

Reliable®

**Model DDX Double Interlock
Preaction System – Type D**
2" (50 mm), 2½" (65 mm), 3" (80 mm),
76 mm, 4" (100 mm), 6" (150 mm), 165
mm & 8" (200 mm)

Technical Specifications and Instructions for Installation, Operation, and Maintenance

- Available with 175 psi (12.1 bar) or 300 psi (20.7 bar) Rated Solenoid Valve
- Externally Resettable Clapper
- One Main Drain
- 7 psi (0.48 bar) Minimum Supervisory Pressure
- Electric/Electric Actuation



Image subject to change.

General

The Reliable Model DDX Type D Double Interlock Preaction system is designed for water sensitive areas that require protection from inadvertent water flow into the sprinkler system piping, but where a mechanical backup for the electric release is not required. Typical applications for this type of system are libraries and computer server rooms.

To release the valve and flow water into a Type D Double Interlock Preaction System, two events must take place: a fire detection device must operate, and the low pressure switch must be operated by the loss of system air or nitrogen pressure due to sprinkler operation (see note 1 below). These two signals must coexist at the releasing control panel, which only then will energize the normally closed solenoid valve (175 psi (12.1 bar) or 300 psi (20.7 bar) rated), causing the water flow into the system.

These systems utilize fire detection devices and system air pressure as separate zones (inputs) to a cross-zoned releasing control panel. The solenoid releasing valve remains closed until energized by the releasing control panel. This will occur only when both a fire detection device is operated and the low air pressure switch has detected sufficient loss of system air pressure generally resulting from the operation of a fire sprinkler.

In the event that the system piping is ruptured, or a sprinkler is accidentally opened, the low air pressure switch will operate and an alarm will sound. The Model DDX Deluge Valve, however, will not release water since the solenoid valve remains closed due since the detection system has not activated.

Conversely, in the event of a false alarm from the detection system, the Model DDX Deluge Valve will not release water provided air pressure in the system is maintained and the low pressure switch is not activated. The requirement for both detector operation and loss of system pressure before the Model DDX Type D Double Interlock Preaction system releases water assures maximum protection against inadvertent water flow.

At the heart of the Reliable Type D Double Interlock Preaction System is the Model DDX Deluge Valve. This deluge valve is a hydraulically operated, straight-through-design, differential latching clapper-type (see Fig. 1). System maintenance is simplified since the deluge valve can be reset externally without removing the cover plate. This feature provides a significant system-restoration time advantage. The Model DDX Deluge Valve has an intermediate chamber and thereby does not require an in-line air check valve. Subsequently, the deluge valve only requires a single drain connection.

The Reliable Model DDX Type D Double Interlock Preaction System trim set provides all of the necessary equipment for connections to the Model DDX Deluge Valve pushrod chamber inlet and outlet ports, a 1¼" (30 mm) main drain on 2" (50 mm), 2½" (65 mm), 76 mm and 3" (80 mm) valve sizes or a 2" (50 mm) main drain on 4" (100 mm), 165 mm, 6" (150 mm) and 8" (200 mm) valve sizes, alarm devices, air supply, and required pressure gauges. This trim set is available in individual (loose) parts, in time-saving, segmented assembled kit forms or fully assembled to the Model DDX Deluge Valve (with or without a control valve).

Listings & Approvals:

(Only when used with Reliable Trim Sets.)

1. Reliable's Type D Double Interlock Preaction Systems 2" (50 mm), 2½" (65 mm), 76 mm and 3" (80 mm), 4" (100 mm), 165 mm, 6" (150 mm) and 8" (200 mm) are Factory Mutual Approved Refrigerated Area Sprinkler Systems for use in refrigerated rooms or buildings. Refrigerated area sprinkler systems are FM Approved as complete systems. Systems are FM Approved for use with thermal detectors and Class A detector wiring only.
2. Factory Mutual Approved for applications where FM Global Data Sheets allow the use of double-interlock preaction systems.
3. Reliable's Type D Double Interlock Preaction Systems 2" (50 mm), 2½" (65 mm), 76 mm, 3" (80 mm), 4" (100 mm), 165 mm, 6" (150 mm) and 8" (200 mm) are Underwriters Laboratories, Inc. Listed and UL certified for Canada (cULus) in the Special System Water Control Valve-Double Interlock Type (VLJH) category.

Note: Wherever the word "air" is used in this bulletin as a reference to the pneumatic pressure source it shall also mean "air or nitrogen."

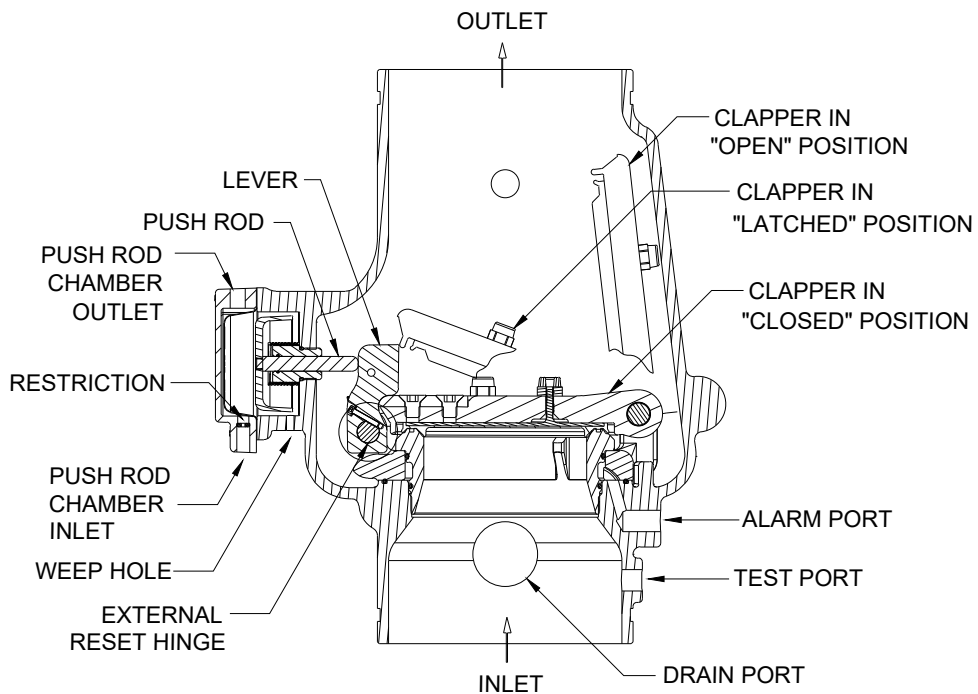
System Operation

When set correctly for service, the Model DDX Deluge Valve is hydraulically established to separate the supply water from the sprinkler system piping. The Reliable Model DDX Deluge Valve is shown in both closed and open positions in Fig. 1. In the closed position, the supply pressure acts on the underside of the clapper and also on the pushrod through the pushrod chamber inlet restriction. The resultant force due to the supply pressure acting on the pushrod is multiplied by the mechanical advantage of the lever and is more than sufficient to hold the clapper closed against normal supply pressure surges.

Whenever the detection system is activated and a low system air pressure condition coexist, the solenoid valve is energized open which vents the pushrod chamber to atmosphere through the chamber outlet. Since the pressure can not be replenished through the inlet restriction as rapidly as it is vented, the pushrod chamber pressure falls instantaneously. When the pushrod chamber pressure approaches approximately on-third of the supply pressure, the upward force of the supply pressure acting beneath the clapper overcomes the lever applied force thereby opening the clapper.

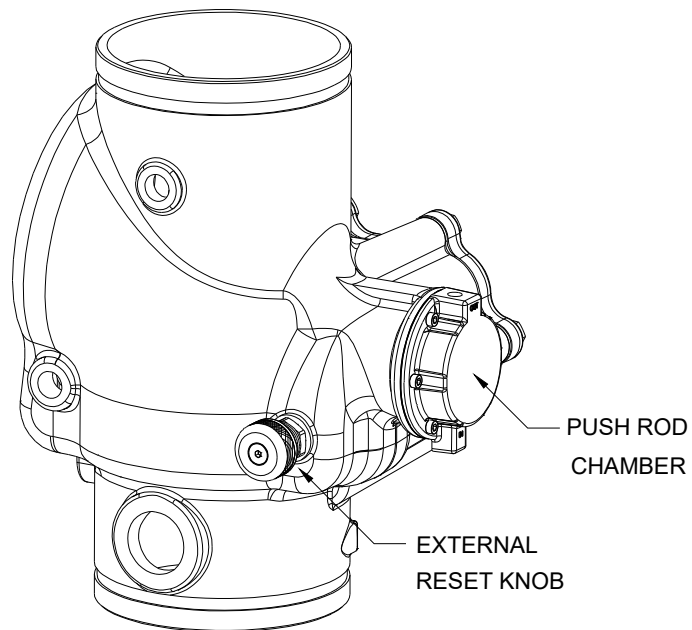
Once the clapper has opened, the lever acts as a latch, preventing the clapper from returning to the closed position. Water from the supply flows through the Deluge Valve into the sprinkler system piping. Water also flows through the alarm outlet to the alarm devices.

