



FIRE SUPPRESSION SYSTEMS

Installation and Maintenance User Manual



INERT GAS (IG-01 / IG-100 / IG-55 / IG-541)

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IMPORTANT

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Any questions concerning the information presented in this manual should be addressed to:



Thank you for your trust in AIRfire, your confidence increases our desire to follow ahead.

NOTE:

Unless otherwise stated, images/ diagrams are for illustrative purposes only. Colours and dimensions may not represent the true product. Always verify Technical Datasheets for as-built characteristics.

1 INTRODUCTION

1.1 GENERAL



The terms **DANGER, WARNING, ATTENTION** denote that non-compliance with the warnings can cause severe injuries and even fatalities, or that there is the risk of substantial material damage. All other notices shall also be observed to prevent faults and resulting personal injuries and material damage.

Do not expose yourself or others to hazards. Carefully read the following safety instructions before installing, operating or servicing the system equipment, to prevent accidents, personal injuries and material damage. The fittings and the product itself shall only be used for the intended purposes.

Limits and values listed in these operating instructions shall be observed, particularly operating pressures, ambient temperatures and dimensions of the system installation too. The company AIRfire will accept no liability for damages resulting from improper use or non-compliance with the instructions in this user manual.

1.2 HAZARD NOTICE

All work shall be performed by qualified personnel trained according to the operating instructions throughout the service life of the system. Qualified personnel mean all persons officially trained by AIRfire in the planning, installation, commissioning, operation and maintenance of the gas suppression systems. Furthermore, the personnel shall comply with:

- Regional, national and internal regulations and safety standards.
- Use of appropriate safety equipment and work apparel.

These operating instructions are intended for all persons installing, operating and servicing the products and fittings listed below. It is assumed that persons are aware of the general rules and safety guidelines for handling gases and pressurized units. It is also assumed that the personnel are acquainted with handling electrical components.

In case of difficulties with operating the pressure units that cannot be resolved by consulting these instructions further information must be requested from the manufacturer, AIRfire.

The manufacturer reserves the right to implement technical changes, improvements, and amendments. Always consult the newest version of this user manual.



The extinguishing system described in this user manual may only be used for the protection of enclosure meeting the designated system limits, otherwise the protective function cannot be guaranteed.

Any modification of components and materials is prohibited, only parts which are listed in this manual and properly functioning must be used. Unsuitable tools and working practices entail risks for personal injuries and malfunctions.

Ignoring these instructions can cause severe personal injuries and material damage.

1.3 FUNCTION OF THE EXTINGUISHING SYSTEM

The Inert gas fire suppression system is designed as a permanently pressurised automatic fire suppression system, i.e. the extinguishing agent is stored in a pressurised vessel at an operating pressure of 200 or 300 bar. This pressure provides the energy to expel the extinguishing agent.

When a fire occurs in the protected enclosure, it is detected by the fire detection system which is in communication with the automatic fire suppression system through an Extinguishing Control panel.

The heat/smoke created by the fire causes the detectors to send a signal to the extinguishing control panel. Which consequently sends an electrical signal to the solenoid actuator of the cylinder valve, opening all the cylinder valves and thus releasing the extinguishing agent. The system activation can be triggered manually or electronically. The extinguishing agent released will then flow through the discharge pipework to the nozzles, which are arranged in a manner to guarantee the entire protected enclosure is homogeneously flooded with extinguishing agent to guarantee rapid fire suppression and avoid reignition.

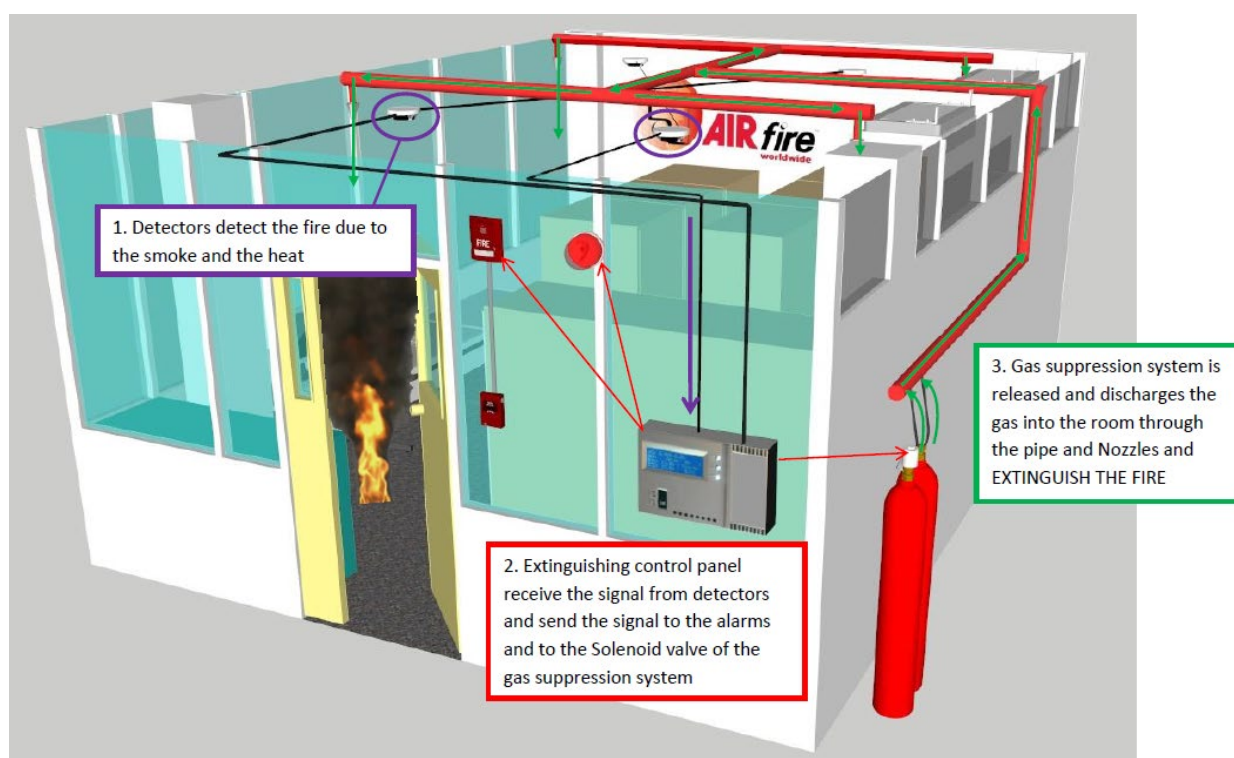


Figure 1 - Room protection features

1.4 DIRECTIVES FOR SYSTEM INSTALLERS AND SERVICE PERSONNEL

1.4.1 Using the Installation and Maintenance User Manual

There are two different useful ways to use this manual. First, following the index accurately (mainly when it is the first system to be installed and the personnel has no previous experience) and secondly, as a reference book. In both cases, it is necessary the use of the drawings provided with the system for accurate, project specific installation.

In the first way of use, the manual layout provides step by step installation of a system chronologically. It is also convenient to refer to the project drawings to identify the position and number of the components to be installed.

As for the second way of use, this manual is used when the installer, with previous experience, firstly checks the project drawings provided with the system. Since the denomination and technical data sheet of each part appears in them, each component is easily located in the table of content of the manual and therefore, the appropriate chapter can be quickly consulted.

Intention of this manual is to give specific instructions for installation, maintenance, and testing requirements for AIRfire systems and components. In any case is intended to accomplish any requirements of the applicable and mandatory standards of design and installation of systems.

1.4.2 Directives



AIRfire systems may only be installed by specialist companies with the required expertise, qualified personnel trained by AIRfire directly.

Authorized companies and specialists installing a fire extinguishing system on behalf of AIRfire must have been provided with enough training.

The installer of the extinguishing system is responsible for the correct installation and labelling of the approved installed system.



The manufacturer and/or the installer of the fire extinguishing system must deliver technical documentation and system-specific operating instructions at the time of commissioning the system to the End User.

In addition, the operating instructions to the individual components complementing the information in this documentation must be observed.

Do not hesitate to contact AIRfire in case of overlapping, missing information or doubts.

1.5 RULES FOR FIRE EXTINGUISHING SYSTEM OPERATORS



The system components shall never be damaged, disassembled or readjusted during operation of cleaning/ maintenance work. A qualified installation engineer from the installing company must be contacted in case of doubt.

This manual is written for those who install, operate and maintain *Inert* fire extinguishing systems manufactured by **AIRfire Worldwide**. It contains system installation, operation and maintenance instructions

Inert fire suppression systems designed and manufactured by AIRfire are considered as heavy-duty equipment, reliable and easy to mount, with simple test routines to check their operating condition as described in this manual. However, **AIRfire Worldwide** wishes to clarify the following points:

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- All personnel who are assigned to the equipment shall be properly trained in its use, inspection, tests and maintenance.
- AIRfire recommends always the adoption of safe working practice in accordance with current health legislation and safety procedure. It is recommended that personnel in charge of installation and maintenance of the fire extinguishing system should be properly trained in its safe use and should read the whole of this manual before initiating any of the operations mentioned above.
- All personnel working in an enclosure protected by *Inert* systems should be warned of the effects on humans. Personnel in the protected area should be trained in the modes of actuation in case of alarm and in the different types of system activation.
- During installation and maintenance operations personnel should be protected by wearing protective clothing and shoes and when necessary helmet and gloves. Safety glasses or facemask should be worn whenever holes are drilled for pipe supports or cylinder bank brackets. Such protection is also needed when dealing with particle emission.
- Due to possible false alarm of the detection system (if installed) produced by dust or smoke caused by installation works, the detection system in the area should be isolated or disconnected until commissioning of the system has been finalised.
- All the equipment and pipe system should be installed in accordance with the project drawings. Systems are made up of units tested within limitations. The system designer must be consulted whenever changes are planned for the system or area of protection. Constructive drawings should be corrected, and modifications included in the project.
- An authorized installer or system designer must be consulted after the system has discharged.
- Protective cap must always be installed on the discharge valve when a cylinder is being transported to its destination.

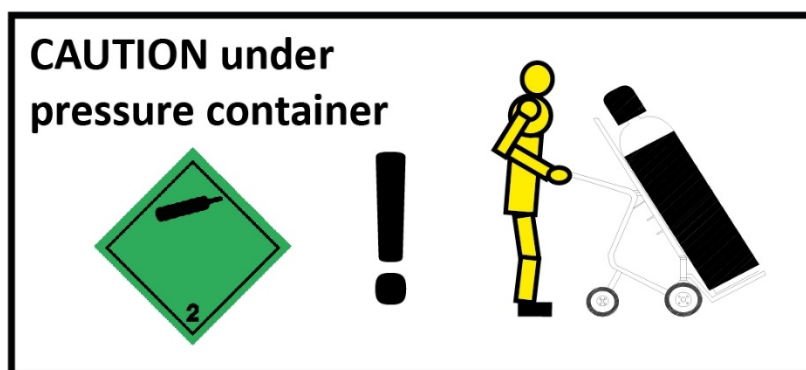


Figure 2 - Manipulation warning

2 SYSTEM CONFIGURATIONS

2.1 GENERAL SYSTEM DATA

2.1.1 Agent features and classification

The inert systems can be classified in the following groups:

- Agent:
 - **IG-01: Argon**
 - **IG-55: Mixture of 50% Argon and 50% Nitrogen**
 - **IG-100: Nitrogen**
 - **IG-541: Mixture of 52% Nitrogen, 40% Argon and 8% Carbon Dioxide**
- Storage pressure: **200 or 300 bar**
- Cylinder capacity: **80 L or 140 L**

To define the system is necessary to choose one point of each group and it can vary depending on the protected volume taking into consideration that bigger capacity and more pressure means more quantity of gas which means more protected volume with one storage unit.

The following table shows the quantity of gas (Kg), that can be storage in each cylinder unit depending on the agent, cylinder capacity and pressure:

IG - 01	
Cylinder type	Kg
140 L 300 bar	70.40
140 L 200 bar	49.30
80 L 300 bar	40.30
80 L 200 bar	28.20

IG - 100	
Cylinder type	Kg
140 L 300 bar	43.53
140 L 200 bar	31.33
80 L 300 bar	24.88
80 L 200 bar	17.90

IG - 55	
Cylinder type	Kg
140 L 300 bar	56.15
140 L 200 bar	39.87
80 L 300 bar	32.09
80 L 200 bar	22.78

IG - 541	
Cylinder type	Kg
140 L 300 bar	57.90
140 L 200 bar	41.60
80 L 300 bar	33.14
80 L 200 bar	23.80

2.2 SYSTEM VARIANTS

Depending on the design carried out to adequately protect the enclosure, different system variants are available:

2.2.1 System 1: Modular cylinder

Modular cylinder system consists of only one cylinder, that contains the Inert gas extinguishing agent. The valve incorporates all actuation and discharge release components. Also, valve incorporate a pressure gauge with contact for monitoring the pressure of the cylinder. The valve makes use of the pressure contained in the cylinder to open its internal chamber when activated and release the gas. It is normally fitted with a manual actuator and electrical solenoid actuator. Pneumatic actuation is also possible for special applications.

This configuration is used for small enclosures/ hazards where according design calculations the needed quantity of gas to protect the volume is same or less than the capacity of one cylinder.

Nº	Description	Code
1'a'	80 L. cylinder with 200 bar Inert	0332X1
1'b'	80 L. cylinder with 300 bar Inert	0332X2
1'c'	140 L. cylinder with 200 bar Inert	0333X1
1'd'	140 L. cylinder with 300 bar Inert	0333X2
2'a'	Cylinder bracket 80 L	081110
2'b'	Cylinder bracket 140 L	081120
3'a'	Inert Valve 200 bar	0732X1
3'b'	Inert Valve 300 bar	0732X2
4	Solenoid actuator 24 Vdc	022001
5	Manual actuator	072203
6	Pressure gauge with contact	0540XX
7'a'	Discharge hose (Female-3/4" M)	0412BX
7'b'	Discharge hose (M24 F-3/4" F)	0413A0
8'a'	Reduction M 1" NPT to F G3/4" (For discharge hose 7 'a')	124203
8'b'	Reduction M 1" NPT to M G3/4" (For discharge hose 7 'b')	124204
9	Restrictor 1"	0922A0
10	Discharge Nozzle	063XXX

More details of the modular cylinder components will be explained in chapter 3: System components.

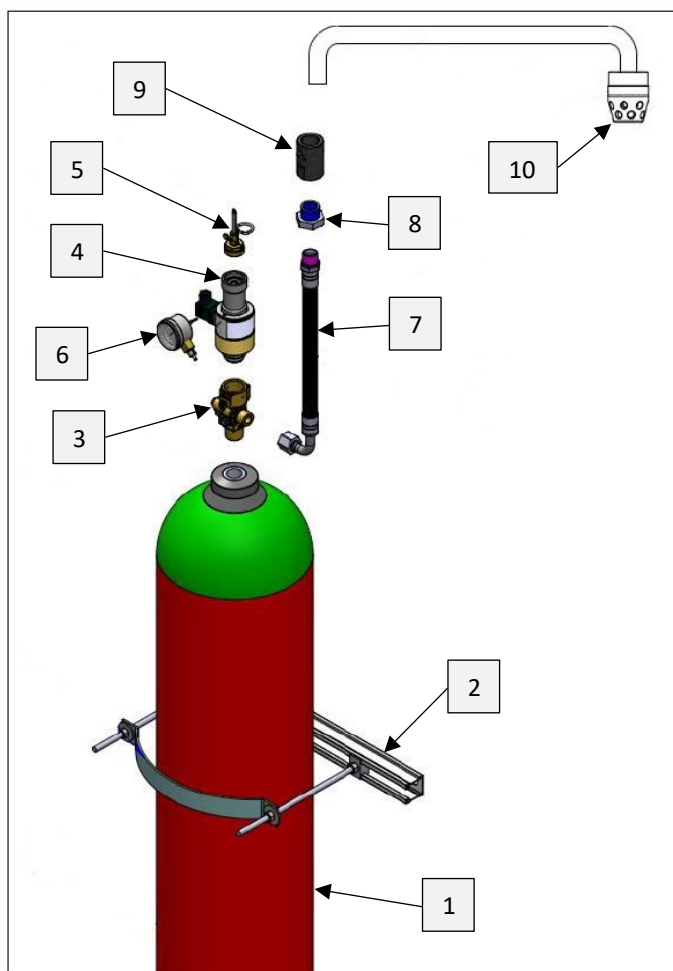


Figure 3 - Modular cylinder

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2.2.2 System 2: Cylinder bank

Cylinder bank or battery of cylinders is composed of two or more cylinders connected to a common manifold. An automatic mean, check valves (n.8 in fig. 4 and fig. 5), are supplied to prevent agent loss and guarantee personnel safety in case the system is activated when any cylinders are removed for maintenance.

The 1st cylinder of the system is known as the *Master cylinder* as it is fitted with the electric solenoid (n.4 in fig. 4 and fig. 5) and manual actuator (n.5 in fig. 4 and fig. 5) allowing to activate the remaining cylinders (*slaves*) of the system. Upon activation of the Master cylinder, part of the pressure of the agent released at the opening of the valve is directed through the pneumatic release line (n.9 in fig. 4 and fig. 5) towards the pneumatic actuators (n.10 in fig. 4 and fig. 5) located on the valves of the slave cylinders opening them pneumatically and simultaneously.

This configuration is used for large enclosures/ hazards where according design calculations the needed quantity of gas to protect the volume is equal to 2 cylinders or more.

Depending on the system installation to be carried out, two configurations are available determined by the type of discharge hose used (n.7 in fig. 4 and fig. 5), as shown on the following pages.

OPTION 'A'

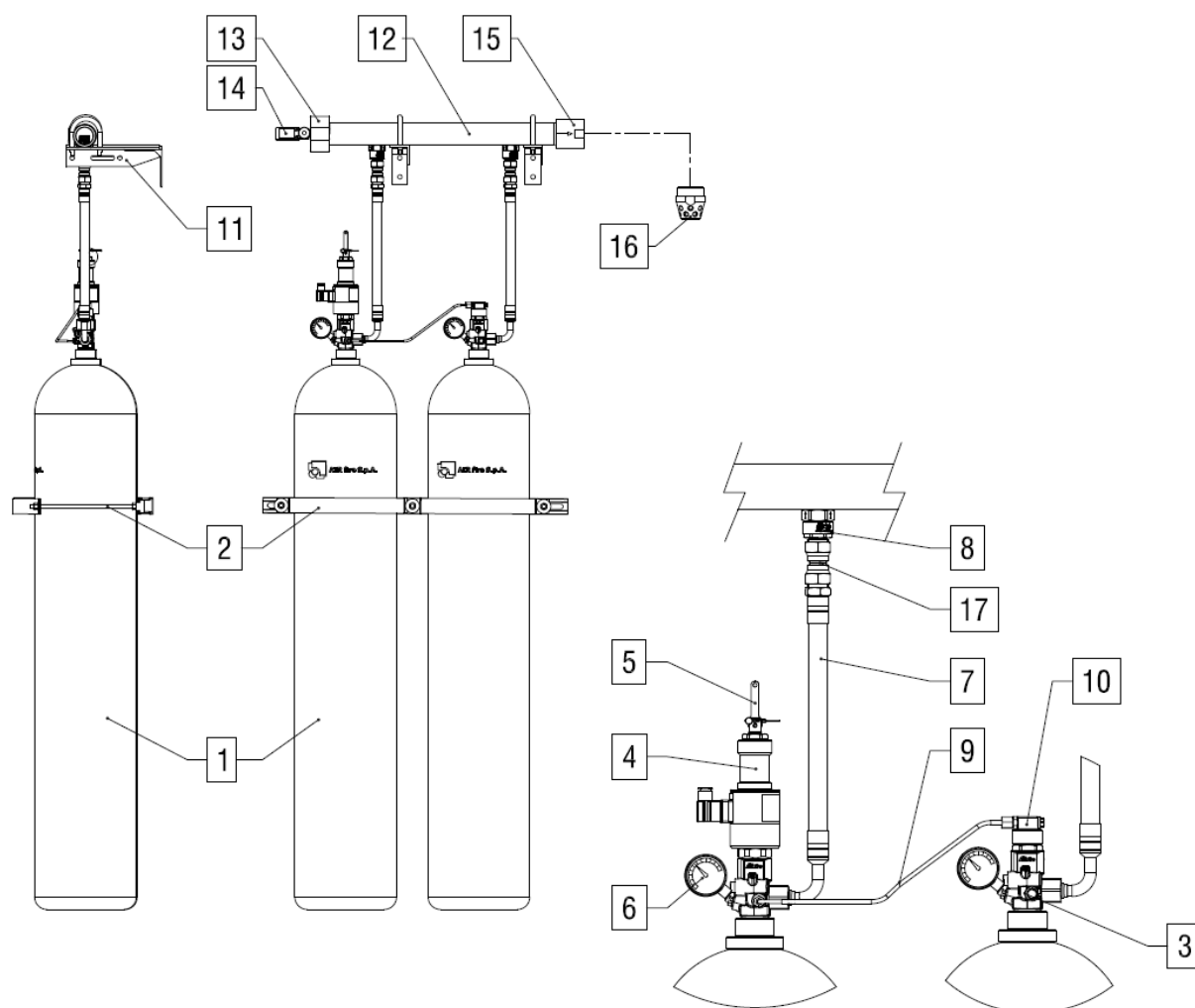


Figure 4 - Cylinder bank (OPTION A)

Nº	Description	Code	Nº	Description	Code
1'a'	80 L. cylinder with 200 bar Inert	0332X1	7	Discharge hose (Female-3/4" M)	0412BX
1'b'	80 L. cylinder with 300 bar Inert	0332X2	8	Check valve 3/4"	0112A2
1'c'	140 L. cylinder with 200 bar Inert	0333X1	9	Release hose R7 1/8" 500 mm	0422A1
1'd'	140 L. cylinder with 300 bar Inert	0333X2	10	Pneumatic actuator	072202
2'a'	Cylinder bracket 80 L	081XXX	11	Manifold supports	081XXX
2'b'	Cylinder bracket 140 L	081XXX	12	Discharge Manifold	133XXX
3'a'	Inert Valve 200 bar	0732X1	13	Manifold blind cap	13420X
3'b'	Inert Valve 300 bar	0732X2	14	Pressure switch on manifold	0510B0
4	Solenoid actuator 24 Vdc	022001	15	Restrictor	092XA0
5	Manual actuator	072203	16	Discharge Nozzle	063XXX
6	Pressure gauge with contact	0540XX	17	Reduction (3/4" SF – 3/4" SF)	124104

More details of the cylinder banks will be explained in chapter 3: *System components*

OPTION 'B'

