High-Pressure Carbon Dioxide Fire Extinguishing System

Operation, Design, & Service Manual

FM APPROVED UL LISTED 3RE2 ULC LISTED

Issued March 17, 2010
DOC153 REV E
(Revised August 20, 2014)

JANUS FIRE SYSTEMS®

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Revision History

Revision	Description of Change	Date
---	Initial Printing	3/17/2010
A	Appendix A, B, C, and D added. Solenoid Support Bolt shown in Figure 3.1.2 changed to Solenoid Support Bolt Connection. Section 3.2.5 through 3.2.5.4 and associated tables and diagrams removed and replaced with Section 3.2.5 through 3.2.5.6 and associated tables and diagrams. Figure 3.2 labels adjusted to reflect changes to Sections 3.2.5 through 3.2.5.4. Section 3.5 through 3.5.4 and all associated tables and diagrams added in place of Section 3.6 - Discharge Nozzles. All sections following Section 3.5.4 renumbered accordingly. Section 3.11.1 through 3.11.9 and associated diagrams added. Paragraph reading "Special cylinders without dip tubes may be used for inerting applications. Contact Janus Fire Systems for ordering information." added to Section 3.1.3. Sentence beginning "Winterized cylinders are filled" and sentence beginning "For cylinders used in local application systems" added to Section 3.1.1. Winterized part numbers added to Table 3.1.1. Part Number added to Figure 3.1.2. Sentence "Refer to Janus Fire Systems® Datasheet DS1093 for part numbers and ordering information" in Section 3.12 changed to "Refer to Appendix A for part numbers and ordering information". Sentence "Refer to Janus Fire Systems® Datasheet DS1093 for part numbers and ordering information" in Section 3.13 changed to "Refer to Appendix B for part numbers and ordering information". Phrase "and less than 32°F (0°C) or higher than 120°F (49°C) for local application systems" added to sentence beginning "Do not install the cylinders where they will be subjected to" in Section 5.4.1. Sentence "For pipe sizes 1 in (25 mm) and above, Schedule 80 pipe shall be used" added to Section 3.14. Sentence beginning "Except where more than one tier of nozzles" in Section 5.5.1 changed to "Except where more than one tier of nozzles is used, or special application conditions apply, the nozzle shall not be mounted more than 25% of the total enclosure height from the top of the enclosure and no hazards shall be located above the highest nozzle". Dimension "W" added to Figure 4.1b and Table 4.1b. Dimensions "W" and "H2" added to Figure 4.1c and Table 4.1c. Sentence beginning "In wall-mount rack arrangements" in Section 4.2.1.2 changed to "In wall-mount rack arrangements, the brackets are mounted to the wall as heights as shown in Table 4.1c"	3/14/2011
B	Caution added to Section 3.2.5.1. Captions added to Figure 3.2.5.1.	4/5/2011
C	Valve width in Figure 3.12c corrected from '5.12" 130 mm' to '2.37" 60 mm'.	6/29/2011
D	Sentence "(Local application is not FM Approved.)" added to Section 1.1. Sentence "The J120-192 is not FM Approved." added to Section 3.7. FM Approval, UL Listed, and ULC Listed logos added to cover and page footers. Sentence "(Inerting applications are not UL Listed or FM Approved)." added to Section 3.1.3. Sentence "(Inerting applications are not UL Listed or FM Approved.)" added to Section 3.5.3. Figure 5.13 updated. Note "Winterized cylinders are not UL Listed or FM Approved." added to Table 3.1.1. Note reading 'Throughout this manual the terms "carbon dioxide" and "CO2" are used interchangeably' added to Section 1. Sentence reading "These system are custom designed for this specific application" removed from Section 1. Sentence in Section 1 beginning "A connected reserve bank of cylinders" replaced with sentence beginning "A secondary connected bank of reserve cylinders". Phrase "Automatic systems incorporate detection" in Section 1 changed to "Automatic systems incorporate fire detection". Phrase "Enclosures with openings that cannot be closed can be protected" in Section 1.1 changed to "Enclosures with openings that cannot be closed can be compensated for by additional carbon dioxide".	8/4/2011

D (CONTINUED FROM PREVIOUS PAGE) 8/4/2011

Sentence beginning "Carbon dioxide then penetrates" removed from fourth paragraph of Section 1.2. Sentence beginning "For local application systems with attendant high velocity" in Section 1.5 removed. Section 1.6 removed and Section 1.7 renumbered accordingly. Phrase "850 psi" in first paragraph of Section 1.7 (renumbered to 1.6) changed to "approximately 850 psi". Phrase "300 psi" in second paragraph of Section 1.7 (renumbered to 1.6) changed to "approximately 300 psi". Word "Advantages" in third paragraph of Section 1.7 (renumbered to 1.6) changed to "Characteristics". Sentences beginning "Low-pressure containers are typically" and "This greater flexibility" removed from Section 1.7 (renumbered to 1.6). Sentence beginning "Refrigeration of carbon" removed from Section 1.7 (renumbered to 1.6). Sentence beginning "Electric power is not required" removed from Section 1.7 (renumbered to 1.6). Points a, b, and c in Section 2 made into Warning and phrase "concentrations" changed to "CO_2 concentrations". Sentences in Section 2 beginning with "Do not use carbon dioxide" and ending with "promptly removed from such atmospheres" replaced with sentence "Seek medical attention immediately." Sentence in Section 2.1 beginning "The following list" replaced with the sentence beginning "At a minimum the following precaution". Phrase "Section 4.3.2.4" in Section 2.1 point f removed. Phrase "Provide for the prompt discovery" in Section 2.1 point g changed to "Provide the means for prompt discovery". Phrase "and/or exhaust hazardous atmospheres to a safe location (e.g. outdoors)" added to Section 2.1 point i. Phrase "really dissipate" changed to "completely dissipate" and phrase "another location" changed to "another area" in Section 2.1 point i. Phrase "can collect in pits" in Section 2.1 point j changed to "can migrate to and collect in pits". Phrase "inside the hazard area(s), in adjacent areas, and in areas above and below the hazard(s)" added to Section 2.1 point j. Sentence "All cylinders are seamless" in Section 3.1.1 changed to "All cylinders are seamless spun steel". Phrase "Large cylinders" changed to "Cylinders" in Section 3.1.1. Phrase "and are made of steel" and sentence "Cylinders are not partially filled" removed from Section 3.1.1. Phrase "manufactured of brass" in Section 3.1.2 changed to "brass". Phrase "It is of force differential type" in Section 3.1.2 changed to "It is a differential type valve". Phrase "cylinder pressure raises the piston" in Section 3.1.2 changed to "cylinder pressure below the piston forces the piston up". Sentence order of the Caution in Section 3.2.3 transposed. Section 3.2.4 retitled as "Manual Actuator". Phrase "(unless the system design incorporates a mechanical time delay)" removed from Warning in Section 3.2.4. Warning beginning "Do not attach the manual actuator" added to Section 3.2.4. Phrase "to operate the manual actuator" in second paragraph of Section 3.2.5 replaced with phrase "to vent". Warning beginning "Do not attach the solenoid valve" added to Section 3.2.5. All occurrences of the phrase "manual valve actuator" replaced with the phrase "manual actuator". Phrase "without freezing" removed from Section 3.5.1. Blank pages 33 and 34 removed and all page number adjusted accordingly. Phrase "no special tools" in Section 5 changed to "standard tools". Warnings beginning "Do not attach the manual actuator" and "Do not attach the solenoid valve" added to Section 5.4. Phrase "at the hazard" removed from Section 5.5.1 point 6. Caution beginning "The manual actuator should not be installed" in Section 5.6 replaced with Warning beginning "Do not attach the manual actuator". Caution beginning "The solenoid valve should not be connected" in Section 5.7 replaced with Warning beginning "Do not attach the solenoid valve". Paragraph beginning "Ensure that the initiating devices" removed from Section 5.8.

D	(CONTINUED FROM PREVIOUS PAGE)	8/4/2011
	Phrase 'An "as built" instruction and maintenance manual' in Section 5.12 changed to 'An instruction and maintenance manual'. Phrase "that includes a full sequence of operations" removed from Section 5.12. Phrase 'a full set of drawings' in Section 5.12 changed to 'a full set of "as-built" drawings'. Phrase "or local application systems where the discharge exposes personnel to concentrations greater than 7.5% by volume for more than 5 minutes" added to Section 3.11. Section 3.11.1 added and all following section renumbered accordingly. Diagrams 3.11b through 3.11i renumbered as 3.11.1a through 3.11.1i. Diagram 3.11.1b added. Paragraphs beginning "If there is any doubt of the ability of the system to operate" and "If a full discharge test is not performed" in Section 6 replaced with paragraph beginning "NFPA 12 requires a full discharge test". Paragraph beginning "After the installation of the system piping" and following Caution statement removed from Section 6.2. Caution beginning "Manual controls should" removed from Section 6.5. Points 1 through 6 removed from Section 6.6. Points 1, 2, and 3 in Section 6.7 replaced with Section 6.7.1, Section 6.7.2, and Section 6.7.3 respectively. Section 6.8 removed and all following sections renumbered accordingly. Point 1 in Section 6.9 (renumbered Section 6.8) removed and all following points renumbered accordingly. Section 7 renamed "Following System Discharge (Fire Event)". Point 1 removed from Section 7. Phrase "or an approved liquid level gauge" removed from Point 3 of Section 8. Paragraph beginning "Alternatively, unplug the cable connectors" in Point 10 Subpoint a of Section 8.2 replaced with Warnings beginning "Do not attach the manual actuator" and "Do not attach the solenoid valve". Document number and revision added to cover. Entire point 2 in Section 5.7 deleted and replaced with new point 2 beginning with phrase "On completion of all testing, follow the steps outlined below". Phrase "hazardous (explosion-proof) area" in Section 5.4.1 replaced with phrase "hazardous area (explosive atmosphere)".	
E	Part number in Section 3.11.6 changed to "99109" and phrase "40 micron" changed to "20 micron". Figure 3.11.1a revised. Table 3.12 revised. Figure 3.12c revised. Dimensions in Table 3.13 adjusted. Phrase "2,600 to 3,000 psi" in Section 3.1.2 corrected to "2,650 to 3,000 psi". Sentence "The minimum manifold pressure for slave actuation is 500 psi (34.5 bar)" removed from Section 3.14. Paragraphs beginning "To open (or discharge) the valve" and ending "cylinder is completely discharged" added to Section 3.1.2. Note added to Section 6.8. Note added to Section 7.1.	8/20/2014

Preface

This manual is intended for use with the Janus Fire Systems® High-Pressure Carbon Dioxide Fire Extinguishing System. Those who install, operate, or service this panel should read this entire manual.

All design, implementation, and maintenance of the Janus Fire Systems® High-Pressure Carbon Dioxide Fire Extinguishing System must be performed in compliance with the National Fire Protection Association (NFPA) 12 - Standard on Carbon Dioxide Extinguishing Systems, NFPA 70 - The National Electrical Code, NFPA 72 - The National Fire Alarm Code, and the guidelines outlined in this manual.

All system designs are preformed in conjunction with the Janus Design Suite® hydraulic flow calculation software and in compliance with the Janus Design Suite® $HPCO_2$ Flow Calculation Software Manual, DOC170.

Janus Fire Systems® reserves the right to revise and improve its products as it deems necessary without prior notification. This manual describes the state of Janus Fire Systems® products at the time of its publication and may not reflect those products at all times in the future.

All references to Codes or Standards in this manual refer to the latest edition of that Code or Standard unless otherwise indicated.

Compressed gases shall be handled and used only by persons properly trained in accordance with Compressed Gas Association, Inc. (CGA) pamphlets C-1, C-6, G-6, and P-1.

CGA pamphlets are published by the Compressed Gas Association Inc. (www.cganet.com).

Refer to www.janusfiresystems.com for Carbon Dioxide Material Safety Data Sheet.

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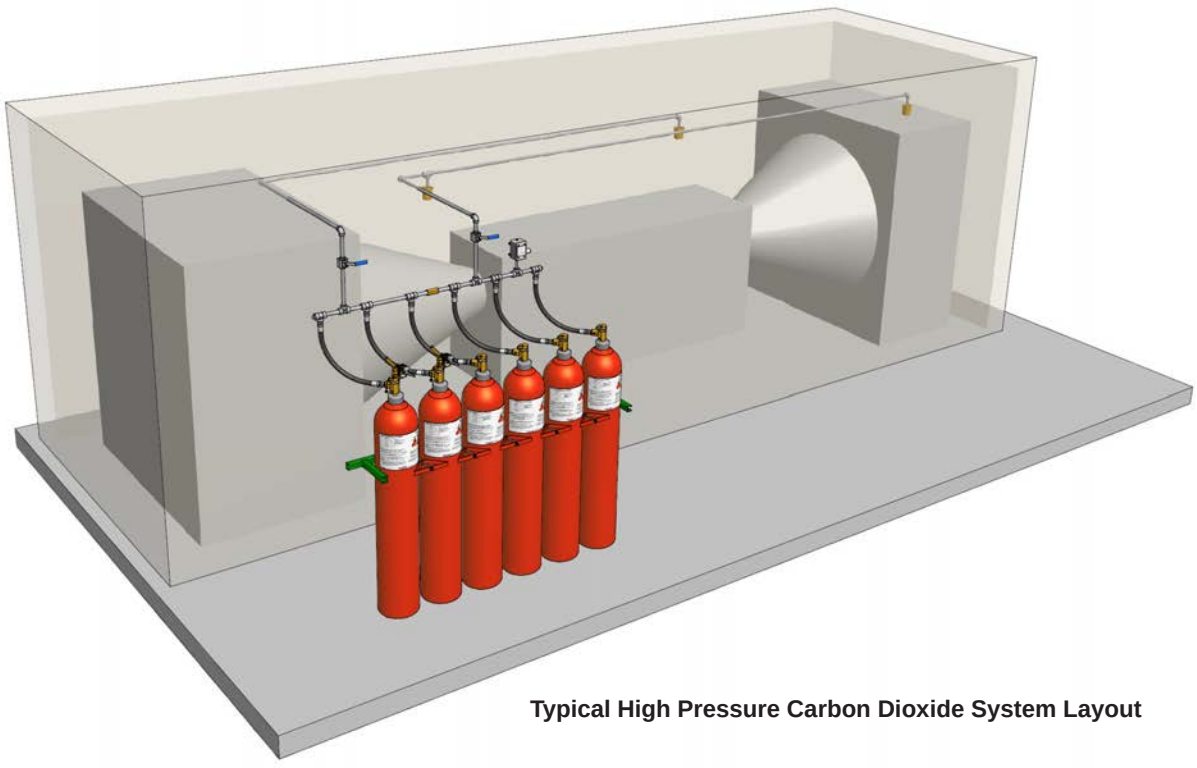
Section 1 General Information

1 GENERAL INFORMATION

The Janus Fire Systems® High-Pressure Carbon Dioxide Fire Extinguishing System[1] consists of a battery of one or more cylinders manifolded together and connected to a system of distribution pipework terminating with special carbon dioxide discharge nozzles. The quantity of carbon dioxide required for the protection of any particular hazard is dependent on the nature and type of the hazard, the type of flammable material involved, and the temperature of the hazard with allowance for special conditions.

More than one hazard can be protected by the same bank of cylinders. These systems are referred to as selector valve systems. Selector or directional valves are utilized to direct the carbon dioxide to the fire area. A secondary connected bank of reserve cylinders should be considered to maintain facility operation in the event of a system discharge.

Janus Fire Systems® High-Pressure Carbon Dioxide Fire Extinguishing Systems may be actuated manually or automatically. Automatic systems incorporate fire detection and controls. Detection is placed in the hazard area, and when a fire occurs, detectors send a signal to the control panel which releases the carbon dioxide. Automatic systems are electrically operated and always incorporate a manual override feature.



Typical High Pressure Carbon Dioxide System Layout

1 Throughout this manual the terms "carbon dioxide" and "CO_2" are used interchangeably.

Section 1 General Information

1.1 Principles of Operation

There are two methods of applying carbon dioxide to hazards:

- **Total flooding** injects a sufficient volume of carbon dioxide into an enclosure so that an inert atmosphere is created. The enclosure should be reasonably well sealed and doors, vents and other openings should be arranged to close on the discharge of the system. Enclosures with openings that cannot be closed can be compensated for by additional carbon dioxide if known at the design stage. For deep-seated type hazards (insulation, exhaust ducts, storage vaults, etc.) the enclosure must be well sealed to retain the carbon dioxide for a long period of time (approximately 20 minutes per NFPA 12). The location and orientation of discharge nozzles for these applications is not of major concern, minor deviations to project design can generally be accommodated.

- **Local application** is the method used to protect a specific hazard (engine, dip tank, etc.) within an enclosure — *without flooding the entire enclosure*. Nozzles are arranged to discharge carbon dioxide directly onto the hazard, to build up an inert atmosphere immediately surrounding the hazard. For this application, the layout of piping and nozzles is critical, and deviations to project design must not be made unless approved by the designer. (Local application is not FM Approved.)

1.2 Properties of CO_2 as a Fire Extinguishing Agent

Carbon dioxide (CO_2) is a colorless, odorless, clean, dry, electrically non-conductive, non-corrosive, non-damaging and non-deteriorating inert gas that is approximately 50 percent heavier than air.

Carbon dioxide is a standard commercial product. It is commonly used for carbonating beverages, for fast freezing food, for medical purposes, and for purging pipes and tanks in addition to its use as a fire extinguishing agent. Carbon dioxide is available in most cities and seaports throughout the world.

When inhaled, CO_2 produces a tingle in the nostrils, the same as is experienced when drinking carbonated beverages. Carbon dioxide stimulates breathing (increases the rate of breathing) and is useful in small controlled doses in the resuscitation of drowning and electric shock victims.

Carbon dioxide is stored in liquid form in high pressure steel containers at 850 psig (58.6 bar) at 70°F (21°C). One of carbon dioxide's most valuable properties for use as a fire extinguishing agent is its high ratio of expansion, approximately 450 to 1. Carbon dioxide is discharged from the cylinder by the force of its own expansion without the need for pumps or other pressurizing mechanisms.

On discharge, carbon dioxide creates a cold fog. The temperature of carbon dioxide discharging from a nozzle is approximately 110°F below zero. This cloud effect, or fogging, is due to the moisture in the air being frozen by the extremely low temperature of the carbon dioxide. The fogging will generally dissipate after a few minutes. Carbon dioxide has a low heat absorption potential and so this cold discharge generally has no adverse effect on equipment being protected.

1.3 How Carbon Dioxide Extinguishes Fire

Carbon dioxide extinguishes fire by diluting oxygen content to a point where it will not support combustion. Reducing the oxygen content from the normal 21 percent in air to 15 percent will extinguish most fires. For some materials, the oxygen content must be reduced below 15 percent. In some cases its concentration must be lowered to six percent of the volume. Surface and flash type fire (oils, paints, etc.) are quickly extinguished, while smouldering or deep-seated fires (baled cotton, clothing, etc.) are extinguished by the prolonged action of a high carbon dioxide concentration.

In addition to its smothering action, the reduction in temperature due to its rapid expansion will provide some suppression caused by the cooling effect.

1.4 Cleanup Following a CO_2 Discharge

Carbon dioxide vaporizes completely on discharge. Whereas the cost of clean-up and peripheral damage associated with water, foam, and dry chemical agents can exceed the cost of the fire damage itself, cleanup costs associated with carbon dioxide are negligible.

Carbon dioxide is inert and most materials and equipment are totally unaffected by exposure to it. Carbon dioxide is stable, even at high temperatures, and does not decompose when subjected to fire, therefore it does not cause metals to corrode.

⚠ WARNING

Following discharge, all carbon dioxide must be ventilated from a hazard area and the oxygen content checked to ensure it is within OSHA guidelines before allowing entrance by personnel.

1.5 Use and Limitations

Carbon dioxide fire extinguishing systems may be utilized for Class A, B, and C fires (North American definition). They are particularly useful for extinguishing fires in specific hazard areas or equipment:

a) where an inert, electrically non-conductive medium is desirable

b) in high value occupancies particularly susceptible to fire, smoke, and water damage

c) where clean up another medium would present a problem

Carbon dioxide will not extinguish fires involving the following materials:

a) chemical containing their own oxygen supply such as cellulose nitrate

b) reactive metals such as sodium, potassium, magnesium, titanium, zirconium, uranium, and plutonium

c) metal hydrides

While carbon dioxide will not extinguish these fires, it will not react dangerously with these materials or increase their burning rate. Carbon dioxide, if used in this type of situation in a total flooding system, will provide protection for adjacent combustibles or can be successfully used if the reactive metals or hydrides are first covered by another material. The following are examples of this latter condition:

a) sodium stored or used under kerosene

b) cellulose nitrate in solution of lacquer thinner

c) magnesium chips covered with heavy oil

Carbon dioxide fire-extinguishing systems protecting areas where explosive atmospheres could exist shall utilize metal nozzles and the entire system shall be grounded. In addition, objects exposed to discharge from carbon dioxide nozzles shall be grounded to dissipate possible electrostatic charge.

1.6 Typical High-Pressure CO_2 Cylinder Assembly and Equipment

High-pressure storage systems are comprised of CO_2 cylinders stored at ambient temperatures. At 70°F (21°C), the pressure in this type of storage container is approximately 850 psi (58.6 bar).

Low-pressure storage systems are comprised of CO_2 pressure vessels stored at a controlled low temperature of 0°F (-18°C). At this temperature the pressure in the storage unit is approximately 300 psi (20.7 bar).

Characteristics of high-pressure systems

- High-pressure cylinders are available in 50 lb (20 kg) and 100 lb (45 kg) capacities.
- Cylinders can be stored at temperatures between 0°F (-18°C) and 130°F (54°C) for total flooding systems and between 32°F (0°C) and 120°F (49°C) for local application.
- Cylinders can be easily adjusted for higher or lower temperatures by underfilling for higher temperatures or adding nitrogen for lower temperatures. Contact Janus Fire Systems for more information on these options.
- Flexible space requirements — if a single large space is not available, multiple cylinder banks can be divided and stored in a number of smaller locations.
- Flexible for weight requirements — if floor loading is a problem, multiple cylinder banks can be divided and stored in a number of locations to distribute the floor loading.

2 SAFETY CONSIDERATIONS

Carbon dioxide (not to be confused with carbon monoxide) is only mildly toxic. It does not carry oxygen in any form for sustaining human life, therefore the principle action of carbon dioxide is to cause suffocation. The following human reactions have been determined by test:

⚠ WARNING

a) At CO_2 concentrations of 3 to 4 percent by volume in air, the breathing rate increases and can cause headaches
b) At CO_2 concentrations of 9 percent by volume, personnel can lose consciousness within minutes, this being preceded by disorientation, visual disturbance, ringing in the ears, tremors, etc.
c) At CO_2 concentrations of about 20 percent by volume, death will follow in 20 to 30 minutes.

The above effects are important to note because inexperienced personnel may fail to think clearly and take proper action if suddenly exposed to relatively low concentrations of carbon dioxide.

Any person overcome by carbon dioxide should be moved immediately to a location where plenty of fresh air is available and artificial respiration should be applied. ***Seek medical attention immediately***.

Direct contact with carbon dioxide will cause frostbite burns to the skin. Carbon dioxide vaporizes rapidly, therefore this hazard is generally limited to the immediate vicinity of the discharge nozzle.

The discharge of carbon dioxide will create a fog and this may seriously interfere with visibility during and immediately after the discharge period. The fog effect could last for several minutes.

If it is necessary to enter a hazard space following a carbon dioxide discharge, a fresh air mask or other type of self-contained breathing apparatus should be worn. ***Do not use a filter type of mask or a canister gas mask.*** No one should enter such a space without another person as observer and standby outside the space. A lifeline is also strongly recommended.

When all traces of the fire have been extinguished and the possibility of re-ignition has been eliminated, thoroughly ventilate the space to make certain that only fresh air is present. Never test the atmosphere by inserting a naked flame as the possible presence of flammable vapors may result in an explosion.

In hazard areas where personnel could be present, suitable safeguards should be provided to ensure prompt evacuation and to prevent entry into such atmospheres. Such safety items as warning signs, discharge delay devices, and pre-discharge alarms should be provided with all automatic carbon dioxide systems as mandated by NFPA 12.

2.1 Safety Precautions

Safeguards must be taken to ensure the safety of personnel in areas where the atmosphere could be made hazardous by the discharge of carbon dioxide. At a minimum the following precautions should be taken:

a) Provide adequate aisle ways and routes of exit and keep them clear at all times

b) Provide emergency lighting and directional signs as necessary to ensure quick, safe evacuation.

c) Provide alarms within such areas that will operate immediately upon detection of the fire, with the discharge of the carbon dioxide and the activation of automatic door closures delayed for sufficient time to allow evacuation of the area before discharge begins.

d) Provide only outward swinging self-closing doors at exits from hazard areas and, where such door are latched, provide panic hardware.

e) Provide continuous alarms at entrances to such areas until the atmosphere has been restored to normal.

f) Provide warning and instruction signs at entrances to and inside such areas. These signs must inform persons in or entering the protected areas that a carbon dioxide system is installed and contain additional instructions pertinent to the conditions of the hazard in compliance with ANSI Z535. Existing signs that are a part of an established training and safety program may be implemented if in compliance with NFPA 12.

g) Provide the means for prompt discovery and rescue of persons rendered unconscious in such areas. This may be accomplished by having such areas searched immediately by trained persons equipped with proper breathing equipment. Self-contained breathing equipment (and personnel trained in its use and in rescue practices including artificial respiration), should be readily available.

h) Provide instruction and drills for all personnel within or in the vicinity of such areas (including maintenance or construction people who may be brought into the area), to ensure their correct action when carbon dioxide protective equipment operates.

i) Provide the means for prompt ventilation of such areas. Forced ventilation will often be necessary. Care should be taken to completely dissipate hazardous atmospheres and/or exhaust hazardous atmospheres to a safe location (i.e. outdoors) and not merely move them to another area.

j) Carbon dioxide is much heavier than air and can migrate to and collect in pits, cellars, and low-lying areas. Care should be taken when entering such areas after carbon dioxide has been discharged. Oxygen levels should be checked inside the hazard area(s), in adjacent areas, and in areas above and below the hazard(s) to ensure the oxygen content is within OSHA guidelines.

k) Provide means to mechanically lockout the system during periods of system inspection, maintenance, or modification.

l) Provide the fire alarm system with a disconnect switch to allow testing of the alarm system without actuating the fire suppression system. The disconnect shall be a physical switch and not be accomplished by using software.

m) Provide such other steps and safeguards that a careful study of each particular situation indicates are necessary to prevent injury or death.

3 SYSTEM COMPONENTS

3.1 Cylinder Assemblies

A basic cylinder assembly consists of a cylinder, a valve and dip tube assembly, and a charge of carbon dioxide.

3.1.1 Cylinder

A variety of cylinder sizes are available. They are all designed to hold pressurized carbon dioxide in liquid form at atmospheric temperatures, corresponding to a nominal pressure of 850 psi (58.6 bar) at 70˚F (21˚C).

All cylinders are seamless spun steel. They are manufactured and tested in accordance with the requirements of Transport Canada and/or Department of Transport (USA), Specification 3AA-1800 or higher. Cylinders have standard capacities of 50 lbs (22.7 kg), 75 lbs (34.0 kg), and 100 lbs (45.4 kg). Small cylinders, used for special applications, are available and may be made of aluminum or steel depending on availability.

Except for special temperature conditions, all cylinders are filled to their specified weight with liquid carbon dioxide. Winterized cylinders are filled to 90% of their capacity with carbon dioxide and superpressurized with nitrogen in order to prevent an excessive drop in cylinder pressure in extremely cold environments.

The pressure inside the cylinder will vary as the temperature changes. In general, the ambient storage temperature for standard cylinders used in total flooding application systems should be between 0˚F (-18˚C) and 130˚F (54˚C). For cylinders used in local application systems, the ambient temperature range is 32˚F to 120˚F (0˚C to 49˚C).

