quality in construction

Instytut Techniki Budowlanej
BUILDING RESEARCH INSTITUTE
GROUP OF TESTING LABORATORIES
accredited by Polish Center for Accreditation
accreditation certificate
N° AB 023

AB 023



**Thermal Physics, Sanitary Systems and Environment Department**

**Thermal Physics, Sanitary Systems and Environment Laboratory**

# TEST REPORT N°LFS01-1191/15/Z00NF

| | |
|---|---|
| **Client:** | **SGE-FLEX s.p.r.l** |
| **Client address:** | **Avenue du Forum 19, 1020 Bruxelles, BELGIUM** |

**Information about test item**

| | |
|---|---|
| **Test item:**<br>**name, description, condition, identification** | Construction products of chemical origin – insulation polyurethane foam POLYNOR.<br>For laboratory tests four samples with dimensions 30x60x10 cm were delivered. Samples were tightly wrapped with aluminium foil, and plastic foil.<br>Manufacturer:<br><<ChemStar>> LLC.<br>VAT No420107, Russia, Kazan. Spartakovskaya str bl.2<br>VAT # 1655250652 TEL/FAX:+7(495) 9406625 |
| **Date of receipt:** | 01.09.2015; 02.09.2015; 04.09.2015 |
| **N° of receipt protocol:** | LFS08-1191/15/Z00N, LFS09-1191/15/Z00NF, LFS10-1191/15/Z00NF |
| **Receipt procedure:** | The receipt procedure in accordance with the Procedure ZLB № 18 |

**Information about tests:**

| | |
|---|---|
| **Test commencement date:** | 01.09.2015 |
| **Test completion date:** | 15.10.2015 |
| **Further information about tests:** | For laboratory test two samples of polyurethane foam POLYNOR delivered on 01.09.2015 were applied. Date of the sample production: 28.08.2015 and 29.08.2015. |

## CHARACERISTICS EXAMINED

Determination of emissions of volatile organic compounds from the product in laboratory chamber. Emission of product was tested according to ISO 16000 standards.

## TEST CONDITIONS

Laboratory chamber stainless steel cap. 0.1 $m^3$,
Temperature (23 ± 2) ° C,
Relative humidity (50 ± 5)%
Multiplicity of air exchange 0.05 $m^3h^{-1}$.
Product loading factor 1.8 $m^2/m^3$

## TEST METHODS

ISO 16000-6:2011 Indoor air – Part 6: Determination of volatile organic compounds in indoor air and test chamber air by active sampling on Tenax TA sorbent, thermal desorption and gas chromatography using MS or MS/FID

PN-EN ISO 16000-9:2009 Indoor air – Part 9: Determination of the emission of volatile organic compounds from building products and furnishing – Emission test chamber method

PB LS-002/5/12-2011 „Determination of solvents and unsaturated monomers vapours by gas chromatography with sample enrichment"

PB LS-012/2/09-2004 Determination of isocyjanates in air by liquid chromatography as 2-(1-Pirydyl)piperazine derivatives

## HARMONISED STANDARD

**EN 14315-1:2013** Thermal insulating products – In-situ formed sprayed Brigid polyurethane (PUR) and polyisocyjanurate (PIR) foam products – Part 1: Specification for the rigid foam spray system before installation

## REQUIREMENTS

There is no harmonized European requirements. National provisions in the place of use are in force.
POLAND
Zarządzenie Ministra Zdrowia i Opieki Społecznej z dnia 12.03.1996 r. w sprawie dopuszczalnych stężeń i natężeń czynników szkodliwych dla zdrowia wydzielanych przez materiały budowlane, urządzenia i elementy wyposażenia w pomieszczeniach przeznaczonych na pobyt ludzi (Monitor Polski Nr 19, poz.231:1996)

