IOM FDV-AC1

ELECTRO-PNEUMATICALLY ACTUATED, REMOTE RESET, ECONOMIC DELUGE VALVE

Installation Operation & Maintenance manual

Fire Protection

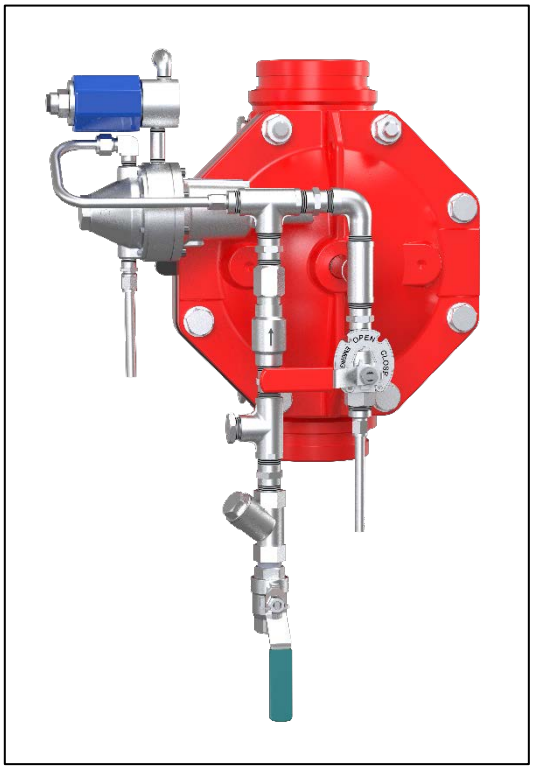
RAPHAEL VALVES INDUSTRIES

RAPHAEL FP

IOM FDV-AC1

Electro-Pneumatically Actuated, Remote Reset, Economic Deluge Valve

DESCRIPTION



This deluge system is based on Raphael's FDV valve, equipped with an electro-pneumatically actuated control trim. The installed FDV valve is available in a range of optional materials and coatings to meet the required operating conditions, while the system's functional principle remains unchanged:

Two detection systems - pneumatic and electric - are installed in series and operate a pneumatic actuator. In a fire situation, either detection system can individually shift the actuator to its OPEN state, drain the FDV control chamber, and open the FDV deluge valve.

Opening the emergency valve overrides all conditions and opens the deluge valve immediately.

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

RAPHAEL FP

PARTS LIST

Electro-Pneumatically Actuated, Remote Reset, Economic Deluge Valve

1. Vent port (plugged, 1/4" NPT female)
2. 3-way solenoid valve
3. Air supply & dry pilot connection (plugged, 1/4" NPT female)
4. PAV-2 pneumatic actuator
5. Check Valve
6. control chamber pressure gauge connection (plugged, ½" NPT female)
7. "Y" Strainer
8. Trim Pressure Supply Valve
9. Emergency valve
10. Orifice
11. Downstream side port (plugged, ½" NPT) for optional acc. List [1]
12. Botton downstream drain port for optional acc. List [2]
13. Bottom upstream port (plugged)
14. side port (plugged, ½" NPT) for optional acc. List [2]

List of optional accessories for plugged ports:

List[1] – Downstream pressure gauge, WMV – Water Motor Alarm, MADV – Manual Automatic Drain Valve, Drain valve.

