

# Pressure Relief / Sustaining Valve

Series 700D-01S03

**inbal**  
v a l v e s



Model 799D-01S03

## General Description

The **Inbal** series 700D-01S03 Valve is specifically designed for pressure sustaining (back pressure) applications in fire protection systems. The **Inbal** 700D-01S03 Valve automatically maintains a maximum predetermined inlet pressure regardless of fluctuations in the upstream potential and/or changes in demand. The valve can be installed either in the main line or in a by-pass system, and will relieve excess pressure to downstream or pump suction piping. The series 700D-01S03 consists of the **Inbal** Valve, which is pressure operated, sleeve actuated, axial valve and a pressure relief / sustaining pilot control. The **Inbal** Pressure Sustaining Valve maintains the upstream pressure within a narrow pressure range. If the upstream pressure changes slightly, the pilot control responds immediately to

modulate the **Inbal** Valve to the present pressure.

The **Inbal** Pressure Sustaining Valve is used to balance the distribution of the water capacity available throughout the system and to prevent escape of pressure from higher altitude to lower areas. The **Inbal** 700D-01S03 Valve is also used to maintain the pressure in the column of water which feeds upper decks, towers, or any other high elevation fire protection user. Thus, when the fire pump starts, the pressure surge, due to the filling of an empty line, is eliminated. The **Inbal** Pressure Sustaining Valve, when installed in the upstream of the conventional type deluge valve or in the fire pump discharge, will also eliminate the pressure surge developed when the deluge valve opens or the pump starts against empty lines. The **Inbal** Valve

700D-01S03 can also be used as a pressure relief valve when the maintained pressure is in a location other than the valve inlet.

Standard material **Inbal** Pressure Sustaining Valves are rated to 300 psi (21 bar) and are available in sizes 1½" (40 mm) to 12" (300 mm) with threaded, flanged, and wafer ends.

The **Inbal** Control Valve has an excellent operating characteristic: the only moving part is the reinforced sleeve which actuates without delay due to frictionless motion. The closure of the **Inbal** Valve is achieved when the heavy-duty sleeve forms a drip-tight seal with the corrosion resistant core.

The unique design of the **Inbal** Valve and the pilot control, as well as the variety of materials and coatings, make the **Inbal** Pressure Sustaining Valve suitable for use with brackish or sea water similar to those found in chemical and petrochemical facilities or in offshore platforms.

## Technical Data

### Approvals

The basic **Inbal** Valve is FM Approved as an Automatic Water Control Valve to 300 psi (21 bar) in sizes 3" (80 mm) to 8" (200 mm). **Inbal** Valves have Lloyd's, ABS, and DNV Type Approval to 300 psi (21 bar) in sizes 1½" (40 mm) to 12" (300 mm).

### Model Numbers

| Inlet End | Outlet End | Model No.  |
|-----------|------------|------------|
| Threaded  | Threaded   | 711D-01S03 |
| Flanged   | Flanged    | 733D-01S03 |
| Wafer     | Wafer      | 799D-01S03 |

### Sizes

#### Threaded end:

1½", 2", 2½", & 3" (40, 50, 65, & 80 mm).

#### Flanged End:

2", 2½", 3", 4", 6", 8", 10", & 12" (50, 65, 80, 100, 150, 200, 250, & 300 mm).

#### Wafer End:

3", 4", 6", 8", 10", & 12" (80, 100, 150, 200, 250, & 300 mm).

## End Standards

*Threaded End:*

NPT or BSPT.

*Flanged End:*

ANSI B16.5 class 150 & 300 ;

ISO 7005 - PN 10 ; 16 & 25 ;

BS 10 Table D & E ;

AS 2129 Table D & E.

*Wafer End:*

Fits most of the above standards.

## Pressure Rating

Maximum working pressure\*: 300 psi (21 bar).

\* Standard material valve.

## Adjustment Range

**Standard\***

30 to 300 psi (2 to 21 bar).

\* Marked red.

## Temperature Range

Water: Max. +150°F (+65°C).

## Materials

### Standard

*Valve Housing:*

Carbon Steel (SAE 1021).

*Valve Ends:*

Ductile Iron (ASTM A536-65 45 12).

*Sleeve:*

SMR5 Elastomer reinforced with Polyester and Kevlar.

*Control Trim:*

Brass Nickel Chrome plated, Stainless Steel AISI 304.

### Optional

Cast Steel ;

Bronze ;

Nickel Aluminum Bronze ;

Stainless Steel AISI 316 ;

Super Austenitic Stainless Steel ;

Super Duplex Stainless Steel ;

Titanium.

