

TRMAXX Series Safety Valves

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

APPLICATION

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

BENEFITS

- Equalizes the valve without compromising reliability
- Protects the hydraulic piston bore and increases reliability
- Allows fewer potential leak paths
- Reduces operating friction and resists corrosive chemicals to provide safe, long-term operation
- Reduces solids and scale-deposition problems
- Provides a simple slickline procedure, with or without secondary communication

FEATURES

- Inconel® 718 flapper and all metal-to-metal sealing, with flapper-mounted, dart-based equalizing system
- A static operating piston seal
- Minimum number of seals
- Metal-seal body joints and a static operating piston seal
- Rod piston hydraulic seals
- High hydraulic system pressure rating—15,000 psi [103,421 MPa]
- Optimal geometry and clearance between sliding components
- Metal-seal communication and lockout mechanism

The TRMAXX* tubing-retrievable, surface-controlled, subsurface safety valves are engineered to provide remarkable versatility and reliability. This compact design incorporates the best of the unsurpassed, field-proven Schlumberger technologies. The TRMAXX series features rod piston actuation; metal-to-metal seal body joints; a rugged flapper-closure mechanism; and a minimum number of critical, static, and dynamic seals to ensure maximum reliability.

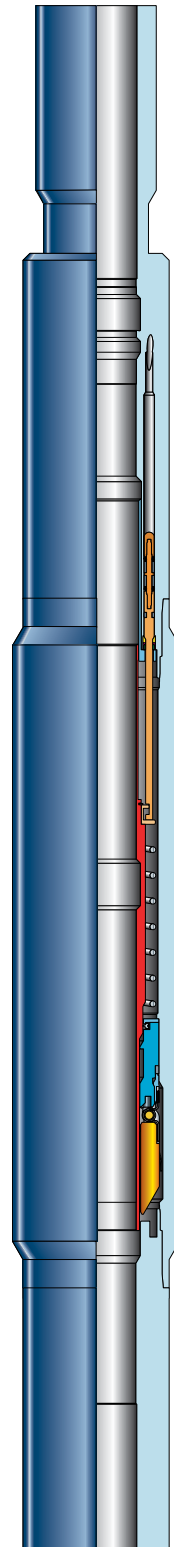
TRMAXX series valves use a single-rod piston with reliable spring-energized, filled Teflon® sealing elements; a static, full-closed, metal-to-metal seal; and a static, fully open seal and centralizing system. For maximum reliability, all TRMAXX valves have only two body joints and use proprietary Cam-P* threads to achieve a reliable, metal-to-metal seal. The premium flapper mechanism in the TRMAXX 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 TRMAXX series allows for a maximum number of material and design options, including a wide range of upper nipple profiles, to cost effectively fit specific applications and operating environments. TRMAXX valves are available with working pressure ratings to 10,000 psi [68,950 kPa] and setting depths to 5,000 ft [1,524 m].

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

INTERNAL EQUALIZING FEATURE

The TRMAXX flapper-mounted equalizing system is an industry-recognized, proven method of equalizing the pressure across the flapper. The 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 reliable operation, whatever the well conditions.



TRMAXX safety valve.

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PREMIUM PISTON SEALING SYSTEM

The rod piston within the valve's hydraulic 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 TRMAXX 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 moves the rod piston and flow tube down. This downward movement 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 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 out the valve and initiate secondary hydraulic communication. The lockout tool permanently deforms the flow tube in specifically designed areas to prevent the valve from closing, and permanently locks the safety valve open. If a secondary valve is required, a further slickline operation locates a sleeve above the flow tube and shifts it downward. This downward movement parts the shear plug, establishing hydraulic communication to the valve ID. A slickline safety valve can then be installed in the TRMAXX valve.

EQUALIZING OPERATION

To open the TRMAXX valve with pressure below the flapper, hydraulic pressure is applied to the actuating piston. The pressure causes the flow tube to move downward and land on the flapper-mounted dart; this surface contact in turn opens the equalizing system. The 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.

Specifications

Tubing Size [†] (in. [mm])	Valve Type	Max OD (in. [mm])	Nipple Bore (in. [mm])	Working Pressure (psi [kPa])	Tensile Strength [‡] (lbf [kg])
2.375 [60.3]	TRMAXX-5E	3.640 [92.5]	1.875 [47.6]	5,000 [34,475]	108,000 [48,978]
	TRMAXX-10E	4.124 [104.7]	1.812 [46.0]	10,000 [68,950]	133,000 [60,315]
2.875 [73.0]	TRMAXX-5E	4.609 [117.1]	2.312 [58.7]	5,000 [34,475]	184,000 [83,444]
	TRMAXX-10E	5.166 [131.2]		10,000 [68,950]	222,000 [100,677]
3.500 [88.9]	TRMAXX-5E	5.176 [131.5]	2.812 [71.4]	5,000 [34,475]	261,000 [118,363]
	TRMAXX-10E	5.916 [150.3]		10,000 [68,950]	263,637 [119,559]
4.500 [114.3]	TRMAXX-5E	6.923 [175.8]	3.812 [96.9]	5,000 [34,475]	413,000 [187,295]
	TRMAXX-10E	7.500 [190.5]		10,000 [68,950]	495,833 [224,860]
5.500 [129.7]	TRMAXX-5E	8.226 [208.9]	4.562 [115.9]	5,000 [34,475]	466,000 [211,331]
	TRMAXX-10E	9.415 [239.1]		10,000 [68,950]	833,691 [378,078]

[†] 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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