

SAFETY DATA SHEET

Version 2.0
Revision Date 06.11.2017
Supersedes Version: 1.4

SDS Number 30000023748
Print Date 16.12.2017

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier : Oxygen (Refrigerated)

CAS No. : 7782-44-7

Chemical formula : O₂

REACH Registration Number: Listed in Annex IV / V REACH, exempted from registration.

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

Use of the Substance/Mixture : Medical Applications

Restrictions on Use : No data available.

1.3. Details of the supplier of the safety data sheet : Air Products Plc
2 Millennium Gate
Westmere Drive
Crewe
Cheshire

Email Address – Technical Information : GASTECH@airproducts.com

Telephone : +44(0)3457 020202

1.4. Emergency telephone number : +44(0)8085 020202

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Oxidizing gases - Category 1 H270:May cause or intensify fire; oxidiser.

Gases under pressure - Refrigerated liquefied gas H281:Contains refrigerated gas; may cause cryogenic burns or injury.

2.2. Label elements

Hazard pictograms/symbols



Signal Word: Danger

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Hazard Statements:

H270:May cause or intensify fire; oxidiser.
H281:Contains refrigerated gas; may cause cryogenic burns or injury.

Precautionary Statements:

Prevention : P220:Keep away from clothing and other combustible materials.
P244:Keep valves and fittings free from oil and grease.
P282:Wear cold insulating gloves/face shield/eye protection.

Response : P370+P376 :In case of fire: Stop leak if safe to do so.
P336 :Thaw frosted parts with lukewarm water. Do not rub affected area.
P315 :Get immediate medical advice/attention.

Storage : P403:Store in a well-ventilated place.

2.3. Other hazards

Extremely cold liquid and gas under pressure.
Direct contact with liquid can cause frostbite.
May react violently with combustible materials.
Keep oil, grease, and combustibles away.

SECTION 3: Composition/information on ingredients

3.1. Substances

Components	EINECS / ELINCS Number	CAS Number	Concentration (Volume)
Oxygen	231-956-9	7782-44-7	100 %

Components	Classification (CLP)	REACH Reg. #
Oxygen	Ox. Gas 1 ;H270 Press. Gas (Ref. liq.)	*1

*1:Listed in Annex IV / V REACH, exempted from registration.
*2:Registration not required: Substance manufactured or imported < 1 t/y.
*3:Registration deadline not expired.

Refer to section 16 for full text of each relevant hazard statement (H).

3.2. Mixtures : Not applicable.

SECTION 4: First aid measures

4.1. Description of first aid measures

Eye contact : In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

Skin contact : In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash frost-bitten areas with plenty of water. Do not remove clothing. As soon as practical, place the affected area in a warm water bath- which has a temperature not to exceed

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40 °C (105 °F). Cover wound with sterile dressing.

Ingestion : Ingestion is not considered a potential route of exposure.

Inhalation : Consult a physician after significant exposure. Move to fresh air.

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

Symptoms : No data available.

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

Treatment : If exposed or concerned: Get medical attention/advice.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : All known extinguishing media can be used.
Use extinguishing media appropriate for surrounding fire.

Extinguishing media which must not be used for safety reasons. : No data available.

5.2. Special hazards arising from the substance or mixture

: Combustibles in contact with liquid oxygen may explode on ignition or impact. Some materials which are noncombustible in air may burn in the presence of an oxidizer. Contact with organic and most inorganic materials may cause fire. Move away from container and cool with water from a protected position. Do not direct water spray at container vent. If possible, stop flow of product. Gas is heavier than air and may collect in low areas or travel along the ground where there may be an ignition source present. Vapor cloud may obscure visibility.

5.3. Advice for firefighters

: Fire resistant clothing may burn and offer no protection in oxygen rich atmospheres. Wear self contained breathing apparatus for fire fighting if necessary. Standard protective clothing and equipment (Self Contained Breathing Apparatus) for fire fighters. Standard EN 137 - Self-contained open-circuit compressed air breathing apparatus with full face mask. Standard EN 469 - Protective clothing for firefighters. Standard - EN 659: Protective gloves for firefighters.

