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VSH1230 Clean Agent Fire Suppression System
Novec™ 1230 Extinguishing Agent
Installation and Maintenance Manual

Viking Special Hazards

WARNING: Cancer and Reproductive Harm- www.P65Warnings.ca.gov

UL LISTED ULC LISTED FM APPROVED

Read this manual prior to performing any task!

The Viking Corporation

210 N. Industrial Park Dr.
Hastings, MI 49058
Technical Services Telephone: 877-384-5464
Email: techsvcs@vikingcorp.com
www.vikinggroupinc.com
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⚠ This manual enables safe and efficient assembly, installation, commissioning, and service of the VSH1230 fire extinguishing system (hereinafter referred as the "system"). This manual is an integral part of the system and must be kept in its immediate vicinity at all times. It is intended for the company that installs the system ↳ *Chapter 2.5.1 “Qualifications” on page 26*.

Before commencing any task personnel must have carefully read and understood this manual. The prerequisite for safe operation of the system is compliance with all the specified safety instructions and handling instructions. In addition to the information provided in this manual, all local accident prevention and general safety regulations applicable for the system’s area of implementation must also be complied with. The graphic illustrations in this manual are provided for purposes of basic understanding and can deviate from the actual version of the system.

This installation and maintenance manual does not contain extensive information about secure and efficient operation of the system and project planning. An operating manual can be ordered from the manufacturer (↳ page 2) with the part number 932161. For the project planning of VSH1230 fire extinguishing systems, a design manual can be ordered from the manufacturer with the part number 932157.

The operation of the DesignManager software is described in a separate document (part number 924240).

See the respective product sheet (separate document, part number 932163) for technical data on the individual components and parts.

Limitations of liability

All specifications and information provided in this manual have been compiled in consideration of all applicable standards and regulations as well as the state of the art. The manufacturer shall not be liable for any damages caused by:

- Failure to follow the instructions provided in this manual
- Disregarding local, federal, and state provisions and any regulations regarding the installation, operation and maintenance of fire extinguishing systems

Supplemental directives

- Operating the system in environmental and usage conditions other than the ones for which the system has been designed
- Improper use
- Use of untrained personnel
- Technical modifications not authorized by the manufacturer
- Use of unapproved components
- Non-compliance with maintenance intervals

Fire extinguishing systems are engineered to meet the standards of NFPA 2001, ISO 14520, EN 15004, FM Global, UL, CEA 4045 or other similar organizations, and will also need to comply with the provisions of governmental codes, ordinances, and standards where applicable. The system must be designed by qualified design professionals in conjunction with insuring bodies. The Authorized Distributor and the user are responsible for the design and configuration of the system, its appropriateness for the use intended and its compliance with all standards, codes, ordinances and the use intended. The manufacturer or private labeler of the products, described in this manual , does not design systems for specific installations and makes no representation or warranty concerning whether any specific system installation will be sufficient for the intended use or will comply with any standard, code or ordinance.

System depictions, calculations, graphs or reports provided by the manufacturer or private labeler of the products, described in this manual, are for illustrative purposes only, and are not warranted to be representative or descriptive of any specific system, installation or design, or of the performance of or results attainable through same. The manufacturer or private labeler and its representatives disclaim use of the accompanying system depictions, calculations, graphs and reports for any purpose other than illustration; any other application or usage is solely the responsibility of the user.

Customer service

Our customer service department will be happy to assist you with any technical question you may have regarding the system. For contact information and additional details, please log on to our website (page 2). The members of our staff are, furthermore, always interested in obtaining information and learning about the experiences our customers have made while using our products as these may contribute to their improvement.

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1 General

Overview (sample)

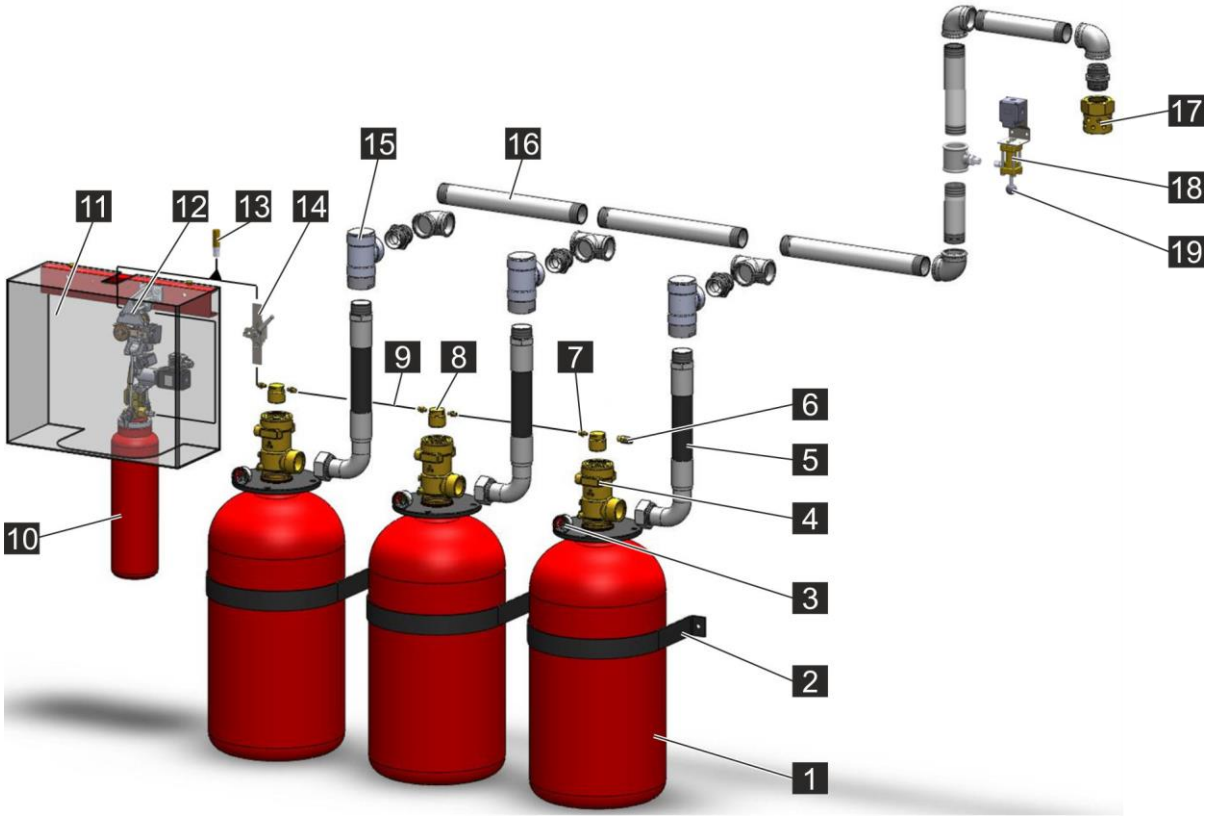


Fig. 1: Multi container system with pneumatic release device (PAE)

1 Extinguishing agent container
2 Clamp
3 Pressure gauge/Contact pressure gauge
4 Valve
5 DN40/DN50 hose (1 $^{1}/_{2}$ inch and 2 inch)
6 Manual pressure relief valve
7 Adapter
8 Release device, pneumatic
9 DN4 hose ($^{5}/_{32}$ inch) / pilot line
10 Pilot cylinder
11 Protective cover
12 Pneumatic release device (PAE), complete
13 Safety device malfunction pressure (safeguard against slow gas leaks)
14 Blocking device
15 Check valve
16 Pipeline
17 Discharge nozzle
18 Pneumatically actuated limit switch
19 Manual release of the limit switch

1.1 Non-approved items

Please note, that some of the mentioned parts or system components in this document are not UL[1)] listed, not FM[2)] Approved, not VdS[3)] approved or not CNPP/A2P[4)] approved.

These parts or system components are distinguished with

- an asterisk combined with "not UL", for those parts or system components not UL listed, example: Component* not UL.
- an asterisk combined with "not FM", for those parts or system components not FM Approved, example: Component* not FM.
- an asterisk combined with "not VdS", for those parts or system components not VdS approved, example: Component* not VdS.
- an asterisk combined with "not CNPP/A2P", for those parts or system components not CNPP/A2P approved, example: Component* not CNPP/A2P.

You will find the distinguished marks at the headlines.

1) Underwriters Laboratories

2) FM Approvals

3) VdS Schadenverhütung GmbH

4) Centre National de Prévention et de Protection / A2P

1.2 UL Approved systems

In addition to this installation and maintenance manual, the following must be taken into consideration for UL Approved fire extinguishing systems:

- NFPA 2001 for installation, maintenance and testing requirements
- Use of clean agent system unit in accordance with the Environmental Protection Agency's Significant New Alternatives Program (EPA's SNAP)

Monitoring of the electrical release devices

Electrical release devices are used as activating devices of a fire extinguishing system and NFPA 2001 requires these devices to be in place and ready to use.

During installation, service and inspection it is common to demount the electrical release devices and supervisory switches shall be installed to send a signal to the fire detection and extinguishing control panel if the electrical release devices are not in place.

- The wiring methods for the electrical release devices are to be in accordance to the installation instructions provided with the UL Listed fire detection and extinguishing control panel for the release devices.

Requirements for electrical release device accessories:

Each individual electrical release device is to be provided with an UL Listed supervisory switch. The supervisory switches are to be installed by the Authorized Distributor, in accordance with NFPA 2001 for all the electrical release devices.

The supervisory switch must provide a supervisory signal to the fire detection and extinguishing control panel if the electrical release devices are not in place and not ready to release the fire extinguishing system.

The Authorized Distributor must use UL certified components as junction box, flexible conduit and conduit fittings and install the system according to NFPA 70 and NFPA 72.

1.3 Systems according to VdS and CNPP/A2P

For systems following VdS or CNPP/A2P design and installation regulations, please check current VdS or CNPP/A2P system listings/approvals. Only listed components as well as listed fire detection and suppression control panels shall be used.

CNPP/A2P: For systems following CNPP/A2P regulations all pipes must have inside and outside coating/ galvanization.

VdS or CNPP/A2P requirements for Authorized Distributors as well as design and installation standards for pipe systems must be observed.

1.4 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. Permission to use any content of this document must be obtained from the manufacturer. 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.

1.5 Abstract

The system uses Novec™ 1230 manufactured by 3M™ (hereinafter referred to as "extinguishing agent") as its extinguishing agent.

This extinguishing agent is suitable for suppressing class A and class B fires and stored in the system's extinguishing agent containers. To create the pressure necessary for the agent to be released, the extinguishing agent containers are superpressurized with nitrogen at a pressure of 25 bar (360 psi), 42 bar (610 psi) or 50 bar (725 psi).

The system is activated by release devices located on the valves of the extinguishing agent containers or integrated in the valves. The valves open, and the extinguishing agent flows through the pipelines of the extinguishing agent containers to the discharge nozzles, where it vaporizes.

For more detailed brief descriptions of the different system models, please refer to the description of the system ↬ *Chapter 3 “Design and function” on page 38*.

Use the system only as intended in order to ensure its proper and trouble-free operation ↬ *Chapter 2.2 “Intended use” on page 18*.

1.6 Scope of delivery

The following components are included in the scope of delivery, depending on system type:

- Extinguishing agent container (filled extinguishing agent) with siphon tube, neck ring, type plate, valve, protective valve cap, and anti-recoil cap
  - Valve with/without integrated electric release device
- Release device
  - Electrical with/without blocking device
  - Pneumatic
  - Pneumatic/manual
  - Manual* not VdS, not CNPP/A2P
  - Release device EM
- Pressure gauge/Contact pressure gauge
- Adapter
- Hose DN40/DN50 (1 $^1/_2$" and 2")
- Discharge nozzles
- Hose DN4 (pilot line; $^5/_{32}$")
- Malfunction pressure safety device
- Pneumatic release device (PAE)
- Weighing device
- Leakage monitor of the pneumatic release device (PAE)
- Monitor of the EM release device
- Test connection
- Pneumatically actuated limit switch
- Manual pressure relief valve
- Shuttle non-return valves (only for multi zone systems)
- Safety valves (only for multi zone systems)
- DN15 ($^1/_2$ inch) pilot distributor
- Solenoid valves
- Selector valves (only for multi zone systems)
- Blocking devices
- Check valves
- Pipeline components (optional)
- Pneumatic alarm components (optional)

The following is not included in the manufacturer's scope of delivery:

- Fire detection and extinguishing control device
- Electrical manual release elements

- Fire detection and fire alarm elements
- Cable

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 life stages of the plant.

2.1 Explanation of symbols

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 medium risk level. If the danger is not avoided, it may 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.**

Further markings

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

Safety instructions in behavior guidelines

Safety instruction can refer to specific, individual behavior guidelines. Such safety guidelines 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.
2. **⚠ CAUTION! Clamping danger on the cover.**

   Carefully close the cover.
3. Tighten screw.

Additional markings

This manual uses the following markings to highlight instructions, results, lists, references and other elements:

Marking	Explanation
⇨	Results of operating steps
↳	References to sections in this manual and other applicable documents
•	Unordered lists

2.2 Intended use

This system is intended to be used only for the proper purpose described herein.

The VSH1230 fire extinguishing system is intended only for suppressing fires in enclosed rooms using Novec™ 1230 extinguishing agent.

Typical fire hazards for which the system is suitable include:

- Electric or electronic equipment
- Telecommunications equipment
- Flammable and combustible liquids
- Other goods of particularly high quality

The system may only be used in the environmental and usage conditions for which it has been designed.

Intended use also includes the adherence to all specifications regarding assembly, installation, maintenance, and inspection.

Incorrect use

Any other use exceeding or deviating from the scope of intended use is considered incorrect use.

⚠ WARNING

Risk from incorrect use!

- **Do not use and operate the system if the design is faulty.**
- **Do not use and operate the system if the installation is faulty.**
- **Do not suspend objects from pipelines.**
- **Do not block the discharge nozzles or the ventilation equipment.**

If used incorrectly, the VSH1230 fire extinguishing system may lead to personal injury and property damage.

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
- The effects of agent decomposition on fire protection effectiveness and equipment shall be considered where using clean agents in hazards with high ambient temperatures (e.g., furnaces and ovens)

2.3 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 (e.g. visible damage) can no longer be assured, put the system out of operation without delay and secure against accidental start-up.

Also observe the following:

- 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.
- Replace components not in perfect order immediately.
- Use only original spare and wear parts.

Also observe the following basic details:

- 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

2.4 General dangers

The following section describes remaining 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 these instructions must be followed.

2.4.1 General dangers associated with fire extinguishing systems

Electrical current

⚠ DANGER

Risk of death due to electric shock!

- **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:**
  - **Power down.**
  - **Safeguard against restart.**
  - **Ensure de-energized state.**
  - **Ground and short circuit.**
  - **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.**

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.

High extinguishing agent concentration

⚠ WARNING

There is a life-threatening danger if the extinguishing agent concentration is too high!

- **Ensure that the locally applicable regulations for rooms where containers of extinguishing agents are stored 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.**
- **When handling extinguishing agent, always ensure sufficient ventilation or extraction. If this cannot be ensured, use a self-contained breathing apparatus.**
- **Avoid inhaling vapors, aerosols, and atomized spray that exceed the recommended exposure limits per NFPA 2001.**

If the extinguishing agent concentration exceeds 10 % by vol. (NOAEL), the extinguishing agent can have a toxic effect. There is a danger of harming the heart and lungs, and danger of suffocating due to the reduced oxygen content in the air.

Pressurized extinguishing agent

⚠ WARNING

Risk of injury due to pressure in extinguishing agent containers!

- **Do not transport or store extinguishing agent containers unless they are sealed with a protective valve cap and an anti-recoil cap.**
- **Ensure that the extinguishing agent container is mounted with a clamp on a wall.**
- **Replace damaged extinguishing agent containers immediately.**

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

Faulty activation

⚠ WARNING

Risk of injury from faulty activation!

- **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:**
  - **Isolate the system.**
  - **Switch off the fire alarm system.**

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

Tipping extinguishing agent containers

⚠ WARNING

Risk of injury due to tipping extinguishing agent containers!

- **Generally fasten extinguishing agent containers to a wall or other structural elements with a clamp.**
- **Transport extinguishing agent containers in such a way that they cannot tip.**

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.

2.4.2 Dangers due to activating the system

Decomposition products

⚠ WARNING

Risk of injury from developing products of decomposition and fire smoke!

- **Do not use the system if surface temperatures in excess of 500 °C (932 °F) are to be expected.**
- **Do not use the system if glowing fires or fires with fire energy in excess of 50 kW (67.05 hp) are to be expected.**
- **Exit the extinguishing zone without delay and within the pre-discharge timer when an alarm is given.**
- **Do not reenter the extinguishing zone after a fire until the fire department has given the all-clear.**

Fires generate decomposition products which may lead to chronic health impairments if inhaled and if there is contact with the skin.

Cold extinguishing agent

⚠ WARNING

Risk of injury from cold extinguishing agent!

- **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.**

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

Shock

⚠ WARNING

Risk of injury from 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.**

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

Falling and flying objects

⚠ WARNING

Risk of injury from falling and flying objects!

- **Do not place any loose objects into the discharge area of the discharge nozzles.**
- **Leave the extinguishing zone without delay and within the pre-discharge timer when an alarm is given.**

The discharge velocity of the extinguishing agent may cause objects to tip over or become airborne. This may lead to severe injuries.

Noise

⚠ WARNING

Risk of injury from noise!

- **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.**

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

Effects of cold

NOTICE

Property damage from cooling ambient air!

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

The discharged extinguishing agent extracts heat from the ambient air contained in the extinguishing zone in order to put out the flames. This cools down the extinguishing zone by as much as 20 °C (36 °F) when fighting a fire.

Overpressure/underpressure

NOTICE

Property damage from overpressure/underpressure!

- **Ensure that pressure relief devices are installed in the protected enclosure and included in the design of the system, per NFPA 2001.**
- **Make sure that the function of the pressure relief is checked regularly.**

Immediately after activated, the system briefly generates an underpressure which will then turn into an overpressure. This may cause damage to the walls of the protected enclosure.

2.5 Personnel requirements

2.5.1 Qualifications

The different tasks described throughout this manual require different qualifications and skills from the persons entrusted with these tasks.

⚠ WARNING

Risk from insufficiently qualified personnel!

- **Allow only qualified personnel to perform the work.**

Insufficiently qualified personnel is incapable of assessing the risk involved in handling the system and may cause severe or fatal injuries to themselves or others.

All work must be limited to personnel that can be expected to complete the work in a reliable manner. Persons whose ability to respond is impaired, for example, by drugs, alcohol or medication are not permitted.

The following is a list of qualifications this manual specifies as necessary for the persons entrusted with completing the different work tasks:

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.

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.

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.

2.5.2 Unauthorized personnel

⚠ WARNING

Risk of injury from unauthorized personnel!

- **Keep unauthorized personnel away from controlling and regulating equipment.**
- **If in doubt, ask the respective persons to step away from the controlling and regulating equipment.**
- **Make sure that a person in charge of the system is available who has the knowledge necessary to handle the system properly.**

Unauthorized personnel who do not meet the requirements described herein are not familiar with the risks involved in activating and/or isolating the system. This will lead to risk of injury.

2.6 Training

The Authorized Distributor must instruct the owner's 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

2.7 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 specially indicated in the individual sections of this document, when carrying out the various tasks.

The personal protective equipment is described in the following section:

Extinguishing-agent-resistant safety gloves
Extinguishing-agent-resistant safety gloves protect the hands from contact with extinguishing agent.

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.

Protective work clothing
Protective work clothing is close-fitting work clothing with low tear resistance, with close sleeves and without protruding parts.

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

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.

Self-contained breathing apparatus
The self-contained breathing apparatus is used to protect against harmful gases, fumes, dusts and similar materials and media. Respiratory protection devices (e.g. compressed air breathers) must be used if an oxygen content of at least 17% is not ensured in the ambient air, or if the extinguishing agent concentration exceeds 10% by volume.

Respiratory protective devices should only be used by specially trained personnel.

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 systems. The performance of these tasks pursues commercial or business purposes. Consequently during the tasks cited above the Authorized Distributor bears the legal product responsibility for protecting the personnel performing the tasks.

Obligations of the Authorized Distributor

- The Authorized Distributor must ensure that the system complies with the provisions and regulations applicable for installation of fire suppression systems and that the system has been correctly designed. In this regard the following particularly applies:
  - The Authorized Distributor must comply with the applicable NFPA 2001 regulations, as well as all additional local regulations, and consider these regulations in the design of the system.
  - The Authorized Distributor must comply with all provisions specified by Underwriters Laboratories Inc. (UL) and FM Global relative to the design and installation of fire suppression systems.
  - The Authorized Distributor must take the current state of the technology into consideration at all times.
- The Authorized Distributor must calculate the system with the calculation program of the manufacturer.
- The "Occupational Safety and Health Act" of 1970 specifies that a safe workplace must be provided at all times for execution of tasks. To this end, the Authorized Distributor must ensure that the system is erected, installed, and maintained in accordance with all applicable commercial, industrial, local, federal and state laws, standards and regulations.
- The Authorized Distributor must label the system and affix all necessary information where it is permanently visible.
- The Authorized Distributor must ensure that the personnel performing the tasks have the qualifications necessary for execution of the tasks.
- The Authorized Distributor must ensure that all employees who handle the system have read and understood this manual. In addition, the Authorized Distributor must train personnel and inform them of hazards at regular intervals.
- The Authorized Distributor must instruct a responsible person appointed by the owner in the safe execution of the tasks and inspections that must be executed by the owner, and document execution of this instruction.

- The Authorized Distributor must document the actual status of the system at the time of transfer and inform the owner's responsible person of the actual status.
- The Authorized Distributor must label selector valves and blocking devices of multi zone systems in such a manner that assignment to the individual extinguishing zones is possible.

2.9 Safety devices

⚠ WARNING

Risk of injury due to non-functioning safety devices!

- **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.**

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

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.

Pressure relief valves

Pressure relief valves are used to manually vent pilot lines. This ensures that the pilot lines can be depressurized without having to disconnect them.

Malfunction pressure safety device (SFD safeguard against slow gas leaks)

The “malfunction pressure safety 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 "malfunction pressure safety 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.

Safety valve

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 safety valve ensures pressure compensation. The blow-off lines connected to the safety valve safely dissipate the medium.

Check valves

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 hose to manifold.

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.

Anti-recoil cap

The anti-recoil caps seal the valve outlets so that extinguishing agent does not escape in the event of unintentional release. They are provided with vent bores in order to enable a controlled release of pressure in case of unintentional activation.

The anti-recoil caps are secured with chains so that they are not lost.

2.10 Signage

The following symbols and information signs are located in the work area. They relate to the direct environment where they have been put up.

⚠ WARNING

Risk in conjunction with illegible signage!

- **Always keep safety, warning and operating notices in good legible condition.**
- **Immediately replace damaged signs or stickers.**

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

System labeling

In addition to the information on the type plate attached to the extinguishing agent container, the Authorized Distributor must label the system with the following information.

Fig. 2 shows an example of a label. The actual layout depends on the local conditions.

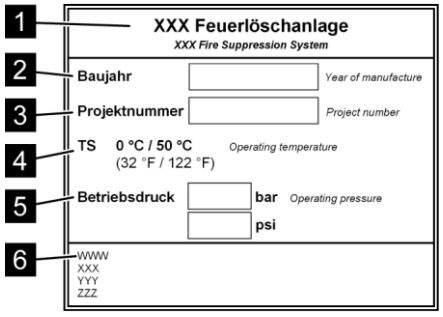


Fig. 2: System labeling (example)

1 System type (shown here as a placeholder)
2 Year of manufacture
3 Project number
4 Application temperature range
5 Operating pressure of the extinguishing agent containers
6 Authorized Distributor (shown here as a placeholder)

In addition, the Authorized Distributor must provide an operating manual in the protected enclosure that is protected by the system.

Identification of the extinguishing zones

Fig. 3: Identification of the extinguishing zones

The owner must attach a sign to the access doors to identify the extinguishing zone, warning of the existence of a fire suppression system and the risks involved.

The text marked in Fig. 3 states:

- This area is protected by a VSH1230 fire suppression system

Alternatively, there are two additional variants for the text, the use of which is regulated by NFPA 2001 or local provisions.

- Do NOT enter unless automatic release is isolated
- Do NOT enter unless isolate valve is in the closed position

Non-toxic, non-flammable gas

This sign identifies containers containing non-toxic and non-flammable gases.

Inhaling high concentrations of these gases is hazardous to a person's health. Coming into contact with liquefied gas involves the risk of sustaining frostbite.

Protect the containers from tipping over and falling down as well as from heating, impact, and shock. Keep away from sparks, flames, and other sources of ignition. Do not smoke. The extinguishing agent containers are subject to labeling requirements as they are pressurized with nitrogen.

Marking of extinguishing agent containers

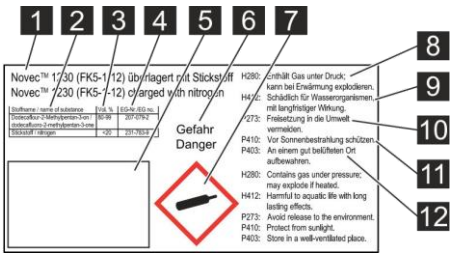


Fig. 4: Marking in accordance with CLP/GHS

1 Extinguishing agent[1)]: Novec™ 1230 (FK-5-1-12) charged with nitrogen
2 Substance name[1)]
3 Volume percent[1)]
4 EC no.[1)]
5 Address label of the private labeler (system manufacturer)
6 Signal word: Danger
7 Hazard pictogram
8 Danger note *H280*: Contains gas under pressure; may explode if heated

9 Danger note *H412*: Harmful to aquatic life with long lasting effects
10 Safety instruction *P273*: Avoid release to the environment
11 Safety instruction *P410*: Protect from sunlight
12 Safety instruction *P403*: Store in a well-ventilated place
1) Product identifier

Table 1: Product identifiers (↳ Fig. 4)

Substance name	Volume percent	EC no.
Dodecafluoro-2-methylpentan-3-one	80-99	207-079-2
Nitrogen	< 20	231-783-9

Marking extinguishing agent containers with the UL mark/FM mark

Extinguishing agent containers filled in accordance with UL requirements, are marked in the factory with a UL sticker. Retroactive marking of extinguishing agent containers with the UL mark that are not factory marked is not permitted.

Extinguishing agent containers filled in accordance with FM requirements, are marked in the factory with a FM sticker. Retroactive marking of extinguishing agent containers with the FM mark that are not factory marked is not permitted.

2.11 Environmental protection

NOTICE

Danger to the environment due to incorrect handling of materials that can harm the environment!

- **Always heed the notes below about the handling of materials that can harm the environment and their disposal.**
- **If materials that can harm the environment accidentally escape into the environment, take suitable measures immediately. In case of doubt, inform the responsible local authority about the damage and ask what suitable measures to take might be.**

In case of incorrect handling of materials that can harm the environment, especially improper disposal, there can be significant damage to the environment.

The following materials that might harm the environment are used:

Extinguishing agent Novec™ 1230

The extinguishing agent has been classified as slightly reactive to water. It must be disposed of in accordance with all applicable local waste disposal regulations. Follow the safety data sheet for the extinguishing agent (↳ Appendix).

The photolytic half-life of the extinguishing agent is 3 – 5 days. The global warming potential (GWP) value is 1, while the value of the ozone decomposition potential (ODP) is 0.

2.12 Behavior in the event of a fire

Preventive steps

- Be prepared for fires and accidents at all times!
- Keep first-aid equipment (first-aid kit, blankets, etc.) and substitute extinguishing agents (e. g. fire extinguisher) in proper working order and readily available.
- Familiarize personnel with accident prevention, first aid and rescue equipment as well as options for activating the system manually.
- Keep access paths clear for rescue vehicles.

Steps in the event of a fire

⚠ WARNING

Danger to life from fire!

- **Leave the extinguishing zone immediately if it is affected by fire.**
- **Do not re-enter the extinguishing zone after a fire until the fire department has given the all-clear.**

Severe fire smoke may develop when a fire erupts and while the fire is being suppressed. Staying inside a burning extinguishing zone may lead to severe injuries or death.

When the alarm equipment of the system is activated (main alarm), a pre-discharge timer (generally 10 s) will start to elapse. The system will subsequently be activated when the pre-discharge timer has elapsed.

Take the following steps when a fire erupts:

- If there is no risk to a person's health, activate the system manually when it is obvious that smoke/fire has developed.
- Provided there is no risk to your own health, evacuate all persons from the hazard zone.
- Leave the extinguishing zone immediately.
- Initiate first-aid measures if necessary.
- Alert any endangered persons in the adjoining areas.
- Notify the fire department and/or emergency medical services.
- Notify the person in charge at the system's location.

After the system is activated

The behavior after the activation of the system is subject to specific rules of conduct, which will be explained in a separate section.

3 Design and function

3.1 Functional description

As soon as the detection system installed in the protected enclosure detects a fire, an alarm will be triggered by the fire suppression detection system. A pulse is transmitted to the electric release devices after the specified pre-discharge timer has expired. Afterwards, the quick release valves of the pressurized extinguishing agent containers open.

The liquid extinguishing agent flows into the pipeline system. The check valves installed in the pipeline system prevent the extinguishing agent from flowing back into the container. The extinguishing agent flows to the discharge nozzle(s) of the system which are installed in the protected enclosure.

The extinguishing agent vaporizes at the discharge nozzles and is dispersed across the extinguishing zone as a gaseous mix made up of extinguishing agent and air. This suppresses the fire by extracting heat energy from the flames. Throughout the extinguishing process, the oxygen concentration in the extinguishing zone is slightly reduced. The retention time (hold time) of the extinguishing zone must comply with NFPA 2001.

In addition to the automatic, electric release, electric manual releases can be used to activate the system manually. These releases are installed at the extinguishing zone.

3.2 Single zone systems

Single container systems

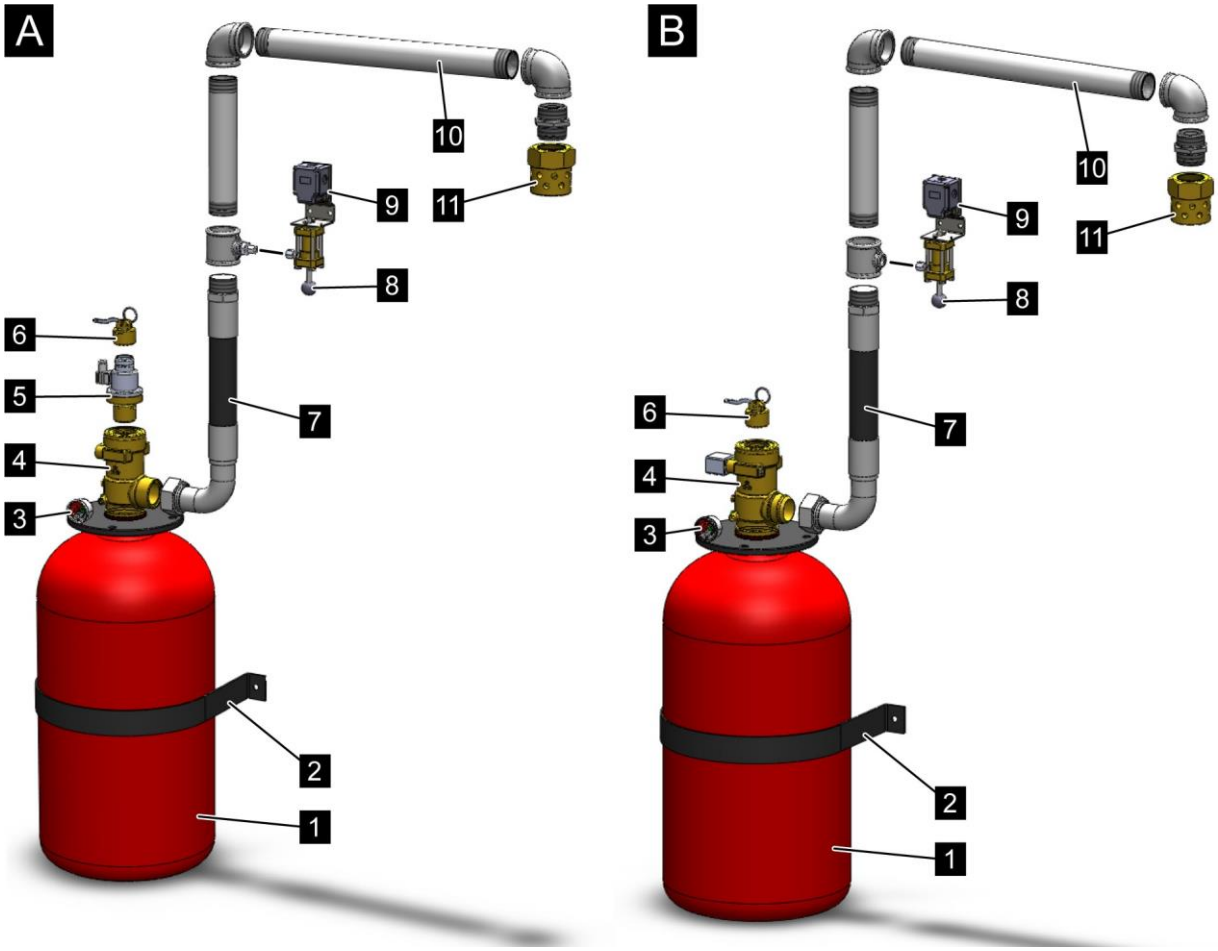


Fig. 5: Single container system

1 Extinguishing agent container
2 Clamp
3 Pressure gauge/Contact pressure gauge
4A Valve
4B Valve with integrated electrical release
5 Release device, electric (also available with a mechanic blocking device)
6 Release device, manual or pneumatic/ manual
7 Hose DN40/DN50 (1 $^{1}/_{2}$" and 2")
8 Manual release of the limit switch
9 Pneumatically actuated limit switch
10 Pipeline
11 Discharge nozzle

Multi container system

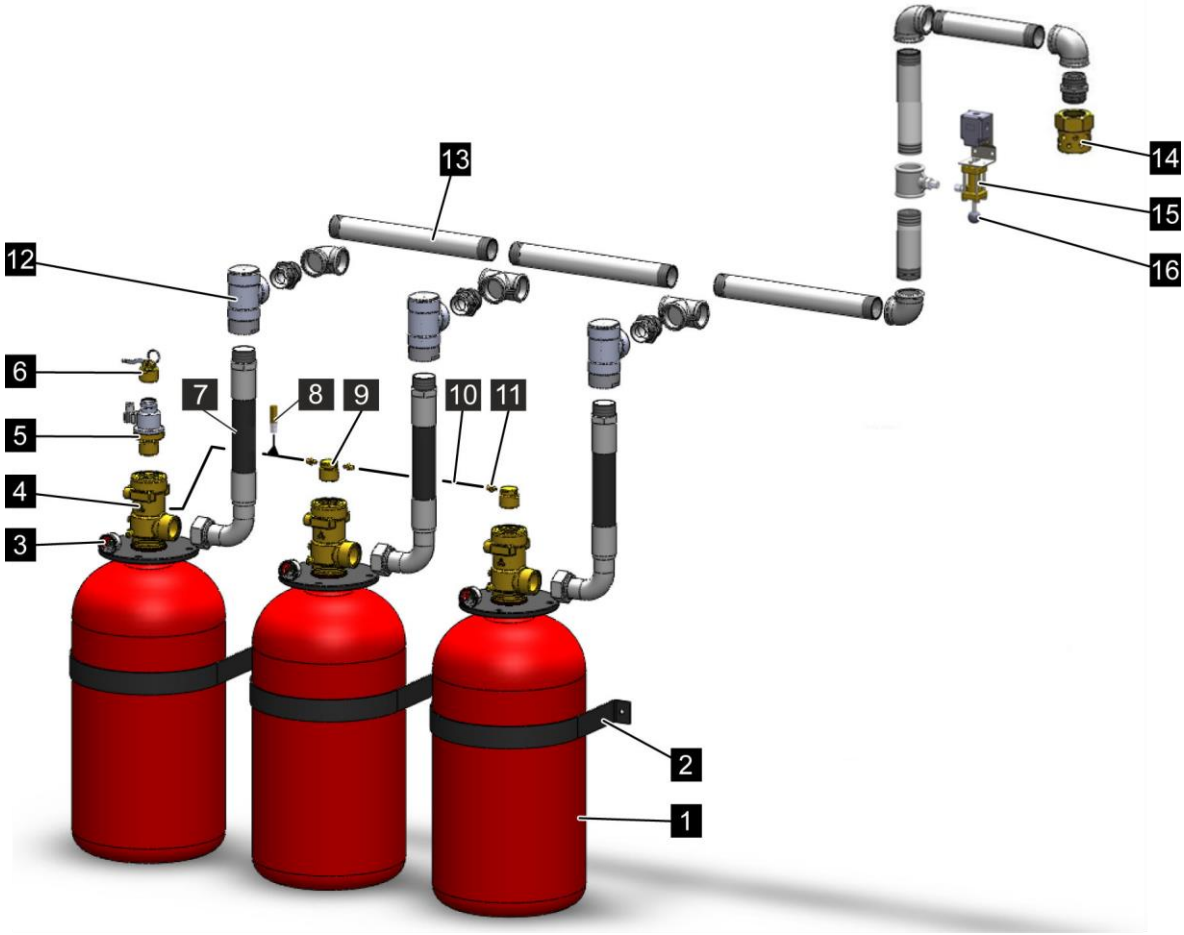


Fig. 6: Multi container system

1 Extinguishing agent container
2 Clamp
3 Pressure gauge/Contact pressure gauge
4 Valve
5 Release device, electric (also available with a mechanic blocking device)
6 Release device, manual or pneumatic/ manual
7 Hose DN40/DN50 (1 $^{1}/_{2}$" and 2")
8 Safety device malfunction pressure (safeguard against slow gas leaks)
9 Release device, pneumatic
10 Hose DN4 (pilot line; $^{5}/_{32}$")
11 Adapter
12 Check valve
13 Pipeline
14 Discharge nozzle
15 Pneumatically actuated limit switch
16 Manual release of the limit switch

Multi container system with redundant electrical release

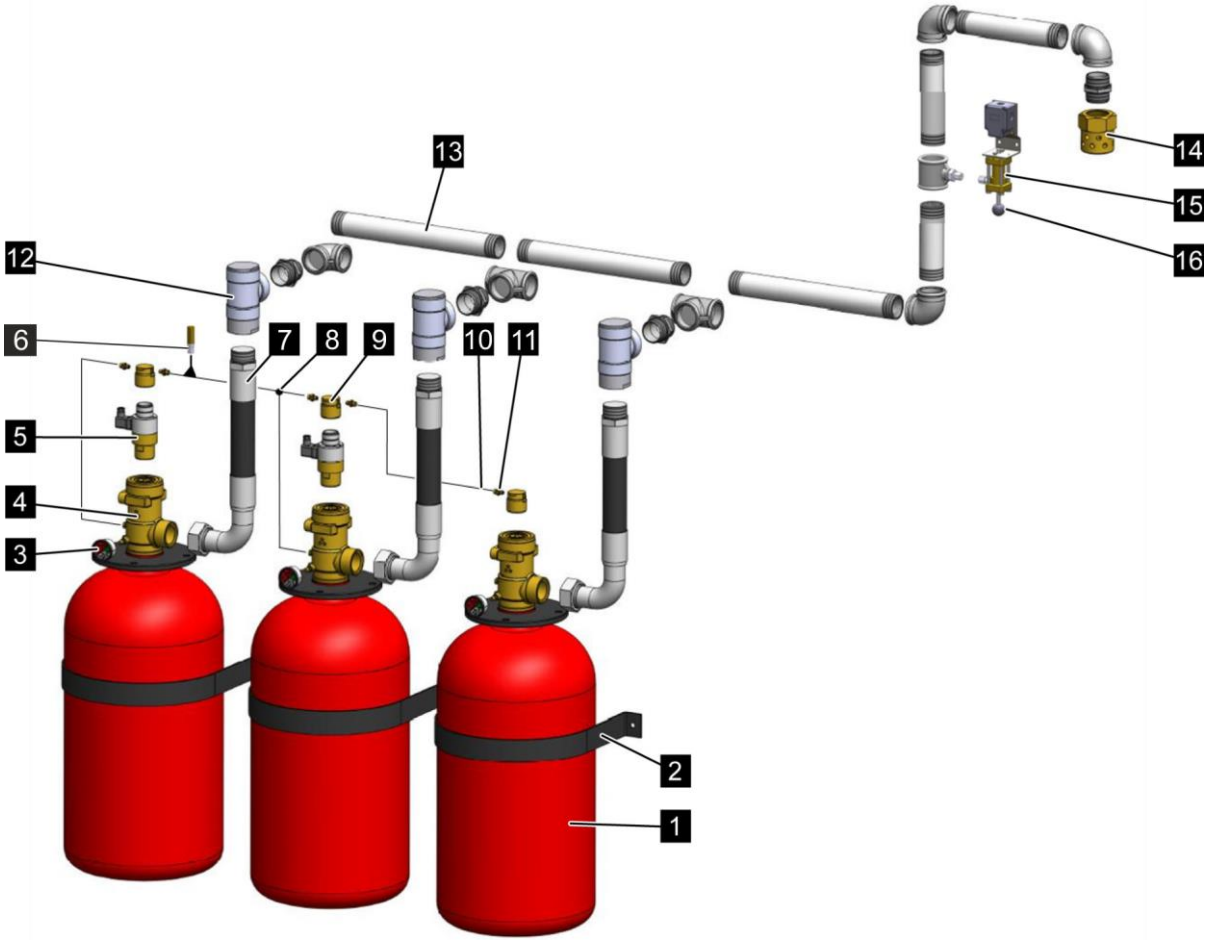


Fig. 7: Multi container system with redundant electrical release

1 Extinguishing agent container
2 Clamp
3 Pressure gauge/Contact pressure gauge
4 Valve
5 Release device, electric (also available with a mechanic blocking device)
6 Safety device malfunction pressure (safeguard against slow gas leaks)
7 Hose DN40/DN50 (1 $^{1}/_{2}$" and 2")
8 Threaded union T 6-PL (part number 125633)
9 Release device, pneumatic
10 Hose DN4 (pilot line; $^{5}/_{32}$")
11 Adapter
12 Check valve
13 Pipeline
14 Discharge nozzle
15 Pneumatically actuated limit switch
16 Manual release of the limit switch

Multi container system with pneumatic release device (PAE)

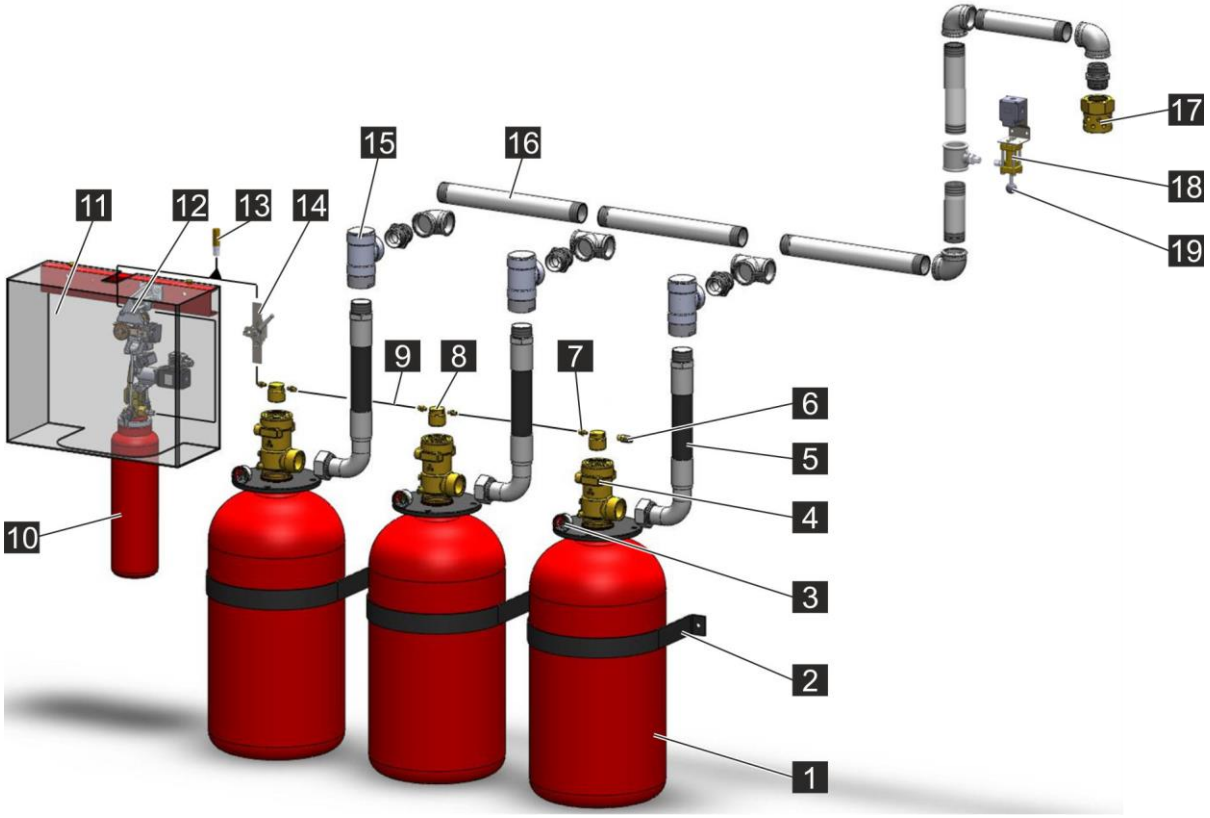


Fig. 8: Multi container system with pneumatic release device (PAE)

1 Extinguishing agent container
2 Clamp
3 Pressure gauge/Contact pressure gauge
4 Valve
5 Hose DN40/DN50 (1 $^{1}/_{2}$" and 2")
6 Manual pressure relief valve
7 Adapter
8 Release device, pneumatic
9 Hose DN4 (pilot line; $^{5}/_{32}$")
10 Pilot cylinder
11 Protective cover
12 Pneumatic release device (PAE), complete including weighing device
13 Safety device malfunction pressure (safeguard against slow gas leaks)
14 Blocking device
15 Check valve
16 Pipeline
17 Discharge nozzle
18 Pneumatically actuated limit switch
19 Manual release of the limit switch

Abstract

Single zone systems safeguard one protected enclosure and can be composed of one or several extinguishing agent containers.

Single zone systems equipped with only one extinguishing agent container (single container systems) have an electric release device (also available with a mechanic blocking device). The device is fitted on the valve of the extinguishing agent container and activated by the fire suppression detection system. There is also the option of fitting a manual release device on the electric release device in order to allow the system to be activated manually.

Multi container systems are equipped with several extinguishing agent containers which are connected by a pilot line. These are required, for instance, if you wish to safeguard an extensive protected enclosure. The first extinguishing agent container ("control cylinder") of a multi container system lacking a pneumatic release device (PAE) is activated electrically (and, as an option, manually as well) just as the extinguishing agent container of a single container system. All other extinguishing agent containers ("Slave") are activated pneumatically via a pilot line.

Multi container systems equipped with a pneumatic release device (PAE) have a pilot cylinder that is activated electrically. The CO_2 contained in the pilot cylinder flows through the pilot line to the pneumatic release devices, mounted on the extinguishing agent containers, and opens them.

In contrast to single container systems, the extinguishing agent released in a multi container system first flows from the hose via check valves to a manifold. The extinguishing agent flows from there through the nozzle pipeline to the discharge nozzles where it evaporates and exits into the extinguishing zone.

