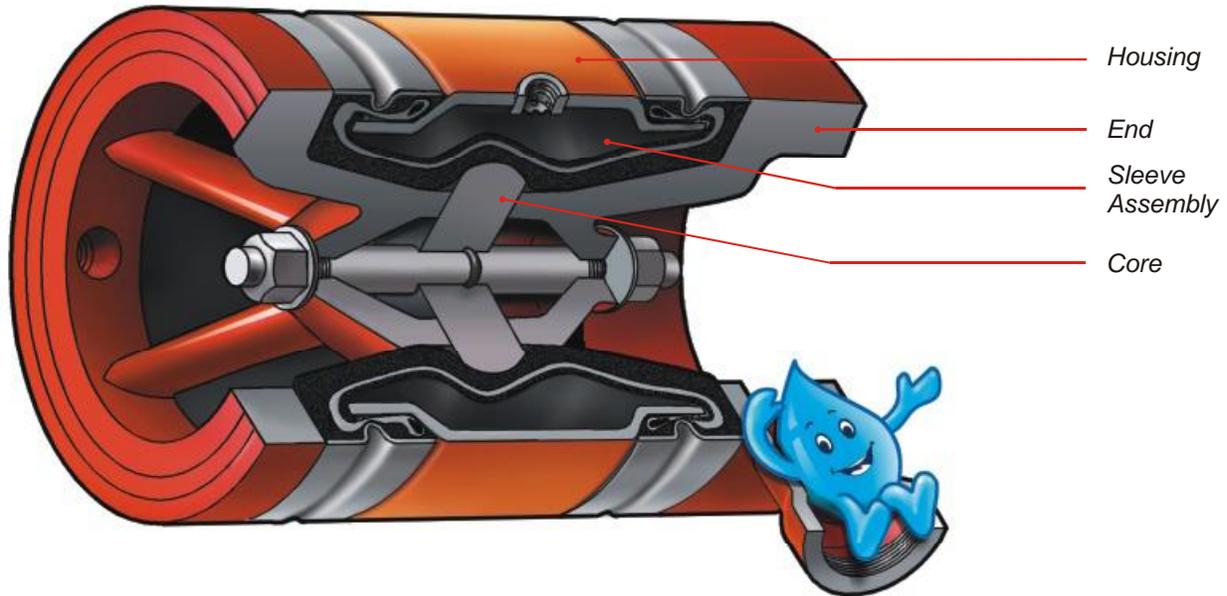


The Inbal Valve Technology



Inbal Valves embody a breakthrough in the conceptual design of automatic water control valves. Developed from basic principles, they are free of limitations imposed by the human hand, which characterize conventional control valves such as clapper, latch, or diaphragm actuated types. The major concept that led to the development of the **Inbal** Valve is the N.M.M.P. (No Moving Mechanical Parts), a significant feature in fire protection systems where long life of reliable operation is considered the first criterion in selecting equipment, particularly control valves.

The **Inbal** valves are listed by Underwriters Laboratories (UL), approved by Factory Mutual (FM) and Schadenverhütung Laboratorien (VdS), and Type Approved by Lloyd's Register, American Bureau of Shipping (ABS), Bureau Veritas (BV), and Det Norske Veritas (DNV)*. Additional approvals are in process.

As standard, **Inbal** Valves are made of Ductile Iron ends and Steel housing - both epoxy coated. A large variety of optional materials including Cast Steel, Stainless Steel, Bronze, Nickel-Aluminum-Bronze, and Titanium are available from stock. Optional coating such as high built epoxy or Halar® can be supplied upon request.

All standard material **Inbal** valves are rated to 300 psi (21 bar), and are available in sizes 1½" to 12" (40 to 300 mm) with threaded, flanged, wafer, or grooved ends.

The control trim, as standard is made of Stainless Steel and Brass, Nickel-Chrome plated. It is supplied, unless required otherwise, pre-assembled in sections. The trim

package is compact, incorporates innovative components, and is designed for quick mounting, dependable operation and easy resetting. The widest range of pilot valves, actuators, and accessories enables the selection of the **Inbal** components to ideally adapt to the specified requirements.

The small physical dimensions and the low weight enable the **Inbal** Valve and the trim assembly to occupy much less space and reduce significantly the time and labor needed for installation. Moreover, the simple design of the **Inbal** Valve and the control trim, ease of operation, and the low maintenance, reduce the life cycle cost. The **Inbal** Valve withstands pressure surges and it is entirely resistant to false tripping. Opening is quick, yet smooth, virtually eliminating water hammer.

The unique design and variety of materials and coatings make the **Inbal** Valve ideally suitable for use in brackish or sea water and in corrosive environments similar to those found in oil refineries, petrochemicals, chemical and steel plants, power stations, as well as production platforms, drilling rigs, floating storage tanks, and other marine applications.

All **Inbal** Valves are fully tested, before being supplied, at similar conditions of flows and pressures to those designated.

* Contact Mil for the specific approved / listed / registered **Inbal** Valve configuration and application.



