INERTECH™

System design manual, Installation & Maintenance

Foreword

This manual provides instructions and information on the Design, Installation and maintenance of the Inertech Suppression System.

Systems shall be designed and installed in accordance with this manual and the internationally recognised standards:

- NFPA 2001, Standard on clean agent fire extinguishing systems
- ISO 14520, Gaseous fire-extinguishing systems
- EN 15004, Gaseous fire-extinguishing systems

This manual has been written in conjunction with EN15004, however at relevant points within this document reference is paid to NFPA 2001 and ISO 14520. When designing/installing Inertech systems that require compliance with either NFPA 2001 or ISO 14520 this manual must be read in conjunction with the relevant international standard, as some requirements may be excluded from this text.

Inertech suppression systems must be designed, installed, commissioned and maintained by qualified and competent personnel who have the relevant training and experience. Any questions, queries and suggested improvements should be brought to the attention of the company.

This design manual does NOT include the use of the Inertech suppression system for local application or explosion suppression systems. Marine and aviation applications are not suitable for this system. The system is for use within buildings in Total Flood applications. The Company will continually improve its products and systems and this manual may not reflect the latest products.

The Inertech system uses a Pressure Controller directly coupled to the Inert Gas discharge valve to replace the orifice plate on traditional inert gas systems. The use of the pressure controller has a number of significant benefits over traditional inert gas systems:

- Smaller pipe diameters or extended pipe runs.
- Reduced room venting.
- Lower pressure discharge hoses
- Lower pressure manifolds
- Lower pressure selector valves
- Safer systems by limiting the pressure from the discharge valve.

The pressure controller works by constantly adjusting the flow restriction to compensate for the reducing cylinder pressure thus maintaining the inert gas mass flow rate. In traditional inert gas systems the flow control orifice is set for the maximum cylinder pressure which gives a very high peak flow rate (high room venting requirement) but then over restricts the flow to give a too low flow rate and poor utilisation of the pipe work.

120 second discharge is an option with the Inertech System. The latest edition of NFPA 2001 allows for 120 s discharge time for inert gas systems. The Inertech System has been fire tested for 60 and 120 s discharges. Using 120 s discharge times provides further reductions in distribution pipe sizes and protected space venting area.

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1. INTRODUCTION

The Inertech suppression system provides a total flooding fire suppression system in accordance with EN15004, NFPA 2001 or ISO14520

Inert Gas may be used in the protection of the following types of facilities:

- Data processing
- Process control rooms
- Telecommunications facilities
- Fuel Stores
- Engine rooms
- High value assets

Inert Gas is NOT suitable for but may inhibit the spread of fire to normal combustibles for the following types of fire:

- Certain chemicals or mixtures of chemicals, such as cellulose nitrate and gunpowder, that are capable of rapid oxidation in the absence of air
- Reactive metals such as lithium, sodium, potassium, magnesium, titanium, zirconium, uranium, and plutonium
- Metal hydrides
- Chemicals capable of undergoing automatic thermal decomposition, such as certain organic peroxides or hydrazine

Fire detection and Controls:

This manual covers the design and installation of the fire suppression/extinguishing system not the fire detection, actuation, or control requirements. These are important aspects to ensure the correct operation of the suppression system and must be completed by skilled and competent personnel to appropriate international standards e.g. ISO14520, EN15004, NFPA2001, BS 5839, BS 7273, BS6266.

Gaseous fire extinguishing systems require fast detection and discharge to minimise the fire damage and the fire decomposition products. Do not delay the extinguishant discharge longer than is necessary to evacuate the protected space.

Configurations covered:

This manual covers engineered systems for a single risk, multiple risks with a simultaneous discharge and multiple risk protection where a single extinguishant storage facility protects multiple risks with the use of selector valves.

2. APPROVALS - LPCB Ref. no. 1222

This manual has been approved by the Loss Prevention Certification Board for the Design of Eurotech Fire Protection in collaboration with Firetec Systems Ltd. INERTECH Inert gas Clean Agent Engineered Systems using approved components and equipment. The Approval was obtained against LPS 1230.

Full details of the Scope, Qualifications/limitations can be found on the BRE Red Book live web site. www.redbooklive.com/

Product Name	EN 15004 Part:	EN 15004 Risk	EN 15004 Design Concentration % vol	LPCB Approved Design Concentration	NFPA 2001 Risk	NFPA Design Concentration % vol
IG-01	7	Surface Class A	41.9	45.5	Class A	
		Higher Hazard Class A	49.2	49.6	Class B	
		Class B	51.7	52.7	Class C	
IG-100	8	Surface Class A	40.3	38.9	Class A	37.2
		Higher Hazard Class A	45.2	42.8	Class B	43.7
		Class B	47.6	46.3	Class C	41.9
IG-55	9	Surface Class A	40.3	40.0	Class A	37.9
		Higher Hazard Class A	45.2	43.8	Class B	39.1
		Class B	47.6	47.1	Class C	42.7
IG-541	10	Surface Class A	39.9	38.5	Class A	34.2
		Higher Hazard Class A	45.7	45.7	Class B	40.6
		Class B	48.1	46.5	Class C	38.5

Table 2.1 – The Approved Systems Design Concentrations

The LPCB Approval covers both the components and system for all 4 inert gases.

2.1. Deciding on Which Concentration To Use

The current EN15004 and ISO14520 standards require a minimum design concentration as listed in the table above, which we would always recommend using. We are aware that in a very competitive world the lowest approved concentration is preferable. The effectiveness of the Inertech system has been demonstrated with the LPCB and achieved generally much lower concentrations than published in the standards. The use of these concentrations shows benefits on larger systems.

If using the NFPA2001 Standard the concentrations above for Class A can be reduced by 7.7% because the NFPA uses a safety factor of 20% (over the extinguishing concentration) against the EN and ISO standards which use a 30% safety factor.

2.2. 120 Second Discharge

The Inertech system can also be optimised for 120 second discharge. The benefits of the system are:

- Smaller pipe sizes and nozzles
- Smaller vent area
- Lower noise levels
- Fewer disturbances from the discharge within the protected space.

The outcome from relevant fire testing undertaken with the LPCB raised the recommendation that for floor voids surface Class A risks, the Higher Hazard concentration be used. This is a conservative recommendation.

The latest edition of the NFPA 2001 permits normal Class A concentrations for surface fires as follows:

NFPA 2001 – 2015 Edition clause 5.7.1.2.2 "for inert gas agents, the discharge time required to achieve 95% of the minimum design concentration for flame extinguishment shall not exceed 60 seconds for class B fuel hazards, 120 seconds for class A surface fire hazards or Class C hazards, or otherwise required by the authority having jurisdiction".

3. GAS PROPERTIES

3.1. Inert Gas Physical Properties

Inert Gases Argon and Nitrogen are naturally occurring colourless, odourless and electrically non-conductive gases at normal temperatures and pressures. They leave no residue and have acceptable toxicity for use in occupied spaces.

Inert Gas suppresses a fire by reducing the oxygen content within a protected space to a concentration which does not sustain combustion. Concentrations can be chosen which allow people to see and breathe while permitting them to leave the fire area safely.

The system should be designed to discharge in accordance with the national standard depending on the authority having jurisdiction. Inert Gas is clean, efficient, environmentally acceptable, and leaves no residue, thus minimizing any downtime after a fire. Most materials contained in areas protected by Inert Gas, such as aluminium, brass, rubber, plastics, steel, and electronic components, are unaffected when exposed to Inert Gas.

Inert Gas is stored as a compressed gas in steel cylinders at a pressure of 200 or 300 bar. When discharged, Inert Gas will expand at the discharge nozzles and effectively mix with the air throughout the protected area.

Various gases and mixtures are permitted under EN15004, NFPA 2001 and ISO 14520 Standards. They provide guidance on their use and concentrations including deep seated fires.

Inert Gas Physical Properties	IG-01	IG100	IG55	IG541
Chemical formula	-	-	-	-
Gas : Argon - Ar	100%	-	50%	42%
Gas : Nitrogen - N_2	-	100%	50%	50%
Gas : Carbon Dioxide - CO_2	-	-	-	8%
Density with respect to air at standard temperature/pressure	1.38	0.97	1.17	1.18
Saturated vapour density at 1 atm 20°C kg/m^3	1.661	1.166	1.412	1.434

Table 3.1– Inert Gas Physical Properties

These inert gases are equipped to suppress class A and B fires.

3.2. Safety Considerations

The Material Safety Data Sheet (MSDS) covering Inert Gas should be read and understood prior to working with the agent. Safety items such as personnel training, evacuation plans and fire drills should be considered.

3.2.1. Visibility

The discharge of Inert Gas into a space may cause a reduction in visibility due to the moisture in the air condensing for a brief period. This will disappear in seconds as the agent warms to the surroundings.

3.2.2. Chilling

The Inert Gas is stored as a compressed gas and will expand at the nozzle which causes a reduction in temperature. Any direct contact with the extinguishing agent will cause rapid cooling and possibly frostbite. The air within the protected space will cool by as much as 10^{O}C but will quickly rise again. Consider the effect of the temperature change on the equipment within the protected space.

3.2.3. Noise

The discharge may result in some noise from the nozzles. Use of the Inertech system and 120s discharge time will minimise the discharge sound levels.

3.2.4. Turbulence

There will be a jet of gas from the nozzles which may disturb paperwork and light objects.

3.2.5. Combustion Decomposition Consideration

A fires' products of combustion and decomposition can be acidic and corrosive to the contents of the protected space and should not be allowed to remain in the protected space. These products must be promptly and thoroughly ventilated from the protected space prior to allowing re-entry. Cylinder caps comply with EN ISO 11117 and should not be removed unless cylinders are secured.

3.2.6. Inert Gas Agent Storage Cylinders

These are heavy and must be handled with care and with the correct handling facilities. To prevent accidental discharge or damage to the equipment when not fully restrained (in the installed location) all actuators must be disconnected or removed and all anti-recoil devices must be in place and transport caps fitted. Do not fit the actuators until the system is fully installed.

3.2.7. Toxicity

Inert Gas has acceptable toxicity for use in occupied spaces as a total flooding agent. Refer to the EN 15004, NFPA 2001 and ISO 14520 or National guidelines for specific exposure limitations and discharge controls.

3.2.8. Physiological Effects

Physiological effect levels due to breathing inert gas can be found in the EN 15004-1 (2008) annex E including manned and unmanned areas.

3.2.9. Local Area

The discharge gases may migrate to neighbouring areas. Ensure that these areas are thoroughly ventilated following system discharge.

3.2.10. Glazing

Ensure all glazing is wired or strong enough to withstand over pressure.

3.2.11. Venting

The volume of gas discharged must be vented from the protected space to prevent over pressurization. The Inertech calculation software will give the vent free flow area to prevent over pressurization.

The controlled flow discharge significantly reduces the vent area and the difficulties of installing adequate venting. Using a 120 second discharge will approximately halve the vent area again.

4. SYSTEM DESIGN

The information contained in this section covers the design of engineered systems only. The designer must be fully conversant with the relevant Standards i.e. NFPA 2001, ISO 14520 or EN15004.

Consideration should be given to the consultation with all interested parties and authorities.

The selection and placement of the alarm and control devices shall conform to the relevant International Standards.

4.1. Design Procedure

Design the system in this order:

- Calculate the agent quantity
- Calculate the number of storage cylinders
- Locate the storage cylinders and consider safety
- Locate the discharge nozzles taking note of their coverage and pipe work configuration
- Determine the piping routes, consider venting and leakage from the protected space
- Configure the system and actuation using the logic from P&ID diagrams (Section 5.18)

4.2. Agent Requirement

A risk assessment and survey of the space must be completed to confirm:

- Room integrity (to prevent the loss of agent after discharge). This includes room venting and ventilation; all forced ventilation must be shut down. This manual does NOT cover extended discharge so the room must be completely sealed to ensure sufficient hold time
- Fire resistance of the enclosure
- Dimensions - the difference between the Gross and the Net volume must be taken into consideration. EN15004 should be adhered to, in general ceiling and floor voids should be treated as separate spaces.
- Use and occupancy
- A temperature range of -20 ℃ to + 50 ℃ for the protected space and cylinder store
- That no other gaseous extinguishing system is installed
- There are no class C risks e.g.: Methane because the build-up of flammable gas could produce an explosion hazard
- Doors should open outwards and be fitted with self-closers to facilitate evacuation in the event of a fire
- Consider the environmental impact of the system selected. Use the system which gives the lowest environmental impact against fire fighting effectiveness, speed of extinguishment, safety, weight and economics
- Should a single agent supply be available to protect more than one risk then the quantity should be sufficient for the largest risk. Take account of the achieved concentration in the smallest risk
- The calculation program takes into account the friction loss through the pipes and components and changes in elevation. All the information is contained within the Inertech calculation program and this shall be the only method of designing and calculating a discharge pipe work system

Use NFPA 2001, ISO 14520 or EN15004 to determine the quantity of agent. Note the differences between the standards on concentration requirements. **Ensure that the insurer and client's representative agrees to the design parameters**. The environment must be suitable for this suppression system which is also stated in the standards.

4.3. Quantity of Agent

- Use the concentrations in Table 2.1 derived from the approval fire testing ans International Standards to determine the quantity of agent. The concentration should be based on the highest concentration required for the fuel present in the risk area. Note the differences between NFPA 2001, EN 15004 -1 or ISO 14520 standards on concentration requirements
- For highly volatile fuels inerting concentrations may be necessary as discussed in the standard. Where the design concentrations for extinguishing and inerting are not given follow the advice given in the standards on how to determine these. Consider the time taken to achieve an inerting concentration and possible electrostatic discharges.
- Hazards to be protected e.g. Class A, B. Refer to EN 15004 7.5 and the LPCB listing for guidance on

extinguishing concentrations. If the fuel/Fire type is unknown, seek advice

- To calculate the quantity of agent use *Equation 1 or 2* in EN 15004 -1 7.6, (all openings sealed) and use the minimum temperature of the protected volume. Guidance is given in Table 3 of EN15004 -7, 8, 9, 10:2008 which also includes specific vapour volumes against temperature, formula and pre-calculation tables
- The Inertech Calculation program which should be run for every system automates this process and provides a record
- The Table, formula and calculation program takes into account temperature, specific volume of vapour and altitude (see EN15004 -1 7.7 for the altitude correction factor)
- For altitude alterations see EN 15004-1 7.7 which gives figures for -1,000m to +4,500m

4.4. Discharge Time

The maximum discharge time shall be in accordance with international standards. NFPA 2001 permits a 120 second discharge for Class A and Class C fires but 60 seconds for Class B fires, whereas EN 15004 -1 7.9.1 currently includes a 60 second discharge.

4.5. Number of Storage Cylinders

The number of cylinders used on a system is dependent on the capacity and charge pressure of the cylinders and system design configuration. A skilled system designer will consider all of the variables to determine the optimum solution.

4.6. Storage Cylinder Location

Refer to EN 54004-1 6.2.3 and cylinder mounting considerations including:

- Floor loading
- Access for manual release of the system, installation and service
- Tampering, obstruction and damage
- Environment (hot/cold, dirty, corrosive. Normally cylinders will be mounted within or adjacent to the protected space). Refer to the storage and use limitations
- Distance from the protected space
- Mount in a protected environment away from direct sunlight, corrosive atmospheres and away from wind and rain and any enclosure doors opening outwards
- Temperature to be within -20 ℃ to + 50 ℃
- The storage cylinder will normally be mounted vertically with the valve uppermost but may be mounted horizontally.
- Refer to Figure 5.1b – Storage Cylinder Dimensions, for storage cylinder assembly dimensions
- Store cylinders in a well-ventilated area to account for any discharge from the over pressure relief mounted on the cylinder valve. All storage spaces must have outward opening doors.
- Consider the heat from a fire impinging on the cylinders.

4.7. Personnel Safety Check

The "achieved" Inert Gas concentration could be greater than the design concentration. When the system is being used to protect manned areas the achieved concentration must be determined and compared to the safe limits indicated in the relevant design standards (NFPA 2001, ISO 14520 or EN15004). If it is higher than the safe limits (NOAEL, LOAEL) indicated then the minimum safety precautions recommended in the relevant design standards must be included in the system design. Calculate the achieved concentration using the formula:

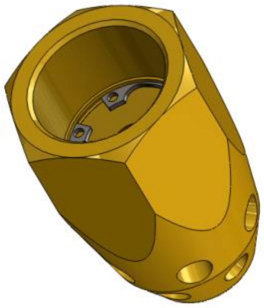
$$C_{MAX} = \frac{100 \times Wf \times S2}{(Wf \times S2) + V_{MIN}} \qquad \textit{Equation 4.7}$$

Given:

- C_{MAX} = Maximum Concentration % by volume
- Wf = Stored weight of agent kg
- S2 = Specific vapour volume at the highest protected space temperature. See EN15004 -7, 8,9,10 (table 3) for values.i
- V_{MIN} = Minimum net volume of the protected space m^3

For manned areas the concentration must be determined and compared to the safe limits indicated in the relevant design standards (EN 15004-1 5.2.2). If it is higher than the safe limits indicated then the Minimum safety precautions recommended in the relevant design standards must be included in the system design.

4.8. Nozzle Range



The Nozzle controls the flow rate and quantity of gas discharge into the risk.

The orifice size must be determined by the Inertech calculation program to discharge the correct amount of gas in the required discharge time. Minimum nozzle pressure 2 bar.

Orifices smaller than 3mm diameter require inline strainer at inlet of nozzle.

FSL recommends to use Low noise nozzles when protecting data centre to reduce the damage risk to hard risk.

Low noise nozzles are designed to discharge the Inert gases in a uniform configuration and reduce air turbulence and noise in the enclosure to less than 110dB. Available in ½" NF351515, 1" NF352515 and 1.1/2" NF354015 sizes.

Table 4.7.1- Available Nozzle Data

ASSEMBLY	ORIFICE	Height	A/F	DN	Design Flow rate	Max Flow rate
Part No	RANGE	mm	mm	mm (inch)	Kg/min	Kg/min
NF35150	1.6-10mm	44	24	15 (½")	23	33
NF35200	7-14mm	55	32	20 (¾")	45	66
NF35250	10-18mm	67	41	25 (1")	90	133
NF35320	12-23mm	82	54	32 (1-¼")	118	175

4.9. Nozzle Coverage

- Decide on the most appropriate nozzle locations. 360° coverage is achieved by nozzles ceiling mounted across the space. 180° coverage is achieved from the same nozzle wall mounted and angled **@ 45°** to the midpoint of the protected volume
- Nozzles should be spaced to give an even coverage and best results can be expected by discharging similar quantities from each nozzle. Refer to the diagram below for maximum coverage details
- The larger nozzles can have very high discharge rates. The flow rate should be less than 180 kg/min (360 kg for 120 second discharge but note the nozzle coverage below) for all spaces with false ceilings and moveable objects or where a high flow rate may have an impact
- For shallow voids a flow rate of more than 90 kg/min should be avoided for both 60 and 120 second discharges
- High cabinets etc. can restrict the distribution of the extinguishant from the nozzles. Aim for a minimum the clearance between the ceiling and the obstruction of 1 m. If less than 1m consider the obstruction as forming a compartment and add nozzles accordingly either side.

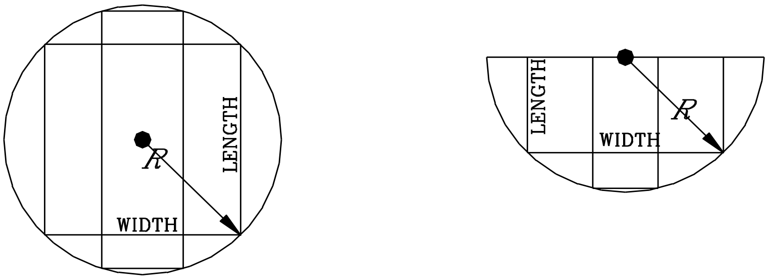


Figure 4.7.2a – 360° Nozzle (left), 180° Nozzle (right)

Nozzle:	360°	Wall Mounted Covering 180°
R Max if void height >0.3m R Max if void height <0.3m*	7m 3.5m	7m 3.5m
Maximum distance between nozzles	10m	10m
Maximum distance from wall		0.15m
Room height. Use multiple rows if exceeding maximum height	5m	5m
Maximum distance from ceiling (single row)	0.3m	0.3m

Table 4.7.2b - Nozzle Data for a 1 ½" nozzle at 2.4m height

*NOTE: If the floor void is too shallow or restricted we recommend replacing a minimum of 1 in 4 floor tiles to grille tiles to allow the room to flood the floor void.

