IOM FDV-DH0

HYDRAULICALLY ACTUATED, LOCAL RESET, ECONOMIC DELUGE VALVE

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

Fire Protection

RAPHAEL VALVES INDUSTRIES

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IOM FDV-DH0

Hydraulically Actuated, Local Reset, Economic Deluge Valve

DESCRIPTION



This deluge system is based on Raphael's FDV valve, equipped with a hydraulically 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 functional principle of the FDV-DH0 system remains unchanged.

In a fire situation, a hydraulic detection system (a wet pilot line with automatic sprinklers) trips the valve's control trim and, consequently, the pressurized water trapped in the FDV control chamber is drained and the valve opens.

The trim is equipped with a PSA – a latching device that enables local system reset, i.e., closing the FDV valve by pressurizing the valve control chamber.

This system is suitable for main spraying pipelines equipped with open nozzles.

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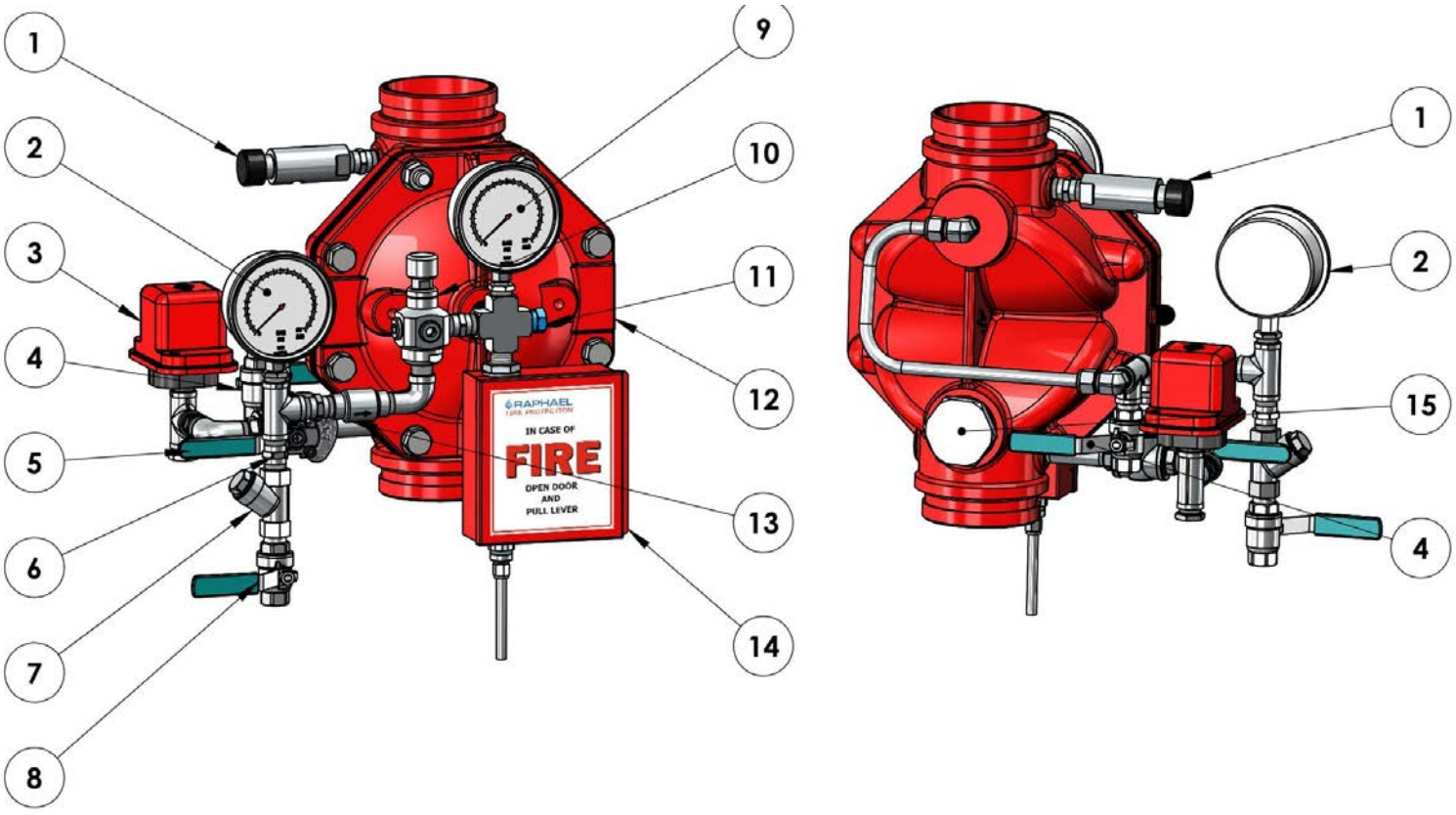
PARTS LIST

