

TEST REPORT No. 106 SF/23 U

Date: 30 of May 2023

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**Determination of declared thermal resistance of reflective insulation product according LST
EN 16012:2012+A1:2015 and LST EN ISO 8990:1999**

(test title)

Test method: LST EN 16012:2012+A1:2015: Thermal insulation for buildings-Reflective insulation products-Determination of the declared thermal performance;
LST EN ISO 8990:1999 Thermal insulation - Determination of steady-state thermal transmission properties - Calibrated and guarded hot box (ISO 8990:1994).

(number of normative document or test method, description of test procedure, test uncertainty)

Specimen description: **Type of product: reflective insulation product (Type 3)**
Names of product:
ATI PRO PREMIUM
Thickness of product installed in the „Hot box” – 99 mm; 103 mm; 106 mm; 107 mm
Declared thickness of product – 90 mm +/- 10 mm*
*Declaration numbers: 220622 Epaisseur AP2; 120722 Epaisseur AP3; 090822 Epaisseur AP4; 010922 Epaisseur AP5
At the center of the specimen installed the beam of polyurethane. Dimension: Width – 50mm, length – 1.13 m, thickness – 99 mm.

(name, description and identification details of a specimen)

Customer: SAS ATI FRANCE, 146 avenue du bicentenaire 01120 Dagneux, France
(name and address)

Manufacturer: SAS ATI FRANCE, 146 avenue du bicentenaire 01120 Dagneux, France
(name and address)

Test results:

Name of the indicator and unit	Test method reference no.	Test result
Declared thermal resistance of the core of product ATI PRO PREMIUM $R_{core90/90}$, (m ² ·K)/W	LST EN ISO 16012:2012+A1:2015	3.52
Declared thermal resistance of system with 2 air gaps $R_{sys 90/90}$, (m ² ·K)/W		4.60
Declared thermal resistance values determined according to EN ISO 10456:2008 Position of specimen: vertical (direction of heat flow – horizontal)		

Tested at: Building Physics Laboratory, Institute of Architecture and Construction of Kaunas University of Technology
(name of the test laboratory)

Specimen delivery dates: 2022-07-19; 2022-10-05 **Date of testing:** 2022-07-27 ÷ 2022-11-02

Production date: 2022-06-22 ÷ 2022-09-01

Sampling: The test specimens sampled by customer. Description of the sample 2022-07-08; 2022-12-22

Additional information: Application 2023-04-05. This report is prepared according to tests reports 159 SF/22 U, 222 SF/22 U, 223 SF/22 U, 224 SF/22 U.
(any deviations, complementary tests, exceptions and any information related with particular test)

Annexes: **Annex 1.** Parameters of Guarded Hot Box measurement and $R_{sys 90/90}$;
Annex 2. Specimen air gaps thermal properties;
Annex 3. $R_{core 90/90}$ thermal resistance value according to LST EN 6012:2012+A1:2015.
(indicate annex numbers and titles)

Head of Laboratory: _____
(approves the test results) (signature)

K. Banionis
(n., surname)

Tested by: _____
(technically responsible for testing) (signature)

A. Burlingis
(n., surname)

Validity – the named data and results refer exclusively to the tested and described specimens.
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Annex 1. Parameters of Guarded Hot Box measurement and R_{sys} 90/90

Table 1. ATI PRO PREMIUM insulation system's specimen measured at 20°C/10°C temperature regime

