BLUE ANGEL

The German Ecolabel

Low-Emission Floor Covering Adhesives and other Installation Materials

DE-UZ 113

Basic Award Criteria

Edition June 2011

Version 3

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.

Umwelt Bundesamt

The German Environmental Agency with its specialist department for "Ecodesign, Eco-Labelling 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.

Jury Umweltzeichen

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.

RAL gGmbH

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.

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Version 1 (06/2011): First Edition, Expiry date: December 31, 2015
Version 2 (04/2015): Prolongation with changes for 1 year, until 31.12.2016
Modifications in paragraphs 2, 3.1.2.1, 3.2.2, 3.2.3 and additional editorial adaptations
Version 3 (01/2016): Prolongation with changes for 3 years, until 31.12.2019

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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 Technical Reasons

Installation materials are used to prepare bases for floor coverings and to bond large-surface floor coverings in indoor environments. Therefore, the lowest possible emissions from such products would be desirable for environment and health reasons.
The eco-label lends itself as a label to identify low-emission products which are thus compatible with healthy living. The concept of these Basic Award Criteria is based on the evaluation scheme (AgBB-Scheme) developed by the "Ausschuss zur gesundheitlichen Bewertung von Bauprodukten" (AgBB) (Committee for Health-related Evaluation of Building Products) - a joint state and federal government committee consisting of experts from environmental and health authorities.
Different product groups - as for example, emulsion paints, linoleum, laminate floor coverings, wood parquet, panels, furniture, sealants - may be awarded a “Blue Angel” eco-label, provided that their emission values are particularly low.
The replacement of solvent-based adhesives by aqueous systems achieved by the German adhesive industry in recent years has already led to a significant reduction of the indoor-air solvent load.
Modern installation materials partly differ with regard to their emissions of high-boiling and smelling components, as for example, degradation products of oxidizable fatty acids and alkylphenol ethoxylates (APEOs). Additional requirements for limiting a possible odour impact are planned but cannot yet be fixed for lack of validated evaluation processes. Processes for the evaluation of odour emissions are currently being developed by the "Ausschuss zur gesundheitlichen Bewertung von Bauprodukten" (AgBB) (Committee for Health-related Evaluation of Building Products). The plans are to include corresponding requirements in the next revised edition of these Basic Award Criteria.

With today's normal indoor air exchange rates the consumer wishes to identify and buy adhesives involving the lowest-possible risk. The Environmental Label for low-emission floor covering adhesives and other installation materials shall help the consumer to make such a choice.

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

2 Scope

These Basic Award Criteria apply to:

- solvent-free adhesives according to TRGS 610[1] as, for example,
  - emulsion adhesives according to DIN EN 923[2]
  - powdered adhesives
  - fixing materials,
- solvent-free base coats and primers pursuant to TRGS 610
- cement-containing surfacers[3] and calcium sulfate-based surfacers intended for use as installation materials in indoor environments
- floor covering adhesives based on silane-modified polymers (SMP adhesives)
- adhesive tapes/films for the all-over adhesion of floor coverings[4]
- tile adhesives - emulsion adhesives D according to EN 12004[5]
- cement-containing tile adhesives according to DIN EN 120045
- mineral grout according to DIN EN 13888[6,7]

Excluded are:

- wallpaper adhesives
- reactive adhesives R according to DIN EN 120045

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1 TRGS 610, Substitutes and substitute processes for high-solvent-content primers and adhesive agents for floor finishes, March 1998

2 DIN EN 923, 2008-06, Adhesives - Terms and Definitions

3 According to the REACH Regulation, Annex XVII, Entry 47, cement-containing preparations may not be placed on the market if - in their ready-to-use form after water addition - the content of soluble chromium VI exceeds a total dry matter of the cement of 2mg/kg.

4 At the suggestion of the Federal Environmental Agency the Environmental Label Jury may include additional adhesives and installation materials

5 DIN EN 12004:2014-02, Adhesives for tiles - Requirements, evaluation of conformity, classification and designation;

6 DIN EN 13888:2009-1, Grout for tiles - Requirements, evaluation of conformity, classification and designation.

7 At the suggestion of the Federal Environmental Agency the Environmental Label Jury may include additional adhesives and installation materials.

The floor covering adhesives and other installation materials listed under “Scope” are hereinafter referred to as „installation material“.

3 Requirements

3.1 Substance Requirements

3.1.1 Volatile and Semi-volatile Organic Substances - Indoor Air Quality

The products under para. 2 must not exceed the following emission values in the test chamber in conformity with the „health risk assessment process for emissions of volatile organic compounds (VOC) from building products"[8] developed by the Committee for Health-related Evaluation of Building Products:

Substance	3rd Day	Final Value (28th Day)
Total organic compounds within the retention range $C_6 – C_{16}$ (TVOC)[9]	< 1000 µg/m³ 10	< 100 µg/m³ 10
Total organic compounds within the retention range > $C_{16} – C_{22}$ (TSVOC)	-	< 50 µg/m³
C-Substances[11]	< 10 µg/m³ **total**	< 1 µg/m³ **per single value**
Total VOC without LCI[12,13]		< 40 µg/m³

The test may be stopped prematurely (but not before the 7th day after loading) if on each of four consecutive measurement days the admissible emission values are not exceeded and if during this period none of the substances to be detected shows a rise in concentration.

