IOM FDV-DA0

Hydraulic Actuation & Ant-Columning Local Reset Deluge Valve

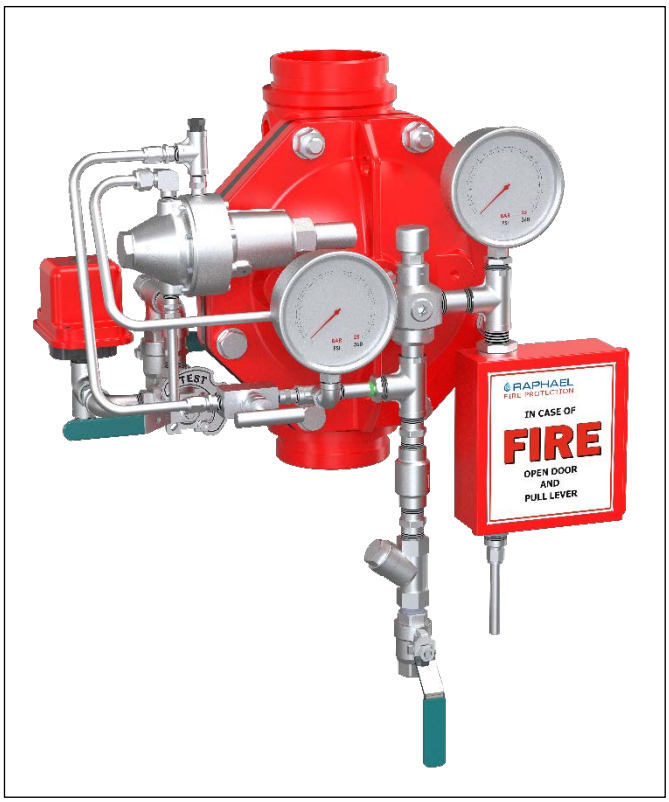
Installation **O**peration & **M**aintenance manual

Fire Protection

RAPHAEL VALVES INDUSTRIES

FDV-DA0 – Hydraulic actuated & Anti-Columning Local Reset Deluge Valve

Description



This deluge system is based on the Raphael's FDV valve, equipped with hydraulic 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: in fire situation, a hydraulic detection system (wet pilot pipe), trips the valve's control trim and consequently, pressurized water trapped in the FDV' control chamber are drained, and the valve opens.

The trim is equipped with a PSA, a device that enables the local reset of the system and serves as a latching device. In addition, it will compensate pressure loss due to small leaks caused by trim's component crack or loos connection.

The anti-Columning property enables the use of a nearly unlimited wet pilot height: The system gets tripped by the pressure drop caused by the blow-opened of one or more of the wet pilot's automatic sprinklers, regardless the hydrostatic pressure caused by the vertical water supply pipeline of the wet pilot line.

This system is suitable for water spray pipelines with open nozzles.

Parts list

1. – FDV deluge valve
2. – DCPV Piot
3. – Needle Valve
4. – Alarm Test Valve
5. – Check valve
6. – “Y” Strainer
7. – Control Chamber PG
8. – PSA (latch device)
9. – Upstream PG
10. - Manual Emergence unit
11. - Trim pressure supply
12. – Upstream Drain Plug
13. – Downstream drain Valve
14. – MADV Drain Valve
15. – Downstream PS
16. – Gong Connection.

