

QUL-CERTIFICATE

Status: January 2025

I EXTENT OF TESTING

II TEST CRITERIA and -REQUIREMENTS

III TESTING MANUAL „analysis of emissions“



CHEMICAL TEST

Test of the basic toxicological requirements

Tests in the latex core

Natural latex / synthetic latex shares
Filler shares
Nitrosamine
Volatile organic compounds (VOC)
Carbon disulfide (CS₂)
Formaldehyde
Acetaldehyd
Odour

Tests in the rubberized coir, rubberized horse hair¹⁾

Natural latex / synthetic latex shares
Nitrosamine
Volatile organic compounds (VOC)
Carbon disulfide (CS₂)
Formaldehyde
Acetaldehyde
Odour
Pesticides
Pyrethroids
Chlorophenols (PCP, TeCP)
o-phenyl phenol (sample)

¹⁾ horse hair additionally: Alkylphenol(ethoxylates)

Testing in fillers from plant and animal fibres¹⁾

Testing in fillers from plant and animal fibres¹⁾
Pesticides
Pyrethroids
Chlorophenols (PCP, TeCP)
o-phenyl phenol (sample)
Formaldehyde

¹⁾ Alkylphenol(ethoxylates) in animal fibers

Optical brighteners

Testing in cover materials from plant and animal fibres¹⁾

Pesticides
Pyrethroids
Chlorophenols (PCP, TeCP)
o-phenyl phenol (sample)
Triclosan
Formaldehyde
pH value
Optical brighteners

¹⁾ Alkylphenol(ethoxylates) in animal fibers

Arsenic- and Antimony-Compounds

Additional testing in colored materials

AOX (organic halogenated compounds)
 Organotin compounds (TBT/DBT)
 Heavy metals (as per IVN standard for infant clothing)
 Azo-colorants (amines as per LMBG regulations)
 Saliva / sweat resistance
 Sweat resistance alkaline / acidic
 Water resistance
 Friction resistance
 Phthalates

Testing of the complete mattress structure

Testing of parameters as above.

The partial testing and certification of the mattress core for VOC, CS₂ and nitrosamine is recognized for the certification of the complete mattress as per QUL standard.

Information about the contents

The mattress does not contain plastics.
 The mattress does not contain flame retardants.
 The latex core does not contain halogenated preservatives
 The latex core does not contain UV stabilizers.
 The covers do not contain optic brighteners
 The cotton content in covers comes entirely from organic certification
 The mattress does not contain PVC
 The packaging does not contain PVC
 Butadiene and phthalate are not contained in the utilized materials
 Separating fleeces (synthetic) are not contained

Mechanical Testing according to DIN EN 1957

Extent of testing for the QUL-Certificate

The QUL certificate includes the complete chemical and mechanical testing. The certificate refers to the partial tests of all ingredients, indicating the test reports and the testing laboratories of the QUL. The chemical testing is carried out at least once a year according to the QUL-criteria. The mechanical test must be repeated every 3 years. The testing of the adhesives is carried out every 5 years.

Test Laboratory

eco-INSTITUT GmbH

Products

Natural-latex mattresses and pillows, futons with covering materials and upholstery / padding materials of plant & animal fibres (cheep wool, linen, cotton, kapok, coconut/latexed coconut, horsehair/latexed horshair, Tencel (lyocell))

