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THERMAL INSULATION MADE OF LOOSE MINERAL WOOL

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1 SCOPE OF THE EAD

1.1 Description of the construction product

The construction product is a thermal insulation product made of loose-fill mineral wool (MW), hereinafter referred to as thermal insulation product.

The product is not fully covered by the following harmonised technical specification: EN 14064-1¹.

The following essential characteristics of the thermal insulation product are covered for the assessment of the construction product in addition EN 14064-1 (see also clause 2):

- settlement (no test method is described in EN 14064-1, e.g. for double wall masonry with core insulation)
- long term water absorption (no assessment method is provided in EN 14064-1)
- bulk density (no test method is described in EN 14064-1)
- Propensity to undergo smouldering combustion (no test method is described in EN 14064-1)

The thermal insulation product consists of loose mineral wool and can be manufactured with additional hydrophobic agents and other additives.

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 thermal insulation product is intended to be used for the thermal insulation of buildings as follows:

- insulation in cavities of building elements (e.g. double wall masonry with core insulation, timber frame work, installation shafts)
- insulation of roofs and floors inside water proofing and insulation between the rafters

The thermal insulation product is executed in dry condition as loose fill with machine processing on site.

The thermal insulation product is intended to be used in structures where it will not be exposed to compression loads, precipitation, wetting or weathering and for construction elements with no contact to water and soil.

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

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 insulation product for the intended use of 50 years when installed in the works (provided that the insulation product is subject to appropriate installation (see 1.1)) 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 1 shows how the performance of thermal insulation product 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

No	Essential characteristic	Assessment method	Type of expression of product performance
Basic Works Requirement 2: Safety in case of fire			
1	Reaction to fire	See clause 2.2.1	Class
2	Propensity to undergo continuous smouldering combustion	See clause 2.2.2	Description
Basic Works Requirement 6: Energy economy and heat retention			
3	Thermal conductivity	See clause 2.2.3	Level
4	Short term water absorption	See clause 2.2.4	Level
5	Long term water absorption	See clause 2.2.5	Level
6	Bulk density	See clause 2.2.6	Level
7	Water repellency	See clause 2.2.7	Level
8	Water vapour transmission (water vapour diffusion resistance factor)	See clause 2.2.8	Level
9	Settlement		
9.1	Settling of loose fill insulation applied in ceilings	See clause 2.2.9.1	Level
9.2	Settling of loose fill insulation applied in cavities of walls and between rafters	See clause 2.2.9.2	Level
9.3	Settling of loose fill insulation under constant temperature and humidity conditions	See clause 2.2.9.3	Level

No	Essential characteristic	Assessment method	Type of expression of product performance
9.4	Settling under cyclical temperature and cyclic humidity	See clause 2.2.9.4	Level
10	Airflow resistivity	See clause 2.2.10	Level

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 assessments 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 this performance in the Declaration of Performance.

For sampling, conditioning and testing (dimensions of the test specimens, minimum number of measurements, specific conditions), EN 14064-1 shall apply, unless otherwise is specified in the following. The test specimens shall be chosen in order to cover the range of density and thicknesses in built-in state (number of test specimens, thickness and density of test specimens).

2.2.1 Reaction to fire

The thermal insulation product shall be tested using the procedures/test method(s) relevant for the corresponding reaction to fire class according to EN 13501-1. The product shall be classified according to Commission Delegated Regulation (EU) 2016/364 in connection with EN 13501-1, taking into account the EXAP rules given in Annex A for the loose mineral wool as placed on the market. The provisions for mounting and fixing given in Annex A shall be considered within the tests.

The reaction to fire class is given in the ETA.

Loose mineral wool satisfying the requirements for performance class A1 of the characteristic Reaction to fire in accordance with the Commission Decision 96/603/EC (as amended) do not need to be tested with regard to the reaction to fire performance on the basis of fulfilling the conditions set out in that Decision and its intended use being covered by that Decision.

As precondition only the organic content of the mineral wool product shall be determined by tests in accordance with EN 13820 and EN 14064-1. Each different composition (fibre type, type of binder and additives) of the loose mineral wool and the highest as well as the lowest bulk density shall be considered within testing.

Provided that the conditions set out in the aforementioned Decision are fulfilled the performance of the product is to be classified as class A1 and stated in the ETA.

The organic content (in percentage per mass) can be given in addition in the ETA.