## Coating

### Standard

Powder epoxy coated. Thickness: 0.004" (0.1 mm) external and internal surfaces.

### Optional

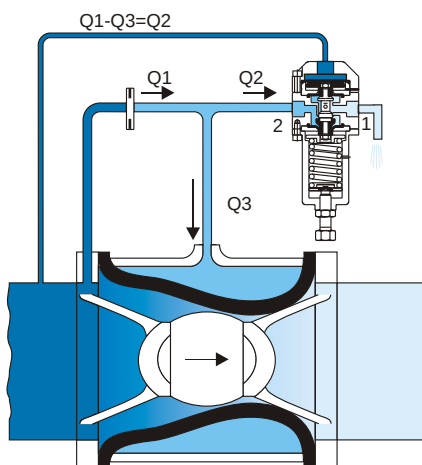
High built epoxy coated and polyurethane finish. Thickness: 0.01" (0.3 mm).

Halar® coated. Thickness: 0.02" (0.5 mm).

Halar® is a registered trade mark of Ausimont USA Inc.

## Features

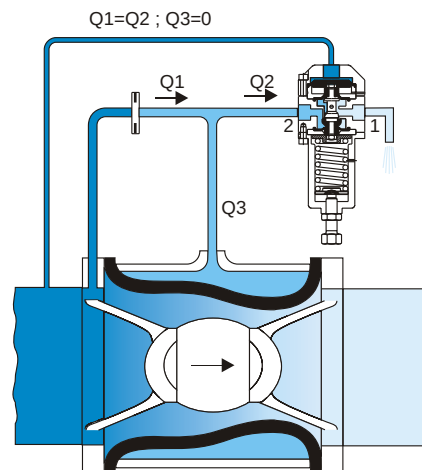
- No Moving Mechanical Parts (N.M.M.P.) design provides a fast and accurate response to small pressure changes, and maintains the upstream system pressure within a close limit.
- Balanced single seat design pilot control for very accurate performance.
- Long spring design Pilot Valve for sensitive setting and maintaining precise maximum upstream pressure.
- Easily adjusted to the desired maximum system pressure.
- Hydrodynamically designed **Inbal** Valve with streamline flow path provides increased flow capacity.
- Pressure rating to 300 psi (21 bar) for standard material valve.
- Wide range of sizes for optimal system design.
- Emergency Release Valve, Strainer, Shutoff Valve, and Check Valve are standard items.
- Water Supply Unit provides for neat, space saving control trim.
- Control trim made of high grade materials as standard.
- Epoxy coating supplied as standard ensures excellent corrosion resistance.
- Variety of available materials to ensure corrosion-free service even under severe conditions.
- Additional functions of various types of deluge control could be easily added on the same valve body.



### "Under Satisfied" Position

The upstream pressure drops below the setting. The Pilot Valve closes to increase the Control Chamber pressure. The **Inbal** Valve closes to increase the upstream pressure.

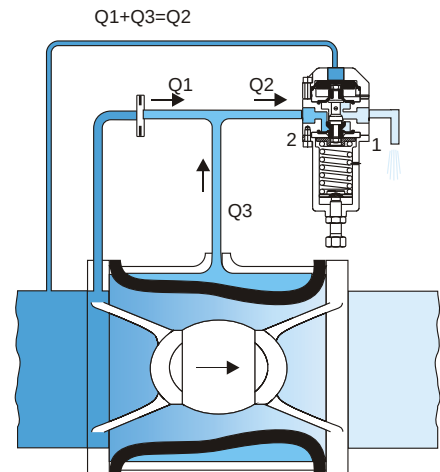
Figure (1)



### "Satisfied" Position

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

Figure (2)



### "Over Satisfied" Position

The upstream pressure exceeds the setting. The Pilot Valve opens wider to decrease the Control Chamber pressure. The **Inbal** Valve opens wider to decrease the upstream pressure.

Figure (3)

## Operation

The **Inbal** Pressure Sustaining Valve series 700D-01S03 is a pilot operated automatic valve. The pilot system controls the **Inbal** Valve Control Chamber, which is the annular space between the valve Housing and the Sleeve. Flow through the Pilot Valve responds to changes in the upstream pressure, thus controlling the pressure in the **Inbal** Valve Control Chamber.

