

CIRIAF

Centro Interuniversitario
di Ricerca sull'Inquinamento
da Agenti Fisici - "Mauro Felli"

Thermotechnical laboratory
Determination of thermal resistance
according to
UNI EN ISO 8990:1999

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Test Report n° T046/09

**Determination of thermal resistance according to
UNI EN ISO 8990:1999**

**of a board consisting of a pure aluminium film and two layers of
bubble polyethylene**

Client

SA.M.E. S.r.l.

Via Ferriera, 68 - 06089 Torgiano (PG)

Tel. 075-5996528 - Fax 075-5976846

internet website: www.samesrl.com

Name of the sample:
(according to the client's indications)

ISOLIVING SA.M.E.

Date of the test: 15/07/2009

Issue date: 02/10/2009

Place: Perugia

Operator: *Franco Biondi*

Issued by: *F. Biondi*

Laboratory Chief: *F. Biondi*



Test report n° T046/09

This test report consists of 6 sheets

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Reference standard

- **UNI EN ISO 8990:1999** – Thermal insulation - Determination of steady-state thermal transmission properties - Calibrated and guarded hot box

Product description

ISOLIVING is a radiant insulation material.

It consists of two layers of bubble polyethylene and a low-emissivity aluminum film continuously thermowelded with the following features:

- polyethylene film, 80 μm thick (bubble);
- polyethylene film, 60 μm thick (layer);
- aluminum film, 25 μm thick.

Nominal thickness of the semi-rigid board is 8 mm.



Figura 1 –Isolving board

Description of the measurement apparatus

The thermal resistance measures were carried out in the Calibrated Hot-Box at the CIRIAF (Inter-university Research Center on Pollution by physical agents) laboratories of the Faculty of Engineering of the University of Perugia. The apparatus was designed according to UNI EN ISO 8990:1999; Hereafter, some of the main features of the different parts constituting the equipment are reported:

- Air-conditioning chambers

The hot and cold parallelepiped chambers have an inner volume of 4.8 m³ each and the following sizes:

- external sizes 2.50 × 1.18 × 3.20 m;
- internal sizes 1.98 × 0.90 × 2.68 m.

The two chambers are composed of wood boards (19 mm thick), with an inner insulation provided by polystyrene foam (240 mm thick).

- Supporting frame

The sample is placed and clamped into the supporting frame by means of a pneumatic system applying vertical and horizontal pressure on the sample perimeter. The whole frame is composed of a wood-polystyrene foam-wood assembly.

- The heating system in the hot chamber is composed of a wire covered outside by self-extinguishing silicone with a diameter of 2.5 mm, whose inner core consists of a resistive wire of nickel-chromium. The wire is 50 m long and it has a maximum power of 500 W. The resistance is regulated by a PID system which maintains the chamber temperature at a fixed value.

- The refrigerating system, provided with a condensing unit, is a ventilated evaporator type. The system is driven by a temperature controller especially designed for stand-alone refrigerating units.

- The T (Cu-Ni) type thermocouples placed on the apparatus are 94 (47 in each chamber) and they have the following features:

- temperature range: -200°C ÷ 350°C;
- tolerance values: 1.5°C o 0.004×T (°C);
- wire section and diameter: 0.03 mm²/0.2 mm;
- insulating material of conductors: PTFE;



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Figure 2 – Measurement apparatus

Test sample layout

The test product can be set in different ways, in order to provide the best thermo-insulating performances.

Both sides of the panel board have to be enveloped by an air space 2.0 ÷ 2.5 cm thick.

To evaluate the performance of the product was done by creating two air spaces, with the panel between two wood boards (5 mm).

In order to ensure a steady thickness of the air space (2.0 cm) some polystyrene wedges were placed between the wood board and the ISOLIVING layer (Figure 3).

In order to evaluate the thermal resistance of the board and to obtain a value not depending on the wood boards, a series of thermal probes are placed in the inner surface of the wood boards to evaluate the air spaces (20 mm) thermal resistance alone (Figure 4).





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Figura 3 –Building up of the test sample

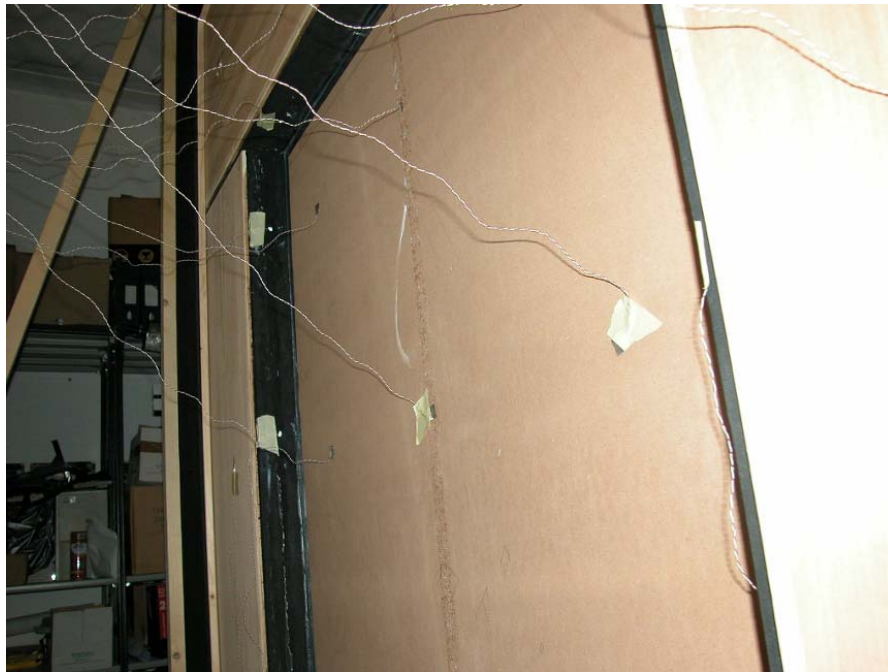


Figura 4 –Test sample placed in the measurement apparatus

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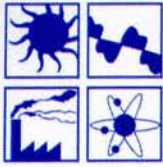
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Thermal resistance determination

The chambers are brought to a steady-state temperature, before the measurements start. The test lasted 60 minutes; table 1 shows the values of the main parameters during the test.

Table 1 – Values of main parameters registered during the test.

Test specimen sizes		
Width	123	cm
Height	148	cm
Thickness	4.80	cm
Measurement values – hot side		
Air temperature	23.86	°C
Surface temperature inside the air space	22.05	°C
Surface temperature of the baffle	23.58	°C
Power input in the hot chamber	49.70	W
Measurement values – cold side		
Air temperature	3.99	°C
Surface temperature inside the air space	5.84	°C
Surface temperature of the baffle	4.77	°C
Calculated values		
Heat flux through the test specimen	10.06	W/m ²
Surface temperature difference of the test sample	16.21	°C
Average temperature of the test sample	13.95	°C

The thermal resistance value is:

$$R = 1.61 \text{ m}^2\text{K/W}$$

(according to UNI EN ISO 8990)

The calculated value refers to the overall thermal resistance of an assembly composed of air space – ISOLIVING – air space.

The assessed overall uncertainty of the measurement expressed is $\pm 6\%$ based on a standard uncertainty multiplied by a coverage factor $k=2$, based on the level of confidence of 95%.

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Laboratory Operator: *F. Rossi*

Date of test: 15/07/2009

Laboratory Chief: *F. Rossi*



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