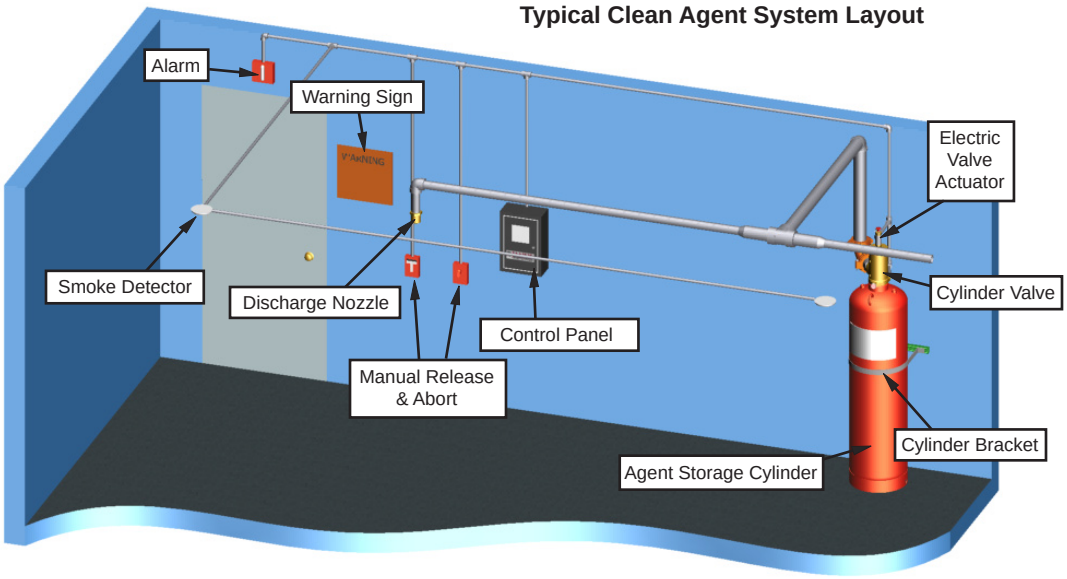
P-Sv Series

FM-200® Fire Extinguishing System

The Janus Fire Systems® P-Sv Series Pre-Engineered Clean Agent Fire Extinguishing System utilizes FM-200® as the extinguishing medium. FM-200® is a colorless, non-toxic gas perfectly suited to protect high value assets in areas that may be normally occupied, in locations where clean-up of other agents is problematic, when storage space for a fire suppression agent is restricted, or when an electrically non-conductive agent is required. Each system consists of the following components and their associated accessories:

1. **FM-200® Storage Components** - Storage components consist of the cylinder assembly(s), which contains the FM-200® chemical agent, and the cylinder bracket(s), which holds the cylinder assembly securely in place.
2. **FM-200® Distribution Components** - Distribution components consist of the discharge nozzles used to introduce the FM-200® agent into a protected hazard along with the associated piping system used to connect the nozzles to the cylinder assembly.
3. **Trim Components** - Trim components complete the installation of the FM-200® system and consist of the electric valve actuator and the manual valve actuator.
4. **Slave Arrangement Components** - Slave arrangement components consist of the pneumatic valve actuator(s), actuation check valve, and vent check required for a multiple cylinder (slave) arrangement.
5. **Supplemental Components** - Supplemental components include the discharge pressure switch and secondary outlet adapter. They supplement the core equipment and complete specific system arrangements.
6. **Control Panel** - This device monitors the condition of the electric actuator, detectors, warning devices, cylinder pressure, and any manual release and abort stations. All electric or electronic devices must connect to the control panel in order to function.
7. **Early Warning Detection and Alarm Devices** - Early warning detection devices coupled with manual release and abort stations maximize system efficiency while audible and visual alarm devices alert staff of alarm conditions.

