

Safety Data Sheet

according to UK REACH Regulation

Black Devil Bluing solution

Revision date: 27.03.2023

Product code: 0243

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SECTION 1: Identification of the substance/mixture and of the company/undertaking**1.1. Product identifier**

Black Devil Bluing solution

UFI: 2TYP-9PUN-300H-TV50

1.2. Relevant identified uses of the substance or mixture and uses advised against**Use of the substance/mixture**

Metal surface treatment products

Uses advised against

No further relevant information available.

1.3. Details of the supplier of the safety data sheet

Company name:	MARAWE GmbH & Co. KG	
Street:	Donaustauer Str. 378 - Gebäude 64	
Place:	D-93055 Regensburg	
Telephone:	+49 941 / 29020439	Telefax: +49 941 / 29020593
e-mail:	info@marawe.de	
Contact person:	Product safety department	
Internet:	www.marawe.de	

1.4. Emergency telephone number:+49 941 / 29020439,
Mon-Thu 9:00 - 16:00; Fri 9:00 - 14:00**SECTION 2: Hazards identification****2.1. Classification of the substance or mixture****GB CLP Regulation**Met. Corr. 1; H290
Aquatic Chronic 3; H412

Full text of hazard statements: see SECTION 16.

2.2. Label elements**GB CLP Regulation****Signal word:** Warning**Hazard statements**H290 May be corrosive to metals.
H412 Harmful to aquatic life with long lasting effects.**Precautionary statements**P101 If medical advice is needed, have product container or label at hand.
P102 Keep out of reach of children.
P234 Keep only in original packaging.
P273 Avoid release to the environment.
P390 Absorb spillage to prevent material damage.
P501 Dispose of contents/container to an appropriate recycling or disposal facility according to local/national regulations.**SECTION 3: Composition/information on ingredients****3.2. Mixtures**

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Hazardous components

CAS No	Chemical name			Quantity
	EC No	Index No	REACH No	
	Classification (GB CLP Regulation)			
7775-09-9	sodium chlorate			1.9 - < 5 %
	231-887-4		01-2119474389-23	
	Ox. Sol. 1, Acute Tox. 4, Aquatic Chronic 2; H271 H302 H411			
7664-38-2	phosphoric acid; orthophosphoric acid			1.9 - < 5 %
	231-633-2		01-2119485924-24	
	Met. Corr. 1, Acute Tox. 4, Skin Corr. 1B, Eye Dam. 1; H290 H302 H314 H318			
7681-49-4	sodium fluoride			1 - < 1.9 %
	231-667-8			
	Acute Tox. 3, Skin Irrit. 2, Eye Irrit. 2; H301 H315 H319 EUH032			
7446-08-4	Seleniumdioxide			< 1 %
	231-194-7		01-2120089867-33	
	Acute Tox. 2, Acute Tox. 3, Skin Corr. 1B, Eye Dam. 1, STOT RE 2, Aquatic Acute 1, Aquatic Chronic 1; H330 H301 H314 H318 H373 H400 H410			
7758-99-8	copper sulphate pentahydrate			< 1 %
	231-847-6		01-2119520566-40	
	Acute Tox. 4, Eye Dam. 1, Aquatic Acute 1, Aquatic Chronic 1; H302 H318 H400 H410			

Full text of H and EUH statements: see section 16.

Specific Conc. Limits, M-factors and ATE

CAS No	EC No	Chemical name	Quantity
	Specific Conc. Limits, M-factors and ATE		
7775-09-9	231-887-4	sodium chlorate	1.9 - < 5 %
	oral: LD50 = 1200 mg/kg		
7664-38-2	231-633-2	phosphoric acid; orthophosphoric acid	1.9 - < 5 %
	dermal: LD50 = 2740 mg/kg; oral: LD50 = 850 mg/kg Skin Corr. 1B; H314: >= 25 - 100 Skin Irrit. 2; H315: >= 10 - < 25 Eye Irrit. 2; H319: >= 10 - < 25		
7681-49-4	231-667-8	sodium fluoride	1 - < 1.9 %
	oral: LD50 = 148,5 mg/kg		
7446-08-4	231-194-7	Seleniumdioxide	< 1 %
	inhalation: LC50 = 0,51 mg/l (vapours); inhalation: LC50 = 0,052 - 0,51 mg/l (dusts or mists); oral: LD50 = 68,1 mg/kg M acute; H400: M=1 M chron.; H410: M=1		
7758-99-8	231-847-6	copper sulphate pentahydrate	< 1 %
	oral: LD50 = 300 mg/kg M acute; H400: M=10		

