A&D (Asia Pacific) Company Limited

DK-110 PLUS
28/08/28 Version 1.00

DK-110 PLUS

Bright Nickel Plating Process

INTRODUCTION

The **DK-110 PLUS** bright nickel process is outstanding for producing exceptionally fast rates of leveling and brightening for decorative plating. When operated according to the following instructions, the **DK-110 PLUS** bright nickel process is capable of giving excellent deposits of nickel on different basis metals with maximum rates of brightening and leveling. It is especially designed for air-agitated applications. The brightener system employed is versatile and gives excellent results in Watts baths.

The outstanding features of the **DK-110 PLUS** bright nickel process are:

- Outstanding bright whitish nickel deposit with superior rates of brightening and leveling without loss of ductility
- Exceptional low current density bright range, giving the ability to produce clear bright deposits in recesses and on areas of intricate shape
- Excellent chromium receptivity
- Ease of control and maintenance under production conditions

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BATH COMPOSITION

Nickel Sulfate ($NiSO_4$ $6H_2O$) -	225 - 375 g/L
Nickel Chloride ($NiCl_2$ $6H_2O$) -	53 - 150 g/L
Boric Acid (H_3BO_3) -	38 - 56 g/L
DK-99 Carrier -	8 - 10 ml/L
DK-110 PLUS Brightener -	0.4 - 0.8 ml/L
DK-88 Wetter -	1 - 2 ml/L

OPERATING CONDITIONS

	Range	**Preferred**
pH -	3.5 - 5	4
Temperature -	49 - 66° C	60° C
Current Density -	2 - 10 A/dm^2	2 - 8 A/dm^2

MAKE-UP MATERIALS

The choice of plating bath composition depends on the particular operating requirements such as cathode current density, type and finish of the basis metal, thickness of deposit, and shape of the article to be plated. Because of the flexibility of the DK-110 PLUS nickel process, it can be used with a variety of nickel plating bath formulations. The following make-up composition of the Watts type bath is one that will meet many plating requirements.

	1,000 Liters
Nickel Sulfate ($NiSO_4$ $6H_2O$) -	250 kg
Nickel Chloride ($NiCl_2$ $6H_2O$) -	55 kg
Boric Acid (H_3BO_3) -	40 kg
DK-99 Carrier -	8.0 liters
DK-110 PLUS Brightener -	0.5 liters
DK-88 Wetter -	1.0 liter

MAKE-UP PROCEDURE

The solution should be made up in a storage tank that has been thoroughly cleaned. All dirt, grease, etc., should be wiped off and the tank sides and bottom scrubbed with a solution of DK-88 wetting agent and hot water, and then thoroughly rinsed. The lining of the tank, filters, etc., should be leached with 0.2 to 0.5% by volume solution of sulfuric acid heated to 60° C containing 1 liter per thousand liters of DK-88 Wetter. Leaching should continue overnight. After this has been completed:

1. Fill tank about two-thirds full with deionized water, heat to 60 - 71° C.
2. Add and dissolve the required amount of nickel sulfate ($NiSO_4$ $6H_2O$).
3. Add and dissolve the required amount of nickel chloride ($NiCl_2$ $6H_2O$).
4. Add enough nickel carbonate ($NiCO_3$) to raise the pH to 5.2.
5. Add 2.5 ml/liter of 30% hydrogen peroxide, well diluted with water.
6. Add 2.4 g/liter of activated, powdered carbon and stir for 30 - 60 minutes. Turn off agitation and allow carbon to settle to bottom of the tank for 3-4 hours or, preferably, overnight.
7. Clean filter & repack it with a mixture of diatomaceous earth filter aid & carbon.
8. Filter this solution into the plating tank that has been leached and cleaned in the same manner as the storage tank.
9. Heat solution to operating temperature, add the boric acid and agitate to dissolve.
10. Dilute tank to near final volume and confirm that bath is at operating temperature.
11. Adjust the pH to 3.5 - 4 with a 10% by volume sulfuric acid (Chemical Pure or Analytical Reagent grade).
12. Electrolyze solution with dummy cathodes at 0.5 A/dm^2 for about 12 hours. Use of agitation and filtration during this period is beneficial.
13. Readjust the pH, if necessary.
14. Add the required amounts of DK-110 PLUS Brightener, DK-99 Carrier and DK-88 Wetter, circulate for 20 minutes to assure thorough mixing, and commence plating.

PROCESS CONTROL

Nickel Sulfate is the main source of nickel ions which deposit out as metallic nickel at the cathode, i.e., on the work being plated.

Nickel Chloride supplies chloride ions to facilitate anode corrosion, increases conductivity and makes it possible to plate at higher current densities.

Boric Acid stabilizes the pH of the cathode film by exerting buffer action.

DK-99 CARRIER has strong ductilizing and stress-reducing abilities and is added to maintain maximum brilliance and ductility of the deposit. It is depleted very slowly by electrolysis and is removed only slightly by continuous filtration through a carbon pack.

DK-110 PLUS Brightener contains the primary brightener for the DK-110 PLUS process. Replenishment of the additives is determined by deposit properties and analysis.

DK-88 Wetter is used in mechanical and air-agitated baths respectively. Normally, little or no anti-pitting agent is required for the prevention of pitting. However, the maintenance of a small concentration of DK-88 (e.g. 0.5 ml/liter) will insure the production of pit-free deposits under most production conditions. Replenishment of DK-88 may be accomplished based on stalagmometer measurements. Both DK-88 are removed by batch treatments with activated carbon. DK-88 tends to saturate a carbon-packed filter, and continuous operation under these conditions results in only a minor loss of this addition agent.

Temperature of the plating solution should be maintained between 50-70° C. The use of automatic temperature control is recommended to assist in maintaining constant operating conditions. Operation at higher temperatures provides benefits such as improved leveling, higher permissible current densities, and greater solution conductivity. However, before selecting a higher temperature, the operator should make certain that the equipment will withstand it. Higher temperatures will require recalculation of addition agent consumption. The use of additives may be greater. The DK-110 PLUS bright nickel process can be operated at lower temperatures (38-50° C) by utilizing higher nickel chloride and boric acid concentrations.

pH of the DK-110 PLUS plating solution should be measured regularly and maintained within the range of 3.5 - 4.5. Dilute C.P. or reagent grade sulfuric acid (one part sulfuric acid added carefully to ten parts of water) should be used to lower the pH. Nickel carbonate, applied to the filter, should be used to raise the solution pH.

Cathode Current Density - Bright deposits are produced by the DK-110 PLUS bright nickel plating process over a wide range of current densities. The operator should take the proper steps to assure proper nickel metal concentration, good racking, proper positioning of parts, adequate agitation, etc., where current density extremes are encountered.

Anode Current Density - As in plating solutions in general, the average anode current density is determined by dividing the total tank current by the anode area. It is desirable that this value not exceed 1 A/dm^2, although 'S' rounds will operate at higher values. This value may be used as a very rough guide for design purposes. Comparing this figure with the cathode current density range, it is evident that the anode area normally must be many times greater than the area of the work being plated. In practical operations, permissible anode current density is affected by many factors such as type of anode material and anode bag, amount of solution agitation, operating temperature, nickel chloride concentration, and pH. Consequently, attempts to maintain anode current density at a specific numerical value are seldom, if ever, made and such attempts are not likely to give useful results. Good nickel anode operation is based on an easily observed fundamental plating principle. The anode area must be sufficiently large so that the anodes will dissolve and replace the nickel removed by plating. In other words, the total anode area must be large enough so that the anodes do not become 'passive' or 'polarized'.

SOLUTION REPLENISHMENT

The following table of consumption rates of the DK-110 PLUS nickel process addition agents will be found to fit nearly all installations. If the actual rates in the plant are found to be different than the tabulated values, your local A&D representative should be consulted.

Addition Agent	Addition Rate
DK-110 PLUS Brightener	80 - 150 ml/kAh
DK-88 Wetter	10 - 30 ml/kAh
DK-99 Carrier	50 - 100 ml/kAh

EQUIPMENT

Tank or tank liner -	CPVC, PVC, Koroseal-lined steel, or polypropylene
Pumps -	High temp. or conventional plastic suitable for acid applications.
Heaters -	Quartz, PTFE, or Titanium. The titanium should be grounded or anodically biased.
Racks -	Plastisol-coated steel or Plastisol-coated copper. Stainless steel should be avoided.
Filters -	6-8 turnovers per hour through a 5 micron polypropylene cartridge or horizontal plate filter packed with diatomaceous earth filter aid.
Anodes -	1. 'S' rounds or pellets 2. Electrolytic nickel in small, rectangular pieces 3. Rolled 99+% depolarized or carbon-type nickel
Anode Bags -	Dynel, polypropylene, or cotton leached in a 5% by volume sulfuric acid solution and then flushed with hot running water prior to use.
Anode Hooks -	Monel or titanium
Anode Baskets -	Titanium

Steel or iron containing materials should be avoided anywhere around the tank (e.g. ventilation, tank supports, piping, etc.). The acid environment will corrode such materials and drippage may contaminate the plating bath. Equipment fabricated from or soldered with lead or lead-based materials that comes into contact with the plating solution should not be used.

STORAGE

DK-110 PLUS Brightener, DK-99 Carrier and DK-88 Wetter should be stored in a cool, dry location and not near supplies of food, drink or animal feeds. Containers should be kept closed. The shelf life on unopened containers of these products is one year.

GENERAL SAFETY PRECAUTIONS

When working with this product(s), ensure that all health, environmental, and safety regulations and standards are met. Avoid direct contact with this material. Do not inhale associated mist, vapors, and/or dust. Emergency showers and eyewashes must be readily available.

Material Safety Data Sheet
According to 91/155 EC

Printing date 6/30/2014

Revision date 6/22/2010
Version 2.01

1. Identification of substance

- **Product details**
- **Trade name: WETTER DK-88**
- **Article number:**
- **SD - No. AD-701-DK88V2**
- **Manufacturer / Supplier:**
  A&D (Asia Pacific) Company Limited
  Flat D, 13th Floor, Hung Cheung Industrial Center (Phase 2),
  10 Tsing Yeung Circuit, Tuen Mun, New Territories,
  Hong Kong Tel: (852) 2786 4091 Fax: (852) 2786 4427
- **Informing department: Quality Management Division**
- **Emergency information: 2786 4091**

2. Composition / Data on components:

- Chemical characterization
- Description:
  Mixture of the substances listed below harmless additions.
- Dangerous components:

CAS No.	Designation	%	Index	R-phrases
151-21-3	Sodium dodecyl sulfate	3 - 8	Xn	20/34/35/36

3. Hazards identification

- **Hazard designation** — Void
- **Information pertaining to particular dangers for man and environment** — Void
- **Classification system** — The classification is in line with current EC lists. It is expanded, however, by information from technical literature and by information furnished by supplier companies.

4. First aid measures

- **General information** — No special measures required
- **After inhalation** — Supply fresh air; consult doctor in case of symptoms
- **After skin contact**. — May cause transient irritation
- **After eye contact** — Rinse opened eye for several minutes under running water.
- **After swallowing** — In case of persistent symptoms consult doctor.

5. Fire fighting measures

- **Suitable extinguishing agents** — CO_2, extinguishing powder or water jet. Fight larger fires with water jet.
- **Protective equipment** — No special measures required.
  For dust: Filter DN 3181 A 2

Material Safety Data Sheet
According to 91/155 EC

Printing date 6/30/2014

Revision date 6/22/2010
Version 2.01

Trade name: WETTER DK-88

6. Accidental release measures

• **Person-related safety precautions**	Not required
• **Measures for environmental protection**	Dilute with much water
• **Measures for cleaning / collecting**	Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust) Adsorb with liquid-binding material and dispose at a waste depot or incineration paint, which is especially equipped to handle hazardous waste.
• **Additional information**	No dangerous materials are released.

7. Handling and storage

• **Handling**	
• **Information for safe handlings**	No special measures required. Keep containers tightly sealed.
• **Information about protection against explosions and fires**	No special measures required.
• **Storage**	
• **Requirements to be met by store rooms and containers**	No special requirements.
• **Information about storage in one common storage facility**	Store away from foodstuffs.
• **Further information about storage conditions**	None.
• **Storage class**	
• **Class according to regulation on inflammable liquids**	Void.

8. Exposure controls and personal protection

• **Additional information about design of technical systems**	No further data; see item 7.

• **Components with critical values that require monitoring at the workplace:**

CAS NO.	Designation of material	Type	Value	Unit

The product does not contain any relevant quantities of materials with critical values that have to be monitored at the workplace.

• **Additional information**	The lists that were valid during the compilation were used as basis.
• **Personal protect equipment**	
• **General protective and hygienic measures**	The usual precautions measures should adhered to in handling the chemicals.
• **Breathing equipment**	Not required.
• **Protection of hands**	Void.
• **Eye protection**	Safety glasses recommended during refilling.

9. Physical and chemical properties:

• **Form**	Fluid
• **Colour**	Light yellow to brown. According to product specification

Material Safety Data Sheet
According to 91/155 EC

Printing date 6/30/2014

Revision date 6/22/2010
Version 2.01

Trade name: WETTER DK-88

• **Smell**	odorless		
	Value / Range	Unit	Method
• **Change in condition**			
• **Melting point / Melting range**	Not determined		
• **Boiling point / Boiling range**		100 °C	
• **Flash point**	Not applicable		
• **Ignition temperature**	Not applicable		
• **Self-inflammability**	Product is not self-igniting		
• **Danger of explosion**	Product is not explosive		
See item 7			
• **Steam pressure**	at 20 ° C	23 mbar	
• **Density**	at 20 ° C	1.04-1.09 g/cm^3	
• **Solubility in / Miscibility with**	Fully miscible		
• **Water**			
• **pH-value** (100 g/l) at 20 ° C	4 - 7		
• **Solvent content**			
• **Organic solvents**	0.0 %		
• **Water**	1.0 mixable		

10. Stability and reactivity

• **Thermal decomposition / conditions to be avoided**	No decomposition if used according to specifications.
• **Dangerous reactions**	No dangerous reactions known.
• **Dangerous products of composition**	No dangerous decomposition products known.

11. Toxicological information

- **Acute toxicity**
- **LD/LC50 values that are relevant for classifications**

Components	Type	Value	Species
Sodium dodecyl sulfate	Oral LD50	1,288 mg/kg	Rat

• **Primary irritant effect**	
• **On the skin**	No irritant effect
• **On the eye**	No irritant effect
• **Sensitization**	No sensitizing effect known
• **Additional toxicological information**	The product is not subject to classification according to the calculation method of the General EC Classification Guidelines for Preparations as issued in the latest version: When used and handled according to specifications, the product does not have any harmful effects according to our experience and the information provided to us.

Material Safety Data Sheet
According to 91/155 EC

Printing date 6/30/2014

Revision date 6/22/2010
Version 2.01

Trade name: WETTER DK-88

12. Ecological information

- **General notes** Water hazard class 1 (Self-assessment):
Slightly hazardous for water. Do not allow undiluted product or large quantities of it to reach ground water, water bodies or sewage system.

13. Disposal considerations

- **Product**
- **Recommendation** Smaller quantities can be disposed with household garbage.
- **Waste disposal key number** 59301

- **Uncleaned packagings**
- **Recommendation** Disposal must be made according to official regulations.
- **Recommended cleaning agent** Water, if necessary with cleaning agent.

14. Transport information

- Land transport ADR/RID and GGVS/GGVE (cross-border/domestic)
- ADR/RID-GGVS/E Class : -
- Number/Letter: -
- Kemler Number: -
- UN-number -
- Designation of goods: Non dangerous goods

- Maritime transport IMDG/GGVSea:
- IMDG/GGVSea Class : -
- Page: -
- UN Number: -
- Packaging group: -
- EMS Number -
- MFAG: -
- Correct technical name: Non Dangerous Goods

- Air transport ICAO-TI and IATA-DGR:
- ICAO/ITAT Class: -
- UN/ID Number: -
- Packaging group: -
- Correct technical name: Non Dangerous Goods

15. Regulatory information

- **Designation according to EC guidelines:** Observe the normal safety regulations when handling chemicals. The product is not subject to identification regulations under EC Directives and the Ordinance on Hazardous Materials (GefStoffv).

Material Safety Data Sheet
According to 91/155 EC

Printing date 6/30/2014

Revision date 6/22/2010
Version 2.01

Trade name: WETTER DK-88

- **National regulations**
- **Classification according to VbF:** Void.
- **Water hazard class:** Water hazard class 1 (Self-assessment) : slight hazardous for water.

16. Other information

These data are based on our present knowledge. However, they shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

- **Department issuing data specification sheet:** QMS-TD-701-DK88V2
- **Contacts:** Albert Lee

Material Safety Data Sheet
According to 91/155 EC

Printing date 6/30/2014

Revision date 9/15/2011
Version 3.02

1. Identification of substance

- **Product details**
- **Trade name: CARRIER DK-99**
- **Article number:**
- **SD - No. AD-701-DK99V3**
- **Manufacturer / Supplier:**
  A&D (Asia Pacific) Company Limited
  Flat D, 13th Floor, Hung Cheung Industrial Center (Phase 2),
  10 Tsing Yeung Circuit, Tuen Mun, New Territories,
  Hong Kong Tel: (852) 2786 4091 Fax: (852) 2786 4427
- **Informing department: Quality Management Division**
- **Emergency information: 2786 4091**

2. Composition / Data on components:

- Chemical characterization
- Description:
  Mixture of the substances listed below harmless additions.
- Dangerous components:

CAS No.	Designation	%	Index	R-phrases
6155-57-3	Sodium saccharine dihydrate	16 - 28	Xn	20

3. Hazards identification

- **Hazard designation** Void
- **Information pertaining to particular dangers for man and environment** Void
- **Classification system** The classification is in line with current EC lists. It is expanded, however, by information from technical literature and by information furnished by supplier companies.

4. First aid measures

- **General information** No special measures required
- **After inhalation** Supply fresh air; consult doctor in case of symptoms
- **After skin contact**. May cause transient irritation
- **After eye contact** Rinse opened eye for several minutes under running water.
- **After swallowing** In case of persistent symptoms consult doctor.

5. Fire fighting measures

- **Suitable extinguishing agents** CO_2, extinguishing powder or water jet. Fight larger fires with water jet.
- **Protective equipment** No special measures required.
  For dust: Filter DN 3181 A 2

Material Safety Data Sheet
According to 91/155 EC

Printing date 6/30/2014

Revision date 9/15/2011
Version 3.02

Trade name: CARRIER DK-99

6. Accidental release measures

• **Person-related safety precautions**	Not required
• **Measures for environmental protection**	Dilute with much water
• **Measures for cleaning / collecting**	Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust) Adsorb with liquid-binding material and dispose at a waste depot or incineration paint, which is especially equipped to handle hazardous waste.
• **Additional information**	No dangerous materials are released.

7. Handling and storage

• **Handling**	
• **Information for safe handlings**	No special measures required. Keep containers tightly sealed.
• **Information about protection against explosions and fires**	No special measures required.
• **Storage**	
• **Requirements to be met by store rooms and containers**	No special requirements.
• **Information about storage in one common storage facility**	Store away from foodstuffs.
• **Further information about storage conditions**	None.
• **Storage class**	
• **Class according to regulation on inflammable liquids**	Void.

8. Exposure controls and personal protection

• **Additional information about design of technical systems**	No further data; see item 7.

• **Components with critical values that require monitoring at the workplace:**

CAS NO.	Designation of material	Type	Value	Unit

The product does not contain any relevant quantities of materials with critical values that have to be monitored at the workplace.

• **Additional information**	The lists that were valid during the compilation were used as basis.
• **Personal protect equipment**	
• **General protective and hygienic measures**	The usual precautions measures should adhered to in handling the chemicals.
• **Breathing equipment**	Not required.
• **Protection of hands**	Void.
• **Eye protection**	Safety glasses recommended during refilling.

9. Physical and chemical properties:

• **Form**	Fluid
• **Colour**	Light yellow. According to product specification

Material Safety Data Sheet
According to 91/155 EC

Printing date 6/30/2014

Revision date 9/15/2011
Version 3.02

Trade name: CARRIER DK-99

• **Smell**	odorless		
	Value / Range	Unit	Method
• **Change in condition**			
• **Melting point / Melting range**	Not determined		
• **Boiling point / Boiling range**		100 °C	
• **Flash point**	Not applicable		
• **Ignition temperature**	Not applicable		
• **Self-inflammability**	Product is not self-igniting		
• **Danger of explosion**	Product is not explosive		
See item 7			
• **Steam pressure**	at 20 ° C	23 mbar	
• **Density**	at 20 ° C	1.1-1.2 g/cm^3	
• **Solubility in / Miscibility with**	Fully miscible		
• **Water**			
• **pH-value** (100 g/l) at 20 ° C	4 - 7		
• **Solvent content**			
• **Organic solvents**	0.0 %		
• **Water**	1.0 mixable		

10. Stability and reactivity

• **Thermal decomposition / conditions to be avoided**	No decomposition if used according to specifications.
• **Dangerous reactions**	No dangerous reactions known.
• **Dangerous products of composition**	No dangerous decomposition products known.

11. Toxicological information

• **Acute toxicity**
• **LD/LC50 values that are relevant for classifications**

Components	Type	Value	Species
Sodium saccharine dihydrate	LD50 Oral	500 mg /kg	rat

• **Primary irritant effect**	
• **On the skin**	No irritant effect
• **On the eye**	No irritant effect
• **Sensitization**	No sensitizing effect known
• **Additional toxicological information**	The product is not subject to classification according to the calculation method of the General EC Classification Guidelines for Preparations as issued in the latest version: When used and handled according to specifications, the product does not have any harmful effects according to our experience and the information provided to us.

Material Safety Data Sheet
According to 91/155 EC

Printing date 6/30/2014

Revision date 9/15/2011
Version 3.02

Trade name: CARRIER DK-99

12. Ecological information

- **General notes** Water hazard class 1 (Self-assessment):
  Slightly hazardous for water. Do not allow undiluted product or large quantities of it to reach ground water, water bodies or sewage system.

13. Disposal considerations

- **Product**
- **Recommendation** Smaller quantities can be disposed with household garbage.
- **Waste disposal key number** 59301

- **Uncleaned packagings**
- **Recommendation**
- **Recommended cleaning agent** Disposal must be made according to official regulations.
  Water, if necessary with cleaning agent.

14. Transport information

- Land transport ADR/RID and GGVS/GGVE (cross-border/domestic)
- ADR/RID-GGVS/E Class : -
- Number/Letter: -
- Kemler Number: -
- UN-number -
- Designation of goods: Non dangerous goods

- Maritime transport IMDG/GGVSea:
- IMDG/GGVSea Class : -
- Page: -
- UN Number: -
- Packaging group: -
- EMS Number -
- MFAG: -
- Correct technical name: Non Dangerous Goods

- Air transport ICAO-TI and IATA-DGR:
- ICAO/ITAT Class: -
- UN/ID Number: -
- Packaging group: -
- Correct technical name: Non Dangerous Goods

15. Regulatory information

- **Designation according to EC guidelines:** Observe the normal safety regulations when handling chemicals. The product is not subject to identification regulations under EC Directives and the Ordinance on Hazardous Materials (GefStoffv).

Material Safety Data Sheet
According to 91/155 EC

Printing date 6/30/2014

Revision date 9/15/2011
Version 3.02

Trade name: CARRIER DK-99

- **National regulations**
- **Classification according to VbF:** Void.
- **Water hazard class:** Water hazard class 1 (Self-assessment) : slight hazardous for water.

16. Other information

These data are based on our present knowledge. However, they shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

- **Department issuing data specification sheet:** QMS-TD-701-DK99V3
- **Contacts:** Albert Lee

PT.Canang Indah
Particleboard & MDF Industries

PARTICLEBOARD / MDF
MATERIAL SAFETY DATA SHEET

A. GENERAL INFORMATION

PRODUCT NAME: **Urea Formaldehyde Bonded Wood Product** **(Particleboard & MDF)**	**C.A.S .NO.** **N.A**
DESCRIPTION : This panel product is manufactured from particles or fibres of wood bonded together with Urea- Formaldehyde Resin	
MANUFACTURER DISTRIBUTOR PT.CANANG INDAH: **Particleboard & MDF Industries** **Jl. Prof.H.M.Yamin S.H No.46 Medan** **20234 North Sumatera - Indonesia**	**PHONE NUMBER :** **T.(+6261) 4525799 , 4560573** **F.(+6261) 4524422**

B. INGREDIENTS & HAZARDS

Under some condition the following hazardous chemical or components may be released from fibreboard, particleboard, and or products manufactured from the same Wood dust may also be developed from machining various wood products.

MATERIAL COMPONENT	C.A.S#	OSHA Exposure Limit	ACGIH/TLV Celling
Formaldehyde	50-00-0	0.75 PPM 8 hr TWA Pel 2 PPM STEL	0.3 PPM
Wood Dust	N.A	5 mg/m³ , 8 hr TWA 10 mg/m³ STEL	5 mg/m³ , 8 hr TWA 10 mg/m³ ,15-min STEL

Particleboard and Medium Density Fibreboard certified as meeting the HUD manufactured and Home Contruction and Safety Standards 24 C.F.R. Part 3200 does not emit excess of 0.3 PPM formaldehyde when tested. in accordance with FTM 2-1983, large scale test methode for determining formaldehyde emmision from wood products.

PT.Canang Indah
Particleboard & MDF Industries

Cipta
www.tjipta.com

PARTICLEBOARD / MDF
MATERIAL SAFETY DATA SHEET

C.PHYSICAL CHARACTERISTICS

Boiling- Point :N.A Odor :No distinctive Appearance :Shades of brown	Specific Gravity:(Water=1):1 Melting Point :N.A	Vapor Pressure :N.A Reactivity in water :N.A

D. FIRE & EXPLOSION DATA

Flash Point : Auto Ignition Temperature: **Flammable limits :** Fire Extinguisher Media : Special Fire Fighting Procedures: Fire and Explosion Hazards :	N.A 400 - 500 °Fahrenheit (204 - 260°C) Formaldehyde LEL 7%, UEL 73% Water Spray Fire -Fighting procedures for wood products are well known-water **Wood products do not constitute an explosion hazard. Sawing, sanding and/or machining can produce wood dust as a by-product wich may present a severe explosion hazard if a dust cloud contacts an ignition source. According to data contained in HFPA standards, 0.040 ounce per cubic foot is the minimum explosive concentration for wood flour.**

E. HEALTH AND HAZARD DATA

Formaldehyde Vapor-Sign and Symtoms of Exposure
Acute : May Cause temporary irritation of skin, eyes or respiratory system. May cause sensitization in susceptible individuals.

Chronic : Rats exposed to 14 PPM formaldehyde develope nasal cancer. The NCI (National Cancer Institute) epidemiology study of 26,000 workers found little evidence linking formaldehyde exposure to cancer.The EPA has classified formaldehyde as a B-1 Probably Human Carcinogen.

Formaldehyde is listed by IARC and the HTP as an animal carcinogen
Medical condition aggravated by exposure : Respiratory condition or allergies

Emergency First Aids Procedures :
Inhalation : Remove to fresh air
Eyes : Remove to fresh air
Skin : Remove to fresh air
Ingestion : N.A
If Irritation, or other symptoms persist-consult a physician

PT.Canang Indah
Particleboard & MDF Industries

PARTICLEBOARD / MDF
MATERIAL SAFETY DATA SHEET

F. REACTIVITY DATA

Stability:	Stable
Conditions to avoid:	High humidity & temperatures = higher formaldehyde emision
Materials to avoid:	Strong oxidizing agents and/or strong acid.
Hazardous Decomposition:	Thermal and/or thermal-oxidative decompesition can produce irritating and toxic fumes and gases, including Carbon Monoxide, aldebydes and organic acids.
Hazardous Polymerization :	Will not accur.

G. SPILL/LEAK PROCEDURES

Handling & Storage:	Provide adequate ventilation/reducin g formaldehyde vapor.
Waste Disposal:	Incinerate,or landfill in accordance with local & federal regu1llations

H. SPECIAL PROTECTION INFORMATION

Respiratory Protection :	Wear NIOSH approved breathing protection for Exposure to wood dust
E y e Protection	Wear safety goggles in dusty enviroments.

PT.Canang Indah
Particleboard & MDF Industries

PARTICLEBOARD / MDF
MATERIAL SAFETY DATA SHEET

A. GENERAL INFORMATION

PRODUCT NAME: **Urea Formaldehyde Bonded Wood Product** **(Particleboard & MDF)**	**C.A.S .NO.** **N.A**
DESCRIPTION : This panel product is manufactured from particles or fibres of wood bonded together with Urea- Formaldehyde Resin	
MANUFACTURER DISTRIBUTOR PT.CANANG INDAH: **Particleboard & MDF Industries** **Jl. Prof.H.M.Yamin S.H No.46 Medan** **20234 North Sumatera - Indonesia**	**PHONE NUMBER :** **T.(+6261) 4525799 , 4560573** **F.(+6261) 4524422**

B. INGREDIENTS & HAZARDS

Under some condition the following hazardous chemical or components may be released from fibreboard, particleboard, and or products manufactured from the same Wood dust may also be developed from machining various wood products.

MATERIAL COMPONENT	C.A.S#	OSHA Exposure Limit	ACGIH/TLV Celling
Formaldehyde	50-00-0	0.75 PPM 8 hr TWA Pel 2 PPM STEL	0.3 PPM
Wood Dust	N.A	5 mg/m³ , 8 hr TWA 10 mg/m³ STEL	5 mg/m³ , 8 hr TWA 10 mg/m³ ,15-min STEL

Particleboard and Medium Density Fibreboard certified as meeting the HUD manufactured and Home Contruction and Safety Standards 24 C.F.R. Part 3200 does not emit excess of 0.3 PPM formaldehyde when tested. in accordance with FTM 2-1983, large scale test methode for determining formaldehyde emmision from wood products.

PT.Canang Indah
Particleboard & MDF Industries

Cipta
www.tjipta.com

PARTICLEBOARD / MDF
MATERIAL SAFETY DATA SHEET

C.PHYSICAL CHARACTERISTICS

Boiling- Point :N.A Odor :No distinctive Appearance :Shades of brown	Specific Gravity:(Water=1):1 Melting Point :N.A	Vapor Pressure :N.A Reactivity in water :N.A

D. FIRE & EXPLOSION DATA

Flash Point : Auto Ignition Temperature: **Flammable limits :** Fire Extinguisher Media : Special Fire Fighting Procedures: Fire and Explosion Hazards :	N.A 400 - 500 °Fahrenheit (204 - 260°C) Formaldehyde LEL 7%, UEL 73% Water Spray Fire -Fighting procedures for wood products are well known-water **Wood products do not constitute an explosion hazard. Sawing, sanding and/or machining can produce wood dust as a by-product wich may present a severe explosion hazard if a dust cloud contacts an ignition source. According to data contained in HFPA standards, 0.040 ounce per cubic foot is the minimum explosive concentration for wood flour.**

E. HEALTH AND HAZARD DATA

Formaldehyde Vapor-Sign and Symtoms of Exposure
Acute : May Cause temporary irritation of skin, eyes or respiratory system. May cause sensitization in susceptible individuals.

Chronic : Rats exposed to 14 PPM formaldehyde develope nasal cancer. The NCI (National Cancer Institute) epidemiology study of 26,000 workers found little evidence linking formaldehyde exposure to cancer.The EPA has classified formaldehyde as a B-1 Probably Human Carcinogen.

Formaldehyde is listed by IARC and the HTP as an animal carcinogen
Medical condition aggravated by exposure : Respiratory condition or allergies

Emergency First Aids Procedures :
Inhalation : Remove to fresh air
Eyes : Remove to fresh air
Skin : Remove to fresh air
Ingestion : N.A
If Irritation, or other symptoms persist-consult a physician

PT.Canang Indah
Particleboard & MDF Industries

PARTICLEBOARD / MDF
MATERIAL SAFETY DATA SHEET

F. REACTIVITY DATA

Stability:	Stable
Conditions to avoid:	High humidity & temperatures = higher formaldehyde emision
Materials to avoid:	Strong oxidizing agents and/or strong acid.
Hazardous Decomposition:	Thermal and/or thermal-oxidative decompesition can produce irritating and toxic fumes and gases, including Carbon Monoxide, aldebydes and organic acids.
Hazardous Polymerization :	Will not accur.

G. SPILL/LEAK PROCEDURES

Handling & Storage:	Provide adequate ventilation/reducin g formaldehyde vapor.
Waste Disposal:	Incinerate,or landfill in accordance with local & federal regu1llations

H. SPECIAL PROTECTION INFORMATION

Respiratory Protection :	Wear NIOSH approved breathing protection for Exposure to wood dust
E y e Protection	Wear safety goggles in dusty enviroments.

SAFETY DATA SHEET

Chromium Trioxide

This Safety Data Sheet contains information concerning the potential risks to those involved in handling, transporting and working with the material, as well as describing potential risks to the consumer and the environment. This information must be made available to those who may come into contact with the material or are responsible for the use of the material. This Safety Data Sheet is prepared in accordance with formatting described in the Regulation (EU) No 453/2010, and described in CLP Regulation (EC) No 1272/2008.

Section 1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Chemical Name: Chromium Trioxide
CAS No.:1333-82-0
EINECS No: 215-607-8
REACH Registration No.: 01-211-9458868-17-0010

1.2 Relevant identified uses of the substances or mixture and of the company/undertaking

Identified uses:	Intermediate, Formulation of preparations, Surface treatments, Use of catalysts containing chromium trioxide, small scale laboratory use of chromium trioxide.
Uses advised against:	All consumer use

1.3 Details of the supplier of the safety data sheet

Non-EU Manufacturer

Company name:	JSC "Aktyubinsk Chromium Chemicals Plant"
Address:	030015, Aktobe, Kazakhstan
Phone number:	+7 7132 536501
Fax number:	+7 7132 536508
E-mail of the person responsible for the SDS:	ves@azhs.kz

1.4 Emergency telephone number

In case of emergency:

Emergency telephone number:	+7 7132 536517
Hours of operation:	24/7

Section 2. Hazards Identification

2.1 Classification of the substance or mixture

Harmonised Classification according to Regulation (EC) No. 1272/2008 (CLP)
Ox. Sol. 1. H271 Carc. 1A. H350 Muta. 1B. H340 Repr. 2. H361F Acute Tox. 2. H330 Acute Tox. 3. H311 Acute Tox. 3. H301 STOT RE 1. H372 Skin Corr. 1A. H314 Resp. Sens. 1. H334 Skin Sens. 1. H317 Aquatic Acute 1. H400 Aquatic Chronic 1. H410 STOT SE 3. H335

For full text of hazard statements, see section 16.

Physicochemical hazards:A strong oxidiser.

Human health:

May cause cancer. May cause genetic defects. May damage fertility. May damage the unborn child. Fatal if inhaled. Causes severe skin burns and eye damage. Toxic if swallowed.

Environment:

Very toxic to aquatic life with long lasting effects.

2.2 Label elements

Labelling according to Regulation (EC) No 1272/2008:



Signal Word

Danger

Hazard Statements

H271	May cause fire or explosion; intensify fire: strong oxidiser.
H350	May cause cancerif inhaled
H340	May cause genetic defects
H361F	Suspected of damaging fertility
H330	Fatal if inhaled.
H311	Toxic in contact with skin
H301	Toxic if swallowed.
H372	Causes damage to respiratory organs through prolonged or repeated exposure.
H314	Causes severe skin burns and eye damage.
H410	Very toxic to aquatic life with long lasting effects
H335	May cause respiratory irritation

Precautionary statements:

Prevention

P201	Obtain special instructions before use
P210	Keep away from heat/sparks/open flames/hot surfaces.-no smoking
P220	Keep/Store away from clothing/combustible materials
P260	Do not breathe dust
P280	Wear protective gloves/protective clothing/eye protection/face protection

Response

P304+P340+P310	IF INHALED remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTRE
P301+P331+310	IF SWALLOWED: Do NOT induce vomiting. Immediately call a POISON CENTRE
P308 +P313	If exposed or concerned: Get medical advice/attention

Storage

P403+P233	Store in well ventilated place. Keep container tightly closed. Highly recommended

2.3 Other hazards

PBT:	Not considered to be a PBTor vPvB

Section 3. Composition

Name	CAS Number	EINECS Number	CLP Index number	% Composition
Chromium (VI) Trioxide	1333-82-0	215-607-8	024-001-00-0	100 %

Section 4. First Aid Measures

4.1 Description of first aid measures

Inhalation

Seek medical attention immediately.Remove exposed person to fresh air. If breathing is difficult, administer oxygen. If breathing has stopped, give artificial respiration.It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation as the inhaled material is toxic and corrosive.Loosen tight clothing. Continue to monitor for respiratory distress for 72 hours.

