IOM FDV-AP1

PNEUMATICALLY ACTUATED, REMOTE RESET, ECONOMIC DELUGE VALVE

Installation Operation & Maintenance manual

Fire Protection

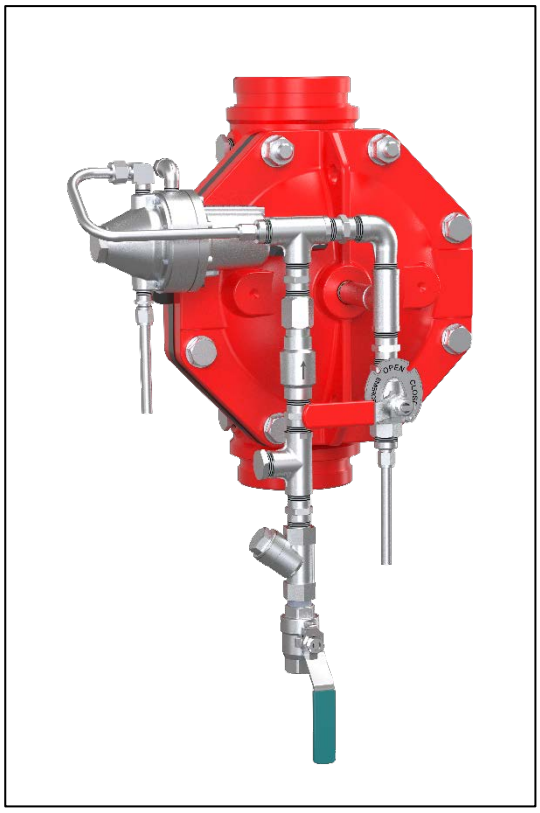
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IOM FDV-AP1

Pneumatically Actuated, Remote Reset, Economic Deluge Valve

DESCRIPTION



This deluge system is based on Raphael's FDV valve and is equipped with a pneumatically actuated control trim.
The FDV valve can be supplied in a range of optional materials and coatings to meet the required operating conditions; however, the system's operating principle remains unchanged.

A pneumatic detection system — a dry pilot pipeline — operates a pneumatic actuator.
In a fire situation, when the dry pilot line is depressurized (air pressure vents), the actuator changes its state, draining the FDV control chamber and consequently causing the FDV deluge valve to open.

Opening the manual emergency valve overrides all control conditions and opens the deluge valve immediately.
This system is suitable for water spray pipelines with open nozzles.

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PARTS LIST

Pneumatically Actuated, Remote Reset, Economic Deluge Valve

1. FDV Deluge valve
2. Dry pilot line connection & Air supply (1/4” NPT female, temporary plugged).
3. PAV-2 pneumatic actuator
4. Check Valve
5. Upstream pressure gauge connection (1/2” NPT)
6. “Y” Strainer
7. Trim Pressure Supply Valve
8. Orifice
9. Emergency valve
10. Downstream side port (plugged, ½” NPT) for optional acc. List[1]
11. Bottom downstream drain port (1/2” NPT) for optional acc. List[1]
12. Bottom upstream drain port for optional acc. List [2]
13. Upstream side port (plugged 1/2" NPT) for optional acc. List[2]

List of optional accessories for plugged ports:

List[1]: Downstream pressure gauge, WMA – water motor alarm, MADV – manual automatic drain valve, drain valve.