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1R9A7.AH



EX 3850



G4000015



97/00057



10270/BV



P-10490
P-10491

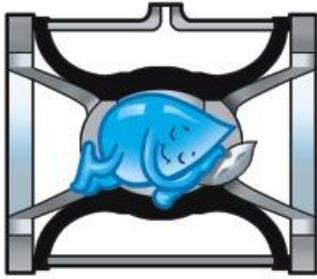


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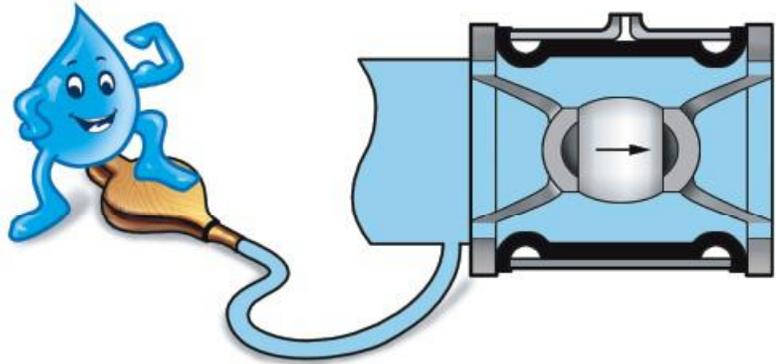


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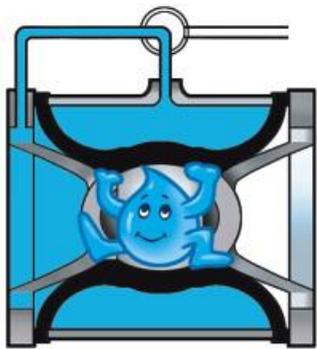
How does the Inbal Valve operate?



When no pressure acts on the valve, the resilient heavy duty sleeve holds the **Inbal** valve closed.



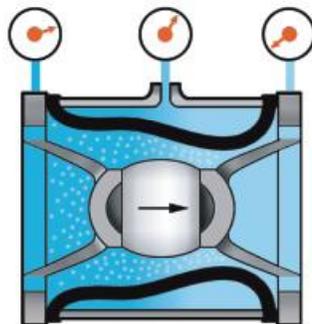
When installed in a pipeline and pressure is applied, the **Inbal** Valve opens.



The **Inbal** Valve closes when inlet pressure is applied to the control chamber. The equilibrium in pressures and forces acting on the sleeve maintains the valve in a closed position.



The **Inbal** Valve opens wide when the operating pressure is relieved from the control chamber. A minimum line pressure is required to hold the **Inbal** Valve in a fully open position. The flow through the valve is streamlined with low pressure loss.



Modulating Operation

The **Inbal** Valve is used broadly in various pressure/flow control applications. In the development of the **Inbal** Valve priority was given to accurate modulating action.



If the pressure in the **Inbal** Valve control chamber is held between the line inlet and outlet pressures, then the **Inbal** Valve will modulate to any degree of opening in response to the pressure changes in the control chamber.

Since the sleeve is enveloped by the housing in an open position and it is well reinforced by kevlar and polyester in a closed position, the valve withstands severe pressure surges and is classified with standard materials, up to a working pressure of 300psi (21 bar).



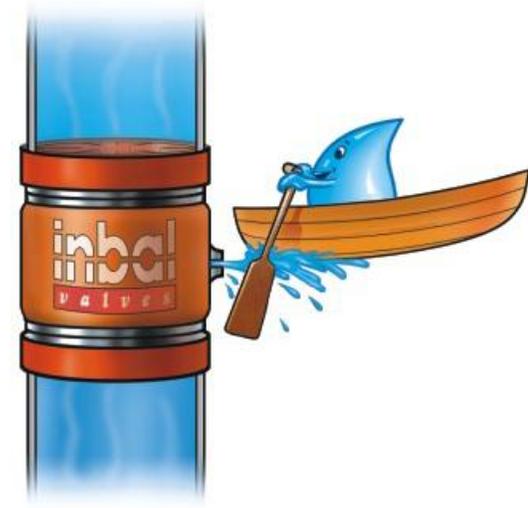
When the **Inbal** Valve opens to fill an empty line, as in a deluge system, the valve will not allow more than the flow rate for which the system is designed; thus, the surge that is often developed when a conventional deluge valve opens is eliminated. As long as the system is not pressurized, the **Inbal** Valve restricts the filling flow rate. Once water reaches the sprinklers or nozzles, the **Inbal** Valve opens fully.



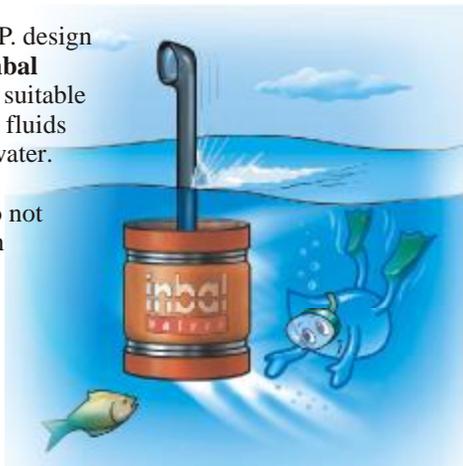
The opening speed of the **Inbal** Valve is determined by the rate of which the pressure is relieved from the control chamber. Various sizes of control ports are suggested in case exceptional high speed is required. An independent laboratory has recorded 18 milliseconds from fire detection until the nozzles started to spray water with a 6" (150 mm) Ultra High Speed **Inbal** Deluge Valve.