Compliance Verification

The applicant shall submit test report according to BAM-Test Method[14] (Appendix B to the Basic Award Criteria DE-UZ 113), based on ENV standards 13419-1 and 13419-2 (today DIN EN ISO 16000-9 and DIN EN ISO 16000-10)[15], issued by a testing laboratory accredited to

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8 Health-related Evaluation Procedure for Volatile Organic Compounds Emissions (VOCs) from Building Products - Homepage of the German Umweltbundesamt (Federal Environmental Agency) http://www.umweltbundesamt.de/themen/gesundheit/kommissionen-arbeitsgruppen/ausschuss-zur-gesundheitlichen-bewertung-von#textpart-1

9 The determination of the emission of methanol-separating SMP adhesives also includes the determination of methanol emission by means of gas chromatography-mass spectrometry (GC/MS) using a suitable adsorbent and its consideration in the calculation of the TVOC value.

10 Based on the ring test results available the current standard deviation is 40 percent.

11 C Substances = carcinogenic substances; pursuant to category Carc. 1/Carc 1A and category Carc. 2/Carc. 1B according to EU classification and TRGS 905

12 including non-identifiable substances

13 LIC = Lowest Concentration of Interest

14 Official Journal of BAM - Bundesanstalt für Materialforschung und Prüfung (Federal Institute for Material Research and Testing), Volume 33 (2/2003) p. 160 et seqq.

15 DIN EN ISO 16000 – Indoor air; Part 9: Determination of the emission of volatile organic compounds from building products and furnishing – Emission test chamber method and Part 10: Determination of

conduct such tests by BAM (Bundesanstalt für Materialforschung und Prüfung (Federal Institute for Material Research and Testing)[16] which confirms compliance with this requirement (Annex 2 to the Contract pursuant to DE-UZ 113).

3.1.2 Exclusion of Substances and Preparations

3.1.2.1 General Substance Requirements

Installation materials must not contain as constituents any substances with following properties:

a) Substances that have been identified as substances of very high concern under the Chemicals Regulation REACH[17] and have been included on the list drawn up in accordance with Article 59 (1) of the REACH Regulation (so-called "candidate list").[18]

b) Substances that are classified in the following hazard classes and hazard categories in accordance with the criteria of the CLP Regulation[19] or meet the criteria for such classification:[20,21]
   - Acutely toxic of category Acute Tox. 1, Acute Tox. 2 or Acute Tox. 3
   - Specific target organ toxicity of category STOT SE 1 or STOT RE 1
   - Carcinogenic of category Carc. 1A, Carc. 1B or Carc.2
   - Mutagenic of category Muta. 1A, Muta. 1B or Muta. 2
   - Reprotoxic of category Repr. 1A, Repr. 1B, Repr. 2

   The H statements (R phrases) corresponding to the hazard classes and categories can be seen from Appendix C.

c) Substances that are classified in TRGS 905[22] as
   - carcinogenic (K1, K2, K3)
   - mutagenic (M1, M2, M3)
   - reprotoxic (R_F1, R_F2, R_F3);

d) Substances that are classified in the MAK Value List[23] as:

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the emission of volatile organic compounds from building products and furnishing – Emission test cell method

16 The current list of accredited testing laboratories can be found at www.blauer-engel.de under the respective Basic Criteria

17 Regulation (EC) No. 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), REACH Regulation for short

18 The Candidate List, as amended at the time of application, shall be applicable. For the current version of the Candidate List please go to: https://echa.europa.eu/de/candidate-list-table.

19 Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures (CLP for short). It replaces the old Directives 67/548/EEC (Dangerous Substances Directive) and 1999/45/EC (Dangerous Preparations Directive).

20 The harmonised classifications and labelling of hazardous substances can be seen from Part 3 of Annex VI to the CLP Regulation. Moreover, the European Chemicals Agency's (ECHA) website provides public access to a comprehensive classification and labelling inventory which also includes the manufacturers' self-classifications of hazardous substances: ECHA Einstufungs- und Kennzeichnungsverzeichnis (Classification & Labelling Inventory).

21 Here, substances with additional hazardous properties are not excluded but reduced by an emission assessment (see paragraph 3.1.1).

22 TRGS 905, List of carcinogenic, mutagenic or reprotoxic substances of the Committee on Hazardous Substances (AGS): TRGS 905. The TRGS 905 list, as amended at the time of application, shall be applicable. The total CMR list of the statutory accident insurance may also be used as a tool. (Combined list of CMR substances according to CLP Regulation and TRGS 905): CMR-Gesamtliste.

23 MAK and BAT Value List, Senate Commission for the Testing of Harmful Working Materials, last amended by Communication 48 (2012), as amended.

- carcinogenic working materials, Category 1, 2 or 3;
- germ-cell mutagenic working materials, Category 1, 2, 3A or 3B;
- teratogenic working materials in the column „Pregnancy“ in Group A or B.

Compliance Verification

The applicant shall verify compliance with the requirement in Annex 1 to the Contract pursuant to DE-UZ 113. In addition, the applicant shall prepare a list (Annex 4 to the Contract) indicating the trade names and suppliers of the individual products (raw materials) of the adhesives produced.[24] For compliance with the criteria the applicant shall additionally present current Material Safety Data Sheets of the installation material and of the raw materials used in accordance with the REACH Regulation[17].

3.1.2.2 Polymer Emulsions, Resins or Comparable Components (Binders)

a) The installation materials must not contain any oxidizable fatty acids or oxidizable fatty-acid esters as constituent components.
b) Products containing alkyl phenol ethoxylates must not be added to the installation materials.

Compliance Verification

The applicant shall verify compliance with the requirement by presenting the corresponding declarations according to Annex 3 to the Contract pursuant to DE-UZ 113 made out by the manufacturers or distributors of the polymer emulsions, resins or comparable components (binders) used.

3.1.2.3 Plasticizers

Plasticizing substances from the class of phthalates may not be used in the manufacture of SMP adhesives pursuant to paragraph 2.

