

# IOM FDV-AC0

Electric - Pneumatic Actuation, Local Reset Basic Deluge Valve

**INSTALLATION OPERATION & MAINTENANCE MANUAL**

**FIRE PROTECTION**

**RAPHAEL VALVES INDUSTRIES**

## FDV-AC0– Electric - Pneumatic Actuation, Local Reset Basic Deluge Valve

### Description

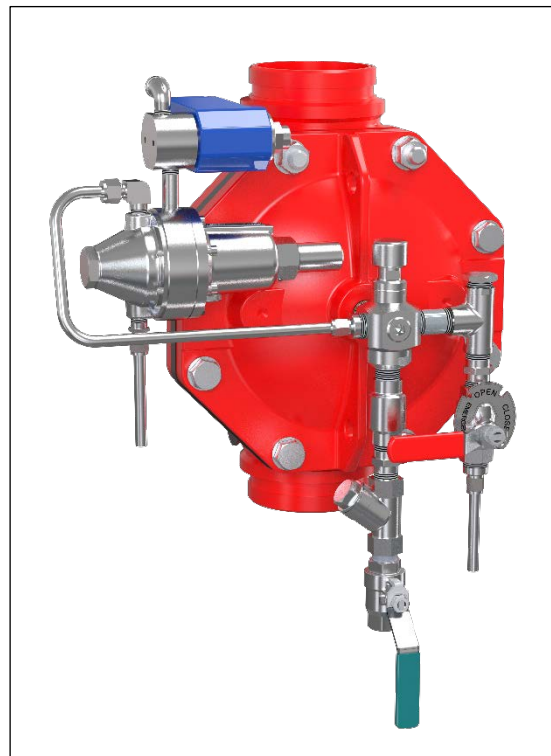
This deluge system is based on the Raphael's FDV valve, equipped with a pneumatic/Electrical actuated control trim. The FDV valve installed, have a range of optional materials and coating to fulfill operation condition needed, but the system function principle stays unchanged:

Two detection systems, pneumatic (Dry pilot line) and Electric (smoke / heat detectors), installed in series and operate a pneumatic actuator.

In fire situation, each of those detection systems can cause an actuation of the pneumatic actuator, that in turns, drain the FDV's control chamber and open the deluge valve.

Opening the emergency valve overcomes all conditions and open the deluge valve immediately. The system is equipped with the PSA that serves as a local reset and hydraulic device.

This system is suitable for sprinklers with open nozzles.



## Parts list

1. – Solenoid valve (3 way)
2. – PAV-2 Pneumatic actuator
3. – Check Valve
4. – “Y” Strainer
5. – Trim supply valve (1/2” NPT female)
6. – Manual Emergence valve
7. – Control chamber pressure gauge port (1/2” NPT female, plugged)
8. – PSA Pressure Supply Arrestor
9. – FDV deluge valve
- 10.– Dry pilot & air supply connection (1/4” NPT female, temporary plugged).
- 11.– PAV-2 vent port (1/4” NPT)
12. Downstream side port (1/2” NPT plugged) - **List<sup>1</sup>**

- 13.– Downstream drain port (1/2” NPT plugged) - **List<sup>1</sup>**
- 14.– Upstream Drain port (plugged) **List<sup>2</sup>**
- 15.– Upstream side port (1/2” NPT plugged) - **List<sup>2</sup>**

### Lists of optional accessories for plugged ports:

**List<sup>1</sup>** – Downstream pressure gauge, WMA – water motor alarm, MADV – manual automatic drain valve, drain valve.

