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VOC EMISSION TEST REPORT
Indoor Air Comfort GOLD

30 October 2025

1 Sample Information

Sample name	Tranquillity
Batch no.	4150
Stated production date	09/09/2025
Product type	Textile flooring
Stated thickness, mm	6.1
Sample reception	17/09/2025

2 Brief Evaluation of the Results

Regulation or protocol	Conclusion	Version of regulation or protocol
Indoor Air Comfort GOLD	Pass	Indoor Air Comfort GOLD 9.0 of June 2023
Indoor Air Comfort	Pass	Indoor Air Comfort 9.0 of June 2023
ABG/AgBB	Pass	Ausschuss zur gesundheitlichen Bewertung von Bauprodukten (September 2024)
Belgian Regulation	Pass	Royal decree of May 2014 (C-2014/24239)
EU Taxonomy	Pass	Regulation (EU) 2020/852 of the European Parliament and of the Council
Blue Angel (DE-UZ 128)	Pass	DE-UZ 128 for “Low-Emission Textile Floor Coverings”, February 2016
BREEAM International	Exemplary Level	BREEAM International New Construction v6.0 (2021)
BREEAM NOR	Exemplary Level	BREEAM NOR v6.1.1 New Construction (2024)
LEED v4.1 BETA (outside U.S.)	Pass	LEED v4.1 BETA for Building Design and Construction (February 2025)
WELL V2	Pass	WELL V2, Q2 2025
Italian CAM Edilizia	Pass	Regulation 23 June 2022, decree 6 August 2022
French VOC Regulation		Decree of March 2011 (DEVL1101903D) and Arrêté of April 2011 (DEVL1104875A) modified in February 2012 (DEVL1133129A)
French CMR components	Pass	Regulation of April and May 2009 (DEVP0908633A and DEVP0910046A)
Formaldehyde Emission Class§	E1	EN 16516 - July 2020, EN14041:2018

Full details based on the testing and direct comparison with limit values are available in the following pages
Regarding pass/fail decision rule please see appendix

Claus Bonde
Analytical Service Manager

Rasmus Verdier
Analytical Service Manager

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3 Applied Test Methods

3.1 General Test References

Regulation, protocol or standard	Version	Reporting limit VOC [µg/m³]	Calculation of TVOC	Combined uncertainty¤ [RSD(%)]
EN 16516	2017 + A1:2020	5	Toluene equivalents	22%
ISO 16000 -3 -6 -9 -11	2021-2024 depending on part	2	Toluene equivalents	22%
ASTM D5116-17	2017	-	-	-
Specifications Indoor Air Comfort Gold	9.0 of June 2023	5	Toluene equivalents	22%
AgBB (MVV TB/ABG)	September 2024 (2024/2025)	5	Compound Specific	22%
Belgian VOC	Royal decree of May 2014 (C - 2014 / 24239)	5	Toluene equivalents	22%
EU Taxonomy	Regulation (EU) 2020/852; Annex 1/2 section 7.1 and 7.2	-	-	22%
Blue Angel (DE-UZ 128)	February 2016	5	Compound Specific	22%
BREEAM NOR	BREEAM NOR v6.1.1 New Construction (2024)	5	Toluene equivalents	22%
BREEAM International	BREEAM International New Construction v7.0 (2025)	5	Toluene equivalents	22%
LEED v4.1 BETA (outside U.S.)	February 2025	5	Compound Specific	22%
WELL V2	Q2 2025	5	Compound Specific	22%
Italian CAM Edilizia	Regulation 23 June 2022, decree 6 August 2022	2	Toluene equivalents	22%
French VOC Classes	Decree of 03/2011 (DEVL1101903D) and arrêté of 02/2012 (DEVL1133129A)	2	Toluene equivalents	22%

3.2 Specific Laboratory Sampling and Analyses

Procedure	External Method	Internal SOP	Quantification limit / sampling volume	Analytical principle	Uncertainty¤ [RSD(%)]
Sample preparation	ISO 16000-11:2024, EN 16516:2017+A1:2020, AgBB:2024, EMICODE:2022	71M549810	-	-	-
Emission chamber testing	ISO 16000-9:2024, EN 16516:2017+A1:2020	71M549811	-	Chamber and air control	-
Sampling of VOC	ISO 16000-6:2021, EN 16516:2017+A1:2020	71M549812	5 L	Tenax TA	-
Analysis of VOC	ISO 16000-6:2021, EN 16516:2017+A1:2020	71M542808B	1 µg/m³	ATD-GC/MS	10%
Sampling of aldehydes	ISO 16000-3:2022, EN 16516:2017+A1:2020	71M549812	35 L	DNPH	-
Analysis of aldehydes	ISO 16000-3:2022, EN 16516:2017+A1:2020	71M548400	3-6 µg/m³	HPLC-UV	10%
Sampling of phthalates*	ISO 16000-33:2017, MEL-09:2003	71M549812	60 L	Florisil	-
Analysis of phthalates*	ISO 16000-33:2017	71M546060	0.6 µg/m³	GC/MS	10%