Resetting the clapper of the Model DDX Deluge Valve is accomplished using the convenient external reset knob on the rear of the valve. The external reset feature of the Model DDX Deluge Valve provides a means for simple, economical system testing, which is one essential facet of a good maintenance program. The external reset feature does not,



MODEL DDX VALVE: SECTION VIEW

1C_COMMDDX_1



MODEL DDX VALVE: REAR VIEW

TO RESET: PUSH INWARD AND ROTATE KNOB CLOCKWISE (AS VIEWED FROM REAR)
 TO RESET CLAPPER. NOTE: PUSH ROD CHAMBER MUST BE VENTED TO DRAIN.

however, eliminate another important facet of good maintenance, namely, periodic cleaning and inspection of the internal valve parts.

A valve body drain is provided in the event that water builds up due to condensate from the air supply system or water left inside form system testing. After closing the main supply valve, the condensate drain can be opened slightly until the water inside the vale body and main pipe column has drained. See the section titled "Draining Excess/Condensate Water from the System" in this bulletin for the detailed procedure.

The Model B Manual Emergency Station is included in the Reliable Type D Double Interlock Preaction System trim sets. It consists of an aluminum nameplate mechanically attached to a ball valve. The valve handle in its OFF position is guarded against accidental turning to the ON position (and system discharge) by a nylon cable tie provided with each trim kit. The cable tie is inserted after the system has been restored for operation. The nylon cable tie is designed to allow, in case of an emergency, forceful turning of the valve handle to the ON position. As an alternative to the Model B Hydraulic Manual Emergency Station, the Model A Hydraul-

lic Manual Emergency Pull Box (see Reliable Bulletin 506) is also available and can be provided as an option.

Whenever ambient temperature conditions are high, the water temperature in the Model DDX Deluge Valve pushrod chamber could possibly increase, thereby increasing the pressure in the chamber to values exceeding the rated pressure of the system. In an indoor installation where standard room temperatures are exceeded, a pressure relief kit may be needed. Pressure relief kit, P/N 6503050001, can be installed into the pushrod chamber's releasing line to limit the pressure to 250 psi (17.2 bar).

Reliable Model DDX Deluge Valve with associated Type D Double Interlock Preaction Trims sizes 2" (50 mm), 2½" (65 mm), 76 mm, 3" (80 mm), 4" (100 mm), 165 mm, 6" (150 mm) and 8" (200 mm) are rated for use at a minimum water supply pressure of 20 psi (1.4 bar) and a maximum water supply pressure of 250 psi (17.2 bar) for 2" (50mm), 2½" (65mm), 3" (80mm), 76mm and 8" (200mm) valve sizes and 300 psi (20.7 bar) for 4" (100mm), 6" (150mm) and 165mm valve sizes. Water supplied to the inlet of the valve and to the pushrod chamber must be maintained between 40°F (4°C) and 140°F(60°C).

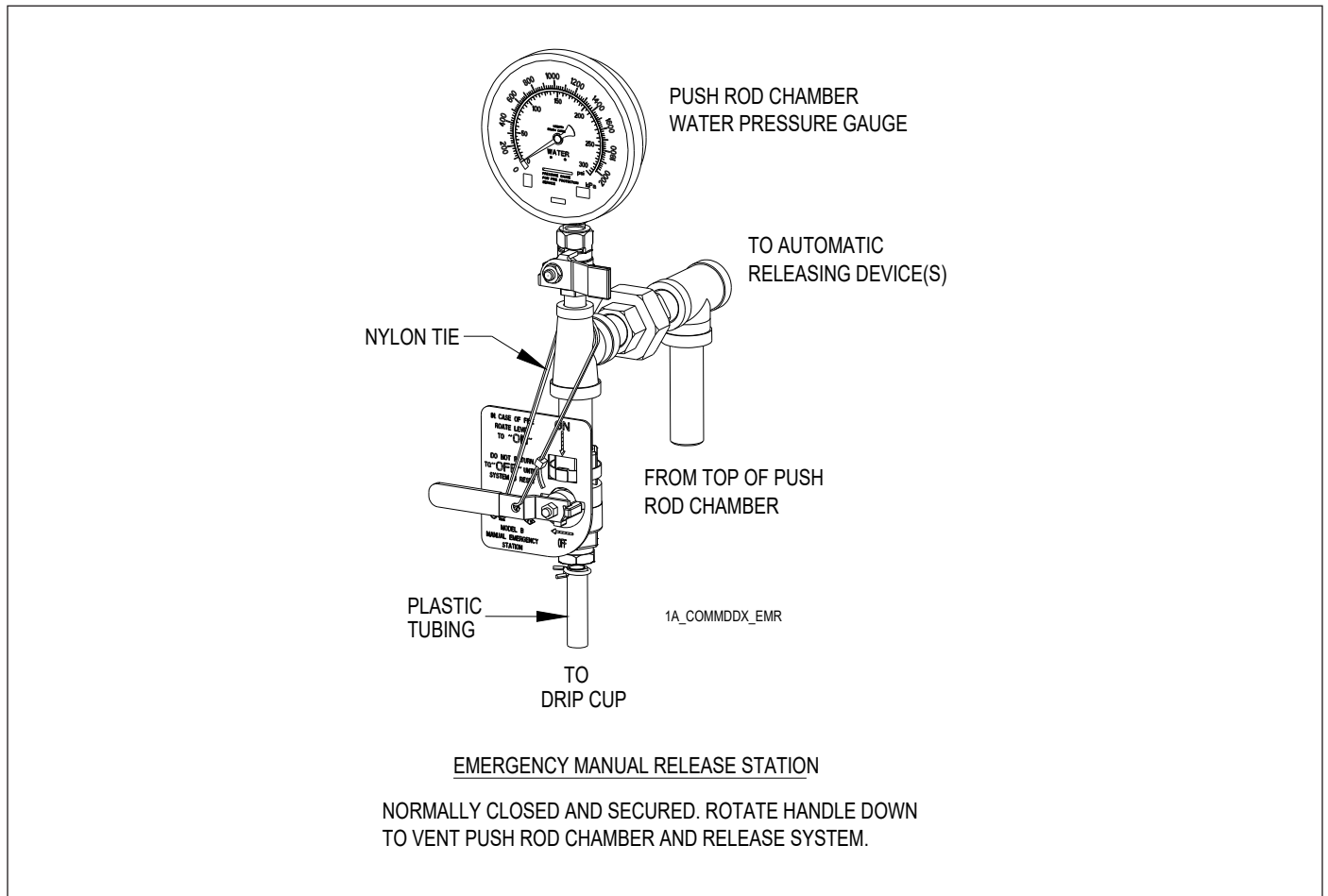


Fig. 2

Pressurizing Line Connection

The water supply for the pushrod chamber must be provided a dedicated connection to the water supply piping. Pressurizing lines for multiple Model DDX Deluge Valve pushrod chambers must never be manifolded together. Each Model DDX Deluge Valve must have its own pushrod chamber pressurizing line connection.

This connection must be made on the supply side of the water supply control valve. This can be accomplished by:

- Using a tapped connection directly below or next to the main water supply control valve using a welded outlet or the appropriate mechanical fittings. A grooved-end outlet coupling is one way to achieve this; or
- Using a water supply control valve that has an available threaded (NPT) supply-side tap design to allow for a direct water supply connection to the Model DDX Deluge Valve's pushrod chamber.

Caution: Reliable's DDX valve is designed with an inlet restriction built into the pushrod chamber. It is important not to introduce additional restrictions into the direct water supply connection or the discharge from the pushrod chamber by installing additional valves or improperly installing the copper lines used in the trim of the valve.

