



## SAFETY DATA SHEET-extended

Prepared in accordance with Commission Regulation (EU) 830/2015, amending Regulation 1907/2006, REACH

### n-BUTANOL

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## 1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

### 1.1. Substance Identification

Trade name	n-Butanol
IUPAC name	Butan-1-ol
Synonym	1-Butanol, propyl carbinol
EINECS (EC no)	200-751-6
CAS	71-36-3
Index no.	603-004-00-6
Molecular Formula	C <sub>4</sub> H <sub>10</sub> O
Molecular weight	74.12
REACH Registration number	01-2119484630-38-0014
Type of substance	Organic Mono-constituent substance

### 1.2. Relevant identified uses of the substance or mixture and uses advised against

Extraction agent for perfumes and oils  
Solvent for laquers based on nitrocellulose and alkyd resins  
Raw material for vitamins, hormones and plasticizers  
Use as wax, oil and camphor solvent.  
Raw material for preparation of resole and ether cellulose substance.

#### Relevant identified uses

Industrial use [SU3, SU8, SU9] Manufacturing of substances [PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC15]

Industrial use [SU3, SU8, SU9]; Use as intermediate [PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC9]

Industrial use [SU3,SU10] Formulation & Repacking of substances and mixture (PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC 9, PROC15)

Industrial use [SU3, SU8, SU9]; Distribution of substance [PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC9, PROC15]

Industrial use [SU3] Use in coatings (paints, ink, toners, adhesives) [PROC1, PROC2, PROC3, PROC4, PROC5, PROC7, PROC8a, PROC8b, PROC9, PROC10, PROC13, PROC15]

Industrial use [SU3] ; Use cleaning agents [PROC1, PROC2, PROC3, PROC4, PROC7, PROC8a, PROC8b, PROC9, PROC10, PROC13]

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Industrial use [SU3] ; Use in lubricants [PROC1, PROC2, PROC3, PROC4, PROC7, PROC8a, PROC8b, PROC9, PROC10, PROC13, PROC17, PROC18]

Industrial use [SU3]; Metal working fluids/rolling oils [PROC1, PROC2, PROC3, PROC5, PROC7, PROC8a, PROC8b, PROC9, PROC10, PROC13, PROC17]

Professional use [SU 22]; Distribution of the substance [PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC9, PROC15]

Professional use [SU 22]; Use in coatings (paints, ink, toners, adhesives) [PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC10, PROC11, PROC13, PROC15, PROC19]

Professional use [SU 22]; Use cleaning agents [PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC9, PROC10, PROC11]

Professional use [SU 22]; Use in lubricants [PROC1, PROC2, PROC3, PROC8a, PROC8b, PROC9, PROC10, PROC11, PROC13, PROC17, PROC18, PROC20]

Professional use [SU 22]; Metal working fluids/rolling oils [PROC1, PROC2, PROC3, PROC8a, PROC8b, PROC10, PROC11, PROC13, PROC17]

Professional use [SU 22]; Use in laboratories [PROC10, PROC15]

Consumer Use [21]; Use in coatings (paints, ink, toners, adhesives) [PC1, PC4, PC9, PC15, PC18, PC23, PC24, PC31]

Consumer Use [21]; Use cleaning agents [PC4, PC9, PC24, PC35, PC38]

Consumer Use [21]; Use in lubricants [PC1, PC24, PC31, PC35]

Consumer Use [21]; Use as consumer care product or disinfectant [PC28, PC39]

**Uses advised against:** No uses advised against.

### 1.3. Details of the supplier of the safety data sheet

Name	S.C. OLTCHIM S.A
Address	1 Uzinei Street, 240050 Ramnicu Valcea, Romania
Phone N°	+40 250 701 200
FAX N°	+40 250 735 030
E-mail of competent person responsible for SDS in the MS or in the EU:	tehnic@oltchim.com

### 1.4. Emergency telephone number

European Emergency N°:	112
Emergency telephone at the company:	+40/250/738141- available 24h/day/365days



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For Romania- The institution responsible with providing information in case of a health emergency is The National Institute for Public Health, Department for the International Sanitary Regulation and Toxicological Information.

Telephone: 021.318.36.06,  
Opening hours: Monday -  
Friday from 8 a.m. to 3 p.m.

## 2. HAZARD IDENTIFICATION

### 2.1. Classification of the substances or the mixture

#### 2.1.1. Classification according to Regulation (EC) 1272/2008 (CLP)

Flam. Liquid 3- H226

Acute Tox. 4- H302

Skin Irritation 2 -H315

Eye Damage 1 - H318STOT Single Exp. 3 - H335

STOT Single Exp. 3 -H336

### 2.2. Label elements

Labeling according to Regulation (EC) 1272/2008

Signal word: Danger

Hazard pictogram:

GHS02: flame



GHS05: corrosion



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GHS07: exclamation mark



### Hazard statements:

H226: Flammable liquid and vapour.  
H302: Harmful if swallowed.  
H335: May cause respiratory irritation.  
H315: Causes skin irritation.  
H318: Causes serious eye damage.  
H336: May cause drowsiness or dizziness.

### Precautionary statements:

P210: Keep away from heat/sparks/open flames/hot surfaces. No smoking.  
P233: Keep container tightly closed.  
P240: Ground/bond container and receiving equipment.  
P241: Use explosion-proof electrical/ventilating/lighting equipment.  
P242: Use only non-sparking tools.  
P280: Wear protective gloves/protective clothing/eye protection/face protection.  
P303+P361+P353: IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.  
P370+P378: In case of fire: Use water spray, alcohol-resistant foam, carbon dioxide for extinction.  
P403+P235: Store in a well-ventilated place. Keep cool.  
P501: Dispose of absorbed material in accordance with regulations.

**2.3. Other effects:** The substance does not fulfil the PBT criteria (not PBT) and not the vPvB criteria (not vPvB). n-Butanol is a combustible and flammable liquid, sensible to static discharges. Both vapours and liquid are flammable.

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### 3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical name	CAS no	EC No	Index no.	Concentration (%)
n-Butanol	71-36-3	200-751-6	603-004-00-6	Min.99.5



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### Impurities

No impurities relevant for classification and labeling.

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## 4. FIRST - AID MEASURES

### 4.1 Description of first aid measures

**General Advice:** IF exposed or if you feel unwell: Call a Poison Center or doctor/physician. Show this safety data sheet to the doctor in attendance.

**Following inhalation:** Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult give oxygen. Keep person warm and at rest. Call a physician.

**Following skin contact:** Wash the contaminated skin with plenty of soap or mild detergent and water for at least 15 minutes while removing contaminated clothing and shoes. If irritation persists after washing, get medical attention.

**Following eye contact:** Wash the eyes immediately with large amount of water lifting the upper and lower lids, until no evidence of chemical remains at least 15-20 minutes. If irritation persists after washing get medical attention. Contact lenses should not worn with this product.

**Following ingestion:** Remove ingested material by gastric lavage or emesis. Get medical attention. Administration of gastric lavage is permitted by qualified medic personnel. Nothing will be orally administrated to person unconscious or in convulsions.

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

By inhalation: n-Butanol is irritant/narcotic. Inhalation of high concentrations of vapors may cause irritation of the respiratory tract with sore throat, coughing, shortness of breath, headaches, nausea, dizziness, dullness, narcosis. It is absorbed into the sanguine system with symptoms like those of ingestion.

By skin contact: n-Butanol has an irritating and deggreasing effect. May cause skin sensibilization and allergic reactions.

By eye contact: Vapors are irritating for the eyes, causing tears and aches. Splashing causes eyes inflammation and visual rabblement

By ingestion: May cause abdominal pain, headache, nausea and diarrhoea. Large doses affect liver and kidnees. May have narcotic effect.



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Chronic effects: Prolonged inhalation has caused auditory nerve and vestibular injury resulting in severe vertigo and hearing loss in workers exposed to 1-butanol. Repeated or prolonged contact may degrease the skin resulting in drying, cracking and eczematoid dermatitis. Person with pre-existing skin disorders or eye problems or impaired liver, kidney or respiratory function may be more susceptible to the effects of the substance.

### 4.3 Indication of immediate medical attention and special treatment needed

Keep the victim warmed. Treat symptomatically and supportively. symptomatic treatment should include, above all, measured of support as correction of hydro electrolytic and metabolic disturbances and respiratory failure.

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## 5. FIRE - FIGHTING MEASURES

### 5.1 Extinguishing media

**Suitable extinguishing media:** Large fire: foam.

Small fire: Dry chemical, carbon dioxide, sand, earth

Dry chemical powder extinguishers are recommended particularly when fires involve "live" electrical equipment, because the powder is non-conducting.

For maintaining the tanks cool, use sprayed water.

**Unsuitable extinguishing media:** Do not use water streams, since the streams will scatter and spread the fire.

**Exposure hazards:** n-Butanol is a combustible and flammable liquid, sensible to static discharges. Dangerous fire hazard when exposed to heat and flame. Vapor-air mixtures are explosive above flash point. Vapours may travel considerable far distances.

In the event of a fire, move the containers from fire area, if you can do it without risks. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from the area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to.

Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire.

**Hazardous combustion products:** Carbon monoxide and carbon dioxide.



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### 5.3 Advice for firefighters

**Protection of fire-fighters:** Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. Clothing for firefighters (including helmets, protective boots and gloves) conforming to European standard EN 469 will provide a basic level of protection for chemical incidents.

**Remarks:** FLAMMABLE!! VAPORS CAN CAUSE FLASH FIRE.

Isolate from inorganic acids (hazardous of explosion), heat, sparks, electric equipment & open flame. Closed containers may explode if exposed to extreme heat.

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## 6. ACCIDENTAL RELEASE MEASURES

### 6.1. Personal precautions, protective equipment and emergency procedures

**For non-emergency personnel:** Keep unnecessary and unprotected personnel away from entering. Avoid contact with skin, eyes, and clothing – wear suitable protective equipment (see section 8). Do not touch or walk through spill material. Shut off all ignition sources.

**For emergency responders:** Ventilate area of leak or spill. Persons performing clean-up work should wear adequate personal protective equipment and a self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Remove all sources of ignition.

### 6.2. Environmental precautions

Environmental precautions: Stop leak and use water spray to reduce vapors. Prevent from contamination the ground and the surface waters by isolating the hazard area. Contain and recover liquid when possible. Keep closed containers and dispose according to all applicable federal, state or local environment regulations

### 6.3. Methods and materials for containment and cleaning up

Methods of cleaning up: Contain and recover liquid when possible. Use water spray to reduce vapors. For small spills, take up with sand or other absorbent material (e.g. vermiculite, earth) and place in a chemical waste container. For large spills, dike for ahead of spill for later disposal.



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**Special precautions:** Do not use combustible materials, such as saw dust. Do not flush to sewer!  
Use only non sparking tools and equipment.

### 6.4 Reference to other sections

Additional advice: Refer to section 8, 13.

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## 7. HANDLING AND STORAGE

### 7.1. Precautions for safe handling

**Protective measures:** Protect against physical damage. Sources of ignition such as smoking and open flames are prohibited where n-butanol is used, handled or stored in a manner that could create a potential fire or explosion hazard. Metal containers should be bonded and grounded for transfers to avoid static sparks. When handling this product use non-sparking type tools and equipment, including proof ventilation. Do not use compressed air or oxygen for filling, discharging or handling. The personnel which handling the product must wear protective equipment.

**Advice on general occupational hygiene:** Avoid inhalation or ingestion and contact with skin and eyes. General occupational hygiene measures are required to ensure safe handling of the substance. These measures involve good personal and housekeeping practices (i.e. regular cleaning with suitable cleaning devices), no drinking, eating and smoking at the workplace. Shower and change clothes at end of work shift. Do not wear contaminated clothing at home.

### 7.2. Conditions for safe storage, including any incompatibilities

**Storage:** Store in a cool, dry well-ventilated location, away from any area where fire may be acute. Separate from incompatibles. Storage and use area should be No Smoking areas. Drums must be equipped with self-closing valves, nitrogen blanket. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

Incompatible materials: inorganic acids, oxidizers, easily dehydrate in the presence of catalyzers (aluminium, magnesium chloride).

Incompatible materials for storage: metals are insensible to 1-butanol action.

### 7.3. Specific end use(s)

Please check the identified uses from Section 1.2.

For more information please see the relevant exposure scenario, available via your supplier/given in the Annex I.