4 Test Parameters, Sample Preparation and Deviations

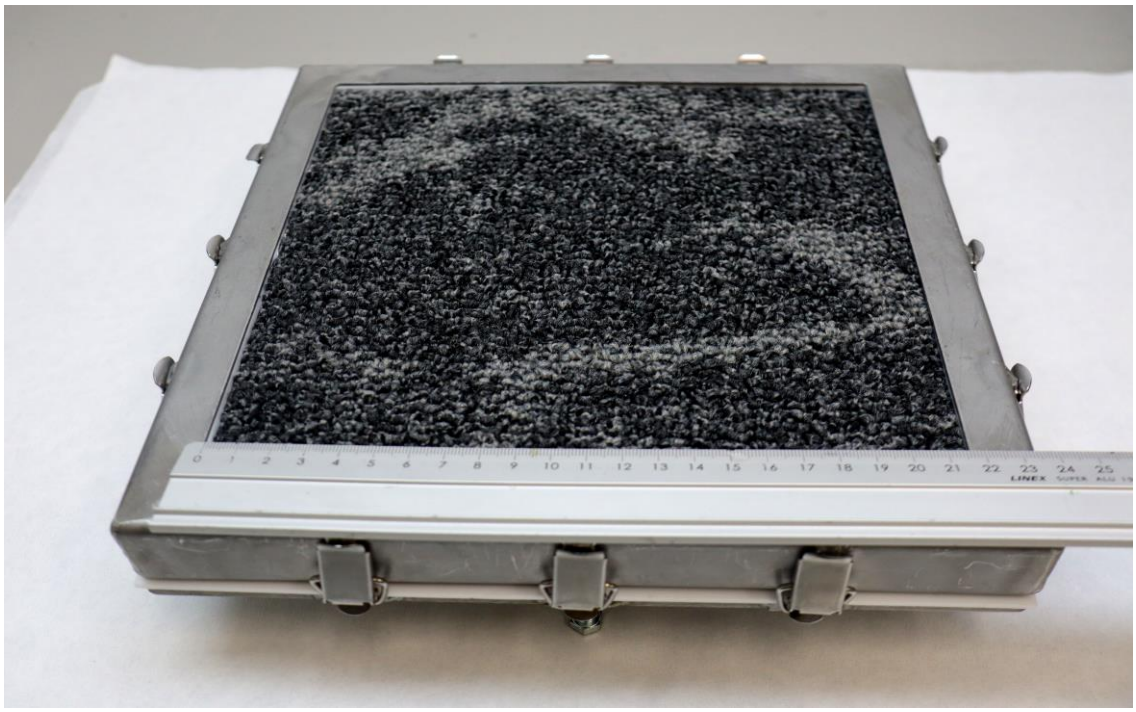
4.1 VOC Emission Chamber Test Parameters

Parameters	Value	Sample Conditions	Value
Chamber volume, V[L]	119	Date and time of unpacking and start of sample preparation	25/09/2025 - 09:02
Air change rate, n[h^{-1}]	0.5	Preconditioning period	-
Air Velocity [m/s]	0.1	Chamber test period	25/09/2025 - 23/10/2025
Area specific ventilation rate, q [m/h or $m^3/m^2/h$]	1.25	Analytical test period	25/09/2025 - 28/10/2025
Relative humidity of supply air, RH [%]	50 ± 3	Exposed sample area [m^2]	0.0475
Temperature of supply air, T [°C]	23 ± 1	Loading factor [m^2/m^3]	0.40
Background concentration of individual VOC's [µg/m^3]	< 2	Test scenario	Flooring or ceiling
Background concentration of TVOC [µg/m^3]	< 20	Sample thickness [mm]	6.1

4.2 Preparation of the Test Specimen

Edges and back were covered with aluminium foil and the sample was mounted into a frame in accordance with JIS A 1901.

4.3 Picture of Sample



4.4 Deviations from Referenced Protocols and Regulations

No deviations from the referenced test methods were observed except the general deviations.

4.4.1 General Deviations

Formaldehyde emission class is tested according to EN 16516 as specified in EN 14041:2018(Resilient, textile, laminate and modular multilayer floor coverings. Essential characteristics), which was not yet published in the EU journal and as a consequence not yet valid for CE labelling of resilient and textile flooring. The referenced conclusion is consequently only for advisory use.

4.5 Air Samplings from the Test Chamber

Sampling media	Day (yyyy-mm-dd)	Time (hh:mm)	Volume [L]
3 Day, DNPH silicagel	2025-09-28	08:10 - 09:58	35
3 Day-Res, DNPH silicagel	2025-09-28	08:11 - 09:58	35
3 Day, Tenax TA	2025-09-28	08:12 - 09:12	5.3
3 Day-Res, Tenax TA	2025-09-28	09:13 - 09:59	2.0
28 Day, Florisil	2025-10-23	10:04 - 12:35	61
28 Day-Res, Florisil	2025-10-23	10:05 - 12:35	61
28 Day, DNPH silicagel	2025-10-23	07:35 - 09:23	35
28 Day-Res, DNPH silicagel	2025-10-23	07:36 - 09:24	37
28 Day, Tenax TA	2025-10-23	07:36 - 08:35	5.0
28 Day-Res, Tenax TA	2025-10-23	08:35 - 09:24	2.3