- Nozzle flow rate limitations are determined by the flow calculation and depend on the orifice size and nozzle pressure
- There will be some turbulence around the discharge nozzle and ceiling tiles etc. should be fixed for a radius of 1.5m around the nozzle
- Ensure that the discharge will not directly impinge on nearby objects such as light fittings or disturb any flammable liquids
- For floor and ceiling voids consider the degree of clutter and obstructions that will impede the discharge flow
- Place extra nozzles to compensate. For shallow voids consider mounting the nozzles horizontally
- 360° nozzles should be mounted vertically and 180° nozzles **should be angled at 45°**
- In dirty environments the nozzles should be protected by blow off caps (not LPCB approved) which must be restrained or light to prevent becoming a damaging projectile and must be replaced after a discharge.

4.10. Piping Configuration

- The piping configuration should be kept as simple as possible
- Pipe work /manifold shall be constructed from strong materials such as steel and be to international/European standards suitable for a maximum working pressure of 60 bar
- Pipes and fittings should be kept away from any corrosive environments and kept in a good condition free from rust
- Use the Inertech calculation software to determine pipe sizes and nozzle orifices.
- Consider mechanical damage and fire involvement when routing the pipe work.

4.11. Venting Considerations

- Venting of an enclosure will be necessary to relieve the over pressure due to the increased volume of gas in the risk area
- Remember that the Constant Pressure Discharge feature will significantly reduce the venting area when compared to conventional systems
- For specific vent sizes follow the details provided by the Inertech calculation programme
- Vent opening pressures should be set in relation to the strength of the enclosure
- If a single vent area is provided for a system with room and ceiling voids then adequate venting between

the spaces must be provided to avoid over pressurisation.

- If venting into another space consider its ability to vent the volume of gas and activating any fire detection system within that space.

4.12. Leakage From The Protected Space

- After discharge the Inert Gas must be retained for a sufficient period of time to allow the cooling of the ignition source and to prevent re-ignition. Refer to NFPA 2001, EN15004 & ISO 14520 for guidance on the period. This is known as the hold time
- To ensure that the hold time is achieved a room integrity test must be carried out in accordance with the standards
- The hold time is determined by the fan test specified in Annex E of EN 15004 -1 or a discharge test based on the criteria in EN 15004 -1 7.8.2 and must be a minimum of 10 minutes. Unless specified otherwise by the authority

4.13. Pipe Size Estimates

EN 10255/Schedule 40 pipe

Pipe Size	Design Discharge Quantity, kg	Maximum Discharge Quantity, kg
1/2"	1 to 23	1 to33
3/4"	24 to 45	34 to 67
1"	46 to 90	68 to 134
1 1/4"	91 to 118	135 to 175
1 1/2"	119 to 155	176 to 235
2"	156 to 237	236 to 419
2 1/2"	238 to 336	420 to532
3"	337 to 777.1	533 to 1151
4"	778 to 1337	1152 to 1982
6"	1338 to 2817	1983 to 4173

Figure 4.11 – Pipe size estimation table by flow rate

(Note: For 120s discharge time double the values above.)

5. EQUIPMENT DESCRIPTION AND INSTALLATION

An Inertech system can be used to protect a single risk or multiple risks with a single bank (with or without a reserve) of storage cylinders. All of the parts used in a single risk system are listed and described in this section along with steps to install them correctly.

System Components

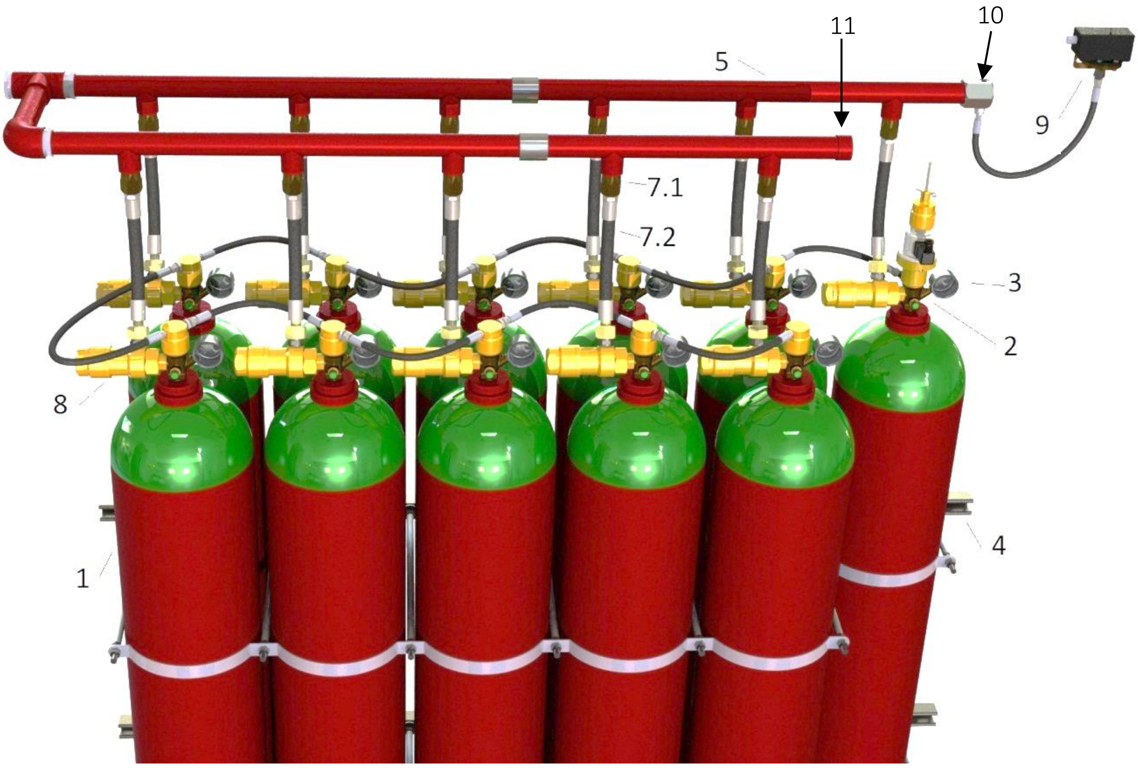


Figure 5.0 – Basic non – selector valve system setup with basic components labelled

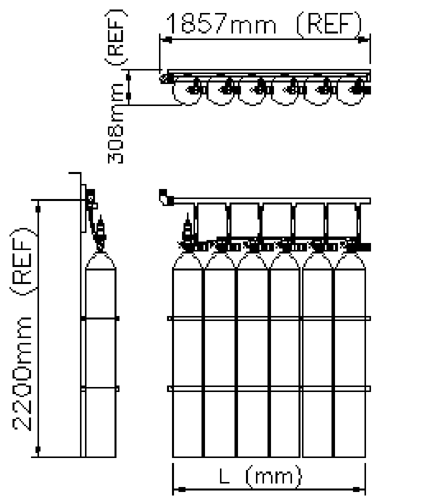
Key

1. Cylinder
2. Cylinder Valve
3. Cylinder Pressure Gauge
4. Racking System
5. Manifold System
6. Discharge Nozzle (Not shown)

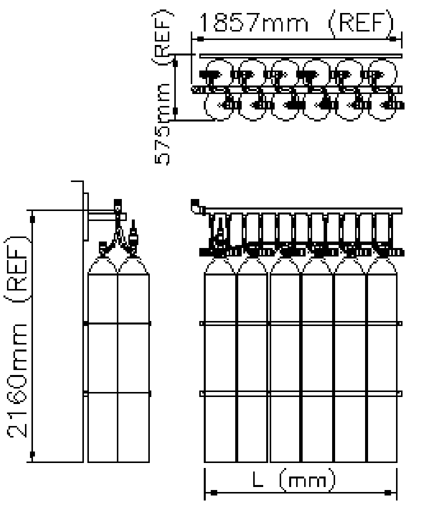
7.1 – Check Valve, 7.2 – Discharge Hose

8. Pressure Controller
9. Discharge Pressure Switch
10. DN50 Manifold End Cap - 1/4 DPS Connection
11. DN50 Manifold Blind End Cap

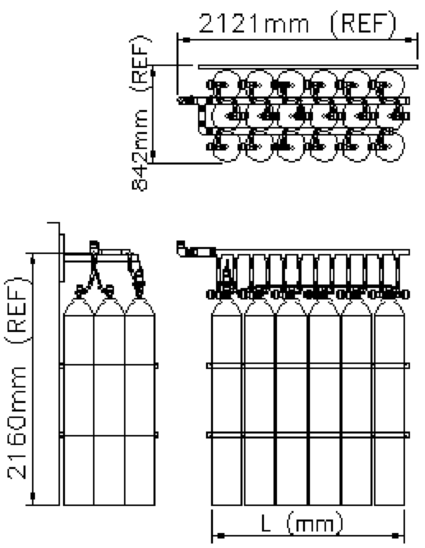
Note: Non Selector valve systems do NOT use the bleed valve, selector valves or their pressure regulator, manifold pressure gauge. See Sections 5.10 - 5.14 for Selector valve systems.



Single Row Arrangement



Double Row Arrangement



L = [(No. of cylinders – 1) x 286] + 267
in front row

Triple Row Arrangement

Note: Diagrams for 80L Inertech cylinder arrangements (For demostation purposes)

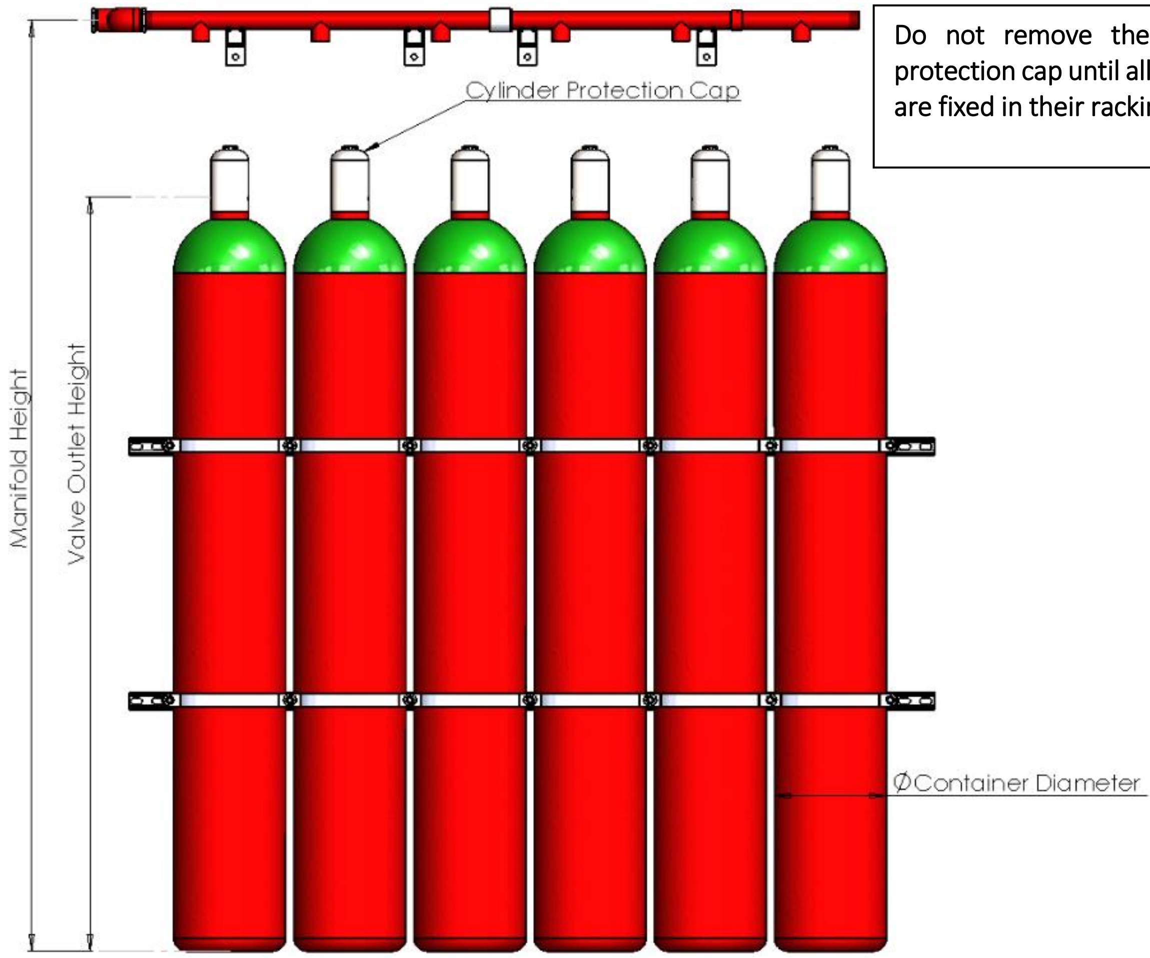
5.1.Storage Cylinder Assembly

Inert Gas is stored in specially designed storage cylinder assemblies. Storage cylinders are available in various sizes and are pressurised to 200 or 300 bar. Each storage cylinder is equipped with an identification label indicating the quantity of Inert gas, pressurisation level and supplier. Dip tubes within the cylinder are not required.

The steel storage cylinders are manufactured to the requirements of the National Standards appropriate with their country of use. Valve cap to EN 11117.

Storage cylinders must be secured with the supplied racking to a solid wall or framework. Only cylinders of the same capacity and pressure shall be manifolded together. Refer to *Figure 5.1b* for storage cylinder dimensions, outlet heights and weights. (note: all sizes and pressures are kept in stock)

Storage cylinder fills / Dimensions



Do not remove the cylinder protection cap until all cylinders are fixed in their racking.

Figure 5.1a - Height indicator

Assembly Part no.	Empty wt. kg	Vol. l	Dia.	Cylinder Spacing	Outlet Height *	Single Manifold Height (DN50)	Double Manifold Height (DN50)
NF320672#	90	67	267	286	1560±10	1950±25	1910±25
NF320803#	108	80	267	286	1810±10	2200±25	2160±25
NF321402#	196	140	356	376	1785±10	2175±25	-

*Check Cylinder details before installation (table based on 300bar Cylinders)

Figure 5.1b – Storage Cylinder Dimensions

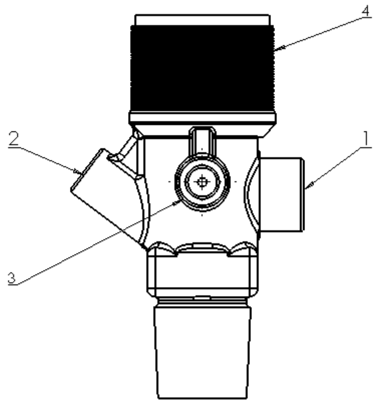
Part no.	Capacity, V/L	IG100, kg	IG01,kg	IG55,kg	IG541,kg
200 bar @ 15 °C					
NF3206721#	67.5	15.15	24.17	19.41	20.32
NF3208021#	80	17.95	28.64	23	24.08
NF3214021#	140	31.42	50.13	40.25	42.14
300 bar @ 15 °C					
NF3208031#	80	24.74	40.92	32.23	33.5
NF3214031#	140	43.29	71.61	56.40	58.5
NF3215031#	150	46.38	76.72	60.43	62.5
*Code #:		2 = IG100	4 = IG01	3 = IG55	5 = IG541

Figure 5.1c – Gas variant storage cylinder fills

Important: The cylinders must be installed in the racking before the cylinder transport cap is removed. An arrow on the cylinder will indicate the position of the valve discharge outlet as shown in *Figure 5.2* The cylinders must always be transported with their protection caps fitted. Use of a 4 wheel trolley to move the cylinders.

5.2.Storage Cylinder Valve

Storage cylinder discharge valves have a forged brass body and accept connections for the discharge outlet, actuator, pilot gas connection and a pressure gauge/switch. The 200/300 bar differential pressure valve (*Figure 5.2.1*) can be actuated pneumatically, manually and electrically through the top screwed connection.



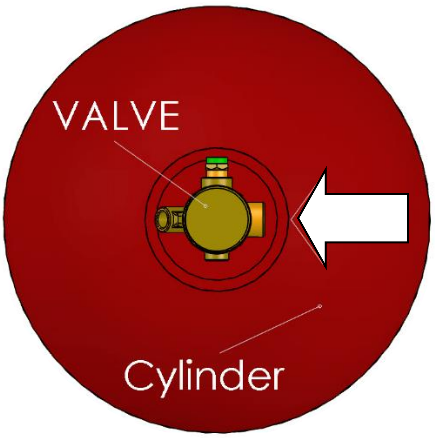


Figure 5.2 - 200 / 300 bar Differential Pressure Valve (left),

Plan view of cylinder with protection cap removed showing out position sticker (right)

Technical Data:

The storage cylinder valve has five connections:

1. Outlet with DIN477 connection
2. Pressure gauge/pressure switch connection: This is a threaded connection housing a check valve and must be fitted with Firetec Fire Protection approved devices to function correctly
3. Valve 'discharge pressure' connection G1/8 to pneumatically actuate slave storage cylinders. The master cylinder valve plug is removed and used to plug the last pneumatic actuator port on NON selector valve systems.
4. Top mounted actuator connection for solenoid actuator and pneumatic actuator
5. Rupture disc (green not shown, opposite 3) to discharge the gas should the working pressure of the storage cylinder be exceeded. DO NOT UNSCREW.

5.3.Storage cylinder pressure gauge/switch

5.3.1. Pressure Gauge (NF384003)

DO NOT fit until the cylinders are fully secured in their racking.

