IOM FDV-DP0

PNEUMATICALLY ACTUATED, LOCAL RESET, DELUGE VALVE

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

Fire Protection

RAPHAEL VALVES INDUSTRIES

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IOM FDV-DP0

Pneumatically Actuated, Local Reset, Deluge Valve

DESCRIPTION



This deluge system is based on Raphael's FDV valve, equipped with a pneumatically actuated control trim. The installed FDV valve is available in a range of optional materials and coatings to meet the required operating conditions, but the system's functional principle remains unchanged: in a fire situation, a pneumatic detection system (dry pilot-line sprinklers) trips the pneumatic actuator, which in turn drains the valve's control chamber. Draining and depressurizing the control chamber causes the valve to open.

The trim is equipped with a PSA, a device that enables local system reset, meaning that the FDV valve can be closed by re-pressurizing its control chamber. This system is suitable for automatic water-spray operation using a pilot pipeline with closed sprinkler heads and open nozzles in the main spraying pipelines.

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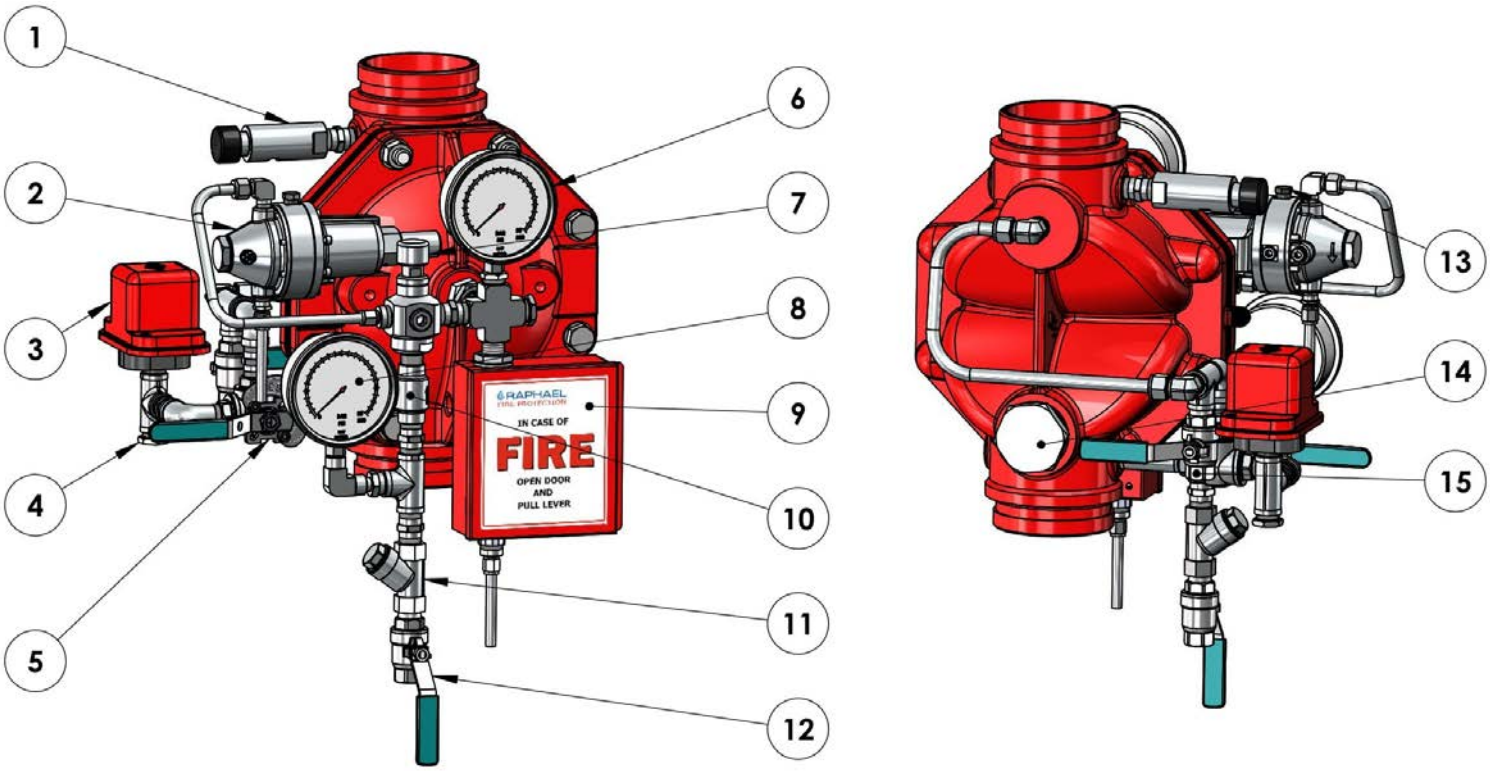
PARTS LIST