As long as the inlet pressure is lower than the setting, the Pressure Sustaining Pilot Valve and the **Inbal** Valve are closed. Once the inlet pressure exceeds the set point, the Pilot Valve and the **Inbal** Valve open to decrease the inlet pressure [see Figure (3)]. When the inlet pressure decreases, the Pilot Valve and the **Inbal** Valve close to throttle further the flow, and consequently, the inlet pressure increases [see Figure (1)]. Thus, the inlet pressure is maintained within a close limit. If the inlet pressure drops below the setting and does not recover during the closure process, the **Inbal** Valve will close tightly. Adjustment of the upstream pressure is done with the adjusting screw on the pilot valve.

## Control Trim

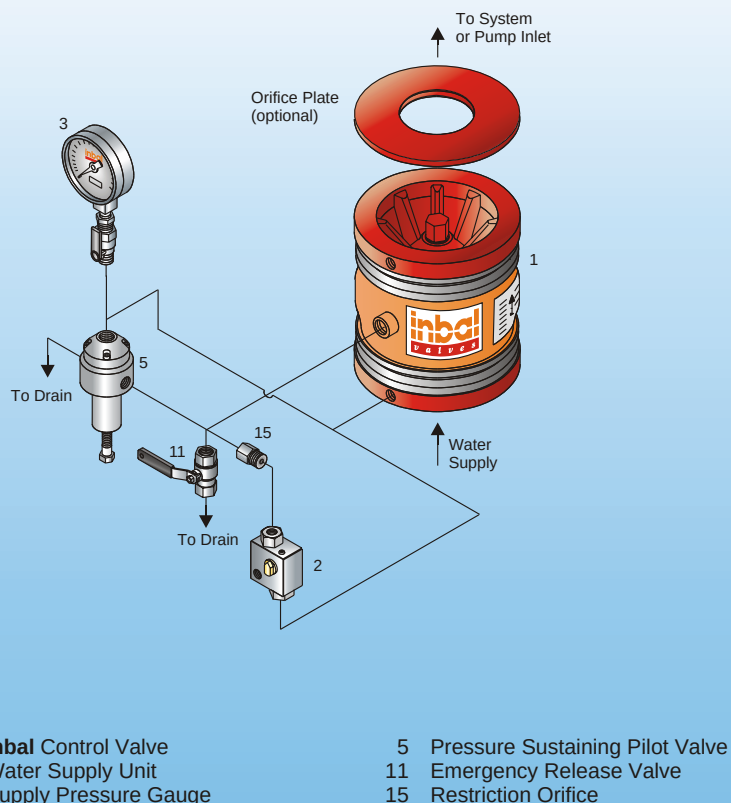
The control trim includes Pilot Valve, accessories, gauges, fittings, and tubing. The control trim is supplied preassembled in sections. The system is fully hydraulically tested and set, on standard (unless otherwise required), to 150 psi (10 bar). The control trim includes the following components:

- Pressure Relief / Sustaining Pilot Valve.
- Water Supply Unit.
- Restriction Orifice Emergency.
- Emergency Release Valve.
- Pressure Gauge and Pressure Gauge Valve.

## Valve Sizing

To extend the life span of the **Inbal** Pressure Relief / Sustaining Valve, it is recommended to calculate cavitation conditions at the given outlet / inlet pressure ratio. Refer to the **Inbal** Valve Sizing bulletin F50-01-01.

## Schematic Control Diagrams – 700D- 01S03



## Capacity Chart

| Inbal Valve Size<br>(Inch) (mm) |     | Maximum Intermittent Flow Rate |                     |
|---------------------------------|-----|--------------------------------|---------------------|
|                                 |     | (gpm)                          | (m <sup>3</sup> /h) |
| 1½"                             | 40  | 200                            | 45                  |
| 2"                              | 50  | 310                            | 70                  |
| 2½"                             | 65  | 530                            | 120                 |
| 3"                              | 80  | 700                            | 160                 |
| 4"                              | 100 | 1250                           | 285                 |
| 6"                              | 150 | 2800                           | 640                 |
| 8"                              | 200 | 5000                           | 1135                |
| 10"                             | 250 | 7700                           | 1750                |
| 12"                             | 300 | 11200                          | 2550                |

## Installation

Refer to the Trim Chart applicable to the **Inbal** Pressure Sustaining Valve model in use. The valve must be installed in an area not subject to freezing temperatures or physical damage. The **Inbal** Valve series 700D-01S03 can be installed horizontally or vertically.