Hydrostatic Testing of DDX Valves and DDX Systems

As required by NFPA 13, fire sprinkler systems with working pressures up to and including 150 psi are to be hydrostatically tested at a water pressure of 200 psi. Fire sprinkler systems with working pressures above 150 psi are required to be hydrostatically tested at 50 psi above the system working pressure. In addition to the hydrostatic tests described above, dry pipe and double interlock preaction systems require an additional low pressure air test.

In some cases, hydrostatic testing (in accordance with the NFPA 13 requirements noted above) will result in pressures that exceed the working pressure of the valve and trim kit for the two-hour test period. **The valve and applicable trim kit have been tested, approved and listed under these conditions and as such, hydrostatic testing in accordance with NFPA 13 is acceptable. In addition, the clapper can remain in the closed position and the trim kit need not be isolated, as each has been designed to withstand hydrostatic testing as required by NFPA 13.**

Hydrostatically testing the valve and trim to pressures higher than their rating is limited to the hydrostatic test as referenced by NFPA 13. It does not address the occurrence(s) of a "water hammer" effect, which can indeed damage the valve. A "water hammer" in the water supply piping of the valve can create pressures in excess of the rated pressure and should be avoided by all necessary means. This condition may be created from improper fire pump settings, underground construction work, or an improper venting of trapped air in the water supply piping.

System Design Considerations

The automatic sprinklers, releasing devices, electric releasing control equipment, fire detection devices, manual pull stations, and signaling devices which are utilized with the Type D Double Interlock Preaction System must be UL or ULC Listed or FM Approved, as applicable.

Factory Mutual requires that detection devices in refrigerated areas be of the fixed temperature type having a temperature rating lower than that of the sprinklers and preferably as low as possible for the given ambient conditions.

The Deluge Valve, and all interconnecting piping must be located in a readily visible and accessible location and in an area that can be maintained above 40°F (4°C). **Note:** Heat Tracing is not permitted.

Pendent sprinklers, other than dry pendants, used on preaction systems shall be installed on return bends per NFPA 13.

The solenoid valve must be operated and the system supervised by a listed releasing control panel.

System Air Pressure Requirements

In accordance with NFPA 13, Double Interlock Preaction Systems require a minimum of 7 psi (0.5 bar) pneumatic pressure to supervise the sprinkler system. The Reliable Model A Pressure Maintenance Device is used to maintain the system pneumatic pressure where a dry nitrogen gas supply or a clean, dependable and continuous (24 hours a day, 7 days a week) compressed air source is available. To adjust the system pneumatic pressure, refer to Reliable Bulletin 251.

The high/low pressure alarm switch should be set to operate between 5 and 6 psi (0.3 and 0.4 bar) on decreasing (low) and increasing (high) pneumatic pressure. Adjustment can be made to the pressure switch by following the manufacturer's installation and maintenance procedures.

Note: The dew point of the air supply must be maintained below the lowest ambient temperature to which the double interlock preaction system piping will be exposed. Introduction of moisture into the system piping that is exposed to freezing temperatures can create ice blockage, which could prevent proper operation of the sprinkler system. As a minimum, the air supply of air should be taken from the refrigerated area at the lowest temperature. The air supply system must be carefully designed to prevent plugging by frost deposits. Special requirements such as those in FME&R Installation Guidelines for Refrigerated Storage may need to be incorporated.

Each Type D Double Interlock Preaction system is provided with a Reliable Model A Pressure Maintenance Device for individual monitoring of pneumatic pressure and proper operation of the system. The Reliable Model A Pressure Maintenance Device requires a tank mounted air compressor.

DO NOT use bleeder valves for testing of the low-pressure switch on the trim. Release of pneumatic pressure from the actuator trim will result in operation of the system.

System Electrical Requirements

All releasing and detection devices in Reliable's Model DDX Type D Double Interlock Preaction System may be operated and supervised by the PFC-4410G3 Releasing Control Panel. An emergency manual pull station should be provided near the sprinkler riser to facilitate setup of the system.

The power supply, the standby emergency power supply, battery charger, and the rectifier circuitry are all contained within the Potter PFC-4410G3 Releasing Control Panel. Batteries that provide ninety hours of standby power are required for Factory Mutual Approved systems.

The Potter PFC-4410G3 Releasing Control Panel can utilize either 120VAC or 220VAC.

Note: The high/low pressure alarm switch should be set to operate between 5 and 6 psi (0.3 and 0.4 bar) on decreasing (low) and increasing (high) pneumatic pressure. Adjustment can be made to the pressure switch by following the manufacturer's installation and maintenance procedures.

Standard Solenoid Valve Specifications:

Parker-Hannifin Model 73218BN4UNLVN0C111C2

Rated working pressure: 175 psi (12.1 bar)

Voltage: 24 VDC

Power: 10 Watts

Current: 0.41 Amps Holding

Enclosure Coil: NEMA 4X

Pipe Size: ½" NPT Female

Cv Factor: 4.0

Alternate Solenoid Valve Specifications:

Parker-Hannifin Model 73212BN4TNLVN0C322C2

Rated working pressure: 300 psi (20.7 bar)

Voltage: 24 VDC

Power: 22 Watts

Current: 0.83 Amps Holding

Enclosure Coil: NEMA 4X

Pipe Size: ½" NPT Female

Cv Factor: 2.8

Pneumatic Supervisory Pressure Supply Options

Note: See Reliable Bulletins 254 and 251 for complete information on air and nitrogen regulating equipment.

Owner's Air supply

Supervisory air supply shall be provided by an owner supplied air system in conjunction with a listed automatic pressure maintenance device, capable of maintaining a constant system pressure regardless of pressure fluctuations in the compressed air source.

Compressed Air Supply

Supervisory air supply shall be provided by an automatic tank-mounted air compressor sized for the capacity of the double interlock preaction system piping, and be capable of restoring normal air pressure in the system within the time limits specified by NFPA 13. Unit shall include a motor mounted, oil-less, piston compressor, pressure gauge, pressure switch, check valve, drain valve and safety relief valve. Single-phase motor shall have internal thermal protection.

Nitrogen

Nitrogen cylinders are an acceptable source of supervisory pneumatic pressure. The nitrogen cylinder pressure shall be regulated and supervised through the use of nitrogen regulating device and low-pressure trim kit. This device shall consist of a brass, single stage pressure regulator, equipped with high pressure inlet and low pressure outlet gauges, and ¼" copper connection tubing with galvanized ¾" x ¼" reducer bushing. This kit shall include a low-pressure switch with associated galvanized connection trim. Assembly shall be a Reliable Nitrogen Regulating Device. This device is to be used in conjunction with the Reliable Model A Pressure Maintenance Device.

Nitrogen generators meeting the requirements of NFPA 13 are also an acceptable source of supervisory pneumatic pressure. Note the the nitrogen generator system must incorporate a storage tank.

Technical Data

Reliable Double Interlock Type D Preaction Systems, with associated trim, size 2" (50 mm), 2½" (65 mm), 76 mm, 3" (80 mm), 4" (100 mm), 165 mm, 6" (150 mm), 8" (200 mm) are rated for use at minimum water supply pressure of 20 psi (1.4 bar) and maximum supply pressure of 250 psi (17.2 bar) for 2" (50mm), 2½" (65mm), 3" (80mm), 76mm and 8" (200mm) valve sizes and 300 psi (20.7 bar) for 4" (100mm), 6" (150mm) and 165mm valve sizes. Water supplied to the inlet of the valve and to the pushrod chamber must be maintained between 40°F (4°C) and 140°F (60°C).

