

Determination and classification of sound absorption coefficient of Lumir Comfort

Requested by	Lumir Oy Jose Cucharero jose.cuchareromoya@lumir.fi Tammiston Kauppatie 22 01510 Vantaa FINLAND
Order ref.	VWZOPT210029-01
Contact person	Eurofins Expert Services Oy Mika Lojander Tekniikantie 4 02150 Espoo MikaLojander@eurofins.fi
Assignment	Determination and classification of sound absorption coefficient for Lumir Comfort coated products according to EN ISO 354:2003 and EN ISO 11654:1997.
Sample details	The customer supplied on 7 th March 2021 to the laboratory wool and Gypsum board samples coated with Lumir Comfort acoustic coating. The additional information and principal section of the samples delivered by the customer is presented in in Appendix 2
Date and place of testing	The samples were tested on 7 th March 2021 Eurofins Expert Services Oy research hall 1 (Tekniikantie 15 A, 02150 Espoo).
Installation and measuring	The tested samples were installed in reverberation chamber and different airspaces were achieved with solid frames. The edge joints of the specimen and the airspace between chamber surface and specimen were totally enclosed by gypsum board. Tests were performed by the Eurofins Expert Services Oy Senior Technician Ville Joensuu.
Method and equipment	The sound absorption coefficient, α_s was measured according to the standard SFS EN ISO 354:2003 [1] and the rating of sound absorption (calculation of α_w) was determined according to the standard SFS EN ISO 11654:1997 [2] Reverberation room dimensions and measuring equipment are presented in Appendix 3.
Result	The sound absorption coefficient α_s in one-third-octave bands and the practical sound absorption coefficient α_p in octave bands are presented in Appendix 1. The weighted sound absorption coefficient α_w and the sound absorption class are presented also in Table 1.

Table 1. Weighted sound absorption coefficient α_w and sound absorption class of Lumir Comfort products

No.	Sample	Mounting type	Weighted sound absorption coefficient α_w	Sound absorption class
1.	LW20 + Comfort	A	0,75 (H)	C
2.	LW20 + Comfort	E-25	0,9	A
3.	LW20 + Comfort	E-75	0,9	A
4.	LW20 + Comfort	E-175	0,85	B
5.	LW40 + Comfort	A	0,9	A
6.	LW40 + Comfort	E-55	0,9	A
7.	LW40 + Comfort	E155	0,85	B
8.	Lumir Comfort on Gypsum board	A	0,35 (MH)	D
9.	Lumir Comfort on Gypsum board + wool (partial)	E-120	0,35 (MH)	D

Espoo, 10.3.2021



Mika Lojander
Expert

The report is electronically signed

Eurofins Expert Services Oy is notified body No. NB 0809

FINAS Finnish Accreditation Service has accredited our laboratory (T001, Eurofins Expert Services Oy) to perform measurements according to standards listed below..

References

[1] EN ISO 354:2003, Acoustics - Measurement of sound absorption in a reverberation room

[2] *ISO 11654:1997, Acoustics - Sound absorbers for use in buildings - Rating of sound absorption*

Appendices

3

Distribution

Customer, electronically approved

Determination of sound absorption and classification

Client: Lumir Oy

Order: VWZOPT210029-01 / EUFI29-21001410 Volume of the rev. room: 201 m³
 Area of the inner surf.: 209 m²

Test place: Eurofins Expert Services Oy TH1 Sample size: 10,8 m²

Task: Determination of absorption coefficient (EN ISO 354)
 Octaves valuation and classification (ISO 11654:1997) Temperature and relative humidity of rev. room
 Empty: 19 °C 58 %
 Sample: 19,3 °C 50 %

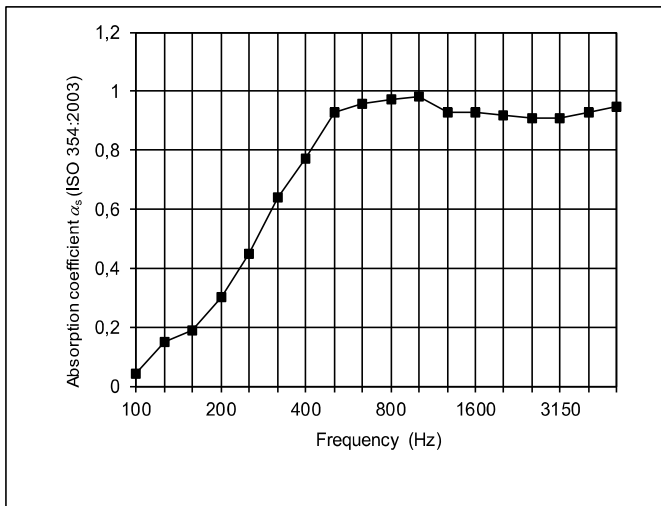
Test date: 7.3.2021

Sample: LW20 + Comfort: 20mm wool + Lumir Comfort 5mm

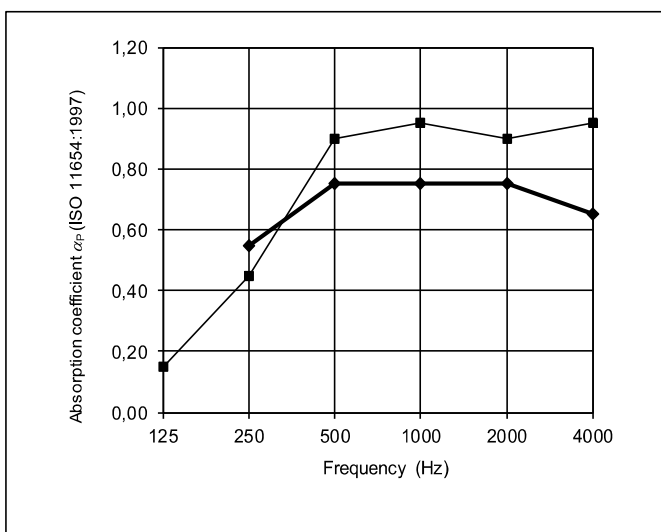
Board size: 15pcs (600 x 1200 x 25)

