

BLUE ANGEL

The German Ecolabel



Low-Emission-Furniture and Slatted Frames made of Wood and Wood-Based Materials

DE-UZ 38

Basic Award Criteria

Edition January 2013

Version 5

The Environmental Label is supported by the following four institutions:



Federal Ministry
for the Environment, Nature Conservation
and Nuclear Safety

The Federal Ministry for the Environment, Nature Conservation and Nuclear Safety is the owner of the label. It regularly provides information on the decisions taken by the Environmental Label Jury.



The German Environmental Agency with its specialist department for "Ecodesign, Eco-Labeling and Environmentally friendly Procurement" acts as office of the Environmental Label Jury and develops the technical criteria of the Basic Criteria for Award of the Blue Angel.



The Environmental Label Jury is the independent, decision-making body for the Blue Angel and includes representatives from environmental and consumer associations, trade unions, industry, the trade, crafts, local authorities, academia, the media, churches, young people and the German federal states.



The RAL gGmbH is the awarding body for the Environmental Label. It organises the process for developing the relevant award criteria in independent expert hearings – which involve all relevant interest groups.

If you require further information please contact:

RAL gGmbH

RAL UMWELT

Fränkische Straße 7

53229 Bonn

Tel: +49 (0) 228 / 6 88 95 - 0

E-Mail: umweltzeichen@ral.de

www.blauer-engel.de

Version 1 (01/2013): First Edition, Expiry date : December 31, 2013
 Version 2 (08/2014): Editorial changes to paragraph 3.2.1, footnote 13
 Version 3 (01/2017): Prolongation for 3 years without any change (until 31.12.2019)
 Version 4 (10/2016): Editorial changes to paragraph 3.2.1, change of footnote 13
 Version 5 (08/2017): Editorial change - Adding footnote 3

Table of contents

1	Introduction.....	4
1.1	Preface	4
1.2	Background	4
1.3	Objectives of the Environmental Label	5
2	Scope	5
3	Requirements	5
3.1	Manufacture	5
3.1.1	Requirements for the Wood	5
3.1.1.1	Origin of the Wood.....	5
3.1.1.2	Formaldehyde in Wood-Based Materials.....	6
3.1.2	General Substance Requirements for Coating Systems.....	6
3.1.3	Emissions from the Coating Systems	7
3.2	Use.....	8
3.2.1	Indoor Air Quality.....	8
3.2.2	Odour Test (optional).....	9
3.2.3	Packaging	9
3.2.4	Wearing Parts	9
3.3	Recycling and Disposal.....	10
3.3.1	Halogens	10
3.3.2	Flame Retardants	10
3.3.3	Biocides	10
3.4	Consumer Information	10
3.5	Advertising Messages.....	11
4	Applicants and Parties Involved.....	11
5	Use of the Environmental Label.....	11
	Appendix A Wood Certification.....	13
	Appendix B BAM Test Method	16

This document is a translation of a German original. In case of dispute, the original document should be taken as authoritative.

1 Introduction

1.1 Preface

In cooperation with the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, the German Environmental Agency and considering the results of the expert hearings conducted by RAL gGmbH, the Environmental Label Jury has set up these Basic Criteria for the Award of the Environmental Label. RAL gGmbH has been tasked with awarding the Environmental Label.

Upon application to RAL gGmbH and on the basis of a Contract on the Use of the Environmental Label to be concluded with RAL gGmbH, the permission to use the Environmental Label may be granted to all products, provided that they comply with the requirements as specified hereinafter.

The product must comply with all the legal requirements in the country in which it is to be marketed. The applicant shall declare that the product meets this requirement.

1.2 Background

Furniture and slatted frames can have environmental impact throughout their entire life cycle. That is why the requirements for the Blue Angel eco-label cover not only the materials used in the production but also the period of use, the disposal as well as the packaging for the transportation of furniture and slatted frames.

And added to that, furniture and slatted frames are used indoors and therefore the lowest possible emissions from these products will be of great benefit to the user from a health and environmental perspective. Here, the Blue Angel eco-label lends itself as a perfect medium for the labelling of low-emission products. Also, good serviceability combined with a long service life have a key role in the protecting environment and health.

For evaluating the emissions from furniture and slatted frames made of wood and wood-based materials the concept of these Basic Criteria has been developed along the lines of the evaluation scheme established by the "Ausschuss zur gesundheitlichen Bewertung von Bauprodukten" (Committee for Health-Related Evaluation of Building Products) - a federal and länder expert committee representing German environmental and health authorities.

Since emissions are often accompanied by odours which can also cause health problems the odour test is an important element in evaluating the individual products designed for indoor use. The DIN ISO 16000-28 standard „Indoor Air - Determination of odour emissions from building products using test chambers“ of March 2012 offers measurement method. This standard describes the measurement of odours from building products in parallel with the measurements of volatile organic compounds (VOC) in test chambers. In the years to come, the standard will have to prove its worth to furniture. With a view to such proving, low odour requirements and appropriate compliance verification are expected to be included into the next version of these Basic Criteria. The present Basic Criteria recommend manufacturers to have odour tests carried out voluntarily.