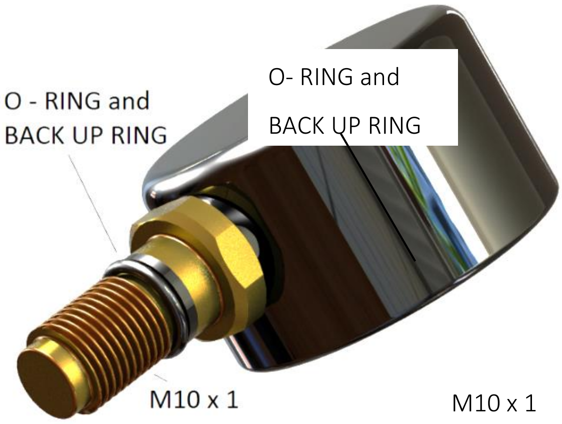


Figure 5.3 – Cylinder Pressure Gauge

- To indicate the pressure in the storage cylinder
- Displays 0-360 bar
- M10 x 1 connection to storage cylinder

5.3.2. Pressure Gauge Including Switch (NF3850XX)

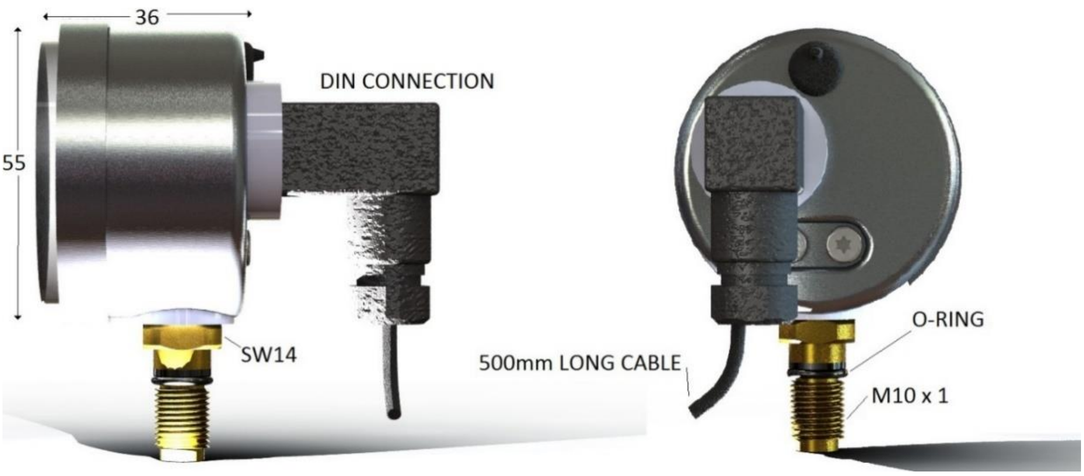
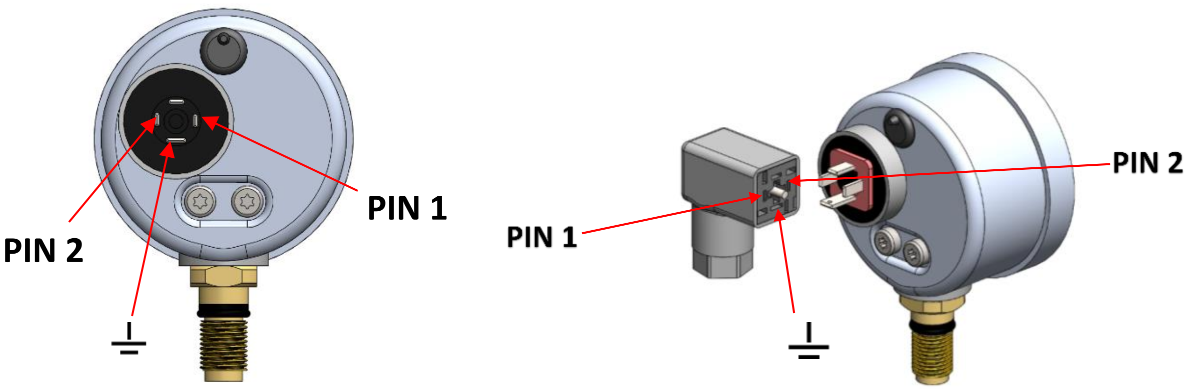


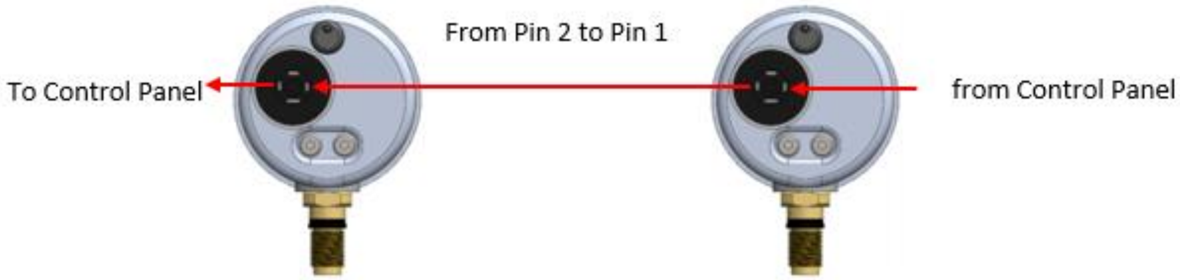
Figure 5.3.1 – Cylinder Pressure Gauge Including Switch side view (left) and back view (right)

- 200 bar cylinder: NF385022
- 300 bar cylinder: NF385023



a. **Single cylinder pressure gauge connection**

b. **Multiple cylinder pressure gauge connection**



Technical Specification	200 Bar Gauge (NF385022)	300 Bar Gauge (NF385023)
Pressure Range, bar	0-250	0-400
U	4.5-2.4VDC/VAC	4.5-2.4VDC/VAC
I	5 – 100 mA	5 – 100 mA
Switching Pressure, bar	180 ± 0.9bar	270 ± 0.9bar
P Max,W	2.4	2.4

The switches within the gauges are closed when the cylinder pressure is higher than the switching pressure and the monitoring circuit is maintaned. They open when the cylinder pressure drops below the switching pressure.

5.3.3. Pressure Switch Control Panel Connection

- Kentec panel example - Low Pressure Switch input inverted on panel
- Circuit valid for Sigma XT4 Series 21000 other panels may vary

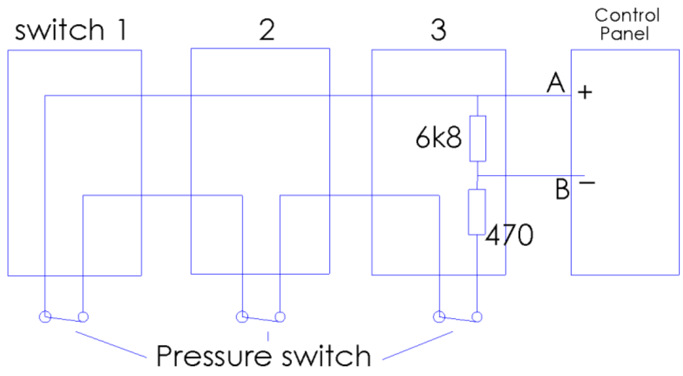


Figure 5.3.2a – Series circuit shown with all cylinders above pressure

Event	Message	Fault	Alarm
Switch Open	Extinguishing Pressure Fault	Fault Light	Buzzer
Short Circuit A	Low Pressure I/P Fault	Fault Light	Buzzer
Open Circuit B	Low Pressure I/P Fault	Fault Light	Buzzer

Figure 5.3.2 b – Kentec Sigma XT behaviour due to switch events

(Refer to Figure 5.3.2)

5.3.4. Installation of Storage Cylinder Valve Pressure Gauge/Switch

- Remove the pressure gauge connection transit plug using a 4mm hexagonal key and retain for future use, See *Figure 5.2*
- Connect the storage cylinder valve gauge to the storage cylinder valve using connection 2 *Figure 5.2* and the M10 x 1 connection on the gauge
- Before screwing in the parts, make sure that the O-ring seal and back-up ring are not damaged. The backing ring goes behind the O ring with the concave face towards the ring. (The pressure pushes on the O -ring and the O -ring pushes on the backing ring).
- Align correctly, the gauge to avoid shredding the O-ring or back-up ring.
- Hand tighten until pressure, and then use a 14mm spanner across the flats to fully tighten, if the display is not visible unwind until visible using maximum of 1 rotation
- If removed, seal the port with the transit plug
- The gauge may be connected and detached while the storage cylinder is pressurized
- Use only original connecting parts designed for these valves
- If this gauge is removed when the cylinder is pressurized the O –ring may make a loud pop, this is normal.
- Do <u>NOT</u> use any external lube to coat the gauge.

5.4. Cylinder Racking

5.4.1. Wall Rails

All racking systems use a BS6296:1988 rail as shown (commonly known as Unistrut) as shown below. Note: Supplied by the installer.

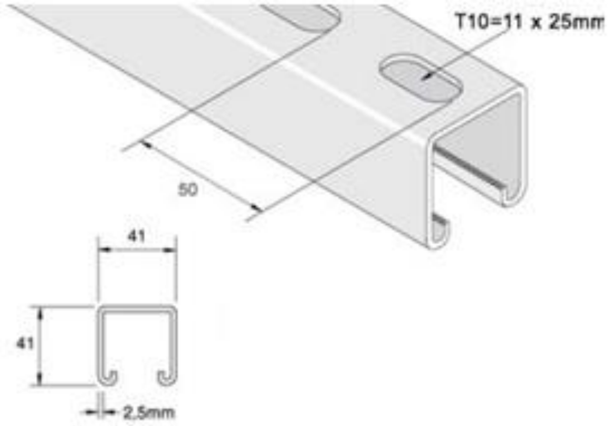


Figure 5.4.1 – Wall Rail Dimensions

5.4.2. Single Row Cylinder Strap

Used to secure single cylinders using the wall rails (*Figure 5.4.1)* and a M10 bolt and nut (included) for single row cylinder systems.

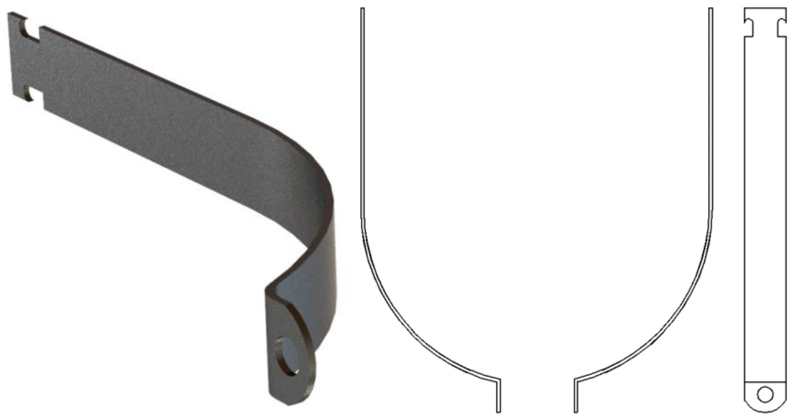


Figure 5.4.2.– Cylinder straps

Single cylinder strap kit	Cylinder diameter
NF3291267	267
NF3291356	356

2 sets required for upper and lower strapping

5.4.3. Multi-Cylinder Racking

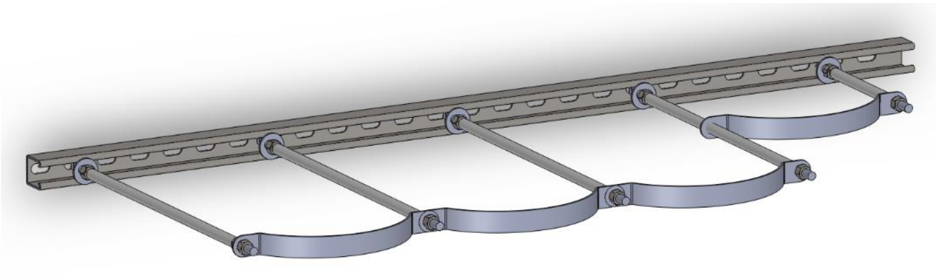


Figure 5.4.3 – Standard Racking for a bank of a row of 2 and a row of 3

5.4.4. Front Strap

The front rails have holes in specific locations so that the securing studding can connect to the wall rails in between each row of storage cylinders.

	Cylinder dia.	Spacing
NF3294267	267	286
NF3294356	356	376

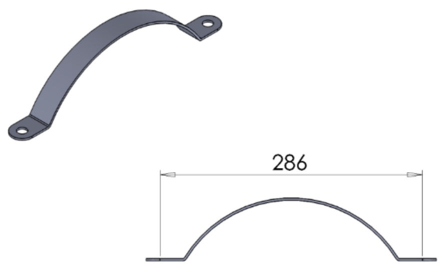
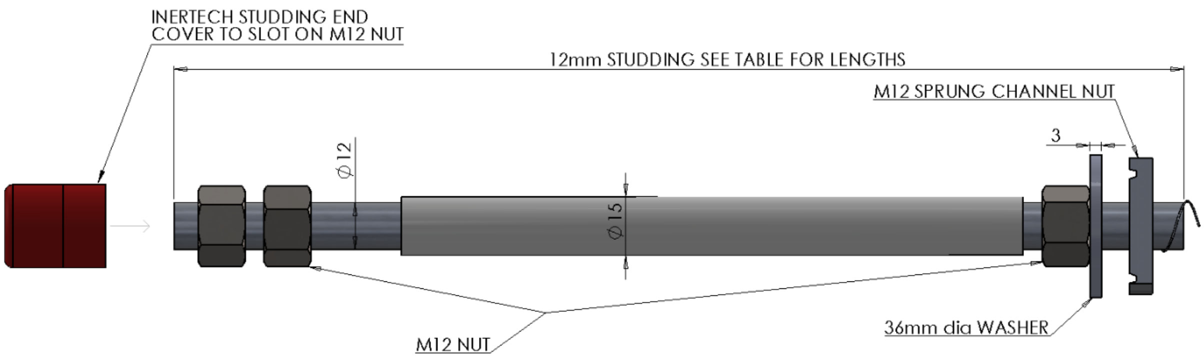


Figure 5.4.4 – Front Strap Information

5.4.5. Studding Assembly



267 cylinder diameter

Rows	Part Number	Studding Length, mm
1	NF3293250	250
2	NF3293520	520
3	NF3293790	790

356 cylinder diameter

Rows	Part Number	Studding Length, mm
1	NF3293347	347
2	NF3293703	703
3	NF3293059	1059

Figure 5.4.5 – Studding Assembly layout and lengths

5.4.6. Installation of the Racking System and Storage Cylinder Positioning

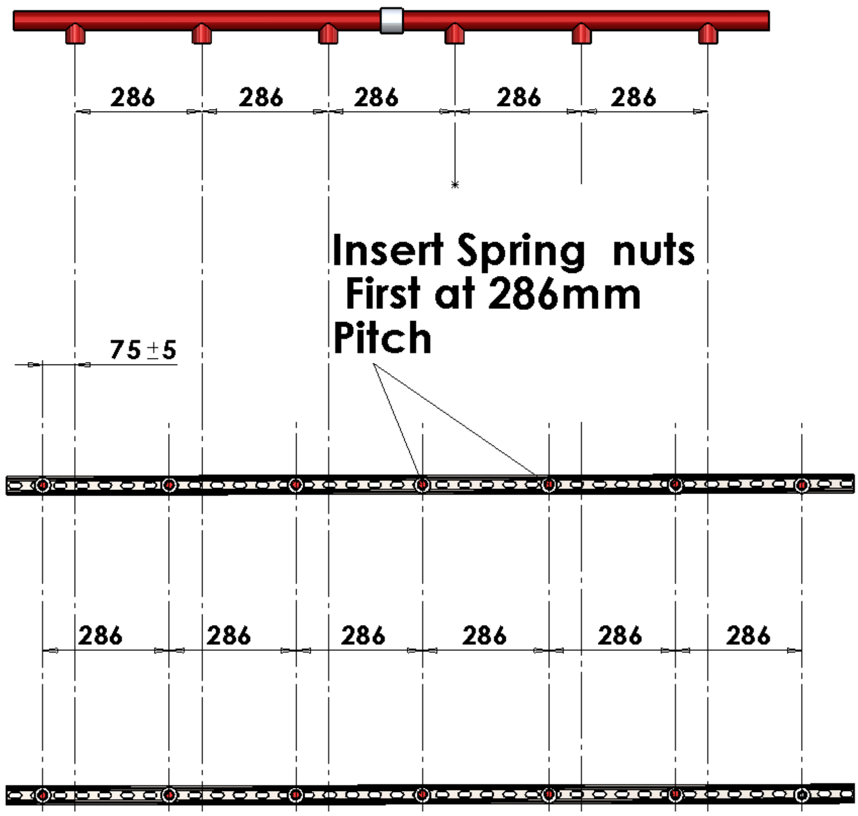


Figure 5.4.6 – Layout of studding and wall rail relative to the manifold

These steps must be taken to ensure that the storage cylinders are secured safely and correctly.

- Fix 2 rows of wall rail to solid wall or framework (parallel to the ground) at 1/3 and 2/3 the height of storage cylinders.
- Fix manifold wall rail to the wall at the appropriate height. (refer to *Figure 5.1) (*normal to the ground*)*
- Slot all of the channel spring nuts into the wall rail with the correct position relative to the manifold, refer to *Figure 5.4.6* for dimensions.
- Starting with the furthest left or right cylinder position install first studding to the wall rails:
  - NB. The discharge outlet hose connection is offset to the manifold inlet by 70 mm and outlet may be left or right handed depending on the installation preference. (use label on cylinder to determine outlet direction, do not remove cap)
  - The sprung channel nut and the M12 nut in *Figure 5.4.5* must be tightened together so that the studding is firmly fixed to the wall rail.
- Ensure the storage cylinder outlets are parallel to the wall.
- Fit the next studding assembly against the positioned cylinder column.
- Secure the first cylinder column with its front strap and allow the front strap of the next column to hang down ready for securing the next column.
- Repeat for all columns of cylinders
- Make sure all of the storage cylinder valves have the same orientation. The orientation of the valve outlet

is indicated by an arrow on the cylinder (*Figure 5.2*). **DO NOT REMOVE THE STORAGE CYLINDER VALVE PROTECTION CAPS UNTIL THE ENTIRE RACKING SYSTEM IS COMPLETE AND SECURE AND THE SYTEM IS READY FOR COMMISSIONING.**

5.5. Discharge Manifold Pipe Work

The Inertech system will operate at no more than 60 bar (downstream of the pressure controller)

- For multi space protection using selector valves the discharge manifold shall be fitted with a pressure gauge and a relief valve
- The manifold will supply the pressure for selector valve with pneumatic actuation via a pressure reducing regulator
- The manifold spacing for the 140 L storage cylinder is 376mm
- The manifold spacing for the 80 L storage cylinder is 286mm
- Refer to *Section 5.5.4* for directions on how to connect more than one row of manifolds.

5.5.1. Standard DN50 Manifolds

Alternatively for larger systems we have available a DN50 manifold allowing for higher flow rates due to the larger bore. The main difference being the double row of cylinder layout, this manifold allows for a single piece of pipe to run along the centre of the two rows rather than two separate sections as per the DN32 version. The second row of cylinders must have the valve outlets positioned 180° to the first row as shown below.

Note. For single rows the manifold is wall mounted and for triple rows 2 manifolds are used.

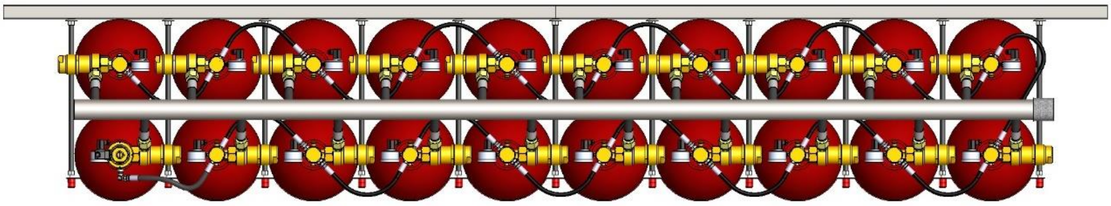


Figure 5.5.1a – Discharge manifold DN50

This component is available in different spacings to suit the cylinder arrangement it will be manifolding together. It is manufactured in the following dimensions:

Part Number	Cylinder Size	Check Valve Spacing	Intended Application
NF335501	80L	286mm	Single Row
NF335502	80L	143mm	Double Row
NF336501	140L	376mm	Single Row
NF336502	140L	188mm	Double Row

Figure 5.5.1b – DN50 Manifold Part Information

The part number is ordered per check valve. For example if a 5x80L cylinder single row manifold was required, the part number would be NF335501 quantity x 5.

Also available for this component:

- NF335650 - DN50 Blind End Cap
- NF335650A - DN50 Manifold Cap with ¼” DPS Connection

Figure 5.5.1.c Double Row manifold DN50

5.5.2. Modular Manifolds

For efficient transport to site the manifolds can be joined together using the special joining piece.

Manifold Connector - NF335450.

Figure 5.5.3 – Discharge manifold assembly comprising of a 2 port and a 3 port manifold and the joining piece

5.5.3. Manifold Arrangements

- The modular standard manifolds are joined together with a special fitting to make longer arrangements.
- FOR EASE OF FITTING THE SELECTOR VALVE REGULATOR TO THE MANIFOLD THE CENTER LINE OF THE MANIFOLD MUST BE NO MORE THAN 100mm FROM THE BACK WALL.