Typical Clean Agent System Layout



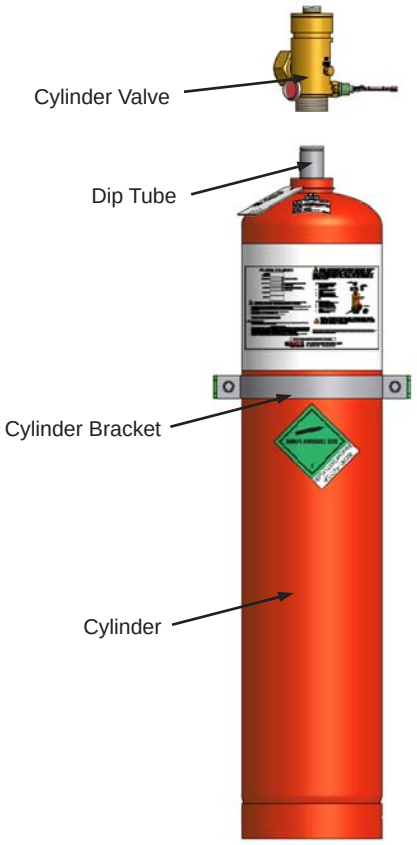
EQUIPMENT DESCRIPTION

The FM-200® agent is stored as a liquid in cylinder assemblies designed specifically for the application and charged to a fill density of between 25 lb/ft^3 (400 kg/m^3) and 71 lb/ft^3 (1137 kg/m^3). To ensure optimal performance, each cylinder is superpressurized with dry nitrogen to 360 psi (24.8 bar) at 70°F (21°C). An identification label is affixed to the cylinder body indicating the fill quantity of FM-200®, charging pressure, date of fill, and fill station. The P-Sv Series supports two cylinder capacities.

FM-200® fire extinguishing systems are designed in accordance with National Fire Protection Association (NFPA) 2001 - Standard on Clean Agent Fire Extinguishing Systems, which states each system shall be total flooding, meaning it discharges FM-200® into a room, area, or enclosure with the structural integrity to retain the agent, and that each system discharges within 10 seconds with the FM-200® becoming thoroughly mixed throughout the protected area, reaching a minimum concentration level of 6.25%, but not exceeding 9% in normally occupied areas.

Nominal Cylinder Size	P/N	Fill Capacity				Empty Weight	
		Minimum		Maximum			
		lb	kg	lb	kg	lb	kg
44 lb	20016 - 20044	16	7.3	44	20.96	36	16.3
130 lb	20046 - 20130	46	20.0	130	50.97	77	35.0

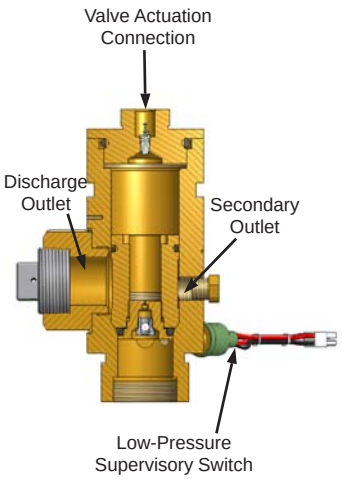
The cylinder assembly is composed of a cylinder, dip tube, and cylinder valve.

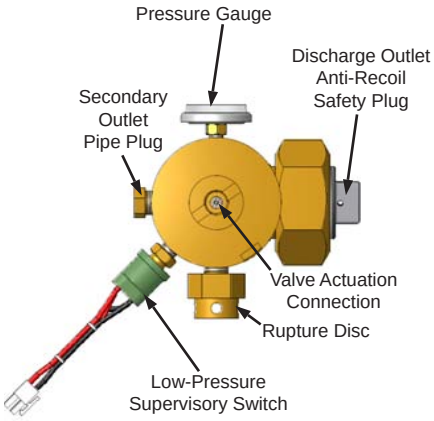


Cylinder Valve: The automatic release of FM-200® is controlled by a forged brass, differential pressure operated cylinder valve connected to the neck of the cylinder. The valve assembly is shipped with an anti-recoil safety plug installed in the discharge outlet and chained to the cylinder valve.

Dip Tube: A threaded, rigid dip tube extends from the cylinder neck down to its bottom.

Cylinder: The light walled, welded seam cylinder is manufactured according to the requirements of the U.S. Department of Transportation (USDOT) for compressed gas. Internal neck threads allow connection of the cylinder valve. The cylinder is designed for mounting in a vertical position only.