2.2.2 Propensity to undergo continuous smouldering

The loose mineral wool shall be tested according to EN 16733. The following conditions and parameters shall be considered within the tests:

- highest organic content (in percentage per mass), to be determined by tests according to EN 13820 (see clause 2.2.1)

- highest as well as lowest bulk density and – if part of the bulk density range to be considered – a bulk density of about $100 \text{ kg/m}^3 (\pm 15 \%)$

The test shall be performed for each composition of the loose mineral wool (fibre type, type of binder and additives).

The tests shall be done on free-hanging specimens using the specimen holder for loose-fill products as specified in this test standard (wire mesh box with a thickness of about 100 mm) without consideration of the intended end-use conditions.

The test results are given in the ETA and expressed in accordance with EN 16733, chapter 11. The test results considering the aforementioned parameters in fully are also valid for products:

- of the same chemical composition,
- with lower organic content,
- with any bulk densities between those evaluated,
- for any thickness and
- for any end-use conditions.

2.2.3 Thermal conductivity

The thermal conductivity at a temperature of $10 \text{ }^\circ\text{C}$ is determined according to EN 12667 in accordance with EN 14064-1.

The thermal conductivity λ_D , based on $\lambda_{90/90}$ (representing at least 90 % of the production with a confidence level of 90 %), is given in the ETA - in levels with steps of $0,001 \text{ W/(m}\cdot\text{K)}$.

According to EN ISO 10456 the moisture conversion factors for the conversion of λ_{dry} to $\lambda_{23/50}$ and of $\lambda_{23/50}$ to $\lambda_{23/80}$ amount to $F_m = 1.00$.

2.2.4 Short term water absorption

The determination of the short term water absorption by partial immersion is performed according to EN 1609 in accordance with EN 14064-1.

The short term water absorption W_p is given in the ETA.

2.2.5 Long term water absorption

The determination of the long term water absorption by partial immersion is performed according to EN 12087, method 1A, using specimens according to Annex D of EN 14064-1.

The long term water absorption W_p is given in the ETA in levels using steps of 1 kg/m^2 .

2.2.6 Bulk density

2.2.6.1 Bulk density in case of use in closed cavities

In order to determine the bulk density of an insulation layer installed under a spatial boundary, the insulating material is placed in a closed container of perforated sheet metal (approximately $3,2 \text{ mm}$ perforation) with the internal dimensions of $0,55 \text{ m} \times 0,55 \text{ m} \times 0,33 \text{ m}$ (volume = $0,10 \text{ m}^3$) through an opening. After weighing the filled container and after deducting the container weight, the bulk density is determined from the weight of the insulating material and the measuring volume by forming a quotient.

The content of the container is accurately weighed to 100 g . The individual results of 3 tests and the mean value (arithmetic average) are determined.

The mean bulk density with tolerances is given in the ETA.

2.2.6.2 Bulk density in case of free placing

In order to determine the bulk density in case of free placing the dry insulating material is blown into a dimensionally stable container with the internal dimensions 1,00 m × 1,00 m × 0,25 m (length x width x height, volume = 0,25 m³). The surface will be flush with the upper edge of the container.

The contents of the container are accurately weighed to 100 g. The density (kg/m³) is calculated from the mass and the volume (0,25 m³). The individual results of 3 tests and the mean value (arithmetic average) are determined.

The mean bulk density with tolerances is given in the ETA.

2.2.7 Water repellency (where relevant)

The water repellency of the thermal insulation product is determined as follows.

The test of the water-repellent property of the thermal insulation product shall be carried out on three compacted samples with a volume of 1 dm³ each. These specimens are produced by means of a cylindrical measuring vessel with an internal diameter of 100 mm, the underside of which is closed with a non-rusting wire mesh (mesh width 0,2 mm).

Insulation is filled into the measuring vessel so that a volume of 1 dm³ is obtained after compression with a tamper (circular area approx. 25 cm² / weight of the stamper approx. 30 g). The determined bulk density of the samples should correspond with the bulk density according to clause 2.2.6.

Subsequently, the samples are stored 20 ± 2 mm deep in the test liquid (water with a pH value of 9,0 ± 0,5) for 4 hours.

The test liquid shall be prepared before from distilled water with the addition of calcium hydroxide.

During the entire test procedure, the pH value of the test liquid shall be checked and corrected if necessary at appropriate intervals.

After the 4 hours the samples (including the tube and strainer) are removed from the test liquid and placed for 15 minutes to drain and then weighed.

Subsequently, the samples are dipped again and the process is repeated 7 d and 28 d after the first immersion.