The closing speed of the **Inbal** Valve could be very slow if the pressure introduced to the control space is well restricted. Closing and/or opening speed control devices are optional items in all **Inbal** Control Valves.



The N.M.M.P. design makes the **Inbal** Valve ideally suitable for corrosive fluids such as sea water. Sand and sediments do not interfere with the operation of the valve.

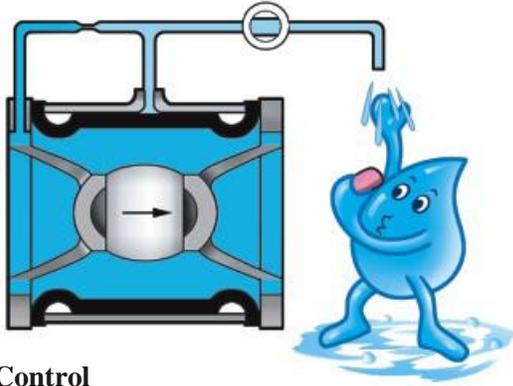


Inbal Valves are provided epoxy coated as standard. Moreover, **Inbal** Valves are available in a large variety of materials at a reasonable cost due to their simple, compact, and lightweight design.



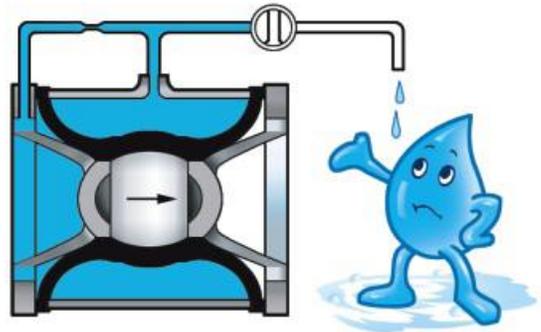
Types of Control

There are basically two types of control used to operate the **Inbal** Valve:

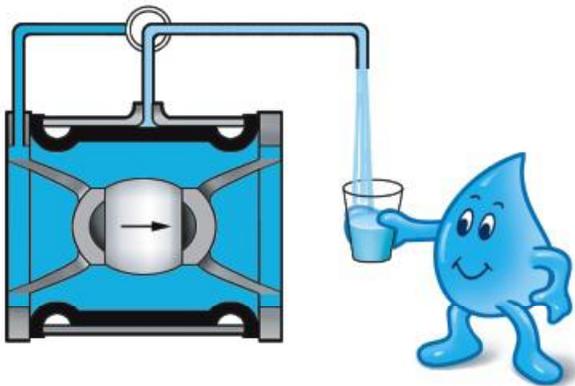


2 Way Control

The **Inbal** Valve opens wide since the flow rate released from the control chamber is greater than the flow rate introduced. Obviously, if the incoming flow rate is eliminated (as in **Inbal** Deluge Valve), then the opening speed is faster.



The **Inbal** Valve closes tightly when the flow rate introduced to the control chamber is greater than the released flow rate. Obviously, if there is no outgoing flow rate, then the closing speed is faster.



3 Way Control

The **Inbal** Valve opens wide when the common port is interconnected with the vent port. The pressure port is sealed.

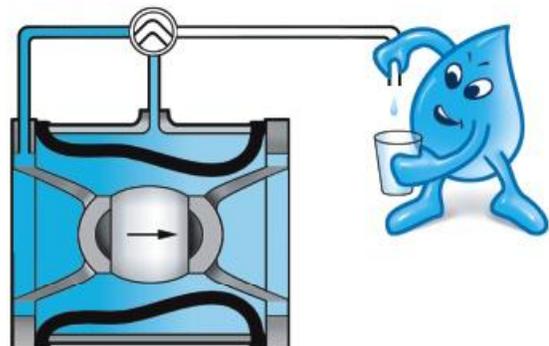


The **Inbal** Valve closes tightly when the pressure port is interconnected with the common port. The vent port is isolated.

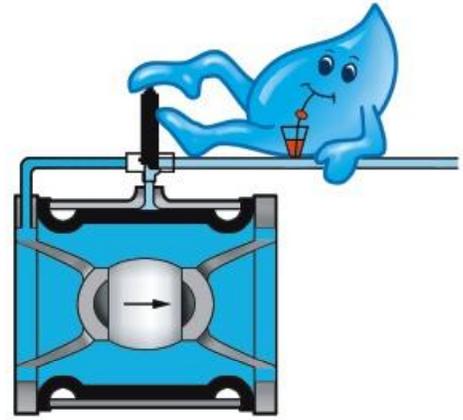
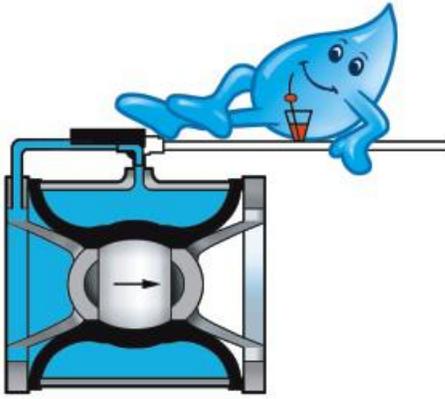
And one more...