List[2] – Upstream pressure gauge, Drain valve

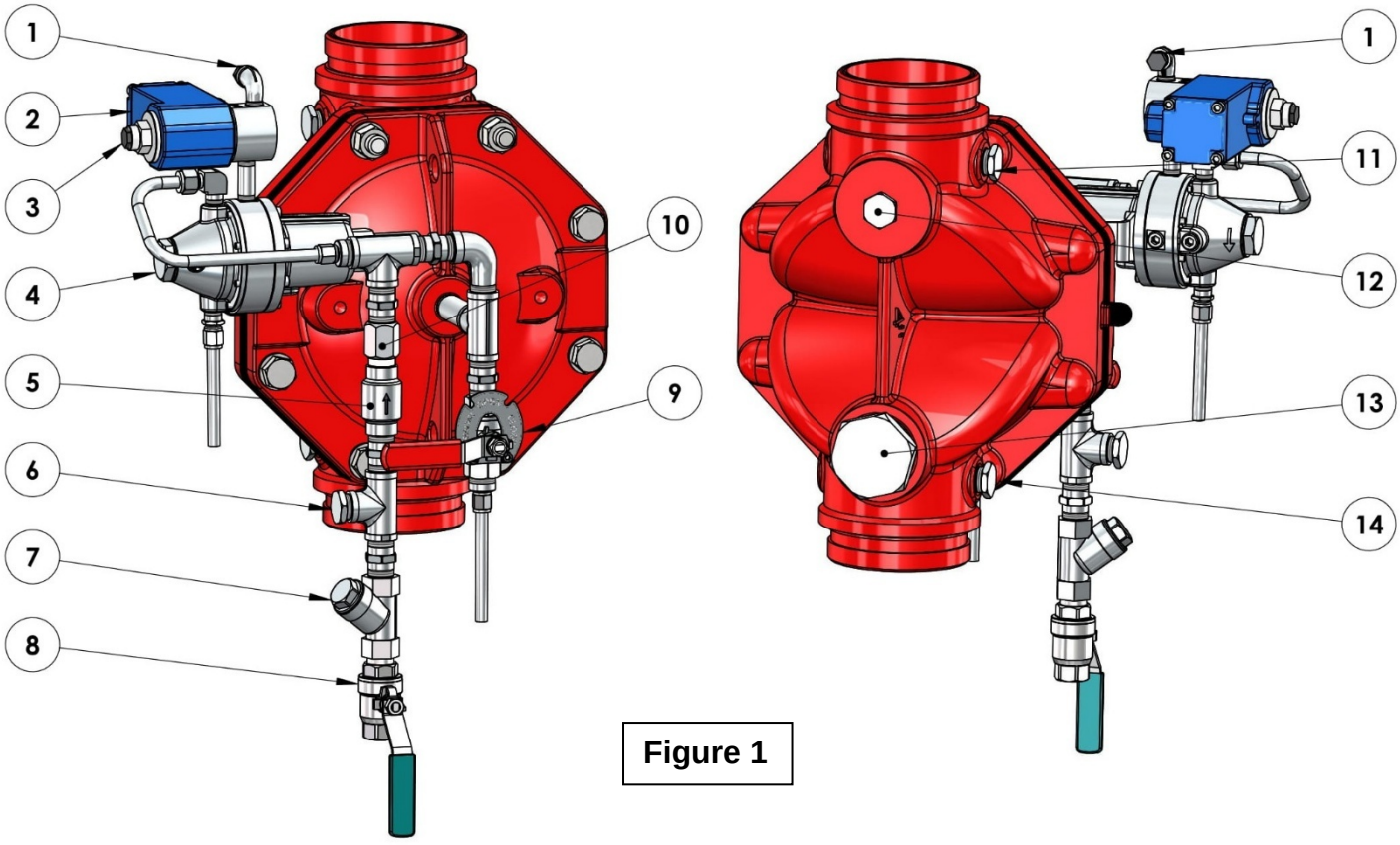


Figure 1

OPERATION (Reference Figure 1)

SET position:

Water is supplied through the trim supply valve (**8**), the “Y” strainer (**7**), and the check valve (**5**), then passes through the orifice (**10**) and fills the FDV control chamber. The pressurized water in the control chamber is trapped by the check valve (**5**), the close PAV-2 actuator (**4**), and the closed emergency valve (**9**), keeping the deluge valve in the closed position.

Pressurized air in the dry pilot line passes through the open ports of the solenoids (**2**), holding the PAV-2 actuator in its closed state, and therefore the FDV deluge valve remains closed.

Fire Situation

When one or more automatic sprinklers along the dry pilot line are exposed to flame heat and open, air escapes and the pilot line depressurizes. The pressure drop passes through the solenoid (**2)** and is sensed by the PAV-2 diaphragm in its sensing chamber.

Alternatively, an electric detection system senses fire conditions and triggers the main control board. The control board sends an electrical signal to the solenoid coil, shifting it to a venting state and venting the PAV-2 sensing chamber while simultaneously isolating the dry pilot line.

In either case, the pressure drop in the PAV-2 sensing chamber shifts the device to its open state. Water from the FDV control chamber drains, and the deluge valve opens.

Opening the emergency valve (**9**) bypasses all inputs, drains the FDV control chamber, and opens the deluge valve immediately.

