

EQUIPMENT, DESIGN & SERVICE MANUAL



FIRE EXTINGUISHING SYSTEM

W/IG-541 AGENT

200 & 300 BAR CYLINDERS

UNIVERSAL VALVE OPERATOR (UVO)

LPCB APPROVED COMPONENTS

ISO14520 & EN15004 STANDARDS

U.S. & Foreign Patents

P/N 06-678 (Rev. 2 / March, 2017)

Fike®

REVISION HISTORY

ORIGINAL RELEASE DATE:May, 2013

REVISION / DESCRIPTION OF CHANGE REVISION DATE

Revision 1November, 2014

- 1) Changes to the Equipment Section – ProInert2 Equipment Information / Component Spec (p/n 06-078-1 rev 1)
- 2) Change to the Design Information (p/n 06-678-2 rev 1)

Revision 2 March, 2017

- 1) Corrected gross and tare weights in Specification table for ProInert® Agent Storage Cylinder Assembly (p/n 06-678-1-2 rev 2)
- 2) Added Reset Multi-tool instructions (p/n 06-681-1-2 rev 2)
- 3) Changed IG71-002 to IG71-104 (p/n 06-678-1-3 rev 2, 06-681-1-3 rev 1, 06-681-1-9 rev 2)
- 4) Revised Nitrogen Actuator Cylinder service/maintenance information (p/n 06-681-2 rev 1)

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SERVICE INFORMATION (P/N 06-681-2 REV 1)

INTRODUCTION

Fike is pleased to present the ProInert™ Fire Extinguishing System. This manual has been provided for those individuals that are responsible for the design, installation, and/or maintenance of Fike ProInert hardware and systems. Others such as architects, engineers, sales and marketing personnel, etc. will find the information useful as well.

Fike ProInert systems shall be designed as detailed in the following chapters.

- Engineered Systems – These systems are designed within the basic parameters outlined in this manual, and their performance is evaluated with the assistance of the ProInert Flow Calculation Program.

Tests have shown that the ProInert Flow Calculation Program can accurately determine the expected performance of the ProInert system when it is discharged. This provides the system designer with the maximum degree of flexibility possible as it pertains to flow imbalance, piping configurations, etc.

Fike ProInert systems must be installed and maintained in accordance with the limitations established by NFPA Standard no. 2001 (latest edition). The information contained within this manual defines these limitations in detail.

Enough information is incorporated into this manual to allow those responsible for designing Fike ProInert systems to properly do so, and for the parties responsible for verifying the system design to determine if the design parameters have in deed been met.

The data contained within this manual is provided for informational purposes only. Fike believes this data to be accurate; however, all dimensions are approximate and this document is presented without any guarantee or warranty whatsoever.

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



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APPROVALS

The ProInert™ system components contained in this manual are listed by Underwriters Laboratories and approved by LPCB and FM Approvals.

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DISCLAIMERS

The information contained in this manual is as accurate as possible. Fike does not guarantee that this manual is technically correct, complete, or free from writing problems or that this product is free from minor flaws.

In accordance with our policy of continuing product and system improvement, Fike reserves the right to change designs or specifications without obligation and without further notice.

READER RESPONSES

Fike encourages input from our distributors and end users on how we can improve this manual and even the product itself. Please direct all calls of this nature to Fike's Systems Sales Department at (800)-979-FIKE (3453), option 22.

Any communication received becomes the property of Fike.

WARRANTIES

Fike provides a one-year limited manufacturer's warranty on this product. The standard warranty is printed in each Marketing Price List. All warranty returns must be returned from an authorized Fike Distributor. Contact Fike's Marketing Department for further warranty information. Fike maintains a repair department that is available to repair and return existing electronic components or exchange/purchase previously repaired inventory component (advance replacement). All returns must be approved prior to return. A Material Return Authorization (MRA) number should be indicated on the box of the item being returned. Contact the appropriate Regional Sales Manager for further information regarding Return Material Procedures.

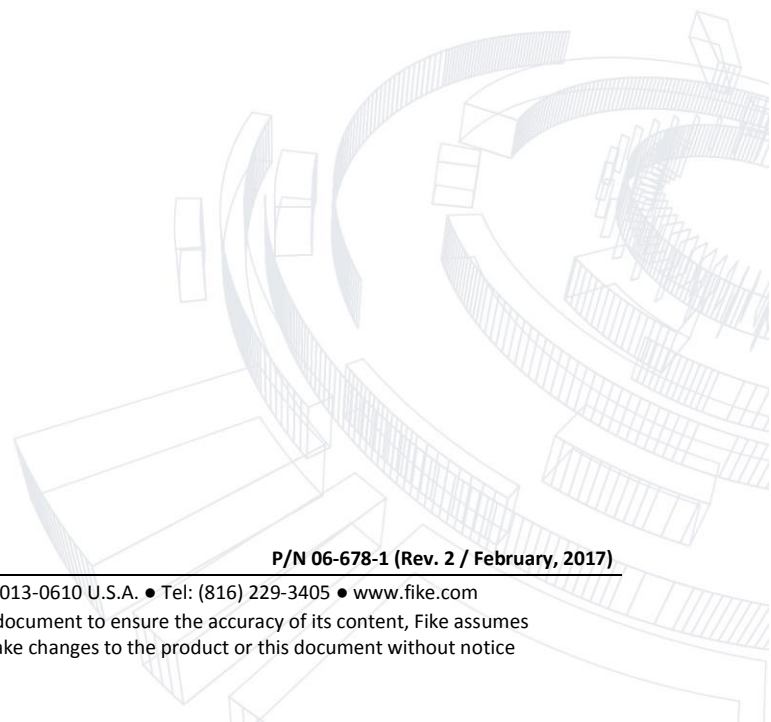
LIMITATION OF LIABILITY

Fike cannot be held liable for any damages resulting from the use or misuse of this product.

QUALITY NOTICE

Fike has maintained ISO 9001 certification since 1996. Prior to shipment, we thoroughly test our products and review our documentation to assure the highest quality in all respects.

**FIKE PROINERT[®] SYSTEM
W/ IG-541 AGENT
200 & 300 BAR CYLINDERS
UNIVERSAL VALVE OPERATOR (UVO)
LPCB APPROVED COMPONENTS**



REVISION HISTORY

ORIGINAL RELEASE DATE:.....May, 2013

REVISION / DESCRIPTION OF CHANGE	REVISION DATE
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Revision 1	November, 2014
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1) Revised the following Comp Spec from rev 0 to rev 1:

- 06-678-1-1
- 06-678-1-2
- 06-678-1-3
- 06-681-1-2
- 06-681-1-8
- 06-681-1-9

Revision 2	February, 2017
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1) Revised the following Comp Spec from rev 0 to rev 1:

- 06-681-1-3

2) Revised the following Comp Spec from rev 1 to rev 2:

- 06-678-1-2
- 06-678-1-3
- 06-681-1-2
- 06-681-1-9

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PROINERT® IG-541 AGENT

DESCRIPTION

IG-541 is a colorless, odorless, electrically non-conductive gas with a density approximately the same as air. (See Physical Properties for additional information).

IG-541 is stored as pressurized gas within the cylinder assembly. It is available at storage pressures of 200 bar and 300 bar. When discharged into a protected space, IG-541 is clear and does not obscure vision. It leaves no residue and has zero ozone depleting potential and zero global warming potential.

FEATURES AND BENEFITS

- Natural gas present in the atmosphere
- Suitable for occupied areas
- No toxic or corrosive decomposition products from agent
- Colorless, odorless, compressed gas
- Stored as a gas
- Fogging does not occur when agent is discharged
- Electrically non-conductive
- No residue to clean up after discharge
- Zero ozone depleting potential
- Zero global warming potential
- Included on the U.S. EPA Significant New Alternative Policy (SNAP) rules

EXTINGUISHING METHOD IG-541

IG-541 extinguishes a fire by reducing the residual oxygen concentration to a level that will no longer support combustion.

USE AND LIMITATIONS – IG-541 AGENT

System shall be used on the following Class of Hazards:

- Class A & C: Electrical and Electronic Hazards
Telecommunications Facilities
High value assets, where the associated down-time would be costly
- Class B: Flammable liquids and gases

Systems shall “**NOT**” be used on fires involving the following materials:

- 1) Chemicals or mixtures of chemicals that are capable of rapid oxidation in the absence of air. (Examples include: Cellulose Nitrate and Gunpowder)
- 2) Reactive metals such as Lithium, Sodium, Potassium, Magnesium, Titanium, Zirconium, Uranium, and Plutonium
- 3) Metal hydrides such as Sodium Hydride and Lithium Aluminum Hydride
- 4) Chemicals capable of undergoing auto-thermal decomposition. (Examples: Organic Peroxides and Hydrazine)

EXPOSURE LIMITATIONS

Hazard Type	Design Concentration / Oxygen Levels	Maximum Human Expose Time
Normally Occupied Space	Up to 43% / 12% minimum	5 minutes
	43% to 52% / 12% to 10%	3 minutes
Normally Un-Occupied Space	52% to 62% / minimum 8%	30 seconds
	Above 62% / 8% or lower	0 seconds (Personnel CANNOT be exposed)

NOTES: EN 15005, ISO 14520 & NFPA 2001 does not allow Clean Agent Systems to be used in any occupiable spaces where the design concentration required is above **52%** unless provided with supervised system lockout valve, pneumatic pre-discharge alarm, pneumatic time delay and warning signs.

Fike does not recommend ProInert systems to be used in normally occupied spaces where the design concentration required is above **52%**.

WARNING: The discharge of clean agent systems to extinguish a fire can result in potential hazard to personnel from the natural form of the clean agent or from the products of combustion that result from exposure of the agent to the fire or hot surfaces. Unnecessary exposure of personnel either to the natural agent or to the products of decomposition shall be avoided.

PHYSICAL PROPERTIES OF IG-541

Chemical Name	N ₂ /Ar/CO ₂
Molecular Weight	34
Boiling Point at 1 ATM (1.013 bar)	-196°C
Critical Pressure	N/A
Critical Temperature	N/A
Density at 1 ATM at 20°C	1.435 kg/m ³

ProInert™ IG-541

SECTION 1: Identification of the substance/mixture and of the company/undertaking

Product identifier

ProInert™ IG-541

Use of the substance/preparation

Fire extinguishing agent

Company/undertaking identification

Fike Corporation
704 SW 10th Street
P.O. Box 610
Blue Springs
Missouri 64013-0610
USA

Tel : +1 816 229 3405

Emergency telephone

SECTION 2: Hazards identification

Classification of the substance or mixture

Gases under pressure

H280 : Contains gas under pressure; may explode if heated.

Label elements



Warning

H280 : Contains gas under pressure; may explode if heated.

P410 + P403 : Protect from sunlight. Store in a well-ventilated place.

Other Hazards

The gas mixture is heavier than air and can cause suffocation by reducing oxygen available for breathing.

SECTION 3: Composition/information on ingredients

Mixture of 48.8-55.2% Nitrogen, 37.2-42.8% Argon and 7.6-8.4% Carbon dioxide

SECTION 4: First aid measures

General advice

If unconscious place in recovery position and seek medical advice. Never give anything by mouth to an unconscious person. If breathing is irregular or stopped, administer artificial respiration. If symptoms persist, call a physician.

Inhalation

May cause asphyxiation at high concentrations. Symptoms may include loss of mobility/consciousness. Victim may not be aware of asphyxiation. Remove victim to an uncontaminated area, wearing self-contained breathing apparatus. Keep person warm and at rest. Seek medical assistance. Apply artificial respiration if breathing has stopped.

Skin/eye contact

Compressed gas directed at the skin can enter the body through small wounds or even penetrate the skin, causing serious or fatal injuries. Seek medical advice immediately.

Ingestion

Ingestion is not considered a potential route of exposure.

SECTION 5: Fire-fighting measures

Suitable extinguishing media

All known extinguishants can be used.

Specific methods

If possible stop flow of product. Move container away or cool with water from a protected position.

Specific hazards during firefighting

- Pressure buildup
- Fire of intense heat may cause violent rupture of containers.
- No hazardous combustion products.

Advice for fire fighters

In confined spaces use self-contained breathing apparatus. Use personal protective equipment.

SECTION 6: Accidental release measures

Personal precautions

Evacuate personnel to safe areas. Ventilate area, especially low or enclosed places where the mixture might collect. Refer to protective measures listed in sections 7 and 8.

Environmental precautions

Provided it is safe to do so, try to stop release. Prevent from entering sewers, basements and work pits or any place where accumulation can be dangerous.

Methods for cleaning up

Ventilate area.

Disposal

Refer to section 13 for disposal instructions.

SECTION 7: Handling and storage

Handling

- Substance is heavier than air and may spread along floors.
- Compressed gas cylinders are heavy and contain considerable stored energy. Use suitable equipment and handle with appropriate caution. Contact supplier if in doubt.

Storage

Do not drag, slide or roll containers. Never attempt to lift cylinder by its cap. Use a check valve in the discharge line to prevent hazardous back flow into the container.

Storage temperature

Keep containers in a dry, cool and well ventilated place at a temperature of between -20°C and 50°C.

SECTION 8: Exposure controls/personal protection

Exposure limits

No exposure limit specified, but atmosphere must have a minimum of 18% free oxygen.

Exposure controls

- Ensure adequate ventilation, especially in confined areas.
- **Eye protection** - wear safety glasses complying with EN 166 or ANSI Z87.1
- **Hand protection** - Leather gloves that are resistant to low temperature complying with EN 374 or US OSHA guidelines. The choice of the gloves also depends on other quality features other than material and is different from one manufacturer to another. Consideration must be given to specific local conditions such as the danger of cuts, abrasion and contact time with the substance.
- **Skin and body protection** – Wear suitable protective equipment.
- **Protective measures** – Self-contained breathing apparatus is required if a large release is experienced.
- **Respiratory protection** – For rescue use self-contained breathing apparatus. The mixture is heavier than air and can cause suffocation by reducing the oxygen concentration available for breathing. Apparatus must comply with EN 137.

SECTION 9: Physical and chemical properties

Physical and chemical properties

Form	: Colorless gas
Odour	: None
Molecular weight	: 34.0
Freezing point	: -78.5°C
Boiling point	: -196°C
Relative density gas	: Heavier than air
Relative density liquid	: Not applicable
Vapour pressure @ 20°C	: Not applicable
Solubility in water	: Negligible
Auto ignition temperature	: Not applicable
Flammability range	: Not applicable

SECTION 10: Stability and reactivity

Reactivity and chemical stability

Stable under normal conditions

Possibility of hazardous reactions

Stable

Hazardous decomposition products

None

SECTION 11: Toxicological information	
General No toxicological effects from this product LC50/ih No acute toxicity	
SECTION 12: Ecological information	
No ecological damage is caused by this product. Nitrogen, Argon and Carbon dioxide are natural components of air. Nitrogen constituting approximately 78%, Argon approximately 0.9% and Carbon dioxide 0.03% of the earth's atmosphere.	
SECTION 13: Disposal considerations	
To atmosphere in a well-ventilated area. Consider noise and pressure hazards. Do not discharge into any place where its accumulation could be dangerous. Contact your Fike Corporation supplier if guidance is required.	
SECTION 14: Transport information	
UN No.	: 1956
Class	: 2
Proper shipping name	: Compress gas, n.o.s. (52% Nitrogen, 40% Argon, 8% Carbon dioxide)
ADR/RID Item No.1	: 2.1a
Other transport information	: Avoid transport on vehicles where the load space is not separated from the driver's compartment. Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in an emergency. Before transporting product containers ensure: • Cylinder valve is closed and not leaking. • Valve outlet cap is correctly fitted. • Adequate ventilation. • Compliance with applicable regulations.
SECTION 15: Regulatory information	
SECTION 16: Other information	
Refer to Section 3. H280 Contains gas under pressure; may explode if heated. The hazard of asphyxiation is often overlooked and must be stressed during operator training. Before using this product in any new processes or experiment, a thorough material compatibility and safety study should be carried out.	
The information provided in this document is correct at the date of publication. The information is designed only as a guide for safe handling, use, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. Whilst great care has been taken in the preparation of this information, no liability for injury, damage or non-compliance with any legislation or directive arising from its use can be accepted. This sheet does not constitute or substitute for the user's own assessment of workplace risk as required by other health and safety legislation.	

PROINERT® AGENT STORAGE CYLINDER ASSEMBLY – IG-541

DESCRIPTION

The Agent Storage Cylinder Assembly comprises of a steel pressure vessel designed to hold the IG-541 agent under pressure and a ProInert Valve Assembly.

The ProInert Valve Assembly is a self-regulating valve that allows the extinguishing agent to be released from the cylinder at a constant pressure. Because pipe pressure and nozzle flow rates remain constant throughout the discharge, smaller diameter piping can be used throughout the protected space, and the need for installing over pressure relief vents in the room is minimised.

The valve is equipped with a safety relief disc that will rupture if the cylinder exceeds the rating of the rupture disc. The rupture disc is set to relieve at below the test pressure of the cylinder.

Each valve is also equipped with a port to allow monitoring of its contents via a combined pressure gauge and switch.

SPECIFICATIONS

IG-541 Agent Storage Cylinder		
Cylinder Size (Water Capacity)	80 Liter	140 Liter
Cylinder Specification	EN ISO 9809-2 & TPED 2010/35/EU	
Color	Traffic Red	
Height (approx.)	1910 mm (75.2 in)	2015 mm (79.3 in)
Diameter (approx.)	267 mm (10.5 in)	356 mm (14.0 in)
Cylinder Part Number (200 bar)	IG71-080-200-541	IG71-140-200-541
Cylinder Part Number (300 bar)	IG71-080-300-541	IG71-140-300-541
Pressurization	200 bar at 15°C	
	300 bar at 15°C	
Storage Temperature	-20°C to 50°C	
Agent Capacity (200 bar)	17.0 m ³ (28.2 kg)	29.7 m ³ (49.3 kg)
Agent Capacity (300 bar)	24.3 m ³ (40.3 kg)	42.5 m ³ (70.5 kg)
Cylinder Actuation Methods	Electric – UVO (Input from Control Panel)	
	Manual – UVO (Push Button)	
	Pneumatic – Relay Actuator or Pneumatic Actuator	
Tare Weight (approx.)	102 kg (225 lbs)	198 kg (437 lbs)
Gross Weight (200 bar) (approx.)	130 kg (287 lbs)	247 kg (545 lbs)
Gross Weight (300 bar) (approx.)	142 kg (314 lbs)	269 kg (592 lbs)



APPROVAL



Certification
Number 654a

ProInert Valve Assembly		
Valve Part Number	200 bar	300 bar
	IG71-001-2	IG71-001-1
Valve Type	Type 2 – valve with pressure relief device relieving other than into the valve discharge outlet.	
Process Connections	1" NGT – Inlet connection G 5/8" – Outlet connection	
Materials of Construction	Forged brass valve body with brass and stainless steel internal components	
Maximum Working Pressure	200 bar	300 bar
	240 bar	366 bar
Temperature Range	-20°C to 50.0°C	
Free Flow Cross-sectional Area	12 mm	
Listings and Approvals	LPCB	



APPROVAL



Certification
Number 654a

ITEMS SUPPLIED WITH CYLINDER

NOTE: The following items are furnished with each Cylinder Assembly			
Item No.	Description	(P/N IG71-080-XXX-XXX)	(P/N IG71-140-XXX-XXX)
		Part Number	Part Number
1	Cylinder	02-10631	02-10812
2	Cylinder I.D. Label	02-13415	02-13709
3	ProInert Valve Assembly for 300 bar	IG71-001-1	
	ProInert Valve Assembly for 200 bar	IG71-001-2	
4	Safety/Shipping Cap	02-4829	02-14145

NOTES:

- 1) Fike Cylinder I.D. Label provides the information that is specific to each cylinder:
Assembly number of the cylinder, Weight information: tare, gross and agent and Installation, operation and safety information.
All cylinders filled either by the factory or by an Approved Initial Fill Station are provided with a nameplate bearing the approval agency markings.
- 2) All cylinders do not have siphon tubes and can be mounted the vertical or horizontal position.

ORDERING FORMAT FOR CYLINDER ASSEMBLY

When placing an order for a Cylinder Assembly, you MUST specify the following in addition to the basic part number.

IG71 – 080 – XXX – XXX
Pressure Agent

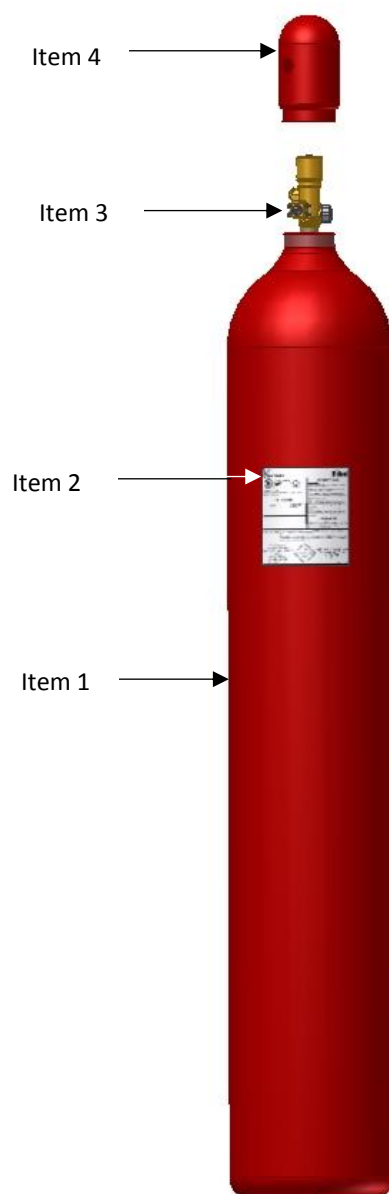
For a 80L Cylinder @ 200 bar and IG-541 Agent
p/n is IG71-080-200-541

For a 80L Cylinder @ 300 bar and IG-541 Agent
p/n is IG71-080-300-541

IG71 – 140 – XXX – XXX
Pressure Agent

For a 140L Cylinder @ 200 bar and IG-541 Agent
p/n is IG71-140-200-541

For a 140L Cylinder @ 300 bar and IG-541 Agent
p/n is IG71-140-300-541



INSTALLATION

The system installation must comply with the requirements of this manual; ISO 14520 or EN 15004 or NFPA 2001 and all applicable local codes, regulations, and standards; and the authority having jurisdiction (AHJ).

WARNING: **DO NOT** start system installation until the final design of the total system has been verified using Fike's Engineered Flow Calculation.

WARNING: The Actuator should **always** be the last component installed on a Fike Clean Agent Fire Suppression system.

SAFETY: The system involves handling high pressure equipment. All installers must be fully trained by Fike and conversant with this manual.

Attention is drawn to the European Pressure Equipment Directive 97/23/EC. All pipe-work must be made using certified materials.

Do not locate any system components where they would be subject to physical damage, exposure to corrosive chemicals, or harsh weather conditions or fire.

AGENT STORAGE CYLINDERS

Make certain that each cylinder has been installed in the correct location. Each cylinder has a nameplate with an identifying part number. Check the cylinder part number against those listed on the system plans to verify their locations.

Cylinders should be located in clean, dry, and relatively vibration-free areas. Avoid aisles and other high traffic areas where physical damage or tampering is more likely. Cylinders should never be mounted where the cylinder could potentially be splashed with, or submerged in any liquid.

Cylinder brackets must be mounted securely to solid load-bearing surfaces that will support the cylinder load. Some installations may require additional mounting support not supplied by Fike.

Cylinders should be located to allow easy accessibility to the actuation package for manual release of the system. Manual release is achieved by removing the locking pin and pressing the red manual activation strike knob adjacent to the electric solenoid. This will pneumatically initiate the discharge sequence.

WARNING: The Solenoid Actuator should **always** be the last component installed on any Fike ProInert system.

Procedure:

1. Confirm the cylinder location and mount the cylinder back rack and manifold support.
2. Position the cylinders in the racking. Do NOT remove the valve protection cap until the cylinders are fully mounted. The orientation of the valve outlet is indicated by a label on the cylinder neck. Generally discharge outlets will be to the right and at an angle of 30° to the wall.
3. Secure the cylinders and mount the manifold.
4. Fit the discharge hose assemblies to the manifold.
5. Install and test the discharge pipe-work.
6. Remove the valve protection caps and valve outlet caps (retain for future use.)
7. Remove and retain the Pressure Gauge blanking plug.
8. Fully screw in the gauge and then unscrew it by a maximum of 1 turn to the correct orientation.
9. Remove and retain the plug from the valve actuation port.
10. Connect the Solenoid Actuator and pilot hoses to each cylinder valve actuator. Do NOT fit actuators to the cylinder valves until the system is fully commissioned.

PROINERT® CYLINDER COMPLETER KIT – IG-541

DESCRIPTION

Fike ProInert Cylinder Completer Kit provides the items necessary to monitor cylinder pressure, pneumatically operate cylinder valve and provide a flexible connection between the cylinder and the manifold / piping network.

Kits are available for:

- 200 bar cylinder systems
- 300 bar cylinder systems

ITEMS SUPPLIED WITH CYLINDER COMPLETER KIT

Cylinder Completer Kit (200 bar) – P/N IG71-108		
Item No.	Part Number	Description
1	02-12561	Pressure Gauge w/ Low Pressure Switch
2	IG71-104	Pneumatic Actuator Assembly
3	IG71-003	Discharge Hose Kit

Cylinder Completer Kit (300 bar) – P/N IG71-109		
Item No.	Part Number	Description
1	02-12560	Pressure Gauge w/ Low Pressure Switch
2	IG71-104	Pneumatic Actuator Assembly
3	IG71-003	Discharge Hose Kit

ITEM 1 – PROINERT® PRESSURE GAUGE W/ LOW PRESSURE SWITCH

DESCRIPTION

Each Fike ProInert Cylinder is equipped with a Pressure Gauge and Switch Assembly to indicate a visual pressure indication at the cylinder, as well as continuous cylinder pressure monitoring at the control panel. The Pressure Gauge scale is calibrated to show the actual pressure, as well as a color-coded acceptable operating range, under-pressure range, and over-pressure range.

The low pressure switch is continuously monitoring the container pressure for a low-pressure condition. If the pressure inside the container drops below the set pressure, the switch contacts will transfer and invoke a “supervisory” indication on the control panel.

The pressure gauge / low pressure switch assembly can be installed, removed/replaced on a charged container without removing the agent first.



SPECIFICATIONS

Assembly Part Number	02-12561 (200 bar) 02-12560 (300 bar)
Temperature Limits	-40°C to +60°C
Protection Rating	IP65
Contact Rating	Single pole, 4.5 to 24VDC/VAC, 5 to 100 mA; 3 W
Pressure Connection	M10 x 1
Electrical Connection	DIN 43650 Compact (Hirshmann).
Wire Leads	(2) 18 gauge x 0.3 m long
Pressure Setting	Contacts open @ 240 bar (decreasing) 300 bar cylinder @ 160 bar (decreasing) 200 bar cylinder
Body Material	Stainless Steel
APPROVALS	VdS

INSTALLATION / REPLACEMENT

The following procedure is used to install and/or replace the pressure gauge with low pressure switch on a charged cylinder. This device can be installed in the fill port on a container that is charged by using the following steps:

IMPORTANT NOTE: Cylinder must be securely mounted in the cylinder racking or cylinder strap before installing pressure gauge.

Step 1: Prior to Assembly; lubricate the Pressure Gauge Assembly O-Ring (p/n 02-10674) with Molykote 55 or equal. Use care not to get lubricant into pressure port.

NOTES: **DO NOT** apply PTFE thread tape to Pressure Gauge Adaptor threads.
DO NOT cross thread the Pressure Gauge Assembly during installation.

Step 2: Remove and retain Plug from pressure gauge port.

Step 3: Screw in the Pressure Gauge Assembly (Hand Tight) until resistance is felt. Use locking pliers or wrench to screw in the Pressure Gauge Assembly until it bottoms out. This will open an internal check valve and pressurize the gauge.

Step 4: To align the Pressure Gauge, un-screw Pressure Gauge Assembly up to 1 turn.

Step 5: Leak check around the pressure gauge port using Snoop leak test fluid or equivalent.

If a leak is detected; remove the Pressure Gauge Assembly from the ProInert valve and remove the lubricant and contaminants from the O-Ring, threads and valve port using isopropyl alcohol and a soft clean cloth. Lubricate the O-Ring with Molycoat 55 or equal and reinstall. Leak test around the pressure gauge port.

If a leak is detected; remove the Pressure Gauge Assembly from the ProInert valve, remove the O-Ring, install a new O-Ring, lubricate the O-ring with Molycoat 55 or equal, install the Pressure Gauge Assembly in the ProInert valve, and leak test around the pressure gauge port.

WARNING: When removing the Pressure Gauge Assembly from a pressurized ProInert cylinder, a “pop” sound will occur. This is the result of a minor amount of gas being trapped in the pressure gauge port; this is a normal occurrence. If a pressure leak continues after backing-off the Pressure Gauge Assembly five turns (O-Ring is visible), the Schrader core did not reseal, do not remove the Pressure Gauge Assembly, reinstall and follow the proper procedure to empty cylinder and replace Schrader core.

WIRING DIAGRAM – LOW PRESSURE SWITCH

The Pressure Gauge w/ LPS should be wired into a supervised circuit in the control panel used to provide a supervisory signal if the container pressure drops. The switch is wired as a normally open contact (closed under pressure). (See Figure 1)

NOTE: Refer to the Installation, Operation & Maintenance for the control panel being used for specific wiring criteria.

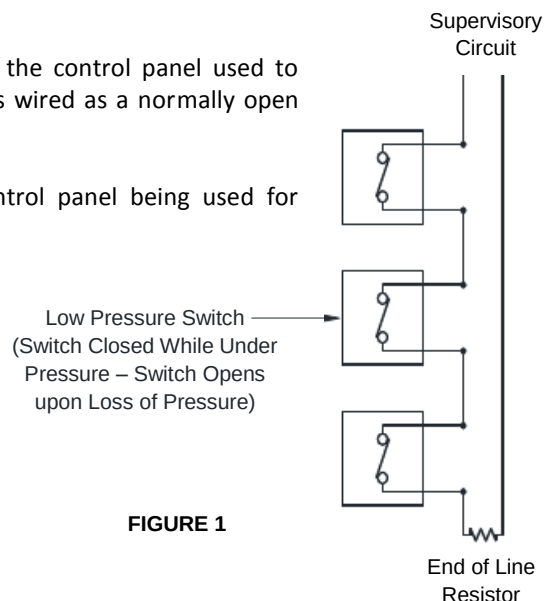
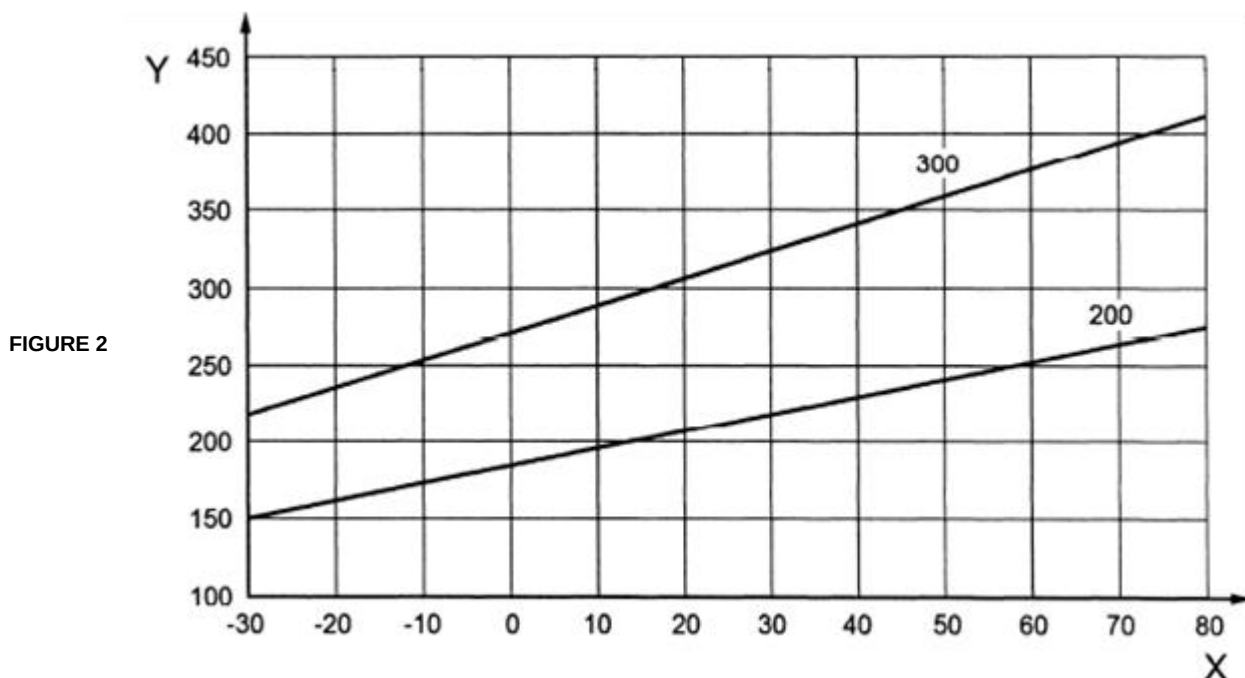


FIGURE 1

The container pressure needs to be checked as a part of the installation procedure. They should read 200 bar or 300 bar at 15°C. For temperatures other than 15°C, reference Figure 2 – Temperature vs. Pressure Chart.