Further information : Some materials that are noncombustible in air will burn in the presence of an oxygen enriched atmosphere (greater than 23.5%). Fire resistant clothing may burn and offer no protection in oxygen rich atmospheres.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

: Clothing exposed to high concentrations may retain oxygen 30 minutes or longer and become a potential fire hazard. Stay away from ignition sources. Evacuate personnel to safe areas. Ventilate the area. Monitor oxygen level. Spill will rapidly vaporize forming an oxygen rich vapor cloud. Gas/vapor heavier than air. May accumulate in confined spaces, particularly at or below ground level. Personnel who have been exposed to high concentrations of oxygen should stay in a well-ventilated or open area for 30 minutes before going into a confined space or near an ignition source.

6.2. Environmental : No data available.

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precautions

6.3. Methods and material for containment and cleaning up : Ventilate the area.

Additional advice : Increase ventilation to the release area and monitor oxygen level.

6.4. Reference to other sections : For more information refer to Sections 8 & 13

SECTION 7: Handling and storage

7.1. Precautions for safe handling

All gauges, valves, regulators, piping and equipment to be used in oxygen service must be cleaned for oxygen service. Oxygen is not to be used as a substitute for compressed air. Never use an oxygen jet for cleaning purposes of any sort, especially clothing, as it increases the likelihood of an engulfing fire. Know and understand the properties and hazards of the product before use. Only experienced and properly instructed persons should handle compressed gases/cryogenic liquids. Before using the product, determine its identity by reading the label. Do not remove or deface labels provided by the supplier for the identification of the cylinder contents. Before connecting the container, check the complete gas system for suitability, particularly for pressure rating and materials. Before connecting the container for use, ensure that back feed from the system into the container is prevented. Close container valve after each use and when empty, even if still connected to equipment. Never attempt to repair or modify container valves or safety relief devices. Damaged valves should be reported immediately to the supplier. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier. Do not remove or interchange connections. Prevent entrapment of cryogenic liquid in closed systems not protected with relief device. When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders. When doubt exists as to the correct handling procedure for a particular gas, contact the supplier. Employ suitable pressure regulating devices on all containers when the gas is being emitted to systems with lower pressure rating than that of the container. Do not subject containers to abnormal mechanical shock. Only transfer lines designed for cryogenic liquids shall be used. Use only with equipment cleaned for oxygen service and rated for cylinder pressure. Never permit oil, grease, or other readily combustible substances to come into contact with valves or containers containing oxygen or other oxidants. All vents should be piped to the exterior of the building.

7.2. Conditions for safe storage, including any incompatibilities

Containers should be stored in a purpose build compound which should be well ventilated, preferably in the open air. Do not allow storage temperature to exceed 50°C (122°F). Full containers should be stored so that oldest stock is used first. Do not store in a confined space. Full and empty cylinders should be segregated. Store containers in location free from fire risk and away from sources of heat and ignition. Return empty containers in a timely manner. Stored containers should be periodically checked for general condition and leakage. Protect containers stored in the open against rusting and extremes of weather. Containers should not be stored in conditions likely to encourage corrosion. Cryogenic containers are equipped with pressure relief devices to control internal pressure. Under normal conditions these containers will periodically vent product. Where necessary containers containing oxygen and oxidants should be separated from flammable gases by a fire resistant partition.

7.3. Specific end use(s)

Refer to section 1 or the extended SDS if applicable.

SECTION 8: Exposure controls/personal protection

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8.1. Control parameters

If applicable, refer to the extended section of the SDS for further information on CSA.

8.2. Exposure controls

Engineering measures

Natural or mechanical to prevent oxygen-enriched atmospheres above 23.5% oxygen.