**List<sup>2</sup>** - Upstream pressure gauge, Drain valve.

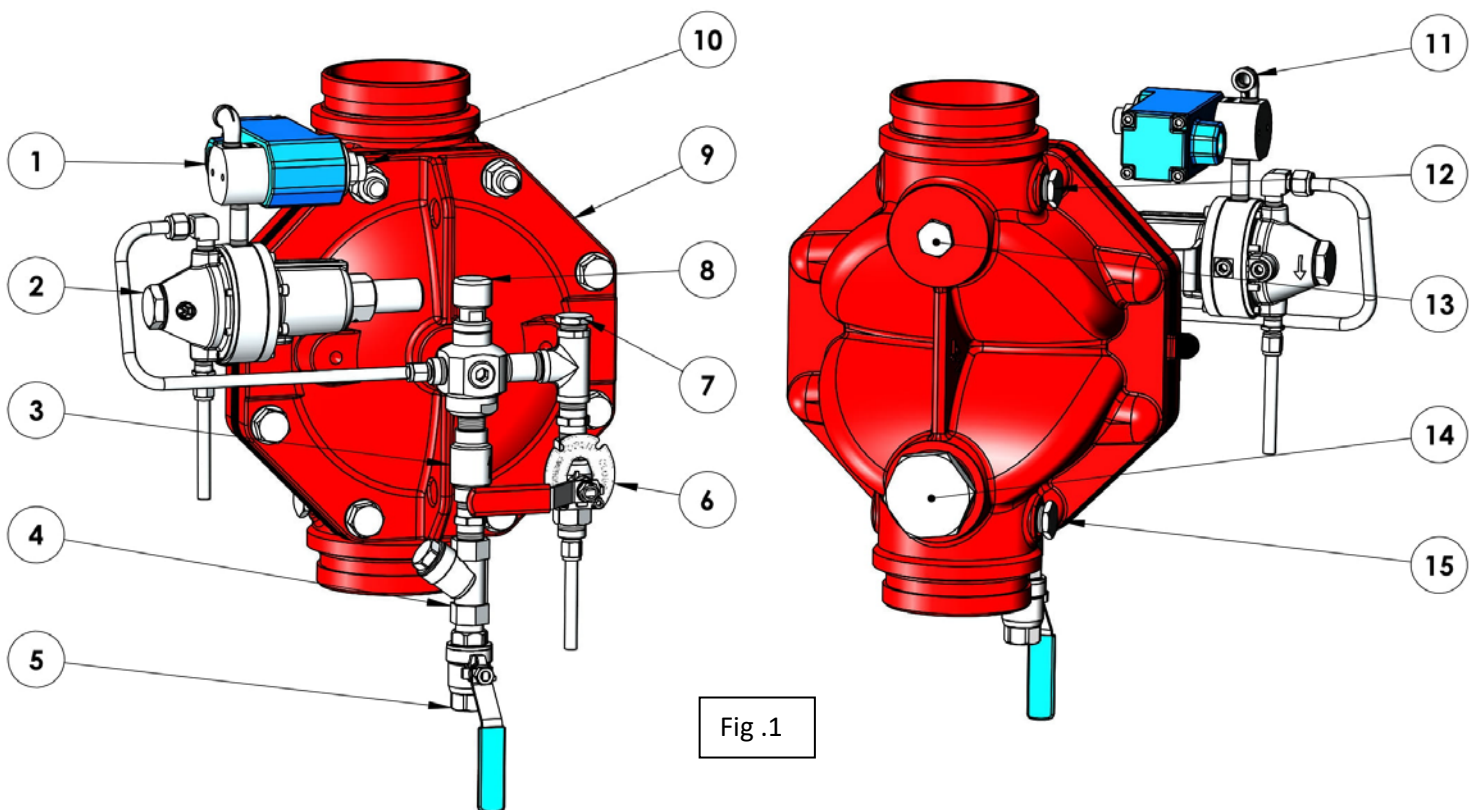


Fig .1

## **Operation** (Reference Figure 1)

### **SET position:**

Water is supplied by the trim pressure supply valve (5), passes the “Y” strainer (4), the check valve (3) flows PSA (8) while its push button is pressed, and fills the FDV’s control chamber.

