg]* $u_{23,50}$ *[kg/(kg]* and $u_{23,80}$ *[kg/(kg]*, $f_{u,2}$ *[kg/kg]*, F_{m1} *[-]* and F_{m2} *[-]*
12	Apparent density	see clause 2.2.7	Level *ρ [kg/m3]*
13	Moisture sorption	see clause 2.2.16	Level *u [kg/kg]*

Table 3 Essential characteristics of the product and methods and criteria for assessing the performance of the product in relation to those essential characteristics - related to application as sound absorbing board of building constructions (see point 1.2.1)

No	Essential characteristic	Assessment method	Type of expression of product performance *(level, class, description)*
Basic Works Requirement 2: Safety in case of fire			
1	Reaction to fire	see clause 2.2.1	Reaction to fire class according to Commission Delegated Regulation (EU) 2016/364)
Basic Works Requirement 3: Hygiene, health and the environment			
2	Water vapour permeability	see clause 2.2.2	Level *μ [-]*
Basic Works Requirement 4: Safety and accessibility in use			
3	Tensile strength perpendicular to the faces	see clause 2.2.4	Level σ_{mt} *[kPa]*
4	Shear strength and shear modulus of elasticity	see clause 2.2.5	Level *T [kPa]* *G [kPa]*
5	Bending strength	see clause 2.2.6	Level σ_b *[kPa]*
6	Compressive stress at 10 % strain and/or compressive strength (for applications in floors only)	see clause 2.2.10	Level σ_{10} *[kPa]* or σ_m *[kPa]*
7	Dimensions - length, width, thickness - squareness, flatness	see clause 2.2.8	Level *l [mm], b [mm], d [mm],* $S_{b/d}$ *[mm/m],* S_{max} *[mm],*
8	Dimensional stability at 23 °C/ 50 % RH; under specified conditions	see clause 2.2.9.1 see clause 2.2.9.2	Level $\Delta\varepsilon_l$ *[%],* $\Delta\varepsilon_b$ *[%];* $\Delta\varepsilon_l$ *[%],* $\Delta\varepsilon_b$ *[%],* $\Delta\varepsilon_d$ *[%]*
9	Point load (for applications in floors only)	see clause 2.2.14	Level F_p *[N]*

No	Essential characteristic	Assessment method	Type of expression of product performance *(level, class, description)*
10	Compressive stress at 10% strain and/or compressive strength (for applications in floors only)	see clause 2.2.10	Level σ_{10} *[kPa]* or σ_m *[kPa]*
11	Deformation under specified compressive load and temperature conditions (for applications in floors only)	see clause 2.2.11	Level ε, ε_2 *[%]*
Basic Works Requirement 5: Protection against noise			
12	Mass per square meter	see clause 2.2.12	Level ρ *[kg/m²]*
13	Sound absorption - practical sound absorption coefficient - weighted sound absorption coefficient	see clause 2.2.15	Level α_{pi} *[-] for all standardized frequencies* α_w *[-]*
14	Dynamic stiffness (for applications in floors only)	see clause 2.2.17	Level s' *[MN*m³]*

2.2 Methods and criteria for assessing the performance of the product in relation to essential characteristics of the product

2.2.1 Reaction to fire

The insulation boards shall be tested, using the test method(s) according to EN 13501-1 and relevant for the corresponding reaction to fire class. The product shall be classified according to Commission Delegated Regulation (EU) 2016/364.

Annex A for choosing the samples and executing the relevant reaction to fire tests shall be applied.

The Euroclass of reaction to fire of the product is stated in the ETA.

2.2.2 Water vapour permeability

Water vapour permeability shall be tested in accordance with EN ISO 12572, climatic condition A and water vapour diffusion factor μ *[-]* according to EN ISO 12572 Art. 8.6 shall be determined.

Water vapour permeability shall be tested in accordance with EN ISO 12572 in climatic condition A according to EN ISO 12572, Tab. 1 and vapour diffusion factor μ *[-]* according to EN ISO 12572, Art. 8.6 for each test shall be determined.

The two-sided confidence interval of water vapour diffusion factor μ_c *[-]* at the confidence level 95 % according to ISO 2602, Cl. 6.2 is to be calculated.

The two-sided confidence interval of mean of water vapour diffusion factor μ_c *[-]* is stated in the ETA.

Note: The historical testing according to EN 12086, climatic condition A, can be taken into account, because it corresponds to EN 12572, climatic condition A.

2.2.3 Water absorption

Short-term water absorption by partial immersion for all applications and long term water absorption by immersion for application in floors only shall be determined.

2.2.3.1 Short-term water absorption

Short-term water absorption by partial immersion shall be determined according to EN 1609, Method A. The result is stated as the upper level of 95 % quartile on confidence level 75 % for V_x as unknown according to EN 1990, Annex D, Cl. 7.2.

Short-term water absorption is stated in the ETA.

2.2.3.2 Long-term water absorption

Long term water absorption by immersion shall be determined according to EN 12087, Method 1A. The result is stated as the upper level of 95 % quartile on confidence level 75 % for V_x as unknown according to EN 1990, Annex D, Cl. 7.2.

Long-term water absorption is stated in the ETA.