List[2]: Upstream pressure gauge, Drain valve

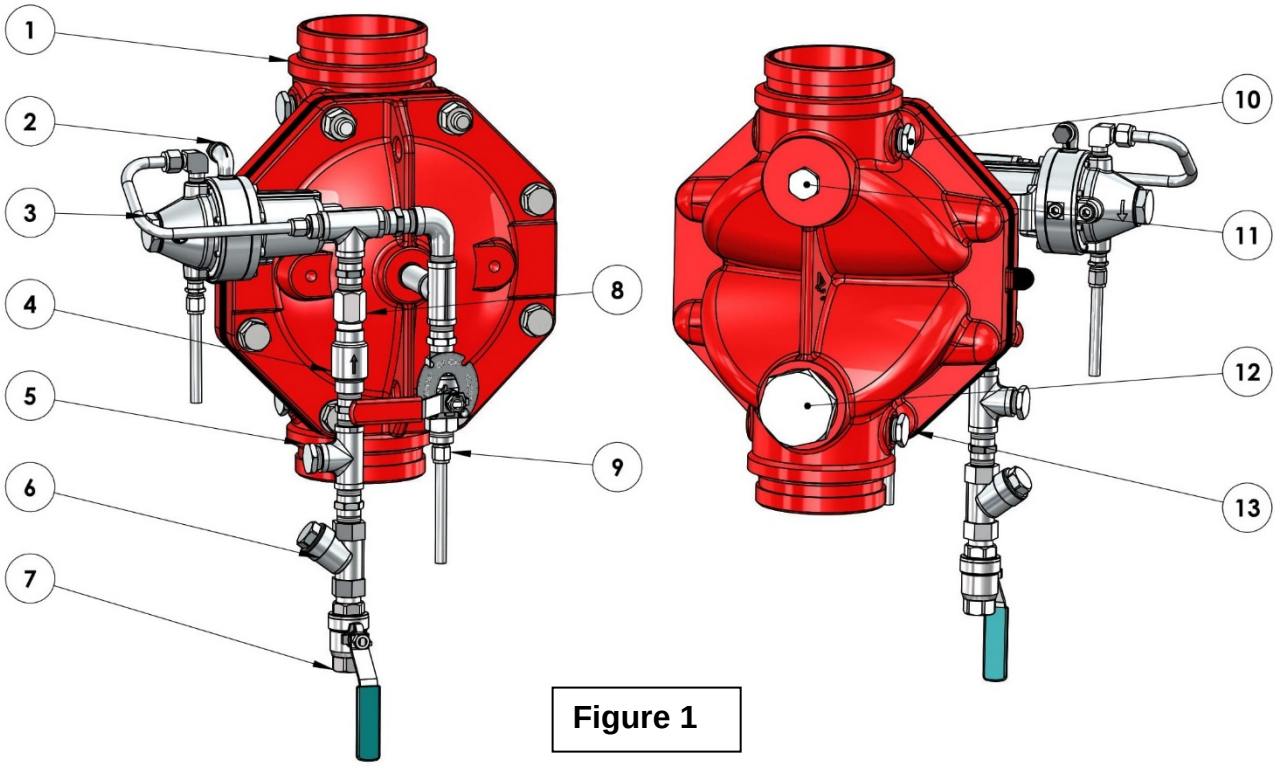


Figure 1

OPERATION (Reference Figure 1)

SET position:

Water is supplied by the trim supply valve (**7**), the “Y” strainer (**6**), and the check valve (**4**), flows through the orifice (**8**), and fills the FDV control chamber. Pressurized water in the control chamber is trapped by the check valve (**4**), the PAV-2 actuator (**3**), and the closed emergency valve (**9**), keeping the deluge valve in the closed position. The pressurized air in the dry pilot line holds the PAV-2 actuator in its CLOSED state and, consequently, the FDV deluge valve remains closed.

Fire Situation

When one or more automatic sprinklers located along the dry pilot line are exposed to heat and blow open, air escapes and the pilot line depressurizes. Consequently, the pressure in the PAV-2 sense chamber also drops, and the actuator shifts to its OPEN state. Water from the FDV control chamber drains, and the deluge valve opens.
Opening the emergency valve (**9**) bypasses all components, 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 blown open. This allows the dry pilot line to be repressurized and returns the PAV-2 (**3**) to its initial CLOSED state. The upstream pressure flows through the orifice and fills the deluge valve control chamber. Consequently, the valve closes.
It is recommended to drain the sprinkler pipeline by opening the ball valve connected to the FDV downstream drain port (if present). Otherwise, unscrew the 1/2 in. plug and drain the line.

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 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-AP1.

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 done in accordance with **fig 1**:

   * (**10**) – Pressure switch connection port (all ½" NPT female)
   * (**10 or 11**) – Water motor alarm connection
   * (**10**) – MADV manual automatic drain valve
   * (**10 & 13**) – Pressure gauges connections
   * (**2**) – Air supply and dry pilot line (1/4" NPT female)

9. Remove plastic plugs 1/4" from port (**2)**

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)

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. Main Control hub
9. Dry pilot line
10. Downstream separation valve (butterfly or OS&Y valves).
11. Control chamber pressure gauge port (plugged)
12. Orifice
13. Manual Emergency valve
14. Upstream separation valve (butterfly or OS&Y valves).

