

THIONYL CHLORIDE

S D FINE-CHEM LIMITED

Version No: 4.1.1.1
Safety Data Sheet

Issue Date: 03/12/2018
S.GHS.IND.EN

SECTION 1 IDENTIFICATION OF THE SUBSTANCE / MIXTURE AND OF THE COMPANY / UNDERTAKING

Product Identifier

Product name	THIONYL CHLORIDE
Chemical Name	thionyl chloride
Synonyms	Cl2-O-S; SOCl2; sulfinyl chloride; sulphonyl chloride; sulfur chloride oxide; sulphur chloride oxide; sulfurous dichloride; sulphurous dichloride; sulfurous oxychloride; sulphurous oxychloride
Proper shipping name	THIONYL CHLORIDE
Chemical formula	Cl2OS
Other means of identification	Not Available
CAS number	7719-09-7

Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses	Used as a chlorination agent, a catalyst, and in the manufacture of pesticides and engineering plastics. A component in lithium dry cell batteries.
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Details of the supplier of the safety data sheet

Registered company name	S D FINE-CHEM LIMITED
Address	315-317, T.V. INDUSTRIAL ESTATE, 248, WORLI, MUMBAI 400030 India
Telephone	91-22-24959898
Fax	91-22-24937232
Website	www.sdfine.com
Email	technical@sdfine.com

Emergency telephone number

Association / Organisation	Not Available
Emergency telephone numbers	91-22-24959899
Other emergency telephone numbers	Not Available

SECTION 2 HAZARDS IDENTIFICATION

Classification of the substance or mixture

Classification	Metal Corrosion Category 1, Acute Toxicity (Oral) Category 4, Specific target organ toxicity - single exposure Category 3 (respiratory tract irritation), Skin Corrosion/Irritation Category 1A, Serious Eye Damage Category 1, Acute Toxicity (Inhalation) Category 4
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Label elements

Hazard pictogram(s)	 
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SIGNAL WORD **DANGER**

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Hazard statement(s)

H290	May be corrosive to metals.
H302	Harmful if swallowed.
H335	May cause respiratory irritation.
H314	Causes severe skin burns and eye damage.
H332	Harmful if inhaled.

Precautionary statement(s) Prevention

P260	Do not breathe dust/fume/gas/mist/vapours/spray.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves/protective clothing/eye protection/face protection.
P234	Keep only in original container.
P270	Do not eat, drink or smoke when using this product.

Precautionary statement(s) 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.
P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310	Immediately call a POISON CENTER/doctor/physician/first aider.
P363	Wash contaminated clothing before reuse.
P390	Absorb spillage to prevent material damage.
P301+P312	IF SWALLOWED: Call a POISON CENTER/doctor/physician/first aider/if you feel unwell.
P304+P340	IF INHALED: Remove person to fresh air and keep comfortable for breathing.

Precautionary statement(s) Storage

P405	Store locked up.
P403+P233	Store in a well-ventilated place. Keep container tightly closed.

Precautionary statement(s) Disposal

P501	Dispose of contents/container in accordance with local regulations.
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SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

Substances

CAS No	%[weight]	Name
7719-09-7	>98	<u>thionyl chloride</u>
		reacts with water or moisture to produce
7647-01-0.		<u>hydrogen chloride</u>
7446-09-5		<u>sulfur dioxide</u>
7664-93-9		<u>sulfuric acid</u>

Mixtures

See section above for composition of Substances

SECTION 4 FIRST AID MEASURES

Description of first aid measures

Eye Contact	If this product comes in contact with the eyes: ▶ Immediately hold eyelids apart and flush the eye continuously with running water. ▶ Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids. ▶ Continue flushing until advised to stop by the Poisons Information Centre or a doctor, or for at least 15 minutes. ▶ Transport to hospital or doctor without delay.
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	▶ Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.
Skin Contact	If skin or hair contact occurs: ▶ Immediately flush body and clothes with large amounts of water, using safety shower if available. ▶ Quickly remove all contaminated clothing, including footwear. ▶ Wash skin and hair with running water. Continue flushing with water until advised to stop by the Poisons Information Centre. ▶ Transport to hospital, or doctor.
Inhalation	▶ If fumes or combustion products are inhaled remove from contaminated area. ▶ Lay patient down. Keep warm and rested. ▶ Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures. ▶ Apply artificial respiration if not breathing, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary. ▶ Transport to hospital, or doctor, without delay. ▶ Inhalation of vapours or aerosols (mists, fumes) may cause lung oedema. ▶ Corrosive substances may cause lung damage (e.g. lung oedema, fluid in the lungs). ▶ As this reaction may be delayed up to 24 hours after exposure, affected individuals need complete rest (preferably in semi-recumbent posture) and must be kept under medical observation even if no symptoms are (yet) manifested. ▶ Before any such manifestation, the administration of a spray containing a dexamethasone derivative or beclomethasone derivative may be considered. This must definitely be left to a doctor or person authorised by him/her. (ICSC13719)
Ingestion	▶ For advice, contact a Poisons Information Centre or a doctor at once. ▶ Urgent hospital treatment is likely to be needed. ▶ If swallowed do NOT induce vomiting. ▶ If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration. ▶ Observe the patient carefully. ▶ Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious. ▶ Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink. ▶ Transport to hospital or doctor without delay.