3.3 Multi zone systems

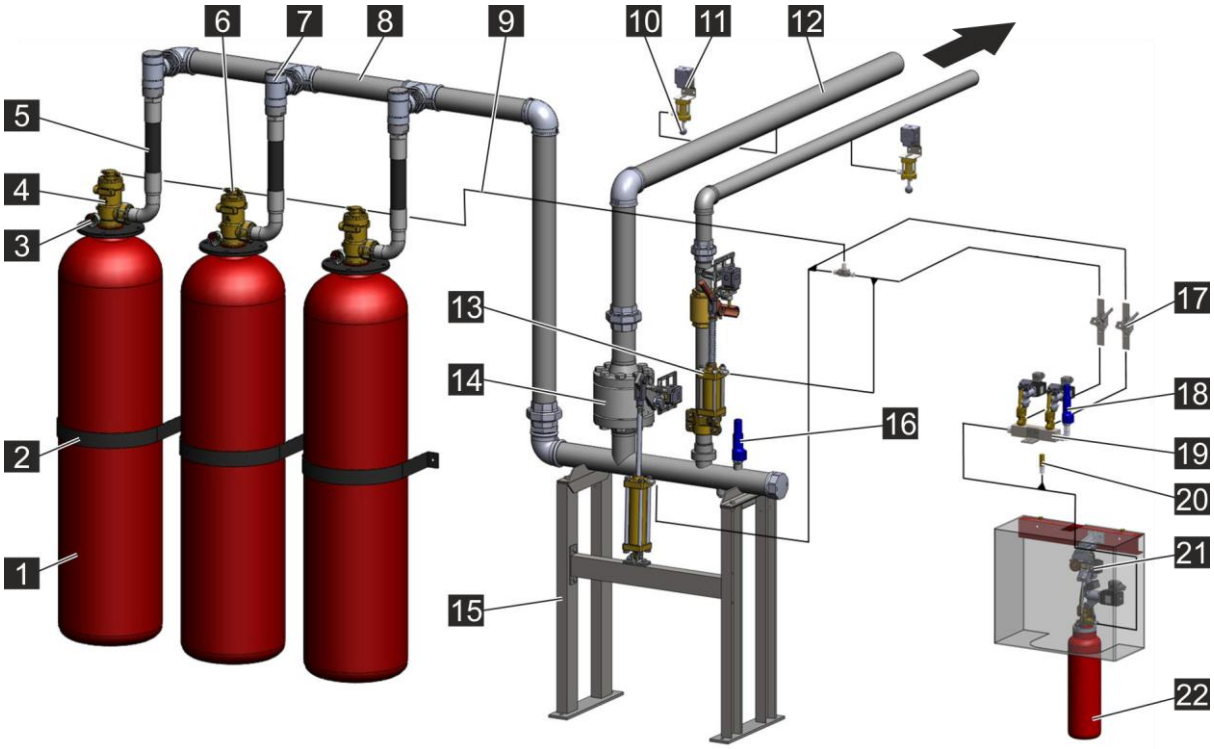


Fig. 9: Multi zone system

1 Extinguishing agent container
2 Clamp
3 Pressure gauge/Contact pressure gauge
4 Valve
5 DN40/DN50 (1 $^{1}/_{2}$ inch and 2 inch) hose
6 Release device, pneumatic
7 Check valve
8 Manifold
9 DN4 ($^{5}/_{32}$ inch) hose (pilot line)
10 Manual release of the limit switch
11 Pneumatically actuated limit switch
12 Nozzle pipeline
13 Selector valve
14 Selector valve
15 Bracket
16 Safety valve 66 bar (957 psi)
17 Blocking device
18 Safety valve 140 bar (2031 psi)
19 DN15 ($^{1}/_{2}$ inch) pilot distributor
20 Safety device malfunction pressure (safeguard against slow gas leaks)
21 Pneumatic release device (PAE), complete including protective cover and weighing device
22 Pilot cylinder

Abstract

Multi zone systems safeguard several extinguishing zones. If the extinguishing zones are of different sizes, multi zone systems will be equipped with several extinguishing agent containers. The extinguishing agent supply and, thus, the number of extinguishing agent containers always follow the largest extinguishing zone. When activated, the system will only flood one extinguishing zone.

Multi zone systems are equipped with a pneumatic release device (PAE). The pilot cylinder of these systems is activated electrically when a fire is detected. The CO_2 contained in the pilot cylinder flows through the pilot line to the pneumatic release devices, mounted on the extinguishing agent containers, and opens them.

Pilot distributors and selector valves ensure that the extinguishing agent containers assigned to the associated extinguishing zone open and the corresponding pipings are released. This prevents the extinguishing agent from flowing into extinguishing zones that are not affected by fire.

Just as the extinguishing agent of single zone systems equipped with several extinguishing agent containers, the extinguishing agent of multi zone systems first flows, when the system is activated, from the hose via check valves to a manifold. The extinguishing agent flows from there via the selector valves and the nozzle pipe to the discharge nozzles (Fig. 9/arrow) where it exits and vaporizes into the extinguishing zone.

3.4 Component description

3.4.1 Extinguishing agent

Novec™ 1230 manufactured by 3M™ is used as the extinguishing agent. It leaves no residue and is not electrically conductive. In does not induce corrosion and thus is particularly suitable for use in rooms with electrical and electronic equipment. Novec™ 1230 binds the thermal energy in the flame and thus interrupts the combustion reaction. The oxygen concentration in the flooded area remains at 19 % by volume, so that direct personal injuries do not occur.

In addition Novec™ 1230 is extremely environmentally compatible. It only has a very slight influence on global warming and no influence whatsoever on the ozone layer.

The safety data sheet is in the Appendix ↬ Appendix C “Safety data sheet FK-5-1-12” on page 224.

Shelf life

If stored properly in extinguishing agent containers, the extinguishing agent, according to the manufacturer, has a shelf life of 30 years.

The shelf life in transport containers and steel barrels is significantly lower. For more information, see the technical data sheets of the extinguishing agent manufacturer.

3.4.2 Extinguishing agent container with valve

Extinguishing agent container

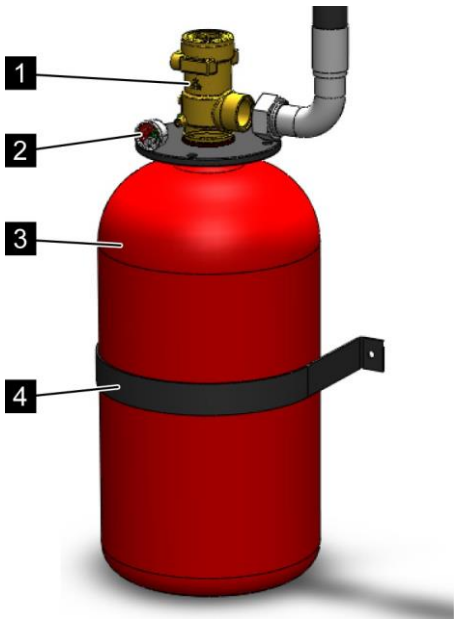


Fig. 10: Extinguishing agent container

The extinguishing agent is stored in extinguishing agent containers (Fig. 10/3). These containers are designed, manufactured and labeled in accordance with European directives, the standard of the US Department of Transportation (D.O.T), or in accordance with the country-specific pressure equipment directives.

The extinguishing agent containers have a siphon tube and are, thus, only suitable for upright operation. Attached to the extinguishing agent container is a type plate which contains, among other things, maintenance and filling instructions as well as information about the fill quantity. By default, the containers are painted red and must be secured (Fig. 10/4).

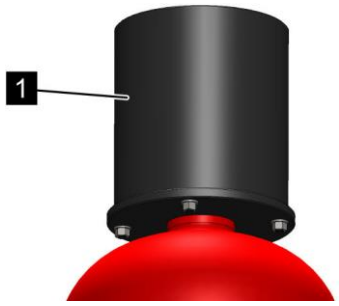


Fig. 11: Protective valve cap

Containers must not be moved and transported unless fitted with the protective valve cap (Fig. 11/1) and the anti-recoil cap (Fig. 12/1). When filled, the containers must be labeled and transported as hazardous material in accordance with all applicable local regulations ↳ *Chapter 4.4.1 “Transporting extinguishing agent containers” on page 69*.

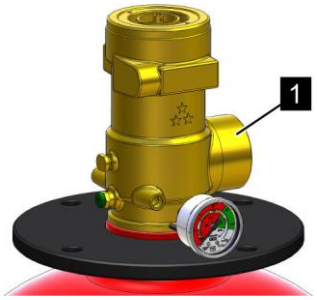


Fig. 12: Anti-recoil cap with vent bores and chain (not shown)

Prior to delivery the containers are filled with the desired quantity of extinguishing agent then charged with dry nitrogen at a pressure of 25 bar (360 psi), 42 bar (610 psi) or 50 bar (725 psi). The extinguishing agent containers are available in different sizes:

- 22.0 l (60 lbs)
- 40.0 l (100 lbs)
- 52.0 l (140 lbs)[1)]
- 80.0 l (220 lbs)
- 100.0 l (270 lbs)
- 106.0 l (280 lbs)[1)]
- 140.0 l (390 lbs)
- 147.0 l (390 lbs)[1)]
- 180.0 l (500 lbs)

[1)] Only 25 bar (360 psi)

Valve

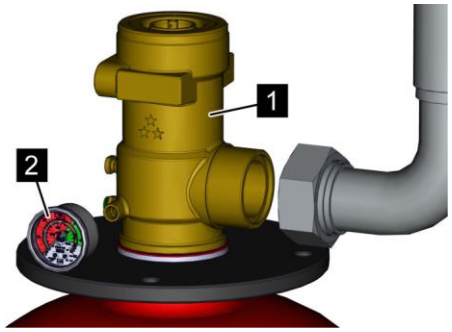


Fig. 13: Valve

The valve (Fig. 13/1) is on the extinguishing agent container. The valve is a quick-opening valve that is available in the nominal diameters 33 mm ($1^1/_2$ inch) and 49 mm (2 inch) depending on the size of the container. The valve makes it possible to discharge the extinguishing agent within 10 s. It works in accordance with the differential pressure principle and has a piston and brass housing.

If the upper chamber is depressurized via the control valve in the upper part of the valve, or through the electrical release unit, the valve opens abruptly. From a pressure in the extinguishing agent container of less than approx. 1 bar (14.5 psi) the valve closes automatically through an integrated spring. Thus a residual pressure always remains in the extinguishing agent container.

Contact pressure gauge

A contact pressure gauge (Fig. 13/2) is on the valve, it indicates the fill pressure of the container, there is also a bursting disk that is used to protect against overpressure. Contact pressure gauges enable additional monitoring of the fill pressure.

There is also an option of connecting an additional pressure switch to the valve or the pipeline, which will switch a potential-free electrical contact when the system is activated. The switching status of this contact can be monitored by the fire suppression detection system and, thus, indicate an activation of the system.

For better readability in this manual, instead of the term "pressure gauge/contact pressure gauge" only the term "contact pressure gauge" is used below.

Multi container systems

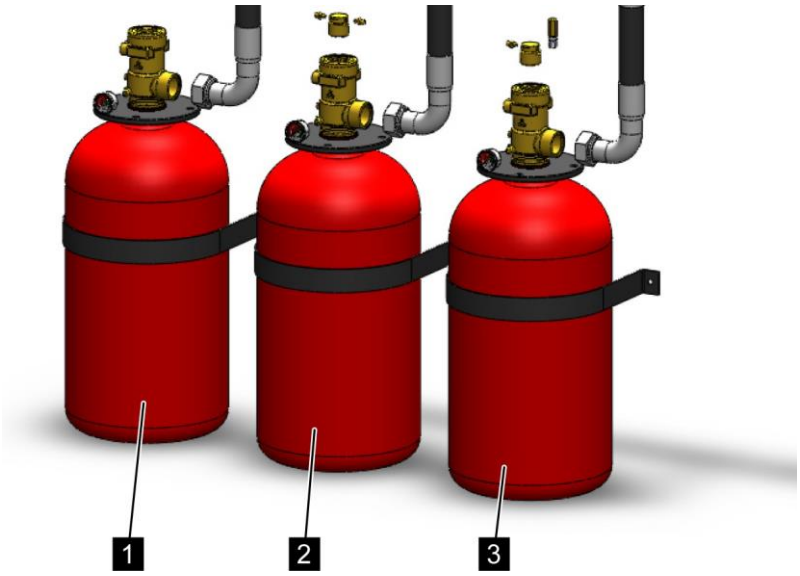


Fig. 14: Multi container system

Multi container systems are always equipped with a "control cylinder" extinguishing agent container (Fig. 14/1) or a pilot cylinder combined with a varying number of slave extinguishing agent containers (Fig. 14/2+3). The number of slave extinguishing agent containers varies with the number and size of the extinguishing zones and is determined when the system is designed. The number of slave containers is not optional.

While the “control cylinder” extinguishing agent container is released electrically, pneumatically, pneumatically/manually or manually, the slave extinguishing agent containers are always released and opened by the “control cylinder” extinguishing agent container or the pilot cylinder pneumatically via a pilot line. The length of the pilot line is not optional.

3.4.3 Release devices

General

The release devices are used to activate the valve. Activation results in the valve being actuated and the extinguishing agent container being opened. So that the valve is guaranteed to open, all release devices must be activated for 5 s.

Release device, electrical

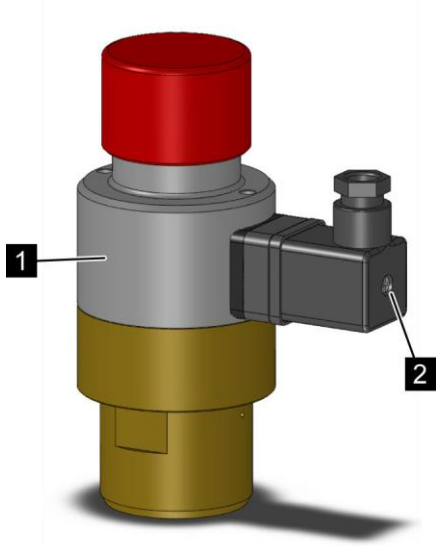


Fig. 15: Release device, electrical

The electrical release device (Fig. 15/1) is used to release the container electrically. The electrically activated valve is connected to the fire suppression detection system via a cable (Fig. 15/2). The electrical signal must be applied for at least 5 s to ensure a release.

Release device, electrical with blocking device* not UL

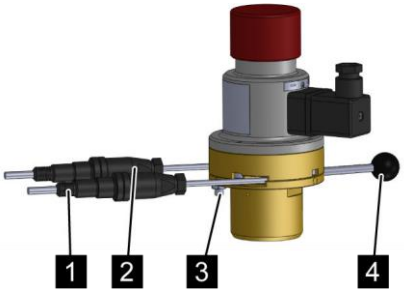


Fig. 16: Release device, electrical

Optionally the electrical release device can also be equipped with a blocking device in the form of a lever (Fig. 16/4). If the lever is in the "blocked" position and this position is fixed in place with the hex bolt (Fig. 16/3) the blocking device is active. It prevents the valve of the extinguishing container from being opened even if the release device is activated electrically or manually via supplemental devices.

The two positions "blocked" and "ready for operation" are labeled through appropriate information on the blocking device. Via a micro switch integrated in the release device it is possible to evaluate the position of the hand lever electrically (Fig. 16/1+2) and to display the position on the fire suppression detection system.

Release device, pneumatic

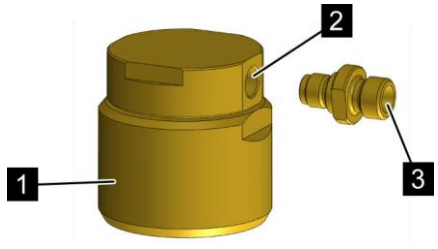


Fig. 17: Release device, pneumatic

The pneumatic release device (Fig. 17/1) is used to pneumatically activate additional slave extinguishing agent containers of multi container systems. It is screwed onto the valve of an extinguishing agent container instead of the electrical release device and connected to a pneumatic pilot line and an adapter (Fig. 17/3) on the pilot outlet of the electrically activated "control cylinder" extinguishing agent container or it is connected to a pilot cylinder.

Each pneumatic release device has 2 control connections Fig. 17/2), so that it can be activated pneumatically and the control gas can be further conveyed to an additional extinguishing agent container via a pilot line.

The connection of the pneumatic release devices between the control connections is executed with flexible hydraulic hoses via a rigid pipe connection that can be fastened to the components via adapters.

The pneumatic release device can be mounted on an electrical release device – unless it has a blocking device.

Release device, pneumatic/ manual

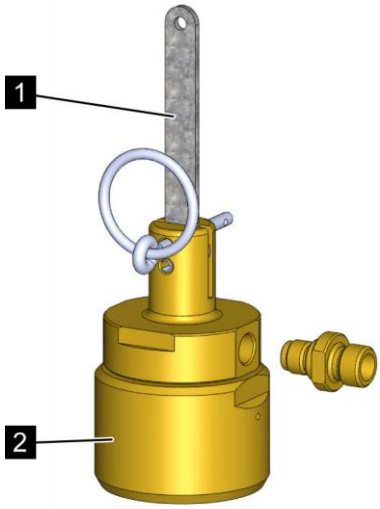


Fig. 18: Release device, pneumatic/manual

For the pneumatic/manual release device (Fig. 18/2) it is also possible to release an extinguishing agent container locally by hand. To do this it has a lever (Fig. 18/1) that can be pulled down.

Release device, manual* not VdS, not CNPP/A2P

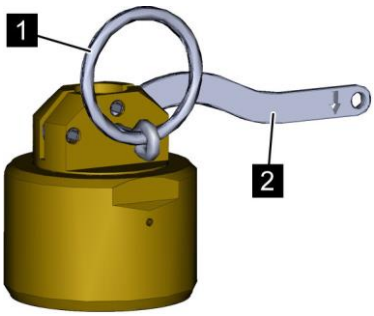


Fig. 19: Release device, manual

With the aid of a manual release device an extinguishing agent container can be opened manually by pressing the lever (Fig. 19/2) downward manually until the stop. This presses the release pin down and activates the valve.

Manual release devices should only be mounted on a "control cylinder" extinguishing agent container or as a supplemental release device on an electrical release device. A locking pin with ring (Fig. 19/1) protects the manual release device from unintentional activation.

3.4.4 Liquid level indicator

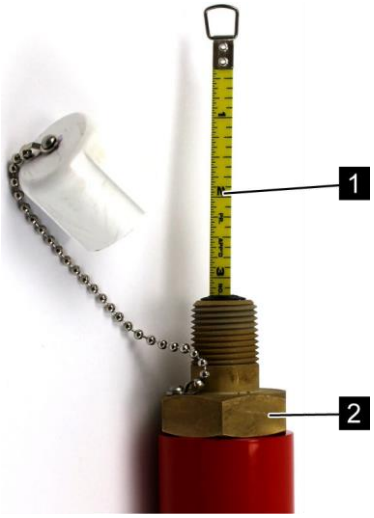


Fig. 20: Liquid level indicator

Some extinguishing agent containers are equipped with a liquid level indicator (Fig. 20/2). The level indicator is non-electrical and enables manual read-out of the fill level on an integrated tape measure (Fig. 20/1). Inside the extinguishing agent container a float equipped with a magnet moves on the stem of the liquid level indicator.

Liquid level indicators have been designed to resist shock and vibration. However, shock and vibration should be avoided.

3.4.5 Hose DN40/DN50 (1 $^1/_2$" and 2")

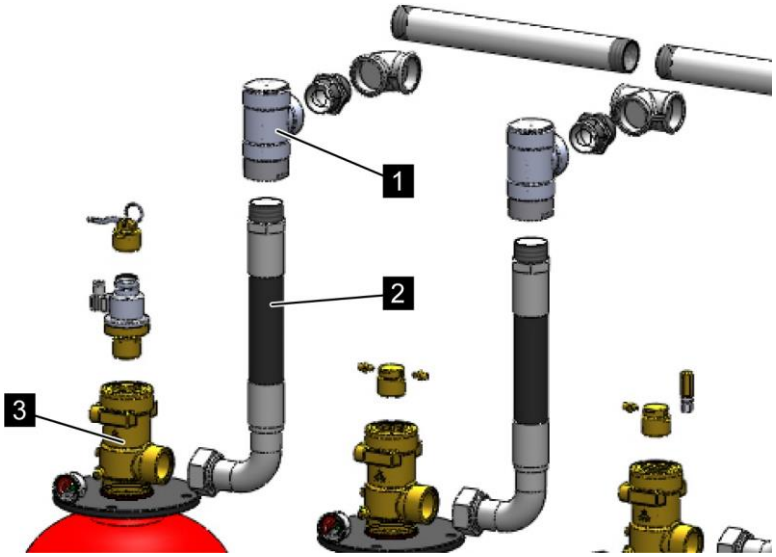


Fig. 21: Hose

The DN40/DN50 (1 $^1/_2$" and 2" hose Fig. 21/2) is used to connect the valve (Fig. 21/3) of the extinguishing agent container to the pipeline or the check valves (Fig. 21/1, for multi container systems). It is flexible and has steel armatures on both sides.

There are two versions:

- Hose with 90° bend
- Hose with straight connection

In special cases a connecting piece (adapter) is used instead of a hose, so that a rigid connection is present between pipeline or check valve and valve.

Adapter NPT-ISO

To connect extinguishing agent containers to a pipeline system with NPT thread, we recommend that you use components (e.g. hoses or check valves) with NPT thread. In special cases, special NPT-ISO adapters can also be used.

3.4.6 Pipeline system

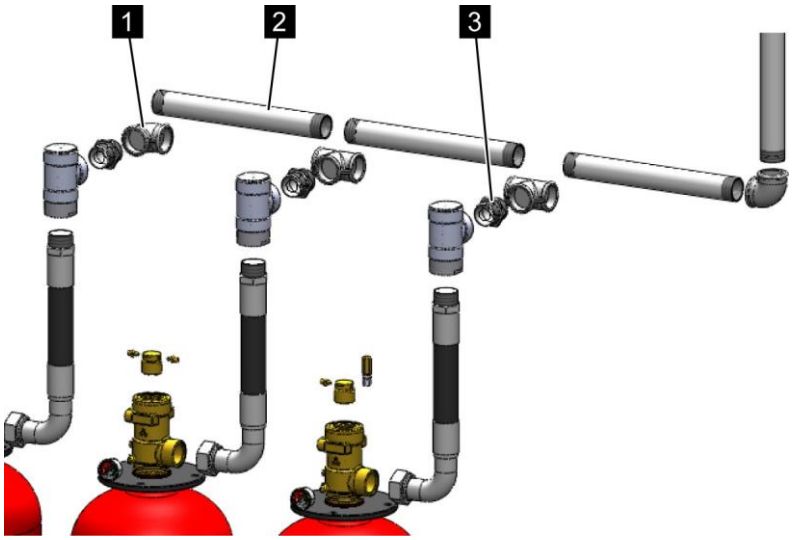


Fig. 22: Pipes and fittings

Pipes (Fig. 22/2) and fittings (Fig. 22/1+3) make up the pipeline system between the extinguishing agent containers and discharge nozzles. This is an optional portion of the scope of delivery.

The pipeline system including the required pipe cross sections must be executed through a hydraulic calculation with the aid of a calculation program based on the pipeline routing.

Changes in the pipeline routing require a new hydraulic calculation. In this regard changes in pipe diameter, extinguishing agent size and nozzle bores can occur.

CNPP/A2P: For systems following CNPP/A2P regulations all pipes must have inside and outside coating/ galvanization.

Manifold

Manifolds are used to connect several extinguishing agent containers together and on one supply line for multi container systems.

3.4.7 Discharge nozzles

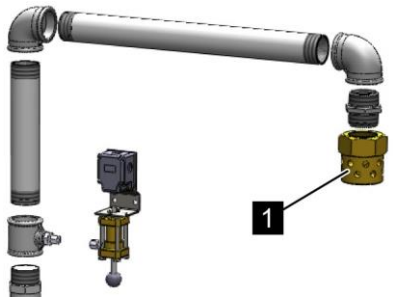


Fig. 23: Discharge nozzle

The discharge nozzles (Fig. 23/1) are used to apply the extinguishing agent within the calculated flooding time and to distribute it uniformly in the extinguishing zone.

The following two types of discharge nozzles are used:

- 180° nozzles that spray the extinguishing agent in a semicircle around the discharge nozzles
- 360° nozzles that spray the extinguishing agent in a full circle around the discharge nozzles

The orifice diameters and the maximum effective area and minimum pressure of the discharge nozzles are dimensioned as part of the design process.

3.4.8 Blocking devices

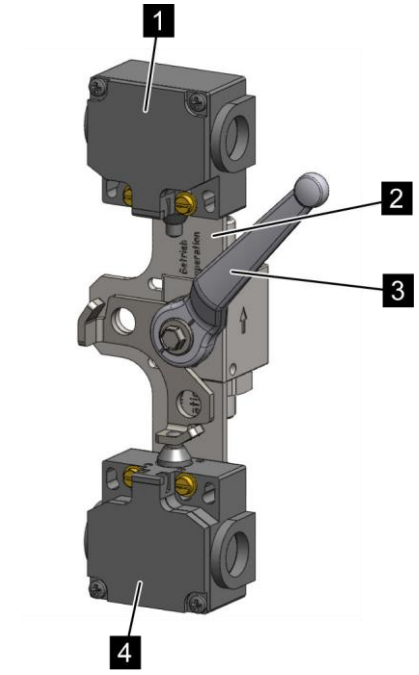


Fig. 24: Blocking device (optionally with 1 or 2 limit switches)

Multi zone systems and systems with pneumatic release device (PAE) have blocking devices (Fig. 24/2) to block the pilot line of individual extinguishing zones.

If, for example, repair and maintenance tasks that could result in unintentional release, or that do not enable the extinguishing zone to be exited within the pre-discharge timer, must be executed in one extinguishing zone, the suppression system must be blocked for this extinguishing zone. This prevents the extinguishing agent from flowing into the extinguishing zone.

A ball valve (Fig. 24/3) enables the blocking of the pilot line; simultaneously venting of the continuing line prevents unintentional pressure increase through leaks.

In order to monitor the ready-for-operation and the blocked status with the aid of the fire suppression detection system, limit switches (Fig. 24/1+4) can be mounted, one upstream of the blocking device and one downstream of the blocking device. This is not part of the scope of delivery of the blocking device.

3.4.9 Hose DN4 (pilot line; $^{5}/_{32}$")

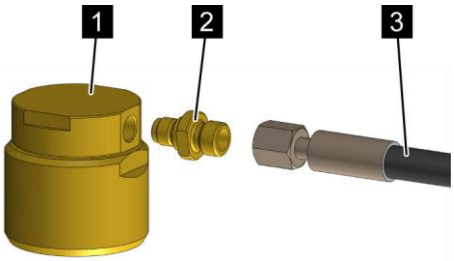


Fig. 25: Pilot line

For multi-container systems the individual extinguishing agent containers must be connected together. This is done via the pilot line that can handle the following tasks.

- Connecting the valve of the "pilot cylinder" extinguishing agent container with the pneumatic release devices of additional slave extinguishing agent containers
- Connecting two pneumatic release devices (Fig. 25/1) of different slave extinguishing agent containers
- Connecting a pneumatic release device (Fig. 25/1) with a pneumatic pilot line for multi zone systems

For connecting the pilot line (Fig. 25/3) an adapter (Fig. 25/2) is required.

To ensure the correct functioning of pneumatic release devices, the pilot line and all connections must be free of leaks. The only permissible leakage point is the “malfunction pressure safety device”.

3.4.10 Check valve (optional)

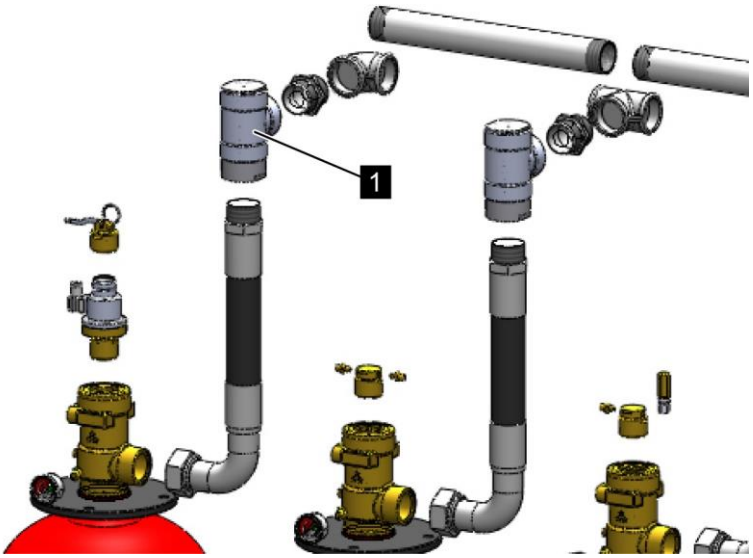


Fig. 26: Check valves

For systems for which more than one extinguishing agent container is connected on a common pipeline system, (multi container system) there is a check valve (Fig. 26/1) between hose and manifold for each extinguishing agent container.

The check valves permit the flow of extinguishing agent in the flow direction, i.e. toward the discharge nozzle, and prevent it in the opposite direction. Thus extinguishing agent cannot get to non-activated valves, if there are dismounted extinguishing agent containers it cannot escape in an uncontrolled manner.

Check valves NPT

For a pipeline system with NPT thread, use the check valve with NPT connection thread.

3.4.11 Malfunction pressure safety device

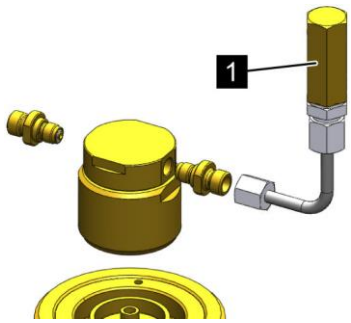


Fig. 27: Malfunction pressure safety device

The "malfunction pressure safety device" (Fig. 27/1) 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 "malfunction pressure safety 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.

3.4.12 Manual pressure relief valve

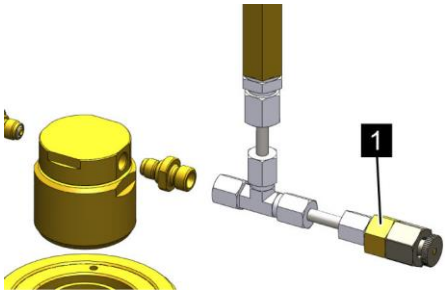


Fig. 28: Manual pressure relief valve

The manual pressure relief valve (Fig. 28/1) is used to manually vent pilot lines. This ensures that the pilot lines can be pressure-relieved without having to dismount them.

The manual pressure relief valve is located at the end of the pilot line. It is only required if a pneumatic release device (PAE) or a pilot cylinder is used.

3.4.13 Shuttle non-return valves

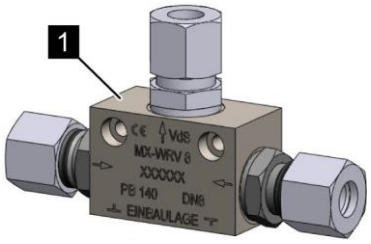


Fig. 29: Shuttle non-return valves

Shuttle non-return valves (Fig. 29/1) for pneumatic control units enable differentiated activation of a pneumatic component through two pressure sources. They are used exclusively for multi container systems and wherever components of the system are pneumatically activated.

3.4.14 Safety valves

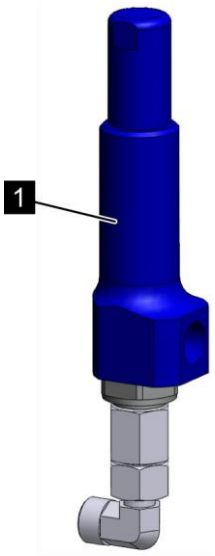


Fig. 30: Safety valve

Safety valves (Fig. 30/1) are attached wherever dangers exist due to unreliably high pressure:

- On DN50 (2 inch) distributors
- On DN15 ($^1/_2$ inch) pilot distributors
- In pilot lines

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

3.4.15 Selector valves (only multi zone system)

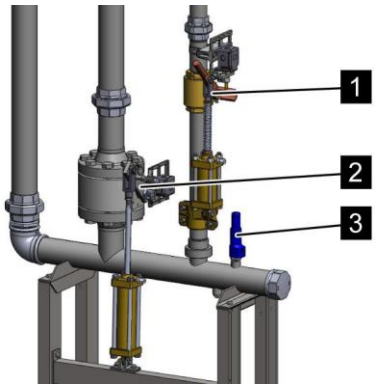
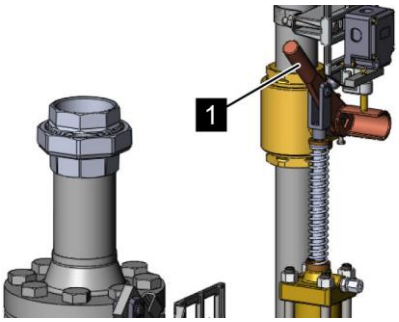


Fig. 31: Selector valves

Multi zone systems have selector valves (Fig. 31/1+2), that enable selective flooding of individual extinguishing zones. The selector valves are closed in operating status. After a fire has been detected in a extinguishing zone (or if the system has been released manually in a extinguishing zone), the selector valve that belongs to this extinguishing zone opens automatically and the extinguishing agent can flow into the extinguishing zone. This measure enables focused spraying of extinguishing agent in individual extinguishing zones and safeguarding extinguishing zones that are not affected.

The selector valves are activated via the fire suppression detection system with the aid of the EM release devices. To prevent pressure increases in the distributor as a result of a closed selector valve, safety valves are installed on the distributors of the selector valves (Fig. 31/3).



The selector valves do not close automatically after a release. They must be reclosed manually via a hand lever that is fitted onto an operating element (Fig. 32/1) on the selector valve.

Fig. 32: Operating element

3.4.16 DN15 pilot distributor ($^1/_2$ inch; only for a multi zone system)

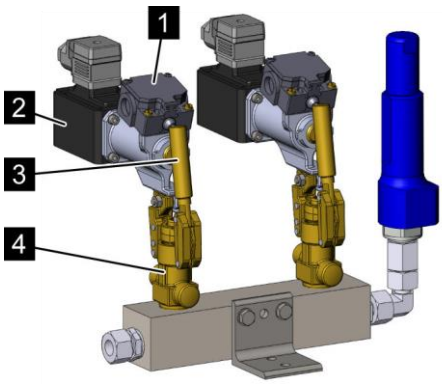


Fig. 33: Pilot distributor

DN 15 ($^1/_2$ inch) pilot distributors are used for multi zone systems. EM electric release devices (Fig. 33/2) are mounted on these pilot distributors that are electrically activated if there is release of the system via the fire suppression detection system. The release pin of the EM release device is unlocked and activates the valve lever (Fig. 33/3). The valve lever swings approx. 90° and opens the valve (Fig. 33/4).

When the EM release devices open, the pilot line is released and the pneumatic cylinder of the associated selector valve opens so that extinguishing agent can flow into the appropriate extinguishing zone.

The number of EM electric release devices depends on the design of the system and the number of extinguishing zones that must be protected. Optionally limit switches (Fig. 33/1) can be used on the release devices for monitoring.

3.4.17 Pneumatic release device (PAE)

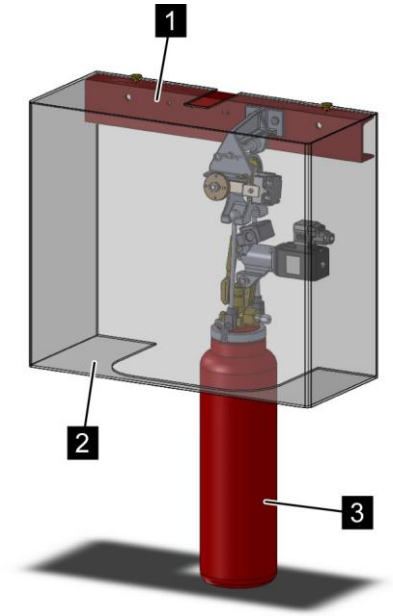


Fig. 34: Pneumatic release device (PAE)

With use of a pneumatic release device (PAE), when a fire is detected a release pulse is relayed from the fire detection and extinguishing control panel to the pneumatic release device (PAE). Thus the release device of the pilot cylinder (Fig. 34/3) is activated electrically. Then the valve opens, the CO_2 streams out and all connected extinguishing agent containers are triggered pneumatically by the pilot line.

In addition the pneumatic release device (PAE) is used to activate all other pneumatic system components with CO_2 as work medium:

- Pneumatically activated extinguishing agent containers and valves
- Selector valves
- Pneumatic control elements and alarm components
- Pneumatic door closing devices
- Pneumatic pressure relief dampers

Depending on the version, a 4kg (8.8lb) or 8kg (17.6lb) pilot cylinder is used. Moreover the pneumatic release device (PAE) can have a reserve cylinder.

Pneumatic release devices (PAE) have a protective hood (Fig. 34/2) to protect against unintentional contact. Alternatively in this regard, they must be protected through a contact safeguard measure (e.g. fencing in). The entire pneumatic release device (PAE) is fastened to the wall via a U-profile (Fig. 34/1).

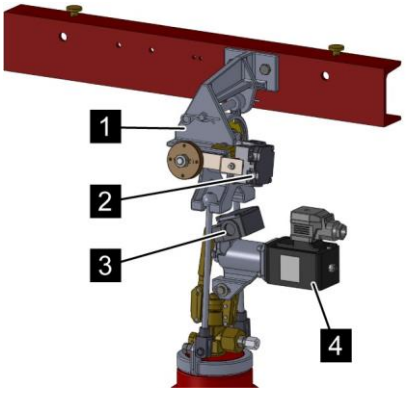


Fig. 35: Pneumatic release device (PAE)

In addition the following components are also part of the pneumatic release device (PAE):

- Weighing device (Fig. 35/1)
- Leakage monitoring (Fig. 35/2)
- Monitoring of the EM release device (Fig. 35/3)
- EM release device (Fig. 35/4)

Weighing device

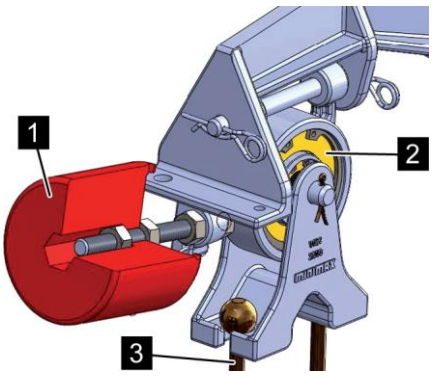


Fig. 36: Weighing device

The weighing device (Fig. 36/2) is used to detect and indicate any loss on the pneumatic release device (PAE). If loss is detected, the counterweight will tilt down to make the leakage instantly visible.

A loss is indicated by the specified difference between the weight of the container and a counterweight (Fig. 36/1). The pilot cylinder is hooked into the weighing device by means of holding rods (Fig. 36/3).

Loss monitoring

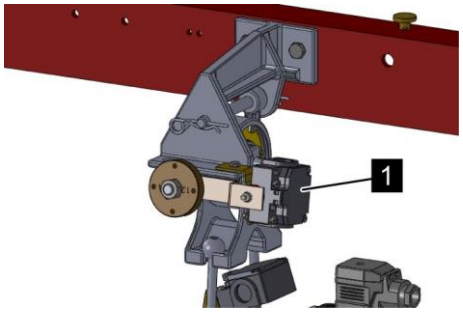


Fig. 37: Loss monitoring

The loss monitoring (Fig. 37/1) function of the pneumatic release device (PAE) enables monitoring of the maximum acceptable leakage of the pilot cylinder via the fire detection and extinguishing control panel. The maximum acceptable leakage is 10% of the stored quantity per pilot cylinder.

If the acceptable loss is exceeded the counterweight of the weighing device tilts and activates a limit switch. The limit switch relays a signal to the fire detection and extinguishing control panel where the excess of the acceptable loss is displayed as a fault.

Release device EM

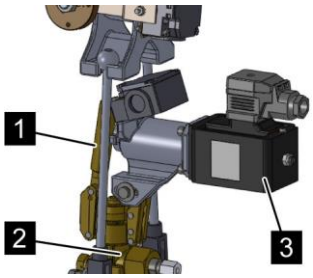


Fig. 38: Release device EM

The EM release device (Fig. 38/3) is used for direct activation of the valves (Fig. 38/2) of a pilot cylinder or of a DN15 ($^1/_2$") pilot distributor via a spring-operated release pin, that is unlocked via a lifting magnet, and a valve lever (Fig. 38/1) is operated.

The release can also be executed manually through direct activation of the valve lever.

To safeguard the pilot container e.g. during maintenance work against faulty release, the valve lever must be unscrewed. In this case the release pin protrudes into empty space and the pilot cylinder is not activated.

Monitor of the EM release device

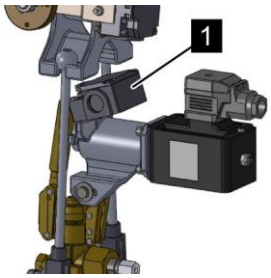


Fig. 39: Monitoring

The electrical monitoring (Fig. 39/1) of the EM release device monitors whether the EM release device is mounted and whether the valve lever is mounted. As soon as the EM release device or the valve lever is removed, a corresponding signal is sent to the fire detection and extinguishing control panel.

This occurs even if the pilot cylinder has been activated manually via the valve lever or electrically.

Monitoring the EM release device as per UL

Electrical monitoring of the EM release device as per UL is equipped with a cable in the factory (Fig. 40).

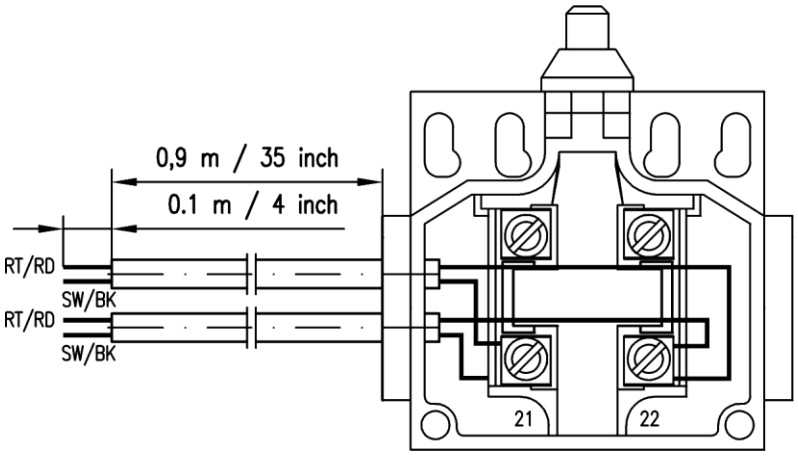


Fig. 40: Switch with factory-installed cable

3.4.18 Test connection (optional)

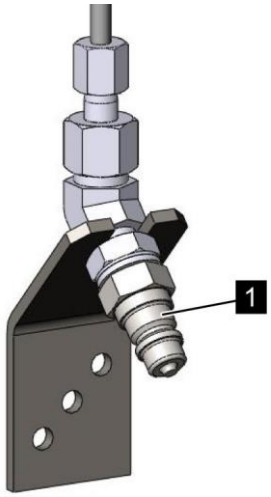


Fig. 41: Test connection

A test cylinder can be connected to the optional test connection (Fig. 41/1), that can be used to check the pneumatic activation.

Alternatively to the test connections of the manufacturer, suitable connections from other manufacturers can also be used. These other connections must be configured and tested for an operating pressure of at least 140 bar (2031 psi).

Only the test connections of the manufacturer are described below.

3.4.19 Pneumatically actuated limit switch

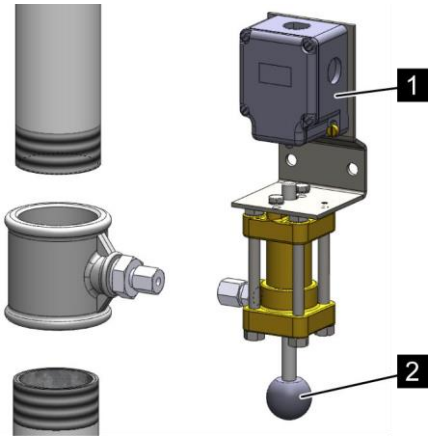


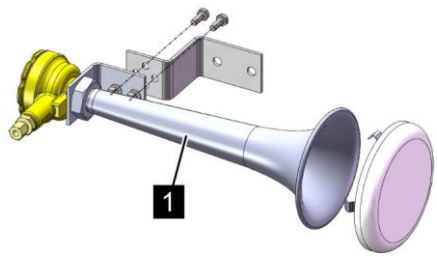
Fig. 42: Limit switch

The pneumatically actuated limit switch (Fig. 42/1) enables evaluation of whether a extinguishing zone has actually been flooded after release of the selector valve. The applied extinguishing agent pressure activates the cylinder, which on its side opens or closes the floating contacts of the limit switch.

Through this measure the signals that can be used for different purposes can be triggered via the limit switch if it is connected electronically to the fire suppression detection system. For example, these signals can be used for alarm notification of the fire department.

An additional pushbutton (Fig. 42/2) offers the possibility of triggering electrical signals for test purposes.

3.4.20 Acoustic alarm components (optional)



Optionally the system can have alarm components (e.g. makrofones, Fig. 43/1), that are pneumatically activated when the system is released and that acoustically signal the release of the system.

Fig. 43: Makrofon

3.4.21 Fire detection and suppression control panel

The system is controlled via the fire detection and suppression control panel. If a fire is detected or if the system has been manually activated via the electrical manual release, the fire detection and suppression control panel relays an alarm pulse to the release device of the “master" extinguishing agent container or the pneumatic release device (PAE) and to the DN15 ($^1/_2$") pilot distributor or the solenoid valves.

In addition it controls the activation of the alarm devices (signal horns and signal lights) and the alarm relay to the fire department. Depending on whether the appropriate component is used in the system, the states can be monitored via limit switches. These include:

- Monitoring of the pressure of the extinguishing agent container via the contact pressure gauge ↬ *“Valve” on page 47*
- Position monitoring of the selector valves (for multi zone systems)
- Monitoring of the EM electrical release device on the pneumatic release device (↬ *“Monitor of the EM release device” on page 61*) or on the DN15 ($^1/_2$ inch) pilot distributor (↬ *Chapter 3.4.16 “DN15 pilot distributor ($^1/_2$ inch; only for a multi zone system)” on page 58*)
- Leakage monitoring of the pneumatic release device (PAE) ↬ *“Loss monitoring” on page 60*
- Monitoring of the pipeline downstream of a selector valve for flooding (can also be used for test purposes) ↬ *Chapter 3.4.19 “Pneumatically actuated limit switch” on page 62*
- Monitoring of the position of the blocking devices (for multi zone systems) ↬ *Chapter 3.4.8 “Blocking devices” on page 54*

- Monitoring of the position of the blocking device if there are electrical release devices with integrated blocking device *“Release device, electrical with blocking device* not UL” on page 50*
- Monitoring the presence of the electrical release device *Chapter 3.4.24 “Monitoring external electrical release devices” on page 65*

The fire detection and suppression control panel is not considered in more detail in this manual.

Comply with the manufacturer’s instructions in the separate operation manual for the fire detection and suppression control panel.

For systems following VdS or CNPP/A2P design and installation regulations, please check current VdS or CNPP/A2P system listings/approvals. Only listed components as well as listed fire detection and suppression control panels shall be used.

