

Test Report

Report No.: 927372-1-ED



**DANISH
TECHNOLOGICAL
INSTITUTE**

Gregersensvej
DK-2630 Taastrup
Tel. +45 72 20 20 00
Fax +45 72 20 20 19

info@teknologisk.dk
www.teknologisk.dk

Page 1 of 1
Hbk/jle

Order no.: 927372
No. of appendices: 3

Assignor: Knauf A/S
Kløvermarksvej 6
9500 Hobro
Denmark

Test material: Ceiling: Tectopanel G1 600x600 mm

Sampling: The test material was sampled by the assignor and received at the Danish Technological Institute on 2020-05-01. Details are shown in Appendix 1.

Methods: EN 16516:2017 Construction products: Assessment of release of dangerous substances – Determination of emissions into indoor air.

Danish Indoor Climate Labelling. General test and labelling criteria, 6th edition, January 2018.

Additional information of test sample and testing is given in appendices 1 and 2.

Period: The testing was carried out from 2020-05-25 to 2020-07-09.

Result: Results from the analysis of air samples are shown in appendices:
Appendix 2: Emission testing and results according to EN 16516
Appendix 3: Evaluation for the Danish Indoor Climate Label (DACL)

Note: -

Storage: The test material will be destroyed after the issue of this test report, unless otherwise agreed.

Terms: Accredited testing was carried out in compliance with international requirements (EN/ISO/IEC 17025:2005) and in compliance with Danish Technological Institute's General Terms and Conditions regarding Commissioned Work accepted by Danish Technological Institute. The test results apply to the tested products only. This report may be quoted in extract only if the laboratory has granted its written consent.

Date/place: 2020-07-09, Danish Technological Institute, Taastrup, Building and Construction.

Signature: Test responsible

Co-signatory



Sample information

Report no. 9273721-1-ED
Appendix 1
Page 1 of 2
Initials Hbk/Jle

Sample form:

Sampling form EN 16516:2017 Construction products: Assessment of release of dangerous substances. Determination of emissions into indoor air			
Testing laboratory / certification body: Danish Technological Institute Gregersensvej 3K 2630 Taastrup Denmark		Sampler (name, company, phone): KnaufDanoline A/S Kløvermarksvej 6 9500 Hobro Tlf: 96573000	
Name of the manufacturer at the place of sampling (address/stamp): KnaufDanoline A/S Kløvermarksvej 6 9500 Hobro Tlf: 96573000		Manufacturer (if deviating from company's name at the place of sampling):	
Name of the product: Tectopanel G1 600x 600		Type of product (e.g. laminate, textile flooring, PVC flooring):	
Model/program/series: Knauf Danoline acoustic products		Batch No.:	
Article No.: Misc.:		Date of batch production: <i>23-08-2019 13:54</i>	
Sample is taken from:	<input checked="" type="checkbox"/> Production <input type="checkbox"/> Store <input type="checkbox"/> Miscellaneous Place of storage: From the stock by the factory in Hobro	How had the product been stored prior to sampling?	<input checked="" type="checkbox"/> Open in the stack <input type="checkbox"/> Wrapped up Packing material: Standard packaging
Subsampling? Describe from where the subsample was taken:			
Product sample must be packed first with a layer of aluminium foil, then wrapped in airtight clear plastic wrapping, followed by an outer protective wrapping for transportation.			
Please enclose one sampling form for each product sample.			
Specifics (possible negative influences by emission at the place of taking the sample, petrol emissions, solvent emissions from production, uncertainties, questions, etc.):			
Cut edges (identification of cut edges when present and identification of new surfaces and surface to be exposed in the emission test): the edges have been cutted due to the size of the sampling			
Confirmation The signer herewith 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 samples.			
Date of sampling: <i>April 2020</i>		Signature: (Stamp) <i>Enk/xa</i>	
		Knaufdanoline Kløvermarksvej 6 DK 9500 Hobro	
Reception at DTI laboratory	<i>01-05-2020 / MHON</i>		
Laboratory ID	<i>927372-1</i>		
General information of DTI: https://www.dti.dk/general-information			

Sample information

Report no. 9273721-1-ED
Appendix 1
Page 2 of 2
Initials Hbk/Jle

Photo of sample label:



Sample handling:

Prior to testing the wrapped samples were stored at the test laboratory at 20-25 °C.

Sample preparation:

Preparation date of test specimen: 2020-05-25.

The test specimens were prepared according to: Testing and labelling criteria. Ceiling and wall systems. 5th edition, January 2018. Danish Indoor Climate Labelling. (*not part of accreditation*)

The test material was unwrapped and 2 samples (21,2 x 21,2 cm) were cut from the middle of the panel and placed back to back. The laboratory cut edges were sealed with emission free alumina tape. The test specimen was placed vertically in chamber with exposure of both sides.