Compliance Verification

The applicant shall declare compliance with the requirement in Annex 1 to the Contract pursuant to DE-UZ 113. In the event of detection, the content of phthalates shall be determined by extraction of a sample in a Soxhlet apparatus and subsequent analysis by use of GC/MS. The quantitative determination of the target substances is achieved by using an internal standard and a reference compound. The cured adhesive shall not contain more than 0.1 percent by mass of phthalates as impurities.

3.1.2.4 Organotin Compounds

If organotin compounds are used as catalysts in the curing reaction of SMP adhesives pursuant to para. 2 the following requirements must be met:

- The product may contain only those organotin compounds that are listed in the German “Bedarfgegenständeverordnung” (Ordinance on Food and Other Commodities)[25], except for dibutyl tin compounds.

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[24] If alkyl phenols are detected by quantitative determination the concentration in the preparation shall be limited to 0.1 % in conformity with REACH, Annex XVII, Entry 46.

[25] BGBl (Federal Law Gazette) I 1992, 866; revised by publication of 23 December 1997; 1998 I 5; last amended by Article 1 V of 30 May 2006 I 1279 (No. 26)

Compliance Verification

The applicant shall declare compliance with the requirement in Annex 1 to the Contract pursuant to DE-UZ 113.

- Impurities of tributyl and dibutyl tin compounds (TBT/DBT) in the catalyst must not exceed 0.1 percent.

Compliance Verification

The applicant shall submit a corresponding declaration from its pre-suppliers (Annex 6 to the Contract pursuant to DE-UZ 113).
In the event of detection, the content of TBT/DBT is to be determined by extraction of a sample using n-hexane, alkylation using pentyl magnesium bromide or sodium tetraethyl borate and subsequent analysis by use of GC-FPD, GC-AED, GC-MS or LC-MS. The quantitative determination of the target substances shall be done by using an internal standard and a reference compound.

3.1.3 Additional Substance Requirements

Contrary to paragraph 3.1.2.1 the substances listed in the following paragraphs may be contained in or split off from the product, provided that they meet the requirements specified below.

3.1.3.1 Preservatives

The installation materials according to para. 2 must not contain any biocides, except for the in-can preservatives for aqueous installation materials listed in Appendix A in the concentrations given therein.

Compliance Verification

The applicant shall declare compliance with the requirement in Annex 5 to the Contract pursuant to DE-UZ 113.

3.1.3.2 Formaldehyde and Acetaldehyde

The total emissions of formaldehyde and acetaldehyde must not exceed 0.05 ppm during the 3-day test chamber measurement.

Compliance Verification

The applicant shall submit a test report according to the BAM Test Method (Appendix B to the Basic Award Criteria pursuant to DE-UZ 113) which is based on standards ENV 13419-1 and ENV 13419-2 (today DIN EN ISO 16000-9 and DIN EN ISO 16000-10)15 prepared by a testing laboratory[16] accredited for this test by BAM (Federal Institute for Materials Research and Testing) which confirms compliance with this requirement (Annex 2 to the Contract pursuant to DE-UZ 113).

3.1.3.3 Methanol

When processing methanol-separating SMP adhesives according to para. 2 a MAK value of methanol of 200 ppm is to be observed.

Compliance Verification

The applicant shall present an analysis report confirming compliance with the requirement (Annex 2 to the Contract pursuant to DE-UZ 113). The analysis method is to be performed in accordance with a method on the list of appropriate analysis methods for determination of chemical substances in the workplace air[26]*.*
The analysis is to be performed by a measurement laboratory[27] *accredited for workplace testing in accordance with Section 7, para. 10 Gefahrstoffverordnung (GefStoffV) (Ordinance on Hazardous Substances).*

3.2 Special Requirements

3.2.1 Serviceability

The installation materials under para. 2 shall satisfy the usual quality standards for serviceability of the corresponding product group.

Compliance Verification

The applicant shall declare compliance with the requirement in Annex 1 to the Contract pursuant to DE-UZ 113.

3.2.2 Advertising Statements

The type of installation material pursuant to paragraph 2 is to be named on the container in connection with the product designation.

Advertising statements must not include any indications that would downplay possible risks within the meaning of Article 25 (4) of the CLP Regulation19, such as, for example, "non-toxic", "non-harmful" and the like.

Exception: The comment „solvent-free according to TRGS 610“ shall be admissible for installation materials according to TRGS 610.

Compliance Verification

The applicant shall declare compliance with the requirement in Annex 1 to the Contract and submit a Material Safety Data Sheet as well as a Technical Data Sheet.

3.2.3 Instructions / Notes

The container text as well as the Technical Data Sheet shall include the following easily readable instructions (similar wordings shall be admissible):

- „Keep out of reach of children“.
- „Ensure good ventilation during and after application and drying“.

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[26] The list of suitable analytical methods for determination of chemical substances in the workplace air forms part of the GESTIS database on hazardous substances (http://www.dguv.de/bgia/de/gestis/analytical_methods/index.jsp http://bgia-online.hvbg.de/AMCAW/substance/methoden/065-L-Methanol.pdf).

[27] Measurement laboratories accredited for workplace testing are published in the list of the Bundesverband der Messstellen für Umwelt- und Arbeitsschutz e. V. (BUA) (Federal Association of Measurement Laboratories for Environmental and Workplace Protection) (http://www.bmua.de/gefahrstoffmessstellen.html).

