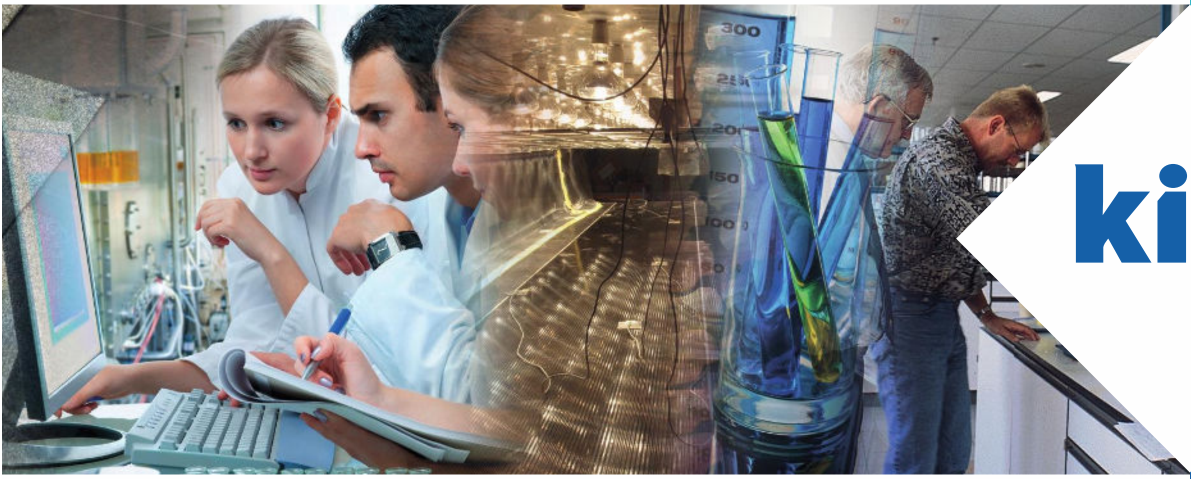
0619-L-21/1
10 May 2022

Test report

Magnesiet



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BDA TESTING

0619-L-21/1
10 May 2022

Test report

Magnesiet

Kiwa BDA Testing B.V.
Avelingen West 35-37
P.O. Box 389
4200 AJ Gorinchem
The Netherlands

Tel. +31 183 669 690
testing@bda.nl
www.kiwabda.nl

Commercial register Registered by Chamber of Commerce Midden Nederland 23059445

Details

Principal	Woodstock Vloeren B.V. Meiland 17 NL-1713 GJ OBDAM
Contact person	S. de Leeuw
Email	sjgdeleeuw@icloud.com
Date of order	11 January 2022
Project number	0619-L-21/1
Author	A.R. Hameete
Subject	determination of thermal resistance

Contents

1 Introduction

By order of Woodstock Vloeren B.V., Kiwa BDA Testing B.V. has determined the thermal resistance of **Magnesiet**.

On 17 February 2022 a sample, provided by Mrs J. Liphuyzen of Woodstock Vloeren B.V., has been received at Kiwa BDA Testing B.V. for the purpose of testing.

On the sample no data or further identification marks have been found.

Table 1 – Other product data

Subject	Description
Manufacturer/supplier	Woodstock Vloeren B.V.
Material	Magnesiet
Relevant product standard	not revealed
Production date/code	24-01-2022
Finishing / Facing	Non
Nominal thickness	60 mm
Mass / Density	not revealed

Kiwa BDA Testing is not responsible for the product data revealed by the principal and/or found on the sample.

See annex I for photos of the delivered sample.

2 Investigation

The investigation into the thermal resistance has been performed according to 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.

The dimensions of the test specimens have been determined at 600 mm × 600 mm × thickness.

The test specimens have not been prepared by Kiwa BDA Testing B.V., but have been delivered poured into a wooden frame. There is a thin plastic foil at the bottom side of the frame.

The test equipment concerns a single-specimen heat flow meter (LaserComp FOX602 L, S.N. 18112359), and has been calibrated on 8 March 2022 using the European reference material IRMM-440 (see annex II). The test equipment has been positioned in a conditioned room at 23 °C and 50% relative humidity.

The measuring device of the equipment has been orientated horizontally, at which the hot plate has been located at the bottom side and the cold plate has been located at the topside of the test specimen. In order to prevent so called edge heat losses the metering zone of the apparatus has been equipped with circa 100 mm insulation and a *dual zone heating / cooling*.

