

SECTION 1: Identification

1.1. Identification

Product form : Substance
 Substance name : Chlorine
 CAS No : 7782-50-5
 Product code : SG-1001-01518

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

Use of the substance/mixture : Test gas/Calibration gas

1.3. Details of the supplier of the safety data sheet

Air Liquide USA LLC and its affiliates
 9811 Katy Freeway, Suite 100
 Houston, TX 77024 - USA
 T 1-800-819-1704
www.us.airliquide.com

1.4. Emergency telephone number

Emergency number : CHEMTREC: 1-800-424-9300

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture

GHS-US classification

Oxidizing gases H270
 Category 1
 Gases under pressure H280
 Compressed gas
 Acute toxicity H330
 (inhalation:gas)
 Category 2
 Skin corrosion/irritation H314
 Category 1A
 Serious eye H318
 damage/eye irritation
 Category 1
 Specific target organ H335
 toxicity (single
 exposure) Category 3
 Full text of H statements : see section 16

2.2. Label elements

GHS-US labeling

Hazard pictograms (GHS-US) :



GHS03



GHS04



GHS05



GHS06

Signal word (GHS-US) : Danger

Hazard statements (GHS-US) :
 H270 - May cause or intensify fire; oxidizer
 H280 - Contains gas under pressure; may explode if heated
 H314 - Causes severe skin burns and eye damage
 H318 - Causes serious eye damage
 H330 - Fatal if inhaled
 CGA-HG22 - Corrosive to the respiratory tract

Precautionary statements (GHS-US) :
 P202 - Do not handle until all safety precautions have been read and understood
 P220 - Keep/Store away from combustible materials, clothing
 P244 - Keep reduction valves/valves and fittings free from oil and grease
 P260 - Do not breathe gas
 P271 - Use only outdoors or in a well-ventilated area
 P280 - Wear eye protection, face protection, protective gloves, protective clothing
 P284 - Wear respiratory protection

Chlorine

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

P303+P361+P353 - If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
P304+P340 - If inhaled: Remove person to fresh air and keep comfortable for breathing
P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P307+P311 - If exposed: Call a poison center/doctor
P370+P376 - In case of fire: Stop leak if safe to do so
P403 - Store in a well-ventilated place
P405 - Store locked up
P501 - Dispose of contents/container in accordance with local/regional/national/international regulations
CGA-PG02 - Protect from sunlight when ambient temperature exceeds 52°C (125°F)
CGA-PG05 - Use a back flow preventive device in the piping
CGA-PG06 - Close valve after each use and when empty
CGA-PG10 - Use only with equipment rated for cylinder pressure
CGA-PG14 - Approach suspected leak area with caution
CGA-PG18 - When returning cylinder, install leak tight valve outlet cap or plug
CGA-PG20 - Use only with equipment of compatible materials of construction and rated for cylinder pressure
CGA-PG21 - Open valve slowly
CGA-PG22 - Use only with equipment cleaned for oxygen service

2.3. Other hazards

No additional information available

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/Information on ingredients

3.1. Substance

Name	Product identifier	%	GHS-US classification
Chlorine (Main constituent)	(CAS No) 7782-50-5	> 99	Ox. Gas 1, H270 Compressed gas, H280 Acute Tox. 2 (Inhalation:gas), H330 Skin Corr. 1A, H314 Eye Dam. 1, H318 STOT SE 3, H335

Full text of H-phrases: see section 16

3.2. Mixture

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures after inhalation	: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If you feel unwell, seek medical advice.
First-aid measures after skin contact	: Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. Wash contaminated clothing before reuse.
First-aid measures after eye contact	: Rinse immediately with plenty of water for 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get immediate medical advice/attention.
First-aid measures after ingestion	: Ingestion is not considered a potential route of exposure.

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

Symptoms/injuries after inhalation	: Fatal if inhaled. Corrosive to the respiratory tract.
Symptoms/injuries after skin contact	: Causes severe skin burns and eye damage.
Symptoms/injuries after eye contact	: Causes serious eye damage.
Symptoms/injuries after ingestion	: Ingestion is not considered a potential route of exposure.
Symptoms/injuries upon intravenous administration	: Not known.
Chronic symptoms	: Adverse effects not expected from this product.

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

If you feel unwell, seek medical advice. If breathing is difficult, give oxygen.

