

# **BLUE ANGEL**

**The Environmental Label**



## **Underwater Coatings and Other Antifouling Systems**

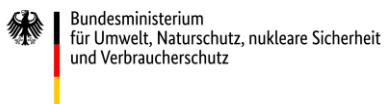
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**Basic Award Criteria**

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## The environmental label is supported by the following institutions:



The Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (Bundesministerium für Umwelt, Naturschutz, nukleare Sicherheit und Verbraucherschutz) is the owner of the label. It regularly provides information on the decisions taken by the Environmental Label Jury.



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



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



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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# 1 Introduction

## 1.1 Preliminary remarks

In cooperation with the Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection, the German Environment 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 these conditions.

## 1.2 Background

Antifouling coatings containing biocides can introduce a considerable amount of pollutants into the aquatic environment. They are used to prevent the growth of fouling organisms on sports boat and ship hulls and other underwater structures because they can increase the frictional resistance and thus the fuel consumption of ships and also induce corrosion processes. The objective of the environment label is to minimise the environmental risks caused by the introduction of biocides through the use of non-biocidal alternatives, while at the same time guaranteeing that the materials and processes used are environmentally compatible and have comparable efficacy.

## 1.3 Objectives of the environmental label

This environmental label may be awarded to products that – above and beyond the legal regulations – deliver benefits to the environment because they:

- are manufactured using materials and substances that place less burden on the environment and people than comparable products;
- are safe for the environment from an ecological perspective;
- do not contain any harmful substances that are released during their application and service life;
- demonstrate a sufficient level of efficacy. For this purpose, minimum standards for assessing their efficacy and effective service life were developed and must be complied with by the certified products.

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



## 1.4 Definitions

- **Antifouling effect:** In the sense of these Basic Award Criteria, an antifouling effect can be assumed in (1) biocidal antifouling products covered by the Biocidal Directive (EU) No 528/2012, (2) coatings with a zinc oxide content of  $\geq 2.5$  % by mass and (3) coatings based on silicone and Teflon with anti-stick properties. In contrast, an antifouling effect is **not** provided by corrosion protection coatings or non-biocidal hard coatings (e.g. on an epoxy, acrylic and polyurethane basis).
- **Biocide:** Biocidal substances and biocidal products in the sense of the Biocidal Directive (EU) 528/2012
- **CEPE:** The European Council of the Paint, Printing Ink and Artists' Colours Industry is an association representing the interests of the paint, printing ink and artists' colours industry at a European level
- **CLP:** CLP Regulation (EC) No. 1272/2008 on classification, labelling and packaging of substances and mixtures
- **ECHA:** European Chemicals Agency
- **M-factor:** Multiplication factor for the classification of mixtures with highly toxic components in the hazard classes acute or chronic aquatic toxicity.
- **Macrofouling:** Difficult to remove biological fouling e.g. with barnacles, mussels, tube-worms and some tunicate.
- **Microfouling:** Biological fouling with bacteria or algae that is usually easy to remove
- **Microplastic:** Material consisting of solid polymers, where  $\geq 1$  % by mass of the particles have a size of 1 nm to 5 mm or a fibre length of 3 nm to 15 mm and a length to diameter ratio of  $> 3$  (definition changed in accordance with ECHA 2019)
- **Nanomaterial:** A natural or manufactured material containing particles in an unbound state or as an aggregate or as an agglomerate where, for 50 % or more of the particles in the number size distribution, one or more external dimensions is in the size range 1 nm - 100 nm.
- **Natural substance:** A naturally occurring substance that is unprocessed, has not been chemically modified and corresponds to the definition in Article 3 (39) and (40) of the REACH Regulation (EC) No 1907/2006.
- **Niche areas of a ship's hull:** Special areas of the hull such as sea chests, stabilisers, bilge keels, thruster tunnels, etc.
- **OECD:** Organisation for Economic Co-operation and Development
- **Product-type (PT) 6: Preservatives for products during storage:** Products used for the preservation of manufactured products in containers by the control of microbial deterioration to ensure their shelf life.
- **Product-type (PT) 7: Film preservatives:** Products used for the preservation of films or coatings by the control of microbial deterioration or algal growth in order to protect the initial properties of the surface of materials.
- **Product-type (PT) 21: Antifouling products:** Products used to control the growth and settlement of fouling organisms (microbes and higher forms of plant or animal species) on vessels, aquaculture equipment or other structures used in water.
- **REACH:** REACH Regulation (EC) No. 1907/2006 concerning chemical legislation in the European Union (Registration, Evaluation, Authorisation and Restriction of Chemicals).

- **Exterior of the hull:** also called the “outer skin of the ship”. The smooth external hull of the ship consisting of vertical areas on the side and the underbody, which depending on the type of ship has a flat bottom or a keel.
- **SVHC:** Substance of Very High Concern according to the REACH Regulation (EC) No 1907/2006 Article 57.
- **VOC:** A “volatile organic compound” describes any organic compound having a vapour pressure of 0.01 kPa or more at 293.15 K, or having a corresponding volatility under the particular conditions of use.
- **Plasticiser:** Substances that influence the plasticity/elasticity of a material. A distinction is made between external (which can in some cases be washed out) and internal (integrated into the polymer matrix) plasticisers.

## 2 Scope

These Basic Award Criteria apply to the following product groups designed for use on the exterior of the hull on ships and boats. This includes niche areas such as sea chests, bow thrusters, rudder systems, shafts, propeller tunnels, etc.

Underwater coatings:

- ♦ Coatings (non-stick coatings, fibre coatings),
- ♦ Adhesive films (non-stick films, fibre films),
- ♦ Cleanable hard coatings,
- ♦ Electrical processes with a special coating structure.

Other systems:

- ♦ Underwater tarpaulins,
- ♦ Ultrasonic systems,
- ♦ Boat lifting systems.

Cleaning:

- ♦ Mobile ship cleaning equipment,
- ♦ Stationary ship cleaning equipment.

The scope of the individual product groups is explained in more detail in Appendix A. Self-polishing and eroding coatings are excluded from the scope of these Basic Award Criteria.

The scope may be expanded to include other innovative product groups upon application and after consultation between RAL gGmbH and the UBA.

## 3 Requirements

The criteria for the award of the environmental label are split into requirements for the starting substances (Paragraph 3.1), requirements for the final product (Paragraph 3.2), advertising messages (Paragraph 3.3) and user information (Paragraph 3.4). The product group “Underwater Coatings and Other Antifouling Systems” stands out due to its very high level of heterogeneity with respect to the different working principles. Therefore, it is not possible to sensibly apply all of the requirements defined below to all of the product types. Please refer to the following matrix for information on which requirements must be complied with by each product type.