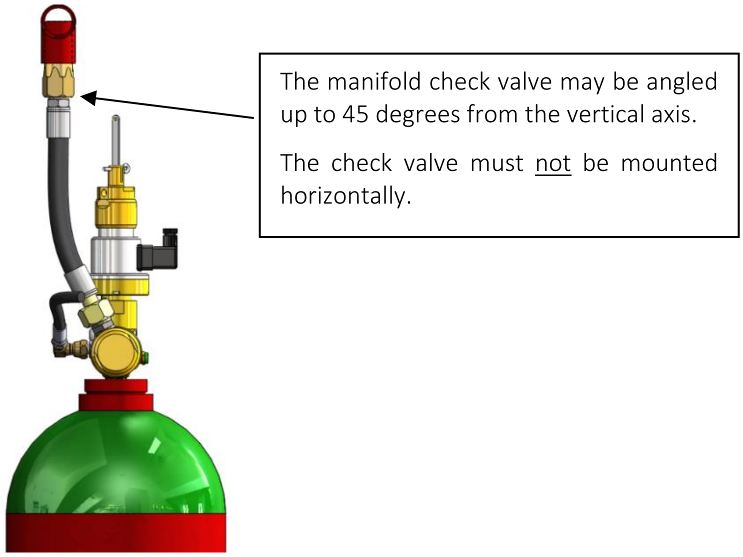


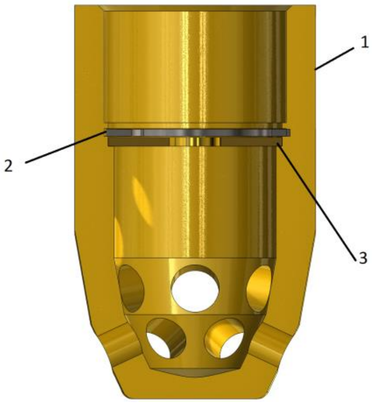
Figure 5.5.3 – Single row Storage cylinder Manifold Mounted side view

5.6. Discharge Nozzle (NF35**0)

A single range of nozzles provides 180 and 360̊ coverage

The orifice plate within the nozzle controls the flow and is pre-determined by the calculation program. Check the correct orifice size against the system design drawing

Please refer to the nozzle part of the design section for nozzle limitations and coverages



Item	Decription
1	Inertech Nozzle Body
2	Circlip
3	Inertech Nozzle Orifice

Figure 5.6a - NF35**0 Nozzle Assembly Cross Section

ASSEMBLY	ORIFICE	Height	A/F	DN
Part No	RANGE	mm	mm	mm(inch)
NF35150	1.6*-10mm	44	24	15 (½”)
NF35200	7-14mm	55	32	20 (¾”)
NF35250	10-18mm	67	41	25(1”)
NF35320	12-23mm	82	54	32 (1-¼”)
NF35400	15-26mm	93	63	40 (1-½”)

* Fit strainer NF35159 when orifice < 3.0mm

Figure 5.6b - Nozzle Data

1. The Inertech inert gas discharge nozzle has a maximum working pressure of 60 bar
2. Material: Brass and stainless steel
3. Suitable for indoor applications
4. Fit to discharge pipework using PTFE sealing tape
5. Visually check every 6 months for blockages, damage or corrosion

5.7. Installation of Manifold, Discharge Pipe Work and Nozzles

- Check for changes to protected space.
  - The pipe work design, discharge rate and nozzle size shall be calculated in accordance with this design manual and the Inertech design software. If the protected spaces change a new calculation must be undertaken using the Inertech calculation software.
- Pipe work fixing - Horizontal and vertical pipe work hangers must:
  - Support the pipe work under all conditions
  - Allow expansion and contraction of pipes
  - Relieve stress on other equipment by taking weight of the pipes
  - Be anchored in to beams, columns, concrete walls to stop longitudinal or lateral movement.
  - Support riser piping independently from horizontal piping
  - Must not be supported by other piping e.g. water pipes
  - Maximum recommended spacing between hangers are given in EN 15004 -1 6.3.4
- Pipe Work Requirements:
  - In corrosive environments the pipe work shall be protected. In general all steel pipe work should be galvanised or zinc plated
  - Use only appropriately pressure rated pipe and fittings for 60 bar pressure
  - Take into account closed sections when selector valve with pneumatic actuators are used
  - Use concentric reducer and reducing couplings/bushes for pipe size reductions
  - All screwed pipe joints (ie all taper threads) are made with sealing tape/compound. Do not cover the first 2 threads to prevent sealant entering pipe work
  - Screwed pipe must be clean cut with full length threads
  - Welded joints must permit full bore flow
  - Do not use mitre welds
  - Follow the guidance in the international standards and local regulations on protecting the system and pipe work from mechanical damage, the effects of fire, earthing (see EN 15004-1 5.5) and electrical clearance (see EN 15004-1 5.4), marking of pipe work and the competency of the installer. Do not install pipe work where it could be subjected to mechanical damage.
  - All pipe work must be free from deformities and ridges that can impede the flow and all burrs and sharp edges must be removed
  - Pipe work must be painted or banded to identify use in accordance with national standards.
  - Each pipe section shall be cleaned internally after preparation and before assembly by means of swabbing, utilizing a suitable non-flammable cleaner
  - The pipe network shall be free of particulate matter and oil residue before installation
  - To be installed by a competent pipe fitter with full knowledge of the relevant standards
  - No changes to the pipe work layout are permitted without the authority of the system designer. Any changes in lengths, pipe diameter and number of fittings will have a significant impact on the flow calculations.
- Manifold installation
  - Fix the manifold in place with the horizontal and vertical rails. Referring to Figures 5.5.1a, 5.5.1b, 5.5.2, 5.5.3 and 5.5.4 for different manifold connection arrangements. Refer to Figure 5.1b for dimensions.

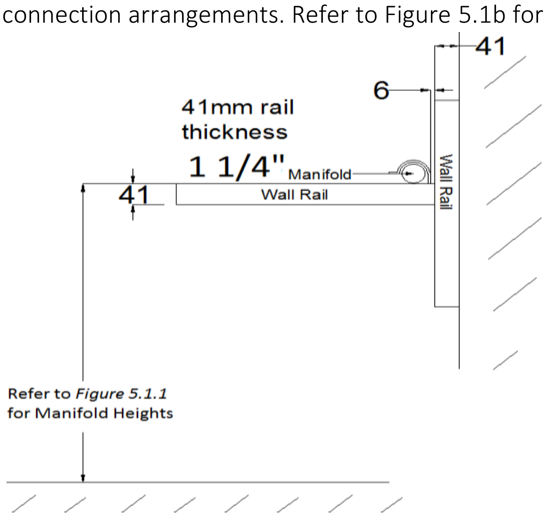


Figure 5.7- Manifold Rail Dimensions.

*see table in figure 5.1b for heights

- Connect discharge nozzles:
    - Place nozzles in location and direction shown on the installation diagram
    - Place away from areas so that discharge area will not impinge personnel in normal conditions
    - Place away from loose items such as shelves that could become missiles on discharge
    - Check nozzle for correct stamping indicating the orifice diameter, if ignored this could affect the performance of the Inertech system.

5.8. Discharge line

5.8.1. Discharge Check Valve (NF34131)

Only the hoses supplied shall be used which have an appropriate pressure and flow rating.

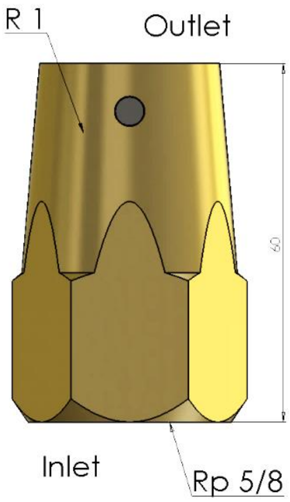


Figure 5.8.1- Discharge Check Valve

- A safety feature to prevent flow from the manifold when a cylinder is removed.
- Minimum through bore is 13mm
- Maximum working pressure is 350 bar
- Check valve is in accordance with En 12094 -13
- The materials are brass and stainless steel
- Use the R1 connection to connect the check valve to the Rp 1 port on the manifold
- Visually check every 6 months for damage

5.8.2. Flexible Discharge Hose (NF3312300)

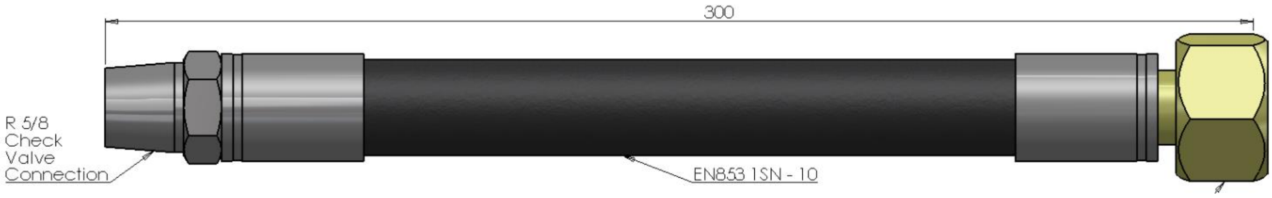


Figure 5.8.2 - Flexible Discharge Hose

Discharge hoses and check valves must be used for all systems

- Flexible hoses must be used
- All storage cylinders must be of the same size, fill and pressurisation
- All flexible hoses must be fitted with the Firetec Systems Ltd. Check/Non return valve. The check valve stops the flow from the discharge pipe work/manifold back to non-operated discharge valves and any unconnected discharge valves as a safety measure
- The check valve inlet must face vertically downwards, at up to 45 degrees from the vertical but NOT horizontally or inverted. The inlet is the end of the check valve that is connected to the flexible discharge hose.
- The Inertech check valves provide an unrestricted full bore discharge
- Minimum through bore 12mm
- Maximum working pressure 130bar for the hose
- The fittings are steel with zinc plating, the hose is made from synthetic rubber
- The connection is type 1 to the EN12094 -8 standards
- Assemble to the check valve with PTFE tape before connecting to pressure controller. Do not use PTFE tape to connect to the pressure controller
- Minimum bend radius of 200mm
- Visually check every 6 months for damage or discolorations

5.8.3. Pressure Controller (NF311250)

The pressure controller connects directly onto the outlet of the discharge valve and receives the high pressure inert gas of up to 300 bar at its connection (A). The device produces a controlled output pressure of inert gas at its connection (B). This controlled pressure will be a maximum of 60 bar.

Controlling the pressure over the discharge time allows for smaller bore pipe work throughout of the system than traditional orifice plate systems.

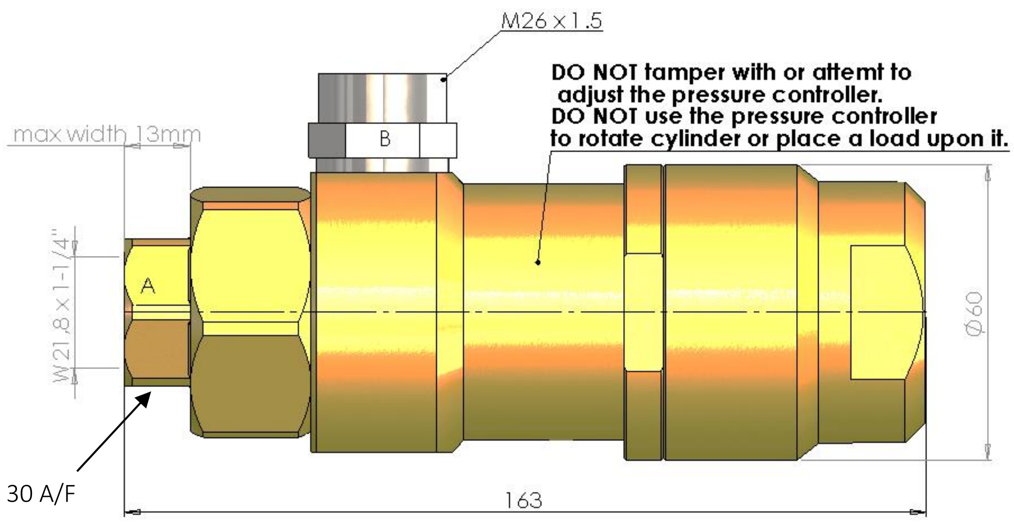


Figure 5.8.3 - Discharge Pressure Controller

5.8.4. Installation of Pressure Controller, Discharge Hoses and Check Valves

Only follow this section if the storage cylinders are securely fastened and the discharge pipe work and nozzles are fitted, refer to *Section 5.4.1 & 5.6*

- The manifold ports face downwards
- Use thread sealing tape
- Screw all discharge check valves tightly into every manifold port
- Screw a discharge hose into the inlet of each check valve
- The 'check valve' inlet faces downwards as it is biased closed by gravity
- The 'check valve' is designed for fitment to welded socket and screwed tee manifolds
- Remove storage cylinder valve protection cap
- Attach the Pressure Controller to the discharge valve outlet using the swivel nut A shown on Fig 5.8.2 using a 30mm A/F open ended spanner (ensure that the plastic seal is in place before attachment). **Ensure the seal is still present inside the female connection for connection 'A' on the pressure controller**
- Screw the free end of the discharge hose (36mm A/F) onto the pressure controller via connection B (*Figure 5.8.2).*
- Do not place any strain on the pressure controllers or attempt to move or rotate the cylinder using the pressure controller
- The Pressure Controller may be rotated to assist the alignment/engagement of the discharge hose.

5.9. Pipework accessories

5.9.1. Discharge Pressure Switch (NF380210)(– 2 bar rising)

The discharge pressure switch will confirm the discharge of the inert gas. The switch changes state when pressure is applied, the switch will require the reset button to be pressed after a discharge. The connection to the pressurized system is a ¼" BSP male Parallel.

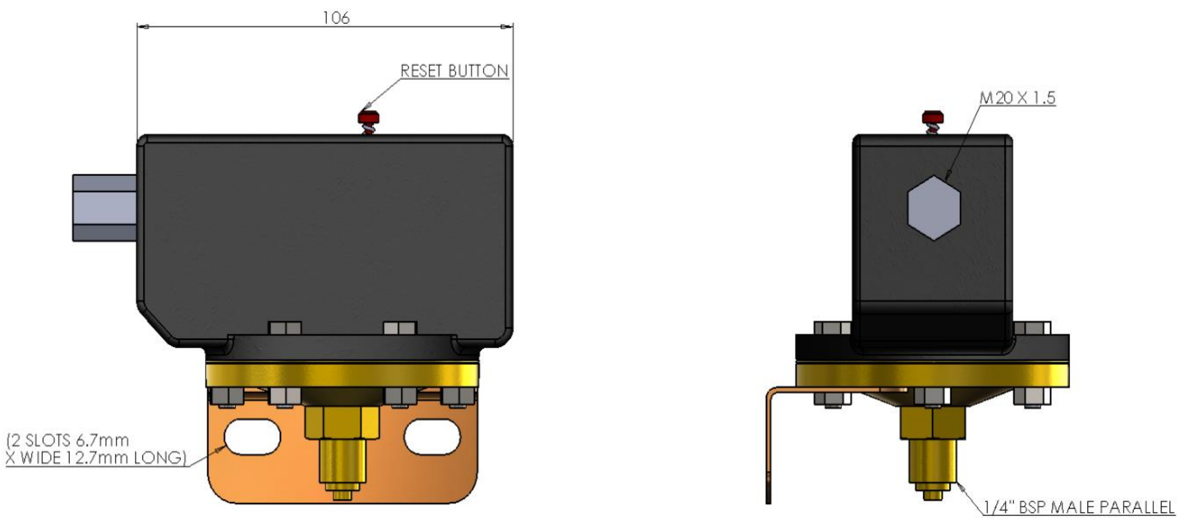


Figure 5.9.1 – Discharge pressure switch

- Overload protected to 70 bar
- Set 2 bar rising (latching, manual reset)

5.9.2. Discharge Pressure Switch Hose (NF380211)

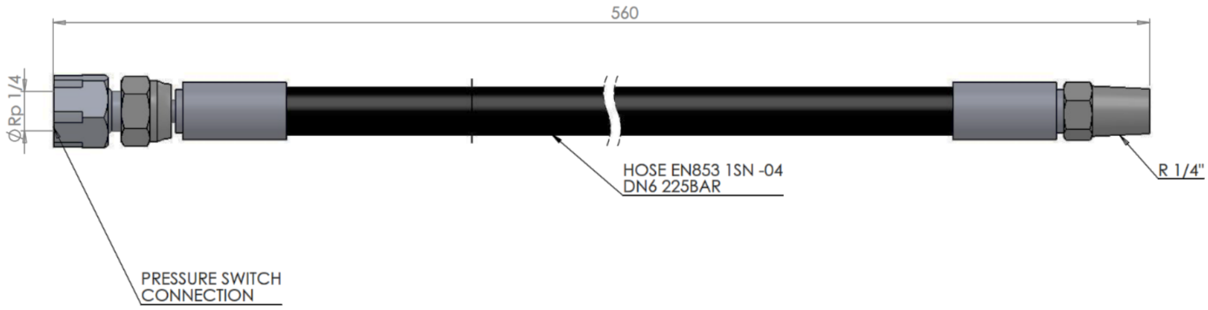


Figure 5.9.2 – Discharge Pressure Switch Hose

5.9.3. Installation of Discharge Pressure Switch

- The switch itself must be mounted securely to the wall near either the manifold or the pipe work downstream of the selector valves within range of the discharge pressure switch hose
- Connect the G1/4" male connection on *Figure 5.9* to the female ¼" parallel connection on *Figure 5.9.1*
- If system is a selector valve system then a discharge pressure switch is required downstream of each selector valve

SAFETY PRECAUTIONS

- All electrical installation, adjustment and maintenance should be carried out by a competent electrician with the pressure switch electrically isolated
- Do not exceed the electrical rating given on the label
- Check that the pressure connection correctly matches that of the pipe work
- Before removing pressure switch from the pipe work ensure system is unpressurised

Note: The Discharge Pressure Switch must be connected to the downstream pipework for selector valve systems downstream from each selector valve so that it confirms the discharge to each particular risk. The fitting is R ¼" to prevent connect to the pneumatic actuation.

DO NOT CONNECT TO THE DISCHARGE VALVES

5.9.4. Odouriser (NF361076)

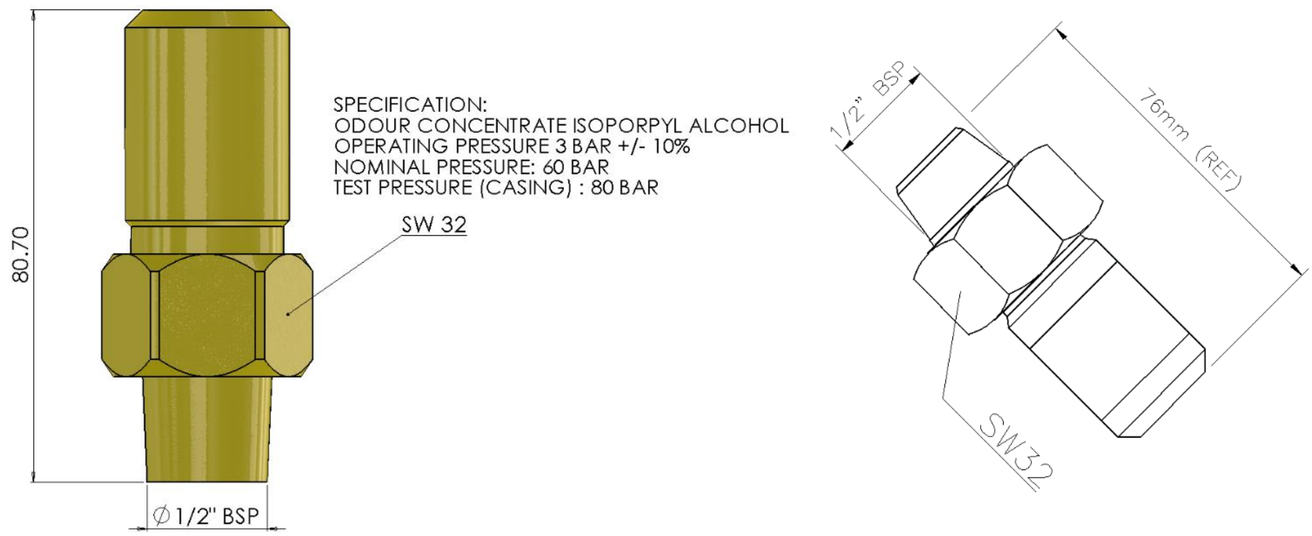


Figure 5.9.4.a – Inertech Odouriser

- Fit into the discharge pipe work so the outlet is uppermost using reducing tee to ½" BSP followed by a 45 degree elbow angled towards the flow.
- The Odourising device adds concentrated odour fluid to gaseous fire extinguishing systems
- Upon discharge of the extinguishant, the bursting disc will be ruptured, adding the odour fluid to the flowing extinguishant
- Replace after system discharge.
- Recommendation is to use if the occupied protected space oxygen concentration is below the LEL. See EN15004 and clause 3.27

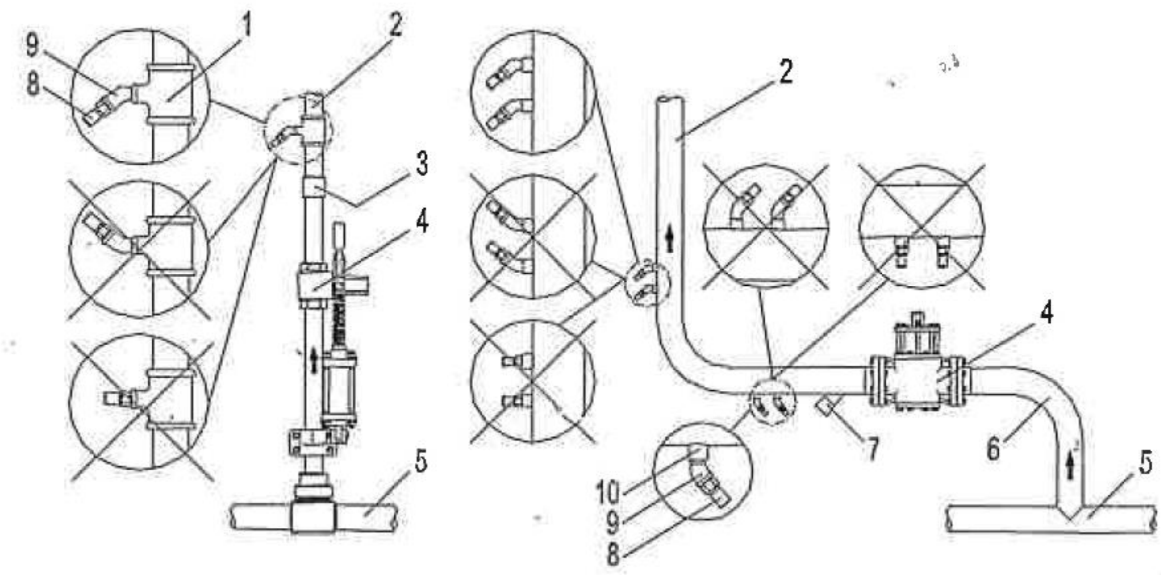


Figure 5.9.4.b – Inertech Odouriser Installation

5.10. Selector Valve Configuration

Additional parts are required over a non-selector valve system.