The cylinder valve has four key features:

Valve Actuation Connection: A threaded connection located on top of the cylinder valve serves as the attachment point for the electric (primary) or pneumatic (slave) valve actuator.

Pressure Gauge: A pressure gauge is affixed to the cylinder valve exterior as shown on the cylinder valve assembly diagram.

Low-Pressure Supervisory Switch: A low-pressure supervisory switch is mounted to the cylinder valve as shown on the cylinder valve assembly diagram.

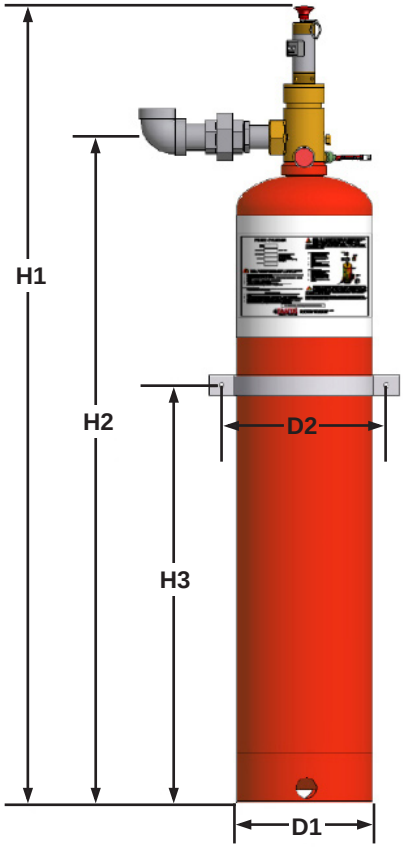
Rupture Disc: A frangible rupture disc is fitted to the cylinder valve body. It functions as an emergency relief device in the event of excessive pressure within the cylinder. Its rupture point is between 850 psi (58.6 bar) and 1000 psi (68.9 bar).

The cylinder valve has two outlets:

Discharge Outlet: A 1 1/4 in (32 mm) FNPT connection serves as the connection point for discharge piping.

Secondary Outlet: A 3/8 in (10 mm) FNPT connection (shipped with a removable plug) provides a means of applying actuation pressure to the slave cylinder(s), discharge pressure switch, or can be used as a secondary discharge outlet. The port is pressurized only during the 10 second discharge period.