3.4.22 Fire detection elements

Fire detection elements are used for early detection of fires. The earlier a fire is detected the earlier the system is triggered and thus minimizing the fire damage.

The fire detection elements include automatic and non-automatic fire detectors that are in the protected enclosure.

Type, number and position of the fire detection elements must be taken into account when designing the system, and consequently are not considered in more detail in this manual.

Comply with the manufacturer’s instructions in the separate operating manual for the fire detection elements.

3.4.23 Electrical manual release

Electrical manual triggering elements are used to manually trigger the system via a pushbutton.

If the pushbutton is activated the manual release relays an electrical signal to the fire suppression detection system. The system is released.

Electrical manual triggering elements are not part of the scope of delivery of the system. Consequently they are not considered in more detail in this manual.

3.4.24 Monitoring external electrical release devices

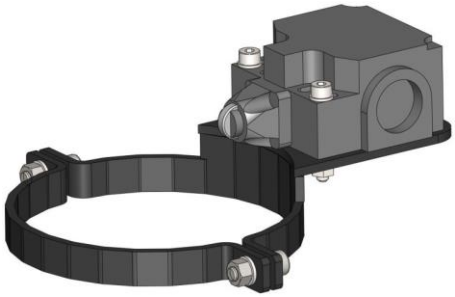


Fig. 44: Monitoring

The monitor (Fig. 44) checks whether an external electrical release device (without an integrated blocking device) is present.

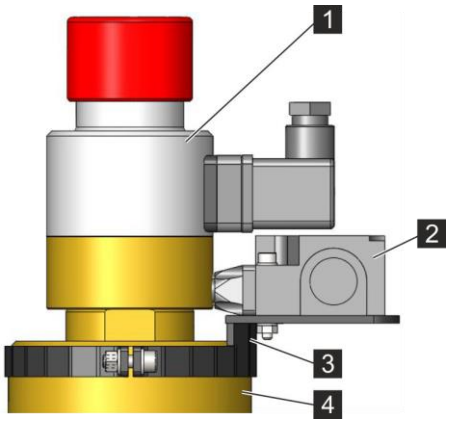


Fig. 45: Monitor, mounted

If there is a release device (Fig. 45/1) the switch (Fig. 45/2) on the monitor (Fig. 45/3) is activated. If the release device is removed, the switch is not activated and forwards a signal to the fire detection and extinguishing control panel. There the lack of an external electrical release device is displayed as a malfunction.

The monitor is mounted on the valve (Fig. 45/4) and has a factory-installed cable (Fig. 46).

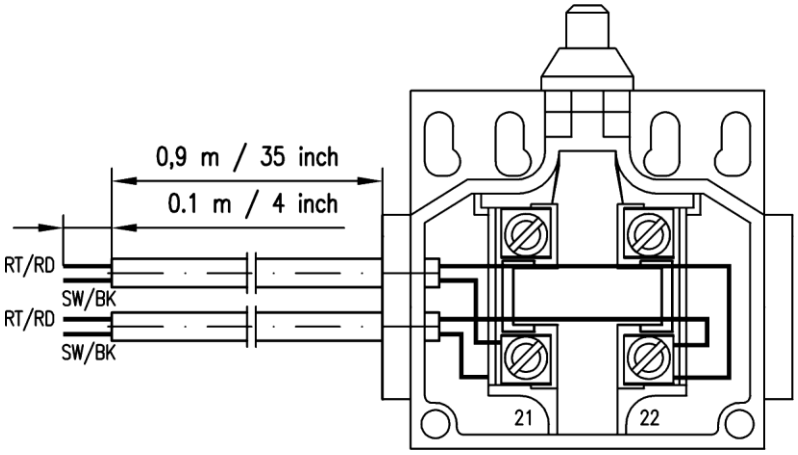


Fig. 46: Electrical connection

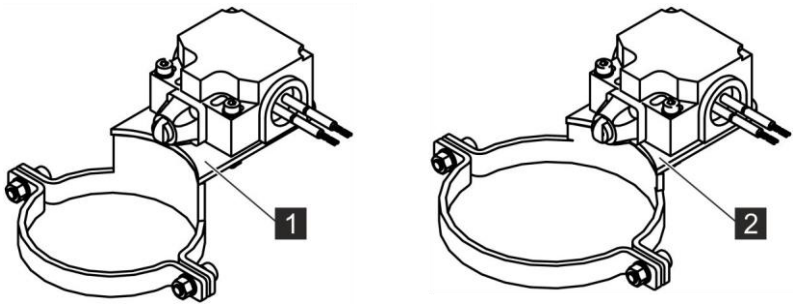


Fig. 47: Monitors B0482 and B0481

1 Monitor B0482, part number 922291
2 Monitor B0481, part number 922290

4 Transport, packaging and storage

4.1 Warnings for transport

Eccentric center of gravity

⚠ WARNING

Risk of injury due to falling or tilting 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.**

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.

Improper transport of hazardous goods

⚠ WARNING

Life-threatening danger due to improper transport of hazardous goods!

- **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.**

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.

Improper transport

NOTICE

Material damage due to improper transport!

- **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 used the designated attachment points.**
- **Only remove packaging immediately prior to installation.**

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

4.2 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 ↬ *Chapter 8.5.9.1 “Check filling quantity” on page 172*.
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.

4.3 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!

- **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.**

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.

4.4 Transport

4.4.1 Transporting extinguishing agent containers

⚠ WARNING

Risk of death due to extinguishing agent escaping in an uncontrolled manner.

- **Damaged extinguishing agent container should only be transported in a depressurized state.**
- **Only start the transport when the anti-recoil cap on the valve outlet and the blind plug on the control outlet as well as the protective valve cap are mounted.**
- **Always secure extinguishing agent containers in compliance with the following instructions.**

The extinguishing agent containers are under high pressure. If they are damaged extinguishing agent can escape uncontrolled. This can result in the extinguishing agent containers flying around uncontrollably and causing severe injuries or even death. In addition, the escaping extinguishing agent can cause freezing and life-threatening injuries to the skin and eyes.

⚠ WARNING

Risk of injury due to tipping extinguishing agent containers!

- **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.**

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.

Transporting filled extinguishing agent containers

Filled extinguishing agent containers are class 2 hazardous goods and assigned the UN number UN 1956 with the proper shipping name "COMPRESSED GAS, N.O.S. (NITROGEN, DODECAFLUORO-2-METHYL-PENTAN-3-ONE)". Consequently they must be transported in accordance with the locally valid regulations for transporting hazardous goods.

Fig. 48: Valve

1. Ensure that the anti-recoil cap on the valve outlet (Fig. 48/2) and the blind plug on the control outlet (Fig. 48/1) are attached.

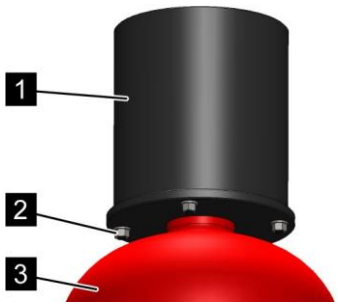


Fig. 49: Protective valve cap

2. Fit on and screw (Fig. 49/2) the protective valve cap (Fig. 49/1) onto the extinguishing agent container (Fig. 49/3).

Fig. 50: Hazard label

3. Label extinguishing agent containers as class 2 hazardous goods by attaching the hazard label (Fig. 50).
4. Always fasten extinguishing agent containers in vertical position in a suitable transport frame or horizontally on a pallet and safeguard them from slipping.
5. Transport the pallet in compliance with the instructions contained in this manual ↬ *Chapter 4.4.2 “Transporting pallets” on page 73*.

Transporting emptied extinguishing agent containers

Extinguishing agent containers that have been activated contain a residual quantity of extinguishing agent depending on the size of the container of approx. 1 – 7 % percent of the container volume and a residual pressure of approx. 1 bar (14.5 psi). This residual pressure prevents soiling and moisture from penetrating into the container via the valve outlet.

Depending on the locally applicable regulations this container is considered hazardous goods and accordingly is subject to the regulations governing the transport of hazardous goods.

→ Consult with a local expert for transport of hazardous goods and ask for the regulations concerning transport of extinguishing agent containers that have been activated.

If you cannot consult with an expert:

→ Label the extinguishing agent containers as hazardous goods and transport the containers in accordance with the specified information ↬ *Further information on page 69*.

Fig. 51: Valve

Alternatively:

1. Relieve the residual pressure in the extinguishing agent container via the pressure gauge connection.
2. Attach the anti-recoil cap on the valve outlet (Fig. 51/2) and the blind plug on the control outlet (Fig. 51/1).

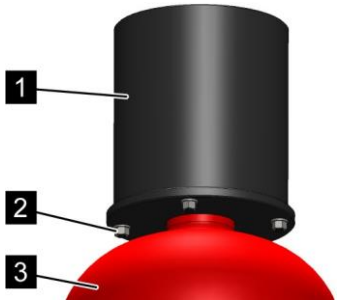


Fig. 52: Protective valve cap

3. Fit on and screw (Fig. 52/2) the protective valve cap (Fig. 52/1) onto the extinguishing agent container (Fig. 52/3).

   ⇨ The extinguishing agent container is no longer considered hazardous goods and can be transported without consideration of the transport regulations that apply for hazardous goods.

Emptying extinguishing agent containers

Do not continue to use visibly damaged extinguishing agent containers, and those that show deep corrosion in the floor area. They must be emptied before a transport and subsequently disposed of.

1. Remove the protective valve cap from the extinguishing agent container.
2. Relieve the pressure via the pressure gauge connection.
3. When the container is completely depressurized except for the residual pressure of the liquid extinguishing agent (approx. 0.4 bar (5.8 psi) at 20 °C (68 °F)) unscrew the valve.
4. Fill the extinguishing agent into a dry storage container and store it temporarily under a nitrogen atmosphere.
5. Dispose of extinguishing agent as specified in the safety data sheet.

4.4.2 Transporting pallets

Transporting pallets with the fork lift

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

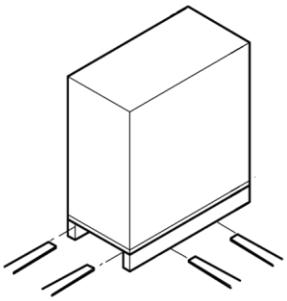


Fig. 53: Transport with the fork-lift

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.

4.5 Storage

Storing extinguishing agent containers

Store spare containers of extinguishing agent in the following conditions:

- Do not store outside.
- Store in a dry area.
- Do not expose to abrasive media.
- Protect against direct sunlight.
- Avoid mechanical vibrations.
- Avoid condensation moisture.
- Storage temperature: -18 to +50 °C (0 to +122 °F).
- Store with the protective valve cap installed.
- Store only upright inside the included transport frame or lying on the included pallet.
- Observe national regulations for the storage of extinguishing agent containers.
- When storing them for a period of more than 3 months, inspect the overall condition of all extinguishing agent containers on a regular basis. If necessary, contact an Authorized Distributor to replace any damaged or corroded extinguishing agent containers. Contact can be established through the manufacturer (see page 2).

⚠ WARNING

Risk of injury from illegible symbols!

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

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.

The packing pieces may contain instructions that exceed the requirements specified herein. Follow these additional instructions 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.

5 Assembly and installation

Systems according to VdS and CNPP/A2P:
VdS or CNPP/A2P requirements for Authorized Distributors as well as design and installation standards for pipe systems must be observed.

5.1 Warnings for assembly and installation

Improper installation and commissioning

WARNING

Risk of injury due to improper installation and initial commissioning!

- **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.**

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

Faulty release

⚠ WARNING

Danger of injury due to escaping extinguishing agent!

- **Remove all securing pins on components of the system only after the components have been completely mounted.**
- **Isolate the system or parts of the system as needed.**
- **Ensure that the valve outlet is always closed with an anti-recoil cap and connected to a pipeline.**
- **Only mount release devices when the extinguishing agent containers have been connected to the pipe system.**
- **For valves with an integrated electrical release device, only establish the electrical connection for the release device when the extinguishing agent containers have been connected to the pipe system.**
- **Make sure the extinguishing agent container is adequately braced utilizing clamps.**

If the system is unintentionally activated in the course of mounting tasks, extinguishing agent can escape uncontrolled. There is therefore a risk of death.

Fouling

⚠ WARNING

Danger of damage due to soiling!

- **Check all pilot lines and pipelines for residue prior to mounting and clean them if necessary.**
- **Only use cleaned pilot lines and pipelines.**

When pilot lines or pipelines are fouled the danger of system malfunction exists. This can cause severe injuries.

Defective components

NOTICE

Material damage due to the use of unsuitable components!

- **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.**

If unsuitable, defective or fouled components are mounted this can impair the functionality of the system.

Insufficient load-bearing capacity

NOTICE

Material damage due to insufficient load-bearing capacity!

- **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.**

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.

5.2 Requirements imposed on the pipeline system

⚠ WARNING

Danger of injury due to an unsuitable pipeline system!

- **Hydraulically calculate the layout of pipelines.**
- **Lay out and install pipeline systems in accordance with the locally valid regulations for Novec™-1230 fire suppression systems with an operating pressure of 25, 42 or 50 bar (360, 610 or 725 psi).**
- **Do not retroactively change the pipe routing or cross sections.**
- **Always execute a new calculation if there are planned changes.**
- **Comply with all the requirements imposed on pipelines cited below.**

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.

Pipelines, fittings and fastenings are part of the pipeline system. The manufacturer does not lay out the pipeline system. It must be individually executed for each system 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.

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

CNPP/A2P: For systems following CNPP/A2P regulations all pipes must have inside and outside coating/ galvanization.

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 ISO 14520 or NFPA 2001 and other locally applicable regulations.
- Install pipeline systems in accordance with the hydraulic calculation.
- Take the supplemental weight of the extinguishing agent during an activation into consideration.
- Take lateral thrust through 180° discharge nozzles into consideration.
- Design the pipeline system balanced so that the path from the extinguishing agent container to the discharge nozzle is identical.
- Comply with the tee quantity distribution rules ↬ *"Tee quantity distribution rules" on page 79*.
- Avoid unnecessary angles.
- Comply with the branching specifications ↬ *"Branches" on page 80*.
- 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.

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

Tee quantity distribution rules

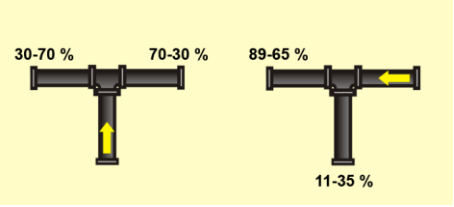


Fig. 54: Tee quantity distribution rules

The conditions shown in Fig. 54 apply for tee quantity distributions. This can make it necessary to overfill intermediate ceilings or raised floors that have volumes of less than 10 % of the room volume and for which the extinguishing agent quantity is tapped laterally by the main line.

Branches

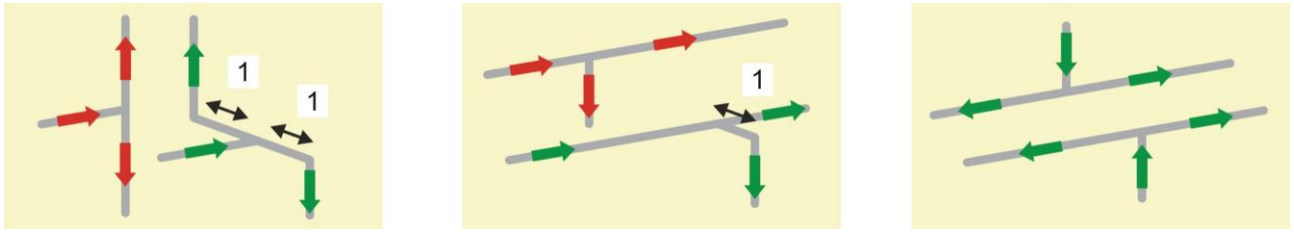


Fig. 55: Acceptable and unacceptable branches

Unacceptable branching
Acceptable branching
1 Minimal length of the lateral branch

Due to the 2-phase flow (liquid, gaseous) outlets to discharge nozzles or distributors at tees are only acceptable via lateral branches. Fig. 55 provides a good example.

The minimum pipe length upstream and downstream of tees must be at least 10x the pipe diameter

See the design manual for details. The design manual can be ordered from the manufacturer (page 2) with part number 916659.

Old pipelines

Personnel: ■ Authorized Distributor

Protective equipment: ■ Protective goggles

NOTICE

Material damage due to unsuitable pipelines!

– **Only use pipelines if they can withstand the required pressures.**

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

If old pipelines are used in the system, or if existing pipelines are used in the protected enclosure, 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 Mounting the components of a single zone system

5.3.1 Mounting the check valve (optional)

Personnel: ■ Authorized Distributor

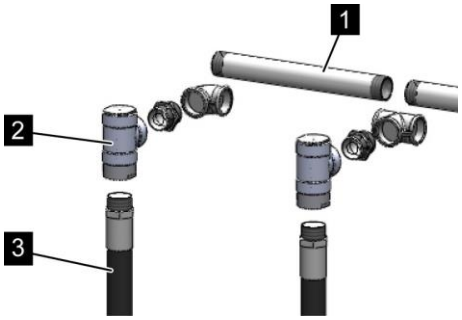


Fig. 56: Mounting the check valves

For multi container systems a check valve (Fig. 56/2) must be mounted for each extinguishing agent container, between hose (Fig. 56/3) and manifold (Fig. 56/1).

Depending on the pipe type and the thread diameter, approved adapters must be used for mounting the check valve. These are available from the manufacturer, see page 2 for contact data. For a pipeline system with NPT thread, use the check valve with NPT connection thread.

1. Ensure that all extinguishing agent containers connected to the manifold are secured in such a manner that extinguishing agent cannot escape.
2. Wrap outer thread of the component to be screw fastened with a suitable sealant.
3. Mount the check valve (possibly with adapter) with due consideration of the direction of flow (Fig. 57/ arrows).

   If the check valve is screwed in incorrectly its functionality is not ensured.

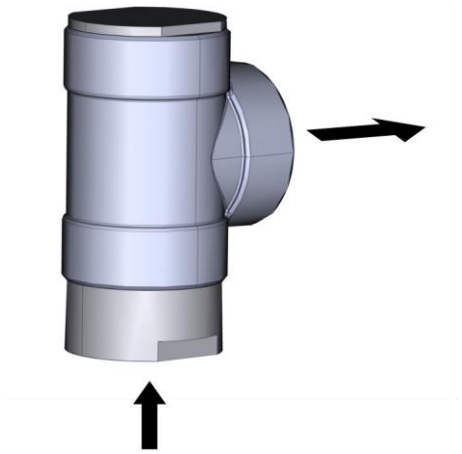


Fig. 57: Direction of flow

5.3.2 Mounting the hose or connecting piece

Mounting the DN40/DN50 (1 $^1/_2$" inch and 2") hose

Personnel: ■ Authorized Distributor

Protective equipment: ■ Safety gloves
■ Protective goggles

Materials: ■ Sealant

NOTICE

Material damage due to excessive stress!

- **Do not stress DN40/DN50 (1 $^1/_2$" and 2") hose through torsion.**
- **Do not underrange the minimum bend radii.**
  - **500 mm (19 inch) for the DN40 (1 ^{1}/2") version**
  - **630 mm (24 inch) for the DN50 (2") version**

If the DN40/DN50 (1 $^1/_2$" and 2") hose is excessively stressed, it can be damaged and can leak.

Proceed as follows to mount the DN40/DN50 (1 $^1/_2$" and 2") hose between the valve of the extinguishing agent container and the pipeline system:

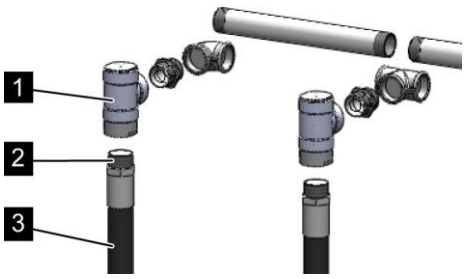


Fig. 58: Mounting the hose

1. Wrap G2 thread (Fig. 58/2) with a suitable sealant (e.g. Teflon tape).
2. Screw fasten and carefully align DN40/DN50 (1 $^1/_2$" and 2" hose Fig. 58/3) to the nozzle pipeline, the manifold, and the check valve (Fig. 58/1).

Mounting the connecting piece

Personnel: ■ Authorized Distributor

Protective equipment: ■ Safety gloves
■ Protective goggles

If the valve of the extinguishing agent container will be connected to the nozzle pipeline, the manifold, or the check valve without a DN40/DN50 (1 $^1/_2$" and 2") hose, a connecting piece (adapter) must be mounted. In this case a rigid connection is present.

1. Wrap male thread of the adapter with a suitable sealant (e.g. Teflon tape).
2. Screw the adapter to the pipeline, the manifold or the check valve.

5.3.3 Mounting the discharge nozzles

Personnel: ■ Authorized Distributor

Protective equipment: ■ Safety gloves
■ Protective goggles

Materials: ■ Sealant

⚠ WARNING

Life-threatening danger due to improperly functioning safety devices!

- **Do not paint over or cover discharge nozzles under any circumstances.**
- **Do not undertake any structural changes that influence the spray area of the discharge nozzles.**
- **Take impermissible spray obstructions into consideration** ***"Spray obstacles" on page 84*****.**

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

Position, orifice diameter, and the number of discharge nozzles 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 orifice diameter of the discharge nozzles.

1. Ensure that the pipeline system is properly installed to the install location of the discharge nozzles and that the required fittings are present.
2. **⚠ CAUTION! Danger of injury due to falling objects!**

   Remove or fasten inadequately fastened elements in the direct effective area of the discharge nozzles.
3. Arrange discharge nozzles based on their marking (value of the diameter of the orifice within the discharge nozzle) in the intended install positions.

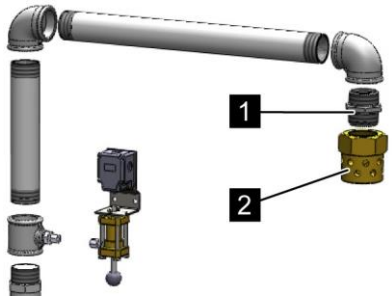


Fig. 59: Mounting the discharge nozzles

4. Wrap fitting (Fig. 59/1) with a suitable sealant (e.g. Teflon sealing tape) and screw the discharge nozzle (Fig. 59/2) onto the vertically aligned fitting.

   The discharge nozzles may be aligned vertically up and vertically down. Comply with locally valid fastening guidelines relative to the minimum screw-in depth.

5. Pay attention to correct alignment of the nozzle holes (particularly for 180° discharge nozzles).

6. Ensure that the required free space is available around the discharge nozzles, and that spray obstructions that were not considered in the design are not present.

   Comply with the minimum distances to installed elements and walls in accordance with locally valid regulations.

7. Ensure that the enclosure that will be protected by a discharge nozzle does not exceed the maximum protected enclosure *Chapter 12.2 "Performance values" on page 193*.

Spray obstacles

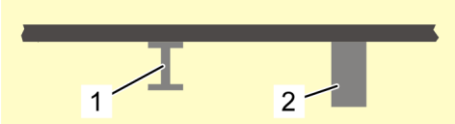


Fig. 60: Spray obstacles

1 Spray obstacle
2 Discharge nozzle

When designing the system possible spray obstructions (Fig. 60/1) must be taken into consideration and planned for. They should not be located in the direct discharge area of the discharge nozzles. The height of a potential spray obstruction, or whether the obstruction covers the nozzle stream are the crucial factors in determining whether a spray obstruction is acceptable or not.

If unacceptable spray obstructions occur retroactively, e.g. through structural changes, the position of the discharge nozzles or the number of discharge nozzles must be changed.

5.3.4 Mounting extinguishing agent containers

Personnel: ■ Authorized Distributor

Protective equipment: ■ Safety footwear
■ Safety gloves
■ Protective goggles

⚠ DANGER

Life-threatening danger due to improper procedure!

- **Comply with the sequence specified for mounting the extinguishing agent containers under all circumstances.**
- **Do not mount any extinguishing agent containers that are fouled or visibly damaged or that show deep corrosion in the floor area.**
- **Comply with locally applicable regulations governing the handling of extinguishing agent containers.**
- **Only remove the protective valve cap when the extinguishing agent container is properly fastened.**
- **Ensure that the valve outlet is always closed with an anti-recoil cap and connected to a pipeline.**
- **Keep the time in which the valve opening is not closed for assembly purposes as short as possible.**

  During this time period
  - **No release device may be mounted on the valve.**
  - **No integrated electrical release device may be connected electrically.**
  - **No one may stand in front of the valve outlet.**

If the extinguishing agent containers are improperly mounted, there is a danger of them being damaged. This can result in uncontrolled pressure compensation, that can cause severe or fatal injuries.

NOTICE

Material damage due to penetrating fouling!

- **Only remove the anti-recoil cap on the valve outlet directly before mounting the hose or the connecting piece on the extinguishing agent container.**
- **Remove the blind plug on the control outlet only directly before connecting a pilot line (optional).**

If fouling penetrates into the extinguishing agent container via the control or valve outlet, the functionality of the system can be impaired.

1. Transport the extinguishing agent container to the installation site in accordance with transport specifications ↬ *Chapter 4.4.1 “Transporting extinguishing agent containers” on page 69*.

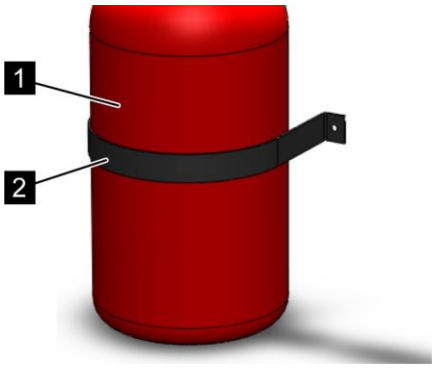


Fig. 61: Mounting extinguishing agent containers

2. Fasten extinguishing agent containers (Fig. 61/1) vertically on a wall or other structural elements with a clamp (Fig. 61/2).

   i Arrange the clamp in such a manner that the type plate of the extinguishing agent container is not covered.

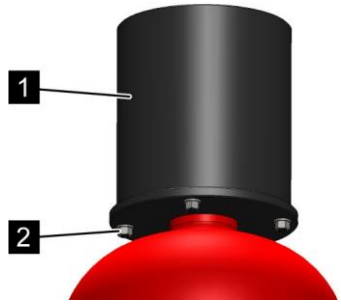


Fig. 62: Removing the protective valve cap

3. Unscrew the threaded unions (Fig. 62/2) on the underside of the protective valve cap (Fig. 62/1).
4. Remove the protective valve cap (Fig. 62/1) and keep it in a safe place for return transport of the extinguishing agent container.

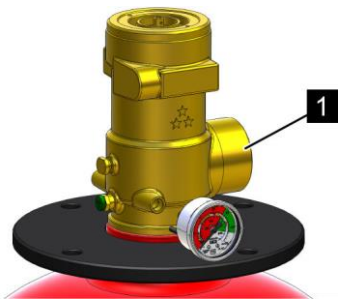


Fig. 63: Valve outlet

5. Remove the anti-recoil cap on the valve outlet (Fig. 63/1) and keep it in a safe place for return transport of the extinguishing agent container.

6. Ensure that the hose or the connecting piece (for the version without hose) is properly connected to the nozzle piping, the manifold, or the check valve ↳ *Chapter 5.3.2 “Mounting the hose or connecting piece” on page 82*.

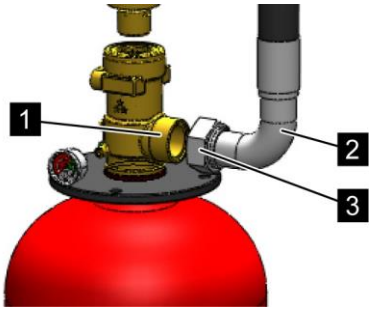


Fig. 64: Mounting the hose

7. **L CAUTION! Improper installation can result in leaks and thus escape of extinguishing agent!**

   Align valve outlet (Fig. 64/1) and cap nut (Fig. 64/3) of the hose (Fig. 64/2) or of the connecting piece (for version without hose) so that they are precisely flush.

8. Initially screw the cap nut (Fig. 64/3) of the hose (Fig. 64/2) or connecting piece (for the version without hose) to the valve outlet (Fig. 64/1) hand tight.

   If it is hard to turn the cap nut, check the alignment between valve outlet and cap nut.

9. Firmly tighten the cap nut of the hose or of the connecting piece (for the version without hose) with a wrench.

   Tighten this type of connection as follows:

   - Tighten the cap nuts until the seal surfaces are completely touching.
   - Then turn the cap nuts an additional ¼ turn.

   The connection between the cylinder valve and the pipeline is a component of the pipeline. The leakage checks of the pipe system required by the regulations should be conducted with a connected extinguishing agent container.

   The test pressure may not exceed 50% of the filling pressure of the extinguishing agent container. Pressure spikes that exceed this value should be avoided. Otherwise the valve could open.

   The connection is sealed metallically. Additional sealant is generally not required. If leakages occur in this connection in spite of correct assembly, an additional metal seal) can be used.*
   **) Seal DN40 hose VSH1230/200 (part no. 919305), seal DN50 hose VSH1230/200 (part no. 919306).*

Connecting the pilot line

10. Connect pilot lines to all intended pneumatic release devices and connect the malfunction pressure relief valve.

11. Remove the blind plug on the control outlet (Fig. 65/1) of the “master" extinguishing agent container and screw in the adapter.

12. Connect the pilot line on the control outlet of the “master" extinguishing agent container.

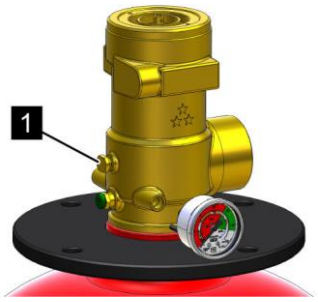


Fig. 65: Control outlet

5.3.5 Mounting the contact pressure gauge

Personnel: ■ Authorized Distributor

Each valve has two connections at which the contact pressure gauge can be connected. These are provided with a plug for protection.

Both connections have non-return valves, so that the contact pressure gauge can also be mounted if the extinguishing agent container is under pressure.

For UL and FM fire suppression systems, the contact pressure gauge will be shipped installed on the extinguishing agent containers.

1. Remove the blind plug on the valve.
2. Screw the contact pressure gauge (Fig. 66/2) into the connection on the valve (Fig. 66/1) as far as it turns easily *by hand*.

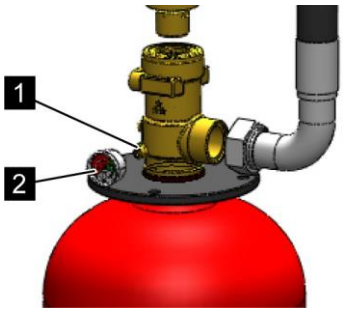


Fig. 66: Screw in the contact pressure gauge

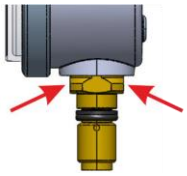


Fig. 67: Key surface

3. As soon as the contact pressure gauge is under pressure and is thus more difficult to turn, turn the contact pressure gauge on the key surface SW14 (Fig. 67) with a suitable tool until the stop in the connection.

   For alignment, the contact pressure gauge can be turned maximum ¾ turn back.

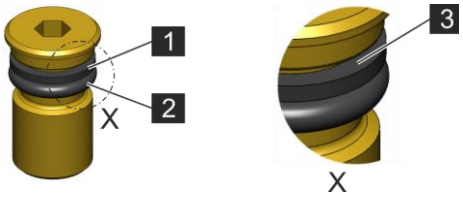


Fig. 68: Blind plugs

4. ***NOTICE!* Danger of leaks!**

   Check the valves to see whether all unused pressure gauge connections are closed off with blind plugs and the blind plugs are screwed in all the way.

   When mounting blind plugs, check whether the support ring (Fig. 68/1) and the O-ring (Fig. 68/2) are correctly mounted on the blind plug and are undamaged. The flat side of the support ring (Fig. 68/3) must be turned away from the O-ring.

5. Connect contact pressure gauge to the fire alarm center.

5.3.6 Mounting the malfunction pressure safety device

Personnel: ■ Authorized Distributor

Protective equipment: ■ Protective goggles

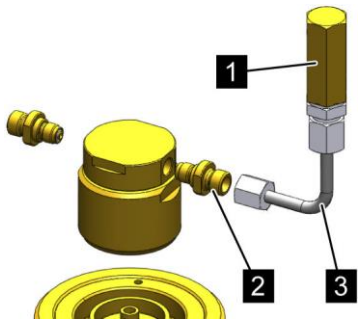


Fig. 69: Mounting the malfunction pressure safety device

1. Check pilot lines for any residues and clean them if necessary.
2. Install the adapter (Fig. 69/2) at the outlet of the last pneumatic release device in the pilot line in such a way that the “malfunction pressure safety device” (Fig. 69/1) can be screwed onto the adapter connector piece (Fig. 69/3) from above.
3. Screw the "malfunction pressure safety device" (Fig. 69/2) directly onto the adapter connecting piece or onto the adapter connecting piece that is fitted onto the pipe segment.
4. **LWARNING! Danger of injury due to malfunction caused by incorrect installation!**

   Ensure that the “malfunction pressure safety device” faces straight upwards.

5.3.7 Mounting the manual pressure relief valve

Personnel: ■ Authorized Distributor

Protective equipment: ■ Protective goggles

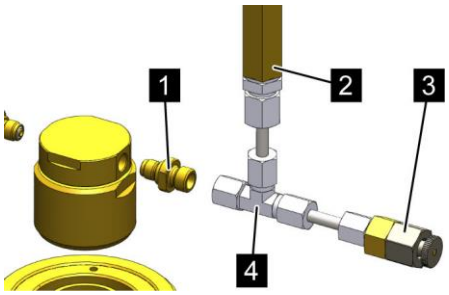


Fig. 70: Mounting the pressure relief valve

1. Check pilot lines for any residues and clean them if necessary.
2. Install the adapter (Fig. 70/1) on the outlet of the last pneumatic release device in the pilot line.
3. Connect the tee (Fig. 70/4) to the adapter in such a manner that the "malfunction pressure safety device" (Fig. 70/2) can be screwed on from above and the pressure relief valve (Fig. 70/3) can be screwed onto it horizontally.
4. Screw the "malfunction pressure safety device" and manual pressure relief valve onto the tee.
5. **LWARNING! Danger of injury due to malfunction caused by incorrect installation!**

   Ensure that the “malfunction pressure safety device” faces straight upwards.

5.3.8 Mounting the pneumatic release device (PAE, optional)

Personnel:
- Authorized Distributor
- Qualified electrician

Protective equipment:
- Safety gloves
- Safety footwear
- Protective goggles

Special tool:
- Clamping device (885530)

⚠ WARNING

Life-threatening danger due to improper procedure!

- **Comply with the sequence specified for mounting the containers under all circumstances.**
- **Do not mount any pressurized containers that are soiled or visibly damaged or that show deep corrosion in the floor area.**
- **Comply with locally applicable regulations governing the handling of pressurized containers.**
- **Ensure that the valve outlet is always closed with a cap or connected to a pipeline.**
- **Keep the time in which the valve opening is not closed for assembly purposes as short as possible.**

  During this time period
  - **No release device may be mounted on the valve.**
  - **No one may stand in front of the valve outlet.**

If pressurized containers are improperly mounted, there is a danger of them being damaged. This can result in uncontrolled pressure compensation, that can cause severe or fatal injuries.

The pneumatic release device (PAE) supplies all pneumatic system components with CO_2 as operating medium.

Operation of the pneumatic release device (PAE) is only acceptable with a protective hood or comparable contact protection. Alternatively the contact protection can be dispensed with if the pneumatic release device (PAE) is mounted in a separate room that cannot be accessed by unauthorized persons.

Preparing for wall mounting

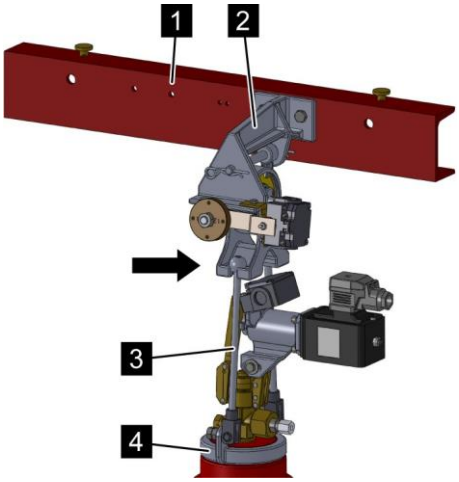


Fig. 71: Wall mounting

1. Screw the holder of the weighing device (Fig. 71/2) onto the U-profile (Fig. 71/1) with the M8 x 25 hex bolts.
2. Fasten the U-profile (Fig. 71/1) onto a bearing structural element.

   Take the height that is required for pilot cylinder, holding rods, and weighing device into consideration.

Mounting the weighing device

3. Insert weighing device with bolt into the holder of the weighing device.
4. Secure the bolt with spring cotter pins on both sides.

   ⇨ The weighing device is fastened.

Mounting the suspension element

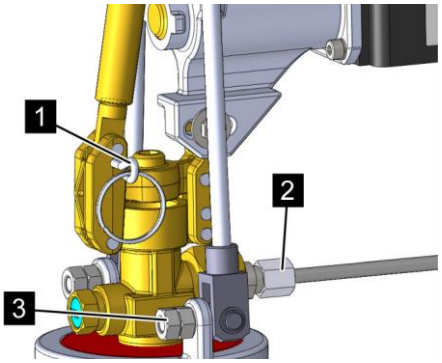


Fig. 72: Lock pin

5. Remove the protective cap of the pilot cylinder.
6. **WARNING! Danger of a faulty release!**

   Ensure that the lock pin (Fig. 72/1) is inserted in the valve.
7. Screw the suspension element onto the pilot cylinder and align it in such a manner that the fastenings of the holding rods and the control connection are aligned at right angles, and so that the pilot line can be safely mounted.
8. Mount M8x20 ring bolts with nuts (Fig. 72/3) on the fastenings of the holding rods in such a manner that the ring is vertical and points in the direction of the control connection (Fig. 72/2).

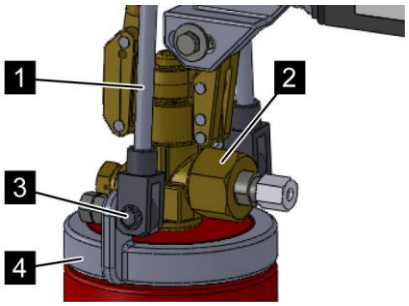


Fig. 73: Screw in the adapter

→ Fit retaining rods (Fig. 73/1) onto the ring bolts from above and fasten to the suspension element (Fig. 73/3) with snap bolts (Fig. 73/4).

10. Screw the adapter (Fig. 73/2) with seal into the control connection of the valve.

11. Hook the pilot cylinder into the weighing device (Fig. 71/arrow) by means of the holding rods (Fig. 71/3).

Mounting the EM release device

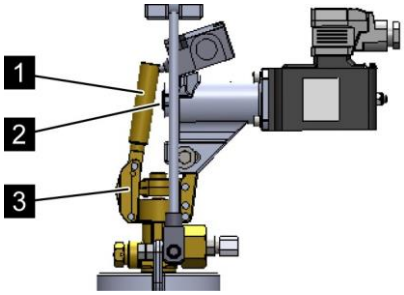


Fig. 74: Valve lever

12. **⚠ WARNING! Danger of a faulty release!**

Unscrew the valve lever (Fig. 74/1) from the valve (Fig. 74/3) of the pilot cylinder.

13. Ensure that the EM release device is not tensioned, i.e. that the release pin (Fig. 74/2) is projecting.

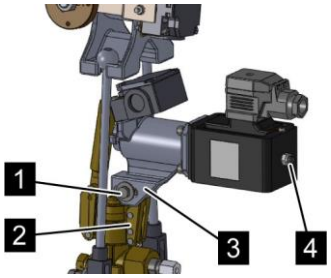


Fig. 75: Mounting the EM release device

14. First loosely fasten the holder (Fig. 75/3) of the EM release device with the included hex bolt (Fig. 75/1), hex nut and washer on the base of the valve (Fig. 75/2).

ℹ Ensure that the release pin is centered and pointing to the valve lever.

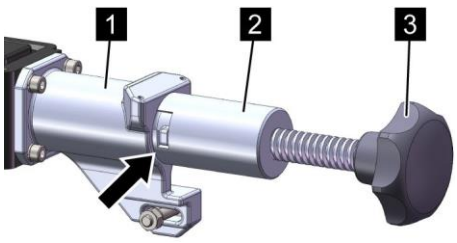


Fig. 76: Clamping device

15. Fit the clamping device (Fig. 76/2) onto the holder of the EM release device (Fig. 76/1) and fix it in place (Fig. 76/arrow).

16. By turning the adjustment wheel, push the release pin (Fig. 76/3) of the clamping device far enough into the housing that the locking bolt (Fig. 75/4) can be pushed in the counter direction and lock the release pin.

9.

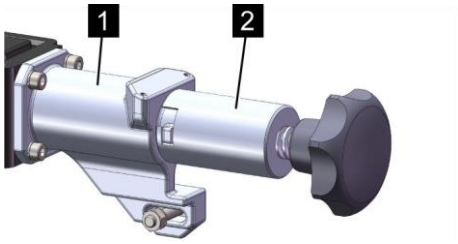


Fig. 77: Clamping device

17. Remove clamping device (Fig. 77/2) from the holder (Fig. 77/1).
18. Fit the valve lever onto the valve of the pilot cylinder again.
19. Align the EM release device in such a manner that the distance between release pin and valve lever is 3 ± 1 mm (0.12 ± 0.04 inches).
20. Tighten the hex nut (Fig. 75/1).
21. Establish the electrical connection ↳ *"Release device EM" on page 127*.

    ⇨ The EM release device is mounted.

Mounting the monitor of the EM release device

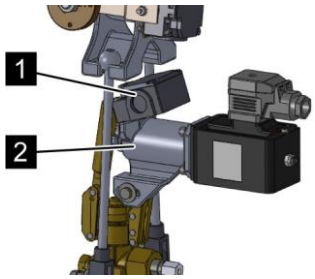


Fig. 78: Mounting the monitor

22. Connect the limit switch (Fig. 78/1) as shown in the terminal diagram ↳ *"Monitoring of the release device EM" on page 127*.
23. Loosely fasten the limit switch (Fig. 78/1) with cylinder-head screws and washers on the holder of the EM release device (Fig. 78/2).
24. Align the limit switch (Fig. 78/1) in such a manner that the contact is activated with the valve lever.
25. Tighten the cylinder screws.

    ⇨ The monitoring of the EM release device is mounted.

Mounting the leakage monitor

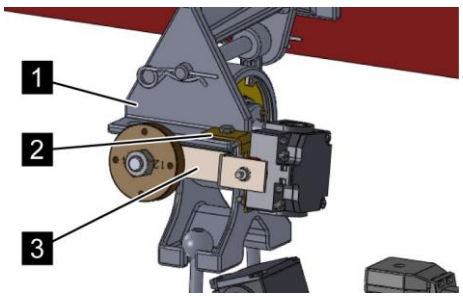


Fig. 79: Mounting the leakage monitor

26. Fasten the limit switch of the leakage monitor with the provided cylinder screws, washers and nuts on the holder of the leakage monitor (Fig. 79/2).
27. Mount the holder (Fig. 79/2) with mounted limit switch with screw, washer and nut on the holder of the weighing device (Fig. 79/1).
28. Fasten the magnets with the countersunk head screw, washer, and hex nut on the second holder (Fig. 79/3).

29. Guide the second holder (Fig. 79/3) to the threaded rod and fasten it with hex nut in the horizontal position to the weighing device.

   Ensure that the magnet and limit switch are flush on the facing side and that the contact between the magnet and limit switch is not greater than 10 mm (0.4 inch).

30. Establish the electrical connection of the leakage monitor *“Loss monitoring” on page 128*.

Adjusting the weighing device

31. See the order documentation for the filling quantity of the pilot cylinder and calculate the number of counterweight revolutions for 5% of the filling based on the example below.

32. If the pilot cylinder has a filling quantity of 5.4 l, shorten the threaded rod by 50 mm (2 inches).

33. Select the counterweight in accordance with the table below *“Calculating the number of counterweight turns” on page 96*.

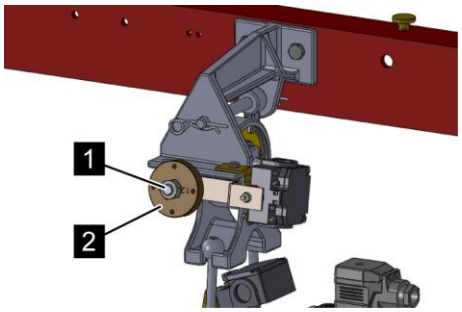


Fig. 80: Adjusting the weighing device

34. Screw the counterweight (Fig. 80/2) far enough onto the threaded rod (Fig. 80/1) that it still goes into the self-holder.

   For small cylinders with small counterweights proceed with particular care, as the weighing device reacts with more sensitivity the smaller the masses are.

35. Turn the counterweight by the calculated number of counterweight turns (*“Calculating the number of counterweight turns” on page 96*) clockwise.

36. Tighten the lock nuts.

37. Secure the counterweight with seal wire.

   ⇨ The weighing device is correctly adjusted.

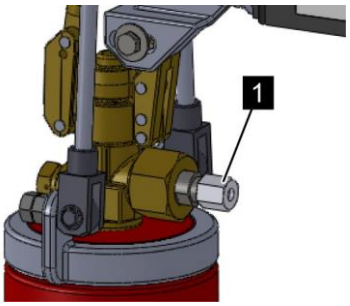


Fig. 81: Connecting the pilot line

38. Connect the pilot line on the control connection (Fig. 81/1) of the valve.

Pipe in accordance with DIN 2394-C-RSt 34-2 NBK-6x1

- *with galvanized outer casing in accordance with EN 12329-FE//Zn 12//C*
- *with acceptance test certificate 3.1 in accordance with EN 10204 for material and internal pressure check 210 bar (3046 psi)*

If a pipeline is to be used as a pilot line, only use the pipeline DN6 (nominal diameter 4 mm ($^{5}/_{32}$“)) available from the manufacturer: Part number: 823563

Mounting the protective hood

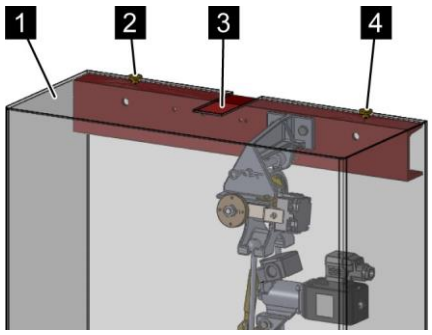


Fig. 82: Mounting the protective hood

39. Screw the protective hood (Fig. 82/1) onto the U-profile (Fig. 82/3) from above (Fig. 82/2+4).

Calculating the number of counterweight turns

Container size	Net fill quantity	Required counterweight	Adjustment constant in kg/turn (lbs/turn)
5.4 l	3.6 kg (7.94 lbs)	0.16 kg (0.35 lbs)	0.19 (0.42)
10.7 l	6.8 kg (15.0 lbs)	0.3 kg (0.66 lbs)	0.25 (0.55)
10.7 l	7.1 kg (15.65 lbs)	0.3 kg (0.66 lbs)	0.25 (0.55)

The calculation of the number of counterweight turns is shown in the example below:

Example

```
Number of counterweight turns =
net fill quantity * 5%/adjustment constant
```

Sample calculation of a pilot cylinder with a volume of 5.4 l and a net fill quantity of 3.6 kg (7.94 lbs).

```
3.6 kg * 0.05 = 0.18 kg

0.18 kg/0.19 kg/turn = 0.95 turns =
number of counterweight turns

7.94 lbs * 0.05 = 0.4 lbs

0.4 lbs/0.42 lbs/turn = 0.95 turns =
number of counterweight turns
```

5.3.9 Mounting the release devices

⚠ WARNING

Risk of injury due to possible pressurized containers!