Hydraulically Actuated, Local Reset, Economic Deluge Valve

1. MADV (MB) Drain valve
2. Upstream pressure gauge
3. Pressure switch (Optional)
4. Downstream drain valve
5. Water motor alarm conn. (1/2” NPT female).
6. Alarm test valve (3 way)
7. “Y” Strainer
8. Trim Pressure Supply Valve
9. Control chamber pressure gauge
10. PSA – Pressure Supply Arrestor
11. Wet pilot’s conn. Port (1/2” NPT female)
12. Deluge valve
13. Check Valve
14. MEU Manuel emergency unit
15. Upstream drain (Plugged)

Fig. 1



OPERATION (Reference Figure 1)

SET position:

The trim is supplied by the line-pressure via ball valve (**8**), "Y" strainer (**7**), flows through the PSA (**10**), and fills the FDV's control chamber. Pressurized water in the valve's control chamber gets trapped by the check-valve (**13**), by automatic close sprinklers at the wet pilot line, by the PSA internal check valve and by the closed emergency valve unit (**14**), maintaining the deluge valve in closed position.

In case of minor leakage from the FDV's control chamber piping, the PSA moves to its compensation state, ensuring the valve remains close.

FIRE situations:

When one or more of the wet pilot's line sprinklers are subjected to fire, it blows open and the hydraulic pressure drops.

Consequently, the FDV's control chamber drains depressurize through the PSA's upper manifold, to the atmosphere. The FDV deluge valve opens and water flows into the sprinkler's pipeline/s. The drop of pressure in the PSA's upper manifold causes the internal ball to move to its upper seal seat, preventing the upstream flow from entering the deluge valve control chamber. By that, the PSA latches the FDV valve in its open position.

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

RESET position.

The first step in the trim's reset procedure is closing the Upstream Butterfly valve (**16** figure 2) and the trim pressure supply ball valve (**8**).

At the second step, all the Wet pilot line's blown-open sprinklers need to be replaced.
At third step, the pressure supply valve needs to be opened. When done, the PSA (8) push-button should be pressed down until the FDV control chamber is fully pressurized and its control chamber gauge (**10**) reading, is the same as the upstream pressure gauge (**2**).

Finally, the Upstream Butterfly valve (**16** figure 2) should be opened, and the systems is 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 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-DH0.

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**) – Alarm gong to alarm test valve - ½" NPT female.
   (**11** Fig **1**) – wet pilot line connection – ½" NPT female (temporary plugged).

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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INSTALLATION PARTS LIST (Reference Figure 2)

Hydraulically Actuated, Local Reset, Economic Deluge Valve

1. Trim supply valve (1/2” NPT female).
2. Y Strainer.
3. 3-way alarm test valve.
4. Water Motor Alarm connection (1/2” NPT female, plugged).
5. Downstream drain valve (1/2” NPT female).
6. Pressure switch *****. (½” NPT female connection).
7. Upstream pressure gauge.
8. MADV – Manual Automatic Drain Valve (MB).
9. Main control board.
10. Dry pilot line.
11. Downstream separation valve (butterfly or OS&Y valves).
12. Downstream pressure gauge.
13. PSA – Pressure Supply Arrestor
14. Check Valve.
15. MEU - Manual Emergency Unit.
16. Upstream separation valve (butterfly or OS&Y valves).

