TFI Report 481380-01

Sound Absorption
Impact Sound Insulation

Customer

NEWSPEC CARPET (NINGBO) CO. LTD Cevin
Yindong South Road NO. 399
315100 Ningbo
CHINA VR

Product

textile floor covering

Nylon Carpet Tile with ESC™ Elastic Back (PU)

This report includes 2 pages and 2 annex(es)

Responsible at TFI

-Senior Engineer-
Dr.-Ing. Heike Kempf
Tel: +49 241 9679 171
h.kempf@tfi-aachen.de

Aachen, 10.09.2018

Dr. Alexander Siebel
- Head of the testing laboratory -

The present document is provided with an advanced electronic signature

TFI Aachen GmbH Germany

This report only applies to the tested samples and has been established to the best of our knowledge. Only the entire report shall be reproduced. Under no circumstances, extracts shall be used. Furthermore, we apply the "General Terms and Conditions for the Execution of Contracts" of the TFI Aachen GmbH, also with regard to the order execution.

1 Transaction

Test order	sound absorption according to EN ISO 354 impact sound insulation according to EN ISO 10140
Order date	31 July 2018
Your reference	KE Dai
Product designation	Nylon Carpet Tile with ESC™ Elastic Back (PU)
TFI sample number	18-08-0102

2 Product Specification

Type of manufacture	tufted
Type of surface	loop pile
Backing	textile fleece backing
Pattern	tonal effect without pattern
Colour	Violet, dark violet
View	
Thickness [mm]	9.0±0.5*
Area density [g/m²]	4000±200*
Type of delivery	tiles
	*customer information

3 Results

Sound absorption	α_W = 0,25
Impact sound insulation	ΔL_w = 33 dB

4 Annexes

Sound absorption	SA 481380-01[a]
Sound absorption	TS 481380-01[a]

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

TFI Aachen GmbH
Charlottenburger Allee 41
52068 Aachen · Germany
www.tfi-aachen.de

HRB 8157 Aachen
VAT No. DE209411312
Managing Director
Dr.-Ing. Bayram Aslan

Annex SA - Sound Absorption Coefficient

1 Transaction

Product designation	Nylon Carpet Tile with ESC™ Elastic Back (PU)
TFI sample number	18-08-0102
Testing period	27 August 2018

2 Test Method / Requirements

EN ISO 354:2003	Measurement of sound absorption in a reverberation room
EN ISO 11654:1997	Sound absorbers for use in buildings – Rating of sound absorption
Deviation from the standard	None

3 Remarks

None

4 Measuring Operation

Test noise:	broadband pink noise
Receive filter:	third octave band filter
Measurement:	2 loudspeaker positions
	6 microphone positions

5 Laboratories

Test rooms:	laboratory of the TFI Aachen GmbH, Hauptstr. 133, 52477 Alsdorf, Germany
Test method:	reverberation room method
Volume:	211 m³
Total surface:	213 m²
Floor plan:	trapezoidal
Reflectors:	6 aluminium plates 1.0 m x 2.0 m
	7 plywood boards 1.5 m x 1.3 m
	1 aluminium plate 1.8 m x 0.9 m

TFI Aachen GmbH
Charlottenburger Allee 41
52068 Aachen · Germany
www.tfi-aachen.de

HRB 8157 Aachen
VAT No. DE209411312
Managing Director
Dr.-Ing. Bayram Aslan

6 Measuring Devices

Real time analyser:	Norsonic Nor140, SN: 1406926
Microphone:	Norsonic Type 1209/21134
Loudspeaker:	2 dodecahedrons