5 Results

5.1 VOC Emission Test Results after 3 Days

	CAS No.	Retention time [min]	ID-Cat	Specific Conc. [µg/m³]	Toluene eq. [µg/m³]	Specific SER [µg/(m²·h)]	R_D	R_B
VOC with NIK/LCI								
1,2-Propandiol (Propylene glycol) *	57-55-6	3.67	1	9.5	< 5	12	0.0045	0.0045
Cyclohexanol	108-93-0	6.71	1	5.4	< 5	6.8	0.0027	0.0027
Caprolactam *	105-60-2	11.89	1	74	28	93	0.25	0.25
VOC without NIK/LCI								
None determined								
Sum of VOC without NIK/LCI				< 5	< 5	< 7		
VVOC compounds								
None determined								
TVVOC				< 5	< 5	< 7		
SVOC compounds								
None determined								
TSVOC				< 5	< 5	< 7		
Carcinogens								
Total carcinogens				< 1	< 1	< 2		
Aldehydes								
Formaldehyde	50-00-0		1	< 3		< 4		
Acetaldehyde	75-07-0		1	< 3		< 4		
Propionaldehyde	123-38-6		1	< 3		< 4		
Butyraldehyde	123-72-8		1	< 3		< 4		
Acrolein *	107-02-8		1	< 5		< 7		
2-Butenal *	123-73-9		1	< 5		< 7		
Glutaraldehyde *	111-30-8		1	< 3		< 4		
R-values							0.25	0.25
TVOC				89	28	110		

5.2 VOC Emission Test Results after 28 Days

	CAS No.	Retention time [min]	ID-Cat	Specific Conc. [µg/m³]	Toluene eq. [µg/m³]	Specific SER [µg/(m²·h)]	R_D	R_B
VOC with NIK/LCI								
Caprolactam *	105-60-2	11.80	1	53	20	66	0.18	0.18
VOC without NIK/LCI								
None determined								
Sum of VOC without NIK/LCI				< 5	< 5	< 7		
VVOC compounds								
None determined								
TVVOC				< 5	< 5	< 7		
SVOC compounds								
None determined								
TSVOC				< 5	< 5	< 7		
Carcinogens								
Total carcinogens				< 1	< 1	< 2		
CMR (French reg.)								
Benzene	71-43-2		1	< 1		< 2		
Trichloroethylene	79-01-6		1	< 1		< 2		
Dibutylphthalate (DBP)*	84-74-2		1	< 1		< 2		
Diethylhexylphthalate (DEHP)*	117-81-7		1	< 1		< 2		
Other phthalates								
Dimethylphthalate (DMP)*	131-11-3		1	< 1		< 2		
Diethylphthalate (DEP)*	84-66-2		1	< 1		< 2		
Benzylbutylphthalate (BBP)*	85-68-7		1	< 1		< 2		
Dioctylphthalate (DOP)*	117-84-0		1	< 1		< 2		
Aldehydes								
Formaldehyde	50-00-0		1	< 3		< 4		
Acetaldehyde	75-07-0		1	< 3		< 4		
Propionaldehyde	123-38-6		1	< 3		< 4		
Butyraldehyde	123-72-8		1	< 3		< 4		
Acrolein *	107-02-8		1	< 5		< 7		
2-Butenal *	123-73-9		1	< 5		< 7		

	CAS No.	Retention time [min]	ID-Cat	Specific Conc. [µg/m³]	Toluene eq. [µg/m³]	Specific SER [µg/(m²·h)]	R_D	R_B
Glutaraldehyde *	111-30-8		1	< 3		< 4		
R-values							0.18	0.18
TVOC				53	20	66		
TVOC (French label)					22			
Toluene	108-88-3			< 2	< 2	< 3		
Tetrachloroethylene *	127-18-4			< 2	< 2	< 3		
Ethylbenzene	100-41-4			< 2	< 2	< 3		
Xylene *	1330-20-7			< 2	< 2	< 3		
Styrene	100-42-5			< 2	< 2	< 3		
2-Butoxyethanol	111-76-2			< 2	< 2	< 3		
1,2,4-Trimethylbenzene	95-63-6			< 2	< 2	< 3		
1,4-Dichlorobenzene	106-46-7			< 2	< 2	< 3		

6 Summary and Evaluation of the Results

6.1 Comparison with Limit Values of Indoor Air Comfort Gold

	Test after 3 days		Test after 28 days	
	Concentration µg/m³	**Limit Value** µg/m³	**Concentration** µg/m³	**Limit Value** µg/m³
TVOC (EN 16516)	28	≤ 1000	20	≤ 100
TVOC (AgBB)	89	-	53	≤ 100
TSVOC	< 5	-	< 5	≤ 30
R_D-value (NIK) (dimensionless)	0.25	-	0.18	≤ 1
R_B-value (LCI) (dimensionless)	0.25	-	0.18	≤ 1
Sum of VOC without NIK/LCI	< 5	-	< 5	≤ 50
Total carcinogens	< 1	≤ 10	-	-
Any individual carcinogens	-	-	< 1	≤ 1
CMR (French reg.)	-	-	< 1	≤ 1
Formaldehyde	< 3	-	< 3	≤ 4
Acetaldehyde *	< 3	-	< 3	≤ 4
Octanal *	< 5	-	< 5	≤ 5
Other aldehydes *	< 5	-	< 5	≤ 8
4-vinylcyclohexene *	< 2	-	< 2	≤ 2
Styrene	< 2	-	< 2	≤ 2
Naphthalene	< 3	-	< 3	≤ 3
4-phenylcyclohexene	< 5	-	< 5	≤ 5
Tetrachloroethylene *	< 5	-	< 5	≤ 10
2-ethylhexanoic acid *	< 5	-	< 5	≤ 15
Toluene	< 5	-	< 5	≤ 20
1,4-dichlorobenzene *	< 5	-	< 5	≤ 40
Vinylacetate *	< 5	-	< 5	≤ 40
Xylene *	< 5	-	< 5	≤ 40
Ethylbenzene	< 5	-	< 5	≤ 40
DEP *, DOP *, DMP *, each	-	-	< 1	≤ 1
French A+	-	-	Complies	