- **Ensure that the valve outlet is always closed with an anti-recoil cap and connected to a pipeline.**
- **Keep the time in which the valve opening is not closed for assembly purposes as short as possible.**

  During this time period
  - **No release device may be mounted on the valve.**
  - **No integrated electrical release device, if any, may be connected electrically.**
  - **No one may stand in front of the valve outlet.**

If pressurized extinguishing agent containers/pilot cylinders are damaged and if extinguishing agent/gas escapes in an uncontrolled manner, serious injury or death may occur.

NOTICE

Material damage due to improper mounting!

- **Only apply tools on the intended wrench flat.**
- **Only use standard tools such as adjustable wrenches for mounting the release devices.**

If the release devices are improperly mounted or incorrectly mounted they can be damaged and thus rendered unusable.

5.3.9.1 Interconnecting the pneumatic release devices

Personnel: ■ Authorized Distributor

Special tool: ■ Wrench

Materials: ■ DN4 hose ($^5/_{32}$ inch)

■ Adapter M12x1.5 (part number 887644)

⚠ WARNING

Danger due to excessive extinguishing agent concentration!

– **If the main and reserve batteries are connected to the same manifold without hydraulic separation, either use exclusively electrical release devices on all valves or pneumatic release devices (PAE).**

If main and reserve extinguishing agent containers are connected to a manifold without hydraulic separation (e.g. by a ball valve in the manifold between the main and reserve extinguishing agent container) and in the main and reserve batteries extinguishing agent containers "slave" are pneumatically triggered via the control outlet of the valve of an extinguishing agent container "master", even the smallest leaks in the check valve on the extinguishing agent container "master" of the reserve battery can lead to the inadvertent triggering of all pneumatically activated extinguishing agent containers of the reserve battery.

Multi-container systems are equipped with several extinguishing agent containers. So that these all open when the system is activated, they must be interconnected via a pilot line. A DN4 ($^5/_{32}$") hose or a rigid pipeline that satisfies the locally valid regulations and the current state of technology can serve as the pilot line.

The following versions use a DN4 ($^5/_{32}$ inch) hose as pilot line.

The pilot line must be attached between the valve of the “pilot cylinder" extinguishing agent container and a pneumatic release device of a slave extinguishing agent container if present between the pneumatic release devices of multiple “slave” extinguishing agent containers. Each pneumatic release device has two control connections for this purpose.

1. Secure the extinguishing agent container in such a manner that an unintentional activation cannot occur.
2. Ensure that the connection thread for control connections and adapters are free of grease and are clean.
3. Remove the blind plugs at the control outlet of the “master" extinguishing agent container.
4. **LWARNING! Danger of injury due to escaping extinguishing agent!**

   Immediately after removing the blind plug, attach a self-enclosed pilot line to the control outlet.

   The pilot outlet must always either be closed with a blind plug or a self-enclosed pilot line must be attached to the control outlet.
   If the control outlet is open, when the system is activated there is a loss of extinguishing agent that can lead to system failure and thus to severe injuries or even death.
5. Screw the adapter into the control connection (Fig. 83/1) of the valve of the "pilot cylinder" extinguishing agent container and tighten with 8 +0/-2 Nm (5.9 +0/-1.5 ft-lb).

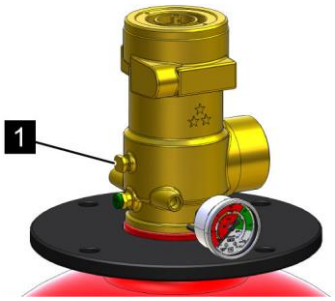


Fig. 83: Control connection

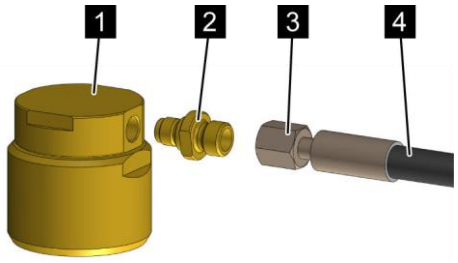


Fig. 84: Connecting the pilot line

6. Screw the adapter (Fig. 84/2) into a control connection of the pneumatic release device (Fig. 84/1) of a "slave" extinguishing agent container and tighten with 8 +0/-2 Nm (5.9 +0/-1.5 ft-lb).
7. Connect the DN4 hose ($^{5}/_{32}$"; Fig. 84/4) with the adapters. To do this fit the hose onto the adapters and screw the cap nut (Fig. 84/3) with a wrench onto the thread of the adapter without using sealant.
8. Ensure that the hose is not subjected to torsion and is only bent in one direction.

   Do not underrange the minimum bending radius of 90 mm (3 $^{1}/_{2}$ inch).
9. Control connections on which a pilot line is not connected must be sealed with a plug.

5.3.9.2 Mounting the pneumatic release device

Personnel: ■ Authorized Distributor

Pneumatic release devices are used for pneumatic activation of the valves of extinguishing agent containers.

A pneumatic release device can also be mounted on an electrical release device as a supplemental release device, if it does not have a mechanical blocking device.

The following steps apply for the pneumatic release devices and pneumatic/manual release devices. Before a pneumatic release device or pneumatic/manual release device can be mounted on the valves, it must be checked for function and leaks.

Checking

1. Check the pneumatic release device for function and leaks ↬ *Chapter 8.5.5 “Checking the pneumatic release device” on page 158*.

Mounting

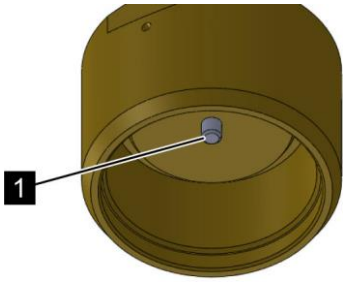


Fig. 85: Release pin

2. **⚠ WARNING! Danger of a faulty release!**

   Prior to mounting, carefully press the release pin (Fig. 85/1) inward as far as possible and insert the lock pin (only for pneumatic/manual release devices).

   Purely pneumatic release devices have a spring that presses the release pin into the resting position while in a depressurized state. But it must be checked whether this is the case.

   ⇨ The release device is inactive.

3. Unscrew the protective cap of the release device on the valve and keep it in a safe place.

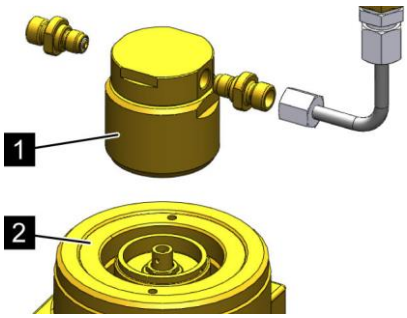


Fig. 86: Mounting the release device

4. Screw the release device (Fig. 86/1) onto the valve (Fig. 86/2) from above, or screw on the electrical release device and tighten with 50 +0/-15 Nm (36.9 +0/-11.1 ft-lb) until it metallically rests on the valve.

   Just before the release device rests on the valve (approximately the last 10 mm (0.4 inches)), the resistance when screwing on will increase.

5. Ensure that the hose is not subjected to torsion and is only bent in one direction.

5.3.9.3 Mounting the electrical release device

Version without mechanical blocking device

Personnel: ■ Authorized Distributor

Special tool: ■ Screw reset tool (887645)

Before an electrical release device is mounted it must be checked.

1. Check the release device for external damage and fouling.
2. **⚠ WARNING! Danger of faulty release!**

   Ensure that all release devices are unscrewed completely from the extinguishing agent cylinders.
3. **⚠ WARNING! Risk of injury due to release pin coming out suddenly.**

   During test releases, do not reach into the area around the release pin (Fig. 87/1).
4. Activate the release device with 24 V DC.
5. Check whether the red marking (Fig. 87/2) is visible on the release pin (Fig. 87/1).

   If the release pin has been correctly activated, the red marking must be visible. If it is not visible the release device is defective and must be replaced.
6. Switch off the power.

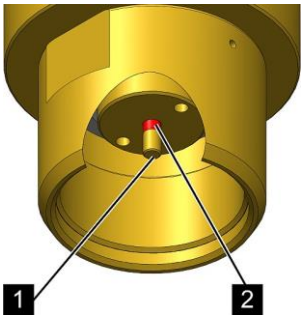


Fig. 87: Release pin

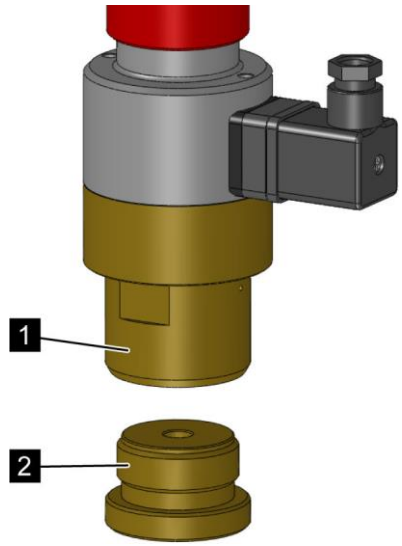


Fig. 88: Resetting the release pin

7. Screw the screw reset tool (Fig. 88/2) onto the electrical release device (Fig. 88/1) by hand until the stop.
8. Unscrew the screw reset tool and remove it.

   ⇨ If the red marking can no longer be seen the electrical release device is deactivated.

Checking the version with mechanical blocking* **not UL**

Personnel: ■ Authorized Distributor

Special tool: ■ Screw reset tool (887645)

Release devices with mechanical blocking must also be checked.

1. Check the release device for external damage and fouling.
2. **⚠ WARNING! Danger of faulty release!**

   Ensure that all release devices of extinguishing agent cylinders are unscrewed.
3. Unscrew the hex nut (Fig. 89/1).
4. Switch the hand lever (Fig. 89/4) to the “ready for operation” position.
5. Tighten the hex nut (Fig. 89/1) with 10 ± 2 Nm (7.38 ± 1.48 ft-lb).

   ⇨ The "ready for operation" position is secured.
6. **⚠ WARNING! Risk of injury due to release pin coming out suddenly.**

   During test releases, do not reach into the area around the release pin (Fig. 90/1).
7. Activate the release device (Fig. 89/2) with 24 V DC.

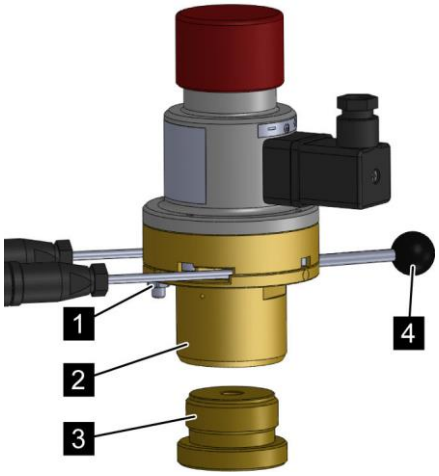


Fig. 89: Release device with mechanical blocking

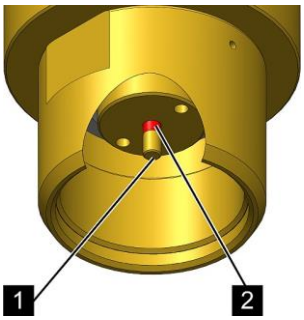


Fig. 90: Release pin

8. Check whether the red marking (Fig. 90/2) is visible on the release pin (Fig. 90/1).

   If the release pin has been correctly activated, the red marking must be visible. If it is not visible the release device is defective and must be replaced.

9. Switch off the power.
10. Screw the screw reset tool (Fig. 89/3) onto the electrical release device (Fig. 89/2) by hand until the stop.
11. Unscrew the screw reset tool (Fig. 89/3) and remove it.

    ⇨ If the red marking can no longer be seen the electrical release device is deactivated.

12. Unscrew the hex nut (Fig. 89/1).
13. Switch the hand lever (Fig. 89/4) to the “isolated” position.
14. Tighten the hex nut (Fig. 89/1) with 10 ± 2 Nm (7.38 ± 1.48 ft-lb).

    ⇨ The "isolated" position is secured.

15. Activate the release device (Fig. 89/3) with 24 V DC.
16. Check whether the red marking is visible on the release pin.

    When the blocking is functioning correctly the red marking should no longer be visible. If it is visible the release device is defective and must be replaced.

17. Switch off the power.
18. Unscrew the hex nut (Fig. 89/1).
19. Switch the hand lever (Fig. 89/4) to the “ready for operation” position.
20. Tighten the hex nut (Fig. 89/1) with 10 ± 2 Nm (7.38 ± 1.48 ft-lb).

    ⇨ The "ready for operation" position is secured.

21. Screw the screw reset tool (Fig. 89/3) onto the electrical release device (Fig. 89/2) by hand until the stop.

22. Unscrew the screw reset tool (Fig. 89/3) and remove it.

⇨ If the red marking can no longer be seen the electrical release device is deactivated.

Mounting on extinguishing agent cylinders

Personnel:
- Authorized Distributor
- Qualified electrician

Special tool:
- Screw reset tool (887645)

Electrical release devices are used for electrical activation of the valves of extinguishing agent cylinders. The following 2 versions are available:

- Electrical release device without mechanical blocking device
- Electrical release device with mechanical blocking device

1. **WARNING! Danger of faulty release!**

   Ensure that the electrical release device is deactivated.

   In the activated state a red marking can be seen on the release pin. If the electrical release device is activated it must first be deactivated.

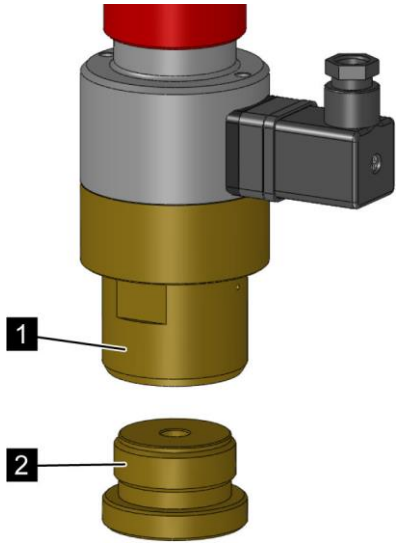


Fig. 91: Resetting the release pin

2. Screw the screw reset tool (Fig. 91/2) onto the electrical release device (Fig. 91/1) by hand until the stop.
3. Unscrew the screw reset tool (Fig. 91/2) and remove it.

   ⇨ If the red marking can no longer be seen the electrical release device is deactivated.
4. Unscrew the protective cap of the release device on the valve and keep it in a safe place.
5. Screw the release device onto the valve from above and tighten with 50 +0/-15 Nm (36.878 +0/-11.063 ft-lb) until it metallically rests on the valve.

   Just before the release device rests on the valve (approximately the last 10 mm (0.4 inches)), the resistance when screwing on will increase.

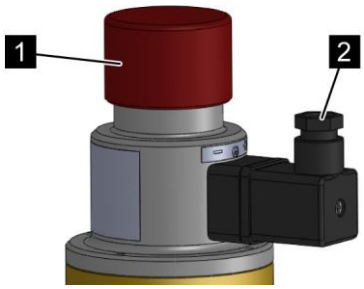


Fig. 92: Protective cap

6. If no additional pneumatic release devices will be screwed on, screw a protective cap (Fig. 92/1) onto the free thread on the top side of the electrical release device.

7. Fit the device plug onto the connection (Fig. 92/2) on the electrical release device.

   Pay attention to the terminal assignments
   Chapter 6.4 “Terminal assignment of the electrical release device” on page 125.

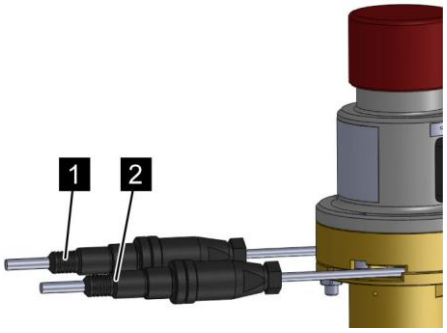


Fig. 93: Round plugs

8. Screw the connectors of the provided cables onto the round plugs (Fig. 93/1+2) of the connecting cable of the micro switches and connect them to the fire extinguishing detection system (only for electrical release devices with blocking device).

   The plug connections are different so that they cannot be confused.

Mounting on the pilot cylinder

Personnel: ■ Authorized Distributor

If the system has a pneumatic release device (PAE) with pilot cylinder, then EM release devices are used.

Mounting a pneumatic release device (PAE) is explained in a separate section of the manual
Chapter 5.3.8 “Mounting the pneumatic release device (PAE, optional)” on page 91.

5.3.9.4 Mounting a manual release device* not VdS, not CNPP/A2P

Personnel: ■ Authorized Distributor

Manual release devices are used for manual activation of the valves of extinguishing agent containers.

A manual release device can also be mounted on an electrical release device as a supplemental release device, regardless of whether or not it has a mechanical blocking device. However in this case the electrical release device should not yet be mounted.

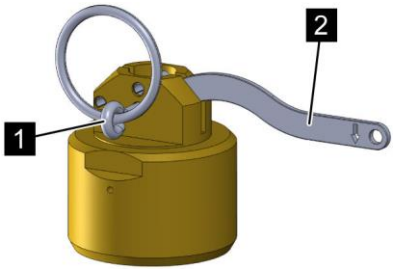


Fig. 94: Lock pin

1. **WARNING! Danger of a faulty release!**

   Prior to mounting bring the lever (Fig. 94/2) of the manual release device into start position.

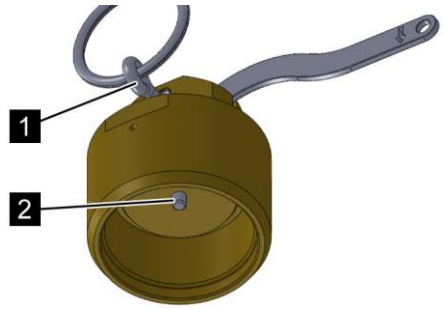


Fig. 95: Release and lock pin

2. Carefully press the release pin (Fig. 95/2) inward as far as possible.
3. Insert the lock pin (Fig. 95/1) into the manual release device.
4. If the manual release device will be screwed onto an electrical release device, remove the protective cap of the electrical release device.
5. Screw the release device onto the valve from above and tighten with 50 +0/-15 Nm (36.878 +0/-11.063 ft-lb) until it metallically rests on the valve.

   Just before the release device rests on the valve (approximately the last 10 mm (0.4 inches)), the resistance when screwing on will increase.

5.3.9.5 Mounting the monitor for external electrical release devices

Personnel: ■ Authorized Distributor

The monitor is only suitable for electrical release devices without integrated blocking devices.

Follow the operation manual of the switch

The electrical release device has been removed

The following steps apply to the mounting of the monitor for cases in which the electrical release device has been removed.

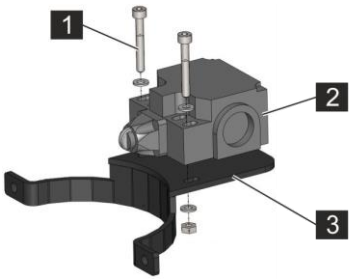


Fig. 96: Mounting the switch

Mounting of the monitor with a mounted electrical release device *“The electrical release device is mounted” on page 109*.

1. Attach the switch (Fig. 96/2) with the screws (Fig. 96/1), washers (4 pcs) and nuts to the clamp (Fig. 96/3). (Do not tighten the screws yet.)

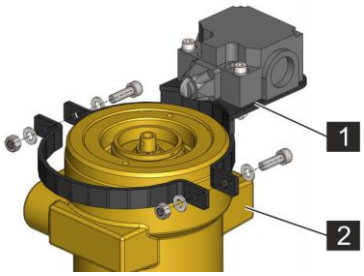


Fig. 97: Removing the clamp

2. Fasten both halves of the clamp (Fig. 97/1) to the upper collar of the valve (Fig. 97/2) with a torque of 5 ± 0.5 Nm (3.69 ± 0.37 ft-lb).
3. **⚠ WARNING! Danger of a faulty release!**

   Ensure that the electrical release device is deactivated.

   In the activated state a red marking can be seen on the release pin. If the electrical release device is activated it must first be deactivated “Mounting on extinguishing agent cylinders” on page 105.
4. Screw the electric release device (Fig. 98/1) onto the valve (Fig. 98/2) from above *“Mounting on extinguishing agent cylinders” on page 105*.

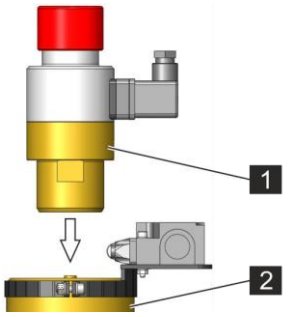


Fig. 98: Mounting the electrical release device

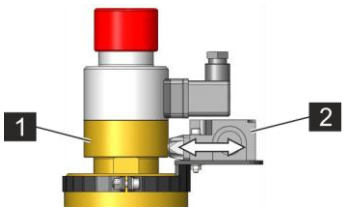


Fig. 99: Adjusting the switch

5. Pull the switch (Fig. 99/2) as far as possible from the housing of the electrical release device (Fig. 99/1).
6. Slide the against the housing of the electrical release device until you hear a clicking sound.

7. Pull the switch away from the electrical release device by 1 to 2 mm (0.039 to 0.079 inches).

   *While pulling, **no** clicking sound should be heard!*

8. Fasten the screws of the switch with a torque of 3 ± 0.3 Nm (2.21 ± 0.22 ft-lb).

9. Check whether the switch is in the switched state.

The electrical release device is mounted

The following steps apply to mounting the monitor in cases in which the electrical release device is mounted.

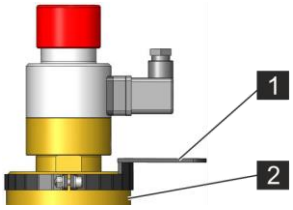


Fig. 100: Removing the clamp

1. Fasten both halves of the clamp (Fig. 100/1) to the upper collar of the valve (Fig. 100/2) with a torque of 5 ± 0.5 Nm (3.69 ± 0.37 ft-lb).

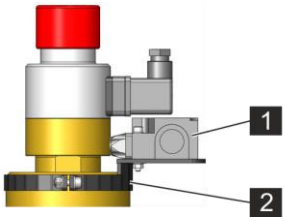


Fig. 101: Mounting the switch

2. Attach the switch (Fig. 101/1) with the screws, washers (4 pcs) and nuts to the clamp (Fig. 101/2). (Do not tighten the screws yet.)

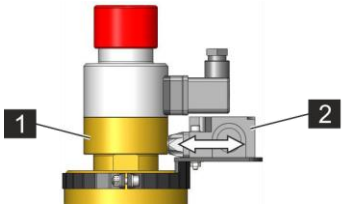


Fig. 102: Adjusting the switch

3. Pull the switch (Fig. 102/2) as far as possible from the housing of the electrical release device (Fig. 102/1).

4. Slide the against the housing of the electrical release device until you hear a clicking sound.

5. Pull the switch away from the electrical release device by 1 to 2 mm (0.039 to 0.079 inches).

   *While pulling, **no** clicking sound should be heard!*

6. Fasten the screws of the switch with a torque of 3 ± 0.3 Nm (2.21 ± 0.22 ft-lb).

7. Check whether the switch is in the switched state.

5.4 Mounting supplemental components of a multi zone system

5.4.1 Mounting selector valves

Personnel: ■ Authorized Distributor

Protective equipment: ■ Safety gloves
■ Safety footwear

⚠ WARNING

Danger of injury due to improper handling!

- **Mount selector valves in a separate room that cannot be accessed by unauthorized persons.**
- **If this is not possible, initiate other measures that prevent access to the selector valves by unauthorized persons.**

If unauthorized personnel have access to the selector valves, improper operation and incorrect settings can result in system malfunctions.

Selector valves DN25/DN40/ DN50 (1"/1 $^1/_2$"/2")

The selector valves DN25 (1"), DN40(1 $^1/_2$") and DN50 (2") are delivered in three pieces:

- Selector valve
- Distributor
- Bracket (manifold support)

The distributors are pre-assembled for the specific design. The safety valve is assembled by the manufacturer.

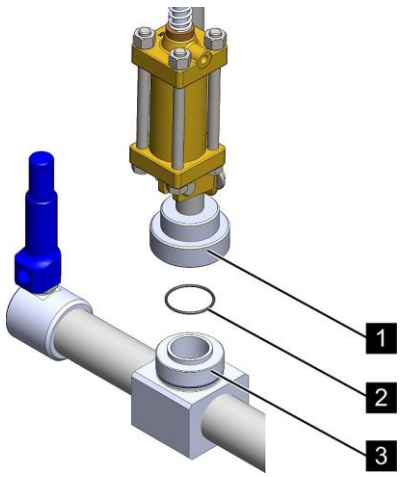


Fig. 103: Using O-ring

1. Grease the O-ring (Fig. 103/2) and O-ring seat and insert it into the flange connection (Fig. 103/3) on the distributor.
2. Fasten the selector valve with flange (Fig. 103/1) on the distributor.
3. Fasten the distributor on the bracket in such a manner that it can withstand the anticipated stress.
4. Bolt the bracket onto the floor.

   i Ensure that there is sufficient load-bearing capacity and that the construction is not subject to torsion or other stress.
5. Connect the outlet pipe of the selector valve onto the nozzle pipe system.
6. Connect the manifold on the threaded connection of the distributor.

7. Connect the pilot line from the pneumatic release device (PAE) to the connection of the pneumatic cylinder.
8. Mount the safety relief line for the safety valve and connect it to the safety valve *Chapter 5.4.8 “Connecting the safety valves to the safety relief line” on page 122*.

Selector valves DN65/DN80/ DN100 (2 $^1/_2$"/3"/4")

The selector valves DN65 (2 $^1/_2$"), DN80 (3") and DN100 (4”) are manufactured according to the design and delivered completely pre-assembled.

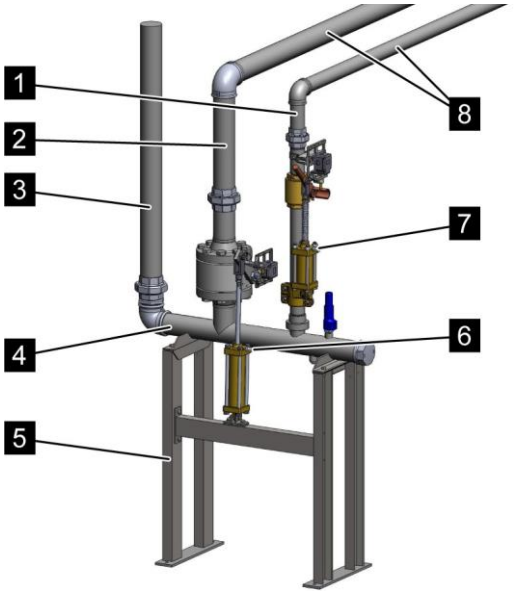


Fig. 104: Mounting selector valves DN65/DN80/DN100 (2 $^1/_2$""/3"/4")

1. Bolt the bracket (Fig. 104/5) onto the floor.

   Ensure that there is sufficient load-bearing capacity and that the construction is not subject to torsion or other stress.
2. Connect the outlet pipes (Fig. 104/1+2) of the selector valves to the nozzle pipe system (Fig. 104/8).
3. Connect the manifold (Fig. 104/3) to the distributor (Fig. 104/4).

4. Connect the pilot line from the pneumatic release device (PAE) to the connections of the pneumatic cylinders (Fig. 104/6+7).

   Connect the pilot line of the DN100 (4 inch) selector valves in such a manner that both pneumatic cylinders are activated simultaneously. To do this the pilot line for both pneumatic cylinders must have the same diameter and the same length.

5. Mount the safety relief line for the safety valve and connect it to the safety valve *Chapter 5.4.8 "Connecting the safety valves to the safety relief line" on page 122*.

Mounting the limit switches

Personnel:
- Authorized Distributor
- Qualified electrician

Protective equipment:
- Safety gloves

On each selector valve a limit switch (Fig. 105/1+2) must be mounted that is used to evaluate the position of the selector valves on the fire detection and extinguishing control panel.

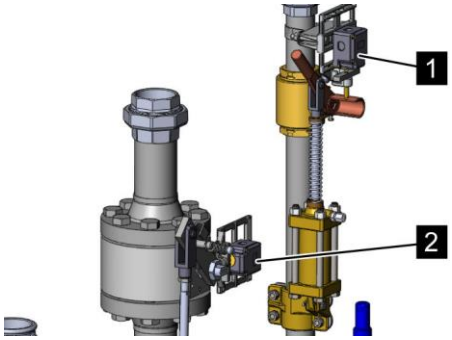


Fig. 105: Limit switch

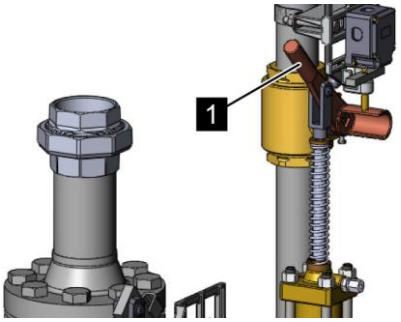


Fig. 106: Operating element

1. Fit the hand lever (Fig. 106/1) onto the operating element of the selector valve.
2. Close the selector valve. To do this push the hand lever upward in the upper limit position.

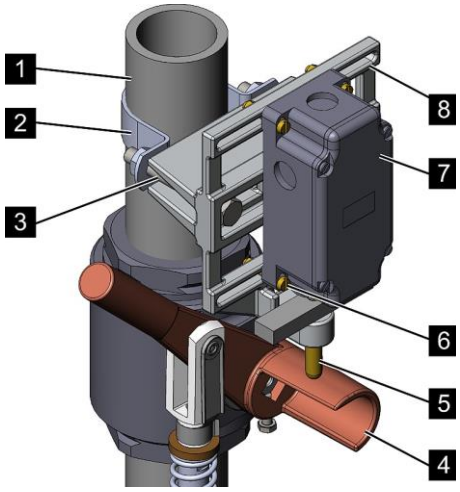


Fig. 107: Mounting the limit switches

3. Place the pipe clamp (Fig. 107/2) around the output pipe (Fig. 107/1) of the selector valve.
4. Insert the hex bolts (Fig. 107/3) through the bracket (Fig. 107/8) of the limit switch and of the pipe clamp (Fig. 107/2).
5. Fit on the washers and counter the hex bolts with the hex nuts.

   Lightly tighten the hex bolts.
6. Align the bracket (Fig. 107/8) of the limit switch in such a manner that the tappet (Fig. 107/5) rests on the eccentric of the operating element (Fig. 107/4).
7. Tighten the hex bolts (Fig. 107/3).
8. Place the limit switch (Fig. 107/7) with the bolts (Fig. 107/6) on the bracket in such a manner that the bolts fit through the slotted holes of the bracket (Fig. 107/8).
9. Fit on the washers and counter the bolts with nuts.
10. Establish the electrical connection of the limit switch *Chapter 6.9 “Terminal assignment of the pneumatically actuated limit switch” on page 129*.

5.4.2 Mounting the manifold

Personnel: ■ Authorized Distributor

Protective equipment: ■ Safety gloves
■ Protective goggles

Manifolds are not included in the scope of delivery. They can be manufactured individually on site and they must be able to withstand operating pressure of 60 bar.

1. Ensure that the manifolds are made of the same material as the distribution pipes and sized so that the general requirements imposed on pipelines are maintained *Chapter 5.2 “Requirements imposed on the pipeline system” on page 78*.
2. Check the compressive strength and permeability of the manifolds in accordance with locally prescribed test pressure.

3. Connect the manifold to the distribution pipe of the selector valves [DN 25 (1inch), 40 (1 $^1/_2$inch), 50 (2inch)] or to the thread [DN 65 (2 $^1/_2$ inch) or flange connection [DN 80 (3inch) und 100 (4inch)] of the selector valves.

5.4.3 Mounting the pilot distributor

Personnel:
- Authorized Distributor
- Qualified electrician

Protective equipment:
- Safety gloves
- Safety footwear

⚠ WARNING

Danger of injury due to escaping extinguishing agent!

– Mount pilot distributors in the control room for extinguishing agents.

– Alternatively mount the pilot distributor in such a manner that it cannot be accessed by unauthorized persons (e. g. separate room, enclosure, etc.).

If there is manipulation or wrong allocation of extinguishing zones, faulty flooding of extinguishing zones can occur when the system is activated. This can cause severe injuries and material damage.

For multi zone systems pilot distributors can be used as an alternative to solenoid valves. They must be mounted upstream from the blocking devices.

Not included in the scope of delivery:

- Adapter CO_2 connection:
  - DN4 ($^5/_{32}$"): Part. No. 827325
  - DN8 ($^5/_{16}$"): Part. No. 855425
- Monitor of the EM release device: Part. No. 885740

Mounting the distributor block

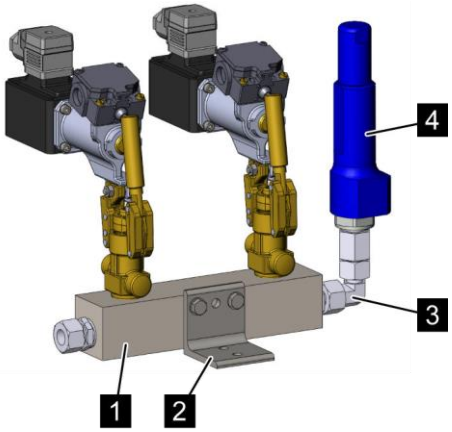


Fig. 108: Mounting the distributor block

1. Screw the holder (Fig. 108/2) on the distributor block (Fig. 108/1).
2. Screw the distributor block with holders onto the floor or bearing structural elements in such a manner that it is aligned horizontally and that the valves are standing vertically.
3. Mount a short connecting piece (Fig. 108/3) on the end of the valve block so that the safety valve (Fig. 108/4) can be mounted vertically upward.
4. Mount the safety valve on the end of the distributor block vertically and in such a manner that in the event of an activation no danger exists for personnel due to escaping CO_2.
5. **L WARNING! Danger of suffocation due to uncontrolled escape of CO_2.**

   Provide a blow-off line to the outside.

Mounting the EM release device

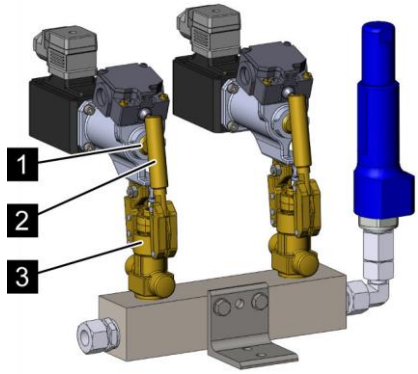


Fig. 109: Mounting the EM release device

6. Unscrew the valve lever (Fig. 109/2) from the valve (Fig. 109/3) of the distributor block.
7. Ensure that the EM release device is not tensioned, i.e. that the release pin (Fig. 109/1) is projecting.

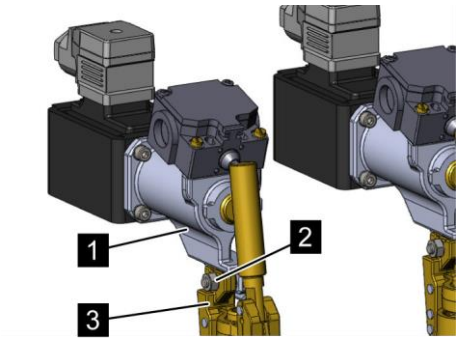


Fig. 110: Mounting the EM release device

8. First loosely fasten the holder (Fig. 110/1) of the EM release device with the included hex bolt (Fig. 110/2), hex nut and washer on the base (Fig. 110/3). Mount the washer in front of the slot hole of the EM release device.

   Ensure that the release pin is centered and pointing to the valve lever.

9. Push the release pin with the clamping device far enough into the housing that the locking bolt can be pushed in the counter direction and lock the release pin.

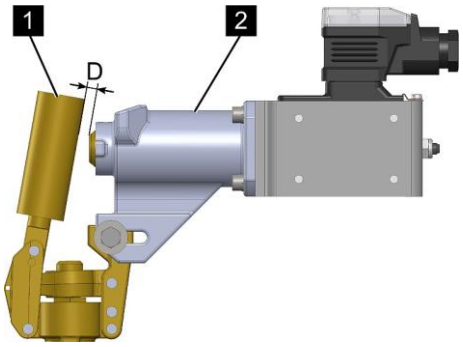


Fig. 111: Aligning the EM release device

10. Align the EM release device in such a manner that the distance between release pin (Fig. 111/1) and valve lever is (Fig. 111/2) 3 ± 1 mm.

11. Tighten the hex nut (Fig. 110/2).

    ⇨ The EM release device is mounted.

Mounting the monitor of the EM release device

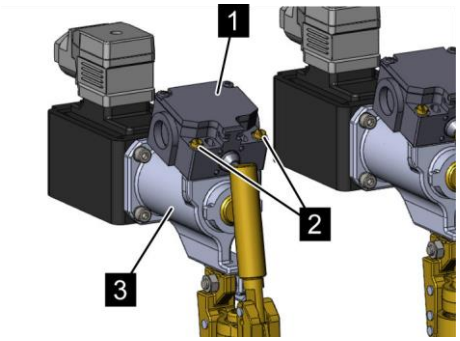


Fig. 112: Mounting the limit switches

12. Loosely fasten the limit switch (Fig. 112/1) with cylinder screws and washers on the holder of the EM release device (Fig. 112/3).

13. Align the limit switch (Fig. 112/1) in such a manner that the contact is activated with the valve lever.

14. Tighten the cylinder screws (Fig. 112/2).

    ⇨ The monitoring of the release device is mounted.

15. Bolt the pilot line of the pneumatic delay device or the pneumatic release device (PAE) to the output of the valve block that is opposite the safety valve.

16. **WARNING! Danger of leaks!**

    Mount the pilot line to the selector valves on the release devices with the supplied, pressure-tested threaded union.

17. Screw the valve lever onto the valve again.

18. Establish the electrical connection of the EM release device ↳ *“Release device EM” on page 127*.

19. Establish the connection of the limit switches ↳ *“Monitoring of the release device EM” on page 127*.

5.4.4 Mounting the shuttle non-return valves

Personnel: ■ Authorized Distributor

Protective equipment: ■ Protective goggles

Shuttle non-return valves must be installed wherever control gas should only flow in one direction and a pneumatic component is activated by two pressure sources.

1. Check pilot lines for residues and clean them if necessary.

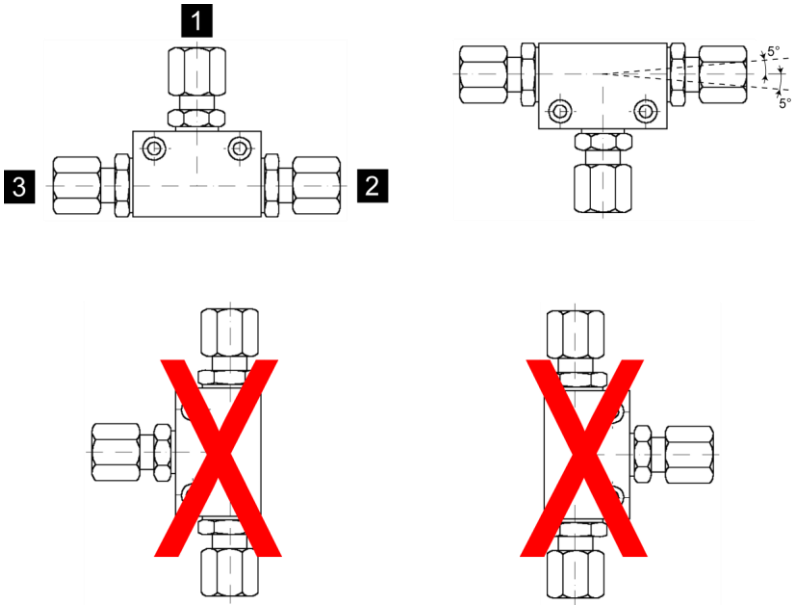


Fig. 113: Acceptable and unacceptable installation positions

1 Outlet
2 Inlet
3 Inlet

2. **L WARNING! Danger of malfunctions and injuries resulting from these malfunctions!**

   Mount the shuttle non-return valve in the pilot line with due consideration of the install position (Fig. 113).

5.4.5 Mounting the blocking device

Personnel:
- Authorized Distributor
- Qualified electrician

Protective equipment:
- Safety gloves
- Safety footwear
- Protective goggles

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”). The following is required for mounting:

- Limit switches: Type ZS 256-11Z; part number 828482
- Cylinder screw M4x25-MS; part number 106745
- Washer B 4.3-MS; part number 109734

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

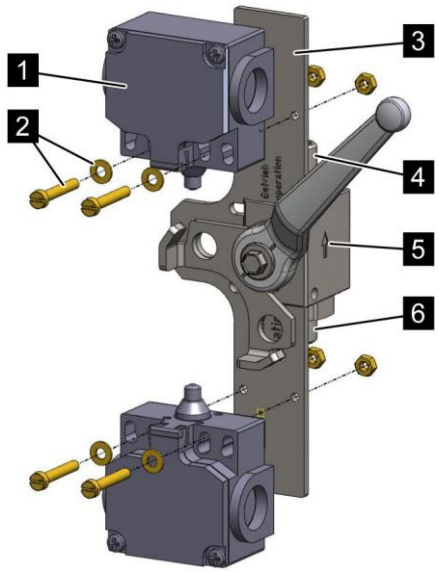


Fig. 114: Mounting the blocking device (optionally with 1 or 2 limit switches)

1. Optionally screw one or two limit switches (Fig. 114/1) onto the blocking device (Fig. 114/3) with the cylinder screws and washers (Fig. 114/2).
2. Fasten the holder of the blocking device in a wall with the provided screws and plugs.

   Do not fasten the blocking device on other system parts.
3. Bolt the blocking device with the provided cylinder screws, washers, and hex nuts on the holder in such a manner that the ready-to-operate position points in the flow direction (marked with an arrow, Fig. 114/5).

   The blocking device has an integrated vent. If the blocking device is incorrectly installed it will not function as intended.
4. Bolt the pilot line with the cap nut to the two connections of the blocking device (Fig. 114/4+6).
5. Establish the electrical connection of the limit switches *Chapter 6.8 “Terminal assignment of the blocking device” on page 128*.

5.4.6 Mounting the test connection

Personnel: ■ Authorized Distributor

Special tool: ■ Wrench

The test connection must be mounted in such a manner that testing of the pneumatically activated system components is possible via the pilot line without opening the pilot cylinder.

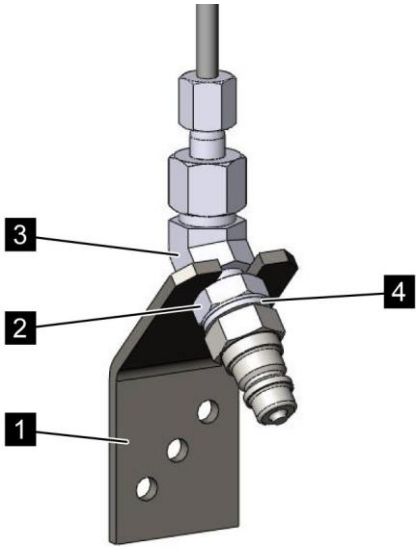


Fig. 115: Mounting the test connection

1. Fasten the fastening bracket (Fig. 115/1) on a wall or on the cylinder battery frame.
2. Hook in and align the angled threaded union (Fig. 115/3).

   If necessary turn the lock nut (Fig. 115/2) counterclockwise until the angled threaded union fits into the fastening bracket.
3. Hold the base element of the angled threaded union (Fig. 115/3) in position with a wrench and tighten the lock nut (Fig. 115/2) with a second wrench.
4. Ensure that the O-ring with support ring (Fig. 115/4) is clean and not tilted.
5. Hold the base element of the angled threaded union in position and screw on the connector with a wrench so that the O-ring with support ring rests on the lock nut.
6. Fit on the protective cap.
7. Connect the pilot line (Fig. 116/1) to the test connection and ensure correct connection:

   2 - To the pneumatic release devices or the pilot distributor

   3 - From the pilot cylinder of the pneumatic release device (PAE)

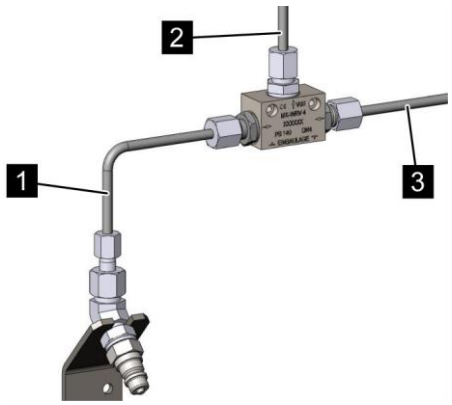


Fig. 116: Connecting the pilot line

5.4.7 Mounting the pneumatically actuated limit switch

Personnel:
- Authorized Distributor
- Qualified electrician

Protective equipment:
- Safety gloves

Pneumatically activated limit switches must be connected to the pipeline to the extinguishing zone so that executed flooding of an extinguishing zone can be detected. There are two installation possibilities:

- Downstream of the selector valves: Flooding of the assigned extinguishing zone will be detected.
- Upstream of the selector valves: Flooding will be detected –regardless of the extinguishing zone.

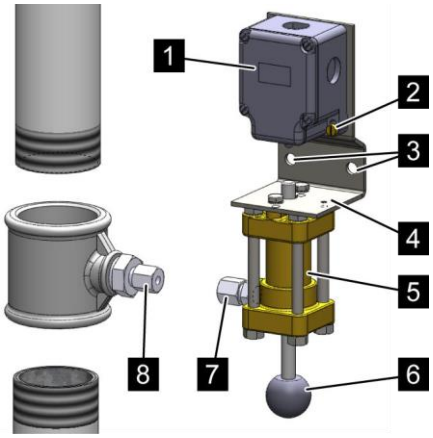


Fig. 117: Mounting

1. Screw the cylinder (Fig. 117/5) onto the holder (Fig. 117/4) with the two provided screws.
2. Screw the limit switches (Fig. 117/1) on the holder with the two provided M5 x 25 cylinder screws, washers and hex nuts (Fig. 117/2).
3. Fasten the holder to the bearing structural elements with the provided screws via the two fastening bores (Fig. 117/3).
4. Connect the compressed air line from the pipeline (Fig. 117/8) on the compressed air connection (Fig. 117/7) and fasten with threaded union.
5. Establish the electrical connection in accordance with the terminal diagram *Chapter 6.9 “Terminal assignment of the pneumatically actuated limit switch” on page 129*.
6. Press the pushbutton (Fig. 117/6) on the limit switch and check the functionality on the fire extinguishing detection system.

   ⇨ If the functionality is correct a signal will be displayed. If no signal is displayed correct the position of the limit switch relative to the pneumatic piston.

5.4.8 Connecting the safety valves to the safety relief line

Personnel: ■ Authorized Distributor

Protective equipment: ■ Safety gloves
■ Protective goggles

⚠ WARNING

Health hazard due to CO_2!

- **Route the safety relief line of the safety valve to the outdoors.**
- **If the design data and locally applicable regulations allow, alternatively route the safety relief line into the largest extinguishing zone.**

If there is uncontrolled CO_2 escape there is a danger of health impairments extending to death by suffocation.