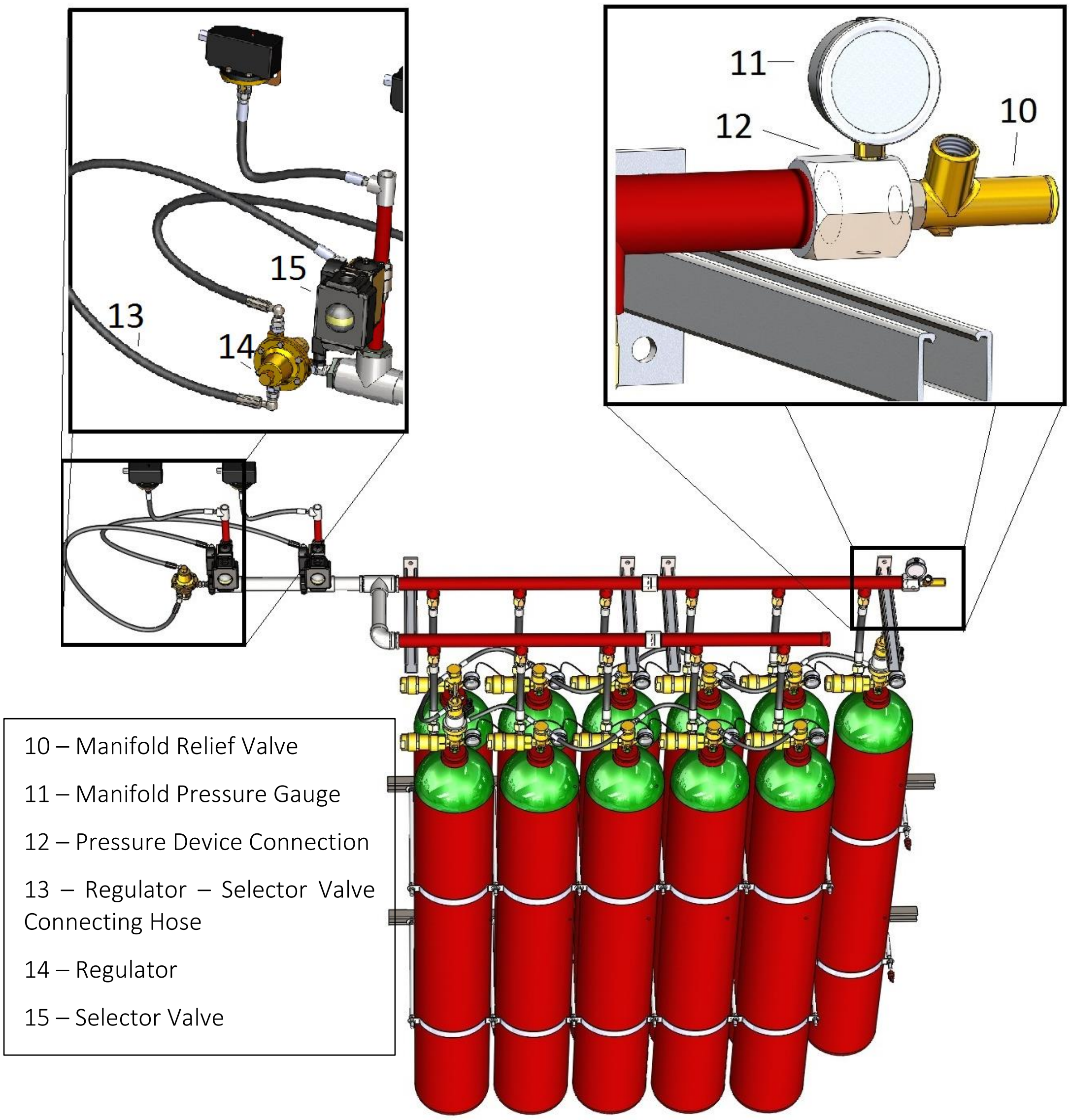


Figure 5.10a – Basic selector valve system with additional parts unique to the selector valve system labelled

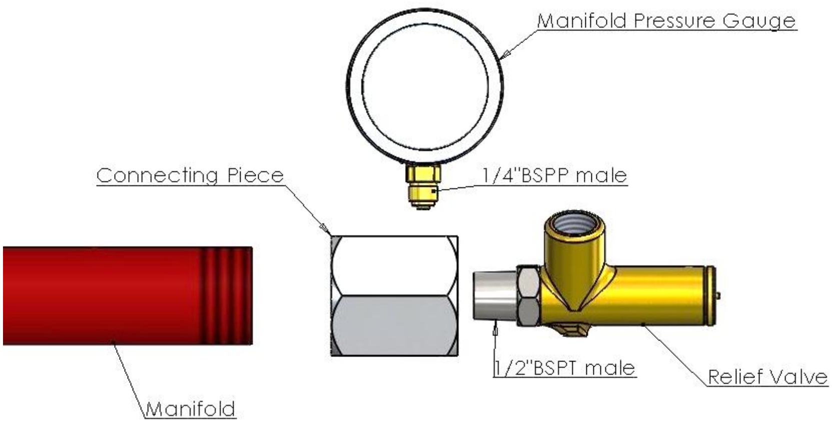


Figure - 5.10b – DPS/Relief Valve/ Manifold Gauge Connection Diagram

5.10.1. Manifold Relief Valve (NF3412075)

- Must be fitted to all closed sections of pipe work
- Protects the manifold from over pressure.
- Set pressure 75 bar
- Vented to a safe area
- ½" BSP thread

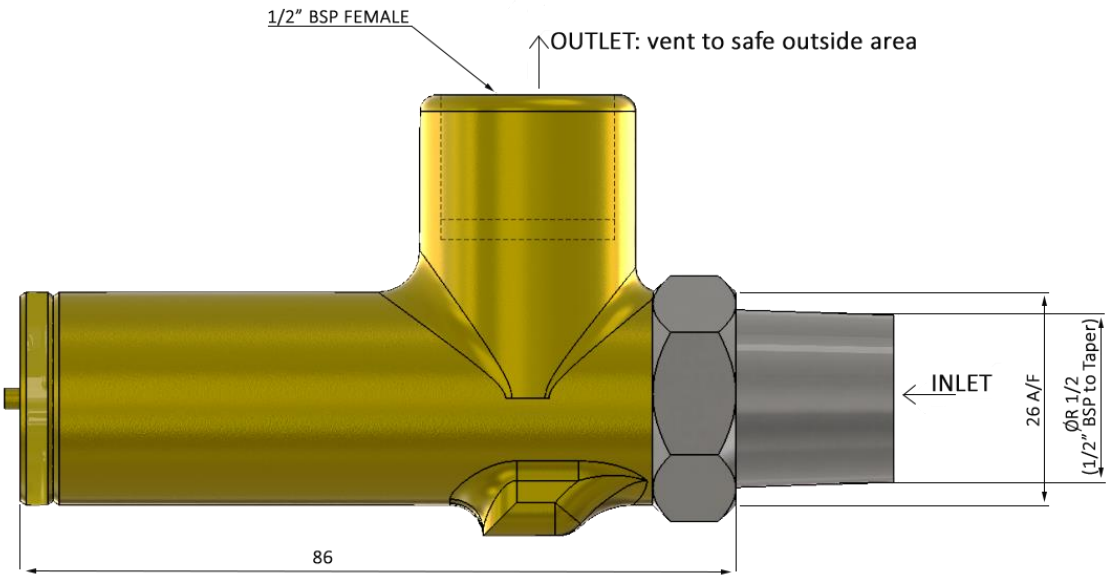


Figure 5.10.1 – Manifold Relief Valve

5.11. Manifold Pressure Gauge (NF386810)

- To indicate the pressure in the manifold
- Displays 0-100 bar
- ¼" BSP connection to manifold

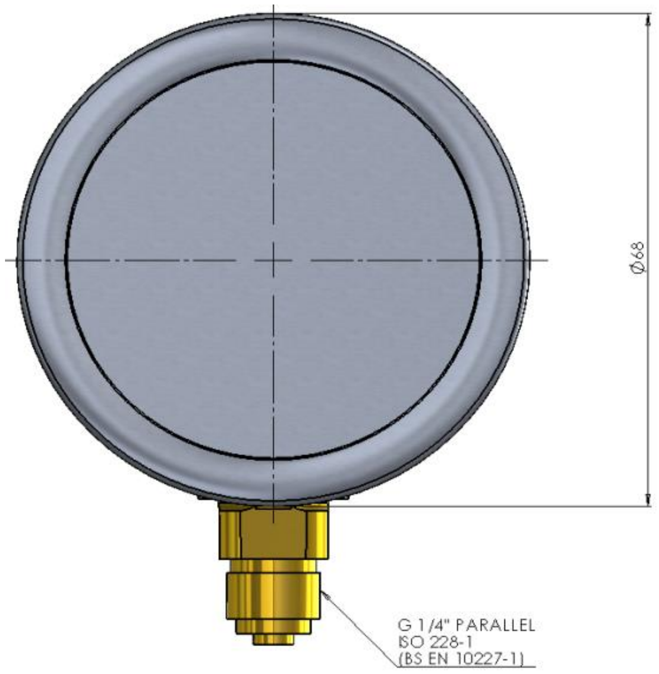


Figure 5.11 – Manifold Pressure Gauge

5.12. Manifold Pressure Device Connection (NF335550 DN50)

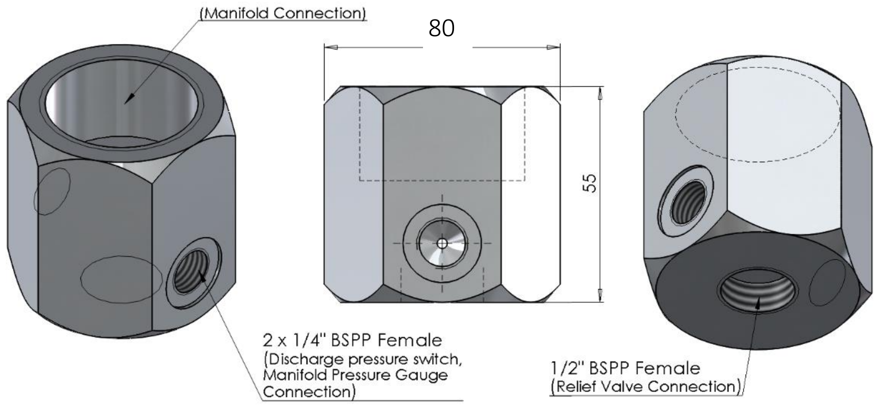


Figure 5.12 – NF335550 Pressure Device Connection

5.12.1. Installation of Manifold Relief Valve, Pressure Gauge

NOTE: Refer to figure 5.10

Manifold Gauge

- Fully screw the manifold pressure gauge into the pressure device connection.
- If the gauge face is not visible unscrew the gauge until visible using maximum of 1 turn

Relief Valve

- Screw the manifold relief valve into the ½" pressure device connection via the R ½" connection (*Figure 5.10.2) Connect the outlet to pipe work directed to a safe area.*

General

- Use only supplied parts.

5.13. Installation of Selector Valve Pressure Regulator and Selector Valve

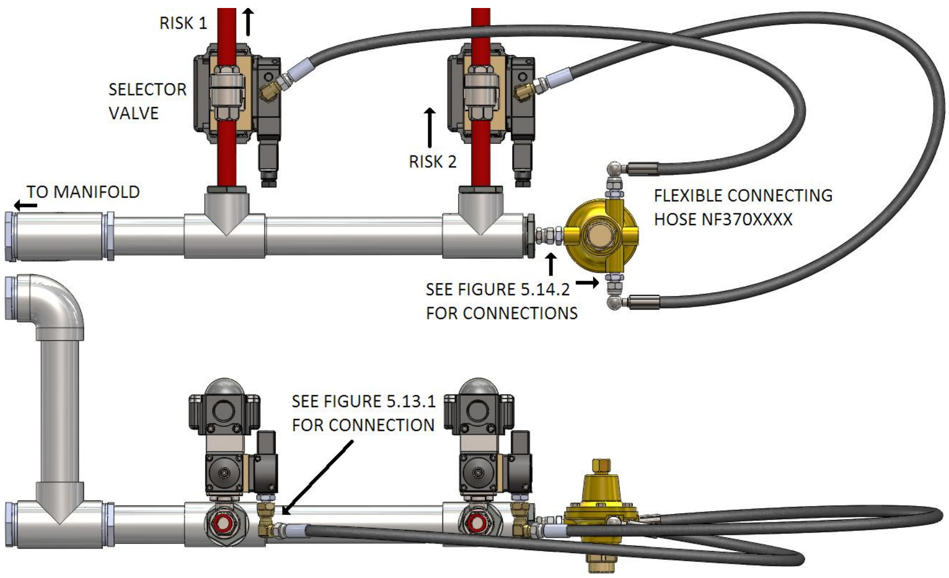


Figure 5.13 – Pressure Regulator, Selector Valves, Connecting Hoses and Fittings. Back view (Top), Plan view (Bottom).

5.13.1. Connecting Hose – Selector Valve - Regulator (1000) (NF3701000)

PART NUMBER	SIZE,mm
NF3701000	1000
NF3701500	1500
NF3702000	2000

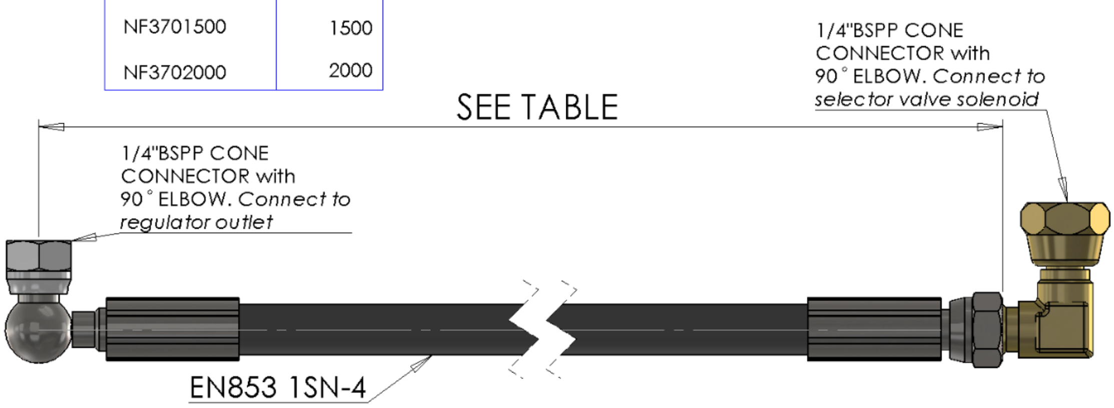


Figure 5.13.1 – Connection Hose - Selector Valve - Connecting Hose

- Supplied with elbow NF370002
- To be connected to the outlet of the regulator via the ¼" BSPP connection (*Figure 5.14a, 5.14b)* and the other end to be connected to the solenoid valve on the selector valve via the ¼" BSPP connection (*Figure 5.15a).*

5.14. Pressure Regulator – Selector Valve (NF321608)

- Reduces 60 bar manifold pressure to fixed 7.5 bar suitable for the selector valve pneumatic actuator and solenoid valve.

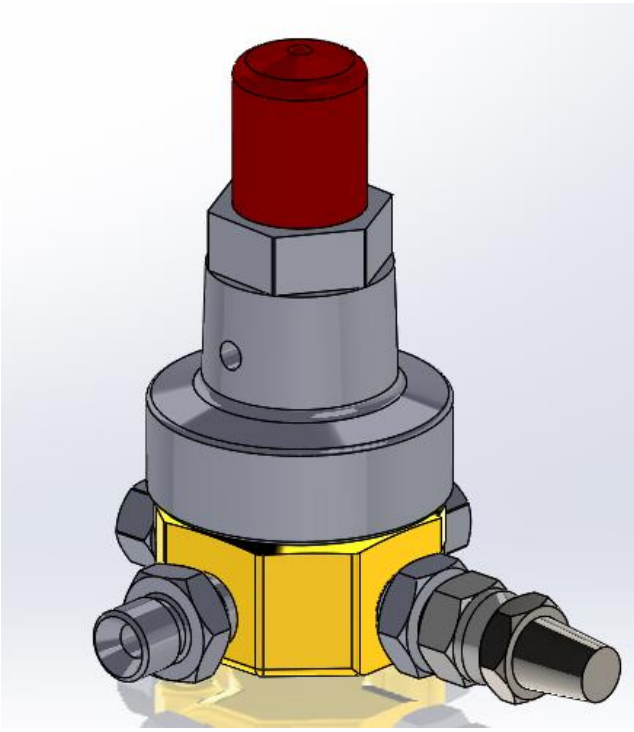


Figure 5.14.a – Regulator Assembly

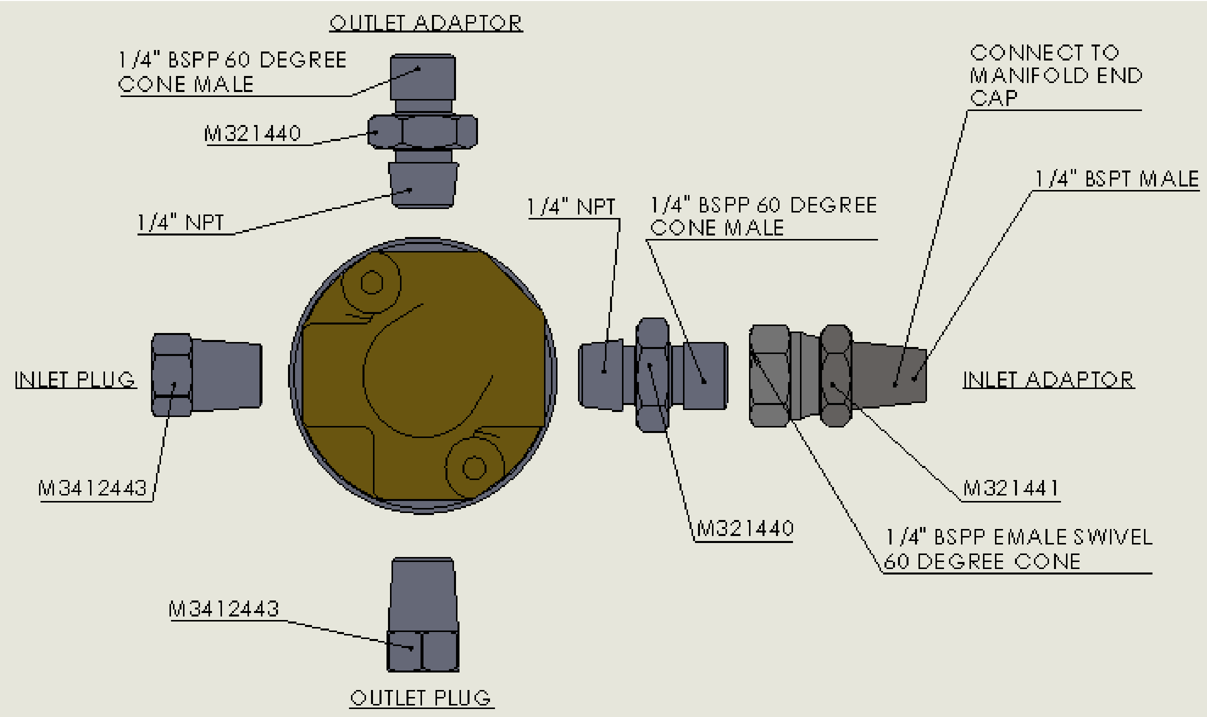


Figure 5.14.b – Regulator Inlet Connection Instructions

5.15. Alternative Selector Valve Configuration

Selector Valves may be connect with tubing, minimum bore 4mm. we recommend that the connection hoses be used to connect the regulator to the tube and tube to the selector valve. Note that the hoses have a ¼" BSP 60° cone connections. The maximum tube length to the selector valves is 20m and a maximum of 4 x DN50 selector valves operating simultaneously.

