BLUE ANGEL

The German Ecolabel

Low-emission and low-pollutant paints and varnishes

DE-UZ 12a

Basic Award Criteria

Edition August 2011

Version 6

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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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

The use of "low-emission and low-pollutant paints and varnishes" does not only help reduce the release of organic solvents into the atmosphere but also the pollution load on the indoor air.
For further reduction of solvents in certain fields of application the water-based coating systems have been subdivided into 3 groups of different maximum organic solvent contents (2 to 10 percent by mass).
In many cases the change of the paint formulations to water-based paint systems requires the addition of further auxiliaries, such as for example, the addition of preservatives and tensides. This had prompted the German Umweltbundesamt (Federal Environmental Agency) to include, above all, and in addition to adaptations to the revised legislation on hazardous substances, new rules for preservatives into these Basic Award Criteria for "low-emission and low-pollutant paints and varnishes".
In 1980, the Environmental Label for "Low-Pollutant Paints and Varnishes" had been the first eco-label for a complex compound product. The first revision of the Award Criteria in 1986 lowered the maximum allowable content of organic solvents in "low-pollutant paints and varnishes" to 10 percent by mass. Said Blue Angel eco-label helped to raise the share of "low-pollutant paints and varnishes" in recent years from 1 to 30 percent. When differentiating between commercial and private users the rate of do-it-yourselfers using "low-pollutant paints and varnishes" is even 70 percent.
In 2008, a comprehensive revision of the Basic Award Criteria placed a stronger focus on health aspects. Thanks to the new eco-label for „low-emission and low-pollutant paints and varnishes" the pollutant content of the paints and varnishes is as low as possible and, from a health and environmental point of view, this leads to the lowest possible emissions from these products. This is based on the results of a research project into the relation between the solvent content (VOC) and the solvent emissions from paints and varnishes during drying[1]. In addition to the requirements for the raw materials and intermediates used in the

[1] „Machbarkeitsstudien für neue Umweltzeichen – Grundlagenarbeiten zur Überarbeitung des Umweltzeichens für Lacke"; (Feasibility Studies for new Eco-Labels – Work on the fundamentals of revising the Environmental Label for Paints and Varnishes) Project funding reference number: 205 95 357/02; http://www.umweltbundesamt.de/publikationen/grundlagenarbeiten-zur-ueberarbeitung-des

manufacturing process and for product disposal the requirements for award of the Blue Angel eco-label thus place a greater focus on the period of use.
RAL gGmbH examines the paint formulations on the basis of the formulations presented.
For evaluation of the emissions from paints and varnishes the concept of these Basic Award Criteria is structured along the lines of the toxicological evaluation of the evaluation scheme (AgBB evaluation scheme) developed by the Committee for Health-related Evaluation of Building Products (Ausschuss zur gesundheitlichen Bewertung von Bauprodukten) - a joint state and federal government committee composed of experts from German environmental and health authorities. Representative emission measurements are performed on Blue Angel eco-labelled paints and varnishes during each term of the Basic Award Criteria (scheduled to take place every four years) to find out whether this evaluation is still appropriate or whether the Basic Award Criteria need not be updated. Such tests shall be conducted by a recognized testing laboratory; the costs of the tests shall borne by the applicants.[2]

1.3 Objectives of the Environmental Label

The Blue Angel eco-label for "low-emission and low-pollutant paints and varnishes" may be awarded to products that – beyond the legal provisions -

- are manufactured by the use of low-pollutant materials which have less harmful environmental impact,
- are low-emission during processing,
- pose no risk to health in the living environment
- do not contain any pollutants that might significantly impede recycling and disposal of painted articles.

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

2 Scope

These Award Criteria apply to paints and varnishes and comparable coating materials with paint properties for interior and exterior use as architectural paints[3] and for use as industrial coatings[4]. The criteria characterizing the paint properties are specifications[5], formulation and processing.

Included are:

- Primers, undercoats, clear and coloured paints and varnishes,

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[2] According to para. 3.2.1. Volatile organic compounds (VOC) according to DE-UZ 12a
[3] Cf. Decopaint Directive, Section 2 Definitions (1) in Appendix 1.
[4] At the suggestion of the Federal Environmental Agency the Environmental Label Jury may include additional coating materials in the scope of the Basic Award Criteria
[5] Product category data on the basis of Annexes I and II to the Decopaint Directive (1) in Appendix 1

- thin and high-build glazes,
- water-thinnable paints and varnishes.

Excluded are:
- wood preservatives and chemical wood preservative glazes with biocidal properties,
- pickling solutions,
- surfacers[6],
- waxes,
- wall paints[7],
- printing inks,
- other coating materials without paint properties.

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 General Substance Requirements (Manufacture)

3.1.1 Toxic, carcinogenic, mutagenic, reprotoxic and teratogenic components

Low-emission and low-pollutant paints and varnishes shall not contain as constituents or split off under processing conditions any substances or mixtures that:

a) have been identified as substances of very high concern in accordance with the REACH Regulation (EC/1907/2006)[8] and have been included in the list (so-called Candidate List) set up in accordance with REACH, Article 59, paragraph 1.[9]

b) are listed in Regulation (EC) No 1272/2008 (CLP)[10], Annex VI, and exhibit the following properties or meet the criteria for such classification (self-classification)[11]:
   - acutely toxic of category Acute Tox. 1, Acute Tox. 2, Acute. Tox. 3
   - toxic to specific target organs of category STOT SE 1, STOT RE 1

c) are listed in Regulation (EC) No 1272/2008 (CLP)[10], Annex VI, and exhibit the following properties or meet the criteria for such classification (self-classification)[11]:
   - carcinogenic of category Carc. 1A, Carc. 1B, Carc. 2[12]
   - germ-cell mutagenic of category Muta. 1A, Muta. 1B, Muta. 2
   - reprotoxic of category Repr. 1A, Repr. 1B, Repr. 2;

   The H statements corresponding to the hazard categories can be seen from Appendix A.

d) are classified in TRGS 905[13] as:
   - carcinogenic (K1, K2, K3)

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6 Specifications can be provided in accordance with DE-UZ 113 „Low-emission floor covering adhesives and other installation materials".