Pressurized water in the FDV valve’s control chamber get trapped by PSA (8) while its push button is released, the check-valve (3), by the closed pneumatic actuator PAV-2 (2) and by the closed emergency valve (6), maintaining the deluge valve in closed position. The PAV-2 actuator’s sense-chamber is subjected to constant pneumatic pressure through the dry pilot line and air pressure supply connection port (10), keeping the actuator in its CLOSE state and by that, blocking the FDV’s drain line.

### **Fire Situation**

When one or more of the dry pilot line automatic sprinklers is subjected to fire, it blows open and the pneumatic pressure vents to the atmosphere.

When its sense-chamber gets de-pressurized, the PAV-2 (2) moves to its OPEN state and drains the FDV’s control chamber through the PAV-2 drain tube to the atmosphere.

Consequently, the FDV deluge valve opens, and admits water into the open spray nozzles pipeline/s. The drop of pressure in the control chamber, causes the PSA (8) to prevent the upstream flow to re-pressurize the control chamber (and close the valve). Consequently, the FDV deluge valve remains latched open.

Alternately, if a heat / smoke detector senses flames heat, it transmits an electric signal to the main control board that in turn, transmits a signal to the solenoid valve. Its coil energizes and it opens. When open, it vents the pneumatic pressure at the sense chamber of the PAV-2 through vent port (11), what causes the PAV-2 actuator to open.

Consequently, the FDV deluge valve opens, and admits water into the open spray nozzles pipeline/s. The PSA serves as a latching device as described above.

### **Reset Position**

The upstream butterfly valve needs to be closed and all the blown-open sprinklers at the dry pilot line should be replaced. This enables the re-pressurizing of the dry pilot line and the sense chamber of the PAV-2 actuator. Consequently, the PAV-2 actuator moves to its close position and blocks the valve’s control chamber drain line. Then, the PSA push button needs to be pressed, pressurizing the deluge control chamber and causing the valve to close. The open sprinklers water spray stops. Then, the upstream butterfly valve needs to be opened.

## Installation (Reference Figure 2)

1. This system is supplied pre-assembled and factory pre-adjusted. Any change carried out at the system's trim components order, pipes and tubes length or ports for axillary connection sizes, will affect the system operation and therefore, prohibited.
2. The system cannot be installed at a location where it might be subjected to freezing temperatures.
3. Maintaining sufficient room around the system location ensures operational safety, and ease of maintenance.
4. It should be considered that water will be drained during regular maintenance on a routine base, during periodical tests procedures and when operating in fire situation. Therefore, a drainage plan should be considered.
5. The system described is to be mounted vertically only, as the PSA need to be positioned vertically only. Systems with identical operation but for horizontal installation are marked with a prefix "H", e.g. HFDV-AC0.
6. The downstream pipe connected to the FDV valve at a vertical and horizontal mount system, must be supported firmly to prevent the pipeline's weight to be loaded on the system's valve.
7. Any use of pipe/thread reduction-fittings installed at open ports designated for axillary components, (like water motor alarm, trim pressure supply, FDV valve's drains), is prohibited.
8. All connections to water supply, should be done in accordance with figure 2
  - (5) – Trim pressure supply connection - ½" NPT female.
  - (11) – Dry pilot line & ASK supply line to the PAV-2 actuator – ¼" NPT female (temporary plugged).
  - (12) – list <sup>1</sup> figure 1
  - (13) – list <sup>1</sup> figure 1
  - (14) – list <sup>2</sup> figure 1
  - (15) – list <sup>2</sup> figure 1
  - (21) –Emergency valve drain tube – 3/8" tube.
9. The FDV valve should be installed with the flow arrow marked on the valve's body, in the proper direction.

