



## H 01 EN

Translation of original instructions



## Oxygen

Instructions and information on how to safely handle devices for oxygen service

Edition January 2024



## Note on these mounting and operating instructions

These mounting and operating instructions assist you in mounting and operating the device safely. The instructions are binding for handling SAMSON devices.

- For the safe and proper use of these instructions, read them carefully and keep them for later reference.
- If you have any questions about these instructions, contact SAMSON's After-sales Service (aftersaleservice@samsongroup.com).



Documents relating to the device, such as the mounting and operating instructions, are available on our website at [www.samsongroup.com](http://www.samsongroup.com) > **Downloads > Documentation.**

## Definition of signal words

### **DANGER**

*Hazardous situations which, if not avoided, will result in death or serious injury*

### **WARNING**

*Hazardous situations which, if not avoided, could result in death or serious injury*

### **NOTICE**

*Property damage message or malfunction*

### **Note**

*Additional information*

### **Tip**

*Recommended action*

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# 1 Safety instructions and measures

## Scope of documentation

This manual contains instructions and information that are relevant to the use of SAMSON devices intended for oxygen service.

The following documents apply in addition to this manual:

- Mounting and operating instructions for the purchased SAMSON device, e.g. valve, actuator or valve accessories
- Material safety data sheet (MSDS) for oxygen (issued by the oxygen supplier)

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### **! WARNING**

***Risk of personal injury and misuse resulting from the failure to observe the mounting and operating instructions.***

*This manual applies to devices for oxygen service in addition to the mounting and operating instructions for the specific device.*

→ *Observe the referenced documentation.*

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## Intended use

The SAMSON devices with a label for oxygen service affixed to them (see Chapter 2.2) are designed to control the flow of liquid or gaseous oxygen.

- Only use devices approved for oxygen in oxygen applications.
- In case of doubt about the suitability for oxygen service, contact SAMSON's After-sales Service.

The devices are designed to operate under exactly defined conditions (e.g. pressure, temperature). Therefore, operators must ensure that the devices are only used in operating conditions that meet the specifications used for sizing the devices at the ordering stage. In case operators intend to use the devices in applications or conditions other than those specified, contact SAMSON.

SAMSON does not assume any liability for damage resulting from the failure to use the device for its intended purpose or for damage caused by external forces or any other external factors.

- Refer to the technical data and nameplate for limits and fields of application as well as possible uses.

## Safety instructions and measures

### Reasonably foreseeable misuse

The device is not suitable for the following applications:

- Use outside the limits defined during sizing and by the technical data
- Use outside the limits defined by the accessories connected to the device

Furthermore, the following activities do not comply with the intended use:

- Use of non-original spare parts
- Use of spare parts not suitable for oxygen service
- Performing service and repair work not described

### Qualifications of operating personnel

The device must be mounted, started up, serviced and repaired by fully trained and qualified personnel only; the accepted industry codes and practices must be observed. According to this manual, qualified personnel refers to individuals who are able to judge the work they are assigned to and recognize possible dangers due to their specialized training, their knowledge and experience as well as their knowledge of the applicable standards.

Furthermore, the operating personnel must be specially trained for the correct and safe handling of oxygen. The minimum knowledge required involves:

- Knowledge on how fires occur (e.g. fire triangle)
- Knowledge on potential ignition sources and mechanisms in the system
- Knowledge on flammability of the materials used in the plant and device
- Knowledge of the relevant standards commonly used in the process industry e.g. EIGA (European Industrial Gases Association), AIGA (Asia Industrial Gases Association) and CGA (Compressed Gas Association)

SAMSON does not assume any liability for personal injury or property damage caused by untrained operating personnel.



#### Tip

*All SAMSON staff receives appropriate training before performing any activities in connection with oxygen service. SAMSON's After-sales Service also offers such training courses for customers to allow them to learn how to handle devices for oxygen service correctly and safely.*

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### Personal protective equipment

To prevent fire or injury, make sure that the personal protective equipment fulfills the following criteria:

- Clean and above all free of oil and grease
- Cold resistant
- Lint-free
- Flame retardant

#### **⚠ DANGER**

**Fire risk due to increased concentration of oxygen in the atmosphere.**

Flame-retardant protective clothing can also catch fire when the oxygen concentration in the air is high enough.

→ Observe the information on how a fire starts and on possible ignition sources.

We recommend wearing the following protective equipment when handling oxygen:

Personal protective equipment	Note
Eye protection	Goggles with side shields when performing visual inspections Fully enclosed goggles when performing service and repair work
Respiratory prot.	In hazardous areas
Hearing protection	When working close to the device
Safety gloves	Lint-free and cold-resistant
Protective clothing (e.g. apron)	Lint-free, cold-resistant and flame-retardant

→ Check with the plant operator for details on further protective equipment.

#### **⚠ DANGER**

**Fire risk due to oxygen-enriched clothing.**

Personal protective equipment does not protect clothing and hair against becoming saturated with oxygen. When taking off oxygen-enriched clothing, the resulting electrostatic discharge may suffice as an ignition source.