## TEST RESULTS

**Table 1. Emission of volatile organic compounds from insulation polyurethane foam POLYNOR**

| Substances | CAS | Concentration in test chamber air [µg/m³] | |
|---|---|---|---|
| | | After 3 days | After 28 days |
| Ethane, 1,2-dichloro | 107-06-2 | 16 | 7 |
| 1,4 - Dioxane | 123-91-1 | 26 | 8 |
| Chlorobenzene | 108-90-7 | 10 | 4 |
| 1-Methoxy-2-propyl) acetate | 108-65-6 | 12 | <1 |
| 2-Butoxyethanol | 111-76-2 | 14 | <1 |
| α-Pinene | 95-63-6 | 8 | 4 |
| Octamethylcyclotetrasiloksane | 106-46-7 | 12 | 9 |
| Decamethylcyclopentasiloksane | 541-02-6 | 15 | 14 |
| Bis(2-chloroethyl) ether | 114-44-4 | 34 | 20 |
| Propylene carbonate | 108-32-7 | 108 | 79 |
| Nonanal | 124-19-6 | 18 | 10 |
| Decanal | 112-31-2 | 10 | 4 |
| Aliphatic hydrocarbons $C_6 - C_{16}$ | - | 322 | 289 |
| 4,4'–Metylenodifenylodiisocyanate (MDI) | (101-68-8) | <5 | <5 |
| Total organic volatile compounds (TVOC) | - | 605 | 448 |

The expanded uncertainty calculated using a factor of k = 2, which corresponds to the level of confidence of approximately 95% is ± 18%

## OPINION (out of scope of accreditation)

Insulation polyurethane foam POLYNOR meets polish national provisions.

**Responsible for the test**

**Halina Deptuła, Msc**

**Authorizing person**

**Adam Niesłochowski, PhD**

**Warsaw, 19.10.2015**

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*Test Report is not substitute for documents required for placing on the market and making available of construction products*

BUILDING STRUCTURES DEPARTMENT

BUILDING STRUCTURES LABORATORY

# REPORT OF THE TESTS AND ASSESSMENT OF THE PERFORMANCE Nº LK00-01191/15/Z00NF

| | |
|---|---|
| **Client:** | *SGE-FLEX s.p.r.l.* |
| **Client address:** | *Avenue du Forum 19, 1020 Bruxelles, Belgium* |
| | **INFORMATION ABOUT PRODUCT** |
| **Manufacturer (name and address):** | *<<ChemStar>> LLC.*<br>*VAT No420107, Russia, Kazan. Spartakovskaya str bl.2*<br>*VAT # 1655250652 TEL/FAX:+7(495) 9406625* |
| **Name and address of factory:** | *As above* |
| **Product:** | *PU FOAM – POLYNOR* |
| **Harmonised standard:** | *PN-EN 14315-1:2013 (EN 14315-1:2013)* |
| **Information about product, intended use, and the number of the applicable system of assessment and verification of constancy of performance** | *Thermal Insulation. System 3* |
| **Unique identification code of the product-type:** | *POLYNOR* |
| | **Information about test item** |
| **Test item:**<br>**name, description, condition, identification** | *Detailed information about product can be found on p. 2 of the test report „Test specimens"* |
| **Date of receipt by the Laboratory:** | *31.08.2015, 01.09.2015, 02.09.2015, 03.09.2015* |
| **Receipt procedure:** | *Nº 18* |
| **Nº of receipt protocol:** | *LFS01-01191/15/Z00NF, LFS02-01191/15/Z00NF, LFS03-01191/15/Z00NF, LFS04-01191/15/Z00NF* |
| | **Information about tests:** |
| **Test commencement date:** | *29.10.2015* |
| **Test completion date:** | *02.11.2015* |

**TEST METHOD**:

PN-EN 826:2013-07 *Thermal insulating products for building applications. Determination of compression behaviour.*

**HARMONISED STANDARD**:

PN-EN 14315-1:2013 *Thermal insulating products for buildings. In-situ formed sprayed rigid polyurethane (PUR) and polyisocyanurate (PIR) foam products. Part 1: Specification for the rigid foam spray system before installation.*

## 1. The scope of tests

The scope of tests covered compressive stress at 10% strain.

