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Authorised and notified according to Article 10 of the Council Directive of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products (89/106/EEC)

Deutsches Institut für Bautechnik

DIBt

Mitglied der EOTA
Member of EOTA

European Technical Approval ETA-13/0549

English translation prepared by DIBt - Original version in German language

Handelsbezeichnung *Trade name*		MISAPOR
Zulassungsinhaber *Holder of approval*		Misapor Management AG Löserstrasse 2 7302 LANDQUART SCHWEIZ
Zulassungsgegenstand und Verwendungszweck *Generic type and use of construction product*		Werksmäßig hergestellte Schüttung aus Schaumglasschotter *Factory made cellular glass loose fill*
Geltungsdauer: *Validity:*	vom *from* bis *to*	22 June 2013 22 June 2018
Herstellwerke *Manufacturing plants*		siehe Anhang 1 *see Annex 1*

Diese Zulassung umfasst *This Approval contains*	11 Seiten einschließlich 1 Anhang *11 pages including 1 annex*

I LEGAL BASES AND GENERAL CONDITIONS

1 This European technical approval is issued by Deutsches Institut für Bautechnik in accordance with:

- Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products[1], modified by Council Directive 93/68/EEC[2] and Regulation (EC) N° 1882/2003 of the European Parliament and of the Council[3];
- *Gesetz über das In-Verkehr-Bringen von und den freien Warenverkehr mit Bauprodukten zur Umsetzung der Richtlinie 89/106/EWG des Rates vom 21. Dezember 1988 zur Angleichung der Rechts- und Verwaltungsvorschriften der Mitgliedstaaten über Bauprodukte und anderer Rechtsakte der Europäischen Gemeinschaften (Bauproduktengesetz - BauPG) vom 28. April 1998[4], as amended by Article 2 of the law of 8 November 2011[5];*
- Common Procedural Rules for Requesting, Preparing and the Granting of European technical approvals set out in the Annex to Commission Decision 94/23/EC[6].

2 Deutsches Institut für Bautechnik is authorized to check whether the provisions of this European technical approval are met. Checking may take place in the manufacturing plant. Nevertheless, the responsibility for the conformity of the products to the European technical approval and for their fitness for the intended use remains with the holder of the European technical approval.

3 This European technical approval is not to be transferred to manufacturers or agents of manufacturers other than those indicated on page 1, or manufacturing plants other than those laid down in the annex 1 to this European technical approval.

4 This European technical approval may be withdrawn by Deutsches Institut für Bautechnik, in particular pursuant to information by the Commission according to Article 5 (1) of Council Directive 89/106/EEC.

5 Reproduction of this European technical approval including transmission by electronic means shall be in full. However, partial reproduction can be made with the written consent of Deutsches Institut für Bautechnik. In this case partial reproduction has to be designated as such. Texts and drawings of advertising brochures shall not contradict or misuse the European technical approval.

6 The European technical approval is issued by the approval body in its official language. This version corresponds fully to the version circulated within EOTA. Translations into other languages have to be designated as such.

1 Official Journal of the European Communities L 40, 11 February 1989, p. 12
2 Official Journal of the European Communities L 220, 30 August 1993, p. 1
3 Official Journal of the European Union L 284, 31 October 2003, p. 25
4 *Bundesgesetzblatt Teil I 1998*, p. 812
5 *Bundesgesetzblatt Teil I 2011*, p. 2178
6 Official Journal of the European Communities L 17, 20 January 1994, p. 34

II SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

1 Definition of the products and intended use

1.1 Definition of the construction product

This European technical approval applies to the thermal insulation fill made of recycled waste glass powder. This foam glass gravel consists of factory made particles of cellular foamed glass, with typical size 10/50 mm or 10/75 (nominal sizes d/D). Typical loose bulk density, dry, is in the range of approximately 125 – 190 kg/m³. The thermal insulation fill "MISAPOR" is manufactured in two standard classes.

Depending on particle size the insulating material is designated as follows:

particle size ≤ 50 mm "MISAPOR 10/50",

particle size ≤ 75 mm "MISAPOR 10/75".

1.2 Intended use

Typical uses are thermal insulation/frost protection layer underneath building foundations or floor slabs in areas with in-ground frost and lightweight fill.

Under load-bearing structures the fill material shall be compacted to obtain optimal load bearing capacity, though without excessive crushing.

Areas for application in building constructions:

- thermal insulation/frost protection layer under floor slaps in areas with load-bearing function (subjected to static or quasi-static loading)
- thermal insulation layer/frost protection layer under floor slaps without load-bearing function
- water capillary barrier and drainage for in-ground constructions
- lightweight fill

As to the application of thermal insulation loose fill, the respective national regulations shall in addition be observed.