Pneumatically Actuated, Local Reset, Deluge Valve

1. MADV (MB) Drain valve
2. Pneumatic actuator
3. Pressure switch (Optional)
4. Water motor alarm connection (plugged)
5. Alarm test valve (3-way)
6. Control chamber pressure gauge
7. PSA-Pressure Surge Arrestor
8. Upstream pressure gauge
9. MEU Manuel emergency unit
10. Check Valve
11. “Y” Strainer
12. Trim Pressure Supply Valve
13. Dry pilot connection port
14. Upstream drain (Plugged)
15. Downstream drain valve



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SET position:

The trim is supplied by the line pressure via ball valve (12) and “Y” strainer (11), flows through the PSA (7), and fills the FDV control chamber. Pressurized water in the control chamber is trapped by check valve (10), by the pneumatic actuator PAV-2 (2), by the PSA while its push-button is released, and by the closed emergency valve unit (9), keeping the deluge valve in the closed position.
The PAV-2 control chamber (13) is subjected to the pneumatic pressure of the dry pilot line, which keeps the actuator in its closed state and blocks the FDV drain line. In case of minor leakage from the FDV control-chamber piping, the PSA (7) shifts to its compensation state, ensuring that the valve remains closed.

FIRE situation:

When one or more dry pilot-line sprinklers are exposed to fire, they open and the pneumatic pressure drops. Consequently, the PAV-2 shifts to its open state and drains the FDV control chamber through the PSA upper manifold to the atmosphere. The FDV deluge valve opens and water flows into the sprinkler pipeline. The pressure drop in the PSA upper manifold causes the internal ball to move to its upper seat, preventing upstream flow from re-entering the control chamber. In this way, the PSA latches the FDV valve in the open position.
Opening the emergency ball valve bypasses all conditions, drains the FDV control chamber, and opens the valve immediately.

RESET position:

1. Close the upstream butterfly valve (3, figure 2).
2. Close the trim-pressure supply valve (12). Close the air-pressure supply to the dry pilot line by closing the ball valve at the entrance to the ASK Air Supply Unit.
3. Replace all dry pilot-line sprinklers that opened.
4. When complete, open the ball valve at the ASK entrance and pressurize the dry pilot pipeline. Pressurizing the dry pilot line will cause the PAV-2 to move to its closed state and block the control-chamber drain.
5. Open the trim-pressure supply valve (12).
6. Press the PSA (7) push-button down until the FDV control chamber is fully pressurized.
7. Open the upstream butterfly valve (3, figure 2). The system is now in SET position.

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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 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-DP0.

6. The downstream pipe connected to the FDV valve at Vertical and horizontal mount system, is to 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, trim pressure supply, FDV valve's drains), is prohibited.

8. All connections to water supply, should be done in accordance with figure 2
   (**1**) – Trim pressure supply connection - ½" NPT female.
   (**4** Fig **1**) – Alarm gong to alarm test valve - ½" NPT female.
   (**11** Fig **2**) – Dry pilot line to the PAV-2 actuator – ¼" NPT female (remove temporary plug!).

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

10. 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.

11. 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, Local Reset, Deluge Valve

1. Trim supply valve (1/2” NPT female)
2. “Y” Strainer
3. Upstream separation valve (butterfly or OS&Y valves).
4. MEU Manual Emergency Unit
5. Check Valve
6. Upstream pressure gauge
7. PSA Pressure Surge Arrestor
8. Downstream pressure gauge
9. Downstream separation valve (butterfly or OS&Y valves).
10. Dry pilot line
11. Air supply & Dry pilot line connection (1/4” NPT female).
12. MADV – Manual Automatic Drain Valve (MB)
13. PAV-2 Pneumatic Actuator Valve 2 way.
14. Pressure switch*****. (½” NPT female connection)
15. Downstream drain valve (1/2” NPT female)
16. 3-way alarm test valve
17. ASK Air Supply Kit (In & out ¼” NPT female).