From the weight of the samples before the first immersion and the respective weight after the individual immersion times, the weight increase, based on 1 dm³, is determined and the mean value (arithmetic average) is formed. Values should be expressed as 0,1 g, mean values rounded to the nearest whole number.

The water absorption after 4 h and after 28 d is given in the ETA.

2.2.8 Water vapour transmission

The water vapour permeability (water vapour diffusion resistance factor) is determined in accordance with EN 14064-1 ($\mu = 1$ by using EN ISO 10456 instead of EN 12524).

The water vapour diffusion resistance factor μ is given in the ETA.

2.2.9 Settlement

The settlement depends on the density of the product, the thickness or height of the in-situ formed insulation and the application. Therefore the settlement should be assessed for different densities, at different thicknesses or heights covering the intended use conditions.

2.2.9.1 Settling of loose fill insulation applied in ceilings

a)

In the case of free placing (e.g. on the ceiling or between beams) the characteristics shall be determined following EN 15101-1, Annex B3. Deviating from EN 15101-1 the test shall be performed with 3 test specimens stored at (23 ± 2) °C and (50 ± 5) % relative humidity (without conditioning at 40 °C/90 % r.h.). The density of the specimens shall approximately correspond to the minimum density covering in the ETA.

The settling s_v , of the loose fill insulation shall be stated in the ETA together with the minimum installation density and the maximum thickness to be observed. Equation B.6 of EN 15101-1 is used for calculation.

b)

In the case of subsequent blowing into closed cavities, the characteristics shall be determined according to a). But in this case the insulation material is blown into a closed box.

The settling s_v , of the loose fill insulation shall be stated in the ETA together with the minimum installation density and the maximum thickness to be observed.

2.2.9.2 Settling of loose fill insulation applied in cavities of walls and between rafters

The determination of settlement s_d shall be carried out according to EN 15101:2013, Annex B2. The density of the specimens shall approximately correspond to the minimum density covering by the ETA.

The settling s_d shall be given in the ETA using the class according to EN 15101-1:2013, Table 2, together with the minimum installation density and the maximum thickness to be observed.

In case of an installation density of at least 65 kg/m³ the settling s_d can be assumed as ≤ 1 % without testing.

2.2.9.3 Settling of loose fill insulation under constant temperature and humidity conditions

The determination of settlement s_{cli} shall be carried out according EN 15101, Annex B.3.4 but without preceding impact excitation (only conditioning at 40 °C/90 % r.h.). Concerning the apparatus EN 15101, Annex B.3.2.1, B.3.2.3 and B.3.2.4 shall be applied, concerning test specimens EN 15101, Annex B.3.3. The test specimen shall represent the density range covered by the ETA.

The settling s_{cli} shall be determined according to EN 15101, Annex B.3.5.2 and given in the ETA together with the covered density.

The indication of settling s_{cli} is not relevant if the settling S_{cyc} according to the following clause is given in the ETA.

2.2.9.4 Settling under cyclical temperature and cyclic humidity

The determination of settlement shall be carried out according to EN 14064-1, Annex K.

The settling S_{cyc} shall be given in the ETA using classes according to EN 14064-1, Table 1.

2.2.9.5 Calculating the thermal resistance

For the case of free placing (e.g. on the ceiling or between beams) a reduced insulation layer thickness for calculating the thermal resistance is to be determined from the installation thickness taking account the settlement.

For this purpose the reduction value in %, determined from the highest value of settlement rounded upwards to the nearest one percent, shall be given in the ETA together with and based on the test results according to 2.2.9.1, 2.2.9.3 and/or 2.2.9.4.

2.2.10 Airflow resistivity

The determination of the airflow resistivity is performed according to EN 29053 in accordance with EN 14064-1.

The airflow resistivity is given in the ETA in levels with steps of 1 kPa s/m².

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 1999/91/EC.

The system is: 3 for any use except for uses subject to regulations on reaction to fire.

For uses subject to regulations on reaction to fire (including continuous smouldering combustion) the applicable AVCP systems are 1, or 3, or 4 depending on the conditions defined in the said Decision.

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 2.