IG-541 Pressure vs. Temperature Chart Filling (Reference Temperature 15°C)



X = Temperature, °C

Y = Pressure, Bar

ITEM 2 – PROINERT® PNEUMATIC ACTUATOR ASSEMBLY

DESCRIPTION

Each Fike ProInert Cylinder is equipped with a latching Actuator Assembly that operates the cylinder valve.

SPECIFICATIONS

Part Number	IG71-104
Operating Pressure	320 psi (22 bar)
Working Pressure	2,395 psi (165 bar)
Overall Length	18.75" (475 mm)
Listings and Approvals	LPCB



The actuator includes a flexible hose that is used to connect it to the next actuator assembly on multiple cylinder systems.

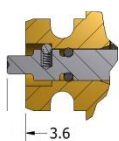
INSTALLATION

Prior to inserting of the pneumatic actuator into the valve, ensure that the actuation piston is retracted as shown.

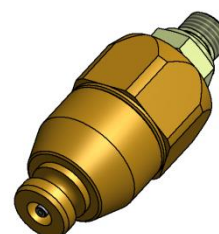
If inspection of the actuator reveals that it has been operated as shown, reset the actuator by depressing the latching ball into its housing with the aid of the reset tool (P/N IG71-0166), this will retract the actuation piston.



Reset Tool (P/N IG71-0166)



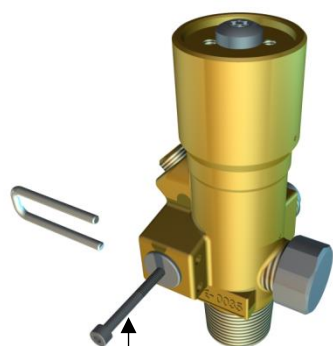
Operated Position



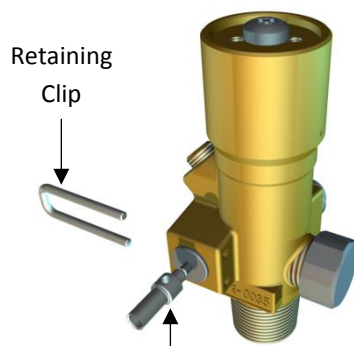
Retracted Position

CONNECTION OF PNEUMATIC ACTUATOR ASSEMBLY TO VALVE

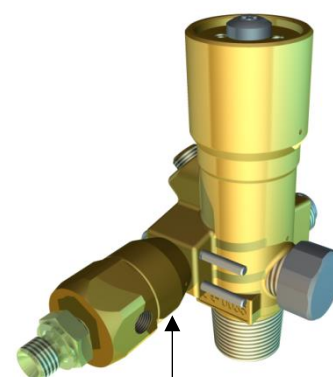
Remove the plug from the actuation port of the valve with the aid of either the set screw or Actuator Reset Tool (IG71-0166) as shown. Retain the plug for future use when the cylinder has to be re-filled/serviced. Insert the actuator into the valve and secure with either the set screws and locknuts or retaining clip.



Set Screw



Reset Tool (P/N IG71-0166)



Actuator

ITEM 3 – PROINERT® DISCHARGE HOSE KIT

DESCRIPTION

The Flexible Discharge Hose Kit includes the Discharge Hose and a Check Valve. This Kit provides the connection between the valve outlet and the discharge manifold.

Kit Part Number	IG71-003
Items included in Kit	Item 1 – Flexible Discharge Hose(p/n 02-10721)
	Item 2 – Check Valve (p/n IG71-008)
Listings and Approvals	LPCB



FLEXIBLE DISCHARGE HOSE (P/N 02-10721)

One end of the Discharge Hose is connected to the valve outlet, the other end to the check-valve. The entire assembly is then connected to the discharge manifold.

SPECIFICATIONS

Pressure Rating	5,076 psi (350 bar)
Thread Type	G $\frac{5}{8}$ - ISO 228-1 (Female Connector w/ Swivel Fitting) R $\frac{5}{8}$ - ISO7-1 (Male Connector)
Overall Length	20.5" (520 mm)

CHECK VALVE (P/N IG71-008)

A Check Valve is required for each ProInert Cylinder. The Check Valve shall be installed between the outlet end of the Discharge Hose and the distribution manifold. When installed properly, the Check Valve provides a means of preventing back-flow of agent through an open discharge hose in the event of an accidental discharge during installation or while a cylinder is removed for service. Each check valve is marked with the part number, working pressure, DN15, flow direction and batch number.

SPECIFICATIONS

Pressure Rating	5,308 psi (366 bar)
Free Flow Area	0.175 in ² (113 mm ²)
Thread Type	Rc $\frac{1}{2}$ " - ISO7-1 (Female) R1- ISO7-1 (1" BSPT)(Male)
Overall Length	2.36" (60 mm)

INSTALLATION

PROINERT VALVE CONNECTIONS

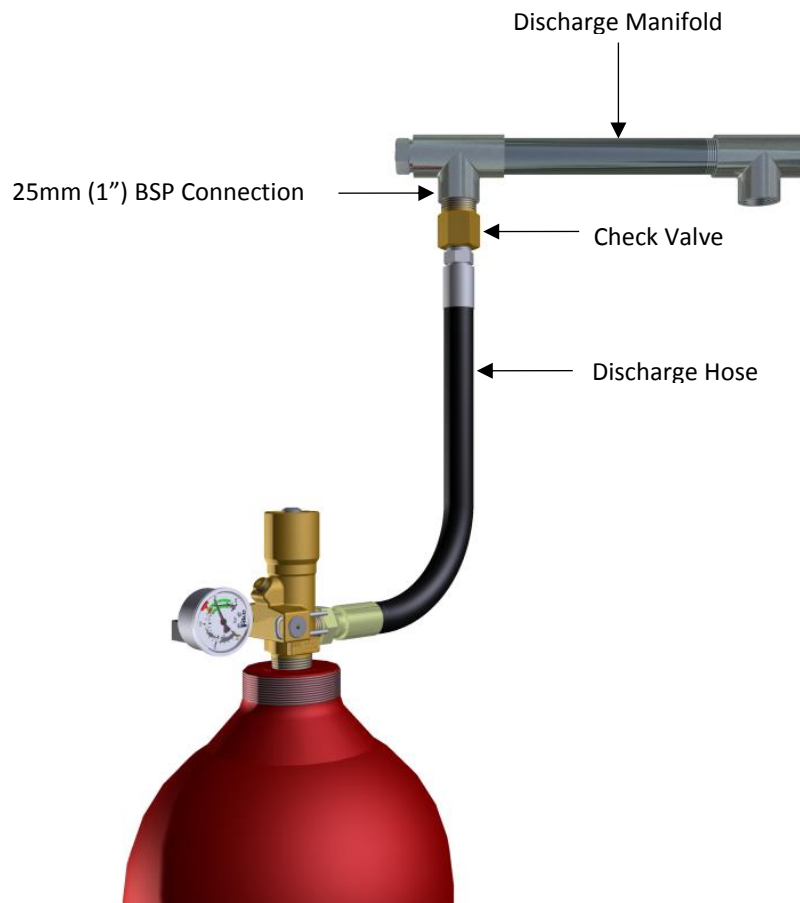
Install the Discharge Hose check valve by threading the 1" BSPT (25mm) male end into the piping or manifold in the location(s) shown on the drawings. Connect the male end of the discharge hose into other end of the check valve, then connect the female end w/ swivel fitting of discharge hose to the outlet of the discharge valve, and verify that the hose does not have any kinks in it. All connections must be wrench-tight.

The following drawing details the valve to manifold connection for the ProInert system.

DISCHARGE PIPING CONNECTIONS

The discharge piping is connected to the discharge valves by a discharge hose and check valve. The check valve utilizes a 1" BSPT pipe thread to connect to the manifold or piping network. The other end of the check valve has threads that will connect to the discharge hose. The check valve will stop the flow from the other cylinders in the manifold in case the system was to discharge with a cylinder removed.

NOTE: When removing a container from a manifold never remove the check valve or the hose from the check valve prior to disconnecting from the valve.



TYPICAL VALVE TO MANIFOLD CONNECTION

PROINERT® MOUNTING HARDWARE

DESCRIPTION

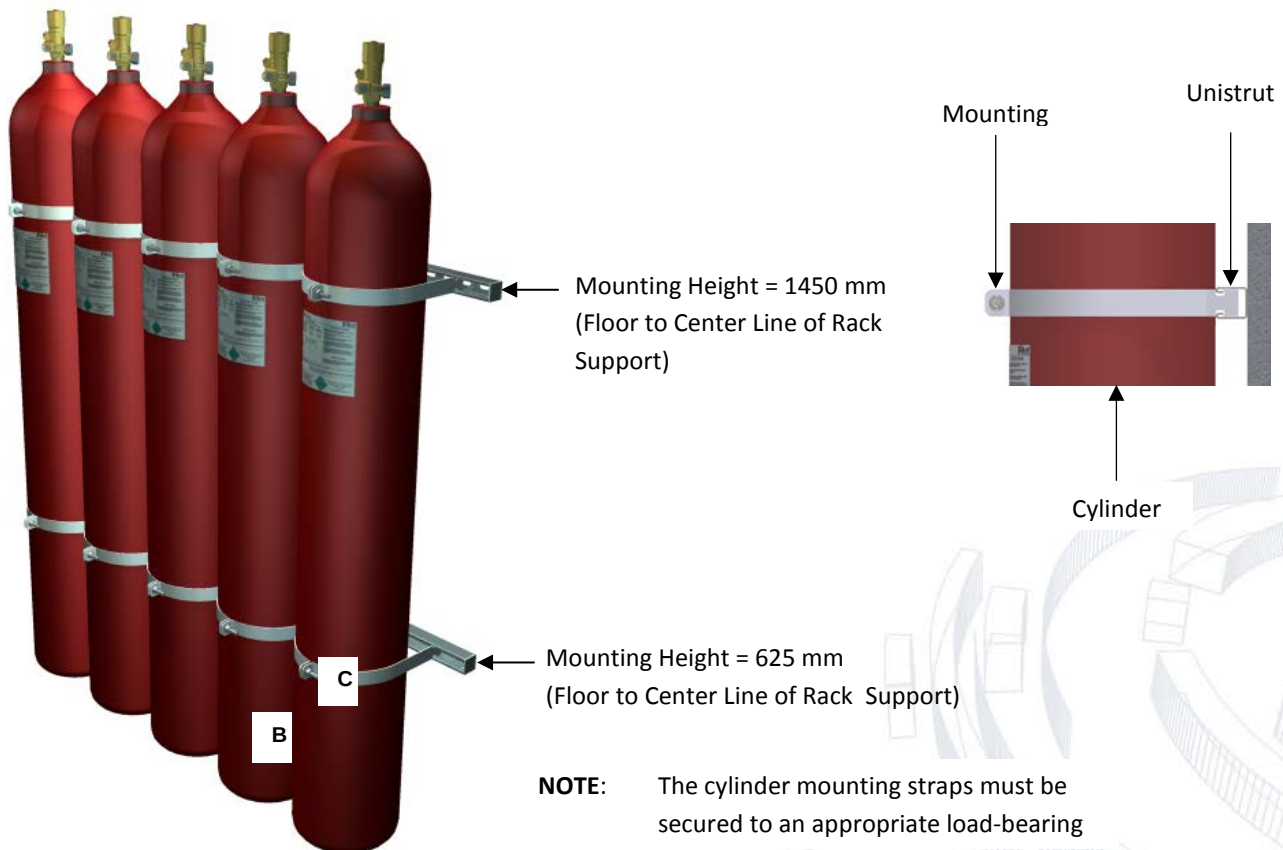
All ProInert cylinders must be adequately mounted and supported. Fike offers rack system for securing the cylinders. The racking consists of the hardware necessary for assembly, including front support, rear support and clamp rods, this provides the installer with multiple options for cylinder arrangement. Cylinders may be mounted in Single-Row, Double-Row or Triple-Row configurations.

SINGLE-ROW MOUNTING CONFIGURATION

Mounting Straps are used to secure the ProInert cylinder to a wall or other suitable mounting surface. (If cylinders are mounted in multi-row configurations utilize the Racking Assembly.)

Fike offers single row cylinder mounting kits for configurations of 1 to 5 cylinders. A single-row cylinder rack utilizes the cylinder mounting straps, along with Unistrut backing to secure the cylinders. The assembly part numbers include all the hardware required to secure the cylinders to the rear support.

The Mounting Straps are two-piece units that clip into the Unistrut® Channel on each side of the container and bolt together in front of the container. The installer must provide the hardware necessary to secure the back Unistrut to the mounting structure.



Typical Single – Row Cylinder Rack Assembly
(Assembly IG71-016-005 Shown)

DOUBLE-ROW MOUNTING CONFIGURATION

Double-row cylinder mounting may be used when it is necessary to have up to 10 cylinders in a single storage rack. A double-row cylinder storage rack utilizes Unistrut and threaded rod to secure the cylinders. The assembly part numbers include all the hardware required to assemble the racking and secure the cylinders. The installer must provide the hardware necessary to secure the rear support Unistrut to the mounting structure.



Typical Double – Row Cylinder Rack Assembly
(Assembly IG71-016-050 Shown)

TRIPLE-ROW MOUNTING CONFIGURATION

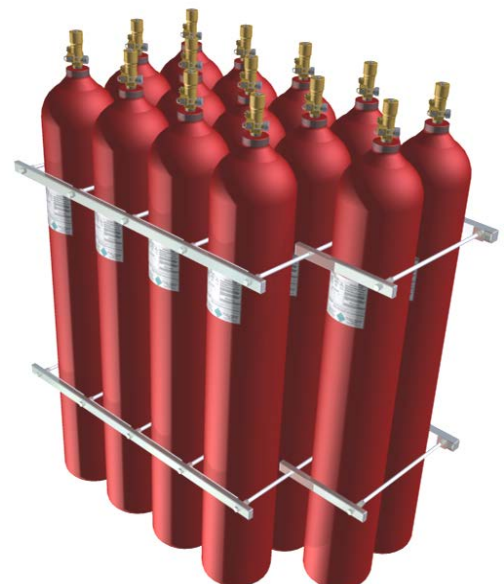
Triple-row cylinder mounting may be used when it is necessary to have up to 15 cylinders in a single storage rack. A triple-row cylinder storage rack utilizes Unistrut and threaded rod to secure the cylinders. The assembly part numbers include all the hardware required to assemble the racking and secure the cylinders. The installer must provide the hardware necessary to secure the rear support Unistrut to the mounting structure.



Typical Triple – Row Cylinder Rack Assembly
(Assembly IG71-016-500 Shown)

OTHER MOUNTING CONFIGURATIONS

There will be times when the system will require a number of bottles that does not match any of the configurations above. Because of this, Fike makes available additional racking options for cylinder storage. Details for these racking configurations are shown below.



Typical Cylinder Rack Assembly
(Assembly IG71-016-410 Shown)

CYLINDER RACK ASSEMBLY OPTIONS

By utilizing various Rack Assemblies independently or in combination, the installer may install cylinder banks consisting of up to 15 ProInert Cylinders. The table below shows the available Racking options.

RACK ASSEMBLY for 80L Cylinder	CYLINDER ARRANGEMENT (Cylinder Qty. per Row)			Total Cylinder Count
	Back Row	Middle Row	Front Row	
IG71-016-001	1	-	-	1
IG71-016-002	2	-	-	2
IG71-016-003	3	-	-	3
IG71-016-004	4	-	-	4
IG71-016-005	5	-	-	5
IG71-016-010	1	1	-	2
IG71-016-020	2	2	-	4
IG71-016-030	3	3	-	6
IG71-016-040	4	4	-	8
IG71-016-050	5	5	-	10
IG71-016-200	2	2	2	6
IG71-016-300	3	3	3	9
IG71-016-400	4	4	4	12
IG71-016-500	5	5	5	15
IG71-016-031	4	3	-	7
IG71-016-041	5	4	-	9
IG71-016-110	4	4	3	11
IG71-016-320	5	5	3	13
IG71-016-410	5	5	4	14

CYLINDER RACKING ORDERING FORMAT

The part numbering of the racking will provide the necessary information to assist the designer when ordering racking. The following describes how to read the racking part number sequence.

I G 7 1 - X X X - X X X
A B C D

A = 016 for 80L cylinders

B = The number of triple row cylinders in the rack

C = The number of double row cylinders in the rack

D = The number of single row cylinders in the rack

CYLINDER RACKING FOOT-PRINT

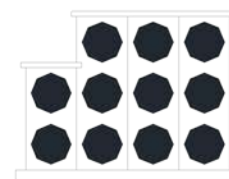
The diagram below shows the cylinder “foot-print” for the various Racking Assemblies available.



IG71-016-010



IG71-016-001



IG71-016-110



IG71-016-200



IG71-016-020



IG71-016-002



IG71-016-041



IG71-016-300



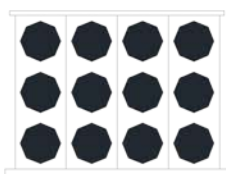
IG71-016-030



IG71-016-003



IG71-016-031



IG71-016-400



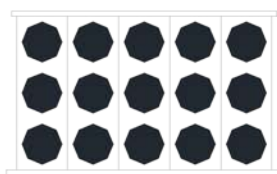
IG71-016-040



IG71-016-004



IG71-016-032



IG71-016-500



IG71-016-050



IG71-016-005



IG71-016-410

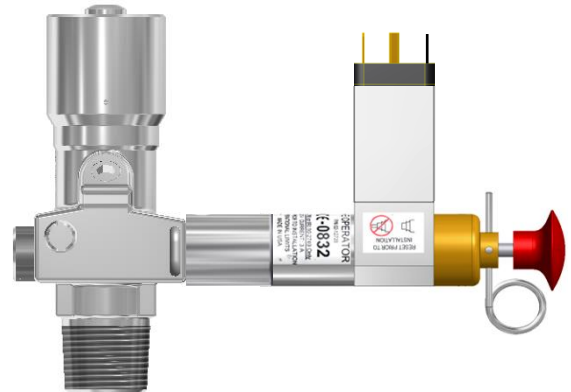
UNIVERSAL VALVE OPERATOR (UVO) KIT

DESCRIPTION

The Universal Valve Operator (UVO) provides means to electrically or manually activate the Fike Prolnert Valve inert gas cylinder by providing the force required to extend a piston that will open the valve, allowing the agent to be released from the cylinder.

The UVO can be activated electrically via a signal from a control panel or manually by depressing red manual strike button.

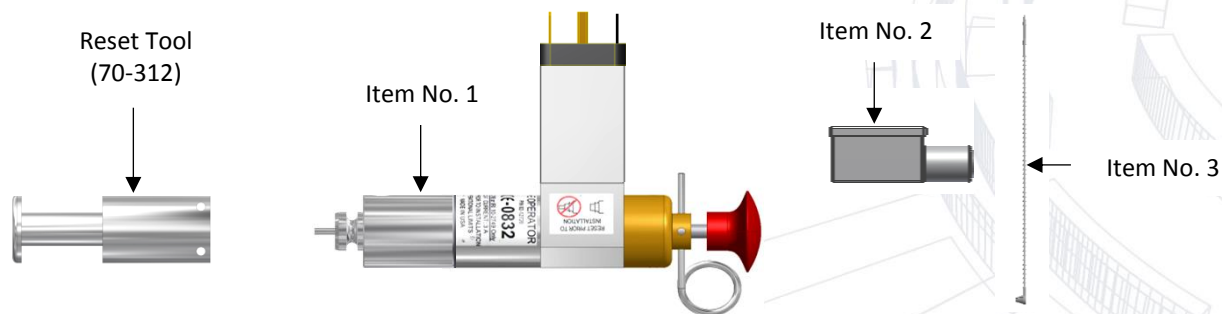
Fike's Inert Gas Cylinder with Prolnert Valve / UVO can be connected directly to the releasing circuit of conventional control panels. This wiring connection will be supervised for open and ground fault conditions from the container to the control panel.



SPECIFICATIONS

UNIVERSAL VALVE OPERATOR (UVO) KIT (P/N 70-330)		
NOTE: The following items are furnished with this kit:		
Item No.	Part Number	Description
1	02-13571	Universal Valve Operator (UVO)
2	02-10219	DIN (4 pin) Connector
3	02-2213	Security Tie
4	02-10798	Actuation Hose (not shown)
Normal Supply Voltage		24 VDC (minimum & nominal)/ 30 VDC (maximum)
Minimum Duration of Firing Signal		1 second
Current Consumption (for Battery Calculation)		Supervision max. 10 mA. Minimum current during activation at 24 VDC of 0.36A. Rated for continuous duty at 24 VDC.
Electrical Connection		IP65 - DIN Connector
UVO Material		Stainless Steel (Body) / Brass (End Cap)
Temperature Range		-20°C to 50.0°C

Note: Reset Tool (P/N 70-312) to be ordered separately.



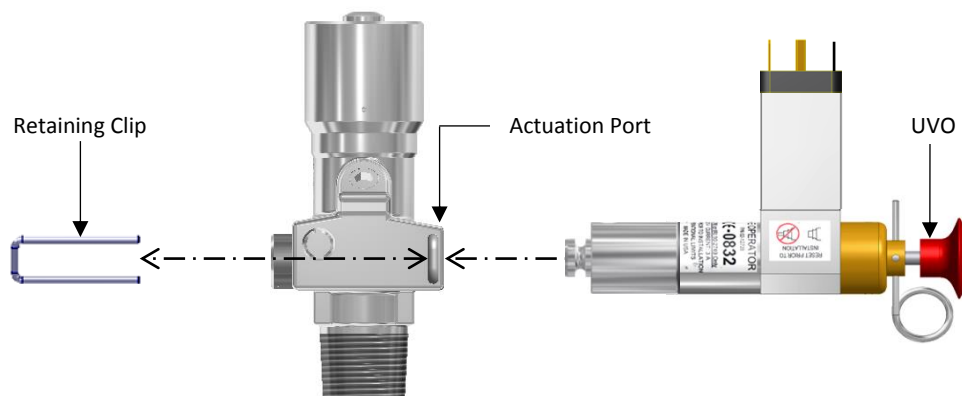
INSTALLATION

The UVO should be the last component installed on the Fike ProInert system. The following items should be completed prior to final installation of the UVO:

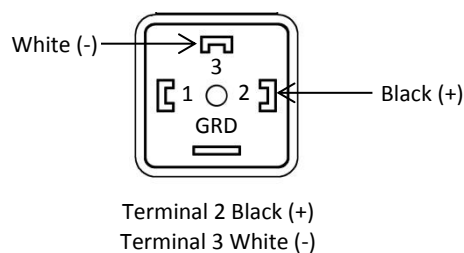
- Cylinder installation should be complete and secured in place
- Discharge piping installation should be complete and all bracing, brackets, etc. in place
- The discharge nozzles should be installed
- The detection & control system installation should be complete & tested – no faults shall be present

SINGLE CYLINDER SYSTEM INSTALLATION

Step	Details
IMPORTANT NOTE: Check to ensure UVO is armed (Firing Pin retracted) and the Safety Pin is place and secured in position with the security tie before installing to the ProInert Valve on the cylinder. Refer to Reset Instructions for details.	
1	Install the DIN connector to the UVO connector and secure with set screw.
2	Remove Retaining Clip and Plug from the ProInert Valve Actuation Port.
3	Insert UVO into ProInert Valve Actuation Port and re-insert Retaining Clip.
The cylinder is "NOW ARMED" .	



UVO INSTALLATION DETAIL

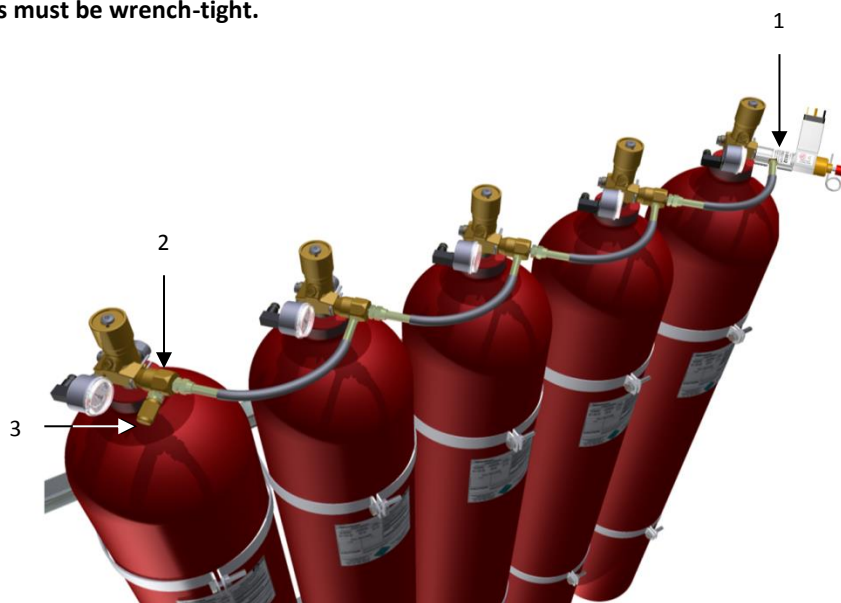


CONNECTOR DETAIL

MULTIPLE CYLINDER SYSTEM INSTALLATION

IMPORTANT NOTE: Before starting installation, check to ensure all actuators are armed (Firing Pin retracted) and Safety Pin on UVO is place and secured in position with the security tie. Refer to Reset Instructions for details.	
1	Remove hose from the last Pneumatic Actuator (Item 2 - P/N IG71-104) in the cylinder bank.
2	Install R ½" x G ¼ Adaptor, Sealing Washer and Vent Assembly (Item 3 - P/Ns 02-10797, 02-10926 & IG71-026 - these items must be ordered separately). Ensure that the threaded connection into the Pneumatic Actuator (Item 2) is made with either PTFE thread tape or thread sealant (Loctite 542 or equivalent). Install this Pneumatic Actuator to the last cylinder in the bank and secure in position with the retaining pin.
3	Install the remaining Pneumatic Actuators on to the cylinder valves and secure them in position with the retaining pins. Connect the hoses on these actuators in a daisy chain as shown by installing the ¼" swivel side of Actuation Hose into the end port onto Pneumatic Actuator. IMPORTANT NOTE: A maximum of 100 ProInert cylinders and / or pneumatic actuators can be operated from a single UVO.
4	Remove the plug from the outlet port of the UVO and install Actuation Hose to outlet port of UVO (Item 1). Ensure that the threaded connection into the outlet port of the UVO is made with either PTFE thread tape or thread sealant (Loctite 542 or equivalent), then connect the hose to the end port of next Pneumatic Actuator.
5	Install the DIN connector to the UVO (Item 1) connector and secure with set screw.
6	Remove Retaining Clip and Plug from the ProInert Valve Actuation Port.
7	Insert UVO into ProInert Valve Actuation Port and re-insert Retaining Clip.
8	For double / multiple row installations, connect the actuator hoses between rows with the G ¼ x G ¼ adaptor (Item 4 – P/N 02-10824) and actuation hose (Item 5 – P/N 02-10798) (these items must be ordered separately).
The cylinder is NOW ARMED	

NOTE: All connections must be wrench-tight.



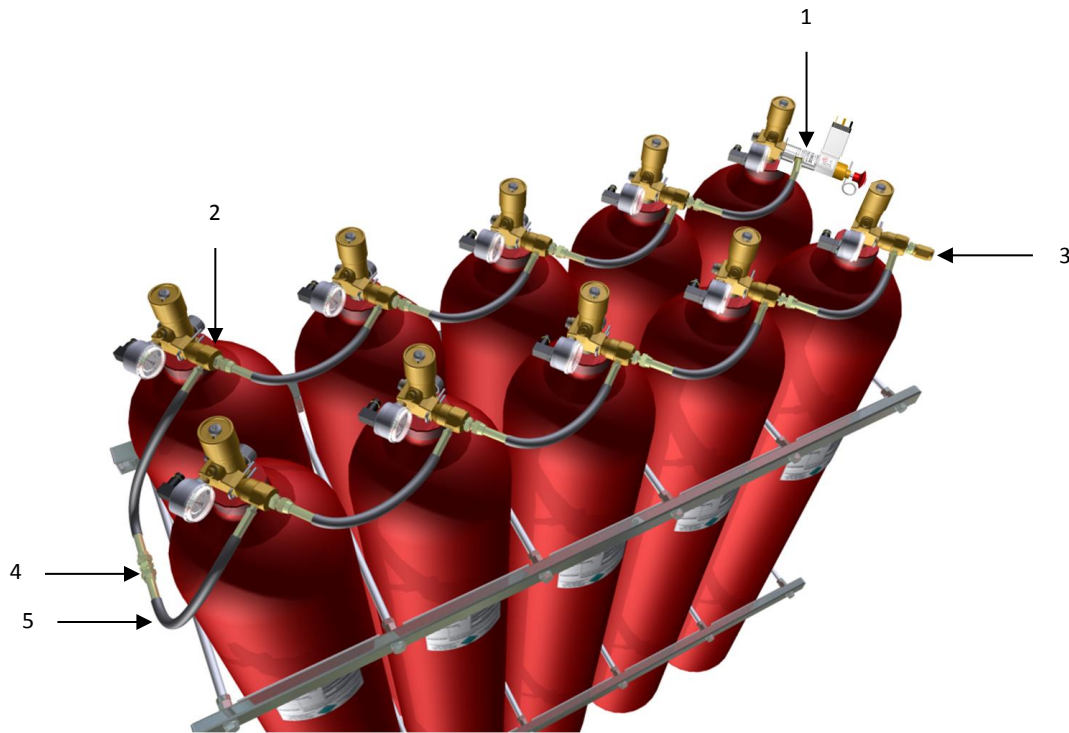
SINGLE ROW INSTALLATION

Part of Manuals: P/N 06-677, 06-678, 06-679, 06-680

P/N 06-681-1-2 (Rev. 2 / February, 2017)

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DOUBLE / MULTIPLE ROW INSTALLATION

UVO WIRING

The UVO coil is not polarity sensitive and can be wired to a compatible control panel releasing circuit. Final termination is through the DIN connector supplied with the unit. Refer to the manual & wiring requirements for the specific control panel being used to ensure proper operation.

ELECTRICAL OPERATION OF UVO

The UVO can be remotely operated by providing it with a 24 VDC electrical signal from the Control panel releasing circuit.

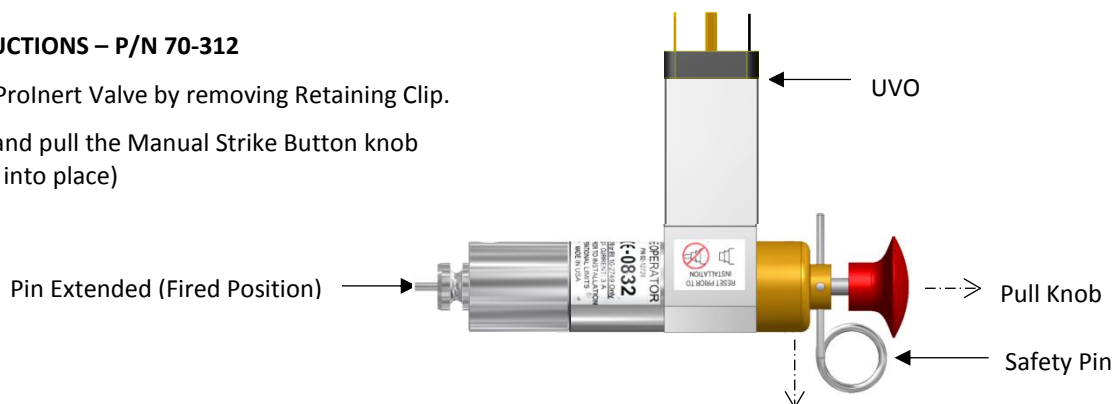
MANUAL OPERATION OF UVO

The UVO can be manually operated by breaking the safety tie, pulling out the safety pin and striking the red knob.