- Do not wear oxygen-enriched clothing while working.
- Do not remove oxygen-enriched clothing in the danger zone.
- Before removing clothing, air them for at least 15 minutes in the open air.

## Safety instructions and measures

### Safety devices

For oxygen applications, we recommend using oxygen measuring equipment and safety devices which issue a warning when the concentration of oxygen in the atmosphere becomes too high.

### Warning against residual hazards

To avoid personal injury or property damage, operators and operating personnel must prevent hazards that could be caused in the device by the process medium (oxygen) by taking appropriate precautions. Plant operators and operating personnel must observe all hazard statements, warnings and caution notes in this manual as well as the mounting and operating instructions of the devices used.

### Responsibilities of the operator

Operators are responsible for proper use and compliance with the safety regulations. The operator is obliged to provide this manual as well as the referenced documents to the operating personnel and to instruct them in proper operation. Furthermore, operators must ensure that operating personnel or third parties are not exposed to any danger.

We recommend establishing a work permit procedure to regulate entry into the plant and the hazardous area as well as the performance of certain activities (e.g. mounting, start-up, operation, service and repair work). The plant operator is responsible for granting such approvals.

### Responsibilities of operating personnel

Operating personnel must read and understand this manual as well as the referenced documents and observe the specified hazard statements, warnings and caution notes. Furthermore, operating personnel must be familiar with the applicable health, safety and accident prevention regulations especially concerning oxygen service and comply with them (see 'Qualifications of operating personnel').

### Material safety data sheet (MSDS)

Oxygen is classified as a hazardous substance according to the Regulation (EC) No. 1907/2006 (REACH Regulation). Material safety data sheets must be issued for hazardous substances by the supplier (see Article 31 and Annex II in 1907/2006/EC).

- ➔ Observe the instructions in the material safety data sheet (MSDS).
- ➔ If necessary, contact the oxygen supplier to obtain an MSDS.

## 1.1 Notes on possible severe personal injury

### DANGER

#### **Risk of explosion or fire through the presence of oxygen.**

Oxygen is classified as a hazardous substance. A risk of explosion exists for pressurized plants. Oxygen accelerates combustion. Even slightly higher oxygen concentrations lead to rapid and intense combustion.

- Remove ignition sources.
- Avoid sparking.
- Make sure the cleanliness meets the requirements specified in the standards for oxygen service.
- Avoid oxygen enrichment.
- Only allow qualified operating personnel to work.
- Wear personal protective equipment.
- Observe the instructions in the material safety data sheet (MSDS). If necessary, contact the oxygen supplier to obtain an MSDS.

#### **Risk of injury due to incorrect handling of oxygen.**

Operating personnel must be trained for oxygen service. Unqualified operating personnel expose themselves and others to an increased risk of injury.

- Operating personnel must be sufficiently trained and be made aware of the hazards occurring in oxygen service.
- Do not enter the hazardous area without prior permission and without appropriate training.

#### **Frostbite and severe burn injuries through contact with liquid oxygen.**

The temperature of liquid oxygen is  $-183\text{ °C}$  at atmospheric pressure. Skin contact with liquid oxygen causes severe frostbite and cold burns (cryogenic burns). Severe cryogenic burns can be fatal.

- Do not touch liquid oxygen.
- Wear cold-resistant safety gloves and protective equipment.

### DANGER

#### **Fire risk due to the use of unsuitable lubricant.**

Unsuitable lubricants can react with oxygen and cause a fire.

- Only use lubricants that have been tested for use with oxygen by a laboratory nominated by EIGA (European Industrial Gases Association).
- Only use lubricants approved by SAMSON.

#### **Fire risk due to the use of contaminated tools.**

The tools must be cleaned before use in oxygen applications. Particles collecting on contaminated tools can react with oxygen and cause a fire.

- Only use clean tools.

- See associated device documentation for additional notes on possible severe personal injury.

## 1.2 Notes on possible personal injury

### WARNING

#### **Damage to health through inhaling high concentrations of oxygen.**

Inhaling high concentrations of oxygen can cause adverse health effects (e.g. dizziness, nausea, impaired vision, hearing defects, impaired balance and unconsciousness). The presence of an oxygen-enriched atmosphere cannot be detected by human senses.

- Avoid oxygen enrichment.
- Leave the oxygen-enriched environment. Move to fresh air.
- Use oxygen measuring equipment.
- Wear a respirator for applications with gaseous oxygen.

- See associated device documentation for additional notes on possible personal injury.

### 1.3 Notes on possible property damage

**!** NOTICE

- See associated device documentation for notes on possible property damage.

## 2 Markings on the device

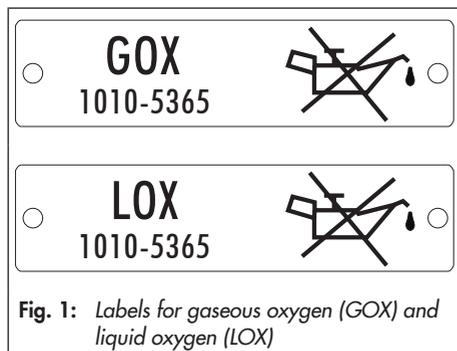
### 2.1 Nameplate

The nameplate includes details on the device version. Detailed information on the nameplate can be found in the associated device documentation.