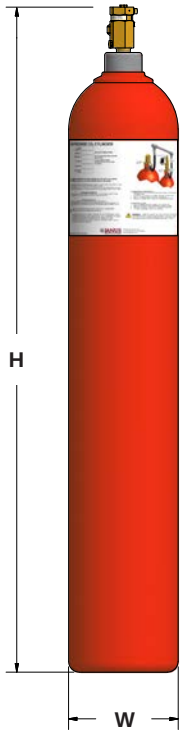


Figure 3.1.1 Cylinder Assembly

Table 3.1.1 Cylinder Sizes and Dimensions

Nominal Cylinder Size[1]		P/N		Empty Weight		Full Weight		Height (H)		Width (W)	
lb	kg	Standard	Winterized	lb	kg	lb	kg	in	mm	in	mm
50	22.7	19561	20470[2]	96	43.5	146	66.2	55.6	1412	8.5	216
75	34.0	19560	20471[2]	160	72.6	235	106.6	61.1	1552	9.2	234
100	45.4	19559	20472[2]	210	95.3	310	140.6	62.6	1590	10.4	264

1 Additional sizes available for special orders.
2 Winterized cylinders are not UL Listed or FM Approved.

Section 3 System Components

3.1.2 Cylinder Valve

The cylinder valve (SW50-M) is brass. It is a differential type valve using a piston seal. The pressure above the piston is maintained at cylinder pressure, but the area at the top of the piston is greater than the seal area. This results in a higher force above the piston, which acts to keep the valve closed.

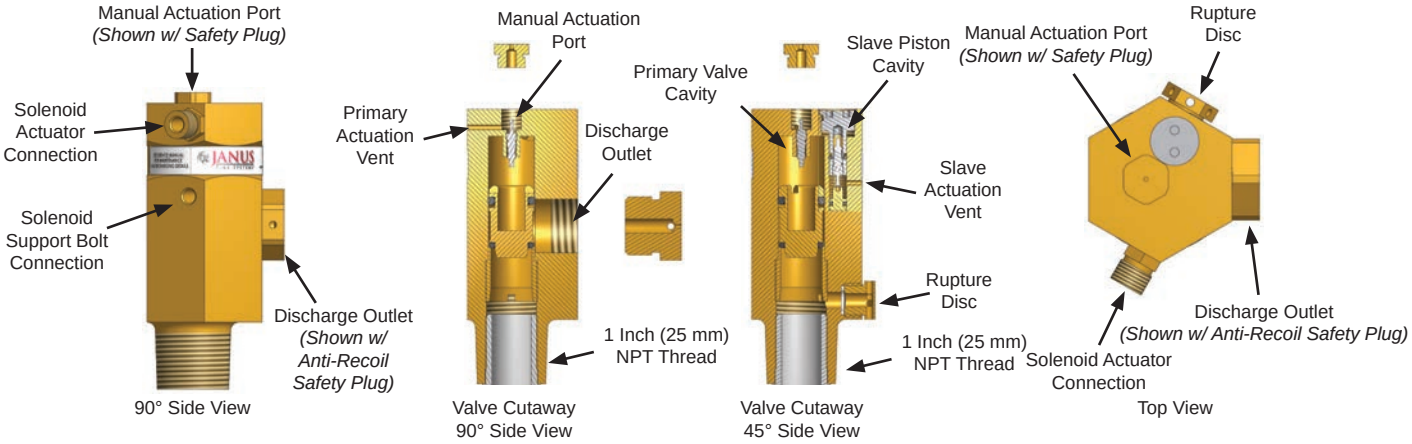


Figure 3.1.2 SW-50M Cylinder Valve (P/N 19428)

To open (or discharge) the valve, the pressure above the piston (the Primary Valve Cavity as indicated in Figure 3.1.2) is vented and the cylinder pressure below the piston forces the piston upward allowing carbon dioxide from the cylinder to flow through the valve and discharge through the valve outlet.

The pilot cylinder has two (2) external means to release the pressure above the piston, either electronically or mechanically.

1. Electronic Actuation - The cylinder is opened electrically by attaching the solenoid to the Solenoid Actuator Connection, (refer to Figure 3.1.2) and energizing the solenoid via the fire control panel.

2. Mechanical Actuation - The cylinder opened mechnically by attaching the Manual Valve Actuator (P/N 19589) to the Manual Actuation Port (refer to Figure 3.1.2) and then by operating the manual valve actuator.

The slave cylinders are operated pneumatically by creating back pressure in the discharge outlets of slave CO_2 valve assemblies connected to the cylinder manifold. The manifold pressure originates from the discharge of the pilot cylinder. The function of venting the pressure above the piston on slave cylinder assemblies (as noted above) is performed internally [as opposed to an external operation (i.e. solenoid or manual operation)] via the Slave Actuation Vent (refer to Figure 3.1.2).

The purpose of Slave Actuation Vent (refer to Figure 3.1.2) is two-fold. The first purpose is to automatically discharge all the slave cylinders connected to a common manifold as described above. The second purpose is to ensure that all operating CO_2 valves are maintained in the open (discharge) position by the continuous venting of the Primary Valve Cavity; the valve cannot be closed or reset as long as pressure is provided by discharging carbon dioxide at the discharge outlet of the valve. This continuous venting of the primary valve cavity of each cylinder assembly is through the Slave Actuation Vent, (refer to Figure 3.1.2) and is discharged to the atmosphere at an approximate rate of 0.3 lbs of CO_2 per minute (kg/min) and will continue until the CO_2 cylinder is completely discharged.

An anti-recoil safety plug is attached to the valve by a chain and must be attached to the discharge port when the cylinder is disconnected from the discharge piping.

A pressure relief rupture disc, incorporated into the cylinder valve, is designed to release pressure should the cylinder be subjected to exceptionally high temperatures or other abnormal conditions. The disc rupture point is in the range of 2,650 to 3,000 psi (182.7 to 206.8 bar). The rupture disc nut is of a type that will relieve pressure without cylinder recoil.

The SW-50M cylinder valve can be operated either manually utilizing the manual actuator, electrically utilizing the solenoid valve kit, or pneumatically through direct back pressure from the discharge manifold.

Single cylinder systems operate with a single cylinder assembly equipped with a manual actuator and/or a solenoid valve called the primary cylinder. For systems with two cylinders connected to a single manifold, one primary cylinder equipped with a manual actuator and/or solenoid valve is required. The other cylinder (called a slave cylinder) actuates from the back pressure produced in the discharge manifold when the primary cylinder is actuated. For systems with three or more cylinders connected to a single manifold, two cylinders must act as primary cylinders and have solenoid and/or manual actuators arranged for simultaneous operation. The rest are slave cylinders.

3.1.3 Dip Tube

A rigid dip tube is used in all cylinders to ensure liquid discharge. All cylinders must therefore be installed in the normal upright position.

Special cylinders without dip tubes may be used for inerting applications. Contact Janus Fire Systems for ordering information. (Inerting applications are not UL Listed or FM Approved).

Section 3 System Components

3.2 Trim Components

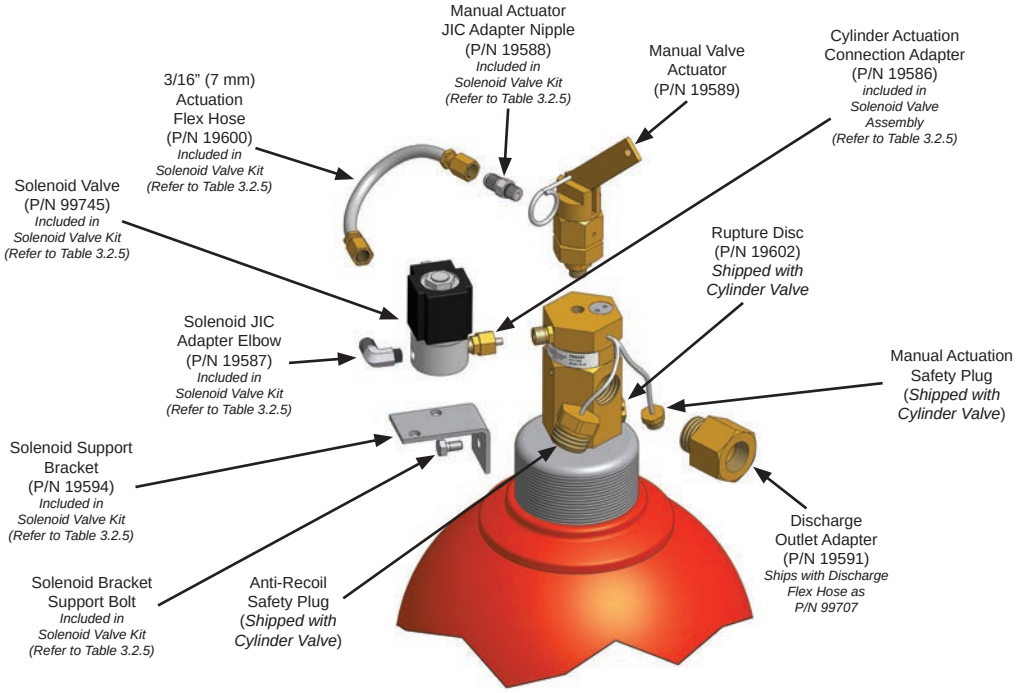


Figure 3.2 Trim Components

3.2.1 Discharge Flex Hose

A 22 in (559 mm) discharge flex hose is used to connect the cylinder valve outlet to the system manifold and discharge piping. This flexible hose allows for the temporary misalignment of the cylinders on installation and for ease of cylinder removal during maintenance. The 3/4 in (20 mm) MNPT cylinder end of the hose has a swivel connection for ease of installation. The flex hose has a minimum bend radius of 9.5 inches (241 mm).

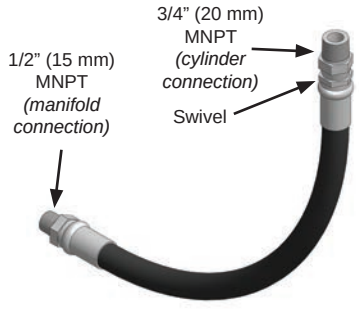


Figure 3.2.1 Discharge Flex Hose

3.2.2 Discharge Check Valve

Shipped with Flex Hose P/N 99706 (See Figure 3.2.2)

Discharge flex hose with a built-in discharge check valve must be used when cylinders are manifolded together. One end of the discharge check valve is locked onto the hose assembly and must not be separated from it. The other end threads into the cylinder valve outlet. When a cylinder assembly is disconnected from the manifold for maintenance, the discharge check valve and discharge flex hose remain attached to the manifold. Should the system actuate while the cylinder is disconnected, the check valve will ensure that an appreciable quantity of carbon dioxide does not discharge from the disconnected flex hose.

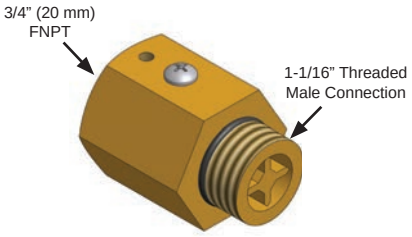


Figure 3.2.2 Discharge Check Valve

3.2.3 Discharge Outlet Adapters

Shipped with Flex Hose P/N 99707 (See Figure 3.2.3)

Discharge outlet adapters are used to facilitate the attachment of discharge flex hose in single cylinder systems where a check valve is not required. When the discharge adapter is used without the discharge flex hose, a union connection must be installed close to the cylinder for ease of installation and maintenance.

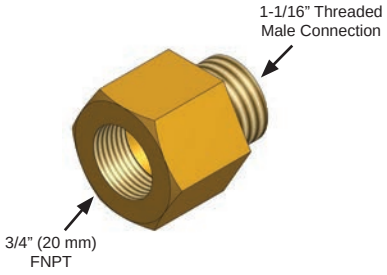


Figure 3.2.3 Discharge Outlet Adaptor

⚠ CAUTION

The anti-recoil safety plug must remain in place in the cylinder valve outlet at all times when the cylinder assembly is not secured in the cylinder bracket and connected to the discharge piping. Discharge flex hose, the discharge check valve, or the discharge outlet adapter should **NOT** be mounted onto the cylinder valve during transportation and storage.

3.2.4 Manual Actuator

P/N 19589 (See Figure 3.2.4)

A manual actuator is used to operate the carbon dioxide system manually and locally at the cylinders. The actuator is screwed into a port on the top of the SW-50M cylinder valve on each primary cylinder.

The actuator has a hole in the side of the main body fitted with a blank plug. This hole allows the actuator to be operated from an external pressure source. It is also used to connect to the outlet port of the solenoid valve. The blank plug is removed from the actuator only for these two purposes. Otherwise the plug must remain tightly connected at all times.

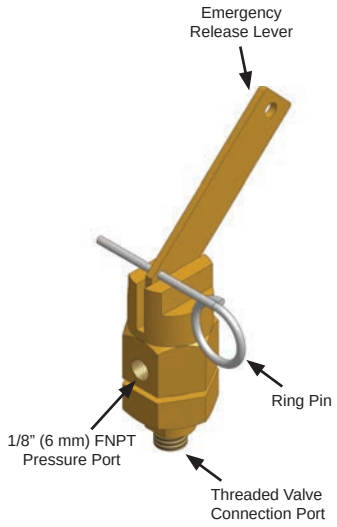


Figure 3.2.4 Manual Actuator

⚠ WARNING

Do not attach the manual actuator to the HPCO2 cylinder until it is verified that the cylinder is properly secured, that piping and nozzles are connected to the cylinder valve outlet, and that the protected hazard(s) is evacuated of all personnel in order to minimize the risk of potential injury or death caused by an accidental discharge.

⚠ WARNING

Operation of the manual actuator will immediately begin the discharge of carbon dioxide into the protected hazard. Make sure personnel have been evacuated from the hazard space prior to actuating the system.

Section 3 System Components

3.2.5 Solenoid Valve Kit

Refer to Table 3.2.5 for P/N

Electric actuation is achieved by using a standard solenoid valve kit or optional explosion-proof solenoid valve kit.

The standard or explosion-proof solenoid valve connects to the solenoid actuation port on the SW-50M cylinder valve via the supplied cylinder actuation connection adapter (P/N 19586). The discharge side of the solenoid valve is connected to the pressure port on the manual actuator with supplied 3/16 inch braided flex hose (P/N 19600). The supplied JIC adapter elbow (P/N 19587) and JIC adapter nipple (P/N 19588) are utilized to accommodate the attachment of the flex hose. When energized, the solenoid valve opens allowing pressure from above the main piston of the cylinder valve to vent and open the cylinder valve.

Table 3.2.5 - Solenoid Valve Kits

P/N		Voltage	Enclosure Rating
Solenoid Valve Kit[1]	Solenoid Valve		
19585	99745	24 VDC	NEMA 4x
99733	99744	24 VDC	NEMA 4x, 7, and 9
99594	99617	120 VAC	NEMA 4x
99593	99616	120 VAC	NEMA 4x, 7, and 9

[1] All Solenoid Valve Kits include Cylinder Actuation Connection Adapter (19586), JIC Adapter Elbow (19587), Flex Hose (19600), JIC Adapter NIpple (19588), Support Bracket (19594), Support Bolt (99750), 2x Screw (99751), and Lock Washer (99746)

⚠ WARNING

Do not attach the solenoid valve to the HPCO2 cylinder until it is verified that the cylinder is properly secured, that piping and nozzles are connected to the cylinder valve outlet, and that the protected hazard(s) is evacuated of all personnel in order to minimize the risk of potential injury or death caused by an accidental discharge.

The solenoid valve is mounted using two (2) supplied machine screws (P/N 99751) to the solenoid support bracket (P/N 19594), which is mounted to the cylinder valve using the solenoid support bolt (P/N 99750).

The solenoid should be connected to a control panel that is powered through a separately fused circuit and that also incorporates battery backup power.

3.2.5.1 Solenoid Valve

Refer to Table 3.2.5 for P/N (See Figure 3.2.5.1)

Four model solenoid valves are available. Each solenoid valve is a normally closed device, closed when de-energized and open when energized. Each solenoid has a 1/2 inch (15 mm) conduit connection with 18 inch (457 mm) leads. Orifice size for all four model solenoids is 1/32 inch (0.8 mm). The solenoids have a temperature range of -20˚F to 130˚ F (-29˚C to 54˚C).

The standard solenoid voltage is 24 VDC, 10 Watts, with an enclosure rating NEMA 4x. An optional 120 VAC model solenoid is also available with an enclosure rating NEMA 4x. Explosion-proof solenoids are available with enclosure ratings NEMA 4x, 7, and 9 in either a 24 VDC, 10 Watt model or 120 VAC model. Refer to Table 3.2.5 for Valve Kit and individual Solenoid part numbers.

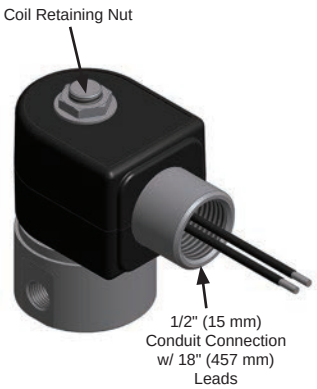


Figure 3.2.5.1 Solenoid Valve

⚠ CAUTION

Do not overtighten the coil retaining nut. Overtightening of the coil retaining nut may cause the coil inside the solenoid valve to crack. The coil retaining nut should be tightened hand-tight.

3.2.5.2 Actuation Flex Hose
P/N 19600 (See Figure 3.2.5.1)

A 3/16 in (7 mm) Teflon® lined stainless steel wire braided flex hose with 1/4 in (8 mm) 37˚ female JIC fittings is utilized to connect the solenoid valve outlet port to the pressure port of the manual actuator. One (1) length of actuation flex hose is shipped as part of each solenoid valve kit.

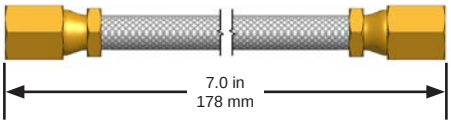


Figure 3.2.5.2 Actuation Flex Hose

3.2.5.3 JIC Adapter Elbow
P/N 19587 (See Figure 3.2.5.3)

A 1/8 in (6 mm) MNPT by 1/4 in (8 mm) 37˚ male JIC adapter elbow is threaded into the discharge port of the solenoid valve to facilitate the connection of actuation flex hose. One (1) JIC adapter elbow is shipped as part of each solenoid valve kit.

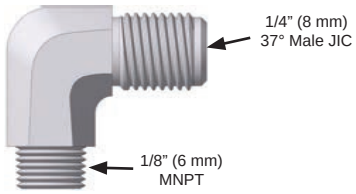


Figure 3.2.5.3 JIC Adapter Elbow

3.2.5.4 JIC Adapter Nipple
P/N 19588 (See Figure 3.2.5.4)

A 1/8 in (6 mm) MNPT by 1/4 in (8 mm) 37˚ male JIC adapter nipple is threaded into the pressure port of the manual actuator to facilitate the connection of actuation flex hose. One (1) JIC adapter nipple is shipped as part of each solenoid valve kit.

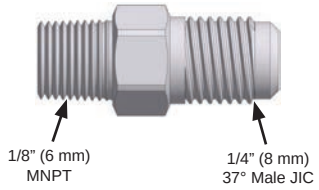


Figure 3.2.5.4 JIC Adapter Nipple

3.2.5.5 Cylinder Actuation Connection Adapter
P/N 19586 (See Figure 3.2.5.5)

A cylinder actuation connection adapter is threaded into the inlet port of the solenoid valve to facilitate connection to the solenoid actuator connection port of the cylinder valve. One (1) cylinder actuation connection adapter is shipped as part of each solenoid valve kit.

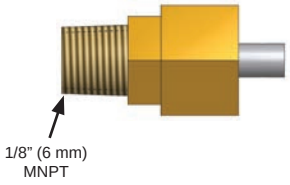


Figure 3.2.5.5 Cylinder Actuation Connection Adapter

3.2.5.6 Solenoid Bracket
P/N 19594 (See Figure 3.2.5.6)

A bracket attaches to the SW40-M cylinder valve using the solenoid support bolt fitted into the solenoid support bolt connection on the side of the cylinder valve. The bracket supports the solenoid valve. One (1) solenoid bracket is shipped as part of the solenoid valve kit along with two (2) machine screws for fastening the solenoid to the bracket and one (1) solenoid support bolt.



Figure 3.2.5.6 Solenoid Bracket

Section 3 System Components

3.3 Inline Check Valves

A range of inline check valves are available. These are used in main/reserve or initial/extended cylinder arrangements to prevent connected cylinder banks from being actuated by the discharge from an actuated cylinder bank.

Table 3.3a - Inline Check Valves							
P/N		Valve Size (FNPT)		Length (L)		Weight	
Brass	Stainless Steel	in	mm	in	mm	lbs	kg
19501	19507	1/2	15	2.71	69	0.6	0.3
19502	19508	3/4	20	2.94	75	0.7	0.3
19503	19509	1	25	3.64	92	1.4	0.6
19504	19510	1-1/2	40	4.37	111	3.9	1.8
19505	19511	2	50	5.85	149	5.8	2.6
19506	19512	3	80	6.25	159	16.4	7.4

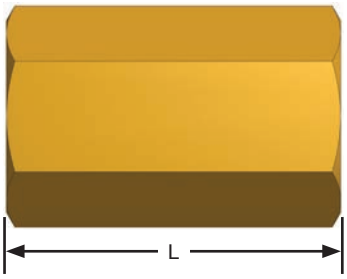


Figure 3.3a Inline Check Valve

Additional male connection check valves are available. These check valves have a maximum pressure of 3000 psig @ 70°F (206 bar @ 21°C) and are available in two different sizes and made of brass or stainless steel.

Table 3.3b - Male Inline Check Valves							
P/N		Valve Size (MNPT)		Length		Weight	
Brass	Stainless Steel	in	mm	in	mm	lbs	kg
19475	19476	1/4	8	1.62	41	0.4	0.2
19477	19375	1/2	15	2.28	58	0.6	0.3



Figure 3.3b Male Check Valve

3.4 Vent Check

P/N 10173 (See Figure 3.4)

Vent checks are used in the manifolds of main/reserve systems as well as in the manifolds of systems that have selector valves. When one bank of cylinders discharges, the vent check bleeds off any accidental check valve leakage that could discharge the other bank or banks of cylinders. The vent check is normally open with a ball seal that closes when manifold pressure reaches approximately 20 psi (1.4 bar) to prevent loss of CO_2 under normal discharge conditions. The pipe connection is 1/4 in (8 mm) MNPT.

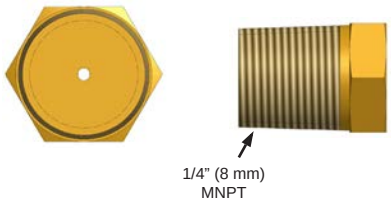


Figure 3.4 Vent Check

3.5 Discharge Nozzles

Janus Fire Systems offers numerous discharge nozzle options to suit the unique requirements of each hazard space.

⚠ CAUTION

Nozzles must be installed exactly as specified on project drawings. Failure to do so may cause one or more nozzles to not discharge the designed quantity of carbon dioxide.

3.5.1 Radial Nozzles

Refer to Table 3.5.1 for P/N (See Figure 3.5.1)

Radial nozzles are designed to discharge large volumes of carbon dioxide. The nozzles are performance tested to ensure that the agent is properly distributed throughout the protected area. Radial nozzles are available in brass or stainless steel with three separate port arrangements to accommodate placement in varying locations around a room or enclosure: 90˚ (1 port) corner nozzles, 180˚ (2 port) sidewall nozzles, and 360˚ (4 port) center room nozzles. All nozzles have drilled orifices. The nozzle orifice size varies depending on the rate of application (flow rate) and the location of the nozzle in the system. The Janus Design Suite is used to calculate the orifice drill size (drill code) required. Each nozzle is stamped with the nozzle part number, orifice code, and orifice diameter.

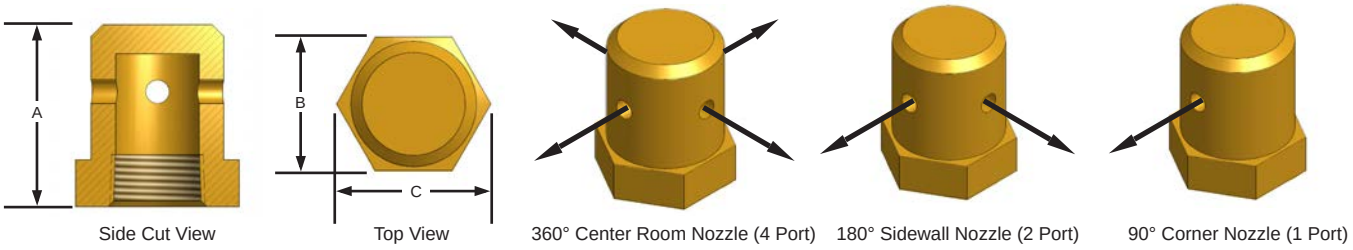


Figure 3.5.1 Radial Nozzle Configurations

Table 3.5.1 - Radial Nozzle Sizes

Nozzle Orientation Part Number						Nominal Pipe Size	Nozzle Dimensions					
Brass			Stainless Steel				A		B		C	
360°	180°	90°	360°	180°	90°		in	mm	in	mm	in	mm
18508	18501	18494	18797	18790	18783	1/2 in (15 mm)	1.722	43.7	1.250	37.75	1.44	36.58
18509	18502	18495	18798	18791	18784	3/4 in (20 mm)	1.926	48.9	1.500	38.10	1.73	43.94
18510	18503	18496	18799	18792	18785	1 in (25 mm)	2.176	55.3	1.750	44.45	2.02	51.31
18511	18504	18497	18800	18793	18786	1-1/4 in (32 mm)	2.500	63.5	2.250	57.15	2.60	66.04
18512	18505	18498	18801	18794	18787	1-1/2 in (40 mm)	2.689	68.3	2.250	57.15	2.60	66.04
18513	18506	18499	18802	18795	18788	2 in (50 mm)	3.100	78.7	3.000	76.20	3.46	87.88

Ordering Instructions: Specify the Nozzle P/N followed by a dash and the three digits representative of the drill code as provided by the Janus Design Suite software.

Example: 18508-XXX = Nozzle: 360°, 1/2” (15 mm), Brass (with drill code as specified)

Section 3 System Components

3.5.1.1 Corner Nozzle

The 90˚ corner nozzle can cover a maximum area of 18 ft x 18 ft (5.49 m x 5.49 m) for a total of 324 ft^2 (30.1 m^2). The centerline of a 90˚ corner nozzle must be located within 12 in (305 mm) of each adjacent wall (see figure 3.5.1.1). A single corner nozzle may be used to protect a room of less total area than 324 ft^2 (30.1 m^2) provided the nozzle is not more than 25.4 ft (7.74 m) from the farthest point of the hazard it is intended to protect. The nozzle should typically be oriented so that the orifice is aimed at the diagonally opposing corner (farthest point). The maximum height for a single tier of nozzles is 40 ft (12.19 m). A single tier of nozzles should not be mounted lower than 75% of the enclosure height (e.g. for an enclosure height of 40 ft, a nozzle cannot be mounted below 30 ft above finished floor.) No hazard should be located above the nozzle.

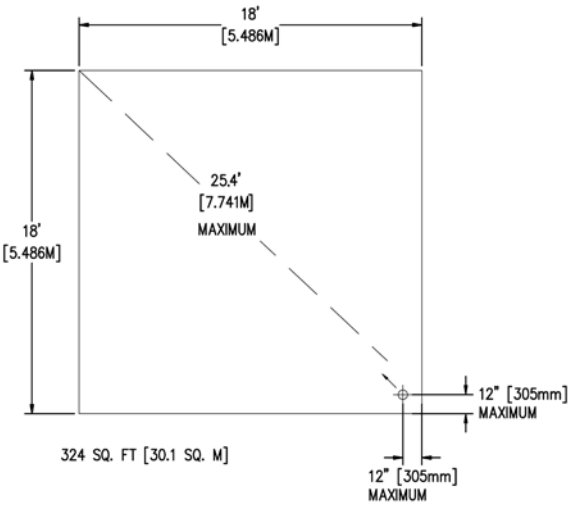


Figure 3.5.1.1 90° Corner Nozzle Coverage

3.5.1.2 Sidewall Nozzle

The 180˚ sidewall nozzle can cover an area that is up to 36 ft x 18 ft (10.97 m x 5.49 m) for 648 ft^2 (60.2 m^2). The centerline of a 180˚ nozzle must be located within 12 in (305 mm) off the back wall. A single sidewall nozzle may be used to protect a room of less total area than 648 ft^2 (60.2 m^2) provided the nozzle is not more than 25.4 ft (7.74 m) from the farthest point of the hazard it is intended to protect. The nozzle should typically be oriented so that the point on the nozzle face that is halfway between its orifices is perpendicular to the adjacent wall. The maximum height for a single tier of nozzles is 40 ft (12.19 m). A single tier of nozzles should not be mounted lower than 75% of the enclosure height (e.g. for an enclosure height of 40 ft, a nozzle cannot be mounted below 30 ft above finished floor.) No hazard should be located above the nozzle.