Indication of any immediate medical attention and special treatment needed

For acute or short term repeated exposures to strong acids:

- ▶ Airway problems may arise from laryngeal edema and inhalation exposure. Treat with 100% oxygen initially.
- ▶ Respiratory distress may require cricothyroidotomy if endotracheal intubation is contraindicated by excessive swelling
- ▶ Intravenous lines should be established immediately in all cases where there is evidence of circulatory compromise.
- ▶ Strong acids produce a coagulation necrosis characterised by formation of a coagulum (eschar) as a result of the dessicating action of the acid on proteins in specific tissues.

INGESTION:

- ▶ Immediate dilution (milk or water) within 30 minutes post ingestion is recommended.
- ▶ **DO NOT attempt to neutralise the acid since exothermic reaction may extend the corrosive injury.**
- ▶ Be careful to avoid further vomit since re-exposure of the mucosa to the acid is harmful. Limit fluids to one or two glasses in an adult.
- ▶ Charcoal has no place in acid management.
- ▶ Some authors suggest the use of lavage within 1 hour of ingestion.

SKIN:

- ▶ Skin lesions require copious saline irrigation. Treat chemical burns as thermal burns with non-adherent gauze and wrapping.
- ▶ Deep second-degree burns may benefit from topical silver sulfadiazine.

EYE:

- ▶ Eye injuries require retraction of the eyelids to ensure thorough irrigation of the conjunctival cul-de-sacs. Irrigation should last at least 20-30 minutes.
DO NOT use neutralising agents or any other additives. Several litres of saline are required.
- ▶ Cycloplegic drops, (1% cyclopentolate for short-term use or 5% homatropine for longer term use) antibiotic drops, vasoconstrictive agents or artificial tears may be indicated dependent on the severity of the injury.
- ▶ Steroid eye drops should only be administered with the approval of a consulting ophthalmologist).

[Ellenhorn and Barceloux: Medical Toxicology]

SECTION 5 FIREFIGHTING MEASURES**Extinguishing media****FOR SMALL FIRE:**

- ▶ USE FLOODING QUANTITIES OF WATER.
- ▶ **DO NOT use dry chemical, CO₂, foam or halogenated-type extinguishers.**

FOR LARGE FIRE

- ▶ Flood fire area with water from a protected position

Special hazards arising from the substrate or mixture

Fire Incompatibility	▶ Avoid storage with reducing agents.
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Advice for firefighters

Fire Fighting	▶ Use water delivered as a fine spray to control fire and cool adjacent area. ▶ Do not approach containers suspected to be hot. ▶ Cool fire exposed containers with water spray from a protected location. ▶ If safe to do so, remove containers from path of fire.
Fire/Explosion Hazard	▶ Non combustible. ▶ Not considered to be a significant fire risk. ▶ Acids may react with metals to produce hydrogen, a highly flammable and explosive gas. ▶ Heating may cause expansion or decomposition leading to violent rupture of containers. Decomposition may produce toxic fumes of: hydrogen chloride sulfur oxides (SO_x) ▶ The material may provide sufficient oxygen to make the fire fierce and self sustaining. ▶ Smothering action may not be effective for established fire. ▶ Intense heat may cause spontaneous decomposition (detonation). ▶ Due to possibility of reignition, extinguished residues must be thoroughly cooled before approaching.

SECTION 6 ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

See section 8

Environmental precautions

See section 12

Methods and material for containment and cleaning up

Minor Spills	▶ Drains for storage or use areas should have retention basins for pH adjustments and dilution of spills before discharge or disposal of material. ▶ Check regularly for spills and leaks. ▶ Clean up all spills immediately. ▶ Avoid breathing vapours and contact with skin and eyes. ▶ Control personal contact with the substance, by using protective equipment. ▶ Contain and absorb spill with sand, earth, inert material or vermiculite.
Major Spills	▶ Clear area of personnel and move upwind. ▶ Alert Fire Brigade and tell them location and nature of hazard. ▶ May be violently or explosively reactive. ▶ Wear full body protective clothing with breathing apparatus.

Personal Protective Equipment advice is contained in Section 8 of the SDS.

SECTION 7 HANDLING AND STORAGE

Precautions for safe handling

Safe handling	▶ DO NOT allow clothing wet with material to stay in contact with skin ▶ Avoid all personal contact, including inhalation. ▶ Wear protective clothing when risk of exposure occurs. ▶ Use in a well-ventilated area. ▶ WARNING: To avoid violent reaction, ALWAYS add material to water and NEVER water to material.
Other information	▶ Store in original containers. ▶ Keep containers securely sealed. ▶ Store in a cool, dry, well-ventilated area. ▶ Store away from incompatible materials and foodstuff containers.