The investigation has been performed by Mr J.C. Delgado of Kiwa BDA Testing B.V. in week 10, 2022.

For these thermal resistance measurements Kiwa BDA Testing B.V. has been designated as a Keymark Registered Laboratory.

Keymark Registered Laboratory

3 Results

Table 2 – Test results

Description	Unit	Result
Date of completion of the test	-	09-03-2022
Thermal resistance	$m^2.K.W^{-1}$	0,324
Thermal conductivity (λ_{10})	$W.m^{-1}.K^{-1}$	0,1939
Density of heat flow	$W.m^{-2}$	61,8
Average temperature difference across specimen	K	20,0
Mean temperature of test	°C	10,0
Measured thickness, (obtained from apparatus)	mm	62,7
Initial mass	g	13450,1
Mass after thermal measurements	g	13451,6
Change of mass during measurements	% (*m/m*)	0,0

Remarks:

The results are only related to the investigated samples, products and/or systems. Kiwa BDA Testing B.V. is not liable for interpretations or conclusions that are made in consequence of the results obtained.

Sampling was not performed by Kiwa BDA Testing B.V., so no judgement can be given with regard to the origin and representativeness of the samples.

Gorinchem, 10 May 2022
The laboratory

A.R. Hameete
operational manager

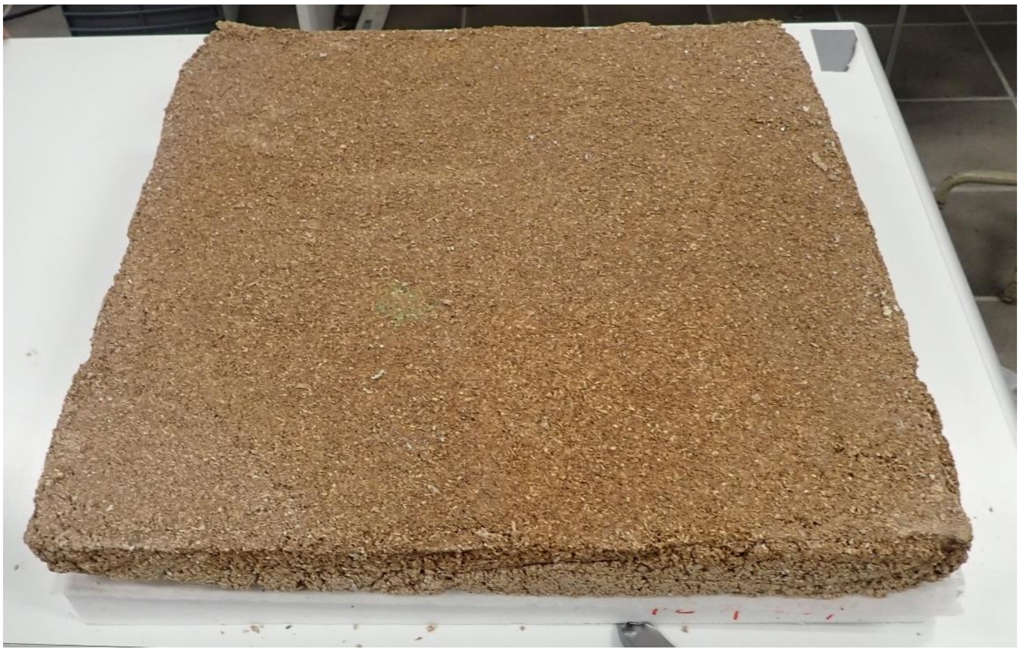
Kiwa BDA Testing B.V.

N.W.J. Haanappel BSc
manager testing

Designated as Notified Body NB 1640 pursuant to the Construction Products Regulation (EU, No 305/2011)

TESTING
RvA L 447

I Photos of the delivered sample




STANLEY
3m

II Certificate of measurement

European Commission

JOINT RESEARCH CENTRE
Directorate F – Health, Consumers and Reference Materials

CERTIFICATE OF ANALYSIS

IRMM – 440 D

RESIN BONDED GLASS FIBRE BOARD		
	Thermal Conductivity	
	Certified value [2] [W/(m·K)]	Uncertainty [3] [W/(m·K)]
Thermal conductivity [1] as a function of test temperature T in °C for -10 °C ≤ T ≤ 50 °C	$2.93949 \cdot 10^{-2} + \frac{T}{°C} \cdot 1.060 \cdot 10^{-4} + \frac{T^2}{(°C)^2} \cdot 2.047 \cdot 10^{-7}$	0.00028