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### 8 . EXPOSURE CONTROLS / PERSONAL PROTECTION

#### 8.1 Control parameters

##### 8.1.1. Occupational Exposure limit values

###### Exposure limit values

STEL: 150 ppm (450 mg/m<sup>3</sup>)

OEL AUSTRIA: TWA 100 ppm ( 300 mg/m<sup>3</sup>)

OEL BELGIUM: TWA 50ppm (150 mg/ m<sup>3</sup>)

OEL DENMARK: TWA 50 ppm (150 mg/m<sup>3</sup>)

SKIN OEL FRANCE: TWA 100 ppm (300mg/ m<sup>3</sup>)

OEL GERMANY: TWA 100 ppm (300mg/ m<sup>3</sup>)

OEL THE NETHERLANDS: TWA 100 ppm (300mg/ m<sup>3</sup>)

##### 8.1.2. Information on monitoring procedures

**Substance name:** n-Butanol - EC no: 200-751-6; CAS no.: 71-36-3

##### DN(M)EL(s) for workers

Exposure pattern	Route	DNEL / DMEL	Justification
Acute - systemic effects	Dermal	N/A	Hazard sufficiently covered by derivation of the respective DNEL for long term inhalative exposure/ local effects.
Acute - systemic effects	Inhalation	N/A	Hazard sufficiently covered by derivation of the respective DNEL for long term exposure/ local effects.
Acute - local effects	Dermal	N/A	Hazard sufficiently covered by derivation of the respective DNEL for long term inhalative exposure.
Acute - local effects	Inhalation	N/A	Hazard sufficiently covered by derivation of the respective DNEL for long term exposure.
Long-term - systemic effects	Dermal	N/A	Hazard sufficiently covered by derivation of the respective DNEL for inhalative exposure/ local effects.
Long-term - systemic effects	Inhalation	N/A	Hazard sufficiently covered by derivation of the respective DNEL for local effects.
Long-term - local effects	Dermal	N/A	Hazard sufficiently covered by derivation of the respective DNEL for inhalative exposure.
Long-term - local effects	Inhalation	310 mg/m <sup>3</sup>	



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**DN(M)EL(s) for**

Exposure pattern	Route	DNEL / DMEL	Justification
Acute - systemic effects	Dermal	N/A	Hazard sufficiently covered by derivation of the respective DNEL for long term inhalative exposure/ local effects.
Acute - systemic effects	Inhalation	N/A	Hazard sufficiently covered by derivation of the respective DNEL for long term exposure/ local effects.
Acute - systemic effects	Oral	N/A	Hazard sufficiently covered by derivation of the respective DNEL for long term oral exposure/ systemic effects.
Acute - local effects	Dermal	N/A	Hazard sufficiently covered by derivation of the respective DNEL for long term inhalative exposure.
Acute - local effects	Inhalation	N/A	Hazard sufficiently covered by derivation of the respective DNEL for long term exposure.
Long-term - systemic effects	Dermal	N/A	Hazard sufficiently covered by derivation of the respective DNEL for inhalative exposure/ local effects.
Long-term - systemic effects	Inhalation	N/A	Hazard sufficiently covered by derivation of the respective DNEL for local effects.
Long-term - systemic effects	Oral	3.125 mg/kg bw/day	
Long-term - local effects	Dermal		Hazard sufficiently covered by derivation of the respective DNEL for inhalative exposure.
Long-term - local effects	Inhalation	55 mg/m <sup>3</sup>	

**PNECs**

Environmental protection target	PNEC
Freshwater (mg/l)	0.082
Freshwater sediments (mg/kg ww)	0.178
Marine water (mg/l)	0.0082
Marine sediments (mg/kg sediment dw)	0.0178
Soil (mg/kg soil dw)	0.015
STP (mg/l)	2476

**8.2 Exposure controls**

**Appropriate engineering controls:** A system of local and/or general exhaust is recommended to keep employee exposure as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its sources, preventing dispersions of it into the



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general work area. Ventilation equipment should be explosion- proof if explosive concentration of vapors or fume are present.

### 8.2.2. Personal Protection Equipment

**Eye / Face protection :** Use chemical safety goggles and/or a full face shield where splashing is possible. Avoid using contact lenses at work. Equipment for eye protection should be tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). The working area will be equipped with eyewash fountains

**Skin protection:** Complete suit protecting against chemicals (solvent resistant). Flame retardant antistatic protective clothing. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace. Do not take contaminated work clothes home, family members could be exposed.

**Hand protection:** Gloves tightness must be checked before use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. The selected protective gloves have to satisfy the specifications of EU Directive 89/686/EEC and the standard EN 374 derived from it.

Recommended material: nitrile rubber, neoprene rubber

The following materials are suitable for protective gloves (Permeation time  $\geq$  8 hours):

Polychloroprene - CR (0,5 mm)

Nitrile rubber/Nitrile latex - NBR (0,35 mm)

Butyl rubber - Butyl (0,5 mm)

Fluoro carbon rubber - FKM (0,4 mm)

Natural rubber and PVC are unsuitable for protective gloves because of degradation, severe swelling or low permeation time.

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. Above recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

**Respiratory protection:** If the exposure limit is exceeded, wear a supplied air, full-face piece self contained breathing apparatus.

Organic vapor respirator with a particulate pre-filter may be worn if vapors are detected or irritating. For emergency conditions, use an approved positive-pressure self-contained breathing apparatus. In confined or poorly ventilated areas, use an approved self-contained breathing apparatus or positive pressure air line with auxiliary self-contained air supply.



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*Warning! Air purifying respirators do not protect workers in oxygen-deficient atmospheres.*

**Environmental Exposure Control:** It is recommendable to develop a monitoring plan in order to maintain the releases in the environment below the maximum allowed concentrations, complying with local, regional, regional and national legislation.

**Other precautions:** Maintain shower, eye wash fountain and quick-drench facilities in work area.

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**9. PHYSICAL AND CHEMICAL PROPERTIES****General informations**

Appearance    Clear colorless liquid  
Odor     Alcohol like

**Important health, safety and environmental informations**

pH    7 (for 70 g/l solution at la 20°C)  
Boiling point                                        119° C, at 1013.25 hPa  
Flash point                                         35°C (c.c.), at 1013 hPa  
Flammability                                        Flammable upon ignition. The substance has no pyrophoric properties and does not liberate flammable gases on contact with water.  
Upper/lower flammability or explosive limits:  
1.4 – 11.2% (LEL, UEL)  
Explosive properties                              non explosive  
Oxidizing properties                              No oxidizing properties  
Vapor pressure at 20 °C                         < 10 hPa at 20 °C  
Specific gravity (water=1) at 20° C            0,8098  
Solubility - water                                 66 g/l, at 20° C  
                                  -ethanol, ether         freely soluble  
Partition coefficient (log K<sub>ow</sub>)                 1la 25° C  
Dynamic viscosity                                2.947 mPa/s at 20° C  
Vapor relative density (air=1)                 2,55  
Evaporation rate (BuAc=1)                    0.01

**Other informations**

Melting/freezing point                         < -90° C  
Self-ignition temperature                      355° C at 1013 hPa



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### 10. STABILITY AND REACTIVITY

**10.1. Reactivity:** See section 10.5.

**10.2. Chemical stability:** Stable under normal conditions of use and storage. It easily dehydrate at temperatures of 175-400°C in the presence of catalyzers (aluminum, magnesium chloride) forming butenes.

**10.3. Possibility of hazardous reactions:**

- oxidizers (strong): transforms 1-butanol in butyric acid;
- easily dehydrate in the presence of catalyzers (aluminium, magnesium chloride)
- inorganic acids: hazardous of explosion;

**10.4. Conditions to avoid:** Heat, flame, sources of ignition and incompatibles.

**10.5. Incompatible materials:** Strong oxidizers, catalyst such as aluminum, magnesium chloride, inorganic acids, halogens, aluminum, alkali metals, chromium trioxide.

### 11. TOXICOLOGICAL INFORMATION

	Conclusions
<b>Absorbtion</b>	Ready absorption through the skin, intestinal tract and lungs dermal: dog: 8.8 mg/min*cm2 over 60 min
<b>Acute toxicity</b>	<u>Oral route:</u> Rat: LD50=2290 mg/kg bw (similar OECD 401) n-Butanol is classified according to the Annex I of 67/548/EEC as "harmful if swallowed" (R22), corresponding to Cat. 4 following 1272/2008/EC (CLP) requirements. <u>Inhalation route:</u> rats LC0 >= 17.76 mg/l/ 4 h (similar OECD 403) Due to very low inhalative toxicity, butan-1-ol has not to be classified according to 67/548/EEC and 1272/2008/EC (CLP) requirements. <u>Dermal route:</u> Rabbits: LD50= 3430 mg/kg bw (similar OECD 402) Due to the slight dermal toxicity of butan-1-ol (rabbit LD50 ca. 3430 mg/kg bw), the substance has not to be classified according to 67/548/EEC and 1272/2008/EC (CLP) requirements.
<b>Irritation/Corrosion</b>	<u>Skin</u>



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	<p>rabbit, 24 h, occlusive: irritating rabbit, 4 h, semioclusive: not irritating (pure substance; GLP, OECD 404) n-Butanol is classified as skin irritant (R 38 according to Annex I of 67/548/EEC and Cat. 2 according to 1272/2008/EC (CLP) criteria, respectively.</p> <p><u>Eye</u> rabbit, 24 h, 0.1 mL: risk of serious eye damage due to irreversible effects after 7 d observation period (OECD 405, GLP) rabbit, 24 h, 0.1 mL: irritating due to reversible effects within 21 d (OECD 405, GLP) human, 10 a study on workers: No effects on human eyes in concentrations <math>\leq 310 \text{ mg/m}^3</math> (= 100 ppm; Sterner et. al. 1949; see chapter 7.10.5) butan-1-ol is classified as risk for serious eye damage (R41) according to Annex I of 67/548/EEC and has to be classified as Cat. 1 according to 1272/2008/EC (CLP) requirements</p> <p><u>Respiratory tract</u> Human, 3-5 min: irritating effects on nose and throat (Nelson et al. 1943) Rat, inhalation hazard test, 7 h: irritating effects on the respiratory system (BASF 1980) n-Butanol is classified as irritant to the respiratory system (R37, according to Annex I of 67/548/EEC) and has to be classified as STOT Single Exposure Cat. 3 according to 1272/2008/EC (CLP) requirements.</p>
<b>Sensitisation</b>	Butan-1-ol has not to be classified as skin sensitiser according to according to 67/548/EEC and 1272/2008/EC (CLP) requirements..
<b>Repeated dose toxicity</b>	<p><u>Oral route</u> rat, 90d: NOAEL = 125 mg/kg bw (based on CNS effects; US EPA 1986)</p> <p><u>Dermal route</u> rabbit, 12*5h, occlusive: drying of the skin (no systemic toxicity observed; Omie et al. 1949)</p> <p><u>Inhalation route</u> rat, 90 d, vapour: NOAEL systemic = 2.35 mg/L, corresponding to 500 ppm No need for classification of butan-1 -ol for repeated dose systemic toxicity. Repeated dermal application can cause skin dryness.</p>
<b>Mutagenity</b>	The available data demonstrate that butan-1 -ol has no genotoxic



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	potential neither in vitro nor in vivo, therefore no classification is required according to 67/548/EEC and 1272/2008/EC (CLP) requirements
<b>Carcinogenity</b>	No cancerogenic potential of butan-1-ol.
<b>Toxicity for reproduction</b>	Butan-1-ol caused no fetotoxic or teratogenic effects.

## 12. ECOLOGICAL INFORMATIONS

### 12.1. Toxicity

#### Acute (short-term) toxicity

##### Fish

*Pimephales promelas*/Fresh water/static      LC50 (96 h)= 1376 mg/L  
n-Butanol is acutely not harmful to fish.

##### Aquatic invertebrates

*Daphnia magna*//Fresh water/static      EC50 (48 h): 1328 mg/L

##### Aquatic invertebrates:

*Daphnia magna*//Fresh water/semi-static      NOEC (21 d): 4.1 mg/L

##### Algae and aquatic plants

*Selenastrum capricornutum* (new name: *Pseudokirchnerella subcapitata*) /fresh water/static  
EC50 (96 h): 225 mg/L  
n-Butanol is acutely not harmful to aquatic algae.

##### Long-term toxicity to fish

Data waiving: a long-term toxicity study in fish is not provided.

##### Toxicity to sediment

Substance is not persistent in sediment. No requirement under REACH.

##### Toxicity to soil macro-organisms

The substance however, exhibits little potential for adsorption, is not bioaccumulative and readily biodegradable.



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### Toxicity to terrestrial plants

*Lactuca sativa*: EC50 (3 d): ca. 390 mg/l

The substance has no potential for adsorption to soils, is not bioaccumulative and readily biodegradable.

### **12.2. Persistence and degradability:**

Abiotic degradation: substance is readily biodegradable.

Biodegradation: The test substance is readily biodegradable according to OECD criteria.

### **12.3. Bioaccumulative potential:**

Due to the low log Pow (0.81), accumulation in organisms is not to be expected.

### **12.4. Mobility**

Air: After evaporation or exposure to the air, the product will be slowly degraded by photochemical processes. Half-life (DT50):46 — 53.5 h

Water: When dissolved in water the substance will not significantly evaporate into air (Henry's Law constant < 1 Pa m<sup>3</sup>/mol). In general, the main target for environmental distribution will be water.

Soil and sediments: Based upon a calculated log Koc adsorption to solid soil phase is not expected.

### **12.5. Results of PBT and vPvB assessment:**

n-Butanol does not fulfil the PBT criteria (not PBT) and not the vPvB criteria (not vPvB).

**PBT** : No.

P: No. B: No. T: Yes.

**vPvB** : No.

vP: No. vB: No

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## **13. DISPOSAL CONSIDERATIONS**

This section contains generic advice and guidance.

### **13.1 Waste treatment methods**

#### **13.1.1 Product**

Methods of disposal : The generation of waste should be avoided or minimised wherever possible.

Empty containers or liners may retain some product residues. This material and its container must be



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disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spill material and runoff and contact with soil, waterways, drains and sewers.

**Waste Code:** No waste key number as per the European Waste Types List can be assigned to this product, since such classification is based on the (as yet undetermined) use to which the product is put by the consumer.

### 13.1.2. Packaging

Methods of disposal : The generation of waste should be avoided or minimised wherever possible. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible.

#### Relevant European legislation regarding waste:

Directive 2008/98/EC on waste (Waste framework Directive)

Directive 2008/532/EC replacing Decision 94/3/EC establishing a list of wastes pursuant to Article 1(a) of Council Directive 75/442/EEC on waste and Council Decision 94/904/EC establishing a list of hazardous waste pursuant to Article 1(4) of Council Directive 91/689/EEC on hazardous waste  
Regulation (Ec) No 1013/2006 of the European Parliament and of the Council on shipments of waste, with subsequent modifications and additions

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## 14. TRANSPORT INFORMATION

n-Butanol can be shipped according to transport regulations for dangerous goods, hazard class 3, Flammable Liquids.

### Transport Labeling



**Label no.3**  
**Flammable liquids**



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**RID/ADR**

UN No.	1120
Proper shipping name	Butanols, N.S.A, n-Butanol
Hazard class	3
UN Packing Group	III
Classification code	F1

*Danger panel*    **30/1120**    (*Hazard Identification No.*    **30**)  
(*UN Identification No*    **1120**)

**IMDG/IMO**

UN No.	1120
Hazard class	3
UN Packing Group	III
Proper shipping name	Butanols,NSA, n-Butanol
EmS No.	F-E, S-D
Marine pollutant	No

**IATA/IT-ICAO**

Proper shipping name	Butanols,N.S.A, n-Butanol
UN No.	1120
Hazard class	3
UN Packing Group	III
IATA Label	Flammable Liquid
Packaging Note Passenger	309
Packaging Note Cargo	310
Max. Quantity Passenger	60 l
Max. Quantity Cargo	220 l

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**15. REGULATORY INFORMATION****15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture**Relevant information regarding the European legislation

EU Regulation (EC) No. 1907/2006 (REACH) Regulation (EC) no.1907/2006 of the European Parliament and of the Council regarding the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH) Regulation



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Regulation (EC) no.1272/2008 of the European Parliament and of the Council on the Classification, Labeling and Packaging of substances and mixtures.