Personal protective equipment

- Respiratory protection : None necessary.
- Hand protection : Wear working gloves when handling gas containers.
Gloves must be clean and free of oil and grease.
If the operation involves possible exposure to a cryogenic liquid, wear loose fitting thermal insulated or cryo-gloves.
Standard EN 388 - Protective gloves against mechanical risk.
Standard EN 511 - Cold insulating gloves.
- Eye/face Protection : Safety glasses recommended when handling cylinders.
Wear goggles and a face shield when transfilling or breaking transfer connections.
Standard EN 166 - Personal eye-protection.
- Skin and body protection : Personnel who have been exposed to high concentrations of oxygen should stay in a well-ventilated or open area for 30 minutes before going into a confined space or near an ignition source.
Never allow any unprotected part of the body to touch uninsulated pipes or vessels which contain cryogenic fluids. The extremely cold metal will cause the flesh to stick fast and tear when one attempts to withdraw from it.
Safety shoes are recommended when handling cylinders.
Standard EN ISO 20345 - Personal protective equipment - Safety footwear.
Encapsulated chemical protective suit in emergency situations.
- Special instructions for protection and hygiene : Ensure adequate ventilation, especially in confined areas.
- Environmental Exposure Controls : If applicable, refer to the extended section of the SDS for further information on CSA.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

- (a/b) Physical state/Colour : Liquefied gas. blue
- (c) Odour : No odor warning properties.
- (d) Density : 0.0013 g/cm³ (0.081 lb/ft³) at 21 °C (70 °F)
Note: (as vapor)
- (e) Relative Density : 1.1 (water = 1)
- (f) Melting point / freezing point : -362 °F (-219 °C)
- (g) Boiling point/range : -297 °F (-183 °C)
- (h) Vapor pressure : Not applicable.

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- (i) Water solubility : 0.039 g/l
- (j) Partition coefficient:
n-octanol/water [log Kow] : Not applicable for inorganic gases.
- (k) pH : Not applicable for gases and gas mixtures.
- (l) Viscosity : No reliable data available.
- (m) Particle characteristics : Not applicable for gases and gas mixtures.
- (n) Upper and lower explosion /
flammability limits : Non flammable.
- (o) Flash point : Not applicable for gases and gas mixtures.
- (p) Autoignition temperature : Non flammable.
- (q) Decomposition
temperature : Not applicable.

9.2. Other information

- Explosive properties : Not applicable.
- Oxidizing properties : Ci =1
- Molecular Weight : 32 g/mol
- Odor threshold : Odour threshold is subjective and inadequate to warn of overexposure.
- Evaporation rate : Not applicable for gases and gas mixtures.
- Flammability (solid, gas) : Refer to product classification in Section 2
- Specific Volume : 0.7540 m³/kg (12.08 ft³/lb) at 21 °C (70 °F)
- Relative vapor density : 1.105 (air = 1) Heavier than air.

SECTION 10: Stability and reactivity

- 10.1. Reactivity : No reactivity hazard other than the effects described in sub-sections below.
- 10.2. Chemical stability : Stable under normal conditions.
- 10.3. Possibility of hazardous
reactions : Violently oxidises organic material.
- 10.4. Conditions to avoid : None under recommended storage and handling conditions (see section 7).

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10.5. Incompatible materials : Avoid oil, grease and all other combustible materials.
Flammable materials.
Organic materials.
finely divided aluminium
Carbon steel.
Reducing agents.

10.6. Hazardous decomposition products : No data available.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Likely routes of exposure

- Effects on Eye : Contact with liquid may cause cold burns/frostbite.
- Effects on Skin : Contact with liquid may cause cold burns/frostbite. May cause severe frostbite.
- Inhalation Effects : Breathing 75% or more oxygen at atmospheric pressure for more than a few hours may cause nasal stuffiness, cough, sore throat, chest pain and breathing difficulty. Breathing pure oxygen under pressure may cause lung damage and also central nervous system effects. Breathing 75% or more oxygen at atmospheric pressure for more than a few hours may cause nasal stuffiness, cough, sore throat, chest pain and breathing difficulty. Breathing pure oxygen under pressure may cause lung damage and also central nervous system effects.
- Ingestion Effects : Ingestion is not considered a potential route of exposure.
- Symptoms : No data available.