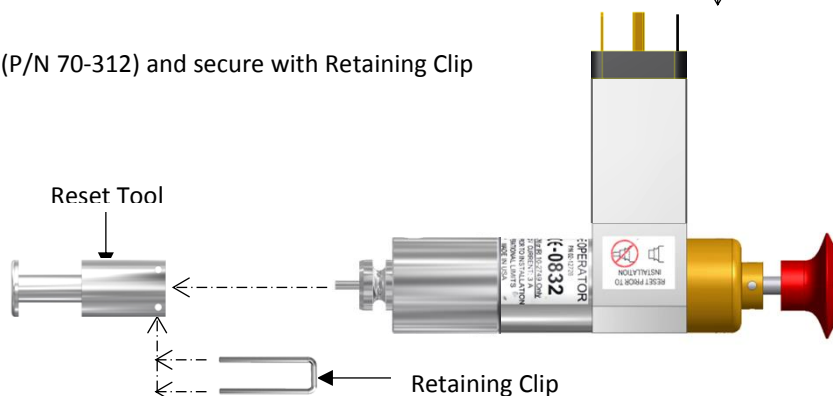
RESET TOOL INSTRUCTIONS – P/N 70-312

Remove UVO from ProInert Valve by removing Retaining Clip.

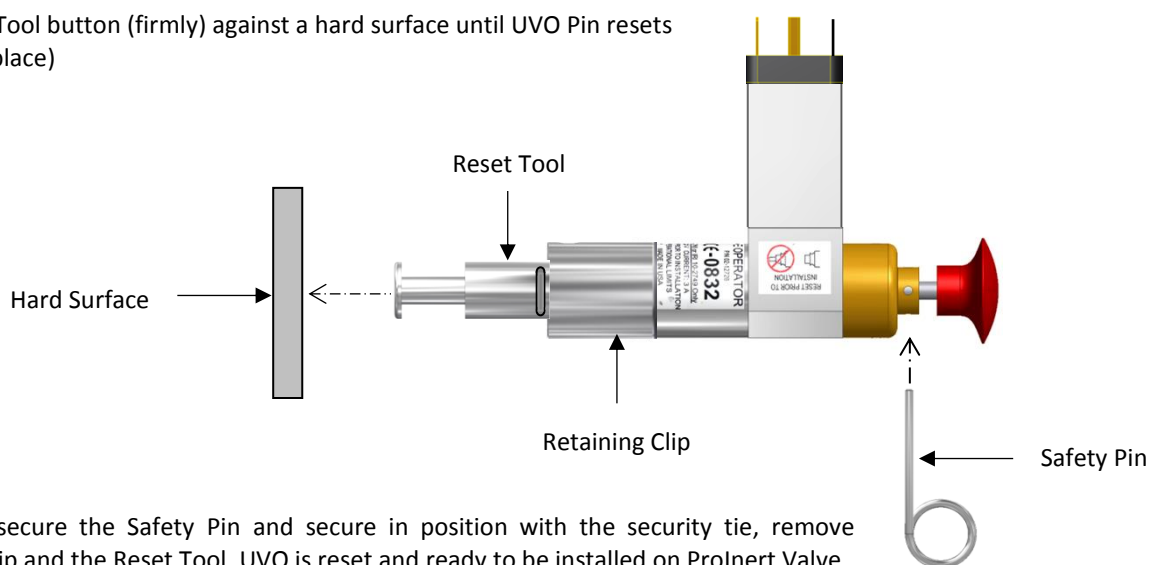
Remove Safety Pin and pull the Manual Strike Button knob until it resets (clicks into place)



Insert UVO into Reset Tool (P/N 70-312) and secure with Retaining Clip

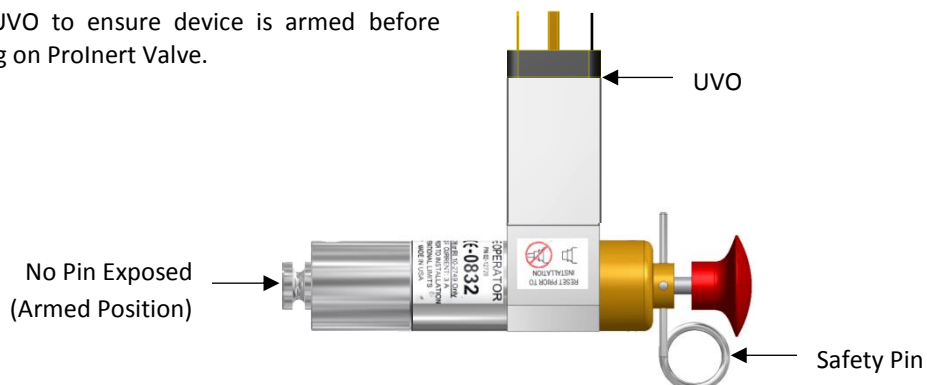


Push Reset Tool button (firmly) against a hard surface until UVO Pin resets (clicks into place)



Insert and secure the Safety Pin and secure in position with the security tie, remove Retaining Clip and the Reset Tool, UVO is reset and ready to be installed on ProInert Valve.

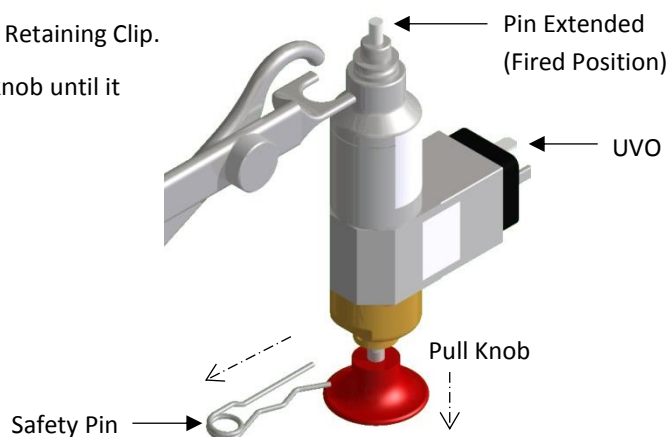
IMPORTANT NOTE: Check UVO to ensure device is armed before inserting on ProInert Valve.



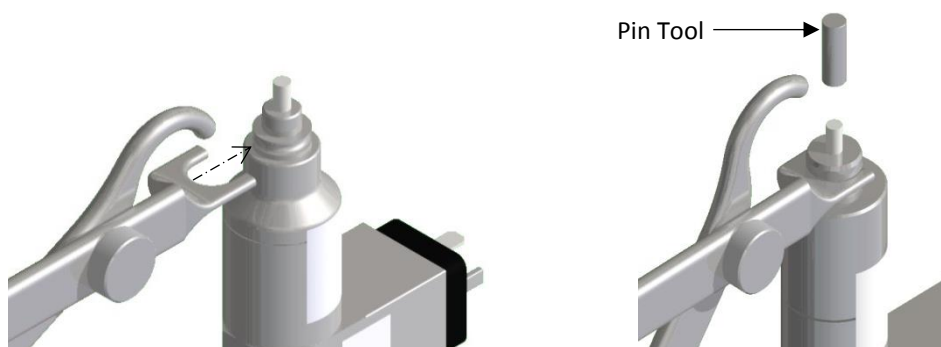
RESET MULTI-TOOL INSTRUCTIONS – P/N 02-14782

Remove the UVO from the ProInert Valve by removing Retaining Clip.

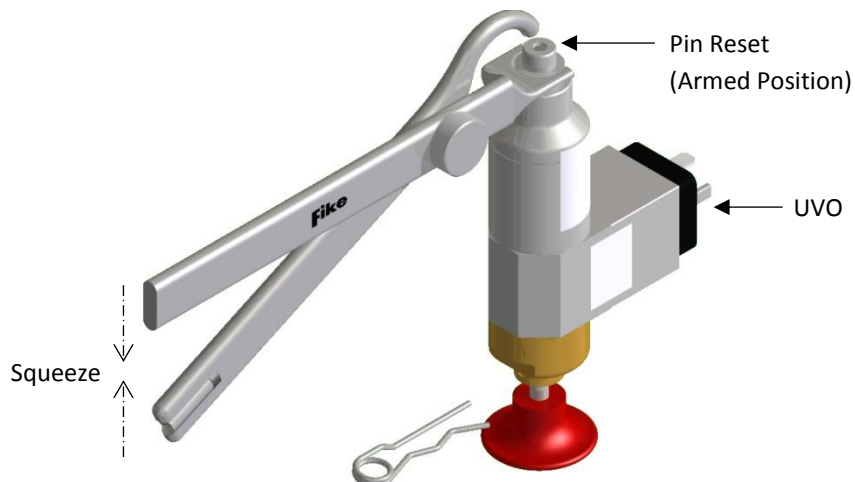
Remove Safety Pin and pull the Manual Strike Button knob until it resets (internal click is heard).



Align the forked end of the anvil handle around the grooved end of the UVO tip. It is recommended to use the additional Pin Tool included with the Reset Multi-tool.



Squeeze Reset Multi-tool handles until UVO pin resets (clicks into place).



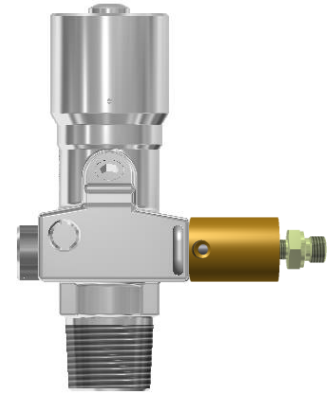
IMPORTANT NOTE: Check that UVO pin is reset to ensure device is armed before inserting on ProInert Valve.

RELAY ACTUATOR ASSEMBLY

DESCRIPTION

The Relay Actuator provides means to pneumatically operate the Fike ProInert Valve inert gas cylinder by providing the force required to extend a piston that will open the valve, allowing the agent to be released from the cylinder.

The Relay Actuator is activated from the cylinder pressure / UVO and provides the pressure to operate up to an additional 60 ProInert cylinder valves and / or Relay Actuator.



SPECIFICATIONS

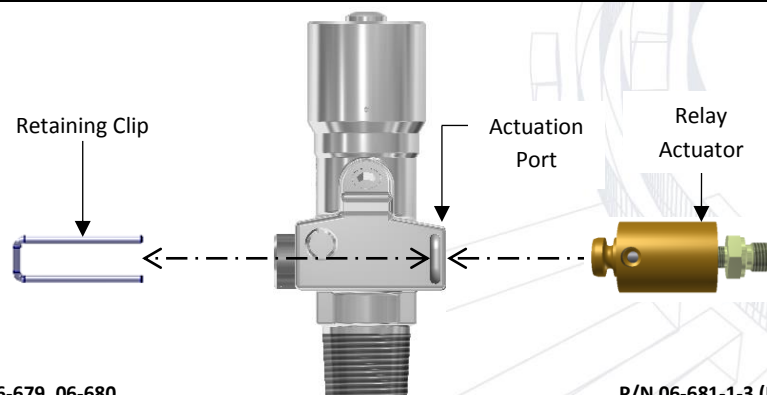
Part Number	IG71-220
Material	Brass
Temperature Range	-4°F to 120°F (-20°C to 48.9°C)
Listing and Approvals	LPCB

INSTALLATION

The following items should be completed prior to final installation of the Relay Actuator and UVO:

- Cylinder installation should be complete and secured in place
- Discharge piping installation should be complete and all bracing, brackets, etc. in place
- The discharge nozzles should be installed
- The detection & control system installation should be complete & tested – no faults shall be present

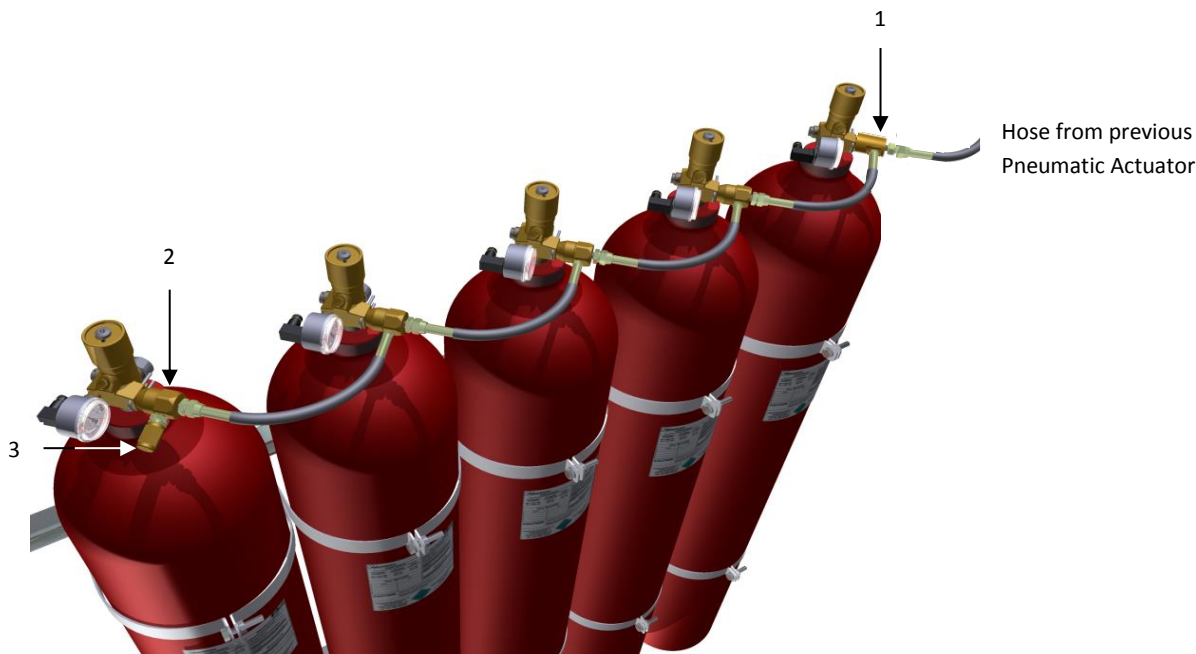
Step	Details
IMPORTANT NOTE: Check to ensure Relay Actuator is armed (Firing Pin retracted) before installing to the ProInert Valve on the cylinder. If the Relay Actuator is in the operated position (Firing Pin extended), reset the actuator by depressing the latching ball into its housing with the aid of the reset tool (P/N IG71-0166), this will retract the actuation piston.	
1	Remove Retaining Clip and Plug from the ProInert Valve Actuation Port
2	Insert Relay Actuator into ProInert Valve Actuation Port and re-insert Retaining Clip.
The cylinder is NOW ARMED .	



MULTIPLE CYLINDER SYSTEM INSTALLATION

IMPORTANT NOTE: Before starting installation, check to ensure all actuators are armed (Firing Pin retracted).	
1	Remove hose from the last Pneumatic Actuator (Item 2 - P/N IG71-104) in the cylinder bank.
2	Install R 1/8" x G 1/4 Adaptor, Sealing Washer and Vent Assembly (Item 3 - P/Ns 02-10797, 02-10926 & IG71-026). Ensure that the threaded connection into the Pneumatic Actuator (Item 2) is made with either PTFE thread tape or thread sealant (Loctite 542 or equivalent). Install this Pneumatic Actuator to the last cylinder in the bank and secure in position with the retaining pin.
3	Install the remaining Pneumatic Actuators on to the cylinder valves and secure them in position with the retaining pins. Connect the hoses on these actuators in a daisy chain as shown by installing the 1/4" JIC side of Actuation Hose into the end port onto Pneumatic Actuator. IMPORTANT NOTE: A maximum of 60 Prolnert cylinders and / or pneumatic actuators can be operated from a single Relay Actuator.
4	For double / multiple row installations, connect the actuator hoses between rows with the G 1/4 x G 1/4 adaptor (P/N 02-10824) and actuation hose (P/N 02-13713) (these items must be ordered separately).
5	Connect the hose on Pneumatic Actuator by installing the 1/4" JIC side of Actuation Hose into the outlet port on Relay Actuator.
6	Connect the hose from previous Pneumatic Actuator into the inlet port on Relay Actuator (Item 1).
7	Remove Retaining Clip and Plug from the Prolnert Valve Actuation Port.
8	Insert Relay Actuator (Item 1) into Prolnert Valve Actuation Port and re-insert Retaining Clip.
The cylinder is NOW ARMED .	

NOTE: All connections must be wrench-tight.



PROINERT® DISCHARGE MANIFOLD

DESCRIPTION

Proinert manifolds are offered in 2, 3, 4 and 5 cylinder configurations utilizing 80L cylinders. For systems that require more than 5 cylinders, manifolds must be interconnected into a common feed pipe.

When utilizing multiple cylinders or a “Connected Reserve” supply of cylinders in a common cylinder bank a discharge manifold is necessary. Multiple cylinders may be connected to a common discharge manifold to allow delivery of agent through a single piping network. Fike offers four variations of Discharge Manifolds. Discharge Manifolds may be used in combination or modified as necessary to fit the exact quantity of cylinders required for the system. Each manifold is designed to be connected to the cylinder via a Check Valve and Discharge Hose and comes ready assembled.

MANIFOLD PART NUMBER	MANIFOLD DESCRIPTION
IG71-004-2	2 Cylinder Manifold
IG71-004-3	3 Cylinder Manifold
IG71-004-4	4 Cylinder Manifold
IG71-004-5	5 Cylinder Manifold

Manifold Relief Valve
Fitted Here (See Note)



Manifold Height
= 2200 mm @ 80L Cylinder
(Floor to Center Line of Manifold)

NOTE:

Manifold Relief Valve(P/NIG71-007)
must be installed when Selector
Valves are used. (ordered separately)

Typical Single – Row Cylinder Rack Assembly
(Assembly IG71-016-005 Shown)

APPROVAL

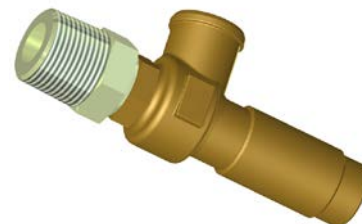


Certification
Number 654a

Once the manifold is assembled and the cylinders connected, the manifold should not be supported by the cylinders. The manifold piping should be secured with pipe hangers or brackets to support the manifold when the containers are removed.

MANIFOLD RELIEF VALVE ASSEMBLY (P/N IG71-007)

The Manifold Relief Valve Assembly consists of a safety relief valve, sealing washer and reducing adaptor. It is connected to the discharge manifold of systems that protect multiple hazards via the use of Selector Valves. The safety relief valve is CE marked and has a set pressure of 55.2 bar. It has a G $\frac{1}{4}$ outlet connection to allow any discharge to be piped to atmosphere.



CUSTOM MANIFOLD CONFIGURATIONS

For cylinder banks of more than 5 Cylinders it may be necessary to interconnect multiple manifolds. Manifolds may be connected as center feed, end feed or "H" feed configurations into a common discharge pipe.

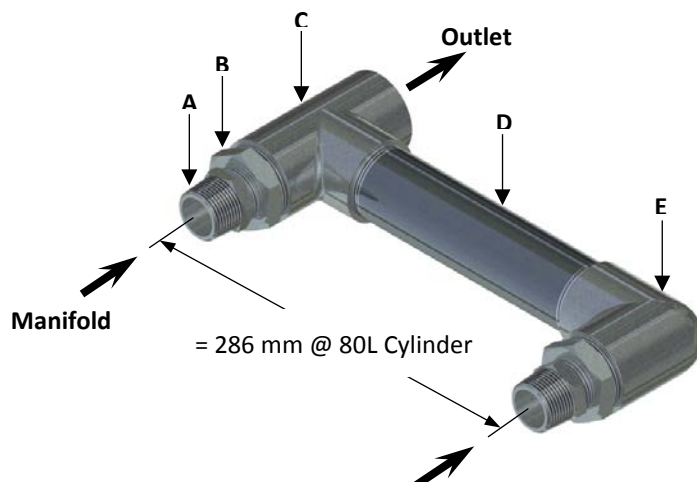
TYPICAL MANIFOLD COLLECTOR CONFIGURATIONS

Manifold piping materials must conform to the requirements as outlined in NFPA 2001, ISO 14520 or EN 15004. Schedule 40 & Schedule 80 piping materials are acceptable.

Manifold fitting materials must conform to the requirements as outlined in NFPA 2001. In general, Class 300 malleable or ductile iron fittings are acceptable through 80mm sizes. 1000 lb. ductile or forged steel fittings are required for all sizes greater than 80mm. Class 600 flanged fittings are acceptable for all pipe sizes. Cast Iron fittings are **NOT** acceptable. The following screwed fittings are acceptable:

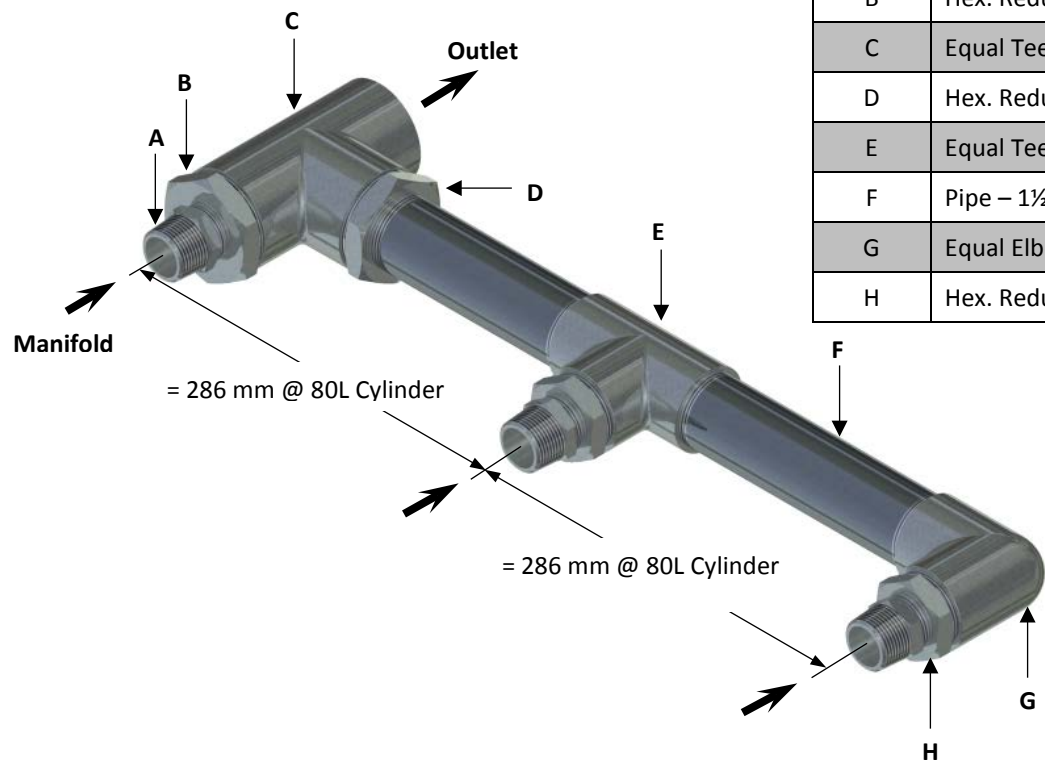
- EN 10241 Steel Threaded pipe fittings, Seamless with a test pressure of 150 bar
- EN 10242 Threaded pipe fittings in malleable cast iron. (These must be purchased to special order with a test pressure of 100 bar)

10 CYLINDER, DOUBLE ROW MANIFOLD COLLECTOR



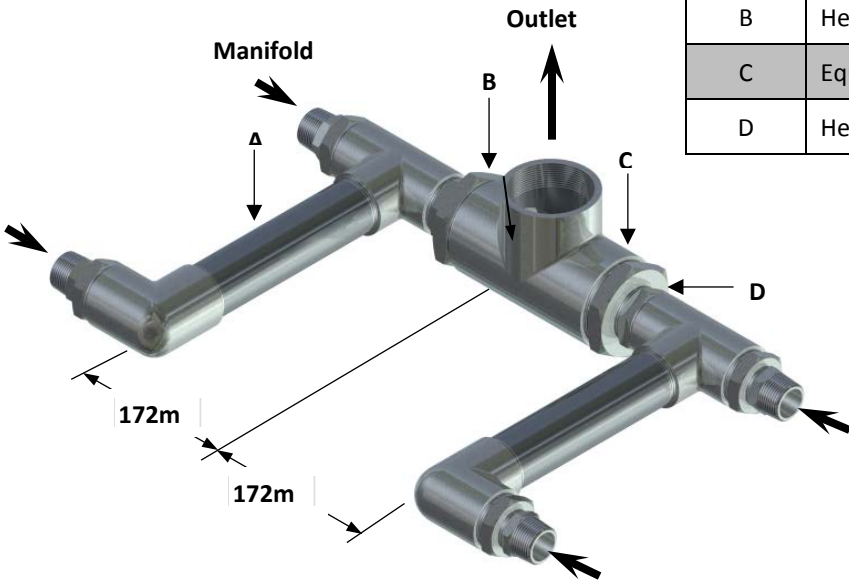
Item	Description
A	Hex. Nipple 1" x 1"
B	Hex. Reducing Bush 1½" x 1"
C	Equal Tee - 1½"
D	Pipe – 1½"
E	Equal Elbow – 1½"

15 CYLINDER, TRIPLE ROW MANIFOLD COLLECTOR



Item	Description
A	Hex. Nipple 1" x 1"
B	Hex. Reducing Bush 2" x 1"
C	Equal Tee - 2"
D	Hex. Reducing Bush 2" x 1½"
E	Equal Tee - 1½"
F	Pipe – 1½"
G	Equal Elbow – 1½"
H	Hex. Reducing Bush 1½" x 1"

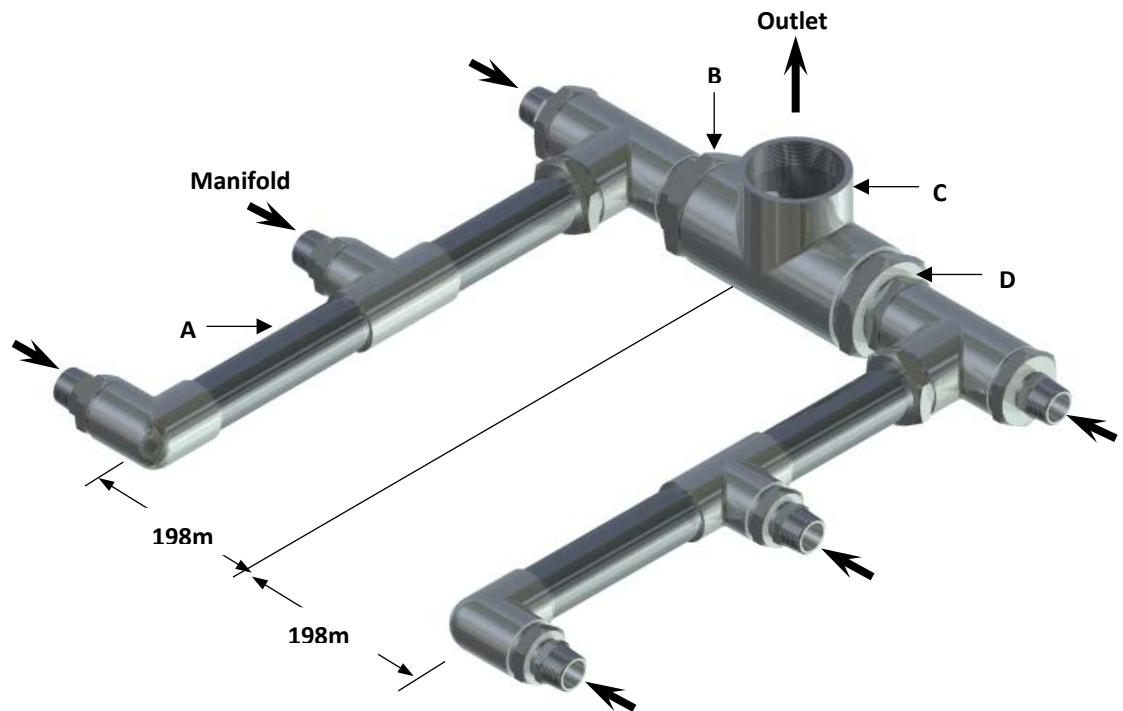
20 CYLINDER, DOUBLE ROW MANIFOLD COLLECTOR



Item	Description
A	10 Cylinder, Double Row Manifold Collector
B	Hex. Reducing Bush 2½" x 1½"
C	Equal Tee - 2½"
D	Hex. Nipple 1½" x 1½"

30 CYLINDER, TRIPLE ROW MANIFOLD COLLECTOR

Item	Description
A	15 Cylinder, Triple Row Manifold Collector
B	Hex. Reducing Bush 3" x 2"
C	Equal Tee - 3"
D	Hex. Nipple 2" x 2"



PROINERT® PIPE AND FITTINGS

DESCRIPTION

Pipe and fittings used in Clean Agent System piping network must conform to the requirements as outlined in NFPA 2001 and ISO 14520, latest editions.

PIPING MATERIALS

Piping materials, supports and spacing, must conform to the requirements as outlined in NFPA 2001, ISO 14520 or EN 15004. The thickness of the piping wall shall be calculated in accordance with ASME B31.1 Power Piping Code. For ProInert, use a minimum piping design pressure of 870 bar @ 68°C. (60 bar @ 20°C)



The following piping materials and configurations are acceptable:	Schedule 40 Threaded
	Schedule 40 Welded
	Schedule 40 Grooved
	Schedule 80 Threaded
	Schedule 80 Threaded
	BS 1387 Heavy
NOTE: Galvanized piping shall be utilized where corrosion to the pipe network is likely.	
CAUTION: Cast iron pipe, steel pipe conforming to ASTM A120, or nonmetallic pipe shall not be used.	

FITTING MATERIALS

Fitting materials **MUST** conform to the requirements as outlined in NFPA 2001, ISO 14520 or EN 15004 latest editions.

FITTINGS SIZE	FITTING CLASS
Up to 3" (80 mm)	Class 300 malleable or ductile iron
Over 3" (80 mm)	1000 lb. ductile or forged steel
All pipe sizes	Class 600 flanged

NOTE: All grooved fittings must conform to the pressure requirements outlined in NFPA 2001, latest edition. Cast Iron fittings are **NOT** acceptable.

The following piping types and grades are acceptable for pipe configurations utilizing threaded, welded or grooved end connections: [Reference: NFPA 2001]

Pipe Size in. (mm)	Pipe Grade												
	BS1387 Heavy		A-53B	A-53B			A-53A			A-53A			
			A-106B				A-106A						
	Pipe & Joint Type												
	Seamless		Seamless	ERW			Seamless			ERW			
1,2,3 & 4		1,2,3 & 4	1	2,3	4	1	2,3	4	1	2	3	4	
½" (15)	✓	Schedule 40	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
¾" (20)	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1" (25)	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1¼" (32)	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1½" (40)	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2" (50)	NO		✓	✓	✓	✓	✓	✓	✓	NO	✓	✓	✓
2½" (65)	NO		✓	✓	✓	✓	✓	✓	✓	NO	✓	✓	✓
3" (80)	NO		✓	✓	✓	✓	✓	✓	✓	NO	✓	✓	✓
4" (100)	NO		✓	✓	✓	✓	✓	✓	✓	NO	✓	✓	NO
5" (125)	NO		✓	✓	✓	✓	NO	✓	✓	NO	NO	✓	NO
6" (150)	NO		✓	NO	✓	✓	NO	✓	NO	NO	NO	✓	NO
8" (200)	NO		✓	NO	✓	NO	NO	✓	NO	NO	NO	✓	NO
½" (15)	NO	Schedule 80	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
¾" (20)	NO		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1" (25)	NO		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1¼" (32)	NO		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1½" (40)	NO		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2" (50)	NO		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2½" (65)	NO		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
3" (80)	NO		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
4" (100)	NO		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
5" (125)	NO		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
6" (150)	NO		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
8" (200)	NO		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Joint types: 1 – NPT 2 – BSPT 3 – Rolled Groove & Welded 4 – Cut Groove													
ERW – Electric Resistance Welded Pipe													

INSTALLATION

The piping system should be securely supported with due allowance for agent thrust forces, thermal expansion, and contraction, and should not be subject to mechanical, chemical, vibration, or other type of damage.

The maximum horizontal spacing for screwed, welded or grooved pipe are as indicated on the following table:

Pipe Size in. (mm)	Distance Between Supports ft. (m)	Rod Diameter in. (mm)	NOTE: - Each pipe section shall be cleaned internally before installation with a nonflammable cleaner such as Perchlorethylene in accordance with NFPA 2001, latest edition. - Teflon tape or joint compound shall be used on all threaded joints. All grooved coupling gaskets shall be lubricated per the manufacturer's specifications. "C" Clamps are not acceptable to support rod hangers. - Rigid pipe supports are required to support the "live load" of the pipe system during discharge. Rigid bracing is required at each directional change, fitting, tee and nozzle. All drops to 180° nozzles require back bracing in the opposite direction of the discharge. Earthquake bracing shall be used where required by local code. (Refer to ANSI B31.1 <i>Power Piping Code</i> and ISO 14520-1 and EN 15004-1 tables 3 & 4 for additional information) - For additional information on pressure rating of pipe and fittings, plus recommended pipe supports and hangers, refer to FSSA's Pipe Design Handbook, FSSA PDH-01. - All system piping shall be installed in strict accordance to system plans. If piping changes are necessary, they must be recalculated on Fike's Flow Calculation Program.
3/8" (10)	7 (2.2)	3/8" (10)	
1/2" (15)	7 (2.2)	3/8" (10)	
3/4" (20)	7 (2.2)	3/8" (10)	
1" (25)	7 (2.2)	3/8" (10)	
1¼" (32)	7 (2.2)	3/8" (10)	
1½" (40)	9 (2.8)	3/8" (10)	
2" (50)	10 (3.1)	3/8" (10)	
2½" (65)	11 (3.4)	1/2" (15)	
3" (80)	12 (3.7)	1/2" (15)	
4" (100)	14 (4.3)	5/8" (16)	
6" (150)	17 (5.2)	3/4" (20)	

Piping shall be installed in areas to prevent mechanical and fire damage.