1.3 Objectives of the Environmental Label

The Blue Angel eco-label for furniture and slatted frames may be awarded to products primarily made of the renewable resource wood which - beyond the scope of the legal provisions -

- are manufactured in an environmentally friendly manner (especially applies to coatings),
- from the health point of view have no negative impact on the living environment and
- do not contain any hazardous substances that may well impede recycling.

The Blue Angel eco-label for furniture and slatted frames promotes the use of wood from sustainable forestry and low-emission wood-based materials.

Therefore, following benefits for the environment and health are stated in the explanatory box:



2 Scope

These Basic Criteria apply to ready-to-use indoor furniture and slatted frames made predominantly – i.e. more than 50 percent by volume – of wood and/or wood-based materials (chipboards, coreboards, fibreboards, veneer-faced boards, each non-coated or coated). Window elements and semi-finished products do not fall within the scope.

The Environmental Label Jury may include additional ready-to-use products made of wood and wood-based materials at the suggestion of the German Umweltbundesamt (Federal Environmental Agency).

3 Requirements

The Blue Angel eco-label shown on page 1 may be used for the labelling of products under paragraph 2, provided that they meet the requirements set forth hereinafter:

3.1 Manufacture

3.1.1 Requirements for the Wood

3.1.1.1 Origin of the Wood

It shall be ensured that all processed wood comes from legal sources. Moreover, at least 50 percent of the wood or 50 percent of the primary raw materials for wood-based materials shall be sourced from sustainable forests which are managed in a verifiably economically viable, environmentally sound and socially responsible way.

Compliance Verification

The applicant shall declare compliance with the legal source requirement according to Regulation (EU) 995/2010¹.

Compliance with the requirement for using wood from sustainable forestry can be verified in the following ways:

- If the applicant itself is certified according to the FSC or PEFC criteria for a chain of custody (CoC) the applicant shall present the relevant certificate. In such case no further evidence will be required.*
- If the applicant is not certified the applicant shall submit appropriate certificates of its raw material supplier. RAL accepts certificates from the Forest Stewardship Council (FSC) and PEFC (Programme for the Endorsement of Forest Certification Schemes) certifying sustainable forestry and a chain of custody (CoC). The applicant shall present a record of the wood used specifying the percentage of certified wood used (Annex 2 to the contract pursuant to DE-UZ 38).*
- The applicant shall submit other appropriate compliance verifications according to Appendix A (Annex 3 to the contract pursuant to DE-UZ 38). The appendix may be extended at the request of and after review by the German Umweltbundesamt (Federal Environmental Agency). The applicant shall submit a record of the wood used specifying the percentage of certified wood used (Annex 2 to the Contract pursuant to DE-UZ 38).*

3.1.1.2 Formaldehyde in Wood-Based Materials

Products under paragraph 2 may be manufactured using wood-based materials marked with the DE-UZ 76 Blue Angel eco-label. If the wood-based materials used are not DE-UZ 76-ecolabelled they shall not exceed in their raw state, i.e. prior to machining or coating, a formaldehyde steady state concentration of 0.1 ppm in the test chamber.

Compliance Verification

For DE-UZ 76 eco-labelled wood-based materials, the applicant shall indicate manufacturer and product designation. For not-yet DE-UZ 76-ecolabelled wood-based materials, the applicant shall present a test report according to the test method for wood-based materials².

3.1.2 General Substance Requirements for Coating Systems

Coating systems are usually applied to the products under paragraph 2 to protect and design the product surfaces. Such coating systems include, for example, stains, primers, clear varnishes, topcoats, foils, decorative papers, adhesives.

The coating systems shall not contain as constituent elements (i.e. substances that remain in the final product where they perform a certain function) any substances³ classified as:

¹ OJ L 295, of 12 November 2010

² Test Method for Wood-Based Materials, Federal Health Bulletin 10/91 p. 488-489. Compliance can also be verified by submitting a test certificate confirming the classification as E1 materials.

³ Formaldehyde shall be exempt from these general requirements. These Basic Criteria list specific requirements to be met by this substance.

- a) carcinogenic in categories 1 or 2 according to Table 3.2 or categories 1A and 1B according to Table 3.1 of Annex VI to Regulation (EC) No1272/2008⁴
- b) mutagenic in categories 1 or 2 according to Table 3.2 or categories 1A and 1B according to Table 3.1 of Annex VI to Regulation (EC) No1272/2008
- c) reprotoxic in categories 1 or 2 according to Table 3.2 or categories 1A and 1B according to Table 3.1 of Annex VI to Regulation (EC) No1272/2008
- d) being of very high concern for other reasons and which have been included in the list (so-called candidate list⁵) set up in accordance with REACH, Article 59, paragraph 1.

