TECHNICKÝ A ZKUŠEBNÍ ÚSTAV STAVEBNÍ PRAHA, s.p.
Technical and Test Institute for Construction Prague
Akreditovaná zkušební laboratoř, Autorizovaná osoba, Notifikovaná osoba, Oznámený subjekt, Subjekt pro technické posuzování, Certifikační orgán, Inspekční orgán / Accredited Testing Laboratory, Authorized Body, Notified Body, Technical Assessment Body, Certification Body, Inspection Body. Prosecká 811/76a, 190 00 Praha 9, Czech Republic

Laboratory tests for thermal insulation coatings

FALSIFIED

1. Unique identification code of the product-type: Insulating coating ASTRATEK

2. Intended use: Multifunctional composition for various purposes. For insulation of brick, concrete, metal, plastic, wooden and other surfaces.

3. Manufacturer: NPP Termalkom, LLC Address: 1, 25-leya Oktyabrya str., Volgograd, Russia, 400119

4. Authorized representative: Pienne Services Srl via Maria 230 - 03029 Veroli (FR) Italia p.iva 02971050600

5. Notified Body: NB 1020 TZUS Praha, s.p. Prosecka 811/76a 190 00 Praha 9 – ProsekClassification

6. Report No.: UL-6816

7. Test No.: 2/2

8. Test methods: EN 12667 ISO 8301

Date of issue: 20.10.2020

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Pobočka Požární bezpečnost staveb
190 00 Praha 9, Prosecká 811/76a
IČ 00015679 (1)

Determination of thermal conductivity of ultra-thin thermal insulation "Astratek - Facciata"

Manufacturer NPP Termalkom, LLC

Address: 1, 25-leya Oktyabrya str., Volgograd, Russia, 400119,

Build Date 15.08.2020г, batch №002451.

1. Description of HFM 436 Lambda unit manufactured by Germany for determination of thermal conductivity

The Heat Flow Meter (HFM) is an accurate, fast and easy-to-use device for measuring insulation materials with low thermal conductivity.

HFM 436 Lambda - calibrable instrument; it works according to the method set out in ASTM C 518 ISO 8301 JIS A1412, DIN EN 12667. The sample is located between the hot and cold plates, and the heat flow generated by a given temperature gradient is measured using a heat flow sensor. The HFM 436 Lambda series features speed, reproducibility, and accuracy through the use of patented temperature sensors and heat flow measurement techniques. The Lambda series uses modern cooling technology with the Peltier system, which does not require an external cooling device (with the exception of the HFM 436/6 and/ lE models), as well as water cooling or refrigerant cooling. This increases reliability saves time and reduces operating costs. The patented plate temperature control system and the two heat meters enable accurate data to be quickly obtained.

The device is stable within 0.1-0.25% with continuous operation for several days and has high reproducibility. This allows you to use quick test results as a reliable indicator of product variability during the manufacturing process. Analysis of changes in thermal conductivity over a long period of time is important when studying the issues of aging of materials or the long-term stability of their properties.

The device comes with a built-in length sensor with a resolution in the range of μm and allows you to determine the current thickness of the sample automatically during measurement. The test sample is placed in a device between two heated plates. The average temperature and temperature difference between the plates are set by the user. Thermocouples built into the surface of the plates measure the temperature difference in the sample. Plate temperatures are controlled by Peltier systems. Cooling, heating of Peltier systems is carried out using built-in liquid circulation. The liquid is cooled again using the built-in compressed air cooling system. For very low temperatures, the compressed air cooling system can be replaced by an external cooling system. Heat flow sensors (heat meters) mounted on the working surfaces of each instrument plate measure a voltage that is proportional to the heat flow passing through the sample. Steady-state values of thermocouples and heat meters indicate thermal equilibrium. These readings are recorded and the next test can start at new temperatures. The use of two sensors increases the speed of measurements, which is important for quality control. The instrument is calibrated using a certified NIST standard with known thermal conductivity.

This establishes the correspondence between the heat meter voltage signal and the heat flow passing through it. The thermal conductivity coefficient is calculated from the calibration data, sample thickness and temperature difference of the surfaces of the test sample. Definitely, the User can use any other reference material to calibrate the instrument.