*** Optional**

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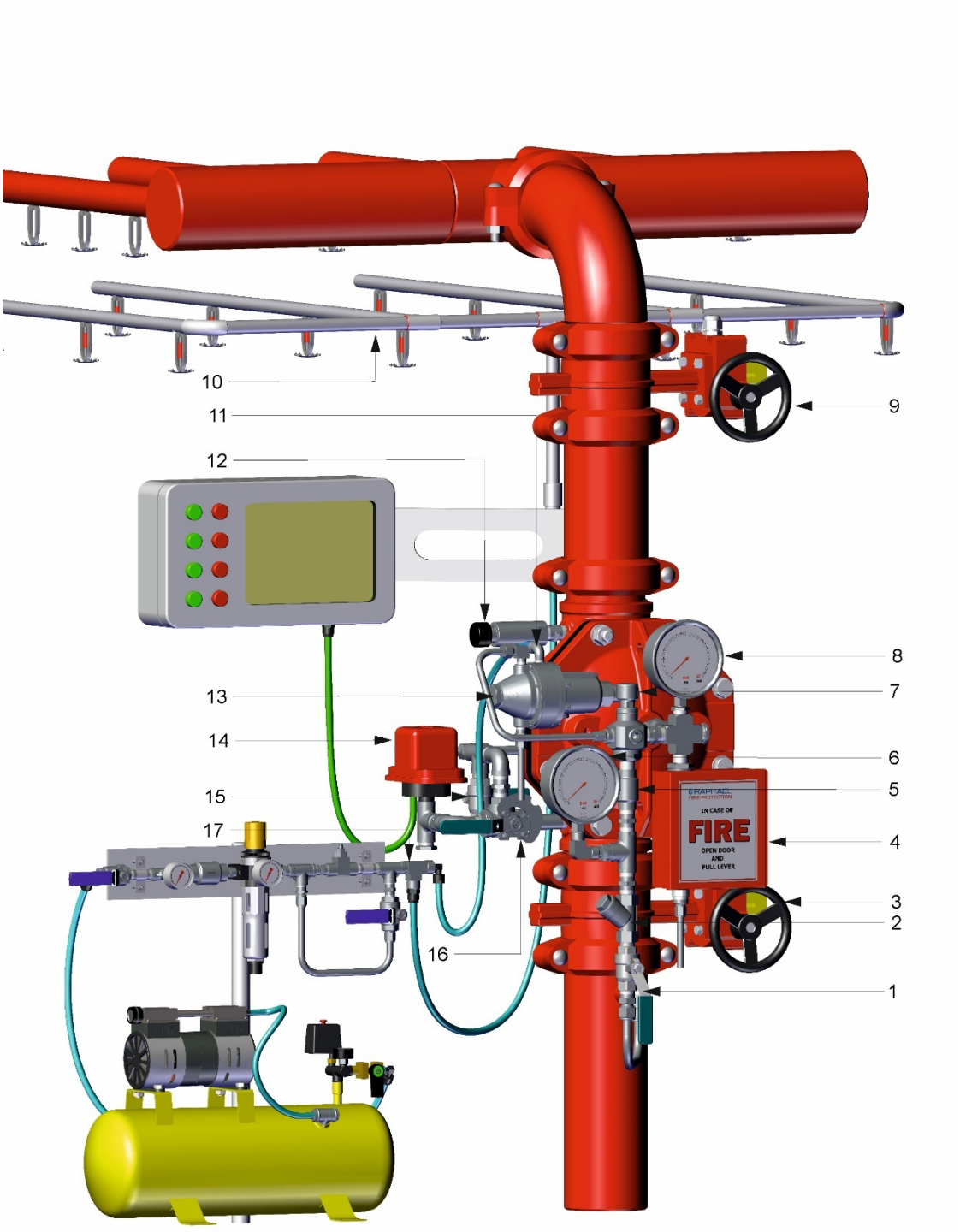
Fig. 2



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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 (**3** & **9**) are open, and the trim supply valve (**1**) is closed.