SECTION 4: First aid measures
4.1. Description of first aid measures
General information

This product contains selenium dioxide. Selenium dioxide can be absorbed by skin and can damage the nerves. Absolutely avoid contaminations. Don't use on aluminium, as this can create the highly toxic hydrogen selenide!

After inhalation

Provide fresh air. When in doubt or if symptoms are observed, get medical advice.

After contact with skin

After contact with skin, wash immediately with plenty of water and soap. Take off immediately all contaminated

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clothing and wash it before reuse. In case of troubles or persistent symptoms, consult a doctor.

After contact with eyes

In case of contact with eyes flush immediately with plenty of flowing water for 10 to 15 minutes holding eyelids apart and consult an ophthalmologist. Remove contact lenses, if present and easy to do.

After ingestion

Do NOT induce vomiting. Rinse mouth immediately and drink 1 glass of water.

4.2. Most important symptoms and effects, both acute and delayed

No information available.

4.3. Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

SECTION 5: Firefighting measures**5.1. Extinguishing media****Suitable extinguishing media**

The product itself does not burn. Co-ordinate fire-fighting measures to the fire surroundings.

Unsuitable extinguishing media

High power water jet.

5.2. Special hazards arising from the substance or mixture

Non-flammable. Ambient fire may liberate hazardous vapours.

5.3. Advice for firefighters

Wear a self-contained breathing apparatus and chemical protective clothing. Full protection suit.

Additional information

Use water spray jet to protect personnel and to cool endangered containers. Suppress gases/vapours/mists with water spray jet. Collect contaminated fire extinguishing water separately. Do not allow entering drains or surface water.

SECTION 6: Accidental release measures**6.1. Personal precautions, protective equipment and emergency procedures****General advice**

Provide adequate ventilation. Do not breathe gas/fumes/vapour/spray. Avoid contact with skin, eyes and clothes. Use personal protection equipment. If local exhaust ventilation is not possible or not sufficient, the entire working area should be ventilated by technical means.

6.2. Environmental precautions

Do not allow to enter into surface water or drains.

6.3. Methods and material for containment and cleaning up**For cleaning up**

Absorb with liquid-binding material (sand, diatomaceous earth, acid- or universal binding agents). Treat the recovered material as prescribed in the section on waste disposal.

6.4. Reference to other sections

Safe handling: see section 7

Personal protection equipment: see section 8

Disposal: see section 13

SECTION 7: Handling and storage**7.1. Precautions for safe handling****Advice on safe handling**

If local exhaust ventilation is not possible or not sufficient, the entire working area should be ventilated by technical means.

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Advice on protection against fire and explosion

No special fire protection measures are necessary.

Advice on general occupational hygiene

Remove contaminated, saturated clothing immediately. Draw up and observe skin protection programme. Wash hands and face before breaks and after work and take a shower if necessary. When using do not eat, drink, smoke, sniff.

7.2. Conditions for safe storage, including any incompatibilities

Requirements for storage rooms and vessels

Keep container tightly closed. Unsuitable container/equipment material: Metal.

Hints on joint storage

The regulations of the Ordinance on Hazardous Substances with its respective technical rules (TRGS 510) have to be respected.
Store away from food.

Further information on storage conditions

Make sure spills can be contained, e.g. in sump pallets or kerbed areas.