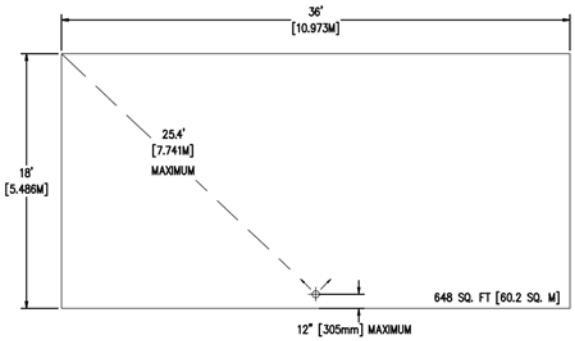


Figure 3.5.1.2 180° Sidewall Nozzle Coverage

3.5.1.3 Center Room Nozzle

The 360˚ center room nozzle can cover an area that is up to 36 ft x 36 ft (10.97 m x 10.97 m) for 1296 ft^2 (120.4 m^2). A single center room nozzle may be used to protect a room of less total area than 1296 ft^2 (120.4 m^2) provided the centerline of the nozzle is not more than 25.4 ft (7.74 m) from the farthest point of the hazard it is intended to protect. The maximum height for a single tier of nozzles is 40 ft (12.19 m). A single tier of nozzles should not be mounted lower than 75% of the enclosure height (e.g. for an enclosure height of 40 ft, a nozzle cannot be mounted below 30 ft above finished floor.) No hazard should be located above the nozzle.

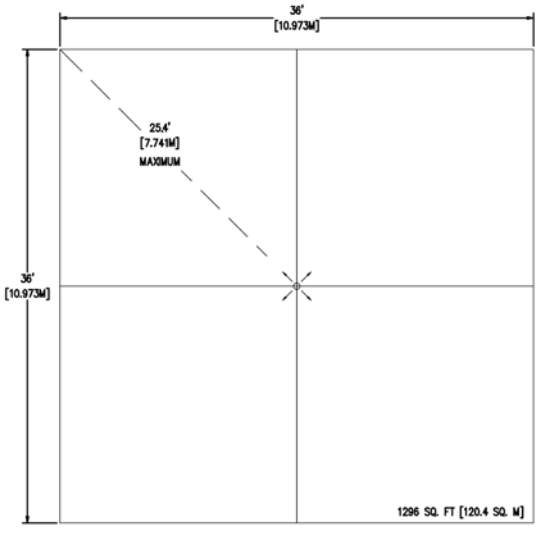


Figure 3.5.1.3 360° Center Room Nozzle Coverage

3.5.2 Orifice Nozzles

P/N 19372 (See Figure 3.5.2)

1/2 inch (15 mm) stainless steel orifice nozzles are designed specifically for small volume hazards. The nozzles are performance tested to ensure that the agent is properly distributed throughout the protected area. The nozzle orifice size varies depending on the rate of application (flow rate) and the location of the nozzle in the system. The Janus Design Suite is used to calculate the orifice drill size (drill code) required. Each nozzle is stamped with the nozzle part number, orifice code, and orifice diameter. When ordering, specify the nozzle P/N followed by a dash and the three digits representative of the drill code as provided by the Janus Design Suite software.

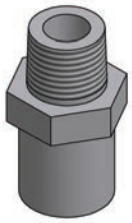


Figure 3.5.2 Orifice Nozzle

3.5.3 Orifice Unions

Refer to Table 3.2.3 for P/N (See Figure 3.2.3)

1/2 in (15 mm) or 1 in (25 mm) stainless steel orifice unions are designed specifically for inerting applications. The unions are performance tested to ensure that the agent is properly distributed throughout the protected area. The union orifice size varies depending on the rate of application (flow rate) and the location of the orifice union in the system. The Janus Design Suite is used to calculate the orifice drill size (drill code) required. Each orifice union is stamped with the union part number, orifice code, and orifice diameter. When ordering, specify the union P/N followed by a dash and the three digits representative of the drill code as provided by the Janus Design Suite software. (Inerting applications are not UL Listed or FM Approved.)

Table 3.5.3 - Orifice Union Sizes	
P/N	**Nominal Pipe Size (FNPT)**
19373	**1/2 in (15 mm)**
19374	**1 in (25 mm)**

Ordering Instructions: Specify the Nozzle P/N followed by a dash and the three digits representative of the drill code as provided by the Janus Design Suite software.

Example: 19373-XXX = Union, Orifice, 1/2 in FNPT (with drill code as specified)

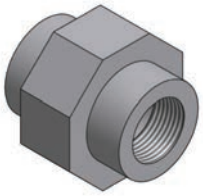


Figure 3.5.3 Orifice Union

3.5.4 JLA Nozzles

Refer to Table 3.5.4 for P/N (See Figure 3.5.4)

Janus Local Application (JLA) nozzles may be utilized for total flooding applications but are also the only discharge nozzle suitable for use in local application (while JLA nozzles are UL Listed for both total flooding and local application, they are FM Approved only for total flooding application). For local application systems, a JLA nozzle is installed at a specific distance from the individual hazard. The nozzles are performance tested to ensure that the agent is properly distributed. The nozzle orifice size varies depending on the rate of application (flow rate) and the location of the nozzle in the system. The Janus Design Suite is used to calculate the orifice drill size (drill code) required. Each nozzle is stamped with the nozzle part number, orifice code, and orifice diameter. JLA nozzles are available with painted cones and brass jet tip nozzles or with stainless steel cones and stainless steel jet tip nozzles.

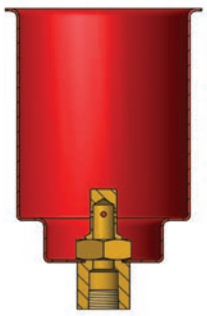


Figure 3.5.4 JLA Nozzle

Section 3 System Components

Table 3.5.4a - JLA Nozzle Sizes			
P/N		Nominal Pipe Size	Nominal Cone Size
Painted	SST		
19382	19650	1/2 in (15 mm)	4 in (100 mm)
19383	19651	3/4 in (20 mm)	4 in (100 mm)
19384	19652	1/2 in (15 mm)	6 in (150 mm)
19385	19653	3/4 in (20 mm)	6 in (150 mm)

Ordering Instructions: Specify the Nozzle P/N followed by a dash and the three digits representative of the drill code as provided by the Janus Design Suite software.

Example: 18382-XXX = Nozzle, JLA, 1/2" NPT, 4" Cone, Painted (with drill code as specified)

	Table 3.5.4b - Local Application Nozzle Limitations[1]		
	Height (ft)	Flow Rate (lbs/min)	Area of Coverage (ft^2)
4" Cone JLA Nozzles (19382, 19383, 19650, 19651)	2	24	4.5
	3	35	7.5
	4	46	10.0
	5	57	13.0
	6	68	15.5
	7	79	18.0
6" Cone JLA Nozzles (19384, 19385, 19652, 19653)	3	51.5	10.0
	4	68.0	16.0
	5	84.5	20.0
	6	101.0	23.0
	7	117.5	26.5
	8	134.0	30.0
	9	150.5	33.5

[1] All JLA Nozzles are UL Listed for both Total Flooding and Local Application but are FM Approved only for Total Flooding.

3.6 Discharge Pressure Switch

P/N 18773 (See Figure 3.6)

The discharge pressure switch connects to the carbon dioxide discharge piping and operates off the pressure produced when the system discharges. The switch may be wired with contacts in the open or closed position. Operation causes the electrical switch contacts to reverse position. Discharge pressure switches can be used to send a signal confirming system discharge to the control panel or to initiate the shutdown of equipment that may deplete the agent concentration in the protected hazard.

It is a single pole, double throw (SPDT) switch with contacts rated 10 Amps resistive at 30VDC.

The discharge pressure switch may be mounted in any position, but preferred installation is with the pressure connection (CO_2 supply line) entering from the bottom. When the line load of the equipment to be operated is greater than the switch rating, the switch should be used to break a relay holding-coil circuit.

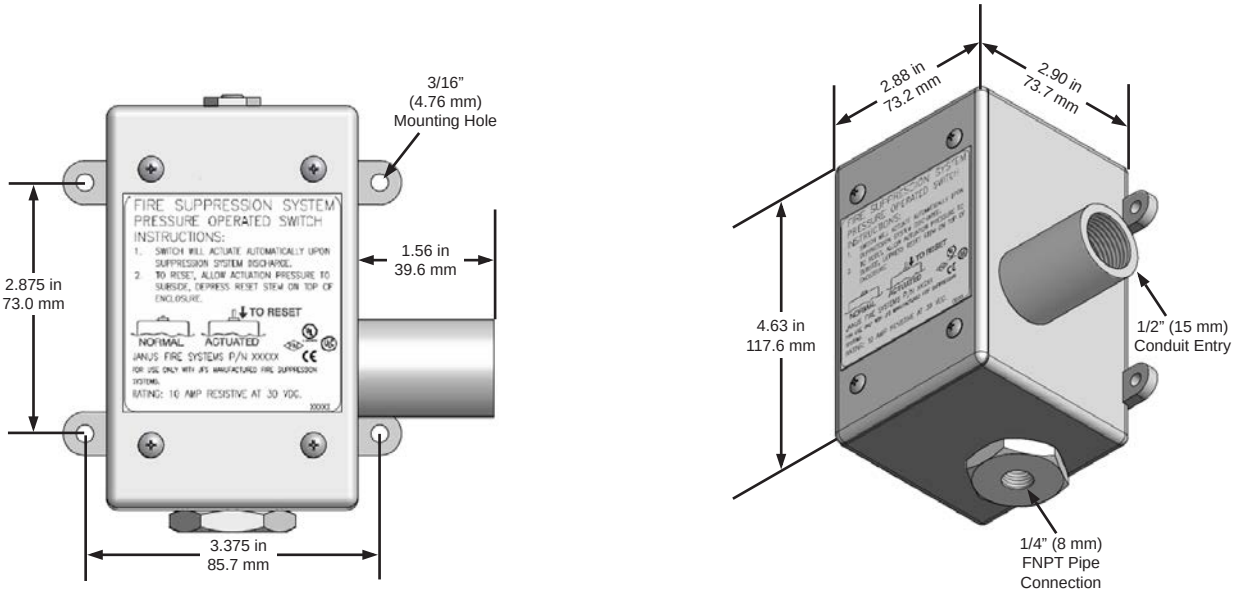


Figure 3.6 Discharge Pressure Switch

⚠ CAUTION

Notification devices may not be wired directly to a discharge pressure switch. NFPA 12 and NFPA 72 mandate notification devices must be supervised.

3.7 Explosion-Proof Discharge Pressure Switch

P/N 16384 (See Figure 3.7)

The J120-192 Explosion-Proof Discharge Pressure Switch is used in potentially explosive atmospheres to send indication of agent discharge to a releasing panel and/or initiate the shut down of equipment that may deplete agent concentration. It is a single pole, double throw (SPDT) switch with contacts rated 15 Amps at 125/250/480 VAC resistive.

The J120-192 must be manually reset by turning the Manual Reset knob in the direction indicated on the knob itself. The J120-192 is not FM Approved.



Figure 3.7 Explosion-Proof Pressure Switch

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3.8 Main/Reserve Transfer Switch

P/N 18846 (See Figure 3.8)

In a Main/Reserve Cylinder Arrangement, the Janus Fire Systems® MRS-1 Main/Reserve Transfer Station is used to transfer suppression system releasing circuits from the main bank of cylinders to the reserve bank of cylinders. The MRS-1 is a maintained toggle switch with a ring pin and lead wire seal for additional security.

To operate the MRS-1, break the lead wire seal, remove the safety pin and then push the toggle switch down into the Reserve position. Finally, the pin is replaced and a new lead wire seal is installed to ensure the switch is not accidentally tripped.

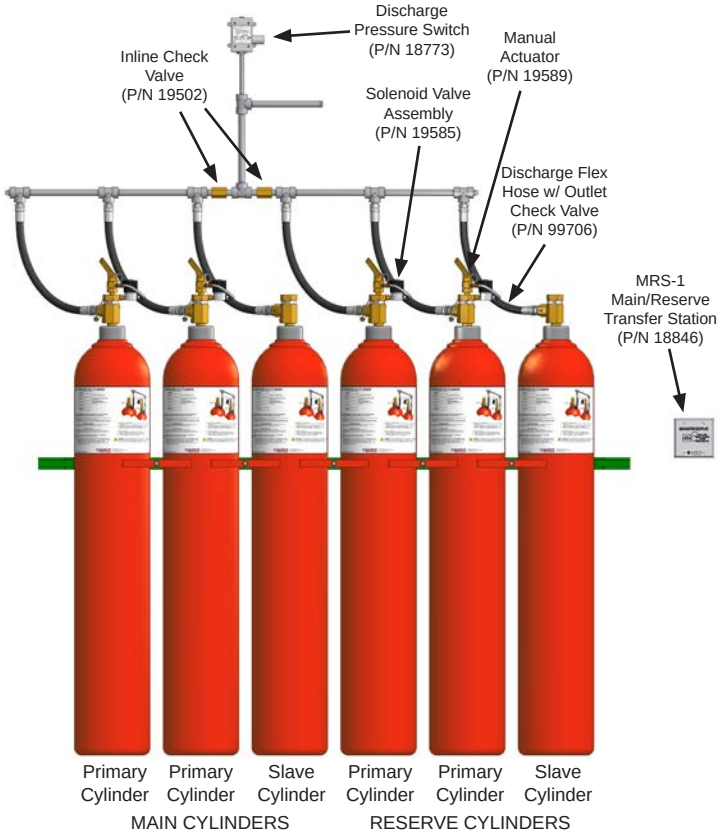


Figure 3.8 Typical Main/Reserve Cylinder Arrangement

3.9 Explosion-Proof Main/Reserve Transfer Switch

P/N 99764

The Janus Fire Systems® MRS-2 Explosion-Proof Main/Reserve Transfer Station is used to transfer suppression system releasing circuits from a main supply to a reserve supply in potentially explosive atmospheres.

To transfer control from the main bank to the reserve bank using the MRS-2, remove the safety pin and turn the selector switch from the Main position into the Reserve position. Replace safety pin. To return control to the main bank, remove safety pin and turn the selector switch from the Reserve position into the Main position. Replace safety pin.

3.10 Pressure Release Trip

P/N 20239 (See Figure 3.10)

The pressure release trip can be used to release dampers, close fire doors, windows, louvres, fuel supply valves, to open dump valves, etc., automatically when the system discharges. The equipment to be operated must be weight or spring loaded, or be pivoted off center. The release trip is connected to the carbon dioxide discharge piping for operation when the system discharges. A cable from the equipment to be controlled is looped over the pressure release operating stem. When the trip is operated, the stem retracts and the cable is released. The maximum load that can be hung on the piston stem is 35 lbs (15.88 kg).



Figure 3.10 Pressure Release Trip

3.11 Pneumatic Pilot Cabinets

NFPA 12 mandates that total flooding CO_2 systems for normally occupied and occupiable enclosures or local application systems where the discharge exposes personnel to concentrations greater than 7.5% by volume for more than 5 minutes be provided with pneumatic time delays and pneumatic predischarge alarms. This is achieved with the use of a pneumatically actuated selector valve operated by the Janus Fire Systems® Pneumatic Pilot Cabinet.

When the $HPCO_2$ cylinders are actuated, pneumatic pressure from the discharge manifold is regulated down to 100 psi (6.89 bar) and enters the Pneumatic Pilot Cabinet as pilot pressure. A solenoid valve within the cabinet is opened by a signal from the releasing panel initiating a pneumatic timer and directing pilot pressure to sound a pneumatic predischarge siren. Upon completion of the predischarge period, the pneumatic timer opens allowing pressure to actuate the pneumatic actuation port of the selector valve, opening the valve and beginning discharge.

Multiple Pneumatic Pilot Cabinets may be implemented with multiple selector valves to allow protection over multiple hazards or hazard zones.

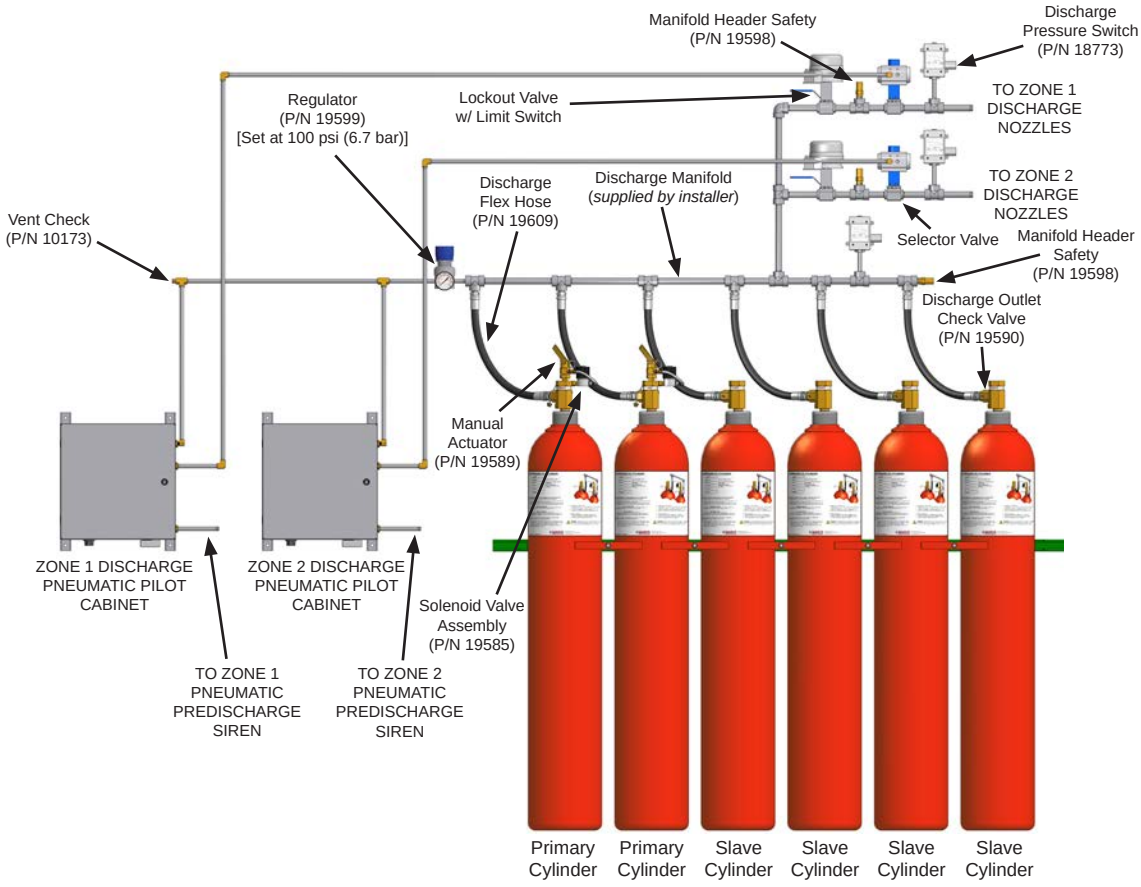


Figure 3.11a Typical Selector Valve Cylinder Arrangement w/ Pneumatic Time Delay

3.11.1 Pneumatic Pilot Cabinet Sequence of Operation

The pneumatic pilot cabinet is normally depressurized in standby condition. When the primary $HPCO_2$ cylinders are actuated with either the manual valve actuator or solenoid valve located on the primary cylinder valve(s), the pneumatic pilot cabinet enters a pressurized standby condition.

During pressurized standby condition, pressure off the discharge manifold is regulated down to 100 psi (6.89 bar) and enters the pneumatic pilot cabinet. This pilot pressure (100 psi/6.89 bar) is stopped at the constant pressure port of the pneumatic pilot valve, the solenoid bypass valve, and the actuation solenoid.

For an automatic discharge, the fire suppression control panel sends an actuation signal to the solenoid valve causing it to open. For a manual discharge, the lever of solenoid bypass valve located within the pneumatic pilot cabinet is moved to the "open" position.

⚠ CAUTION

Opening the solenoid bypass lever within the pneumatic pilot cabinet will **NOT** actuate the system unless the manual valve actuator or solenoid valve located on the primary $HPCO_2$ cylinder valve is **ALSO** actuated.

Once the cabinet is either automatically or manually actuated, pilot pressure (100 psi/6.89 bar) enters the pneumatic timer, initiating the pre-discharge time delay. Pilot pressure also actuates the pneumatic pre-discharge siren.

The pre-discharge time delay can be bypassed by opening the timer bypass valve.

⚠ WARNING

Opening the timer bypass valve will cause the system to discharge CO_2 immediately upon system actuation. The timer bypass valve should only be opened if the hazard area has been cleared of all personnel and there is no possibility that personnel will be occupying the protected hazard during discharge.

Upon completion of the pre-discharge time delay, pressure passes through the pneumatic timer to the actuation port of the pneumatic pilot valve. Once actuated, the pneumatic pilot valve allows pilot pressure (100 psi/6.89 bar) to pass through and actuate the selector valve.

Enclosure
NEMA 4 & 12 (IP66)
Dimensions:
20“ x 20" x 6"
(762 mm x 762 mm x 152 mm)
Ambient Temp: 40° to 130°F (4° to 54°C)
Heater Optional

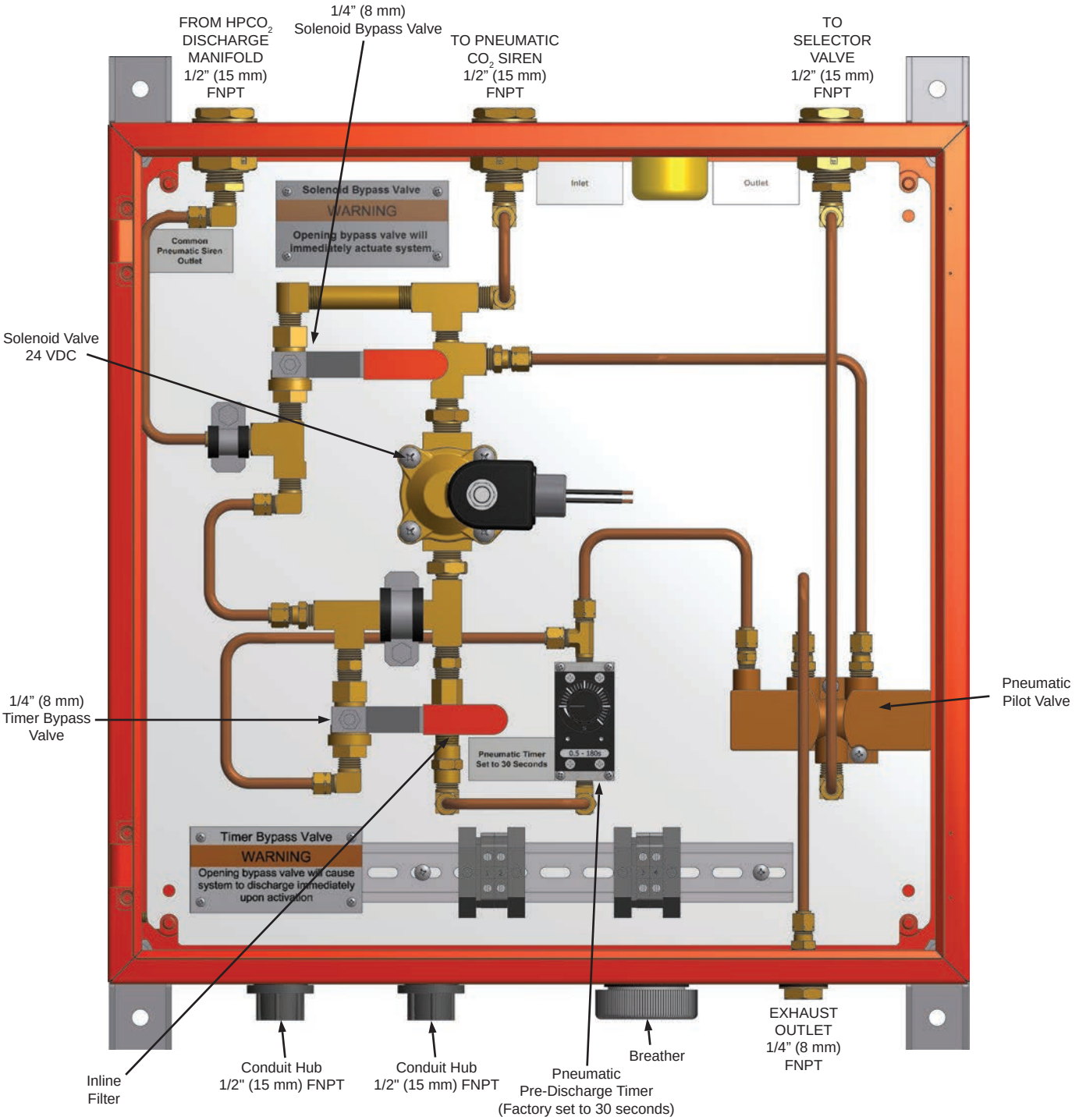


Figure 3.11.1a Standard Selector Pilot Cabinet

Section 3 System Components

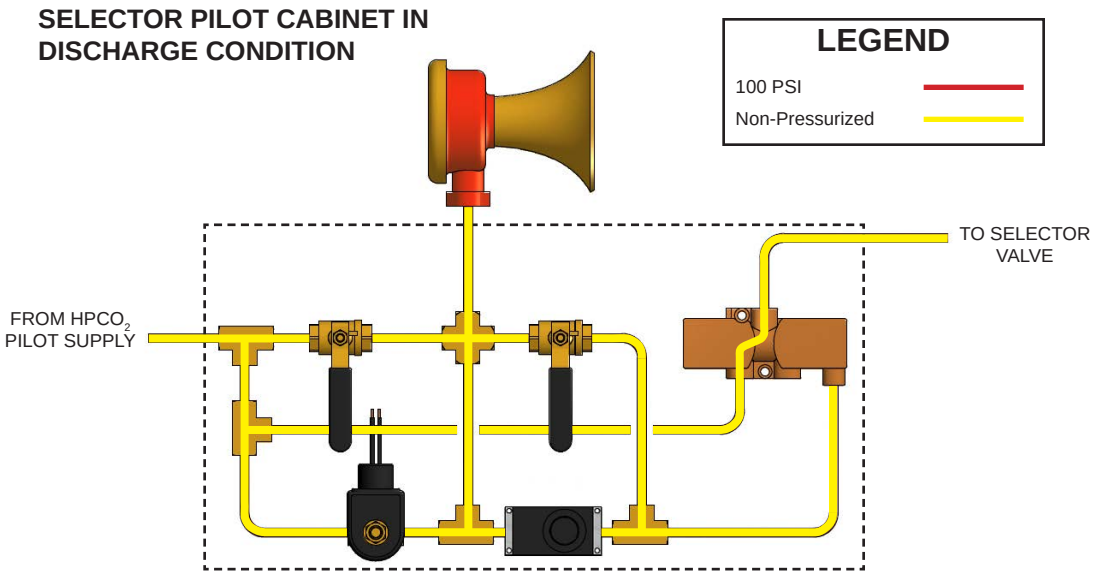


Figure 3.11.1b Selector Pilot Cabinet P&ID (Standby - Cylinders Not Actuated)

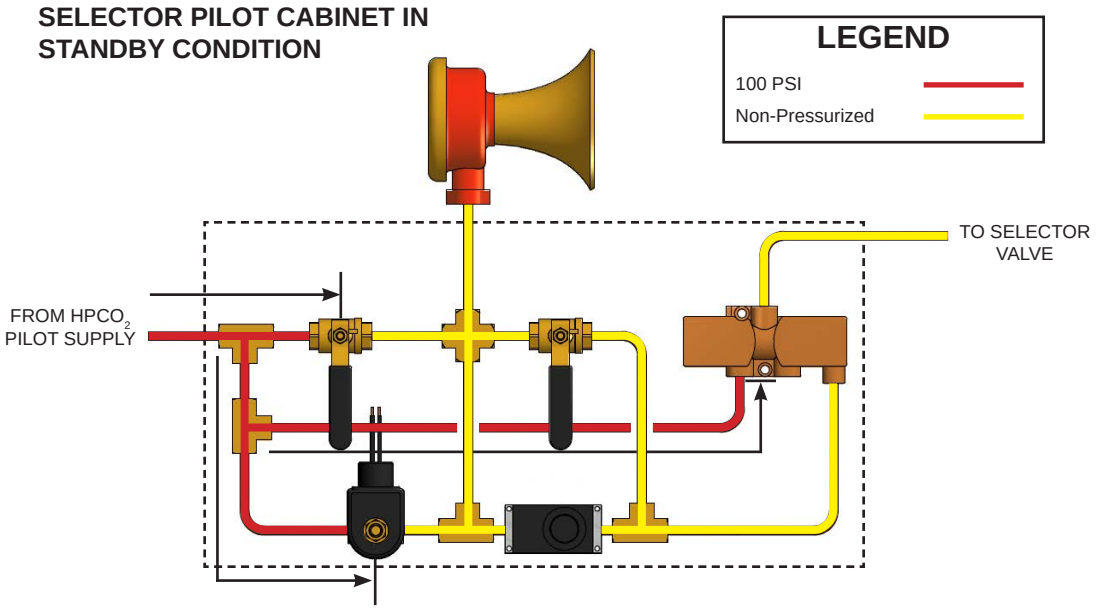


Figure 3.11.1c Selector Pilot Cabinet P&ID (Standby - Cylinder Actuated)