The following list of technical bulletins pertains to valves and devices that may be used in this preaction system:

Deluge Valve	Reliable 519
Hydraulic Emergency Station (Model A)	Reliable 506
Mechanical Sprinkler Alarm	Reliable 612/613
Pressure Maintenance Device	Reliable 251
Nitrogen Regulating Device	Reliable 254
Releasing/Control Panel	Potter #5401600
Low Air Pressure Supervisory Switch	Potter 5401524, 5401564
Waterflow Pressure Alarm Switch	Potter 5400928

Model DDX Deluge Valve Description

- Rated working pressure:
Valve & System - 250 psi (17.2 bar) for 2" (50mm), 2½" (65mm), 3" (80mm), 76mm and 8" (200mm) valve sizes and 300 psi (20.7 bar) for 4" (100mm), 6" (150mm) and 165mm valve sizes.
- Factory tested to a hydrostatic pressure of 500 psi (34.5 bar) for 2" (50mm), 2½" (65mm), 3" (80mm), 76mm and 8" (200mm) valve sizes and 600 psi (41.7 bar) for 4" (100mm), 6" (150mm) and 165mm valve sizes. (Valve only)
- End and trim connections:
 - ANSI/AWWA C606 grooved inlet and outlet

Nominal Pipe Size	Outlet Diameter	Groove Diameter	Groove Width	Outlet Face to Groove
2" (50 mm)	2.375" (60 mm)	2.250" (57 mm)	11/32" (9.0 mm)	5/8" (16 mm)
2½" (65 mm)	2.875" (73 mm)	2.720" (69 mm)	11/32" (9.0 mm)	5/8" (16 mm)
76 mm	3.000" (76 mm)	2.845" (72 mm)	11/32" (9.0 mm)	5/8" (16 mm)
3" (80 mm)	3.500" (89 mm)	3.344" (85 mm)	11/32" (9.0 mm)	5/8" (16 mm)
4" (100 mm)	4.500" (114 mm)	4.334" (110 mm)	3/8" (9.5 mm)	5/8" (16 mm)
165 mm	6.500" (165 mm)	6.330" (161 mm)	3/8" (9.5 mm)	5/8" (16 mm)
6" (150 mm)	6.625" (168 mm)	6.455" (164 mm)	3/8" (9.5 mm)	5/8" (16 mm)
8" (200 mm)	8.625" (219 mm)	8.441" (214 mm)	7/16" (11 mm)	3/4" (19 mm)

- Threaded openings Per ANSI B 2.1
- Flange Dimensions

Flange Type:	Nominal Pipe Size	Bolt Circle Diameter	Bolt Hole Diameter	Flange Outside Diameter	Flange Thickness	Number of Bolts
ASME B16.5 Class 150	4" (100mm)	7½" (191mm)	¾" (19mm)	9" (229mm)	15/16" (24mm)	8
ISO 7005-2 PN16	4" (100mm)	7¾" (180mm)	¾" (19mm)	9" (229mm)	15/16" (24mm)	8
ASME B16.5 Class 150	6" (150mm)	9½" (241mm)	7/8" (22mm)	11" (279mm)	15/16" (24mm)	8
ISO 7005-2 PN16	6" (150mm)	9¾" (240mm)	29/32" (23mm)	11" (279mm)	15/16" (24mm)	8
ASME B16.5 Class 150	8" (200mm)	11¾" (298mm)	7/8" (22mm)	13½" (343mm)	1" (25.4mm)	8
ISO 7005-2 PN16	8" (200mm)	11½" (295mm)	29/32" (23mm)	13½" (343mm)	1" (25.4mm)	12

- Valve Color:

Valve Size	Color
2" (50 mm)	Black or Red
2½" (65 mm)	Black or Red
76 mm	Red
3" (80 mm)	Black or Red
4" (100 mm)	Black or Red
165 mm	Red
6" (150 mm)	Black or Red
8" (200 mm)	Black or Red

- Face to face dimensions:

Valve Size:	End Connection:	End to End:
2" (50mm), 2½" (65mm), 76mm & 3" (80mm)	Groove/ Groove	12½" (318mm)
4" (100mm)	Groove/ Groove	14" (356mm)
	Flange/ Groove	16" (406mm)
	Flange/ Flange	16" (406mm)
6" (150mm) & 165mm	Groove/ Groove	16" (406mm)
	Flange/ Groove	19" (483mm)
	Flange/ Flange	19" (483mm)
8" (200mm)	Groove/ Groove	19¾" (492mm)
	Flange/ Flange	21¼" (540mm)

- Valve shipping weight:

Valve Size:	End Connection:	Weight:
2" (50mm), 2½" (65mm), 76mm & 3" (80mm)	Groove/ Groove	34 lbs (15 kg)
4" (100mm)	Groove/ Groove	64 lbs (29 kg)
	Flange/ Groove	79 lbs (36 kg)
	Flange/ Flange	92 lbs (42 kg)
6" (150mm) & 165mm	Groove/ Groove	95 lbs (43 kg)
	Flange/ Groove	122 lbs (56 kg)
	Flange/ Flange	138 lbs (69 kg)
8" (200mm)	Groove/ Groove	148 lbs (67 kg)
	Flange/ Flange	197 lbs (90 kg)

- Trim shipping weight:

Trim Configuration	2" (50 mm), 2½" (65 mm), 3" (80 mm) & 76 mm	4" (100 mm), 6" (150 mm), 8" (200 mm) & 165 mm
Type D Double Interlock	47 lbs (21 kg)	52 lbs (24 kg)

- Friction loss (Expressed in equivalent length of Schedule 40 pipe, based on Hazen & Williams formula: Reference Figure 3.
- Installation position: Vertical



MODEL DDX HYDRAULIC FRICTION LOSS GRAPH

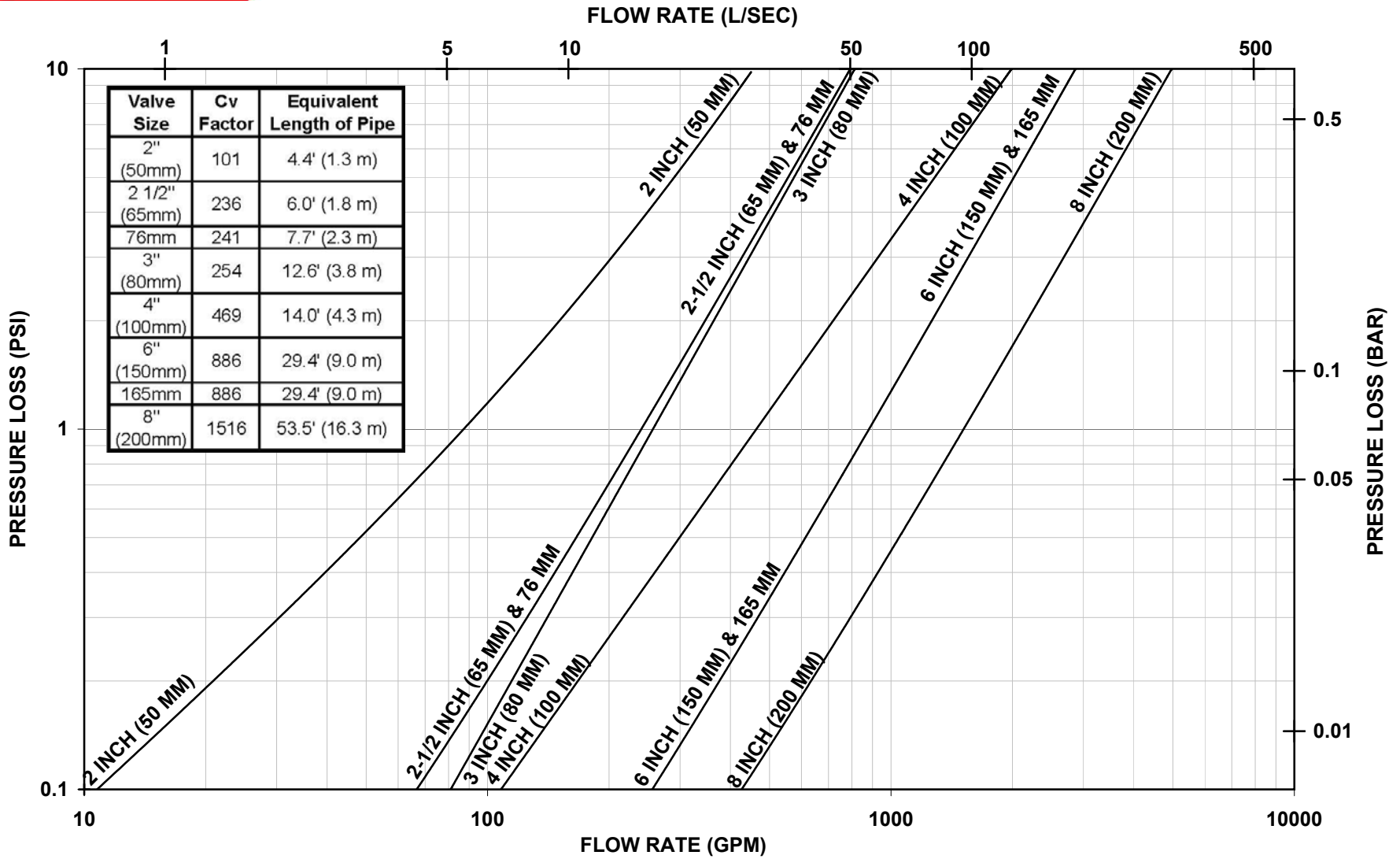


Fig. 3

Trim Descriptions

The Type D Double Interlock Preaction Trims for the Reliable Model DDX Deluge Valve are arranged for rapid, easy, and compact attachment, and serve as connection points to Reliable Model C Mechanical Alarms and other devices.