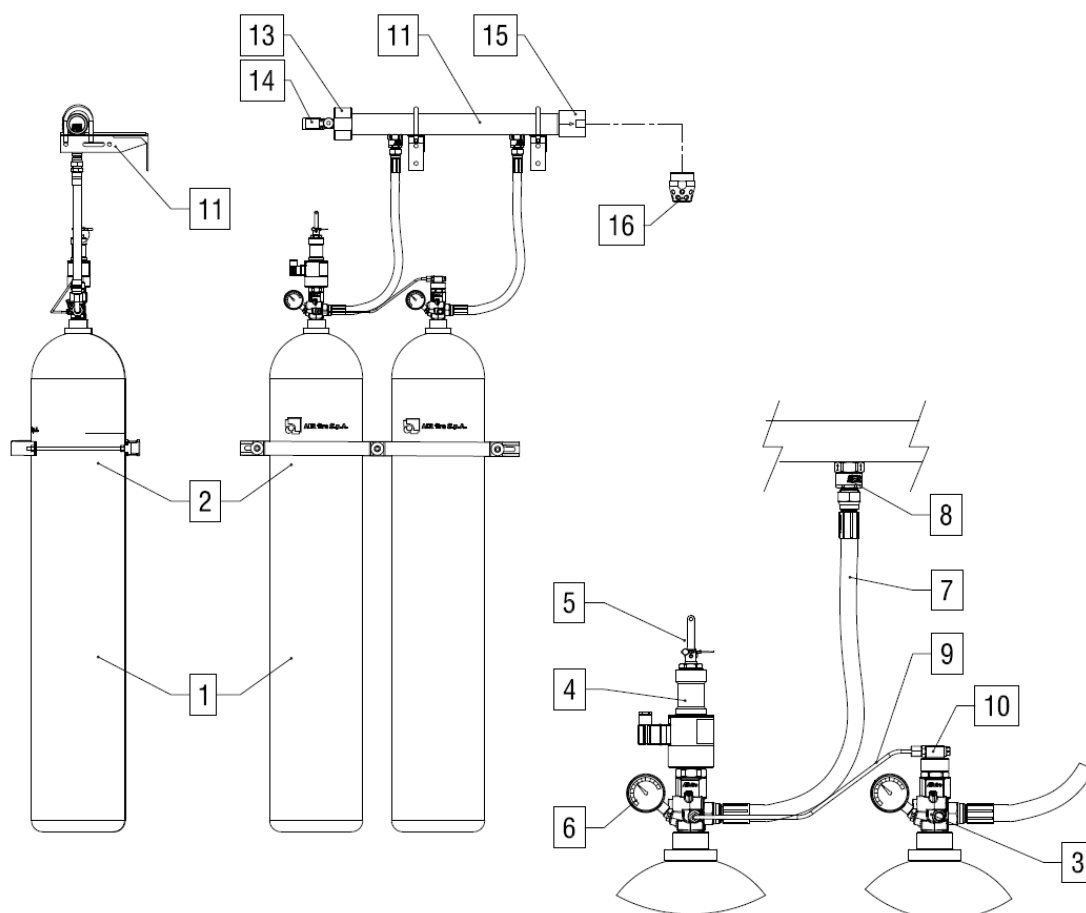


Figure 5 - Cylinder bank (OPTION B)

Nº	Description	Code	Nº	Description	Code
1'a'	80 L. cylinder with 200 bar Inert	0332X1	7	Discharge hose (M24 F – 3/4" F)	0413A0
1'b'	80 L. cylinder with 300 bar Inert	0332X2	8	Check valve 3/4"	0112A2
1'c'	140 L. cylinder with 200 bar Inert	0333X1	9	Release hose R7 1/8" 500 mm	0422A1
1'd'	140 L. cylinder with 300 bar Inert	0333X2	10	Pneumatic actuator	072202
2'a'	Cylinder bracket 80 L	081XXX	11	Manifold supports	081XXX
2'b'	Cylinder bracket 140 L	081XXX	12	Discharge Manifold	133XXX
3'a'	Inert Valve 200 bar	0732X1	13	Manifold blind cap	13420X
3'b'	Inert Valve 300 bar	0732X2	14	Pressure switch on manifold	0510B0
4	Solenoid actuator 24 Vdc	022001	15	Restrictor	092XA0
5	Manual actuator	072203	16	Discharge Nozzle	063XXX
6	Pressure gauge with contact	0540XX			

More details of the cylinder banks will be explained in chapter 3: *System components*

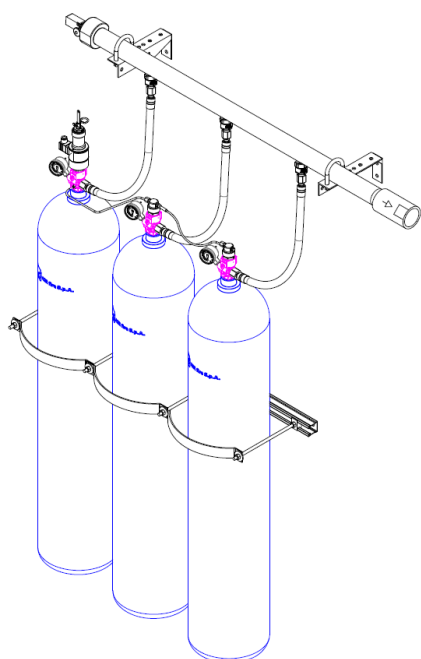
3 SYSTEM COMPONENTS

The components of the system can be divided in different groups depending on their use:

- **Storage vessel** - Pressurized seamless steel cylinders containing the extinguishing agent.
- **Activation components** - Controls the activation of the valves so to discharge the agent contained in the cylinders. There are 3 possible activation mechanisms: Electric, manual, and pneumatic.
- **Monitoring components** – Components that monitor the cylinder pressure and provide an electrical signal alerting if the cylinder has leaked and/ or discharged.
- **Distribution components** - Directs agent flow during discharge from the cylinders to the protected zone.
- **System support** - It consists of a structure that supports the cylinders. According to the configuration there are single row and double row models.

NOTE: All component codes that include an 'X' means that multiple versions are available. Always check component specific Technical Data Sheet for further details.

3.1 STORAGE VESSEL



Storage vessel consists of an assembly of seamless steel cylinder where the extinguishing agent is stored, and cylinder valve mounted on top to maintain the agent inside.

All vessels are supplied with a transport cap mounted on top of the cylinder valve to protect it.

Figure 6 - Storage vessels

ATTENTION:



The transport cap shall always be installed whenever a cylinder is being transported or manipulated.

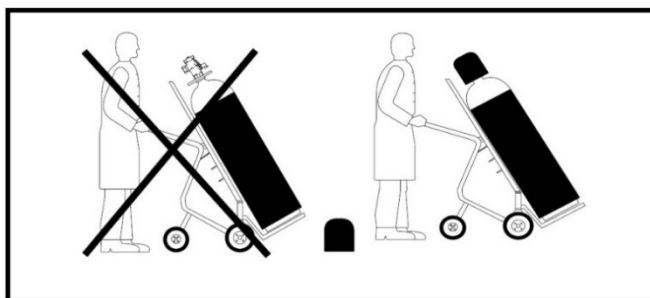


Figure 7 - Transporting cylinder

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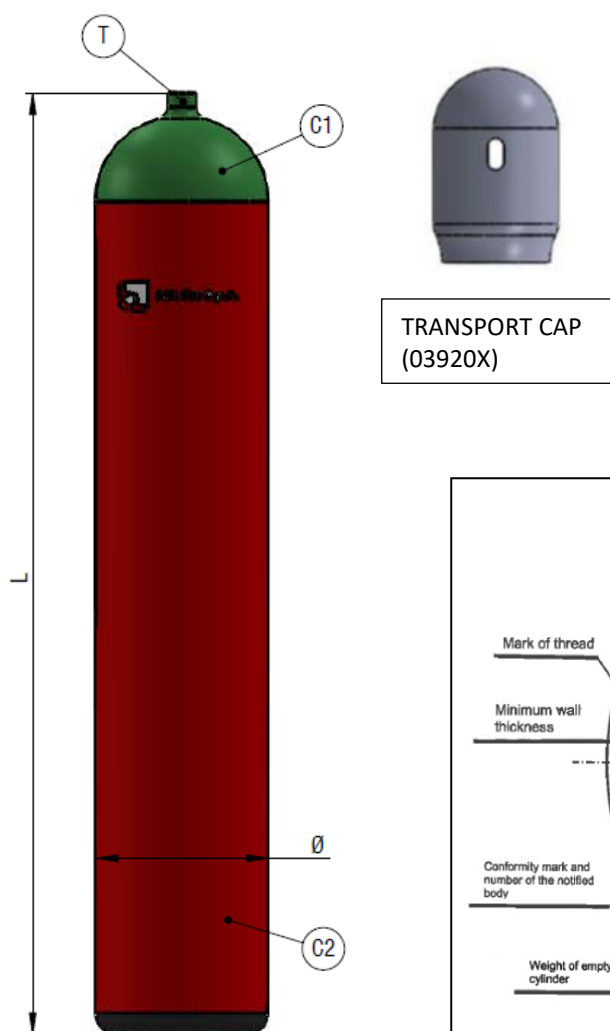
3.1.1 High-pressure cylinder: (033XXX)

The high-pressure cylinders are refillable seamless steel gas cylinders manufactured according ISO 9809-1 and in compliance with Directive 2008/68/EC and Directive 2010/35/EU. The cylinder capacity are 80 and 140 litres, pressurized with 200 or 300 bar (15 °C).

The cylinder-valve is supplied fully mounted onto the cylinder and is protected by the cylinder transport cap to avoid any impacts (causing leaks or accidental discharge) during transportation and manipulation of the cylinder.

According previously mentioned directives, all cylinders include marked details (Fig. 9) on their shoulder to correctly identify them, trace them and guarantee they fully comply with regulations/ standards in force.

Further details can be found in Technical Data Sheet, code: TDS0321A0.



Nº	Description
L (80 L)	~ 1740 mm
L (140 L)	~ 1710 mm
Ø (80 L)	267 mm
Ø (140 L)	360 mm
T	25E or 1" NPT
C1	Green, RAL 6018
C2	Red, RAL 3000

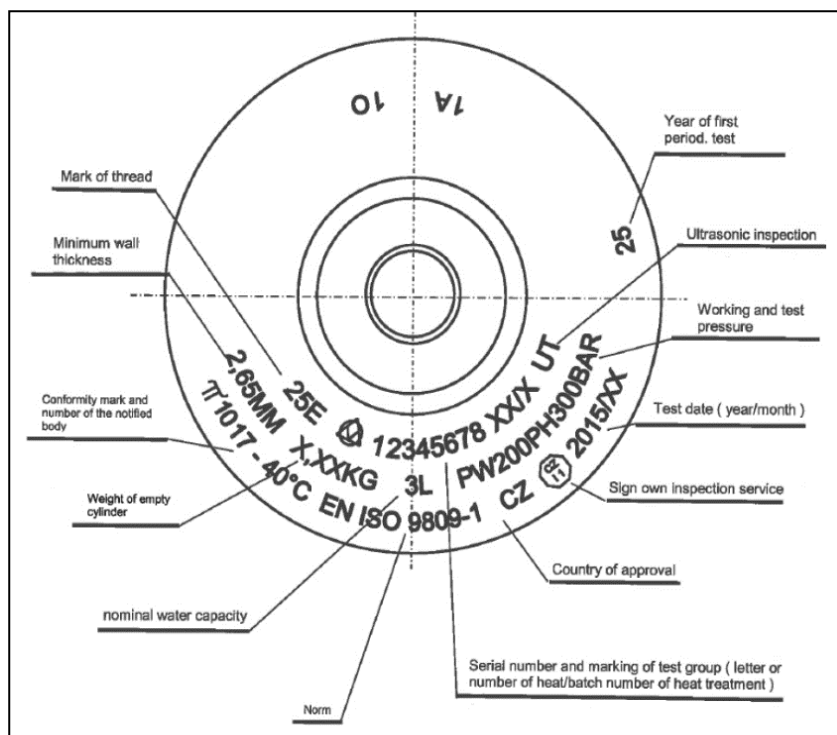


Figure 9 - Inert cylinder

Figure 8 - Cylinder shoulder marking

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3.1.2 Cylinder label: (14100X)

All cylinders are supplied with their corresponding label holding all relevant data (Fig. 10):

- Inert stored in the cylinder,
- Inert quantity,
- Cylinder serial number,
- Working pressure,
- Weight of the empty cylinder (033XXX) incl. valve (0732XX),
- Total Weight,
- Date of filling.

The label(s) are delivered with order documentation and not on the cylinder. This is to prevent any damages during transport and cylinder installation.

As soon as the cylinder has been installed and the system is to be commissioned, the label(s) shall be attached on the cylinder in a visible location, easy to read and not covered by the cylinder bracket. Following the cylinder serial number marked on the shoulder, stick the corresponding label with same serial number.



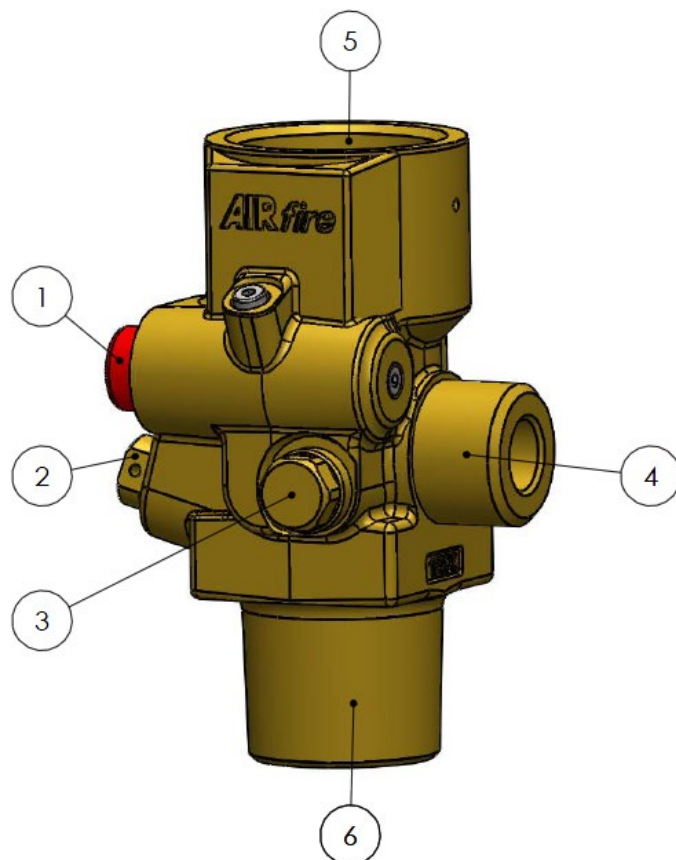
<h1>IG-01 100% Argon [Ar]</h1>		<p>AGENTE ESTINGUENTE EXTINGUISHING AGENT AGENT ESTINCTEUR ONU: 1006</p> 
<p>CARICA DI IG-01 FILLED WITH IG-01 CHARGE AVEC IG-01</p> <p>CILINDRO n° CYLINDER n° BOUTEILLE n°</p> <p>PRESSURIZZATO A PRESSURIZED AT PRESSURISÉ A</p> <p>TARA DELLA BOMBOLA (kg) CYLINDER TARE (kg) TARE DE BOUTEILLE (kg)</p> <p>PESO TOTALE (kg) TOTAL WEIGHT (kg) POIDS TOTAL (kg)</p> <p>DATA DI RIMPIOMBAMENTO FILLING DATE DATE DE REMPLISSAGE</p>	<p>Kg</p> <p>BAR (T = 16.20)</p> <p>INCLUIDO VALVOLA INCLUDED VALVE AVEC VANNE</p> <p>TARA + CARICA IG-01 TARE + CHARGE IG-01 TARE + CHARGE IG-01</p>	<p>TEMPERATURA DI STOCCAGGIO: da -20 °C a + 50 °C STORAGE TEMPERATURE: -20 °C to + 50 °C TEMPERATURE STOCKAGE: -20 °C to + 50 °C</p> <p>PRESSIONE DEL TEST IDRAULICO INDICATA SULLA BOMBOLA HYDRAULIC TEST PRESSURE MARKED ON THE CYLINDER PRESSION D'ÉPREUVE HYDRAULIQUE MARQUÉ SUR LE BOUTEILLE</p>
<p>ATTENZIONE: Bombola ad alta pressione, può scaricare con violenza. Estremamente pericoloso. Può provocare gravi ferite. Non manipolare la bombola senza capello di sicurezza. Il sistema dev'essere installato in aree conformi alla 2010/95/UE.</p> <p>WARNING: High pressure cylinder, capable of violent discharge. Extremely hazardous. May cause severe injuries. Do not manipulate the cylinder without safety transportation cap. System shall be installed in locations in accordance with 2010/95/UE.</p> <p>ATTENTION: Bouteille à haute pression, capable de décharge violente. Extrêmement dangereux. Peut causer des blessures graves. Ne pas manipuler la bouteille sans le capuchon de transport et sécurité. Système doit être installé dans des endroits conformes à la norme 2010/95/UE.</p> <p>Leggere e seguire tutte le istruzioni su questa etichetta e nel manuale dell'utente. Per lo stoccaggio e l'installazione della bombola, seguire scrupolosamente le procedure indicate nel manuale. Controllare periodicamente la pressione sul manometro.</p> <p>INSTALLATION:</p> <ol style="list-style-type: none"> 1) Fissare la staffa (A) al muro. 2) Pondere la bombola (B) nella staffa (A). 3) Rimuovere il capello di protezione (C) e porre l'uscita della valvola nella giusta posizione. 4) Fissare la bombola (B) nella staffa (A). 5) Svitare il tappo di sicurezza (D). 6) Montare la manichetta di scarica (E) alla valvola e collegarla alla tubazione di distribuzione (F) o al collettore. 7) Montare sulla valvola tutti i dispositivi di rilascio (leggere il manuale dell'utente). 8) Controllare con acqua saponata possibili perdite di gas della valvola, in particolare provenienti dalla testa della valvola. Pulire e asciugare. <p>Read and follow all instructions on this label and in the User Manual. For storage and installation of the cylinder follow exactly the procedure indicated in the manual. Periodically check the pressure on the pressure gauge.</p> <p>INSTALLATION:</p> <ol style="list-style-type: none"> 1) Fix brackets (A) to the wall. 2) Place cylinder (B) in bracket (A). 3) Remove safety transportation cap (C) and place outlet valve in right position. 4) Clamp cylinder (B) in bracket (A). 5) Remove outlet cap (D). 6) Install discharge hose (E) and connect it to piping network (F) or manifold. 7) Place all release devices on the valve if they are not installed (see user manual). 8) Check possible leaks with soapy water all around the valve, especially on the valve head. Clean and dry. <p>Lisez et suivez scrupuleusement les consignes de cette étiquette et dans le manuel d'utilisateur. Pour le stockage et l'installation de la bouteille suivre exactement la procédure indiquée dans le manuel. Vérifier périodiquement la pression du manomètre.</p> <p>INSTALLATION:</p> <ol style="list-style-type: none"> 1) Fixer le(s) support(s) (A) au mur. 2) Positionner la bouteille (B) dans le(s) support (A). 3) Retirer le capuchon protecteur (C) et orienter la bouche de sortie de la vanne correctement. 4) Fixer la bouteille (B) dans le(s) support (A). 5) Retirer le bouchon de sécurité (D). 6) Installer le tuyau de décharge (E) et le connecter au réseau de tuyauterie (F) ou collecteur. 7) Monter les accessoires d'activation de la vanne (voir mode d'emploi). 8) Vérifier les fuites éventuelles avec de l'eau savonneuse tout autour de la vanne, principalement sur la tête de la vanne. Nettoyer et sécher. <p>MANUTENZIONE:</p> <ol style="list-style-type: none"> 1) Disattivare e rimuovere la bobina del solenoide e i dispositivi di rilascio dall'attacco (G). 2) Rimuovere la manichetta di scarica (E). 3) Avvitare il tappo di sicurezza (D). 4) Montare il capello di protezione (C). 5) Rimuovere la bombola (B) dalla staffa (A). 6) Per ulteriori procedure di manutenzione leggere il manuale dell'utente. <p>MAINTENANCE:</p> <ol style="list-style-type: none"> 1) Deactivate and remove solenoid coil and release devices from connection (G). 2) Remove discharge hose (E). 3) Place outlet cap (D). 4) Place safety transportation cap (C). 5) Remove cylinder (B) from bracket (A). 6) For further maintenance procedures see user manual. <p>ENTRETIEN:</p> <ol style="list-style-type: none"> 1) Désactiver et retirer bobine de solénoïde et accessoires d'activation de connexion (G). 2) Retirer tuyau de décharge (E). 3) Placer le bouchon de sécurité (D). 4) Placer le capuchon protecteur (C). 5) Retirer la bouteille (B) du support (A). 6) Pour plus de procédure d'entretien, voir le mode d'emploi. 		
		<p>SEDE - HEADQUARTERS: Via Tenda della Morsa, 33/37 00155 ROMA Tel +39 06227341 - Fax +39 062285044 FILIALI - CUSAGO (MI) - GIOVINAZZO (BA) info@airfire.it - www.airfire.eu</p> <p>INTERNATIONAL DIVISION: C/ Mata 21, local 08004 BARCELONA (SPAIN) Tel + 34 933 249 094 info@airfire.eu - www.airfire.eu</p> <p style="writing-mode: vertical-rl; transform: rotate(180deg);">Label code: 141004</p>

Figure 10 - Cylinder label

3.1.3 Inert gas cylinder valve: (0732XX)



Nº	Description
1	Push button – valve closure
2	Safety screw with burst disc
3	Pilot line connection, G1/8"
4	Valve outlet
5	Actuator connection
6	Cylinder thread

Figure 11 – Inert cylinder valve

The valves 0732XX operate according to the pressure difference principle.

By actuating the release device (*connected in position 5 of Fig. 11*), the integrated pilot valve in the Inert cylinder valve opens and the upper pressure chamber vents immediately. This pressure drop causes that the cylinder pressure pushes the closing piston in the open position. The Inert cylinder valve is now open allowing a total discharge of the agent in the cylinder. The Inert cylinder valve 0732XX can be triggered manually, pneumatically, and electrically.

The cylinder is filled through the valve outlet (*position 4 of Fig. 11*).

For the protection against unacceptable high pressure in the cylinder the valve is equipped with a burst disc safety device (*position 2 of Fig. 11*).

NOTE: Inert cylinder valve 0732XX is equipped with a pressure gauge connection port.

The valve is supplied mounted onto the cylinder. Do not try to disassemble any of the accessories that come incorporated. The components that connect to the valve (discharge hose and activation components) shall be installed later, following the order they are described in this User Manual.

Further details can be found in Technical Data Sheet, code: TDS0732XX

ATTENTION AND WARNINGS:



- During handling and transportation, until commissioning of the automatic fire suppression system the valve outlet shall always be kept closed with a gas-tight seal (valve outlet cap supplied).
- No activation component shall be mounted while handling, assembling, filling and transporting the cylinder, until commissioning of the automatic fire suppression system. Unintentional actuation of the activation components leads to the system discharge and risk of injury and damage.
- For the mounting or dismounting of the valve from a pressure cylinder, a suitable tool must be used to avoid damaging the valve.
- Damaged or leaking valve shall be replaced immediately.
- Modifications of the cylinder valve and corresponding activation components are not permitted.
- The valve thread and the cylinder thread must be free from impurities, grease, and other adhesive residues.
- Before screwing the valve make sure that the valve interior is free from impurities.
- The valve unscrewing is only allowed when the cylinder is empty, free of pressure.

NOTE:

Negligence or bad handling could cause uncontrolled discharge, injuries to personnel and damage to property. In case of doubt, always consult AIRfire technical department.

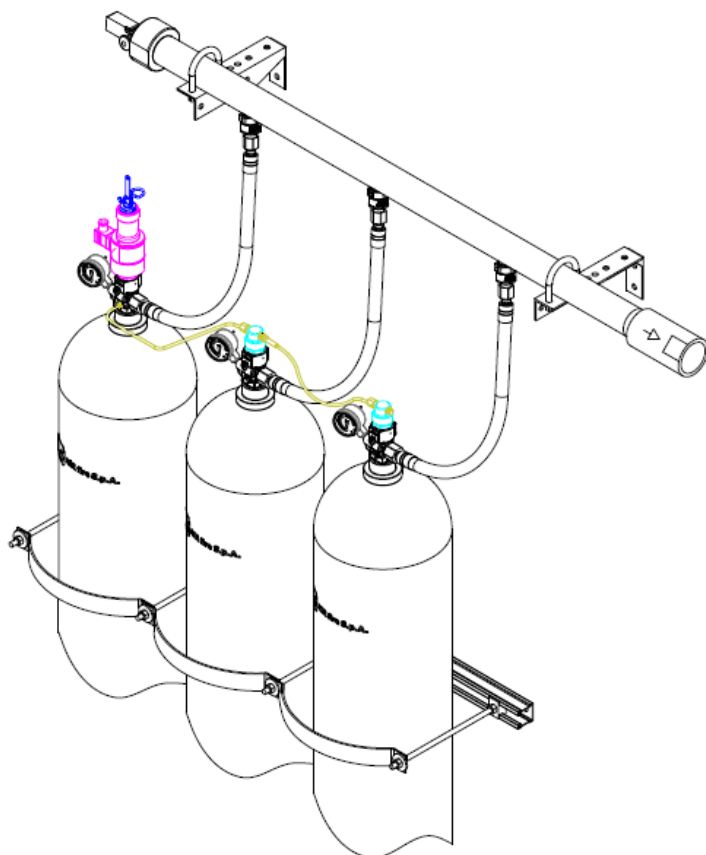
This equipment is pressurized.