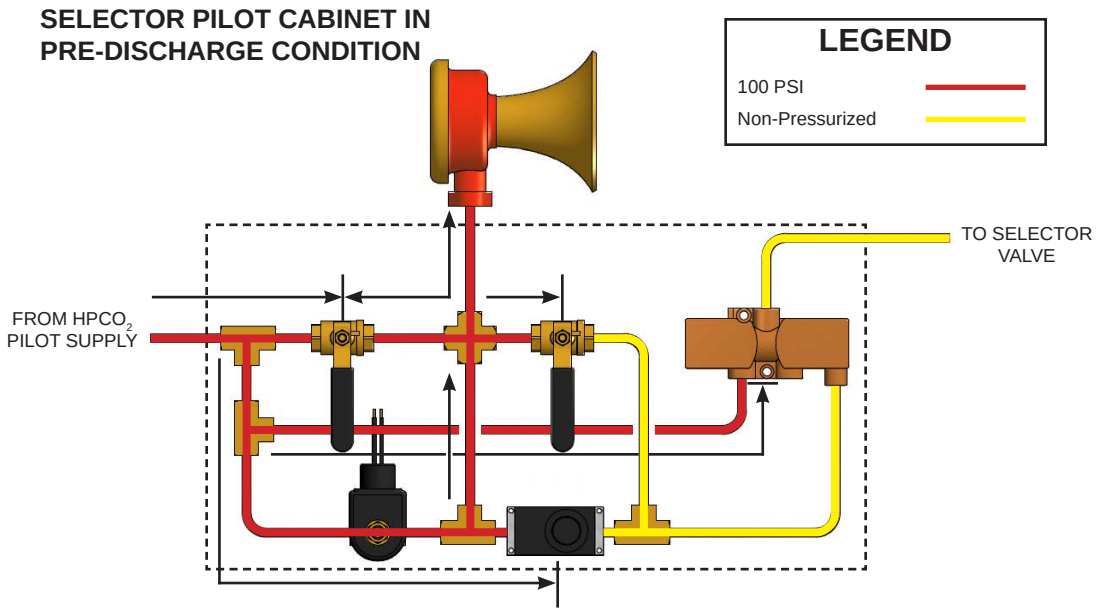


Figure 3.11.1d Electrically Actuated Cabinet (Pre-Discharge)

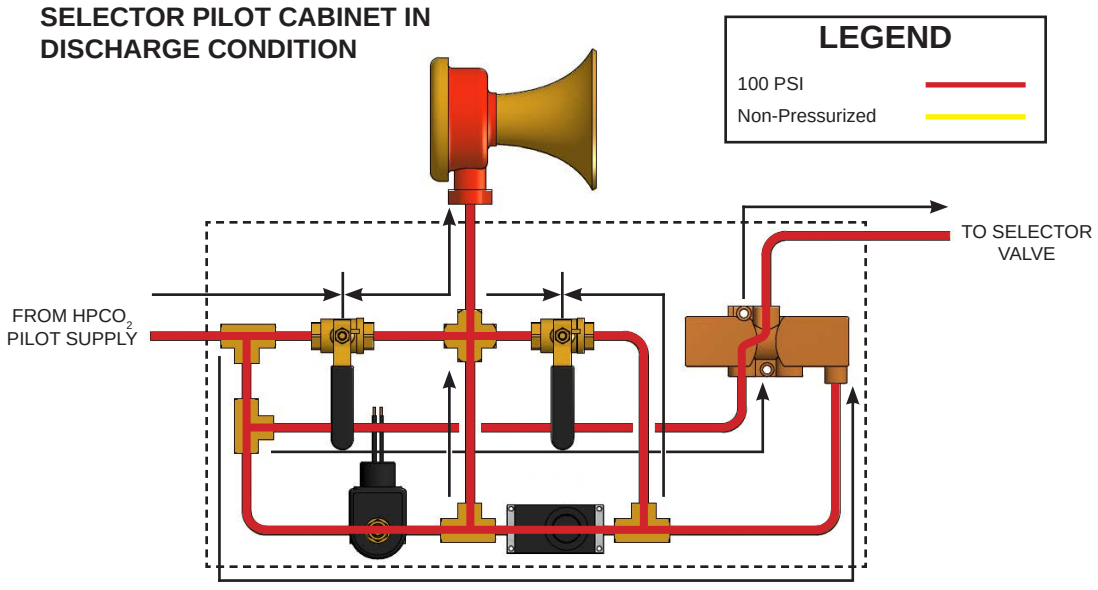


Figure 3.11.1e Electrically Actuated Cabinet (Discharge)

Section 3 System Components

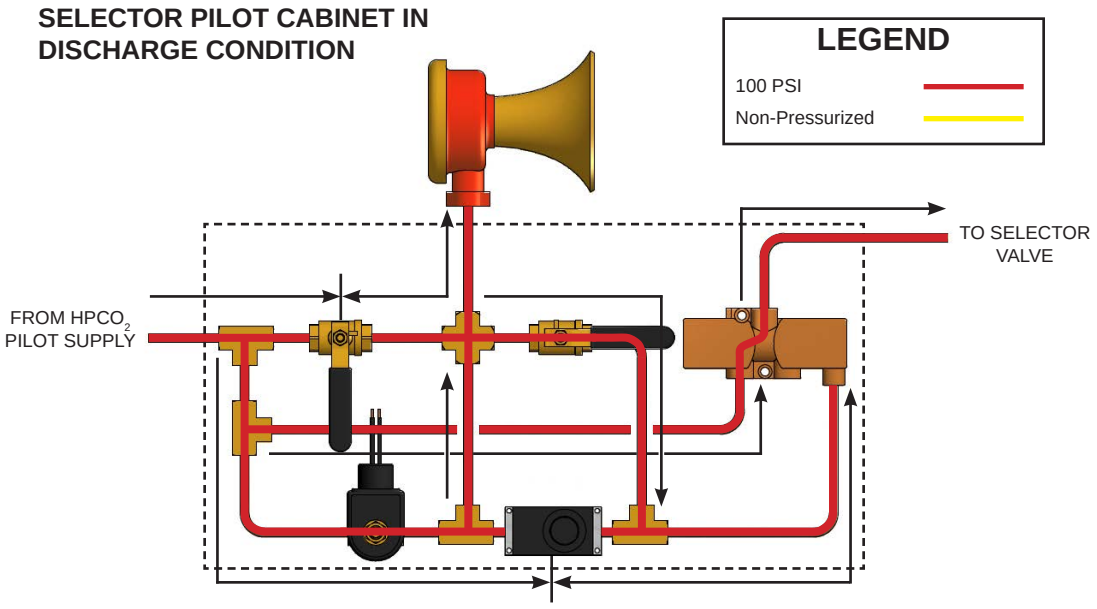


Figure 3.11.1f Electrically Actuated Cabinet (Timer Bypass)

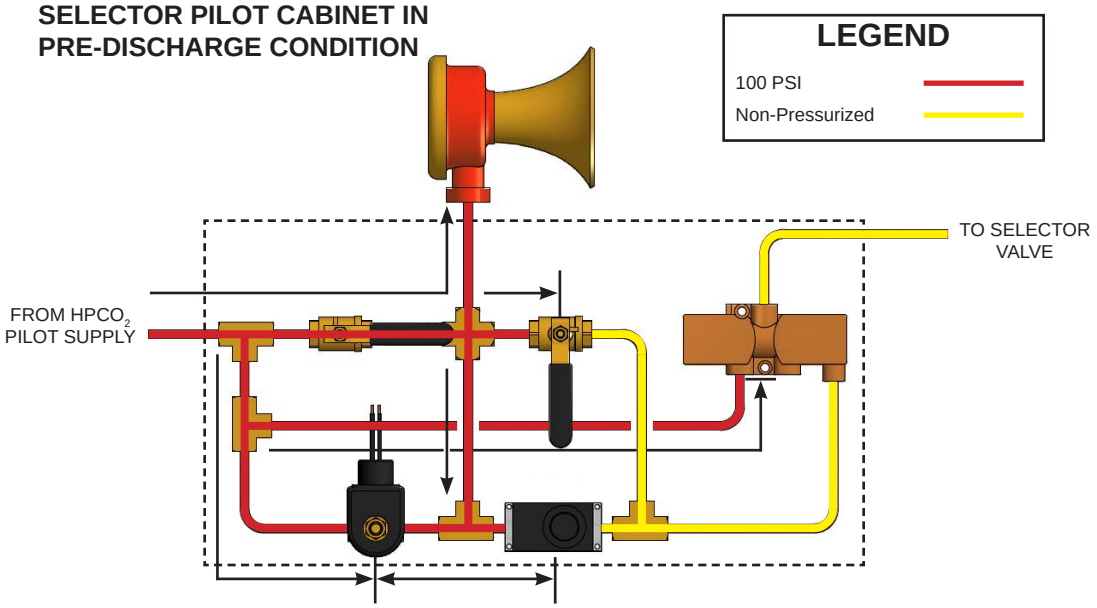


Figure 3.11.1g Manually Actuated Cabinet (Pre-Discharge)

Note: The $HPCO_2$ primary cylinder manual actuators operate independently of the pilot cabinet. Actuation must occur at both locations to manually actuate the system.

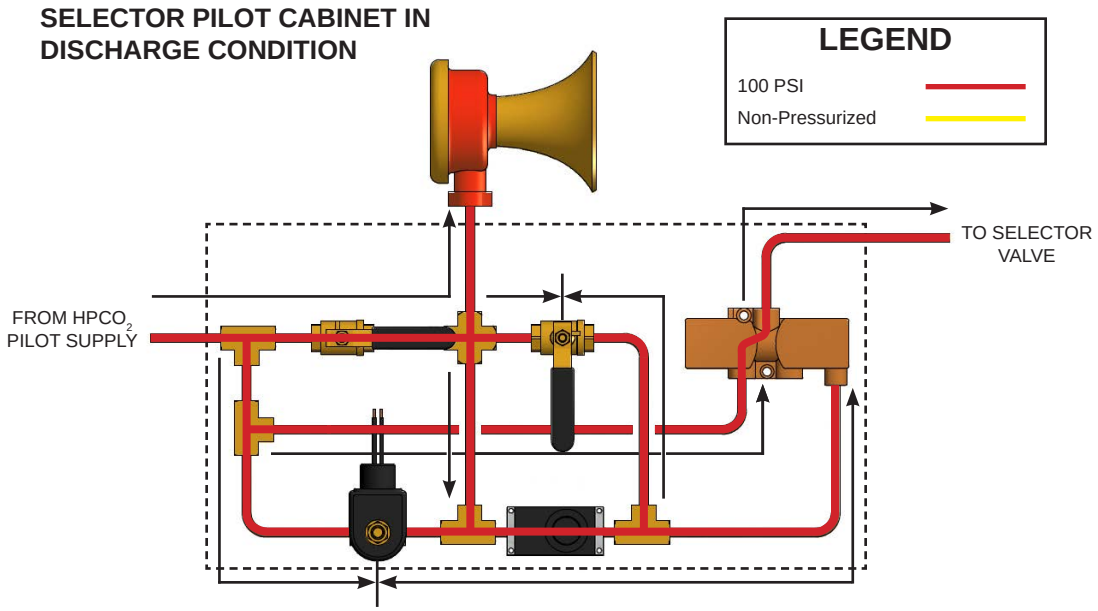


Figure 3.11.1h Manually Actuated Cabinet (Discharge)

Note: The $HPCO_2$ primary cylinder manual actuators operate independently of the pilot cabinet. Actuation must occur at both locations to manually actuate the system.

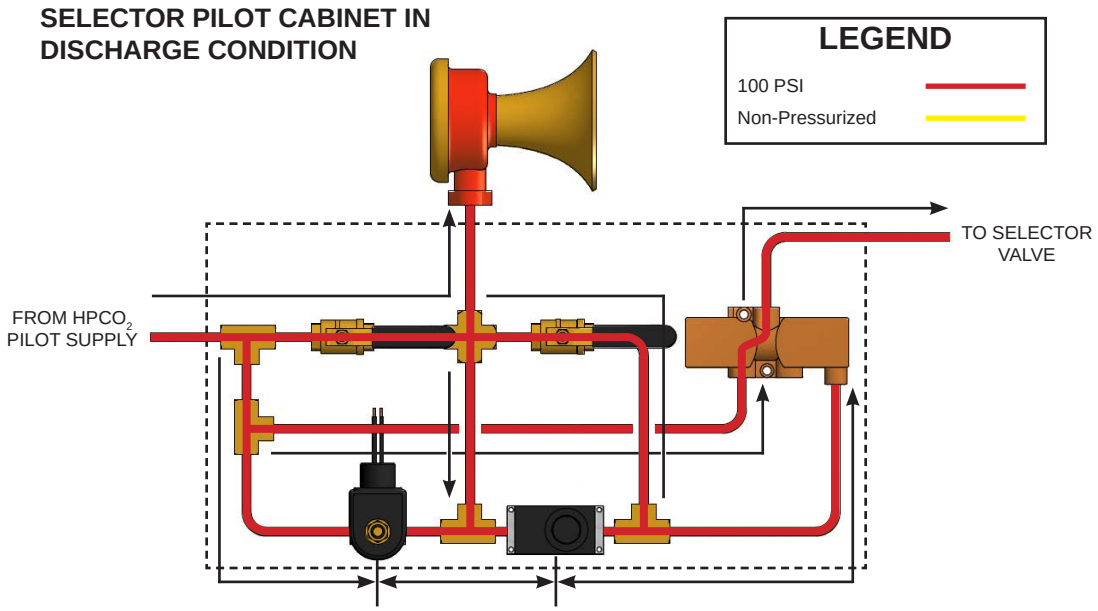


Figure 3.11.1i Manually Actuated Cabinet (Timer Bypass)

Note: The $HPCO_2$ primary cylinder manual actuators operate independently of the pilot cabinet. Actuation must occur at both locations to manually actuate the system.

Section 3 System Components

3.11.2 Manual Actuation/Timer Bypass Valve

P/N 19173 (See Figure 3.11.2)

The manual actuation valve is installed upstream of the pneumatic timer and acts as means to manually begin the pre-discharge process by sending actuation pressure to the pneumatic siren and pneumatic timer. (The $HPCO_2$ primary cylinder manual actuators operate independently of the pilot cabinet. Actuation must occur at both locations to manually actuate the system.) The timer bypass valve is placed downstream of the solenoid and manual actuation valves. When open, it bypasses the pneumatic timer and immediately begins the discharge process upon electric or manual actuation of the cabinet (and $HPCO_2$ cylinder valve) by sending pilot pressure to the pneumatic pilot valve. Both the manual actuation and timer bypass valves are manually actuated full port ball valves made of forged brass with reinforced PTFE seats and seals and have 1/4 in (8 mm) FNPT connections. The standalone ambient temperature range for both valves is -20˚ to 130˚F (-29˚ to 54˚C).

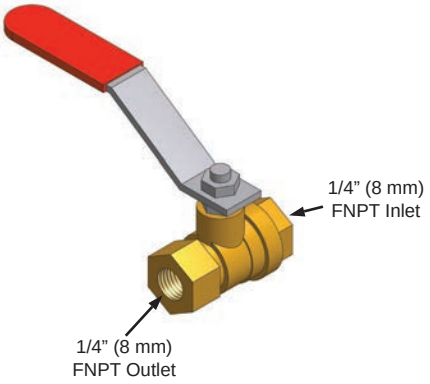


Figure 3.11.2 Manual Actuation/ Timer Bypass Valve

3.11.3 Pneumatic Pilot Valve

P/N 19174 (See Figure 3.11.3)

A pneumatic pilot valve is installed in the pilot cabinet upstream of the selector valve pneumatic actuator inlet. It has a brass body with buna seal and has four ports: a supply inlet, an actuation inlet, an outlet, and an exhaust. Upon receiving pressure to its actuation inlet, the valve opens sending pilot pressure from its supply inlet to the pneumatic actuator of the selector valve, which causes the selector valve to open, releasing the CO_2 agent. It has a standalone ambient temperature range of 5˚ to 150˚F (-15˚ to 66˚C).

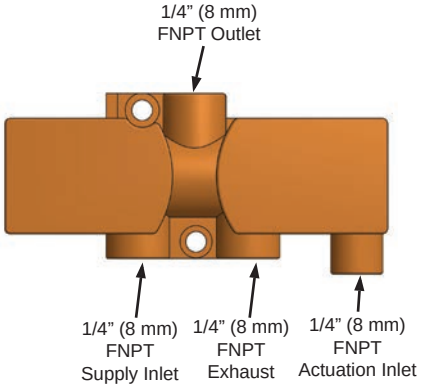


Figure 3.11.3 Pneumatic Pilot Valve

3.11.4 Pilot Solenoid Valve

P/N 19309 (See Figure 3.11.4)

A solenoid valve is installed inside the pilot cabinet upstream of the pneumatic siren, timer bypass valve, and pneumatic timer. It operates at 24 VDC, 10 Watts and has a NEMA 4X enclosure with a standalone ambient temperature range of -20˚ to 150˚F (-29˚ to 66˚C). Upon receiving a signal from the releasing panel, the valve opens sending pilot pressure received from the open $HPCO_2$ cylinder valve to the pneumatic siren and pneumatic timer.

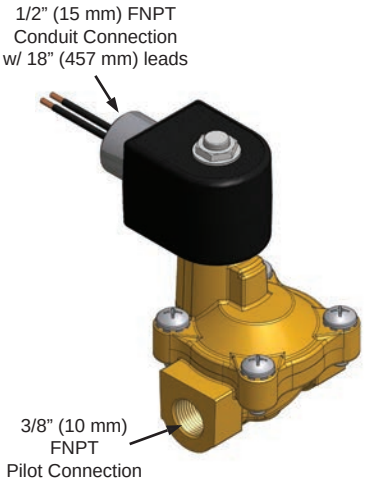


Figure 3.11.4 Solenoid Valve

3.11.5 Pneumatic Timer

P/N 19172 (See Figure 3.11.5)

The pneumatic timer is installed downstream of the solenoid and manual actuation valve. It acts to create a pre-discharge delay between system actuation and system discharge to allow for notification of personnel via the pneumatic siren as mandated by NFPA 12. The approved timer set point range is 25 to 80 seconds (1 to 180 second dial). It has a 1/8 in (6 mm) NPT inlet and outlet port and a 3-way internal exhaust. The standalone ambient temperature range for the timer is 20˚ to 130˚F (-7˚ to 54˚C).

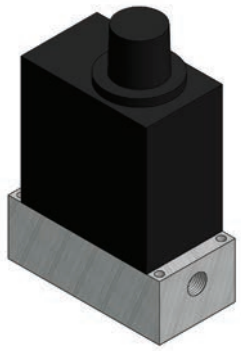


Figure 3.11.5 Pneumatic Timer

3.11.6 Inline Filter

P/N 99109 (See Figure 3.11.6)

A 20 micron inline filter is installed immediately upstream of the pneumatic timer to protect the timer from debrids. It has a brass body with a sintered bronze filter element. The filter has a 1/4 in (8 mm) FNPT inlet and a 1/4 in (8 mm) MNPT outlet.

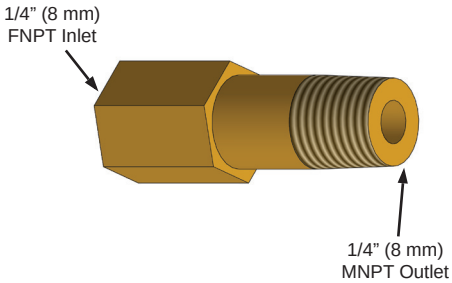


Figure 3.11.6 Inline Filter

3.11.7 Pneumatic Siren

P/N 19224 (See Figure 3.11.7)

A pneumatic siren is installed outside the selector pilot cabinet immediately downstream of both the solenoid valve and manual actuation valve but upstream of the pneumatic timer so that it is sounded during the pre-discharge period as required by NFPA 12. It has a solid cast bronze bell with a stainless steel diaphragm and reaches a sound level of 119 ± 1DBA @ 100 psi at 10 ft (3.05 m). The siren uses 1.3 lbs/minute (0.49 kg/minute) and has a Cv of .25. It has an operating pressure of 50 to 150 psi (3 to 10 bar) and a standalone ambient temperature range of -4˚ to 400˚F (-20˚ to 204˚C).

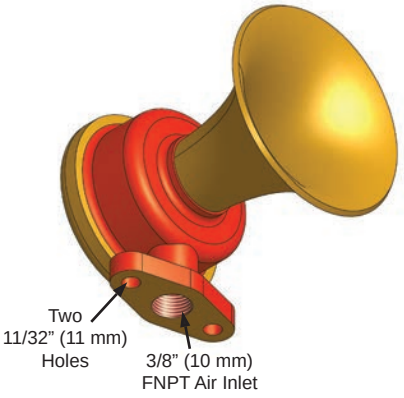


Figure 3.11.7 Pneumatic Siren

3.11.8 Pneumatic Siren Bracket

P/N 19225 (See Figure 3.11.8)

The pneumatic siren bracket affixes to the base of the pneumatic siren to allow the siren to be fastened to an outside surface.

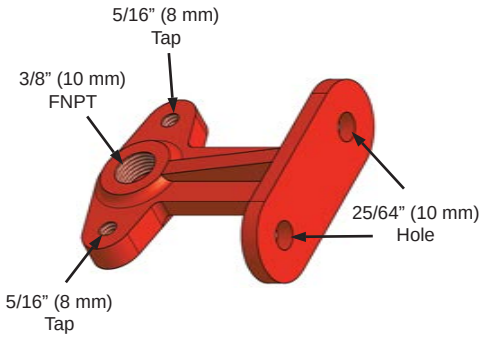


Figure 3.11.8 Pneumatic Siren Bracket

3.11.9 Pressure Regulator

P/N 19599 (See Figure 3.11.9)

A 316L stainless steel self-relieving pressure regulator with Teflon seat is utilized to regulate pressure to the pneumatic pilot cabinet or pneumatic actuation ports of selector valves.. It has a 1/4 in (8 mm) FNPT inlet and outlet with a maximum operating inlet pressure of 3600 psig (248 bar) and an outlet range of 0 to 250 psig (0 to 17.2 bar). The regulator has a standalone ambient temperature range of -40˚ to 500˚F (-40˚ to 260˚C) and a Cv of 0.5. A pressure gauge (0-160 psig P/N 19171) may be fastened to the regulator to allow visual monitoring of outlet pressure. An optional model with a Cv of 1.0 (P/N 99772) is available for applications that require a higher Cv (e.g. where more than two sirens are being implemented from the same pilot cabinet or line.)

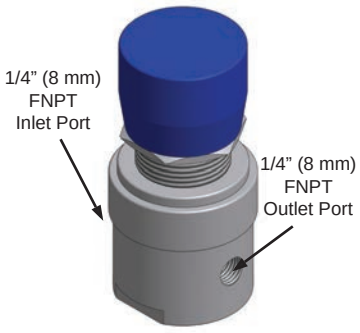


Figure 3.11.9 Pressure Regulator

3.11.10 Pilot Relief Valve

P/N 19316 (See Figure 3.11.10)

A pilot relief valve is installed outside of the selector pilot cabinet just downstream of the pressure regulator. It has a 0.062 in^2 (40 mm^2) orifice area and is set to open should line pressure exceed 125 psi (8.6 bar). The relief valve has a brass body with a stainless steel spring and a standalone ambient temperature range of -320˚F to 165˚F (-196˚C to 74˚C). An optional pipe-away adapter (P/N 19318) is available to convert the outlet to a 1/2 in (15 mm) FNPT connection.

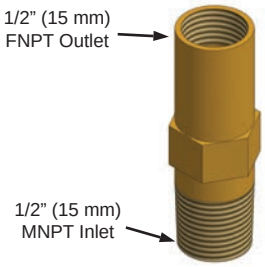


Figure 3.11.10 Pilot Relief Valve

3.12 Selector Valves

Selector valves are used in specific cylinder arrangements to allow the protection of multiple hazards or hazard zones by one set of $HPCO_2$ cylinders or where a time delay is required. Janus Fire Systems® $HPCO_2$ selector valves are available as 1/2 in (15 mm) through 2 in (50 mm) pneumatically actuated ball valves or a 3 in (80 mm) pneumatically actuated wafer valve. Optional solenoid and lockout with proximity switch are available. Refer to Appendix A for part numbers and ordering information.

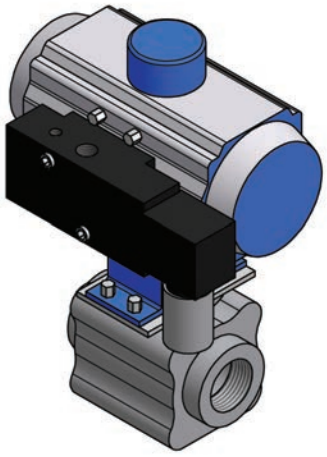


Figure 3.12a Selector Valve

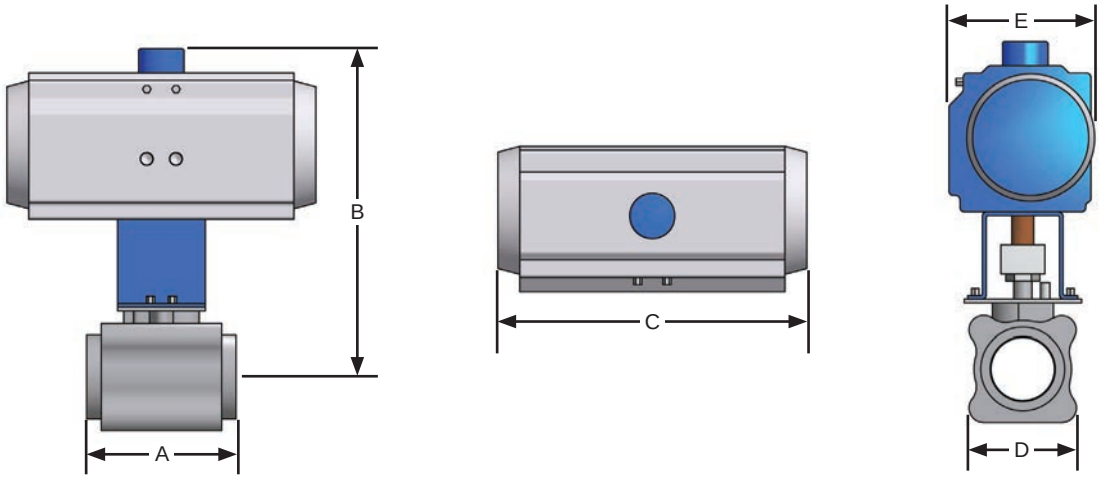


Figure 3.12b Pneumatically Actuated Ball Valve Dimensions

Table 3.12 - Pneumatically Actuated Ball Valve Dimensions													
Valve Size		Port Size		Dimensions									
				A		B		C		D		E	
in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
1/2	15	1/8	6	2.56	65	6.00	152	5.38	137	2.06	52	2.81	71
3/4	20	1/8	6	3.00	76	6.94	176	6.06	154	2.25	57	3.31	84
1	25	1/8	6	3.69	94	7.06	179	6.06	154	2.63	67	3.31	84
1-1/2	40	1/8	6	4.56	116	9.56	243	9.50	241	3.31	84	4.06	103
2	50	1/4	8	5.13	130	10.19	259	10.19	259	3.69	94	4.69	119

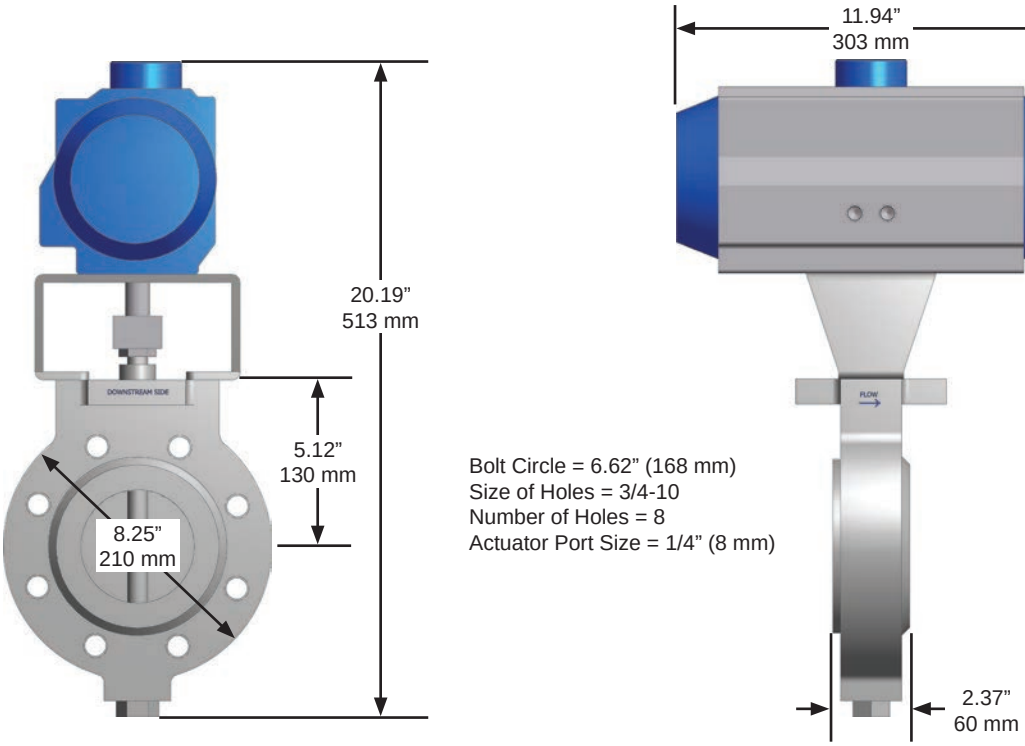


Figure 3.12c Pneumatically Actuated Wafer Valve Dimensions

3.13 Lockout Valves

Lockout valves are used in specific cylinder arrangements where manual isolation of pipe is required. Janus Fire Systems® $HPCO_2$ lockout valves are available as 1/2 in (15 mm) through 2 in (50 mm) manually actuated ball valves or a 3 in (80 mm) manually actuated wafer valve. Optional stem extension and explosion-proof limit switch are available. Refer to Appendix B for part numbers and ordering information.