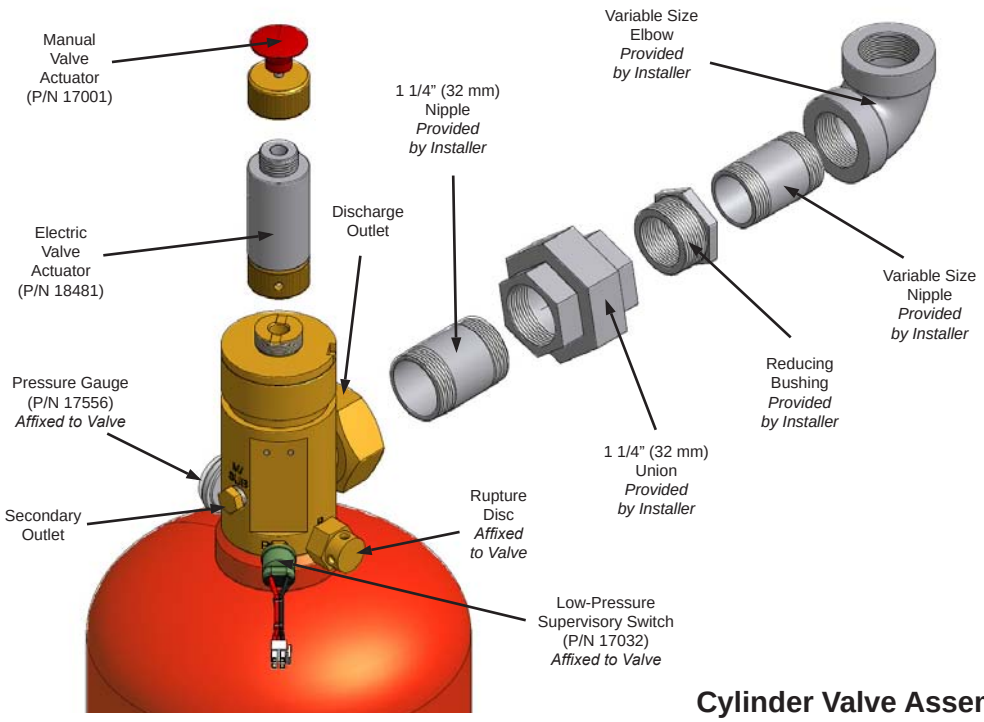
CYLINDER MOUNTING



Wall Mount Cylinder Bracket Assembly (P/N 18595)

Cylinder stability is ensured by the cylinder bracket assembly, consisting of one strap and rail with accompanying bolts, nuts, and washers. The rail is slotted for ease of mounting with fasteners provided by the installer.

	Cylinder Dimensions			
	44 lb		130 lb	
	in	mm	in	mm
H1	29.70	754	58.95	1497
H2	19.93	506	49.10	1247
H3	13.63	346	30.75	781
D1	10.0	254	10.0	254
D2	11.9	302	11.9	302

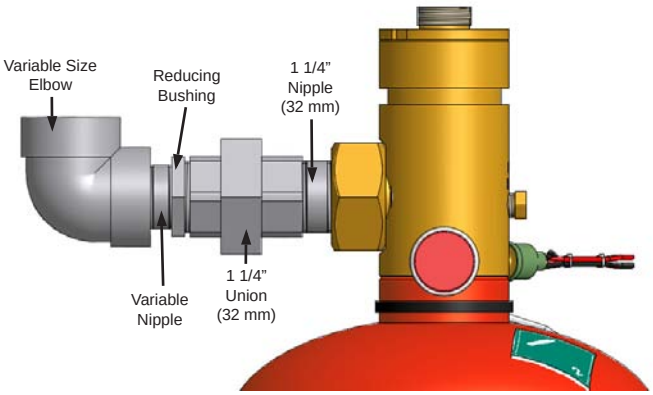


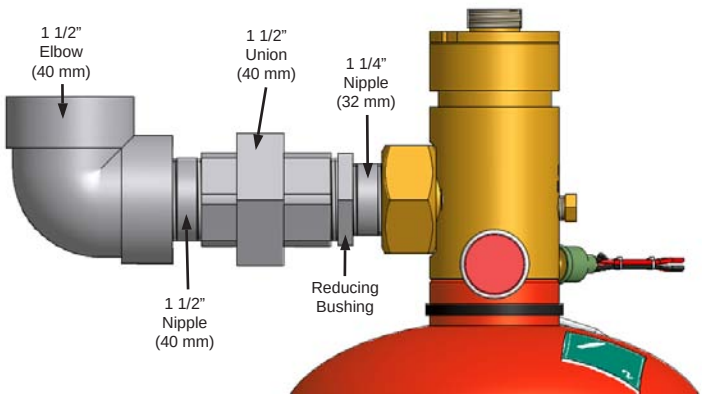
Cylinder Valve Assembly with Trim Components

CYLINDER VALVE FEATURES

Discharge Outlet / Connections

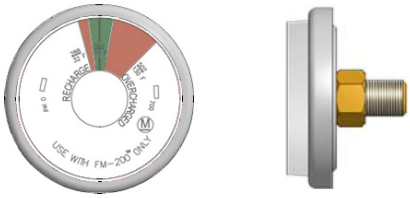
The discharge outlet of the cylinder valve is a 1 1/4 in (32 mm) female NPT connection that is used to attach the cylinder to the discharge piping system. The suggested pipe configurations are shown below. Pipe and fittings are to be supplied by the installer.





Low-Pressure Supervisory Switch (P/N 17032)

The low-pressure supervisory switch continuously monitors the pressure of the cylinder. The contact configuration is single pole, single throw (SPST) with contacts rated 1.5 Amps at 24 VDC. Should the cylinder pressure drop to approximately 285 psi (19.7 bar), the switch contacts will close transmitting an abnormal signal to the system control panel. It is mounted to the cylinder valve and cannot be replaced while under pressure.