6.2 Comparison with Limit Values of Indoor Air Comfort

	Test after 3 days		Test after 28 days	
	Concentration µg/m³	**Limit Value** µg/m³	**Concentration** µg/m³	**Limit Value** µg/m³
TVOC (EN 16516)	28	≤ 10000	20	≤ 1000
TSVOC	< 5	-	< 5	≤ 100
R_D-value (NIK) (dimensionless)	0.25	-	0.18	≤ 1
R_B-value (LCI) (dimensionless)	0.25	-	0.18	≤ 1
Sum of VOC without NIK/LCI	< 5	-	< 5	≤ 100
Total carcinogens	< 1	≤ 10	-	-
Any individual carcinogens	-	-	< 1	≤ 1
CMR (French reg.)	-	-	< 1	≤ 1
Formaldehyde	< 3	-	< 3	≤ 60
Acetaldehyde	< 3	-	< 3	≤ 200
French A+/A	-	-	Complies	

6.3 Comparison with Limit Values of AgBB/ABG

Parameters	Test after 3 days		Test after 28 days	
	Concentration mg/m³	**Limit Value** mg/m³	**Concentration** mg/m³	**Limit Value** mg/m³
TVOC	0.089	≤ 10	0.053	≤ 1.0
TSVOC	< 0.005	-	< 0.005	≤ 0.1
R-value (dimensionless)	0.25	-	0.18	≤ 1
Sum of VOC without NIK/LCI	< 0.005	-	< 0.005	≤ 0.1
Formaldehyde	-	-	< 0.003	≤ 0.1
Any individual carcinogens	< 0.001	≤ 0.01	< 0.001	≤ 0.001

Compliance with the limits alone does not replace an approval or voluntary documentation by a Technical Assessment Body according to the Construction Product Regulation. This requires an application and approval.

6.4 Comparison with Limit Values of the Belgian Regulation

Parameters	Test after 28 days	
	Concentration µg/m³	Limit Value µg/m³
TVOC (EN 16516)	20	≤ 1000
TSVOC	< 5	≤ 100
R-value (dimensionless)	0.18	≤ 1
Total carcinogens	< 1	≤ 1
Toluene	< 5	≤ 300
Formaldehyde	< 3	≤ 100
Acetaldehyde	< 3	≤ 200

6.5 Comparison with Limit Values of EU Taxonomy

Parameters	Test after 28 days	
	Concentration mg/m³	Limit Value mg/m³
Formaldehyde	< 0.004	≤ 0.06
Any individual carcinogens	< 0.001	< 0.001

The formaldehyde emission is tested according to EN 16516 with air change rate 0.5 /h and relative humidity of 50 ± 5 %. Results have been recalculated to a loading of 1 m²/m³ and air change rate of 1 /h.

6.6 Comparison with Limit Values of Blue Angel (DE-UZ 128)

	Test after 3 days		Test after 28 days	
	Concentration µg/m³	Limit Value µg/m³	Concentration µg/m³	Limit Value µg/m³
TVOC	89	≤ 250	53	≤ 100
TSVOC	< 5	-	< 5	≤ 30
R_D-value (NIK) (dimensionless)	0.25	-	0.18	≤ 1
Sum of VOC without NIK/LCI	< 5	-	< 5	≤ 50
Any individual carcinogens	-	-	< 1	≤ 1
Formaldehyde [ppm]	< 0.005	-	< 0.005	≤ 0.02
Other aldehydes [ppm]	-	-	< 0.005	≤ 0.02
4-Phenylcyclohexene	< 5	-	< 5	≤ 5

6.7 Comparison with Limit Values of BREEAM International

Parameters	Concentration mg/m³	Basic Level mg/m³	Exemplary Level mg/m³
Formaldehyde 28 days	< 0.003	≤ 0.06	≤ 0.01
TVOC (EN 16516) 28 days	0.020	≤ 1.0	≤ 0.3
TSVOC 28 days	< 0.005	-	≤ 0.1
Total carcinogens 28 days	< 0.001	≤ 0.001	≤ 0.001

6.8 Comparison with Limit Values of BREEAM NOR

Parameters	Concentration mg/m³	Basic Level mg/m³	Exemplary Level mg/m³
Formaldehyde 28 days	< 0.003	≤ 0.06	≤ 0.01
TVOC (EN 16516) 28 days	0.020	≤ 0.3	≤ 0.3
TSVOC 28 days	< 0.005	-	≤ 0.1
Total carcinogens 28 days	< 0.001	≤ 0.001	≤ 0.001

6.9 Comparison with Limit Values of LEED v4.1 BETA and WELL V2

Parameters	Test after 28 days	
	Concentration µg/m³	**Limit Value** µg/m³
TVOC	53	≤ 1000
Sum of VOC without NIK/LCI	< 5	< 100
Formaldehyde	< 3	≤ 10
R-value (dimensionless)	0.18	≤ 1
AgBB Compliancy	Pass	

6.10 Comparison with Limit Values of the Italian CAM Regulation

	CAS No.	Conc. 28 days µg/m³	Limit value 28 days µg/m³	Limit value Rewarding score 28 day µg/m³
TVOC	-	22	< 1500	< 1000
Formaldehyde	50-00-0	< 3	< 60	< 10
Acetaldehyde	75-07-0	< 3	< 300	< 200
Toluene	108-88-3	< 2	< 450	< 300
Tetrachloroethylene *	127-18-4	< 2	< 350	< 250
Ethylbenzene	100-41-4	< 2	< 1000	< 750
Xylene *	1330-20-7	< 2	< 300	< 200
Styrene	100-42-5	< 2	< 350	< 250
2-Butoxyethanol	111-76-2	< 2	< 1500	< 1000
1,2,4-Trimethylbenzene	95-63-6	< 2	< 1500	< 1000
1,4-Dichlorobenzene	106-46-7	< 2	< 90	< 60
Benzene	71-43-2	< 1	< 1	
Trichloroethylene	79-01-6	< 1	< 1	
Dibutylphthalate (DBP)*	84-74-2	< 1	< 1	
Diethylhexylphthalate (DEHP)*	117-81-7	< 1	< 1	

The product was assigned a VOC emission class without taking into account the measurement uncertainty associated with the result.