7 Specifications can be provided in accordance with DE-UZ 102 „Low-emission interior wall-paints"

8 (2) in Appendix 1

9 The Candidate List as amended at the time of application shall be applicable. It can be found at: REACH-Kandidatenliste.

10 (3) in Appendix 1

11 (4) in Appendix 1

12 Except titanium dioxide, if the product is sold as a liquid mixture because its classification only applies to inhalable powders.

13 TRGS 905, List of carcinogenic, mutagenic or reprotoxic substances, (5) in Appendix 1

- mutagenic (M1, M2, M3)
- reprotoxic (R_F1, R_F2, R_F3)
- teratogenic (R_E1, R_E2, R_E3);

e) are classified in the MAK value list[14] as:
- carcinogenic (Category 1, Category 2, Category 3A or 3B)
- germ-cell mutagenic (Category 1, Category 2, Category 3A or 3B)
- teratogenic in the „Pregnancy" column in group A or B;

f) according to scientific knowledge must be classified in one of the categories under Nos. 1 to 3 either as carcinogenic, mutagenic, reprotoxic or teratogenic or have other chronically damaging properties or which as such or as their impurities or decomposition products are apt to cause considerable risk or considerable disadvantage for the public.

g) Exceptions
- Production-related/raw-material-related impurities of substances under Nos. 1 und 2, under No. 2 of categories 1A and 1B as well as under Nos. 4 and 5 of categories 1 and 2 shall not exceed 0.01 percent by mass. Substances under No. 3 of category 2 and those under Nos. 4 and 5 of category 3 shall not exceed 0.1 percent by mass in the individual intermediate.
- Notwithstanding Nos. 1 to 5 substances with a low action relevance may, in duly substantiated exceptional cases, be contained in the paint if it can be proved that, when properly used, these substances won't be released or emitted from the thoroughly dried paint film.[15]
- Paras. 3.2.3 und 3.2.4 shall apply to preservatives and formaldehyde.

Notwithstanding the above, carcinogenic, mutagenic and reprotoxic substances shall be minimized using state-of-the-art technology.

3.1.2 Irritant and Environmentally Hazardous Components

Low-emission and low-pollutant paints and varnishes shall not contain other hazardous substances or mixtures in concentrations that would - according to the CLP Regulation[10] - result in one of the following classifications of the paint:

a) irritant effect on skin, eyes and respiratory tract - and assigned the hazard pictogram GHS05 „Corrosion", the signal word „Danger" as well as the H statement H318 (Causes serious eye damage) or assigned the hazard pictogram GHS07 „Exclamation Mark", the signal word „Warning" as well as the H statements H315, H319 or H335 (Irritates skin, eyes or the respiratory tract) or H 317 (May cause an allergic skin reaction).

b) hazardous to waters and assigned the hazard pictogram GHS09 „Environment", possibly the signal word „Warning" as well as the H statements H400, H410 or H411.

3.1.3 Harmful and Corrosive Components

Low-emission and low-pollutant paints and varnishes may contain other hazardous substances or mixtures but only up to 40 percent by mass (≤ 40 percent by mass) of the limiting concentration that, according to the CLP Regulation[10], would lead to one of the following classifications of the paints and varnishes:

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[14] MAK and BAT Value List, Senate Commission for the Testing of Harmful Working Materials, as amended (6) in Appendix 1

[15] Exceptional cases are evaluated by the German Umweltbundesamt (Federal Environmental Agency) and presented for decision to the Environmental Label Jury.

a) harmful and assigned the pictogram GHS07 „Exclamation Mark", the signal word "Warning" as well as the H statements H302, H312 or H332 (harmful if swallowed, in contact with skin or if inhaled) or assigned the pictogram GHS08 „Health Hazard" (torso)", the signal words "Danger" or "Warning" as well as the H statements H304 (May be fatal if swallowed and enters airways), H334 (May cause allergy or asthma symptoms or breathing difficulties if inhaled) H371 or H373 (May cause damage to organs through prolonged or repeated exposure).
b) corrosive and assigned the pictogram GHS05 „Corrosion", the signal word "Danger" as well as the H statement 314 (Causes severe skin burns and eye damage).

Verification of Compliance with the Requirements by Testing the Formulation (Paras. 3.1 to 3.3)

The applicant shall submit the complete formulations of the product (Annex 2). If the product consists of several basic formulations the applicant shall complete a separate Annex 2 for each of them. If an application is filed for several colour shades of the product the applicant shall attach the formulations of each individual shade either as Annex 2 or the formulations for the shades applying for the Blue Angel as Annex 2a. If the application is filed for colour mixing systems (tinting systems) the applicant shall submit Annex 2b. For further details, please see Appendix E.
In addition, the applicant shall attach to the application the Material Safety Data Sheets for the product in German or English in accordance with REACH[8] Annex II - and, if so requested by RAL gGmbH, those for all components of the formulation(s).

3.2 Use

3.2.1 Volatile Organic Compounds (VOCs)

The following requirement shall apply to the maximum allowable content of volatile organic compounds in low-pollutant paints and varnishes as a function of the solids content:

	Solids Content	**maximum VOC Content**
Group I	< 20 %	2 percent by mass
Group II	> 20 % to < 30 %	8 percent by mass
Group III	> 30 %	10 percent by mass

The low-emission and low-pollutant paints and varnishes shall not exceed the VOC content limits[16] listed in the respective table (see Table 1 to Table 3). Compounds with a higher boiling point are required to meet more stringent requirements in order to avoid, above all, low-volatile substances that can emit over a long period of time. In addition, the individual compounds are toxicologically evaluated using LCI values[17] as listed in the „Vorgehensweise bei der gesundheitlichen Bewertung der Emissionen von flüchtigen organischen Verbindungen (VOC) aus Bauprodukten" (Health-related Evaluation Procedure for Volatile Organic

[16] VOCs are all TVOCs and SVOCs according to DIN ISO 16000-6, (7) in Appendix 1, i.e. the total of organic compounds within the retention range C_6 – C_{16} and > C_{16} – C_{22}.
[17] LCI = Lowest concentration of interest; cf. „ Health-related Evaluation Procedure for Volatile Organic Compounds Emissions (VOCs) from Building Products", (8) in Appendix 1

Compounds Emissions (VOCs) from Building Products) elaborated by the Committee for Health-related Evaluation of Building Products.