Table 1: Requirement matrix for the different product groups

		Underwater coatings			Other systems			Cleaning	
		Coatings and adhesive films	Cleanable hard coatings	Electrical processes with a special coating structure	Underwater tarpaulins	Ultrasonic systems	Boat lifting systems	Mobile ship cleaning equipment	Stationary ship cleaning equipment
<b>3.1</b>	<b>Requirements for the starting substances</b>								
<b>3.1.1</b>	<b>General requirements</b>	x	x	x	x	x	x	x	x
<b>3.1.2</b>	<b>Requirements on the use of biocides</b>	x	x	x	x	N.A.	N.A.	x	x
<b>3.1.3</b>	<b>Volatile organic compounds (VOC)</b>	x	x	x	N.A.	N.A.	N.A.	N.A.	N.A.
<b>3.1.4</b>	<b>Special requirements for specific substances</b>	x	x	x	x	N.A.	N.A.	x	x
<b>3.1.5</b>	<b>Intended release of substances</b>	x	x	x	x	N.A.	N.A.	N.A.	N.A.
<b>3.2</b>	<b>Requirements for the product</b>								
<b>3.2.1</b>	<b>Product requirements according to the regulations on hazardous substances</b>	x	x	x	x	N.A.	N.A.	N.A.	N.A.
<b>3.2.2</b>	<b>Ecotoxicity of the eluates</b>	x	x	x	x	N.A.	N.A.	N.A.	N.A.
<b>3.2.3</b>	<b>Proof of efficacy</b>	x	N.A.	x	x	x	N.A.	x	x
<b>3.2.4</b>	<b>Special system-specific requirements</b>	N.A.	x	N.A.	N.A.	N.A.	x	x	x
<b>3.3</b>	<b>Advertising messages</b>	x	x	x	x	x	x	x	x
<b>3.4</b>	<b>User information</b>	x	x	x	x	x	x	x	x

X = Relevant

N.A. = Not applicable

### 3.1 Requirements for the starting substances

#### 3.1.1 General requirements

Observance of the legal regulations according to European and German chemical law is a prerequisite; this includes, in particular, the REACH Regulation Annexes XIV and XVII, the POP Regulation Annex I and the CLP Regulation. If other legal regulations also apply to specific products, these also need to be observed. If a product consists of multiple individual components (e.g. adhesive + film), the following requirements must be complied with by each component. The ready-to-use product and the primary products may not contain any substances with the following properties in a concentration > 0.1 % by mass:



1. Substances which are identified as particularly alarming under the REACH Regulation and which have been incorporated into the list drawn up in accordance with Article 59, Paragraph 1 of the REACH Regulation (so-called "list of candidates"<sup>1</sup>).

2. Substances that according to the CLP Regulation have been classified in the following hazard categories or which meet the criteria for such classification<sup>2</sup>:

- carcinogenic in categories Carc. 1A or Carc. 1B or Carc. 2
- germ cell mutagenic in categories Muta. 1A or Muta. 1B or Muta. 2;
- reprotoxic (teratogenic) in categories Repr. 1A or Repr. 1B or Repr. 2;
- acute toxicity (poisonous) in categories Acute Tox. 1 or Acute Tox. 2 or Acute Tox. 3
- hazardous to the ozone layer in category Ozone 1.

The hazard statements (H Phrases) that correspond to the hazard categories can be found in Anhang E

3. Substances that are classified in TRGS 905 as:

- carcinogenic (K1A, K1B, K2)
- germ cell mutagenic (M1A, M1B, M2)
- reprotoxic (RF1A, RF1B, RF2)
- teratogenic (RD1A, RD1B, RD2)

### **Compliance verification**

*The applicant shall submit the formulation for the underwater coating, specify the material composition (Annex 2) and declare compliance with the requirements (Annex 1). The ingredients should be clearly identified using their EC/CAS numbers. In addition, the applicant shall state the brand names and suppliers of all individual primary products and their proportions and function in the product. The applicant shall also enclose the safety data sheets or comparable information for these primary products with the application.*

*Furthermore, the applicant shall enclose the safety data sheet for his/her product according to REACH Annex II or CLP in either German or English with the application. RAL gGmbH must be informed immediately about all changes to the product and the formulation or the material composition and compliance with the requirement must be examined and documented again.*

#### **3.1.2 Requirements on the use of biocides**

The use of biocides according to Directive (EU) No 528/2012 in the products and primary products is prohibited. As an exception to this rule, primary products may contain in-can preservatives (PA 6) if the requirements for the classification of the product in 3.2.1 are observed.

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<sup>1</sup> The version of the list of candidates at the time of application is valid. It can be found at: <https://www.echa.europa.eu/candidate-list-table>.

<sup>2</sup> The harmonized classifications and labellings of hazardous substances can be found in Annex VI, Part 3 of the CLP Regulation. Furthermore, a comprehensive classification and labelling inventory, which also includes all of the self-classifications of hazardous substances made by manufacturers, has been made available to the public on the website of the European Chemicals Agency: <https://echa.europa.eu/de/regulations/clp/cl-inventory>.

### **Compliance verification**

*The applicant shall declare compliance with the requirement (Annex 1) or submit corresponding declarations from the manufacturer/suppliers (Annex 3) and the technical data sheets and safety data sheets. If in-can preservatives are used in the primary products, the applicant shall submit a calculation according to the classification rules in the CLP Regulation for mixtures with the hazard phrases H400-H413. If the term of validity of the Basic Award Criteria is extended, new declarations from the manufacturer or suppliers shall be submitted.*

#### **3.1.3 Requirements with respect to volatile organic compounds (VOC)**

For underwater coatings, the following maximum allowable content of volatile organic compounds applies:

- ♦ a VOC limit of 100 g/L for water-based products and 250 g/L for solvent-based products.<sup>3</sup>
- or
- ♦ an area-based total consumption for all applied layers of 150 g/m<sup>2</sup>.<sup>4</sup>

### **Compliance verification**

*The applicant shall declare compliance with the requirement (Annex 1) and submit the calculation for the VOC emissions. Alternatively, the applicant shall submit verification in accordance with DIN EN ISO 11890-2 (< 15 % VOC) or DIN EN ISO 11890-1 (> 15 % VOC).*

#### **3.1.4 Special requirements for specific substances (supplementary to requirements according to 3.1.1)**

##### **a) Pigments and siccatives**

Pigments or siccatives containing lead compounds may not be added to the underwater coatings or plastics. Exempted are natural and production-related impurities of up to 200 ppm which may be contained with the pigment.