6.11 Comparison with Limit Values of the French VOC Regulation

	CAS No.	Conc. 28 days µg/m³	C µg/m³	B µg/m³	A µg/m³	A+ µg/m³
TVOC	-	22	> 2000	< 2000	< 1500	< 1000
Formaldehyde	50-00-0	< 3	> 120	< 120	< 60	< 10
Acetaldehyde	75-07-0	< 3	> 400	< 400	< 300	< 200
Toluene	108-88-3	< 2	> 600	< 600	< 450	< 300
Tetrachloroethylene *	127-18-4	< 2	> 500	< 500	< 350	< 250
Ethylbenzene	100-41-4	< 2	> 1500	< 1500	< 1000	< 750
Xylene *	1330-20-7	< 2	> 400	< 400	< 300	< 200
Styrene	100-42-5	< 2	> 500	< 500	< 350	< 250
2-Butoxyethanol	111-76-2	< 2	> 2000	< 2000	< 1500	< 1000
1,2,4-Trimethylbenzene	95-63-6	< 2	> 2000	< 2000	< 1500	< 1000
1,4-Dichlorobenzene	106-46-7	< 2	> 120	< 120	< 90	< 60

The product was assigned a VOC emission class without taking into account the measurement uncertainty associated with the result. As specified in French Decree no. 2011-321 of March 23 2011, correct assignment of the VOC emission class is the sole responsibility of the party responsible for distribution of the product in the French market.

6.12 Comparison with Limit Values of the CMR Components

CMR (French reg.)	CAS No.	Conc. 28 days µg/m³	Max. allowed air concentration µg/m³
Benzene	71-43-2	< 1	< 1
Trichloroethylene	79-01-6	< 1	< 1
Dibutylphthalate (DBP)*	84-74-2	< 1	< 1
Diethylhexylphthalate (DEHP)*	117-81-7	< 1	< 1

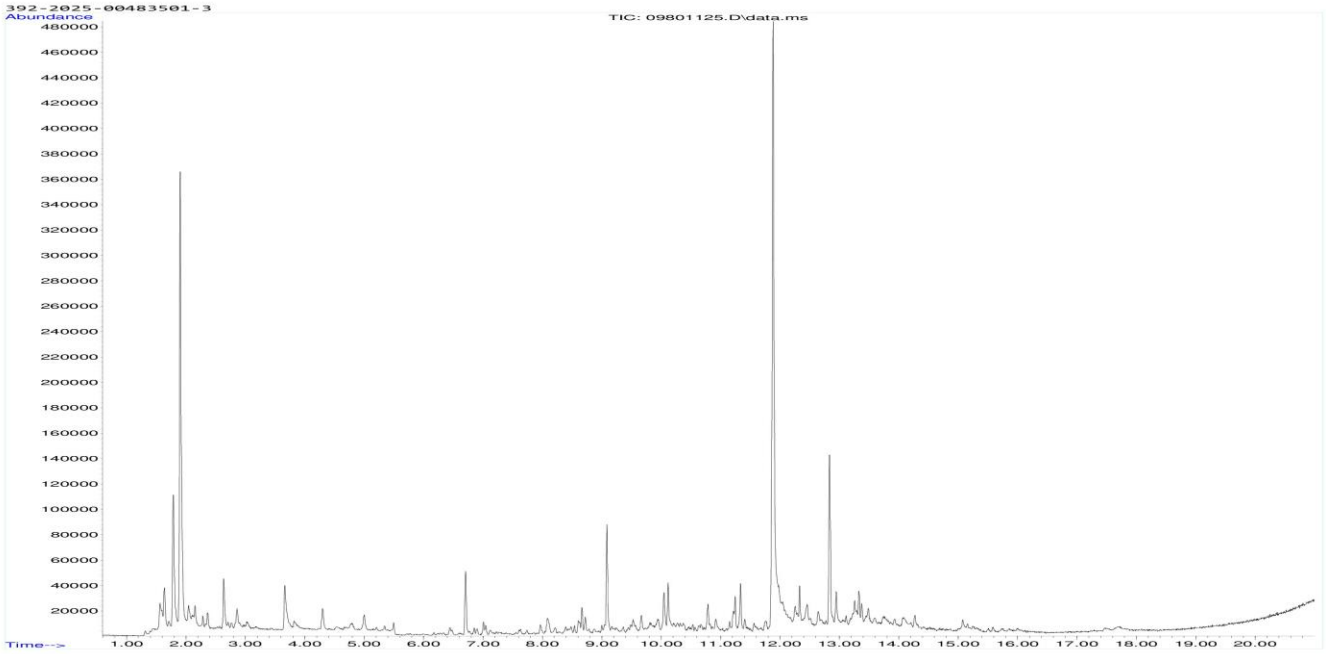
6.13 Formaldehyde Emission Class§

Parameters	Concentration mg/m³	E2 mg/m³	E1 mg/m³
Formaldehyde 28 days	< 0.003	> 0.124	≤ 0.124