The following shall be exempt from these rules:

- process-related, technically unavoidable impurities falling below the classification thresholds for mixtures.
- Monomers or additives which turn into polymers during the manufacture of plastics or are chemically (covalently) bound to the plastic if their residual concentrations are below the classification thresholds for mixtures.

Compliance Verification

The applicant shall prove compliance with the requirements by submitting a declaration from the coating materials manufacturer (Annex 4 to the Contract pursuant to DE-UZ 38) as well as the Technical Data Sheets and Material Safety Data Sheets.

3.1.3 Emissions from the Coating Systems

Operators of installations for the coating of products under para. 2 shall limit the emissions of volatile organic compounds in accordance with the requirements of the 31st Bundesimmissionsschutzverordnung (BImSchV) (Federal Immission Control Ordinance)⁶ (Solvent or VOC Ordinance) or the European VOC Directive⁷ by using low-emission coating systems or exhaust gas purification systems.

⁴ Regulation (EC) No1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No1907/2006, Annex VI Harmonized classification and labelling for certain hazardous substances, Part 3: Harmonized classification and labelling. (short: GHS Regulation). http://www.reach-info.de/ghs_verordnung.htm, as amended.

The GHS Regulation (Global Harmonization System), that has come into force on January 20, 2009, replaces the old Directives 67/548/EEC and 1999/45/EC. According to the said regulation, substances are classified, labelled and packed until December 1, 2010 according to Directive 67/548/EEC (Dangerous Substances Directive) while mixtures are classified, labelled and packed until June 1, 2015 according to Directive 1999/45/EC (Dangerous Preparations Directive). Notwithstanding this, substances and preparations may be classified, labelled and packed according to the provisions of the GHS Regulation already before December 1, 2010 or June 1, 2015, respectively. In such case, the provisions of Dangerous Substances Directive or Dangerous Preparations Directive shall not be applicable.

⁵ Link to the Candidate List of Regulation (EC) No. 1907/2006 concerning the Registration, Evaluation, Authorization, and Restriction of Chemicals (REACH):

http://echa.europa.eu/chem_data/authorisation_process/candidate_list_table_en.asp

⁶ 31st Ordinance on the Implementation of the Federal Immission Control Act (Ordinance on the limitation of emissions of volatile organic compounds due to the use of organic solvents in certain installations) of August 21, 2001 (Federal Law Gazette I p. 2180), last amended by Article 2 of the Ordinance of 20 December 2010 (Federal Law Gazette I p. 2194), as amended.

⁷ Council Directive 1999/13/EC of 11 March 1999 on the limitation of emissions of volatile organic compounds due to the use of organic solvents in certain activities and installations, as amended.

Compliance Verification:

The applicant shall declare compliance with the requirements in Annex 1 to the Contract pursuant to DE-UZ 38.

3.2 Use

3.2.1 Indoor Air Quality

The products under para. 2 shall not exceed the emission values⁸ listed in Table 1 measured in the test chamber in accordance with the BAM test method (BAM - Bundesanstalt für Materialforschung und –prüfung - Federal Institute for Materials Research and Testing) based on the „health risk assessment process for emissions of volatile organic compounds (VOC and SVOC) from building products“ developed by the Ausschuss zur gesundheitlichen Bewertung von Bauprodukten (AgBB) (Committee for Health-Related Evaluation of Building Products)⁹ (Appendix B: Method for the measurement of emissions of formaldehyde and other volatile organic compounds (BAM test method)).

Table 1: Emission Requirements

Compound or Substance	3rd Day	Final Value (28th day)
Total organic compounds within the retention range of C ₆ to C ₁₆ (TVOC)	< 3.0 mg/m ³	< 0.4 mg/m ³
Total organic compounds within the retention range of > C ₁₆ to C ₂₂ (TSVOC)	-	< 0.1 mg/m ³
Carcinogenic substances ¹⁰	< 10 µg/m ³ total	< 1 µg/m ³ per single value
Total VOC without LCI ¹¹	-	< 0.1 mg/m ³
R value ¹²	-	< 1
Formaldehyde ¹³	-	< 0.05 ppm

⁸ The emission values represent a highly advanced state of the art for low-emission wooden furniture. They do not provide immediate information on indoor air quality, as the furniture load on indoor environments can differ a lot and component testing does not take into account the usual conditions of storage and shipment for measurement reasons (worst-case-measurement). The emission value corresponds to the area-specific emission rate in µg/m²h, because $q = 1 \text{ m}^3/\text{m}^2\text{h}$.

⁹ AgBB-Bewertungsschema (Evaluation Scheme of the Committee for Health-related Evaluation of Building Products) May 2010. Published on the homepage of the German Umweltbundesamt (Federal Environmental Agency): http://www.umweltbundesamt.de/produkte/bauprodukte/dokumente/AgBB-Bewertungsschema_2010.pdf, as amended.

¹⁰ Substances classified according to para. General Substance Requirements for Coating Systems, No. 3.1.2a).