Emission testing and results

Report no. 927372-1-ED
Appendix 2
Page 1 of 3
Initials Hbk/jle

Photo of test specimen in the climate chamber:



Climate chamber	113 L Polished stainless steel
Temperature	23°C ± 1°C
Relative humidity	50 % RH ± 5 % RH
Air velocity at the surface of the specimen	0.1 – 0.3 m/s
Air change	1.0 h ⁻¹ ± 0.05 h ⁻¹
Material load	0.8 m ² / m ³
Area specific air flow rate (q)	1.25 m ³ /m ² h

The test material was tested in the emission chamber without prior conditioning.

The chamber testing was carried out from 2020-05-25 to 2020-06-22.

Sampling and analytical methods of air samples:

	Method	Absorbent	Sampling volume	Quantification/Analysis method	Detection limit
VOC and Carcinogens	ISO 16000-6	Tenax TA	3 - 5 L	TDS-GC/MS Calibrated with pure reference standards	1 µg/m ³
Formaldehyde and carbonyls	ISO 16000-3	DNPH coated silica gel	60 L	HPLC-DAD Calibrated with pure reference standards	1 µg/m ³

Emission testing and results

Report no. 927372-1-ED
Appendix 2
Page 2 of 3
Initials Hbk/jle

The measured chamber concentrations are equal to the emissions from ceiling in a model room of 30 m³, with an air change rate of 0.5 h⁻¹ and a material loading factor of 0.4 m²/m³.

Results from volatile organic substances (VOC) analysis are shown in Table 1.

ISO 16000-6: 2011. Indoor air – Part 6: Determination of volatile organic compounds in indoor and test chamber air by active sampling on Tenax TA sorbent, thermal desorption and gas chromatography using MS/FID. Reporting of measured concentrations according to EN 16516.

Analysis of the air sampled on Tenax was performed at the Wilhelm Klauditz Institut (WKI) under DAkKS accreditation number D-PL-11140-05-02. MAIC-2020-2207.

Table 1: Emissions of VOC*

CAS-No.	Substance	Conc. 3 d (µg/m ³)	Conc. 28 d (µg/m ³)	SER 3 d (µg/m ² h)	SER 28 d (µg/m ² h)	AgBB- LCI ² (µg/m ³)	Info
000078-78-4	iso-Pentane	< 5	< 5	< 5	< 5	NA	VVOC
000067-64-1	Acetone	7	10	9	13	1200	VVOC
000064-19-7	Acetic acid	8	< 5	10	< 5	1200	VOC
000078-83-1	iso-Butanol	< 5	< 5	< 5	< 5	11000	VOC
000100-52-7	Benzaldehyde	< 5	< 5	< 5	< 5	90	VOC
000124-19-6	n-Nonanal	< 5	< 5	< 5	< 5	900	VOC
	saturated aliphatic hydrocarbons C9-C16 (Toluene)	< 5	< 5	< 5	< 5	6000	VOC
000112-31-2	n-Decanal	< 5	< 5	< 5	< 5	900	VOC
	saturated aliphatic hydrocarbons C9-C16 (Toluene)	< 5	< 5	< 5	< 5	6000	VOC
	Benzoic acid, ester (Toluene)	< 5	5	< 5	6	NA	VOC
	Sum VVOC (< C6)	7	10	9	13		
	Sum VOC (C6-C16)	8	5	10	6		
	Sum SVOC (C16-C22)	< 5	< 5	< 5	< 5		
	Sum of identified target VVOC	7	10	9	13		
	Sum of non-target and unidentified VVOC	< 5	< 5	< 5	< 5		
	Sum of identified target VOC	8	< 5	10	< 5		
	Sum of non-target and unidentified VOC	< 5	5	< 5	6		
	Sum of identified target SVOC	< 5	< 5	< 5	< 5		
	Sum of non-target SVOC	< 5	< 5	< 5	< 5		
	Sum of VOC (C6-C16,non-LCI)	< 5	< 5	< 5	< 5		
	Carcinogens (Cat 1A,1B)	< 1	< 1	< 1	< 1		
	TVOC (C6-C16)	< 5	5	< 5	6		
	TSVOC (C16-C22)	< 5	< 5	< 5	< 5		
	TSVOC (EN 16516) with LCI	< 5	< 5	< 5	< 5		
	Sum TVOC + TSVOC (LCI)	< 5	5	< 5	6		

* Reporting limit is 5 µg/m³ according to EN 16516:2017. The analytical uncertainty for VOC is typically within ± 30 %, but higher for VVOC and acetic acid.

Single substances/volatile compounds were quantified with pure reference standards, and in some cases the substances shown in subscript were used for the quantification.

¹ Sum of all individual substances quantified with toluene as reference.

