

TEST REPORT No. **046B SF/22 U**

**Date: 21 of April 2022**

page (pages)

1 (3)

**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)**

**Name of product:**

- **BOOST'R HYBRID / BOOST'R HYBRID<sup>S</sup> / BOOST'R HYBRID<sup>MAX</sup> (ACTIS SA)**
- **TOP TOIT / TOP TOIT<sup>S</sup> (ISO 2000 SAS)**

**Declared thickness – 8.5±1 cm\***

\*according to the manufacturer declaration: ACTIS 220210 – Declared thickness EN 823 (3 Pa)

(name, description and identification details of a specimen)

**Customer:**

SA Orion financement – Avenue de la Gare – FR-11230 CHALABRE, France

(name and address)

**Manufacturer:**

ACTIS SA : 30 Avenue de Catalogne - 11300 LIMOUX, France

(name and address)

**Test results:**

Name of the indicator and unit	Test method reference no.	Test result
Declared corrected $R_{core,90/90}$ thermal resistance of product <b>BOOST'R HYBRID</b> , (m <sup>2</sup> ·K)/W	LST EN ISO 16012:2012+A1:2015	<b>3.00</b>
Declared thermal resistance of system with 2 air gaps $R_{TOTAL,90/90}$ , (m <sup>2</sup> ·K)/W		<b>3.75</b>
Declared thermal resistance values determined according to EN ISO 10456:2008** Position of specimen: vertical (direction of heat flow – horizontal) **not accredited activity		

Building Physics Laboratory, Institute of Architecture and Construction of Kaunas

**Tested at:**

University of Technology

(name of the test laboratory)

**Specimen delivery date:**

2022-03-14

**Date of testing:**

2022-04-06 – 2022-04-18

**Production date:**

2022-01-21 – 2022-02-07

**Sampling:**

The test specimens sampled by customer. Description of the sample 2022-03-10

**Additional information:**

Application 2022-03-02. This report is prepared according to tests reports 046B-1 SF/22 U, 046B-2 SF/22 U, 046B-3 SF/22 U, 046B-4 SF/22 U, 046B-5 SF/22 U, 046B-6 SF/22 U.

(any deviations, complementary tests, exceptions and any information related with particular test)

**Annexes:**

**Annex 1.** Parameters of Guarded Hot Box measurement;

**Annex 2.** Specimen air gaps thermal properties;

**Annex 3.**  $R_{core,90/90}$  and  $R_{TOTAL,90/90}$  thermal resistance values according to LST EN 16012:2012+A1:2015.

(indicate annex numbers and titles)

Head of Laboratory:

(approves the test results)

Tested by:

(technically responsible for testing)

DOKUMENTAI

Architektūros ir statybos instituto  
Kauno technologijos universitetas

(signature)

(signature)

K. Banionis

(n., surname)

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.**

**Table 1. BOOST'R HYBRID insulation system's specimen measured at 20°C/10°C temperature regime**

<i>Guarded Hot Box measurement. Parameters of "BOOST'R HYBRID" insulation system's specimen:</i>						
Specimen's area A, m <sup>2</sup>	1.831	Actual mean thickness of specimen, mm	≈ 146*			
Position of a specimen	vertical	Length of specimen perimeter L, m	5.44			
		Linear thermal transmittance of perimeter zone Ψ <sub>L</sub> , W/(m·K)	0.00434			
<i>Measurement data:</i>						
<i>Insulation system with product "BOOST'R HYBRID":</i>						<i>Result:</i>
Sample No.	Hot side surface temperature τ <sub>h</sub> , °C	Cold side surface temperature τ <sub>c</sub> , °C	Temperature difference Δτ = (τ <sub>h</sub> - τ <sub>c</sub> ), °C	Measured heat flow density q, W/m <sup>2</sup>	Corrected heat flow density q <sub>c</sub> , W/m <sup>2</sup>	R-value of insulation system, m <sup>2</sup> ·K/W
046-1B-22	19.9540	9.6560	10.2980	2.8254	<b>2.6927</b>	<b>3.824±0.1343</b>
046-2B-22	19.9398	9.6397	10.3000	2.8060	<b>2.6733</b>	<b>3.853±0.1357</b>
046-3B-22	19.9238	9.6343	10.2895	2.8166	<b>2.6840</b>	<b>3.834±0.1349</b>
046-4B-22	19.9298	9.6360	10.2938	2.7728	<b>2.6401</b>	<b>3.899±0.1381</b>
046-5B-22	19.9433	9.6397	10.3035	2.8139	<b>2.6811</b>	<b>3.843±0.1352</b>
046-6B-22	20.0010	9.6422	10.3588	2.8077	<b>2.6742</b>	<b>3.874±0.1359</b>
<b>Average:</b>						<b>3.855</b>