Surface mass: 3,1 kg/m² (2,25kg/board)

Arrangements: Type A



Frequency (Hz)	T ₁ (s)	T ₂ (s)	α_s
100	5,29	4,95	0,04
125	4,92	3,97	0,15
160	5,71	4,20	0,19
200	5,04	3,35	0,30
250	5,48	3,02	0,45
315	5,55	2,53	0,64
400	4,97	2,19	0,77
500	4,82	1,93	0,93
630	5,10	1,94	0,96
800	5,05	1,92	0,97
1000	5,10	1,92	0,98
1250	4,88	1,94	0,93
1600	4,38	1,86	0,93
2000	4,05	1,80	0,92
2500	3,70	1,73	0,91
3150	3,20	1,60	0,91
4000	2,68	1,43	0,93
5000	2,21	1,26	0,95



Octave values and classification - ISO 11654

Frequency (Hz)	Reference Curve	α_p
125		0,15
250	0,55	0,45
500	0,75	0,90
1000	0,75	0,95
2000	0,75	0,90
4000	0,65	0,95

Weighted absorption coefficient, α_w : 0,75 (H)

Sound absorption class: C

Absorption classes: A, B, C, D, E and no classification.

Determination of sound absorption and classification

Client: Lumir Oy

Order: VWZOPT210029-01 / EUFI29-21001410 Volume of the rev. room: 201 m³
 Area of the inner surf.: 209 m²

Test place: Eurofins Expert Services Oy TH1 Sample size: 10,8 m²

Task: Determination of absorption coefficient (EN ISO 354)
 Octaves valuation and classification (ISO 11654:1997) Temperature and relative humidity of rev. room
 Empty: 19 °C 58 %
 Sample: 19,3 °C 50 %

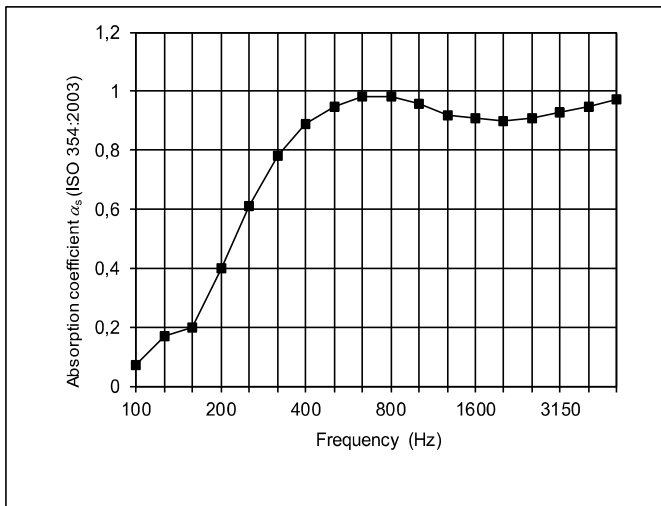
Test date: 7.3.2021

Sample: LW20 + Comfort: 20mm wool + Lumir Comfort 5mm

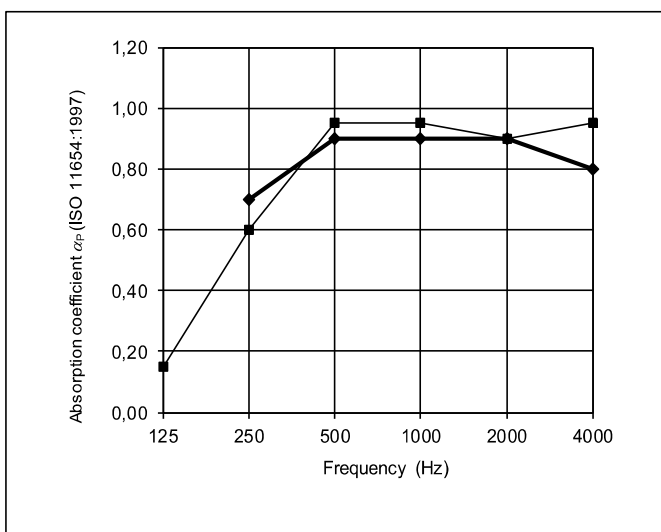
Board size: 15pcs (600 x 1200 x 25)

Surface mass: 3,1 kg/m² (2,25kg/board)

Arrangements: Type E-25



Frequency (Hz)	T ₁ (s)	T ₂ (s)	α _s
100	5,29	4,68	0,07
125	4,92	3,86	0,17
160	5,71	4,12	0,20
200	5,04	3,00	0,40
250	5,48	2,58	0,61
315	5,55	2,27	0,78
400	4,97	2,01	0,89
500	4,82	1,91	0,95
630	5,10	1,92	0,98
800	5,05	1,91	0,98
1000	5,10	1,94	0,96
1250	4,88	1,95	0,92
1600	4,38	1,88	0,91
2000	4,05	1,82	0,90
2500	3,70	1,73	0,91
3150	3,20	1,58	0,93
4000	2,68	1,42	0,95
5000	2,21	1,25	0,97



Octave values and classification - ISO 11654

Frequency (Hz)	Reference Curve	α _p
125		0,15
250	0,70	0,60
500	0,90	0,95
1000	0,90	0,95
2000	0,90	0,90
4000	0,80	0,95

Weighted absorption coefficient, α_w: 0,9

Sound absorption class: A

Absorption classes: A, B, C, D, E and no classification.

