IOM FDV-R-PN2 & FDV-Ra-PN2

Hydraulically Operated Pressure Reducing Valve

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

Fire Protection

RAPHAEL VALVES INDUSTRIES

FDV-R-PN2 & FDV-Ra-PN2 Hydraulically operated Pressure Reducing Valve

Description

This pressure-reduction system is based on Raphael FDV-R or FDV-Ra angled valves equipped with a pilot for precise pressure-reducing applications under fluctuating flow conditions. The FDV-R and FDV-Ra valves can be supplied in various optional materials and coatings to meet the required operating conditions, but the functional principle of the system remains unchanged:

Under flow conditions, the pressure-reducing pilot senses the downstream pressure and maintains it at a steady level through real-time adjustment.

The system is equipped with a self-cleaning strainer, can be installed in any required orientation, and is suitable for all-purpose fire-protection water-supply pipelines.

Operation (Reference drawing – figure 1)

The PRPV Pressure Reducing Pilot Valve (**5**) is adjusted to a predetermined outlet pressure. During water flow through the FDV-R or FDV-Ra valve (**6**), the pilot valve senses downstream pressure changes and regulates the drain flow from the FDV-R control chamber. Since the control chamber receives a constant upstream flow through the needle valve (**2**), the chamber pressure varies according to the ratio between the incoming flow and the drain flow through the pilot valve.

When the downstream pressure rises above the set pressure, water fills the PRPV internal cavity and applies force to the pilot diaphragm. The seal assembly moves upward and partially restricts the passage of water through the pilot seal seat.

Consequently, the control-chamber drain flow is reduced, causing the pressure applied to the valve diaphragm to increase. This reduces the valve flow and gradually lowers the downstream pressure.

When the force applied by the downstream pressure balances the counterforce of the pilot spring, the PRPV modulates the valve flow rate according to the change in water pressure and maintains the downstream pressure at the set value.

FDV-R-PN2 & FDV-Ra-PN2

hydraulically operated Pressure Reducing Valves

Parts list

1. Upstream gauge.
2. Needle valve.
3. Sense tube (downstream)
4. Downstream gauge.
5. PRPV - Pressure reducing pilot valve.
6. FDV-Ra (right) or FDV-R (left) valve
7. Internal self-cleaning filter