Conditions for safe storage, including any incompatibilities

Suitable container	▶ DO NOT use aluminium or galvanised containers ▶ Check regularly for spills and leaks ▶ Lined metal can, lined metal pail/ can. ▶ Plastic pail. ▶ Polyliner drum. ▶ Packing as recommended by manufacturer. For low viscosity materials ▶ Drums and jerricans must be of the non-removable head type. ▶ Where a can is to be used as an inner package, the can must have a screwed enclosure. For materials with a viscosity of at least 2680 cSt. (23 deg. C) and solids (between 15 C deg. and 40 deg C.): ▶ Removable head packaging;
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	▶ Cans with friction closures and ▶ low pressure tubes and cartridges may be used. ▶ Glass container is suitable for laboratory quantities [Dry stainless steel drum.] [Glass-lined steel container.] [NOTE: in contact with moisture thionyl chloride is highly corrosive to most metals.]
Storage incompatibility	Thionyl chloride (and presumably other thionyl halides): ▶ is highly reactive ▶ is a strong oxidiser ▶ reacts violently with water or steam, producing sulfur dioxide, sulfuric acid and hydrochloric acid ▶ reacts with moisture in air or light, emitting fumes of sulfur dioxide, hydrochloric acid and sulfur acid ▶ reacts violently with alcohols, ammonia, chloryl perchlorate, chromyl chloride, diethylzinc, dimethyl sulfoxide, dimethylformamide, lead dioxide, nitric acid, red phosphorus, potassium, sodium, sodium peroxide ▶ reacts with acids, alkalis, amines, bis(dimethylamino)sulfoxide, combustible materials, organic substances, 2-nitrobenzoylacetic acid, 2-nitrophenylacetic acid, linseed oil, quinoline, sodium 2,4-hexadiyn-1,6-diol, and other materials with risk of ignition, fire or explosion ▶ is incompatible with hexafluoroisopropylideneaminolithium ▶ attacks some plastics, rubber, and coatings, ▶ Inorganic acids are generally soluble in water with the release of hydrogen ions. The resulting solutions have pH's of less than 7.0. ▶ Inorganic acids neutralise chemical bases (for example: amines and inorganic hydroxides) to form salts - neutralisation can generate dangerously large amounts of heat in small spaces. ▶ The dissolution of inorganic acids in water or the dilution of their concentrated solutions with additional water may generate significant heat. ▶ Inorganic peroxy compounds are potent oxidisers that pose fire or explosive hazards when in contact with ordinary combustible materials. ▶ Inorganic peroxides react with organic compounds to generate organic peroxide and hydroperoxide products that react violently with reducing agents. ▶ Inorganic oxidising agents can react with reducing agents to generate heat and products that may be gaseous (causing pressurization of closed containers). The products may themselves be capable of further reactions (such as combustion in the air). ▶ Inorganic reducing agents react with oxidizing agents to generate heat and products that may be flammable, combustible, or otherwise reactive. Their reactions with oxidizing agents may be violent. ▶ Incidents involving interaction of active oxidants and reducing agents, either by design or accident, are usually very energetic and examples of so-called redox reactions. Hydrogen chloride: ▶ reacts strongly with strong oxidisers (releasing chlorine gas), acetic anhydride, caesium cyanotridecahydrodecaborate(2-), ethylidene difluoride, hexalithium disilicide, metal acetylide, sodium, silicon dioxide, tetraselenium tetranitride, and many organic materials ▶ is incompatible with alkaline materials, acetic anhydride, acetylides, aliphatic amines, alkanolamines, alkylene oxides, aluminium, aluminium-titanium alloys, aromatic amines, amines, amides, 2-aminoethanol, ammonia, ammonium hydroxide, borides, calcium phosphide, carbides, carbonates, cyanides, chlorosulfonic acid, ethylenediamine, ethyleneimine, epichlorohydrin, formaldehyde, isocyanates, metals, metal oxides, metal hydroxides, metal acetylides, metal carbides, oleum, organic anhydrides, potassium permanganate, perchloric acid, phosphides, 3-propiolactone, silicides, sulfides, sulfites, sulfuric acid, uranium phosphide, vinyl acetate, vinylidene fluoride ▶ attacks most metals forming flammable hydrogen gas, and some plastics, rubbers and coatings ▶ reacts with zinc, brass, galvanised iron, aluminium, copper and copper alloys Sulfur dioxide: ▶ reacts with water or steam forming sulfurous acid; reaction may be violent ▶ reacts with acrolein, alcohols, aluminium powder, alkali metals, amines, bromine, pentafluoride, caustics, caesium, acetylene carbide, chlorates, chlorine trifluoride, chromium powder, copper or its alloy powders, diethylzinc, fluorine, lead dioxide, lithium acetylene carbide, metal powders, monolithium acetylide-ammonia, nitril chloride, potassium acetylene carbide, potassium acetylide, potassium chlorate, rubidium carbide, silver azide, sodium, sodium acetylide, stannous oxide; reaction may be violent ▶ decomposes above 60 deg. C releasing oxides of sulfur ▶ Incompatible with alkalis, alkylene oxides, ammonia, aliphatic amines, alkanolamines, amides, organic anhydrides, caesium monoxide, epichlorohydrin, ferrous oxide, halogens, interhalogens, isocyanates, lithium nitrate, manganese, metal acetylides, metal oxides, perbromyl fluoride, red phosphorus, potassium azide, rubidium acetylide, sodium hydride, sulfuric acid ▶ attacks some plastics, coatings and rubber ▶ attacks metals, especially chemically active metals, in the presence of moisture. ▶ Avoid strong acids, bases. ▶ Avoid storage with reducing agents.



