Textiles & Flooring Institute GmbH

# TFI Report 450971-01

## Impact Sound Insulation
## Thermal Resistance

**Customer**

LG Hausys Ltd.
One IFC, 20 Yeouido-gong, Yeongdeungpo-gu
150-876 Seoul
SOUTH KOREA

**Product**

resilient floor covering

Decotile 3.0

**Responsible at TFI**

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This report includes 2 pages and 2 annex(es)

**Aachen, 07.07.2015**

**Dr. Ernst Schröder**

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Textiles & Flooring Institute GmbH

## 1 Transaction

| | |
|---|---|
| Test order | sound insulation according to EN ISO 10140:2010 |
| | thermal resistance according to EN 12664:2001 |
| Order date | 08.06.2015 |
| Your reference | Dan Bi |
| Product designation | Decotile 3.0 |
| TFI sample number | 15-06-0075 |

## 2 Product Specification

| | |
|---|---|
| Use surface | PVC |
| Construction | heterogeneous |
| Structure | structureless |
| Pattern | multicoloured, patterned |
| Colour of the use surface | light brown, brown |
| View |  |
| Thickness [mm] | 3.0* |
| Area density [g/m²] | 6042* |
| Type of delivery | tiles |
| | *customer information |

## 3 Results

| | |
|---|---|
| Impact sound insulation | $\Delta L_w$ = 2 dB |
| Thermal resistance | R = 0,0099 [m²K/W] |

## 4 Annexes

| | |
|---|---|
| Impact sound insulation | TS 450971-01 |
| Thermal resistance | WD 450971-01 |

The annexes marked [a] are based on tests accredited in accordance with EN ISO/IEC 17025.





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# **Annex TS** - Impact Sound Reduction

## 1 Transaction

| | |
|---|---|
| Product designation | Decotile 3.0 |
| TFI sample number | 15-06-0075 |
| Testing period | 25.06.2015 |

## 2 Test Method / Requirements

| | |
|---|---|
| EN ISO 10140-1:2014 | Acoustics - Laboratory measurement of sound insulation of building elements<br>Part 1: Application rules for certain products |
| EN ISO 10140-2:2010 | Acoustics - Laboratory measurement of sound insulation of building elements<br>Part 2: Measurement of airborne sound insulation |
| EN ISO 10140-3:2010 | Acoustics - Laboratory measurement of sound insulation of building elements<br>Part 3: Measurement of impact sound reduction |
| EN ISO 10140-4:2010 | Acoustics - Laboratory measurement of sound insulation of building elements<br>Part 4: Measurement procedures and requirements |
| EN ISO 10140-5:2014 | Acoustics - Laboratory measurement of sound insulation of building elements<br>Part 5: Requirements for test facilities and equipment |
| EN ISO 717-1:2013 | Acoustics - Rating of sound insulation in buildings and of building elements - Part 1: Airborne sound insulation |
| EN ISO 717-2:2013 | Acoustics - Rating of sound insulation in buildings and of building elements - Part 2: Impact sound reduction |
| EN ISO 12999-1: 2014 | Acoustics - Determination and application of measurement uncertainties in building acoustics - Part 1: Sound insulation |

## 3 Remarks

None





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## 4 Measuring Operation

| | |
|---|---|
| Measurement of the impact sound pressure level: | Using 3 fixed microphone positions, with 1 tapping machine position for each microphone position<br>(The single results of the one-third-octave-bands were averaged on an energy basis) |
| Measurement of the reverberation time: | Using 5 fixed microphone positions, with 2 loudspeaker positions for each microphone position<br>(The single results of the one-third-octave-bands were averaged arithmetically ) |
| Corrections: | None, since<br>- background noise corrections not relevant<br>- airborne sound corrections not relevant |

## 5 Laboratories

| | |
|---|---|
| Test rooms: | Laboratories of the Textiles & Flooring GmbH, Hauptstr. 133, 52477 Alsdorf, Germany |
| Sending room (1.04): | 4.29 m x 4.51 m x 2.76 m; V = 53.40 m³ (with diffusers) |
| Receiving room (0.01): | 4.29 m x 4.51 m x 3.05 m; V = 59.01 m³ (with diffusers) |
| Reference floor: | 4.29 m x 4.51 m; S = 19.35 m²<br>14 cm concrete slab floor with an area-related mass of m‘ ≈ 322 kg/m² |
| Flanking walls: | Lime sand brick walls without light wall facings<br>with an average area-related mass of m‘ ≈ 330 kg/m² |