The system shall be adequately bonded and earthed to minimize the risk of electrostatic discharge. Consult NFPA 2001, ISO 15420 or EN 15004 for guidance on requirements on earthing and electrical clearances.

Systems within electrical substations or switch rooms shall be sufficiently bonded and earthed to prevent the metalwork becoming electrically charged.

PROINERT® DISCHARGE NOZZLE

DESCRIPTION

The Discharge Nozzle is the device that controls the flow and distribution of the agent into the protected area. Fike offers 360° and 180° ProInert nozzles in six sizes.

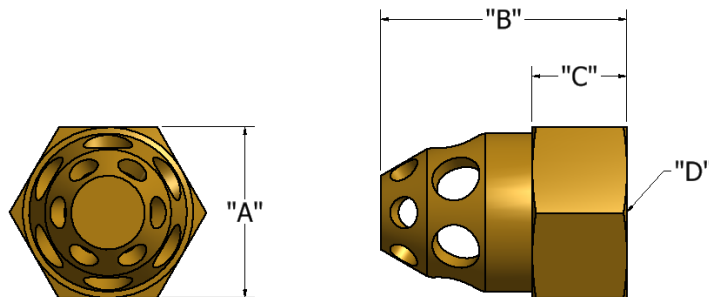
Fike ProInert Discharge Nozzles are machined from brass to prevent corrosion. The nozzles are designed to comply with ISO 14520 EN 15004, EN 12094-7 and NFPA 2001 requirements for agent discharge.

Engineered Discharge Nozzles are available in six sizes. Each nozzle has an internal orifice plate to control agent flow. The orifice plate hole diameters are determined by the Fike Engineered ProInert Flow Calculation Program.



SPECIFICATIONS

Description	Part Number / 360° Nozzle	Part Number/ 180° Nozzle
½" (15 mm) Nozzle	IG71-010-XXX	IG71-221-XXX
¾" (20 mm) Nozzle	IG71-011-XXX	IG71-222-XXX
1" (25 mm) Nozzle	IG71-012-XXX	IG71-223-XXX
1 ¼" (32 mm) Nozzle	IG71-227-XXX	IG71-224-XXX
1 ½" (40 mm) Nozzle	IG71-013-XXX	IG71-225-XXX
2" (50 mm) Nozzle	IG71-229-XXX	IG71-226-XXX
Listings and Approvals	LPCB	



Nozzle Size in. (mm)	A In. (mm)	B in. (mm)	C in. (mm)	D (BSPT)
½" (15 mm)	1.00 (25)	1.77 (45)	0.63 (16)	½
¾" (20 mm)	1.25 (32)	2.28 (58)	0.79 (20)	¾
1" (25 mm)	1.75 (44)	2.44 (62)	0.87 (22)	1
1 ¼" (32 mm)	2.00 (51)	2.82 (71.6)	1.13 (28.7)	1 ¼
1 ½" (40 mm)	2.25 (57)	3.07 (78)	1.02 (26)	1½
2" (50 mm)	2.75 (70)	3.70 (94.0)	1.45 (36.8)	2

NOTE: Each nozzle will be permanently marked with the part number, nozzle orifice.

NOZZLE ORIFICE PLATES

Each Engineered Discharge Nozzle comes with a brass Orifice Plate. The Orifice Plate controls the flow of the agent through the nozzle. The hole diameter of the orifice plate is determined by the Fike Engineered ProInert Flow Calculation Program.

NOZZLE ORDERING FORMAT FOR ENGINEERED DISCHARGE NOZZLES

When placing an order for a ProInert Discharge Nozzle, you **MUST** specify the orifice plate hole diameter code in addition to the basic part number for the nozzle needed.

I G 7 1 - X X X - X X X
 A B

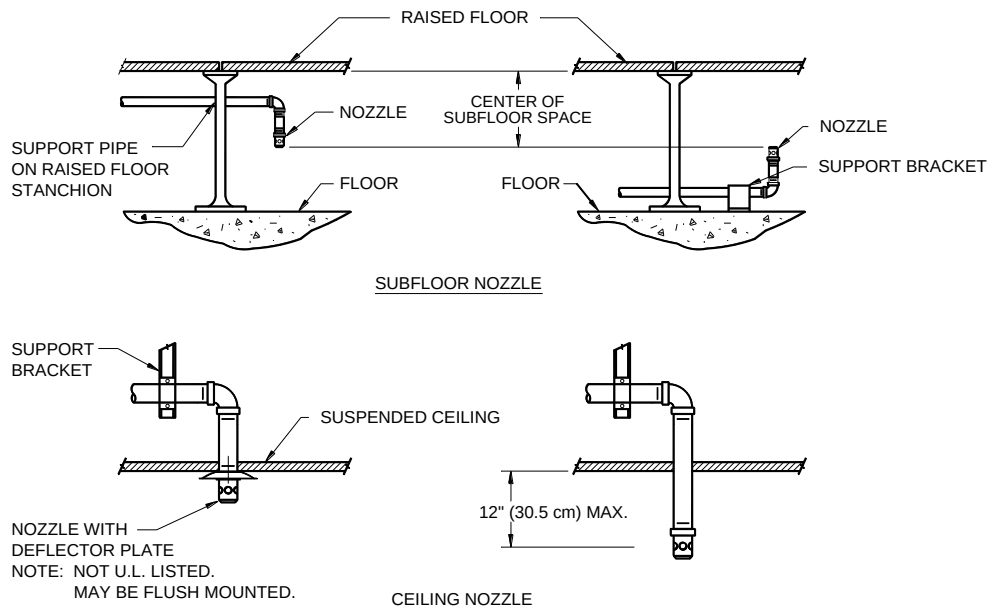
A = Basic Nozzle part number (e.g., IG71-**012**-XXX, etc.)

B = Orifice Plate Hole Diameter Code (obtained from Engineered Flow Calculation Program)

INSTALLATION

Always verify the nozzle identification number (stamped on the closed end of the nozzle) matches the nozzle part number listed on the system installation plans. All nozzle locations should be within 1'- 0" (0.3m) of their intended locations on the system plans. Discharge Nozzles must be mounted in the vertical position and can face either up or down.

CAUTION: The piping should be blown clear to remove chips, mill scale, or metal shavings before the nozzles are installed.

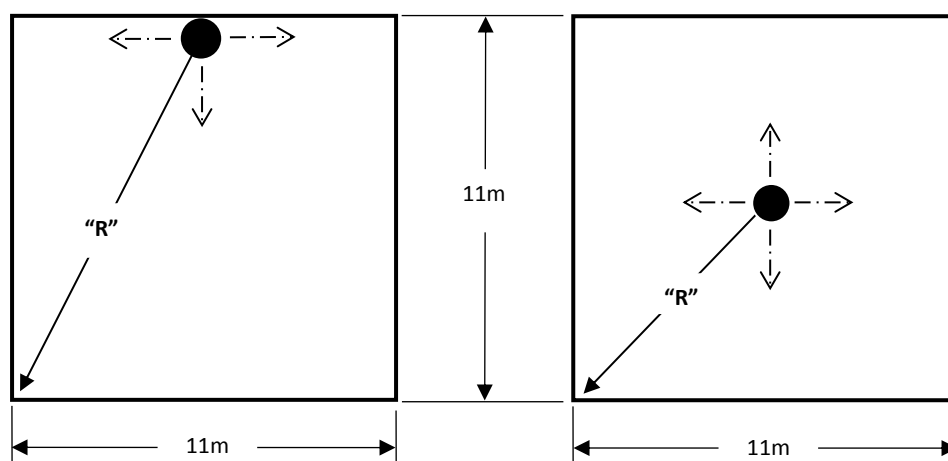


NOTE: Clip all ceiling tiles in the protected enclosure to avoid ceiling tiles from being lifted during agent discharge.

NOZZLE AREA COVERAGE

Nozzle Type	Radius "R" Dimension ft. (m)	Ceiling Height Range ft. (m)
180°	12.2	0.3 to 4.9
360°	7.7	0.3 to 4.9

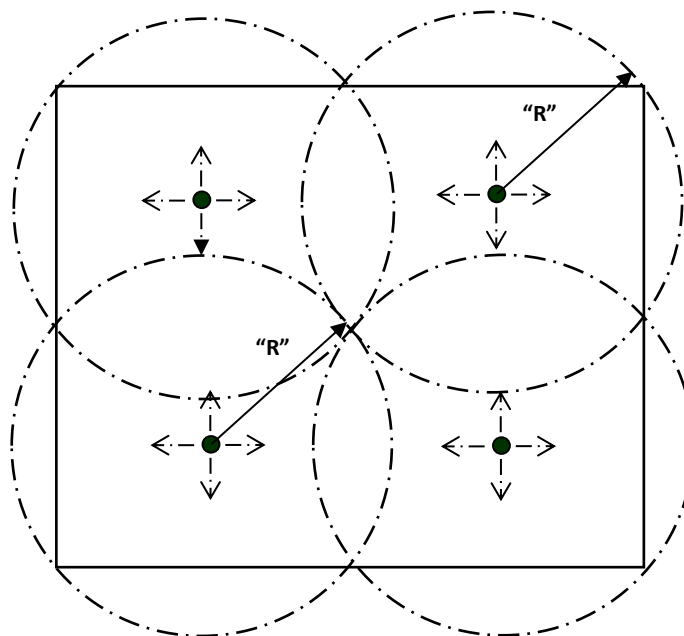
Maximum Distance	180° Nozzle	360° Nozzle	Note
Below Ceiling	0.3 m	0.3 m	Maximum distance above highest point of protection when stacking nozzles.
Away from Sidewall	0.3 m		



360° NOZZLES

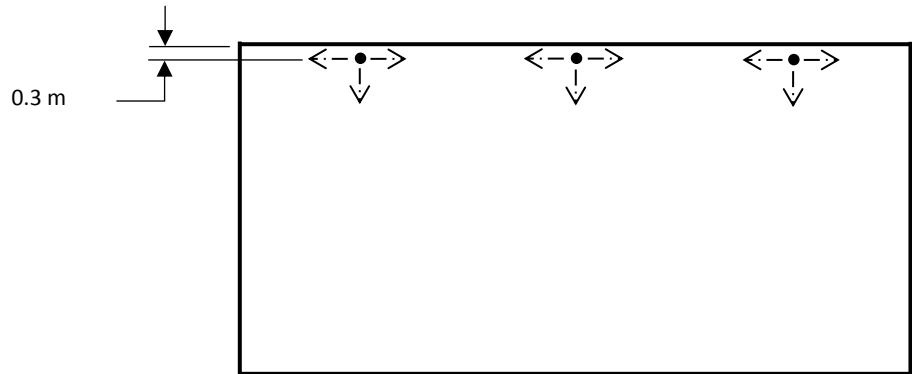
Nozzles should be located in a symmetrical, or near symmetrical, pattern within the protected area. Nozzle patterns need to overlap, to adequately cover the area without any "blind spots" due to nozzle locations. Apply to all Nozzle types.

360° Nozzles are designed to be located on, or near, the centerline of the protected area, discharging toward the perimeter of the area being covered. The system designer should lay out the nozzles on a floor plan and verify that the entire area being protected is adequately covered without any "blind spots" due to nozzle locations.



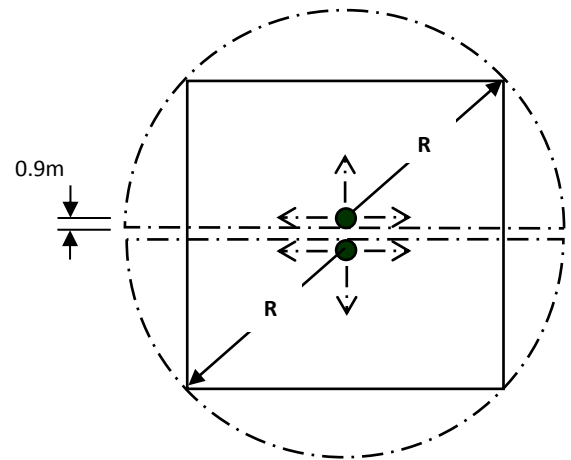
180° NOZZLES

180° Nozzles should be located in a symmetrical, or near symmetrical, pattern within the protected area. 180° Nozzles should be located along the perimeter of the area – discharging along the perimeter and toward the opposite side. These nozzles can be located a maximum of 0.3 m out from the wall.



180° NOZZLES – BACK-TO-BACK APPLICATION

180° Nozzles can also be installed in “Back-to-Back” applications. The distance between nozzles can be a maximum of 0.9 m, this allows 10.7 m radius “R” to be used.



Always verify the nozzle identification number (stamped on the closed end of the nozzle) matches the nozzle part number listed on the system

PROINERT® DISCHARGE PRESSURE SWITCH ASSEMBLY

DESCRIPTION

Discharge Pressure Switch Assembly (DPS) is used to provide a latching electrical input to the control panel to confirm a system discharge / actuation. If the ProInert Fire Extinguishing System is actuated via the manual activation button on the top of the actuation solenoid, this input signal will activate the audio-visual alarms for the system.

The Discharge Pressure Switch should be wall mounted adjacent to the container or manifold. Connection to the manifold can be made with the 1/4" BSP connector supplied with the switch.

The switch is operated pneumatically using the agent pressure in the discharge piping network.



Item 1



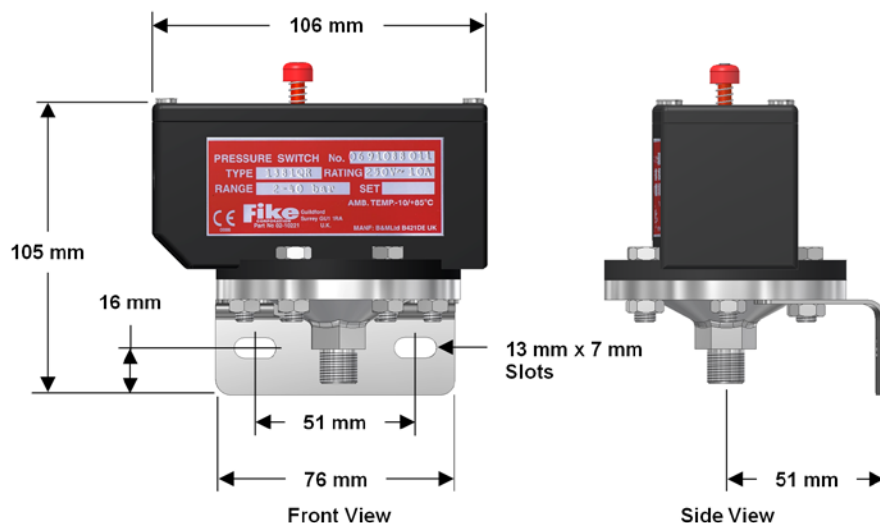
Item 3



Item 2

SPECIFICATIONS

Assembly Part Number 02-9635 includes:	Item 1: (1) 02-10221 Discharge Pressure Switch Item 2: (1) 02-9751 Swivel End Hose Item 3: (1) 02-10797 Adaptor
Temperature Limits	0 to 54.4°C
Enclosure Rating	IP65
Contact Rating	Single pole, double throw; 5 amp 240VAC, 1 amp @ 24VDC (can be wired for normally open or normally closed operation)
CE Marked	EN 60730-1
Electrical Connection	20 mm
Pressure Connection	1/8" NPT
Pressure Setting	2 bar (Increasing)



INSTALLATION

The Discharge Pressure Switch has a SPST switch that can be wired for a normally open or normally closed discharge input to the system control panel.

The pressure connection to the Discharge Pressure Switch is accomplished using the flex hose supplied with the unit. Connect the 1/8" NPT end to the Adapter Nipple; which has a 1/8" NPT port machined in the side as shown in the illustration below. (See Figure 1)

- Step 1: Mount the Discharge Pressure Switch next to the container(s) using the mounting bracket supplied with (2) 6mm fasteners.
- Step 2: Apply Teflon Tape to the male 1/8" NPT threads of the 1/8" Adaptor, install the 1/8" NPT x 1/4" BSPM Adaptor into the Adaptor Nipple (Wrench tight).
- Step 3: Connect the Flex Hose to the 1/8" Adaptor (Wrench tight).
- Step 4: Apply Teflon Tape to the male 1/8" NPT threads on the Discharge Pressure Switch, install Flex Hose to 1/8" threads on Discharge Pressure Switch (Wrench tight).

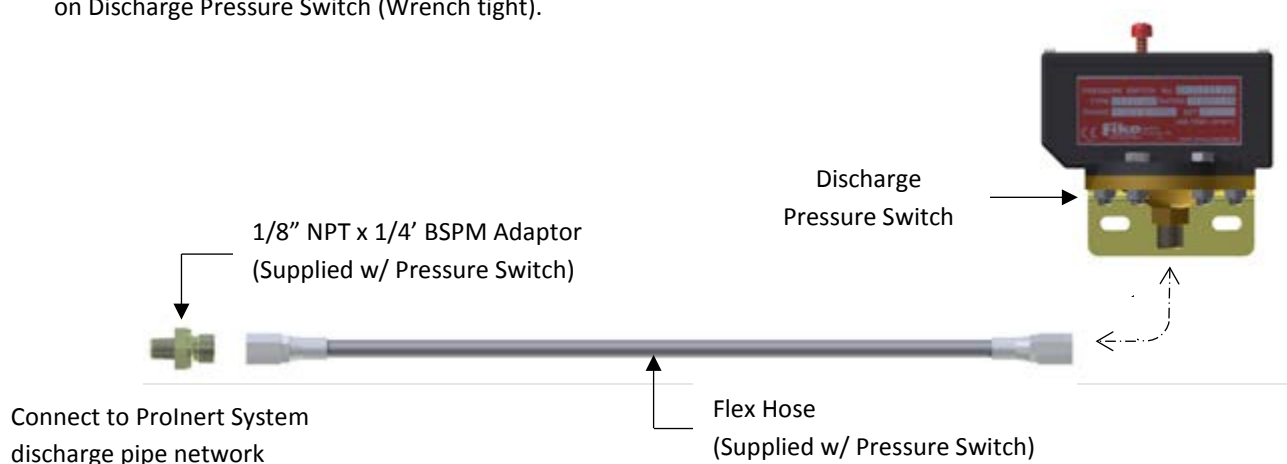


FIGURE 1

WIRING DIAGRAM

Following is a typical wiring diagram showing how the discharge pressure switch is wired to the manual release input of a control panel (See Figure 2) (Refer to the Control Panel Manufacturer's manual for wiring details).

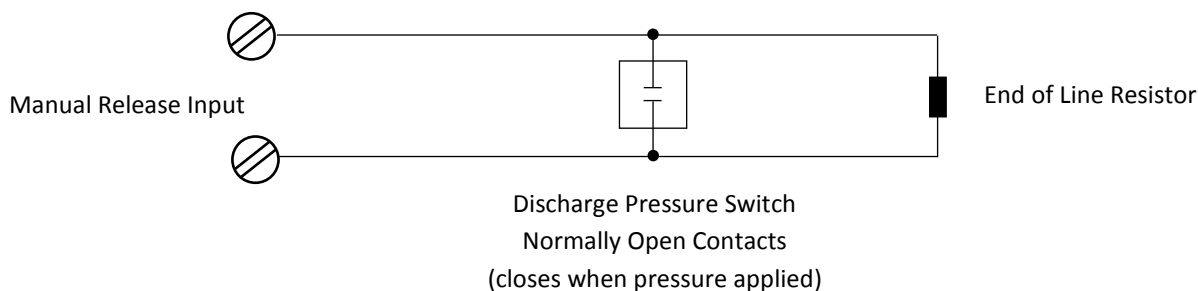


FIGURE 2

PROINERT® SELECTOR VALVE ASSEMBLY (DOUBLE ACTING)

DESCRIPTION

Fike offers several selector valves for use with the ProInert Fire Extinguishing System. The Selector Valve allows a single agent supply to be utilized for protection of multiple hazards, reducing the total number of cylinders required.

NOTE: When protecting multiple hazards with a single agent source, each hazard will require a Selector Valve.

Special considerations shall be made when using a selector valve controlled system to protect adjacent hazards that may simultaneously become involved in a fire.

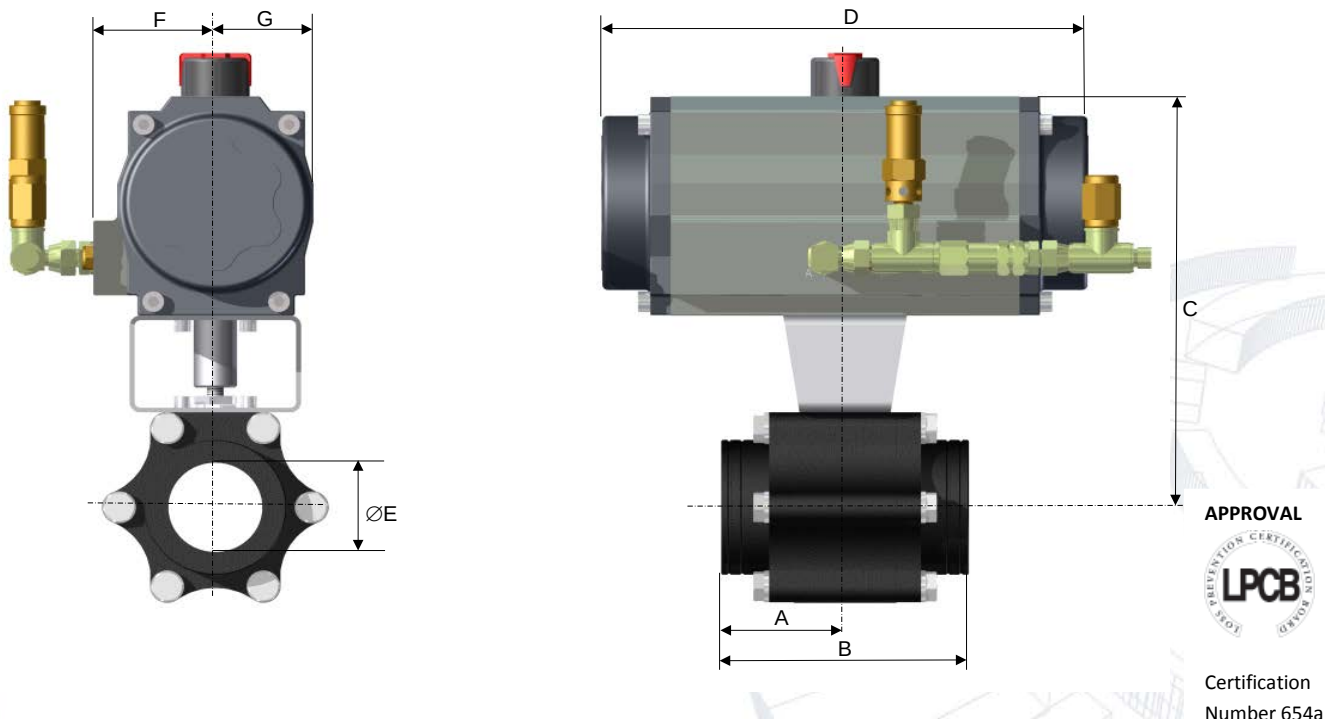
The Selector Valve body is available in a carbon steel finish. The unit consists of a ball-valve that blocks agent flow until the valve has been activated. Selector Valves are available in 25 mm, 40 mm, 50 mm and 80 mm sizes. All sizes are supplied with BSPT (ISO 7-1) threaded ends.

Each Selector Valve is equipped with a Valve Position Monitor that provides a visual indication of the status of the valve (open or closed). Electrical position indicators are available as an optional extra (P/N 02-12425 for 25 to 50mm valves and P/N 02-12426 for 80mm valves).

The Selector Valve Assembly can be pneumatically operated by either a ProInert Primary Actuation Package (P/N IG71-118) or a ProInert Secondary Actuation Package (P/N IG71-119). Activating the Actuator will result in the release of Nitrogen from the Nitrogen Cylinder and subsequently pneumatically opening the Selector Valve. Each Selector Valve Assembly comes equipped with the Selector Valve and its actuator with relief / pop-off valve.

The selector valve has a minimum actuation pressure range of 8.0 to 8.5 bar. The actuator is double acting, hence it requires pressure to operate and close. The valve can also be manually operated.

NOTE: For additional information on the ProInert Actuation Packages, reference Component Spec Number 06-681-1-9.



Part Number	Size	A	B	C	D	E	F	G
IG71-025-SV-3	25mm	68.5	137	175	215	25	42	53
IG71-040-SV-3	40mm	68.5	137	205	236	38	49	57
IG71-050-SV-3	50mm	72.5	145	240	266	49	51	72
IG71-080-SV-3	80mm	153	306	284	361	75	71	79
All Dimensions in mm								

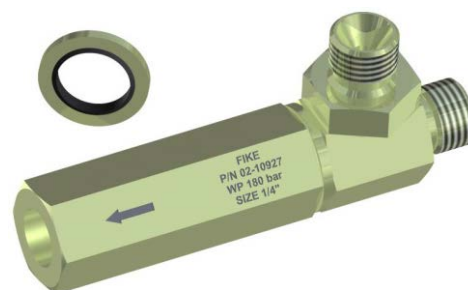
	IG71-025-SV-3	IG71-040-SV-3	IG71-050-SV-3	IG71-080-SV-3
Nominal pipe diameter	25mm	40mm	50mm	80mm
Inlet/Outlet thread	1" BSPT	1 ½" BSPT	2" BSPT	3" BSPT
Internal diameter of pipe work at inlet and outlet connection	26.6mm	40.8mm	52.5mm	77.9mm
Flow coefficient - K _v	38	99	227	583
Weight	6.6 kg	10.2 kg	14.4 kg	38.6 kg
Mounting details	Can be mounted in any orientation for installation on both walls and machinery.			
Actuator pressure	8 bar (minimum & nominal) / 8.5 bar (maximum)			

NON-RETURN VALVE KIT – SELECTOR VALVE ACTUATION (P/N IG71-028)

The Non-return Valve kits are used in the Selector Valve pneumatic actuation line. The correct placement of these kits within the actuation lines ensures that the required numbers of cylinders from a central bank are operated. The kits also protect against unwanted back pressure within the actuation line. The design of the Non-return Valve is such that it can be mounted in any orientation and does not require any maintenance.

The kit comprises of a 1/4" Non-return Valve, a 1/4" Equal Tee and two sealing washers.

The rating for the 1/4" Non-return Valve has a nominal Free Flow Diameter of 5.5mm with a working pressure of 180 bar and a minimum cracking pressure of 0.35 bar.

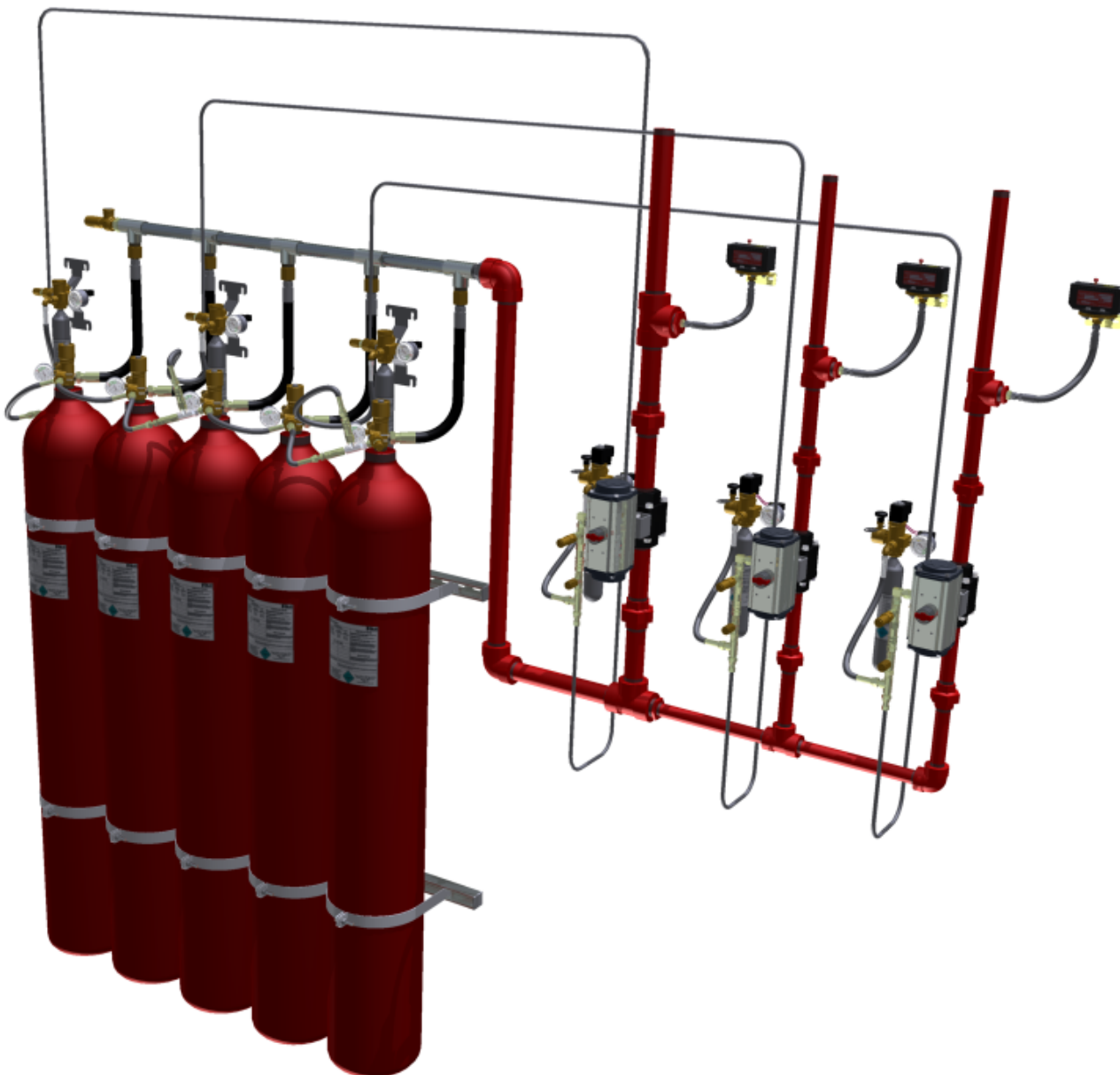


MULTIPLE HAZARDS WITH IDENTICAL VOLUMES

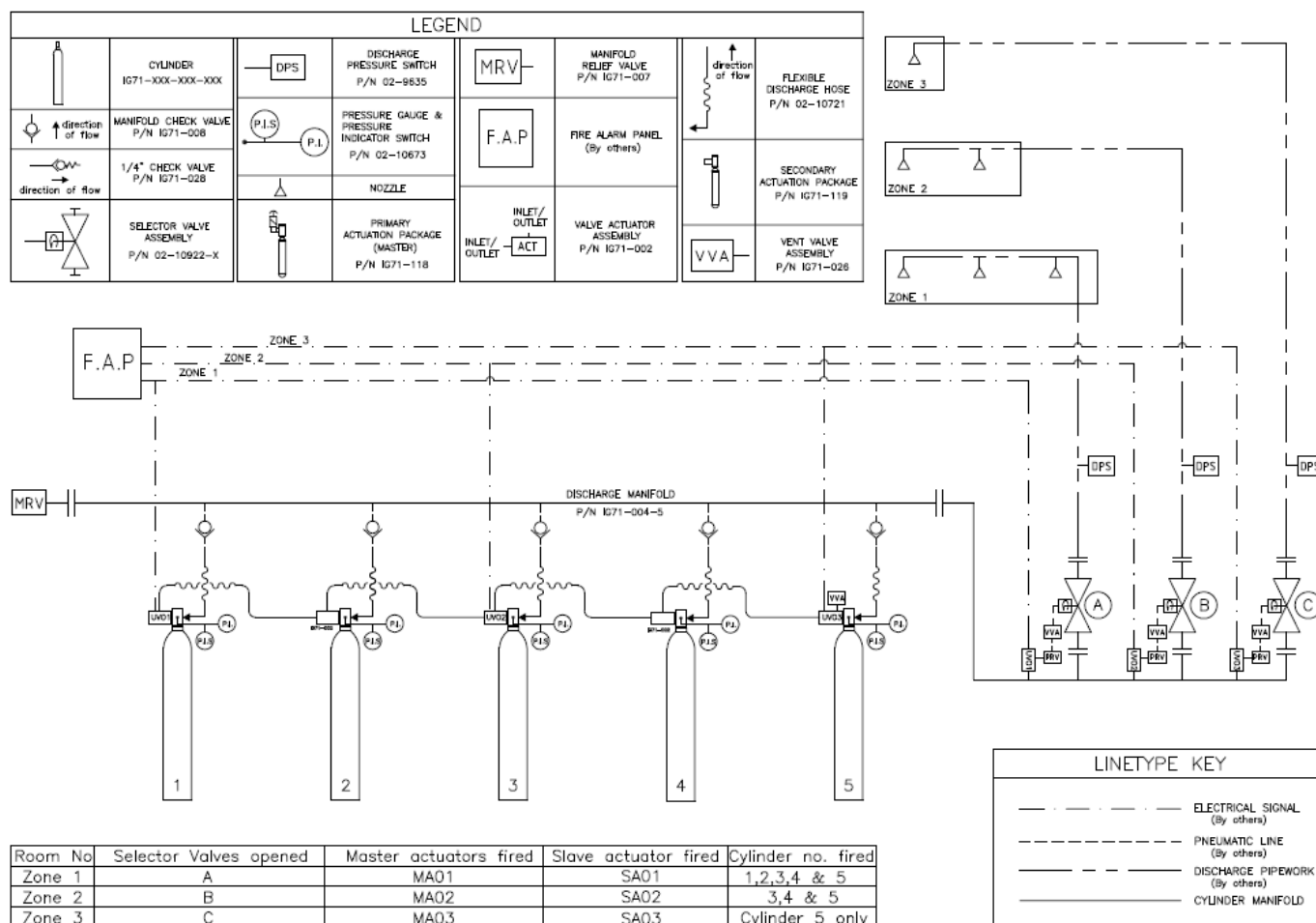
When utilizing multiple cylinders to protect multiple hazards with identical volumes it is necessary to use Selector Valves to divert the flow of agent into the activated hazard. The selector valves may be activated electronically or manually by pneumatically connecting to the solenoid actuator provided with the selector valve. The selector valves may also be activated by pneumatically connecting to a slave actuator, which in turn is pneumatically connected to a solenoid actuator.