¹¹ LCI = Lowest Concentration of Interest; cf. AgBB evaluation scheme (footnote 9)

¹² $R = \text{total of all quotients } (C_i / LCI_i) < 1$ (where C_i = substance concentration in the chamber air, LCI_i = LCI value of the substance), cf. AgBB evaluation scheme (footnote 15)

¹³ Moreover, saunas and infrared cabins shall be tested (a) according to VDA 276 (Determination of organic emissions from components used for the car interior using a 1m³ test chamber) at a temperature of 65°C to prove that the formaldehyde emission is < 0.05 ppm or (b) the gas analysis value shall be determined in accordance with DIN EN ISO 12460-3:2016-03. It shall be ≤0.4 mg/m²h.

The test may be stopped from day 7 after loading if the required final values of day 28 are reached prematurely and if, compared with the measurement of day 3, no rise has been observed in the concentration of any of the detected substances.

Compliance Verification

The applicant shall submit test reports according to the BAM test method (Appendix B: Method for the measurement of emissions of formaldehyde and other volatile organic compounds) based on DIN EN ISO 16000-9. The BAM test method distinguishes between whole-product test and component test. The component test included in the BAM test method allows the applicant to distribute the emission tests over initial and follow-up test (Appendix B, No. 7). The results of the first follow-up test shall be submitted to RAL gGmbH without being asked by December 31 of the year ending two years after concluding the Contract on the Use of the Environmental Label.

3.2.2 Odour Test (optional)

The measurement of the likewise significant odour emissions is recommended for the entire term of the Basic Criteria (see para. 1.2). For guidance on evaluating the measurement results, reference is made to the research report "UBA Texts 35/2011"¹⁴.

Compliance Verification

If applicable, the applicant shall submit a test report according to DIN ISO 16000-28.

3.2.3 Packaging

Where practicable, the products under para. 2 shall be packed for sale so as to allow post-manufacture outgassing of volatile elements.

Compliance Verification

The applicant shall submit a description of the packaging system and declare that the packaging system is so designed as to allow the outgassing of volatile components or give the reason why such packaging cannot be used.

3.2.4 Wearing Parts

The availability of functionally compatible spare parts shall be guaranteed for a period of at least five years for those parts in the products under para. 2 which are subject to wear, e.g. hinges, locks, table leaves. Lights and light fixtures shall be exempt from this requirement.

Compliance Verification

The applicant shall declare compliance with the requirement in Annex 1 to the Contract pursuant to DE-UZ 38.

¹⁴ „Sensorische Bewertung der Emissionen aus Bauprodukten – Integration in die Vergabegrundlagen für den Blauen Engel und das AgBB-Schema“ (Sensory evaluation of emissions from building products – Integration into the Basic Criteria the Blue Angel eco-label and the evaluation scheme of the Committee for Health-related Evaluation of Building Products), Project No. 37 07 62 300; <http://www.umweltbundesamt.de/produkte/bauprodukte/schadstoffe-gerueche.htm>

3.3 Recycling and Disposal

3.3.1 Halogens

With a view to future recycling and disposal, no halogenated organic compounds may be used (e.g. as binders, flame retardants) in the manufacture of the products, including the materials used in the manufacture (wood-based materials, adhesives, coatings etc.). Electrical components (e.g. cables, plugs) that may be separated during disposal shall be exempt from this requirement.

Compliance Verification

The applicant shall declare compliance with the requirement in Annex 1 to the Contract pursuant to DE-UZ 38.

3.3.2 Flame Retardants

The following flame retardants may be used, if any: inorganic ammonium phosphates (diammonium phosphate, ammonium polyphosphate etc.), other dehydrating minerals (aluminium hydroxide or the like), or expandable graphite.

Compliance Verification

The applicant shall declare compliance with the requirement in Annex 1 to the Contract pursuant to DE-UZ 38.

3.3.3 Biocides

The use of biocides shall not be permitted. Biocides exclusively used for in-can preservation in aqueous coating materials and glues or flame retardants according to para. 3.3.2 shall be exempt from this requirement.

Compliance Verification

The applicant shall declare compliance with the requirement in Annex 1 to the Contract pursuant to DE-UZ 38.

3.4 Consumer Information

The product under paragraph 2 shall be accompanied by the consumer information providing at least the following basic information, possibly in conjunction with other information:

- Information about wearing parts and their repair or replacement, and, if applicable, about a repair service, including a note that functionally compatible replacement parts will be available for at least 5 years;
- Information about type and origin of the predominantly used wood in accordance with para. 3.1.1;
- Information about the other materials (> 3 weight percent);
- Instructions for the assembly or laying of the products;
- Instructions for disassembly for moving and future material recycling purposes;
- Information on the serviceability (fields of application and material test results, if applicable).

Compliance Verification

The applicant shall present the consumer information.

3.5 Advertising Messages

- Advertising messages shall not include any notes such as „no negative impact on the living environment“ or those which would play down risks in terms of Article 23, para. 4 of Directive 67/548/EEC, as, for example, „non-toxic“, „non-hazardous to health, free of ...“).
- Product designations including elements or designations, such as „organic“, „eco“ or the like, shall not be admissible.