Table 2 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	Reaction to fire	see clause 2.2.1	Acc. to control plan	see EN 14064-1	
2	Propensity to undergo continuous smouldering	see clause 2.2.2	Acc. to control plan	1	every two years
3	Thermal conductivity	see clause 2.2.3	Acc. to control plan	see EN 14064-1	
4	Short term water absorption	see clause 2.2.4	Acc. to control plan	see EN 14064-1	
5	Long term water absorption	see clause 2.2.5	Acc. to control plan	1	twice per year
6	Bulk density	see clause 2.2.6	Acc. to control plan	1	once a week
7	Water repellency	see clause 2.2.7	Acc. to control plan	1	twice per year
8	Settlement	see clause 2.2.9.1	Acc. to control plan	1	twice per year
		see clause 2.2.9.2 ³	Acc. to control plan	1	Every two years
9	Airflow resistivity	see clause 2.2.10	Acc. to control plan	see EN 14064-1	

³ For FPC a specimen box with a height of at least 1000 mm is sufficient.

3.3 Tasks of the notified body

The cornerstones of the actions to be undertaken by the notified body of the product in the procedure of assessment and verification of constancy of performance are laid down in Table 3.

The intervention of the notified body under AVCP system 1 is only necessary for reaction to fire (including continuous smouldering combustion) for products/materials 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 3 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 <i>(for systems 1 only)</i>					
1	<p>Initial inspection of the manufacturing plant and of factory production control carried out by the manufacturer regarding the constancy of performance related to reaction to fire (including continuous smouldering combustion)** and taking into account a limiting of organic material and/or the addition of fire retardants</p> <p>In particular the following items shall be appropriately considered:</p> <ul style="list-style-type: none"> - Presence of suitable test equipment - Presence of trained personal - Presence of an appropriate quality assurance system an necessary stipulations 	-	Acc. to control plan	-	When starting the production
Continuous surveillance, assessment and evaluation of factory production control <i>(for systems 1 only)</i>					
2	<p>Continuous surveillance, assessment and evaluation of the factory production control carried out by the manufacturer regarding the constancy of performance related to reaction to fire (including continuous smouldering combustion)** and taking into account a limiting of organic material and/or the addition of fire retardants</p> <p>In particular the following should be dealt with:</p> <ul style="list-style-type: none"> - Inspection of factory, of the production of the product and of the facilities for factory production control - Evaluation of the documents concerning the factory production control - Issuing a report of surveillance 	-	Acc. to control plan	-	Annually

** Only relevant for products of class C and higher

4 REFERENCE DOCUMENTS

EN 1609:2013	Thermal insulating products for building applications – Determination of short term water absorption by partial immersion
EN 12087:2013	Thermal insulating products for building applications – Determination of long term water absorption by immersion
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 13501-1:2007+A1:2009	Fire classification of construction products and building elements – Part 1: Classification using test data from reaction to fire tests
EN 13820:2003	Thermal insulating materials for building applications – Determination of organic content
EN 14064-1:2010	Thermal insulating products for building applications – In-situ formed loose-fill mineral wool (MW) products
EN 15101-1:2013	Thermal insulation products for buildings – In-situ formed loose fill cellulose (LFCI) products – Part 1: Specification for the products before installation
EN 16733:2016	Reaction to fire tests for building products – Determination of a building product's propensity to undergo continuous smouldering
EN 29053:1993	Acoustics; Materials for acoustical applications; Determination of airflow resistance
EN ISO 1182:2010	Reaction to fire tests for products – Non-combustibility test
EN ISO 1716:2010	Reaction to fire tests for products – Determination of the gross heat of combustion (calorific value)
EN ISO 10456:2007+AC:2009	Building materials and products - Hygrothermal properties - Tabulated design values and procedures for determining declared and design thermal values
EN ISO 11925-2:2010	Reaction to fire tests – Ignitability of products subjected to direct impingement of flame – Part 2: Single-flame source test
EN 13823:2010+A1:2014	Reaction to fire tests for building products – Building products excluding floorings exposed to the thermal attack by a single burning item
EN 13238:2010	Reaction to fire tests for building products – Conditioning procedures and general rules for selection of substrates

ANNEX A - TESTING OF REACTION TO FIRE OF LOOSE MINERAL WOOL

A.1 Scope

This annex gives the basic rules for reaction to fire testing on loose mineral wool as placed on the market (product itself), including instructions for mounting and fixing (M&F) as well as the extended application of test results.

A.2 Product and installation parameters

Tables A.1 and A.2 give the parameters that have to be taken into account when determining the reaction to fire performance and the field of application of the test results.