MULTIPLE HAZARDS WITH DIFFERENT VOLUMES

In cases where a bank of cylinders is used to protect multiple hazards with different volumes, a configuration of solenoid actuators and slave actuators may be utilized to control the cylinder bank and the agent flow. A typical example of such a system is shown below.



The system illustrated comprises of a bank of 5 cylinders that will provide protection to three separate zones. The P & ID below shows how the system is connected.

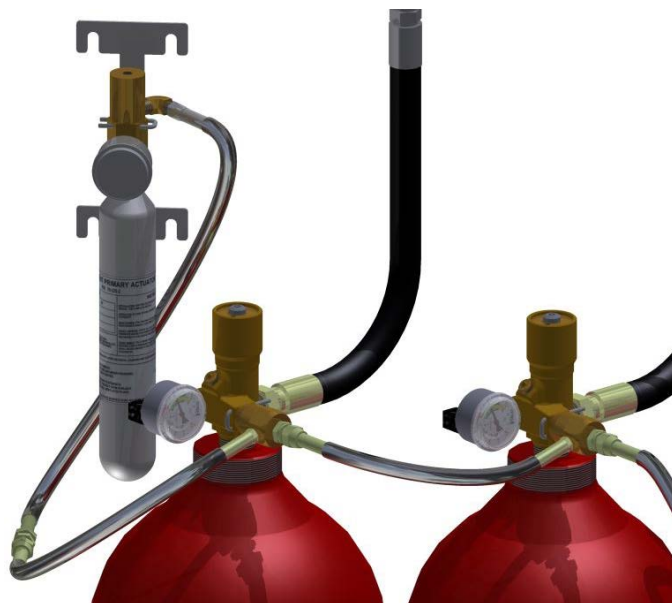


Actuation Scenarios	
Zone 1 Activation	Electrical operation of master actuator MA01 will result in the operation of selector valve A and slave actuator SA01. The slave actuator will operate cylinders 1, 2, 3, 4 & 5.
Zone 2 Activation	Electrical operation of master actuator MA02 will result in the operation of selector valve B and slave actuator SA02. The slave actuator will operate cylinders 3, 4 & 5. Cylinders 1 & 2 are not operated due to the 1/4" non-return valves installed in the actuation line that connects the cylinder valves.
Zone 3 Activation	Electrical operation of master actuator MA03 will result in the operation of selector valve C and slave actuator SA03. The slave actuator will operate cylinder 5 only. Cylinders 1, 2, 3 & 4 are not operated due to the 1/4" non-return valves installed in the actuation line that connects the cylinder valves.

As each selector valve system is different in design and configuration the fittings used on the actuation circuit can vary. Please consult Fike for assistance on selecting the correct additional fittings that will be required for the system that is designed.

Detailed below are the fittings that would be required for the design illustrated above.

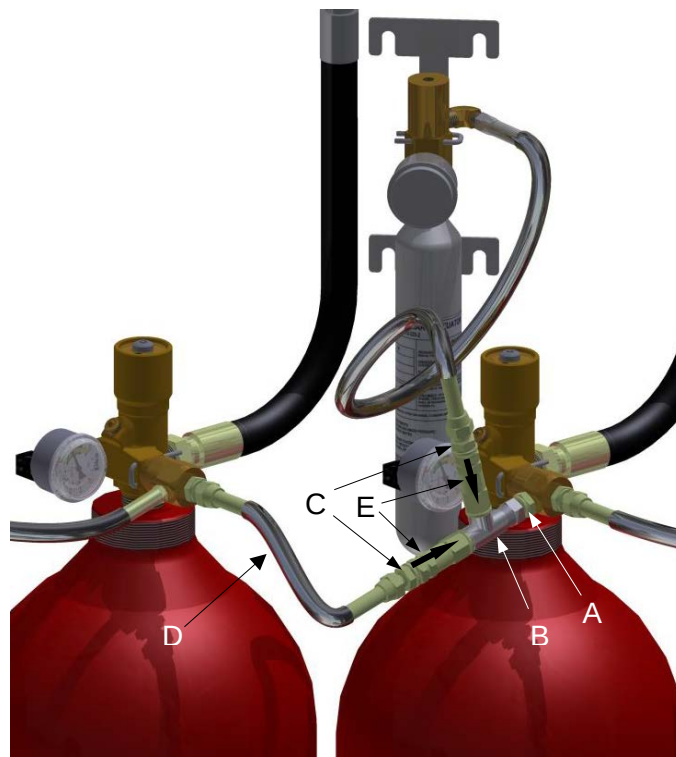
The connections between cylinder nos. 1 and 2 are made up using the standard fittings provided with the cylinder assemblies.



Connection detail at Cylinder Nos.1 and 2

The connections at cylinder nos. 2 and 3 are made up using the standard fittings provided with the cylinder assemblies and the following additional parts.

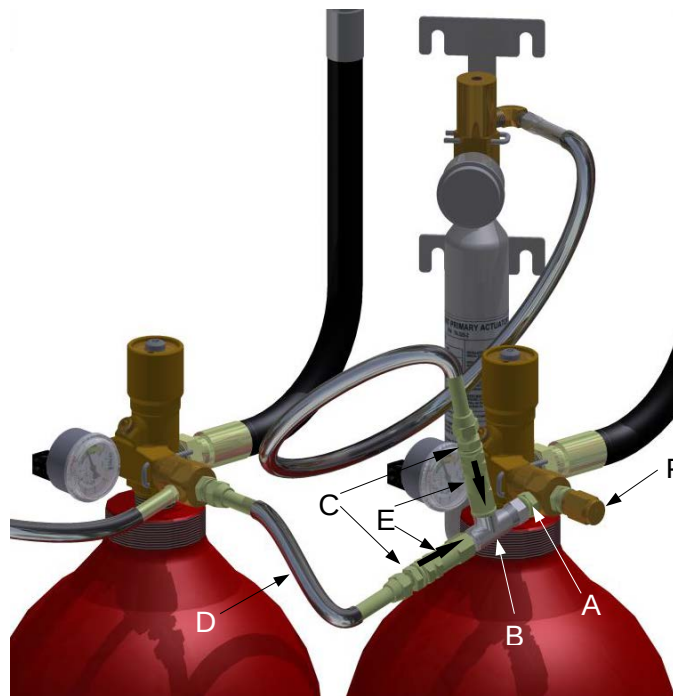
Item	Part Number	Description
A	02-10797	Adaptor, R 1/8 to G 1/4
B	02-11731	Tee, G 1/4 Male x G 1/4 Female x G 1/4 male Branch
C	02-10824	Connector, G 1/4 to G 1/4
D	02-9751	Hose
E	02-10927	Non-return valve
Not shown	02-10926	1/4" Sealing washer



Connection detail at Cylinder Nos.2 & 3

The connections at cylinder nos. 4 & 5 are made up using the standard fittings provided with the cylinder assemblies and the following additional parts.

Item	Part Number	Description
A	02-10797	Adaptor, R ½ to G ¼
B	02-11731	Tee, G ¼ Male x G ¼ Female x G ¼ male Branch
C	02-10824	Connector, G ¼ to G ¼
D	02-9751	Hose
E	02-10927	Non-return valve
F	IG71-026	Vent Assembly
Not shown	02-10926	¼" Sealing washer



Connection detail at Cylinder Nos.4 & 5

The ProInert Actuation Package is used to operate a selector valve and its associated slave actuator and cylinder assemblies. This should be the last component installed on the system. All components are shipped as separate items to be field installed.

NOTE: Ensure that the pneumatic connection to the selector valve is connected to the port labeled 'A'.

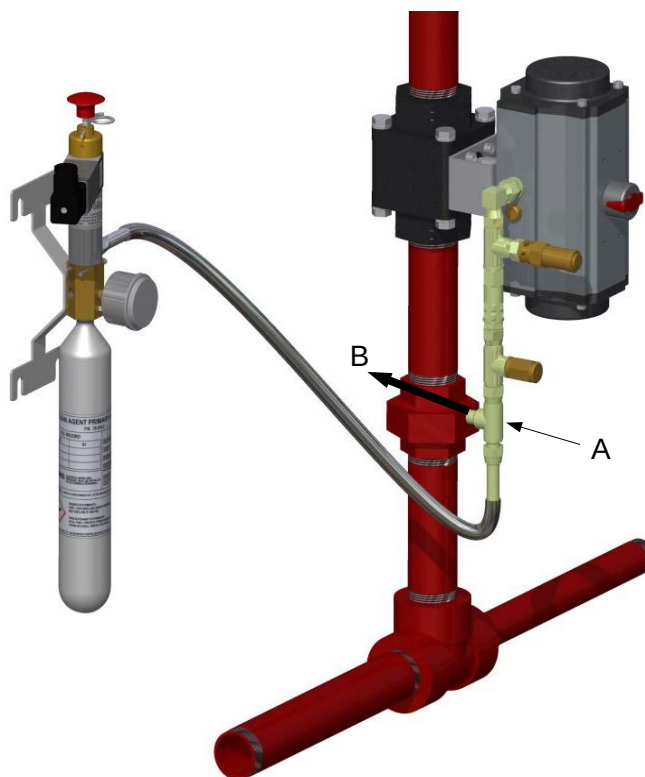
The following items should be completed prior to final installation of the ProInert Actuation Package:

- Container installation should be complete and secured in place
- Selector Valves should be installed and secured in place
- Discharge piping installation should be complete and all bracing, brackets, etc. in place
- The discharge nozzles should be installed

The detection & control system installation should be complete & tested – no faults shall be present.

The typical connections at a selector valve are made up using the standard fittings provided and the following additional parts.

Item	Part Number	Description
A	02-11731	Tee, G ¼ Male x G ¼ Female x G ¼ male Branch
B	By others	Tube 6mm OD



Typical connection detail at the Selector Valve

RESETTING THE SELECTOR VALVE AFTER OPERATION

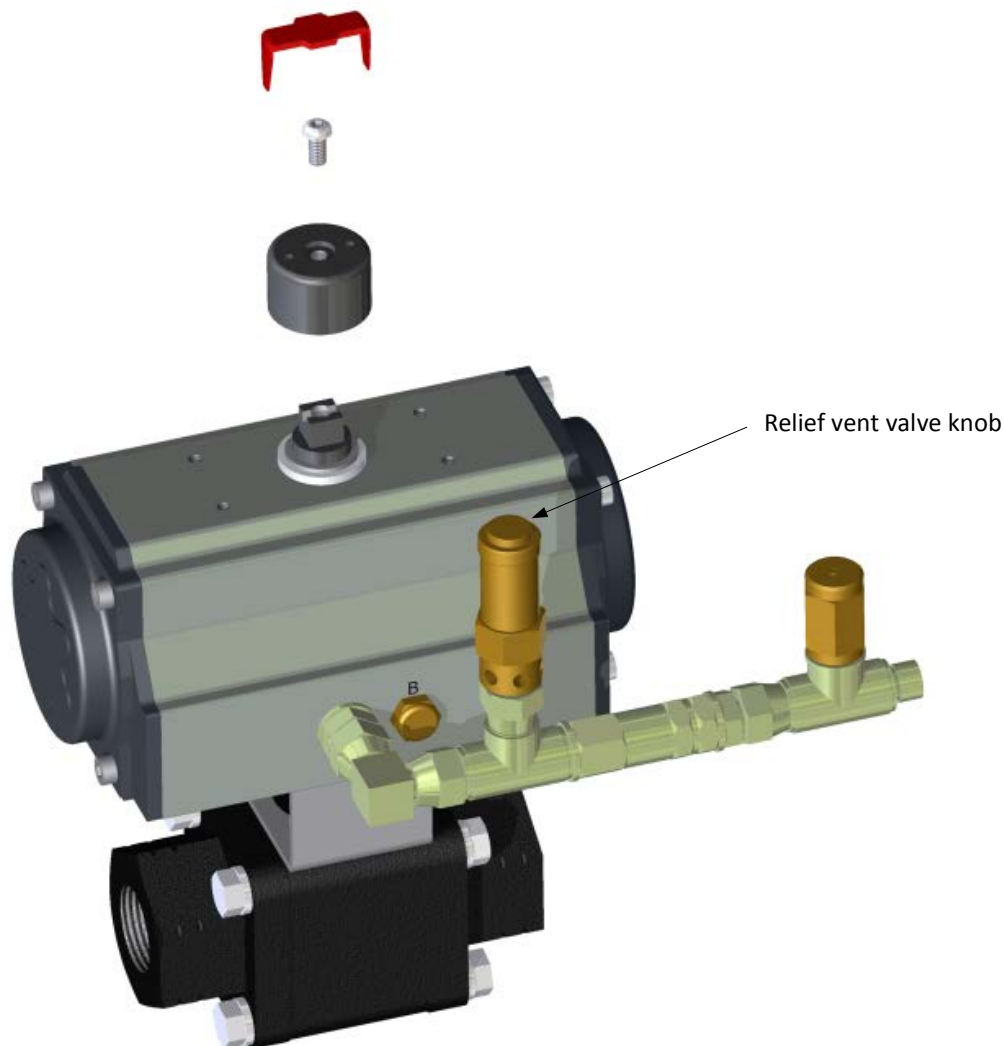
Part of Manuals: P/N 06-677, 06-678, 06-679, 06-680

P/N 06-681-1-8 (Rev. 1 / May, 2014)

Fike®, 704 SW 10th Street, P.O. Box 610, Blue Springs, Missouri 64013-0610 U.S.A. • Tel: (816) 229-3405 • www.fike.com

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After the selector valve has been operated it can be reset with either of the following procedures:



Reset Method	Procedure
Manual	Open the relief valve vent by turning the knob indicated anti-clockwise. Remove visual indicator from the top of the valve. Turn valve stem by quarter turn to close the valve. Refit the visual indicator. Fully close relief valve vent by turning the knob indicated clockwise. The valve is now re-set.
Pneumatic	Open the relief valve vent by turning the knob indicated anti-clockwise. Remove sintered plug from port 'B'. Apply a pneumatic supply regulated at a pressure of 8 bar to port 'B'. Ensure that the valve has closed. Fully close relief valve vent by turning the knob indicated clockwise. Refit sintered plug to port 'B'. The valve is now re-set.

PILOT CYLINDER ASSEMBLY (P/N 70-325-2)

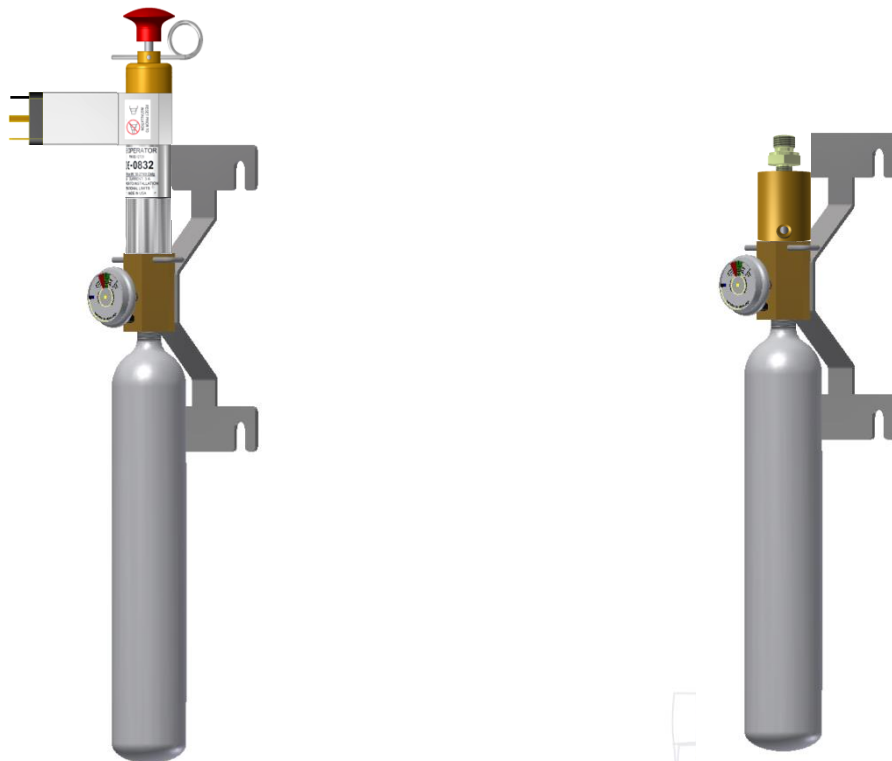
DESCRIPTION

The Pilot Cylinder Assembly can utilize either a Universal Valve Operator (UVO) or a Relay Actuator connected to a rechargeable nitrogen cylinder that when operated allows pressure contained within the nitrogen cylinder to flow into the actuation circuit of an extinguishing system.

The actuators may be activated electrically or manually or pneumatically. Electrical activation is accomplished via a 24VDC signal from the control panel. To initiate manual activation, remove the UVO's safety pin and by depressing red manual strike button.

The Pilot Cylinder Assembly can be used to operate the following type of systems:

- Single Hazard ProInert Fire Suppression Systems
- Multiple Hazard ProInert Fire Suppression Systems using Selector Valves.



SPECIFICATIONS

PILOT CYLINDER ASSEMBLY (P/N 70-325-2)

IMPORTANT NOTE: The Pilot Cylinder assembly is available in kits that incorporate either the UVO (Kit p/n IG71-118) or the Relay Actuator (Kit p/n IG71-119). These kits include all the necessary components to make connections to the system.

The following items are furnished with the Pilot Cylinder Assembly (70-325-2):

Item No.	Part Number	Description
1	70-331	Actuator Valve Assembly c/w Mounting Bracket
2	02-10816	Rechargeable Cylinder
3	02-14229	Pressure Gauge with Low Pressure Switch

PRESSURE SWITCH SPECIFICATIONS

Temperature Limits	-20°C to 50°C
Protection Rating	IP65
Contact Rating	Contacts rated at 333mA resistive @ 30V DC
Electrical Connection	18Ga 500 mm Leads
Switch Setting	112 ± 5 bar decreasing (Normally Open at Operating Pressure)

NITROGEN CYLINDER SPECIFICATIONS

Fill Pressure	124 bar @ 15°C
Volume	410ml
Classification	EN 13322-1
Temperature Range	(-20°C to 50°C)

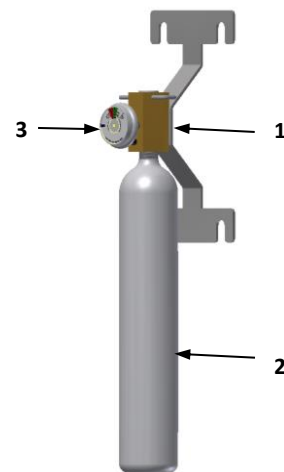
SERVICE / MAINTENANCE NOTE

Every Six Months:

Check the pressure gauge on the valve. The nominal pressure should be 124 bar at 15°C; however, the pressure will vary with temperature. If the actuator cylinder pressure loss exceeds ten percent of the pressure (adjusted for temperature) return the cylinder for recharge.

Example: If the cylinder temperature is 15°C the pressure must be above 111 bar.

Refer to the Service Information Section of the FIKE Equipment, Design and Service Manual.



For specification details on UVO kit refer to Component Spec 06-681-1-2 and for specification details on Relay Actuator refer to Component Spec 06-631-1-5.

PRIMARY PROINERT ACTUATOR KIT (P/N IG71-118)		
The following items are furnished with the Primary ProInert Actuator Kit:		
Item No.	Part Number	Description
1	70-325-2	Primary Actuator Assembly
2	02-13571	Universal Valve Operator (UVO)
3	02-13280	DIN Connector
4	02-2213	Security Tie
5	02-10801	Hose
6	02-11243	Adaptor
7	02-10926	Sealing Washer
8	02-10797	Adaptor R ½ x G ¼
9	IG71-026	Vent Valve Assembly
10	02-10824	G ¼ x G ¼ Adaptor

Note: Reset Tool (P/N 70-312) to be ordered separately.

Additional Items to be ordered with Primary Actuator Kit Depending on agent

Description
Manual Discharge Station Sign P/N 02-13420 for IG-01 P/N 02-10759 for IG-55 P/N 02-13421 for IG-100 P/N 02-13419 for IG-541

SECONDARY PROINERT ACTUATOR KIT (P/N IG71-119)		
The following items are furnished with the Secondary ProInert Actuator Kit:		
Item No.	Part Number	Description
1	70-325-2	Primary Actuator Assembly
2	IG71-220	Pneumatic Relay Unit
3	02-10797	Adaptor R ½ x G ¼
4	02-10926	Sealing Washer
5	IG71-026	Vent Valve Assembly

INSTALLATION

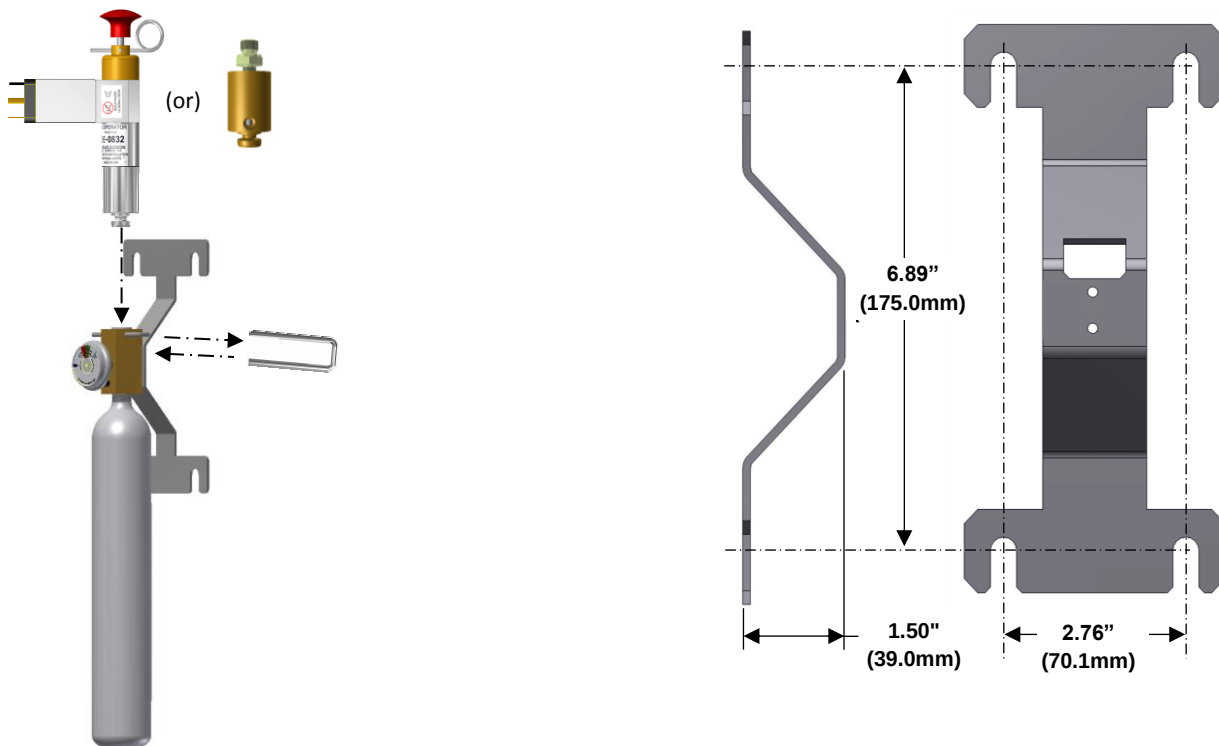
The Pilot Cylinder Assembly w/ UVO or Relay Actuator should be the last component installed on the Fike Extinguishing System. The following items should be completed prior to final installation of the Actuator:

- Cylinder installation should be complete and secured in place
- Discharge piping installation should be complete and all bracing, brackets, etc. in place
- The discharge nozzles should be installed
- The detection & control system installation should be complete & tested – no faults shall be present

Step 1: The Pilot Cylinder Assembly Mounting Bracket must be secured to a solid, load-bearing surface using a minimum of two fasteners. As an option, the brackets may be welded into place.

Step 2: Remove Retaining Clip and Safety Plug from the Pilot Cylinder Assembly actuator port.

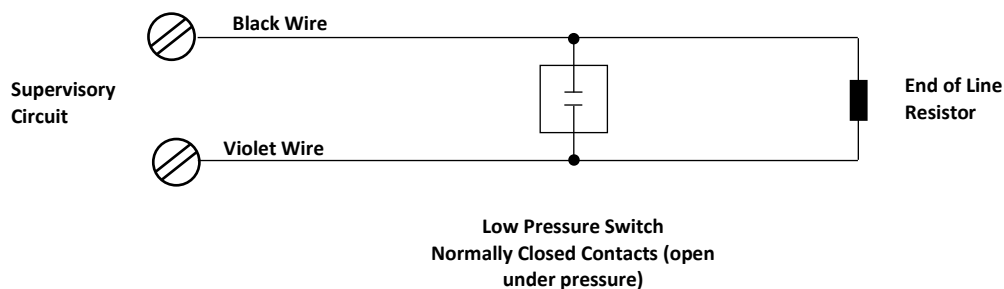
Step 3: Insert UVO or Relay Actuator into the Pilot Cylinder Assembly actuator port and re-insert Retaining Clip.



WIRING DIAGRAM – LOW PRESSURE SWITCH

The Low Pressure Switch should be wired into a supervised circuit in the control panel used to provide a supervisory signal if the nitrogen pressure within the pilot cylinder drops below 112 bar. The switch is wired as a normally closed contact (open under pressure).

NOTE: Refer to the Installation, Operation & Maintenance for the control panel being used for specific wiring criteria.

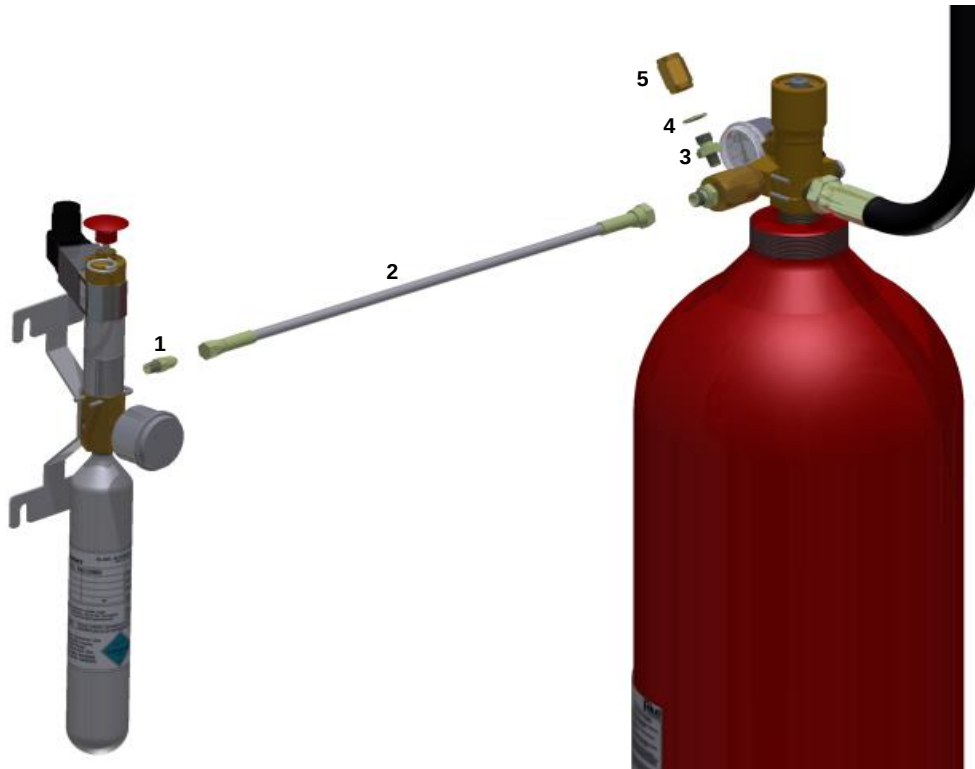


INSTALLATION INSTRUCTIONS WHEN USED TO OPERATE PROINERT CYLINDERS

SINGLE CYLINDER SYSTEM INSTALLATION

Step	Details
IMPORTANT NOTES: Check to ensure: • UVO is armed (Firing Pin retracted) and the Safety Pin is place and secured in position with the security tie before installing to the Primary Pilot Cylinder Assembly. Refer to Reset Instructions for details. • Pneumatic actuator is armed (Firing Pin retracted) before installing to the ProInert Valve on the cylinder. Refer to Reset Instructions for details. • The Primary Pilot Cylinder Assembly MUST be located within 1m of the Pneumatic Actuator (P/N IG71-104) on the ProInert cylinder.	
1	Remove and retain the Safety Plug from the UVO outlet port.
2	Install the Adaptor P/N 02-11243 (Item 1) into UVO outlet port.
3	Install the Actuation Hose P/N 02-10801 (Item 2) between the Adaptor (Item 1) and the G ¼" connection of the Pneumatic Actuator on the cylinder.
4	Remove hose from the pre-assembled hose from the Pneumatic Actuator and install Adaptor P/N 02-10797 (Item 3) into the port that the hose was pre-assembled into.
5	Insert ¼" Sealing Washer P/N 02-10926 (Item 4) into Adaptor (Item 3)
6	Install Vent Valve Assembly (Item 5) onto Adaptor (Item 3)
The cylinder is NOW ARMED	

NOTE: All connections must be wrench-tight.



MULTIPLE CYLINDER SYSTEM INSTALLATION

SINGLE ROW INSTALLATION

Step	Details
IMPORTANT NOTES: Check to ensure: • UVO is armed (Firing Pin retracted) and the Safety Pin is place and secured in position with the security tie before installing to the Primary Pilot Cylinder Assembly. Refer to Reset Instructions for details. • Pneumatic actuators are armed (Firing Pin retracted) before installing to the ProInert Valve on the cylinders. Refer to Reset Instructions for details. • The Primary Pilot Cylinder Assembly MUST be located within 1m of the Pneumatic Actuators (P/N IG71-104) on the 1st ProInert cylinder. • A maximum of 60 ProInert cylinders and / or pneumatic actuators can be operated from a single Primary / Secondary Pilot Cylinder Assembly.	
1	Remove and retain the Safety Plug from the UVO outlet port.
2	Install the Adaptor P/N 02-11243 (Item 1) into UVO outlet port.
3	Install the Actuation Hose P/N 02-10801 (Item 2) between the Adaptor (Item 1) and the G ¼" connection of the Pneumatic Actuator on the 1 st cylinder.
4	Connect the Pneumatic Actuator Hose from the 1 st ProInert Cylinder to the Connector on the Pneumatic Actuator of the 2 nd ProInert Cylinder
5	Repeat Step 4 until all ProInert Pneumatic Actuators are connected.
6	Remove hose from the pre-assembled hose from the last Pneumatic Actuator and install Adaptor P/N 02-10797 (Item 3) into the port that the hose was pre-assembled into.
7	Insert ¼" Sealing Washer P/N 02-10926 (Item 4) into Adaptor (Item 3)
8	Install Vent Valve Assembly (Item 5) onto Adaptor (Item 3)
The cylinder is NOW ARMED	

NOTE: All connections must be wrench-tight.