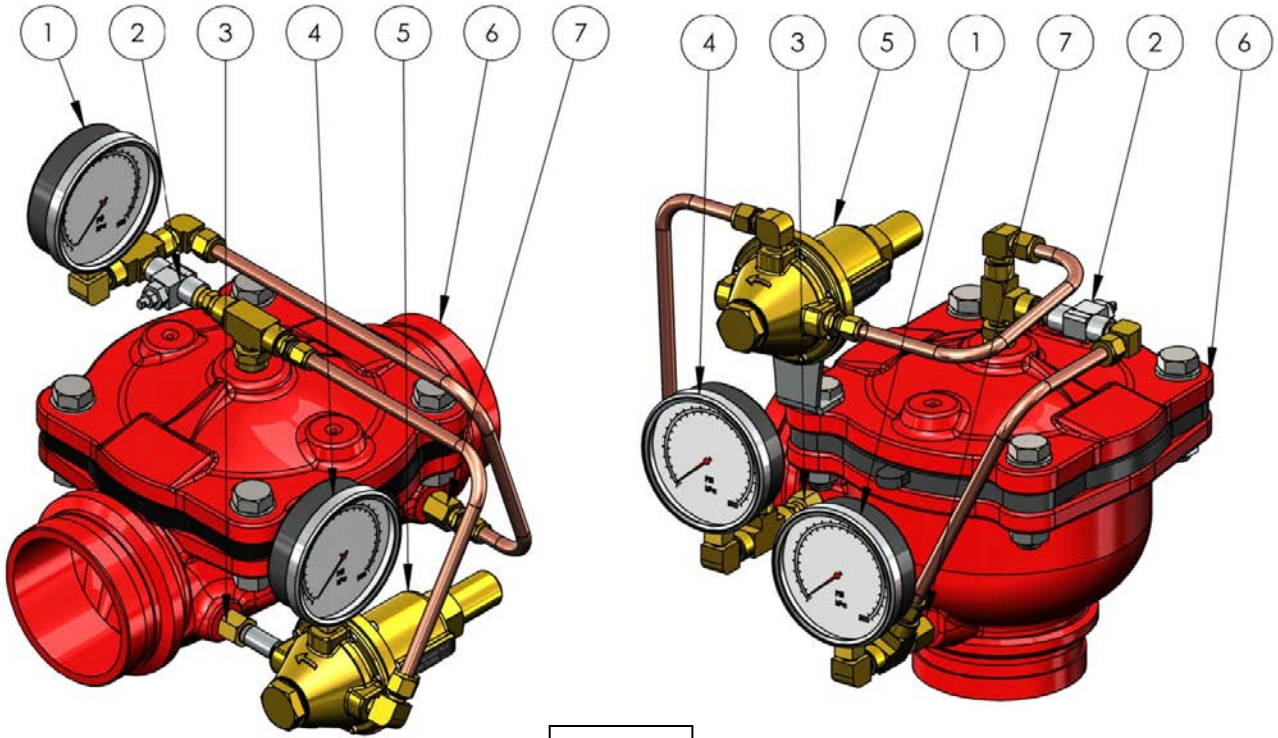


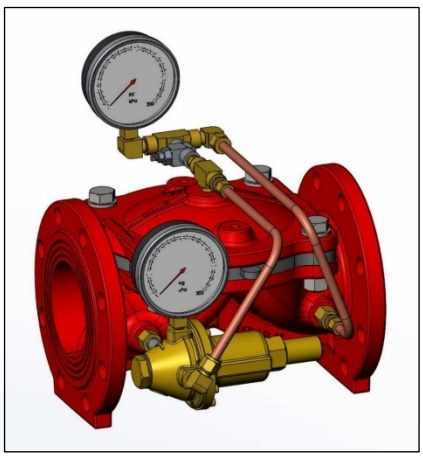
Figure 1

Installation

1. This system is supplied pre-assembled and factory-preset to the outlet pressure requested by the customer. Any change made to the trim-component settings, configuration, or to the length of pipes and tubes will affect system operation and is therefore prohibited.
2. The system must not be installed in a location where it may be exposed to freezing temperatures.
3. Sufficient space must be kept around the system to allow assembly, disassembly, and maintenance work.
4. In principle, the valve is supplied according to the customer's request. When ordered for horizontal installation, the valve part number will begin with the letter H. Note that the globe-type valve (figure 1, page 3, left side) can be mounted horizontally or vertically after adjusting the orientation of the pressure gauges. This change does not require any additional accessories, and the procedure is described on pages 4–6.
5. The upstream and downstream pipes connected to either valve type must be firmly supported to prevent pipeline weight from being applied to the valve body.
6. During the leakage test, it must be taken into account that the maximum allowable pressure for this valve must not exceed 250 psi.

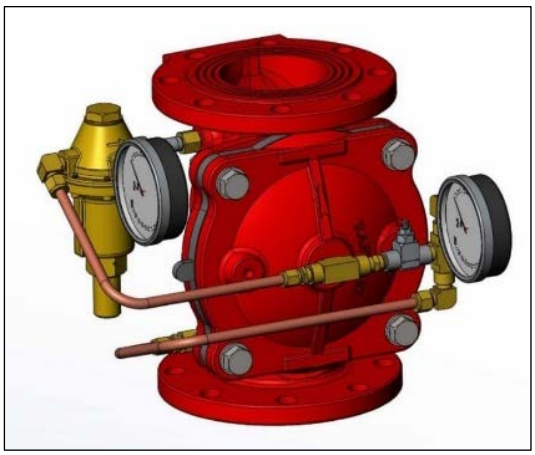
Procedure for Converting a pressure reducing valve from a horizontal to a vertical installation

Typical pressure reducing valve for horizontal installation.
The top pressure gauge is the upstream pressure gauge, and the lower one is the downstream pressure gauge.



Step 1

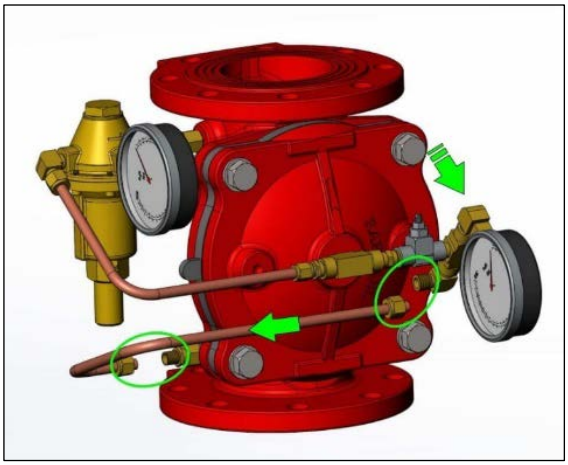
Turn valve to its vertical position, resting on its lower end