2.2.4 Tensile strength perpendicular to faces

Tensile strength perpendicular to faces shall be determined according to EN 1607. Dimensions of the samples are at least 100 mm x 100 mm x thickness. 5 specimens are used for testing.

Characteristic value of tensile strength perpendicular to faces $\sigma_{mt,\ c}$ *[kPa]* as the bottom level of 95 % quartile on confidence level 75 % for V_x as unknown according to EN 1990, Annex D, Cl. 7.2 is stated in the ETA.

2.2.5 Shear strength and shear modulus of elasticity

Shear strength and shear modulus of elasticity shall be determined according to EN 12090.

Characteristic value of shear strength T_c *[kPa]* and characteristic value of shear modulus of elasticity *G [kPa]* as the bottom level of 95 % quartile on confidence level 75 % for V_x as unknown according to EN 1990, Annex D, Cl. 7.2 is given in the ETA.

2.2.6 Bending strength

Bending strength shall be determined according to EN 12089, Method B.

Characteristic value of bending strength $\sigma_{b,\ c}$ *[kPa]* as the bottom level of 95 % quartile on confidence level 75 % for V_x as unknown according to EN 1990, Annex D, Cl. 7.2 is stated in the ETA.

2.2.7 Apparent density

The apparent density shall be determined according to EN 1602.

The two-sided confidence interval of mean value of apparent density at the confidence level 95 % according to ISO 2602, Cl. 6.2 shall be calculated.

The two-sided confidence interval of mean value of apparent density ρ *[kg/m^3]* is given in the ETA.

2.2.8 Dimensions

2.2.8.1 Dimensions and tolerances

The length and width of the insulation board shall be determined in accordance with EN 822. Thickness shall be determined according to EN 823, using a load equal to (250±5) Pa. Number of test specimens shall be according to EN 13163, Table B.1.

The median (see ISO 3534-1, Cl. 1.13) of measurements on all test specimens shall be evaluated for each dimension separately.

The median, minimum and maximum of measured values of the length *l [mm],* width *b [mm] and* thickness *d [mm]* are given in the ETA for each dimension separately.

EN 13163, Cl. 4.2.2 (Tab. 1 for length and width) and Cl. 4.2.3 (Tab. 1 for thickness) shall be used for determination of declared class of tolerances.

2.2.8.2 Squareness

The squareness *S* shall be determined according to EN 824. Number of test specimens shall be according to EN 13163, Table B.1.

The maximum measured deviation from the squareness $S_{b/d}$ *[mm/m]* in the direction of length and width is stated in the ETA.

EN 13163, Cl. 4.2.4 and Tab. 1 shall be used for determination of declared class of deviation from the squareness.

2.2.8.3 Flatness

The flatness *S* shall be determined according to EN 825. Number of test specimens shall be according to EN 13163, Table B.1.

The maximum measured deviation from the flatness S_{max} *[mm]* is stated in the ETA.

EN 13163, Cl. 4.2.5 and Tab. 1 shall be used for determination of declared class of deviation from the flatness.

2.2.9 Dimensional stability

2.2.9.1 Dimensional stability at 23 °C / 50 % RH

The test shall be performed in accordance with EN 1603, Method B1.

The relative changes in length $\Delta\varepsilon_l$ *[%] and* width $\Delta\varepsilon_b$ *[%]* for dimensional stability at 23 °C / 50 % RH are stated in the ETA.

The relative changes in length $\Delta\varepsilon_l$ *[%]* and width $\Delta\varepsilon_b$ *[%]* shall meet requirements of EN 13163, Cl. 4.3.2 and Tab. 2 for the specified class.

2.2.9.2 Dimensional stability under specified conditions

The test shall be performed in accordance with EN 1604 for one or more test conditions specified in EN 13163, Cl. 4.3.2 and Tab. 2, applied for by manufacturer.

The relative changes in length $\Delta\varepsilon_l$ *[%]*, width $\Delta\varepsilon_b$ *[%]* and thickness $\Delta\varepsilon_d$ *[%]* for dimensional stability at other specified conditions are stated in the ETA.

The relative changes in length $\Delta\varepsilon_l$ *[%]*, width $\Delta\varepsilon_b$ *[%]* and thickness $\Delta\varepsilon_d$ *[%]* at specified conditions shall meet requirements of EN 13163, Cl. 4.3.2 and Tab. 2 for the specified class.

2.2.10 Compressive stress at 10 % strain and/or compressive strength

Compressive stress at 10 % strain and/or compressive strength shall be determined according to EN 826 with at least 5 samples of 100 x 100 mm.

Characteristic value of compressive stress at 10% strain σ_{10} *[kPa]* and/or compressive strength σ_m *[kPa]* as the bottom level of 95 % quartile on confidence level 75 % for V_x as unknown according to EN 1990, Annex D, Cl. 7.2 are stated in the ETA.

2.2.11 Deformation under specified compressive load and temperature conditions

Deformation under specified compressive load and temperature conditions shall be determined according to EN 1605 for test conditions No. 1 with at least 3 samples of 100 x 100 mm.

Deformation under specified compressive load and temperature conditions according to EN 13163, Table 5 including ε, ε_2 *[%]* is stated in the ETA.

For each set of conditions, the total of deformation under specified load and temperature conditions according to EN 13163, Cl. 4.3.7 shall not exceed the values given in EN 13163, Table 5 for the specified level.

