Carbon monoxide

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

1.1. Product identifier

Product form	:	Substance
Trade name	:	Carbon monoxide
SDS code	:	019
Internal reference no.	:	003005
Chemical description	:	Carbon monoxide
CAS-No.	:	630-08-0
EC-No.	:	211-128-3
EC Index-No.	:	006-001-00-2
Registration-No.	:	01-2119480165-39
Chemical formula	:	CO

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

Relevant identified uses	:	See the list of identified uses and exposure scenarios in the annex of the safety data sheet. Industrial and professional. Perform risk assessment prior to use. Contact supplier for more information on uses.
Uses advised against	:	Consumer use.

1.3. Details of the supplier of the safety data sheet

Company identification	:	Sapio Produzione Idrogeno Ossigeno Srl Via S. Pellico, 48 20900 Monza - ITALIA +39 039 83981 | +39 039 836068 http://www.sapio.it/ sds@sapio.it

1.4. Emergency telephone number

Emergency telephone number	:	+39 0295705444 (24/7)

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP]

Physical hazards	Flammable gases, Category 1	H220
	Gases under pressure: Compressed gas	H280
Health hazards	Acute toxicity (inhalation:gas) Category 3	H331
	Reproductive toxicity, Category 1A	H360D
	Specific target organ toxicity — Repeated exposure, Category 1	H372

2.2. Label elements

Labelling according to Regulation (EC) No. 1272/2008 [CLP]

Hazard pictograms (CLP) :

GHS02 GHS04 GHS06 GHS08

Signal word (CLP) : Danger

Hazard statements (CLP) :
H220 - Extremely flammable gas.
H280 - Contains gas under pressure; may explode if heated.
H331 - Toxic if inhaled.
H360D - May damage the unborn child.
H372 - Causes damage to organs through prolonged or repeated exposure.

Precautionary statements (CLP)

- Prevention :
P202 - Do not handle until all safety precautions have been read and understood.
P260 - Do not breathe gas, vapours.
P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
- Response :
P308+P313 - IF exposed or concerned: Get medical advice.
P304+P340+P315 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Get immediate medical advice / attention.

P377 - Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P381 - In case of leakage, eliminate all ignition sources.
- Storage : P405 - Store locked up.
P403 - Store in a well-ventilated place.

Supplemental information : Restricted to professional users.

2.3. Other hazards

Other hazards not contributing to the classification : None.

SECTION 3: Composition/information on ingredients

3.1. Substances

Name	Product identifier	%	Classification according to Regulation (EC) No. 1272/2008 [CLP]
Carbon monoxide	CAS-No.: 630-08-0 EC-No.: 211-128-3 EC Index-No.: 006-001-00-2 Registration-No.: 01-2119480165-39	100	Flam. Gas 1, H220 Press. Gas (Comp.), H280 Acute Tox. 3 (Inhalation:gas), H331 Repr. 1A, H360D STOT RE 1, H372

Contains no other components or impurities which will influence the classification of the product.

3.2. Mixtures

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

- Inhalation : Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Perform cardiopulmonary resuscitation if breathing stopped.
Provide oxygen.
- Skin contact : Adverse effects not expected from this product.
- Eye contact : Adverse effects not expected from this product.
- Ingestion : Ingestion is not considered a potential route of exposure.

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

Symptoms may include dizziness, headache, nausea and loss of co-ordination.
Delayed adverse effects possible.
Refer to section 11.

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

Obtain medical assistance.

SECTION 5: Firefighting measures

5.1. Extinguishing media

- Suitable extinguishing media : Water spray or fog.
Dry powder.
- Unsuitable extinguishing media : Carbon dioxide.
Do not use water jet to extinguish.

5.2. Special hazards arising from the substance or mixture

Specific hazards : Exposure to fire may cause containers to rupture/explode.
Hazardous combustion products : None that are more hazardous than the product itself.

5.3. Advice for firefighters

Specific methods : Use fire control measures appropriate for the surrounding fire. Exposure to fire and heat radiation may cause gas receptacles to rupture. Cool endangered receptacles with water spray jet from a protected position. Prevent water used in emergency cases from entering sewers and drainage systems.
If possible, stop flow of product.
Use water spray or fog to knock down fire fumes if possible.
Do not extinguish a leaking gas flame unless absolutely necessary. Spontaneous/explosive re-ignition may occur. Extinguish any other fire.
Move containers away from the fire area if this can be done without risk.
Special protective equipment for fire fighters : Wear gas tight chemically protective clothing in combination with self contained breathing apparatus.
Standard EN 943-2: Protective clothing against liquid and gaseous chemicals, aerosols and solid particles. Gas-tight chemical protective suits for emergency teams.
Standard EN 137 - Self-contained open-circuit compressed air breathing apparatus with full face mask.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Try to stop release.
Evacuate area.
Monitor concentration of released product.
Consider the risk of potentially explosive atmospheres.
Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe.
Eliminate ignition sources.
Ensure adequate air ventilation.
Act in accordance with local emergency plan.
Stay upwind.

