

IOM FDV-PH1

Hydraulic Actuation with Remote Reset and pressure reducing Deluge Valve

Installation Operation & Maintenance manual
Fire Protection

RAPHAEL VALVES INDUSTRIES

FDV-PH1 – Hydraulic Actuation, Remote Reset Pressure reducing Deluge Valve

Description

The FDV is a fire protection control valve for deluge fire sprinkler systems, designed for installation in hazardous environments. It is suitable for vertical or horizontal installation and features a globe-pattern, line-pressure-operated design with a direct elastomeric diaphragm seal. The valve contains no balancing spring or internal metallic components in the wetted space. Its hydrodynamic flow path ensures high flow rates with minimal head loss.

The FDV-PH1 is a hydraulically actuated, remotely reset, pressure-control deluge system. Its functional principle is as follows:

In a fire situation, a hydraulic detection system (a wet pilot line with automatic sprinklers) triggers a hydraulic actuator. The actuator then

releases the pressurized water trapped in the FDV's control chamber, causing the valve to open.

The system includes an emergency manual override valve, which bypasses the fire detection system and enables manual activation when needed.

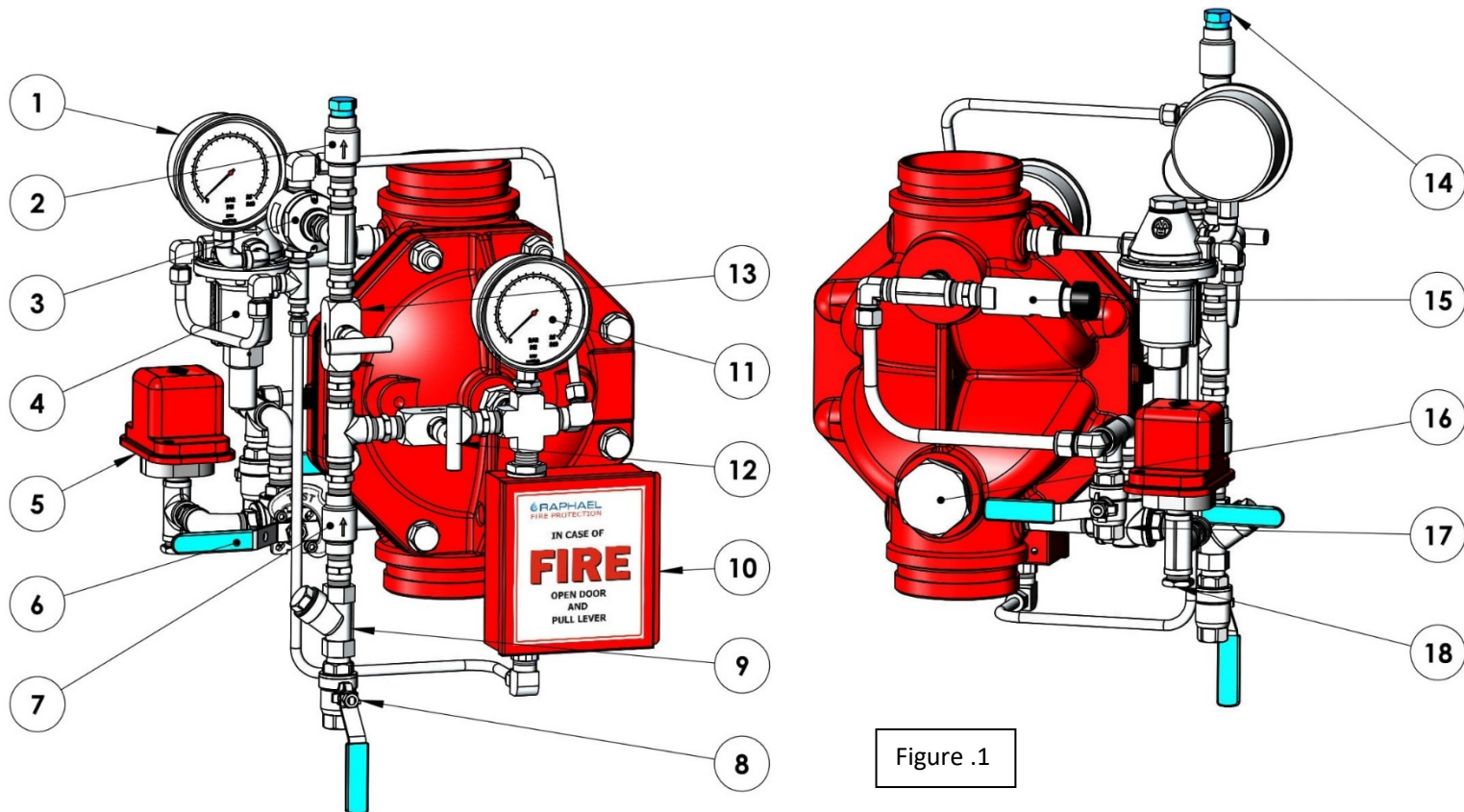
This system reduces upstream pressure to a set downstream value and maintains it at a steady level. It responds to downstream pressure fluctuations caused by changes in flow demand, ensuring stable output pressure.