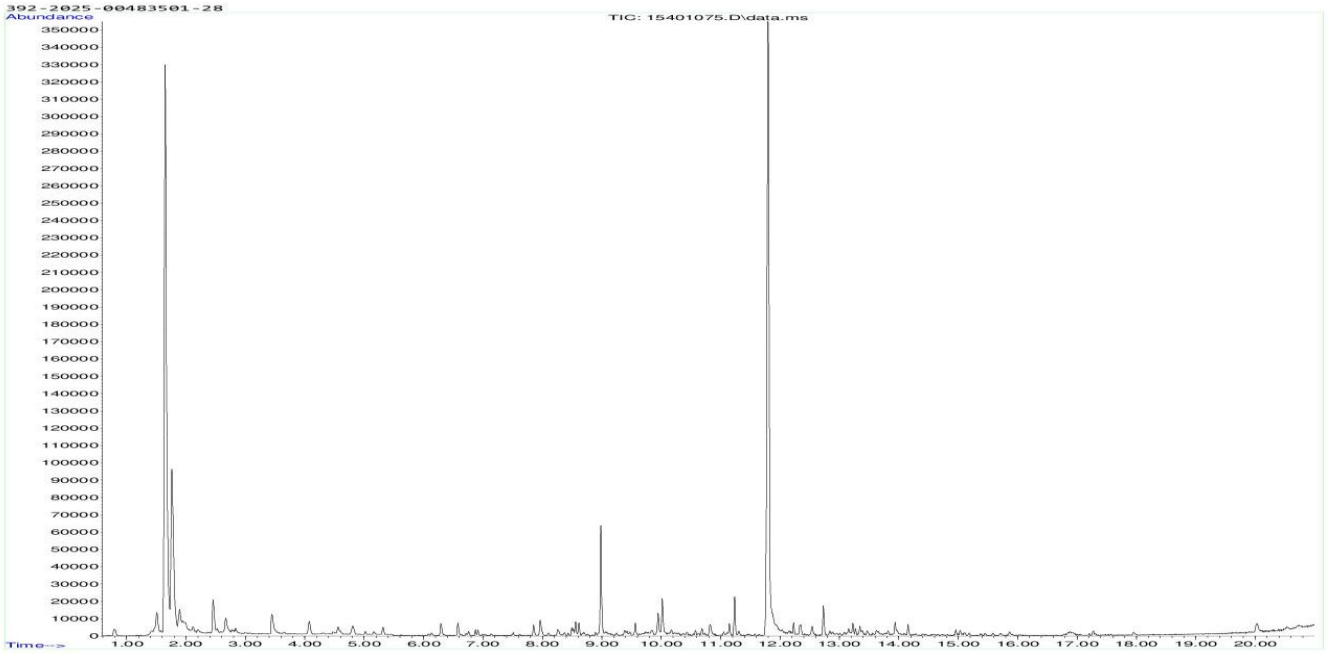
The formaldehyde result is based on chamber testing and DNPH sampling according to ISO 16000/EN 16516.

7 Appendices

7.1 Chromatogram of VOC Emissions after 3 Days



7.2 Chromatogram of VOC Emissions after 28 Days



Please consider the different scales.

7.3 Sampling Report

Combined Sampling Report and Chain of Custody			
Name of applicant (name, company, phone)	**Andrew Smith** **Forbo Flooring UK Ltd.** **+44 7917 215830**		
Product Information			
Name of the product:	**Tranquillity**	**Product Type:**	**Textile flooring**
Batch No:	**4150**	**Article No:**	
Model/Program/ Series:		**Manufacturer** (Company, Address, Stamp)	**Forbo Flooring UK Ltd.** **Unit 92 Seedlee Road** **PR5 8AE Preston**
Production & Sampling information			
Production date:	**9/9/2025**	**Sampling Date:**	**9/9/2025**
Time:	**09:30**	**Time:**	**09:30**
Place of sampling (if deviation form the manufacture)	**Tile cutting**	**Sample is taken from:**	☑ ongoing production ☐ stocks ☐ retained sample
		Number of samples:	4
Person in charge of sampling: (Name, company, telephone)	**Andrew Smith** **Forbo Flooring UK Bamber Bridge** **00447917215830**	**Signature of sample collector:**	
Where has the product been stored prior to sampling? Place of storage	☑ production ☐ store ☐ miscellaneous	**How has the poduct been stored prior to sampling?** Packaging material	☑ open ☐ in the stack ☐ wrapped up
Specifics (possible negative influences by air contamination where sample was takes, by petrol emissions, by solvent emissions from production, any other uncertainties, questions, etc).		**none**	
Cut edges (identification of cut edges when present and identification of new surfaces and surface to be exposed in the emission test).		none	
Confirmation from the applicant			
Here with the signer confirms the correctness of the data given above. The sample was selected, drawn and packed personally in accordance with the instructions for the taking of the samples.			
Date: 12/09/25	**Signature:** J.Smith		

	(stamp) FORBO Flooring UK Bamber Bridge.