Table 1: Maximum Contents in the Formulation of Group I Products

	Maximum contents in the formulation [% by mass]	
	VOC and SVOC	**out of which VOC with LCI < 100 µg/m³ and substances without LCI**
VOC (boiling point up to 200°C)	2.0	1.0
VOC (boiling point above 200 °C)	1.0	0.5
SVOC	0.1	-
Total of maximum contents	*2.0*	*1.0*

Table 2: Maximum Contents in the Formulation of Group II Products

	Maximum contents in the formulation [% by mass]	
	VOC and SVOC	**out of which VOC with LCI < 100 µg/m³ and substances without LCI**
VOC (boiling point up to 200°C)	8.0	1.0
VOC (boiling point above 200 °C)	3.0	0.5
SVOC	0.2	-
Total of maximum contents	*8.0*	*1.0*

Table 3: Maximum Contents in the Formulation of Group III Products

	Maximum contents in the formulation [% by mass]	
	VOC and SVOC	**out of which VOC with LCI < 100 µg/m³ and substances without LCI**
VOC (boiling point up to 200°C)	10.0	1.0
VOC (boiling point above 200 °C)	3.0	0.5
SVOC	0.3	-
Total of maximum contents	*10.0*	*1.0*

If, due to insufficient data, the product contains non-classifiable organic compounds or unidentifiable substances these substances shall be listed for precautionary reasons under „VOC with LCI < 100 µg/m³ and substances without LCI".
If the product contains compounds that sublimate (e.g. camphor) the sublimation point shall be used as boiling point for evaluation purposes.
An accompanying board will assign the VOCs to the individual categories. This board is composed of representatives of UBA, RAL gGmbH, VdL and testing laboratories.

Emission measurements[18] shall be performed every four years on selected paints and varnishes by selected recognized testing laboratories in order to see as to what extent the determined VOC contents correlate with low-emission products[19].
To accompany these emission measurements UBA and RAL gGmbH will set up an advisory accompanying board composed of representatives of the applicants' companies, of the Verband der deutschen Lack- und Druckfarbenindustrie e.V. (Association of the German Paint and Printing Ink Industry) and of recognized testing laboratories. This board will establish the test criteria and the criteria for product selection.

[18] For the test conditions, please see Appendix 3 to DE-UZ 12a.
[19] Please see the study mentioned in footnote 1 with regard to the first examination of the relationship between VOC content and emissions.

To cover the cost of the tests, each applicant shall pay RAL gGmbH 500.00 € for each of its basic contracts. This amount shall fall due for the first time upon conclusion of the Contract for Use of the Environmental Label for the corresponding basic contracts.
For subsequent 4-year periods, the fee shall be paid, on one side, on the basis of the existing Contracts on the Use of the Environmental Label for the basic contracts and - with regard to newly applied basic contracts - upon conclusion of the Contract on the Use of the Environmental Label.

Compliance Verification

The applicant shall use Annex 1 to declare compliance with the requirement and consent to bear the cost pursuant to para. 3.2.1.

3.2.2 Residual Monomers

Unless specified, the content of residual monomers in the binder shall not exceed 0.05 percent by mass.

3.2.3 Preservatives

Low-emission and low-pollutant paints and varnishes must not contain any biocides. Exempted are the micro-biocides listed in Appendix B to the DE-UZ 102 Basic Criteria used as in-can preservatives in the contents specified therein (also contrary to para. 3.1.1, if applicable).
As regards the limit for the content, the following regulation shall alternatively apply for a transitional period (at the end of the term of these Basic Criteria it will be checked whether this regulation will still be needed):
The minimum quantity of preservative preparations required for in-can preservation shall be determined by germ inoculation (bioassay). The resulting value shall not be exceeded in the paint.

Compliance Verification

The applicant shall declare compliance with the requirements. If the transitional regulation is used the applicant shall present a bioassay according to Appendix F to the Basic Criteria DE-UZ 12a. Here, attention should be paid to the fact that only the active substances or combinations of active substances listed in Appendix B to the Basic Criteria DE-UZ 102 may be used.

3.2.4 Formaldehyde

Contrary to paragraph 3.1.1 the paint may contain formaldehyde if one of the following three criteria is met. A modification of the formulation requires the applicant to present a new verification of compliance with the formaldehyde requirement. If an application is filed for several shades of colour it shall provide verification for the product types „colourless" or „white" and additionally for two hues.

a) The emission of formaldehyde into the indoor air determined using a test chamber method shall not exceed 0.25 ppm during processing and drying and it shall be less than 0.05 ppm no later than 24 hours after starting the paint application.

Compliance Verification

The applicant shall declare compliance with the requirements and present the test protocol prepared by an independent testing laboratory. The test chamber examination shall satisfy the conditions set out in the current publication in the Federal Health Bulletin or in the Official Journal of BAM-Bundesanstalt für Materialforschung und -prüfung (Federal Institute for Material Research and Testing) for „Prüfverfahren für Holzwerkstoffe" (Test Methods for Wood Materials)[20]. Notwithstanding the above, the measurements may be conducted in a small test chamber and compliance may be verified by use of DNPH.
The sample prepared for the test chamber examination (measurement no earlier than four weeks after the production of the paint, 250µm applied to a glass plate in accordance with the application instructions on the container) shall be placed into the test chamber immediately after applying the paint. The measurements shall be taken 1 hour and 24 hours after paint application.

b) The in-can concentration of free formaldehyde shall not exceed 100 mg/kg.