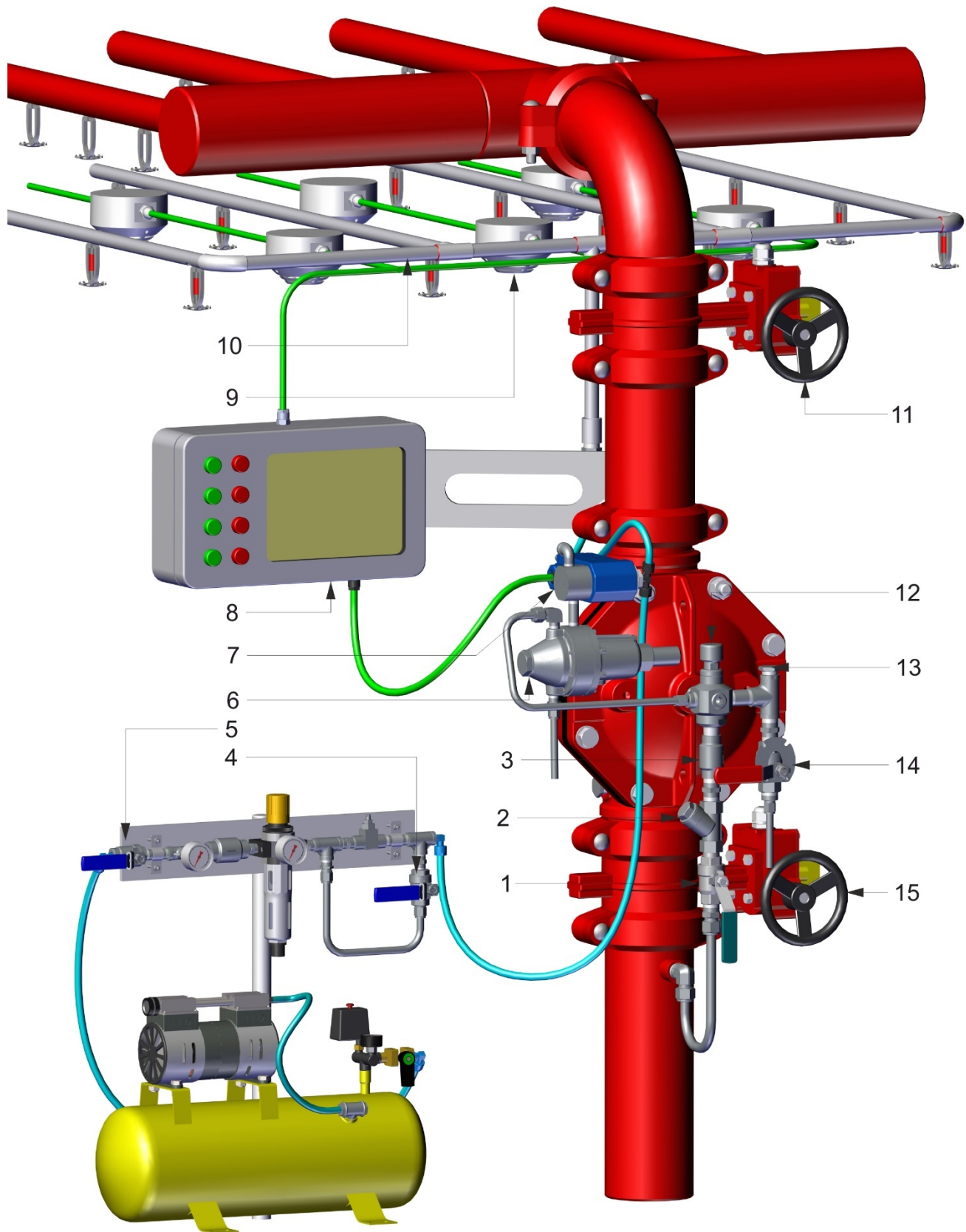
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10. **Note:** Remove plastic plugs ¼” from the vent elbow (11) on the solenoid valve and from the dry pilot & air supply connection (10).