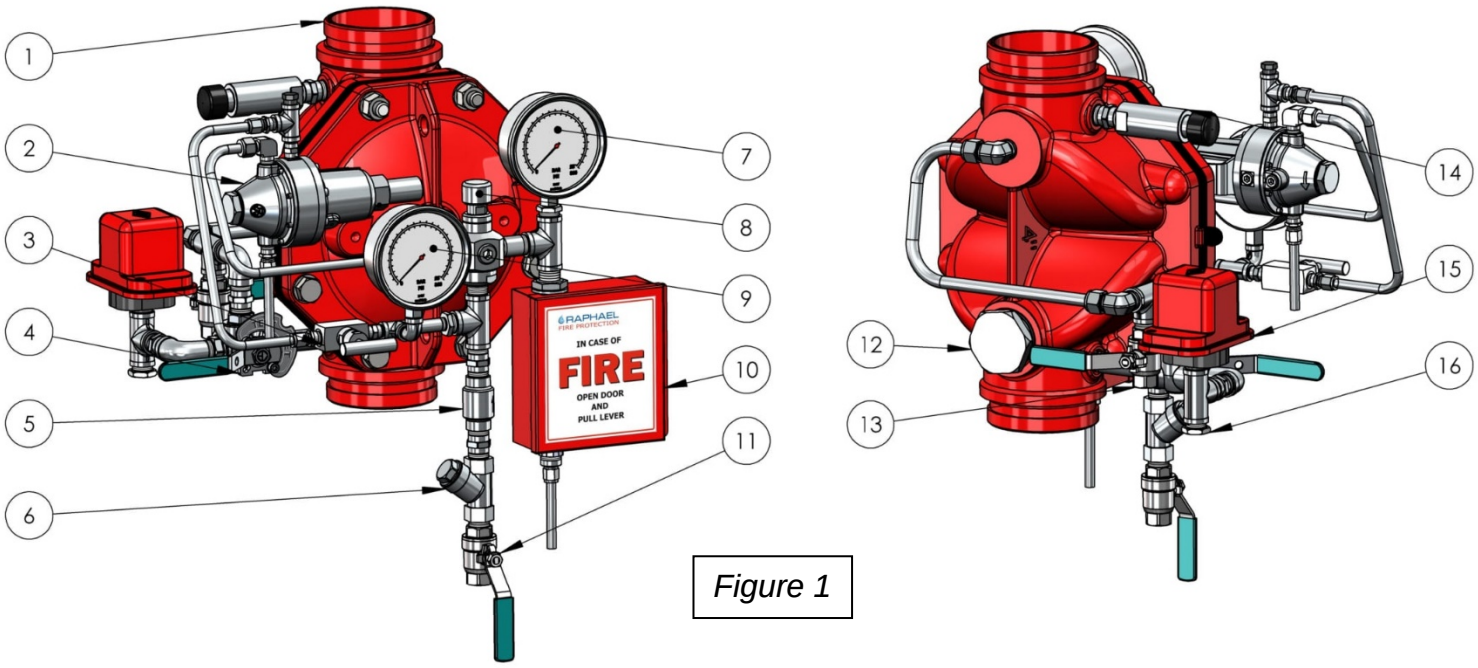


Figure 1

Operation (reference figure 1)

SET position:

Water is supplied by the Trim pressure supply valve (**11**) via the "Y" strainer (**6**), Check valve (**5**), flows through the PSA (**8**), and fills the FDV's control chamber.
Pressurized water in the valve's control chamber is trapped by the check-valve (**5**), by the closed emergency valve (**10**), and by the blocked port of the DCPV pilot valve (**10**), maintaining the deluge valve in closed position.

The pressurized wet pilot line is connected to the DCPV's sense port. Its pressure overcomes the pilot valve's spring and hold this N.O. accessory in a close state. If the wet pilot stays pressurized, the FDV valve is close, and the system is in SET position.

FIRE situation:

When one or more of the automatic sprinklers along the wet pilot line senses fire heat and blows-open, the pressure drops, and the horizontal pipeline drains through the open sprinkler/s. this pressure drop is transmitted into the sense port of the DCPV's. The pilot valve spring overcomes the decreased wet pilot pressure, moving the DCPV to its open position. When the DCPV pilot drains the FDV control chamber through its opened and vented port to the atmosphere, the FDV deluge valve opens and admits water to the sprinklers spray pipeline/s. Simultaneously, the wet pilot's drop of pressure, causes the PSA's internal rubber ball to move to its upper seal seat, preventing upstream flow entering the deluge valve control chamber. By that, the PSA latches the FDV valve in its open position.

Opening the Emergency ball valve's, bypasses all terms, drains the FDV control chamber and opens the valve immediately.

RESET procedure.

1. Close the upstream butterfly valve (7) or the OS&Y to stop the open sprinklers spray.

2. Close the trim pressure supply valve (6) to stop the automatic sprinkler/s spray.

3. Replace all blown-open automatic sprinklers at the wet pilot line.
4. Open inspector valve at the wet pilot pipe end. Open the trim pressure supply valve (6) and observe the water flow through the open inspector valve: drain until flow is clear, without air bubbles. Then close the inspector valve.

5. When the wet pilot line is fully pressurized, push the PSA push button (9) and fully pressurize the deluge control chamber.