- „Avoid eating, drinking or smoking while processing this product.
- „In case of contact with eyes or skin rinse immediately with plenty of water“.
- „Do not allow product to reach sewage system or any water course. Do not allow to penetrate the ground/soil“.
- „Clean tools with soap and water immediately after use “ (applies only to water-based products).
- „Only properly emptied containers may be recycled. Dried product residues can be disposed of as normal household waste“.
- „Product contains:……. (indication of the name(s) of the preservative(s) according to Annex 1, para. 1); For information for allergic people, please call at……..“

Additional instructions/notes for SMP Adhesives:
- „Methanol separates during hardening“
- „Wear protective gloves“

Additional instructions for surfacers:
- „Wear protective gloves“
- „Storage conditions: Keep in dry and cool place. Reseal container tightly immediately after use.“

The Technical Data Sheet of cement-containing surfacers shall indicate the shelf-life and the best-before date shall be placed on the container.

Additional instructions for GHS05 and GHS07-labelled products (other similar wording may be used):
- „Always wear safety glasses!“
- „If adhesive or installation material gets into contact with your eyes rinse immediately with plenty of water and see an ophthalmologist.“
- „Always wear heavy-duty waterproof gloves to protect your hands!“
- „Always wear long trousers!“
- „Avoid prolonged skin contact with the adhesive or installation material. Rinse affected areas immediately with plenty of water.“
- „The longer fresh adhesive or installation material remains on your skin the greater the risk of severe skin damage.“
- „Keep children away from fresh adhesive or installation material.“

In addition, the shelf-life shall be specified in the Technical Data Sheet of the GHS05 and GHS07-labelled products and the best-before date shall be given on the container.

The components of the installation materials under paragraph 2 shall be listed in the Technical Data Sheets in accordance with VdL Directive on „Bautenanstrichstoffe“ (Building Coating Materials) - VdL-RL 01/June 2004.
Also, the container text must include a prominent reference to the Technical Data Sheet and as to where the latter may be obtained as well as the manufacturer’s phone number at which consumers may obtain additional information.
If the product contains a preservative the container text must additionally include a corresponding note and a phone number of the installation material manufacturer where

consumers can get additional information. If no preservatives are used the container text may include the note: „preservative-free“.

Compliance Verification

The applicant shall declare compliance with the requirement and submit the corresponding Technical Data Sheet as well as the container text.

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.

Appendix A Preservatives

= Appendix A to the Basic Award Criteria DE-UZ 102

Appendix B Test method for VOC Emissions

Test Method for Determining Emissions of Volatile Organic Compounds for Award of the Environmental Label according to DE-UZ 113*

Contents

1. Definitions
2. Equipment
3. Test material
4. Test chamber or emission test cell measurement
5. Air sampling and analytical methods
6. Evaluation and test report
7. Testing laboratories
8. Literature

1 Definitions

Emission Test Chamber
Closed container with controlled operating parameters for the determination of volatile organic compounds emitted from building materials.

Emission Test Cell
Portable device for the determination of volatile organic compounds emitted from building materials. The emission test cell is installed on the surface of the test specimen which thus becomes a part of the emission test cell itself.

Area-Specific Air Flow Rate (q [m^3/m^2h])
Ratio between air flow rate and the emissive surface area of the test specimen.

Air Exchange Rate (n [h^{-1}])
Ratio between the volume of pure air introduced into the emission test chamber every hour and the free volume of the emission test chamber which is to be determined in identical units, referred to as air changes per hour.

Air Flow Rate (°V [m^3/h])
Volume of air that is introduced into the emission test chamber per unit of time.

Air Velocity (v [m/s])
Air speed above the surface of the test specimen (distance: 10 mm).

Product Loading Factor (L [m^2/m^3])
Ratio between the emissive surface area of the test specimen and the free emission test chamber volume.

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* Official Journal of BAM - Bundesanstalt für Materialforschung und Prüfung (Federal Institute for Material Research and Testing), vol. 33, 2/2003, p. 160 et seqq.

Test Specimen
Part of the sample specially prepared for emission testing in an emission test chamber in order to simulate the emission behaviour of the material or product to be tested.

Total Volatile Organic Compounds (TVOC)
Total of concentrations of the identified and non-identified volatile organic compounds eluting between n-hexane and n-hexadecane on a non-polar column, including these compounds.

Volatile Organic Compounds (VOC)
General meaning: organic compounds emitted by the test specimen and detected in the chamber air. In terms of this test method it means identified and non-identified organic compounds eluting between n-hexane and n-hexadecane on a non-polar column, including these compounds.

Semi-volatile Organic Compounds (SVOC)[1]
Less readily volatile organic compounds (both identified and non-identified), eluting after n-hexadecane on a non-polar column.

Total Semi-Volatile Organic Compounds (TSVOC)
Total of concentrations of the identified and non-identified semi-volatile organic compounds eluting after n-hexadecane on a non-polar column.

2 Equipment

- Equipment for test material application
- Glass plates:
  - size depending on the volume of the emission test chamber or area of the emission test cell for an area-specific air-flow rate of 1.25 m^3/m^2h;
  - degreasing cleaning prior to the start of the test by means of a proper method which does not result in a blank value;
  - blank value check of the glass plates before starting the test.
- Glass dishes with a flat bottom (e.g. petri dishes) or glass plates with a rim:
  - size depending on the volume of the emission test chamber or area of the emission test cell for an area-specific air-flow rate of 1.25 m^3/m^2h;
  - degreasing cleaning prior to the start of the test by means of a proper method which does not result in a blank value;
  - blank value check of the glass dishes before starting the test.
- Template for preparation of a test specimen (as well as non-emitting adhesive strip, glass rim or stainless steel templates, if applicable)

[1] It may be assumed that by using today's modern analytical equipment (e.g. Gerstel, Perkin-Elmer) semi-volatile organic compounds may be quantitatively determined without any problem up to a volatility comparable to that of docosane (C 22 alcane, boiling point 369°C). According to current knowledge the Tenax sampling method with subsequent thermodesorption will encounter increasing difficulty in the analysis of organic compounds with an even lower volatility. There is, however, insufficient experience to recommend the use of other sampling and analytical techniques. cf. [5]