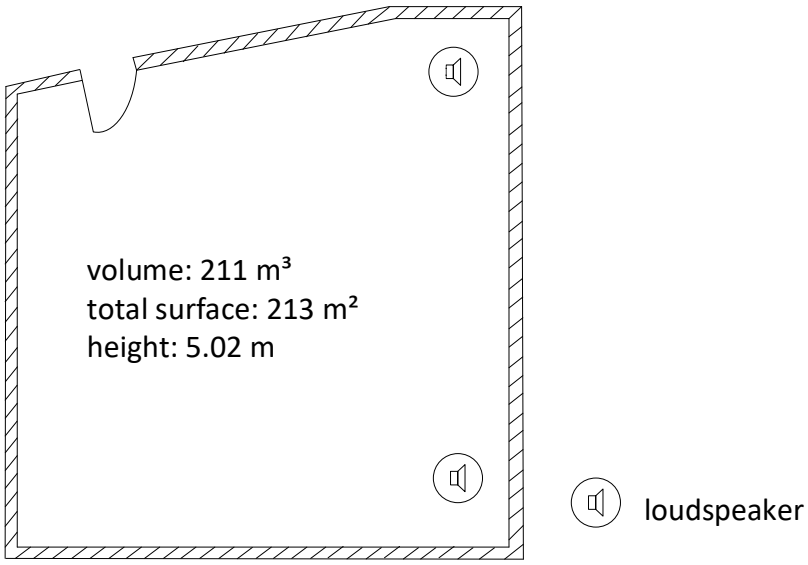
7 Evaluation

The decay curves are determined using the interrupted noise method. Several decay curves measured at one microphone and/or loudspeaker position are averaged in order to reach a sufficient reproducibility. The reverberation time of the room is expressed by the arithmetic mean derived from the total number of all reverberation time measurements in each frequency band.

The equivalent sound absorption area of the test specimen A_T is calculated as the difference between the equivalent sound absorption area of the reverberation room with test specimen A_2 and the equivalent sound absorption area of the empty reverberation room A_1 without test specimen.

The equivalent sound absorption coefficient α_s describes the ratio of the equivalent sound absorption area A_T of a test specimen divided by the area of the test specimen.

The evaluated sound absorption coefficient α_w is a single-number frequency-independent value which equals the value of the reference curve at 500 Hz after shifting it.



Drawing reverberation room

TFI Aachen GmbH
Charlottenburger Allee 41
52068 Aachen · Germany
www.tfi-aachen.de

HRB 8157 Aachen
VAT No. DE209411312
Managing Director
Dr.-Ing. Bayram Aslan

Sound absorption according ISO 11654

SA 481380-01

Measurement of sound absorption coefficient in a reverberation room

Annex SA – Sound absorption

TFI sample no.: 18-08-0102 Testing period: 27.08.2018

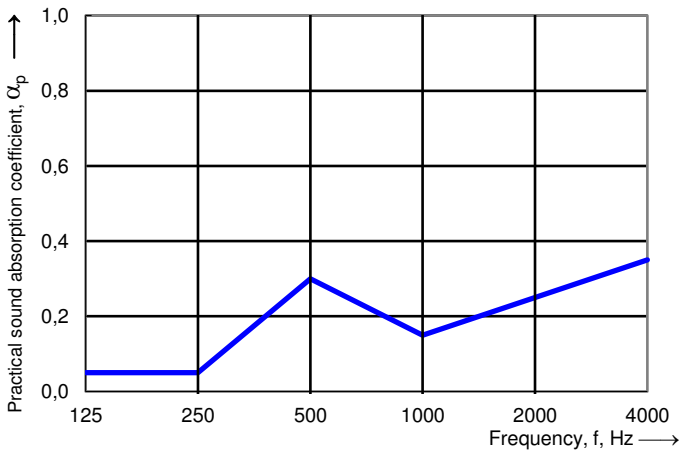
Construction: (from top to bottom) Nylon Carpet Tile with ESC™ Elastic Back (PU) (18-08-0102)□

Product name: Nylon Carpet Tile with ESC™ Elastic Back (PU)

Reverberation room / without		Reverberation room / with sample	
Relative humidity:	63,5 %	Relative humidity:	63,5 %
Temperature:	21,1 °C	Temperature:	21,1 °C
Barometric pressure:	99,4 kPa	Barometric pressure:	99,4 kPa