Parts List

FDV-PH1 – Hydraulic actuated with Remote Reset Deluge Valve

- | | |
|---|---|
| 1. – Downstream pressure gauge | 11.– Control Chamber Pressure gauge |
| 2. – Pilot line compensation check valve | 12. – Upstream needle valve |
| 3. – HAV-2 hydraulic actuator | 13.– Pilot line Compensation needle valve |
| 4. – PRPV Pressure reducing pilot | 14.– Wet pilot's conn. Port (1/2" NPT female temporary plugged) |
| 5. – Pressure switch (optional) | 15.– MADV (MB) drain valve |
| 6. – Alarm test valve (3 way) | 16.– Upstream drain (Plugged) |
| 7. – Supply Check valve | 17.– Downstream drain valve |
| 8. – Trim Pressure Supply Valve | 18.– Water motor alarm conn. (1/2" NPT female). |
| 9. – "Y" Strainer | |
| 10.– MEU Manuel emergency unit Needle valve | |



Operation (Reference Figure 1)

SET position:

Water is supplied by the trim supply valve (8), through the “Y” strainer (9), the Upstream check valve (7), flows through the needle valve (12) and fills the FDV’s control chamber. In addition, water flows through the compensation needle valve (13), compensation check valve (2) and pressurizes the pilot line. Pressurized water in the valve’s control chamber gets trapped by the check-valve (7), by the HAV-2 actuator (3) and by the closed emergency valve MEU (10), maintaining the deluge valve in closed position. The pressurized water in the Wet pilot line holds the HAV-2 (3) in its close state.

FIRE situation:

When one or more of the automatic sprinklers located along the Wet pilot line gets subjected to flames heat and blows-open, it depressurizes. consequently, the HAV-2 will open and drain the FDV deluge valve’s control chamber through the pressure reducing pilot valve - PRPV. The opened FDV valve admits water into the sprinklers pipeline/s. The PRPV pilot senses the downstream pressure and regulates the FDV’s valve opening, maintaining a steady downstream preset pressure. Opening the MEU door and pulling down the ball valve’s handle, bypasses all terms, drains the FDV control chamber and opens the valve immediately.

RESET position

The reset procedure requires the replacement of all Wet pilot line’s blown-open automatic sprinklers. Then, the Wet pilot line needs to become pressurized. When done, the HAV-2 moves to its close state, blocks the control deluge valve chamber drainage while the upstream constantly fills it through the trim’s needle valve (12). Consequently, the FDV valve close and by that, the system moved into the SET position.

The sprinklers pipeline should be drained by opening the FDV downstream drain ball valve (17) or by pressing down the MADV-MB push bottom (15).

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 base, 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-PH1.
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 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 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
(**TS**) – Trim pressure supply connection - ½" NPT female.
(**GC**) – Alarm gong to alarm test valve - ½" NPT female.
(**WPL**) – wet pilot line connection – ½" NPT female (plugged).
(**PS**) Pressure switch (optional) connection - ½" NPT female (plugged).
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.

