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## SECTION 1: Identification

### 1.1 GHS Product identifier

Product name Ozone

### 1.2 Other means of identification

Product number -

Other names Triatomic oxygen;Oxygen,mol (O3);Ozon [Polish]

### 1.3 Recommended use of the chemical and restrictions on use

Identified uses Oxidizing/reducing agents

Uses advised against no data available

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## SECTION 2: Hazard identification

### 2.1 Classification of the substance or mixture

Oxidizing gases, Category 1

Skin corrosion, Sub-category 1B

Serious eye damage, Category 1

Acute toxicity - Category 1, Inhalation

Specific target organ toxicity "repeated exposure, Category 1

Hazardous to the aquatic environment, short-term (Acute) - Category Acute 1

Hazardous to the aquatic environment, long-term (Chronic) - Category Chronic 1

### 2.2 GHS label elements, including precautionary statements

Pictogram(s)



Signal word

Danger

Hazard statement(s)

H270 May cause or intensify fire; oxidizer

H314 Causes severe skin burns and eye damage

H330 Fatal if inhaled

H372 Causes damage to organs through prolonged or repeated exposure

H400 Very toxic to aquatic life

H410 Very toxic to aquatic life with long lasting effects

Precautionary statement(s)

Prevention

P220 Keep away from clothing and other combustible materials.

P244 Keep valves and fittings free from oil and grease.

P260 Do not breathe dust/fume/gas/mist/vapours/spray.

P264 Wash ... thoroughly after handling.

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

P271 Use only outdoors or in a well-ventilated area.

P284 [In case of inadequate ventilation] wear respiratory protection.

P270 Do not eat, drink or smoke when using this product.

P273 Avoid release to the environment.

Response

P370+P376 In case of fire: Stop leak if safe to do so.

P301+P330+P331 IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.

P363 Wash contaminated clothing before reuse.

P304+P340 IF INHALED: Remove person to fresh air and keep comfortable for breathing.

P316 Get emergency medical help immediately.

P321 Specific treatment (see ... on this label).

P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P305+P354+P338 IF IN EYES: Immediately rinse with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P317 Get medical help.

P320 Specific treatment is urgent (see ... on this label).

P319 Get medical help if you feel unwell.

P391 Collect spillage.

Storage

P403 Store in a well-ventilated place.

P405 Store locked up.

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

Disposal

P501 Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.

### 2.3 Other hazards which do not result in classification

no data available

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## SECTION 3: Composition/information on ingredients

### 3.1 Substances

Chemical name	Common names and synonyms	CAS number	EC number	Concentration
Ozone	Ozone	10028-15-6	233-069-2	100%

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## SECTION 4: First-aid measures

### 4.1 Description of necessary first-aid measures

#### If inhaled

Fresh air, rest. Half-upright position. Refer for medical attention.

#### Following skin contact

ON FROSTBITE: rinse with plenty of water, do NOT remove clothes. Refer for medical attention .

#### Following eye contact

First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.

#### Following ingestion

Rinse mouth with water. Do not induce vomiting. Never give anything by mouth to an unconscious person. Call a doctor or Poison Control Center immediately.

### 4.2 Most important symptoms/effects, acute and delayed

Ozone is highly toxic via inhalation or by contact of liquid to skin, eyes, or mucous membranes. It is capable of causing acute to chronic lung damage, burns, and death or permanent injury. Ozone can be toxic at a concentration of 100 ppm for 1 minute. Ozone is capable of causing death from pulmonary edema. It increases sensitivity of the lungs to bronchoconstrictors and allergens, increases susceptibility to and severity of lung bacterial and viral infections. (EPA, 1998)

### 4.3 Indication of immediate medical attention and special treatment needed, if necessary

Treatment is supportive, similar to that for smoke inhalation and chlorine

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## SECTION 5: Fire-fighting measures

### 5.1 Suitable extinguishing media

In case of fire: keep cylinder cool by spraying water. (EPA, 1998)

### 5.2 Specific hazards arising from the chemical

Severe explosion hazard when shocked, exposed to heat or flame, or by chemical reaction with organic substances, especially reducing agents. Ozone is a powerful oxidizing agent. Incompatible with alkenes; aromatic compounds; benzene, rubber; bromine; dicyanogen; diethyl ether; dinitrogen tetroxide; hydrogen bromide; 4-hydroxy-4-methyl-1,6-heptadiene; nitrogen trichloride; stibine; tetrafluorohydrazine. Avoid contact with organic materials. (EPA, 1998)

### 5.3 Special protective actions for fire-fighters

In case of fire in the surroundings, use appropriate extinguishing media. Combat fire from a sheltered position.