Acute toxicity

- Acute Oral Toxicity : No data is available on the product itself.
- Acute Inhalation Toxicity : No data is available on the product itself.
- Acute Dermal Toxicity : No data is available on the product itself.
- Skin corrosion/irritation : No data available.
- Serious eye damage/eye irritation : No data available.
- Sensitization. : No data available.

Chronic toxicity or effects from long term exposures

- Carcinogenicity : No data available.
- Reproductive toxicity : No data is available on the product itself.
- Germ cell mutagenicity : No data is available on the product itself.

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Specific target organ systemic toxicity (single exposure) : No data available.

Specific target organ systemic toxicity (repeated exposure) : No data available.

Aspiration hazard : No data available.

SECTION 12: Ecological information

12.1. Toxicity

Aquatic toxicity : No data is available on the product itself.

Toxicity to other organisms : No data is available on the product itself.

12.2. Persistence and degradability

No data available.

12.3. Bioaccumulative potential

Refer to Section 9 "Partition Coefficient (n-octanol/water)".

12.4. Mobility in soil

Because of its high volatility, the product is unlikely to cause ground pollution.

12.5. Results of PBT and vPvB assessment

If applicable, refer to the extended section of the SDS for further information on CSA.

12.6. Other adverse effects

No data available.

Effect on the ozone layer
Ozone Depleting Potential : No data available.

Global Warming Potential : No data available.

SECTION 13: Disposal considerations

13.1. Waste treatment methods : Return unused product in original cylinder to supplier. Contact supplier if guidance is required. Refer to the EIGA code of practice Doc. 30 "Disposal of Gases", downloadable at <http://www.eiga.org> for more guidance on suitable disposal methods. List of hazardous waste codes: 16 05 04: Gases in pressure containers (including halons) containing dangerous substances.

Contaminated packaging : Return cylinder to supplier.

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SECTION 14: Transport information

ADR

UN/ID No. : UN1073
Proper shipping name : OXYGEN, REFRIGERATED LIQUID
Class or Division : 2
Tunnel Code : (C/E)
Label(s) : 2.2 (5.1)
ADR/RID Hazard ID no. : 225
Marine Pollutant : No

IATA

Transport Forbidden

IMDG

UN/ID No. : UN1073
Proper shipping name : OXYGEN, REFRIGERATED LIQUID
Class or Division : 2.2
Label(s) : 2.2 (5.1)
Marine Pollutant : No
Segregation Group: : None

RID

UN/ID No. : UN1073
Proper shipping name : OXYGEN, REFRIGERATED LIQUID
Class or Division : 2
Label(s) : 2.2 (5.1)
Marine Pollutant : No

Transport in bulk according to Annex II of Marpol and the IBC Code
For complete transportation information, contact customer service.

Further Information

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. The transportation information is not intended to convey all specific regulatory data relating to this material. For complete transportation information, contact customer service.

SECTION 15: Regulatory information

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

Country	Regulatory list	Notification
USA	TSCA	Included on Inventory.
EU	EINECS	Included on Inventory.
Canada	DSL	Included on Inventory.
Australia	AICS	Included on Inventory.
Japan	ENCS	Included on Inventory.
South Korea	ECL	Included on Inventory.
China	SEPA	Included on Inventory.
Philippines	PICCS	Included on Inventory.

Other Regulations

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REGULATION (EC) No 1907/2006 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC.

COMMISSION REGULATION (EU) 2015/830 of 28 May 2015 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).

Regulation (EC) No 1272/2008 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.