6. When done, open the upstream butterfly valve (7) or the OS&Y.

The valve is in SET position.

Installation (Reference Figure 2)

1. This system is supplied pre-assembled and factory pre-adjusted **except of the DCPV pilot valve**. Any change carried out at the system's trim components order, pipe 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. Sufficient room around the system location should be kept, to enable assembly/disassembly and maintenance work.

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. Systems marked with a prefix "H", e.g. HFDV-DA0 are designed to be installed in horizontal orientation.

6. The downstream pipe connected to the FDV valve at a vertical and horizontal mount systems need to 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 trim pressure supply, FDV valve's drains, DCPC or Emergency valve drain lines), is prohibited.
8. All connections to water supply, alarms etc. should be done in accordance with figure 2:
   Wet pilot pipeline connection.
   (TS) – Trim pressure supply connection.

9. The FDV valve should be installed with the flow arrow marked on the valve's body, in the proper direction.

Installation Parts List

- **WP** – Wet pilot
- **CB** – Control Board
- **DC** – DCPV
- **PS** – Pressure Switch
- **TV** – Alarms Test Valves
- **NV** – Needle Valve
- **CV** – check Valve
- **ST** – Strainer
- **BF** – Butterfly valve
- **DL** – Deluge Valve
- **PGC** –PG for Control chamber
- **PSA** – Pressure Surge Arrestor
- **PGU** – PG for Upstream
- **EU** – Emergency Unit
- **TS** – Trimm Supply Valve