6.2. Environmental precautions

Try to stop release.

6.3. Methods and material for containment and cleaning up

Ventilate area.

6.4. Reference to other sections

See also sections 8 and 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Safe use of the product :
The product must be handled in accordance with good industrial hygiene and safety procedures.
Only experienced and properly instructed persons should handle gases under pressure.
Consider pressure relief device(s) in gas installations.
Ensure the complete gas system was (or is regularily) checked for leaks before use.
Do not smoke while handling product.
Avoid exposure, obtain special instructions before use.
Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Contact your gas supplier if in doubt.
Installation of a cross purge assembly between the cylinder and the regulator is recommended.
Avoid suck back of water, acid and alkalis.
Assess the risk of potentially explosive atmospheres and the need for explosion-proof equipment.
Purge air from system before introducing gas.
Take precautionary measures against static discharge.
Keep away from ignition sources (including static discharges).
Consider the use of only non-sparking tools.
Do not breathe gas.
Avoid release of product into atmosphere.
Ensure equipment is adequately earthed.

Safe handling of the gas receptacle :
Refer to supplier's container handling instructions.
Do not allow backfeed into the container.
Protect receptacles from physical damage; do not drag, roll, slide or drop.
When moving receptacles, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport receptacles.
Leave valve protection caps in place until the container has been secured against either a wall or bench or placed in a container stand and is ready for use.
If user experiences any difficulty operating receptacle valve discontinue use and contact supplier.
Never attempt to repair or modify container valves or safety relief devices.
Damaged valves should be reported immediately to the supplier.
Keep container valve outlets clean and free from contaminants particularly oil and water.
Replace valve outlet caps or plugs and container caps where supplied as soon as container is disconnected from equipment.
Close container valve after each use and when empty, even if still connected to equipment.
Never attempt to transfer gases from one container to another.
Never use direct flame or electrical heating devices to raise the pressure of a container.
Do not remove or deface labels provided by the supplier for the identification of the receptacle contents.
Suck back of water into the container must be prevented.
Open valve slowly to avoid pressure shock.

7.2. Conditions for safe storage, including any incompatibilities

Observe all regulations and local requirements regarding storage of containers.
Containers should not be stored in conditions likely to encourage corrosion.
Container valve guards or caps should be in place.
Containers should be stored in the vertical position and properly secured to prevent them from falling over.
Stored containers should be periodically checked for general condition and leakage.
Keep container below 50°C in a well ventilated place.
Store containers in location free from fire risk and away from sources of heat and ignition.
Keep away from combustible materials.
Segregate from oxidant gases and other oxidants in store.
All electrical equipment in the storage areas should be compatible with the risk of a potentially explosive

atmosphere.

7.3. Specific end use(s)

None.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Carbon monoxide (630-08-0)		
OEL : Occupational Exposure Limits		
ACGIH	ACGIH TWA (ppm)	25 ppm
	Regulatory reference	ACGIH 2017

Carbon monoxide (630-08-0)	
DNEL: Derived no effect level (Workers)	
Acute - local effects, inhalation	100 ppm
Acute - systemic effects, inhalation	117 mg/m³
Long-term - local effects, inhalation	20 ppm
Long-term - systemic effects, inhalation	23 mg/m³

PNEC (Predicted No-Effect Concentration) : None established.

8.2. Exposure controls

8.2.1. Appropriate engineering controls

Product to be handled in a closed system and under strictly controlled conditions.
Provide adequate general and local exhaust ventilation.
Preferably use permanent leak-tight installations (e.g. welded pipes).
Systems under pressure should be regularly checked for leakages.
Ensure exposure is below occupational exposure limits (where available).
Gas detectors should be used when toxic gases may be released.
Consider the use of a work permit system e.g. for maintenance activities.

8.2.2. Individual protection measures, e.g. personal protective equipment

A risk assessment should be conducted and documented in each work area to assess the risks related to the use of the product and to select the PPE that matches the relevant risk. The following recommendations should be considered:

PPE compliant to the recommended EN/ISO standards should be selected.