For any installation or maintenance operation, the valve outlet cap shall remain screwly fastened on the valve as a safety measure.

When any Installation, maintenance or test operation are finished, do not forget to remove the valve outlet cap and reconnect discharge hose.

3.2 ACTIVATION COMPONENTS

Control the activation of the valves so to discharge the agent contained in the cylinders. There are 3 possible activation mechanisms: Electrical, manual, and pneumatic.

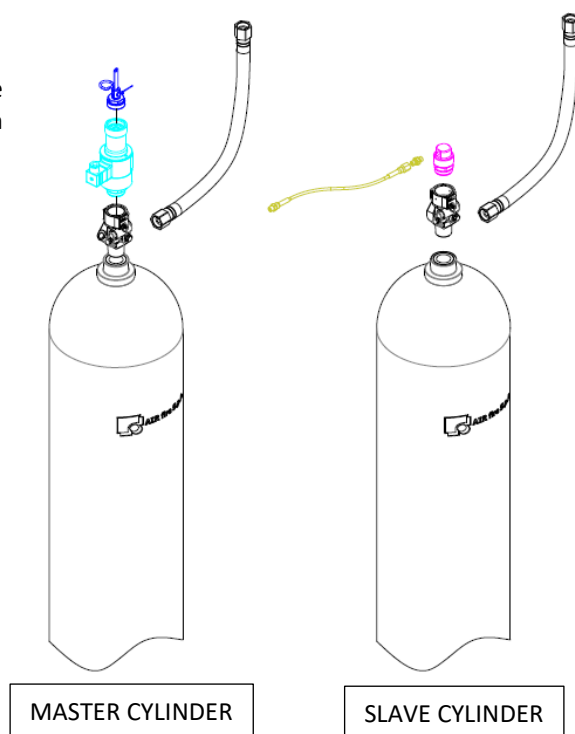


In a cylinder bank configuration there are 2 different valve activations:

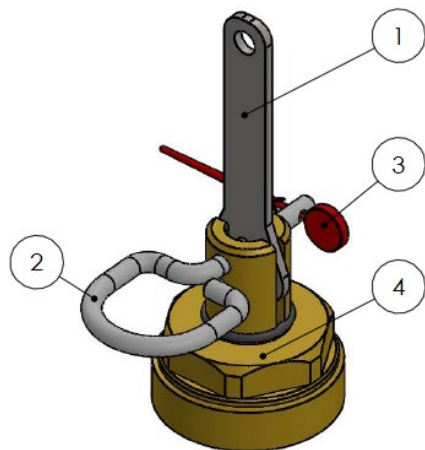
- **Master cylinder:** It's the responsible to receive the signal from the extinguishing control panel to the solenoid valve and release itself to then activate the other cylinders of the bank pneumatically. One part of the gas contained in the cylinder is used for the activation; the rest is discharged to the manifold. A manual actuator is also mounted.
- **Slave cylinder:** Is the cylinder(s) that follow the Master cylinder. The valve counts with a pneumatic actuator that is activated by the agent released from the Master cylinder and distributed through the release hoses.

Figure 12 - Activation components

In modular cylinder configuration, the activation would be the same as the Master cylinder, solenoid activation (electrical) or manual activation



3.2.1 Manual actuator: (072203)



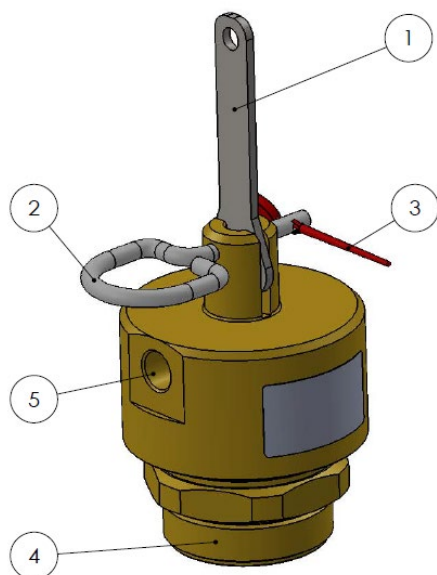
The manual actuator allows manual activation of the cylinder valve. It is compulsory to always include such actuator. Located ontop of the cylinder valve or solenoid valve (022001), the lever (Pos. 1) is manually operated to open the valve and activate the system. It includes a safety pin (Pos. 2) to prevent accidental activation and this safety pin incorporates a safety seal (Pos. 3) to avoid incorrect manipulation.

Nº	Description
1	Lever
2	Safety pin
3	Safety lock
4	Connection to cylinder valve or solenoid valve

Figure 13 - Manual actuator

Further details can be found in Technical Data Sheet code: TDS072203

3.2.2 Pneumatic-manual actuator: (072213)



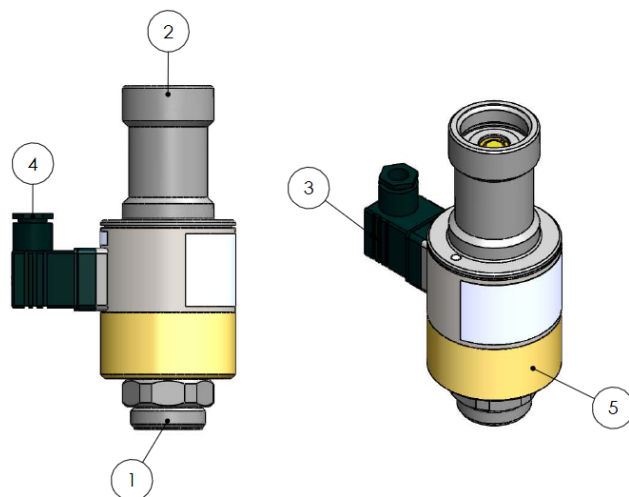
The pneumatic-manual actuator can be installed directly on the cylinder valve or ontop of the solenoid valve (022001). It allows manual activation as well as pneumatic activation of the cylinder valve. Useful for special activation configurations e.g. Dual redundant solenoid setup or selector valve systems. It includes a safety pin (Pos. 2) to prevent accidental activation and this safety pin incorporates a safety seal (Pos. 3) to avoid incorrect manipulation.

Nº	Description
1	Lever
2	Safety pin
3	Safety lock
4	Connection to cylinder valve or solenoid valve
5	Release hose connection

Figure 14 - Pneumatic-manual actuator

Further details can be found in Technical Data Sheet code: TDS072213

3.2.3 Solenoid valve: (022001)



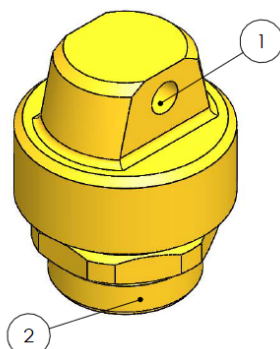
The solenoid valve allows to open the cylinder valve electrically (receive signal from a fire panel for example). It is installed directly onto the cylinder valve. On top of it can be installed other actuators.

Nº.	Description
1	Connection to cylinder valve
2	Connection for other actuators
3	Male connector plug socket
4	Cable gland inlet
5	Body

Further details can be found in Technical Data Sheet code: TDS022001

Figure 15 - Solenoid valve

3.2.4 Pneumatic actuator: (072202)



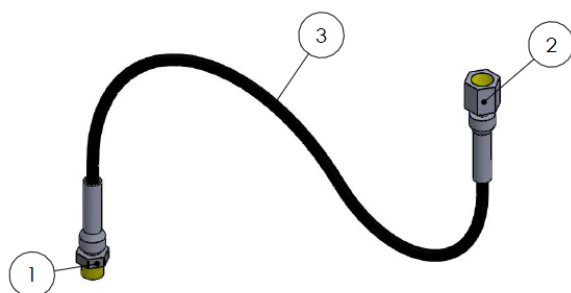
The pneumatic actuator is installed directly on top of the slave cylinder valve allowing to activate it pneumatically. It is equipped with an internal piston and with two pneumatic connections. Once pressure arrives above the piston, it pushes it down opening the valve associated to the head.

Nº.	Description
1	Release hose connection
2	Connection to cylinder valve

Further details can be found in Technical Data Sheet code: TDS072202

Figure 16 - Pneumatic actuator

3.2.5 High-pressure release hose: (0422A1)



The high-pressure release hose is a flexible connection in the release circuit to activate the valves pneumatically. It is installed between the pilot line connection from the Master cylinder valve to the pneumatic actuators and/or pneumatic-manual actuator on the slave cylinders.

Nº.	Description
1	Male connection
2	Swivel female connection
3	Hose

Figure 17 - High-pressure release hose

Further details can be found in Technical Data Sheet code: TDS0422A1

3.3 Monitoring components

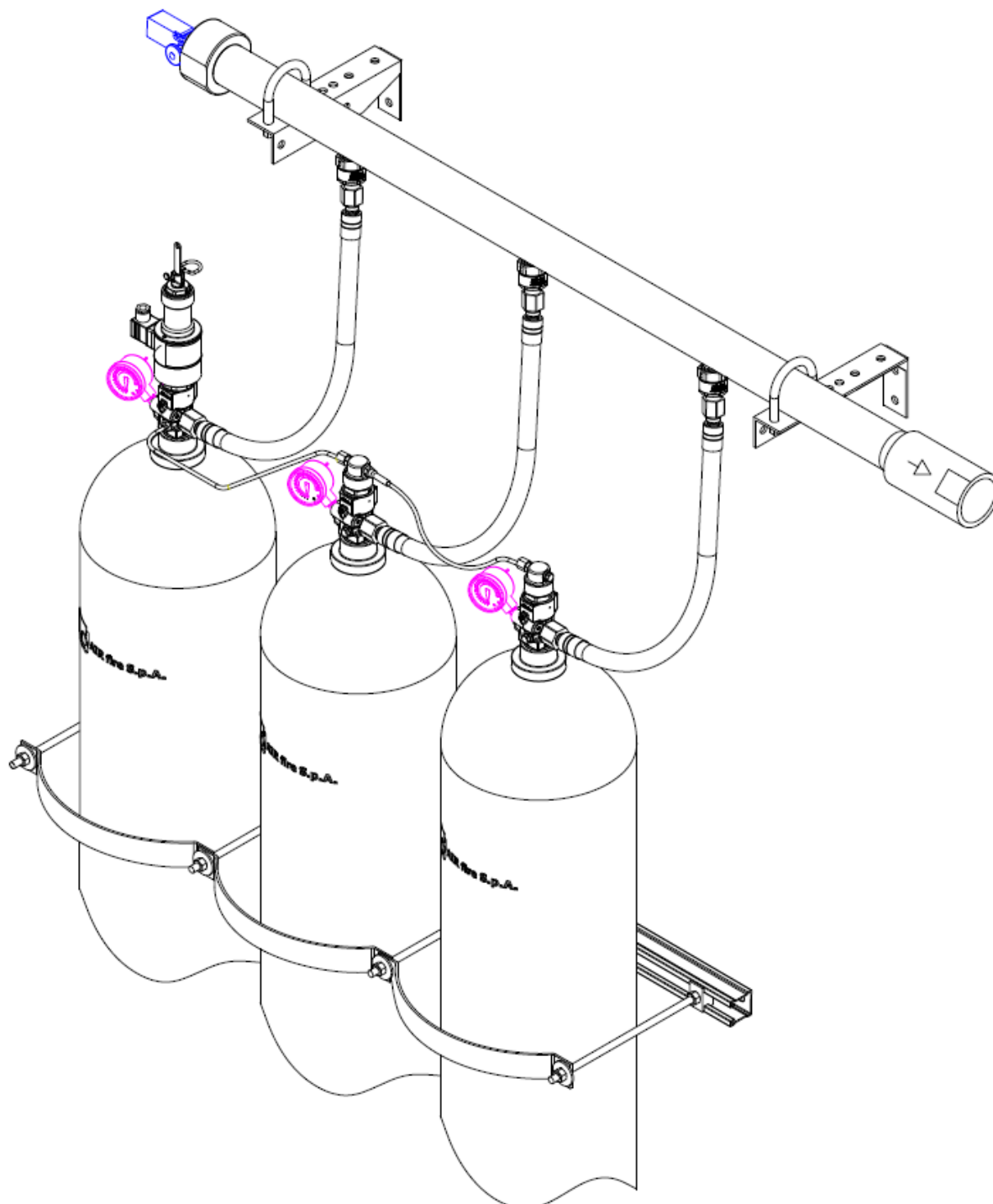


Figure 18 – Monitoring components

Components that monitor the cylinder pressure and provide an electrical signal alerting if the cylinder has leaked and/ or discharged.

Installation and Maintenance User Manual

3.3.1 Pressure gauge with contact (0540XX)

Pressure gauge is provided with each cylinder valve to indicate the pressure inside the cylinder. Its electrical contact allows real time monitoring notifying in case of leaks.

- Use only pressure gauges with contact specified by AIRfire S.p.A.
- The pressure gauges with contact can be assembled and disassembled under pressure.
- Before mounting the pressure gauge, the plug screw (Pos. 1 in Fig. 19) at the pressure gauge connection on the valve shall be unscrewed. When dismantling the pressure gauge the plug screw shall be screwed back in place.

Further information at its Technical Data Sheet (code: TDS05400x-A)

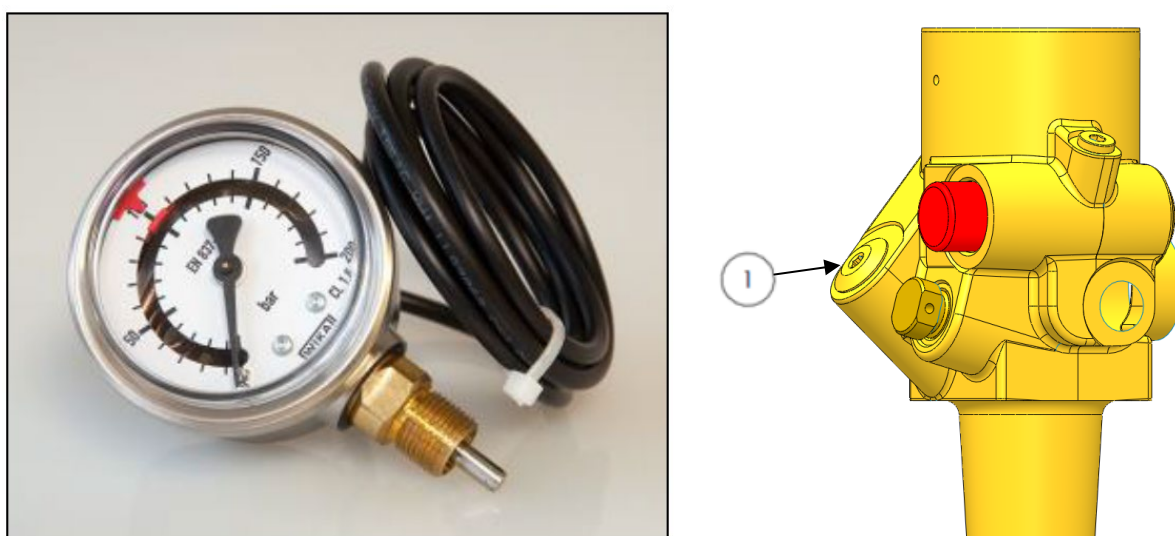
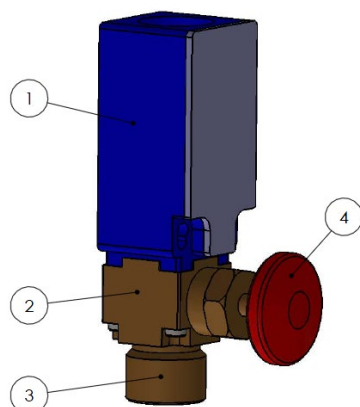


Figure 19 – Pressure gauge with contact and plug screw

3.3.2 Pressure switch on manifold with locking device (0510B0)



The pressure switch closes or opens an electric circuit when a discharge from the manifold takes place. Notifying gas flow has occurred. The electric signal may be monitored by a control panel to operate and/or shut down other electrical devices. Once activated it is rearmed manually by pulling the rearming button (4), which incorporates the latching mechanism.

It is mounted on the manifold pipe or on the blind manifold cap.

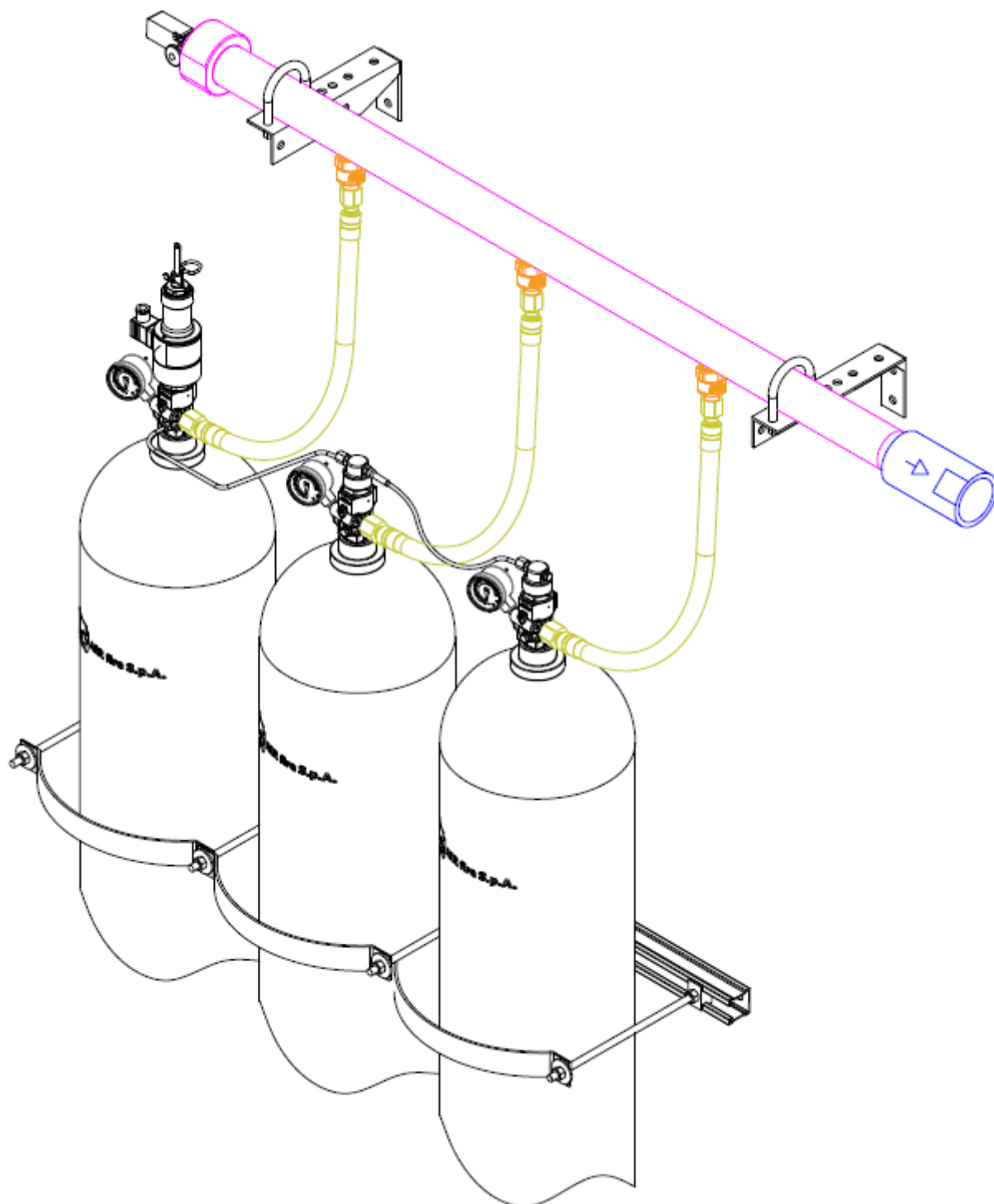
Nº	Description
1	Electrical body
2	Brass body
3	Manifold connection
4	Rearming button

Figure 20 - Pressure switch on manifold

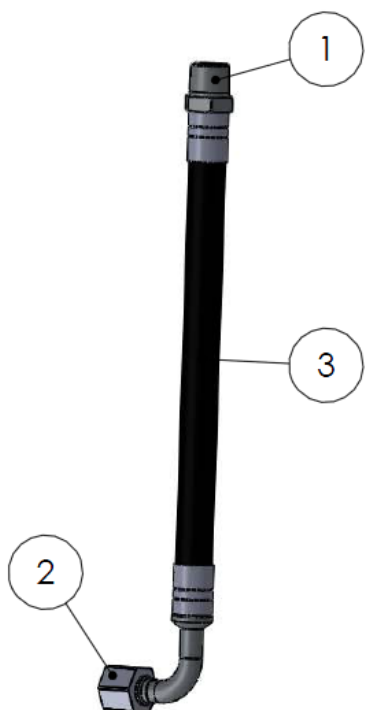
Further details can be found in Technical Data Sheet code: TDS0510B0-1

3.4 DISTRIBUTION COMPONENTS

The distribution components are the components responsible to direct the extinguishing agent from the cylinders to the protected enclosure.



3.4.1 High-pressure discharge hose 90°: (0412BX)



The discharge hose 90° is used to connect the cylinder valve to the manifold so to direct the agent flow to the pipe network.

It is installed between the cylinder valve and the check valve. In case of a modular cylinder, it is installed directly to the discharge pipe. It is recommended to connect first the male port of the hose to the check valve and then the female nut to the outlet of the cylinder valve.

WARNING: It is necessary to connect the coupling (124104) between the check valve and discharge hose when installing cylinder bank systems.

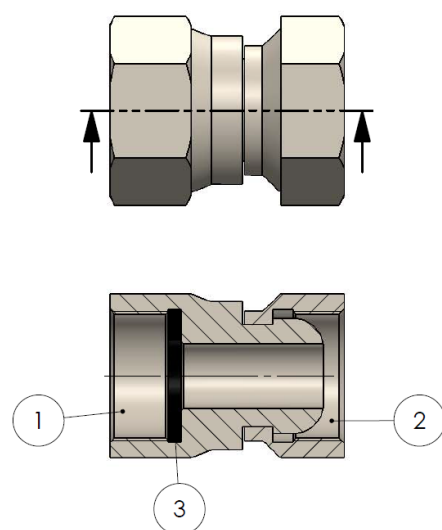
Nº.	Description
1	Male connection to check valve or discharge pipe (modular cylinder)
2	Swivel female connection to cylinder valve
3	Hose

Further details can be found in Technical Data Sheet code: TDS0412BX

Figure 22 - Discharge hose 90°

3.4.2 Coupling Swivel Female to Fixed Female: (124104)

This coupling is used for connecting the high-pressure discharge hose 90° (0412BX) to the check valve (0112A2). Only required for cylinder bank systems.



Nº	Description
1	Fixed female to check valve
2	Swivel female to discharge hose (0412BX)
3	Flat gasket

Further details can be found in Technical Data Sheet code: TDS0124104

Figure 23 - Coupling SF to FF

3.4.3 High-pressure discharge hose straight: (0413A0)

The discharge hose straight is used to connect the cylinder valve to the manifold so to direct the agent flow to the pipe network. It is installed between the cylinder valve and the check valve. In case of a modular cylinder, it is installed directly to the discharge pipe.

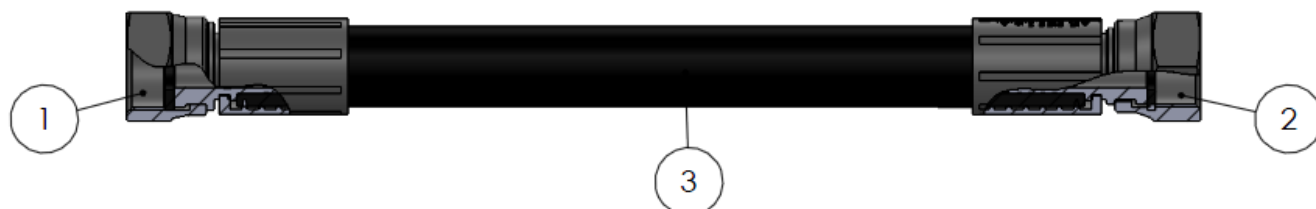


Figure 24 - High-pressure discharge hose straight

Nº	Description	Nº	Description	Nº	Description
1	Swivel female G3/4" (Flat gasket included)	2	Swivel female G3/4" (Flat gasket included)	3	Hose

Further details can be found in Technical Data Sheet code: TDS00413A0

3.4.4 3/4" Check valve: (0112A2)

The 3/4" check valve (*used only in cylinder banks*) prevents the gas backflowing from the manifold pipe into the cylinders, thus ensuring a complete discharge of all the cylinders. It also acts as a safety element during maintenance operations, in case cylinders are disconnected from the manifold and an accidental discharge is produced it prevents the gas from being released and injuring personnel.