Chlorine

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

SECTION 5: Firefighting measures

5.1. Extinguishing media

- Suitable extinguishing media : Use extinguishing media appropriate for surrounding fire.
- Unsuitable extinguishing media : Do not use water jet to extinguish.

5.2. Special hazards arising from the substance or mixture

- Fire hazard : The product is not flammable.
- Explosion hazard : Product is not explosive. Heat may build pressure, rupturing closed containers, spreading fire and increasing risk of burns and injuries.
- Reactivity : Reacts with water to form corrosive acids. Corrosive vapors.

5.3. Advice for firefighters

- Firefighting instructions : In case of fire: Evacuate area. Fight fire remotely due to the risk of explosion. Use water spray or fog for cooling exposed containers. Exercise caution when fighting any chemical fire.
- Protection during firefighting : Standard protective clothing and equipment (e.g., Self Contained Breathing Apparatus) for fire fighters. Do not enter fire area without proper protective equipment, including respiratory protection.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

- General measures : Ensure adequate ventilation.

6.1.1. For non-emergency personnel

- Protective equipment : Wear protective equipment consistent with the site emergency plan.
- Emergency procedures : Escape the danger area by the closest safe route. Close doors and windows of adjacent premises. Keep containers closed. Mark the danger area. Seal off low-lying areas. Keep upwind.

6.1.2. For emergency responders

- Protective equipment : Standard protective clothing and equipment (e.g., Self Contained Breathing Apparatus) for fire fighters. Equip cleanup crew with proper protection.
- Emergency procedures : Evacuate and limit access. Ventilate area.

6.2. Environmental precautions

Try to stop release if safe to do so.

6.3. Methods and material for containment and cleaning up

- For containment : Try to stop release if safe to do so.
- Methods for cleaning up : Dispose of this material and its container in accordance with local regulations.

6.4. Reference to other sections

See also Sections 8 and 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

- Additional hazards when processed : Pressurized container: Do not pierce or burn, even after use. Use equipment rated for cylinder pressure. Close valve after each use and when empty.
- Precautions for safe handling : Do not handle until all safety precautions have been read and understood. Use only outdoors or in a well-ventilated area.
- Hygiene measures : Do not eat, drink or smoke when using this product.

7.2. Conditions for safe storage, including any incompatibilities

- Technical measures : Comply with applicable regulations.
- Storage conditions : Do not expose to temperatures exceeding 52°C (125°F). Keep container closed when not in use. Protect cylinder from physical damage. Store in well ventilated area. Store locked up.
- Incompatible products : None known.
- Incompatible materials : Flammable materials. Combustible materials. Reducing agents.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Chlorine (7782-50-5)

ACGIH	ACGIH TWA (ppm)	0.5 ppm
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Chlorine

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Chlorine (7782-50-5)		
ACGIH	ACGIH STEL (ppm)	1 ppm
OSHA	OSHA PEL (Ceiling) (mg/m³)	3 mg/m³
OSHA	OSHA PEL (Ceiling) (ppm)	1 ppm
IDLH	US IDLH (ppm)	10 ppm
NIOSH	NIOSH REL (ceiling) (mg/m³)	1.45 mg/m³
NIOSH	NIOSH REL (ceiling) (ppm)	0.5 ppm