Reset Position

Resetting the system requires replacing all automatic sprinklers in the dry pilot line that have opened.

If an electrical alarm system is used, it must be reset, and the solenoid coil must be de-energized. These steps allow the dry pilot line to be repressurized and the PAV-2 to return to its closed state.

It is recommended to drain the sprinkler pipeline by opening the ball valve connected to the FDV downstream drain port (if installed). Otherwise, remove the 1/2-inch plug and drain the line.

RAPHAEL FP

INSTALLATION (Reference Figure 2)

1. This system is supplied pre-assembled and factory pre-adjusted, including the PAV-2 actuator, that is adjusted according to the dry pilot set air pressure. Any change carried out at the system's trim components adjustments or 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 enabling assembly/disassembly and maintenance work.
4. It should be considered that water will be drained during regular maintenance on a routine basis, during periodical tests procedures and when operating in a fire situation. Therefore, a drainage plan should be considered.

5. The system described is to be mounted vertically only. Systems with identical operation but for horizontal installation are marked with a prefix "H", e.g. HFDV-AC1.

6. The downstream pipe connected to the FDV valve at a horizontal mount must be supported firmly to prevent the pipeline's weight 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, alarm pressure switch, trim pressure supply, Dry pilot pipeline, FDV valve's drains, etc.), is prohibited.

8. All connections to water supply, alarms etc. And other optional equipment should be provided in accordance with **figure 1**:

   * (**11**) – Pressure switch connection port (all ½" NPT female)
   * (**11**) – Water motor alarm connection
   * (**11**) – MADV manual automatic drain valve
   * (**7**) – Pressure gauges connections
   * (**3**) – Air supply and dry pilot line (1/4" NPT female)

9. Remove plastic plugs 1/4" from ports **1** & **3**.

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

11. Before performing the high-pressure leak test, make sure that the butterfly valve or the OS&Y valve upstream of the deluge valve is closed, in order to prevent damage to the diaphragms in the valve and in the trim components.

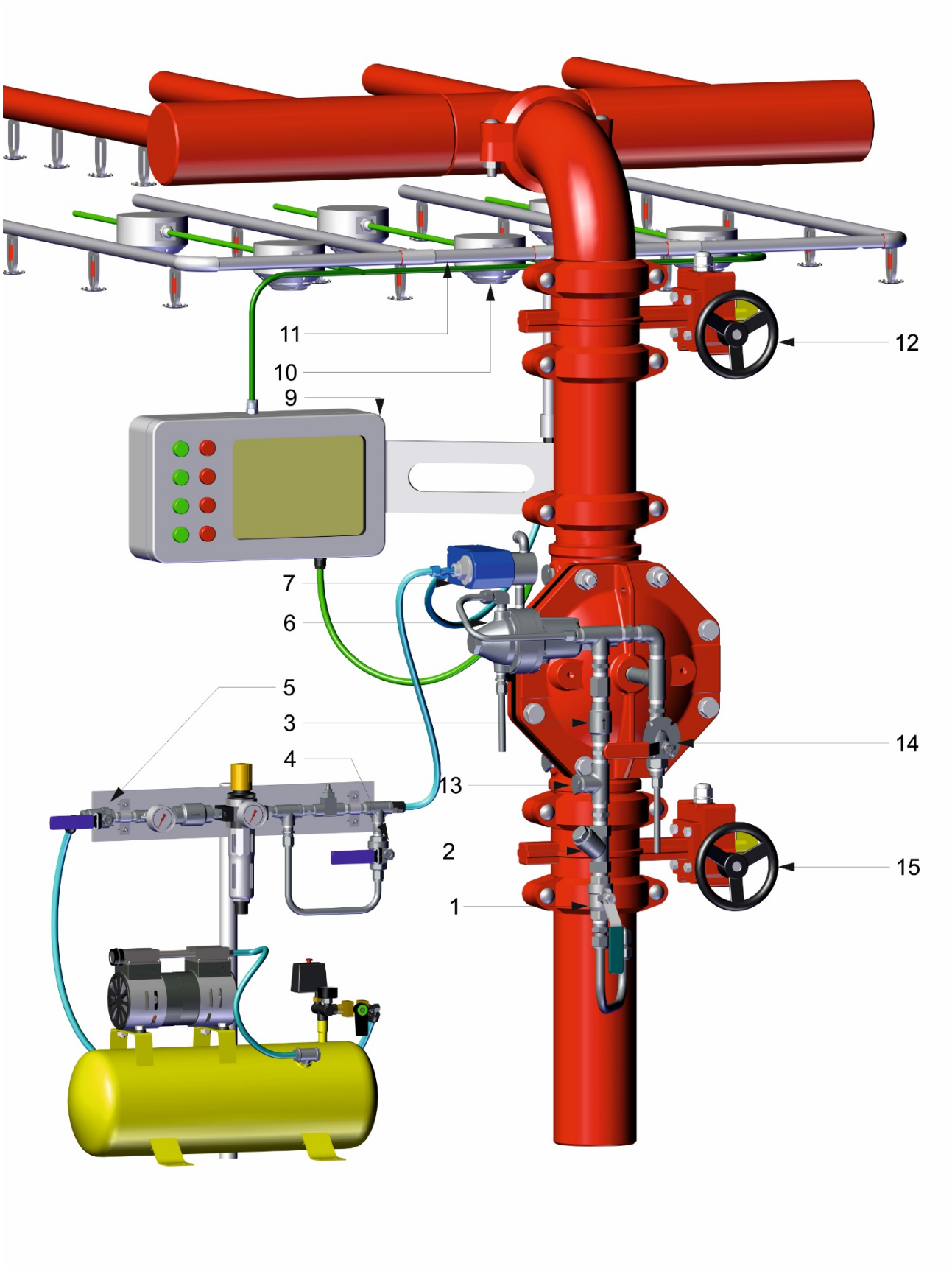
12. Make sure that the gong connected to its designated outlet is supported so that its weight, along with the weight of the piping attached to it, is not applied to the valve trim.