- Toothed spatula TKB B1
  The toothing has a triangular indentation of the following dimensions:

Dimension			Tolerance
a	indentation space / tooth width	2.7 mm	- 0.2 mm
b	indentation width / tooth space	2.3 mm	+ 0.2 mm
c	indentation depth / tooth space depth	2.0 mm	+ 0.15 mm
γ	indentation angle	55 °	+/- 0.5 °

- Emission test chamber, emission test cell, see Chapter. 4.
- Air sampling systems
- Adsorbents for air sampling pursuant to Chapter 5.
- Capillary gas chromatograph equipped with thermal desorption unit, linked to a mass spectrometer with evaluation unit
- Liquid chromatograph with diode-array-detector.

3 Test Material

3.1 Selection

Testing should be done on samples produced no longer than 8 weeks ago. The person/company ordering the test shall be responsible for the supply of fresh test material. Samples are usually supplied in the original container. The contents are homogenized by the testing laboratory and a reference sample is taken. The date of manufacture shall be indicated.

3.2 Preparation of the Test Specimen

Ready-to-use installation materials are tested as supplied. Others are to be mixed according manufacturer's instructions.
Depending on the type of installation material to be tested the test specimens are prepared in different ways.
Test specimens shall be prepared in strict accordance with the following instructions.

3.2.1 Base Coats/Primers

are liquid installation materials when being applied. They are used for the preparation of the surface of the underlying floor. This also includes, for example, conductive primers and anti-slip coatings.

a) Procedure with Respect to Aqueous Products

Homogenize the sample. If there is no binding manufacturer's information on the dry residue of the sample supplied the dry residue shall be determined in accordance with ISO 1625 by drying a separate partial sample at 105 °C until a constant weight is reached. The sample is to be adjusted and homogenized by the use of VOC-free water to a 10% dry residue on the basis of the dry residue value as indicated by the manufacturer or -by way of substitution- on the basis of the self-determined dry residue value. Pour as much of the, possibly, diluted sample into a weighed glass dish (see Chapter 2) as is needed to load the dish with 100 +/- 5 g/m².

Wave the dish to reach a uniform wetting of the bottom. Place the dish into the test chamber immediately thereafter. Make sure by re-weighing after the test that the weight of sample film that has dried in the test chamber is 10 +/- 1 g/m², as expected.

b) Procedure with Respect to Water-free Products

Homogenize the sample components as described above and, if applicable, mix them homogenously at a mixing ratio as specified by the manufacturer. Test an undiluted sample of 100 +/- 5 g/m², as described above.

3.2.2 Surfacers

are powdered installation materials which become solid after being mixed with water. They are used to fill the underlying floor. This includes, for example, cement and plaster surfacers.
Surfacers on the basis of emulsions or reaction resins are to be tested like adhesives (see para. 3.2.3).

Procedure:

Mix the sample homogenously according to manufacturer's instructions with VOC-free water. Let the mixture rest for about 5 minutes. Stir again. Apply a 3-mm uniform layer of the mixed sample over the entire surface of a glass plate (see Chapter 2.) and remove with a flat spatula. For this purpose, the rim of the loading area must be limited high enough by means of an emission-free auxiliary limitation (e.g. glass rim or stainless steel as template). Put the test specimen into the test chamber immediately after preparation together with the emission-free auxiliary limitation.

3.2.3 Floor Covering and Wood Parquet Adhesives

are liquid to paste-like installation materials when being applied. They are used to provide a strong adhesion between covering and underlying floor. This includes, for example, contact adhesives and fixing materials.

a) Procedure with Respect to Ready-to-Use Adhesives

Homogenize the sample. Apply the sample (surplus weight) to the pre-weighed glass plate (see Chap. 2., examples see Chap. 4.) and spread it evenly by a one-time use of a toothed spatula TKB B 1 (angle of attack of about 60 °) so that an evenly structured sample covers the entire surface. Reweigh the glass plate and document the applied quantity. The applied quantity should be 300 g/m², as precisely as possible. A tolerance range of 300 ± 50 g/m² can be accepted. Should the weight fail to be within the tolerance range a new test specimen is to be made. Increasing the spatula's angle of attack will increase the applied quantity while decreasing the angle of attack will reduce the applied quantity. The sample should be fully applied within 3 minutes. Place the test specimen(s) into the test chamber immediately after completion of preparation.

b) Procedure with Respect to 2-Component Adhesives and Powdered Adhesives

Mix the sample homogeneously according to manufacturer's instructions. If water is used check if it is VOC-free. The test specimen is to be prepared analogously to para. 3.2.3.1

3.2.4 Underlying Materials

are "surface structures" used underneath floor coverings. This includes insulating base materials, bases coated with pressure-sensitive adhesive, laying boards and the like.

a) Procedure with Respect to Roll Floor Coverings

In the case of roll floor coverings the material is rolled off by turning the roll at least twice. In the case of wide runs a sample of at least 1 m² is taken from the middle of the run. In the case of narrower runs (width < 1 m) sampling is done over the entire width of the roll at a length that will do for the test. To the extent possible, the samples are rolled up in a direction opposite to the usual rolling direction and preferably fixed by means of clips. They are double wrapped in aluminium foil and packed in unprinted airtight polyethylene or polypropylene foil. Each foil may contain just one sample. Not more than 1 hour may elapse between sampling and airtight packing. The sample is unpacked at the test lab immediately before starting the test and introduced into the test chamber as described under Chapter 4. All open rims are sealed by means of an inert material, e.g. low-emitting adhesive tape or aluminium foil.
The emissions of the rim covers used are to be determined and documented prior to starting the test.

b) Procedure with Respect to Tile Floor Coverings

Tiled material is preferably shipped in customary packing units (but additionally wrapped in aluminium foil and in polyethylene or polypropylene foil). The sample is unpacked at the test lab immediately before starting the test. The sample material is taken from the middle of the package. The test specimen is either cut or joined to the size required for testing. All open rims are sealed by means of an inert material, e.g. low-emitting adhesive tape or aluminium foil.
The emissions of the rim covers used are to be determined and documented prior to starting the test.