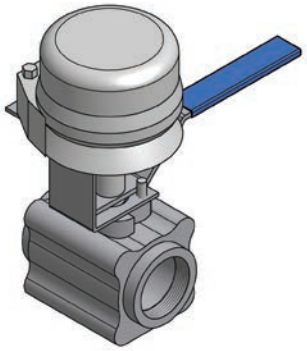


Figure 3.13a Lockout Valve

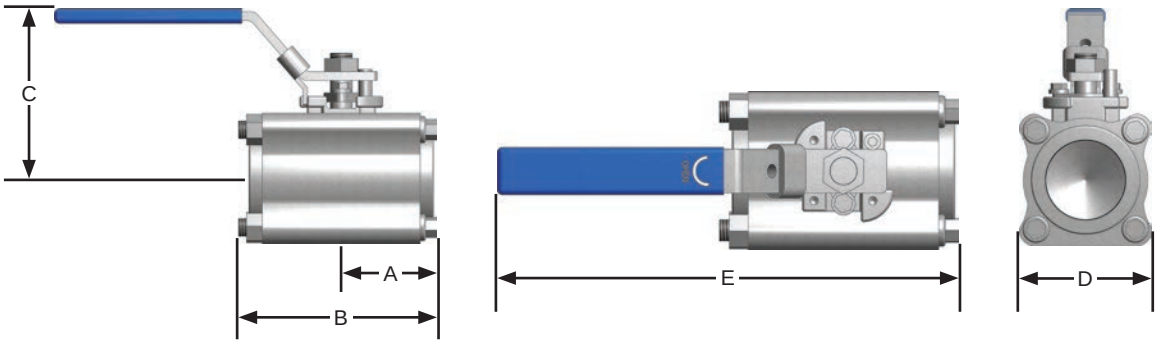


Figure 3.13b Manually Actuated Ball Valve Dimensions

Table 3.13 - Manually Actuated Ball Valve Dimensions											
Valve Size		Dimensions									
		A		B		C		D		E	
in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
1/2	15	1.28	33	2.59	66	2.36	60	2.05	52	6.29	160
3/4	20	1.50	38	3.05	78	2.53	64	2.24	57	6.50	165
1	25	1.86	47	3.76	96	3.28	83	2.57	65	8.54	217
1-1/2	40	2.43	62	5.05	128	4.27	108	3.31	84	10.42	265
2	50	2.66	68	5.53	140	4.73	120	3.64	93	10.66	271

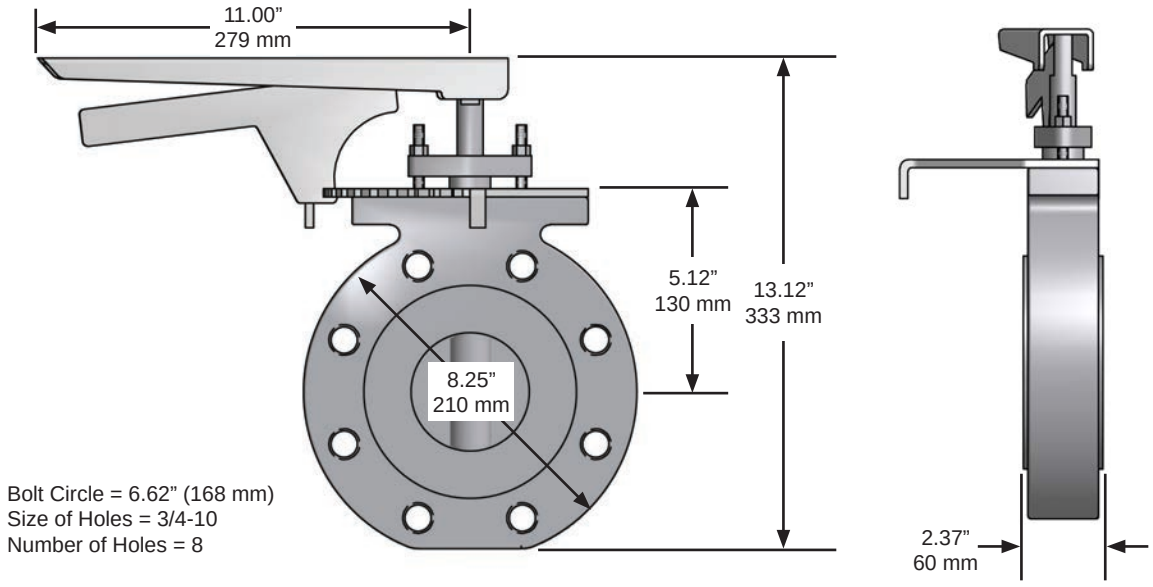


Figure 3.13c Manually Actuated Wafer Valve Dimensions

3.14 Discharge Manifolds

(Supplied by installer)

A discharge manifold is used in multiple cylinder systems to direct the flow of agent from two or more cylinders into a common pipe and to allow the actuation of slave cylinders through back pressure. Manifolds are to be supplied by the installer and may be constructed out of threaded or welded pipe and fittings. When two or more cylinders are grouped together with a common manifold, they must be of the same size. Manifold pipe size is determined by flow calculation software. For pipe sizes 1 in (25 mm) and above, Schedule 80 pipe shall be used.

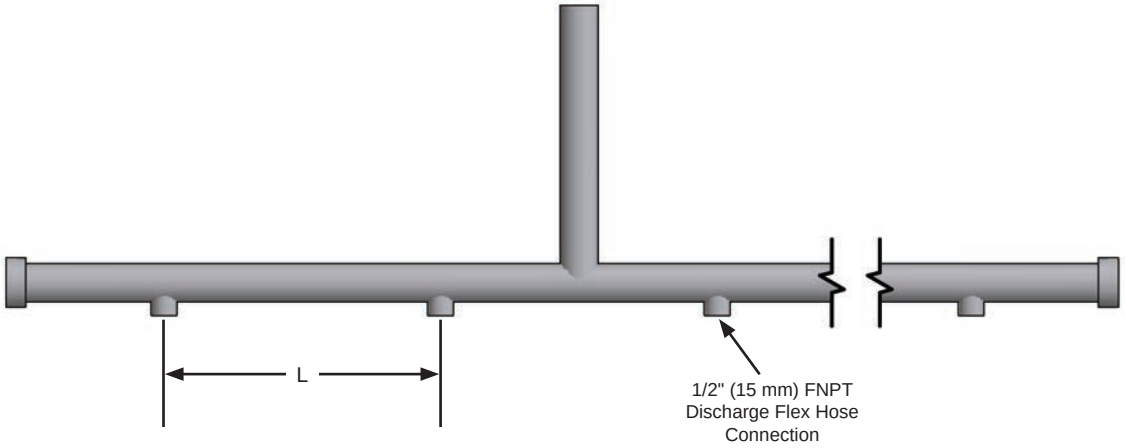


Figure 3.14 Suggested Discharge Manifold Configuration

Table 3.14 - Discharge Manifold Dimensions

Cylinder	Length (L)	
	in	mm
50 lb	9-1/8	234
75 lb	10-3/8	264
100 lb	11-5/16	287

3.15 Discharge Indicator

P/N 20238 (See Figure 3.15)

The Janus Fire Systems® Discharge Indicator acts as a nonelectrical visual indicator of system actuation. It is actuated through discharge pressure and remains in the upright (discharged) position until manually reset.

Upon system actuation, pressure within the discharge piping enters the discharge indicator, actuating the internal plunger. This forces the external indication stem into the upright (discharged) position. The stem and plunger remain in the upright position until the discharge indicator is manually reset by depressing the indication stem into the down (standby) position.

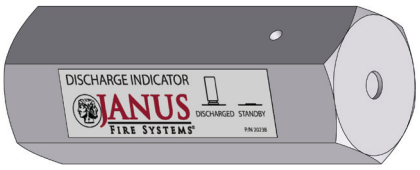


Figure 3.15 Discharge Indicator

3.16 Manifold Header Safety

P/N 19598 (See Figure 3.16)

This pressure relief device is installed in sections of closed piping such as between selector valves or lockout valves and the cylinder manifold. It is a frangible disc assembly designed to rupture if trapped CO_2 expands and the line pressure exceeds 2,650 to 3,000 psi (182.7 to 206.8 bar). The body is made of brass and the pipe connection is 1/2 inch (15 mm) MNPT.

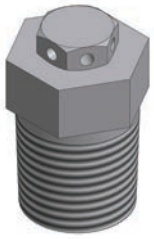


Figure 3.16 Manifold Header Safety

3.17 Odorizer Assembly

P/N 99703 (See Figure 3.17)

The odorizer assembly is installed into system piping to provide an olfactory indication of system actuation. During system discharge, a frangible disc inside the odorizer assembly ruptures, allowing wintergreen contained in the odorizer body to mix with the discharging agent. This causes the normally odorless carbon dioxide agent released into the protected hazard to possess a distinct wintergreen smell. The odorizer assembly is non-refillable.



Figure 3.17 Odorizer Assembly

3.19 Control Panels

For systems requiring UL listing, the control panel must be UL listed and compatible with the solenoid valve as indicated in the control panel manual. For systems requiring FM approval, the control panel must be FM approved and compatible with the solenoid valve as indicated in the control panel manual. The control panel should be located in an accessible area and must be installed in compliance with NFPA 72 (National Fire Alarm Code). The Janus Fire Systems® JFS-C1 Conventional Panel is recommended for most applications. Other control panels are available for advanced installations. Contact Janus Fire Systems for more information.

3.20 Initiating Devices

Initiating devices such as heat detectors, smoke detectors, and manual stations should be listed devices compatible with the control panel being utilized. See the respective manufacturers instruction manuals for installation and operating details. A remote, field-located electric manual station should be included in all automatic electric systems. This allows the system to be manually actuated should a fire be visually detected before an automatic detector operates. Janus Fire Systems offers a full range of initiating devices for use with the Janus Fire System® High-Pressure Carbon Dioxide Fire Extinguishing System. Refer to www.janusfiresystems.com or contact Janus Fire Systems for more information.

Section 3 System Components

BLANK

4 CYLINDER MOUNTING

Wall-mount cylinder straps are available for mounting one or two cylinders.

For installation of 3 or more cylinders, multiple cylinder rack options are available. Wall-mount rack arrangements are utilized to mount cylinder arrangements to a solid vertical structural member. Floor-mount rack arrangements are used where wall-mount racks are unfeasible or the number of cylinders required is greater than the number supported by wall-mount arrangements.

For marine applications, additional cylinder supports are required. Two straps or sets of retainers must be used.

Mounting bolts must be anchored to a solid structural member.

4.1 Wall-Mount Cylinder Strap

(See Table 4.1a for P/N)

For mounting systems of one or two cylinders, the wall-mount cylinder strap is recommended.

Table 4.1a - Wall-Mount Cylinder Strap Dimensions			
P/N	Cylinder	Length (L)	
		in	mm
99758	50 lb	10.38	264
99757	75 lb	11.04	280
99747	100 lb	12.32	313

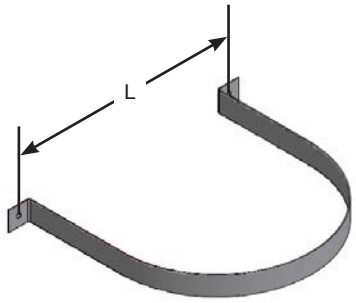


Figure 4.1a Wall-Mount Cylinder Strap

4.2 Cylinder Rack Arrangements

For installations of between 3 and 12 cylinders, the single row, wall-mount cylinder rack arrangement is recommended. The double row, wall-mount arrangement is generally used when sufficient space is not available for a single row wall-mounting arrangement or for installations requiring 13 to 24 cylinders.

Floor-mount rack arrangements are available in four options to optimize space, cost, and cylinder capacity: one-sided, single row; one-sided, double row; two-sided, single row; two-sided, double row.

In single row rack arrangements, each slot of the rack holds one cylinder. For even numbered cylinder arrangements, each slot of a double row rack arrangement holds two cylinders. For odd numbered cylinder arrangements, each slot of the double row rack arrangement holds two cylinders except for the final slot, which holds a single cylinder.

NOTE: Double row rack arrangements are shipped with one single-row style threaded rod in addition to the double-row style threaded rods. When installing an odd number of cylinders, use the single-row style threaded rod in place of a double-row style threaded rod on the outer edge of the slot to contain the single cylinder.

Section 4 Cylinder Mounting

Figure 4.1b Cylinder Strap, Single Cylinder Example



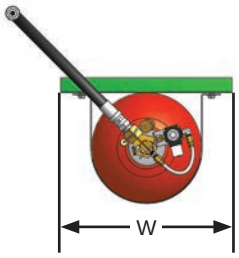
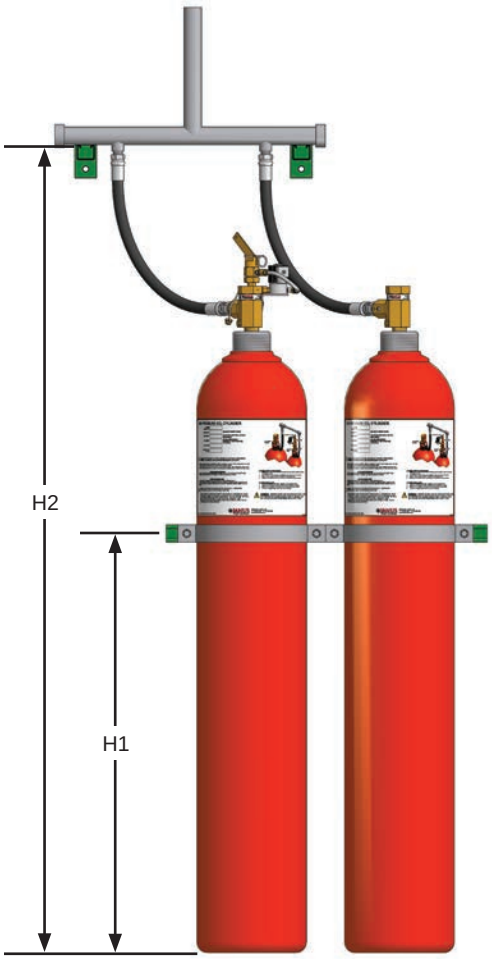


Table 4.1b - Cylinder Strap Mounting Dimensions

P/N	Cylinder	H1		W	
		in	mm	in	mm
99758	50 lb	32.0	813	14.0	356
99757	75 lb	36.0	914	14.0	356
99747	100 lb	39.0	991	14.0	356

Figure 4.1c Cylinder Strap, Double Cylinder Example





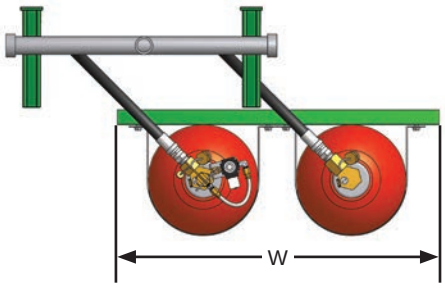


Table 4.1c - Cylinder Strap Mounting Dimensions

P/N	Cylinder	H1		H2		W	
		in	mm	in	mm	in	mm
99758	50 lb	32.0	813	67.0	1702	28.0	711
99757	75 lb	36.0	914	74.0	1880	28.0	711
99747	100 lb	39.0	991	75.5	1918	28.0	711

Section 4 Cylinder Mounting

4.2.1 Common Rack Components

The following components are common to all wall-mount and floor-mount cylinder rack arrangements.

4.2.1.1 Threaded Rod

(See Table 4.2.1.1 for P/N)

A threaded rod is fastened to the unistrut back channel using a 1/2"-13 twirl nut on either side of a cylinder. This forms a slot to support and restrain the cylinder during discharge.

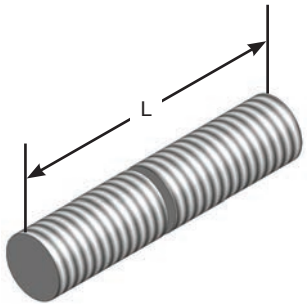


Figure 4.2.1.1 Threaded Rod

Table 4.2.1.1 - Threaded Rod Dimensions			
P/N	Row Type	Length (L)	
		in	mm
99713	Single	9	229
99712	Double	20	508

4.2.1.2 Manifold Bracket

(See Table 4.2.1.2 for P/N)

Manifold brackets are used to provide support for the discharge manifold.

In wall-mount rack arrangements, the brackets are mounted to the wall at heights as shown in Table 4.1c. Single row wall-mount arrangements of 5 or less cylinders and double row wall-mount arrangements of 10 or less cylinders require one manifold bracket to be installed at each end of the manifold. All other wall-mount arrangements require these brackets and an additional manifold bracket placed halfway between them.

In one-sided floor-mount rack arrangements, one manifold bracket must be installed to each vertical support bar 75.5 in (1918 mm) off the floor. Two-sided floor-mount arrangements require a manifold bracket to be installed at this position on each side of the vertical support bars.

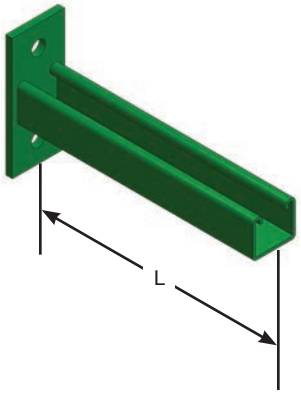


Figure 4.2.1.2 Manifold Bracket

Table 4.2.1.2 - Manifold Bracket Dimensions			
P/N	Row Type	Length (L)	
		in	mm
99716	Single	9	229
99715	Double	18	457

4.2.1.3 Strut Rail

One-Sided P/N 18404; Two-Sided P/N 99709 (See Figure 4.2.1.3)

Unistrut Rail is used as the back channel for both cylinders mounted using cylinder straps and mounted using the wall-mount rack arrangement.

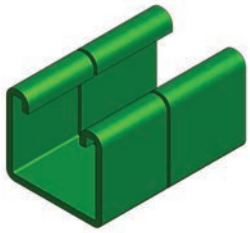


Figure 4.2.1.3 Strut Rail

In floor-mount rack arrangements, Unistrut Rail is used as the horizontal cylinder support channel to which cylinders are restrained in addition to being used as an overhead horizontal support bar and as vertical support bars that secure the rack to the floor. Two-sided floor-mount racks utilize double-sided Unistrut Rail. All other arrangements use single-sided Unistrut Rail.

One-sided, single row floor-mount rack arrangements containing more than 6 cylinders, two-sided, single row and one-sided, double row floor-mount rack arrangements containing more than 12 cylinders, and two-sided, double row cylinders containing more than 24 cylinders require a third vertical support bar installed halfway between the two outside vertical support bars.

4.2.1.4 Cylinder Half Strap

P/N 99714 (See Figure 4.2.1.4)

A cylinder half strap is installed onto the threaded rods for each cylinder slot to secure the cylinder(s) within the slot.

The cylinder half strap must always be installed so that it is flush against the cylinder. For double row rack arrangements containing an odd number of cylinders, this means that the strap placed on the slot containing one cylinder must be installed before the strap on the adjacent cylinder slot.



Figure 4.2.1.4 Cylinder Half Strap

⚠ CAUTION

Failure to secure the cylinder half strap flush against a cylinder when installing a cylinder rack may result in violent and dangerous movement of the cylinder during discharge.

4.2.2 Floor-Mount Components

The following components are used only in floor-mount rack arrangements.

4.2.2.1 Strut Cross

P/N 99721 (See Figure 4.2.2.1)

In floor-mount rack arrangements requiring three vertical support bars, a strut cross is used to attach the central vertical support bar to the horizontal cylinder support channel. A separate cross must be installed on each side of the rack in two-sided rack arrangements.



Figure 4.2.2.1 Strut Cross

4.2.2.2 Strut Tee

P/N 99722 (See Figure 4.2.2.2)

Strut tees are used in floor-mount rack arrangements to attach each outside vertical support bar to the horizontal cylinder support channel. An additional strut tee is used in rack arrangements requiring three vertical support bars to attach the central vertical support bar to the overhead horizontal support bar. In two-sided rack arrangements, an additional tee must be installed on the opposite side of the rack for each location requiring installation of a strut tee.



Figure 4.2.2.2 Strut Tee

Section 4 Cylinder Mounting

4.2.2.3 Strut Corner

P/N 99720 (See Figure 4.2.2.3)

Strut corners are used in floor-mount rack arrangements to attach each outside vertical support bar to the overhead horizontal support bar. In two-sided rack arrangements, a strut corner must be installed on both sides of each outside vertical support bar.

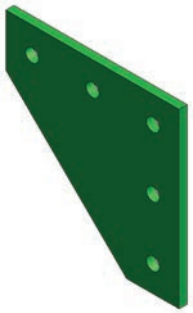


Figure 4.2.2.3 Strut Corner

4.2.2.4 Strut Corner Base

P/N 99719 (See Figure 4.2.2.4)

Strut corner bases are installed in floor-mount rack arrangements at the bottom of each outside vertical support bar to allow the rack to be bolted to the floor (floor bolts provided by installer). In two-sided rack arrangements, a strut corner base must be installed on both sides of each outside vertical support bar.



Figure 4.2.2.4 Strut Corner Base

4.2.2.5 Center Base

One-Sided P/N 99718; Two-Sided P/N 99717 (See Figure 4.2.2.5)

In floor-mount arrangements that require three vertical support bars, a center base is installed at the bottom of the central vertical support bar to allow the rack to be bolted to the floor (floor bolts provided by installer). The style of center base used depends on whether the rack arrangement is one-sided or two-sided.

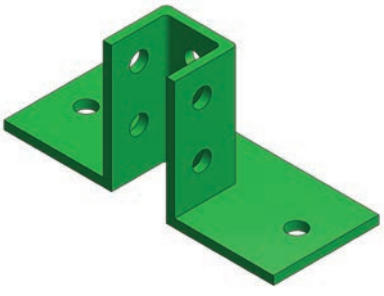


Figure 4.2.2.5a One-Sided Center Base

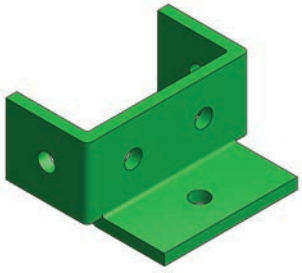


Figure 4.2.2.5b Two-Sided Center Base

4.2.2.6 Pipe Clamp

(See Table 4.2.2.6 for P/N)

A pipe clamp is installed on each manifold bracket to secure the manifold to the cylinder rack. Pipe clamps are ordered according to manifold size.