7.3. Specific end use(s)

Water-based surface treatment agents, solvent-free

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Exposure limits (EH40)

CAS No	Substance	ppm	mg/m ³	fibres/ml	Category	Origin
-	Nickel and its inorganic compounds (except nickel tetracarbonyl): water-soluble nickel compounds (as Ni)	-	0.1		TWA (8 h)	WEL
7664-38-2	Orthophosphoric acid	-	1		TWA (8 h)	WEL
		-	2		STEL (15 min)	WEL
-	Selenium and compounds, except hydrogen selenide (as Se)	-	0.1		TWA (8 h)	WEL

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DNEL/DMEL values

CAS No	Substance	Exposure route	Effect	Value
7775-09-9	sodium chlorate			
Consumer DNEL, long-term		oral	systemic	0,05 mg/kg bw/day
Worker DNEL, long-term		dermal	systemic	3,08 mg/kg bw/day
Worker DNEL, long-term		inhalation	systemic	5 mg/m ³
7664-38-2	phosphoric acid; orthophosphoric acid			
Worker DNEL, acute		inhalation	local	2 mg/m ³
Worker DNEL, long-term		inhalation	local	1 mg/m ³
Worker DNEL, long-term		inhalation	systemic	10,7 mg/m ³
Consumer DNEL, long-term		inhalation	local	0,36 mg/m ³
Consumer DNEL, long-term		inhalation	systemic	4,57 mg/m ³
Consumer DNEL, long-term		dermal	systemic	0,1 mg/kg bw/day
7681-49-4	sodium fluoride			
Worker DNEL, long-term		dermal	systemic	0,36 mg/kg bw/day
Worker DNEL, acute		inhalation	systemic	2,5 mg/m ³
Worker DNEL, long-term		inhalation	local	2,5 mg/m ³
7446-08-4	Seleniumdioxide			
Worker DNEL, long-term		dermal	systemic	9,8 mg/kg bw/day
Worker DNEL, long-term		inhalation	systemic	0,07 mg/m ³
Consumer DNEL, long-term		oral	systemic	0,00602 mg/kg bw/day
Consumer DNEL, long-term		dermal	systemic	6,02 mg/kg bw/day
Consumer DNEL, long-term		inhalation	systemic	0,021 mg/m ³

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PNEC values

CAS No	Substance	Value
Environmental compartment		
7775-09-9	sodium chlorate	
Freshwater		1 mg/l
Marine water		1 mg/l
Secondary poisoning		10 mg/kg
Micro-organisms in sewage treatment plants (STP)		100 mg/l
Soil		3,33 mg/kg
7681-49-4	sodium fluoride	
Freshwater		0,9 mg/l
Micro-organisms in sewage treatment plants (STP)		51 mg/l
Soil		11 mg/kg
7446-08-4	Seleniumdioxide	
Freshwater		0,00374 mg/l
Freshwater (intermittent releases)		0,0077 mg/l
Marine water		0,0028 mg/l
Freshwater sediment		11,48 mg/kg
Marine sediment		8,68 mg/kg
Secondary poisoning		1,4 mg/kg
Soil		0,06 mg/kg

8.2. Exposure controls



Appropriate engineering controls

If handled uncovered, arrangements with local exhaust ventilation have to be used. Do not breathe gas/fumes/vapour/spray.

Individual protection measures, such as personal protective equipment

Eye/face protection

Wear eye/face protection.

Hand protection

When handling with chemical substances, protective gloves must be worn with the CE-label including the four control digits. The quality of the protective gloves resistant to chemicals must be chosen as a function of the specific working place concentration and quantity of hazardous substances. For special purposes, it is recommended to check the resistance to chemicals of the protective gloves mentioned above together with the supplier of these gloves.

Skin protection

Wear suitable protective clothing and eye/face protection.

Respiratory protection

In case of inadequate ventilation wear respiratory protection.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state:

Liquid

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Colour: light blue
Odour: odourless

Changes in the physical state

Melting point/freezing point: not determined
Boiling point or initial boiling point and boiling range: >100 °C
Flash point: >60 °C

Flammability

Solid/liquid: not applicable
Gas: not applicable

Explosive properties

The product is not: Explosive.

Lower explosion limits: not determined
Upper explosion limits: not determined

Self-ignition temperature

Solid: not applicable
Gas: not applicable

Decomposition temperature: not determined

pH-Value (at 25 °C): 2,5 - 3,5

Viscosity / dynamic:
(at 20 °C) <1,0 mPa·s

Water solubility: easily soluble

Solubility in other solvents

not determined

Partition coefficient n-octanol/water: not determined

Vapour pressure:
(at 20 °C) >20 hPa

Density (at 20 °C): not determined

Relative vapour density: not determined

9.2. Other information**Information with regard to physical hazard classes**

Oxidizing properties
The product is not: oxidising.