1) Thermal conductivity as determined by the guarded hot plate technique (ISO 8302).
2) The certified value is valid only in the temperature range [-10, 50] °C, and only for samples within the density range [64, 78] kg/m³. The certified value is deduced from results obtained at 6 laboratories, each using the guarded hot plate technique, a primary method. The value is traceable to the International System of Units (SI).
3) Uncertainty at about 95 % confidence level over the temperature range [-10, 50] °C. The uncertainty is deduced from the uncertainties of thermal conductivity measurements at the 6 participating laboratories, and from the uncertainty due to the fit of thermal conductivity versus temperature.

This certificate is valid for 18 years after purchase or 200 measurement cycles.

Sales date: 16 NOV 2020

DESCRIPTION OF THE SAMPLE

Identification number	17
Length (mm) x width (mm)	1200 x 1200
Thickness (mm)	34.8
Apparent density (kg/m^3)	73.0

Geel, March 2000
Latest revision: January 2019

Signed: D. Flo

Dr Doris Florian
Head of Unit Reference Materials
European Commission, Joint Research Centre
Directorate F – Health, Consumers and Reference Materials
Retieseweg 111
B-2440 Geel, Belgium

All following pages are an integral part of the certificate.
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NOTE

This material replaces the exhausted BCR-064B.

Indicative Values		
	Thermal conductivity	
	Indicative value [2] [W/(m K)]	Uncertainty [3] [%]
Thermal conductivity [1] as a function of test temperature T in °C for -170 °C ≤ T < - 10 °C	$2.95 \cdot 10^{-2} + \frac{T}{°C} \cdot 1.08 \cdot 10^{-4} + \frac{T^2}{(°C)^2} \cdot 2 \cdot 10^{-8}$	5

1) Thermal conductivity as determined by the guarded hot plate technique (ISO 8302).

2) The indicative value is obtained by fitting of an unweighted second-order polynomial through data obtained by 5 laboratories as described by A. Koenen, C. Stacey, E. Rasmussen, R. Schreiner, G. Swolek, *International Comparison of Guarded Hot Plate Facilities at Low Temperature on Mineral Wool Insulation Material*, Proceedings of the ITCC 32nd International Thermal Conductivity Conference and 20th International Thermal Expansion Symposium April 27–May 1, 2014 (in press). The value is traceable to the International System of Units (SI).

3) Relative expanded uncertainty (k=2.78) at about 95 % confidence level over the temperature range [-10, -170] °C. The uncertainty is deduced from the uncertainties of thermal conductivity measurements at the 5 participating laboratories and from the uncertainty due to the fit of thermal conductivity versus temperature.

ANALYTICAL METHOD USED FOR CERTIFICATION

Specimen thickness measurements

Each specimen was put on a reference table and was gently covered by a measuring plate. The flatness of the table and the measuring plate was better than 0.05 mm. The nominal dimensions of the measuring plate were equal to or slightly larger than the specimen itself and its mass was such that the pressure applied on the specimen was the same as the one in the apparatus during the thermal conductivity measurements. The current working pressure for Guarded Hot Plate or Heat Flow Meter apparatuses is from 1000 Pa up to 2000 Pa. This pressure range ensures adequately uniform contact between the specimen and the cold and hot plates of the apparatus. The thickness of each specimen was measured at the four corners of the measuring plate using gauge comparators or micrometers.

Specimen density measurements

The specimen apparent density was calculated from the measurements of the mass, length and width of specimens and from the thickness measurements as described above. These physical characteristics were measured after the conditioning of the specimens in the surrounding environment (standard laboratory atmosphere) to reach equilibrium with the environment (constant mass). The specimen apparent density is given by dividing the mass by its volume (length x width x thickness).

Thermal conductivity measurements

The thermal conductivity measurements were carried out according to the International Standard ISO 8302 using Guarded Hot Plate (GHP) apparatuses. In order to avoid thickness change during the measurements (due to the compressibility of the material), the specimen thickness was fixed using spacers or plate separation. The principle of thermal conductivity measurements (using the example of a two specimen GHP apparatus) and the details of the test results are given in the certification report.