2.2.12 Mass per square meter

Mass per square meter shall be determined according to EN 1602, Cl. 7.2, for each declared thickness of product individually. Calculation shall be performed according to relation*:*

$$\rho_c = \frac{m}{A}$$

where

ρ_c	mass per square meter *[kg/m²]*
m	mass of the tested specimen *[kg]*
A	*a*rea calculated from length and width implicated for volume calculation of the tested specimen in 2.2.8 *[m²].*

The two-sided confidence interval of mean value of mass per square meter at the confidence level 95 % according to ISO 2602, Cl. 6.2 shall be calculated.

The two-sided confidence interval of mean value of mass per square meter ρ *[kg/m²]* is given in the ETA.

2.2.13 Thermal conductivity

Determination of declared thermal conductivity and the mass-related moisture conversion coefficient to high moisture content shall be performed according to Annex B.

2.2.13.1 Lambda fractile value at 10 °C, at dry conditions

The determination of the lambda fractile value at 10 °C, at dry conditions ($\lambda_{10,dry,90/90}$), representing at least 90 % of the production with a confidence limit of 90 % shall be carried out in accordance with Annex B, clause 1.
At least 4 measurements shall be performed at a notified testing laboratory.

2.2.13.2 Mass-related moisture conversion coefficient ($f_{u,1}$)

The mass-related moisture conversion coefficient ($f_{u,1}$) for the conversion of $\lambda_{10,dry}$ to $\lambda_{23,50}$ shall be determined according to Annex B, clause 2 and stated in the ETA.

2.2.13.3 Lambda declared at 23 °C and 50 % relative humidity $\lambda_{D(23,50)}$

The calculation of the lambda declared at 23 °C and 50 % relative humidity shall be carried out in accordance with Annex B, clause 3.

The calculated lambda declared at 23 °C and 50 % relative humidity $\lambda_{D(23,50)}$, representing at least 90 % of the production with a confidence level of 90 %, shall be stated in the ETA.

2.2.13.4 Mass-related moisture conversion coefficient to high moisture content ($f_{u,2}$)

The determination of the mass-related moisture conversion coefficient to high moisture content ($f_{u,2}$) shall be carried out in accordance with Annex B, clause 4.

The mass-related moisture conversion coefficient to high moisture content ($f_{u,2}$), and the moisture content mass by mass (kg/kg) $u_{23,50}$ at 23 °C and 50 % relative humidity and $u_{23,80}$ 23 °C and 80 % relative humidity is to be given in the ETA.

2.2.13.5 Moisture conversion factor (dry-23/50 and 23/50-23/80)

The moisture conversion factor F_{m1} for the conversion of $\lambda_{10,dry}$ to $\lambda_{23,50}$ and F_{m2} for the conversion of $\lambda_{23/50}$ to $\lambda_{23,80}$ shall be determined in accordance with EN ISO 10456:2010, equation (4).

The moisture conversion factors F_{m1} *[-]* and F_{m2} *[-]* are stated in the ETA. It is also possible to give a summarized / accumulated moisture conversion factor F_m (dry-23/80) in the ETA.

2.2.14 Point load

Point load at 2 mm deformation shall be determined according to EN 12430. At least 3 test specimens shall be used for the testing.

Characteristic value of point load F_p *[N]* as the bottom level of 95 % quartile on confidence level 75 % for V_x as unknown according to EN 1990, Annex D, Cl. 7.2 in levels with steps of 50 N is stated in the ETA.

2.2.15 Sound absorption

The test of the sound absorption performances shall be performed according to EN ISO 354.

Determination of the sound absorption characteristics α_{pi} and α_w shall be performed according to EN ISO 11654. Outcome shall be expressed as a table or a graph.

The values of practical sound absorption coefficient α_p *[-]* as a table or a graph and weighted sound absorption coefficient α_w *[-]* as a single number value are stated in the ETA.

As stated in EN 13168, Cl. 4.3.11 no test result of α_p *[-]* and α_w *[-]* shall be lower than the specified level.

2.2.16 Moisture sorption

The moisture sorption shall be determined according to EN ISO 12571, Cl. 5.2 and Cl.7.3 for temperature (23 ± 0.5 ºC) for minimally 4 specified levels of humidity between 30 % and 95 % RH..

The moisture sorption *u [kg/kg]* is stated in the ETA by mean value of sorption at 23 °C and 50 % RH and at 23 °C and 80 % RH.

2.2.17 Dynamic stiffness

The determination of the dynamic stiffness shall be determined according to EN 29052-1 on three test specimens at least.

The dynamic stiffness as the level SD_i according to EN 13163, Tab. 6 is stated in the ETA.

No test result shall exceed the value SD_i given in EN 13163, Tab. 6 for the specified level.

3 ASSESSMENT AND VERIFICATION OF CONSTANCY OF PERFORMANCE

3.1 System(s) of assessment and verification of constancy of performance to be applied

For the products covered by this EAD the applicable European legal act is: 1999/91/EC

The system(s) is (are): 3

In addition, with regard to reaction to fire for products covered by this EAD the applicable European legal act is: 1999/91/EC amended by 2001/596/EC

The system(s) is (are): 1, 3, 4

System 1: in case of reaction to fire class A1, A2, B, C of the product for which a clearly identifiable stage in the production process results in an improvement of the reaction to fire classification (e.g. an addition of fire retardants or a limiting of organic material).