INSTALLATION PARTS LIST (Reference Figure 2)

Electro-Pneumatically Actuated, Remote Reset, Economic Deluge Valve

1. Trim supply valve (1/2” NPT female)
2. “Y” Strainer
3. Check Valve
4. Needle valve bypass ball valve at the ASK
5. Air supply ball valve at the ASK
6. PAV-2 Pneumatic Actuator Valve 2 way.
7. Air supply from ASK & Dry pilot line connection (temporary plugged)
8. Solenoid valve
9. Main Control hub
10. Electrical heat sensor
11. Dry pilot line
12. Downstream separation valve (butterfly or OS&Y valves).
13. Control chamber pressure gauge port (plugged)
14. Manual Emergency valve
15. Upstream separation valve (butterfly or OS&Y valves).

Figure 2



RAPHAEL FP

OPERATING INSTRUCTIONS (Reference Drawing - figure 2)

Commissioning the system - Phase 1

Filling and pressurizing the system.

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 (**13**) is close

2. Make sure that the downstream drain port (**12 fig 1**) is open - Unscrew the ½" plug.

3. **Actuated by the dry pilot line**: Open the inspector's valve (at the end of the dry pilot line **11** – not illustrated) and vent the pilot line. The pilot's pressure drop will cause the PAV-2 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.
   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 temporarily opening the needle valve bypass ball valve (**4**) at the ASK.

5. **Actuated by the Heat/Smoke detection sensors**: initiate a false alarm for the Heat/Smoke detection sensors at the control board. The solenoid valve (**8**) needs to be energized and the pressurized air in the PAV-2 sense chamber needs to be vented through the solenoid's open to atmosphere port (**1 figure 1**)

6. Consequently, the FDV valve will open, and a significant stream of water should flow out of the open downstream drain port (**12 figure 1**).

The system is ready for re-setting and placing in service.

RAPHAEL FP

Commissioning the system - phase 2.

Fire Situation Simulation (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 **11**) and / or turn off the fault alarm for the Heat/Smoke detection sensors (**10**) at the control board (**9**). 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 make sure there is no leakage or dripping out of the open downstream drain port. If ok, re-install the plug.
6. The Upstream Butterfly valve (**15**) and the downstream butterfly valve (**12**) 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 (**11**).
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 temporarily 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**).
8. Open the Upstream Butterfly Valve (**15**) gradually, then open the downstream butterfly valve (**12**).

The system is in SET state and placed in service.

RAPHAEL FP

Commissioning the system - phase 3.

