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Isolation Barrier Valves



Introduction

For completions requiring effective flow control and wellbore isolation, Halliburton offers a suite of reliable, testable isolation barrier valves to simplify completion programs.

The FS and IB valves provide simple and effective methods of isolating the reservoir and lower completion. Both valves allow unlimited mechanical operation, while the FS valve incorporates interventionless technology to facilitate remote opening. The LV and eMotion®-LV valves provide a fully testable downhole barrier in the upper completion to facilitate equipment deployment operations and also to act as a shallow-set barrier to facilitate safe offline subsea completion installation operations.

Halliburton has barrier valves that provide bi-directional pressure-holding capabilities. This allows complete

formation isolation to increase well completion options and improve efficiencies for a wide range of applications:

- » Fluid loss control
- » Well suspension device
- » Subsea tree deployment using intervention vessels
- » Underbalanced perforating
- » Extended well control barrier operations
 - Increased lubricator length
- » Opening in high overbalanced conditions
 - Multizone isolation

Dedicated manufacturing cells allow Halliburton to supply isolation barrier valves to the highest standard of quality, while meeting urgent, short lead-time delivery requirements.

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Completion Tools

FS2 Fluid Loss Isolation Barrier Valve

For efficient asset management, the Halliburton FS2 fluid loss isolation barrier valve provides a reliable, interventionless solution for fluid loss control during well completion operations, thus eliminating potential formation damage.

The FS2 valve isolates the formation below the uppermost gravel pack packer before the upper completion is installed. It can be used in frac pack, gravel pack, and standalone screen applications. The valve provides a reliable means of:

- » Preventing fluid loss to formations after completing initial gravel pack operations
- » Isolating formations during uphole operations throughout the life of the well
- » Helping reduce costs on subsea or deep wells through the use of interventionless technology
- » Use as a barrier in a well suspension system

The closure device is a proven, high-performance ball mechanism that provides a positive bi-directional seal in brine and oil-based mud environments. The debris-tolerant, non-translating ball design eliminates unnecessary movement within the mechanism during opening and closing operations, thus allowing operation in debris-laden environments.

Optimum FS2 valve placement is normally below the gravel pack or liner hanger assembly. Washpipe, located on the bottom of the service tool, is extended through the valve. A collet shifting tool is attached to the end of the washpipe, which upon retrieval closes the valve. This immediately isolates the formation and allows inflow or positive pressure testing above the ball. Remote actuation in the form of hydraulic pressure cycles is then used to open the valve after upper completion installation.



FS2 Fluid Loss
Isolation Barrier Valve

Features and Benefits

- » Initial valve closure is achieved when the washstring/collet is retrieved through the valve.
- » Bi-directional sealing mechanism provides a fully tested downhole barrier.
- » Unlike nitrogen pre-charged systems, the fluid spring indexing mechanism eliminates well-specific setup and enhances long-term suspension capability.
- » One-time remote activation achieved by the application of pressure cycles helps eliminate the need for well intervention.
- » Activation piston provides increased opening force (up to 200% increase over previous FS valve designs).
- » Improved fluid management helps ensure valve operation in debris.
- » Increased differential opening capability.
- » Design provides unlimited mechanical opening/closing of the valve. The indexing system is unaffected by changes in hydrostatic pressure, making it suitable for use in wells with fluid loss.
- » Valve opens on pressure bleed down, minimizing the risk of surging the formation.
- » Full bore ID maximizes production and allows access to the formation.
- » Design incorporates enhanced debris exclusion features.
- » Mechanical shifting profile is incorporated within the design.
- » Sealed actuation mechanism helps prevent control system contamination.
- » Cycling mechanism is isolated from debris in the wellbore.

Qualification Testing

Each FS2 valve is subjected to extensive qualification testing during prototyping. In addition to rigorous discrete component level testing, a full valve test program designed to help ensure reliable performance in well conditions is performed. Testing includes:

- » Remote opening at maximum rated temperature
- » Differential opening capability test
- » Collapse testing at maximum rated temperature
- » Multiple remote open tests in debris

Qualified in accordance with ISO 28781 requirements.

Options

- » Available to suit 7-, 7 5/8-, 9 5/8-/9 7/8-, and 10 3/4-in. casing
- » Ball differential rating up to 10,000 psi (689.5 bar)
- » Collapse rating up to 15,000 psi (1034.2 bar)
- » Burst rating up to 12,000 psi (827.4 bar)
- » Temperature rating to 375°F (190.5°C)
- » Increased differential opening capability

Part Number Prefix: P.226FS2

IB-Series Mechanical Fluid Loss Isolation Barrier Valve

The IB-series mechanically activated fluid loss isolation barrier valve provides a reliable, mechanical solution for fluid loss control during well completion, thus eliminating potential formation damage. Initially designed for electric submersible pump applications, the IB valve isolates the formation below the uppermost gravel pack packer before the upper completion is installed and can be used in frac pack, gravel pack, and standalone screen applications.

