

Tecsedo SA  
 Industrial Zone camp de Niscio  
 6534 San Vittore (Kanton Graubunden)  
 SWITZERLAND

## Determination of thermal conductivity

(2 appendices)

### Sampling

Cut-out pieces of sandwich door leafs were sent to RISE by the client and arrived in good condition to RISE HSi at 2017-12-18.

### Test preparation

The samples consisted of polyurethane foam sandwiched between sheets of steel. Before determination of thermal conductivity of the polyurethane foam the surface sheets were removed and the test specimens were cut.

### Test method

The thermal conductivity was determined according to SS-EN 12667:2001.

### Test results

| Tested product | Thermal conductivity, W/(m·K) |
|----------------|-------------------------------|
| Tecsedo TBM    | 0.0206                        |

The results, which are only valid for the tested specimens, are reported in more detail in Annex 1, where also the uncertainty of measurement and testing dates are reported.

### RISE Research Institutes of Sweden AB Building Technology - Building Physics and Indoor Environment

Performed by



Bertil Jonsson

### Appendices

- 1 Test results
- 2 Definition of product families

### RISE Research Institutes of Sweden AB

|                 |                 |                      |
|-----------------|-----------------|----------------------|
| Postal address  | Office location | Phone / Fax / E-mail |
| Box 857         | Brinellgatan 4  | +46 10 516 50 00     |
| SE-501 15 BORÅS | SE-504 62 BORÅS | +46 33 13 55 02      |
| Sweden          |                 | info@ri.se           |

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## Appendix 1

## Test results

### Determination of thermal conductivity

|                                |  |
|--------------------------------|--|
| <b>Client</b>                  | Flexiforce   |
| <b>Products</b>                | The samples consisted of polyurethane foam sandwiched between sheets of steel.   |
| <b>Test date</b>               | 2017-12-27 – 29  |
| <b>Test preparation</b>        | Before determination of thermal conductivity the surface sheets were removed and the test specimens were cut.  |
| <b>Test data</b>               | <p><b>Apparatus:</b> Heat-flow meter apparatus HFM2000 single specimen symmetrical configuration with double heat-flow meters (400 x 400 mm). Calibration 2017-10-07 with reference specimen IRMM 440 F66d <math>\lambda = 0.0304 \text{ W}/(\text{m}\cdot\text{K})</math>.</p> <p><b>Heat-flow:</b> vertical, downwards</p> <p><b>Mean temperature:</b> <math>10\pm 0.3 \text{ }^\circ\text{C}</math></p> <p><b>Ambient temperature:</b> <math>10 \text{ }^\circ\text{C}</math></p> <p>The specimen thickness in the metering zone were determined by a caliper (inv.nr 900911), measuring plate (TP250 A): 250 Pa, 200 x 200 mm.</p> |
| <b>Measurement uncertainty</b> | <p>The uncertainty of the measured thermal conductivity is estimated to <math>\pm 2 \%</math>. The uncertainty of the measured thickness is 0.05 mm</p> <p>The measured results only refer to the tested specimen.</p>   |
| <b>Remarks</b>                 | No thickness or volume changes were observed during the tests.   |
| <b>Ageing</b>                  | The increment for aged value according to table C.2, EN 13165:2012 is 0.0015-0.0025 $\text{W}/(\text{m}\cdot\text{K})$ .   |

## Appendix 1

**Test results**

|  |             |
|--|-------------|
| Product                                      | Tecsedo TBM |
| Material                                     | PUR         |
| Density of the specimen, kg/m <sup>3</sup>   | 39.4        |
| Thickness of the specimen, mm                | 33.6        |
| Mass change during test, kg/kg               | 0.002       |
| Temperature difference across the sample, °C | 18.2        |
| Density of the heat-flow, W/m <sup>2</sup>   | 11.2        |
| Thermal conductivity, W/(m·K)                | 0.0206      |

## Appendix 2

**Definition of product families**

The following product families can be assembled, see table below. According to the client and the manufacturers of the sandwich panels the PUR insulation is identical within each product family. The tested specimens are marked in bold letters.

| Manufacturer | Product family         |
|--------------|------------------------|
| Tecsedo      | <b>TBM</b> and TSS/TSX |