Compliance Verification

The applicant shall declare compliance with the requirement in Annex 1 to the Contract pursuant to DE-UZ 38.

4 Applicants and Parties Involved

Manufacturers of final products according to Paragraph 2 shall be eligible for application.

Parties involved in the award process are:

- RAL gGmbH to award the Blue Angel Environmental Label,
- the federal state being home to the applicant's production site,
- Umweltbundesamt (German Environmental Agency) which after the signing of the contract receives all data and documents submitted in applications for the Blue Angel in order to be able to further develop the Basic Award Criteria.

5 Use of the Environmental Label

The use of the Environmental Label by the applicant is governed by a contract on the use of the Environmental Label concluded with RAL gGmbH.

Within the scope of such contract, the applicant undertakes to comply with the requirements under Paragraph 3 while using the Environmental Label.

Contracts on the Use of the Environmental Label are concluded to fix the terms for the certification of products under Paragraph 2. Such contracts shall run until December 31, 2019. They shall be extended by periods of one year each, unless terminated in writing by March 31, 2019 or March 31 of the respective year of extension.

After the expiry of the contract, the Environmental Label may neither be used for labelling nor for advertising purposes. This regulation shall not affect products being still in the market.

The applicant (manufacturer) shall be entitled to apply to RAL gGmbH for an extension of the right to use the ecolabel on the product entitled to the label if it is to be marketed under another brand/trade name and/or other marketing organisations.

The Contract on the Use of the Environmental Label shall specify:

- Applicant (manufacturer)
- Brand/trade name, product description
- Distributor (label user), i.e. the above-mentioned marketing organisations.

© 2017 RAL gGmbH, Bonn

Appendix A Wood Certification

1) Record of the wood used

Type of wood-based material ¹⁵	Type of wood	Country/Region of origin of the wood	Volume	Sourced from certified sustainable forestry?	Verification of controlled wood ¹⁶
			m ³	<input type="checkbox"/> yes: % <input type="checkbox"/> no Certificate No:	Annex No:
			m ³	<input type="checkbox"/> yes: % <input type="checkbox"/> no Certificate No:	Annex No:
			m ³	<input type="checkbox"/> yes: % <input type="checkbox"/> no Certificate No:	Annex No:
			m ³	<input type="checkbox"/> yes: % <input type="checkbox"/> no Certificate No:	Annex No:
			m ³	<input type="checkbox"/> yes: % <input type="checkbox"/> no Certificate No:	Annex No:
			m ³	<input type="checkbox"/> yes: % <input type="checkbox"/> no Certificate No:	Annex No:

¹⁵ Solid-wood board, coreboard, oriented strand board (OSB), chipboard ...

¹⁶ Other compliance verification if no certificate available

2) Risk Assessment

Date	
Type of Wood	
Country and region of origin	
Name, address of the FSC and/or PEFC accredited certification body	

Annex No:

Category	Indicators	Sources of Information ¹⁷	Justification	Risk Classification Indicator ¹⁸	Risk Classification Category ¹⁹
1. Forest regions where traditional or civil rights are violated ²⁰	UN Security Council ban on timber exports			please classify	please classify
	Trade in conflict timber			please classify	
	Child labour or violation of ILO Fundamental Principles			please classify	
	There are processes in place to recognise and respect the legal and customary rights of indigenous groups pertaining to ownership, use and management of land, territories and resources.			please classify	
	Suspected violation of ILO Convention 169 on indigenous peoples.			please classify	
2. High conservation value forests ^{21,22}	Threat to high conservation value forests by forestry activities.			please classify	please classify
	A system of protection is in place to ensure the survival of the high			please classify	

¹⁷ For examples, please see FSC Standard FSC-STD-40-005

¹⁸ „Unspecified risk“ is to be entered if no reliable information is available. In such case it shall be evidenced otherwise, if possible, that an indicator may be classified as „low risk“.

¹⁹ A category is to be classified as „unspecified risk“ or „high risk“ if at least one indicator has been classified „unspecified risk“ or „high risk“.

²⁰ All indicators must be classified as „low risk“ in order to be able to classify the category as „low risk“.

²¹ Forests which as rare ecosystems have significant nature conservation value or serve as habitats for particularly rare species of plants or animals.

²² One of the two indicators mentioned must be classified as low risk in order to be able to classify the category as low risk.

Category	Indicators	Sources of Information ¹⁷	Justification	Risk Classification Indicator ¹⁸	Risk Classification Category ¹⁹
	conservation value.				
3. Natural forests converted to plantations or non-forest uses.	Net loss and significant rate of loss (> 0.5 %/year) of natural forests			please classify	please classify
4. Use of genetically modified trees (GMO) ²³	Commercial use of genetically modified trees in the country of origin.			please classify	please classify
	Licenses are required for the commercial use of genetically modified trees and there are no licenses for commercial use available.			please classify	
	The commercial use of genetically modified trees in the country of origin is prohibited.			please classify	

Certified:

Date / Signature of Certifying Person

²³ One of the three indicators mentioned must be classified as low risk in order to be able to classify the category as low risk.

