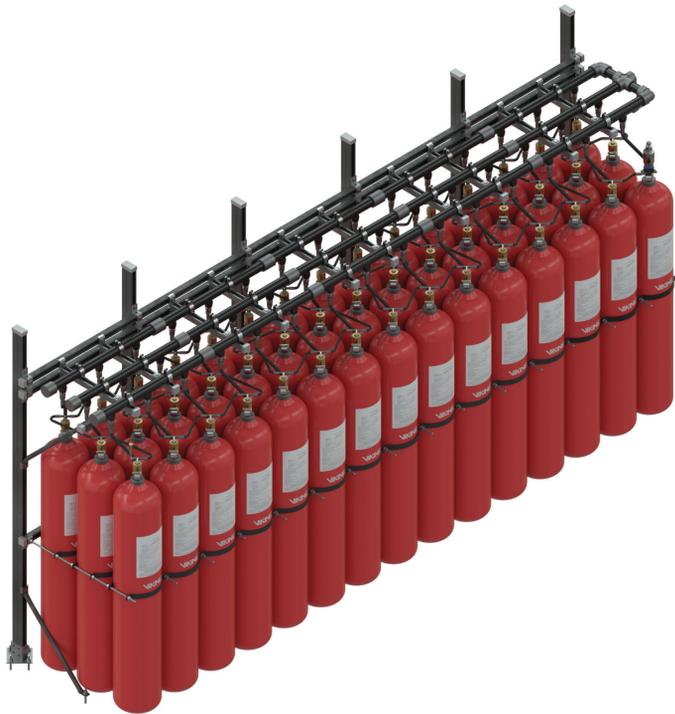




## Installation and Maintenance Manual

# Oxeo Inert Gas Extinguishing System



IMPORTANT! Read this document before starting any work.

This document is a mandatory part of the installation and should always be stored in a easily accessible location and retained for future use.

This document is a translation of the original German document with modifications specific to the usage in North and South America.

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# 1 General



This manual is intended for the installer of the fire extinguishing system.

## 1.1 Information about this manual

This manual describes the installation and maintenance of Oxexo inert gas extinguishing systems Oxexo PR LCP with a pressure reducer (also referred to hereinafter as “system”). Information about fire detection and electrical control is not part of this manual. Qualified knowledge of the extinguishing agent used and the technical details of Oxexo inert gas extinguishing systems Oxexo PR LCP with a pressure reducer are prerequisites for working with this manual.

This installation and maintenance manual contains neither detailed information concerning project planning of the system, nor detailed information concerning operation. For this, observe the design manual and the operating manual. This manual can be obtained through authorized dealers.

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## Applicable documents

Operating manual "Oxeo inert gas extinguishing system with pressure reducer, Oxeo PR LCP" (form no. F\_101821).

Design manual "Oxeo inert gas extinguishing system with pressure reducer, Oxeo PR LCP" (form no. F\_102021).

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## 1.2 About this document

This document enables the intended use of the system described. Observing all specified instructions and safety instructions is the prerequisite for safe work. Furthermore, the local accident prevention regulations and general safety conditions for the use of the system are also applicable.

If this document refers directly or indirectly to laws, regulations, or directives or quotes from them, the manufacturer cannot be held responsible for the correctness, completeness or up-to-date nature of the reference.

Observe the applicable guidelines, standards, and statutory legislation of the respective country of deployment.



The manufacturer reserves the right to make modifications resulting from further developments while retaining the key features of the system described without making corrections to this document.

Illustrations in this document are intended to facilitate basic understanding, and may differ from the actual design of the product.

## 1.3 Copyright

Any content in this document, particularly texts, photos, and graphics, are protected by copyright. If not otherwise clearly indicated, copyright lies with the manufacturer.

The manufacturer can issue permission of usage for contents of this document. Anyone violating copyright law, e.g. by copying the contents into their own documentation without the respective permission, is liable to prosecution. Copyright violators shall also receive a written warning and be liable to pay costs.



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## 2 Safety

This section provides an overview of all important aspects that are essential for the protection of personnel as well as safe and trouble-free operation. Additional task-specific safety instructions will be provided in the sections that refer to the individual stages of the installation process.

### 2.1 Safety and warning notices

Safety and warning notices are marked with symbols in this document. The introductory signal words express the respective extent of the danger.



#### **DANGER**

The signal word describes a danger with a high risk level. If the danger is not avoided, it will result in death or serious injury.



#### **WARNING**

The signal word describes a danger with a high risk level. If the danger is not avoided, it will result in death or serious injury.



#### **CAUTION**

The signal word describes a danger with a low risk level. If the danger is not avoided, it may result in minor or moderate injury.

---

### **NOTICE**

The signal word describes a danger with a low risk level. If the danger is not avoided, it may result in property and environmental damage.



This marking emphasizes useful tips and recommendations as well as information for efficient and trouble-free operation.

In instructions, this marking starts with the symbol shown above.

## 2.2 Warnings within instructions

### **Warnings in behavior guidelines**

Warnings can refer to specific, individual behavior guidelines. Such warnings are embedded in behavior guidelines so that they do not interrupt the reading flow when executing the action. The signal words described above are used.

Example:

1. Unscrew screw.



### **CAUTION**

Clamping danger on the cover.

2. Carefully close the cover.
3. Tighten screw.

## 2.3 Intended use

This system is designed exclusively for the intended use described here.

The Oxeo inert gas extinguishing system is intended only for extinguishing fires burning in enclosed rooms using the following inert extinguishing gases:

- IG-100 (nitrogen)
- IG-01 (argon)

---

Typical fire hazards for which the system should be used include:

- Electrical or electronic equipment
- Telecommunications equipment
- Ignitable and combustible liquids
- Other goods of particularly high value

The system should only be used within the usage and ambient conditions for which it has been designed.

Intended use also includes compliance with all instructions of this document.

## Misuse

Any use that extends beyond the intended use, or any other use of the system is considered misuse.



### **WARNING Danger due to misuse.**

Misuse of the Oxexo inert gas extinguishing system can lead to personal injury and material damage.

- Do not perform any structural modifications on the protection zone or the system.
- Do not use and operate the system if components are damaged or not functional.
- Do not use the protection zone for any purpose other than the one intended by the Authorized Distributor.
- Do not hang objects from pipe lines.
- Do not block the extinguishing nozzles or the ventilation devices.

## Fire hazards

Do NOT use the system in conjunction with the following fire hazards:

- Chemicals that release oxygen.
- Mixtures containing oxidizing substances (e.g. sodium chlorate, sodium nitrate, explosives, gunpowder).
- Chemicals capable of thermally decomposing autonomously (e.g. certain organic peroxides).

- 
- Reactive metals (e.g. sodium, potassium, magnesium, titanium or zirconium) and reactive hybrids or metal amides.

**i** In certain circumstances, some of the mentioned fire types can be suppressed using IG-01 (argon). Consult the manufacturer about this.

## 2.4 Safe operation

If system components are used improperly or for other than their intended purpose, the system in which they are used can pose hazards or be impaired. Only use undamaged and fully functional products and machines. If safe operation damage can no longer be assured (for example, if visible damage is present), put the system out of operation without delay and secure against accidental commissioning.

Also observe the following:

- Use only original spare and wear parts.
- Replace parts that are not in perfect condition immediately.
- Do not carry out any changes, extensions or modifications without the express permission of the manufacturer or distributor.

This also applies to welding work on load-bearing parts.

**i** Any changes, extensions or modifications not approved by the manufacturer are the sole responsibility and liability of the person making the modification and exclude any responsibility of the manufacturer.

---

Also observe the following fundamental information:

- National safety regulations
- National accident prevention regulations
- National assembly and installation regulations
- Generally accepted technical principles
- Safety and warning notices as described in this document
- Demands on personnel as described in this document

## 2.5 General dangers

The following section describes residual risks that can arise from the system even with proper use.

In order to reduce risks of personal injury and property damage and avoid dangerous situations, the safety instructions listed here and the safety instructions in the other sections of this document must be followed.

### **2.5.1 General dangers associated with fire extinguishing systems**

---

## Electrical current



### **DANGER Risk of death due to electric shock**

An imminent, risk of death due to electric shock exists if live components are touched. Damage to the cable insulation of individual components involves the risk of fatal injury. Moreover, incorrect connection can cause system malfunctions.

- Allow only qualified electricians to work on electrical components and the electrical connection.
- If there is damage to the cable insulation, shut off the power supply immediately and replace defective cables with new cables.
- Prior to starting tasks on live components of electrical equipment and supplies, establish the de-energized state and ensure this state for the duration of the tasks. In this process comply with the 5 safety rules:
  1. Power down.
  2. Safeguard against restart.
  3. Ensure de-energized state.
  4. Ground and short circuit.
  5. Cover or shield any adjacent live components.
- Never remove safety devices, change them, or render them inoperable. Only replace defective fuses with fuses of the same amperage.
- Keep moisture away from live components. This may lead to short circuits.

## Oxygen deficiency



### **WARNING Risk of death due to oxygen deficiency**

If the extinguishing agent concentration exceeds 52% by vol. (LOAEL), the extinguishing agent can have a toxic effect due to the reduced oxygen concentration. A danger of asphyxiation exists with extinguishing agent concentrations above 62% by vol.

- Ensure that the locally applicable directives for rooms used for the storage of extinguishing agent containers are complied with.
- Comply with NOAEL (No Observed Adverse Effect Level) and LOAEL (Lowest Observed Adverse Effect Level) and ensure that the limit values are not exceeded.
- Avoid inhaling vapors, aerosols, and atomized spray.
- Comply with the safety data sheet for the extinguishing agent.

---

## Extinguishing agent cylinders under high pressure



### **WARNING Risk of death due to pressure in extinguishing agent cylinders.**

If pressurized extinguishing agent cylinders are damaged and extinguishing agent escapes uncontrollably, there is a risk of severe injuries.

- Do not transport or store extinguishing agent cylinders unless they are sealed with a protective valve cap and a lock nut.
- Ensure that the extinguishing agent cylinders are attached correctly.
- Replace damaged extinguishing agent cylinders immediately.

## 2.5.2 Dangers when the system is activated

### Cold extinguishing agent



### **WARNING Risk of injury from cold extinguishing agent.**

The extinguishing agent exiting at the discharge nozzles is very cold. Direct contact may result in injury.

- Leave the extinguishing zone without delay and within the pre-discharge timer when an alarm is given.
- Stay out of the direct flow area of a discharge nozzle.

### Shock



### **WARNING Risk of injury from shock.**

The activation of the system involves noises from the discharged agent which may surprise persons to an extent that they suffer shock.

- Inform all persons staying inside or close to the protected enclosure about the existence of an automatic fire suppression system and the possibility of the system's activation.
- Make persons familiar with the procedures required in the event of an alarm, a fire, or the activation of the fire suppression system.
- If in doubt, deny persons direct access to the protected enclosure.

---

## Faulty activation



### **WARNING Risk of injury from faulty activation.**

A faulty activation of the system may cause severe injuries and property damage.

- Activate the system only in the event of a fire.
- Protect the manual release devices in the protected enclosure from inadvertent activation.
- Refrain from smoking inside the protected enclosure.
- Before performing any work generating heat and smoke, observe the following:
  1. Isolate the system.
  2. Switch off the fire alarm system.

---

## Falling and flying objects



### **WARNING Risk of injury from falling and flying objects.**

The discharge velocity of the extinguishing agent may cause objects to tip over or become airborne or to be damaged. This can cause severe injuries and significant material damage.

- Do not place any loose objects into the discharge zone of the discharge nozzles.
- Exit the extinguishing zone without delay and within the pre-discharge timer when an alarm is given.
- Do not place any sensitive objects (e.g. hard drives) directly into the discharge zone of the discharge nozzles.

## Noise



### **WARNING Risk of injury from noise.**

High sound pressure levels caused by discharged gas and acoustic alarm equipment (e. g. signal horns) may cause hearing damage.

- Leave the extinguishing zone without delay and within the pre-discharge timer when an alarm is given.
- Stay out from the immediate vicinity of acoustic alarm equipment and discharge nozzles.

## Effects of cold

### **NOTICE Property damage from cooling ambient air.**

The discharged extinguishing agent extracts heat from the ambient air contained in the extinguishing zone. This causes the air in the immediate discharge zone of the extinguishing nozzles to cool to below -58 °F (-50 °C).

- Do not attach/store components that are sensitive to cold in the immediate vicinity of the discharge nozzles.

---

## Excess pressure

### **NOTICE Property damage from excess pressure.**

Due to the emitted extinguishing agent, an overpressure arises in the extinguishing zone which can lead to damages to walls and doors of the protected enclosure.

- Ensure that pressure relief devices are installed in the protected enclosure and included in the design of the system.
- Make sure that the function of the pressure relief is checked regularly.

## 2.6 Qualification of personnel



### **WARNING Inadequately qualified persons pose a hazard.**

Inadequately qualified persons cannot assess the risks involved in handling the system. They expose themselves and others to the risk of severe or fatal injuries.

- All work should be carried out only by persons qualified to do so.

Before starting any work, the following persons must be designated who have the knowledge required to operate the system:

- A person to be responsible for the system
- An operator/person authorized by the operator

For all tasks, only persons from whom it can be expected that they will carry out their tasks reliably are authorized to perform such tasks. Persons whose reaction time is affected, for instance by drugs, alcohol or medication, are not authorized.

Furthermore, all work must only be carried out by persons who meet the following prerequisites:

- They have read and understood this document including the safety instructions and warning notices.
- They are familiar with basic regulations on occupational safety and accident prevention.
- They have been given instruction on handling the system.

The various tasks described in this document require that the persons responsible for them have different qualifications. These qualifications are specified in the following section:

---

### **2.6.1 Authorized Distributor**

The Authorized Distributor has verifiably undergone training provided by the manufacturer, during which the company was made familiar with the knowledge and procedures necessary to install, commission and service fire suppression systems in a safe manner.

### **2.6.2 Person in charge of the system**

The person in charge of the system has verifiably been given instructions by the company that installed the system as to the specifics of the tasks entrusted to him/her and all possible dangers that may arise from improper conduct.

The person in charge of the system has been appointed by the owner as the person who is responsible for the correct and proper completion of the work and inspections performed on the system.

### **2.6.3 Qualified electrician**

The qualified electrician is capable of performing work on electrical systems and independently detecting and avoiding any possible risks due to his/her long years of expertise and experience and his/her familiarity with all applicable standards and regulations.

A qualified electrician must also provide proof of his/her professional qualification that confirms his/her capacity to perform work on electrical systems.

The qualified electrician must comply with the provisions of all applicable legal regulations regarding accident prevention.

### **2.6.4 Qualified specialist personnel**

Qualified specialist personnel are persons with the following qualifications and authorizations:

- These persons are qualified for the respective activities as a result of their education, experience, and participation in a training course conducted by the manufacturer or distributor.
- These persons have the appropriate knowledge of standards, directives, accident prevention regulations, and operating conditions.
- These persons have been authorized by the person responsible for the safety of the system to carry out the necessary activities and are capable of recognizing and avoiding possible risks.

---

## Unauthorized persons



### **WARNING Risk of injury for unauthorized persons.**

Unauthorized persons who do not meet the requirements described are not familiar with the risks connected with the function (e.g. triggering and/or isolating) of the system.

This poses risk of injury.

- Keep unauthorized persons away from control equipment.
- In the case of doubt, speak to persons and instruct them to move away from control equipment.

## 2.7 Personal protective equipment

Personal protective equipment is designed to protect people from risks to their safety and health at the workplace.

Personnel must wear personal protective equipment, which is specifically indicated in the individual sections of this document, when carrying out the various tasks.

The personal protective equipment is described in the following sections:

### **2.7.1 Hearing protection**

Hearing protection serves to protect hearing from high sound levels (noise).

### **2.7.2 Industrial hard hat**

Industrial hard hats protect the head against falling objects, hanging loads and bumping against stationary objects.

### **2.7.3 Protective goggles**

Protective goggles cover the entire area of the eyes (including the sides) and are used to protect the eyes from the extinguishing agent and from particles that are whirled up by the extinguishing agent.

### **2.7.4 Safety footwear**

Safety footwear protects the feet from crushing injuries, falling parts, and slipping on slippery surfaces.

---

### 2.7.5 Safety gloves

Safety gloves are used to protect the hands from friction, abrasions, puncture wounds or deeper wounds as well as coming into contact with hot surfaces.

### 2.7.6 Safety goggles

Safety goggles cover the entire eye area (also on the side) and are used to protect the eyes, e.g. against chemicals, raised particles or pressurized gases or liquids.

## 2.8 Obligations of the Authorized Distributor

### Authorized Distributor

The Authorized Distributor is the entity that installs the system, commissions the system, and performs the service on the system. These tasks are executed for commercial or business purposes. Consequently, during the tasks cited above the Authorized Distributor bears the legal product responsibility for the tasks and protecting the personnel performing the tasks.

### Obligations of Authorized Distributor

The Authorized Distributor must:

- Ensure that the system complies with the valid provisions and regulations for the installation of fire extinguishing systems with the extinguishing agent used in this system and that the system has been designed correctly. The following applies in particular:
- The Authorized Distributor must comply with the valid national regulations for fire extinguishing systems and other local valid regulations and take them into account in the design of the system; specifically those that relate to alarm systems.
- The Authorized Distributor must consider the current state of technology.
- Design the system using CAA or a recognized calculation program authorized by the manufacturer.
- Ensure that the system is installed, set up and - if contracted - maintained in accordance with valid local laws, standards and guidelines.
- Mark the system and all necessary information in a clearly visible and permanent manner.
- Ensure that the personnel carrying out the work have the necessary qualifications for completion of the work.
- Ensure that all employees working with the system have read and understood this document.

- 
- Ensure that all employees working with the system are familiar with the object and ambient conditions, the safety concept, the protection task, and, if applicable, the monitoring task of a higher-level fire detection system before starting work.
  - Instruct a responsible person on the operator side on how to carry out the work and on checks that must be carried out by the operator, and document this instruction.
  - Document the actual status of the system at the time of the handover and inform a responsible person on the operator side of the actual status.
  - Mark selector valves and blocking devices in multi-zone systems in such a way that assignment to the individual extinguishing zones is possible.

### 2.8.1 Training

The Authorized Distributor must instruct the owner or the person in charge of the system in the handling of the system and subsequently hand over the operating manual to this person. For better traceability an instruction log must be drawn up with at least the following contents:

- Date of the instruction
- Name of the person being instructed
- Content of the instruction
- Name of the instructor
- Signatures of the instructed person and the instructor

## 2.9 Safety and protective devices



### **WARNING Risk of injury due to non-functioning safety devices.**

If safety devices are not functioning or have been rendered inoperable, there is danger of severe injuries and considerable material damage.

- Before starting work, check whether all safety devices are functioning and correctly installed.
- Never render safety devices inoperable or bypass safety devices.
- Ensure that all system safety devices are always accessible.

The system has various safety devices that are described below.

---

## **Bursting disks**

Bursting disks are safety devices that protect a container from excess pressure. If a critical pressure level is exceeded the disk bursts, the excess pressure is dissipated.

Bursting disks that have burst must be replaced.

## **Pressure relief dampers**

Pressure relief dampers are installed in the exterior walls of buildings to dissipate the pressure increase or drop that occurs when the system is activated.

Pressure relief dampers are closed in idle position. If there is an increase or drop in pressure over or under a specified value the pressure relief dampers open and ensure that the pressure is relieved.

## **Check valve**

Check valves permit the flow of extinguishing agent in the flow direction and prevent it in the opposite direction. They are located at the transitions of the hoses to the manifold.

## **Pilot pressure relief device**

The pilot pressure relief device dissipates a slow increase in pressure via a vent bore. Slow gas leaks can occur, for example, if there are leaks in the extinguishing agent container. The pilot pressure relief device closes automatically if there is an abrupt pressure increase through an activation, so that the pilot line of the respective extinguishing zone is closed at flooding.

## **Manifold safety valve**

Manifold safety valves are attached wherever dangers exist due to unreliably high pressure, e.g. at distributors for multi-zone systems.

In the event of impermissibly high pressure the manifold safety valve ensures pressure compensation. The blow-off lines connected to the manifold safety valve safely dissipate the medium.

---

## Protective valve caps

Protective valve caps are used to protect sensitive components (e.g. valves) of the extinguishing agent containers. They prevent the valves from being damaged during transport. The protective valve caps must be attached before each transport.

## Locking nut

The locking nuts seal the valve outlets, e.g. during transport or storage, so that extinguishing agent does not escape in the event of unintentional activation. They are provided with vent bores in order to enable a controlled release of pressure in case of unintentional activation.

The locking nuts are connected to the valves by means of loss protection devices.

## 2.10 Signage

The following symbols and information signs have been attached in the area of the system.



### **WARNING Risk from illegible or missing signs.**

Over time, stickers and signs can become dirty or illegible for other reasons, so that risks can no longer be recognized and necessary operating instructions can no longer be adhered to. This will lead to risk of injury.

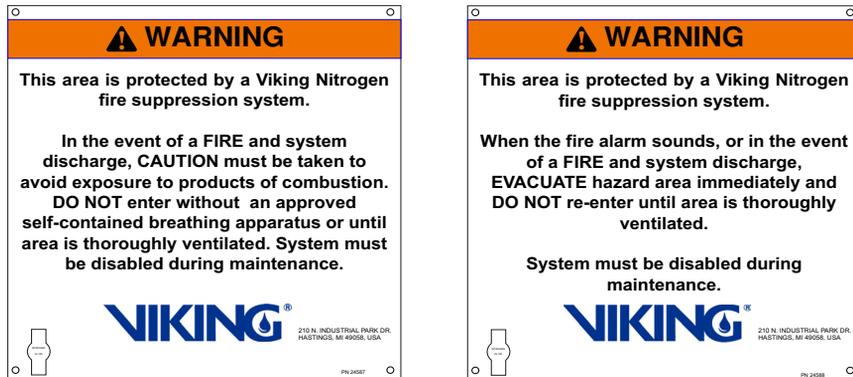
- Keep all safety, warning and operating instructions easily legible at all times.
- Immediately replace damaged signs or stickers.

---

## Marking of the extinguishing zones

The operator must mark the extinguishing zones of the system to point out the presence of the fire extinguishing system and the involved risks.

Signs for both Nitrogen and Argon systems are available (Nitrogen pictured below). Signs are available in English, Spanish, and French.



**FIGURE 2-1: Marking of the extinguishing zones**

---

## Non-toxic, non-flammable gas under pressure

This hazard pictogram indicates containers with gases under pressure, which can explode if they are heated.

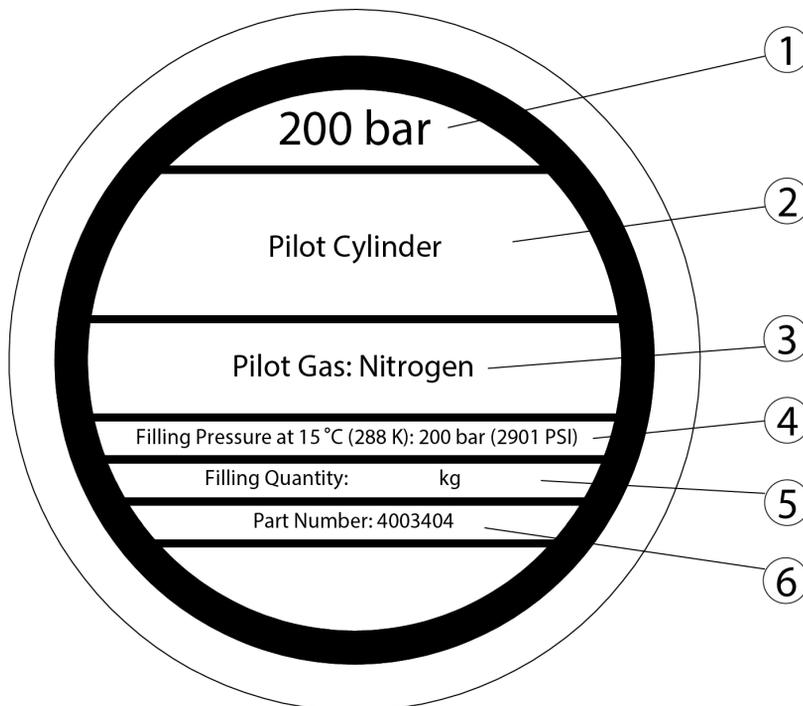
Inhaling high concentrations of these gases is hazardous to a person's health.

Protect the containers from tipping over and falling down as well as from heating, impact, and shock.

---

## Label - Pilot cylinder

There is a label on every pilot cylinder providing specific information about the container. It contains the specifications listed below.



**FIGURE 2-2: Type plate**

---

1. Nominal pressure [bar]
  2. Designation: pilot cylinder
  3. Pilot gas: Nitrogen
  4. Filling pressure at 59 °F (15 °C) [bar]
  5. Filling quantity [kg]
  6. Part number of the pilot cylinder
-

## Label for extinguishing agent container FM/UL

For FM/UL, each extinguishing agent container has an additional label with more specific information. It includes the following information.

**FM APPROVED**      **UL LISTED**      **ULC LISTED**

CLEAN AGENT EXTINGUISHING SYSTEM UNIT  
34YN

Type of agent	IG-01 (Argon)	IG-100 (Nitrogen)
Operating pressure at 70°F (21°C)	<input type="checkbox"/> 206 bar (2988 psi)	<input type="checkbox"/> 207 bar (3002 psi)
	<input type="checkbox"/> 311 bar (4511 psi)	<input type="checkbox"/> 310 bar (4496 psi)
Model number (order number)		
Weight of agent charge	kg	
Gross weight of charged cylinder and valve assembly	kg	
Maintenance Manual	F_101921	
Operation Manual	F_101821	
Fill station	Purity Cylinder Gases, 2940 Clydon Ave. SW, Wyoming MI 49519 (VKC016)	

System operation temperature range 0°C to 55°C (32°F to 131°F)  
Cylinder tested to marked service pressure, see cylinder marking for manufacturing date  
System to be installed and maintained in accordance with the National Fire Protection Association Standard for Clean Agent Extinguishing Systems, NFPA 2001

**INSPECTION AND MAINTENANCE:**

- Check agent quantity or pressure at least semiannually.
- Refill or replace container when it shows a loss in agent quantity (indicated at the weighing device) of more than 5%.
- For detailed instructions for correct system handling usage and maintenance see: Installation, Maintenance Manual
- If the system fails above inspections use only a qualified service agency to safely restore system to operation condition.

**WARNING: Avoid exposure to vapors, fumes, and products of combustion.**  
**MISE EN GARDE: Éviter toute exposition aux vapeurs, aux fumées et aux produits de combustion.**

**SAFETY INSTRUCTIONS:**

- READ AND UNDERSTAND ALL INFORMATION CONTAINED ON THIS CYLINDER
- Pressure vessel - Do not incinerate or expose to temperatures above 55°C (131°F).
- For safety information on agent types see Material Safety Data Sheet (MSDS)
- Hazardous properties: Asphyxiant in high concentrations, heavier than air, compressed gas.

**HIGH PRESSURE CYLINDER, CAPABLE OF VIOLENT DISCHARGE  
EXTREMELY HAZARDOUS - CAN CAUSE SEVERE INJURY OR DEATH**

IF CONTAINER CONTENTS MUST BE REMOVED FOR SERVICE, MAINTENANCE OR DISMANTLING OF THE CLEAN AGENT SYSTEM - PRIOR TO REMOVAL, CONTACT YOUR LOCAL INSTALLER OR MANUFACTURER FOR INSTRUCTIONS CONCERNING THE EQUIPMENT AND CLEAN AGENT.

**DO NOT COVER, REMOVE OR DEFACE THIS LABEL**

VIKING CORPORATION, 210 N. INDUSTRIAL PARK DRIVE, HASTINGS MI, 49058

**FIGURE 2-3: FM/UL nameplate**

1. Type of extinguishing agent

2. Operating pressure at 70 °F (21 °C)
3. Order number of the extinguishing agent container
4. Weight of extinguishing agent charge
5. Overall weight of the extinguishing agent container
6. Part numbers of the manuals
7. Fill station

---

## 2.11 Environmental protection

Comply with safety data sheets of the extinguishing agent.



The safety data sheets belong to the scope of delivery of the extinguishing agent containers or can be obtained from the manufacturer.

## 2.12 Behavior in the case of fire

### Preventive measures

- Always be prepared for fire and accidents.
- Keep first-aid supplies (first-aid kit, blankets, etc.) and replacement extinguishing equipment (e.g. fire extinguishers) in good working condition and within easy reach.
- Familiarize personnel with accident reporting, first-aid, and rescue equipment as well as the possibilities for manually actuating the system.
- Keep access roads for rescue vehicles clear.

### Measures in the case of fire



#### **WARNING Danger to life due to fire.**

When a fire breaks out and during extinguishing operations, severe fire smoke can build up. Being present in a flooding zone in the event of a fire may result in severe respiratory injury or even death by suffocation.

- Immediately leave the flooding zone affected by the fire.
- Only access the flooding zone again once this has been permitted by the fire department.

When the system alarm devices have been activated (main alarm), a pre-warning time (usually 30 - 45seconds) starts to run down. After this pre-warning time elapses, the system actuates.

---

Take the following measures if fire breaks out:

- If there is no danger posed to your own health, actuate the system manually if there is evidence of a smoke/fire build-up.
- If there is no danger posed to your own health, rescue people from the danger zone.
- Immediately leave the extinguishing zone.
- Begin applying first-aid measures if required.
- Warn people who are in danger in adjacent areas.
- Alert the fire department and/or rescue service.
- Inform the person responsible on-site.

### **After the system is triggered**

Certain rules of behavior apply for how to act after the system has been activated - these are explained in a separate section.



---

## 3 Transport, packaging and storage

### Eccentric center of gravity



**WARNING Risk of injury due to falling or tilting packages**

Packages can have an eccentric center of gravity. If attached incorrectly, the package can tip over and fall. Severe injuries or even death can result by falling or tipping packages.

- When transporting with a crane, attach the crane hook in such a manner that it is above the center of gravity of the package.
- Carefully lift the package and see whether it tips. If necessary, change the attachment.

---

## Improper transport of hazardous goods



### **WARNING Life-threatening danger due to improper transport of hazardous goods**

The extinguishing containers are hazardous goods if they are filled with or contain residual quantities of extinguishing agents, e.g. after a release. If extinguishing agent containers are damaged due to improper transport, severe to fatal injuries can occur.

- Always transport extinguishing agent containers in compliance with the instructions contained in this manual.
- Comply with locally valid regulations concerning transport of hazardous goods.
- Only remove protective valve caps of the extinguishing agent containers after they have been mounted at the installation site; reattach the protective valve caps prior to every transport.
- Comply with the additional instructions on the extinguishing agent containers.

### **NOTICE Material damage due to improper transport**

Improper transport may cause transported items to fall down or topple over. This may cause significant and costly material damage.

- Proceed carefully during the unloading of the transport pieces during delivery as well as during the transport to its final destination and comply with the symbols and information displayed on the packaging.
- Only use the designated attachment points.
- Only remove packaging immediately prior to installation.

## 3.1 Transport inspection

1. Check all system parts for completeness and transport damage immediately upon receipt.
2. Check the fill quantity of the extinguishing agent container.
3. If there is apparent external transport damage or if an extinguishing agent container does not have the specified fill quantity, proceed as follows:
  - Do not accept the delivery or only accept the delivery with reservation.
  - Note the scope of the damage on the transport documents or on the freight forwarder's delivery ticket.
  - Initiate a complaint procedure.



Report every complaint as soon as it is detected. Claims for damage compensation can only be asserted within the applicable period specified for the reporting of complaints.

---

## 3.2 Transport

### 3.2.1 Transport extinguishing agent containers

Personnel:

- Authorized Distributor



**WARNING Danger to life due to extinguishing agent escaping in an uncontrolled manner**

The extinguishing agent containers are pressurized. If they are damaged, extinguishing agent may escape in an uncontrolled manner. This may cause the extinguishing agent containers to slide around uncontrollably and cause serious injuries. Escaping extinguishing agent can also result in frostbite and life-threatening injuries to the skin and eyes.

- Damaged extinguishing agent containers should not be transported under pressure and should instead be emptied before the transport.
- Only start the transport when the locking nuts are on the valve output and the blanking plugs are on the control output and the valve protection caps have been assembled.
- Always secure the extinguishing agent containers in accordance with the following specifications.



**WARNING Risk of injury due to improper transport of heavy extinguishing agent containers**

If heavy extinguishing agent containers are transported incorrectly, dangerous injuries may be caused, e.g. crushing or injuries to the spine.

- On the construction site, only transport extinguishing agent containers using suitable transport methods.



**WARNING Risk of injury due to tipping extinguishing agent containers**

Extinguishing agent containers are heavy and may have a high center of gravity depending on the design. If extinguishing agent containers tip while being handled, this can lead to severe injuries or even death.

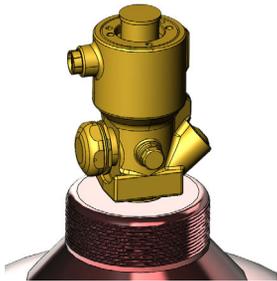
- Transport extinguishing agent containers in such a way that they cannot tip.
- Fasten extinguishing agent containers to a wall or other part of the building with a clamp immediately after transport.

---

## Transporting filled extinguishing agent containers

Filled extinguishing agent containers are dangerous goods of class 2.2 (non-ignitable, non-toxic gases). The extinguishing agent containers must thus be transported in accordance with the valid local regulations for the transport of dangerous goods.

1. Contact the local specialist for the transport of dangerous goods and inquire about the regulations on transporting extinguishing agent containers.



**FIGURE 3-1: Valve (example)**

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2. Make sure that the locking nut on the valve output and the blanking plugs on the control output are attached.



**FIGURE 3-2: Valve protection cap (example diagram)**

---

3. Screw on the valve protection cap to the extinguishing agent container.



**FIGURE 3-3: Hazard label**

4. Identify the extinguishing agent containers as class 2 dangerous goods by applying the hazard label.
5. Check that the dangerous goods label (UN number and name) is present.
6. Fasten the extinguishing agent containers standing up in a suitable transport frame or lying down on a pallet, and secure against sliding.
7. Transport the pallets in accordance with the specifications in this instruction.

### **Transporting empty extinguishing agent containers**

Extinguishing agent containers that have been activated contain a residual pressure of approx. 22 psi (1.5 bar). This residual pressure prevents dirt and moisture entering the container via the valve output.