### 2.2 Label for oxygen service

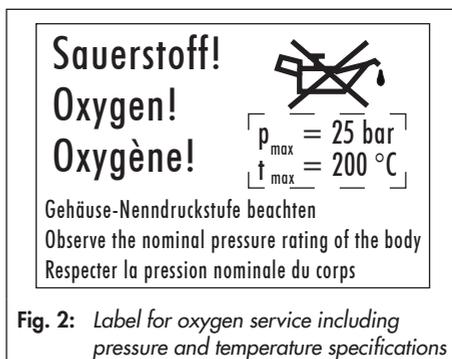
In addition to the nameplate, control valves for oxygen service have a label for oxygen service affixed to them. Which label is used depends on the version:

- Gaseous oxygen: GOX
- LOX: liquid oxygen and cold gaseous oxygen below  $-30\text{ °C}$



**Fig. 1:** Labels for gaseous oxygen (GOX) and liquid oxygen (LOX)

If a certain pressure and temperature have been specified in the order, the device is marked with a label for oxygen service which includes these specifications (see Fig. 2).



**Fig. 2:** Label for oxygen service including pressure and temperature specifications

### 2.3 Marking on the packaging

All components that have been cleaned and packed by SAMSON for oxygen service have a label on the packaging (see Fig. 3).



**Fig. 3:** Adhesive label on the packaging

### 3 Basics

#### **i Note**

*This chapter outlines the basics of oxygen. This information does not replace a training course. SAMSON does not assume any liability for personal injury or property damage caused by untrained operating personnel.*

### 3.1 Properties of oxygen

#### **! WARNING**

**Risk of injury arising from handling hazardous substances.**

Oxygen is classified as a hazardous substance. On delivery, the manufacturer must ensure that the oxygen is specially labeled and that a material safety data sheet (MSDS) is provided.

→ Make sure that an MSDS is available. If necessary, contact the oxygen supplier to obtain an MSDS.

Oxygen is a colorless and odorless gas under normal conditions. Atmospheric air contains approximately 21 % (w/v) oxygen.

At atmospheric pressure, oxygen liquefies at  $-183\text{ }^{\circ}\text{C}$  and is light blue in color. At  $-219\text{ }^{\circ}\text{C}$  it crystallizes.

Oxygen is not flammable, but supports and accelerates combustion. In principle, oxygen is capable of reacting with all organic materials (e.g. dust, oil, wood, even most metals and their alloys). Noble metals and metal

oxide of the highest oxidation state are an exception. Even materials which are regarded to be fireproof can still burn at a sufficiently high pressure and oxygen concentration, e.g. PTFE, silicone and stainless steel.

Inhaling high concentrations of oxygen can cause adverse health effects (e.g. dizziness, nausea, impaired vision, hearing defects, impaired balance and unconsciousness).

A risk of asphyxiation exists if the oxygen concentration in the atmosphere falls below 21 % (w/v).

## 3.2 Necessary conditions for a fire

Generally, three elements are needed to start a fire or explosion:

- Flammable material
- Oxygen
- Ignition source (see 'Possible ignition sources')

A fire or explosion cannot start if one of the three elements is missing.

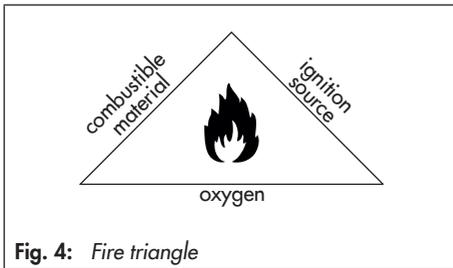


Fig. 4: Fire triangle

### Contributory factors

#### 1. Oxygen enrichment

Even a slight increase in oxygen concentration above 21 % (w/v) affects combustion as follows:

- Increasingly intense reaction
- Wide spreading of the fire
- Lowers the required ignition energy and temperature
- Increases the flame temperature

The higher the oxygen concentration is, the more intense the combustion is.

#### 2. Effect of temperature

Substances can ignite spontaneously at the auto-ignition temperature without an external ignition source. Oxygen causes intense combustion in this case.

#### 3. Effect of pressure

Substances that cannot burn under normal conditions can ignite at sufficiently high pressure.

#### 4. Flow velocities

High flow velocities can lead to vibrations which, in turn, can act as an ignition source.

#### 5. Contamination

Contamination (e.g. oil or grease) of tools, clothing or components influences the probability of ignition

### Possible ignition sources

On handling oxygen, various factors can act as an ignition source. For example:

- Mechanical stress
- Friction between moving and static parts as well as frictional heating
- Hot surfaces
- Particle impact (especially in cold gaseous oxygen)
- Rapid vaporization
- Electric arcs
- Electrostatic discharge
- Mechanical failure of a component
- Surface imperfections
- Contamination
- Hot work (e.g. welding, cutting, soldering, grinding)

- Sparking, e.g. through tools being dropped or oxygen-enriched clothing being opened

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**⚠ DANGER*****Risk of explosion or fire through the presence of oxygen.***

*Lighting a cigarette can ignite a fire or cause an explosion.*

- *Smoking is absolutely forbidden on handling oxygen.*
- 

### 3.3 Cleanliness

It is particularly important to pay attention to cleanliness on handling oxygen. Even the smallest amount of contamination can act as an ignition source and cause a fire:

- Dirt, deposits, particles, hydrocarbons, cleaning agent residues
  - Unsuitable lubricant
  - Contaminated lubricant, tools or cloths
  - Particles (originating from gasket breakdown, valve friction, abrasion etc.)
  - Packaging material
- Make sure the cleanliness meets the requirements specified in the standards for oxygen service.
- Observe notes on cleaning (see Chapter 7.3).

