

DeepShield deepwater subsurface safety valve

Rely on fail-safe protection in critical deepwater completions

The award winning **DeepShield™ deepwater subsurface safety valve** delivers fail-safe performance in completions requiring low operating pressures due to control system limitations.

As the industry's first VI-validated valve in accordance with the Twelfth Edition of API 14A Specification for Subsurface Safety Valve Equipment, the DeepShield valve underwent more stringent prototype testing than was required by previous versions of API 14A. With only minor modifications to the standard Baker Hughes test program, the DeepShield valve met, and even exceeded, the new API VI validation specifications. One such example is the DeepShield valve's tested cycle count, which is more than 250% of the VI requirements.

Using an integrated nitrogen-charged system, the DeepShield safety valve opposes the hydrostatic pressure acting on top of the piston, balancing hydrostatic pressure to ensure low operating pressures – even in deepwater applications.

The valve's patented operating system is capable of closing in all applications, even if the primary nitrogen chamber pressure is lost. With two independent operating systems and an integral control line filter, the DeepShield valve delivers the redundancy and operational assurance customers need and expect in remote subsea wells.

In addition to undergoing rigorous quality control and inspection of all seals, the DeepShield valve features the following enhancements to ensure long-term nitrogen containment:

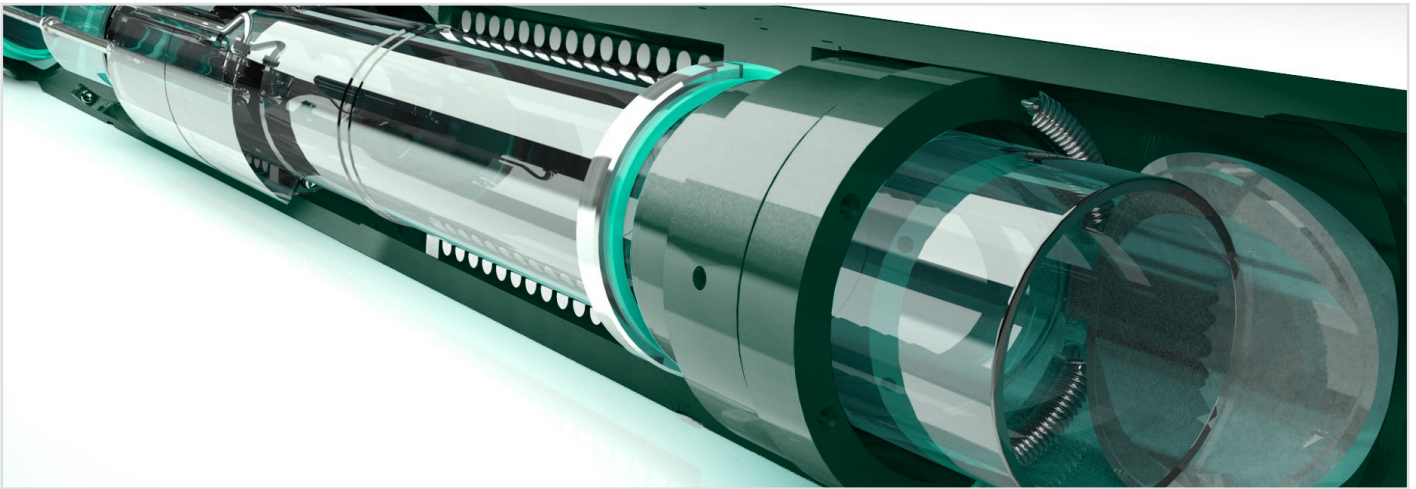
- Redundant seals in the fail-safe piston
- The most robust dynamic piston seal stack on the market
- Increased secondary chamber volume
- Internal alignment modifications
- Reduced leak paths in the primary nitrogen system
- Upgraded materials for enhanced low-pressure sealing performance of the fill ports

Applications

- Completions requiring low operating pressures
- Remote subsea wells
- Deep-set wells in dry-tree applications
- Completions requiring a VI-validated safety valve

Benefits

- Features a primary nitrogen chamber that adapts to changing well conditions
- Provides redundancy via two independent operating systems
- Maintains functionality in harsh, debris-laden environments
- Includes multiple seal stacks between wellbore fluid and the control line to ensure reliable operation
- Maintains a low operating pressure at any setting depth to reduce cost
- Delivers gas-tight sealing and high tensile ratings via proprietary RBT metal-to-metal sealing threads



The dynamic seal configuration represents a significant engineering achievement and was built using reliable, field-proven sealing technology designed for nitrogen-charged safety valves. Fault tolerance built into the DeepShield control system prevents the valve from failing open due to any single seal failure, and redundant operating systems means that no single seal failure will permanently fail the valve closed.

The DeepShield valve also provides additional protection against harsh, debris-laden environments. This is accomplished through an energized scraper ring that protects the dynamic seals from debris ingress, and a high-force power-spring that provides reliable closure in the presence of debris. The flapper closure mechanism's performance has been proven through extreme slam testing (up to 375 ft/sec). For even more

protection, Baker Hughes can deliver chemical treatments directly into the spring cavity of the valve to remove buildup. Additionally, the DeepShield valve features multiple seal stacks between control fluid and wellbore fluid, eliminating failure modes due to hydrate formation in the control line. RBT metal-to-metal sealing thread technology provides gas-tight sealing and high tensile ratings.

When it comes to critical applications, the innovative design and simple operation of the DeepShield valve makes it a smart choice for protecting people, the environment, and investments.

With over 400 deepwater installations around the globe – and in water depths exceeding 9,500 ft (2895.6 m) and valve depths beyond 14,500 ft (4419.6 m) – the DeepShield valve has delivered reliable performance, in very challenging environments.

Contact your local Baker Hughes representative today to learn how the DeepShield valve can deliver fail-safe operation in your next critical deepwater application.

Specification Guide

Size	Working pressure	Max. value OD	Max. seal bore	Temp. rating	API 14A rating
3 ½ in.	10,000 psi	5.940 in.	2.81 in.	300° F (176.7°C)	V1
	15,000 psi		2.56 in.		V2
4 ½ in.†	10,000 psi*	7.400 in.	3.81 in.		V1
	15,000 psi	7.560 in.	3.81 in.		V1
5 ½ in.†	10,000 psi*	8.260 in.	4.56 in.		V1
	15,000 psi	8.600 in.	4.43 in.		V1
7 in.†	7,500 psi‡	9.375 in.	5.95 in.	V1	

* Optional gas-tight closure mechanism available to provide zero bubble performance, even in low pressure differential applications

† Integral chemical injection in spring cavity available for improved performance in high-debris environments.

‡ Optional super-slam closure mechanism provides reliable performance in high-rate-gas applications.