INSTITUTE OF ARCHITECTURE AND CONSTRUCTION OF KAUNAS UNIVERSITY OF TECHNOLOGY

BUILDING PHYSICS LABORATORY

NACIONALINIS AKREDITACIJOS BIURAS

Bandymai / tyrimai ISO/IEC 17025

ilac-MRA

Nr. LA.01.031

TEST REPORT No. 267 SF/24 R
Date: 4th of November 2024

Test methods: **LST EN ISO 22097:2023** Thermal insulation for buildings - Reflective insulation products - Determination of thermal performance.
LST EN 12667:2002 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.
Test method – heat flow meter.
Type and identification of apparatus – symmetrical single-specimen apparatus No. 1/99 (ISO 8301).
(number of normative document or test method, description of test procedure, test uncertainty)

Customer: SAS ATI FRANCE, SAS ATI FRANCE, Parc industriel de la Plaine de l'Aine - 1 Avenue des Troussilières- 01150 BLYES, France
(name and address)

Manufacturer: SAS ATI FRANCE, SAS ATI FRANCE, Parc industriel de la Plaine de l'Aine - 1 Avenue des Troussilières- 01150 BLYES, France
(name and address)

Samples description: Type 2 multilayer reflective insulation **Bulld'Oz'Air**, 600×600mm; Declared thickness of product 12±2mm.
(name, description and identification details of a specimen)

Samples selected: By customer
(who selected/place/date)

Samples delivery date: 29/10/2024

Place of samples conditioning: Building Physics Laboratory, Institute of Architecture and Construction Kaunas University of Technology, Tunelio st. 60, LT 44451 Kaunas, Lithuania
(name and address)

Samples conditioning date: 29/10/2024 – 30/10/2024 **Date of testing:** 30/10/2024 –31/10/2024

Production date: no data

Tested at: Building Physics Laboratory IAC KTU
(name and address)

Test results:

Name of the indicator and unit	Test method reference no.	Test result
Declared core thermal resistance of product **Bulld'Oz'Air**, $R_{D(core)}$90/90, (m²·K)/W	LST EN ISO 22097:2023	**0.29**
Declared thermal resistance of system with 2 air gaps R_{system} 90/90, (m²·K)/W		**1.60**

Additional information: Mean ambience temperature 10.00 °C, Ambience relative humidity 65.0 %.

Annexes: ***Annex 1.*** Tests results; ***Annex 2.*** Calculation of declared thermal resistance***; Annex 3.*** Calculation of thermal resistance including associated airspaces; ***Annex 4.*** The parameters of heat flow meter apparatus.

Technical manager: (approves the test results) — (signature) — J. Ramanauskas (n., surname)

Tested by: (technically responsible for testing) — (signature) — A. Burlingis (n., surname)

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S.P.

Annex 1. ***Tests results:***

Specimen No. 267-1/24

Heat flow direction – vertical		
Conditioning of sample – Climate chamber 48 h, T = 23±2°C, RH = 50±5 %.		
Testing parameters	**unit**	**Value**
Temperature of hot plate, *T(h)*	°C	20.02
Temperature of cold plate, *T(c)*	°C	0.02
Density of heat flow of hot plate, *q(h)*	W/m²	31.51
Density of heat flow of cold plate, *q(c)*	W/m²	32.61
Mean density of heat flow through the specimen, *q*	W/m²	31.06
Mean temperature of specimen, *T*	°C	10.02
Mean thermal conductivity, *λ*	W/(m·K)	**0.04181**
Uncertainty of the measurement, *Δλ*	W/(m·K)	± 0.000182
Core thermal resistance, *Rc*	(m²·K)/W	**0.64389**
Uncertainty of the measurement, *ΔR*	m²·K/W	± 0.0024

Specimen No. 267-2/24

Heat flow direction – vertical		
Conditioning of sample – Climate chamber 48 h, T = 23±2°C, RH = 50±5 %.		
Testing parameters	**unit**	**Value**
Temperature of hot plate, *T(h)*	°C	20.02
Temperature of cold plate, *T(c)*	°C	0.01
Density of heat flow of hot plate, *q(h)*	W/m²	32.24
Density of heat flow of cold plate, *q(c)*	W/m²	31.58
Mean density of heat flow through the specimen, *q*	W/m²	31.91
Mean temperature of specimen, *T*	°C	10.02
Mean thermal conductivity, *λ*	W/(m·K)	**0.04205**
Uncertainty of the measurement, *Δλ*	W/(m·K)	± 0.000181
Core thermal resistance, *Rc*	(m²·K)/W	**0.62713**
Uncertainty of the measurement, *ΔR*	m²·K/W	± 0.0023

Specimen No. 267-3/24

Heat flow direction – vertical		
Conditioning of sample – Climate chamber 48 h, T = 23±2°C, RH = 50±5 %.		
Testing parameters	**unit**	**Value**
Temperature of hot plate, *T(h)*	°C	20.02
Temperature of cold plate, *T(c)*	°C	0.02
Density of heat flow of hot plate, *q(h)*	W/m²	33.15
Density of heat flow of cold plate, *q(c)*	W/m²	32.24
Mean density of heat flow through the specimen, *q*	W/m²	32.70
Mean temperature of specimen, *T*	°C	10.02
Mean thermal conductivity, λ	W/(m·K)	**0.04278**
Uncertainty of the measurement, $\Delta\lambda$	W/(m·K)	± 0.000182
Core thermal resistance, *Rc*	(m²·K)/W	**0.61168**
Uncertainty of the measurement, ΔR	m²·K/W	± 0.0022