During sand control applications, the valve is run into the well (ball open) below the uppermost gravel pack packer as an integral part of the gravel pack assembly. The washpipe, located on the bottom of the gravel pack service tool, is extended through the valve. A collet shifting tool is attached to the end of the washpipe. Upon washpipe retrieval, the collet shifting tool closes the ball and isolates the formation, which enables inflow or positive pressure testing. The lower sandface completion and reservoir is isolated by the closed ball in the IB valve, which permits safe installation of the upper production completion.

The IB valve is opened mechanically using a collet shifting tool attached to the end of the upper completion. The closure device is a proven, high-performance ball mechanism that provides a positive bi-directional seal in brine and oil-based mud environments. The debris-tolerant, non-translating ball design eliminates unnecessary movement within the mechanism during opening and closing operations.

The IB4 valve can be considered as the base design. The collet shifting tool opens the ball mechanism while passing through the valve. This eases space-out concerns and provides maximum flexibility.

The IB5 fluid loss device provides the collet shifting profile of the IB4 valve but also includes a secondary larger ID shifting profile. The secondary profile allows the valve to be opened and closed while maintaining the ID through the valve. The IB5 valve is ideally suited for use in stacked frac pack completions in which a reduced ID might be a concern.

Features and Benefits

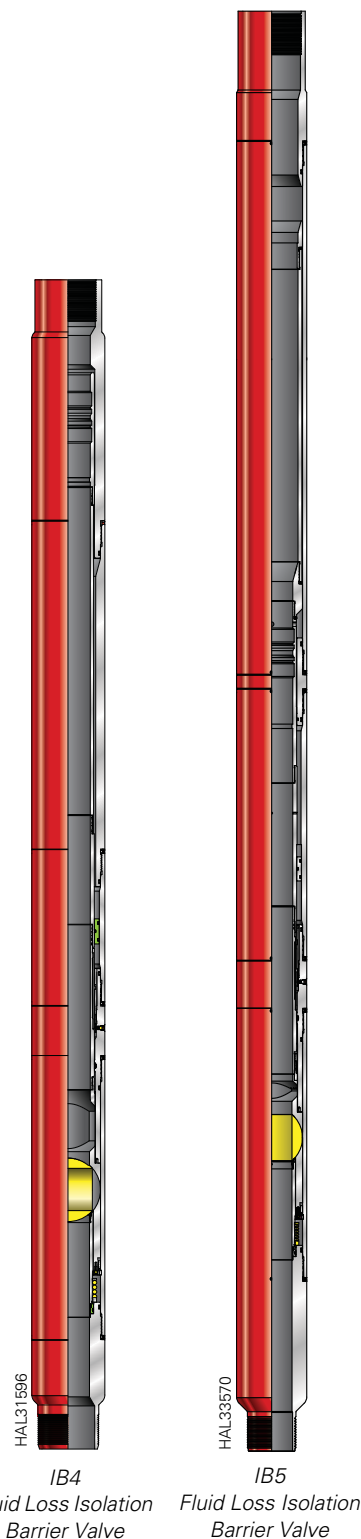
- » Initial valve closure is achieved when the washpipe/collet is retrieved through the valve.
- » Bi-directional sealing mechanism provides a fully tested downhole barrier.
- » Improved fluid management helps ensure valve operation in debris.
- » Design provides unlimited mechanical valve opening/closing.
- » Full bore ID maximizes production and allows access to the formation.

Options

- » Available to suit 7-, 7 5/8-, 9 5/8-, 9 7/8-, and 10 3/4-in. casing
- » Ball differential rating up to 10,000 psi (689.5 bar)
- » Collapse rating up to 15,000 psi (1034.2 bar)
- » Burst rating up to 12,000 psi (827.4 bar)
- » Temperature rating to 350°F (176.7°C)

Qualification Testing

Qualified in accordance with ISO 28781 requirements.



Part Number Prefixes: P.226IB4; P.226IB5

LV4 Downhole Lubricator Valves

The LV4 lubricator valve is a high-performance, surface-controlled, tubing-retrievable isolation barrier valve used as part of a downhole lubricator system. The valve provides a means of isolating well pressure in tubing strings in which it has been deployed. Application of hydraulic pressure to the tool via dual control lines will operate the valve open or closed.

Traditionally, well intervention string lengths are limited to the length of lubricator that can be stacked on top of the production tree. The addition of an LV4 lubricator valve extends these possibilities by placing the swab valve within the tubing string.

Applications

Typical applications include deployment of long tubing-conveyed perforating guns/straddle assemblies and bottomhole pressure/temperature instruments.