4 Test Chamber or Test Cell Measurement

Test chambers/test cells must meet the requirements listed under [1].
This particularly applies to:

- High-purity air supply (VOC-free and dust-free)
- High-purity water supply
- Chamber/cell walls of glass or stainless steel
- To the greatest extent possible, without the use of sealing materials
- Chamber wall tempering recommended.

The following test conditions must be observed in conformity with [1]:

• Temperature (T)	23 °C	± 1 K
• Relative air humidity	50 %	± 5 %
• Area-specific air flow rate (q)[2]	1.25	± 3 %
• Air flow velocity (v)	0.1 - 0.3 m/s	

[2] The area-specific air-flow rate is determined in accordance with [1, Annex B] on the basis of a floor area of 7 m² and an air change (n) of 0.5/h in a room with a volume of 17.4 m³. A chamber loading (L) of 0.4 m²/m³ is calculated on the basis of the floor space of 7 m² and the room volume of 17.4 m³. Hence the result is: q = n/L = 1.25 m³/m²h.

A blank value determination shall be performed inside the chamber/cell before loading the test chamber. The blank value for the individual substances must not exceed 2 µg/m³ in general and 0.5 µg/m³ for carcinogenic (C) substances. The total of all blank values of the individual substances must not exceed 10 µg/m³. The adsorbent blank value is to be determined and deducted for the blank value determination of the test chamber/test cell.

The test chamber/test cell measurement shall be conducted without interruption over the entire test period. The samples may not be removed.

The following framework conditions have proved useful for test chamber/cell loading. It must be made sure that air is circulated evenly and on all sides of the specimens for chamber measurement (do not place the test specimen on the bottom of the test chamber):

Floor Covering Adhesives and Parquet Adhesives:

- **1 m³ - Chamber:** 8 glass plates (à 220 mm x 270 mm), adhesive layer 200 x 250 mm (one side) = 0.4 m²
  (Air change = 0.5 h^{-1} (air volume flow rate = 0.5 m³/h), space loaded = 0.4 m²/m³)
- **225 l - Chamber:** 1 glass plate à 300 mm x 300 mm (one side) = 0.09 m²
  (Air change = 0.5 h^{-1} (air volume flow rate = 0.112 m³/h), space loaded = 0.4 m²/m³)
- **20 l – Chamber:** 2 glass plates (à 220 mm x 270 mm), adhesive layer 200 x 250 mm (one side) = 0.1 m²
  (Air change = 6.25 h^{-1} (air volume flow rate = 0.125 m³/h), space loaded = 5 m²/m³)
- **Emission Test Cell (e.g. BAM [4]):** 1 glass plate (minimum edge length or diameter: 200 mm), circle-shaped adhesive layer, diameter: 140 mm = 0.0154 m²
  (Air change = 19.2 h^{-1} (air volume flow rate = 0.0192 m³/h), space loaded = 15.4 m²/m³)

Base Coats, Surfacers and Primers:

- **1 m³ - Chamber:** 8 petri dishes with a diameter of 250 mm = 0.393 m²
  (Air change = 0.49 h^{-1} (air volume flow rate = 0.49 m³/h), space loaded = 0.393 m²/m³)
- **225 l - Chamber:** 1 petri dish 300 mm x 300 mm = 0.09 m²
  (Air change = 0.5 h^{-1} (air volume flow rate = 0.112 m³/h), space loaded = 0.4 m²/m³)
- **20 l - Chamber:** 1 petri dish with a diameter of 250 mm = 0.049 m²
  (Air change = 3.06 h^{-1} (air volume flow rate = 0.061 m³/h), space loaded = 2.45 m²/m³)
- **Emission Test Cell (e.g. BAM [4]):** 1 petri dish with an inside diameter of 115 mm = 0.0104 m². It is to be placed on a plane and inert base (glass plate, see above). The cell is to be mounted on the glass plate at a uniform distance from the rim of the petri dish.
  (Air change = 13 h^{-1} (air volume flow rate = 0.013 m³/h), space loaded = 10.4 m²/m³)

Bases:

- **1 m³ - Chamber:** The bases are to be cut to a size of 270 mm x 220 mm. Eight test specimens are to be glued together back-to-back by use of self-adhesive aluminium foil in a surrounding and overlapping manner (1 cm). The resulting emission surface is 0.4 m² in size.
  (Air change = 0.5 h^{-1} (air volume flow rate = 0.5 m³/h), space loaded = 0.4 m²/m³)
- **225 l - Chamber:** The bases are to be cut to a size of 320 mm x 170 mm. Two test specimens are to be glued together back-to-back by use of self-adhesive aluminium foil in

a surrounding and overlapping manner (1 cm). The resulting emission surface is 0.09 m² in size.
(Air change = 0.5 h^{-1} (air volume flow rate = 0.112 m³/h), space loaded = 0.4 m²/m³)

- **20 l - Chamber:** The bases are to be cut to a size of 270 mm x 220 mm. Two test specimens are to be glued together back-to-back by use of self-adhesive aluminium foil in a surrounding and overlapping manner (1 cm). The resulting emission surface is 0.1 m² in size.
  (Air change = 6.25 h^{-1} (air volume flow rate = 0.125 m³/h), space loaded = 5 m²/m³)
- **Emission Test Cell (e.g. BAM [4]):** The bases are to be cut to an edge length or diameter of at least 200 mm and placed on a plane and inert base (glass plate, see above). The cell is to be mounted on this surface. The resulting emission surface is 0.0177 m² in size.
  (Air change = 22.1 h^{-1} (air volume flow rate = 0.0221 m³/h), space loaded = 17.7 m²/m³)

5 Methods of Air Sampling and Analysis

With respect to VOC and SVOC, sampling is to be done by using Tenax followed by a thermal desorption pursuant to [2] and evaluation by GC/MSD.