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X — Must not be stored together

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- 0 — May be stored together with specific preventions
 + — May be stored together

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Control parameters

OCCUPATIONAL EXPOSURE LIMITS (OEL)

INGREDIENT DATA

Source	Ingredient	Material name	TWA	STEL	Peak	Notes
India Permissible Levels of Certain Chemical Substances in Work Environment	hydrogen chloride	Hydrogen chloride	Not Available	Not Available	5 ppm / 7 mg/m ³	Not Available
India Permissible Levels of Certain Chemical Substances in Work Environment	sulfur dioxide	Sulphur dioxide	2 ppm / 5 mg/m ³	10 mg/m ³ / 5 ppm	Not Available	Not Available
India Permissible Levels of Certain Chemical Substances in Work Environment	sulfuric acid	Sulphuric Acid	1 mg/m ³	Not Available	Not Available	Not Available

EMERGENCY LIMITS

Ingredient	Material name	TEEL-1	TEEL-2	TEEL-3
thionyl chloride	Thionyl chloride	Not Available	Not Available	Not Available
hydrogen chloride	Hydrogen chloride; (Hydrochloric acid)	Not Available	Not Available	Not Available
sulfur dioxide	Sulfur dioxide	Not Available	Not Available	Not Available
sulfuric acid	Sulfuric acid	Not Available	Not Available	Not Available

Ingredient	Original IDLH	Revised IDLH
thionyl chloride	Not Available	Not Available
hydrogen chloride	50 ppm	Not Available
sulfur dioxide	100 ppm	Not Available
sulfuric acid	15 mg/m ³	Not Available

Exposure controls

Appropriate engineering controls	Explosive reaction may result from the interaction of strong oxidisers and organics. - Do NOT use strong oxidising agents in fume hoods designed for other purposes. Identify fume hoods used for strong oxidising agents with large warning signs. - Provide exhaust ventilation and room supply air in accordance with appropriate Standard.
Personal protection	
Eye and face protection	- Safety glasses with unperforated side shields may be used where continuous eye protection is desirable, as in laboratories; spectacles are not sufficient where complete eye protection is needed such as when handling bulk-quantities, where there is a danger of splashing, or if the material may be under pressure. - Chemical goggles whenever there is a danger of the material coming in contact with the eyes; goggles must be properly fitted. - Full face shield (20 cm, 8 in minimum) may be required for supplementary but never for primary protection of eyes; these afford face protection. - Alternatively a gas mask may replace splash goggles and face shields.
Skin protection	See Hand protection below
Hands/feet protection	- Elbow length PVC gloves - When handling corrosive liquids, wear trousers or overalls outside of boots, to avoid spills entering boots. The selection of suitable gloves does not only depend on the material, but also on further marks of quality which vary from manufacturer to manufacturer. Where the chemical is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application. The exact break through time for substances has to be obtained from the manufacturer of the protective gloves and has to be observed when making a final choice.

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	Personal hygiene is a key element of effective hand care. ▶ Neoprene gloves
Body protection	See Other protection below
Other protection	▶ Overalls. ▶ PVC Apron. ▶ PVC protective suit may be required if exposure severe. ▶ Eyewash unit. ▶ Some plastic personal protective equipment (PPE) (e.g. gloves, aprons, overshoes) are not recommended as they may produce static electricity. ▶ For large scale or continuous use wear tight-weave non-static clothing (no metallic fasteners, cuffs or pockets). ▶ Non sparking safety or conductive footwear should be considered. Conductive footwear describes a boot or shoe with a sole made from a conductive compound chemically bound to the bottom components, for permanent control to electrically ground the foot and shall dissipate static electricity from the body to reduce the possibility of ignition of volatile compounds.

Recommended material(s)

GLOVE SELECTION INDEX

Glove selection is based on a modified presentation of the:

"Forsberg Clothing Performance Index".

The effect(s) of the following substance(s) are taken into account in the **computer-generated** selection:

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Material	CPI
NATURAL RUBBER	A
NATURAL+NEOPRENE	A
NEOPRENE	A
NEOPRENE/NATURAL	A
NITRILE	A
PE	A
PVC	A
SARANEX-23	A

* CPI - Chemwatch Performance Index

A: Best Selection

B: Satisfactory; may degrade after 4 hours continuous immersion

C: Poor to Dangerous Choice for other than short term immersion

NOTE: As a series of factors will influence the actual performance of the glove, a final selection must be based on detailed observation. -

* Where the glove is to be used on a short term, casual or infrequent basis, factors such as "feel" or convenience (e.g. disposability), may dictate a choice of gloves which might otherwise be unsuitable following long-term or frequent use. A qualified practitioner should be consulted.

Respiratory protection

Type BE-P Filter of sufficient capacity. (AS/NZS 1716 & 1715, EN 143:2000 & 149:2001, ANSI Z88 or national equivalent)

Selection of the Class and Type of respirator will depend upon the level of breathing zone contaminant and the chemical nature of the contaminant. Protection Factors (defined as the ratio of contaminant outside and inside the mask) may also be important.