1. Ensure that the safety valve is positioned vertically upward and is properly bolted to the pipeline.
2. Ensure that the safety relief line installed on the shortest path to the safety valve, and that there is a slight incline away from the safety valve.
3. Connect the safety relief line to the escape on the safety valve.
4. Ensure that no medium (extinguishing agent, CO_2) can get into rooms where it could be harmful to health.

5.5 Documents for mounting and installation

Installation attest

The installation attest certifies the proper mounting and installation in accordance with the specified design data. This attest must be transferred to the person responsible for the system after the mounting and installation has been executed.

A template for an installation attest is provided in the Appendix of this manual.

Acceptance report

After the installation has been executed the system must be subjected to a function test, and the function of all system components must be certified in the acceptance report. Thus the acceptance report certifies the proper function of the system at the time it was commissioned.

6 Information about electrical connections

6.1 Safety instructions for the electrical connection

Electrical current

DANGER

Life-threatening danger due to electric shock!

- **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.**

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.

6.2 Protection classes

The specified IP protection classes cannot be directly converted into NEMA protection classes. Please use the following non-binding estimate as a guide:

- IP 54 corresponds roughly to NEMA 3
- IP 65 corresponds roughly to NEMA 4

6.3 Terminal assignment of the electrical release device with blocking device

Release device, electrical

Data	Value	Unit
Voltage	24	V DC
Amperage	0.5	A
Maximum acceptable test current	20	mA
Power	12	W
	0.0161	hp
Protection type	IP 65	
Operating time	100	%

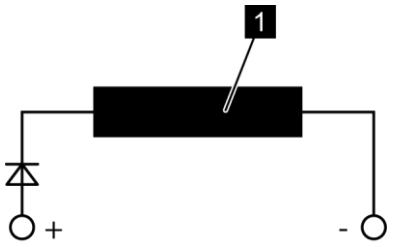


Fig. 118: Terminal assignment

1 Magnet

Terminal assignment:

- Terminal 1: **-**
- Terminal 2: **-**

Connection via connector EN 175301-803, type A 3-pole.

Micro switch

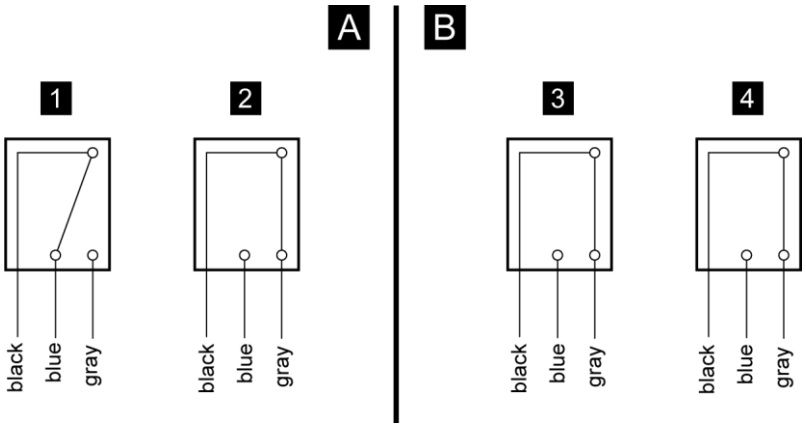


Fig. 119: Switch positions “ready for operation” (A) and “isolated” (B)

1 Micro switch 1 activated
2 Micro switch 2 not activated
3 Micro switch 1 not activated
4 Micro switch 2 activated

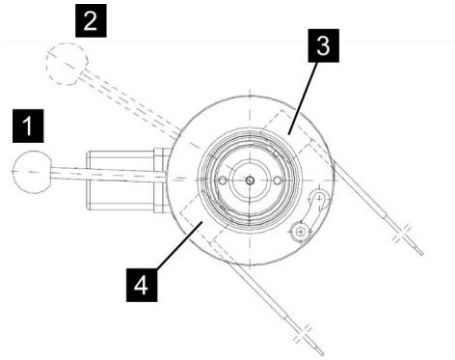


Fig. 120: Release device, electrical

1 Position “ready for operation"
2 “Blocked” position
3 Micro switch 2
4 Micro switch 1

The contacts are routed out with a cable approx. 12 cm (5 inches) and fitted with a screwable round connector. Make the additional connection via the two provided cables (length approx. 2 m (6ft)) each with the suitable connector.

Micro switch 1 and micro switch 2 have different plug connections so that it is impossible to mistake the connections.

If the colors of the cores differ from the specifications in the manual, the switch assignments must be determined with a resistance measuring device.

6.4 Terminal assignment of the electrical release device

Data	Value	Unit
Voltage	24	V DC
Amperage	0.5	A
Maximum permissible test current	20	mA
Power	12	W
	0.0161	hp
Degree of protection	IP 65	
Operating time	100	%

Terminal assignment with diode

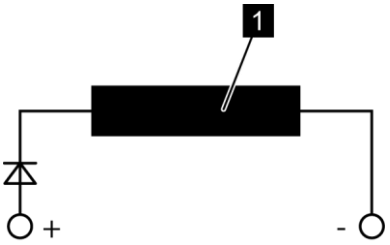


Fig. 121: Terminal assignment with diode

1 Magnet

Terminal assignment:

- Terminal 1: **+**
- Terminal 2: **-**

Connection via connector EN 175301-803, type A 3-pole.

Terminal assignment without diode

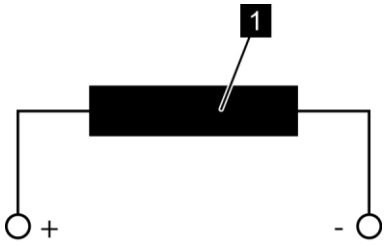


Fig. 122: Terminal assignment without diode

1 Magnet

Terminal assignment:

- Terminal 1: **+**
- Terminal 2: **-**

Connection via connector EN 175301-803, type A 3-pole.

6.5 Terminal assignment of the valve with integrated electrical release device

Data	Value	Unit
Voltage	24	V DC
Amperage	0.25	A

Data	Value	Unit
Power	6	W
	0.00805	hp
Degree of protection	IP 54	
Operating time	100	%

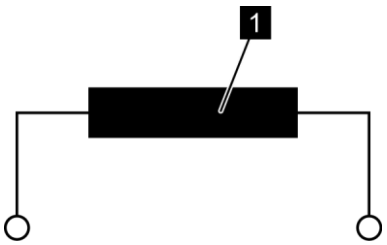


Fig. 123: Terminal assignment

1 Magnet

Terminal assignment:

- Terminal 1: **+/-**
- Terminal 2: **-/+**

Connection via connector EN 175301-803, type A 3-pole.

6.6 Terminal assignment of the contact pressure gauge

Data	Value	Unit
Switch voltage	4.5 – 24	V DC/ V AC
Switch current	5 – 100	mA
Maximum contact load	3	W
	0.00402	hp
Degree of protection	IP 65	

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

- Contact material: Gold-plated

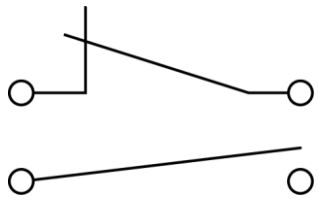


Fig. 124: Terminal assignment

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

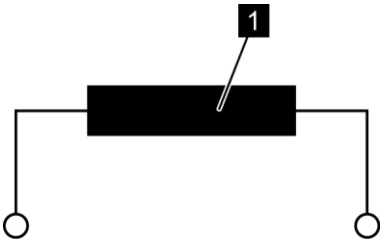
Connection via fixed mounted, 2-pole cable:

- Cable cross diameter: 0.14 mm² (AWG 26)
- Length: 1 m (3.3 ft)

6.7 Terminal assignment for the components of the pneumatic release device (PAE)

Release device EM

Data	Value	Unit
Voltage	24	V DC
Current intensity	1.04	A
Power	25	W
	0.03353	hp
Protection type	IP 54	
Duration of connection	100	%



1 Magnet

Terminal assignment:

- Terminal 1: **+/-**
- Terminal 2: **-/+**

Fig. 125: Terminal assignment

An MVA LÖ card is installed in the supplied plug, for more information see part no.: 904653.

Monitoring of the release device EM

Data	Value	Unit
Maximum switch voltage	500	V AC
Switching current at 500 V AC	1	A
Switching current at 230 V AC	4	A
Maximum contact loading	500	W
	0.67049	hp
Protection type	IP 67	

- Contact material: Silver

The monitoring of the release device EM includes limit switch ZS 256-11Z.

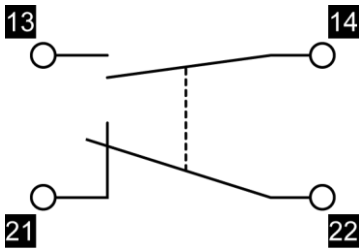


Fig. 126: Terminal assignment

Contact type:

- 1 NC contact
- 1 NO contact

Connection:

- Terminals direct

Loss monitoring

Data	Value	Unit
Switch voltage	30	V DC
Switching current	0.5	A
Maximum contact loading	10	W
	0.01341	hp
Protection type	IP 67	

- Contact material: Rhodium

The loss monitoring includes the limit switch reed contact.

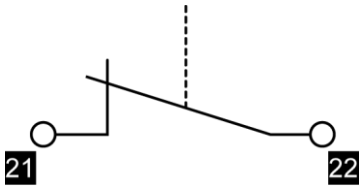


Fig. 127: Terminal assignment

Contact type:

- Reed switch for loss (magnet not on reed switch) closed

Connection:

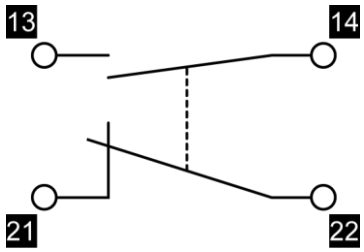
- Terminals direct

6.8 Terminal assignment of the 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

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



Contact type:

- 1 normally open
- 1 normally closed

Connection:

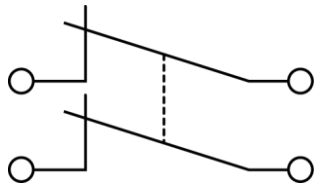
- Terminals direct

Fig. 128: Terminal assignment

6.9 Terminal assignment of the pneumatically actuated limit switch

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

- Contact material: Silver



Contact type:

- 2 normally closed/normally open (adjustable)

Connection:

- Terminals direct

Fig. 129: Terminal assignment

6.10 Terminal assignments of the 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	

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 *Chapter 6.11 “Connection of limit switches to monitored electrical circuits as per NFPA” on page 130.*

- Contact material: Silver

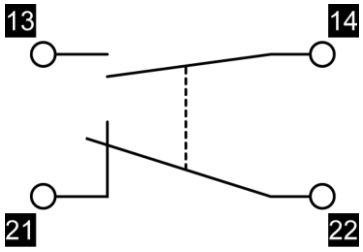


Fig. 130: Terminal assignment

Contact type:

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

Switch principle:

- Snap-action switch

Connection:

- Terminals direct

6.11 Connection of limit switches to monitored electrical circuits as per NFPA

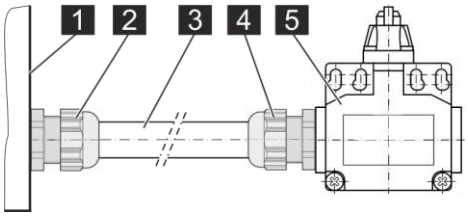


Fig. 131: Limit switches with flexible metal cable conduit

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 (Fig. 131/5) and the connection socket (Fig. 131/1) must be protected by a flexible metal cable conduit (Fig. 131/3). The flexible metal cable conduit must be fastened with suitable fittings (Fig. 131/2+4).

Connection without an alarm device

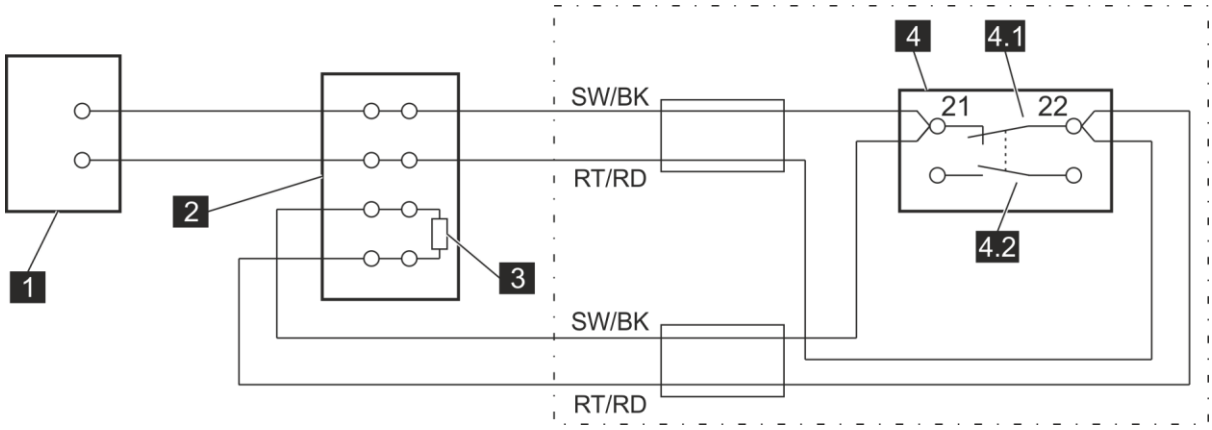


Fig. 132: Wiring diagram without an alarm device

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

Connection with an alarm device

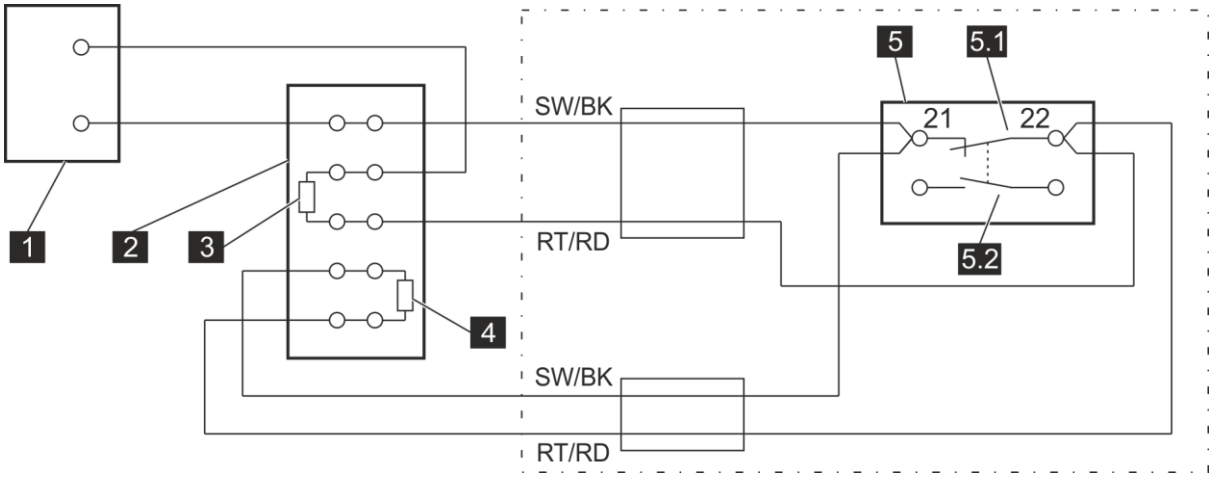


Fig. 133: Wiring diagram with an alarm device

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

Information about electrical connections

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

5.2 Normally closed (NC); unused

7 Commissioning and re-commissioning

7.1 Safety instructions for commissioning

⚠ WARNING

Risk of injury due to incorrect sequence of commissioning!

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

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.

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.

7.2 Activities before commissioning

Personnel: ■ Authorized Distributor

The system must be checked for status and functionality ↳ *Chapter 8.5 "Inspection and maintenance tasks" on page 154*.

In addition to these checks, the following activity must be executed prior to commissioning:

→ Remove and keep safe all lock pins of the system components.

7.3 Restoring operational readiness after a release

Personnel:
- Authorized Distributor

Protective equipment:
- Self-contained breathing apparatus
- Safety gloves
- Protective goggles

⚠ WARNING

Danger of injury through the occurrence of decomposition products!

– Do not reenter the extinguishing zone after a fire until the fire department has given the all-clear.

– If the presence of decomposition products cannot be excluded, wear respiratory equipment.

Fires generate decomposition products which may lead to significant and chronic health impairments if inhaled and if there is contact with the skin.

⚠ WARNING

Danger due to faulty release!

– Only perform a pressure test of the pipe system when NO extinguishing agent containers are connected to the pipe system.

Even if check valves are mounted, no extinguishing agent containers may be connected to the pipe system during the pressure test.

The valve of the extinguishing agent container opens when the outlet side of the valve is charged with a pressure approaching that of the system pressure. Through a pressure test of the pipe system, pressure can also be applied to the control connection of the valve of an extinguishing agent container "master" and pneumatically activated extinguishing agent containers can be triggered.

For leakage tests of the pipe system, which are generally conducted with low pressures of roughly 3 to 4 bar (44 to 58 psi), the extinguishing agent containers can be connected to the pipe system; however, there cannot be a pneumatic release device of any additional valves connected to any secondary trigger connection of the valves.

After the system is activated and the fire is extinguished, execute the following activities to restore operational readiness of the system:

- Relieve the pressure in the pilot lines (if present)
- Close the valve of the pilot cylinder (if present)

- Close the selector valves (only for multi zone systems)
- Removing the release devices
- Have the extinguishing agent containers replaced/ filled
- Replace the pilot cylinder (if present)
- Starting up the fire detection and extinguishing control panel
- Performing a function test
- Mounting the release devices

The individual activities are explained in the following sections.

Relieve pressure in the pilot lines

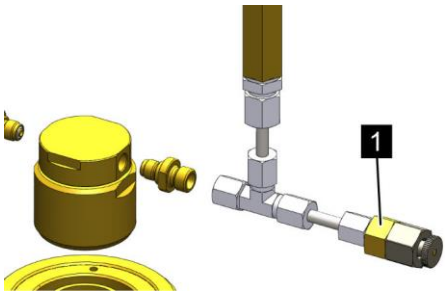


Fig. 134: Manual pressure relief valve

WARNING! Pilot lines can be under pressure!

Relieve the pressure of all pilot lines via the manual pressure relief valve (Fig. 134/1).

Close the valve of the pilot cylinder/pilot distributor

Special tool: ■ Clamping device (885530)

If present the valves on the pilot cylinder as well as on the pilot distributor must be closed.

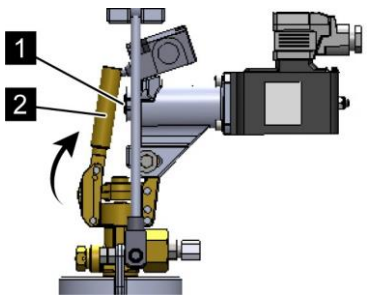


Fig. 135: Close valve

1. Fit the clamping device onto the holder of the EM release device and fix it in place.
2. By turning the adjustment wheel, push the release pin of the clamping device far enough into the housing that the locking bolt (Fig. 135/1) can be pushed in the opposite direction and lock the release pin.
3. Swing the valve lever (Fig. 135/2) upward (Fig. 135/arrow).

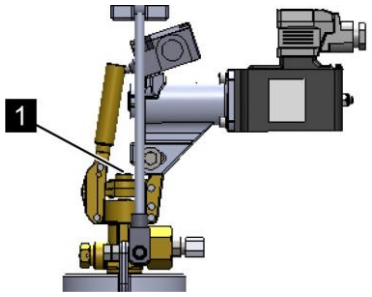


Fig. 136: Valve seal seat

4. Check whether the tightening torque for the pre-tension of the valve seat seal (Fig. 136/1) is 12 – 13 Nm (8.85 to 9.59 lb·ft) and correct if necessary.

Closing the selector valves

Special tool: ■ Hand lever

After an activation opened selector valves must be reclosed manually. The spring of the selector valve is not a return spring, rather it prevents gravity-induced, and vibration-induced opening of the selector valve.

A selector valve has the following positions:

- Operating element up: Selector valve closed
- Operating element down: Selector valve open

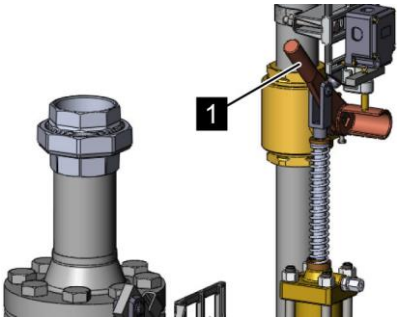


Fig. 137: Closing the selector valve

1. Fit the hand lever (Fig. 137/1) onto the operating element of the selector valve.
2. Press the operating element with hand lever upward.

   ⇨ The selector valve is closed.
3. Take off the hand lever of the operating element (Fig. 137/1) and store it safely in the vicinity of the system.

Removing the release devices

All extinguishing agent containers that are opened in the course of the activation must be refilled. To do this, first the associated release devices must be removed.

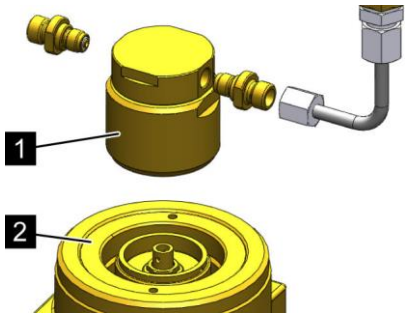


Fig. 138: Removing the release device

1. Unscrew the release device (Fig. 138/1) from the valve (Fig. 138/2) of the extinguishing agent container.
2. Screw the protective cap onto the connection of the release device on the valve.

Replacing the extinguishing agent container

To make the system ready for operation again, all extinguishing agent containers from which extinguishing agent has escaped in the course of the activation must be replaced.

1. Ensure that the release device is removed.
2. Remove the connected pilot line from the valve.
3. Seal all control outlets with blind plugs (Fig. 139/1).

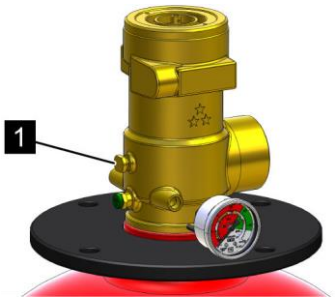


Fig. 139: Attach the blind plug

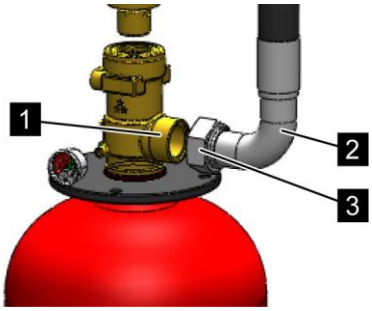


Fig. 140: Remove the hose

4. Unscrew the cap nut (Fig. 140/3) of the hose (Fig. 140/2) or connecting piece (for the version without hose) from the valve outlet (Fig. 140/1).
5. Attach the anti-recoil cap on the valve outlet (Fig. 140/1).

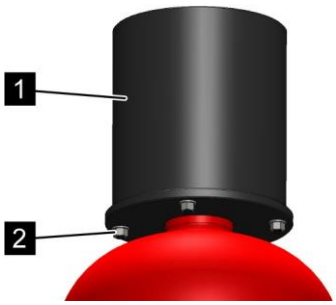


Fig. 141: Install the protective valve cap

6. Fit the protective valve cap (Fig. 141/1) onto the extinguishing agent container.
7. Screw the protective valve cap (Fig. 141/1) with the device onto the extinguishing agent container (Fig. 141/2).

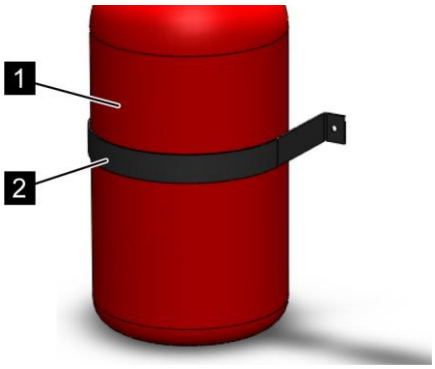


Fig. 142: Remove the clamp

8. Remove the clamp (Fig. 142/2) and carefully place the extinguishing agent container (Fig. 142/1) to the side.

   Send the extinguishing agent container back to a refilling company for refilling in accordance with the transport information ↳ Chapter 4.4.1 “Transporting extinguishing agent containers” on page 69.

9. Mount a new extinguishing agent container ↳ *Chapter 5.3.4 “Mounting extinguishing agent containers” on page 85*.

Replacing the pilot cylinder

If the system has a pneumatic release device (PAE) the weight of the pilot cylinder must be checked after a release ↳ *Further information on page 174*.

If more than 10 % loss is present the pilot cylinder must be replaced.

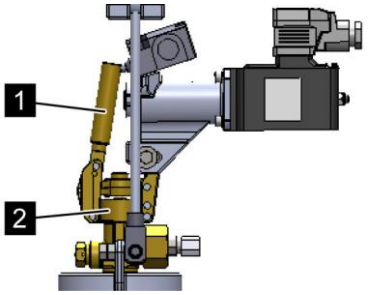


Fig. 143: Remove the valve lever

1. Unscrew the valve lever (Fig. 143/2) from the valve (Fig. 143/1) of the pilot container.
2. Disconnect the electrical connection.

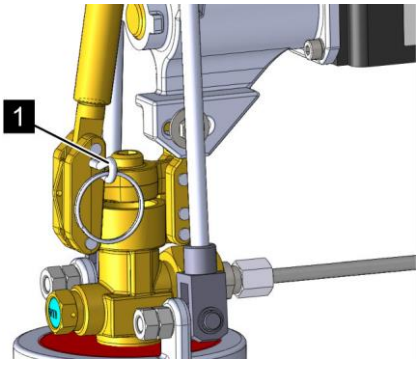


Fig. 144: Lock pin

3. Safeguard the valve of the pilot cylinder against faulty release, with a lock pin (Fig. 144/1).

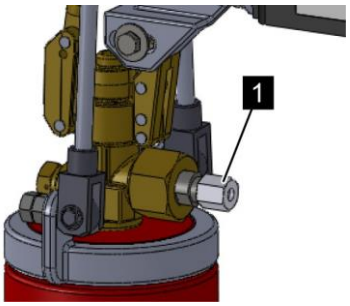


Fig. 145: Disconnect the pilot line

4. Remove the pilot line from the connection (Fig. 145/1) on the valve.

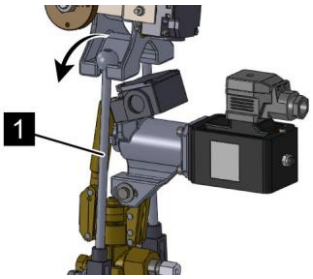


Fig. 146: Unhooking

5. Unhook the holding rods of the pilot cylinder (Fig. 146/1) on the weighing device (Fig. 146/ arrow).

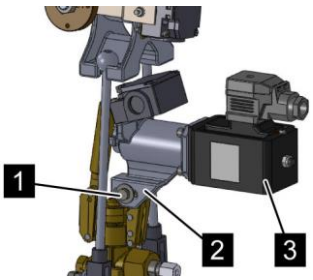


Fig. 147: Removing the release device

6. Unscrew the hex bolt (Fig. 147/1) on the holder (Fig. 147/2) of the EM release device. Remove hex bolt, washer and hex nut and keep them in a safe place.
7. Take the release device (Fig. 147/3) off of the valve.

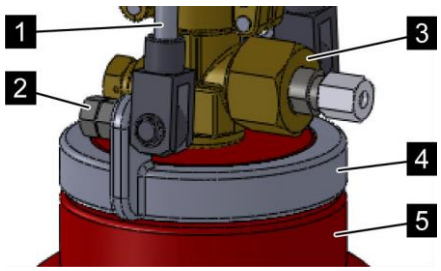


Fig. 148: Suspension

8. Unscrew the hex nuts (Fig. 148/2) on the suspension of the pilot cylinder.

   ⇨ The holding rods (Fig. 148/1) are detached.
9. Take the holding rods with ring bolt off the suspension element.
10. Unscrew the adapter (Fig. 148/3).
11. Unscrew the suspension element (Fig. 148/4) from the pilot cylinder (Fig. 148/5).
12. Screw suspension element (Fig. 148/4) onto a new pilot cylinder.
13. Fasten the holding rods (Fig. 148/1) with eye bolts and hex nuts (Fig. 148/2) on the suspension element (Fig. 148/4).

14. Remount the pneumatic release device ↳ *Chapter 5.3.8 “Mounting the pneumatic release device (PAE, optional)” on page 91*.

Starting up the fire detection and extinguishing control panel

Comply with the manufacturer’s instructions in the separate operation manual for the fire detection and extinguishing control panel.

Performing a function test

Before the system can be placed in service again a function test must be executed.

→ Perform a function test before placing the system in service again in accordance with the instructions for commissioning ↳ *Chapter 7.2 “Activities before commissioning” on page 133*.

Mounting the release devices

→ Remount the release device on the extinguishing agent container ↳ *Chapter 5.3.9 “Mounting the release devices” on page 97*.

7.4 Restoring operational readiness after an activation in isolated status

Personnel:	■ Authorized Distributor
Protective equipment:	■ Self-contained breathing apparatus ■ Safety gloves ■ Protective goggles

⚠ WARNING

Risk of death due to fire!

– Do not enter the extinguishing zone after a fire until the fire department has given the all-clear.

– If in doubt wear a respiratory protection apparatus.

If there is a fire intense smoke development can occur. Staying inside a burning extinguishing zone may result in severe injuries or death.

⚠ WARNING

Life-threatening danger due to a non-functional system!

– **Place the system in service again as quickly as possible.**

If the system is isolated it is not functional. Thus if there is fire life-threatening danger as well as significant material damage can occur.

If the system was activated through fire, cigarette smoke, or welding tasks, while it was completely isolated, execute the following tasks to restore ready for operation status:

- Relieve the pressure in the pilot lines (if present)
- Close the valve of the pilot cylinder (if present)
- Close the valves on the pilot distributor (if present)
- Starting up the fire detection and extinguishing control panel
- Resetting the isolation
- Performing a function test

Relieve pressure in the pilot lines

Relieve the pressure in the pilot lines in accordance with the instructions for restoring operational readiness after an activation ↬ *Further information on page 135*.

Close the valve of the pilot cylinder/pilot distributor

Close the valves of the pilot distributor in accordance with the instructions for restoring operational readiness after an activation ↬ *Further information on page 135*.

Starting up the fire detection and extinguishing control panel

Comply with the manufacturer's instructions in the separate operation manual for the fire detection and extinguishing control panel.

Resetting the isolation

Reset the isolation as specified in the operating manual.

Performing a function test

Perform a function test before placing the system in service again in accordance with the instructions for commissioning ↬ *Chapter 7.2 "Activities before commissioning" on page 133*.

7.5 Filling extinguishing agent containers

⚠ WARNING

Risk of injury due to pressure in extinguishing agent containers!

- **Extinguishing agent containers should only be done by a specialized company authorized by the manufacturer.**
- **Comply with locally applicable regulations governing the handling of extinguishing agent containers.**

Improper use of extinguishing agent containers can lead to severe injuries or even death.

7.5.1 Repair components

Defective components cannot be repaired and must be replaced with new original spare parts.

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

Prepare extinguishing agent tanks

1. Clean and repair the extinguishing agent container.
2. Check extinguishing agent containers – if necessary – in accordance with the locally applicable pressure equipment regulations.

7.5.2 Required tools

The following tools are required for the filling. The measuring devices and their periodic calibration must conform with the locally applicable guidelines (e.g. NFPA 2001).

- Filling adapter for the valves for the connection of a pump
- Nitrogen fill line connecting unit for connection to a pressure reducer; part number of the connecting unit: 888868
- Testing device adapter for the valve manometer connection for the connection of a pressure measuring device; part number of the adapter: 888042
- Extinguishing agent pump
- Pressure reducer for the reduction of the pressure of the nitrogen source to system pressure
- Thermometer
- Pressure measuring device

- Scale
- Leak detector with high resolution
- Moisture measuring device

The contact manometers on the valve are not permitted as pressure measuring devices.

7.5.3 Requirements

Spatial requirements

Depending on the local provisions and authorizations, the filling location must be recognized by authoritative agencies and/or testing centers. The filling of extinguishing agent containers from systems approved by UL may only take place at a filling location recognized by UL.

Filling and storage areas must be sufficiently ventilated so that the maximum permissible extinguishing agent concentration (NOAEL) is not exceeded with an unintentional release of extinguishing agent.

Requirements imposed on the extinguishing agent and nitrogen

The following requirements apply for extinguishing agents and nitrogen:

- The nitrogen may have a maximum moisture content of 60 x 10^{-6} percent by weight.
- The extinguishing agent may not come into contact with air humidity. Therefore, the flowing air during the extraction from the transport containers must either be dehumidified or replaced with dry nitrogen.
- The requirements and conditions listed in the storage and transport instructions of the extinguishing agent manufacturer must be complied with.

Information can be found on the homepage of the extinguishing agent manufacturer.

7.5.4 Filling conditions

The following conditions apply for the filling process:

- The filling temperature must be 21 °C (70 °F).
  If this temperature cannot be maintained due to the prevailing climate conditions, a pressure-temperature table must be requested from the manufacturer.
- The following pressure tolerances are permissible for a system pressure at 21 °C (70 °F):
  – UL: -0/+0.69 bar (-0/+10 psi)
  – CE, EN: -0/+1 %
  – FM: -0/+3 %
- The weight tolerance of the extinguishing agent filling in relation to the target weight: -0/+1 %

7.5.5 Filling process

Personnel:	■ Authorized Distributor
Protective equipment:	■ Protective work clothing ■ Extinguishing-agent-resistant safety gloves ■ Protective goggles ■ Safety footwear

⚠ DANGER

Risk of injury due to extinguishing agent escaping under pressure!

– Make sure that extinguishing agent containers on which anti-recoil caps, blind plugs on valve outlets or protective valve caps are not mounted are always fastened to building elements with a clamp.

– Keep the time in which the valve opening is not closed for assembly purposes as short as possible. During this time period, do not stand in front of the valve outlet.

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

⚠ WARNING

Danger of injury due to escaping extinguishing agent!

- **Filling may only be carried out with the specified personal protective equipment.**
- **Keep body parts away from valve outlets and the side ball valve of the filling adapter.**

During filling, extinguishing agent can escape from valve outlets which are not closed and cause injury.

Based on the mode of operation of the valve, an activated extinguishing agent container has a residual pressure of approx. 1 bar (14.5 psi). If this residual pressure prevails, the extinguishing agent container may be refilled immediately, because the valve is correctly sealed. In this case, dehumidifying and an additional quantity are not necessary.

Check the condition of the valve seat

1. Check the valve seat for soiling.
2. Replace dirty valves.

Check the condition of the extinguishing agent container

3. Check the extinguishing agent container for corrosion and damage.
4. Check the date of the initial inspection.

   i Only undamaged extinguishing agent containers with a valid test seal may be filled. The test intervals according to the locally valid provisions for pressure devices apply.

Check the condition of the valve

5. Check the valve for corrosion and damage.
6. Replace damaged or corroded valves.

   i Activated extinguishing agent containers normally have a residual pressure of approx. 1 bar (14.5 psi).

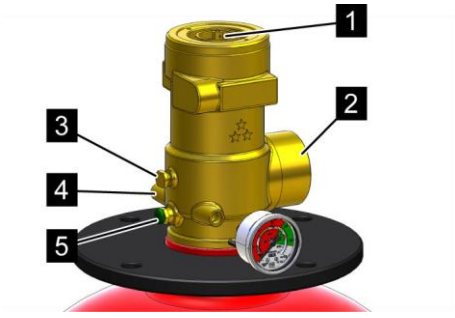


Fig. 149: Valve

7. **L WARNING! Risk of injury due to escaping extinguishing agent from damaged blind plugs!**

   Check the anti-recoil cap (Fig. 149/2) and blind plug on the control outlet (Fig. 149/3) and replace if damaged.
8. Check bursting disk (Fig. 149/5) for correct pressure range and condition.

Filling extinguishing agent containers

9. Remove all external activating elements and the cap on the control connection (Fig. 149/1) of the valve.

10. Disconnect the electrical pilot line.
11. Connect the filling adapter with the filling mechanism connected to the valve outlet (Fig. 149/2).
12. ***NOTICE!* Damage from the application of excessive pressure!**

    Fill extinguishing agent containers with the required extinguishing agent quantity.
13. Insert a pressure reducing device between the nitrogen source and the extinguishing agent container so that the nitrogen pressure is limited to the desired charging pressure.
14. Layer the extinguishing agent with nitrogen to ensure that the desired system pressure is reached.

    The maximum filling pressure may not exceed 20% over the nominal system pressure.

    The filling pressure (pump pressure > 5 bar (73 psi)) opens the valve.
15. Close the ball valve in the supply line and release pressure through the side ball valve of the filling adapter.

    ⇨ When releasing the pressure at the valve output the valve closes automatically.
16. Remove the filling adapter.
17. Fit the anti-recoil cap on the valve outlet (Fig. 150/1).

Fig. 150: Fit the anti-recoil cap

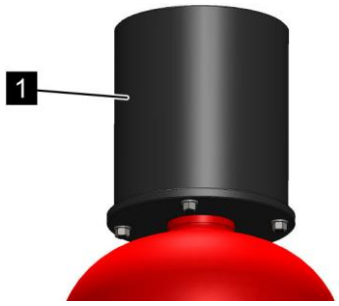


Fig. 151: Protective valve cap

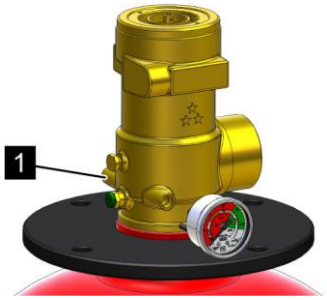


Fig. 152: Connect the pressure measuring device

18. **⚠ WARNING! Risk of injury due to pressure in extinguishing agent containers!**

    Place and fasten a protective valve cap (Fig. 151/1) on extinguishing agent containers that are not affixed to a wall.

19. Carefully shake the extinguishing agent container or change its position in order to saturate with nitrogen.

    ℹ The saturation state has been reached if the pressure no longer changes at a constant temperature. This can take a few moments.

20. Connect the pressure measuring device to a free pressure gauge connection (Fig. 152/1) and check the system pressure.

    ℹ The contact pressure gauge should not be used for exact determination of the system pressure.

21. If the desired system pressure is not reached, fill in more nitrogen.

    ℹ Low nitrogen quantities can be topped up with an adapter via the pressure gauge connections. Otherwise top up the nitrogen as described above.

22. Check extinguishing agent containers for leaks with a leak detector.

8 Inspection and servicing

8.1 Warnings for inspection and servicing

Lack of fire safety

⚠ WARNING

Life-threatening danger due to a lack of fire safety!

- **Keep functional reserve extinguishing equipment on hand (e.g. fire extinguishers).**
- **Do not shut down the system longer than necessary.**
- **Place the system in service immediately after conclusion of the inspection and maintenance tasks.**

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.

Improperly executed service tasks

⚠ WARNING

Danger of injury due to improperly executed maintenance tasks!

- **Prior to starting tasks ensure that there is adequate free space for installation.**
- **Ensure order and cleanliness at the installation location! Parts and tools that are lying loose or on top of each other are accident hazards!**
- **If components have been replaced mount them in compliance with the instructions contained in this manual. Reinstall all fastening elements and comply with the specified screw-tightening torque.**
- **Ensure that all inspection and maintenance tasks are only performed by appropriately qualified personnel.**

Improper maintenance can cause severe injuries and significant material damage.

Escaping extinguishing agent

⚠ WARNING

Danger of injury due to escaping extinguishing agent!

- **Prior to starting the tasks, for which a false release is threatened, ensure that all release devices are dismounted.**
- **If there is a false release, immediately exit the extinguishing zone.**
- **Instruct all persons working in the system area, in advance of the danger of a false release, familiarize them with the measures that must be initiated in this case.**

If the system is unintentionally released in the execution of inspection and maintenance tasks, extinguishing agent can escape uncontrolled. This can cause severe injuries and significant material damage.

False alarm

False alarms can occur due to function tests of different components. Instruct personnel working in the system area of possible false alarms prior to starting the tasks.

8.2 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.

Always replace damaged and/or defective components with new original spare parts. Repairs are not permitted.

Interval	Maintenance work	Personnel
Weekly	Inspection and check ↳ Operating manual	Person in charge of the system
Semi-annually	Checking the extinguishing agent containers ■ Filled quantity ■ Filling pressure ↳ *Chapter 8.5.9.1 “Check filling quantity” on page 172*	Authorized Distributor
Annually	Check protected enclosure for structural changes ■ Dimensions ■ Use ■ Fire loads ↳ *Chapter 8.5.1 “Check protected enclosure for structural changes” on page 154*	Authorized Distributor
	Check the protected enclosure for permeability ■ Automatic locking system ■ Devices that prevent unintentional opening ↳ *Chapter 8.5.2 “Check the protected enclosure for permeability” on page 155*	Authorized Distributor
	Check documentation and labels ■ Report book ■ Operating manual ■ System labeling ■ Labeling of the protected enclosure, escape routes, etc. ↳ *Chapter 8.5.3 “Check documentation and labels” on page 155*	Authorized Distributor
	Check activations and switch-offs in the event of an alarm through manual release	Authorized Distributor
	Check activations and switch-offs in the event of an alarm through automatic fire detectors	Authorized Distributor
	Check the relaying of alarms	Authorized Distributor
	Check electrical release devices ↳ *Chapter 8.5.4 “Check electrical release devices” on page 156*	Authorized Distributor

Interval	Maintenance work	Personnel
Annually	Check pneumatic release devices ■ Activation through "control cylinder" extinguishing agent container ■ Activation through pneumatic release device (PAE) ↳ *Chapter 8.5.5 “Checking the pneumatic release device” on page 158*	Authorized Distributor
	Check manual release devices ↳ *Chapter 8.5.6 “Check manual release device* not VdS, not CNPP/A2P” on page 164*	Authorized Distributor
	Check a valve with integrated electrical release device ↳ *Chapter 8.5.7 “Check valve with integrated electrical release device” on page 166*	Authorized Distributor
	Check components for damage and function as necessary ■ Valves ■ Selector valves ■ Hoses ■ Check valves ■ etc. ↳ *Chapter 8.5.8 “Checking components for damage and function” on page 167*	Authorized Distributor
	Check the extinguishing agent containers ■ Status ■ Fastening ■ Function of the contact pressure gauge ↳ *Chapter 8.5.9 “Check the extinguishing agent containers” on page 171*	Authorized Distributor
	Check pipelines and discharge nozzles ↳ *Chapter 8.5.10 “Check pipeline system, discharge nozzles and outflow areas” on page 178*	Authorized Distributor

Interval	Maintenance work	Personnel
Annually	Check the fire suppression detection system ■ Status ■ Proper connection ■ Electrical pilot lines including equipotential bonding *Chapter 8.5.11 “Checking the fire detection and extinguishing control panel” on page 179*	Authorized Distributor
	Check supplemental components ■ Fire alarm boxes ■ Pressure compensating devices – Function – Permeability of the flaps ■ Alarm equipment ■ etc. *Chapter 8.5.12 “Check supplemental components” on page 180*	Authorized Distributor

Also service components that are subject to wear, such as hoses, etc. in accordance with locally applicable 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.

8.3 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.

8.4 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.

8.5 Inspection and maintenance tasks

8.5.1 Check protected enclosure for structural changes

Personnel: ■ Authorized Distributor

⚠ WARNING

Life-threatening danger due to lack of fire safety!

- **If there are apparent changes or other use of the protected enclosure, the system must be redesigned.**
- **As a provisional measure provide functional reserve extinguishing equipment on hand (e.g. fire extinguishers).**

There is inadequate fire safety if there have been retroactive structural changes of the system or of the protected enclosure or other use of the protected enclosure. There is a life-threatening danger as well as the danger of considerable material damage.

Consider the following:

- Are there structural changes to the protected enclosure that have not been considered in the design?
- Is the protected enclosure used in accordance with the design data, or is there another type of use/ extended use?
- Do the dimensions of the protected enclosure agree with those that were considered in the design?
- Are there additional fire loads that have not been considered in the design (e.g. stacks of paper, boxes, etc.)?

8.5.2 Check the protected enclosure for permeability

Personnel: ■ Authorized Distributor

When checking the protective enclosure for leaks, perform the following tasks:

1. Visually check the protected enclosure for leaks.
2. Check the automatic locking devices for functionality.
3. Check the functionality of panic locks and other escape possibilities.
4. Ensure that all escape possibilities are safeguarded and available in the event of fire.

If statements cannot be made concerning the permeability of the protected area have a door fan test or trial flooding performed.

8.5.3 Check documentation and labels

Check documentation

Personnel: ■ Authorized Distributor

Inspection of the documentation includes the following points:

- Is a report book present?
- Are all entries in the report book up to date?
- Has the person in charge of the system executed all prescribed inspections regularly and noted the execution in the report book?
- Is the operating manual present on the system?

If the documentation is not complete, assign the person in charge of the system to complete the documentation.

Check the labels

Personnel: ■ Authorized Distributor

Inspection of the labels includes following points:

- Is the system properly labeled ↬ *"System labeling" on page 33*?
- Are the extinguishing zones of the system labeled ↬ *"Identification of the extinguishing zones" on page 34*?
- Are rescue routes labeled?

- Are manual release units labeled as such?
- Are fire detectors labeled?

If the labeling is not complete, assign the person in charge of the system to complete the labeling.

8.5.4 Check electrical release devices

Check electrical release devices

Personnel: ■ Authorized Distributor

Special tool: ■ Screw reset tool (887645)

1. Check the release device for external damage and soiling.
2. **⚠ WARNING! Danger of a faulty release!**

   Unscrew all electrical release devices from the extinguishing agent containers.
3. If an “electrical release device monitor” is in place, perform a function check of the monitor:
   - Remove the release device from the valve.
     ⇨ The “Electrical release device monitor" switch switches.
   - Check whether it is displayed in the fire detection and extinguishing control panel that the suppression system is not operational.
     Ideally, “Release device removed/system isolation" will be displayed.
4. Check the release device in accordance with the instructions for mounting *Chapter 5.3.9.3 “Mounting the electrical release device” on page 102*.
5. If an “electrical release device monitor” is in place, perform a check of the fire detection and extinguishing control panel.

   With correctly mounted electrical release devices, no signal is sent by the monitor to the fire detection and extinguishing control panel and thus no fault message is displayed by the monitor.

Check the EM release device

Personnel: ■ Authorized Distributor

Special tool: ■ Clamping device (885530)

1. Check the EM release device for external damage and soiling.
2. **⚠ WARNING! Danger of a faulty release!**

   Unscrew the valve lever on the valves of all pilot cylinders.

   If there is a monitor for the EM release device, the switch of the monitor must switch and the fire detection and extinguishing control panel must display that the fire suppression system is not operational. Ideally, "Release device removed/system isolation" will be displayed.
3. **⚠ CAUTION! Risk of injury due to release pin coming out suddenly.**

   Keep away from the area in front of the release pin.
4. Activate the EM release device with 24 V DC.
5. Check whether the release pin (Fig. 153/1) projects on the EM release device.

   If the EM release device has been correctly activated, the release pin must project. If this is not the case the EM release device is defective and must be replaced.
6. Switch off the power.