Depending on the valid local regulations, this container represents a dangerous good and is thus subject to the regulations for transporting dangerous goods.

Contact the local specialist for the transport of dangerous goods and inquire about the regulations on transporting activated extinguishing agent containers.

- i** With a residual pressure of up to max. 29 psi (2 bar), the extinguishing agent container is not subject to dangerous goods regulations.  
at 68 °F (20 °C)

---

## Emptying extinguishing agent containers

- Empty containers are also considered dangerous goods.
- I** Observe the instructions on transporting empty extinguishing agent containers

Extinguishing agent containers with obvious damage or with far-reaching corrosion in the base area must not be re-used. They must be emptied before transportation and then disposed of.

1. Unscrew the valve protection cap from the extinguishing agent container.
2. Relieve the pressure via the pressure gauge connection.
3. Screw the valve protection cap onto the extinguishing agent container.

### 3.2.2 Transporting pallets

#### Transporting pallets with the fork lift

Personnel:

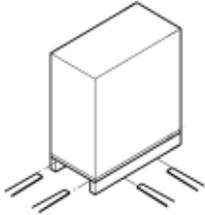
- Authorized Distributor

Transport packages that are attached to pallets can be transported with a forklift under the following conditions:

- The forklift must be configured appropriately for the weight of the transport cases.
- The transport package must be securely fastened on the palette.

---

## Transporting



**FIGURE 3-4: Transport with the forklift**

---

1. Drive the forklift with the forks between or under the spars of the pallets.
2. Drive in the forks until they protrude on the opposite side.
3. If there is an eccentric center of gravity, ensure that the pallet cannot tilt.
4. Lift the pallet with the transport package and start the transport

## 3.3 Packaging

### About the packaging

The individual packages are packed in boxes or crates in accordance with the expected transport conditions.

The packaging should protect the individual components from transport damage and other damage until the components are mounted. Consequently do not destroy the packaging and only remove it just before the components are mounted.

---

## Handling packaging materials

Dispose of packaging materials in accordance with the respectively valid statutory regulations and local guidelines.

### **NOTICE Improper disposal poses an environmental hazard**

Packaging materials are valuable raw materials and in many cases, they can be reused, or they can be effectively treated and recycled. Improper disposal of packaging materials causes environmental hazards.

- Dispose of packaging materials in an environmentally responsible manner.
- Comply with locally applicable disposal guidelines. If necessary, commission a specialized company to dispose of packaging.

## 3.4 Storage

### Storing extinguishing agent containers

Store reserve extinguishing agent cylinders under the following conditions:

- Do not store outdoors.
- Store in a dry, dust-free environment.
- Do not expose to aggressive media.
- Protect against direct exposure to sunlight.
- Avoid mechanical vibrations/shocks.
- Avoid condensation moisture.
- Storage temperature: -4 to +131 °F (-20 to +55 °C).
- Store with the valve protection cap in place.
- Always store in the supplied transport frame or lying on the supplied pallet.
- Observe national regulations on the storage of extinguishing agent cylinders.
- If stored for more than 3 months, regularly check the general condition of all extinguishing agent cylinders. If necessary, contact an authorized distributor or service personnel authorized by the authorized distributor and have damaged or corroded extinguishing agent containers replaced. Contact via the manufacturer if possible.



### **WARNING Risk of injury from illegible symbols**

Over the course of the storage period, labels and signs can become soiled or illegible in some other way, which may result in risks no longer being detected and the necessary operating instructions no longer being followed. This will lead to a risk of injury.

- Keep all safety, warning and operating instructions easily legible at all times.
- Replace any damaged signs or labels immediately (or have them replaced).



There might be notices on storage on the packaging items that go beyond the requirements stipulated here. Observe them accordingly.

## **Storing packages**

Only store packages under the following conditions:

- Do not store outdoors.
- Store in a dry area.
- Do not expose to abrasive media.
- Protect from direct sunlight.
- Avoid mechanical vibration.



It may be that storage instructions are affixed to the packages that extend beyond the requirements cited here. Follow these additional instructions accordingly.



---

## 4 Design and Function



UL listed or FM Approved extinguishing system devices with an electric release require the use of a UL listed or FM Approved fire detection system/electric control device that is compatible with the release device. Likewise, all fire detection devices must also be UL-listed or FM-accredited and compatible with the fire detection system/electric control device.

### 4.1 Functional description

If at least 2 fire detectors installed in the protection zone detect a fire or the manual release is activated, the fire detection and suppression control panel sets the activation state and electrically activates the pneumatic control device LCP immediately.

In systems without life safety, the activation pulse is issued to the electrical release device of the system once a defined pre-warning time passes.

In systems with life safety measures, the control gas is guided to the pneumatic alarm device (makrofon) and the non-electrical time delay unit immediately. Once the set delay time passes, the extinguishing agent containers assigned to the extinguishing zone are opened pneumatically.

The extinguishing agent flows from the extinguishing agent containers through a manifold with check valves and then through the open selector valve. The extinguishing agent then flows through the pressure reducer and reaches the discharge nozzles through the downstream pipe-

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work. The discharge nozzles distribute the extinguishing agent evenly in the extinguishing zone.

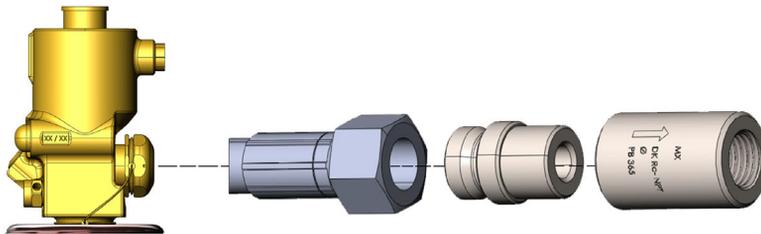
To fight the fire, the extinguishing agent reduces the relative oxygen level in the air through oxygen displacement.

To divert the resulting overpressure and the oxygen away from the extinguishing zone, a pressure relief flap is mechanically or pneumatically/electrically opened for the flooding period at minimum.

As well as the automatic electric release, the system can also be activated manually using manual electric releases. These releases are usually installed at the extinguishing zone access point.

For more details and information about the variants of the manual release for the system, see the applicable local regulations.

#### 4.1.1 Single container systems



**FIGURE 4-1: Single container system connection line**

Single container systems have only one single extinguishing agent container. They are used solely for small extinguishing zones. Single container systems have an electric release device that is fitted to the extinguishing agent container valve. Optionally, a mechanical manual release device for manually activating the system can be fitted on the electric release device.

---

Single container systems with a pneumatic release device have a pilot cylinder that is activated electrically. The control gas flows through a pilot line from the pilot cylinder to the pneumatic release device for the extinguishing agent container and opens it.



Use single container systems without a pilot cylinder only if you have ensured that the extinguishing agent that flows out does not pose a danger to people.

#### 4.1.2 Multi container systems



**FIGURE 4-2: Multi container system**

---

Multi container systems feature several extinguishing agent containers interconnected via a pilot line. They are required, for example, if a large protection zone must be protected.

In multi container systems without a pneumatic release device, the first extinguishing agent container (master) is actuated electrically in the same way as in single container systems (and optionally also manually). All other extinguishing agent containers (slaves) are opened pneumatically through a pilot line.

Multi container systems with a pneumatic release device feature a pilot cylinder that is triggered electrically. The control gas flows through a pilot line from the pilot cylinder to the pneumatic release devices for the extinguishing agent containers and opens them.

In contrast to single container systems, the extinguishing agent initially flows from the hose through check valves into a manifold if a multi container system is actuated. From there, the extin-

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guishing agent flows through the downstream pipework to the discharge nozzles where it escapes into the extinguishing zone.

## 4.2 Oxeo unistrut racking arrangements

For information pertaining to system racking, See “Appendix A - Racking Assembly” on page 183.

## 4.3 Pipeline system

Pipes and fittings make up the pipeline system between the extinguishing agent cylinders and discharge nozzles. This is an optional portion of the scope of delivery.

The pipeline system for Oxeo inert gas extinguishing systems is divided into two different areas:

- High pressure pipework: The area of the high-pressure pipework starts at the manifold and ends at the pressure reducer. The selector valves and manifold pipes are also located in the high-pressure pipework for multi-zone systems.
- Downstream pipework: The area of the downstream pipework starts behind the pressure reducer and ends at the nozzles.

The design of the pipeline system including the required pipe cross sections must be executed through a hydraulic calculation program recognized by the manufacturer. The pipeline serves as the basis here.



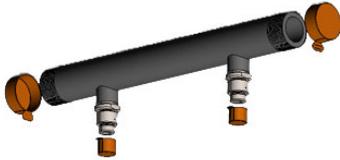
Changes in the pipeline routing require a new hydraulic calculation. In this regard changes in pipe cross section, extinguishing agent cylinder size, pressure reducer bezel, and nozzle bores can occur.



The manufacturer provides technical specifications for materials made available for the pipeline system. A checking of the materials for matching with local guidelines for pressurized pipelines and their corresponding selection is the responsibility of the Authorized Distributor.

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## 4.4 Manifold 200 bar and 300 bar, DN50



**FIGURE 4-3: Manifold with 2 inlets**

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**FIGURE 4-4: Manifold with 3 inlets**

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Manifolds serve as a shared connection for the extinguishing agent containers on the pipe network.

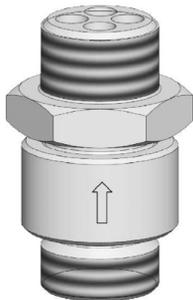
Manifolds are intended for a one-, two-, or three-row set-up for extinguishing agent containers.

Manifolds with 2 to 3 inlets are available for the one-, two-, or three-row set-ups.

A check valve is installed in each inlet to allow the extinguishing agent to flow in the correct flow direction and to prevent it from flowing in the opposite direction. The manifolds are pressure tested at the factory.

---

## 4.5 Check valve KRV-2



**FIGURE 4-5: Check valve KRV-2**

---

The check valve KRV-2 is used in stationary 300 bar inert gas extinguishing systems. The check valve enables the flow of extinguishing agent in the flow direction and prevents it flowing in the opposite direction.

The check valve is a component of the manifold.

## 4.6 Extinguishing cylinder with quick release valve QRV



**FIGURE 4-6: Extinguishing agent container and valve protection cap**

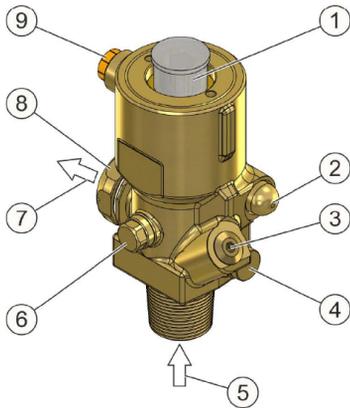
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The extinguishing agent is stored in one or more extinguishing agent containers in a container battery that is suitable for the extinguishing agent containers. For safety reasons, the container batteries must be fastened to load-bearing parts of the building (wall and/or floor).

The extinguishing agent containers are designed, produced and marked in accordance with American standards (e.g. DOT) or other country-specific pressure equipment guidelines. An appropriate nameplate is attached to each extinguishing agent container.

---

#### 4.6.1 Quick release valve QRV



**FIGURE 4-7: Quick release valve QRV**

1. Thread for manual/electrical release device (here with a plastic protective cap)
2. Pressure relief button for the filling process
3. Pressure gauge connection
4. Bursting disc safety device (safety screw)
5. Valve inlet
6. Sequence valve connection
7. Valve output
8. Locking nut
9. Control connection

---

The quick release valve is installed on an extinguishing agent container and can be opened pneumatically, electrically or manually. When the valve is open, the extinguishing agent flows through the pipelines to the extinguishing nozzles.

The valve works according to the differential pressure system. By activating a release device, the pilot valve integrated in the valve is opened and the upper pressure chamber is vented abruptly. This drop in pressure causes the extinguishing agent container pressure to press the closing piston in the opened position, thereby opening the valve.

The valve is fitted with an integrated pneumatic release device as standard. In addition, an electrical release device and/or manual release device can be fitted on their designated thread.

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The extinguishing agent containers are filled through the valve output.

To protect against impermissibly high pressure, each valve is equipped with a burst disk device.

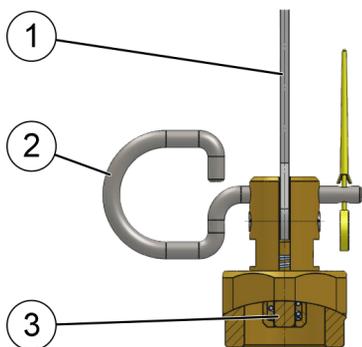
Each valve includes a pressure gauge connection with an integrated non-return valve and control connection.

The quick release valve is a total discharge (TD) valve, meaning that following activation, the valve remains open until the extinguishing agent container is empty (with the exception of the remaining residual pressure; see below).



If the pressure in the extinguishing agent container is approximately 22 psi (1.5 bar), the valve closes again automatically. There is subsequently always a residual pressure in the extinguishing agent container.

#### 4.6.2 Release device, manual, QRV



**FIGURE 4-8: Release device, manual**

1. Manual lever
2. Split pin
3. Release pin

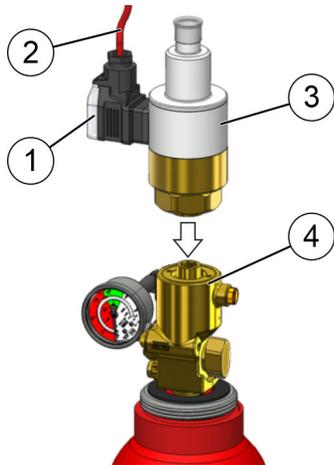
The release device, manual QRV, is used for the manual release of a type QRV quick release valve. The manual release takes place by pressing the manual lever until it stops whereby the release pin is pressed downwards and thus the quick release valve QRV is activated. The split

---

pin must be removed before manual release. The manual release must be held for at least 5 seconds to ensure activation.

The release device can also be assembled on the “release device, electrical QRV” as an additional release device.

#### 4.6.3 Release device, electrical, QRV



**FIGURE 4-9: Release device, electrical, QRV**

1. Connector plug
2. Cable leading to control panel
3. Release device electrical QRV
4. Cylinder valve

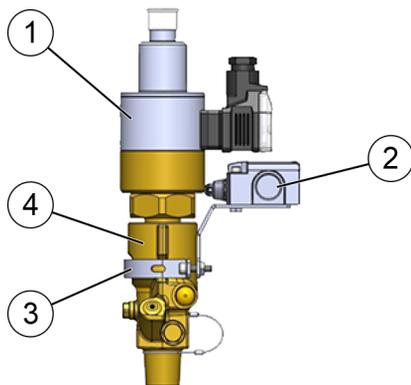
The “release device, electrical, QRV” with the connector plug activates the valve electrically. The “release device, electrical, QRV” is connected to the fire detection and suppression control panel via a cable. The electrical signal must be applied for at least 5 seconds to ensure an activation.

Only the following release devices may be assembled:

- Release device, manual, QRV (part no. 914028)
- Release device, electrical, QRV (part no. 914027D)

---

#### 4.6.4 Monitoring of release device, electrical, QRV



**FIGURE 4-10: Monitoring, assembled**

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1. Release device electrical QRV
  2. Monitoring, release device electrical QRV
  3. Monitoring mounting clamp
  4. Cylinder valve
- 

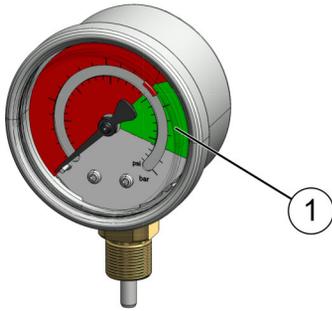
The monitoring serves to check for the presence and correct assembly of the electrical release device on the QRV valve.

If the release device is present and correctly assembled, the monitoring switch is activated. If the release device is disassembled or incorrectly assembled, the switch is not activated and transmits a signal to the fire detection and suppression control panel. There, the absence or incorrect assembly of the electrical release device is displayed as a fault.

The monitoring is mounted on the QRV valve with a clamp.

---

#### 4.6.5 Contact pressure gauge “extinguishing agent container”



**FIGURE 4-11: Contact pressure gauge**

---

1. Green area notating 10% pressure loss
- 

Each valve has a connection for a contact pressure gauge. This connection is closed with a plug. Pressure gauges must be ordered separately from the cylinders.

Since the connection is fitted with a check valve, the contact pressure gauge can be assembled even if the extinguishing agent container is pressurized.

The automatic loss monitoring is set to a 10% pressure loss (scale area marked in green) based on the nominal filling pressure.

Part no.	Nominal pressure	Pressure range	Switching point
927612	2901 psi (200 bar)	4351 psi (300 bar)	2611 psi (180 bar)- NO under pressure
927615	2901 psi (200 bar)	4351 psi (300 bar)	2611 psi (180 bar)- NC under pressure
927616	4351 psi (300 bar)	6527 psi (450 bar)	3916 psi (270 bar)- NO under pressure
921617	4351 psi (300 bar)	6527 psi (450 bar)	3916 psi (270 bar)- NC under pressure

## 4.7 Hose for extinguishing agent

The hose serves as a flexible connection between the extinguishing agent container and the manifold. The hose is provided with unions at both ends and marked. Seals in the unions are required for proper function (seals are not included in the scope of delivery of the hose). Both hoses come with gaskets 149890 and 149970 included. Gaskets 149890 and 149970 can also be ordered as spare parts.



**FIGURE 4-12: Hose**

1. Seal
2. Unions
3. Seal
4. Unions

Designation	Length [in. (mm)]	Thread G1	Thread G2	Part no.
Agent hose, 375 mm long	14.8 (375 mm)	W21.8 x 1/14 DIN 477	G3/4 ISO 228	934921D
Agent hose, 600 mm long	23.6 (600 mm)	W21.8 x 1/14 DIN 477	G3/4 ISO 228	934922D*

\*Parts are special order only

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## 4.8 Pilot hoses for activation of “slave” cylinder



**FIGURE 4-13: Hose DN4 x 600 - MX PH300**

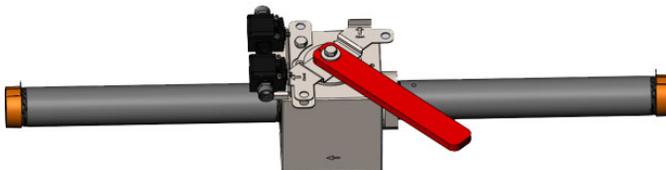
The hose DN4 (5/32”) serves as a flexible connection between the valve of the extinguishing agent container “master” and the pneumatic release device of an extinguishing agent container “slave” as between other “slave” extinguishing agent containers.

The master/slave combination is only used if no pilot cylinder is required and there are no life safety requirements.

Both connections have a thread of M12 x 1.5 and 24° sealing cone (light series) with O-ring (DKOL).

Designation	Thread	Part no.
20” Flexible Oxexo pilot hose	M12 x 1.5	24467
39” Flexible Oxexo pilot hose	M12 x 1.5	24468
59” Flexible Oxexo pilot hose	M12 x 1.5	24469
20” Flexible Oxexo pilot hose, kit	See tech data	25132
39” Flexible Oxexo pilot hose, kit	See tech data	25133
59” Flexible Oxexo pilot hose, kit	See tech data	25134

## 4.9 Monitored blocking



**FIGURE 4-14: Monitored blocking device**

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The monitored blocking device is comprised of a ball valve, electrical monitoring component, and a manually operated lever. The blocking is to be installed before the pressure reducer, and is rated for both 2901 psi and 4351 psi systems. Lock is NOT included. Refer to the appropriate technical data sheet for more information.

## 4.10 Pressure reducer

The pressure reducer reduces the pressure of the high pressure pipe system. The pressure reduction occurs by means of an orifice, the diameter of which is dependent on the extinguishing agent throughput and is determined by the pipe system via the DesignManager Oxexo. It is installed between the high pressure pipe system (3408 psi and 5294 psi or 235 bar and 365 bar) and the nozzle pipe system, whereby any combination (if available) of the inlet and outlet connection threads are possible. The pressure reducer is produced with conical inner thread in accordance with two different standards:

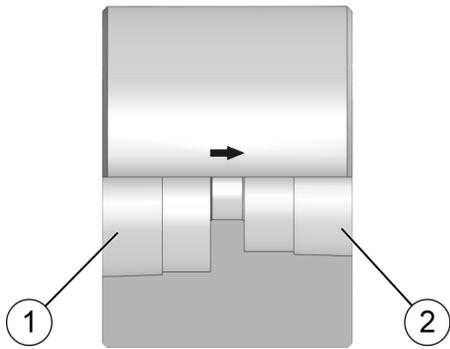
- ISO 7
- ANSI/ASME B1.20.1-NPT

The pressure reducer can only fulfill its function in conjunction with the complete system. Every deviation of the system from the design calculation (e.g. different nozzle holes) can restrict the function of the pressure reducer. In this instance, the pressure reducer is to be redesigned.

Orifice diameters are indicated by a four digit suffix. For example, part number 25014-0118 would correspond to a 2" NPT inlet / 2" NPT outlet pressure reducer with a 0.118" orifice diameter. See Technical Data Sheet for all available pressure reducer configurations and maximum orifice sizes.

The pressure reducer is moreover available in two different variants:

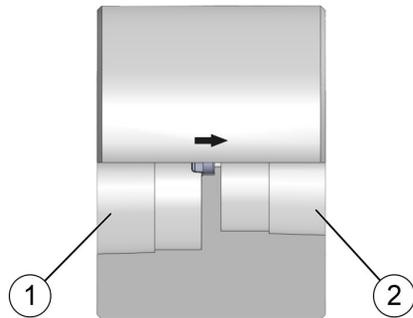
- Pressure reducer with orifice for hole diameters of 0.118 in. (3 mm) to 1.811 in. (46 mm)
- Pressure reducer with orifice and protective screen for hole diameters of 0.039 in. (1 mm) to 0.114 in. (2.9 mm)



**FIGURE 4-15: Pressure reducer**

---

1. Inlet side
2. Outlet side



**FIGURE 4-16: Pressure reducer with sieve**

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**Table: Part numbers pressure reducer**

Designation	Base part no.
Pressure reducer 3/4" BSPT / 3/4" NPT with protective screen* <sup>1</sup>	25011
Pressure reducer 3/4" BSPT / 3/4" NPT* <sup>2</sup>	25012
Pressure reducer 2" NPT / 2" NPT with protective screen <sup>1</sup>	25013
Pressure reducer 2" NPT / 2" NPT <sup>2</sup>	25014
Pressure reducer 2" NPT / 2-1/2" NPT with protective screen <sup>1</sup>	25015
Pressure reducer 2" NPT / 2-1/2" NPT <sup>2</sup>	25016
Pressure reducer 2" NPT / 3" NPT with protective screen <sup>1</sup>	25017
Pressure reducer 2" NPT / 3" NPT <sup>2</sup>	25018

\*Configuration available in single tank systems only

<sup>1</sup>Orifice diameters range from 0.039" (1.0 mm) to 0.114" (2.9 mm)

<sup>2</sup>Orifice diameters start at 0.118" (3.0 mm)

**NOTE: Only base part numbers shown. For the complete ordering number, refer to the Technical Data Sheet.**

## 4.11 Manifold safety valve



**FIGURE 4-17: Safety valve (example)**

1. Safety valve
2. Valve outlet

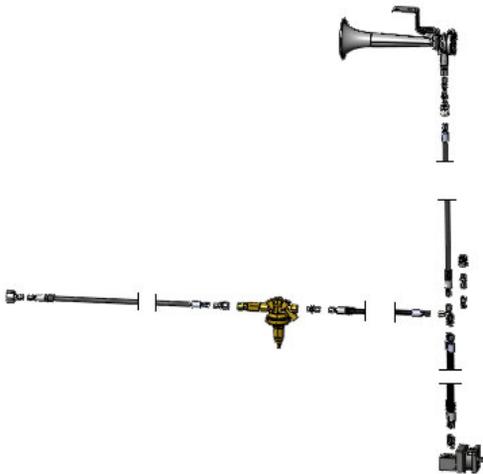
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Safety valves are used to protect components against impermissibly high pressures, e.g. on manifolds of multi-zone systems.

In the event of an impermissibly high pressure, the safety valve ensures pressure relief. A blow-off line attached to the outlet on the safety valve leads the medium to safely discharge on the outside.

## 4.12 Occupiable space protection kit

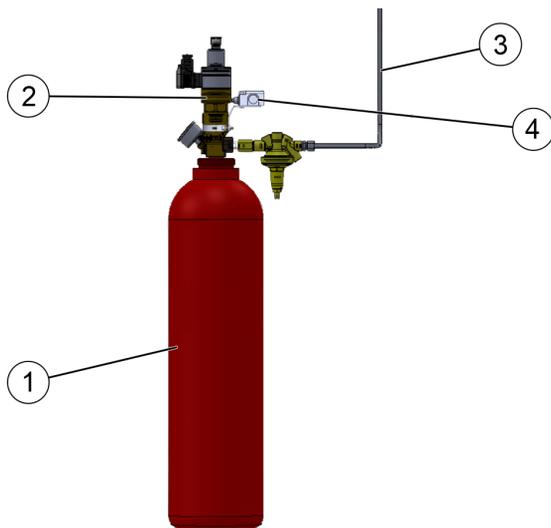


**FIGURE 4-18: Occupiable space protection kit assembly**

The occupiable space protection kit is comprised of components that give personnel within the extinguishing zone both warning and an egress time to vacate the area. The occupiable space protection kit is comprised of the following.

---

## Pneumatic control device



**FIGURE 4-19: Pneumatic control device**

1. Steel cylinder (pilot cylinder) UL/FM QRV-TD 80 l N<sub>2</sub> 200 EU (part no. 4003404)

Contact pressure gauge UL Oxeo 2901 psi (200 bar), NO under pressure (part no. 927612)

Contact pressure gauge UL Oxeo 2901 psi (200 bar), NC under pressure (part no. 927615)

2. Release device, electrical, QRV (part no. 914027D)

3. Pneumatic pilot line (precision steel pipe)

4. Monitoring of electric release device QRV

---

The pneumatic control device is installed standing on the floor and fastened to a wall using a wall bracket set. The pneumatic control device is activated by an electrical release device.

When activated, a release pin is activated in the electric release device. The release pin opens the pilot cylinder valve. The control gas then flows through the pressure reducer into the connected pneumatic pilot line to the pneumatic system parts of the fire extinguishing system.

---

The pneumatic control device is used to activate:

- Extinguishing agent container batteries
- Selector valves
- Pneumatic control and alarm components

An 80 l pilot cylinder is used.

The pneumatic control device can additionally be connected to a reserve pilot cylinder via a shuttle non-return valve.

### Pilot cylinder with wall support



**FIGURE 4-20: Pilot cylinder with unistrut racking**

1. Protective cap
2. Locking nut
3. Pilot cylinder
4. Unistrut racking

---

Nitrogen (N<sub>2</sub>) is stored as control gas in pilot cylinders with a volume of 80 l (21.13 gal).

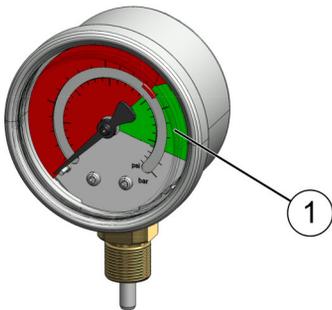
The pilot cylinders are designed, manufactured, and labeled in accordance with European guidelines (EU/UN) or in accordance with the country-specific pressure equipment guidelines.

---

A type plate is attached to each pilot cylinder. For safety reasons, all pilot cylinders must be mounted using a wall support set on stable building elements (e.g. a wall).

Pilot cylinders may not be moved and transported unless fitted with a protective valve cap and locking nut on the valve output. Filled pilot cylinders must be labeled and transported as hazardous material in accordance with all applicable local guidelines.

### Contact pressure gauge “pilot cylinder”



**FIGURE 4-21: Contact pressure gauge**

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1. Contact pressure gauge
- 

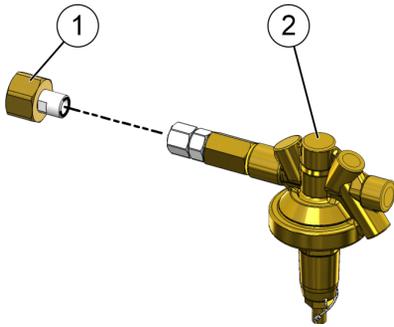
The contact pressure gauge monitors any pressure drop in the pilot cylinder.

The contact pressure gauge is screwed into the connection thread M12 x 1 on the quick release valve QRV.

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## Adapter and pressure reducer



**FIGURE 4-22: Adapter and pressure reducer**

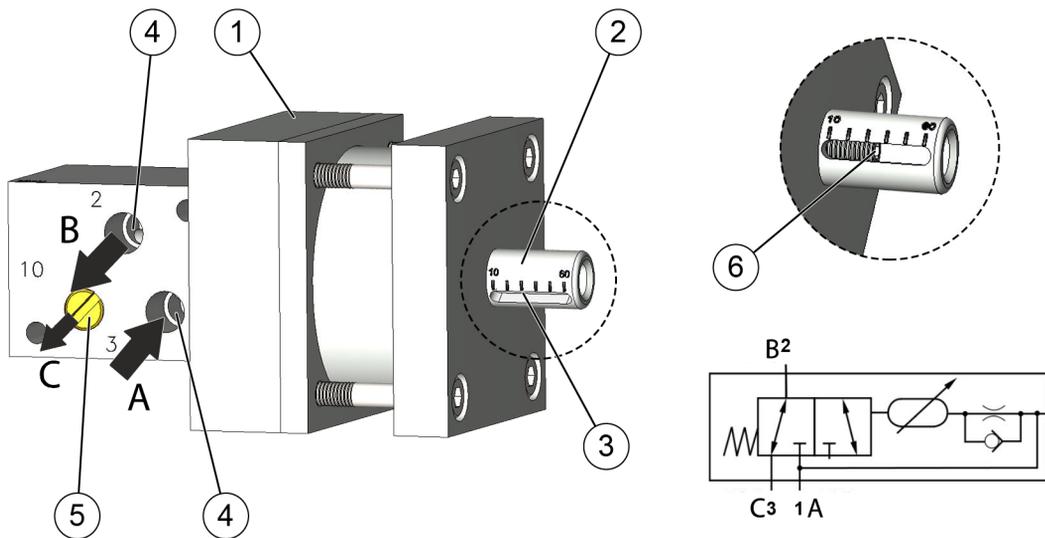
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1. Adapter connection DN8
2. Pressure reducer

---

The “adapted connection DN8” adapts the valve thread to the 200/10 bar N<sub>2</sub> pressure reducer.

## Pneumatic time delay



**FIGURE 4-23: Pneumatic time delay**

1. 3/2-way piston slide valve (there is no separate control connection because the control input is internally connected to the pressurized connection [1])
2. Delay time setting range
3. Adjusting spindle with hexagon socket (secured with sealing wax)
4. Threaded connection G1/8
5. Sinter filter/Silencer
6. Factory-set delay time (30 seconds)

A - Pressure connection “pneumatic pilot line”, coming from the pressure reducer for the nitrogen pilot cylinder (connection “A” is marked on the time delay unit and in the circuit symbol with [1]).

B - Operating connection “pneumatic pilot line”, outgoing to the extinguishing agent container battery/extinguishing agent container group (connection “B” is marked on the time delay unit and in the circuit symbol with [2]).

---

C - Venting with sinter filter/silencer (connection "C" is marked on the time delay unit and in the circuit symbol with [3]).

The delay time can be set from 10 to 60 seconds (7 to 55.5 seconds in accordance with FM/UL requirements). The delay time is set to 30 seconds at the factory. The adjusting spindle has been secured with sealing wax.

In an idle state, the non-electrical time delay unit is closed and not supplied with control gas. The pilot line going to the quick release valves for the extinguishing agent container battery at operating connection "B" is kept depressurized via venting "C". This stops the build up of creeping pressure in the pilot line and prevents the faulty release of the extinguishing agent container battery.

After detecting a fire in an extinguishing zone and once a fire extinguishing signal has been given by the electric control device/fire detection and suppression control panel, the pilot cylinder is opened electrically without delay. A pressure reducer downstream of the pilot cylinder reduces and regulates the control gas to a pressure of 152 psi (10.5 bar).

This provides the control pressure at pressurized connection "A" which is internally connected to the control input. The time delayed release of the working pressure at operating connection "B" is achieved by filling a chamber via the control input through a defined overflow channel. Once the predefined pressure in the chamber has been achieved, the piston slide valve is actuated and the control pressure is released via operating connection "B".

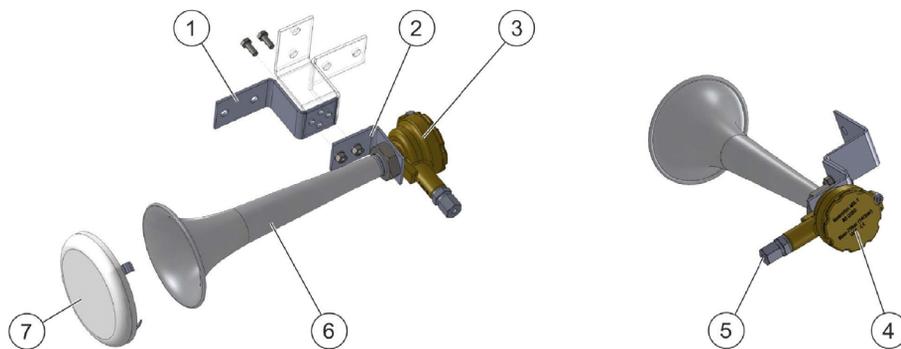
The delay time is set by increasing or reducing the chamber volume using a hexagon socket wrench.

Once the control pressure is withdrawn, the time delay unit immediately switches back to an idle state automatically.

During the delay time, flooding of the extinguishing zone can be prevented only by an optional stop valve downstream of the pneumatic time delay unit.