DOUBLE / MULTIPLE ROW INSTALLATION

Step	Details
IMPORTANT NOTES: Check to ensure: • UVO is armed (Firing Pin retracted) and the Safety Pin is place and secured in position with the security tie before installing to the Pilot Cylinder Assembly. Refer to Reset Instructions for details. • Pneumatic actuators are armed (Firing Pin retracted) before installing to the ProInert Valve on the cylinders. Refer to Reset Instructions for details. • The Primary Pilot Cylinder Assembly MUST be located within 1m of the Pneumatic Actuators (P/N IG71-104) on the 1st ProInert cylinder. • A maximum of 60 ProInert cylinders and / or pneumatic actuators can be operated from a single Primary / Secondary Pilot Cylinder Assembly.	
1	Remove and retain the Safety Plug from the UVO outlet port.
2	Install the Adaptor P/N 02-11243 (Item 1) into UVO outlet port.
3	Install the Actuation Hose P/N 02-10801 (Item 2) between the Adaptor (Item 1) and the G ¼" connection of the Pneumatic Actuator on the 1 st cylinder.
4	Connect the Pneumatic Actuator Hose from the 1 st ProInert Cylinder to the Connector on the Pneumatic Actuator of the 2 nd ProInert Cylinder
5	Repeat Step 4 until all ProInert Pneumatic Actuators are connected on the first row of cylinders.
6	Connect the actuators between the rows with a G ¼ x G ¼ adaptor P/N 02-10824 (Item 3) as shown.
7	Insert ¼" Sealing Washer P/N 02-10926 (Item 4) into Adaptor of last actuator.
8	Install Vent Valve Assembly (Item 5) onto Adaptor of last actuator as shown.
The cylinder is NOW ARMED	

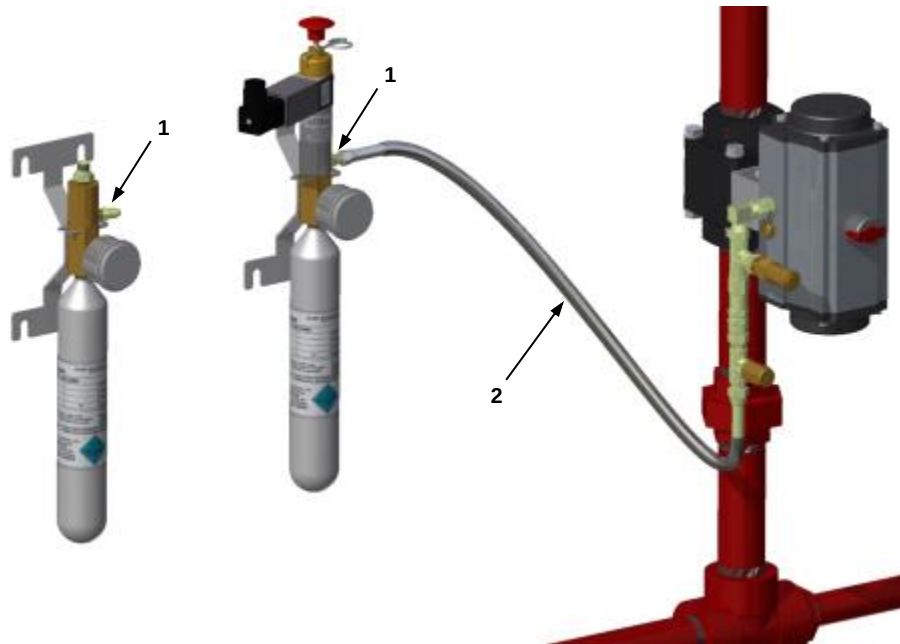
NOTE: All connections must be wrench-tight.



INSTALLATION INSTRUCTIONS WHEN USED TO OPERATE SELECTOR VALVE SYSTEM

Step	Details
IMPORTANT NOTES: Check to ensure: - UVO is armed (Firing Pin retracted) and the Safety Pin is place and secured in position with the security tie before installing to the Primary Pilot Cylinder Assembly. Refer to Reset Instructions for details. - The Primary / Secondary Pilot Cylinder Assembly can be located up to 3 feet (1 m) from the Selector Valve Assembly.	
1	Remove and retain the Safety Plug from the UVO outlet port.
2	Install the Adaptor P/N 02-11243 (Item 1) into UVO / Relay unit outlet port.
3	Install the Actuation Hose P/N 02-10801 (Item 2) between the Adaptor (Item 1) and the G ¼" connection of the Selector Valve Assembly as shown.
The Selector Valve Assembly is NOW ARMED	

NOTE: All connections must be wrench-tight.



PROINERT® CAUTION / ADVISORY SIGNS – IG-541

DESCRIPTION

Caution / Advisory Signs are provided to comply with ISO/EN and/or NFPA 2001 requirements, and to provide the necessary information to personnel in the area.

The caution lettering and backgrounds meet the requirements of ANSI Z535.

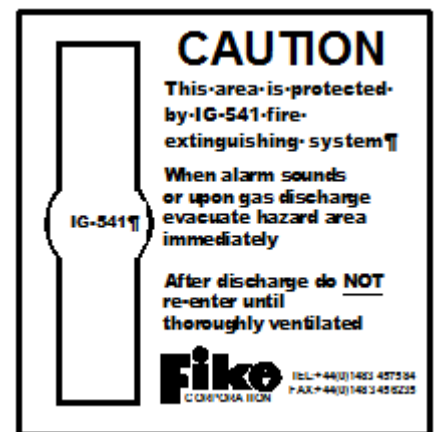
The signs are made from flame retardant, Lexan™ polycarbonate material. Each sign has an adhesive backing for mounting purposes.

Caution / Advisory signs are an optional item and must be ordered separately

CAUTION SIGN (P/N 02-13416)

This sign is provided to alert personnel that the room is protected by a Prolnert system and to evacuate the area when the alarms sound. This sign measures 160 mm x 160 mm.

The Caution Sign should be placed on the outside of each door entering the protected space.

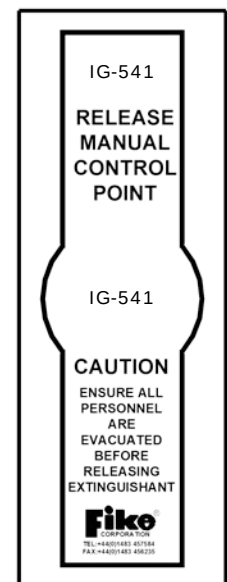


MANUAL DISCHARGE STATION (P/N 02-13419)

This sign is provided to identify each Manual Release Station associated with the Prolnert system. Manual Discharge Station being mistaken for a Fire Alarm Call Point.

This sign measures 195 mm x 70 mm.

The Manual Discharge Station Sign should be placed at each Manual Release Station location for pos

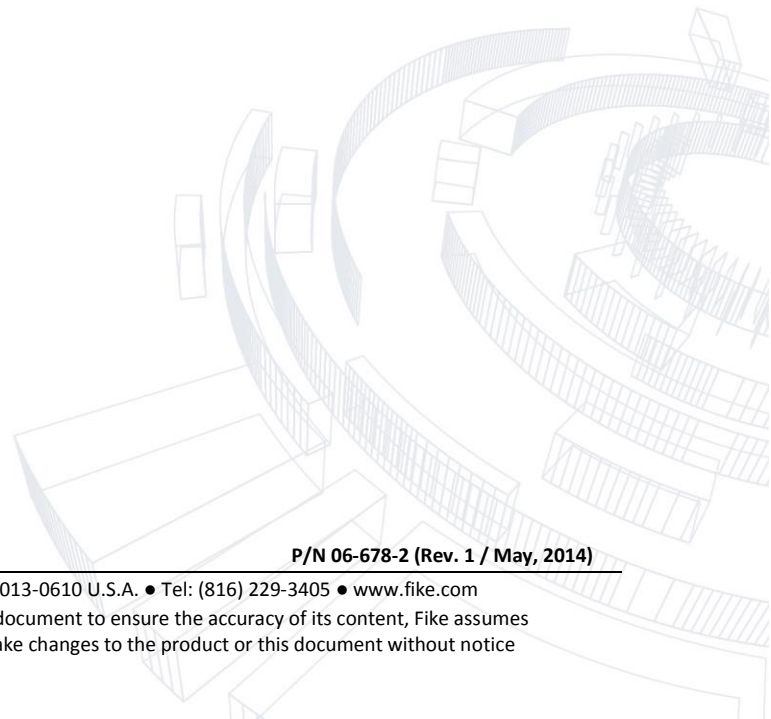


FIKE PROINERT® SYSTEM

W/ IG-541 AGENT

200 & 300 BAR CYLINDERS

LPCB APPROVED COMPONENTS



REVISION HISTORY

ORIGINAL RELEASE DATE: May, 2013

REVISION / DESCRIPTION OF CHANGE	REVISION DATE
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Revision 1	May, 2014
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- 1) Updated Minimum Design Concentration valves for NFPA 2001 on page 1 of 29.

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DESIGN INFORMATION

The following information details the steps necessary to design a Fike Inert Agent Fire Suppression System w/ IG-541 agent (for both the 200 bar & 300 bar) in compliance with NFPA 2001, ISO Standard 14520 & EN-15004.

NOTE: The designer of the system **MUST** perform the system flow calculations in order to verify the system, its associated manifold and piping network prior to installation. If specified limitations are not maintained, the system may not supply the correct amount of extinguishing agent into the protected hazard(s).

HAZARD CLASSIFICATION

Class of Hazard	Definitions of Fire Class (definitions per NFPA 2001, ISO-14520 & EN-15004)
Class A	A fire in ordinary combustibles materials, such as wood, cloth, paper, rubber and many plastics (anything that leaves an ash residue after combustion). Higher Hazard (Refer to ISO-14520 & EN-15004 for definition)
Class B	A fire in flammable liquids, combustible liquids, petroleum greases, tars, oils, oil-based paints, solvents, lacquers, alcohols, and flammable gases.
Class C	(Electrical fires-U.S.) A fire that involves energized electrical equipment. (Gaseous) Europe. Note: extinguishing gaseous fuels may allow explosive atmospheres to be produced

Note: Where the hazard may become deep seated, consideration should be given to increasing the protected space extinguishant hold time to allow for the fire seat to cool thus preventing re-ignition.

MINIMUM DESIGN CONCENTRATION

The following is a guideline to be used in determining the Fire Extinguishing concentration percentage for the hazard(s) being protected. For combinations of fuels (hazard types) the design value for the fuel requiring the greatest concentration **MUST** be used. (References: ISO-14520, EN 15004 and NFPA 2001) The design concentrations listed below are based on the extinguishing concentration value required for each specific fire type (Class A, B, C, etc.). These values have been multiplied by a safety factor as required by the applicable standard. It shall be noted that a variance in the safety factor exists between standards. Consult Fike for specific fuel or fire type design concentrations not covered in this manual.

Hazard Classification (Type)	Minimum Design Concentration			Notes
	NFPA 2001	ISO-14520	EN-15004	
Class A	34.2%	39.9%	39.9%	Clean Agent System incorporates Detection & Control System to automatically discharge agent.
Class C	38.5%			
Higher Hazard Class A	- - -	39.9%	45.7%	Refer to ISO-14520 & EN-15004 for definition
Class B (Heptane)	40.6%	41.2%	48.1 %	For design concentrations of other Class B (flammable liquids), consult Fike's Product Support group.

SAFETY RECOMMENDATIONS (Refer to NFPA 2001 for exposure guidelines)

The following are safety recommendations as outlined in either ISO 14520-1 or EN15004-1. The designer must be aware of the occupancy of the hazard(s) being protected as they complete their evaluation of the project and make adjustments or recommendations as necessary.

Maximum Concentration	Time-Delay Device	Automatic/Manual Switch	Lock-Off Device
Up to and including the NOAEL	Required	Not Required	Not Required
Greater than NOAEL and up to the LOAEL	Required	Required	Not Required
LOAEL and Above	Required	Required	Required

Note: It is the intent of this table to provide a means of preventing unnecessary exposure of personnel to the discharged agent. Factors such as egress time and risk of exposure to the fire should be considered when determining the system discharge time delay. Local and National standards may require additional precautions which should be implemented.

EXPOSURE LIMITS

Concentration Level	Oxygen Level	Maximum Exposure Limit	Type of Space
Up to 43%	Minimum of 12%	5 minutes	Normally Occupied
43% to 52%	Minimum of 10%	3 minutes	Normally Occupied
52% to 62%	Minimum of 8%	30 seconds	Not Normally Occupied

NOTE: Fike does not recommend ProInert systems to be used in Normally Occupied spaces where the design concentration required is above 52%

Above 62%	Below 8%	0	Personnel CANNOT be exposed to this environment
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In addition to the guidelines outlined in the proceeding paragraphs, the following guidelines shall apply to all spaces: (Reference ISO 14520 or EN 15004)

- The system shall incorporate a pre-discharge alarm with a time delay sufficient to allow any personnel present to evacuate the protected space prior to discharge. Such time delay devices shall only be used for personnel evacuation or to prepare the hazard for discharge.
- Automatic/Manual Switch and Lock-Off devices shall be provided where required by Safety Recommendations.
- Exit routes shall be kept clear at all times and travel distances shall be minimized by providing adequate directional signs, as well as emergency lighting.
- The doors shall be capable of being opened from the inside, even when locked from the outside.
- Continuously operated visual and audible alarm devices shall be provided inside the protected space at all entrances and designated exits. Similar devices shall be provided outside of the protected space at the same entrances and exits. These devices shall operate continuously until the protected area has been made safe to enter.
- Appropriate warning and instructional signs shall be provided.
- A distinctive pre-discharge alarm shall be provided (where required) to operate upon activation of the time delay.
- A means of prompt evacuation of the agent (natural or forced ventilation) shall be provided to remove agent after the system has discharged and the space has been properly secured. Forced air ventilation will be required for most applications. (Care shall be taken to assure that evacuated agent is not introduced into other occupied spaces.)
- Provide adequate training and instructions to all personnel within or near the protected area(s) to ensure proper action is taken during and after system discharge. This should include any maintenance, security or construction personnel that may be present in the vicinity of the protected space(s).

- Electrostatic Discharge. The system shall be adequately bonded and earthed to minimize the risk of electrostatic discharge. Consult with ISO 14520 or EN 15004 for guidance on requirements on earthing and electrical clearances.
- Glazing should be wired or otherwise suitable for the design room pressure.

ENCLOSURE VOLUME

Formula	Notes
Protected Volume =	As a general rule, Hazard Volume should be based on the empty (gross) volume.
Base Volume	Length x Width x Height
+ Added Volume	Volume that is open to the space being protected (i.e. non-dampered ductwork, unclosable openings, etc.)
- Removed Volume	Volume for items that are solid, non-permeable, and non-removable objects can be deducted from the protected volume
IMPORTANT NOTE:	Any object that can be removed from the protected space CANNOT be deducted from the volume

AGENT REQUIRED

Calculation Based on:	Lowest Expected Ambient Temperature	Minimum Design Concentration Required (to protect this type of hazard)
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Equation for calculating the amount of inert gas required:

$$Q_R = m S_R$$

Where:

S_R	is the specific reference volume (in cubic meters per kilogram); i.e. the specific vapor volume at the filling reference temperature for superheated IG-541 vapor at a pressure of 1.013 bar which may be approximated by the formula: $S_R = k_1 + k_2 \cdot T_R$ ($k_1 = 0.65799$; $k_2 = 0.00239$; T_R is the reference temperature (in degrees Celsius), i.e. filling temperature)
$m =$	$\frac{V}{S} \cdot \ln\left(\frac{100}{100 - c}\right)$
V	is the net volume of hazard (in cubic meters); i.e. the enclosed volume minus the fixed structures imperious to the extinguishant.
T	is the temperature (in degrees Celsius); i.e. the design temperature in the hazard area.
S	Is the specific volume (in cubic meters per kilogram); the specific vapor volume at the filling reference temperature for superheated IG-541 vapor at a pressure of 1.013 bar which may be approximated by the formula: $S = k_1 + k_2 \cdot T$
c	Is the concentration (in percent); i.e. the volumetric concentration of IG-541 in air at the temperature indicated and at a pressure of 1.013 bar absolute.

EXAMPLE

Therefore, in order to produce a 39.7% concentration for a 150 m³ room at 20° C with the cylinders being filled at a temperature of 15° C:

The mass of IG-541 required to achieve the concentration within the enclosure which is at a temperature of 20° C is:

$$m = \frac{150}{(0.65799 + 0.00239 \cdot 20)} \cdot \ln\left(\frac{100}{100 - 39.7}\right) = 107.50 \text{ kg}$$

The volume of IG-541 required to be filled into the cylinders at a filling temperature of 15° C in order to achieve the required mass of 107.15 kg is:

$$Q_R = 107.97 \cdot (0.65799 + 0.00239 \cdot 15) = 74.59 \text{ m}^3$$

FLOODING FACTORS

Temp. T (°C) ^b	Specific Vapor Volume S (m ³ /kg) ^c	IG-541 Mass Requirements of Agent per Unit Volume of Hazard Design Concentration, m (Kg/m ³) ^a					
		IG-541 Design Concentration (% by Volume) ^d					
		35	38	40	42	46	52
-20	0.6102	0.7060	0.7834	0.8372	0.8927	1.0098	1.2029
-15	0.6221	0.6924	0.7684	0.8211	0.8756	0.9904	1.1797
-10	0.6341	0.6794	0.7539	0.8056	0.8591	0.9718	1.1575
-5	0.6460	0.6668	0.7399	0.7907	0.8432	0.9538	1.1361
0	0.6580	0.6547	0.7265	0.7763	0.8279	0.9365	1.1155
5	0.6699	0.6430	0.7136	0.7625	0.8131	0.9198	1.0956
10	0.6819	0.6317	0.7010	0.7491	0.7988	0.9036	1.0764
15	0.6938	0.6209	0.6890	0.7362	0.7851	0.8881	1.0578
20	0.7058	0.6104	0.6773	0.7238	0.7718	0.8730	1.0399
25	0.7177	0.6002	0.6660	0.7117	0.7589	0.8585	1.0226
30	0.7297	0.5904	0.6551	0.7001	0.7465	0.8444	1.0059
35	0.7416	0.5809	0.6446	0.6888	0.7345	0.8308	0.9897
40	0.7536	0.5716	0.6343	0.6779	0.7228	0.8177	0.9740
45	0.7655	0.5627	0.6244	0.6673	0.7116	0.8049	0.9588
50	0.7775	0.5541	0.6148	0.6570	0.7006	0.7925	0.9440

m [agent volume requirements (kg/m³)

^b T [temperature (°C)] = the design temperature in the hazard area.

S [specific volume (m³/kg)]

^d C [concentration (%)]

ALTITUDE CORRECTION FACTORS

The design quantity of agent can be adjusted to compensate for ambient pressures that vary more than 11% [equivalent to approximately 1000 m of elevation change] from standard sea level pressures [1.013 bar absolute]. (Reference: ISO 14520-1 or EN 15004-1)

Definition	Where compensation is made when pressure varies from standard sea level pressure due to elevation change.
Altitude (m)	Correction Factor
-1,000	1.11
0	1.00
1,000	0.89
1,500	0.82
2,000	0.78
2,500	0.72
3,000	0.70
3,500	0.65
4,000	0.61
4,500	0.57

NOTE: The Fike flow calculation program will automatically calculate the agent required based altitude correction factor entered.

ACTUAL OXYGEN CONCENTRATION AT MAXIMUM TEMPERATURE

It is important to determine the resulting Oxygen concentration in the protected hazard after the system has discharged. Exposure limit guidelines are discussed in Section 1 of this manual. The following table outlines the exposure limits based on the Oxygen concentrations within the hazard following agent discharge.

	Oxygen Concentration	
	10% - 12%	12% and Up
Exposure Time	3 Minutes	5 Minutes

Information from ISO 14520 or EN15004, Annex G. Other Countries and authorities may have different requirements.

The expected concentrations can be determined by applying the following formulae:

$$R_{IG-541} = [e^z - 1] \times (-100)$$

$$R_{OXYGEN} = \left(\left(\frac{R_{IG-541}}{100} \right) - 1 \right) \times 20.9 \times (-1)$$

Where:

R_{IG-541} Is the resulting IG-541 concentration

R_{OXYGEN} Is the resulting Oxygen concentration

$$Z = \left[\frac{(-1) \times M}{\left(\frac{293}{273 + T} \right)} \right]$$

M Is the volume of IG-541 per volume of the room (V_{IG-541}/V_{ROOM})

T Is the maximum temperature of the hazard in °C

EXAMPLE

Calculate the resultant IG-541 and Oxygen concentrations when 35 m³ of IG-541 is discharged into a 60 m³ hazard at a maximum temperature of 35°C. Using the above equations:

$$Z = \left[\frac{(-1) \times \left(\frac{35}{60} \right)}{\left(\frac{293}{273 + 35} \right)} \right] = -0.613197$$

$$R_{IG-55} = [e^{-0.613197} - 1] \times (-100) = 45.84\%$$

$$R_{OXYGEN} = \left(\left(\frac{45.84}{100} \right) - 1 \right) \times 20.9 \times (-1) = 11.32\%$$

C

Therefore the residual concentrations after the discharge of IG-541 within the hazard are:

$$R_{IG-541} = 45.84\% \quad \& \quad R_{OXYGEN} = 11.32\%$$

For a design concentration of 39.9% :-

- The maximum oxygen concentration achieved after total discharge is 12.6%.
- To comply with ISO 14520 or EN 15004 guidelines, 95% of the agent should be discharged within 60 seconds. This requires a maximum oxygen concentration of 13.0% at 60 seconds for a design concentration of 39.9%.

EVALUATION OF ENCLOSURE

The structural strength and integrity of the protected space(s) must be taken into consideration when designing a ProInert system. Venting shall be provided to prevent excessive over pressurization of the enclosure.

All openings must be sealed or equipped with automatic closures. Where reasonable confinement of the extinguishing agent is not practical, protection shall be extended to include the adjacent areas by determination of the additional volume and adjusting the agent quantity as necessary to achieve the necessary concentration.

Forced-air ventilating systems shall be shut down or closed automatically where their continued operation would adversely affect the ability of the system to extinguish a fire or result in propagation of the fire.

Any process within the hazard that is likely to interfere with the performance of the extinguishing system should be shut down at or before discharge. (fuel, power supplies, heating units, paint spraying, etc.)

All enclosures must be sealed in order to achieve and maintain the desired concentration for a period of time of not less than 10 minutes. Under normal circumstances, the agent will extinguish the fire rapidly, thereby limiting the potential for fire damage and the creation of dangerous products of decomposition released due to the effects of the fire on materials within the protected space. Therefore, it is critical that the protected space is constructed to minimize leakage.

The general guidelines for controlling leakage from the hazard are outlined in the Service Information Section of this manual.

A room integrity fan pressurization test is an accepted means of determining how long the protected space will hold the agent (concentration) after a discharge. In conjunction with testing the integrity of the room, the test has a program that predicts the performance of the Fike ProInert System so that the Authority Having Jurisdiction can determine if the system has been designed and installed properly.

The room integrity fan pressurization test must be performed in accordance with the manufacturer's requirements, and ISO 14520-1 or EN 15004-1, annex E.

SYSTEM DESIGN CONCEPTS

ProInert systems can be designed using any of the 3 methods/arrangements as described below:

Modular System	Where the containers are located throughout or around the protected area(s) to keep the discharge piping requirements down to a minimum, but increases the electrical materials necessary to reach each individual container location.
Central Storage System	Where the containers are located in one location, and piped to the protected space(s) from this location. This concept often requires more discharge piping, but it decreases the electrical materials necessary to reach the singular container(s) location. This concept may be more difficult to design due to the increased piping runs involved, and the installation labor will tend to be more costly.
Selector Valve System	Where more than one zone is to be protected by a common Central Storage Bank the Selector Valve is used to direct the agent flow into the appropriate zone. When designing a system utilizing Selector Valves the designer must always calculate the largest zone of protection when sizing the cylinder bank
NOTE: All system design concepts described above require Engineered flow calculations.	

SYSTEM OPERATION

CONTROL PANEL	The Control Panel must be a listed and approved device that has a releasing circuit with a time delay.
DETECTORS	The detectors shall be spaced and installed in accordance with the manufacturer's specifications and the guidelines of EN 54.
MANUAL RELEASE (Electric)	The electric manual release switch shall be a dual action device providing a means of manually discharging the ProInert Fire Extinguishing System. Manual actuation shall bypass the time delay and abort functions and shall cause the system to discharge and all release and shutdown devices to operate in the same manner as if the system had operated automatically. An electrical Manual Release Station shall be located at each exit from the protected hazard and shall have an advisory sign, Fike P/N 02-13419, provided at each location.
MANUAL RELEASE (Manual)	Mechanical Manual Release shall be made available in the event all battery back-up and commercial power is lost. A manual activation button on the Actuation Package permits manual pneumatic activation of the ProInert Fire Extinguishing System.
HOLD-OFF CONTROL POINT (Optional)	The optional Hold-off control shall be the "Dead Man" type and shall be located next to each manual switch. "Locking" or "Keyed" Hold-off controls shall not be permitted.
AUDIBLE and VISUAL ALARMS	Alarm audible and visual signal devices shall operate from the Control Panel. A Strobe device shall be placed outside, and above, each exit door from the protected space
CAUTION and ADVISORY SIGNS	Provide signs, as required, to comply with ISO 14520 or EN 15004 and the recommendations of the ProInert Fire Extinguishing System equipment supplier: Entrance Sign: (1) required at each entrance to a protected space. (Fike P/N 02-13416) Manual Discharge Sign: (1) required at each manual discharge station. (Fike P/N 02-13419)
SYSTEM and CONTROL WIRING	All system wiring shall be furnished and installed by the contractor. All wiring shall be installed in accordance with National Regulations, and must be installed and kept separate from all other building wiring.

CYLINDER SIZE AND FILL PRESSURE

Fike's ProInert system is available in two arrangements (200 bar and 300 bar filling pressure). All cylinders are filled to capacity with no partial fills allowed. The following table identifies the available cylinders:

CYLINDER DATA TABLE				
Cylinder Size	Cylinder Part Number	Filling Pressure	IG-541 Capacity	Mounting Position
80 Liter	IG71-080-200-541	200 bar	16.7 m ³	Upright
80 Liter	IG71-080-300-541	300 bar	23.2 m ³	Upright
140 Liter	IG71-140-200-541	200 bar	29.3 m ³	Upright
140 Liter	IG71-140-300-541	300 bar	40.5 m ³	Upright

The factors to consider when selecting the type of location(s) for the storage cylinder(s) is outlined on the Agent Storage Cylinder Component Spec in the Equipment Section of this manual.

TEMPERATURE LIMITATION

Description	Minimum	Maximum	Note
Container Storage / Location	-20°C	50°C	At temperatures outside of this range, the system may not supply the desired quantity of agent or discharge due to over-pressure.

NOZZLE FLOW RATE

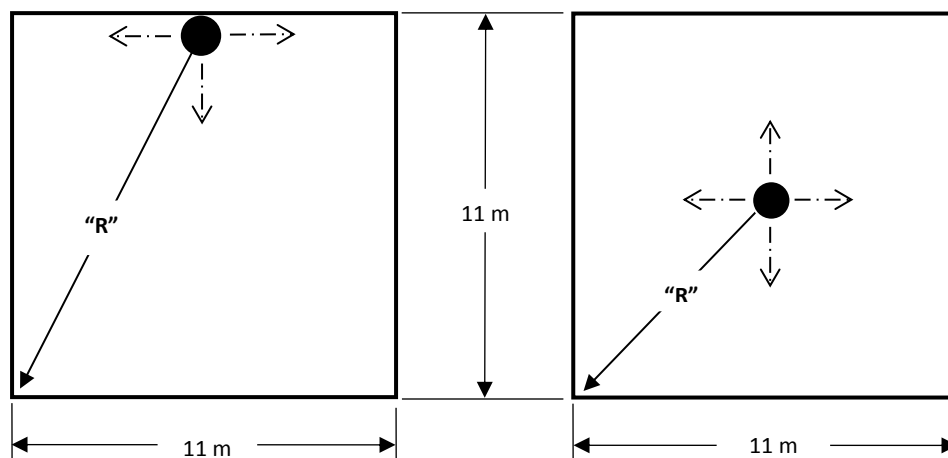
NOTE: This information is provided for estimating purposes only. Final system design MUST be verified using the Fike ProInert Flow Calculation Software Version 7.3 or later.

NOZZLE FLOW RATES (Kg / 60 Seconds)		
PIPE SIZE	MINIMUM DESIGN FLOW RATE	MAXIMUM DESIGN FLOW RATE
15 mm	0.6 Kg	34 Kg
20 mm	3.5 Kg	66 Kg
25 mm	7.5 Kg	104 Kg
40 mm	15.0 Kg	255 Kg

NOZZLE AREA COVERAGE

Nozzle Type	Radius "R" Dimension ft. (m)	Ceiling Height Range ft. (m)
180°	12.2	0.3 to 5.0
360°	7.7	0.3 to 5.0

Maximum Distance	180° Nozzle	360° Nozzle	Note
Below Ceiling	0.3 m	0.3 m	Maximum distance above highest point of protection when stacking nozzles.
Away from Sidewall	0.3 m		

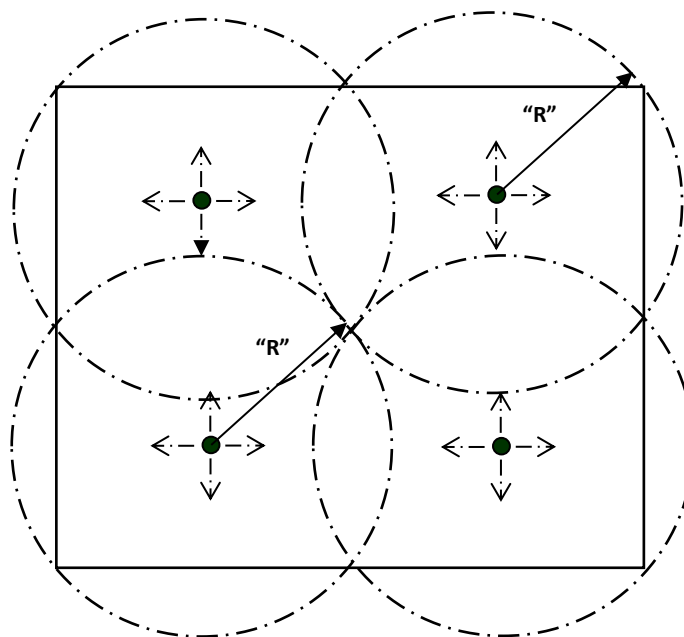


NOZZLE PLACEMENT

360° NOZZLES

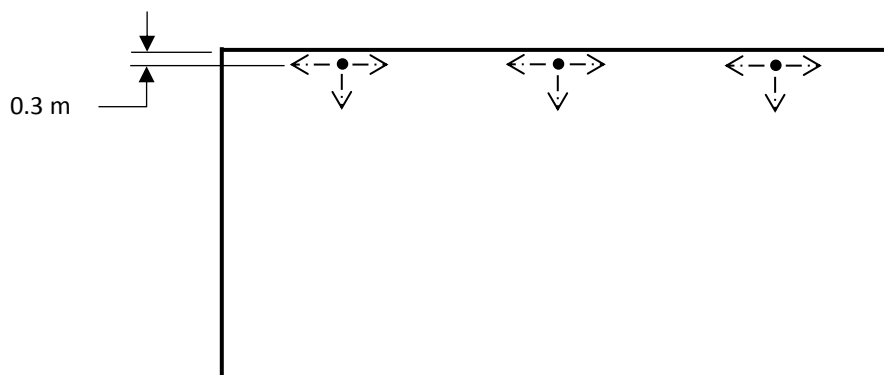
Nozzles should be located in a symmetrical, or near symmetrical, pattern within the protected area. Nozzle patterns need to overlap, to adequately cover the area without any "blind spots" due to nozzle locations. Apply to all Nozzle types.

360° Nozzles are designed to be located on, or near, the centerline of the protected area, discharging toward the perimeter of the area being covered. The system designer should lay out the nozzles on a floor plan and verify that the entire area being protected is adequately covered without any "blind spots" due to nozzle locations.



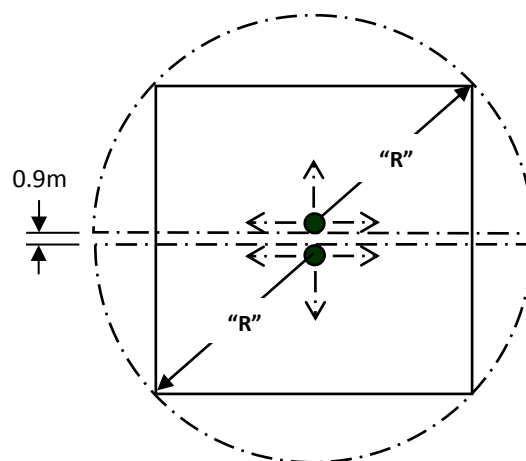
180° NOZZLES

180° Nozzles should be located in a symmetrical, or near symmetrical, pattern within the protected area. 180° Nozzles should be located along the perimeter of the area – discharging along the perimeter and toward the opposite side. These nozzles can be located a maximum of 0.3 m out from the wall.