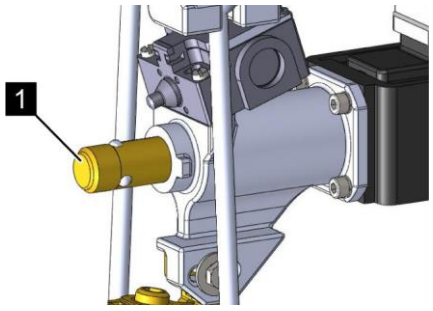


Fig. 153: Release pin

7. Fit the clamping device (Fig. 154/2) onto the holder of the EM release device (Fig. 154/1) and fix it in place (Fig. 154/arrow).

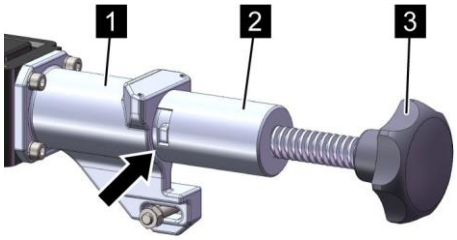


Fig. 154: Clamping device

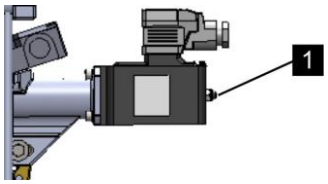


Fig. 155: Locking bolts

8. By turning the adjustment wheel, push the release pin (Fig. 154/3) of the clamping device far enough into the housing that the locking bolt (Fig. 155/1) can be pushed in the counter direction and lock the release pin.

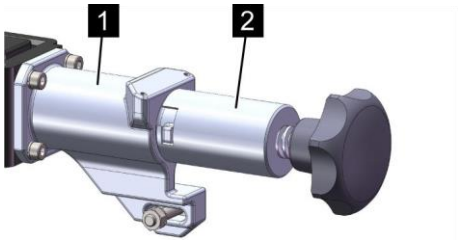


Fig. 156: Clamping device

9. Remove clamping device (Fig. 156/2) from the holder (Fig. 156/1).
10. Unscrew all release devices on the extinguishing agent container.

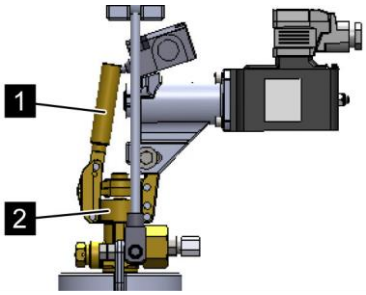


Fig. 157: Unscrewing the valve lever

11. Screw the valve lever (Fig. 157/1) onto the valve (Fig. 157/2) of the pilot cylinder again.
12. If an EM release device monitor is in place, perform a check of the fire detection and extinguishing control panel.

With correctly mounted electrical release devices, no signal is sent by the monitor to the fire detection and extinguishing control panel and thus no fault message is displayed by the monitor.

8.5.5 Checking the pneumatic release device

A complete inspection of all pneumatic release devices – beyond checking the activation functionality of the "master" extinguishing agent container – is only necessary:

- *Before commissioning*
- *If leaks/malfunctions are suspected*
- *Every 5 years unless locally applicable regulations stipulate more frequent inspections*

Activation through pilot and "pilot cylinder" extinguishing agent container

Personnel:	■ Authorized Distributor
Protective equipment:	■ Protective goggles
Special tool:	■ Clamping device (885530)
Materials:	■ Test cylinder (at least 21 bar (305 psi))

The following information applies for systems without test connection.

1. Check the release device for external damage and soiling.
2. **⚠ WARNING! Danger of a faulty release!**

   Unscrew all release devices from the extinguishing agent containers and unscrew the valve lever on the valve of the pilot cylinder (if present).
3. Disconnect the pilot line of the first pneumatic release device from the "pilot cylinder" extinguishing agent container or the pilot cylinder and connect it to the test cylinder.
4. Open the test cylinder.
5. Check whether the release devices of the associated extinguishing agent container/s have been activated, i.e. whether the release pin (Fig. 158/1) protrudes 8.2 ± 0.5 mm (0.323 ± 0.02 inches).

   ℹ If the release pin does not protrude appropriately the release device is defective and must be replaced. In deactivated status the release pin protrudes 3.9 ± 0.4 mm (0.15 ± 0.016 inches).
6. Check the pilot line for leaks.

   ℹ Replace damaged pilot lines.
7. Close the test cylinder.
8. Vent the pilot lines.
9. **⚠ WARNING! Danger of a faulty release!**

   Check whether all release pins are in deactivated status. In deactivated status the release pin protrudes 3.9 ± 0.4 mm (0.15 ± 0.016 inches).
10. Remove the pilot line and adapter from the test cylinder.
11. Replace non-functioning release devices with new release devices.

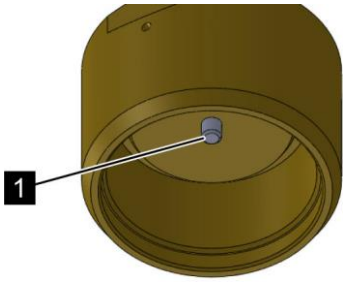


Fig. 158: Release pin

12. Reconnect adapter and pilot line to the "pilot cylinder" extinguishing agent container or the pilot cylinder *Chapter 5.3.9.1 “ Interconnecting the pneumatic release devices” on page 98*.

13. Remount all release devices on the valves of the extinguishing agent containers *Chapter 5.3.9 “Mounting the release devices” on page 97*.

Activation through pneumatic release device (PAE)

Personnel: ■ Authorized Distributor

Materials: ■ Test cylinder (at least 21 bar (305 psi))

1. **WARNING! Danger of a faulty release!**

   Unscrew all release devices from the extinguishing agent containers and unscrew the valve lever on the valve of the pilot cylinder.

2. If a test connection is present, remove the protective cap of the test connection.

   Alternatively connect the test cylinder instead of the pilot cylinder.

3. Connect the pilot cylinder to the test connection.

4. Open the test cylinder.

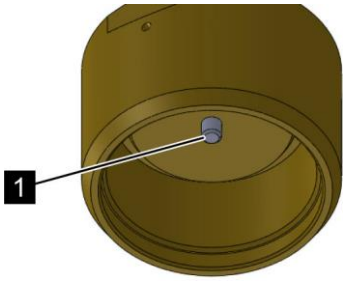


Fig. 159: Release pin

5. Check whether the release devices of the associated extinguishing agent container/s have been activated, i.e. whether the release pin (Fig. 159/1) protrudes 8.2 ± 0.5 mm (0.315 ± 0.02 inches).

   If the release pin does not protrude appropriately the release device is defective and must be replaced. In deactivated status the release pin protrudes 3.9 ± 0.4 mm (0.15 ± 0.016 inches).

6. Check the pilot line for leaks.

   Replace damaged pilot lines.

7. Close the test cylinder.

8. Vent pilot lines via the manual pressure relief valve.

9. **WARNING! Danger of a faulty release!**

   Check whether all release pins are in deactivated status. In deactivated status the release pin protrudes 3.9 ± 0.4 mm (0.15 ± 0.016 inches).

10. Remove the test cylinder from the test connection.

11. Fit the protective cap onto the test connection.
12. Remount all release devices on the valves of the extinguishing agent containers ↳ *Chapter 5.3.9 “Mounting the release devices” on page 97*.

Supplemental check for multi zone systems

Personnel: ■ Authorized Distributor

Materials: ■ Test cylinder (at least 21 bar (305 psi))

For multi zone systems you must also check whether the activation of the individual selector valves of the extinguishing zones functions correctly and the correct number of extinguishing agent containers for each zone are opened.

1. **⚠ WARNING! Danger of a faulty release!**

   Unscrew all release devices from the extinguishing agent containers and unscrew the valve lever on the valve of the pilot cylinder.
2. If a test connection is present, remove the protective cap of the test connection.

   Alternatively connect the test cylinder instead of the pilot cylinder.
3. Connect the pilot cylinder to the test connection.
4. Open the test cylinder.
5. Throw over the valve lever (Fig. 160/1) of a valve on the pilot distributor.

   ⇨ The valve is open.
6. Check whether only the selector valve allocated to the appropriate extinguishing zone has opened.

   If not just the selector valve assigned to the extinguishing zone has opened, a system malfunction is present.
7. Check whether the pneumatic release device of the associated extinguishing agent container/s has/have been activated.

   If release devices other than those of the extinguishing agent containers intended for the extinguishing zone have been activated, a system malfunction is present.

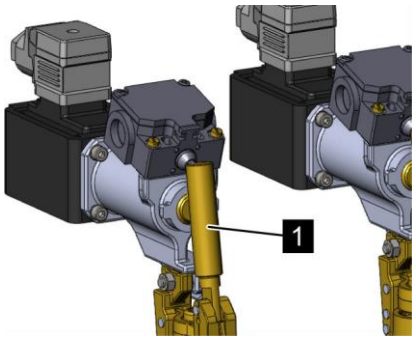


Fig. 160: Throwing over the valve lever

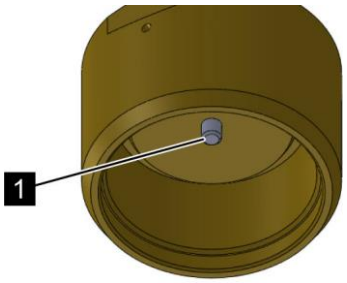


Fig. 161: Release pin

8. Check whether all release pins (Fig. 161/1) are in deactivated status. In deactivated status the release pin protrudes 3.9 ± 0.4 mm (0.15 ± 0.016 inches).

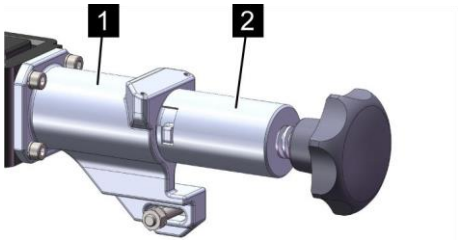


Fig. 162: Clamping device

9. If the valves on the pilot distributor have been opened electrically, reset the EM release device (Fig. 162/1) with clamping device (Fig. 162/2) ↬ *Further information on page 157*.

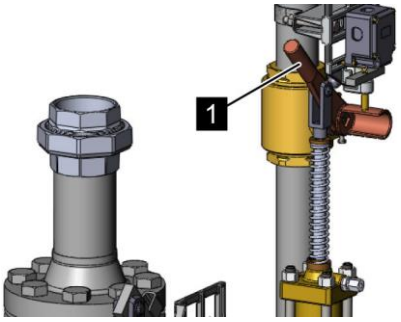


Fig. 163: Closing the selector valve

10. Fit the hand lever (Fig. 163/1) onto the operating element of the selector valve.
11. Press the operating element with hand lever upward.

    ⇨ The selector valve is closed.
12. Take off the hand lever of the operating element (Fig. 163/1) and store it safely in the vicinity of the system.

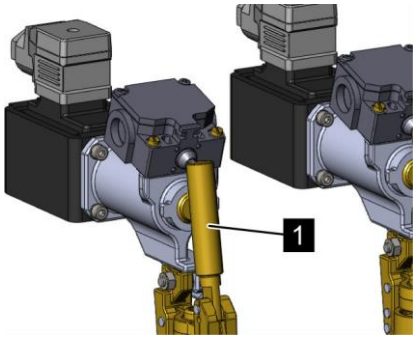


Fig. 164: Valve lever

13. Swing the valve lever (Fig. 164/1) of the pilot distributor upward again.

    ⇨ The valve is closed again.
14. Unscrew the valve lever.

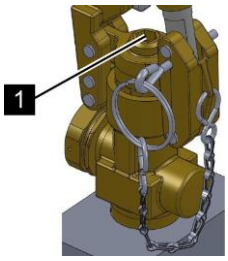


Fig. 165: Allen head screw

15. **WARNING! Risk due to malfunction of the valve on the pilot distributor! Use a calibrated torque wrench to check whether the Allen head screw (Fig. 165/1) is set with a torque of 12 - 13 Nm (8.85 to 9.59 ft-lb).**

    *The tightening torque of the Allen head screw must be reset with a calibrated torque wrench after every actuation of the control valve. The thread of the Allen head screw must **not** be oiled or greased.*

    A rattling sound may be heard when setting the tightening torque.

16. Screw the valve lever on again.

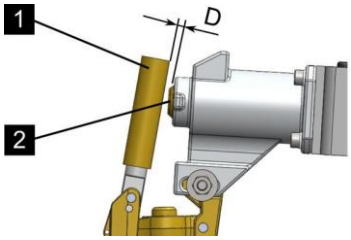


Fig. 166: Checking distance

17. Check distance D = 3 ± 1 mm (0.118 ± 0.039 inches) (Fig. 166/D) between valve lever (Fig. 166/1) and release bolts (Fig. 166/2) and readjust if necessary.
18. Repeat steps **5.** to **17.** for all extinguishing zones.
19. Remove the test cylinder from the test connection.
20. Fit the protective cap onto the test connection.
21. **WARNING! Danger of a faulty release!**

    Ensure that all release pins are in the inactive position.
22. Remount all release devices on the valves of the extinguishing agent containers *Chapter 5.3.9 “Mounting the release devices” on page 97*.

Check the electrical locking mechanisms that are switched from the fire detection and extinguishing control panel based on the instructions in the separate operation manual. Even with a simultaneous alarm in multiple zones of a multi zone system, only one extinguishing zone can be electrically activated by the fire detection and extinguishing control panel, i.e. the first zone in which an alarm occurs. Other alarms in other zones may not lead to the electrical activation of additional zones (activation of further valves at pilot distributor DN 15).

8.5.6 Check manual release device* not VdS, not CNPP/A2P

Without electrical release device

Personnel: ■ Authorized Distributor

1. Check the release device for external damage and fouling.
2. **WARNING! Danger of false triggering!**

   Unscrew the release device from the valve.
3. Press the hand lever (Fig. 167/1) downward to the stop (Fig. 167/arrow).

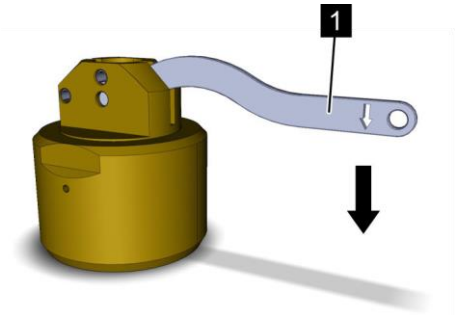


Fig. 167: Hand lever down

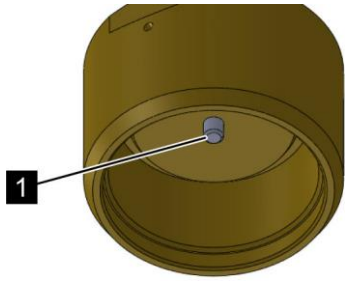


Fig. 168: Release pin

4. Check whether the release pin (Fig. 168/1) protrudes on the release device. Target dimensions: 8.1 +0.65/-0.55 mm (0.319 +0.026/-0.022 inches).

   If the release pin does not protrude appropriately the release device is defective and must be replaced. In deactivated status the release pin protrudes 3.9 ± 0.4 mm (0.15 ± 0.016 inches).

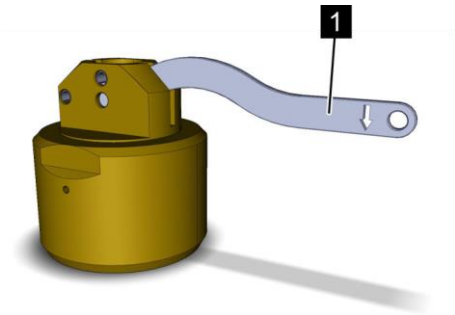


Fig. 169: Hand lever up

5. Return the hand lever (Fig. 169/1) to starting position.
6. Recheck the dimensions and compare them with the target dimensions.

   If there are deviations from the target dimensions replace the release device.
7. Remount the release device *Chapter 5.3.9.4 "Mounting a manual release device* not VdS, not CNPP/A2P" on page 106*.

With electrical release device

Personnel: ■ Authorized Distributor

1. Check the release device for external damage and fouling.
2. **⚠ WARNING! Danger of false triggering!**

   Unscrew the manual and electrical release device from the valve together.
3. Unscrew the manual release device from the electrical release device.
4. Press the hand lever (Fig. 170/1) of the manual release device downward to the stop (Fig. 170/ arrow).

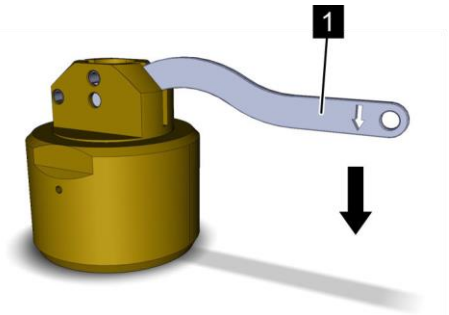


Fig. 170: Hand lever down

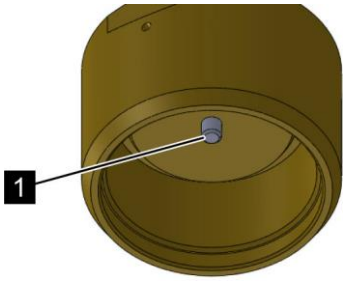


Fig. 171: Release pin

5. Check whether the release pin (Fig. 171/1) protrudes on the release device. Target dimensions: 8.1 +0.65/-0.55 mm (0.319 +0.026/-0.022 inches).

   ℹ If the release pin does not protrude appropriately the release device is defective and must be replaced. In deactivated status the release pin protrudes 3.9 ± 0.4 mm (0.15 ± 0.016 inches).

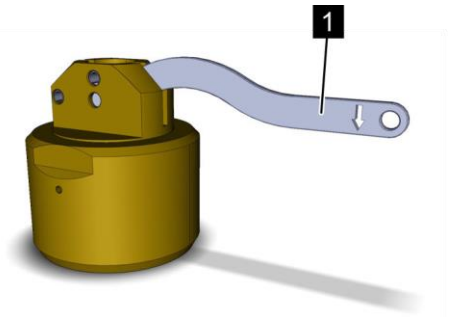


Fig. 172: Hand lever up

6. Return the hand lever (Fig. 172/1) to starting position.
7. Recheck the dimensions and compare them with the target dimensions.

   ℹ If there are deviations from the target dimensions replace the manual release device.
8. Remount the manual release device on the electrical release device and then mount both on the valve *Chapter 5.3.9.4 “Mounting a manual release device* not VdS, not CNPP/A2P” on page 106*.

8.5.7 Check valve with integrated electrical release device

Check the coil on the valve

Personnel: ■ Authorized Distributor

Special tool: ■ Resistance measurement device

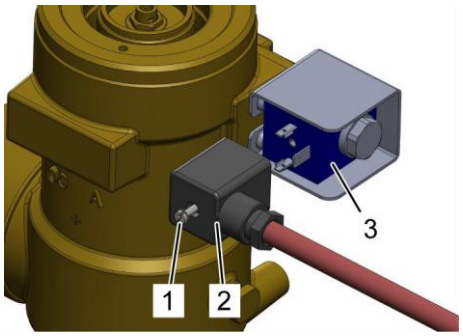


Fig. 173: Check the coil

1. Unscrew screw (Fig. 173/1) on the plug and pull off plug (Fig. 173/2).
2. Measure the electrical resistance of the coil (Fig. 173/3) with a resistance measurement device. The target value should be 96 Ohm ± 10 %.

Check the activation

Personnel: ■ Authorized Distributor

Special tool: ■ Release device, electrical (887667 or 889323)
■ Screw reset tool (887645)

Only use a separate electrical release device for the check.

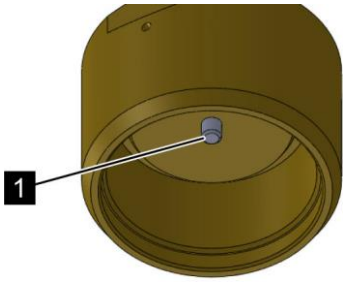


Fig. 174: Release pin

1. Check whether the release pin (Fig. 174/1) of the electric release device is deactivated.

   If the release device is deactivated, the red marking is not visible.

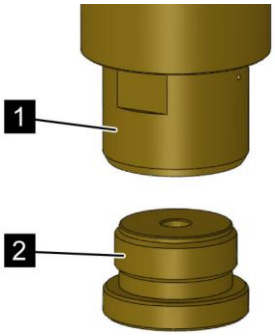


Fig. 175: Resetting the release pin

2. Deactivate the electrical release device if necessary. To do this, screw the screw reset tool (Fig. 175/2) into the electrical release device (Fig. 175/1) by hand until the stop.
3. Unscrew the screw reset tool and remove it.

   ⇨ If the red marking can no longer be seen the electrical release device is deactivated.

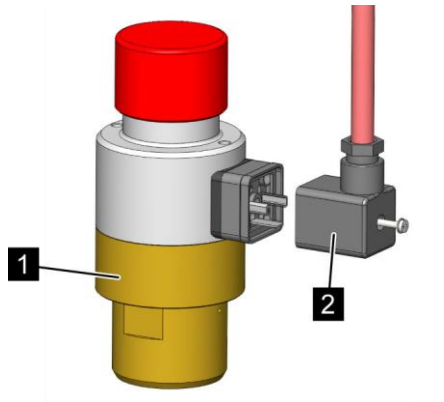


Fig. 176: Check the activation

4. Connect the electrical release device (Fig. 176/1) on the plug (Fig. 176/2).
5. **⚠ WARNING! Danger of a faulty release!**

   Ensure that the plug is not connected on the coil (Fig. 173/3) of the valve.
6. Activate the electric release device through the fire detection and extinguishing control panel.

   ⇨ The release pin of the electrical release device must trigger.
7. Reset the release pin with the screw reset tool.

   ⇨ If the red marking can no longer be seen the electrical release device is deactivated.
8. **⚠ WARNING! Danger of a faulty release!**

   Ensure that there is no activation on the fire detection and extinguishing control panel side.
9. Plug the plug (Fig. 177/2) onto the coil (Fig. 177/3) of the valve and secure with the screw (Fig. 177/1).

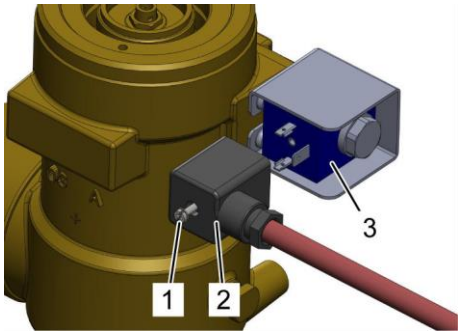


Fig. 177: Check the coil

8.5.8 Checking components for damage and function

8.5.8.1 Checking components for damage

Personnel: ■ Authorized Distributor

1. Check all installed components for external damage and corrosion.

   ℹ Replace damaged components immediately.
2. Remove fouling.
3. Check protective coating of all system parts and improve if necessary.

8.5.8.2 Checking the functionality of components

Some components must be checked not only for damage, they must also be checked for functionality. These components are listed in the following sections.

Checking the shuttle non-return valve

Personnel: ■ Authorized Distributor

→ Visually inspect the sinter metal filter for soiling.

i Clean fouled sinter metal filters or have them replaced by new ones.

Checking the weighing device

Personnel: ■ Authorized Distributor

1. → Move the lever arm of the counterweight up and down several times.

   i If the counterweight cannot be moved without resistance, replace the weighing device.

2. → Mathematically determine the acceptable leakage amount (5–10% of the net filling quantity of the pilot cylinder).

3. → ***NOTICE!*** **Property damage due to falling pilot cylinder!**

   Carefully lift the pilot cylinder in mounted status with a spring scale or a cylinder lifter with scale, until the calculated acceptable leakage quantity is displayed.

   ⇨ The counterweight must fall.

4. → If the counterweight does not fall, but is movable, lower the pilot cylinder and adjust the weighing device ↬ *Chapter 5.3.8 “Mounting the pneumatic release device (PAE, optional)” on page 91*.

5. → Repeat step **3** and check functionality again.

Checking blocking devices

Personnel: ■ Authorized Distributor

i A complete inspection of all blocking devices is only necessary:

- *Before commissioning*
- *If leaks/malfunctions are suspected*
- *Every 5 years unless locally applicable regulations stipulate more frequent inspections*

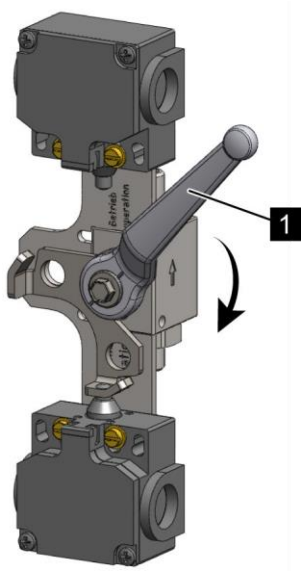


Fig. 178: Checking blocking device (optionally with 1 or 2 limit switches)

1. Remove safety lock.
2. Check the ball valve (Fig. 178/1) for ease of movement.
3. Switch the ball valve (Fig. 178/arrow).

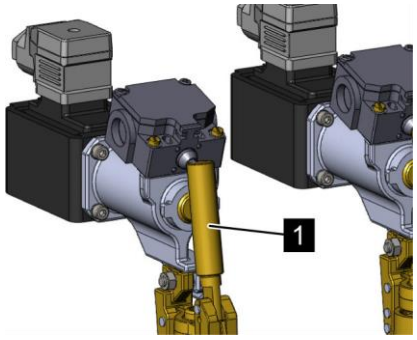


Fig. 179: Valve lever

4. **⚠ WARNING! Danger of a faulty release!**

   Unscrew all release devices from all extinguishing agent containers and unscrew the valve lever (Fig. 179/1) on the valve of the pilot cylinder.
5. If a test connection is present, remove the protective cap of the test connection.

   ℹ Alternatively connect the test cylinder instead of the pilot cylinder.
6. Connect the pilot cylinder to the test connection.
7. Open the test cylinder.
8. Check whether the release devices of the associated extinguishing agent container/s has/have been activated (Fig. 180/1) and that no selector valve is open.

   ℹ If the associated release devices have been activated or a selector valve is open, the blocking device is defective. Replace the blocking device.
9. Close the test cylinder.
10. Blow off the control pressure.

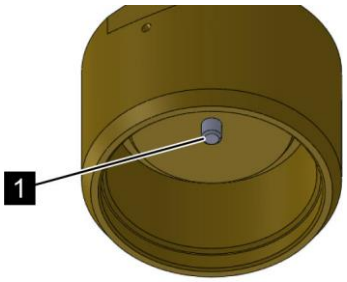


Fig. 180: Release pin

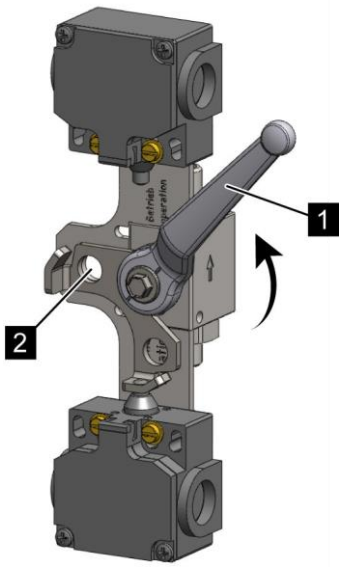


Fig. 181: Blocking device (optionally with 1 or 2 limit switches)

11. Switch the ball valve (Fig. 181/1) to the “ready for operation” position (Fig. 181/arrow).
12. Attach the padlock (Fig. 181/2).
13. Repeat the check for all blocking devices.

Checking the pneumatically actuated limit switch

Personnel: ■ Authorized Distributor

1. **⚠ WARNING! Danger of a faulty release!**

   Unscrew the electrical release devices from all extinguishing agent containers and unscrew the valve levers on the valves of the pilot cylinders.

   ℹ The pneumatically actuated limit switch can, depending on the type of integration in the fire detection and extinguishing control panel, activate the same controls as an electrical manual release.

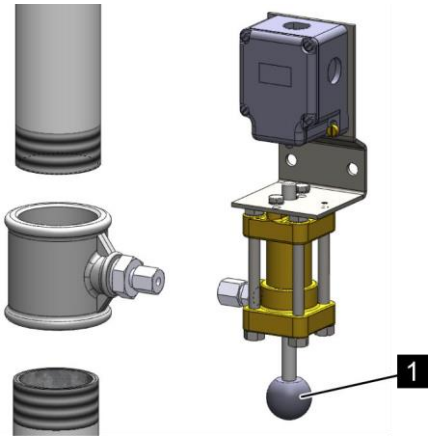


Fig. 182: Checking limit switches

2. Press the pushbutton (Fig. 182/1) on the cylinder of the limit switch in the direction of the limit switch.
3. Check whether a signal is queued on the fire detection and extinguishing control panel.
4. Return the pushbutton to the resting position (as shown in Fig. 182).
5. Reset the fire detection and extinguishing control panel.
6. Check whether there is an alarm or activation on the fire detection and extinguishing control panel. If there is an alarm or activation, put the system in the idle state.
7. **⚠ WARNING! Danger of a faulty release!**

   Ensure that all release devices are reset.

8. Remount the release devices.

8.5.9 Check the extinguishing agent containers

Personnel: ■ Authorized Distributor

1. Check all extinguishing agent containers for damage and corrosion (visual).
2. Check the fastening of extinguishing agent containers *Chapter 8.5.9.2 “Check the fastening of the extinguishing agent containers” on page 177*.
3. Check the filling quantity of the extinguishing agent containers *Chapter 8.5.9.1 “Check filling quantity” on page 172*.
4. Check the functionality of all contact pressure gauges *Chapter 8.5.9.3 “Checking the function of the contact pressure gauge” on page 177*.
5. Check the valves to see whether all unused pressure gauge connections are closed off with blind plugs and the blind plugs are screwed in all the way. Cap unused pressure gauge connections with blind plugs for pressure gauge outlets (part no. 888027).
6. Check the valves to see whether all unused control connections (Fig. 183/1) are closed off with blind plugs and the blind plugs are screwed in all the way. Cap unused control connections with blind plugs for control connection G1/8 (part no. 888032).
7. On valves with an integrated electric release, check the connection for external release devices to see whether either an additional release device or a protective cap made of brass is screwed on. If this is not the case, screw on a “protective cap valve control side" (part no. 888028) with 50 +0/-15 Nm (36.9 +0/-11.1 lb•ft) of torque.

   The protective cap must rest metallically on the valve.
8. On valves with an integrated electric release, check whether the “protective cap valve control side" (part no. 888028) is fastened with 50 +0/-15 Nm (36.9 +0/-11.1 lb•ft) of torque.

   The protective cap must rest metallically on the valve.

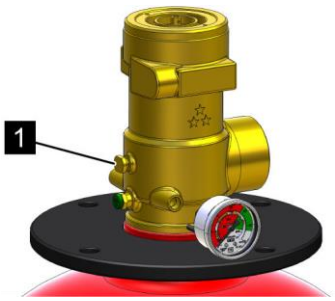


Fig. 183: Control connection

8.5.9.1 Check filling quantity

The filling quantity of the extinguishing agent container must be checked semi-annually, as well as after delivery, insofar as local provisions do not require a shorter interval. The following checks are required:

- Checking the system pressure through pressure measurement
- Check of extinguishing agent quantity

Checking the system pressure through pressure measurement

Personnel: ■ Authorized Distributor

Special tool: ■ Pressure measurement device

NOTICE

Material damage due to escaping extinguishing agent!

– Ensure that the pressure measurement device is absolutely sealed.

If the pressure measurement device is not absolutely sealed, the danger exists that extinguishing agent will unintentionally escape in the course of the measurement.

Due to the system structure the pressure of an extinguishing agent container is an indicator of whether extinguishing agent leakage is present.

Only use tested and calibrated pressure measurement devices. Suitable pressure measurement devices with control pressure gauges or with pressure transmitters are available from the manufacturer.

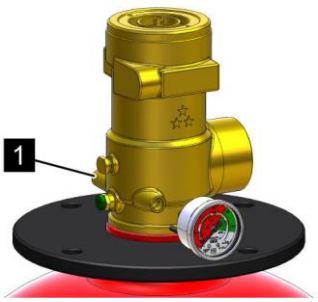


Fig. 184: Pressure gauge connection

1. ***NOTICE!* Danger of pressure loss!**

   Ensure that the pressure measurement device is mounted pressure tight. Check the seat of O-ring and supporting ring.

2. Remove the blind plug on the unused pressure gauge connection (Fig. 184/1) of the valve.

   In this process through the pressure relief occasioned by the system a brief, harmless bang can occur.

3. Screw the pressure measurement device with the provided adapter into the pressure gauge connection.

4. Ensure that the minimum bending radius of 35 mm (1.378 inches) is not underranged.

   The hose of the pressure measurement devices with control pressure gauge should not be kinked.

5. Measure the enclosure temperature.

6. Read out the pressure on the pressure measurement device.

   With a pressure drop of ≥ 10 % of the system pressure at 21 °C (70 °F), nitrogen must be filled in.

   If the values listed in the table are underranged then the extinguishing agent container is insufficiently filled. All values are rounded.

Minimum pressure at -18 °C (0 °F)	Minimum pressure at 21 °C (70 °F)	System pressure at 21 °C (70 °F)	Maximum pressure at 21 °C (70 °F)	Pressure at 50 °C (122 °F)
21.2 bar (307 psi)	22.5 bar (324 psi)	25 bar (360 psi)	27.5 bar (396 psi)	29 bar (421 psi)
34.5 bar (500 psi)	37.8 bar (549 psi)	42 bar (610 psi)	46.2 bar (671 psi)	48 bar (696 psi)
42.5 bar (616 psi)	45 bar (653 psi)	50 bar (725 psi)	55 bar (798 psi)	57.4 bar (833 psi)

7. Unscrew the pressure measurement device from the pressure gauge connection.

   In this process through the pressure relief occasioned by the system a brief, harmless bang can occur.

8. Screw the blind plug onto the pressure gauge connection of the valve.

9. Remove the insufficiently filled extinguishing agent container, top it up, or replace it with a new one *Further information on page 137*.

   Only use extinguishing agent containers with the Novec™ extinguishing agent.

Checking extinguishing agent quantity through weighing

Personnel: ■ Authorized Distributor

Special tool: ■ Scale

With this method the containers must be disconnected from the pipe system and weighed with a transportable calibrated scale. Because the removal of the clamp or transport and handling of the extinguishing agent container are only acceptable with mounted protective valve cap, the weight of the protective valve cap (approx. 7.7 kg (16.97 lbs)) must be separately determined and retrospectively subtracted.

1. Remove the extinguishing agent container
↬ *Chapter 11.2.2 “Removing the extinguishing agent containers” on page 190*.
2. Weigh the extinguishing agent container with protective valve cap.
3. Compare the weight minus the weight of the protective valve cap with the weight specified on the type plate of the extinguishing agent container.

   The weight specified on the type plate includes the extinguishing agent container with valve, all anti-recoil caps on the valve and neck ring. Not included are the release device (if not integrated in the valve), the protective valve cap, and the contact pressure gauge.

   If the loss is ≥ 5 % of the extinguishing agent weight, the extinguishing agent must be topped up.
4. Remove the insufficiently filled extinguishing agent container, top it up, or replace it with a new one
↬ *Further information on page 137*.

   Only use extinguishing agent containers with the Novec™ extinguishing agent.

Alternatively: Check through ultrasonic measurement* not UL, not FM

Personnel: ■ Authorized Distributor

Special tool: ■ Ultrasonic measurement device

With the aid of the ultrasonic measurement, it is possible to determine the liquid level in the extinguishing agent container. For the ultrasonic measurement, first a check through weighing must take place.

Only use ultrasonic measuring devices that satisfy the locally applicable regulations.

At installation of the extinguishing agent container the target filling level must be determined with the ultrasonic measuring device specified for the ongoing tests, and marked on the container. If the marking is inadequate or insufficient, determination of the target liquid level must be checked by weighing.

1. Determine the liquid level with an ultrasonic measurement device.
2. Check whether the detected liquid level corresponds to the required extinguishing agent quantity.

   If the loss is ≥ 5 % of the extinguishing agent weight, the extinguishing agent must be topped up.
3. Remove the insufficiently filled extinguishing agent container, top it up, or replace it with a new one
   Further information on page 137.

   Only use extinguishing agent containers with the Novec™ extinguishing agent.

Alternatively: Check with liquid level indicator

Personnel:
- Authorized Distributor

Protective equipment:
- Protective goggles
- Extinguishing-agent-resistant safety gloves

WARNING

Risk of injury due to extinguishing agent escaping under pressure!

– Do not unscrew the brass hexagon (Fig. 185/3) of the liquid level indicator.

If the liquid level indicator has been unscrewed from the extinguishing agent container, there is danger of severe or fatal injury.

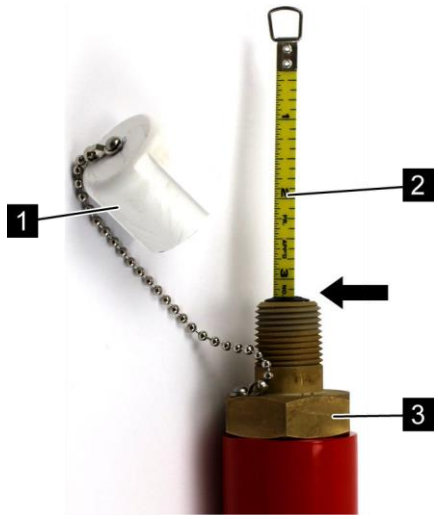


Fig. 185: Reading the liquid level

At installation of the extinguishing agent container the target filling level must be determined with the liquid level indicator and must be noted. Upon installation of the extinguishing agent container, the target filling level must be determined with the liquid level indicator and recorded.

1. Unscrew the plastic protective cap (Fig. 185/1).
2. Pull tape measure (Fig. 185/2) out of the liquid level indicator to the stop.
3. Slowly lower the tape measure into the liquid level indicator until a slight pull is felt.

   ⇨ The measuring tape is fixed magnetically on the float.
4. Read the liquid level on the measuring tape above the threaded union (Fig. 185/arrow).
5. Detach the measuring tape (Fig. 185/2) from the float with rapid hand movement, and lower it completely into the liquid level indicator.
6. Screw on the plastic protective cap (Fig. 185/1).
7. Check whether the detected liquid level corresponds to the required extinguishing agent quantity. If the loss is ≥ 5 % of the extinguishing agent weight, the extinguishing agent must be topped up, and in addition the extinguishing agent quantity must be checked by weighing the extinguishing agent container.

   Determine the extinguishing agent weight depending on the measured value specified in the liquid level indicator diagrams ↬ Appendix D “Liquid level indicator diagrams” on page 242.
8. Remove the insufficiently filled extinguishing agent container, top it up, or replace it with a new one ↬ *Chapter 7.5 “Filling extinguishing agent containers” on page 142*.

   Only use extinguishing agent containers with the Novec™ extinguishing agent.

8.5.9.2 Check the fastening of the extinguishing agent containers

Personnel: ■ Authorized Distributor

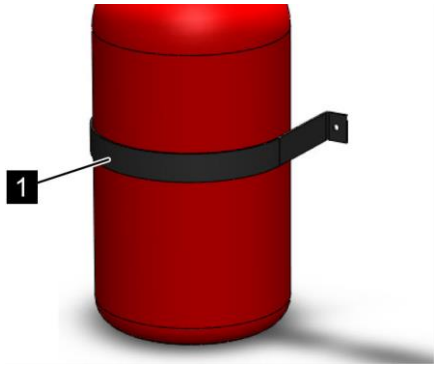


Fig. 186: Check fastening

1. Check whether the clamp (Fig. 186/1) is correctly fastened on bearing structural elements.
2. Check clamp for damage or corrosion.
3. Check whether the name plate of the extinguishing agent container is completely legible.

8.5.9.3 Checking the function of the contact pressure gauge

Personnel: ■ Authorized Distributor

A function check of the contact pressure gauge is only required if locally-applicable regulations require this.

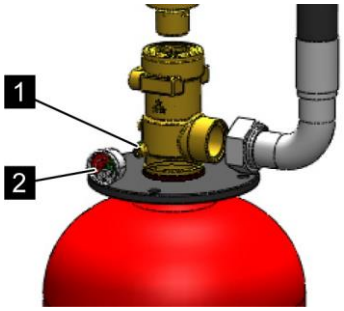


Fig. 187: Contact pressure gauge

1. Unscrew the contact pressure gauge (Fig. 187/2) out of the valve (Fig. 187/1) by hand. If the contact pressure gauge is difficult to turn, unscrew the contact pressure gauge on the key surface SW14 (Fig. 188) with a suitable tool.

   In this process through the pressure relief occasioned by the system a brief, harmless bang can occur.

   ⇨ The electrical contact closes or opens (depending on the version); on the fire detection and extinguishing control panel, this status must be displayed as extinguishing agent leakage.

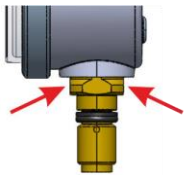


Fig. 188: Key surface

2. Check whether extinguishing agent leak is displayed on the fire detection and extinguishing control panel.

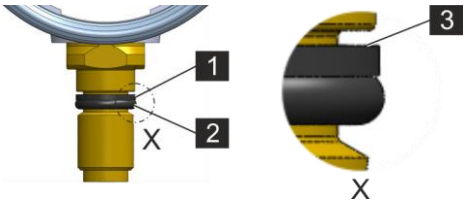


Fig. 189: O-ring and supporting ring

3. Check the O-ring (Fig. 189/2) and support ring (Fig. 189/1) of the contact pressure gauge for deformation and damage and replace if necessary (always as a pair). The flat side of the support ring (Fig. 189/3) must be turned away from the O-ring.
4. Screw the contact pressure gauge into the connection on the valve (Fig. 187/1) as far as it turns easily *by hand*.
5. As soon as the contact pressure gauge is under pressure and is thus more difficult to turn, turn the contact pressure gauge on the key surface SW14 (Fig. 188) with a suitable tool until the stop in the connection.

   i For alignment, the contact pressure gauge can be turned maximum ¾ turn back.

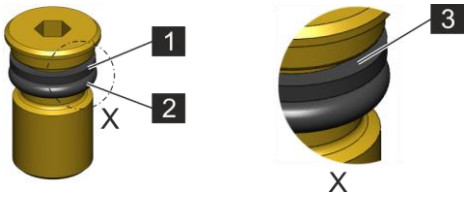


Fig. 190: Blind plugs

6. ***NOTICE!* Danger of leaks!**

   Check the valves to see whether all unused pressure gauge connections are closed off with blind plugs and the blind plugs are screwed in all the way.

   When mounting blind plugs, check whether the support ring (Fig. 190/1) and the O-ring (Fig. 190/2) are correctly mounted on the blind plug and are undamaged. The flat side of the support ring (Fig. 190/3) must be turned away from the O-ring.

8.5.10 Check pipeline system, discharge nozzles and outflow areas

Check pipeline system

Personnel: ■ Authorized Distributor

Materials: ■ Isometric or hydraulic calculation

1. Check the status of all holders.
2. Check pipelines for proper fastening, corrosion and other damage.
3. Check all threaded unions and retighten if required.
4. Check whether all pipelines enable free flow-through.
5. Check pipelines for leaks and if in doubt subject the pipelines to a leak test.

6. Check whether pipeline routing and nominal diameter correspond to the isometric or hydraulic calculation.
7. Ensure that all pipelines are grounded.

Check nozzles and outflow areas

Personnel: ■ Authorized Distributor

Materials: ■ Isometric or hydraulic calculation

1. Check whether all discharge nozzles are firmly tightened and free of fouling.
2. Check discharge nozzles for external damage.
3. Check whether all discharge nozzles are free of lacquer and paint.
4. Check the effective area of the discharge nozzles and align if necessary.
5. Check whether the necessary free space around the discharge nozzles is available.
6. Check whether there are non-considered spray obstructions in the outflow area of the discharge nozzles *“Spray obstacles” on page 84*.
7. Check the position, type, and bore diameter of all discharge nozzles based on the existing isometric or hydraulic calculation.

8.5.11 Checking the fire detection and extinguishing control panel

Check the fire detection and extinguishing control panel in accordance with the information in the manufacturer’s operation manual.

The test of the activation and monitoring of the system must include the following points:

- Activation of all alarm devices if there is an activation
- Activations and switch-offs in the event of an alarm
- Monitoring functions
- Relaying of alarms
- Switchover to reserve (if present)
- Functionality of the display

- For multi zone systems:
  - Correct assignment of the zones to each other (detector, alarm device, selector valve)
  - Correct locking of the other zones as soon as a zone has been actively triggered
- etc.

8.5.12 Check supplemental components

Supplemental components, such as alarm devices, electrical manual release units, pressure compensating devices are not discussed in this manual. Comply with the information in the operating manuals provided by the respective manufacturers.

8.6 Activities after maintenance

After all maintenance tasks have been completely executed, do the following:

- Properly place the system in service again.
  - Check whether all release devices (observe tightening torques) and valve levers are correctly mounted.
  - Check whether all electrical connections and pilot lines are firmly connected.
  - Check whether all locking pins have been removed.
  - Check whether all isolations have been disengaged.
  - Check whether there are any malfunctions, isolations, deactivations, etc. on the fire detection and extinguishing control panel that would inhibit the functioning of the fire suppression system.
- Inform company management and the departments to which malfunctions are automatically relayed that the maintenance has been concluded.
- If parts of the system are not functional schedule dates for resolving these malfunctions.

9 Malfunctions

The following section describes possible causes for faults and the work required to correct these faults.

If faults occur frequently or cannot be remedied by following the instructions listed below, contact a company approved to install the system. Contact can be established through the manufacturer (see page 2).

9.1 Warnings regarding troubleshooting

Non-operational system

⚠ WARNING

Risk of death when system is not ready for operation!

- **Correct malfunctions (or have malfunctions corrected) immediately.**
- **Check the system for proper operation before putting it back into service.**

If the system experiences malfunctions, it may not be operational. Fires cannot be fought effectively and may lead to severe injuries including death as well as significant property damage.

Improperly performed troubleshooting operations

⚠ WARNING

Risk of injury from improper troubleshooting!

- **Have faults that cannot be remedied by following the instructions specified in this section corrected only by the Authorized Distributor or service personnel authorized by the Authorized Distributor.**

Improperly performed troubleshooting operations may cause severe injuries and significant property damage.

Behavior in the event of a failure

The following always applies:

1. Determine cause of fault using the following fault table.
2. If a failure cannot be remedied by following the instructions specified in the failure table, contact the manufacturer.
3. Notify the owner of all detected faults.

The fault table provided below specifies who is authorized to correct a fault.

9.2 Fault indicators

Possible faults are indicated on the fire extinguishing detection system.

This manual does not include a description of the fire extinguishing detection system. Follow the separate operation manual of the fire extinguishing detection system.

Other indications of faults such as leakage of extinguishing agent are provided by the contact pressure gauge fitted on the extinguishing agent cylinders, the liquid level indicators (if present), and the weighing device of the pneumatic release device (PAE).