Determination of sound absorption and classification

Client: Lumir Oy

Order: VWZOPT210029-01 / EUFI29-21001410

Volume of the rev. room: 201 m³

Area of the inner surf.: 209 m²

Test place: Eurofins Expert Services Oy TH1

Sample size: 10,8 m²

Task: Determination of absorption coefficient (EN ISO 354)
Octaves valuation and classification (ISO 11654:1997)

Temperature and relative humidity of rev. room

Empty: 19 °C 58 %

Sample: 19,3 °C 50 %

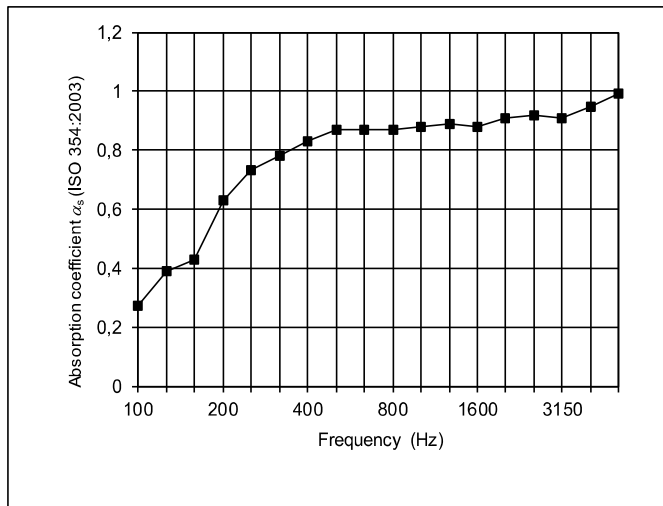
Test date: 7.3.2021

Sample: LW20 + Comfort: 20mm wool + Lumir Comfort 5mm

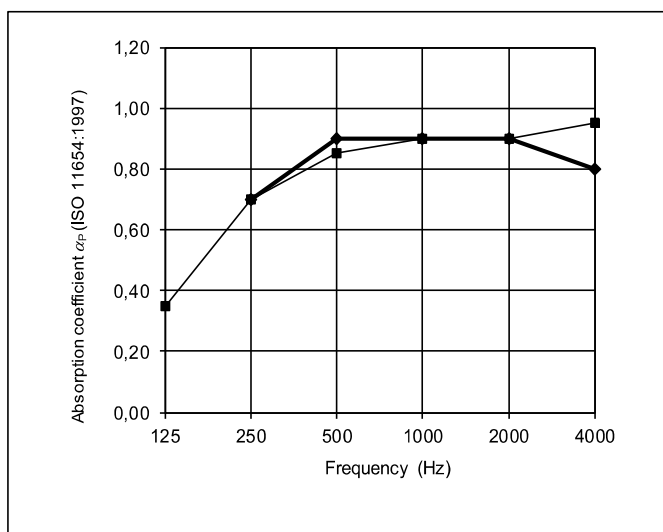
Board size: 15pcs (600 x 1200 x 25)

Surface mass: 3,1 kg/m² (2,25kg/board)

Arrangements: Type E-75



Frequency (Hz)	T ₁ (s)	T ₂ (s)	α_s
100	5,29	3,60	0,27
125	4,92	3,01	0,39
160	5,71	3,15	0,43
200	5,04	2,44	0,63
250	5,48	2,35	0,73
315	5,55	2,27	0,78
400	4,97	2,09	0,83
500	4,82	2,01	0,87
630	5,10	2,06	0,87
800	5,05	2,05	0,87
1000	5,10	2,04	0,88
1250	4,88	2,00	0,89
1600	4,38	1,91	0,88
2000	4,05	1,81	0,91
2500	3,70	1,72	0,92
3150	3,20	1,60	0,91
4000	2,68	1,42	0,95
5000	2,21	1,24	0,99



Octave values and classification - ISO 11654

Frequency (Hz)	Reference Curve	α_p
125		0,35
250	0,70	0,70
500	0,90	0,85
1000	0,90	0,90
2000	0,90	0,90
4000	0,80	0,95

Weighted absorption coefficient, α_w : 0,9

Sound absorption class: A

Absorption classes: A, B, C, D, E and no classification.

Determination of sound absorption and classification

Client: Lumir Oy

Order: VWZOPT210029-01 / EUFI29-21001410

Volume of the rev. room: 201 m³

Area of the inner surf.: 209 m²

Test place: Eurofins Expert Services Oy TH1

Sample size: 10,8 m²

Task: Determination of absorption coefficient (EN ISO 354)
Octaves valuation and classification (ISO 11654:1997)

