

Deluge Valve

INBAL VALVES

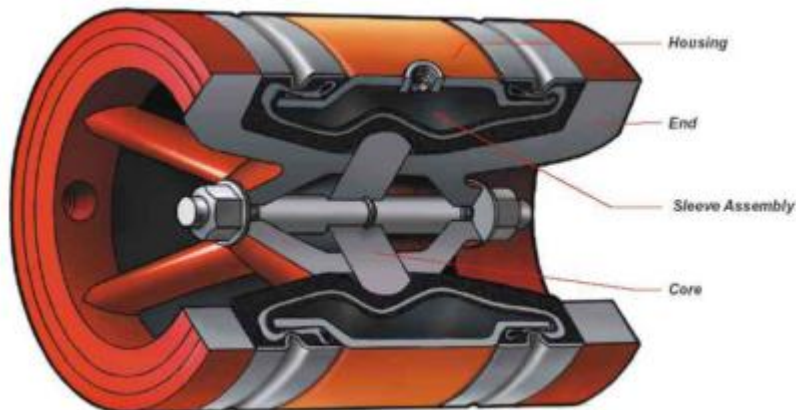
Since 1990 FPE has used Inbal to protect oil and gas installations around the world with a total quantity exceeding several thousand.

The Inbal valve has a 3- layer rubber sleeve, proprietary to Inbal, incorporating a Kevlar / Nylon reinforcement material. The valve is more resistant to severe surge pressures than any other manufacturers in the market, including other rubber sleeve valves. Pressures up to and exceeding 50 barg has routinely been passed without defect.

Inbal constantly develops their valve and random sample valves out of each production series are tested extensively for wear and mechanical failure.

The sample valves are run through 10,000 opening and closing cycles, completed without leakage or malfunction. In extreme cases sample valves have performed more than 180,000 cycles without fail.

The Inbal valve has no moving mechanical parts and maintenance is therefore kept at a minimum.



Deluge Valve

VALVE OPERATION

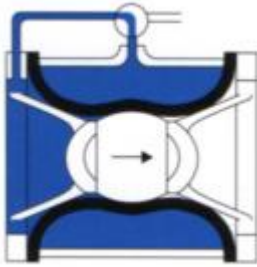


Figure 1: Closed

The upstream water pressure is directed into the control chamber (formed between the rubber sleeve and the valve housing) via the pilot valve. The cross section area of the external surface is larger than the exposed internal surface and the rubber sleeve is thereby squeezed tightly around the valve disc closing the valve.



Figure 2: Open

Blocking the upstream water supply and relieving the water in the control chamber opens the valve.

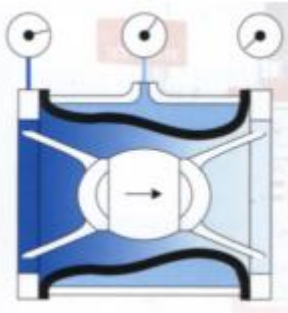


Figure 3: Pressure Control

Pressure control is achieved by relieving the water in the control chamber partially, thereby keeping the valve in a semi-open position. This is done through a Pressure Control Pilot Valve that senses the downstream pressure and adjusts the water pressure in the control chamber accordingly.

Deluge Valve

ACTIVATION AND PRESSURE CONTROL

Pneumatic

The on/off pilot valve is operated by instrument air provided by the platform instrument air system. Instrument air is typically delivered to an air reservoir located on skid that acts as a backup in case of instrument air system failure.

Pneumatically controlled valves utilize a combination pilot valve, PA4 (valves ≤ 6 ") or PB4 (valves ≥ 8 "). The valve is pressure operated, diaphragm actuated, and spring-loaded combining on/off operation via a manual release, solenoid valve remotely controlled by the Fire & Gas System, and/or fusible loop system and adjustable downstream pressure control (if option is required). A fusible loop system utilizes the instrument air to pressurize a grid complete with fusible plugs that open at pre-set temperatures. This in turn provides the third option in the on/off control of the valve.

Applying pressure to the actuator port closes the valve by forcing water to flow into the deluge valve control chamber and removing pressure reverses the flow thus opening the valve.