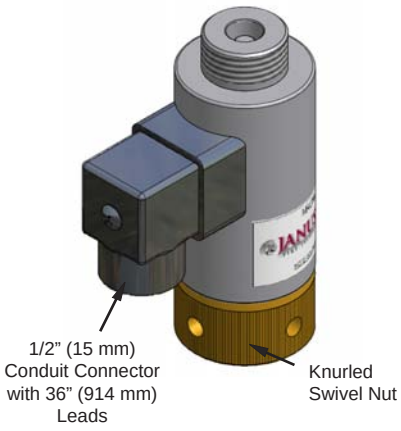


Pressure Gauge (P/N 17556)

NFPA 2001 mandates a pressure gauge for each cylinder as a method of visually monitoring the internal pressure condition of the cylinder. The pressure gauge is mounted to the cylinder valve and cannot be replaced while under pressure.

TRIM COMPONENTS

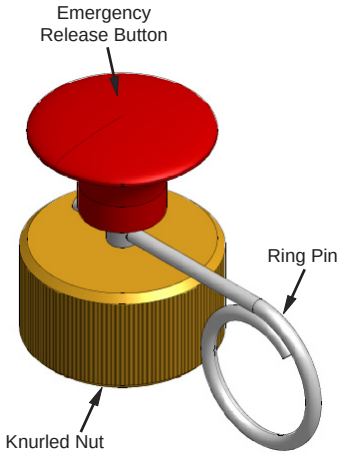
Trim components are required to operate the FM-200® cylinder(s).



Electric Valve Actuator (P/N 18481)

The electric valve actuator attaches to the primary cylinder at the valve actuation connection and is utilized to automatically open the cylinder valve upon receipt of a signal from the control panel or other source. It operates between 17 and 30 VDC and consumes 500 mA (.5 Amps) at 24 VDC nominal with a maximum supervisory current of 30 mA (0.03 Amps).

The electric valve actuator body is steel construction with a brass knurled swivel nut and a stainless steel actuation pin that depresses the valve core when energized.



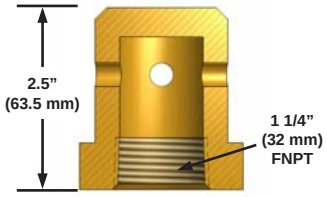
Manual Valve Actuator (P/N 17001)

An optional manual valve actuator attaches to the top of the electric valve actuator and provides a means to manually open the cylinder valve. The manual valve actuator consists of a brass body, stainless steel actuation pin, and steel safety ring pin.

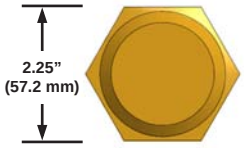
To discharge the primary cylinder manually, the ring pin is removed and the emergency release button is depressed forcing the pin in the electric valve actuator to depress the valve core of the cylinder valve. All other connected cylinders will be opened pneumatically.

DISCHARGE NOZZLES

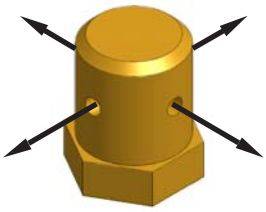
Discharge nozzles (1, 2, or 4 ports) are used to uniformly distribute the FM-200® agent. They are performance tested to ensure that the agent is discharged within 10 seconds and properly dispersed throughout the protected area. Discharge nozzles are machined red brass with orifice diameters in accordance with the design manual. Nozzle selection is predetermined by cylinder weight. Nozzles are drilled based upon a flow rate of lbs (kg) per second. Maximum nozzle height for a protected space is 16 ft (4877 mm) per tier of nozzles. Additional tiers are required for heights greater than 16 ft.