Nº	Description
1	Thread to manifold
2	Thread to discharge hose
3	O-ring

Further details can be found in Technical Data Sheet code: TDS0112A2-B

Figure 25 - 3/4" Check valve

3.4.5 Discharge manifold (13XXXX)

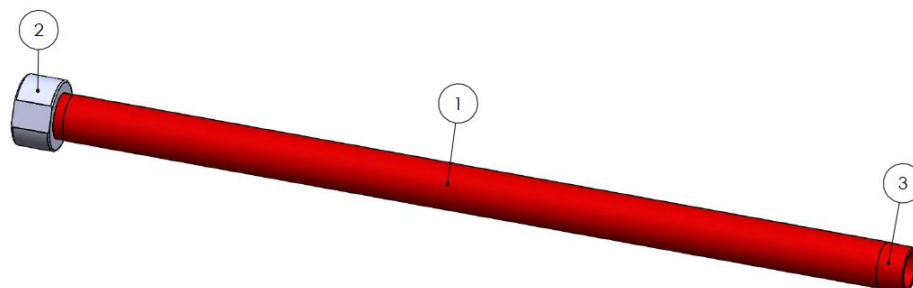


Figure 26 - Discharge manifold

The cylinder discharge manifold collects all the gas discharged from the cylinders connected to it via the discharge hoses, directing the flow toward the pipe network to discharge into the protected enclosure.

Nominal diameter of the manifold is determined by the results obtained from the hydraulic calculation software.

The manifold pipe is located above the cylinder bank.

Further details can be found in Technical Data Sheet code: TDS13XXXX-1

Nº	Description
1	Manifold pipe
2	Blind cap of manifold
3	NPT Thread outlet

3.4.6 Restrictor (092XA0)

The restrictor is used to control the discharge and flow of inert systems, to reduce the storage pressure from 200 or 300 bar to 60 bar downstream of the manifold side according to the standards. It is installed between the end of the manifold and the piping network.

Inside the restrictor, is mounted a diaphragm with a calibrated orifice obtained from the hydraulic calculation software VdS approved. The software takes into consideration all features of the enclosure, piping layout and system details. The orifice diameters are determined in increments of 0.1 mm.

The restrictor body has an arrow marked to show the direction of flow of the gas.

Note: The AIRfire inert system flow calculation software is required to determine restrictor orifice sizes and pressure downstream of the restrictor.

Nº	Description
1	Restrictor body
2	Diaphragm
3	Cir-clip

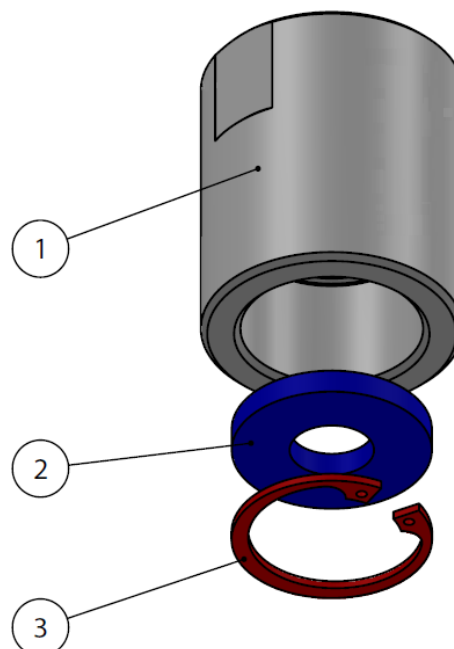


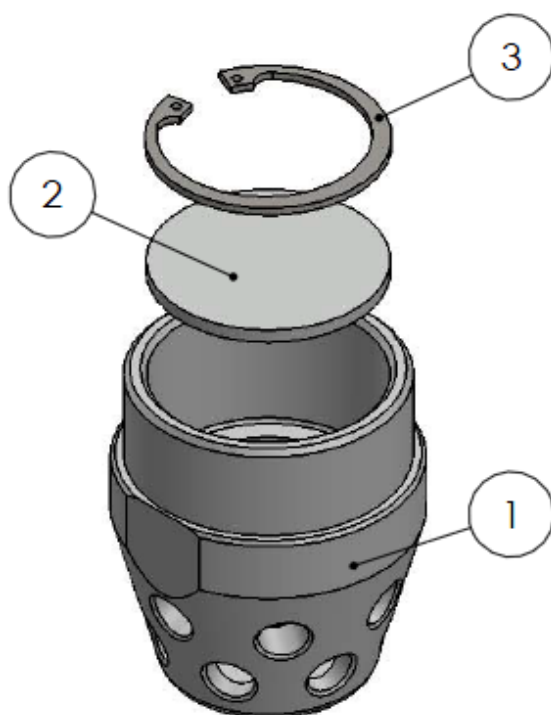
Figure 27 - Restrictor

Further details can be found in Technical Data Sheet code: TDS092XA0-1

3.4.7 High-pressure nozzle (063XX1)

Through the nozzles is discharged the extinguishing agent into the protected enclosure. They are designed so that according each available diameter a predetermined amount of agent is released. The agent flow is controlled by a calibrated diaphragm (2) inside the nozzle body, determined by the results from the hydraulic calculation software VdS approved. It guarantees a homogenous gas distribution throughout the volume.

Further details can be found in Technical Data Sheet code: TDS063XX1-A



Nº	Description
1	Nozzle body
2	Diaphragm
3	Cir-clip

Figure 28 - High-pressure nozzle

3.5 SYSTEM SUPPORTS

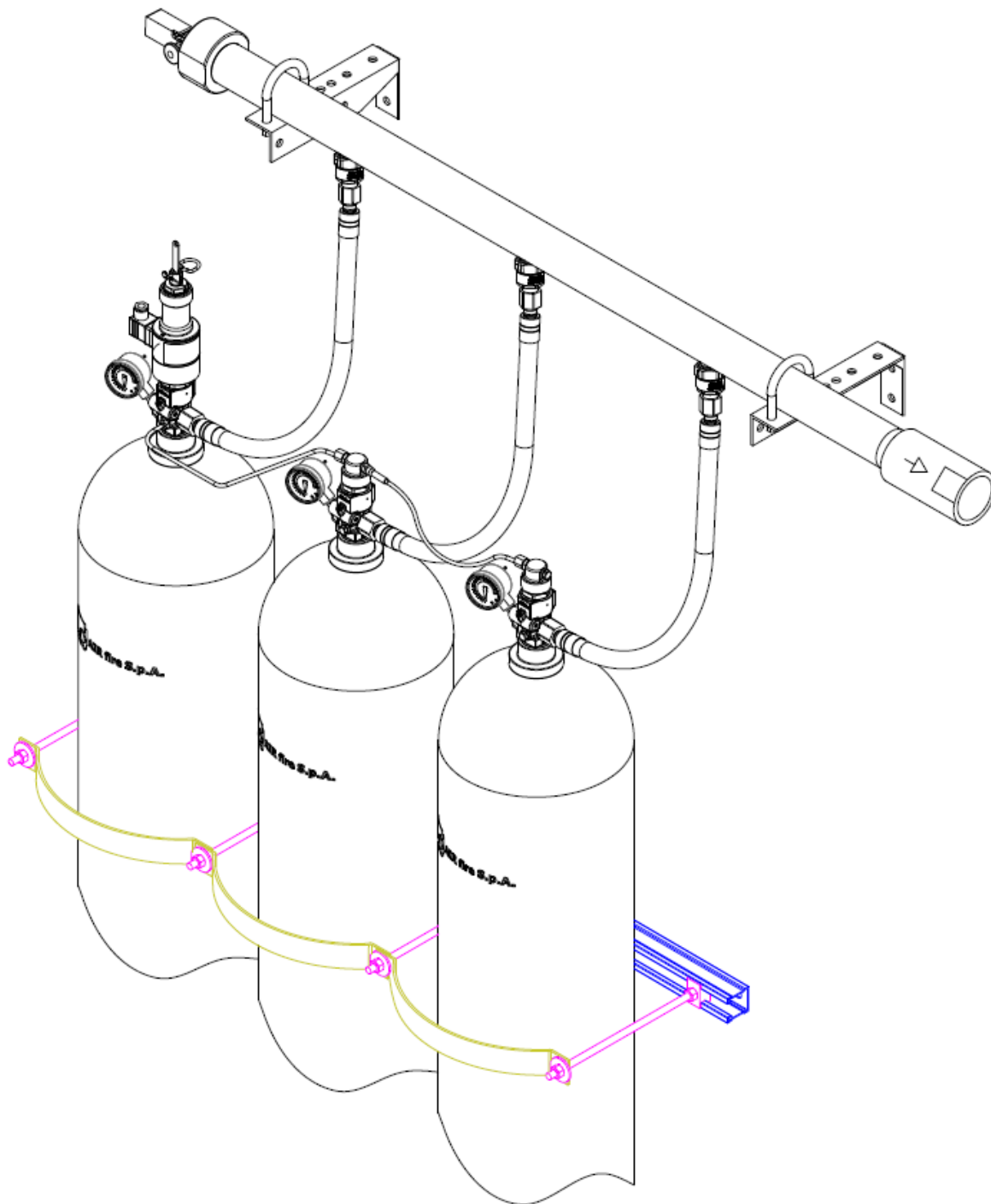
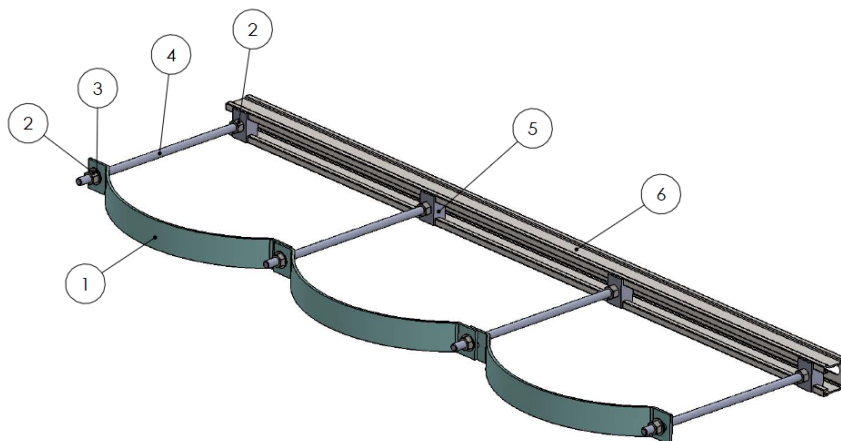


Figure 29 - System supports

The cylinder support is a metallic structure consisting of a frame (brackets) that hold in place the cylinders. The brackets can be used in modular cylinders or for cylinder banks in single or double row configurations. The brackets can be fixed to the wall or to the floor.

3.5.1 Wall bracket

This type of cylinder bracket is installed directly to the wall.



Nº	Description
1	Clamp
2	Nut
3	Washer
4	Threaded rod
5	Rod fattener
6	Wall mount bar

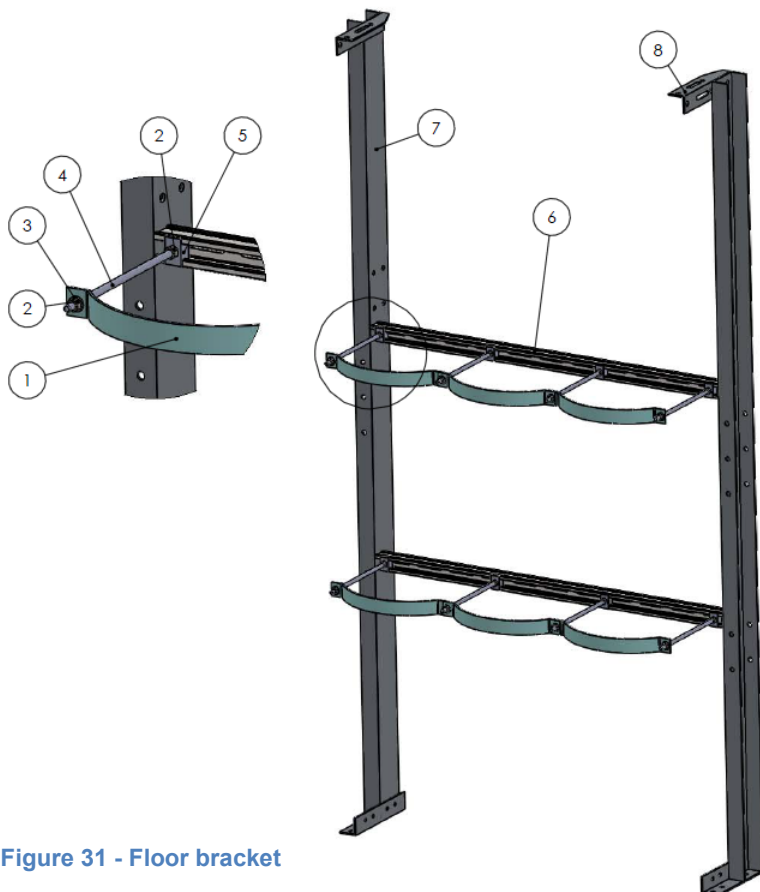
Figure 30 - Wall bracket

Further details can be found in
Technical Data Sheet code:
TDS081XXX-A

3.5.2 Floor bracket

This type of cylinder bracket allows the cylinders to be installed free standing, when a wall is not available.

Nº.	Description
1	Clamp
2	Nut
3	Washer
4	Threaded rod
5	Rod fattener
6	Bar
7	Floor support
8	Manifold support

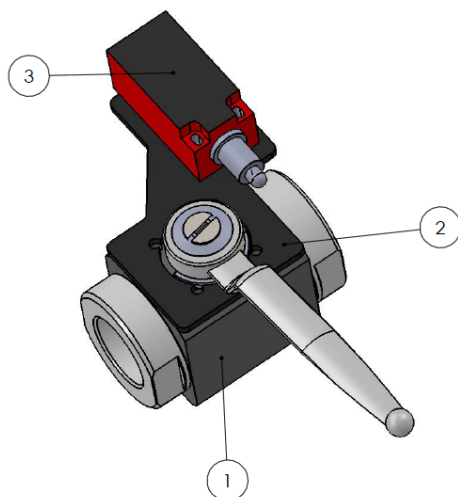


Further details can be found in
Technical Data Sheet code
TDS081XXX-A

Figure 31 - Floor bracket

3.6 OTHER ACCESSORIES

3.6.1 Lock-off valve (11130X)



The lock-off valve is a manually operated valve located between the discharge manifold and the nozzles, which can be locked in the closed position to prevent flow of Inert to the protected enclosure. To be used especially when the protected enclosure is normally occupied by people avoiding creating a hazard to the personnel in case of a discharge (during system maintenance or testing for example). The lock-off can have single or double limit switch and can be ATEX.

*Further details can be found in
Technical Data Sheet code
TDS11130X-A*

Nº	Description
1	Ball valve 2 ways*
2	Limit switch plate
3	Limit switch

Figure 32 - Lock-off valve

3.6.2 Pilot cylinder (112XXX)

The pilot cylinder is used for activating the slave cylinders in a selector valve system configuration. It can be activated manually or electrically. The electrical activation can be ATEX solenoid actuator.

Nº	Description
1	N ₂ pilot cylinder
2	Pilot valve
3	Solenoid actuator
4	Manual actuator
5	Pressure gauge

For further information regarding the AIRfire Pilot cylinders consult the manual: (TUM112XAX)

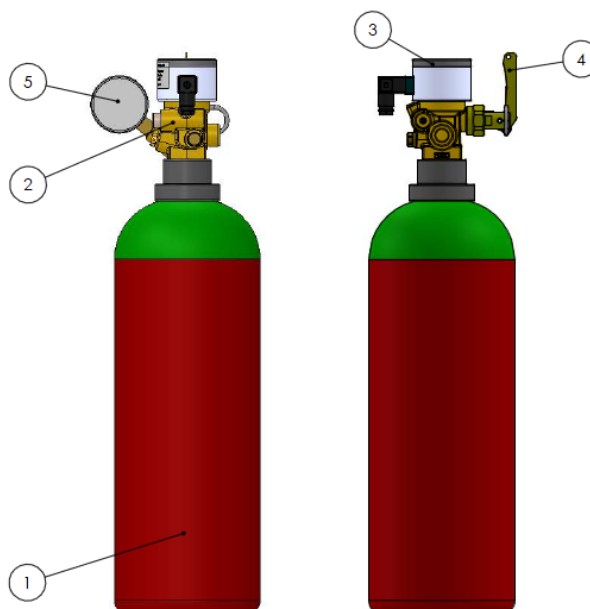


Figure 33 - Pilot cylinder

4 INSTALLATION – ASSEMBLY INSTRUCTIONS

- During the installation, it is recommended to follow step by step all points of this manual.
- **Prior to starting installation check the cylinder bank location.**
 - o It is recommended the placement of the cylinders be in a dedicated room near as possible but outside the protected enclosure.
 - o Big enough to be able to comfortably position all equipment and carry out easily installation and maintenance procedures.
- The equipment shall not be exposed to severe weather conditions, direct contact with flame, excessive humidity and safe from unauthorized handling and mechanical or chemical damage.
- **A minimum of two operators is required to perform equipment installation.**

4.1 GOODS RECEPTION

Check all the material has been correctly received according to delivery documentation. If in doubt do not hesitate to contact AIRfire.

Carefully unpack the cylinders and other components of the system. Cylinders must be in a safe and stable place.

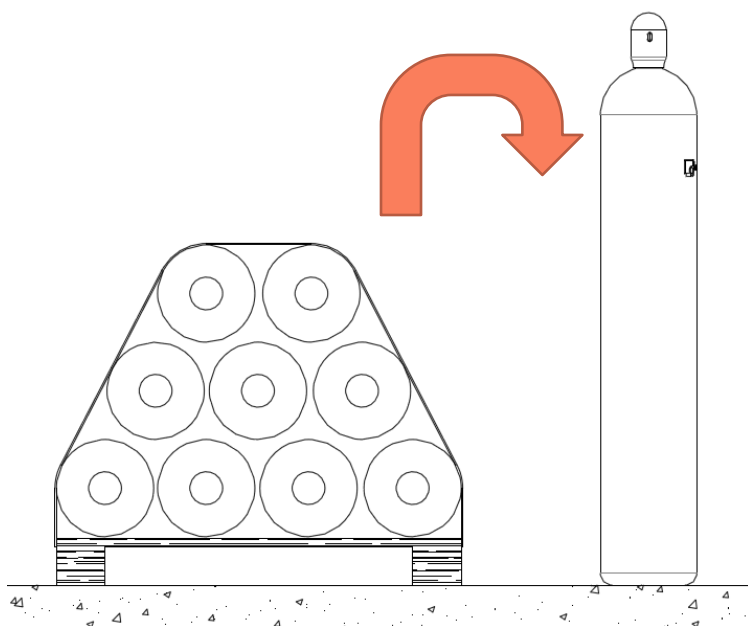


Figure 34 - Cylinder unpacking



WARNING:

- The cylinder transport cap must always be firmly screwed in place whenever a cylinder is being transported/ manipulated.
- Do not remove the valve outlet cap until all distribution components are installed and ready to be connected to the cylinder valve.

4.2 SYSTEM SUPPORT INSTALLATION

NOTE:



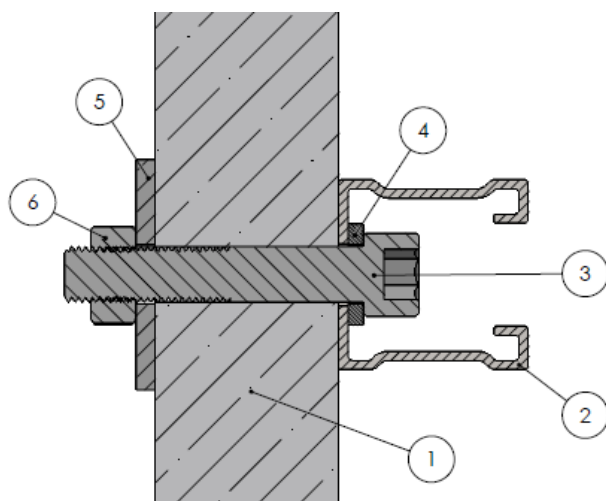
- *Never begin to mount bracket by connecting manifold pipe to the nozzle pipe system. Such method gives rise to many adjustment problems during the installation of the remainder of the cylinder bank components.*
- *Always complete the final installation of brackets, cylinders, and manifold pipe prior to performing connection between the manifold pipe and the nozzle system. This method prevents many adjustment problems during installation of different cylinder bank components.*
- *It is very important never to install nozzles directly at cylinder valve outlet for two reasons. Firstly, if nozzle is installed directly on valve outlet there are many possibilities that the nozzle will be at a person's height. In case of cylinder discharge (accidental or otherwise) pressure released could cause serious injuries to personnel who might be somewhere near to the cylinder. Furthermore, the strength of reaction produced by the discharge is always generated at the gas outlet. If coupled to the cylinder outlet, the result could be that the wall bracket could be violently pulled out.*

Thoroughly clean the area where the system is going to be located. Check the drawing measurements to ensure that the cylinder bank fits perfectly in chosen location.

Verify that the floor where the system is going to be mounted is as flat as possible.

The wall where the bracket is going to be fixed (if it is the case) must be solid and perpendicular to the floor (avoid partition walls, plasterboard or similar).

If the bracket must be fixed to a partition wall, plates to support the bracket on the opposite face of the partition wall shall be used in accordance with drawing below:



Nº	Description
1	Partition wall
2	Bracket bar
3	M12 screw
4	M12 washer
5	Support plate
6	M12 nut

Figure 35 - Fixing bracket in partition

Installation and Maintenance User Manual

4.2.1 Bracket installation

AIRfire supplies the cylinder fixing brackets together with equipment. Among them, 2 types may be distinguished:

- Brackets to mount on the wall.
- Brackets provided with vertical support column to mount on the floor.

The characteristic of these types of brackets is that in any case, the cylinders are completely fixed, and the manifold can be located at the right distance of the cylinder valve without any problem. By this way, these configurations give stability and rigidity to the cylinder bank assembly.

- a) **Modular cylinder bracket:** It is for one only cylinder.
- b) **Single row bracket:** All bank cylinders are aligned in a single row and the weight of the manifold pipe rests on the bracket structure.
- c) **Double row bracket:** All bank cylinders are aligned in two parallel rows and the weight of the manifold pipe rests on the bracket structure.

NOTE: Every type of bracket can have one or two level, available under request.

Please see **the Bracket Manual Installation (TUM081XXX-A)** to verify the bracket type that is necessary for your project and how to install it.

