Pressure Reducing Pilot Valve

Models PA1 & PB1

Model PA1

Model PB1

General Description

The **Inbal** Pressure Reducing models PA1 & PB1 are two-way, direct acting, power-to-close, pressure operated, diaphragm actuated, adjustable spring loaded pilot valves.

The **Inbal** Pilot Valves models PA1 & PB1 automatically reduce a higher inlet pressure to a steady lower downstream pressure. Due to the balanced design, the PA1 or PB1, when installed as pilot controls, make the **Inbal** Valve function as a Pressure Reducing Valve to accurately maintain the outlet pressure to a predetermined level regardless of upstream pressure fluctuations.

The **Inbal** Pilot Valve model PA1 is used in the **Inbal** Pressure Control from 1½" to 4" (40-100 mm); model PB1 - for sizes 6" to 12" (150-300 mm).The Pilot Valve PA1 or PB1, furnished with the standard spring, are capable of handling an overall pressure range of 30 to 300 psi (2 to 21 bar).

The unique "dry" design of the **Inbal** Pilot Valves, which features the frictionless operation of internal parts, makes them ideally suitable for use with brackish or sea water similar to those found in offshore platforms or other industrial facilities.

Features

- Direct acting operation - responds instantaneously to inlet pressure variations.
- Balanced, single seat design - very accurate performance, not affected even slightly by inlet pressure fluctuations.
- Simple design, easy to maintain.
- Long spring enables sensitive pressure adjustment.
- Resilient seal assures positive shutoff.
- "Dry" design, frictionless operation - ensures trouble-free operation for prolonged periods of time with brackish or sea water.
- Available in a wide range of materials.

Technical Data

Model Numbers

PA1; PB1.

Ends

PA1 : 3 ports, ¼" NPT each.
PB1 : 3 ports, ½" NPT each.

Pressure Rating

Maximum working pressure: 300 psi (21 bar).

Adjustment Range

Standard*

30 to 300 psi (2 - 21 bar).

* *Marked in red.*

Temperate Range

Water: Max. +180°F (+80°C).

Materials

Standard

Brass, Nickel Chrome plated.

Optional

Bronze ;
Nickel Aluminum Bronze ;
Stainless Steel ;
Super Austenitic Stainless Steel ;
Super Duplex Stainless Steel ;
Titanium;
Monel 400/500.

Flow Factors

PA1 : Cv = 0.92 (Kv = 0.79).
PB1 : Cv = 1.83 (Kv = 1.58).

Weight

PA1 : 3.7 lbs (1.7 kg).*
PB1 : 4.2 lbs (1.9 kg).*

* *Standard materials.*

Operation

The ***Inbal*** Pilot Valves models PA1 & PB1 are held open by the force of the compression spring and close when the downstream pressure, acting on the diaphragm, exceeds the spring setting. Flow through the Pilot Valve responds to changes in downstream pressure, thus the Pilot Valve modulates the flow to maintain the preset outlet pressure. Turning the adjusting screw clockwise increases the delivery pressure and turning it counter-clockwise decreases the pressure. A resilient seal assures a tight shutoff on a dead-end service. The changing inlet pressure does not affect the setting since it acts on the same areas in opposing directions, thus the operation of the Pilot Valve is well balanced.

When the Pilot Valve is installed as a control on an **Inbal** Pressure Reducing Valve, it monitors the pressure in the **Inbal** Valve Control Chamber as a response to the pipe downstream pressure. If downstream pressure drops below the setting, the Pilot Valve allows more flow to "escape" from the **Inbal** Valve Control Chamber, thus the **Inbal** Valve opens wider to increase the delivery pressure [see Figure (1A)]. As soon as the **Inbal** Valve outlet pressure exceeds the setting, the Pilot Valve restricts the flow released from the Control Chamber and the **Inbal** Valve closes to reduce the pipe pressure to the preset level [see Figure (1C)].