With regard to formaldehyde and acetaldehyde, sampling is done on silica gel or on dinitrophenylhydrazine-impregnated (DNPH) filters or in an aqueous solution of DNPH. Loaded DNPH filters are to be desorbed not later than 2 days after sampling in order to avoid a result short of the expected result for formaldehyde. Desorption is to be done by means of acetonitril, separation and identification by means of HPLC/UV. When using a diode array detector quantification is to be done at 1 or 2 significant wave lengths (see DIN ISO 16000-3 [3]).

Sampling for formaldehyde and acetaldehyde is done after 72 + 2 h.

Sampling for VOC und SVOC shall at least be done at the following times after test chamber loading (each at least as a double determination):

- 3rd day after loading (72 + 3 h)
- 28th day after loading.

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 to reduce uncertainty of measurement because one receives supplementary data for extended substance identification and quantification. Apart from that, this allows a premature stopping of the test if the criteria under para. 6, "Evaluation", are complied with.

The method of sampling and analysis described in the Annex is suited for a wide range of emissive compounds. A list of compounds to be considered for emission measurements of building products can be seen from DIN ISO 16000-6 (Annex A) [2].

If possible, all substances are to be identified and individually quantified by means of the relative response factors of the internal standard (toluene, deuterated) resulting from calibration. The sum (total VOC) of all identified values ≥ 2 µg/m³ with a retention period between hexane and hexadecane shall be determined for each measurement day. With regard to semi-volatile organic compounds (SVOC), i.e. compounds with retention times longer than that of hexadecane, the sum (TSVOC) of all identified values > 2 µg/m³ shall be determined as well.

If substances cannot be identified or if the relative response factor cannot be determined quantification shall be done by assuming the response factor (RF) of the internal standard. The eco-label will not be awarded if - at the end of the test - the share of non-identifiable and/or non-exactly-quantifiable substances amounts to more than 40 µg/m³ (calculated by means of the response factor of the internal standard toluene [deuterated]).

Exempted are ≥ C_3 benzenes and iso-aliphatic mixtures if they exceed either individually or as a sum 40 µg/m³ - quantified by using the response factor of deuterated toluene. In this case, the R-value is calculated on the basis of the LCI value of toluene.
Allocating non-identifiable compounds to VOC or SVOC shall be done by use of the retention-time criterion. If an unknown compound eluates after hexadecane such compound shall be considered as a semi-volatile organic compound (SVOC).

6 Evaluation and Test Report

The measured values are standardised to the standard conditions (adhesives: 300 g/m^2, surfacers: 3-mm layer, aqueous primers/base coats: 10 g/m^2, water-free primers/base coats: 100 g/m^2) as follows:

- **Adhesives, primers, base coats:**
- Result (µg/m^3) = measured value (µg/m^3) x standard application (g/m^2) / actual application (g/m^2)
- **Surfacers:**
- Result (µg/m^3) = measured value (µg/m^3) x 3 (mm) / actual thickness (mm)

All individual substances (> 2 µg/m³) are to be indicated together with their concentration values. In order to simplify procedures the blank concentration is to be deducted from the determined concentration value of the test piece if the emitted substances are detected in the chamber blank too (max. 2 µg/m³, or 0.5 µg/m³ for C-substances). The concentration values determined on the 3rd and the 28th day shall at least be indicated for the overall concentration and the concentration of the individual substances.

For indication of the TVOC value, the total of the concentration values of all identified and non-identified substances > 2 µg/m³ shall be determined whose retention period is between n-hexane und n-hexadecane.

For indication of the TSVOC value, the total of the concentration values of all identified and non-identified substances > 2 µg/m³ shall be determined whose retention period is longer than that of n-hexadecane.

For evaluation of the identified VOC, whose concentration is greater than 5 µg/m³, the quotient of the concentration value and the so-called LCI value (cf. [6]) shall be determined in accordance with the following formula:

$$R = \Sigma\, Ci/LCI_i$$

The LCI values to be entered in the calculation formula can be seen from table [6].

Testing may be stopped prematurely (but not before the 7th day after loading) if on four consecutive measurement days the admissible emission values and R are each not exceeded and if during this period none of the substances to be detected shows an increase in the concentration by more than 2 µg/m³, determined on the basis of the linear regression function over a period of 4 measurement days. If so, the requirements for award of the Environmental Label shall be considered complied with.

The test report shall document the entire test as well as the complete evaluation for the product.