### 4 Measures for preparation

After receiving the shipment, proceed as follows:

1. Check the scope of delivery. Compare the shipment received with the delivery note.
2. Check the shipment for transportation damage. Report any damage to SAMSON and the forwarding agent (refer to delivery note).
3. Check the packaging for damage.

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#### **i Note**

*In case the packaging is damaged, the components contained in the packaging must be cleaned, dried and packed again. Contact our after-sales service concerning recleaning.*

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4. Check the delivery for contamination (visual inspection without opening the packaging).
5. The delivery must be marked with a label for oxygen service (see Chapter 2.3). If it is not labeled accordingly, the device must not be used for oxygen service. Contact our after-sales service.

### 4.1 Unpacking

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#### **i Note**

*All components intended for oxygen service have been carefully cleaned and packed by*

*SAMSON to meet the requirements of all common standards.*

- *Unpack components cleaned for oxygen service only in areas intended for this purpose.*
  - *Do not remove the packaging from the components cleaned for oxygen service until immediately before installation.*
- 

Before installing the device, proceed as follows:

1. Remove the packaging from the device.
2. Dispose of the packaging in accordance with the valid regulations.

### 4.2 Transporting and lifting

- Make sure that the packaging is not damaged during transportation and hoisting.
- 

#### **i Note**

*Additional instructions on transportation and lifting can be found in the associated device documentation or are available from our after-sales service on request.*

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### 4.3 Storage

We recommend the following for storage of components and devices intended for oxygen service:

- During long storage periods, check regularly that the labeling for oxygen service remains legible and the packaging intact. Renew any labeling

that has become illegible. When the packaging is damaged, the device may possibly be contaminated. Contact our after-sales service.

- Store components intended for oxygen service in a separate area which is marked accordingly.
- Store components in a dry atmosphere.

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**i Note**

*Additional instructions on storage can be found in the associated device documentation or are available from our after-sales service on request.*

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## 4.4 Preparation for installation

We recommend performing all preparation work on the device in an area specially intended for oxygen service.

Proceed as follows:

- Perform a visual inspection of the device, e.g. at the valve inlet and outlet as well as at all accessible points. Make sure that all components have been cleaned. Contact our after-sales service when components are contaminated.
- Make sure that the packaging has not been damaged during transport and storage (visual inspection). When the packaging is damaged, the device may possibly be contaminated. Contact our after-sales service before using the device.
- Clean all tools. The tools must be free of grease, oil and hydrocarbons. The same applies to the immediate work environment (workbench etc.). Cover up the working area with a lint-free cloth to prevent the tools and components from being contaminated.
- Make sure that clothing and safety gloves are clean.
- Blow out the pipeline section with clean, dry, oil-free compressed air.
- Completely remove any drying agent (if used).
- Check the material and cleanliness of gaskets.
- Check the lubricant to ensure it is compatible with oxygen.

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**i Note**

*See associated device documentation for further preparation.*

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## 5 Mounting and start-up

### **⚠ DANGER**

#### **Risk of explosion or fire through the presence of oxygen.**

Oxygen is classified as a hazardous substance. A risk of explosion exists for pressurized plants. Oxygen accelerates combustion. Even slightly higher oxygen concentrations lead to rapid and intense combustion.

- Remove ignition sources.
- Avoid sparking.
- Make sure the cleanliness meets the requirements specified in the standards for oxygen service.
- Avoid oxygen enrichment.
- Only allow qualified operating personnel to work.
- Wear personal protective equipment.
- Observe the instructions in the material safety data sheet (MSDS). If necessary, contact the oxygen supplier to obtain an MSDS.

### **⚠ DANGER**

#### **Frostbite and severe burn injuries through contact with liquid oxygen.**

The temperature of liquid oxygen is  $-183\text{ }^{\circ}\text{C}$  at atmospheric pressure. Skin contact with liquid oxygen causes severe frostbite and cold burns (cryogenic burns). Severe cryogenic burns can be fatal.

- Do not touch liquid oxygen.
- Wear cold-resistant safety gloves and protective equipment.

### **⚠ DANGER**

#### **Fire risk due to the use of unsuitable lubricant.**

Unsuitable lubricants can react with oxygen and cause a fire.

- Only use lubricants that have been tested for use with oxygen by a laboratory nominated by EIGA (European Industrial Gases Association).
- Only use lubricants approved by SAMSON.

### **⚠ DANGER**

#### **Fire risk due to the use of contaminated tools.**

The tools must be cleaned before use in oxygen applications. Particles collecting on contaminated tools can react with oxygen and cause a fire.