## Installation parts list.

(reference - figure 2)

1. Trim supply valve (1/2” NPT female)
2. “Y” Strainer
3. Check Valve
4. Quick filling valve (orifice bypass)
5. Air supply ball valve on the ASK
6. PAV-2 Pneumatic Actuator Valve 2 way.
7. Solenoid valve, 3 way, ¼” NPT.
8. Main Control hub
9. Heat / Smoke detection sensors
10. Dry pilot line & Compressor connection port (1/4” NPT female)
11. Downstream separation valve (butterfly or OS&Y valves).
12. PSA – Pressure Supply Arrestor
13. Control chamber pressure gauge port (plugged)
14. Manual Emergency valve
15. Upstream separation valve (butterfly or OS&Y valves).





## Commissioning the system - Phase 1

### Filling and pressurizing the system.

*The procedure described should be carried out after system installation completion and a comprehensive inspection.* (Reference Drawing - figure 2)

1. The filling process is performed only after flushing the pipeline. The flushing needs to be done when both butterfly valves (**11 & 15**) are open, and the trim supply valve (**1**) is close.
2. After flushing, close the upstream butterfly valve (**15**).
3. Close the trim pressure supply ball valve (**1**).
4. Make sure that the Emergency valve (**14**) is closed.
5. Pressurize the pilot line to the rated pressure. No adjustments at the PAV-2 (**6**) actuator are needed as the device is factory set.
6. Close downstream separation butterfly valve (**11**) and open the FDV's downstream drain valve if equipped or unscrew the port's plug (**13 figure 1**). The Upstream drain remains plugged, or its valve (if equipped) is close.
7. Open the trim pressure supply valve (**1**). Press the PSA (**12**) push button for about 5-15 seconds and fill the trim and FDV's control chamber.
8. Open gradually the upstream butterfly valve (**15**).
9. Observe the downstream drain port (**13 figure 1**): there should be no leakage or dripping.

The system is ready for the “**fire situation simulation**”.



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## Commissioning the system - Phase 2

### Fire Situation Simulation (Reference Drawing - figure 2)

*The procedure described, should be carried out after the system was pressurized and a comprehensive leakage inspection was commissioned.*

*Energizing the solenoid can simulate a fire situation and cause the system to response by opening the FDV deluge valve.*

**NOTICE:**

***Prior to any stoppage of the fire protection system, a fire patrol should be placed in the area covered by the interrupted system.***

***Prior to generating any test procedures, turning on false alarms or turning off the alarm system, the local safety personnel and the close central fire station must be reported.***

(Reference drawing - figure 2)

1. Make sure the downstream separation valve (**11**) is close
2. Make sure that the downstream drain valve (**13 figure 1**) is open.
3. **Actuated by the dry pilot line:** Open the inspector's valve (at the end of the dry pilot line – not illustrated) and vent the pilot line. The pilot's pressure drop will cause the PAV-2 (**6**) actuator to open and drain the FDV's control chamber. Consequently, the FDV deluge valve will open.
4. Observe the downstream drain port: A significant stream of water should flow out of this valve. If ok, close the inspector's valve at the end of dry pilot line and wait until the line gets pressurized to air set pressure. The process can be expedited by temporary opening the needle valve bypass ball valve (**4**) at the ASK (Air Supply Kit).
5. **Actuated by the Heat/Smoke detection sensors:** initiate a fault alarm for the Heat/Smoke detection sensors at the control board. The solenoid valve (**7**) needs to be energized and the pressurized air in the pilot pipeline need to be vented through the PAV-2 vent port (**11 figure 1**)
6. Consequently, the FDV valve will open, and a significant stream of water should flow out of the downstream drain valve.

**System is ready for re-setting and placing in service.**

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## Commissioning the system - phase 3.