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## Makrofon



**FIGURE 4-24: Makrofon and silencer**

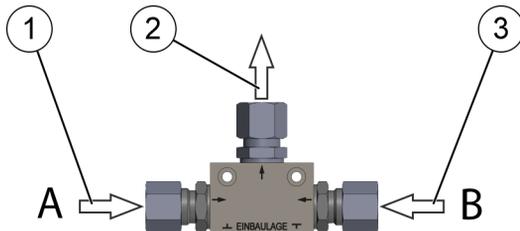
1. Large fastening bracket
2. Small fastening bracket
3. Housing
4. Marking
5. Screw-in union (connection for pneumatic pilot line)
6. Horn (always mount with the sound outlet facing downward)
7. Silencer (not included in the scope of delivery)

---

The makrofon is a pneumatically operated alarm device that is used in stationary gas extinguishing systems for life safety. Membranes in the makrofon are made to vibrate as a result of pressurization with gas. This generates a sound at a constant frequency. This sound is amplified by the horn so that a sound pressure level of approx. 100dB(A) to 125dB(A) is reached depending on the pressure. The makrofon can optionally be fitted with a silencer.

---

## 4.13 Shuttle non-return valve



**FIGURE 4-25: Shuttle non-return valve**

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1. Input "A"
2. Output
3. Input "B"

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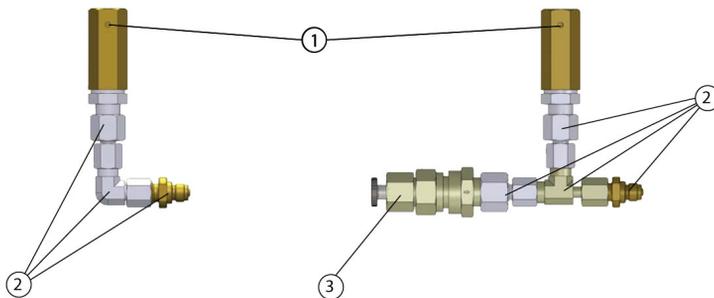
The shuttle non-return valve enables the differentiated triggering of a pneumatic assembly/components through two pressure sources.

By pressure at input "A", input "B" is closed, and there is a passage from input "A" to the output.

By pressure at input "B", input "A" is closed, and there is a passage from input "B" to the output.

---

## 4.14 Pilot pressure relief assemblies



**FIGURE 4-26: Pilot pressure relief automatic assembly (part no. 24498) and automatic/manual assembly (part no. 24499)**

1. Pilot pressure relief device
2. Union
3. Push button pressure relief

The pilot pressure relief device is used to prevent an unintentional pressure buildup in pneumatic pilot lines due to leakage.

The pilot pressure relief device is used on the quick release valve QRV to prevent the downstream extinguishing agent containers from being incorrectly activated by such an unintentional pressure build-up.

After an activation, the push button “selector valve” is used to manually relieve pressure from pneumatic pilot lines without having to disassemble them.



### **WARNING Danger to life due to flying parts**

If other, unlisted components are used, this may result in failure due to over strain. This can cause fragments to fly around uncontrollably and cause life-threatening injuries.

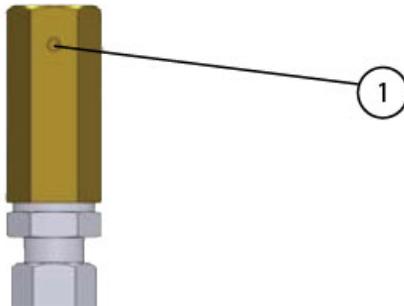
- Only use the 300 bar version (4351 psi) of the complete set.



The pilot pressure relief device can only be assembled vertically (pointing upwards) as shown in Figure 4-26 on page 62.



For more information, observe the documentation for the pilot pressure relief device.



**FIGURE 4-27: Pilot pressure relief device**

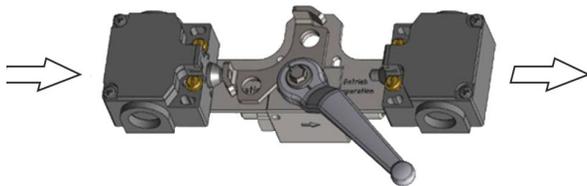
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1. Relief bore
- 

The pilot pressure relief device enables the discharge of small leaks in pneumatic pilot lines using a relief bore. The pilot pressure relief device closes automatically at high pressures.

---

## 4.15 Blocking device, pilot line



**FIGURE 4-28: Disable device MX, complete**

---

The blocking device is a non-electrical disable device for disabling fire extinguishing systems. It prevents the extinguishing agent from flowing out into the extinguishing zone.

If it is necessary to carry out repair or servicing work in the protection zone that could lead to the accidental activation of the fire extinguishing system or prevent exit from the rooms within the pre-warning time, the fire extinguishing system must be blocked.

The ball valve makes it possible to shut off the pilot line. At the same time, the shut-off vents the onward pilot line to prevent an accidental pressure increase due to leakage.

A limit switch can be installed to monitor the quiescent and blocked states (not included in the scope of delivery).

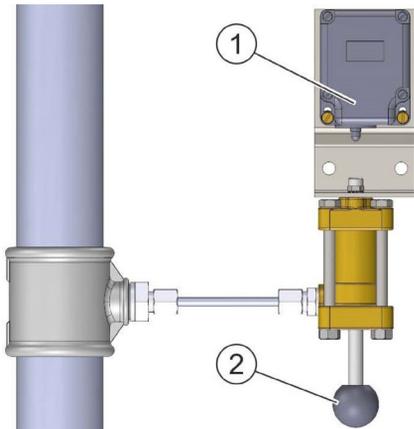
## 4.16 Downstream pipework

For the downstream pipework, pipes and fittings with a suitable pressure rating, made from a suitable material, and so on, must be used. They are defined for the various standards, such as those of DIN, EN and ANSI (American National Standards Institute), in their respective applicable provisions.

---

## 4.17 Limit switch, pneumatically operated

The “pneumatically operated limit switch” allows you to evaluate whether an extinguishing zone has actually been flooded after the selector valve is actuated. Pressure tapping must occur only downstream from the pressure reducer. The extinguishing agent pressure activates the cylinder, which opens or closes the floating contacts of the limit switch.



**FIGURE 4-29: Pneumatically operated limit switch (part no. 826758D)**

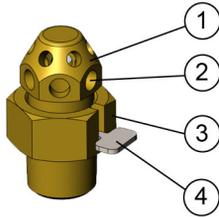
1. Pneumatically operated limit switch
2. Push button

This allows signals that can be used for various purposes to be triggered via the limit switch if it is electrically connected to the fire detection and extinguishing control panel. For instance, they can also be used to alert the fire department.

An additional push button allows you to trigger the electrical signal for test purposes.

---

## 4.18 VN Nozzle



**FIGURE 4-30: Nozzle VN**

---

1. Nozzle head
  2. Nozzle bores
  3. Nozzle socket
  4. Orifice
- 

The nozzle consists of a nozzle socket, a nozzle head and an orifice with a calculated orifice diameter. All components sold as a singular unit.

During activation, the extinguishing agent flows through the nozzle, expanding once it exits the nozzle bores.

The structure of the nozzle allows the flow-determining component (orifice) to be adjusted and used after the final pipework installation. In the case of self-adjusting orifice diameters in the orifice, these are merely replaced, and the removed orifices can be re-used.

- i** Two versions of the nozzle VN are available:
- 360° for assembly in the middle of the room
  - 180° for assembly near walls

---

## 4.19 DCM Nozzle



**FIGURE 4-31: DCM Nozzle**

During activation, the extinguishing agent flows through the nozzle, expanding evenly once it exits through the nozzle orifice.

The nozzle is provided with threads on the inlet and outlet sides to enable mounting of the nozzle from the outside. Designed for use in particulate-dense applications such as bag houses, dust collectors, and machining centers.

## 4.20 Pilot line made of precision steel pipe



**FIGURE 4-32: Pilot line made of precision steel pipe**

Pilot lines made of precision steel pipe are used for the activation of pneumatic components, e.g. pneumatic alarm devices (makrofons), selector valves or extinguishing agent container valves.

The pilot lines made of precision steel pipe are connected to the components using solderless pipe unions with a cut ring in accordance with DINENISO8434-1 and DIN2353, standard steel version in accordance with DIN3859-1.

---

Version:

- Cut ring form A or B in accordance with DIN3861 or in accordance with DINENISO8434-1
- Steel pipes in accordance with DIN2394 (DINEN10305), test certificate in accordance with EN10204-3.1

---

# 5 Assembly and installation

The racking and support structure for your system is a crucial component and must be assembled prior to cylinder and manifold connections. Refer to Appendix for racking assembly instructions.

This chapter is intended for expert installation personnel who are familiar with the handling of the fire extinguishing systems described herein.

## 5.1 Warnings for assembly and installation



### **WARNING Danger of injury from faulty release**

A faulty release of the system may cause severe injuries including death and significant property damage.

- Perform all tasks so that the system is not activated under any circumstance.
- Ensure that no electrical release device is mounted on the pilot cylinder during the assembly.
- Keep the pneumatic connection of the pilot and testing supply separate from the pilot line network until the commissioning and function test.



### **WARNING Risk of injury due to improper installation and initial commissioning**

Improper installation and commissioning can lead to severe injuries or even death as well as significant property damage.

- Prior to starting tasks ensure that there is adequate free space for installation.
- Handle open, sharp-edged components carefully.
- Ensure order and cleanliness at the installation location! Parts and tools that are lying loose or on top of each other are accident hazards.
- Mount components properly. Maintain the prescribed bolt torque and tightening torque.



### **WARNING Danger of injury due to escaping extinguishing agent**

If the system is unintentionally activated in the course of assembly, extinguishing agent can escape uncontrolled. This can lead to severe injuries or even death, as well as significant property damage.

- Remove all safety pins on components of the system only after complete assembly of the components.
- Block the system or parts of the system as needed.
- Ensure that the valve output is always closed with a locking nut and connected to a pipe line.
- Only mount release devices when the extinguishing agent containers have been connected to the pipe network.
- Use a clamp to make sure the extinguishing agent container is adequately braced against tipping over.
- If there is a faulty release, exit the extinguishing zone immediately.
- Instruct all persons working in the fire extinguishing zone, in advance, of the danger of a faulty release and familiarize them with the measures that must be initiated in this case.



### **WARNING Danger due to contamination**

Contaminated pneumatic pilot lines or pipelines can cause individual components to malfunction and thus also cause the whole system to malfunction. This can cause serious injury or even death, and may also cause substantial property damage.

- Before assembly, check all pneumatic pilot lines and pipelines for contamination (e.g. particles or grease) and clean if necessary.



### **WARNING Danger due to the usage of unsuitable components**

If unsuitable, defective or contaminated components are mounted this can impair the functionality of the system. This can lead to severe injuries or even death, as well as significant property damage.

- Only use undamaged and clean components.
- Do not use any components that do not correspond to the design data or that do not fit the other components.
- If in doubt contact the manufacturer.

### **NOTICE Material damage due to insufficient load-bearing capacity**

If system components are fastened to building components that do not have sufficient load-bearing capacity, they can fail in operation and damage the system.

- Only fasten components on building parts (e.g. walls) that have adequate load-bearing capacity and that can withstand the anticipated loads.
- Only use fastening elements with sufficient bearing capacity.

## 5.2 Requirements imposed on the pipeline system



### **WARNING Risk of death due to improper pipe mounting**

If components leak or fail due to improper pipe mounting, this can cause failure of the system. Thus if there is fire life-threatening danger as well as significant material damage can occur.

- Fit pipelines stress-free before mounting. The cap nut of the pipe connection must screw on easily across the entire thread length.
- Catch vibrations with suitable pipe holders.



### **WARNING Danger of injury due to an unsuitable pipeline system**

If the pipeline system is not correctly configured or properly installed this can restrict the functionality of the system and cause the pipeline system to fail.

- Hydraulically calculate the layout of pipelines.
- Design and mount pipeline system up to the pressure reducer according to locally-valid provisions for fire extinguishing systems with an operating pressure according to the system pressure [200 bar (2901 psi) or 300 bar (4351 psi)].
- Design and install pipeline system behind the pressure reducer in accordance with the locally valid regulations for fire extinguishing systems with an operating pressure of 60 bar (870 psi).
- Do not retroactively change the pipeline routing or cross sections.
- Always execute a new calculation if there are planned changes.
- Comply with all the requirements imposed on pipelines cited below.

---

Pipelines, fittings and fastenings are part of the pipeline system. The manufacturer does not lay out the pipeline system. It must be individually executed by the Authorized Distributor in accordance with local regulations.

The system components fit the pipeline components that are offered by the manufacturer. If pipelines other than the offered pipelines are used, these must be selected, installed, and connected in accordance with locally valid regulations.

- **i** The pipeline system must be installed in accordance with the design data before the system components are installed.

## Design criteria

Always comply with the following when designing the pipeline system:

- The pipeline system must be able to withstand the required system pressures. Take pressure hammers into account.
- Select materials and diameters of pipelines in accordance with VdS2380 and ISO14520 and NFPA2001 and other locally applicable regulations. Here, special attention must be paid to the compressive strength.
- Install pipeline systems in accordance with the hydraulic calculation.
- Heed recoil due to discharge nozzles.
- Avoid unnecessary angles.
- Clean the pipeline system in the course of installation.
- Protect the pipeline system against corrosion.
- Seal the pipeline system with a suitable, locally approved and recognized sealant.
- Provide equipotential bonding.
- Do not suspend objects from pipelines.

- **i** Structural changes of the protected enclosure require a new design of the entire system including the pipeline system.

---

## Old pipelines

Personnel:

- Authorized Distributor

***NOTICE* Material damage due to unsuitable pipelines**

If pipelines do not satisfy the requirements, there is a danger that they will fail when there is flooding.

- Only use pipelines if they can withstand the required pressures.

If old pipelines are used in the system, or if existing pipelines are used in the protected area, they must be checked before they are used.

1. Pressure test the pipelines.
2. Empty pipelines.
3. Clean the pipelines.
4. Let the pipelines dry

---

## 5.3 Manifold Assembly

Personnel:

- Authorized Distributor

Protective equipment:

- Safety gloves
- Safety footwear

Dimensioning of the manifold is primarily based on the hydraulic calculation.

**i** During the assembly of the manifold, pay attention to whether it is for a one-, two-, or multiple-row extinguishing cylinder set-up



**FIGURE 5-1: Manifold assembly**

1. Bolt
2. Bracket
3. Manifold

---

1. Install the racking assembly brackets and cut an appropriate length of rubber (see “Appendix I - Racking Assembly” on page 191.)

- 
2. Open the bracket by unscrewing the bolt connecting the two components.
  3. Wrap the cut rubber around the location of the manifold that will rest against the brackets.
  4. Place the manifold into the brackets.
  5. Close the brackets around the manifold and secure with the bolt.

## 5.4 Extinguishing cylinder with quick release valve QRV

Personnel:

- Authorized Distributor

Protective equipment:

- Safety gloves
- Safety footwear

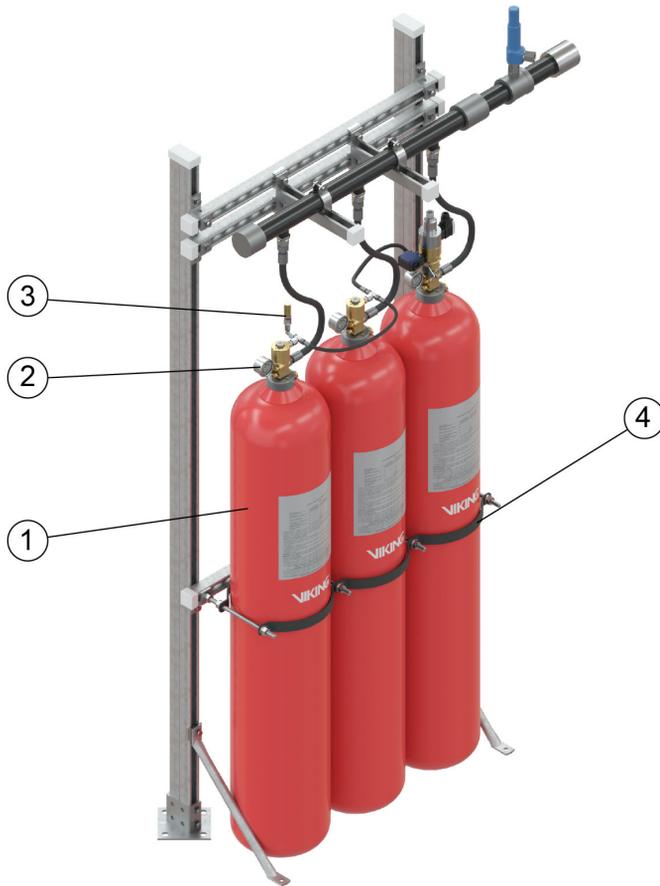
### 5.4.1 Assembling extinguishing agent containers



#### **DANGER Risk of accidents due to heavy pressurized containers**

Extinguishing agent containers are very heavy and may be pressurized. If handled improperly, they can pose a life-threatening hazard.

- Always handle extinguishing agent containers with at least 2 people.
- Always use suitable means of transport.
- In the meantime, or as soon as possible, secure the valve outlet with a locking nut and the valve with a protective valve cap.
- Wear safety gloves, safety footwear, protective goggles and hearing protection.



**FIGURE 5-2: Assembling extinguishing agent containers**

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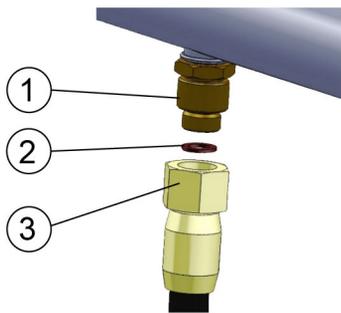
1. Extinguishing agent container
  2. Contact pressure gauge
  3. Pilot pressure relief
  4. Mounting bracket BAS M300/M400
-

1. Remove the extinguishing agent container from the transport frame or from the pallet and place into the support frame for the extinguishing agent container using a suitable transport method.
2. Secure the extinguishing agent container from falling over using mounting brackets.

**i** Screw in the mounting brackets until the extinguishing agent container **CANNOT** fall but can still be adjusted.

3. Unscrew the valve protection cap from the extinguishing agent container.
4. Align the extinguishing agent containers using the valve output.
5. Repeat the process for all extinguishing agent containers.
6. Tighten all mounting brackets.

#### 5.4.2 Assembling the hose



**FIGURE 5-3: Assembling the hose onto the manifold**

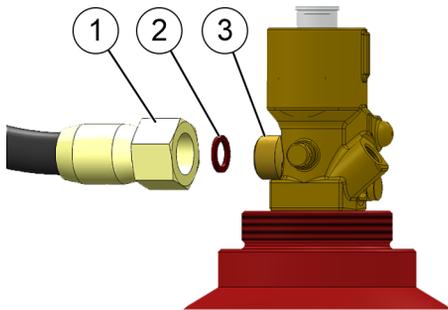
1. Check valve
2. Seal
3. Hose union

1. Insert a new seal in the union nut G3/4 of the hose union.
2. Screw the hose union onto the check valve until hand-tight.



**CAUTION Property damage due to excessive stress on the hose**

Do not subject the hose to torsion. Do not go below the minimum bending radius. Do not exceed the maximum bending angle.



**FIGURE 5-4: Assembling the hose onto the valve**

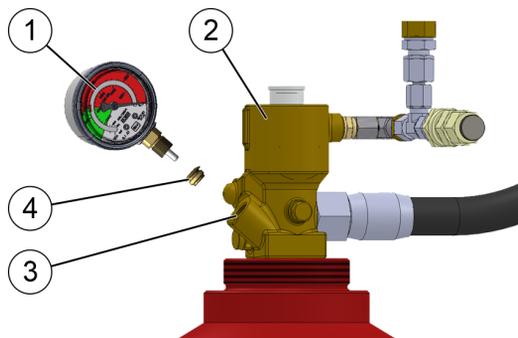
1. Hose Union
2. Seal
3. Valve Output

3. Insert a new seal in the union nut of the hose union.
4. Screw the union nut of the hose union onto the valve output until hand-tight.
5. Check that the hose, manifold, and valve output are correctly aligned with one another.
6. Firmly tighten both union nuts of the hose using a suitable wrench, without twisting the hose (do not subject the hose to torsion).

### 5.4.3 Mounting the contact pressure gauge



- Only pressure gauges/contact pressure gauges suitable for this valve type may be used.
- The quick release valve has a non-return valve on the pressure gauge connection so that the pressure gauge/contact pressure gauge can also be assembled if the extinguishing agent container is pressurized.

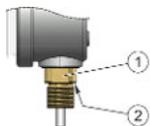


**FIGURE 5-5: Removing plug**

---

1. Contact pressure gauge
2. Quick release valve QRV
3. Pressure gauge connection, connection thread M12 x 1
4. Plug

- 
1. Remove the plug at the pressure gauge connection.
  2. Manually screw in the contact pressure gauge into the pressure gauge connection until it can no longer be turned easily.



**FIGURE 5-6: Screwing in the contact pressure gauge**

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1. Size 14 flat
2. Proper positioning of flat

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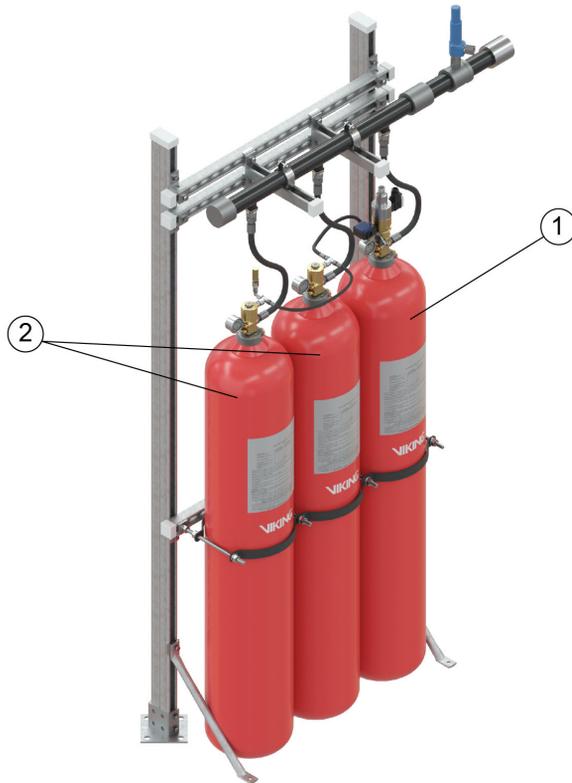
3. If the contact pressure gauge is pressurized and is therefore more difficult to turn, screw it on the size 14 flat with a suitable tool until it stops.



To align, the contact pressure gauge can be turned back by a maximum of 3/4 rotation.

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#### 5.4.4 Assembling pneumatic connection to the master and slave extinguishing agent containers



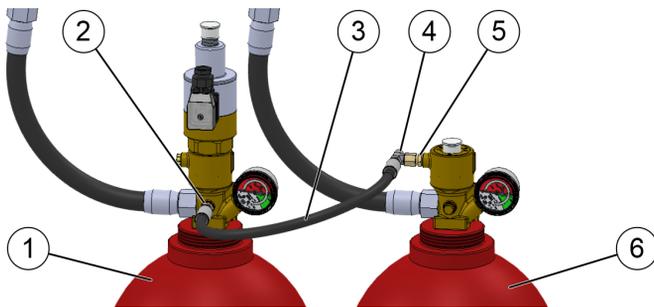
**FIGURE 5-7: Alignment with installation**

1. Master extinguishing agent container
2. Slave extinguishing agent container

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#### Connecting the master extinguishing agent container to the slave extinguishing agent container

1. Unscrew the seal plug from the sequence valve connection of the quick release valve.



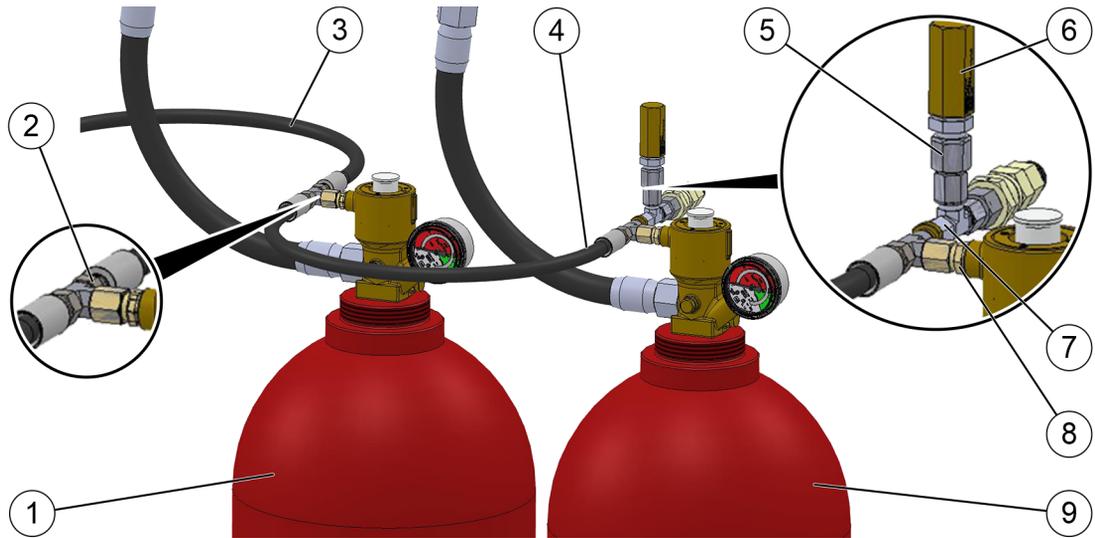
**FIGURE 5-8: Connecting the master extinguishing agent container to the slave extinguishing agent container**

1. Master extinguishing agent container
2. Sequence valve connection
3. Flexible pilot hose
4. Sealing cone
5. Straight union GE
6. Slave extinguishing agent container

2. Screw the straight union into the sequence valve connection and tighten with a torque of  $12 \times 1 \text{ Nm}$  ( $8.85 \times 0.74 \text{ ft-lb}$ ).
3. Remove the threaded plugs from the control connections for the quick release valves on the slave extinguishing agent container.
4. Screw the straight unions into the control connections and tighten with a torque of  $12 \times 1 \text{ Nm}$  ( $8.85 \times 0.74 \text{ ft-lb}$ ).
5. Assemble an L-union with sealing cone on the straight union on all slave extinguishing agent containers and align with the connection facing forwards.
6. Connect the master extinguishing agent container and the first slave extinguishing agent container using the flexible pilot hose.

---

## Connecting the slave extinguishing agent containers with each other



**FIGURE 5-9: Assembling the pneumatic connection on the slave extinguishing agent containers**

1. Slave extinguishing agent container
2. T-union
3. Flexible pilot hose
4. Flexible pilot hose
5. Straight reducer union
6. Pilot pressure relief
7. Sealing cone
8. Straight union
9. Slave extinguishing agent container

7. Connect the flexible pilot hose to the available connection on the L-union of the slave extinguishing agent container and on the straight connection of the L-union of the next slave extinguishing agent container.
8. Connect all slave extinguishing agent containers to each other as per the previous step.

Connecting the last slave extinguishing agent container

9. Assemble an L-union with sealing cone on the straight union on the last slave extinguishing agent container and align with the connection facing upwards.
10. Assemble a straight reducer union on the L-union connection aligned as above.
11. Connect the malfunction pressure safety device to the reducer union.
12. Connect the first and last slave extinguishing agent containers using the flexible pilot hose.

#### 5.4.5 Electrical release device QRV Assembly



##### **WARNING Risk of injury due to escaping extinguishing agent**

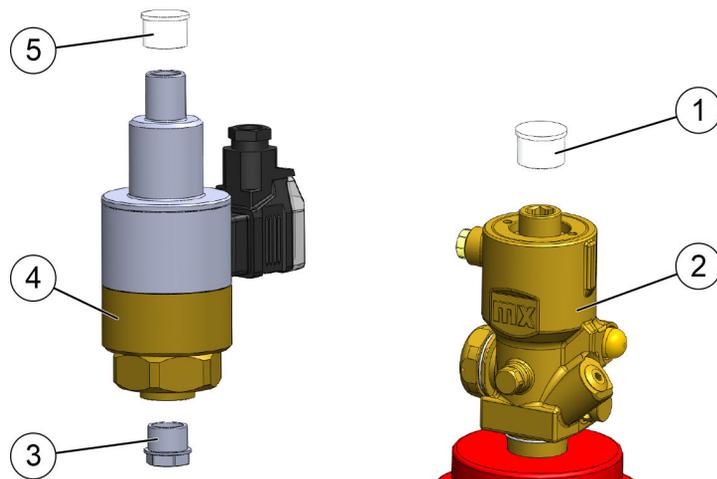
Assembly of the release device with a release pin in the activated position causes the quick release valve to open immediately. This results in a risk of serious injury and substantial property damage.

- Before assembling the release device, you must ensure that the release pin is in the not activated position.
- Before assembling the release device, you must ensure that the extinguishing agent cylinder is securely fastened and that the extinguishing agent line is connected to the valve output.
- Immediately vacate the suppression zone in case of faulty release.
- Inform all persons working in the installation zone about the risk of faulty release.



For assembly, only use the intended wrench flat and a suitable tool, e.g. a torque wrench.

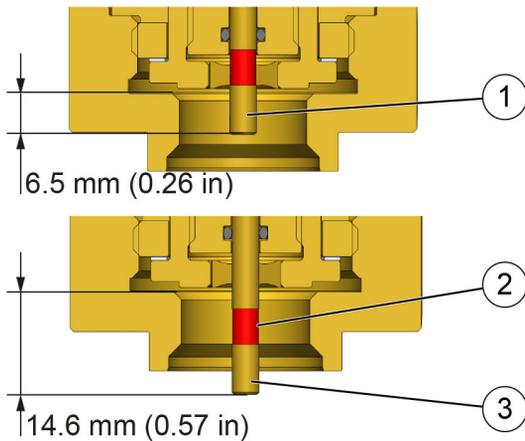
1. Pay attention to the instructions on the release device.
2. Check that the connection thread is undamaged and free of contamination.



**FIGURE 5-10: Remove protective caps**

1. Plastic protective cap
2. Quick release valve QRV
3. Plastic protective cap
4. Release device
5. Plastic protective cap

3. Remove the plastic protective cap from the quick release valve QRV.
4. Remove the plastic protective caps from the release device.



**FIGURE 5-11: Release pin; not activated (up), activated (down)**



**WARNING Risk of faulty release**

Make sure that the release pin is in the not activated position.



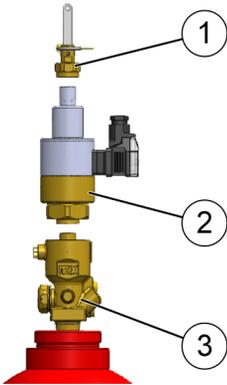
The activated position is indicated by the red marking on the release pin, or by measuring.

1. Release pin in the "not activated" position
2. Release pin indicator
3. Release pin in the "activated" position

5. Tension the activated release device as required.



Observe the documentation of the release device.



**FIGURE 5-12: Assemble the release device**

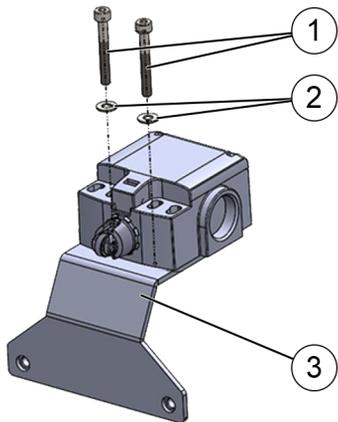
1. Manual release device QRV
2. Release device
3. Quick release valve QRV

6. Screw the release device to the quick release valve QRV from above with  $25 \pm 4$  Nm ( $18.44 \pm 2.95$  ft-lb).
7. It is also possible to screw the manual release device QRV (part no. 914028) to the release device from above.

**i** Observe the documentation of the release device.

---

### 5.4.6 Assembling the monitoring of the electrical release device



**FIGURE 5-13: Attach limit switch**

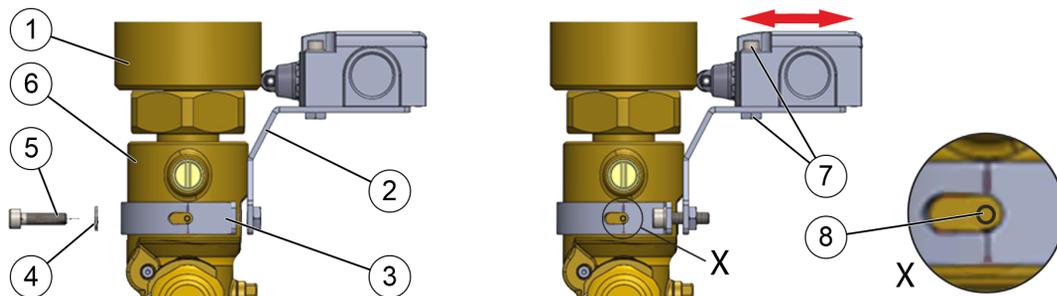
---

1. M4 x 30 cylinder bolts
  2. Washers
  3. QRV support bracket
- 

1. Attach the limit switch to the holder QRV with two M4 x 30 cylinder bolts and two washers.



Do not screw the limit switch tightly. Slight mobility simplifies the further assembly steps.



**FIGURE 5-14: Assembly on the QRV valve**

1. Electrical release device
2. QRV support bracket
3. Pipe clamp QRV
4. Washers
5. M5 x 20 cylinder bolts
6. QRV valve
7. Screws
8. Pressure relief bore

2. Hand-tighten the electrical release device onto the QRV valve.
3. Attach the holder QRV to the QRV valve using a pipe clamp QRV, two M5 x 20 cylinder bolts and two washers.



**WARNING Danger due to incorrectly assembled pipe clamp**

Make sure that the pressure relief bore of the QRV valve is visible through the extended hole of the pipe clamp.

4. Position the limit switch on the electrical release device so that the limit switch actuates properly but does not exceed its maximum activation path. Securely tighten the limit switch in this position using the screws.
5. Tighten the electrical release device using a suitable tool and a torque of  $25 \pm 4$  Nm ( $18.44 \pm 2.95$  ft-lb).

---

## 5.5 Installing the safety valve

Personnel:

- Authorized Distributor

Protective equipment:

- Safety goggles
- Safety gloves
- Safety footwear



### **WARNING Risk of injury due to leaking safety valve**

Improper handling may cause seals and sealing surfaces in the safety valve to become damaged, causing extinguishing agent to escape in an uncontrolled manner. This can cause serious injury and substantial damage to the system.

- Protect the safety valve from impacts, blows and vibrations.
- The safety valve must only be transported and stored in its original packaging.