Temperature and relative humidity of rev. room

Empty: 19 °C 58 %

Sample: 19,3 °C 50 %

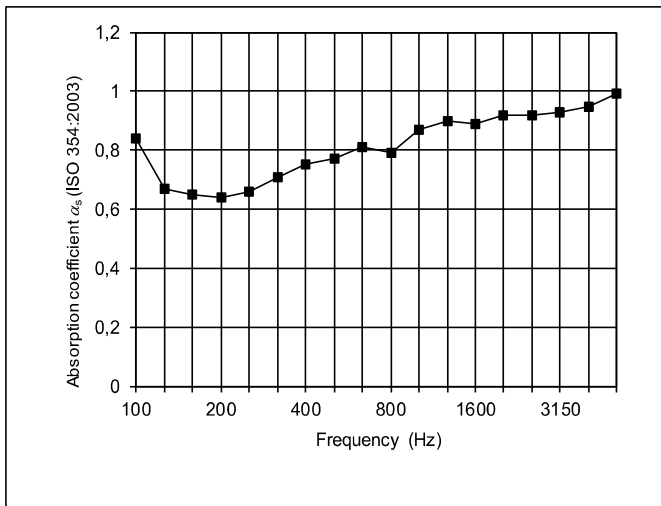
Test date: 7.3.2021

Sample: LW20 + Comfort: 20mm wool + Lumir Comfort 5mm

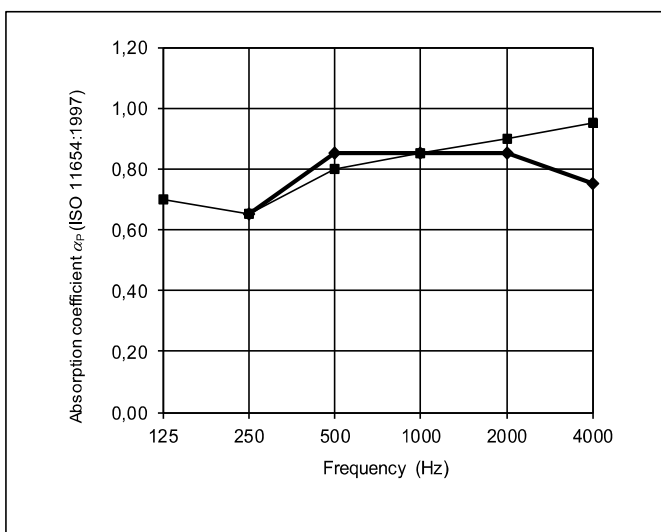
Board size: 15pcs (600 x 1200 x 25)

Surface mass: 3,1 kg/m² (2,25kg/board)

Arrangements: Type E-175



Frequency (Hz)	T ₁ (s)	T ₂ (s)	α_s
100	5,29	2,14	0,84
125	4,92	2,35	0,67
160	5,71	2,56	0,65
200	5,04	2,43	0,64
250	5,48	2,48	0,66
315	5,55	2,40	0,71
400	4,97	2,22	0,75
500	4,82	2,15	0,77
630	5,10	2,15	0,81
800	5,05	2,17	0,79
1000	5,10	2,06	0,87
1250	4,88	1,98	0,90
1600	4,38	1,90	0,89
2000	4,05	1,80	0,92
2500	3,70	1,72	0,92
3150	3,20	1,58	0,93
4000	2,68	1,42	0,95
5000	2,21	1,24	0,99



Octave values and classification - ISO 11654

Frequency (Hz)	Reference Curve	α_p
125		0,70
250	0,65	0,65
500	0,85	0,80
1000	0,85	0,85
2000	0,85	0,90
4000	0,75	0,95

Weighted absorption coefficient, α_w : 0,85

Sound absorption class: B

Absorption classes: A, B, C, D, E and no classification.

Determination of sound absorption and classification

Client: Lumir Oy

Order: VWZOPT210029-01 / EUFI29-21001410

Volume of the rev. room: 201 m³

Area of the inner surf.: 209 m²

Test place: Eurofins Expert Services Oy TH1

Sample size: 10,8 m²

Task: Determination of absorption coefficient (EN ISO 354)
Octaves valuation and classification (ISO 11654:1997)

Temperature and relative humidity of rev. room

Empty: 19 °C 58 %

Sample: 19,3 °C 50 %

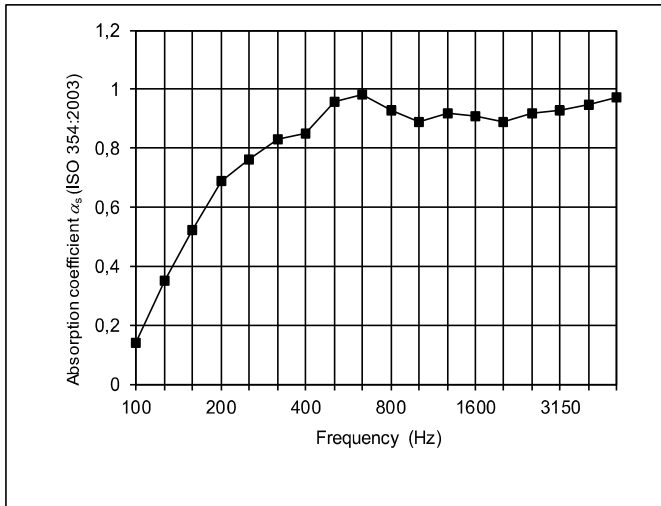
Test date: 7.3.2021

Sample: LW40 + Comfort: 40mm wool + Lumir Comfort 5mm

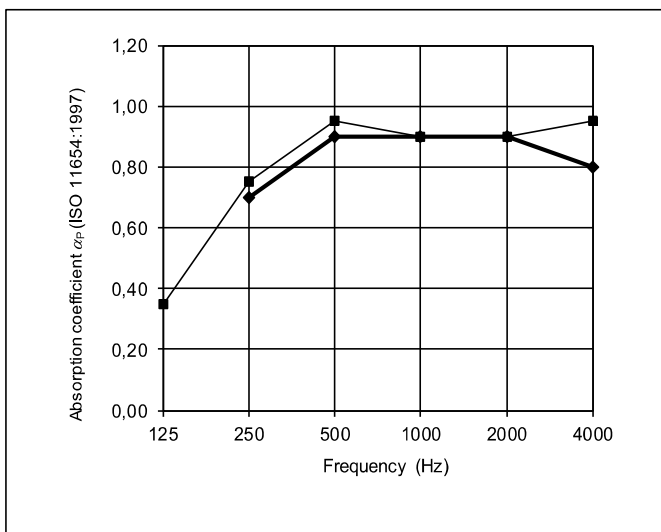
Board size: 15pcs (600 x 1200 x 45)

Surface mass: 4,4 kg/m² (3,2kg/board)