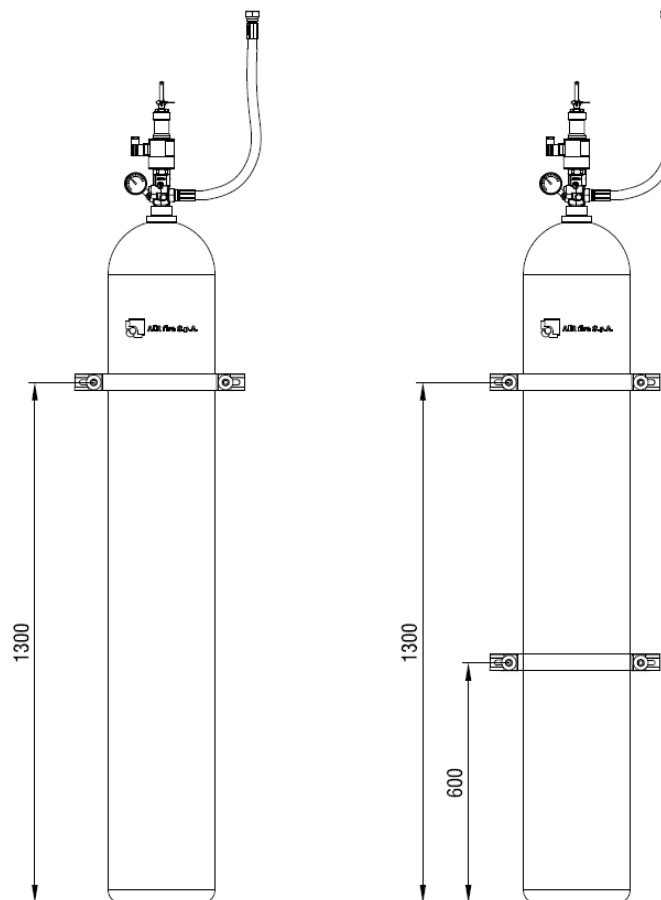


Figure 36 - Modular cylinder single level and double level brackets, dimensions

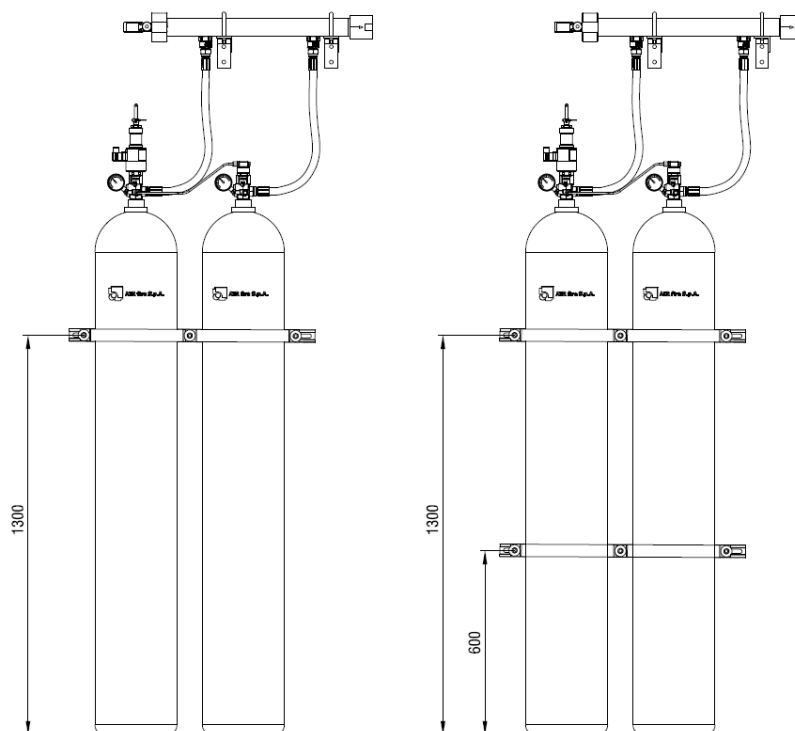


Figure 37 - Bank cylinder single level and double level brackets, dimensions

4.2.2 Storage cylinder positioning

Position the cylinders in the brackets and secure them with the bracket. Do not completely tighten the screws yet.



WARNING: Do not remove the cylinder transport cap.

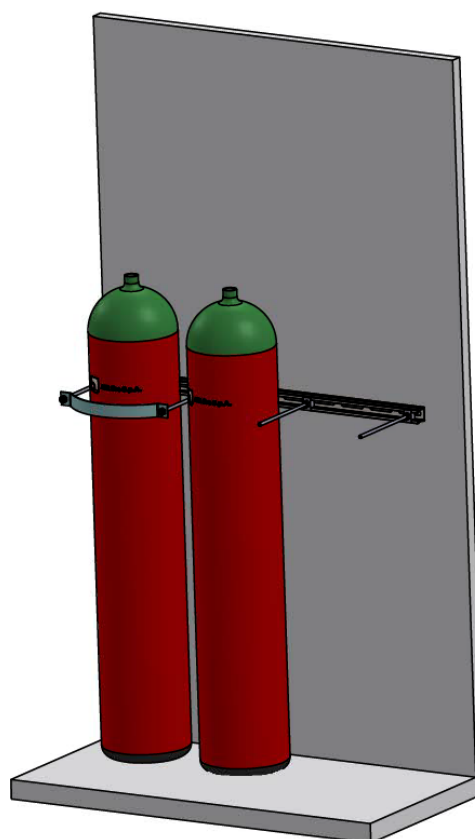


Figure 38 - Positioning cylinders in brackets

4.3 SYSTEM INSTALLATION:

4.3.1 Discharge manifold (133XXX) - Installation: (only for cylinder bank systems)

Manifold shall be mounted considering its adjustment at the right height to the cylinder valves so that the connection of the discharge hose between both parts will be easy and hasslefree.

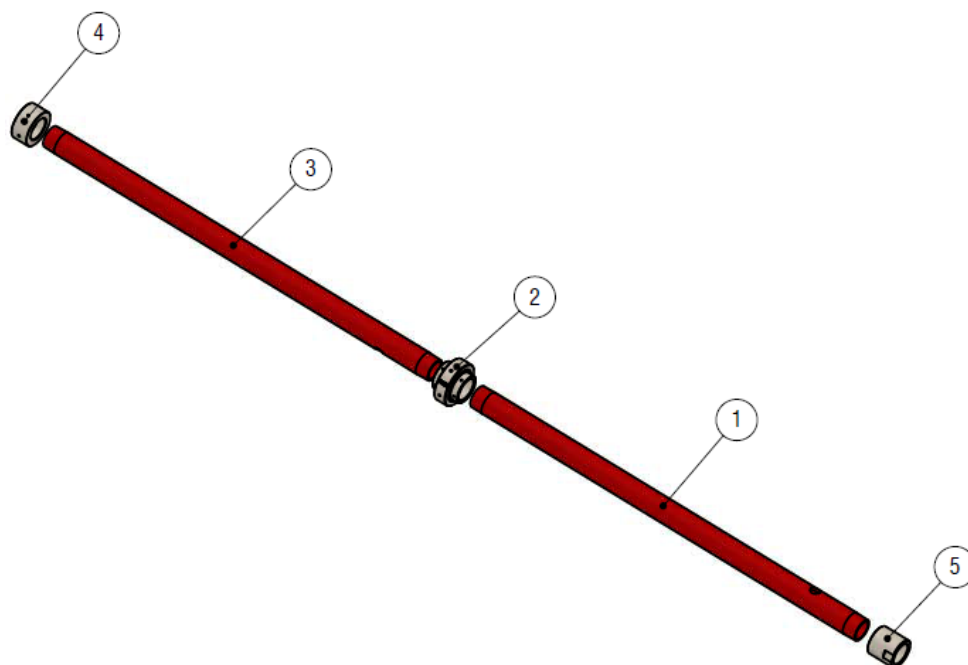
NOTE: Manifold supports are not included with the cylinder bank system as they can vary depending on the wall type where they will be installed, and other particularities of the cylinders storage room better assessed by the installer directly on site.

Depending on the length of the manifold it may be divided into sections to facilitate transport to site and onsite manipulation.

Before mounting the manifold to the supports it is necessary to assemble the different sections between them. In each shipment are included the necessary union couplings to assemble the manifold. Screw the union coupling (2) with the appropriate wrench to one of the sections and then connect the other section making sure to align the check valve connections.

Screw the manifold blind cap (4) and the restrictor (5) to the manifold with a wrench according to the union size.

NOTE: Use high-pressure thread sealant on the thread unions.



Nº	Description
1	Manifold section 1
2	Union join
3	Manifold section 2
4	Blind cap
5	Restrictor

Figure 39 - Discharge manifold assembly

Position the manifold onto the manifold supports and mount the U-bolt.

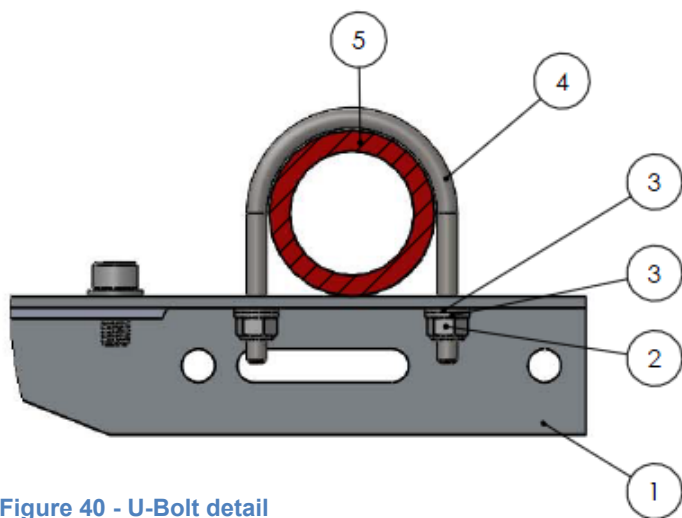


Figure 40 - U-Bolt detail

Nº	Description
1	Manifold support*
2	Nut*
3	Washer*
4	U-Bolt*
5	Manifold
*Material not supplied by AIRfire.	

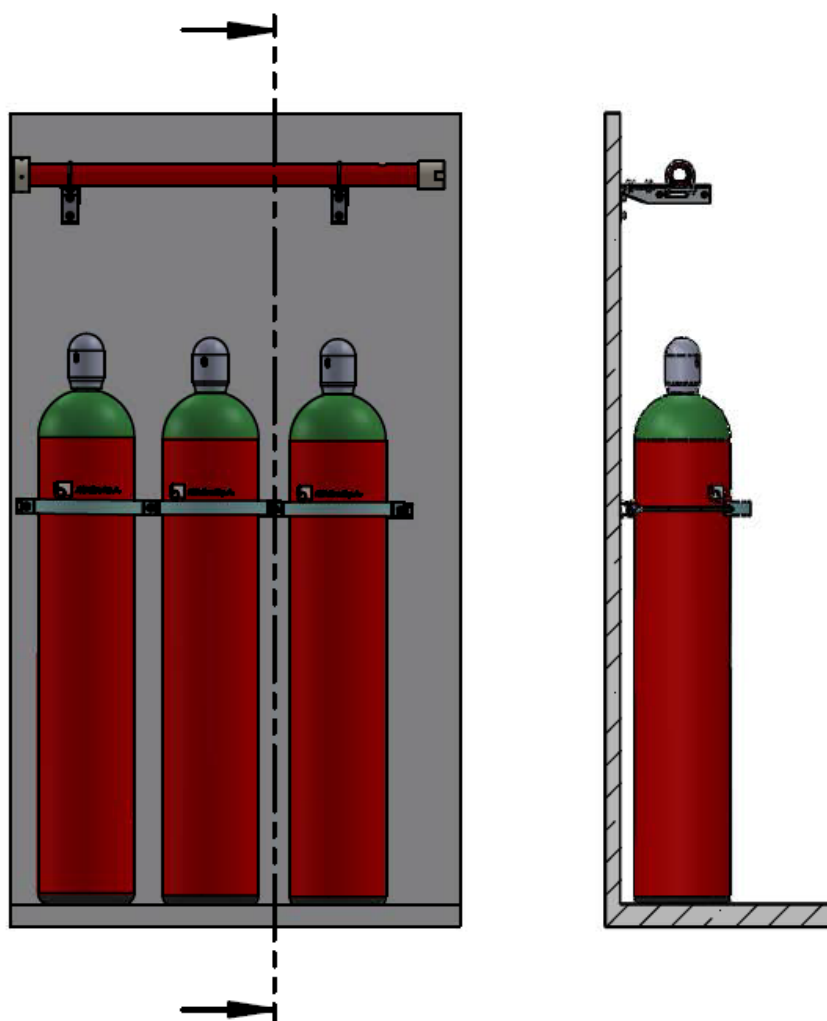


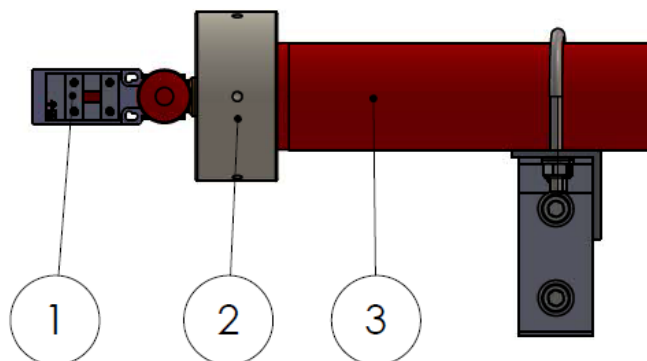
Figure 41 - Manifold positioning

Installation and Maintenance User Manual

4.3.2 Pressure switch with locking device (0510B0) – Installation:

- **Modular cylinder:** Install the pressure switch on the discharge pipe using a Tee shaped pipe connector between discharge hose and discharge pipe (pressure switch thread is ½" BSPT).
- **Cylinder bank:** Screw the pressure switch (1) into the manifold blind cap (2) with a 25 mm wrench, as shown in Fig. 42.

NOTE: Use high-pressure thread sealant on the thread union.



Nº	Description
1	Pressure switch with locking device
2	Blind cap
3	Manifold

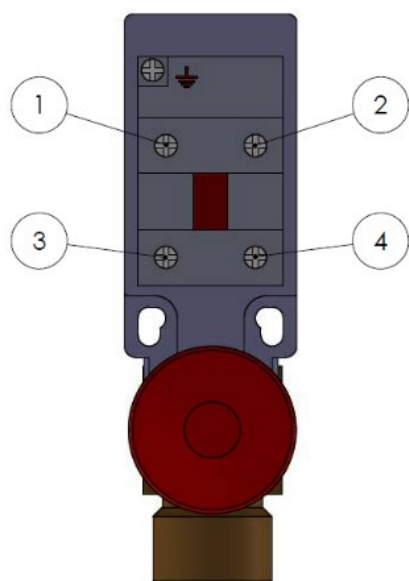
Figure 42 - Pressure switch with locking device

Electrical connection:

Connect the electrical contacts to the fire extinguishing control panel according to manufacturer's indications.

The pressure switch can be connected as follows:

- For a normally closed circuit connect to terminals 1 and 2.
- For a normally open circuit connect to terminals 3 and 4.



ALL FIRE FIGHTING INSTALLATIONS SHOULD BE CONNECTED TO GROUND.

NOTE: The pressure switch electrical connections do not have polarity. All electrical connections should be connected in single cable runs from the switch straight to the panel, so to simplify commissioning procedures and maintenance operations.

Figure 43 - Pressure switch electrical connections

4.3.3 Pipe and fittings installation

Pipes should be installed in accordance with the isometric drawing supplied with the project.

Measurements, dimensions and pipe quality indicated in the drawing shall be complied with, **any modifications of these values, as well as any modifications of the content and/ or architecture of the protected enclosure, will affect system operation not guaranteeing fire suppression.** In case of any modification(s) being required, the engineering department responsible for the system design shall be notified for appropriate actions to be taken.

Piping shall be of metallic non-combustible material having physical and chemical characteristics such that its deterioration under stress can be predicted with reliability.

Where piping is installed in severely corrosive atmospheres, special corrosion –resistant materials or coatings shall be used accordingly to guarantee best results for long term durability.

The pipe system shall comply with the pressure requirements specified in the table below. ASTM A-106 grade A, B or C seamless steel pipe of the following classes (According to ANSI B-36-10) **is recommended:**

Type of pipe after restrictor

Pipe Size	Max Working Pressure	Pipe Class
½"	65 bar	Schedule 40 or larger
¾"		
1"		
1¼"		
1½"		
2"		
2½"		
3"		
4"		

Note: Other pipe classes can be used, if the type of piping installed can withstand the maximum pressure at maximum storage temperatures, in this case 65 bar at 50°C.

- Pipes smaller or equal to 2" nominal diameter shall not be connected by welding on site. Connections on site shall be threaded.
- Installation shall be earthed.
- Pipe painting shall be red (RAL 3000).

4.3.4 Piping supports installation

Pipe supports shall be of a non-combustible material, shall be suitable for the expected temperature and shall be able to withstand the dynamic and static forces involved. Due allowance shall be made for the stresses induced in the pipe work by temperature variations. Adequate environmental protection shall be given to supports and associated steelwork.

The distance between pipe supports shall be as the following table:

Nominal Ø (mm)	Nominal Ø (inches)	Max. distance between supports (m)
10	3/8"	1.0
15	1/2"	1.5
20	3/4"	1.8
25	1"	2.1
32	1 1/4"	2.4
40	1 1/2"	2.7
50	2"	3.4
70	2 1/2"	3.5
80	3"	3.7
100	4"	4.3

Adequate support shall be provided for nozzles and their reactive forces such that in no case shall the distance from the last support be greater than as follows:

- For pipelines with a smaller or equal diameter than 25 mm, the maximum distance from support to nozzle shall be 0.1 m.
- For pipelines more than 25 mm diameter, the maximum distance from support to nozzle shall be 0.25 m.

Movement of pipework, caused by temperature fluctuations arising from environment or the discharge of extinguishant, may be considerable particularly over long lengths and should be considered when deciding support fixing methods.

Correct installation of pipe support according to their position:

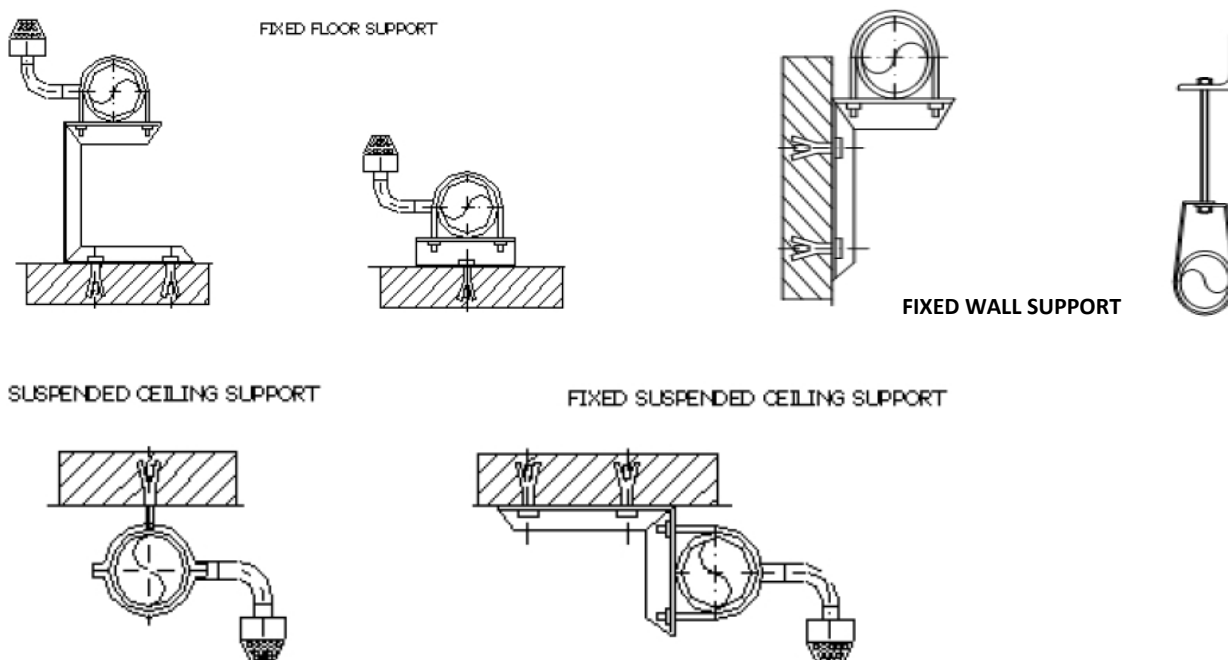


Figure 44 – Nozzle pipe support

4.3.5 High-pressure Nozzles (063XX1) installation

The nozzles are designed to be installed directly onto the pipe that will have to be threaded GAS according to ISO-228. **Use high-pressure thread sealant to the distribution pipe thread** and tighten using the right fixed wrench according to nozzle diameter.

To prevent mistakes during installation, AIRfire supplies the nozzles punch marked with:

- The calibration diameter, (which follow the results obtained in the hydraulic calculation report)



NOTE: Fixing of the nozzles and nozzle alignment is very important. The nozzles should never point at false ceilings or mobile/ loose objects as gas discharge could raise the ceiling tiles or drag objects. Never locate discharge nozzles directly on the valve outlet.

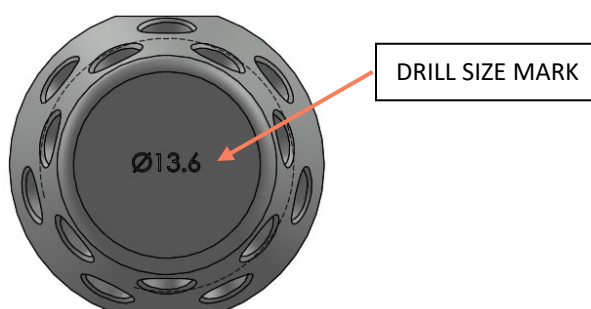


Figure 45 - Diaphragm drill marking

4.3.6 Distribution components installation.

a) $\frac{3}{4}$ " Check valve (0112A2) installation: (SPECIFIC ONLY FOR CYLINDER BANK SYSTEM)

- Check the $\frac{3}{4}$ " check valve o-ring (3) is in position.
- Check the direction of the arrow (2).
 - o This arrow indicates the sense of the flow. It must always be installed with the arrow towards the manifold.
- Screw the $\frac{3}{4}$ " Check valve on the manifold (1) with a 38 mm wrench.
- Apply 25 Nm as maximum torque.
- Repeat this process with all $\frac{3}{4}$ " Check valve of the system.

NOTE: Do not put any sealant on the thread.

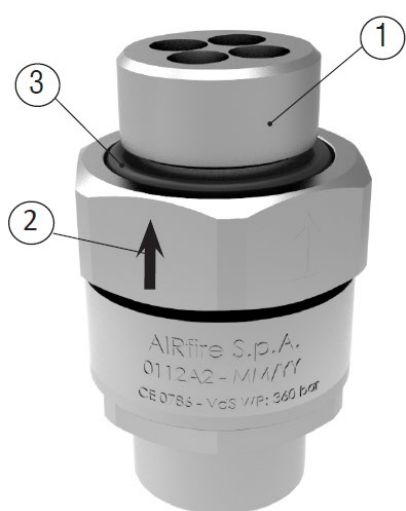


Figure 46 - Check valve

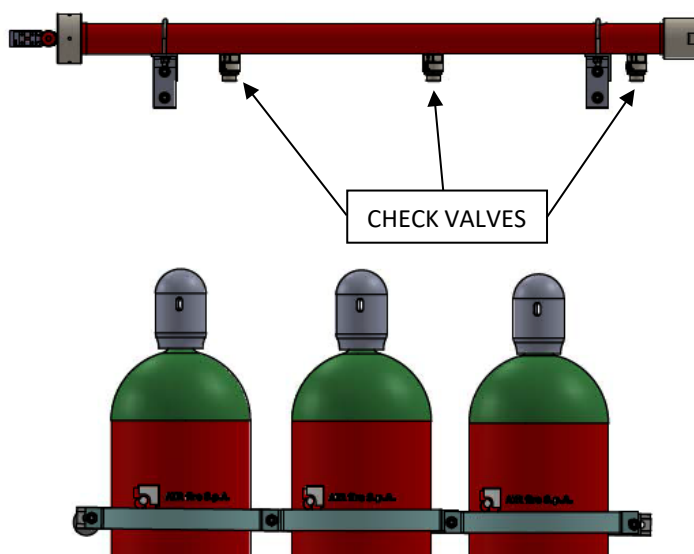


Figure 47 - Check valve on manifold

b) Remove the cylinder transport cap:



WARNING: From this point on starts the cylinder valve manipulations, for this reason it is important to actuate carefully to avoid any accident or unwanted system activation.

NOTE: Keep the cylinder transport cap near the system. They must be assembled again to the cylinder in case of refill or maintenance procedures.