Table 4.2.2.6 - Pipe Clamp Part Numbers					
P/N	Nominal Pipe Size		P/N	Nominal Pipe Size	
	in	mm		in	mm
99674	1/2	15	99671	1-1/2	40
99673	3/4	20	99670	2	50
99672	1-1/4	32	99669	3	80

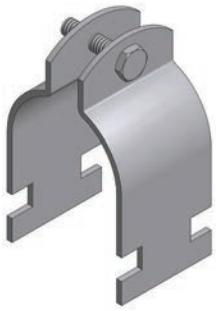


Figure 4.2.2.6 Pipe Clamp

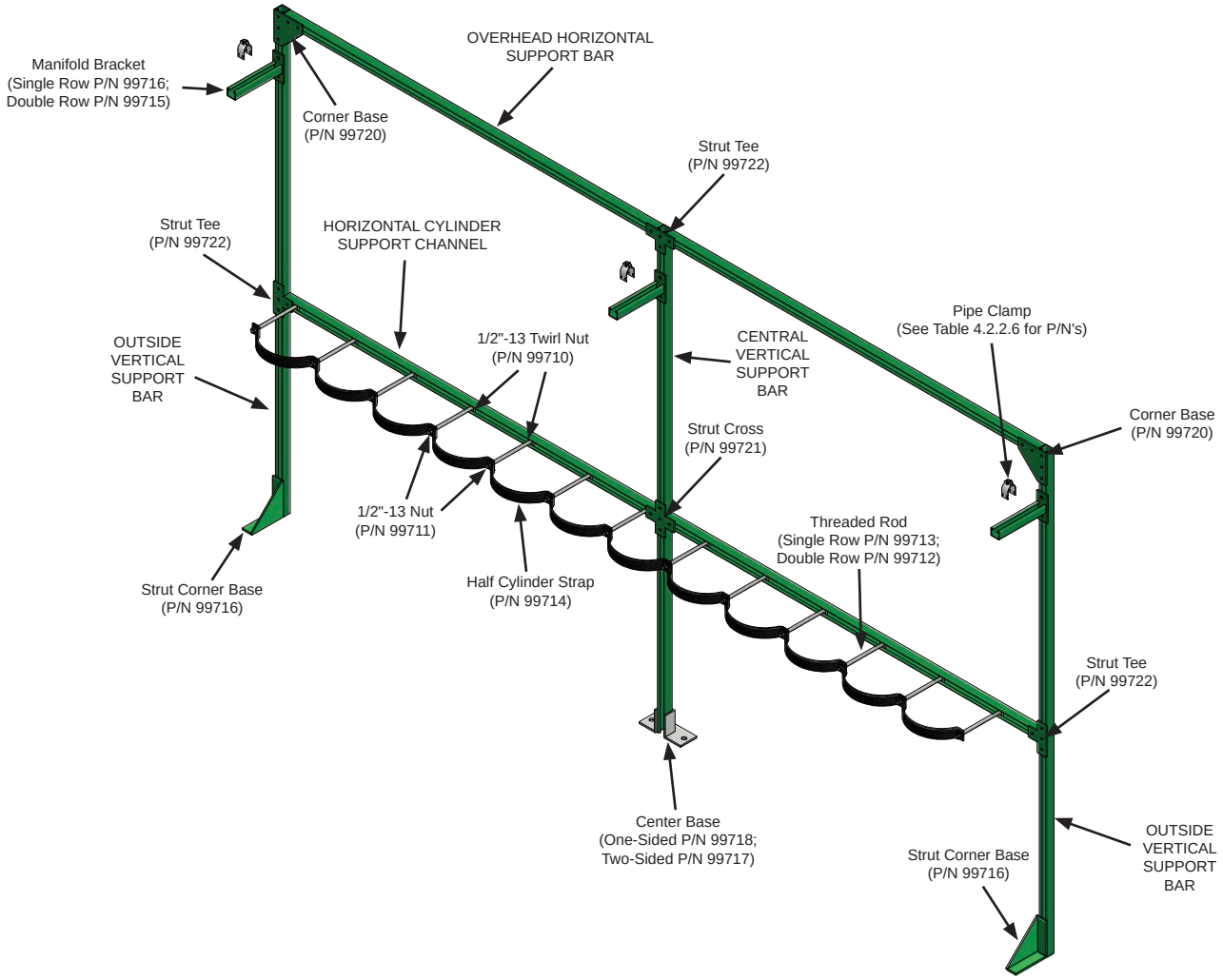


Figure 4.2.2a Typical Floor-Mount Rack Arrangement

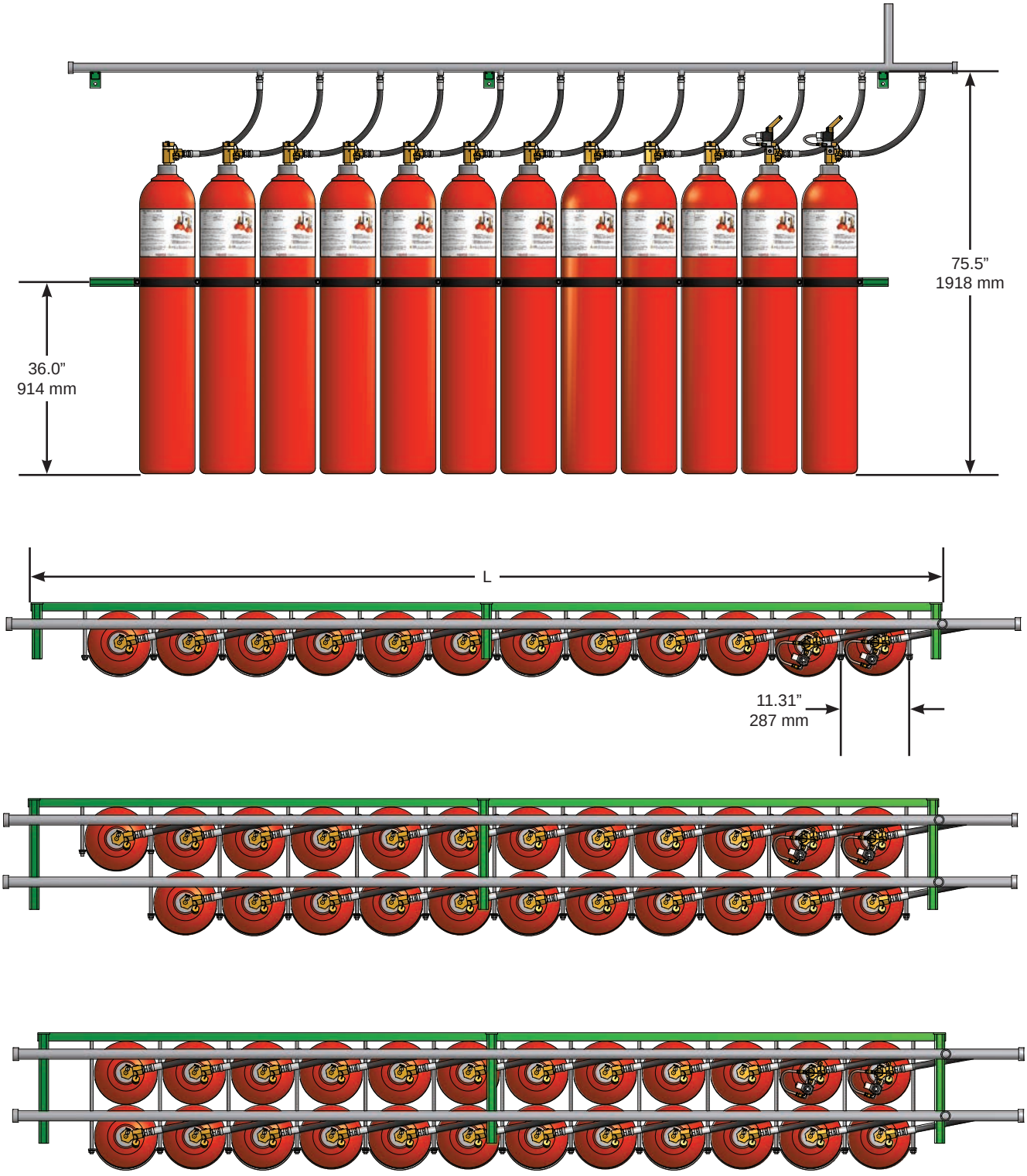
Section 4 Cylinder Mounting

Table 4.2.1a - Wall-Mount Cylinder Rack Kit Part Order Matrix - Single Row								
Cylinder Rack Kit P/N	Number of Cylinders	Length of Strut (L) (P/N 18604)		Number of Manifold Brackets Single Row Style (P/N 99716)	Number of Threaded Rods Single Row Style (P/N 99713)	Number of Half Cylinder Straps (P/N 99714)	Number of 1/2"-13 Nuts (P/N 99711)	Number of 1/2"-13 Twirl Nuts (P/N 99710)
		in	m					
99761-103	3	38	965	2	4	3	3	3
99761-104	4	50	1270	2	5	4	4	4
99761-105	5	62	1575	2	6	5	5	5
99761-106	6	74	1880	3	7	6	6	6
99761-107	7	88	2235	3	8	7	7	7
99761-108	8	100	2540	3	9	8	8	8
99761-109	9	112	2845	3	10	9	9	9
99761-110	10	124	3150	3	11	10	10	10
99761-111	11	136	3454	3	12	11	11	11
99761-112	12	148	3759	3	13	12	12	12

Table 4.2.1b - Wall-Mount Cylinder Rack Kit Part Order Matrix - Double Row								
Cylinder Rack Kit P/N	Number of Cylinders	Length of Strut (L) (P/N 18604)		Number of Manifold Brackets Double Row Style (P/N 99715)	Number of Threaded Rods Double Row Style[1] (P/N 99712)	Number of Half Cylinder Straps (P/N 99714)	Number of 1/2"-13 Nuts (P/N 99711)	Number of 1/2"-13 Twirl Nuts (P/N 99710)
		in	mm					
99761-202	3 or 4	26	660	2	3	2	4	3
99761-203	5 or 6	38	965	2	4	3	5	4
99761-204	7 or 8	50	1270	2	5	4	6	5
99761-205	9 or 10	62	1575	2	6	5	7	6
99761-206	11 or 12	74	1880	3	7	6	8	7
99761-207	13 or 14	88	2235	3	8	7	9	8
99761-208	15 or 16	100	2540	3	9	8	10	9
99761-209	17 or 18	112	2845	3	10	9	11	10
99761-210	19 or 20	124	3150	3	11	10	12	11
99761-211	21 or 22	136	3454	3	12	11	13	12
99761-212	23 or 24	148	3759	3	13	12	14	13

[1] Double row rack arrangements are shipped with one single-row style threaded rod in addition to the double-row style threaded rods. When installing an odd number of cylinders, use the single-row style threaded rod in place of a double-row style threaded rod on the outer edge of the slot to contain the single cylinder as illustrated in Figure 4.2.1.

Figure 4.2.1 Wall-Mount Cylinder Rack Arrangements



Section 4 Cylinder Mounting

Table 4.2.2a - Floor-Mount Cylinder Rack Kit Part Order Matrix - One-Sided, Single Row

Cylinder Rack Kit Part Number	Number of Cylinders	Length of Strut Single-Sided (P/N 18604)		Strut Tee (P/N 99722)	Strut Cross (P/N 99721)	Strut Corner (P/N 99720)	Strut Corner Base (P/N 99719)	Center Base Single Sided (P/N 99718)	Number of Manifold Brackets Single Row Style (P/N 99716)	Number of Threaded Rods Single Row Style (P/N 99713)	Number of Half Cylinder Straps (P/N 99714)	Number of 1/2"-13 Nuts (P/N 99711)	Number of 1/2"-13 Twirl Nuts (P/N 99710)	Number of 1/2"-13 Bolts (P/N 99681)
		in	mm											
99708-112	2	228	5791	2	0	2	2	0	2	3	2	3	23	20
99708-113	3	252	6401	2	0	2	2	0	2	4	3	4	24	20
99708-114	4	276	7010	2	0	2	2	0	2	5	4	5	25	20
99708-115	5	300	7620	2	0	2	2	0	2	6	5	6	26	20
99708-116	6	324	8230	2	0	2	2	0	2	7	6	7	27	20
99708-117	7	444	11278	3	1	2	2	1	3	8	7	8	39	31
99708-118	8	468	11887	3	1	2	2	1	3	9	8	9	40	31
99708-119	9	492	12497	3	1	2	2	1	3	10	9	10	41	31
99708-110	10	516	13106	3	1	2	2	1	3	11	10	11	42	31
99708-11A	11	540	13716	3	1	2	2	1	3	12	11	12	43	31
99708-11B	12	564	14326	3	1	2	2	1	3	13	12	13	44	31

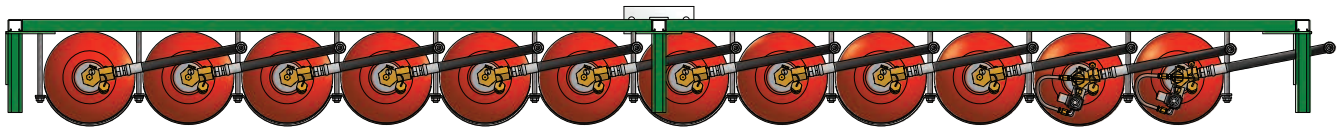


Figure 4.2.2b Floor-Mount Cylinder Rack One-Sided, Single Row Arrangement, 12 Cylinders

Figure 4.2.2c Floor-Mount Cylinder Rack One-Sided, Single Row Arrangement Dimensions

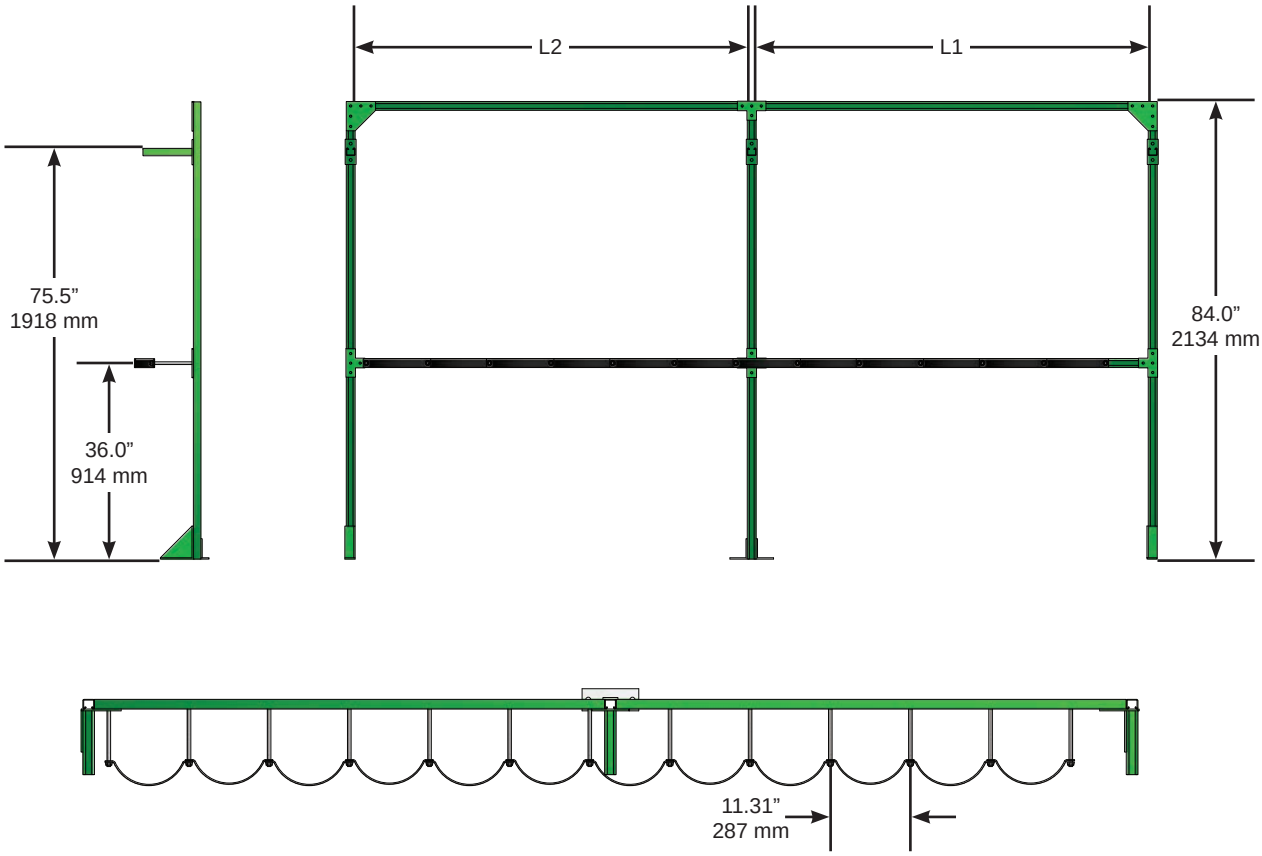


Table 4.2.2b - Floor-Mount Cylinder Rack Kit - One-Sided, Single Row Dimensions					
Cylinder Rack Kit Part Number	Number of Cylinders	L1		L2	
		in	mm	in	mm
99708-112	2	26.0	660	N/A	N/A
99708-113	3	38.0	965	N/A	N/A
99708-114	4	50.0	1270	N/A	N/A
99708-115	5	62.0	1575	N/A	N/A
99708-116	6	74.0	1880	N/A	N/A
99708-117	7	74.0	1880	14.0	356
99708-118	8	74.0	1880	26.0	660
99708-119	9	74.0	1880	38.0	965
99708-110	10	74.0	1880	50.0	1270
99708-11A	11	74.0	1880	62.0	1575
99708-11B	12	74.0	1880	74.0	1880

Section 4 Cylinder Mounting

Table 4.2.2c - Floor-Mount Cylinder Rack Kit Part Order Matrix - One-Sided, Double Row

Cylinder Rack Kit Part Number	Number of Cylinders	Length of Strut (P/N 18604)		Strut Tee (P/N 99722)	Strut Cross (P/N 99721)	Strut Corner (P/N 99720)	Strut Corner Base (P/N 99719)	Center BaseSingle Sided (P/N 99718)	Number of Manifold Brackets Double Row Style (P/N 99715)	Number of Threaded Rods Single Row Style (P/N 99713)	Number of Threaded Rods Double Row Style (P/N 99712)	Number of Half Cylinder Straps (P/N 99714)	Number of 1/2"-13 Nuts (P/N 99711)	Number of 1/2"-13 Twirl Nuts (P/N 99710)	Number of 1/2"-13 Bolts (P/N 99681)
		in	mm												
99708-122	3 or 4	228	5791	2	0	2	2	0	2	1	3	2	4	23	20
99708-123	5 or 6	252	6401	2	0	2	2	0	2	1	4	3	5	24	20
99708-124	7 or 8	276	7010	2	0	2	2	0	2	1	5	4	6	25	20
99708-125	9 or 10	300	7620	2	0	2	2	0	2	1	6	5	7	26	20
99708-126	11 or 12	324	8230	2	0	2	2	0	2	1	7	6	8	27	20
99708-127	13 or 14	444	11278	3	1	2	2	1	3	1	8	7	9	39	31
99708-128	15 or 16	468	11887	3	1	2	2	1	3	1	9	8	10	40	31
99708-129	17 or 18	492	12497	3	1	2	2	1	3	1	10	9	11	41	31
99708-120	19 or 20	516	13106	3	1	2	2	1	3	1	11	10	12	42	31
99708-12A	21 or 22	540	13716	3	1	2	2	1	3	1	12	11	13	43	31
99708-12B	23 or 24	564	14326	3	1	2	2	1	3	1	13	12	14	44	31

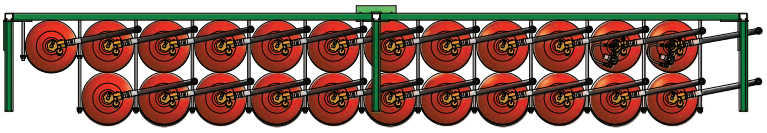


Figure 4.2.2d Floor-Mount Cylinder Rack One-Sided, Double Row Arrangement, 23 Cylinders (P/N 99708-12B)

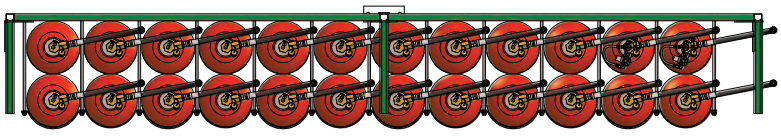


Figure 4.2.2e Floor-Mount Cylinder Rack One-Sided, Double Row Arrangement, 24 Cylinders (P/N 99708-12B)

Figure 4.2.2f Floor-Mount Cylinder Rack One-Sided, Double Row Arrangement Dimensions

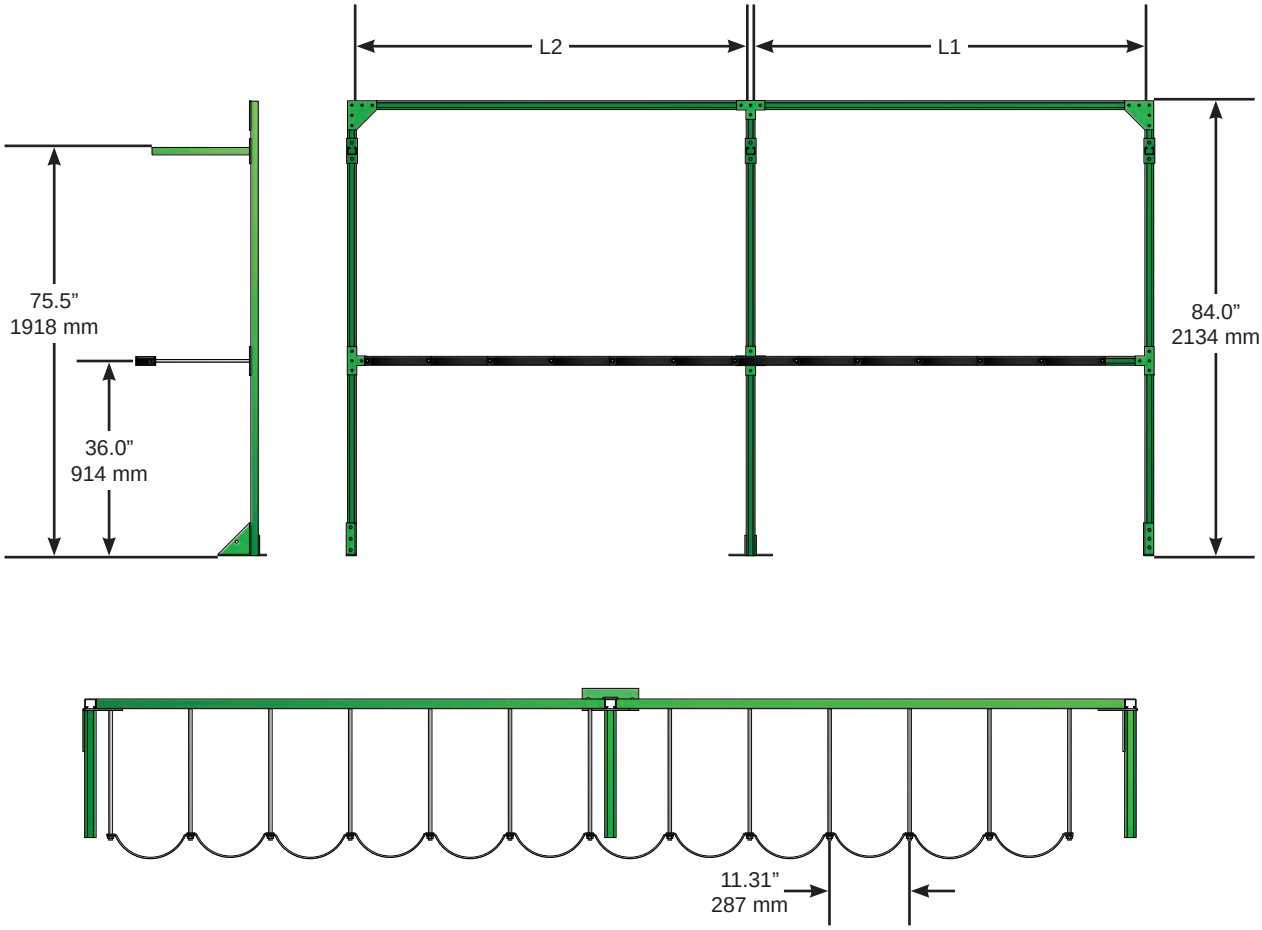


Table 4.2.2d - Floor-Mount Cylinder Rack Kit - One-Sided, Double Row Dimensions					
Cylinder Rack Kit Part Number	Number of Cylinders	L1		L2	
		in	mm	in	mm
99708-122	3 or 4	26.0	660	N/A	N/A
99708-123	5 or 6	38.0	965	N/A	N/A
99708-124	7 or 8	50.0	1270	N/A	N/A
99708-125	9 or 10	62.0	1575	N/A	N/A
99708-126	11 or 12	74.0	1880	N/A	N/A
99708-127	13 or 14	74.0	1880	14.0	356
99708-128	15 or 16	74.0	1880	26.0	660
99708-129	17 or 18	74.0	1880	38.0	965
99708-120	19 or 20	74.0	1880	50.0	1270
99708-12A	21 or 22	74.0	1880	62.0	1575
99708-12B	23 or 24	74.0	1880	74.0	1880

Section 4 Cylinder Mounting

Table 4.2.2e - Floor-Mount Cylinder Rack Kit Part Order Matrix - Two-Sided, Single Row

Cylinder Rack Kit Part Number	Number of Cylinders	Length of Strut Double-Sided (P/N 99709)		Strut Tee (P/N 99722)	Strut Cross (P/N 99721)	Strut Corner (P/N 99720)	Strut Corner Base (P/N 99719)	Center Base Double Sided (P/N 99717)	Number of Manifold Brackets Single Row Style (P/N 99716)	Number of Threaded Rods Single Row Style (P/N 99713)	Number of Half Cylinder Straps (P/N 99714)	Number of 1/2"-13 Nuts (P/N 99711)	Number of 1/2"-13 Twirl Nuts (P/N 99710)	Number of 1/2"-13 Bolts (P/N 99681)
		in	mm											
99708-212	3 or 4	228	5791	4	0	4	4	0	4	6	4	6	46	40
99708-213	5 or 6	252	6401	4	0	4	4	0	4	8	6	8	48	40
99708-214	7 or 8	276	7010	4	0	4	4	0	4	10	8	10	50	40
99708-215	9 or 10	300	7620	4	0	4	4	0	4	12	10	12	52	40
99708-216	11 or 12	324	8230	4	0	4	4	0	4	14	12	14	54	40
99708-217	13 or 14	444	11278	6	2	4	4	1	6	16	14	16	76	60
99708-218	15 or 16	468	11887	6	2	4	4	1	6	18	16	18	78	60
99708-219	17 or 18	492	12497	6	2	4	4	1	6	20	18	20	80	60
99708-210	19 or 20	516	13106	6	2	4	4	1	6	22	20	22	82	60
99708-21A	21 or 22	540	13716	6	2	4	4	1	6	24	22	24	84	60
99708-21B	23 or 24	564	14326	6	2	4	4	1	6	26	24	26	86	60

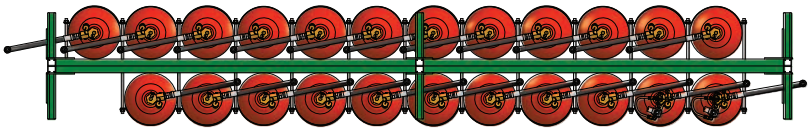


Figure 4.2.2g Floor-Mount Cylinder Rack Two-Sided, Single Row Arrangement, 23 Cylinders (P/N 99708-21B)

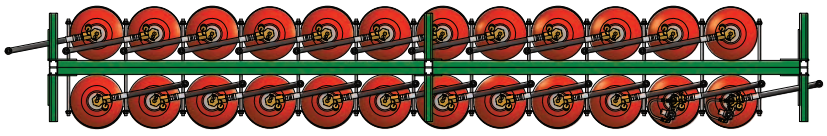


Figure 4.2.2h Floor-Mount Cylinder Rack Two-Sided, Single Row Arrangement, 24 Cylinders (P/N 99708-21B)

Figure 4.2.2i Floor-Mount Cylinder Rack Two-Sided, Single Row Arrangement Dimensions

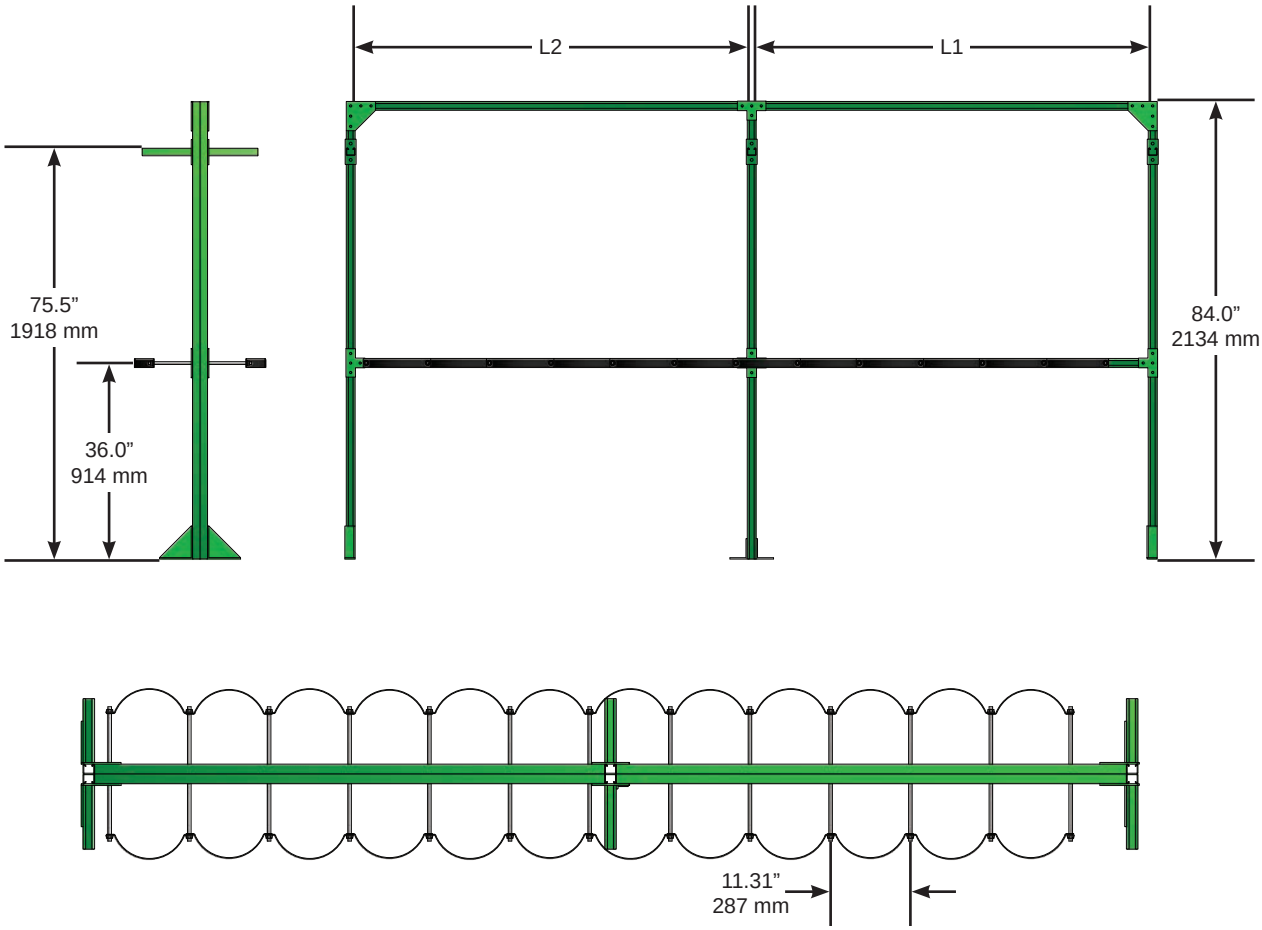


Table 4.2.2f - Floor-Mount Cylinder Rack Kit - Two-Sided, Single Row Dimensions					
Cylinder Rack Kit Part Number	Number of Cylinders	L1		L2	
		in	mm	in	mm
99708-212	3 or 4	26.0	660	N/A	N/A
99708-213	5 or 6	38.0	965	N/A	N/A
99708-214	7 or 8	50.0	1270	N/A	N/A
99708-215	9 or 10	62.0	1575	N/A	N/A
99708-216	11 or 12	74.0	1880	N/A	N/A
99708-217	13 or 14	74.0	1880	14.0	356
99708-218	15 or 16	74.0	1880	26.0	660
99708-219	17 or 18	74.0	1880	38.0	965
99708-210	19 or 20	74.0	1880	50.0	1270
99708-21A	21 or 22	74.0	1880	62.0	1575
99708-21B	23 or 24	74.0	1880	74.0	1880