- Only use clean tools.

### **⚠ WARNING**

#### **Damage to health through inhaling high concentrations of oxygen.**

Inhaling high concentrations of oxygen can cause adverse health effects (e.g. dizziness, nausea, impaired vision, hearing defects, impaired balance and unconsciousness). The presence of an oxygen-enriched atmosphere cannot be detected by human senses.

- Avoid oxygen enrichment.
- Leave the oxygen-enriched environment. Move to fresh air.
- Use oxygen measuring equipment.

- Wear a respirator for applications with gaseous oxygen.

**⚠ WARNING**

**Risk of injury due to incorrect handling of oxygen.**

*Operating personnel must be trained for oxygen service. Unqualified operating personnel expose themselves and others to an increased risk of injury.*

- *Operating personnel must be sufficiently trained and be made aware of the hazards occurring in oxygen service.*
- *Do not enter the hazardous area without prior permission and without appropriate training.*

**General conditions**

- Wear clean personal protective equipment that is suitable for the purpose (see Chapter 1).
- Only use clean tools.
- Do not allow the device and the components to become contaminated. Pay attention to cleanliness.

**5.1 Installation**

- On installation, make sure that the cleaned components do not become contaminated. Contact our after-sales service concerning the cleaning of contaminated components.
- On installation, make sure that no vibrations or forces from external sources can

occur (see subsection 4.6.2 of EI-GA Doc 13/12).

**Mounting orientation**

- Refer to the mounting and operating instructions of the device for details on the mounting position.

**Procedure for mounting and start-up**

1. Shut off the oxygen supply. Close any upstream shut-off valves in the pipeline while the valve is being installed.
2. Depressurize the plant.
3. Do not enter the danger zone until the oxygen concentration in the atmosphere is safe. Use oxygen measuring equipment.
4. Blow out the pipeline section with clean, dry, oil-free compressed air. Alternatively, use nitrogen or a noble gas to blow out the pipe.
5. Remove any protective caps from the valve ports before installing the valve.
6. Install the device. Read 'Notes on performing hot work'.
7. After installation, blow out the device and adjoining pipeline to remove any weld spatter or other residue. Observe notes on cleaning (see Chapter 7.3).
8. Depending on the field of application, allow the device to cool down or warm up to reach ambient temperature before start up.
9. Check the device to ensure it functions properly (see Chapter 5.3).

## Mounting and start-up

10. Put the device into operation (see Chapter 5.4).

### Notes on performing hot work

Hot work (e.g. welding, soldering, cutting, grinding) can be a potential ignition source.

- Do not perform hot work without prior written permission (hot work permit).
- Make sure the area is sufficiently ventilated during welding work.
- Use suitable welding techniques.

### DANGER

**Risk of explosion due to incorrect performance of hot work.**

- *Hot work is to be performed only by staff trained for this purpose.*

## 5.2 Additional fittings

### Note

*The listed additional fittings are recommended by SAMSON. The plant operator is responsible for implementation and installation.*

### Shut-off valves

We recommend installing a hand-operated shut-off valve both upstream and downstream of the device. The shut-off valves ensure that the entire plant does not need to be shut down for service and repair work on the device.

### Bypass

A bypass can be installed to prevent high flow velocities, rapid pressurization and high mechanical loads. The bypass must be installed in such a way that vibrations are kept to a minimum.

### Ventilation

Sufficient ventilation (exchange of air) must be ensured to prevent oxygen enrichment in the plant.

### Noise reduction

Information on the selection of suitable measures to reduce noise emissions can be found in the associated device documentation or contact our after-sales service.

### Fire wall

A fire wall can be added to additionally safeguard the danger zone.

## 5.3 Quick testing

Additional instructions on how to briefly test the device can be found in the associated device documentation. Additionally observe the following instructions on performing the tests.

### Pressure test

- Perform the pressure test using clean, dry, oil-free compressed air or nitrogen.

### Leakage

- Perform the leak test using clean, dry, oil-free compressed air or nitrogen.

## 5.4 Start-up

We recommend that the operating personnel leave the plant during start-up.

The applicable industry standards for cleaning procedures (e.g. EIGA) must be observed. Suitable measures include:

- Before starting up the plant, blow out the plant with clean, dry, oil-free air to remove any particles or dirt. Alternatively, nitrogen or a noble gas can be used for blowing out the plant.
- Observe design limits.
- Make sure that the process medium remains free of particles while the plant is running.
- Pressurize the plant. Pressure surges (rapid pressurization) in the plant must be ruled out (see EIGA Doc 13/12, Appendix B).
- Open the oxygen supply. Slowly open the upstream shut-off valve in the pipeline, if installed.

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### **NOTICE**

***Risk of valve damage due to a sudden pressure increase and resulting high flow velocities.***

- *Slowly open the shut-off valve in the pipeline during start-up.*
-

## 6 Operation

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### **⚠ DANGER**

#### **Risk of explosion or fire through the presence of oxygen.**

Oxygen is classified as a hazardous substance. A risk of explosion exists for pressurized plants. Oxygen accelerates combustion. Even slightly higher oxygen concentrations lead to rapid and intense combustion.