### **Resetting & placing in service** (Reference Drawing - figure 2)

*The procedure described, should be carried out after any periodic operational test - simulated or real fire situation. After a real fire situation, replace all blown-open sprinklers before pressurizing the pilot line.*

#### **Resetting after a Fire Situation Simulation:**

1. Close the Upstream Butterfly valve (15)
2. Close the trim pressure supply (1).
3. Close the inspector's valve (at the end of dry pilot line 10) and / or turn off the fault alarm for the Heat/Smoke detection sensors (9) at the main control board. Make sure the dry pilot line became pressurized to set pressure.
4. Disassemble the "Y" strainer (2) and clean its screen. Re-assemble the strainer.
5. Open the pressure supply valve (1) and press the PSA (12) push button for about 5-15 seconds. Open temporary the downstream drain port and make sure there is no leakage or dripping. If ok, screw in its plug.
6. The Upstream Butterfly valve (15) and the downstream butterfly valve (11) should be opened gradually.

#### **Resetting after a Real Fire Situation:**

1. Close the Upstream Butterfly valve (15)
2. Close the trim pressure supply (1).
3. Close the air supply ball valve at the ASK (5)
4. All the Dry pilot line's blown-open sprinklers must be replaced.
5. When done, open the air supply ball valve at the ASK (5). The dry pilot line needs to be pressurized to set pressure. The process can be expedited by temporary opening the needle valve bypass ball valve (4) at the ASK.
6. Disassemble the "Y" strainer (2) and clean its screen. Re-assemble the strainer.
7. Open the pressure supply valve (1). and press the PSA (12) push button for about 5-15 seconds.
8. Open the Upstream Butterfly valve (15) gradually, then open the downstream butterfly valve (11) and close the downstream drain valve.

**System is in SET state and placed in service.**

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## Maintenance

*Prior to any stoppage of the fire protection system, a fire patrol should be placed in the area covered by the interrupted system.*

*Prior to generating any test procedures, turning on false alarms or turning off the alarm system, the local safety personal and the close central fire station must be notified.*

*The Maintenance and inspection procedures are based on the relevant chapters at the NFPA 25.*

## Daily Inspection

Make sure that the deluge valve's heating system (If equipped), functions correctly and that the Fire protection valve surrounding temperature is 4°C min.

## Monthly Inspection

1. Observe the FDV deluge valve and its trim for external damage: observe the trim piping and hose connections for leakage or damage.
2. Verify that the upstream and downstream separation butterfly valves (**15 & 11**) and the Trim pressure supply valve (**1**) are in fully open position.  
Downstream drain valve and upstream drain valve (if equipped) are fully close.
3. Press the PSA push button about 5-10 seconds and release. Make sure that the required supply water pressures are applied to the deluge Valve inlet and trim.
4. Unscrew the downstream drain plug (or open its valve if equipped) and make sure that after emptying condensing water, the drain flow/dripping stops. If a constant leakage is observed, it might indicate a deluge valve sealing problem.

## Annual test procedure

1. Conduct the monthly test & inspection procedure.
2. Perform the procedure described in chapter - **Commissioning the system - phase 2.** - Fire Situation Simulation. Check the system's proper operation.
3. Follow the procedure described in chapter - **Commissioning the system - phase 3.** - Resetting & placing in service, chapter ***Resetting after a Fire Situation Simulation.***

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## Every 5 years inspection procedure

*This major inspection and maintenance procedure includes the removal of the trim, the dismantling of the FDV's valve cover and a performance of a comprehensive internal part examination. Then, the relevant trim accessories should be replaced, After the completion, the Annual maintenance procedure is to be conducted.*