Step 2

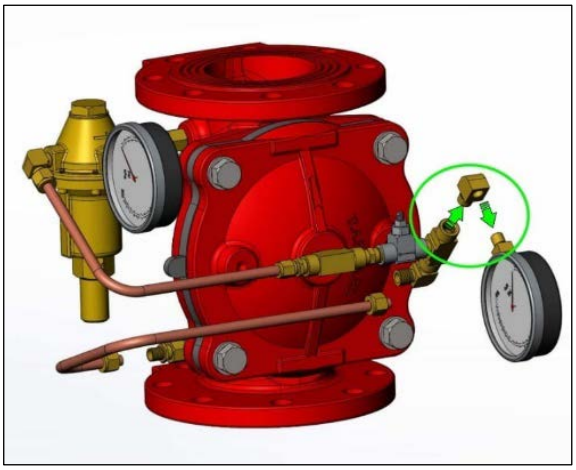
Unscrew both tube compression fitting nuts and remove the lower tube.

When done, turn the Tee fitting connected to the needle valve, counterclockwise until the free compression fitting is close to the valve cover. This will enable the male-female ¼" elbow removal.



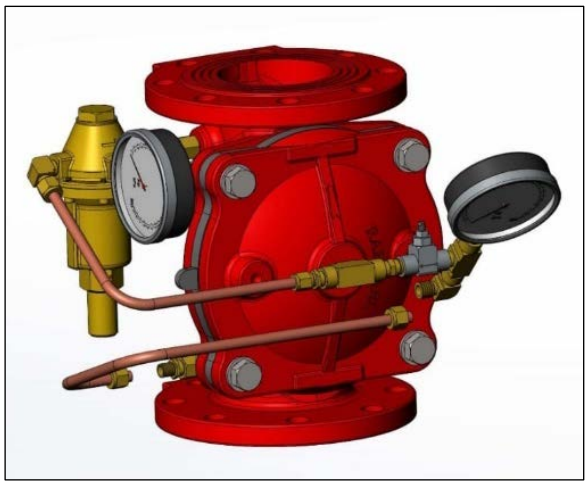
Step 3

Unscrew the upstream pressure gauge. Remove the male-female ¼" elbow and keep both parts for the next steps



Step 4

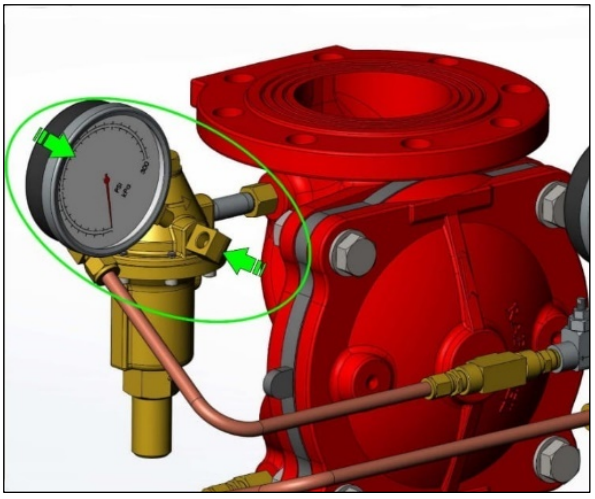
Re-install the Upstream pressure gauge



Step 5

Install the male-female ¼" elbow in the pilots open port.

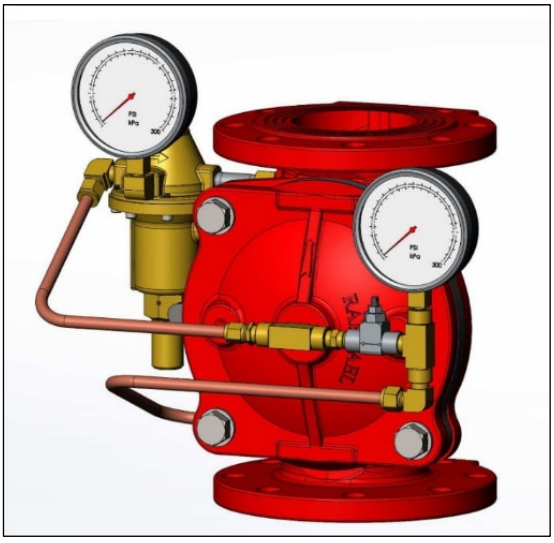
Position the elbow temporarily at the angle shown to enable the downstream pressure gauge installation.



Step 6

Turn the elbow together with the pressure gauge installed, to its final full vertical position.

End of process.