##### **b) Alkylphenol ethoxylates**

Products containing alkylphenol ethoxylates (APEO) and/or their derivatives may not be added to the underwater coatings or plastics. This rule also applies to primary products.

##### **c) Plasticisers**

Products that contain plasticising substances from the group of phthalates or group of organophosphates may not be added to the underwater coatings or plastics. The same also applies to primary products.

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<sup>3</sup> Based on ChemVOCFarbV (2004), which contains VOC limits of 130 g/L (water-based) and 300 g/L (solvent-based) for coatings for wood, metal or plastic.

<sup>4</sup> Calculated using typical product formulations and their VOC content and application volumes.

**d) Oximes**

Oximes and primary products containing oximes may not be added to the products.

**e) Perfluorinated and polyfluorinated chemicals**

Perfluorinated or polyfluorinated chemicals (PFAS), such as fluorocarbon resins and fluorocarbon emulsions, perfluorinated surfactants, perfluorinated sulfonic and carboxylic acids may not be added to the product. The use of polytetrafluoroethylene (PTFE) is also prohibited.

**f) PVC**

The use of the plastic polyvinyl chloride (PVC) is not permitted.

**g) Organotin compounds**

The use of organotin compounds is not permitted.

**h) Copper as a catalyst**

The use of copper as a catalyst in silicone coatings is only permitted if the requirements for the classification of the product in 3.2.1 are observed.

**i) Zinc oxide**

The use of zinc oxide as an auxiliary agent (e.g. pigment, UV absorber, catalyst) is only permitted if the requirements for the classification of the product in 3.2.1 are observed.

**j) Epoxy resin**

The use of synthetic resins based on bisphenol A or similar bisphenol compounds is not permitted.

**k) Nanomaterials**

The use of nanomaterials is not permitted.

***Compliance verification***

*The applicant shall declare compliance with the requirements (Annex 1).*

**3.1.5 Intended release of substances**

**a) Plastics**

The intended release of plastics (such as microplastics) is not permitted. Eroding and self-polishing coatings are thus explicitly prohibited.

**b) Silicone oils**

The use of silicone oils, which are designed to exude from coatings, is prohibited. Silicone oils that are approved for use in materials that come into contact with foodstuffs or which are

classified as harmless to drinking water are exempt from this general ban on the use of silicone oils.<sup>5 6</sup>

### **c) Natural substances**

The release of natural substances, which have not been chemically modified, such as waxes or greases with the aim of achieving a non-stick effect is generally only permitted if no polymer matrices are also released, as is the case with self-polishing or eroding coatings. The German Environment Agency will make a decision on whether the intended release of natural substances is permitted in each individual case.

#### **Compliance verification**

*The applicant shall declare compliance with the requirement (Annex 1). In the case of the intended release of natural substances, the applicant shall submit information on the composition of the released components and provide corresponding verifications of their biodegradability and ecotoxicological relevance (e.g. from specialist literature, the REACH database<sup>7</sup> or test reports). The German Environment Agency will make a decision on whether the intended release of natural substances is permitted in each individual case.*

## **3.2 Requirements for the product**

### **3.2.1 Product requirements according to the regulations on hazardous substances**

The final product may not be classified with the H-Phrases H400, H410, H411, H412 or H413.

#### **Compliance verification**

*The applicant shall submit a calculation in accordance with the classification rules in the CLP Regulation for mixtures with the hazard phrases H400-H413 or the safety data sheet.*

### **3.2.2 Ecotoxicity of the eluates from a dynamic surface leaching test**

Products in constant contact with water must be eluted in a dynamic surface leaching test according to CEN/TS 16637-2 and the ecotoxicity of the eluate must be tested according to CEN/TR 17105 using the following table. If the product consists of multiple components, it must be tested in its completed state. A mixture of the first two eluates produced in accordance with CEN/TS 16637-2 after 6 hours and a further 18 hours and the eluate after 64 days (eluate fraction 8 from day 36 to 64, total length 28 days) should be tested. The eluate must comply with the criteria in Table 2.

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<sup>5</sup> Database "BfR Recommendations on Food Contact Materials": XV. Silicone. Version as of 01/06/2019 <https://bfr.ble.de/kse/faces/DBEmpfehlung.jsp> (accessed on 07/09/2020)

<sup>6</sup> [https://www.umweltbundesamt.de/sites/default/files/medien/5620/dokumente/silikon-uebergangsempfehlung\\_2\\_aenderung.pdf](https://www.umweltbundesamt.de/sites/default/files/medien/5620/dokumente/silikon-uebergangsempfehlung_2_aenderung.pdf) (accessed on 07/09/2020)

<sup>7</sup> <https://echa.europa.eu/de/information-on-chemicals/registered-substances>

Table 2: Test criteria for ecotoxicity

Test species	Test standard	Endpoint	Criterion
Luminescent bacteria ( <i>Vibrio fischeri</i> )	EN ISO 11348-1 or EN ISO 11348-2	Light	$LID_L \leq 8$
Algae ( <i>Pseudokirchneriella sub- capitata</i> or <i>Desmodesmus subspi- catus</i> )	EN ISO 8692	Growth	$LID_A \leq 4$
Crustaceans ( <i>Daphnia magna</i> )	EN ISO 6341	Mobility	$LID_D \leq 4$
Zebra fish eggs ( <i>Danio rerio</i> )	EN ISO 15088	Mortality	$LID_{egg} \leq 4$
umu test	ISO 13829	Genotoxicity	$LID_{EU} \leq 1.5$

### Compliance verification

The applicant shall submit a test certificate that verifies compliance with the criteria. The testing laboratory must have implemented a quality assurance system according to DIN EN ISO/IEC 17025 "General requirements for the competence of testing and calibration laboratories" or a comparable certification system (e.g. GLP) and confirm that this is the case in the test report.

#### 3.2.3 Proof of efficacy

The required proof of efficacy differs depending on the type of product. Therefore, the applicable test criteria will be presented separately for each product type. The test methods required in each case are described in detail in Appendix B.

