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# Determination of declared value of thermal conductivity ($\lambda_D$) of *SEALEC*TION Agribalance® two component open cell, spray applied, semi-rigid polyurethane foam

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Requested by:   IsoGreen Industries Ab.

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**Task**

## Determination of declared value of thermal conductivity ($\lambda_D$) of *SEALEC*TION Agribalance® two component open cell, spray applied, semi-rigid polyurethane foam

Declared value of thermal conductivity

The calculations of the declared thermal conductivity value were performed according to the standard EN ISO 10456.

For the calculations were used ten test results measured by VTT Expert Services Ltd.

Value $\lambda_{90/90}$ of the thermal conductivity is calculated using formula 1.

$$\lambda_{90/90} = \lambda_{\text{mean value}} + k \times S_\lambda \tag{1}$$

where

$\lambda_{90/90}$     is a 90 % fractile with confidence level of 90 % for the thermal conductivity, W/(m·K).

$\lambda_{\text{mean value}}$     is the mean value of the results of the thermal conductivity measurements, W/(m·K).

$k$     is the factor which depends of the number of test results, 10 test results, **k=2.07** (tabulated value).

$S_\lambda$     is the standard deviation of the test results.

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The test results relate only to the sample tested.

$S_\lambda$ is calculated using formula 2.

$$S_\lambda = \sqrt{\frac{\sum_{i=1}^{n}(\lambda_i - \lambda_{ka})^2}{n-1}} \qquad (2)$$

The mean value, the standard deviation and the $\lambda_{90/90}$ -value of the test results W/(m·K) are presented in table 1

If the test results meet the requirements of the table 2 of the standard EN ISO 10456 (measurements at + 10 °C mean temperature for dried material) the conversion of the data can be omitted.

The λ-declared-value is calculated rounding the $\lambda_{90/90}$ –value to the nearest higher value with accuracy of 0,001 W/(m·K).

Ten test results measured by VTT Expert Services Ltd were used for the calculations. The detailed test results are presented in test report No. VTT-S-03734-13.

*Table 1.*

*The results of the thermal conductivity measurements, mean value and standard deviation of the test results of SEALECTION Agribalance® two component open cell, spray applied, semi-rigid polyurethane foam.*

| Test specimen / Manufacturing day | Dry density $\rho$ (kg/m³) | Thermal conductivity $\lambda_{10}$ W/(m·K) |
|---|---|---|
| 1 | 9.2 | 0.0380 |
| 2 | 9.1 | 0.0382 |
| 3 | 9.0 | 0.0373 |
| 4 | 9.0 | 0.0369 |
| 5 | 9.5 | 0.0369 |
| 6 | 9.0 | 0.0375 |
| 7 | 9.6 | 0.0368 |
| 8 | 8.9 | 0.0368 |
| 9 | 9.2 | 0.0375 |
| 10 | 9.5 | 0.0367 |
| Mean value | 9.2 | **0.03726** |
| Standard deviation $S_\lambda$ | - | 0.000532 |

*Table 2.*　　　　　　　　*The $\lambda_{90/90}$ -value and the declared value of thermal conductivity of SEALECTION Agribalance® two component open cell, spray applied, semi-rigid polyurethane foam.*

| Mean value of thermal conductivity $\lambda_{10}$ W/(m·K) | k-factor (10 test results) | Standard deviation $S_\lambda$ | $\lambda_{90/90}$-value | Declared value of thermal conductivity $\lambda_D$ (W/mK) |
|---|---|---|---|---|
| 0.03726 | 2.07 | 0.000532 | 0.03836 | **0.039** |

$\lambda$-declared values is given according to the standard EN ISO 10456 table 2, set I (10 °C) a.

Espoo 27.5.2013

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