3 way, 3 position control

A variation of the 3 way control is when an additional position is used: all three ports are locked. This type of control is used when a regulating position is required. An example of this is the UL Listed **Inbal** Fire Pump Valve.



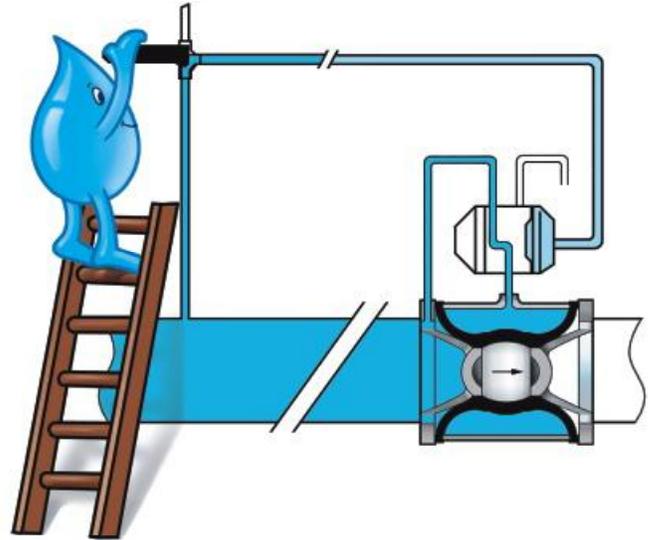
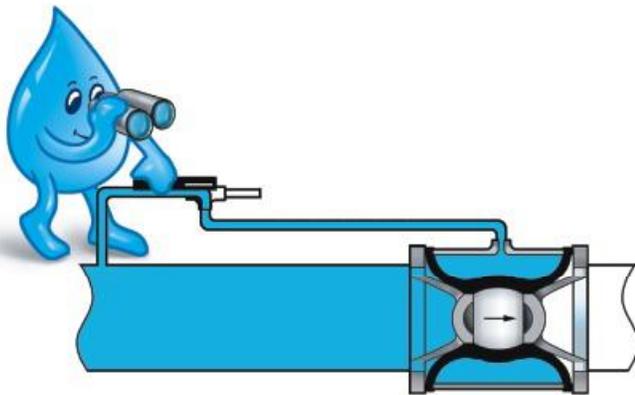
Types of Operation



Local Manual Operation

The energy required to operate any size of **Inbal Valve** is merely for turning the handle of the release valve. The **Inbal Valve** utilizes the line pressure as a source of energy for opening and closing.

Operation of the ½" release valve is all that is needed to open the **Inbal Valve**. The operator can move on to other tasks while the **Inbal Valve** completes the opening process, to a fully open position, fairly quickly but with no surges.

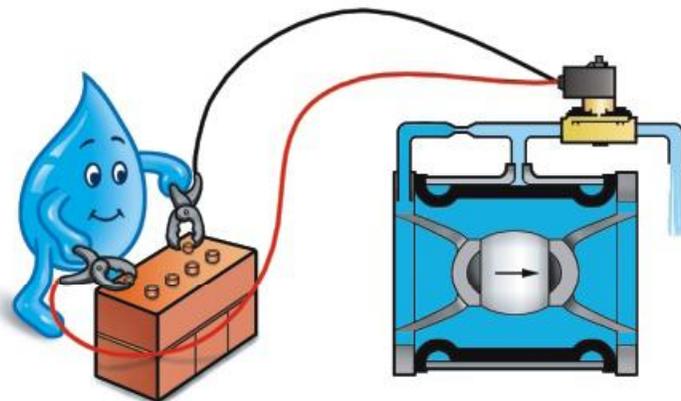


Remote Hydraulic Operation

Operation of the **Inbal Valve** is also available by a release valve, installed remotely on a control panel, located in an accessible spot.

In cases where the pressure in the hydraulic pilot line is

lower than the line pressure, or when the control panel is located far away and/or at a higher elevation, a hydraulic actuator (or hydraulic pilot actuator) is added to the **Inbal Valve** control.