Pressure Control

The pilot valve can be trimmed to control the downstream firewater supply pressure. Connecting the sensing line of the pilot valve to the downstream piping allows the pilot valve to be adjusted to the desired downstream pressure thus controlling the pressure / flow by modulating the control chamber water pressure. The set-pressure is adjustable by means of an adjustment screw located on top of the pilot valve.

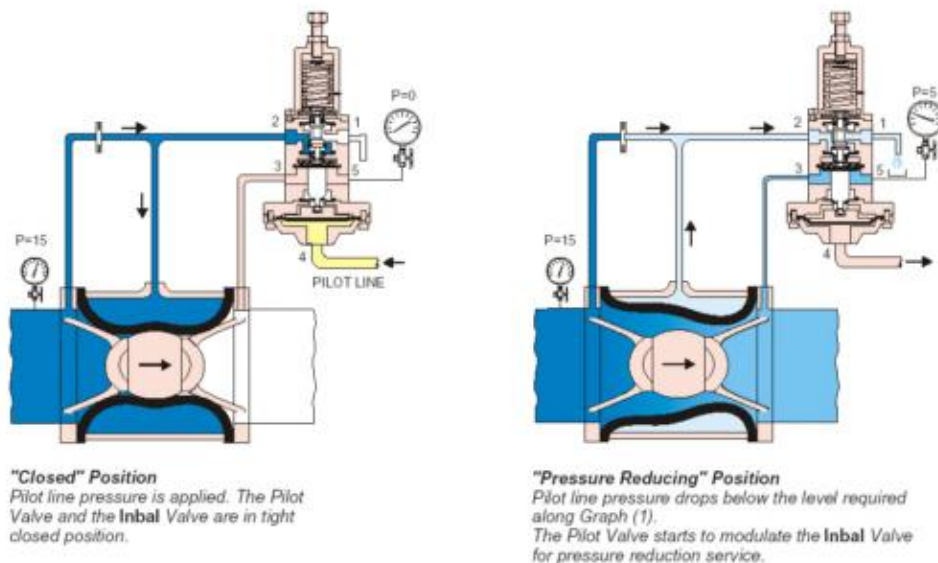


Figure 4: Pneumatic Pilot Valve Operation

Deluge Valve



Model PA4

Figure 5: PA4 Pilot Valve

Limitations

Based on our experience the skid inlet pressure varies between 10-18 barg while the required outlet pressure will be between 3-7 barg. The Inbal valve noting skid piping, misc. valves, and elevation etc. does not solely perform the required pressure reduction and one can expect a 1-2 barg pressure drop for the misc. designs.

The pressure regulating capacity of the Inbal valve is limited to the velocity through the valve and the respective skid inlet pressure. Excessive pressure reduction can lead to cavitation so care should be taken in evaluating the velocity. When reviewing the velocity also consider future system expansion possibilities in the evaluation. FPE recommends a deluge valve velocity not to exceed 5 m/s. The following table is provided for a quick reference guide.

Deluge Valve

Table 1: Max Flow and Velocity

Size in	Flow			Velocity
	m ³ /hr	l/min	gpm	m/s
12	1200	20040	5280	4.6
10	850	14195	3740	4.6
8	550	9185	2420	4.7
6	320	5344	1408	4.8
4	140	2338	616	4.7
3	75	1253	330	4.9

Notes
1. Pipe >3" Sch 40, otherwise Sch 80.

Dependent upon the system, the designer should consider increasing the valve size thus increasing pressure-regulating capability. Reference the Inbal graph below for clarification on velocity versus pressure reduction.