9.3 Fault table

Fault description	Cause	Remedy	Personnel
The contact pressure gauge installed on the extinguishing agent container indicates leakage of extinguishing agent.	The temperature has dropped below the minimum operating temperature of the contact pressure gauge	Increase the temperature at the installation site of the extinguishing agent containers to more than 5 °C (41 °F). Contact the manufacturer if this is not possible.	Person in charge of the system
	Leakage	Replace the extinguishing agent container ↳ *Further information on page 137*.	Authorized Distributor
Leakage of extinguishing agent is indicated on the fire suppression detection system.	The temperature has dropped below the minimum operating temperature of the contact pressure gauge	Increase the temperature at the installation site of the extinguishing agent containers to more than 5 °C (41 °F). Contact the manufacturer if this is not possible.	Person in charge of the system
	Leakage	Replace the extinguishing agent container ↳ *Further information on page 137*.	Authorized Distributor
The weighing device indicates leakage.	Weighing device set incorrectly	Adjust the weighing device ↳ *Chapter 5.3.8 “Mounting the pneumatic release device (PAE, optional)” on page 91*.	Authorized Distributor
	Leakage of the pilot cylinder	Check the filling quantity of the pilot cylinder (if present) and replace it if necessary ↳ *Further information on page 174*.	Authorized Distributor
Leakage of extinguishing agent is determined via the liquid level indicator.	Reading error	Repeat reading.	Person in charge of the system
	Liquid level indicator is defective	Check extinguishing agent quantity through weighing.	Authorized Distributor
	Leakage	Replace the extinguishing agent container.	Authorized Distributor

Fault description	Cause	Remedy	Personnel
The fire suppression detection system displays a short circuit or an interrupted electrical transmission line.	Short circuit or wire break	Check the cable and the connection and have them repaired.	Qualified electrician

9.4 Correcting the leakage of extinguishing agent

Personnel: ■ Person in charge of the system

NOTICE

Material damage due to excessive enclosure temperature!

- **Do not increase the enclosure temperature unless all electrical equipment is safeguarded against overheating.**
- **Comply with the specifications provided by the manufacturer of the electrical devices. Consult with the manufacturer if in doubt.**

Excessive enclosure temperature (e. g. inside PC or server rooms) may cause electrical equipment to overheat and lead to significant property damage.

1. Use the installed heating equipment to increase the enclosure temperature to at least 5 °C (41 °F).
2. Check the indicator position on the contact pressure gauge (Fig. 191/1).

   ⇨ The indicator of the contact pressure gauge must return to the green area.

Fig. 191: Indicator position

Replace the contact pressure gauge

3. If the indicator of the contact pressure gauge does not return to the green area unscrew the contact pressure gauge.

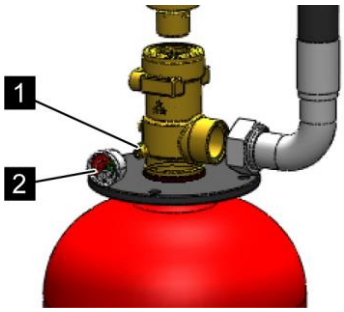


Fig. 192: Screw in the contact pressure gauge

4. ***NOTICE!* Using tools can damage the valve and contact pressure gauge!**

   Screw a new contact pressure gauge (Fig. 192/2) manually into the stop in the connection (Fig. 192/1) on the valve.

   As long as the contact pressure gauge is not under pressure it can be moved. However alignment of the contact pressure gauge is not necessary. If alignment must be executed, turn the contact pressure gauge a maximum of one turn.

5. Check the indicator position.

   If the pointer of the contact pressure gauge is not in the green area for an extended period of time, the extinguishing agent container must be replaced.

Replacing the extinguishing agent containers

6. Remove the release device *Further information on page 136*.
7. Replace the extinguishing agent container *Further information on page 137*.
8. Mount the release device *Further information on page 140*.

9.5 Place the system in service again after a fault has been corrected

Personnel: ■ Authorized Distributor

→ Place the system in service as specified in the instructions for commissioning and placing in service *Chapter 7.2 “Activities before commissioning” on page 133*.

10 Spare parts and small parts

Ordering spare parts

Defective system components cannot be repaired, but rather must be replaced by new components.

Component	Part number
Screw reset tool	887645
Protective cap	887643
Nut M12 (for the protective cap)	811386
Washer for nut M12	109886
Accessories connection pressure relief	889320
Test connection	887431
O-ring valve B0481 (DN49)	888021
O-ring valve B0482 (DN33)	888022
O-ring contact pressure gauge	888023
Support ring O-ring contact pressure gauge	888024
Bursting disk 63.0 bar (914 psi) for valve B0481-A25/B25	915517
Bursting disk 63.5 bar (921 psi) for valve B0482-A25/B25	915518
Bursting disk 88 bar (1276 psi) for valve B0481-A/B	889295
Bursting disk 89 bar (1291 psi) for valve B0482-A/B	888026
Plug for contact pressure gauge outlet	888027
Protective cap valve control side	888028
Anti-recoil cap, valve outlet 2 ½" - 12 UNJ B0481	888029
Anti-recoil cap, valve outlet 1 ⅞" - 12 UNJ B0482	888030
Plug for pilot connection G1/8	888032
Coil, valve with integrated electrical release device	888033
Fastening bolt for coil	888034
Liquid level indicator - extinguishing agent container 106 l	914133
Liquid level indicator - extinguishing agent container 147 l	914134
Liquid level indicator - extinguishing agent container 180 l	914135
Plug - complete for liquid level indicator	914189

Component	Part number
Sealing DN40 hose VSH1230/200	919305
Sealing DN50 hose VSH1230/200	919306

11 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.

11.1 Warnings for disassembly and disposal

Electrical system

⚠ DANGER

Life-threatening danger due to electric shock!

– Prior to dismantling, switch off the electrical supply and definitively disconnect it.

There is a life-threatening hazard when touching live components.

Lack of fire safety

⚠ WARNING

Life-threatening danger due to a lack of fire safety!

– Keep functional reserve extinguishing equipment on hand (e.g. fire extinguishers).

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.

Pressurized extinguishing agent

⚠ WARNING

Risk of injury due to pressure in extinguishing agent containers!

– Only start to dismantle system components if the extinguishing agent containers are removed and safeguarded with a protective valve cap.

If extinguishing agent containers are damaged during disassembly and extinguishing agent escapes uncontrollably, there is a risk of severe or even fatal injuries.

Escaping extinguishing agent

⚠ WARNING

Danger of injury due to escaping extinguishing agent!

- **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.**

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.

11.2 Disassembly

11.2.1 Taking the system out of service

Personnel: ■ Authorized Distributor

Protective equipment: ■ Protective goggles

Prior to starting the disassembly process the system must be taken out of service.

1. Disconnect the electrical pilot lines of the release devices and the monitoring devices to the fire detection and extinguishing control panel.
2. **LWARNING! Danger of a faulty release!**

   Unscrew all release devices from the extinguishing agent containers and unscrew the valve lever on the valve of the pilot cylinder (if present).

   ⇨ The system has been taken out of service.
3. Manually relieve the pressure in the pilot lines via the manual pressure relief valve.

11.2.2 Removing the extinguishing agent containers

Personnel: ■ Authorized Distributor

Protective equipment: ■ Safety gloves
■ Protective goggles

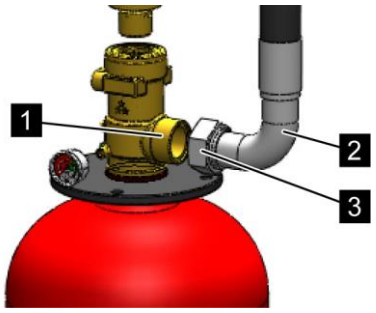


Fig. 193: Remove the hose

1. Remove the connected pilot line from the valve.
2. Seal all control outlets with blind plugs.
3. Unscrew the cap nut (Fig. 193/3) of the hose (Fig. 193/2) or connecting piece (for the version without hose) from the valve outlet (Fig. 193/1).
4. Attach the anti-recoil cap on the valve outlet (Fig. 193/1).
5. Attach a blind plug on the control outlet.

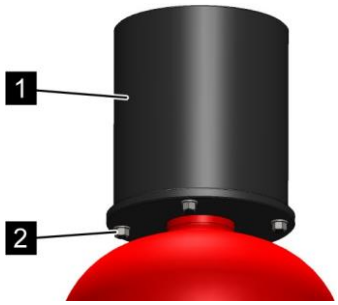


Fig. 194: Install the protective valve cap

6. Fit the protective valve cap (Fig. 194/1) onto the extinguishing agent container.
7. Screw the protective valve cap (Fig. 194/1) with the device onto the extinguishing agent container (Fig. 194/2).

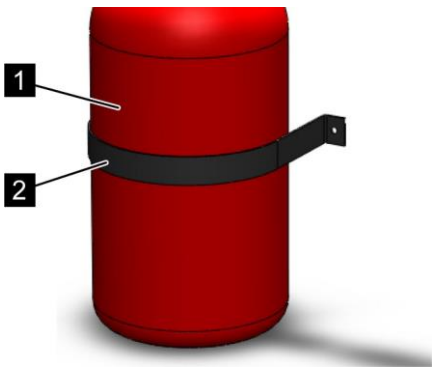


Fig. 195: Remove the clamp

8. Remove the clamp (Fig. 195/2) and carefully place the extinguishing agent container (Fig. 195/1) to the side.

   Send the extinguishing agent container back to a refilling company for refilling in accordance with the transport information Chapter 4.4.1 “Transporting extinguishing agent containers” on page 69.

11.2.3 Disassembling system components

Personnel: ■ Authorized Distributor

Protective equipment: ■ Safety footwear
■ Safety gloves
■ Protective goggles

→ Dismantle all system components in accordance with locally applicable occupational health and safety and environmental regulations.

11.3 Disposal

NOTICE

Danger to the environment due to incorrect disposal!

- **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.**

Incorrect disposal can cause hazards for the environment.

If a return or disposal agreement has not been concluded, then recycle dismantled components:

- Scrap metals.
- Recycle plastic elements.
- Sort and dispose of all other components according to material composition.

Disposing of extinguishing agent containers

NOTICE

Danger to the environment due to incorrect disposal!

- **Extinguishing agent must be disposed of in accordance with applicable local waste disposal regulations.**
- **Follow the safety data sheet for the extinguishing agent.**

The extinguishing agent contains components that can harm aquatic organisms and that can have long-term harmful effects on bodies of water.

1. Empty extinguishing agent containers *Further information on page 72*.
2. Dispose extinguishing agent in accordance with locally applicable directives.
3. Dispose of emptied extinguishing agent containers as scrap steel or brass.

12 Technical data

The technical data that affects the overall system is listed below.

- See the respective product sheet for technical data on the individual components and parts (separate document, part number 924680).

12.1 System layout

The system layout must be drawn up by the Authorized Distributor when configuring the system. It is not part of this manual.

12.2 Performance values

Specification	Value	Unit
System pressure 21 °C (70 °F)[1)]	25/42/50	bar
	360/610/725	psi
Maximum effective nozzle height, standard	4.27	m
	14	ft
Maximum effective nozzle height, extended [2)]	5.45	m
	17.9	ft
Minimum effective nozzle height	0.3	m
	1	ft
Flooding time, minimum	7	s
Flooding time, maximum	10	s

[1)] Depending on the design and size of the protected enclosure

[2)] Has a higher design concentration as the prerequisite; the temperature range for set up of the extinguishing agent container is limited (see the Design Manual)

The design concentration depends on the individual fire load.

Technical data

Extinguishing agent

Specification	Value	Unit
Inherent pressure at 20 °C (68 °F)	0.4	bar
	5.8015	psi
Density at 20 °C (68 °F)	1.6	kg/l
	100	lbs/ft³
Shelf life*	30	a

* If stored correctly between -18 and +50 °C (0 and +122 °F)

Extinguishing agent container

Specification	Value	Unit
Nominal fill	22 (60)	l (lbs)
	40 (100)	l (lbs)
	52 (140)*	l (lbs)
	80 (220)	l (lbs)
	100 (270)	l (lbs)
	106 (280)*	l (lbs)
	140 (390)	l (lbs)
	147 (390)*	l (lbs)
	180 (500)	l (lbs)
Fill factor for UL/FM/CE, maximum**	1.2	kg/l
	75	lbs/ft³
Fill factor for VdS, maximum**	1.05	kg/l
	65.5	lbs/ft³
Fill factor, minimum**	0.4	kg/l
	25	lbs/ft³

* Only 25 bar (360 psi)

** At 21 °C (70 °F)

Pneumatic follow-on releases

Operating pressure of the "control cylinder" extinguishing agent container	Maximum length of the pilot line*	Maximum number of the pneumatic release devices for the slave extinguishing agent containers
25 bar (360 psi)	4 m (13.12 ft)	1 control cylinder + 4 Slaves
42 bar (610 psi)	6 m (19.69 ft)	1 control cylinder + 6 Slaves
50 bar (725 psi)	8 m (23.25 ft)	1 control cylinder + 8 Slaves

	Maximum length of the pilot line*	Maximum number of the pneumatic release devices for the slave extinguishing agent containers
Pilot cylinder	30 m (98 ft)	30

* Minimum nominal diameter 4 mm ($^{3}/_{16}$ inch)

Pipeline system

Specification	Value	Unit
Operating pressure	60	bar
	870	psi

Discharge nozzles

Specification	Value	Unit
Version of discharge nozzles	180	°
	360	°
Minimum pressure, discharge nozzles	7.65	bar
	111	psi
Coverage area, discharge nozzles	9.75 x 9.75	m
	32 x 32	ft
Radius 180° discharge nozzle, maximum	10.9	m
	35.8	ft
Radius 360° discharge nozzle, maximum	6.9	m
	22.6	ft
Extinguishing agent quantity per discharge nozzle, maximum	216	kg
	476	lbs

12.3 Operating conditions

Specification	Value	Unit
Temperature for the installation of the extinguishing agent containers (standard effective nozzle height)	-18 – +50	°C
	0 – +122	°F
Temperature for the installation of the extinguishing agent containers (extended effective nozzle height)	-5 – +50	°C
	+23 – +122	°F
Temperature in the protected enclosure	0 – +50	°C
	+32 – +122	°F
Temperature in the protected enclosure (UL and FM)	+15.6 – +26.7	°C
	+60 – +80	°F

The system must not be exposed to natural weathering.

12.4 Emissions

Noise emissions at activation

Data	Value	Unit
Noise emission, maximum*	Approximately 125	dB(A)
Noise emission, pneumatic horn	Approximately 120	dB(A)

* at a nozzle pressure of 25 bar (360 psi)

Gases

- Extinguishing agent Novec™ 1230 (FK-5-1-12)
- Nitrogen
- CO_2 (when using a makrofon)

Decomposition products

Due to the process, the extinguishing agent can lead to the occurrence of hydrogen fluoride with high fire energies.

12.5 Type plate of the extinguishing agent container

There is a type plate on every extinguishing agent container providing specific information about this container. It contains the specifications listed below.

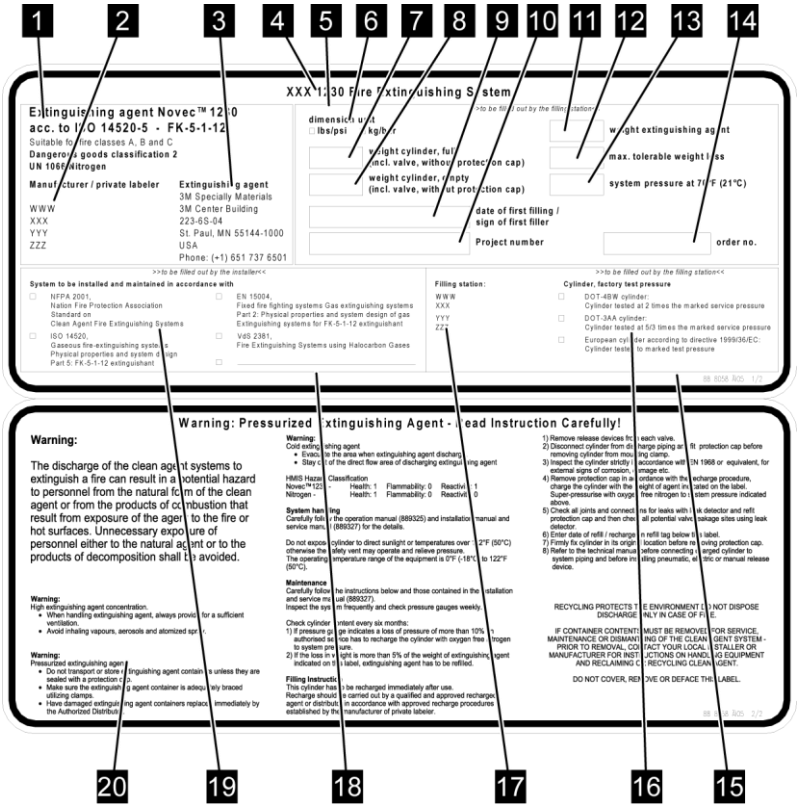


Fig. 196: Type plate - extinguishing agent container (example)

1 Extinguishing agent filled
2 Manufacturer of the fire suppression system (shown here as a placeholder)*
3 Manufacturer of the extinguishing agent
4 Type of the fire suppression system (shown here as a placeholder)*
5 Field to be filled out by the refilling company
6 Unit, lbs/psi or kg/bar
7 Weight of the extinguishing agent container, full (including valve, without protective valve cap)
8 Weight of the extinguishing agent container, empty (including valve, without protective valve cap)
9 Date of first fill/identification of the initial filling company
10 Project number
11 Weight of the extinguishing agent
12 Maximum acceptable weight loss
13 System pressure at 21 °C (70 °F)

14 Part number of the extinguishing agent container
15 Field to be filled out by the refilling company
16 Specification of the type of pressure test of the extinguishing agent container
17 Refiller (shown here as a placeholder)
18 Field to be filled out by the Authorized Distributor
19 Specification of regulations with which the system complies
20 Safety instructions, handling of the system, filling and maintenance instructions

* Printed on the type plate by the manufacturer

Languages

The extinguishing agent containers are delivered with original type plates in German and English. Type plates in other languages have to be ordered. Please contact your Authorized Distributor.

All specifications missing in these type plates have to be copied from the original type plate by the Authorized Distributor. This also applies to specifications of original type plates, that are printed by the manufacturer or completed by the filling company.

13 Glossary

Additional quantity
Quantity of extinguishing agent that needs to be kept available in addition to the required quantity used in consideration of the allowable leakage quantities and other tolerances.

Approved
Approved by an Authority Having Jurisdiction (ADJ) / competent authority.

Blocking device
Mechanical device used to prevent the extinguishing agent from flowing into the extinguishing zone, e. g. during maintenance, inspections, and repairs inside the extinguishing zone.

Check valves
The check valve allows the extinguishing agent to flow only in the designated direction of flow (towards the extinguishing zone). It is installed in the inlets of the manifold (multi-container system) and prevents extinguishing agent originating from other extinguishing agent cylinders to exit the manifold into the open when the system is activated or extinguishing agent cylinders have been removed.

Control room for extinguishing agent
Room or area holding the extinguishing agent cylinders.

Cylinder valve
The cylinder valve is the valve used to discharge the extinguishing agent from the extinguishing agent cylinder. The cylinder valve is activated by means of a manual, electric or pneumatic release device (release device).

Design concentration
Concentration of the extinguishing agent that includes a safety factor and must be taken into consideration when the system is designed.

Discharge nozzle
Last component in the pipe system of a fire suppression system from which extinguishing agent flows into the extinguishing zone. The orifice cross section of the discharge nozzle opening(s) has an overall or partial effect (depending on the extinguishing agent) on essential parameters including flooding time and extinguishing agent distribution.

Glossary

Door fan test	The door fan test (often also referred to as blower door test) is a check testing the integrity of an enclosure in connection with the installation of a gaseous fire suppression system or active fire prevention systems. For the purposes of this test, a fan installed in a door is used to generate an overpressure/underpressure in the enclosure which will then be compared to theoretical set values. This makes it possible to determine the size of the leakage area in this enclosure. A door fan test is often the more affordable alternative to test flooding.
Enclosure temperature	The usually prevalent temperature in the protected room. The calculation of the extinguishing agent quantity must be made based on the enclosure temperature that is to be expected.
Extinguishing zone	Total of all areas that will be flooded with extinguishing agent simultaneously in the event of fire.
Filled quantity	Quantity of the extinguishing agent that is filled into the extinguishing agent cylinder based on all calculated partial quantities.
Fill factor	Mass of the extinguishing agent per volume unit of the extinguishing agent cylinder.
Filling pressure	Pressure used to superpressurize the extinguishing agent container with nitrogen at the filling temperature in order to reach the system pressure.
Flooding	Outflow of the extinguishing agent into the extinguishing zone.
Flooding time	Period during which the required quantity of extinguishing agent flows out.
Hold time	Period during which a concentration of the extinguishing agent is present inside the extinguishing zone which is higher than the specified minimum concentration.
Loss monitoring	Loss monitoring (e. g. provided by contact pressure gauges) is an indispensable part of every fire suppression system. It ensures that any slow leaks of extinguishing agent, which may result in the extinguishing agent concentration being too low due to an insufficient quantity of available extinguishing agent, will be detected.

Manifold
Manifolds connect several extinguishing agent cylinders with one another and merge them into a single unit. Each manifold is fitted with a ↯ check valve.

Multi-container system
The extinguishing agent supply contained in a multi-container system is stored across several extinguishing agent cylinders. All containers are of the same size and filled with the same quantity of extinguishing agent (↯ single container system).

Multi-zone system
Multi-zone systems are equipped with central extinguishing agent stockpiling, which is intended for several extinguishing zones. Selector valves are used to discharge the quantity of extinguishing agent into the respective extinguishing zone (↯ single zone system).

NOAEL (no observed adverse effect level)
Highest concentration at which no adverse toxicological or physiological effects could be established.

Nozzle pipe system
Part of the pipe system of a fire suppression system that begins at the outlet of the manifold and the outlet of the selector valves for single-zone systems and multi-zone systems, respectively.

Operating pressure
Pressure inside a container at the maximum permitted operating temperature.

Pilot cylinder
Compressed gas cylinder, the contents of which is used for control purposes.

Pre-discharge timer
Period between the time when the alarm signal is issued as a warning to evacuate persons and the release of the extinguishing agent.

Pressure relief device
Preventing damage to the containment components caused by excessive overpressures (required for extinguishing gases as they must be introduced at high concentrations and rates) requires a mechanical pressure relief device which will limit the increase or drop of pressure inside the extinguishing zone to a specified value.

Protected enclosure
Total of all extinguishing zones connected to a fire suppression system.

Release
Automatic or manual activation of the fire suppression system for the purpose of flooding the extinguishing zone by opening the container valves and – if present – the selector valves.

Release device

Device integrated into the container valve or screwed on to the container valve. It opens the cylinder valve to allow the extinguishing agent to flow out. There are the following different types of release devices:

Manual release device: It can/may only be fitted on top of the "Master" extinguishing agent container and, if applicable, also on top of an electrical release device already mounted on the container.

Electrical release device: It is used to electrically release the container. The electrical release device receives its triggering signal from the fire extinguishing detection system.

Pneumatic release device: It is used to pneumatically release additional containers in multi-container systems. It is screwed onto the extinguishing agent container instead of the electric release device and connected to a pneumatic pilot line that is located at the side release outlet of the electrically activated "master" extinguishing agent container.

Pneumatic/manual release device: The pneumatic/manual release device also makes it possible to release a container manually on location.

Safety device malfunction pressure

↳ Safeguard against slow gas leaks

Selector valve

A valve installed in the main supply line which will, when activated, release the extinguishing agent into the respective zone to be flooded.

SFD safeguard against slow gas leaks

Device ensuring that slow gas leaks cannot release the fire suppression system unintentionally. Safeguards are also necessary in cases where discharging ↳ pilot gas is not always possible due to the design of the system.

Spray obstacle

An object present in the immediate spray zone of the discharge nozzle which obstructs the even distribution of the extinguishing agent.

System pressure

Pressure for which the fire suppression system has been designed and tested.

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Appendix

Table of contents

A Installation attest (template)

The installation attest certifies the proper mounting and installation in accordance with the specified design data. This attest must be transferred to the person responsible for the system after the mounting and installation has been executed.

Installation Certificate for the VSH1230 Fire Extinguishing System

Company: _____

_____

_____

Location: _____

Works: _____

☒ Novec™ 1230 cylinder system (VSH1230), approval S_____, with

_____extinguishing zone(s)

_____kg total quantity Novec™ 1230

_____, _____

Place and date

_____

Signature

File no. of auditing agency: _____ Project no.: _____

Installation attest (template)

Company: _____

Object: _____ **Installation Certificate Page 1**

1. ☐ Total flooding system / enclosed arrangement, protection target at least 3 respectively 4	EZ1 R: _____ EZ1 FF: _____ EZ1 SC: _____	EZ2 R: _____ EZ2 FF: _____ EZ2 SC: _____
2. The ☐ rooms ☐ arangements have following volume: [V]	EZ1 R: _____ m^3 EZ1 FF: _____ m^3 EZ1 SC: _____ m^3	EZ2 R: _____ m^3 EZ2 FF: _____ m^3 EZ2 SC: _____ m^3
3. Deductible volume: [V_G]	EZ1 R: _____ m^3 EZ1 FF: _____ m^3 EZ1 SC: _____ m^3	EZ2 R: _____ m^3 EZ2 FF: _____ m^3 EZ2 SC: _____ m^3
4. Volume: [V_R]	EZ1 R: _____ m^3 EZ1 FF: _____ m^3 EZ1 SC: _____ m^3	EZ2 R: _____ m^3 EZ2 FF: _____ m^3 EZ2 SC: _____ m^3
5. Novec™ 1230 - Design temperature (min.)	EZ1 min: _____ °C	EZ2 min: _____ °C
6. Novec™ 1230 - Design concentration: [DF * C_L]	EZ1 R: _____ % EZ1 FF: _____ % EZ1 SC: _____ %	EZ2 R: _____ % EZ2 FF: _____ % EZ2 SC: _____ %
7. Total surface of calculated area Enclosing surface: [A_V] ☐ not taken into consideration, because sufficient room tightness is guaranteed by ☐ Door Fan Test ☐ trial flooding ☐ _____	EZ1 R: _____ m^2 EZ1 FF: _____ m^2 EZ1 SC: _____ m^2	EZ2 R: _____ m^2 EZ2 FF: _____ m^2 EZ2 SC: _____ m^2
8. Factor for surcharge quantity: [FT] = 1,1	EZ1 R: _____ kg ☐ (n/a) EZ1 FF: _____ kg ☐ (n/a) EZ1 SC: _____ kg ☐ (n/a)	EZ2 R: _____ kg ☐ (n/a) EZ2 FF: _____ kg ☐ (n/a) EZ2 SC: _____ kg ☐ (n/a)
9. a) Following discharge quantity is planned: [Q] $Q = p_{Gas} * [(DF*C_L) / (100-DF*C_L)] * (V_R+0{,}27m*A_V)$	EZ1 R: _____ kg Novec™ 1230 EZ1 FF: _____ kg Novec™ 1230 EZ1 SC: _____ kg Novec™ 1230	EZ2 R: _____ kg Novec™ 1230 EZ2 FF: _____ kg Novec™ 1230 EZ2 SC: _____ kg Novec™ 1230
b)	EZ1 _____ pcs. Novec™ 1230 cylinder _____ kg EZ2 _____ pcs. Novec™ 1230 cylinder _____ kg	
c) 100 % reserve supply exists:	☐ yes ☐ no ☐ (n/a)	
10. Extinguishant supply in total:	_____ x discharge qnty.	_____ kg Novec™ 1230

* R = Room FF = False Floor SC = Suspended Ceiling

Company: _____

Object: _____ **Installation Certificate Page 2**

11. Pressure relief in spaces protected with Novec™ 1230 is provided by the customer:	☐ yes ☐ no Comment:
12. By ☐ pneum. ☐ electr. door and window unlocking devices the escape of Novec™ 1230 is prevented:	EZ1 ☐ yes ☐ (n/a) EZ2 ☐ yes ☐ (n/a)
13. Following equipment is switched off or operated before the Novec™ 1230 discharge:	☐ Air conditioning system ☐ ☐ Current supply ☐ ☐ Ventilation system
14. Following mechanisms are restarted and/or operated automatically after the Novec™ 1230 discharge::	☐ Air conditioning system ☐ ..... with recirculating air operation ☐ .....

15. ☐ The Novec™ 1230 supply is stored in a separate, easily accessible and not fire-endangered room
☐ The Novec™ 1230 supply is stored surround by a safety guard in a corridor
☐ The Novec™ 1230 supply is stored within the extinguishing zone

16. ☐ The release of the system is carried out by a fire detection system (see seperate certificate)

17. Hazard class corresponding to VdS 3518 / BGI 888 in accordance with quantity dimensioning: ☐ I ☐ II ☐ III ☐ IV

18. An advanced warning is carried out for each extinguishing zone via:	☐ quiescent current-supervised alarm from fire detection panel ☐ pneum. means of alarms ☐ electr. means of alarms ☐

☐ A preliminary warning is void, since in rooms with an extinguishing system persons are not endangered by the discharge of Novec™ 1230 with extinguishant concentrations under 10 % per volume.

19. Pre-warning time: [t_v]	EZ1 _____ sec., EZ2 _____ sec., ☐ (n/a)
20. The time delay device operates:	☐ mechanically by clockwork ☐ by pneumatic time delay ☐ electrically in the fire detection system ☐ (n/a)
21. Discharge time: [t_t]	EZ1 _____ sec., EZ2 _____ sec., _____
22. Used pipe material for upstream pipe: for downstream pipe:	DIN 2448/58 quality pipe ☐ not galvanised ☐ galvanised DIN 2448/58 quality pipe ☐ not galvanised ☐ galvanised
23. The pipework was blown-out after being installed: The pressure test of the upstream pipe was carried out:	☐ yes ☐ no, because _____ ☐ yes ☐ no, because _____

* R = Room FF = False Floor SC = Suspended Ceiling

Company: _____

Object: _____ **Installation Certificate Page 3**

24. The alarm is forwarded to the following permanently occupied space:	☐ to porter ☐ others : _____ ☐ to fire brigade ☐ none, as _____ ☐ to reception
25. The Novec™ 1230 supply is monitored by:	☐ Pressure monitoring ☐ Weighing device ☐
26. Size of the selector valves ☐ not specified	DN _____ DN _____ DN _____ EZ1 _____ EZ2 _____ LB _____
27. The system can be tested:	see test instruction
28. The system was tested:	☐ by function test ☐ by Door Fan Test ☐ Novec™ 1230 was discharged ☐ Novec™ 1230 was not discharged
29. Number of nozzles:	pcs. room protection nozzles
30. a) The nozzle bores are (s. 26): b) Assembly of "Deep-seated nozzles in high room":	from _____ mm Ø to _____ mm Ø ☐ yes ☐ (n/a)
31. The system was handed over to the insurant by the manufacturer on:	Date: _____
32. The system corresponds in all parts to the VdS regulations, which were valid when placing the order:	☐ yes ☐ no, as _____
33. Comments:	

* R = Room FF = False Floor SC = Suspended Ceiling

B Service report (template)

This document serves as a template for a service report. Depending on the version of the system content and visual design can deviate.

Service report (template)

Service checklist for VSN 200/ VSH1230 systems (sample*)

Customer: _____

Address: _____

Object: _____

Year of construction: _____ Installation company: _____

Maintenance carried out by: _____

Triggering fire control panel (FCP): _____

In charge for maintenance / service of FCP: _____

* Contents and optical design can deviate from this sample.

A) General:

A1) Person in charge for the system on the part of the operator

_____

A2) Persons affected were informed about the carrying out of maintenance and the related optical and acoustic signalling ☐ **OK**

A3) The person in charge for the system was informed about the fact that in the course of maintenance disconnections (e.g. air conditioning system, ventilation) and controls (e.g. energy shut-offs, pressure relief flaps) take place ☐ **OK**

A4) It was guaranteed by _____ that with the function check no extinguishant can be set free ☐ **OK**

A5) The carrying out of the maintenance was released by _____

A6) Report available ☐ **OK**

A7) Records in the report are up-to-date ☐ **OK** / updated ☐ **OK**

A8) Periodical inspections acc. to report were carried out by operator ☐ **OK**

A9) System documentation available ☐ **OK** / completely available ☐ **OK**

A10) Design parameters are still valid (no modifications at protected object) ☐ **OK**

A11) There ar no additional fire loads (different to system design) ☐ **OK**

A12) Dimensions of the protected area coincide with the design ☐ **OK**

A13) Room tightness (visual inspection) ☐ **OK**

A14) Automatic door / gate / window closing mechanisms in case of emergency ☐ **OK**

A15) Unlocking of locking systems (access controls) of the doors in the case of emergency ☐ **OK**

A16) Windows (flaps and other opening possibilities (not doors) are secured against unintentional opening and/or provided with indications ☐ **OK**

A17) Labels and signs that point to the fire extinguishing system ☐ **OK**

A18) Protection against manipulation at the fire extinguishing system through _____

A 19) Function of the pressure relief equipment ☐ **OK**

A 20) Temperature at installation location of cylinder _____ °C

B) Functions of the triggering fire detection panel in connection with the fire extinguishing system

B1) Documentation available ☐ **OK** Table of detector groups ☐ **OK**

B2) Operation manual available ☐ **OK** Logic layouts available ☐ **OK**

B3) Function check of triggering in case of manual release

- ☐ **Flashing light** ☐ Further controls _____
- ☐ **Alarm horn pre-alarm** _____
- ☐ **Alarm horn main alarm** _____
- ☐ **Warning signs**
- ☐ Shut-offs (**ventilation/ air condition**)
- ☐ Alarm forwarding
- ☐ Pressure relief flap
- ☐ **Triggering of extinguishing system after _____ seconds**

B4) Function check of triggering in case of alarm on first detector line (automatic fire detector)

- ☐ **Flashing light** ☐ Further controls _____
- ☐ **Alarm horn pre-alarm** _____
- ☐ Shut-offs (**ventilation/ air condition**) _____
- ☐ Alarm forwarding

B5) Function check of further triggering in case of additional alarm on second detector line (automatic fire detector)

- ☐ **Alarm horn main alarm** ☐ Further controls _____
- ☐ **Warning signs** _____
- ☐ Alarm forwarding _____
- ☐ Pressure relief flap
- ☐ **Triggering of extinguishing system after _____ seconds**

B6) The release device of the extinguishing system has functioned correctly with all runs on the control by the FCP ☐ **OK**

B7) The function of the pneumatically operated limit switch was tested by means of _____ and recognised correctly as extinguishant release by the FCP ☐ **OK**

B8) The changeover to reserve is indicated at the FCP ☐ **OK**

B9) The release device of the reserve functioned correctly when triggered by the FCP ☐ **OK**

B10) When resetting the FCP the following systems **do not** restart automatically:

_____

B11) Monitoring by FCP

- Extinguishant monitoring wire break ☐ **OK** short-circuit ☐ **OK**
- Electric release device wire break ☐ **OK** short-circuit ☐ **OK**
- Non-automatic detectors wire break ☐ **OK** short-circuit ☐ **OK**
- automatic detectors wire break ☐ **OK** short-circuit ☐ **OK**
- Main horn wire break ☐ **OK** short-circuit ☐ **OK**

B12) Protection against unintended false release by the operator at the FCP by

_____

B13) Allocation of the detectors to the flooding zone: _____

B14) Function of alarm forwarding ☐ **OK** to _____

B15) Indication of position of mains fuse at the FCP ☐ **OK**

B16) Indication of the service call number at the FPC ☐ **OK**

B17) Marking of the detectors ☐ **OK**

B18) Marking of the manual release ☐ **OK**

B20) Condition of the detectors (visual) ☐ **OK**

B21) Condition of the wiring ☐ **OK** marking ☐ **OK**

B22) Users of the room are acquainted with the handling of the system (manual release/ type of fire detection) ☐ **OK**

B23) Check of the disable device by triggering the extinguishing control (function check only with disassembled release devices!)

- ☐ The blocked condition is indicated at the FCP
- ☐ An undefined condition (intermediate position) is indicated at the FCP
- ☐ The fire extinguishing system is not released in blocked condition

B24) Check of the revision switch by triggering the extinguishing control

- ☐ The condition “revision” is indicated at the FCP
- ☐ The fire extinguishing system is not released in position “revision”

B25) Control of the loss indication devices by simulation of loss of extinguishant ☐ **OK**

C) Extinguishing system components

C1) Cylinder weight resp. filling level alternatively checked by means of _____:

Cylinder number	Targeted filling weight	Actual filling weight	Alternative check
			□ **OK**
			□ **OK**
			□ **OK**
			□ **OK**
			□ **OK**
			□ **OK**
			□ **OK**
			□ **OK**
			□ **OK**
			□ **OK**
			□ **OK**
			□ **OK**

C2) Condition of cylinder (visual) ☐ **OK**

C3) Pressure indication at cylinder (if existent) ☐ **OK**

C4) Condition of pilot pipe and pneumatic release devices of slave actuation ☐ **OK**

C5) Function of the slave actuation and tightness of the pilot pipe and pneumatic release devices checked by means of a test cylinder ☐ **OK**

C6) Function of the pneumatic pressure relief flap and tightness of the pilot pipe checked by means of a test cylinder ☐ **OK**

C7) Function check of the loss indication devices of all cylinders ☐ **OK**

C8) Condition of the hose and its correct fit ☐ **OK** (age in years:_____)

C9) Condition of the check valves ☐ **OK**

C10) Check of the correct mounting direction of the check valves ☐ **OK**

C11) Condition of the pipework and the fittings ☐ **OK**

C12) Condition of the pipe supports and their correct fit ☐ **OK**

C13) Check of the free flow in the pipework ☐ **OK**

C14) Check of the pipework mounting according to layout ☐ **OK**

C15) Earthing of the pipework ☐ **OK**

C16) Condition of the nozzles ☐ **OK**

C17) Check of nozzle on free flow / correct operation direction and correct fit ☐ **OK**

C18) Check if there is sufficiently free space around the nozzles ☐ **OK**

C19) Check if nozzles are mounted correctly acc. to nozzle layout ☐ **OK**

C20) Check whether the release pins of all release devices are reset ☐ **OK**

C21) Check of correct mounting of release devices after termination of function check ☐ **OK**

C22) Check resp. carrying out of sealing and affixing of labels ☐ **OK**

D) Termination of service and hand-over to the operator

All determined deficiencies

☐ were corrected

☐ will be corrected until _____

☐ must be corrected until _____

All persons concerned were informed about the termination of maintenance work and that ☐ **OK** with immediate effect each alerting will be an emergency. All additional disconnections and blockings of forwardings carried out in the course of maintenance were abolished.

Remarks: _____

_____

The system ☐ complies / ☐ does not comply with the state when being installed

The system was handed over in a ☐ ready-for-operation / ☐ not ready-for-operation state to the operator.

_____

For the operator / Stamp / Date / Signature

C Safety data sheet FK-5-1-12

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH)

VSH1230, CPS 1230

Version number: 4.1 Revision: 2017-09-27
Replaces version of: 2017-09-26 (4.0) First version: 2012-11-14

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

1.1 Product identifier

Trade name **VSH1230, CPS 1230**

Other names or synonyms Novec ™ 1230 (FK 5-1-12) charged with nitrogen

Registration number (REACH) not relevant (mixture)

CAS number not relevant (mixture)

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

Relevant identified uses Fire extinguishing agent

1.3 Details of the supplier of the safety data sheet

Minimax GmbH & Co.KG
Industriestrasse 10/12
23840 Bad Oldesloe
Germany

Telephone: +49 (0) 4531 - 803 0
Telefax: +49 (0) 4531 - 803 248
Website: www.minimax.de

National contact

MV Global R&D Technical Product Management
Halocarbon based Products
Tel.: +49 45 31 80 3-543, Fax: +49 45 31 80 3-499
E-Mail: Habitzlw@minimax.at

e-mail (competent person) sdb@csb-online.de

Please do not use this e-mail adress to ask for the latest safety data sheet. For this purpose contact Minimax GmbH & Co.KG.

1.4 Emergency telephone number

Emergency information service Consultank GmbH +49 (0) 178 433 7434

Poison centre

Country	Name	Telephone	Telefax
Germany	Giftinformationszentrum - Nord Göttingen	+49 551 19240	

As above or next toxicological information centre.

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SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

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

Classification acc. to GHS

Section	Hazard class	Category	Hazard class and category	Hazard state-ment
2.5	gases under pressure	C	Press. Gas C	H280
4.1C	hazardous to the aquatic environment - chronic hazard	3	Aquatic Chronic 3	H412

for full text of abbreviations: see SECTION 16

Contains gas under pressure; may explode if heated.

Additional information

This mixture does not contain any substances that are assessed to be a PBT or a vPvB.
EIGA-0783: Contains fluorinated greenhouse gases covered by the Kyoto protocol. .
EIGA-As: Asphyxiant in high concentrations.

2.2 Label elements

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

Signal word warning

Pictograms

GHS04

Hazard statements

H280 Contains gas under pressure; may explode if heated.
H412 Harmful to aquatic life with long lasting effects.

Precautionary statements

P273 Avoid release to the environment.
P410+P403 Protect from sunlight. Store in a well-ventilated place.

2.3 Other hazards

There is no additional information.

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Results of PBT and vPvB assessment

This mixture does not contain any substances that are assessed to be a PBT or a vPvB.

SECTION 3: Composition/information on ingredients

3.1 Substances

not relevant (mixture)

3.2 Mixtures

Description of the mixture

Hazardous ingredients acc. to GHS

Name of sub-stance	Identifier	Wt%	Classification acc. to GHS	Pictograms	M-Factors
1,1,1,2,2,4,5,5,5-nonafluoro-4-(tri-fluoromethyl)-3-pentanone	CAS No 756-13-8 EC No 436-710-6 Index No 606-108-00-X REACH Reg. No 01-0000018239-65-xxxx	80 – 99	Aquatic Chronic 3 / H412		
nitrogen	CAS No 7727-37-9 EC No 231-783-9	< 20	Press. Gas C / H280		

SECTION 4: First aid measures

4.1 Description of first aid measures

General notes

In all cases of doubt, or when symptoms persist, seek medical advice.

Following inhalation

Provide fresh air.
If breathing is irregular or stopped, immediately seek medical assistance and start first aid actions. Mouth to mouth resuscitation should be avoided. Use alternative methods, preferably with oxygen or compressed air driven apparatus.

Following skin contact

Wash with plenty of soap and water.

Following eye contact

Rinse cautiously with water for several minutes.
Remove contact lenses, if present and easy to do. Continue rinsing.

Following ingestion

Rinse mouth. Do not induce vomiting.
Get medical advice/attention if you feel unwell.

Notes for the doctor

none

4.2 Most important symptoms and effects, both acute and delayed

These information are not available.

4.3 Indication of any immediate medical attention and special treatment needed

none

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media

co-ordinate firefighting measures to the fire surroundings

5.2 Special hazards arising from the substance or mixture

Hazardous decomposition products: Section 10.
Contact with the product can cause burns and/or frostbite.
Contains gas under pressure; may explode if heated.

Hazardous combustion products

hydrogen fluoride (HF)

5.3 Advice for firefighters

In case of fire and/or explosion do not breathe fumes.
Co-ordinate firefighting measures to the fire surroundings.
Do not allow firefighting water to enter drains or water courses.
Collect contaminated firefighting water separately.
Fight fire with normal precautions from a reasonable distance.

Special protective equipment for firefighters

use suitable breathing apparatus

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SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

For non-emergency personnel

Remove persons to safety.
Ventilate affected area.
Wearing of suitable protective equipment (including personal protective equipment referred to under Section 8 of the safety data sheet) to prevent any contamination of skin, eyes and personal clothing.

For emergency responders

Wear breathing apparatus if exposed to vapours/dust/spray/gases.

6.2 Environmental precautions

Keep away from drains, surface and ground water.
Retain contaminated washing water and dispose of it.

6.3 Methods and material for containment and cleaning up

Ventilate affected area.

Other information relating to spills and releases

Place in appropriate containers for disposal.

6.4 Reference to other sections

Hazardous combustion products: see section 5.
Personal protective equipment: see section 8.
Incompatible materials: see section 10.
Disposal considerations: see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Measures to prevent fire as well as aerosol and dust generation

Use local and general ventilation.
Prevent from heating up above 50 °C/122 °F.
Pressurized container: may burst if heated.

Specific notes/details

None.

Measures to protect the environment

Avoid release to the environment.

Advice on general occupational hygiene

Do not eat, drink and smoke in work areas.

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7.2 Conditions for safe storage, including any incompatibilities

Flammability hazards

Protect from sunlight.

Incompatible substances or mixtures

Incompatible materials: see section 10. **Protect**

against external exposure, such as

heat

Consideration of other advice

Keep away from food, drink and animal feedingstuffs.

Ventilation requirements

Provision of sufficient ventilation.

Packaging compatibilities

Only packagings which are approved (e.g. acc. to ADR) may be used.

7.3 Specific end use(s)

No information available.

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Relevant DNELs of components of the mixture

Name of substance	CAS No	End-point	Threshold level	Protection goal, route of exposure	Used in	Exposure time
1,1,1,2,2,4,5,5,5-nonafluoro-4-(trifluoromethyl)-3-pentanone	756-13-8	DNEL	1,286,130 mg/m³	human, inhalatory	worker (industry)	acute - systemic effects
1,1,1,2,2,4,5,5,5-nonafluoro-4-(trifluoromethyl)-3-pentanone	756-13-8	DNEL	780 mg/m³	human, inhalatory	worker (industry)	chronic - systemic effects
1,1,1,2,2,4,5,5,5-nonafluoro-4-(trifluoromethyl)-3-pentanone	756-13-8	DNEL	1,000,000 mg/m³	human, inhalatory	worker (industry)	chronic - local effects
1,1,1,2,2,4,5,5,5-nonafluoro-4-(trifluoromethyl)-3-pentanone	756-13-8	DNEL	147 mg/kg	human, dermal	worker (industry)	chronic - systemic effects

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Relevant PNECs of components of the mixture				
Name of substance	**CAS No**	**Endpoint**	**Threshold level**	**Environmental compartment**
1,1,1,2,2,4,5,5,5-nonafluoro-4-(trifluoromethyl)-3-pentanone	756-13-8	PNEC	0.008 mg/l	freshwater
1,1,1,2,2,4,5,5,5-nonafluoro-4-(trifluoromethyl)-3-pentanone	756-13-8	PNEC	0.001 mg/l	marine water
1,1,1,2,2,4,5,5,5-nonafluoro-4-(trifluoromethyl)-3-pentanone	756-13-8	PNEC	1 mg/l	sewage treatment plant (STP)
1,1,1,2,2,4,5,5,5-nonafluoro-4-(trifluoromethyl)-3-pentanone	756-13-8	PNEC	0.006 mg/kg	freshwater sediment
1,1,1,2,2,4,5,5,5-nonafluoro-4-(trifluoromethyl)-3-pentanone	756-13-8	PNEC	0.001 mg/kg	marine sediment
1,1,1,2,2,4,5,5,5-nonafluoro-4-(trifluoromethyl)-3-pentanone	756-13-8	PNEC	0.006 mg/kg	soil

8.2 Exposure controls

Appropriate engineering controls

General ventilation.

Individual protection measures (personal protective equipment)

Eye/face protection

Use protective eyewear to guard against splash of liquids.

Hand protection

Material	Material thickness	Breakthrough times of the glove material
data are not available	data are not available	data are not available

Respiratory protection

[In case of inadequate ventilation] wear respiratory protection.
Self-contained breathing apparatus (EN 133).

Environmental exposure controls

Use appropriate container to avoid environmental contamination. Keep away from drains, surface and ground water.