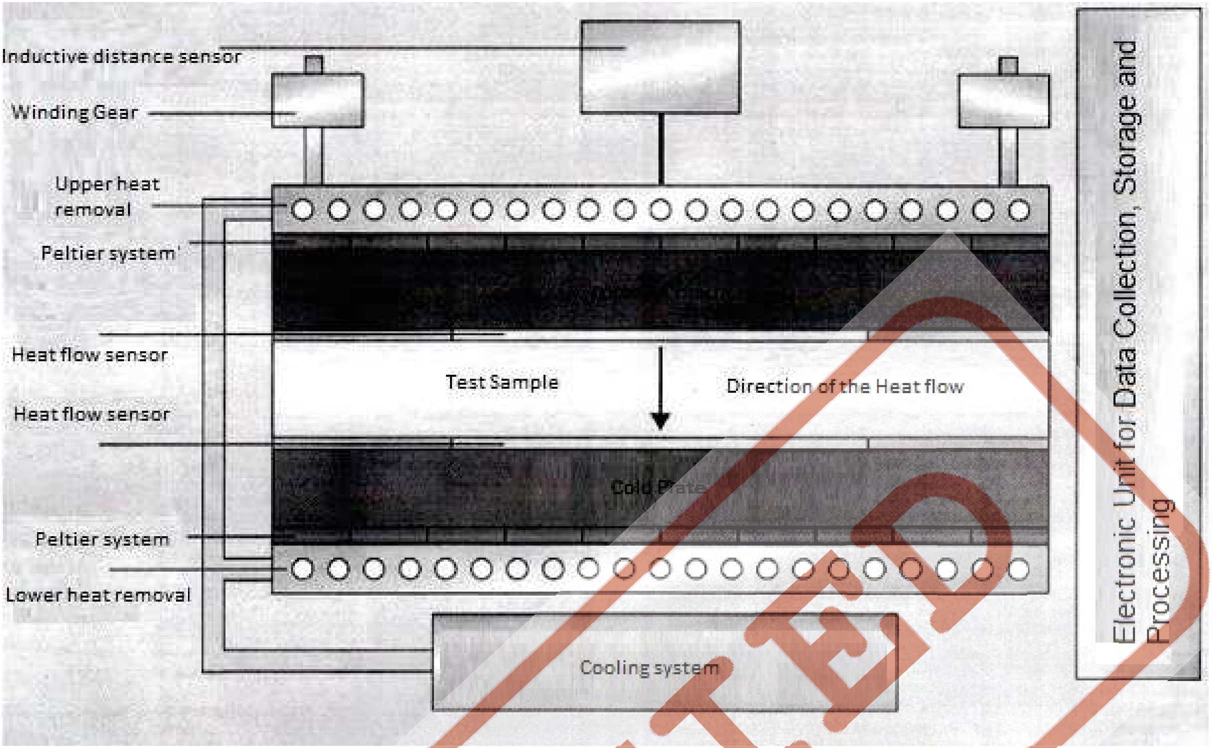

Fig. 1. NETZSCH HFM 436/3/1 Lambda instrument diagram (temperature range FROM 0 TO 100 ° C).

2.Objective: Determination of thermal conductivity of liquid ceramic thermal insulation coating "Astratek - Facciata."

3. Progress of work:

For the experiment to determine the thermal conductivity of the liquid ceramic thermal insulation coating by the size of the plant, 2 samples of polymethylmethacrylate (organic glass) with a thickness of 2 mm with sides of 10 cm, certified in accordance with the established procedure, were made. The thermal conductivity of polymethylmethacrylate is well understood over a wide temperature range. Heat-insulating paint "Astratek - Facciatia" of various thicknesses (1, 2 and 3 mm) is applied on one of the sheets of organic glass. It is applied in layers (1 layer - 0.5 mm) with an interval of interlayer drying of 24 hour. It is covered with a second sheet of organic glass and then the sample is placed in the measuring cell of the installation. Thus, 9 samples were made (3 pieces for each thickness) and their thermal conductivity was determined.

2. Results of the "Astratek - Facciata" ultra-thin thermal insulation paint test for thermal conductivity.

Annex 1.

№ of Sample	Thickness of Astratek insulation layer, mm	Value of Thermal conductivity coefficient, W/m · K	Average value of Thermal conductivity coefficient, W/m · K
1.1	1	0,0009	0,001
1.2	1	0,0011	
1.3	1	0,001	
2.1	2	0,0014	0,0012
2.2	2	0,0012	
2.3	2	0,0011	
3.1	3	0,0012	0,0013
3.2	3	0,0013	
3.3	3	0,0015	
		Total:	**0,0012**

The thermal conductivity of the liquid ceramic thermal insulation coating of the Astratek-Facciatia series declared by the manufacturer is 0.001 W/m · K, which has slight discrepancies with the results of experiments and is due to contact with polymethylmethacrylate (organic glass), taking into account that the error of the test method and measurements is permissible. Therefore, the declared heat engineering data is confirmed.

Annex 2.
Initial Data

№ Of a sample	Thickness of thermal insulation layer and Astratek, mm	Value of calibration value on heat meter coefficient device, f **u** ,	Output signal of heat meter a of the device, **eu** , **eu**	Difference between temperatures and upper and lower plates, deltaT, ^{0}C	Thermal resistance of thermal glass, **R orgseelda** ' W/(m·^{0}C)
1.1	1	26634, 21457	0,00058	20,01	0,27
1.2	1	28335, 19764	0,00071	19,36	0,27
1.3	1	27741, 23820	0,0006	19,81	0,27
2.1	2	22743, 19189	0,00082	28,76	0,27
2.2	2	21157, 18615	0,00077	29,18	0,27
2.3	2	22457, 17615	0,0007	29,59	0,27
3.1	3	19196 , 16068	0,00073	34,76	0,27
3.2	3	20582, 15357	0,00075	34,21	0,27
3.3	3	21496, 14668	0,00083	33,98	0,27

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Test Report No. 2.

Product name: Liquid ceramic heat-insulating coatings of the Astratek series.

Designation and name of regulatory document -

Manufacturer: NPP Termalkom, LLC Address: 1, 25-leya Oktyabrya str., Volgograd, Russia, 400119

Sampling Date – 15.08.2020.

Object of measurement - thermal conductivity of coating.

Name of regulatory documents -ISO 8301.

Test Tool - HFM 436 Lambda Installation

№	Description of indicators	Test Results
1	Dry thermal conductivity ISO 8301 W/m · 0 C	0,0012

Conclusion: The acquired results of the conducted test bring us to the conclusion that the thermal insulation coating of the Astratek series corresponds to the values declared by manufacturers.

Materials Research Laboratory 22.10.2020

TECHNICKÝ A ZKUŠEBNÍ ÚSTAV STAVEBNÍ Centrální laboratoř s.p.

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