System 3: in case of reaction to fire class A1, A2, B, C, D, E that are not covered in system 1

System 4: in case of reaction to fire class A1 to E - products that do not require to be tested for reaction to fire (e.g. Products/materials of Classes A1 according to Commission Decision 96/603/EC), reaction to fire class F.

3.2 Tasks of the manufacturer

The cornerstones of the actions to be undertaken by the manufacturer of the product in the procedure of assessment and verification of constancy of performance are laid down in Table 4.

Table 4 is an example only; the control plan depends on the individual manufacturing process and has to be established between notified body and manufacturer. In case of discontinuous production these minimum frequencies should be adapted to an equivalent frequency.

Table 4 Control plan for the manufacturer; cornerstones

No	Subject/type of control *(product, raw/constituent material, component - indicating characteristic concerned)*	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Factory production control (FPC) [including testing of samples taken at the factory in accordance with a prescribed test plan]					
1	Characteristics in accordance with the provisions of EN 13163 (Annex B)	EN 13163	control plan	EN 13163	See EN 13163
2	Density	EN 1602	control plan	EN 1602	Daily
3	Short-term water absorption by partial immersion	EN 1609	control plan	EN 1609	Once a year
4	Shear strength and shear modulus of elasticity	EN 12090	control plan	EN 12090	Once per three month

3.3 Tasks of the notified body

The cornerstones of the actions to be undertaken by the notified body in the procedure of assessment and verification of constancy of performance for insulation boards are laid down in Table 5.

The involvement of the notified body is required only under the conditions defined in 1999/91/EC amended by 2001/596/EC - in case of reaction to fire class A1, A2, B, C of the product for which a clearly identifiable stage in the production process results in an improvement of the reaction to fire classification (e.g. an addition of fire retardants or a limiting of organic material).

Table 5 Control plan for the notified body; cornerstones

No	Subject/type of control *(product, raw/constituent material, component - indicating characteristic concerned)*	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Initial inspection of the manufacturing plant and of factory production control *(for system 1 only – only for reaction to fire)*					
1	The notified body shall verify the ability of the manufacturer for a continuous and orderly manufacturing of the product. In particular the following items shall be appropriately considered in connection with the reaction to fire – personnel and equipment – the suitability of the factory production control established by the manufacturer – full implementation of the prescribed control plan				1/year
Continuous surveillance, assessment and evaluation of factory production control *(for system 1 only - only for reaction to fire)*					
2	The notified body shall verify in connection with the reaction to fire – the manufacturing process – the system of factory production control – the implementation of the prescribed test plan are maintained.				1/year

4 REFERENCE DOCUMENTS

As far as no edition date is given in the list of standards thereafter, the standard in its current version at the time of issuing the European Technical Assessment, is of relevance.

EN 196-10 Methods of testing cement - Part 10: Determination of the water-soluble chromium (VI) content of cement

EN 197-1 Cement - Part 1: Composition, specifications and conformity criteria for common cements

EN 822 Thermal insulating products for building applications - Determination of length and width

EN 823 Thermal insulating products for building applications - Determination of thickness

EN 824 Thermal insulating products for building applications - Determination of squareness

EN 825 Thermal insulating products for building applications - Determination of flatness

EN 826 Thermal insulating products for building applications - Determination of compression behaviour

EN 1602 Thermal insulating products for building applications - Determination of the apparent density

EN 1603 Thermal insulating products for building applications - Determination of dimensional stability under constant normal laboratory conditions (23 °C/ 50 % relative humidity)

EN 1604 Thermal insulating products for building applications - Determination of dimensional stability under specified temperature and humidity conditions

EN 1605 Thermal insulating products for building applications - Determination of deformation under specified compressive load and temperature conditions

EN 1607 Thermal insulating products for building applications - Determination of tensile strength perpendicular to faces

EN 1609 Thermal insulating products for building applications - Determination of short term water absorption by partial immersion

EN 12086 Thermal insulating products for building applications - Determination of water vapour transmission properties

EN 12087 Thermal insulating products for building applications - Determination of long term water absorption by immersion

EN 12089 Thermal insulating products for building applications - Determination of bending behaviour

EN 12090 Thermal insulating products for building applications - Determination of shear behaviour

EN 12667 Thermal performance of building materials and products - Determination of thermal resistance by means of guarded hot plate and heat flow meter methods - Products of high and medium thermal resistance

EN 12939 Thermal performance of building materials and products - Determination of thermal resistance by means of guarded hot plate and heat flow meter methods - Thick products of high and medium thermal resistance

EN 13163+A1 Thermal insulation products for buildings - Factory made expanded polystyrene (EPS) products - Specification

EN 13168+A1 Thermal insulation products for buildings – Factory made wood wool (WW) products – Specification

EN 13172 Thermal insulation products - Evaluation of conformity

EN 13238 Reaction to fire tests for building products - Conditioning procedures and general rules for selection of substrates

EN 13501-1 Fire classification of construction products and building elements - Part 1: Classification using test data from reaction to fire tests

EN 29052-1 Acoustics – Determination of dynamic stiffness – Part 1: Materials used under floating floors in dwellings (ISO 9052-1)