Other safety characteristics

Solid content: not determined
Evaporation rate: not determined

Further Information**SECTION 10: Stability and reactivity****10.1. Reactivity**

Corrosive to metals.

10.2. Chemical stability

The product is stable under storage at normal ambient temperatures.

10.3. Possibility of hazardous reactions

This product contains selenium dioxide. Selenium dioxide can be absorbed by skin and can damage the nerves. Absolutely avoid contaminations. Don't use on aluminium, as this can create the highly toxic hydrogen

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selenide!

10.4. Conditions to avoid

none

10.5. Incompatible materials

Not suited for the application on base metals (e.g. aluminium, zinc).

10.6. Hazardous decomposition products

No known hazardous decomposition products.

SECTION 11: Toxicological information

11.1. Information on hazard classes as defined in GB CLP Regulation

Acute toxicity

Based on available data, the classification criteria are not met.

CAS No	Chemical name				
	Exposure route	Dose	Species	Source	Method
7775-09-9	sodium chlorate				
	oral	LD50 1200 mg/kg	Rat	Manufacturer	
7664-38-2	phosphoric acid; orthophosphoric acid				
	oral	LD50 850 mg/kg	Rat	Manufacturer	
	dermal	LD50 2740 mg/kg	Rabbit	Manufacturer	
7681-49-4	sodium fluoride				
	oral	LD50 148,5 mg/kg	Rat	OPPTS 870 1100	
7446-08-4	Seleniumdioxide				
	oral	LD50 68,1 mg/kg	Rat	Manufacturer	
	inhalation (4 h) vapour	LC50 0,51 mg/l			
	inhalation (4 h) dust/mist	LC50 0,052 - 0,51 mg/l		Manufacturer	
7758-99-8	copper sulphate pentahydrate				
	oral	LD50 300 mg/kg	Rat	Manufacturer	

Irritation and corrosivity

Based on available data, the classification criteria are not met.

Sensitising effects

Based on available data, the classification criteria are not met.

Carcinogenic/mutagenic/toxic effects for reproduction

Based on available data, the classification criteria are not met.

STOT-single exposure

Based on available data, the classification criteria are not met.

STOT-repeated exposure

Based on available data, the classification criteria are not met.

Aspiration hazard

Based on available data, the classification criteria are not met.

Additional information on tests

The mixture is classified as hazardous according to regulation (EC) No 1272/2008 [CLP].

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SECTION 12: Ecological information
12.1. Toxicity

Harmful to aquatic life with long lasting effects.

CAS No	Chemical name					
	Aquatic toxicity	Dose	[h] [d]	Species	Source	Method
7775-09-9	sodium chlorate					
	Acute fish toxicity	LC50 > 1000 mg/l	96 h	Daphnia magna (Big water flea)	Manufacturer	
	Acute algae toxicity	ErC50 129 mg/l	72 h	Pseudokirchneriella subcapitata	Manufacturer	
7664-38-2	phosphoric acid; orthophosphoric acid					
	Acute fish toxicity	LC50 3 mg/l	96 h	Lepomis macrochirus (Bluegill)	Manufacturer	
	Acute algae toxicity	ErC50 >100 mg/l	72 h	Desmodesmus subspicatus	Manufacturer	OECD 201
	Acute crustacea toxicity	EC50 >100 mg/l	48 h	Daphnia magna (Big water flea)	Manufacturer	OECD 202
	Acute bacteria toxicity	(EC50 >1000 mg/l)	3 h	Activated sludge	Manufacturer	OECD 209
7681-49-4	sodium fluoride					
	Acute fish toxicity	LC50 51 mg/l	96 h	unspecified	Manufacturer	
	Acute algae toxicity	ErC50 43 - 122 mg/l	96 h	unspecified	Manufacturer	
	Acute crustacea toxicity	EC50 26 - 48 mg/l	48 h	Daphnia magna (Big water flea)	Manufacturer	
7446-08-4	Seleniumdioxide					
	Acute fish toxicity	LC50 2,9 mg/l	96 h	Pimephales promelas (fathead minnow)	Manufacturer	
	Acute algae toxicity	ErC50 0,11 mg/l	72 h	Desmodesmus subspicatus	Manufacturer	
	Acute crustacea toxicity	EC50 4,8 mg/l	48 h	Daphnia magna (Big water flea)	Manufacturer	
7758-99-8	copper sulphate pentahydrate					
	Acute fish toxicity	LC50 < 1 mg/l	96 h		Manufacturer	

12.2. Persistence and degradability

The product has not been tested.