Deluge Valve

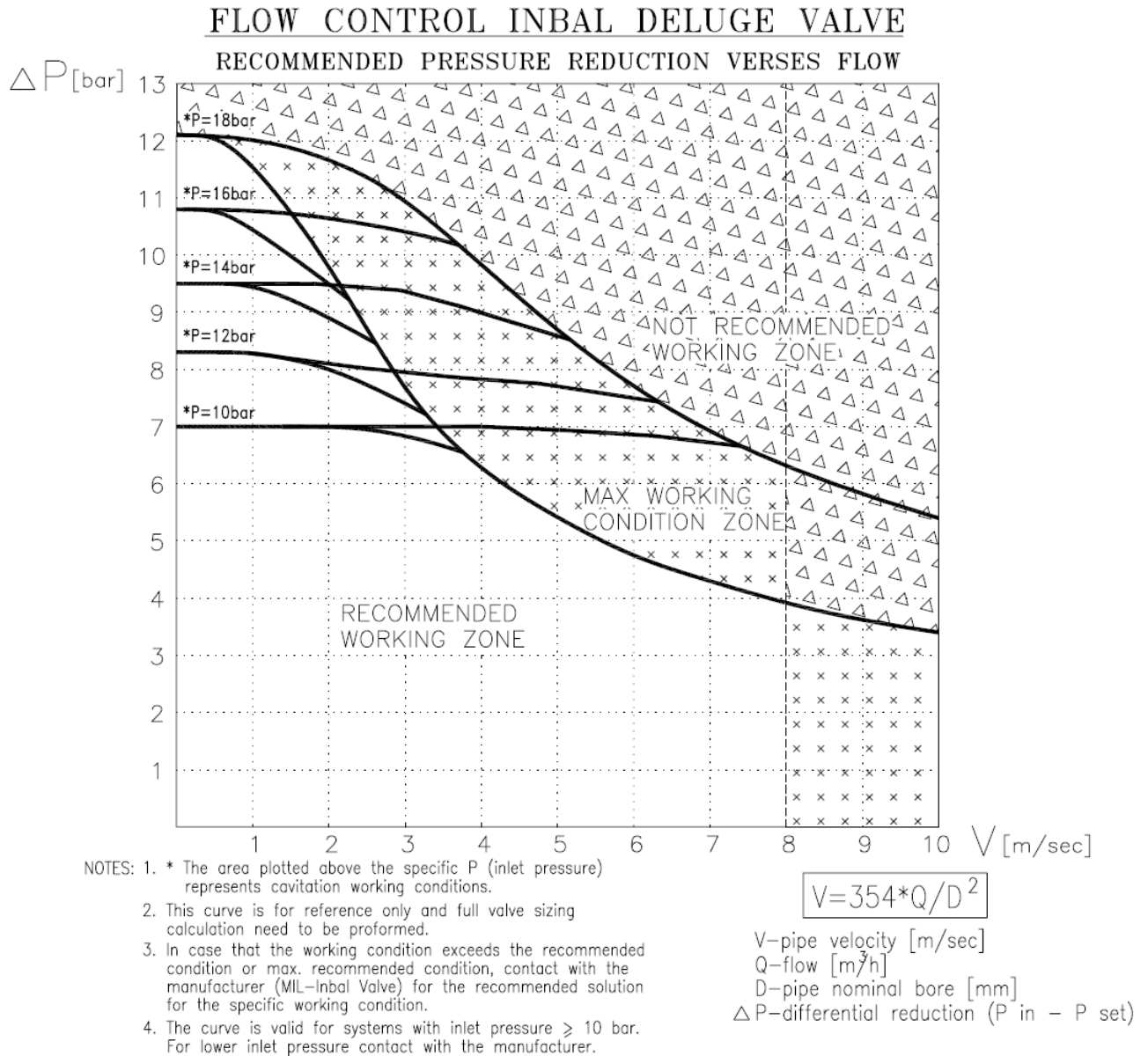


Figure 6: Inbal Valve Pressure Regulating Capability

Locate the maximum recommended FPE velocity of 5 m/s and note the location of the corresponding point 6 barg is in the maximum working zone.

Should the pressure reduction requirement exceed the limits in the graph above consider increasing the valve size or incorporating restriction orifices on the skid / system outlets.