EN ISO 175 Plastics - Methods of test for the determination of the effects of immersion in liquid chemicals

EN ISO 354 Acoustics - Measurement of sound absorption in a reverberation room

EN ISO 1182 Reaction to fire tests for products - Non-combustibility test

EN ISO 1716 Reaction to fire tests for products - Determination of the cross heat of combustion (calorific value)

EN ISO 11654 Acoustics - Sound absorbers for use in buildings - Rating of sound absorption

EN ISO 12571 Hygrothermal performance of building materials and products - Determination of hygroscopic sorption properties

EN ISO 10456 Building materials and products - Hygrothermal properties - Tabulated design values and procedures for determining declared and design thermal values (ISO 10456:2007)

EN ISO 11925-2 Reaction to fire tests - Ignitability of building products subjected to direct impingement of flame - Part 2: Single-flame source test

ISO 2602 Statistical interpretation of test results. Estimation of the mean. Confidence interval

ISO 3534-1 Statistics – Vocabulary and symbols – Part 1: General statistical terms and terms used in probability

ANNEX A GUIDANCE FOR TEST OF REACTION TO FIRE ON THERMAL INSULATION AND/OR SOUND ABSORBING BOARDS BASED ON EXPANDED POLYSTYRENE AND CEMENT

1. General
This test covers homogenous insulation material according to clause 1.1 of the EAD without any coating or finishing on its surface.

2. Conditioning
All specimens shall be conditioned according to the provisions given in EN 13238 before testing.

3. Testing according to EN ISO 1182 and EN ISO 1716
These methods are needed to determine classes A1 and A2 according to Commission Delegated Regulation (EU) 2016/364 (also EN 13501-1). If required the specimens shall be prepared and tested according to the provisions given in the test standards EN ISO 1182 and EN ISO 1716. Each different chemical composition has to be considered when testing. In case of products with the same composition but different densities and different amounts of organic components in particular expanded polystyrene the variation with the lowest density and the highest amount of polystyrene and additional organic components shall be tested. If the product contains flame retardant the variation with the lowest amount of the flame retardant shall be tested.

The test result is valid for that variation tested and all variation of the products:
- with the same chemical composition,
- with higher densities,
- of any thickness,
- with lower amounts of polystyrene and additional organic components and
- with higher amounts of the same type of flame retardant as the one which has been tested.

4. Testing according to EN 13823 (SBI)
This method is relevant for determining of the classes A2, B, C and D as well as for the additional classifications s1, s2, s3, d0, d1 and d2 regarding smoke production and flaming droplets. Using this approach the end use applications have to be taken into account. Two different types of substrates are possible in end use – solid floor structures made of mineral material (e. g. concrete) and floor structures made of beams with timber floorboards or wood based panels on the upper side. Hence a particle board according to EN 13238 shall be used as substrate for testing representing both types of substrates in practice. If other substrates are possible in the end use application other substrates according to EN 13238 exactly representing the substrate of the end use application can be used for testing. Since the reaction to fire performance of the insulation material shall be evaluated, all test shall be conducted without any covering (e.g. screeds) to the insulation material.

The following test configuration shall be used:
1. The samples (insulation + substrate) will be produced in the dimensions of the SBI test specimens.
2. Due to the kind of production – casting of the insulation material on site without joints - no joints shall be considered when preparing the long wing of the SBI specimens.
3. Both the short and the long wing of each sample will be mounted together on the SBI trolley after conditioning.
4. The sample shall be mounted in a distance of 80 mm to the backing board of the SBI apparatus. For samples with a thickness greater than 120 mm the distance can be reduced to 40 mm. The cavity behind the sample shall be non-ventilated. Samples with a thickness greater than 160mm shall be mounted directly in front of the backing board of the SBI apparatus without any distance to the backing board.
5. The samples shall be fixed on the substrate only mechanically by screws with a diameter of 6 mm (see Figure 1 and 2).
6. The correct length of the screws shall be derived from Figure 3.
7. Before fixing the sample, pilot holes with a diameter of 4 mm shall be drilled into the substrate according to Figure 1 and 2.

Instead of fixing of the insulation on the substrate using screws the whole sample can be mounted in a steel frame made of U-profiles covering the lateral edges and the top edge of the sample.
The following parameters of the insulation material shall be taken into account when conducting the SBI tests:
- each different chemical composition,
- the greatest and lowest thickness,
- the lowest density,
- the highest amount of polystyrene and additional organic components and
- the lowest amount of flame retardant.

The test results are valid for the variation tested and any variations of the product
- with the same chemical composition,
- with higher densities,
- all thickness between those evaluated in the tests,
- with lower amounts of polystyrene and additional organic components and
- with higher amounts of the same type of flame retardant as the one which has been tested.

Test results on the standard particleboard substrate or on other standard substrates are valid for those end use substrates for which the standard substrate is representative according to the rules given in EN 13238.

5. Testing according to EN ISO 11925-2
This method is relevant for determining the reaction to fire classes B, C, D and E of Commission Delegated Regulation (EU) 2016/364 (also EN 13501-1). Due to the thickness of the insulation material used in practice, the low energy level of the ignition source and the short time of flame exposure the influence of the end use condition can be considered as negligible when testing the specimens. Hence the insulation material shall be tested without any substrate behind. Testing of all specimens shall be conducted with edge exposure according to clause 7.3.3.2 of the test standard.