Products designed for seawater and brackish water must pass the relevant test in seawater or brackish water. Products offered by manufacturers solely for use in fresh water must only pass the relevant test in fresh water. However, any existing tests carried out in seawater or brackish water will also be accepted for fresh water products. All of the tests are only valid in combination with a simultaneous control test (see **Fehler! Verweisquelle konnte nicht gefunden werden.**).

### Compliance verification

The applicant shall submit a test certificate confirming compliance with the test criterion according to 3.2.3 in combination with the requirements in the test method in Appendix B. The test certificate must be issued by an independent testing laboratory accredited according to ISO/IEC 17025 for the fouling test (ASTM D3623 - 78a (2020) or ASTM D6990 - 20 (2020) that has experience in biological testing. If the testing laboratory does not have this type of accreditation, it can verify its suitability using a comparable qualification e.g. the testing institution could be accredited for comparable tests according to DIN EN ISO/IEC 17025. The qualification of the testing institution must be stated on the test report.

### **3.2.3.1 Coatings and adhesive films**

Efficacy tests can be carried out using correspondingly loaded test panels or ship tests in accordance with the test method described in Appendix B. The following test criteria must be complied with:

#### **Test criterion in seawater or brackish water**

The test panel or test surface must not display more than 25 % macrofouling on any of the three replicates at the end of the test (ASTM Fouling Rating  $\geq 75$ ).

#### **Test criterion in fresh water**

The test panel or test surface must not display more than 5 % macrofouling on any of the three replicates at the end of the test (ASTM Fouling Rating  $\geq 95$ ).

### **3.2.3.2 Cleanable hard coatings**

**Efficacy tests for an antifouling effect or resistance to fouling are not required** for cleanable hard coatings. As an alternative proof of quality, a Taber abrasion test must be carried out on these coatings (see Paragraph 3.2.4.1 **Fehler! Verweisquelle konnte nicht gefunden werden.**).

### **3.2.3.3 Electrical processes with a special coating structure**

Efficacy tests can be carried out using correspondingly loaded test panels or ship tests in accordance with the test method described in Appendix B. The following test criteria must be complied with:

#### **Test criterion in seawater or brackish water**

The test panel or test surface must not display more than 25 % macrofouling on any of the three replicates at the end of the test (ASTM Fouling Rating  $\geq 75$ ).

#### **Test criterion in fresh water**

The test panel or test surface must not display more than 5 % macrofouling on any of the three replicates at the end of the test (ASTM Fouling Rating  $\geq 95$ ).

### **3.2.3.4 Underwater tarpaulins**

Efficacy tests can only be carried out using ship tests in accordance with the test method described in Appendix B. The following test criteria must be complied with:

#### **Test criterion in seawater or brackish water**

The test panel must not display more than 25 % macrofouling on any of the three replicates at the end of the test (ASTM Fouling Rating  $\geq 75$ ).

#### **Test criterion in fresh water**

The test panel must not display more than 5 % macrofouling on any of the three replicates at the end of the test (ASTM Fouling Rating  $\geq 95$ ).

### 3.2.3.5 Ultrasonic systems

Efficacy tests for ultrasonic systems can be carried out using test panels loaded based on the manufacturer's instructions or ship tests in accordance with the test method described in Appendix B.

#### **Test criterion in seawater or brackish water**

The test panel or test surface must not display more than 25 % macrofouling on any of the three replicates at the end of the test (ASTM Fouling Rating  $\geq$  75).

#### **Test criterion in fresh water**

The test panel or test surface must not display more than 5 % macrofouling on any of the three replicates at the end of the test (ASTM Fouling Rating  $\geq$  95).

### 3.2.3.6 Boat lifting systems

There are floating and overhead beam boat lifting systems. **No efficacy test** is required for these products because any growth of fouling organisms can be excluded if the ship's hull is not in the water.

### 3.2.3.7 Mobile ship cleaning equipment

Efficacy tests for mobile ship cleaning equipment can be carried out using correspondingly loaded test panels or ship tests in accordance with the test method described in Appendix B. The limits for the cleaning interval according to Anhang B7.3.3 must be strictly observed. Other requirements are also placed on these systems (see Paragraph 3.2.4.3).

The following test criteria must be complied with:

#### **Test criterion in seawater or brackish water**

The test panel or test surface must not display more than 25 % macrofouling on any of the three replicates at the end of the test (ASTM Fouling Rating  $\geq$  75).

#### **Test criterion in fresh water**

The test panel or test surface must not display more than 5 % macrofouling on any of the three replicates at the end of the test (ASTM Fouling Rating  $\geq$  95).

### 3.2.3.8 Stationary ship cleaning equipment

Efficacy tests for stationary ship cleaning equipment can only be carried out using ship tests in accordance with the test method described in Appendix B. The cleaning intervals according to Anhang B7.4.3 must be strictly observed. Other requirements are also placed on these systems (see Paragraph 3.2.4.4).

The following test criteria must be complied with:

#### **Test criterion in seawater or brackish water**

The test panel must not display more than 25 % macrofouling on any of the three replicates at the end of the test (ASTM Fouling Rating  $\geq$  75).

### **Test criterion in fresh water**

The test panel must not display more than 5 % macrofouling on any of the three replicates at the end of the test (ASTM Fouling Rating  $\geq$  95).

### **3.2.4 Special system-specific requirements**

Additional system-specific requirements for some product types are defined in Paragraph 3.2.4.

There are no system-specific requirements for the following product types:

- ♦ Coatings and adhesive films
- ♦ Electrical processes with a special coating structure
- ♦ Underwater tarpaulins
- ♦ Ultrasonic systems

Specific requirements must be complied with for the following product types.

#### **3.2.4.1 Cleanable hard coatings**

As cleanable hard coatings do not provide a sufficient antifouling effect or resistance to fouling, it is not necessary to carry out an efficacy test for these coatings. Instead, the resistance to wear of these products must be verified using a modified Taber abrasion test according to ASTM D4060-19 as described in Anhang C. The following test criterion must be complied with:

#### **Test criterion**

The requirements are deemed to have been fulfilled if the abrasion of the tested underwater coating is  $\leq$  50  $\mu$ m and at least 10 % of the original coating thickness remains at the end of the test.

#### **Compliance verification**

*The applicant shall submit a test certificate that confirms compliance with the test criterion and the test method according to Anhang C. The test certificate must be issued by a testing laboratory accredited according to ISO/IEC 17025 for the Taber abrasion test (ASTM D4060-19) or a comparable test method.*

#### **3.2.4.2 Boat lifting systems**

Floating systems can only be certified with the Blue Angel if the floating element is not coated with an antifouling coating containing biocides.