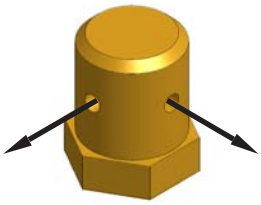
Discharge Nozzle
Cut View



Discharge Nozzle
Top View

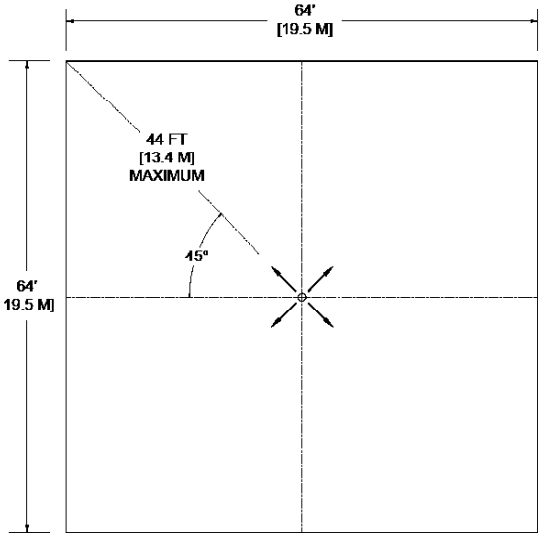


360° Radial Nozzle (4 Port)
P/N 18511

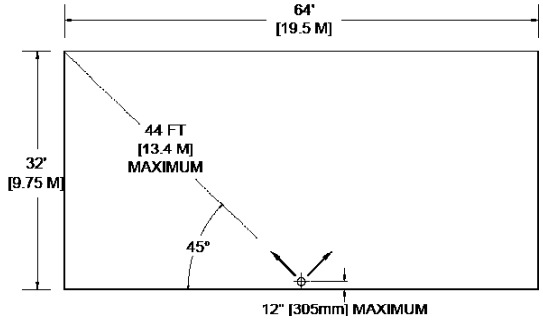


180° Sidewall Nozzle (2 Port)
P/N 18504

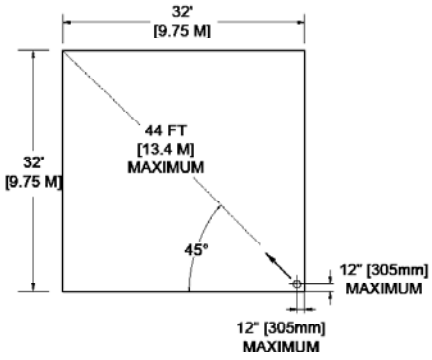
90° Corner Nozzle (1 Port)
P/N 18497



360° Radial Nozzle (4 Port)
Arrangement



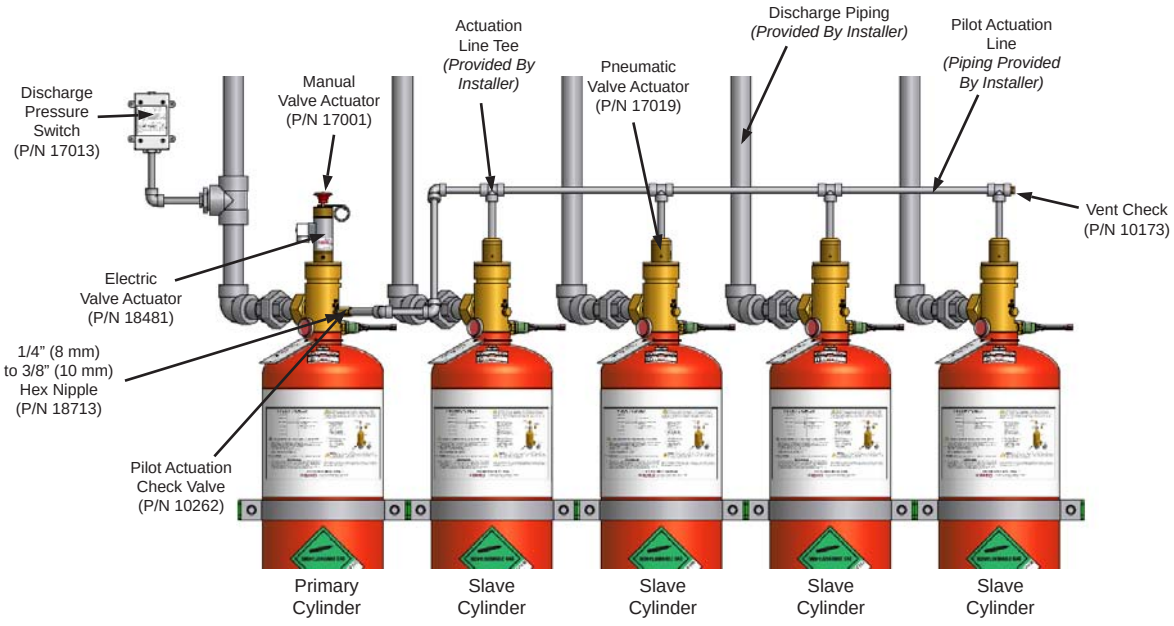
180° Sidewall Nozzle (2 Port)
Arrangement