Skin contact

Immediately flush affected area(s) with copious amounts of water for at least 15 minutes. Remove contaminated clothing and shoes. Seek medical attention immediately. Thoroughly clean or discard contaminated clothing and shoes.

Accidental eye contact
Hold affected eye(s) open and irrigate with water for at least 15 minutes. Remove contact lenses if present. Seek medical attention immediately.

Ingestion
If swallowed, do not induce vomiting. Seek medical attention immediately. Loosen tight clothing such as a collar, tie, belt or waistband. Do not give anything by mouth to someone who is unconscious, having convulsions, or unable to swallow.

4.2 Most important symptoms and effects, both acute and delayed

Eyes

Eye contact will cause irritation and inflammation characterised by redness, watering, itching, contractions around the eye and sensitivity to light. Severity will depend on the length of exposure, solution concentration and first aid measures provided.

Skin

Skin contact causes skin irritation, ulceration and burns. Allergic response may occur up to 3 days after exposure. Prolonged contact with product may cause discomfort.

Ingestion

Ingestion will cause gastrointestinal discomfort characterised by feelings of nausea, vomiting, pain and bloody diarrhoea and vomit.

Inhalation

Inhalation of dust or mist may cause irritation characterised by,coughing, chest pain, cold-like symptoms and sore throat. Asthma and a build-up of fluid in the lungs may occur up to 3 days after exposure.

4.3 Indication of any immediate attention and special treatment needed

No information available

Section 5. Firefighting Measures

5.1 Extinguishing media

No known unsuitable extinguishing media

Use fire extinguishing media appropriate for surrounding materials.

5.2 Special hazards arising from the substance or mixture

Combustion can be violent. The substance reacts strongly with materials which are readily oxidised. Reaction may be rapid enough to cause ignition.

5.3 Advice for fire-fighters

Firefighters should wear self-contained breathing apparatus in positive pressure mode and chemical protective clothing.

Section 6. Accidental Release Measures

6.1 Personal precautions, protective equipment and emergency procedures

Uncontrolled releases should be responded to only by trained personnel using pre-planned procedures. In case of a spill, clear the affected area and protect people.

Clean-up personnel should wear appropriate protective equipment including respiratory protection.

6.2 Environmental precautions

Accidental spills should be dealt with immediately to prevent the formation of inhalable dusts or aerosols and release to the aquatic environment.

6.3 Method for cleaning up

Spilled solid material should be placed in a separate clean, dry closed container. Spilled liquid material should be treated with adsorbent material (sand, soil, vermiculite) and placed in a clean dry container. Spillage should be disposed of through an approved contractor or by reduction to trivalent chromium with an excess of strong reducing agent such as sodium dithionate or sodium bisulphite. The addition of alkaline (calcium oxide, calcium hydroxide) causes precipitation of insoluble chromium hydroxide from liquid waste.

6.4 Reference to other sections

For disposal see section 13

Section 7. Handling and Storage

7.1 Precautions for safe handling

Protect containers from physical damage and contamination. Do not eat, drink or smoke in areas where the substance is being used or stored. Wash thoroughly after handling. Wear appropriate personal protective equipment. Avoid contact with skin, eyes, and clothing. Wear respiratory protection where there is risk of exposure to the substance. Double-bag soiled clothing and place in a sealed container clearly labelled as a chemical hazard. Do not reuse empty containers.

7.2 Condition for safe storage, including any incompatibilities

Store locked up in a cool, dry place away from ignition sources, combustible, organic or other readily oxidisable materials. Keep containers closed when not in use.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated.

Section 8. Exposure Controls/Personal Protection

8.1 Control parameters

Chromium Trioxide 100%

Workers:
Inhalation DMEL: 0.01 mg/m^{3}Cr (VI), equivalent to 0.02 mg/m^3 chromium trioxide

General population:

Oral DNEL: 0.00035 mg/kg bw/d chromium (III), equivalent to 0.0007 mg/kg bw/dayCrO_3
Inhalation DMEL: 3.5 ng/m^3 chromium (VI), equivalent to 6.6 ng/m^3 chromium trioxide.

There is no agreed occupational exposure limit at EU level.

Workplace exposure limits

France: VLE (15 minutes): 0.1 mg/m^3 and VME (8 hour): 0.05 mg/m^3
Finland: Chromium (VI) compounds (TWA): 0.05 mg/m^3
Germany: Production of soluble chromium (VI) compounds: TRK (TWA): 0.1 mg/m^3 chromium (VI) and other chromium (VI) compounds: TRK (TWA): 0.05 mg/m^3
The Netherlands: Soluble chromium (VI) compounds (TWA): 0.025 mg/m^3 and STEL: 0.05 mg/m^3
Sweden: Chromates and chromic acid (TWA): 0.02 mg/m^3 and STEL: 0.06 mg/m^3
UK – MEL (8 hour reference period): 0.5 mg m^{-3} (0.24 ppm) Cr (III) compounds (as Cr) and 0.05 mg m^{-3} Cr (VI)PNEC (freshwater):3.4 µg/L for chromium (VI) equivalent to 6.5 µg/L CrO_3 and 4.7 µg/L for chromium (III) equivalent to 9.0 µg/L CrO_3
PNEC (fresh watersediment): 31 mg/kg for chromium (III), equivalent to 60 mg/kg CrO_3
PNEC(soil): 3.3 mg/kg for chromium (III) equivalent to 6.3 mg/kg CrO_3
PNEC(sewage treatment plant): 0.21 mg/L chromium (VI) equivalent to 0.40 mg/L CrO_3 and 10 mg/L for chromium (III) equivalent to 20 mg/L CrO_3

8.2 Exposure controls

Maintain air concentrations below occupational exposure standards. Local exhaust ventilation with full or partial enclosure should be used for processes likely to generate dust. Use under strictly controlled conditions. Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at end of workday.Ensure eyewash/safety shower stations are available near areas where this product is used.

Respiratory protection

Approved filter type dust respirator if open system is employed.

Skin/Body protection
Use of chemicallyresistant apron, gloves, and footwear or other full-body protective clothingis recommended. The selected protective gloves have to satisfy the specifications of EU Directive 89/686/EEC andthe standard EN 374 derived from it.

Eye protection

Face shield, safety glasses or close fitting chemical safety goggles are recommended when dust or mist is present.

Section 9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Appearance:	Dark red solid
Odour:	n.a
Odour threshold:	n.a.
pH:	n.a.
Melting point/freezing point °C:	196
Initial boiling point and boiling range °C:	n.a
Flash point:	n.a
Evaporation rate:	n.a
Flammability	Not flammable
Vapour pressure:	n.a.
Vapour density	n.a.
Relative density:	Approximately 2.7 g/cm^3
Solubility:	Approximately 1,667g/L.
Partition Coefficient: n-octanol/water:	n.a.
Auto-ignition temperature:	Does not spontaneously ignite.
Decomposition temperature:	The substance decomposes at 250°Cto produce Cr_2O_3 and O_2
Viscosity:	n.a.
Explosive properties:	Not explosive.
Oxidising properties:	Oxidising

9.2 Other information

No further details

Section 10. Stability and Reactivity

10.1 Reactivity

Stable under normal conditions and use. Hazardous polymerisation will not occur.

10.2 Chemical stability

Stable under normal conditions and use.

10.3 Possibility of hazardous reactions

Hazardous reactions are not expected.

10.4 Conditions to avoid

Incompatibles.

10.5 Incompatible materials

Readily oxidises combustible, organic or other readily oxidisable materials (wood, paper, sulphur, aluminium, plastics, etc.). Corrosive to metals.

10.6 Hazardous decomposition products

Thermal decomposition begins at 196°C and may produce fumes of chromic oxide and oxygen.

Section 11. Toxicological Information

11.1 Information on toxicological effects

Acute Toxicity: Toxic in contact with skin and if swallowed. Very toxic by inhalation. Causes severe burns. Danger of serious damage to health by prolonged exposure through inhalation.

LD_{50}(acute oral toxicity study in Fischer 344 rats) = 52 (42 – 62) mg/kg bw/d

LD_{50}(acute inhalation toxicity study in Fischer 344 rats) = 263 (224 – 309) mg/m^3in males and 167 (116 – 238 mg/m^3 in females.

LD_{50} (acute dermal toxicity study in New Zealand White rabbits) = 57 mg/kg bw.

Skin Irritation:OECD 404, New Zealand White rabbits: Skin irritant

Eye Irritation: In Vivo, rabbit, 7 days: Eye irritant

Sensitisation: May cause sensitisation,asthma or breathing difficulties by inhalation. May an allergic reactionwhen in contact with skin.

Repeated dose toxicity:

Repeated dose toxicity (Oral), Sprague Dawley rats, 9 weeks: NOAEL > 400 ppm

Repeated dose toxicity (Inhalation), ICR mice, 2 periods/30minutes 6-12 months: LOAEC 3.63 $mg(Cr)m^{-3}$

Carcinogenicity: Classified as a Category 1 carcinogen according to IARC.

Mutagenicity: May cause heritable genetic damage. A bacterial reverse mutation assay conducted on Chromium Trioxide indicates that Chromium Trioxide is directly mutagenic *in vitro*. An *in vitro*cytogenicity study

indicated that Chromium Trioxide is directly clastogenic. An *in vitro* mammalian cell mutagenicity study indicates that Chromium Trioxide is directly mutagenic. The results of an *in vivo* study indicate that Chromium Trioxide can produce significant mutagenic activity *in vivo*.

Toxicity for reproduction: Possible risk of impaired fertility, with adverse effects on the fertility of male and female mice observed. Foetotoxicity, including post-implantation losses, were observed in mice.

Route of exposure: Inhalation, Ingestion and Dermal.

Symptoms related to the physical, chemical and toxicological characteristics:

Eye and Skin Corrosion. Inhalation may result in the onset of asthma and respiratory tract irritation. May be carcinogenic and cause heritable genetic damage. Impaired fertility with a loss in the number of implantations may occur. Following prolonged inhalation exposure, cardiovascular, skin, kidney damage, damage to the liver, gastrointestinal tract, respiratory system, eyes and lung damage may occur.

Section 12. Ecological Information

12.1 Toxicity

Very toxic to aquatic organisms. Long-term adverse effects may result in the aquatic environment.

96-hour LC_{50} was determined to be 13 mg/L (*Oncorhynchus mykiss*)
96-hour $EC_{50}$was determined to be 0.13 – 4.6 mg/L (*Scenedesmus subspicatus*)

12.2 Persistence and degradability

Not relevant for a simple organic substance.

12.3 Bioaccumulative potential

Chromium Trioxide is taken up by fish but is not expected to bioaccumulate, with bioconcentration factor of less than 1L/kg.

12.4 Mobility in soil

Under neutral to alkaline conditions, high mobility in soil is expected with leaching into the lower anaerobic zone where reduction to Chromium (III) may occur. In the presence of organic matter, Chromium Trioxide is rapidly reduced to Chromium (III). In soils with low organic matter, reduction is likely to be slower.

12.5 Results of PBT and vPvB assessment

This substance is not identified as a PBT or a vPvBsubstance.

12.6 Other adverse effects

No further details.

Section 13. Disposal Considerations

13.1 Waste treatment methods

Disposal operations - Waste disposal must be in accordance with appropriate local regulations or laws. Do not discharge into sewers or waterways.Do not incinerate or dispose of in landfill.The substance should be reclaimed or recycled where possible or reduced to trivalent Cr (III), and disposed of at an appropriately licensed waste disposal facility.
Disposal of packaging–No information available.

Please follow all local, regional, national and international laws.

Section 14. Transport Information

14.1 UN number

1463

14.2 UN proper shipping name

Chromium Trioxide, Anhydrous

14.3 Transport hazard class(es)

5.1 (6.1, 8)

14.4 Packing group

II

14.5 Environmental hazards

Environmentally Hazardous Substance

14.6 Special precautions for user

No information available

14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code

Not applicable to packaged goods

Section 15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

EU Legislation:

Regulation (EC) No 1272/2008of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006 with amendments. Regulation (EC) No 648/2004 of the European Parliament and of the Council of 31 March 2004 on detergents (as amended).

15.2 Chemical safety assessment

A chemical safety assessment has been conducted.

Section 16. Other Information

Other information

This safety data sheet is prepared in accordance with Regulation (EC) No 453/2010.

Hazard statements used in section 2

H271 May cause fire or explosion, strong oxidiser.
H350 May cause cancer.
H340 May cause genetic defects
H361F Suspected of damaging fertility.
H330 Fatal if inhaled.
H311 Toxic in contact with skin
H301 Toxic if swallowed.
H372 Causes damage to organs through prolonged or repeated exposure.
H314 Causes severe skin burns and eye damage
H410 Very toxic to aquatic life with long lasting effects.
H335 May cause respiratory irritation

Glossary of selected terms used in the SDS

CAS	Chemical Abstracts Service
CLP	Regulation (EC) No 1272/2008 on classification, labelling and packaging of substance and mixtures
EC	European Commission
EEC	European Economic Community
EINECS	European Inventory of Existing Commercial chemical Substances
EU	European Union
PBT	Persistent, Bioaccumulative and Toxic substance
REACH	Regulation (EC) 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals
SDS	Safety Data Sheet
TWA	Time weighted average
UK	United Kingdom
UN	United Nations
vPvB	Very Persistent and Very Bioaccumulative

Note: The regulatory information given above only indicates the principal regulations specifically applicable to the product described in the safety data sheet. The user's attention is drawn to the possible existence of additional provisions which complete these regulations. Refer to all applicable national, international and local regulations or provisions.

Disclaimer
This information is offered in good faith as typical values and not as a product specification. No warranty, expressed or implied is hereby made. The recommended industrial hygiene and safe handling procedures are believed to be generally applicable. However, each user should review these recommendations in the specific context of the intended use and determine whether they are appropriate.

Annex to extended Safety Data Sheet (eSDS):

Downstream user exposure scenario for Chromium Trioxide

1	Exposure Scenario 1

Intermediate in the Manufacture of other Chromium Substances

Processes Covered:

Environmental Releases

ERC6a: Industrial use resulting in manufacture of another substance (use of intermediates)

Worker Processes

PROC01: Use in closed process, no likelihood of exposure.
PROC02: Use in closed, continuous process with occasional controlled exposure.
PROC03: Use in closed batch process (synthesis or formulation).
PROC08b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
PROC09: Transfer of substance or preparation into small containers (dedicated filling line, including weighing).

Product Category

PC19: Intermediate

Contributing Environmental Scenario: Environmental exposure arising due to Intermediate use of Chromium Trioxide in the Manufacture of other Chromium Substances.

Contributing Worker Scenario: Worker exposure arising due to transfer from storage drums/barrels to reactor vessel, day to day operation of the closed system reactor and cleaning and maintenance of the reactor.

2.1	Contributing scenario 1 controlling environmental exposure for ES 1

Environmental exposure arising due to Intermediate use of Chromium Trioxide in the Manufacture of other Chromium Substances.

Section 2.1 describes the environmental releases that may occur during the intermediate use of Chromium Trioxide in the manufacture of other Chromium Substances. These releases may occur due to emission to wastewater or through emission to the atmosphere. If emission to wastewater occurs on-site treatment in an industrial waste water treatment plant will be required in order to lower downstream emissions to the environment. Removal efficiencies in the industrial WWTP operates at 99.99% efficiency. The WWTP also reduces the majority of Cr(VI) present to Cr(III) and alkaline substances added to precipitate chromium hydroxide which is insoluble in water, allowing for its removal to landfill, incineration or recycling. Emissions to the municipal STP should be avoided.

Emissions to air should be removed by scrubbing. As a minimum it is expected that off gas removal efficiency of 99% would be required. Emissions to local air (after scrubbing) should have a concentration of no more than 0.0027mg/M^3.

Product characteristics

The produced substance is a non-flammable, non-dusty solid. The substance has a high melting point (196°C) and is of low volatility.

Amounts used

Production sites may use up to 400 tonnes per annum, with approximately 1,000 tonnes used per year in the European Union. According to the guidance for this tonnage band, the default REACH number of emission days per year are 20 days, however, with continuous emissions, it may be up to 365 emission days per year.
Frequency and duration of use
Frequency of exposure is estimated to be 220 days per year, with an 8 hour working day.
Environmental factors influenced by risk management
Flow rate of receiving water at least 18,000 m^3 per day. Dilution of STP emissions at least 10 fold.
Other operational conditions affecting environmental exposure
Production takes place in a highly specialized indoor facility with emissions to air being scrubbed before release. Reactions are performed under closed conditions, with transfer pipelines are either fully or partially closed systems.
Technical conditions and measures at process level (source) to prevent release
Transfer operations are carried out indoors in dedicated facilities, under a hood to reduce potential emissions. Total losses to water are measured.
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil
Waste water should be emitted to either the on-site WWTP or to the municipal STP for smaller facilities with less than 10kg per day loss to wastewater. If an onsite WWTP is available emission to surface water after treatment should be less than 0.0002 % per day Cr (III). Emissions to air after scrubbing should be less than 0.5 kg per day. Sludge from the on-site WWTP should not be spread to soil. Substances present in waste water is chemically treated on site to reduce Chromium Trioxide to Cr(III), which is insoluble in water. This solid waste will be sent as waste for landfill, incineration or recycling.
Organizational measures to prevent/limit releases from site
Workers are fully trained in order to prevent accidental release and exposures are monitored to ensure airborne concentrations are within acceptable levels.
Conditions and measures related to municipal STP
If emissions to the municipal STP are to be made they should be limited to 10 kg per day. Removal efficiencies in the standard STP are estimated to be 99%. The emission volume of the STP should be at least the default of 2,000 m^3 per day.
Conditions and measures related to external treatment of waste for disposal
Residues from scrubbers may be sent to external waste treatment, on-site effluent treatment or recycled back into the manufacturing process. Sludge is recycled, incinerated or sent to landfill.Cr(III) residues are sent as solid waste to landfill, incineration or recycling.
Conditions and measures related to external recovery of waste
There is no envisaged external recovery of waste. Waste sludge is reduced and then incinerated.

2.2	**Contributing scenario 2 controlling worker exposure for transferring of substance from barrel to reactor vessel**
Worker exposure arising due to Intermediate use of Chromium Trioxide in the Manufacture of other Chromium Substances.	
Section 2.2 describes the potential exposure to workers during the intermediate use of chromium trioxide. The potential exposure arises from the transfer of the substance from its storage source (barrel/drum) to the reactor vessel in order for the reaction to take place. Workers involved in this transfer of the substance will be exposed in the manual handling of the substance from barrel/drum to reactor vessel. Appropriate PPE and onsite control parameters are in place to limit the risk of exposure to workers involved in this task.	
Product characteristics	
The produced substance is a non-flammable, non-dusty solid. The substance has a high melting point (196°C) and is of low volatility.	
Amounts used	
Production sites may use up to 400 tonnes per annum, with approximately 1,000 tonnes used per year in the European Union.	
Frequency and duration of use exposure	
Workers perform standard shifts of 8 hours per day and have standard working years of 220 days per year. Transfer of chromium trioxide is generally a short duration task, with limited potential for exposure.	

Human factors not influence by risk management
Respiration volume under conditions of use: 10 m^3/d Area of skin contact with the substance under conditions of use: 0 cm^2 due to the use of protective equipment during the transfer of the compound from the barrel to the reactor vessel.
Other given operational conditions affecting worker exposure
The transfer of chromium trioxide to the reactor vessel is carried out with local exhaust ventilation in place. Personal protective equipment is also used to minimize the potential for dermal exposure during the transfer process.
Technical conditions and measures at process level (source) to prevent release
The transfer of the substance from the barrel/drum to the reactor vessel takes place in a fully closed system, with LEV in place.
Technical conditions to control dispersion from source towards worker
LEV should be in place during transfer.
Organizational measures to prevent/limit release
Workers are fully trained in safe use and the use of appropriate PPE in order to prevent accidental release. Frequent monitoring for health effects is conducted by medical surveillance programs.
Conditions and measures related to personal protection, hygiene and health.
Protective gloves with an efficiency of greater than 90%, faceshield and overalls are worn, in addition to RPE if the system is not fully closed. LEV operates at the site of transfer of the substance to ensure there is minimal exposure.
2.3 **Contributing scenario 3 controlling worker exposure due to day to day operation of closed system reactor**
Worker exposure arising due to day to day operation of closed system reactor
Section 2.3 describes the potential exposure to workers involved in the day to day operational processes associated with the use of chromium trioxide as an intermediate occur in a closed reactor system. In order to ensure efficient operation, workers will undertake tasks to allow proper day to day operation of the closed system reactor. As the system is completely closed, there is low risk of exposure to workers, however, appropriate PPE is worn and LEV in place to minimise the potential for exposure.
Product characteristics
The produced substance is a non-flammable, non-dusty solid. The substance has a high melting point (196°C) and is of low volatility
Amounts used
Production sites may use up to 400 tonnes per annum, with approximately 1,000 tonnes used per year in the European Union. According to the guidance for this tonnage band, the default REACH number of emission days per year are 20 days, however, with continuous emissions, it may be up to 365 emission days per year.
Frequency and duration of use exposure
Workers perform standard shifts of 8 hours per day and have standard working years of 220 days per year. All activities involved in the day to day operation of the reactor vessel are not expected to be of a long duration.
Human factors not influence by risk management
Respiration volume under conditions of use: 10 m^3/d Area of skin contact with the substance under conditions of use: 0 cm^2 due to the use of protective equipment during the transfer of the compound from the barrel to the reactor vessel.
Other given operational conditions affecting worker exposure
All reactions occur under closed conditions, with limited opportunity for worker exposure. Protective gloves with an efficiency of 90%, faceshield and overalls are worn in the event of accidental contact during day to day operations associated with the reactor vessel.
Technical conditions and measures at process level (source) to prevent release
As previously mentioned, all operations occur in a closed system, with limited potential for exposure and with LEV in place. Workers involved in the day to day operation of the reactor vessel wear appropriate PPE (and RPE if LEV is not in place) to minimise dermal and inhalation contact should the opportunity for exposure arise.
Technical conditions to control dispersion from source towards worker
All processes occur in a closed system. During the day to day operation of the closed reactor vessel, workers wear appropriate PPE, including gloves faceshield and overalls to prevent accidental contact. All operations are

conducted under controlled conditions, with local exhaust ventilation in place to minimise the potential for inhalation exposure.	
Organizational measures to prevent/limit release	
Workers are fully trained in the safe use of the substance and the use of appropriate PPE. All workers are actively monitored for health effects by medical surveillance programs to ensure exposure levels do not exceed acceptable levels.	
Conditions and measures related to personal protection, hygiene and health.	
Protective gloves with an efficiency of greater than 90%, faceshield and overalls are worn, in addition to RPE if LEV is not in place. LEV operates at the site of transfer of the substance to ensure there is minimal exposure.	
2.4	**Contributing scenario 4 controlling worker exposure for cleaning and maintenance of reactor**
Worker exposure arising due to cleaning and maintenance of the reactor.	
Section 2.4 describes the potential exposure to workers during the cleaning and maintenance of the reactor vessel used in the intermediate use of chromium trioxide. Workers will be involved in activities to ensure the reactor vessel is properly maintained to allow efficient functioning. Such activities include cleaning of the reactor and system repair. When these activities are taking place, LEV will be in place and appropriate PPE will be worn by workers to minimise the possible risk of exposure.	
Product characteristics	
The produced substance is a non-flammable, non-dusty solid. The substance has a high melting point (196°C) and is of low volatility.	
Amounts used	
Production sites may use up to 400 tonnes per annum, with approximately 1,000 tonnes used per year in the European Union.	
Frequency and duration of use exposure	
Workers perform standard shifts of 8 hours per day and have standard working years of 220 days per year.Cleaning and maintenance operations of the reactor only rarely occur.	
Human factors not influence by risk management	
Respiration volume under conditions of use: 10 m^3/d Area of skin contact with the substance under conditions of use: 0 cm^2 due to the use of protective equipment during the transfer of the compound from the barrel to the reactor vessel.	
Other given operational conditions affecting worker exposure	
All maintenance activities occur under closed conditions, with limited potential for worker exposure. Protective gloves with an efficiency of 90%, faceshield and overalls are worn in the event of accidental contact during cleaning and maintenance operations necessary for ensuring the reactor vessel can function efficiently.	
Technical conditions and measures at process level (source) to prevent release	
As previously mentioned, there is limited potential for exposure in all maintenance activities and with LEV in place. Workers involved in cleaning and maintaining the reactor vessel wear appropriate PPE (and RPE if LEV is not in place) to minimise dermal and inhalation contact should the opportunity for exposure arise.	
Technical conditions to control dispersion from source towards worker	
All processes occur in a closed system. During cleaning and maintenance activities, workers wear appropriate PPE, including gloves,faceshield and overalls to prevent accidental contact. All operations are conducted under controlled conditions, with local exhaust ventilation in place to minimise the potential for inhalation exposure.	
Organizational measures to prevent/limit release	
Workers are fully trained in the safe use of the substance and the use of appropriate PPE. All workers are actively monitored for health effects by medical surveillance programs to ensure exposure levels do not exceed acceptable levels.	
Conditions and measures related to personal protection, hygiene and health.	
Protective gloves with an efficiency of greater than 90%, faceshield and overalls are worn, in addition to RPE if LEV is not in place. LEV operates at the site of transfer of the substance to ensure there is minimal exposure.	

3	Exposure estimation and reference to its source

Information for contributing scenario 1:

The following PEC values were calculated using EUSES 2.1

PEC	Values
PEC in sewage	0.004 mg/L (Cr(III)) 0 mg/L (Cr(VI))
PEC in aquatic compartment: Freshwater	0.0004 mg/L (Cr(III)) 0 mg/L (Cr(VI))
Marine Water	0.00004 mg/L (Cr(III)) 0 mg/L (Cr(VI))
PEC in sediments: Freshwater sediments	3.88×10^{4} mg/kg d.w. (Cr(III))
Marine water sediments	3.8×10^{5} mg/kg d.w. (Cr(III))
PEC in soil and groundwater: Agricultural soil	1.39×10^{-4} mg/kg ww (Cr(III))
Grassland	1.39×10^{-4} mg/kg ww (Cr(III))
Groundwater	8.03×10^{-4} mg/L (Cr(III))
PEC in air: annual average	8.03×10^{-4} mg/L (Cr(III))

The following RCR values were obtained:

Compartment	RCR Values
Freshwater	0.044
Marine Water	0.044
Freshwater sediments	6.47×10^{-6}
Marine sediment	6.47×10^{-6}
Agricultural soil	1.58×10^{-5}
Grassland	1.58×10^{-5}
STP (EUSES model)	0.0002
STP (measured data)	0.0025 – 0.003

Information for contributing scenario 2:

The following values were obtained using MEASE

PROC 8b: Dermal Exposure – 0.0004 mg/kg bw/d CrO_3
Inhalational Exposure - 0.004 mg/m^3 CrO_3
RCR Inhalation exposure - 0.02
PROC 9: Dermal Exposure - 0.00037 mg/kg bw/d CrO_3
Inhalational Exposure - 0.004 mg/m^3 CrO_3
RCR Inhalation exposure - 0.02

Information for contributing scenario 3:

The following values were obtained using MEASE

PROC 1: Dermal Exposure – 0.00018 mg/kg bw/d CrO_3
Inhalational Exposure - 0.01 mg/m^3 CrO_3
RCR Inhalation exposure - 0.5

Information for contributing scenario 4:

The following values were obtained using MEASE

PROC 2:Dermal Exposure – 0.0004 mg/kg bw/d CrO_3
Inhalational Exposure - 0.01 mg/m^3 CrO_3
RCR Inhalation exposure - 0.5

PROC 3: Dermal Exposure – 0.00018 mg/kg bw/d CrO_3
Inhalational Exposure - 0.004 mg/m^3 CrO_3
RCR Inhalation exposure - 0.02

4	**Guidance to DU to evaluate whether he works inside the boundaries set by the ES**

Environmental releases:

In order to work within the boundaries of the ES the following conditions should be met:

- Emission to air after scrubbing less than 0.0027 mg/M^3
- If an on-site WWTP is used the WWTP sludge should not be spread to soil
- If an onsite WWTP is used emission from the plant to surface water should be no more than 0.0002% per day
- Residues from scrubbers may be sent to external waste treatment, on-site effluent treatment or recycled back into the manufacturing process.
- Cr(III) residues are sent as solid waste to landfill, incineration or recycling.

Worker exposure:

In order to work within the boundaries of the ES the following conditions should be met:

- Transfer operations are conducted in closed facilities.
- The transfer of chromium trioxide to the reactor vessel is carried out with local exhaust ventilation in place.
- LEV should be in place in transfer areas and in the system housing the reactor vessel during activities such as cleaning, general maintenance of the reactor and in the day to day activities to ensure its efficient functioning.
- Workers should wear protective gloves, faceshield and overalls at all times while in the transfer area, during day to day operations and during the cleaning and maintenance operations.
- Where the potential for dermal exposure exists, gloves with a minimum efficiency of 90% should be worn.
- Health monitoring should be conducted regularly to ascertain the potential levels of exposure.
- All worker exposures were below the DNEL, indicating safe use. The inhalation DNEL was determined to be 0.02mg/m^3.

1	**Exposure Scenario 2**

Formulations of Preparations used e.g., in metal finishing or as a catalyst

Processes Covered:

Environmental Releases

ERC2: Formulations of preparations.

Worker Processes

PROC01: Use in closed process, no likelihood of exposure.
PROC03: Use in closed batch process (synthesis or formulation).
PROC05: Mixing or blending in batch processes for formulation of preparations* and articles (multistage and/or significant contact)
PROC08b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
PROC09: Transfer of substance or preparation into small containers (dedicated filling line, including weighing).
PROC14: Production of preparations* or articles by tabletting, compression, extrusion, pelletisation.

Product Category

PC14: Metal surface treatment products, including galvanic and electroplating products.
PC15: Non-metal-surface treatment products.
PC20: Products such as pH-regulators, flocculants, precipitants, neutralization agents.

Contributing Environmental Scenario: Environmental exposure arising due to formulations in preparations.

Contributing Worker Scenario: Worker exposure arising due to transfer of substances or preparations from storage container to formulation machinery, mixing and blending of compound, production of solid preparations and articles and day to day operations and maintenance of the reactor vessel.

2.1	**Contributing scenario 1 controlling environmental exposure for ES 2**

Environmental exposure arising due to Formulations of Preparations.

Section 2.1 describes the environmental releases that may occur during the use of Chromium Trioxide for the formulation of preparations in metal finishing processes or as a catalyst. These releases may occur due to emission to wastewater or through emission to the atmosphere. If emission to wastewater occurs on-site treatment in an industrial waste water treatment plant will be required in order to lower downstream emissions to the environment. Removal efficiencies in the industrial WWTP operates at 99% efficiency. The WWTP also reduces the majority of Cr(VI) present to Cr(III) and alkaline substances added to precipitate chromium hydroxide which is insoluble in water, allowing for its removal to landfill, incineration or recycling. Emissions to the municipal STP should be avoided.

Emissions to air should be removed by scrubbing. As a minimum it is expected that off gas removal efficiency of 90% would be required. Emissions to local air (after scrubbing) should be no more that 0.00062 kg per day.

Product characteristics

The substance prior to production of the preparation is a non-dusty solid. Following preparation of the formulation, the substance is liquid. The substance has a high melting point (196°C) and is of low volatility.

Amounts used

The largest concentration handled at 3 sites is 2000-3000 tonnes per annum, with an approximate totalof 9,100 tonnes used per year. According to the guidance for this tonnage band, the default REACH number of emission

days per year are 100 emission events per year; however, this may increase to 365 emission days per year with continuous processes. The concentration of substance per preparation is usually in the range of 50-450g/L.
Frequency and duration of use
Frequency of exposure is estimated to be 220 days per year, with an 8 hour working day.
Environmental factors influenced by risk management
Flow rate of receiving water at least 18,000 m^3 per day. Dilution of STP emissions at least 10 fold.
Other operational conditions affecting environmental exposure
Charging, mixing and packaging of the formulation takes place in a highly controlled way to minimise exposure. Any emissions to air are scrubbed before release. Wastewater from cleaning of the equipment are recycled back into the process and incorporated into subsequent batches. Reactions are performed under closed conditions.
Technical conditions and measures at process level (source) to prevent release
The formulation of preparations is conducted in a highly enclosed system, under a hood to reduce potential emissions.
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil
Waste water should be emitted to the on-site WWTP. If an onsite WWTP is available emission to surface water after treatment should be less than 1 kg per year Cr (III) and 0 kg per year Cr (VI). Wastewater may be either recycled for re-use in subsequent batches formulated or reduced to Cr (III) and disposed of to a landfill site. Emissions to air after scrubbing should be less than 0.025% per day. Sludge from the on-site WWTP should not be spread to soil. Substances present in waste water is chemically treated on site to reduce Chromium Trioxide to Cr(III), which is insoluble in water. This solid waste will be sent as waste for landfill, incineration or recycling. Any residues from scrubbers should be treated on site or recycled.
Organizational measures to prevent/limit releases from site
Workers are fully trained in order to prevent accidental release and exposures are monitored to ensure airborne concentrations are within acceptable levels.
Conditions and measures related to municipal STP
Removal efficiencies in the standard STP are estimated to be 99%. The emission volume of the STP should be at least the default of 2,000 m^3 per day.
Conditions and measures related to external treatment of waste for disposal
Residues from scrubbers may be sent to external waste treatment, on-site effluent treatment or recycled back into the manufacturing process. Sludge is recycled, incinerated or sent to landfill. Cr(III) residues are sent as solid waste to landfill, incineration or recycling.
Conditions and measures related to external recovery of waste
There is no envisaged external recovery of waste.
2.2 Contributing scenario 2 controlling worker exposure for transfer of substances or preparations from storage container to formulation machinery.
Worker exposure arising due to transfer of substances or preparations from storage container to formulation machinery.
Section 2.2 describes the potential exposure to workers during the formulation of preparations using Chromium Trioxide. The most likely time of potential exposure to workers arises during the transfer of substances or preparations from storage container to formulation machinery. Appropriate PPE and onsite control parameters are in place to limit the risk of exposure to workers involved in this task.
Product characteristics
The substance prior to production of the preparation is a non-dusty solid. Following preparation of the formulation, the substance is liquid. The substance has a high melting point (196°C) and is of low volatility.
Amounts used
The largest concentration handled at 3 sites is 2000-3000 tonnes per annum, with an approximate total of 9,100 tonnes used per year. The concentration of substance per preparation is usually in the range of 50-450g/L.
Frequency and duration of use exposure
Workers perform standard shifts of 8 hours per day and have standard working years of 220 days per year. The transfer of Chromium trioxide into the formulation machinery is generally a short duration task, with limited potential for exposure.
Human factors not influence by risk management
Respiration volume under conditions of use: 10 m^3/d/8h-day Area of skin contact with the substance under conditions of use: 0 cm^2 due to the use of protective equipment

during the transfer of the compound from the barrel to the reactor vessel.
Other given operational conditions affecting worker exposure
The transfer of chromium trioxide into the formulation machinery is carried out with local exhaust ventilation in place. Personal protective equipment is also used to minimize the potential for dermal exposure during the transfer process.
Technical conditions and measures at process level (source) to prevent release
The transfer of chromium trioxide into the formulation machinerytakes place in the presence of LEV. Once in the formulation machinery, the preparation is fully contained.
Technical conditions to control dispersion from source towards worker
LEV should be in place during the transfer process.
Organizational measures to prevent/limit release
Workers are fully trained in safe use and the use of appropriate PPE in order to prevent accidental release. Frequent monitoring for health effects is conducted by medical surveillance programs.
Conditions and measures related to personal protection, hygiene and health.
Protective gloves with an efficiency of greater than 90%, washable/disposable overalls, safety boots/wellingtons and faceshield are worn, in addition to RPE if the system is not fully closed. LEV operates at the site oftransferof the substance to ensure there is minimal exposure.