A Basic requirements

- Full declaration of materials
- Minimisation requirements for substances with dangerous properties according to dangerous substances regulations.
- Compliance with requirements for harmful substances (refer to C laboratory examinations)
- Compliance with the provisions of the European (e.g. REACH Regulation (EC) No. 1907/2006 and Biocidal products Regulation (EU) 528/2012) and German chemicals legislation
- Materials with the following classifications may not be used in the product:
 - Substances according to Regulation (EC) No. 1272/2008 Category Carc. 1A and 1B, Muta. 1A and 1B, Repr. 1A and 1B
 - Substances according to national law (TRGS 905): Category K1A and K1B, M1A and M1B, R1A and R1B
 - Substances according to MAK lists III1 and III2
 - Substances according to IARC groups 1 and 2A
 - Substances requiring official approval as per Appendix XIV of the REACH regulations
 - Substances of very high concern according to REACH Regulation (EC) No. 1907/2006, Article 59, paragraph 1 (SVHC, Candidate List)
 - POPs (Persistent Organic Pollutants) according to Regulation (EC) No 850/2004
 - Arsenic, lead, cadmium, mercury and compounds
 - Organic compounds of tin
 - Antimony trioxide
 - HFC
 - Organophosphates
 - Organic halogenated compounds
 - Pyrethroids
 - Phthalatic acid esters, Terephthalatic acid esters (apart from PET), DINCH
- The use of substances with the following classification (H-phrased) is strictly limited. If a requirement value is defined (refer to C), the substance in question may be contained in the product or may be emitted from the product up to this value (provided the requirement value was derived based on the property that the H-statement also addresses).
- Otherwise, the following applies to products that are present as a homogeneous mixture of substances: all input materials that are classified with the H statements listed in the table and whose content in the product is above the concentration limit values are excluded.
- For articles that are made up of several different components, the following applies: all input materials that are classified with the H statements listed in the table and whose content in a homogeneous component (e.g. paint, adhesive, coating component) of the product is above the concentration limit values are excluded.
- Substances whose properties change during production (e.g. through reaction/chemical change) in such a way that the danger in question no longer applies are exempt from the restriction. Likewise, input materials that have critical hazard characteristics (H phrase) due to respirable wood dust or mineral dust are permitted, provided that the overall product does not have any critical hazard characteristics.

Description		H-Statement	Concentration limit in %
Fatal	Fatal if swallowed.	H300	0.1
	Fatal in contact with skin.	H310	0.1
	Fatal if inhaled.	H330	0.1
Toxic	Toxic if swallowed.	H301	0.1
	Toxic in contact with skin.	H311	0.1
	Toxic if inhaled.	H331	0.1
Specific target organ toxicity	Cause damage to organs.	H370	1
	May cause damage to organs.	H371	1
	Causes damage to organs through prolonged or repeated exposure.	H372	1
	May cause damage to organs through prolonged or repeated exposure.	H373	1
Sensitization of respiratory tract	May cause allergy or asthma symptoms or breathing difficulties if inhaled.	H334	Category 1/1B: 0.1 Category 1A: 0.01
Carcinogenicity	May cause cancer.	H350	0.1
	Suspected of causing cancer.	H351	0.1
Mutagenicity	May cause genetic defects.	H340	0.1
	Suspected of causing genetic defects.	H341	1
Reproductive toxicity	May damage fertility or the unborn child.	H360	0.1
	Suspected of damaging fertility or the unborn child.	H361	0.1
	May cause harm to breast-fed children.	H362	0.1
Acute hazardous to water	Very toxic to aquatic life.	H400	0.1
Chronically hazardous to water	Very toxic to aquatic life with long lasting effects.	H410	0.1
	Toxic to aquatic life with long lasting effects.	H411	1
Hazardous to ozone layer	Hazardous to the ozone layer.	H420	0.1

B Special requirements⁰¹

- The use of the following vulcanization agents in latex production is permitted: ZnO (CAS: 1314-13-2), ZMBT / MBT (CAS: 155-04-4/149-30-4), ZDEC (CAS: 14324-55-1), ZBEC (CAS: 14726-36-4), ZDBC (CAS: 136-23-2), sodium hexafluorosilicate (CAS: 16893-85-9), 1,3-diphenylguanidine (CAS: 102-06-7), poly-(dicyclopentadiene-co-p-cresol) (CAS: 68610-51-5)
Prerequisite: Wastewater must be treated in internal or external wastewater treatment plants before being discharged into the environment. Wastewater analyses must be performed and documented regularly.
- The use of adhesives containing chloroprene is permitted – if the emission requirements are met.
- The use of recycled materials is not permitted.
- A mechanical test valid in all parts (in accordance with DIN EN 1957) must be presented.
The following quality criteria must be met:
 - Strength loss : < 20 %
 - Height loss : < 15 mm
 The test report must not be older than 3 years.