Surface area:	11,16 m²
Room volume:	211,0 m³
Total room area St:	213 m²

Frequency f [Hz]	α_p Oktave
100 125 160	0,05
200 250 315	0,05
400 500 630	0,30
800 1000 1250	0,15
1600 2000 2500	0,25
3150 4000 5000	0,35



Weighted sound absorption coefficient according to ISO 11654

α_w = 0,25

Sound absorption according ISO 354

SA 481380-01

Measurement of sound absorption coefficient in a reverberation room

Annex SA − Sound absorption

Weighted sound absorption coefficient according to ISO 11654

α_w = 0,25

Surface area: 11,16 m²

Room volume: 211,0 m³

Total room area St: 213,0 m²

Frequency [Hz]	α_p	α_s	A [m²]	T1 [s]	T2 [s]
50		-0,01	-0,1	7,13	7,25
63	0,00	0,03	0,4	8,87	8,05
80		0,00	0,0	9,94	10,02
100		-0,04	-0,5	9,28	10,76
125	0,05	0,11	1,2	7,72	6,02
160		0,05	0,5	6,50	5,89
200		0,02	0,2	6,99	6,69
250	0,05	0,04	0,5	6,46	5,93
315		0,09	1,0	5,69	4,85
400		0,30	3,4	6,05	3,78
500	0,30	0,41	4,5	6,13	3,37
630		0,21	2,3	5,82	4,17
800		0,18	2,0	5,60	4,21
1000	0,15	0,16	1,8	5,29	4,14
1250		0,18	2,0	5,47	4,14
1600		0,21	2,3	5,30	3,90
2000	0,25	0,25	2,8	5,04	3,56
2500		0,29	3,3	4,46	3,13
3150		0,31	3,5	3,74	2,71
4000	0,35	0,34	3,8	3,09	2,30
5000		0,40	4,4	2,40	1,83

Reverberation room / without sample:

Relative humidity: 63,5 %

Temperature: 21,1 °C

Barometric pressure: 99,4 kPa

Reverberation room / with sample:

Relative humidity: 63,5 %

Temperature: 21,1 °C

Barometric pressure: 99,4 kPa

TFI sample number: 18-08-0102

Annex TS - Impact Sound Insulation

1 Transaction

Product designation	Nylon Carpet Tile with ESC™ Elastic Back (PU)
TFI sample number	18-08-0102
Testing period	27 August 2018

2 Test Method / Requirements

EN ISO 10140-1:2014	Acoustics - Laboratory measurement of sound insulation of building elements - Part 1: Application rules for certain products
EN ISO 10140-2:2010	Acoustics - Laboratory measurement of sound insulation of building elements - Part 2: Measurement of airborne sound insulation
EN ISO 10140-3:2015	Acoustics - Laboratory measurement of sound insulation of building elements - Part 3: Measurement of impact sound reduction
EN ISO 10140-4:2010	Acoustics - Laboratory measurement of sound insulation of building elements - Part 4: Measurement procedures and requirements
EN ISO 10140-5:2014	Acoustics - Laboratory measurement of sound insulation of building elements - 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

4 Measuring Operation

Measurement of the impact sound pressure level:	Using 4 fixed microphone positions, with 1 tapping machine position for each microphone position (The single results of the one-third-octave-bands were averaged on an energy basis)
Test surface:	~1,5m²
Category:	I
Connection with the floor:	loose laid

TFI Aachen GmbH
Charlottenburger Allee 41
52068 Aachen · Germany
www.tfi-aachen.de

HRB 8157 Aachen
VAT No. DE209411312
Managing Director
Dr.-Ing. Bayram Aslan

Damage to the sample:	None
Corrections:	- background noise correction - airborne sound correction