Required minimum protection factor	Maximum gas/vapour concentration present in air p.p.m. (by volume)	Half-face Respirator	Full-Face Respirator
up to 10	1000	BE-AUS / Class1 P2	-
up to 50	1000	-	BE-AUS / Class 1 P2
up to 50	5000	Airline *	-
up to 100	5000	-	BE-2 P2
up to 100	10000	-	BE-3 P2
100+			Airline**

* - Continuous Flow ** - Continuous-flow or positive pressure demand
A(All classes) = Organic vapours, B AUS or B1 = Acid gasses, B2 = Acid gas or hydrogen cyanide(HCN), B3 = Acid gas or hydrogen cyanide(HCN), E = Sulfur dioxide(SO2), G = Agricultural chemicals, K = Ammonia(NH3), Hg = Mercury, NO = Oxides of nitrogen, MB = Methyl bromide, AX = Low boiling point organic compounds(below 65 degC)

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance	Clear, colourless through pale yellow to red liquid. Reacts violently with water giving hydrogen chloride (HCl) and sulfur dioxide (SO2), and fumes upon exposure to air. Miscible with benzene, chloroform and carbon tetrachloride. Pungent suffocating odour.		
Physical state	Liquid	Relative density (Water = 1)	1.64
Odour	Not Available	Partition coefficient n-octanol / water	Not Available
Odour threshold	Not Available	Auto-ignition temperature (°C)	Not available.
pH (as supplied)	Not Applicable	Decomposition temperature	Not Available
Melting point / freezing point (°C)	-105	Viscosity (cSt)	Not Available
Initial boiling point and boiling range (°C)	79	Molecular weight (g/mol)	118.96

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Flash point (°C)	Non combustible	Taste	Not Available
Evaporation rate	Not Available	Explosive properties	Not Available
Flammability	Non combustible	Oxidising properties	Not Available
Upper Explosive Limit (%)	Not Applicable	Surface Tension (dyn/cm or mN/m)	Not Available
Lower Explosive Limit (%)	Not Applicable	Volatile Component (%vol)	100
Vapour pressure (kPa)	13.33 @ 21.4 C.	Gas group	Not Available
Solubility in water	Decomposes	pH as a solution (1%)	< 7
Vapour density (Air = 1)	4.1	VOC g/L	Not Available

SECTION 10 STABILITY AND REACTIVITY

Reactivity	See section 7
Chemical stability	► Contact with alkaline material liberates heat
Possibility of hazardous reactions	See section 7
Conditions to avoid	See section 7
Incompatible materials	See section 7
Hazardous decomposition products	See section 5

SECTION 11 TOXICOLOGICAL INFORMATION

Information on toxicological effects

Inhaled	Inhalation of vapours or aerosols (mists, fumes), generated by the material during the course of normal handling, may be harmful. The material can cause respiratory irritation in some persons. The body's response to such irritation can cause further lung damage. Corrosive acids can cause irritation of the respiratory tract, with coughing, choking and mucous membrane damage. There may be dizziness, headache, nausea and weakness. There was a fatal instance of exposure to thionyl chloride where the exposed person experienced severe breathing distress and fluid build-up in the lung. The concentration of sulfur dioxide in the room was extremely high at 1.7%. Inhalation of quantities of liquid mist may be extremely hazardous, even lethal due to spasm, extreme irritation of larynx and bronchi, chemical pneumonitis and pulmonary oedema. Hydrogen chloride (HCl) vapour or fumes present a hazard from a single acute exposure. Exposures of 1300 to 2000 ppm have been lethal to humans in a few minutes. Inhalation of HCl may cause choking, coughing, burning sensation and may cause ulceration of the nose, throat and larynx. Fluid on the lungs followed by generalised lung damage may follow. Sulfur dioxide is irritating. Short-term exposure causes constriction of the bronchi.
Ingestion	Accidental ingestion of the material may be harmful; animal experiments indicate that ingestion of less than 150 gram may be fatal or may produce serious damage to the health of the individual. Ingestion of acidic corrosives may produce burns around and in the mouth, the throat and oesophagus. Immediate pain and difficulties in swallowing and speaking may also be evident.
Skin Contact	The material may cause severe inflammation of the skin either following direct contact or after a delay of some time. Repeated exposure can cause contact dermatitis which is characterised by redness, swelling and blistering. Skin contact with acidic corrosives may result in pain and burns; these may be deep with distinct edges and may heal slowly with the formation of scar tissue. Open cuts, abraded or irritated skin should not be exposed to this material Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects. Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.
Eye	If applied to the eyes, this material causes severe eye damage. Direct eye contact with acid corrosives may produce pain, tears, sensitivity to light and burns. Mild burns of the epithelia generally recover rapidly and completely. Eye contact with vapours may cause a burning sensation, lachrymation, conjunctivitis, redness, pain, blurred vision and eye damage.
Chronic	Repeated or prolonged exposure to acids may result in the erosion of teeth, swelling and/or ulceration of mouth lining. Irritation of airways to lung, with cough, and inflammation of lung tissue often occurs. Long-term exposure to respiratory irritants may result in airways disease, involving difficulty breathing and related whole-body problems. Substance accumulation, in the human body, may occur and may cause some concern following repeated or long-term