• Eye/face protection : Wear safety glasses with side shields.
Standard EN 166 - Personal eye-protection - specifications.

• Skin protection

- Hand protection : Wear working gloves when handling gas containers.
Standard EN 388 - Protective gloves against mechanical risk.

- Other : Consider the use of flame resistant anti-static safety clothing.
Standard EN ISO 14116 - Limited flame spread materials.
Standard EN 1149-5 - Protective clothing: Electrostatic properties.
Wear safety shoes while handling containers.
Standard EN ISO 20345 - Personal protective equipment - Safety footwear.

• Respiratory protection : Never use any kind of filtering respiratory protection equipment when working with this substance due to it having poor or no warning properties.
Keep self contained breathing apparatus readily available for emergency use.
Self contained breathing apparatus is recommended, where unknown exposure may be expected, e.g. during maintenance activities on installation systems.
Standard EN 137 - Self-contained open-circuit compressed air breathing apparatus with full face mask.

• Thermal hazards : None in addition to the above sections.

8.2.3. Environmental exposure controls

Refer to local regulations for restriction of emissions to the atmosphere. See section 13 for specific methods for waste gas treatment.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Appearance
- Physical state at 20°C / 101.3kPa : Gas
- Colour : Colourless.

Odour : Odourless.
Odour threshold : Odour threshold is subjective and inadequate to warn of overexposure.
pH : Not applicable for gases and gas mixtures.
Melting point / Freezing point : -205 °C
Boiling point : -192 °C

Flash point	:	Not applicable for gases and gas mixtures.
Evaporation rate	:	Not applicable for gases and gas mixtures.
Flammability (solid, gas)	:	Extremely flammable gas.
Explosive limits	:	10,9 - 76 vol %
Vapour pressure [20°C]	:	Not applicable.
Vapour pressure [50°C]	:	Not applicable.
Vapour density	:	Not applicable.
Relative density, liquid (water=1)	:	0,79
Relative density, gas (air=1)	:	1
Water solubility	:	30 mg/l
Partition coefficient n-octanol/water (Log Kow)	:	1,78
Auto-ignition temperature	:	605 °C
Decomposition temperature	:	Not applicable.
Viscosity	:	No reliable data available.
Explosive properties	:	Not applicable.
Oxidising properties	:	Not applicable.

9.2. Other information

Molar mass	:	28 g/mol
Critical temperature	:	-140 °C

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

Can form explosive mixture with air.
May react violently with oxidants.

10.4. Conditions to avoid

Keep away from heat/sparks/open flames/hot surfaces. – No smoking.
Avoid moisture in installation systems.

10.5. Incompatible materials

Air, Oxidisers.
For additional information on compatibility refer to ISO 11114.
See also 'EIGA Doc.95: Avoidance of Failure of CO and of CO/CO2 Mixtures Cylinders' at www.eiga.eu.

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 : Toxic if inhaled.

LC50 inhalation rat	3760 ppm/1h 1300 ppm/4h

Skin corrosion/irritation	:	No known effects from this product.
Serious eye damage/irritation	:	No known effects from this product.
Respiratory or skin sensitisation	:	No known effects from this product.
Germ cell mutagenicity	:	No known effects from this product.
Carcinogenicity	:	No known effects from this product.
Toxic for reproduction : Fertility	:	No known effects from this product.
Toxic for reproduction : unborn child	:	May damage the unborn child.
STOT-single exposure	:	Suppresses the oxygen uptake by red blood cells.
Target organ(s)	:	Blood.
STOT-repeated exposure	:	Causes damage to organs through prolonged or repeated exposure.
Target organ(s)	:	heart.
Aspiration hazard	:	Not applicable for gases and gas mixtures.

SECTION 12: Ecological information

12.1. Toxicity

Assessment	:	No ecological damage caused by this product.
EC50 48h - Daphnia magna	:	Study scientifically unjustified.
EC50 72h - Algae	:	Study scientifically unjustified.
LC50 96 h - Fish	:	Study scientifically unjustified.

12.2. Persistence and degradability

Assessment	:	Will not undergo hydrolysis. Not readily biodegradable.

12.3. Bioaccumulative potential

Assessment	:	Not expected to bioaccumulate due to the low log Kow (log Kow < 4). Refer to section 9.

12.4. Mobility in soil

Assessment	:	Because of its high volatility, the product is unlikely to cause ground or water pollution. Partition into soil is unlikely.