Chain of custody

Whenever the sample is handed over, please fill out the below information

Handed over between:	Initials + Signature	Date + Time	Condition
Handed over by	JdeS JdeSmith	09/09/25 09:30	OK
Handed over by	Rm Russell Miller	09/09/25 09:30	OK.
Handed over by	Rm Russell Miller	09/09/25 09:00	OK.
Handed over by	SC SCoyle.	17/09/25 09:00	OK
Handed over by			
Handed over by			

Laboratory receiving details (date condition of package and samle, assigned lab no.):	23/9-25, ok, 392-2025-00483501
Receptionist, Eurofins Product Testing A/S: LqR)	Signature of receptionist:

7.4 How to Understand the Results

7.4.1 Acronyms Used in the Report

<	Means less than
>	Means bigger than
*	Not a part of our accreditation
¤	Please see section regarding uncertainty in the Appendices
§	Deviation from method. Please see deviation section
a	The method is not optimal for very volatile compounds. For these substances smaller results and a higher measurement uncertainty cannot be ruled out
b	The component originates from the substrate and is thus removed
c	The results have been corrected by the emission from the substrate
d	Very polar organic compounds are not suitable for reliable quantification using Tenax TA adsorbent and HP-5ms GC column. A high degree of uncertainty must be expected
e	The component may be overestimated due to contribution from the system
SER	Specific Emission Rate

7.4.2 Explanation of ID Category

Categories of Identity:

1: Identified by comparison with a mass spectrum obtained from library and supported by other information and quantified through specific calibration.

2: Identified by comparison with a mass spectrum obtained from library and supported by other information. Quantified as toluene equivalent.

3: Identified with a lower match by comparison with a mass spectrum obtained from a library. Quantified as toluene equivalent.

4: Not identified, quantified as toluene equivalent.

7.5 Applied LCI and NIK Values

7.5.1 LCI/NIK Values for Compounds Found After 3 Day Measurements

Compound	CAS No.	AgBB 2024 NIK [µg/m³]	Belgian NIK [µg/m³]
1,2-Propandiol (Propylene glycol) *	57-55-6	2100	2100
Cyclohexanol	108-93-0	2000	2000
Caprolactam *	105-60-2	300	300

7.5.2 LCI/NIK Values for Compounds found after 28 Day Measurements

Compound	CAS No.	AgBB 2024 NIK [µg/m³]	Belgian NIK [µg/m³]
Caprolactam *	105-60-2	300	300

7.6 Description of VOC Emission Test

7.6.1 Test Chamber

The test chamber is made of stainless steel. A multi-step air clean-up is performed before loading the chamber, and a blank check of the empty chamber is performed.
The chamber operation parameters are as described in the test method section. (EN 16516, ISO 16000-9, internal method no.: 71M549811).
The recovery rates in the climate test chamber have been investigated using toluene and n-dodecane. The mean recovery rates of toluene and n-dodecane were concluded to be between 95 % and 100 % depending on the chamber size. These values comply with the criteria of a minimum mean recovery rate of 80 % stated in the 16000-9 test method.
Air sampling from the test chamber is carried out in a clean test chamber room at ambient air pressure and 23 ± 1 °C.

7.6.2 Expression of the Test Results

All test results are calculated as specific emission rate, and as extrapolated air concentration in the European Reference Room (EN 16516, AgBB, EMICODE, M1 and Indoor Air Comfort).

7.6.3 Testing of Carcinogenic VOCs

The emission of carcinogens (EU Categories C1A and C1B, as per European law) is tested by drawing sample air from the test chamber outlet through Tenax TA tubes after the specified duration of storage in the ventilated test chamber. Analysis is performed by ATD-GC/MS (automated thermal desorption coupled with gas chromatography and mass spectroscopy using 30 m HP-5 (slightly polar) column with 0.25 mm ID and 0.25 µm film, Agilent) (EN 16516, ISO 16000-6, internal methods no.: 71M549812 / 71M542808B).

All identified carcinogenic VOCs are listed; if a carcinogenic VOC is not listed then it has not been detected. Quantification is performed using the TIC signal and authentic response factors, or the relative response factors relative to toluene for the individual compounds.

This test only covers substances that can be adsorbed on Tenax TA and can be thermally desorbed. If other emissions occur, then these substances cannot be detected (or with limited reliability only).

7.6.4 Testing of VOC, SVOC and VVOC

The emissions of volatile organic compounds are tested by drawing sample air from the test chamber outlet through Tenax TA tubes after the specified duration of storage in the ventilated test chamber. Analysis is performed by ATD-GC/MS using HP-5 column (30 m, 0.25mm ID, 0.25µm film) (EN 16516, ISO 16000-6, internal methods no.: 71M549812 / 71M542808B).

All single substances that are listed with a LCI/NIK value in the latest publications (hereafter referred to as target compounds) are identified if present. All other appearing VOCs are identified as far as possible. Quantification of target compounds is done using the TIC signal and authentic response factors, or the relative response factors relative to toluene. For certain compound groups, which differ significantly in chemistry from toluene, quantification is performed relative to a representative member of the group for more accurate and precise results. This can include quantification of for example glycols and acids. In addition to that, all results are also expressed in toluene equivalents. All non-target compounds, as well as all non-identified substances, are quantified in toluene equivalents.

The results of the individual substances are calculated in three groups depending on their retention time when analyzing using a non-polar column (HP-1):

- Volatile Organic Compounds (VOC) are defined as: All substances eluting between and including n-hexane (n-C6) and n-hexadecane (n-C16)

- Semi-Volatile Organic Compounds (SVOC) are defined as: All substances eluting after n-hexadecane (n-C16) and before and including n-docosane (n-C22)
- Very Volatile Organic Compounds (VVOC) are defined as: All substances eluting before n-hexane (n-C6).