Deluge Valve

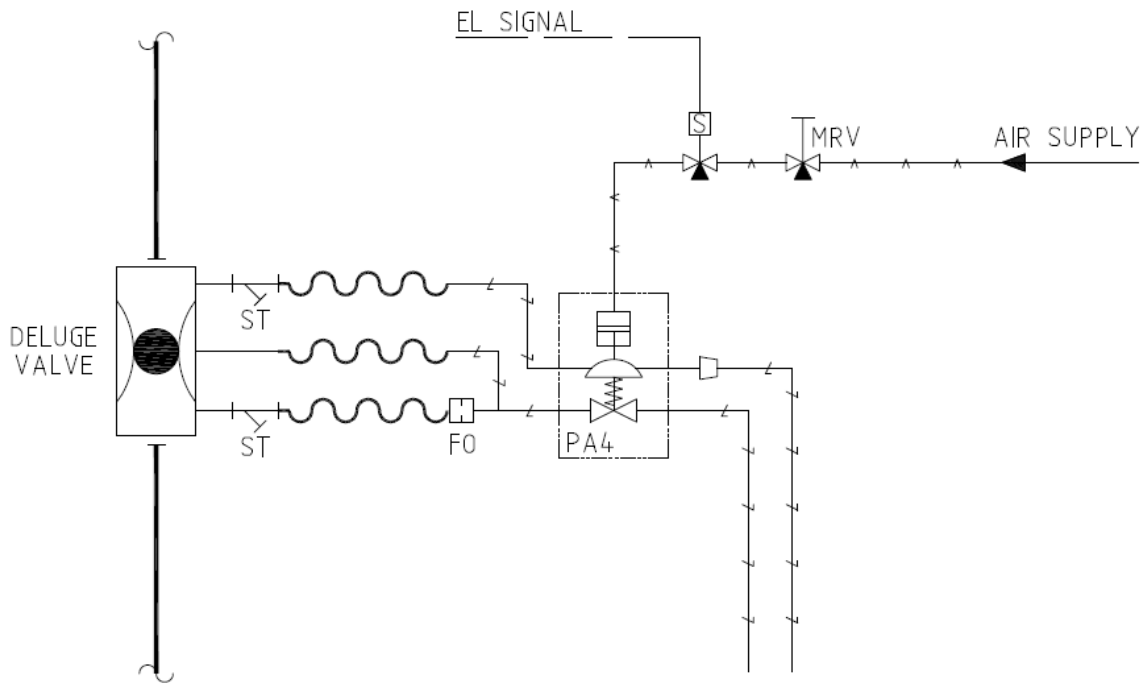


Figure 7: Pneumatic P&ID No. 1

Note the two release options with a local manual release and remotely activated solenoid valve.

