



EUROPEAN ASSESSMENT DOCUMENT

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**BUILDING KIT BASED ON MASSIVE
PANELS WITH METAL FRAME
STRUCTURE**

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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).

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1 SCOPE OF THE EAD

1.1 Description of the construction product

The building kit consists of multi-layered prefabricated massive structural panels, the connections between panels and the connection of the building to the foundation. The building kit includes panels for walls, floors and roofs.

Floor and roof finishes as well as windows and doors are not part of the kit.

These panels are made of structural metal frames, an insulation mixture of EPS-mortar and, when needed, by other insulation layers, ETICS, mortar, gypsum and plasterboards. All layers except external renderings and gypsum lining are mechanically fixed to the metal frames.

Roof and floor panels shall be finished on site with a concrete layer above the metal frame structure. Between the roof and floor panels and the concrete layer a profiled metal sheet and/or shear connectors may be used. The concrete layer, the profiled metal sheet and the shear connectors are not part of the kit.

Only the metal frame, and the concrete in panels for floors and roofs, contribute to the structural performance of the panels.

Height of wall panels is floor-to-floor. Length of wall panels as well as width and length of floor and roof panels are limited by the transport. The minimum thickness of the panels is 160 mm for walls and 270 mm for roofs and floors. The maximum thermal transmittance of the panels is 0,30 W/m²·K.

For the connections between panels and the connection to the foundation metal fasteners are used. Additional metal frames of hot-rolled steel profiles between panels can be used if required by the structural calculation of the building.

Only the kit as a whole can be placed on the market. The kit components are not to be CE marked separately using this EAD.

The material and component specifications are shown in table 1.1.1.

Table 1.1.1 Specifications of materials and components.

Component	Walls	Floors/ Roofs	Specifications
Metal frame	x	x	1,2 mm – 3,0 mm thick cold formed steel profiles made from steel flat products according to EN 10346 ¹ , and metal fasteners.
Additional metal frame	X	X	hot-rolled steel profiles for beams and columns.
Insulation mixture of EPS-mortar	x	x	based on EN 16025-1, with minimum thickness = 40 mm.
Insulation layers	x	x	according to EN 13163 and EN 13165
Mortar	x	x	according to EN 998-1. Type GP.
Gypsum	x	x	according to EN 13279-1.
Plasterboards	x	x	according to EN 520.
Connection between panels	x	x	nut and bolt system inside a metal casing embedded in the panels to be joined.
Connection to the foundation	x	--	metal anchor according to ETA 02/0001, inside a metal casing embedded in the panels to be joined.
ETICS (**)	x		mechanically fixed, comprising an insulation product and a rendering system with reinforcement. The ETICS is assessed according to an ETA and the relevant EAD.
Concrete (*)	--	x	minimum thickness = 60 mm.

¹ All undated references to standards or to EAD's in this EAD are to be understood as references to the dated versions listed in clause 4.

Component	Walls	Floors/ Roofs	Specifications
Profiled metal sheet (*) (**)	--	x	minimum thickness = 0,6 mm, steel class according to EN 10346.
Shear connector (*)	--	x	according to EAD 200033-00-0602

(*) Not part of the kit.

(**) Optional.

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 kit is intended to be used in detached single-family or row buildings, maximum ground + two floors.

Kits covered by this EAD are also intended to be used in areas of seismic actions.

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 building kit composed by massive panels for the intended use of 50 years when installed in the works, except for the ETICS whose assessment methods are based on a working life of 25 years. 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 works².

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

2 ESSENTIAL CHARACTERISTICS AND RELEVANT ASSESSMENT METHODS AND CRITERIA

2.1 Essential characteristics of the product

Table 2.1.1 shows how the performance of the building kit composed by massive panels is assessed in relation to the essential characteristics.

Table 2.1.1 Essential characteristics of the product and methods and criteria for assessing the performance of the product in relation to those essential characteristics.