8.2. Exposure controls

Appropriate engineering controls	: Ensure exposure is below occupational exposure limits. Provide adequate general and local exhaust ventilation. Systems under pressure should be regularly checked for leakages. Consider work permit system e.g. for maintenance activities. Alarm detectors should be used when toxic gases may be released.
Hand protection	: Wear working gloves when handling gas containers. 29 CFR 1910.138: Hand Protection. Wear chemically resistant protective gloves when making or breaking process connections.
Eye protection	: Wear safety glasses with side shields. Wear goggles and a face shield when transfilling or breaking transfer connections. 29 CFR 1910.133: Eye and Face Protection.
Skin and body protection	: Wear suitable protective clothing, e.g. - lab coats, coveralls or flame resistant clothing.
Respiratory protection	: Wear a respirator when performing non-routine tasks not limited to line breaking or sampling. Wear a respirator during routine operations if determined to be necessary during a process-specific review. Consult respirator suppliers' product information or their representatives for the selection of the appropriate respirator. See Sections 5 & 6.
Thermal hazard protection	: None necessary during normal and routine operations.
Environmental exposure controls	: Refer to local regulations for restriction of emissions to the atmosphere. See section 13 for specific methods for waste gas treatment.
Other information	: Wear safety shoes while handling containers. Keep suitable chemically resistant protective clothing readily available for emergency use. 29 CFR 1910.136: Foot Protection.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	: Gas
Appearance	: Greenish-yellow gas.
Color	: Greenish gas.
Odor	: Pungent.
Odor threshold	: 0.23 mg/m³ (Dixon and Ikels)
pH	: If dissolved in water pH-value will be affected.
Melting point	: -101 °C
Freezing point	: -101 °C
Boiling point	: -32.95 °C
Critical temperature	: 144.75 °C
Critical pressure	: 7991 kPa
Flash point	: No data available
Relative evaporation rate (butyl acetate=1)	: No data available
Relative evaporation rate (ether=1)	: Not applicable.
Flammability (solid, gas)	: See Section 2.1 and 2.2
Explosion limits	: Not applicable - non flammable
Explosive properties	: Not applicable - not flammable.
Oxidizing properties	: Not combustible but enhances combustion of other substances. May cause or intensify fire; oxidizer.
Vapor pressure	: 3692.2873186981 mbar
Relative density	: 1.6
Relative vapor density at 20 °C	: 2.473
Specific gravity / density	: 2.7 kg/m³ (at 50 °C)
Molecular mass	: 70.906 g/mol

Chlorine

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Relative gas density	: Heavier than air
Solubility	: Water: 8620 mg/l
Log Pow	: Not applicable for inorganic gases.
Auto-ignition temperature	: Not applicable - non flammable
Decomposition temperature	: No data available
Viscosity	: No data available
Viscosity, kinematic	: Not applicable.
Viscosity, dynamic	: Not applicable.

9.2. Other information

Additional information	: Gas/vapor heavier than air. May accumulate in confined spaces, particularly at or below ground level
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SECTION 10: Stability and reactivity

10.1. Reactivity

Reacts with water to form corrosive acids. Corrosive vapors.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

May react violently with reducing agents. Can form explosive mixtures with flammable materials.

10.4. Conditions to avoid

Moisture.

10.5. Incompatible materials

Combustible materials. Flammable materials. Reducing agents.

10.6. Hazardous decomposition products

Under normal conditions of storage and use hazardous decomposition products should not be produced.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Inhalation:gas: Fatal if inhaled.

Chlorine (7782-50-5)	
LC50 inhalation rat (mg/l)	0.86 mg/l (Exposure time: 1 h)
LC50 inhalation rat (ppm)	146.5 ppm/4h
ATE US (gases)	146.500 ppmV/4h
ATE US (vapors)	0.860 mg/l/4h
ATE US (dust, mist)	0.860 mg/l/4h

Skin corrosion/irritation	: Causes severe skin burns and eye damage. pH: If dissolved in water pH-value will be affected.
Serious eye damage/irritation	: Causes serious eye damage. pH: If dissolved in water pH-value will be affected.
Respiratory or skin sensitization	: Not classified
Germ cell mutagenicity	: Not classified
Carcinogenicity	: Not classified
Reproductive toxicity	: Not classified
Specific target organ toxicity (single exposure)	: May cause respiratory irritation.
Specific target organ toxicity (repeated exposure)	: Not classified
Aspiration hazard	: Not classified
Symptoms/injuries after inhalation	: Fatal if inhaled. Corrosive to the respiratory tract.
Symptoms/injuries after skin contact	: Causes severe skin burns and eye damage.
Symptoms/injuries after eye contact	: Causes serious eye damage.

Chlorine

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Symptoms/injuries after ingestion	: Ingestion is not considered a potential route of exposure.
Symptoms/injuries upon intravenous administration	: Not known.
Chronic symptoms	: Adverse effects not expected from this product.

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general : Very toxic to aquatic life.

Chlorine (7782-50-5)	
LC50 fish 1	0.44 mg/l (Exposure time: 96 h - Species: Lepomis macrochirus [flow-through])
EC50 Daphnia 1	0.017 mg/l (Exposure time: 48 h - Species: Daphnia magna)
LC50 fish 2	0.014 mg/l (Exposure time: 96 h - Species: Oncorhynchus mykiss [flow-through])

12.2. Persistence and degradability

Chlorine (7782-50-5)	
Persistence and degradability	Not applicable for inorganic gases.

12.3. Bioaccumulative potential

Chlorine (7782-50-5)	
BCF fish 1	(no bioaccumulation expected)
Log Pow	Not applicable for inorganic gases.
Bioaccumulative potential	No data available.