Appendix B BAM Test Method

Method for the measurement of emissions of formaldehyde and other volatile organic compounds

Table of contents

1	Definitions.....	16
2	Test Material.....	17
2.1	Whole-Product Test	18
2.2	Component Test.....	18
2.3	Transportation	18
3	Sample Preparation	18
4	Test Chamber Measurement	19
5	Methods of Air Sampling and Analysis.....	20
6	Evaluation and Test Report.....	20
7	Initial and Follow-up Test	22
8	Testing Laboratories	22
9	Literature	22

1 Definitions

Component

Part of a complete piece of furniture (e.g. door, shelf board, side board, backing, drawer) or of another product made of wood and wood-based materials including different surfaces and materials in a ready-for-shipment state that does not undergo any further changes (varnishing, bonding, boring, milling etc.).

Component Test

Testing of a component.

Emission area

Area of a test specimen that is capable of emission and in contact with the ambient air in the emission test chamber or emission test cell. The emission test chamber measurement shall include not only the actual surfaces but also the narrow faces for calculation of the emission area. Unvarnished glass and metal surfaces shall not be included.

Emission Test Chamber

Closed container with controlled operating parameters for the determination of volatile organic compounds emitted from furniture.

Emission Test Cell

Small chamber for the determination of volatile organic compounds emitted from furniture. The test cell is placed on the surface of the test specimen; it is so designed as to make sure that the surface of the test specimen becomes part of the emission test cell.

Volatile Organic Compound (VOC)

All single substances within the retention range of C₆ to C₁₆ on a non-polar column. Single substances are identified and unidentifiable compounds.

Whole-Product Test

Testing of a complete product (e.g. piece of furniture).

Air Volume Flow

Air volume passed through the emission test chamber or emission test cell per unit of time.

Air Change

Quotient of the air volume flow passing through an emission test chamber or test cell and the chamber/cell volume.

Sample Material

Furniture or component pulled from production for testing.

Test Specimen

Samples selected for the emission test (furniture, components or parts thereof cut to the required size).

Loading of the Chamber

Quotient of emission area and the chamber/cell volume.

Narrow Faces

Side faces of a three-dimensional test specimen.

Area-specific Air Flow Rate

Quotient of air change and chamber loading or air volume flow and emission area.

2 Test Material

The finished products falling within the scope of the Basic Criteria differ with regard to shape, materials and the number of materials used. That is why the test procedure and the selection of test specimens shall be determined in each particular case by the testing laboratory upon consultation with the manufacturer.

There are two test methods for wooden furniture and wood-based materials with three-dimensional surfaces:

- a) Whole-product test
especially for small furniture, chairs etc.
- b) Component test

especially for unit furniture and furniture programmes with identical components.

2.1 Whole-Product Test

The product to be tested shall be taken directly from current production. Parts from suppliers must not be older than 10 days. Exceptions to this rule may be made if the manufacturer can prove that some of the supplied parts are regularly older during normal production.

The product shall be packed air-tight immediately after being produced. Cabinet furniture shall be packed in closed condition.

2.2 Component Test

For a component test, e.g. furniture programmes, the components to be tested shall be selected by the testing laboratories upon consultation with the manufacturer. In doing so, the different materials used, especially different coating systems, shall be taken into account. Such selection shall make sure that the requirements of the Basic Criteria for the product to be tested are met. No sampling and emission test shall be required for components with a total area portion of no more than 5 percent of the product.

The components to be tested shall be taken in sufficient quantities directly from current production. Components from suppliers must not be older than 10 days. Exceptions to this rule may be made if the manufacturer can prove that some of the supplied components are regularly older during normal production. A pile of at least 3 pieces shall be taken for a test of flat components, only the middle piece of which shall be used for the emission test.

The exact sample quantity shall be coordinated with the testing laboratory taking into account the component size and the emission test chamber to be used. Samples of identical components shall be packed together air-tight immediately after being selected. In doing so, the individual samples should be packed as close as possible to one another in order to keep unavoidable emissions during the transport of the samples to the testing laboratory as low as possible.

2.3 Transportation

The packed samples shall be transported as quickly as possible to the testing laboratory. No more than 7 days may pass between the packing and the arrival at the testing laboratory.

3 Sample Preparation

The sample material shall be stored in their packaging at the testing laboratory until test specimens are prepared.

Only the components in the middle of the pile shall be used for the preparation of the specimens for the emission test of flat components, disregarding the upper and lower component.

Components and entire products can be tested in their original condition in a large test chamber. Here, attention shall be paid to the fact that the measured values of low-volatile compounds may be too low (cf. 5.1). As a rule, test specimens shall be taken from the sample

material which can be tested in a test chamber suited for volatile organic compounds. The tests specimens shall represent the materials used and the different surfaces of the component. Narrow faces laid open as a result of sample cutting shall be sealed by means of adequate sealing.