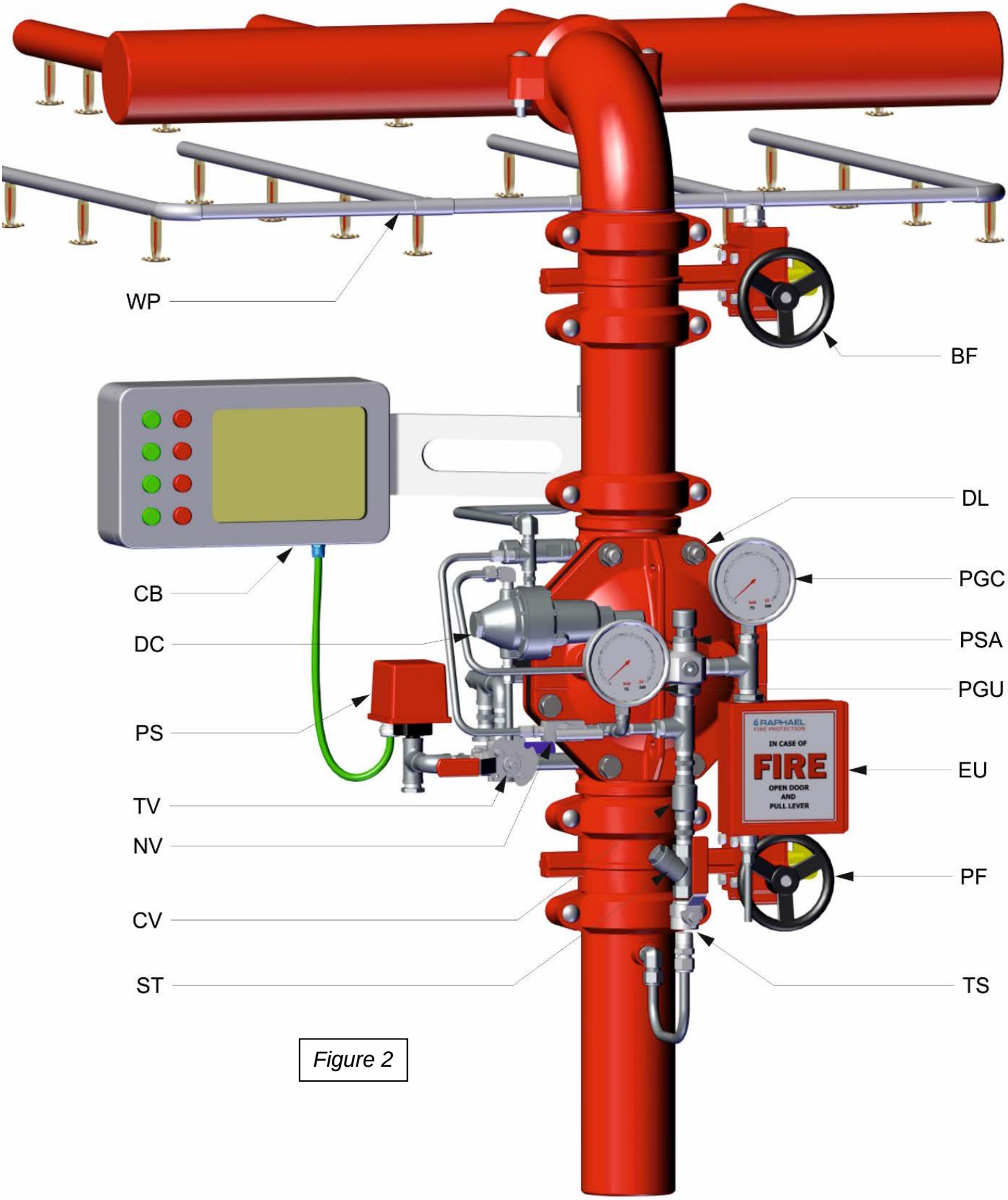

WP
BF
DL
CB
PGC
DC
PSA
PGU
PS
EU
TV
NV
PF
CV
ST
TS
RAPHAEL
IN CASE OF
FIRE
OPEN DOOR
AND
PULL LEVER

Figure 2

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. Make sure the upstream butterfly valve (**BF**) or OS&Y is fully closed.
2. Open fully the needle valve (to speed up the wet pilot filling)
3. open the downstream drain valve (**13 figure 1**) of the FDV valve.
4. Make sure the trim pressure supply valve (**TS**) is Closed.
5. Make sure that Emergency valve (**EU**) is fully closed.
6. Loosen completely the DCPV (**DC**) pilot's spring by turning the adjustment screw anticlockwise. This closes the drain passage of the valve and enables the wet pilot line filling and pressurizing.
7. Open the inspector's test valve located at the wet pilot line end.
8. Open the trim pressure supply valve (**TS**). Drain the wet pilot valve until a continuous and free of air bubbles flow is observed.
9. Close the inspector's test valve.
10. Close pressure supply valve, Open the strainer's screen plug and clean the screen. Re-install the parts and open the trim pressure supply valve.
11. Press the PSA's push-button and fill the trim and the FDV's control chamber. Consequently, the FDV deluge will close.
12. Gradually open the upstream butterfly valve and make sure there is no dripping out of the downstream drain port. Dripping out means the FDV have a sealing problem and need to be fixed.

The system is ready for a leakage inspection.

DCPV Pilot's adjustment procedure:

This procedure should be carried out after the system was pressurized and a comprehensive leakage inspection was commissioned.

As the pilot line's elevation increase, the residual hydrostatic pressure – "column pressure" increases. Therefore, enabling the drainage of FDV's control chamber requires an additional tension applied on the DCPV's spring.

1. Close the upstream butterfly valve (**BF**) or the OS&Y.

2. Verify that the DCPV (**DC)** pilot's spring is completely loose (step 7 page 7). The DCPV should remain in its close state and no dripping through its vented port should be observed.

3. Open the inspector's test valve located at the wet pilot line end to depressurize the line.

4. Press the PSA's (**PSA**) push-button.
   Note: the PSA's push-button should be pressed consecutively up to the completion of chapter 10.

5. Increase the spring tension of the DCPV pilot by turning the adjusting screw clockwise until water is released out of the Pilot's drain port.

6. Turn the adjusting screw an additional ¼ of a turn clockwise.

7. Close the inspector's test valve. As the pressure in the wet pilot builds up, the flow out of the DCPV's vented port should **stop**.

8. Assure the proper function of the Anti-Columning sub system by re-opening the pilot line inspector's valve. The DCPV should drain the FDV control valve through its vented port.

9. Close the inspector's test valve and wait for the wet pilot pressure increase to maximum value.

10. When DCPV drain port closed, release the PSAs push-button.

Note: downstream butterfly valve (BF) is still closed.

FDV downstream port is still unplugged.

The upstream butterfly valve (BF) or OS&Y is still closed.

The system is ready for the 'needle valve adjustment'.

Needle Valve adjustment procedure:

This procedure should be carried out to assure that the needle valve flow rate would not "overcompensate" the pressure drop caused by a blown-open automatic sprinkler. The pressure drop is needed to activate the DCPV pilot and drain the FDV's control chamber.