The following parameters shall be taken into account when preparing the specimens:
- each different chemical composition,
- the greatest thickness (usually that means the greatest testable thickness of 60 mm),
- the lowest density,
- the highest amount of polystyrene and additional organic components, and
- the lowest amount of flame retardant

The test results are valid for the variation tested and any variant of the product:
- with the same chemical composition,
- with higher densities,
- with lower amounts of polystyrene and additional organic components,
- with higher amounts of the same type of flame retardant as the one which has been tested and
- of any thickness, if the maximum testable thickness of 60 mm was tested.

If a lower thickness than 60 mm was used for testing test results are valid for lower thickness.

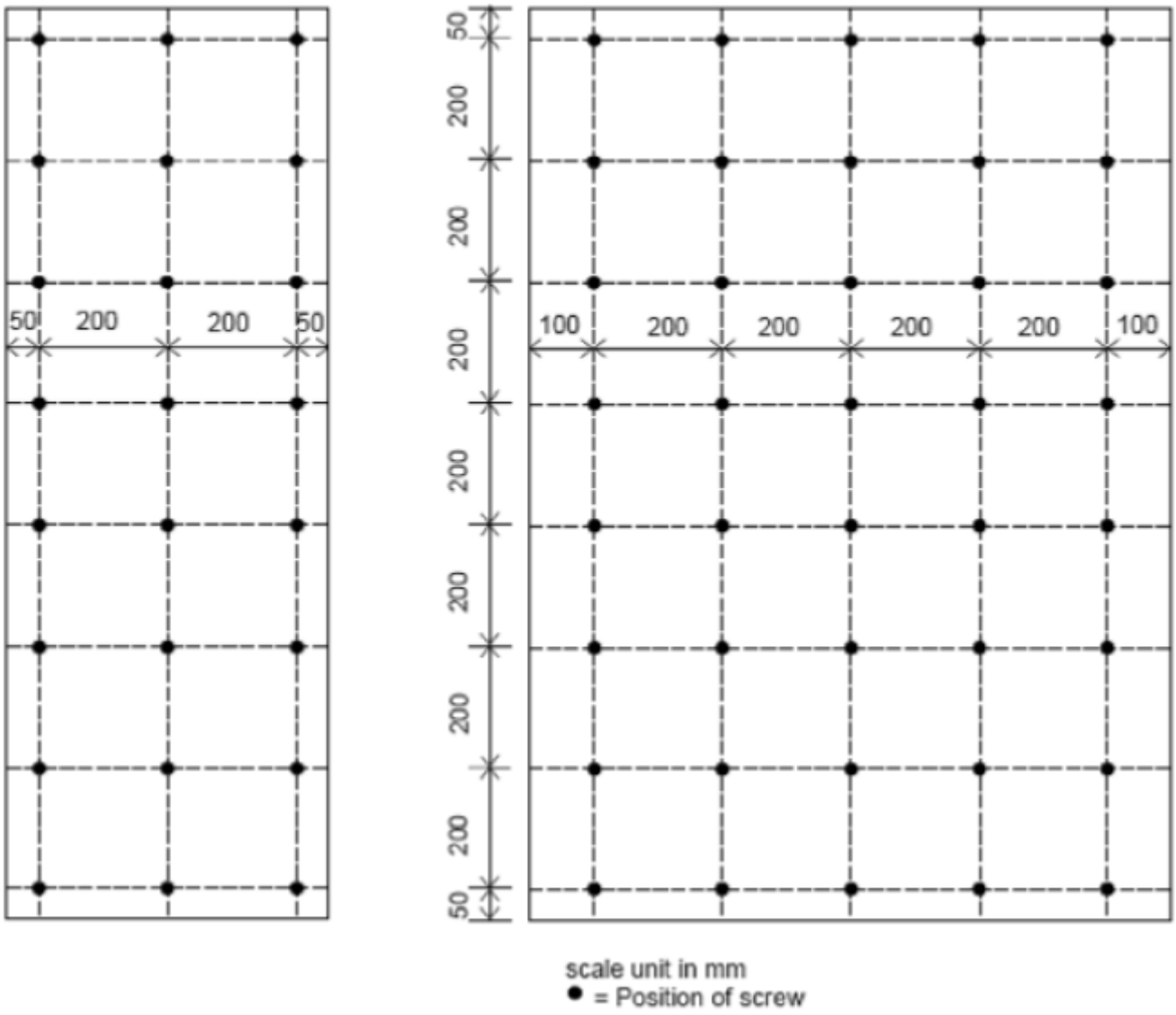

Figure 1, Figure 2: Mechanical fixing of the sample on the substrate

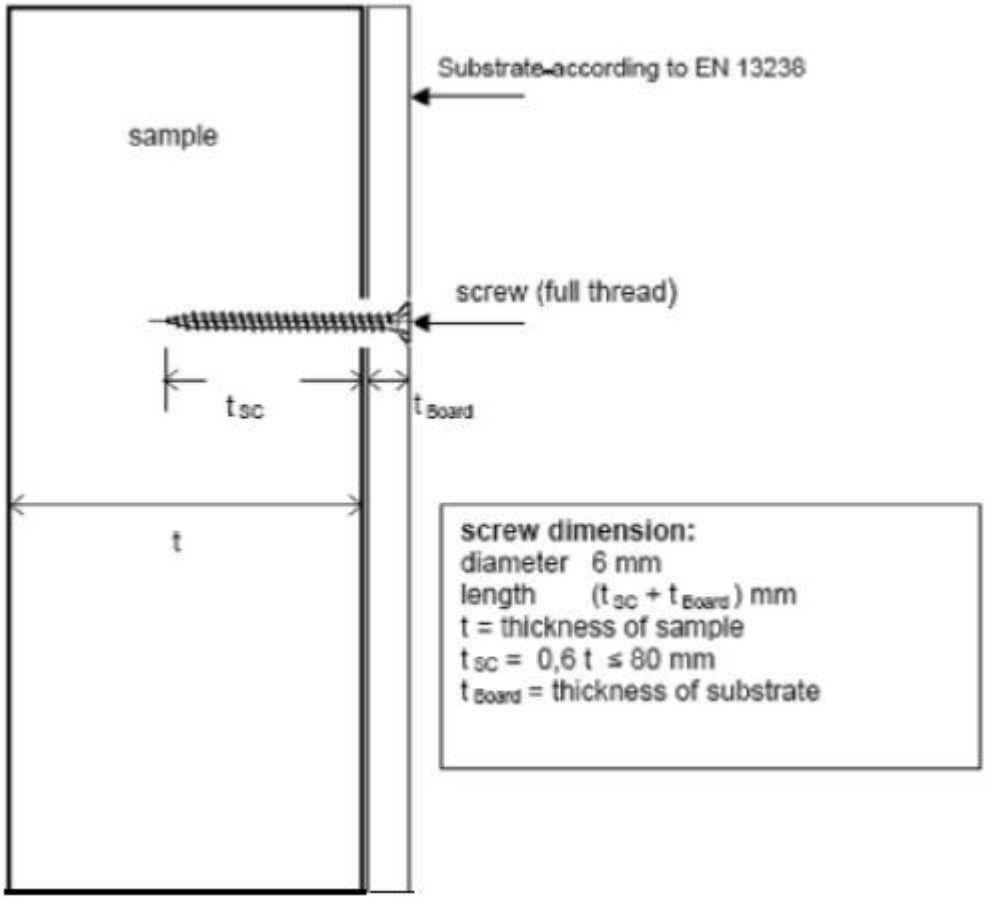

Figure 3: The correct length of the screws (t_{SC} + t_{BOARD})

ANNEX B DETERMINATION OF DECLARED THERMAL CONDUCTIVITY AND THE MASS-RELATED MOISTURE CONVERSION COEFFICIENT TO HIGH MOISTURE CONTENT

B.1 Determination of the λ fractile value at 10 °C, at dry conditions ($\lambda_{10,dry,90/90}$)

B.1.1 Measurement of the λ_{dry} at 10 °C

B.1.1.1 Test specimens for the determination of the thermal conductivity λ at 10 °C shall be conditioned to dryness after storage for at least 72 hours at (70 ± 2)°C in an oven ventilated with air taken at (23 ± 2)°C and (50 ± 5)% relative humidity.

B 1.1.2 The thermal conductivity of the test specimens conditioned according to B.1.1.1 shall be measured according to EN 12667 or EN 12939 for thick products at a mean temperature of (10 ± 0,3)°C.