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Pneumatically Actuated, Remote Reset, Economic Deluge Valve

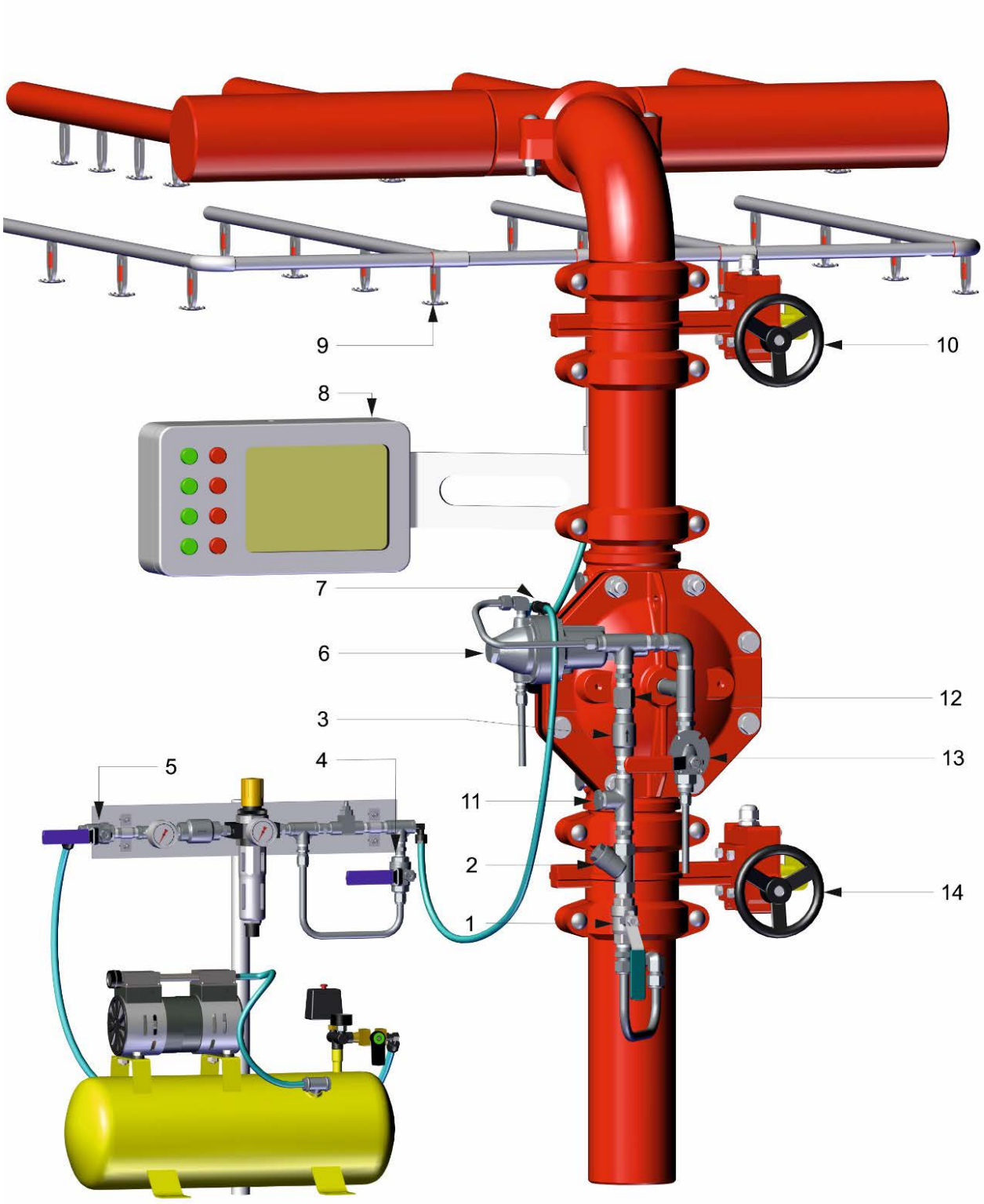


Figure 2

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OPERATING INSTRUCTIONS (Reference Drawing - 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. The filling process is performed only after flushing the pipeline. The flushing needs to be done when both butterfly valves (**10** & **14**) are open, and the trim supply valves (**1**) is close.
2. After flushing, close the upstream butterfly valve (**14**).
3. Make sure the trim pressure supply ball valve (**1**) is Closed.
4. Make sure that the Emergency valve (**13**) is fully closed.
5. Pressurize the pilot line (**9**) to the set pressure:
   Open air supply valve (**5**) at the ASK 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.
   Note: No adjustments for the PAV-2 (**6**) actuator are needed as the device is factory set.
6. Close downstream separation butterfly valve (**10**) and open the FDV's downstream drain port by removing its plug (**11 fig 1**). The Upstream drain port remains plugged, or its valve (if equipped) remains close.
7. Open the trim pressure supply valve (**1**) and fill the trim and FDV's control chamber.
8. Open gradually the upstream butterfly valve (**14**).
9. Observe the open downstream drain port: there should be no leakage or dripping.
10. Leave it open/unplugged for phase II.

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 (**10**) is close

2. Make sure that the downstream drain port (**11 fig 1**) is open. Unscrew the ½" plug.

3. Open the inspector's valve (at the end of the dry pilot line **9** – 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 open downstream drain port. A significant stream of water should flow out.

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

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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 Simulation:

1. Close the Upstream Butterfly Valve (**14**)
2. Close the trim pressure supply (**1**).
3. Close the inspector's valve at the end of dry pilot line (**9**) 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. 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 (**14**) and the downstream butterfly valve (**10**) should be opened gradually.