2.3	**Contributing scenario 3 controlling worker exposure for mixing and blending of Chromium Trioxide intoliquid formulations.**

Worker exposure arising due to mixing and blending of Chromium Trioxide into liquid formulations.
Section 2.3 describes the potential exposure to workers involved in the mixing and blending of Chromium Trioxide intoliquid formulations in the formulation machinery. In this task, worker exposure is minimized as it occurs in a highly controlled, closed system. As the system is completely closed, there is low risk of exposure to workers, however, appropriate PPE is worn and LEV is in place to minimise the potential for exposure.
Product characteristics
The substance prior to production of the preparation is a non-dusty solid. Following preparation of the formulation, the substance is liquid. The substance has a high melting point (196°C) and is of low volatility.
Amounts used
The largest concentration handled at 3 sites is 2000-3000 tonnes per annum, with an approximate total of 9,100 tonnes used per year. The concentration of substance per preparation is usually in the range of 50-450g/L.
Frequency and duration of use exposure
Workers perform standard shifts of 8 hours per day and have standard working years of 220 days per year. Worker contact with chromium trioxide is expected to be very low during the mixing and blending process due to the use of engineering controls and PPE so only short exposure duration is expected.
Human factors not influence by risk management
Respiration volume under conditions of use: 10 m^3/d/8h-day Area of skin contact with the substance under conditions of use: 0 cm^2 due to the use of protective equipment during the transfer of the compound from the barrel to the reactor vessel.
Other given operational conditions affecting worker exposure
The mixing and blending of chromium trioxide into liquid formulations in the formulation machinery is conducted in a highly controlled, closed system. Local exhaust ventilation is in place (effectiveness of 80%) to minimise inhalation exposure. Personal protective equipment is also used to minimize the potential for dermal exposure during mixing and blending.
Technical conditions and measures at process level (source) to prevent release
The mixing and blending of chromium trioxide into liquid formulations in the formulation machinery takes place in the presence of LEV. Once in the formulation machinery, the preparation is fully contained and no exposure to workers is expected.
Technical conditions to control dispersion from source towards worker
LEV should be in place during the mixing and blending process.
Organizational measures to prevent/limit release
Workers are fully trained in safe use and the use of appropriate PPE in order to prevent accidental release. Frequent monitoring for health effects is conducted by medical surveillance programs.
Conditions and measures related to personal protection, hygiene and health.
Protective gloves with an efficiency of greater than 90%, washable/disposable overalls, safety boots/wellingtons

and faceshield are worn, in addition to RPE if the system is not fully closed. LEV operates during the mixing and blending process.	
2.4	**Contributing scenario 4 controlling worker exposure for production of solid preparations or articles.**
Worker exposure arising due toproduction of solid preparations or articles.	
Section 2.4 describes the potential exposure to workers during the production of solid preparations or articles. The final preparation exists as a ready-to-use liquid, eliminating the risk of dust formation in the application. This reduces the potential of exposure to workers.	
Product characteristics	
The substance prior to production of the preparation is a non-dusty solid. Following preparation of the formulation, the substance is liquid. The substance has a high melting point (196°C) and is of low volatility.	
Amounts used	
The largest concentration handled at 3 sites is 2000-3000 tonnes per annum, with an approximate total of 9,100 tonnes used per year. The concentration of substance per preparation is usually in the range of 50-450g/L.	
Frequency and duration of use exposure	
Workers perform standard shifts of 8 hours per day and have standard working years of 220 days per year. Worker contact with chromium trioxide is expected to be very low during the production of solid preparations or articles due to the physical state of the formulation, indicating that the potential for exposure will be very limited.	
Human factors not influence by risk management	
Respiration volume under conditions of use: 10 m^3/d/8h-day Area of skin contact with the substance under conditions of use: 0 cm^2 due to the use of protective equipment during the transfer of the compound from the barrel to the reactor vessel.	
Other given operational conditions affecting worker exposure	
Protective gloves with an efficiency of 90%, washable/disposable overalls, safety boots/wellingtons and faceshield are worn, in addition to RPE if the system is not fully closed, in the event of accidental contact during the preparation of formulations. Local exhaust ventilation is also in place (effectiveness of 80%) to minimise inhalation exposure.	
Technical conditions and measures at process level (source) to prevent release	
As previously mentioned, precautionary measures are taken to minimise exposure during the production of solid preparations or articles. LEV, with an effectiveness of 80%, is in place. Workers involved in the preparation of formulations or articles wear appropriate PPE (and RPE if LEV is not in place) to minimise dermal and inhalation contact should the opportunity for exposure arise.	
Technical conditions to control dispersion from source towards worker	
During the production of solid preparations or articles, workers wear appropriate PPE, including gloves, washable/disposable overalls, safety boots/wellingtons and faceshield to prevent accidental contact. All operations are conducted under controlled conditions, with local exhaust ventilation in place to minimise the potential for inhalation exposure.	
Organizational measures to prevent/limit release	
Workers are fully trained in the safe use of the substance and the use of appropriate PPE. All workers are actively monitored for health effects by medical surveillance programs to ensure exposure levels do not exceed acceptable levels.	
Conditions and measures related to personal protection, hygiene and health.	
Protective gloves with an efficiency of greater than 90%, washable/disposable overalls, safety boots/wellingtons and faceshield are worn, in addition to RPE if the system is not fully closed. LEV operates during day to day maintenance operations.	
2.5	**Contributing scenario 5 controlling worker exposure for day to day operations and maintenance of the formulation machinery**
Worker exposure arising due today to day operations and maintenance of the reactor vessel.	
Section 2.5 describes the potential exposure to workers during the day to day operations and maintenance of the formulation machinery used in the intermediate use of chromium trioxide. Workers will be involved in activities to ensure the formulation machinery is properly maintained to allow efficient functioning. Such activities include cleaning and sampling of the formulation machinery and system repair. When these activities are taking	

place, LEV will be in place and appropriate PPE will be worn by workers to minimise the possible risk of exposure.
Product characteristics
The substance prior to production of the preparation is a non-dusty solid. Following preparation of the formulation, the substance is liquid. The substance has a high melting point (196°C) and is of low volatility.
Amounts used
The largest concentration handled at 3 sites is 2000-3000 tonnes per annum, with an approximate total of 9,100 tonnes used per year. The concentration of substance per preparation is usually in the range of 50-450g/L.
Frequency and duration of use exposure
Workers perform standard shifts of 8 hours per day and have standard working years of 220 days per year. Worker contact with chromium trioxide is expected to be very low during the day to day operations and maintenance of the formulation machinery due to the use of engineering controls and PPE so only short exposure duration is expected.
Human factors not influence by risk management
Respiration volume under conditions of use: 10 m^3/d/8h-day Area of skin contact with the substance under conditions of use: 0 cm^2 due to the use of protective equipment during the transfer of the compound from the barrel to the reactor vessel.
Other given operational conditions affecting worker exposure
Protective gloves with an efficiency of 90%, washable/disposable overalls, safety boots/wellingtons and faceshield are worn, in addition to RPE if the system is not fully closed, in the event of accidental contact during cleaning and maintenance operations necessary for ensuring the formulation machinery can function efficiently. Local exhaust ventilation is also in place (effectiveness of 80%) to minimise inhalation exposure.
Technical conditions and measures at process level (source) to prevent release
As previously mentioned, precautionary measures are taken to minimise exposure during day to day maintenance operations. LEV, with an effectiveness of 80%, is in place. Workers involved in cleaning and maintaining the formulation machinery wear appropriate PPE (and RPE if LEV is not in place) to minimise dermal and inhalation contact should the opportunity for exposure arise.
Technical conditions to control dispersion from source towards worker
During cleaning and maintenance of the closed formulation machinery, workers wear appropriate PPE, including gloves, washable/disposable overalls, safety boots/wellingtons and faceshield to prevent accidental contact. All operations are conducted under controlled conditions, with local exhaust ventilation in place to minimise the potential for inhalation exposure.
Organizational measures to prevent/limit release
Workers are fully trained in the safe use of the substance and the use of appropriate PPE. All workers are actively monitored for health effects by medical surveillance programs to ensure exposure levels do not exceed acceptable levels.
Conditions and measures related to personal protection, hygiene and health.
Protective gloves with an efficiency of greater than 90%, washable/disposable overalls, safety boots/wellingtons and faceshield are worn, in addition to RPE if the system is not fully closed. LEV is also in place during preparation of formulations.

3	Exposure estimation and reference to its source

Information for contributing scenario 1:

The following PEC values were calculated using EUSES 2.1

PEC	Values
PEC in sewage	0.001 mg/L (Cr(III))
PEC in aquatic compartment: Freshwater Marine Water	1.02×10^{-4} mg/L (Cr(III)) 1.02×10^{-5} mg/L (Cr(III))
PEC in sediments: Freshwater sediments Marine water sediments	0.000133 mg/kg d.w. (Cr(III)) 1.32×10^{-5} mg/kg d.w. (Cr(III))
PEC in soil and groundwater: Agricultural soil Grassland Groundwater	1.53×10^{-4} mg/kg ww (Cr(III)) 1.53×10^{-4} mg/kg ww (Cr(III)) 8.82×10^{-4} mg/L (Cr(III))
PEC in air: annual average during emission annual deposition	1.73×10^{-4} mg/L (Cr(III)) 6.32×10^{-4} mg/L (Cr(III)) 3.13×10^{-4} mg/L (Cr(III))

The following RCR values were obtained:

Compartment	RCR Values
Freshwater	0.011
Marine Water	0.011
Freshwater sediments	2.22×10^{-6}
Marine Water sediment	2.2×10^{-6}
Agricultural soil	0.0000179
Grassland	0.0000179
STP (EUSES model)	<1 (Cr(VI)) 0.00005 (Cr(III))

Information for contributing scenario 2:

The following values were obtained using MEASE

PROC 8b: Dermal Exposure – 0.00037 mg/kg bw/d CrO_3
Inhalational Exposure - 0.018 mg/m^3 CrO_3(Solid)
- 0.002 mg/m^3 CrO_3(Liquid)
RCR Inhalation Exposure - 0.9 (Solid)
- 0.1 (Liquid)

PROC 9: Dermal Exposure - 0.00037 mg/kg bw/d CrO_3
Inhalational Exposure - 0.018 mg/m^3 CrO_3(Solid)
- 0.002 mg/m^3 CrO_3(Liquid)
RCR Inhalation Exposure - 0.1 (Solid)
- 0.1 (Liquid)

Information for contributing scenario 3:

The following values were obtained using MEASE

PROC 5: Dermal Exposure – 0.00037 mg/kg bw/d CrO_3 (Liquid)
- 0.00037 mg/cm^2/d
Inhalational Exposure - 0.009 mg/m^3 CrO_3(Liquid)
- 0.005 mg/m^3 CrO_3(Solid)
RCR Inhalation Exposure - 0.25 (Solid)
- 0.45 (Liquid)

Information for contributing scenario 4:

The following values were obtained using MEASE

PROC 14:Dermal Exposure – 0.00037 mg/kg d CrO_3
Inhalational Exposure - 0.002 mg/m^3 CrO_3
RCR Inhalation Exposure - 0.1

Information for contributing scenario 5:

The following values were obtained using MEASE

PROC 1:Dermal Exposure – 0.00018 mg/kg bw/d CrO_3
Inhalational Exposure - 0.001 mg/m^3 CrO_3
RCR Inhalation Exposure - 0.05
PROC 3: Dermal Exposure – 0.00018 mg/kg bw/d CrO_3
Inhalational Exposure - 0.002 mg/m^3 CrO_3
RCR Inhalation Exposure - 0.1

4	**Guidance to DU to evaluate whether he works inside the boundaries set by the ES**

Environmental releases:

In order to work within the boundaries of the ES the following conditions should be met:

- Emission to air after scrubbing less than 0.025% per day
- If an on-site WWTP is used the WWTP sludge should not be spread to soil
- If an onsite WWTP is used emission from the plant to surface water should be no more than 1kg per year for Cr (III).
- Residues from scrubbers may be sent to external waste treatment, on-site effluent treatment or recycled back into the manufacturing process.
- Cr(III) residues are sent as solid waste to landfill, incineration or recycling.

Worker exposure:

In order to work within the boundaries of the ES the following conditions should be met:

- Weighing and loading, mixing and blending and preparation of formulations are conducted in closed facilities.
- The weighing and loading of chromium trioxide to the reactor vessel is carried out with local exhaust ventilation in place.
- LEV should be in place in weighing and loading areas and in the system housing the reactor vessel during activities such as cleaning, general maintenance of the reactor, mixing and blending activities and preparation of the formulation.
- Workers should wear protective gloves, faceshield, safety boots/wellingtons and washable/disposable overalls at all times while in the weighing and loading areas and in the system housing the reactor vessel during activities such as cleaning, general maintenance of the reactor, mixing and blending activities and preparation of the formulation.
- Where the potential for dermal exposure exists, gloves with a minimum efficiency of 90% and disposable/washable overalls should be worn.
- Health monitoring should be conducted regularly to ascertain the potential levels of exposure.
- All worker exposures were below the DNEL, indicating safe use. The inhalation DNEL was determined to be 0.02mg/m^3.

1	**Exposure Scenario 3**

Surface treatment, including e.g., functional and decorative electroplating, passivation, anodising, plastic plating

Processes Covered:

Environmental Releases

ERC5: Industrial use resulting in inclusion into or onto a matrix.

Worker Processes

PROC02: Use in closed continuous process with occasional controlled exposure.
PROC08b:Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
PROC09: Transfer of substance or preparation into small containers (dedicated filling line, including weighing).
PROC10: Roller application or brushing.
PROC13: Treatment of articles by dipping or pouring.

Product Category

PC14: Metal surface treatment products, including galvanic and electroplating products.
PC15: Non-metal-surface treatment products.

Contributing Environmental Scenario: Environmental exposure arising due to surface treatment.

Contributing Worker Scenario: Worker exposure arising due to transfer of compound into reactor vessel, day to day maintenance operations of the reactor vessel, application of the substance to the item andimmersion operations.

2.1	**Contributing scenario 1 controlling environmental exposure for ES 2**

Environmental exposure arising due to surface treatment

Section 2.1 describes the environmental releases that may occur during the use of Chromium Trioxide in the surface treatment of metals. These releases may occur due to emission to wastewater or through emission to the atmosphere. If emission to wastewater occurs on-site treatment in an industrial waste water treatment plant will be required in order to lower downstream emissions to the environment. Removal efficiencies in the industrial WWTP operates at 99.99% efficiency. Emissions to the municipal STP should be avoided.

Emissions to air should be removed by scrubbing. As a minimum it is expected that off gas removal efficiency of 99% would be required. Emissions to local air (after scrubbing) should be no more that$2.78x10^{-5}mg/m^3$.

Product characteristics

The substanceis a liquid, with a high melting point (196°C) and low volatility.

Amounts used

The different surface treatments require different concentrations of chromium trioxide to be used, with approximately 350 – 450g/L for decorative chrome plating, 30 -100 g/L for anodising and220 – 280g/L for passivation/chromating. An approximate total of 9,000 tonnes is estimated to be used per year, with a maximum annual amount per site of 500 tonnes per annum. According to the guidance for this tonnage band, the default REACH number of emission days per year are 20 emission events per year; however, this may increase to 365 emission days per year with continuous processes.

Frequency and duration of use

Frequency of exposure is estimated to be 220 days per year, with an 8 hour working day.

Environmental factors influenced by risk management
Flow rate of receiving water at least 18,000 m^3 per day. Dilution of STP emissions at least 10 fold.
Other operational conditions affecting environmental exposure
Process tanks, equipped with a fume extraction hood and fume suppressants to control foaming and reduce the amount of aerosol are used. Extracted vapours are treated with a mist eliminator and the wash liquor treated with other chromium effluents or recycled to the plating tanks for evaporative losses. Effluents are treated in a separate WWTP with reduction of CR(VI) to Cr(III), followed by flocculation and precipitation. Any emissions to air are scrubbed before release.
Technical conditions and measures at process level (source) to prevent release
The formulation of preparations is conducted in an enclosed system, under a hood to reduce potential emissions.
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil
Waste water should be emitted to the on-site WWTP. If an onsite WWTP is available emission to surface water after treatment should be less than 0.0064% per year Cr (III) and 0 % per year Cr (VI). Wastewater is treated by reduction to Cr (III) and disposal in a landfill site or recycled. Emissions to air after scrubbing should be less than 0.5 % per day. Sludge from the on-site WWTP should not be spread to soil. Substances present in waste water is chemically treated on site to reduce Chromium Trioxide to Cr(III), which is insoluble in water. This solid waste will be sent as waste for landfill, incineration or recycling. Any residues from scrubbers should be treated on site or recycled.
Organizational measures to prevent/limit releases from site
Workers are fully trained in order to prevent accidental release and exposures are monitored to ensure airborne concentrations are within acceptable levels.
Conditions and measures related to municipal STP
Removal efficiencies in the standard STP are estimated to be 99.99%. The emission volume of the STP should be at least the default of 2,000 m^3 per day.
Conditions and measures related to external treatment of waste for disposal
Residues from scrubbers may be sent to external waste treatment, on-site effluent treatment or recycled back into the manufacturing process. Sludge is recycled, incinerated or sent to landfill. Cr(III) residues are sent as solid waste to landfill, incineration or recycling.
Conditions and measures related to external recovery of waste
There is no envisaged external recovery of waste.

2.2	**Contributing scenario 2 controlling worker exposure for transfer of compound from storage source to plating equipment.**

Worker exposure arising due to transfer of compound from storage source to plating equipment
Section 2.2 describes the potential exposure to workers during the transfer of chromium trioxide from storage source to the plating equipment. Appropriate PPE and onsite control parameters are in place to limit the risk of exposure to workers involved in this task.
Product characteristics
The substance is a liquid, with a high melting point (196°C) and low volatility.
Amounts used
The different surface treatments require different concentrations of chromium trioxide to be used, with approximately 350 – 450g/L for decorative chrome plating, 30 -100 g/L for anodising and220 – 280g/L for passivation/chromating. An approximate total of 9,000 tonnes is estimated to be used per year, with a maximum annual amount per site of 500 tonnes per annum.
Frequency and duration of use exposure
Frequency of exposure is estimated to be 220 days per year, with an 8 hour working day.
Human factors not influence by risk management
Respiration volume under conditions of use: 10 m^3/d/8h-day Area of skin contact with the substance under conditions of use: 0 cm^2 due to the use of protective equipment during the transfer of the compound from the barrel to the reactor vessel.
Other given operational conditions affecting worker exposure
Personal protective equipment is used to minimize the potential for dermal exposure during the transfer process. If open solutions of chromium trioxide are used, RPE must be worn. LEV and mist suppressants are also in place to reduce inhalation exposure.
Technical conditions and measures at process level (source) to prevent release

The transfer of chromium trioxide onto the plating equipment takes place in the presence of LEV. The preparation is fully contained within a vessel.
Technical conditions to control dispersion from source towards worker
LEV and mist suppressants should be in place.
Organizational measures to prevent/limit release
Workers are fully trained in safe use and the use of appropriate PPE in order to prevent accidental release. Frequent monitoring for health effects is conducted by medical surveillance programs.
Conditions and measures related to personal protection, hygiene and health.
Protective gloves with an efficiency of greater than 90%, washable/disposable overalls, safety boots/wellingtons and faceshield are worn, in addition to RPE if in the vicinity of the plating tank. LEV (80% efficiency) and mist suppressants operate at the site of transfer of the substance to ensure there is minimal exposure.

2.3	**Contributing scenario 3 controlling worker exposure for application of chromium trioxide**

Worker exposure arising due to the application of chromium trioxide.
Section 2.3 describes the potential exposure to workers involved in the application of chromium trioxide tothe surface of the metal by roller or brushing. In this task, the process can be automated, semi-automated, barrel or manual, with the potential for worker exposure greatest during manual application.To minimise the potential of worker exposure, PPE, RPE, LEV and mist suppressants are used to reduce the potential for dermal and inhalation exposure.
Product characteristics
The substance is a liquid, with a high melting point (196°C) and low volatility
Amounts used
The different surface treatments require different concentrations of chromium trioxide to be used, with approximately 350 – 450g/L for decorative chrome plating, 30 -100 g/L for anodising and220 – 280g/L for passivation/chromating. An approximate total of 9,000 tonnes is estimated to be used per year, with a maximum annual amount per site of 500 tonnes per annum.
Frequency and duration of use exposure
Frequency of exposure is estimated to be 220 days per year, with an 8 hour working day.
Human factors not influence by risk management
Respiration volume under conditions of use: 10 m^3/d/8h-day Area of skin contact with the substance under conditions of use: 0 cm^2 due to the use of protective equipment during the transfer of the compound from the barrel to the reactor vessel.
Other given operational conditions affecting worker exposure
The application of chromium trioxide to metals by brush or roller application is conducted either by automatic, semi-automatic, barrel or manual process. Local exhaust ventilation (effectiveness of 80%) and mist suppressants are in place to minimise inhalation exposure. This is particularly important for reducing exposure when applied in the semi-automatic or manual process. In the automated and barrel application process, the system is more enclosed. Personal protective equipment is also used to minimize the potential for dermal exposure during mixing and blending.
Technical conditions and measures at process level (source) to prevent release
The application of chromium trioxide takes place in the presence of LEV and mist suppressants. If applied by barrel or automated plating, there is some degree of system closure.
Technical conditions to control dispersion from source towards worker
LEV and mist suppressants should be in place during application by brush or roller.
Organizational measures to prevent/limit release
Workers are fully trained in safe use and the use of appropriate PPE in order to prevent accidental release. Frequent monitoring for health effects is conducted by medical surveillance programs.
Conditions and measures related to personal protection, hygiene and health.
Protective gloves with an efficiency of greater than 90%, washable/disposable overalls, safety boots/wellingtons and faceshield are worn, in addition to RPE if the system is not fully closed. LEV and mist suppressants operate during the mixing and blending process.

2.4	**Contributing scenario 4 controlling worker exposure for day to day operations and maintenance of the plating tanks**
Worker exposure arising due to day to day operations and maintenance of the reactor vessel.	
Section 2.4 describes the potential exposure to workers during the cleaning and maintenance of the plating tanks used in the surface treatment of metals with chromium trioxide. Workers will be involved in activities to ensure the plating tanks are properly maintained to allow efficient functioning. Such activities include cleaning of the reactor and system repair. When these activities are taking place, LEV will be in place and appropriate PPE will be worn by workers to minimise the possible risk of exposure.	
Product characteristics	
The substance is a liquid, with a high melting point (196°C) and low volatility	
Amounts used	
The different surface treatments require different concentrations of chromium trioxide to be used, with approximately 350 – 450g/L for decorative chrome plating, 30 -100 g/L for anodising and220 – 280g/L for passivation/chromating. An approximate total of 9,000 tonnes is estimated to be used per year, with a maximum annual amount per site of 500 tonnes per annum.	
Frequency and duration of use exposure	
Workers perform standard shifts of 8 hours per day and have standard working years of 220 days per year. Worker contact with chromium trioxide is expected to be very low during the day to day operations and maintenance of the plating tanks due to the use of engineering controls and PPE so only short exposure duration is expected.	
Human factors not influence by risk management	
Respiration volume under conditions of use: 10 m^3/d/8h-day Area of skin contact with the substance under conditions of use: 0 cm^2 due to the use of protective equipment during the transfer of the compound from the barrel to the reactor vessel.	
Other given operational conditions affecting worker exposure	
Protective gloves with an efficiency of 90%, washable/disposable overalls, safety boots/wellingtons and faceshield are worn, in addition to RPE if the system is not fully closed, in the event of accidental contact during cleaning and maintenance operations necessary for ensuring the plating equipment can function efficiently. Local exhaust ventilation is also in place (effectiveness of 80%) and mist suppressants also minimise inhalation exposure.	
Technical conditions and measures at process level (source) to prevent release	
As previously mentioned, precautionary measures are taken to minimise exposure during day to day maintenance operations. LEV, with an effectiveness of 80%, and mist suppressants are in place. Workers involved in cleaning and maintaining the plating tank wear appropriate PPE (and RPE if LEV is not in place) to minimise dermal and inhalation contact should the opportunity for exposure arise.	
Technical conditions to control dispersion from source towards worker	
During cleaning and maintenance of the plating equipment, workers wear appropriate PPE, including gloves, washable/disposable overalls, safety boots/wellingtons and faceshield to prevent accidental contact. All operations are conducted under controlled conditions, with local exhaust ventilation and mist suppressants in place to minimise the potential for inhalation exposure.	
Organizational measures to prevent/limit release	
Workers are fully trained in the safe use of the substance and the use of appropriate PPE. All workers are actively monitored for health effects by medical surveillance programs to ensure exposure levels do not exceed acceptable levels.	
Conditions and measures related to personal protection, hygiene and health.	
Protective gloves with an efficiency of greater than 90%, washable/disposable overalls, safety boots/wellingtons and faceshield are worn, in addition to RPE if the system is not fully closed. LEV and mist suppressants operate during day to day maintenance operations.	
2.5	**Contributing scenario 5 controlling worker exposure for immersion operations**
Worker exposure arising due toimmersion operations	
Section 2.5 describes the potential exposure to workers during immersion of the metal into chromium trioxide.	

Product characteristics
The substance is a liquid, with a high melting point (196°C) and low volatility
Amounts used
The different surface treatments require different concentrations of chromium trioxide to be used, with approximately 350 – 450g/L for decorative chrome plating, 30 -100 g/L for anodising and220 – 280g/L for passivation/chromating. An approximate total of 9,000 tonnes is estimated to be used per year, with a maximum annual amount per site of 500 tonnes per annum.
Frequency and duration of use exposure
Workers perform standard shifts of 8 hours per day and have standard working years of 220 days per year.
Human factors not influence by risk management
Respiration volume under conditions of use: 10 m^3/d/8h-day Area of skin contact with the substance under conditions of use: 0 cm^2 due to the use of protective equipment during the transfer of the compound from the barrel to the reactor vessel.
Other given operational conditions affecting worker exposure
Protective gloves with an efficiency of 90%, washable/disposable overalls, safety boots/wellingtons and faceshield are worn, in addition to RPE if there is no system closure (in the case of semi-automated and manual plating process), in the event of accidental contact during the preparation of formulations. Local exhaust ventilation is also in place (effectiveness of 80%), as well as mist suppressants, to minimise inhalation exposure.
Technical conditions and measures at process level (source) to prevent release
As previously mentioned, precautionary measures are taken to minimise exposure during the immersion of metals into chromium trioxide. LEV, with an effectiveness of 80%, is in place, as well as mist suppressants. Workers involved in the immersion operations wear appropriate PPE (and RPE if LEV is not in place) to minimise dermal and inhalation contact should the opportunity for exposure arise.
Technical conditions to control dispersion from source towards worker
During the immersion operation, workers wear appropriate PPE, including gloves, washable/disposable overalls, safety boots/wellingtons and faceshield to prevent accidental contact. All operations are conducted under controlled conditions, with local exhaust ventilation and mist suppressants in place to minimise the potential for inhalation exposure.
Organizational measures to prevent/limit release
Workers are fully trained in the safe use of the substance and the use of appropriate PPE. All workers are actively monitored for health effects by medical surveillance programs to ensure exposure levels do not exceed acceptable levels.
Conditions and measures related to personal protection, hygiene and health.
Protective gloves with an efficiency of greater than 90%, washable/disposable overalls, safety boots/wellingtons and faceshield are worn, in addition to RPE if the system is not fully closed. LEV and mist suppressantsare also in place during preparation of formulations.

3	**Exposure estimation and reference to its source**

Information for contributing scenario 1:

The following PEC values were calculated using EUSES 2.1

PEC	**Values**
PEC in sewage	0.048 mg/L (Cr(III))
PEC in aquatic compartment: Freshwater	0.0048 mg/L (Cr(III))
Marine Water	0.00048 mg/L (Cr(III))
PEC in sediments: Freshwater sediments	0.004 mg/kg d.w. (Cr(III))
Marine water sediments	4.14×10^{-4} mg/kg d.w. (Cr(III))
PEC in soil and groundwater: Agricultural soil	4.07×10^{-5} mg/kg ww (Cr(III))
Grassland	4.07×10^{-5}mg/kg ww (Cr(III))
Groundwater	2.35×10^{-4} mg/L (Cr(III))
PEC in air: annual average	1.52×10^{-6} mg/L (Cr(VI))

The following RCR values were obtained:

Compartment	RCR Values
Freshwater	0.533
Marine Water	0.553
Freshwater sediments	0.000068
Marine Water sediment	0.000068
Agricultural soil	1.58×10^{-7}
Grassland	1.58×10^{-7}
STP (EUSES model)	0.0024

Information for contributing scenario 2:

The following values were obtained using MEASE

PROC 8b: Dermal Exposure – 0.000037 mg/kg d CrO_3
Inhalational Exposure - 0.002 mg/m^3 CrO_3
RCR Inhalation Exposure - 0.1
PROC 9: Dermal Exposure - 0.000037 mg/kg d CrO_3
Inhalational Exposure - 0.002 mg/m^3 CrO_3
RCR Inhalation Exposure - 0.1

Information for contributing scenario 3:

The following values were obtained using MEASE

PROC 10: Dermal Exposure – 0.000037 mg/kg d CrO_3
Inhalational Exposure - 0.009 mg/m^3 CrO_3
RCR Inhalation Exposure - 0.045

Information for contributing scenario 4:

The following values were obtained using MEASE

PROC 2:Dermal Exposure – 0.000369 mg/kg d CrO_3
Inhalational Exposure - 0.01 mg/m^3 CrO_3
RCR Inhalation Exposure - 0.5

Information for contributing scenario 5:

The following values were obtained using MEASE

PROC 13:Dermal Exposure – 0.000037 mg/kg d CrO_3
Inhalational Exposure - 0.002 mg/m^3 CrO_3
RCR Inhalation Exposure - 0.1

4	**Guidance to DU to evaluate whether he works inside the boundaries set by the ES**

Environmental releases:

In order to work within the boundaries of the ES the following conditions should be met:

- Emission to air after scrubbing less than 0.5%.
- If an onsite WWTP is used emission from the plant to surface water after treatment should be no more than 0.0064% per year Cr (III) and 0% Cr (VI).
- Residues from scrubbers may be sent to external waste treatment, on-site effluent treatment or recycled back into the manufacturing process.
- Cr(III) residues are sent as solid waste to landfill, incineration or recycling.

Worker exposure:

In order to work within the boundaries of the ES the following conditions should be met:

- Transfer, application of chromium trioxide and immersion operations can be conducted in automated, semi-automated, manual or barrel processes. Automated and barrel processes have a degree of system closure while semi-automated and manual processes have a lower level of system closure.
- LEV, with a minimum efficiency of 80%, and mist suppressants should be in place in transfer areas and during the semi-automated and barrel processes during application and immersion applications.
- Workers should wear protective gloves, faceshield, safety boots/wellingtons and washable/disposable overalls at all times while transfer areas and in the system housing the reactor vessel during activities such as cleaning, general maintenance of the reactor, application of chromium trioxide and immersion operations
- Where the potential for dermal exposure exists, gloves with a minimum efficiency of 90% and disposable/washable overalls should be worn.
- Health monitoring should be conducted regularly to ascertain the potential levels of exposure.
- All worker exposures were below the DNEL, indicating safe use. The inhalation DNEL was determined to be 0.02mg/m^3.

1	**Exposure Scenario 4**

Use of catalysts containing chromium trioxide.

Processes Covered:

Environmental Releases

ERC6b: Industrial use of reactive processing aids.

Worker Processes

PROC01: Use in closed process, no likelihood of exposure
PROC02: Use in closed continuous process with occasional controlled exposure.
PROC03: Use in closed batch process (synthesis or formulation)
PROC04: Use in batch and other process (synthesis) where opportunity for exposure arises.
PROC08b:Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
PROC09: Transfer of substance or preparation into small containers (dedicated filling line, including weighing).

Product Category

PC20: Products such as pH-regulators, flocculants, precipitants, neutralization agents.

Contributing Environmental Scenario: Environmental exposure arising due to use of catalysts containing chromium trioxide.

Contributing Worker Scenario: Worker exposure arising due to loading and transfer of catalyst into reactor vessel, day to day maintenance operation of the reactor vessel and cleaning and maintenance of the reactor.

2.1	Contributing scenario 1 controlling environmental exposure for ES 2

Environmental exposure arising due to surface treatment

Section 2.1 describes the environmental releases that may occur during theuse of catalysts containing Chromium Trioxide. These releases may occur due to emission to wastewater or through emission to the atmosphere. If emission to wastewater occurs on-site, treatment in an industrial waste water treatment plant will be required in order to lower downstream emissions to the environment. Removal efficiencies in the industrial WWTP operates at 99.99% efficiency. The majority of Cr (VI) is incorporated into the catalyst. Any remaining Cr (VI) is treated in the WWTP by reduction of Cr (VI) to Cr (III) and precipitated as chromium hydroxide which is insoluble in water, allowing for its removal to landfill, incineration or recycling. Emissions to the municipal STP should be avoided.

Emissions to air should be removed by scrubbing. As a minimum it is expected that off gas removal efficiency of 99% would be required. Emissions to local air (after scrubbing) should be no more that 1.39×10^{-6} mg/m^3.

Product characteristics

The substance is a solid of low dust, with a high melting point (196°C) and low volatility.

Amounts used

An approximate total of 100 tonnes is estimated to be used per year. According to the guidance for this tonnage band, the default REACH number of emission days per year are 20 emission events per year; however, this may increase to 365 emission days per year with continuous processes.

Frequency and duration of use

Frequency of exposure is estimated to be 220 days per year, with an 8 hour working day.

Environmental factors influenced by risk management

Flow rate of receiving water at least 18,000 m^3 per day. Dilution of STP emissions at least 10 fold.

Other operational conditions affecting environmental exposure

Catalyst use of Chromium Trioxide is a highly automated process which takes place in an enclosed environment.Potential emissions to air are scrubbed before release. Reactions are performed under closed conditions.

Technical conditions and measures at process level (source) to prevent release

Catalyst use of Chromium Trioxide is conducted in an enclosed system,with local exhaust ventilation in place to minimise emissions.

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil

Waste water should be emitted to the on-site WWTP. If an onsite WWTP is available emission to surface water after treatment should be less than 0.000005% per year Cr (III) and 0 % per year Cr (VI). Wastewater is treated by reduction to Cr (III), which is then precipitated as chromium hydroxide, and disposed of in a landfill site, incinerated or recycled. Emissions to air after scrubbing should be less than 0.001% per day. Sludge from the on-site WWTP should not be spread to soil. Substances present in waste water is chemically treated on site to reduce Chromium Trioxide to Cr(III), which is insoluble in water. This solid waste will be sent as waste for landfill, incineration or recycling. Any residues from scrubbers should be treated on site or recycled.

Organizational measures to prevent/limit releases from site

Workers are fully trained in order to prevent accidental release and exposures are monitored to ensure airborne concentrations are within acceptable levels.

Conditions and measures related to municipal STP

Removal efficiencies in the standard STP are estimated to be 99.99%. The emission volume of the STP should be at least the default of 2,000 m^3 per day.

Conditions and measures related to external treatment of waste for disposal

Residues from scrubbers may be sent to external waste treatment, on-site effluent treatment or recycled back into the manufacturing process. Sludge is recycled, incinerated or sent to landfill. Cr(III) residues are sent as solid waste to landfill, incineration or recycling.

Conditions and measures related to external recovery of waste

There is no envisaged external recovery of waste. Waste sludge is reduced and then incinerated.