2. Make sure the upstream butterfly valve (**3**) is fully close.

3. Make sure the trim pressure supply ball valve (**1**) is Closed.

4. Make sure that the Emergency valve in the EMU (**4**) is fully closed.

5. Pressurize the pilot line to the rated pressure. No adjustments at the PAV-2 actuator are needed as the device is factory set.

6. Make sure the FDV's downstream drain valve (**15**) is open and upstream drain remains plugged or its valve (if equipped) is close.

7. Open the trim pressure supply valve (**1**).

8. Press the PSA's push-button (**7**) and fill the trim and FDV's control chamber.
9. Open gradually the upstream butterfly valve (**3**) and make sure the downstream drain (**15**) valve is not dripping.

10. Leave the Downstream drain valve.

The system is ready for the "**fire situation simulation**".

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Commissioning the system - phase 2.

Fire Situation Simulation

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. open downstream drain valve (**15**).

2. Close the downstream separation butterfly valve (**9**).

3. Open the inspector's valve (at the end of the dry pilot line **10** – not illustrated) to 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 valve (**15**): A significant stream of water should flow out of this valve.

5. Observe the PAV-2 drain tube: While draining the valve's control chamber, the flow should run for no more than a few seconds (depending on the valve's size) and when deluge control chamber become fully drained, the flow should stop.
   Note that a drain flow for an extended period, or a constant flow, can indicate an internal leakage at the PSA device. If ok.

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

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>:

1. Close the Upstream Butterfly valve (**3**)
2. Close the trim pressure supply (**1**).
3. Close the inspector's valve (at the end of the dry pilot line **10**). Waite until pilot's line reaches to set pressure. The process can be expedited by opening <u>temporary</u> the quick filling valve at the ASK.
4. Disassemble the "Y" strainer (**2**) and clean its screen. Re-assemble the strainer.
5. Open the pressure supply valve (**1**).
6. The PSA (**7**) push-button should be pressed down until the FDV control chamber is fully pressurized. Pressure gauges **6** & **8** need to show the same reading.
7. The Upstream Butterfly valve (**3**) and the downstream butterfly valve (**9**) should be opened gradually.
8. Make sure that there is no leakage out of downstream drain valve (**15**) and if ok, close this ball valve.

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

1. Close the Upstream Butterfly valve (**3**)
2. Close the trim pressure supply (**1**).
3. Close the entrance ball valve at the ASK (**17**)
4. All the Dry pilot line's blown-open sprinklers, need to be replaced (**10**).
5. When done, open the entrance ball valve at the ASK (**17**)
6. Disassemble the "Y" strainer (**2**) and clean its screen. Re-assemble the strainer.
7. Open the pressure supply valve (**1**).
8. The PSA (**7**) push-button should be pressed down until the FDV control chamber is fully pressurized. Pressure gauges **6** & **8** need to show the same reading.
9. The Upstream Butterfly valve (**3**), and the downstream butterfly valve (**9**) should be gradually opened.

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 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 valve for external damage: observe the piping and hose connections for leakage or damage.

2. Verify that the upstream butterfly valve (**3** figure 2) and the Trim pressure supply valve (**1**) are in fully open position.
   Downstream drain valve (**15**) and upstream drain valve (if equipped) are fully close.

3. Observe the FDV control chamber pressure gauge (**8**) and the upstream pressure gauge (**6**) make sure that its readings are the same and that the required supply water pressures are applied to the deluge Valve inlet and trim.

4. Push the MADV (MB) (**12**) 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.

5. Move the 3-way SET/TEST valve (**16**) to TEST. The acoustic alarm should sound, and the alarm pressure switch (**14**) should transmit a signal to the main control board.

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 (**3**) and the trim pressure supply valve (**1**).

2. Open the drain valves (**15**) and the upstream drain valve if equipped. Drain the FDV's control chamber using the EMU Emergency valve (**4**).

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 the disassembled front trim.

6. Remove all the FDV's cover bolts. The cover will hang on its studs. 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.