No	Essential characteristic	Assessment method	Type of expression of product performance
Basic Works Requirement 1: Mechanical resistance and stability			
1	Resistance, stability and stiffness of wall, floor and roof panels and their connections	2.2.1	Description
2	Seismic resistance	2.2.2	Level
Basic Works Requirement 2: Safety in case of fire			
3	Reaction to fire of components	2.2.3	Class
4	Resistance to fire	2.2.4	Class
Basic Works Requirement 3: Hygiene, health and the environment			
5	Water vapour resistance	2.2.5	Level
6	Watertightness of the façade	2.2.6	Level
Basic Works Requirement 4: Safety and accessibility in use			
7	Adherence between layers	2.2.7	Level
Basic Works Requirement 5: Protection against noise			
8	Airborne sound insulation	2.2.8	Level
9	Impact sound insulation	2.2.9	Level
Basic Works Requirement 6: Energy economy and heat retention			
10	Thermal resistance	2.2.10	Level
11	Air permeability	2.2.11	Level
12	Thermal inertia	2.2.12	Level
Aspects of durability			
13	Durability	2.2.13	Description

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

This chapter is intended to provide instructions for TABs. Therefore, the use of wordings such as “shall be stated in the ETA” or “it has to be given in the ETA” shall be understood only as such instructions for TABs on how results of assessment shall be presented in the ETA. Such wordings do not impose any obligations for the manufacturer and the TAB shall not carry out the assessment of the performance in relation to a given essential characteristic when the manufacturer does not wish to declare his performance in the Declaration of Performance.

Testing will be limited only to the essential characteristics which the manufacturer intends to declare. If for any components covered by harmonised standards or European Technical Assessments the manufacturer of the component has included the performance regarding the relevant characteristic in the Declaration of Performance, retesting of that component for issuing the ETA under the current EAD is not required.

2.2.1 Resistance, stability and stiffness of wall, floor and roof panels and their connections

Purpose of the assessment

The assessment is required to provide the resistance, stability and stiffness of wall, floor and roof panels and their connections.

Assessment method

Indication of geometrical data of the components and elements and their properties related to mechanical resistance and stability are used as an expression of resistance, stability and stiffness of wall, floor and roof panels and their connections.

Expression of results

For wall panels, the structural steel profiles shall be defined by cross section and maximum spacing. The strength of the steel shall be given by reference to the steel grade according to EN 10346. Maximum dimensions of walls shall also be specified.

For floor and roof panels, the structural steel profiles shall be defined by cross section, maximum spacing and maximum span. The strength of the steel shall be given by reference to the steel grade according to EN 10346.

Fasteners and other relevant metal parts for assembling the panels shall also be defined by type, number and spacing.

Note: The described method above is used to provide the basis for case by case calculations. Testing according to relevant product standards or by a combination of both (design assisted by testing) is also possible.

Manufacturer's attention is drawn that respective production documentation and/or structural design calculations shall be attached to the DoP as requested by Regulation (EU) 574/2014, section 3, point 7.

2.2.2 Seismic resistance

Purpose of the assessment

The assessment is required to provide the seismic resistance of the building kits.

Assessment method

The behaviour factor (q) of the building kits is limited to 1,5 (see EN 1998-1 clause 2.2.2 (2)). This factor can be used without the need of further assessment.

Expression of results

The behaviour factor of the building kits shall be stated in the ETA.

2.2.3 Reaction to fire of components

Purpose of the assessment

The assessment is required to provide the reaction to fire of the relevant parts of the building kit.

Assessment method

Kit components and materials considered to satisfy the requirements for performance class of the characteristic reaction to fire in accordance with the relevant EC Decision, without the need for testing, on the basis of its conformity with the specification of the product and its intended use detailed in that Decision shall be classified according to that Decision. These Decisions are 2003/43/EC, as amended in 2006/673/EC for plasterboards; 96/603/EC, as amended in 2000/605/EC and 2003/424/EC for mortar, gypsum, steel and concrete.

The rest of kit components and materials shall be tested according to the test method(s) referred to in EN 13501-1 and relevant for the corresponding reaction to fire class. These individual kit components and materials shall be classified according to the Commission Delegated Regulation (EU) No 2016/364.

Expression of results

The classes of the kit components and materials shall be stated in the ETA.

2.2.4 Resistance to fire

Purpose of the assessment

The assessment is required to provide the resistance to fire of the relevant parts of the building kit.

Assessment method

The resistance to fire shall be determined by testing according to EN 1365-1 for walls and EN 1365-2 for floors and roofs, and classified according to EN 13501-2.

Only the representative configurations in accordance with the criteria of clause 13 of EN 1365-1 for walls and EN 1365-2 for floors and roofs shall be tested.

Expression of results

The resistance to fire classification according to EN 13501-2 shall be stated in the ETA.

2.2.5 Water vapour resistance

Purpose of the assessment

The assessment is required to provide the water resistance of the relevant building parts.

Assessment method

Assessment of the relevant building parts shall be undertaken based on calculations according to EN ISO 13788, taking into account the relevant design climatic conditions. In absence of well defined data of indoor air conditions, the indoor temperature and humidity of buildings (dwellings and offices) for continental climatic conditions can be obtained from outdoor air conditions as given in Annex A of EN ISO 13788.