Directive 2012/18/EU (SEVESO III) of the European Parliament and of the Council on the control of major-accident hazards involving dangerous substances, amending and subsequently repealing Council Directive 96/82/EC

Regulation (EC) No 1005/2009 of the European Parliament and of the Council on substances that deplete the ozone layer

European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR)

Regulation referring to the International Carriage of Dangerous Goods by Rail (RID)

International Maritime Dangerous Goods (IMDG)

EU Regulation (EC) No. 1907/2006 (REACH)

### **Annex XIV - List of substances subject to authorization**

Substances of very high concern (Authorizations): n-Butanol is not subject to authorization

### **Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles**

Restrictions on use:                    see Restriction 40 from Anex XVII.

Directive 2012/18/EU -SEVESO III Directive- n-Butanol is listed on Annex I Part 1 in Sections P5a, P5b, P5c.

WGK (Germany):                    WGK 1 low hazard to water

**Other EU regulations:** n-Butanol is not subject to:

Regulation (EC) No 1005/2009 on substances that deplete the ozone layer

Regulation (EC) No 850/2004 on persistent organic pollutants

Regulation (EC) No 649/2012 concerning the export and import of dangerous chemicals

### **15.2 Chemical safety Assessment Assessment**

A chemical safety assessment has been carried out for this substance and a CSR was issued.

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## **16. OTHER INFORMATION**

### **16.1. Full text of H-Statements referred to under sections 2 and 3**

H226: Flammable liquid and vapour.

H302: Harmful if swallowed.

H315: Causes skin irritation.

H318: Causes serious eye damage.



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H335: May cause respiratory irritation.

H336: May cause drowsiness or dizziness.

### **16. 2. Abbreviation and acronyms (NOT ALL ARE USED IN THIS SDS)**

ADR European agreement concerning the international carriage of dangerous goods by road

BSAF Bio soil accumulation factor

BCF Bio concentration factor

CAS Chemical Abstracts Service

CLP Classification, labelling and packaging

CMR Carcinogenic, mutagenic or toxic for reproduction

CSA/CSR Chemical safety assessment / Chemical safety report

DNEL Derived no effect level

EC10 Concentration of a substance where 10% of the population is affected

EC50 Concentration of a substance where 50% of the population is affected

ECHA European chemicals agency

EINECS EU list of existing chemical substances

EmS Emergency schedule

ERC Environmental release category

ES Exposure scenario

eSDS Extended safety data sheet

GHS Globally harmonised system

IATA-DGR International air transport association - dangerous goods regulations

ICAO Technical Instructions for the Safe Transport of Dangerous Goods by Air

IU Identified use

IUPAC International Union of Pure and Applied Chemistry

IBC code International code for the construction and equipment of ships carrying dangerous chemicals in bulk

IMDG International maritime dangerous goods

KP Partition coefficient

LC10 Lethal concentration of a substance that can be expected to cause death in 10% of the population

LC50 Lethal concentration of a substance that can be expected to cause death in 50% of the population

LD50 Lethal dose of a substance that can be expected to cause death in 50% of the population

NO(A)EC No observed (adverse) effect concentration

NO(A)EL No observed (adverse) effect level

OECD Organisation for economic co-operation and development

OEL Occupational exposure limit

PBT Persistent, bioaccumulative, and toxic



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PC Product category  
PNEC Predicted no-effect concentration  
PROC Process category  
REACH Registration, evaluation, authorisation and restriction of chemicals (i.e. Regulation (EC) No. 1907/2006)  
RID International rule for transport of dangerous substances by railway  
SDS Safety data sheet  
STOT Specific target organ toxicant  
STP Sewage treatment plant  
SU Sector of end use  
TWA Time weighted average  
vPvB Very persistent, very bioaccumulative

### 16.3. Key literature references

The information provided in this eSDS is consistent with the information provided in the REACH CSR. The CSR contains a complete reference list for all data used. Non confidential data from the REACH registration dossier are published by the ECHA, see <https://echa.europa.eu/information-on-chemicals/registered-substances>, [http://echa.europa.eu/clp/c\\_1\\_inventory\\_en.asp](http://echa.europa.eu/clp/c_1_inventory_en.asp)  
<http://chelist.jrc.ec.europa.eu>  
<http://www.dguv.de/ifa/gestis/gestis-stoffdatenbank/index-2.jsp> (GESTIS chemicals database)

### 16.4. Revision: Revision 5 replace revision dated November 23, 2015 .

Section 1.2, 3, 8, 12, 15, 16 of this safety data sheet have been revised according to the provision of Regulation (EC) No. 1907/2006, as amended by Regulation 830/2015. The information provided in this SDS is consistent with the information provided in the REACH CSR for n-butanol.

#### Disclaimer:

*Oltchim provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. Furthermore, this safety data sheet is made up based on the legal requirements as set by EC 1907/2006 (REACH) and EC Regulation 830/2015.*

### Annex I to this SDS –Exposure scenario



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**ANNEX I- EXPOSURE SCENARIO****1.ES1- Manufacture of butan-1-ol (Industrial)**

<b>Section 1</b>		<b>Exposure Scenario Title</b>
Title	<b>Manufacture of butan-1-ol; CAS: 71-36-3</b>	
Use Descriptor	Sector of Use: Industrial (SU3, SU8, SU9)	
	Process Categories: PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC15	
	Environmental Release Categories: ERC1, ERC4, ERC6a	
Processes, tasks, activities covered	Use as process chemical or extraction agent. Includes recycling/ recovery, material transfers, storage, maintenance and loading (including marine vessel/barge, road/rail car and bulk container), sampling and associated laboratory activities	
<b>Section 2</b>		<b>Operational conditions and risk management measures</b>
<b>Section 2.1</b>		<b>Control of worker exposure</b>
<b>Product characteristics</b>		
Physical form of product	Liquid, vapour pressure 0.5 - 10 kPa [OC4].	
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) [G13].	
Amounts used	<i>Not applicable</i>	
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]	
Human factors not influenced by risk management	<i>Not applicable</i>	
Other Operational Conditions affecting worker exposure	Assumes a good basic standard of occupational hygiene is implemented [G1]. Assumes activities are at ambient temperature (unless stated differently) [G17]. Operation is carried out at elevated temperature (> 20°C above ambient temperature) [OC7]. (PROC 17, PROC18)	
<b>Contributing Scenarios</b>	<b>PROCs</b>	<b>Risk Management Measures</b>



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General exposures (closed systems) [CS15]. Continuous process [CS54].	1	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
General exposures (closed systems) [CS15]. Continuous process [CS54]. With sample collection [CS56]. Equipment cleaning and maintenance [CS39].	2	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
General exposures (closed systems) [CS15]. Batch process [CS55]. With sample collection [CS56].	3	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
General exposures (open systems) [CS16]. Batch process [CS55]. With sample collection [CS56].	4	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
Transfer from/pouring from containers [CS22]. Non-dedicated facility [CS82]	8a	Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 90%) Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
Transfer from/pouring from containers [CS22]. Dedicated facility [CS81]	8b	Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 97%) Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
Laboratory activities [CS36]. Small scale [CS61].	15	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>

<sup>#1</sup> refers to qualitative assessment



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**2. ES2 – Use as intermediate (Industrial)**

<b>Section 1</b>		<b>Exposure Scenario Title</b>
Title	<b>Use as intermediate; CAS: 71-36-3</b>	
Use Descriptor	Sector of Use: Industrial (SU3, SU8, SU9)	
	Process Categories: PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC9	
	Environmental Release Categories: ERC6a	
Processes, tasks, activities covered	Use as intermediate. Includes recycling/ recovery, material transfers, storage, maintenance and loading (including marine vessel/barge, road/rail car and bulk container), sampling and associated laboratory activities	
<b>Section 2</b>	<b>Operational conditions and risk management measures</b>	
<b>Section 2.1</b>	<b>Control of worker exposure</b>	
<b>Product characteristics</b>		
Physical form of product	Liquid, vapour pressure 0.5 - 10 kPa [OC4].	
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) [G13].	
Amounts used	<i>Not applicable</i>	
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]	
Human factors not influenced by risk management	<i>Not applicable</i>	
Other Operational Conditions affecting worker exposure	Assumes a good basic standard of occupational hygiene is implemented [G1]. Assumes activities are at ambient temperature (unless stated differently) [G17]. Operation is carried out at elevated temperature (> 20°C above ambient temperature) [OC7]. (PROC17, PROC18)	
<b>Contributing Scenarios</b>	<b>PROCs</b>	<b>Risk Management Measures</b>
General exposures (closed systems) [CS15]. Continuous process [CS54].	1	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>



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General exposures (closed systems) [CS15]. Continuous process [CS54]. With sample collection [CS56]. Equipment cleaning and maintenance [CS39].	2	Minimization of manual phases. #1 Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Use suitable eye protection and gloves [PPE14]. #1
General exposures (closed systems) [CS15]. Batch process [CS55]. With sample collection [CS56].	3	Minimization of manual phases. #1 Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Use suitable eye protection and gloves [PPE14]. #1
General exposures (open systems) [CS16]. Batch process [CS55]. With sample collection [CS56].	4	Minimization of manual phases. #1 Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Use suitable eye protection and gloves [PPE14]. #1
Transfer from/pouring from containers [CS22]. Non-dedicated facility [CS82].	8a	Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 90%) Minimization of manual phases. #1 Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Use suitable eye protection and gloves [PPE14]. #1
Transfer from/pouring from containers [CS22]. Dedicated facility [CS81].	8b	Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 97%) Minimization of manual phases. #1 Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Use suitable eye protection and gloves [PPE14]. #1
Pouring from small containers [CS9]. Dedicated facility [CS81].	9	Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 90%) Minimization of manual phases. #1 Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Use suitable eye protection and gloves [PPE14]. #1

#1 refers to qualitative assessment



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**3. ES3 – Formulation & (re)packing of substances and mixtures (Industrial)**

<b>Section 1</b>		<b>Exposure Scenario Title</b>
Title	<b>Formulation &amp; (re)packing of substances and mixtures; CAS: 71-36-3</b>	
Use Descriptor	Sector of Use: Industrial (SU3, SU10)	
	Process Categories: PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC 14, PROC15	
	Environmental Release Categories: ERC 2	
Processes, tasks, activities covered	Formulation, packing and re-packing of the substance and its mixtures in batch or continuous operations, including storage, materials transfers, mixing, large and small scale packing, maintenance and associated laboratory activities	
<b>Section 2</b>		<b>Operational conditions and risk management measures</b>
<b>Section 2.1</b>		<b>Control of worker exposure</b>
<b>Product characteristics</b>		
Physical form of product	Liquid, vapour pressure 0.5 - 10 kPa [OC4].	
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) [G13].	
Amounts used	<i>Not applicable</i>	
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]	
Human factors not influenced by risk management	<i>Not applicable</i>	
Other Operational Conditions affecting worker exposure	Assumes a good basic standard of occupational hygiene is implemented [G1]. Assumes activities are at ambient temperature (unless stated differently) [G17]. Operation is carried out at elevated temperature (> 20°C above ambient temperature) [OC7]. (PROC17, PROC18)	
<b>Contributing Scenarios</b>	<b>PROCs</b>	<b>Risk Management Measures</b>
General exposures (closed systems) [CS15]. Continuous process [CS54].	1	Minimization of manual phases <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>



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General exposures (closed systems) [CS15]. Continuous process [CS54]. With sample collection [CS56]. Equipment cleaning and maintenance [CS39].	2	Minimization of manual phases. #1 Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Use suitable eye protection and gloves [PPE14]. #1
General exposures (closed systems) [CS15]. Batch process [CS55]. With sample collection [CS56].	3	Minimization of manual phases. #1 Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Use suitable eye protection and gloves [PPE14]. #1
General exposures (open systems) [CS16]. Batch process [CS55]. With sample collection [CS56].	4	Minimization of manual phases. #1 Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Use suitable eye protection and gloves [PPE14]. #1
Batch process [CS55]. Mixing operations (open systems) [CS30].	5	Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 90%) Minimization of manual phases. #1 Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Use suitable eye protection and gloves [PPE14]. #1
Transfer from/pouring from containers [CS22]. Non-dedicated facility [CS82].	8a	Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 90%) Minimization of manual phases. #1 Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Use suitable eye protection and gloves [PPE14]. #1
Transfer from/pouring from containers [CS22]. Dedicated facility [CS81].	8b	Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 97%) Minimization of manual phases. #1 Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Use suitable eye protection and gloves [PPE14]. #1
Pouring from small containers [CS9]. Dedicated facility [CS81].	9	Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 90%) Minimization of manual phases. #1 Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Use suitable eye protection and gloves [PPE14]. #1



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Laboratory activities [CS36]. Small scale [CS61].	15	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
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<sup>#1</sup> refers to qualitative assessment

#### 4. ES4 – Distribution of butan-1-ol (Industrial)

Section 1		Exposure Scenario Title
Title	Distribution of substance; CAS: 71-36-3	
Use Descriptor	Sector of Use: Industrial (SU3, SU8, SU9)	
	Process Categories: PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC9, PROC15	
	Environmental Release Categories: ERC1, ERC2	
Processes, tasks, activities covered	Loading (including marine vessel/barge, rail/road car and IBC loading) and repacking (including drums and small packs) of substance, including its distribution and associated laboratory activities	
Section 2		Operational conditions and risk management measures
Section 2.1		Control of worker exposure
Product characteristics		
Physical form of product	Liquid, vapour pressure 0.5 - 10 kPa [OC4].	
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) [G13].	
Amounts used	<i>Not applicable</i>	
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]	
Human factors not influenced by risk management	<i>Not applicable</i>	
Other Operational Conditions affecting worker exposure	Assumes a good basic standard of occupational hygiene is implemented [G1]. Assumes activities are at ambient temperature (unless stated differently) [G17]. Operation is carried out at elevated temperature (> 20°C above ambient temperature) [OC7]. (PROC17, PROC18)	
Contributing Scenarios	PROCs	Risk Management Measures