Resetting & placing in service

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 <u>Simulation</u>:

7. Close the Upstream Butterfly Valve (**15**)
8. Close the trim pressure supply (**1**).
9. 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.
10. Disassemble the "Y" strainer (**2**) and clean its screen. Re-assemble the strainer.
11. Open the pressure supply valve (**1**) and press the PSA (**12**) push button for about 5-15 seconds. Temporary open the downstream drain port and make sure there is no leakage or dripping. If ok, screw in its plug.
12. The Upstream Butterfly valve (**15**) and the downstream butterfly valve (**11**) should be opened gradually.

Resetting after a <u>Real</u> Fire Situation:

9. Close the Upstream Butterfly Valve (**15**)
10. Close the trim pressure supply (**1**).
11. Close the air supply ball valve at the ASK (**5**)
12. All the Dry pilot line's blown-open sprinklers must be replaced.
13. 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 temporarily opening the needle valve bypass ball valve (**4**) at the ASK.
14. Disassemble the "Y" strainer (**2**) and clean its screen. Re-assemble the strainer.
15. Open the pressure supply valve (**1**). and press the PSA (**12**) push button for about 5-15 seconds.
16. Open the Upstream Butterfly valve (**15**) gradually, then open the downstream butterfly valve (**11**) and close the downstream drain port (**12** fig **1**).

The system is in SET state and placed in service.

RAPHAEL FP

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 personnel and the close central fire station must be notified.

The Maintenance and inspection procedures are based on the relevant chapters at 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** & **12**) and the Trim pressure supply valve (**1**) are in fully open position.

3. If the valve is not equipped with a drain valve, the downstream port needs to be unplugged, and the downstream pipeline needs to be drained. Make sure there is no leakage or dripping.

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.***

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 performance of a comprehensive internal part examination. Then, the relevant trim accessories should be replaced. After 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 both upstream and downstream bottom drain ports plugs and drain the valve. Drain the FDV's control chamber using the Emergency valve (**14**).

3. Turn off or disconnect all relevant electrical.

4. Release all relevant tubes, fitting nuts and the central union pipe connection (if equipped) at valves cover center.

5. Remove and disassemble the 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 pealing).

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.

RAPHAEL FP

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

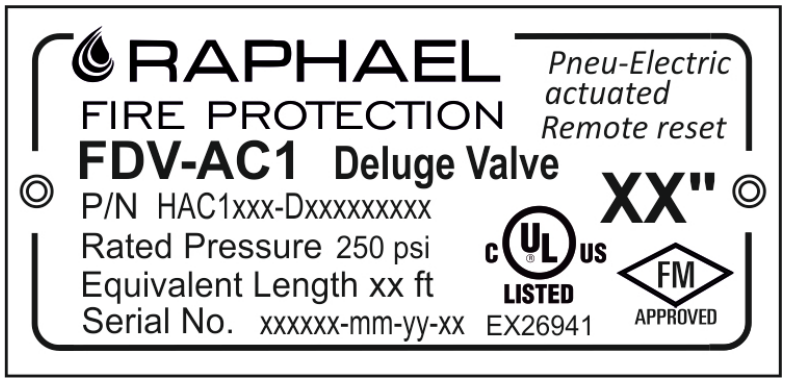
Valve size		1.5"	2"	2.5"	3"	4"	6"	8"	10"
Equivalent length value	ft	11	24	25	28	31	46	72	117
	m	3.6	7.3	7.6	8.5	9.4	14	21.9	35.6