Deluge Valve

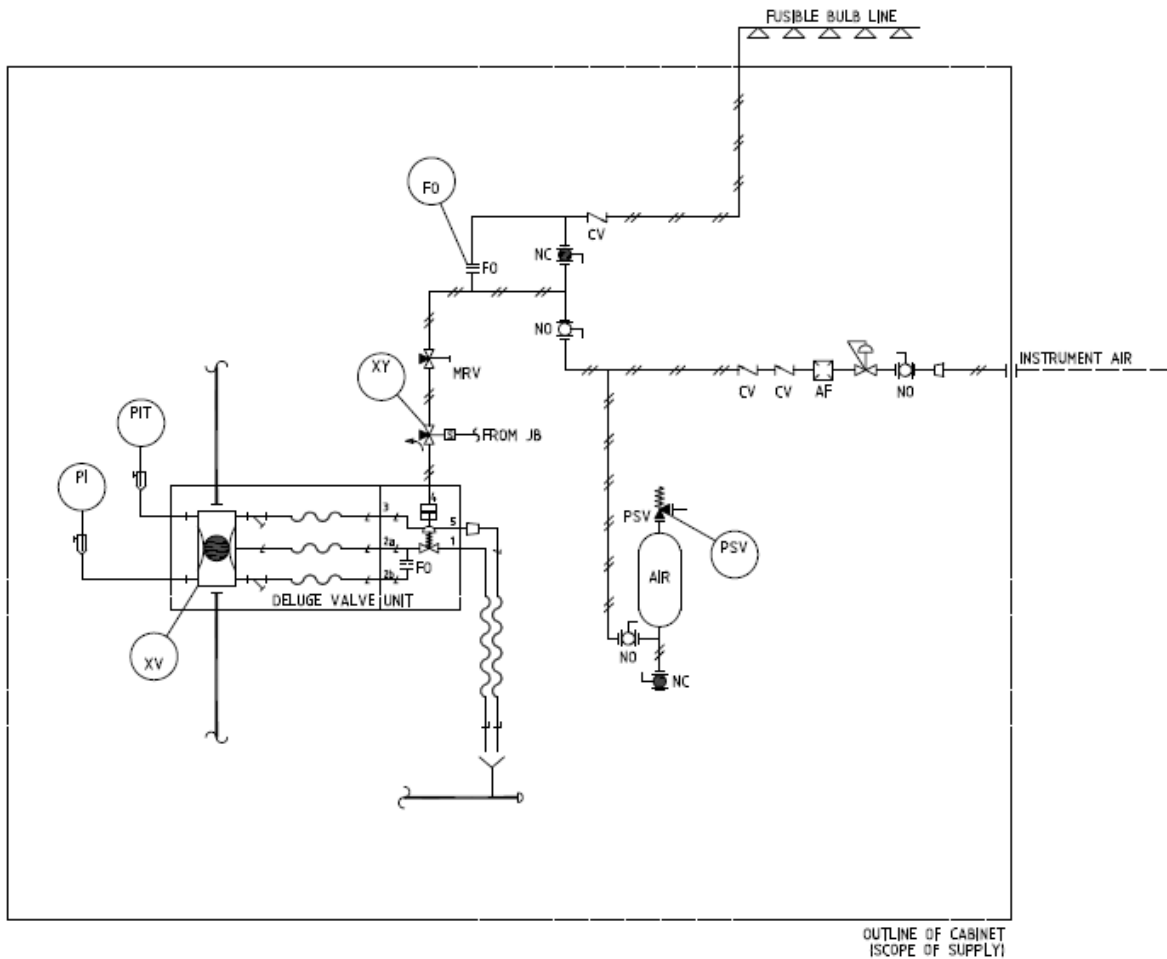


Figure 8: Pneumatic P&ID No. 2

Note all three options including the manual release, solenoid valve, and fusible plug (bulb) system.

Deluge Valve

Hydraulic

Valve release may utilize water in the absence of instrument air or to simplify design. This is achieved by incorporating a 3/2 solenoid valve downstream of the pilot valve.

The hydraulic release activation incorporates a pressure control pilot valve, PA1 (valves $\leq 6''$) or PB1 (valves $\geq 8''$). The valve is a pressure operated and spring-loaded pressure control design combining on/off operation via a manual release or solenoid valve with adjustable downstream firewater supply pressure control.

When the solenoid and manual release valve is closed water is forced to flow into the deluge valve control chamber and operating either valve reverses the flow thus opening the valve.

Pressure Control

See the Pressure Control section.