The assessment is undertaken with respect to both interstitial and internal surface condensation. The performance of the kit shall be stated in the form of acceptable intended uses relevant to the design climatic conditions, e.g. types of buildings and geographical zones.

The risk of condensation can normally be verified on the basis of hygrothermal characteristics of the products used in each component and the construction details. However, the principle of critical component

(when a highly effective water vapour barrier is used, then parameters of this barrier may apply for the kit and a calculation can be omitted) can be applied.

The water vapour resistance of the relevant layers should be based upon:

- Design values given in EN ISO 10456 or declared in the DoP in accordance with harmonised technical specifications.
- or
- Tests according to EN ISO 12572 or declared in the DoP in accordance with harmonised technical specifications.

Expression of results

Vapour transmission coefficients shall be expressed in the ETA by means of a level.

2.2.6 Watertightness of the façade

Purpose of the assessment

The assessment is required to provide the water permeability of façades.

Assessment method

The watertightness of the façade shall be determined by testing the representative configuration according to EN 12865, A procedure.

Expression of results

The limit level of pressure, in Pa, shall be expressed in the ETA.

2.2.7 Adherence between layers

Purpose of the assessment

The assessment is required to provide the adherence between layers of the panels.

Assessment method

The adherence between layers of the panels shall be determined by testing the tensile strength perpendicular to the faces of the layers susceptible of be disjoined from the panel.

Layers joined by mechanical fixings are not considered susceptible to be disjoined, therefore the union between fixed layers does not need to be assessed.

Adherence between gypsum and insulation mixture of EPS mortar shall be determined by testing in accordance with EN 13279-2. The curing time of specimens is 28 days, contrary to provisions of EN 13279-2, which corresponds to the minimum curing time of the panel. At least both ends of the range of time between the manufacturing of EPS mortar and the application of gypsum during the manufacturing of the panel shall be tested.

Adherence between mortar and insulation mixture of EPS mortar shall be determined by testing in accordance with EN 1015-12. At least both ends of the range of time between the manufacturing of EPS mortar and the application of mortar during the manufacturing of the panel shall be tested.

Expression of results

The tensile strength perpendicular to the faces shall be stated in the ETA for each pair of layers.

2.2.8 Airborne sound insulation

Purpose of the assessment

The assessment is required to provide the airborne sound insulation of the panels of the kit.

Assessment method

The airborne sound insulation of the panels of the kit shall be determined by tests according to EN ISO 10140-2. The rating of airborne sound insulation shall be done according to EN ISO 717-1.

It is not possible to know in advance the worst configuration due to the variability on the distribution of profiles within the panels of the kit. The range of available panel's configurations could be analysed in order to identify the representative panel(s) to be assessed. In principle, the most adverse configuration(s) shall become the representative(s) panel. The extended applications to assign the performance to the range of available panel's configurations will be stated in the ETA.

Expression of results

The airborne sound insulation of the panels shall be stated in the ETA by means of a level together with a detailed description of the configurations for which the values are valid.

2.2.9 Impact sound insulation

Purpose of the assessment

The assessment is required to provide the impact sound insulation of the panels for floors of the kit.

Assessment method

The impact sound insulation of the panels for floors of the kit shall be determined by tests according to EN ISO 10140-3. The rating of impact sound insulation shall be done according to EN ISO 717-2.

It is not possible to know in advance the worst configuration due to the variability on the distribution of profiles within the panels of the kit. The range of available panel's configurations could be analysed in order to identify the representative panel(s) to be assessed. In principle, the most adverse configuration(s) shall become the representative(s) panel. The extended applications to assign the performance to the range of available panel's configurations will be stated in the ETA.

Expression of results

The impact sound insulation of the panels shall be stated in the ETA by means of a level together with a detailed description of the configurations for which the values are valid.

2.2.10 Thermal resistance

Purpose of the assessment

The assessment is required to provide the thermal resistance and conductivity of the panels of the kit.

Assessment method

The thermal resistance of the panels of the kit shall be calculated according to EN ISO 6946 or tested according to EN ISO 8990, and stated in the ETA as the thermal resistance of the panels.

If the panels of the kit do not meet the criteria of application of the simplified method given in clauses 6.2.1 to 6.2.5 of EN ISO 6946, then the assessment shall be undertaken by calculations according to EN ISO 10211 or by testing according to EN ISO 8990.

When an assessment based on testing is used the worst case shall be obtained from the panel with minimum spacing between profiles and with the minimum thickness of the panels. The optimization of the configurations to be assessed is not relevant when an assessment based on calculations is used.