1. Close the upstream butterfly valve (15) and the trim pressure supply valve (1).
2. Open the downstream and upstream drain ports or valves if equipped. Drain the FDV's control chamber using the Emergency valve (14).
3. Turn off or disconnect all relevant electrical circuits.
4. Release all relevant tubes, fitting nuts and the central union pipe connection (if equipped) at valves cover center.
5. Remove and disassembled front trim.
6. Remove all the FDV's cover bolts. The cover will hang on its studs (4" DN100 valve size and up). Release both nuts and remove the cover carefully.
7. Observer the internals of the valve and cover for excessive scale residuals, foreign particles, damaged coating (rust, cracks, or peeling).
8. Worn or damaged parts should be replaced. Consult Raphael's local representative or the service department for any maintenance issue or part replacement issue.
9. Replace the Diaphragm. The identification tongue should point to the valve's stamped size side (from top view – at the left side).
10. Reinstall the valve's cover: use the Anti-seize paste supplied in the maintenance kit for bolts and nuts pre-installation lubrication. Tight it in accordance with “**Bolt's torque moments table**”.
11. Reinstall the front trim carefully: avoid causing twists or dents on bent tubes and do not overtight the compression fitting's nuts.
12. When the system is fully re-assembled, perform the “**Commissioning the system - phase 1** - Filling and pressurizing the system” procedure.
13. Perform the **Annual test procedure**.

### Bolt's Torque Moments Table

Valve size	1.5"	2"	2.5"	3"	4"	6"	8"	10"
Torque lb/ft	22	29	36	54	65	72	87	118

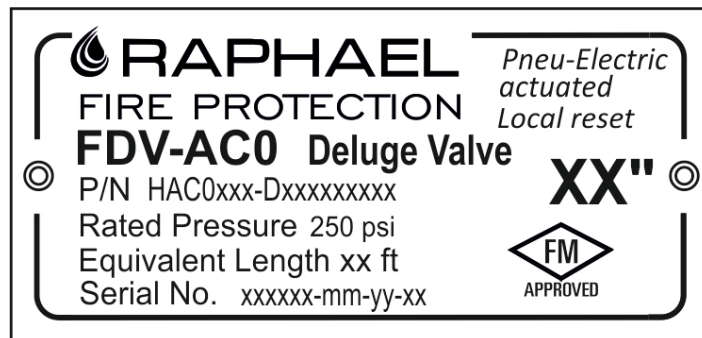
### Equivalent pipe length for FDV deluge valves

Valve size	Equivalent length value ft (m)
1.5"	11 (3.6)
2"	24 (7.3)
2.5"	25 (7.6)
3"	28 (8.5)
4"	31 (9.4)
6"	46 (14)
8"	72 (21.9)
10"	117 (35.6)