1.3 Assumed working life of the construction product

The provisions made in this European technical approval are based on an assumed working life of the thermal insulation products of 50 years, provided that the conditions laid down in sections 4.2/5.1 for the packaging/transport/storage/installation are met. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

2 Characteristics of the products and methods of verification

2.1 Composition and production methods

With regard to composition and production method the thermal insulation loose fill shall correspond to that which was the basis for the approval tests. Composition and production methods are deposited with Deutsches Institut für Bautechnik. See also clause 4.1.

2.2 Release of dangerous substances

The thermal insulation is manufactured from recycled glass. Table 1 shows the limit values of selected chemical substances determined in the approval testing after digestion for subsequent determination of aqua regia soluble according to EN 13657[7].

Table 1: Limit values of chemical substances

row	Chemical substance	analytical method	limit value [µg/l]
1	arsenic (As)	EN ISO 11885[8]	10
2	plumb (Pb)	EN ISO 11885[8]	7
3	cadmium (Cd)	EN ISO 11885[8]	0.5
4	chromium (Cr)	EN ISO 11885[8]	7
5	copper (Cu)	EN ISO 11885[8]	14
6	nickel (Ni)	EN ISO 11885[8]	14
7	quicksilver (Hg)	EN ISO 12846[9]	0.2
8	zinc (Zn)	EN ISO 11885[8]	58

Note: In addition to the specific clauses relating to dangerous substances contained in this European Technical Approval, there may be other requirements applicable to the products falling within its scope (e. g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the Construction Products Directive, these requirements need also to be complied with, when and where they apply.

2.3 Density

Loose bulk density is measured in accordance with EN 1097-3[10].

Densities in wet and dry state are given in Table 2, with varying ratios of compaction.

Table 2: Densities in dry and wet state with varying ratios of compaction

Product	Densities in kg/m³	
	MISAPOR 10/50	MISAPOR 10/75
Dry Loose bulk	160-190	125-150
Dry Compaction 1.3:1	208-247	163-195
Wet, moisture content 12 % by volume. Compaction 1.3 : 1 (Moisture content obtained after 28 days of immersion in accordance with EN 12087)	310	290

[7] EN 13657:2002 — Characterization of waste; Digestion for subsequent determination of aqua regia soluble portion of elements in waste

[8] EN ISO 11885:2009 — Water quality; Determination of selected elements by inductively coupled plasma optical emission; spectrometry (ICP-OES) (ISO 11885:2007)

[9] EN ISO 12846:2012 — Water quality - Determination of mercury - Method using atomic absorption spectrometry (AAS) with and without enrichment

[10] EN 1097-3:1998 — Tests for mechanical and physical properties of aggregates; Part 3: Determination of loose bulk density and voids

2.4 Particle size distribution

The particle size distribution is measured in accordance with EN 933-1[11], applying sieve sizes according to EN 933-2[12]. Nominal aggregate size in mm is

for "MISAPOR 10/50" d/D = 10-50 mm and

for "MISAPOR 10/75" d/D = 10-75 mm.

The cleanliness of the aggregate is $G_{85/15}$ which means that the content of oversize material shall not exceed 15 % by mass and the undersize material shall not exceed 15 % by mass.

2.5 Thermal conductivity

The thermal conductivity is measured in accordance with EN 12667[13] at a mean temperature of 10 ± 0.3 °C on compacted (1.3 : 1) test specimens. The declared value of thermal conductivity is representative for at least 90 % of the production with a confidence level of 90 %. For the admissible deviation of an individual value of the thermal conductivity from the declared value the method described in the standard EN 13172[14], Annex F applies.

Table 3: Thermal conductivity

Product	Compaction degree	Compacted density 1.3 : 1 (dry) (kg/m³)	Declared thermal conductivity dry material λ_D (W/(m·K))	Correction factor moisture content 1 to 5 % by volume F_m
MISAPOR 10/50	1.3 : 1	225	0.103	1.20
MISAPOR 10/75	1.3 : 1	175	0.082	1.28

2.6 Water absorption by total immersion

Long term water absorption by total immersion is determined following EN 12087[15], method 2 (total immersion) on not compacted (see Table 4) and on compacted specimens (1.3 : 1, see Table 5).