The thermal conductivity values for materials used to calculate the thermal properties shall be obtained from CE-marking of components, tabulated values from EN ISO 10456 or tests according to EN 12664 or EN 12667.

Expression of results

The thermal resistance of the panels of the kit and the thermal conductivity values for materials shall be expressed in the ETA by means of a level.

2.2.11 Air permeability

Purpose of the assessment

The assessment is required to provide the air permeability of the panels of the kit.

Assessment method

The air permeability of the panels of the kit shall be determined by test according to EN 12114.

When assessing the air permeability through elements joints, tests according to EN 12114 shall be done by placing at least two panels in the test rig.

The range of available panel's configurations could be analysed in order to identify the representative panel(s) to be assessed. In principle, the most adverse configuration(s) shall become the representative(s) panel. The extended applications to assign the performance to the range of available panel's configurations will be stated in the ETA.

When identifying the representative panel(s) to be assessed, the distribution of profiles in the panel is not of relevance, and when the thickness of the continuous layers decreases the air permeability performance of the panel also decreases.

Expression of results

The results shall be stated in the ETA by means of a level and a detailed description of the tested panel's configuration for which the values are valid.

2.2.12 Thermal inertia

Purpose of the assessment

The assessment is required to provide the thermal inertia of the panels of the kit.

Assessment method

Thermal inertia shall be assessed according to EN ISO 13786.

For the assessment of thermal inertia, the following properties of the relevant component shall be defined in the ETA based on product declaration of performances or on tabulated values in accordance with EN 10456:

- Thermal conductivity or thermal resistance
- Density
- Specific heat capacity

Expression of results

Thermal inertia assessed according to EN ISO 13786, Ch. 6 and 7, shall be expressed in the ETA as internal thermal admittance (Y_{11}), time shift on internal side (Δt_{int}) and internal areal heat capacity (κ_1).

2.2.13 Durability

Purpose of the assessment

The assessment is required to provide the durability of the kit.

Assessment method

The durability of the kit is assessed by means of determining the corrosion resistance of its structural metal components, based on the rules given in EN 1090-2. Atmospheric corrosivity categories are in accordance with EN ISO 12944-2.

The loss of mass per unit of surface or loss of thickness for each corrosivity category, and the classification of environments of exposure linked to the corrosivity category is given in table 1 of EN ISO 12944-2.

Expression of results

The durability of the kit shall be expressed in the ETA by means of the loss of mass per unit of surface or loss of thickness for each corrosivity category.

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: Decision 2003/728/EC.

The system is: 1

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 3.2.1.

The manufacturer (regarding the components he buys from the market with DoP) shall take into account the Declaration of Performance issued by the manufacturer of that component. No retesting is necessary.

Table 3.2.1 Control plan for the manufacturer; cornerstones.

No	Subject/type of control	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	Fulfilment of specifications of raw materials and components of the kit	Check of raw material specifications	Manufacturer's Control Plan	All	Every delivery
2	Geometry and dimensions of metal frames, including their fixings.	Manufacturer's Control Plan	Manufacturer's Control Plan	All	Every metal frame
3	EPS granules sieving	Manufacturer's Control Plan	Manufacturer's Control Plan	Manufacturer's Control Plan	Every delivery
4	EPS and mortar mixture dosing	Manufacturer's Control Plan	Manufacturer's Control Plan	All	Every mixture
5	Density of EPS and mortar mixture	EN 12350-6	Manufacturer's Control Plan	3	Every 100 m ³ or building kit.
6	Thickness(es) of the panel layers	Manufacturer's Control Plan	Manufacturer's Control Plan	All	Every panel

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 building kit composed by massive panels are laid down in Table 3.3.1.

Table 3.3.1 Control plan for the notified body; cornerstones.

No	Subject/type of control	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					
1	<p>The notified body shall verify that the factory production control is in conformity with the prescribed control plan. In particular, the following items shall be appropriately considered:</p> <ul style="list-style-type: none"> • Personnel and equipment. • The suitability of the factory production control established by the manufacturer, specially those referred to: <ul style="list-style-type: none"> ○ Position of steel profiles ○ Thickness of layers ○ Conformity with order • Full implementation of the prescribed test plan. 	Acc. to Control Plan	Acc. to Control Plan	Acc. to Control Plan	When starting the production
Continuous surveillance, assessment and evaluation of factory production control					
2	<p>The notified body shall verify:</p> <ul style="list-style-type: none"> • The manufacturing process. • The system of factory production control. • The implementation of the prescribed test plan according to the Manufacturer's Control Plan. 	Acc. to Control Plan	Acc. to Control Plan	Acc. to Control Plan	Once per year