#### **Compliance verification**

*The applicant shall declare compliance with the requirement (Annex 1).*

#### **3.2.4.3 Mobile ship cleaning equipment**

The equipment must have collection and filtration systems to sufficiently retain the cleaned fouling so that they do not pollute the body of water. The filtrate and the filter cake must be disposed of professionally. Any additional general or local regulations must also be observed.



**Test criterion**

The applicant must verify that 95 % of the fouling is collected and not released into the body of water.

**Compliance verification**

*The applicant shall declare compliance with the requirement (Annex 1). The applicant shall submit a test report for this purpose. The test report must be issued by institutions such as classification societies, maritime authorities or independent laboratories.*

**3.2.4.4 Stationary ship cleaning equipment**

The equipment must have collection and filtration systems to sufficiently retain the cleaned fouling so that they do not pollute the body of water. The filtrate and the filter cake must be disposed of professionally. Any additional general or local regulations must also be observed.

**Test criterion**

The applicant must verify that 95 % of the fouling is collected and not released into the body of water.

**Compliance verification**

*The applicant shall declare compliance with the requirement (Annex 1). The applicant shall submit a test report for this purpose. The test report must be issued by institutions such as classification societies, maritime authorities or independent laboratories.*

**3.3 Advertising messages**

The type of underwater coating or antifouling system must be stated in combination with the product designation in a suitable location on the container or packaging.

Advertising messages must not include claims in the sense of Article 25 (4) of the CLP Regulation (EC) No. 1272/2008) that could play down the risks such as e.g. "non-toxic", "non-harmful to health" or similar claims.

Advertising messages that contain terms such as "Bio", "Eco", "Natural" or "Nano" etc. as part of the name or description are not permitted.

**Compliance verification**

*The applicant shall declare compliance with the requirement to the contract (Annex 1) and submit a container text and a technical data sheet.*

**3.4 User information**

The applicant must enclose the product information that is designed to guarantee the safe use of the product and which contains all important information on the operation and use of the product. The system-specific requirements in Paragraphs 3.4.1 to 3.4.3 also apply. A note must be added to the product to indicate that this product may only be used on the exterior of the hull.

### **Compliance verification**

*The applicant shall declare compliance with the requirement (Annex 1) and submit the product information. The applicant shall take measures to ensure that this information is available to end customers via his/her suppliers.*

#### **3.4.1 Underwater coatings**

The main components of the coating system must be stated on the container and in the technical data sheet. If the product is a multi-layer system, all of the layers must be named. In addition to the obligatory P-phrases in accordance with the CLP Regulation (EC) No. 1272/2008, the following must also be stated in an easy to read form (comparable wording / P-phrases are permitted):

- "Keep out of the reach of children"
- "Ensure good ventilation during application and drying"
- "Do not eat, drink or smoke when applying this product"
- "In case of contact with skin or eyes, rinse immediately with plenty of water"
- "Dispose of the contents/container in accordance with the local regulations for waste disposal"

#### **3.4.2 Cleanable hard coatings**

Information must be included with the cleanable hard coatings to explain that these coatings are only effective in combination with regular cleaning. In addition, these products must include recommendations for cleaning intervals and suitable cleaning processes in different types of water and for different activity profiles. The information should include a recommendation that a control panel is hung at the mooring so that the extent of the fouling can be observed more easily.

#### **3.4.3 Mobile ship cleaning equipment and stationary ship cleaning equipment**

A clearly legible note must be displayed in a suitable location to indicate that the use of the cleaning process with antifouling coatings containing biocides is prohibited in Germany without approval from the relevant authorities because environmentally damaging biocides could be released into the body of water.

The note must also indicate that removal of fouling in the water is not permitted if the removed fouling cannot be collected and properly disposed of and if the cleaning water is not purified using suitable treatment processes.

The mobile ship cleaning equipment must be sold together with a cleaning guide that indicates in which types of water the equipment is effective and on what type of coatings the equipment works and also includes precise cleaning instructions and information on the different cleaning intervals depending on the type of water. In addition, the guide should include instructions for maintaining a reporting log in which the dates, locations and number of cleaning processes can be documented. Furthermore, the guide should recommend that additional test panels are hung at the mooring so that the fouling on the test panel can be used to assess whether the ship needs to be cleaned.

### 3.5 Outlook

- In the next revision of the Basic Award Criteria, the theme of nanotechnology will be reevaluated based on the current state of science and technology.
- There are currently no standardised methods for evaluating the effectiveness of products in this niche sector, which is why they have been excluded from the Basic Award Criteria. The situation will be reevaluated for the next revision based on the current state of science and technology.
- In the latest version, it was not possible to include products and systems based on intermediate cleaning due to the lack of standardised test methods. The theme “proof of efficacy with regular intermediate cleaning” will be reevaluated for the next revision based on the current state of science and technology.
- At this point in time, underwater cleaning of boats and ships is not subject to a uniform set of regulations in all German federal states. The requirements for stationary ship cleaning equipment and mobile ship cleaning equipment will be reevaluated in the next revision.
- For the next revision of the Basic Award Criteria, the general requirements (Paragraph 3.1.1) and the requirements according to the regulations on hazardous substances (Paragraph 3.2.1) will be compared with the latest hazard criteria in the CLP Regulation (EG) No 1272/2008 at this point in time.<sup>8</sup>
- In the next revision of the Basic Award Criteria, the extent to which requirements could be placed on ultrasound emissions from ultrasonic systems (e.g. with respect to the frequencies, maximum sound pressure and duration (exposure)) will be examined in order to limit or exclude any noise pollution for aquatic fauna.

## 4 Applicants and associated parties

Manufacturers or distributors of 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 Environment Agency) which after the signing of the contract receives all data and documents submitted in application 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.

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<sup>8</sup> Background: As part of the revision of the CLP Regulation, the EU Commission is planning, amongst other things, to introduce new hazard classes for endocrine disruptors (which e.g. interfere with hormones), (very) persistent and (very) bioaccumulative, toxic chemicals (PBT, vPvB) and (very) persistent and (very) mobile and toxic chemicals (PMT, vPvM). The criteria and thresholds have not yet been defined for the CLP Regulation. However, this combination of properties is already being used today in the process to identify substances as SVHC under REACH and SVHC substances are already used in Point 1 of Paragraph 3.1.1 (general requirements) as an exclusion criteria for the award of the ecolabel if the ready-to-use product or primary products contain any of these substances in a concentration > 0.1 % by mass.