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General exposures (closed systems) [CS15]. Continuous process [CS54].	1	<p>Minimization of manual phases.<sup>#1</sup> Avoid frequent and direct contact with substance.<sup>#1</sup></p> <p>Supervision in place to check that the RMMs in place are being used correctly and OCs followed.<sup>#1</sup></p> <p>Use suitable eye protection and gloves [PPE14].<sup>#1</sup></p>
General exposures (closed systems) [CS15]. ; Continuous process [CS54]. With sample collection [CS56]. ; Equipment cleaning and maintenance [CS39].	2	<p>Minimization of manual phases.<sup>#1</sup> Avoid frequent and direct contact with substance.<sup>#1</sup></p> <p>Supervision in place to check that the RMMs in place are being used correctly and OCs followed.<sup>#1</sup></p> <p>Use suitable eye protection and gloves [PPE14].<sup>#1</sup></p>
General exposures (closed systems) [CS15]. Batch process [CS55]. ; With sample collection [CS56].	3	<p>Minimization of manual phases.<sup>#1</sup> Avoid frequent and direct contact with substance.<sup>#1</sup></p> <p>Supervision in place to check that the RMMs in place are being used correctly and OCs followed.<sup>#1</sup></p> <p>Use suitable eye protection and gloves [PPE14].<sup>#1</sup></p>
General exposures (open systems) [CS16]. Batch process [CS55]. ; With sample collection [CS56].	4	<p>Minimization of manual phases.<sup>#1</sup> Avoid frequent and direct contact with substance.<sup>#1</sup></p> <p>Supervision in place to check that the RMMs in place are being used correctly and OCs followed.<sup>#1</sup></p> <p>Use suitable eye protection and gloves [PPE14].<sup>#1</sup></p>
Transfer from/pouring from containers [CS22]. Non-dedicated facility [CS82]	8a	<p>Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 90%) Minimization of manual phases.<sup>#1</sup> Avoid frequent and direct contact with substance.<sup>#1</sup></p> <p>Supervision in place to check that the RMMs in place are being used correctly and OCs followed.<sup>#1</sup></p> <p>Use suitable eye protection and gloves [PPE14].<sup>#1</sup></p>



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Transfer from/pouring from containers [CS22]. Dedicated facility [CS81]	8b	Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 97%) Minimization of manual phases. #1 Avoid frequent and direct contact with substance. #1  Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1  Use suitable eye protection and gloves [PPE14]. #1
Pouring from small containers [CS9]. Dedicated facility [CS81]	9	Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 90%) Minimization of manual phases. #1 Avoid frequent and direct contact with substance. #1  Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1  Use suitable eye protection and gloves [PPE14]. #1
Laboratory activities [CS36]. Small scale [CS61].	15	Minimization of manual phases. #1 Avoid frequent and direct contact with substance. #1  Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1  Use suitable eye protection and gloves [PPE14]. #1

#1 refers to qualitative assessment

## 5. ES4 – Distribution of butan-1-ol (Professional)

Section 1	Exposure Scenario Title
Title	<b>Distribution of substance; CAS: 71-36-3</b>
Use Descriptor	Sector of Use: Professional (SU22)
	Process Categories: PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC9, PROC15
	Environmental Release Categories: ERC1, ERC2
Processes, tasks, activities covered	Loading (including marine vessel/barge, rail/road car and IBC loading) and repacking (including drums and small packs) of substance, including its distribution and associated



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		laboratory activities
<b>Section 2</b>		<b>Operational conditions and risk management measures</b>
<b>Section 2.1</b>		<b>Control of worker exposure</b>
<b>Product characteristics</b>		
Physical form of product		Liquid, vapour pressure 0.5 - 10 kPa [OC4].
Concentration of substance in product		Covers percentage substance in the product up to 100 % (unless stated differently) [G13].
Amounts used		<i>Not applicable</i>
Frequency and duration of use		Covers daily exposures up to 8 hours (unless stated differently) [G2]
Human factors not influenced by risk management		<i>Not applicable</i>
Other Operational Conditions affecting worker exposure		Assumes a good basic standard of occupational hygiene is implemented [G1]. Assumes activities are at ambient temperature (unless stated differently) [G17]. Operation is carried out at elevated temperature (> 20°C above ambient temperature) [OC7]. (PROC17, PROC18)
<b>Contributing Scenarios</b>	<b>PROCs</b>	<b>Risk Management Measures</b>
General exposures (closed systems) [CS15]. Continuous process [CS54].	1	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
General exposures (closed systems) [CS15]. Continuous process [CS54]. With sample collection [CS56]. Equipment cleaning and maintenance [CS39].	2	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
General exposures (closed systems) [CS15]. Batch process [CS55]. With sample collection [CS56].	3	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
General exposures (open systems) [CS16]. Batch process [CS55]. With sample collection [CS56].	4	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>



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Transfer from/pouring from containers [CS22]. Non-dedicated facility [CS82].	8a	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Avoid carrying out operation for more than 4 hours [OC12] Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
Transfer from/pouring from containers [CS22]. Dedicated facility [CS81].	8b	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Avoid carrying out operation for more than 4 hours [OC12] Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
Pouring from small containers [CS9]. Dedicated facility [CS81].	9	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Avoid carrying out operation for more than 4 hours [OC12] Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
Laboratory activities [CS36]. Small scale [CS61].	15	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>

<sup>#1</sup> refers to qualitative assessment

## 6. ES5 – Use in coatings (paints, ink, toners, adhesives; Industrial)

Section 1	Exposure Scenario Title
Title	<b>Use in coatings (paints, ink, toners, adhesives); CAS: 71-36-3</b>
Use Descriptor	Sector of Use: Industrial (SU3)
	Process Categories: PROC1, PROC2, PROC3, PROC4, PROC5, PROC7, PROC8a, PROC8b, PROC9, PROC10, PROC13, PROC15;
	Environmental Release Categories: ERC4
Processes, tasks, activities covered	Covers the use in coatings (paints, inks, adhesives, etc) including exposures during use (including materials receipt, storage, preparation and transfer from bulk and semi-bulk, application by spray, roller, spreader, dip, flow, fluidised bed on production lines and film formation) and equipment cleaning, maintenance and associated



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		laboratory activities.
<b>Section 2</b>		<b>Operational conditions and risk management measures</b>
<b>Section 2.1</b>		<b>Control of worker exposure</b>
<b>Product characteristics</b>		
Physical form of product		Liquid, vapour pressure 0.5 - 10 kPa [OC4].
Concentration of substance in product		Covers percentage substance in the product up to 100 % (unless stated differently) [G13].
Amounts used		<i>Not applicable</i>
Frequency and duration of use		Covers daily exposures up to 8 hours (unless stated differently) [G2]
Human factors not influenced by risk management		<i>Not applicable</i>
Other Operational Conditions affecting worker exposure		Assumes a good basic standard of occupational hygiene is implemented [G1]. Assumes activities are at ambient temperature (unless stated differently) [G17]. Operation is carried out at elevated temperature (> 20°C above ambient temperature) [OC7]. (PROC17, PROC18)
<b>Contributing Scenarios</b>	<b>PROCs</b>	<b>Risk Management Measures</b>
General exposures (closed systems) [CS15]. Continuous process [CS54].	1	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
General exposures (closed systems) [CS15]. Continuous process [CS54]. With sample collection [CS56]. Equipment cleaning and maintenance [CS39].	2	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
General exposures (closed systems) [CS15]. Batch process [CS55]. With sample collection [CS56].	3	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>



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General exposures (open systems) [CS16]. Batch process [CS55]. With sample collection [CS56].	4	Minimization of manual phases. #1 Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Use suitable eye protection and gloves [PPE14]. #1
Batch process [CS55]. Mixing operations (open systems) [CS30].	5	Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 90%) Minimization of manual phases. #1 Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Use suitable eye protection and gloves [PPE14]. #1
Spraying [CS10].	7#2	Use in a spraying booth. Minimization of manual phases. #1 Clean equipment and the work area every day [C&H3]. Regular inspection and maintenance of equipment and machines. Ensure that the task is being carried out outside the breathing zone of a worker. Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Use suitable eye protection and gloves [PPE14]. #1
Transfer from/pouring from containers [CS22]. Non-dedicated facility [CS82].	8a	Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 90%) Minimization of manual phases. #1 Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Use suitable eye protection and gloves [PPE14]. #1
Transfer from/pouring from containers [CS22]. Dedicated facility [CS81].	8b	Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 97%) Minimization of manual phases. #1 Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Use suitable eye protection and gloves [PPE14]. #1
Pouring from small containers [CS9]. Dedicated facility [CS81].	9	Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 90%) Minimization of manual phases. #1 Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Use suitable eye protection and gloves [PPE14]. #1
Rolling, Brushing [CS51].	10	Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 90%)



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		Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
Dipping, immersion and pouring [CS4].	13	Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 90%) Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
Laboratory activities [CS36]. Small scale [CS61].	15	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>

<sup>#1</sup> refers to qualitative assessment

<sup>#2</sup> other Tool used: Stoffenmanager (v. 4.0; 75<sup>th</sup> percentile for long term assessment)

## 7. ES5 – Use in coatings (paints, ink, toners, adhesives; (Professional)

Section 1		Exposure Scenario Title
Title	Use in coatings (paints, ink, toners, adhesives); CAS: 71-36-3	
Use Descriptor	Sector of Use: Professional (SU22)	
	Process Categories: PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC 9, PROC10, PROC11, PROC13, PROC15, PROC19;	
	Environmental Release Categories: ERC8a, ERC8c, ERC8d, ERC8f	
Processes, tasks, activities covered	Covers the use in coatings (paints, inks, adhesives, etc) including exposures during use (including materials receipt, storage, preparation and transfer from bulk and semi-bulk, application by spray, roller, spreader, dip, flow, fluidised bed on production lines and film formation) and equipment cleaning, maintenance and associated laboratory activities.	
Section 2		Operational conditions and risk management measures
Section 2.1		Control of worker exposure
Product characteristics		
Physical form of product	Liquid, vapour pressure 0.5 - 10 kPa [OC4].	
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless	



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		stated differently) [G13].
Amounts used		<i>Not applicable</i>
Frequency and duration of use		Covers daily exposures up to 8 hours (unless stated differently) [G2]
Human factors not influenced by risk management		<i>Not applicable</i>
Other Operational Conditions affecting worker exposure		Assumes a good basic standard of occupational hygiene is implemented [G1]. Assumes activities are at ambient temperature (unless stated differently) [G17]. Operation is carried out at elevated temperature (> 20°C above ambient temperature) [OC7]. (PROC17, PROC18)
<b>Contributing Scenarios</b>	<b>PROCs</b>	<b>Risk Management Measures</b>
General exposures (closed systems) [CS15]. Continuous process [CS54].	1	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
General exposures (closed systems) [CS15]. Continuous process [CS54]. With sample collection [CS56]. Equipment cleaning and maintenance [CS39].	2	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
General exposures (closed systems) [CS15]. Batch process [CS55]. With sample collection [CS56].	3	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
General exposures (open systems) [CS16]. Batch process [CS55]. With sample collection [CS56].	4	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
Batch process [CS55]. Mixing operations (open systems) [CS30].	5	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Avoid carrying out operation for more than 4 hours [OC12] Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>



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Transfer from/pouring from containers [CS22]. Non-dedicated facility [CS82].	8a	<p>Minimization of manual phases. <sup>#1</sup>          Avoid frequent and direct contact with substance. <sup>#1</sup>          Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup>          Avoid carrying out operation for more than 4 hours [OC12]          Use suitable eye protection and gloves [PPE14]. <sup>#1</sup></p>
Transfer from/pouring from containers [CS22]. Dedicated facility [CS81].	8b	<p>Minimization of manual phases. <sup>#1</sup>          Avoid frequent and direct contact with substance. <sup>#1</sup>          Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup>          Avoid carrying out operation for more than 4 hours [OC12]          Use suitable eye protection and gloves [PPE14]. <sup>#1</sup></p>
Pouring from small containers [CS9]. Dedicated facility [CS81].	9	<p>Minimization of manual phases. <sup>#1</sup>          Avoid frequent and direct contact with substance. <sup>#1</sup>          Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup>          Avoid carrying out operation for more than 4 hours [OC12]          Use suitable eye protection and gloves [PPE14]. <sup>#1</sup></p>
Rolling, Brushing [CS51].	10	<p>Minimization of manual phases. <sup>#1</sup>          Avoid frequent and direct contact with substance. <sup>#1</sup>          Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup>          Avoid carrying out operation for more than 4 hours [OC12]          Use suitable eye protection and gloves [PPE14]. <sup>#1</sup></p>
Spraying [CS10].	11 <sup>#2</sup>	<p>Use in a spraying booth.          Minimization of manual phases. <sup>#1</sup>          Clean equipment and the work area every day [C&amp;H3].          Regular inspection and maintenance of equipment and machines.          Ensure that the task is being carried out outside the breathing zone of a worker.          Avoid frequent and direct contact with substance. <sup>#1</sup>          Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup>          Use suitable eye protection and gloves [PPE14]. <sup>#1</sup></p> <p>Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 47%)          Minimization of manual phases. <sup>#1</sup>          Clean equipment and the work area every day [C&amp;H3].          Regular inspection and maintenance of equipment and machines.          Avoid frequent and direct contact with substance. <sup>#1</sup>          Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup>          Avoid carrying out operation for more than 6 hours.          Use suitable eye protection and gloves [PPE14]. <sup>#1</sup></p>



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		<p>Provide enhanced mechanical ventilation by mechanical means [E48].(effectiveness general ventilation: 47%) Minimization of manual phases. #1 Clean equipment and the work area every day [C&amp;H3]. Regular inspection and maintenance of equipment and machines. Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Use suitable eye protection and gloves [PPE14]. #1 Wear a suitable respiratory protection (effectiveness: 80%). If no adequate respiratory protection is available, avoid carrying out operation for more than 5 hours.</p>
Dipping, immersion and pouring [CS4].	13	<p>Minimization of manual phases. #1 Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Avoid carrying out operation for more than 4 hours [OC12] Use suitable eye protection and gloves [PPE14]. #1</p>
Laboratory activities [CS36]. Small scale [CS61].	15	<p>Minimization of manual phases. #1 Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Use suitable eye protection and gloves [PPE14]. #1</p>
Hand-mixing with intimate contact. Only PPE.	19	<p>Minimization of manual phases. #1 Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Avoid carrying out operation for more than 4 hours [OC12] Use suitable eye protection and gloves [PPE14]. #1</p>