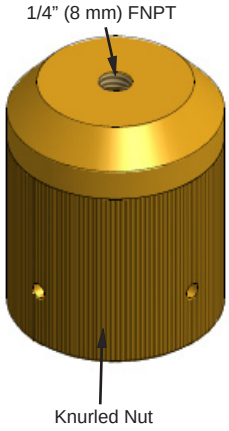
90° Corner Nozzle (1 Port)
Arrangement

SLAVE ARRANGEMENT COMPONENTS

The slave arrangement components are required for a multiple cylinder (slave) arrangement. Up to five slave cylinders may be pneumatically actuated with the pilot actuation pressure from one primary cylinder.



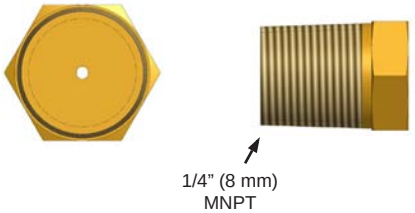
Typical Primary and Slave Cylinder Arrangement



Pneumatic Valve Actuator (P/N 17019)

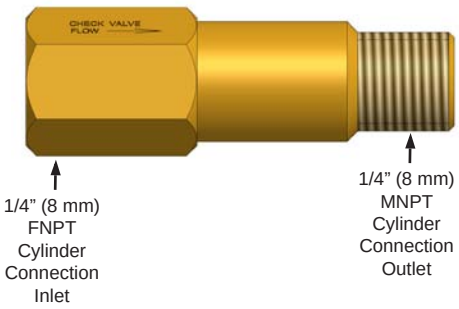
On multiple cylinder systems the electric valve actuator will open the primary cylinder and then, in a rapidly occurring sequence, the pneumatic valve actuator(s) will open all other cylinders using pressure from the primary cylinder.

A pneumatic valve actuator attaches to the valve actuation connection of each slave cylinder. It receives pressure from the secondary outlet of the primary cylinder through the pilot actuation check valve. It is brass with a brass piston and pin.



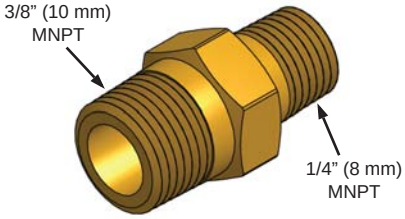
Vent Check (P/N 10173)

The vent check is a safety device with 1/4 in (8 mm) MNPT threads that is to be installed in the pilot actuation line downstream of the pilot actuation check valve. It is used to bleed off pressure that may accumulate in the pilot actuation hose or piping minimizing the chance of inadvertent pressurization of the pneumatic actuators or discharge pressure switch.



Pilot Actuation Check Valve (P/N 10262)

A 1/4 in (8 mm) FNPT by MNPT check valve fits into the secondary outlet of the primary cylinder valve (via a 1/4 in (8 mm) MNPT by 3/8 in (10 mm) MNPT hex nipple) with direction of flow OUT of the valve. When the valve opens, pressure will be directed through the pilot actuation check valve to the pneumatic valve actuators on the slave cylinders. The purpose of the pilot actuation check valve is to ensure the pneumatic actuator(s) remain pressurized for the entire discharge period.