5.16. Selector Valve inc. Pneumatic Actuator, Position Indicator and Solenoid Valve

These valves are used in order to select a discharge pipework for the inert gas to be discharged into. They can also be used to vent a pressure build up in the manifold. 2” valves and below are threaded full bore, 2-½” and above are flanged to ANSI/ASME B16.5 class 600 raised face, full bore. All selector valves are supplied complete with pneumatic actuator, position indicator switch and solenoid valve for remote actuation.

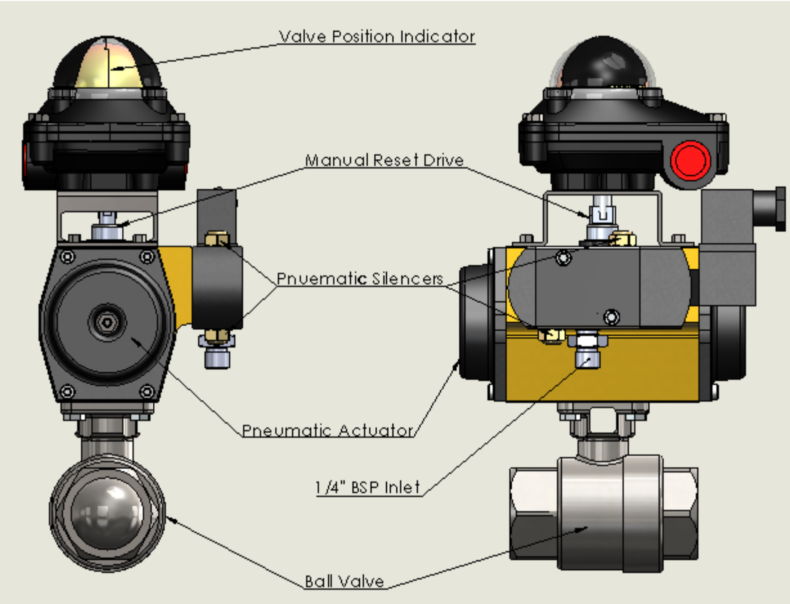


Figure 5.16a - Threaded Selector Valve Assembly ½” to 4”

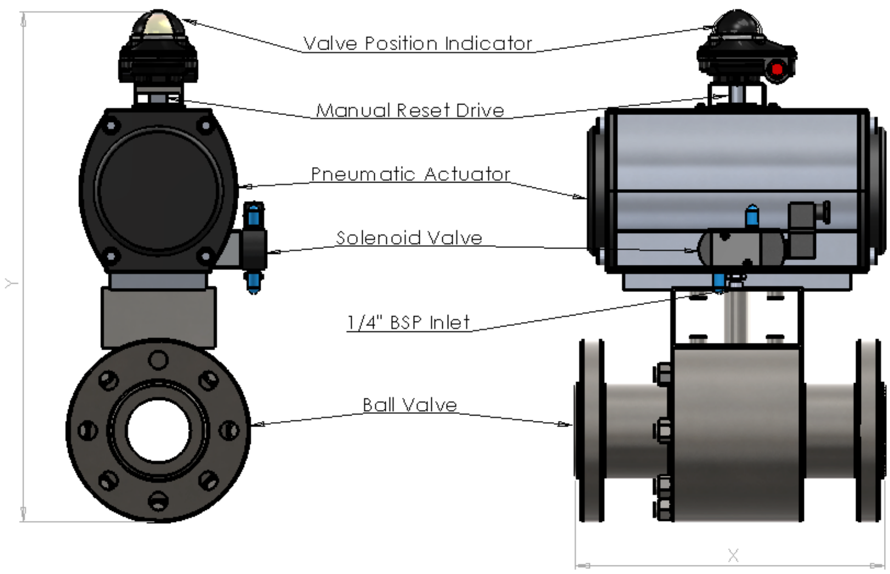


Figure 5.15b - Flanged Selector Valve Assembly 2 ½” to 4”

Selector Valve Working Pressure	60 Bar
Full Bore	
Manual Return	
Operating temperature	- 20°C to 50°C
Actuation Pressure	7-8 bar

Table 5.15c – Selector Valve Details

5.16.1. Selector Valve

Part Number	Ball Valve Size	Shown in Figure	Dimension X, mm	Dimension Y, mm	Weight, kg	Design Flow Rate, kg/min	Maximum Flow Rate, kg/min	Manual Reset A/F
NF34015	DN15#	5.15.1	137	188	2.4	23	33	8mm
NF34020	DN20#	5.15.1	137	216	2.5	45	66	8mm
NF34025	DN25#	5.15.1	137	256	2.9	90	133	8mm
NF34032	DN32#	5.15.1	150	282	3.7	118	175	8mm
NF34040	DN40#	5.15.1	204	300	5.8	155	235	10mm
NF34050	DN50#	5.15.1	204	338	6.8	237	419	10mm
NF34065*	DN65*	5.15.2	330	500	52.5	336	532	19mm
NF34080*	DN80*	5.15.2	356	600	77.5	777	1151	25.4mm
NF34100*	DN100*	5.15.2	432	650	126.5	1337	1983	25.4mm

*ANSI/ASME B16.5 class 600 flanged valves & also available in screwed connection (threaded Connection)

= Available in NPT and BSP options

Table 5.16.a – Selector Valve Properties

- The solenoid valve is supplied loose and fitted on site to prevent damage during shipping and valve installation
- The position indicator switch is supplied mounted on the top of the pneumatic actuator and gives visual indication of valve position as well as supplying a signal to the fire panel
- Connect the selector valve regulator to the designated tee on the manifold following *Figure 5.14.2*
- Connect the selector valves into the pipe work according to the calculation software results making sure the correct size valves are used in combination with the correct size pipework
- Connect Flexible Connecting Hose (1000) (NF3701000) to each solenoid valve (mounted on the selector valve) using the 1/4"BSPP connection shown on *Figure 5.15.1*
- Connect the other end of the flexible hoses to the outlet ports on the regulator via the ¼" BSPP swivel/cone connection as shown in *Figure 5.14.2*
- Refer to *Figure 5.10.1* for information on how to connect up the Manifold Pressure Gauge and the Relief Valve to the Manifold
- Actuation pressure is taken from the discharge manifold via the selector valve regulator @7.5bar nominal pressure
- The selector valve can be reset after operation using the supplied lever (NF3940X) that is to be kept attached to the selector valve with a chain
- In the case of control system failure, the selector valve can be manually overridden using the screw adjacent to port 3 on the solenoid valve
- Excess pressure in the manifold can be relieved via the selector valve by using the supplied lever.
- The selector valve must be returned to the closed position

THE SELECTOR VALVE MUST BE LEFT IN THE CLOSED POSITION

5.16.2. Selector Valve Solenoid Control Valve

- The actuation signal must be supplied for 1.5 times the discharge time
- Ports 3 & 5 supplied with pneumatic silencers fitted

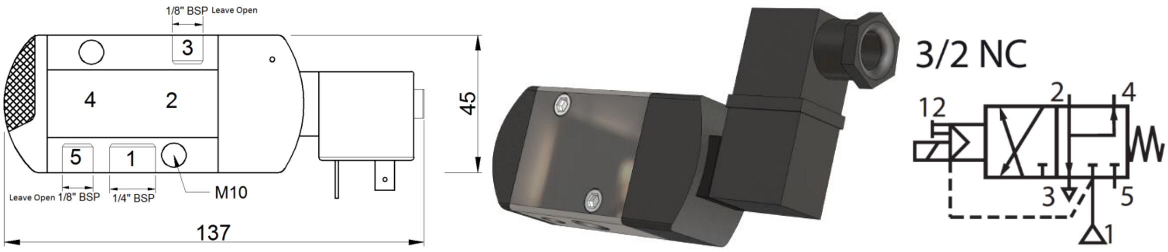


Figure 5.15.2a – Solenoid Valve & Logic Diagram

Technical Information

Operation	Normally Closed
Pneumatic connection	1/4" BSP
Solenoid actuation	24V DC, 2.5W coil
DIN connector	
Operational temperature range	-25 to +60 ℃
Operating pressure	7.5 bar
Flow	Max 700 L/min@6bar

Figure 5.15.2b – Solenoid Valve Details

5.16.3. Valve Position Indicator / Limit Switch Box

The valve position indicator can be connected to the fire panel to give feedback on the selector valve position. The wiring diagram (*Figure 5.16.3b)* and fire panel user manual should be used as guidance.

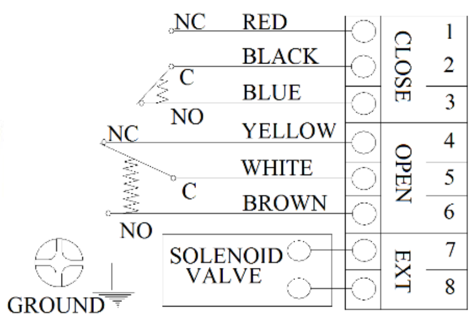


Figure 5.16.3a – Valve Position Indicator

Figure 5.16.3b – Open/Closed Switch Wire Diagram

5.16.4. Selector Manual Reset Lever

Manual reset lever supplied with each threaded selector valve. Lever must be attached to selector valve by chain for ease of access. See *Figure 5.15.(a, b)* for manual reset location. Both ends need to be used to fully rotate the valve by 90°.

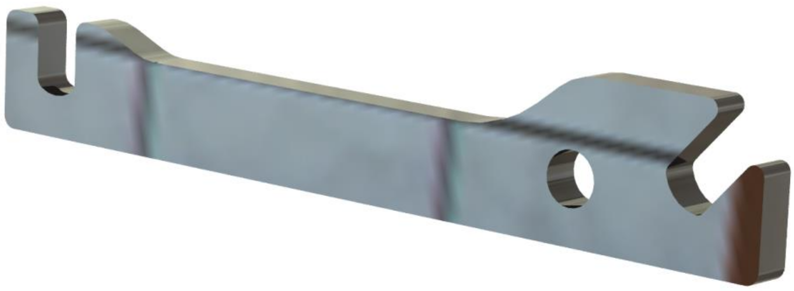


Figure 5.16.4 – Selector Valve Manual Reset Lever

Flanged valves must be reset by dismounting the valve position indicator and using an appropriately sized spanner, refer to table 5.15.1 for spanner sizing.

5.17. Non Selector Valve - Actuation

5.17.1. Non-Selector Valve Diagram Schematic – Main and Reserve

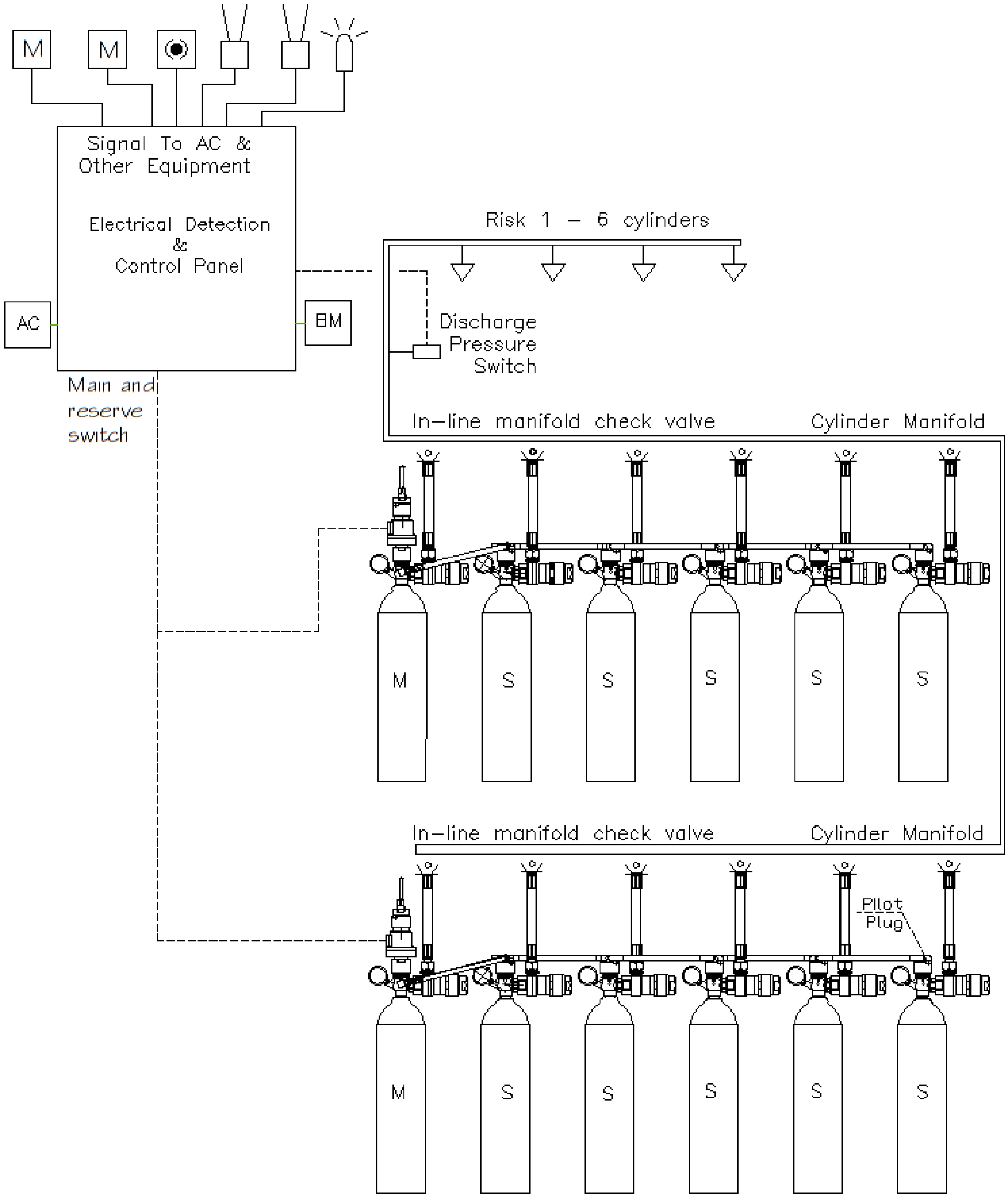


Figure 5.17.1 – P&ID for a single risk Inertech System – Main + Reserve

5.17.2. Explanation of the Non-Selector Valve System P&ID

The control panel will receive a signal from the fire detection devices when the fire is detected and send out various signals. These signals include sound and visual warnings to evacuate the area along with a signal to actuate the fire extinguishing system.

- Once a fire is confirmed the control panel will actuate either the main or reserve bank electrically via the master discharge valve solenoid actuator NF26011
- To operate the slave cylinder valve pressure is taken from the master discharge valve from a special port opposite the main discharge outlet. This pressure is directed to the slave valve pneumatic actuator NF26020. From the other side of this actuator the next pneumatic actuator is operated until the last actuator where the plug removed from the master discharge valve is fitted to unplugged actuator port and thus seals the pilot line. (the Bleed Valve is not required for non-selector valve system. Use the discharge outlet plug from the master cylinder valve to seal the last pneumatic actuator)
- The pressure controller is directly connected to the outlet of the discharge valve and the controllers outlet is connected to the discharge pipe work via the discharge hose and check valve
- Pipe work will distribute the pressure controlled inert gas to the discharge nozzles
- The discharge pressure switch is connected to the discharge pipe work and confirms the gas discharge back to the control panel

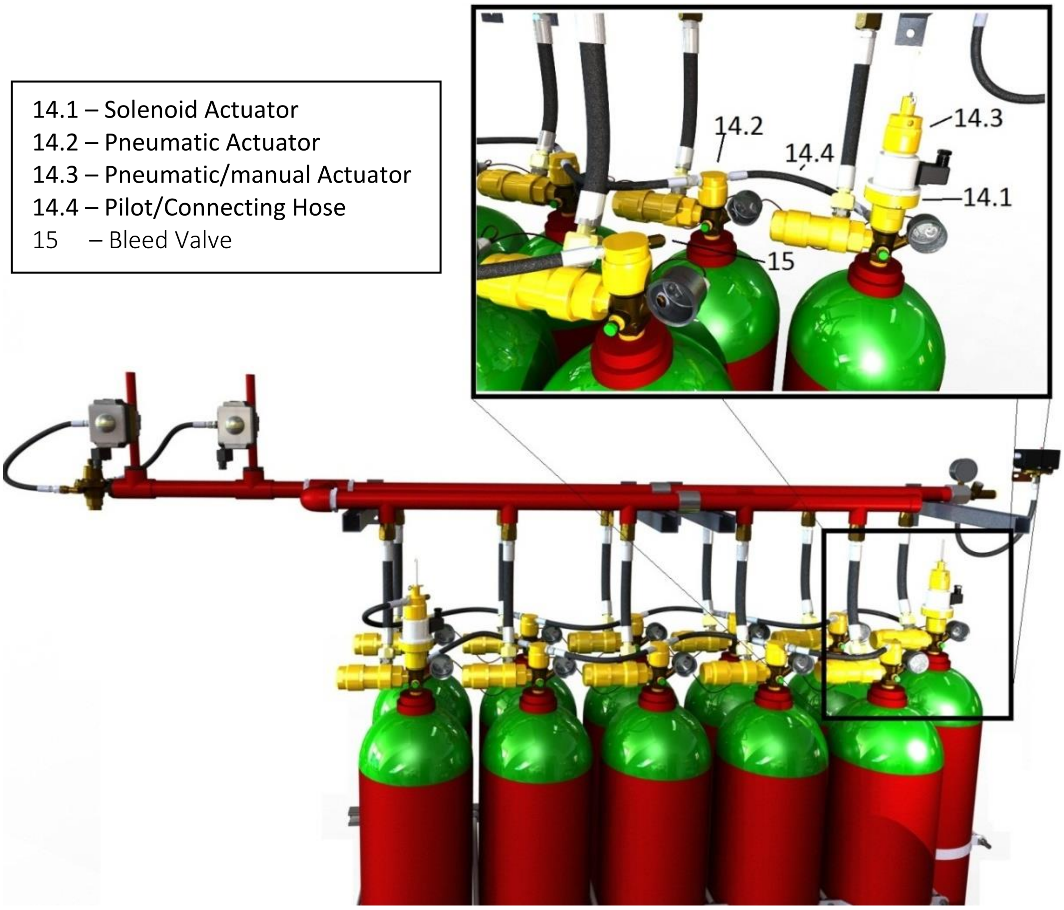


Figure 5.17.2 – Basic Selector Valve system with the major actuation components

5.18. Cylinder Actuation

DO NOT INSTALL ANY ACTUATOR UNTIL ALL STORAGE CYLINDERS ARE FIXED AND CONNECTED TO THE DISCHARGE PIPE WORK.