- » Forms part of a well suspension system in conjunction with the tubing-retrievable safety valve (TRSV)
- » Allows through-tubing deployment of long length assemblies using intervention methods without killing the well

Features and Benefits

- » Cost savings is achieved by reducing the number of well interventions required.
- » Metal-to-metal body joints.
- » Full bore ID maximizes production and allows unrestricted access to the TRSV.
- » Bi-directional sealing mechanism provides a fully tested downhole barrier.
- » Provides dropped object protection to TRSV during intervention operations.
- » Balanced piston design provides deep-set capability.
- » Shrouded ball mechanism provides high debris tolerance.
- » Mechanical shifting profile incorporated within design.
- » Toolstring shock absorber system protects the sealing system from impact damage.

Options

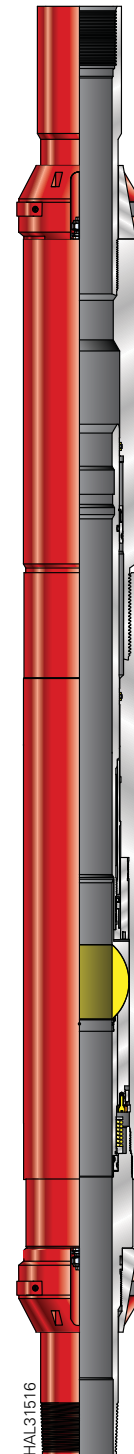
- » Available to suit 9 5/8- and 10 3/4-in. casing
- » Ball differential rating up to 10,000 psi (689.5 bar)
- » Temperature rating to 325°F (176.7°C)

Qualification Testing

Qualified in accordance with ISO 28781 requirements.

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Completion Tools



LV4 Downhole
Lubricator Valve

Part Number Prefix:
P.560LV4

LS0 Liquid Spring Actuation Device

The LS0 liquid spring actuation device is a pressure cycle-operated, self-contained tool used to initiate any hydraulically activated downhole device. The tool allows for setting of equipment after the application of a predetermined number of pressure cycles. Tool operation is performed by a ratchet mechanism that travels each time pressure is applied. When the predetermined number of pressure cycles are applied, communication from the tubing to the control line is opened, allowing pressure to reach the target device.

Applications

The liquid spring actuation device is used when it is necessary to apply a number of tubing pressure tests before activation of hydraulically operated downhole tools. It is primarily used with a twin-flow absolute isolation system (AIS) during SmartWell® or multizone completions.

Features

- » No atmospheric chamber or nitrogen-charged chamber to limit time to actuation.
- » Actuation system is unaffected by changes in pressure in the lower annulus.
- » Control fluid in the actuation mechanism is sealed and therefore protected from contamination.

Benefits

- » Total interventionless actuation of hydraulically operated tools.
- » Unlike similar actuation devices, the liquid spring is not affected by changes in pressure in the lower annulus.
- » Unlike nitrogen pre-charged systems, the liquid spring mechanism eliminates well-specific setup and enhances long-term suspension capability.
- » Fluid used to communicate with the hydraulically activated device is carried within the liquid spring module. Therefore, it remains separate from the tubing fluid at all times, which reduces the possibility of control line blockages.



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LS0 Liquid Spring Actuation Device

Part Number Prefix:
P.224LS0

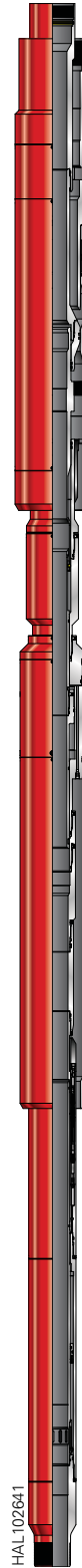
Twin-Flow AIS-LS

The twin-flow AIS-LS fluid control device is designed for use in multizone applications and is particularly suited to SmartWell® or multizone completions. It protects a zone from fluid loss and helps enable separate production between the upper and lower zones. The tool is run in the closed position. It remains in the closed position until the upper zone is completed and ready for production. The tool works in conjunction with a liquid spring module that responds to tubing pressure and only opens after 10 to 12 pressure cycles — with no time limit for actuation. This provides the option of testing the tubing before the AIS-LS device activates and opens.

External differential pressure across the tool has no effect on the indexing mechanism. The device is remotely opened by the application of tubing pressure cycles, which help eliminate the need for well intervention.

Features and Benefits

- » Suited for SmartWell system completions
- » Provides zonal isolation and zone access
- » Eliminates need for intervention to open a zone to flow
- » Provides a secondary mechanical means to open the valve
- » Offers proven and reliable solutions for fluid loss isolation
- » Option of tubing testing before the AIS-LS device activates and opens
- » Protects the zone from fluid loss
- » Allows separate production between upper and lower zones



*Twin-Flow AIS
with LS0 Liquid Spring
Actuation Device*