Section 4 Cylinder Mounting

Table 4.2.2g - Floor-Mount Cylinder Rack Kit Part Order Matrix - Two-Sided, Double Row

Cylinder Rack Kit Part Number	Number of Cylinders	Length of Strut Double-Sided (P/N 99709)		Strut Tee (P/N 99722)	Strut Cross (P/N 99721)	Strut Corner (P/N 99720)	Strut Corner Base (P/N 99719)	Center Base Double Sided (P/N 99717)	Number of Manifold Brackets Double Row Style (P/N 99715)	Number of Threaded Rods Single Row Style (P/N 99713)	Number of Threaded Rods Double Row Style (P/N 99712)	Number of Half Cylinder Straps (P/N 99714)	Number of 1/2"-13 Nuts (P/N 99711)	Number of 1/2"-13 Twirl Nuts (P/N 99710)	Number of 1/2"-13 Bolts (P/N 99681)
		in	mm												
99708-222	5, 6, 7 or 8	228	5791	4	0	4	4	0	4	1	6	4	7	46	40
99708-223	9, 10, 11 or 12	252	6401	4	0	4	4	0	4	1	8	6	9	48	40
99708-224	13, 14, 15 or 16	276	7010	4	0	4	4	0	4	1	10	8	11	50	40
99708-225	17, 18, 19 or 20	300	7620	4	0	4	4	0	4	1	12	10	13	52	40
99708-226	21, 22, 23 or 24	324	8230	4	0	4	4	0	4	1	14	12	15	54	40
99708-227	25, 26, 27 or 28	444	11278	6	2	4	4	1	6	1	16	14	17	76	60
99708-228	29, 30, 31 or 32	468	11887	6	2	4	4	1	6	1	18	16	19	78	60
99708-229	33, 34, 35 or 36	492	12497	6	2	4	4	1	6	1	20	18	21	80	60
99708-220	37, 38, 39 or 40	516	13106	6	2	4	4	1	6	1	22	20	23	82	60
99708-22A	41, 42, 43 or 44	540	13716	6	2	4	4	1	6	1	24	22	25	84	60
99708-22B	45, 46, 47 or 48	564	14326	6	2	4	4	1	6	1	26	24	27	86	60

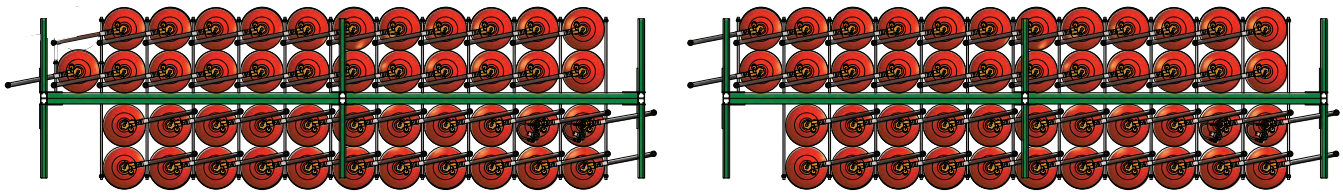


Figure 4.2.2j Floor-Mount Cylinder Rack Two-Sided, Double Row Arrangement, 45 and 46 Cylinders (P/N 99708-22B)

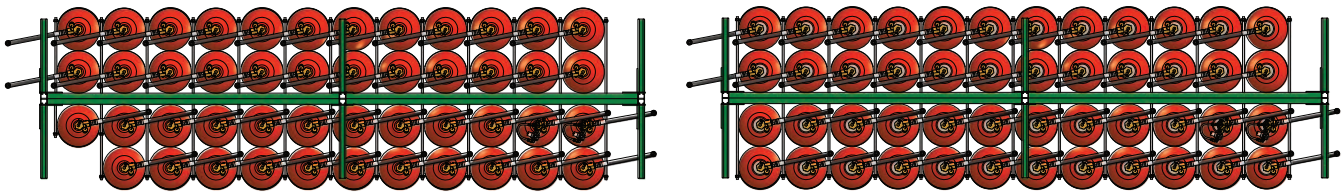


Figure 4.2.2k Floor-Mount Cylinder Rack Two-Sided, Double Row Arrangement, 47 and 48 Cylinders (P/N 99708-22B)

Figure 4.2.2l Floor-Mount Cylinder Rack Two-Sided, Double Row Arrangement Dimensions

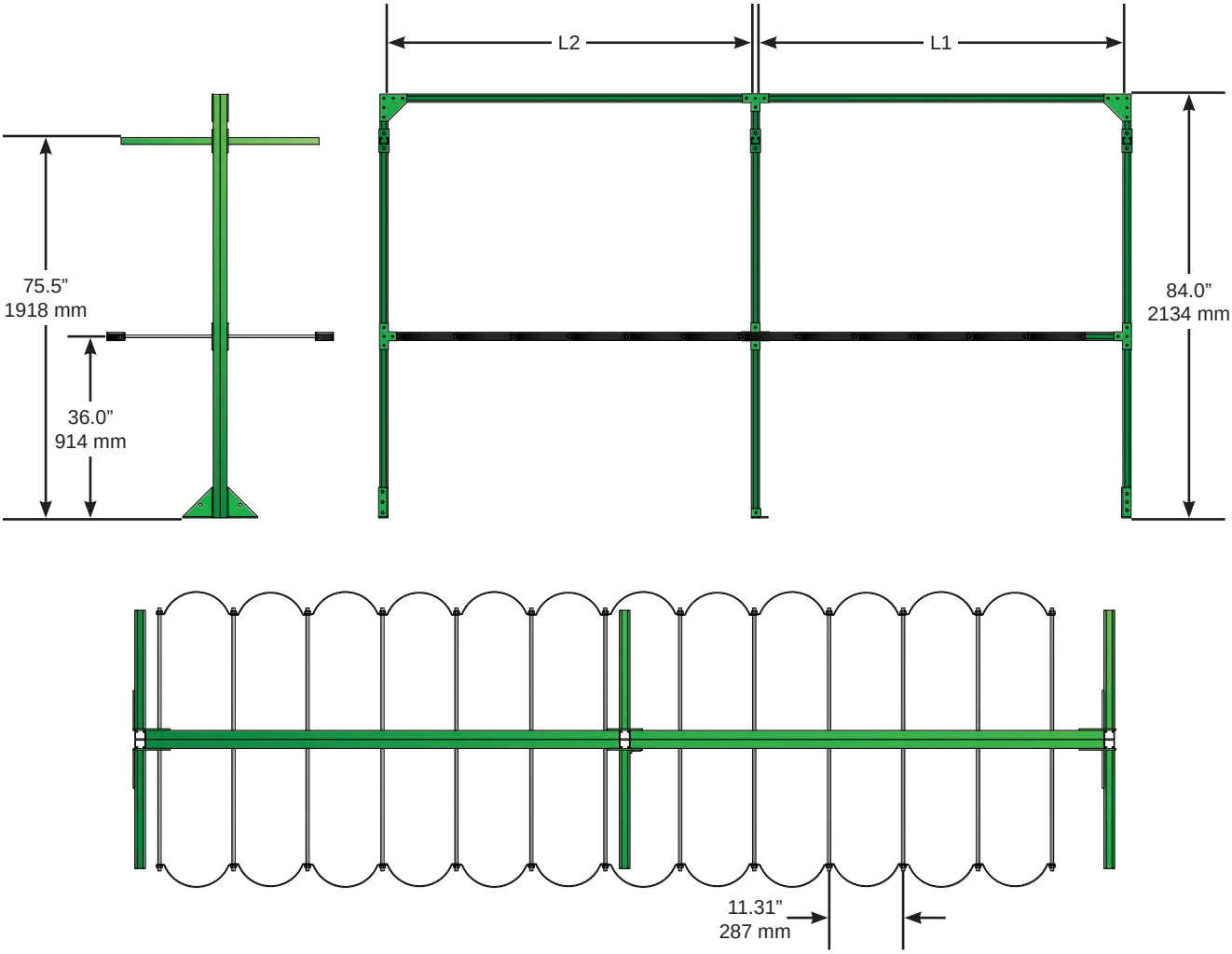


Table 4.2.2h - Floor-Mount Cylinder Rack Kit - Two-Sided, Double Row Dimensions					
Cylinder Rack Kit Part Number	Number of Cylinders	L1		L2	
		in	mm	in	mm
99708-222	5, 6, 7 or 8	26.0	660	N/A	N/A
99708-223	9, 10, 11 or 12	38.0	965	N/A	N/A
99708-224	13, 14, 15 or 16	50.0	1270	N/A	N/A
99708-225	17, 18, 19 or 20	62.0	1575	N/A	N/A
99708-226	21, 22, 23 or 24	74.0	1880	N/A	N/A
99708-227	25, 26, 27 or 28	74.0	1880	14.0	356
99708-228	29, 30, 31 or 32	74.0	1880	26.0	660
99708-229	33, 34, 35 or 36	74.0	1880	38.0	965
99708-220	37, 38, 39 or 40	74.0	1880	50.0	1270
99708-22A	41, 42, 43 or 44	74.0	1880	62.0	1575
99708-22B	45, 46, 47 or 48	74.0	1880	74.0	1880

Section 4 Cylinder Mounting

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5 SYSTEM INSTALLATION

The installation of the Janus Fire Systems® High-Pressure Carbon Dioxide Fire Extinguishing System should be undertaken by competent mechanical and electrical technicians familiar with NFPA 12 and with the installation of high-pressure carbon dioxide systems who have reviewed this manual and all hazard drawings and calculations. Standard tools are required to assemble the equipment.

A complete hazard analysis and system design, including a drawing of the system layout, must be completed before the installation of any system and submitted to the authority having jurisdiction (AHJ). The design, drawings, and material list should be compared with conditions found on site. Cylinder size and agent fill must match design calculations. Temperature and humidity of the area must be within system limitations and room integrity must be consistent with the initial design. All components should be inspected for shipping damage.

Materials such as pipe, pipe fittings, tubing, tube fittings, conduit, EMT, wire, hangers and brackets, and all standard mounting hardware, etc., are not typically provided as part of the system supply. These items are to be provided by the installer to suit the installation specifications and the requirements for the specific system.

All materials used for the installation must be new, free from all defects and imperfections, and be of a grade and type as indicated below. Items not specifically covered should be of a grade and type to suit the intended service. All materials should be produced by recognized commercial manufacturers.

The complete installation should be carried out in accordance with the current issue of the applicable national, state, provincial, municipal and local codes and standards. Typically these consists of NFPA 12 - Carbon Dioxide Extinguishing Systems, NFPA 72 - The National Electrical Code, as well as local building and fire codes or local norms.

Specific projects may have requirements for other special codes or standards such as the Fire Commissioner, Coast Guard, Armed Forces, Factory Mutual, etc. Where two or more standards or codes are in conflict, the most stringent requirement applies.

Prior to installation, all materials should be protected from damage and stored in a clean, dry location.

All tools and installation equipment should be provided by the installer. Wrenches and other tools must be the correct size for the components to be installed. Unless stated otherwise, all components should be installed wrench tight. Where a gasket is provided, components should be tightened to ensure an effective seal.

The project drawings will generally identify the work to be performed, however, it is the installer's responsibility to visit the site and become familiar with both the jobsite and the working conditions.

5.1 Distribution System

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

Where piping is in severely corrosive atmospheres, special corrosion-resistant materials or coatings shall be used.

At a minimum, pipe and fittings shall conform to National Fire Protection Association (NFPA) 12 - Standard on Carbon Dioxide Extinguishing System (current edition) or ASME B31.1: Power Piping (or equivalent).

This includes the use of other materials such as brass, copper, stainless steel, flexible hose, etc. provided that they satisfy the system pressure/temperature requirements (working pressure of 3,000 psi [207 bar]). Pipe and fittings should have a minimum burst pressure (not working pressure) of 5,000 psi (345 bar).

The project drawings will indicate the specific piping materials to be utilized for each project. As the type of piping materials to be utilized are incorporated into the system flow/pressure loss design, the system designer must be contacted if materials other than those specified are used, and the designers approval must be received.

5.2 Hangers and Bracing

All system piping, both vertical and horizontal, must be suitably supported with hangers conforming to the latest requirements of ASME B31.1.

Pipe hangers should be capable of supporting the pipe under all conditions of operation and service. They should allow for the expansion and contraction of the piping, and should prevent pipe loads and stresses from being transmitted into connected equipment. Hangers and supports should be of rugged design and installed so that they will not be loosened by movement of the supported pipe. U-bolts with double nuts should be used.

Pipes must be braced or anchored to the building structure such as beams, columns, concrete walls, etc., in order to prevent longitudinal and lateral movement and sway. Carbon dioxide piping must not be hung or supported from other piping systems (i.e. water, compressed air, etc.).

Large forces are exerted on the system cylinders and piping during discharge. Each section of pipe must be braced or secured to restrict both the vertical and lateral movement. Where practical, riser piping should be supported independently of the connected horizontal piping. A support must be installed adjacent to each discharge nozzle and wherever a change in pipe direction occurs.

In addition, for some regions classified as earthquake zones, or for projects such as nuclear sites subject to unique code requirements, special sway bracing and/or hangers may be required. Refer to the project and/or contract drawings for requirements of special bracing.

Generally, no section of pipe should be without a hanger or brace. Maximum spacing between hangers and hanger rod sizes should be as indicated as shown, which are in accordance with ASME B31.1.0.

Table 5.2 Hangar Spacing

Rod Size	3/8 in						1/2 in			5/8 in		3/4 in
Max Spacing	5 ft	6 ft	7 ft	9 ft	9 ft	10 ft	11 ft	12 ft	13 ft	14 ft	16 ft	17 ft
Pipe Size	1/2 in	3/4 in	1 in	1-1/4 in	1-1/2 in	2 in	2-1/2 in	3 in	3-1/2 in	4 in	5 in	6 in

5.3 Expansion Joints

A certain amount of contraction can occur, which is caused by a maximum temperature change in long continuous pipe runs. Approximately 1 inch per 100 feet of steel pipe. Often, as part of the natural layout of the system, a swing joint can serve to give the desired flexibility. In straight runs an expansion joint should be installed on the basis of one after approximately 100 feet of continuous run and after each 100 feet run thereafter.

5.4 Installing Cylinder Assemblies

Each cylinder assembly has safety features and components to ensure against accidental discharge during installation. Prior to starting work, the installer should become familiar with these features by reviewing the equipment, the appropriate data sheets, and the installation instructions.

All SW-50M cylinder valves are supplied with anti-recoil safety plugs screwed into the discharge ports. These plugs have a small hole drilled at right angles to the axis of the discharge port, so that if accidental discharge does occur, it will be diffused in a safe manner. In addition, the SW-50M cylinder valves have safety plugs to shield the manual actuation and solenoid actuation ports. These plugs must be in position whenever the cylinder assemblies are not secured and/or disconnected from the discharge piping. (The SW-50M valve is initiated by depressing the pilot valve stem in either of these ports.)

Actuators must only be assembled to the cylinder valves after the cylinders are secured in their brackets and connected to the discharge piping, which must be complete with nozzles, using the correct discharge bend assemblies.

⚠WARNING

Do not attach the manual actuator to the HPCO2 cylinder until it is verified that the cylinder is properly secured, that piping and nozzles are connected to the cylinder valve outlet, and that the protected hazard(s) is evacuated of all personnel in order to minimize the risk of potential injury or death caused by an accidental discharge.

⚠WARNING

Do not attach the solenoid valve to the HPCO2 cylinder until it is verified that the cylinder is properly secured, that piping and nozzles are connected to the cylinder valve outlet, and that the protected hazard(s) is evacuated of all personnel in order to minimize the risk of potential injury or death caused by an accidental discharge.

5.4.1 Cylinder Location

Carbon dioxide cylinders may be located inside or outside the protected space, although it is preferable to locate them outside the space. When they are installed within the space they protect, a remote manual control must be installed to ensure the system can be actuated from a safe location outside the fire area.

The cylinders should be located to provide convenient access so that they can be readily inspected and also easily removed after use for recharging. Do not install the cylinders where they will be exposed to the weather elements or the direct rays of the sun. Do not install the cylinders where they will be subjected to temperatures of less than 0˚F (-18˚C) or higher than 130˚F (54˚C) for total flooding systems and less than 32˚F (0˚C) or higher than 120˚F (49˚C) for local application systems, unless otherwise specified on the project drawings.

If cylinders are located in a hazardous area (explosive atmosphere), ensure that the cylinder solenoid control and all other components are approved for such use, and that the installation of all materials is made in an approved manner.

Cylinders are to be installed in the normal upright position. All cylinders are provided with a rigid dip tube.

5.4.2 Cylinder Installation

1. Fasten cylinder bracketing and manifold brackets securely onto a solid wall or floor or structural member using 1/2 in bolts with suitable anchors. Bolts must not be anchored into plaster or other facing materials. Cylinder brackets must be absolutely secure to withstand the discharge thrust forces. Be sure that threaded rods are inserted in channel before channel is permanently mounted.

2. Fasten cylinder securely in bracketing.

3. All carbon dioxide system cylinders are shipped with valve protection caps. Remove protection cap from the cylinder and coat it with a light film of grease. Protection caps should be stored close to the cylinders, where they will be readily available for re-installation when cylinders are disconnected from the system and/or transported for recharging.

5.5 Installing Pipe and Nozzles

Generally, drawings provide schematic piping layouts showing pipe diameter, pipe fittings, and conceptual pipe lengths utilized for the design calculations. The information shown should not be used for fabrication of pipe. The installer must verify that the pipe can be installed as indicated, and establish fabrication data based upon his inspection of the site. Changes to the piping that may be necessary to suit site conditions can critically affect the system flow balance. Any deviations to the piping must be approved by the designer prior to their implementation.

Where reducing fittings are called for on the installation drawings, hexagon bushing of 3,000 lbs forged steel may be used. Under no conditions should flush bushings or cast iron bushings be used. Bushings are not allowed for more than one pipe size reduction. If two reducing fittings are required to make the necessary reduction, they should be chosen to split the reduction equally.

Pipe should be reamed and cleaned before assembly, and after assembly the entire piping system should be blown out before nozzles and other devices are installed.

All valves (isolation and selector) not flanged should be installed with a flanged joint or union immediately downstream of the valve to facilitate inspection, repair, or replacement.

All pressure relief devices should be located and orientated so that the discharge of carbon dioxide will not injure personnel, damage equipment, or be otherwise objectionable.

A dirt trap and blow-out, consisting of a tee with a capped nipple 3 to 6 inches (76 to 152 mm) long, should be installed at the end of each pipe run.

Piping through walls, floors, etc. should be run through sleeves of Schedule 40 pipe at least two sizes larger than the pipe being run and not smaller than 1 inch. Sleeves through floor slabs should extend at least 2 inches above the floor. Sleeves should be packed with a fire resistant material so as to be dust and weather tight, as specified on project drawings.

5.5.1 Pipe and Manifold Installation

1. With cylinders properly mounted, attach discharge flex hose to cylinder valves, hand tight only.
2. Mount the header manifold using the discharge flex hose so that the least possible strain is put on the connections.
3. Disconnect the discharge flex hose from the cylinder valve. Connect the discharge flex hose to the manifold and tighten until wrench tight. NOTE: Male threads of the discharge flex hose must be wrapped with Teflon tape or pipe sealant.
4. For total flooding applications, nozzles should be located at the highest practical elevation within the enclosure. Except where more than one tier of nozzles is used, or special application conditions apply, the nozzle shall not be mounted more than 25% of the total enclosure height from the top of the enclosure and no hazards shall be located above the highest nozzle. For local applications, nozzles must be located exactly as shown on the project drawings.
5. There must not be any obstructions adjacent to the nozzles (structural columns or beams, ducts, cable trays, racks, equipment, etc.) that will affect the discharge patterns or disbursement of the carbon dioxide.
6. Install nozzle piping as shown on the project drawings. Be sure to fasten piping securely at each nozzle and change in direction of flow.
7. Run supply pipe from the hazard to the cylinder manifold.
8. Reconnect the discharge bends to the cylinders.

5.6 Installing Manual Actuator

⚠WARNING

Do not attach the manual actuator to the HPCO2 cylinder until it is verified that the cylinder is properly secured, that piping and nozzles are connected to the cylinder valve outlet, and that the protected hazard(s) is evacuated of all personnel in order to minimize the risk of potential injury or death caused by an accidental discharge.

1. Remove the manual actuation safety plug from the manual actuation port on top of the SW-50M cylinder valve.
2. Ensure that the piston in the actuator is in the retracted position and that the hand lever is secured with a lock-pin and sealed. Then install the actuator into the manual actuation port of the cylinder valve, wrench tight. (During servicing, if piston does not retract, the pressure on top of the piston must be relieved. Loosen then retighten the tube connector.)

   If any hissing or discharge of gas is noticed during connection of the actuator, stop at once and remove the actuator from the cylinder valve. Check the actuator. If no cause for the discharge is found contact the manufacturer.

3. To orientate the manual lever, unscrew the locking nut one quarter turn, rotate main body of the actuator to the position required, then retighten locking nut.

   IMPORTANT: Do not unscrew the locking nut more than one quarter turn.

4. If the manual actuator is to be used with the solenoid valve, remove the blank plug from the pressure port of the manual actuator and install the 1/8 inch (6 mm) solenoid JIC adaptor elbow that is supplied in the solenoid valve kit.

5.7 Installing Solenoid Valve Kit

Check the solenoid nameplate to ensure that the coil voltage agrees with the supply voltage of the system and the site conditions.

⚠WARNING

Do not attach the solenoid valve to the HPCO2 cylinder until it is verified that the cylinder is properly secured, that piping and nozzles are connected to the cylinder valve outlet, and that the protected hazard(s) is evacuated of all personnel in order to minimize the risk of potential injury or death caused by an accidental discharge.

1. A cable and connector assembly is provided to connect the solenoid to the electric actuating circuit. It is therefore necessary to provide only a junction box conveniently located close to the cylinder valve for connection to the electric actuating circuit.

2. On completion of all testing, follow the steps outlined below to connect the solenoid valve to the solenoid actuation port located near the top of the SW-50M cylinder valve, AFTER first confirming that there is no electric power being applied to the solenoid and that all o-rings are in place:

   a) secure the mounting bracket square to the valve

   b) connect the solenoid valve loosely to the bracket with the screws supplied (do not tighten screws at this time)

   c) attach the solenoid to the pressure connection of the cylinder valve finger tight and then wrench tight another 1/4 to 1/2 turn maximum. A slight discharge (puff) of carbon dioxide might occur as this connection is made

⚠WARNING

Overtightening the solenoid connection to the valve could cause the hex nut to break and create the possibility of an accidental discharge and/or pieces of the solenoid assembly becoming projectiles.

   d) tighten the screws holding the solenoid to the bracket

3. Install the 3/16 inch actuation flex hose to connect the solenoid valve exhaust port to the manual actuator.

5.8 Electrical Installation

The power supply for the system operation or for the control panel, must be from a separate circuit breaker or fuse taken from the building's main power supply, preferably with an emergency back-up supply. No other equipment is powered from the same circuit breaker or fuse.

The carbon dioxide system wiring, devices, and components should not have any connection to ground except as may be specifically noted on the drawings or in the manuals. All wiring must be tested to ensure it is free of any grounds or shorts prior to connection to system components. In addition, prior to final connection of the electrical control to the solenoid actuators, the completed electrical system must be tested.

For the installation of the system control panel and associated devices, refer to the panel manufacturer's installation manual for the acceptable installation, connection and testing information. Only materials listed or approved for the intended purpose are to be used in the installation. All wiring must be mechanically protected from damage.

The detectors must be installed in accordance with their listings and manufacturer's recommendations for the specific detector in addition to NFPA 72. Installation codes and other Authorities Having Jurisdiction may specify the location for detectors. However, the more stringent of all requirements should be followed to ensure an acceptable system is provided.

1. Install electric junction boxes suitable for mounting each device and for making the necessary wiring connections.

2. Generally, initiating devices have four terminals or wire pigtails for wiring connections. Two are for the wires from the control panel and the others are for the outgoing wires to feed additional devices. Ensure that all field wires are individually terminated.

3. The manual stations should be installed 4' 6" (1372 mm) above finished floor level and on a permanent wall or structure adjacent to the main egress from the protected area.

⚠ CAUTION

Detectors must not be painted or similarly covered as this will alter their thermal or smoke entry characteristics and void their listings and warranties.

5.9 Installing Discharge Pressure Switch

The discharge pressure switch has a SPDT contact and is normally located adjacent to the cylinder(s) and connected to the discharge manifold. When a lockout valve is installed, a discharge pressure switch must be installed between the cylinders and the lockout valve.

1. Mount the switch box securely onto a wall or structural member using the mounting holes provided. Preferred mounting is upright with pipe and conduit connections to the bottom.

2. Connect 1/2 inch conduit and appropriate wiring to the electrical connection on the switch box.

3. To switch loads heavier than the switch rating, or requiring more than two contacts, the switch should be used to operate a relay or contactor to control the load.

4. Connect the 1/4 inch NPT connection at the bottom of the front plate to the carbon dioxide piping using 1/4 inch steel pipe or 1/4 inch or 3/16 inch O.D. copper tube. Install a union fitting at base of cover to allow removal of front plate for testing.

5.10 Installing Pressure Release Trip

The pressure release trip is used to release loads of up to a maximum of 75 lbs (34 kg), which are hung on the piston stem.

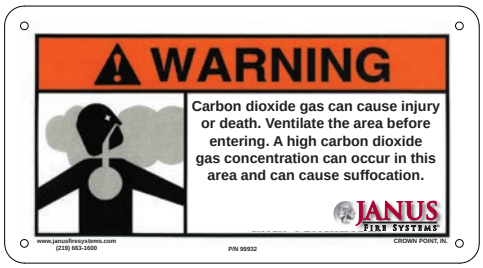
1. Mount the pressure release trip onto a solid structural member using 5/16 inch bolts and appropriate anchors. Fixing must be suitable for the loading, including spring tension and/or dead weight of operated equipment.

2. Connect the release trip 1/4 inch NPT connection to the carbon dioxide discharge piping using 1/4 inch steel pipe or 1/4 inch or 3/16 inch O.D. copper tube. The release trip must be installed to the top of the discharge piping to avoid liquid CO2 entering the pressure release trip during discharge.

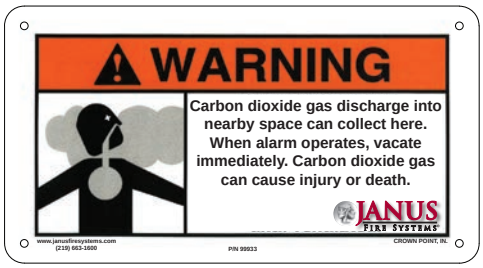
3. Using 1/16 inch stainless steel cable and cable clamp (or equivalent), connect the equipment to be operated to the piston stem. The cable must be suspended at right angles to the piston stem so that it neither binds nor slides off the stem.

5.11 Installing Warning Signs

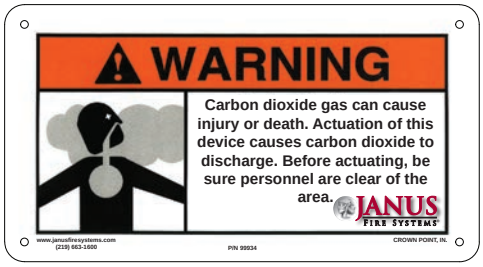
NFPA 12 mandates that warning signs designed in compliance with ANSI Z535 be placed in and around areas protected by CO_2 fire extinguishing systems. Janus Fire Systems offers the ANSI Z535 compliant sign options illustrated in Figure 5.12 Each warning sign is 6-1/2 in x 12 in (165 mm x 305 mm).



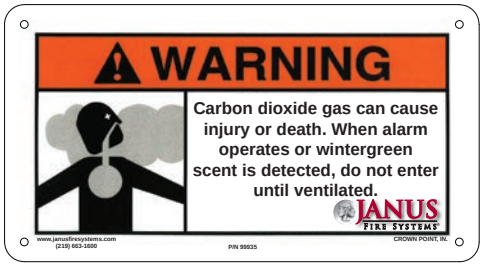
Warning – Storage – P/N 99932
Post sign outside each entrance to carbon dioxide storage rooms.



