INSTITUTE OF ARCHITECTURE AND CONSTRUCTION OF KAUNAS UNIVERSITY OF TECHNOLOGY

BUILDING PHYSICS LABORATORY

NACIONALINIS AKREDITACIJOS BIURAS

Bandymai / tyrimai ISO/IEC 17025

Nr. LA.01.031

TEST REPORT No. 256 SF/24 R

Date: 28th of October 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 **AIRFLEX**, 600×600mm
(name, description and identification details of a specimen)

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

Samples delivery date: 21/10/2024

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: 21/10/2024 – 22/10/2024 **Date of testing:** 22/10/2024 – 23/10/2024

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 **AIRFLEX**, $R_{D(core)}$90/90, (m²·K)/W	LST EN ISO 22097:2023	**0.28**
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)

Lietuvos Respublika DOKUMENTAI S.P. Kauno technologijos universitetas Architektūros ir statybos institutas

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

Specimen No. 256-1/24

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	32.51
Density of heat flow of cold plate, *q(c)*	W/m²	32.24
Mean density of heat flow through the specimen, *q*	W/m²	32.37
Mean temperature of specimen, *T*	°C	10.02
Mean thermal conductivity, λ	W/(m·K)	**0.03912**
Uncertainty of the measurement, $\Delta\lambda$	W/(m·K)	± 0.000172
Core thermal resistance, *Rc*	(m²·K)/W	**0.61781**
Uncertainty of the measurement, ΔR	m²·K/W	± 0.0022

Specimen No. 256-2/24

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	34.00
Density of heat flow of cold plate, *q(c)*	W/m²	32.43
Mean density of heat flow through the specimen, *q*	W/m²	32.21
Mean temperature of specimen, *T*	°C	10.02
Mean thermal conductivity, λ	W/(m·K)	**0.04004**
Uncertainty of the measurement, $\Delta\lambda$	W/(m·K)	± 0.000173
Core thermal resistance, *Rc*	(m²·K)/W	**0.6025**
Uncertainty of the measurement, ΔR	m²·K/W	± 0.0021

Specimen No. 256-3/24

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	0.01
Density of heat flow of hot plate, *q(h)*	W/m²	35.76
Density of heat flow of cold plate, *q(c)*	W/m²	32.48
Mean density of heat flow through the specimen, *q*	W/m²	34.12
Mean temperature of specimen, *T*	°C	10.01
Mean thermal conductivity, λ	W/(m·K)	**0.03938**
Uncertainty of the measurement, $\Delta\lambda$	W/(m·K)	± 0.000170
Core thermal resistance, *Rc*	(m²·K)/W	**0.5861**
Uncertainty of the measurement, ΔR	m²·K/W	± 0.0020

Specimen No. 256-4/24

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	34.50
Density of heat flow of cold plate, *q(c)*	W/m²	32.12
Mean density of heat flow through the specimen, *q*	W/m²	33.31
Mean temperature of specimen, *T*	°C	10.02
Mean thermal conductivity, λ	W/(m·K)	**0.03812**
Uncertainty of the measurement, $\Delta\lambda$	W/(m·K)	± 0.000168
Core thermal resistance, *Rc*	(m²·K)/W	**0.6004**
Uncertainty of the measurement, ΔR	m²·K/W	± 0.0021

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	0.617808	0.391222	24.17
2	0.602462	0.0400357	24.12
3	0.586127	0.0393771	23.08
4	0.600431	0.0381226	22.89
Average:	***0.601707***	***0.0391644***	***23.57***

Sample size: 600 x 600 mm.

Declared derived R-value of double insulation product:

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

$S_{R(core)} = 0.01123$;

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

$k_2 = 3.19$

$R_{D(core)\ 90/90} = 0.56589 = 0.56\ m^2 \cdot K/W$

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

$$\boldsymbol{R_{D(core)\ 90/90} = 0.56589/2 = 0.282945 = 0.28\ m^2 \cdot K/W}$$

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 $m^2 \cdot K/W$;

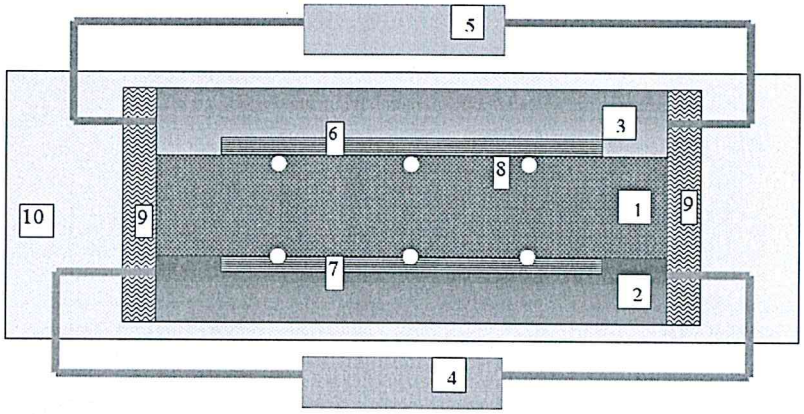
***Calculation of thermal resistance including two vertical airspaces*:**

Air gap 20 mm – Product - Air gap 20 mm

$R_{D(system)\ 90/90}$ **= 0.282945+1.3280= 1.610945=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.