12.4. Mobility in soil

Chlorine (7782-50-5)	
Ecology - soil	Because of its high volatility, the product is unlikely to cause ground or water pollution.

12.5. Other adverse effects

Other adverse effects	: May cause pH changes in aqueous ecological systems.
Effect on ozone layer	: None
Effect on global warming	: No known effects from this product

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste treatment methods	: Contact supplier if guidance is required. Do not discharge into any place where its accumulation could be dangerous. Ensure that the emission levels from local regulations or operating permits are not exceeded.
Waste disposal recommendations	: Refer to the CGA Pamphlet P-63 "Disposal of Gases" available at www.cganet.com for more guidance on suitable disposal methods.

SECTION 14: Transport information

Department of Transportation (DOT)

In accordance with DOT

Transport document description	: UN1017 Chlorine, 2.3
UN-No.(DOT)	: UN1017
Proper Shipping Name (DOT)	: Chlorine
Class (DOT)	: 2.3 - Class 2.3 - Poisonous gas 49 CFR 173.115
Hazard labels (DOT)	: 2.3 - Poison gas 5.1 - Oxidiser 8 - Corrosive



DOT Packaging Non Bulk (49 CFR 173.xxx)	: 304
DOT Packaging Bulk (49 CFR 173.xxx)	: 314;315

Chlorine

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

DOT Special Provisions (49 CFR 172.102)	: 2 - This material is poisonous by inhalation (see 171.8 of this subchapter) in Hazard Zone B (see 173.116(a) or 173.133(a) of this subchapter), and must be described as an inhalation hazard under the provisions of this subchapter B9 - Bottom outlets are not authorized B14 - Each bulk packaging, except a tank car or a multi-unit-tank car tank, must be insulated with an insulating material so that the overall thermal conductance at 15.5 C (60 F) is no more than 1.5333 kilojoules per hour per square meter per degree Celsius (0.075 Btu per hour per square foot per degree Fahrenheit) temperature differential. Insulating materials must not promote corrosion to steel when wet N86 - UN pressure receptacles made of aluminum alloy are not authorized T50 - When portable tank instruction T50 is referenced in Column (7) of the 172.101 Table, the applicable liquefied compressed gases are authorized to be transported in portable tanks in accordance with the requirements of 173.313 of this subchapter TP19 - The calculated wall thickness must be increased by 3 mm at the time of construction. Wall thickness must be verified ultrasonically at intervals midway between periodic hydraulic tests (every 2.5 years). The portable tank must not be used if the wall thickness is less than that prescribed by the applicable T code in Column (7) of the Table for this material
DOT Packaging Exceptions (49 CFR 173.xxx)	: None
DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27)	: Forbidden
DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75)	: Forbidden
DOT Vessel Stowage Location	: D - The material must be stowed "on deck only" on a cargo vessel and on a passenger vessel carrying a number of passengers limited to not more than the larger of 25 passengers or one passenger per each 3 m of overall vessel length, but the material is prohibited on passenger vessels in which the limiting number of passengers is exceeded
DOT Vessel Stowage Other	: 40 - Stow "clear of living quarters",51 - Stow "separated from" acetylene,55 - Stow "separated from" ammonia,62 - Stow "separated from" diborane,68 - Stow "separated from" hydrogen,89 - Segregation same as for oxidizers,90 - Stow "separated from" radioactive materials
Emergency Response Guide (ERG) Number	: 124
Other information	: No supplementary information available.
Special transport precautions	: Avoid transport on vehicles where the load space is not separated from the driver's compartment. Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency. Before transporting product containers: - Ensure there is adequate ventilation. - Ensure that containers are firmly secured. - Ensure cylinder valve is closed and not leaking. - Ensure valve outlet cap nut or plug (where provided) is correctly fitted. - Ensure valve protection device (where provided) is correctly fitted.