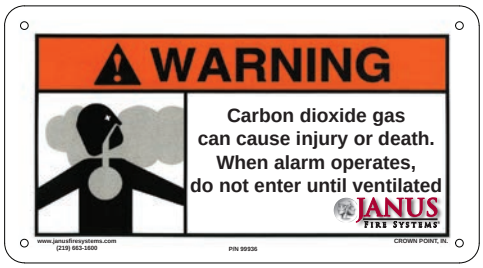
Warning – Nearby –P/N 99933
Post sign in every nearby space where carbon dioxide can accumulate to hazardous levels.



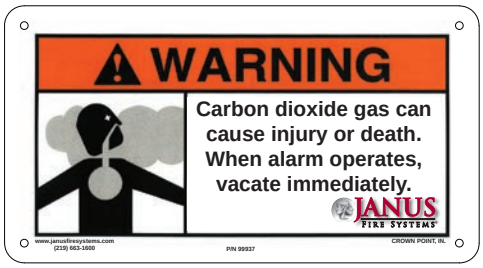
Warning – Manual Actuation – P/N 99934
Post sign at each manual actuation station.



Warning – Wintergreen – P/N 99935
Post sign at every entrance to protected space for systems provided with wintergreen odorizer.



Warning – Entrance – P/N 99936
Post sign in every protected space.



Warning – Exit – P/N 99937
Post sign at every entrance to protected space.

Figure 5.11 Warning Signs

Note: Existing signs that are a part of an established training and safety program may be implemented if in compliance with NFPA 12 Section 4.3.2.4.

5.12 Manual

An instruction and maintenance manual and a full set of "as-built" drawings and calculations shall be maintained on site.

5.13 Label

Each cylinder is fitted with an identification label indicating the fill quantity of carbon dioxide.

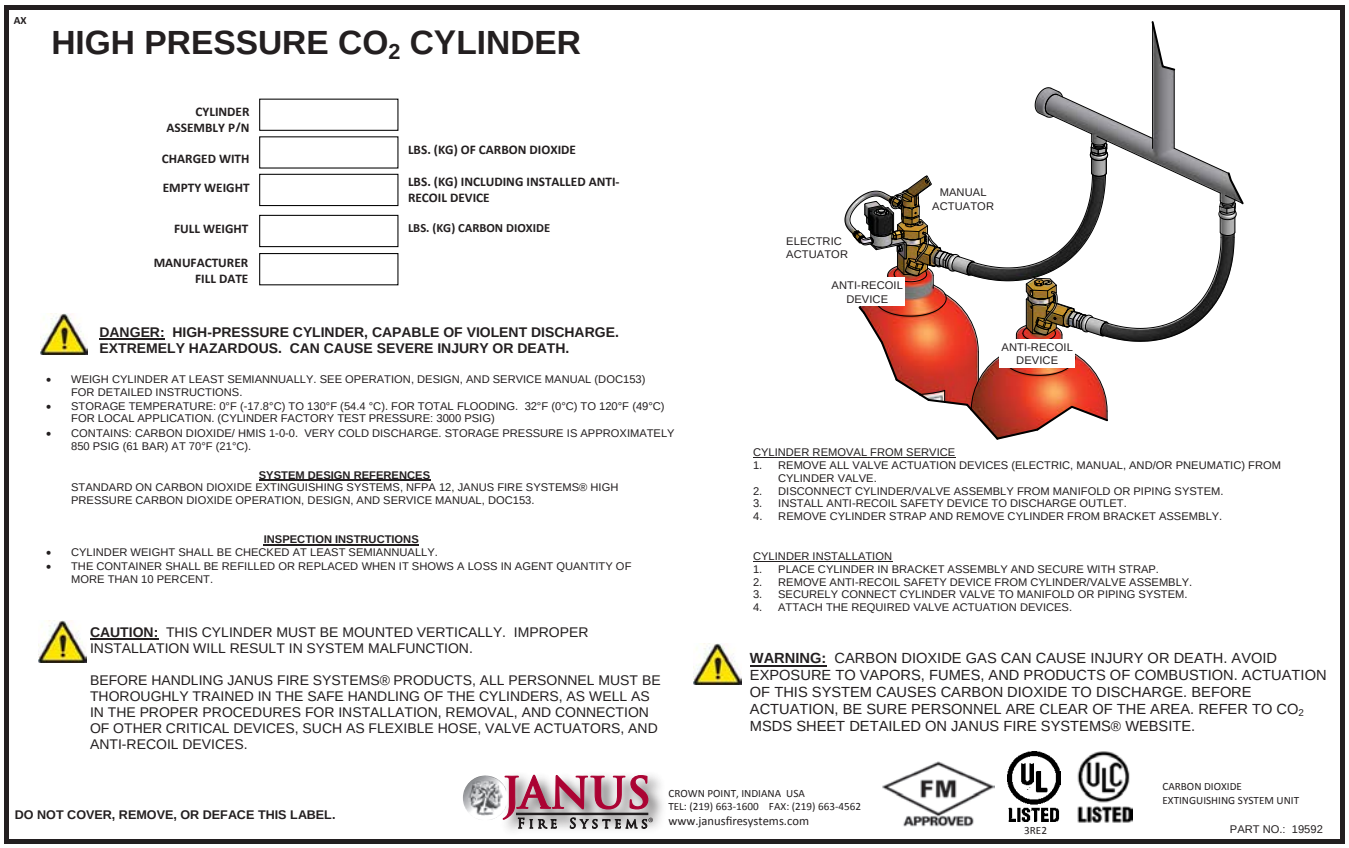


Figure 5.13 $HPCO_2$ Cylinder Label

6 SYSTEM COMMISSIONING

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

1. Conformance to system design.
2. Suitability of piping, its correctness to project design, and its support and bracketing.
3. Conformance to the required system operating sequence.
4. The suitability of the hazard environmental control, safety precautions, sealing, etc.
5. Compliance with the requirements of NFPA 12 – Standard on Carbon Dioxide Extinguishing Systems and other applicable standards.

NFPA 12 requires that a full discharge test be performed on all systems.

6.1 Design

Measure the room and calculate the actual room volume. Check actual volume against design volume (volume shown on project drawings) and ensure correct quantity of carbon dioxide is provided.

6.2 Piping

Check the pipe layout to ensure it agrees with the system layout drawings.

Inspect the piping supports and ensure that the pipe is secure and restrained so that unacceptable movement will not occur.

6.3 Cylinders

1. Inspect cylinders and ensure bracketing and cylinders are secure.
2. Verify the weight of carbon dioxide in all cylinders, using either an accurate weigh scale or an approved liquid level gauge. The contents should be within +/-10% of the normal capacity.
3. Check cylinder discharge bends and check valves for proper connection and tightness.
4. Ensure that appropriate identification, operating and warning signs are mounted or posted.

6.4 Nozzles

Each nozzle has an orifice drilled to suit the specific location and discharge flow requirements. The orifice identification number is stamped on each nozzle.

1. Verify that orifice sizes and drill codes are as indicated on the project drawings and that the nozzles are orientated to discharge correctly.

⚠ CAUTION

Ensure discharge will not splash flammable liquids or create dust clouds that could extend the fire. Also ensure the discharging agent will not injure personnel in the area.

2. Ensure that each nozzle pipe drop is bracketed or braced against the nozzle discharge thrust, and that the nozzle cannot swivel on its pipe fitting.

3. Check the cleanliness of the protected area to determine if protective caps or seals are required to prevent orifices from clogging.

6.5 Manual Control: Local and Remote Type

Ensure the manual actuators and the remote manual controls, for all parts of the system—primary cylinders for main and reserve systems, all primary cylinders in a selector valve arrangement, and selector and lockout valves—are accurately identified and will be accessible during a fire.

All testing should be carried out with the manual actuator(s) disconnected from the cylinders and other devices.

1. With the manual actuator disconnected from the cylinder or other device, pull the lock pin and operate the lever to verify the movement of the operating piston 1/8 inch (3.2 mm).

6.6 Electric Actuation

Perform all inspections and tests on the controls panels, detectors, signals, and other devices indicated in the specific equipment manufacturer's manuals.

⚠ CAUTION

The solenoid actuator and the manual actuator must be removed from the cylinder valve before any testing is performed.

6.7 Optional Devices

6.7.1 Pneumatic Pilot Cabinet

The following procedure must be performed in order to verify proper installation and operation of the Pneumatic Pilot Cabinet w/ Time Delay.

⚠ WARNING

Prior to performing any service on the Janus Fire Systems® $HPCO_2$ Pneumatic Pilot Cabinet, the discharge lockout valve for each zone must be closed. Failure to close the appropriate lockout/isolation valve(s) before servicing any component of the Janus Fire Systems® $HPCO_2$ Pneumatic Pilot Cabinet may result in the accidental release of CO_2 agent.

- Close main liquid shut-off valve
- Evacuate all pressure from discharge header
- Open main pilot line shut-off valve
- Verify main pilot line regulator setting at 100 psi

- Verify pilot actuation regulator setting at 8 psi
- Verify master/selector valve pilot actuation supervisory pressure switch has cleared off-normal state
- Close main pilot line shut-off valve
- Slowly bleed pressure from master/selector valve actuation line
- Verify master/selector valve pilot actuation supervisory pressure switch is indicating an off-normal state
- Cease bleeding pressure from master/selector valve actuation line
- Open main pilot line shut-off valve
- Again verify master/selector valve pilot actuation supervisory pressure switch has cleared off-normal state
- Verify all normally pressurized pilot line and actuation line fittings and connection points are bubble tight
- Initiate automatic discharge sequence
- Verify immediate pneumatic CO_2 siren operation
- Monitor that pneumatic predischarge timer expires after 30 seconds (factory setting)
- When timer expires observe that the master/selector valve indicator rotates to the open position
- Reset system
- Observe that master/selector valve indicator rotates to the closed position
- Verify that pneumatic CO_2 siren silences
- Rotate manual actuation valve to the open position
- Verify immediate pneumatic CO_2 siren operation
- Monitor that pneumatic predischarge timer expires after 30 seconds (factory setting)
- When timer expires observe that the master/selector valve indicator rotates to the open position
- Return manual actuation valve to the closed position
- Observe that master/selector valve indicator rotates to the closed position
- Verify that pneumatic CO_2 siren silences
- Again rotate manual actuation valve to the open position
- Verify immediate pneumatic CO_2 siren operation

- Rotate the pneumatic timer bypass valve to the open position
- Observe that the master/selector valve indicator immediately rotates to the open position
- Return the pneumatic timer bypass valve to the closed position
- Return manual actuation valve to the closed position
- Observe that master/selector valve indicator rotates to the closed position
- Verify that pneumatic CO_2 siren silences

6.7.2 Pneumatically Operated CO2 Sirens

All sirens should be tested to ensure operation and that the sound is readily heard throughout the protected space. This should be done under normal background noise conditions.

6.7.3 Pressure Release Trip

With a screwdriver or other blunt instrument manually push the stem to the retracted position. Allow the cable to fall and ensure the connected equipment operates as required.

6.8 Carbon Dioxide Discharge Test

NFPA 12 mandates that a full discharge test be performed for all carbon dioxide extinguishing systems to ensure that carbon dioxide is discharged into the hazard, that the concentration is achieved and maintained for the period of time required by the design specifications, and that all pressure-operated devices function as intended. Where multiple hazards are protected from a common supply, a full discharge test must be performed for each hazard. It is recommended that a full discharge test also be performed whenever cylinders are removed for hydrostatic testing.

During this test:

1. With a concentration meter, check the carbon dioxide concentrations achieved at several locations within the enclosure and specifically adjacent to the primary hazard within the enclosure. Should concentrations not be met, modifications to nozzle drill codes and/or piping shall be made and the system shall be retested.
2. Check the discharge time.
3. Check the holding time (the length of time the carbon dioxide concentration is maintained).
4. Ensure that the enclosure is reasonably well sealed and that there is no major leakage.
5. Ensure all alarms function for the required period of time and that they can be heard and/or seen throughout the area. This should be done under normal area operating condition, i.e. normal background noise and lighting, etc.

NOTE: During a successful discharge, CO_2 will continuously vent through the Slave Actuation Vent at a rate of 0.3 lbs of CO_2 per minute (0.1 kg/min) (refer to Section 3.12 for description of valve function). This is a part of the normal function of the $HPCO_2$ cylinder valve and should not be confused with a leak.

7 FOLLOWING SYSTEM DISCHARGE (FIRE EVENT)

1. Do not open doors or windows or remove the carbon dioxide from the protected area until the fire is completely out.

2. Do not enter the area until the carbon dioxide has been removed and the area ventilated. If it is necessary to enter the area while it still contains carbon dioxide, self-contained breathing apparatus should be used. In systems implementing an olfactory warning device, any trace of wintergreen scent indicates the area is not safe for occupancy without a self-contained breathing apparatus.

In general, providing the system discharges during the early stages of the fire and providing all plant shutdown functions are operated and safety precautions are taken, the fire should be extinguished within one minute of the end of carbon dioxide discharge. However, the area should be kept closed for at least fifteen minutes following discharge to allow the area to cool and to prevent re-ignition. For deep seated hazards, the space should be kept tightly closed for at least twenty minutes following discharge.

To check if fire is out:

1. Look for smoke and steam coming from cracks around doors, windows, vents, etc.

2. Feel the doors and walls. If they are hot do not open doors. The fire is still burning or is in the cooling stage.

3. Listen for crackling sounds.

Have your fire department check the space for you.

Do not enter area with a lighted cigarette or open flame as flammable vapors may be present which could cause re-ignition or an explosion.

After opening the door:

1. Completely ventilate the space. CO_2 is heavier than air and will drift into low level spaces (e.g. rooms below grade). Use fans to remove CO_2, smoke, and fumes from low areas.

2. Clean up residue from fire.

3. Determine cause of fire and take corrective action.

Section 7 Following System Discharge

7.1 Refurbishing The System

Have the system completely serviced by Janus Fire Systems or a Janus Fire Systems approved service agency. After operation, the system should be recharged without delay in order to maintain protection.

1. Remove, inspect, and recharge all cylinders.
2. Inspect the piping system and ensure pipe supports are still secure.
3. Inspect all components, including nozzles, switches, detectors, alarms, etc. Replace all equipment that has been damaged or that has been exposed to direct flame or excessive heat from the fire.

   NOTE: During a successful discharge, CO_2 will have continuously vented through the Slave Actuation Vent at a rate of 0.3 lbs of CO_2 per minute (0.1 kg/min) (refer to Section 3.12 for description of valve function). This is a part of the normal function of the $HPCO_2$ cylinder valve and should not be confused with a leak.
4. Reinstall system in accordance with the Installation Instructions.
5. Verify and test system in accordance with Section 6 of this manual.

8 SYSTEM MAINTENANCE

In order to ensure that the system has not been tampered with and is in a fully operational condition, it must be inspected and tested on a regular basis by trained competent service personnel. In accordance with NFPA 12 – Standard on Carbon Dioxide Extinguishing Systems, insurance, and other code requirements, all carbon dioxide systems should be thoroughly inspected and tested annually. It is recommended that a service and maintenance contract be established with a Janus Fire Systems approved service agency.

All persons who may be expected to inspect, test, maintain, or operate carbon dioxide fire suppression systems should be thoroughly trained, and be kept thoroughly trained, in the functions they are expected to perform.

8.1 Monthly Inspections

1. Check system components for mechanical damage and tampering. All system lead and wire seals (or similar) should be intact. Manual actuators should be installed and with ring pins in place.

2. Ensure that all cylinders are in place and properly secured.

3. Ensure that there are no obstructions that would prevent system operation or prevent proper distribution of carbon dioxide from discharge nozzles.

4. Verify that egress is clear to allow safe evacuation of personnel from the hazard area and safe access to the manual controls.

5. Check that all electrical circuits show normal. If a control panel is utilized, check that power is on and the system is in a "normal-ready" condition. Ensure detectors are in place and free from obstructions.

8.2 Semi-Annual Inspections

1. Perform all the monthly inspections.

2. Check if there have been any changes in the shape, size, contents, or use of the protected space. Any changes will necessitate a review of the system design. Contact Janus Fire Systems should this occur.

3. Check the cylinder contents (weight). This may be done by using a platform or beam scale. Record weight on the cylinder tag or in the log book. If the cylinder has a loss in net weight of more than 10 percent, it should be recharged or replaced. The cylinder full weight is indicated on the valve.

4. Check the date of the last hydrostatic test. If the system has never been discharged and more than 12 years have elapsed since the last test OR the system has previously been discharged and more than 5 years have elapsed since the last test, the cylinders should be discharged and retested before being returned to service. If (It is recommended that a full discharge test be performed when cylinders are emptied for hydrostatic testing.)

5. Examine cylinders, piping, and nozzles for evidence of corrosion or other physical damage.

6. Check cylinder bracketing, piping, pipe hangers, and straps to ensure all are secure and suitably supported. This is particularly important where shock and vibration are encountered as a normal part of the environment (e.g. on board ships, etc.)

7. Ensure discharge nozzles are still located as originally installed, that the nozzle discharge orifices are clear and unobstructed, and that the nozzles are properly positioned and aligned. Ensure seals are used where necessary.

8. Remove the manual actuators from all cylinders that they operate and operate the hand lever. The actuator should operate freely and the operating stem should travel 1/8 inch (3.2 mm).

⚠ CAUTION

When two actuators are connected together, both actuators must be removed from the equipment they control before testing.

9. Inspect and clean all fire detectors. Check the sensitivity and adjust all smoke detectors.

10. If the system is automatically electrically actuated, disconnect the solenoid actuators and manual actuators from the cylinder valves, then:

    a) Operate all electric initiating devices (detectors, manual stations, etc.) one at a time and ensure the respective actuators operate. There will be a click sound when the solenoid operates. This check should be made for both main and reserve banks of cylinders, if used. Reinstall the solenoid and manual actuators after all testing is completed.

⚠ WARNING

Do not attach the manual actuator to the HPCO2 cylinder until it is verified that the cylinder is properly secured, that piping and nozzles are connected to the cylinder valve outlet, and that the protected hazard(s) is evacuated of all personnel in order to minimize the risk of potential injury or death caused by an accidental discharge.

⚠ WARNING

Do not attach the solenoid valve to the HPCO2 cylinder until it is verified that the cylinder is properly secured, that piping and nozzles are connected to the cylinder valve outlet, and that the protected hazard(s) is evacuated of all personnel in order to minimize the risk of potential injury or death caused by an accidental discharge.

    b) Verify that all electric alarm signals function and that all audible devices can be heard and all illuminated devices can be seen throughout the protected space. This should be done in the normal working environment with normal background noises and lighting in place.

    c) If the system has an extinguishment control panel, refer to the panel manufacturer's instruction manual for maintenance procedures.

11. Confirm operation of all auxiliary and supplementary components such as time delays, pressure operated switches, release trips, damper releases, shutoff valves, etc. by manual operation where possible. Pressure operated time delays and gas operated sirens should be checked using a carbon dioxide portable extinguisher as a pressurizing source.

12. Ensure all equipment is reset and all components are installed and left in the normal standby condition on completion of testing.

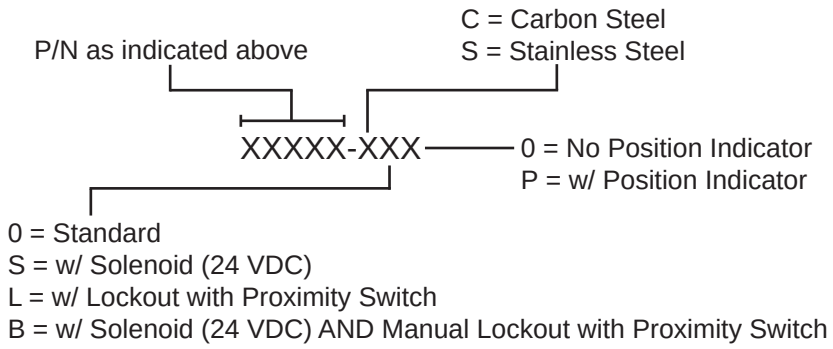
Appendix A

Selector Valve Ordering Information

Appendix A

Table A.1 - Selector Valve Ordering Information			
P/N	**Valve Size**	**Description (see below for options)**	**Nominal Weight lb (kg)**
19483	1/2”	Ball Valve, Pneumatically Actuated	4.2 (1.9)
19484	3/4”	Ball Valve, Pneumatically Actuated	6.5 (2.9)
19485	1”	Ball Valve, Pneumatically Actuated	8.6 (3.9)
19486	1-1/2”	Ball Valve, Pneumatically Actuated	19.5 (8.8)
19487	2”	Ball Valve, Pneumatically Actuated	27.0 (12.3)
19492	3”	Wafer Valve, 860 Series, Pneumatically Actuated	47.3 (21.5)

Ordering Instructions: Specify the Valve P/N followed by a dash and the appropriate three digit option code as illustrated below.



Examples:
19483-C00 – 1/2” Ball Valve, Carbon Steel
19485-SS0 – 1” Ball Valve, with Solenoid (24 VDC), Stainless Steel

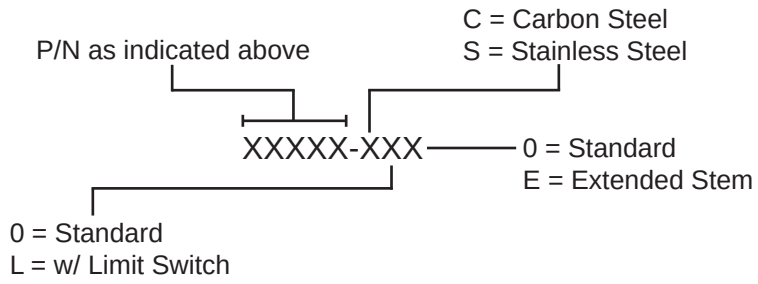
Appendix B

Lockout Valve
Ordering Information

Appendix B

Table B.1 - Lockout Valve Ordering Information			
P/N	**Valve Size**	**Description (see below for options)**	**Nominal Weight lb (kg)**
19465	1/2”	Ball Valve, Manually Actuated	1.9 (0.9)
19466	3/4”	Ball Valve, Manually Actuated	2.7 (1.2)
19467	1”	Ball Valve, Manually Actuated	4.8 (2.2)
19468	1-1/2”	Ball Valve, Manually Actuated	9.8 (4.4)
19469	2”	Ball Valve, Manually Actuated	12.7 (5.8)
19474	3”	Wafer Valve, 860 Series, Manually Actuated	29.0 (13.3)

Ordering Instructions: Specify the Valve P/N followed by a dash and the appropriate three digit option code as illustrated below.



Examples:
19465-C00 – 1/2” Ball Valve, Carbon Steel
19467-SL0 – 1” Ball Valve, with Limit Switch, Stainless Steel

Appendix C

Nonstandard Components

Appendix C

C.1 Auxiliary Pilot Line Supervisory Pressure Switch

P/N 99813 (See Figure C.1)

The optional auxiliary pilot line supervisory pressure switch may be used in place of the standard pilot line supervisory pressure switch. The auxiliary switch has a NEMA 4 enclosure for outdoor use and a standalone ambient temperature range of -20˚ to 180˚F (-29˚ to 82˚C). It has two single pole double throw contacts rated .15 Amp resistive at 125/250 VAC. The maximum operating pressure for the switch is 350 psi (24.1 bar).

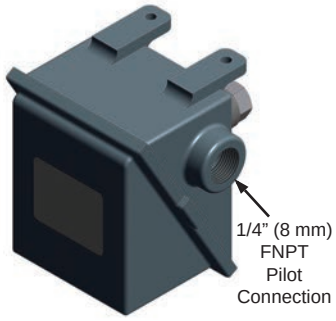


Figure C.1 Auxiliary Pilot Line Supervisory Pressure Switch

C.2 Auxiliary Shuttle Valve

P/N 99767 (See Figure C.2)

The optional auxiliary shuttle valve may be used in place of the standard shuttle valve. The auxiliary shuttle valve has a standalone ambient temperature range of -300˚ to 450˚F (-184˚ to 232˚C) and is rated for an operating pressure of 3000 psi (207 bar).

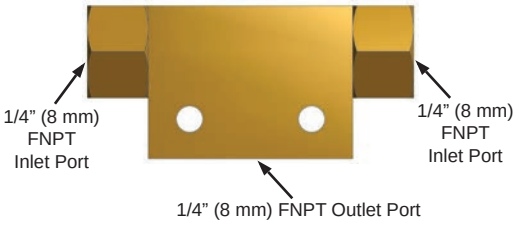


Figure C.2 Auxiliary Shuttle Valve

C.3 Three-Way Pilot Valve

P/N 99766 (See Figure C.3)

A three-way pilot valve is available for functions that require a pilot valve without an exhaust. It has a standalone ambient temperature range of -40˚ to 300˚F (-40˚ to 149˚C) and is rated for an operating pressure of 3000 psi (207 bar). (Note: The Three-Way Pilot Valve may **not** be used as a replacement for the Pneumatic Pilot Valve contained in the Selector Pilot Cabinet.)

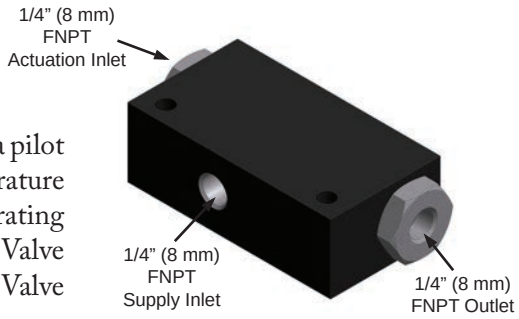


Figure C.3 Three-Way Pilot Valve

C.4 Auxiliary Inline Filter

P/N 99873 (See Figure C.4)

The auxiliary inline filter is an 40 micron inline filter with an 1/8 in (6 mm) FNPT inlet and an 1/8 in (6 mm) MNPT outlet. It functions in the same manner as the standard inline filter. The auxiliary inline filter has a brass body with a sintered bronze filter element and a working pressure of 300 psi (20.7 bar).

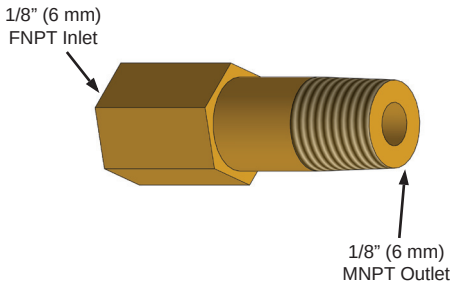


Figure C.4 Auxiliary Inline Filter

Appendix D

Auxiliary Solenoid Valves

Appendix D

Table D.1 - Auxiliary Solenoid Valves						
P/N	Style	Voltage	NEMA Rating	Normal State[1]	Pressure Rating	
					Low	High
99446	3-Way	24VDC	NEMA 4	N/A	x	
99445	3-Way	120VAC	NEMA 4	N/A	x	
99444	3-Way	24VDC	NEMA 7	N/A	x	
99443	3-Way	120VAC	NEMA 7	N/A	x	
99442	3-Way	24VDC	NEMA 4	N/A	x	
99441	3-Way	120VAC	NEMA 4	N/A	x	
99440	3-Way	24VDC	NEMA 7	N/A	x	
99439	3-Way	120VAC	NEMA 7	N/A	x	
99607	2-Way	24VDC	NEMA 4	NE	x	
99606	2-Way	24VDC	NEMA 4	NDE	x	
99604	2-Way	24VDC	NEMA 7	NDE	x	
99603	2-Way	120VAC	NEMA 4	NE	x	
99602	2-Way	120VAC	NEMA 4	NDE	x	
99600	2-Way	120VAC	NEMA 7	NDE	x	
99809	2-Way	24VDC	NEMA 4	NE	x	
99611	2-Way	24VDC	NEMA 7	NE	x	
99610	2-Way	24VDC	NEMA 7	NDE	x	
99808	2-Way	120VAC	NEMA 4	NE	x	
99810	2-Way	120VAC	NEMA 4	NDE	x	
99609	2-Way	120VAC	NEMA 7	NE	x	
99608	2-Way	120VAC	NEMA 7	NDE	x	
99654	2-Way	24VDC	NEMA 4	NDE	x	x
99653	2-Way	24VDC	NEMA 7	NDE	x	x
99619	2-Way	120VAC	NEMA 4	NDE	x	x
99618	2-Way	120VAC	NEMA 7	NDE	x	x
99872	2-Way	24VDC	NEMA 4	NDE	x	
99876	2-Way	24VDC	NEMA 4	NE	x	
99811	2-Way	120VAC	NEMA 4	NDE	x	
99812	2-Way	120VAC	NEMA 4	NE	x	
99612	2-Way	120VAC	NEMA 7	NDE	x	
99613	2-Way	120VAC	NEMA 7	NE	x	
99614	2-Way	24VDC	NEMA 7	NDE	x	
99615	2-Way	24VDC	NEMA 7	NE	x	

[1] NE = Normally Energized, Held Closed; NDE - Normally De-energized, Held Open

BLANK