### **WARNING Danger of injury if blow-off line incorrectly installed**

If the blow-off line is not correctly laid out or improperly installed, this may impede the functioning of the safety valve. This results in a risk of serious injury as well as substantial property damage.

- The safety valve blow-off line should be measured adequately, taking into account local operating conditions.
- The internal diameter of the blow-off line should nowhere be less than 0.4 inches (10 mm).



### **CAUTION Danger due to improper pipe installation**

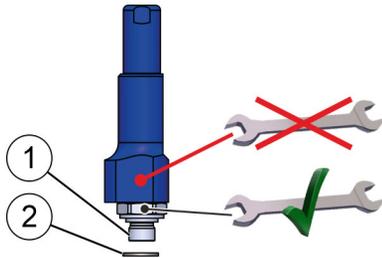
The connection for the blow-off line is a pipe connection that does NOT seal in the thread. Unions with unsuitable threads can lead to leaks. This results in a risk of injury as well as substantial property damage.

- Use only a thread according to ENISO228-1 or other permissible thread pairings listed in this standard for the thread connections in the blow-off line.



The safety valve is usually installed in the control room for extinguishing agent. If this is not the case, the safety valve must be secured against unauthorized use by suitable measures (e.g. kept in a separate room).

- 
- 
1. Ensure that the information on the safety valve marking matches the operating conditions (pressure, etc.).



**FIGURE 5-15: Assembling the safety valve**

---

1. Screw-in connector
2. Seal ring

2. Push the seal ring onto the screw-in connector of the safety valve.



**WARNING Risk of malfunctioning**

The safety valve must always be installed vertically (aligned upwards).

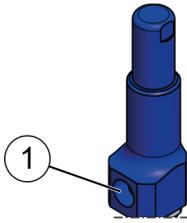
3. Screw the safety valve together with the seal ring into the intended component.



Observe the tightening torque of 90 Nm (66 ft-lb).

During assembly, use only the intended flats.

Ensure that the seal ring sits concentrically to the screw-in connector.



**FIGURE 5-16: Assembling the blow-off line**

---

1. Outlet

---

4. Connect the blow-off line de-energized to the outlet of the safety valve.

## 5.6 Mounting the pilot control cylinder

For information regarding the installation of the pilot cylinder into the racking system, see “Appendix A - Racking Assembly” on page 183.

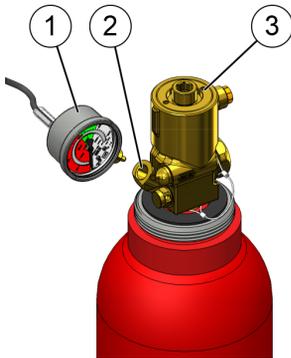
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---

## Assembling the contact pressure gauge

**i** Only contact pressure gauges suitable for this valve type may be used.

**i** The quick release valve has a check valve on the pressure gauge connection so that the contact pressure gauge can also be assembled if the extinguishing agent container is pressurized.

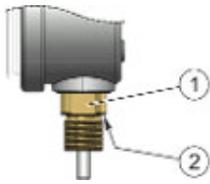


**FIGURE 5-17: Assembling the contact pressure gauge**

---

1. Contact pressure gauge
  2. Pressure gauge connection
  3. Quick release valve
- 

5. Remove the plug at the pressure gauge connection.
6. Manually screw the contact pressure gauge into the pressure gauge connection M12 x 1 of the quick release valve until it can no longer be turned easily.



**FIGURE 5-18: Screwing in the contact pressure gauge**

1. Size 14 flat
2. Proper positioning of flat

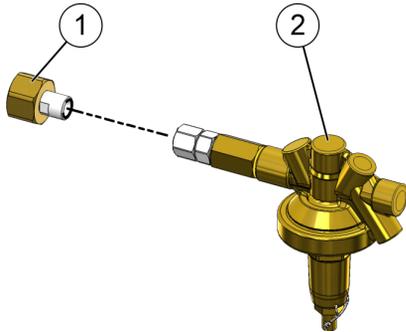
7. If the contact pressure gauge is pressurized and is therefore more difficult to turn, screw it on the size 14 flat with a suitable tool until it stops.



To align, the contact pressure gauge can be turned back by a maximum of 3/4 rotation.

---

## Pre-assembling the occupiable space protection kit



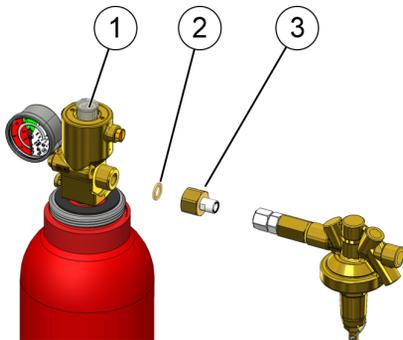
**FIGURE 5-19: Assembled “adapter connection DN8” on to the pressure reducer**

1. Adapter connection DN8
2. Pressure reducer

---

8. Screw the “adapter connection DN8” onto the union nut of the pressure reducer using a size 19 flat wrench.

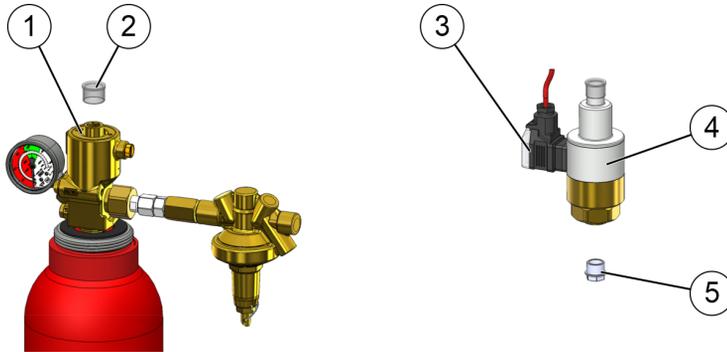
## Assembling the pre-assembled “pressure reducer” assembly and electrical release device on the quick release valve



**FIGURE 5-20: Assembling the “adapter connection” on the quick release valve**

- 
1. Quick release valve
  2. gasket
  3. Union nut

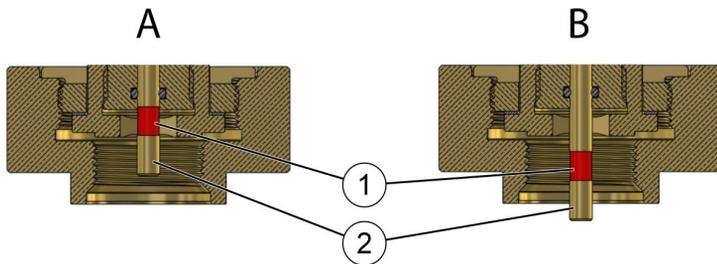
- 
9. Check that the gasket is correctly inserted into the hexagonal union nut.
  10. Screw the hexagonal union nut onto the quick release valve using a size 30 flat wrench.



**FIGURE 5-21: Protective caps and electrical release device**

- 
1. Quick release valve
  2. Plastic protective cap
  3. Connector plug
  4. Electrical release device
  5. Plastic protective cap

- 
11. Remove plastic protective caps from the quick release valve and from the electrical release device.
  12. Disconnect the connector plug from the electrical release device and connect to electricity.



**FIGURE 5-22: Release pin deactivated (A) and activated (B)**

1. Marking
2. Release pin



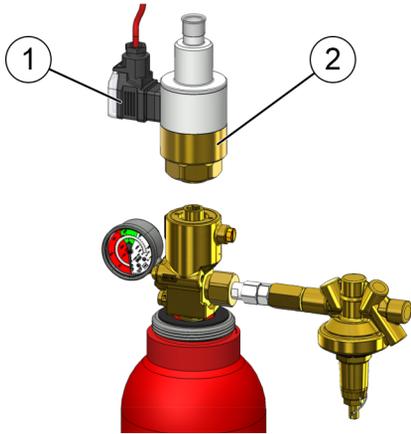
**WARNING Risk of faulty release**

Make sure that the release pin is in the deactivated position. If necessary, tension the activated electrical release device.



The red marking on the release pin is visible in both the activated and deactivated position and is thus not an indicator of whether or not the electrical release device is under tension.

The activated position can be identified if the release pin protrudes from the enclosure of the electrical release device.



**FIGURE 5-23: Assembling the electrical release device**

1. Connector plug
2. Electric release device

13. Assemble the electrical release device on the quick release valve.
14. Assemble the monitoring of the electrical release device, see “Assembling the monitoring of the electrical release device” on page 88.
15. Assemble the connector plug.

## 5.7 Assembling the shuttle non-return valve

Personnel:

- Authorized Distributor

Protective equipment:

- Safety goggles

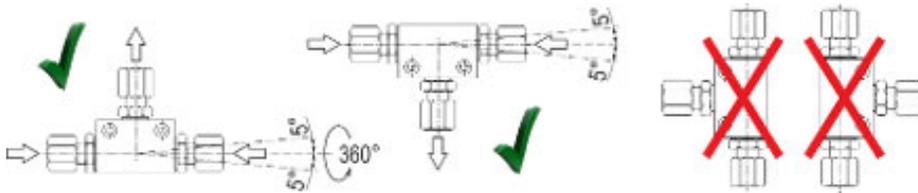
Shuttle non-return valve must be installed wherever control gas may only flow in one direction, and a pneumatic component is activated through two pressure sources.

1. Check the inside of the pilot lines for contamination. If necessary, clean the pilot lines.



**WARNING Danger of malfunction and resulting injuries**

Make sure that the specifications on the marking on the shuttle non-return valve correspond to the actual operating conditions.

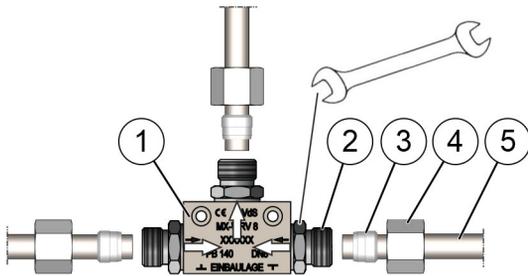


**FIGURE 5-24: Permitted and non-permitted installation positions of the shuttle non-return valve**



**WARNING Danger of malfunction and resulting injuries**

Align the shuttle non-return valve observing the permitted installation positions (the inputs must lie horizontally).



**FIGURE 5-25: Assembling pilot lines**

1. Shuttle non-return valve
2. Cutting ring union
3. Cutting ring
4. Union nut
5. Precision steel pipe

2. Secure the shuttle non-return valve, e.g. to a load-bearing part of the building.
3. Push the union nut and cutting ring of the shuttle non-return valve onto the precision steel pipe.
4. Insert the precision steel pipe into the cutting ring union of the shuttle non-return valve up to the stop.
5. Tighten the union nut.

**i** When tightening the union nut, counteract with an open-end wrench on the hexagonal flat of the shuttle non-return valve. **DO NOT** place the open-end wrench on the enclosure of the shuttle non-return valve.



**FIGURE 5-26: Assembled pilot lines**

6. Assemble the other two pilot lines in the same way.

## 5.8 Mounting flexible pilot hose

Personnel:

- Authorized Distributor

Protective equipment:

- Safety goggles
- Safety gloves
- Safety footwear



### **WARNING Danger due to contamination**

Contaminated pilot hoses can cause individual components to malfunction and thus also cause the whole system to malfunction. This can cause serious injury or even death, and may also cause substantial property damage.

- Before assembly, check all pilot hoses lines for contamination (e.g. particles) and clean if necessary.



**FIGURE 5-27: Mounting flexible pilot hose**

1. Union nuts

- 
1. Screw on both hexagonal union nuts until hand-tight by turning them to the right.

● Do not use additional sealant.

**i**

2. Tightly screw both hexagonal union nuts by turning them to the right using a suitable tool (e.g. an open-end wrench).

● Do not go below the minimum bending radius (observe the documentation of the flexible pilot hose).

**i** Do not twist the hose in the longitudinal direction (torsion). If necessary, loosen the hexagonal union nut and then fasten the hose without torsion.

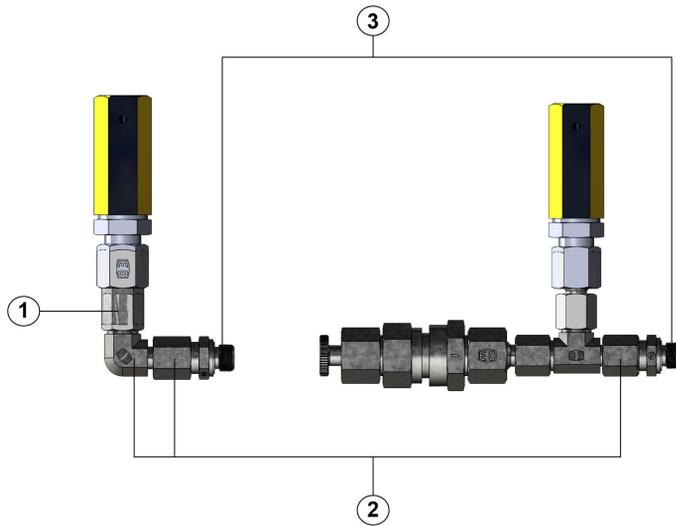
## 5.9 Assembling the pilot pressure relief device

Personnel:

- Authorized Distributor

Protective equipment:

- Safety goggles
- Safety gloves
- Safety footwear



**FIGURE 5-28: Installation examples - pilot pressure relief SFD 300**

1. Transition screw
2. Transition screw
3. Adapter M12 x 1.5-G1/8 (For pneumatic or pneumatic/manual release device)

**NOTICE Property damage due to incorrect assembly**

Integrate the safety device upright at all times into the pilot line. Install the safety device as close as possible to a point of possible leakage (e.g. control gas container).

**Assembly in the pilot line**

1. Connect the pilot pressure relief to the union.



**WARNING Risk of injury due to incorrect installation**

Make sure that the safety device is positioned vertically pointing upward.

---

## Assembly on the release device

1. Install the adapter at the output of the last pneumatic release device.



### **WARNING Risk of injury due to incorrect installation**

Make sure that the safety device is positioned vertically pointing upward.

## 5.10 Mounting the blocking device

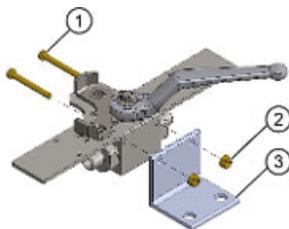
Personnel:

- Authorized Distributor
- Qualified electrician

Protective equipment:

- Safety gloves
- Safety footwear

### 5.10.1 Mounting holder



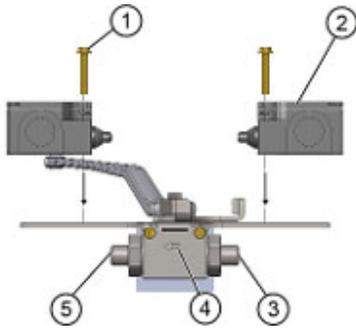
**FIGURE 5-29: Mounting blocking device holder**

---

1. Cylinder screws
  2. Hexagon nuts
  3. Blocking device holder
-

1. Fasten the holder of the blocking device to a wall with the provided screws and plugs.

**i** Do not fasten the blocking device on other system parts.



**FIGURE 5-30: Mounting the blocking device (device includes two limit switches, part number 878070D)**

1. Cylinder screws
2. Limit switch
3. Blocking device connection
4. Directional indicator
5. Blocking device connection

2. Screw blocking device with the included cylinder screws and hexagon nuts to the holder so that the marking of the flow direction corresponds to the intended pilot gas flow.

**i** The blocking device has an integrated vent. If the flow direction (arrow) is not heeded, the blocking device will not work properly.

3. Bolt the pilot line with the cap nut to the two connections of the blocking device.

---

### 5.10.2 Mounting the limit switch (optional)

Optionally the blocking device has one or two limit switch(es) that enable(s) monitoring of the position of the blocking device (isolated / ready for operation). To mount the limit switch, the following parts are required:

- Limit switches: Type PS226-Z11-S200
- Cylinder screw M4x25
- Washer B 4.3

**i** Limit switches, cylinder screws and washers are not included in the scope of delivery of the blocking device.

1. Optionally screw one or two limit switches onto the blocking device with the cylinder screws and washers.
2. Establish the connection of the limit switches (see “Blocking device” on page 134.)

### 5.10.3 Connecting limit switches

Personnel:

- Qualified electrician

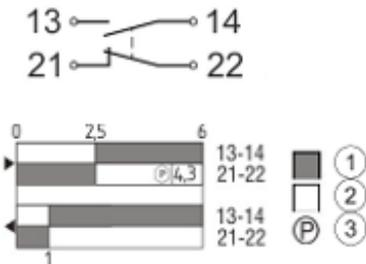
#### **WARNING Life-threatening danger due to electric shock**

There is an imminent, life-threatening danger due to electric shock if live components are touched. Moreover there is danger of significant material damage if there are wrong connections.



- Only qualified electricians should perform tasks on the electrical equipment.
- Comply with locally applicable directives and regulations for the execution of tasks on electrical components.
- Only use suitable and approved cables and lines.
- Install cables and lines in such a manner that the possibility of mechanical stress or damage is excluded.

1. Connect the cable to the intended screw terminals and according to the wiring diagram.
2. Close the selector valve and check the signaling from the limit switch to the fire alarm control panel.



**FIGURE 5-31: Terminal assignment and switching path diagram**

1. Contact closed
2. Contact opened
3. Positive opening path/angle

## 5.11 Mounting the pressure reducer

Personnel:

- Authorized Distributor

Protective equipment:

- Safety gloves
- Safety footwear

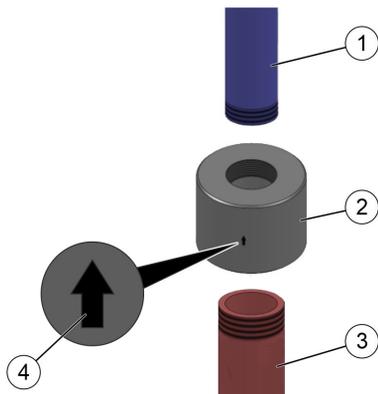
### **WARNING Risk of malfunctioning**

The pressure reducer can only fulfill its function in conjunction with the complete system. Every deviation of the system from the design calculation (e.g. different nozzle holes) can restrict the function of the pressure reducer. This can lead to severe injuries or even death, as well as significant property damage.



- Never seal the output of the pressure reducer or of the following pipe system.
- In case of deviation of the system from the calculation (e.g. course of pipeline, quantity of extinguishing agent, flooding time, extinguishing gas), re-design the pressure reducer.
- Heed the flow direction of the pressure reducer marked by a directional arrow.

1. Make sure that the selected pressure reducer corresponds to the design calculation.
2. Heed flow direction of the pressure reducer.



**FIGURE 5-32: Mounting pressure reducer**

1. Nozzle pipe system
2. Pressure reducer
3. High-pressure line

3. Mount the pressure reducer as connection of the high-pressure line with the nozzle pipe system.

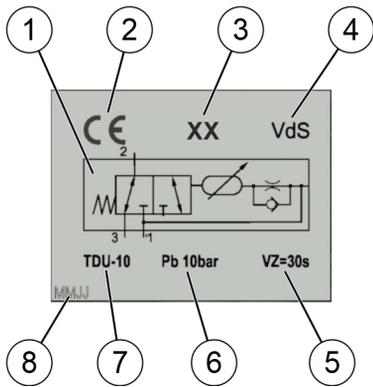
## 5.12 Mounting the pneumatic time delay

Personnel:

- Authorized Distributor

Protective equipment:

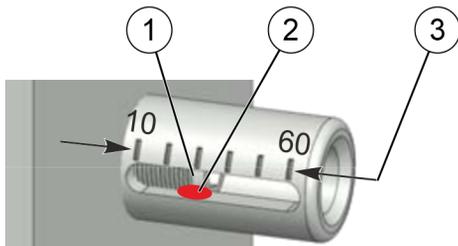
- Safety goggles
- Safety gloves
- Safety footwear



**FIGURE 5-33: Marking on the enclosure**

1. Circuit symbol
2. Conformity mark
3. Manufacturer's mark
4. VdS type approval code
5. Delay time (factory setting)
6. Working pressure
7. Type designation
8. Serial/batch number

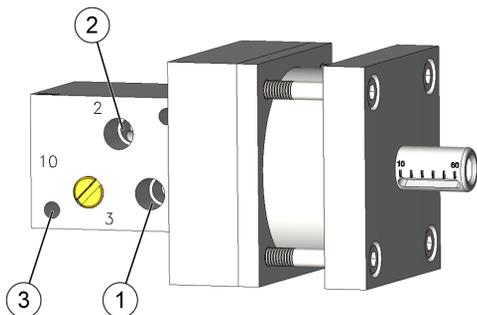
1. Check whether the working pressure specified on the enclosure corresponds to the actual operating conditions.



**FIGURE 5-34: Checking the adjusting spindle and sealing wax**

1. Adjusting spindle
2. Sealing wax
3. Setting range

2. Check whether the setting of the adjusting spindle corresponds to the delay time on the enclosure. If necessary, reset the delay time (see “Checking the functioning of the pneumatic time delay” on page 145.)
3. Check that the sealing wax is present and undamaged.



**FIGURE 5-35: Assembling the time delay unit**

1. Pressurized connection
2. Operating connection
3. Mounting bores

4. Firmly fix the time delay unit to the building in the correct installation position using the two bores [Ø 0.18 in (4.5 mm)]. It can be fixed to a wall, support frame, or installation rail, for example.



From a technical perspective, the time delay unit can be installed in any installation position; however, the time delay relay must be assembled so that

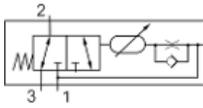
- the marking on the enclosure is visible
- the setting range of the delay time is visible
- the pneumatic pilot lines do not cross.



### **WARNING Risk due to contaminations**

Before assembly, check the pneumatic pilot line for contaminations and, if necessary, clean.

5. Connect the pneumatic pilot line (coming from the nitrogen pilot cylinder) to the pressurized connection [1].
6. Connect the pneumatic pilot line (going to the extinguishing agent container battery/extinguishing agent container group) to the operating connection [2].



**FIGURE 5-36: Pneumatic circuit symbol**

[1] Pressurized connection, coming from the pressure reducer of the nitrogen pilot cylinder

[2] Operating connection, from the extinguishing agent container battery/extinguishing agent container group

[3] Venting with sinter filter/silencer

## 5.13 Assembling the downstream pipework

Personnel:

- Authorized Distributor

Protective equipment:

- Industrial hard hat
- Safety gloves
- Safety footwear

For the downstream pipework, pipes and fittings with a suitable pressure rating, made from a suitable material, and so on, must be used. They are defined for the various standards, such as those of DIN, EN and ANSI (American National Standards Institute), in their respective applicable provisions.

---

When assembling the downstream pipework, only use the following unions, pipes and sealants:

- The fittings must be marked with a red dot or an imprinted “D”.
- The pipes must be clearly marked with a 1305 psi (90 bar) stamp. Each thread cut on the construction site must be tested with a thread gauge.
- Only use the following sealing materials<sup>1</sup>:
  - PTFE sealing tape
  - Fermit sealing cord (silicone-free)
  - Loctite 55 sealing cord (NOT silicone-free)
  - Loctite AVX 586 adhesive
  - Hemp MES with Neo-Fermit
  - Sealant Permabond - A1046
  - Sealing paste HD Stucarit 309 sealing gel

<sup>1</sup>Check the validity and suitability for the thread size using the product sheet M1-01-04\_Part1.

National requirements for sealant may differ from those mentioned above; in this case, the national requirements take priority.

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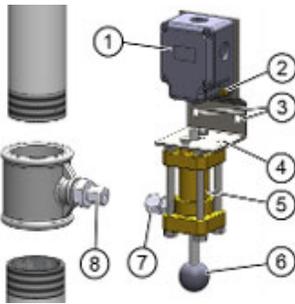
## 5.14 Assembling the pneumatically operated limit switch

Personnel:

- Authorized Distributor
- Qualified electrician

Protective equipment:

- Safety gloves

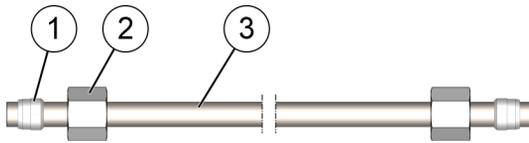


**FIGURE 5-37: Assembling**

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1. Limit switch
2. Fittings
3. Fastening bores
4. Support
5. Cylinder
6. Button
7. Pressurized air connection
8. Pipeline

1. Screw the cylinder to the support using the two screws supplied.
2. Fasten the limit switch to the support using the two cylinder bolts M5 x 25, the washers and the hexagon nuts supplied.
3. Fasten the support to a load-bearing part of the building using the two fastening bores and the screws supplied.



**FIGURE 5-38: Pilot line**

1. Cutting rings
2. Union nuts
3. Pilot line



**FIGURE 5-39: Flexible hose pilot line**

4. Slide the union nuts and the cutting rings on both ends of the pilot line.
5. Mount the pilot line between the pipeline and the pressurized air connection.

**i** The pilot line must be inserted into the respective cut ring union to the stop.

6. Tighten the union nuts.



**WARNING Danger due to electric shock**

Only carry out work on electrical connections if you are professionally qualified to do so.

7. Create an electrical connection as per the connection plan(see “Pneumatically actuated limit switch” on page 135.)
8. Press the button on the limit switch and check the functionality of the fire detection and suppression control panel.

---

=>If the functionality is correct, a signal appears. If no signal appears, correct the position of the limit switch to the pneumatic piston.

## 5.15 Mounting the VN Nozzle

Personnel:

- Authorized Distributor

Protective equipment:

- Industrial hard hat
- Safety gloves
- Safety footwear

### **WARNING Risk of death due to improperly functioning nozzles**

If the nozzles do not function properly, system function is not ensured. This can cause life-threatening injuries.



- Never operate the nozzles without first removing the plastic insert.
- Only screw the nozzles into the nozzle socket to connect them to the piping (never via the nozzle head).
- Never paint or cover nozzles.
- Do not undertake any structural changes in the protected enclosure that would affect the spray area of the nozzles.



### **CAUTION Risk of injury caused by nozzle parts during mounting**

Working overhead can pose a risk of injury from falling nozzle parts.

- Mount the nozzles in such a way that there is no risk of danger created by falling objects.

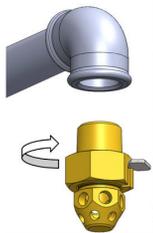


- The position, bore diameter, and number of nozzles in relation to the fire extinguisher system must be specified by a calculation program prior to the installation.
- Structural changes of the protected enclosure require a new design of the entire system including the bore diameter of the orifices.
- During mounting, the nozzles may be aligned horizontally, vertically facing down or vertically facing up.
- The plastic insert serves as a placeholder for the appropriate orifice and indicates that the nozzle body has not yet been completed.

---

Completion of the nozzle body and assembly of the nozzle may be carried out in various sequences. Here, assembly of the nozzle body to the pipe network with immediate or subsequent completion is described.

### Mounting the nozzle body



**FIGURE 5-40: Mounting the orifice**

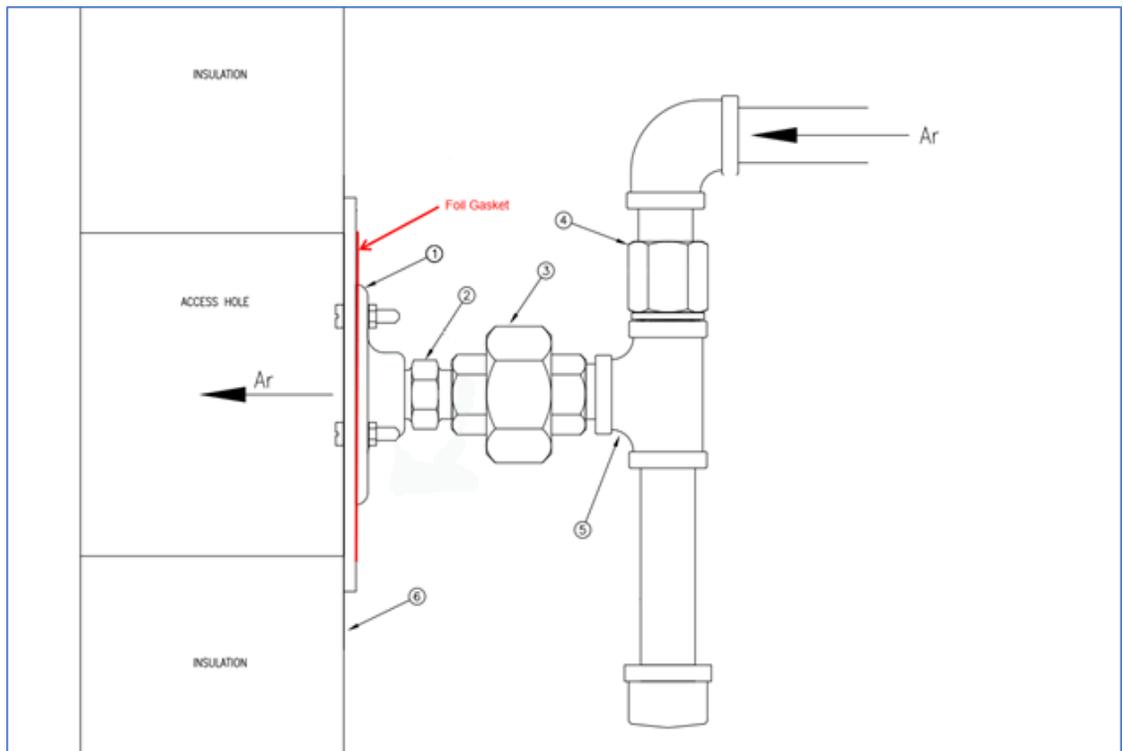
---

1. Wrap the connection thread on the nozzle socket with a suitable sealant (e.g. PTFE sealing tape).
2. Using a standard socket wrench on the wrench flats of the nozzle socket, firmly screw the nozzle body into the fitting.

NOTE: Nozzle comes with all components assembled

### Mounting the DCM style nozzle with gasket (optional)

The nozzle must be located 1' from the top of the enclosure in order to achieve proper distribution of agent. The DCM nozzle is provided in either 1/2" NPT or 3/4" NPT thread on the inlet and outlet. With proper installation material, the nozzle can be mounted from the outside in bag houses, dust collectors, and machining centers. To prevent obstructions to the nozzle orifice, the foil gasket must be used. The nozzle must be installed in the calculation area and should never be directly over sensitive equipment or devices. Modifications to the DCM nozzles are not allowed.



**FIGURE 5-41: Typical DCM nozzle installation**

1. Mounting socket
2. Nozzle Type DCM
3. 1/2" Galvanized Union
4. 1/2 BSPT to 1/2 NPT Adapter
5. NPT Piping to bag house
6. Baghouse side wall

## 5.16 Mounting the pilot line made of precision steel pipe

NOTE: Viking does not sell a steel pipe pilot line. See information regarding flexible Oxeo pilot hoses.

Personnel:

- Authorized Distributor

Protective equipment:

- Safety goggles
- Safety gloves
- Safety footwear

**WARNING Danger due to contamination**



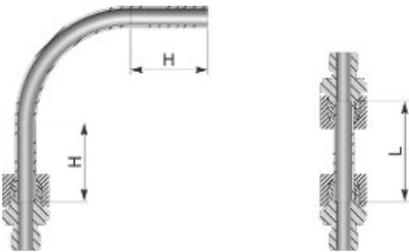
Contaminated pneumatic pilot lines or pipelines can cause individual components to malfunction and thus also cause the whole system to malfunction. This can cause serious injury or even death, and may also cause substantial property damage.

- Before assembly, check all pneumatic pilot lines and pipelines for contamination (e.g. particles or grease) and clean if necessary.



Only if the necessary auxiliary materials are used and the following work steps are observed can technically flawless and operationally safe connections between precision steel pipes and cut ring unions be established.

The precision steel pipe is hereinafter referred to as “pipe.”



**FIGURE 5-42: Minimum pipe lengths**



**WARNING Danger of a malfunction from improperly installed pilot lines**

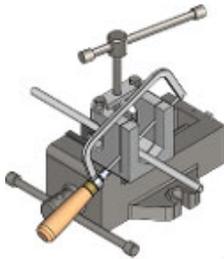
Observe the minimum pipe lengths:

	Pipe Outer Diameter	
	0.24 inches (6 mm)	0.39 inches (10 mm)
Straight minimum pipe length $H_{min}$ (without bending) <sup>1</sup>	1.38 inches <sup>2</sup> (35 mm)	1.58 inches <sup>2</sup> (40 mm)
Minimum installation length $L_{min}$	1.77 inches (45 mm)	1.97 inches (50 mm)

<sup>1</sup>The straight pipe end must not deviate from the dimension tolerance of the pipe in accordance with DINEN10305-1 regarding roundness and straightness in the entire zone "H".

<sup>2</sup>If twice the height of the union nut is a higher value, maintain the higher value.

### Saw, deburr, and clean the pipe



**FIGURE 5-43: Sawing device**

1. Clamp the pipe in a sawing device so the pipe is not deformed.
2. Cut the pipe to length with a hacksaw. Do not use any pipe cutter or angle grinder.



**FIGURE 5-44: Checking the right angles**

**NOTICE Reduced service life and leaks from obliquely sawn pipe ends**

Check the right angles of the saw cut. The angle tolerance is  $\alpha = \pm 0.5^\circ$ .



**FIGURE 5-45: Deburring pipe ends**

**NOTICE Reduced service life and leaks from sharp-edged pipe ends**

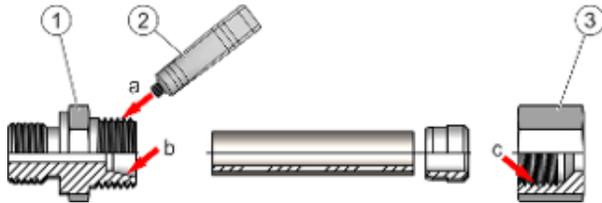
Deburr the inner and outer pipe ends with a manual deburrer.

3. Clean pipes properly with compressed air.

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## Connecting the pipe to the cut ring union



**FIGURE 5-46: Applying lubricant to the threads and cone**

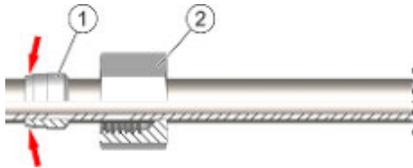
1. Union body
2. Lubricant
3. Union nut

a. thread (union body)

b. cone

c. thread (union nut)

- 
4. Apply lubricant to the thread and cone of the union body as well as the thread of the union nut to achieve a connection with non-destructive ease of movement.