Figure 48 - Removing cylinder transport cap

c) High-pressure Discharge Hose DN16 90° (0412BX) (option A):

To install this hose model, to the cylinder bank manifold, a 3/4" coupling (124104) between the 3/4" check valve and the hose is needed:

- Swivel Female 3/4" to Fixed Female 3/4" Coupling (1241A0) installation: (only for bank of cylinders)

Check the flat gasket (Pos. 3 in Fig. 49) is set inside the coupling. Screw the coupling thread (1) on the 3/4" check valve with a wrench of 32 mm. The reference value for the mounting torque is approx. 40 Nm.

NOTE: Do not put any sealant on the thread.

- High-pressure Discharge Hose DN16 90° (0412BX) installation:

Check the flat gasket (Pos. 1 in Fig. 50) is set inside the hose. Screw the male thread of the hose to the port of the coupling with a wrench of 30 mm (Fig. 51). It's important to tighten the discharge hose until its female nut connection is positioned close to the outlet of the cylinder valve to guarantee an easy mounting. The reference value for the mounting torque is approx. 100 Nm.

NOTE: Do not put any sealant on the thread.

Attention: In case of modular cylinder, screw the discharge hose directly to the restrictor using the reduction coupling, code 124203.

Note: In this case, use high-pressure thread sealant on all reduction coupling threads.

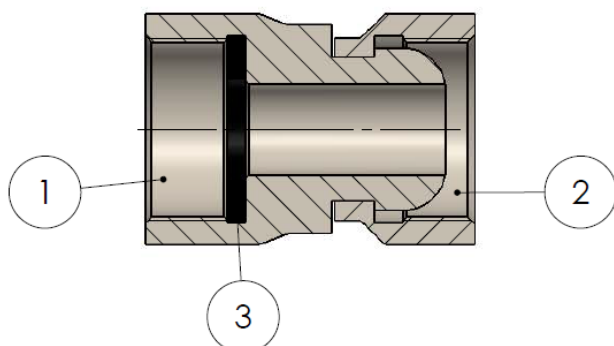


Figure 49 - Discharge hose coupling

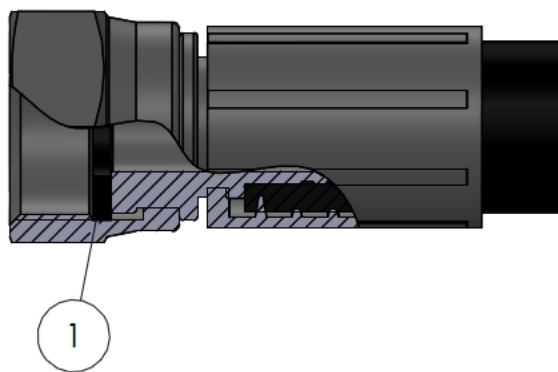


Figure 50 - Discharge hose flat gasket

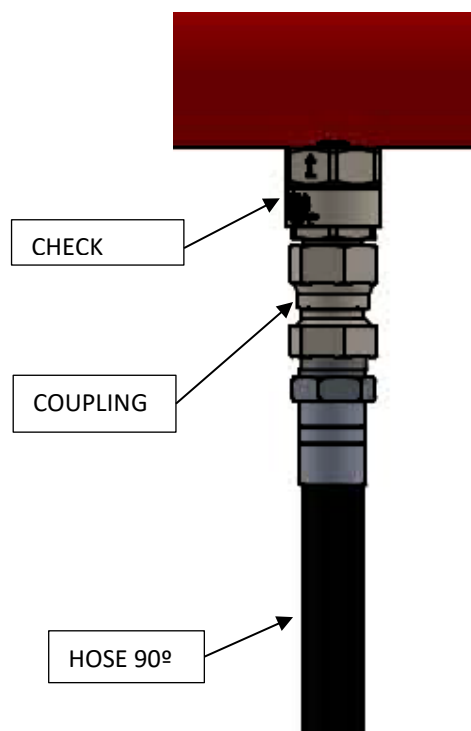


Figure 51 - Hose mounted to the coupling and check valve

d) High-pressure Discharge Hose DN16 Straight (0413A0) (option B):

Check the flat gasket (Pos. 1 in Fig. 52) is set inside each end of the hose. Screw the G3/4" swivel female port of the hose to the check valve with a wrench of 32 mm (Fig. 53). The reference value for the mounting torque is approx. 40 Nm.

NOTE: Do not put any sealant on the thread.

Attention: In case of modular cylinder, screw the discharge hose directly to the restrictor using the reduction coupling, code 124204. **Note: In this case, use high-pressure thread sealant on all reduction coupling threads.**

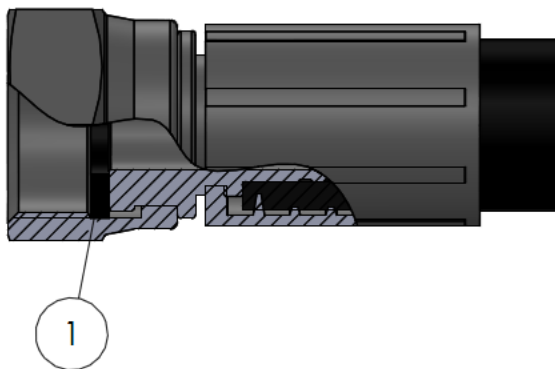


Figure 52 – Flat gasket

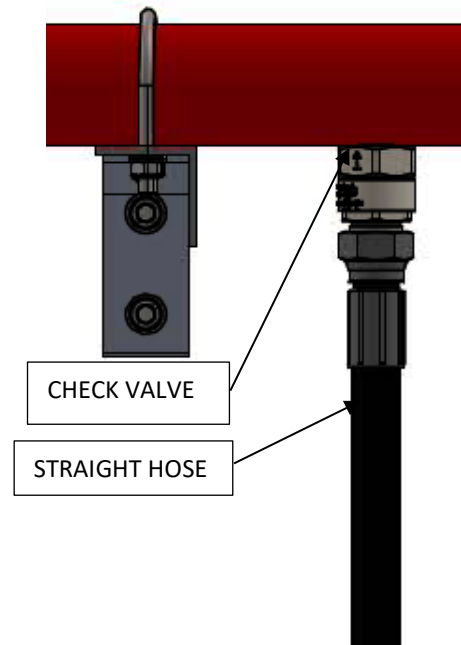


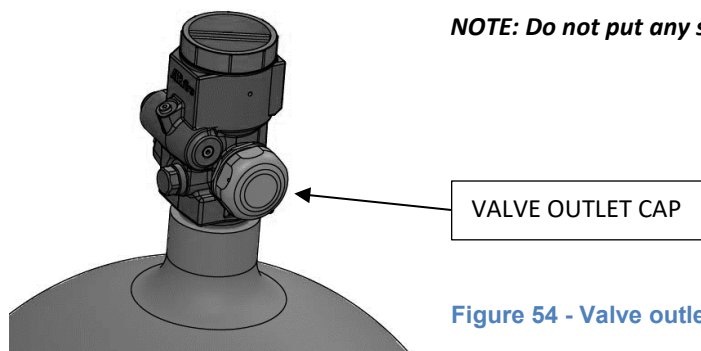
Figure 53 - Straight hose mounted

e) Install the hose to the valve outlet port:

Remove the valve outlet cap (Fig. 54) to connect the discharge hose. Check if the flat gasket is set inside of the hose.

Using option, A: Screw the M24 or W21,8 swivel female port of the hose (Pos. 2, Fig. 55) to the outlet valve port (Pos. 3, Fig. 55) with a wrench of 30 mm. The reference value for the mounting torque is approx. 40 Nm.

Using option, B: Screw the M24 swivel female port of the hose (Pos. 2, Fig. 55) to the outlet valve port (Pos. 3, Fig. 55) with a wrench of 32 mm. The reference value for the mounting torque is approx. 40 Nm.



NOTE: Do not put any sealant on the thread.

Figure 54 - Valve outlet cap

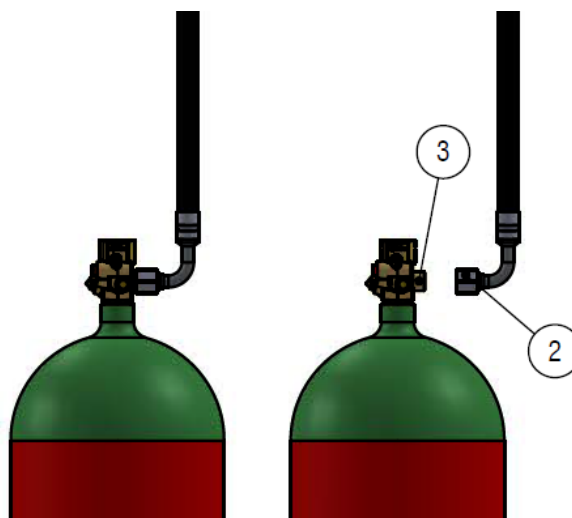


Figure 55 - Connecting discharge hose to valve outlet

4.3.7 Activation components installation

Pneumatic actuator (072202) installation: *(only for cylinder bank)*

Once determined which cylinder will be the Master, the remaining cylinders (Slaves) will have the pneumatic actuator mounted on their valves.

NOTE: The Master cylinder usually is the first cylinder of the bank, located furthest away from the manifold outlet.

Screw the pneumatic actuator (1) on top of valve (2) with a wrench of 41 mm. The reference value for the mounting torque is approx. 25 Nm.

NOTE: Do not put any sealant on the thread.

Attention: The 1/8" port of the pneumatic actuator must be positioned in parallel (inline) to the valve outlet.

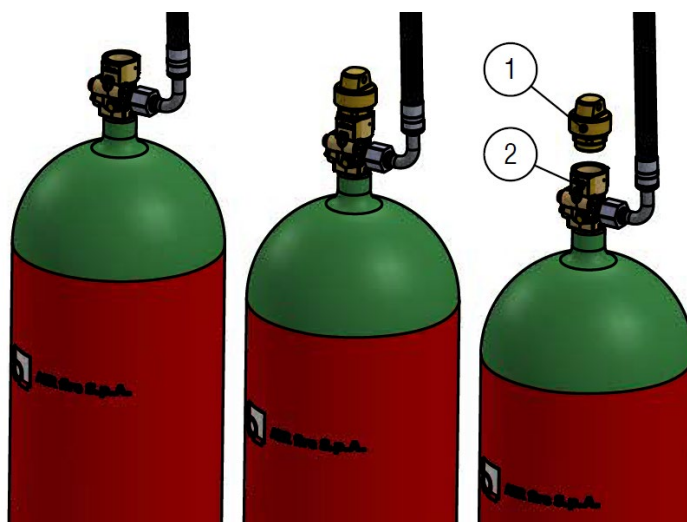


Figure 56 - Mounting pneumatic actuators to valve head

High-pressure release hose (0422A1) installation: (*ONLY FOR CYLINDER BANK SYSTEM*)

From Master cylinder to Slave cylinder:

Pneumatic release line starts at the Master cylinder valve

The male connection of the release hose (1) goes to the master cylinder. In the front part of the master cylinder valve there is a screw (2) (code 079005), which shall be unscrewed with a wrench of 12 mm and connect the male connection of the activation hose (1) with a wrench of 14 mm in the master cylinder.



NOTE: Do not put any sealant on the thread.

This screw G1/8" (2) (code 079005), shall be screwed in the free inlet of the pneumatic actuator of last slave cylinder (Fig. 59).



Figure 58 - Release hose

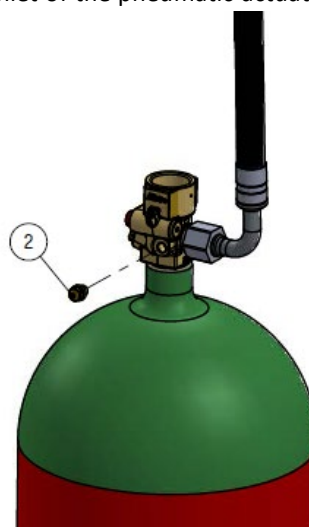


Figure 57 - Master cylinder, Screw 1/8"

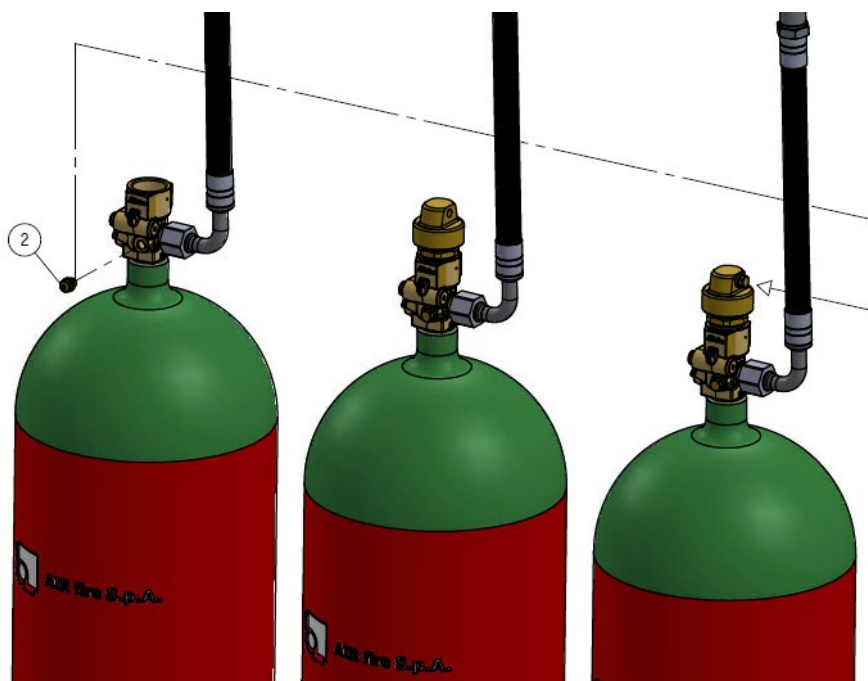


Figure 59 - 1/8" screw mounted on last cylinder

Screw the male connection of the release hose (1) to the Master cylinder valve 1/8" release port (3).

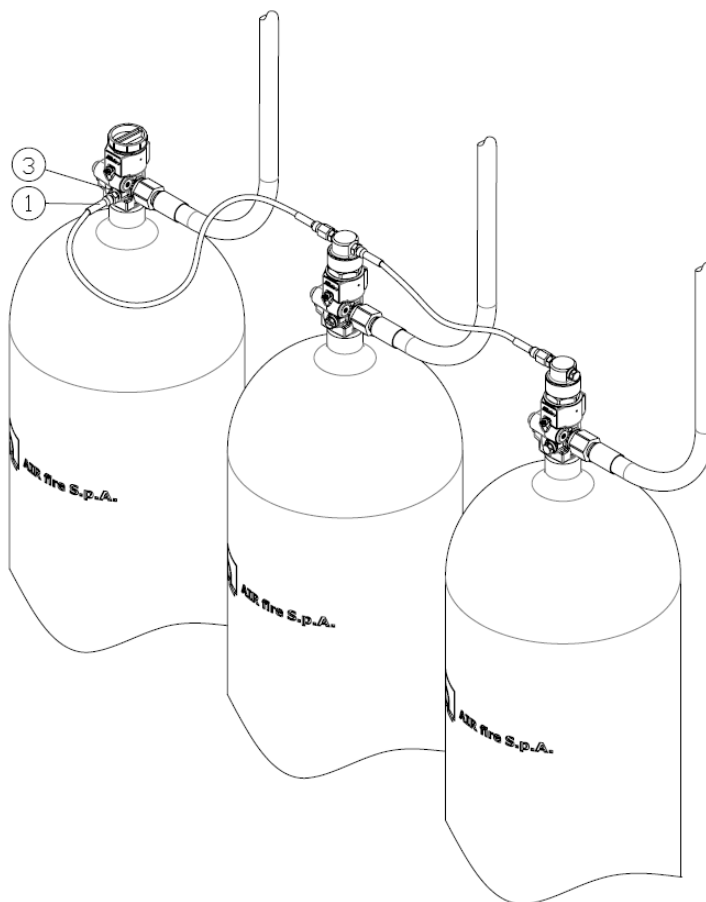


Figure 60 - Release hose connected to Master valve

The release hose has two types of threads. One end has male connection (Fig. 57, pos.1), and the other end has swivel female connection (Fig.61, pos. 5). To connect the swivel female thread to the pneumatic actuator, a nipple G1/8" (Fig. 61, pos. 6) has to be used. Screw the nipple (6) to the pneumatic actuator port (4) with a wrench of 14 mm. Then screw the swivel female end of the hose (5) to the G1/8" nipple (6) with a wrench of 14 mm.

NOTE: Do not put any sealant on the thread.

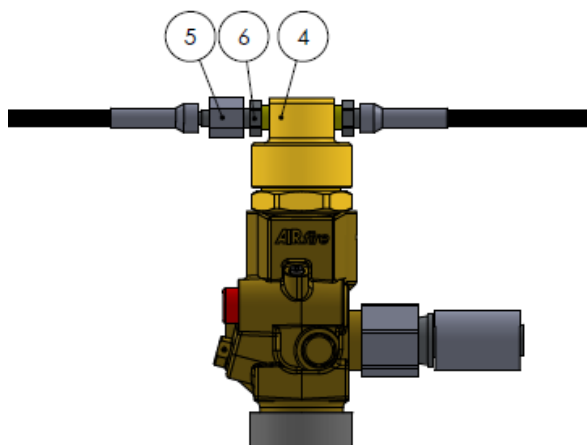


Figure 61 - Nipple for release hose connection to pneumatic actuator

From Slave cylinder to Slave cylinder:

Screw the male connection of the release hose (1) to the free pneumatic actuator port of first slave cylinder (7). Screw the G1/8" nipple (6) to the pneumatic actuator port of the second slave cylinder (8). Screw the swivel female connection of the release hose (5) to the G1/8" nipple (6)

Repeat this process with the next slave cylinders up to a maximum of 5 slave cylinders.

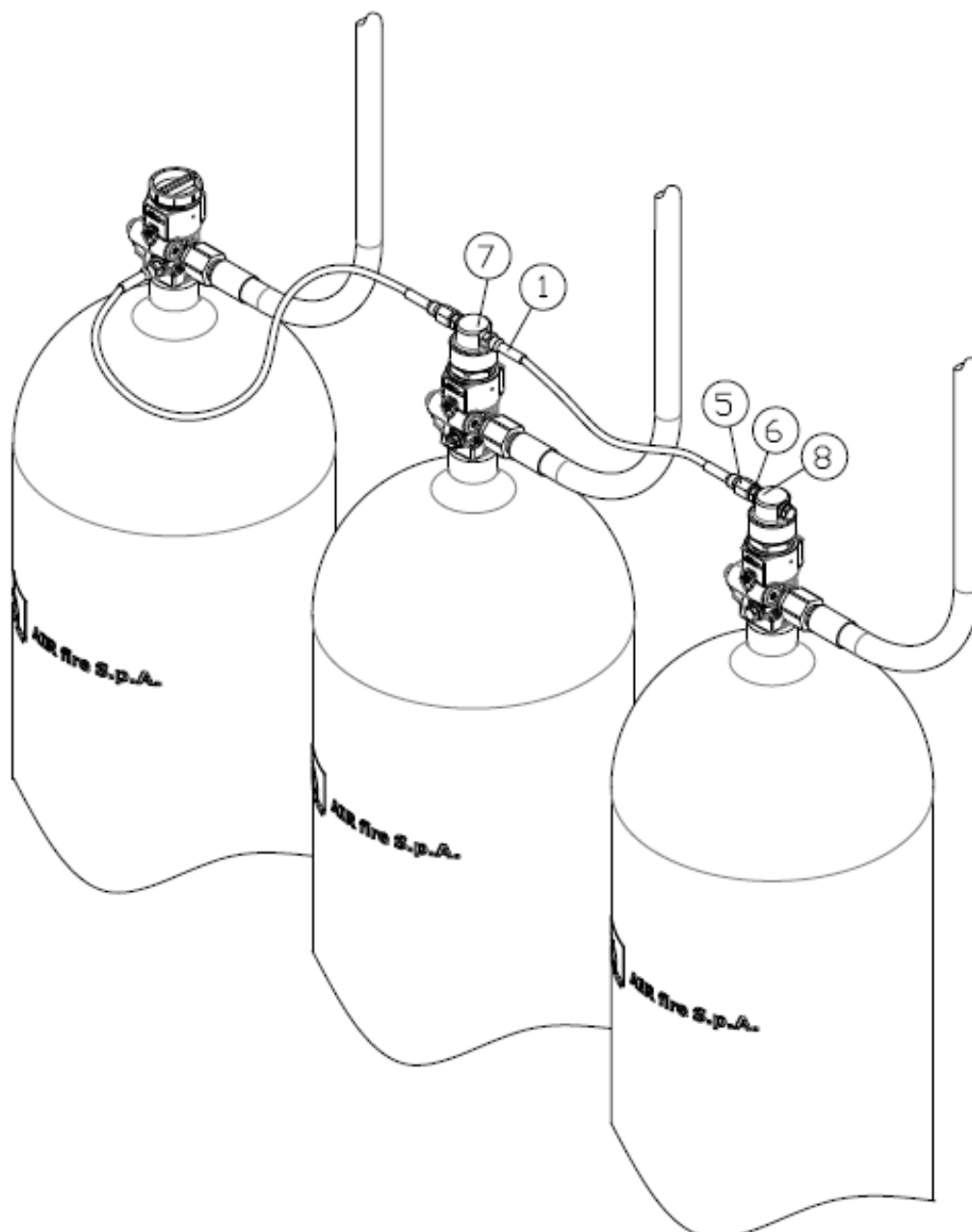


Figure 62 - Release hose connected from slave to slave cylinder

Important: If the bank of cylinders has more than 1 master cylinder + 5 slave cylinders (6 cylinders total), the procedure: From Master cylinder to Slave cylinder shall be repeated. The 7th slave cylinder acts as a new master cylinder that will activate the following slave cylinders (see Fig. 63 and 64).

NOTE: The maximum number of cylinders per solenoid actuator or manual actuator are 79 cylinders.