12.3. Bioaccumulative potential

The product has not been tested.

BCF

CAS No	Chemical name	BCF	Species	Source
7446-08-4	Seleniumdioxide	944		

12.4. Mobility in soil

The product has not been tested.

12.5. Results of PBT and vPvB assessment

The substances in the mixture do not meet the PBT/vPvB criteria according to UK REACH.

The product has not been tested.

12.6. Endocrine disrupting properties

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This product does not contain a substance that has endocrine disrupting properties with respect to non-target organisms as no components meets the criteria.

12.7. Other adverse effects

No information available.

Further information

Do not allow to enter into surface water or drains. Do not allow to enter into soil/subsoil.

SECTION 13: Disposal considerations**13.1. Waste treatment methods****Disposal recommendations**

Do not allow to enter into surface water or drains. Do not allow to enter into soil/subsoil. Dispose of waste according to applicable legislation.

List of Wastes Code - residues/unused products

060313 WASTES FROM INORGANIC CHEMICAL PROCESSES; wastes from the MFSU of salts and their solutions and metallic oxides; solid salts and solutions containing heavy metals; hazardous waste

List of Wastes Code - used product

060313 WASTES FROM INORGANIC CHEMICAL PROCESSES; wastes from the MFSU of salts and their solutions and metallic oxides; solid salts and solutions containing heavy metals; hazardous waste

List of Wastes Code - contaminated packaging

060313 WASTES FROM INORGANIC CHEMICAL PROCESSES; wastes from the MFSU of salts and their solutions and metallic oxides; solid salts and solutions containing heavy metals; hazardous waste

Contaminated packaging

Non-contaminated packages may be recycled. Handle contaminated packages in the same way as the substance itself.

SECTION 14: Transport information**Land transport (ADR/RID)****14.1. UN number or ID number:**

UN 3082

14.2. UN proper shipping name:ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.
(CONTAINS COPPER SULFATE, SELENIUM DIOXIDE)**14.3. Transport hazard class(es):**

9

14.4. Packing group:

III

Hazard label:

9



Classification code:

M6

Special Provisions:

274 335 375 601

Limited quantity:

5 L

Excepted quantity:

E1

Transport category:

3

Hazard No:

90

Tunnel restriction code:

-

Inland waterways transport (ADN)**14.1. UN number or ID number:**

UN 3082

14.2. UN proper shipping name:ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.
(CONTAINS COPPER SULFATE, SELENIUM DIOXIDE)**14.3. Transport hazard class(es):**

9

14.4. Packing group:

III

Hazard label:

9

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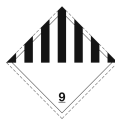
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Classification code:	M6
Special Provisions:	274 335 375 601
Limited quantity:	5 L
Excepted quantity:	E1

Marine transport (IMDG)

<u>14.1. UN number or ID number:</u>	UN 3082
<u>14.2. UN proper shipping name:</u>	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (CONTAINS COPPER SULFATE, SELENIUM DIOXIDE)
<u>14.3. Transport hazard class(es):</u>	9
<u>14.4. Packing group:</u>	III
Hazard label:	9



Special Provisions:	274, 335, 969
Limited quantity:	5 L
Excepted quantity:	E1
EmS:	F-A, S-F

Air transport (ICAO-TI/IATA-DGR)

<u>14.1. UN number or ID number:</u>	UN 3082
<u>14.2. UN proper shipping name:</u>	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (CONTAINS COPPER SULFATE, SELENIUM DIOXIDE)
<u>14.3. Transport hazard class(es):</u>	9
<u>14.4. Packing group:</u>	III
Hazard label:	9



Special Provisions:	A97 A158 A197 A215
Limited quantity Passenger:	30 kg G
Passenger LQ:	Y964
Excepted quantity:	E1
IATA-packing instructions - Passenger:	964
IATA-max. quantity - Passenger:	450 L
IATA-packing instructions - Cargo:	964
IATA-max. quantity - Cargo:	450 L

14.5. Environmental hazards

ENVIRONMENTALLY HAZARDOUS:	No
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14.6. Special precautions for user

No information available.