Control of Substances Hazardous to Health Regulations 2002 (as amended)

Health and Safety at Work etc. Act 1974

Management of Health and Safety at Work Regulations (Northern Ireland) 2000 c.388, and as amended

The Health and Safety at Work etc. Act 1974 (Application to Environmentally Hazardous Substances) Regulations 2002 (England and Wales and Scotland) 11 March 2002 c.282, and as amended

Health and Safety at Work Order (Application to Environmentally Hazardous Substances) Regulations (Northern Ireland) 2003 (Northern Ireland) 14 March 2003 c52, and as amended

The Control of Major Accident Hazards Regulations 2015 c483

The Control of Major Accident Hazards Regulations (Northern Ireland) 2015 c325

The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2011 c1885, and as amended

The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations with amendments (Northern Ireland) 2011 c365

The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 c.407

The Water Environment Regulations (Northern Ireland) 2017 c.81

Pollution Prevention and Control Act 1999 c.24

The Fluorinated Greenhouse Gases Regulations 2015 c.310

The Fluorinated Greenhouse Gases Regulations (Northern Ireland) 2015 c.425

The Acetylene Safety (England and Wales and Scotland) Regulations 2014 c.1639

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The Highly Flammable Liquids and Liquefied Petroleum Gases Regulations 1972 c.917

The Highly Flammable Liquids and Liquefied Petroleum Gases Regulations (Northern Ireland) 1975 c.256

Dangerous Substances and Explosive Atmospheres Regulations (Northern Ireland) 2003 c.152

The Dangerous Substances and Explosive Atmospheres Regulations 2002 c.2776

Pollution Prevention and Control Act 1999

The Environmental Permitting (England and Wales) Regulations 2016

Ozone Depleting Substances Regulations 2015

15.2. Chemical safety assessment

A CSA does not need to be carried out for this product.

SECTION 16: Other information

Ensure all national/local regulations are observed.

Hazard Statements:
H270 May cause or intensify fire; oxidiser.

Indication of Method:
Oxidizing gases Category 1 May cause or intensify fire; oxidiser. Calculation method

Gases under pressure Refrigerated liquefied gas Contains refrigerated gas; may cause cryogenic burns or injury.
Calculation method

Abbreviations and acronyms:

ATE - Acute Toxicity Estimate

CLP - Classification Labelling Packaging Regulation; Regulation (EC) No 1272/2008

REACH - Registration, Evaluation, Authorisation and Restriction of Chemicals Regulation (EC) No 1907/2006

EINECS - European Inventory of Existing Commercial Chemical Substances

ELINCS - European List of Notified Chemical Substances

CAS# - Chemical Abstract Service number

PPE - Personal Protection Equipment

Kow - octanol-water partition coefficient

DNEL - Derived No Effect Level

LC50 - Lethal Concentration to 50 % of a test population

LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose)

NOEC - No Observed Effect Concentration

PNEC - Predicted No Effect Concentration

RMM - Risk Management Measure

OEL - Occupational Exposure Limit

PBT - Persistent, Bioaccumulative and Toxic

vPvB - Very Persistent and Very Bioaccumulative

STOT - Specific Target Organ Toxicity

CSA - Chemical Safety Assessment

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EN - European Standard
UN - United Nations
ADR - European Agreement concerning the International Carriage of Dangerous Goods by Road
IATA - International Air Transport Association
IMDG - International Maritime Dangerous Goods
RID - Regulations concerning the International Carriage of Dangerous Goods by Rail
WGK - Water Hazard Class

Key literature references and sources for data:
ECHA - Guidance on the compilation of safety data sheets
ECHA - Guidance on the application of the CLP Criteria
ARIEL database

Prepared by : Air Products and Chemicals, Inc. Global EH&S Department

For additional information, please visit our Product Stewardship web site at
<http://www.airproducts.com/productstewardship/>

This Safety Data Sheet has been established in accordance with the applicable European Directives and applies to all countries that have translated the Directives in their national laws. COMMISSION REGULATION (EU) 2015/830 of 28 May 2015 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).

Details given in this document are believed to be correct at the time of going to press. Whilst proper care has been taken in the preparation of this document, no liability for injury or damage resulting from its use can be accepted.