⁰¹ If there are indications that materials used are classified as critical from an ecological point of view or cannot be produced consistently with the same properties, they can be excluded from certification

C Laboratory examinations

P1 Complete mattress		
Test parameter	Requirements	Test method
Emission test		
TVOC (total volatile organic compounds)	$\leq 400 \mu\text{g}/\text{m}^3$ (2 days after test chamber loading) $\leq 200 \mu\text{g}/\text{m}^3$ (7 days after test chamber loading)	DIN EN 16516, DIN ISO 16000-3, DIN ISO 16000-6, DIN EN ISO 16000-9, Test chamber conditions: cf. testing manual
VOC (incl. VVOC and SVOC) with the following categorisations ² : Regulation (EC) No. 1272/2008: Category Carc. 1A and 1B, Muta. 1A and 1B, Repr. 1A and 1B; TRGS 905: K1A, K1B, M1A, M1B, R1A, R1B; IARC: Group 1 and 2A; DFG (MAK list): Categories III1, III2	$\leq 1 \mu\text{g}/\text{m}^3$ (2 + 7 days after test chamber loading)	
VOC (sum) without NIK	$\leq 100 \mu\text{g}/\text{m}^3$ (7 days after test chamber loading)	
VOC (individual values):		
Sum of bicyclic terpenes	$\leq 200 \mu\text{g}/\text{m}^3$ (7 days after test chamber loading)	
Sum of sensitising materials with the following categorisations: DFG (MAK lists): Category IV, TRGS 907	$\leq 100 \mu\text{g}/\text{m}^3$ (7 days after test chamber loading)	
Sum of VOC (incl. VVOC and SVOC) with the following categorisations: Regulation (EC) No. 1272/2008: Category Carc. 2, Muta. 2, Repr. 2; TRGS 905: K2, M2, R2; IARC: Group 2B; DFG (MAK list): III3	$\leq 50 \mu\text{g}/\text{m}^3$ (7 days after test chamber loading)	
Sum C9 – C14 Alkanes / Isoalkanes	$\leq 200 \mu\text{g}/\text{m}^3$ (7 days after test chamber loading)	
Sum C4 – C11 Aldehydes, acyclic, aliphatic	$\leq 100 \mu\text{g}/\text{m}^3$ (7 days after test chamber loading)	
Sum C6 – C15 Alkyl benzenes	$\leq 100 \mu\text{g}/\text{m}^3$ (7 days after test chamber loading)	
Sum Cresols	$\leq 5 \mu\text{g}/\text{m}^3$ (7 days after test chamber loading)	
Sum Xylenes	$\leq 100 \mu\text{g}/\text{m}^3$ (7 days after test chamber loading)	
Sum Naphthalene and naphthalene-like subst.	$\leq 10 \mu\text{g}/\text{m}^3$ (7 days after test chamber loading)	
VOC (individual substances):		
Methylisothiazolinone (MIT)	$\leq 1 \mu\text{g}/\text{m}^3$ (7 days after test chamber loading)	
Octylisothiazolinone (OIT)	$\leq 1 \mu\text{g}/\text{m}^3$ (7 days after test chamber loading)	
Benzaldehyde	$\leq 20 \mu\text{g}/\text{m}^3$ (7 days after test chamber loading)	
2-Ethyl-1-hexanol, Ethylene glycol mono-butyl ether, 2-Hexoxyethanol (Requirements per single substance)	$\leq 100 \mu\text{g}/\text{m}^3$ (7 days after test chamber loading)	
2-Butoxyethylacetate	$\leq 200 \mu\text{g}/\text{m}^3$ (7 days after test chamber loading)	
Glycol ethers with insufficient data ⁰² (Requirements per single substance)	0,005 ppm (7 days after test chamber loading)	
Propane-1,2-diol	$\leq 60 \mu\text{g}/\text{m}^3$ (7 days after test chamber loading)	
2-Phenoxyethanol	$\leq 30 \mu\text{g}/\text{m}^3$ (28 days after test chamber loading)	
Phenol	$\leq 20 \mu\text{g}/\text{m}^3$ (28 days after test chamber loading)	
Benzothiazol ⁰³	$\leq 15 \mu\text{g}/\text{m}^3$ (7 days after test chamber loading)	
Ethylacetat (VVOC)	$\leq 600 \mu\text{g}/\text{m}^3$ (7 days after test chamber loading)	
Acetophenone	$\leq 66 \mu\text{g}/\text{m}^3$ (7 days after test chamber loading)	
TSVOC (total semi-volatile organic compounds)	$\leq 40 \mu\text{g}/\text{m}^3$ (7 days after test chamber loading)	
Ammonia ⁰⁴	$\leq 200 \mu\text{g}/\text{m}^3$ (7 days after test chamber loading)	DIN EN 16516 DIN ISO 7150-1
Nitrosamine	$\leq 0,1 \mu\text{g}/\text{m}^3$ (2 days after test chamber loading)	BGI 505.23
Disulphide	$\leq 50 \mu\text{g}/\text{m}^3$ (2 days after test chamber loading)	