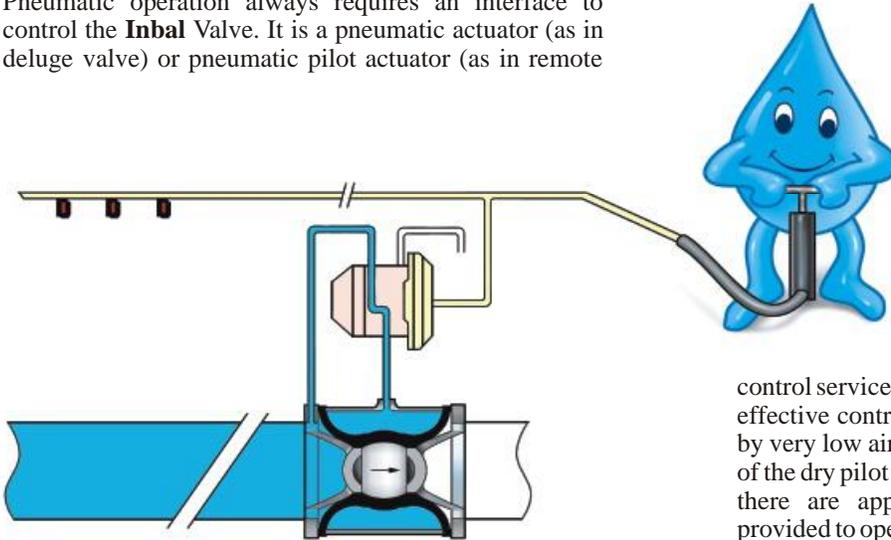


Electric Operation

Electric operation also requires an interface to control the **Inbal Valve**. The interface is either a 2-way or 3-way solenoid valve. A wide range of solenoid valves is available to fit all sorts of requirements for enclosures, explosion protection, voltages, and frequencies to either American or European standards.

Pneumatic Operation

Pneumatic operation always requires an interface to control the **Inbal** Valve. It is a pneumatic actuator (as in deluge valve) or pneumatic pilot actuator (as in remote

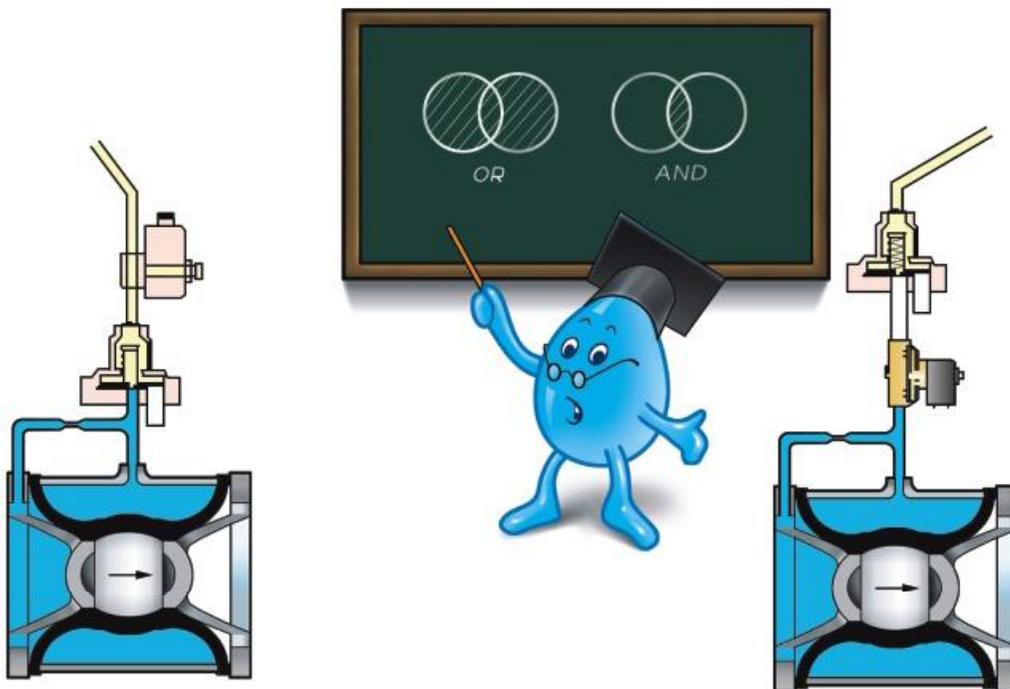


control service). The pneumatic (pilot) actuator enables an effective control to open and close the **Inbal** Valve even by very low air or gas pressure. In most applications, loss of the dry pilot line pressure will open the **Inbal** Valve, but there are applications where pneumatic pressure is provided to open the **Inbal** Valve.

Combination of Operation

Hydraulic, pneumatic, and electric release control can be combined in non-interlock, single interlock, and double interlock arrangements. Also, two separate release

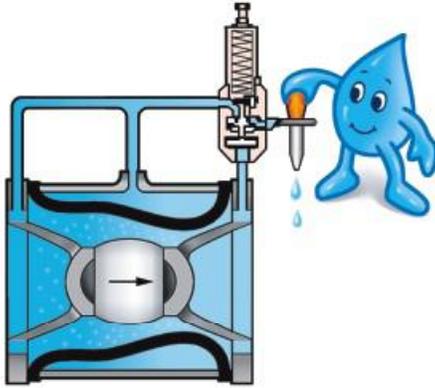
controls of the same type (pneumatic-pneumatic, electric-electric) can be combined in the same arrangements.