1. Close the trim pressure supply valve (**TS**)
2. Unscrew the most remote sprinkler at the wet pilot line.
3. Push the PSA push button consecutively.
4. Open the trim pressure supply valve.
5. Gradually, close the needle valve and observe the DCPV drainage: stop turning the needle valve handle when water drainage starts. It means that the needle valve rate of flow does not interfere the drop of pressure caused by the "open sprinkler".
6. After meeting the right needle valve rate of flow, secure the valve's stem by tightening its counter nut.
7. Stop pushing the PSA button when the FDV's control chamber is fully pressurized.
8. Open the upstream butterfly valve (**BF**) or OS&Y. Check the FDV's open drain port for any leakage. If ok, screw in its plug.
9. Open the downstream butterfly valve.
   The system is in Set position.

Commissioning the system - phase 2.

Fire Situation Simulation

By the drainage of the wet pilot valve, one can simulate a fire situation and cause the system to response by opening the FDV deluge valve.

1. Close the downstream butterfly valve. Open the downstream drain valve (**13** figure **1**)

2. Open the inspector's valve (located on the wet pilot's pipeline). Trapped water will drain out from the FDV's control chamber through the DCPV pilot's vented port and the FDV valve will open. Water flow out of the open downstream drain valve should be observed.

3. Observe this DCPV drain flow: the flow should run for a few seconds and stop. A drain flow for an extended period or a constant flow can indicate an internal leakage at the PSA.

The valve is ready for Resetting & placing in service

Commissioning the system - phase 3.

Resetting & placing in service

The procedure described, should be carried out after any periodic operational test was simulated.

Note: downstream butterfly valve (BF) is still closed.

FDV downstream drain valve is still open.

ITALIC - For real fire situation reset.
Regular – For fire situation simulation

1. Close the Upstream butterfly valve (**PF**) or OS&Y valve.
2. *Close the trim pressure supply valve (**TS**).*
3. *Replace all wet pilot pipeline's blown-open automatic sprinkler/s.*
4. *Open the trim pressure supply valve.*
5. *Open inspector's valve, drain air bubbles.*
6. *(*For real and simulation fire situation) - *close the inspector's valve.*
7. Close the trim pressure supply valve (**TS**).
8. Clean the "Y" strainer's (**ST**) screen. Reassemble the strainer.
9. Open the trim pressure supply valve.
10. Press the PSA's (PSA) push-button. Release the push-button a few seconds after internal flow sound stops, to assure a complete filling of the FDV valve's control chamber.
11. Open the Upstream butterfly valve (BF) or OS&Y valve.
12. Open the FDV downstream ball valve.

System is in SET state and placed in service.

13. 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.

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 valve for external damage: observe the piping and hose connections for leakage or damage.
2. Verify that the upstream butterfly valve (**PF**) and the Trim pressure supply valve (**TS**) are in fully open position.
   Downstream drain valve and upstream drain valve (if equipped) are fully close.
3. Push the MADV (**PSA**) 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.
4. Move the 3-way SET/TEST valve (**TV**) to TEST. The acoustic alarm should sound, and alarm pressure switch (**PS**) should transmit a signal to the main control board.

Annual maintenance procedure

1. Conduct the monthly inspection procedure.

2. Perform the procedure described in chapter - **Commissioning the system - phase 2. -** Fire Situation Simulation. Check and confirm the system's proper operation.

3. Follow the procedure described in chapter - **Commissioning the system - phase 3**. - Resetting & placing in service. Check and confirm the system's proper operation.

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 (**BF**) or OS&Y valve and the trim pressure supply valve (**TS**).

2. Open FDV bottom drain ports. Drain the FDV's control chamber using the emergence valve.

3. Turn off or disconnect all relevant electrical wiring.

4. Release all relevant tubes fitting nuts, cover central union pipe connection and remove the disassembled trim.

5. Remove all the FDV's cover bolts. The cover will hang on its studs (at vertical installation). Release both nuts and remove the cover carefully.

6. Observe the internals of the valve and cover for excessive scale residuals, foreign particles, damaged coating (rust, cracks, or pealing). Worn or damaged parts need to be replaced. Consult Raphael's local representative or the service department for any maintenance or part replacement issue.