2.2	**Contributing scenario 2 controlling worker exposure for transfer and loading of catalyst.**
Worker exposure arising due to loading and transfer of catalyst from storage source to reactor vessel.	
Section 2.2 describes the potential exposure to workers during the use of catalysts containing chromium trioxide. The potential exposure arises from the transfer of the substance from its storage source (barrel/drum) to the reactor vessel in order for the reaction to take place. Workers involved in this transfer of the substance will be exposed in the manual handling of the substance from barrel/drum to reactor vessel. Appropriate PPE and onsite control parameters are in place to limit the risk of exposure to workers involved in this task.	
Product characteristics	
The substance is a solid of low dust, with a high melting point (196°C) and low volatility.	
Amounts used	
An approximate total of 100 tonnes is estimated to be used per year.	
Frequency and duration of use exposure	
Frequency of exposure is estimated to be 220 days per year, with an 8 hour working day.	
Human factors not influence by risk management	
Respiration volume under conditions of use: 10 m^3/d/8h-day Area of skin contact with the substance under conditions of use: 0 cm^2 automated system in an enclosed environment, therefore no dermal contact.	
Other given operational conditions affecting worker exposure	
The transfer of catalysts containing chromium trioxide to the reactor vessel is carried out with local exhaust ventilation in place. Personal protective equipment is also used to minimize the potential for dermal exposure during the transfer process.	
Technical conditions and measures at process level (source) to prevent release	
The transfer of the catalysts from its source to the reactor vessel is an automated process which takes place in a fully closed system, with LEV in place.	
Technical conditions to control dispersion from source towards worker	
LEV should be in place during the transfer process.	
Organizational measures to prevent/limit release	
Workers are fully trained in safe use and the use of appropriate PPE in order to prevent accidental release. Frequent monitoring for health effects is conducted by medical surveillance programs.	
Conditions and measures related to personal protection, hygiene and health.	
Protective gloves with an efficiency of greater than 90%, washable/disposable overalls, safety boots/wellingtons and faceshield are worn, in addition to RPE if the system is open. LEV operates at the site of transfer of the substance to ensure there is minimal exposure.	
2.3	**Contributing scenario 3 controlling worker exposure due to day to day operation of closed system reactor**
Worker exposure arising due to day to day operation of closed system reactor.	
Section 2.3 describes the potential exposure to workers involved in the day to day operational processes associated with the use of catalysts containing chromium trioxide in a closed system. In order to ensure efficient operation, workers will undertake tasks to allow proper day to day operation of the closed system reactor. As the system is completely closed, there is low risk of exposure to workers, however, appropriate PPE is worn and LEV in place to minimise the potential for exposure.	
Product characteristics	
The substance is a solid of low dust, with a high melting point (196°C) and low volatility.	
Amounts used	
An approximate total of 100 tonnes is estimated to be used per year.	
Frequency and duration of use exposure	
Frequency of exposure is estimated to be 220 days per year, with an 8 hour working day. All activities involved in the day to day operation of the reactor vessel are not expected to be of a long duration.	
Human factors not influence by risk management	
Respiration volume under conditions of use: 10 m^3/d/8h-day	

Area of skin contact with the substance under conditions of use: 0 cm^2 automated system in an enclosed environment, therefore no dermal contact.
Other given operational conditions affecting worker exposure
All reactions occur under closed conditions, with limited opportunity for worker exposure. Protective gloves with an efficiency of 90%, faceshield, safety boots/wellingtons and washable/disposable overalls are worn in the event of accidental contact during day to day operations associated with the reactor vessel.
Technical conditions and measures at process level (source) to prevent release
As previously mentioned, all operations occur in a closed system, with limited potential for exposure and with LEV in place. Workers involved in the day to day operation of the reactor vessel wear appropriate PPE (and RPE if LEV is not in place and it is an open system) to minimise dermal and inhalation contact should the opportunity for exposure arise.
Technical conditions to control dispersion from source towards worker
All processes occur in a closed system. During the day to day operation of the closed reactor vessel, workers wear appropriate PPE, including gloves faceshield, safety boots/wellingtons and washable/disposable overalls to prevent accidental contact. All operations are conducted under controlled conditions, with local exhaust ventilation in place to minimise the potential for inhalation exposure.
Organizational measures to prevent/limit release
Workers are fully trained in the safe use of the substance and the use of appropriate PPE. All workers are actively monitored for health effects by medical surveillance programs to ensure exposure levels do not exceed acceptable levels.
Conditions and measures related to personal protection, hygiene and health.
Protective gloves with an efficiency of greater than 90%, faceshield, safety boots/wellingtons and washable/disposable overalls are worn, in addition to RPE if LEV is not in place. LEV operates in the system to ensure there is minimal exposure.

2.4	**Contributing scenario 4 controlling worker exposure for cleaning and maintenance of reactor**
Worker exposure arising due to cleaning and maintenance of the reactor.
Section 2.4 describes the potential exposure to workers during the cleaning and maintenance of the reactor vessel used in processes with catalysts containing chromium trioxide. Workers will be involved in activities to ensure the reactor vessel is properly maintained to allow efficient functioning. Such activities include cleaning and sampling of the reactor and system repair. When these activities are taking place, LEV will be in place and appropriate PPE will be worn by workers to minimise the possible risk of exposure.
Product characteristics
The substance is a solid of low dust, with a high melting point (196°C) and low volatility.
Amounts used
An approximate total of 100 tonnes is estimated to be used per year.
Frequency and duration of use exposure
Workers perform standard shifts of 8 hours per day and have standard working years of 220 days per year. Cleaning and maintenance operations of the reactor only rarely occur.
Human factors not influence by risk management
Respiration volume under conditions of use: 10 m^3/d/8h-day Area of skin contact with the substance under conditions of use: 0 cm^2 automated system in an enclosed environment, therefore no dermal contact.
Other given operational conditions affecting worker exposure
Protective gloves with an efficiency of 90%, washable/disposable overalls, safety boots/wellingtons and faceshield are worn, in addition to RPE if the system is not fully closed, in the event of accidental contact during cleaning and maintenance operations necessary for ensuring the reactor vessel can function efficiently. Local exhaust ventilation is also in place to minimise inhalation exposures.
Technical conditions and measures at process level (source) to prevent release
As previously mentioned, there is limited potential for exposure in all maintenance activities and with LEV in place. Workers involved in cleaning and maintaining the reactor vessel wear appropriate PPE (and RPE if LEV is not in place) to minimise dermal and inhalation contact should the opportunity for exposure arise.
Technical conditions to control dispersion from source towards worker

All processes occur in an automated, closed system. During cleaning and maintenance activities, workers wear appropriate PPE, including gloves, washable/disposable overalls, safety boots/wellingtons and faceshield to prevent accidental contact. All operations are conducted under controlled conditions, with local exhaust ventilation in place to minimise the potential for inhalation exposure.
Organizational measures to prevent/limit release
Workers are fully trained in the safe use of the substance and the use of appropriate PPE. All workers are actively monitored for health effects by medical surveillance programs to ensure exposure levels do not exceed acceptable levels.
Conditions and measures related to personal protection, hygiene and health.
Protective gloves with an efficiency of greater than 90%, washable/disposable overalls, safety boots/wellingtons and faceshield are worn, in addition to RPE if the system is not fully closed. LEV operates during day to day maintenance operations.

3	**Exposure estimation and reference to its source**

Information for contributing scenario 1:

The following PEC values were calculated using EUSES 2.1

PEC	Values
PEC in sewage	2.5×10^{-4} mg/L (Cr(III))
PEC in aquatic compartment: Freshwater	2.67×10^{-5} mg/L (Cr(III))
Marine Water	2.66×10^{-6} mg/L (Cr(III))
PEC in sediments: Freshwater sediments	
Marine water sediments	
PEC in soil and groundwater: Agricultural soil	5.9×10^{-4} mg/kg ww (Cr(III))
Grassland	5.9×10^{-4} mg/kg ww (Cr(III))
Groundwater	2.29×10^{-4} mg/L (Cr(III))
PEC in air: annual average	7.64×10^{-8} mg/L (Cr(VI))

The following RCR values were obtained:

Compartment	RCR Values
Freshwater	2.25×10^{-7}
Marine Water	0.0028
Freshwater sediments	1.15×10^{-6}
Marine Water sediment	1.15×10^{-6}
Agricultural soil	7.9×10^{-9}
Grassland	7.9×10^{-9}
STP	<1 (Cr(VI)) 1.25×10^{-5} (Cr(III))

Information for contributing scenario 2:

The following values were obtained using MEASE

PROC 8b: Dermal Exposure – 0.00037 mg/kg/d CrO_3
Inhalational Exposure - 0.002 mg/m^3 CrO_3
RCR Inhalation Exposure - 0.1
PROC 9: Dermal Exposure - 0.00037 mg/kg/d CrO_3
Inhalational Exposure - 0.002 mg/m^3 CrO_3
RCR Inhalation Exposure - 0.1

Information for contributing scenario 3:

The following values were obtained using MEASE

PROC 3: Dermal Exposure – 0.00018 mg/kg/d

Inhalational Exposure - 0.002 mg/m^3 CrO_3
RCR Inhalation Exposure - 0.1
PROC 4: Dermal Exposure – 0.00037 mg/kg/d
Inhalational Exposure - 0.008 mg/m^3 CrO_3
RCR Inhalation Exposure - 0.4

Information for contributing scenario 4:

The following values were obtained using MEASE

PROC 1:Dermal Exposure – 0.00018 mg/kg bw/d CrO_3
Inhalational Exposure - 0.01 mg/m^3 CrO_3
RCR Inhalation Exposure - 0.5
PROC 2: Dermal Exposure – 0.00037 mg/kg bw/d CrO_3
Inhalational Exposure - 0.01 mg/m^3 CrO_3
RCR Inhalation Exposure - 0.5

4	**Guidance to DU to evaluate whether he works inside the boundaries set by the ES**

Environmental releases:

In order to work within the boundaries of the ES the following conditions should be met:

- Emission to air after scrubbing less than 0.001% per day
- If an on-site WWTP is used the WWTP sludge should not be spread to soil
- If an onsite WWTP is used emission from the plant to surface water should be no more than 0.000005% per year
- Residues from scrubbers may be sent to external waste treatment, on-site effluent treatment or recycled back into the manufacturing process.
- Cr(III) residues are sent as solid waste to landfill, incineration or recycling.

Worker exposure:

In order to work within the boundaries of the ES the following conditions should be met:

- Transfer operations are conducted in closed facilities, with local exhaust ventilation in place.
- LEV should be in place in transfer areas and in the system housing the reactor vessel during activities such as cleaning, general maintenance of the reactor and in the day to day activities to ensure its efficient functioning.
- Workers should wear protective gloves, faceshield, safety boots/wellingtons and washable/disposable overalls at all timeswhile in the transfer area, during day to day operations and during the cleaning and maintenance operations.
- Where the potential for dermal exposure exists, gloves with a minimum efficiency of 90% and disposable/washable overalls should be worn.
- Health monitoring should be conducted regularly to ascertain the potential levels of exposure.
- All worker exposures were below the DNEL, indicating safe use. The inhalation DNEL was determined to be 0.02mg/m^3.

1	**Exposure Scenario 5**

Small scale laboratory use of chromium trioxide.

Processes Covered:

Environmental Releases

ERC8b: Wide dispersive indoor use of reactive substances in open systems.

Worker Processes

PROC15: Use as laboratory reagent

Product Category

PC21: Laboratory chemicals.

Contributing Environmental Scenario: Environmental exposure arising due to small scale laboratory use of chromium trioxide.

Contributing Worker Scenario: Worker exposure arising due to manual handling of chromium trioxide in oxidative reactions.

2.1	**Contributing scenario 1 controlling environmental exposure for ES 2**

Environmental exposure arising due to small scale laboratory use of chromium trioxide.

Section 2.1 describes the environmental releases that may occur during thesmall scale laboratory use of Chromium Trioxide as an oxidising agent.These releases may occur due to emission to wastewater or through emission to the atmosphere. If emission to wastewater occurs on-site, treatment in an industrial waste water treatment plant will be required in order to lower downstream emissions to the environment. Removal efficiencies in the industrial WWTP operates at 99% efficiency. Cr (VI) is treated in the WWTP by reduction of Cr (VI) to Cr (III) and precipitated as chromium hydroxide which is insoluble in water, allowing for its removal to landfill, incineration or recycling. Alternatively, in a laboratory setting in educational institutions, chromium aqueous waste is collected and disposed of via special waste. Emissions to the municipal STP should be avoided.

Emissions to air should be removed by scrubbing. As a minimum it is expected that off gas removal efficiency of 99% would be required. Emissions to local air (after scrubbing) should be no more that 1.39×10^{-8} mg/m^3.

Product characteristics

The substance is a solid of low dust or a liquid, with a high melting point (196°C) and low volatility.

Amounts used

An approximate total of 1 ton is estimated to be used per year, with less than 1 kg used per site. According to the guidance for this tonnage band, the default REACH number of emission days to the STP per year is 365; however, 20 emission events per year was used for calculation.

Frequency and duration of use

Frequency of exposure is estimated to be 220 days per year, with an 8 hour working day.

Environmental factors influenced by risk management

Flow rate of receiving water at least 18,000 m^3 per day. Dilution of STP emissions at least 10 fold.

Other operational conditions affecting environmental exposure

The small scale laboratory use of Chromium Trioxide is normally conducted in a closed system, under nitrogen. Potential emissions to air are scrubbed before release. Reactions are performed under closed conditions.

Technical conditions and measures at process level (source) to prevent release
Catalyst use of Chromium Trioxide is conducted in an enclosed system,with local exhaust ventilation in place to minimise emissions.
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil
Waste water should be emitted to the on-site WWTP. If an onsite WWTP is available emission to surface water after treatment should be less than 0.0002% per year Cr (III) and 0 % per year Cr (VI). In analytical laboratories, wastewater is treated by reduction to Cr (III), which is then precipitated as a salt. In educational institutes, the chromium aqueous waste is collected and disposed of *via* special waste. Emissions to air after scrubbing should be less than 0.001% per day. Sludge from the on-site WWTP should not be spread to soil. Any residues from scrubbers should be treated on site or recycled.
Organizational measures to prevent/limit releases from site
Workers are fully trained in order to prevent accidental release and exposures are monitored to ensure airborne concentrations are within acceptable levels.
Conditions and measures related to municipal STP
Removal efficiencies in the standard STP are estimated to be 99 %. The emission volume of the STP should be at least the default of 2,000 m^3 per day.
Conditions and measures related to external treatment of waste for disposal
Residues from scrubbers may be sent to external waste treatment, on-site effluent treatment or recycled back into the manufacturing process. Chromium aqueous waste from educational institutes is collected and disposed of *via* special waste.
Conditions and measures related to external recovery of waste
There is no envisaged external recovery of waste. Waste sludge is reduced and then incinerated.
2.2 Contributing scenario 2 controlling worker exposure for manual handling of chromium trioxide in oxidative reactions.
Worker exposure arising due to manual handling of chromium trioxide in oxidative reactions.
Section 2.2 describes the potential exposure to workers during thesmall scale laboratory use of chromium trioxide. The potential exposure arises from the manual handling of chromium trioxide in laboratory based oxidative reactions. Appropriate PPE and onsite control parameters are in place to limit the risk of exposure to workers involved in this task.
Product characteristics
The substance is a solid of low dust or a liquid, with a high melting point (196°C) and low volatility.
Amounts used
An approximate total of 1 ton is estimated to be used per year in Europe, with less than 1 kg used per site.
Frequency and duration of use exposure
Frequency of exposure is estimated to be 220 days per year, with an 8 hour working day.
Human factors not influence by risk management
Respiration volume under conditions of use: 10 m^3/d/8h-day Area of skin contact with the substance under conditions of use: 0 cm^2 use of protective clothing during the process means that any dermal contact will be avoided.
Other given operational conditions affecting worker exposure
The small scale laboratory use of chromium trioxide is carried out in a closed system, under nitrogen, with local exhaust ventilation in place. Personal protective equipment is also used to minimize the potential for dermal exposure during the manual handling of chromium trioxide.
Technical conditions and measures at process level (source) to prevent release
The small scale laboratory use of chromium trioxide is carried out in a closed system, under nitrogen, with local exhaust ventilation in place.
Technical conditions to control dispersion from source towards worker
LEV should be in place during manual handling.
Organizational measures to prevent/limit release
Workers are fully trained in safe use and the use of appropriate PPE in order to prevent accidental release. Frequent monitoring for health effects is conducted by medical surveillance programs.
Conditions and measures related to personal protection, hygiene and health.
Protective gloves with an efficiency of greater than 90%, washable/disposable overalls and goggles are worn.

LEV operates during the manual handling and oxidative reactions to minimise inhalation exposure.

3	**Exposure estimation and reference to its source**

Information for contributing scenario 1:

The following PEC values were calculated using EUSES 2.1

PEC	**Values**
PEC in sewage	
PEC in aquatic compartment: Freshwater Marine Water	1.65×10^{-6} mg/L (Cr(III)) 1.6×10^{-7} mg/L (Cr(III))
PEC in sediments: Freshwater sediments Marine water sediments	4.782×10^{-5} mg/kg d.w. (Cr (III)) 4.707×10^{-6} mg/kg d.w. (Cr (III))
PEC in soil and groundwater: Agricultural soil Grassland Groundwater	3.97×10^{-5} mg/kg ww (Cr(III)) 3.97×10^{-5} mg/kg ww (Cr(III)) 2.28×10^{-4} mg/L (Cr(III))
PEC in air: annual average	7.62×10^{-10} mg/L (Cr(VI))

The following RCR values were obtained:

Compartment	**RCR Values**
Freshwater	1.11×10^{-5}
Marine Water	1.11×10^{-5}
Freshwater sediments	7.97×10^{-7}
Marine Water sediment	7.8×10^{-7}
Agricultural soil	7.9×10^{-11}
Grassland	7.9×10^{-11}
STP	<1 (Cr(VI)) 5×10^{-8} (Cr(III))

Information for contributing scenario 2:

The following values were obtained using MEASE

PROC 15: Dermal Exposure – 0.00018 mg/kg/d CrO_3
Inhalational Exposure - 0.005 mg/m^3 CrO_3
RCR Inhalation Exposure - 0.25

4	**Guidance to DU to evaluate whether he works inside the boundaries set by the ES**

Environmental releases:

In order to work within the boundaries of the ES the following conditions should be met:

- Emission to air after scrubbing less than 0.001% per day
- If an on-site WWTP is used the WWTP sludge should not be spread to soil
- If an onsite WWTP is used emission from the plant to surface water should be no more than 0.000002% per year
- Residues from scrubbers may be sent to external waste treatment, on-site effluent treatment or recycled back into the manufacturing process.
- Wastewater from educational institutes, chromium aqueous waste is collected, and disposed *via* special waste.
- In analytical laboratories, Cr (VI) is reduced to Cr (III) followed by precipitation to salt.

Worker exposure:

In order to work within the boundaries of the ES the following conditions should be met:

- LEV should be in place during manual handling procedures
- Protective gloves with an efficiency of greater than 90%, washable/disposable overalls and goggles should be worn during manual handling procedures.
- Where the potential for dermal exposure exists, gloves with a minimum efficiency of 90% and disposable/washable overalls should be worn.
- Health monitoring should be conducted regularly to ascertain the potential levels of exposure.
- All worker exposures were below the DNEL, indicating safe use. The inhalation DNEL was determined to be 0.02mg/m^3.

MATERIAL SAFETY DATA SHEET

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	Nickel dichloride
Chemical formula	$NiCl_2 \cdot 6H_2O$
Manufacturer	**SUMITOMO METAL MINING CO., LTD.** NON-FERROUS METALS DIV./ADMINISTRATION DEPT. 3-5-3, NISHIBARA-CHO, NIIHAMA, EHIME, 792-8555 JAPAN TEL +81- 897-37-4817 FAX +81- 897-37-4910
Product use	This material is used for Nickel-plating.

2. HAZARDS IDENTIFICATION

GHS classification

Physical hazards:	
Explosives	Outside scope of the classification
Flammable gases	Outside scope of the classification
Flammable aerosols	Outside scope of the classification
Oxidizing gases	Outside scope of the classification
Gases under pressure	Outside scope of the classification
Flammable liquids	Outside scope of the classification
Flammable solids	Not classified
Self-reactive substances and mixtures	Outside scope of the classification
Pyrophoric liquids	Outside scope of the classification
Pyrophoric solids	Not classified
Self-heating substances and mixtures	Not classified
Substances and mixtures which, in contact with water, emit flammable gases	Not classified
Oxidizing liquids	Outside scope of the classification
Oxidizing solids	Classification not possible
Organic peroxides	Outside scope of the classification
Corrosive to metals	Classification not possible
Health hazards:	
Acute toxicity – oral	Category 3
Acute toxicity – dermal	Classification not possible
Acute toxicity – inhalation (gases)	Outside scope of the classification
Acute toxicity – inhalation (vapors)	Classification not possible
Acute toxicity – inhalation (dust, mist)	Classification not possible
Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Classification not possible
Respiratory sensitization	Category 1
Skin sensitization	Category 1
Germ cell mutagenicity	Category 2
Carcinogenicity	Category 1A
Reproductive toxicity	Category 2
Specific target organ toxicity (single exposure)	Category 1(central nervous system)

Specific target organ toxicity (repeated exposure)	Category1 (kidney, respiratory organ, testis)
Aspiration hazard	Classification not possible
Environmental hazards:	
Hazardous to the aquatic environment - acute toxicity	Category 1
Hazardous to the aquatic environment - chronic toxicity	Classification not possible

HAZARDS EXCLUDED FROM THE GHS CLASSIFICATION CATEGORIES

HEALTH HAZARDS

- The dust may severely irritate the eyes, respiratory tract or skin. May cause damage to the membrane of respiratory system. If inhaled, cough.
- If contact with solid or melting solid or solution, may cause strong irritation and sore to eyes and skin.
- On combustion to decompose, form hazardous and corrosive chlorine gas.
- Carcinogenic to nasal cavity, paranasal sinus and lung.
- If swallowed large amount, cause gastroenteritis.

PICTOGRAM



SIGNAL WORD DANGER

HAZARD STATEMENT

- Toxic if swallowed.
- Skin irritation.
- May cause allergy or asthma symptoms or breathing difficulties if inhaled.
- May cause an allergic skin reaction.
- Suspected of causing genetic defects.
- May cause cancer.
- Suspected of damaging fertility or the unborn child.
- Causes damage to organs <central nervous system>
- Causes damage to organs <kidney, respiratory organ, testis> through prolonged or repeated exposure.
- Very toxic to aquatic life.

PRECAUTIONARY STATEMENTS

〔Prevention〕

- Do not handle until all safety precautions have been read and understood.
- Wear personal protector or use ventilator to avoid exposure.
- In case of inadequate ventilation, wear respiratory protection.
- Avoid breathing the dust or fume.
- Do not eat, drink, or smoke during work.
- Wash hands thoroughly after handling.
- Avoid release to the environment.

〔Response〕
- If inhaled: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If experiencing respiratory symptoms, get medical attention.
- Get medical attention if you feel unwell.
- If on skin : Wash with plenty of water and soap.
- If skin irritation or rash occurs, seek medical attention.
- If exposed or concerned ; Get medical attention.

〔Storage〕
- Store in a cool, well-ventilated place.
- Keep container tightly closed and store in a cool, well-ventilated place.

〔Disposal〕
- Please consult us about the possibility of recycling.
- Disposal should be in accordance with applicable regional, national and local laws and regulations.

3. COMPOSITION / INFORMATION ON INGREDIENTS

COMPONENT	CAS No.	TSCA	EINECS	%w/w
Nickel dichloride	7791-20-0	Listed	231-743-0	$NiCl_2 \cdot 6H_2O$:97.2< Ni:24.0<

4. FIRST AID MEASURES

Eye contact	Immediately rinse cautiously with plenty of water for several minutes. Get medical attention.
Skin contact	Wash with plenty of water and soap. Get medical attention if you feel unwell. Wash contaminated clothing before reuse.
Inhalation	Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately get medical attention. Get medical attention.
Ingestion	Rinse mouth. Get medical attention.

5. FIRE FIGHTING MEASURES

Flammable properties	
Flash point	No data available.
Extinguishing media	
Suitable extinguishing media	This substance is nonflammable. Use adequate extinguishing agents for surrounding fire.
Unsuitable extinguishing media	Use adequate extinguishing agents for surrounding fire.

Protection of firefighters	Wear adequate respiratory protection and chemical-resistant clothing. (heat resistance)
Specific hazards arising from the chemical	On combustion to decompose, form hazardous and corrosive chlorine gas.
Protective equipment and precautions for firefighters	Move container to safe area, if possible with low risk.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions	Immediately isolate the spilled area with adequate distance for all directions. Wear adequate protector refer to Section 8 and avoid contact with eyes and skin or inhaling. Keep unnecessary and unprotected personnel from entering.
Environmental precautions	Do not let this substance enter the environment. Avoid entering the river or affecting to the environment.
Method for clean-up	Sweep diffused spillage and place in an empty container. Residual substances are collected completely with care and moved to a safe place. Sweep up spillage and place in a sealable empty container for later disposal. Solved in water and add the Calcium hydroxide or Sodium carbonate solution, then filter the precipitates and dike the residues. Prevent the spillage release to the river.

7. HANDLING AND STORAGE

Handling	Wear protective equipment and set the engineering controls refer to Section 8. Local exhaust or general ventilation may be necessary. (Refer to Section 8) Wear protective gloves when handling. Use only outdoors or in a well-ventilated area. Avoid breathing the dust or fume. Wash hands thoroughly after handling.. Avoid to contact: Water, hot surface. Refer to Section 10.
Storage	In case of powder; provide adequate engineering control for treating hazardous material as lighting or ventilation. Keep away from acids and store in a cool, well-ventilated place. Keep container tightly closed and store in a cool, well-ventilated place.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure guidelines	ACGIH has established the following exposure limit. <ACGIH> 0.1mg/m3 (TWA)(as Ni, Soluble inorganic compounds (NOS))(2007) <JSOH> Not established （2007）. <OSHA> 1mg/m3 (PEL-TWA) （as Ni)
Engineering controls	Store in a cool, well-ventilated place. Keep container tightly closed to avoid contact with water. In case of dust; Provide local exhaust.
Personal protective equipments	
Respiratory protection	Wear respiratory protection.
Skin protection	Wear protective gloves.
Eye / face protection	Wear eye protection. (e.g. A pair of goggles) Wear protective clothing or face protection if necessary.
General hygiene considerations	Do not eat, drink, or smoke during work. Wash hands thoroughly after handling.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Crystal, deliquescence
Color	Green
Odor	Odorless
Melting point	No data available.
Boiling point	No data available.
Flash point	No data available.
Explosive range	No data available.
Vapor pressure	No data available.
Vapor density	No data available.
Specific gravity	1.92
Solubility in water	67.8g/100g(26℃)
Solubility in other solvents	Soluble in alcohol.
Partition Coefficient: n-octanol/water	No data available.
Auto-ignition point	No data available.
Decomposition temperature	No data available.
Odor threshold	No data available.
Evaporation rate	No data available.
Flammability (solid, gas)	No data available.
Viscosity	No data available.

10. STABILITY AND REACTIVITY

Chemical stability	Stable under normal condition.
Conditions to avoid	No information available.

Incompatible materials	No information available.
Hazardous decomposition products	On combustion to decompose, form hazardous and corrosive chlorine gas.
Possibility of hazardous reactions	No information available.

11. TOXICOLOGICAL INFORMATION

Acute toxicity – oral	LD_{50} 175～529 mg/kg (rat)
Acute toxicity – dermal	No data available
Acute toxicity–inhalation	No data available
Skin corrosion/irritation	Irritant to human skin
Serious eye damage/eye irritation	No data available
Respiratory sensitization	Respiratory sensitizer. As nickel compounds including this substance are listed as respiratory sensitization substances by DFG and listed as Group 2 by the Japan Society of Occupational Health.
Skin sensitization	Skin sensitizer. As nickel compounds including this substance are listed as skin sensitization substances by DFG and listed as Group 1 by the Japan Society of Occupational Health.
Germ cell mutagenicity	Dominant lethal test; Negative. Somatic cell in vivo mutagenicity study of Cytogenetic Test ; Positive.
Carcinogenicity	As nickel compound : IARC : Group 1 (Carcinogenic to humans)(1990) ACGIH : A1(Confirmed Human Carcinogen)(2001) NTP : K(Known to be a Human Carcinogen)(2005)
Reproductive toxicity	Effects on parent fertility and development of pups are observed in animal studies.

Specific target organ toxicity (single exposure)	Acute symptoms, such as nausea, an abdominal spasm, diarrhea, vomiting, headache, giddiness, a sense of exhaustion or muscular pain were observed. In addition, as acute intoxication of a nickel compound, nausea, diarrhea, giddiness, and headache were seen in human.
Specific target organ toxicity (repeated exposure)	Repeated exposure of nickel or nickel compounds may damage the membrane of respiratory system at the established level. Prolonged exposure at high concentration may cause pulmonary fibrosis.
Aspiration hazard	No data available

12. ECOLOGICAL INFORMATION

Hazardous to the aquatic environment - acute toxicity	LC_{50} (48h) 0.013mg/L (Ceriodaphnia quadrangula)
Hazardous to the aquatic environment - chronic toxicity	No data available This substance is metal. No data is available about the behavior in the water.

13. DISPOSAL CONSIDERATIONS

- Please consult us about the possibility of recycling.
- Disposal should be in accordance with applicable regional, national and local laws and regulations.
- When order to dispose the remainder to the private or public waste disposer, inform the physico-chemical and health hazards of this substance.
- Container should be cleaned up prior to recycling or dispose in accordance with applicable regional, national and local standard method.
- Empty container should be cleaned up prior to disposal.

14. TRANSPORT INFORMATION (not meant to be all-inclusive)

Proper Shipping Name	TOXIC SOLID INORGANIC.N.O.S.
UN Number	3288
Class	6.1
Sub Risk	None
Packing Group	Ⅲ

15. REGULATORY INFORMATION (not meant to be all-inclusive)

TSCA Inventory Listed

This product is followed by the competent regulations in an applicable country or region.

16. OTHER INFORMATION

Reference

1 USNLM ; Hazardous Substance Data Bank.(HSDB) (2006)
2 European Center of Ecotoxicology and Toxicology of Chemicals(ECETOC) ; Technical Report No. 33 (1989)
3 WHO/IPCS : Environmental Health Criteria (EHC) No.108 (1991)
4 JSOH ; Recommendation of Occupational Exposure Limits. J. Occup. Health. (2006) <Japanese>
5 IARC ; IARC Monographs on the Evaluation of Carcinogenic Risk to Humans. Vol. 49 (1990)
6 USDHHS ; The Agency for Toxic Substances and Disease Registry (ATSDR) Toxicological Profiles. (2005)
7 US NTP ; NTP Database Search (2005)
8 European Center of Ecotoxicology and Toxicology of Chemicals(ECETOC) ; Technical Report No. 91 (2003)
9 "Biodegradation and Bioaccumulation Data of Existing Chemicals based on the CSCL Japan." ed by Chemicals Inspection & Testing Institute Japan (1992)
10 GHS Classification of Nickel (Chemical Management Center, National Institute of Technology and Evaluation ; http://www.safe.nite.go.jp/english/dbi.html , 2007)
11 15170 Chemical commodities. The Chemical Daily Co. Ltd. <Japanese>
12 化学物質の危険・有害性便覧 中央災害防止協会 1993
13 "2004 Emergency Response Guidebook. 2nd revised ed." Japanese ed. Japa Chemical Industries Association (2005)

This information only concerns the above-mentioned product and does not need to be valid if used with other(s) or in any process. The information is to our best present knowledge correct and complete and is given in good faith but without warranty. It remains the user's own responsibility to make sure that the information is appropriate and complete for his special use of this product.

(This is the last page of this MSDS.)

MATERIAL SAFETY DATA SHEET

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	Nickel sulfate
Chemical formula	$NiSO_4 \cdot 6H_2O$
Manufacturer	**SUMITOMO METAL MINING CO., LTD.** NON-FERROUS METALS DIV./ADMINISTRATION DEPT. 3-5-3, NISHIBARA-CHO, NIIHAMA, EHIME, 792-8555 JAPAN TEL +81- 897-37-4817 FAX +81- 897-37-4910
Product use	This material is used for Nickel plating, Coloring for aluminum surface, Catalysts, and Electric cells.

2. HAZARDS IDENTIFICATION

GHS classification

Physical hazards:	
Explosives	Outside scope of the classification
Flammable gases	Outside scope of the classification
Flammable aerosols	Outside scope of the classification
Oxidizing gases	Outside scope of the classification
Gases under pressure	Outside scope of the classification
Flammable liquids	Outside scope of the classification
Flammable solids	Not classified
Self-reactive substances and mixtures	Classification not possible
Pyrophoric liquids	Outside scope of the classification
Pyrophoric solids	Not classified
Self-heating substances and mixtures	Not classified
Substances and mixtures which, in contact with water, emit flammable gases	Not classified
Oxidizing liquids	Outside scope of the classification
Oxidizing solids	Classification not possible
Organic peroxides	Outside scope of the classification
Corrosive to metals	Classification not possible
Health hazards:	
Acute toxicity – oral	Category 4 (see the following index 11.)
Acute toxicity – dermal	Classification not possible
Acute toxicity – inhalation (gases)	Outside scope of the classification
Acute toxicity – inhalation (vapors)	Classification not possible
Acute toxicity – inhalation (dust, mist)	Classification not possible
Skin corrosion/irritation	Classification not possible
Serious eye damage/eye irritation	Classification not possible
Respiratory sensitization	Category 1
Skin sensitization	Category 1
Germ cell mutagenicity	Not classified
Carcinogenicity	Category 1A

Reproductive toxicity	Category 2
Specific target organ toxicity (single exposure)	Category 1(central nervous system, respiratory organ)
Specific target organ toxicity (repeated exposure)	Category1 (respiratory organ, kidney, testis) Category 2(liver)
Aspiration hazard	Classification not possible
Environmental hazards:	
Hazardous to the aquatic environment - acute toxicity	Category 1
Hazardous to the aquatic environment - chronic toxicity	Classification not possible

HAZARDS EXCLUDED FROM THE GHS CLASSIFICATION CATEGORIES

HEALTH HAZARDS

- Seriously irritate the eyes, membrane of respiratory tract or skin.
- If swallowed large amount, may cause displeasure, nausea, giddiness, fatigue, headache, vomiting, diarrhea, cough, rapid breathing, temporary half-blindness.
- The increased rate of chromosomal aberration was observed in human peripheral lymphocyte who exposed occupationally to nickel chloride or nickel sulfate.
- In the epidemiological studies in the workers occupationally exposed to nickel oxide, nickel sulfate or nickel chloride, it is reported that the exposure may cause lung and nasal cavity cancer.
- The effects on nasal cavity, lung, testis, liver, heart and intestinal tract were observed in the repeatedly dosed animal study.

PICTOGRAM



SIGNAL WORD DANGER

HAZARD STATEMENT

- Toxic if swallowed.
- May cause allergy or asthma symptoms or breathing difficulties if inhaled.
- May cause an allergic skin reaction.
- May cause cancer.
- Suspected of damaging fertility or the unborn child.
- Causes damage to organs <central nervous system, respiratory organs>
- Causes damage to organs <respiratory organs, kidney, testis> through prolonged or repeated exposure.
- May cause damage to organs <liver> through prolonged or repeated exposure.
- Very toxic to aquatic life.

PRECAUTIONARY STATEMENTS

〔Prevention〕

- Do not handle until all safety precautions have been read and understood.

- Wear personal protector or use ventilator to avoid exposure.
- In case of inadequate ventilation, wear respiratory protection.
- Avoid breathing dust or fume.
- Do not eat, drink, or smoke during work.
- Wash hands thoroughly after handling.
- Avoid release to the environment.

〔Response〕

- If inhaled: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If experiencing respiratory symptoms, get medical attention.
- Get medical attention if you feel unwell.
- If on skin : Wash with plenty of water and soap.
- If skin irritation or rash occurs, get medical attention.
- If exposed or concerned ; Get medical attention.

〔Storage〕

- Store in a cool, well-ventilated place.
- Keep container tightly closed and store in a cool, well-ventilated place.

〔Disposal〕

- Please consult us about the possibilities of recycling, treatment or handling.
- Disposal should be in accordance with applicable regional, national and local laws and regulations.

3. COMPOSITION / INFORMATION ON INGREDIENTS

COMPONENT	CAS No.	TSCA	EINECS	%w/w
Nickel sulfate	10101-97-0	Listed	231-104-9	$NiSO_4 \cdot 6H_2O$:98.5< Ni:22.0 <

4. FIRST AID MEASURES

Eye contact	Rinse cautiously with plenty of water for several minutes. Get medical attention.
Skin contact	Wash with plenty of water and soap. Take off all contaminated clothing and shoes. Wash contaminated clothing before reuse.
Inhalation	Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately get medical attention. Get medical attention if you feel unwell.
Ingestion	Rinse mouth. Get medical attention.

5. FIRE FIGHTING MEASURES

Flammable properties	
Flash point	No data available

Extinguishing media	
Suitable extinguishing media	This substance is nonflammable. Use adequate extinguishing agents for surrounding fire.
Unsuitable extinguishing media	Use adequate extinguishing agents for surrounding fire.
Protection of firefighters	Wear adequate respiratory protection and chemical-resistant clothing. (heat resistance)
Specific hazards arising from the chemical	In case of fire, irritating or toxic fumes or gases may be generated.
Protective equipment and precautions for firefighters	Move container to safe area, if possible with low risk.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions	Immediately isolate the spilled area with adequate distance for all directions. Wear adequate protector refer to Section 8 and avoid contact with eyes and skin or inhaling. Keep unnecessary and unprotected personnel from entering.
Environmental precautions	Avoid entering the river or affecting to the environment. Do not let this substance enter the environment.
Method for clean-up	Sweep diffused spillage and place in an empty container. Residual substances are collected completely with care and moved to a safe place. Sweep up spillage and place in a sealable empty container for later disposal. Treat with solution of calcium hydrate or sodium carbonate, and then wash plenty of water. Prevent the spillage release to the river.