The Double Interlock Type D Preaction System trim configurations can be ordered as individual parts, in time-saving segmentally assembled kit forms, or fully assembled to the Model DDX Deluge Valve (with or without a control valve).

The Model B Hydraulic Manual Emergency Station is a standard item of all Deluge Valve trim sets. It consists of an aluminum nameplate mechanically attached to a ball valve. The valve handle in its OFF position is guarded against accidental turning to the ON position (and system discharge) by a nylon cable tie provided with each trim kit. The cable tie is inserted, after the system has been restored for operation. The nylon cable tie is designed to allow, in case of an emergency, forceful turning of the valve handle to the ON position. As an alternative to the Model B Hydraulic Manual Emergency Station, the Model A Hydraulic Manual Emergency Pull Box (see Bulletin 506) is also available and can be provided as an option.

Resetting Model DDX Type D Double Interlock Preaction System

1. Close the valve controlling water supply to the Deluge Valve and close the air or nitrogen supply to the sprinkler system.
2. Close the pushrod chamber supply valve.
3. Open main drain valve and drain system.
4. Open all drain valves and vents at low points throughout the system, closing them when flow of water has stopped. Open the Model B Manual Emergency Station to relieve pressure in the pushrod chamber of the Deluge Valve.
5. With the alarm line valve open, push in the plunger of ball drip valve, forcing the ball from its seat, and drain the alarm line.
6. With the Model B Manual Emergency Station open, push in and rotate the Deluge Valve's external reset knob counterclockwise (when facing the valve), until you hear a distinct noise indicating that the clapper has reset. **Note:** The reset knob can be rotated only while pressure in the pushrod chamber is vented to atmospheric conditions (0 psig).
7. Inspect and replace any portion of the detection system and/or sprinkler system subjected to fire conditions.
8. Open the pushrod chamber supply valve and allow water to fill the pushrod chamber. Close the Model B Manual Emergency Station.
9. Bleed all air from the actuation piping: Open the solenoid valve by operating a detector or an electric manual emergency station. While water is flowing through the solenoid valve, cause it to close using the release control panel reset.

10. Close the alarm line valve. Open the air or nitrogen supply quick fill valve to restore 10 psi (0.7 bar) supervisory pressure in the sprinkler system, then set the pneumatic supply to automatic operation. Note: To build supervisory air pressure in the sprinkler system, it may be necessary to temporarily close the main drain valve until air pressure has built up to the recommended level.

11. Open the alarm line valve. Verify the main drain valve is open. Open slightly the main valve controlling water supply to the Model DDX Deluge Valve, closing the main drain valve when water flows. Observe if water leaks through the ball drip valve into the drip cup. If no leak occurs, the Deluge Valve clapper is sealed. Open slowly and verify the main valve controlling water supply is fully opened and properly monitored.

12. Verify that the pushrod chamber supply valve and alarm line valve are open. The pushrod chamber supply valve must remain open when the Deluge Valve has been reset, to maintain water pressure in the pushrod chamber.

13. Verify that the Model B Manual Emergency Station is secured in the OFF position with the appropriate nylon tie.

Inspection and Testing

1. Water supply — Confirm that valves controlling water supply to the Deluge Valve are opened fully and properly monitored.
2. Alarm line — Confirm that the alarm line valve is open and remains in this position.
3. Other trim valves — Confirm that the pushrod chamber supply valve is open, as well as all pressure gauge valves. The main drain valve, condensate drain valve, and alarm test valve should be closed.
4. Ball drip valve — Push in on the plunger to be sure ball check is off its seat. If no water appears, the Deluge Valve water seat is tight. Inspect the bleed hole on the underside of the pushrod chamber for leakage.
5. Dry pilot trim — Inspect air pressure for conformance to Table A.
6. Releasing device — Check outlet of the releasing device (i.e., solenoid valve and hydraulic manual emergency station) for leakage. Also verify that tubing drain lines from releasing devices are not pinched or crushed which could prevent proper releasing of the Deluge Valve.
7. Testing alarms — Open the alarm test valve permitting water from the supply to flow to the electric sprinkler alarm switch and to the mechanical sprinkler alarm (water motor). After testing, close this valve securely. Push in on the plunger of ball drip valve until all water has drained from the alarm line.
8. Operational test — Open the Model B Manual Emergency Station. Alternatively, operate the electrical detection system and deplete pneumatic pressure from the sprinkler system.

Note: AN OPERATIONAL TEST WILL CAUSE THE DELUGE VALVE TO OPEN AND FLOW WATER INTO THE SPRINKLER SYSTEM.

9. Secure the Model B Manual Emergency Station in the OFF position with nylon tie after Deluge Valve is reset.

Testing Detection System Without Operating Deluge Valve

1. Close the valve controlling water supply to the deluge valve and open the main drain valve.
2. Verify that valve supplying hydraulic pressure to the piston/pushrod chamber is open, allowing water to enter the pushrod chamber.
3. Operate the electrical detection system and deplete pneumatic pressure from the sprinkler system.
4. Operation of the detection combined with loss of pneumatic pressure must result in a sudden drop of water pressure in the pushrod chamber, as indicated by the pressure gauge on the hydraulic release trim.
5. Reset the valve per the reset instructions.

Maintenance

The owner is responsible for maintaining the fire protection system in proper operating condition. Any system maintenance or testing that involves placing a control valve or detection/control system out of service may eliminate the fire protection that is provided by the fire protection system.

The Reliable Model DDX valve and associated equipment shall periodically be given a thorough inspection and test. NFPA 25, "Inspection, Testing, and Maintenance of Water Based Fire Protection Systems," provides minimum maintenance requirements. System components shall be tested, operated, cleaned, and inspected at least annually, and parts replaced as required. Replace any components found to be corroded, damaged, worn, or non-operable. Increase the frequency of inspections when the valve is exposed to corrosive conditions or chemicals that could impact materials or operation of the assembly.

If face plate is removed during maintenance, torque face plate bolts to the following values during re-installation:

- 35 ft-lbs. (47 N-m) for 2" through 4" valves
- 70 ft-lbs. (95 N-m) for 6"-8" valves

Troubleshooting

1. Mechanical sprinkler alarm not operating: This is most likely caused by a clogged screen in the strainer of the water motor. Proceed as follows: Remove plug from the strainer. Remove and clean the screen. Replace the screen and the plug, and then tighten securely (Ref. Bulletin 613).
2. Water leaking from Ball Drip. This can be caused by either a water column on top of the clapper or a supply water leakage.
 - a. Leakage due to water column. This condition is caused by leakage past the clapper seal assembly. Be sure the clapper seal and seat are free of any type of debris or damage. If necessary, follow steps below to replace the seal assembly and/or seat.
 - b. Supply water leakage. This condition is caused by leakage past the lower seat O-ring. Follow steps below for inspection and/or replacement of lower seat O-ring.

Repair Procedures - Model DDX Deluge Valve

The following section provides instructions to correct both conditions:

1. Disable detection system.
2. Shut down the valve controlling the water supply to the Deluge Valve and open the main drain valve. Open the condensate drain valve. Close the pushrod chamber supply valve and open the Model B Manual Emergency Station.
3. Remove the Deluge Valve front (handhold) cover and inspect the seat, clapper, and seal assembly for damage. If inspection indicates damage to the seal assembly, replace as follows:
4. Remove the bumpstop nuts and remove the seal assembly. Install a new seal assembly and thread the bumpstop nuts onto the threaded studs of the seal assembly. Tighten finger tight plus $\frac{1}{4}$ to $\frac{1}{2}$ turn.
5. If inspection indicates damage to the clapper, proceed to step 6.
6. At the rear of the valve, disconnect the condensate drain trim section starting with the elbow connector. Then remove the $\frac{1}{4}$ " globe valve, followed by the $\frac{3}{4}$ "x $\frac{1}{4}$ " reducing bushing. Remove the retaining rings from the clapper hinge pin, push the hinge through the condensate drain opening and remove the clapper subassembly. Install a new clapper subassembly in the reverse order making sure the clapper spacers are in their proper position.
7. If the seat is damaged, or it is suspected that the leakage is through the seat O-rings, proceed to step 8.
8. Using Reliable P/N 6881603000 Seat Wrench for 2" (50mm), 2½" (65mm), 76mm and 3" (80mm) valve sizes, Reliable P/N 6881604000 for 4" (100mm) valve size, Reliable P/N 6881606000 for the 6" (150mm) and 165mm valve sizes or Reliable P/N 6881608000 Seat Wrench for 8" (200mm) valve size, remove the seat by unscrewing. This will loosen the seat-clapper-mounting ring subassembly. Reach into the valve and grasp the seat and remove it from the valve. Then remove the clapper-mounting ring subassembly from the valve. Visually examine all components of the seat-clapper-mounting ring subassembly and replace any component that appears damaged. New O-rings should always be used for reassembly.
9. Reassembly: clean the bore of the valve body. Lubricate the bore with O-ring grease. Lubricate and install the O-rings onto the seat. Lubricate and install the mounting ring O-ring into the body (8" (200mm) valve size only). Insert the clapper-mounting-ring subassembly into the handhold opening of the Deluge Valve using caution to not damage or dislodge the mounting ring O-ring (8" (200mm) valve size only). Align the mounting ring so that the Lever is near the pushrod and the mounting ring "ears" are between the tabs of the valve body. Insert the seat into the valve body and through the clapper-mounting ring subassembly. Start to tread the seat into the body by hand, then tighten the seat with the seat wrench until it bottoms out on the mounting ring. Verify that the seat-clapper-mounting ring subassembly is in the fully down position between the tabs of the body, and check to see that the lever lines up with the pushrod. Reassemble the handhold cover and set up the Model DDX Deluge Valve as per the section "Resetting Model DDX Type D Double Interlock Preaction System."

Pushrod Chamber Maintenance - Model DDX Deluge Valve

A small bleed hole is located on the underside of the pushrod chamber. Water leakage from the bleed hole can be caused by a ruptured pushrod diaphragm:

- a) Disable detection system.
- b) Shut down the valve controlling water supply to the Deluge Valve. Relieve the inlet pressure by opening the main drain valve. Close the pushrod chamber supply valve and open the Model B Manual Emergency Station.
- c) Remove the trim at the unions nearest to the pushrod chamber cover.
- d) Take the pushrod chamber cover off by removing the six retaining screws.
- e) Visually inspect the pushrod chamber cover and piston to determine what could have damaged the diaphragm and then correct. Install a new diaphragm.

Note: The diaphragm has two different surfaces; it is not bi-directional and will fail if installed backwards. Roll the diaphragm so that the smooth surface (the pressure side) conforms to the inside of the pushrod chamber cover and the fabric side engages the pushrod.

- f) Reassemble the six retaining screws with an installation torque of 15 foot-pounds in a star pattern.
- g) Set up the Model DDX Deluge Valve as per the section "Resetting Model DDX Type D Double Interlock Preaction System."

Draining Excess/Condensate Water from the System

1. Notify the owner and monitoring company that maintenance is being performed on the system.
2. Close the main water control valve.
3. Open the Main Drain Valve.
4. Open the Condensate Drain Valve until all water has drained.
5. Close Condensate Drain Valve.
6. Partially open the Main Water Control Valve.
7. Slowly close the Main Drain Valve.
8. Fully open the Main Water Control Valve.
9. Notify the owner and monitoring company that the system has been returned to service.

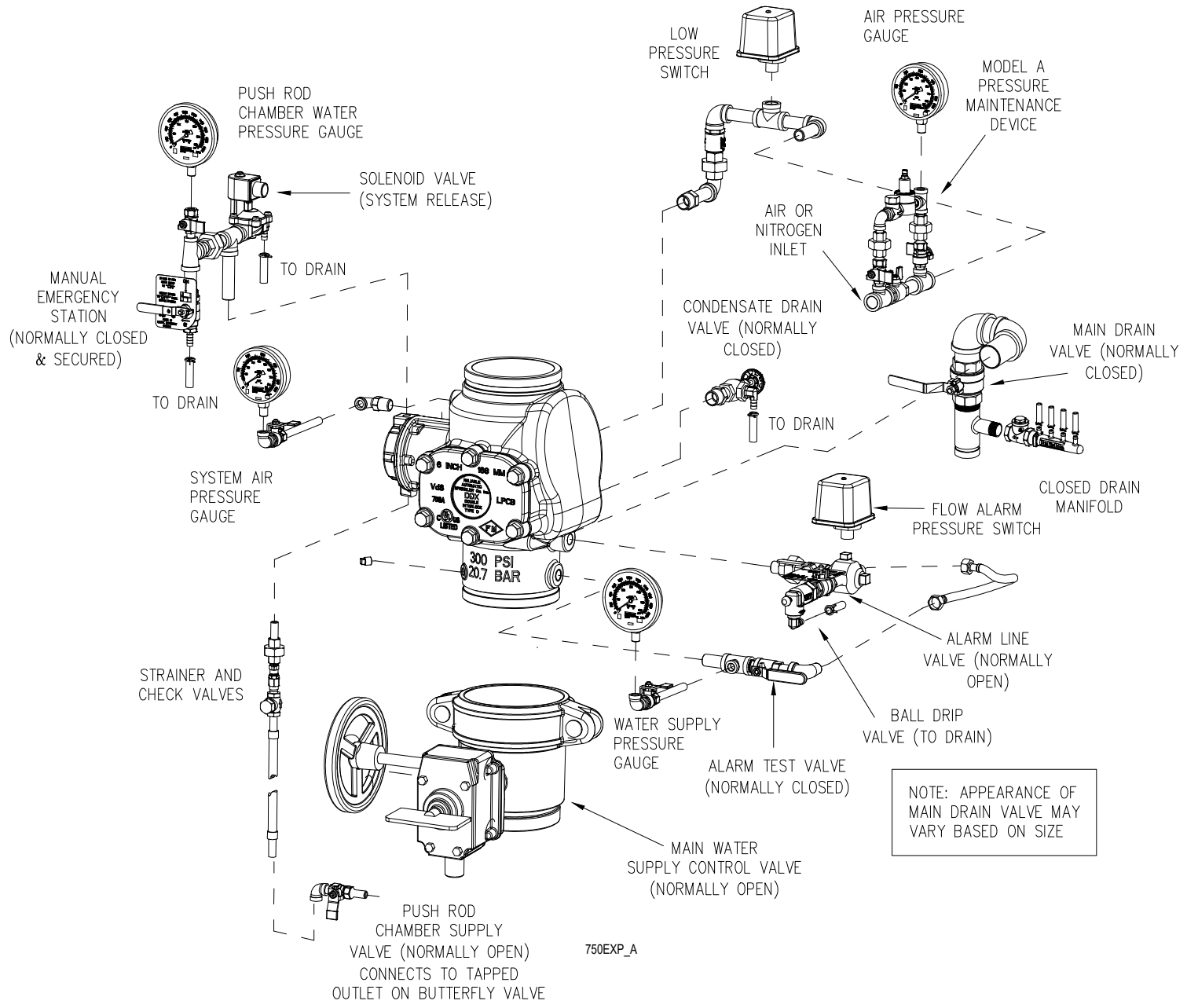


Fig. 4

MODEL DDX VALVE WITH STAINLESS STEEL SCREW-IN SEAT

IMPORTANT NOTE: Early generation 4" and 6" DDX valves may incorporate a brass drop-in seat. Prior to ordering replacement parts, confirm the presence of a stainless steel screw-in seat or brass drop-in seat. For replacement parts for valves with brass drop-in seat, please contact Reliable Sprinkler Company Technical Services (techserv@reliablesprinkler.com)