#1 refers to qualitative assessment

#2 other Tool used: Stoffenmanager (v. 4.0; 75<sup>th</sup> percentile for long term assessment)

### 8. ES5 – Use in coatings (paints, ink, toners, adhesives; Consumer)

Section 1		Exposure Scenario Title
Title		<b>Use in coatings (paints, ink, toners, adhesives)</b>
Sector of Use (SU code)		21
Use Descriptor (PC codes)		PC1, PC4, PC9, PC15, PC18, PC23, PC24, PC31
Processes, tasks, activities covered		Covers the use in coatings (paints, inks, adhesives, etc) including exposures during use (including product transfer and preparation, application by



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		brush, spray by hand or similar methods) and equipment cleaning.
Environmental Release Category		ERC8a, ERC8c, ERC8d, ERC8f
Specific Environmental Release Category		
<b>Section 2</b>		<b>Operational conditions and risk management measures</b>
<b>Section 2.1</b>		<b>Control of consumer exposure</b>
<i>Product characteristics</i>		
Physical form of product		liquid
Vapour pressure (Pa)		1000
Concentration of substance in product		Unless otherwise stated, covers concentration up to 50% [ConsOC1]
<i>Amounts used</i>		Unless otherwise stated, covers use amounts up to 9000g [ConsOC2];
<i>Frequency and duration of use/exposure</i>		Unless otherwise stated, covers use frequency up to 1 times per day [ConsOC4]; covers exposure up to 6 hours per event [ConsOC14]
<i>Other Operational Conditions affecting exposure</i>		Unless otherwise stated, assumes use at ambient temperature [ConsOC15]; assumes use in rooms up to 58m3 [ConsOC11]; assumes use with typical ventilation [ConsOC8];
<b>Section 2.1.1</b>		<b>Product categories</b>
PC1:Adhesives, sealants--Glues, hobby use	OC	Covers concentrations up to 30% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; for each use event, covers use amounts up to 9g [ConsOC2]; covers use under typical household ventilation [ConsOC8]; covers use in room size of 20m3[ConsOC11]; for each use event, covers exposure up to 4.00hr/event[ConsOC14];
	RMM <sup>#1</sup>	Avoid contact with skin. After contact with skin, wash immediately with plenty of water. <sup>#1</sup> Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>
PC1:Adhesives, sealants--Glues DIY-use (carpet glue, tile glue, wood parquet glue)	OC	Covers concentrations up to 0.2% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; for each use event, covers use amounts up to 6390g [ConsOC2]; covers use only in sufficiently ventilated rooms; covers use in room size of 20m3[ConsOC11]; for each use event, covers exposure up to 6.00hr/event[ConsOC14];
	RMM	No specific RMMs identified beyond those OCs stated



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PC1:Adhesives, sealants--Glues DIY-use (carpet glue, tile glue, wood parquet glue); Tier 2: ConsExpo estimates (carpet glue as representative example)	OC	Covers concentrations up to 2% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; for each use event, covers use amounts up to 9000g [ConsOC2]; covers use only in sufficiently ventilated rooms; covers use in room size of 53m3[ConsOC11]; for each use event, covers exposure up to 1.25hr/event[ConsOC14];
	RMM <sup>#1</sup>	Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>
PC1:Adhesives, sealants--Glue from spray; Tier 2: ConsExpo estimates (spray glue)	OC	Covers concentrations up to 30% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; covers use under typical household ventilation [ConsOC8]; covers use in room size of 20m3[ConsOC11]; for each use event, covers exposure up to 4.00hr/event[ConsOC14];
	RMM <sup>#1</sup>	Avoid contact with skin. After contact with skin, wash immediately with plenty of water. <sup>#1</sup> Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>
PC1:Adhesives, sealants--Sealants; Tier 2: ConsExpo estimates (assembly sealant as representative worst case)	OC	Covers concentrations up to 12% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; for each use event, covers use amounts up to 390g [ConsOC2]; covers use only in sufficiently ventilated rooms; covers use in room size of 20m3[ConsOC11]; for each use event, covers exposure up to 4.00hr/event[ConsOC14];
	RMM <sup>#1</sup>	Avoid contact with skin. After contact with skin, wash immediately with plenty of water. <sup>#1</sup> Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>
PC4_n:Anti-freeze and de-icing products-- Washing car window	OC	Covers concentrations up to 1% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; for each use event, covers use amounts up to 0.5g [ConsOC2]; covers use in a one car garage (34 m3) under typical ventilation [ConsOC10]; covers use in room size of 34m3[ConsOC11]; for each use event, covers exposure up to 0.02hr/event[ConsOC14];
	RMM <sup>#1</sup>	Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>
PC4_n:Anti-freeze and de-icing products-- Pouring into radiator; Tier 2: ConsExpo estimates (all purpose cleaner (liquid), mixing and loading)	OC	Covers concentrations up to 10% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; for each use event, covers use amounts up to 2000g [ConsOC2]; covers use with open windows; for each use event, covers exposure up to 0.17 hr/event[ConsOC14];



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	RMM <sup>#1</sup>	Avoid contact with skin. After contact with skin, wash immediately with plenty of water. <sup>#1</sup> Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>
PC4_n:Anti-freeze and de-icing products-- Lock de-icer	OC	Covers concentrations up to 50% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; for each use event, covers use amounts up to 4g [ConsOC2]; covers use in a one car garage (34 m3) under typical ventilation [ConsOC10]; covers use in room size of 34m3[ConsOC11]; for each use event, covers exposure up to 0.25hr/event[ConsOC14];
	RMM <sup>#1</sup>	Avoid contact with skin. After contact with skin, wash immediately with plenty of water. <sup>#1</sup> Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>
PC9a:Coatings, paints, thinners,paint removers--Waterborne latex wall paint; Tier 2: ConsExpo estimates (waterborne wall paint)	OC	Covers concentrations up to 2% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; for each use event, covers use amounts up to 3750g [ConsOC2]; covers use under typical household ventilation [ConsOC8]; covers use in room size of 20m3[ConsOC11]; for each use event, covers exposure up to 2.20hr/event[ConsOC14];
	RMM <sup>#1</sup>	Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>
PC9a:Coatings, paints, thinners,paint removers--Solvent rich, high solid, water borne paint; Tier 2: ConsExpo estimates (high solid paint as a representative worst case)	OC	Covers concentrations up to 5% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; for each use event, covers use amounts up to 1300g [ConsOC2]; covers use only in sufficiently ventilated rooms; covers use in room size of 20m3[ConsOC11]; for each use event, covers exposure up to 2.20hr/event[ConsOC14];
	RMM <sup>#1</sup>	Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>
PC9a:Coatings, paints, thinners,paint removers--Aerosol spray can; Tier 2: ConsExpo estimates (spray can)	OC	Covers concentrations up to 25% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; covers use under typical household ventilation [ConsOC8]; covers use in room size of 20m3[ConsOC11]; for each use event, covers exposure up to 0.33hr/event[ConsOC14];
	RMM <sup>#1</sup>	Avoid contact with skin. After contact with skin, wash immediately with plenty of water. <sup>#1</sup> Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>



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PC9a:Coatings, paints, thinners,paint removers--Removers (paint-, glue-, wall paper-, sealant-remover); Tier 2: ConsExpo estimates (glue remover as a representative worst case)	OC	Covers concentrations up to 4% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; for each use event, covers use amounts up to 2000g [ConsOC2]; covers use under typical household ventilation [ConsOC8]; covers use in room size of 30m3[ConsOC11]; for each use event, covers exposure up to 4.00hr/event[ConsOC14];
	RMM <sup>#1</sup>	Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>
PC9c:Finger paints	OC	Covers concentrations up to 1% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; for each use event, assumes swallowed amount of 1.35g [ConsOC13];
	RMM <sup>#1</sup>	Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>
PC15_n: Non-metal surface treatment products--Waterborne latex wall paint; Tier 2: ConsExpo estimates (waterborne wall paint)	OC	Covers concentrations up to 2% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; for each use event, covers use amounts up to 3750g [ConsOC2]; covers use under typical household ventilation [ConsOC8]; covers use in room size of 20m3[ConsOC11]; for each use event, covers exposure up to 2.20hr/event[ConsOC14];
	RMM <sup>#1</sup>	Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>
PC15_n: Non-metal surface treatment products--Solvent rich, high solid, water borne paint; Tier 2: ConsExpo estimates (high solid paint as a representative worst case)	OC	Covers concentrations up to 5% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; for each use event, covers use amounts up to 1300g [ConsOC2]; covers use only in sufficiently ventilated rooms; covers use in room size of 20m3[ConsOC11]; for each use event, covers exposure up to 2.20hr/event[ConsOC14];
	RMM <sup>#1</sup>	Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>
PC15_n: Non-metal surface treatment products--Aerosol spray can; Tier 2: ConsExpo estimates (spray can)	OC	Covers concentrations up to 25% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; covers use under typical household ventilation [ConsOC8]; covers use in room size of 20m3[ConsOC11]; for each use event, covers exposure up to 0.33hr/event[ConsOC14];
	RMM <sup>#1</sup>	Avoid contact with skin. After contact with skin, wash immediately with plenty of water. <sup>#1</sup> Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>



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PC15_n: Non-metal surface treatment products--Removers (paint-, glue-, wall paper-, sealant-remover); Tier 2: ConsExpo estimates (glue remover as a representative worst case)	OC	Covers concentrations up to 4% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; for each use event, covers use amounts up to 2000g [ConsOC2]; covers use only in sufficiently ventilated rooms; covers use in room size of 30m3[ConsOC11]; for each use event, covers exposure up to 4.00hr/event[ConsOC14];
	RMM <sup>#1</sup>	Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>
PC18_n: Ink and toners--Inks and toners.	OC	Unless otherwise stated, covers concentrations up to 4% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; for each use event, covers use amounts up to 40g [ConsOC2]; covers use under typical household ventilation [ConsOC8]; covers use in room size of 20m3[ConsOC11]; for each use event, covers exposure up to 2.20hr/event[ConsOC14];
	RMM <sup>#1</sup>	Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>
PC23_n: Leather tanning, dye, finishing, impregnation and care products--Polishes, wax / cream (floor, furniture, shoes); Tier 2: ConsExpo estimates (furniture polish as representative example)	OC	Covers concentrations up to 50% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; for each use event, covers use amounts up to 56g [ConsOC2]; covers use under typical household ventilation [ConsOC8]; covers use in room size of 58m3[ConsOC11]; for each use event, covers exposure up to 4hr/event[ConsOC14];
	RMM <sup>#1</sup>	Avoid contact with skin. After contact with skin, wash immediately with plenty of water. <sup>#1</sup> Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>
PC23_n: Leather tanning, dye, finishing, impregnation and care products--Polishes, spray (furniture, shoes); Tier 2: ConsExpo estimates (furniture leather spray as representative worst case)	OC	Covers concentrations up to 50% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; for each use event, covers use amounts up to 56g [ConsOC2]; covers use under typical household ventilation [ConsOC8]; covers use in room size of 58m3[ConsOC11]; for each use event, covers exposure up to 4hr/event[ConsOC14];
	RMM <sup>#1</sup>	Avoid contact with skin. After contact with skin, wash immediately with plenty of water. <sup>#1</sup> Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>



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PC31:Polishes and wax blends--Polishes, wax / cream (floor, furniture, shoes); Tier 2: ConsExpo estimates (furniture polish as representative worst case)	OC	Unless otherwise stated, covers concentrations up to 20% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; for each use event, covers use amounts up to 550g [ConsOC2]; covers use in rooms with open windows; covers use in room size of 58m3[ConsOC11]; for each use event, covers exposure up to 4hr/event[ConsOC14];
	RMM <sup>#1</sup>	Avoid contact with skin. After contact with skin, wash immediately with plenty of water. <sup>#1</sup> Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>
PC31:Polishes and wax blends--Polishes, spray (furniture, shoes); Tier 2: ConsExpo estimates (furniture leather spray as representative worst case)	OC	Covers concentrations up to 50% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; covers use under typical household ventilation [ConsOC8]; covers use in room size of 58m3[ConsOC11]; for each use event, covers exposure up to 4hr/event[ConsOC14];
	RMM <sup>#1</sup>	Avoid contact with skin. After contact with skin, wash immediately with plenty of water. <sup>#1</sup> Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>
PC24:Lubricants, greases, release products		A use by consumers which is related with intensive and direct handling of lubricants, greases (PC24) containing butan-1-ol has not been assumed.