Compliance Verification

The applicant shall declare compliance with the requirement and present the results of a determination in accordance with VdL-RL 03: „Richtlinie zur Bestimmung der Formaldehydkonzentration in wasserverdünnbaren Dispersionsfarben und verwandte Produkte" (Directive for Determining the Formaldehyde Concentration in Water-thinnable Emulsion Paints and Related Products", May 1997, para. 4.1" Determination of the in-can concentration of free formaldehyde using the acetylacetone method.
Compliance shall be verified by means of a repeat determination according to VdL Directive 03 para. 4.1 (Annex 3).

c) For paints with less than 10 ppm of free formaldehyde. If the simplified test method is used the content of free formaldehyde shall not exceed 10 mg/kg (10 ppm). Formaldehyde-deposit substances may only be added in quantities not to exceed a total content of free formaldehyde of 10 mg/kg.

Compliance Verification

The applicant shall declare compliance with the requirement and present the results of a repeat determination of the free formaldehyde content in accordance with the Merckoquant method pursuant to Appendix C to the Basic Criteria DE-UZ 12a (Annex 3).

3.3 Disposal

3.3.1 Pigments and Siccatives

Low-emission and low-pollutant paints and varnishes shall not be dyed or siccativated using pigments and siccatives based on lead, cadmium, chromium VI and their compounds. Exempted are natural or production-related impurities of up to 100 ppm, - or 200 ppm for lead, respectively - which may be contained in the raw material.

[20] (13) in Appendix 1

3.3.2 Plasticizers

Products containing plasticizing substances from the group of phthalates or from the group of organophosphates shall not be added to the low-emission and low-pollutant paints and varnishes.

Compliance Verification

The applicant shall declare compliance with the requirement by submitting declarations from the upstream suppliers (Annex 4).
If compliance cannot be declared the phthalate content shall be determined by means of extracting a material sample in a Soxhlet apparatus followed by an analysis using a GC/MS. The quantitative determination of the target substances shall be made by use of a substance-specific reference mixture. The content of phthalates as impurities in low-emission and low-pollutant paints and varnishes shall not exceed 0.1 percent by mass.

3.3.3 Alkylphenol Ethoxylates

Products containing alkylphenol ethoxylates and/or their derivatives shall not be added to the paint.

Compliance Verification

The applicant shall declare compliance with the requirement by submitting declarations from the upstream suppliers (Annex 4).
If compliance cannot be declared the content of alkylphenol ethoxylates shall be determined by means of quantitative determination. A concentration limit of 0.1 percent in the preparation shall apply on the basis of "Achte Verordnung zur Änderung chemikalienrechtlicher Verordnungen" (Eighth Regulation for Amending Chemical Law Regulations) (Published March 4, 2004, Federal Law Gazette I, p. 328).

3.4 Fitness for Use

Low-emission and low-pollutant paints and varnishes shall meet the usual quality requirements for fitness for use of the corresponding product group (e.g. adherence, hardness, drying properties, light-fastness, elasticity and, if applicable, opacity and surface resistance to household chemicals according to current DIN standards.

Compliance Verification

The applicant shall declare compliance with the requirement by completing Annex 1.

3.5 Advertising Statements

- The paint system shall be indicated on the container and in the Technical Data Sheets in connection with the product designation. The Technical Data Sheets shall also specify the binder base.
- The use of advertising statements apt to mistake the paint for other coating systems and product names including terms or designations, such as "organic", "eco", "natural", "wood protection", "fungi", "insect" or "nano" shall not be allowed.
  Advertising statements shall not include any statements that would play down the risks within the meaning of Article 25 para. 4 of the CLP Regulation[10], such as for example,

"non-toxic", „harmless" as well as „free of……" and the like, except for "free of solvents < 1.0 g/l"[21].

Compliance Verification

The applicant shall declare compliance with the requirement by completing Annex 1.

3.6 Notes and Instructions

Container text and technical data sheet shall include the following notes and instructions in an easy-to-read manner (similar wording shall be allowed):

- „Keep out of the reach of children "
- „Use A2/P2 combination filter for paint spraying "
- „Use P2 dust filter for grinding "
- „Ensure good ventilation during use and drying "
- „When using do not eat, drink or smoke"
- „In case of contact with eyes or skin, immediately and thoroughly rinse with water"
- „Do not allow product to enter drains, waterways or soil"
- „Clean utensils immediately after use with soap and water "
- „Make sure that containers are completely empty for recycling "
- „Liquid paint leftovers should be returned to a collection facility for paint residues"
- Also, the container text shall include a clear reference to the technical data sheet and information as to where it may be obtained (www……de) as well as a phone number of the manufacturer / distributor where consumers could access additional information.
- Paint contains …… (indication of the name of the preservative agent(s) according to Appendix B, No 1 to DE-UZ 102); Information for persons with allergies at (telephone number): …….

The ingredients of the paints shall be given in the technical data sheets in accordance with „Richtlinie zur Deklaration von Inhaltsstoffen in Bautenlacken, Bautenfarben und verwandten Produkten" (Guidelines for the declaration of ingredients in architectural paints, architectural coatings and related products[22].

Compliance Verification

The applicant shall declare compliance with the requirement by completing Annex 1 and present the corresponding technical data sheet as well as the container text.

4 Applicants and Parties Involved

Manufacturers or distributors 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,

[21] All VOCs shall be considered as solvents. VOCs are all TVOCs and SVOCs according to DIN ISO 16000-6, i.e. the total of organic compounds within the retention range C_6 – C_{16} and > C_{16} – C_{22}. Determination is made within the scope of the examination of the paint formulation by RAL gGmbH in accordance with para. 3.2.1.

[22] Richtlinie zur Deklaration von Inhaltsstoffen in Bautenlacken, Bautenfarben und verwandten Produkten (Guidelines for the declaration of ingredients in architectural paints, architectural coatings and related products) VdL-RL 01, (12) in Appendix 1

- 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 Assignment of Hazard Categories and Hazard Statements

The following table assigns the respective hazard statements (H statements) to the hazard categories of the substances generally excluded under paragraph 3.1.1.