Arrangements: Type A



Frequency (Hz)	T ₁ (s)	T ₂ (s)	α_s
100	5,29	4,26	0,14
125	4,92	3,11	0,35
160	5,71	2,88	0,52
200	5,04	2,34	0,69
250	5,48	2,30	0,76
315	5,55	2,19	0,83
400	4,97	2,06	0,85
500	4,82	1,90	0,96
630	5,10	1,92	0,98
800	5,05	1,97	0,93
1000	5,10	2,03	0,89
1250	4,88	1,96	0,92
1600	4,38	1,88	0,91
2000	4,05	1,83	0,89
2500	3,70	1,72	0,92
3150	3,20	1,58	0,93
4000	2,68	1,42	0,95
5000	2,21	1,25	0,97



Octave values and classification - ISO 11654

Frequency (Hz)	Reference Curve	α_p
125		0,35
250	0,70	0,75
500	0,90	0,95
1000	0,90	0,90
2000	0,90	0,90
4000	0,80	0,95

Weighted absorption coefficient, α_w : 0,9

Sound absorption class: A

Absorption classes: A, B, C, D, E and no classification.

Determination of sound absorption and classification

Client: Lumir Oy

Order: VWZOPT210029-01 / EUFI29-21001410 Volume of the rev. room: 201 m³
 Area of the inner surf.: 209 m²

Test place: Eurofins Expert Services Oy TH1 Sample size: 10,8 m²

Task: Determination of absorption coefficient (EN ISO 354)
 Octaves valuation and classification (ISO 11654:1997) Temperature and relative humidity of rev. room
 Empty: 19 °C 58 %
 Sample: 19,3 °C 50 %

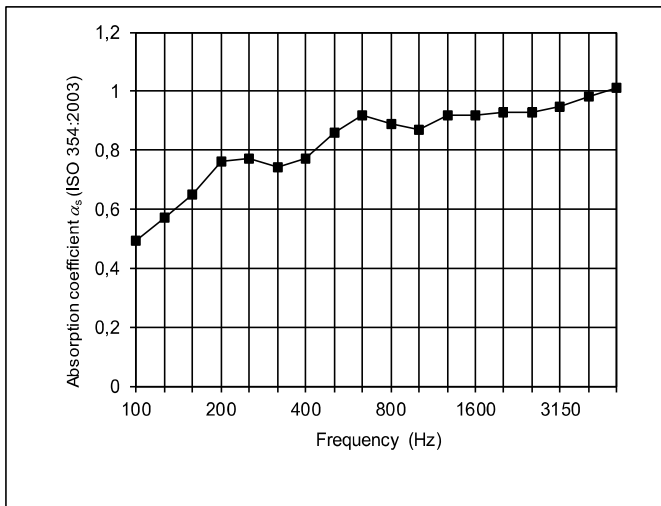
Test date: 7.3.2021

Sample: LW40 + Comfort: 40mm wool + Lumir Comfort 5mm

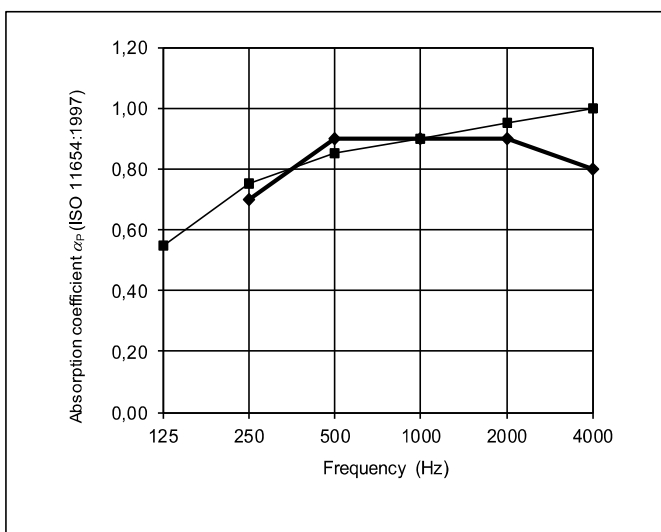
Board size: 15pcs (600 x 1200 x 45)

Surface mass: 4,4 kg/m² (3,2kg/board)

Arrangements: Type E-55



Frequency (Hz)	T ₁ (s)	T ₂ (s)	α_s
100	5,29	2,83	0,49
125	4,92	2,55	0,57
160	5,71	2,55	0,65
200	5,04	2,21	0,76
250	5,48	2,27	0,77
315	5,55	2,34	0,74
400	4,97	2,19	0,77
500	4,82	2,02	0,86
630	5,10	1,99	0,92
800	5,05	2,02	0,89
1000	5,10	2,06	0,87
1250	4,88	1,96	0,92
1600	4,38	1,87	0,92
2000	4,05	1,79	0,93
2500	3,70	1,71	0,93
3150	3,20	1,57	0,95
4000	2,68	1,40	0,98
5000	2,21	1,23	1,01



Octave values and classification - ISO 11654

Frequency (Hz)	Reference Curve	α_p
125		0,55
250	0,70	0,75
500	0,90	0,85
1000	0,90	0,90
2000	0,90	0,95
4000	0,80	1,00

Weighted absorption coefficient, α_w : 0,9

Sound absorption class: A

Absorption classes: A, B, C, D, E and no classification.