PARTICIPANTS

- Dipartimento di Fisica Tecnica (DFT), Universitá degli studi di Padova, Padova (IT)
- Eidgenössische Materialprüfungs- und Forschungsanstalt (EMPA), Section Building Physics 176, 8600 Dübendorf (CH)
- Forschungs-Institut für Wärmeschutz e.V. München (FIW), 82166 Gräfelfing (DE)
- Instytut Mechanizacji Budownictwa i Górnictwa Skalnego (IMBiGS), Warszawa (PL)
- Laboratoire National d'Essais (LNE), Division Energie et Produits pour la Construction, 78197 Trappes Cedex (FR)
- National Physical Laboratory (NPL), Thermophysical Properties Section, Teddington, Middlesex TW11 0LW (GB)
- Rockwool International, Hedehusene (DK)
- Sveriges Provnings- och Forskningsinstitut (SP), Building Physics, 501 15 Boras (SE)

SAFETY INFORMATION

Precautions need to be taken to avoid inhalation or excessive exposure of the operator skin to glass fibre fragments.

INSTRUCTIONS FOR USE

Intended use

The reference material is intended for the quality control of equipment for absolute measurements (i.e. Guarded Hot Plate equipment, Guarded Hot Box equipment...), or for the calibration of instruments based on relative measuring methods (i.e. Heat Flow Meter equipment). In the latter case (reference material used for calibration), it is particularly important to follow the instructions for use of the reference material to avoid measurement errors.

Sample conditioning before measurements

Before performing the thermal conductivity measurements, the reference material shall be dried in an oven at a temperature ranging from 70 °C to 100 °C until a constant mass is obtained. Then, the reference material shall be conditioned in the standard atmosphere of the laboratory (usually temperature from 20 °C up to 23 °C - relative humidity from 40 % RH up to 65 % RH) to reach equilibrium with the environment. This is achieved if two successive mass measurements with a 24 h interval do not differ by more than 0.5 %. It is imperative to verify that the density of the sample is in the certification range [64, 78] kg/m^3.

Precautions during the thermal conductivity measurements

In order to avoid the thickness change (and density change) of the reference material during the thermal conductivity measurements (due to the compressibility of the material), the sample thickness shall be fixed with adequate spacers or plate separation. When using spacers, it is recommended to measure prior to testing the spacers size at each mean test temperature, particularly when operating over the full range [-10, 50] °C, in order to avoid thickness measurement errors due to thermal expansion of the spacers. Whenever possible, accurate thickness measurements should be carried out in situ.

When operating below ambient temperature, it is recommended to control the dew point of the atmosphere surrounding the reference material at least 5 °C below the cold plate temperature or to place the reference material in a vapour-tight envelope during the thermal conductivity measurements, in order to avoid moist air transfer into the apparatus, causing condensation and/or freezing of water vapour within the material,.

Mass check after the thermal conductivity measurements

After completion of a series of tests, the reference material shall be removed from the apparatus and after reaching equilibrium with the standard laboratory atmosphere, the reference material shall be weighed again. The difference between mass determinations before and after the thermal conductivity measurements should be within 0.5 % to ensure the absence of disturbing moisture transfer into the sample during the thermal conductivity measurements.

Size reduction

The reduction of the size of the sample to suit the lateral dimensions of a particular equipment, is allowed. However, the thickness of the reference material sample shall not be modified by such slicing. The minimum size of sample to be used is 30 x 30 cm².

Re-use of the material

The data available demonstrate that, provided samples are not physically damaged and stored properly, IRMM-440 is stable over extended periods and frequent measurement cycles and a shelf life of 18 years or 200 heating cycles was set.
Based on the care of handling and storage conditions, samples may be stable for even longer, but this is beyond the control of JRC. Customers can demonstrate the stability of their individual sample beyond the stated shelf lives by performing regression analyses in the same way as described in the certification report.

STORAGE

To protect the reference material from accidental damage, it is recommended to keep it in a strong protective box. However, the European Commission cannot be held responsible for changes that happen during storage of the material at the customer's premises, especially of opened samples.

LEGAL NOTICE

NOTE

A certification report on the production of IRMM-440 is supplied on the internet (https://crm.jrc.ec.europa.eu). A paper copy can be obtained from the JRC on explicit request

European Commission – Joint Research Centre
Directorate F – Health, Consumers and Reference Materials
Retieseweg 111, B - 2440 Geel (Belgium)
Telephone: +32-(0)14-571.705 - Fax: +32-(0)14-590.406
jrc-rm-distribution@ec.europa.eu