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 31 December 2027.

They shall be extended by periods of one year each, unless terminated in writing by 31 March 2027 or 31 March 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 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 organizations.

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

- Applicant (manufacturer/distributor)
- Brand/trade name, product description
- Distributor (Label User), i.e. the marketing organization.

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## **Anhang A Scope of the product groups**

### **1 Coatings: Non-stick coatings, fibre coatings**

The purpose of the non-stick coating is to prevent the fouling organisms from sticking firmly to the hull so that they are removed at the latest during the next voyage as part of a self-cleaning process. Non-stick coatings are usually based on hydrophobic siloxanes that are increasingly equipped with hydrophilic additives such as hydrogels or lanolin.

Fibre coatings prevent fouling organisms from settling on the surface of the hull because the fibres already cover the available surface area and keep it clear through mutual friction. There are systems with both artificial and natural fibres that are electrically charged and integrated into the epoxy matrix before it has hardened. Both the fibre material and also the epoxy coating must comply with the Blue Angel criteria.

### **2 Adhesive films: Non-stick films, fibre films**

There are adhesive films with a top layer of either silicone or fibres. The adhesive, the film and the top layer must comply with the Blue Angel criteria.

### **3 Cleanable hard coatings**

Cleanable hard coatings do not have a sufficient non-stick effect to clean themselves during the voyage. Therefore, they require regular cleaning. The cleaning interval is dependent on various spatial and temporal factors: the navigated area, travel speed and activity, as well as the time of the year.

They can be epoxy coatings with or without additives. The additives can help to reduce the ability of the fouling organisms to stick to the hull (e.g. graphite) or strengthen the stability of the coating (e.g. glass, ceramic). The matrix and also the additive must comply with the Blue Angel criteria.

### **4 Electrical processes with a special coating structure**

This group of products covers three electrically-induced systems with different working principles: pH fluctuations, UV-C light and laser technology.

The pH value of the coating is fluctuated by periodically inducing a current. The system requires a special coating structure. An isolating layer protects the hull of the ship against the current and any associated corrosion. This is covered by a conducting layer, e.g. made of titanium film. All layers of the coating structure and the electrical process itself must comply with the Blue Angel criteria. For example, the induced current must be so low that no free radicals can be produced on a scale that would classify the system as a biocidal process.

Processes using radiation with UV-C light or laser light are currently in development. These processes can only be evaluated when the working principle has been precisely defined. These systems can only be certified in combination with permitted coatings.

### **5 Underwater tarpaulins**

The underwater tarpaulin product group covers two different principles: In one principle, the underwater tarpaulin is pulled over the hull of the ship like a curtain when the ship is moored to prevent fouling organisms from settling on the hull. In the other principle, boats sail onto a film at the mooring and the fouling organisms are thus rubbed off the hull.

The film material used for the tarpaulins must comply with the Blue Angel criteria in both cases.

## **6 Ultrasonic systems**

In ultrasonic systems, transducers evenly positioned inside the hull send an ultrasonic wave through the hull to prevent fouling. The efficacy criteria can be verified on static panels or hulls that have not been coated with an underwater coating with an antifouling effect.

## **7 Boat lifting systems**

Boat lifting systems lift the hull fully out of the water at the mooring at the ship's home port.

## **8 Mobile ship cleaning equipment**

Mobile ship cleaning equipment is used for the intermediate cleaning of hulls in the water. They are only suitable for use with cleanable hard coatings that are designed to be cleaned with this equipment. This product group only includes mobile ship cleaning equipment that is inserted into the water without lifting the ship out of the water. The removed material must be collected and must not escape into the body of water.

## **9 Stationary ship cleaning equipment**

Stationary ship cleaning equipment is also used for the intermediate cleaning of hulls in the water. They are only suitable for use with cleanable hard coatings that are designed to be cleaned with this equipment. This product group only includes stationary ship cleaning equipment that is inserted into the water without lifting the ship out of the water. The removed material must be collected and must not escape into the body of water.

## **Anhang B Methods for the efficacy tests**

### **1 Test method**

In accordance with the ECHA criteria "Guidance on the Biocidal Products Regulation Volume II Efficacy - Assessment and Evaluation (Parts B+C) Version 3.0 April 2018", the test results can either be produced using a simulated static panel test (1.1) **or** a simulated dynamic panel test on a test stand (1.2) **or** using a real dynamic field test on a ship (1.3).

#### **1.1 Simulated static panel tests**

In the case of simulated static panel tests, the test must be carried out in accordance with the test method ASTM D 3623-78a (2020) "Standard Method for Testing Antifouling Panels in Shallow Submergence". Test panels (3 replicate panels) with a minimum size of 15 \* 25 cm must be produced for this purpose. The three replicates must be exposed to fouling in different ways. This could be placing them in different locations or exposing them to fouling at different water depths and/or light orientations. In contrast to ASTM D 3623-78a (2020), the material used for the test panels can be freely selected. All of the panels must have a suitable primer coating. Systems with a non-stick effect should not be tested using a static panel test because the reduced adhesion of the fouling organisms cannot be taken into account here due to the lack of thresholds in the barnacle adhesion test according to ASTM D5618 – 20 (2020). These types of foul-release coatings should be subjected instead to a dynamic panel test or a ship test.

#### **1.2 Simulated dynamic panel tests**

Verifications should be provided using test panels (3 replicates) produced in accordance with the specifications for the selected test stand including a negative control. The speed and activity level of the test stand must be between 8 and 18 knots.

#### **1.3 Ship test**

Verification tests using test surfaces on ships (vertical midship, at least 100 \* 100 cm) or whole hull coatings should each be completed on three ships. The ships should sail under their normal operating conditions. A maximum of one ship is permitted to sail at a speed of more than 20 knots. Verification can be provided using an *Automatic Identification System (AIS)*, e.g. via *Marine Traffic*. *Marine Traffic* is an open service that manages the positional data and movements of ships.

## **2 Environmental conditions**

### **2.1 General**

The test must be carried out in a body of water containing relevant fouling organisms for at least one fouling season of six months. The test period must include the period of the year with the peak fouling activity.

### **2.2 Seawater and brackish water**

For tests carried out in seawater and brackish water, the test site must be home to barnacles and at least one type of mussel. The salinity at the test site must be at least 18 ‰ according to Watermann et al. (2014).

## **2.3 Fresh water**

For tests carried out in fresh water, the test site must be home to zebra and quagga mussels.