FDV-PH1 – Hydraulic Actuated with Remote Reset Pressure Reducing Deluge Valve

Installation parts list. (reference - figure 2)

- **TS** – Trim Supply
- **ST** – Strainer
- **AT** – Alarm Test valve
- **GC** – Gong Connection
- **DDR** – Downstream Drain Valve
- **PS** – Pressure Switch
- **PR** – PRPV – Pressure Reducing Pilot Valve
- **DPG** – Downstream Pressure Gauge
- **HAV2** – Hydraulic actuator 2 way
- **WPL** – Wet Pilot Line
- **DBV** – Downstream Butterfly Valve
- **CV** – Check Valve
- **NV1** – WPL compensation Needle Valve
- **CPG** – Control chamber Pressure Gauge
- **NV1** – WPL compensation Needle Valve
- **DL** – Deluge valve
- **EU** – Emergence Valve
- **UBV** – Upstream Butterfly Valve

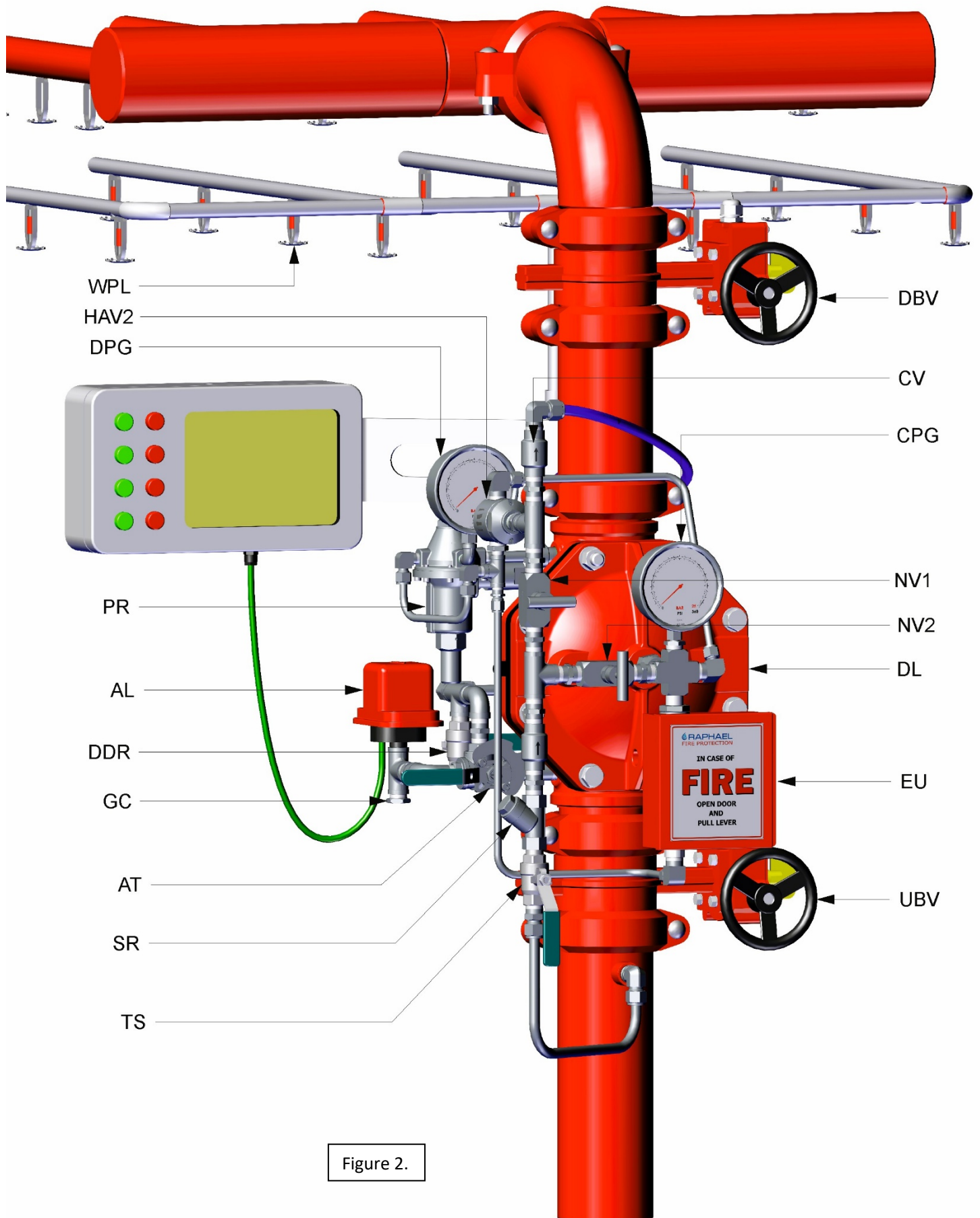


Figure 2.

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 with both butterfly valves (**UBV & DBV**) are open, and the trim supply valve (**TS**) closed.
2. Close both upstream and downstream butterfly valves (**UBV & DBV**) and make sure the trim pressure supply ball valve (**TS**) remains closed.
3. Make sure that Emergency valve at the EMU (**EU**) is fully closed.
4. Open the FDV's downstream drain valve (**DDV**) and make sure the upstream drain valve if equipped is closed or port is plugged.
5. Open the inspector's valve located at the very end of the wet pilot's pipeline (**WPL**).
6. Open the trim pressure supply valve (**TS**). Let water flow out of the inspector's valve until a clear flow, free of air bubbles is observed. Close the inspector's valve and make sure that the pilot line gets pressurized at upstream pressure.
7. Fully open the compensation line needle valve (**NV2**). Do not change upstream needle valve (**NV1**) setting as it needs to stay factory set.
8. Open gradually the upstream butterfly valve and make sure that after a short time, the deluge valve closes, and the downstream drain valve (**DDV**) is not dripping. If a dripping occurs, it might indicate a FDV valve sealing issue.
9. leave the downstream drain valve open and the downstream butterfly (**DBV**) close

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

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 Remote safety personnel and the close central fire station must be reported.