7. HANDLING AND STORAGE

Handling	Wear protective equipment and set the engineering controls refer to Section 8. Local exhaust or general ventilation may be necessary. (Refer to Section 8) Wear protective gloves when handling. Use only outdoors or in a well-ventilated area. Avoid breathing dust or fume. Wash hands thoroughly after handling. Avoid to contact with strong oxidizers. (refer to Section 10)
Storage	Keep away from high temperature, humidity and direct sun light. Keep container tightly closed and store in a cool, well-ventilated place. Store keeping away from incompatible materials.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure guidelines	ACGIH has established the following exposure limit. <ACGIH> 0.1mg/m3 (TWA)(as Ni, Soluble inorganic compounds (NOS))(2007) <JSOH> Not established （2007）. <OSHA> 1mg/m3 (PEL-TWA) （as Ni)
Engineering controls	Indoor use, seal the source or provide local exhaust. In case of dust or fume may generate, use local ventilation.
Personal protective equipments	
Respiratory protection	Wear respiratory protection.
Skin protection	Wear protective gloves.
Eye / face protection	Wear eye protection. (e.g. A pair of goggles) Wear protective clothing or face protection if necessary.
General hygiene considerations	Do not eat, drink, or smoke during work. Wash hands thoroughly after handling.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Crystal
Color	Pale blue green
Odor	Odorless
Melting point	No data available (Decomposed to nickel oxide and sulfur trioxide at 840℃)
Boiling point	No data available.
Flash point	No data available.
Explosive range	No data available.
Vapor pressure	No data available.
Vapor density	No data available.
Specific gravity	2.07
Solubility in water	Water 40.8g/100g （25℃ Anhydrous salts)
Partition Coefficient: n-octanol/water	No data available.
Auto-ignition point	No data available.
Decomposition temperature	No data available.
Odor threshold	No data available.
Evaporation rate	No data available.
Flammability (solid, gas)	No data available.
Viscosity	No data available.

10. STABILITY AND REACTIVITY

Chemical stability	Stable under normal condition.
Conditions to avoid	Contact with incompatible materials.
Incompatible materials	Strong oxidizers.
Hazardous decomposition products	In case of fire, irritating or toxic fumes or gases may be generated.
Possibility of hazardous reactions	React with base and form hydroxides. Upon heating, decompose at 848 ℃ and generate hazardous fumes of sulfur trioxide or Nickel oxide. The solution is a weak acid.

11. TOXICOLOGICAL INFORMATION

Acute toxicity – oral	LD_{50} 275～500 mg/kg (rat) Category 4 would be suitable based on ECETOC TR33.
Acute toxicity – dermal	No data available
Acute toxicity–inhalation	No data available
Skin corrosion/irritation	Skin irritation: Negative (rabbits)
Serious eye damage/eye irritation	Eye irritation: Negative (rabbits)
Respiratory sensitization	Respiratory sensitizer. As nickel compounds including this substance are listed as respiratory sensitization substances by DFG and listed as Group 2 by the Japan Society of Occupational Health.
Skin sensitization	Skin sensitizer. (guinea pig; maximization study) As nickel compounds including this substance are listed as skin sensitization substances by DFG and listed as Group 1 by the Japan Society of Occupational Health.
Germ cell mutagenicity	Germ cell in vivo mutagenicity study of Cytogenetic test and somatic cell in vivo mutagenicity study of Micronuclei test and Cytogenetic Test; Negative.
Carcinogenicity	As nickel compound : IARC : Group 1 (Carcinogenic to humans)(1990) ACGIH : A1(Confirmed Human Carcinogen)(2001) NTP : K(Known to be a Hunan Carcinogen)(2005)

Reproductive toxicity	Effects on male fertility and development of pups are observed.
Specific target organ toxicity (single exposure)	Acute symptoms, such as nausea, an abdominal spasm, diarrhea, vomiting, headache, giddiness, a sense of exhaustion, muscular pain or single-sided visual field defect were observed. In addition, as acute intoxication of a nickel compound, nausea, diarrhea, giddiness, and headache were seen in human.
Specific target organ toxicity (repeated exposure)	The increase of protein, β2-microglobulin, retinol binding protein or NAG concentration in urine was observed in human. Also Chronic allergic rhinitis, nasal-septum erosion, perforation and ulcer were observed in human. Degeneration and atrophy of olfactory epithelium, alveolitis, atrophy of vas deferens, vacuolation or degeneration of liver cell, glomerular degeneration in kidney, deciduation of alveolar and bronchial epithelium and thickening of alveolar cell wall in lung, emphysema were observed in animal experiments. The target organs are respiratory system, kidney, testis and liver. Repeated exposure of nickel or nickel compounds may damage the membrane of respiratory system at the established level. Prolonged exposure at high concentration may cause pulmonary fibrosis.
Aspiration hazard	No data available.

12. ECOLOGICAL INFORMATION

Hazardous to the aquatic environment – acute toxicity	EC_{50} (72h) 0.75 mg/l (Selenastrum)
Hazardous to the aquatic environment – chronic toxicity	No data available. This substance is metal. No data is available about the behavior in the water.

13. DISPOSAL CONSIDERATIONS

- Please consult us in case of recycling.
- Disposal should be in accordance with applicable regional, national and local laws and regulations.
- When order to dispose the remainder to the private or public waste disposer, inform the physico-chemical and health hazards of this substance.
- Container should be cleaned up prior to recycling or dispose in accordance with applicable regional, national and local standard method.

・ Empty container should be cleaned up prior to disposal.

14. TRANSPORT INFORMATION (not meant to be all-inclusive)

Proper Shipping Name	-
UN Number	-
Class	-
Sub Risk	-
Packing Group	-

15. REGULATORY INFORMATION (not meant to be all-inclusive)

TSCA Inventory	Listed

This product is followed by the competent regulations in an applicable country or region.

16. OTHER INFORMATION

Reference

1 European Center of Ecotoxicology and Toxicology of Chemicals(ECETOC) ; Technical Report No. 33 (1989)
2 WHO/IPCS : Environmental Health Criteria (EHC) No.108 (1991)
3 JSOH ; Recommendation of Occupational Exposure Limits. J. Occup. Health. (2005) <Japanese>
4 IARC ; IARC Monographs on the Evaluation of Carcinogenic Risk to Humans. Vol. 49 (1990)
5 USDHHS ; The Agency for Toxic Substances and Disease Registry (ATSDR) Toxicological Profiles. (2005)
6 US NTP ; NTP Database Search (2005)
7 ACGIH ; Documentation of the Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices. 7th Ed. (2001)
8 CERI ; Hazard data sheet 97-19(1) (1998) <Japanese>
9 "Biodegradation and Bioaccumulation Data of Existing Chemicals based on the CSCL Japan." ed by Chemicals Inspection & Testing Institute Japan (1992)
10 "Biodegradation and Bioaccumulation Data of Existing Chemicals based on the CSCL Japan." ed by Chemicals Inspection & Testing Institute Japan (1992)
11 GHS Classification of Nickel (Chemical Management Center, National Institute of Technology and Evaluation ; http://www.safe.nite.go.jp/english/dbi.html , 2007)
12 "2004 Emergency Response Guidebook. 2nd revised ed." Japanese ed. Japan Chemical Industries Association (2005)

This information only concerns the above-mentioned product and does not need to be valid if used with other(s) or in any process. The information is to our best present knowledge correct and complete and is given in good faith but without warranty. It remains the user's own responsibility to make sure that the information is appropriate and complete for his special use of this product.

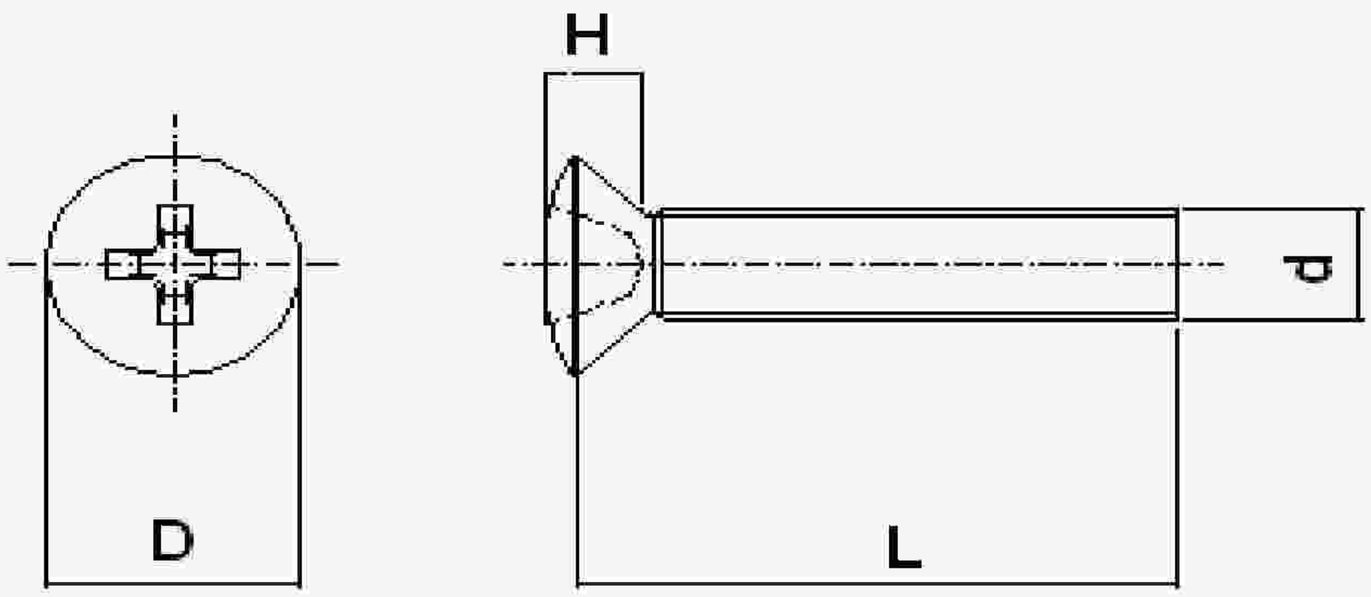
(This is the last page of this MSDS.)

PT. Ginsa Inti Pratama
Manufacturer of Fasteners

Part Inspection Check Sheet

Part Name	PO/MS M6X30 PUTIH	P/O		Decision	
Part No.	BOLT JO 6X30	Test Date	4 Juli 2025		
Cust. P/N	PT. Chitose Mfg.	Qty	6000 pcs	OK	
Material	SWCH 8A	Test Qty	5 Pcs		

Test Item	Instrument	Specification	Test Result								
			1	2	3	4	5	Max	Min	R	Result
•Dimension											
D	Micrometer	11,30 ~ 12,00	11,47	11,59	11,52	11,65	11,61	11,65	11,47	0,18	OK
H	Height Gauge	4,20 ~ 4,80	4,52	4,53	4,55	4,53	4,52	4,55	4,52	0,03	OK
L	D.Caliper	29,00 ~ 30,00	29,62	29,54	29,43	29,91	29,69	29,91	29,43	0,48	OK
d	Micrometer	5,79 ~ 5,97	5,90	5,91	5,90	5,91	5,90	5,91	5,90	0,01	OK
•Appearance											
Plating	Visual	• Putih	OK	OK	OK	OK	OK				OK
		• Tidak Berkarat	OK	OK	OK	OK	OK				OK
		• Tidak Kusam	OK	OK	OK	OK	OK				OK
Fisik	Visual	• Tidak Cacat	OK	OK	OK	OK	OK				OK
		• Tidak Burry	OK	OK	OK	OK	OK				OK



LOT NO.		Approved	Inspection
NO.WOE/Packing			

PT MEGA PRATAMA FERINDO

PT. MEGA PRATAMA FERINDO

MATERIAL SAFETY DATA SHEET

Section 1. Product & Company Identification

Product Name : Cold Drawn Steel Wire
Company Identificatior : PT. Mega Pratama Ferindo
Address : jl. Industri Raya III Blok AB No.5 Zona Industri Raya Jatake
Tangerang 15710, Indonesia
Phone : + 62 21 5901927 or + 62 21 5901928
Fax : + 62 21 5901929
Emergency Phone No: Same as the above

Section 2, Composition & Information on Ingredients

Distinction (single-component: substance, or compound): Compound (alloy)
Composition and content : refer to MILL SHEET
CAS No. And ICSC No.

Element	Content (mass %)	CAS No	ICSC No	Note
Iron (Fe)	99 or lower	7439-89-6	-	-
Manganese (Mn)	25 or lower	7439-96-5	0174	O
Chromium (Cr)	10 or lower	7440-47-3	0029	O
Nickel (Ni)	4 or lower	2/9/7440	0062	O

Note : O Mark indicates those that are regulated by industrial Safety and Health Law

Section 3, Summary of Hazards

This product is solid at room temperature and is chemically stable. However, it's fume or coarse particulate that occur during machining, such as welding, thermal cutting, grinding and machining, may irritate mucous membrane of respitory organs, eye, etc. And arc or chips that are generated from machining may cause burns or cut wounds to human body

Section 4, First-Aid Measures

Appropriate protection should be provided against furne, dust, arc, chips that occurduring the machining of welding, thermal cutting, cutting, grinding, Etc

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- Skin Contact : Wash thoroughly with soap and water
- Eye Contact : Flush with clean water sufficiently
- Ingestion : Vomit immediately. Take gargling
- Burns : Cool the affected part sufficiently, Apply medicine
- Cut wounds : Flush with clean water, Apply medicine

For all case above, see a physician if necessary

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Date 07-07-20

Section 5, Fire-Fighting Measures

Not applicable. The product is solid and chemically stable

Section 6, Accidental-Release Measures

Not applicate. The product is solid under normal conditions

Section 7, Handling and Storage

Handling : Wear protective glove to provent possible cut wounds due to sharp edges of product
Storage : If necessary, provide preventive measures against leakage of rainwater, seawater, etc
Also, ensure to keep the products from falling.

PT MEGA PRATAMA FERINDO

PT. MEGA PRATAMA FERINDO

MATERIAL SAFETY DATA SHEET

Section 8, Exposure Controls and Personal Protections
The Product is solid and cemically stable
However, during welding, thermal cutting, cutting, grinding, etc. Use respiratory protection mask, safety goggles, protective glove, and protective clothing to guard face, hand and foot againt the furne, dust chips, etc. Occurring from machining .

Section 9, Physical and Chemical Properties
Physical State : Silid showing silver-white under normal conditions
Physical Properties : - Melting poin : 1440 - 1535 °C
- Specific Gravity : Approx, 7.85

Section 10, Stability and Rectifity
The product is chemically stable having fe as it's base and some alloy element as additives so reactifity is low.

Section 11, Hazards Information
As a steel product, no significant data on toxicity for humans has been reported to date. For some alloy elements, however, potential hazards are pointed out. When each element as a single-component substance exceeds allowable concentration rate and the machining mentioned in section 9 are applied.

Section 12, Environmental Impact
As a steel product, no significant data on environment impact has been reported up to the present

Section 13, Disposal Consideration
Disposal of by using officially licensed waste disposal agent, if any deposit is involved, take due consideration for such deposit as well.

Section 14, Transport Information
Since it is heavy load, fasten tightly to avoid tumbling of load, it is advisable to provide measure againts leak in of rain water.

Section 15, Applicable laws and regulations
Industrial Safety and Health Law (attention : This law is available in Indonesia)

Section 16, Other Information
Contact for inquiries about the contents of this data sheet :
Product Name : Rolled Steel
Company Identification : China Steel Corporation
Address : China Steel
Address : Chung Kang Road, Hsiao Kang, Kaohsiung 81233, Taiwan
Phone:886 (7) 802-1111 Ext.3821
Fax :886 (7) 805-1292
e-mail address :072223 @mail. csc. com. tw
Emergency Phone No: Same as th Emergency P

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PT MEGA PRATAMA FERINDO

PT. MEGA PRATAMA FERINDO

MATERIAL SAFETY DATA SHEET

The information in this MSDS was obtained from sourees which we believe are reliable. This material Safety Data Sheet is made available to the product user as **" references data "** to help them ensure the worker's safety and prevent personal injuries it is not intended to guarantee the safety of product. The product may cause such potential hazards that are not our know ledge to date
It is the user's responsibility to implement the proper measures for their own particural situation. making reference to the information provided in this Material Safety Data Sheet .

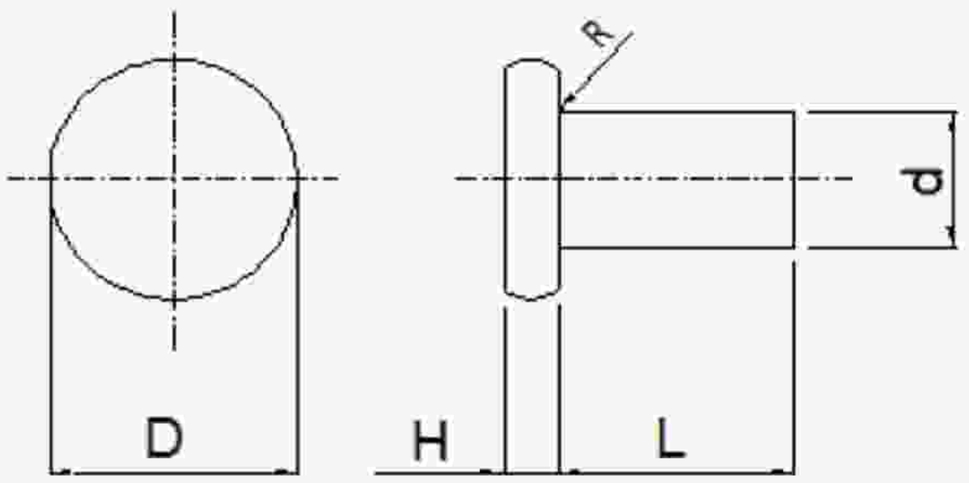
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PT. Ginsa Inti Pratama
Manufacturer of Fasteners

Part Inspection Check Sheet

Part Name	RIVET 6X8 ZB	P/O		Decision	
Cust.P/N	RIVET (ROLAND)	Test Date	15 Jul 2025		
Customer	PT. CHITOSE Mfg	Qty	2000 pcs	OK	
Material	SWCH 8A	Test Qty	5 Pcs		

Test Item	Instrument	Specification	Test Result								
			1	2	3	4	5	Max	Min	R	Result
•Dimension											
D	D. Caliper	Ø11.50 ~ 12.00	11,80	11,84	11,92	11,71	11,69	11,92	11,69	0,23	OK
H	Dial Indicator	2.00 ~ 2.40	2,31	2,30	2,27	2,29	2,03	2,31	2,03	0,28	OK
L	D. Caliper	8	8,08	8,10	8,07	8,09	8,11	8,11	8,07	0,04	OK
d	Micrometer	Ø5.94 ~ 6.24	6,00	5,99	6,00	5,98	5,98	6,00	5,98	0,02	OK
•Appearance											
Warna Platting	Visual	•Zinc Black (ZB)	OK	OK	OK	OK	OK				OK
Fisik	Visual	•Tidak Cacat	OK	OK	OK	OK	OK				OK
		•Tidak Burry	OK	OK	OK	OK	OK				OK
		•Tidak Karat	OK	OK	OK	OK	OK				OK



LOT NO.		Approved	Inspected
NO.WOE/Packing			

☐ FORM 020/GINSA-QA/Rev.00 – QMS ISO 9001 : 2008

☐ FORM 020/GINSA-QA/Rev.00 – QMS ISO / TS 16949 : 2009

* Catatan : Beri tanda √ sesuai QMS yang digunakan

PT MEGA PRATAMA FERINDO

PT. MEGA PRATAMA FERINDO

MATERIAL SAFETY DATA SHEET

Section 1. Product & Company Identification

Product Name : Cold Drawn Steel Wire
Company Identificatior : PT. Mega Pratama Ferindo
Address : jl. Industri Raya III Blok AB No.5 Zona Industri Raya Jatake
Tangerang 15710, Indonesia
Phone : + 62 21 5901927 or + 62 21 5901928
Fax : + 62 21 5901929
Emergency Phone No: Same as the above

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Distinction (single-component: substance, or compound): Compound (alloy)
Composition and content : refer to MILL SHEET
CAS No. And ICSC No.

Element	Content (mass %)	CAS No	ICSC No	Note
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Note : O Mark indicates those that are regulated by industrial Safety and Health Law

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For all case above, see a physician if necessary

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Date 07-07-20

Section 5, Fire-Fighting Measures

Not applicable. The product is solid and chemically stable

Section 6, Accidental-Release Measures

Not applicate. The product is solid under normal conditions

Section 7, Handling and Storage

Handling : Wear protective glove to provent possible cut wounds due to sharp edges of product
Storage : If necessary, provide preventive measures against leakage of rainwater, seawater, etc
Also, ensure to keep the products from falling.

PT MEGA PRATAMA FERINDO

PT. MEGA PRATAMA FERINDO

MATERIAL SAFETY DATA SHEET

Section 8, Exposure Controls and Personal Protections
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Physical State : Silid showing silver-white under normal conditions
Physical Properties : - Melting poin : 1440 - 1535 °C
- Specific Gravity : Approx, 7.85

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Section 12, Environmental Impact
As a steel product, no significant data on environment impact has been reported up to the present

Section 13, Disposal Consideration
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PT MEGA PRATAMA FERINDO

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MATERIAL SAFETY DATA SHEET

The information in this MSDS was obtained from sourees which we believe are reliable. This material Safety Data Sheet is made available to the product user as **" references data "** to help them ensure the worker's safety and prevent personal injuries it is not intended to guarantee the safety of product. The product may cause such potential hazards that are not our know ledge to date
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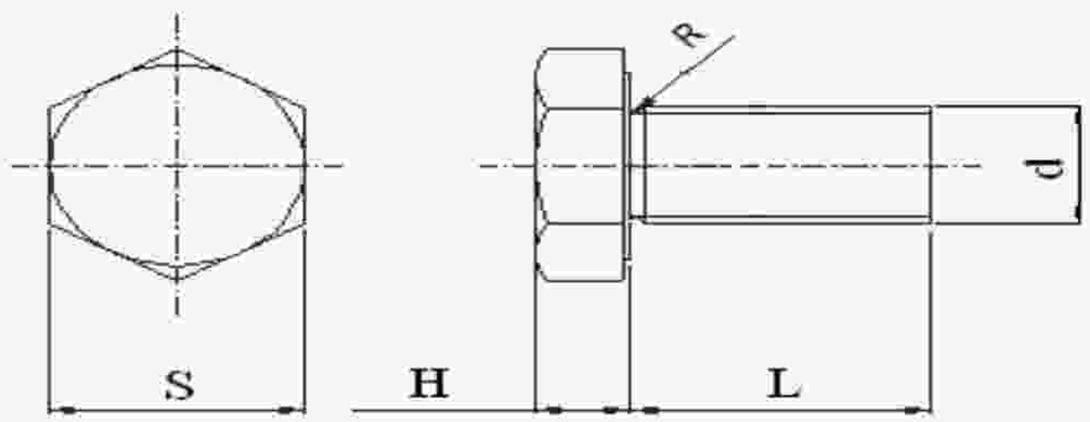
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PT. Ginsa Inti Pratama
Manufacturer of Fasteners

Part Inspection Check Sheet

Part Name	BH/MS M10X1.5X50 (K17) ZB	P/O		Decision	
Part No.	HEX BOLT M10XP1.5X50 ZINC BLACK	Test Date	14. Juli 2025		
Cust. P/N	PT. Chitose Mfg.	Qty	8.000 Pcs	OK	
Material	SWCH 45K	Test Qty	5 Pcs		

Test Item	Instrument	Specification	Test Result								
			1	2	3	4	5	Max	Min	R	Result
•Dimension											
S	D.Caliper	16.75 ~ 17.00	16,96	16,92	16,95	16,91	16,93	16,96	16,91	0,05	OK
H	D.Caliper	6.80 ~ 7.20	7,06	7,05	7,07	7,06	7,04	7,07	7,04	0,03	OK
L	D.Caliper	49,50 ~ 50,50	50,09	49,85	49,97	49,93	50,05	50,09	49,85	0,24	OK
d	Micrometer	9.73 ~ 9.96	9,76	9,74	9,75	9,80	9,77	9,80	9,74	0,06	OK
•Hardness	HRC	20 ~ 28	26	24	25	27	26	27	24	3	OK
•Appearance											
Plating	Visual	• Zinc Black (ZB)	OK	OK	OK	OK	OK				OK
		• Tidak Berkarat	OK	OK	OK	OK	OK				OK
		• Tidak Kusam	OK	OK	OK	OK	OK				OK
Fisik	Visual	• Tidak Cacat	OK	OK	OK	OK	OK				OK
		• Tidak Burry	OK	OK	OK	OK	OK				OK



LOT NO.		Approved	Inspection
NO.WOE/Packing			

PT MEGA PRATAMA FERINDO

PT. MEGA PRATAMA FERINDO

MATERIAL SAFETY DATA SHEET

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Section 5, Fire-Fighting Measures

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PT MEGA PRATAMA FERINDO

PT. MEGA PRATAMA FERINDO

MATERIAL SAFETY DATA SHEET

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Physical State : Silid showing silver-white under normal conditions
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Disposal of by using officially licensed waste disposal agent, if any deposit is involved, take due consideration for such deposit as well.

Section 14, Transport Information
Since it is heavy load, fasten tightly to avoid tumbling of load, it is advisable to provide measure againts leak in of rain water.

Section 15, Applicable laws and regulations
Industrial Safety and Health Law (attention : This law is available in Indonesia)

Section 16, Other Information
Contact for inquiries about the contents of this data sheet :
Product Name : Rolled Steel
Company Identification : China Steel Corporation
Address : China Steel
Address : Chung Kang Road, Hsiao Kang, Kaohsiung 81233, Taiwan
Phone:886 (7) 802-1111 Ext.3821
Fax :886 (7) 805-1292
e-mail address :072223 @mail. csc. com. tw
Emergency Phone No: Same as th Emergency P

PT. MPF
HANYA INFORMASI
Issued To PT Ginsa
Date 07-07-20

PT MEGA PRATAMA FERINDO

PT. MEGA PRATAMA FERINDO

MATERIAL SAFETY DATA SHEET

The information in this MSDS was obtained from sourees which we believe are reliable. This material Safety Data Sheet is made available to the product user as **" references data "** to help them ensure the worker's safety and prevent personal injuries it is not intended to guarantee the safety of product. The product may cause such potential hazards that are not our know ledge to date
It is the user's responsibility to implement the proper measures for their own particural situation. making reference to the information provided in this Material Safety Data Sheet .

PT. MPF
HANYA INFORMASI
Issued To PT. Ginsa
Date 07-07-20

ATOTECH

UNICLEAN 291

Application

Uniclean 291 is formulated as a general-purpose product. Thanks to its special and unique combination of emulsifiers and wetting agents, this product is applicable as electro-cleaner and in soak operations. The first application must however be emphasized.

Uniclean 291 has been designed in such a way that it can be used with out any problem in areas with hard water.

A solution of Uniclean 291 remains clear, even in very hard water, without noticeable effect on the detergency.

Uniclean 291 removes all kinds of mill-oils and grease from steel and alkali resistant metals. As cathodic cleaner it is also possible to remove polishing compound residue.

Notes :

1) The last step of the cleaning cycle should be anodic cleaning.
2) Time of anodic cleaning should be equal to or longer than the time of cathodic cleaning, if any.

Description:

Uniclean 291 is a strong alkaline product containing a.o. caustic soda and silicates. The surfactants used are very stable even at high electrolyte concentration and at high temperature. Moreover, these components are not sensitive to hard water salts.

A solution of Uniclean 291 has a high conductivity, allowing effective cleaning when used as electro-cleaner. In this case a thin, uniform foam blanket is formed which prevents irritating spray and vapour.

Control Procedure:

Cool a 10 ml sample to room temperature and add a few drops of methylorangre. Titrate 0,5 N acid to pink endpoint.

Calculation:

ml of N acid x 2,5 = ... g/l Uniclean 291

Operating Conditions:

Material	Current density	Concentration pro 100 l	Temp.	Time
Iron/Steel	4 - 10 A/dm2	4 - 15 kg	40 - 80 °C	cath. :1/2-3min
				anod.:1/2-5min

UNICLEAN 501 PART 1

Version 2.0
SDS_MY SDS Number: 1668018 Revision Date: 22.03.2018

SECTION 1: Identification of the hazardous chemical and of the supplier

Product identifier

Product name : UNICLEAN 501 PART 1

Product code : 1668018

Recommended use of the chemical and restrictions on use

Recommended use : Plating agents and metal surface treating agents
Surface treatment

Restrictions on use : For industrial use only.

Manufacturer or supplier's details

Company : Atotech Deutschland GmbH

Address : Erasmusstrasse 20
Berlin 10553
Germany

Telephone : +4930349850

Company : Atotech (Malaysia) Sdn Bhd

Address : 1182 Lorong Perindustrian Bukit Minyak 22,
Taman Perindustrian Bukit Minyak
Simpang Ampat, Penang 14100
Malaysia

Telephone : +6045069800

Prepared by
Product Safety Department (PSD): product-safety@atotech.com

Inquiries
Questions about content of Safety Data Sheets: product-safety@atotech.com

Emergency telephone number : CARECHEM24 INTERNATIONAL (MULTILINGUAL SERVICE) +6531581074

SECTION 2: Hazards identification

Classification of the hazardous chemical

Acute toxicity (Oral) : Category 4

Serious eye damage/eye irritation : Category 1

Label elements

Hazard pictograms :



Signal word : Danger

Hazard statements : H302 Harmful if swallowed.
H318 Causes serious eye damage.

Precautionary statements :

Prevention:

P264 Wash skin thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P280 Wear eye protection/ face protection.

Response:

P301 + P312 + P330 IF SWALLOWED: Call a POISON CENTER or doctor/ physician if you feel unwell. Rinse mouth.
P305 + P351 + P338 + P310 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/ physician.

Disposal:

P501 Dispose of contents/ container to an approved waste disposal plant.

Other hazards which do not result in classification

None known.

SECTION 3: Composition and information of the ingredients of the hazardous chemical

Substance / Mixture : Mixture

Chemical nature : Aqueous solution

Hazardous ingredients

Chemical name	CAS-No.	Concentration (% w/w)
Alcohols, C9-11-iso-, C10-rich, ethoxylated	78330-20-8	>= 40 -< 60

SECTION 4: First aid measures

General advice : Call a physician or poison control center immediately.
Show this safety data sheet to the doctor in attendance.

If inhaled : Move to fresh air.

In case of skin contact	:	In case of contact, immediately flush skin with plenty of water. Take off all contaminated clothing immediately. Wash contaminated clothing before reuse.
In case of eye contact	:	Consult a physician. In case of contact, immediately flush eyes with plenty of water for at least 30 minutes.
If swallowed	:	Never give anything by mouth to an unconscious person. Call a physician or poison control center immediately. Do not induce vomiting without medical advice.
Most important symptoms and effects, both acute and delayed	:	Harmful if swallowed. Causes serious eye damage. Redness Blindness Nausea
Protection of first-aiders	:	First Aid responders should pay attention to self-protection and use the recommended protective clothing
Notes to physician	:	For specialist advice physicians should contact the Poisons Information Service.

SECTION 5: Firefighting measures

Extinguishing media

Suitable extinguishing media	:	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Unsuitable extinguishing media	:	No information available.

Physicochemical hazards arising from the chemical

Hazardous combustion products	:	Carbon oxides

Special protective equipment and precautions for fire-fighters

Special protective equipment for fire-fighters	:	In the event of fire, wear self-contained breathing apparatus.
Specific extinguishing methods	:	Use a water spray to cool fully closed containers. Collect contaminated fire extinguishing water separately. This must not be discharged into drains. Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations.

SECTION 6: Accidental release measures

Personal precautions, protective equipment and	:	Use personal protective equipment. Avoid contact with skin, eyes and clothing.

emergency procedures		Evacuate personnel to safe areas. Prevent unauthorized access.
Environmental precautions	:	Prevent product from entering drains. Prevent further leakage or spillage if safe to do so. If the product contaminates rivers and lakes or drains inform respective authorities.
Methods and materials for containment and cleaning up	:	Avoid formation of aerosol. Soak up with inert absorbent material. Keep in suitable, closed containers for disposal. Clean contaminated surface thoroughly. Dispose of in accordance with local regulations.

SECTION 7: Handling and storage

Handling

Precautions for safe handling

Advice on safe handling	:	For personal protection see section 8. Smoking, eating and drinking should be prohibited in the application area. Dispose of rinse water in accordance with local and national regulations. Handle in accordance with good industrial hygiene and safety practice.

Storage

Conditions for safe storage, including any incompatibilities

Conditions for safe storage	:	Keep container tightly closed in a dry and well-ventilated place.
Recommended storage temperature	:	-5 - 40 °C

SECTION 8: Exposure controls and personal protection

Control parameters

Contains no substances with occupational exposure limit values.

Appropriate engineering controls	:	Ensure adequate ventilation, especially in confined areas.

Individual protection measures, such as personal protective equipment

Eye/face protection	:	Tightly fitting safety goggles Face-shield Ensure that eyewash stations and safety showers are close to the workstation location.
Skin protection	:	Impervious clothing Choose body protection according to the amount and

concentration of the dangerous substance at the work place.

Hand protection		
Material	:	Nitrile rubber
Break through time	:	480 min
Glove thickness	:	0,4 mm
Manufacturer	:	e.g. KCL
Recommendation	:	e.g. KCL Camatril®Velours 730
Remarks	:	The selected protective gloves have to satisfy the specifications of EU Directive 89/689/EEC and the standard EN 374 derived from it.The information is based on our own tests, on data from literature and information from protective glove producers or is based on data obtained from similar substances. 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.Be aware that in daily use the durability of a chemical resistant protective glove can be notably shorter than the break through time measured according to EN 374, due to the numerous outside influences (e.g. temperature).Gloves should be discarded and replaced if there is any indication of degradation or chemical breakthrough.
Respiratory protection	:	In case of insufficient ventilation, wear suitable respiratory equipment. When workers are facing concentrations above the exposure limit they must use appropriate certified respirators. No personal respiratory protective equipment normally required.
Hygiene measures	:	Avoid contact with skin, eyes and clothing. When using do not eat or drink.

SECTION 9: Physical and chemical properties

Appearance	:	liquid
Color	:	colorless
Odor	:	No information available.
Odor Threshold	:	No data available
pH	:	5,0 - 8,0
Melting point/range	:	not determined
Boiling point/boiling range	:	not determined
Flash point	:	Not applicable

Evaporation rate	:	No data available
Flammability (solid, gas)	:	Not applicable
Upper explosion limit	:	No data available
Lower explosion limit	:	No data available
Vapor pressure	:	ca. 23 hPa (20 °C)
Relative vapor density	:	No data available
Density	:	1,00 - 1,10 g/cm3 (20 °C)
Solubility(ies)		
Water solubility	:	completely miscible
Partition coefficient: n-octanol/water	:	No data available
Autoignition temperature	:	No data available
Decomposition temperature	:	No data available
Viscosity		
Viscosity, dynamic	:	No data available
Viscosity, kinematic	:	No data available
Oxidizing properties	:	Not applicable

SECTION 10: Stability and reactivity

Reactivity	:	Not classified as a reactivity hazard.
Chemical stability	:	Stable under recommended storage conditions.
Possibility of hazardous reactions	:	No dangerous reaction known under conditions of normal use.
Conditions to avoid	:	To avoid thermal decomposition, do not overheat.
Incompatible materials	:	No data available
Hazardous decomposition products	:	No hazardous decomposition products are known.

SECTION 11: Toxicological information

Information on likely routes of exposure : Eye contact

Acute toxicity

Harmful if swallowed.

Product:

Acute oral toxicity : Acute toxicity estimate: 1.060 mg/kg
Method: Calculation method

Ingredients:

Alcohols, C9-11-iso-, C10-rich, ethoxylated:

Acute oral toxicity : Acute toxicity estimate: 500 mg/kg

Skin corrosion/irritation

Not classified based on available information.

Serious eye damage/eye irritation

Causes serious eye damage.

Product:

Remarks: May cause irreversible eye damage such as corneal damage and blindness.

Respiratory or skin sensitization

Skin sensitisation

Not classified based on available information.

Respiratory sensitisation

Not classified based on available information.

Germ cell mutagenicity

Not classified based on available information.

Carcinogenicity

Not classified based on available information.

Reproductive toxicity

Not classified based on available information.