Table A.1

Product parameters	EN ISO 1182 (class A1 and A2)	EN ISO 1716 (class A1 and A2)	EN 13823 (SBI) (class A2 to D)	EN ISO 11925-2 (class B to F)
Thickness	No influence	No influence	X	No influence
Bulk density	X	No influence	X	X
Organic content	X	X	X	X
Composition	X	X	X	X

Table A.2

Installation parameters	EN 13823 (SBI)	EN ISO 11925-2
Substrates	X	Not relevant
Air gaps / cavities	Not relevant	Not relevant
Joints / edges	Not relevant	Not relevant
Size and positioning of test specimen	X	X
Fixing of test specimen	X	Not relevant
Product orientation and geometry	Not relevant	Not relevant
Exposure to thermal attack	X	X

Ageing or weathering procedures are not relevant for loose mineral wool

A.3 Specific provisions for conducting the reaction to fire tests

A.3.1 Preparing and conditioning of the test specimens

Any test specimens shall be prepared and conditioned in accordance with the provisions given in EN 13238, clause 4.2, and the relevant reaction to fire test standard.

A.3.2 Testing according to EN ISO 1182

The following shall be considered within the tests:

- each separate chemical composition (type of fibre, type of binder and additives)
- highest as well as lowest bulk density
- highest organic content (percentage per mass)

The specimen holder as prescribed in EN ISO 1182 has to be used for testing purposes.

The results of tests taking into account the aforementioned parameters are valid for loose mineral wool with:

- the same chemical composition,
- the entire range of bulk densities between those evaluated and
- the same or lower organic content (in percentage per mass).

A.3.3 Testing according to EN ISO 1716

The following shall be considered within the tests:

- each separate chemical composition (type of fibre, type of binder and additives)
- highest organic content (percentage per mass)

The results of tests taking into account the aforementioned parameters are valid for loose mineral wool with:

- the same chemical composition and
- the same or lower organic content (in percentage per mass).

A.3.4 Testing according to EN 13823 (SBI)

For the purposes of testing of loose mineral wool a cage shall be used forming a L-shape with dimensions (width and height of long and short wing) given in EN 13823, but without any joints on the long wing and in the inner corner of the test specimens. The cage is to be made of a galvanized steel frame (angles of 25 x 25 x 3 mm at the outer edges of the long and the short wing) and one or two galvanized steel meshes. The first mesh shall have a size of 4 x 4 mm and a wire thickness of 0,7 mm. To avoid moulding of the cage a second mesh layer can be used as reinforcement with a mesh size of 40 x 40 mm and a wire thickness of 2 mm.

The rear side of the cage is to be formed by an appropriate standard substrate acc. to EN 13238.

The entire test specimen (including the standard substrate acc. to EN 13238) shall be mounted directly in front of the backing board of the SBI test apparatus and fixed with some less mechanical fixing devices.

In the case of conducting SBI tests, comparative tests by a notified testing lab shall have proven (taking into account doc. NB-CPR-SH02-15-594r1) that the wire meshes on the surface – which are being used to hold the loose mineral wool in the test specimen - do not influence the final testing results in the SBI tests. This is achieved by performing tests using both methods.

The following product parameters shall be taken into account within the tests:

- a) chemical composition
each separate chemical composition (type of fibre, type of binder and additives)
- b) thickness
 - the highest thickness, if a standard substrate acc. to EN 13238 of class A1 or A2 is used, or
 - the highest as well as the lowest thickness, if a combustible substrate (of class B or lower) acc. to EN 13238 is used
- c) organic content
the highest organic content (in percentage per mass)
- d) bulk density
the highest as well as the lowest bulk density.

The results of tests taking into account the aforementioned parameters are valid for loose mineral wool with:

- the same chemical composition,
- the same or lower organic content (in percentage per mass),
- the whole range of bulk densities between those evaluated,
- the same or lower thickness, if a class A1 or A2 standard substrate acc. to EN 13238 has been used for testing, or
- all thickness between those evaluated, if a combustible standard substrate (class B or lower) acc. to EN 13238 has been used for testing.

Test results on specimens with a total thickness of about 200 mm (including the standard substrate) are also valid for any higher thickness.

A.3.5 Testing according to EN ISO 11925-2

A specimen holder as described and shown in figure 3c) of the test standard shall be used for testing purposes. Only in cases where material falls down from this specimen holder, an additional wire lacing as described in clause 4.5e) and shown in figure 3d) of the test standard shall be used to retain the specimen material.

The following parameters shall be considered within the tests:

- each separate chemical composition (type of fibre, type of binder and additives),
- the highest organic content (in percentage per mass) and
- the highest as well as the lowest bulk density.

The results of tests taking into account the aforementioned parameters are valid for loose mineral wool with:

- the same chemical composition,
- the same or lower organic content (in percentage per mass),
- the whole range of bulk densities between those evaluated and
- any thickness.