Installation

1. Verify that the **Inbal** Pressure Reducing Pilot is equipped with the appropriate spring type for the desired downstream pressure.
2. Verify that the inlet / outlet pressure ratios at the given flow are not subjected to cavitation conditions. Refer to **Inbal** Valve Sizing bulletin F50-01.
3. Refer to the applicable Trim Chart for piping arrangement. Note that port "2" is the Pressure Port. Vent Port "1" should be connected to a drain.
4. It is preferable, if possible, that the sensing line connection to downstream piping be installed approximately five pipe diameters from the **Inbal** Valve outlet end.
5. For air removal, release the spring by turning the adjusting screw counter-clockwise to introduce water to the control and to the **Inbal** Valve Control Chamber. When all air has been expelled, turn the adjusting screw clockwise until water flow ceases.
6. The setting of the Pilot Valve should be done at a minimum velocity of 1.5 ft/sec. (0.45 m/sec). Actual setting is commenced only after the downstream pipe system is water pressurized. If either or both the isolating valve and the test valve are installed, the isolating Valve should be closed and the test valve should be opened prior to **Inbal** Valve operation. The adjustment of pressure is done by

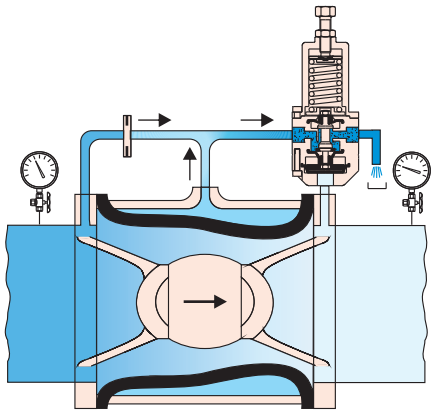


Figure (1A)

"Under Satisfied" Position

The system pressure drops below the setting. The Pilot Valve opens wider to decrease the **Inbal** *Valve control chamber pressure. The* **Inbal** *Valve opens further to increase the delivery pressure.*

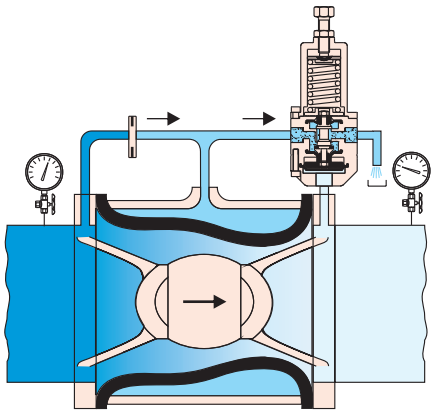


Figure (1B)

"Satisfied" Position

The system pressure is precisely as the preset point. The Pilot Valve releases the exact same flow rate which is introduced through the orifice. The **Inbal** *Valve stays in a stable throttling position.*

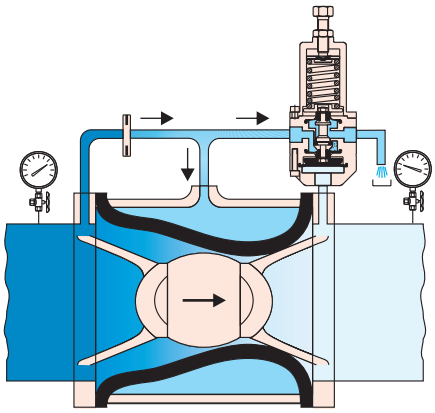
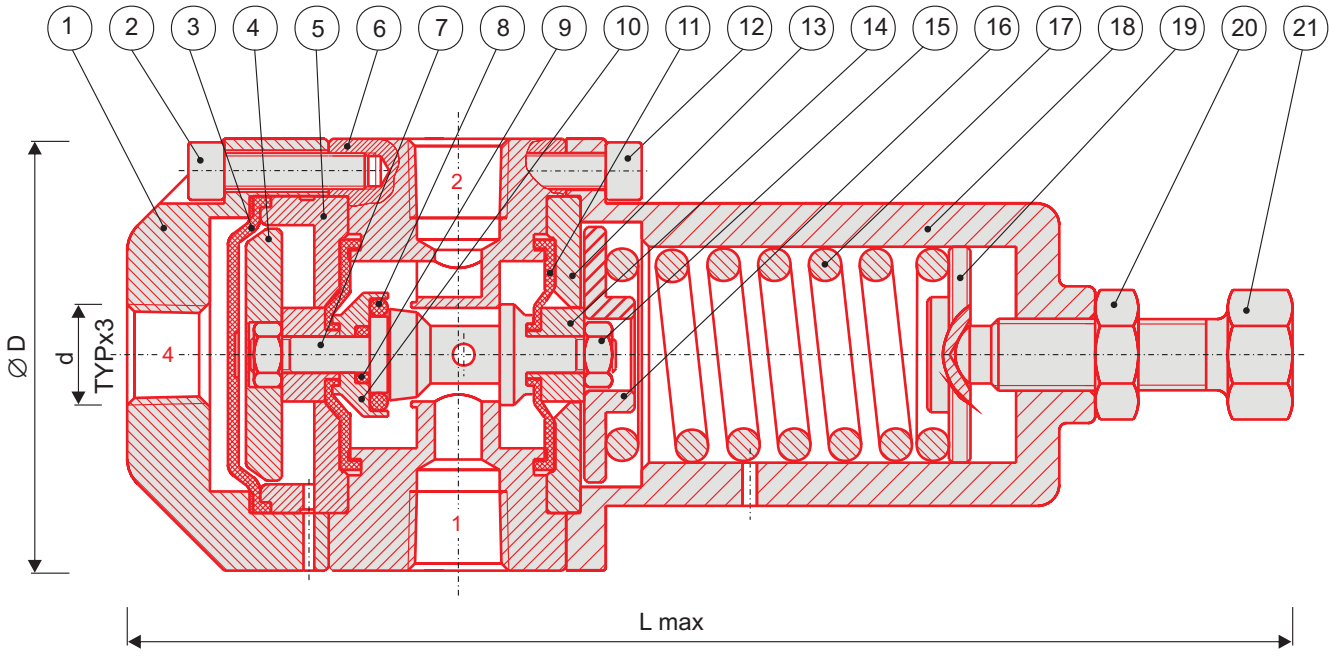