RAPHAEL FP

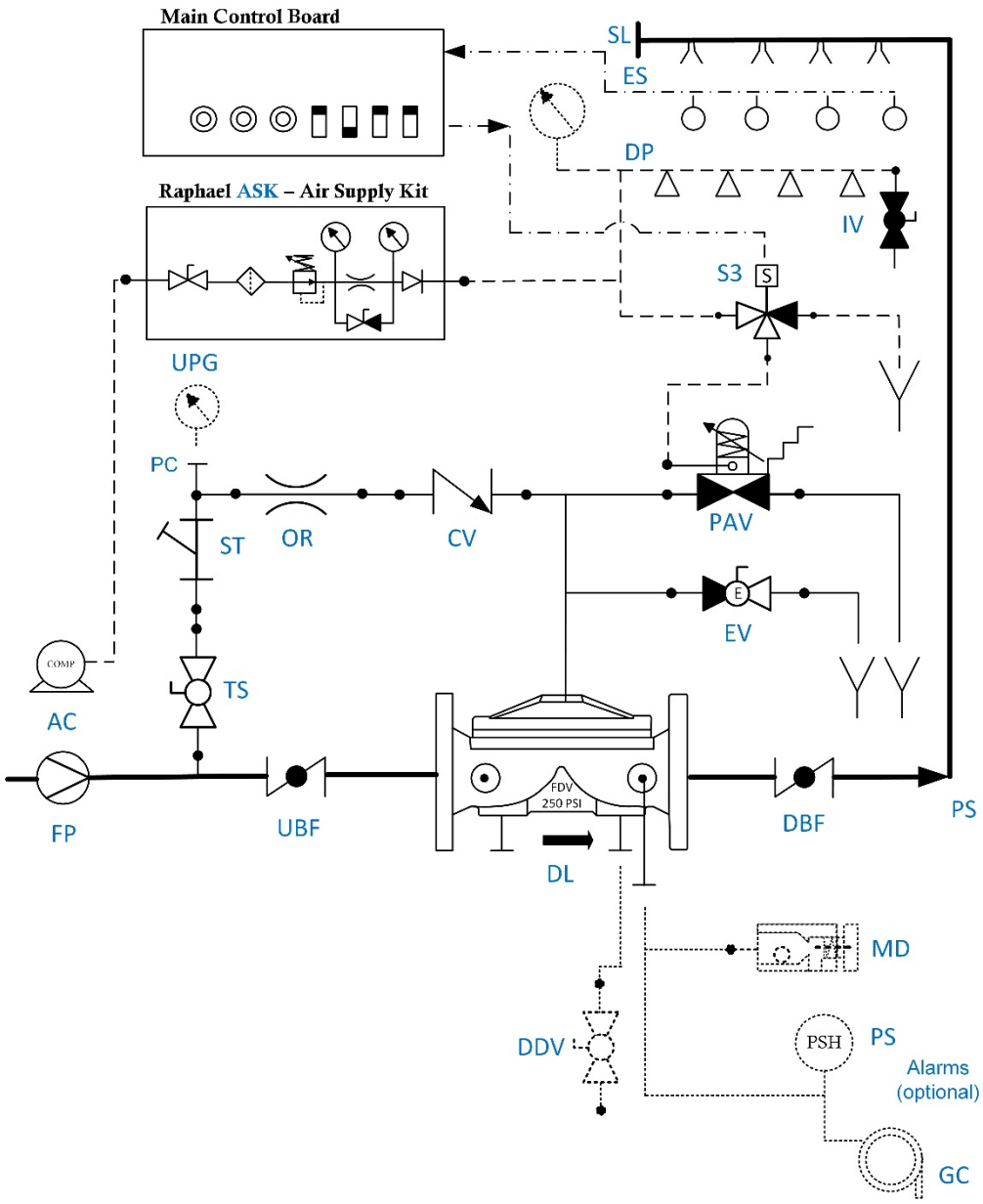
MARKING

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-AC1 – Electro-Pneumatically actuated, Remote Reset with
- (P/N) *The Application’s part number*: System properties–Valve properties
- *Rated pressure*: 250 psi
- *Equivalent Length*: reference table - page 11.
- *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”



RAPHAEL FP



TS -	Trim supply	DL -	Deluge Valve		Water lines
ST -	Strainer	SL -	Sprinkles Line		Air line
OR -	Orifice	PC -	Pressure Gauge Connection		Optional
PAV -	PAV2 – Pneumatic Actuator Valve	IV -	Inspector's valve		Electric wire
CV -	Check Valve	ES -	Electrical Sensors		
UBF -	Upstream Butterfly Valve	AC -	Air Compressor	Optional	
DBV -	Downstream Butterfly Valve	ASK -	Air Supply Kit	DDV -	Downstream Drain Valve
S3 -	3-way solenoid valve			PS -	Pressure Switch
EV -	Manual Emergency Valve			MD -	Drain Valve
DP -	Dry Pilot Line			UPG -	Upstream pressure gauge
FP -	Fire Pump			GC -	Gong connection

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.



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 | raphael-valves.com

Nov-25