\* 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.

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

$$S_{R-sys} = 0.027733 ;$$

$$R_{90/90-sys} = R_{average} - k_2 \cdot S_{R-sys}; \quad k_2 = 2.49;$$

$$R_{90/90-sys} = 3.7854 = 3.75 \text{ m}^2 \cdot \text{K/W}$$

**Table 2. BOOST'R HYBRID insulation specimen products**

Specimen product	Specimen surface layer	Test method reference No.	Declared emissivity, ε
<b>BOOST'R HYBRID</b>	PERFORATED EXTER ALU	EN 16012:2012+A1:2015	0.08*
	HPV MEMBRANE		0.94**

\*according to the manufacturer declaration – raport 18/03/05 – Emissivite EN16012.

\*\*according to the manufacturer declaration ACTIS 220309 – Emissivity EN 126012.

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**Table 3. BOOST'R HYBRID insulation specimen air gaps 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, $m^2 \cdot K/W$
046B-1	Air gap #1	30	1.5465	0.4493	1.25	0.5885
	Air gap #2	30	0.6218	4.3805	1.25	0.1776
046B-2	Air gap #1	30	1.5185	0.4493	1.25	0.5885
	Air gap #2	30	0.5700	4.3786	1.25	0.1777
046B-3	Air gap #1	30	1.5408	0.4491	1.25	0.5885
	Air gap #2	30	0.5960	4.3789	1.25	0.1777
046B-4	Air gap #1	30	1.5055	0.4493	1.25	0.5885
	Air gap #2	30	0.5913	4.3789	1.25	0.1777
046B-5	Air gap #1	30	1.5138	0.4493	1.25	0.5885
	Air gap #2	30	0.5715	4.3786	1.25	0.1777
046B-6	Air gap #1	30	1.4978	0.4496	1.25	0.5884
	Air gap #2	30	0.5880	4.3791	1.25	0.1776

**Annex 3.  $R_{core90/90}$  and  $R_{TOTAL90/90}$  thermal resistance values according to EN 16012:2012+A1:2015**

**Table 4. BOOST'R HYBRID R-core thermal resistance value according to LST EN 16012:2012+A1:2015**

Sample No.	R-core thermal resistance value according to LST EN 16012
046B-1	3.0579 $m^2 \cdot K/W$
046B-2	3.0868 $m^2 \cdot K/W$
046B-3	3.0678 $m^2 \cdot K/W$
046B-4	3.1328 $m^2 \cdot K/W$
046B-5	3.0768 $m^2 \cdot K/W$
046B-6	3.1080 $m^2 \cdot K/W$
<b>Average: 3.0884 <math>m^2 \cdot K/W</math></b>	

Standard deviation of derived R-value of insulation product:

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

$$S_{R-prod} = 0.027739 ;$$

Declared derived R-value of insulation product

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

$$k_2 = 2.49;$$

$$R_{90/90-prod} = 3.0193 = 3.00 \text{ m}^2 \cdot K/W$$

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