<i>Guarded Hot Box measurement. Parameters of "ATI PRO PREMIUM" insulation system's specimen:</i>						
Specimen's area A, m ²	1.831	Actual mean thickness of specimen, mm		≈ 160*		
Position of a specimen	vertical	Length of specimen perimeter L, m		5.44		
	Linear thermal transmittance of perimeter zone Ψ_L , W/(m·K)		0.00189			
<i>Measurement data:</i>						
<i>Insulation system with product "ATI PRO PREMIUM":</i>						<i>Result:</i>
Sample No.	Hot side surface temperature t_h , °C	Cold side surface temperature t_c , °C	Temperature difference $\Delta t = (t_h - t_c)$, °C	Measured heat flow density q , W/m ²	Corrected heat flow density q_c , W/m ²	R-value of insulation system, m ² ·K/W
159-22	20,2478	9,7543	10,4935	2,1776	2,1188	4,953±0,2021
222/22	20,4330	9,7723	10,6608	2,2134	2,1535	4,950±0,1988
223/22	20,3675	9,7603	10,6073	2,1094	2,0499	5,175±0,2141
224/22	20,3400	9,7530	10,5870	2,0999	2,0405	5,188±0,2154
Average:						5,067±0,2076

* Previous test has shown that when installed on real building the average thickness of product is slightly larger than its nominal value. To keep surfaces of test sample as parallel as possible in the test setup, it is decided to install the product in a frame. After internal validation, the thickness of the frame is representative of the average thickness of an installed product, as requested by LST EN ISO 8990.

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

$$S_{R-sys} = 0.132902;$$

$$R_{90/90-sys} = R_{average} - k_2 \cdot S_{R-sys}; \quad k_2 = 3.19;$$

$$R_{90/90-sys} = 4.6425 = 4.60 \text{ m}^2 \cdot \text{K/W}$$

Annex 2. Specimen air gaps thermal properties

Table 2. ATI PRO PREMIUM insulation specimen products

Specimen product	Specimen surface layer	Test method reference No.	Declared emissivity, ϵ
ATI PRO PREMIUM	External reflective layer	EN 16012:2012+A1:2015	0.10**
	External reflective layer		0.10**

** Declaration numbers: 220622 Emissivite AP2; 120722 Emissivite AP3; 090822 Emissivite AP4; 010922 Emissivite AP5;

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Table 3. ATI PRO PREMIUM insulation specimen air gaps for corrected R-core values calculation results according to LST EN 16012:2012+A1:2015 and LST EN ISO 6946:2017

Sample No.	Air gap number	Thickness d, mm	Measured temperature differences of surfaces, $\Delta\tau$, °C	Radiative heat transfer coefficient, h_r	Convective heat transfer coefficient, h_a	Air gap R- core value, $m^2 \cdot K/W$
159-22	Air gap #1	30	1.1028	0.5633	1.25	0.5515
	Air gap #2	30	1.4250	0.5117	1.25	0.5676
222/22	Air gap #1	30	1.067	0.5645	1.25	0.5511
	Air gap #2	30	1.365	0.5117	1.25	0.5676
223/22	Air gap #1	30	1.146	0.5639	1.25	0.5513
	Air gap #2	30	1.379	0.5116	1.25	0.5677
224/22	Air gap #1	30	1.034	0.5641	1.25	0.5512
	Air gap #2	30	1.258	0.5113	1.25	0.5678

Annex 3. $R_{core90/90}$ thermal resistance value according to EN 16012:2012+A1:2015

Table 4. ATI PRO PREMIUM R-core thermal resistance values according to LST EN 16012:2012+A1:2015

Sample No.	Thickness of sample d, mm	R-core thermal resistance value according to LST EN 16012
159-22	99	3.834 $m^2 \cdot K/W$
222/22	103	3.832 $m^2 \cdot K/W$
223/22	106	4.056 $m^2 \cdot K/W$
224/23	107	4.069 $m^2 \cdot K/W$
Average: 3.948 $m^2 \cdot K/W$		

Standard deviation of derived R-value of insulation product:

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

$$S_{R-core} = 0.132611 ;$$

Declared derived R-value of insulation product

$$R_{90/90-core} = R_{average} - k_2 \cdot S_{R-core}$$

$$k_2 = 3.19;$$

$$R_{90/90-core} = 3.5247 = 3.52 m^2 \cdot K/W$$

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