180° NOZZLES – BACK to BACK APPLICATION

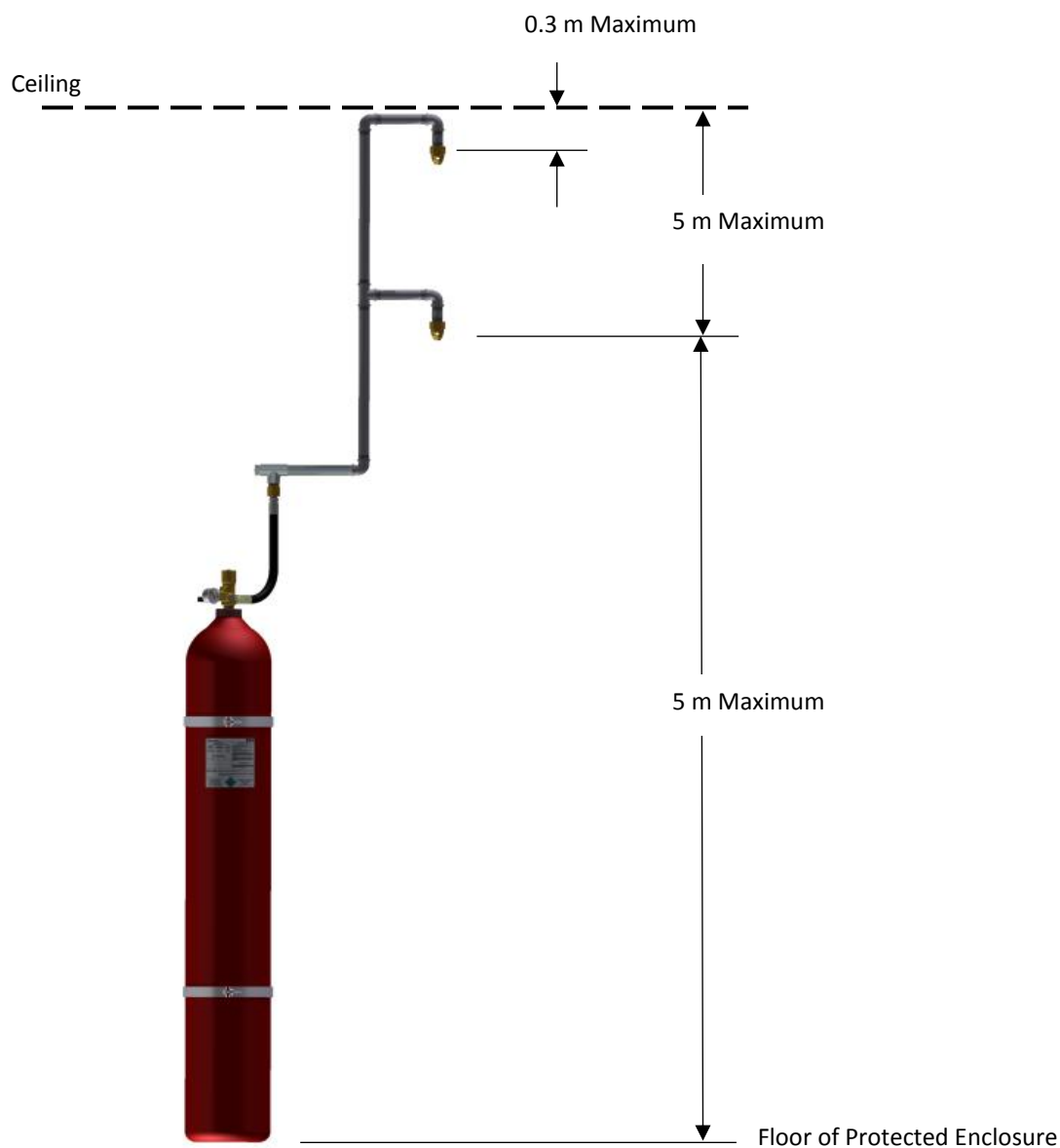
180° Nozzles can also be installed in “Back-to-Back” applications. The distance between nozzles can be a maximum of 0.9 m, this allows 10.7 m radius “R” to be used.



NOTE: Clip all ceiling tiles in the protected enclosure to avoid ceiling tiles from being lifted during agent discharge.

CEILING HEIGHT vs. LEVELS OF NOZZLES

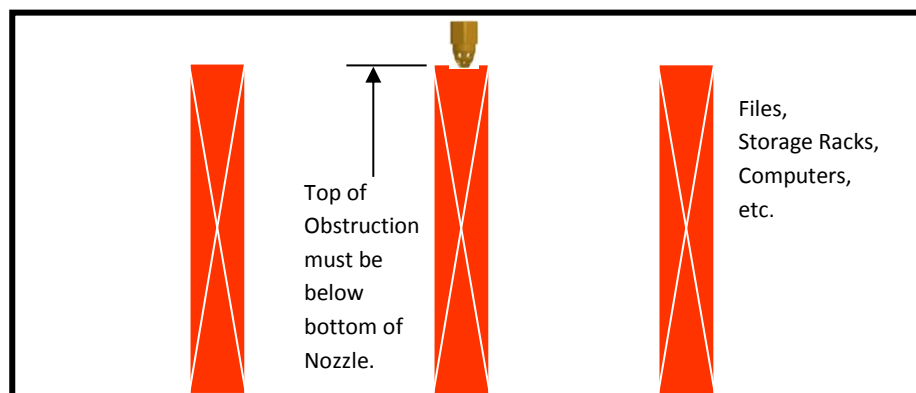
Ceiling Height	Levels of Nozzles Required
0.3 m to 5 m	1
Over 5 m to 10 m	2 (See Maximum Elevation Differences in Pipe Runs Limitation)



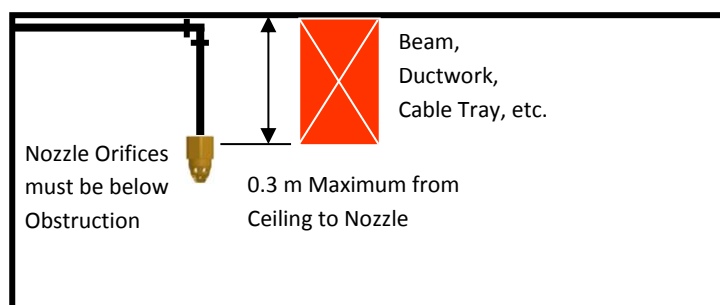
NOZZLE DISCHARGE OBSTRUCTIONS

Walls, partitions, dense equipment racks, and tall equipment can make area coverage obstructions for nozzle discharges. For this reason, the discharge “path” of the nozzles must also be taken into account when determining the quantity of nozzles required.

Any time solid obstructions extend to where they could interfere with the “line-of-sight” discharge path from the nozzle, they should be treated as separate areas. All nozzles should be located in a manner that will provide a clear discharge path that reaches all of the outer extremes for the protected space.



(Side View)



(Side View)

Allow a clearance of 0.5m between the highest object and the nozzle to avoid forming a partial separate compartment.

PIPING NETWORK LIMITATIONS

ESTIMATING PIPE SIZE

The proper pipe size for each section of piping is selected based on the design flow rate for each pipe section. Generally, the size selection should be based on the smallest pipe size that will handle the design flow rate for branch lines supplying the discharge nozzles, and the next to smallest size for main feed pipes.

DISCHARGE DURATION

ProInert Systems must discharge the agent in a manner that will achieve 95% of the design concentration within sixty (60) seconds in accordance with NFPA 2001, ISO 14520 and EN 15004. Therefore, these time requirements must be taken into account when estimating pipe sizes. The Fike ProInert Flow Calculation Program selects pipe sizes based on these criteria and selects the nozzle orifice hole size accordingly. Ultimate control of the discharge time is accomplished through the custom sizing of the discharge nozzles by the Fike ProInert Flow Calculation Program.

ESTIMATING MAXIMUM FLOW RATES

The pipe sizes selected must be in accordance with the Flow Rate Table below.

To determine the flow rate of a pipe section, divide the amount of agent flowing through that section by the discharge time (60 seconds).

Diameter		(kg/min)
mm	in	max
15	½"	42
20	¾"	82
25	1"	130
32	1 ¼"	232
40	1 ½"	318
50	2"	480
65	2 ½"	682
80	3"	1065
100	4"	1860
125	5"	2940
150	6"	4200

WARNING: **DO NOT** install the pipe system based on estimates from this chart. The pipe system design **MUST** be verified by the Fike Prolnert Flow Calculation Software Version 6.2 or later prior to installing the system.

EQUIVALENT LENGTH VALUES

All pipe, fittings, valves and other piping components have Equivalent Length values that have been determined by flow testing and are included in the Prolnert Flow Calculation Software Version 7.3 or later.

PRESSURE RELIEF / ROOM VENTING

Fire suppression systems that use inert gas extinguish fires by reducing the level of oxygen to a point where combustion of the flammables cannot be maintained. The amount of gas discharged into the hazard results in a positive pressure, which displaces the air from the room. Suitable means of pressure relief/vent shall always be employed in order to avoid structural damage to building and equipment.

To avoid personal and property damage, the fire and IG-541 released by the pressure relief device must not result in a hazard outside the extinguishing zone.

For this reason the pressure relief/vent should always be directed to free air. Although 'cascade' venting may be required in certain circumstances.

If a duct cannot be avoided, the duct must be gas tight, and should lead directly into the open. The duct must be designed so as to make sure that during pressure relief the fire is not allowed to spread into other hazards or areas.

The pressure relief device shall close after completed pressure relief. Preferably the pressure relief device should be equipped with its own power source and should be able to open and close automatically. Pressure relief devices, which depend on an external power supply, shall be triggered directly by the extinguishing system and shall be energized by the extinguishing system. (Preferably with non-electric energy)

If electrically triggered pressure relief devices are used, the guidelines for triggering the extinguishing system shall be observed.

If pressure relief takes place through a vent, or if ducted directly into free air, and there is no requirement for a fire resistant segregation of the perimeter walls containing the pressure relief vent; louvered shutters can be used opening as a result of the over pressure, closing by their own weight or via springs at a certain overpressure in the room.

If requirements in terms of structural segregation must be observed, the pressure relief device shall be designed accordingly.

The pressure relief vent shall be installed so as to make sure that it is not positioned in the immediate discharge area of the nozzles.

Pressure relief must not be provided in form of active exhaust suction devices.

Each separate space within the flooded zone must be equipped with its own pressure relief vent device. The pressure relief device must be sufficiently dimensioned taking into account the allowable overpressure in the room, the mass flow during the release and the type of pressure relief device to be used. (Drag coefficient of the vent, pressure drop in duct, etc).

If the pressure relief vent is provided in form of a duct arrangement, the pressure drop of the duct must be calculated additionally and must be considered when dimensioning the cross sectional surface of the vent.

A duct shall always be suitable for taking the applied pressure and the gas flow.

No enclosure is 100% tight; a certain amount of leakage to adjacent areas is to be anticipated during and following an IG-541 discharge.

Note: Should the pressure relief/vent be taken to an adjacent room not provided with a pressure relief/vent, this room shall be at least 100 times the volume of the protected room. The products of combustion will be spread to this room, which may affect personnel and any fire detection system. Refer to the FIA Venting Guide for further details.

In most cases, the required quantity of inert gas to extinguish a fire is equal to approx. 50% of the volume in the room, therefore in a completely sealed room pressure will increase 50% equal to approx. 0,5 bar (50,000 Pa) overpressure. Literature has reported that the normal strength of building components can be considered to allow an overpressure of 0.005 bar (5 mbar)(500 pa). But the strength can be considerably less, information for the building owner must always be sought. In this example of a completely sealed space then the over pressure is 100 times that allowed.

The lowest rated construction element shall always govern as the basis for calculating the required relief/vent opening.

It shall also be noted that over-pressure will affect the opening of doors into the room. If the door opens inward and the room is pressurized, it may be almost impossible to open the door. If the door opens outward from a pressurized room, the door may open in a face with a tremendous force as soon as the doorknob is turned.

It shall be noted that not all flow calculating programs take the restriction there might be over the relief device into account, in which case the free area required shall be calculated.

Consideration shall be given to concentration, products of combustion and relative size of adjacent space. Additional consideration shall be given to exhaust/ventilation paths when opening or ventilating the enclosure after a discharge.

Fike does not take any responsibility of verification of weak points there might be in the enclosure construction. Examples of weak points may be; windows, ventilation channels (Spiro Tubes sectioned by dampers etc.), door frames, door plates at locks, ceilings etc.

Pressure relief vents shall be installed by a qualified ventilating company.

The pressure relief/vent opening calculation shall be made part of the system documentation and issued to owner for information and compliance.

Note: Calculated area shall be verified against actual resistance of the vent manufacturer. The Fike spreadsheet calculates the net area required

The use of the vent area derived from the Room Integrity check can be considered. Generally the sealing of the protected space is beyond the scope and responsibility of the Fire Protection contractor. Any leakage at the time of the test can be both increased and decreased by simple changes to the spaces. If the building owner confirms that the level of sealing will NOT be increased then up to 50% of the Integrity Test area can be considered as part of the ventilation area.

Provision shall be made to ventilate the area after discharge to remove the products of combustion and extinguishant before the space is reoccupied.

The pressure relief vent area can be calculated from the formulae detailed in the FIA venting Guidance document.

$$A = \frac{M \times S_{IG-55}}{\sqrt{P \times S_H}} \quad \& \quad S_H = \frac{C \times S_{IG-55}}{100} + \left(\frac{100 - C}{100} \right) \times S_{AIR}$$

Where:

A Is the total vent area (square meters)

M Is the mass flow of extinguishant (kgs/second)

S_{IG-541} Is the specific vapor volume of extinguishant (cubic meters/kg)

P Is the maximum room strength (pascals)

S_H Is the specific vapor volume of the homogenous mix (cubic meters/kg)

C Is the design concentration (%)

S_{AIR} Is the specific vapor volume of air given by:

$$S_{AIR} = 0.773824 + 0.002832967 \times T$$

T is the temperature in degrees C

EXAMPLE

Calculate the pressure relief vent area for a Prolnert system with the following parameters:

Hazard volume : 260m³

Hazard temperature : 20°C

Maximum room strength : 500 Pa

Design concentration : 39.7%

Cylinder size used for hazard : 80 Litre containing 32.1 kg of IG-541

The mass of IG-541 required to achieve the concentration within the enclosure which is at a temperature of 20° C is:

$$m = \frac{260}{(0.65799 + 0.00239 \cdot 20)} \cdot \ln\left(\frac{100}{100 - 39.9}\right) = 187.57 \text{ kg}$$

Therefore the number of cylinders required for the hazard is:

$$\frac{187.57}{33.2} = 5.65 = 6$$

cylinders (rounded up) with a total of 199.2 kg.

Since Prolnert provides a constant discharge over 60 seconds the mass flow rate is:

$$\frac{199.2}{60} = 3.32 \text{ kg/s}$$

$$S_{IG-541} = (0.65799 + 0.00239 \cdot 20) = 0.7058 \text{ m}^3 / \text{kg}$$

$$S_{AIR} = 0.773824 + 0.002832967 \times 20 = 0.8305 \text{ m}^3 / \text{kg}$$

$$S_H = \frac{39.9 \times 0.7085}{100} + \left(\frac{100 - 39.9}{100}\right) \times 0.8305 = 0.7807 \text{ m}^3 / \text{kg}$$

$$A = \frac{3.32 \times 0.7058}{\sqrt{500 \times 0.7807}} = 0.119 \text{ m}^2$$

SAMPLE PROBLEM

This section is intended to illustrate a step by step procedure for designing a Fike ProInert system. The sample system will be designed to comply with the guidelines and limitations discussed in the previous sections.

For detailed instructions, consult Fike's ProInert Engineered System Flow Calculation Program manual for the use and operation of the program.

The following example consists of a computer room, U.P.S. room and operations room with a common sub-floor.

NOTE: This sample system has been designed in accordance with the requirements in NFPA Standard 2001, ISO 14520 and EN15004.

DETERMINE HAZARD VOLUME

The first step is to determine the hazard area and volume for each enclosure involved. Refer to Figure 3.1.1 for details.

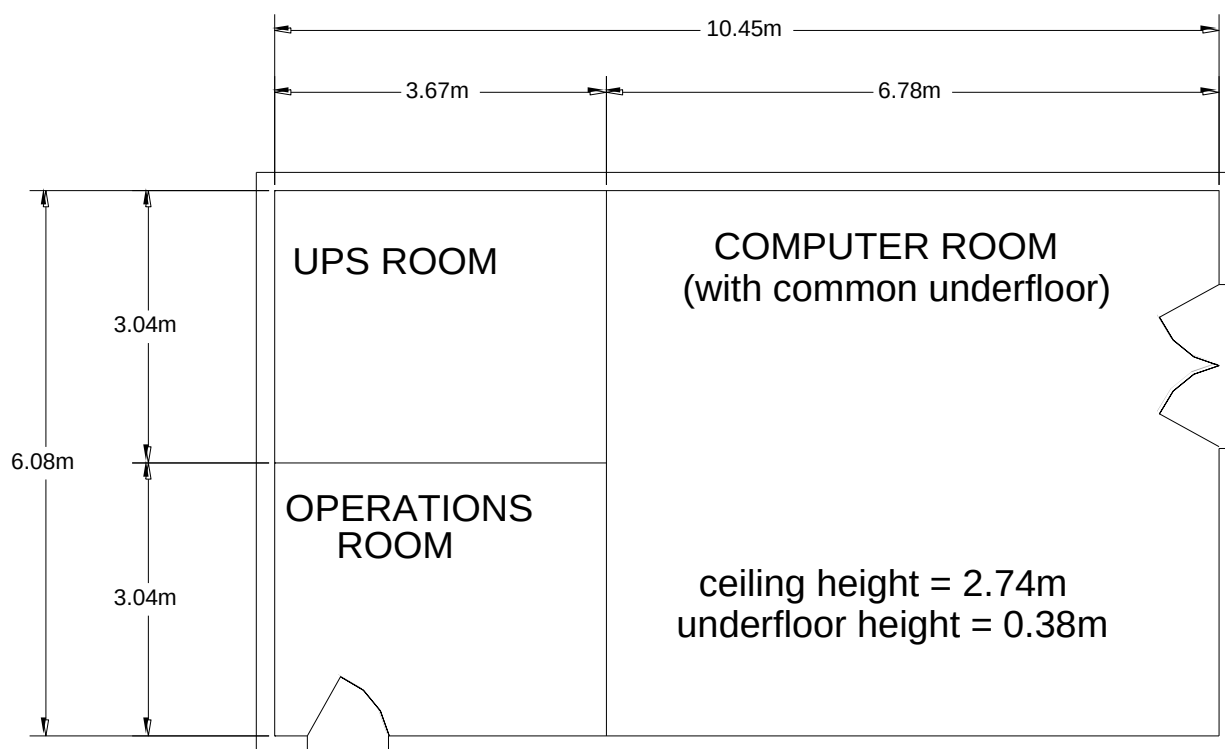


Figure 3.1.1

HAZARD VOLUMES				
Computer Rm.	6.78 x 6.08 =	41.22m ²	x 2.74 =	112.95m ³
UPS Room	3.67 x 3.04 =	11.16m ²	x 2.74 =	30.58m ³
Operations Rm.	3.67 x 3.04 =	11.16m ²	x 2.74 =	30.58m ³
Underfloor	10.45 x 6.08 =	63.54m ²	x 0.38 =	24.14m ³
				198.25 m ³

CALCULATE AGENT REQUIRED

The minimum design concentration for Class A combustibles is 39.9%. Because this system is going to use one container to protect multiple hazards we shall use a design concentration of 40%. This will allow each enclosure to have a minimum concentration of 39.9%. The minimum expected storage temperature of the container in this example is 20°C.

From the Table on page 4 40% gives a flooding factor 0.724 kg/m³

AGENT QUANTITY CALCULATION					
Computer Room	W =	112.95	x	0.724	= 81.8kg
UPS Room	W =	30.58	x	0.724	= 22.2kg
Operations Room	W =	30.58	x	0.724	= 22.2kg
Underfloor Area	W =	24.14	x	0.724	= 15.3kg
					141.5kg

DETERMINE CONCENTRATION AT MAXIMUM TEMPERATURE

The next step is to check the concentration level [at the maximum temperature that is anticipated within the enclosures being protected] and verify the NOAEL level has not been exceeded. For this example, we are utilizing a maximum temperature of 35°C.

From the Table on Page 4, look along the 35°C line until a flooding factor 0.724 kg/m³ is located and read off the concentration. In this case approximately 42% which is below the NOAEL of 43%.

ESTABLISH SYSTEM CONCEPT

This system has four areas that need fire protection – each with a different amount of agent for each enclosure and different nozzle requirements. Of the three types of systems that we can apply to these hazard areas, the most flexible is the unbalanced system.

CONTAINER SELECTION

This system requires a total of 141.5 kg of IG-541 to protect all four hazard areas; this allows us to utilize a common agent supply.

80 liter 300 bar cylinder stores 33.2 kg of IG-541

5 cylinders will be required giving a total quantity of gas of 166.0 kg

New flooding factor based on the total volume = $166.0/198.25 = 0.8373 \text{ kg/m}^3$

From the Table on Page 4, look along the 35°C line until a flooding factor 0.8373 kg/m³ is located and read off the concentration. In this case approximately 47% which is below the LOAEL of 52%.

As per the NFPA 2001 the personnel egress time from the protected space should be less than 3 minutes.

As per ISO 14520 or EN 15004 an Automatic/Manual Switch should be provided.

As per the UK HAG exposure should not exceed 1 minute.

To reduce the concentration a separate cylinder could be used for the Floor Void

1 off 80 liter 200 bar would give 17.88 kg

The remaining room would require 125.4 kg.

4 off 80 litre 300bar at 33.2 kg each would provide a total of 132.8 kg giving a flooding factor of $132.8 \text{ kg}/174.1 \text{ m}^3 = 0.7628 \text{ kg/m}^3$

From the Table on Page 4 look along the 35°C line until a flooding factor 0.7628 kg/m³ is located and read off the concentration. In this case approximately 44% which is above the NOAEL of 43%.

As per the NFPA 2001 the personnel egress time from the protected space should be less than 5 minutes.

As per ISO 14520 or EN 15004 systems can be left on Automatic Discharge with a discharge time delay.

As per the UK HAG exposure should not exceed 10 minutes.

NOZZLES REQUIRED

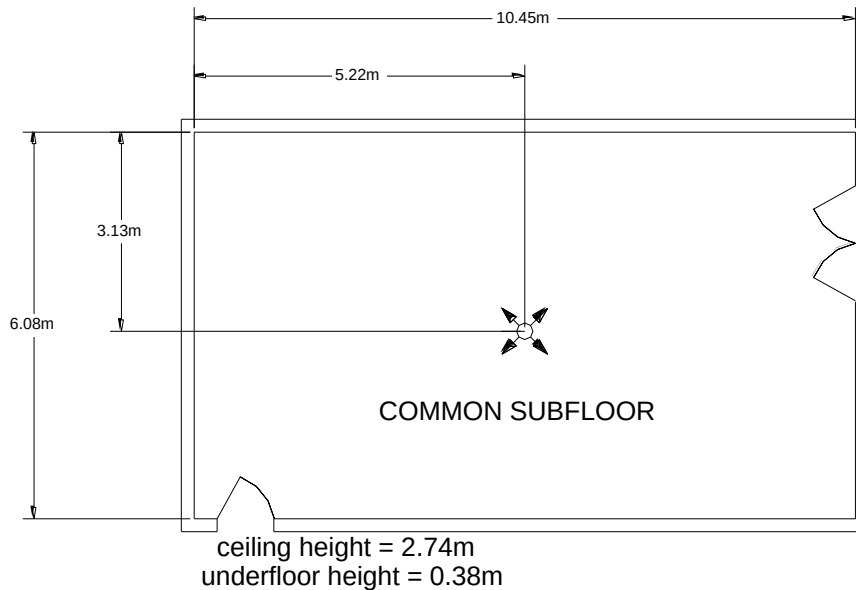
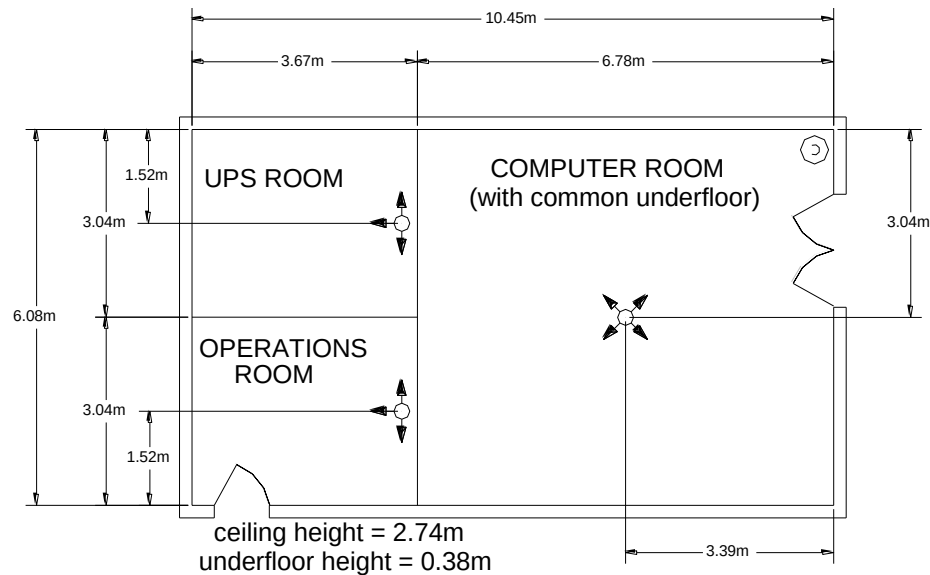
Step 1: Determine the correct number of nozzle(s) required for each hazard area and calculate the nozzle flow rate required to discharge the system in 60 seconds.

Refer to page 9 Nozzle flow rate table

NOZZLE FLOW RATES	
Computer Room	82kg
	60sec. = Use 1 x 25 mm nozzle
UPS Room	22kg
	60sec. = Use 1 x 15 mm nozzle
Operations Room	22kg
	60sec. = Use 1 x 15 mm nozzle
Underfloor Area	16kg
	60sec. = Use 1 x 15 mm nozzle

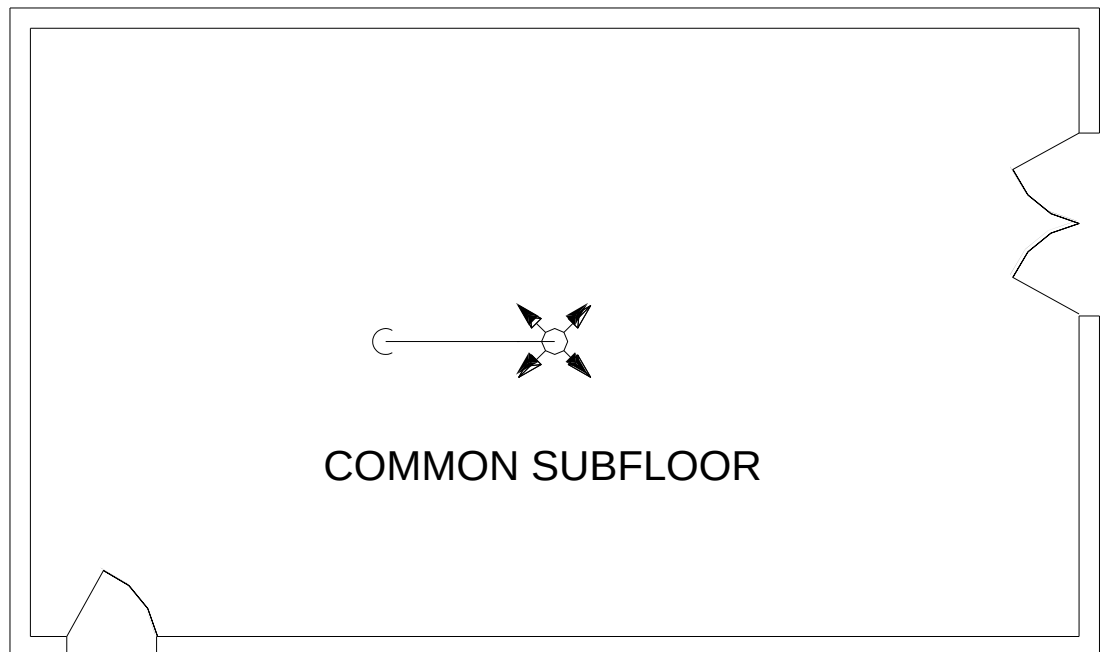
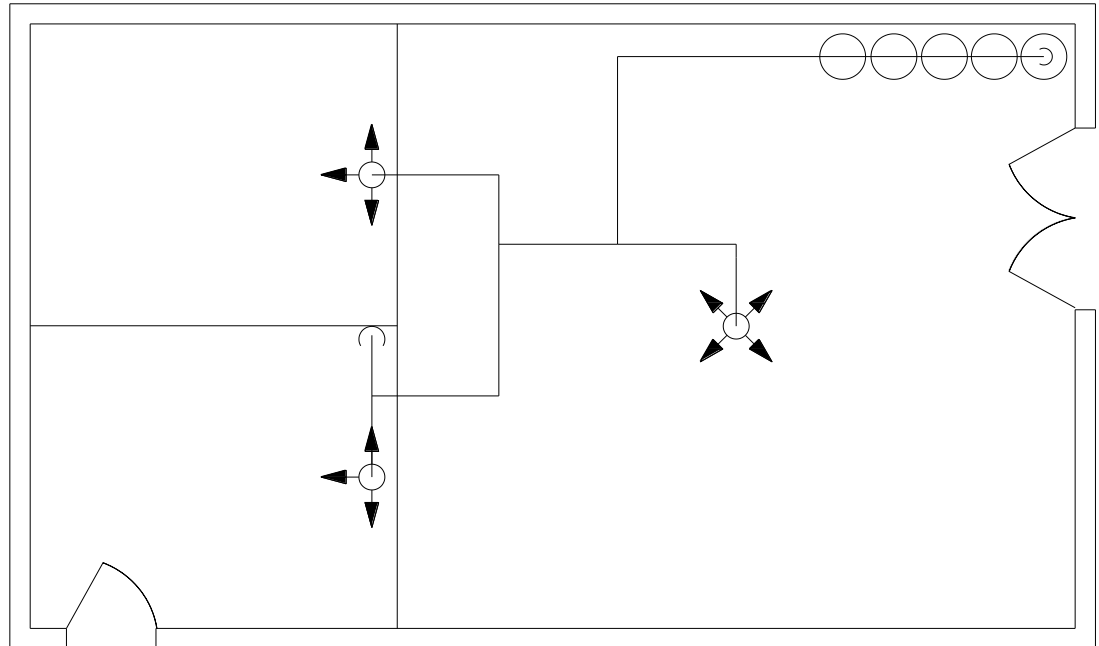
Step 2: Locate the nozzle(s) on a scaled plan view of the hazard areas being protected. This will allow you to check the area coverage of each nozzle being used.

Check the nozzle coverage from page 10. Maximum coverage is 7m radius. From the diagram the floor void has the largest coverage. From the nozzle to the corner is 6.1m which is acceptable. More nozzles may be required if the floor void is particularly cluttered and cable bundles from compartments.



LAYOUT PIPING NETWORK

Step 1: Layout pipe network and container location(s) on a scaled plan view. While many methods of pipe routing may exist in any given system, it is best to supply nozzles, or groups of nozzles, from central points along the trunk line to avoid high degrees of piping imbalance.



Step 2: Layout a piping isometric to show all elevation changes, fittings and lengths. (Refer to Figure 3.4) The sections of pipe should be numbered 1-2, 2-3, 3-4, etc. A new section of pipe begins whenever there is a tee split or pipe size change. All elevation changes must be accounted for by assigning a number, or node point, at the bottom and top of the pipe section. Correct numbering of pipe sections is essential for proper data entry into Fike's Prolnert Engineered Flow Calculation Program. Pipe sizes will be based on the flow rate for each section and selected from Table on page 14.

IMPORTANT: Your final design **MUST** be checked by using Fike's Prolnert Engineered System Flow Calculation Program before installation starts. When using the "Isometric" input portion of the flow calculation program, it is not necessary to assign "Node" points to the piping isometric as the isometric input will automatically assign node point numbers as you draw the piping system.

The following pages are a copy of the Fike's Prolnert Engineered System Flow Calculation Program printout showing the inputs and outputs of the program.