* Optional

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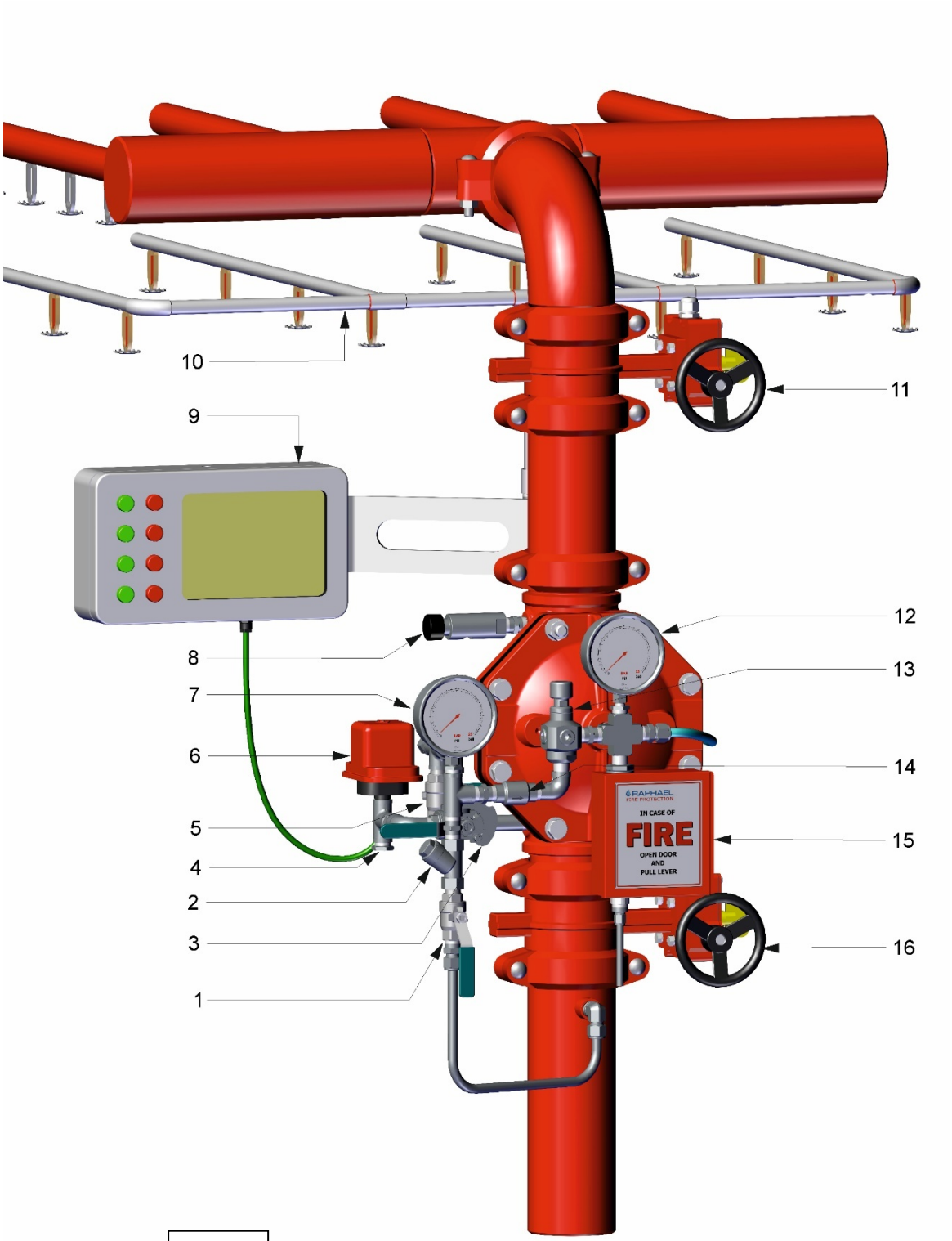

Fig 2

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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 (**11** & **16**) are open, and the trim supply valve (**1**) is close.

2. After flushing, close the upstream butterfly valve (**16**).

3. Open the trim pressure supply ball valve (**1**).

4. Make sure that the Emergency valve in the EMU (**15**) is fully closed.

5. Pressurize the pilot line and the FDV control chamber: press the PSA (**13**) push button until the reading in pressure gauge (**12**) is the same like at the upstream pressure gauge (**14**)

6. Close downstream separation butterfly valve (**11**) and open the FDV's downstream drain valve (**5**). The Upstream drain remains plugged, or its valve (if equipped) is close.