Table 4: Water absorption by total immersion on not compacted specimens in percent by volume

Product	Loose bulk density (dry) kg/m³	28 days of total immersion % (by volume)
MISAPOR 10/50	160-190	≤ 6
MISAPOR 10/75	125-150	≤ 9

[11] EN 9331:2012 Test for geometrical properties of aggregates; Part 1: Determination of particle size distribution; Sieving method

[12] EN 933-2:1995 Test for geometrical properties of aggregates; Part 2: Determination of particle size distribution; Test sieves, nominal size of apertures

[13] 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:

[14] EN 13172:2012 Thermal insulating products – Evaluation of conformity

[15] EN 12087:2013 Thermal insulation products for building applications; Determination of long term water absorption by immersion

Table 5:Water absorption by total immersion on compacted specimens in percent by volume

Product	Compacted density 1.3 : 1 (dry) kg/m³	28 days of total immersion % (by volume)
MISAPOR 10/50	225	≤ 10
MISAPOR 10/75	175	≤ 15

2.7 Resistance to freezing and thawing

The resistance to freezing and thawing is tested as follows:

The compacted specimens are first exposed for long term water absorption by total immersion following EN 12087[15] over a period of 28 days and then they are subjected to 25 freeze-thaw cycles. Each freeze-thaw cycle consist of a 9 hour frost exposure at minus 20 °C followed by 15 hours of thawing in a water bath at about 20 °C.

Table 6: Water absorption after total immersion and 25 freeze-thaw cycles

Product	Compacted density 1.3 : 1 (dry) (kg/m³)	Water absorption by total immersion EN 12087[15] W_{lt} (% by volume)	Water absorption during 25 freeze-thaw cycles W_m (% by volume)
MISAPOR 10/50	225	10.0	16.0
MISAPOR 10/75	175	15.0	18.0

2.8 Water vapour transmission

The water vapour resistance factor (μ) may be assumed to be in the range from 1 to 3.

2.9 Capillary water suction height

The capillary water suction height is measured following EN 1097-10[16], with modifications described in the EOTA testing procedure ("Factory made cellular glass loose fill" Edition June 2005, Revision May 2013)[17]. The capillary water suction height is presented in Table 7.

Table 7: Water suction height and water absorption

Product	Compacted density 1.3 : 1 (dry) (kg/m³)	Water suction height mm	Water absorption after 21 days (kg/m²)
MISAPOR 10/50	225	< 150	15
MISAPOR 10/75	175	< 150	8.3

[16] EN 1097-10:2002 Tests for mechanical and physical properties of aggregates; Part 10: Determination of water suction height

[17] Deposited at Deutsches Institut für Bautechnik.

2.10 Load bearing capacity

The oedometer modulus (compression stiffness) is measured in accordance with the giant oedometer test procedure described in the EOTA testing procedure ("Factory made cellular glass loose fill" Edition June 2005, Revision May 2013)[17]. The test procedure is similar to a standard drained oedometer test as described in EN 1997-2[18], but modified to suit a material with large particle size and low crushing resistance. The test was performed on test specimens with the actual degree of compaction (1.3 : 1). After compaction the test specimen are subjected to a series of incrementally increasing static loads, while the corresponding vertical deformation is recorded versus time.

Table 8: Oedometer modulus and strain at different stress levels

Product	Loose bulk density (dry) (kg/m³)	Compacted (1.3 : 1) density (dry) (kg/m³)	Stress level (kPa)	Oedometer modulus (MPa)	Strain (%)
MISAPOR 10/50	175	225	80	13	1.0
			100	18	1.1
			150	22	1.3
			250	18	1.8
MISAPOR 10/75	130	170	80	6	3.0
			100	8	3.3
			150	10	3.8

Note:
If the cellular glass loose fill is to be used under concentrated loads there may be the necessity of an additional assessment according to national application rules.

2.11 Compressive stress at 10 % deformation

The compressive stress at 10 % deformation, determined according to EN 826[19] with modifications described in the EOTA testing procedure ("Factory made cellular glass loose fill" Edition June 2005, Revision May 2013)[17], has to be measured on dry specimens and on specimens, which were first exposed for long term water absorption by total immersion over a period of 28 days and then they were subjected to 25 freeze-thaw cycles. The reduction of compressive stress at 10 % deformation measured on wet specimens shall not be more than 10 % compared to the actual measured compressive stress at 10 % deformation (dry).

Table 9: Compressive stress at 10 % deformation

Product	Density after compaction kg/m³	Compressive stress at 10 % deformation (dry)
MISAPOR 10/50	225	≥ 660
MISAPOR 10/75	175	≥ 420

[18] EN 1997-2:2007 + AC: 2010 EUROCODE 7; Geotechnical design; Part 2: Ground investigation and testing
[19] EN 826:2013 Thermal insulating products for building applications; Methods for determination of compression behaviour

2.12 Settlement and creep strains

The long-term creep behavior is measured in accordance with the giant oedometer test procedure described in the EOTA testing procedure ("Factory made cellular glass loose fill" Edition June 2005, Revision May 2013)[17]. The long-term creep behavior and the maximum settlement for the stress level are given in Table 10.