**FIGURE 5-47: Sliding the union nut and cut ring on the end of the pipe**

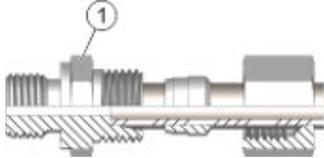
1. Cut ring
2. Union nut

- 
- 
- Slide the union nut on the end of the pipe.



**WARNING Danger of a leaky connection from incorrect position of the cut ring**

Slide the cut ring (/1) onto the pipe with the cutting edge (/arrow) towards the end of the pipe.

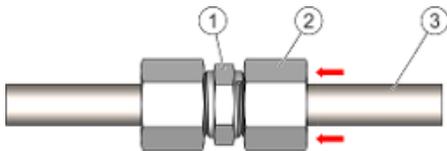


**FIGURE 5-48: Correct installation position of the cut ring**

---

- Union body
- 

- Insert the end of the pipe in the union body.



**FIGURE 5-49: Screwing on the union nut by hand**

---

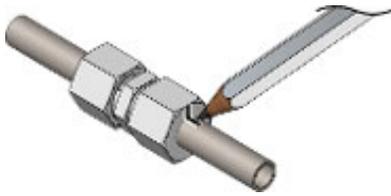
- Union body
  - Union nut
  - Pipe
- 

- Screw on the union nut and cut ring by hand until contact with the union body is felt.



**WARNING Danger of a leaky connection from ineffective cut ring**

Press the pipe into the union body all the way to the stop.



**FIGURE 5-50: Marking the union nut**

8. To check the necessary number of rotations, mark the position of the union nut to the pipe with a marker.



**FIGURE 5-51: Holding the union body in place with an open-end wrench**



**WARNING Danger of leaks or pipes slipping out from incorrect assembly**

Tighten the union nut max. 1.5 rotations and hold the union body in place with an open-end wrench so that the pipe does not rotate with it.



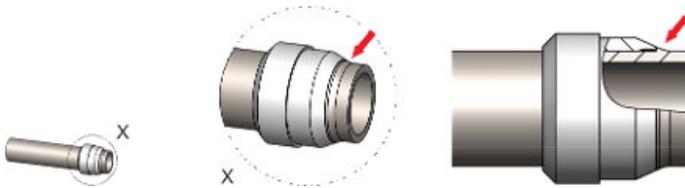
A deviant tightening distance reduces the compressive strength and the service life of the pipe union.

---

## Checking the pipe union

**i** The cut ring union must be removed to check the pipe union.

9. Loosen the union nut with an open-end wrench.



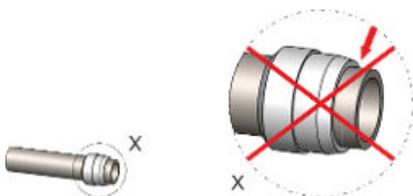
**FIGURE 5-52: Correct assembly with a clearly visible band of cut material**

---

10. Check whether the band of cut material completely covers the front surface of the cut ring.

=>The assembly is correct if there is clearly visible cut pipe material.

**i** For comparison, Figure 5-53 on page 124 shows the cut ring before assembly without a band of cut material.



**FIGURE 5-53: Cut ring prior to assembly without a band of cut material**

---

---

11. Check if the cut ring can NOT be moved in the longitudinal direction.



The cut ring should be able to turn on the pipe.

12. Retighten the union nut with the same force as for the first assembly. Hold the union body in place with an open-end wrench in the process.

## 5.17 Mounting makrofon MX-1

Personnel:

- Authorized Distributor

Protective equipment:

- Safety gloves
- Safety footwear



### **WARNING Malfunction due to contamination of the horn**

The functionality of the makrofon is not ensured if the inside of the horn is contaminated as a result of the makrofon being mounted in an unsuitable position.

- Mount the makrofon in such a way to ensure that the sound outlet is facing downward.



### **WARNING Danger of injury due to noise**

At operating pressure, the makrofon generates a sound pressure level that can damage human hearing.

- Mount the makrofon in a position that is not in the immediate vicinity of escape routes as much as is possible.



### **WARNING Danger of the makrofon malfunctioning**

Changes to the makrofon may cause a malfunction in the event of an alarm sounding. This can cause severe injuries.

- Do not remove or loosen the cylinder screw.



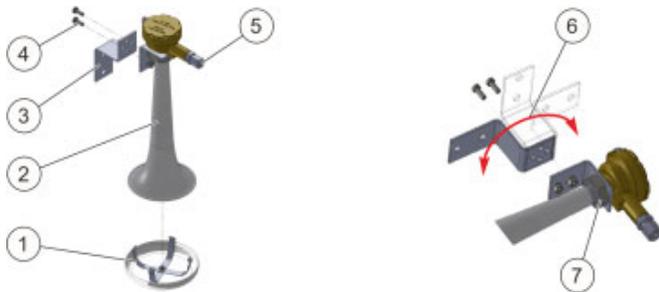
**FIGURE 5-54: Cylinder screw**

**NOTICE Property damage due to disassembly of the horn**

The horn and housing are inextricably linked. The makrofon is heavily damaged and rendered unusable due to disassembly of the horn.

- Do not remove the horn from the housing.

1. Cylinder screw



**FIGURE 5-55: Assembling the makrofon**

1. Silencer
2. Makrofon
3. Large mounting bracket
4. Spring washers and nuts
5. Pneumatic connection
6. Adjustable bracket alignment
7. Counter nuts

---

1. Assemble the large mounting bracket of the wall of the respective extinguishing zone using the clamping materials.

The alignment of the large mounting bracket can be chosen in 90° steps.

2. Optionally, assemble the silencer to the outlet of the makrofon using the clamping bracket.

=>The sound pressure level is reduced.

3. Screw on the makrofon to the large mounting bracket using the hexagon screw (M6 x16), spring washers and nuts so that the sound outlet is directed downwards.

4. If necessary, loosen the counter nuts, align the connection for the pneumatic pilot line, and tighten the counter nuts.

5. Check that the pneumatic pilot line has free passage and that it is free of contamination. If necessary, blow out the pilot line.

6. Connect the pneumatic pilot line to the makrofon connection.



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## 6 Electrical Connections and Terminal Assignments

Personnel: Qualified electrician

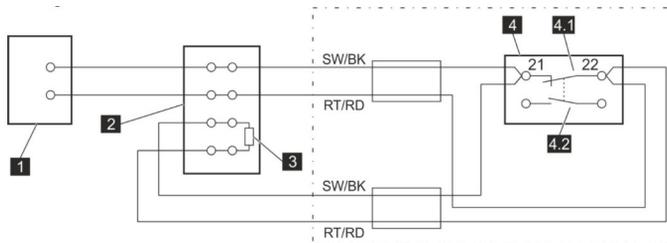


### **DANGER Danger of electrocution**

There is a real and immediate danger of electrocution when touching live parts. Damage to the cable insulation at individual components may result in death. Furthermore, incorrect connection can cause the system to malfunction.

- Have work on electrical components and on the electrical connection carried out only by qualified electricians.
- If damage to the cable insulation is detected, switch off the power supply immediately and replace the defective cables with identical new ones.
- Before starting any work at components of the electrical systems and operating equipment, disconnect the power supply and make sure it cannot be reconnected while work is being carried out. Observe the five safety rules:
  1. Disconnect completely.
  2. Secure against reconnection.
  3. Verify that the installation is dead.
  4. Carry out grounding and short circuiting.
  5. Protect against adjacent live parts.
- Never bypass fuses or put them out of operation.
- Replace defective fuses only with fuses with the same amperage and tripping characteristic.
- Keep moisture away from live parts. Moisture may cause a short circuit.

## 6.1 Electrical release device, QRV



**FIGURE 6-1: Electrical connection of the limit switch**

1. Control panel
2. Connection box
3. End-of-line resistor

---

#### 4. Limit switch

4.1 - NC contact: Open when the limit switch is activated. If the release device is removed or not correctly assembled, the contact is closed

4.2 - NO contact: is not used

---

Please note the following steps when making the electrical connections:

1. Prior to carrying out work which could result in faulty release, make sure all release devices and pneumatic pilot lines have been disassembled. Block the release system of the fire extinguishing system.
2. Connect the limit switch according to the connection diagram.

## 6.2 Monitor for the electrical release device

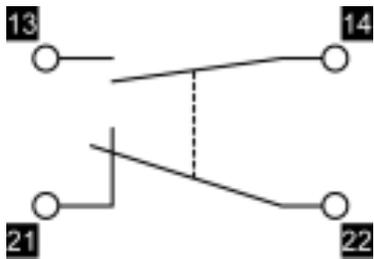
Data	Value	Unit
Switch current at 230 V AC (utilization category Ac 15)	4	A
Switch current at 24 V DC (utilization category DC 13)	1	A
Rated insulation voltage $U_i$	500	V
Protection type	IP 67	

**I** For monitored electrical circuits as per NFPA, the wiring between the limit switch and the connection socket must be protected by a flexible metal cable conduit; see “Limit switch connections to monitored circuits per NFPA” on page 139.

- Contact material: Silver

Contact type:

- 1 Normally open contact (NO)
- 1 Normally closed contact (NC)



**FIGURE 6-2: Terminal assignment**

Switch principle:

- Snap-action switch

Connection:

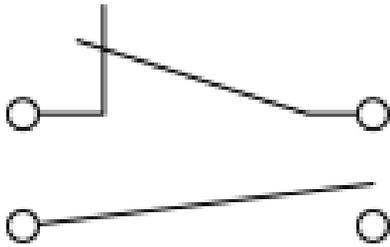
- Terminals direct

### 6.3 Contact pressure gauge

Data	Value	Unit
Switch voltage	4.5 ... 24	VDC/ VAC
Switch current	5 ... 100	mA
Maximum contact load	2.4	W
	0.00322	hp
Degree of protection	IP65	

**i** The deployment temperature range for complying with the switch tolerances is +41 °F...+77 °F (+5 °C...+25 °C).

- Contact material: Gold-plated



**FIGURE 6-3: Terminal assignment**

Contact type:

- Normally closed (NC)

When no pressure exists on the contact pressure gauge, the contacts are closed

- Normally open (NO)

When no pressure exists on the contact pressure gauge, the contacts are open

Connection via fixed mounted, 2-pole cable:

- Cable cross diameter: 0.14 mm<sup>2</sup> (AWG26)
- Length: 1 m (3.3ft)
- Cable colors:

- red (UB+)

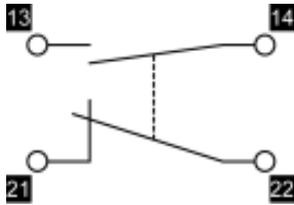
- black

## 6.4 Blocking device

Data	Value	Unit
Maximum switch voltage	500	V/AC
Switching current at 230 V AC	4	A
Switching current at 500 V AC	1	A
Maximum contact load	500	W
	0.67049	hp
Degree of protection	IP 67	

- Contact material: Silver

**i** Limit switches are not included in the scope of delivery and must be ordered separately.



**FIGURE 6-4: Terminal assignment**

Contact type:

- 1 normally open
- 1 normally closed

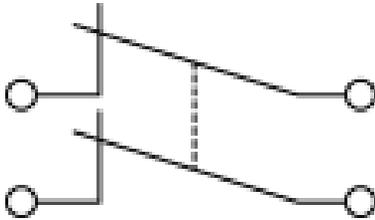
Connection:

- Terminals direct

## 6.5 Pneumatically actuated limit switch

Data	Value	Unit
Maximum switch voltage	400	V/AC
Switching current at 400 V AC	6	A
Maximum contact load	500	W
	0.67049	hp
Degree of protection	IP 65	

- Contact material: Silver



**FIGURE 6-5: Terminal assignment**

Contact type:

- 2 normally closed/normally open (adjustable)

Connection:

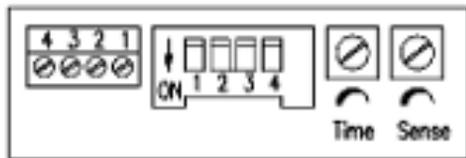
- Terminals direct

## 6.6 Light barrier (loss monitoring)

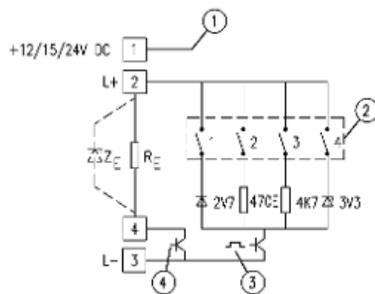
For connection to:	Dip switch On	Last link
FMZ 4100 A group	2	RE = 1K8
FMZ 4100 Z group 2.7V	1	ZE = ZPD 4.3
FMZ 4100 suppr. Z group 3.3V	4	ZE = ZPD 4.3
FMZ 5000	2	RE = 1K8

**i** An external voltage supply of 12/15/24V is always required at terminal 1.

**i** With mixed equipment of other encoders, a light barrier must always be wired as the last component.



**FIGURE 6-6: Connection space**



**FIGURE 6-7: Circuit diagram**

1. Voltage supply for light barrier
2. DIP switch
3. Dark switching
4. Monitoring of supply voltage

---

## 6.7 Limit switch reed contact (loss monitoring)

The short-circuit plugs remain in their delivered condition for all connection types. Only when using the FMZ4100 SUX50 module, the short-circuit plugs must be removed to connect the SUX50 module.

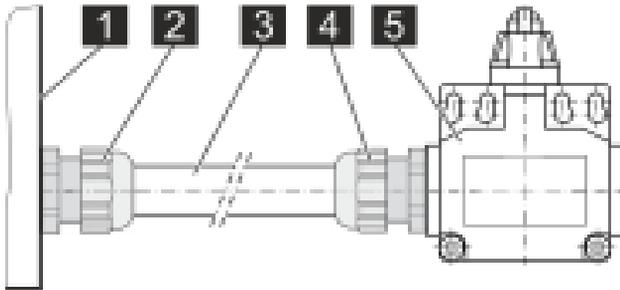
	FMZ 9 V line	Z line (2.7V)	Z line (3.3 V)	SUX50 MxLoop/ SUX5000 AP
<b>Position S2</b>	-	<b>3</b>	<b>1</b>	-
<b>Terminal 13</b>	<b>+UL</b>	<b>12V/15V</b>	<b>12V/15V</b>	<b>STMU</b>
<b>Terminal 14</b>	<b>not used</b>	<b>+UL</b>	<b>+UL</b>	<b>+UL</b>
<b>Terminal 21</b>	<b>-UL</b>	<b>-UL</b>	<b>-UL</b>	<b>-UL</b>
<b>Terminal 22</b>	<b>ext.</b>	<b>ext.</b>	<b>ext.</b>	<b>not used</b>
<b>EoL**</b>	<b>1.8kΩ</b>	<b>ZPD 4.3</b>	<b>ZPD 4.3</b>	-

\*\* EoL (End of Line): end of line always between +UL and -UL



---

## 6.8 Limit switch connections to monitored circuits per NFPA



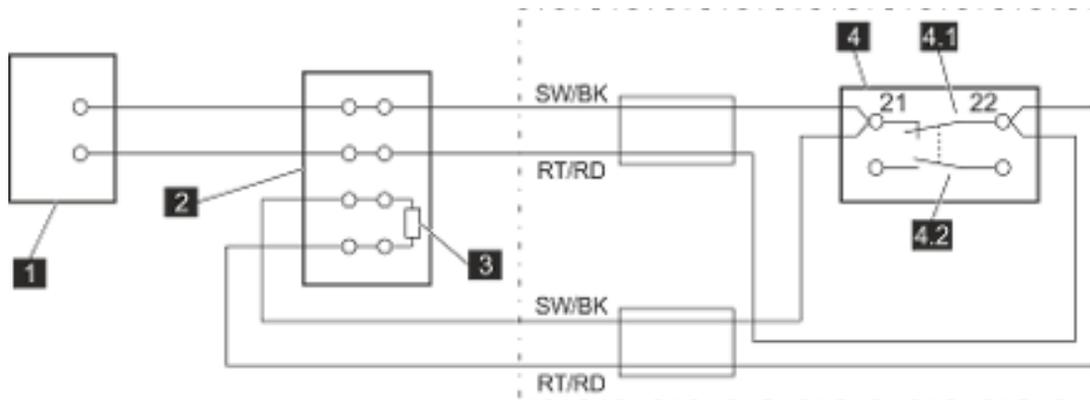
**FIGURE 6-9: Limit switches with flexible metal cable conduit**

1. Connection socket
2. Fitting for flexible metal cable conduit
3. Flexible metal cable conduit
4. Fitting for flexible metal cable conduit
5. Limit switch

For monitored electrical circuits as per NFPA, the wiring between the limit switch and the connection socket must be protected by a flexible metal cable conduit. The flexible metal cable conduit must be fastened with suitable fittings.

---

## Connection without an alarm device



**FIGURE 6-10: Wiring diagram without an alarm device**

1. Fire detection and extinguishing control panel
2. Connection socket
3. Terminating resistor
4. Limit switches (shown here: the actuated limit switch with a mounted electrical release device)

4.1 - Normally open (NO) If no electrical release device is mounted, the contacts are open.

4.2 - Normally closed (NC); unused

---





---

---

## 7 Commissioning



**WARNING Risk of injury due to incorrect sequence of commissioning**

With incorrect sequence of commissioning, there is a danger of mistaken activation. A faulty release of the system may cause severe injuries and property damage.

- For the commissioning (initial or subsequent commissioning, as well as after activation), the following sequence of commissioning must absolutely be adhered to.

---

A successful commissioning test is the prerequisite and final assembly procedure for a system transfer to the operator. Therefore, not only the function test must be completed flawlessly, but the entire system must also be in a commissionable state.

Before commissioning, the acceptance checklist must be used to determine that the entire system complies with the owed capacities and the commissioning test can be performed.

## Sequence of commissioning

1. Consider fire detection lines of fire detection technology and check whether no fire alarms arise.
2. Make sure that no undesired system states are present.
3. Consider activation lines of electrical extinguishing control technology and check whether no control signals arise.
4. Make sure that no undesired system states are present.
5. Commission control and pilot cylinder of the extinguishing system.
6. Make sure that no undesired system states are present.
7. Commission subordinate elements of the pneumatic system control if not in operation.

## 7.1 Preparations

Personnel:

- Authorized Distributor

Protective equipment:

- Safety goggles
- Safety gloves
- Safety footwear

Material:

- Test device for pneumatic actuation (any air supply under 144 psi)



### **WARNING Risk of injury due to faulty release**

Faulty release of the system may cause serious injuries or death and significant property damage.

- Carry out all functional tests during commissioning, servicing and repair work so that the system is not activated.
- Before starting work, always carry out the following tasks.

---

## 7.2 Testing the function of QRV actuation

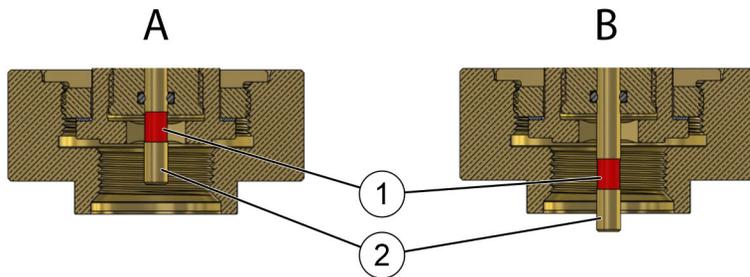
Personnel:

- Authorized Distributor

Material:

- Release device QRV reset tool (part no. 934652)
- Test device for pneumatic actuation (any air supply under 144 psi)

1. Apply power to the electrical release device QRV to activate the device and pop the release pin into the active position.
2. Use the reset tool to reset the release pin back into the non-active position.



**FIGURE 7-1: Release pin deactivated (A) and activated (B)**

1. Marking
2. Release pin

---

## 7.3 Checking the functioning of the pneumatic time delay

Personnel:

- Authorized Distributor

Protective equipment:

- Safety goggles
- Safety gloves

- Safety footwear

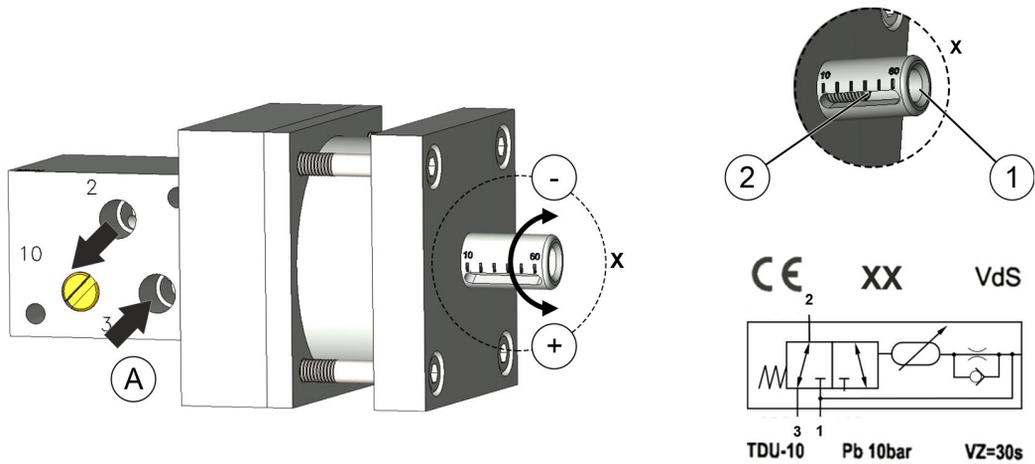
Material:

- Test device for pneumatic actuation (any air supply under 144 psi)



**WARNING Risk of malfunction and resulting injuries**

Always carry out the functional test/adjustment using nitrogen (N<sub>2</sub>) at a pressure of 7.5 bar (109 psi).



**FIGURE 7-2: Testing the time delay unit**

1. Adjusting spindle
  2. Test pressure gauge
- A. Pressurized connection

1. Connect the “test device for pneumatic actuation” directly to the pressurized connection [1] on the time delay unit.

---

2. Pressurize the time delay unit and measure the delay time. Check the pressure on the test pressure gauge.

- The permitted deviation from the target value is:
- i**
- $\pm 10\%$  when a pressure of 10 bar (145 psi) is applied [according to EN12094-2 and VdS]
  - +20/-0% [according to NFPA2001 and UL/FM]

If necessary, reset the delay time; see “Resetting the delay time” on page 147.

Otherwise, continue on to “Establishing the functional condition” on page 148

### Resetting the delay time

- The delay time can be infinitely set from 10 to 60 seconds (7 to 55.5 seconds in accordance with UL/FM requirements).
- i**

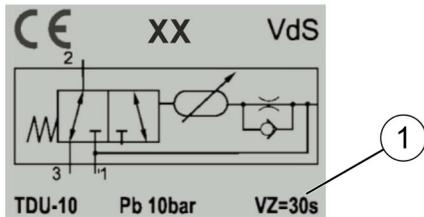
3. Document the reason for changing the delay time and the value in writing (installation certificate) and have it confirmed by an expert.
4. Insert a hexagon wrench (size 4) into the front face of the adjusting spindle and set the time.

- One rotation gives a time change of approx. 3.2 seconds.
- i**
- An adjustment in the clockwise direction reduces the delay time.  
An adjustment in the counterclockwise direction extends the delay time.

5. Test the delay time by pressurizing with test gas (nitrogen; 7.5bar (109 psi)). Check the pressure on the test pressure gauge. Adjust the adjusting spindle until the required delay time is reached.

- The permitted deviation from the target value is:
- i**
- $\pm 10\%$  when a pressure of 10 bar (145 psi) is applied [according to EN12094-2 and VdS]
  - +20/-0% [according to NFPA2001 and UL/FM]

6. Secure the adjusting spindle using sealing wax.



**FIGURE 7-3: Entering the delay time**

1. Delay time marking

7. Disguise the delay time entered on the enclosure and enter the new delay time using a permanent marker.

### Establishing the functional condition

8. Disconnect the “test device for pneumatic actuation” from the time delay unit.
9. Remove the test pressure gauge.
10. Connect the pilot line to the pressurized connection [1] on the time delay unit.

## 7.4 Checking the functioning of the makrofon MX-1

Protective equipment:

- Hearing protection

- Makrofons are tested in the course of extinguishing zone activation. When the selector valves are activated, the makrofon is clearly audible in the extinguishing zone.

## 7.5 Establishing operational readiness

1. Check that no alarms are active on the electrical control device and, if necessary, on the superordinate fire detection and suppression control panel.
2. Check if the testing supply is disconnected from the pneumatic control circuit.
3. Ventilate the pilot line.
4. Check if the selector valves are closed.
5. Check if the extinguishing agent containers are operational:
  - The release devices are pneumatically connected.

- 
- 
- The test pressure gauges are removed.
6. Check if the pilot cylinder is operational:
    - The electrical release device is mounted with a torque of  $25 \pm 4\text{Nm}$  (18.442.95ft-lb).
  7. Check if the switch levers of the blocking devices are in the "OPERATIONAL" position and if the switch levers are secured with padlocks.
  8. Check if the electric control device/fire detection and suppression control panel is in functional condition and that no shut-offs are active.
  9. Remove information signs.



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## 8 Inspection and Servicing

Personnel:

- Authorized Distributor

Protective equipment:

- Industrial hard hat
- Safety goggles
- Safety gloves
- Safety footwear



### **WARNING Risk of death due to missing fire protection**

There is limited or no fire protection when decommissioning the system. Fires can cause serious injury or even death and substantial property damage.

- Keep fully functional substitute fire extinguishing agent (e.g. fire extinguisher) at hand.
- Do not decommission the system any longer than necessary.
- Recommission the system immediately after carrying out the servicing work.



### **WARNING Risk of injury due to improperly executed maintenance work**

Improper maintenance can cause serious injury and substantial property damage.

- Prior to commencing work, make sure there is sufficient space for performing the installation.
- Make sure the installation site is tidy and clean! Components and tools that are laying around loosely or on top of each other pose a potential source of accidents.
- If components were replaced, carry out the installation according to the specifications in this service manual. Reinstall all the fixing elements and observe the specified screw tightening torques.
- Make sure that all servicing work is only carried out by appropriately qualified personnel.



### **WARNING Risk of injury due to escaping extinguishing agent**

If the fire extinguishing system is accidentally triggered when carrying out work (assembly, maintenance etc.), extinguishing agent may escape in an uncontrolled manner. This can cause serious injury and substantial damage to the system.

- Secure the fire extinguishing system against accidental activation before carrying out any work.
- Immediately vacate the extinguishing zone in case of faulty release.
- Inform all persons working in the area of the fire extinguishing system in advance about the danger of faulty release and familiarize them with the measures to be taken in such an event.

## **False alarm**



The alarm devices are activated as part of the functional tests. When the signaling devices sound, this does not mean that there is an alarm situation. Inform personnel working in the system area about possible false alarms before commencing work.

## **Maintenance interval**

The works listed below must be carried out at least annually.

If different local laws, regulations or guidelines demand shorter maintenance intervals, these must be adhered to. If there are special environmental conditions, e.g. corrosive atmosphere, increased dirt load or extreme temperature fluctuations, shorter maintenance intervals may be required.

Shorter service intervals, which can be prescribed for fire alarms, for example, do not apply to this fire extinguishing system.

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This chapter only describes visual checks, functional tests and manual releases or resets. The numbering listed in “Table: Activities in servicing and maintenance” on page 155 is based on the activities to be carried out as per the “Service log for inert-gas extinguishing systems”, in which the servicing tasks must be documented.

Functional tests can usually be carried out per extinguishing zone so that all components are actuated at least once.

Comprehensive servicing includes the following steps in addition to the full system test:

- proper log-in/log-off of work with the operator
- checking of the system specifics and changes and comparison against the log book
- confirmation of the work and the operational state of the system by an authorized signatory of the operator
- documentation of changes or repairs as requested by the operator

**I** In the event of a claim, undocumented deviations from the original or maintenance may represent a high risk with regard to a clear issue of liability. For this reason, seamless documentation throughout the life cycle of the complete system is a prerequisite, in the log book as well as in the service log.



**FIGURE 8-1: Example of an overview of a fire extinguishing system**

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**Table: Activities in servicing and maintenance**

<b>Designation</b>	<b>Visual check</b>	<b>Functional test</b>	<b>Manual release or reset</b>
<b>Support frame for extinguishing agent containers</b>	x		
<b>Manifold with high-pressure pipework</b>	x		
<b>Extinguishing agent containers (main and reserve)</b>	x		
<b>Malfunction pressure safety device SFD 300 (creeping gas assurance)</b>	x		
<b>Time delay unit TDU-10 u</b>	x	x	
<b>EPU-1 - triggering of pneumatic activation elements</b>		x	
<b>EPU-1 - disable device</b>		x	x
<b>EPU-1 - main/reserve change-over</b>		x	x
<b>EPU-1 - electrical control module</b>		x	
<b>Nozzle VN</b>	x		
<b>Downstream pipework</b>	x		
<b>Pneumatic alarm device (makrofon)</b>		x	
<b>Limit switch, pneumatically operated</b>		x	
<b>Safety valve</b>	x		
<b>Selector valve</b>		x	x
<b>Pilot cylinders (main and reserve)</b>	x		
<b>Pneumatic pilot line (precision steel pipe)</b>	x		

---

## 8.1 Inspection and maintenance schedule

All inspection and maintenance tasks that must be executed on the system are described in the following chapters. Execute the tasks listed in the specified intervals, unless locally applicable regulations require different intervals..

- I** In the event of a claim, undocumented deviations from the original or maintenance may represent a high risk with regard to a clear issue of liability. For this reason, seamless documentation throughout the life cycle of the complete system is a prerequisite, in the log book as well as in the service log.

<b>Interval</b>	<b>Maintenance work</b>	<b>Personnel</b>
<b>Weekly</b>	<b>Inspection and checks</b> <b>Operating manual</b>	<b>Person in charge of the system</b>
<b>Every 6 months</b>	<b>Inspecting the extinguishing agent containers</b> <ul style="list-style-type: none"><li>• Amount filled</li><li>• Fill pressure</li></ul>	<b>Qualified specialist personnel</b>

<b>Annually</b>	<b>Checking the protection zone for structural modifications</b> <ul style="list-style-type: none"> <li>• Dimensions</li> <li>• Usage</li> <li>• Fire loads</li> </ul>	<b>Authorized Distributor</b>
	<b>Checking the protection zone for leak tightness</b> <ul style="list-style-type: none"> <li>• Automatic locking systems</li> <li>• Devices that prevent accidental opening</li> </ul>	<b>Authorized Distributor</b>
	<b>Checking documentation and marking</b> <ul style="list-style-type: none"> <li>• Log book</li> <li>• Operating manual</li> <li>• System marking</li> <li>• Markings in the protection zone (for escape routes, etc.)</li> </ul>	<b>Authorized Distributor</b>
	<b>Checking activation and shut-off for alarms with a manual release</b>	<b>Authorized Distributor</b>
	<b>Checking activation and shut-off for alarms with an automatic fire detector</b>	<b>Authorized Distributor</b>
	<b>Checking alarm transmission</b>	<b>Authorized Distributor</b>
	<b>Checking electrical release devices</b>	<b>Authorized Distributor</b>
	<b>Checking pneumatic release devices</b> <ul style="list-style-type: none"> <li>• Activation by the pilot cylinder</li> <li>• Activation by the pneumatic release device</li> </ul>	<b>Authorized Distributor</b>
	<b>Checking manual release devices</b>	<b>Authorized Distributor</b>

<b>Annually</b>	<b>Checking components for damage and checking for proper functioning if necessary</b> <ul style="list-style-type: none"> <li>• Valves</li> <li>• Selector valves</li> <li>• Hoses</li> <li>• Check valves</li> <li>• etc.</li> </ul>	<b>Authorized Distributor</b>
	<b>Inspecting the extinguishing agent containers</b> <ul style="list-style-type: none"> <li>• Condition</li> <li>• Mounting</li> <li>• Function of the contact pressure gauges</li> </ul>	<b>Authorized Distributor</b>
	<b>Checking pipelines and discharge nozzles</b>	<b>Authorized Distributor</b>
	<b>Checking the fire detection and extinguishing control panel</b> <ul style="list-style-type: none"> <li>• Condition</li> <li>• Proper connection</li> <li>• Electrical pilot lines including equipotential bonding</li> </ul>	<b>Authorized Distributor</b>
	<b>Checking additional components</b> <ul style="list-style-type: none"> <li>• Fire detectors</li> <li>• Pressure relief devices</li> </ul> <p>- Function</p> <p>- The flow through the butterfly valves</p> <ul style="list-style-type: none"> <li>• Alarm devices</li> <li>• etc.</li> </ul>	<b>Authorized Distributor</b>
<b>Every 5 years</b>	<b>Replace hoses</b> <b>Documentation of the hoses</b>	<b>Authorized Distributor</b>

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- 
- In addition, maintain components that are subject to wear such as hoses, and so on, in accordance with the applicable local regulations.

### **Check extinguishing agent containers**

- Check extinguishing agent containers in accordance with locally applicable regulations for checking pressure vessels. Have visibly damaged extinguishing agent containers, and those that show deep corrosion in the floor area checked without delay and replace them with new containers, if necessary.

## **8.2 Service report**

A service report must be kept concerning the execution of the inspection and maintenance tasks. The following applies in this regard:

- Log execution of all inspection and maintenance tasks in the service report.
- Note damaged or non-functioning parts in the service report.
- Have the service report countersigned after conclusion of the tasks by the person in charge of the system.
- Give a copy of the service report to the person in charge of the system.

- A sample template for such a service report is provided in the Appendix of this manual.

## **8.3 Activities before servicing**

### **In advance**

Servicing must be announced in advance and prepared for:

- Inform the operator of the pending servicing in advance.
- Inform the operator that the automatic relaying of alarms must be deactivated for the time of the servicing.
- Obtain information on incidents (fires, malfunctions, conversions, spatial changes and changes in use, etc.).

- Inform the operator of the necessity of access to the affected facilities.

### **On the day of servicing**

- Inform the operator's person in charge of the system that the system servicing will take place and that due to the servicing, alarm and error messages as well as function interruptions can occur.
- Ensure that the departments where the alarms and malfunctions are automatically detected have been informed of the tasks that will be performed on the system and that the automatic relaying of alarms has been deactivated.
- Keep reserve extinguishing equipment on hand (e.g. fire extinguishers).
- Take the system out of service before starting service tasks:

- Secure extinguishing agent containers against faulty release (e.g. unscrew all the release devices from the extinguishing agent containers or remove the pilot lines depending on the valve type).