² AgBB lowest concentration of interest (LCI) values 2018:

https://www.umweltbundesamt.de/sites/default/files/medien/355/dokumente/agbb_evaluation_scheme_2018_1.pdf

Emission testing and results

Report no. 927372-1-ED
Appendix 2
Page 3 of 3
Initials Hbk/jle

Definitions according to ISO 16000-6/EN 16516:

VOC (C6-C16): Volatile organic compounds, between hexane (C6) and hexadecane (C16)
 VVOC (<C6): Very volatile organic compounds, eluting before hexane, not included in TVOC.
 SVOC (>C16): Semi-volatile organic compounds, eluting after hexadecane, not included in TVOC
 TVOC: Total volatile organic compounds is the sum of all VOCs eluting between C6 and C16, quantified as toluene equivalents.

Results from formaldehyde and lower aldehydes analysis are shown in Table 2.

ISO 16000-3: 2011. Indoor Air – Part 3: Determination of formaldehyde and other carbonyl compounds – Active sampling method. Reporting of measured concentrations according to EN 16516.

Analysis of the air sampled on DNPH was performed at the Danish Technological Institute under DANAK accreditation 90. Reports no. 930100 and 933492.

Table 2: Emissions of formaldehyde and carbonyls*

CAS-No.	Substance	Conc. 3 d ($\mu\text{g}/\text{m}^3$)	Conc. 28 d ($\mu\text{g}/\text{m}^3$)	SER 3 d ($\mu\text{g}/\text{m}^2\text{h}$)	SER 28 d ($\mu\text{g}/\text{m}^2\text{h}$)	AgBB-LCI ² ($\mu\text{g}/\text{m}^3$)
50-00-0	Formaldehyde ¹	< 5	< 5	< 5	< 5	100
75-07-0	Acetaldehyde	< 5	< 5	< 5	< 5	1200
123-38-6	Propanal	< 5	< 5	< 5	< 5	750
123-72-8	Butanal	< 5	< 5	< 5	< 5	650
107-02-8	Acrolein	< 5	< 5	< 5	< 5	14

* Reporting limit is $5 \mu\text{g}/\text{m}^3$ according to EN 16516:2017

¹ AgBB lowest concentration of interest (LCI) values 2018:

https://www.umweltbundesamt.de/sites/default/files/medien/355/dokumente/agbb_evaluation_sch_eme_2018_1.pdf

² Formaldehyde is classified as carcinogenic compound Cat. 1B in Annex VI to Regulation (EC) No. 1272/2008. Since formaldehyde is a VVOC, it does not belong to carcinogenic VOC

Evaluation for the Danish Indoor Climate Label (DICL)

Report no. 927372-1-ED
Appendix 3
Page 1 of 1
Initials Hbk/jle

Calculation of R-value

The R-value (Risk index) for each compound (R_i) is calculated by the following equation (AggB, 2018):

$$R_i = \frac{C_i}{LCI_i}$$

where C_i is the measured chamber concentration of said compound and LCI_i is the corresponding LCI-value.

The R value of the product is equal to the sum of all the found R-values for all assessable compounds (all TVOC, VOC, SVOC):

$$R = \sum R_i = \sum \frac{C_i}{LCI_i}$$

Evaluation of emissions of volatile compounds

Parameter ¹	Measured	DICL Criteria ³	Evaluation
TVOC ₃	< 0.005 mg/m ³	≤ 10 mg/m ³	Pass
Carcinogens ₃ ²	< 0.001 mg/m ³	≤ 0.01 mg/m ³	Pass
Sum TVOC ₂₈ + SVOC _{28 LCI}	0.005 mg/m ³	≤ 1.0 mg/m ³	Pass
Sum SVOC ₂₈	< 0.005 mg/m ³	≤ 0.1 mg/m ³	Pass
Carcinogens ₂₈ ²	< 0.001 mg/m ³	≤ 0.001 mg/m ³	Pass
Sum VOC ₂₈ (Non-LCI)	< 0.005 mg/m ³	≤ 0.1 mg/m ³	Pass
R-value ₂₈ (LCI)	0.008	≤ 1	Pass

¹Suffix indicates the day of concentration measurement. ²The emission of carcinogenic compounds belonging to category 1A or 1B in Annex VI to Regulation (EC) No 1272/2008. ³DICL General test and labelling criteria, 6th edition, January 2018.

Sensory evaluation of odour acceptability

Result from sensory evaluation of odour according to ISO 16000-28 from DTI test report no. 927372-1-SA is shown in the table below.

Days	Measured Acceptability	DICL Criteria	Evaluation
8	0.49	> 0.1	Pass

*The DICL criteria of acceptance > 0.1 are fulfilled for measured acceptance ≥ 0.15

The indoor-relevant time-value of acceptable air quality is estimated to be: 8 days.