STOT - single exposure

Not classified based on available information.

STOT - repeated exposure

Not classified based on available information.

Aspiration toxicity

Not classified based on available information.

Further information

Product:

Remarks: No data available

SECTION 12: Ecological information

Ecotoxicity

No data available

Persistence and degradability

No data available

Bioaccumulative potential

No data available

Mobility in soil

No data available

Other adverse effects

Product:

Additional ecological information : No data available

SECTION 13: Disposal information

Disposal methods

Waste from residues : Do not dispose of waste into sewer.
Do not contaminate ponds, waterways or ditches with chemical or used container.
Dispose of in accordance with local regulations.

Contaminated packaging : Empty containers should be taken to an approved waste handling site for recycling or disposal.

SECTION 14: Transport information

International Regulations

UNRTDG
Not regulated as a dangerous good

IATA-DGR
Not regulated as a dangerous good

IMDG-Code
Not regulated as a dangerous good

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable for product as supplied.

SECTION 15: Regulatory information

Safety, health, and environmental regulations specific for the hazardous chemical

Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013.
Occupational Safety and Health (Use and Standards of Exposure of Chemicals Hazardous to Health) Regulations 2000.

Substances currently restricted by WEEE/RoHS (European Directives 2015/863/EU, 2012/19/EU and 2011/65/EU) or ELV (European Directive 2000/53/EC):

PBDE	PBB	CrVI	Hg	Pb	Cd
-	-	-	-	-	-

	DEHP	BBP	DBP	DIBP
Phthalates:	-	-	-	-

Please note: Current legislation restricting the use of certain substances applies to „homogeneous material" in finished articles being supplied to the market. Substances deposited during surface finishing may have a composition (weight percent) higher than the weight percent of the substance in the operating solution from which the deposit is made. Atotech encourages its customers to implement systems to ensure their finished products comply with the regulations in force.

SECTION 16: Other information

Full text of other abbreviations

(Q)SAR - (Quantitative) Structure Activity Relationship; ANTT - National Agency for Transport by Land of Brazil; ASTM - American Society for the Testing of Materials; bw - Body weight; CPR - Controlled Products Regulations; DIN - Standard of the German Institute for Standardisation; ECx - Concentration associated with x% response; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ErCx - Concentration associated with x% growth rate response; ERG - Emergency Response Guide; GHS - Globally Harmonized System; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organization; ISO - International Organisation for Standardization; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; n.o.s. - Not Otherwise Specified; Nch - Chilean Norm; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NOM - Official Mexican Norm; NTP - National Toxicology Program; OECD - Organization for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; SADT - Self-Accelerating Decomposition Temperature; SDS - Safety Data Sheet; TDG - Transportation of Dangerous Goods; UN - United Nations; UNRTDG - United Nations Recommendations on the Transport of Dangerous Goods; vPvB - Very Persistent and Very Bioaccumulative; WHMIS - Workplace Hazardous Materials Information System; CMR - Carcinogen, Mutagen or Reproductive Toxicant; GLP - Good Laboratory Practice

Date format : dd.mm.yyyy

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is

not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

MY / EN

UNICLEAN 547

Application:

UniClean 547 is a liquid pickling cleaner concentrate, which is added to hydrochloric acid and/or sulphuric acid, for cleaning and descaling of iron and steel articles. Strongly corroded parts are cleaned and stripped from millscale in a short time. UniClean 547 has a strong cleaning power, and exhibits outstanding low foaming properties, not only in subsequent rinses, but also during waste treatment.

Description:

The system of surface-active agents makes very short pickling times possible without any attack of base-metal. Long pickling times have no harmful influence on the treated material.

Pretreatment:

Parts which are strongly soiled by oil or grease, should be degreased first in alkaline cleaner. For this purpose we recommend Uniclean 155,156,157.
Other parts can directly be cleaned in UniClean 547.

Use:

Pickling time depends on the degree of corrosion and amount of oxyde to be removed, and varies from 2 - 30 minutes. After pickling, the articles should be intensively rinsed in current water. A subsequent electrolytic (anodic) cleaning is recommended.

Installation:

Tank : lined with hard rubber or acid-resistant plastic, provided with adequate heating (preferably PTFE heat exchangers).

Concentration: (depending on the amount of soil, and operating cycle):

a). Hydrochloric acid (s.g. 1.16) 1:1	3 % UniClean 547	:operating temperature max. 40°C
b). Sulphuric acid (66°Be, density 1,84) 15% by vol.	3 % UniClean 547	:operating temperature max. 60°C
c). Mixture of acids consisting of: 15 % by vol. Sulphuric acid and 10 % by vol. Hydrochloric acid	3 % Uniclean 547	:operating temperature max. 60° C.

Control procedure:

Chemicals needed: Caustic soda solution 1 N
Indicator methylorange

-.Pipette 5 ml pickling cleaner solution,
-.Add 100 ml water and indicator methylorange,
-.Titrate with caustic soda solution 1 N from red to yellow.

In case of sufficient acid content of the solution, 25 ml or more NaOH 1 N are used. If the titration needs less than 25 ml NaOH 1 N, there should be added 2 liter concentrated hydrochloric acid (s.g. 1.16) per 100 liter bath, for each failing ml NaOH 1 N.

Analysis of pickling cleaning solution containing 15 % by vol. Sulphuric acid:

Int the titration takes less than 27 ml Na OH 1 N, there should be added for each failing ml NaOH; 0.55 liter concentrated H_2SO_4 per 100 liter bath.

UNICLEAN 157

Version 2.0
SDS_SG SDS Number: 1472968 Revision Date: 29.07.2019

1. PRODUCT AND COMPANY IDENTIFICATION

Product name : UNICLEAN 157

Product code : 1472968

Manufacturer or supplier's details

Company : Atotech Deutschland GmbH

Address : Erasmusstrasse 20
Berlin 10553
Germany

Telephone : +4930349850

Company : Atotech (Singapore) Chemicals Pte Ltd

Address : 8 Buroh St, Unit #03-01
Singapore 627563
Singapore

Telephone : +6568622618

Prepared by
Product Safety Department (PSD): product-safety@atotech.com

Inquiries
E-mail address for a competent person responsible for the safety data sheet: product-safety@atotech.com

Emergency telephone number : Emergency Contact# +6531581074

Recommended use of the chemical and restrictions on use

Recommended use : Plating agents and metal surface treating agents
Surface treatment

Restrictions on use : For industrial use only.

2. HAZARDS IDENTIFICATION

GHS Classification

Corrosive to metals : Category 1

Skin corrosion/irritation : Category 1

Serious eye damage/eye irritation : Category 1

Specific target organ toxicity - single exposure	:	Category 3 (Respiratory system)

GHS label elements

Hazard pictograms	:	
Signal word	:	Danger
Hazard statements	:	H290 May be corrosive to metals. H314 Causes severe skin burns and eye damage. H335 May cause respiratory irritation.
Precautionary statements	:	**Prevention:** P234 Keep only in original container. P260 Do not breathe dust or mist. P264 Wash skin thoroughly after handling. P271 Use only outdoors or in a well-ventilated area. P280 Wear protective gloves/ protective clothing/ eye protection/ face protection. **Response:** P301 + P330 + P331 IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. P303 + P361 + P353 IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. P304 + P340 + P310 IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/doctor. P305 + P351 + P338 + P310 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/doctor. P363 Wash contaminated clothing before reuse. P390 Absorb spillage to prevent material damage. **Storage:** P403 + P233 Store in a well-ventilated place. Keep container tightly closed. P405 Store locked up. P406 Store in corrosive resistant container with a resistant inner liner. **Disposal:** P501 Dispose of contents/ container to an approved waste disposal plant.

Other hazards which do not result in classification

None known.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Mixture

Chemical nature : Solid

Hazardous ingredients

Chemical name	CAS-No.	Concentration (% w/w)
Sodium carbonate	497-19-8	>= 10 -< 25
Sodium hydroxide	1310-73-2	>= 10 -< 25
sodium metasilicate pentahydrate	10213-79-3	>= 10 -< 20
Sodium metasilicate	6834-92-0	>= 10 -< 20
Benzenesulfonic acid, C10-13-alkyl derivatives sodium salt	68411-30-3	>= 3 -< 5
Alcohols, C9-11-iso-, C10-rich, ethoxylated	78330-20-8	>= 1 -< 2.5
Polyoxyethylene trimethyldecyl alcohol	69011-36-5	>= 1 -< 2.5

The remaining 100% of the recipe consists of non-hazardous and/or confidential components.

4. FIRST AID MEASURES

General advice : Call a physician or poison control center immediately.
Show this safety data sheet to the doctor in attendance.

If inhaled : Call a physician or poison control center immediately.
Move to fresh air.

In case of skin contact : Wash off immediately with plenty of water for at least 15 minutes.
Take off all contaminated clothing immediately.
Consult a physician.

In case of eye contact : Consult a physician.
In case of contact, immediately flush eyes with plenty of water for at least 60 minutes.

If swallowed : Never give anything by mouth to an unconscious person.
Call a physician or poison control center immediately.
Do not induce vomiting without medical advice.

Most important symptoms and effects, both acute and delayed : Redness
Blindness
Necrosis
Shortness of breath
Causes serious eye damage.
May cause respiratory irritation.
Causes severe burns.

Protection of first aid : First Aid responders should pay attention to self-protection

responders		and use the recommended protective clothing
Notes to physician	:	For specialist advice physicians should contact the Poisons Information Service.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media	:	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Unsuitable extinguishing media	:	No information available.
Hazardous combustion products	:	Carbon oxides Oxides of phosphorus Silicon oxides Sulfur oxides
Specific extinguishing methods	:	Use a water spray to cool fully closed containers. Collect contaminated fire extinguishing water separately. This must not be discharged into drains. Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations.
Special protective equipment for fire-fighters	:	In the event of fire, wear self-contained breathing apparatus.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	Use personal protective equipment. Avoid breathing dust. Avoid contact with skin, eyes and clothing. Evacuate personnel to safe areas. Prevent unauthorized access.
Environmental precautions	:	Prevent product from entering drains. Prevent further leakage or spillage if safe to do so. If the product contaminates rivers and lakes or drains inform respective authorities.
Methods and materials for containment and cleaning up	:	Avoid dust formation. Use approved industrial vacuum cleaner for removal. Shovel or sweep up. Keep in suitable, closed containers for disposal. Clean contaminated surface thoroughly. Dispose of in accordance with local regulations.

7. HANDLING AND STORAGE

Advice on protection against fire and explosion	:	Provide appropriate exhaust ventilation at places where dust is formed.

Advice on safe handling : Avoid formation of respirable particles.
Do not breathe vapors/dust.
For personal protection see section 8.
Smoking, eating and drinking should be prohibited in the application area.
Provide sufficient air exchange and/or exhaust in work rooms.
Dispose of rinse water in accordance with local and national regulations.
Handle in accordance with good industrial hygiene and safety practice.
Avoid breathing dust.

Conditions for safe storage : Keep container tightly closed in a dry and well-ventilated place.
May be corrosive to metals.

Materials to avoid : Do not store near acids.

Recommended storage temperature : -5 - 40 °C

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Ingredients with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
Sodium hydroxide	1310-73-2	PEL (short term)	2 mg/m3	SG OEL
		C	2 mg/m3	ACGIH

Engineering measures : Ensure adequate ventilation, especially in confined areas.

Personal protective equipment

Respiratory protection : In case of insufficient ventilation, wear suitable respiratory equipment.
When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.

No personal respiratory protective equipment normally required.

Hand protection
Material : Nitrile rubber
Break through time : 480 min
Glove thickness : 0.4 mm
Manufacturer : e.g. KCL
Recommendation : e.g. KCL Camatril®Velours 730

Remarks	:	The selected protective gloves have to satisfy the specifications of Regulation (EU) 2016/425 and the standard EN 374 derived from it. The information is based on our own tests, on data from literature and information from protective glove producers or is based on data obtained from similar substances. 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. Be aware that in daily use the durability of a chemical resistant protective glove can be notably shorter than the break through time measured according to EN 374, due to the numerous outside influences (e.g. temperature). Gloves should be discarded and replaced if there is any indication of degradation or chemical breakthrough.
Eye protection	:	Tightly fitting safety goggles Face-shield Ensure that eyewash stations and safety showers are close to the workstation location.
Skin and body protection	:	Choose body protection according to the amount and concentration of the dangerous substance at the work place.
Hygiene measures	:	Avoid contact with skin, eyes and clothing. Avoid breathing dust. When using do not eat or drink.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	solid
Color	:	light gray, beige, light brown
Odor	:	No information available.
Odor Threshold	:	No data available
pH	:	> 11.5 (20 °C) Concentration: 5 % (as aqueous solution)
Melting point/range	:	not determined
Boiling point/boiling range	:	not determined
Flash point	:	Not applicable
Evaporation rate	:	Not applicable
Flammability (solid, gas)	:	Not classified as a flammability hazard

Upper explosion limit	:	No data available
Lower explosion limit	:	No data available
Vapor pressure	:	not determined
Relative vapor density	:	Not applicable
Density	:	not determined
Solubility(ies)		
Water solubility	:	soluble
Partition coefficient: n-octanol/water	:	No data available
Autoignition temperature	:	No data available
Decomposition temperature	:	No data available
Viscosity		
Viscosity, dynamic	:	No data available
Viscosity, kinematic	:	No data available
Oxidizing properties	:	Not applicable

10. STABILITY AND REACTIVITY

Reactivity	:	May be corrosive to metals.
Chemical stability	:	Stable under recommended storage conditions.
Possibility of hazardous reactions	:	Gives off hydrogen by reaction with metals. Risk of violent reaction Potential for exothermic hazard
Conditions to avoid	:	Avoid dust formation. To avoid thermal decomposition, do not overheat. Exposure to moisture
Incompatible materials	:	Acids Metals
Hazardous decomposition products	:	No hazardous decomposition products are known.

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure	:	Inhalation Eye contact Skin Absorption

Acute toxicity

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

Product:

Acute oral toxicity : Acute toxicity estimate: > 2,000 mg/kg
Method: Calculation method

Components:

Benzenesulfonic acid, C10-13-alkyl derivatives sodium salt:

Acute oral toxicity : Acute toxicity estimate (Rat): 500 mg/kg

Alcohols, C9-11-iso-, C10-rich, ethoxylated:

Acute oral toxicity : Acute toxicity estimate: 500 mg/kg

Polyoxyethylene trimethyldecyl alcohol:

Acute oral toxicity : Acute toxicity estimate: 500 mg/kg

Skin corrosion/irritation

Causes severe burns.

Product:

Remarks: Extremely corrosive and destructive to tissue.
May cause irreversible skin damage such as necrosis, ulcers or burns.

Serious eye damage/eye irritation

Causes serious eye damage.

Product:

Remarks: May cause irreversible eye damage such as corneal damage and blindness.

Respiratory or skin sensitization

Skin sensitisation

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

Respiratory sensitisation

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

Germ cell mutagenicity

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

Carcinogenicity

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

Reproductive toxicity

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

STOT - single exposure

May cause respiratory irritation.

STOT - repeated exposure

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

Aspiration toxicity

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

Further information

Product:

Remarks: No data available

12. ECOLOGICAL INFORMATION

Ecotoxicity

Components:

Sodium carbonate:

Toxicity to fish	:	LC50 (Lepomis macrochirus (Bluegill sunfish)): 300 mg/l Exposure time: 96 h
Toxicity to daphnia and other aquatic invertebrates	:	EC50 (Daphnia magna (Water flea)): 265 mg/l Exposure time: 48 h

Alcohols, C9-11-iso-, C10-rich, ethoxylated:

Toxicity to fish	:	LC50: > 10 - 100 mg/l Exposure time: 96 h

Persistence and degradability

Components:

Alcohols, C9-11-iso-, C10-rich, ethoxylated:

Biodegradability	:	Result: Readily biodegradable.

Bioaccumulative potential

No data available

Mobility in soil

No data available

Other adverse effects

Product:

Additional ecological information	:	No data available

13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues	:	Do not dispose of waste into sewer. Do not contaminate ponds, waterways or ditches with chemical or used container. Dispose of in accordance with local regulations.
Contaminated packaging	:	Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. TRANSPORT INFORMATION

International Regulations

UNRTDG

UN number	:	UN 3262
Proper shipping name	:	CORROSIVE SOLID, BASIC, INORGANIC, N.O.S.
Technical name(s)		(Sodium hydroxide, disodium trioxosilicate)
Class	:	8
Packing group	:	II
Labels	:	8

IATA-DGR

UN/ID No.	:	UN 3262
Proper shipping name	:	Corrosive solid, basic, inorganic, n.o.s.
Technical name(s)		(Sodium hydroxide, disodium trioxosilicate)
Class	:	8
Packing group	:	II
Labels	:	Corrosive
Packing instruction (cargo aircraft)	:	863
Packing instruction (passenger aircraft)	:	859

IMDG-Code

UN number	:	UN 3262
Proper shipping name	:	CORROSIVE SOLID, BASIC, INORGANIC, N.O.S.
Technical name(s)		(Sodium hydroxide, disodium trioxosilicate)
Class	:	8
Packing group	:	II
Labels	:	8
EmS Code	:	F-A, S-B
Marine pollutant	:	no

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable for product as supplied.

15. REGULATORY INFORMATION

Safety, health and environmental regulations/legislation specific for the substance or mixture

Workplace Safety and Health Act and Workplace Safety and Health (General Provisions) Regulations: This product is subjected to the SDS, labelling, PEL and other requirements in the Act/Regulations.

Environmental Protection and Management Act and Environmental Protection and Management (Hazardous Substances) Regulations	:	Sodium hydroxide
Fire Safety (Petroleum and Flammable Materials) Regulations	:	Not applicable

Substances currently restricted by WEEE/RoHS (European Directives 2015/863/EU, 2012/19/EU and 2011/65/EU) or ELV (European Directive 2000/53/EC):

	PBDE	PBB	CrVI	Hg	Pb	Cd
	-	-	-	-	-	-

	DEHP	BBP	DBP	DIBP
Phthalates:	-	-	-	-

Please note: Current legislation according to WEEE/RoHS or ELV restricting the use of certain substances applies to "homogeneous material" in finished articles being supplied to the market. Substances deposited during surface finishing may have a composition (weight percent) higher than the weight percent of the substance in the operating solution from which the deposit is made. Atotech encourages its customers to implement systems to ensure their finished products comply with the regulations in force.

16. OTHER INFORMATION

Full text of other abbreviations

(Q)SAR - (Quantitative) Structure Activity Relationship; ANTT - National Agency for Transport by Land of Brazil; ASTM - American Society for the Testing of Materials; bw - Body weight; CPR - Controlled Products Regulations; DIN - Standard of the German Institute for Standardisation; ECx - Concentration associated with x% response; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ErCx - Concentration associated with x% growth rate response; ERG - Emergency Response Guide; GHS - Globally Harmonized System; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organization; ISO - International Organisation for Standardization; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; n.o.s. - Not Otherwise Specified; Nch - Chilean Norm; NO(A)EC - No Observed (Adverse) Effect

Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NOM - Official Mexican Norm; NTP - National Toxicology Program; OECD - Organization for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; SADT - Self-Accelerating Decomposition Temperature; SDS - Safety Data Sheet; TDG - Transportation of Dangerous Goods; UN - United Nations; UNRTDG - United Nations Recommendations on the Transport of Dangerous Goods; vPvB - Very Persistent and Very Bioaccumulative; WHMIS - Workplace Hazardous Materials Information System; CMR - Carcinogen, Mutagen or Reproductive Toxicant; GLP - Good Laboratory Practice

Date format	:	dd.mm.yyyy
ACGIH	:	USA. ACGIH Threshold Limit Values (TLV)
SG OEL	:	Singapore. Workplace Safety and Health Act - First Schedule Permissible Exposure Limits of Toxic Substances
ACGIH / C	:	Ceiling limit
SG OEL / PEL (short term)	:	Permissible Exposure Level (PEL) Short Term

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

SG / EN

LEMBARAN DATA KESELAMATAN

menurut Peraturan (EC) No. 1907/2006

MSDS Umum Uni Eropa - Tidak ada data untuk negara tertentu - Tidak ada OEL Data

BAGIAN 1: Identitas Bahan dan Perusahaan

1.1 Pengidentifikasi produk

Nama produk	:	Barium karbonat untuk analisis EMSURE® ACS,Reag. Ph Eur
Nomor Produk	:	1.01714
No katalog	:	101714
Merek	:	Millipore
No-Indeks	:	056-003-00-2
Nomor REACH	:	Nomor registrasi tidak tersedia untuk bahan ini karena bahan atau penggunaan dibebaskan dari pendaftaran, tonase tahunan tidak memerlukan pendaftaran atau pendaftaran dipertimbangkan untuk batas waktu pendaftaran akan datang.
No-CAS	:	513-77-9

1.2 Penggunaan yang relevan dari bahan atau campuran yang diidentifikasi dan penggunaan yang disarankan terhadap

Penggunaan yang teridentifikasi	:	Reagen untuk analisis

1.3 Rincian penyuplai lembar data keselamatan

Perusahaan	:	Merck KGaA Frankfurter Str. 250 D-64271 DARMSTADT
Telepon	:	+49 (0)6151 72-0
Fax	:	+49 6151 727780
Alamat email	:	TechnicalService@merckgroup.com

1.4 Nomor telepon darurat

Nomer Telepon Darurat #	:	001-803-017-9114 (CHEMTREC)

BAGIAN 2: Identifikasi bahaya

2.1 Klasifikasi bahan atau campuran

Klasifikasi menurut Peraturan (EC) No 1272/2008
Toksisitas akut, Oral (Kategori 4), H302

Teks pernyataan-H penuh yang disebutkan dalam Bagian ini, baca Bagian 16.

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2.2 Elemen label

Pelabelan menurut Peraturan (EC) No 1272/2008

Piktogram



Kata sinyal	Awas
Pernyataan Hazard (s)	
H302	Berbahaya jika tertelan.
Pernyataan pencegahan)	
P264	Cuci kulit dengan seksama setelah menangani.
P270	Jangan makan, minum atau merokok pada saat menggunakan produk ini.
P301 + P312	JIKA TERTELAN: Hubungi SENTRA INFORMASI KERACUNAN atau dokter/ tenaga medis jika kamu merasa tidak sehat.
P501	Buang isi/ wadah ke tempat pembuangan limbah yang disetujui.
Pernyataan Bahaya Tambahan	tidak ada

Pelabelan dikurangi (<= 125 ml)

Piktogram



Kata sinyal	Awas
Pernyataan Hazard (s)	tidak ada
Pernyataan pencegahan)	tidak ada
Pernyataan Bahaya Tambahan	tidak ada

2.3 bahaya lainnya

Zat/campuran ini tidak mengandung satu komponen pun yang dianggap baik persisten, bioakumulatif, dan beracun (PBT) maupun sangat persisten dan sangat bioakumulatif (vPvB) pada kadar 0,1% atau lebih.

BAGIAN 3: Komposisi Bahan

3.1 Bahan

Rumus	:	$BaCO_3$
Berat Molekul	:	197,35 g/mol
No-CAS	:	513-77-9
No-EC	:	208-167-3
No-Indeks	:	056-003-00-2

Komponen		Klasifikasi	Konsentrasi
Barium carbonate			
No-CAS No-EC No-Indeks	513-77-9 208-167-3 056-003-00-2	Acute Tox. 4; H302	<= 100 %

Teks pernyataan-H penuh yang disebutkan dalam Bagian ini, baca Bagian 16.

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BAGIAN 4: Tindakan pertolongan pertama pada kecelakaan (P3K)

4.1 Penjelasan mengenai tindakan pertolongan pertama

Saran umum
Tunjukkan lembar data keselamatan ini kepada dokter yang merawat.

Jika terhirup
Setelah menghirup: hirup udara segar.

Jika kontak dengan kulit
Bila terjadi kontak kulit: Tanggalkan segera semua pakaian yang terkontaminasi. Bilaslah kulit dengan air/ pancuran air.

Jika kontak dengan mata
Setelah kontak pada mata : bilaslah dengan air yang banyak. Lepaskan lensa kontak.

Jika tertelan
Setelah tertelan: segera beri korban minum air putih (dua gelas paling banyak). Periksakan ke dokter.

4.2 Kumpulan gejala / efek terpenting, baik akut maupun tertunda
Gejala dikenal dan efek yang paling penting dijelaskan dalam label (lihat bagian 2.2) dan / atau di bagian 11

4.3 Indikasi pertolongan medis pertama dan perawatan khusus yang diperlukan
Data tidak tersedia

BAGIAN 5: Tindakan Penanggulangan Kebakaran

5.1 Media pemadaman api

Media pemadaman yang sesuai
Gunakan tindakan pemadaman kebakaran yang sesuai untuk situasi lokal dan lingkungan sekeliling.

Media pemadaman yang tidak sesuai
Untuk bahan/campuran ini, tidak ada batasan agen pemadaman yang diberika n.

5.2 Bahaya khusus yang muncul dari bahan atau campuran
Karbon oksida
barium oksida
Tidak mudah terbakar.
Api ambient dapat melepaskan uap yang berbahaya.

5.3 Saran bagi petugas pemadam kebakaran
Jika terjadi kebakaran, pakai alat bantu pernapasan SCBA.

5.4 Informasi lebih lanjut
Cegah air pemadam kebakaran mengkontaminasi air permukaan atau sistim air tanah.

BAGIAN 6: Tindakan terhadap tumpahan dan kebocoran

6.1 Langkah-langkah pencegahan diri, alat pelindung dan prosedur tanggap darurat
Nasihat untuk personel nondarurat Hindari penghisapan debu. Hindari kontak dengan bahan. Pastikan ventilasi memadai. Evakuasi dari daerah bahaya, amati prosedur darurat, hubungi ahli.
Untuk perlindungan pribadi lihat seksi 8.

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6.2 Langkah-langkah pencegahan bagi lingkungan

Jangan biarkan produk masuk ke saluran pembuangan.

6.3 Metode dan bahan untuk penangkalan (containment) dan pembersihan

Tutup saliran. Kumpulkan, ikat dan pompa keluar tumpahan. Amati kemungkinan pembatasan bahan (lihat bagian 7 dan 10). Ambil dalam keadaan kering. Teruskan ke pembuangan. Bersihkan area yang terkena. Hindari pembentukan debu.

6.4 Rujukan ke bagian lainnya

Untuk pembuangan lihat bagian 13.

BAGIAN 7: Penyimpanan dan Penanganan Bahan

7.1 Kehati-hatian dalam menangani secara aman

Untuk tindakan pencegahan lihat bagian 2.2.

7.2 Kondisi penyimpanan yang aman, termasuk adanya inkompatibilitas

Kondisi penyimpanan
Tertutup sangat rapat. Kering.

Suhu penyimpanan yang direkomendasikan, lihat label produk.

Kelas penyimpanan
Kelas penyimpanan Jerman (TRGS 510): 13: Zat-zat Padat yang tidak mudah terbakar

7.3 Penggunaan akhir khusus

Selain penggunaan yang disebutkan dalam bagian 1.2, tidak ada penggunaan spesifik lain yang diantisipasi

BAGIAN 8: Kontrol paparan/ perlindungan diri

8.1 Parameter pengendalian

Komponen dengan parameter pengendalian di tempat kerja

8.2 Pengendalian paparan

Alat perlindungan diri

Perlindungan mata/wajah
Gunakan peralatan untuk perlindungan mata yang sudah diuji dan disetujui di bawah standar pemerintah yang tepat seperti NIOSH (US) atau EN 166 (EU).
Kacamata pengaman

Perlindungan kulit
Rekomendasi ini berlaku hanya untuk produk yang disebutkan dalam lembar data keselamatan dan disuplai oleh kami sesuai tujuan yang kami maksud. Ketika dilarutkan dalam atau dicampur dengan bahan lain dan dalam kondisi yang menyimpang dari yang disebutkan dalam EN374 silahkan hubungi suplier sarung tangan CE-resmi (misalnya KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Kontak penuh
Materi: Karet nitril
ketebalan lapisan minimal: 0,11 mm
Waktu terobosan: 480 min
Bahan yang diuji:KCL 741 Dermatril® L

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Rekomendasi ini berlaku hanya untuk produk yang disebutkan dalam lembar data keselamatan dan disuplai oleh kami sesuai tujuan yang kami maksud. Ketika dilarutkan dalam atau dicampur dengan bahan lain dan dalam kondisi yang menyimpang dari yang disebutkan dalam EN374 silahkan hubungi suplier sarung tangan CE-resmi (misalnya KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
percikan
Materi: Karet nitril
ketebalan lapisan minimal: 0,11 mm
Waktu terobosan: 480 min
Bahan yang diuji:KCL 741 Dermatril® L

Perlindungan Badan
sarungtangan pelindung

Perlindungan pernapasan
diperlukan ketika debu dihasilkan.
Rekomendasi kami tentang filter perlindungan pernapasan didasarkan atas standar berikut: DIN EN 143, DIN 14387, dan standar lainnya yang menyertai terkait dengan sistem perlindungan pernapasan yang digunakan.
Jenis filter yang direkomendasikan: Filter tipe P2

Pengusaha harus memastikan bahwa perawatan, pembersihan, dan pengujian perangkat perlindungan pernafasan telah dilakukan sesuai dengan petunjuk dari pabriknya. Tindakan ini harus didokumentasikan dengan benar.

Kontrol pemaparan lingkungan
Jangan biarkan produk masuk ke saluran pembuangan.

BAGIAN 9: Sifat-sifat Fisika dan Kimia

9.1 Informasi tentang sifat fisik dan kimia

a)	Tampilan	Bentuk: padat Warna: putih
b)	Bau	Tak berbau
c)	Ambang Bau	Tidak berlaku
d)	pH	6,8 pada 3,67 g/l pada 37 °C
e)	Titik lebur/titik beku	Titik lebur/rentang: 811 °C
f)	Titik didih awal/rentang didih	Data tidak tersedia
g)	Titik nyala	Data tidak tersedia
h)	Laju penguapan	Data tidak tersedia
i)	Flamabilitas (padatan, gas)	Produk ini tidak mudah-menyala.
j)	Batas bawah/atas flamabilitas atau ledakan	Data tidak tersedia
k)	Tekanan uap	Data tidak tersedia
l)	Densitas uap	Data tidak tersedia
m)	Densitas	Data tidak tersedia

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	Kerapatan (den-sitas) relatif	Data tidak tersedia
n)	Kelarutan dalam air	0,014 g/l - agak larut
o)	Koefisien partisi (n-oktanol/air)	Tidak berlaku untuk zat anorganik
p)	Suhu dapat membakar sendiri (auto-ignition temperature)	Data tidak tersedia
q)	Suhu penguraian	Data tidak tersedia
r)	Kekentalan (viskositas)	Viskositas, kinematis: Data tidak tersedia Viskositas, dinamis: Data tidak tersedia
s)	Sifat peledak	Data tidak tersedia
t)	Sifat oksidator	Data tidak tersedia

9.2 informasi keselamatan lainnya

Densitas curah	kira-kira350 kg/m3

BAGIAN 10: Reaktifitas dan Stabilitas

10.1 Reaktifitas
Data tidak tersedia

10.2 Stabilitas kimia
Produk ini stabil secara kimiawi di bawah kondisi ruangan standar (suhu kamar).

10.3 Reaksi berbahaya yang mungkin di bawah kondisi spesifik/khusus
Reaksi yang hebat dapat terjadi dengan :
Asam kuat

10.4 Kondisi yang harus dihindari
tidak ada informasi yang tersedia

10.5 Bahan yang harus dihindari
Oksidator kuat

10.6 Produk berbahaya hasil penguraian
Dalam kebakaran lihat bagian 5

BAGIAN 11: Informasi Toksikologi

11.1 Informasi tentang efek toksikologis

Toksisitas akut
LD50 Oral - Tikus - pria dan wanita - 1.690 mg/kg
(Pedoman Tes OECD 401)
Penghirupan: Data tidak tersedia
Kulit: Data tidak tersedia

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Korosi/iritasi kulit
Kulit - Penelitian dalam tabung percobaan
Hasil: Tidak menyebabkan iritasi kulit - 15 min
Komentar: (ECHA)

Kerusakan mata serius/iritasi mata
Mata - Kelinci
Hasil: Tidak menyebabkan iritasi mata - 1 h
(Pedoman Tes OECD 405)

Sensitisasi saluran pernafasan atau pada kulit
Uji kelenjar getah bening lokal (LLNA) - Mencit
Hasil: Bukan sensitizer kulit.
(Pedoman Tes OECD 429)

Mutagenisitas pada sel nutfah
Data tidak tersedia

Karsinogenisitas
Data tidak tersedia

Toksisitas terhadap Reproduksi
Data tidak tersedia

Toksisitas pada organ sasaran spesifik - paparan tunggal
Data tidak tersedia

Toksisitas pada organ sasaran spesifik - paparan berulang
Data tidak tersedia

Bahaya aspirasi
Data tidak tersedia

11.2 Tambahan Informasi

Sifat mengganggu endokrin

Produk:

Evaluasi	Zat/campuran tersebut tidak mengandugn komponen-komponen yang disinyalir memiliki kandungan pengganggu endokrin menurut artikel REACH 57(f) atau peraturan Comission Delegated (EU) 2017/2100 atau peraturan Commission Regulation (EU) 2018/605 pada level 0.1% atau lebih tinggi.

Muntah, Diare, Untuk yang terbaik dari pengetahuan kita, kimia, fisik, dan sifat toksikologi belum diselidiki secara menyeluruh.

BAGIAN 12: Informasi Ekologi

12.1 Toksisitas

Keracunan untuk ikan	Tes statik LC50 - Danio rerio (Ikan zebra) - > 97,5 mg/l - 96 h (Pedoman Tes OECD 203)

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Komentar: (merujuk pada kation)

Keracunan untuk ganggang	Tes statik ErC50 - Pseudokirchneriella subcapitata - > 100 mg/l - 72 h (Pedoman Tes 201 OECD)
	Tes statik NOEC - Pseudokirchneriella subcapitata - >= 100 mg/l - 72 h (Pedoman Tes 201 OECD)
Keracunan untuk bakteria	

12.2 Persistensi dan penguraian oleh lingkungan
Metode untuk menentukan tingkat-penguraian hayati tidak berlaku untuk bahan anorganik.

12.3 Potensi bioakumulasi
Data tidak tersedia

12.4 Mobilitas dalam tanah
Data tidak tersedia

12.5 Hasil dari asesmen PBT dan vPvB
Zat/campuran ini tidak mengandung satu komponen pun yang dianggap baik persisten, bioakumulatif, dan beracun (PBT) maupun sangat persisten dan sangat bioakumulatif (vPvB) pada kadar 0,1% atau lebih.

12.6 Sifat mengganggu endokrin
Produk:

Evaluasi	:	Zat/campuran tersebut tidak mengandugn komponen-komponen yang disinyalir memiliki kandungan pengganggu endokrin menurut artikel REACH 57(f) atau peraturan Comission Delegated (EU) 2017/2100 atau peraturan Commission Regulation (EU) 2018/605 pada level 0.1% atau lebih tinggi.

12.7 Efek merugikan lainnya
Data tidak tersedia

BAGIAN 13: Pembuangan limbah

13.1 Metode penanganan limbah

Produk
Lihat www.retrologistik.com untuk mengetahui proses pengembalian bahan k imia dan wadah, atau hubungi kami di sana jika Anda memiliki pertanyaan lebih lanjut.

BAGIAN 14: Informasi pengangkutan

14.1 Nomor PBB
ADR/RID: - IMDG: - IATA: -

14.2 Nama pengapalan yang sesuai berdasarkan PBB
ADR/RID: Bukan barang berbahaya

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IMDG: Bukan barang berbahaya
IATA: Bukan barang berbahaya

14.3 Kelas bahaya transportasi
ADR/RID: - IMDG: - IATA: -

14.4 Kelompok pengemasan
ADR/RID: - IMDG: - IATA: -

14.5 Bahaya lingkungan
ADR/RID: Tidak IMDG Bahan pencemar laut: Tidak IATA: Tidak

14.6 Tindakan kehati-hatian khusus bagi pengguna

Informasi lebih lanjut
Tidak diklasifikasikan sebagai berbahaya menurut peraturan pengangkutan.

BAGIAN 15: Peraturan Perundang - undangan

15.1 Regulasi tentang lingkungan, kesehatan dan keamanan untuk produk tersebut
Lembar data keselamatan ini taat pada persyaratan Peraturan (UE) No. 1907/2006.

Peraturan-peraturan lain
Patuhi semua larangan kerja mengenai perlindungan ibu hamil sesuai denga n jika berlaku.