Personnel executing the test: Jarosław Sówka.

## 2. Test specimens

The Client has delivered test specimens of sprayed foam *POLYNOR* with dimensions:

- app. (50x50x50) mm – 3 samples for each of 4 different production date (12 samples total),
- app. (100x100x100) mm – 3 samples for each of 4 different production date (12 samples total).

## 3. Test methods and results

### 3.1. Compressive stress at 10% strain

Compressive stress at 10% strain was carried out in accordance with PN-EN 826:2013, on samples with dimensions app. (50x50x50) mm and (100x100x100) mm.

Immediately before the test samples were conditioned at temp. (23±2)°C and (50±5)% relative humidity for 4 days. Testing was carried out in testing machine with constant speed of crosshead respectively 5 mm/min. and 10 mm/min.

Test results are shown in table 1.

**Table 1.** The results of compressive strength/ compressive stress at 10% strain

| No. | **Compressive stress at 10% strain, kPa**, of foam sprayed: | | | |
|---|---|---|---|---|
| | 28.08.2015 | 29.08.2015 | 31.08.2015 | 01.09.2015 |
| *1* | *2* | *3* | *4* | *5* |
| **Samples with dimensions (50x50x50) mm** | | | | |
| 1 | 49,2 | 48,8 | 47,1 | 48,9 |
| 2 | 50,8 | 51,2 | 48,7 | 50,2 |
| 3 | 40,9 | 41,4 | 44,4 | 51,8 |
| Average value | **47,0** | **47,1** | **46,7** | **50,3** |
| Uncertainty of the single measurement | ±0,2* | | | |
| **Samples with dimensions (100x100x100) mm** | | | | |
| 4 | 48,6 | 43,7 | 44,1 | 66,4 |
| 5 | 45,8 | 48,9 | 48,6 | 47,8 |
| 6 | 47,7 | 47,3 | 44,0 | 45,4 |
| Average value | **47,4** | **46,6** | **45,6** | **53,2** |
| Uncertainty of the single measurement | ±0,2* | | | |

**The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95%*

Responsible for the test

**M. Sc. Eng. Iwona Komosa**

I. Komosa

Authorizing person

**M. Sc. Eng. Marzena Jakimowicz**

Jakimowicz Marzena

**Warsaw, November 03th, 2015**

Laboratory Head

**Dr Eng. Artur Piekarczuk**

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**THERMAL PHYSICS, SANITARY SYSTEMS AND ENVIRONMENT DEPARTMENT**
**THERMAL PHYSICS, SANITARY SYSTEMS AND ENVIRONMENT LABORATORY**

# REPORT OF THE TESTS AND ASSESSMENT OF THE PERFORMANCE N° LFS02-01191/15/Z00NF

| | |
|---|---|
| **Client:** | SGE-FLEX s.p.r.l. - producer |
| **Client address:** | Avenue du Forum 19, 1020 Bruxelles, Belgium |
| **INFORMATION ABOUT PRODUCT** | |
| **Manufacturer (name and address):** | <<ChemStar>> LLC.<br>VAT No420107, Russia, Kazan. Spartakovskaya str bl.2<br>VAT # 1655250652 TEL/FAX:+7(495) 9406625 |
| **Name and address of factory:** | as above |
| **Product:** | polyurethane foam POLYNOR |
| **Harmonised standard:** | PN-EN 14315-1:2013 |
| **Information about product, intended use, and the number of the applicable system of assessment and verification of constancy of performance** | thermal insulation. POLYNOR. System N° 3. |
| **Unique identification code of the product-type:** | POLYNOR |
| **Information about test item** | |
| **Test item:**<br>**name, description, condition, identification** | materials and construction products for insulation – polyurethane foam POLYNOR. Additional information of the test object provided by the Client is presented in the Annex N° 1 in this report |
| **Date of receipt:** | 31.08; 01.09; 02.09; 03.09; 04.09; 07.09; 08.09.2015 |
| **Receipt procedure** | The receipt procedure in accordance with the Procedure PZ ZLB 18 |
| **N° of receipt protocol** | LFS(01-07)-01191/15/Z00NF |
| **Information about tests:** | |
| **Test commencement date:** | 31.08.2015 |
| **Test completion date:** | 23.09.2015 |