TDG

Transport document description	: UN1017 CHLORINE, 2.3
UN-No. (TDG)	: UN1017
TDG Proper Shipping Name	: CHLORINE
TDG Primary Hazard Classes	: 2.3 - Class 2.3 - Toxic Gas.
TDG Subsidiary Classes	: 5.1;8
TDG Special Provisions	: 23 - (1) A consignor of these dangerous goods must include, except for UN1005, ANHYDROUS AMMONIA, the words "toxic by inhalation" or "toxic — inhalation hazard" or "toxique par inhalation" or "toxicité par inhalation" in the following places, unless the words are already part of the shipping name: (a) on a shipping document, immediately after the description of the dangerous goods; (b) on a small means of containment, next to the shipping name of the dangerous goods; and (c) on a large means of containment, next to the placard for the primary class of the dangerous goods or the placard for the subsidiary class, if any. For example, the notation on a shipping document would be "UN1935, CYANIDE SOLUTION, N.O.S., Class 6.1, PG I, toxic by inhalation". (2) This special provision does not apply to a person who transports these dangerous goods in accordance with an exemption set out in sections 1.15, 1.17 or 1.17.1 of Part 1 (Coming Into Force, Repeal, Interpretation, General Provisions and Special Cases). (3) A consignor of UN1005, ANHYDROUS AMMONIA, must include the words "inhalation hazard" or "dangereux par inhalation": (a) on a shipping document, immediately after the shipping name of the dangerous goods; and (b) on a small means of containment, next to the shipping name of the dangerous goods. When UN1005, ANHYDROUS AMMONIA, is contained in a large means of containment on which is affixed the anhydrous ammonia placard, the words "Anhydrous Ammonia, Inhalation Hazard" or "Ammoniac anhydre, dangereux par inhalation" must be displayed next to the placard in accordance with paragraph 4.18.2(b). SOR/2014-306
ERAP Index	: 500
Explosive Limit and Limited Quantity Index	: 0

Chlorine

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Passenger Carrying Road Vehicle or Passenger : Forbidden
Carrying Railway Vehicle Index
Passenger Carrying Ship Index : Forbidden

Transport by sea

UN-No. (IMDG) : 1017
Class (IMDG) : 2 - Gases
MFAG-No : 124

Air transport

UN-No. (IATA) : Forbidden

SECTION 15: Regulatory information

15.1. US Federal regulations

Chlorine (7782-50-5)

Listed on the United States TSCA (Toxic Substances Control Act) inventory
Listed on the United States SARA Section 302
Subject to reporting requirements of United States SARA Section 313

SARA Section 302 Threshold Planning Quantity (TPQ)	100
SARA Section 313 - Emission Reporting	1.0 %

15.2. International regulations

CANADA

Chlorine (7782-50-5)

Listed on the Canadian DSL (Domestic Substances List)

WHMIS Classification	Class A - Compressed Gas Class D Division 1 Subdivision A - Very toxic material causing immediate and serious toxic effects Class E - Corrosive Material
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EU-Regulations

Chlorine (7782-50-5)

Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)

National regulations

Chlorine (7782-50-5)

Listed on the AICS (Australian Inventory of Chemical Substances)
Listed on IECSC (Inventory of Existing Chemical Substances Produced or Imported in China)
Listed on the Korean ECL (Existing Chemicals List)
Listed on NZIoC (New Zealand Inventory of Chemicals)
Listed on PICCS (Philippines Inventory of Chemicals and Chemical Substances)
Japanese Poisonous and Deleterious Substances Control Law
Listed on the Canadian IDL (Ingredient Disclosure List)

15.3. US State regulations

Chlorine (7782-50-5)

State or local regulations	U.S. - Massachusetts - Right To Know List U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List U.S. - Pennsylvania - RTK (Right to Know) List
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SECTION 16: Other information

Other information : This Safety Data Sheet is offered pursuant to OSHA's Hazard Communication Standard, 29 CFR, 1910.1200. Other government regulations must be reviewed for applicability to this product.

Chlorine

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Full text of H-phrases:

H270	May cause or intensify fire; oxidizer
H280	Contains gas under pressure; may explode if heated
H314	Causes severe skin burns and eye damage
H318	Causes serious eye damage
H330	Fatal if inhaled
H335	May cause respiratory irritation

SDS US (GHS HazCom 2012)

This Safety Data Sheet is offered pursuant to OSHA's Hazard Communication Standard, 29 CFR, 1910.1200. Other government regulations must be reviewed for applicability to this product. To the best of Air Liquide USA LLC and its affiliates' knowledge, the information contained herein is reliable and accurate as of this date; however, accuracy, suitability or completeness are not guaranteed and no warranties of any type, either express or implied, are provided. The information contained herein relates only to this specific product. If this product is combined with other materials, all component properties must be considered. Data may be changed from time to time. Be sure to consult the latest edition.