⁰² cf. announcement of the Ad-hoc Working Group on Indoor Guidelines of the Indoor Air Hygiene Committee and of the Supreme State Health Authorities: Richtwerte für Glykolether und Glykolester in der Innenraumluft, Bundesgesundheitsblatt, February 2013, Volume 56, Issue 2, pp 286-320

⁰³ Preliminary, exceeding the limit does not lead to devaluation at present.

⁰⁴ Preliminary, exceeding the limit does not lead to devaluation during the transitional period until 2026.

P1 Complete mattress		
Test parameter	Requirements	Test method
Emission test		
R value	≤ 1,0 (7 days after test chamber loading)	
Formaldehyde	≤ 24 µg/m³ (2 days after test chamber loading)	DIN EN 16516, DIN EN ISO, 16000-3
Acetaldehyd	≤ 24 µg/m³ (2 days after test chamber loading)	
Odour	≤ Stufe 4 (2 days after test chamber loading) ≤ Stufe 3 (7 days after test chamber loading at the latest)	cf. testing manual

P2 Covering materials	P21 Undyed textile covering materials	P22 Dyed textile covering materials	
Test parameter	Requirements	Requirements	Test method
Content analysis ⁰⁵			
AOX (adsorbable organic halogenated compounds)		≤ 5,0 mg/kg	DIN EN ISO 9562
Heavy metals			
Arsenic (As)	≤ 0,2 mg/kg	≤ 0,2 mg/kg	Eluate, analysis ICP/MS Cr(VI): DIN EN ISO 17075
Cadmium (Cd)		≤ 0,1 mg/kg	
Cobalt (Co)		≤ 1,0 mg/kg	
Chrome sum (Cr)		≤ 3,0 mg/kg	
Chrome VI (Cr VI)		≤ 3,0 mg/kg	
Copper (Cu)		≤ 25 mg/kg	
Mercury (Hg)		≤ 0,02 mg/kg	
Nickel (Ni)		≤ 1,0 mg/kg	
Lead (Pb)		≤ 0,2 mg/kg	
Antimony (Sb) (only synthetic or blended fibres; covering material incl. filler and padding material)	≤ 0,2 mg/kg	≤ 0,2 mg/kg	
Pesticides/Biocides			following DFG-S19, GC-ECD
Pyrethroids animal fibres (sum) Cyfluthrin, Cyhalothrin, Cypermethrin, Deltamethrin, Esfenvalerat, Fenvalerat, Flumethrin, Permethrin, Transfluthrin	≤ 1,0 mg/kg	≤ 1,0 mg/kg	
Pyrethroids vegetable fibers (sum; only natural fibres or blended fabric)	≤ 0,5 mg/kg	≤ 0,5 mg/kg	

⁰⁵ If there are indications that the basic requirements (exclusion of the substance groups listed there) are not met or if there is insufficient information on the substances used, additional ingredient analyses may be necessary.