Total Volatile Organic Compounds (TVOC) is calculated by summation of all individual VOCs with a concentration ≥ 5 µg/m³. The TVOC can be expressed either in toluene equivalents as defined in EN 16516 and similar to ISO 16000-6, or as the sum of concentrations using specific or relative response factors. In the case of summation of concentrations using authentic or relative response factors, the toluene equivalent is applied to all non-target and non-identified VOCs before summing up. Compounds regarded as VOC in line with the above definition but elute before n-C6 or after n-C16 on the HP-5 column are treated as VOC, and are thus added to the TVOC.

Total Semi-Volatile Organic Compounds (TSVOC) is calculated by the summation of all individual SVOCs expressed in toluene equivalents with a concentration ≥ 5 µg/m³, as defined in EN 16516. VOCs that are regarded as VOC in line with the above definition, but elute after n-C16 in this test, are not added to the TSVOC.

Total Very Volatile Organic Compounds (TVVOC) is calculated by the summation of all individual VVOCs with a concentration ≥ 5 µg/m³ and expressed in toluene equivalents. VOCs that are regarded as VOC in line with the above definition, but elute before n-C6 in this test, are not added to the TVVOC.

This test only covers substances which can be adsorbed on Tenax TA and can be thermally desorbed. If emissions of substances outside these specifications occur then these substances cannot be detected (or with limited reliability only).

7.6.5 Calculation of R Values with LCI Lists

The concentrations of detected compounds ≥ 5 µg/m³ are divided by their respective LCI/NIK value (if defined in the given publication). The sum of the quotients gives the R value, which can be mathematically expressed:

$$R = \sum_{i}^{n} \left({}^{c_i}/_{NIK_i} + \ldots + {}^{c_n}/_{NIK_n} \right)$$

This R value is calculated, depending on the purpose of this test, for the European LCI list, for the German LCI/NIK list (R_D), and/or for the Belgian LCI list (R_B).

All VOCs without published LCI/NIK value and concentration ≥ 5 µg/m³ are summed up as sum of VOCs without LCI/NIK if required by the standard or protocol.

7.6.6 Testing of Aldehydes

The presence of aldehydes is tested by drawing air samples from the test chamber outlet through DNPH-coated silicagel tubes after the specified duration of storage in the ventilated test chamber. Analysis is performed by solvent desorption and subsequently by HPLC and UV-/diode array detection.

The absence of formaldehyde and other aldehydes is stated if UV detector response at the specific wavelength is lacking at the specific retention time in the chromatogram. Otherwise it is checked whether the reporting limit is exceeded. In this case the identity is finally checked by comparing full scan sample UV spectra with full scan standard UV spectra.

Conversions of specific aldehydes from µg/m³ to ppm are done by the ideal gas law using a temperature of 23 degree Celsius and standard atmospheric pressure.

7.6.7 Testing of Phthalates

The presence of phthalates is tested by drawing air samples from the test chamber outlet through tube with Florisil adsorbent after the specified duration of storage in the ventilated test chamber. Analysis is performed by solvent desorption and subsequently by GC/MS. Analysis of phthalates is not currently covered by the accreditation (Internal methods no.: 71M549812 / 71M546060).

7.7 Quality Assurance

Before loading the test chamber, a blank check of the empty chamber is performed and compliance with background concentrations in accordance with EN 16516 / ISO 16000-9 is determined.

Air sampling at the chamber outlet and subsequent analysis is performed in duplicate. Relative humidity, temperature and air change rate in the chambers is logged every 5 minutes and checked daily. A double determination is performed on random samples at a regular interval and results are registered in a control chart to ensure the uncertainty and reproducibility of the method.

The stability of the analytical system is checked by a general function test of device and column, and by use of control charts for monitoring the response of individual substances prior to each analytical sequence.

7.8 Accreditation

The testing methods described above are accredited online with EN ISO/IEC 17025 by DANAK (no. 522). This accreditation is valid worldwide due to mutual approvals of the national accreditation bodies (ILAC/IAF, see also www.eurofins.com/galten.aspx#accreditation).

Eurofins Product Testing Denmark A/S is notified body for the construction products regulation (EU) No 305/2011 with number NB 2657 under system 3.

Not all parameters are covered by this accreditation. The accreditation does not cover parameters marked with an asterisk (*), however analysis of these parameters is conducted at the same level of quality as for the accredited parameters.

7.9 Uncertainty of the Test Method

The relative standard deviation of the overall analysis is 22%. The expanded uncertainty Um equals 2 x RSD. For further information please visit www.eurofins.dk/product-testing/uncertainty/.

7.10 Decision Rules

Eurofins Product Testing A/S, declare statement of conformity based on the “Binary Statement for Simple Acceptance Rule” described in ILAC’s “Guidelines on decision Rules and Statements of Conformity” ILAC-G8:09/2019.

This means that results above the detection limit are always reported with two significant digits. Results are evaluated with the same number of significant digits as the corresponding limit values, and conformity is based on results being less than or equal to limit values.

For limit values with more than two significant digits, the third digit will be used to confirm whether a result is below or equal to the limit value. It will always be indicated in the evaluation table if this expanded evaluation is performed.

For further information, please visit www.eurofins.dk/product-testing/om-os/beslutningsregler/

7.11 Version History

Report date	Report number	Modification
30/10/2025	392-2025-00483501_A_EN	Current version