Schlumberger

TRM-4P-DS and -4HP-DS Series Safety Valves

APPLICATION

- Sweet to severely corrosive applications from 40 degF to 300 degF [4 degC to 149 degC] at depths exceeding 7,500 ft [2,286 m]

BENEFITS

- Eliminates piston side loading and increases reliability and durability.
- Prevents torsional loading from the power spring being transmitted to the flow tube.
- Protects the hydraulic piston bore and increases reliability.
- Allows fewer potential leak paths.
- Has high hydraulic system pressure rating (15,000-psi [103,421-kPa] piston seals)
- Reduces operating friction and resists corrosive chemicals to provide safe, long-term operation.
- Reduces solids and scale-deposition problems.
- Provides a simple slickline lockout procedure, with or without secondary communication.

FEATURES

- Full metal-to-metal Inconel® flapper mechanism
- Flow tube antirotational key
- Static non-elastomeric operating piston seat in full-open position
- Minimum number of seals
- Metal-seal body joints and static operating piston seal in full-closed position
- Optimal geometry and clearance between sliding components
- Metal-seal communication and lockout mechanism

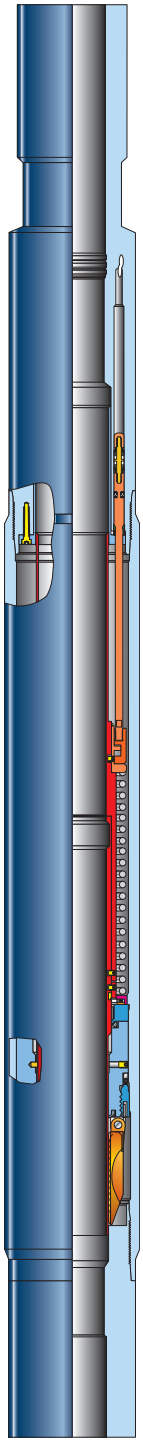
General service, deepset, premium rod piston, metal-seal body joints, flapper valve with working pressures to 10,000 psi [68,950 kPa]

The Camco* TRM-4P-DS tubing-retrievable, surface-controlled, subsurface safety valves are engineered to provide long-lasting, safe, and reliable operation. Their compact design incorporates the best of the unsurpassed, field-proven Schlumberger technologies. The TRM-4P-DS series features rod piston actuation, metal-to-metal seal body joints, a rugged flapper-closure mechanism, and a minimum number of critical seals to ensure maximum reliability.

All TRM-4P-DS series valves use a single rod piston with reliable spring-energized, filled Teflon sealing elements; a static, full-closed, metal-to-metal seal; and a static, fully open seal and centralizing system. For maximum reliability, all TRM-4P-DS valves have only two body joints and use proprietary Cam-P threads to achieve a reliable, metal-to-metal seal. The premium flapper mechanism in the TRM-4P-DS 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.

The modular design of the TRM-4P-DS series allows for a maximum number of material and design options, including a wide range of nipple profiles, to cost effectively fit specific applications and operating environments. TRM-4P-DS valves are available with working pressure ratings to 10,000 psi [68,950 kPa] and setting depths exceeding 7,500 ft [2,286 m].

Schlumberger offers a special optional ScaleGard* surface treatment on selected internal surfaces that minimizes solids buildup caused by produced fluids.



TRM-4P-DS safety valve.

TRM-4P-DS and -4HP-DS Series Safety Valves

TRM-4P-DS DEEPSET VALVE SYSTEM

The TRM-4P-DS deepset systems decrease the torsional loading normally found in deepset valve power springs. They use a specially designed flow tube with an indexing key connected to the seat assembly to prevent the rotation of the flow tube. TRM-4P-DS valves minimize the side loading of the operating piston to ensure reliable operations in critical applications. Counter-wound power springs prevent torsional loading from being transmitted to the flow tube. Schlumberger can also customize a TRM-4P-DS valve to meet specific requirements.

PREMIUM PISTON-SEALING SYSTEM

The rod piston within the valve's chamber housing, consists of a stepped OD and a compliant downstop of a polyetheretherketone polymer. As the operating piston reaches full open, it contacts the static full-open seal and protects the dynamic operating piston from produced fluids. The polymer sealing element provides a compliant sealing surface to avoid incomplete sealing caused by particulate matter. All of the premium piston system components are manufactured from wear-resistant materials for maximum durability.

VALVE OPERATION

The TRM-4P-DS 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 forces the rod piston and flow tube down. This downward force compresses the power spring, moves the flapper off seat, and continues until the valve is in the fully open position. When fully open, the flapper and seat system are isolated from production flow, thereby preventing contamination. When the hydraulic control line pressure is released, the power spring lifts the flow tube and the rod piston. 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 off flow from the well.

LOCKOUT OPERATION

A unique lockout mechanism enables a simple slickline procedure to permanently lock the valve open and initiate secondary hydraulic communication. A lockout sleeve located above the flow tube is shifted downward. This downward movement parts the shear plug, engages the lockout rod, and permanently locks the safety valve open while establishing hydraulic communication to the valve ID. A secondary valve can then be installed in the TRM-4P-DS valve. A second lockout option allows the valve to be locked open without activating secondary hydraulic communication.

Engineering Data for TRM-4P-DS and TRM-4HP-DS Series Safety Valves

Tubing Size† (in [mm])	Valve Type	Max. OD (in [mm])	Nipple Bore (in [mm])	Working Pressure (psi [kPa])	Tensile Strength‡ (lbf [kg])
3.500 [88.9]	TRM-4HP-DS	5.578 [141.7]	2.812 [71.4]	5,000 [34,475]	263,395 [119,449.6]
		5.780 [146.8]		10,000 [68,950]	279,800 [126,889.3]
4.500 [114.3]	TRM-4P-DS	7.350 [186.7]	3.812 [96.8]	5,000 [34,475]	495,000 [224,482.5]
	TRM-4HP-DS	7.923 [201.2]		10,000 [34,475]	495,833 [224,860.3]
5.500 [139.7]		6.923 [175.8]	3.750 [95.3]	7,500 [34,475]	617,000 [279,809.5]
	TRM-4P-DS	8.025 [203.8]	4.625 [117.5]	5,000 [34,475]	678,000 [307,473.0]
		8.071 [205.0]	4.562 [115.9]		755,272 [342,515.9]

† The engineering data provided illustrate the scope of this product offering but are not all inclusive. Additional sizes and pressure ratings are available upon request.

‡ Tensile ratings are given for specific example valves; higher-strength materials affect this value. Tensile ratings shown are exclusive of end connection (EOEC) and at ambient temperature.

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