## **3 Test period**

The minimum test period based on the "Guidance on the Biocidal Products Regulation Volume II Efficacy - Assessment and Evaluation (Parts B+C) Version 3.0 April 2018" from the ECHA is six months during the fouling period. The test period must include the month with the peak fouling activity.

## **4 Intermediate cleaning**

No intermediate cleaning is permitted during the test period. As an exception to this rule, Paragraphs 7.3.3 or 7.4.3 apply to mobile ship cleaning equipment and stationary ship cleaning equipment.

## **5 Control tests**

A prerequisite for recognition of the test is that an obligatory negative control is carried out with all three variants (static, dynamic or ship test) to verify the fouling activity in the body of water during the selected test period. Untreated plastic (PVC, PE) or metal panels with a primer coating can be used for the control panels or surfaces.

### **5.1 Simulated static panel tests**

A negative control must also be carried out in parallel to the test panels for verification purposes. The control panel must have a minimum size of 10 \* 10 cm.

#### **Requirement in seawater or brackish water**

In seawater or brackish water, the negative control must have at least 75 % macrofouling (= ASTM Fouling Rating  $\leq$  25) at the end of the test (after six months at the earliest) so that the test can be recognized.

#### **Requirement in fresh water**

In fresh water, the negative control must have at least 10 % macrofouling (ASTM Fouling Rating  $\leq$  90) at the end of the test (after six months at the earliest) so that the test can be recognized.

### **5.2 Simulated dynamic panel tests**

When using dynamic test stands, the negative control must comply with the required dimensions for the relevant test stand.

#### **Requirement in seawater or brackish water**

In seawater or brackish water, the negative control must have at least 75 % macrofouling (= ASTM Fouling Rating  $\leq$  25) at the end of the test (after six months at the earliest) so that the test can be recognized.



### **Requirement in fresh water**

In fresh water, the negative control must have at least 10 % macrofouling (ASTM Fouling Rating  $\leq 90$ ) at the end of the test (after six months at the earliest) so that the test can be recognized.

## **5.3 Ship tests**

The control surfaces on the hulls must have a minimum size of 50 \* 50 cm and be located on a vertical section of the hull.

### **Requirement in seawater or brackish water**

In seawater or brackish water, the negative control must have at least 75 % macrofouling (= ASTM Fouling Rating  $\leq 25$ ) at the end of the test (after six months at the earliest) so that the test can be recognized.

### **Requirement in fresh water**

In fresh water, the negative control must have at least 10 % macrofouling (ASTM Fouling Rating  $\leq 90$ ) at the end of the test (after six months at the earliest) so that the test can be recognized.

### **5.3.1 Control panels at the mooring as negative controls for the ship tests**

As an exception to the rules in 5.3, the reference control panels for the proof of efficacy for underwater tarpaulins can be hung at the mooring.

In the case of mobile ship cleaning equipment and stationary ship cleaning equipment, control panels at the mooring can also be used as the negative control for the proof of efficacy test, as an exception to the rules in 5.3.

The control panels must have a minimum size of 15 \* 25 cm. The following requirements apply to the control panels at the mooring:

### **Requirement in seawater or brackish water**

In seawater or brackish water, the negative control must have at least 75 % macrofouling (= ASTM Fouling Rating  $\leq 25$ ) at the end of the test (after six months at the earliest) so that the test can be recognized.

### **Requirement in fresh water**

In fresh water, the negative control must have at least 10 % macrofouling (ASTM Fouling Rating  $\leq 90$ ) at the end of the test (after six months at the earliest) so that the test can be recognized.

## **6 Evaluation method**

The fouling must be evaluated in accordance with ASTM 6990-20 "Standard Practice for Evaluating Biofouling Resistance and Physical Performance of Marine Coating Systems" or CEPE 2011 "Efficacy evaluation of antifouling products – Conduct and reporting of antifouling efficacy evaluation trials" for all test variants and application areas.

## **7 Deviations**

Deviating or supplementary rules to those stated in Appendix B sections 1-6 apply to the systems in sections 7.1, 7.2, 7.3 and 7.4.

### **7.1 Underwater tarpaulins**

For the efficacy test, the underwater surfaces of the ship must not have an underwater coating with an antifouling effect or an adhesive film. This must be documented in the test report.

### **7.2 Ultrasonic systems**

For simulated static tests and ship tests, the test surfaces must have a minimum size of 50 \* 50 cm and must not have an underwater coating with an antifouling effect or an adhesive film. This must be documented in the test report.

### **7.3 Mobile ship cleaning equipment**

#### **7.3.1 Test system**

Simulated static panel tests and also ship tests can be used for testing mobile ship cleaning equipment.

#### **7.3.2 Requirements for the coating to be cleaned**

The tests must be carried out on an underwater coating that has passed the Taber abrasion test based on the requirements in Paragraph 3.2.4.1 and which has no antifouling effect. Corresponding verification must be enclosed with the test report.

#### **7.3.3 Cleaning interval**

In seawater and brackish water, there must be a gap of at least two weeks between two cleaning steps. In fresh water, there must be a gap of at least two months between two cleaning steps. The cleaning steps must be documented in the test report.

### **7.4 Stationary ship cleaning equipment**

#### **7.4.1 Test system**

In the case of stationary ship cleaning equipment, the efficacy tests can only be carried out in the form of ship tests.

#### **7.4.2 Requirements for the coating to be cleaned**

The tests must be carried out on an underwater coating that has passed the Taber abrasion test based on the requirements in Paragraph 3.2.4.1 and which has no antifouling effect. Corresponding verification must be enclosed with the test report.

#### **7.4.3 Cleaning interval**

In seawater and brackish water, there must be a gap of at least two weeks between two cleaning steps. In fresh water, there must be a gap of at least two months between two cleaning steps. The cleaning steps must be documented in the test report.

## **Anhang C Test method for the abrasion test**

Cleanable hard coatings must pass a Taber abrasion test according to ASTM D4060-19. Abrasive wheels are used in the test to wear the coated surface.

The test should be carried out in accordance with ASTM Method 4060-19 but with the following deviations:

- ◆ Using the CS 10 attachment to clean the coating
- ◆ Weight load of 500 g
- ◆ 10 test procedures at 100 rpm.
- ◆ Coating and panel under water (wet condition)
- ◆ Duration of tests: 15 minutes or 15 x 1 minute per test

## Anhang D Quoted laws and standards, literature

The current versions are stated here. The valid versions of the standards at the time of application will be accepted.

