

# TRFC-HD

## Dual-line multiposition flow control valve



Reservoir pressure up to 15,000 psi [103 MPa]



Rated up to 325 degF [163 degC]

### APPLICATIONS

- Multizone intelligent completions
- Commingled-flow completions
- Auto (natural) gas-lift wells
- Well environments with scale deposition, severe erosion, or high temperature conditions

### BENEFITS

- Maximize production by
  - reducing unwanted water and gas
  - increasing reservoir understanding through periodic zonal tests
- Eliminate costs and risks of well interventions

### FEATURES

- Simple, reliable J-slot indexer controlling valve movement
- Protector sleeve that prevents damage to choke seals in all open positions
- Integral shifting profile for mechanical override
- Capability of being opened or closed under very high differential pressures
- Compatibility with oil- and water-based control line fluids
- Injection valve flow ports eccentrically aligned to minimize casing erosion
- Balanced piston choking valve
- Ability to be multidropped using the mini-indexer module
- Availability in 3½-in (slim), 3½-in, and 4½-in sizes
- Well barrier qualified with downhole instrumentation and control system (DIACS) testing

TRFC-HD dual-line multiposition flow control valve provides surface-actuated downhole control of oil and gas production and injection for intelligent completion systems. Using multiple TRFC-HD valves provides a reliable completion system for selectively controlling a reservoir. The valves are manufactured in a variety of materials to suit a wide range of oil, water, and gas applications, including high-flow-rate production and injection wells with multizone or commingled-flow completions and natural gas lift completions. The rugged design makes the valve suitable for severe environments with scale deposits, erosion, and other demanding conditions.

### Operation

TRFC-HD valves have two hydraulic control lines operated at the surface to activate the downhole choke section. Applying hydraulic differential pressure between the two control lines actuates the valve. In multiple-valve completions, one line is dedicated to each valve, and a common close line is shared with other TRFC-HD valves in the well. Setting depths are almost unrestricted because of the fully balanced piston design. This design is simple and reliable because there is no control line hydrostatic head to consider or counteract.

### Valve types

Two versions of the TRFC-HD valve are available: the annular valve and the inline valve. The annular valve controls flow between the annulus and tubing. The inline valve controls flow from a lower zone within the same tubing string by the use of a shroud and retrievable plug design. In production applications, the plug is located immediately below the choke section, and the flow is diverted into the shroud before it enters through the choke. In injection applications, because the flow path is reversed, the plug is located immediately above the choke section and the flow is again diverted into the shroud before it enters the choke.

### Multiposition valve

The TRFC-HD valve features eight positions in its standard configuration, including fully open, fully closed, and six intermediate choking positions. It is easily adapted to specific reservoir needs because the choke area at each position can be customized and the indexer can be configured to enable a different number of positions. The choke is designed to ensure that well-defined flow characteristics for the various choke positions are achieved with minimal erosion at high differential pressures. The choke position is controlled by a specially designed J-slot indexer that allows flow through the choke in each position, allowing for precise flow regulation and control. An internal collet mechanism secures the choke in the desired position, ensuring that a system vibration or an imbalance in the hydraulic lines does not move the choke accidentally.



TRFC-HD flow control valve.

## Seal protection

A protective sleeve keeps the choke seals from being exposed to flow during actuation and operation, thereby preventing damage by erosive fluids at high differential pressures.

## Control line bypass

The TRFC-HD valve uses field-proven pressure-tested control line connections. It can bypass four 0.433-in [11-mm] encapsulated control lines or six bare 0.250-in [6.35-mm] control lines, ensuring a high degree of compatibility with hydraulic and electric systems in any completion design.

## Mechanical override feature

The TRFC-HD valve is not hydraulically locked and as a contingency measure can be mechanically shifted by means of an integral shifting profile in the valve.

## Compatibility with monitoring systems

Either WellWatcher\* permanent monitoring systems or Metris\* permanent monitoring systems can be used in conjunction with TRFC-HD valves to monitor downhole pressure and temperature and to allow a better understanding and more precise control of a reservoir in real time.

### TRFC-HD Flow Control Valve Specifications

Annular Valve	3½ in	4½ in
Max. OD, in [mm]	5.844 [148.438]	8.01 [203.454]
Min. ID, in [mm]	2.812 [71.425]	3.79 [96.266]
Drift ID, in [mm]	2.797 [71.044]	3.775 [95.885]
Eccentricity, in [mm]	0.250 [6.350]	na <sup>†</sup>
Overall length, in [mm]	139 [3,531]	143 [3,632]
Max. flow rate, bbl/d [m <sup>3</sup> /d]	40,000 [6,360]	50,000 [7,949]
Max. flow area, % of tubing area	125	113
Working pressures, psi [kPa]	6,500 [44,815], 7,500 [51,710], or 10,000 [68,946], depending on material	7,500 [51,710]
Max. equalization differential pressure, psi [kPa]	3,000 [20,684]	1,500 [10,342]
Max. continuous differential pressure, psi [kPa]	1,500 [10,342]	1,500 [10,342]
Max. reservoir pressure, psi [kPa]	7,500 [51,710]	15,000 [103,420]
Operating temperature rating, degF [degC]	40–200 [4–93] or 68–325 [20–163], depending on temperature range required	50–260 [10–127]
Min. storage temperature, degF [degC]	–40 [–40]	–40 [–40]

<sup>†</sup> Not applicable

Inline Valve	3½ in	4½ in
Max. OD, in [mm]	7.900 [200.660]	8.25 [209.55]
Min. ID, in [mm]	2.812 [71.425]	3.790 [96.27]
Drift ID, in [mm]	2.797 [71.044]	3.750 [95.25]
Overall length, in [mm]	170 [4,318]	143 [3,632]
Max. flow rate, bbl/d [m <sup>3</sup> /d]	40,000 [6,360]	45,000 [7,155]

### TRFC-HD Flow Control Valve System Specifications

Max. number of tool positions	8 (open, closed, and 6 choking positions)
Actuator principle	Balanced dual hydraulic lines to surface
Control line bypasses	Four 0.433-in [11.0-mm] encapsulated control lines or six bare 0.250-in [6.35-mm] control lines
Control line fitting type	Inverted dual ferrule connector (optional hydraulic dry-mate connector)

### Materials

Material specification	NACE MR0175
Seal material	Teflon®, Chemraz®, PEEK®
Control line fluid compatibility	Oil or water based