P2 Covering materials	P21 Undyed textile covering materials	P22 Dyed textile covering materials	
Test parameter	Requirements	Requirements	Test method
Content analysis ⁰⁵			
Pesticides without pyrethroids (sum; only natural fibres or blended fabric) 2,4,5-T, 2,4-D, Acetameprid, Aldrin, Atrazine, Azinophos-ethyl, Azinophos-methyl, Bendiocarb, Bifenthrin, Bioresmethrin, Bromophos-ethyl, Buprofezin, Captafol, Carbaryl, Carbosulfan, Clethodim, Chlordane, Chlordimeform, Chlorfenapyr, Chlorfenvinphos, Chlorfluazuron, Chlorpyrifos-ethyl, Chlorpyrifos-methyl, Coumaphos, Cyclanilide, DDD, DDE, DDT, DEF, Diafenthiuron, Diazinon, Dichlofenthion, Dichlorprop, Dichlorvos, Dicrotophos, Dieldrin, Diflubenzuron, Dimethoat, Dinoseb und Salze, Diuron, Empenthrin, α -Endosulfan, β -Endosulfan, Endosulfansulfate, Endrin, Ethion, Fenchlorphos, Fenitrothion, Fenthion, Fenpropathrin, Fipronil, Heptachlor, Heptachlorepoxyd, Hexachlorbenzol, α -HCH, β -HCH, δ -HCH, Imidacloprid, Isodrin, Kelevan, Kepon, Lindan, Lufenuron, Malathion, MCPA, MCPB, Mecoprop, Methamidophos, Methidathion, Methomyl, Methoxychlor, Metolachlor, Mevinphos, Mirex, Monocrotophos, Parathion-ethyl, Parathion-methyl, Pendimethalin, Perthan, Phosalon, Phosdrin, Phosmet, Phoxim, Pirimiphos-ethyl, Pirimiphos-methyl, Profenophos, Prometryn, Propetamphos, Pymethrozine, Quinalphos, Quintozin, Strobilan, Teflubenzuron, Telodrin, Tetrachlorvinphos, Thiamethoxam, Thidiazuron, Thiodicarb, Toclofos-methyl, Toxaphen, Trifloxysulfuron-sodium, Trifluralin, Trifluralin	$\leq 0,5$ mg/kg	$\leq 0,5$ mg/kg	
Orthophenylphenol (OPP; only natural fibres or blended fabric)	$\leq 1,0$ mg/kg	$\leq 1,0$ mg/kg	Extraction, esterification, GC/MS
Chlorophenols (sum; only natural fibres or blended fabric) PCP, 2,3,4,5-TeCP, 2,3,4,6-TeCP, 2,3,5,6-TeCP, 2,3,5-Trichlorophenol, 2,3,6-Trichlorophenol, 2,4,5-Trichlorophenol, 2,4,6-Trichlorophenol	$\leq 0,1$ mg/kg	$\leq 0,1$ mg/kg	CEN / TR 14823
Triclosan	$\leq 0,5$ mg/kg	$\leq 0,5$ mg/kg	CEN / TR 14823
Organotin compounds (requirements per single substance) TBT, DBT, TeBT, MBT, MOT, DOT, TcyT, TPhT		$\leq 0,05$ mg/kg	Extraction, analysis following DIN EN ISO 17353
Formaldehyde	≤ 20 mg/kg	≤ 20 mg/kg	DIN EN ISO 14184-1, LFGB § 64, 82.02-1
Amines (azo dyes)		≤ 20 mg/kg	DIN EN 14362-1, -3
Allergenic dyes materials (dispersion dyes materials; only synthetic fibres or blended fabric)		≤ 50 mg/kg	DIN 54231
Chloroorganic carrier (only synthetic fibres or blended fabric)		$\leq 1,0$ mg/kg	Extraction with acetone, GC/MS
Optical brighteners	not allowed	not allowed	UV light
pH value	4.5-9	4,5-9	DIN EN ISO 3071
Colour fastness		saliva/sweat fastness: 5 sweat fastness alkali/acidic: $\geq 3-4$ rubbing fastness dry: $\geq 3-4$ rubbing fastness wet: ≥ 2 water fastness: ≥ 3	LFGB
Alkylphenol(ethoxylates) (for animal hair only)	≤ 20 mg/kg	≤ 20 mg/kg	HPLC-MS/MS, GC/MSD
Phthalates (sum; only printings) DMP, DEP, DPP, DBP, BBP, DEHP, DNOP, DIBP, BMEP, DHP, DNPP, DIPP, PIPP, DINP, DIDP, DIHP, DHNUP, DIHxP	≤ 100 mg/kg	≤ 100 mg/kg	following DIN EN 15777
Terephthalate DEHT (only printings)	≤ 100 mg/kg	≤ 100 mg/kg	following DIN EN 15777
Diisononyl cyclohexane-1,2-dicarboxylate DINCH (only printings)	≤ 100 mg/kg	≤ 100 mg/kg	following DIN EN 15777