Commissioning the system

Filling the System:

Flush the supply pipeline thoroughly before installing the reducing valve.
It is recommended to fill an empty pipeline gradually by partially opening the main supply butterfly or gate valve. This should be done whenever there is a risk of destructive water hammer.
After running a sufficient amount of water through the valve, close the main supply valve and disconnect the upstream tube by loosening the fitting nuts. Dismantle the strainer and clean it thoroughly. Then reinstall it: dry the strainer threads, apply sealant paste to the accessory threads, and install it back into its bore. Reinstall the tube and open the main supply valve.

Note: *in case that a separation valve is installed at the downstream of the pressure reducing valve and this valve was manually closed while the system is during operation, the PRV valve will become fully close and the space between its downstream and the separation valve will remain pressurized at the full upstream pressure. Therefore, it is advised to install a pressure relief valve adjusted higher than the downstream reduced pressure, and lower than the trapped upstream pressure.*

Adjusting the downstream pressure:

For set pressure adjustment, follow those instructions:

1. Take off the adjusting screw cover by loosen its 4M hexagon socket screw and un-screwing this cover off.
2. Release the adjustment screw-locking M10 nut.
3. Set pressure adjustment -
   - To increase the downstream pressure: Turn the adjusting screw clockwise
   - To decrease the downstream pressure: Turn the adjusting screw counterclockwise.
4. When reached to the desired pressure, tighten the locknut at the adjusting screw. Re-install the cover and tighten the 4M cover's locking screw.

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 personal and the close central fire station must be notified.

Quarterly inspection

1. Verify that the FDV-R valve and its trim piping & accessories is free from physical damage. Observe for leakage or dropping.

Annual maintenance procedure

1. Conduct the quarterly inspection.
2. Make sure that the required supply water pressure is applied to the valve's inlet
3. Open the pipelines drain valve, let the downstream pressure to stabilize and compare it to the known set pressure. If needed, re-adjust pressure according to the process described at the chapter **Adjusting the downstream pressure**

Every 5 years inspection procedure

This major inspection procedure includes the removal of the trim, the dismantling of the FDV-R's valve cover and a performance of a comprehensive internal part examination. Then, the relevant trim accessories should be replaced or maintained, After the completion, the Annual maintenance procedure is to be conducted.

1. Close the OS&Y/ Butterfly valve/Main supply valve. Drain water and make sure that there is no pressure at the pipeline.
2. Release all relevant tubes fitting nuts.
1. Remove the disassembled trim.
2. Remove all the FDV-R's cover bolts.

3. Observer the internals of the valve and cover for excessive scale residuals, foreign particles, damaged coating (rust, cracks, or pealing). Worn or cavitation damaged parts should be replaced. Consult Raphael's local representative or the service department for any maintenance or part replacement issue.
4. Replace the Diaphragm with the one supplied with the system's maintenance kit. The identification tongue should point to the valve's stamped flow direction arrow side.
5. Reinstall the valve's cover: use the Anti-seize paste tube supplied at the maintenance kit for bolts and nuts lubrication. Tighten bolts in accordance with "Bolt's torque moments table".
6. Replace the diaphragm in the PRPV.
7. Reinstall the trim carefully: avoid causing twists or dents on bent tubes and do not overtight the compression fittings nuts. When the system is fully reassembled, perform the "**Commissioning the system and** procedure and perform the "***Annual maintenance procedure***".

Cover bolt's Torque Moments Table

Valve size	Torque lb/ft
2"	22
2.5"-3"	36
4"	36
6"	58
8"	65
10"-12"	87
14"-16"	108

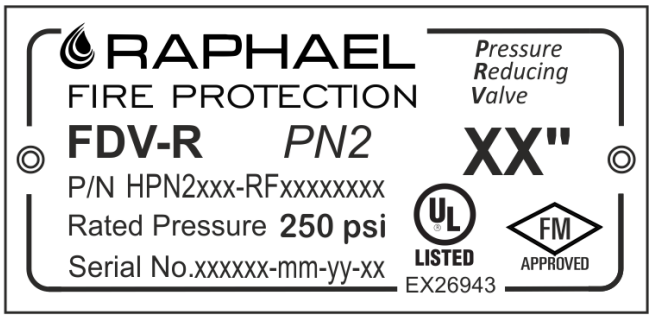
Technical data

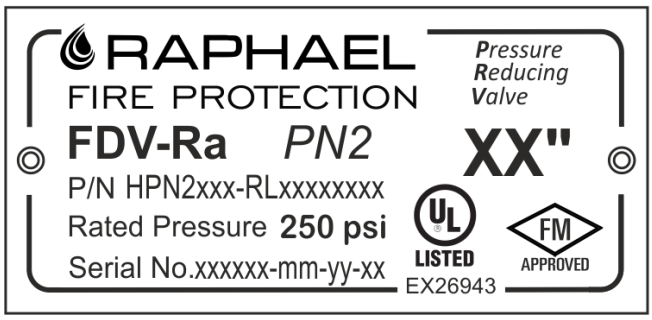
- Maximum inlet pressure – 250 psi
- Outlet set pressure range at 1½", 2", 2½", 3", 8", 10", 12" valves diameter is between 50 to 200 psi
- Outlet set pressure range at 4", 6" is between 35 to 200 psi