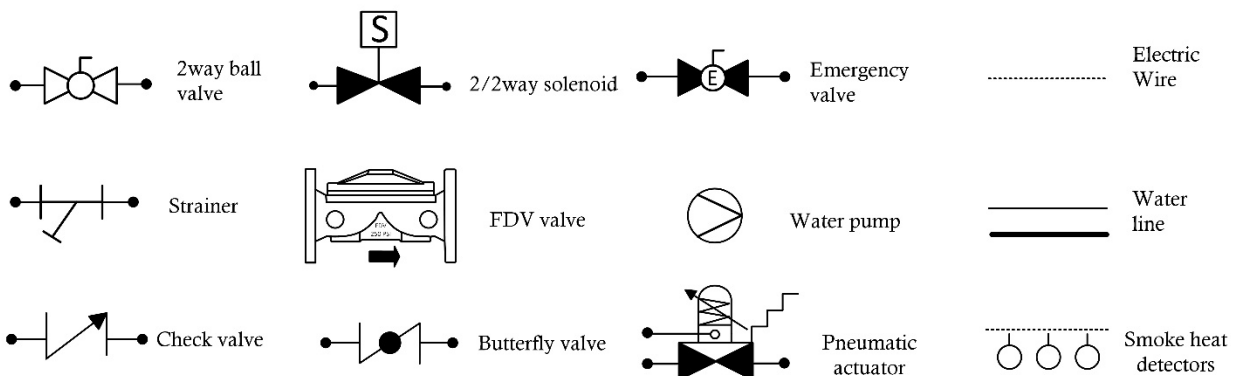
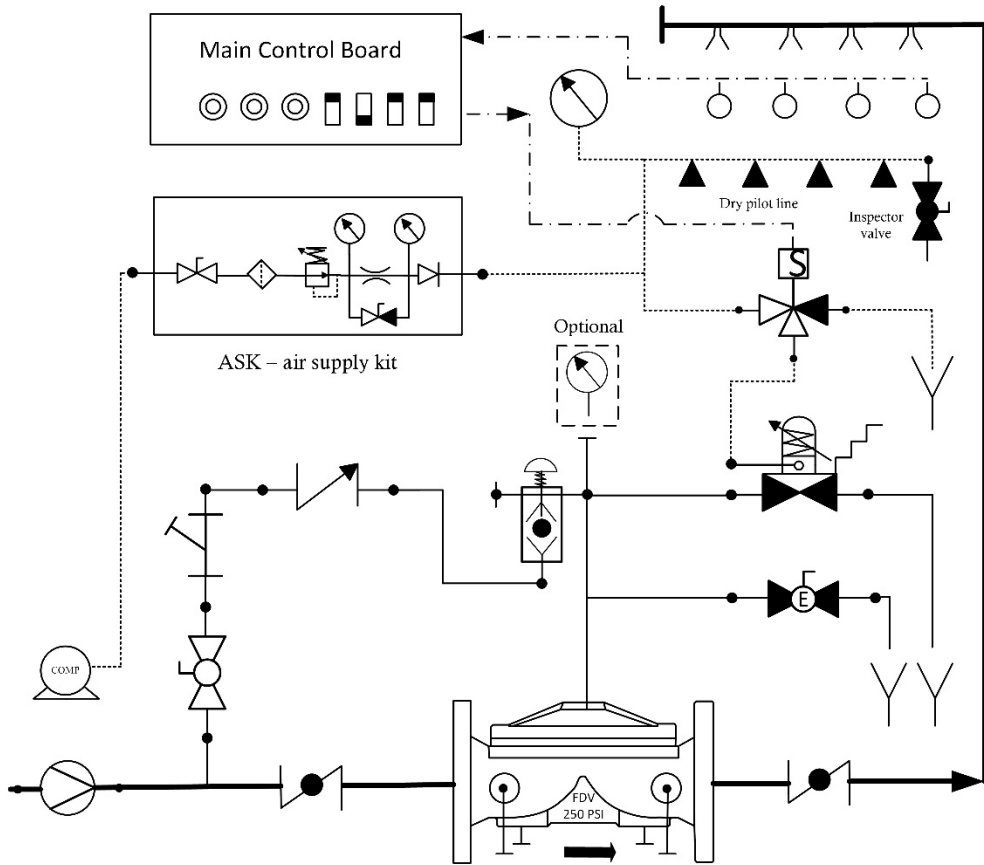
## Marking

The FDV valves are marked by a laser engraved, black anodized, 0.8mm (0.031”) thick metal plate, riveted to the valve’s cover.

- *Company name and trademark.*
- *Short description (Italic letters)*
- *Application’s type:* FDV-AC0 – Electric / Pneumatic actuated, Local Reset.
- *(P/N) The Application’s part number:* System properties–Valve properties
- *Rated pressure:* 250 psi
- *Equivalent Length:* reference table - page 12.
- *Serial Number:* Work order number-MM-YY-Number in batch 01-99
- *The Application’s diameter in inch:* XX”



Pneu - Electric actuated, Local Reset FDV  
 Basic Deluge valve, Type: **FDV-AC0**





**RAPHAEL**, founded in 1949, is the first Israeli manufacturer of water control valves. **RAPHAEL** 's research department constantly strives to introduce new and innovative products and solutions for water control systems including water works, fire-protection and irrigation systems.



Waterworks



Fire Protection



Irrigation



Smart Solutions

 **RAPHAEL**

**RAPHAEL Valves Industries (1975) Ltd.**

North Industrial Zone Or Akiva, 3063927 P.O.Box 555, Israel

Tel. +972 4 6263555 | [info@raphael-valves.com](mailto:info@raphael-valves.com) | [raphael-valves.com](http://raphael-valves.com)