EUROLAB Laboratory Services

TEST/MUAYENE RAPORU

EUROLAB LABORATUVAR HİZMETLERİ

TÜRCERT TEKNİK KONTROL VE BELGELENDİRME A.Ş.

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Test Result : PASS

Report No : 2020032306
Applicant : **5K MÜHENDİSLİK TAAHHÜT ELEKTRİK İNŞAAT SAN.TİC.LTD.ŞTİ.**
Applicant Address: Mustafakemalpaşa mh. Çetin sok. No13/B AVCILAR /İSTANBUL
Contact Person: Şahin Kırmızı
Contact Telephone: 0212 422 76 76
Contact e-mail: Info@redpaint.com
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Sample ID : REDMANTO

	TEST	METHOD	RESULT
*	**Thermal insulation; determination of steady-state thermal resistance and related properties; guarded hot plate apparatus**	**ISO 8302**	**0.058 W/(m.K)**

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Seal

Customer Representative
Hasan KUTLU

EUROLAB LABORATUVAR HİZMETLERİ TÜRCERT

Laboratory Manager
Hava Sarıaydın

Merkez Mh, Gençosman Cd, No 11 / A GÜNGÖREN / İSTANBUL
Tel: 0212 702 20 10 Fax: 0212 909 21 10
Web: www.laboratuvar.com E-mail: info@laboratuvar.com

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Environment

The requirements and standards apply to equipment intended for use in

X	Residential (domestic) environment
X	Commercial and light-industrial environment
X	Industrial environment
X	Medical environment

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Thermal Insulation - Determination of Steady Thermal Resistance and Related Properties

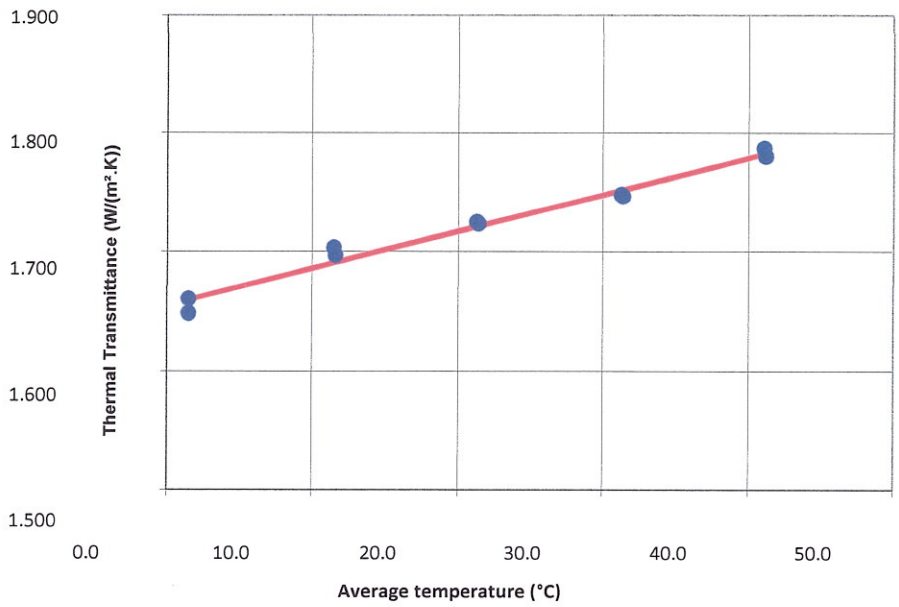
Method

The thermal resistance of the samples was measured with a heat flow meter for 30x30 cm samples as described in ISO 8302 (Figure 1). The device consists of a central hot plate with a cold plate above and below. Round heat flow meters with a diameter of 10 cm are positioned centrally in the lower part of the upper plate, on both sides of the central plate and in the upper part of the lower plate. These heat flow counters are embedded in a neoprene sheet that is the same thickness as the counters and is as large as the area of the plates. In the middle of each plate side, extremely thin Cu / Co thermocouples are glued against the heat flow counters. Samples are then mounted between the top plate and the center plate and between the bottom plate and the center plate. All of them are finally packaged in a thermally insulated box to create close to adiabatic conditions around the installation. Before the measurements start, heat flow meters are recalibrated using reference samples of the EU's BCR.

The temperature difference between the thermostatic bath that keeps the upper and lower cold plate at temperature and the thermostatic bath that keeps the central hot plate at temperature is set to 10 ° C. The temperatures and heat fluxes on both surfaces of the samples are not fixed, all data are recorded in the 10 "time interval and stored on the hard disk. All calculations are done in Excel. Values are converted in averages lasting three hours and the resistance is calculated using the equation below.

$$R = \frac{\square 2\Delta\theta}{C_1E_1 + C_2E_2.}$$

C_1, C_2	Calibration constants of heat flow meters W / (m².mV))
E_1, E_2	Electric voltage difference measured on heat flow meters at mV
⍰⍰	Temperature difference on samples in K (measured with Cu / Co thermocouples)



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Results of the measurement

Sample	Thickness m	Vol. humidity $\%m^3/m^3$	Average Tempetature °C	Temperature Difference °C	Thermal Resistance $m^2.K/W_{1)}$
1	10	0	1.5	9.0	0.58^2
			10.5	9.2	0.60^7
			21.2	9.2	0.60^0
			31.1	9.3	0.59^2
			40.8	9.2	0.58^0
2	10	0	1.5	8.9	0.61^7
			10.5	9.1	0.58^0
			21.2	9.2	0.57^0
			31.1	9.2	0.57^2
			40.8	9.2	0.56^2
3	10	0	1.5	9.2	0.61^5
			10.3	8.7	0.53^2
			24.2	9.3	0.62^1
			31.2	9.4	0.55^2
			40.6	9.2	0.54^2

(1) The last number in the superscript is uncertain

Sample	$\frac{\partial q}{q}$ %	$\frac{\partial \theta}{\theta}$ %	$\frac{qR_n}{\Delta\theta}$ %	Maximum Uncertainty %	Most Possible Uncertainty %
1	1.4	0.55	1	3.1	1.9
2	1.4	0.55	1	3.1	1.9
3	1.4	0.55	1	3.1	1.9

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Thermal conductivity at different average temperatures

These are given in the table below:

Average Temperature °C	Thermal Conductivity W/(m.K)
-10	0.061
0	0.060
10	0.060
20	0.060
30	0.062
50	0.065
100	0.070
200	0.081
300	0.089
400	0.098
500	0.105

SAMPLE decreases to 36 W / m, i.e. it decreases by 77.3%.
The average thermal conductivity in SAMPLE then reaches 0.058 W / (m.K).

In the test environment, the relative humidity in the environment is 50%.
In the test environment, the air temperature is about 21 degrees Celsius.

End of Report

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