1. When the **Inbal** Pressure Sustaining Valve is delivered, carefully unpack and check that there has been no damage to the operating components, piping, and fittings.
2. Verify that the factory presetting is correct or alternatively that the spring type is within the desired pressure setting (see Adjustment Range in Technical Data).
3. Always flush the pipeline before installing the **Inbal** Valve.
4. Place the **Inbal** Valve in the piping. Verify that the arrow on the **Inbal** Pressure Sustaining Valve matches

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the actual flow direction. Determine which side the system will be accessed from and locate the **Inbal Valve** on the piping system accordingly.

5. Install the **Inbal Pressure Sustaining Valve** in the pipeline. Use tape, gaskets, bolts, stud bolts, bolt sleeves, and nuts as required by the valve ends.
6. Complete the trim assembly by mounting the preassembled sections. Refer to the applicable Trim Chart and Installation Guide.
7. Connect the drain port of the Pressure Relief / Sustaining Pilot Valve to the drainage system.
8. Open the shutoff valve. To ensure smooth operation, all air must be expelled from the **Inbal Valve Control Chamber and Pilot Control System**.
9. Operate the system to establish the minimum flow. Check the Supply Pressure Gauge reading. If adjustment is required, see (3) in Resetting.
10. Test the **Inbal Pressure Sustaining Valve** according to the Testing procedure.

## Resetting

1. In a normal course of operation, the **Inbal Pressure Sustaining Valve** is automatically reset after operation.
2. If the **Inbal Valve** was actuated by the Emergency Release Valve, the handle of the L-port ball valve should be returned to the SET position.
3. If the inlet pressure should be adjusted, turn the Pilot Valve adjusting screw clockwise to increase and counter-clockwise to decrease the pressure setting. The adjustment is recommended at a minimum flow velocity of 1.5 ft/sec (0.5 m/sec).

## Maintenance, Inspection, & Testing

It is recommended that periodic inspections and tests be conducted by qualified personnel to ensure that the **Inbal Pressure Sustaining Valve** is in good operating condition. The inspections and testing activities should be done according to NFPA standards, the guidelines and regulations of the authorities having jurisdiction, and the following instructions. It is recommended that the **Inbal Pressure Sustaining Valve** be tested, operated, cleaned, and inspected at least on a routine basis.

### Inspection

A *monthly* Inspection is recommended:

1. Check the Supply Pressure Gauge reading.
2. Verify that the Emergency Release Valve is in SET position.
3. Verify that the Shutoff Valve device in the Water Supply Unit is in SET position.
4. Verify that the Pilot Valve and the **Inbal Valve** are tightly closed.
5. Visually inspect for broken or missing parts or other evidence of impaired protection.

### Strainer Cleaning

A *quarterly* Strainer Cleaning is recommended:

1. Close the Shutoff Valve device in the Water Supply Unit by turning the Rotor to MAINTENANCE position.
2. Remove the cover of the strainer device in the Water Supply Unit, clean if necessary. Reinstall the screen and the cover.
3. Open the Shutoff Valve device by returning the Rotor to SET position.

## Pressure Relief Valve Testing

An *annual* Pressure Sustaining Valve Testing is recommended. The Testing should be combined with the periodical testing of the whole system:

1. Operate the Fire Pump. Verify that all the system are closed and that there is no demand at the **Inbal Pressure Sustaining Valve** inlet piping. Thus, all the pump capacity is dedicated to the Pressure Sustaining consumption.
2. Establish a demand in any of the system at the **Inbal Pressure Sustaining Valve** outlet piping.
3. The **Inbal Pressure Sustaining Valve** should open while maintaining the preset inlet pressure.
4. Check the Supply Pressure Gauge reading. Verify that the upstream pressure is as predetermined.
5. Record the actual flow rate and upstream pressure.

## Pilot Valve Testing

Operation of the **Inbal Pilot Valve** should be done *quarterly*.

If operation of the whole system is not feasible, then an individual Pilot Valve Testing should be performed.

Testing of the Pilot Valve should be done according to the instructions in bulletin F36-03-01 - "Pressure Sustaining Pilot Valve models PA2 and PB2".

## Removal

To remove the **Inbal Pressure Sustaining Valve**:

1. Close the Water Supply Valve.
2. Close the Shutoff Valve device in the Water Supply Unit (turn the Rotor to MAINTENANCE position).
3. Open the Emergency Release Valve to release the water pressure from the **Inbal Valve Control Chamber**.
4. Remove the **Inbal Pressure Sustaining Valve** from the line for inspection.
5. To reinstall, follow the installation procedure (use new gaskets for flanged or wafer valve).

## Inquiries/Orders

The Data Sheet For Inquiries/Orders (bulletin F01-05-01) should be submitted.