Self-adhesive low-emission aluminium foil has proved its worth in this respect. Pre-tests shall be made to determine possible emissions from the aluminium foil itself.

The two surfaces and the narrow faces (without the surfaces sealed as a result of specimen cutting) shall be included in the determination of the total emission area.

The test specimens shall be placed into the test chambers immediately after being completed or stored in a packed condition until chamber loading.

The time between sample packing at manufacturer's site and chamber loading shall be as short as possible (no more than 14 days).

4 Test Chamber Measurement

The test chambers shall meet the requirements specified in DIN ISO 16000-9 [4].

The following test conditions shall be met:

Temperature (T)	23 °C	± 1 K
Relative air humidity (RH)	50	± 5 %
Air change (n)	0.5 – 1.5 h ⁻¹	± 3 %
Chamber load (a)	0.5 – 1.5 m ² /m ³	± 3 %
or area-specific air flow rate q = n/a	1.0 m ³ /m ² h	± 0.1 m ³ /m ² h
Air flow velocity (v) surrounded on all sides by ambient air (cf. [4])	0.1 – 0.3 m/s	
Test chamber size	≥ 20 L	

Prior to loading the chamber, the blank value of the empty chamber shall be determined. The blank value shall not exceed 2 µg/m³ for individual substances and 0.5 µg/m³ for carcinogenic substances. The total of all blank values of the individual substances shall not exceed 20 µg/m³. For a blank value determination of the test chamber, the adsorbent blank value shall be determined and deducted.

The joint testing of different individual components shall be inadmissible. In well-founded exceptional cases, for example, when the piece of furniture is bigger than a large test chamber, it shall be admissible to test a downscaled piece of furniture or corresponding portions of furniture parts with due regard to para. 3.

The entire product (e.g. cabinet furniture) shall be tested in an open condition.

5 Methods of Air Sampling and Analysis

Sampling and analysis on the emission test chambers for formaldehyde can be performed in accordance with [1] or [7], respectively. Supplementally, emissions can be tested using small test chambers as well as an analysis according to ISO 16000-3 [2].

With respect to other volatile organic compounds, sampling shall be done by means of Tenax followed by thermal desorption on the basis of ISO 16000-6 [3] and evaluation by GC/MS.

An odour test shall be performed in accordance with DIN ISO 16000-28 [6].

The sampling for volatile organic compounds shall be performed at least at the following times after chamber loading:

- 3 days \pm 2 h after loading (at least by way of double determination, indication of the mean value).
- 28 days after loading (at least by way of double determination, indication of mean value).

It is recommended to do intermediate sampling on at least three additional days in between as this will give additional information on emission dynamics or ageing behaviour which again may serve as important information for manufacturer's future product development. Moreover, analytical results achieved as a result of additional sampling may help reduce uncertainty of measurement because it provides supplemental data for extended substance identification and quantification. Apart from that, it may provide the opportunity to stop the test ahead of schedule if the criteria specified in para. 6, "Evaluation", are met.

All substances on the LCI list shall be quantified by way of a substance-specific calibration.

Non-LCI substances and unidentifiable substances shall be quantified as toluene equivalent.

6 Evaluation and Test Report

Formaldehyde shall be measured on day 3 and day 28 at least by way of double determination (indication of mean value).

All individual substances $\geq 5 \mu\text{g}/\text{m}^3$ shall be added for indication of the total concentration of volatile organic compounds (TVOC). Moreover, the individual substances ($\geq 2 \mu\text{g}/\text{m}^3$) shall be indicated together with their concentration values. If the emitted substances are also detected in the chamber blank (max. $2 \mu\text{g}/\text{m}^3$) the background concentration shall be deducted from the determined concentration value of the test specimen. The concentration values determined on day 3 and day 28 shall at least be indicated for the total concentration and the concentration of the individual substances.

Testing for formaldehyde and for other volatile organic compounds may be stopped prematurely from day 7 after loading if the required emission values of day 28 are reached prematurely and if, compared with the measurement of day 3, no rise in the concentration of any of the detected substances has been observed.

In component tests, the total concentrations of volatile organic compounds determined for the individual components may be extrapolated using the following calculation formula to determine the total concentration of entire products which consist of known area portions of the examined components. In doing so, the area portions of the entire product shall be determined for each component and entered into the formula together with the emission values determined:

$$C_{\text{calc.}} = \frac{\sum_{i=1}^n A_i(>5\%) * C_i}{\sum_{i=1}^n A_i(\%)}$$

- $C_{\text{calc.}}$ Calculated total concentration for the entire product in $\mu\text{g}/\text{m}^3$
 n Number of components tested
 i Component index
 $A_i(\%)$ Area portion of the i^{th} component in %
 C_i Concentration of i^{th} component in $\mu\text{g}/\text{m}^3$

One can do without this procedure if none of the components tested exceeds the admissible emission values or if an entire product is tested.

The test report shall document the entire test, including the preparation of sample material (especially the component selection) and test specimens, as well as the complete evaluation for the product.