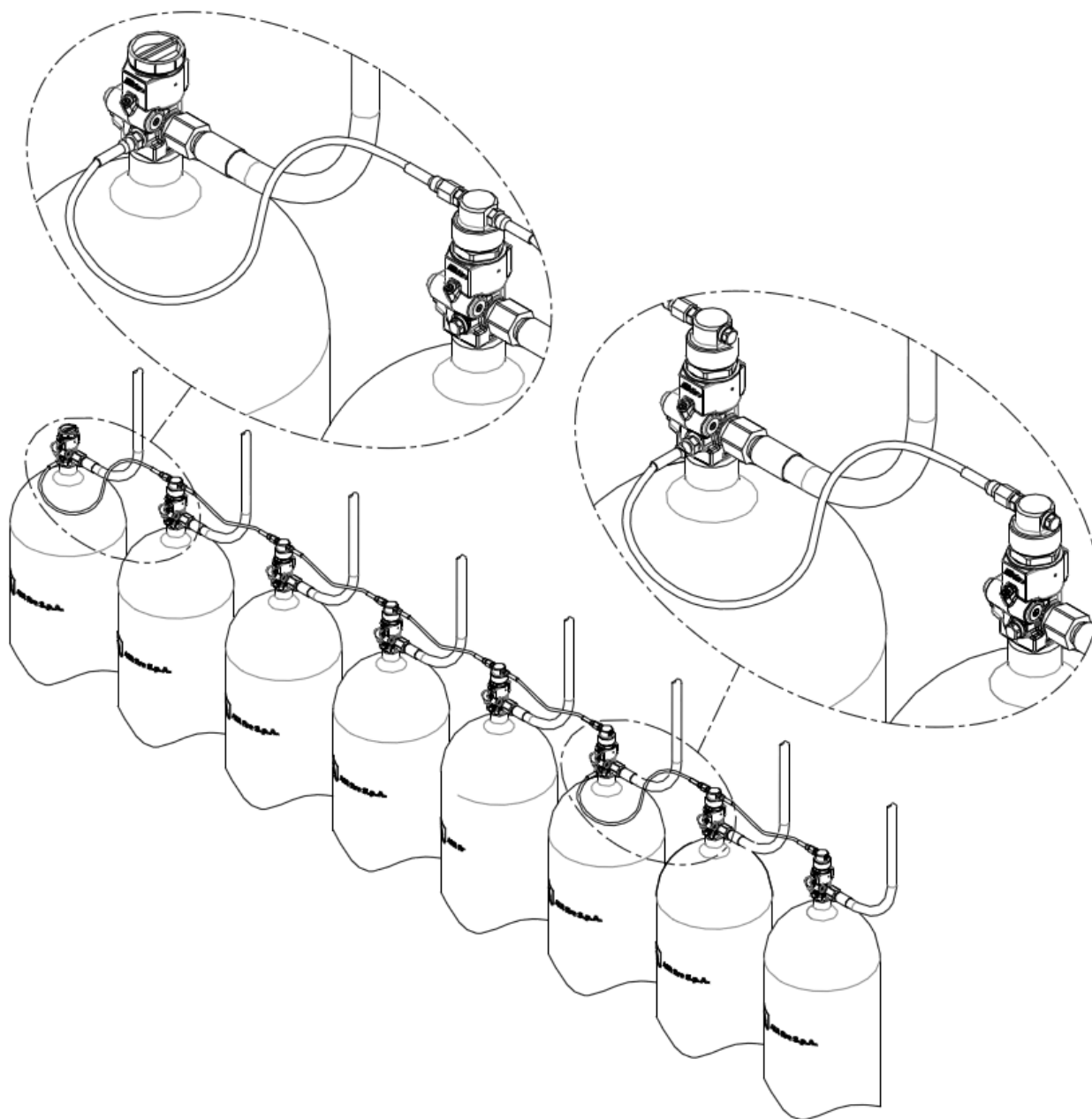


Figure 63 - Release scheme for single row cylinder bank

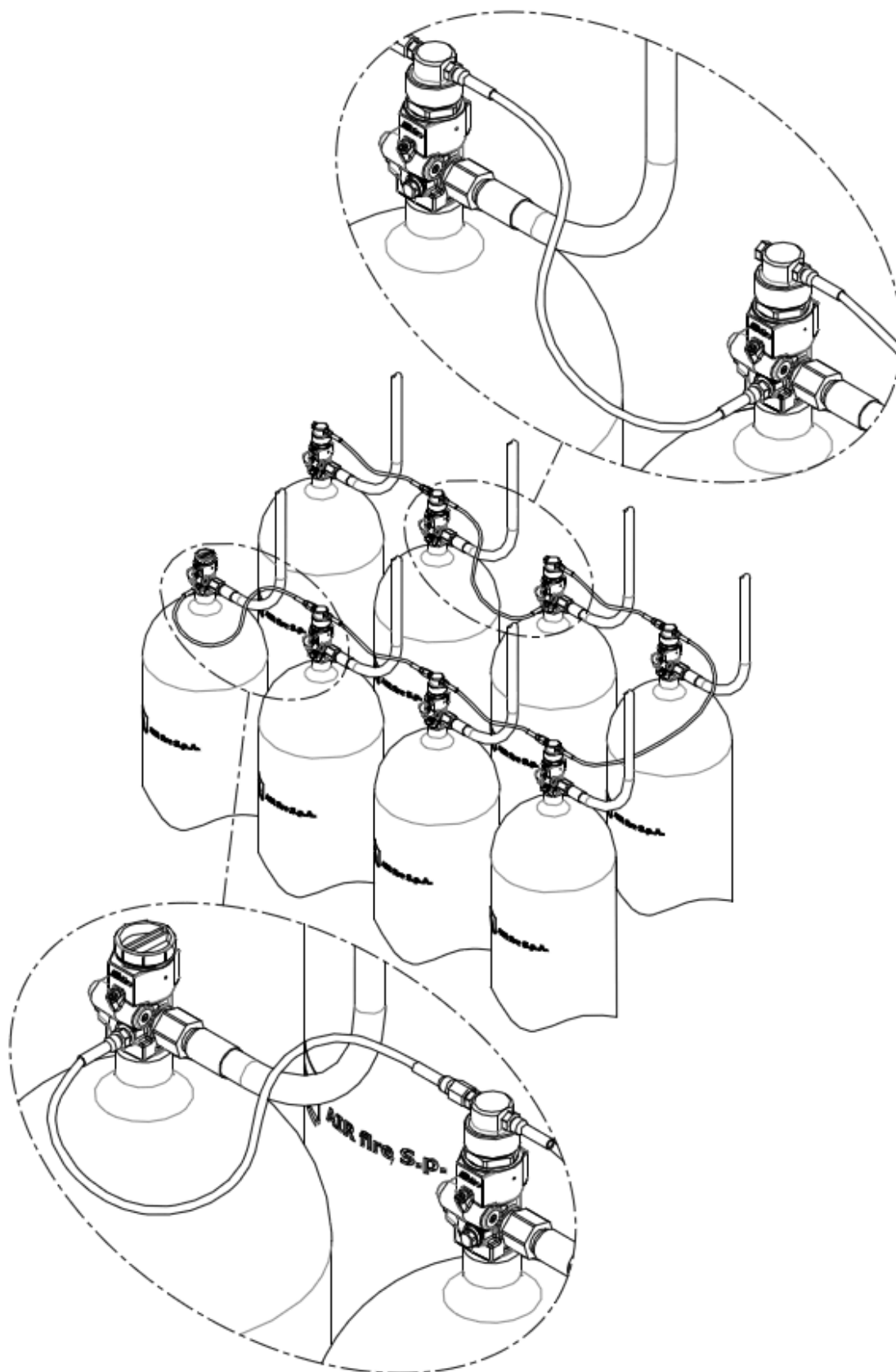


Figure 64 - Release scheme for double row cylinder bank

Solenoid actuator (022001) installation:



Attention: The solenoid actuator shall be installed during the commissioning phase only so to avoid incorrect manipulation and possible accidental activation of the system, which would discharge the agent.

The solenoid actuator is installed on the Master cylinder valve.



It is important to check that the solenoid actuator plunger (Fig. 66) is in the armed position before connecting to the cylinder valve. If plunger is released (extended position), please see the instructions in section 7.3.2. of this manual before assembling Solenoid, otherwise cylinder valve will be activated causing agent to be discharged.

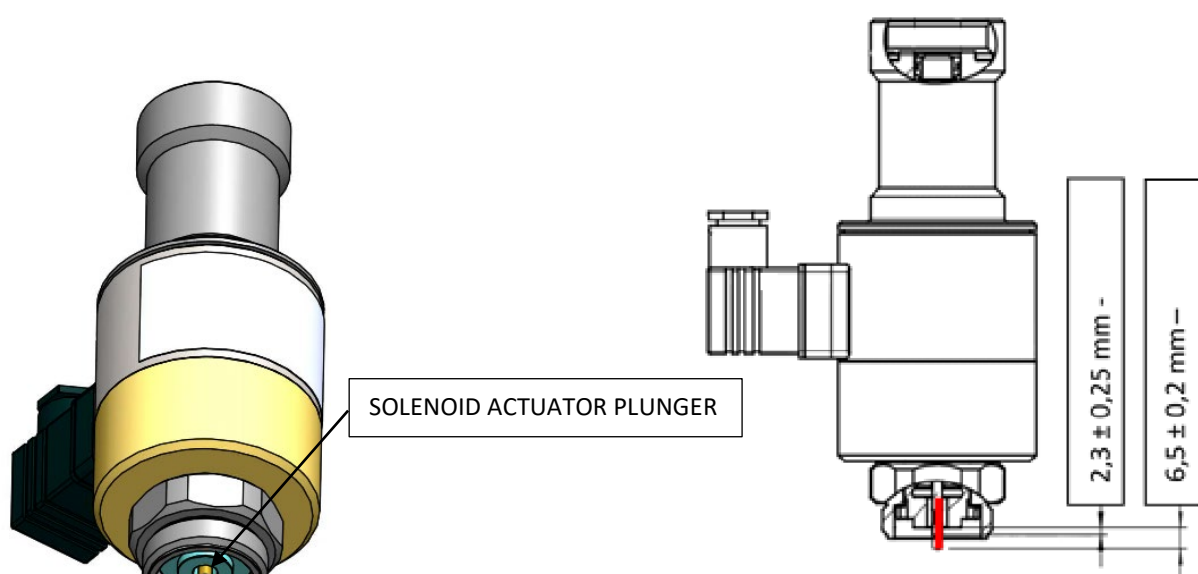


Figure 66 - Solenoid actuator plunger

Figure 65 - Solenoid actuator plunger position

- Screw the solenoid actuator (1) on top of the master cylinder valve (2) with a 41 mm wrench. **The reference value for the mounting torque is approx. 25 Nm.**

NOTE: Do not put any sealant on the thread.

- Connect the electrical cables to the extinguishing panel/ fire alarm control panel.

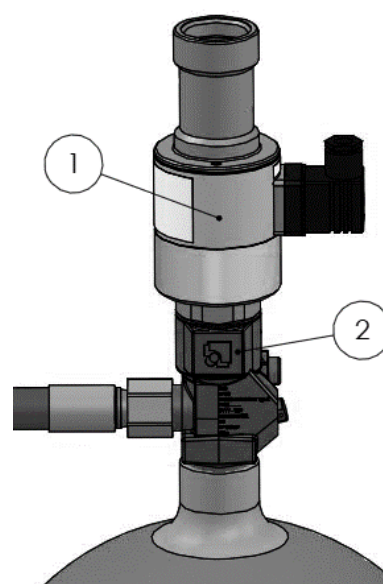


Figure 67 - Solenoid actuator mounted on cylinder valve

Electrical connections:

EVERY FIRE FIGHTING INSTALLATION SHOULD BE ELECTRICALLY GROUNDED.



Attention: The solenoid actuator has polarity that is indicated on the body. Connect the cables according the label (Fig. 68). Ideally all electrical connections should be single, continuous lines to corresponding panel, simplifying testing and maintenance work.

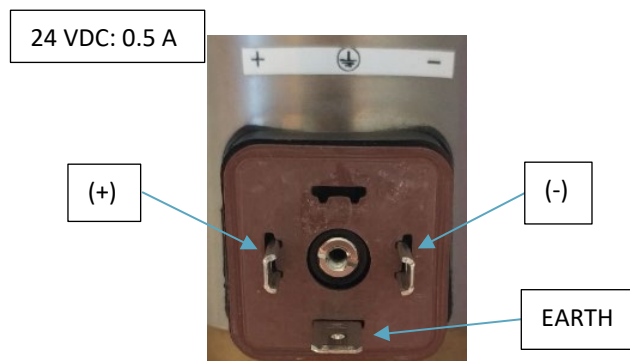


Figure 68 - Solenoid actuator connections

Manual actuator (072203) installation:



Attention: The manual actuator shall be installed during the commissioning phase only so to avoid incorrect manipulation and possible accidental activation of the system, which would discharge the agent.

Check that the safety seal is fastened to the safety pin and it is not damaged. Screw the manual actuator (1) on top of the solenoid actuator (2) with a 30 mm wrench. The reference value for the mounting torque is approx. 25 Nm.

NOTE: Do not put any sealant on the thread.

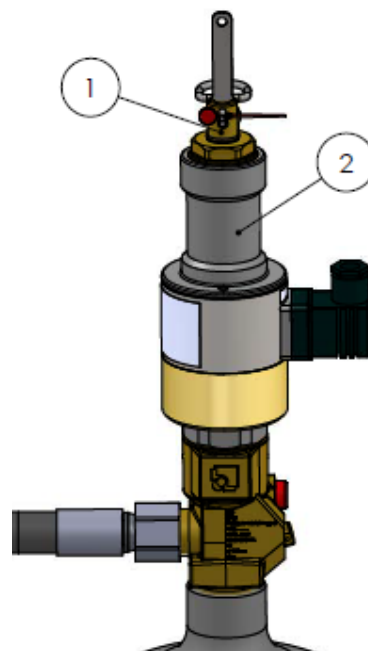


Figure 69 - Manual actuator mounted on solenoid actuator.

Pneumatic-manual actuator (072213) installation: *(only used in cylinder banks)*



Attention: The pneumatic-manual actuator shall be installed during the commissioning phase only so to avoid incorrect manipulation and possible accidental activation of the system, which would discharge the agent.

Check that the safety seal is fastened to the safety pin and it is not damaged. Screw the pneumatic-manual actuator (1) on top of the solenoid actuator (2) with a 41 mm wrench. The reference value for the mounting torque is approx. 25 Nm.

NOTE: Do not put any sealant on the thread.

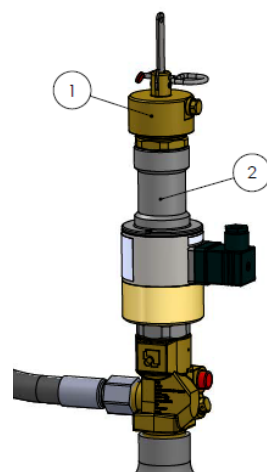


Figure 70 - Pneumatic-manual actuator mounted on solenoid actuator

Double activation/ Redundant solenoid configuration: In certain situations, it is necessary to provide extra reliability and foresee incase the solenoid actuator does not work. In this case it is needed to use the pneumatic manual release to allow activation of a 2nd solenoid.

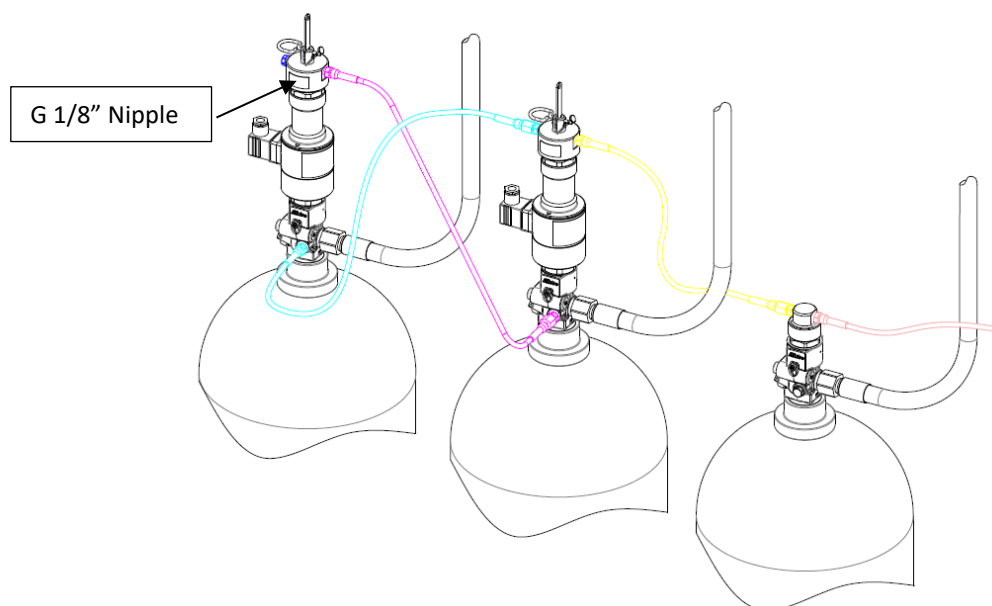


Figure 71 - Double activation/ redundant solenoid configuration

Pilot cylinder (112XA0) installation:



Attention: The pilot cylinder shall be installed during the commissioning phase only so to avoid incorrect manipulation and possible accidental activation of the system, which would discharge the agent.

For more information regarding the AIRfire Pilot Cylinder consult its corresponding manual: TUM112XAXEN-A

5 COMMISSIONING

Inert extinguishing system shall be inspected and tested by trained and competent personnel during system commissioning after its installation phase. Furthermore, a system inspection and maintenance schedule shall be followed. The objective of a periodical inspection is to ensure that the system is in perfect operating condition always. It is also useful for identification of problems due to age, accidental and environmental damage, unauthorized handling, changes in the contents of protected volume, uses, openings communicating with rooms and in general all those factors which may negatively affect the predicted performance of the extinguishing system.

5.1 SYSTEM COMMISSIONING AND HAND-OVER

Commissioning the fire extinguishing system consists of an installation inspection to evaluate compliance of installed system with that projected and the execution of a series of tests, which ensure proper operation of the extinguishing system.

This document covers commissioning operations and inspections for *AIRfire* automatic gas suppression systems only. For detection system and other related fire safety systems possibly present as well, commissioning operations and inspections, the appropriate manufacturer must be contacted directly.

Only personnel properly trained on how to manipulate fire suppression systems shall perform system hand-over inspection and commissioning.

It is recommended to study the installation drawings carefully showing the connection diagrams and the *AIRfire* standard cylinder bank releases; in the case of commissioning of a non-standard cylinder bank it is necessary to consider the drawing supplied together with the cylinder bank components.

The tests to be carried out for system commissioning should follow the steps described in this manual, failing to do so could cause accidental system discharge. Extinguishing system tests for components, which are not described in this manual, should not be carried out.

During the execution of tests all personnel not assigned to commissioning operations should evacuate the cylinder storage area and the area or areas protected by cylinder bank.

Protection masks and gloves should be worn for handling components subjected to pressure.



All operations carried out during commissioning must be included in the Commissioning checklist in Annex I.

5.1.1 Component revision

After the installation of the system, proceed with a hand-over inspection of the system. This consists of a component revision where the condition, proper connection, and installation of components is in accordance with project documentation.

5.1.2 Commissioning operations and operational tests

For commissioning, it is recommended to carry out all the tests described herein after.

Some of these tests are also carried out for maintenance operations. The material supplied by AIRfire is subject to factory quality control, so the following tests on the installed system constitute a complement to ensure proper operation of the extinguishing system and to prevent possible damage resulting from installation.

5.1.3 Blow out with nitrogen

Blowing out a pipe system with nitrogen (or any other suitable gas) ensures that the inside of the pipe is cleaned and clears pipe or nozzle obstructions. Nitrogen flow should be continuous. To perform the blow out, follow the steps below.

- Remove the master or pilot cylinder valve head cap.
- Remove the manifold pressure switch with locking device.
- Connect to the manifold free port (where pressure switch was connected) a dry nitrogen cylinder, fitted with the output set at pressure 50 bar in accordance.
- Remove all nozzles of the system to be blown out. To perform nozzle reinstallation, it is very important to have available isometric drawings or project document where the location of each nozzle is specified, as the internal calibrated diameters differ for each.
- Plug all the free pipe ends, except one.
- Open the nitrogen cylinder valve. Open the ball valve located at nitrogen cylinder outlet and keeps blowing for approximately 5 seconds.

Clouds of dust may be produced during this test liquid and solid residues may be thrown through the free outlet.

- Repeat the operation freeing a different pipe end each time and plugging the remainder until all the pipe ends are completed.
- Remove all the plugs and replace the nozzles **into their original position**.
- Disconnect the nitrogen cylinder and reconnect the pressure switch with locking device.
- Replace the master or pilot cylinder valve head cap.

5.1.4 Gas integrity pneumatic test for open pipes

This test verifies the gas integrity for the pipe distribution system.

When do you perform this test? **Always, except when:**

- Other pipe tests have been performed which ensure its gas integrity.
 - The distribution system is very simple, fitted with no more than one accessory which changes flow direction between the manifold and the nozzle.
- Limitations
- if the temperature to which the pipe is exposed undergoes variations of over 10 °C during the 10 minutes test, the results of the test will not be reliable.
 - Remove the master or pilot cylinder head cap.
 - Remove the manifold pressure switch with locking device.

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- On manifold, connect a nitrogen cylinder to the pressure switch port (nitrogen or any other suitable gas) with the output set at 3 – 5 bar. Insert a “T” fitted with a ½” or ¼” PN-16 (relief) sphere valve.
- Remove all nozzles making up the system to be blown out. To carry out nozzle reinstallation it is very important to have available isometric drawings or project document where the location of each nozzle is specified, as the internal calibrated diameters differ for each.
- Plug all the free pipe ends except one.
- Connect to the free end a 0-10 bar pressure gauge or a pressure recording device. Pressure recording may be continuous or carried out only at the beginning and end of test.
- Pressurize the pipe slowly at 3 - 5 bar. Wait for 10 minutes and register the initial pressure value. Shut off the pressure supply, keeping the pressurization for 10 minutes and then, register the pressure again.

Has the test been successful?

The pressure registered at the end of the test should be at least 80% of the pressure registered at the beginning of the test. Otherwise, look for system leakage: with pressurized pipe, check with soapy water the pipe and accessory joints. If any leakage is found, depressurize, and redo the threaded joints and repeat the test.

Once the test is finished:

- Depressurize system by means of the relief valve inserted into the nitrogen connection.
- Disconnect the nitrogen supply and reconnect the pressure switch with locking device.
- Disconnect the pressure meter and unplug the free pipe ends. Locate the nozzles into their *initial position*.
- Install the master or pilot cylinder valve head caps

5.1.5 Operating test for the pressure switch with locking device

This test should be carried out when the pressure switch is already connected (to the manifold and to the alarm control panel) and it is not going to be disconnected again. Carry out this test again in case of pressure switch disconnection for maintenance operations or for any other reason.

- Remove the box cap of the electrical system.
- Remove the box electric body without disconnecting the wiring. With the help of a ballpoint pen or a rod, push the lower piston until the upper terminals in the box are short circuited by the contact rod. Check that the control panel receives a corresponding alarm signal.
- Re-insert the pressure switch body into its box, replace the box cap and re-arm the pressure switch

Re-arming of the AIRfire pressure switch with locking device:

- To re-arm this device it is only necessary to pull the circular button incorporated in the latching system.



Figure 72 - Pressure switch reset

5.1.6 Release circuit pneumatic integrity test.

To carry out this test, dismantle the complete triggering system: Unscrew all pneumatic actuators and the first release hose from the Master cylinder.

Place the complete and mounted release system, just with a free inlet of the first release hose, on a solid and stable surface.

In this free inlet shall be connected the source of pressurized gas at least at 12 bar. While pressure gas entrance is maintained, the plunger of the pneumatic actuator keeps its release position.

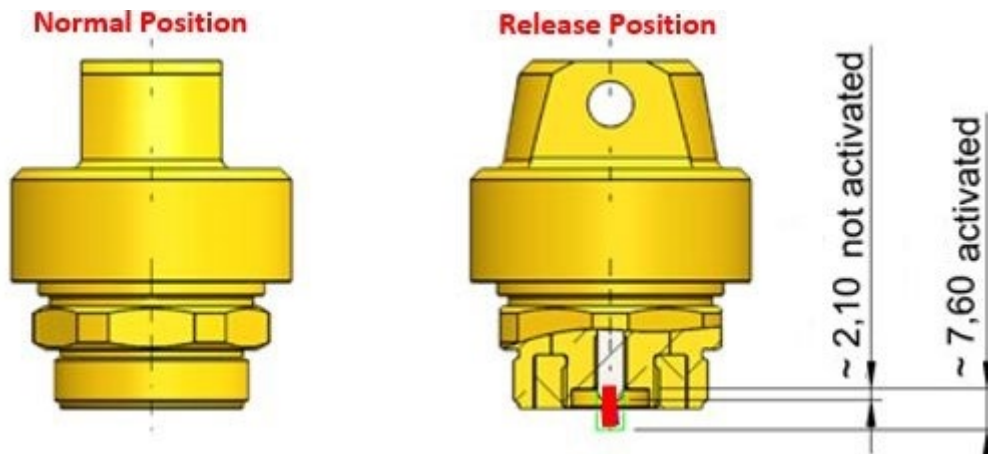


Figure 73 - Pneumatic actuator



Upon removal of pressure source, the plunger automatically goes back to its initial position (not activated).

During this test, pneumatic actuators cannot be mounted onto the valve as it will cause an unintended release of the valve and discharge of the gas.