Determination of sound absorption and classification

Client: Lumir Oy

Order: VWZOPT210029-01 / EUFI29-21001410

Volume of the rev. room: 201 m³

Area of the inner surf.: 209 m²

Test place: Eurofins Expert Services Oy THI

Sample size: 10,8 m²

Task: Determination of absorption coefficient (EN ISO 354)
Octaves valuation and classification (ISO 11654:1997)

Temperature and relative humidity of rev. room

Empty: 19 °C 58 %

Sample: 19,3 °C 50 %

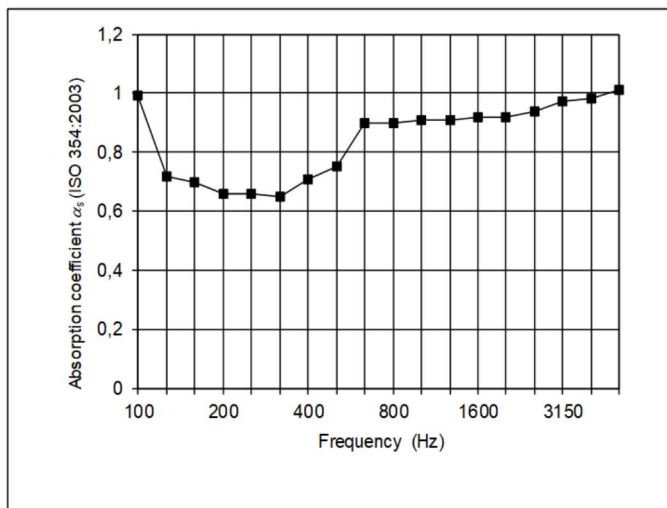
Test date: 7.3.2021

Sample: LW40 + Comfort: 40mm wool + Lumir Comfort 5mm

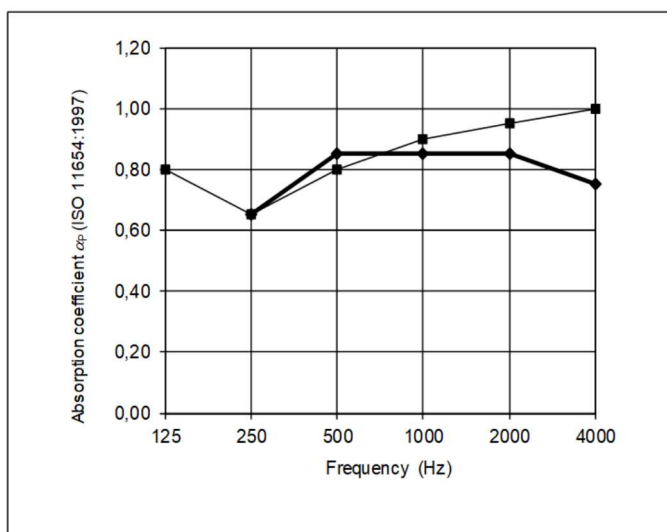
Board size: 15pcs (600 x 1200 x 45)

Surface mass: 4,4 kg/m² (3,2kg/board)

Arrangements: Type E-155



Frequency (Hz)	T ₁ (s)	T ₂ (s)	α_s
100	5,29	1,93	0,99
125	4,92	2,26	0,72
160	5,71	2,44	0,70
200	5,04	2,39	0,66
250	5,48	2,49	0,66
315	5,55	2,51	0,65
400	4,97	2,29	0,71
500	4,82	2,19	0,75
630	5,10	2,02	0,90
800	5,05	2,01	0,90
1000	5,10	2,01	0,91
1250	4,88	1,97	0,91
1600	4,38	1,87	0,92
2000	4,05	1,80	0,92
2500	3,70	1,70	0,94
3150	3,20	1,55	0,97
4000	2,68	1,40	0,98
5000	2,21	1,23	1,01



Octave values and classification - ISO 11654

Frequency (Hz)	Reference Curve	α_p
125		0,80
250	0,65	0,65
500	0,85	0,80
1000	0,85	0,90
2000	0,85	0,95
4000	0,75	1,00

Weighted absorption coefficient, α_w : 0,85

Sound absorption class: B

Absorption classes: A, B, C, D, E and no classification.

Determination of sound absorption and classification

Client: Lumir Oy

Order: VWZOPT210029-01 / EUFI29-21001410

Volume of the rev. room: 201 m³

Area of the inner surf.: 209 m²

Test place: Eurofins Expert Services Oy TH1

Sample size: 10,8 m²

Task: Determination of absorption coefficient (EN ISO 354)
Octaves valuation and classification (ISO 11654:1997)