Perhatikan peraturan Dir 94/33/EC mengenai perlindungan kaum muda dalam pekerjaan.

15.2 Asesmen Keselamatan Kimia
Untuk produk ini penilaian keamanan bahan kimia tidak dilakukan

BAGIAN 16: Informasi lain

Teks Pernyataan-H penuh mengacu pada bagian 2 dan 3.

H302 Berbahaya jika tertelan.

Informasi lebih lanjut
Informasi di atas diyakini benar namun tidak diakui termasuk semua dan akan digunakan sebagai panduan saja. Informasi dalam dokumen ini didasarkan pada status pengetahuan kami yang ada dan berlaku pada produk terkait dengan tindakan pencegahan untuk keselamatan yang sesuai. Ini tidak mewakili setiap jaminan properti produk. Sigma-Aldrich Corporation dan Afiliasinya tidak akan bertanggung jawab atas semua kerusakan yang disebabkan oleh penanganan atau kontak dengan produk di atas. Lihat www.sigma-aldrich.com dan/atau sisi belakang faktur atau slip pengemasan untuk syarat dan ketentuan penjualan tambahan._x000D_
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Merek di header dan/atau footer dokumen ini untuk sementara tidak sesuai secara visual dengan produk yang dibeli karena kami sedang berada dalam transisi merek kami. Namun, semua informasi di dokumen terkait produk tetap tidak berubah dan sesuai dengan produk yang dipesan. Untuk informasi lebih lanjut, mohon hubungi mlsbranding@sial.com.

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ETiMADEN
İŞLETMELERİ GENEL MÜDÜRLÜĞÜ

BORIC ACID
SAFETY DATA SHEET

Date of Issue : March 2007

Revision No : 5

Date of Revision : January 2016

ETI MADEN ISLETMELERI GENEL MUDURLUGU

Ayvalı Mah. Halil Sezai Erkut Cad. Afra Sok. No. 1/A, 06010, Keçiören, Ankara, TURKEY

SECTION 1. Identification

1.1. GHS Product Identifier

Boric Acid

1.2. Other means of identification

Chemical name/synonyms: Boric acid, Orthoboric acid, boracic acid

1.3. Recommended use of the chemical and restrictions on use

The product is used in industrial manufacturing, in particular in:

- Ceramics
- Cosmetics
- Detergent
- Borosilicate glass
- Textile fibreglass

There is no restriction on use of chemical.

1.4. Supplier's details

Name : ETI MADEN ISLETMELERI GENEL MUDURLUGU

Addres : Ayvalı Mah., Halil Sezai Erkut Cad., Afra sok. No:1/A 06010 Keçiören Ankara, TURKEY

Phone No : +90 312 294 23 42

Fax No : +90 312 232 59 10

1.5. Emergency phone number: +90 312 294 23 42 (Monday-Friday, 08:00 a.m – 17:30 p.m)

SECTION 2. Hazard Identification

2.1. Classification of the substance

Reproductive toxicant, Category 2

H 361d : Suspected of damaging the unborn child

Acute Oral 5

H303: May be harmful if swallowed.

2.2. GHS Label elements, including precautionary statements



H361d: Suspected of damaging the unborn child

H303: May be harmful if swallowed

Warning

P201: Obtain special instructions before use.

P202: Do not handle until all safety precautions have been read and understood.

P280: Wear protective gloves/protective clothing/eye protection/face protection.

P308 + P313: If exposed or concerned: get medical advice/attention.

P312: Call a POISON CENTER/doctor/physician if you feel unwell.

P405: Store locked up.

2.3. Other hazards which do not result in classification

Boric acid is a white odourless, powdered substance that is not flammable, combustible, or explosive, and has low acute oral and dermal toxicity.

Potential health effects

Inhalation is the most significant route of exposure in occupational and other settings. Dermal exposure is not usually a concern because boric acid is poorly absorbed through intact skin.

Inhalation

Occasional mild irritation effects to nose and throat may occur from inhalation of boric acid dusts at levels greater than 10 mg/m^3.

Eye contact

Boric acid is non-irritating to eyes in normal industrial use.

Skin contact

Boric acid does not cause irritation to intact skin.

Ingestion

Products containing Boric Acid are not intended for ingestion. Boric Acid has a low acute toxicity. Small amounts (e.g., a teaspoon) swallowed accidentally are not likely to cause effects; swallowing amounts larger than that may cause gastrointestinal symptoms.

Potentional ecological effects

Large amounts of Boric Acid can be harmful to plants and other species. Therefore, releases to the environment should be minimized.

Signs and symptoms of exposure

Symptoms of accidental over-exposure to Boric Acid have been associated with ingestion or absorption through large areas of damaged skin. These may include nausea, vomiting and diarrhoea, with delayed effects of skin redness and peeling.

Refer to section 11 for details on Toxicological data.

SECTION 3. Composition / Information on Ingredients

3.1. Substances

The product contains greater than 99.9 percent (%) boric acid (H_3BO_3).

Chemical Name	EC No/CAS No	Purity,%
Boric Acid (Orthoboric acid, boracic acid)	233-139-2 10043-35-3	min. 99.9

For other "Chemical inventory listing", please refer to section 15.

SECTION 4. First aid measures

4.1. Description of first aid mesaures

Skin contact

No treatment necessary because boric acid has low dermal toxicity.

Eye contact

No treatment necessary because non-irritant.

Inhalation

If symptoms such as nose or throat irritation are observed, remove person to fresh air. Boric acid has low inhalation toxicity.

Ingestion

If large amounts are swallowed (i.e. more than one teaspoon), contact a doctor or toxicity centre immediately.

Note to physicians

Observation only is required for adult ingestion of less than 4 grams of boron oxide. For ingestion in excess of 4 grams, maintain adequate kidney function and force fluids. Gastric lavage is recommended for symptomatic patients only. Hemodialysis should be reserved for massive acute ingestion or patients with renal failure. Boron analyses of urine or blood are only useful for documenting exposure and should not be used to evaluate severity of poisoning or to guide treatment[1] (see section 11).

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

N.A.

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

N.A.

SECTION 5. Fire-fighting measures

5.1. Suitable Extinguishing media

Any fire extinguishing media may be used on nearby fires.

5.2. Specific hazards arising from the chemical

Boric acid is not flammable, combustible or explosive. The product is itself a flame retardant.

5.3. Special protective actions for fire-fighters

N.A.

SECTION 6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Avoid dust formation. In case of exposure to prolonged or high level of airborne dust, wear a personal respirator in compliance with national legislation.

6.2. Environmental precautions

Boric acid is a water-soluble white powder that may, at high concentrations cause damage to trees or vegetation by root absorption (see section 12).

6.3. Methods and materials for containment and cleaning up

Land spill

Vacuum, shovel or sweep up boric acid and place in containers for disposal in accordance with applicable local regulations. Avoid contamination of water bodies during clean up and disposal. No personal protective equipment is needed to clean up land spills.

Spillage into water

Where possible, remove any intact containers from the water. Advise local water authority that none of the affected water should be used for irrigation or for the abstraction of potable water until natural dilution returns the boron value to its normal environmental background level (see sections 12, 13 and 15).

SECTION 7. Handling and Storage

7.1. Precautions for safe Handling

To maintain package integrity and to minimise caking of the product, bags should be handled on a first-in first-out basis. Good housekeeping and dust prevention procedures should be followed to minimise dust generation and accumulation. Your supplier can advise you on safe handling, please contact the supplier.

7.2. Conditions for safe storage, including any incompatibilities

Dry, indoor storage is recommended since the product is highly hygroscopic.

SECTION 8. Exposure controls / Personal protection

8.1. Control parameters

Occupational exposure limits for dust (total and respirable). are treated by OSHA, Cal OSHA and ACGIH as "Particulate Not Otherwise Classifed" or "Nuisance Dust"

ACGIH/TLV	10 mg/m^3
Cal OSHA/PEL	10 mg/m^3
OSHA/PEL (total dust)	15 mg/m^3
OSHA/PEL (respirable dust)	5 mg/m^3

8.2. Appropriate engineering controls

Maintain air concentrations below occupational exposure standards.

Use local exhaust ventilation to keep airborne concentrations of boric acid dust below permissible exposure levels. Wash hands before breaks and at the end of the workday. Remove and wash soiled clothing.

8.3. Individual protection measures, such as personal protective equipment

Respiratory protection

In case of prolonged exposure to dust wear a personal respirator in compliance with national legislation (make reference to the appropriate CEN standart)

Where airborne concentrations are expected to exceed exposure limits, respirators should be used.

Eyes and hands protection

Goggles and gloves are not required for normal industrial exposures, but may be warranted if environment is excessively dusty.

SECTION 9. Physical and chemical properties

9.1. Information on basic physical and chemical properties

Appearance	white solid, granular/powder
Odour	odourless
Odour threshold	N.A.
pH @ 20°C	6.1 (0.1 % solution) 5.1 (1.0% solution) 3.7 (4.7 % solution)
Melting point	450°C
Boiling point	1860°C
Flash point	Non flammable
Evaporation rate	N.A.
Flammability	N.A.
Upper/lower flammability or explosive limits	Non explosive
Vapour pressure	Negligible @ 20°C
Relative density	1.49 gr/cm^3@ 23°C
Solubility in water	4.7% @ 20°C; 27.5% @ 100°C
Partition coefficient: n-octanol/water	N.A
Auto-İgnition temperature	N.A.
Decomposition temperature	169±1 toHBO_2 & -1 ½ H_2O at 300 °C
Viscosity	N.A.

9.2. Other information

Molecular weight	61.83
Specific gravity	1.51 @ 20°C

SECTION 10. Stability and reactivity

10.1. Reactivity

N.A.

10.2. Chemical stability

Boric acid is a stable product, but when heated it loses water, first forming metaboric acid (HBO_2), and on further heating it is converted into boron oxide (B_2O_3).

10.3. Possibility of hazardous reactions

Reaction with strong reducing agents such as metal hydrides or alkali metals will generate hydrogen gas which could create an explosive hazard.

10.4. Conditions to avoid:

N.A.

10.5. Incompatible materials

Boric acid reacts as a weak acid which may cause corrosion of base metals. Avoid contact with strong reducing agents such as metal hydrides or alkali

10.6. Hazardous decomposition products

N.A.

SECTION 11. Toxicological information

11.1. Information on toxicological effect

11.1.1. Substances

Acute toxicity[(2)]

Low acute oral toxicity; LD50 in rats > 2600 mg/kg of body weight (Test material: Boron Oxide) (Denton SM, 1996).

Skin corrosion/irritation

Low acute dermal toxicity; LD_{50} in rabbits is greater than 2,000 mg/kg of body weight. Boric acid is poorly absorbed through intact skin[(2)]. Non-irritant.

Serious eye damage/irritation

Non-irritant. Boric acid is not a skin sensitizer.

Respiratory or skin sensitization

Boric acid is not a skin sensitizer.

Germcell mutagenicity

Boric acid is not mutagenic.

Carcinogenicity

Boric acid is not carcinegenic

Reproductive/Developmental toxicity

Animal feeding studies in rat, mouse and dog, at high doses, have demonstrated effects on fertility and testes[2]. Studies with the chemically related boric acid in rat, mouse and rabbit, at high doses, demonstrate developmental effects on the foetus including foetal weight loss and minor skeletal variations. The doses administered were many times in excess of those which humans would normally be exposed to [3,4,5]. Human epidemiological studies show no increase in pulmonary disease in occupational populations with chronic exposures to sodium borate dust. A recent epidemiology study under the conditions of normal occupational exposure to borate dusts indicated no effect on fertility [6,7,8].

STOT-single exposure

N.A.

STOT-repeated exposure

N.A.

Aspiration Hazard

Boric acid has no aspiration hazard.

SECTION 12. Ecological information

12.1. Toxicity

Boron occurs naturally in sea water at an average concentration of 5 mg B/l and fresh water at 1 mg B/l or less. In dilute aqueous solutions the predominant boron species present is undissociated boric acid. To convert boric acid into equivalent boron (B) content, multiply by 0.1748.

Phytotoxicity

Boron is an essential micronutrient for healthy growth of plants, however, it can be harmful to boron sensitive plants in higher quantities. Care should be taken to minimise the amount of borate product released to the environment.

Algal toxicity[9]

Green algae, *Pseudokirchneriella subcapitata* (Hansveit and Oldersma, 2000)

72-hr EC_{50} –biomass = 40 mg B/L, or 229 mg boric acid/L

Invertebrate toxicity[10]

Daphnia, Daphnids, *Daphnia magna* (Gersich, 1984a)

48-hr LC_{50} = 133 mg B/L or 760 mg boric acid/L

Fish toxicity[11]

Fish, Fathered minnow, *Pimephales promelas* (Soucek et al., 2010)

96-hr LC_{50} = 79.7 mg B/L or 456 mg boric acid/L

12.2. Persistence and degradability

Boron is naturally occurring and ubiquitous in the environment. Boric acid decomposes in the environment to natural borate.

12.3. Bioaccumulative potential

Not significantly bioaccumulative.

12.4. Mobility in soil

The product is soluble in water and is leachable through normal soil.

12.5. Other adverse effects

No Data Available.

SECTION 13. Disposal considerations

13.1. Disposal methods

Small quantities of boric acid can usually be disposed of at landfill sites. No special disposal treatment is required, but local authorities should be consulted about any specific local requirements. Tonnage quantities of product are not recommended to be sent to landfills. Such product should, if possible, be used for an appropriate application.

SECTION 14. Transport information

Boric acid has no UN Number, and is not regulated under international rail, road, water or air transport regulations.

14.1. UN number : N.A.

14.2. UN proper shipping name : N.A

14.3. Transport of hazard classes : N.A

14.4. Packing group : N.A

14.5. Environmental hazards : N.A.

14.6. Special precautions for user : N.A

14.7. Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code: N.A.

SECTION 15. Regulatory information

15.1. Safety, health and environmental regulations

It should be noted that borates are safe under conditions of normal handling and use, besides, they are essential nutrients to plants, and research shows that they play a beneficial role in human health. CLP classification has been solely based on animal tests where animals were exposed to high doses of boric acid over long periods of time. These doses were many times higher than humans are exposed to under conditions of normal handling and use. Consequently, a precautionary decision was taken by the European Commission. Although we will comply with the body of legislation triggered by that decision, we are in process of all possible legal actions.

Clean Air Act (Montreal Protocol)

Boric acid was not manufactured with and does not contain any Class I or Class II ozone depleting substances.

Chemical inventory listing

U.S. EPA TSCA Inventory	10043-35-3
Canadian DSL	10043-35-3
EINECS	233-139-2
South Korea	1-439
Japanese MITI	(1)-63

Ensure all national/local regulations are observed.

SECTION 16. Other information

16.1. Mainly changes made to the previous version of this Material Safety Data Sheet (MSDS):

- This MSDS complies with ISO 11014; the requirements of UN-GHS

Revision No	Revision content
05	• This SDS is updated in accordance with the GHS (Rev.6) (2015)-Guidance on the Compilation of Safety data Sheets. • This SDS is updated in line with Eti Maden Corporate identity.

16.2. List of abbreviation and acronyms used in this MSDS

Eti Maden : Eti Maden İşletmeleri Genel Müdürlüğü

SDS : Safety Data Sheets

Index N° : Atomic number of the element most characteristic of the properties of the substance

CAS No : Chemical Abstracts Service number

EC No : EINECS Number : European Inventory of Existing Commercial Substances

Repr. Cat. 2 : Substance presumed human reproductive toxicant

Acute Oral Cat. 5 : Substance which is of relatively low acute oral toxicity.

GHS : Globally Harmonised System of Classification and Labelling

LD_{50} : Median Lethal Dose

LC_{50} : Lethal Concentration, 50%

N.A. : Not Applicable

OSHA : Occupational Safety & Health Administration

Cal OSHA : The State of California Division of Occupational Safety and Health (DOSH)

PEL : Permissible Exposure Limits

ACGIH : American Conference of Governmental Industrial Hygienists

TLV : Threshold Limit Value

Japanese MITI : Japanese Ministry of International Trade and Industry

EC_{50} : Half maximal effective concentration

UN : United Nations

U.S. EPA TSCA Inventory: Inventory of the chemical substances manufactured or processed in the United States according to Toxic Substances Control Act compiled and published under the autority of the Environmental Protection Agency

Canadian DSL: Canadian Domestic Substances List

16.3. List of relevant hazard statements and precautionary statements used in this MSDS

Hazard Statement
H361 d: Suspected of damaging the unborn child **H303**: May be harmful if swallowed
Precautionary Statements
Prevention **P201:** Obtain special instructions before use. **P202:** Do not handle until all safety precautions have been read and understood. **P280:** Wear protective gloves/protective clothing/eye protection/face protection. **Response** **P308 + P313:** If exposed or concerned: get medical advice/attention. **P312:** Call a POISON CENTER/doctor/physician if you feel unwell **Storage** **P405:** Store locked up. **Disposal:** **P501:** Dispose of contents/container to in accordance with local regulations.

16.4. References

1. Litovitz T L, Norman S A, Veltri J C, Annual Report of the American Association of Poison Control Centers Data Collection System. Am. J. Emerg. Med. (1986), 4, 427-458

2. Denton SM (1996). Acute oral toxicity study in the rat: anhydrous boric acid. Final report. Report no.: 1341/7-1032.

3. National Toxicology Program (NTP) – Technical Report Series No. TR324, NIH Publication No. 88-2580 (1987), PB88 213475/XAB

4. Fail *et al*., Fund. Appl. Toxicol. (1991) 17, 225-239

5. Heindel *et al*., Fund. Appl. Toxicol. (1992) 18, 266-277

6. Birge W J, Black J A, EPA-560/-76-008 (April 1977) PB 267 085

7. Scialli AR, Bonde JP, Brüske-Hohlfeld I, Culver D, Li Y, Sullivan FM; ELSEVIER 2009

8. Robbins WA, Xun L, Jia J, Kennedy N, Elashoff DA, Ping L. ;ELSEVIER 2009;(Reproductive Toxicology)

9. Hansveit and Oldersma, 2000; TNO Nutrition and Food Research Institute. Report No. V99.157.

10. Gersich, FM (1984a). Environ.Toxicol.Chem., 3 #1, 89-94 (1984)

11. Soucek et al., 2010. Illinois Natural History Survey, University of Illinois.

For general information on the toxicology of borates see ECETOC Technical Report No. 63 (1995); Patty's Industrial Hygiene and Toxicology, 4th Edition Vol. II, (1994) Chap. 42, 'Boron'.

16.5. Disclaimer of Liability

The information in this MSDS was obtained from sources which we believe are reliable. However, the information is provided without any warranty, express or implied, regarding its accuracy, reliability or completeness. The conditions or methods of handling, storage use or disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of the product. It is the user's responsibility to satisfy himself as to the suitableness and completeness of such information for his own particular use.

This MSDS was prepared and is to be used only for this product. If the product is used as a component in another product, this MSDS information may not be applicable.

MATERIAL SAFETY DATA SHEET

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	Nickel dichloride
Chemical formula	$NiCl_2 \cdot 6H_2O$
Manufacturer	**SUMITOMO METAL MINING CO., LTD.** NON-FERROUS METALS DIV./ADMINISTRATION DEPT. 3-5-3, NISHIBARA-CHO, NIIHAMA, EHIME, 792-8555 JAPAN TEL +81- 897-37-4817 FAX +81- 897-37-4910
Product use	This material is used for Nickel-plating.

2. HAZARDS IDENTIFICATION

GHS classification

Physical hazards:	
Explosives	Outside scope of the classification
Flammable gases	Outside scope of the classification
Flammable aerosols	Outside scope of the classification
Oxidizing gases	Outside scope of the classification
Gases under pressure	Outside scope of the classification
Flammable liquids	Outside scope of the classification
Flammable solids	Not classified
Self-reactive substances and mixtures	Outside scope of the classification
Pyrophoric liquids	Outside scope of the classification
Pyrophoric solids	Not classified
Self-heating substances and mixtures	Not classified
Substances and mixtures which, in contact with water, emit flammable gases	Not classified
Oxidizing liquids	Outside scope of the classification
Oxidizing solids	Classification not possible
Organic peroxides	Outside scope of the classification
Corrosive to metals	Classification not possible
Health hazards:	
Acute toxicity – oral	Category 3
Acute toxicity – dermal	Classification not possible
Acute toxicity – inhalation (gases)	Outside scope of the classification
Acute toxicity – inhalation (vapors)	Classification not possible
Acute toxicity – inhalation (dust, mist)	Classification not possible
Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Classification not possible
Respiratory sensitization	Category 1
Skin sensitization	Category 1
Germ cell mutagenicity	Category 2
Carcinogenicity	Category 1A
Reproductive toxicity	Category 2
Specific target organ toxicity (single exposure)	Category 1(central nervous system)

Specific target organ toxicity (repeated exposure)	Category1 (kidney, respiratory organ, testis)
Aspiration hazard	Classification not possible
Environmental hazards:	
Hazardous to the aquatic environment - acute toxicity	Category 1
Hazardous to the aquatic environment - chronic toxicity	Classification not possible

HAZARDS EXCLUDED FROM THE GHS CLASSIFICATION CATEGORIES

HEALTH HAZARDS

- The dust may severely irritate the eyes, respiratory tract or skin. May cause damage to the membrane of respiratory system. If inhaled, cough.
- If contact with solid or melting solid or solution, may cause strong irritation and sore to eyes and skin.
- On combustion to decompose, form hazardous and corrosive chlorine gas.
- Carcinogenic to nasal cavity, paranasal sinus and lung.
- If swallowed large amount, cause gastroenteritis.

PICTOGRAM



SIGNAL WORD DANGER

HAZARD STATEMENT

- Toxic if swallowed.
- Skin irritation.
- May cause allergy or asthma symptoms or breathing difficulties if inhaled.
- May cause an allergic skin reaction.
- Suspected of causing genetic defects.
- May cause cancer.
- Suspected of damaging fertility or the unborn child.
- Causes damage to organs <central nervous system>
- Causes damage to organs <kidney, respiratory organ, testis> through prolonged or repeated exposure.
- Very toxic to aquatic life.

PRECAUTIONARY STATEMENTS

〔Prevention〕

- Do not handle until all safety precautions have been read and understood.
- Wear personal protector or use ventilator to avoid exposure.
- In case of inadequate ventilation, wear respiratory protection.
- Avoid breathing the dust or fume.
- Do not eat, drink, or smoke during work.
- Wash hands thoroughly after handling.
- Avoid release to the environment.

〔Response〕
- If inhaled: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If experiencing respiratory symptoms, get medical attention.
- Get medical attention if you feel unwell.
- If on skin : Wash with plenty of water and soap.
- If skin irritation or rash occurs, seek medical attention.
- If exposed or concerned ; Get medical attention.

〔Storage〕
- Store in a cool, well-ventilated place.
- Keep container tightly closed and store in a cool, well-ventilated place.

〔Disposal〕
- Please consult us about the possibility of recycling.
- Disposal should be in accordance with applicable regional, national and local laws and regulations.

3. COMPOSITION / INFORMATION ON INGREDIENTS

COMPONENT	CAS No.	TSCA	EINECS	%w/w
Nickel dichloride	7791-20-0	Listed	231-743-0	$NiCl_2 \cdot 6H_2O$:97.2< Ni:24.0<

4. FIRST AID MEASURES

Eye contact	Immediately rinse cautiously with plenty of water for several minutes. Get medical attention.
Skin contact	Wash with plenty of water and soap. Get medical attention if you feel unwell. Wash contaminated clothing before reuse.
Inhalation	Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately get medical attention. Get medical attention.
Ingestion	Rinse mouth. Get medical attention.

5. FIRE FIGHTING MEASURES

Flammable properties	
Flash point	No data available.
Extinguishing media	
Suitable extinguishing media	This substance is nonflammable. Use adequate extinguishing agents for surrounding fire.
Unsuitable extinguishing media	Use adequate extinguishing agents for surrounding fire.

Protection of firefighters	Wear adequate respiratory protection and chemical-resistant clothing. (heat resistance)
Specific hazards arising from the chemical	On combustion to decompose, form hazardous and corrosive chlorine gas.
Protective equipment and precautions for firefighters	Move container to safe area, if possible with low risk.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions	Immediately isolate the spilled area with adequate distance for all directions. Wear adequate protector refer to Section 8 and avoid contact with eyes and skin or inhaling. Keep unnecessary and unprotected personnel from entering.
Environmental precautions	Do not let this substance enter the environment. Avoid entering the river or affecting to the environment.
Method for clean-up	Sweep diffused spillage and place in an empty container. Residual substances are collected completely with care and moved to a safe place. Sweep up spillage and place in a sealable empty container for later disposal. Solved in water and add the Calcium hydroxide or Sodium carbonate solution, then filter the precipitates and dike the residues. Prevent the spillage release to the river.

7. HANDLING AND STORAGE

Handling	Wear protective equipment and set the engineering controls refer to Section 8. Local exhaust or general ventilation may be necessary. (Refer to Section 8) Wear protective gloves when handling. Use only outdoors or in a well-ventilated area. Avoid breathing the dust or fume. Wash hands thoroughly after handling.. Avoid to contact: Water, hot surface. Refer to Section 10.
Storage	In case of powder; provide adequate engineering control for treating hazardous material as lighting or ventilation. Keep away from acids and store in a cool, well-ventilated place. Keep container tightly closed and store in a cool, well-ventilated place.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure guidelines	ACGIH has established the following exposure limit. <ACGIH> 0.1mg/m3 (TWA)(as Ni, Soluble inorganic compounds (NOS))(2007) <JSOH> Not established （2007）. <OSHA> 1mg/m3 (PEL-TWA) （as Ni)
Engineering controls	Store in a cool, well-ventilated place. Keep container tightly closed to avoid contact with water. In case of dust; Provide local exhaust.
Personal protective equipments	
Respiratory protection	Wear respiratory protection.
Skin protection	Wear protective gloves.
Eye / face protection	Wear eye protection. (e.g. A pair of goggles) Wear protective clothing or face protection if necessary.
General hygiene considerations	Do not eat, drink, or smoke during work. Wash hands thoroughly after handling.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Crystal, deliquescence
Color	Green
Odor	Odorless
Melting point	No data available.
Boiling point	No data available.
Flash point	No data available.
Explosive range	No data available.
Vapor pressure	No data available.
Vapor density	No data available.
Specific gravity	1.92
Solubility in water	67.8g/100g(26℃)
Solubility in other solvents	Soluble in alcohol.
Partition Coefficient: n-octanol/water	No data available.
Auto-ignition point	No data available.
Decomposition temperature	No data available.
Odor threshold	No data available.
Evaporation rate	No data available.
Flammability (solid, gas)	No data available.
Viscosity	No data available.

10. STABILITY AND REACTIVITY

Chemical stability	Stable under normal condition.
Conditions to avoid	No information available.

Incompatible materials	No information available.
Hazardous decomposition products	On combustion to decompose, form hazardous and corrosive chlorine gas.
Possibility of hazardous reactions	No information available.

11. TOXICOLOGICAL INFORMATION

Acute toxicity – oral	LD_{50} 175～529 mg/kg (rat)
Acute toxicity – dermal	No data available
Acute toxicity–inhalation	No data available
Skin corrosion/irritation	Irritant to human skin
Serious eye damage/eye irritation	No data available
Respiratory sensitization	Respiratory sensitizer. As nickel compounds including this substance are listed as respiratory sensitization substances by DFG and listed as Group 2 by the Japan Society of Occupational Health.
Skin sensitization	Skin sensitizer. As nickel compounds including this substance are listed as skin sensitization substances by DFG and listed as Group 1 by the Japan Society of Occupational Health.
Germ cell mutagenicity	Dominant lethal test; Negative. Somatic cell in vivo mutagenicity study of Cytogenetic Test ; Positive.
Carcinogenicity	As nickel compound : IARC : Group 1 (Carcinogenic to humans)(1990) ACGIH : A1(Confirmed Human Carcinogen)(2001) NTP : K(Known to be a Human Carcinogen)(2005)
Reproductive toxicity	Effects on parent fertility and development of pups are observed in animal studies.

Specific target organ toxicity (single exposure)	Acute symptoms, such as nausea, an abdominal spasm, diarrhea, vomiting, headache, giddiness, a sense of exhaustion or muscular pain were observed. In addition, as acute intoxication of a nickel compound, nausea, diarrhea, giddiness, and headache were seen in human.
Specific target organ toxicity (repeated exposure)	Repeated exposure of nickel or nickel compounds may damage the membrane of respiratory system at the established level. Prolonged exposure at high concentration may cause pulmonary fibrosis.
Aspiration hazard	No data available

12. ECOLOGICAL INFORMATION

Hazardous to the aquatic environment - acute toxicity	LC_{50} (48h) 0.013mg/L (Ceriodaphnia quadrangula)
Hazardous to the aquatic environment - chronic toxicity	No data available This substance is metal. No data is available about the behavior in the water.

13. DISPOSAL CONSIDERATIONS

- Please consult us about the possibility of recycling.
- Disposal should be in accordance with applicable regional, national and local laws and regulations.
- When order to dispose the remainder to the private or public waste disposer, inform the physico-chemical and health hazards of this substance.
- Container should be cleaned up prior to recycling or dispose in accordance with applicable regional, national and local standard method.
- Empty container should be cleaned up prior to disposal.

14. TRANSPORT INFORMATION (not meant to be all-inclusive)

Proper Shipping Name	TOXIC SOLID INORGANIC.N.O.S.
UN Number	3288
Class	6.1
Sub Risk	None
Packing Group	Ⅲ

15. REGULATORY INFORMATION (not meant to be all-inclusive)

TSCA Inventory Listed

This product is followed by the competent regulations in an applicable country or region.

16. OTHER INFORMATION

Reference

1 USNLM ; Hazardous Substance Data Bank.(HSDB) (2006)
2 European Center of Ecotoxicology and Toxicology of Chemicals(ECETOC) ; Technical Report No. 33 (1989)
3 WHO/IPCS : Environmental Health Criteria (EHC) No.108 (1991)
4 JSOH ; Recommendation of Occupational Exposure Limits. J. Occup. Health. (2006) <Japanese>
5 IARC ; IARC Monographs on the Evaluation of Carcinogenic Risk to Humans. Vol. 49 (1990)
6 USDHHS ; The Agency for Toxic Substances and Disease Registry (ATSDR) Toxicological Profiles. (2005)
7 US NTP ; NTP Database Search (2005)
8 European Center of Ecotoxicology and Toxicology of Chemicals(ECETOC) ; Technical Report No. 91 (2003)
9 "Biodegradation and Bioaccumulation Data of Existing Chemicals based on the CSCL Japan." ed by Chemicals Inspection & Testing Institute Japan (1992)
10 GHS Classification of Nickel (Chemical Management Center, National Institute of Technology and Evaluation ; http://www.safe.nite.go.jp/english/dbi.html , 2007)
11 15170 Chemical commodities. The Chemical Daily Co. Ltd. <Japanese>
12 化学物質の危険・有害性便覧 中央災害防止協会 1993
13 "2004 Emergency Response Guidebook. 2nd revised ed." Japanese ed. Japa Chemical Industries Association (2005)

This information only concerns the above-mentioned product and does not need to be valid if used with other(s) or in any process. The information is to our best present knowledge correct and complete and is given in good faith but without warranty. It remains the user's own responsibility to make sure that the information is appropriate and complete for his special use of this product.

(This is the last page of this MSDS.)

Iwatani Group
PT. Iwatani Industrial Gas Indonesia

PT. IWATANI INDUSTRIAL GAS INDONESIA

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LEMBAR DATA KESELAMATAN

1 Identifikasi Senyawa (Tunggal Atau Campuran)

- Identifikasi / nama produk berdasarkan GHS	:	Gas Carbon Dioxide
- Indentifikasi lainnya	:	Carbon Dioxide Gas, Gas CO2, CO2
- Penggunaan yang dianjurkan dan pembatasan penggunaan	:	Untuk Industri Umum
- Data rinci pengenai pemasok	:	PT. Petro Kimia Gersik Jl. Jenderal Ahmad Yani – Gersik 61119
- Nomor telepon darurat	:	Tlp. 031-3981811, 031-3982100

2 Indikasi Bahaya

- Klasifikasi bahaya produk	:	Gas Dibawah Tekanan – Cairan Gas Yang Didinginkan
- Elemen Label	:	-
- Kata sinyal	:	Berbahaya
- Pernyataan bahaya	:	H280 – Berisi gas dalam tekanan, dapat meledak apabila dipanaskan H281 - Berisi gas yang di dinginkan, dapat menyebabkan luka bakar dingin atau cedera
- Pernyataan kehati-hatian	:	P202 - Jangan menangani produk sampai semua tindakan pencegahan keselamatan telah di baca dan dipahami P262 – Hindari kontak langsung dengan mata, kulit dan pakaian P271 - Gunakan hanya diluar ruangan atau di area yang berventilasi baik
- Piktogram	:	
- Bahaya lain diluar yang berperan dalam klasifikasi	:	Dapat menyebabkan sesak nafas dalam konsentrasi tinggi Cairan dingin dapat menyebabkan luka bakar atau frostbite

3 Komposisi / Informasi Tentang Bahaya Penyusunan Senyawa Tunggal

- Nama kimia : Carbon Dioxide (CO2)
- Nama umum : Gas Carbon Dioxide; LCO2;
- Nomor CAS (Chemical Abstract Service) : 124-38-9
- Zat pengotor dan bahan tambahan : -
- Campuran : -
- Identifikasi konsentrasi bahan baku : 100% Carbon Dioxide

4 Tindakan Pertolongan Pada Kecelakaan

- Uraian langkah pertolongan pertama yang diperlukan
  - Penghirupan : Dalam konsentrasi tinggi dapat menyebabkan sesak napas. Gejala yang dapat terjadi seperti kehilangan mobilitas / kesadaran. Pindahkan korban ke daerah yang tidak terkontaminasi dengan mengenakan SCBA. Kendurkan pakaian ketat seperti kancing leher, dasi, ikat pinggang. Istirahatkan korban dan jaga agar tetap hangat. Panggilkan dokter. Terapkan pernapasan buatan jika pernapasan berhenti.
  - Terkena Kulit : Apabila kontak dengan kulit dapat menyebabkan radang dingin (frostbite). Untuk paparan dalam bentuk cairan, uap dingin atau dry ice. Cuci kulit yang terkena paparan dengan air hangat untuk mencairkan jaringan kulit yang tekana frostbite, pastikan suhu air harus harus dapat ditoleransi oleh kulit normal sehingga tidak menyebabkan luka bakar menjadi lebih parah. Apabila terkena pakaian, lepaskan pakaian yang terkena paparan. Dapatkan bantuan medis jika diperlukan. Jangan menggosok area yang terkena efek paparan.
  - Terkena Mata : Segera siram dengan air yang mengalir, Gerakan kelopak mata keatas dan kebawah. Periksa dan lepaskan lensa kontak. Terus bilas setidaknya 10 menit. Dapatkan bantuan medis jika terjadi iritasi pada mata.
  - Tertelan : Pindahkan korban ke udara segar dan baringkan dengan posisi yang nyaman untuk bernafas. dapatkan bantuan medis jika efek kesehatannya menurun. Apabila Tertelan dapat dapat menyebabkan luka bakar yang mirip dengan radang dingin pada jalur pencernaan. Jangan pernah memberi apapun melalui mulut korban

			apabila tidak sadarkan diri. Jika pingsan, pindahkan ke ruangan pemulihan dan mendapatkan bantuan medis. Agar aliran pernafasan berlangsung lancar, Kendurkan pakaian ketat seperti kerah, dasi, ikat pinggang.
	- Gejala akut maupun tertunda	:	-
	- Indikasi yang memerlukan bantuan medis dan tindakan khusus jika diperlukan	:	-

5 Tindakan Pemadam Kebakaran

	- Media pemadam yang sesuai	:	Gunakan bahan atau tipe pemadam yang cocok untuk area kebakaran sekitar
	- Bahaya Spesifikasi yang diakibatkan bahan kimia tersebut	:	-
	- Proses pemadaman kebakaran yang spesifik/khusus	:	-
	- Alat pelindung diri khusus dan pernyataan kehati-hatiam bagi petugas pemadam kebakaran	:	Gunakan pakaian pelindung dan SCBA bagi petugas pemadam kebakaran. Jika memungkinkan, hentikan aliran produk. Koordinasikan untuk mengukur seberapa besar api. Jauhkan wadah dan dinginkan dengan air dari posisi yang terlindungi. Jika bocor jangan menyemprotkan air langsung pada tempat kebocoran. Jaga container / wadah di sekitar agar tetap dingin dengan cara disemprotkan air

6 Tindakan Penanggulangan Jika Terjadi Tumpahan Dan Kebocoran

	- Langkah-langkah pencegahan diri , alat pelindung dan prosedur tanggap darurat	:	Usahakan hentikan kebocoran. Mengevakuasi area tumpahan / kebocoran. Gunakan pakaian pelindung. Pakai alat bantu pernapasan SCBA ketika memasuki area tumpahan / kebocoran kecuali dapat dipastikan aman. Pastikan ventilasi udara yang memadai
	- Langkah-langkah pencegahan bagi lingkungan	:	Usahakan hentikan kebocoran. Cegah tumpahan atau kebocoran masuk ke selokan, ruang bawah tanah atau tempat di mana apabila terakumulasi dapat mengakibatkan bahaya
	- Metode dan bahan penangkalan (Contaiment) dan pembersihan	:	-

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7 Penanganan dan Penyimpanan

- Langkah-langkah pencegahan untuk penanganan yang aman : Hindari menghirup gas CO2, Kenakan APD yang dianjurkan untuk menangani gas Cryogenic dan di bawah tekanan. Jangan sampai terkena mata atau kulit atau pakaian. Jauhkan kontainer dari sumber panas atau api. Lindungi bagian tubuh (kulit) menyentuh langsung pipa yang berisi atau terlewati cairan Cryogenic. Cegah agar cairan cryogenic terjebak dalam sistem tertutup atau pipa tanpa safety valve. Beberapa bahan mungkin menjadi rapuh pada suhu rendah dan akan mudah patah.
- Kehati-hatian dalam menangani secara aman : Hindari kebocoran di area tertutup atau yang berventilasi kurang karena dapat mengakibatkan kekurangan oksigen sehingga mengakibatkan gejala seperti lemas, sesak nafas, pingsan hingga kematian
- Kondisi untuk penyimpanan yang aman, termasuk inkompatibilitas : Simpanlah ditempat yang suhunya kurang dari 52^{O}C. Pasang safety sign yang sesuai dengan produk CO2. Amati semua peraturan dan persyaratan mengenai penyimpanan kontainer. Wadah harus disimpan dalam posisi vertikal dan benar-benar aman untuk mencegah dari kejatuhan. kontainer yang disimpan harus secara berkala diperiksa kondisi umumnya dan dilakukan pemeriksaan kebocoran. Jauhkan container dari api, panas dan Jauhkan dari bahan yang mudah terbakar

8 Kontrol Paparan / Perlindungan Diri

- Parameter pengendalian batas paparan :

ACGIH TLV (United States, 3/2015).
Oxygen Depletion [Asphyxiant].
STEL: 54000 mg/m³ 15 minutes.
STEL: 30000 ppm 15 minutes.
TWA: 9000 mg/m³ 8 hours.
TWA: 5000 ppm 8 hours.