CLP Regulation (EC) No 1272/2008		
Hazard Category	**Hazard Statements**	
	H Statement	**Wording**
Carcinogenic Substances		
Carc. 1A / 1B	H350	May cause cancer.
Carc. 1A / 1B	H350i	May cause cancer by inhalation.
Carc. 2	H351	Suspected of causing cancer.
Germ-cell Mutagenic Substances		
Muta. 1A / 1B	H340	May cause genetic defects.
Muta. 2	H341	Suspected of causing genetic defects.
Reprotoxic Substances		
Repr. 1A / 1B	H360D	May damage the unborn child.
Repr. 1A / 1B	H360F	May damage fertility.
Repr. 1A / 1B	H360FD	May damage fertility. May damage the unborn child.
Repr. 1A / 1B	H360Df	May damage the unborn child. Suspected of damaging fertility.
Repr. 1A / 1B	H360Fd	May damage fertility. Suspected of damaging the unborn child.
Repr. 2	H361f	Suspected of damaging fertility.
Repr. 2	H361d	Suspected of damaging the unborn child.
Repr. 2	H361fd	Suspected of damaging fertility. Suspected of damaging the unborn child.
Acutely Toxic Substances		
Acute Tox. 1 Acute Tox. 2	H300	Fatal if swallowed
Acute Tox. 3	H301	Toxic if swallowed
Acute Tox. 1 Acute Tox. 2	H310	Fatal in contact with skin
Acute Tox. 3	H311	Toxic in contact with skin
Acute Tox. 1 Acute Tox. 2	H330	Fatal if inhaled
Acute Tox. 3	H331	Toxic if inhaled
Substances classified for Specific Target Organ Toxicity		
STOT SE 1	H370	Causes damage to organs.
STOT RE 1	H372	Causes damage to organs through prolonged or repeated exposure.

Appendix B References

(updated July 2015)

[1] Decopaint Directive: implemented into German law by "Chemikalienrechtliche Verordnung zur Begrenzung der Emissionen flüchtiger organischer Verbindungen (VOC) durch Beschränkung des Inverkehrbringens lösemittelhaltiger Farben und Lacke (Lösungsmittelhaltige Farben- und Lack-Verordnung - ChemVOCFarbV) (Chemicals regulation for the limitation of emissions of volatile organic compounds (VOCs) by restricting the marketing of solvent-based paints and varnishes (Solvent-based paints and coatings Regulation), dated 16 December 2004, as amended.

[2] Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), as amended.

[3] Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures - short: CLP Regulation, as amended. The CLP Regulation entered into force on January 20, 2009. It replaced step by step until June 1, 2015 the hitherto Directives 67/548/EEC (Dangerous Substances Directive) und 1999/45/EC (Dangerous Preparations Directive).

[4] The European Chemicals Agency (ECHA) has kept a classification and labelling system („C&L-Inventory") since December 1, 2010 in accordance with Articles 113/114 of Regulation (EC) No. 1907/2006 of the European Parliament and of the Council of 18 December 2006 (REACH Regulation), cf. http://echa.europa.eu/clp/c_l_inventory_de.asp

[5] TRGS 905, List of carcinogenic, mutagenic or reprotoxic substances, as amended: TRGS 905.
The TRGS lists those CMR substances where so far no harmonised classification exists or where the Committee on Hazardous Substances arrives at a different classification. The total CMR list of the statutory accident insurance may also be used as a tool: CMR-Gesamtliste (Combined list of CMR substances according to CLP Regulation and TRGS 905).

[6] MAK- und BAT-Werte-Liste, Senatskommission zur Prüfung gesundheitsschädlicher Arbeitsstoffe (MAK and BAT Value List, Senate Commission for the Testing of Harmful Working Materials), as amended.

[7] DIN ISO 16000-6 (Indoor air - Part 6: Determination of volatile organic compounds in indoor and test chamber air), as amended.

[8] Vorgehensweise bei der gesundheitlichen Bewertung der Emissionen von flüchtigen organischen Verbindungen (VOC) aus Bauprodukten (Health-related Evaluation Procedure for Volatile Organic Compounds Emissions (VOCs) from Building Products), as amended, please go to: http://www.umweltbundesamt.de/themen/gesundheit/kommissionen-arbeitsgruppen/ausschuss-zur-gesundheitlichen-bewertung-von

[9] Richtlinie zur Deklaration von Inhaltsstoffen in Bautenlacken, Bautenfarben und verwandten Produkten. (Guidelines for the declaration of ingredients in architectural paints, architectural coatings and related products), VdL-RL 01, 3rd revision of June 2004; published by: Verband der deutschen Lack- und Druckfarbenindustrie e. V. (Association of the German Paint and Printing Ink Industry), Frankfurt am Main
http://www.lackindustrie.de/Publikationen_/VdL-Richtlinien/Seiten/VdL-Richtlinie-01.aspx

[10] Prüfverfahren für Holzwerkstoffe (Test Method for Wood Materials)
(Bundesgesundheitsblatt, (Federal Health Bulletin) 34, 10 (1991), 488-489)

Appendix C Method for Determining Free Formaldehyde in Water-Based Paints and Varnishes according to para. 3.2.4 of the Basic Award Criteria DE-UZ 12a

1 Introduction

The manufacture of water-based and emulsion paints involves the addition of small quantities of fungicidal/bactericidal substances to prevent a decomposition of the pigments or mould growth in the container during storage. This so-called in-can preservation also uses, among others, formaldehyde-containing and formaldehyde-releasing products (formaldehyde deposit substances).
The award process for the Blue Angel eco-label for low-emission and low-pollutant paints and varnishes DE-UZ 12a includes the task to verify the free formaldehyde content for water-based paint systems. This refers to the formaldehyde contained in the aqueous phase in contrast to the additional share of formaldehyde existing in a bound state when formaldehyde deposit substances are used. The "free" formaldehyde escapes during the drying of the applied paint with the evaporated liquid phase into the indoor air. The limit set by DE-UZ 12a is to make sure that the recommended maximum value of 0.1 ppm for formaldehyde in the indoor air won't be exceeded during use and drying of the coating material.
The method described below can be used for determining the "free" formaldehyde in addition to the formaldehyde "bound" in the deposit substances:

2 The "Merckoquant Method"

E. Merck AG based in Darmstadt/Germany sells test strips for detection and semi-quantitative determination of formaldehyde in aqueous solutions under the trade name "Merckoquant". According to Merck the detection reaction is based on the condensation of aldehydes with 4-amino-3-hydrazino-5-mercapto-1,2,4-triazole during which, as a result of air oxidation, crimson tetrazine derivatives come into being.
It is true that Merck calls this method "semi-quantitative" in its product descriptions. Its informative value is, however, good enough to find out whether or not a product complies with or exceeds the given free formaldehyde limit. This can be achieved, in particular, by using the opportunity set forth in the Instructions for Use to raise the sensitivity of the method by extending the waiting period between immersing the test strip into the solution and comparing the colours from 1 to 2 minutes.
Serial tests showed that within the range between 10 and 20 ppm, i.e. after exceeding the limiting value, intermediate shades of colour become clearly visible.
If this method produces results around the limiting value which indicate - even a slight - exceedance of the limit additional tests have to be performed for exact determination and final clarification as described under paragraph 5. "Note".

3 Conduct of the Test:

3.1 Determination of the Solids Content (non-volatile portion)

Since, however, the free formaldehyde only appears in the liquid phase and is determined therein the final determination of the free formaldehyde content requires the determination of the solids content of the water-based paint.
The non-volatile portion (solids content) is determined in accordance with DIN EN 3251:2008.

3.2 Separation of the Liquid Phase in the Solid

A given quantity, for example 50g of the coating material to be examined, is diluted and well mixed with the same amount of water (W). Part of his mixture is centrifuged for two hours in a centrifuge at a minimum speed of 4.000 revolutions per minute. This process usually yields a clean separation. By means of decanting the serum of the coating material is carefully separated from the sediment and used for the determination of formaldehyde.
Low-speed centrifuges sometimes do not produce a clear serum, e.g. on products with a small portion of pigments/extender. In such case, a centrifuge operating at 30,000 revolutions per minute should be used for separating binder and solids.

3.3 Determination of the Formaldehyde Content in the Aqueous Phase:

Necessary instruments and reagents:
Merckoquant formaldehyde test kit, stopwatch
5 ml of the serum are pipetted off. 10 drops of the soda lye from the kit are added to these 5ml and carefully stirred.
Then a Merckoquant test strip is briefly immersed into the solution. After exactly 2 minutes the intensity of colouring is compared with the colour scale and the corresponding concentration is read off.
As a next step, the reading is to be divided by 2.
The resulting value gives the formaldehyde concentration (HCHO) in the solution in mg per litre.

4 Calculation of the Free Formaldehyde in Coating Materials:

The calculation is to be made by use of the following equation. It takes into account the solids content as well as the quantity of water added to the base product. It converts the measured formaldehyde content in the serum in mg/l into mg of formaldehyde per kg of paint:

$$\frac{C_{HCHO} \cdot ((100 - FK) + W)}{100} = \text{mg of formaldehyde per kg of paint}$$

HCHO = Formaldehyde concentration in the serum in mg
FK = Solids of the coatings materials in mass percent
W = Water added before centrifuging for sample dilution in mass percent

5 Note

Products rich in binders containing organic pigments, such as, for example, glazes, do not produce a clear serum, not even in high-speed centrifuges. Due to the fact that the tinting of the serum obscures the colouring of the test strip, an exact reading of the concentration value becomes more difficult or even impossible. Hence, when used on a tinted serum, this method yields, at the most, approximate values.

The detection reaction may be disturbed by substances, such as ketones, esters, aldehydes and others. If the first sample shows a very intensive colour change that might indicate a very high free formaldehyde content which would, however, be implausible considering the paint formula the free formaldehyde content must be determined by means of another detection method.

The following methods are accepted for determining the formaldehyde content in addition to the above-described Merckoquant Method:

- Photometric determination of the free formaldehyde in aqueous phase of a paint using acetyl acetone;
- The indoor air emission of formaldehyde determined by means of a chamber test must not exceed 0.25 during use and drying and must be less than 0.05 ppm no later than 24 hours after starting paint application.

Appendix D Chamber Test[23]

Emission measurements have been performed as follows within the scope of the UFOPLAN research project FKZ 205 95 357-02 „Grundlagenarbeiten zur Überarbeitung des Umweltzeichens für Lacke Blauer Engel - Überarbeitung der Kriterien „Schadstoffarme Lacke" (Fundamental work for revising the Blue Angel eco-label for paints and varnishes – Revision of the criteria for „low-pollutant paints":

1 Sample preparation:

Sample holder:	glass
Height of the doctor blade:	200 µm
Preconditioning:	3 days under test conditions according to DIBt „Grundsätze zur gesundheitlichen Bewertung von Bauprodukten" (Principles of health risk assessment of building products) for liquid coatings

2 Chamber Test[22]):

Test chamber:	ISO 16000-9
Temperature:	23 °C
Relative humidity:	50 %
Loading:	0.5 m^2 / m3
q :	1 m^3/ (m^2 h)
Sampling:	3, 7, 14, 28 d

Evaluation is conducted according to the AgBB evaluation scheme

Emission measurements to be made every four years are to be performed under the same test conditions in order to obtain comparable test results.

[23] On the basis of DIN EN ISO 16000 – Indoor air - Part 6: Determination of volatile organic compounds in indoor and test chamber air; Part 9: Emission test chamber method; Part 11: Sampling, storage of sample and preparation of test specimens.

