

TEST REPORT No. **282 SF/24 U**

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**Date: 09 of December 2024**

1 (3)

**Determination of declared thermal resistance of reflective insulation product  
according LST EN ISO 22097:2023 and LST EN ISO 8990:1999**

(test title)

**Test method:** LST EN ISO 22097:2023 Thermal insulation for buildings - Reflective insulation products - Determination of thermal performance (ISO 22097:2023);  
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:**

TOP COUVERTURE / TOP ISO / TOP AIR

Thickness of product installed in the „Hot box” – 60 mm

Declared thickness – 5.5±0.5 cm\* according EN 823 (3 Pa)

\*according to the manufacturer declaration: report ACTIS 241115-declared thickness EN 16863 and EN ISO 29466 (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 core thermal resistance of product <b>TOP COUVERTURE</b> $R_{D(core)90/90}$ , (m <sup>2</sup> ·K)/W	LST EN ISO 22097:2023	<b>2.05</b>
Declared thermal resistance of system with 2 air gaps $R_{system 90/90}$ , (m <sup>2</sup> ·K)/W		<b>2.85</b>
Declared thermal resistance values determined according to LST EN 16863:2023 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 date:** 2024-11-22 **Date of testing:** 2024-11-27 – 2024-12-06

**Production date:** 2024-07-30 – 2024-11-04

**Sampling:** The test specimens sampled by customer. Description of the sample 2024-11-27

**Additional information:** This report is prepared according to tests reports 282-1 SF/24 U; 282-2 SF/24 U;  
282-3 SF/24 U; 282-4 SF/24 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.**  $R_{D(core)90/90}$  thermal resistance values according to LST EN 16863:2023.

(indicate annex numbers and titles)

Head of Laboratory:

(approves the test results)

Tested by:

(technically responsible for testing)

(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. The insulation system's specimen measured at 20°C / 0°C temperature regime**

<i>Guarded Hot Box measurement. Parameters of insulation system's specimen:</i>						
Specimen's area A, m <sup>2</sup>	1.831	Actual mean thickness of specimen, mm	≈ 120*			
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)		0.002415			
Mean weight per square metre of the product – 0.528 kg/m <sup>2</sup> ; Mean weight per square metre of the tested specimen – 9.37 kg/m <sup>2</sup> .						
<i>Measurement data:</i>						
<i>Insulation system with product:</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
282-1/24	19,9365	0,0308	19,9058	6,8632	<b>6,7205</b>	<b>2,962±0,236</b>
282-2/24	19,2753	0,0078	19,2675	6,5284	<b>6,3903</b>	<b>3,015±0,240</b>
282-3/24	20,1260	0,0645	20,0615	6,8239	<b>6,6801</b>	<b>3,003±0,239</b>
282-4/24	20,0410	0,0755	19,9655	6,9487	<b>6,8056</b>	<b>2,934±0,233</b>
<b>Average:</b>						<b>2.9785</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.

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

$$S_{R \text{ system}} = 0.037350;$$

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

$$k_2 = 3.19$$

$$R_{\text{system } 90/90} = 2.8594 = 2.85 \text{ m}^2 \cdot \text{K/W}$$

**Table 2. The insulation specimen products**

Specimen product	Specimen surface layer	Test method reference No.	Declared emissivity, ε
TOP COUVERTURE	PERFORATED EXTER ALU	EN 16012	0.08*
	HPV MEMBRANE		0.94**

\*according to the manufacturer report 18/03/05 – Emissivity EN 16012.

\*\*according to the manufacturer report ACTIS 220309 – Emissivity EN 16012.

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

**Table 3. The insulation specimen air gaps corrected R-core values calculation results according to LST EN 22097:2023 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, $m^2 \cdot K/W$
282-1/24	Air gap #1	30	3.303	0.4452	1.25	0.5899
	Air gap #2	30	1.639	3.9708	1.25	0.1915
282-2/24	Air gap #1	30	3.106	0.4426	1.25	0.5908
	Air gap #2	30	1.547	3.9678	1.25	0.1917
282-3/24	Air gap #1	30	3.234	0.4462	1.25	0.5896
	Air gap #2	30	1.631	3.9721	1.25	0.1915
282-4/24	Air gap #1	30	3.203	0.4459	1.25	0.5897
	Air gap #2	30	1.677	3.9736	1.25	0.1914

**Annex 3.  $R_{D(core)90/90}$  thermal resistance values according to LST EN 16863:2023**

**Table 4. R-core thermal resistance value according to LST EN 22097:2023**

Sample No.	$R_{(core)}$ thermal resistance value according to LST EN 22097:2023
282-1/24	2.180 $m^2 \cdot K/W$
282-2/24	2.233 $m^2 \cdot K/W$
282-3/24	2.222 $m^2 \cdot K/W$
282-4/24	2.153 $m^2 \cdot K/W$
<b>Average: 2.1970 <math>m^2 \cdot K/W</math></b>	

Standard deviation of derived R-value of insulation product:

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

$$S_{R(core)} = 0.037175;$$

Declared derived R-value of insulation product:

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

$$k_2 = 3.19$$

$$R_{D(core)90/90} = 2.0784 = 2.05 \text{ m}^2 \cdot K/W$$

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