NIOSH REL (United States, 10/2013).
STEL: 54000 mg/m³ 15 minutes.
STEL: 30000 ppm 15 minutes.
TWA: 9000 mg/m³ 10 hours.
TWA: 5000 ppm 10 hours.

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OSHA PEL (United States, 2/2013).
TWA: 9000 mg/m³ 8 hours.
TWA: 5000 ppm 8 hours.

OSHA PEL 1989 (United States, 3/1989).
STEL: 54000 mg/m³ 15 minutes.
STEL: 30000 ppm 15 minutes.
TWA: 18000 mg/m³ 8 hours.
TWA: 10000 ppm 8 hours

*TWA = Time-Weighted Average / Batas Paparan Jangka Pendek
*STEL = Short-Term Exposure Limits / Paparan rata-rata di tempat kerja setiap kontaminan yang berbahaya

- Pengendalian teknik yang sesuai : -
- Tindakan perlindungan diri
  - Perlindungan pernafasan : Gunakan Contained Self Breathing Apparatus (SCBA) atau Airline Respirator with mask pada saat kondisi oksigen berkurang di atmosfer
  - Perlindungan tangan : Gunakan sarung tangan kerja yang panjang dari kulit untuk melindungi permukaan tangan dari cairan dingin yang menyebabkan luka bakar dingin (frostbite)
  - Perlindungan mata : Gunakan kaca mata dengan pelindung pada bagian sisinya atau menggunakan, Gunakan Goggle atau gunakan face protector ketika melakukan pengisian ataupun pada saat menggunakan gas Carbon Dioxide
  - Perlindungan kulit dan tubuh : Gunakan baju lengan panjang, safety helmet & sepatu safety ketika menangani Gas Carbon Dioxide, jangan pernah sekali-kali membiarkan bagian tubuh manaput yang tidak terlindungi menyentuh pipa atau bejana yang tidak terisolasi yang berisikan cairan dingin cryogenic

9 Sifat Fisik dan Kimia

- Data empiric dari senyawa tunggal / Campuran : Liqud Carbon Dioxide (CO_2)
- Organoleptik (bentuk fisik, warna dll.) : Berwujid cairan dingin, tidak berwarna (bening)
- Bau : Tidak Berbau
- Ambang Bau : -

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- pH	:	3,7 (Carbonic Acid)
- Titik Lebur	:	-
- Titik didih / rentang didih	:	-78,5 °C
- Sifat mudah menyala	:	-
- Titik nyala	:	-
- Laju penguapan	:	-
- Flammabilitas	:	-
- Nilai batas flammabilitas rendah atau tinggi dan batas ledakan	:	-
- Tekanan uap	:	-
- Rapatan (Densitas Uap)	:	1.1 (Udara=1)
- Kerapatan (Densitas) relative	:	-
- Kelarutan		
• Kelarutan dalam air	:	Water : 2000 mg/l
• Kelarutan dalam pelarut air	:	-
- Koefisien partisi (n-Oktanol/Air)	:	-
- Suhu dapat membakar sendiri (Auto-Ignition Temperature)	:	-
- Suhu pengurai	:	-
- Kekentalan	:	-

10 Stabilitas dan Reaktifitas

- Reaktifitas	:	Tidak ada reaktifitas yang berbahaya
- Stabilitas Kimia	:	Stabil pada kondisi normal
- Reaksi berbahaya yang mungkin di bawah kondisi spesifik / khusus	:	-
- Kondisi yang harus dihindari	:	Hindari suhu tinggi
- Bahan yang harus dihindari	:	Logam Alkali, Acetylide
- Produk berbahaya hasil penguraian	:	Apabila bereaksi dapat mementuk logam baru seperti Chromium, Titanium Uraniun Magnesium

11 Informasi Toksikologi

- Uraian lengkap dan komprehensif tentang efek toksikologi / kesehatan

• Toksisitas Akut	:	-
• Korosi / Iritasi akut	:	-
• Kerusakan mata serius / iritasi	:	-
• Sensitisasi saluran pernafasan / pada kulit	:	-
• Mutagenitas pada sel nutfah	:	-
• Karsinogenitas	:	-
• Toksisitas terhadap reproduksi	:	-
• Toksisitas pada organ sasaran	:	-

spesifik setelah paparan tunggal
- Toksisitas pada organ sasaran spesifik setelah paparan berulang : -
- Bahaya aspirasi : -

- Informasi tentang rute paparan : -
- Kumpulan gejala yang berkaitan dengan sifat fisik, kimia dan toksikologi : Gas dapat menyebabkan luka bakar dingin (frostbite)
- Efek akut, tertunda dan kronik dari paparan jangka pendek dan jangka panjang : -
- Ukuran numeric tingkat toksisitas : -
- Efek interaktif :
- Jika data tambahan kimia secara spesifik tidak tersedia : -
- Campuran : -
- Informasi tentang campuran dan bahan baku penyusunnya : -
- Informasi lainnya : -

12 Informasi Ekologi

- Ekotoksisitas : -
- Persintesia dan penguraian oleh lingkungan : -
- Potensi bioakumulasi : -
- Mobilitas dalam tanah : -
- Efek merugikan lainnya : Dapat menyebabkan kerusakan akibat dingin pada tumbuhan

13 Pembungan Limbah

- Metode Pembuangan :
  - Dapat dilepaskan/dibuang ke atmosfer di tempat terbuka atau yang berventilasi baik
  - pembuangan ke atmosfer dalam jumlah besar harus dihindari.
  - Jangan membuang gas ke tempat dimana akumulasinya dapat menimbulkan bahaya.
  - Tabung harus di kembalikan ke supplier.
  - Hubungi pemasok jika diperlukan panduan.
  - Pengolahan dan pembuangan limbah tabung harus dilakukan sesuai dengan peraturan yang berlaku.

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14 Pertimbangan Pembuatan / Pemusnahan

- Nomor PBB	:	UN 1013
- Nama pengapalan yang sesuai bedasarkan PBB	:	Carbon Dioxide
- Kelas bahaya pengangkutan	:	2.2 – Class 2.2 Non-Flammable Compressed Gas 2.2 – Non-Flammable Gas
- Kelompok pengemasan jika tersedia	:	-
- Bahaya lingkungan	:	-
- Tindakan kehati-hatian khusus bagi pengguna	:	Pengiriman ke pelanggan: Selalu diangkut dalam kontainer-kontainer tertutup yang tegak dan aman. Pastikan sopir kendaraan menyadari potensi bahaya dari muatan dan tahu apa yang harus dilakukan jika terjadi kecelakaan atau keadaan darurat.

15 Informasi yang berkaitan dengan regulasi

- Regulasi tentang lingkungan, kesehatan dan keamanan untuk produk tersebut	:	▪ PERMENAKER No. 37 Tahun 2016 ▪ PERATURAN PEMERINTAH No. 74 Tahun 2001 ▪ PERMENPERIN No. 23 Tahun 2013

16 Informasi lainnya

- Tanggal pembuatan LDK	:	02 Desember 2016
- Tanggal revisi LDK	:	04 Oktober 2023
- Legenda atau singkatan dan akronim yang digunakan dalam LDK	:	
- Referensi atau sumber yang digunakan dalam penyusunan LDK	:	

1. Identification of the substance/mixture

1.1. Product identifier
Product name : Sulfuric Acid
Chemical family : Inorganic Acid

1.2. Relevant identified uses of the substance or mixture and advised against
Identified uses : Manufacture of fertilizers, manufacture of dyestuffs and pigments, manufacture of blowing Agent, manufacture of downstream of sulfate salts, bleaching earth, alkylation catalyst, electroplating baths, purification of petroleum.

2. Hazard Identification

2.1. Classification of the substance or mixture
Classification (REGULATION (EC) No 1272/2008)
Skin corrosion : category 1A, H314
Corrosive to metals, H290
For the full text of the H-Statements mentioned in this section, see section 16.

Classification (67/548/EEC or 1999/45/EC)
C; R35
For the full text of the R-phrases mentioned in this section, see section 16.

2.2. Label elements
Labelling (REGULATION (EC) No.1272/2008)

Hazard pictograms



Signal word
Danger

Hazard statements
H314 Causes severe skin burns and eye damage.
H290 May be corrosive to metals.

Precautionary statements
P280 Wear protective gloves/eye protection/face protection.
P301 + P330 + P331 IF SWALLOWED: rinse mouth. Do NOT induce vomiting
P309 IF exposed or if you feel unwell:
P310 Immediately call a POISON CENTER or doctor/physician.
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Labelling (67/548/EEC or 1999/45/EC)

Symbols(s)	C	Corrosive
R-phrase(s)	35	Causes severe burns
S-phrase(s)	26-30-45	In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Never add water to this product. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

2.3. Other hazards
None known.

3. Composition / information on ingredients

Formula : H_2SO_4 H_2O_4S (Hill)
CAS No. : 7664-93-9
EC No. : 231-639-5
Molar mass: 98.08 g/mol

Hazardous components (REGULATION (EC) No 1272/2008)

Chemical Name (concentration)

CAS No.	EC No.	Classification
Sulphuric Acid (98.2 %)		
7664-93-9	231-639-5	Corrosive to metals, H290 Skin corrosion, Category 1A, H314

For the full text of the H-Statements mentioned in this section, see section 16.

Hazardous components (1999/45/EC)

Chemical Name (concentration)

CAS No.	EC No.	Classification
Sulphuric Acid (98.2 %)		
7664-93-9	231-639-5	C; R35

For the full text of the R-phrases mentioned in this section, see section 16.

4. First aid measures

4.1. Description of first aid measures
After inhalation : fresh air. Call in physician
After skin contact : sweep by dry cloth and then wash off with plenty of water.
Immediately remove contaminated clothing. Call a physician immediately.
After contact with eyes: rinse out with plenty of water. Immediatelly call in

ophthalmologist
After swallowing: make victim drink water, avoid vomiting (risk of perforation). Call a physician immediately. Do not attempt to neutralise

4.2. Most important symptoms and effects, both acute and delayed: Irritation and corrosion, Risk of blindness!.

4.3. Indication of immediate medical attention and special treatment needed: No information available

5. Fire-fighting measures

5.1. Extinguishing media
Suitable extinguishing media: use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Unsuitable extinguishing media: For this substance/mixture no limitations of extinguishing agents are given

5.2. Special hazards arising from the substance or mixture
No combustible. Ambient fire may liberate hazardous vapours.
Fire may cause evolution of : Sulphur oxides.

5.3. Advice for fire fighters
Special protective equipment for fire fighters : stay in danger area only with self contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing protective clothing.

6. Accidental release measures

6.1. Personal precaution, protective equipment and emergency procedures.
Advice for non emergency personnel : Do not breathe vapours, aerosols. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.

6.2. Environmental precautions
Do not empty into drains

6.3. Methods cleaning up
Take up with liquid-absorbent and neutralizing material (sand and lime). Clean up affected area.

6.4. Reference to the other sections
Indication about waste treatment see section 13.

7. Handling and storage

7.1. Precaution for safe handling
Use of personal protective equipment

7.2. Conditions for safe storage, including any incompatibilities
Tightly closed.
Storage temperature: ambient or room temperature

7.3. Specific end uses.
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. Exposure controls/personal protection

8.1. Control parameters

8.2. Exposure controls
Engineering measures
Technical measures and appropriate working operations should be given priority over the use of personal protective equipment

Individual protection measures
Protective cloting needs to be selected specifically for the workplace, depending on concentration and quantities of the hazardous subtances handled. The chemical resistance of the protective equipment should be enquired at the respective supplier.

Hygiene measures
Immediately change contaminated clothing.Apply preventive skin protection.Wash hand and face after working with subtance.

Eye / face protection
Tightly fitting safety goggles

Hand protection
full contact :
Glove material : Viton (R)
Glove thickness : 0.70 mm
Break through time : > 480 min

splash contact :
Glove material : butyl-rubber
Glove thickness : 0.7 mm
Break through time : > 120 min

The protective gloves to be used must comply with the specifications of EC Directive 89/686/EEC and the related standard EN374.

Other protective equipment:
Acid-resistant protective clothing

Respiratory protection
Required when vapour/aerosols are generated.
Recommended filter type : Filter P2 (acc. To DIN 3181) for solid particles of harmful subsatances

Environmental exposure controls
Do not empty into drains.

9. Physical and chemical properties

9.1. Information on basic physical and chemical properties

Form	liquid
Colour	colourless
Odour	odourless

pH(25°C)	0.3 at 49 g/l
Melting point	-20 °C
Boiling point	ca. 335 °C
Flash point	Not applicable
Evaporation rate	No information available.
Flammability (solid,gas)	No information available.
Lower explosion limit	not applicable
Upper explosion limit	not applicable
Vapour pressure	ca. 0.0001 hPa at 20 °C
Relative vapour density	ca. 3.4
Relative density	1,83 g/cm^3 at 15 °C
Water solubility	soluble at 20 °C (caution! development of heat)
Partition coefficient: n-Octanol/water	No information available.
Decomposition temperature	ca. 338 °C
Viscosity, dynamic	ca. 24 mPa.s at 20 °C
Explosive properties	No information available
Oxidizing properties	No information available

9.2. Other data

Igniton temperature	not applicable
Bulk density	not applicable
Corrosion	May be corrosive to metals.

10. Stability and reactivity

10.1. Reactivity
Has a corrosive effect

10.2. Chemical stability
The product is chemically stable under standard ambient conditions (room temperature).

10.3. Possibility of hazardous reactions
A risk of explosion and/or of toxic gas information exists with the following substances.

Violent reactions possible with:
Water, Alkali metals, alkali compounds, Ammonia, Aldehydes, acetonitrile, Alkaline earth metals, alkalines, Acids, alkaline earth compounds, Metals, metal alloys, Oxides of phosphorus, phosphorus, hydrides, halogen-halogen compounds, oxyhalogenic compounds, permanganates, nitrates, carbides, combustible substances, organic solvent, acetylidene, Nitriles, organic nitro compounds, anilines, Peroxides, picrates, nitrides, lithium silicade, iron(III) compounds, bromates, chlorates, Amines, perchlorates, hydrogen peroxide

10.4. Conditions to avoid
Strong heating

10.5. Incompatible materials
Animal/vegetable tissues, Metals
Contact with metals liberates hydrogen gas

10.6. Hazardous decomposition products
In the event of fire, see chapter 5.

11. Toxicological information

11.1. Information on toxicological effects
Acute inhalation toxicity
LC_{50} rat
Dose 510 mg/m^3, 2 h
(calculated on the pure substance) (IUCLID)

Skin irritation
rabbit.
Result: Causes burns.
(IUCLID)
Causes severe burns

Eye irritation
Rabbit
Result: Causes severe burns.
(IUCLID)

Risk of serious damage to eyes.
Risk of blindness!

Genotoxicity in vitro
Ames test
Result: negative
(IUCLID)

Teratogenicity
Did not show teratogenic effects in animal experiments. (IUCLID)

Specific target organ toxicity – single exposure
The substance or mixture is not classified as specific target organ toxicant, single exposure.

Specific target organ – repeated exposure
The substance or mixture is not classified as specific target organ toxicant, repeated exposure.

Aspiration hazard
No aspiration toxicity classification.

11.2. Further information
Handle in accordance with good industrial hygiene and safety practice.

12. Ecological information

12.1. Toxicity
Toxicity to fish
LC_{50}
Species: Lepomis macrochirus (Bluegill sunfish)
Dose: 16-29 mg/l
Exposure time: 96 h
(External MSDS)

12.2. Persistence and degradability
No information available

12.3. Bioaccumulative potential
No information available

12.4. Mobility in soil
No information available

12.5. Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted.

12.6. Other adverse effects.
Additional ecological information
Biological effects:
Form corrosive mixtures with water even if diluted.
Harmful effect due to pH shift.
Endangers drinking-water supplies if allowed to enter soil or water.
Further information on ecology : Do not allow to run into surface waters, wastewater, or soil.

13. Disposal considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options.

14. Transport information

ADR/RID
UN 1830 SULPHURIC ACID , 8, II

IATA
UN 1830 SULPHURIC ACID, 8, II

IMDG
UN 1830 SULPHURIC ACID, 8, II
EmS F-A S-B

The transport regulations are cited according to international regulations. Possible national deviations in other countries are not considered.

15. Regulatory information

Safety, health and environmental regulation/legislation specific for the substance or mixture

EU regulations

Major accident hazard	96/82/EC
Legialation	Directive 96/82/EC does not apply
Occupational restrictions	Take note of Dir 94/33/EC on the protection of young people at work.

16. Other information

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

H290	may be corrosive to metals
H314	Causes severe skin burns and eye damage.

Full text of R-phrases referred to under sections 2 and 3.

R35	Causes severe burns.

Training advice
Provide adequate information, instruction and training for operators.

****

The information accumulated here in is believed to be accurate but is not warranted to be whether originating with the company or not.

Health and safety data sheet should be used only as a guide to the safe handling of the product, and is not intended as a technical specification.

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5-CONTINENT PHOSPHORUS CO., LIMITED
MATERIAL SAFETY DATA SHEET
CAUSTIC SODA FLAKES 99%

ORIGINAL

DATE: MAR.31, 2020

RE: INVOICE NO.:CS20210308

Material Safety Data Sheet – Caustic Soda Flakes 99%

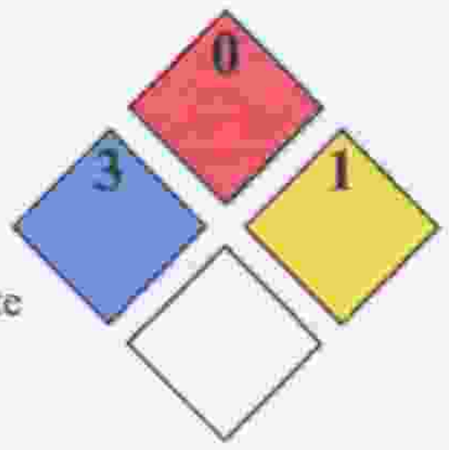
SECTION I · PRODUCT IDENTIFICATION

Address:
No. 4, 25th Floor, Building 2, King Lake City, No.1 Baoshan Street, Jingyang District, Deyang,Sichuan, 618000 P.R. CHINA.

Synonym: Sodium Hydroxide,
Chemical Family: Alkali

NFPA Rating

0- Minimal 1- Slight 2- Moderate
3- Serious 4- Extreme



SECTION II · HAZARDOUS INGREDIENTS

CHEMICAL NAME	CAS Number	%WT	TLV	PEL
Caustic Soda	1310-73-2	100	2 mg/m^3	2 mg/m^3

SECTION III · HAZARDOUS IDENTIFICATION

Potential Acute Health Effects: Prolonged contact with dilute solutions of dust has a destructive effect upon tissue.
Potential Chronic Health Effects: No chronic Sara 311/312 effects listed.

SECTION IV · PHYSICAL and CHEMICAL PROPERTIES

Boiling Point Range: 2534°F
pH: 13-14 (0.5% Soln.)
Solubility In Water: Soluble.
Appearance/Odor: White deliquescent flakes with no odor.
Melting Point/Freezing Point: 604 °F

Vapor Density (Air=1): > 1.0
Vapor Pressure (mmHg): < 0.1
VOC %: 0
Specific Gravity (H_2O=1): 2.13

SECTION V · FIRE FIGHTING MEASURES

Flash Point: None.
Auto Ignition: Decomposes.
Extinguishing Media: Not considered a fire hazard. Use any means suitable for extinguishing surrounding fire.
Flammable Limits: Lower: None Upper: None
Fire Fighting Procedures: Cool fire-exposed containers with water spray to prevent container weakening and possible rupture. Do not enter confined spaces without self-contained breathing apparatus (SCBA) and structural firefighter's protective clothing.
Unusual Fire and Explosion Hazards: Not considered an explosion hazard.

SECTION VI · STABILITY AND REACTIVITY

Stability: Stable under normal use conditions.

Conditions to Avoid: Moisture, dusting and incompatibles.
Incompatibility: Avoid contact with acids, moisture, strong oxidizing agents, powdered metals.
Hazardous Decomposition Products: Oxides of Sodium.
Hazardous Polymerization: Will not
occ

SECTION VII · STORAGE AND HANDLING

Precautions To Be Taken In Handling and Storage: Always store in tightly sealed, properly labeled, original container. Store in a cool, dry well ventilated area. Prevent physical damage. Keep away from sources of heat, moisture and incompatibles.
Other Precautions: Follow Label Instructions and Precautions.

SECTION VIII · HEALTH AND FIRST AID

Skin: Corrosive! Severely irritating.
Eyes: Corrosive! Severely irritating.
Inhalation: Severely irritating. High dust concentrations can do serious damage to respiratory system.
Ingestion: Severely irritating. May cause severe burns of mouth, throat, and stomach.

FIRST AID PROCEDURES:
Eyes: Flush with large amounts of cool running water for at least 15 minutes. Get medical attention immediately. **Skin:** Flush off excess with large amounts of cool running water for at least 15 minutes. Get medical attention immediately.
Inhalation: For excessive inhalation remove to fresh air. If breathing is difficult seek medical attention.
Ingestion: DO NOT induce vomiting. Drink large amounts of water or milk. Seek medical attention immediately.

SECTION IX · EXPOSURE CONTROLS / PERSONAL PROTECTION

Eye Protection: Eye Protection when handling. Goggles, safety glasses with side shields or full-face shield are recommended.
Respiratory Protection: Where adequate ventilation is not available an approved respirator (NIOSH N95 or better) must be worn. In confined or areas where exposure is above is above 50 times the TLV, use a self-contained breathing apparatus.
Skin Protection: Wear impervious clothing, including boots, gloves, apron or coveralls, as appropriate to prevent skin contact.
Ventilation: General Mechanical ventilation to prevent dusting and TLV from exceeding control limits.
Protective Clothing: Selection of protective clothing depends on potential exposure conditions and may include gloves, boots, suits and other protective items.
Other Equipment: Eye wash station and drench shower in close proximity.

SECTION X · ACCIDENTAL RELEASE MEASURES

Ventilate area of spill. Wear appropriate PPE as specified in Section IX. Sweep up and containerize for reclamation or disposal. Avoid dust dispersal during clean up operation.

SECTION XI · DISPOSAL CONSIDERATIONS

Whatever cannot be salvaged should be managed in an appropriate and approved waste disposal facility. Processing use or contamination of this product may alter its waste classification. State and local disposal regulations may differ from federal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements

SECTION XII · TRANSPORTAION

Proper Shipping Name:	Sodium Hydroxide, Solid
Hazard Class:	8
UN Number:	1823
Packaging Group:	II

SECTION XIII · TOXICOLOGY

Carcinogenicity: Not NTP listed
Mutagenicity: Not reported to produce mutagenic effects in humans.
Reproductive: Not reported to produce reproductive effects in humans..
Sensitization: Persons with pre-existing skin disorders or eye problems may be more susceptible to thisproduct.

SECTION XIV · REGULATORY

RMP/PSM: Not listed
CERCLA-RQ: 1000 Lbs
EPCRA 311/312: Yes
EPCRA 313: Yes
FIFRA: No documented information available.
RCRA-CODE: No Hazardous Waste Identification.
TSCA: Listed

SECTION XV · OTHER INFORMATION

The information contained on this Material Safety Data Sheet is considered accurate as of the date of publication. It is not necessarily all inclusive nor fully adequate in every circumstance. The suggestions should not be confused with, nor followed in violation of applicable laws, regulations, rules or insurance requirements. No warranty, express or implied, of merchantability, fitness, accuracy of data, or the results to be obtained from the use thereof is made. The vendor assumes no responsibility for injury or damages resulting from the inappropriate use of this product.

For and on behalf of
5-CONTINENT PHOSPHORUS CO., LIMITED

Authorized Signature(s)
5-CONTINENT PHOSPHORUS CO., LIMITED

Jesse .

(AUTHORIZED SIGNATURE)

Material Safety Data Sheets
AICA HPL - ASIA COLLECTION

Section 1: Product Identification

Product Name:
AICA Melamine Laminated Sheets
(AS, ASW, ASU, ASQ, ASY, ASB, TAS, WAW, VAS, INA, HJ, MAS)

Manufacturer:
PT AICA Indonesia
Jl. Ir. H. Juanda 318, Margahayu, Bekasi Timur, Indonesia
Postal code: 17113
Phone: (+62 21) 8801391; (+62 21) 8816028; (+62 21) 88346976
Fax: (+62 21) 8802807

Section 2: Product Composition

Material Name: Thermosetting Resin Laminated Sheet.

Component Name	**% wt**
Paper Base	50 - 60
Cured Melamine Resin	1 - 20
Cured Phenol Resin	20 - 40

Section 3: Hazard Identification

Potential Health Effects: Not Applicable
(with reference to the Japanese Building Standard Law Enforced on 1 July '03)

Danger:
No hazardous components according to 29 CFR 1910.1200
Nuisance dust may be generated during cutting or sanding operations.
This product is free from heavy metals, azodyes, Tin catalysts, PBBs, PBDEs, phthalates.

Section 4. First Aid Procedure

Eye Contact:
Gently lift eyelids and flush continuously with plenty of clean water.
Seek professional medical assistance, if necessary.

Skin Contact:
Wash the affected area with soap and water or under plenty of flowing water.

Inhalation and Ingestion:
Rinse mouth and dilute with water. Seek professional medical assistance, if necessary.

Section 5: Fire Fighting Procedure

Fire Fighting Procedure:
Fire fighters should wear suitable protective equipment (respirator, heat resistant clothing and other protective wear) to avoid smoke inhalation and to be able to evacuate population down wind).

Extinguish Media: Water, spray, foam, chemical extinguisher.

Hazardous Combustion Products:
Thermal decomposition may release toxic and/or hazardous gases.

Section 6: Accidental Release Measures

In case material is spilled or released:
This material is a non-hazardous waste. Dispose of dust or excess material according to applicable local regulations.

Section 7: Handling and Storage / Personal Protection

Storage & Handling Practices:
- Store this product horizontally flat
- Protect from rain and direct sunlight
- Store at normal temperature and humidity
- Avoid storing directly on the ground or concrete floors, use base layer or pallet
- Keep dust away from heat, ignition sources and oxidizing agents

Work & Hygiene Practices:
Wear protective equipment:
- Safety glasses or goggles in fabrication operations that may generate airborne dust
- Gloves, to prevent injured from sharp edge and dust
- Respirator dust mask, to prevent airborne dust

Ventilation & Engineering Controls:
Provide adequate general and local exhaust ventilation to maintain airborne concentrations below the exposure limits. Enclose fabrication operations, where possible, to minimize dust dispersion into other work areas.

Section 8: Physical and Chemical Properties

Appearance:	Solid - Laminate Sheet
Odor:	No discernible odor
Specific gravity (20 °C):	± 1,4 g/cm^3
Volatility:	Not Applicable
Solubility:	Insoluble in water

Section 9: Risk Information

Flash Point:	Not established
Ignition Point:	Not detected below 300 °C
Explosive Limits:	None
Autoignition, Reactivity:	None, none with water
Stability; Reactivity:	Chemically stable

Section 10: Toxicological Information

Oral:	No data available
Dermal:	No data available
Inhalation:	No data available
Eye:	No data available
Carcinogenicity:	No data available
Mutagenesis:	No data available
Reproductive Toxicity:	No data available

Section 11: Ecological Information

Degradability:	No data available
Accumulative Risk:	No data available
Toxicity Fish:	No data available

Section 12: Disposal Considerations

This material is a non-hazardous waste.
Incineration is permitted as combustibles at regulated sites.
Dispose of dust or excess material according to applicable local regulations.

Section 13: Transportation Information

This product is classified as harmless material. Although there are no safety issues, care should be exercised so that the product is not exposed to direct sunlight or water.

Section 14: Regulatory Information

All regulations described in the classification standard of the guideline for MSDS data sheets issued by the Japan Chemical Industry Association do not apply to the product.

Section 15: Other Information

Although we have written this MSDS based on all available facts at this moment in time, we only intend to provide the MSDS as useful customer reference information and we are unable to guarantee all the contents. Note that the information described assumes the case for normal handling. In case of special handling, safety measures relevant to your application should be exercised prior to use.

Material Safety Data Sheets
AICA HPL PURE CORE

Section 1: Product Identification

Product Name:
AICA Melamine Laminated Sheets (ASW)

Manufacturer:
PT Aica Indonesia
Jl. Ir. H. Juanda 318, Margahayu, Bekasi Timur, Indonesia
Postal code: 17113
Phone: (+62 21) 8801391; (+62 21) 8816028; (+62 21) 88346976
Fax: (+62 21) 8802807

Section 2: Product Composition

Material Name: Thermosetting Resin Laminated Sheet.

Component Name	**% wt**
Paper Base	50 - 60
Cured Melamine Resin	20 - 40

This product is free from chlorine and heavy metals.

Section 3: Hazard Identification

Classification Name: Not Applicable (Not a chemical product)

Danger: None

Potential Health Effects: Not Applicable
(with reference to the Japanese Building Standard Law Enforced on 1 July '03)

Ecological Effects: None

Section 4. First Aid Procedure

Eye Contact:
Gently lift eyelids and flush continuously with plenty of clean water.
Seek professional medical assistance, if necessary.

Skin Contact:
Wash the affected area with soap and water or under plenty of flowing water.

Inhalation and Ingestion:
Rinse mouth and dilute with water. Seek professional medical assistance, if necessary.

Section 5: Fire Fighting Procedure

Fire Fighting Procedure:
Fire fighters should wear suitable protective equipment (respirator, heat resistant clothing and other protective wear) to avoid smoke inhalation and to be able to evacuate population down wind).
Extinguish Media: Water, spray, foam, chemical extinguisher.

Section 6: Accidental Release Measures

Small spill or leak:
Not applicable.

Large spill or leak:
Not applicable.

Section 7: Handling and Storage

Handling: Wear protective equipment to prevent the inhalation of powder fines.
Wear gloves to protect from sharp edges of the sheet.
(Filters for removal of metal fines are required to prevent dust explosion from the flammable dust.)

Storage: Store sheets flat.
Protect from rain and sunlight.
Store under cover at normal temperature and humidity.
Avoid storing directly on the ground or concrete floors.

Section 8: Exposure Controls / Personal Protection

Administrative Levels:	Not Available
Exposure Limits:	
Japan Association on Industrial Health:	Not Available
ACGIH :	Not Established
Facilities:	Local exhaust ventilation
Personal Protection:	
Respiratory protection:	Dust mask
Eye protection:	Safety goggles
Hand protection:	Gloves
Body protection:	Work overalls

Section 9: Physical and Chemical Properties

Appearance:	Sheet solid (molded)
Specific gravity (20 °C):	± 1,4 g/cm^3
Volatility:	Not Applicable
Solubility:	Insoluble in water

Section 10: Risk Information

Flash Point:	Not established
Ignition Point:	Not detected below 300 °C
Explosive Limits:	None
Autoignition, Reactivity:	None, none with water
Oxidation:	None
Explosibility:	None
Stability; Reactivity:	Chemically stable

Section 11: Toxicological Information

Skin Corrosion:	Not available at the time of writing
Irritation (skin, eye):	Not available at the time of writing
Sensitizing property:	Not available at the time of writing
Acute Toxicity:	Not available at the time of writing
Sub acute Toxicity:	Not available at the time of writing
Chronic Toxicity:	Not available at the time of writing
Carcinogenicity:	Not available at the time of writing
Mutagenesis: (bacterial mutation; chromosomal aberration)	Not available at the time of writing
Reproductive Toxicity:	Not available at the time of writing
Teratogenicity:	Not available at the time of writing

Section 12: Ecological Information

Degradability:	Not available at the time of writing
Accumulative Risk:	Not available at the time of writing
Toxicity Fish:	Not available at the time of writing

Section 13: Disposal Considerations

Incineration is permitted as combustibles at regulated sites.
Ash should be treated as industrial waste. Ash must not be illegally disposed off in isolated wilderness or rivers.

Section 14: Transportation Information

AICA HPL is classified as harmless. Although there are no safety issues, care should be exercised so that the product is not exposed to direct sunlight or water.

Section 15: Regulatory Information

All regulations described in the classification standard of the guideline for MSDS data sheets issued by the Japan Chemical Industry Association do not apply to the product.

Section 16: Other Information

Although we have written this MSDS based on all available facts at this moment in time, we only intend to provide the MSDS as useful customer reference information and we are unable to guarantee all the contents. Note that the information described assumes the case for normal handling. In case of special handling, safety measures relevant to your application should be exercised prior to use.

Deli Gloves

PT. Delijaya Global Perkasa
Industrial Working Gloves Manufacturer

Jl. Babakan Rawa Haur no. 89
Citeureup, Bogor 16810, Indonesia

T : +62 21 8791 7878 - 8790 0534
F : +62 21 8791 7879 - 8790 0589
E : info@delijaya.com www.delijaya.com

TÜV NORD
ISO 9001 : 2008
Reg. 16110763

MATERIAL SAFETY DATA SHEET

A. Company Information

Name	:	PT. Delijaya Global Perkasa.
Address	:	Jl. Babakan Rawa Haur No. 89 ,Sentul - Bogor 16810.
Phone Number	:	(021) 8791 7878.
Fax Number	:	(021)8791 7879.

B. Product Information

Product Name	:	B5 BR
Specification	:	Made From T/C Yarn (65% Polyester & 35% Cotton), Natural Color, Medium Size.
Use	:	Working Gloves / Safety Gloves / Multi Purpose Gloves.

C. First Aid Measures

Eye Contact	:	Flush Immediately With Clean Water.
Skin Contact	:	No Effect.
Inhalation	:	No Effect.

D. Storage

Storage Condition	:	Store In Good Ventilation.
Packing Material	:	50 Dzn / Bal (12 Pair / Dzn).

Approval	Revised Date	Issued Date
Mr. Jacob Djaffar	Juli 01, 2023	Juli 01, 2023