⁰⁵ If there are indications that the basic requirements (exclusion of the substance groups listed there) are not met or if there is insufficient information on the substances used, additional ingredient analyses may be necessary.

P3 Upholstery / padding materials	P31 Latex	P32 Latex fibre	P35 Plant & animal fibres	
Test parameter	Requirements	Requirements	Requirements	est method
Content analysis ⁰⁵				
Pesticides/Biocides				following DFG-S19
Pyrethroids wool (sum) Cyfluthrin, Cyhalothrin, Cypermethrin, Deltamethrin, Esfenvalerat, Fenvalerat, Flumethrin, Permethrin, Transfluthrin			≤ 1,0 mg/kg	
Pyrethroids of other fibres (sum; only natural fibres or blended fabric)		≤ 1,0 mg/kg	≤ 0,5 mg/kg	
Pesticides without pyrethroids (sum; only natural fibres or blended fabric) 2,4,5-T, 2,4-D, Acetamepid, Aldrin, Atrazine, Azinophos-ethyl, Azinophos-methyl, Bendiocarb, Bifenthrin, Bioresmethrin, Bromophos-ethyl, Buprofezin, Captafol, Carbaryl, Carbosulfan, Clethodim, Chlordane, Chlordimeform, Chlorfenapyr, Chlorfenvinphos, Chlorfluazuron, Chlorpyrifos-ethyl, Chlorpyrifos-methyl, Coumaphos, Cyclanilide, DDD, DDE, DDT, DEF, Diafenthiuron, Diazinon, Dichlofenthion, Dichlorprop, Dichlorvos, Dicrotophos, Dieldrin, Diflubenzuron, Dimethoat, Dinoseb und Salze, Diuron, Empenthrin, α-Endosulfan, β-Endosulfan, Endosulfansulfate, Endrin, Ethion, Fenchlorphos, Fenitrothion, Fenthion, Fenpropathrin, Fibronil, Heptachlor, Heptachlorepoxyd, Hexachlorbenzol, α-HCH, β-HCH, δ-HCH, Imidacloprid, Isodrin, Kelevan, Kepon, Lindan, Lufenuron, Malathion, MCPA, MCPB, Mecoprop, Methamidophos, Methidathion, Methomyl, Methoxychlor, Metolachlor, Mevinphos, Mirex, Monocrotophos, Parathion-ethyl, Parathion-methyl, Pendimethalin, Perthan, Phosalon, Phosdrin, Phosmet, Phoxim, Pirimiphos-ethyl, Pirimiphos-methyl, Profenophos, Prometryn, Propetamphos, Pymethrozin, Quinalphos, Quintozin, Strobac, Teflubenzuron, Telodrin, Tetrachlorvinphos, Thiamethoxam, Thidiazuron, Thiodicarb, Toclufos-methyl, Toxaphen, Trifloxysulfuron-sodium, Triflurumuron, Trifluralin			≤ 0,5 mg/kg	
Orthophenylphenol (OPP; only natural fibres or blended fabric)		≤ 1,0 mg/kg	≤ 1,0 mg/kg	Extraction DFG/S19, GC/MS
Chlorophenols (sum; only natural fibres or blended fabric) PCP, 2,3,4,5-TeCP, 2,3,4,6-TeCP, 2,3,5,6-TeCP, 2,3,5-Trichlorphenol, 2,3,6-Trichlorphenol, 2,4,5-Trichlorphenol, 2,4,6-Trichlorphenol		≤ 0,1 mg/kg	≤ 0,1 mg/kg	CEN / TR 14823
Formaldehyde Optical brighteners Alkylphenol(ethoxylates) (for animal hair only) Natural latex content Filler content			≤ 20 mg/kg	DIN EN ISO 14184-1, LFGB § 64.82, 02-1
Optical brighteners			not allowed	UV light
Alkylphenol(ethoxylates) (for animal hair only)			≤ 20 mg/kg	HPLC-MS/MS, GC/MSD
Aniline ⁰⁶	10 mg/kg			Extraction LC-MS/MS
Natural latex content	NR ≥ 95 %	NR ≥ 80 %		IR/ATR
Filler content	≤ 5 %			Thermo-gravimetry IR/ATR