Non-interlock pneu-electric release control. The **Inbal** Valve will open either upon the operation of the electric release or a drop of pressure in the dry pilot line.

Double interlock pneu-electric release control. To open the **Inbal** Valve, operation of both of the release systems is required. Operation of only one of them will merely operate an alarm but the **Inbal** Valve will not open.

Applications

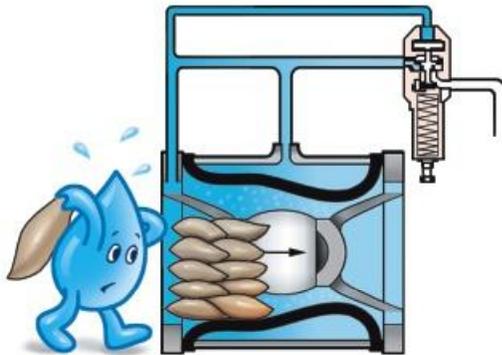


Pressure Reducing Service

The **Inbal** Pressure Reducing Valve is designed to maintain the delivery pressure at the preset level which

remains steady and unaffected by inlet pressure changes or by variations of demand.

The pressure reducing pilot valve controls the **Inbal** Valve's degree of opening. When the delivery pressure drops below the preset point, the pilot valve will open wider to reduce the control chamber pressure. Consequently the outlet pressure increases to meet the preset level. When the delivery pressure exceeds the preset point, the pilot valve will gradually narrow the internal orifice to increase the control chamber pressure. Thus, the **Inbal** Valve will close further to reduce the outlet pressure. Normally, the delivery pressure is at the preset point, thus the incoming and outgoing flow rates to the **Inbal** Valve control chamber are equal.



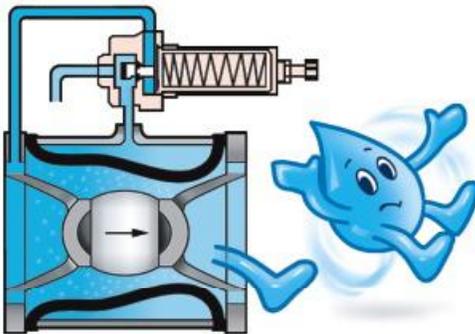
Pressure Sustaining Service

The **Inbal** Pressure Sustaining Valve is designed to maintain the maximum inlet pressure at the preset level regardless of fluctuations in the upstream potential and/or changes in demand.

The **Inbal** Valve is closed as long as the inlet line pressure is below the pressure sustaining pilot valve setting. When the inlet pressure exceeds the setting, the pilot valve will open to allow partial opening of the **Inbal** Valve. Thus, the inlet pressure is maintained at the preset point.

Pressure Relief Service

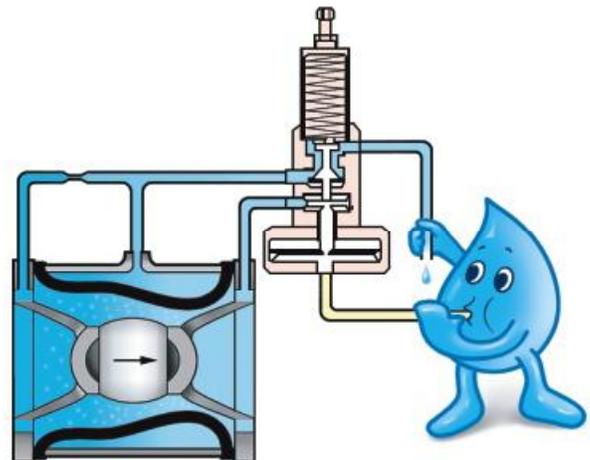
The **Inbal** Pressure Relief Valve is designed to release excess pressure in the fire protection system. The inherent N.M.M.P. - No Moving Mechanical Parts - characteristic of the **Inbal** Valve enables a very fast response. Thus, the damage due to pressure surges is effectively eliminated.



The **Inbal** Valve opens quickly as soon as the line pressure exceeds the setting. Once the pressure surge is safely dissipated, the **Inbal** Pressure Relief Valve closes tightly in readiness for the next excess of pressure.

Pressure Control Deluge Valve

Pressure control service can be added to all types of **Inbal** Deluge Valve.



Once the release system is activated, the opening of the **Inbal** Deluge Valve is of modulating action to maintain the delivery pressure at the preset level.

Outstanding Features



Durability

The resilient sleeve is made of a special rubber compound and is engineered specifically for use in severe conditions. Strict quality control, consisting of mechanical and chemical analyses, life and hydraulic tests, is applied to ensure reliable service and dependable performance.



Maintainability

The resilient sleeve also serves as the only sealing mechanism. The **Inbal** valve utilizes no gaskets, o-rings, packing glands, or stuffing boxes. No lubrication is needed.



9:9:99

Reliability

Free of moving mechanical parts - the only moving part is the resilient sleeve. Consequently, there is no sticking and the **Inbal** Valve opens even after prolonged periods in closed position.