Table 10: Long-term creep behavior

Product	Density after compaction (1.3 : 1) kg/m³	Stress level kPa	initial thickness reduction %	creep deformation after test time 35 days %	Expected total deformation after 50 years %
MISAPOR 10/50	225	250 500	1.8 6.7	- 6.4	1.8 13.1
MISAPOR 10/75	170	150 500	3.8 11.3	- 6.2	3.8 17.5

2.13 Reaction to fire

Cellular glass is considered to satisfy the requirements for performance class A1, in accordance with the provisions of EC decision 96/603/EC (as amended) without the need for testing on the basis of its listing in that decision.

3 Evaluation and attestation of conformity and CE marking

3.1 System of attestation of conformity

According to the communication of the European Commission[20] the system 3 of attestation of conformity laid down in the decision 1999/91/EC of the European Commission[21] for thermal insulating products applies also to the thermal insulation product of particles of cellular glass.

The system of attestation of conformity is defined as follows:

System 3: Declaration of conformity of the product by the manufacturer on the basis of:

(a) Tasks for the manufacturer:

(1) factory production control;

(b) Tasks for the approved body:

(2) initial type-testing of the product.

Note: Approved bodies are also referred to as "notified bodies".

3.2 Responsibilities

3.2.1 Tasks for the manufacturer

3.2.1.1 Factory production control

The manufacturer shall exercise permanent internal control of production. All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures, including records of results performed. This production control system shall insure that the product is in conformity with this European technical approval.

The manufacturer may only use raw materials stated in the technical documentation of this European technical approval.

[20] Letter of the European Commission of 20 March 2009 to EOTA

[21] Official Journal of the European Communities L 29/44 of 03/02/1999

The factory production control shall be in accordance with the control plan which is part of the technical documentation of this European technical approval. The control plan is laid down in the context of the factory production control system operated by the manufacturer and deposited with Deutsches Institut für Bautechnik[22].

The results of factory production control shall be recorded and evaluated in accordance with the provisions of the control plan.

3.2.1.2 Other tasks for the manufacturer

The manufacturer shall, on the basis of a contract, involve a body which is approved for the tasks referred to in section 3.1 in the field of thermal insulation fills in order to undertake the actions laid down in section 3.2.2. For this purpose, the control plan referred to in sections 3.2.1.1 and 3.2.2 shall be handed over by the manufacturer to the approved body involved.

The manufacturer shall make a declaration of conformity, stating that the construction product is in conformity with the provisions of this European technical approval.

3.2.2 Tasks for the approved bodies

The approved body shall perform the

- initial type-testing of the product,

in accordance with the provisions laid down in the control plan.

For initial type-testing the results of the test carried out as part of the assessment for the European technical approval shall be used, provided nothing changes in the production or at the factory. Otherwise the necessary initial type-testing shall be agreed on between Deutsches Institut für Bautechnik and the approved bodies involved.

The approved body shall retain the essential points of its actions referred to above and state the results obtained and conclusions drawn in a written report.

3.3 CE marking

The CE marking shall be affixed on the packaging or on the accompanying commercial document, e. g. the EC declaration of conformity. The letters "CE" shall be accompanied by the following additional information:

- the name and address of the producer (legal entity responsible for the manufacture),
- the last two digits of the year in which the CE marking was affixed,
- the number of the European technical approval,
- Identification of the product (trade name),
- Declared loose bulk density of delivery in kg/m³,
- Declared grading [d/D] and cleanliness [G85/15].

[22] The control plan is a confidential part of the European technical approval and only handed over to the approved body involved in the procedure of attestation of conformity. See section 3.2.2.

4 Assumptions under which the fitness of the thermal insulation fill for the intended use was favourably assessed

4.1 Manufacturing

The European technical approval is issued for the product on the basis of agreed data/information, deposited with Deutsches Institut für Bautechnik, which identifies the product that has been assessed and judged. Changes to the product or production process, which could result in this deposited data/information being incorrect, should be notified to Deutsches Institut für Bautechnik before the changes are introduced. Deutsches Institut für Bautechnik will decide whether or not such changes affect the approval and consequently the validity of the CE marking on the basis of the approval and if so whether further assessment or alterations to the approval shall be necessary.

4.2 Installation of the product

The cellular glass loose fill must be applied and compacted without excessive crushing.

It is the responsibility of the manufacturer to ensure that proper information for the use of the cellular glass loose fill is available at each delivery, including general guidance on the basis of the ETA.

The installation instructions given by the manufacturer shall be taken into account.

4.3 Parameters for the design of construction works or parts of construction works

The design values of thermal conductivity and compressive stress shall be laid down according to relevant national provisions.

The verification of stability and settlement is to be performed according to the national regulations.

5 Indications to the manufacturer

5.1 Packaging, transport and storage

Packaging of the product shall be such that the product is mostly protected from humidity during transport and storage unless there are other measures for this purpose provided for by the manufacturer.

Dirk Brandenburger
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beglaubigt:
Wendler

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Annex 1

Manufacturing plants:

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