5.1.7 Operating test for Master cylinder release solenoid actuators

How to test the solenoid actuator:

- Unscrew solenoid actuator of the valve for the Master cylinder
- Once, it is removed, release it activating the *Test mode* of the extinguishing control panel.
- Check that the plunger is in *Released position* as per picture at right.
- Change the mode of the panel and Reset the Solenoid actuator



The plunger of the electrical release device must be reset using a special resetting tool. Details are described in chapter 7.3.2. "*Reset of Solenoid actuator*"

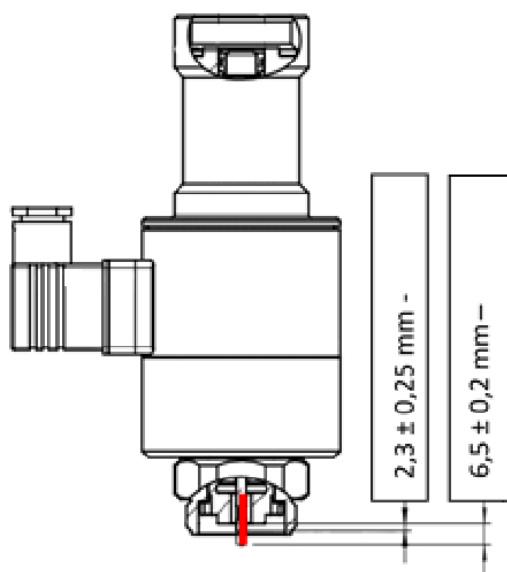


Figure 74 - Solenoid actuator plunger

5.1.8 Other accessories

For the accessories where their commissioning is not specified in this manual, please see specific manual of each accessory.

See section. 3.6 *Other accessories*.

6 OPERATIONS

Normally the activation of the system is automatic where the fire extinguishing panel sends an electrical signal to the solenoid on the master cylinder. If needed the system can also be activated manually.

NOTE: Please see section 7 of this document to see the operations after actuation.

6.1 Manual activation (072203)

The manual actuator is located on top of the master cylinder. It is mounted above of solenoid actuator.

To activate the manual actuator: Remove the safety tag (1), allowing to remove the safety pin (2) and operate the lever by pulling firmly (3).

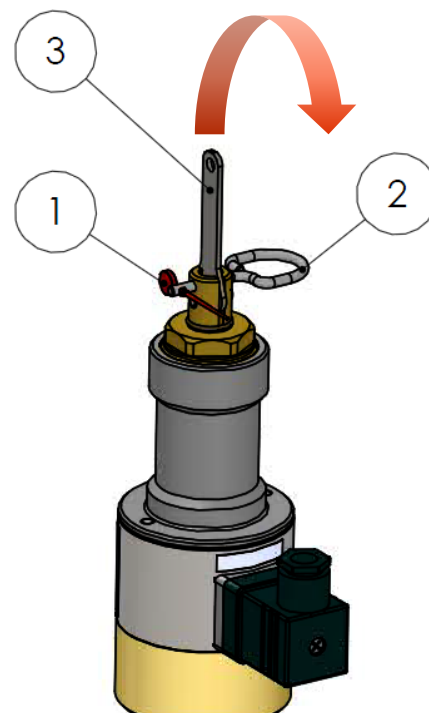


Figure 75 - Activating manual actuator

6.2 Pneumatic-manual activation (072213)

The pneumatic-manual actuator is located on top of a secondary master cylinder. It is mounted above of solenoid actuator.

To activate the pneumatic-manual actuator: Remove the safety tag (1), allowing to remove the safety pin (2) and operate the lever by pulling firmly (3).

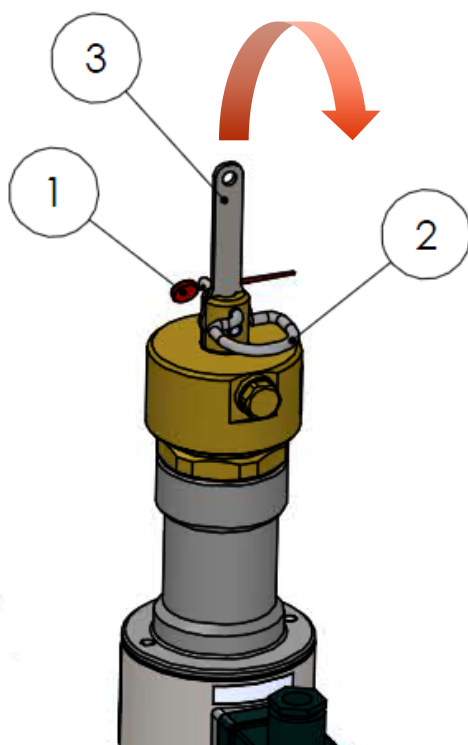


Figure 76 - Activating pneumatic-manual actuator

6.3 Electrical activation (022001)

The solenoid actuator (1) is located on top of the master cylinder (2).

Solenoid actuator activation is produced through an electrical signal sent from the extinguishing fire panel. This signal is sent through an electrical cable to the coil of the solenoid actuator. When the coil is energized, it produces the movement of an internal plunger which will activate the cylinder valve.

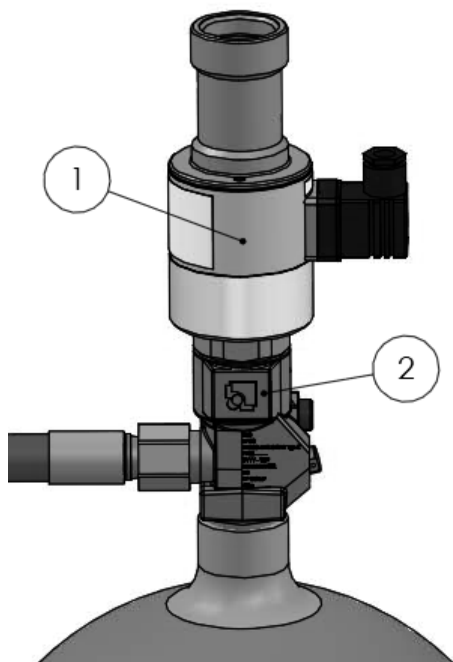


Figure 77 - Electrical activation

7 SERVICING/ MAINTENANCE

System maintenance and servicing is extremely important to ensure the functionality of the system on a long-term basis and to reinstate it after a fire has been extinguished.



All work may only be performed by qualified and trained personnel.

7.1 PROCEDURE IN THE EVENT OF FAILURE OF FIRE

When extinguishing discharge is not released within delay time specified by the Main Panel from fire alarm, if you can see a fire or the alarm system has failed to operate, WAIT UNTIL AREA IS EVACUATED to manually actuate extinguishment. The following operations should be carried out quickly and in order:

1. The person in charge of manual operation should wear a helmet and safety glasses which he will find in the storage area, next to the cylinder bank and close to the warning signs containing the operational instructions for manual discharge.
2. Visually check the condition of the cylinder bank (flexible hoses, gauges on cylinders show correct pressures in accordance with labels, selector valves are closed).
3. Operate the pilot cylinder release or Master cylinder. (see section 6.1 and 6.2. of this document)

7.2 PROCEDURE AFTER CYLINDER BANK DISCHARGE

At the hazard:

1. Prior to opening the door or to operating hazard ventilation where discharge has taken place, wait for the arrival of the fire brigade.
2. Once the hazard is controlled clean the area.
3. Check visually condition of the Inert installation within the hazard (general pipe condition, nozzle condition) Follow the Check list for maintenance after fire of Annex II.

Cylinder bank:

4. Verify that all Inert cylinders have been discharged (check pressure gauges of the cylinders indicate 0 bar). Otherwise, notify the AIRfire technical department.
5. Unlatch the pressure switch (see section 7.3.1. Re-assembly the pressure switch with locking device)
6. Disconnect the electrical cable between Solenoid actuator and Extinguishing panel
7. Unscrew the Solenoid actuator and manual release of the Master cylinder or Pilot cylinder
8. Visually check the condition of the *Inert installation* within the hazard following instructions routine of check list of Annex II.
9. Refill the empty cylinders (see section 7.4. Filling procedure of gas cylinders)
10. Installation hand-over and commissioning of fire extinguishing system should be carried out again

7.3 OPERATIONS AFTER AN ACTUATION

Manual operations to be carried after an actuation:

- Re-assemble the pressure switch with locking device.
- Reset the Solenoid actuator.

7.3.1 Re-assembly of pressure switch with locking device

Unlatch the pressure switch by pulling the lever (1).

The pressure switch is in the cylinder storage area, mounted on the discharge manifold or on the blind cap manifold.

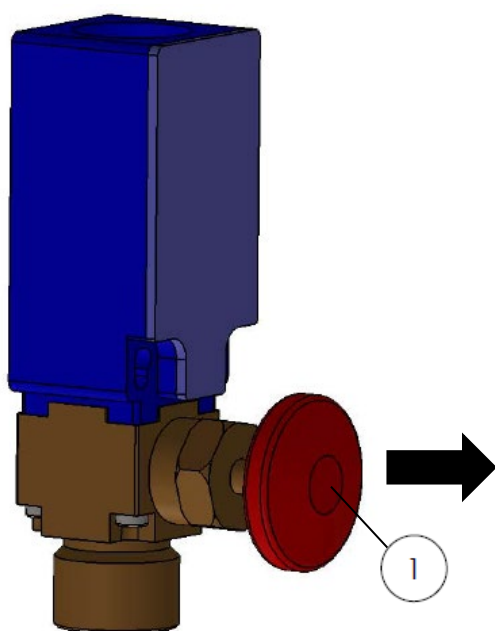


Figure 78 - Pressure switch re-assembly

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7.3.2 Resetting solenoid actuator

Remove / unscrew the solenoid actuator. A special resetting tool must be used to re-insert the plunger.

Screw the resetting tool (1) to the plunger solenoid valve port (2) with a wrench of 41 mm. Operate the lever by pulling (3).

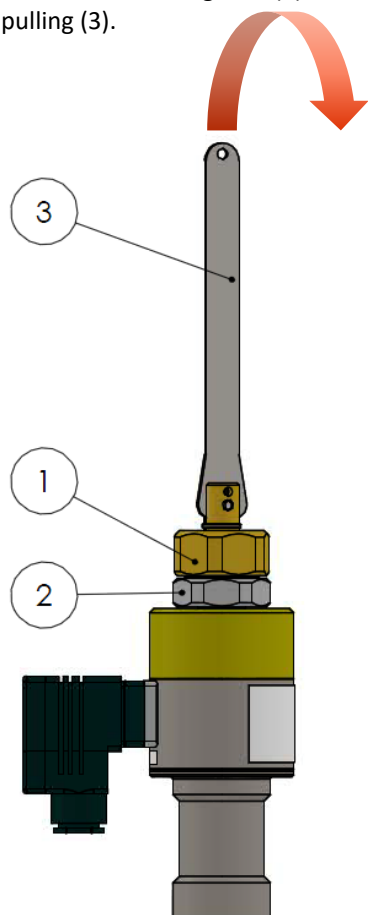


Figure 79 - Resetting solenoid actuator

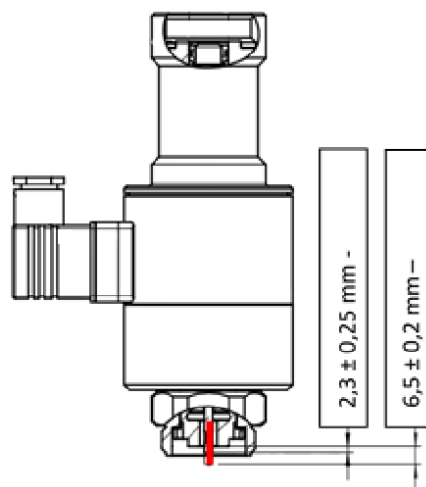


Figure 80 - Solenoid plunger

7.4 FILLING PROCEDURE OF GAS CYLINDERS THROUGH CYLINDER VALVE 07XXXX

1. Filling the cylinder is only permitted with **Dismounted** release device. It means the removing of the Solenoid actuator, Manual release and/or pneumatic actuator.
2. Suitable filling device to use **over the valve outlet** with the correct operating pressure respectively filling weight.
3. Take necessary actions when exceeding the permissible filling pressure or filling weight.
4. Close the filling line when reaching the correct filling pressure or filling weight.
5. The cylinder valve is closing by a short actuation of the filling valve. (= just pushing with the finger until the block – no additional means or tools are allowed – actuating distance ~ 5 mm) → the quick-release valve 07XXXX closes automatically.

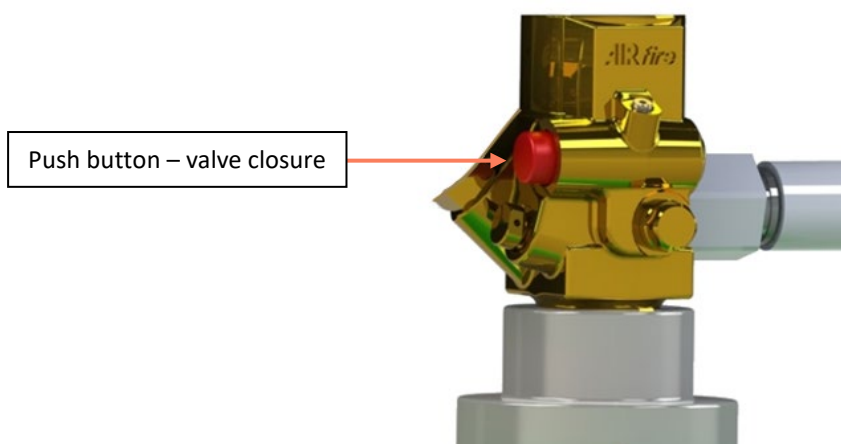


Figure 81 - Red push button

6. The filling line may be vented and unscrewed now.
7. Close immediately the valve outlet by using the provided closing cap.
8. Please note that only the user has the full responsibility for the implementation of the filling process. Special requirements from the manufacturer of the extinguishing agent must necessarily be considered and may cause the need to deviate from the described filling procedure.
9. Before to mount the release devices, make sure that all of them have been reset. See section 7.3. of this document.

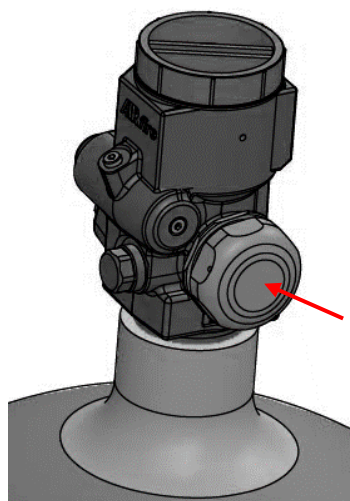


Figure 82 - Valve outlet cap

7.5 MAINTENANCE PROCEDURE



System maintenance and servicing is extremely important to ensure the functionality of the system on a long-term basis and to reinstate it after a fire has been extinguished.

All work may only be performed by qualified and trained personnel.

7.5.1 Service intervals

Service type	Work to be carried out	Interval
Visual Inspection	<ul style="list-style-type: none"> a) Check the general condition of installation b) Check that the information labels of the components are in a good state and are easy to read them. And the user and warning signs as well as the cylinder/s adhesive labels are in their appropriate location. c) The safety devices for system handling and maintenance are in perfect condition. d) Check the electrical connections of the fire suppression system with the control panel (Solenoid actuator, pressure switch). 	Biannual by specialist personnel
Control pressure of the cylinders	<ul style="list-style-type: none"> a) Read the pressure gauge to check if the internal pressure of the cylinder is according to the cylinder label (200 or 300 bar). 	Biannual by specialist personnel
Test inspection	<ul style="list-style-type: none"> a) Nozzles: In dusty atmospheres check that the discharge orifices are not obstructed. b) Releases: Carry out an operating test for the solenoid actuators. c) Alarms: check the audible and visual function of the alarm devices giving the instructions from control panel. Test mode. d) Check the right position and connection of the pressure switch on manifold. 	Annually by specialist personnel
Revision of wear and tear parts	<ul style="list-style-type: none"> a) In unusually dirty and dusty environments the pipe distribution system should be blown out with dry nitrogen to clean the internal parts of the pipe. Before to do it, it's necessary to remove the Nozzles. 	Every two years by specialist personnel
Cylinder and valve testing and refilling	Send the cylinder to the manufacturer for their testing and refilling: <ul style="list-style-type: none"> a) Internal and external Cylinder evaluation and retrofit. b) Cleaning and painting. c) Agent refilling. 	Every ten years by specialist personnel

7.5.2 Maintenance schedule

System age	Visual Inspection	Control pressure of the cylinders	Test inspection	Revision of wear and tear parts	Cylinder and valve testing and refilling
6 months	X	X			
1 year	X	X	X		
1 year + 6 months	X	X			
2 years	X	X	X	X	
2 years + 6 months	X	X			
3 years	X	X	X		
3 years + 6 months	X	X			
4 years	X	X	X	X	
4 years + 6 months	X	X			
5 years	X	X	X		
5 years + 6 months	X	X			
6 years	X	X	X	X	
6 years + 6 months	X	X			
7 years	X	X	X		
7 years + 6 months	X	X			
8 years	X	X	X	X	
8 years + 6 months	X	X			
9 years	X	X	X		
9 years + 6 months	X	X			
10 years			X	X	X

8 USE OF INSTALLATION

8.1 GENERAL FUNCTION OF A FIRE EXTINGUISHING SYSTEM

The following sketch illustrates a typical *firefighting* installation:



Figure 83 - Gas suppression system basic layout

The system of the above picture is composed of the following components:

- Fire suppression system:
 - Master cylinder
 - Slave cylinder
 - Manifold
 - Pressure switch on manifold
 - Pipe
 - Nozzles
- Detection system:
 - Extinguishing control panel with manual release button
 - Detectors
 - Fire alarm
 - Sounder/Beacon
 - Manual pull station
 - Lighted signal

8.2 GENERAL CONSIDERATIONS

Inert systems are designed for the following methods of actuation:

- Automatic Operation: an electrical signal causes the release of master cylinder to initiate the discharge procedure.
- Manual operation: the discharge is activated by operating the manual release lever located on the pilot cylinder or the master cylinder.

The automatic release signal comes from the detectors. The detectors operate by sending a signal to the control panel when a fire is detected inside the room.

At the same time, the control panel sends an instruction to open the master cylinder valve. At this moment, it is **IMPOSSIBLE TO STOP THE DISCHARGE OF THE EXTINGUISHING AGENT**, which will be produced imminently.

The pipe where gas from all cylinders is collected is called the discharge manifold. A pressure switch is located on the manifold or in the blind cap manifold, which sends a signal to the control panel to indicate that the agent discharge has begun.

Gas flows through the pipe system to the nozzles and is expelled at high velocity towards the fire.

System manual actuation is also possible by means of the Release Push Button. This device should only be used **WHEN THE ROOM HAS BEEN EVACUATED**. Use of this device involves the same operation described above for actuation of the automatic fire detection systems. If the delay time is over and the discharge has not been produced, actuate the cylinder bank manually.

Gas is discharged from the nozzles at high velocity. So, suitable means of room evacuation should be provided, as far as possible from the direct reach of the nozzle. The strength of extinguishing agent discharged is not enough to raise heavy objects (computers, tables, cupboards, machines), nor raise personnel but it can raise papers, light books and movable objects located near the discharge nozzle.

Appropriate warning signs should be affixed not only in the enclosure protected by the installation but also at the cylinder storage areas. Appropriate warning signs should provide instructions in case of the fire alarm. The storage area should be provided with instructions for manual system actuation including requirements to previously check that the area to be protected has been VACATED.

Appropriate warning notices should be affixed inside protected room informing its occupants about the type of protection and modes of actuation in case of fire. All these signs should be clearly legible and resistant to environmental conditions. It is advisable to provide adhesive labels in red or green background and white letters. Notices should incorporate at least the following messages:

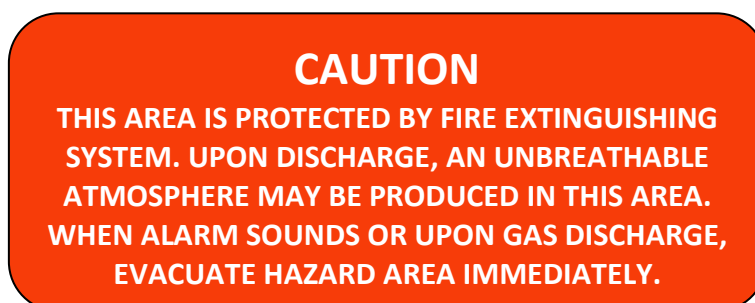
Typical sign inside the protected enclosure:



Typical sign outside the protected enclosure:



Typical sign affixed near the protected areas:



Typical signs placed at every manual actuation device:



For better extinguishing action, all inlets of air which might re-ignite the fire should be prevented. Once discharge is complete, wait a minimum of 30 minutes prior to activating room ventilation, to prevent fire re-ignition. It is advisable to call the fire brigade at the time of activation of room ventilation.

9 ANNEX I: Check list for commissioning

Features of the installation			
Country of installation		Installer company	
Date of installation	...../...../ 20.....		
Code of the system		Name of the responsible installer	

Check points for system commissioning:			
Are system drawings and mounting schemes of the project available?			<input type="checkbox"/> Yes <input type="checkbox"/> No
Working pressure	..... bar	Total Quantity of gas	..... Kg
Cylinder capacity	..... L	Nº of pneumatic actuators	..... units
Nº of manual release devices	..... units	Nº of Solenoid actuators	..... units
Nº of pressure gauges	..... units	Revision of thread connections between components	<input type="checkbox"/>
Observations:			
Blow out with Nitrogen satisfactory?	<input type="checkbox"/>	Gas integrity pneumatic test for open pipes satisfactory?	<input type="checkbox"/>
Operating Test for the pressure switch with locking device	<input type="checkbox"/>	Are the Original schemes for the pneumatic release line available?	<input type="checkbox"/>
Verification of the right mounting of components of the pneumatic line	<input type="checkbox"/>	Gas integrity pneumatic test for pneumatic line satisfactory?	<input type="checkbox"/>
Operation test of Master cylinder actuators satisfactory	<input type="checkbox"/>	Verification of the correct reset of the Solenoid actuator	<input type="checkbox"/>
Operation tests for the pilot cylinders (if the system has)	<input type="checkbox"/>	General inspection of the system satisfactory	<input type="checkbox"/>
Observations:			

Signature of responsible:

In, at of of 20....

10 ANNEX II: Check list for service after system actuation

Features of the installation:			
Country of installation		Installer company	
Installation date	...../...../20.....	Name of the responsible installer	
Code of the system			
Check points for system service after system actuation:			
Last maintenance date	...../...../ 20.....	Responsible company for maintenance	
Working pressure	..... bar	Cylinder capacity	..... L
Triggering type	<input type="checkbox"/> Manual release <input type="checkbox"/> Electric actuation		
Fire confirmation	<input type="checkbox"/> No <input type="checkbox"/> Yes, cause:		
Reason of the system triggering			
Replaced components			
Has AIRfire technical department been noticed about the service?	<input type="checkbox"/> No <input type="checkbox"/> Yes		
Responsible company for the cylinders transport to the refilling point			
Responsible company for the refilling of cylinders			
Observations:			

Signature of responsible:

In, at of of 20....

11 ANNEX III: Check list for Maintenance

Features of the installation				
Country of installation			Installer company	
Installation date	...../...../ 20.....		Name of the responsible installer	
Code of the system				
Maintenance				
Maintenance date	...../...../ 20.....		Date of last maintenance	...../...../ 20.....
Responsible person			Responsible company for maintenance	
Maintenance type	Biannual - Visual inspection - Control pressure of the cylinders <input type="checkbox"/>	Annual Functionality <input type="checkbox"/>	Every 2 years Revision of wear and tear parts <input type="checkbox"/>	Each 10 years Cylinder and valve testing and refilling <input type="checkbox"/>
System working pressure	..... bar		Cylinders capacity	..... L
Verification of the correct cylinders pressure	<input type="checkbox"/>		Verification of the good state of the labels of the cylinders and the room	<input type="checkbox"/>
Safety valve in good state	<input type="checkbox"/>		Electrical connections revised	<input type="checkbox"/>
Revision of nozzles and internal discs satisfactory	<input type="checkbox"/>		Operation test of the electrical trigger satisfactory	<input type="checkbox"/>
Operation test of the extinguishing panel satisfactory	<input type="checkbox"/>		General visual inspection OK	<input type="checkbox"/>
(Each 2 years) Blow out test with Nitrogen done satisfactory due to the dirty and dusty ambient				<input type="checkbox"/>
General maintenance (each 10 years)				
Responsible company of the cylinders hydrostatic tests				
Responsible company for the cylinder refilling				
Observations:				

Signature of responsible:

In, at of of 20....

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