1. Screw a typical blown-open sprinkler into the open end of the inspector's valve. at the wet pilot pipeline's end. Open the inspector's valve. Trapped pressure will escape and the HAV-2 actuator will open and drain the FDV deluge control chamber causing it to open.

*NOTE: is the HAV-2 does not trips, and the deluge valve does not open, the pilot's line compensation flow needs to be reduced by gradually closing needle valve (**NV2**). When the HAV-2 trips open and the deluge valve opens, secure the needle valve position by tightening its stem nut and/or removing its handle.*

2. When the deluge valve is open and water flow out of downstream drain valve (**DDV**), Observe the pressure gauge installed on the PRPV pilot valve (**PR**). Downstream set pressure correction if needed, is performed by this method:

NOTE: Release the small M4 socket screw located at the adjusting screw cover about two turns and remove the cover.

- to increase the pressure – turn the pilot's adjusting screw clockwise
- to decrease the pressure – turn the pilot's adjusting screw anti-clockwise

after adjustment completion, re-install the cover and tighten the M4 screw, to lock the cover.

3. Assure the functionality of the PRPV pilot valve and the downstream pressure steadiness: While the FDV valve is open, turn the

downstream drain valve handle and open the valve. Wait until the pressure reaches to SET. Then, gradually close this ball valve. Observe the downstream gauge reading – it should reach again to SET pressure

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

Commissioning the system - phase 3.

Resetting & placing in service (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 (**UBV**)
2. Close the trim pressure supply (**TS**).
3. Close the inspector's valve (at the end of wet pilot line (**WPL**)). Unscrew the blown open sprinkler out of the inspector's valve.
4. Disassemble the "Y" strainer (**ST**) and clean its screen. Re-assemble the strainer.
5. Open the trim pressure supply valve (**TS**). And make sure both pressure gauges **CPG** & **DPG** show the same reading.
6. The Upstream Butterfly valve (**UBV**) first, and the downstream butterfly valve (**UBV**) should be opened gradually. There should be no flow and no dripping through the downstream drain valve (**DDV**). If ok, close this valve.