9. Replace the Diaphragm. The identification tongue should point to the valve's stamped size (diameter in inch) side.

10. Reinstall the valve's cover: use the Anti-seize paste tube 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

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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-DP0-B0 - 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 UL listing mark & QR code:* EXxxxxx
- *The approved FM mark.*
- *The Application’s* diameter in inch: XX”



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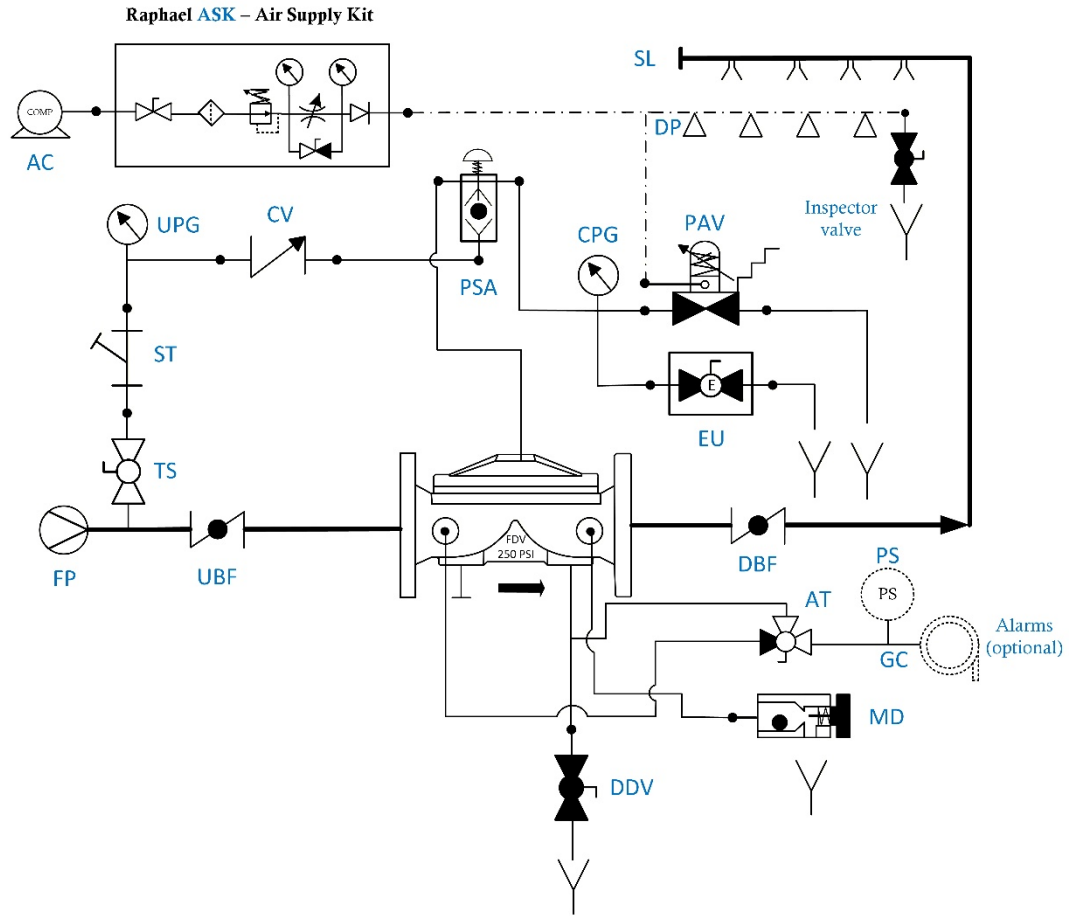

TS -	Trim supply	UBV -	Upstream Butterfly Valve		Water lines
ST -	Strainer	DBV -	Downstream Butterfly Valve		
AT -	Alarm Test valve	PS -	Pressure Switch (optional)		Air line
GC -	Gong connection	DP -	Dry Pilot Line		
CV -	Check Valve	AC -	Air Compressor		
UPG -	Upstream Pressure Gauge	EU -	Manual Emergency Valve		
CPG -	Control Chamber P. gauge	SL -	Sprinkles Line		
PSA -	Pressure Supply Arrestor	DDV -	Downstream Drain Valve		
MD -	MADV – Manual / Automtic Drain Valve	FP -	Fire Pump		
PAV -	Pneumatic Actuator 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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