7. Replace the Diaphragm supplied with the system's maintenance kit. The identification tongue needs to point to the valve's stamped flow direction arrow side.

8. Reinstall the valve's cover: use Anti-seize paste to lubricate bolts and nuts and tight them in accordance with "Bolt's torque moments table".

9. The PSA rubber ball valve and all seal rings must be replaced.

10. DCPV pilot must be replaced.

11. Reinstall the 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 reassembled, perform the chapters listed:

    - "**Commissioning the system - phase 1** - Filling and pressurizing the system"
    - "Commissioning the system - phase 2. - Fire Situation Simulation"
    - "Commissioning the system - phase 3. - Resetting & placing in service"

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

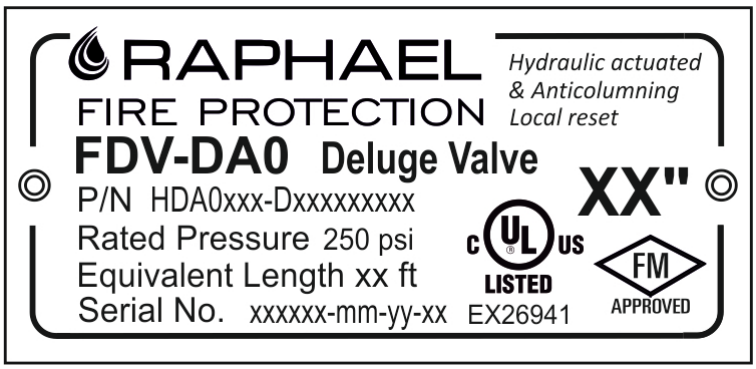
Valve size	Equivalent length value ft (m)
1.5"	11 (3.6)
2"	24 (7.3)
2.5"	25 (7.6)
3"	28 (8.5)
4"	31 (9.4)
6"	46 (14)
8"	72 (21.9)
10"	117 (35.6)

Marking

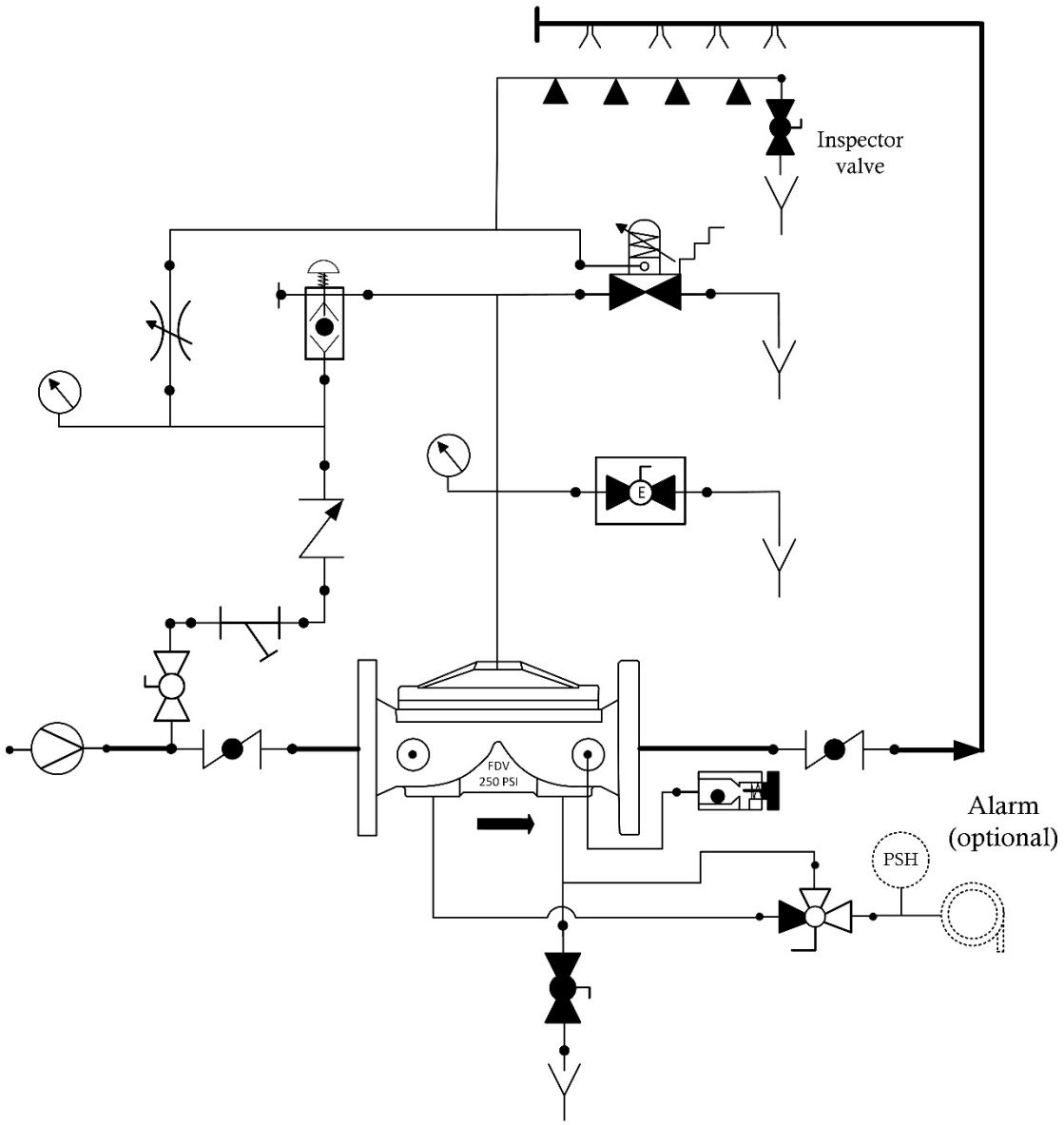
The FDV valves are marked by a laser engraved, black anodized, 0.8mm (0.031”) thick metal plate, riveted to the valve’s cover.