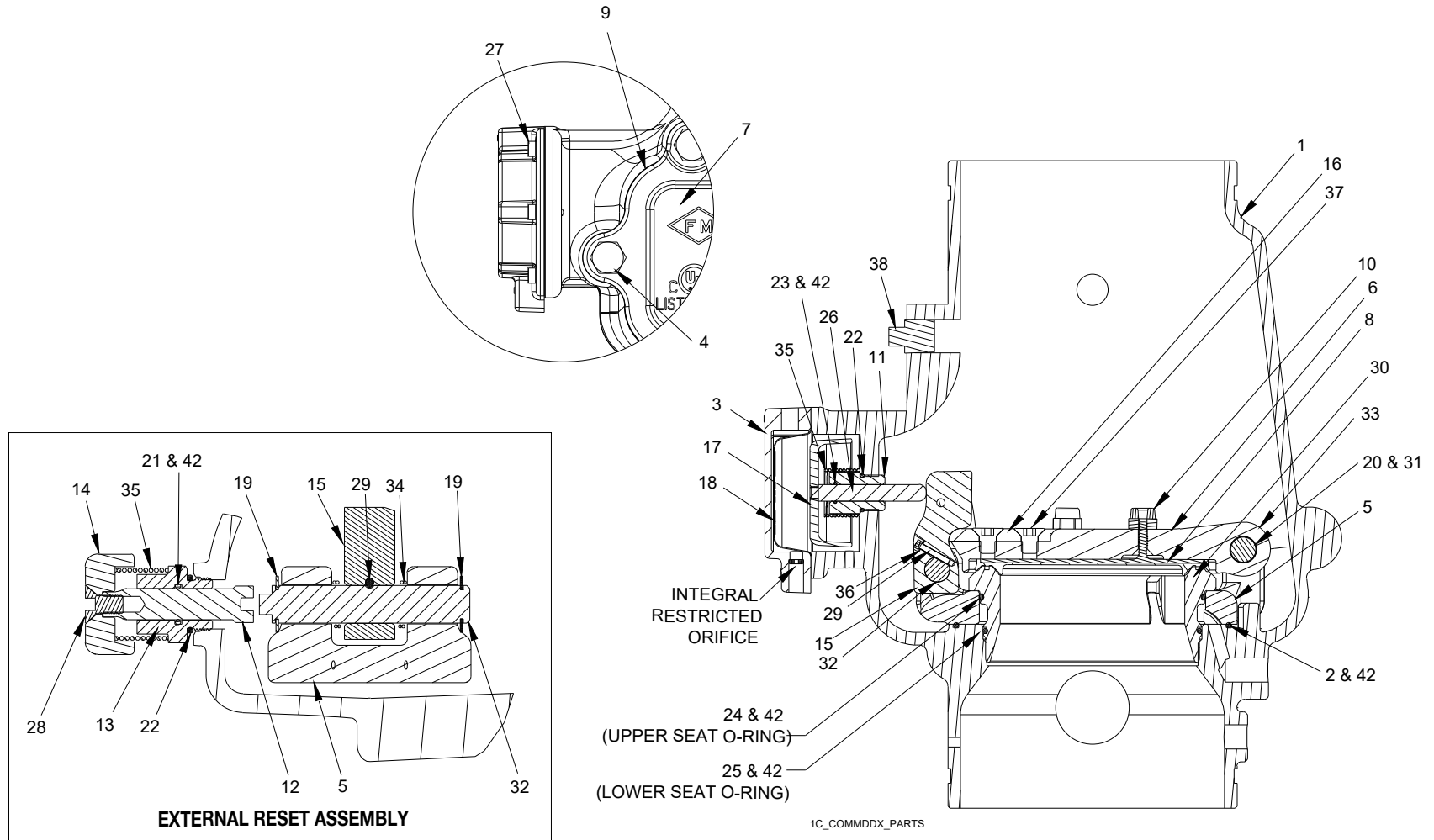


Fig.5

Model DDX (Screw-In Seat Configuration) Deluge Valves Parts List (Refer to Fig. 5)

Item No.	Part No.								Part Description	QTY.	Material	
	2" (50mm)	2½" (65mm)	76mm	3" (80mm)	4" (100mm)	165mm	6" (150mm)	8" (200mm)				
1	91006011	91006012	91006023	91006013	91006005	91006027	91006007	91006028	Valve Body Groove/Groove	1	Ductile Iron 65-45-12	
	N/A	N/A	N/A	N/A	91006045	N/A	91006067	N/A	Valve Body Flange/Groove			
	N/A	N/A	N/A	N/A	91006035	N/A	91006037	91006039	Valve Body Flange/Flange			
2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	95406414	O-ring (Mounting Ring)	1	Buna-N	
3	71040416								Pushrod Cover Assembly	1	Ductile Iron 65-45-12 & Brass C360000	
4	91106123			N/A	N/A	N/A	N/A		Hex Bolt ½"-13 x 1¼"	6	Zinc Plated Steel	
	N/A			95606107	N/A	N/A	N/A		Hex Bolt ½"-13 x 1¼"	6		
	N/A			N/A	91106006	N/A	N/A		Hex Bolt ⅝"-11 x 1¼"	6		
	N/A			N/A	N/A	N/A	95606110		Hex Bolt ⅝"-11 x 2"	8		
5	91306013			91306014	91306016	91306018	N/A		Mounting Ring	1	Stainless Steel CF8 or CF8M	
6	91916003			91916014	91916016	91916008	N/A		Clapper	1	Stainless Steel CF8 or CF8M	
7	92116063			92116064	92116065	92116066	92116068	N/A		Access Cover	1	Ductile Iron 65-45-12
8	93416003			93416014	93416016	93416008	N/A		Seal Assembly	1	Stainless Steel 304 & EPDM	
9	93706003			93706004	93706006	93706008	N/A		Access Cover Gasket	1	Buna-N or Neoprene	
10	93722000			93722000	N/A	N/A	N/A		Bumpstop Assembly	1	Stainless Steel UNS S31600 & EPDM	
	N/A			N/A	93722000	N/A	N/A			2		
	N/A			N/A	N/A	N/A	93722000			3		
11	93916006								Pushrod Guide	1	Acetal	
12	93916066								Reset Shaft	1	Brass UNS C36000	
13	94106066								Reset Housing	1	Brass UNS C36000	
14	94356006								Reset Knob	1	Aluminum 6061	
15	94506003			94506004	94506016	94506008	N/A		Lever	1	Stainless Steel UNS S17400	
16	95006412			94006412	95006410	95006410	N/A		Striker	1	Aluminum Bronze C95400	
17	95106006								Piston	1	Stainless Steel CF8M	
18	95276006								Diaphragm	1	EPDM & Polyester	
19	95306267			N/A	N/A	N/A	N/A		Retaining Ring, ¾" Shaft, Lever Pin	2	Stainless Steel 15-7 or 17-7	
	N/A			95306267	N/A	N/A	N/A		Retaining Ring, ½" Shaft, Lever Pin			
	N/A			N/A	95306269	N/A	N/A		Retaining Ring, ⅝" Shaft, Lever Pin			
	N/A			N/A	N/A	95316408	N/A		Retaining Ring, ¾" Shaft, Lever Pin			
20	95306268			N/A	N/A	N/A	N/A		Retaining Ring, ¾" Shaft, Hinge Pin	2	Stainless Steel 15-7 or 17-7	
	N/A			95306267	95306267	N/A	N/A		Retaining Ring, ½" Shaft, Hinge Pin			
	N/A			N/A	N/A	N/A	95316408		Retaining Ring, ¾" Shaft, Hinge Pin			
21	95406007								O-Ring, Reset Housing ID	1	Buna-N	
22	95406024								O-Ring, Reset Housing & Pushrod Guide OD	2	Buna-N	
23	95406407								O-Ring, Pushrod Guide ID	1	Buna-N	
24	95406410			95406409	95436126	95406413	N/A		O-Ring, Upper Seat	1	Buna-N	
25	95406411			95406420	95446226	95406412	N/A		O-Ring, Lower Seat	1	Buna-N	
26	95506006								Pushrod	1	Stainless Steel UNS S30300	
27	95606114								Socket Head Screw, ¼"-20 x ⅝"	6	Steel	
28	95606127								Flat Head Socket Cap Screw ⅜"-16 x ¾"	1	Steel	
29	95606133			N/A	N/A	N/A	N/A		Socket Head Screw #6-32 x ½"	1	Stainless Steel 18-8	
	N/A			95606130	95606130	95606130	N/A		Socket Head Screw #10-32 x 1"		Stainless Steel UNS S31600	
30	96016003			96016014	96016016	96016008	N/A		Seat	1	Stainless Steel CF8M	
31	96206003			N/A	N/A	N/A	N/A		Hinge Pin	1	Stainless Steel UNS S30400	
	N/A			96216086	96216086	96206008	N/A				Stainless Steel UNS S21800	
32	96216003			N/A	N/A	N/A	N/A		Lever Pin	1	Stainless Steel UNS S17400	
	N/A			96216044	96216047	96216008	N/A				Stainless Steel UNS S21800	
33	96310003			96906904	96906904	96310008	N/A		Clapper Spacer	2	Teflon or Acetal	
34	96406003			N/A	N/A	N/A	N/A		Lever Spring	1	Stainless Steel UNS S30400	
	N/A			96406004	96406005	96406008	N/A				Stainless Steel UNS S31600	
35	96406906								Piston/ Reset Spring	2	Stainless Steel UNS S31600	

Model DDX (Screw-In Seat Configuration) Deluge Valves Parts List (Refer to Fig. 5) (Cont.)