- Remove ignition sources.
  - Avoid sparking.
  - Make sure the cleanliness meets the requirements specified in the standards for oxygen service.
  - Avoid oxygen enrichment.
  - Only allow qualified operating personnel to work.
  - Wear personal protective equipment.
  - Observe the instructions in the material safety data sheet (MSDS). If necessary, contact the oxygen supplier to obtain an MSDS.
- 

### **⚠ DANGER**

#### **Frostbite and severe burn injuries through contact with liquid oxygen.**

The temperature of liquid oxygen is  $-183\text{ }^{\circ}\text{C}$  at atmospheric pressure. Skin contact with liquid oxygen causes severe frostbite and cold burns (cryogenic burns). Severe cryogenic burns can be fatal.

- Do not touch liquid oxygen.
  - Wear cold-resistant safety gloves and protective equipment.
- 

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### **⚠ WARNING**

#### **Damage to health through inhaling high concentrations of oxygen.**

Inhaling high concentrations of oxygen can cause adverse health effects (e.g. dizziness, nausea, impaired vision, hearing defects, impaired balance and unconsciousness). The presence of an oxygen-enriched atmosphere cannot be detected by human senses.

- Avoid oxygen enrichment.
  - Leave the oxygen-enriched environment. Move to fresh air.
  - Use oxygen measuring equipment.
  - Wear a respirator for applications with gaseous oxygen.
- 

### **⚠ WARNING**

#### **Risk of injury due to incorrect handling of oxygen.**

Operating personnel must be trained for oxygen service. Unqualified operating personnel expose themselves and others to an increased risk of injury.

- Operating personnel must be sufficiently trained and be made aware of the hazards occurring in oxygen service.
  - Do not enter the hazardous area without prior permission and without appropriate training.
-

## 6.1 Safe working in the plant

### **i Note**

*The plant operator is responsible for establishing and implementing suitable safety measures in the plant.*

We recommend the following safety precautions to protect the operating personnel while working in the danger zone <sup>1)</sup> during operation:

### **Ventilation**

Sufficient ventilation must be ensured to prevent oxygen enrichment in the plant.

### **Oxygen monitor and alarm equipment**

The equipment triggers an alarm when the concentration of oxygen exceeds a limit and to ensure that the air is regularly exchanged.

### **Warning signs**

We recommend putting up at least the following warning signs in the plant:

- No open flames
- No smoking
- Oxygen warning
- Entry only with portable oxygen measuring equipment
- Entry only for trained/authorized personnel

### **Entry permit**

Entry only for trained operating personnel with written permission (individual authorization).

### **Absence of particles**

→ Make sure that the process medium remains free of particles while the plant is running.

### **Forces and vibrations from external sources**

→ On installation, make sure that no vibrations or forces from external sources can occur (see subsection 4.6.2 of El-GA Doc 13/12).

### **Pressure surges**

→ Pressure surges (rapid pressurization) in the plant must be ruled out (see El-GA Doc 13/12, Appendix B).

<sup>1)</sup> According to the Technical Rules for Hazardous Substances TRGS 407 issued by the German Federal Institute for Occupational Safety and Health (BAUA), the danger zone is the area in which a dangerous gas concentration cannot be ruled out due to the local operating conditions.

## 7 Servicing

### **⚠ DANGER**

#### **Risk of explosion or fire through the presence of oxygen.**

Oxygen is classified as a hazardous substance. A risk of explosion exists for pressurized plants. Oxygen accelerates combustion. Even slightly higher oxygen concentrations lead to rapid and intense combustion.

- Remove ignition sources.
- Avoid sparking.
- Make sure the cleanliness meets the requirements specified in the standards for oxygen service.
- Avoid oxygen enrichment.
- Only allow qualified operating personnel to work.
- Wear personal protective equipment.
- Observe the instructions in the material safety data sheet (MSDS). If necessary, contact the oxygen supplier to obtain an MSDS.

### **⚠ DANGER**

#### **Frostbite and severe burn injuries through contact with liquid oxygen.**

The temperature of liquid oxygen is  $-183\text{ °C}$  at atmospheric pressure. Skin contact with liquid oxygen causes severe frostbite and cold burns (cryogenic burns). Severe cryogenic burns can be fatal.

- Do not touch liquid oxygen.
- Wear cold-resistant safety gloves and protective equipment.

### **⚠ WARNING**

#### **Damage to health through inhaling high concentrations of oxygen.**

Inhaling high concentrations of oxygen can cause adverse health effects (e.g. dizziness, nausea, impaired vision, hearing defects, impaired balance and unconsciousness). The presence of an oxygen-enriched atmosphere cannot be detected by human senses.

- Avoid oxygen enrichment.
- Leave the oxygen-enriched environment. Move to fresh air.
- Use oxygen measuring equipment.
- Wear a respirator for applications with gaseous oxygen.

### **⚠ WARNING**

#### **Fire risk due to the use of unsuitable lubricant.**

Unsuitable lubricants can react with oxygen and cause a fire.

- Only use lubricants that have been tested for use with oxygen by a laboratory nominated by EIGA (European Industrial Gases Association).
- Only use lubricants approved by SAMSON.