## ☐ Testing method

Determination of thermal conductivity λ in steady-state conditions was done by one–sample heat flow meter apparatus, according to PN-EN 12667:2002.
Measurements were done in mean specimen temperature of 10°C, temperature difference over sample thickness 20 K and heat movement vertically up, on ten delivered samples with dimensions of 300x300x50 mm from various production dates. Aged test was done on the sample with dimension of 300x300x21 mm

Additional information about the test is contained in Annex N° 2.

## ☐ Test results

Test results of thermal conductivity for polyurethane foam are given in table 1 and the results of $\lambda_{90/90}$ calculations are shown in table 2.

Table 1

| *Marking of samples in the laboratory* | *Date of producing samples* | **) Thermal conductivity coefficient* W/(m·K) |
|---|---|---|
| 1/ LFS02-01191/15/Z00NF | 28.08.2015 | 0,0300 |
| 2/ LFS02-01191/15/Z00NF | 29.08.2015 | 0,0295 |
| 3/ LFS02-01191/15/Z00NF | 31.08.2015 | 0,0302 |
| 4/ LFS02-01191/15/Z00NF | 01.09.2015 | 0,0301 |
| 5/ LFS02-01191/15/Z00NF | 02.09.2015 | 0,0292 |
| 6/ LFS02-01191/15/Z00NF | 03.09.2015 | 0,0295 |
| 7/ LFS02-01191/15/Z00NF | 04.09.2015 | 0,0294 |
| 8/ LFS02-01191/15/Z00NF | 05.09.2015 | 0,0292 |
| 9/ LFS02-01191/15/Z00NF | 06.09.2015 | 0,0289 |
| 10/ LFS02-01191/15/Z00NF | 07.09.2015 | 0,0299 |
| **) The expanded uncertainty calculated for the coefficient k = 2, which corresponds to the level of confidence of approximately 95% is 3% acc. to Cards uncertainty LF-2/08* | | |

Table 2

| | |
|---|---|
| $\lambda_m$ | 0,02959 W/(m·K) |
| $S_\lambda$ | 0,000435 W/(m·K) |
| $k_{10}$ | 2,07 |
| $\lambda_{90/90}$ | 0,03049 W/(m·K) |

Result of ageing test for the polyurethane foam is shown in table 3.

Table 3

| marking of samples in the laboratory | date of producing sample | thermal conductivity coefficient W/(m·K) | | |
|---|---|---|---|---|
| | | initial test (before exposure) made on 01.09.2015 | test after 21 days in +70 °C temperature made on 22.09.2015 | change after 21 days of exposure **the measured value** / acceptable value *) |
| 11/ LFS02-01191/15/Z00NF | 28.08.15 | 0,0269 | 0,0327 | **0,0058** /0,0075 |
| *) acc. to Annex C to PN-EN 14315-1:2013 | | | | |

As given above the increase of thermal conductivity after exposure at +70°C did not exceed acceptable value, the constant increases of thermal conductivity of PUR core due to the aging which are presented in table C.2 at Annex C to PN-EN 14315-1:2013.
According to the declaration of the Client, the PUR foam is applied only in the facings of steel, and therefore, according to p. 5.1 of Annex C to PN-EN 14315-1:2013, it occurs in the diffusion tight facings. In this case, HFC 134a is used as blowning agent, so the fixed increment to the initial value of thermal conductivity is equal 0,0025 W/(m·K) in accordance with Annex C to PN-EN 14315-1:2013 (Table C.2.).

In the table 4 the value of thermal conductivity coefficient with aged value is given.