<sup>#1</sup> RMMs refer to qualitative assessment

## 9. ES6 – Use in cleaning agents (Industrial)

Section 1	Exposure Scenario Title
Title	Use in cleaning agents; CAS: 71-36-3
Use Descriptor	Sector of Use: Industrial (SU3)
	Process Categories: PROC1, PROC2, PROC3, PROC4, PROC7, PROC8a, PROC8b, PROC9, PROC10, PROC13
	Environmental Release Categories: ERC4



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Processes, tasks, activities covered	Covers the use as a component of cleaning products including transfer from storage, pouring/unloading from drums or containers. Exposures during mixing/diluting in the preparatory phase and cleaning activities (including spraying, brushing, dipping, wiping, automated and by hand), related equipment cleaning and maintenance.	
<b>Section 2</b>	<b>Operational conditions and risk management measures</b>	
<b>Section 2.1</b>	<b>Control of worker exposure</b>	
<b>Product characteristics</b>		
Physical form of product	Liquid, vapour pressure 0.5 - 10 kPa [OC4].	
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) [G13].	
Amounts used	<i>Not applicable</i>	
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]	
Human factors not influenced by risk management	<i>Not applicable</i>	
Other Operational Conditions affecting worker exposure	Assumes a good basic standard of occupational hygiene is implemented [G1]. Assumes activities are at ambient temperature (unless stated differently) [G17]. Operation is carried out at elevated temperature (> 20°C above ambient temperature) [OC7]. (PROC 17, PROC18)	
<b>Contributing Scenarios</b>	<b>PROCs</b>	<b>Risk Management Measures</b>
General exposures (closed systems) [CS15]. Continuous process [CS54].	1	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
General exposures (closed systems) [CS15]. Continuous process [CS54]. With sample collection [CS56]. Equipment cleaning and maintenance [CS39].	2	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
General exposures (closed systems) [CS15]. Batch process [CS55]. With sample collection [CS56].	3	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>



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General exposures (open systems) [CS16]. Batch process [CS55]. With sample collection [CS56].	4	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
Spraying [CS10].	7 <sup>#2</sup>	Use in a spraying booth. Minimization of manual phases. <sup>#1</sup> Clean equipment and the work area every day [C&H3]. Regular inspection and maintenance of equipment and machines. Ensure that the task is being carried out outside the breathing zone of a worker. Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
Transfer from/pouring from containers [CS22]. Non-dedicated facility [CS82]	8a	Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 90%) Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
Transfer from/pouring from containers [CS22]. Dedicated facility [CS81]	8b	Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 97%) Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
Pouring from small containers [CS9]. Dedicated facility [CS81]	9	Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 90%) Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
Rolling, Brushing [CS51].	10	Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 90%) Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>



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Dipping, immersion and pouring [CS4].	13	Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 90%) Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
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<sup>#1</sup> refers to qualitative assessment

<sup>#2</sup> other Tool used: Stoffenmanager (v. 4.0; 75<sup>th</sup> percentile for long term assessment)



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**10. ES6 – Use in cleaning agents (Professional)**

<b>Section 1</b>		<b>Exposure Scenario Title</b>
Title	<b>Use in cleaning agents; CAS: 71-36-3</b>	
Use Descriptor	Sector of Use: Professional (SU22)	
	Process Categories: PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC9, PROC10, PROC11, PROC13	
	Environmental Release Categories: ERC8a, ERC8d	
Processes, tasks, activities covered	Covers the use as a component of cleaning products including pouring/unloading from drums or containers; and exposures during mixing/diluting in the preparatory phase and cleaning activities (including spraying, brushing, dipping, wiping automated and by hand).	
<b>Section 2</b>		<b>Operational conditions and risk management measures</b>
<b>Section 2.1</b>		<b>Control of worker exposure</b>
<b>Product characteristics</b>		
Physical form of product	Liquid, vapour pressure 0.5 - 10 kPa [OC4].	
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) [G13].	
Amounts used	<i>Not applicable</i>	
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]	
Human factors not influenced by risk management	<i>Not applicable</i>	
Other Operational Conditions affecting worker exposure	Assumes a good basic standard of occupational hygiene is implemented [G1]. Assumes activities are at ambient temperature (unless stated differently) [G17]. Operation is carried out at elevated temperature (> 20°C above ambient temperature) [OC7]. (PROC17, PROC18)	
<b>Contributing Scenarios</b>	<b>PROCs</b>	<b>Risk Management Measures</b>
General exposures (closed systems) [CS15]. Continuous process [CS54].	1	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>



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General exposures (closed systems) [CS15]. Continuous process [CS54]. With sample collection [CS56]. Equipment cleaning and maintenance [CS39].	2	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
General exposures (closed systems) [CS15]. Batch process [CS55]. With sample collection [CS56].	3	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
General exposures (open systems) [CS16]. Batch process [CS55]. With sample collection [CS56].	4	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
Transfer from/pouring from containers [CS22]. Non-dedicated facility [CS82].	8a	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Avoid carrying out operation for more than 4 hours [OC12] Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
Transfer from/pouring from containers [CS22]. Dedicated facility [CS81].	8b	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Avoid carrying out operation for more than 4 hours [OC12] Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
Pouring from small containers [CS9]. Dedicated facility [CS81].	9	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Avoid carrying out operation for more than 4 hours [OC12] Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
Rolling, Brushing [CS51].	10	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Avoid carrying out operation for more than 4 hours [OC12] Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>



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Spraying [CS10].	11 <sup>#2</sup>	<p>Use in a spraying booth. Minimization of manual phases. <sup>#1</sup> Clean equipment and the work area every day [C&amp;H3]. Regular inspection and maintenance of equipment and machines. Ensure that the task is being carried out outside the breathing zone of a worker. Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup></p> <p>Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 47%) Minimization of manual phases. <sup>#1</sup> Clean equipment and the work area every day [C&amp;H3]. Regular inspection and maintenance of equipment and machines. Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Avoid carrying out operation for more than 6 hours. Use suitable eye protection and gloves [PPE14]. <sup>#1</sup></p> <p>Provide enhanced mechanical ventilation by mechanical means [E48].(effectiveness general ventilation: 47%) Minimization of manual phases. <sup>#1</sup> Clean equipment and the work area every day [C&amp;H3]. Regular inspection and maintenance of equipment and machines. Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup> Wear a suitable respiratory protection (effectiveness: 80%). If no adequate respiratory protection is available, avoid carrying out operation for more than 5 hours.</p>
Dipping, immersion and pouring [CS4].	13	<p>Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Avoid carrying out operation for more than 4 hours [OC12] Use suitable eye protection and gloves [PPE14]. <sup>#1</sup></p>

<sup>#1</sup> refers to qualitative assessment

<sup>#2</sup> other Tool used: Stoffenmanager (v. 4.0; 75<sup>th</sup> percentile for long term assessment)



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**11. ES6 – Use in cleaning agents (Consumer)**

<b>Section 1</b>		<b>Exposure Scenario Title</b>
Title		<b>Use in Cleaning Agents</b>
Sector of Use (SU code)		21
Use Descriptor (PC codes)		PC4, PC9, PC24, PC35, PC38
Processes, tasks, activities covered		Covers general exposures to consumers arising from the use of household products sold as washing and cleaning products, aerosols, coatings, de-icers, lubricants and air care products.
Environmental Release Category		ERC8a, ERC8d
Specific Environmental Release Category		
<b>Section 2</b>		<b>Operational conditions and risk management measures</b>
<b>Section 2.1</b>		<b>Control of consumer exposure</b>
<b>Product characteristics</b>		
Physical form of product		liquid
Vapour pressure (Pa)		1000
Concentration of substance in product		Unless otherwise stated, covers concentration up to 50% [ConsOC1]
<b>Amounts used</b>		Unless otherwise stated, covers use amounts up to 3750g [ConsOC2];
<b>Frequency and duration of use/exposure</b>		Unless otherwise stated, covers use frequency up to 1 times per day [ConsOC4];covers exposure up to 4 hours per event [ConsOC14]
<b>Other Operational Conditions affecting exposure</b>		Unless otherwise stated, assumes use at ambient temperature [ConsOC15]; assumes use in rooms up to 58m3 [ConsOC11]; assumes use with typical ventilation [ConsOC8];
<b>Section 2.1.1</b>		<b>Product categories</b>
PC4_n:Anti-freeze and de-icing products--Washing car window	OC	Covers concentrations up to 1% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; for each use event, covers use amounts up to 0.5g [ConsOC2]; covers use in a one car garage (34 m3) under typical ventilation [ConsOC10]; covers use in room size of 34m3[ConsOC11]; for each use event, covers exposure up to 0.02hr/event[ConsOC14];
	RMM <sup>#1</sup>	Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>



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PC4_n:Anti-freeze and de-icing products--Pouring into radiator; Tier 2: ConsExpo estimates	OC	Covers concentrations up to 10% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; for each use event, covers use amounts up to 2000g [ConsOC2]; covers use with open windows; for each use event, covers exposure up to 0.17 hr/event[ConsOC14];
	RMM <sup>#1</sup>	Avoid contact with skin. After contact with skin, wash immediately with plenty of water. <sup>#1</sup> Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>
PC4_n:Anti-freeze and de-icing products--Lock de-icer	OC	Covers concentrations up to 50% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; for each use event, covers use amounts up to 4g [ConsOC2]; covers use in a one car garage (34 m3) under typical ventilation [ConsOC10]; covers use in room size of 34m3[ConsOC11]; for each use event, covers exposure up to 0.25hr/event[ConsOC14];
	RMM <sup>#1</sup>	Avoid contact with skin. After contact with skin, wash immediately with plenty of water. <sup>#1</sup> Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>
PC9a:Coatings, paints, thinners,paint removers-- Waterborne latex wall paint; Tier 2: ConsExpo estimates (waterborne wall paint)	OC	Covers concentrations up to 2% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; for each use event, covers use amounts up to 3750g [ConsOC2]; covers use under typical household ventilation [ConsOC8]; covers use in room size of 20m3[ConsOC11]; for each use event, covers exposure up to 2.20hr/event[ConsOC14];
	RMM <sup>#1</sup>	Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>
PC9a:Coatings, paints, thinners,paint removers--Solvent rich, high solid, water borne paint; Tier 2: ConsExpo estimates (high solid paint as a representative worst case)	OC	Covers concentrations up to 5% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; for each use event, covers use amounts up to 1300g [ConsOC2]; covers use only in sufficiently ventilated rooms; covers use in room size of 20m3[ConsOC11]; for each use event, covers exposure up to 2.20hr/event[ConsOC14];
	RMM <sup>#1</sup>	Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>



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PC9a:Coatings, paints, thinners,paint removers--Aerosol spray can; Tier 2: ConsExpo estimates (spray can)	OC	Covers concentrations up to 25% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; covers use under typical household ventilation [ConsOC8]; covers use in room size of 20m3[ConsOC11]; for each use event, covers exposure up to 0.33hr/event[ConsOC14];
	RMM <sup>#1</sup>	Avoid contact with skin. After contact with skin, wash immediately with plenty of water. <sup>#1</sup> Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>
PC9a:Coatings, paints, thinners,paint removers--Removers (paint-, glue-, wall paper-, sealant-remover); Tier 2: ConsExpo estimates (glue remover as a representative worst case)	OC	Covers concentrations up to 4% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; for each use event, covers use amounts up to 2000g [ConsOC2]; covers use under typical household ventilation [ConsOC8]; covers use in room size of 30m3[ConsOC11]; for each use event, covers exposure up to 4.00hr/event[ConsOC14];
	RMM <sup>#1</sup>	Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>
PC9c:Finger paints	OC	Covers concentrations up to 1% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; for each use event, assumes swallowed amount of 1.35g [ConsOC13];
	RMM <sup>#1</sup>	Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>
PC35:Washing and cleaning products (including solvent based products)--Laundry and dish washing products	OC	Covers concentrations up to 5% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; for each use event, covers use amounts up to 15g [ConsOC2]; covers use under typical household ventilation [ConsOC8]; covers use in room size of 20m3[ConsOC11]; for each use event, covers exposure up to 0.50hr/event[ConsOC14];
	RMM <sup>#1</sup>	Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>



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PC35:Washing and cleaning products (including solvent based products)--Cleaners, liquids (all purpose cleaners, sanitary products, floor cleaners, glass cleaners, carpet cleaners, metal cleaners); Tier 2: ConsExpo estimates (floor cleaner (liquid) as a representative worst case; Mixing and Loading)	OC	Covers concentrations up to 50% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; for each use event, covers use amounts up to 500g [ConsOC2]; covers use under typical household ventilation [ConsOC8]; for each use event, covers exposure up to 0.0125hr/event[ConsOC14];
	RMM <sup>#1</sup>	Avoid contact with skin. After contact with skin, wash immediately with plenty of water. <sup>#1</sup> Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>
PC35:Washing and cleaning products (including solvent based products)--Cleaners, liquids (all purpose cleaners, sanitary products, floor cleaners, glass cleaners, carpet cleaners, metal cleaners); Tier 2: ConsExpo estimates (floor cleaner (liquid) as a representative worst case; Application)	OC	Covers concentrations up to 8% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; for each use event, covers use amounts up to 880g [ConsOC2]; covers use under typical household ventilation [ConsOC8]; covers use in room size of 58m3[ConsOC11]; for each use event, covers exposure up to 4hr/event[ConsOC14];
	RMM <sup>#1</sup>	Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>
PC35:Washing and cleaning products (including solvent based products)--Cleaners, trigger sprays (all purpose cleaners, sanitary products, glass cleaners) Tier 2: ConsExpo estimates (bathroom cleaning spray as a representative worst case; Application (spraying))	OC	Covers concentrations up to 20% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; covers use in room size of 10m3[ConsOC11]; for each use event, covers exposure up to 0.42hr/event[ConsOC14];
	RMM <sup>#1</sup>	Avoid contact with skin. After contact with skin, wash immediately with plenty of water. <sup>#1</sup> Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>



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PC35:Washing and cleaning products (including solvent based products)--Cleaners, trigger sprays (all purpose cleaners, sanitary products, glass cleaners) Tier 2: ConsExpo estimates (bathroom cleaning spray as a representative worst case; Application (leaving on and cleaning))	OC	Covers concentrations up to 20% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; for each use event, covers use amounts up to 30g [ConsOC2]; covers use under typical household ventilation [ConsOC8]; covers use in room size of 10m3[ConsOC11]; for each use event, covers exposure up to 0.42hr/event[ConsOC14];
	RMM <sup>#1</sup>	Avoid contact with skin. After contact with skin, wash immediately with plenty of water. <sup>#1</sup> Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>
PC38_n: Welding and soldering products, flux products	OC	Unless otherwise stated, covers concentrations up to 10% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; for each use event, covers use amounts up to 12g [ConsOC2]; covers use under typical household ventilation [ConsOC8]; covers use in room size of 20m3[ConsOC11]; for each use event, covers exposure up to 1.00hr/event[ConsOC14];
	RMM <sup>#1</sup>	Avoid contact with skin. After contact with skin, wash immediately with plenty of water. <sup>#1</sup> Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>
PC24:Lubricants, greases, release products	A use by consumers which is related with intensive and direct handling of lubricants, greases (PC24) containing butan-1-ol has not been assumed.	