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	occupational exposure. Chronic minor exposure to hydrogen chloride (HCl) vapour or fume may cause discolouration or erosion of the teeth, bleeding of the nose and gums; and ulceration of the mucous membranes of the nose. Workers exposed to hydrochloric acid suffered from stomach inflammation and a number of cases of chronic bronchitis (airway inflammation) have also been reported. Repeated or prolonged exposure to dilute solutions of hydrogen chloride may cause skin inflammation. Chronic exposure to sulfur dioxide (SO₂) particle complexes in polluted air can aggravate chronic disease, such as asthma, chronic pulmonary disease, and coronary artery disease. It is not clear what is the concentration level required to cause these effects. Animal testing showed that simultaneous exposure to benz(a)pyrene and sulfur dioxide increases the rate of cancer development compared to exposure to only one of the above substances.	
thionyl chloride	TOXICITY	IRRITATION
	Inhalation (rat) LC50: 124.857375 mg/l/1hd ^[2]	Not Available
	Oral (rat) LD50: 270 mg/kg ^[1]	
hydrogen chloride	TOXICITY	IRRITATION
	Dermal (rabbit) LD50: >5010 mg/kg ^[2]	Eye (rabbit): 5 mg/30s - mild
	Inhalation (rat) LC50: 780.108879 mg/l/1h ^[2]	
	Oral (rat) LD50: =700 mg/kg ^[2]	
sulfur dioxide	TOXICITY	IRRITATION
	Inhalation (rat) LC50: 629.28117 mg/l/1hd ^[2]	Not Available
sulfuric acid	TOXICITY	IRRITATION
	Inhalation (guinea pig) LC50: 0.036 mg/l/8H ^[2]	Eye (rabbit): 1.38 mg SEVERE
	Oral (rat) LD50: 2140 mg/kg ^[2]	Eye (rabbit): 5 mg/30sec SEVERE
Legend:	1. Value obtained from Europe ECHA Registered Substances - Acute toxicity 2.* Value obtained from manufacturer's SDS. Unless otherwise specified data extracted from RTECS - Register of Toxic Effect of chemical Substances	

THIONYL CHLORIDE	The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis. The material may produce respiratory tract irritation, and result in damage to the lung including reduced lung function. The material may cause severe skin irritation after prolonged or repeated exposure and may produce on contact skin redness, swelling, the production of vesicles, scaling and thickening of the skin. Repeated exposures may produce severe ulceration.
HYDROGEN CHLORIDE	4701 ppm/30m
SULFUR DIOXIDE	400-500 ppm - immediately dangerous to life. NOTE: Aggravates chronic pulmonary disease and increases the risk of acute and chronic respiratory disease - condition aggravated by smoking.
SULFURIC ACID	WARNING: For inhalation exposure <u>ONLY</u>: This substance has been classified by the IARC as Group 1: CARCINOGENIC TO HUMANS Occupational exposures to strong inorganic acid mists of sulfuric acid:
THIONYL CHLORIDE & HYDROGEN CHLORIDE & SULFUR DIOXIDE & SULFURIC ACID	Asthma-like symptoms may continue for months or even years after exposure to the material ends. This may be due to a non-allergic condition known as reactive airways dysfunction syndrome (RADS) which can occur after exposure to high levels of highly irritating compound. Main criteria for diagnosing RADS include the absence of previous airways disease in a non-atopic individual, with sudden onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. Other criteria for diagnosis of RADS include a reversible airflow pattern on lung function tests, moderate to severe bronchial hyperreactivity on methacholine challenge testing, and the lack of minimal lymphocytic inflammation, without eosinophilia.
HYDROGEN CHLORIDE & SULFUR DIOXIDE	The material may be irritating to the eye, with prolonged contact causing inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Acute Toxicity	✓	Carcinogenicity	✗
Skin Irritation/Corrosion	✓	Reproductivity	✗
Serious Eye Damage/Irritation	✓	STOT - Single Exposure	✓
Respiratory or Skin sensitisation	✗	STOT - Repeated Exposure	✗
Mutagenicity	✗	Aspiration Hazard	✗

THIONYL CHLORIDE

Legend: ✗ – Data either not available or does not fill the criteria for classification
✔ – Data available to make classification

SECTION 12 ECOLOGICAL INFORMATION

Toxicity

thionyl chloride	ENDPOINT	TEST DURATION (HR)	SPECIES	VALUE	SOURCE
	LC50	96	Fish	119.251mg/L	3
	EC0	24	Crustacea	1-150mg/L	2
hydrogen chloride	ENDPOINT	TEST DURATION (HR)	SPECIES	VALUE	SOURCE
	LC50	96	Fish	70.057mg/L	3
	EC50	96	Algae or other aquatic plants	344.947mg/L	3
sulfur dioxide	ENDPOINT	TEST DURATION (HR)	SPECIES	VALUE	SOURCE
	LC50	96	Fish	12664.232mg/L	3
	EC50	96	Algae or other aquatic plants	166000mg/L	3
sulfuric acid	ENDPOINT	TEST DURATION (HR)	SPECIES	VALUE	SOURCE
	LC50	96	Fish	=8mg/L	1
	EC50	48	Crustacea	=42.5mg/L	1
	EC50	72	Algae or other aquatic plants	>100mg/L	2
Legend:	ENDPOINT	TEST DURATION (HR)	SPECIES	VALUE	SOURCE
	NOEC	Not Available	Crustacea	0.15mg/L	2
	Extracted from 1. IUCLID Toxicity Data 2. Europe ECHA Registered Substances - Ecotoxicological Information - Aquatic Toxicity 3. EPIWIN Suite V3.12 (QSAR) - Aquatic Toxicity Data (Estimated) 4. US EPA, Ecotox database - Aquatic Toxicity Data 5. ECETOC Aquatic Hazard Assessment Data 6. NITE (Japan) - Bioconcentration Data 7. METI (Japan) - Bioconcentration Data 8. Vendor Data				

For Chloride: Although inorganic chloride ions are not normally considered toxic they can exist in effluents at acutely toxic levels. Incidental exposure to inorganic chloride may occur in occupational settings where chemicals management policies are improperly applied. The toxicity of chloride salts depends on the counter-ion (cation) present; that of chloride itself is unknown. Chloride toxicity has not been observed in humans except in the special case of impaired sodium chloride metabolism, e.g. in congestive heart failure.