Hex Nipple (P/N 18713)

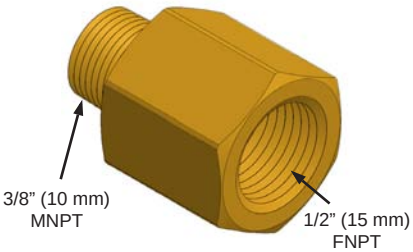
A 1/4 in (8 mm) MNPT by 3/8 in (10 mm) MNPT hex nipple is fitted into the secondary outlet of the primary cylinder to facilitate the attachment of the pilot actuation check valve.

SUPPLEMENTAL COMPONENTS

Supplemental components complete various system arrangements.

Discharge Pressure Switch (P/N 17013)

The discharge pressure switch is used in the system to provide positive indication of agent discharge and to initiate the shut down of equipment that may deplete agent concentration. The pressure switch is a single pole, double throw (SPDT) switch with contacts rated 10 Amps resistive at 30 VDC.



Secondary Outlet Adapter (P/N 17563)

A 3/8 in (10 mm) MNPT by 1/2 in (15 mm) FNPT adapter fits into the secondary outlet to facilitate connection of secondary discharge piping.

FM-200® CHEMICAL PROPERTIES

FM-200® (HFC-227ea) is formed from the elements carbon, fluorine and hydrogen (CF3CHFCF3 - heptafluoropropane). The primary extinguishing mechanism of FM-200® is heat absorption, with a secondary chemical contribution from the thermal decomposition of FM-200® in the flame.

FM-200® leaves no residue and is safe for use in occupied spaces.

Most common metals, such as aluminum, brass, steel, cast iron, lead, stainless steel, and copper, as well as rubber, plastic, and electronic components, are unaffected when exposed to FM-200®.

SAFETY CONSIDERATIONS

Although the EPA Significant New Alternative Program (SNAP) lists FM-200® as acceptable for occupied spaces, NFPA Standard 2001 and SNAP list the following guidelines for human exposure:

The discharge of FM-200® into a hazard may reduce visibility for a brief period. FM-200® may cause frostbite if liquid discharge or escaping vapor contacts the skin.

When FM-200® is exposed to temperatures greater than 1300°F (700°C), the by-product Hydrogen Fluoride (HF) will be formed. FM-200® systems are designed to discharge in 10 seconds or less in order to minimize the amount of HF formed.

The FM-200® Material Safety Data Sheet (MSDS) should be read and understood prior to working with the agent.

A cylinder containing FM-200® should be handled carefully. **The anti-recoil safety plug must be in place at all times when the cylinder is not connected to the discharge piping and restrained.**

Time for Safe Human Exposure at Stated Concentrations for FM-200® (HFC-221ea)

FM-200® Concentration		Maximum Human Exposure Time (Minutes)
% v/v	ppm	
9.0	90,000	5.00
9.5	95,000	5.00
10.0	100,000	5.00
10.5	105,000	5.00
11.0	110,000	1.13
11.5	115,000	0.60
12.0	120,000	0.49

Notes:
1. **Data derived from the EPA-approved and peer-reviewed PBPK model or its equivalent.**
2. **Based on LOAEL of 10.5% in dogs.**

Order Review List		
P/N	**Description**	**Nominal Ship Wt. lb (kg)**
20016 - 20044	44 lb Cylinder - Specify Fill *Fill Range: 16 to 44 lb (7.3 to 20.0 kg) in two pound increments*	36.0 (16.3)
20046 - 20130	130 lb Cylinder - Specify Fill *Fill Range: 46 to 130 lb (20.9 to 59.0 kg) in three pound increments*	77.0 (35.0)
18595	Cylinder Bracket Assembly (44 lb / 130 lb)	10.0 (4.5)
18481	Electric Valve Actuator (primary cylinder)	2.0 (0.9)
17001	Manual Valve Actuator (primary cylinder)	0.6 (0.3)
17019	Pneumatic Valve Actuator (slave cylinder)	1.2 (0.5)
10262	Check Valve, 1/4" *Pilot Actuation Check Valve*	0.3 (0.1)
10173	Vent Check	0.2 (0.1)
17013	Discharge Pressure Switch	1.4 (0.6)
17563	Secondary Outlet Adapter	0.3 (0.1)
Variable	Nozzle, Brass 1 1/4" (32 mm)	1.6 (0.7)

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