⁰⁵ If there are indications that the basic requirements (exclusion of the substance groups listed there) are not met or if there is insufficient information on the substances used, additional ingredient analyses may be necessary.

⁰⁶ After a three-year transitional period, this limit will apply from 2025.

Content

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1 Preliminary remark

This manual regulates the standardised procedure for examining emissions from construction products and furniture in test chambers as part of eco-INSTITUT label certification. The analyses are performed in the laboratory of eco-INSTITUT Germany GmbH, which is accredited both for the test chamber tests and for the subsequent analysis in accordance with DIN EN ISO/IEC 17025.

The specifications for sampling can be found in the sampling instructions. The test must be started no later than 8 weeks after obtaining marketability. In the meantime, the samples must be stored in suitable low-emission packaging under normal climatic conditions.

2 General test chamber conditions

The volatile organic compounds are measured in the test chamber in a manner that simulates practical conditions. Standardised test conditions are defined based on the type of test piece. All emission measurements are performed according to DIN EN 16516 incl. DIN EN ISO 16000-9, DIN ISO 16000-6 and -3.

Test chamber conditions according to DIN EN ISO 16000-9:

Chamber volume:	125 L
Temperature:	23°C ± 1°C
Relative humidity:	50 % ± 5 %
Air pressure:	normal
Air:	cleaned
Air exchange rate:	0,5/h
Inflow velocity:	0.1 - 0.3 m/s
Loading:	0,65 m ² /m ³
Air samplin:	2 und 7 Tage

During the continuous test, air samples are taken from the test chamber after 2 and 7 days. Approx. 5 L of test chamber air are drawn into Tenax with a volume flow rate of 100 mL/min and approx. 100 L into DNPH (dinitrophenylhydrazine) with a volume flow rate of 0.8-1 L/min. To measure the nitrosamine concentration, 200 L of air with a volume flow rate of 1.6 L/min is drawn through a sorbent tube.

3 Analytics

The substances adsorbed on Tenax are analysed after thermal desorption by means of gas chromatographic separation and mass spectrometric determination. Gas chromatographic separation is performed using a 60 m long, slightly polar 5% phenyl / 95% methyl polysiloxane capillary column.

The substances derivatised with DNPH to determine formaldehyde and other short-chain carbonyl compounds (C1 - C6) are analysed by means of high-performance liquid chromatography.

More than 200 compounds are determined and quantified individually, including the substances listed in the NIK list by the AgBB: volatile organic compounds (C6 - C16), semi-volatile organic compounds (C16 - C22) and – as far as possible with this method – also very volatile organic compounds (less than C6). All other substances are identified – as far as possible – by comparison with a spectra library.