7. Open gradually the upstream butterfly valve (**16**).

8. Observe the downstream drain valve (**5**): there should be no leakage or dripping.

9. If ok, leave the Downstream drain valve open for the next phase test.

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. Close the downstream butterfly valve (**11**).

2. Open the inspector's valve (at the end of the dry pilot line **10** – not illustrated) and drain the pilot line. The pilot's pressure drop will cause the FDV deluge control chamber to be drained through the open inspector's valve and consequently, the FDV deluge valve will open.

3. Observe the downstream drain valve (**5**): A significant stream of water should flow out of this valve. If ok. -

The 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 (**16**)
2. Close the trim pressure supply (**1**).
3. Close the inspector's valve (at the end of wet pilot line **10**).
4. Disassemble the "Y" strainer (**2**) and clean its screen. Re-assemble the strainer.
5. Open the trim pressure supply valve (**1**). Push the PSA (**13**) push button until both pressure gauges **7** & **12** show the same reading.
6. The Upstream Butterfly valve (**16**) and the downstream butterfly valve (**11**) need to be opened gradually. There should be no flow and no dripping through the downstream drain valve (**5**). If ok, close this valve.

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

1. Close the Upstream Butterfly valve (**16**)
2. Close the trim pressure supply (**1**).
3. Close the inspector's valve (at the end of wet pilot line **10**).
4. All the Dry pilot line's blown-open sprinklers need to be replaced (**10**).
5. Disassemble the "Y" strainer (**2**) and clean its screen. Re-assemble the strainer.
6. Open the trim pressure supply valve (**1**). Push the PSA (**13**) push button until both pressure gauges **7** & **12** show the same reading.
7. The Upstream Butterfly valve (**16**) and the downstream butterfly valve (**11**) should be opened gradually. There should be no flow and no dripping through the downstream drain valve (**5**). If ok, close this valve.

The system is in SET state and placed in service.

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 (**16** figure **2**) and the Trim pressure supply valve (**1**) are in fully open position.

Downstream drain valve (**5**) and upstream drain valve (if equipped) are fully close.

3. Observe the FDV control chamber pressure gauge (**12**) and the upstream pressure gauge (**7**) 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) (**8**) 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 (**3**) to TEST. The acoustic alarm should sound, and the alarm pressure switch (**6**) 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 (**16**) and the trim pressure supply valve (**1**).
2. Open the downstream drain valve (**5**) and the upstream drain valve if equipped. Drain the FDV's control chamber using the EMU Emergency valve (**15**).
3. Turn off and disconnect all relevant electrical circuits (pressure switch cable)
4. Release all relevant tubes fitting nuts and the central union pipe connection (if equipped) at valve's cover centre.
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. (relevant to valve size 4" and up)
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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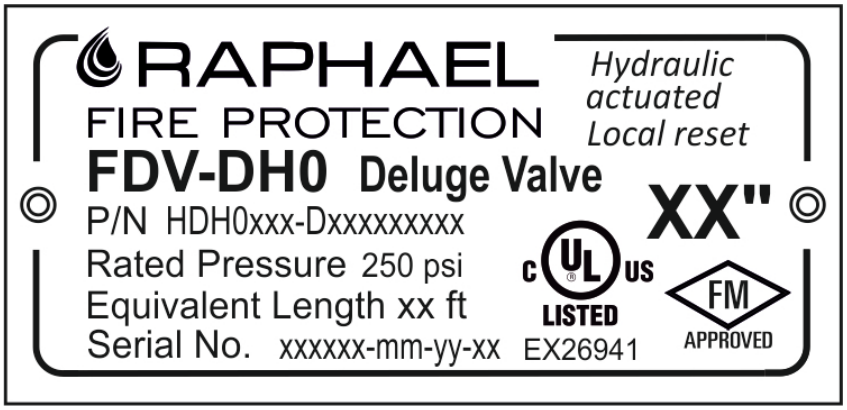
MARKING

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-DH0** – Hydraulic 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 FM approved mark*
- *The Application’s* diameter in inch: XX”