5 Laboratories

Test rooms:	Laboratories of the TFI Aachen GmbH, Hauptstrasse133, 52477 Alsdorf, Germany
Sending room (1.04):	V = 52.1 m³ (with diffusers)
Receiving room (0.01):	4.05 m x 3.95 m x 3.33 m + 2.00 m x 0.98 m x 0.18 m; V = 53.6 m³ (cuboid room, with diffusers)
Reference floor:	4.27 m x 4.46 m; S = 19.04 m² 14 cm concrete slab floor with an area-related mass of m‘ ~ 322 kg/m²
Flanking walls:	Lime sand brick walls with light wall facings (facing shell d= 12cm) with an average area-related mass of m‘ ~ 330 kg/m²

6 Measuring Devices

Real time analyser:	Norsonic Nor140, SN: 1406927 Norsonic Nor140, SN: 1406926
Microphone:	Norsonic Type 1209/21135 Norsonic Type 1209/21134
Tapping machine:	NORSONIC, Type 211, SN: 502 (standard tapping machine with 3 feet and 5 hammers according to ISO 10140)

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.

TFI Aachen GmbH
Charlottenburger Allee 41
52068 Aachen · Germany
www.tfi-aachen.de

HRB 8157 Aachen
VAT No. DE209411312
Managing Director
Dr.-Ing. Bayram Aslan

The linear impact sound level ΔL_{lin} is determined according to the following equation:

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

$L_{n,r,w}$	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.

TFI Aachen GmbH
Charlottenburger Allee 41
52068 Aachen · Germany
www.tfi-aachen.de

HRB 8157 Aachen
VAT No. DE209411312
Managing Director
Dr.-Ing. Bayram Aslan

Impact sound insulation according ISO 10140-1

TS 481380-01

Laboratory measurements of the reduction of transmitted impact noise by floor coverings on a heavyweight reference floor