## 6 Measuring Devices

| | |
|---|---|
| Real time analyser: | CESVA INSTRUMENTS, TYPE: SC310, SN: T234359 |
| Microphone: | CESVA INSTRUMENTS, TYPE: C130, SN: 11861 |
| Microphone amplifier: | CESVA INSTRUMENTS, TYPE: PA13, SN: 49649 |
| Calibrator: | CESVA INSTRUMENTS, TYPE: CB006, SN 49649 |
| Loudspeaker: | Dodecahedron (self-construction) |
| Tapping machine: | NORSONIC, Type 211, SN: 502<br>(standard tapping machine with 3 feet and 5 hammers according to ISO 10140) |





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## 7 Evaluation

The impact sound pressure level generated by the standard tapping machine is measured in the receiving room under a bare heavy floor with and without a floor covering. The impact sound reduction is determined on the basis of the measured values as follows:

$\Delta L = L_{n,0} - L_n$ (dB)

$L_{n,0}$ Impact sound pressure level without a floor covering (dB)

$L_n$ Impact sound pressure level with a floor covering (dB)

For the evaluation of the weighted reduction in impact sound pressure level ΔLw, the relevant reference curve is shifted in increments of 1 dB towards the measured curve until the sum of unfavourable deviations is as large as possible, but not more than 32 dB.

The linear impact sound level $\Delta L_{lin}$ is determined according to the following equation:

$$\Delta L_{lin} = L_{n,r,0,w} + C_{l,r,0} - (L_{n,r,w} + C_{l,r}) = \Delta L_w + C_{l,\Delta,}$$

where

| | |
|---|---|
| | $L_{n,r,w}$ is the calculated weighted normalized impact sound pressure level of the reference floor with the floor covering under test |
| $L_{n,r,0,w}$ | 78 dB, calculated from $L_{n,r,0}$ according to Section 4.3.1 of DIN EN ISO 717-2: 2013 |
| $C_{l,r}$ | Spectrum adaptation term for the reference floor with the floor covering to be tested |
| $C_{l,r,0}$ | -11 dB, spectrum adaptation term for the reference floor with $L_{n,r,0}$ determined according to Annex A, Section A.2.1 of DIN EN ISO 717-2:2013 |

## 8 Note

The results are based on measurements performed under laboratory conditions with artificial excitation (standard procedure). The test results are applicable in due consideration of the national provisions and the local circumstances and/or constructions.

# Impact sound insulation according ISO 10140-1

Measurment of impact sound insulation by a floor covering on a solid concrete floor

| | |
|---|---|
| **Product name** | **Decotile 3.0** |
| **TFI sample number** | 15-06-0075 |
| Construction (from top to bottom) | Decotile 3.0 |

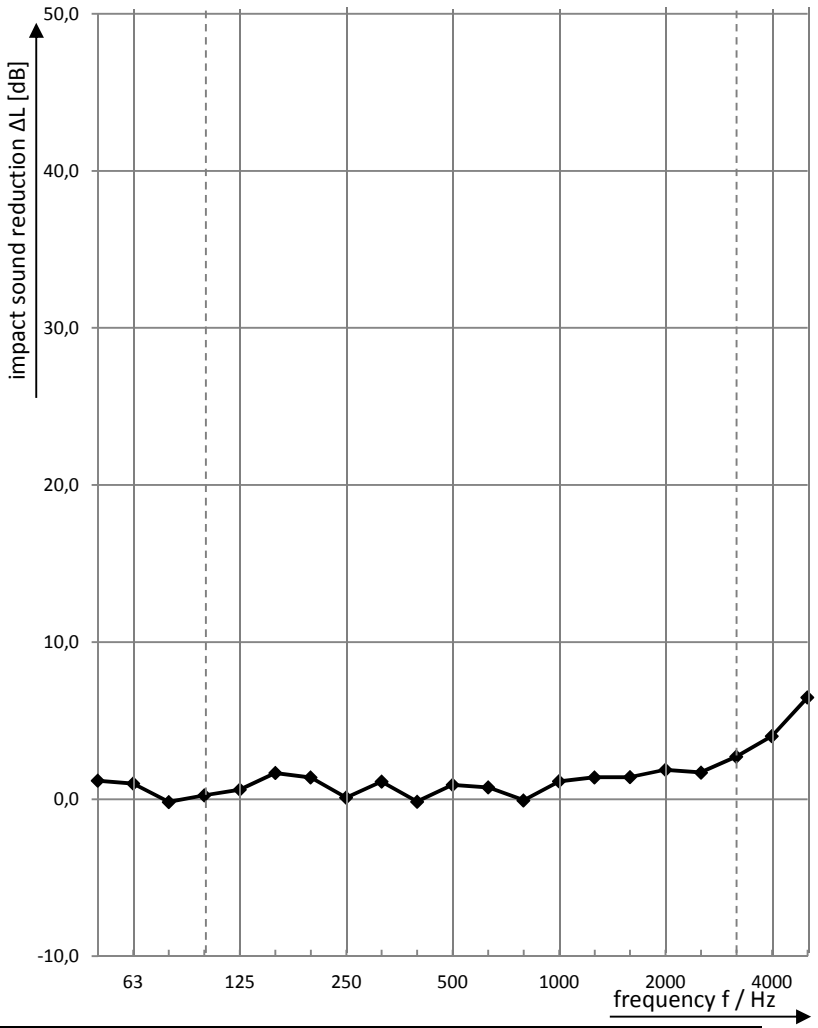
| | |
|---|---|
| Category | I according to ISO 10140 |
| Installation | loose laid |
| Setting time | - |
| Installed by | laboratory |