- Secure the pilot cylinder against faulty release (e.g. unscrew the valve lever on the valve of the pilot cylinder or unscrew the electrical release device from the pilot cylinder depending on the valve type).

- Carry out service tasks and acknowledge their execution in a service report.

## **8.4 Preparation activities**

1. Take the system out of service.
2. Remove electrical release devices from the pilot cylinders.
3. On the quantity control valve, disconnect the pneumatic pilot lines to the extinguishing agent containers and connect the test pressure gauge.

## **8.5 Visual inspections**

### **8.5.1 General visual inspections**

1. Check the components visually for external damage, corrosion, cracks, contamination, completeness of all components, and correct assembly.
2. Remove surface contamination with a cloth.

**i** Cleaning agents that attack plastics, rubber, or metals must not be used under any circumstances.

3. Replace damaged, corroded, cracked or leaky components immediately.

- 
4. Check the tightness of the unions.

### **8.5.2 Checking the fire suppression system center visually**

1. Check that the documentation is available at the control panel.
2. Check that the installer sign is present and in a clearly legible condition.
3. Check whether the room temperature is within the designated temperature range (see “Operating Conditions” on page 181)
4. Check that the markings and warning signs are present and are in a clearly legible condition.
5. Check that the fire extinguishing system control panel is secured against unauthorized access.
6. Check that the lighting is intact and adequate.
7. Check that no objects are stored in the fire extinguishing system control panel and that the fire extinguishing system control panel is not exposed to any damaging environmental influences.
8. Check that the nameplates of the components are present and in clearly legible condition and that the emergency service sticker is up-to-date.
9. Check that the function of the system is not impaired by external installations or objects and that external installations or objects cannot cause a faulty release.
10. Check that the external condition of the extinguishing agent containers, hoses and fixings is free of faults.
11. Check that the pipeline is grounded and that the ground connection is mechanically intact.
12. Check that the content of the extinguishing agent container is within the tolerances. Read the pressure gauges taking into account the room temperature and the temperature-pressure table; for example, see “Table: Temperature-pressure table IG-100, 4351 psi (300 bar)” on page 162 (additional tables are available from the manufacturer).
13. Check the protective coating of the system parts and, if necessary, re-coat.

**Table: Temperature-pressure table IG-100, 4351 psi (300 bar)**

IG-100 (N <sub>2</sub> = nitrogen)		4351 psi (300 bar)			
Enclosure temperature		Rated filling pressure*		Pressure* with 10% loss	
[°F]	[°C]	[psi]	[bar]	[psi]	[bar]
-4	-20	3539	244	3176	219
5	-15	3655	252	3278	226
14	-10	3771	260	3394	234
23	-5	3887	268	3495	241
32	0	4003	276	3597	248
41	5	4119	284	3713	256
50	10	4235	292	3815	263
59	15	4351	300	3916	270
68	20	4467	308	4018	277
77	25	4583	316	4119	284
86	30	4699	324	4235	292
95	35	4815	332	4337	299
104	40	4731	340	4438	306
113	45	5047	348	4540	313
122	50	5163	356	4641	320
131	55	5279	364	4743	327

**\*Values rounded to whole numbers**

## 8.6 Refilling

Personnel:

- Authorized Distributor

Protective equipment:

- Industrial hard hat
- Safety goggles
- Safety gloves

- Safety footwear



### **WARNING Risk of injury due to pressure in extinguishing agent containers**

If pressurized extinguishing agent containers are damaged and extinguishing agent escapes uncontrollably, there is a risk of severe injuries.

- Do not transport or store extinguishing agent containers unless they are sealed with a protective valve cap and an anti-recoil cap.
- Make sure that the extinguishing agent container on the filling unit is secured with the appropriate claw against tipping over. The latch must be closed.
- Replace damaged extinguishing agent containers immediately.

Defective components cannot be repaired; they must be replaced with original spare parts.



If the valve needs to be replaced due to corrosion, contamination or other damage, the seal ring between the extinguishing agent container and valve must also be replaced.

## **Preparing the extinguishing agent container**

1. Clean and re-coat the extinguishing agent container.
2. If necessary, check the extinguishing agent container in accordance with the locally applicable pressurized device regulations.

## **Space requirements**

Depending on local provisions and approvals, the filling service must be recognized by the authorities or a testing authority. Extinguishing agent containers for FM/UL-approved systems must be filled only by a filling service recognized by FM/UL.

Filling and storage areas must be sufficiently ventilated to ensure that the maximum permissible extinguishing agent concentration (NOAEL) is not exceeded when the extinguishing agent is unintentionally released.

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The measuring equipment used and its regular calibrations must comply with the locally applicable guidelines (e.g.NFPA2001, ISO17025).

**i** During the filling process, the pressure gauge attached to the extinguishing agent container must not be used to determine when the intended container pressure has been reached.

**i** A suitable pressure control must be used if the pressure source is a highly pressurized tank.

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## 9 Malfunctions

Protective equipment:

- Industrial hard hat
- Safety goggles
- Safety gloves
- Safety footwear

This section concerns conditions of system components, which occur during operation and present a deviation from the target state.



### **WARNING Risk of malfunctioning**

Improper replacement of components can result in malfunctions and thus prevent triggering of the fire extinguishing system in the event of a fire. This can cause serious injury or death and substantial damage to the system.

- After replacing components, carry out a mechanical and/or electrical functional test.



The electric control device is referred to as “EST” in the following tables.

The fire detection and suppression control panel is referred to as “FACP” in the following tables.

## 9.1 Extinguishing cylinder with quick release valve QRV

<b>Fault description</b>	<b>Cause</b>	<b>Remedy</b>	<b>Personnel</b>
The value indicated is too low or too high	The room temperature is too low or too high	Adjust the room air-conditioning	Person in charge of system
Loss indication shown on the EST/FACP	At least one extinguishing agent container is leaky	Identify the extinguishing agent container	Person in charge of system
	(See above)	Replace the extinguishing agent container immediately	Authorized Distributor
Line breakage or short circuit in the loss monitoring is shown on the EST/FACP	Line or cable connection is faulty	Identify damaged area and repair it	Authorized Distributor

## 9.2 Safety valve

<b>Fault description</b>	<b>Cause</b>	<b>Remedy</b>	<b>Personnel</b>
The lead seal or sealing wire is damaged	External influence, e.g. during the assembly or servicing	Replace the safety valve	Authorized Distributor

### 9.3 Pneumatic control device

<b>Fault description</b>	<b>Cause</b>	<b>Remedy</b>	<b>Personnel</b>
<b>The value indicated on the contact pressure gauge is too low or too high</b>	<b>The room temperature is too high or too low</b>	<b>Compare with the value indicated with other pressure gauges</b> <b>Cool or heat the installation area</b>	<b>Person in charge of system</b>
<b>The value indicated on the contact pressure gauge is faulty</b>	<b>The pressure gauge is defective</b>	<b>Compare the value indicated with other pressure gauges</b>	<b>Person in charge of system</b>
	<b>(See above)</b>	<b>Replace the pressure gauge</b>	<b>Authorized Distributor</b>
<b>The value indicated on the contact pressure gauge is too low</b>	<b>Extinguishing agent loss is less than 10%</b>	<b>Compare the indicated value with the temperature-pressure table</b>	<b>Person in charge of system</b>
	<b>(See above)</b>	<b>Replace the extinguishing agent container(s)</b>	<b>Authorized Distributor</b>
<b>Loss indication shown on the EST/FACP</b>	<b>Extinguishing agent loss is greater than 10%</b>	<b>Compare the indicated value with the temperature-pressure table</b>	<b>Person in charge of system</b>
	<b>(see above)</b>	<b>Replace the extinguishing agent container(s)</b>	<b>Authorized Distributor</b>
<b>The line fault “loss indication” is shown</b>	<b>The line connection is faulty (short circuit or wire break)</b>	<b>Detect the faulty connection</b> <b>Perform repairs</b>	<b>Qualified electrician</b>

<b>Fault description</b>	<b>Cause</b>	<b>Remedy</b>	<b>Personnel</b>
<b>The electrical release device is not activated despite triggering (LED lights up)</b>	<b>The polarization of the electrical connection is incorrect</b>	<b>Check the cable connection and correct it</b>	<b>Qualified electrician</b>
	<b>The electrical release device is defective</b>	<b>Replace the electrical release device</b>	<b>Authorized Distributor</b>
	<b>The connection line is inverted (commissioning)</b>	<b>Correct the connection</b>	<b>Qualified electrician</b>
	<b>The control model is defective (maintenance)</b>	<b>Replace the control module</b>	<b>Qualified electrician</b>
<b>The line fault “electrical release device” is shown</b>	<b>The line connection is faulty (short circuit or wire break)</b>	<b>Detect the faulty connection Perform repairs</b>	<b>Qualified electrician</b>
<b>No pressure is applied behind the pressure reducer</b>	<b>A foreign object or dirt is blocking the inlet to the pressure reducer</b>	<b>Check the connection components (adapter, valve output); clean and remount if necessary</b>	<b>Authorized Distributor</b>
<b>No pressure or the incorrect pressure is applied behind the pressure reducer</b>	<b>The pressure reducer is incorrectly set</b>	<b>Check and set the setting "" on page</b>	<b>Authorized Distributor</b>
	<b>The pressure reducer is defective</b>	<b>If the pressure reducer cannot be set, replace it</b>	<b>Authorized Distributor</b>
<b>The adapter connection is leaky</b>	<b>The seal is defective or not present</b>	<b>Check the seal; replace if necessary</b>	<b>Authorized Distributor</b>
<b>The shuttle non-return valve is leaky or not functioning</b>	<b>The seal fitting is dirty or the ball is stuck</b>	<b>Replace the shuttle non-return valve</b>	<b>Authorized Distributor</b>

## 9.4 Pneumatic time delay unit

<b>Fault description</b>	<b>Cause</b>	<b>Remedy</b>	<b>Personnel</b>
<b>Delay time is incorrect</b>	<b>Time setting is adjusted</b>	<b>Correct the time setting</b>	<b>Authorized Distributor</b>
	<b>Incorrect test gas and/or incorrect test pressure set</b>	<b>Use nitrogen (N2) test gas at a test pressure of 109 psi (7.5 bar)</b>	<b>Authorized Distributor</b>

Fault description	Cause	Remedy	Personnel
	Incorrect test gas and/or incorrect test pressure set	Use nitrogen (N2) test gas at a test pressure of 109 psi (7.5 bar)	Authorized Distributor
Time delay unit does not function	Sinter filter/silencer on vent [3] is contaminated	Clean or replace sinter filter/silencer	Authorized Distributor
	Pneumatic pilot line to operating connection [2] has a leak	Check the union and hose line; seal and replace if necessary	Authorized Distributor
	Pneumatic pilot line to pressurized connection [1] is depressurized	Check the pilot cylinder, pressure reducer, etc. and repair if necessary	Authorized Distributor
Control pressure is not released	Valve does not open in spite of pneumatic actuation (valve defective or contaminated)	Replace time delay unit	Authorized Distributor

## 9.5 Limit switch, pneumatically operated

Fault description	Cause	Remedy	Personnel
Limit switch does not switch	Limit switch is misaligned	Readjust the limit switch	Authorized Distributor
Limit switch does not switch	Limit switch is defective	Replace the limit switch	Authorized Distributor
Limit switch does not switch	Pneumatic pilot line is faulty	Check the pneumatic pilot line and repair if necessary	Authorized Distributor

## 9.6 Makrofon

Fault description	Cause	Remedy	Personnel
The makrofon is not activated	The pilot line is interrupted	Identify the line segment and replace if necessary	Authorized Distributor
	The strainer is dirty	Remove and clean or replace the strainer	Authorized Distributor
	The pilot line is blocked	Clean the pilot line	Authorized Distributor
	The pneumatic pilot line is depressurized	Inspect the pilot cylinder, pressure reducer, etc. and repair if necessary	Authorized Distributor



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# 10 Disassembly and Disposal

After the end of the facility's useful life has been reached, the facility must be disassembled and disposed of in an environmentally appropriate manner.

## Electrical system



### **DANGER Life-threatening danger due to electric shock**

There is a life-threatening hazard when touching live components.

- Prior to dismantling, switch off the electrical supply and definitively disconnect it.

## Lack of fire safety



### **WARNING Life-threatening danger due to a lack of fire safety**

If the system has been taken out of service there is no fire safety. Fires breaking out can result in severe or fatal injuries, as well as significant material damage.

- Keep functional reserve extinguishing equipment on hand (e.g. fire extinguishers).

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## Pressurized extinguishing agent



### **WARNING Risk of injury due to pressure in extinguishing agent containers**

If extinguishing agent containers are damaged during disassembly and extinguishing agent escapes uncontrollably, there is a risk of severe or even fatal injuries.

- Only start to dismantle system components if the extinguishing agent containers are removed and safeguarded with a protective valve cap.

## Escaping extinguishing agent



### **WARNING Danger of injury due to escaping extinguishing agent**

If the system is unintentionally activated in the course of disassembly, extinguishing agent can escape uncontrolled. This can lead to severe injuries or even death, as well as significant property damage.

- Prior to starting the tasks, for which a faulty release is threatened, ensure that all release devices are removed.
- Immediately exit the extinguishing zone if there is a faulty release.
- Instruct all persons working in the system area, in advance of the danger of a faulty release, familiarize them with the measures that must be initiated in this case.

## High pressure and lack of oxygen



### **WARNING Risk of injury with emptying of extinguishing agent cylinders**

If extinguishing agent cylinders are emptied in uncontrolled fashion, there is a risk of severe injuries due to extinguishing agent escaping at high pressure, noise, and a lack of oxygen.

- Only empty extinguishing agent cylinders in the filling plant.
- Alternatively, empty them into the pipe network of the system. For this, create and heed a property-related safety plan.

## 10.1 Disassembly

Personnel:

- Authorized Distributor

Protective equipment:

- Industrial hard hat

- 
- Safety goggles
  - Safety gloves
  - Safety footwear

### 10.1.1 Taking the system out of service

Prior to starting the disassembly process, the complete system must be taken out of service electrically and mechanically.

1. Take the electric control device or fire detection and suppression control panel out of service and secure it against restart.
2. Electrically disconnect the power supply unit and battery (rechargeable).



#### **WARNING** Danger of a faulty release

3. Remove the electrical release device from the pilot cylinder.
4. Remove the pneumatic pilot line - beginning with the pilot cylinders - up to the end of the extinguishing agent container batteries.
5. Disassemble all system components in accordance with locally applicable occupational health and safety and environmental protection directives.

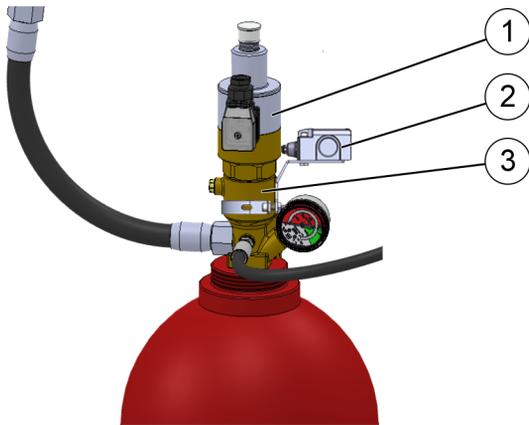
### 10.1.2 Dismantling the extinguishing agent containers



#### **DANGER** Risk of accidents due to heavy pressurized containers

Extinguishing agent containers are very heavy and may be pressurized. If handled improperly, they can pose a life-threatening hazard.

- Always handle extinguishing agent containers with at least 2 people.
- Always use suitable means of transport.
- In the meantime, or as soon as possible, secure the valve outlet with a locking nut and the valve with a protective valve cap.
- Wear safety gloves, safety footwear, protective goggles and hearing protection.

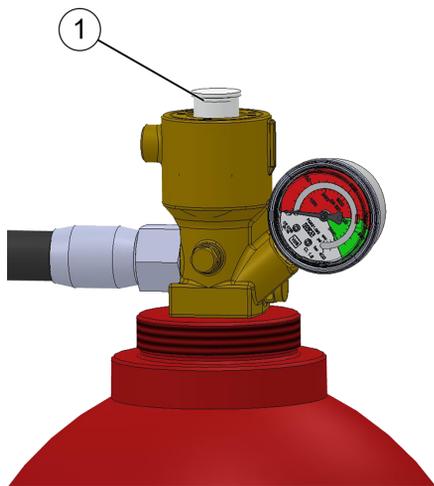


**FIGURE 10-1: Removing the electrical release device**

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1. Electric release device QRV
  2. Electrical release monitoring
  3. QRV valve
- 

1. Remove the monitoring of the electrical release device.
2. Remove the electrical release device QRV from the valve of the “master” extinguishing agent container.



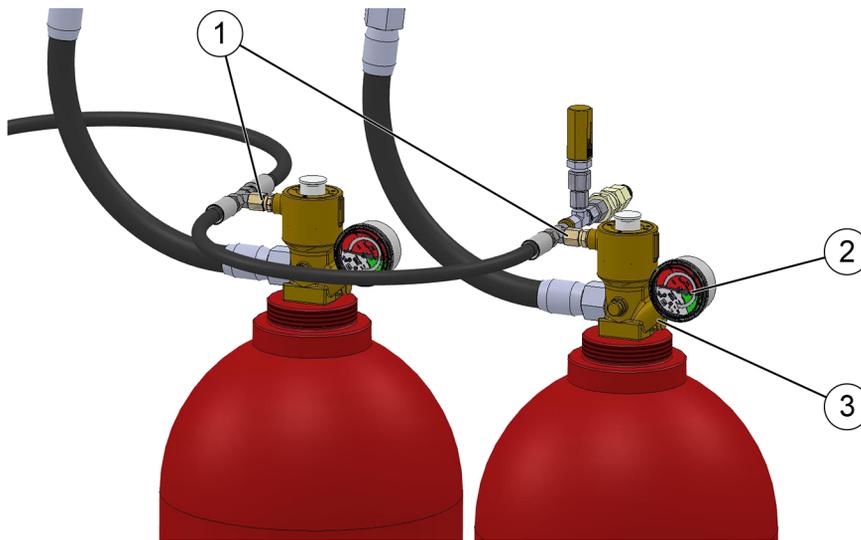
**FIGURE 10-2: Assembling the plastic protective cap**

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1. Plastic protective caps

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3. Place plastic protective caps onto the valve and onto the electrical release device QRV.



**FIGURE 10-3: Removing the pneumatic pilot lines**

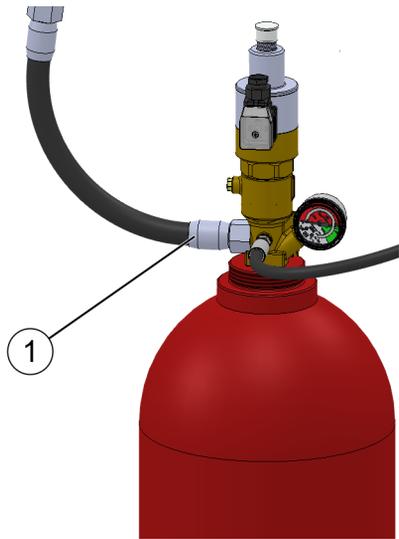
1. Pneumatic pilot lines
2. Contact pressure gauge
3. Pressure gauge connections

4. Remove the pneumatic pilot lines from the valves on the extinguishing agent containers.
5. Screw the plugs into all sequence valve connections and control connections and tighten with a torque of  $12 \pm 1$  Nm ( $8.85 \pm 0.74$  ft-lb).
6. Remove the electrical connections for the contact pressure gauge.
7. Release the contact pressure gauge with a suitable tool on the size 14 flat wrench and as soon as it can be easily turned, unscrew from the valve by hand.



The pressure relief can, due to the system, result in a brief, hazard-free 'pop' noise.

8. Secure all contact pressure gauge connections with plugs at the valves.



**FIGURE 10-4: Removing the hoses**

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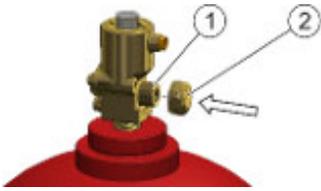
1. Hose

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9. Unscrew the hoses from the valves.

Store the seals in a safe place.





**FIGURE 10-5: Screwing on the union nuts**

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1. Valve outputs
  2. Union nuts
- 

10. Immediately screw union nuts onto all valve outputs with a torque of 35 Nm (26 ft-lb).



**FIGURE 10-6: Valve protection cap (example)**

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11. Screw valve protection caps onto the extinguishing agent containers.



**FIGURE 10-7: Removing the mounting brackets**

1. Mounting bracket

12. Carefully remove the mounting brackets and carefully place the extinguishing agent containers to the side.



Return the extinguishing agent containers to a filler for refilling in accordance with transport specifications; see “Transport extinguishing agent containers” on page 29.

13. Fasten the extinguishing agent containers standing up in a suitable transport frame or lying down on a pallet, and secure against sliding.

14. If required, assemble filled extinguishing agent containers; see “Assembling extinguishing agent containers” on page 75.

---

### 10.1.3 Disassembling system components

Dismantle all system components in accordance with locally applicable occupational health and safety and environmental protection directives.

## 10.2 Disposal

Personnel:

- Authorized Distributor

Protective equipment:

- Industrial hard hat
- Hearing protection
- Safety gloves
- Safety footwear



#### **NOTICE** Danger to the environment due to incorrect disposal

Incorrect disposal can cause hazards for the environment.

- Comply with the applicable legal disposal regulations.
- Have electrical scrap and electronic components disposed of by approved specialized companies.
- If in doubt get information concerning environmentally-responsible disposal from specialized disposal companies.

At the end of the equipment's service life, dispose of it in accordance with legal regulations or through the national recycling system.

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# 11 Technical Data

## 11.1 Operating Conditions

Specification	Value <sup>1</sup>	Unit
Permitted temperature for arrangement of extinguishing agent containers (FM Approval requirements)	+32 ... +131	°F
	0 ... +55	°C
Permitted temperature for transport/storage of extinguishing agent containers (FM Approval requirements)	-4 ... +131	°F
	-20 ... +55	°C
Permitted temperature in extinguishing zone (FM Approval requirements)	-4 ... +131	°F
	-20 ... +55	°C
Permitted operating temperature of the system (according to UL -Listing requirements)	+32 ... +131	°F
	0 ... +55	°C

<sup>1</sup>If locally applicable guidelines and standards define further restrictions, they take priority.

The system must not be exposed to outdoor weather conditions.

---

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## 11.2 Emissions

### Noise emission on activation

Specification	Value	Unit
Noise emission of pneumatic alarm device (makrofon) <sup>1</sup>	approx. 106	dB(A)

<sup>1</sup>The specified value is based on measurements in a laboratory with CO<sub>2</sub> and IG-100. The actual value may differ due to local acoustic influencing factors.

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# 12 Appendix A - Racking Assembly

This chapter is intended for expert installation personnel who are familiar with the handling of the fire extinguishing systems described herein.

This document contains neither detailed information concerning project planning of the system, nor detailed information concerning operation and maintenance. For this, observe the design manual and the operation manual. These documents can be found on the Viking website.

## 12.1 Introduction

The Oxexo support and racking system is ordered and delivered separately from the system. The specific arrangement and measurements of the racking system components depends upon the size and number of cylinders included in the design of the system. For more information on system design, refer to the design manual.

There are slight differences in the assembly measurements between the single, double, and triple row arrangements and the tolerance stack-ups can cause problems if the instructions are not followed carefully.

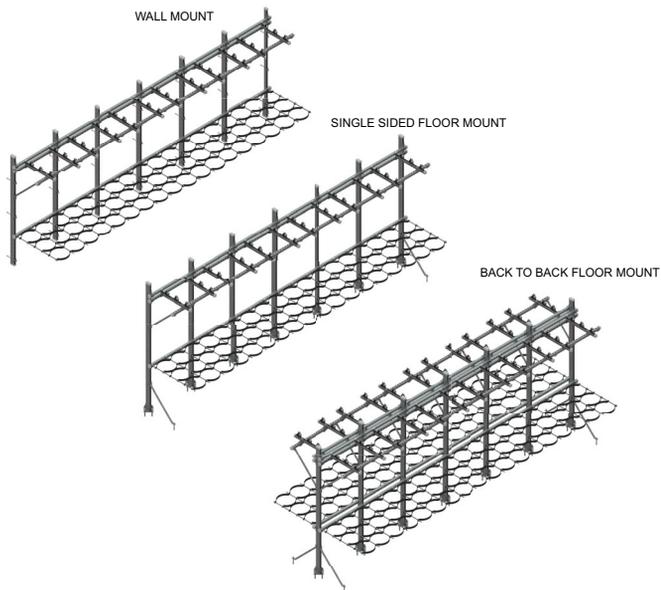
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## 12.2 Racking System Configurations and Ordering Information

There are three types of mounting configurations for the support system:

1. Wall mount
2. 1-sided floor mount
3. Back-to-back floor mount

Each type can be customized however, the systems are limited to 3 rows with a maximum of 18 cylinders per row. To order a pre-configured racking system, use the information in Tables A1, A2, and A3 below then order the appropriate web assembly from Table B. For additional or replacement parts, refer to Table B.



**FIGURE 12-1: Typical Rack Configurations**

---

**Table A1 - Floor mounted, single sided**

Part number	Cylinder rows	Width (cylinders)
24217	1	18
24218	1	15
24219	1	12
24220	1	9
24221	1	6
24222	1	3
24210	2	18
24211	2	15
24212	2	12
24213	2	9
24214	2	6
24215	2	3
24224	3	18
24225	3	15
24226	3	12
24227	3	9
24228	3	6
24229	3	3

**Table A2 - Floor mounted, double sided (back-to-back)**

Part number	Cylinder rows (on each side)	Width (cylinders)
24291	1	18
24292	1	15
24293	1	12
24294	1	9
24295	1	6
24296	1	3
24273	2	18
24274	2	15
24275	2	12
24276	2	9
24277	2	6
24278	2	3
24284	3	18
24285	3	15
24286	3	12

Part number	Cylinder rows (on each side)	Width (cylinders)
24287	3	9
24288	3	6
24289	3	3

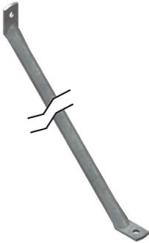
**Table A3 - Wall mounted**

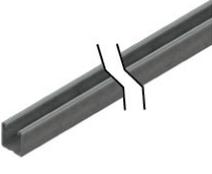
Part number	Cylinder rows	Width (cylinders)
24266	1	18
24267	1	15
24268	1	12
24269	1	9
24270	1	6
24271	1	3
24252	2	18
24253	2	15
24254	2	12
24255	2	9
24256	2	6
24257	2	3
24259	3	18
24260	3	15
24261	3	12
24262	3	9
24263	3	6
24264	3	3

## 12.3 Spare parts and component technical data

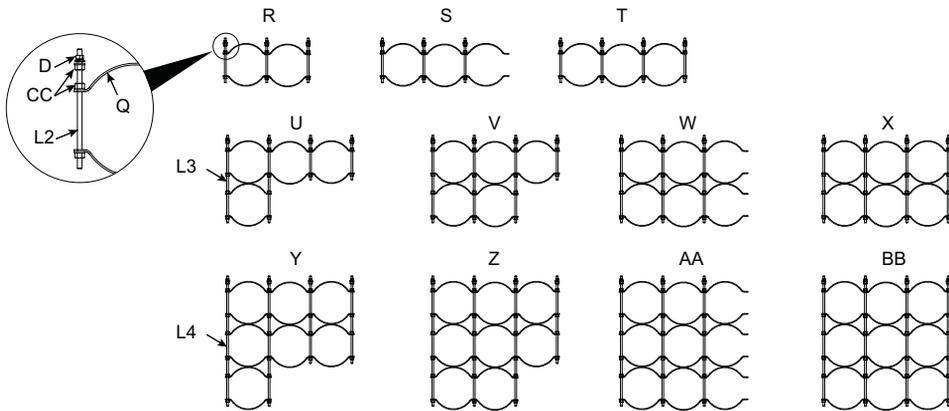
**Table B**

Ref#	Part Number (replacement)	Description	Size	Materials of Construction/ Material Standards	Image **NOT TO SCALE**
A	24125	Unistrut cantilever bracket	1 5/8" x 1 5/8" x 12"	12 gauge HSLAS Gr.45 Electrogalvanized steel per ASTM B633 SC1 Type III	
	24126	Unistrut cantilever bracket	1 5/8" x 1 5/8" x 18"		
	24127	Unistrut cantilever bracket	1 5/8" x 1 5/8" x 24"		
B	24128	Wolf washer	1 5/8"	Stainless steel Gr. 33, galvanized, case hardened	
C	24131	Post base	1 5/8" x 3 1/4"	Hot dipped galvanized steel per ASTM A123 or A153	
D	24132	Retaining nut	1 5/8"	P/M nickel steel FN-0205- 80HT per ASTM B783	
E	24133	Break-off head bolt	1/2" x 13	Steel Gr. 2 per SAE J429	

Ref#	Part Number (replacement)	Description	Size	Materials of Construction/ Material Standards	Image **NOT TO SCALE**
F	24140	Z fitting	1 5/8"	HSLAS Gr.45 Electrogalvanized steel per ASTM B633 SC1 Type III	
G	24142	Brace	1 5/8" x 18"		
	24141	Brace	1 5/8" x 24"		
H	24158	End cap	1 5/8" x 1 5/8"	Vinyl	
I	24157	End cap (double)	1 5/8" x 3 1/4"		

Ref#	Part Number (replacement)	Description	Size	Materials of Construction/ Material Standards	Image **NOT TO SCALE**	
J	24648-09050	Unistrut channel double	1 5/8" x 3 1/4" x 90 1/2", 12 gauge	Stainless steel Gr. 33, Hot dipped galvanized steel per ASTM A123		
	24648-07850	Unistrut channel double	1 5/8" x 3 1/4" x 78 1/2"			
	24648-12000	Unistrut channel double	1 5/8" x 3 1/4" x 120"			
K	24649-01200	Unistrut channel	1 5/8" x 1 5/8" x 12"			
	24649-03975	Unistrut channel	1 5/8" x 1 5/8" x 39 3/4"			
	24649-07475	Unistrut channel	1 5/8" x 1 5/8" x 74 3/4"			
	24649-11000	Unistrut channel	1 5/8" x 1 5/8" x 110"			
	24649-14550	Unistrut channel	1 5/8" x 1 5/8" x 145 1/2"			
	24649-18100	Unistrut channel	1 5/8" x 1 5/8" x 181"			
	24649-21650	Unistrut channel	1 5/8" x 1 5/8" x 216 1/2"			
L1	24650-00400	Threaded rod	1/2"-13 X 4"	Steel, per ASTM F1554-20, Gr. 36, Electrogalvanized per ASTM B633 SC1 Type III		
L2	24650-01250	Threaded rod	1/2"-13 X 12 1/2"			
L3	24650-02450	Threaded rod	1/2"-13 X 24 1/2"			
L4	24650-03650	Threaded rod	1/2"-13 X 36 1/2"			
L5	24650-12000	Threaded rod	1/2"-13 X 120"			
M	24139	Concrete anchor (inc. nut and washer)	5/8" x 5"	Zinc plated carbon steel with stainless steel clip, galvanized		
N	24191	Concrete anchor (inc. nut and washer)	1/2" x 5 1/2"			
P	24250	Concrete anchor (inc. nut and washer)	1/2" x 8 1/2"			
Q	24196WB	Tank bracket, E-coated	n/a	Steel gr. 50 per ASTM A1018, coated with		

Ref#	Part Number (replacement)	Description	Size	Materials of Construction/ Material Standards	Image **NOT TO SCALE**
R	24208	Cylinder brace assembly	1 row x 2 cylinder closed	Materials vary by component. Refer to individual items above.	See below
S	24207	Cylinder brace assembly	1 row x 3 cylinder open		
T	24206	Cylinder brace assembly	1 row x 3 cylinder closed		
U	24205	Cylinder brace assembly	2 row x 1 cylinder closed		
V	24204	Cylinder brace assembly	2 row x 2 cylinder closed		
W	24203	Cylinder brace assembly	2 row x 3 cylinder open		
X	24202	Cylinder brace assembly	2 row x 3 cylinder closed		
Y	24201	Cylinder brace assembly	3 row x 1 cylinder closed		
Z	24200	Cylinder brace assembly	3 row x 2 cylinder closed		
AA	24199	Cylinder brace assembly	3 row x 3 cylinder open		
BB	24198	Cylinder brace assembly	3 row x 3 cylinder closed		
CC	23376	Serrated flange nut			



**FIGURE 12-2: Cylinder web assemblies**

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## 12.4 Assembling the Rack

### 12.4.1 Safety



#### **CAUTION Cutting hazard**

Some components have sharp edges that can cause cuts.

- Wear safety gloves during this procedure.



#### **CAUTION Personal injury hazard**

Some components are heavy and can cause personal injury if not handled properly.

- At least two (2) people are required for this installation.

### 12.4.2 Tools Required

- Drill
- 5/8" and 1/2" Concrete drill bits
- Standard and/or adjustable wrenches
- Measuring tape
- Level
- Hammer

### 12.4.3 Installation Tips

**Inserts:** To install the inserts, it's recommended to place the insert inside the unistrut channel and use 2 fingers to twist it into the proper orientation. The inserts include a plastic guide that may dislodge from the insert during installation and can easily be re-attached. These inserts are not required.

**Break-off bolts:** The break-off bolts include a hexagonal head on top of the square head that is designed to break off a specific torque value. Once head is broken off, the bolt is properly tightened.

**Cylinder web/clamps:** The cylinder web assemblies need to be installed properly in order to have correct spacing of the racking going down the line. If the bracing webs are not installed properly, the tolerance stack-up will affect the installation further down the line and will need to be corrected.

### 12.4.4 Assembly Procedure Information

Refer to “Table A1 - Floor mounted, single sided” on page 185 for reference descriptions.



Unless explicitly instructed, it is recommended to install all components loosely at first, adjust as necessary to achieve the desired end result, and tighten down/secure everything at the end.