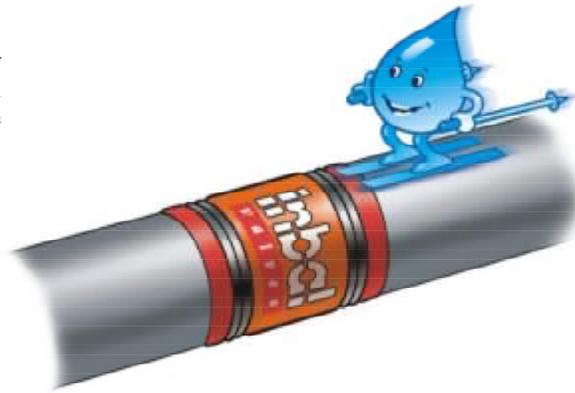


Compatibility

Due to the principle of operation the **Inbal** Deluge, Dry Pipe, or Preaction Valve will not falsely trip to open due to surges at the water supply system.

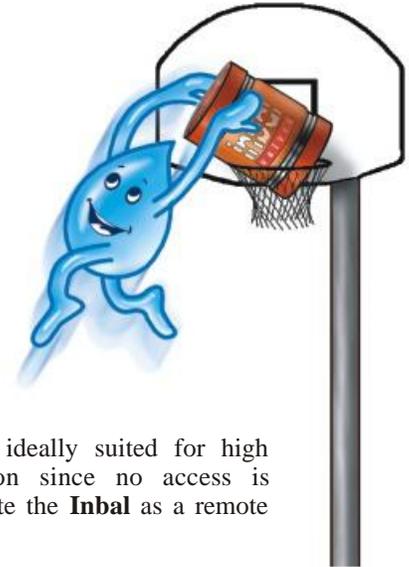
Integrability

Inbal Valve is of in-line construction, only slightly protrudes from the pipeline shape. The compact design of the **Inbal** Valve and the trim assembly enable installation in confined spaces.



Availability

Due to the unique design the **Inbal** Valve is available as threaded, grooved, flanged, as well as wafer type.

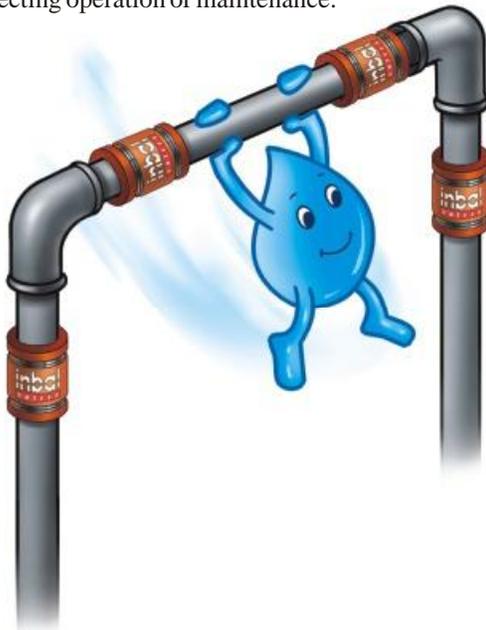


Flexibility

Inbal Valves are ideally suited for high altitude installation since no access is necessary to operate the **Inbal** as a remote control valve.

Versatility

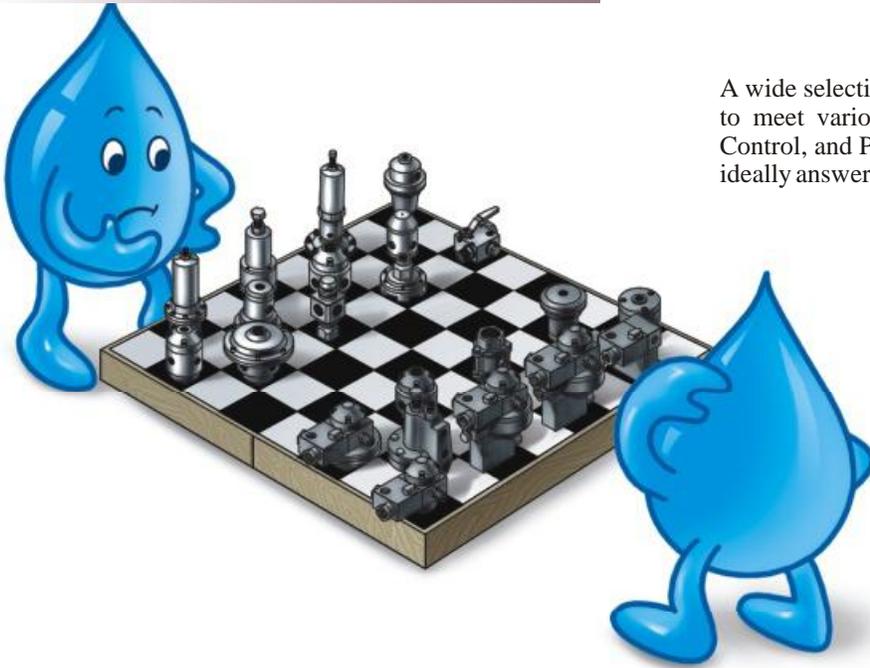
The **Inbal** Valve can be mounted in any position without affecting operation or maintenance.