During the measurement, precaution shall be taken to avoid moisture absorption by the specimen. It is acceptable, for instance, to put the test specimen into a thin plastic bag.

B.1.2.1 Calculation of the λ fractile value at 10°C, at dry conditions ($\lambda_{10,dry,90/90}$)

The λ fractile value at 10 °C, at dry conditions ($\lambda_{10,dry,90/90}$) representing at least 90 % of the production with a confidence limit of 90 % shall be calculated using the principles as detailed in EN 13163, Annex A.

B.2 Determination of the mass-related moisture conversion coefficient ($f_{u,1}$)

For the determination of the mass-related moisture conversion coefficient $f_{u,1}$, two sets of measurements are needed.

Set 1

At least three measurements on dry test specimens, to determine $\lambda_{10,dry}$ and u_{dry} (moisture content mass by mass).

Set 2

At least three measurements on test specimens conditioned at (23 ± 2) °C and (50 ± 5) % relative humidity, to determine $\lambda_{10,(23,50)}$ and $u_{23,50}$ (moisture content mass by mass).

B.2.1 Procedure

B.2.1.1 Set 1

B.2.1.1.1 Dry the test specimens following the procedure in B.1.1.1.

B.2.1.1.2 Determine for each test specimen the mass in dry condition. Average the values to determine the m_{dry}. The u_{dry}, being the moisture content in dry condition, is by definition set to 0.

B.2.1.1.3 Determine for each test specimen the λ value at 10 °C following the procedure in B.1.1.2. Average the values to determine the $\lambda_{10,dry}$.

B.2.1.2 Set 2

B.2.1.2.1 Condition the test specimens at (23 ± 2)°C and (50 ± 5)% relative humidity following the procedures detailed in EN 13171:2013, clause 5.2, step 2.

