

## Reliance Series Safety Valves

High-value, self-equalizing, metal-seal-body-joint rod piston flapper valve with working pressures to 5,000 psi [34.5 MPa]

### APPLICATIONS

- Sweet to moderately corrosive applications from 40 degF to 300 degF [4 degC to 149 degC]

### BENEFITS

- Equalizes the valve without compromising reliability
- Allows fewer potential leak paths
- Reduces problems associated with solids and scale deposition
- Provides a simple lock-out procedure, with or without secondary communication

### FEATURES

- Inconel® 718 flapper and seat with full metal-to-metal sealing and flapper-mounted, dart-based, self-equalizing system
- Compact design
- Minimum number of seals
- Optimal geometry and clearance between sliding components
- Metal-seal communication and lockout mechanism
- Designed and tested to API and ISO criteria

Reliance\* tubing-retrievable subsurface safety valves are engineered to provide industry-leading reliability at a high level of value. The Reliance design features rod piston operation, Cam-P\* body joints, the rugged Camco\* flapper-and-seat design, and self-equalizing and reliable lock-open systems. This design maximizes long-term performance and reduces potential leak paths.

The versatile Reliance safety valves are available in a range of sizes, nipple profiles, and tubing connections.

Reliance valves are operated by a single-rod piston with a premium sealing system. Two proprietary Cam-P body joints are employed for increased reliability. The premium flapper mechanism in the Reliance valve also has full metal-to-metal sealing plus a secondary soft seat, and it meets a leakage-acceptance criterion that is substantially more stringent than API and ISO specifications.

Designed with a flapper lock-open system and an all-metal communication system for secondary valve installation, the Reliance safety valve includes a tested and proven inverted dual-ferrule control line connection for maximum reliability.

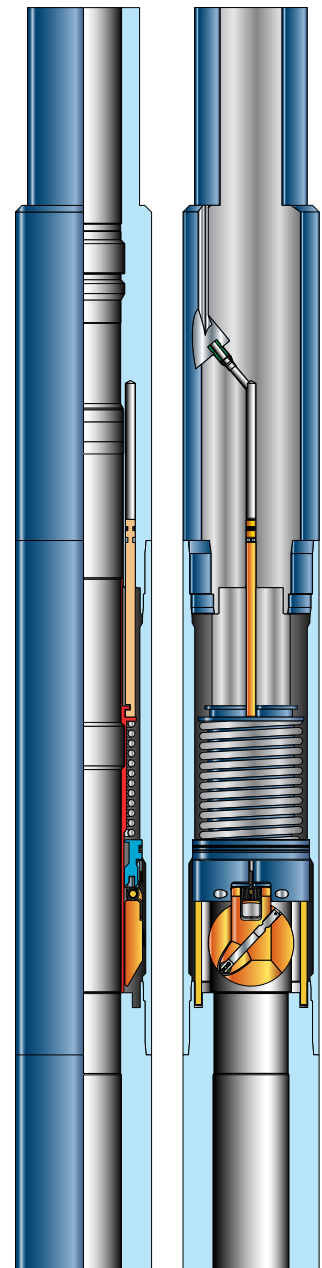
Reliance valves are available with working pressure ratings to 5,000 psi [34.5 MPa] and setting depths to 1,500 ft [457 m].

### Internal equalizing feature

The Reliance flapper-mounted equalizing system is an industry-recognized, proven method of equalizing the pressure across the flapper. The integral ports in the dart provide a dedicated flow path for the wellbore fluid. For wear resistance, Schlumberger manufactures the equalizing system components from erosion-resistant materials and coatings. This design has been rigorously tested with sand slurry to ensure a lifetime of operation, whatever the well conditions.

### Valve operation

The Reliance series safety valves are normally closed. They are opened by applying hydraulic pressure through a control line that extends from the safety valve through the wellhead to the control panel. Hydraulic pressure applied from the surface control panel pushes the rod piston and the flow tube down.



Reliance series safety valve.

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This downward force compresses the power spring, moves the flapper off seat, and continues until the valve is in the fully open position. When the hydraulic control line pressure is released, the power spring lifts the flow tube and the rod piston up. This upward movement permits the torsion spring on the hinged flapper to move the flapper into the flow stream, close against the flapper seat, and shut in flow from the well.

## Lockout operation

A unique lockout mechanism enables a simple slickline procedure to permanently lock the valve open and separately initiate secondary hydraulic communication. The lockout tool permanently deforms the flow tube in a specifically designed area, preventing the valve from closing. A further slickline operation punctures the piston bore to establish hydraulic communication to the valve ID if a secondary valve is required. A slickline safety valve can then be installed.

## Equalizing operation

To open the Reliance valve with pressure below the flapper, the application of increased wellbore pressure from above is preferred until the pressure level across the flapper is minimal; hydraulic pressure is then applied to the actuating piston. The pressure causes the flow tube to move downward and land on the flapper-mounted dart. This pressure opens the equalizing system. Wellbore fluid travels through the port in the equalizing dart and into the bore of the valve above the flapper. The pressure above the flapper increases until it equals the pressure below the flapper. When the pressure is equalized, the flow tube continues to move down to the fully open position and shields the closure and equalizing mechanism.

If equalization is not possible by increasing wellbore pressure, then the safety valve may be completely equalized through the equalizing system.

## Reliance Series Safety Valves Specifications

Tubing Size, <sup>†</sup> in [mm]	Valve Type	Max OD, in [mm]	Nipple Bore, in [mm]	Working Pressure, psi [MPa]	Tensile Strength, <sup>‡</sup> lbf [kg]
2.875 [73.0]	Reliance-5E	4.609 [117.1]	2.312 [58.7]	5,000 [34.5]	184,000 [83,444]
3.500 [88.9]	Reliance-5E	5.176 [131.5]	2.812 [71.4]	5,000 [34.5]	261,000 [118,365]
4.500 [114.3]	Reliance-5E	6.923 [175.8]	3.813 [96.9]	5,000 [34.5]	413,000 [187,300]

<sup>†</sup> Additional sizes and pressure ratings are available on special order.

<sup>‡</sup> Tensile ratings are given for specific example valves. Tensile ratings shown are exclusive of end connection and at ambient temperature.

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