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## SECTION 6: Accidental release measures

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

Evacuate danger area! Consult an expert! Personal protection: chemical protection suit including self-contained breathing apparatus. Ventilation.

### 6.2 Environmental precautions

Evacuate danger area! Consult an expert! Personal protection: chemical protection suit including self-contained breathing apparatus. Ventilation.

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

Collect and arrange disposal. Keep the chemical in suitable and closed containers for disposal. Remove all sources of ignition. Use spark-proof tools and explosion-proof equipment. Adhered or collected material should be promptly disposed of, in accordance with appropriate laws and regulations.

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## SECTION 7: Handling and storage

### 7.1 Precautions for safe handling

NO open flames, NO sparks and NO smoking. NO contact with combustible substances. Closed system, ventilation, explosion-proof electrical equipment and lighting. Handling in a well ventilated place. Wear suitable protective clothing. Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Use non-sparking tools. Prevent fire caused by electrostatic discharge steam.

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

Fireproof if in building. Separated from all substances. Cool.CYLINDERS OF DISSOLVED OZONE SHOULD BE STORED IN

## SECTION 8: Exposure controls/personal protection

### 8.1 Control parameters

#### Occupational Exposure limit values

TLV: (light work): 0.1 ppm as TWA; (moderate work): 0.08 ppm as TWA; (heavy work): 0.05 ppm as TWA. TLV: (less than 2 hours work): 0.2 ppm as TWA. TLV: A4 (not classifiable as a human carcinogen). MAK: carcinogen category: 3B

#### Biological limit values

no data available

### 8.2 Appropriate engineering controls

Ensure adequate ventilation. Handle in accordance with good industrial hygiene and safety practice. Set up emergency exits and the risk-elimination area.

### 8.3 Individual protection measures, such as personal protective equipment (PPE)

#### Eye/face protection

Wear face shield or eye protection in combination with breathing protection.

#### Skin protection

Cold-insulating gloves.

#### Respiratory protection

Use ventilation, local exhaust or breathing protection.

#### Thermal hazards

no data available

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## SECTION 9: Physical and chemical properties and safety characteristics

<b>Physical state</b>	Ozone is a colorless to bluish gas that condenses to a dark blue liquid, or blue-black crystals. Has a characteristic odor in concentrations less than 2 ppm. Used as a disinfectant for air and water; used for bleaching waxes, textiles and oils, ozonolysis of unsaturated fatty acids to pelargonic and other acids; manufacture of ink; catalyst; water treatment for taste and odor control; mold and bacteria inhibitor in cold storage; bleaching agent. (EPA, 1998)
<b>Colour</b>	COLORLESS GAS; DARK BLUE LIQ; BLUE-BLACK CRYSTALS
<b>Odour</b>	CHARACTERISTIC ODOR IN CONC N LESS THAN 2 PPM
<b>Melting point/freezing point</b>	-192.7Â°C
<b>Boiling point or initial boiling point and boiling range</b>	-111.9Â°C
<b>Flammability</b>	Nonflammable Gas, but a powerful oxidizer.
<b>Lower and upper explosion limit/flammability limit</b>	no data available
<b>Flash point</b>	no data available
<b>Auto-ignition temperature</b>	no data available
<b>Decomposition temperature</b>	no data available
<b>pH</b>	no data available
<b>Kinematic viscosity</b>	no data available
<b>Solubility</b>	3e-05 g/100 g at 68Â° F (NTP, 1992)
<b>Partition coefficient n-octanol/water</b>	no data available
<b>Vapour pressure</b>	41257 mm Hg at 10.4Â° F (EPA, 1998)
<b>Density and/or relative density</b>	1.48g/cm3
<b>Relative vapour density</b>	1.7 (EPA, 1998) (Relative to Air)
<b>Particle characteristics</b>	no data available

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## SECTION 10: Stability and reactivity

### 10.1 Reactivity

Decomposes on warming. This produces oxygen. This generates fire and explosion hazard. Reacts violently with inorganic and organic compounds. This generates fire and explosion hazard. Attacks rubber.