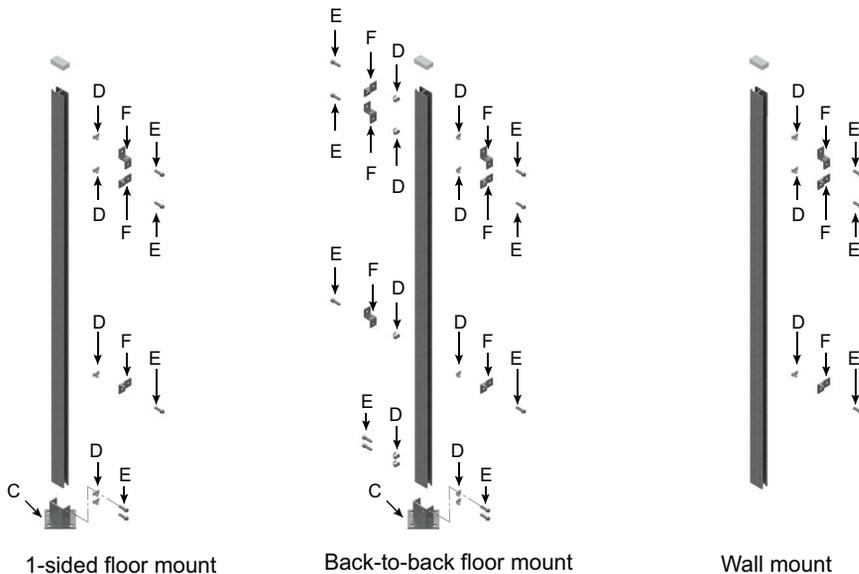


Build the support racking system starting at 1 end and loosely install the opposite end and cross support to assist in configuring the remainder of the components in-between.

### 12.4.5 Pre-assembling The Upright Frame Members

1. Loosely install retaining nuts (D), Z-brackets (F), and base supports (C) using the break-off bolts (E), as shown. Do not tighten the break-off bolts yet.

NOTE: Wall mount versions do not require base supports.



**FIGURE 12-3: Assembling the upright supports**

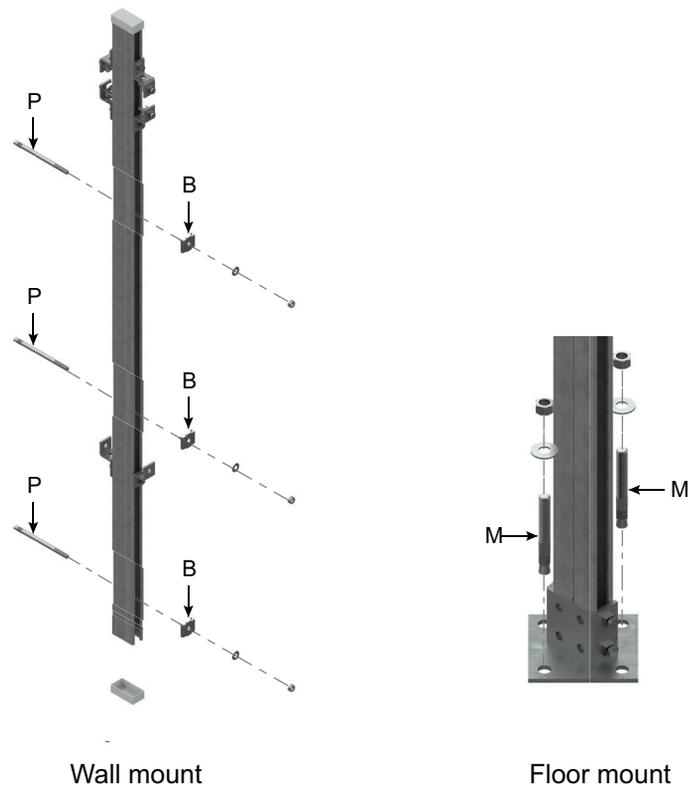
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## 12.4.6 Installing the Support Structure

Refer to

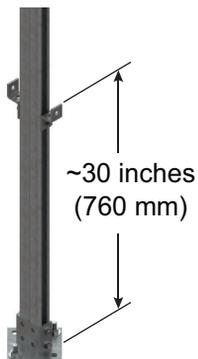
1. Measure and mark the location of the first upright post.
2. Drill pilot holes for the concrete anchors (wall or floor depending on your system).
3. Install the upright post using the concrete anchors (P-wall or M-floor), wolf washers (B), and the included nuts and washers.

**NOTE** Floor mount versions use the 1/2" X 5 1/2" concrete anchor.



**FIGURE 12-4: Mounting the upright supports**

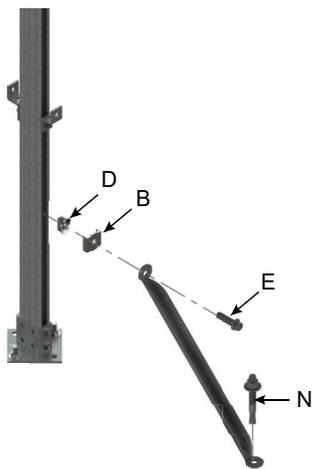
- 
- 
4. Position the bottom Z-bracket approximately 30 inches from the floor and snug the break-off bolt in place but do not break it off.



**FIGURE 12-5: Locating the horizontal support brackets**

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5. For floor mount versions, loosely install floor brace using the retaining nut (D), wolf washer (B), and break-off bolt (E) attached to the post, and concrete anchor (N) in the floor.



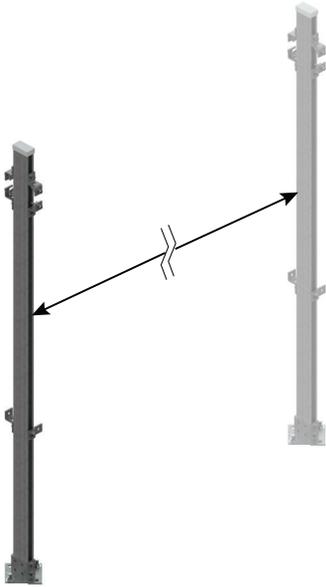
**FIGURE 12-6: Mounting the floor braces**

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6. Measure and mark the location for the next post and loosely install it in the appropriate location.

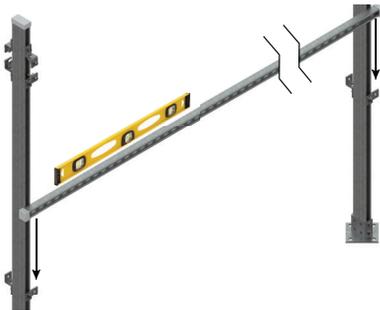
**NOTE** Do not anchor this post in place yet.1



**FIGURE 12-7: Installing the opposite end support**

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7. Install the horizontal cross piece into the Z-brackets as shown.
8. Verify the horizontal cross-piece and vertical posts are level.



**FIGURE 12-8: Leveling the horizontal support**

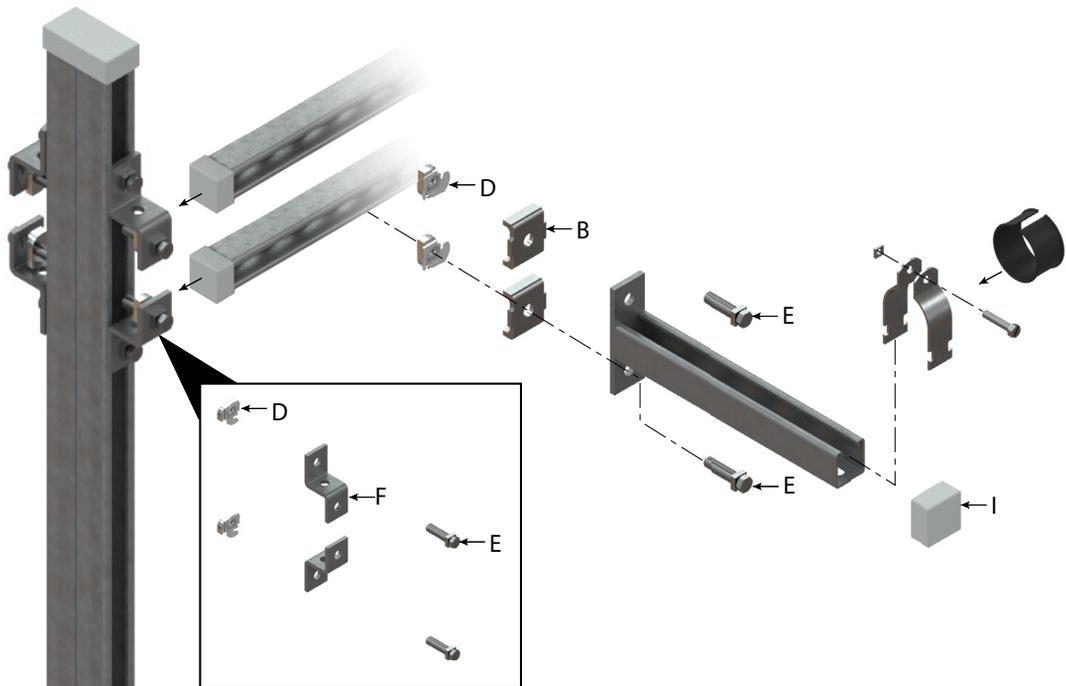
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### 12.4.7 Pre-assembling the Upper Horizontal Support Structure

**NOTE** For larger configurations, it may be easier to pre-assemble the cantilever bracket assemblies and mount them after the horizontal supports are installed. For smaller systems, it is recommended to assemble as described below.

#### Cantilever Brackets

1. Cut the rubber to length (if necessary) and place it inside the clamp if desired or set aside for later installation; install the bolt and nut.
2. Slide the clamp assembly onto the cantilever brackets.
3. Mount the cantilever brackets to the horizontal supports (top and bottom) using the wolf washers (B), inserts (D), and break off bolts (E).
4. Lift and Install the horizontal support assembly to the upright posts.



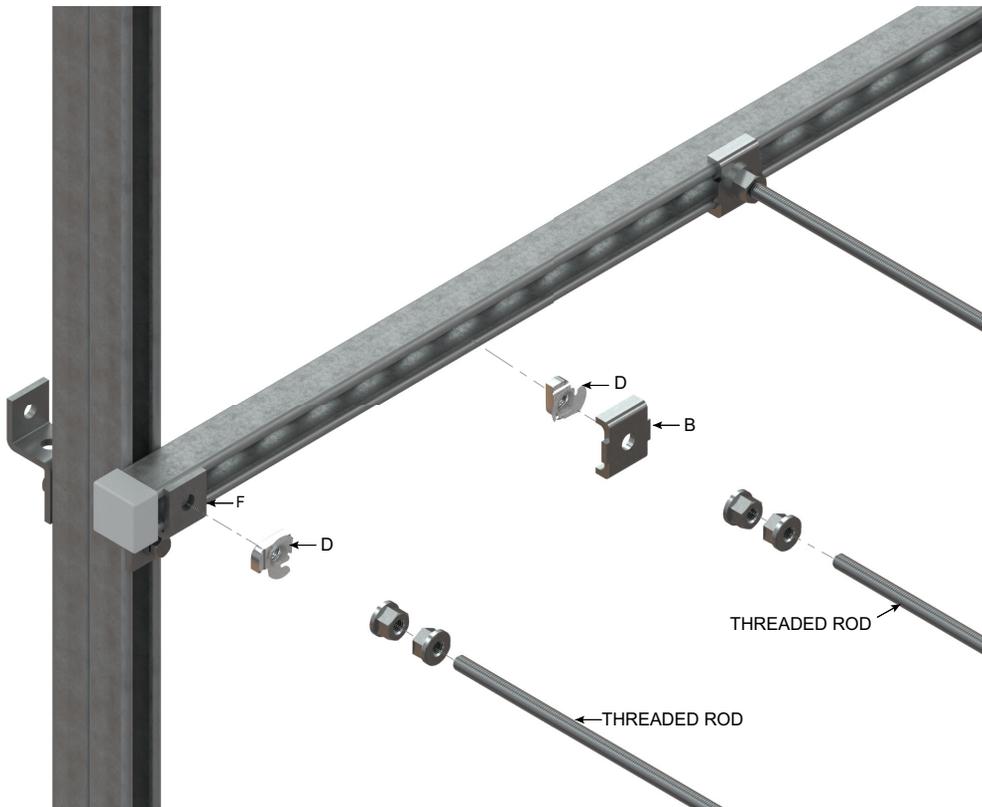
**FIGURE 12-9: Assembling the upper support structure**

### 12.4.8 Installing the Cylinder Bracket Assemblies

1. Place the next upright post into its approximate position (for floor mount versions, install the base support onto the post).
2. Place retaining nut (D) into the channel and push into position BEHIND the Z-bracket (F).

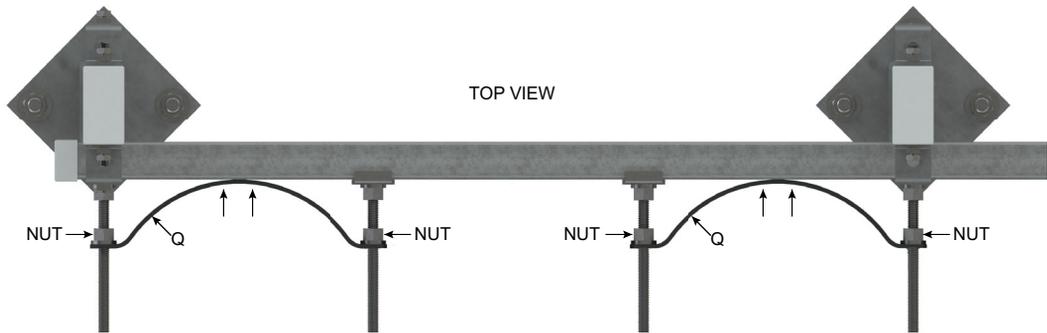
**NOTE Use the farthest hole on the horizontal cross-piece for the first threaded rod to ensure proper alignment.**

3. Install two nuts onto the threaded rod facing opposite each other as shown.
4. Install the threaded rod into the retaining nut (D).
5. Tighten the rod until the end is flush with the back of the retaining nut. Use a finger to feel the back side of the nut as you tighten.
6. In-between uprights, an additional wolf washer (G) is required as shown.
7. Install all threaded rod assemblies for the entire racking system before continuing.



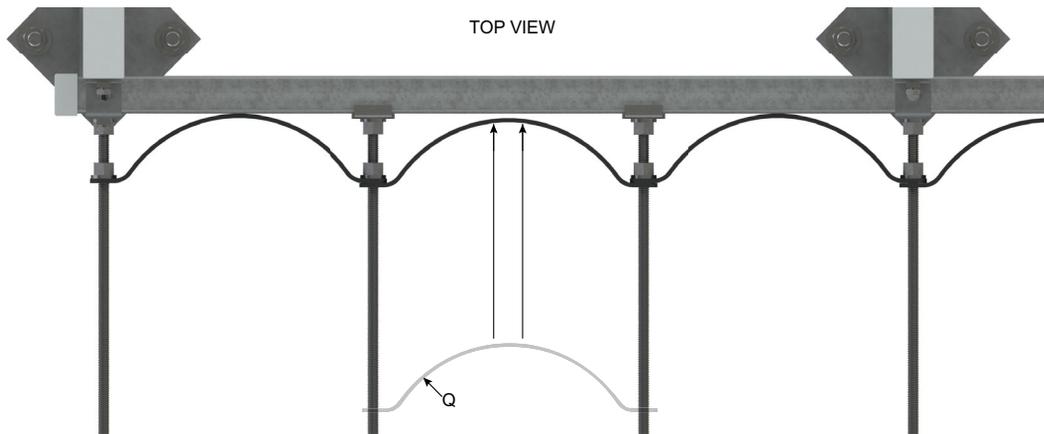
**FIGURE 12-10: Installing the cylinder bracket rods**

8. Install a cylinder bracket (J) onto the first set of threaded rods.
9. Adjust the position of the nuts to ensure the bracket is aligned correctly.
10. Skip one span and install another bracket. Continue installing brackets down the line skipping one span each time.



**FIGURE 12-11: Cylinder bracket installation 1**

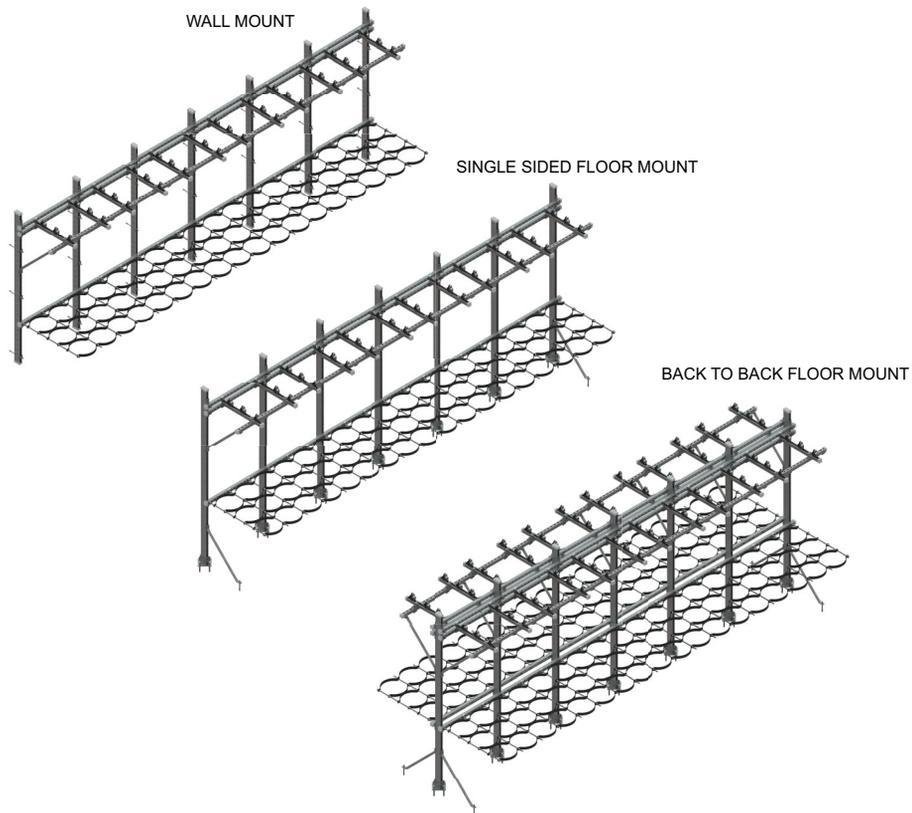
11. Install the remaining bracket (J) in the open span(s).



**FIGURE 12-12: Cylinder bracket installation 2**

**NOTE** For larger systems with multiple rows of tanks, consider placing the cylinders into the racking assembly at this point to ensure web assemblies will be oriented correctly.

- 
1. Install remaining brackets in the manner described above and alternating orientations to support the cylinders as shown below.



**FIGURE 12-13: Fully assembled racking unit**

Refer to Chapter 5 for instructions regarding manifolds and cylinder connections.



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# 13 Appendix B - Replacement components

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See individual product sheets for component-level approvals.

<b>Designation</b>	<b>Part no.</b>
<b>Tank assembly, OXEO, 80 L, 200 bar, Argon</b>	<b>4001024</b>
<b>Tank assembly, OXEO, 80 L, 200 bar, Nitrogen</b>	<b>4001044</b>
<b>Tank assembly, OXEO, 80 L, 300 bar, Argon</b>	<b>4001030</b>
<b>Tank assembly, OXEO, 80 L, 300 bar, Nitrogen</b>	<b>4001050</b>
<b>Tank assembly, OXEO, 80 L, 200 bar, Argon, Canada</b>	<b>4001024C</b>
<b>Tank assembly, OXEO, 80 L, 200 bar, Nitrogen, Canada</b>	<b>4001044C</b>
<b>Tank assembly, OXEO, 80 L, 300 bar, Argon, Canada</b>	<b>4001030C</b>
<b>Tank assembly, OXEO, 80 L, 300 bar, Nitrogen, Canada</b>	<b>4001050C</b>
<b>Manual release device QRV</b>	<b>914028</b>
<b>Electrical release device QRV</b>	<b>914027D</b>
<b>Monitor switch, OXEO, Actuator, NPT</b>	<b>930865D</b>
<b>Warning sign, outside, nitrogen, English</b>	<b>24587</b>
<b>Warning sign, inside, nitrogen, English</b>	<b>24588</b>
<b>Warning sign, outside, argon, English</b>	<b>24589</b>

<b>Designation</b>	<b>Part no.</b>
Warning sign, inside, argon, English	24590
Warning sign, outside, nitrogen, French	24587-F
Warning sign, inside, nitrogen, French	24588-F
Warning sign, outside, argon, French	24589-F
Warning sign, inside, argon, French	24590-F
Warning sign, outside, nitrogen, Spanish	24587-S
Warning sign, inside, nitrogen, Spanish	24588-S
Warning sign, outside, argon, Spanish	24589-S
Warning sign, inside, argon, Spanish	24590-S
Check valve KRV-2 (Included with manifold assemblies)	886030
Discharge hose with gaskets, 375 mm length, inert gas	934921D
Discharge hose with gaskets, 600 mm length, inert gas	934922D
Gasket, inert gas, discharge hose to manifold	149890
Gasket, inert gas, tank to discharge hose	149970
Pressure gauge, 2901 psi, NO under pressure	927612
Pressure gauge, 2901 psi, NC under pressure	927615
Pressure gauge, 4351 psi, NO under pressure	927616
Pressure gauge, 4351 psi, NC under pressure	927617
Pneumatic time delay	926815
Blocking device assembly, pilot line	878070D
Pressure reducer, OXEO, 9201/145 psi, pilot	926811
Shuttle non-return valve	886247
Pilot line pressure relief, OXEO	24498
Pilot line pressure relief with manual release, OXEO	24499
Pilot hose, high pressure, USA specific, 20" length	24467
Pilot hose, high pressure, USA specific, 39" length	24468
Pilot hose, high pressure, USA specific, 59" length	24469
Pilot hose, high pressure, USA specific, 20" length, kit	25132
Pilot hose, high pressure, USA specific, 39" length, kit	25133
Pilot hose, high pressure, USA specific, 59" length, kit	25134

<b>Designation</b>	<b>Part no.</b>
Selector valve assembly, OXEO 2" NPT, 5294 psi	24815
Monitored blocking valve assembly, OXEO, 5294 psi	24768
Limit switch, push pin, Schmersal PS226	930351
Limit switch, roll push pin, Schmersal PS226	930352
Pressure relief, OXEO, 4351 psi, manifold, NPT	886281D
Pressure relief, OXEO, 2901 psi, manifold, NPT	885136D
Pressure reducer 3/4" NPT / BSPT with protective screen (single tank systems only)	25011*
Pressure reducer 3/4" NPT / BSPT (single tank systems only)	25012*
Pressure reducer 2" NPT / 2" NPT with protective screen	25013*
Pressure reducer 2" NPT / 2" NPT	25014*
Pressure reducer 2" NPT / 2-1/2" NPT with protective screen	25015*
Pressure reducer 2" NPT / 2-1/2" NPT	25016*
Pressure reducer 2" NPT / 3" NPT with protective screen	25017*
Pressure reducer 2" NPT / 3" NPT	25018*
Adapter, male 3/4" BSPP x male 3/4" BSPT (single tank systems only)	887706
Pneumatic limit switch assembly	826758D
Pneumatic horn (Makrofon), NPT kit, inert gas	860050D
1/2" NPT VN Nozzles - 180° Style (0.118")	934164D-0118
1/2" NPT VN Nozzles - 180° Style (0.122")	934164D-0122
1/2" NPT VN Nozzles - 180° Style (0.126")	934164D-0126
1/2" NPT VN Nozzles - 180° Style (0.134")	934164D-0134
1/2" NPT VN Nozzles - 180° Style (0.142")	934164D-0142
1/2" NPT VN Nozzles - 180° Style (0.150")	934164D-0150
1/2" NPT VN Nozzles - 180° Style (0.157")	934164D-0157
1/2" NPT VN Nozzles - 180° Style (0.165")	934164D-0165
1/2" NPT VN Nozzles - 180° Style (0.173")	934164D-0173
1/2" NPT VN Nozzles - 180° Style (0.181")	934164D-0181
1/2" NPT VN Nozzles - 180° Style (0.189")	934164D-0189
1/2" NPT VN Nozzles - 180° Style (0.197")	934164D-0197
<b>*Base part number given, see tech data for complete part number</b>	

Designation	Part no.
1/2" NPT VN Nozzles - 180° Style (0.209")	934164D-0209
1/2" NPT VN Nozzles - 180° Style (0.220")	934164D-0220
1/2" NPT VN Nozzles - 180° Style (0.232")	934164D-0232
1/2" NPT VN Nozzles - 180° Style (0.244")	934164D-0244
1/2" NPT VN Nozzles - 180° Style (0.256")	934164D-0256
1/2" NPT VN Nozzles - 180° Style (0.268")	934164D-0268
1/2" NPT VN Nozzles - 180° Style (0.283")	934164D-0283
1/2" NPT VN Nozzles - 180° Style (0.299")	934164D-0299
1/2" NPT VN Nozzles - 180° Style (0.315")	934164D-0315
1/2" NPT VN Nozzles - 180° Style (0.331")	934164D-0331
1/2" NPT VN Nozzles - 180° Style (0.346")	934164D-0346
1/2" NPT VN Nozzles - 180° Style (0.362")	934164D-0362
1/2" NPT VN Nozzles - 180° Style (0.378")	934164D-0378
1/2" NPT VN Nozzles - 180° Style (0.394")	934164D-0394
1/2" NPT VN Nozzles - 180° Style (0.413")	934164D-0413
1/2" NPT VN Nozzles - 180° Style (0.433")	934164D-0433
1/2" NPT VN Nozzles - 180° Style (0.453")	934164D-0453
1/2" NPT VN Nozzles - 180° Style (0.472")	934164D-0472
1/2" NPT VN Nozzles - 180° Style (0.492")	934164D-0492
1/2" NPT VN Nozzles - 360° Style (0.118")	918745D-0118
1/2" NPT VN Nozzles - 360° Style (0.122")	918745D-0122
1/2" NPT VN Nozzles - 360° Style (0.126")	918745D-0126
1/2" NPT VN Nozzles - 360° Style (0.134")	918745D-0134
1/2" NPT VN Nozzles - 360° Style (0.142")	918745D-0142
1/2" NPT VN Nozzles - 360° Style (0.150")	918745D-0150
1/2" NPT VN Nozzles - 360° Style (0.157")	918745D-0157
1/2" NPT VN Nozzles - 360° Style (0.165")	918745D-0165
1/2" NPT VN Nozzles - 360° Style (0.173")	918745D-0173
1/2" NPT VN Nozzles - 360° Style (0.181")	918745D-0181
1/2" NPT VN Nozzles - 360° Style (0.189")	918745D-0189

Designation	Part no.
1/2" NPT VN Nozzles - 360° Style (0.197")	918745D-0197
1/2" NPT VN Nozzles - 180° Style (0.209")	9187454D-0209
1/2" NPT VN Nozzles - 180° Style (0.220")	918745D-0220
1/2" NPT VN Nozzles - 180° Style (0.232")	918745D-0232
1/2" NPT VN Nozzles - 180° Style (0.244")	918745D-0244
1/2" NPT VN Nozzles - 180° Style (0.256")	918745D-0256
1/2" NPT VN Nozzles - 180° Style (0.268")	918745D-0268
1/2" NPT VN Nozzles - 180° Style (0.283")	918745D-0283
1/2" NPT VN Nozzles - 180° Style (0.299")	918745D-0299
1/2" NPT VN Nozzles - 180° Style (0.315")	918745D-0315
1/2" NPT VN Nozzles - 180° Style (0.331")	918745D-0331
1/2" NPT VN Nozzles - 180° Style (0.346")	918745D-0346
1/2" NPT VN Nozzles - 180° Style (0.362")	918745D-0362
1/2" NPT VN Nozzles - 180° Style (0.378")	918745D-0378
1/2" NPT VN Nozzles - 180° Style (0.394")	918745D-0394
1/2" NPT VN Nozzles - 180° Style (0.413")	918745D-0413
1/2" NPT VN Nozzles - 180° Style (0.433")	918745D-0433
1/2" NPT VN Nozzles - 180° Style (0.453")	918745D-0453
1/2" NPT VN Nozzles - 180° Style (0.472")	918745D-0472
1/2" NPT VN Nozzles - 180° Style (0.492")	918745D-0492
3/4" NPT VN Nozzles - 180° Style (0.413")	934165D-0413
3/4" NPT VN Nozzles - 180° Style (0.433")	934165D-0433
3/4" NPT VN Nozzles - 180° Style (0.453")	934165D-0453
3/4" NPT VN Nozzles - 180° Style (0.472")	934165D-0472
3/4" NPT VN Nozzles - 180° Style (0.492")	934165D-0492
3/4" NPT VN Nozzles - 180° Style (0.512")	934165D-0512
3/4" NPT VN Nozzles - 180° Style (0.531")	934165D-0531
3/4" NPT VN Nozzles - 180° Style (0.551")	934165D-0551
3/4" NPT VN Nozzles - 180° Style (0.571")	934165D-0571
3/4" NPT VN Nozzles - 180° Style (0.591")	934165D-0591

Designation	Part no.
3/4" NPT VN Nozzles - 180° Style (0.610")	934165D-0610
3/4" NPT VN Nozzles - 180° Style (0.630")	934165D-0630
3/4" NPT VN Nozzles - 180° Style (0.650")	934165D-0650
3/4" NPT VN Nozzles - 180° Style (0.669")	934165D-0669
3/4" NPT VN Nozzles - 360° Style (0.413")	918746D-0413
3/4" NPT VN Nozzles - 360° Style (0.433")	918746D-0433
3/4" NPT VN Nozzles - 360° Style (0.453")	918746D-0453
3/4" NPT VN Nozzles - 360° Style (0.472")	918746D-0472
3/4" NPT VN Nozzles - 360° Style (0.492")	918746D-0492
3/4" NPT VN Nozzles - 360° Style (0.512")	918746D-0512
3/4" NPT VN Nozzles - 360° Style (0.531")	918746D-0531
3/4" NPT VN Nozzles - 360° Style (0.551")	918746D-0551
3/4" NPT VN Nozzles - 360° Style (0.571")	918746D-0571
3/4" NPT VN Nozzles - 360° Style (0.591")	918746D-0591
3/4" NPT VN Nozzles - 360° Style (0.610")	918746D-0610
3/4" NPT VN Nozzles - 360° Style (0.630")	918746D-0630
3/4" NPT VN Nozzles - 360° Style (0.650")	918746D-0650
3/4" NPT VN Nozzles - 360° Style (0.669")	918746D-0669
1" NPT VN Nozzles - 180° Style (0.591")	934166D-0591
1" NPT VN Nozzles - 180° Style (0.610")	934166D-0610
1" NPT VN Nozzles - 180° Style (0.630")	934166D-0630
1" NPT VN Nozzles - 180° Style (0.650")	934166D-0650
1" NPT VN Nozzles - 180° Style (0.669")	934166D-0669
1" NPT VN Nozzles - 180° Style (0.689")	934166D-0689
1" NPT VN Nozzles - 180° Style (0.709")	934166D-0709
1" NPT VN Nozzles - 180° Style (0.748")	934166D-0748
1" NPT VN Nozzles - 180° Style (0.787")	934166D-0787
1" NPT VN Nozzles - 180° Style (0.827")	934166D-0827
1" NPT VN Nozzles - 360° Style (0.591")	918747D-0591
1" NPT VN Nozzles - 360° Style (0.610")	918747D-0610

Designation	Part no.
1" NPT VN Nozzles - 360° Style (0.630")	918747D-0630
1" NPT VN Nozzles - 360° Style (0.650")	918747D-0650
1" NPT VN Nozzles - 360° Style (0.669")	918747D-0669
1" NPT VN Nozzles - 360° Style (0.689")	918747D-0689
1" NPT VN Nozzles - 360° Style (0.709")	918747D-0709
1" NPT VN Nozzles - 360° Style (0.748")	918747D-0748
1" NPT VN Nozzles - 360° Style (0.787")	918747D-0787
1" NPT VN Nozzles - 360° Style (0.827")	918747D-0827
1-1/4" NPT VN Nozzles - 180° Style (0.709")	934167D-0709
1-1/4" NPT VN Nozzles - 180° Style (0.748")	934167D-0748
1-1/4" NPT VN Nozzles - 180° Style (0.787")	934167D-0787
1-1/4" NPT VN Nozzles - 180° Style (0.827")	934167D-0827
1-1/4" NPT VN Nozzles - 180° Style (0.866")	934167D-0866
1-1/4" NPT VN Nozzles - 180° Style (0.906")	934167D-0906
1-1/4" NPT VN Nozzles - 180° Style (0.945")	934167D-0945
1-1/4" NPT VN Nozzles - 180° Style (0.984")	934167D-0984
1-1/4" NPT VN Nozzles - 180° Style (1.024")	934167D-1024
1-1/4" NPT VN Nozzles - 180° Style (1.063")	934167D-1063
1-1/4" NPT VN Nozzles - 360° Style (0.709")	918748D-0709
1-1/4" NPT VN Nozzles - 360° Style (0.748")	918748D-0748
1-1/4" NPT VN Nozzles - 360° Style (0.787")	918748D-0787
1-1/4" NPT VN Nozzles - 360° Style (0.827")	918748D-0827
1-1/4" NPT VN Nozzles - 360° Style (0.866")	918748D-0866
1-1/4" NPT VN Nozzles - 360° Style (0.906")	918748D-0906
1-1/4" NPT VN Nozzles - 360° Style (0.945")	918748D-0945
1-1/4" NPT VN Nozzles - 360° Style (0.984")	918748D-0984
1-1/4" NPT VN Nozzles - 360° Style (1.024")	918748D-1024
1-1/4" NPT VN Nozzles - 360° Style (1.063")	918748D-1063
1-1/2" NPT VN Nozzles - 180° Style (0.945")	934168D-0945
1-1/2" NPT VN Nozzles - 180° Style (0.984")	934168D-0984