<sup>#1</sup> RMMs refer to qualitative assessment

## 12. ES7 – Use in lubricants (Industrial)

Section 1	Exposure Scenario Title
Title	<b>Use in lubricants; CAS: 71-36-3</b>
Use Descriptor	Sector of Use: Industrial (SU3)
	Process Categories: PROC1, PROC2, PROC3, PROC4, PROC7, PROC8a, PROC8b, PROC9, PROC10, PROC13, PROC17, PROC18
	Environmental Release Categories: ERC4, ERC7



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Processes, tasks, activities covered	Covers the use of formulated lubricants in closed and open systems including transfer operations, operation of machinery/engines and similar articles, reworking on reject articles, equipment maintenance and disposal of wastes.	
<b>Section 2</b>	<b>Operational conditions and risk management measures</b>	
<b>Section 2.1</b>	<b>Control of worker exposure</b>	
<b>Product characteristics</b>		
Physical form of product	Liquid, vapour pressure 0.5 - 10 kPa [OC4].	
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) [G13].	
Amounts used	<i>Not applicable</i>	
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]	
Human factors not influenced by risk management	<i>Not applicable</i>	
Other Operational Conditions affecting worker exposure	Assumes a good basic standard of occupational hygiene is implemented [G1]. Assumes activities are at ambient temperature (unless stated differently) [G17]. Operation is carried out at elevated temperature (> 20°C above ambient temperature) [OC7]. (PROC17, PROC18)	
<b>Contributing Scenarios</b>	<b>PROCs</b>	<b>Risk Management Measures</b>
General exposures (closed systems) [CS15]. Continuous process [CS54].	1	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
General exposures (closed systems) [CS15]. Continuous process [CS54]. With sample collection [CS56]. Equipment cleaning and maintenance [CS39].	2	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
General exposures (closed systems) [CS15]. Batch process [CS55]. With sample collection [CS56].	3	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
General exposures (open systems) [CS16]. Batch process [CS55]. With sample collection [CS56].	4	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>



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Spraying [CS10].	7 <sup>#2</sup>	Use in a spraying booth. Minimization of manual phases. <sup>#1</sup> Clean equipment and the work area every day [C&H3]. Regular inspection and maintenance of equipment and machines. Ensure that the task is being carried out outside the breathing zone of a worker. Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
Transfer from/pouring from containers [CS22]. Non-dedicated facility [CS82].	8a	Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 90%) Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
Transfer from/pouring from containers [CS22]. Dedicated facility [CS81].	8b	Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 97%) Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
Pouring from small containers [CS9]. Dedicated facility [CS81].	9	Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 90%) Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
Rolling, Brushing [CS51].	10	Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 90%) Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
Dipping, immersion and pouring [CS4].	13	Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 90%) Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>



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Operation and lubrication of high energy open equipment [CS17].	17	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
	17 <sup>#3</sup>	Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 95%) Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
Greasing, high energy. General exposures [CS1].	18	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
	18 <sup>#3</sup>	Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 95%) Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>

<sup>#1</sup> refers to qualitative assessment

<sup>#2</sup> other Tool used: Stoffenmanager (v. 4.0; 75<sup>th</sup> percentile for long term assessment)

<sup>#3</sup> assessment at higher temperature (approx. 64 °C)/higher vapor pressure (>= 100 hPa); ECTOC TRA: high fugacity

### 13. ES7 – Use in lubricants (Professional)

Section 1	Exposure Scenario Title
Title	<b>Use in lubricants; CAS: 71-36-3</b>
Use Descriptor	Sector of Use: Professional (SU22)
	Process Categories: PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC9, PROC10, PROC 11, PROC13, PROC17, PROC18, PROC20
	Environmental Release Categories: ERC8a, ERC8d, ERC9a, ERC9b
Processes, tasks, activities covered	Covers the use of formulated lubricants in closed and open systems including transfer operations, operation of engines and similar articles, reworking on reject articles, equipment maintenance and disposal of waste oil.



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Section 2		Operational conditions and risk management measures
Section 2.1		Control of worker exposure
<b>Product characteristics</b>		
Physical form of product		Liquid, vapour pressure 0.5 - 10 kPa [OC4].
Concentration of substance in product		Covers percentage substance in the product up to 100 % (unless stated differently) [G13].
Amounts used		<i>Not applicable</i>
Frequency and duration of use		Covers daily exposures up to 8 hours (unless stated differently) [G2]
Human factors not influenced by risk management		<i>Not applicable</i>
Other Operational Conditions affecting worker exposure		Assumes a good basic standard of occupational hygiene is implemented [G1]. Assumes activities are at ambient temperature (unless stated differently) [G17]. Operation is carried out at elevated temperature (> 20°C above ambient temperature) [OC7]. (PROC17, PROC18)
Contributing Scenarios	PROCs	Risk Management Measures
General exposures (closed systems) [CS15]. Continuous process [CS54].	1	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
General exposures (closed systems) [CS15]. Continuous process [CS54]. With sample collection [CS56]. Equipment cleaning and maintenance [CS39].	2	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
General exposures (closed systems) [CS15]. Batch process [CS55]. With sample collection [CS56].	3	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
General exposures (open systems) [CS16]. Batch process [CS55]. With sample collection [CS56].	4	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>



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Transfer from/pouring from containers [CS22]. Non-dedicated facility [CS82]	8a	<p>Minimization of manual phases. <sup>#1</sup>          Avoid frequent and direct contact with substance. <sup>#1</sup>          Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup>          Avoid carrying out operation for more than 4 hours [OC12]          Use suitable eye protection and gloves [PPE14]. <sup>#1</sup></p>
Transfer from/pouring from containers [CS22]. Dedicated facility [CS81].	8b	<p>Minimization of manual phases. <sup>#1</sup>          Avoid frequent and direct contact with substance. <sup>#1</sup>          Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup>          Avoid carrying out operation for more than 4 hours [OC12]          Use suitable eye protection and gloves [PPE14]. <sup>#1</sup></p>
Pouring from small containers [CS9]. Dedicated facility [CS81].	9	<p>Minimization of manual phases. <sup>#1</sup>          Avoid frequent and direct contact with substance. <sup>#1</sup>          Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup>          Avoid carrying out operation for more than 4 hours [OC12]          Use suitable eye protection and gloves [PPE14]. <sup>#1</sup></p>
Rolling, Brushing [CS51].	10	<p>Minimization of manual phases. <sup>#1</sup>          Avoid frequent and direct contact with substance. <sup>#1</sup>          Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup>          Avoid carrying out operation for more than 4 hours [OC12]          Use suitable eye protection and gloves [PPE14]. <sup>#1</sup></p>
Spraying [CS10].	11 <sup>#2</sup>	<p>Use in a spraying booth.          Minimization of manual phases. <sup>#1</sup>          Clean equipment and the work area every day [C&amp;H3].          Regular inspection and maintenance of equipment and machines.          Ensure that the task is being carried out outside the breathing zone of a worker.          Avoid frequent and direct contact with substance. <sup>#1</sup>          Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup>          Use suitable eye protection and gloves [PPE14]. <sup>#1</sup></p> <p>Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 47%)          Minimization of manual phases. <sup>#1</sup>          Clean equipment and the work area every day [C&amp;H3].          Regular inspection and maintenance of equipment and machines.          Avoid frequent and direct contact with substance. <sup>#1</sup>          Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup>          Avoid carrying out operation for more than 6 hours.</p>



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		<p>Use suitable eye protection and gloves [PPE14]. #1</p>
		<p>Provide enhanced mechanical ventilation by mechanical means [E48].(effectiveness general ventilation: 47%) Minimization of manual phases. #1 Clean equipment and the work area every day [C&amp;H3]. Regular inspection and maintenance of equipment and machines. Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Use suitable eye protection and gloves [PPE14]. #1 Wear a suitable respiratory protection (effectiveness: 80%). If no adequate respiratory protection is available, avoid carrying out operation for more than 5 hours.</p>
Dipping, immersion and pouring [CS4].	13	<p>Minimization of manual phases. #1 Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Avoid carrying out operation for more than 4 hours [OC12] Use suitable eye protection and gloves [PPE14]. #1</p>
Operation and lubrication of high energy open equipment [CS17].	17	<p>Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 90%) Minimization of manual phases. #1 Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Use suitable eye protection and gloves [PPE14]. #1</p>
		<p>Minimization of manual phases. #1 Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Avoid carrying out operation for more than 1 hour [OC11] Use suitable eye protection and gloves [PPE14]. #1</p>



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	17 <sup>#3</sup>	<p>Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 90%) Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup></p> <p>Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup> Wear a suitable respiratory protection (Effectiveness:90%)</p>
Greasing, high energy. General exposures [CS1].	18	<p>Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 90%) Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup></p> <p>Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Avoid carrying out operation for more than 1 hour [OC11] Use suitable eye protection and gloves [PPE14]. <sup>#1</sup></p>
		18 <sup>#3</sup>
	20	<p>Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup></p>
Heat and pressure transfer (dispersive, closed system).		



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<sup>#1</sup> refers to qualitative assessment

<sup>#2</sup> other Tool used: Stoffenmanager (v. 4.0; 75<sup>th</sup> percentile for long term assessment)

<sup>#3</sup> assessment at higher temperature (approx. 64 °C)/higher vapor pressure (>= 100 hPa); ECTOC TRA: high fugacity

**14. ES7 – Use in lubricants (Consumer)**

In general, it is assumed that there is no use by consumers which is related with intensive and direct handling of lubricants, greases (PC24) containing butan-1-ol.

It is assumed that lubricants, greases usually are contained in closed systems in machines and other equipment. Exposure arising from the use of machines and other equipment and arising from short and only occasional periods of manual handling (e.g. pouring of lubricants, greases) is considered to be negligible.

**9.14.1. Exposure scenario**

<b>Section 1</b>		<b>Exposure Scenario Title</b>
Title		<b>Use in Lubricants</b>
Sector of Use (SU code)		21
Use Descriptor (PC codes)		PC1, (PC6) <sup>#2</sup> , PC24, PC31, PC35
Processes, tasks, activities covered		Covers the consumer use of formulated lubricants in closed and open systems including transfer operations, application, operation of engines and similar articles, equipment maintenance and disposal of waste oil.
Environmental Release Category		ERC8a, ERC8d ERC9a, ERC9b
Specific Environmental Release Category		
<b>Section 2</b>		<b>Operational conditions and risk management measures</b>
<b>Section 2.1</b>		<b>Control of consumer exposure</b>
<b>Product characteristics</b>		
Physical form of product		liquid
Vapour pressure (Pa)		1000
Concentration of substance in product		Unless otherwise stated, covers concentration up to 50% [ConsOC1]
<b>Amounts used</b>		Unless otherwise stated, covers use amounts up to 550g [ConsOC2];
<b>Frequency and duration of use/exposure</b>		Unless otherwise stated, covers use frequency up to 1 times per day [ConsOC4]; covers exposure up to 4 hours per event [ConsOC14]



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<i>Other Operational Conditions affecting exposure</i>		Unless otherwise stated, assumes use at ambient temperature [ConsOC15]; assumes use in rooms up to 58m <sup>3</sup> [ConsOC11]; assumes use with typical ventilation [ConsOC8];
<b>Section 2.1.1</b>		<b>Product categories</b>
PC1:Adhesives, sealants--Glues, hobby use	OC	Covers concentrations up to 30% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; for each use event, covers use amounts up to 9g [ConsOC2]; covers use under typical household ventilation [ConsOC8]; covers use in room size of 20m <sup>3</sup> [ConsOC11]; for each use event, covers exposure up to 4.00hr/event[ConsOC14];
	RMM <sup>#1</sup>	Avoid contact with skin. After contact with skin, wash immediately with plenty of water. <sup>#1</sup> Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>
PC1:Adhesives, sealants--Glues DIY-use (carpet glue, tile glue, wood parquet glue)	OC	Covers concentrations up to 0.2% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; for each use event, covers use amounts up to 6390g [ConsOC2]; covers use only in sufficiently ventilated rooms; covers use in room size of 20m <sup>3</sup> [ConsOC11]; for each use event, covers exposure up to 6.00hr/event[ConsOC14];
	RMM	No specific RMMs identified beyond those OCs stated
PC1:Adhesives, sealants--Glues DIY-use (carpet glue, tile glue, wood parquet glue); Tier 2: ConsExpo estimates (carpet glue as representative example)	OC	Covers concentrations up to 2% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; for each use event, covers use amounts up to 9000g [ConsOC2]; covers use only in sufficiently ventilated rooms; covers use in room size of 53m <sup>3</sup> [ConsOC11]; for each use event, covers exposure up to 1.25hr/event[ConsOC14];
	RMM <sup>#1</sup>	Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>



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PC1:Adhesives, sealants--Glue from spray; Tier 2: ConsExpo estimates (spray glue)	OC	Covers concentrations up to 30% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; covers use under typical household ventilation [ConsOC8]; covers use in room size of 20m3[ConsOC11]; for each use event, covers exposure up to 4.00hr/event[ConsOC14];
	RMM <sup>#1</sup>	Avoid contact with skin. After contact with skin, wash immediately with plenty of water. <sup>#1</sup> Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>
PC1:Adhesives, sealants--Sealants; Tier 2: ConsExpo estimates (assembly sealant as representative worst case)	OC	Covers concentrations up to 12% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; for each use event, covers use amounts up to 390g [ConsOC2]; covers use only in sufficiently ventilated rooms; covers use in room size of 20m3[ConsOC11]; for each use event, covers exposure up to 4.00hr/event[ConsOC14];
	RMM <sup>#1</sup>	Avoid contact with skin. After contact with skin, wash immediately with plenty of water. <sup>#1</sup> Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>
PC31:Polishes and wax blends-- Polishes, wax / cream (floor, furniture, shoes); Tier 2: ConsExpo estimates (furniture polish as representative worst case)	OC	Unless otherwise stated, covers concentrations up to 20% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; for each use event, covers use amounts up to 550g [ConsOC2]; covers use in rooms with open windows; covers use in room size of 58m3[ConsOC11]; for each use event, covers exposure up to 4hr/event[ConsOC14];
	RMM <sup>#1</sup>	Avoid contact with skin. After contact with skin, wash immediately with plenty of water. <sup>#1</sup> Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>



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PC31:Polishes and wax blends-- Polishes, spray (furniture, shoes); Tier 2: ConsExpo estimates (furniture leather spray as representative worst case)	OC	Covers concentrations up to 50% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; covers use under typical household ventilation [ConsOC8]; covers use in room size of 58m <sup>3</sup> [ConsOC11]; for each use event, covers exposure up to 4hr/event[ConsOC14];
	RMM <sup>#1</sup>	Avoid contact with skin. After contact with skin, wash immediately with plenty of water. <sup>#1</sup> Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>
PC35:Washing and cleaning products (including solvent based products)-- Laundry and dish washing products	OC	Covers concentrations up to 5% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; for each use event, covers use amounts up to 15g [ConsOC2]; covers use under typical household ventilation [ConsOC8]; covers use in room size of 20m <sup>3</sup> [ConsOC11]; for each use event, covers exposure up to 0.50hr/event[ConsOC14];
	RMM <sup>#1</sup>	Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>
PC35:Washing and cleaning products (including solvent based products)-- Cleaners, liquids (all purpose cleaners, sanitary products, floor cleaners, glass cleaners, carpet cleaners, metal cleaners); Tier 2: ConsExpo estimates (floor cleaner (liquid) as a representative worst case; Mixing and loading)	OC	Covers concentrations up to 5% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; for each use event, covers use amounts up to 15g [ConsOC2]; covers use under typical household ventilation [ConsOC8]; covers use in room size of 20m <sup>3</sup> [ConsOC11]; for each use event, covers exposure up to 0.50hr/event[ConsOC14];
	RMM <sup>#1</sup>	Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>