Temperature and relative humidity of rev. room

Empty: 19 °C 58 %

Sample: 19,3 °C 50 %

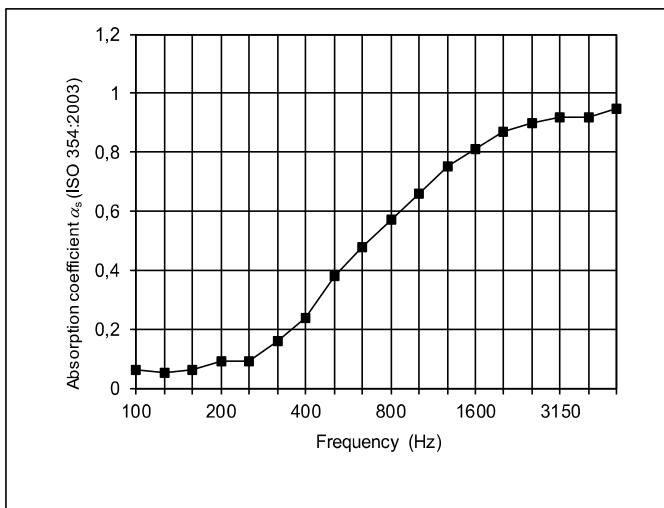
Test date: 7.3.2021

Sample: 10mm Lumir Comfort on Gypsum board 13mm

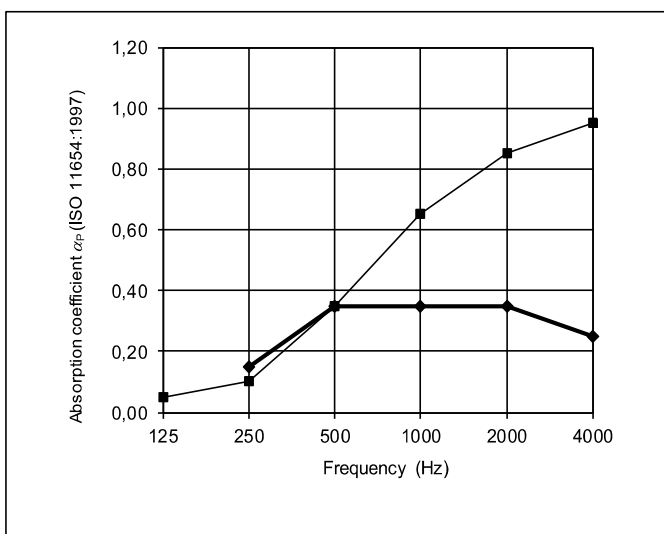
Board size: 15pcs (600 x 1200 x 45)

Surface mass: 11,8 kg/m² (8,5kg/board)

Arrangements: Type A



Frequency (Hz)	T ₁ (s)	T ₂ (s)	α_s
100	5,29	4,80	0,06
125	4,92	4,54	0,05
160	5,71	5,14	0,06
200	5,04	4,35	0,09
250	5,48	4,67	0,09
315	5,55	4,27	0,16
400	4,97	3,57	0,24
500	4,82	2,98	0,38
630	5,10	2,82	0,48
800	5,05	2,57	0,57
1000	5,10	2,41	0,66
1250	4,88	2,20	0,75
1600	4,38	2,00	0,81
2000	4,05	1,85	0,87
2500	3,70	1,74	0,90
3150	3,20	1,59	0,92
4000	2,68	1,44	0,92
5000	2,21	1,26	0,95



Octave values and classification - ISO 11654

Frequency (Hz)	Reference Curve	α_p
125		0,05
250	0,15	0,10
500	0,35	0,35
1000	0,35	0,65
2000	0,35	0,85
4000	0,25	0,95

Weighted absorption coefficient, α_w : 0,35 (MH)

Sound absorption class: D

Absorption classes: A, B, C, D, E and no classification.

Determination of sound absorption and classification

Client: Lumir Oy

Order: VWZOPT210029-01 / EUFI29-21001410

Volume of the rev. room: 201 m³

Area of the inner surf.: 209 m²

Test place: Eurofins Expert Services Oy TH1

Sample size: 10,8 m²

Task: Determination of absorption coefficient (EN ISO 354)
Octaves valuation and classification (ISO 11654:1997)

Temperature and relative humidity of rev. room

Empty: 19 °C 58 %

Sample: 19,3 °C 50 %

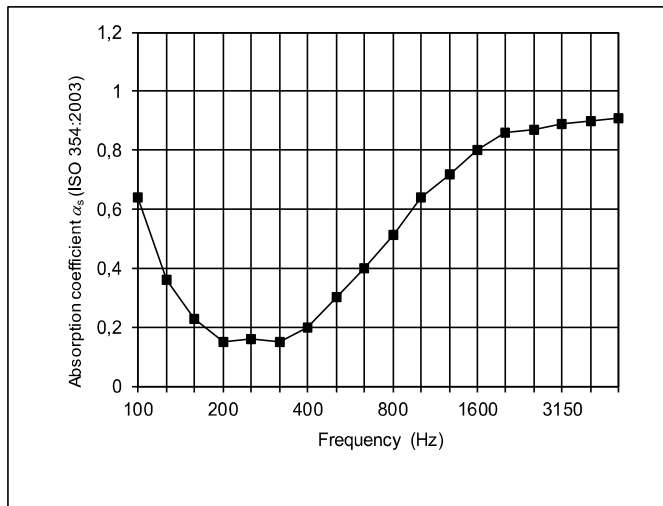
Test date: 7.3.2021

Sample: 10mm Lumir Comfort on Gypsum board 13mm + wool(partial)

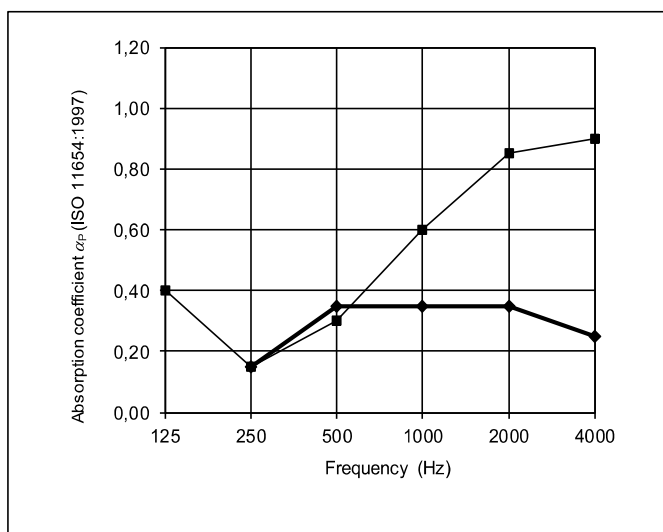
Board size: 15pcs (600 x 1200 x 45)

Surface mass: 11,8 kg/m² (8,5kg/board) + wool 30pcs(500g/pcs)

Arrangements: Type E-120



Frequency (Hz)	T ₁ (s)	T ₂ (s)	α_s
100	5,29	2,49	0,64
125	4,92	3,08	0,36
160	5,71	3,99	0,23
200	5,04	4,01	0,15
250	5,48	4,24	0,16
315	5,55	4,32	0,15
400	4,97	3,74	0,20
500	4,82	3,25	0,30
630	5,10	3,03	0,40
800	5,05	2,72	0,51
1000	5,10	2,45	0,64
1250	4,88	2,24	0,72
1600	4,38	2,01	0,80
2000	4,05	1,86	0,86
2500	3,70	1,77	0,87
3150	3,20	1,62	0,89
4000	2,68	1,45	0,90
5000	2,21	1,28	0,91



Octave values and classification - ISO 11654

Frequency (Hz)	Reference Curve	α_p
125		0,40
250	0,15	0,15
500	0,35	0,30
1000	0,35	0,60
2000	0,35	0,85
4000	0,25	0,90

Weighted absorption coefficient, α_w : 0,35 (MH)

Sound absorption class: D

Absorption classes: A, B, C, D, E and no classification.

