

# TRTO Series Injection Safety Valves

Tubing-pressure-operated, rod piston, metal-seal body joint, flapper valves with working pressures to 7,500 psi [51,713 kPa]

## APPLICATION

- Injection in sweet to moderately corrosive environments with temperatures from 40 degF to 300 degF [4 degC to 149 degC]

## BENEFITS

- No requirement to run control line or have a surface hydraulic control system
- Smooth and reliable operation
- Minimal debris entering the valve's piston bore
- Cost effective and easy to run
- Increased injection rates at low-pressure differentials
- Reduced problems with solids and scale deposits

## FEATURES

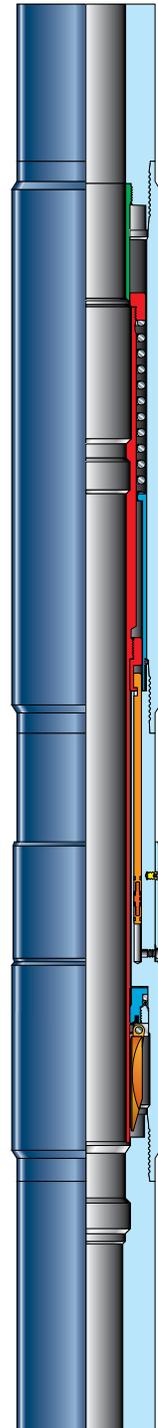
- Spring performance and rod-piston actuation
- Filter sleeve to protect the annulus port
- Compact design
- A large, full valve bore
- Optimal geometry and clearance between sliding components

The Camco\* TRTO series tubing-retrievable subsurface injection valves are used in gas or water injection applications where a hydraulic control system is not available. Value engineered to provide exceptional service and versatility, the TRTO series incorporates the best of the unsurpassed and field-proven Schlumberger technologies: a rod piston actuator, metal-to-metal seal body joints, a rugged flapper-closure system, and a minimum number of critical seals for maximum performance and reliability. The modular design of the TRTO series ensures a wide range of material and design features to fit specific applications.

The TRTO series valves are full-tubing-bore, spring-operated, rod-piston-actuated injection valves. They feature a specially designed debris barrier cover that is positioned to fully encompass the annulus pressure port and minimize debris intrusion into the operating piston area. TRTO valves have only three body joints and use the proprietary Cam-P joint connections for maximum reliability. The single-rod piston incorporates reliable sealing elements for unrivaled performance, and the flapper mechanism has full metal-to-metal sealing with a secondary soft seat. All TRTO injection valves undergo stringent quality control procedures to meet a leakage-acceptance criterion substantially more stringent than API and ISO specifications.

## APPLICATION

The TRTO valve is designed for injection applications in standard to corrosive environments with temperatures ranging from 40 degF to 300 degF [4 degC to 149 degC]. Schlumberger can also provide a special ScaleGard\* surface treatment on the internal surfaces to minimize solids accumulations. This coating is especially effective in hostile environments with high temperatures where severe scaling occurs.



TRTO-1 injection valve.

# TRTO Series Injection Safety Valves

## VALVE OPERATION

To open the TRTO series injection valves, injection pressure is applied down the tubing. To activate the single-rod piston, the tubing pressure must exceed the casing annulus pressure and overcome the predetermined force exerted by the spring holding the valve closed. With minimal friction, the rod piston assembly will then move the flow tube down, which opens the flapper mechanism and the valve.

When the differential pressure from the tubing to the annulus at valve depth decreases to a predetermined pressure, the spring forces the rod piston and the flow tube upward and allows the valve to close.

## LOCKOUT OPERATION

A TRTO injection valve can be temporarily locked open by installing a hold-open sleeve using standard slickline procedures. Due to the customized nature of the TRTO injection valve, Schlumberger recommends contacting the field service department to define the lockout procedures for a specific application.

### Engineering Data for TRTO-1 Injection Valves

Tubing Size <sup>†</sup> (in [mm])	Valve Type	Max. OD (in [mm])	Nipple Bore (in [mm])	Working Pressure (psi [kPa])	Tensile Strength <sup>‡</sup> (lbf [kg])
2.875 [73.0]	TRTO-1	4.653 [118.2]	1.406 [35.7]	6,000 [41,370]	1998,975 [90,235.2]
4.500 [114.3]		7.425 [188.6]	3.563 [90.5]	7,500 [51,713]	495,000 [224,482.5]
4.500 × 5.500 [114.3 × 139.7]					

<sup>†</sup> 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.

<sup>‡</sup> 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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