Storage cylinders are actuated by a solenoid actuator, a manual actuator or a manual/pneumatic actuator. Refer to EN15004-1 6.4, and BS 5839, 7273, and 6266 for information on manual actuation of the system, automatic detection of a fire, alarms and hold switches.

Type	Part Number	Comments
Pneumatic	NF26020	Minimum supply 21bar
Pneumatic/Manual	NF26030	Minimum supply 21bar
Solenoid without diode	NF26010	24Vdc 0.5A
Solenoid reset tool	NF26019	

Figure 5.18.a – Table of Actuators

Solenoids are supplied as assemblies as in the following table.

Assembly	Part Number	Comments
Solenoid/manual (standard)	NF36010A	Include NF26010, NF26019, NF26030
Solenoid	NF26010B	Include NF26010, NF26019

Figure 5.18.b – Table of Actuators assemblies

5.18.1. Solenoid Actuator (NF26010)

The solenoid actuator is fitted to the master discharge valve/s and is the last thing that is connected mechanically to the Inertech system.

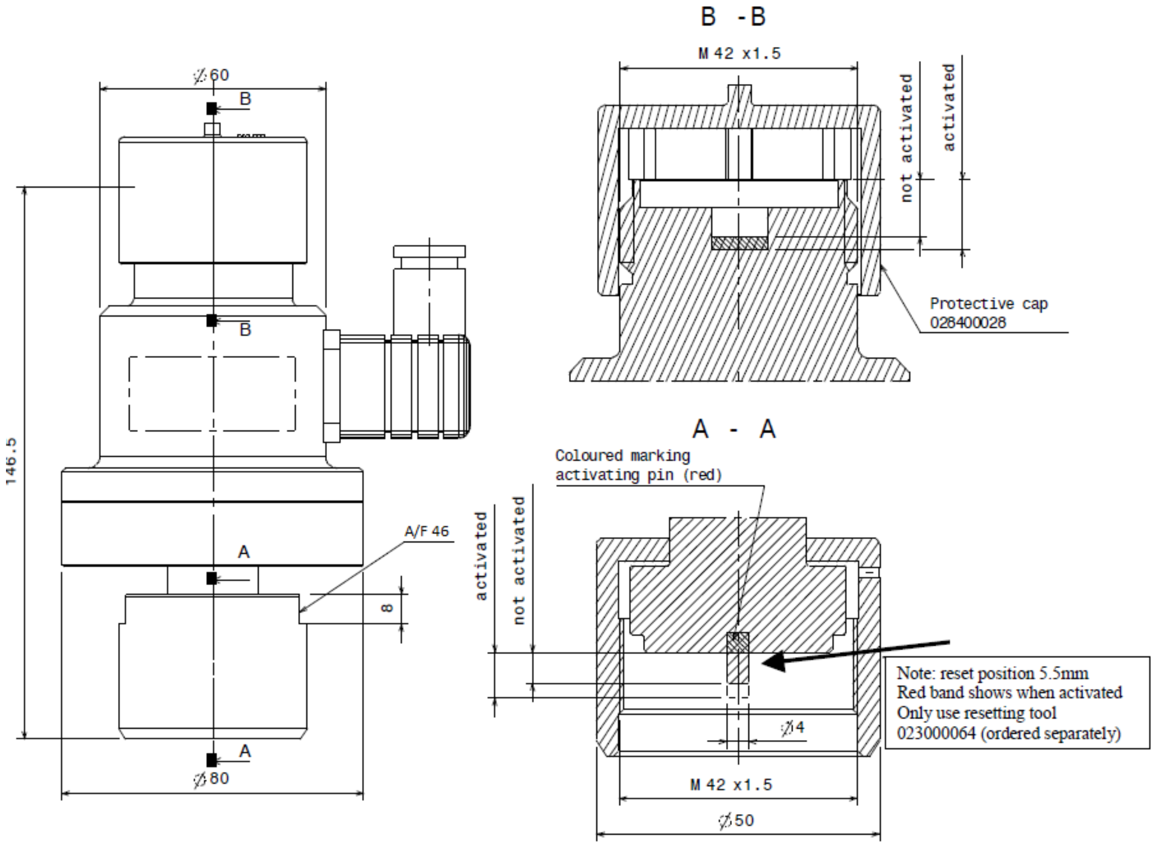


Figure 5.18.1a Solenoid Actuator NF26010

- Note: the solenoid actuator requires a momentary electronic signal and will latch in the actuated position. THE ACTUATOR MUST BE RESET MECHANICALLY WITH THE SUPPLIED RESET TOOL BEFORE MOUNTING ON THE CYLINDER VALVE

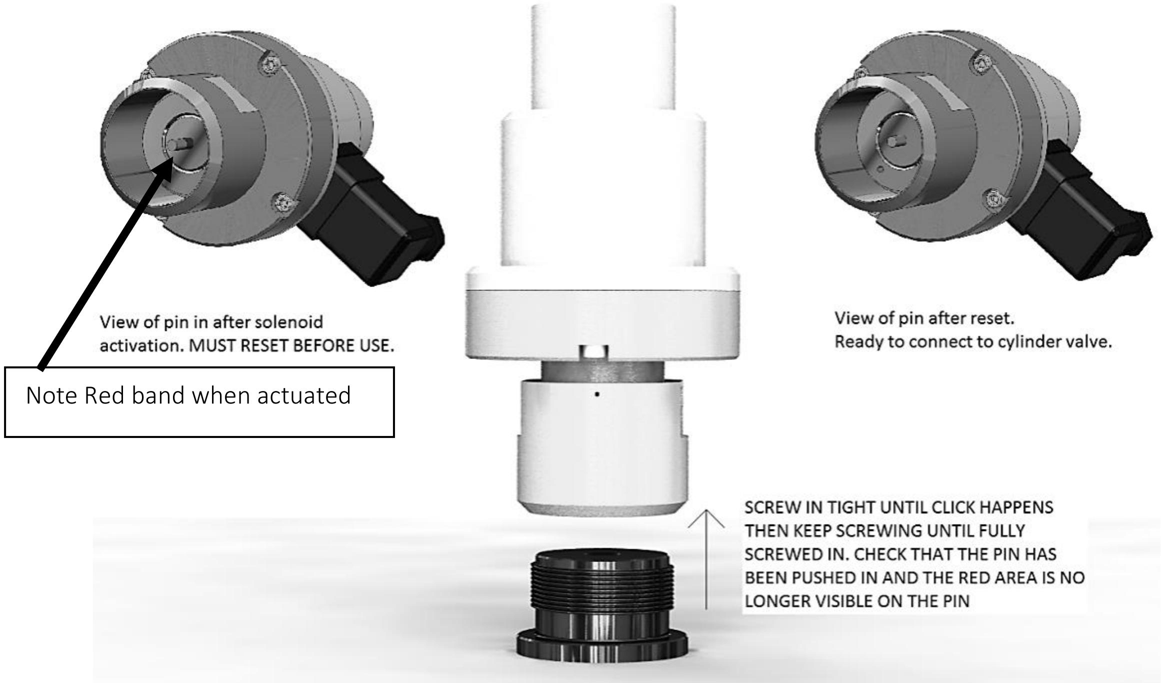


Figure 5.18.1b – Demonstration of How to Reset the Solenoid Actuation Device

- Screw the tool fully in and unscrew. Note the position of the actuation pin shown in *Figure 5.17.1a*

Solenoid Actuator Wiring:

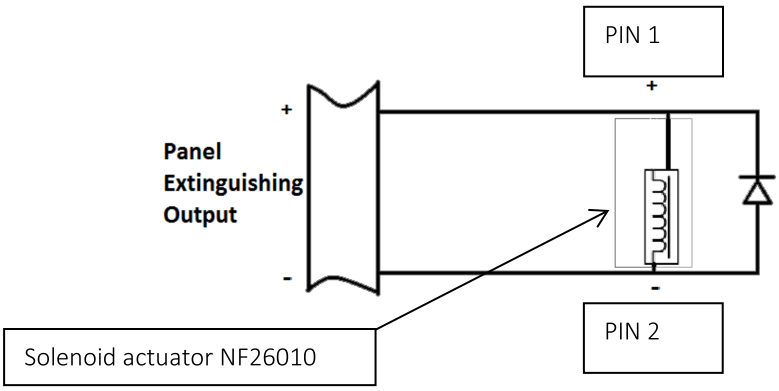


Figure 5.18.1c – Solenoid Actuator Wiring Diagram

Refer to control panel specific instructions for each individual case, diagram shown as a guide only.

5.18.2. Pneumatic Actuator (NF26020)

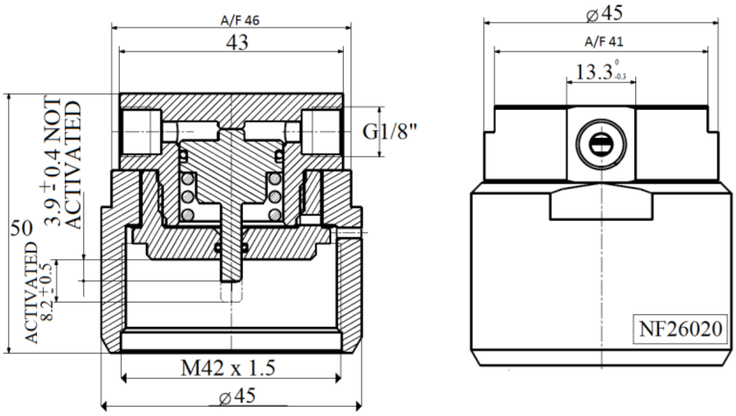


Figure 5.18.2 Pneumatic Actuator

- Actuation Pressure: 21 bar

5.18.3. Pneumatic/Manual Actuator (NF26030)

Note 1: Use to provide manual override of the master valve solenoid actuator.

Note 2: The pressure connections are generally not used on Non Selector valve systems.

Note 3: On Selector Valve systems ensure that if fitted with an actuation hose then the remaining actuation connection must be fitted /plugged with the Bleed Valve see *figure 5.18.3a*

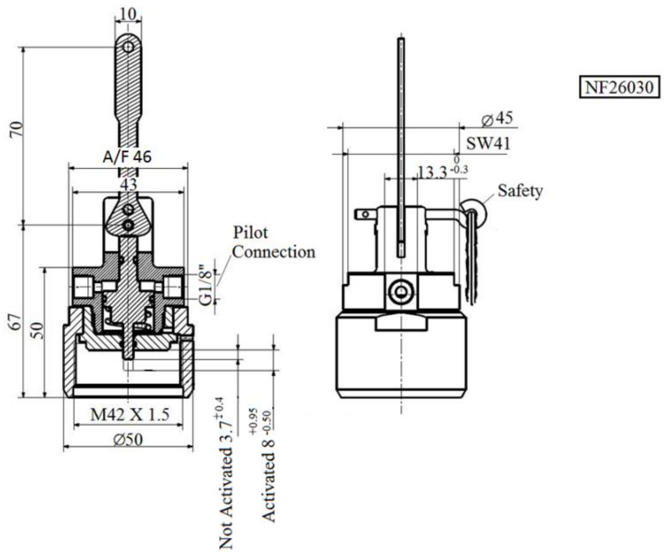


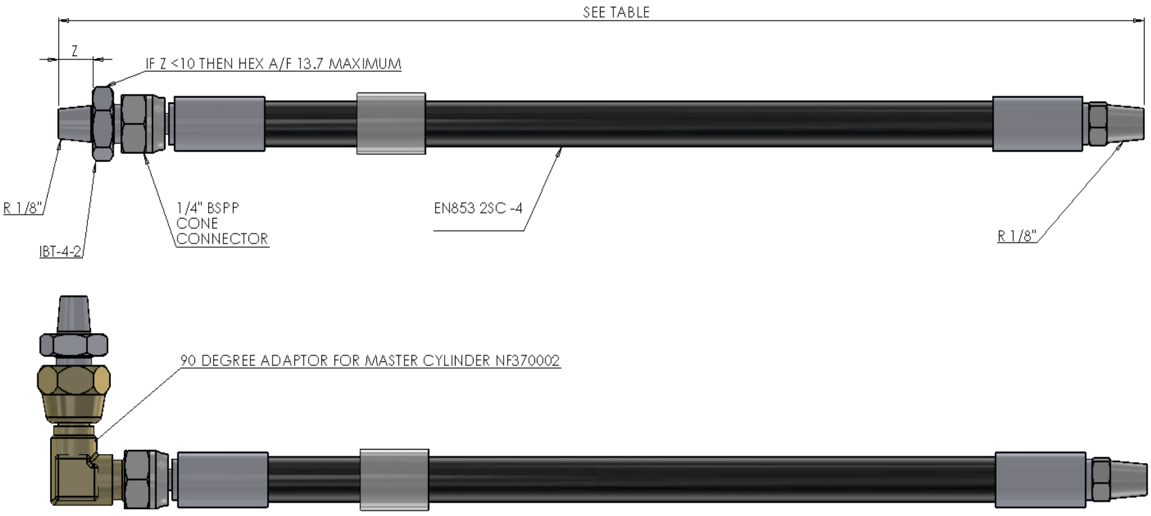
Figure 5.18.3 Manual / Pneumatic Actuator

- The pneumatic actuators are supplied with pressure from the master discharge valve via a pilot hose. Up to 80 actuators can be actuated in a line via this method; some authorities may require 2 master storage cylinders.

5.18.4. Manual Release Sign

All manual release positions shall be identified with a sign including identifying the protected space. The form of the label shall follow the guidance in the Standards and EN 15004.

5.18.5. Pilot/Connecting Hose



Part Number	Length, mm	Assembly	Min Bend Radius ,mm
NF370350	350	Inertech Actuation Hose (350)	60
NF370600	600	Inertech Actuation Hose (600)	60
NF370351	Inertech Actuation Hose + Adaptor (350)		60
NF370601	Inertech Actuation Hose + Adaptor (600)		60

Figure 5.18.5 – Pilot Hose/Pilot hose and adaptor. Only use this assembly for the pilot lines for the actuation of the system

- For the connection of actuation devices between discharge valves
- Maximum working pressure is 400 bar
- Minimum bore diameter is 3.5mm
- Fittings are made of steel with zinc plating, the hose is made out of synthetic rubber
- Type 3 connector to EN12094 – 8
- Cone connections do <u>not</u> require sealing tape
- Visually check every 6 months for damage or discoloration
- Pilot Hoses are supplied with fittings and adaptor to join the Pneumatic Actuators. Hose ends are G1/8".
- Use the special elbow fitting NF370002 on the Master cylinder/valve
- When connecting these hoses use 1 ½ turns of PTFE tape on the 1/8" BSP connections to seal them.

5.18.6. Connecting Hose Adaptor (NF370002)

- Fitting included in hose assemblies NF370xx1
- Connects to port '3' on the storage cylinder valve (*Figure 5.2)* and pilot G 1/8" pilot hose
- Unscrew the G1/8" from the swivel end of the pilot hose and using PTFE tape screw into the valve actuator port (retain the valve plug as this is used to plug the last port on the furthest pneumatic actuator (NF26020) on non-selector valve systems)
- Connect the adaptor

Figure 5.18.6 – Pilot Hose Adapter location (left) and overall dimensions (right)

5.18.7. Installation of Cylinder Actuation and Pilot Line Bleed Valve

Warnings

Only proceed if the storage cylinders are secure and the discharge pipe work is complete, discharge hoses and pressure controller are connected.

During shipping and storage the discharge valve is protected by a shipping cap and should only be removed in order to connect the storage cylinder valve to the discharge pipe work. Retain the shipping cap for future use.

If any hissing or discharge of gas is noticed during connection of the actuator - STOP AT ONCE and disconnect actuator from the valve.

- Discharge of the system is initiated from the master cylinder solenoid actuator which depresses the control valve stem located at the top of the valve
- Identify the secured cylinders that will be actuated pneumatically (Slave) and screw a pneumatic actuator on each one. Pneumatic actuators will need a spanner (A/F 46mm) to fully screw them on and refer to *Figure 5.17.6.* Use the M42 connection on *Figure 5.17.2* to a torque of 50Nm +0Nm -15Nm. Connecting multiple storage cylinders refer to the plan view of the actuation pattern on *Figure 5.17.6* for layout.

IMPORTANT. Screw actuator down until firm and approximately 2 threads are showing. See diagram

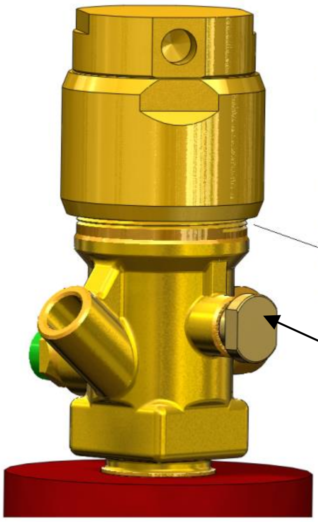


Figure 5.18.7a – Example of how far the pneumatic actuator should be screwed down onto cylinder valve

- Take the R1/8"BSPT- ¼" BSPP connection from each pilot hose and screw 1 into each pneumatic actuator using the R1/8" connection.
- Connect the R1/8" connection on the pilot hose into the other port of each pneumatic actuator.
- Make the remaining swivel connection from the hoses to the pneumatic actuators.
- Referring to *figure 5.17.7a* remove the pilot out let plug from port '3' on *Figure 5.2* and connect the pilot hose connection and the pilot hose adaptor as shown onto each master cylinder.

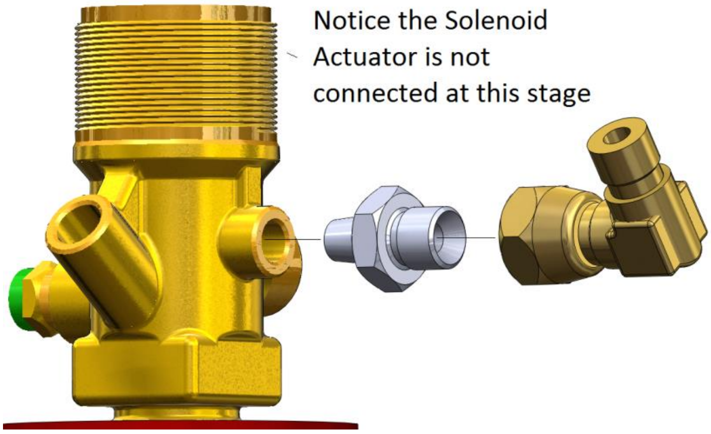


Figure 5.18.7b – Instruction on how to connect actuation to a master cylinder

- Now make the final pilot hose connection to the master cylinder valves.
- Mount the pneumatic/manual actuator onto the Solenoid actuator (Connection 4, Figure 5.2) using the M42 connection on Figure 5.17.2 to a torque of 50Nm +0Nm -15Nm
- Do not connect the Solenoid actuator to the master discharge valve until the electrical system is fully commissioned the actuator operated and most importantly RESET. As with the pneumatic actuation connection ensure that the unit it screwed down tight with a spanner and not just hand tight.
- Ensure that the Solenoid Actuator is not activated and is in the reset position see Figure 5.17.1b. An activated actuator would cause an unintentional release while mounting the actuator onto the valve
- ENSURE THE FURTHEST PNEUMATIC ACTUATOR (NF26020) IS FITTED WITH AN END PLUG (M410061) (SEE 5.17.7c).

Plan View of a non-selector valve actuation pattern

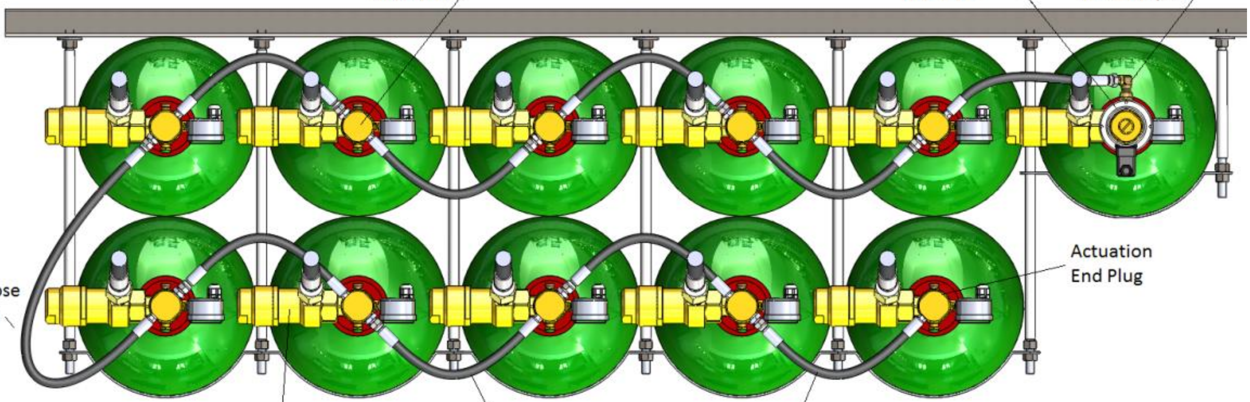


Figure 5.18.7c- Actuation hose layout (Non-Selector Valve System) – Plan View

*For non-selector valve system protection use the plug from the master valve as an actuation end plug.

