

# Integrity

## Injection subsurface safety valve

### APPLICATIONS

- Sweet to moderately corrosive environments
- Temperatures from 40 to 300 degF [4 to 149 degC]
- Water and gas injection wells
- Wells with high flow rates
- Working pressures to 10,000 psi [68,950 kPa]
- Unlimited setting depths

### BENEFITS

- Increases flow path because of large-bore design
- Enhances reliability by
  - minimizing potential leak paths
  - reducing solids and scale deposition
  - minimizing the number of seals
  - optimizing flow path and clearance between sliding components

### FEATURES

- Temporary lockout mechanism
- Retrievable choke mechanism for adjusting orifice sizes
- Cost-effective, compact modular design
- Specifications more stringent than those of API or ISO
- Metal-to-metal seals with proprietary locking and sealing threads
- Minimized number of seals
- Optimal geometry and clearance between sliding components
- No surface control required
- Multiple material and design options

The Integrity\* injection subsurface safety valve is a tubing-retrievable, subsurface-controlled valve engineered to prevent injection wells from flowing back or blowing out if surface controls malfunction or become damaged. The valve maintains reservoir pressure as hydrocarbons are extracted.

This compact, modular safety valve is designed to open at predetermined injection flow rates. Its larger inner diameter allows increased flow without the need for a separate control mechanism, making the valve especially attractive for water-injection applications.

The valve has an unlimited setting depth and with proper material choices is suitable for use in severely corrosive environments. It operates in pressures up to 10,000 psi [68,950 kPa] and temperatures from 40 to 300 degF [4 to 149 degC].

The large-bore design optimizes the flow path. An easily replaced orifice and through-tubing integral choke allow the valve to operate effectively within a wide range of injection rates up to 100,000 bbl/d [15,899 m<sup>3</sup>/d].

### Design ensures maximum reliability

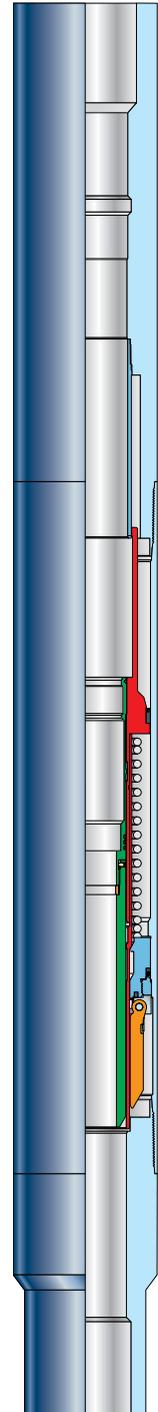
The Integrity safety valve incorporates the best of laboratory- and field-proven Schlumberger technologies and is engineered for maximum reliability. It has only two body joints and uses proprietary locking and sealing threads to achieve a reliable metal-to-metal seal. The flapper closure system has metal-to-metal sealing, plus a secondary soft seat that meets a leakage-acceptance criterion substantially more stringent than API and ISO specifications for large injection valves.

### Modular design accommodates multiple options

The valve's modular design offers numerous material and design options, including a wide range of upper nipple profiles, to cost-effectively fit specific applications and operating environments. The design allows for unlimited setting depths and changes in injection flow rates. An optional coating is available for selected internal surfaces to minimize solids buildup caused by injected fluids.

### Fluid-injection creates pressure drop to open valve

The Integrity safety valve, initially closed, is operated by injection flow, which generates a pressure drop across the orifice in the retrievable choke mechanism. This differential pressure acts on the piston area of the flow tube, causing it to move downward and compressing the power spring to open the valve. In the open position, the flapper and seat system are isolated from the injection flow. When the fluid injection stops, the pressure differential across the orifice decreases and the force of the power spring lifts the flow tube. 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 prevent the injected fluid from flowing back from the well.



*Integrity injection subsurface safety valve.*

## Temporary lockout shifts valve open

A lockout mechanism enables a simple slickline procedure to temporarily shift the valve into the fully open position. The lockout tool locates in the landing nipple profile and positions a set of shifting dogs in a specifically designed area of the lower flow tube. Activation of the temporary lockout tool shifts the lower flow tube downward and away from the upper flow tube, moving the flapper closure mechanism out of the bore of the valve.

## Permanent lockout locks valve open

A simple slickline procedure permanently locks out the valve. The lockout tool permanently deforms the flow tube in a specifically designed area to prevent the valve from closing and to permanently lock it open. If a secondary valve is required, an additional operation allows for the installation of a slickline-retrievable injection valve in the integral landing nipple profile.

## Orifice size change increases pressure to activate valve

The orifice size is selected to ensure that the differential pressure created by the injection fluid creates enough force to operate the valve. The orifice, contained in the choke assembly, is secured in a section of the flow tube. If the orifice size needs to be altered because of an injection flow rate change, the choke assembly can be easily retrieved by using a simple slickline procedure, allowing for the installation of the correct orifice in the choke assembly and reinstallation in the Integrity safety valve.

### Integrity Subsurface Safety Valve Specifications<sup>†</sup>

Tubing Size, in [mm]	Max. OD, in [mm]	Nipple Bore, in [mm]	Working Pressure, psi [kPa]	Tensile Strength, <sup>‡</sup> lbf [N]
4.500 [114.3]	6.768 [171.9]	3.812 [96.8]	5,000 [34,474]	385,855 [175,020]
5.500 [139.7]	8.012 [203.5]	4.625 [117.5]	6,500 [44,816]	612,022 [277,608]
7.000 [177.8]	8.486 [215.5]	6.000 [152.4]	5,000 [34,474]	676,000 [306,628]

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

<sup>‡</sup> Tensile ratings are given for specific example valves. Higher-strength materials affect these values. Tensile ratings shown are exclusive of end connection and are rated at ambient temperatures.