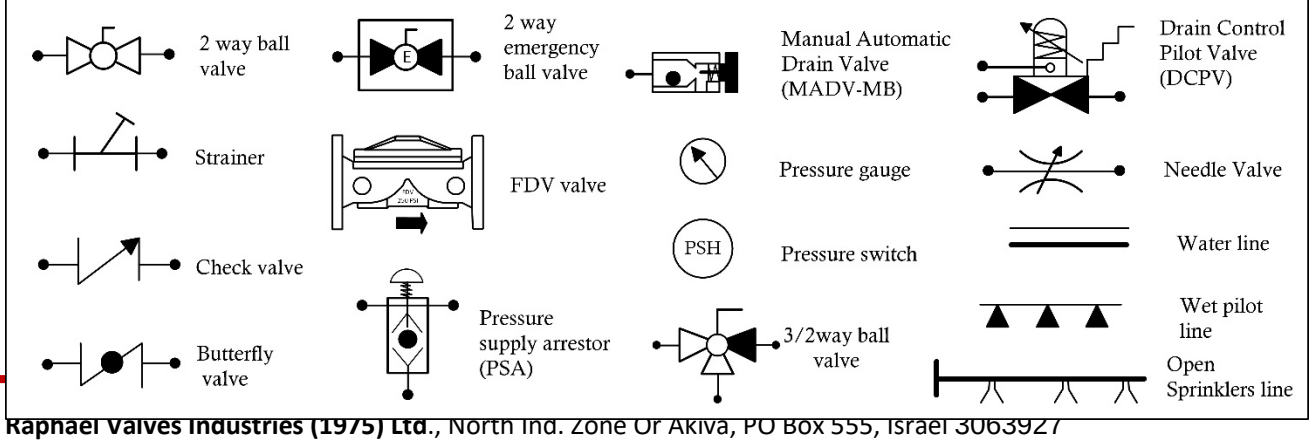
The marking plate contains the data about (top to bottom):

- *Company name and trademark.*
- *Short description (Italic letters)*
- *Application’s type*: FDV-DA0 - Electric actuated Remote Reset Pressure Reducing.
- (P/N) *The Application’s part number*: System properties–Valve properties
- *Rated pressure*: 250 psi
- *Equivalent Length: reference table - page 13.*
- *Serial Number*: Work order number-MM-YY-Number in batch 01-99
- *The UL listing mark & QR code:* EXxxxxx
- *The FM approved mark*
- *The Application’s* diameter in inch: XX”



Hydraulic actuated, manual Local Reset FDV Deluge Valve with Anti-Columning, Type: **FDV-DA0**





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.