Resetting after a Real Fire Situation:

1. Close the Upstream Butterfly Valve (**14**)
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 (**9**).
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 (**14**) gradually, then open the downstream butterfly valve (**10**).

The system is in SET state and placed in service.

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MAINTENANCE (Reference Figure 2)

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 (**14** & **10**) and the Trim pressure supply valves (**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.***

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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 the 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 (**14**) and the trim pressure supply valve (**1**).
2. Open both upstream and downstream drain port plugs and drain the valve. Drain the FDV's control chamber using the Emergency valve (**13**).
3. Release all relevant tubes, fitting nuts and the central union pipe connection (if equipped) at valves cover center.
4. Remove and disassemble front trim.
5. 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.
6. Observer the internals of the valve and cover for excessive scale residuals, foreign particles, damaged coating (rust, cracks, or pealing).
7. Worn or damaged parts should be replaced. Consult Raphael's local representative or the service department for any maintenance issue or part replacement issue.
8. Replace the Diaphragm. The identification tongue should point to the valve's stamped size side (from top view – at the left side).
9. 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".**
10. Reinstall the front trim carefully: avoid causing twists or dents on bent tubes and do not overtight the compression fitting's nuts.
11. When the system is fully re-assembled, perform the "**Commissioning the system - phase 1** - Filling and pressurizing the system" procedure.
12. Perform the **Annual test procedure.**

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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

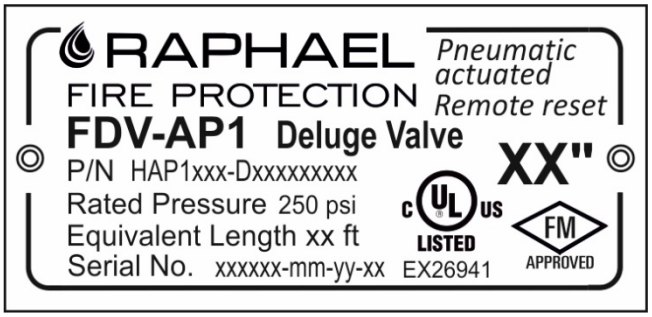
Equivalent pipe length for FDV deluge valves