Specimen No. 267-4/24

Heat flow direction – vertical		
Conditioning of sample – Climate chamber 48 h, T = 23±2°C, RH = 50±5 %.		
Testing parameters	**unit**	**Value**
Temperature of hot plate, *T(h)*	°C	20.02
Temperature of cold plate, *T(c)*	°C	0.02
Density of heat flow of hot plate, *q(h)*	W/m²	32.19
Density of heat flow of cold plate, *q(c)*	W/m²	31.30
Mean density of heat flow through the specimen, *q*	W/m²	31.73
Mean temperature of specimen, *T*	°C	10.02
Mean thermal conductivity, λ	W/(m·K)	**0.04247**
Uncertainty of the measurement, $\Delta\lambda$	W/(m·K)	± 0.000183
Core thermal resistance, *Rc*	(m²·K)/W	**0.63033**
Uncertainty of the measurement, ΔR	m²·K/W	± 0.0023

Annex 2. ***Calculation of declared thermal resistance***

Sample No.	Core thermal resistance of double sample, Rc	Efective thermal conductivity, λ	Thickness of double sample, mm
1	0.643888	0.0418085	26.92
2	0.627129	0.0420488	26.37
3	0.611684	0.0427835	26.17
4	0.630327	0.0424700	26.77
Average:	***0.6283***	***0.0423***	***26.56***

Sample size: 600 x 600 mm.

Declared derived R-value of double insulation product:

$$S_{R(core)} = \sqrt{\frac{\sum(R_i - R_{average})^2}{n-1}};$$

$S_{R(core)} = 0.01557;$

$$R_{D(core)90/90} = R_{average} - k_2 \cdot S_{R(core)};$$

$k_2 = 3.19$

$R_{D(core)\ 90/90} = 0.59173 = 0.59\ m^2{\cdot}K/W$

Declared thermal resistance of the core $R_{D(core)}$ of one insulation product

$\boldsymbol{R_{D(core)\ 90/90} = 0.59173/2 = 0.29586 = 0.29\ m^2{\cdot}K/W}$

Annex 3. ***Calculation of thermal resistance including associated airspaces according EN 16863 Annex D and EN ISO 6946:***

- Declared emissivity of the product surfaces 0.05;
- Temperature difference across each air cavity of 5K, mean temperature of 10°C;

- Thermal resistance of one air gaps 0.6640 $m^2 \cdot K/W$;
- Thermal resistance of two air gaps 1.3280 $m^2 \cdot K/W$;

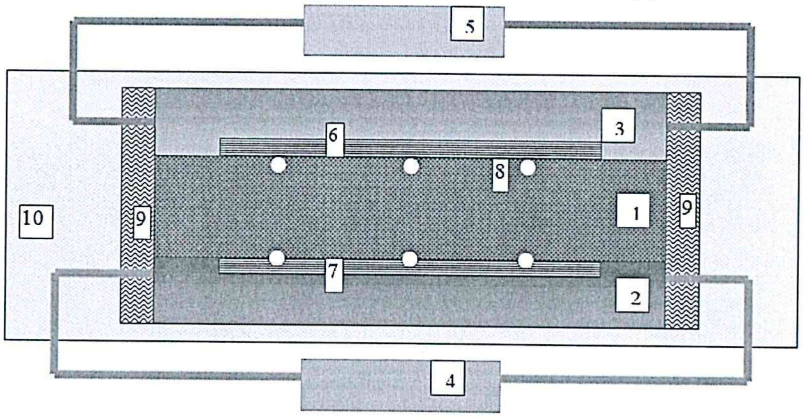
Calculation of thermal resistance including two vertical airspaces:

Air gap 20 mm – Product - Air gap 20 mm

$$R_{D(system)\ 90/90} = \mathbf{0.29586+1.3280= 1.62386=1.60\ m^2 \cdot K/W}$$

Annex 4. ***The parameters of heat flow meter apparatus:***

SCHEME OF HEAT FLOW METER APPARATUS
Single specimen symmetrical configuration apparatus



1 – Specimen under testing;
2 – Cooling plate;
3 – Heating plate;
4 – Cooling thermostat;
5 – Heating thermostat;
6 – Heat flow meter at heating plate;
7 – Heat flow meter at cooling plate;
8 – Thermo-couple;
9 – Guarded space,
10 – Surrounding with controlled constant temperature.

Notes:

- Specimen dimensions 600 x 600 mm, central measuring area of heat flow meter 250 x 250 mm.
- Possibility to measure under various heat flow directions: horizontal, upwards, downwards, on different angles with horizontal plane.
- Used edge heat losses reduction methods:
    - ➢ Specimen thickness limitation (to 150 mm);
    - ➢ Controlled ambient temperature during the test equal to the mean specimen temperature.