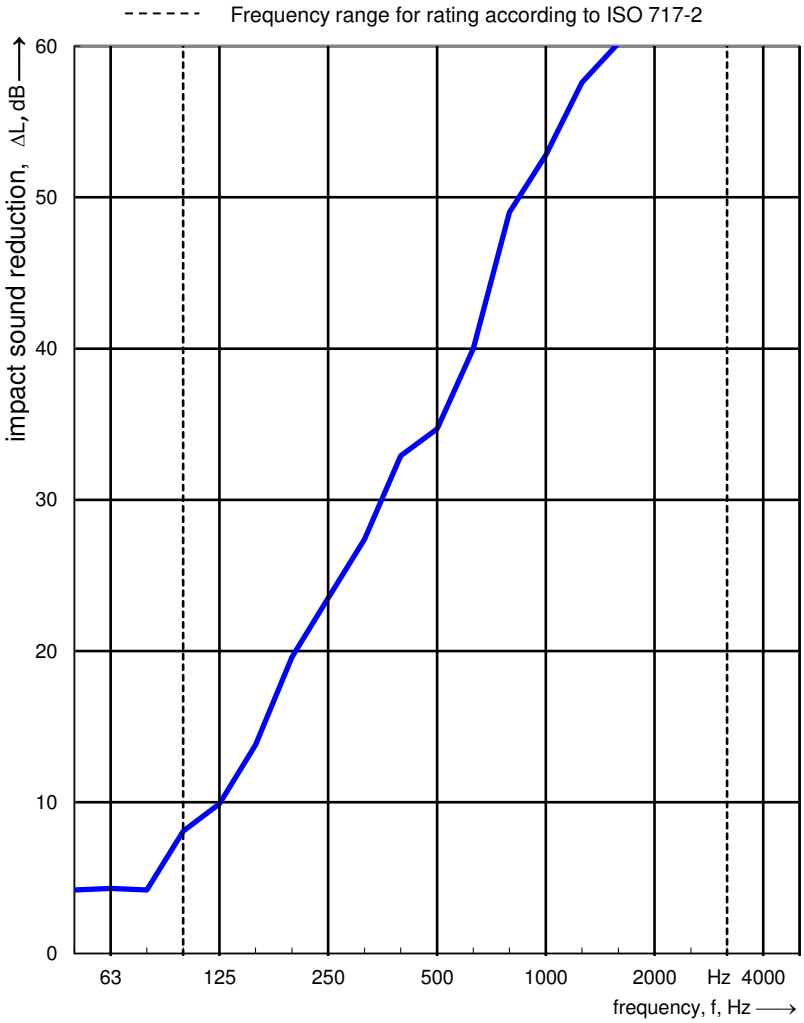
Annex TS – Impact sound insulation

TFI sample number:	18-08-0102	Testing period:	27.08.2018
Product name:	Nylon Carpet Tile with ESC™ Elastic Back (PU)		
Installed by:	TFI Aachen GmbH		
Construction: (from top to bottom)	Nylon Carpet Tile with ESC™ Elastic Back (PU) (18-08-0102)□		

Receiving room:		Source room:	
Volume:	53,6 m³	Volume:	52,1 m³
Air temperature:	21,1 °C	Air temperature:	21,4 °C
Relative air humidity:	74,5 %	Relative air humidity:	59,8 %
Static pressure:	99,5 kPa	Type of reference floor:	Heavyweight

Frequency f [Hz]	$L_{n,0}$ 1/3 oct. [dB]	ΔL 1/3 oct. [dB]
50	62,0	4,2
63	64,3	4,3
80	61,4	4,2
100	59,7	8,1
125	63,3	9,9
160	58,5	13,8
200	63,8	19,6
250	68,5	23,5
315	64,2	27,4
400	64,6	32,9
500	65,3	34,7
630	65,2	40,0
800	66,1	49,0
1000	67,2	52,8
1250	67,7	57,6
1600	68,2	60,2
2000	68,6	62,6
2500	67,9	67,4 [1]
3150	68,2	66,4 [1]
4000	67,0	64,9 [1]
5000	63,6	60,8 [1]

[1] too high



Evaluation according to ISO 717-2

ΔL_w = 33 dB $C_{I,\Delta}$ = -13 dB $C_{I,r}$ = 2 dB

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

Impact sound insulation according ISO 10140-1

TS 481380-01

Laboratory measurements of the reduction of transmitted impact noise by floor coverings on a heavyweight reference floor

Evaluation according to ISO 717-2

ΔL_w = 33 dB $C_{I,\Delta}$ = -13 dB $C_{I,r}$ = 2 dB

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

Weighted normalized impact sound pressure level $L_{n,0,w}$ = 74 dB

Weighted normalized impact sound pressure level $L_{n,w}$ = 40 dB

Weighted normalized impact sound pressure level $L_{n,r,w}$ = 45 dB

Frequency [Hz]	ΔL [dB]	$L_{n,0}$ [dB]	L_n [dB]	$L_{n,r}$ [dB]
50	4,2	62,0	57,8	
63	4,3	64,3	60,0	
80	4,2	61,4	57,2	
100	8,1	59,7	51,6	58,9
125	9,9	63,3	53,4	57,6
160	13,8	58,5	44,7	54,2
200	19,6	63,8	44,2	48,9
250	23,5	68,5	45,0	45,5
315	27,4	64,2	36,8	42,1
400	32,9	64,6	31,7	37,1
500	34,7	65,3	30,6	35,8
630	40,0	65,2	25,2	31,0
800	49,0	66,1	17,1	22,5
1000	52,8	67,2	14,4	19,2
1250	57,6	67,7	10,1	14,4
1600	60,2	68,2	8,0	11,8
2000	62,6	68,6	6,0	9,4
2500	67,4	67,9	0,5	4,6
3150	66,4	68,2	1,8	5,6
4000	64,9	67,0	2,1	
5000	60,8	63,6	2,8	

Receiving room:

Volumen: 53,6 m³

Air temperature: 21,1 °C

Relative air humidity: 74,50 %

Static pressure: 99,5 kPa

Source room:

Volumen: 52,1 m³

Air temperature: 21,4 °C

Relative air humidity: 59,8 %

Type of reference floor: Heavyweight