### **⚠ WARNING**

#### **Fire risk due to the use of contaminated tools.**

The tools must be cleaned before use in oxygen applications. Particles collecting on contaminated tools can react with oxygen and cause a fire.

→ Only use clean tools.

**⚠ WARNING**

**Risk of injury due to incorrect handling of oxygen.**

*Operating personnel must be trained for oxygen service. Unqualified operating personnel expose themselves and others to an increased risk of injury.*

- Operating personnel must be sufficiently trained and be made aware of the hazards occurring in oxygen service.
- Do not enter the hazardous area without prior permission and without appropriate training.

## 7.1 Determining the extent of servicing required

We recommend performing service or repair work at the latest under the following circumstances:

- When the plug stem surface is scratched or cracked.

**i Note**

*Scratches and cracks can impair the sealing ability and, as a result, increase the risk of contamination.*

- When the valve leaks at the packing or body gasket
- In the event of applied lubricant leaks from the actuator

- In the event of the icing up of susceptible components (e.g. valve accessories and actuator)

Depending on the operating conditions, check the valve at certain intervals to prevent possible failure due to wear before it can occur.

**i Note**

*The plant operator is responsible for drawing up an inspection and test plan for the plant. Our after-sales service can support you in drawing up an inspection and test plan for your plant to perform predictive service work.*

## 7.2 Performing service work

**i Note**

*Do not perform any service work without prior written permission from the plant operator.*

1. Shut off the oxygen supply. Close any upstream shut-off valves in the pipeline while the valve is being installed.
2. Depressurize the plant.
3. Do not enter the danger zone until the oxygen concentration in the atmosphere is safe. Use oxygen measuring equipment.
4. Blow out the pipeline section with clean, dry, oil-free compressed air. Alternatively, use nitrogen or a noble gas to blow out the pipe.

## Servicing

5. Replace parts subject to wear. Detailed information on replacing parts subject to wear can be found in the associated device documentation.
6. After performing service work, blow out the device and adjoining pipeline to remove any weld spatter or other residue. Observe notes on cleaning (see Chapter 7.3).
7. Check the device to ensure it functions properly (see Chapter 5.3).
8. Put the plant into operation. See Chapter 5.4.

## 7.3 Cleaning

The device may become contaminated during operation or installation and service work. Contamination can act as an ignition source and cause a fire. The applicable industry standards for cleaning procedures (e.g. EIGA) must be observed.

- Contact our after-sales service concerning the cleaning of the device.
- To remove possible contamination, blow out the pipeline section with clean, dry, oil-free compressed air. Alternatively, nitrogen or a noble gas can be used for blowing out the plant.

## 7.4 Returning devices to SAMSON

Defective or contaminated devices can be returned to SAMSON for repair or cleaning. Proceed as follows to return devices to SAMSON:

1. Put the device out of operation (see Chapter 9).
2. Decontaminate the device. Remove any residual process medium.
3. Exceptions apply concerning some special device models
  - ▶ [www.samsongroup.com](http://www.samsongroup.com) > Service > After-sales Service > Returning goods.
4. Send an e-mail
  - ▶ [retouren@samsongroup.com](mailto:retouren@samsongroup.com) to register the return shipment including the following information:
    - Type
    - Article number
    - Configuration ID
    - Original order
    - Completed Declaration on Contamination, which can be downloaded from our website at
      - ▶ [www.samsongroup.com](http://www.samsongroup.com) > Service > After-sales Service > Returning goods.

**After checking your registration, we will send you a return merchandise authorization (RMA).**

5. Attach the RMA (together with the Declaration on Decontamination) to the outside of your shipment so that the documents are clearly visible.
  6. Send the shipment to the address given on the RMA.
- ➔ The spare parts have been cleaned for oxygen service. Contact our after-sales service concerning recleaning of contaminated components.
  - ➔ Store spare parts for oxygen service separately from spare parts for normal use.

**i Note**

Further information on returned devices and how they are handled can be found at  
 ▶ [www.samsongroup.com](http://www.samsongroup.com) > Service > After-sales Service.

**i Note**

Spare parts lists for SAMSON devices can be found at ▶ [www.samsongroup.com](http://www.samsongroup.com) > Downloads > Documentation.

## 7.5 Ordering spare parts and operating supplies

Contact your nearest SAMSON subsidiary or SAMSON's After-sales Service for information on spare parts, lubricants and tools.

### Spare parts

Only use original spare parts by SAMSON, which comply with the original specifications.

Do not use spare parts that are not designed specially for oxygen service.

When handling spare parts, make sure the following conditions are met:

- ➔ Make sure that supplied spare parts are correctly packed and labeled for oxygen service.
- ➔ Check the cleanliness of supplied spare parts (visual inspection without removing the parts from the packaging).
- ➔ Do not remove the packaging until immediately before installation.

### Lubricant

- ➔ Only use lubricants that have been tested for use with oxygen by a laboratory nominated by EIGA (European Industrial Gases Association).
- ➔ Only use lubricants approved by SAMSON.
- ➔ Make sure that any residual lubricant (e.g. after servicing the actuator) is completely removed.