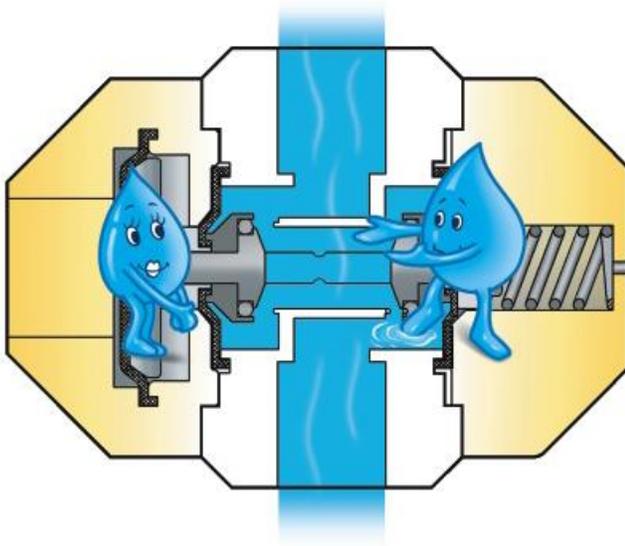
Cost Effectiveness

The simplicity of the basic design leads to a compact and light, yet sturdy construction. **Inbal** valve, capable of handling comparatively high flows. In all materials this is significant economic advantage. In expensive materials (e.g. aluminum bronze, titanium) the saving in cost is considerable.

Inbal Pilot Valves and Actuators



A wide selection of pilot valves and actuators is available to meet various Deluge, Dry Pipe, Preaction, Remote Control, and Pressure / Flow Control applications, and to ideally answer all sorts of requirements and conditions.



Frictionless Operation

The frictionless (also known as "dry") design, in which the water is not in contact with moving mechanical parts and the operating mechanism floats with no mechanical friction, makes the **Inbal** Pilot Valves and Actuators dependable even in brackish or sea water service.



Compact Design

Substantial development has been made to make the **Inbal** Pilot Valves, Actuators, and consequently the control trim to be compact, of sturdy construction, neat, and easily maintained.



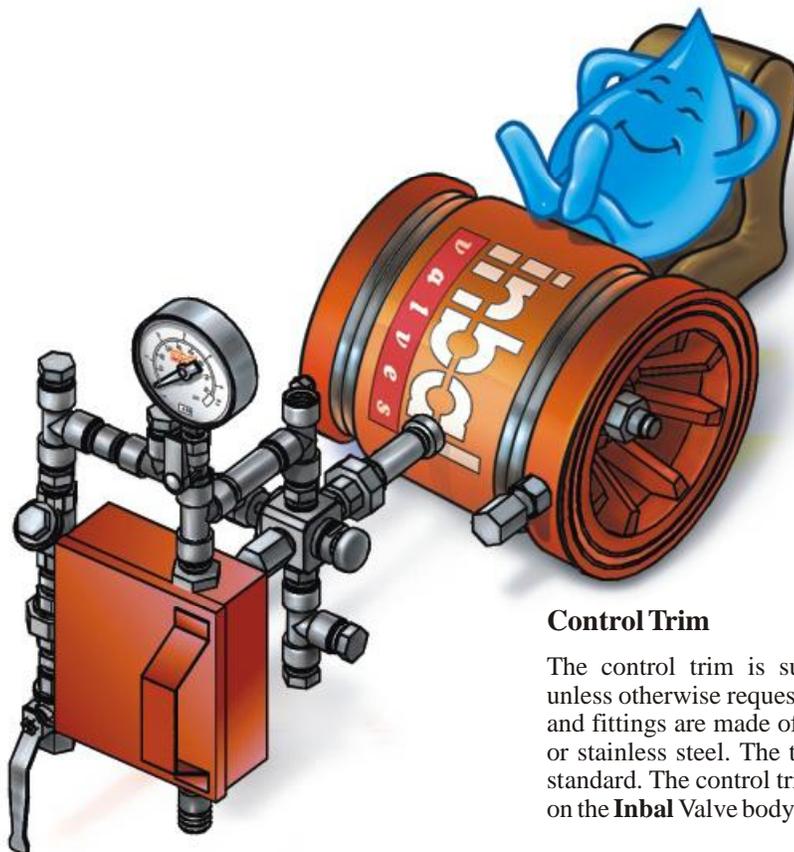
Materials

Most of the **Inbal** Pilot Valves and Actuators are available in a wide selection of materials. The standard material is brass, nickel-chrome plated.



Easy Resetting

The reset of the **Inbal** Deluge, Dry, and Preaction Valves is simple and easy.



Control Trim

The control trim is supplied preassembled in sections, unless otherwise requested. As standard, all the accessories and fittings are made of either brass, nickel-chrome plated or stainless steel. The tubes are made of stainless steel as standard. The control trim is designed for ease of mounting on the **Inbal** Valve body.

The Inbal Valve Technology



A long standing record of
performance and reliability