12.5. Results of PBT and vPvB assessment

Assessment	:	Not classified as PBT or vPvB.

12.6. Other adverse effects

Other adverse effects	:	No known effects from this product.
Effect on the ozone layer	:	None.
Effect on global warming	:	Contains greenhouse gas(es).

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Contact supplier if guidance is required.

Do not discharge into areas where there is a risk of forming an explosive mixture with air. Waste gas should be flared through a suitable burner with flash back arrestor.

Must not be discharged to atmosphere.

Ensure that the emission levels from local regulations or operating permits are not exceeded.

Refer to the EIGA code of practice Doc.30 "Disposal of Gases", downloadable at http://www.eiga.eu for more guidance on suitable disposal methods.

Return unused product in original receptacle to supplier.

List of hazardous waste codes (from Commission Decision 2001/118/EC) : 16 05 04 *: Gases in pressure containers (including halons) containing dangerous substances.

13.2. Additional information

External treatment and disposal of waste should comply with applicable local and/or national regulations.

SECTION 14: Transport information

14.1. UN number

UN-No.	:	1016

14.2. UN proper shipping name

Transport by road/rail (ADR/RID)	:	CARBON MONOXIDE, COMPRESSED
Transport by air (ICAO-TI / IATA-DGR)	:	Carbon monoxide, compressed
Transport by sea (IMDG)	:	CARBON MONOXIDE, COMPRESSED

14.3. Transport hazard class(es)

Labelling :

2.3 : Toxic gases.
2.1 : Flammable gases.

Transport by road/rail (ADR/RID)

Class	:	2
Classification code	:	1TF
Hazard identification number	:	263
Tunnel Restriction	:	B/D - Tank carriage : Passage forbidden through tunnels of category B, C, D and E. Other carriage : Passage forbidden through tunnels of category D and E

Transport by sea (IMDG)

Class / Div. (Sub. risk(s))	:	2.3 (2.1)
Emergency Schedule (EmS) - Fire	:	F-D
Emergency Schedule (EmS) - Spillage	:	S-U

14.4. Packing group

Transport by road/rail (ADR/RID)	:	Not applicable
Transport by air (ICAO-TI / IATA-DGR)	:	Not applicable
Transport by sea (IMDG)	:	Not applicable

14.5. Environmental hazards

Transport by road/rail (ADR/RID)	:	None.
Transport by air (ICAO-TI / IATA-DGR)	:	None.
Transport by sea (IMDG)	:	None.

14.6. Special precautions for user

Packing Instruction(s)

Transport by road/rail (ADR/RID)	:	P200
Transport by air (ICAO-TI / IATA-DGR)		
Passenger and Cargo Aircraft	:	Forbidden.
Cargo Aircraft only	:	Forbidden.
Transport by sea (IMDG)	:	P200

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 container 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.

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

Not applicable.

SECTION 15: Regulatory information

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

EU-Regulations

Restrictions on use	:	Restricted to professional users (Annex XVII REACH).
Seveso Directive : 2012/18/EU (Seveso III)	:	Covered.

National regulations

National legislation	:	Ensure all national/local regulations are observed.

15.2. Chemical safety assessment

A CSA has been carried out.

SECTION 16: Other information

Indication of changes	:	Revised safety data sheet in accordance with commission regulation (EU) No 453/2010.
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
		CAS: Chemical Abstract Service
		PPE: Personal Protection Equipment
		LC50 - Lethal Concentration to 50 % of a test population
		RMM: Risk Management Measures
		PBT - Persistent, Bioaccumulative and Toxic
		vPvB - Very Persistent and Very Bioaccumulative
		STOT- SE: Specific Target Organ Toxicity - Single Exposure
		CSA: Chemical Safety Assessment
		EN: European Standard
		UN: United Nations
		ADR - European Agreement concerning the International Carriage of Dangerous Goods by Road
		IATA - International Air Transport Association
		IMDG code - International Maritime Dangerous Goods
		RID - Regulations concerning the International Carriage of Dangerous Goods by Rail
		WGK: Water Hazard Class
		STOT - RE: Specific Target Organ Toxicity - Repeated Exposure
Training advice	:	Ensure operators understand the flammability hazard.
		Users of breathing apparatus must be trained.
		Ensure operators understand the toxicity hazard.
DISCLAIMER OF LIABILITY	:	Before using this product in any new process or experiment, a thorough material compatibility and safety study should be carried out.
		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.