Appendix E Description of the Procedure for Formulation Testing pursuant to DE-UZ12a (August 2011 edition)

1 Basic Formulations:

- Please use only the Excel Table published (Annex 2) for submission of the **basic formulations**.
- The applicant shall fully complete (or select) all sections highlighted on blue background on pages 1 and 2. Please name the manufacturer and give the exact trades names of the intermediates. Please avoid using abbreviations and in-house designations. The additional manufacturer data on page 2 will ensure speedy processing of the test.
- The Material Safety Data Sheets of the intermediates need not be attached to the application. If necessary, you will be asked to additionally submit Material Safety Data Sheets that may be required.
- If several formulations are submitted with regard to one contract (e.g. two basic formulations or different defined individual shades of colour) please complete one form for each formulation.
- Thereafter, please transfer your stored data in **electronic form** to RAL gGmbH, preferably by attachment to an email or alternatively by mail on a data medium (CD or DVD).

  RAL gGmbH
  Attn. Dr. Andrea Rimkus
  Fränkische Straße 7
  53229 Bonn
  andrea.rimkus@ral.de

- You will be informed about the results of the formulation testing by email. Should the result be negative you will be informed about the deviations from the target values listed in the Basic Criteria and the further course of action can be discussed during a telephone conservation.
- You will receive the invoice for formulation testing upon completion of the testing.

2 Several Colour Shades or Colour Mixing Systems:

- If only very few colour shades need to be tested these shades should be handed in separately as basic formulation using Annex 2. Please complete Annex 2a (Excel file) for **several coulour shades**.
  Please complete only the sections highlighted on green background in the "Colour Shades" worksheet. Enter the names of the colour shades in the horizontal direction (the worksheet may contain up to 50 different colour shades).
  Please enter the basic formulations and pigments or pigment pastes used in the vertical direction. Up to 16 components may be used. The respective percentages used for the colour shade are then to be entered into the matrix highlighted on yellow background. The total shall be 100 percent for each colour shade.

Please note that the basic formulations used are to be submitted along with Annex 2 (unless already previously tested) (Annex 2).
Please also enter the name of the pigment/pigment paste manufacturer into the "Manufacturer" worksheet.
All other worksheets are to be completed by RAL. They are used for formulation testing.
Please save the file and then send it in electronic form.

- Analogously, complete Annex 2b for **tinting systems**.
  Please complete the sections highlighted on green background in the "Applicant" worksheet.
  Please enter the basic formulation used as well as the pigment pastes in the vertical direction. Up to 50 pigment pastes may be used. Please also specify the maximum content of each pigment paste as well as the maximum content of the pigment pastes (total) in the colour mixing system.
  Please note that the basic formulation used is to be submitted along with Annex 2 (unless already previously tested).
  All other worksheets are to be completed by RAL. They are used for formulation testing.
  If several basic formulations are used please complete one Annex 2 per basic formulation.
  If possible, please save the file under a filename similar to those suggested before and then send it in electronic form.
  If the colour shades or colour mixing systems do **not** meet the requirements of the Basic Criteria you will receive the corresponding results in writing along with the invoice for formulation testing. If the requirements are met you will only receive the invoice together with a positive reply.

3 General Information on the Evaluation:

- **Regarding the Solids Content:**
  The solids content is calculated on the basis of the classification of all formulation ingredients. Hence, it does **not** correspond to the non-volatile portion according to DIN EN ISO 3251:2008.
- **Regarding the VOC Content:**
  A group of experts allocates the substances suspected of containing VOC to five VOC groups (pursuant to Tables 1 to 3 in the Basic Criteria). Evaluation is made on the basis of this allocation according to the seven criteria listed in Tables 1 to 3 of the Basic Criteria.
- **Regarding the Total VOC Content (in g/l):**
  The value is additionally given in g/l on the basis of the VOC content determined (in weight percent) and the density of the paint.

Appendix F Conduct of a Biotest

August 2011

The applicant shall conduct a biotest using the following method to determine the minimum quantity of preservative preparation:
Laboratory method for the determination of the required preservative concentration in low-pollutant paints and varnishes according to DE-UZ 12a.

1 Scope

The method can be used to test the effectiveness of preservatives in preventing growth and survival of damaging organisms in aqueous polymer-based low-pollutant paints and varnishes. This method is applied analogously with the adoption of preservatives into Appendix A to the Basic Award Criteria DE-UZ 102 "Low-emission Wall Paints".

2 Health Note

Before starting on any test, make sure that the national public health regulations and EC Directive 2000/54/EU on the 'Protection of Workers from Risks related to Exposure to Biological Agents at Work' are complied with. When using and handling emulsion paints and varnishes as well as biocides the recommendations in the corresponding Material Safety Data Sheets and product information brochures for save product use and handling should be followed.

3 Instruments and Nutrient Media

- Suitable sterile screw cap bottles (100ml);
- Sterile measuring pipettes, nominal volume 1.0 ml and 5.0 ml (according to DIN 12687);
- Sterile glass or plastic petri dishes, diameter 90 or 100 mm;
- Sterile diluent; e.g. distilled water (for agar) pursuant to ISO 3696,
- Physiological saline (to rinse and dilute bacterial cultures);
- Scales;
- Pipette and 0.1 cm^3 sterile tips;
- Bunsen burner;
- Incubator, thermostatically controlled (30°C +/-2°C);
- Autoclave;
- Sterile inoculating loops or needles;
- Sterile spatulas;
- Water bath or thermostat;
- Sterile nutrient media for the corresponding micro-organisms
- Composition and production (see Appendix F1);
- pH meter;
- Bacterial stock cultures;
- Culture tubes;

4 Test Organisms

The following bacteria should be used for the bacterial load test:

Bacteria:				
Alcaligenes faecalis	DSM 6174	or	ATCC	35655
Escherichia coli	DSM 787	or	ATCC	11229
Pseudomonas aeruginosa	DSM 939	or	ATCC	15442
Pseudomonas putida	DSM 291T	or	ATCC	12633
Pseudomonas stutzeri	DSM 5190T	or	ATCC	17588

Other bacteria of practical relevance or bacteria that continuously lead to infections may be used in the inoculation suspension.