The report shall indicate the following:

- Manufacturer
- Exact product designation (including lot, production date, solid content (for primers and base coats)),
- Date of manufacture, Date of receipt
- Type of packaging,
- Date/period of examination,
- Production of test specimens (dimensions, if applicable: mixing process, applied quantity, method of application {applicator used}),
- Test conditions (type and size of chamber, temperature, relative humidity, air change or air volume flow rate, space load, area-specific air flow rate, time and duration of air sampling, volume and volume flow rate of the air sampling),
- Name, CAS-No. and concentration of the identified VOC, as well as concentration of the non-identified VOC of the 3rd and 28th day as well as their sum ($TVOC_3$ and $TVOC_{28}$),
- Name, CAS-No. and concentration of the identified SVOC, as well as concentration of the non-identified SVOC of the 28th day as well as their sum ($TSVOC_{28}$),
- Name, CAS-No. and concentration of the identified C-substances as well as their sum of the 3rd and 28th day
- Calculated R value of the 28th day
- Indication of the formaldehyde and acetaldehyde concentration after 72 hours

7 Testing Laboratories

Emission tests may be performed by appropriate testing labs only.

Testing laboratories shall be considered appropriate if they have the necessary equipment and a quality management system (or if they are accredited for these tests) and have demonstrated their capacity to perform such testing by successfully participating in

corresponding ring tests. Compliance with these requirements shall be established to the Bundesanstalt für Materialforschung und Prüfung (Federal Institute for Material Research and Testing), Division of “Environment-related material and product properties / Emissions from Materials)”.

8 Literature

[1] DIN V ENV 13419-1: Building products. Determination of the emission of volatile organic compounds (VOC). Part 1: Emission test chamber method. German version of ENV 13419-1.
DIN V ENV 13419-2: Building products. Determination of the emission of volatile organic compounds (VOC). Part 1: Emission test cell method. German version of ENV 13419-2.

[2] DIN ISO 16000-6: 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 (ISO/DIS 16000-6).

[3] DIN ISO 16000-3: Indoor air- Part 3: Determination of formaldehyde and other carbonyl compounds - Active Sampling Method. (ISO/DIS 16000-3).

[4] Examination and determination of low-emission adhesives and floor coverings. UBA project No.: 298 95 308, UBA texts 27/03, Umweltbundesamt (Federal Environmental Agency), Berlin, 2003.

[5] Jann, O., Wilke, O.: Möglichkeiten und Grenzen bei der Bestimmung von SVOC-Emissionen aus Materialien und Produkten (Methods and limits of determining SVOC emissions from materials and products) VDI Colloquium „Neuere Entwicklungen bei der Messung und Beurteilung der Luftqualität“ (Recent developments in measuring and evaluating air quality), 11-13 June 2002, Schwäbisch Gmünd, VDI-Report 1656 pp: 357-367, VDI-Verlag, 2002

[6] http://www.umweltdaten.de/down-d/voc.pdf (pp. 12 -17) or
http://www.umweltbundesamt.de/uba-info-daten/daten/voc.htm

Annex to the Test Method

Example of an Established Test Method (cf. [2])

Sampling tubes: Tenax TA (length of the tube: 178 mm, outside diameter: 6 mm, inside diameter: 4 mm, 200 mg Tenax TA (60-80 mesh) with glass wool plugs); sampling volume 1 l (100 ml/min). Before sampling, the Tenax tubes are to be spiked with toluene (deuterated) as internal standard - dissolved in methanol.

Calibration is done by applying the calibrating substances - dissolved in methanol - on separate Tenax tubes (spiked). In order to simulate sampling 1 litre of sample air is drawn off from an empty chamber while, at the same time, the residual methanol on the Tenax left over from spiking is desorbed.

Analysis system: Thermal desorption/cold feed system Gerstel TDS-2/KAS-3 (Programme 40-280°C, 40°C per min., hold for 5 minutes at 280° C / cryofocussing at 150° C, heating by 12°C/s to 290°C / He-flow 35ml/min.)

HP GC 5890 II + / HP-MSD 5972 (column HP 1; 60 m; 0.25 mm; 0.25 µm; temperature programme 40° C for 4 min., 5° C/min. to 140°C, 10°C/min. to 240°C, 25°C/min. to 290° C , hold for 3 min. / MSD: scan 25-400; 1.9 scans/sec; 300° C; NBS-75K - data base).

The above-described method can also be used for the detection of semi-volatile compounds, such as, for example, hexadecanoic acid methyl ester, dimethyl phthalate, dibutyl phthalate and alkylated benzenes (alkyl group > C9), see also [5].

Appendix C Excluded Hazard Classes and Hazard Categories

Table 1: Hazard Statements and Risk Phrases excluded for award of the Blue Angel Ecolabel

Regulation (EC) No. 1272/2008 (GHS Regulation)	Directive 67/548/EWG (Dangerous Substances Directive)	Wording
Toxic substances:		
H300	R28	Fatal if swallowed.
H301	R25	Toxic if swallowed.
H310	R27	Fatal in contact with skin.
H311	R24	Toxic in contact with skin.
H330	R26	Fatal if inhaled.
H331	R23	Toxic if inhaled.
H370	R39/23/24/25/ 26/27/28	Causes damage to organs.
H372	R48/23/24/25	Causes damage to organs through prolonged or repeated exposure.
Carcinogenic, mutagenic and reprotoxic substances:		
H340	R46	May cause genetic defects.
H341	R68	Suspected of causing genetic defects.
H350	R45	May cause cancer.
H350i	R49	May cause cancer by inhalation.
H351	R40	Suspected of causing cancer.
H360D	R61	May damage the unborn child.
H360F	R60	May damage fertility.
H360FD	R60/61	May damage fertility. May damage the unborn child.
H360Df	R61/62	May damage the unborn child. Suspected of damaging fertility.
H360Fd	R60/63	May damage fertility. Suspected of damaging the unborn child.
H361d	R63	Suspected of damaging the unborn child.
H361f	R62	Suspected of damaging fertility.
H361fd	R62/63	Suspected of damaging fertility. Suspected of damaging the unborn child.