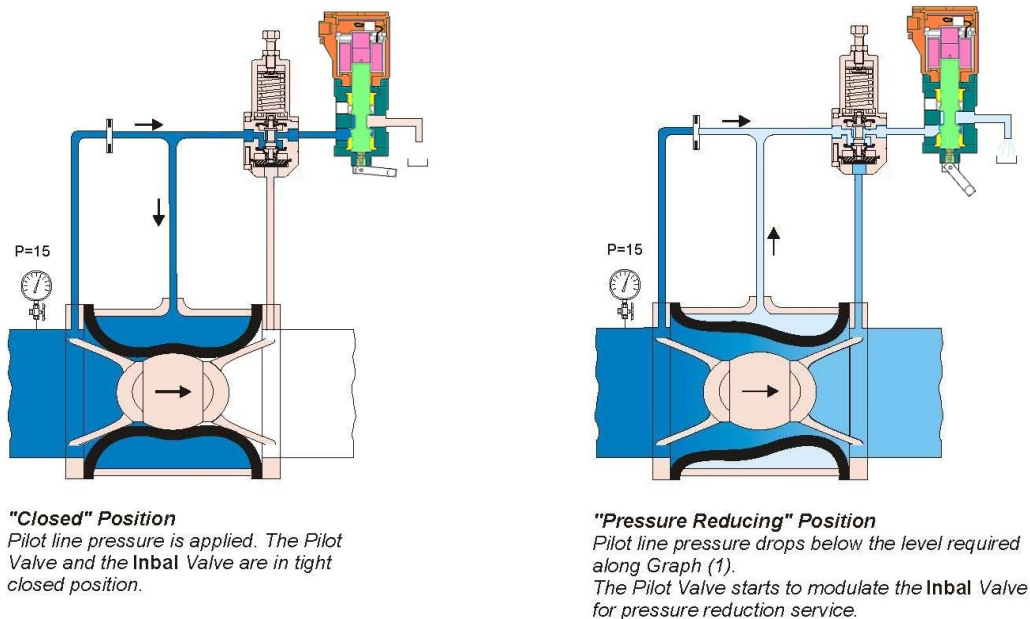


Figure 9: Hydraulic Pilot Valve Operation with Solenoid

Deluge Valve

Model PA1



Figure 10: PA1 Pilot Valve

Deluge Valve

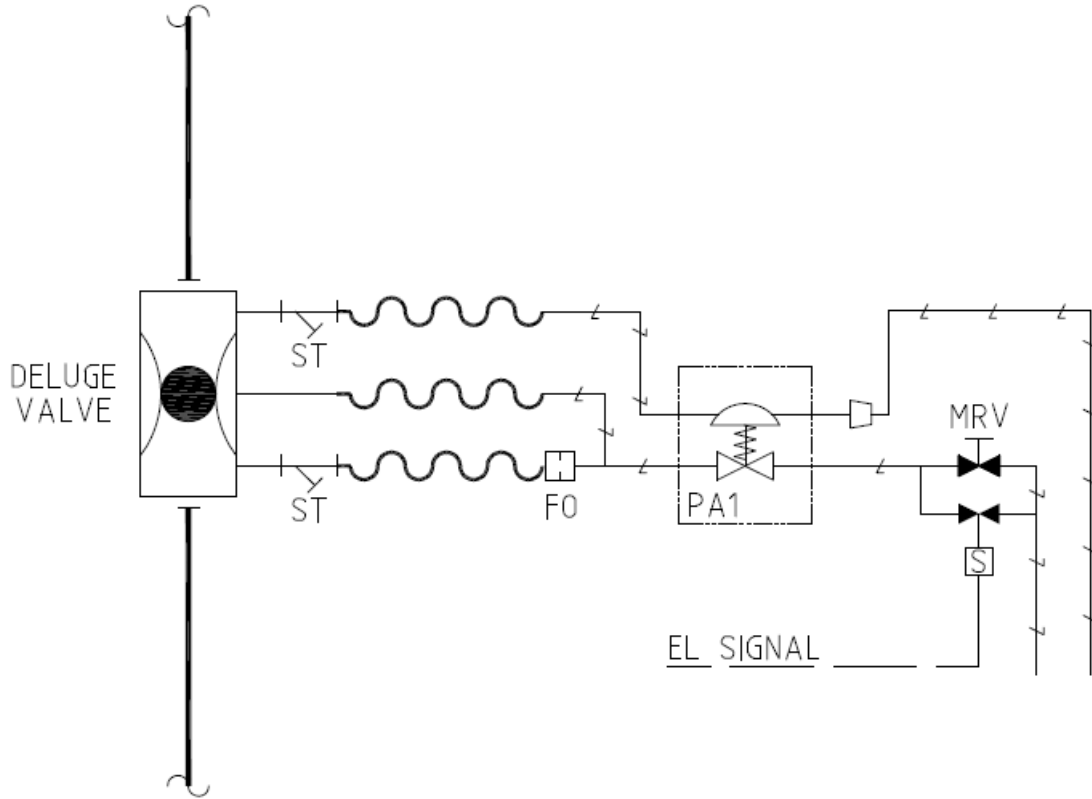


Figure 11: Hydraulic P&ID

Note both release options are included in this design.