Figure (1C)

"Over Satisfied" Position

The system pressure exceeds the setting. The Pilot Valve is closing to increase the **Inbal** *Valve control chamber pressure. The* **Inbal** *Valve is closing to reduce the delivery pressure.*



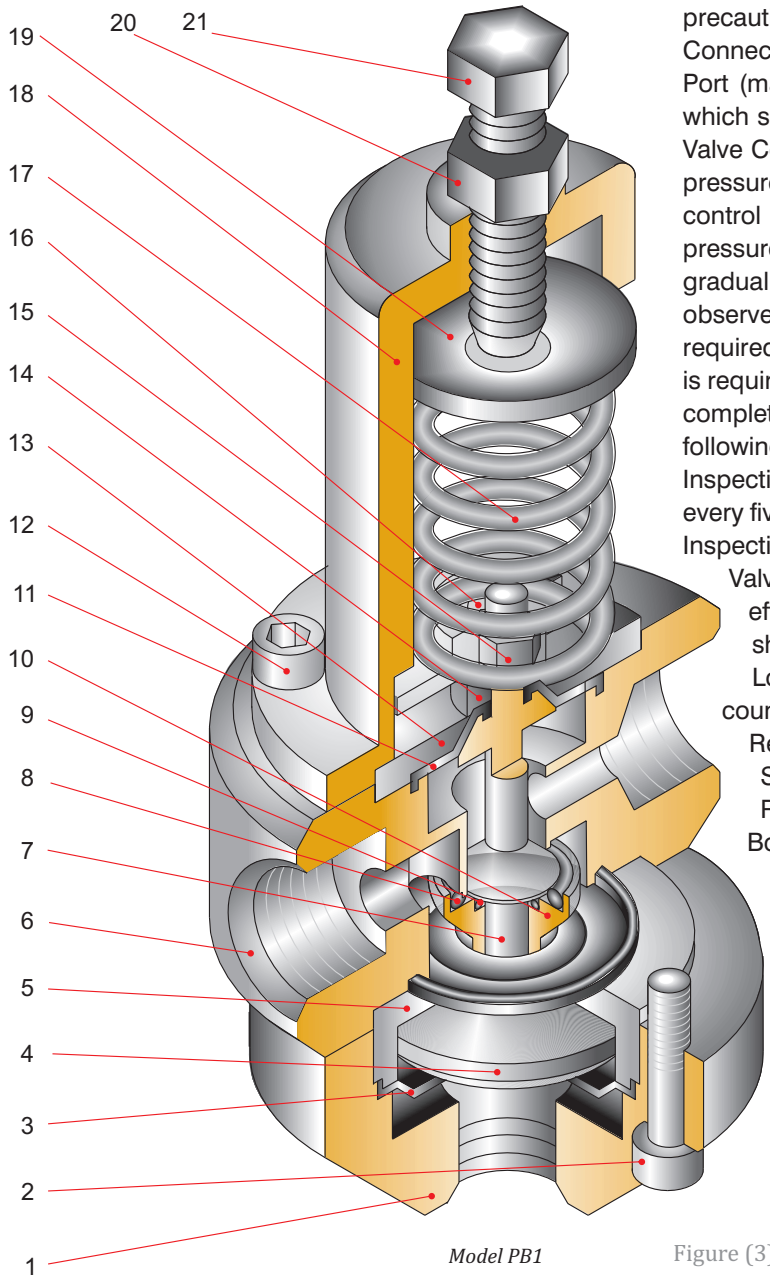
	D	d	L max
PA1	2 3/8" 60 mm	1/4" NPT	6 1/2" 165 mm
PB1	2 3/4" 70 mm	1/2" NPT	6 7/8" 175 mm