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

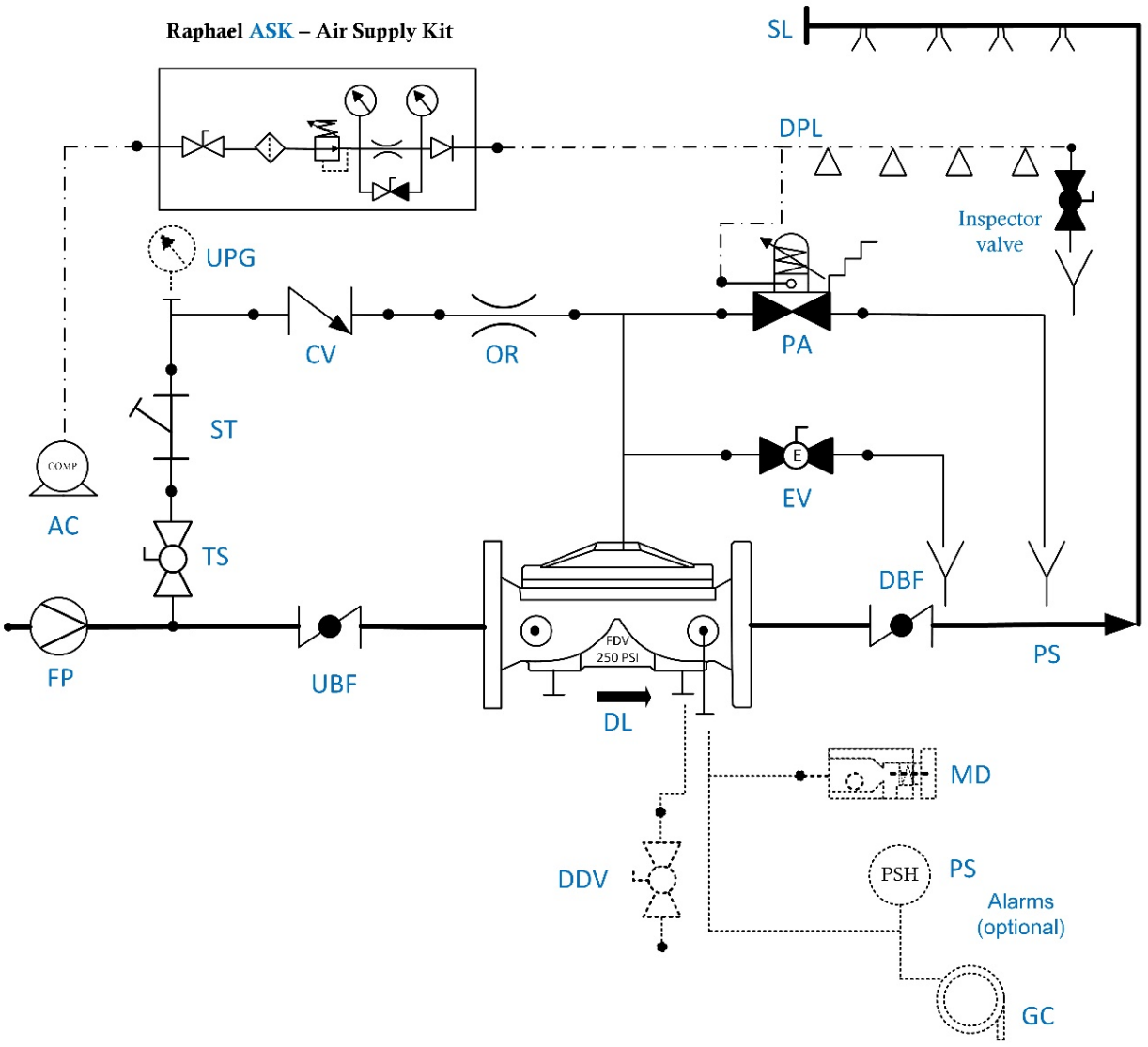
MARKING

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-AP1 – Pneumatic actuated, Remote Reset with
- (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 UL listing mark & QR code:* EXxxxxx
- *The Application's* diameter in inch: XX"



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TS -	Trim supply	SL -	Sprinkles Line		Water lines
ST -	Strainer	FP -	Fire Pump		Pneumatic lines
AT -	Alarm Test valve	DPL -	Dry Pilot Line		Optional
CV -	Check Valve	AC -	Air Compressor		
OR	Orifice				
DL -	Deluge Valve	**OPTIONAL**			
UBV -	Upstream Butterfly Valve	PS -	Pressure Switch		
DBV -	Downstream Butterfly Valve	MD -	MADV – Manual / Automtic Drain Valve		
PA -	2-Way Pneumatic Actuator	GC -	Gong connection		
EV -	Emergency Valve	UPG -	Upstream Pressure gauge		
PC -	Pressure gauge Connection	DDV -	Downstream Drain Valve		

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.



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