14.7. Maritime transport in bulk according to IMO instruments

not applicable

SECTION 15: Regulatory information
15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture
EU regulatory information

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Restrictions on use (REACH, annex XVII):

Entry 3, Entry 27

Information according to 2012/18/EU
(SEVESO III):

Not subject to 2012/18/EU (SEVESO III)

National regulatory information

Employment restrictions:

Observe restrictions to employment for juveniles according to the 'juvenile work protection guideline' (94/33/EC).

Water hazard class (D):

2 - obviously hazardous to water

Skin resorption/Sensitization:

Causes allergic hypersensitivity reactions.

15.2. Chemical safety assessment

Chemical safety assessments for substances in this mixture were not carried out.

SECTION 16: Other information**Abbreviations and acronyms**ADR: Accord européen sur le transport des marchandises dangereuses par Route
(European Agreement concerning the International Carriage of Dangerous Goods by Road)

IMDG: International Maritime Code for Dangerous Goods

IATA: International Air Transport Association

GHS: Globally Harmonized System of Classification and Labelling of Chemicals

EINECS: European Inventory of Existing Commercial Chemical Substances

ELINCS: European List of Notified Chemical Substances

CAS: Chemical Abstracts Service

LC50: Lethal concentration, 50%

LD50: Lethal dose, 50%

CLP: Classification, labelling and Packaging

REACH: Registration, Evaluation and Authorization of Chemicals

GHS: Globally Harmonised System of Classification, Labelling and Packaging of Chemicals

UN: United Nations

DNEL: Derived No Effect Level

DMEL: Derived Minimal Effect Level

PNEC: Predicted No Effect Concentration

ATE: Acute toxicity estimate

LL50: Lethal loading, 50%

EL50: Effect loading, 50%

EC50: Effective Concentration 50%

ErC50: Effective Concentration 50%, growth rate

NOEC: No Observed Effect Concentration

BCF: Bio-concentration factor

PBT: persistent, bioaccumulative, toxic

vPvB: very persistent, very bioaccumulative

RID: Regulations concerning the international carriage of dangerous goods by rail

ADN: European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways
(Accord européen relatif au transport international des marchandises dangereuses par voies de navigation
intérieures)

EmS: Emergency Schedules

MFAG: Medical First Aid Guide

ICAO: International Civil Aviation Organization

MARPOL: International Convention for the Prevention of Marine Pollution from Ships

IBC: Intermediate Bulk Container

SVHC: Substance of Very High Concern

For abbreviations and acronyms, see table at <http://abbrev.esdscom.eu>

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Classification for mixtures and used evaluation method according to GB CLP Regulation

Classification	Classification procedure
Met. Corr. 1; H290	On basis of test data
Aquatic Chronic 3; H412	Calculation method

Relevant H and EUH statements (number and full text)

H271	May cause fire or explosion; strong oxidiser.
H290	May be corrosive to metals.
H301	Toxic if swallowed.
H302	Harmful if swallowed.
H314	Causes severe skin burns and eye damage.
H315	Causes skin irritation.
H318	Causes serious eye damage.
H319	Causes serious eye irritation.
H330	Fatal if inhaled.
H373	May cause damage to organs through prolonged or repeated exposure.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.
H411	Toxic to aquatic life with long lasting effects.
H412	Harmful to aquatic life with long lasting effects.
EUH032	Contact with acids liberates very toxic gas.

Further Information

The information is based on the present level of our knowledge. It does not, however, give assurance of product properties and establishes no contract legal rights. The receiver of our product is singularly responsible for adhering to existing laws and regulations.

(The data for the hazardous ingredients were taken respectively from the last version of the sub-contractor's safety data sheet.)