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PC35:Washing and cleaning products (including solvent based products)-- Cleaners, liquids (all purpose cleaners, sanitary products, floor cleaners, glass cleaners, carpet cleaners, metal cleaners); Tier 2: ConsExpo estimates (floor cleaner (liquid) as a representative worst case; Application)	OC	Covers concentrations up to 8% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; for each use event, covers use amounts up to 880g [ConsOC2]; covers use under typical household ventilation [ConsOC8]; covers use in room size of 58m3[ConsOC11]; for each use event, covers exposure up to 4hr/event[ConsOC14];
	RMM <sup>#1</sup>	Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>
PC35:Washing and cleaning products (including solvent based products)-- Cleaners, trigger sprays (all purpose cleaners, sanitary products, glass cleaners) Tier 2: ConsExpo estimates (bathroom cleaning spray as a representative worst case; Application (spraying))	OC	Covers concentrations up to 20% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; covers use in room size of 10m3[ConsOC11]; for each use event, covers exposure up to 0.42hr/event[ConsOC14];
	RMM <sup>#1</sup>	Avoid contact with skin. After contact with skin, wash immediately with plenty of water. <sup>#1</sup> Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>
PC35:Washing and cleaning products (including solvent based products)-- Cleaners, trigger sprays (all purpose cleaners, sanitary products, glass cleaners) Tier 2: ConsExpo estimates (bathroom cleaning spray as a representative worst case; Application (leaving on and cleaning))	OC	Covers concentrations up to 20% [ConsOC1]; covers use up to 1 time/on day of use[ConsOC4]; for each use event, covers use amounts up to 30g [ConsOC2]; covers use under typical household ventilation [ConsOC8]; covers use in room size of 10m3[ConsOC11]; for each use event, covers exposure up to 0.42hr/event[ConsOC14];
	RMM <sup>#1</sup>	Avoid contact with skin. After contact with skin, wash immediately with plenty of water. <sup>#1</sup> Avoid contact with eyes. In case of contact with eyes, rinse immediately with plenty of water. <sup>#1</sup>
PC24:Lubricants, greases, release products		A use by consumers which is related with intensive and direct handling of lubricants, greases (PC24) containing butan-1-ol has not been assumed.

<sup>#1</sup> RMMs refer to qualitative assessment

<sup>#2</sup> covered by PC31 and PC35



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**15.ES8 – Metal working fluids / rolling oils (Industrial)**

<b>Section 1</b>		<b>Exposure Scenario Title</b>
Title	<b>Metal working fluids / rolling oils; CAS: 71-36-3</b>	
Use Descriptor	Sector of Use: Industrial (SU3)	
	Process Categories: PROC1, PROC2, PROC3, PROC5, PROC7, PROC8a, PROC8b, PROC9, PROC10, PROC13, PROC17	
	Environmental Release Categories: ERC4	
Processes, tasks, activities covered	Covers the use in formulated MWFs/rolling oils including transfer operations, rolling and annealing activities, cutting/machining activities, automated and manual application of corrosion protections (including brushing, dipping and spraying), equipment maintenance, draining and disposal of waste oils.	
<b>Section 2</b>		<b>Operational conditions and risk management measures</b>
<b>Section 2.1</b>		<b>Control of worker exposure</b>
<b>Product characteristics</b>		
Physical form of product	Liquid, vapour pressure 0.5 - 10 kPa [OC4].	
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) [G13].	
Amounts used	<i>Not applicable</i>	
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]	
Human factors not influenced by risk management	<i>Not applicable</i>	
Other Operational Conditions affecting worker exposure	Assumes a good basic standard of occupational hygiene is implemented [G1]. Assumes activities are at ambient temperature (unless stated differently) [G17]. Operation is carried out at elevated temperature (> 20°C above ambient temperature) [OC7]. (PROC17, PROC18)	
<b>Contributing Scenarios</b>	<b>PROCs</b>	<b>Risk Management Measures</b>
General exposures (closed systems) [CS15]. Continuous process [CS54].	1	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>



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General exposures (closed systems) [CS15]. Continuous process [CS54]. With sample collection [CS56]. Equipment cleaning and maintenance [CS39].	2	Minimization of manual phases. #1 Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Use suitable eye protection and gloves [PPE14]. #1
General exposures (closed systems) [CS15]. Batch process [CS55]. With sample collection [CS56].	3	Minimization of manual phases. #1 Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Use suitable eye protection and gloves [PPE14]. #1
Batch process [CS55]. Mixing operations (open systems) [CS30].	5	Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 90%) Minimization of manual phases. #1 Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Use suitable eye protection and gloves [PPE14]. #1
Spraying [CS10].	7#2	Use in a spraying booth. Minimization of manual phases. #1 Clean equipment and the work area every day [C&H3]. Regular inspection and maintenance of equipment and machines. Ensure that the task is being carried out outside the breathing zone of a worker. Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Use suitable eye protection and gloves [PPE14]. #1
Transfer from/pouring from containers [CS22]. Non-dedicated facility [CS82].	8a	Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 90%) Minimization of manual phases. #1 Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Use suitable eye protection and gloves [PPE14]. #1
Transfer from/pouring from containers [CS22]. Dedicated facility [CS81].	8b	Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 97%) Minimization of manual phases. #1 Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Use suitable eye protection and gloves [PPE14]. #1



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Pouring from small containers [CS9]. Dedicated facility [CS81].	9	Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 90%) Minimization of manual phases. #1 Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Use suitable eye protection and gloves [PPE14]. #1
Rolling, Brushing [CS51].	10	Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 90%) Minimization of manual phases. #1 Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Use suitable eye protection and gloves [PPE14]. #1
Dipping, immersion and pouring [CS4].	13	Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 90%) Minimization of manual phases. #1 Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Use suitable eye protection and gloves [PPE14]. #1
Operation and lubrication of high energy open equipment [CS17].	17	Minimization of manual phases. #1 Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Use suitable eye protection and gloves [PPE14]. #1
	17#3	Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 95%) Minimization of manual phases. #1 Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Use suitable eye protection and gloves [PPE14]. #1

#1 refers to qualitative assessment

#2 other Tool used: Stoffenmanager (v. 4.0; 75<sup>th</sup> percentile for long term assessment)

#3 assessment at higher temperature (approx. 64 °C)/higher vapor pressure (>= 100 hPa); ECTOC TRA: high fugacity



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**16. ES8 – Metal working fluids / rolling oils (Professional)**

<b>Section 1</b>		<b>Exposure Scenario Title</b>
Title	<b>Metal working fluids / rolling oils; CAS: 71-36-3</b>	
Use Descriptor	Professional (SU22)	
	Process Categories: PROC1, PROC2, PROC3, PROC5, PROC8a, PROC8b, PROC10, PROC11, PROC13, PROC17	
	Environmental Release Categories: ERC8a	
Processes, tasks, activities covered	Covers the use in formulated MWFs including transfer operations, open and contained cutting/machining activities, automated and manual application of corrosion protections, draining and working on contaminated/ reject articles, and disposal of waste oils.	
<b>Section 2</b>		<b>Operational conditions and risk management measures</b>
<b>Section 2.1</b>		
<b>Control of worker exposure</b>		
<b>Product characteristics</b>		
Physical form of product	Liquid, vapour pressure 0.5 - 10 kPa [OC4].	
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) [G13].	
Amounts used	<i>Not applicable</i>	
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]	
Human factors not influenced by risk management	<i>Not applicable</i>	
Other Operational Conditions affecting worker exposure	Assumes a good basic standard of occupational hygiene is implemented [G1]. Assumes activities are at ambient temperature (unless stated differently) [G17]. Operation is carried out at elevated temperature (> 20°C above ambient temperature) [OC7]. (PROC17, PROC18)	
<b>Contributing Scenarios</b>	<b>PROCs</b>	<b>Risk Management Measures</b>
General exposures (closed systems) [CS15]. Continuous process [CS54].	1	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>



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General exposures (closed systems) [CS15]. ; Continuous process [CS54]. With sample collection [CS56]. ; Equipment cleaning and maintenance [CS39].	2	Minimization of manual phases. #1 Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Use suitable eye protection and gloves [PPE14]. #1
General exposures (closed systems) [CS15]. Batch process [CS55]. ; With sample collection [CS56].	3	Minimization of manual phases. #1 Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Use suitable eye protection and gloves [PPE14]. #1
Batch process [CS55]. Mixing operations (open systems) [CS30].	5	Minimization of manual phases. #1 Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Avoid carrying out operation for more than 4 hours [OC12] Use suitable eye protection and gloves [PPE14]. #1
Transfer from/pouring from containers [CS22]. Non-dedicated facility [CS82]	8a	Minimization of manual phases. #1 Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Avoid carrying out operation for more than 4 hours [OC12] Use suitable eye protection and gloves [PPE14]. #1
Transfer from/pouring from containers [CS22]. Dedicated facility [CS81]	8b	Minimization of manual phases. #1 Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Avoid carrying out operation for more than 4 hours [OC12] Use suitable eye protection and gloves [PPE14]. #1
Rolling, Brushing [CS51].	10	Minimization of manual phases. #1 Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1 Avoid carrying out operation for more than 4 hours [OC12] Use suitable eye protection and gloves [PPE14]. #1
Spraying [CS10].	11#2	Use in a spraying booth. Minimization of manual phases. #1 Clean equipment and the work area every day [C&H3]. Regular inspection and maintenance of equipment and machines. Ensure that the task is being carried out outside the breathing zone of a worker. Avoid frequent and direct contact with substance. #1 Supervision in place to check that the RMMs in place are being used correctly and OCs followed. #1



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		<p>Use suitable eye protection and gloves [PPE14].<sup>#1</sup></p>
		<p>Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 47%) Minimization of manual phases.<sup>#1</sup> Clean equipment and the work area every day [C&amp;H3]. Regular inspection and maintenance of equipment and machines. Avoid frequent and direct contact with substance.<sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed.<sup>#1</sup> Avoid carrying out operation for more than 6 hours Use suitable eye protection and gloves [PPE14].<sup>#1</sup></p>
		<p>Provide enhanced mechanical ventilation by mechanical means [E48].(effectiveness general ventilation: 47%) Minimization of manual phases.<sup>#1</sup> Clean equipment and the work area every day [C&amp;H3]. Regular inspection and maintenance of equipment and machines. Avoid frequent and direct contact with substance.<sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed.<sup>#1</sup> Use suitable eye protection and gloves [PPE14].<sup>#1</sup> Wear a suitable respiratory protection (effectiveness: 80%). If no adequate respiratory protection is available, avoid carrying out operation for more than 5 hours.</p>
Dipping, immersion and pouring [CS4].	13	<p>Minimization of manual phases.<sup>#1</sup> Avoid frequent and direct contact with substance.<sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed.<sup>#1</sup> Avoid carrying out operation for more than 4 hours [OC12] Use suitable eye protection and gloves [PPE14].<sup>#1</sup></p>
Operation and lubrication of high energy open equipment [CS17].	17	<p>Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 90%) Minimization of manual phases.<sup>#1</sup> Avoid frequent and direct contact with substance.<sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed.<sup>#1</sup> Use suitable eye protection and gloves [PPE14].<sup>#1</sup></p>



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		Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Avoid carrying out operation for more than 1 hour [OC11] Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
	17 <sup>#3</sup>	Provide extract ventilation to points where emissions occur [E54]. (effectiveness LEV: 90%) Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
		Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup> Wear a suitable respiratory protection (Effectiveness:90%)

<sup>#1</sup> refers to qualitative assessment

<sup>#2</sup> other Tool used: Stoffenmanager (v. 4.0; 75<sup>th</sup> percentile for long term assessment)

<sup>#3</sup> assessment at higher temperature (approx. 64 °C)/higher vapor pressure (>= 100 hPa); ECTOC TRA: high fugacity

For dermal exposure and effects on the eyes, a qualitative assessment was conducted.

### 17. ES9 – Use as consumer care product or disinfectant (Consumer)

In general, the use of perfumes, fragrances (PC28) and cosmetics, personal care products (PC 39) are considered to be covered by other legislations.

Exposure scenario: see above

### 18. ES10 – Use in laboratories (Professional)

Section 1	Exposure Scenario Title
Title	Use in laboratories; CAS: 71-36-3
Use Descriptor	Professional (SU22)
	Process Categories: PROC10, PROC15
	Environmental Release Categories: ERC8a
Processes, tasks, activities covered	Use of small quantities within laboratory settings, including material transfers and equipment cleaning



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Section 2		Operational conditions and risk management measures
Section 2.1		Control of worker exposure
<b>Product characteristics</b>		
Physical form of product	Liquid, vapour pressure 0.5 - 10 kPa [OC4].	
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) [G13].	
Amounts used	<i>Not applicable</i>	
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]	
Human factors not influenced by risk management	<i>Not applicable</i>	
Other Operational Conditions affecting worker exposure	Assumes a good basic standard of occupational hygiene is implemented [G1]. Assumes activities are at ambient temperature (unless stated differently) [G17]. Operation is carried out at elevated temperature (> 20°C above ambient temperature) [OC7]. (PROC17, PROC18)	
Contributing Scenarios	PROCs	Risk Management Measures
Rolling, Brushing [CS51].	10	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Avoid carrying out operation for more than 4 hours [OC12] Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>
Laboratory activities [CS36]. Small scale [CS61].	15	Minimization of manual phases. <sup>#1</sup> Avoid frequent and direct contact with substance. <sup>#1</sup> Supervision in place to check that the RMMs in place are being used correctly and OCs followed. <sup>#1</sup> Use suitable eye protection and gloves [PPE14]. <sup>#1</sup>

<sup>#1</sup> refers to qualitative assessment



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