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SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance

Physical state	liquid
Form	pressurized
Colour	colourless
Odour	odourless
Odour threshold	these information are not available

Other safety parameters

pH (value)	not relevant
Melting point/freezing point	these information are not available
Initial boiling point and boiling range	49 °C
Flash point	not applicable
Evaporation rate	these information are not available
Flammability (solid, gas)	non-combustible
Explosive limits	
Lower explosion limit (LEL)	these information are not available
Upper explosion limit (UEL)	these information are not available
Vapour pressure	these information are not available
Density	1.6 $^{g}/_{cm^3}$ at 20 °C
Vapour density	these information are not available
Relative density	these information are not available
Solubility(ies)	
Water solubility	insoluble
Partition coefficient	
n-octanol/water (log KOW)	these information are not available
Auto-ignition temperature	these information are not available
Relative self-ignition temperature for solids	not relevant (Gaseous)
Decomposition temperature	these information are not available

Viscosity

Kinematic viscosity	not relevant (gaseous)
Dynamic viscosity	not relevant (gaseous)
Explosive properties	not explosive
Oxidising properties	shall not be classified as oxidising

9.2 Other information

None

SECTION 10: Stability and reactivity

10.1 Reactivity

Gas under pressure.

If heated:

danger of explosion, gas under pressure, danger of bursting container

10.2 Chemical stability

See below "Conditions to avoid".

10.3 Possibility of hazardous reactions

No known hazardous reactions.

10.4 Conditions to avoid

Contains gas under pressure; may explode if heated.

10.5 Incompatible materials

bases, amine

10.6 Hazardous decomposition products

Carbon monoxide (CO).
Carbon dioxide (CO_2).
Hydrogen fluoride (HF).

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SECTION 11: Toxicological information

11.1 Information on toxicological effects

Classification procedure

If not otherwise specified the classification is based on:
Ingredients of the mixture (additivity formula). **Classification**

according to GHS (1272/2008/EC, CLP) Acute toxicity

Acute toxicity of components of the mixture

Name of substance	CAS No	Exposure route	Endpoint	Value	Species	Source
1,1,1,2,2,4,5,5,5-nonafluoro- 4-(trifluoromethyl)-3-pentan- one	756-13-8	oral	LD50	>2,000 $^{mg}/_{kg}$	rat	ECHA
1,1,1,2,2,4,5,5,5-nonafluoro- 4-(trifluoromethyl)-3-pentan- one	756-13-8	dermal	LD50	>2,000 $^{mg}/_{kg}$	rat	ECHA

Skin corrosion/irritation

Classification could not be established because:
Data are lacking, inconclusive, or conclusive but not sufficient for classification.

Serious eye damage/eye irritation

Classification could not be established because:
Data are lacking, inconclusive, or conclusive but not sufficient for classification.

Respiratory or skin sensitisation

Skin sensitisation

Classification could not be established because:
Data are lacking, inconclusive, or conclusive but not sufficient for classification.

Respiratory sensitisation

Classification could not be established because:
Data are lacking, inconclusive, or conclusive but not sufficient for classification.

Germ cell mutagenicity

Classification could not be established because:
Data are lacking, inconclusive, or conclusive but not sufficient for classification.

Carcinogenicity

Classification could not be established because:
Data are lacking, inconclusive, or conclusive but not sufficient for classification.

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Reproductive toxicity

Classification could not be established because:
Data are lacking, inconclusive, or conclusive but not sufficient for classification.

Specific target organ toxicity - single exposure

Classification could not be established because:
Data are lacking, inconclusive, or conclusive but not sufficient for classification.

Specific target organ toxicity - repeated exposure

Classification could not be established because:
Data are lacking, inconclusive, or conclusive but not sufficient for classification.

Aspiration hazard

Shall not be classified as presenting an aspiration hazard.

SECTION 12: Ecological information

12.1 Toxicity

Aquatic toxicity (acute)

Test data are not available for the complete mixture.

Aquatic toxicity (acute) of components of the mixture

Aquatic toxicity (acute) of components of the mixture

Name of substance	CAS No	Endpoint	Value	Species	Source	Exposure time
1,1,1,2,2,4,5,5,5-nonafluoro-4-(trifluoromethyl)-3-pentanone	756-13-8	LC50	>1,070 mg/l	fathead minnow (Pimephales promelas)	ECHA	96 h
1,1,1,2,2,4,5,5,5-nonafluoro-4-(trifluoromethyl)-3-pentanone	756-13-8	EC50	>1,080 mg/l	daphnia magna	ECHA	48 h

Aquatic toxicity (chronic)

Harmful to aquatic life with long lasting effects.
Test data are not available for the complete mixture.

12.2 Persistence and degradability

Degradability of components of the mixture

Degradability of components of the mixture

Name of substance	CAS No	Process	Degradation rate	Time
1,1,1,2,2,4,5,5,5-nonafluoro-4-(trifluoromethyl)-3-pentanone	756-13-8	carbon dioxide generation	1.8 – 3.4 %	28 d

Biodegradation

The relevant substances of the mixture are readily biodegradable.

Persistence

Data are not available.

12.3 Bioaccumulative potential

Data are not available.

Bioaccumulative potential of components of the mixture

Bioaccumulative potential of components of the mixture			
Name of substance	**CAS No**	**BCF**	**Log KOW**
1,1,1,2,2,4,5,5,5-nonafluoro-4-(trifluoromethyl)-3-pentanone	756-13-8	4.8	3.08 (30 °C)

12.4 Mobility in soil

Data are not available.

12.5 Results of PBT and vPvB assessment

This mixture does not contain any substances that are assessed to be a PBT or a vPvB.

12.6 Other adverse effects

Global warming potential 1

Endocrine disrupting potential

None of the ingredients are listed.

Remarks

None.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

This material and its container must be disposed of as hazardous waste.
Dispose of contents/container to an authorized waste treatment facility.

Sewage disposal-relevant information

Do not empty into drains.

Waste treatment of containers/packagings

It is a dangerous waste; only packagings which are approved (e.g. acc. to ADR) may be used.
Handle contaminated packages in the same way as the substance itself.

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Remarks

Please consider the relevant national or regional provisions.

SECTION 14: Transport information

14.1	**UN number**	1956
14.2	**UN proper shipping name**	COMPRESSED GAS, N.O.S.
	Technical name (hazardous ingredients)	NITROGEN, DODECAFLUORO-2-METHYLPENTAN-3-ONE
14.3	**Transport hazard class(es)**	
	Class	2.2
	Subsidiary risk(s)	2.2 (gas under pressure)
14.4	**Packing group**	not assigned to a packing group
14.5	**Environmental hazards**	non-environmentally hazardous acc. to the dangerous goods regulations

14.6 Special precautions for user

Provisions for dangerous goods (ADR) should be complied within the premises.

14.7 Transport in bulk according to Annex II of MARPOL and the IBC Code

The cargo is not intended to be carried in bulk.

14.8 Information for each of the UN Model Regulations

Transport of dangerous goods by road, rail and inland waterway (ADR/RID/ADN)

UN number	1956
Proper shipping name	UN1956, COMPRESSED GAS, N.O.S., (NITROGEN, DODECAFLUORO-2-METHYLPENTAN-3-ONE), 2.2, (E)
Class	2
Classification code	1A
Danger label(s)	2.2

Special provisions (SP)	274, 378, 655, 662
Excepted quantities (EQ)	E1
Limited quantities (LQ)	120 ml
Transport category (TC)	3.
Tunnel restriction code (TRC)	E

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Hazard identification No	20
Emergency Action Code	2TE

International Maritime Dangerous Goods Code (IMDG)

UN number	1956
Proper shipping name	UN1956, COMPRESSED GAS, N.O.S., (NITROGEN, DODECAFLUORO-2-METHYLPENTAN 3-ONE), 2.2
Class	2.2
Marine pollutant	-
Danger label(s)	2.2

Special provisions (SP)	274, 378
Excepted quantities (EQ)	E1
Limited quantities (LQ)	120 ml
EmS	F-C, S-V
Stowage category	A

International Civil Aviation Organization (ICAO-IATA/DGR)

UN number	1956
Proper shipping name	UN1956, Compressed gas, n.o.s., (NITROGEN, DO-DECAFLUORO-2-METHYLPENTAN 3-ONE), 2.2
Class	2.2
Danger label(s)	2.2

Special provisions (SP)	A202
Excepted quantities (EQ)	E1

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SECTION 15: Regulatory information

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

Relevant provisions of the European Union (EU) Restrictions

according to REACH, Annex XVII

none of the ingredients are listed

List of substances subject to authorisation (REACH, Annex XIV)

none of the ingredients are listed

Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS) - Annex II

none of the ingredients are listed

Regulation 166/2006/EC concerning the establishment of a European Pollutant Release and Transfer Register (PRTR)

none of the ingredients are listed

Directive 2000/60/EC establishing a framework for Community action in the field of water policy (WFD)

none of the ingredients are listed

Regulation 98/2013/EU on the marketing and use of explosives precursors

none of the ingredients are listed

SECTION 16: Other information

Indication of changes (revised safety data sheet)

Section	Former entry (text/value)	Actual entry (text/value)
1.3		National contact: MV Global R&D Technical Product Management Halocarbon based Products Tel.: +49 45 31 80 3-543, Fax: +49 45 31 80 3-499 E-Mail: Habitzlw@minimax.at
14.8	Proper shipping name: UN1956, COMPRESSED GAS, N.O.S., (contains: NI- TROGEN, DODECAFLUORO-2-METHYLPENTAN-3- ONE), 2.2, (E)	Proper shipping name: UN1956, COMPRESSED GAS, N.O.S., (NITROGEN, DODECAFLUORO-2-METHYLPENTAN-3-ONE), 2.2, (E)

Abbreviations and acronyms

Abbr.	Descriptions of used abbreviations
ADN	Accord européen relatif au transport international des marchandises dangereuses par voies de nav- igation intérieures (European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways)
ADR	Accord européen relatif au transport international des marchandises dangereuses par route (European Agreement concerning the International Carriage of Dangerous Goods by Road)

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Abbr.	Descriptions of used abbreviations
Aquatic Chronic	Hazardous to the aquatic environment - chronic hazard
BCF	Bioconcentration factor
CAS	Chemical Abstracts Service (service that maintains the most comprehensive list of chemical sub- stances)
CLP	Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures
DGR	Dangerous Goods Regulations (see IATA/DGR)
DNEL	Derived No-Effect Level
EC No	The EC Inventory (EINECS, ELINCS and the NLP-list) is the source for the seven-digit EC number, an identifier of substances commercially available within the EU (European Union)
EINECS	European Inventory of Existing Commercial Chemical Substances
ELINCS	European List of Notified Chemical Substances
EmS	Emergency Schedule
GHS	"Globally Harmonized System of Classification and Labelling of Chemicals" developed by the United Nations
IATA	International Air Transport Association
IATA/DGR	Dangerous Goods Regulations (DGR) for the air transport (IATA)
ICAO	International Civil Aviation Organization
IMDG	International Maritime Dangerous Goods Code
index No	The Index number is the identification code given to the substance in Part 3 of Annex VI to Regula- tion (EC) No 1272/2008
log KOW	n-Octanol/water
MARPOL	International Convention for the Prevention of Pollution from Ships (abbr. of "Marine Pollutant")
NLP	No-Longer Polymer
PBT	Persistent, Bioaccumulative and Toxic
PNEC	Predicted No-Effect Concentration
Press. Gas	Gas under pressure
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
RID	Règlement concernant le transport International ferroviaire des marchandises Dangereuses (Regula- tions concerning the International carriage of Dangerous goods by Rail)
vPvB	Very Persistent and very Bioaccumulative

Key literature references and sources for data

VSH1230, CPS 1230

Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures. Regulation (EC) No. 1907/2006 (REACH), amended by 2015/830/EU.
Transport of dangerous goods by road, rail and inland waterway (ADR/RID/ADN).
International Maritime Dangerous Goods Code (IMDG).
Dangerous Goods Regulations (DGR) for the air transport (IATA).

Classification procedure

Physical and chemical properties.
Health hazards.
Environmental hazards.
The method for classification of the mixture is based on ingredients of the mixture (additivity formula).

List of relevant phrases (code and full text as stated in chapter 2 and 3)

Code	Text
H280	Contains gas under pressure; may explode if heated.
H412	Harmful to aquatic life with long lasting effects.

Responsible for the safety data sheet

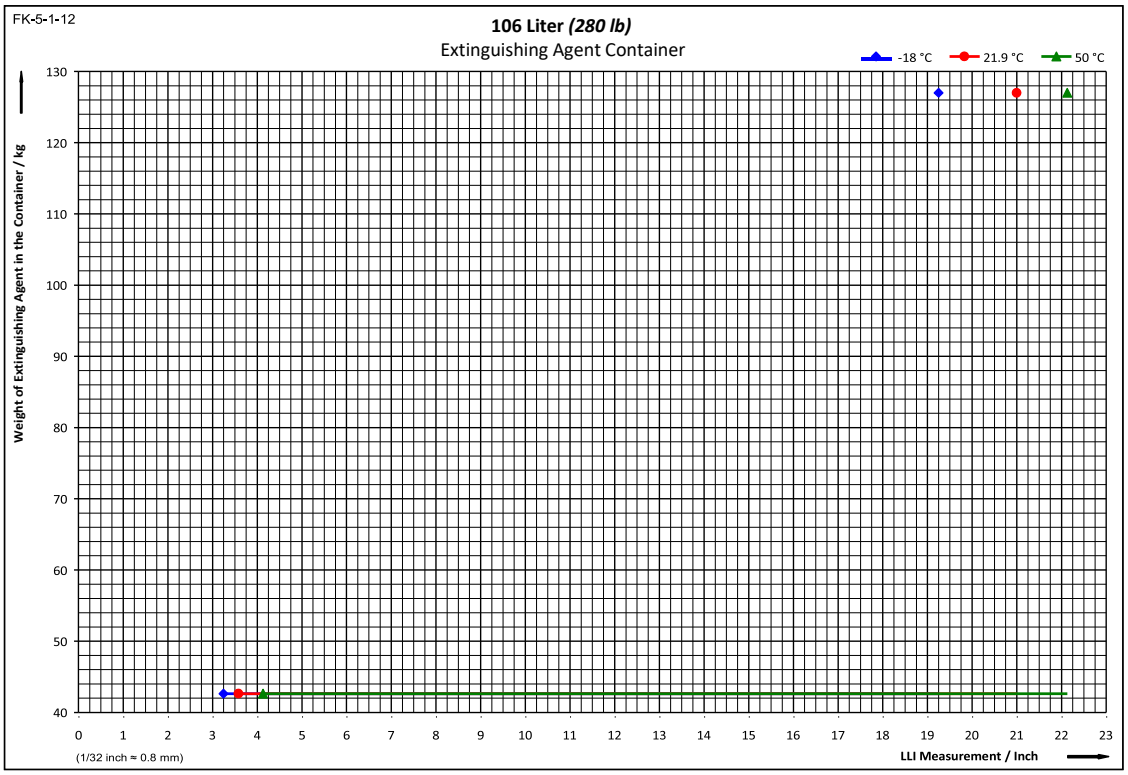
C.S.B. GmbH
Düsseldorfer Str. 113
47809 Krefeld

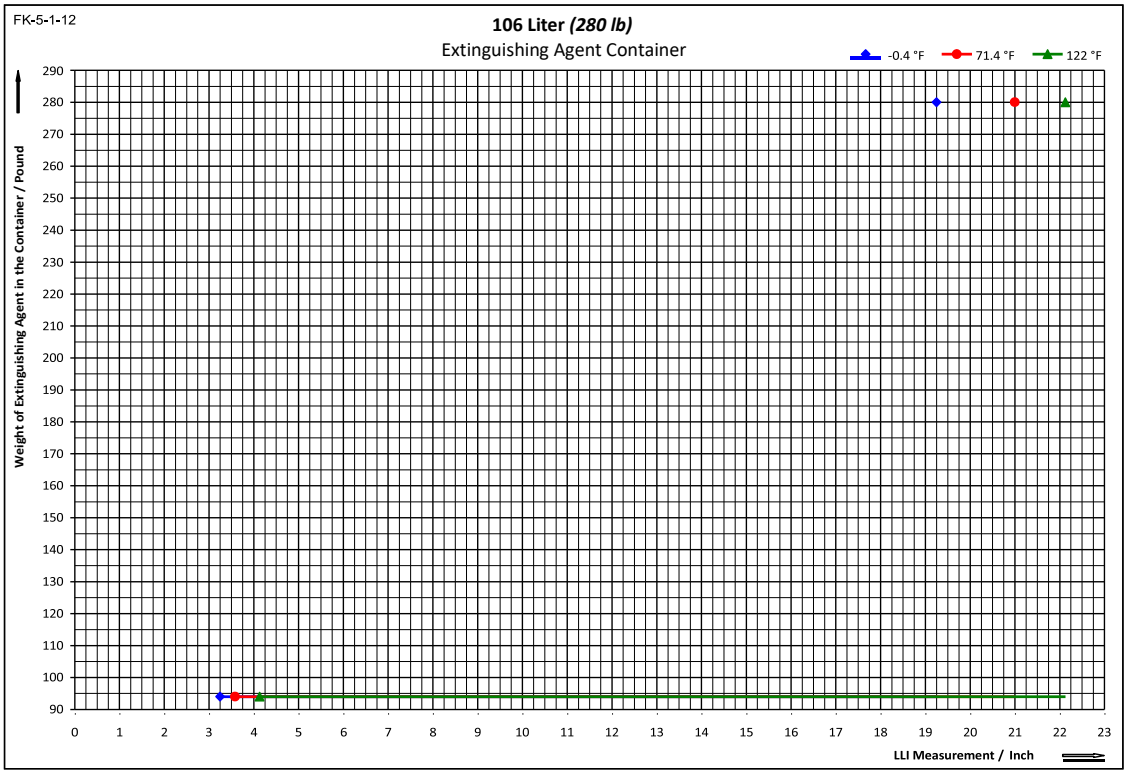
Telephone: +49 (0) 2151 - 652086 - 0
Telefax: +49 (0) 2151 - 652086 - 9
e-Mail: info@csb-online.de
Website: www.csb-online.de

Disclaimer

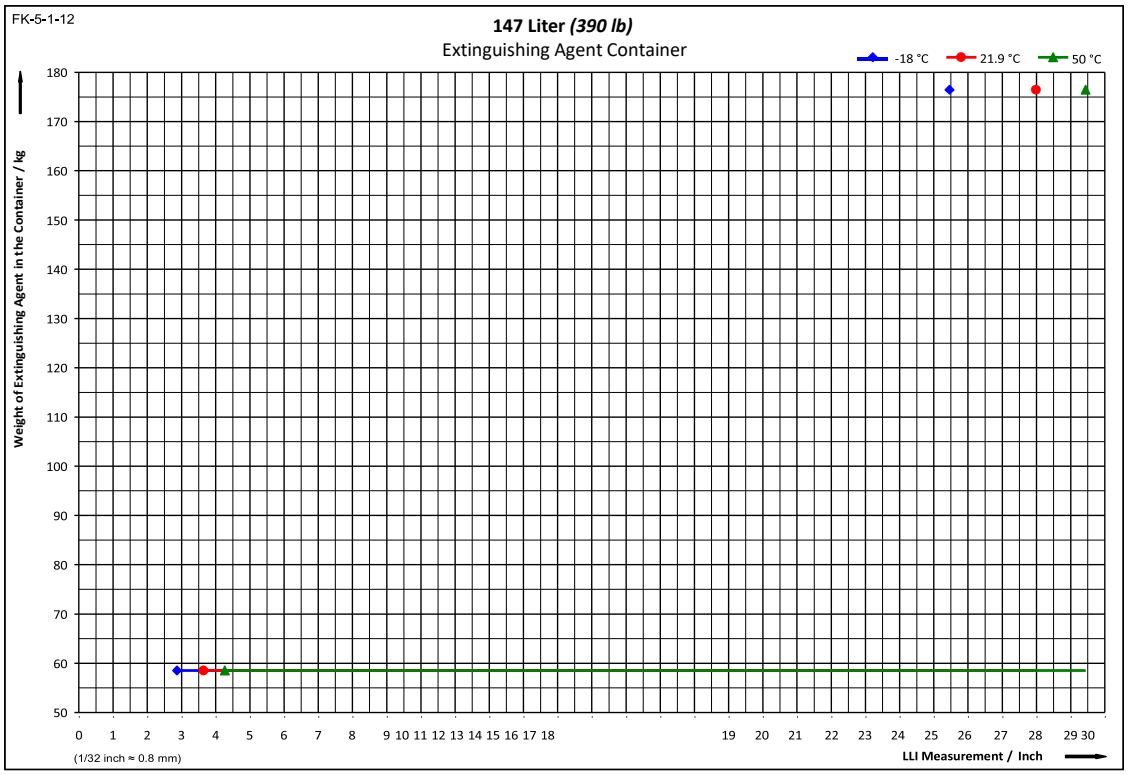
This information is based upon the present state of our knowledge. This SDS has been compiled and is solely intended for this product.

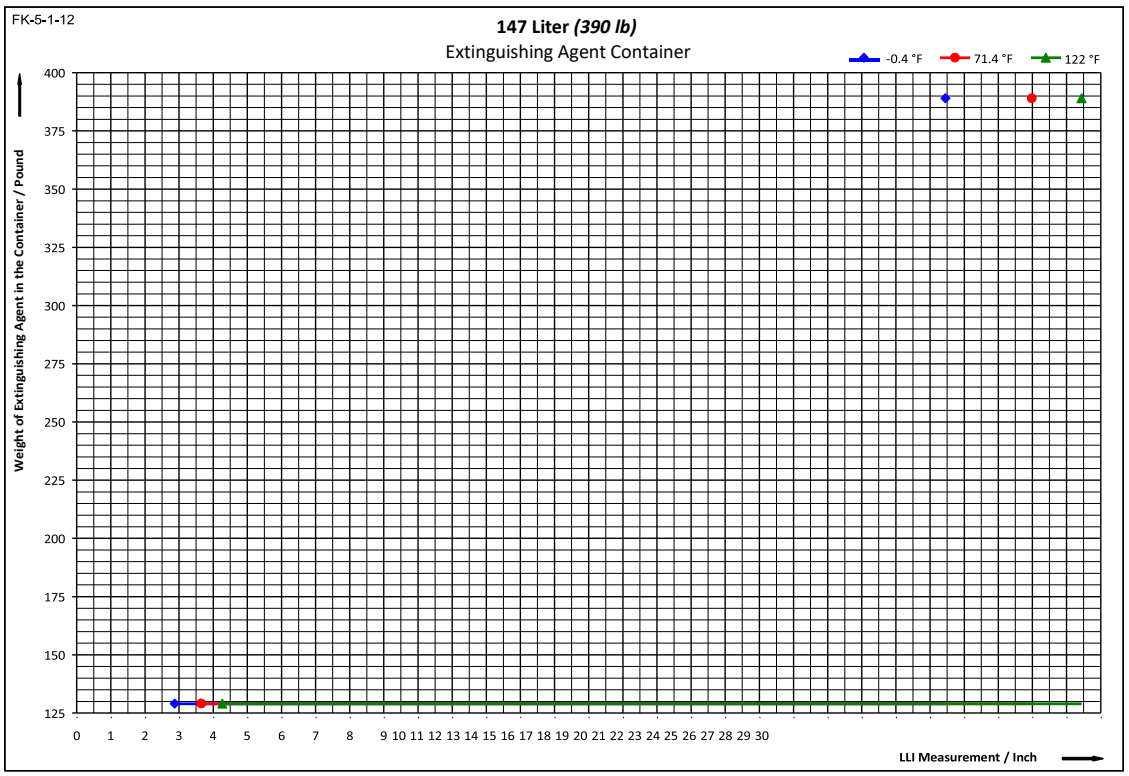
D Liquid level indicator diagrams

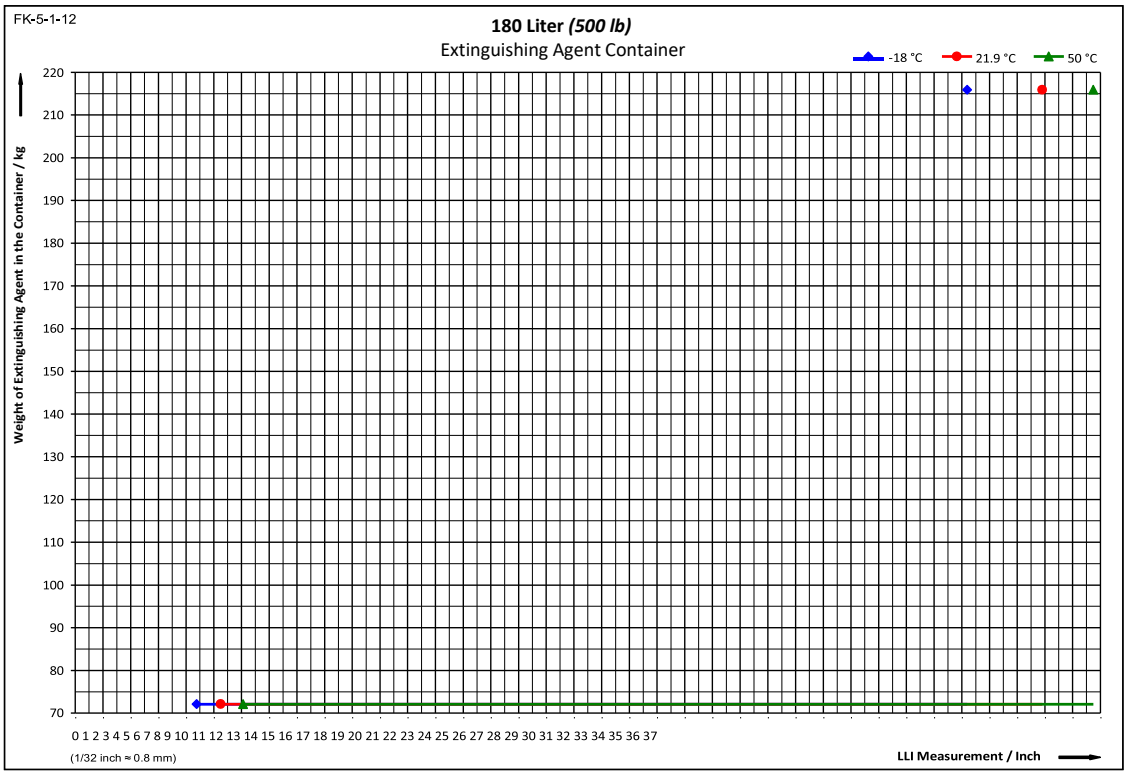

FK-5-1-12
106 Liter (280 lb)
Extinguishing Agent Container
-18 °C
21.9 °C
50 °C
Weight of Extinguishing Agent in the Container / kg
130
120
110
100
90
80
70
60
50
40
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
(1/32 inch ≈ 0.8 mm)
LLI Measurement / Inch

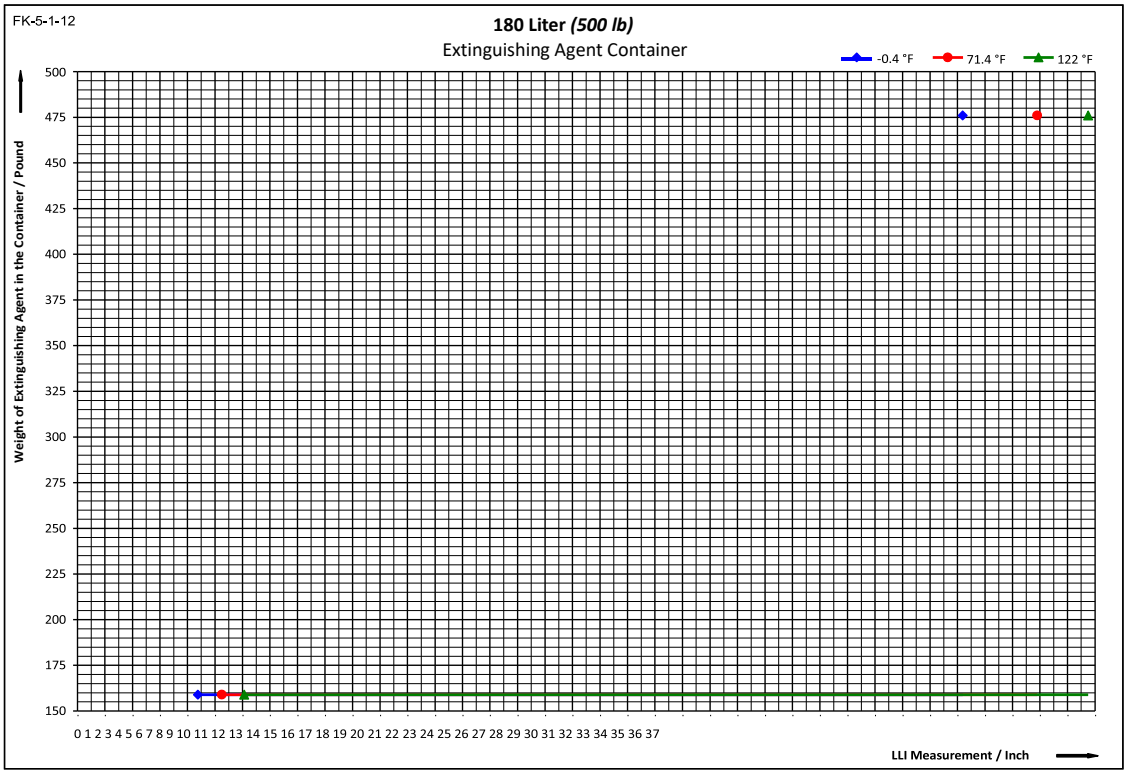

FK-5-1-12
106 Liter (280 lb)
Extinguishing Agent Container
-0.4 °F
71.4 °F
122 °F
Weight of Extinguishing Agent in the Container / Pound
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
90
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
LLI Measurement / Inch

Liquid level indicator diagrams





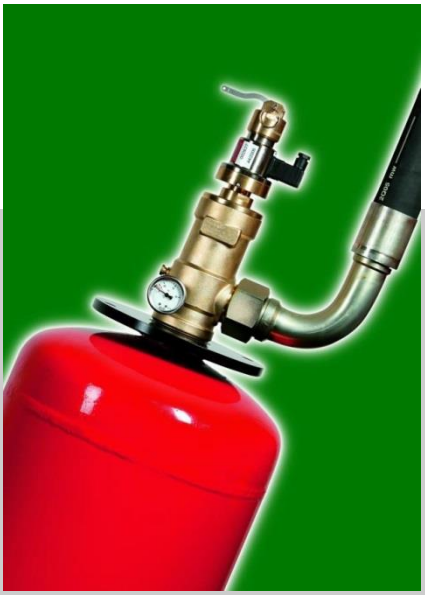

FK-5-1-12
180 Liter (500 lb)
Extinguishing Agent Container
-18 °C
21.9 °C
50 °C
Weight of Extinguishing Agent in the Container / kg
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37
(1/32 inch ≈ 0.8 mm)
LLI Measurement / Inch


FK-5-1-12
180 Liter (500 lb)
Extinguishing Agent Container
-0.4 °F
71.4 °F
122 °F
Weight of Extinguishing Agent in the Container / Pound
500
475
450
425
400
375
350
325
300
275
250
225
200
175
150
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37
LLI Measurement / Inch

E Bulletin

Bulletin

Clean Agent Extinguishing System Units
EX26532 – VSH1230 / VSH200
Supervisory switch



IMPORTANT!

All the specified safety instructions and handling instructions are to be followed (see also Design Manual and Installation/Service Manual). In addition to the information provided in this Bulletin, all local accident prevention and general safety regulations applicable for the system's area of implementation must also be complied with.

The graphic illustrations in this manual are provided for purposes of basic understanding and can deviate from the actual version of the system.

Viking GmbH & Co. KG
Industriestrasse 10/12
23843 Bad Oldesloe
Germany
Phone: +49 4531 803 0
Fax: +49 4531 803 137
E-mail: contact@vikingemea.com
Internet: http://www.vikingemea.com

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Bulletin / VSH1230/200

To	Authorized Viking System Distributors and OEM´s.
Subject	New Instructions on Manual Extinguishant Disablement Switch in compliance with new requirements per UL 2166.
Related to	VSH1230 / VSH200.

VSH1230

ENGINEERED UNITS, Model VSH1230 Engineered Clean Agent Extinguishing System Units containing 3M™ Novec™ 1230 Fire Protection Fluid (FK-5-1-12), stored pressure type, incorporating DOT 4BW-500 storage containers, having nominal storage capacities of 140, 280, 390 and 500 lb (52, 106, 147 and 180 l). The units are super-pressurized with dry nitrogen to 360 psi (25 bar) at 70 °F (21 °C) with operating temperatures of +32 °F to +120 °F (0 °C to +50 °C). The units are designed for total flooding protection against Class A surface burning, Class B flammable liquid and Class C fires occurring within an enclosure.

ENGINEERED UNITS, Model VSH1230 Engineered Clean Agent Extinguishing System Units containing 3M™ Novec™ 1230 Fire Protection Fluid (FK-5-1-12), stored pressure type, incorporating DOT 3AA-870/TPED storage containers, having nominal storage capacities of 60, 100, 220, 270, 390 and 500 lb (22, 40, 80, 100, 140 and 180 l). The units are super-pressurized with dry nitrogen to 360, 610, or 725 psi (25, 42, or 50 bar) at 70 °F (21 °C) with operating temperatures of +32 °F to +120 °F (0° C to +50 °C). The units are designed for total flooding protection against Class A surface burning, Class B flammable liquid and Class C fires occurring within an enclosure.

These systems are intended to be designed and installed in accordance with the Listee's Design manual, part number 916659, Revision 00, Version 01, issued April 2014; Installation manual, part number 916657, Revision 00, Version 01, issued April 2014; the DesignManager Flow Calculation Program - Flow Calculation Math Kernel: MxCalc 1230, Version 1.1.

VSH200

ENGINEERED UNITS, Model VSH200 Engineered Clean Agent Extinguishing System Units containing HFC-227ea, stored pressure type, incorporating DOT 4BW-500 storage containers, having nominal storage capacities of 140, 280, 390 and 500 lb (52, 106, 147 and 180 l). The units are super-pressurized with dry nitrogen to 360 psi (25 bar) at 70 °F (21 °C) with operating temperatures of +32 °F to +120 °F (0 °C to +50 °C). The units are designed for total flooding protection against Class A surface burning, Class B flammable liquid and Class C fires occurring within an enclosure.

ENGINEERED UNITS, Model VSH200 Engineered Clean Agent Extinguishing System Units containing HFC-227ea, stored pressure type, incorporating DOT 3AA-870/TPED storage containers, having nominal storage capacities of 60, 100, 220, 270, 390 and 500 lb (22, 40, 80, 100, 140 and 180 l). The units are super-pressurized with dry nitrogen to 360, 610, or 725 psi (25, 42, or 50 bar) at 70 °F (21 °C) with operating temperatures of +32 °F to +120 °F (0 °C to +50 °C). The units are designed for total flooding protection against Class A surface burning, Class B flammable liquid and Class C fires occurring within an enclosure.

These systems are intended to be designed and installed in accordance with the Listee's Design manual, part number 914387, Revision 00, Version 02, issued April 2014; Installation manual, part number 914386, Revision 01, Version 00, issued April 2014; the DesignManager Flow Calculation Program - Flow Calculation Math Kernel: MxCalc 200, Version 1.0, 2010-12-15.

Important notice

- This Bulletin is not intended to replace the requirements and limitations outlined within the above listed system's manuals. The information contained in this Bulletin will be added to the manual at the next update. We are providing this document immediately for Viking's UL Listed VSH1230 / VSH200 systems.
- It is the responsibility of Authorized Viking System Distributors and OEM´s to verify that this information has been received by all employees who design and work on VSH1230 / VSH200 systems.
- Electrically operated releasing devices / activators of VSH1230 / VSH200 systems must be activated by an UL Listed Fire Alarm Control Panel that is compatible with these electrically operated releasing devices / activators.

⚠ WARNING

Before any inspection and maintenance of the system, the electrically operated releasing devices / activators must be demounted from the system to prevent cylinder discharge during the inspection.

General

Electrically operated releasing devices / activators are commonly used as activating devices of a fire suppression system and NFPA 2001 requires these devices to be in place and ready to use. During installation, service and inspection it is common to demount the electrically operated releasing devices / activators and supervisory switches shall be installed to send a signal to the panel warning of system impairment if the electrically operated releasing devices / activators are not in place.

This Bulletin provides details on the installation and use of supervisory switches for electrically operated releasing devices / activators and release device EM for the VSH1230 / VSH200 extinguishing system unit. For the electrically operated releasing devices, activators, actuators, solenoids, PAE cylinder (release device EM) and electrically operated selector valves (release device EM) Minimax supervisory switches to check if these devices are in place These switches are electrically monitored by the Fire Alarm Control Panel / Control Unit.

- The supervisory switches are permanently monitored by the Control Panel. A short circuit or the demounting of a releasing device will create a supervisory alarm condition at the Fire Alarm Control Panel / Control Unit.
- The wiring methods for the electrically operated releasing devices / activators are to be in accordance to the installation instructions provided with the UL Listed Fire Alarm Control Panel / Control Unit for the releasing devices / activators.

⚠ CAUTION

Electrically operated releasing devices / activators or valve lever of release device EM must be demounted prior to inspection. Failure to demount the electrically operated releasing devices / activators or valve lever will result in system discharge.

A) Requirements for electrically operated releasing device accessories

Each individual electrically operated releasing device / activator is to be provided with an UL Listed supervisory switch. The supervisory switches are to be installed by the Installer, in accordance with NFPA 2001 for all the electrically releasing devices / activators for use with each VSH1230 / VSH200 extinguishing system unit.

The supervisory switch must provide a supervisory signal to the Fire Alarm Control Panel / Control Unit if the electrically operated releasing devices / activators are not in place and not ready to release the fire suppression system.

The Installer must use UL certified components as junction box, flexible conduit and conduit fittings and install the system according to NFPA 70 and NFPA 72.

B) Monitoring V B048x, Function description

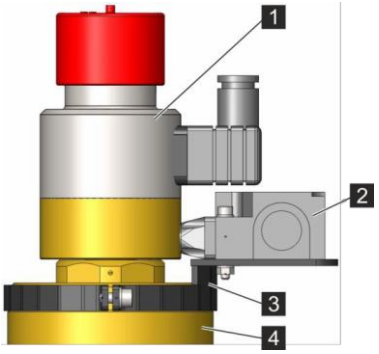

Fig. 1: Monitoring V B048x

When the release device (Fig. 1/1) is mounted on the valve (Fig. 1/4), the switch (Fig. 1/2) of the monitoring (Fig. 1/3) is actuated. When the release device is disassembled, the switch is not actuated and transmitted a signal to the fire alarm and extinguishing control panel. There, the non-existence of external electrical release device is indicated as a fault.

The monitoring is equipped with a cable at the factory (Fig. 4).

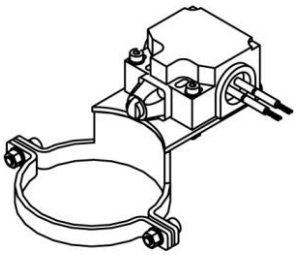

Fig. 2: Monitoring V B0482, part number 923719

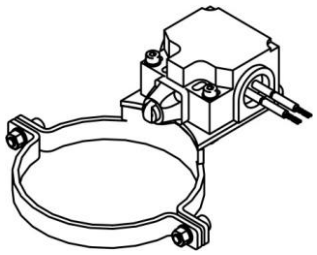

Fig. 3: Monitoring V B0481 part number 923718

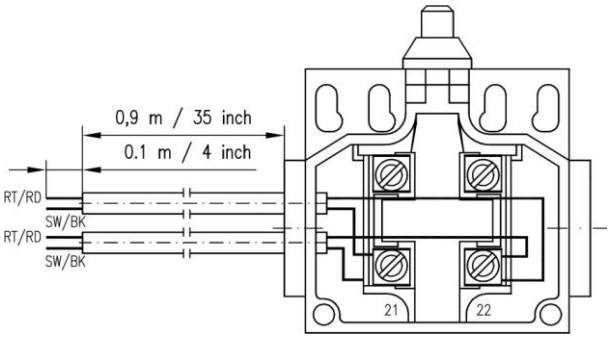

Fig. 4: Electrical connection

C) Monitoring V B048x, Mounting

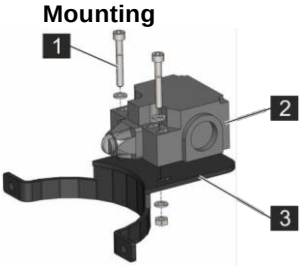

Fig. 5: Mounting switch

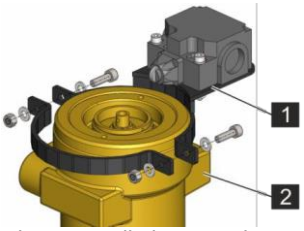

Fig. 6: Installation on valve

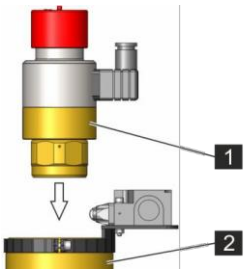

Fig. 7: Installation of release device

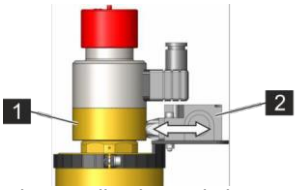

Fig. 8: Adjusting switch

Before starting installation demount electrically operated releasing devices / activators.

1. Install switch (Fig. 5/2) at the support (Fig. 5/3) using screws (Fig. 5/1), washers (4 pcs) and nuts (do not tighten at this point).
2. Install both parts of the support (Fig. 6/1) at the ring surface at the top of the valve (Fig. 6/2) using enclosed screws, washers and nuts. Tighten the screws with a torque of 5 ± 0.5 Nm (3.69 ± 0.37 ft-lb).
3. **⚠ WARNING! Danger of a faulty release!**
   Make sure to mount only reset electrically operated releasing devices / activators. Installation of an activated releasing device results in system discharge.

   If the release device is activated (pin in released position), reset the pin before mounting the release device on the valve.
4. Install release device (Fig. 7/1) on the valve (Fig. 7/2).
5. Move the switch (Fig. 8/2) away from the release device (Fig. 8/1) as far as possible.
6. Move the switch slowly to the release device until the switch is activated.
7. Move the switch 1 to 2 mm (0,039 to 0,079 inch) away from the release device.

   The switch has still been activated. If step 7 results in inactivated switch, start with step 6 and reduce length in step 7!
8. Tighten the screws with a torque of 3 ± 0.3 Nm (2.21 ± 0.22 ft-lb).
9. Check, if switch is still activated.
   If not, go back to step 6.

D) Monitoring V release device EM, Function description

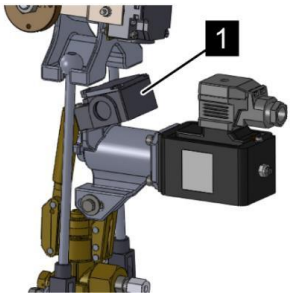

Fig. 9: Monitoring V release device EM

The monitoring (Fig. 9/1) of the EM release device enables electrical monitoring of the position of the valve lever. As soon as the EM release device is activated an appropriate signal is relayed to the fire extinguishing detection system.

This also occurs if the pilot cylinder has been activated manually via the valve lever, or if the valve lever has been removed.

The monitoring is equipped with a cable at the factory (Fig. 11).

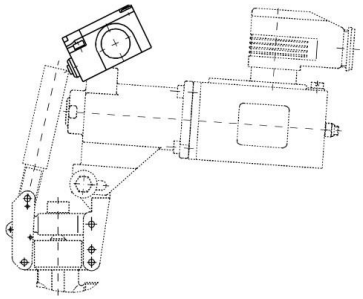

Fig. 10: Monitoring V release device EM, part number 923720

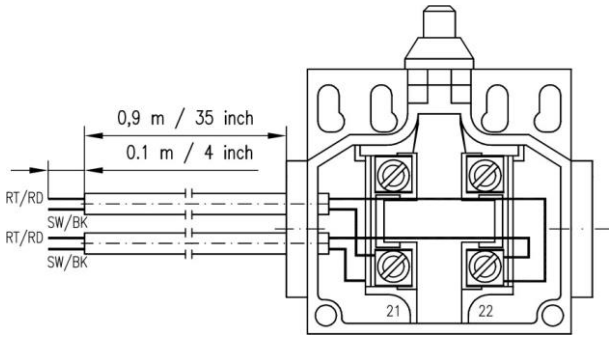

Fig. 11: Electrical connection

E) Monitoring V release device EM, Mounting

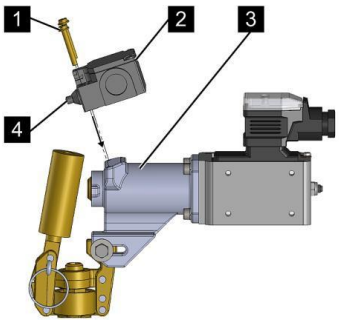

Fig. 12: Mounting the Monitoring V release device EM

1. Loosely fasten the limit switch (Fig. 12/2) with cylinder screws and washers (Fig. 12/1) on the holder of the EM release device (Fig. 12/3).
2. Align the limit switch (Fig. 12/2) in such a manner that the contact (Fig. 12/4) is activated with the valve lever.
3. Tighten the cylinder screws.

F) Connection of the supervisory switches according to NFPA regulations

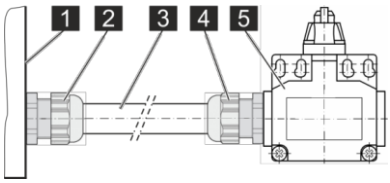

Fig. 13: Supervisory switch, fittings and conduit

1 Junction box
2 Fitting for conduit
3 Flexible metal conduit
4 Fitting for conduit
5 Supervisory switch

Wiring with end of line device

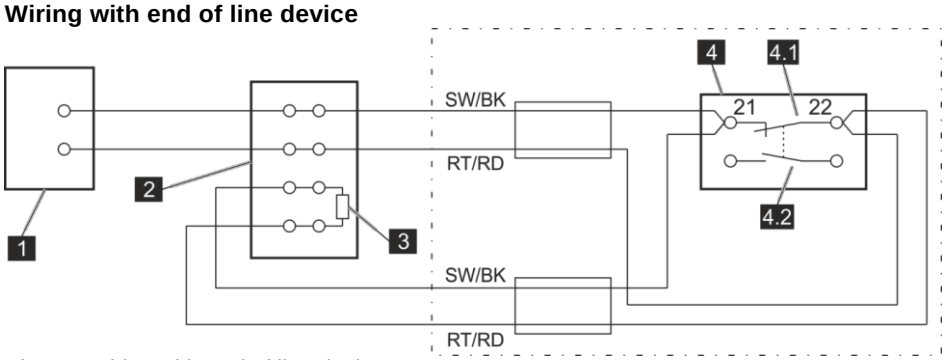

Fig. 14: Wiring with End of line device

1 Control panel
2 Junction box
3 End of line device
4 Supervisory switch
4.1 Make contact; if release device or valve lever are demounted an electric contact is closed
4.2 Break contact (not used)

⚠ WARNING **Before any functional tests, the electrically operated releasing devices / activators must be demounted from the system.**

⚠CAUTION **Before demounting the electrically operated releasing devices / activators after inspection and maintenance it is important to check the status of the Fire Alarm Control Panel / Control Unit. If the Fire Alarm Control Panel / Control Unit is in "Alarm / Discharge" mode, the mounting of the electrically operated releasing devices / activators will result in system discharge.**

⚠ CAUTION **Before demounting the electrically operated releasing devices / activators after inspection and maintenance it is also important to check if the pin of the releasing device is in the "non-released" position.**

Should you have any question regarding this Bulletin, please contact Technical Product Management.

Notes:

Bulletin