### Laws and secondary regulations

- [1] Chemical directive limiting VOC emissions by restricting the sale of paints and varnishes containing solvents (Directive for solvent-based paints and varnishes - ChemVOCFarbV) from 16 December 2004
- [2] CLP: CLP Regulation (EC) No. 1272/2008 on classification, labelling and packaging of substances and mixtures
- [3] ECHA (2019). Annex XV restriction report for intentionally added microplastics. Version number 1.2, 22 August 2019 <https://echa.europa.eu/documents/10162/05bd96e3-b969-0a7c-c6d0-441182893720>
- [4] TRGS 905. Directory of carcinogenic, mutagenic or teratogenic substances. Edition: March 2016
- [5] 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), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC
- [6] Regulation (EU) No. 528/2012 of the European Parliament and of the Council of 22 May 2012 concerning the making available on the market and use of biocidal products
- [7] Regulation (EU) 2019/1021 of the European Parliament and of the Council of 20 June 2019 on persistent organic pollutants
- [8] 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, amending and repealing Directives 67/548/EEC and 1999/45/EC, as well as amending Regulation (EC) No. 1907/2006

### Ingredients:

- [9] DIN CEN/TS 16637-2: 2014-11. Construction products - Assessment of release of dangerous substances - Part 2: Horizontal dynamic surface leaching test
- [10] DIN CEN/TR 17105: 2018-02. Construction products - Assessment of release of dangerous substances - Guidance on the use of ecotoxicity tests applied to construction products
- [11] DIN EN ISO 11348-1 und -2: 2009-05. Water quality - Determination of the inhibitory effect of water samples on the light emission of *Vibrio fischeri* (Luminescent bacteria test) - Part 1: Method using freshly prepared bacteria, Part 2: Method using liquid-dried bacteria.
- [12] DIN EN ISO 8692: 2012-06. Water quality - Fresh water algal growth inhibition test with unicellular green algae
- [13] DIN EN ISO 6341: 2013-01. Water quality - Determination of the inhibition of the mobility of *Daphnia magna* Straus (Cladocera, Crustacea) - Acute toxicity test
- [14] DIN EN ISO 8692:2012-06. Water quality- Fresh water algal growth inhibition test with unicellular green algae (ISO 8692:2012);
- [15] DIN EN ISO 11890-1:2007-09. Paints and varnishes - Determination of volatile organic compound (VOC) content - Part 1: Difference method (ISO 11890-1:2007)

- [16]** DIN EN ISO 11890-2:2020-12. Paints and varnishes - Determination of volatile organic compounds (VOC) and/or semi volatile organic compounds (SVOC) content - Part 2: Gas-chromatographic method (ISO 11890-2:2020)
- [17]** DIN EN ISO 15088:2009-06. Water quality - Determination of the acute toxicity of waste water to zebrafish eggs (*Danio rerio*) (ISO 15088:2007)
- [18]** ISO 13829: 2000-03. Water quality - Determination of the genotoxicity of water and waste water using the umu-test

**Efficacy:**

- [19]** ASTM D3623 - 78a (2020). Standard Test Method for Testing Antifouling Panels in Shallow Submergence
- [20]** ASTM D6990 - 20 (2020). Standard Practice for Evaluating Biofouling Resistance and Physical Performance of Marine Coating Systems
- [21]** CEPE (2012). Efficacy evaluation of antifouling products - Conduct and reporting of static raft tests for antifouling efficacy. First approved in 2011-04, revised in 2012-06
- [22]** ASTM D4060-19. Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser
- [23]** ASTM D5618 - 20 (2020). Standard Test Method for Measurement of Barnacle Adhesion Strength in Shear
- [24]** Watermann, B., D. Daehne, C. Fürle, A. Thomsen (2014): Sicherung der Verlässlichkeit der Antifouling-Expositionsschätzung im Rahmen des EU-Biozid-Zulassungsverfahrens auf Basis der aktuellen Situation in deutschen Binnengewässern für die Verwendungsphase im Bereich Sportboothäfen (Validation of the reliability of antifouling exposure assessments for use in marinas as part of the EU authorization process for biocidal products based on the current situation in German inland waterways)

## Anhang E Assignment of hazard categories and hazard information

The following table assigns the hazard categories stated in Paragraph 3.1.1 to the corresponding hazard statements (H Phrases) according to the CLP Regulation (EC) No. 1272/2008.

Hazard category	H Phrases	Hazard statements
<b>Carcinogenic substances</b>		
Carc. 1A	H350	May cause cancer.
Carc. 1B	H350	May cause cancer.
Carc. 1A, 1B	H350i	May cause cancer if inhaled.
Carc. 2 <sup>9</sup>	H351	Suspected of causing cancer
<b>Germ cell mutagenic substances</b>		
Muta. 1A	H340	May cause genetic defects.
Muta. 1B	H340	May cause genetic defects.
Muta. 2	H341	Suspected of causing genetic defects
<b>Reprotoxic (teratogenic) substances</b>		
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	H361	Suspected of damaging fertility or the unborn child.
<b>Acute toxicity substances</b>		
Acute Tox. 1	H300	Fatal if swallowed
Acute Tox. 2	H300	
Acute Tox. 3	H301	
Acute Tox. 1	H310	Fatal in contact with skin
Acute Tox. 2	H310	
Acute Tox. 3	H311	
Acute Tox. 1	H330	Fatal if inhaled
Acute Tox. 2	H330	
Acute Tox. 3	H331	
<b>Environmental hazards</b>		
Ozone 1	H420	Harms public health and the environment by destroying ozone in the upper atmosphere.

<sup>9</sup> An exception is made for titanium dioxide if the product is sold as a liquid mixture or in a solid and not in powder form because this classification is only based on the respirable dust.

## Anhang F Assignment of hazard categories and hazard information

The following table shows the hazard categories and the corresponding hazard statements (H Phrases) according to the CLP Regulation (EC) No. 1272/2008 for the requirements in Paragraph 3.2.1 for the product.

<b>Hazard category</b>	<b>H Phrases</b>	<b>Hazard statements</b>
<b>Environmental hazards</b>		
Aquatic acute 1	H400	Very toxic to aquatic life.
Aquatic chronic 1	H410	Very toxic to aquatic life with long-lasting effects.
Aquatic chronic 2	H411	Toxic to aquatic organisms with long-lasting effects.
Aquatic chronic 3	H412	Toxic to aquatic organisms with long-lasting effects.
Aquatic chronic 4	H413	May cause long lasting harmful effects to aquatic organisms.