These and unidentified substances are quantified by comparing their signal intensity with the signal of the internal standard (d8 toluene). The identification and quantification of the substances are carried out, as far as technically feasible, from a concentration (limit of determination) of 1 µg per m³ test chamber air or 2 µg per m³ for DNPH-derivatised substances.

The derivatised isocyanates are desorbed by extraction of the collector with acetonitrile in an ultrasonic bath and then analysed by means of HPLC and UV detection (limit of determination: 1 µg/m³).

The ammonia concentration is determined using UV/VIS spectroscopic determination of the indophenol concentration formed by the Berthelot reaction (limit of determination: 15 µg/m³).

After elution, the adsorbed N-nitrosamines are analysed by means of gas chromatography with a dichloromethane/methanol mixture using a TEA detector (Thermal Energy Analyser) (limit of determination: 40 ng/m³).

eco-INSTITUT Germany GmbH is accredited with flexible scope according to DIN EN ISO/IEC 17025. The accreditation covers the analytical determination of all volatile organic compounds including test chamber methods.

In order to check the analysis system, a standard that has a composition based on the specifications of the DIN EN 16516 standard is analysed for each evaluation. The stability of the analytical systems is documented by means of control charts using a test standard.

In interlaboratory tests, which are carried out at least once a year, the performance of the laboratory is checked by comparing the results of identical samples with those of other laboratories.

Before the test piece is introduced into the test chamber, a blank value control is carried out for any volatile organic compounds already present.

4 Determination of the odour characteristics

The determination of odour characteristics as part of eco-INSTITUT label certification is conducted in combination with the determination of volatile organic compounds in the test chamber. Test specimen manufacture, sample preparation and the setting of product-specific test chamber conditions thus take place in accordance with the measurement of volatile organic compounds in the test chamber. The determination of odour characteristics in the test chamber can also be carried out analogously without the measurement of volatile organic compounds.

The measurement times for the odour test are based on the measurement times for determining volatile organic compounds. The first measurement time is 3 days for construction products and furniture and 2 days for mattresses after loading in the test chamber.

The odour panel consists of at least five investigators. Participating investigators must not suffer from anosmia and must be familiar with the 6-point scale in accordance with VDA 270:2018. If the individual assessment of the grades differs by more than two grades, a repeat measurement with at least 7 investigators should be conducted.

An odour sample is taken from the test chamber by collecting an air sample of at least 20 litres in a Nalophan sampling bag. Alternatively, an odour test can be performed directly at the test chamber outlet using a funnel if the air flow volume at the funnel outlet is 0.6 - 1 L/s.

If the air sample is collected in a Nalophan sampling bag, this air is then offered to the investigators within 6 hours at the Airprobe via a funnel. The inflow velocity at the funnel outlet must also be 0.6 - 1 L/s.

The odour assessment takes place in accordance with the 6-point scale according to VDA 270:2018.

The required value for the odour is a mean of 4 for the first measurement time. The required value for the second measurement time a maximum of 28 days (or 7 days for mattresses) after loading in the test chamber is a mean of 3.

If the required value of 3 is already fulfilled at the first measurement time, no further measurement times are required. If the mean at the first measurement time has a grade >4, the requirement for odour characteristics is not fulfilled.

A grade (mean) of 3-4 at the first measurement time leads to a repeat of the odour test for the last measurement time after a maximum of 28 days (or 7 days for mattresses).

If the mean is ≤ 3 at the last measurement time, the requirement for odour characteristics is considered fulfilled.

The requirement for odour characteristics is considered not fulfilled, however, if the grading at this time continues to have a mean of >3.

The table shows an overview of the decision-making criteria:

Measurement time	Required value (mean)	Grade (mean)	Requirement fulfilled?	Further procedure
1	4	3	yes	No further measurement time required
1	4	> 4	no	No further measurement time required
1	4	3-4	yes	Further measurement time required
2	3	≤ 3	yes	-
2	3	> 3	no	-

5 Literaturhinweis

[1] DIN EN 16516, Construction products - Assessment of release of dangerous substances - Determination of emissions into indoor air