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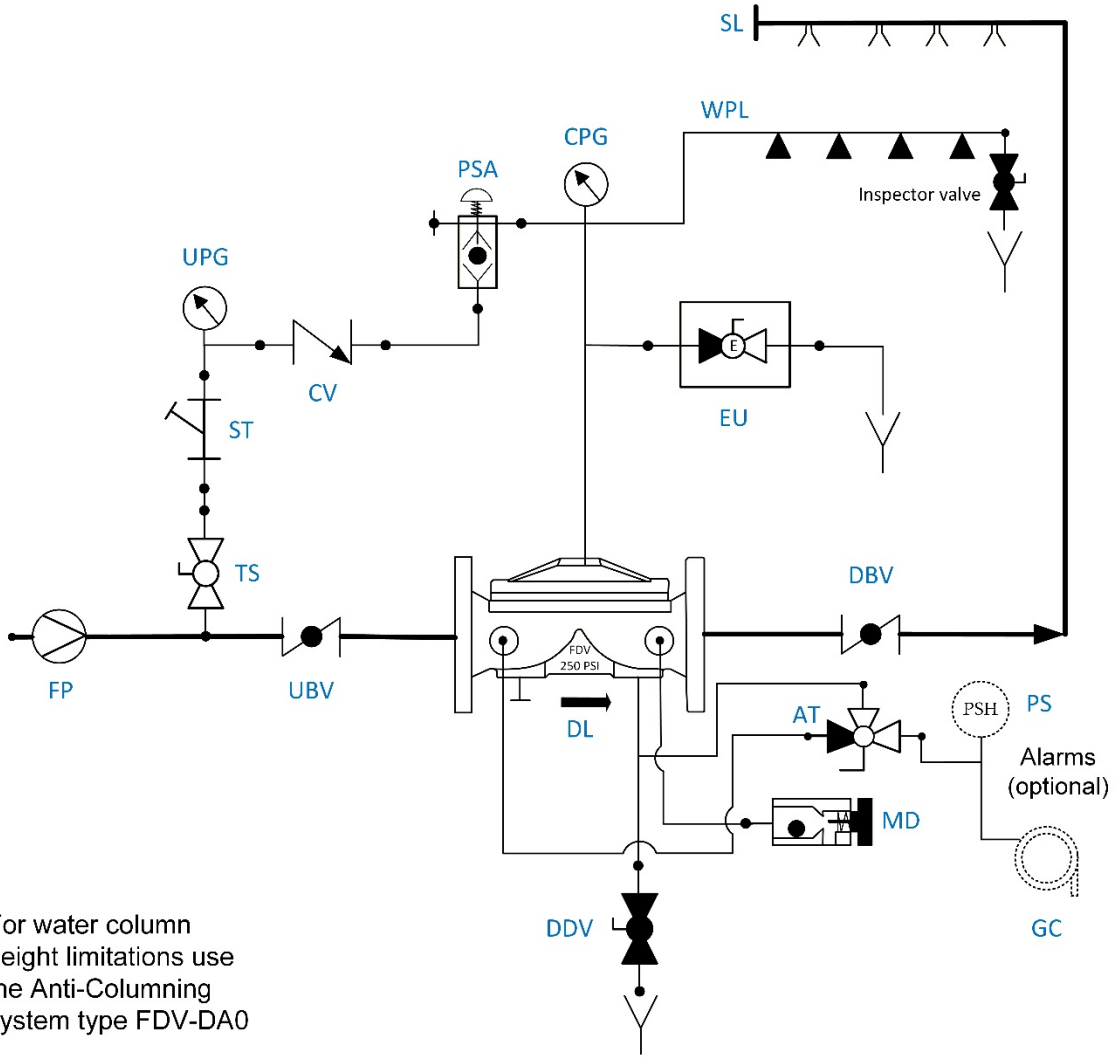

TS -	Trim supply	UBV -	Upstream Butterfly Valve		Water lines
ST -	Strainer	DBV -	Downstream Butterfly Valve		
AT -	Alarm Test valve	CPG -	Control Chamber P. gauge		Electrical line
GC -	Gong connection	UPG -	Upstream Pressure gauge		
CV -	Check Valve	EU -	Manual Emergency Valve		
PSA -	Pressure Supply Arrestor	SL -	Sprinkles Line		
PS -	Pressure Switch	DDV -	Downstream Drain Valve		
DL -	Deluge Valve	FP -	Fire Pump		
MD -	MADV – Manual / Automtic Drain Valve				
WPL -	Wet Pilot Line				

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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