Resetting after a Real Fire Situation:

1. Close the Upstream Butterfly valve (**UBV**)
2. Close the trim pressure supply (**TS**).
3. All the Wet pilot line's blown-open sprinklers should be replaced (**WPL**).

4. Disassemble the “Y” strainer (**ST**) and clean its screen. Re-assemble the strainer.
5. Open the trim pressure supply valve (**TS**). And make sure both pressure gauges **CPG & DPG** show the same reading.
6. The Upstream Butterfly valve (**UBV**) and the downstream butterfly valve (**DBV**) should be opened gradually. There should be no flow and no dripping through the downstream drain valve (**DDV**). If ok, close this valve.

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 Remote safety personal and the close central fire station must be notified.

The Maintenance and inspection procedures are based on the relevant chapters at the 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 and downstream butterfly valves (**UBV & DBV**) and the Trim pressure supply valve (**TS**) are in fully open.

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

3. Observe the FDV control chamber pressure gauge (**CPG**) and make sure that its that the required supply water pressure is applied to the deluge Valve inlet and trim.
4. Push the MADV 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 (**AT**) to TEST. The acoustic alarm should sound, and the alarm pressure switch (**GC**) if equipped, 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 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 both butterfly valves (**UBV & DBV**) and the trim pressure supply valve (**TS**).

2. Open the downstream drain valve (**DDV**) and the upstream drain valve if equipped. Drain the FDV's control chamber using the EMU Emergency valve (**EU**).
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 on)
7. Observer the internals of the valve and cover for excessive scale residuals, foreign particles, damaged coating (rust, cracks, or peeling).
8. Worn or damaged parts should be replaced. Consult Raphael's Remote 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

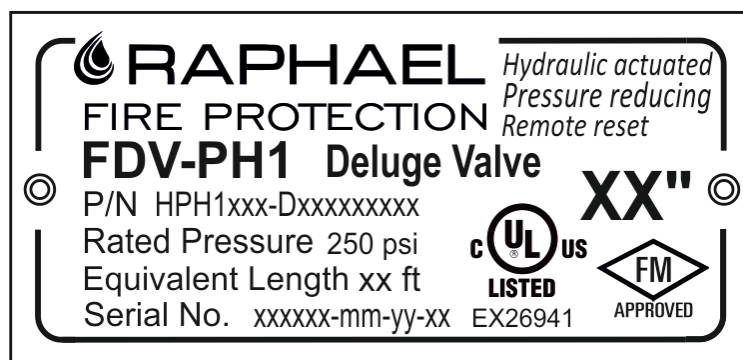
Equivalent pipe length for FDV deluge valves