## Servicing

### Tools

Suitable tools sets that have been cleaned for oxygen service can be ordered from our after-sales service. Non-sparking tools are also available.

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#### **WARNING**

##### ***Contamination of the device and plant due to contaminated tools.***

*The tools must be cleaned before use in oxygen applications. Particles collecting on contaminated tools can react with oxygen.*

*→ Only use clean tools.*

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#### **Tip**

*Lint-free oxygen gloves can be ordered from our after-sales service for handling devices intended for oxygen service.*

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## 8 Troubleshooting

### 8.1 Troubleshooting

**⚠ DANGER**

*Risk of explosion or fire through the presence of oxygen.*

- Do not perform corrective action while the process is running.
- Read instructions in Chapter 7.

Malfunction	Possible reasons	Recommended action
Leakage to the atmosphere (with liquid oxygen)	Gaskets or pipelines leaking.	Renew gaskets. See associated device documentation.
Leakage at the flanges	Flanged joint not tight.	Tighten flange joint manually. Observe tightening torques. Only use manual tools.
Leakage at the screw fittings	Screw fittings loosened.	Tighten screw fittings manually.
Actuator or valve accessories iced up.	Bellows or circulation inhibitor leaking.	Contact our after-sales service. Use hot air, water or steam to melt away ice. Make sure that the medium used is free oil and grease.

- See associated device documentation for further troubleshooting.

### 8.2 Emergency action

Plant operators are responsible for emergency action to be taken in the plant.

In the event of a device malfunction:

1. Shut off oxygen supply if it is safe to do so.
2. After the risk has been eliminated, check the device for damage. Rectify the fault. Contact SAMSON's After-sales Service.
3. To put the back into service, proceed as described in Chapter 5.3.

## 9 Decommissioning and removal

### DANGER

#### **Risk of explosion or fire through the presence of oxygen.**

Oxygen accelerates combustion. Even slightly higher oxygen concentrations lead to rapid combustion.

- Make sure the cleanliness meets the requirements specified in the standards for oxygen service.
- Avoid sparking.
- Wear personal protective equipment.
- Observe the information on how a fire starts and on possible ignition sources.

### DANGER

#### **Frostbite and severe burn injuries through contact with liquid oxygen.**

The temperature of liquid oxygen is  $-183\text{ °C}$  at atmospheric pressure. Skin contact with liquid oxygen causes severe frostbite and cold burns (cryogenic burns). Severe cryogenic burns can be fatal.

- Do not touch liquid oxygen.
- Wear cold-resistant safety gloves and protective equipment.

### WARNING

#### **Damage to health through inhaling high concentrations of oxygen.**

Inhaling high concentrations of oxygen can cause adverse health effects (e.g. dizziness, nausea, impaired vision, hearing defects,

impaired balance and unconsciousness). The presence of an oxygen-enriched atmosphere cannot be detected by human senses.

- Avoid oxygen enrichment.
- Leave the oxygen-enriched environment. Move to fresh air.
- Use oxygen measuring equipment.
- Wear a respirator for applications with gaseous oxygen.

### WARNING

#### **Contamination of the device and plant due to contaminated tools.**

The tools must be cleaned before use in oxygen applications. Particles collecting on contaminated tools can react with oxygen.

- Only use clean tools.

**⚠ WARNING**

**Risk of injury due to incorrect handling of oxygen.**

*Operating personnel must be trained for oxygen service. Unqualified operating personnel expose themselves and others to an increased risk of injury.*

- ➔ *Operating personnel must be sufficiently trained and be made aware of the hazards occurring in oxygen service.*
- ➔ *Do not enter the hazardous area without prior permission and without appropriate training.*

## 9.1 Decommissioning

1. Shut off the oxygen supply.
2. Depressurize the plant.
3. Do not enter the danger zone until the oxygen concentration in the atmosphere is safe. Use oxygen measuring equipment.
4. Seal the pipeline section with blind flanges.
5. Blow out the pipeline section with clean, dry, oil-free compressed air. Alternatively, use nitrogen or a noble gas to blow out the pipe.
6. Detailed information on the removal and decommissioning of devices can be found in the associated device documentation.

## 10 Appendix

### 10.1 After-sales service

Contact our after-sales service for support concerning service, repair and cleaning work or when malfunctions or defects arise.

#### E-mail contact

You can reach our after-sales service at [aftersaleservice@samsongroup.com](mailto:aftersaleservice@samsongroup.com).

#### Addresses of SAMSON AG and its subsidiaries

The addresses of SAMSON AG, its subsidiaries, representatives and service facilities worldwide can be found on our website ([www.samsongroup.com](http://www.samsongroup.com)) or in all SAMSON product catalogs.

#### Required specifications

Please submit the following details:

- Order number and position number in the order
- Type, model number and device version
- Installation drawing
- See associated device documentation for further information.



SAMSON AKTIENGESELLSCHAFT  
Weismüllerstraße 3 · 60314 Frankfurt am Main, Germany  
Phone: +49 69 4009-0 · Fax: +49 69 4009-1507  
samson@samsongroup.com · www.samsongroup.com