Sample details

Samples 1-4

- LW20 + Comfort: 20mm wool + Lumir Comfort
- Wool (93kg/m³)
- Lumir Comfort acoustic coating 5mm
- Board size 600mm x 1200mm
- Total thickness 25mm (20mm wool + 5mm coating)
- Weight 3,1kg/m²

Samples 5-7

- LW40 + Comfort: 40mm wool + Lumir Comfort
- Wool (93kg/m³)
- Lumir Comfort acoustic coating 5mm
- Board size 600mm x 1200mm
- Total thickness 45mm (40mm wool + 5mm coating)
- Weight 4,4kg/m²

Sample 8

- Lumir Comfort on Gypsum board
- Gypsum Board 13mm
- Lumir Comfort acoustic coating 10mm
- Board size 600mm x 1200mm
- Total thickness 23mm (13mm Gypsum Board + 10mm coating)
- Weight 11,8 kg/m²

Sample 9

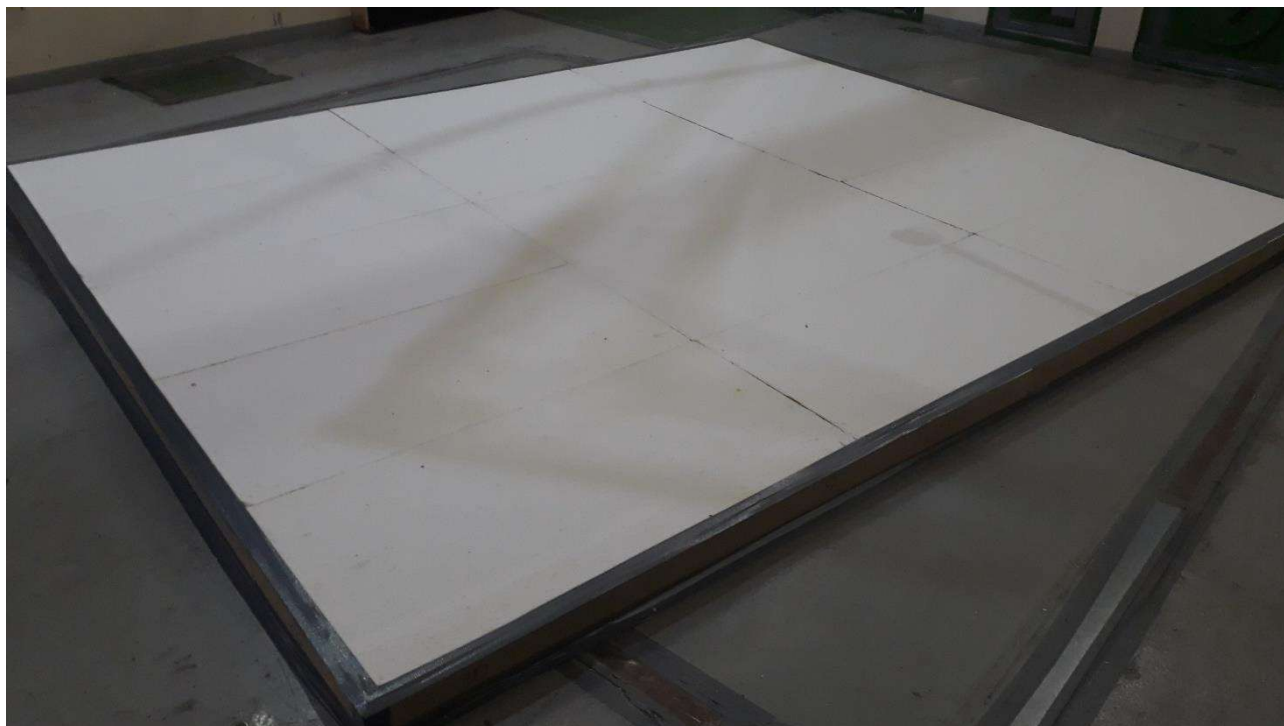
- Lumir Comfort on Gypsum board + wool
- Wool 30pcs (0,5kg pcs)
- Gypsum Board 13mm
- Lumir Comfort acoustic coating 10mm
- Board size 600mm x 1200mm
- Total thickness 23mm (13mm Gypsum Board + 10mm coating)
- Weight 11,8 kg/m² (no wool)
- The wool was in three rows and did not cover the whole airspace



Picture 1. Lumir Comfort on wool



Picture 2. Lumir Comfort on Gypsum Board



Picture 3. Sample installed to reverberation room

Measuring equipment and reverberation room dimensions

Measuring equipment	Name	Serial No.
Condenser microphone	B&K (Brüel & Kjær) 4134	2527717
Microphone preamplifier	B&K 2669	2554550
Rotating microphone boom	B&K 3923	2630663
Power amplifier	Yamaha MX-1000	
Loudspeakers	Sinmarc V121L	
Real-time analyser	Nor 121	31429
Sound calibrator	B&K 4228	3063558

Reverberation room dimensions:	Floor	Height	Volume
(KH 3)	5.95 m x 7.2m	4.7 m	201 m ³

Thickness of the concrete wall, floors and ceiling of the reverberation room is 0,25 m