<b>Designation</b>	<b>Part no.</b>
1-1/2" NPT VN Nozzles - 180° Style (1.024")	934168D-1024
1-1/2" NPT VN Nozzles - 180° Style (1.063")	934168D-1063
1-1/2" NPT VN Nozzles - 180° Style (1.102")	934168D-1102
1-1/2" NPT VN Nozzles - 180° Style (1.142")	934168D-1142
1-1/2" NPT VN Nozzles - 180° Style (1.181")	934168D-1181
1-1/2" NPT VN Nozzles - 180° Style (1.220")	934168D-1220
1-1/2" NPT VN Nozzles - 180° Style (1.260")	934168D-1260
1-1/2" NPT VN Nozzles - 180° Style (1.290")	934168D-1290
1-1/2" NPT VN Nozzles - 360° Style (0.945")	918749D-0945
1-1/2" NPT VN Nozzles - 360° Style (0.984")	918749D-0984
1-1/2" NPT VN Nozzles - 360° Style (1.024")	918749D-1024
1-1/2" NPT VN Nozzles - 360° Style (1.063")	918749D-1063
1-1/2" NPT VN Nozzles - 360° Style (1.102")	918749D-1102
1-1/2" NPT VN Nozzles - 360° Style (1.142")	918749D-1142
1-1/2" NPT VN Nozzles - 360° Style (1.181")	918749D-1181
1-1/2" NPT VN Nozzles - 360° Style (1.220")	918749D-1220
1-1/2" NPT VN Nozzles - 360° Style (1.260")	918749D-1260
1-1/2" NPT VN Nozzles - 360° Style (1.290")	918749D-1290
Socket, VN Nozzles, 1/2" drive, 22 mm	25099
Socket, VN Nozzles, 1/2" drive, 27 mm	25100
Socket, VN Nozzles, 1/2" drive, 32 mm	25101
Socket, VN Nozzles, 3/4" drive, 41 mm	25102
Socket, VN Nozzles, 3/4" drive, 46 mm	25103
Plug, pilot port, G1/8, QRV-TD	914007
Plug, valve outlet W21.8 x 1/14", QRV-TD	914048
Plug, gauge port, M12 x 1, QRV-TD	914008
Manifold assembly, OXEO 2"-2 out, schedule 160	25528
Manifold assembly, OXEO, 2"-3 out, schedule 160	25054

<b>Designation</b>	<b>Part no.</b>
1/2" DCM Nozzle (0.118")	23379-0118
1/2" DCM Nozzle (0.122")	23379-0122
1/2" DCM Nozzle (0.126")	23379-0126
1/2" DCM Nozzle (0.134")	23379-0134
1/2" DCM Nozzle (0.142")	23379-0142
1/2" DCM Nozzle (0.150")	23379-0150
1/2" DCM Nozzle (0.157")	23379-0157
1/2" DCM Nozzle (0.165")	23379-0165
1/2" DCM Nozzle (0.173")	23379-0173
1/2" DCM Nozzle (0.181")	23379-0181
1/2" DCM Nozzle (0.189")	23379-0189
1/2" DCM Nozzle (0.197")	23379-0197
1/2" DCM Nozzle (0.209")	23379-0209
1/2" DCM Nozzle (0.220")	23379-0220
1/2" DCM Nozzle (0.232")	23379-0232
1/2" DCM Nozzle (0.244")	23379-0244
1/2" DCM Nozzle (0.256")	23379-0256
1/2" DCM Nozzle (0.268")	23379-0268
1/2" DCM Nozzle (0.283")	23379-0283
1/2" DCM Nozzle (0.299")	23379-0299
1/2" DCM Nozzle (0.315")	23379-0315
1/2" DCM Nozzle (0.331")	23379-0331
1/2" DCM Nozzle (0.346")	23379-0346
1/2" DCM Nozzle (0.362")	23379-0362
1/2" DCM Nozzle (0.378")	23379-0378
1/2" DCM Nozzle (0.394")	23379-0394
1/2" DCM Nozzle (0.413")	23379-0413
1/2" DCM Nozzle (0.433")	23379-0433
1/2" DCM Nozzle (0.453")	23379-0453

<b>Designation</b>	<b>Part no.</b>
1/2" DCM Nozzle (0.472")	23379-0472
1/2" DCM Nozzle (0.492")	23379-0492
3/4" DCM Nozzle (0.413")	24245-0413
3/4" DCM Nozzle (0.433")	24245-0433
3/4" DCM Nozzle (0.453")	24245-0453
3/4" DCM Nozzle (0.472")	24245-0472
3/4" DCM Nozzle (0.492")	24245-0492
3/4" DCM Nozzle (0.512")	24245-0512
3/4" DCM Nozzle (0.531")	24245-0531
3/4" DCM Nozzle (0.551")	24245-0551
3/4" DCM Nozzle (0.571")	24245-0571
3/4" DCM Nozzle (0.591")	24245-0591
3/4" DCM Nozzle (0.610")	24245-0610
3/4" DCM Nozzle (0.630")	24245-0630
3/4" DCM Nozzle (0.650")	24245-0650
3/4" DCM Nozzle (0.669")	24245-0669
DCM Nozzle, 1/2" dust seal gasket	24454
DCM Nozzle, 3/4" dust seal gasket	24455
DCM Nozzle, 1/2" stainless steel flange	24459
DCM Nozzle, 3/4" stainless steel flange	24460
Occupiable space protection kit	25128
Unistrut cantilever bracket 15/8" x 15/8" x 12"	24125
Unistrut cantilever bracket 15/8" x 15/8" x 18"	24126
Unistrut cantilever bracket 15/8" x 15/8" x 24"	24127
Wolf washer 15/8"	24128
Post base 15/8" x 31/4"	24131
Retaining nut 15/8"	24132
Break-off head bolt 1/2" x 13	24133
Z fitting 15/8"	24140
Brace 15/8" x 18"	24142

<b>Designation</b>	<b>Part number</b>
Brace 15/8" x 24"	24141
End cap 15/8" x 5/8"	24158
End cap (double) 15/8" x 31/4"	24157
Unistrut channel double 15/8" x 31/4" x 901/2", 12 gauge	24648-09050
Unistrut channel double 15/8" x 31/4" x 781/2"	24648-07850
Unistrut channel double 15/8" x 31/4" x 120"	24648-12000
Unistrut channel 15/8" x 15/8" x 12"	24649-01200
Unistrut channel 15/8" x 15/8" x 393/4"	24649-03975
Unistrut channel 15/8" x 15/8" x 743/4"	24649-07475
Unistrut channel 15/8" x 15/8" x 110"	24649-11000
Unistrut channel 15/8" x 15/8" x 1451/2"	24649-14500
Unistrut channel 15/8" x 15/8" x 181"	24649-18100
Unistrut channel 15/8" x 15/8" x 2161/2"	24649-21650
Unistrut channel 15/8" x 15/8" x 240"	24649-24000
Threaded rod 1/2"-13 x 4"	24650-00400
Threaded rod 1/2"-13 x 121/2"	24650-01250
Threaded rod 1/2"-13 x 241/2"	24650-02450
Threaded rod 1/2"-13 x 361/2"	24650-03650
Threaded rod 1/2"-13 x 120"	24650-12000
Concrete anchor 5/8" x 5"	24139
Concrete anchor 1/2" x 51/2"	24191
Concrete anchor 1/2" x 81/2"	24250
Tank bracket, E-coated	24196W/B
Cylinder brace web assy. 1 row x 2 cylinder closed	24208
Cylinder brace web assy. 1 row x 3 cylinder open	24207
Cylinder brace web assy. 1 row x 3 cylinder closed	24206
Cylinder brace web assy. 2 row x 1 cylinder closed	24205
Cylinder brace web assy. 2 row x 2 cylinder closed	24204
Cylinder brace web assy. 2 row x 3 cylinder open	24203
Cylinder brace web assy. 2 row x 3 cylinder closed	24202

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<b>Designation</b>	<b>Part number</b>
<b>Cylinder brace web assy. 3 row x 1 cylinder closed</b>	<b>24201</b>
<b>Cylinder brace web assy. 3 row x 2 cylinder closed</b>	<b>24200</b>
<b>Cylinder brace web assy. 3 row x 3 cylinder open</b>	<b>24199</b>
<b>Cylinder brace web assy. 3 row x 3 cylinder closed</b>	<b>24198</b>

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# 14 Appendix C - Approval Checklists



If necessary, approval checklists can be requested from the manufacturer, for example regarding:

- Structural requirements that have an influence on the functionality and effectiveness of fire extinguishing systems.
- Organizational requirements for commencing operation of the fire extinguishing system.
- Prerequisites for successful expert approval.



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# 15 Safety Data Sheet - IG-01 (Argon)



## Argon IG-01

### Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations  
Issue date: 05/16/2022 Version: 1.0

#### SECTION 1: Identification

##### 1.1. Identification

Product form : Substance  
Substance name : Argon IG-01

##### 1.2. Recommended use and restrictions on use

Use of the substance/mixture : Fire extinguishing agent

##### 1.3. Supplier

Viking Corporation  
210 N. Industrial Park Drive  
Hastings, MI 49058 - USA  
T 269-945-9501

##### 1.4. Emergency telephone number

Emergency number : ChemTel (Contract number MIS0006772) - USA and Canada: 1(800) 225-3924, International:  
+1(613) 248-0585

#### SECTION 2: Hazard(s) identification

##### 2.1. Classification of the substance or mixture

###### GHS-US classification

Press. Gas (Comp.) H280  
Simple Asphy S1AS

##### 2.2. GHS Label elements, including precautionary statements

###### GHS US labelling

Hazard pictograms (GHS US) :



Signal word (GHS US) : Warning

Hazard statements (GHS US) : H280 - Contains gas under pressure; may explode if heated.  
May displace oxygen and cause rapid suffocation

Precautionary statements (GHS US) : P410+P403 - Protect from sunlight. Store in a well-ventilated place.

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

No additional information available

##### 2.4. Unknown acute toxicity (GHS US)

Not applicable

#### SECTION 3: Composition/information on ingredients

##### 3.1. Substances

Name	Product identifier	%
Argon	(CAS-No.) 7440-37-1	100

##### 3.2. Mixtures

Not applicable

#### SECTION 4: First-aid measures

##### 4.1. Description of first aid measures

First-aid measures general : If exposed or concerned, get medical attention/advice. Show this safety data sheet to the doctor in attendance. Wash contaminated clothing before re-use. Never give anything to an unconscious person.

First-aid measures after inhalation : IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing. Get medical attention if breathing is affected. If breathing is difficult, supply oxygen.

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First-aid measures after skin contact	: IF ON SKIN (or clothing): Remove affected clothing and wash all exposed skin with water for at least 15 minutes. If irritation develops or persists, get medical attention. Thaw frosted parts with lukewarm water. Do not rub affected area. Get immediate medical advice/attention.
First-aid measures after eye contact	: IF IN EYES: Immediately flush with plenty of water for at least 15 minutes. Remove contact lenses if present and easy to do so. Continue rinsing if pain, blinking, or irritation develops or persists, get medical attention. Continue rinsing. Thaw frosted parts with lukewarm water. Do not rub affected area. Get immediate medical advice/attention.
First-aid measures after ingestion	: IF SWALLOWED: rinse mouth thoroughly. Do not induce vomiting without advice from poison control center. Get medical attention if you feel unwell.

### 4.2. Most important symptoms and effects (acute and delayed)

Symptoms/effects	: May displace oxygen and cause rapid suffocation. Unconsciousness.
Symptoms/effects after inhalation	: May displace oxygen and cause rapid suffocation. Unconsciousness.
Symptoms/effects after skin contact	: May cause skin irritation. Contact with the product may cause cold burns or frostbite.
Symptoms/effects after eye contact	: Direct contact with eyes is likely to be irritating. Contact with the liquid may cause frostbite and serious damage to eyes.
Symptoms/effects after ingestion	: May cause gastrointestinal irritation.

### 4.3. Immediate medical attention and special treatment, if necessary

No additional information available

## SECTION 5: Fire-fighting measures

### 5.1. Suitable (and unsuitable) extinguishing media

Suitable extinguishing media : Use extinguishing media appropriate for surrounding fire.

### 5.2. Specific hazards arising from the chemical

Fire hazard	: Non-flammable gas.
Explosion hazard	: Contains gas under pressure; may explode if heated.
Reactivity	: No dangerous reactions known under normal conditions of use. In a fire or if heated, a pressure increase will occur and the container may burst.

### 5.3. Special protective equipment and precautions for fire-fighters

Firefighting instructions	: Exercise caution when fighting any chemical fire. Do not dispose of fire-fighting water in the environment. Prevent human exposure to fire, fumes, smoke and products of combustion.
Protection during firefighting	: Do not enter fire area without proper protective equipment, including respiratory protection.

## SECTION 6: Accidental release measures

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

General measures : Evacuate area. Keep upwind. Ventilate area. Spill should be handled by trained cleaning personnel properly equipped with respiratory and eye protection.

#### 6.1.1. For non-emergency personnel

Protective equipment	: Wear Protective equipment as described in Section 8.
Emergency procedures	: Evacuate unnecessary personnel.

#### 6.1.2. For emergency responders

Protective equipment : Wear suitable protective clothing, gloves and eye or face protection. For further information refer to section 8: "Exposure controls/personal protection".

### 6.2. Environmental precautions

Prevent entry to sewers and public waters. Notify authorities if liquid enters sewers or public waters. Avoid release to the environment.

### 6.3. Methods and material for containment and cleaning up

For containment	: Stop leak if safe to do so.
Methods for cleaning up	: Exclude sources of ignition and ventilate the area. Ground equipment electrically. Use explosion-proof equipment.

### 6.4. Reference to other sections

See Sections 8 and 13.

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# Argon IG-01

## Safety Data Sheet

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### SECTION 7: Handling and storage

#### 7.1. Precautions for safe handling

Precautions for safe handling : Do not handle until all safety precautions have been read and understood. Provide good ventilation in process area to prevent formation of vapour. Do not breathe gas. Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work.

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

Storage conditions : Keep container tightly closed. Store in a well-ventilated place. Keep cool. Store in a dry place.

### SECTION 8: Exposure controls/personal protection

#### 8.1. Control parameters

Argon (7440-37-1)		
ACGIH	Remark (ACGIH)	TLV® Basis: Simple Asphyxiant
ACGIH	Regulatory reference	ACGIH 2022
OSHA	Remark (OSHA)	OELs not established

#### 8.2. Appropriate engineering controls

Appropriate engineering controls : Provide adequate general and local exhaust ventilation. Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits. Use explosion-proof equipment with flammable materials. Ensure adequate ventilation, especially in confined areas.

#### 8.3. Individual protection measures/Personal protective equipment

##### Personal protective equipment symbol(s):



##### Personal protective equipment:

Gloves. Protective goggles. Protective clothing. Insufficient ventilation: wear respiratory protection.

##### Hand protection:

Use gloves chemically resistant to this material when prolonged or repeated contact could occur. Gloves should be classified and selected according to regional or national standards. Suggested glove materials are: Neoprene, Nitrile/butadiene rubber, Polyethylene, Ethyl vinyl alcohol laminate PVC, or vinyl. Suitable gloves should be recommended by the glove supplier.

##### Eye protection:

Wear eye protection, including chemical splash goggles and a face shield when possibility exists for eye contact due to spraying liquid or airborne particles

##### Skin and body protection:

Wear long sleeves, and chemically impervious PPE/coveralls to minimize bodily exposure.

##### Respiratory protection:

Use NIOSH (or other equivalent national standard) -approved dust/particulate respirator. Where vapour exceed PELs or other applicable OELs, use NIOSH-approved respiratory protective equipment.

### SECTION 9: Physical and chemical properties

#### 9.1. Information on basic physical and chemical properties

Physical state : Gas  
Color : Colourless  
Odor : Odorless  
Odor threshold : No data available  
pH : No data available

05/17/2022

Argon IG-01

# Argon IG-01

## Safety Data Sheet

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

Melting point	: -189,2 °C
Freezing point	: No data available
Boiling point	: -185,9 °C
Flash point	: No data available
Relative evaporation rate (butylacetate=1)	: No data available
Flammability (solid, gas)	: No data available
Vapor pressure	: No data available
Relative vapor density at 20 °C	: No data available
Relative density	: 1,38 (air=1)
Density	: 0,001784 g/cm <sup>3</sup> at 0°C
Solubility	: 67 mg/l at 20 °C
Partition coefficient n-octanol/water (Log Pow)	: No data available
Auto-ignition temperature	: No data available
Decomposition temperature	: No data available
Viscosity, kinematic	: No data available
Viscosity, dynamic	: No data available
Explosive limits	: No data available
Explosive properties	: No data available
Oxidising properties	: No data available

### 9.2. Other information

No additional information available

## SECTION 10: Stability and reactivity

### 10.1. Reactivity

No dangerous reactions known under normal conditions of use. In a fire or if heated, a pressure increase will occur and the container may burst.

### 10.2. Chemical stability

Stable under recommended handling and storage conditions (see section 7).

### 10.3. Possibility of hazardous reactions

None under normal use.

### 10.4. Conditions to avoid

Ignition sources. Heat. Open flame. Sparks.

### 10.5. Incompatible materials

None known.

### 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 (oral)	: Not classified
Acute toxicity (dermal)	: Not classified
Acute toxicity (inhalation)	: Not classified
Skin corrosion/irritation	: Not classified
Serious eye damage/irritation	: Not classified
Respiratory or skin sensitisation	: Not classified
Germ cell mutagenicity	: Not classified
Carcinogenicity	: Not classified
Reproductive toxicity	: Not classified
STOT-single exposure	: Not classified
STOT-repeated exposure	: Not classified
Aspiration hazard	: Not classified
Viscosity, kinematic	: No data available

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Argon IG-01

# Argon IG-01

## Safety Data Sheet

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

Symptoms/effects	: May displace oxygen and cause rapid suffocation. Unconsciousness.
Symptoms/effects after inhalation	: May displace oxygen and cause rapid suffocation. Unconsciousness.
Symptoms/effects after skin contact	: May cause skin irritation. Contact with the product may cause cold burns or frostbite.
Symptoms/effects after eye contact	: Direct contact with eyes is likely to be irritating. Contact with the liquid may cause frostbite and serious damage to eyes.
Symptoms/effects after ingestion	: May cause gastrointestinal irritation.

### SECTION 12: Ecological information

#### 12.1. Toxicity

No additional information available

#### 12.2. Persistence and degradability

No additional information available

#### 12.3. Bioaccumulative potential

No additional information available

#### 12.4. Mobility in soil

No additional information available

#### 12.5. Other adverse effects

Effect on global warming : No known effects from this product.

### SECTION 13: Disposal considerations

#### 13.1. Disposal methods

Waste treatment methods : Do not discharge to public wastewater systems without permit of pollution control authorities. No discharge to surface waters is allowed without an NPDES permit.

Product/Packaging disposal recommendations : Do not allow the product to be released into the environment. Dispose in a safe manner in accordance with local/national regulations.

### SECTION 14: Transport information

#### Department of Transportation (DOT)

In accordance with DOT

Transport document description (DOT)	: UN1006 Argon, 2.2
UN-No. (DOT)	: UN1006
Proper Shipping Name (DOT)	: Argon
Class (DOT)	: 2.2 - Class 2.2 - Non-flammable compressed gas 49 CFR 173.115
Hazard labels (DOT)	: 2.2 - Non-flammable gas



DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27)	: 75 kg
DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75)	: 150 kg
DOT Vessel Stowage Location	: A - The material may be stowed "on deck" or "under deck" on a cargo vessel and on a passenger vessel.
Emergency Response Guide (ERG) Number	: 121
Other information	: No supplementary information available.

#### Transportation of Dangerous Goods

Not applicable

#### Transport by sea (IMDG)

Transport document description (IMDG)	: UN 1006 ARGON, COMPRESSED, 2.2
UN-No. (IMDG)	: 1006
Proper Shipping Name (IMDG)	: ARGON, COMPRESSED

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Argon IG-01

# Argon IG-01

## Safety Data Sheet

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

Class (IMDG) : 2 - Gases  
 Limited quantities (IMDG) : 120 ml

### Air transport (IATA)

Transport document description (IATA) : UN 1006 Argon, compressed, 2.2  
 UN-No. (IATA) : 1006  
 Proper Shipping Name (IATA) : Argon, compressed  
 Class (IATA) : 2 - Gases

### SECTION 15: Regulatory information

#### 15.1. US Federal regulations

Argon IG-01	
All chemical substances in this product are listed as "Active" in the EPA (Environmental Protection Agency) "TSCA Inventory Notification (Active-Inactive) Requirements Rule" ("the Final Rule") of Feb 2019, as amended Feb 2021 or are otherwise exempt, or regulated by other agencies such as FDA or FIFRA	
SARA Section 311/312 Hazard Classes	Health hazard - Simple asphyxiant Physical hazard - Gas under pressure

#### 15.2. International regulations

No additional information available

#### 15.3. US State regulations

Component	State or local regulations
Argon(7440-37-1)	U.S. - New Jersey - Right to Know Hazardous Substance List; U.S. - Massachusetts - Right To Know List; U.S. - Pennsylvania - RTK (Right to Know) List

### SECTION 16: Other information

Other information : Author: SS.

NFPA health hazard : 0 - Materials that, under emergency conditions, would offer no hazard beyond that of ordinary combustible materials.

NFPA fire hazard : 0 - Materials that will not burn under typical fire conditions, including intrinsically noncombustible materials such as concrete, stone, and sand.

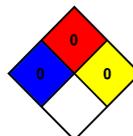
NFPA reactivity : 0 - Material that in themselves are normally stable, even under fire conditions.

HMIS Hazard Rating

Health : 0

Flammability : 0

Physical : 0



*This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.*

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Argon IG-01



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## 16 Safety Data Sheet - IG-100 (Nitrogen)



## Nitrogen IG-100

### Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations  
Issue date: 05/16/2022 Version: 1.0

#### SECTION 1: Identification

##### 1.1. Identification

Product form : Substance  
Substance name : Nitrogen IG-100

##### 1.2. Recommended use and restrictions on use

Use of the substance/mixture : Fire extinguishing agent

##### 1.3. Supplier

Viking Corporation  
210 N. Industrial Park Drive  
Hastings, MI 49058 - USA  
T 269-945-9501

##### 1.4. Emergency telephone number

Emergency number : ChemTel (Contract number MIS0006772) - USA and Canada: 1(800) 225-3924, International:  
+1(813) 248-0585

#### SECTION 2: Hazard(s) identification

##### 2.1. Classification of the substance or mixture

###### GHS-US classification

Press. Gas (Comp.) H280  
Simple Asphy S1AS

##### 2.2. GHS Label elements, including precautionary statements

###### GHS US labelling

Hazard pictograms (GHS US) :



Signal word (GHS US) :

Warning

Hazard statements (GHS US) :

H280 - Contains gas under pressure; may explode if heated.  
May displace oxygen and cause rapid suffocation.

Precautionary statements (GHS US) :

P410+P403 - Protect from sunlight. Store in a well-ventilated place.

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

No additional information available

##### 2.4. Unknown acute toxicity (GHS US)

Not applicable

#### SECTION 3: Composition/information on ingredients

##### 3.1. Substances

Name	Product identifier	%
Nitrogen	(CAS-No.) 7727-37-9	100

##### 3.2. Mixtures

Not applicable

#### SECTION 4: First-aid measures

##### 4.1. Description of first aid measures

First-aid measures general

: If exposed or concerned, get medical attention/advice. Show this safety data sheet to the doctor in attendance. Wash contaminated clothing before re-use. Never give anything to an unconscious person.

First-aid measures after inhalation

: IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing. Get medical attention if breathing is affected. If breathing is difficult, supply oxygen.

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Nitrogen IG-100

# Nitrogen IG-100

## Safety Data Sheet

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

First-aid measures after skin contact	: IF ON SKIN (or clothing): Remove affected clothing and wash all exposed skin with water for at least 15 minutes. If irritation develops or persists, get medical attention. Thaw frosted parts with lukewarm water. Do not rub affected area. Get immediate medical advice/attention.
First-aid measures after eye contact	: IF IN EYES: Immediately flush with plenty of water for at least 15 minutes. Remove contact lenses if present and easy to do so. Continue rinsing if pain, blinking, or irritation develops or persists, get medical attention. Continue rinsing. Thaw frosted parts with lukewarm water. Do not rub affected area. Get immediate medical advice/attention.
First-aid measures after ingestion	: IF SWALLOWED: rinse mouth thoroughly. Do not induce vomiting without advice from poison control center. Get medical attention if you feel unwell.

#### 4.2. Most important symptoms and effects (acute and delayed)

Symptoms/effects	: May displace oxygen and cause rapid suffocation. Unconsciousness.
Symptoms/effects after inhalation	: May displace oxygen and cause rapid suffocation. Unconsciousness.
Symptoms/effects after skin contact	: May cause skin irritation. Contact with the product may cause cold burns or frostbite.
Symptoms/effects after eye contact	: Direct contact with eyes is likely to be irritating. Contact with the liquid may cause frostbite and serious damage to eyes.
Symptoms/effects after ingestion	: May cause gastrointestinal irritation.

#### 4.3. Immediate medical attention and special treatment, if necessary

No additional information available

### SECTION 5: Fire-fighting measures

#### 5.1. Suitable (and unsuitable) extinguishing media

Suitable extinguishing media : Use extinguishing media appropriate for surrounding fire.

#### 5.2. Specific hazards arising from the chemical

Fire hazard	: Non-flammable gas.
Explosion hazard	: Contains gas under pressure; may explode if heated.
Reactivity	: No dangerous reactions known under normal conditions of use. In a fire or if heated, a pressure increase will occur and the container may burst.

#### 5.3. Special protective equipment and precautions for fire-fighters

Firefighting instructions	: Exercise caution when fighting any chemical fire. Do not dispose of fire-fighting water in the environment. Prevent human exposure to fire, fumes, smoke and products of combustion.
Protection during firefighting	: Do not enter fire area without proper protective equipment, including respiratory protection.

### SECTION 6: Accidental release measures

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

General measures : Evacuate area. Keep upwind. Ventilate area. Spill should be handled by trained cleaning personnel properly equipped with respiratory and eye protection.

##### 6.1.1. For non-emergency personnel

Protective equipment	: Wear Protective equipment as described in Section 8.
Emergency procedures	: Evacuate unnecessary personnel.

##### 6.1.2. For emergency responders

Protective equipment : Wear suitable protective clothing, gloves and eye or face protection. For further information refer to section 8: "Exposure controls/personal protection".

#### 6.2. Environmental precautions

Prevent entry to sewers and public waters. Notify authorities if liquid enters sewers or public waters. Avoid release to the environment.

#### 6.3. Methods and material for containment and cleaning up

For containment	: Stop leak if safe to do so.
Methods for cleaning up	: Exclude sources of ignition and ventilate the area. Ground equipment electrically. Use explosion-proof equipment.

#### 6.4. Reference to other sections

See Sections 8 and 13.

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Nitrogen IG-100

# Nitrogen IG-100

## Safety Data Sheet

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

### SECTION 7: Handling and storage

#### 7.1. Precautions for safe handling

Precautions for safe handling : Do not handle until all safety precautions have been read and understood. Provide good ventilation in process area to prevent formation of vapour. Do not breathe gas. Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work.

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

Storage conditions : Keep container tightly closed. Store in a well-ventilated place. Keep cool. Store in a dry place.

### SECTION 8: Exposure controls/personal protection

#### 8.1. Control parameters

Nitrogen (7727-37-9)		
ACGIH	Remark (ACGIH)	TLV® Basis: Simple Asphyxiant
ACGIH	Regulatory reference	ACGIH 2022
OSHA	Remark (OSHA)	OELs not established

#### 8.2. Appropriate engineering controls

Appropriate engineering controls : Provide adequate general and local exhaust ventilation. Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits. Use explosion-proof equipment with flammable materials. Ensure adequate ventilation, especially in confined areas.

#### 8.3. Individual protection measures/Personal protective equipment

##### Personal protective equipment symbol(s):



##### Personal protective equipment:

Gloves. Protective goggles. Protective clothing. Insufficient ventilation: wear respiratory protection.

##### Hand protection:

Use gloves chemically resistant to this material when prolonged or repeated contact could occur. Gloves should be classified and selected according to regional or national standards. Suggested glove materials are: Neoprene, Nitrile/butadiene rubber, Polyethylene, Ethyl vinyl alcohol laminate PVC, or vinyl. Suitable gloves should be recommended by the glove supplier.

##### Eye protection:

Wear eye protection, including chemical splash goggles and a face shield when possibility exists for eye contact due to spraying liquid or airborne particles

##### Skin and body protection:

Wear long sleeves, and chemically impervious PPE/coveralls to minimize bodily exposure.

##### Respiratory protection:

Use NIOSH (or other equivalent national standard) -approved dust/particulate respirator. Where vapor, mist, or dust exceed PELs or other applicable OELs, use NIOSH-approved respiratory protective equipment.

### SECTION 9: Physical and chemical properties

#### 9.1. Information on basic physical and chemical properties

Physical state : Gas  
Color : Colorless  
Odor : Odorless  
Odor threshold : No data available  
pH : No data available

05/17/2022

Nitrogen IG-100

# Nitrogen IG-100

## Safety Data Sheet

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

Melting point	: -210 °C
Freezing point	: No data available
Boiling point	: -195.8 °C
Flash point	: No data available
Relative evaporation rate (butylacetate=1)	: No data available
Flammability (solid, gas)	: No data available
Vapor pressure	: No data available
Relative vapor density at 20 °C	: No data available
Relative density	: No data available
Density	: 0.00125 g/cm <sup>3</sup> at 20°C
Molecular mass	: 28.01 g/mol
Solubility	: No data available
Partition coefficient n-octanol/water (Log Pow)	: No data available
Auto-ignition temperature	: No data available
Decomposition temperature	: No data available
Viscosity, kinematic	: No data available
Viscosity, dynamic	: No data available
Explosive limits	: No data available
Explosive properties	: No data available
Oxidising properties	: No data available

### 9.2. Other information

No additional information available

## SECTION 10: Stability and reactivity

### 10.1. Reactivity

No dangerous reactions known under normal conditions of use. In a fire or if heated, a pressure increase will occur and the container may burst.

### 10.2. Chemical stability

Stable under recommended handling and storage conditions (see section 7).

### 10.3. Possibility of hazardous reactions

None under normal use.

### 10.4. Conditions to avoid

Ignition sources. Heat. Open flame. Sparks.

### 10.5. Incompatible materials

None known.

### 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 (oral)	: Not classified
Acute toxicity (dermal)	: Not classified
Acute toxicity (inhalation)	: Not classified
Skin corrosion/irritation	: Not classified
Serious eye damage/irritation	: Not classified
Respiratory or skin sensitisation	: Not classified
Germ cell mutagenicity	: Not classified
Carcinogenicity	: Not classified
Reproductive toxicity	: Not classified
STOT-single exposure	: Not classified
STOT-repeated exposure	: Not classified
Aspiration hazard	: Not classified

05/17/2022

Nitrogen IG-100

# Nitrogen IG-100

## Safety Data Sheet

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

Viscosity, kinematic	: No data available
Symptoms/effects	: May displace oxygen and cause rapid suffocation. Unconsciousness.
Symptoms/effects after inhalation	: May displace oxygen and cause rapid suffocation. Unconsciousness.
Symptoms/effects after skin contact	: May cause skin irritation. Contact with the product may cause cold burns or frostbite.
Symptoms/effects after eye contact	: Direct contact with eyes is likely to be irritating. Contact with the liquid may cause frostbite and serious damage to eyes.
Symptoms/effects after ingestion	: May cause gastrointestinal irritation.

### SECTION 12: Ecological information

#### 12.1. Toxicity

No additional information available

#### 12.2. Persistence and degradability

No additional information available

#### 12.3. Bioaccumulative potential

No additional information available

#### 12.4. Mobility in soil

No additional information available

#### 12.5. Other adverse effects

Effect on global warming : No known effects from this product.

### SECTION 13: Disposal considerations

#### 13.1. Disposal methods

Waste treatment methods : Do not discharge to public wastewater systems without permit of pollution control authorities. No discharge to surface waters is allowed without an NPDES permit.

Product/Packaging disposal recommendations : Do not allow the product to be released into the environment. Dispose in a safe manner in accordance with local/national regulations.

### SECTION 14: Transport information

#### Department of Transportation (DOT)

In accordance with DOT

Transport document description (DOT) : UN1066 Nitrogen, compressed, 2.2

UN-No.(DOT) : UN1066

Proper Shipping Name (DOT) : Nitrogen, compressed

Class (DOT) : 2.2 - Class 2.2 - Non-flammable compressed gas 49 CFR 173.115

Hazard labels (DOT) : 2.2 - Non-flammable gas



DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27) : 75 kg

DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75) : 150 kg

DOT Vessel Stowage Location : A - The material may be stowed "on deck" or "under deck" on a cargo vessel and on a passenger vessel.

Emergency Response Guide (ERG) Number : 121

Other information : No supplementary information available.

#### Transport by sea (IMDG)

Transport document description (IMDG) : UN 1066 NITROGEN, COMPRESSED, 2.2

UN-No. (IMDG) : 1066

Proper Shipping Name (IMDG) : NITROGEN, COMPRESSED

Class (IMDG) : 2 - Gases

Limited quantities (IMDG) : 120 ml

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Nitrogen IG-100

# Nitrogen IG-100

## Safety Data Sheet

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

### Air transport (IATA)

Transport document description (IATA) : UN 1066 Nitrogen, compressed, 2.2  
 UN-No. (IATA) : 1066  
 Proper Shipping Name (IATA) : Nitrogen, compressed  
 Class (IATA) : 2 - Gases

### SECTION 15: Regulatory information

#### 15.1. US Federal regulations

##### Nitrogen IG-100

All chemical substances in this product are listed as "Active" in the EPA (Environmental Protection Agency) "TSCA Inventory Notification (Active-Inactive) Requirements Rule" ("the Final Rule") of Feb. 2019, as amended Feb. 2021, or are otherwise exempt or regulated by other agencies such as FDA or FIFRA

SARA Section 311/312 Hazard Classes	Health hazard - Simple asphyxiant Physical hazard - Gas under pressure
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#### 15.2. International regulations

No additional information available

#### 15.3. US State regulations

Component	State or local regulations
Nitrogen(7727-37-9)	U.S. - Massachusetts - Right To Know List; U.S. - New Jersey - Right to Know Hazardous Substance List; U.S. - Pennsylvania - RTK (Right to Know) List

### SECTION 16: Other information

Other information : Author: SS.

NFPA health hazard : 0 - Materials that, under emergency conditions, would offer no hazard beyond that of ordinary combustible materials.

NFPA fire hazard : 0 - Materials that will not burn under typical fire conditions, including intrinsically noncombustible materials such as concrete, stone, and sand.

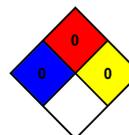
NFPA reactivity : 0 - Material that in themselves are normally stable, even under fire conditions.

HMIS Hazard Rating

Health : 0

Flammability : 0

Physical : 0



*This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.*

05/17/2022

Nitrogen IG-100



**VIKING<sup>®</sup>**



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