Figure (2) *Model PA1*

Item	*Cat. No.*	*Description*	*Standard Material*	*Quantity*
1	*PA1-* 322102010000	Cover	Brass, Nickel Chrome plated	1
	PB1- 322102009000			
2	227006003001	Allen Bolt	Stainless Steel AISI 304	4
3	224109060000	Diaphragm	Nitrile, Nylon fabric reinforced	1
4	422606002001	Diaphragm Washer	Stainless Steel AISI 303	1
5	422906001001	Sleeve	Stainless Steel AISI 303	1
6	*PA1-* 322002003000	Body	Brass, Nickel Chrome plated	1
	PB1- 322002002000			
7	*PA1-* 323706028001	Stem	Stainless Steel AISI 303	1
	PB1- 423706017001			
8	270621110000	O-Ring Parker 2-111	Buna N	1
9	270620080000	O-Ring Parker 2-008	Buna N	1
10	422806001001	Plunger	Stainless Steel AISI 303	1
11	224109070000	Sealing Diaphragm	Nitrile	2
12	227006017000	Allen Bolt	Stainless Steel AISI 304	4
13	322606001001	Sealing Plate	Stainless Steel AISI 303	1
14	422506001001	Bushing	Stainless Steel AISI 303	2
15	224206015001	Locking Nut	Stainless Steel AISI 304	2
16	322402003000	Lower Spring Retainer	Brass	1
17	224001002000	Spring	Spring Steel, Zinc plated	1
18	322302002000	Spring Housing	Brass, Nickel Chrome plated	1
19	322402004000	Upper Spring Retainer	Brass	1
20	323002001000	Nut	Brass, Nickel Chrome plated	1
21	323102001000	Adjusting Screw	Brass, Nickel Chrome plated	1

turning the adjustment screw clockwise to increase pressure or counter-clockwise to decrease pressure.

7. Place the system in service, following the instructions applicable to the specific **Inbal** Valve model in use.



Model PB1 Figure (3)

Inspection, Maintenance, & Testing

It is imperative that the **Inbal** Pilot Valve be inspected and tested on a regular basis. The frequency of inspections may vary due to the quality of water supplies and/or corrosive atmosphere. The following recommendations are the minimum requirements to keep the **Inbal** PA1 or PB1 in good working conditions.

Operation of the **Inbal** Pilot Valve should be done quarterly. If operation of the whole system is not feasible, an individual pilot testing should be implemented.

The Pilot Valve should be removed from the control by taking precautions that the **Inbal** Control Valve remains closed. Connect water pressure source to the Pilot Valve Pressure Port (marked "2"). Connect Water or air pressure source, which should be higher than the pilot setting, to the Pilot Valve Control Port (marked "4"). Apply and release control pressure to verify that the Pilot Valve closes drip tight when control pressure is applied and opens when control pressure is removed. Increase the control pressure gradually until Leakage out of the Vent Port (marked "1") is observed. Record that control pressure and verify it is at the required delivery pressure level at the site. If an adjustment is required see step (6) in Installation . As soon as testing is completed, reinstall the **Inbal** Pilot Valve in the control by following the applicable instructions listed in Installation. Inspection of seals and diaphragms should be done once every five years or when a leak is observed at any time. The Inspection involves placing the **Inbal** Pressure Reducing Valve out of service. An appropriate precaution for effective fire protection service, such as fire patrol, should be taken.

Loosen Nut (20) and turn the Adjusting Screw (21) counter-clockwise to release the Spring (17) tension. Remove Allen Bolts (12), Spring Housing (18), Upper Spring Retainer (19), Spring (17), Lower Spring Retainer (16), and Sealing Plate (13). Remove Allen Bolts (2), Cover (1), Diaphragm (3), Diaphragm Washer (4), and Sleeve (5). Loosen Locking Nuts (15) and remove Bushings (14), Sealing Diaphragms (11), Plunger (10), and Stem (7).

Inspect Diaphragm (3), Sealing Diaphragms (11), and O-Rings (8) & (9), replace if necessary. Reassemble the Pilot Valve and install it back in the control trim by following steps (5), (6), and (7) in Installation. ●