4 REFERENCE DOCUMENTS

EN 10346:2015	Continuously hot-dip coated steel flat products for cold forming - Technical delivery conditions.
EN 16025-1:2013	Thermal and/or sound insulating products in building construction - Bound EPS ballastings - Part 1: Requirements for factory premixed EPS dry plaster.
EN 13163:2012+A2:2016	Thermal insulation products for buildings. Factory made expanded polystyrene (EPS) products. Specification.
EN 13165:2012+A2:2016	Thermal insulation products for buildings. Factory made rigid polyurethane (PU) products. Specification.
EN 998-1:2016	Specification for mortar for masonry - Part 1: Rendering and plastering mortar.
EN 13279-1:2008	Gypsum binders and gypsum plasters - Part 1: Definitions and requirements.
EN 520:2004+A1:2009	Gypsum plasterboards - Definitions, requirements and test methods.
EAD 200033-00-0602 March 2016	Nailed shear connector.
EN 1090-2:2018	Execution of steel structures and aluminium structures. Part 2: Technical requirements for steel structures.
EN 12944-2:2017	Paints and varnishes. Corrosion protection of steel structures by protective paint systems. Part 2: Classification of environments (ISO 12944-2:1998).
EN 13501-1:2018	Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests.
EN 1365-1:2012	Fire resistance tests for loadbearing elements. Part 1: Walls.
EN 1365-1:2012/AC:2013	
EN 1365-2:2014	Fire resistance tests for loadbearing elements. Part 2: Floors and roofs.
EN 13501-2:2016	Fire classification of construction products and building elements. Part 2: Classification using data from fire resistance tests, excluding ventilations services.
EN ISO 10456:2007	Building materials and products - Hygrothermal properties - Tabulated design values and procedures for determining declared and design thermal values (ISO 10456:2007).
EN ISO 10456:2007/AC:2009	
EN 12865:2001	Hygrothermal performance of building components and building elements. Determination of the resistance of external wall systems to driving rain under pulsating air pressure.
EN 13279-2:2014	Gypsum binders and gypsum plasters - Part 2: Test methods.
EN 1015-12:2016	Methods of test for mortar for masonry - Part 12: Determination of adhesive strength of hardened rendering and plastering mortars on substrates.
EN ISO 10140-2:2010	Acoustics. Laboratory measurement of sound insulation of building elements. Part 2: Measurement of airborne sound insulation (ISO 10140-2).
EN ISO 717-1:2013	Acoustics. Rating sound insulation in buildings and of building elements. Part 1: Airborne sound insulation (ISO 717-1:2013).

EN ISO 10140-3:2010 EN ISO 10140-3:2010/A1:2015	Acoustics. Laboratory measurement of sound insulation of building elements. Part 3: Measurement of impact sound insulation (ISO 10140-3).
EN ISO 717-2:2013	Acoustics. Rating sound insulation in buildings and of building elements. Part 2: Impact sound insulation (ISO 717-2:2013).
EN ISO 6946:2017	Building components and building elements. Thermal resistance and thermal transmittance. Calculation methods (ISO 6946:2017).
EN ISO 8990:1996	Thermal insulation. Determination of steady-state thermal transmission properties. Calibrated and guarded hot box (ISO 8990:1994).
EN ISO 10211	Thermal bridges in building construction. Heat flows and surface temperatures. Details calculations (ISO 10211:2007).
EN 12664:2001	Thermal performance of building materials and products. Determination of thermal resistance by means of guarded hot plate and heat flow meter methods. Dry and moist products of medium and low thermal resistance.
EN 12667:2001	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 12114:2000	Thermal performance of buildings. Air permeability of building components and building elements. Laboratory test method.
EN 12350-6:2009	Testing fresh concrete. Part 6: Density.
EN 1998-1: 2018	Eurocode 8: Design of structures for earthquake resistance. Part 1: General rules, seismic actions and rules for buildings.
EN ISO 13786:2017	Thermal performance of building components. Dynamic thermal characteristics. Calculation methods (ISO 13786:2017, Corrected version 2018-03).
EN ISO 13788:2012	Hygrothermal performance of building components and building elements. Internal surface temperature to avoid critical surface humidity and interstitial condensation. Calculation methods (ISO 13788:2012).
EN ISO 12572:2016	Hygrothermal performance of building materials and products. Determination of water vapour transmission properties. Cup method (ISO 12572:2016).