### 10.2 Chemical stability

Unstable gas ... @ normal temp decomp to biatomic oxygen. ... in liq or solid phase particularly unstable.

### 10.3 Possibility of hazardous reactions

POWERFUL OXIDIZING AGENT ... EVOLVES MORE HEAT AND USUALLY STARTS AT A LOWER TEMPERATURE THAN OXIDATION WITH BIATOMIC OXYGEN. The gas is heavier than air. OZONE is a propellant; ignites upon contact with alcohols,

amines, ammonia, beryllium alkyls, boranes, dicyanogen, hydrazines, hydrocarbons, hydrogen, nitroalkanes, powdered metals, silanes, or thiols [Bretherick 1979. p.174]. Aniline in a atmosphere of ozone produces a white gelatinous explosive ozobenzene [Mellor 1:911. 1946-47]. A mixture of ether and ozone forms aldehyde and acetic acid and a heavy liquid, ethyl peroxide, an explosive [Mellor 1:911. 1946-47]. Severe explosions occur attempting to form tribromic octaoxide from bromine and ozone [Mellor 2, Supp. 1:748. 1956]. Mixtures of ozone and dinitrogen pentaoxide are flammable or explosive [Mellor 8, Supp. 2:276. 1967]. Ozone and ethylene react explosively [Berichte 38:3837]. Nitrogen dioxide and ozone react with the evolution of light, and often explode [J. Chem. Phys. 18:366 1920]. Contact of very cold liquefied gas with water may result in vigorous or violent boiling of the product and extremely rapid vaporization due to the large temperature differences involved. If the water is hot, there is the possibility that a liquid "superheat" explosion may occur. Pressures may build to dangerous levels if liquid gas contacts water in a closed container, [Handling Chemicals Safely 1980].

#### 10.4 Conditions to avoid

no data available

#### 10.5 Incompatible materials

All oxidizable materials (both organic and inorganic).

#### 10.6 Hazardous decomposition products

no data available

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### SECTION 11: Toxicological information

#### Acute toxicity

- Oral: no data available
- Inhalation: no data available
- Dermal: no data available

#### Skin corrosion/irritation

no data available

#### Serious eye damage/irritation

no data available

#### Respiratory or skin sensitization

no data available

#### Germ cell mutagenicity

no data available

#### Carcinogenicity

A4; Not classifiable as a human carcinogen. /Heavy work, moderate work, light work, or heavy, moderate, or light workloads (

#### Reproductive toxicity

no data available

#### STOT-single exposure

The substance is irritating to the eyes and respiratory tract. The substance may cause effects on the central nervous system. This may result in impaired vigilance and performance. Inhalation of the gas may cause lung oedema. See Notes. The effects may be delayed. The liquid may cause frostbite.

#### STOT-repeated exposure

Repeated or prolonged inhalation of the gas may cause effects on the lungs.

#### Aspiration hazard

A harmful concentration of this gas in the air will be reached very quickly on loss of containment.

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### SECTION 12: Ecological information

#### 12.1 Toxicity

- Toxicity to fish: no data available
- Toxicity to daphnia and other aquatic invertebrates: no data available
- Toxicity to algae: no data available
- Toxicity to microorganisms: no data available

#### 12.2 Persistence and degradability

no data available

#### 12.3 Bioaccumulative potential

no data available

#### 12.4 Mobility in soil

no data available

## 12.5 Other adverse effects

no data available

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## SECTION 13: Disposal considerations

### 13.1 Disposal methods

#### Product

The material can be disposed of by removal to a licensed chemical destruction plant or by controlled incineration with flue gas scrubbing. Do not contaminate water, foodstuffs, feed or seed by storage or disposal. Do not discharge to sewer systems.