| | |
|---|---|
| Reference floor | solid concrete floor |
| Note | - |

| | ϴ [°C] | r.h. [%] |
|---|---|---|
| in the source room | 19,4 | 58,4 |

Testing period 25.06.2015

| Frequency f [Hz] | $L_{n,0}$ third-octave [dB] | ΔL third-octave [dB] |
|---|---|---|
| 50 | 56,5 | 1,2 |
| 63 | 62,7 | 1,0 |
| 80 | 57,4 | -0,2 |
| 100 | 57,2 | 0,2 |
| 125 | 67,5 | 0,6 |
| 160 | 62,6 | 1,7 |
| 200 | 64,1 | 1,4 |
| 250 | 67,1 | 0,1 |
| 315 | 65,3 | 1,1 |
| 400 | 64,7 | -0,2 |
| 500 | 65 | 0,9 |
| 630 | 65,3 | 0,8 |
| 800 | 66,4 | -0,1 |
| 1000 | 67,8 | 1,1 |
| 1250 | 67,7 | 1,4 |
| 1600 | 68,2 | 1,4 |
| 2000 | 68,8 | 1,9 |
| 2500 | 68,6 | 1,7 |
| 3150 | 67,9 | 2,7 |
| 4000 | 66,9 | |
| 5000 | 64,4 | |




*Airborne noise correction for the measured value

**Evaluation according to ISO 717-2**

$\Delta L_w$ = **2 dB** $\Delta L_{lin}$ = **1 dB**

$C_{I,\Delta}$ = -1 dB $C_{I,r}$ = -10 dB $C_{I,r,50\text{-}2500}$ = -9 dB

The results are based on measurements, which were performed under laboratory conditions with artificial excitation (standard procedure).

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# **Annex WD** - Thermal Resistance

## 1 Transaction

| | |
|---|---|
| Product designation | Decotile 3.0 |
| TFI sample number | 15-06-0075 |
| Testing period | 20.06.2015 |

## 2 Test Method / Requirements

| | |
|---|---|
| EN 12664:2001 | Determination of thermal resistance by means of guarded hot plate and heat flow meter methods - Dry and moist products with medium and low thermal resistance |
| Test device | One-specimen apparatus, horizontal |
| Conditioning | 24 h storage according to EN ISO 139:2011 |
| | (23°C and 50% rel. humidity) |
| Thickness buit-in [m] | 0,0116 |
| Number of Layer | 4 |
| Density [kg/m³] | 520 |

## 3 Results

| Test | $T_1$ [°C] | $T_2$ [°C] | $\Delta T$ [K] | $T_m$ [K] | $R$ [m²*K/W] |
|---|---|---|---|---|---|
| 1 | 15.8 | 24.6 | 8.8 | 20.2 | 0.03692 |
| 2 | 25.5 | 34.2 | 8.6 | 29.9 | 0.03420 |
| 3 | 35.4 | 43.8 | 8.5 | 39.6 | 0.03195 |
| **Calculated thermal resistance $1/\Lambda_{10}$ one layer at a mean temperature of 10 °C [m²k/W]** | | | | | **0.009875** |

$T_1$: temperature of the cold surface of the specimen

$T_2$: temperature of the warm surface of the specimen

$\Delta T$: temperature difference; $\Delta T=T_1-T_2$, $T_m$

$T_m$: average temperature of the specimen; $T_m=T_1+T_2$

$R$: Increment of thermal resistance

Comments: none