For Sulfur Dioxide (SO₂): Vapor Pressure: 3,000 mm Hg @ 20°C; Henry's Law Constant: 1.23 mol.L⁻¹/atm-1 @ 25°C.

Environmental Fate: Natural sources of sulfur dioxide include volcanoes and volcanic vents, decaying organic matter, solar action on seawater and oxidation of dimethyl sulfide emitted from the ocean. On a global scale, man-made emissions represent a significant contribution to the SO₂ emitted to the atmosphere and these emissions are approximately equal to natural emissions.

Atmospheric Fate: Sulfur dioxide is typically present in a gaseous phase and, once released into the atmosphere, may be converted to other compounds, and/or removed from the atmosphere by various mechanisms.

Prevent, by any means available, spillage from entering drains or water courses.

DO NOT discharge into sewer or waterways.

Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
thionyl chloride	HIGH	HIGH
hydrogen chloride	LOW	LOW
sulfur dioxide	LOW	LOW

Bioaccumulative potential

Ingredient	Bioaccumulation
thionyl chloride	LOW (LogKOW = 0.9191)
hydrogen chloride	LOW (LogKOW = 0.5392)
sulfur dioxide	LOW (LogKOW = -2.2002)

Mobility in soil

Ingredient	Mobility
thionyl chloride	LOW (KOC = 4.411)

Continued...

THIONYL CHLORIDE

hydrogen chloride	LOW (KOC = 14.3)
sulfur dioxide	MEDIUM (KOC = 2.989)

SECTION 13 DISPOSAL CONSIDERATIONS

Waste treatment methods

Product / Packaging disposal	- Containers may still present a chemical hazard/ danger when empty. - Return to supplier for reuse/ recycling if possible.
	Otherwise: - If container can not be cleaned sufficiently well to ensure that residuals do not remain or if the container cannot be used to store the same product, then puncture containers, to prevent re-use, and bury at an authorised landfill. - Where possible retain label warnings and SDS and observe all notices pertaining to the product. Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked. A Hierarchy of Controls seems to be common - the user should investigate: - Reduction - Reuse - Recycling - Disposal (if all else fails) This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. DO NOT allow wash water from cleaning or process equipment to enter drains. - It may be necessary to collect all wash water for treatment before disposal. - In all cases disposal to sewer may be subject to local laws and regulations and these should be considered first. - Where in doubt contact the responsible authority. - Recycle wherever possible. - Consult manufacturer for recycling options or consult local or regional waste management authority for disposal if no suitable treatment or disposal facility can be identified. - Treat and neutralise at an approved treatment plant. Treatment should involve: Neutralisation with soda-ash or soda-lime followed by: burial in a land-fill specifically licensed to accept chemical and / or pharmaceutical wastes or Incineration in a licensed apparatus (after admixture with suitable combustible material).

SECTION 14 TRANSPORT INFORMATION

Labels Required

	
Marine Pollutant	NO Not Applicable

Land transport (UN)

UN number	1836				
UN proper shipping name	THIONYL CHLORIDE				
Transport hazard class(es)	<table> <tr> <td>Class</td><td>8</td></tr> <tr> <td>Subrisk</td><td>Not Applicable</td></tr> </table>	Class	8	Subrisk	Not Applicable
Class	8				
Subrisk	Not Applicable				
Packing group	I				
Environmental hazard	Not Applicable				
Special precautions for user	<table> <tr> <td>Special provisions</td><td>Not Applicable</td></tr> <tr> <td>Limited quantity</td><td>0</td></tr> </table>	Special provisions	Not Applicable	Limited quantity	0
Special provisions	Not Applicable				
Limited quantity	0				

Air transport (ICAO-IATA / DGR)

UN number	1836
UN proper shipping name	Thionyl chloride

THIONYL CHLORIDE

Transport hazard class(es)	ICAO/IATA Class	8
	ICAO / IATA Subrisk	Not Applicable
	ERG Code	8W
Packing group	I	
Environmental hazard	Not Applicable	
Special precautions for user	Special provisions	A2
	Cargo Only Packing Instructions	Forbidden
	Cargo Only Maximum Qty / Pack	Forbidden
	Passenger and Cargo Packing Instructions	Forbidden
	Passenger and Cargo Maximum Qty / Pack	Forbidden
	Passenger and Cargo Limited Quantity Packing Instructions	Forbidden
	Passenger and Cargo Limited Maximum Qty / Pack	Forbidden

Sea transport (IMDG-Code / GGVSee)

UN number	1836	
UN proper shipping name	THIONYL CHLORIDE	
Transport hazard class(es)	IMDG Class	8
	IMDG Subrisk	Not Applicable
Packing group	I	
Environmental hazard	Not Applicable	
Special precautions for user	EMS Number	F-A , S-B
	Special provisions	Not Applicable
	Limited Quantities	0

Transport in bulk according to Annex II of MARPOL and the IBC code

Not Applicable

SECTION 15 REGULATORY INFORMATION

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

THIONYL CHLORIDE(7719-09-7) IS FOUND ON THE FOLLOWING REGULATORY LISTS

International Air Transport Association (IATA) Dangerous Goods Regulations
- Prohibited List Passenger and Cargo Aircraft