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-R-PN2 – Hydraulically Operated Pressure Reducing.
- *Rated pressure*: 250 psi
- *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”



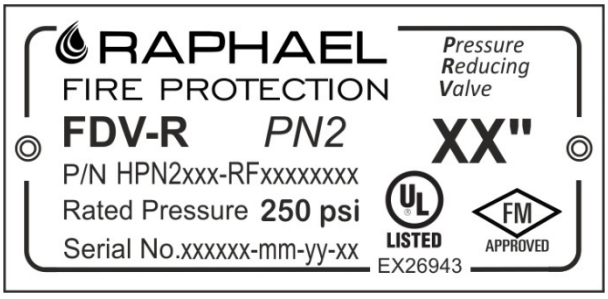


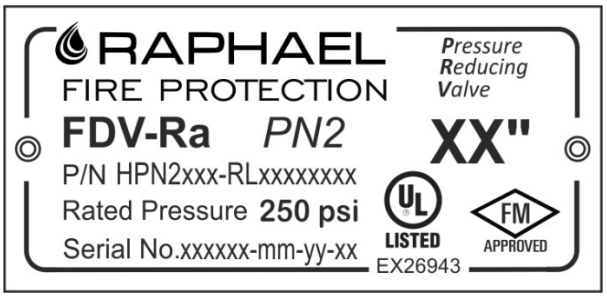
Marking

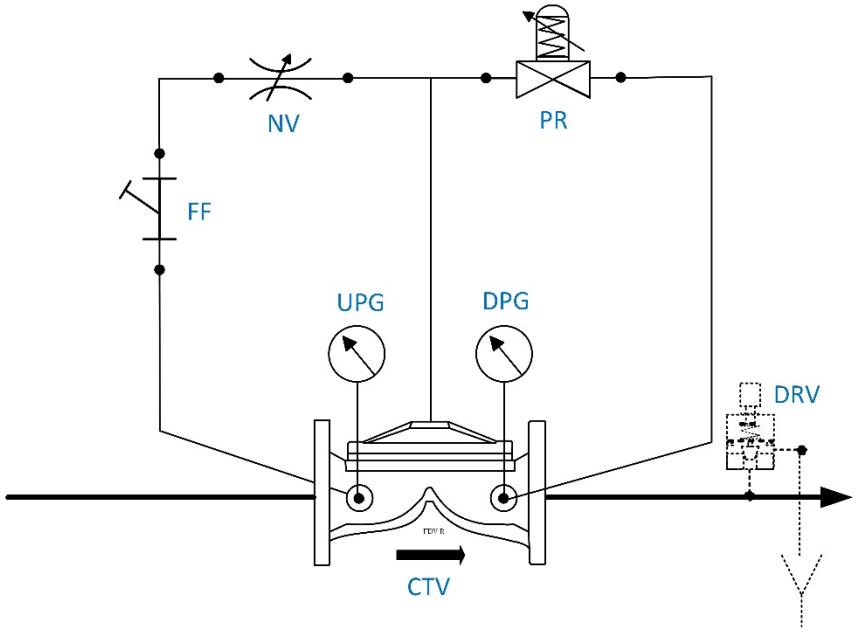
The FDV-R and FDV-Ra valves are marked by a laser engraved, black anodized, 63 x 30 mm 0.8mm (0.031”) thick aluminium metal plate, riveted to the valve’s cover.

The marking plate contains the data about:

- *Company name and trademark.*
- *Application’s type* – Pressure reducing valve FDV-R-PN2, FDV-Ra-PN2
- *The Application’s part number* (P/N) - Trim type–valve properties
- *Rated pressure* - 250 psi.
- *Serial Number* – work order-MM-YY-xx (number in batch 01-99)
- *The UL listing mark & QR code.* – xxxxxx
- *The FM approved mark*
- *The Application’s* diameter in inch - xx”







Water lines
Optional

CTV - Control Valve
FF - Finger Filter
PR PRPV – Pressure Reducing Pilot Valve
UPG - Upstream Pressure Gauge
DPG - Downstream Pressure Gauge
NV - Needle Valve

Optional

DRV - Direct Pressure Reliefe

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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