5 Method

5.1 Inoculation Suspension - Preparation

Prepare separate suspensions of each bacterium by wetting the grown surface of the agar slant cultures following a 24 or 48 hour incubation at 30°C +/- 2°C with the sterile diluent, e.g. distilled water (for agar) or physiological saline (to rinse and dilute bacterial cultures) and carefully wash off the plant cover with a sterile inoculating loop.

- Determine the number of organisms in each suspension using a haemocytometer or determine the microbial content by another appropriate method. (e.g. Koch's pour plate method, ISO 7218 or Miles and Misra Method).
- The cell count of the individual bacteria suspensions should be **10^8-10^9 CFU/cm^3**.
  The prepared inoculation suspension must be used the same day and should be kept in the refrigerator until used.
- In order to prepare a mixed suspension identical volumes of each bacterial suspension are added together and mixed.
  The cell count shall also be **10^8 –10^9 CFU/cm^3**.

5.2 Bacterial Load Test

- Weigh suitable portions (e.g. 50 or 100g) of the emulsion paint or varnish into sterile screw cap bottles.
- Add the preservative in appropriate concentration series.
- Two non-preserved samples shall serve as control samples. One sample is inoculated (positive control) while the other one remains uninoculated (negative control = retained sample).
- Inoculate each sample (except for the negative control) with the same volume of mixed suspension equivalent to 1.0 percent of the sample weight.
- Mix the sample well with a sterile spatula and, finally, screw the cap onto the bottle.
- Determine the microbial initial load of the inoculated non-preserved sample. For this purpose, streak a sample on an agar plate (see Appendix F2). Then incubate the plate at 30°C +/- 2°C for no more than 3 days. Finally, determine the cell count (using an appropriate method).

- Incubate the preserved samples at 30°C +/- 2°C for a period of 7 days.
- Determine the death rate of microbial contamination in the preserved samples. For this purpose, streak samples on agar plates in accordance with Appendix F2. Determine the cell counts after incubating the plates at 30°C +/- 2°C for no more than 3 days.
- Evaluate the microbial growth on the nutrient agar plates using the following scale:

0	No growth
1	1 - 10 CFU
2	11 - 100 CFU
3	101 -1.000 CFU
4	>1.000 CFU

- Repeat steps 5.2.4 to 5.2.8 at weekly intervals until 6 inoculation cycles have been completed.
- Infected samples should not be subjected to further inoculation cycles.
- To determine relative death rates by preservative concentrations additional streaks can be performed and evaluated, for example, after 1 and 3 days following the inoculation.

Appendix F1: Nutrient Medium

Nutrient Agar

Nutrient agar is a universal substrate for the cultivation of non-fastidious micro-organisms.
The substrate is in line with the recommendations of Section 35 „Lebensmittel- und Bedarfsgegenständegesetz" (LMBG) (Food and Consumer Goods Act).

Typical composition	(g/L)
Meat extract 'Lab-Lemco'	1.0
Yeast extract	2.0
Peptone	5.0
Sodium chloride	5.0
Agar	15.0
pH	7.4 +/- 02

Preparation

28 g of nutrient agar shall be suspended in 1 L of diluent (e.g. distilled water), heated until fully dissolved and autoclaved for 15 minutes at 121°C.

Description

Nutrient agar is a base substrate for the sub-culturing of micro-organisms for strain maintenance or isolation preceding the biochemical or serological examination. Nutrient agar is used in a semi-solid state as agar plates or agar slants to keep control strains. Nutrient agar contains 1.5% of agar so that up to 10% of blood or other biological liquids may be added for the preparation of special substrates. Without any additives nutrient agar can be used for the cultivation of non-fastidious bacteria.

Storage and Durability of Dried Substrate

Storage:

- in tightly sealed original containers,
- shielded from light,
- at a temperature of about 25 °C
  Ready-to-use plates: at temperatures from 2 °C – 8 °C

Durability: see Label

Appendix F2: Preparation of Agar Plates

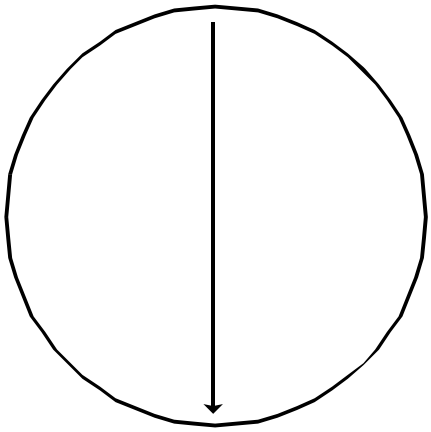
Materials

Sterile 10µl inoculating loops
Petri dishes with appropriate nutrient media (nutrient agar)
Samples

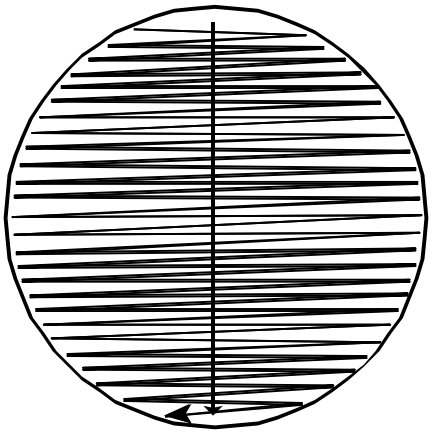
Method

Sterile streak technique

- After thoroughly mixing the sample immerse a 10µl inoculating loop into the sample.
- Create a diagonal streak (a) across the substrate.
- Use the same loop for additional streakings (b) in order to distribute the sample on the entire agar surface as uniformly as possible.



(a)



(b)

- Make streakings of each sample.
- Used inoculating loops are to be disposed of in compliance with current safety and environmental regulations.

Appendix G Preservatives

= Appendix A to Basic Criteria DE-UZ 102