Item No.	Part No.							Part Description	QTY.	Material
	2" (50mm)	2½" (65mm)	76mm	3" (80mm)	4" (100mm)	165mm	6" (150mm)			
36	96906112			N/A		N/A		Spring Lock Washer, #6	1	Stainless Steel 18-8
	N/A			96906111		96906111		Spring Lock Washer, #10		Stainless Steel UNS S31600
37	95606140			N/A		N/A		Flat Head Socket Cap Screw ¼"-20 x ½"	2	Stainless Steel 18-8
	N/A			95606139		N/A				Stainless Steel UNS S31600
	N/A			N/A		N/A		Flat Head Socket Cap Screw ½"-13 x ¾"		Stainless Steel UNS S31600
38	98604402							Plug, ½" NPT	1	Steel
39	94616921							Knob Caution Label (Not Shown)	1	Polystyrene
40	91556922							Ball Chain, 1/8" (Not Shown) (Length is in Inches)	6	Nickel Plated Brass
41	91556923							Clamping Link, Ball Chain (Not Shown)	1	
42	699993406							O-Ring Grease, Dupont™ Krytox® GPL-205	A/R	Krytox®

Ordering Information

Specify:

Model DDX Type D Double Interlock Preaction System

- **Size**
- **End Configuration**
- **Trim Assembly**
 - Loose Trim
 - Segmentally Assembled
 - Fully Assembled no Control Valve
 - Fully Assembled with Control Valve
- **Optional 300 psi (20,7 bar) solenoid valve**

Service Kits

Service kits are available for routine servicing of the valve (reference Figure 5). Service kits for the Model DDX Deluge Valve include the following components:

- Clapper Seal Assembly (item 8)
- Cover Gasket (item 9)
- Bumpstop(s) (item 10)
- Push rod chamber diaphragm (item 18)
- Grease (item 42)

2", 2-1/2", and 3" Model DDX Service Kit: PN 6501200R03

4" Model DDX Service Kit: PN 6501200R04

6" Model DDX Service Kit: PN 6501200R05

8" Model DDX Service Kit: PN 6501200R06

Note: Early generation 4" and 6" Model DDX valves utilize a drop-in brass clapper. Service kits for early Model DDX valves are as follows:

4" Early generation DDX Deluge Valve Service Kit: PN 6501200R07

6" Early generation DDX Deluge Valve Service Kit: PN 6501200R08

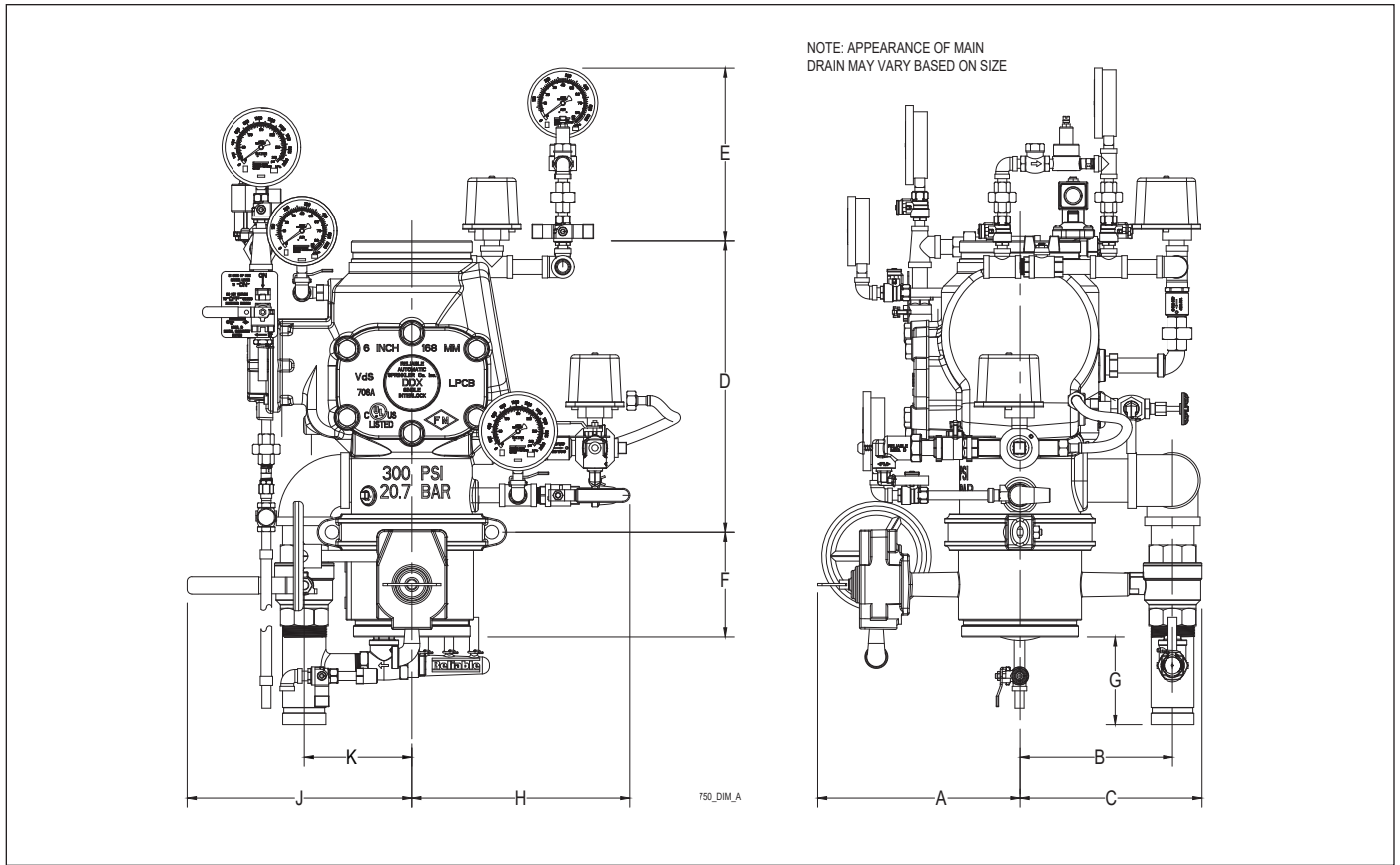


Fig. 7

Nominal Pipe Size	Installation Dimensions in Inches (mm)										
	A	B	C	D ⁽¹⁾	D ⁽²⁾	E	F ⁽³⁾	G	H	J	K
2" (50mm)	8-1/2 (216)	7-3/4 (197)	9-1/8 (232)	12-1/2 (318)	NA	14 (356)	3-7/8 (98)	1-1/2 (38)	10 (254)	9-1/2 (241)	4 (102)
2-1/2" (65 mm), 76 mm, & 3" (80 mm)	8-1/2 (216)	7-3/4 (197)	9-1/8 (232)	12-1/2 (318)	NA	14 (356)	3-7/8 (98)	1-3/8 (35)	9-7/8 (251)	9-1/2 (241)	3-7/8 (99)
4" (100 mm)	9-3/4 (248)	7-5/8 (194)	9-1/4 (235)	14 (356)	16 (406)	10-3/8 (264)	4-9/16 (116)	5-1/4 (133)	11 (279)	11-7/8 (301)	5-1/2 (140)
6" (150 mm) & 165 mm	11-1/8 (283)	8-1/8 (206)	9-3/4 (248)	16 (406)	19 (483)	10-1/8 (257)	5-7/8 (149)	3-3/4 (95)	11 (279)	12 (305)	5-1/2 (140)
8" (200 mm)	12-5/8 (321)	9 (229)	10-5/8 (270)	19-3/8 (492)	21-1/4 (540)	13-1/8 (333)	5-1/4 (134)	4-1/8 (105)	12-5/8 (306)	12 (305)	5-1/2 (140)

Notes:

1. End to end take out of Model DDX valve with grooved inlet.
2. End to end take out of Model DDX valve with flanged inlet where available (see page 8; also reference Bulletin 519).
3. Not applicable to 76mm or 165mm systems, or systems using a flanged inlet Model DDX valve.

The equipment presented in this bulletin is to be installed in accordance with the latest published Standards of the National Fire Protection Association, Factory Mutual Research Corporation, or other similar organizations and also with the provisions of governmental codes or ordinances whenever applicable.

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