Table 4

| *) initial value of thermal conductivity coefficient, $\lambda_{90,90}$ W/(m·K) | nominal thickness of a plate, d mm | constant increaces due to aging W/(m·K) | core thermal conductivity coefficient including aging W/(m·K) | |
|---|---|---|---|---|
| | | | calculated value | **) declared and design value |
| 0,03049 | for all thickness | 0,0025 | 0,03299 | 0,033 |

**) Value determined on the test results of 10 samples ( acc. to table 2)*
***) The declared value of thermal conductivity coefficient is equal to the design value, acc. to PN-EN ISO 10456:2009 + AC:2010 because:*
*- the declared value includes effect of aging,*
*- conversion due to the temperature and moisture content do not have applicable in this case.*

**Assessment of the performance**

The test results of thermal conductivity presented in table 4 may be used by the producer to determine the declared value of thermal conductivity of the product in accordance with PN-EN 14315-1:2013.

**Responsible for the test**

**M.Sc.Eng. Aldona Wasilewska**

Aldona Wasilewska

**Authorizing person**

**PhD Barbara Pietruszka**

B Pietruszka

**Warsaw, 20.10.2015**

## Annex N$^{o}$ 1 – information about the protocols delivered by the Client

Table 1. Information from the protocols delivered by the Client

| N$^{o}$ | date of delivery of samples | date of issue the protocols | date of the sample production |
|---|---|---|---|
| 1 | 31.08.2015 | 28.08.2015 | 28.08.2015<br>28.08.15 (sample for aging test) |
| 2 | 01.09.2015 | 29.08.2015 | 29.08.2015 |
| 3 | 02.09.2015 | 31.08.2015 | 31.08.2015 |
| 4 | 03.09.2015 | 01.09.2015 | 01.09.2015 |
| 5 | 04.09.2015 | 02.09.2015 | 02.09.2015 |
| 6 | 07.09.2015 | 03.09.2015<br>04.09.2015<br>05.09.2015<br>06.09.2015 | 03.09.2015<br>04.09.2015<br>05.09.2015<br>06.09.2015 |
| 7 | 08.09.2015 | 07.09.2015 | 07.09.2015 |

Table 2. Information about marking of samples in the laboratory

| *marking of samples in the laboratory* | *date of the sample production* |
|---|---|
| 1/ LFS02-01191/15/Z00NF | 28.08.2015 |
| 2/ LFS02-01191/15/Z00NF | 29.08.2015 |
| 3/ LFS02-01191/15/Z00NF | 31.08.2015 |
| 4/ LFS02-01191/15/Z00NF | 01.09.2015 |
| 5/ LFS02-01191/15/Z00NF | 02.09.2015 |
| 6/ LFS02-01191/15/Z00NF | 03.09.2015 |
| 7/ LFS02-01191/15/Z00NF | 04.09.2015 |
| 8/ LFS02-01191/15/Z00NF | 05.09.2015 |
| 9/ LFS02-01191/15/Z00NF | 06.09.2015 |
| 10/ LFS02-01191/15/Z00NF | 07.09.2015 |
| 11/ LFS01-01191/15/Z00NF | 28.08.2015 |

## Annex N° 2

**Additional information about test, required by p. 9 PN-EN 12667:2002:**

The method of reduction of heat flux losses on edges: closed measuring chamber with insulated walls

Heat flux density flow through the sample: used in the test heat flow meter apparatus calculates and shows the value of thermal conductivity, does not show the value of heat flux density

Calibration of heat flow meter apparatus:

- the expiration date of the recent calibration: 30.10.2015

- description and numer of the reference sample IRMM-440 sample N° 2

- the date of certification of the reference sample: 2000

- expiry date: indefinite

Information about diffusion tight facings: does not apply

Verification of flatness of the sample:

[x] The surface of the samples are straightened out under the pressure of the plates of the measuring apparatus, thereby ensuring the flatness of the sample during the test.

The list of deviations from the procedure described in PN-EN 12667:2002: does not apply

Notes: no