HYDROGEN CHLORIDE(7647-01-0.) IS FOUND ON THE FOLLOWING REGULATORY LISTS

India Permissible Levels of Certain Chemical Substances in Work
Environment

International Agency for Research on Cancer (IARC) - Agents Classified
by the IARC Monographs

International Air Transport Association (IATA) Dangerous Goods Regulations
- Prohibited List Passenger and Cargo Aircraft

SULFUR DIOXIDE(7446-09-5) IS FOUND ON THE FOLLOWING REGULATORY LISTS

India Permissible Levels of Certain Chemical Substances in Work
Environment

International Agency for Research on Cancer (IARC) - Agents Classified
by the IARC Monographs

International Air Transport Association (IATA) Dangerous Goods Regulations
- Prohibited List Passenger and Cargo Aircraft

SULFURIC ACID(7664-93-9) IS FOUND ON THE FOLLOWING REGULATORY LISTS

India Permissible Levels of Certain Chemical Substances in Work
Environment

International Agency for Research on Cancer (IARC) - Agents Classified
by the IARC Monographs

International Air Transport Association (IATA) Dangerous Goods Regulations
- Prohibited List Passenger and Cargo Aircraft

ECHA SUMMARY

Continued...

THIONYL CHLORIDE

Ingredient	CAS number	Index No	ECHA Dossier
thionyl chloride	7719-09-7	016-015-00-0	01-2119486818-18-XXXX 01-2119965161-41-XXXX 01-2119965160-43-XXXX 01-2120102231-82-XXXX

Harmonisation (C&L Inventory)	Hazard Class and Category Code(s)	Pictograms Signal Word Code(s)	Hazard Statement Code(s)
1	Acute Tox. 4; Skin Corr. 1A; Acute Tox. 4	GHS05; Dgr	H302; H314; H332
1	Skin Irrit. 2; Eye Irrit. 2; Acute Tox. 4; Resp. Sens. 1; STOT SE 3	GHS08; Dgr	H315; H319; H332; H334; H335
1	Skin Irrit. 2; Eye Irrit. 2; Acute Tox. 4; Resp. Sens. 1; STOT SE 3	GHS08; Dgr	H315; H319; H332; H334; H335

Harmonisation Code 1 = The most prevalent classification. Harmonisation Code 2 = The most severe classification.

Ingredient	CAS number	Index No	ECHA Dossier
hydrogen chloride	7647-01-0.	017-002-00-2 017-002-01-X	01-2119484862-27-XXXX 01-2120762784-43-XXXX 01-2120066883-46-XXXX

Harmonisation (C&L Inventory)	Hazard Class and Category Code(s)	Pictograms Signal Word Code(s)	Hazard Statement Code(s)
1	Skin Corr. 1A; Acute Tox. 3	GHS05; GHS04; GHS06; Dgr	H314; H331
1	Skin Corr. 1A; Acute Tox. 3	GHS05; GHS04; GHS06; Dgr	H314; H331
1	Skin Corr. 1B; STOT SE 3	GHS05; Dgr	H314; H335
1	Met. Corr. 1; Skin Corr. 1B; STOT SE 3	GHS05; Dgr	H290; H314; H335

Harmonisation Code 1 = The most prevalent classification. Harmonisation Code 2 = The most severe classification.

Ingredient	CAS number	Index No	ECHA Dossier
sulfur dioxide	7446-09-5	016-011-00-9	01-2119485028-34-XXXX

Harmonisation (C&L Inventory)	Hazard Class and Category Code(s)	Pictograms Signal Word Code(s)	Hazard Statement Code(s)
1	Skin Corr. 1B; Acute Tox. 3	GHS05; GHS06; GHS04; Dgr	H314; H331

Harmonisation Code 1 = The most prevalent classification. Harmonisation Code 2 = The most severe classification.

Ingredient	CAS number	Index No	ECHA Dossier
sulfuric acid	7664-93-9	016-020-00-8	01-2119458838-20-XXXX 01-2120080820-60-XXXX

Harmonisation (C&L Inventory)	Hazard Class and Category Code(s)	Pictograms Signal Word Code(s)	Hazard Statement Code(s)
1	Skin Corr. 1A	GHS05; Dgr	H314
1	Skin Irrit. 2; Eye Irrit. 2	GHS07; Wng	H315; H319

Harmonisation Code 1 = The most prevalent classification. Harmonisation Code 2 = The most severe classification.

National Inventory Status

National Inventory	Status
Australia - AICS	Y
Canada - DSL	Y
Canada - NDSL	N (thionyl chloride; sulfur dioxide; sulfuric acid; hydrogen chloride)
China - IECSC	Y
Europe - EINEC / ELINCS / NLP	Y
Japan - ENCS	Y
Korea - KECI	Y
New Zealand - NZIoC	Y
Philippines - PICCS	Y
USA - TSCA	Y

Continued...

THIONYL CHLORIDE

Legend:*Y = All ingredients are on the inventory**N = Not determined or one or more ingredients are not on the inventory and are not exempt from listing(see specific ingredients in brackets)***SECTION 16 OTHER INFORMATION**

CONTACT POINT

The above information is believed to be accurate and represent the best information currently available to us, but does not represent any warranty expressed or implied of the properties of the product. User should make their own investigation to determine the suitability of the information for their particular purpose.