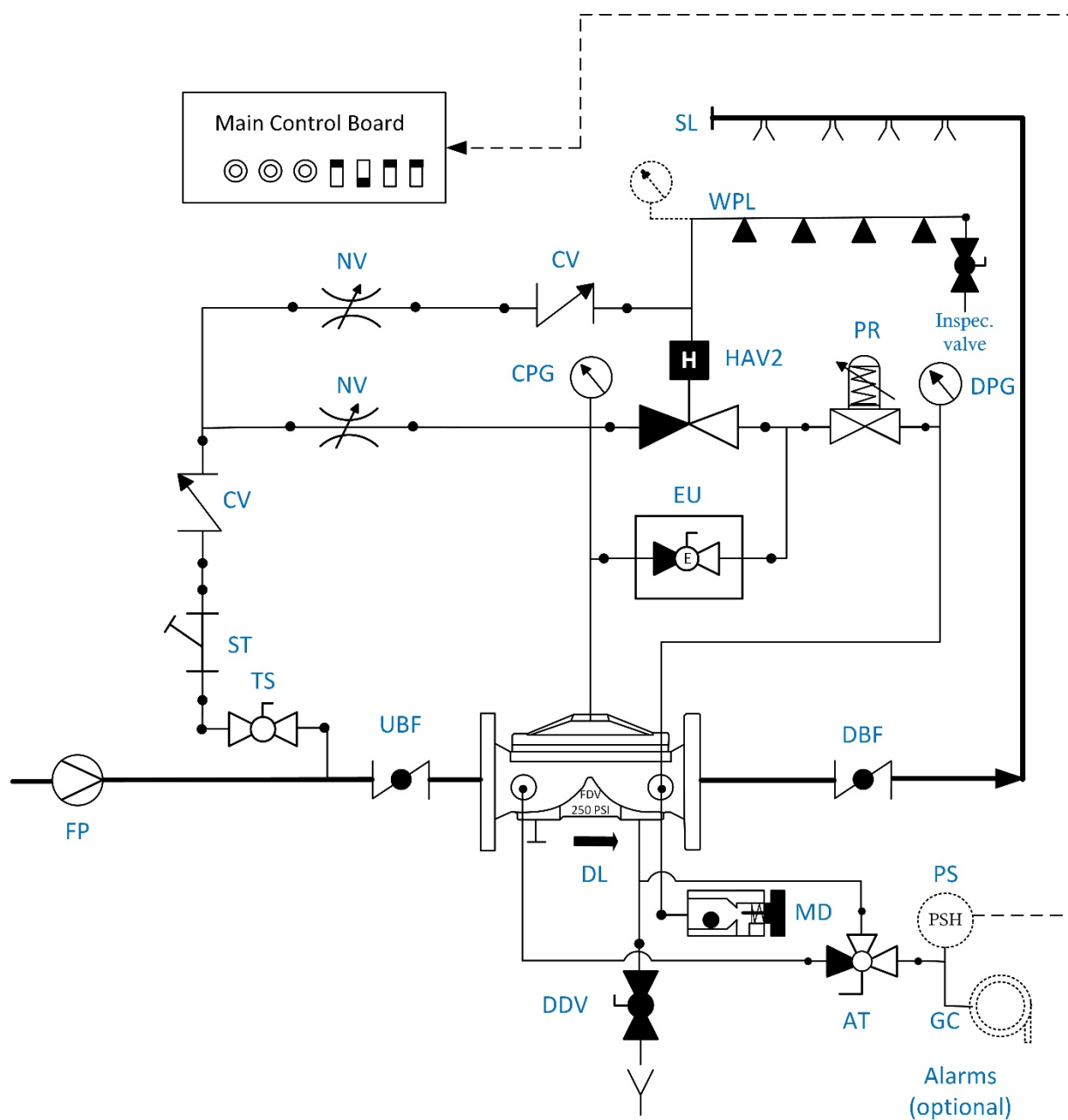
Valve size	Equivalent length value ft (m)
1.5"	11 (3.6)
2"	24 (7.3)
2.5"	25 (7.6)
3"	28 (8.5)
4"	31 (9.4)
6"	46 (14)
8"	72 (21.9)
10"	117 (35.6)

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.

- *Company name and trademark.*
- *Short description (Italic letters)*
- *Application's type:* FDV-PH1 – Hydraulic 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 Application's diameter in inch:* XX"





TS - Trim supply

ST - Strainer

AT - Alarm Test valve

GC - Gong connection

CV - Check Valve

DPG - Downstream pressure gauge

CPG - Control Chamber pressure gauge

PR - Pressure Reducing Pilot Valve

MD - MADV – Manual / Automatic Drain Valve

FP - Fire Pump

UBF - Upstream Butterfly Valve

DBV - Downstream Butterfly Valve

DL - Deluge Valve

WPL - Wet Pilot Line

EU - Manual Emergency Valve

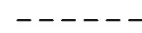
SL - Sprinkles Line

DDV - Downstream Drain Valve

PS - Pressure Switch (optional)

HAV2 - Hydraulic actuator valve 2-way

 Water lines

 Electrical 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.



Waterworks



Fire Protection



Irrigation



Smart Solutions



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