5.19. Selector Valve – Actuation

5.19.1. Multi-way System Diagram Schematic – Main and Reserve

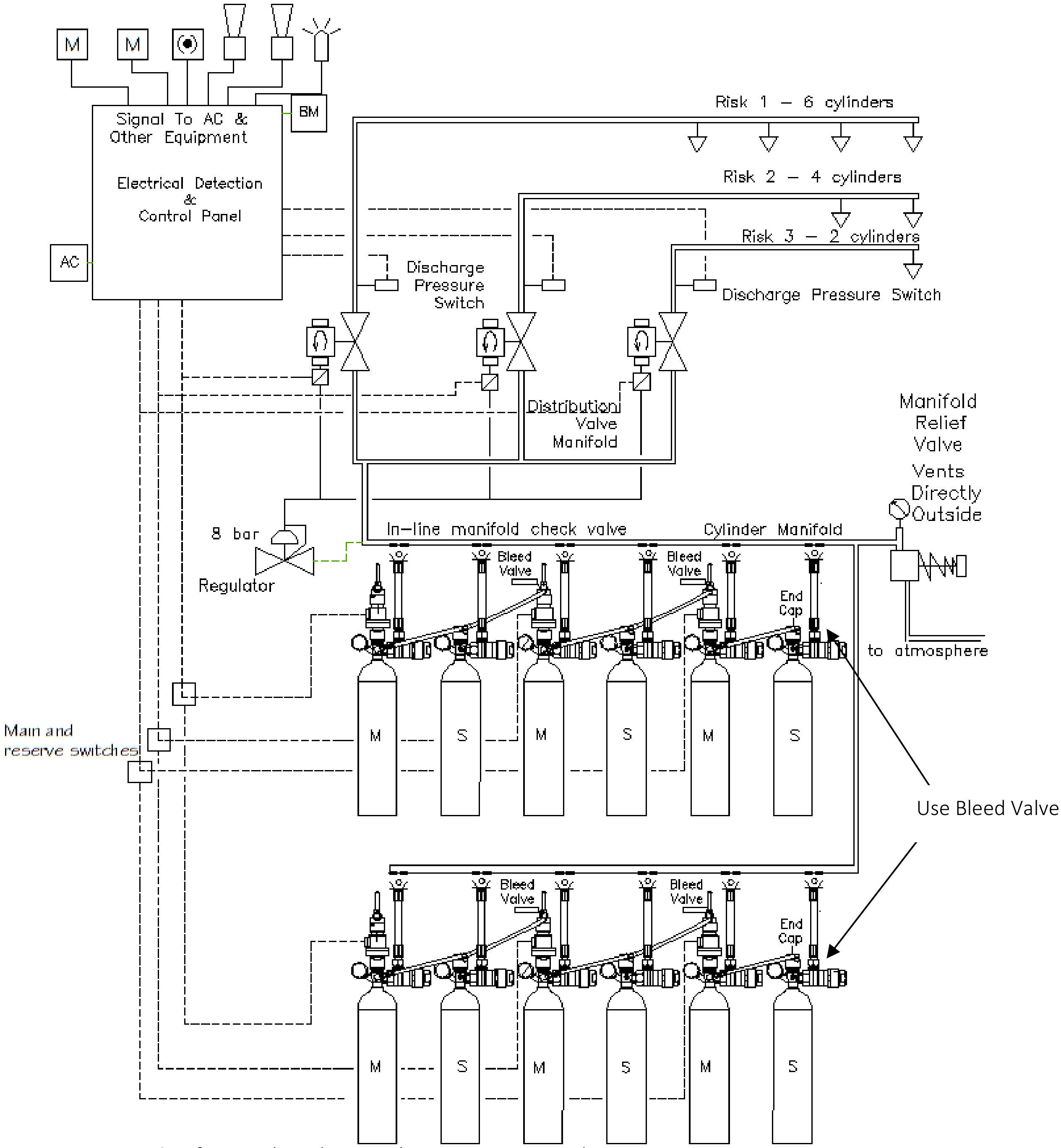


Figure 5.19.1- P&ID for a Multi Risk Inertech System – Main and Reserve

5.19.2. Explanation of the Selector Valve System Diagram Schematic

The control panel will receive a signal from various detection devices when the fire is detected and send out certain signals. These signals include sound and visual warnings to evacuate the area along with a signal to actuate a particular fire extinguishing system.

- For multi space protection from a cylinder bank each protected space will have a Selector Valve which consists of a pneumatically actuated full bore ball valve. The selector valve will be actuated from a signal from the control panel and powered by pressure from the system discharge manifold via a pressure regulator
- The correct number of storage cylinders and the appropriate solenoid valve will receive a signal at the same time
- The main or reserve storage cylinder bank is selected by an electrical switch (supplied as part of the electrical control system) via the control panel
- The combination of solenoid and pneumatic actuators ensures the correct number of storage cylinders actuate according to the room size. On the functional system diagram (*Figure 5.18.1)* the system allows 2, 4 or 6 storage cylinders to actuate
- Diagrammatically when one storage cylinder is actuated all the storage cylinders to the right will actuate on either the main or reserve storage cylinder bank as selected (*Figure 5.18.1)*
- The storage cylinders will actuate and discharge up to the selector valve
- The selector valve will open pneumatically to connect the manifold to the correct protected space
- The manifold relief valve is located on the manifold and is an additional safety device to protect the manifold from over pressure. The relieved gas must be discharged to a safe area
- Pressure in the manifold is indicated by the manifold mounted pressure gauge
- A **bleed valve** must be connected to pneumatic actuators mounted on the solenoid actuators (in a multi risk scenario, excluding the 1st solenoid actuator) and the last pneumatic actuator to prevent any accumulated pressure accidentally actuating a system, the bleed valve locations are shown on (*Figure 5.18.1)*
- The discharge pressure switch downstream of the selector valves confirms the discharge back to the control panel

5.19.3. Bleed Valve (NF361001) (Used on selector valve systems only)

- Allows any accumulated pressure in the pilot line to escape at low pressure before actuating the system.
- R 1/8" tapered connection
- Connect to pneumatic actuator in the line as required for each selector valve/solenoid actuator shown on *Figure 5.18.1*

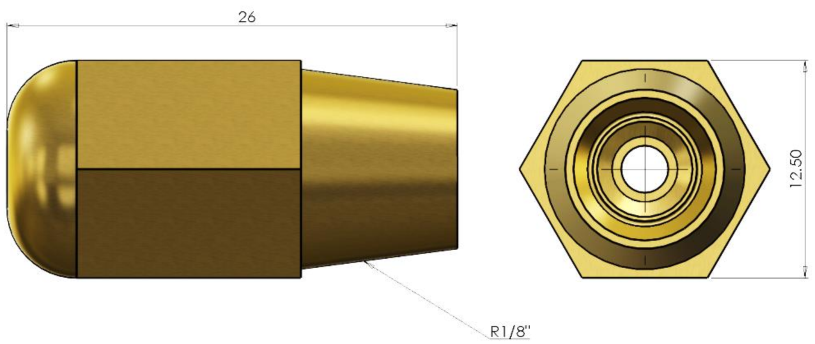


Figure 5.19.3a - Bleed Valve

Plan View of a selector valve actuation pattern

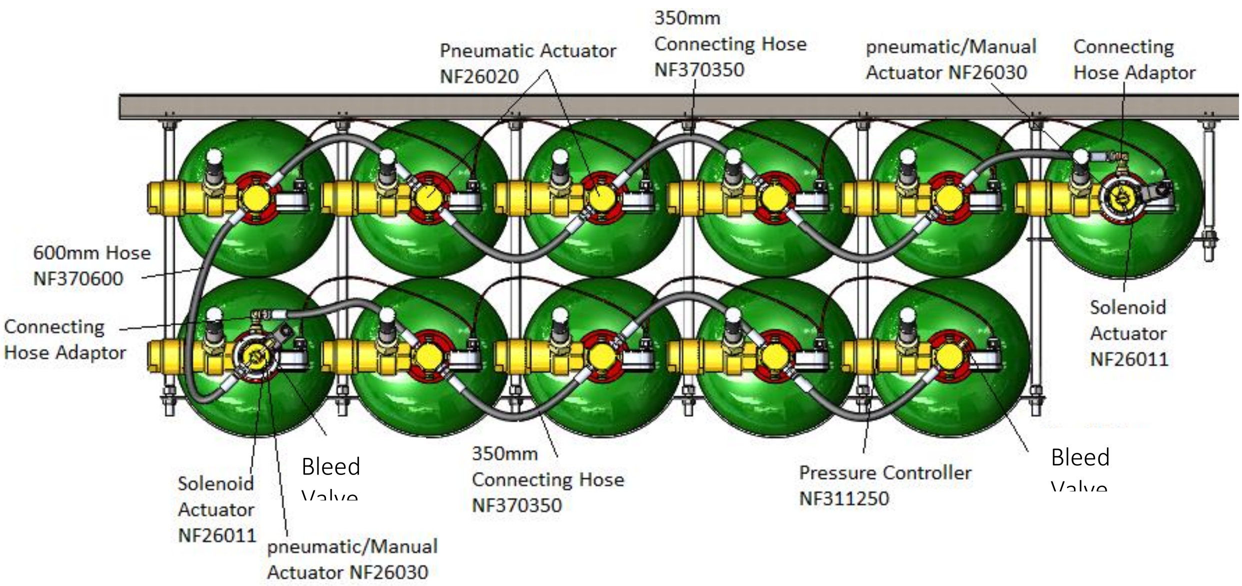


Figure 5.19.3b- Actuation hose layout (selector valve system) – Plan View

*For selector valve system protection use a bleed valve NF361001 as shown above.

5.19.4. Actuation logic for Selector Valve Systems

Refer to *Figure 5.19.1* and the extract below.

This is a 3 selector valve system where system:

A requires 6 cylinders (master valve on the left)

B requires 4 cylinders (master valve 3rd from left)

C requires 2 cylinders (master valve 5th from left)

- Operating system A, the left hand master valve by its solenoid or manual actuator will cause discharge pressure from the master valve to be directed to the adjacent slave cylinder pneumatic actuator and to the manual/pneumatic on system B.
- This will cause system B master cylinder to actuate and in turn deliver discharge pressure to its slave cylinder and to the Manual/Pneumatic on system C. Thus all cylinders are actuated.
- Should only system C be required then only system C cylinders will be actuated.

5.20. Signs and Labels

All entrances to the protected space shall be identified as entering a space protected by Inert Gas. The form of the label shall follow the guidance in the Standards and EN 15004.

The LPCB recommends that within the protected space an information plate be supplied by the installer detailing:

- Protected area volume
- Design concentration (Class A, B etc.)
- NOAEL and LOAEL
- Agent identification
- Type of activation

6. INSTALLATION

6.1. Safety Procedure

To ensure the safety of personnel carrying out the installation and to prevent any accidental discharge of the cylinder contents the steps below must be followed in order:

- All cylinders must have;
    - Shipping Cap fitted to the Actuator port of the valve
    - Anti-Recoil cap fitted to valve outlet
    - Actuators NOT fitted
- Fix cylinders to mounting bracket
- Fix discharge pipe work , all nozzles and fit flexible hose to pipe work
- Remove valve protection cap
- Fit discharge pressure controller
- Fit discharge hose to discharge pressure controller
- Test actuators 'off' of the cylinder valves
- Reset actuators and fit to discharge valves

6.2. Change In Temperature Range

If the risk has a change in temperature range Firetec Systems Ltd. must be contacted as the system is designed to operate from -20℃ to +50℃ as a new system may need to be configured.

6.3. Safety of the Protected Risk

The risk must have the following in order to be safe:

- Visual and audible signals inside and outside the room to alert anybody of the danger
- Venting leading straight out into the atmosphere for during and after a discharge
- Any manual actuation should be locked off while work is carried out on the system

6.4. Storage Cylinder Safety

- The Inert Gas storage cylinders are pressurized at up to 300 bar and must be handled carefully
- The storage cylinder valve is constructed of forged brass, it can be damaged if the storage cylinder is dropped or mishandled. Discharge of an unsecured and disconnected storage cylinder could be extremely dangerous and may result in injury or death, and/or damage to property. The storage cylinders, as delivered, cannot be discharged accidentally unless mishandled
- Under normal conditions, the storage cylinder valve cannot be discharged without having the various actuators attached
- Never attach the actuators or the solenoid actuator until the storage cylinder has been properly secured in the storage cylinder rack and the discharge connection fittings connected to the system piping. The anti-recoil cap should remain in place at the discharge port of the valve until removal is necessary to complete the connection of the storage cylinder to the system piping.

6.5. System Assembly and Safety

Follow these steps to ensure the correct and safe assembly of the entire system. Handle all parts with care and do not damage any of the parts.

- Follow *Section 5.3.4* to ensure correct installation of the cylinder valve gauges
- Follow *Section 5.4.6* to ensure the storage cylinder positions are correct and they are secured sufficiently, consider the safety information below
- Storage cylinders are very high pressure (150, 200 and 300 bar) and should be handled with care
- Do NOT remove storage cylinder valve protectors
- Wear correct foot ware and clothing for the entire installation (very heavy storage cylinders)
- Follow *Section 5.8* ensuring the pressure controller, discharge hose and check valves are correctly installed
- Follow *Section 5.9* to correctly fix discharge pressure switches and odouriser
- Follow *Section 5.12.1* to correctly fit the relief valve and the manifold pressure gauge.
- Follow *Section 5.16* to ensure the selector valve, connecting hose (1000) and the regulator are installed correctly
- Follow *Section 5.18.7* for correct installation of the actuation system
- This section must NOT be completed until the above sections are complete

6.6. Installation Check List

Prior to verification and test the installer should check the following:

Cylinders	
• Extinguishant	
• Pressure	
• Fixed	
Piping	
• Continuous	
• Blown through	
• Correct size	
• Fixed	
Nozzle	
• Correct size and orifice	
• Correct type	
• Orientation	
Labels	
• Cylinder	
• Manual release	
• Door warning	
• System installer/maintenance	

7. VERIFICATION AND TEST

7.1. General

Prior to placing the completed system in service, the installation should be inspected and tested to confirm:

- Conformance to system design
- Suitability of piping, its correctness to project design and its support and bracketing
- Conformance to the system stated operating sequence
- The suitability of the hazard environmental control, safety precautions, sealing etc.
- Compliance with the requirements of the relevant design code

7.2. Piping

7.2.1. All Pipework

Field installed piping shall be tested as per EN15004-1, NFPA 2001:

After the installation of the system piping is complete and prior to the connection of the cylinders, nozzles, etc., the discharge piping shall be pneumatically tested for leakage.

Plug or cap all piping outlets and pneumatically test in a closed circuit for a period of 10 minutes at 3 bar. Hold the pressure for at least 10 minutes. At the end of 10 minutes, the pressure drop shall not exceed 20 percent of the test pressure.

The pressure test may be omitted if the total piping contains no more than one change in direction fitting between the storage cylinder and the discharge nozzle, and if all piping is physically checked for tightness.

Pneumatic testing can be dangerous ensure that all personnel are away from the area and that appropriate safeguards have been taken.

Under no conditions should water be used in testing.

7.2.2. Closed sections of pipework

For closed sections of pipe/manifolds up to the Selector Valve these should be hydraulically tested in accordance with EN15004-1 8.2.3.12 to 1.5 X the maximum working pressure 60 bar (90 bar) with clean water. This test is conducted with all connections plugged before any Selector Valves, Check Valves, Discharge Pressure switches, etc. are fitted. These components are not intended to operate at the test pressure (i.e. above the working pressure), and connecting them during the test may cause malfunction and the loss of warranty.

Following the test the inside of the pipe must be clean and dry. Once these closed sections are installed then the pneumatic leak test above is performed.

7.3. Nozzles

Each nozzle has orifices drilled to suit the specific location and discharge flow requirements. The part number stamped on the bottom of each nozzle identifies the number and size of the orifice plate.

- Verify that pipe and nozzle orifice sizes are as indicated on the drawings and that the nozzles are orientated to discharge correctly
- Ensure that each nozzle pipe drop is bracketed or braced against the nozzle discharge thrust, and that the nozzle cannot swivel on its pipe fitting

7.4. Electrical

All testing of the extinguishing system electrical circuits shall be carried out in accordance with the fire fighting system control panel manual.

All testing is to be performed with the solenoid actuator disconnected from the valve

- Solenoid Actuator Operation

All testing is to be performed with the solenoid actuator disconnected from the valve

With solenoid actuator connected electrically operate the discharge circuit. All solenoids appropriate to the protected spaces should operate. Verify that the pin moves to the released position. Reset all solenoids and repeat for each initiating sequence.

- On completion of **all** the testing and when the system is being restored to or placed in service, reset all solenoid actuators to the position shown in *Figure 5.17.1a* and *5.17.1b*. Check that the solenoid has latched correctly by exerting light finger pressure on the top of the exposed pin, the actuator should **not** operate under this pressure. Reconnect the actuators to the cylinder valves.

7.5. Cylinders

- Inspect cylinder(s) and ensure bracketing and piping are secure.
- Check pressure gauge and ensure pressure is correct for the temperature that it. Pressure should be 200/300 bar plus or minus 5% at 20°C. The pressure gauge is marked to show the expected pressure at other temperatures.
- Verify that the gas fill (kg) of the cylinder contents is clearly shown on the label.
- Ensure that appropriate identification, operating and warning signs are mounted or posted.
- Ensure that components are installed in accordance with the appropriate project drawings.

7.6. Selector Valve System Commissioning

BEFORE CONNECTING ANY ACTUATION

- Connect a 10 bar pneumatic pressure supply to the discharge manifold.
- Check each actuator bleed valve for any gas leakage. Any leak will indicate leakage past the discharge check valve
- Operate the first system and note the operation and the solenoid actuator and the initial opening of the appropriate selector valve. (The selector valve will only partially open due to the gas exhausting through the discharge pipe work)
- Reset the solenoid actuator
- Reset the selector valve

7.7. Over Pressurization

In general the same quantity of air needs to be vented from the protected space as is discharged by the system or unacceptable room pressures are experienced. The Inertech calculation software will provide a recommended vent area based on the maximum acceptable pressure the building can take.

8. MAINTENANCE

Do not attempt any maintenance until full training has been delivered. Ensure that the electrical isolation is enabled; power cables to the electrical actuators removed and all actuators removed from the discharge valves.

The system shall be regularly inspected to ensure that it is fully operational. The interval between inspections and the scope are covered in NFPA 2001 and ISO 14520 and EN 15004.

The inspection shall include:

- The protected space to ensure that there have NOT been any changes affecting the design or discharge retention.
- Equipment to ensure there has been no damage
- The Alarm and Control system should also be inspected at the same time. Pay particular attention to the interface between the suppression system and the control system.
- Auxiliary equipment such as pressure switches, door closures, dampers, air handling shutdown must be checked for correct operation.
- Agent cylinders. Guidance is given in NFPA 2001 and ISO 14520. Should the Pressure show a loss trend or more than 10% by pressure then these must be withdrawn from service and recharged.

Recharge after discharge

- Disconnect and remove all of the actuators and storage cylinder pressure switches/gauges.
- Fit anti recoil caps and valve protection caps to all valves prior to removing them from their racking.
- Only skilled and trained operatives shall recharge the storage cylinders while following the Firetec Systems Ltd. valve maintenance and recharge procedures.
- Before returning to service all storage cylinders should be conditioned for at least 24 hours for the temperature to stabilise and the charge pressure verified.
- Enter the details on the fill label.
- Return to service.