B.2.1.2.2 Determine for each test specimen the mass at (23 ± 2)°C and (50 ± 5)% relative humidity. Average the values to determine the mass at 23 °C and 50 % relative humidity as $m_{23,50}$.

B.2.1.2.3 Calculate $u_{23,50}$ by the following formula:

$$u_{23,50} = \frac{m_{23,50} - m_{dry}}{m_{dry}}$$

where,

$m_{23,50}$ is the mass at 23 °C and 50 % relative humidity according to B.2.1.2.2

m_{dry} is the mass according to B.2.1.1.2

B.2.1.2.4 Determine for each test specimen conditioned according to B.2.1.2.1 the λ value in accordance with EN 12667 or EN 12939 for thick products at a mean temperature of (10 ± 0,3) °C.
Average the values to determine $\lambda_{10,(23,50)}$.

B.2.1.3 Calculation of the mass-related moisture conversion coefficient ($f_{u,1}$)
The mass-related moisture conversion coefficient $f_{u,1}$ shall be calculated by the following formula (derived from ISO 10456:2010, formula 4):

$$f_{u,1} = \frac{\ln \frac{\lambda_{10,(23,50)}}{\lambda_{10,dry}}}{u_{23,50} - u_{dry}}$$

where,

$\lambda_{10,(23,50)}$ is determined according to B.2.1.2.4;
$\lambda_{10,dry}$ is determined according to B.2.1.1.3;
$u_{23,50}$ is determined according to B.2.1.2.3;
u_{dry} is determined according to B.2.1.1.2 and is defined to be 0.

B.3 Calculation of the declared thermal conductivity λ_D
The declared thermal conductivity λ_D shall be calculated using the following formula:

$$\lambda_{(23,50)} = \lambda_{10,dry,90/90} * e^{f_{u,1}(u_{23,50} - u_{dry})}$$

where,

$\lambda_{10,dry,90/90}$ is determined according to B.1.2;
$f_{u,1}$ is determined according to B.2.1.3;
$u_{23,50}$ is determined according to B.2.1.2.3;
u_{dry} is determined according to B.2.1.1.2 and is defined to be 0.

The calculated value $\lambda_{(23/50)}$ shall be rounded upwards to the nearest 0,001W/(m.K) and declared as $\lambda_{D(23,50)}$.

B.4 Determination of the mass-related moisture conversion coefficient ($f_{u,2}$) to high moisture content
For the determination of the mass-related moisture conversion coefficient to high moisture content $f_{u,2}$, two sets of measurements are needed.
Set 1
At least three measurements on test specimens conditioned at (23 ± 2)°C and (50 ± 5)% relative humidity, to determine $\lambda_{10,(23,50)}$ and $u_{23,50}$ (moisture content mass by mass).
Set 2
At least three measurements on test specimens conditioned at (23 ± 2)°C and (80 ± 5)% relative humidity, to determine $\lambda_{10,(23,80)}$ and $u_{23,80}$ (moisture content mass by mass).

B.4.1 Procedure

B.4.1.1 Set 1
Determine the $\lambda_{10,(23,50)}$ and $u_{23,50}$ in accordance with B.2.1.2

B.4.1.2 Set 2

B.4.1.2.1 Condition the test specimens at (23 ± 2)°C and (80 ± 5)% relative humidity following the procedures detailed in EN 13171:2013, clause 5.2, step 2.

B.4.1.2.2 Determine for each test specimen the mass at (23 ± 2)°C and (80 ± 5)% relative humidity. Average the values to determine the mass at 23 °C and 80 % relative humidity as $m_{23,80}$.

B.4.1.2.3 Calculate $u_{23,80}$ by the following formula:

$$u_{23,80} = \frac{m_{23,80} - m_{dry}}{m_{dry}}$$

where,

$m_{23,80}$ is the mass at 23 °C and 80 % relative humidity according to B.4.1.2.2
m_{dry} is the mass according to B.2.1.1.2

B.4.1.2.4 Determine for each test specimen conditioned according B.4.1.2.1 the λ value in accordance with EN 12667 or EN 12939 for thick products at a mean temperature of (10 ± 0,3)°C. Average the values to determine $\lambda_{10,(23,80)}$.

B.4.1.3 Calculation of the mass-related moisture conversion coefficient to high moisture content ($f_{u,2}$)

The mass-related moisture conversion coefficient to high moisture content $f_{u,2}$ shall be calculated by the following formula (derived from ISO 10456:2013, formula 4):

$$f_{u,2} = \frac{\ln \frac{\lambda_{10,(23,80)}}{\lambda_{10,(23,50)}}}{u_{23,80} - u_{23,50}}$$

where,

$\lambda_{10,(23,80)}$ is determined according to B.4.1.2.4;
$\lambda_{10,(23,50)}$ is determined according to B.2.1.2;
$u_{23,80}$ is determined according to B.4.1.2.3.
$u_{23,50}$ is determined according to B.2.1.2.

NOTE 1: For the determination of the mass-related moisture conversion coefficient $f_{u,1}$ and the mass-related moisture conversion coefficient to high moisture content $f_{u,2}$, the test specimens shall be taken from the same production run.

NOTE 2: Thermal conductivity may also be measured at mean temperatures other than 10 °C, providing that the accuracy of the relationship between the temperature and thermal properties is well documented.