#### Contaminated packaging

Containers can be triply rinsed (or equivalent) and offered for recycling or reconditioning. Alternatively, the packaging can be punctured to make it unusable for other purposes and then be disposed of in a sanitary landfill. Controlled incineration with flue gas scrubbing is possible for combustible packaging materials.

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## SECTION 14: Transport information

### 14.1 UN Number

ADR/RID: no data available

IMDG: no data available

IATA: no data available

### 14.2 UN Proper Shipping Name

ADR/RID: no data available

IMDG: no data available

IATA: no data available

### 14.3 Transport hazard class(es)

ADR/RID: 6.1 (For reference only, please check.)

IMDG: 6.1 (For reference only, please check.)

IATA: 6.1 (For reference only, please check.)

### 14.4 Packing group, if applicable

ADR/RID: I (For reference only, please check.) IMDG: I (For reference only, please check.) IATA: I (For reference only, please check.)

### 14.5 Environmental hazards

ADR/RID: Yes

IMDG: Yes

IATA: Yes

### 14.6 Special precautions for user

no data available

### 14.7 Transport in bulk according to IMO instruments

no data available

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## SECTION 15: Regulatory information

### 15.1 Safety, health and environmental regulations specific for the product in question

Chemical name	Common names and synonyms	CAS number	EC number
Ozone	Ozone	10028-15-6	233-069-2
European Inventory of Existing Commercial Chemical Substances (EINECS)			Listed.
EC Inventory			Listed.
United States Toxic Substances Control Act (TSCA) Inventory			Listed.
China Catalog of Hazardous chemicals 2015			Not Listed.
New Zealand Inventory of Chemicals (NZIoC)			Listed.
Philippines Inventory of Chemicals and Chemical Substances (PICCS)			Not Listed.
Vietnam National Chemical Inventory			Listed.
Chinese Chemical Inventory of Existing Chemical Substances (China IECSC)			Listed.
Korea Existing Chemicals List (KECL)			Listed.

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## SECTION 16: Other information

#### Information on revision

Creation Date July 15, 2019

Revision Date July 15, 2019

#### Abbreviations and acronyms

- CAS: Chemical Abstracts Service
- ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road
- RID: Regulation concerning the International Carriage of Dangerous Goods by Rail
- IMDG: International Maritime Dangerous Goods

- IATA: International Air Transportation Association
- TWA: Time Weighted Average
- STEL: Short term exposure limit
- LC50: Lethal Concentration 50%
- LD50: Lethal Dose 50%
- EC50: Effective Concentration 50%

## References

- IPCS - The International Chemical Safety Cards (ICSC), website: <http://www.ilo.org/dyn/icsc/showcard.home>
- HSDB - Hazardous Substances Data Bank, website: <https://toxnet.nlm.nih.gov/newtoxnet/hsdb.htm>
- IARC - International Agency for Research on Cancer, website: <http://www.iarc.fr/>
- eChemPortal - The Global Portal to Information on Chemical Substances by OECD, website: [http://www.echemportal.org/echemportal/index?pageID=0&request\\_locale=en](http://www.echemportal.org/echemportal/index?pageID=0&request_locale=en)
- CAMEO Chemicals, website: <http://cameochemicals.noaa.gov/search/simple>
- ChemIDplus, website: <http://chem.sis.nlm.nih.gov/chemidplus/chemidlite.jsp>
- ERG - Emergency Response Guidebook by U.S. Department of Transportation, website: <http://www.phmsa.dot.gov/hazmat/library/erg>
- Germany GESTIS-database on hazard substance, website: <http://www.dguv.de/ifa/gestis/gestis-stoffdatenbank/index-2.jsp>
- ECHA - European Chemicals Agency, website: <https://echa.europa.eu/>

## Other Information

The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential. Immediate administration of an appropriate inhalation therapy by a doctor, or by an authorized person, should be considered.