For this purpose, the following data shall be recorded in particular:

- Manufacturer,
- Exact product designation (including lot, date of production, varnishing/painting),
- Date of manufacture, date of receipt
- Type of packaging,
- Date or period of testing,
- Manufacture of test specimens (dimensions),
- Test conditions (type and size of the chamber, temperature, relative air humidity, air change and air volume flow, chamber load, area-specific air flow rate, time and duration of air sampling, volume and volume flow of air sampling),
- Name, CAS No. and concentration of the identified VOCs as well as concentration of the unidentified VOCs of day 3 and day 28 and their total (TVOC₃ and TVOC₂₈),
- Name, CAS No. and concentration of the identified SVOCs as well as concentration of the unidentified SVOCs of day 3 and day 28 and their total (TVOC₂₈),
- Name, CAS No. and concentration of the identified C substances and their total on day 3 and day 28,
- Calculated "R" value of day 28.
- Indication of the formaldehyde concentration of day 3 and day 28

7 Initial and Follow-up Test

In a whole-product test, all products shall be subjected to an emission test.

For a component test of furniture programmes, the testing laboratory shall – upon consultation with the manufacturer – select a representative number of test specimens in accordance with the table below for the initial test. Sampling shall be based on the area percentage of all different components in the entire product (s. 2.2). Sampling shall take different surfaces and materials into account.

The tests shall not be older than two years when first applying for the Blue Angel eco-label.

Number of different components (cf. 2.2)	Minimum number of representative initial tests	Minimum number of two-year follow-up tests
up to 4	2	1
up to 7	3	1
up to 11	4	2
up to 15	5	3
more than 15	33% of the number of components	20% of the number of components

In order to ensure uniform quality of Blue Angel eco-labelled products, all products tested as whole products shall undergo a second test after six years. If the product is tested in a component test, follow-up tests shall be made every two years in accordance with the above table so that after six years all components would have been tested.

If, in the course of a follow-up test, individual parameters are exceeded the applicant shall be required to prove compliance with para. 3.2.1 of the Basic Criteria for the entire product.

8 Testing Laboratories

Emission tests shall be performed by qualified testing laboratories only.

Testing laboratories shall be considered qualified if their equipment includes the necessary apparatuses and a quality management system or if they are accredited for this type of testing and have proven their qualification to do such testing by successfully participating in relevant ring tests. Verification of compliance with these requirements shall be provided to BAM - Bundesanstalt für Materialforschung und –prüfung - Federal Institute for Materials Research and Testing, Division 4.2 „Materials and Air Pollutants“.

9 Literature

- [1] Prüfverfahren für Holzwerkstoffe (Test methods for wood-based materials)
Bundesgesundheitsblatt (Federal health Bulletin) 34, 10 (1991), 488-489.
Materialprüfung (Testing of materials) 33, 11-12 (1991), 324-325.

- [2]** DIN ISO 16000-3
Indoor air – Part 3: Determination of formaldehyde and other carbonyl compounds – Active sampling method (2008, draft standard of 2010)
- [3]** DIN ISO 16000-6
Indoor air – Part 6: Determination of volatile organic compounds in indoor and chamber air by active sampling on TENAX TA, thermal desorption and gas-chromatography using MSD/FID (2004, draft standard of 2010)
- [4]** DIN EN ISO 16000-9
Indoor air - Part 9: Determination of the emission of volatile organic compounds from building products and furnishing - Emission test chamber method (2008)
- [5]** DIN EN ISO 16000-10
Indoor air – Part 10: Determination of the emission of volatile organic compounds from building products and furnishing. Emission test cell method (2006)
- [6]** ISO 16000-28
Indoor air - Part 28: Determination of odour emissions from building products using test chambers (2012)
- [7]** DIN EN 717-1
Wood-based panels - Determination of formaldehyde release - Part 1: Formaldehyde emission by the chamber method (2005).

Further Reading:

- Entwicklung eines Prüfverfahrens zur Ermittlung der Emission flüchtiger organischer Verbindungen aus beschichteten Holzwerkstoffen und Möbeln (Development of a test method for determining volatile organic compounds emitted from coated wood-based materials and furniture).
UBA project No. 204 08 515/02, Bundesanstalt für Materialforschung und -prüfung (BAM) (Federal Institute for Materials Research and Testing) Final Report, Berlin, 1999. UBA Texts 74/99
- Salthammer, T.:
Untersuchungen zur Entwicklung und Anwendung einer praxisnahen Materialprüfmethode für flüchtige organische Stoffe aus Möbelbeschichtungen (Studies on the development and applications of a practically relevant material test method for volatile organic substances emitted from furniture coatings). Final report on the research project. WKI, Braunschweig, November 1995.
- Jann, O.; Wilke, O.; Brödner, D.:
Procedure for the determination and limitation of VOC-emissions from furniture and coated wood-based products. Proceedings of Healthy Buildings/Indoor Air Quality (IAQ) '97, Volume 3: 593-598.