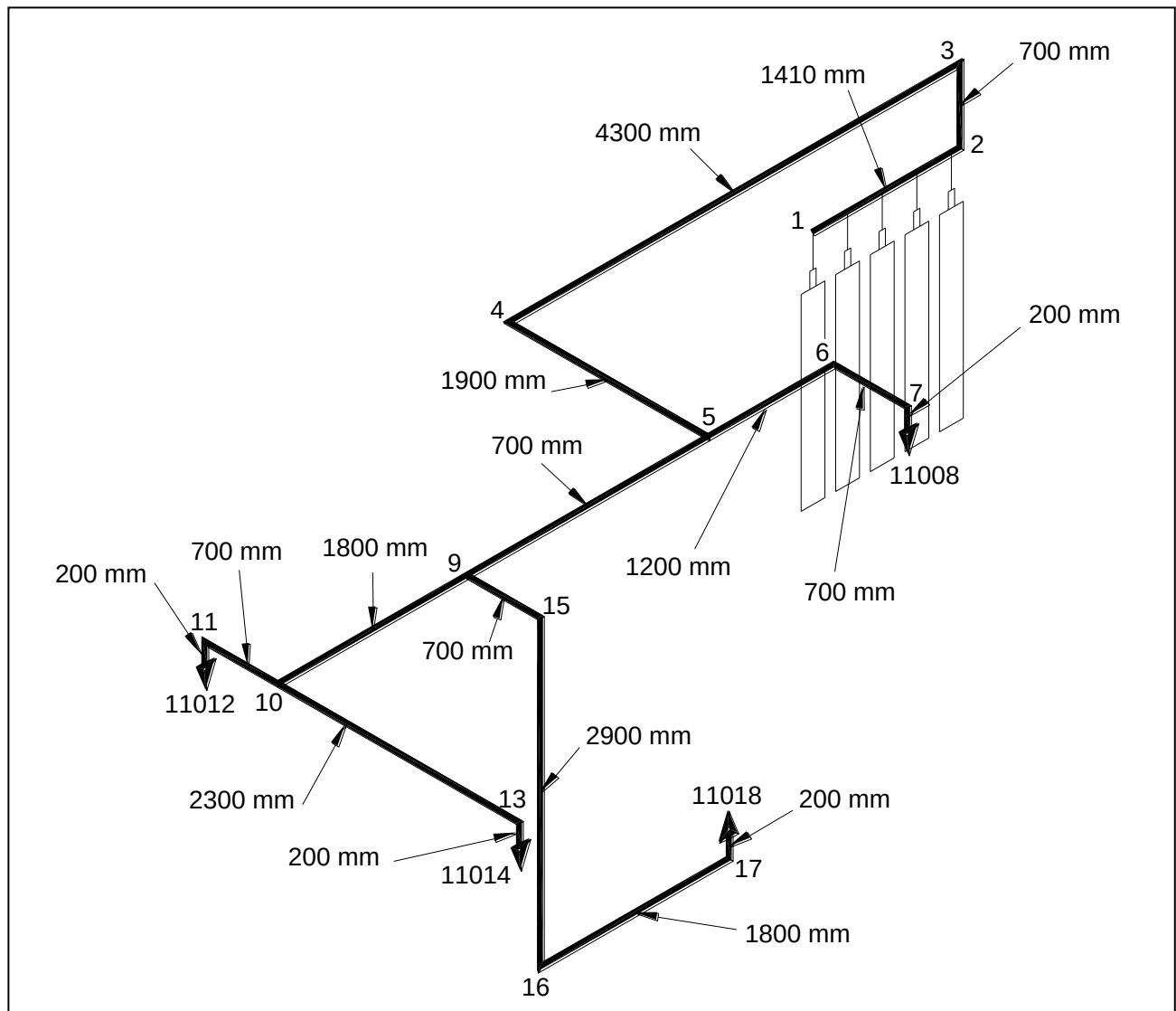


Figure 3.4

OUTPUTS – FIKE FLOW CALCULATION PROGRAM

Pipesystem data:

Section- No:	Starting- node	Endnode Nozzle	Length [m]	Height [m]	Pipe type	Diameter [mm]	Fitting *	Component code	Component coefficient	Nb of containers IG541 quantity
1	0	1	2.200	2.200	12	15.0		-	-	0
2	1	2	1.410	0.000	21	28.6	E	-	-	
3	2	3	0.700	0.700	21	35.0	E	-	-	
4	3	4	4.300	0.000	21	35.0	E	-	-	
5	4	5	1.900	0.000	21	35.0	E	-	-	
6	5	6	1.200	0.000	21	28.6	T-90°	-	-	
7	6	7	0.700	0.000	21	28.6	E	-	-	
8	7	11008	0.200	-0.200	21	28.6	E	-	-	81.8
9	5	9	0.700	0.000	21	20.9	T-90°	-	-	
10	9	10	1.800	0.000	21	20.9	T-0°	-	-	
11	10	11	0.700	0.000	21	15.8	T-90°	-	-	
12	11	11012	0.200	-0.200	21	15.8	E	-	-	22.1
13	10	13	2.300	0.000	21	15.8	T-90°	-	-	
14	13	11014	0.200	-0.200	21	15.8	E	-	-	22.1
15	9	15	0.700	0.000	21	15.8	T-90°	-	-	
16	15	16	2.900	-2.900	21	15.8	E	-	-	
17	16	17	1.800	0.000	21	15.8	E	-	-	
18	17	11018	0.200	0.200	21	15.8	E	-	-	17.5

* C=Component, B=Bend, T=T-Piece, E=Elbow, P=Pressure control valve

Legend of pipetypes

Type	Pipeclass	Pipe roughness
12	Threaded BS1387 then 50+ sch80	hose
21	Schedule 40	galvanized

Calculation zone data:

Zone	Total volume [m3]	Volume of building parts [m3]	Calculated volume [m3]	Max. Over- pressure [mbar]	Design temp. [°C]	Extinguish- cono. [% Vol]	Design factor	Design cono. [% Vol]	Design quantity [kg]
1 Computer Roo	113.0	0.0	113.0	1.000	20.0	30.8	1.30	40.0	81.82
2 UPS Room	30.6	0.0	30.6	1.000	20.0	30.8	1.30	40.0	22.15
3 Operations R	30.6	0.0	30.6	1.000	20.0	30.8	1.30	40.0	22.15
4 Underfloor V	24.1	0.0	24.1	1.000	20.0	30.8	1.30	40.0	17.49

Regulation rule for calculation of IG541 quantities: ISO 14520-1
Altitude above sealevel: 100.0 m

Calculation results:

IG541 design data:

Design quantity:	143.61
Supplement factor:	1.00
Minimum storage quantity:	143.61
Container volume:	80.0 l
Container pressure:	308.9 bar abs
IG541-mass in one container:	33.2 kg
Number of containers:	5
Actual storage quantity:	166.2 kg
Storage temperature:	20.0 °C
Starting container pressure:	308.9 bar abs

Discharge time:

Total discharge time of air and IG541:	58.3 s
--	--------

System information:

Max. pressure downstream control valve:	42.0 bar abs
Pipe system working pressure:	42.0 bar abs
Container working pressure:	308.9 bar abs
Total network volume:	10.5 l

Nozzle data:

Calculation- zone no:	Nozzle no.	Nozzle type	Number of orifices	Pipeconnection Di [mm]	DN	Orifice [mm]	IG541 out- put [kg]
1	11008	1	1	26.6	1	13.1	81.8
2	11012	1	1	15.8	1/2	6.9	22.1
3	11014	1	1	15.8	1/2	7.0	22.1
4	11018	1	1	15.8	1/2	6.2	17.5

MAX. TRANSPORT TIME DIFF. BETWEEN NOZZLES: 11018./ 11008. IS 0.19 S

Concentrations:

Calculation- zone no:	Gascomposition after the discharge of the design quantity [%]			
	O2	CO2	AR	N2
1	12.5	3.2	18.8	67.5
2	12.5	3.2	18.8	67.5
3	12.5	3.2	18.8	67.5
4	12.5	3.2	18.8	67.5

Total flooded design quantity within discharge time: 143.61 kg

Calculation- zone no:	Gascomposition after total discharge [%]			
	O2	CO2	AR	N2
1	11.5	3.6	18.6	66.3
2	11.5	3.6	18.6	66.3
3	11.5	3.6	18.6	66.3
4	11.5	3.6	18.6	66.3

Total flooded IG541 mass: 165.6 KG

Pressure relief opening:

Calculation- zone no:	Recommended area against overpressure		Max. flow [kg/s]
	Area [m²]	Overpressure [mbar]	
1	0.114	1.0	1.38
2	0.031	1.0	0.37
3	0.031	1.0	0.37
4	0.024	1.0	0.29

Component list:

Nozzle-type	Number
Fike Prolnert Nozzle	4

Pipe-type	Di [mm]	DN	Length [m]
12	15.00	1/2	2.200
21	26.60	1	3.500
21	35.00	1 1/4	6.900
21	20.90	3/4	2.500
21	15.80	1/2	9.000

Number of bends (+) and elbows (-)

Bend-type	Di [mm]	DN	Number
-90	26.60	1	3
-90	35.00	1 1/4	3
-90	15.80	1/2	5

Number of T-distributors (in- and outdiameter)

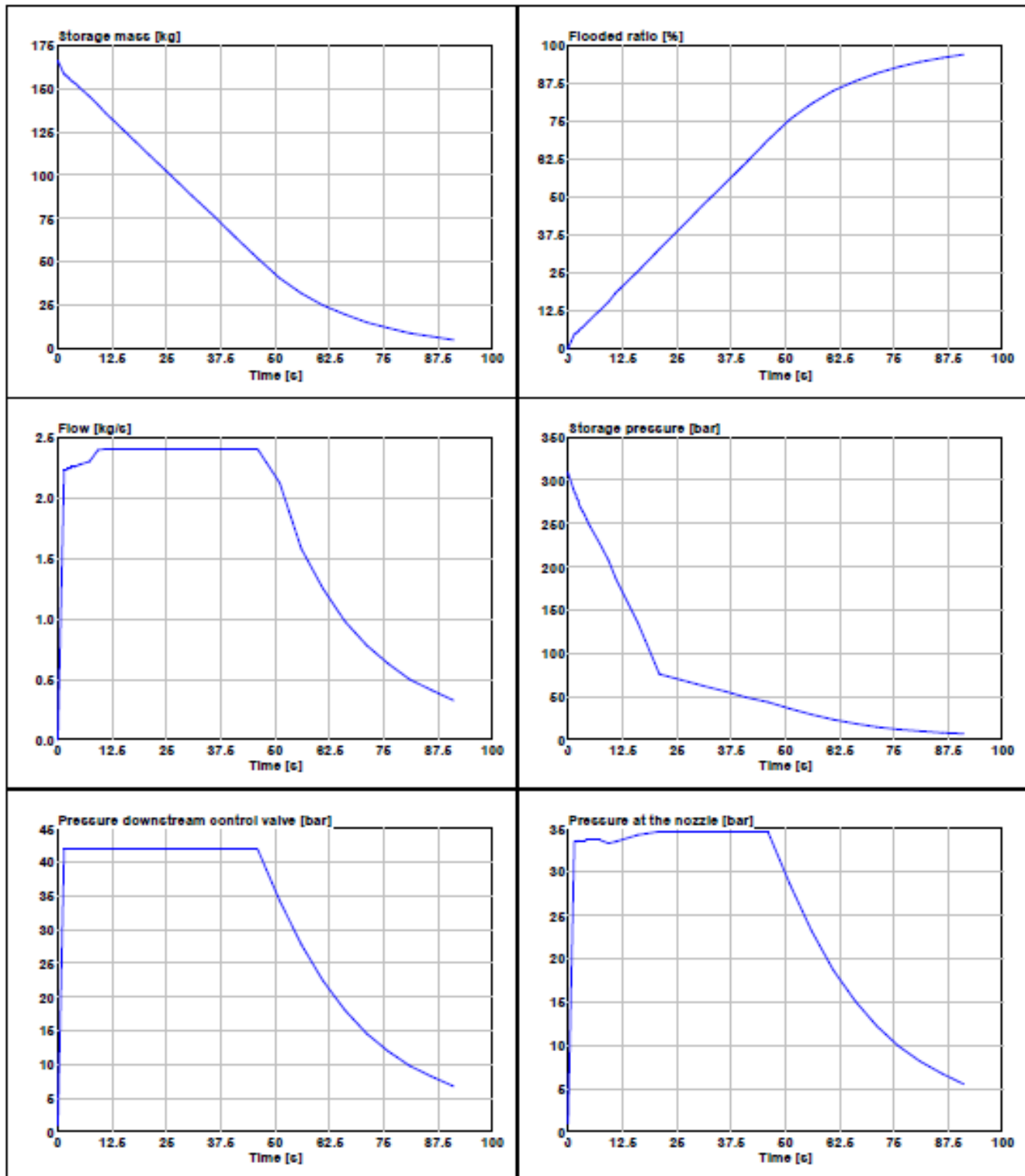
Number	Input	90-out	90-out	0-out
1	35.0	26.6	20.9	0.0
1	20.9	15.8	0.0	20.9
1	20.9	15.8	15.8	0.0

Dynamic flooding results

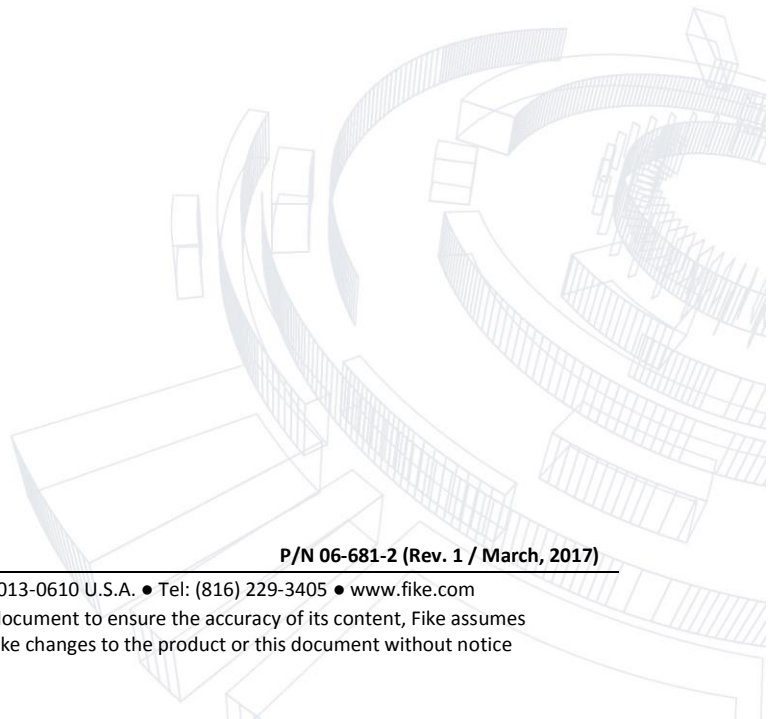
The calculation bases on a mean nozzle pressure!

Flooding time [s]	Storage mass [kg]	Flooded ratio [%]	Flow [kg/s]	Storage pressure [bar]	Pressure downstream control valve [bar]	Pressure at nozzle [bar]
0.0	186.2	0.0	0.00	308.9	1.0	1.0
1.5	158.4	4.7	2.23	286.6	42.0	33.5
1.8	157.9	5.0	2.23	283.2	42.0	33.5
2.0	157.3	5.3	2.23	279.8	42.0	33.5
2.3	156.8	5.7	2.24	276.4	42.0	33.6
2.5	156.2	6.0	2.24	272.9	42.0	33.6
2.8	155.6	6.4	2.24	269.4	42.0	33.6
3.3	154.5	7.0	2.25	264.9	42.0	33.6
3.8	153.4	7.7	2.25	259.9	42.0	33.6
4.3	152.3	8.4	2.26	254.6	42.0	33.7
4.8	151.1	9.1	2.27	249.0	42.0	33.7
7.3	145.4	12.5	2.30	226.9	42.0	33.7
9.3	140.6	15.4	2.39	207.5	42.0	33.3
11.0	135.9	18.3	2.40	186.5	42.0	33.5
16.0	123.9	25.5	2.40	135.0	42.0	34.3
21.0	111.9	32.7	2.40	76.1	42.0	34.7
26.0	99.9	39.9	2.40	69.6	42.0	34.7
31.0	87.9	47.1	2.40	63.1	42.0	34.7
36.0	75.9	54.3	2.40	56.2	42.0	34.7
41.0	64.0	61.5	2.40	48.9	42.0	34.7
46.0	52.0	68.7	2.40	44.1	42.0	34.7
51.0	40.5	75.6	2.12	36.0	34.3	28.5
56.0	31.8	80.8	1.58	29.2	27.8	23.2
61.0	24.9	85.0	1.25	23.6	22.4	18.7
66.0	19.5	88.2	0.98	18.9	18.0	15.1
71.0	15.2	90.8	0.78	15.3	14.6	12.2
76.0	11.8	92.9	0.63	12.6	12.0	9.9
81.0	9.0	94.6	0.50	10.3	9.8	8.1
86.0	6.8	95.9	0.41	8.6	8.2	6.7
91.0	5.0	97.0	0.33	7.1	6.7	5.5

Discharge meantime at nozzle: 56.3 s



FIKE PROINERT® SYSTEM
200 & 300 BAR CYLINDERS
LPCB APPROVED COMPONENTS



REVISION HISTORY

ORIGINAL RELEASE DATE:..... May, 2013

<u>REVISION / DESCRIPTION OF CHANGE</u>	<u>REVISION DATE</u>
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Revision 1.....	March, 2017
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- 1) Removed “Important Note” under Nitrogen Actuator Cylinder section on page 5.
- 2) Revised service / maintenance information under Nitrogen Actuator Cylinder to include period inspection and testing on page 5.

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The following information details the steps necessary to perform system checkout and periodic maintenance on a Fike Inert Agent Fire Suppression System within the limitations established by Fike's listing, approval and in compliance with NFPA 2001, ISO 14520 and/or EN 15004.

The checkout procedures outlined are intended to represent the minimum requirement for the extinguishing portion of the system. Additional procedures may be required by the Authority having Jurisdiction (AHJ)

IMPORTANT NOTE: This information **does not** cover service and maintenance procedures for the electrical and control portions of the system. The control portion of the system should be thoroughly checked out according to the manufacturer's recommendations and the requirements of the AHJ.

SYSTEM CHECKOUT

The checkout procedures outlined in this section are intended to represent the minimum requirements for the Fike ProInert system. These procedures do not preclude those required by ISO 14520 or EN 15004 and/or the authority having jurisdiction.

The detection & control portion of the system should be thoroughly checked out according to the manufacturer's recommendations and the authority having jurisdiction (AHJ).

HAZARD AREA CHECK

A good review of the hazard area is just as important as the proper operation of system components. Certain aspects about the hazard may have changed or been overlooked; this could affect overall system performance. The following points should be thoroughly checked.

AREA CONFIGURATION

The area dimensions should be checked against those shown on the system plan(s). If the area volume has changed, the required agent weight should be recalculated and compared with the agent weight supplied.

The area should also be checked for walls or movable partitions that have been added or changed. If walls or partitions have been added, check to see that all areas within the hazard still receive adequate nozzle coverage and agent distribution.

AREA LEAKAGE

The hazard area should be checked for openings which could allow agent leakage after system discharge. Openings such as cable and duct penetrations into the area should be permanently sealed.

Other sources of leakage should be checked for and sealed, especially in subfloor areas, where potential leak points are easily overlooked. Door(s) entering the hazard area(s) should be checked for tightness.

Door seals and door sweeps should be installed to minimize leakage. Joints where walls contact floors, or other walls, should be sealed as these are potential leak points most often overlooked. Wall switch and receptacle boxes should be sealed. Sub-floor drains must have "P"- traps and be sealed with a non-evaporating liquid, such as anti-freeze or mineral oil. All penetrations between floors must be sealed.

ENCLOSURE INTEGRITY – DOOR FAN TESTING

Door fan testing provides a method to evaluate room enclosure leakage and determine the system's ability to establish and maintain the design concentration after discharge. The calculation method provided makes it possible to predict the time it will take for a descending interface to fall to a given height or, for the continually mixed cases, the time for the concentration to fall to a given percentage concentration.

Enclosure integrity testing is not intended to verify other aspects of Clean Agent system reliability; e.g., hardware operability, agent mixing, hydraulic calculations, and piping integrity.

This procedure is limited to door fan technology. Discharge testing is generally not recommended; but may be required by the authority having jurisdiction.

The door fan testing procedure should not be considered to be an exact model of a discharge test. The complexity of this procedure should not obscure the fact that most failures to hold concentration are due to the leaks in the lower surfaces of the enclosure, but the door fan does not differentiate between upper and lower leaks. The door fan provides a worst-case

leakage estimate that is very useful for enclosures with complex hidden leaks, but will generally require more sealing than is necessary to pass a discharge test. (Refer to NFPA 2001, Appendix C; or Annex E of ISO 14520-1 or EN 15004-1)

CYLINDERS

Check to make sure all cylinders and brackets are securely fastened. Check all cylinder pressure gauges. They should be read 200 bar or 300 bar (as applicable) at 15°C. For temperatures other than 15°C consult the temperature vs. pressure chart on the pressure gauge and switch component sheet for the agent being used.

DISCHARGE PIPING

The discharge piping shall be inspected to verify that it is in compliance with ISO 14520 or EN 15004, or the appropriate authority having jurisdiction for the project. Nozzle placement and orientation, pipe size, and tee orientation shall conform to the design requirements outlined in this manual, and in accordance with the design and installation documents for the project. All piping joints, discharge nozzles, and piping supports shall be securely fastened to prevent vertical or lateral movement during discharge.

A dirt trap consisting of a tee with a capped nipple, at least 50mm long, shall be installed at the end of each pipe run. Drain traps protected against interference by unauthorized personnel should be fitted at the lowest points in the pipe work system if there is any possibility of a buildup of water.

The following pressure tests are required for systems that have more than one change in direction fitting between the storage cylinder and the discharge nozzle.

- All open-ended piping shall be pneumatically tested in a closed circuit for a period of ten minutes at 3 bar. At the end of the ten minute period, the maximum pressure drop cannot exceed 20% of the test pressure [0.6bar].
- All closed-section piping shall be hydrostatically tested to a minimum of 1½ times the maximum working pressure for two minutes; no leakage is acceptable. Remove all moisture from the pipework upon completion of the test.

WARNING: Pneumatic pressure testing creates a potential risk of injury to personnel in the area. The protected area shall be evacuated prior to conducting the test and appropriate safeguards shall be provided for the personnel conducting the test.

A flow test using nitrogen [or a suitable alternative] shall be performed on the piping network to verify that flow through the piping is continuous and unobstructed. Flow must be apparent through all discharge nozzles.

NOZZLES

Check to see that all nozzles are installed in the proper locations, according to system plans. Refer to Equipment Section for nozzle identification. Make sure all nozzle discharge orifices are properly oriented.

Check all nozzle orifices for obstructions and make sure large objects have not been placed in front of the nozzles that would block the discharge. Ensure that nozzles with an orifice diameter of less than 3mm are fitted with the filter provided.

If the piping system has changed from the original system plans, verify that the nozzles provided were calculated using the "as installed" piping configuration.

DISCHARGE PRESSURE SWITCH

The following test should be performed to ensure that the switch and all auxiliary functions are working properly.

Disconnect the pressure connection and attach a small CO₂ or Nitrogen cylinder as a pressure source. Open the valve on the test cylinder. The pressure switch should operate and the internal contacts should transfer as required. Reset the pressure switch after testing.

AUXILIARY FUNCTIONS

Operation of auxiliary functions such as door closures, damper closures, air handling shutdown, etc. should be verified when the control system is activated, both manually and automatically.

WARNING: **Normally the air handling units will be shut down prior to discharge.** If the air handling system is **NOT** to be shut down during system discharge, it must be of the recirculating type without make up air and enough agent added to compensate for the duct and plenum volumes.

After all checkout functions have been performed, and the control system checked out according to the manufacturer's recommendations, proceed with the solenoid actuator installation, as outlined in the Equipment Section.

PROINERT ACTUATION SYSTEM

The following procedure outlines the steps to test and arm the ProInert Actuation System.

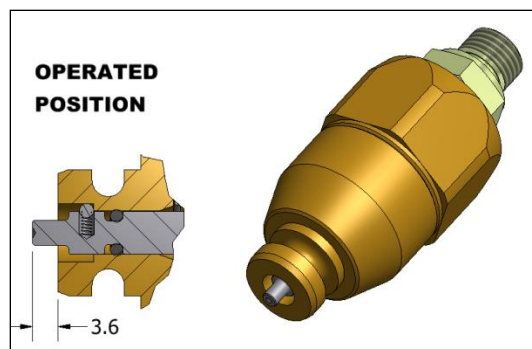
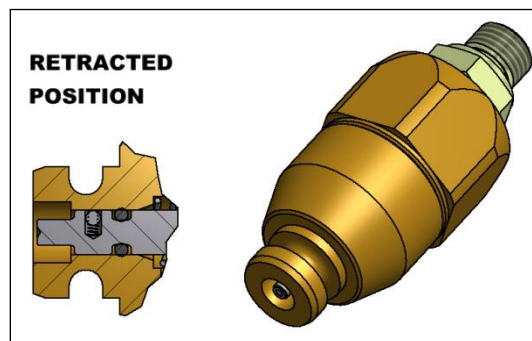
PNEUMATIC ACTUATOR TEST

The following test procedure should be performed prior to connection of the Universal Valve Operator (UVO) to the actuation system.

- Ensure that all the pneumatic actuators are not connected to the cylinder discharge valves.
- Before connecting the pneumatic actuators, connect all of the discharge tubing and hoses.
- Disconnect the flexible hose from the UVO and pressurize the hose to 10 bar.
- Check all the pneumatic actuators and hoses for leaks.
- Check that all of the pneumatic actuator pins have protruded as shown.
- Release the pressure.
- Reset pneumatic actuator

NOTE: The pneumatic actuators are self-latching and need to be reset with the aid of the reset tool (P/N IG71-0166), this will retract the actuation piston.

- Check each valve to ensure that the seal is present in the actuator port. The loss of the seal will cause the valve to malfunction.
- Connect the actuators to the valves. Any difficulty inserting the actuator is an indication that the pin is latched in the operated position.
- If the discharge pressure switch is connected to the actuator, ensure that the switch has been reset after the actuator test.



UNIVERSAL VALVE OPERATOR (UVO) TEST

Electrical Actuation Test

The following test procedure should be performed prior to connection of the Universal Valve Operator (UVO) to the ProInert cylinder valve.

- Ensure that the UVO is not connected to the cylinder discharge valve.
- Check that the firing pin is in the retracted position.
- Apply a 24 VDC electrical signal to the UVO and check that the firing pin is extended out of the UVO upon application of the electrical signal.
- Reset the UVO (refer to the UVO component sheet for reset instructions).

Manual Actuation Test

The following test procedure should be performed prior to connection of the Universal Valve Operator (UVO) to the ProInert cylinder valve.

- Ensure that the UVO is not connected to the cylinder discharge valve.
- Check that the firing pin is in the retracted position.
- Break the safety tie and pull out the safety pin.
- Manually operate the UVO by striking the red knob and check that the firing pin is extended out of the UVO upon manual actuation.
- Reset the UVO (refer to the UVO component sheet for reset instructions).

ARM THE UNIVERSAL VALVE OPERATOR (UVO)

1. Connect the actuator hose to the outlet of the UVO if required (refer to the UVO component sheet for installation instructions).
2. Make the electrical connection from the control panel to the solenoid actuator.

THE SYSTEM IS NOW ARMED!

SYSTEM MAINTENANCE

The following maintenance procedures and the intervals indicated are meant to represent the minimum requirements for Fike ProInert systems. These procedures do not preclude those required by ISO 14520 or EN 15004 and/or the authority having jurisdiction. More frequent service intervals may be necessary if systems are installed in more severe service applications. This section does not cover maintenance and service procedures for the electrical detection and control portions of the system. Consult the appropriate product manuals for those procedures.

WARNING: The control panel and Solenoid Actuator must be disabled and the pneumatic actuators removed – before removing any work is carried out on the system. Ensure that the discharge outlet re-coil cap and the valve protection cap are fitted to the valve and cylinder immediately after the cylinder is disconnected from the discharge hose.

DISCHARGE PIPING

Every six months:

Check the system discharge piping for corrosion and damage. Check all piping supports to make sure they are tight and the pipe is securely supported. Replace or pressure test and repair as necessary all pipework showing corrosion or mechanical damage.

DISCHARGE NOZZLES

Every six months:

Check to see that nozzle orifices are clear and unobstructed and that orifices are not showing signs of corrosion. Repair and/or replace as necessary.

AGENT STORAGE CYLINDERS

Every three months:

Check the pressure gauge on each cylinder. The nominal pressure should be 200 bar or 300 bar (as applicable) at 15°C; however, **the pressure will vary with temperature**. If the pressure loss indicated exceeds ten percent of the nominal pressure, return the cylinder for recharge. Refer to the temperature vs. pressure chart on the pressure gauge and switch component sheet for the agent being used.

WARNING: If the indicator on the cylinder pressure gauge falls into the red sector contact Fike for further information prior to sending the cylinder for refill. The Prolnert Cylinder design is such that it opens at a cylinder pressure of 80 bar. Ensure that the discharge outlet re-coil cap and the valve protection cap are fitted to the valve and cylinder immediately after the cylinder is disconnected from the discharge hose.

After system discharge:

Ensure that all cylinders have discharged with the gauges reading 0 bar. Remove all empty cylinders and send to the factory or an authorized Fike distributor for cylinder recharge.

UNIVERSAL VALVE OPERATOR (UVO)

Every twelve months:

- Check the correct operation of the UVO for both electrical and manual function.
- Ensure that the UVO is removed from the Prolnert cylinder valve prior to conducting the function tests
- Reset the UVO and secure the Safety Pin on the UVO with a security tie prior to re-arming the system (refer to the UVO component sheet for instructions).

NITROGEN ACTUATOR CYLINDER

Every three months:

Check the pressure gauge on the valve. The nominal pressure should be 160 bar at 15°C; however, the pressure will vary with temperature. If the pressure loss indicated exceeds ten percent of the nominal pressure at 15°C, return the cylinder for recharge.

Service / Maintenance Information:

- If actuation package was filled before August 2012, replace actuator cylinder after 5 years from the fill date.
- If actuation package was filled after August 2012, inspect and re-test per EN 1803:2002 **OR** replace actuator cylinder every 10 years from the fill date.

PROTECTED ENCLOSURES

Every twelve months:

Determine whether boundary penetration or other changes to the protected enclosure have occurred that could affect leakage and extinguishing performance. If this cannot be visually determined, a test [e.g. a door fan test] shall be used to determine the enclosure integrity.

Where the room integrity [door fan] test reveals leakage that would result in an inability to retain the extinguishant for the required hold time, action must be taken to identify and reduce the leakage area.

Where it is established that changes to the volume of the enclosure or to the type of hazard within the enclosure have occurred, the system shall be redesigned to provide the appropriate degree of protection.

PROINERT SYSTEM RE-STATEMENT AFTER DISCHARGE

The only items required to put the ProInert system on-line after system operation is to recharge the ProInert cylinders and also to recharge the Nitrogen actuators if fitted for selector valve systems. The UVO, pneumatic actuators and discharge pressure switch must also be reset.

RECHARGING CYLINDERS

All Fike ProInert cylinders shall be filled by an authorized Fike distributor in accordance with Fike's Recharge Manual, P/N 06-312.

- After discharge the Fike valve will be fully open. An empty cylinder can be identified by the cap on the top of the valve protruding.
- Release pressure in the actuator hoses and reset all actuators.
- Remove the pneumatic actuator from each valve.
- The pressure switch cable must be removed from the junction box and the pressure gauge removed from the valve (and safely stored for reuse after the cylinders are recharged) and the plug fitted.
- Remove the discharge hose from the valve and fit the valve outlet cap.
- Fit the valve cap and remove the cylinders from the racking.

RECHARGING NITROGEN ACTUATOR CYLINDER

All Fike ProInert nitrogen actuator cylinders shall be filled by an authorized Fike distributor in accordance with Fike's Recharge Manual, P/N 06-321.

- Release any residual pressure in the actuator hoses and reset all actuators.
- Remove the pneumatic actuator from each valve.
- The pressure switch cable must be removed from the junction box.
- Remove the actuation hose from the valve.

CYLINDER TEST AND INSPECTION

Cylinders shall be subjected to periodical tests as required by EN 1968 or relevant national standard. This may or may not include hydrostatic pressure testing after a system discharge – or for systems that have been in continuous service for an extended period of time.

PROINERT VALVE INSPECTION AND SERVICE

The ProInert valve should be inspected after every operation before recharge. As per EU Regulations cylinders shall be pressure tested every 10 years. At this time Fike recommend that the valve be serviced.

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